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HUMAN FACTORS

HF Case Workshop Report

EUROCONTROL

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EUROPEAN ORGANISATION
FOR THE SAFETY OF AIR NAVIGATION

EUROCONTROL

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Abstract

This is a report of the proceedings of the EUROCONTROL HF Case Workshop held in Brussels 26-28 November 2007. The workshop addressed Integrating Human Factors (HF) into Air Traffic Management (ATM) projects using the HF Case and similar methodologies.

The Workshop included a tutorial on the HF Case, presentations from EUROCONTROL and industry representatives on examples of HF integration, working group sessions to provide solutions for improving the HF Case process and better integrating HF into ATM, and a keynote address.

The outcomes of the HF Case Workshop are summarised and presented in this report.

Keywords

HF Case | Human Factors | Integration | ATM

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EXECUTIVE SUMMARY

This is a report of the Proceedings of the Human Factors Case Workshop held at EUROCONTROL from 26 to 28 November 2007. The workshop marked the launch of the revised HF Case process. It brought together around 100 participants from Europe representing Air Traffic Service Providers, Airlines, Industry, Universities and R & D organisations to share experiences and lessons learned from integrating Human Factors in aviation projects. Participants heard about the experiences from applying the Human Factors Case in EUROCONTROL Programmes (FASTI and N-FPDS in UAC Maastricht), and also about the experience of DFS, NATS and Airbus from integrating human factors into their system design processes.

The workshop was run at a time when the impacts of increasing automation on human performance are moving into the spotlight. This is especially so in the context of the SESAR operational concept which foresees large changes in the roles and responsibilities for operational staff.

This report outlines the HF Case process as presented at the workshop and summarises the presentations given on integrating HF into ATM projects and participants' initial experiences using the HF Case in projects to date. The outcomes of working group sessions to consider the future application and improvements to the HF Case process are also given.

Overall feedback from the workshop was extremely positive, both in terms of the workshop itself, and the response to the revised HF Case methodology. The next step will be to gain further practical experience using the HF Case within ATM projects and to establish an interest group to assist in sharing the lessons learned to further develop the process.

Workshop Recommendations

1. To develop a training course to train a body of HF Case Co-ordinators for applying the HF Case in ATM projects.
2. To establish an interest group to provide a forum for sharing the lessons learned, to further develop the HF Case methodology, and to determine best practices.
3. A follow up workshop in 2009 would provide the next opportunity to share lessons learned in the further application of the HF Case.
4. A Business Case for HF Integration should be developed as a complimentary tool for managers to fully understand the benefits from integrating HF into their ATM projects at all stages of the project life cycle.

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1. INTRODUCTION

1.1 Background

The DAP/SSH Human Factors Domain workshop represented an important phase for Human Factors Integration in ATM Projects. The initial HF Case concept was launched in mid-2004. Initially, the focus was for application in EATM projects and it has been applied within several EUROCONTROL projects. During 2006, the HF Case was revised to incorporate lessons learned from this experience. In addition, together with external stakeholders, it has been adapted for application in local ATM environments external to EUROCONTROL.

The aim of the workshop was to share experiences and determine EUROCONTROL stakeholder needs when integrating HF in ATM.

1.2 Workshop Objectives

The main objectives of the workshop were to:

- Introduce the revised HF Case process as a method to manage the integration of HF in ATM projects.
- Discuss user needs and requirements for applying the HF Case.
- Share experiences and lessons learned when integrating HF in ATM.

1.3 Workshop Programme

The hands-on practical workshop presentation format was designed to promote HF integration in ATM with an emphasis on the HF Case as a primary method of support. (See Appendix 1 for the detailed Programme).

Day 1: HF Case Tutorial:

Hands-on familiarisation sessions for small groups on the revised HF Case Process using a case study example. This was followed by a poster and networking session. (See Appendix 2 for an overview of posters).

Day 2: HF Integration into ATM:

The morning session saw five presentations on the application of the HF Case with concrete examples of HF Integration in aviation. The afternoon session enabled facilitated discussions by five separate working groups on:

1. Using the HF Case in ATM projects.
2. Training requirements for applying the HF Case process.
3. Improving the HF Case methodology.
4. Communicating the benefits of integrating HF to organisational decision-makers.
5. Sharing experiences and lessons learned in HF integration.

Day 3: Plenary Session:

The session commenced with feedback from the Working Groups followed by the keynote address on the theme “HF Integration: Moving forward”.

1.4 Workshop Achievements

The workshop was attended by 99 participants including management, operations staff and HF specialists from EUROCONTROL, ANSPs, industry and R & D institutions. Following the tutorial, presentations and discussions, the workshop objectives were met by:

- Demonstrating the HF Case process in a first day tutorial.
- Sharing lessons learned from HF integration experiences presented by participants.
- Discussing what is required to implement the HF Case in ATM projects.
- Deriving workshop conclusions and summarising these for further development.

1.5 Report outline

The HF Case workshop report is structured as follows:

- Section 2: HF Case Overview.
- Section 3: HF Case Tutorial.
- Section 4: Presentations on HF Integration.
- Section 5: Feedback from Working Groups.
- Section 6: Workshop Evaluation and lessons learned.
- Section 7: Conclusions and recommendations

2. HF CASE OVERVIEW

2.1 Rationale for the HF Case

The role of HF in ATM system design, evaluation and implementation is critical. With increasing automation, HF can determine the impact on human performance and give guidance on ways to optimise the fit of human in the automated system. Since ATM is still critically dependent on effective human performance, it is crucial that HF issues are managed effectively. The challenges for many project managers to integrate HF into their projects are:

- Application of HF can be complex and difficult to understand.
- Interventions are often made too late in the project life cycle.
- Making a case for HF is challenging.

The goal of HF is to better match the system to the human, and the human to the system. Incorporating the wider view of all the HF aspects into the design and ongoing operation of the ATM system increases efficiency, enhances safety, and reduces costs in the long term. The HF Case has been designed to facilitate managing HF within the ATM system.

2.2 History

The HF Case was launched in August 2004, supported by the first edition of the deliverable 'The Human Factors Case: Guidance for Human Factors Integration' (EUROCONTROL, 2004). The primary focus of the original HF Case was for application in European Air Traffic Management (EATM) projects within EUROCONTROL. Using the HF Case in a number of EUROCONTROL projects highlighted areas where the process could be refined and improved. Additionally, a growing interest in using the HF Case from EUROCONTROL external stakeholders suggested a widening of the original scope.

The second edition of the deliverable (EUROCONTROL, 2007) incorporates lessons learned from the application of the HF Case so far. It has been adapted to support those wishing to introduce the HF Case methodology into their organisations. The main change to the updated HF Case is that:

- it now has five clearly defined stages instead of four;
- a flow chart helps users to determine where they are within the process, and the required inputs and outputs for each stage have been made more explicit ;
- in addition to the familiar "HF Pie" classification tool (which has been slightly modified to cluster issues organisationally, there is a new "HF Impacts wheel" classification tool to aid assessment of how HF Issues will impact on human performance in the system;
- definitions for the HF Issues prompts have been significantly expanded in the Guidelines.

To support the application of the HF Case process an internet database tool (e-tool) has been developed. The HF Case e-tool enables:

- documentation and tracking of the HF issues for a project as it moves through the various transition life cycle phases,
- online recording of information during the Issues Analysis workshop,
- online report templates.

2.3 HF Case Process

The HF Case is a five-stage process to systematically identify and address HF issues as early as possible in the project life-cycle. The HF Case stages are:

- Stage 1 - Fact Finding: This stage records the factual information about a project, including its background, system and environment, key stakeholders and documentation. The objective is to scope the project from an HF perspective to identify what will change, who will be affected, and how.
- Stage 2 - Issues Analysis: This stage is about the identification and prioritisation of the project-specific HF Issues and their potential impacts on the project.
- Stage 3 - Action Plan: During Stage 3 an Action Plan is developed which describes actions and mitigation strategies to address the HF Issues identified for the project.
- Stage 4 - Actions Implementation: This stage implements the Action Plan. The output is the HF Case Report which provides findings and conclusions from the actions taken to address the HF Issues from Stage 3.
- Stage 5 - HF Case Review: This stage provides an external review of the HF Case as it was applied and suggests recommendations for improvements to the HF Case methodology.

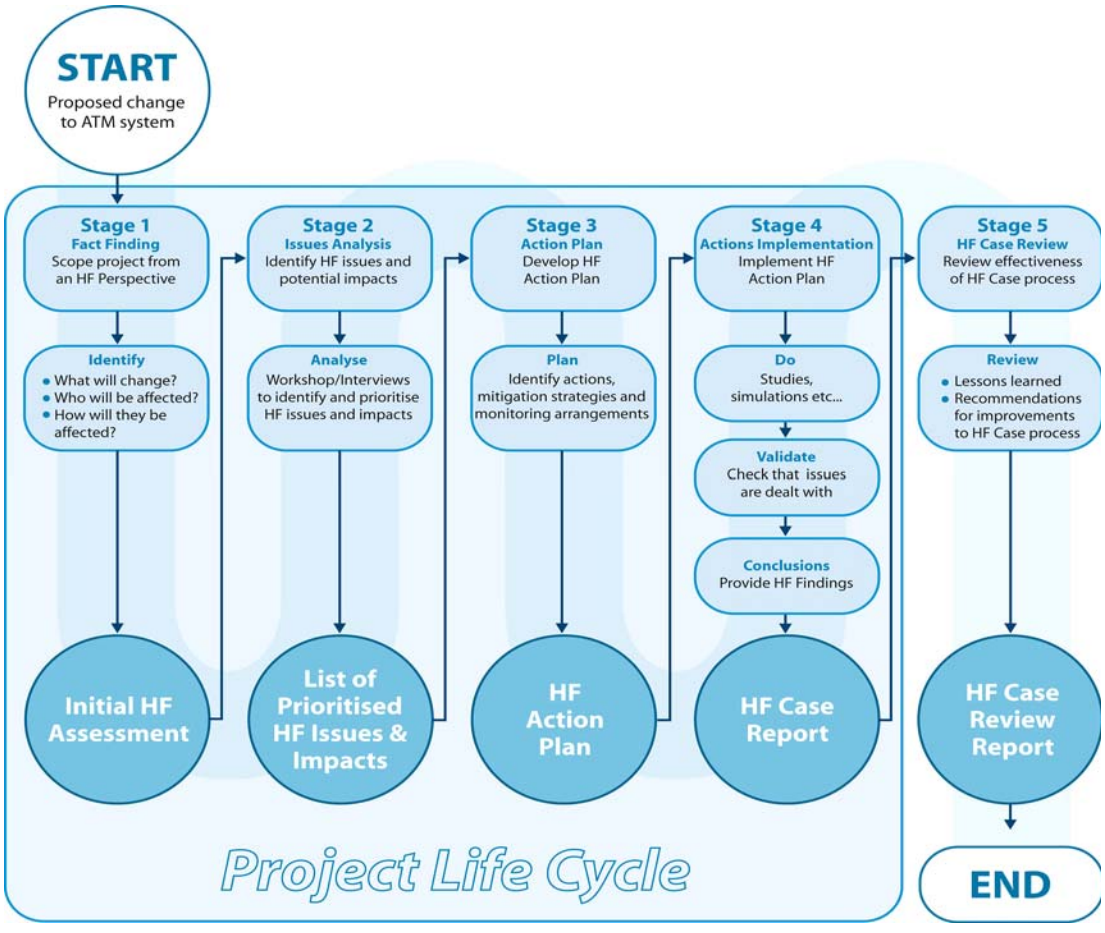

Figure 1: HF Case Process Flow Diagram

2.4 HF Case focus and benefits

The HF Case focus is on the impacts of system changes upon the human, e.g. augmenting human strengths and compensating for human limitations to improve total system performance. It can facilitate project management interventions to address issues such as:

- operator acceptance and trust in the new/changed system or tool;
- operator motivation;
- training and re-training requirements;
- selection profiles;
- job role changes;
- skill and competency requirements;
- fall back processes
- appropriate staffing levels

The HF Case is intended to be:

- a management tool to provide a process to address HF Issues for a project. A phase of the process includes the identification and analysis of HF Issues, their impacts and mitigation;
- the application and integration of Subject Matter Expert (SME) and HF knowledge;
- a comprehensive qualitative analysis methodology.

It is not intended to be:

- a quantitative measurement tool;
- the HF element of a Safety Case. However, addressing the six categories from the HF Pie may lead to the identification of safety-relevant issues that can be used to inform a Safety Case.

The HF Case looks to optimise the human input into the system with efficiency, capacity and safety considerations. For example, Stage 4 of the HF Case may identify safety-relevant HF Issues from an in-depth examination of:

- ‘human error’ (particularly via human error-prediction methods),
- threat and error management,
- human recovery from system failures,
- fatigue,
- workload, etc.

The HF Case benefits include:

- Confirmation and support for the development and application of proposed system performance objectives and criteria
- Guidance and management of the HF aspects in the design cycle

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3. HF CASE TUTORIAL

3.1 Introduction

The objective of the HF Case Tutorial on Day 1 was to:

- Introduce the HF Case Process.
- Walk through the HF Case Process.
- Gain an insight into how the HF Case Process can be applied.

3.2 Structure

The tutorial consisted of four parts:

- *Part 1:* Plenary session providing a general overview of the HF Case.
- *Part 2:* Break out sessions with four groups for participants to get a general understanding of Stage 1 to Stage 3 using a case study and practical exercises.
- *Part 3:* Plenary session on Stage 4 and 5, with a brief demonstration of the e-tool and general questions and answers.
- *Part 4:* Poster session[1] and networking reception.

3.3 Feedback

3.3.1 Awareness Level

Prior to the workshop participants had low awareness of the HF Case and following the workshop participants reported that they now had a good awareness and the workshop was highly relevant to their job, an that the content and delivery at the workshop was extremely good.

3.3.2 Tutorial Expectations

Overall participant's expectations were met. In cases where the expectations were not fully met, participants were seeking a more hands-on experience in the application of the HF Case with more time to work on a complete example.

Over 50% of the participants are interested in receiving further information and training on the HF Case Process.

3.3.3 Tutorial Likes

Participants liked in particular the:

- Case Study/Examples which made the break out sessions hands on.
- Clarity and practicality of the break out session structure and exercises.
- Group work /Facilitation provided for interactive discussion.

[1] PDFs of the posters can be downloaded at http://www.eurocontrol.int/humanfactors/public/standard_page/HF_Case_WS.html

3.3.4 Tutorial Improvements

The main suggestions for improvement were:

- *Time:* There was a general request for more time for the group work e.g. HF Issue priorities, how to manage situations where they come up at different conceptual levels, issues that overlap, and links between causes, impacts and mitigations.
- *Group set up:* Group size for the break out sessions should be smaller e.g. maximum 10 people.
- *Clarity:* The introduction on the HF Case in the Plenary Session could be more detailed on the benefits with practical examples on the application.

4. HF INTEGRATION PRESENTATIONS

4.1 Presentation overview

Following the welcome address on Day 2, presentations[2] were given on:

- The application of the HF Case Process in the First ATC Support Tools Implementation (FASTI) Programme;
- HF Integration in ATM Projects in NATS;
- HF Integration in ATM Projects in DFS;
- HF Integration in Airbus;
- The application of the HF Case process to the New Flight Data Processing System (N-FDPS) in Maastricht UAC.

The Day 3 keynote address was entitled “HF Integration in future ATM – Why not?”

The key points made in each presentation are summarised as follows.

4.2 Welcome Address (Guido Kerkhofs)

The key messages from the welcome address were:

- European ATM faces enormous challenges coping with future changes relating to traffic growth and the automation needed to manage the capacity increase.
- HF need to be considered as early as possible including making use of the HF Case in order to meet these challenges and to share lessons learned.

‘Making the best use of Human Performance’ was the theme suggested for a successful workshop.

[2] PDFs of the presentations can be downloaded at http://www.eurocontrol.int/humanfactors/public/standard_page/HF_Case_WS.html

4.3 Application of the HF Case in the FASTI programme (Chris Brain)

The objective of the FASTI programme is to co-ordinate the use and deployment of controller tools and system support across Europe by 2012. The FASTI toolkit includes conflict prediction tools (e.g. MTCD) and enablers (e.g. MONA, TP HMI and SYSCO). The FASTI programme wants to ensure that the HF elements are addressed fully to encourage the acceptance of the FASTI tools and assist in managing the transition.

Key aspects for the application of the HF Case in the FASTI Programme are:

- FASTI tools are at a conceptual (generic) level.
- The HF issues and findings are also generic. They act as a checklist and guide for individual Air Navigation Providers (ANSPs) when implementing the FASTI tools locally.

The HF Case was applied from August 2005 to April 2007 during the Initial Implementation and Operational Validation Phase for the FASTI Programme.

- Stage 2 identified 66 issues.
- Key deliverables from Stage 4:
    - Good Practice guidelines – generic and specific to the FASTI tools.
    - Cognitive Task Analysis (CTA).
    - HF Case Report.

The main lessons learned were:

- The HF Case contributed to the maturing Operational Concept.
- Mapping of issues to guidelines/CTA recommendations.
- Good access to expert knowledge in team and Focus Group.
- Generic application of the HF Case is only part of the overall process; the next step is local implementation to integrate HF.

The main benefits for applying the HF Case were:

- Structured Approach
- Provided explicit HF focus
- Output digestible and comprehensive
- Offered solutions
- Fostered team understanding of HF issues

Further information can be found at *www.eurocontro.intl/fasti*

4.4 HF Integration in ATM Projects in NATS (Nic Turley)

The HF Group in NATS is located within the Division of Safety. The HF Group has three main streams – Projects, Safety, and Training. It is integrated into the organisation by having HF Lead(s):

- on Future Centres Strategy Team
- on IPT for major projects
- at Centres and major airports

The aims of the HF Group are to:

- Identify potential for detriment and opportunity for benefit;
- Remove human error sources and reduce development and through-life cost;
- Remove health and safety risks and therefore remove sources of human error;
- Respond to demands for increased performance by improving efficiency.

"Human performance is a balance between human capabilities and task demands, problems are often the result of imbalance".

The approach and methodology for HF integration is described as the HF Assurance Framework (see Figure 2). It covers:

HF Risk/benefit assessment

HF Assurance activities

HF Assurance deliverables

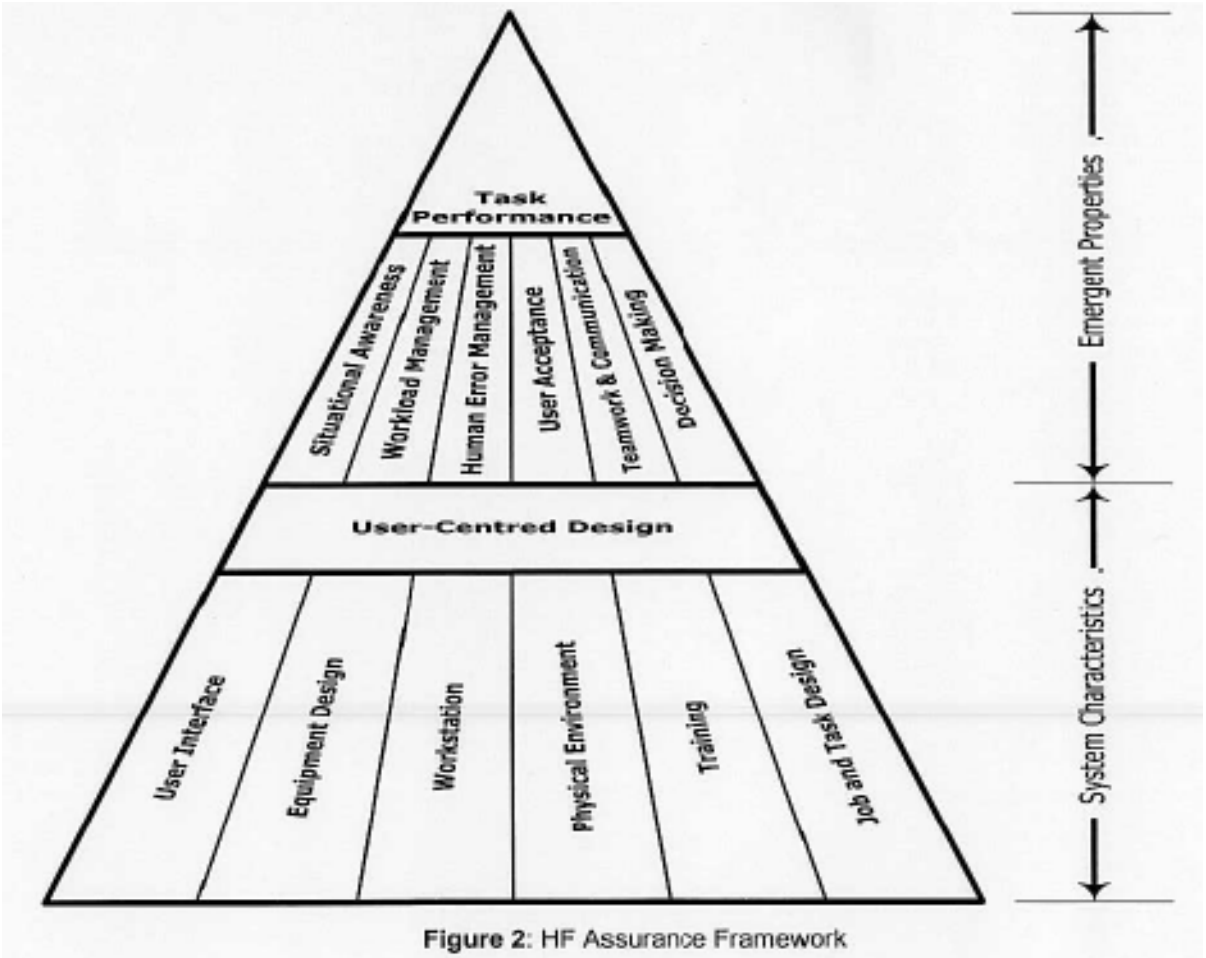

Figure 2: HF Assurance Framework

HF Assurance Typical Activities:

- HF management
- HF risks and benefit control
- User centred design
- Requirements and Validation
- User task, training and MOPS development and validation

Support to the Business process:

- HF risk assessment
- Phase review process
- Validation (Operational and safety)
- Transition and change

HF Integration in iFACTS:

iFACTS (interim Future Area Control Tools Support) is the NATS implementation of the FASTI toolset. It contains NATS own T/P and MTCD. Designed for use by Tactical Controller, it will enter service at LACC in early 2009. iFACTS aims to provide significant safety and capacity benefits over the entire London FIR.

The role of HF in NATS is to:

- Provide HF benefit
- Ensure that the system is fit for purpose
- Ensure that the system delivers the required level of performance
- Remove HF risk
- Protect (mitigate) against hazardous conditions
- Provide evidence to support the Safety Case
- Provide evidence for External Regulatory Safety Requirements

NATS champion a User Centred Approach. They have invested heavily in:

- User buy-in through:
  - Workshops
  - Simulations
  - Rapid prototyping
  - Demo room at target ACC
  - Training design
  - HMI Development
- Verification and validation with:
  - Verification (iFACTS Project)
  - Fitness for purpose (Operational Managers)
  - Safety (Director of Safety)
  - Safety (Regulator)

Lessons learned

- Location within the organisation is critical
  - Division of Safety
  - Future Centres Programme
  - Projects
- Be engaged with the business process
  - Early HF risk/benefit assessment
  - Phase review questions
  - Safety Case development
- Be engaged with the projects
  - HF Leads are Work Package managers
  - HF requirements and risks on project databases
- Have a clear message
  - Don't make promises you can't keep
  - Be part of the solution
- Be engaged with the customer
  - 150 customers consulted
  - 'Generous listening'
- Have a simple process
  - HFA Triangle
  - HF Risk/benefit assessment

"The only constant I am sure of is this exhilarating rate of change..." HERTES

"If you feel in control you probably aren't going fast enough" JMW (NATS Fit for the future)
Peter Gabriel "Downside Up"

4.5 HF Integration in DFS (Stefan Tenoort, Alexander Heintz, Jorg Leonhardt)

DFS focuses on creating the right balance in the development of ATM systems and incident analysis between systems, procedures and operators. DFS are moving towards earlier integration in the development of new systems and components e.g. validation of systems, procedures and HMI. Some examples for HF integration in DFS projects are:

1. P1/ PSS - HF was involved in simulation activities for 'Design Acceptance' during the latter stages of the development phase through:
    - Measurement of HF aspects
    - Qualified debriefings
    - Input for Design
2. VAFORIT (UAC Karlsruhe) - HF was involved during Development (Competence Acceptance) and Implementation (Acceptance of health at work) through:
    - Train the Trainer for upgrade training
        - Methods, software
        - Experts in local projects
        - Dealing with resistance
    - HMI optimisation VAFORIT
    - Literature research
    - Inclusion of medical experts
    - Recommendations

DFS sees a 'Human Factors Platform' (see Figure 3) as the way forward. This means:

- Integration of HF expertise from all affected units;
- Safety Management, R&D, Academy, Ops units (en route and TWR);
- Implementation of harmonised standards and methods; e.g.
    - HF Case as a standard for project management;
    - HMI analysis and guidelines.

Three levels of Human Factors management

Integration	Structures	Harmonisation
Integration of HF in project management guidelines	Establish HF Platform and create acceptance	Develop DFS standards, guidelines
Validation and simulation of concepts, procedures and technologies	Integration of HF aspects in Safety assessment (HRA)	Support development and implementation of international standards
Competence and ability requirements resulting from future systems	Transfer of knowledge (e.g. HF Newsletter, HF training)	Align activities in different units

Figure 2: Human Factors Platform

4.6 HF Integration in Airbus (Florence Reuzeau)

The Airbus focus is on adapting the work to the human to ensure safe, efficient, and easy operations. The primary focus is on the work related to the pilot for which the key drivers for cockpit design are:

- Safety
- Traffic, Flight and flight crew efficiency
- HF certification compliance

Anticipation of the future evolutions

The Safety driver regulation (CS-25 1309) has implicit HF requirements, compared to explicit HF for flight deck certification requirements (CS 25-1302). The A380 was put forward as a good example of HF application in cockpit design from concept to implementation. The A380 uses novel technology on the flight deck with complex systems and interactions. The HF Design Process has to:

- Justify the level of novelties and complexities;
- Define the appropriate demonstrations.

Means of compliance are:

- HF studies throughout the process, application of guidelines, simulations, tools…..
- Involve airline pilots.
- Predict the users' behaviour during the design cycle as much as possible

Deliverables include:

- Design evolutions
- Training or documentation items
- Acceptability of the cockpit

HF relevant disciplines and required competencies

Psychology	***Physiology***	***Linguistics***	***Health***	***Sociology***
Automation Decision making Human errors Cognitive resources and workload Situation awareness	Workload Anthropometry Biomechanics	Terminology Syntax Abbreviations Controlled Language	Venous thrombosis Telemedicine Health and Safety	Human-human co-operation Culture

Critical success factors for Airbus in HF Integration are:

- Management support
- Power
- Added value, competences in techniques and HF
- Relevance to duration
- Go to the end of design and Entry Into Service

"The constant evolution in technology and the new challenges for air and ground provides opportunity for integration between air and ground."

4.7 Application of the HF Case to the N-FDPS at Maastricht UAC (Herman Baret)

The reason for developing the N-FDPS in Maastricht is:

- Obsolescence of current flight server (maintainability);
- Inherent functional limitations in coping with new ATM requirements;
- Increase safety and productivity using new tools made possible by good trajectory prediction algorithms, flexible sectorisation and interoperability (systems, procedures) with neighbours.

The N-FPS represents:

- New generation of Flight Data Processing system
- Modification of 11 legacy systems (interfaces and functional ATCP HMI - more than two thirds of the code fielded in 2002 has been modified)
- Continuous evolution of the centre infrastructure (technical and time synchronisation with 13 legacy systems)
- Mixed Civil Military environment

For the N-FPDS Programme:

- a full formal safety case from the onset
- HF Case – initiated 3.5 years into the programme
- Interoperability regulations (EC) No 552/2004 applied to N-FDPS and HMIs
- EC Declaration of Verification of systems
- Significant e- learning package

The N-FDPS contract started on 29 April 2003. The definition of the new HMI started at the end of 2003. Key elements:

- Support end-users (SMART TEAM) - 1 HF expert
- Rapid prototyping
- Pioneered first large scale Safety Case mid 2001
- Lessons Learned from N-ODS project

HF Case Application

Maastricht UAC is convinced for the need for a HF Methodology as there was none in place. In 2004, the HF Case Version 1.0: Guidance for Human Factors Integration was CONSIDERED BUT …*"The formats to be used for the Human Factors Case assessment are under development and will be specified at a later date".* This meant that the HF Case was discounted at that time.

There was renewed interest in September 2006. The revised HF Case (Version 2.0) was applied from Stage 1 to Stage 4 from December 2006 to November 2007. The next steps are to reassess the action plan and action implementation status and review the HF Case Report.

Lessons Learned

- HF Case to be considered from the outset and embedded in the lifecycle of the ATM project.
    - STAGE 1: During elaboration of specs, before Call for Tender, impact on project definition and organisation
    - STAGES 2 - 4: Iterative with Focus
    - STAGE 5: Complete before O-Date
- Importance of Stage 1, Fact Finding.
- Careful selection of staff involved in Stage 2 Issue Analysis
    - Motivation
    - Group coherency vs. changes to be made (ATCO, FDS; GAT, OAT)
- Importance of supporting tools – HF Case e-tool
- Another cost overhead or an investment that pays off?
- Remain pragmatic – a good checklist and much more
- Specific studies on ATCO workload recommended but may slow down the project
- Importance of Post O-Date monitoring
    - Pre-empt problems
    - Proactive in finding/implementing solutions
- Effort – function of nature of the project
- Keep separate from Safety Case
    - Need for creativity
    - Regulatory Baseline MANDATORY
- Overall a positive experience

This time - “late start and available timeline did not allow the full benefits to be realised”

4.8 Keynote address 'HF integration in future ATM – Why not?' (Peter Jorna)

To integrate HF requires a:

- Need for standards and defined outcomes,
- Focus on solutions and to not only identify problems.

4.8.1 Three key stages of HF Integration **– Consideration, Integration, Certification**

Consideration – from ergonomics to HF

Integration – automation drives HF Issues

Certification – example HF Harmonised Working Group Sub-group B outcome

- Lack of specific requirements
- Mysterious unexceptional pilot
- Not up to date with technology
- Separation of design and use of equipment
- No referral to task concept
- Many deficiencies
- Even more deficiencies

A new rule is in order - HF Certification is task based in the legal and real world

SESAR will require future developments of the ATM Target concept. These should include certification of new roles and responsibilities in order that the legal implications may be assessed.

HF Challenges

Task of controller shifts from executive control towards supervisory control

- More and earlier planning
- Control of traffic flows instead of aircraft
- More monitoring, less vectoring of individual flights
- Maintaining situation awareness of controller

Traditional skills needed for non-nominal situations

- Gap widens between demands under nominal and non-nominal conditions
- Maintain hands on skills of controller

Task analysis measures and individual differences

- Consider the Human Task as a process simplified human information processing model
- Structured source for Human requirements
- Human task behaviour: Need workable rules, procedures and good training – should be knowledge, rule, and skilled based.

Automation: a blessing or curse?

- Positive effect of automation on heart rate variability
- Better performance detecting ‘unconfirmed’ ATC data up links
- Will change be accepted easily? Negative effect on subjective workload.
- Managing the implementation of automation?
- Communication issues should NOT be underestimated
- Expect unexpected user behaviours
- Objective validation: helping the controller?

HF Case

- Show me the money: a management tool.
- Strong on organisation and communication.
- Single case or company process – trade off
- Task perspective needs more focus
- Step towards certification and means of compliance

Challenges

- Business context is changing
- Tasks and tools will change also
- Learn new HF lessons before the accidents…….INNOVATE

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5. WORKING GROUPS

5.1 Overview

Five working groups discussed the following topics:

- WG1: Using the HF Case in ATM Projects
- WG2: Training requirements for applying the HF Case process
- WG3: Improving the HF Case Methodology
- WG4: Communicating the benefits of integrating HF to organisational decision makers
- WG5: Sharing experiences and lessons learned in HF Integration

Feedback from each working group session follows:

5.2 Working Group 1: Using the HF Case in ATM Projects

Objective

To capture challenges in using the HF Case in ATM projects and identify solutions for overcoming these challenges.

Outcome Summary

HF Integration / HF Case Challenges	**Potential Solutions**
Stakeholder input time and energy	Get stakeholders involved as early as possible
Convincing management and others in the team	Convincing others by highlighting relevance of HF
Financial (business case implications)	Highlight financial implications by using examples of potential losses and savings
Prioritisation (of risks and mitigation)	Prioritisation – defining criteria e.g. similar to SAM
Methodology – identification of causal factors 'whys'	Methodology – identification of causal factors 'whys'. e.g. issues log
Diluting and manipulating process (hijacking)	International standards and clearly approved methodology
Integration of Process – link to safety case, potential duplication of efforts	Involving the right people

5.3 Working Group 2: Training requirements for applying the HF Case

Objective

To identify training requirements issues and concerns and how to resolve them

What should the training aim to achieve for each identified role?

Role	*Training Required*	*Areas of Interest*
Project Team and SMEs	Awareness	▪ HF Case Process Overview ▪ Benefits for them ▪ Their role/involvement in the process
Project Manager	Awareness	▪ Benefits ▪ Examples ▪ Resources ▪ His Role ▪ How is it going to fit the project?
HF Specialist/HF Case Co-ordinator	Application	▪ Managing the HF Case Process (e.g. liaising with PM, what to do in each stage, reporting and documenting each stage) ▪ Understand the ATM Context
HF Specialist	Awareness	▪ HF Case Process Overview ▪ Their role/involvement in the process ▪ Knowledge of HF in ATM Context
HF Case Co-ordinator Assumption: Non HF Specialist and supported by an HF specialist as required	Application	▪ Managing the HF Case Process (e.g. liaising with PM, what to do in each stage, reporting and documenting each stage) ▪ Understand the ATM Context ▪ General HF Understanding

How to address the 'HF Case Awareness' Training Package?

- Organise Workshops – awareness initiative for managers
- Produce Awareness Package Material for HF Case Co-ordinators to take home
- Case Studies
- Posters
- Brochures/leaflets
- Emphasise Measurable results
- Briefings

How to address the "HF Case Application" Training Package?

- Skills Training in managing the HF Case Process
- Provide variety of training material to meet training objectives
- Include a case study on which attendees need to work
- Set up a user group and network of practitioners to share best practice
- Consider off-site training

5.4 Working Group 3: Improving the HF Case Methodology

Objective

To identify improvements to the HF Case methodology

- What aspects of the HF Case methodology could be improved?
- Process to manage the improvements

Outcome Summary

Methodology Improvements

- Create a list of do's and don'ts for each step in the process
- Development of a structure for each step
- The process should suggest ways in the "What If" process to release potential benefits from the changes
- At some stage: General guidance on "Best Practice" communication interrelationships between all project team and outside key actors

Stage 2:

- Human Impacts should be categorised, expanded, and contextualised (physiological, psychological, social aspects etc.)
- The term System (equipment, people, processes) should be defined to specify the list of impacted system performances.

Stage 3:

- HF Action Plan should highlight how the actions are related
- Elaborate better criteria to extract priorities for the Action Plan also based on importance of matched requirements
- Prioritisation should be clearer with HF as well as Project considerations

Stage 4:

- Provide guidance to identify methods and tools appropriate for certain maturity stages of the product development (linked to HIFA)
- Flexible methodology to take 'available constraints into account
- Opportunities at each identified project stage (HIFA, R&D phases, and industrial phases)
- Appropriate tools to produce timely results to feed the development process and other domains like safety according to the project planning; and to facilitate decision-making.
- Add guidance on how the HF Case report might look like to specifically address identified decision makers' and regulators' information needs (to demonstrate acceptability).
- Disseminate best practice and lessons learned through user groups/focus groups (Role for the HPFG).

5.5 Working Group 4: Communicating the benefits of integrating HF to organisational decision makers

Objective

To identify ways to communicate the benefits of integrating HF to organisational decision makers

Outcome Summary

Management Orientation	Perspectives	Suggested solutions
Cost focused	▪ Managers who are cost and profit driven ▪ Managers who invest when they can see an advantage in monetary figures ▪ Convincing through monetary cost benefit arguments ▪ Managers who prefer cost-neutral or saving solutions	▪ Develop a business case, including cost benefit analysis ▪ Clearly demonstrate a convincing argument with a supporting financial model showing the cost savings ▪ Communicate with managers, find out what they want – LISTEN! ▪ Have something "appetizing" to offer ▪ Illustrate the "cost of accidents" if you don't comply with good practice
Positive	▪ "OK, I agree! - Now what"? ▪ How to integrate and incorporate HF? ▪ Develop the right team, structures, processes ▪ Setting the right pace, being able to deliver ▪ Making best use of human performance - "exploiting"	▪ Need a good HF facilitator/coach ▪ Standardised and accepted process – need to be consistent in tools and techniques ▪ Embed the HF process in the business process
Negative	▪ Avoiding HF, finding excuses ▪ Perception that HF is not concrete, intangible, fuzzy concepts ▪ Do not understand the link, how it relates to day-to-day business ▪ Slows down achievements of business goals ▪ Afraid that HF analysis will find problems	▪ Whenever a problem is identified, need to also come with solution ▪ Collect and communicate tangible, objective data that illustrate the benefits ▪ Understand the business context. Don't be afraid to confront, if appropriate. It helps if HF has a strong status within the organisation. Be strong! ▪ Know when to back off or withdraw. ▪ Ask for specific evidence where HF might have slowed things down. ▪ Challenge this perspective.

Positive but not yet there	▪ Need evidence to be convinced to invest ▪ Concise	▪ Clarify deliverables and manage expectations ▪ Avoid deliverables being reports, not always read and understood ▪ Short and snappy benefits and success stories. Clear and direct statements and models - get people enthusiastic – "Wow!" ▪ Author needs to re-read their report ▪ Bring out key points in a summary ▪ Identify and resolve misunderstandings amongst stakeholders
Personal interest	▪ Personal gain ▪ Personal gain may not always equal organisational benefits	▪ Understand motivational drivers ▪ Responsible entrepreneur ▪ Demonstrate alignment of goals – pulling in the same direction ▪ Illustrate the personal gains that can be achieved from the process ▪ Encourage organisational citizenship
Fear of the unknown	▪ Failure to communicate and to understand each other perspective ▪ Vulnerability/uncertainty (my boss may not be supportive of this) ▪ "Cover my ass" ▪ I don't know what I'm stepping into ("booby trap", "can of worms")	▪ Provide reassurance, "stand in the future" ▪ Success ▪ Failure ▪ Develop awareness of integral role of HF ▪ Explain that a lot of benefit can be achieved with minimal pain and effort – "quick wins" ▪ Ensure they have control ▪ Use HF advocates project managers who already been convinced – use them to assist

Challenges for HF Practitioners

- Organisation and culture
- Set of facts / evidence
- Application to projects
- Standardisation: try to get influence from outside the organisation
- Money: Cost is scary, how money can be an obstacle
- Communicating with decision makers: with a view to convince
- Lack of knowledge
- Wish list

Actions: Communicating with decision makers with the view of convincing them

- Show incident data/statistical data comparing human performance problems with equipment performance problems
- Elaborate on cost of incidents due to human performance issues Vs technical performance issues
- Show capacity and efficiency gains at lowest cost
- Illustrate/show examples of positive implementation
- Develop application plan with short term, medium term and long term results
- Explain what HF is
- Listen to managers issues
- Point out a project where HF would have been beneficial in hindsight

Actions: Standardisation

- Trying to gather HF specialists in different domains (medical, transportation, etc)
- Involve and meet stakeholders and regulators
- Use media to raise awareness
- Identify stakeholders and involve them

5.6 Working Group 5: Sharing experiences and lessons learned in HF Integration

Objective

1. Where do you currently experience problems in HF Integration?

2. How can we improve HF integration?

Outcome Summary

Where do you currently experience problems in HF Integration?

- Lack of HF (case)-marketing material
- No guidance on what is the optimal moment to address HF
- Lack of HF regulation and certification to “force” it through
- Misconceptions about benefits/scope of HF by other disciplines
- Lack of harmonisation of HF integration
- Lack of trust in HF results (past experience)
- Perceived negative cost/benefit ratio

How can we improve HF integration?

- Ensure a multi-disciplinary approach (build on strengths of each discipline, improve communication
- Increase HF awareness (marketing strategy, management buy-in, ensure proper resources)
- Perfect the HF case methodology (link with life-cycle, HF standards and techniques, human performance measurement)
- Build HF business case
- Train trainers/engineers/HF specialists (ensure sufficient staff is timely trained, also interdisciplinary)
- Set up Human Performance certification process (regulatory body, align airborne/ground certification)

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6. WORKSHOP EVALUATION AND LESSONS LEARNED

Overall feedback from the workshop was extremely positive, both in terms of the workshop itself, and to the revised HF Case methodology it presented. A summary of the feedback responses from 32 participants follows.

6.1 Announcement and Structure

Excellent announcement of the workshop in terms of timeliness, clarity and completeness.

Overall the duration of the workshop was appropriate. Some participants would have liked more time for the practical exercises during the Tutorial on Day 1 and for the Working Group Sessions on Day 2.

6.2 Presentations

All the presentations were considered interesting and highly relevant. Participants liked the user and project manager perspective with their practical experience of integrating HF in projects. Presentations were focused and to the point and highlighted the challenges and benefits in applying the HF Case in the ATM world.

6.3 Working Groups

The outcomes of the Working Group discussions were very practical with excellent suggestions for improvement and moving forward; both for HF integration generally and for the HF Case methodology. Participants liked the facilitation style and interactive nature of the sessions.

6.4 Overall Remarks

The workshop was viewed to be an excellent information sharing experience and a very professional and well organised event. 80% would attend a similar event again, and all participants would recommend others to attend such an event.

6.5 Suggestions for Improvement

Accommodation Information and Organisation: Participants would appreciate a block booking of hotel rooms in a suitable hotel at one location to enhance networking opportunities outside the workshop.

Logistics: A start time at 09.30 would be easier to match the shuttle arrival schedule.

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7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

The workshop was a successful launch for the revised HF Case methodology. Participants left with a clear understanding of the HF Case process and practical examples of application for their own organisations.

It was evident to all, that this is only the beginning of the practical application of the HF Case in ATM projects for HF integration. It signals the start of a period of refinement and further development with further versions and deliverables to be produced for full implementation. To be fully successful, it will be critical to communicate the HF Case issues and benefits the to organisational decision makers to ensure a wide take up and to further develop it into a full validation and certification “Case”.

The initial SESAR findings have strongly recommended the wide application of the HF Case methodology in future aviation projects. The HF Case methodology is recognised as a key means of integrating HF into ATM projects as the first step towards a longer term goal of HF Certification and Regulation in ATM. This will require the development of HF requirements and standards for ATM systems and equipment to demonstrate that users can safely perform their tasks associated with intended functions.

It was also recognised that to achieve the goal of wide application of the HF Case in aviation, a body of trained HF Case Co-ordinators will be needed. This will require the development of a training course.

Aligned with this, a Business Case for HF Integration should be developed as a tool for management to better understand and support the application and integration of HF. The identification of HF Champions to promote the benefits was perceived to be a critical success factor.

The workshop concluded that the next goal should be to have a further refined and integrated HF Case methodology within the next few years. The next step is to gain further practical experience using the HF Case within ATM projects in the wider community. The next 12 months is an opportunity to gather experience using it and to share this knowledge between HF Case practioners.

7.2 Recommendations

1. To develop a training course to train a body of HF Case Co-ordinators for applying the HF Case in ATM projects.
2. To establish an interest group to provide a forum for sharing the lessons learned, to further develop the HF Case methodology, and to determine best practices.
3. A follow up workshop in 2009 would provide the next opportunity to share lessons learned in the further application of the HF Case.
4. A Business Case for HF Integration should be developed as a complimentary tool for managers to fully understand the benefits from integrating HF into their ATM projects at all stages of the project life cycle.

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ABBREVIATIONS AND ACRONYMS

ATC: Air Traffic Control

ATCO: Air Traffic Controller / Air Traffic Control Officer (US/UK)

ATM: Air Traffic Management

DAP/SSH: Safety, Security and Human Factors Business Division (EUROCONTROL Headquarters)

EATM: European Air Traffic Management

HF: Human Factors

HMI; Human-Machine Interface

HSP: Human Factors Sub-Programme (HRS)

ICAO: International Civil Aviation Organization

R&D: Research and Development

SESAR: SES ATM Research Programme

SME: Subject Matter Expert

ANNEX 1 – WORKSHOP STAFF

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