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Deep Blue
Eliciting Information for Safety Assessment
What this presentation is about

How to obtain information, from operational experts, about something they still don’t know?
Content

- The problem
- MFF project
- Safety Assessment in MFF
- MFF Validation exercises
- The approach used to elicit information
- Conclusions
The problem (1)

- Opinion of operational experts as a key element for defining and introducing innovation in ATM
- Especially important for safety analysis, with special regard to identification and characterisation of hazards
- Problem of biases (importance of recent events, under-estimation of rare events, interest in the subject, etc.)
The problem (2)

- Need for deep knowledge to be a “real expert” (experience about how a system works but also how it fails)
- Ability to elaborate on concrete difficulties of day by day activity rather than on abstract discussions about theoretical working practices
- Difficult for new concepts and procedures like in MFF
MFF Project (Characteristics)

- TREN T project investigating new ATM concepts and related procedures
- 5 years of duration, 9 partners including Eurocontrol and the main Air Service Providers of the Mediterranean area
- Focussed on concepts and procedures and not on technological solutions
MFF Project (Concepts and Procedures)

- **Free Routing:**
  - absence of mandatory routing structure

- **ASAS Spacing:**
  - Flight crews to achieve and maintain given spacing with designated aircraft (responsibility remains with controller)

- **ASAS Separation:**
  - As before (responsibility remains with the pilot)

- **Free Flight:**
  - Airborne Self Separation Assurance
Safety Assessment in MFF (context)

- Adoption of MFF procedures do not increase and, where possible, decrease the number of ATM induced accidents (in line with EATMP Safety Policy and ATM 2000+ Strategy)
- Safety Policy and Plan designed to satisfy the ESARR4 requirements
- Methodology based on EUROCAE ED78A guidelines and on Safety Assessment Methodology (SAM)
- Safety Assessment submitted to the Safety Regulation Commission
Safety Assessment in MFF (steps)

- Identification of the Operational Scenarios for the application of the MFF procedures (OSED)
- Identification of potential hazards and of the severity of their consequences (OHA)
- Evaluation of acceptability (with reference to frequency), and safety requirements for limitation of non acceptable hazards or mitigation of their consequences (ASOR)
- Assessment of the achievement of the Safety Requirements (SSA)
Mainly speculative work to be completed with empirical evidence

Need for additional for aspects such as:

- identification of all the possible hazards;
- estimation of controllers and pilots ability to identify and mitigate those hazards;
- evaluation of hazard severity;
- estimation of completeness and likelihood of events leading to the hazards;
- feasibility and effectiveness of safety requirements
Validation of concepts and procedures with an integrated and iterative set of validation exercises:

- 3 Sets of Fast Time Simulations
- 3 Sets of Real Time & Cockpit Simulations
- Flight Trials
- 3 Safety Cases
- Several smaller validation exercises
The Approach Used (principles)

- The iterative nature of the validation exercises (RTS) offered the opportunity for a progressive and growing involvement of the operational experts (controllers and pilots) with concepts and procedures.

- The type and quality of the information elicited were commensurated with the growing experience of operational experts.

- Elicitation techniques were selected on the basis of the type of information to be elicited.
The Approach Used (activities)

**RTS 1**
- Statistical exercises
  - Observation + Open brainstorming

**RTS 2**
- Safety scenarios for identification and analysis of hazards
  - Observation + debriefing sessions + focussed brainst.
An example of Safety Scenario
(wrong target in ASAS spacing)
An example of Safety Scenario (opportunities)

- Simulate hazards due to system failures and human errors
- Controllers unaware of the problems they were going to experience
- Identify possible new hazards and have a better understanding of those already identified
- Offer operational experts the opportunity to reason about what did not work and the potential consequences
The Approach Used (activities)

RTS 1
Statistical exercises
Observation + Open brainstomring

RTS 2
OHA Validation Workshop

RTS 3
ASOR Validation Workshop

Cockpit Sim 1 & 2
Statistical exercises + scenarios
Observation + brainstorming
Conclusions (1)

- Operational experts "exposed" to safety problems related to the MFF concepts and procedures
- Solid information thanks to the level of familiarisation, knowledge and (simulated) operational experience achieved by the experts
- Operational expert have a better understanding of the safety assessment process which increased the quality of their contribution
- They had also the opportunity to identify and understand the relation between identified hazards, and the related mitigation and containment measures
Conclusions (2)

- Information was not large enough to have statistical significance (relatively small number of experts and of large number of variables in safety scenarios)
- Possible biases addressed by combining the opinions of different experts and using consolidated elicitation techniques
- Cost of the approach not easily quantifiable (simulations served different needs) but significant because of the number and the careful preparation of events
- Special attention, given in MFF, to re-usability of results