**PROJECT**

**ESSAI**

Enhanced safety through situation awareness integration in training

**Funding:** European (5th RTD Framework Programme)  
**Duration:** Apr 2000 - Dec 2002  
**Status:** Complete with results

**Background & policy context:**

It is currently widely believed that situation awareness and threat management skills are a significant factor in avoiding aircraft accidents and incidents and play a major role in a crew's ability to cope with hazardous situations.

As air transport operations have become more reliable, aircrews are less exposed to aircraft and system failures. However, the growth in the complexity of highly integrated systems has made the task of identifying developing problems much more difficult. How to train flight crew for these very low probability events is clearly a challenge for the aviation industry.

**Objectives:**

The goal of the project is to provide workable training tools and techniques for:

- Maintaining and recovering situation awareness; and
- Performing threat management should an in-flight situation deteriorate and become potentially hazardous.

The requirements for the training programme were to:

- Base it on scientific and operational data likewise;
- Allow for the integration with existing operator recurrent training practice;
- Allow for the adoption not only by major air carriers, but also medium and small operators;
- Allow for the later adaptation of training solutions for application in ab-initio and/or transition training at e.g. flight schools, aircraft manufacturers and regulators; and
- Develop it in a generic way independent of e.g. type of aircraft and cockpit environment.

**Methodology:**

The project's training tool was developed in 5 phases comprising:

- A literature review and state of the art investigation of situational awareness and threat management concepts;
- An analysis of incidents and accidents related to situational awareness and threat management;
- The definition of training needs and the outline of the training programme based on a preliminary hot-list of skills to be considered for inclusion in training;
- Design, development and tailoring of the training programme based on refined concepts such as the anticipation of future phases of flight in order to maintain situation awareness instead of simply noticing events, the recognition of clues indicating loss of situational awareness, the avoidance to threats rather than the mitigation of consequences, and the application of situation control e.g. through balancing the workload among crew members; and
- A validation exercise, employing an Airbus A330 flight simulator, aimed at assessing the effectiveness of the proposed training.

**Parent Programmes:**

FP5-GROWTH KA2 - Sustainable Mobility and Intermodality

**Institute type:** Public institution
Institute name: European Commission, Directorate-General for Energy and Transport (DG TREN)
Funding type: Public (EU)

Partners:
- Aero Lloyd (DE);
- Alitalia (IT);
- British Airways (UK);
- Dedale (FR);
- German Aerospace Centre DLR (DE);
- QinetiQ (UK);
- Technical University of Berlin (DE); and
- Thales Avionics (FR).

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Key Results:
ESSAI has investigated the topics of situation awareness (SA) and threat management (TM) in great depth which led to a set of particular findings:

- A literature review provided detailed orientation on situation awareness and threat management:
  - adopting the view that SA is an activity or skill rather than the 'mental state' of humans involved;
  - showing the close relation of SA to decision-making and group processes;
  - leading to the definition of threat management (TA) avoiding the negatively perceived term crisis management;
  - evaluating TA in other domains, namely medicine, fire-fighting, nuclear power industry, offshore oil industry, military aviation, and naval operations;
  - investigating the state-of-the-art in aviation training schemes as initiated by airlines and aviation authorities;
- factors affecting SA and TM were identified, focusing on Controlled Flight Into Terrain (CFIT), approach and landing, and loss of control by:
  - screening accident and incident data interpreted by aviation experts, through interviews with flight crew and the evaluation of flight data recordings;
  - SA and TM strategies for the flight deck, based on a novel Factors Affecting Situation Awareness (FASA) scale which comprises attention and information management, cognitive efficiency, automated procedures, and inter-human dynamics;
- training needs were analysed resulting in the proposed activity-based approach to aviation training leading to a framework made of explanation, example, exercise and evaluation bits of information;
- a training scheme was designed and developed, comprising:
  - primarily recurrent and transition airline training but being sufficiently generic to be used in other training regimes;
  - operational application and centering on crew competence in SA and TM;
  - a modular and flexible setup allowing for variations in airline size and resources;
  - the complementarity to existing crew resource management training programmes and progress beyond imparting knowledge so as to improve skills;
  - an interactive DVD featuring the concepts of SA, TM and situation control, providing explanations through the use of video footage from A320 simulator runs;
  - a tactical decision game intended to practice

Policy implications
The ESSAI experiment was designed to find out whether the exposure to the advanced training tools can significantly minimise pilots' loss of situation awareness and improve their effectiveness of threat management strategies.
The project's results provided sufficient empirical evidence as to the effectiveness of the ESSAI training method for enhancing the quantity and quality of pilots' knowledge, skills and attitudes related to situation awareness.

The three airlines participating in ESSAI - AeroLloyd, British Airways and Alitalia - had planned to evaluate options to integrate the new training scheme, at least partially, with existing programmes for recurring and ab-initio training after the end of the project.

Key Findings

No results directly relevant to this theme. However, please note that some findings relevant to the project's key theme (User Aspects) are generically applicable.

Policy Implications

No policy implications directly relevant to this theme. However, please note that some policy implications relevant to the project's key theme (User Aspects) are generically applicable.

User aspects

Key Findings

ESSAI has investigated the topics of situation awareness

Related Projects:

- CAST (FP4)

Documents:
- A validated recurrent training programme for Situation Awareness and Threat Management. (Final report)

STRIA Roadmaps:
Cooperative, connected and automated transport, Vehicle design and manufacturing, Network and traffic management systems

Transport mode: Air transport

Transport sectors: Passenger transport, Freight transport

Transport policies: Safety/Security, Decarbonisation, Societal/Economic issues

Geo-spatial type: Other