



VERRES

VLTA EMERGENCY REQUIREMENTS RESEARCH EVACUATION STUDY .

Sponsored by : European Commission DG TREN supported by French DGAC/SFACT

Consortium :

- Members : Sofréavia, CAA/SRG, Airbus SA, University of Greenwich, Cranfield University, Virgin Atlantic ;
- Observer : EPF represented by SNPNC.

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Abstract :

The development of Very Large Transport Aircraft (VLTA) is of utmost importance to face the forecast increase in air traffic. The VLTA is a challenge for aircraft manufacturers and the certification authorities for emergency evacuation in case of major incident/accident or survivable crash. Indeed, the transition to more than two aisles and full double deck with an significant number of passenger to deal with may raise concerns.

The certification process of the emergency evacuation of aircraft is for an important basis supported by the experience from incidents and accidents. The emergency evacuation of aircraft experience is based on existing aircraft and may be extrapolate in a large measure to the VLTA. Experience has told us however that the extrapolation of empirical experience should be carefully supported by analytical and experiment work to confirm the relevance of hypothesis.

This poses problems not only for industry, but also for the certification authorities who are faced with the approval of a product within a very short time scale. The VERRES project will investigate the problem for different scenarios.

The VERRES project is conducted in the frame work of the "Promoting Competitive and Sustainable Growth" programme of European Commission - DGTREN.

This study is general in nature and will provide information for the future generation of very large transport aircraft and it is intended that some of the recommendations may have immediate applicability to aircraft of this size that are shortly to be developed in Europe and elsewhere.

The purpose of the VERRES project is to:

- To draw on a complete picture of the configurational aspects of the VLTA certification issue.
- Through the investigation of the current state of the art of modelling and data availability, develop requirements for the future use of analysis techniques for safety assessment of VLTA.
- To develop guidelines for airlines to adapt cabin crew training, especially in view of co-ordinator role; guidelines to be included in passengers' information package for VLTA (pre_boarding information leaflets or ground staff briefing, briefing cards, video briefings...)

Three major domains will be studied : the configurational aspects, the use of analysis supported by relevant small-scale evacuation tests and evacuation modelling software and the human aspects via cabin crew co-ordination and training and the mental representation layout of the aircraft for the passenger.

Limited tests will be conducted on an emergency evacuation simulator to validate the assumptions.

The work will then be oriented towards practical aspects by , elaboration of statements and recommendations as to what should be included into training material and tools, towards the certifiers and standardisation bodies.

The consortium is composed of a regulatory authority (CAA/SRG representing JAA) , an aircraft manufacturer (Airbus), one airline operating wide body aircraft (Virgin Atlantic), the department of an university specialised into the software modelling of emergency evacuation (University of Greenwich), the department of an university practising the experimentation of aircraft emergency evacuation with dedicated simulators (Cranfield University), an SME engineering company specialised in the civil aviation domain (Sofréavia) and a cabin crew personnel representative association (ETF represented by SNPNC). The consortium involves three European countries and represent all the stack holders involved in the domain of emergency evacuation of aircraft.

We assist to a growing preoccupation to ensure a better taking into account of Human Factors in the safety field, developing new specific actions and setting out more complete than before the integration modalities of Human factors as a safety issue.

1.1 Technical approach.

1.1.1 Problems to be addressed.

European aircraft manufacturers are leading the world-wide developments of Very Large Transport Aircraft (VLTA). The existing regulation is well adapted to existing aircraft (so called wide or narrow body).

Futurist design are providing flying wing or aircraft with full double deck configuration. The innovative configuration inside those wide areas could impact on the emergency evacuation process in the event of a survivable crash serious incident. The number of passenger involved could make more difficult or dangerous traditional evacuation tests that are used for current certification. With the number of passenger the impact of crowd effect could increase. The handling of passengers outside the aircraft could cause new problems. The size and dispersion of the cabin crew could impact the intra-crew co-ordination needs. The aircraft emergency evacuation software models can't be considered as mature and validated enough to be used as major parts in a certification process. The emergency evacuation of such planes in the event of a survivable crash or serious incident pose a challenge for the aircraft manufacturers and the certification authorities.

1.1.2 Stakeholders concerned.

The European certification authority together with the concerned manufacturers and aircraft operators will have to be innovative and propose to the international community an evolution of the means of compliance to address the VLTA emergency evacuation certification. This innovative process will be reviewed and criticised by the international community and must be supported by strong evidences. Due to the certification-related components and to the complete VLTA evacuation view provided by the VERRES project, all aircraft evacuation stakeholders are expected to be involved. That way regulatory authorities, aircraft manufacturers, research community, aeronautical consultants, aircraft operators and cabin crew representative are involved in the VERRES project.

1.2 State of the Art.

The certification of the emergency evacuation of aircraft are established and adapted to aircraft with single or double aisle configuration and, at the most, limited double decks. Intensive work has been conducted by the industry, the research community and the certification authority, specially in Europe and the certification of new design as A380 are already almost defined.

A VLTA partial emergency evacuation simulator is under development in Europe and should be used to validate hypothesis, partially validate the model results or evaluate the impact of specific factors on sound experimental basis.

The research community has developed evacuation software models. These models are providing promising results but are not mature enough to support certification evidence.

Past real life incident or survival crashes emergency evacuation experience have been analysed and are available to support on going work. Knowledge and models on other domains with greater number of persons involved as ships or building evacuation are also available.

The certification process of emergency evacuation is bases mainly on two domains technical rules on cabin configuration and real life evacuation test. The more flexible process that consist in setting safety goals to be achieved is not applied to emergency evacuation.

2. PROJECT WORKPLAN.

2.1 General description.

The project will focus on research domains concerning VLTA emergency evacuation. In any case the result of the study will not interfere with any on going certification process.

The approach that will enable to identify issues related to the emergency evacuation of Very Large Transport Aircraft and to propose appropriate requirements to facilitate the end-to-end certification/standardisation processes, will have the following structure:

- **WP1: Configurational aspects for VLTA**
- **WP2: Investigating the requirements of a methodology utilising analysis and partial testing**
- **WP3: Aspects of occupants safety for VLTA concepts**
- **WP4: Synthesis**
- **WP5: Dissemination**

The study should start at fall 20001 and last one year.

2.2 Detailed Project Breakdown

2.2.1 WP1: Configurational aspects for VLTA

- Review of previous evacuation research into configurational issues in evacuations
- Analysis of Civil Aviation Accident Reports involving major loss of life as a result of fire over last two decades.
- Evaluation of information available on the interaction between configuration aspects and human performance in emergency evacuations in other scenarios.
- Collation of information from cabin crew regarding configurational aspects for VLTA.
- The identification of the configurational issues and rules which will need to be re-evaluated for VLTA
- Proposal for requirements for future evacuation testing. Interrelation with other workpackages

2.2.2 WP2: Investigating the requirements of a methodology utilising analysis and partial testing

- 2.1 Review state of the art of evacuation models, their validity, data requirements and current availability of data.
- 2.2 Investigate model capability and limitations with regard to crew and configurational aspects using a generic VLTA layout and a relevant evacuation scenario.
- Propose requirements for future model development and data requirements through partial testing.

2.2.3 WP3: Aspects of occupants safety for VLTA concepts

- Cabin crew co-ordination in emergency.
- Building a mental representation of the aircraft for passengers which would assist them in an emergency.
- Conduct limited evacuations experimentation with an evacuation.