

The Usability Evaluation of a Touch Screen in the Flight Deck

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EXECUTIVE SUMMARY

This chapter presents and discusses an Expert Usability Evaluation for a flight deck touch screen prototype, carried out in one European co-funded project called ALICIA (www.alicia-project.eu). Through the presentation of this evaluation activity and its impact on the rest of design process, this chapter will address some methodological issues on usability in complex domains: 1) The specific context in which the technology is introduced has to be well known by the designers as it provides crucial constraints to be taken into account; 2) Evaluating complex safety critical systems entails the use of a holistic multidisciplinary approach and an iterative design process that involve, in different phases, several type of experts (engineers, human factors, usability experts, end users and stakeholders); and 3) The level of maturity of the technology and the evaluation objectives contribute to the definition of the evaluation methods to be used.

ORGANIZATION BACKGROUND

Nowadays, a range of technologies and interfaces design approaches exist which together have the potential to address the management of the flight deck's complexity, whilst maintaining crew situation awareness, reducing workload and simultaneously addressing the issue of through life cost. Example technologies include Direct Voice Input/Output, Auditory Displays and 3D Audio, Graphical User Interfaces with task tailored controls, Improved Display Technologies (Large Area Displays, Head Up/Head Mounted Displays, 3D Displays), Touch screen controls, Multi modal input/output devices. ALICIA is one EU co-founded project started in 2009 and lasting for 4 years, aiming at extending aircraft operations in degraded visibility conditions by developing a new aircraft flight deck architecture facilitating the introduction of new technologies and applications. One of the research challenging concepts of the project is the introduction of touch screens as a means to provide and better manage the information needed to operate efficiently and safely in all weather conditions.

SETTING THE STAGE

In the following paragraphs the importance of the context and the appropriate complexity is highlighted.

The Flight Deck Complexity

The flight deck (also known as cockpit) is the area where a pilot controls the aircraft. This area is located in front of the plane or helicopter and, from it, the aircraft is controlled when moving on the ground and when flying in the air. The cockpit of an aircraft contains flight instruments (providing information such as height, speed and attitude) and controls (which enable the pilot to fly the aircraft).

Early commercial aircraft crew stations featured systems with dedicated control and monitoring facilities. This means that every function (e.g. radio, altimeter) had a dedicated instrument in the cockpit. All these controls were analogic ones as, prior to the 1970s, computer based technology was not mature enough and no sufficiently light and powerful circuits were available. The increasing complexity of transport aircraft and the growing air traffic congestion around airports turned this approach became unsustainable because there was insufficient space to accommodate all the dedicated controls and displays (the evolution in the distribution of the space is illustrated by the Concorde crew station in Figure 1). A commercial aircraft in the mid-1970s had more than one hundred instruments and controls, and the primary flight instruments were already full of indicators, crossbars, and symbols, and the

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