Aviation's most critical human factors challenges: past and present

Engineering, Aviation



Human error has been documented as a primary contributor to more than 70 percent of commercial airplane hull-loss accidents. While typically associated with flight operations, human error has also recently become a major concern in maintenance practices and air traffic management [1].

Human factors

The term " human factors" is often considered synonymous with crew resource management (CRM) or maintenance resource management (MRM). Human factors involves gathering information about human abilities, limitations, and other characteristics and applying it to tools, machines, systems, tasks, jobs, and environments to produce safe, comfortable, and effective human use [1].

Human factor specialists study each factor which can influence on the human activity on the cockpit. The job of an aviation psychologist is to reduce human error during flight. The main and most general objective of their work is optimisation of the human-computer interaction. From the one side electronic equipment should provide the full control of the flight and make easier pilot job. But just one error of board computer may be the cause of the disaster.

Therefore crew should be aware and control all situation along with computer program to be able correct its mistake. Because of high level of system automation often pilots even do not know what it is doing and why. Despite rapid gains intechnology, humans are ultimately responsible for ensuring the success and safety of the aviation industry. They must continue Events of aviation human factors

Since the world's first airplane was invented in 1903 by Wilbur and Orville Wright people studied human factors in aviation and tried to make easier pilot work by all known methods. The first navigation aid was introduced in the USA in the late 1920s.

It was airfield lighting to assist pilots to make landings in poor weather or after dark. The concept of approach lightning was developed from this in the 1930s, indicating to the pilot the angle of descent to the airfield, which later became adopted internationally through the standards of the International Civil Aviation Organization (ICAO).

With the spread of radio technology, several experimental radio based navigation aids were developed from the late 20s onwards. These were most successfully used in conjunction with instruments in the cockpit in the form of Instrument Landing Systems (ILS), first used by a scheduled flight to make a landing in a snowstorm at Pittsburgh in 1938.

A form of ILS was adopted by the ICAO for international use in 1949. Following the development of radar in World War II, it was deployed as a landing aid for civil aviation in the form of Ground Control Approach (GCA) systems, joined in 1948 by Distance Measuring Equipment (DME), and in the 1950s by airport surveillance radar as an aid to air traffic control [3]. After numerous air incidents and accidents were also solved (or minimized a danger of) a lot of technical problems like positive lightning, enginefailure, metal fatigue, delamination, stalling, fire, bird strike, volcanic ash, etc.

Much progress in applying human factors to improving aviation safety was made around the time of World War II by people such as Paul Fitts and Alphonse Chapanis. However, there has been progress in safety throughout the history of aviation, such as the development of the pilot's checklist in 1937. The ability of the flight crew to continually maintain situation awareness is a critical human factor in air safety [3].

During WWII, psychologist Norman Mackworth studied performance of radar operations as he watched for German aircrafts to cross the English Channel. He noted the difficulty of attending to the radar operations for more than a few minutes.

After WWII, Paul Fitts studied selective attention and how pilot's eyes scanned an aircraft's instrumental pattern. He questioned how the brain knows what is important in theenvironmentand how much information can the eye take before moving to another fixation point [4].

Decades after WWII, the focus of research was on aircraft flight design, layout of instrument displays, and basic tasks of flying. Flight simulators were invented for pilot training and would allow for teaching of skills in a safe environment on ground which would transfer into performance in the real task. In the 1950's jet aircrafts were invented with faster speed and less stability. In the 1970's, the focus was on the mental workload and limits of human attention in performing several tasks at once. Finally, in the 1980's a focus on on-board computer power changed the pilot's task from an active pilot to more of a monitoring role [4].

To reduce the commercial aviation accident rate modern aircraft companies establish human factors departments. Human factors specialists work closely with engineers, safety experts, test and training pilots, mechanics, and cabin crews to properly integrate human factors into the design of airplanes. Their areas ofresponsibility include addressing human factors in

Flight		deck		design.		
Design	for	maintainability	and	in-service	support.	
Error		management.				

Passenger cabin design.

Flight deck design should satisfy such validated requirements as customer input, appropriate degree of automation, crew interaction capability, communication, navigation and surveillance traffic management. For instance Boeing commercial airplanes propose flight decks which are designed to provide automation to assist, but not replace, the flight crew member responsible for safe operation of the airplane.

These systems support instrument displays with visual and tactile motion cues to minimize potential confusion about what functions are automated. Flight crew communication relies on the use of audio, visual, and tactile methods. This includes crewmember-to-airplane, crewmember-tocrewmember, and airplane-to-crewmember communication. Design for maintainability and in-service support includes chief mechanic participation, computer-based maintainability design tools, and fault information team and customer support processes [1].

Boeing has developed human factors tools to help understand why the errors occur and develop suggestions for systematic improvements. The tools are: Procedural Event Analysis Tool (PEAT) and Maintenance Error Decision Aid (MEDA). PEAT is an analytic tool created to help the airline industry effectively manage the risks associated with flight crew procedural deviations.

MEDA began as an effort to collect more information about maintenance errors. Three other tools that assist in managing error are: Crew information requirements analysis (CIRA), Training aids, and improved use of automation. CIRA provides a way to analyze how crews acquire, interpret, and integrate data into information upon which to base their actions.

The passenger cabin represents a significant human factors challenge related to both passengers and cabin crews. Human factors principles usually associated with the flight deck are now being applied to examine human performance functions and ensure that cabin crews and passengers are able to do what they need or want to do. Some recent examples illustrate how the passenger cabin can benefit from human factors expertise applied during design.

These include: automatic over wing exit and other cabin applications. The improved version of the over wing emergency exit opens automatically when activated by a passenger or cabin or flight crew member [1].

Conclusion

The list of events in the history of aviation can be endless as the list of events of aviation human factors. However the number of aircraft accidents had not been reduced to zero. Along with legacy achievements should be provide more efficient and modern ones. Therefore aviation industry is an extensive field for specialists of various directions.

Bibliography

Curt Graeber, Human factor engineering, Boeing commercial airplanes, July, 2005

Robert R. Tyler, An interestingcareerinpsychology: aviation human factors practitioner, October, 2000

Wikipedia (free encyclopedia), 6 July 2005. History of human factors, Human performance training institute, July, 2005