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### **Crew resource management application in commercial aviation**

*The purpose of this article is to investigate the interconnectivity of Crew Resource Management application with commercial multi-crew airplane accidents and incidents in the process of aircraft operation as CRM relates to error management during the final approach and landing phase of flight.*

The airline industry, perhaps more than any other, has throughout its history been subject to cyclic variations of the world markets. Some of these have been quite spectacular and damaging for the industry. However, these crises do not mask the underlying growth trend. Accordingly, today's tasks range from pure handling of the aircraft, to managing the whole event of a commercial flight which requires a completely different set of skills.

Needless to say, that travel on modern commercial airplanes is considered to be one of the safest modes of transportation. Due to this fact, when accidents involving air transport operations occur, they tend to attract a significant amount of attention. Moreover, mishaps involving large, commercial aircraft are often accompanied by significant numbers of fatalities. Even in light of the drastic technological advances in modern aircraft, devastating crashes continue to occur.

Long-term research by the National Aeronautics and Space Administration (NASA) has revealed that human error is a contributing factor in nearly 80 percent and many problems encountered by flight crews have little to do with the technical side of working in a multi-crew cockpit, rather, with poor group decision making, ineffective communication, inadequate leadership, and deficient task or resource management.

Traditionally, pilot training programs concentrated almost entirely on the technical aspect of flying and on individual performance. Crew management matters, which also are fundamental to flight safety, were previously not effectively addressed. Certain phases of flight have higher requirements for coordination: the approach and landing phases of flight appear to be the most problematic, as these segments account for the majority of accidents – 53 percent – while compromising a very small portion – 4 percent – of total flight time. As data demonstrate, flight crews failed to conduct stabilized approaches in 64.4 percent of the Approach and Landing Accidents (ALAs). In addition, from all those unstabilized ALAs, 81 percent included rushed approaches and 72 percent revealed inadequate crew coordination. And according to a National Transportation Safety Board study, inadequate monitoring by flight crewmembers was a factor in 63 percent of ALAs.

It is now understood that pilot error cannot entirely be eliminated. Therefore, it is crucial that flight crews develop proper Error Management (EM) skills and

procedures. Error detection and recovery from errors should be reinforced in training in order to mitigate flight safety occurrences.

Effective Crew Resource Management (CRM) starts in initial training and is intensified by repetition and feedback. Therefore, EM must encompass a significant part of CRM training, while also being built into the corporate culture and continuously being emphasized in every subsequent phase of training.

Many global aviation safety organizations, including the FAA, have reconfirmed the significance of Standard Operating Procedures (SOPs) as essential to flight safety. Crews should have a shared mental model of each task because only then is effective crew coordination and crew performance attainable. SOPs have to be clear, comprehensive, and readily available in order to keep aviation operations standardized and reduce perceptual actions by the crew.

Historically, the question of crew training or crew resource management (CRM) arose in the 1970s. A NASA workshop examining the role of human error in air crashes found that the majority of crew errors consisted of failures in leadership, team coordination and decision-making. The aviation community responded by turning to psychologists J. K. Lauber and R. Helmreich to develop new kinds of psychological training for flight crews. That training focuses on group dynamics, leadership, interpersonal communications and decision-making and is known nowadays as crew resource management. Current CRM training continues to offer key guidance on effective communication, task sharing, team building, and teamwork. Threat and Error Management (TEM) training endorses preemptive strategies of threat recognition, avoidance, and management. Both CRM and TEM require data from accidents and incidents as well as from Flight Operations Quality Assurance (FOQA) programs and Line Operational Safety Audits (LOSA).

The most effective training platform for airlines today is the Line-Oriented Flight Training (LOFT) in which crews must fly a simulated flight scenario between two or more points. These scenario-based learning tasks involve a combination of modern, high-fidelity simulators and the conduct of normal flight operations procedures. LOFT provides the most realistic setting in which crew performance, in reference to the operational environment, can be measured. LOFT has been inadequately and infrequently applied and only recently mandated by some regulators.

Minimum training standards approved by the regulator may not adequately prevent airline accidents. However, training is a controllable variable in the airline safety system, and wiser management teams will look for and apply the best practice. The potential cost increase for air carriers, with a contemporary CRM training update for flight crews, would be negligible if compared to the monetary loss of an aircraft, not even considering the catastrophic outcome and subsequent publicity.

*International Policies.* Since the initial development of the airplane into a global instrument of transportation, air travel has encountered various challenges across the globe. The coordination of operational laws, procedures, and techniques is far beyond the capability of individual governments to solve. The standardization of internationally recognized services and procedures is a fundamental aspect of safe operations in the aviation industry in order to alleviate errors caused by

misunderstanding or lack of experience. The organization of the standards – such as air traffic control, personnel licensing, and airport and airplane design – all require actions surpassing the national borders of individual countries. The Chicago Conference of 1944 established the International Civil Aviation Organization (ICAO) to advance the planning and development of international air transport in accordance with specific principles. The ICAO assembly is composed of one representative from each contracting state. Today, there are close to 200 members.

CRM application in commercial aviation around the world is as diverse as the cultures in which it has been implemented. First developed in the United States, its international migration has been varied. Ranging from welcoming approval to simple rejection, most CRM concepts traveled readily throughout different parts of the world. All of the pilot contributors had, on average, 8 to 15 years of CRM design and delivery experience. The following broad areas of CRM influences were selected: perceptions of CRM success in relation to local operations, the impact of TEM on CRM, and the future of CRM in the respective countries. The foremost responses about CRM success in programs outside the U.S. were concentrated on the new delivery format of training. Using line pilots as facilitators was widely accepted, but in strong hierarchical cultures the expectation was rather on a top-to-bottom delivery from management. However, having a current pilot instead of a training consultant as the facilitator made the program more credible, especially when focusing on EM.

In addition, the biggest beneficiary in line operations was the co-pilot. In high power/distance cultures like China, Latin America, and some Asian countries, the importance and respect for rank, elders, and leaders is dominant. Nonetheless, in regards to their flight safety, the management of human error is most important. Therefore, by assuring and authorizing the First Officer (FO) to assert his/her concerns, the captain in a commercial multi-crew cockpit will only benefit from the FO's input and better manage the existing threats and errors. Implementation of TEM was welcomed as it focused more on a scenario-based problem than on a single human factor issue.

Moreover, language differences are still considered to be the most challenging hurdle in proper CRM implementation outside the English-speaking countries. In general, the future of CRM outside the USA, unfortunately, does not take the primary concern of some countries, especially in those outside the Western and English-speaking cultures.

*Human Limitations in the Modern Automated Flight Deck.* While there is an obvious increase in complexity of technology, the human role must change in order to keep up with the automation. In addition, for any mishaps, human limitations appear to be blamed more and more relative to the technology. Air traffic is increasing and new automation will be implemented to enhance SA in order to mitigate aviation accidents.

A future key capability in managing the amplified amount of air traffic is the concept of equivalent visual operations. Here, operational tempos and procedures in reference to Visual Flight Rules (VFR) are maintained, independent of the actual outside weather conditions.

The FAA's Next Generation Air Transportation System (NextGen) is purportedly able to improve aviation operations, but also considerably change the jobs traditionally held by pilots and air traffic controllers. Changes in roles and allocation of function require new procedures, including ground and air responsibilities. Key to human performance is ensuring that design mitigates the potential for human error, recognizing that new automation and procedures may also introduce new sorts of threats and errors. Pilots and controllers will need to maintain SA under new and different operational circumstances; otherwise, without effective management of those threats and errors, they could easily find themselves in new undesired states. Pilot and controller training, as well as strategic procedural guidance from upper management, will be crucial aspects in implementing NextGen.

### **Conclusions**

Aviation industry today as ever before is subject to cyclic developments: either damaging or prosperous. In the course of its development lots of problems have been successfully tackled. Still, the human capabilities aren't almighty, we need clear minds, necessary resources, and scientific researches and, definitely, time to investigate the problem(s) in this domain and minimize errors. Effective good human factors can reduce the likelihood of error and resultant accidents/incidents.

The true key to flight safety is to effectively manage the errors, thus preventing small errors from escalating to dangerous levels. This is a collective crew effort and needs to be addressed in training, evaluation, and during operations – independently of who is actually committing the error versus who is detecting it.

Thus, today professionally-minded pilots are trained to use crew resource management as a vital decision-making tool for managing the flight with sound decisions.

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