CREW RESOURCE MANAGEMENT

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Abstract:

CRM was initially developed as a response to new insights into the causes of aircraft accidents. One of the causes has been found the inability of crews to respond to the situation in which they find themselves. Inadequate solutions could lead to a loss of situational alertness, a failure in teamwork in the aircraft, and final to a wrong decision or series of decisions which outcome in an incident or a fatal accident. This concept is now adopted and implemented in many domains where seems to be a very good instrument dedicated to improving safety and performance.

Key words: crew, management, safety, incident, human, decision

INTRODUCTION

It has been normally accepted that human action is from time to time imperfect. The Roman thinker Cicero thought two thousand years ago "It is the nature of man to err" and a Latin quote said "To err is human". Complete elimination of human error is almost impossible. When people are involved in an action, human error will appear at some point, doesn't matter the gender. A human is not a machine. When an accident occurs, is largely reported in mass media and attract significant public courtesy. Usually there is an investigation into any incident/accident, and almost all nations have investigating aircraft accidents. NASA study has found that up to 70% of aviation accidents implied human error (fig.1). Almost all accidents have human factors as a main contributing factor or cause. What management can do is to cope with error efficiently, diminishing the probability and minimizing their effect.
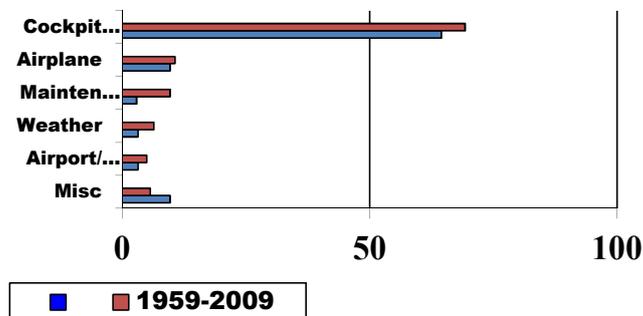

Fig. 1. Aviation accidents causes [3]

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## 1.	Why Crew resource management (CRM)?

There are a lot of people which are working in hazardous environments. Their responsibilities include interaction with modern and sophisticated technologies and with other people. Aviation is one of these domains. From time to time accidents may appear. Aircraft accidents may occur rarely, with a percentage accident ratio of one to two per million sorties. The origins of Crew Resource Management (CRM) are usually found in 1971 to a congress sponsored by the NASA. During the time, the concepts in CRM have changed. The lessons learnt from every generation were unified into CRM. *There have been six generations of CRM until now* [1]. CRM has been useful to a diversity of domains from aviation to industries including nuclear power facilities, ship handling, firefighting, surgical teams and obstetric care, medical operating rooms.

For better understanding, we need to define some concepts:

Human factors - a multidisciplinary field dedicated to improving human performance and reducing human error.

Threats - events that appear without the influence of the flight crew, but which need crew attention and management if safety has to be preserved.

Errors - flight crew actions or sometimes inactions that could lead to deviations from intention or expectation. Old-fashioned thinking was focused on eradicating error in the cockpit. Modern thinking recognizes that error it's a part of existence, and it's mandatory to deal with it. [1]

From the beginning of first flying hours, pilot training programs have dedicated almost totally on the technical aspects and on pilot's performance regarding solving problems skill. But accident indicators show that a lot of difficulties encountered by crews have just a little to do with the technical problems.

## 2.	Defining CRM

CRM refers to the effective use of all available resources. These resources are divided into four broad categories - people, machinery, fuel/time and information. CRM is designed to optimize the human/machine interface and accompanying interpersonal activities. These activities include team building and maintenance, information transfer, problem solving, decision making, maintaining situational awareness and dealing with automated systems. CRM includes a wide range of abilities, attitudes and information containing situational consciousness, communication, decision making and cooperation in resolving problem.

CRM can be defined as a management system which makes optimum use of all available resources - equipment, procedures and people - to promote safety and enhance the efficiency of operations. CRM is concerned with the cognitive and interpersonal skills needed to manage resources within an organized system, not so much with the technical knowledge and skills required to operate equipment. [1]

In this context, cognitive skills are defined as the mental processes used for gaining and maintaining situational awareness, for solving problems and for making decisions. Interpersonal skills are regarded as communications and a range of behavioral activities associated with teamwork. In many operational systems as in other walks of life, skill areas often overlap with each other, and they also overlap with the required technical skills. Furthermore, they are not confined to multi-crew craft or equipment, but also relate to single operator equipment or craft as they invariably need to interface with other craft or equipment and various other support agencies in order to complete a mission successfully.

2.2. Elements of CRM

Inquiry is every crew member's right and obligation. Inquiry is a behavior that causes a pilot to question, analyze, and investigate all that is his surroundings. It is curiosity,

skepticism, interest; it exploits learning and awareness at all times and ensures larger gains in knowledge from each experience. Active inquiry is a method that stimulates early detection and definition of problems by helping crew members sense a discrepancy between what is and what should be occurring. Human errors are reduced by exposing and correcting them at an early stage.

Advocacy -The essence of advocacy involves a crew member accepting the obligation to speak out in support of a course of action different from that is currently being planned or followed. At the same time, it is listening to viewpoints that may be contradictory to one's own. Advocacy is the obligation to support a position firmly, but to also respond to a sound alternative.

Conflict Resolution - Conflict is inevitable. In fact, it is often beneficial if controlled properly and in a useful manner. Differences in feelings, ideas, thoughts, principles, or action (actual or perceived) may lead to divergence or dispute. Sometimes differences in personality alone can create a source of conflict.

Decision Making - Many types of decisions are made during the flight. Specific decisions of high quality can be made especially by one member of the crew; other decisions are of such difficulty or importance that the ideas from more than one crew member, or from an external source, are required to guarantee higher quality decisions.

Critique - used in the context of CRM - refers to consultations between crew members concerning the flight. It begins in the planning phase, continues throughout the flight, and concludes in a post-flight debriefing. Well utilized, critique can be initiated by any crew member at any time when could be helpful to the safety and efficiency of the flight. When free discussions are held between crew members, misinterpretations and errors in perception can be explained and fixed. [3]

2.1. CRM skills

Pilots have a tendency to make decisions quickly, sometimes without gathering all available information. This type of decision making may be an effect of a sum of factors including self-confidence, faith in one's ability and training. To face those tendencies, they need to implement CRM skills.

Communication/interpersonal skills- Specific skills related with good communication practices include polite confidence and participation, active listening and feedback. Polite confidence is a skill regularly ignored in communications training but essential to a healthy environment. To develop the communication channel, some influences should be taken into consideration as well as issues such as crew position, age, rank; all those can generate communication obstacles inside the crew.

Situational Awareness - Situational awareness refers to one's aptitude to precisely recognize what is happeneing in the cabin and outside. Keeping a state of alertness in a situation, is a difficult process, highly motivated by the understanding that one's discernment about reality from time to time differs from what is in reality.

Judgement/ Problem-solving / Decision-making these three themes can interconnect with each other or other expertise areas. One may consider problem-solving as a cycle of events beginning with information input and ending with making a final decision. During the phase in which information is requested and offered, some conflicting points of view or differences of opinion may be represented. The concept of "legitimate avenue of dissent" is an important vehicle for clearing the air, maintaining lines of communication and maintaining self-image. Skills in resolving conflicts are therefore especially appropriate at this time. [4]

Leadership/"followership" -. The pilot-in-command is in charge for accessing and managing all resources that are accessible and applicable for the flight safety. This process

will guarantee that informed decisions are made and if mandatory, specific responsibilities delegated.

Also, every non-command crew member is responsible for dynamically contributing to the team effort, for observing changes in the situation, and for being firm when is compulsory. This is particularly important when flying with a pilot-in-command who does not subscribe to the CRM concept.

Stress Management - Any emergency situation produces stress, but for crew members there is also the residual stress (physical and mental) that might bring into a situation impossible for others to perceive. A crew member could be affected because of exhaustion, mental / emotional problems. In this case, the other crew personnel must be vigilant for any performance decrease or weakness. Skills associated to stress management state not only to one's ability to observe the stress in colleagues but mainly to anticipate, identify and deal with one's stress in good condition.

This could include emotional stress such as those related to crew flight program, commander's orders, anxiety during the fire support flight, career and accomplishment stresses, inter-personal problems with other flight crew member (including home and work interface and domestic problems). We can also include so-called life event stresses, such as those associated to the death of a relative, divorce or marriage, new born baby; all those signify major life events.

Sometimes is good to try to improve stress problems by encouraging open and free communication between management and flight crew members, and inside the crew, trying to view stress as part of the "capability to fly" concept. Fixing relationship problem with humor could be an option when stress level is too high. In every moment, management must be open to understanding stress problems and to deal with it.

Critique -Talents of critique usually refer to the ability to study a future, present, or former plan of action. Procedures for obtaining critique may vary according to the accessibility of time, resources, and information. There are three main types of critique: pre-mission analysis and planning, during the mission analysis as part of the in-flight solving procedure, after-mission debriefing. All those are relevant, but can sometimes be ignored in flight maneuvers. The talent of critique is not to be negative, but to emphasize the positive points and to boost participation from the team. [2]

3. Conclusion

Pilots like to think that they are robotic, performance-oriented beings, capable of incredible achievements. *In fact they have feelings, they could be in a bad mood, and they are now encouraged to acknowledge but this seems to be in conflict with the every backbone of the pilot's reality.* [6] To admit that any "softness" may appear could be interpreted as a loss of confidence opposing to the image of what a pilot is expected to show. But the fact is, pilots are human. Homo sapiens are not perfect 100 %, as we have seen in several accidents and disasters. For a pilot, the skill to work with a crew member a helpful resource will compensate for the human factors errors involved in risk management and decision making.

The CRM concept has been exposed to deliver synergy, which is the combined outcome of cooperation in the cabin and exceeds the amount of individual actions. The results of cockpit synergy would be the mathematical equivalent of 1+1=3.

Handling the crew resources could warranty that all decisions and activities are in conformity with safety procedures, and reduce the risk of incident, accident or worst – disaster.

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