

Analysis Of Crew Resource Management (CRM) Training And Workload On Aviation Syllabus

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Abstract

Crew Resource Management (CRM) is the application of human factors knowledge and skills to conduct flight operations with the aim of using all available resources (equipment, systems and people) efficiently to achieve safe flight operations. As a result, the application of CRM has been successfully applied in recognized flights and an equivalent training method is now widely applied by crews, by combining individual skills and knowledge, the human factor and crew coordination will be effective in flight.

Keyword: Crew Resource Management, Communication, Work load, Aviation Syllabus, Commercial air transport

A. Preliminary

Risk and threat management is the key to managing safety and therefore many aviation systems (such as weather planning, air traffic control, and flight deck warning systems) exist to manage risk. Modern crew resource management focuses on managing all available resources to reduce errors including all specialist aviation groups (e.g. air traffic controllers, pilots, cabin crew, mechanics and operators) through goal setting, teamwork, awareness and pro and feedback feedback. reactive. (Helmreich, 1993).

The main reason for the existence of airlines is to transport people and goods safely from one place to another. Commercial air transport remains one of the safest methods of moving people and goods from one point to another. It has been widely quoted over the past few decades that about 75% of accidents are caused by human error but this term fails to recognize that humans are only one part of the wider environment - they have to interact with many components including weather, technology, social systems, etc. The number of fatal incidents per mile traveled is very low but the industry is paradoxical of a very low accident rate but very high potential for death when accidents do occur. Nonetheless, humans at the most basic level are the root cause of almost every event because humans ultimately design and / or interact with all elements of the broader environment.

The successful application of CRM to in-flight has been recognized and equivalent training methods are now widely applied in a variety of other high-risk industries including, for example, medicine, fire and maritime. In practice Crew Resource Management is an integral part of commercial airline operations. Crew resource management is a management model used to manage in-flight threats and errors. Crew Resource Management training for commercial aircrews has become mandatory practice under most of the world's aviation regulatory environments (CAA, FAA, JAR, EASA).

Crew resource management as a safety management model. The core elements of CRM are: 1). safe flight destination (destination); 2). cooperation and communication between pilots, ATC, cabin crew and delivery; 3). monitoring of internal (intra-crew and aircraft) and external situations for threats (eg poor teamwork, weather, terrain, fuel status, aircraft location with respect to flight plans) and; 4). feedback to allow customized practices and threats to be evaluated.

These core elements allow throughput to be created which improves system performance: 1). Awareness of the current state of both internal (in the aircraft) and external operations (air traffic instructions, environment, weather) and threats; 2). Threat detection (through situation awareness); 3). Threat response through expertise (training / standard operating procedures), coordination and communication (between crew and air traffic control, intra-crew, crew and delivery, etc.),

Using the core elements and outcomes of goals, teamwork (communication / cooperation), situational awareness and feedback, crews practice threat detection and error avoidance behavior.

A commercial flight is approaching an international airport that has heavy convective activity (thunderstorms) nearby. The air traffic controller (TMA controller) issues several instructions to the flight crew to align the aircraft with each other towards the ILS approach. Due to weather-induced delays and extended vectors, flights were running behind schedule. Meanwhile the flight crew detects these threats using core elements of monitoring and expertise (recognizing the effects of severe weather through environmental awareness and meteorological expertise, air traffic control, and their training in CRM / human factors). The situation that arises here presents several threats to the flight (weather, ATC demands, scheduling compliance)

This threat has been detected and the flight crew responds to the threat using situational awareness, expertise, communication / cooperation (teamwork) and feedback: 1). Awareness of the threat status and current situation (state of the aircraft in relation to fuel, capabilities and position of the aircraft in relation to other traffic and flight plans); 2). Skills are used to manage threats through the flight crew's knowledge of the situation and the options available to manage it - eg. divert, hold back; 3). Communication / cooperation between flight crew,

dispatch, ATC, cabin crew is used to discuss threats, formulate action plans and various options available for flights; 4). Feedback on how the action plan worked.

The flight crew formulates a plan of action by discussing among themselves and submitting (sharing expertise via communication) that they will try one approach and if they have to get around (miss the approach) the flight will be diverted to an alternative airport (situation awareness) and the options available to them. them - that is, an alternative airport). The result is the Output of the actions taken is compliance with the action plan, ATC requests and standard operating procedures. Aviation safety (i.e. the decision to only take one approach and divert if unsuccessful) was the result.

CRM and Aviation

In the aviation industry, safety is a top priority even though they (the airline industry) can justify or brag about how safer it is to travel by air than on the ground. 'Natural constraints on human performance and environmental complexity make mistakes inevitable' (Helmreich Pub. 257).

The field of human factors has been of great concern since the inception of commercial aviation (Hawkins 1987). Human factors evolved from an early combination of engineering and psychology with a focus on 'knobs and dials' into a multidisciplinary field that draws on the methods and principles of social-behavioral science, engineering and physiology to optimize human performance and to reduce human error (National Research Council 1989).

This development was first introduced when aircraft investigators concluded that the documented 'pilot error' in past accidents and incidents was reflected in team communication and coordination rather than the pilot's 'stick and rudder' skill abilities (Murphy 1980). CRM courses are designed to deal with human behavior which is a product of knowledge and thought processes, personality, attitudes and backgrounds. It was not designed to change a person's personality (Helmreich, Foushee, Benson & Russini 1986).

One of the most notable developments in aviation safety over the last decade has been the adoption of training programs aimed at increasing effectiveness and efficiency in crew teamwork and flight deck management (Foushee & Helmreich 1993). CRM training aims to develop effective performance consisting of technical abilities and interpersonal and team skills. CRM training will also provide knowledge about the communication styles used by others for interpretation as well as to determine the appropriate emphasis for a response (Jensen 1995). With bad information due to poor communication, there will be a lack of important information or data which in turn will affect decision making. CRM training in communication and decision-making enables aviation personnel to increase team effectiveness, reduce errors and ultimately improve safety (Helmreich, Foushee, Benson & Russini 1986).

The main focus will be on team coordination, individual attitudes and behavior (Jensen 1995). The original label for such training is known as cockpit resource management, but in recognition of the application of its approach to other members of the aviation community; it changed to Crew Resource Management (CRM) (Helmreich, Merritt & Wilhelm 1999).

To achieve the main points mentioned above, most CRM syllabuses around the world contain a common set of elements. (Table 1).

Table 1: CRM structure

NO	Crew Resource Management	Description
1	Communication	
2	Workload Management	
3	Decision-making	
4	Conflict resolution	
5	Leadership	
6	Team Management	
7	Stress management	

Source: USAF Aviation Standards Agency.

Crew Resource Management, Awareness, Efficiency & Cockpit Safety

Communication and Decision Making Skills constitute the first group of CRM modules. These skills are a major core factor in good CRM. This is to build interpersonal skills where the crew needs to ensure optimal performance. Personnel attending CRM must know that information must be freely requested, offered, or given at the right time to enable accurate and effective decision making.

Avianca Flight 052 crashed while making a second attempt to land at JFK International Airport, New York (NTSB plane crash report HK2016). The NTSB reported that the flight crew did not communicate the fuel emergency situation to the ATC prior to the running out of fuel. Communication was reportedly unclear and the captain asked the first officer to repeat the information louder because the captain could not hear it.

This air crash shows us a complete disruption in communication by the flight crew in an attempt to convey an important situation to ATC. The flight crew is reported to have limitations in their respective abilities in English.

The communication between the ATC and the first officer clearly demonstrated a misunderstanding of fuel level. The first officer assumed that ATC had recognized the low fuel status of Flight 052 but in reality, ATC interpreted the transmission as 'Flight 052 had sufficient fuel'. A fatal communication error occurred when the first officer conveyed a message to turn right instead of turning to the Harbor, flew a longer circle so as to burn more fuel and words such as 'emergency' were not used by the first officer leading to an interpretive result. different.

B. Method

Predictive Method Risk Identification The writing of this article is a descriptive qualitative phenomenological approach. The data used in this study are online documents and libraries. The research library method is carried out by referring to journal articles, repositories, mass media coverage, social media and all resources that can be accessed online. These sources are collected based on the discussion and reviewed one by one and are linked from one information to another. All data collection and analysis activities are carried out online considering the limitations of movement openly in public spaces, developed with the behavior of crew members when carrying out tasks. The data were obtained by categorizing the problem, namely referring to the available sources for analysis using triangulation techniques with theory, in this case the theory of mass communication and the theory of work behavior.

C. Result And Discussion

Proper knowledge of CRM training that focuses on inter-personal communication will probably prevent this accident as pilots may have better proficiency in English, communicate better and clearly, standardize phrases that will prevent misinterpretations and pilots can repeat to the party. about the message and make sure they understand what the situation is before engaging in another conversation (Krause, 2003).

Communication and Crew Resource Management

Table 2: Topics required by the FAA in the CRM course

1	Workload Management	4	Stress Awareness	7	Mission Planning
2	Group dynamics	5	Risk management	8	Human Factor
3	Situation Awareness	6	Effective Communication	9	Decision-making

Source: USAF Aviation Standards Agency.

The second skill set is Team Building. Team building consists of two main concepts, namely leadership and team management. Large aircraft such as the A380 or B747-800 are flown by teams not by individual pilots. Teams are often used in aviation because the complexity of the tasks increases as technology advances. Teams are also used to provide redundancy to provide an extra safety factor that is critical to aviation (Ginnett 1993). The focus of CRM is on how people behave in a team / group. Because people behave differently in teams / groups as they do on their own, CRM training teaches personnel to adapt to such situations and to optimize performance rather than gain 'leverage' from teamwork. CRM aims to reduce problems that may be created in teams such as observer effects, conformity, social laziness, team decision making and group thinking (Jensen 1995).

On March 23, 1994, an Aeroflot Russian International Airline A310-304 crashed near Mezhduretshensk, Russia killing 75 of the passengers on board ICAO Adrep Summary 2/94 #

4). The plane crashed after a captain allowed his children to fly the plane. As the boy is flying, he accidentally disconnects the autopilot to the aileron and puts the plane on a 90 degree edge causing his nose to drop sharply. The co-pilot tried to fix by pulling back the yoke to get a level flight but the plane stalled. After several strikes, the plane crashed to the ground.

This example shows how poor team performance can have catastrophic consequences. Conformity affects the co-pilot because he agrees with the captain to allow unauthorized personnel to handle the aircraft. The co-pilot knows that this is against procedure and worst of all; to let someone who is not qualified to fly handle the aircraft. The co-pilot may be under the captain's pressure when he succumbs to the decision. Normative influence occurs so that the captain does not get offended. On the other hand, the captain does not demonstrate leadership capabilities as he has a breach safety policy that allows non-pilots to fly commercial aircraft. If the co-pilot has been properly trained in CRM, he will reject the captain's idea. CRM teaches a person to use appropriate communication skills as well as assertive behavior to handle the situation. Therefore, from this example, we can conclude that CRM is very important and can prevent fatal accidents.

Workload.

This includes concepts such as mission planning, stress management, and workload distribution. Accidents often occur when the workload demands are greater than the team's ability. From a pilot's perspective, most accidents occur during the phrases of takeoff and landing. This phrase is a period with a high workload. But surprisingly, the low workload can also lead to accidents. From the perspective of the flight crew, during long segments of the voyage, pilots may be inattentive as they panic. These periods of low workload are the times when complacency is most common. This is known as the low arousal factor of the Yerkes-Dowson Law (Wickens & Hollands 2000).

On 3 September 1989 at 2045, airline flight VARIG RG 254 made a forced landing into the forest near Sao Jose do Xingu, Brazil due to running out of fuel (Summary Adrep ICAO 5/89 # 11). Flight, B737-241 took off at 1725 hours from Maraba to Belem, Brazil. Flight time approx. 45 minutes. The flight crew uses the flight computer 270 degrees instead of 027 degrees. After 2 hours of flying, the captain finally realized they were flying in the wrong direction. Changes were made to fly back to the original route, but it was too late. The plane was of course 600NM. There was a run out of fuel which resulted in a forced landing in the forest. Navigation errors went unnoticed as crew members reportedly listened to the Brazil vs Chile World Cup Qualifying match.

From this example, we can see that poor workload management is contributing to the accident. If the crew / team managed to prioritize their workload and if the crew double-checked their computer input, such an accident wouldn't even occur. With quality CRM training, teams are trained to follow procedures and double-check their work. A good leader will distribute the workload evenly to the capacity of each member, so that their performance

is optimal. From this accident, if the captain has ordered the co-pilot to carry out a scheduled check on the flight computer, then the accident can be prevented. Distractions such as listening to the radio should be minimized. Pilots must increase their passion through cruising procedures in order to get optimal performance during cruising. CRM training for personnel will prevent such accidents which improve aviation safety. Of the three examples given above that show the human factor being a major failure resulting in massive damage, proper CRM training must be applied to improve in-flight safety. CRM knowledge will reduce the slips / mistakes mentioned above which will prevent accidents. The evolution of CRM training can be traced over three decades. The history of CRM has been further divided into five generations (Foushee & Helmreich 1993):

The first generation CRM training on CRM was started by United Airlines in 1981. These programs emphasize changing individual styles and correcting deficiencies in behavior (Helmreich, Merritt & Wilhelm 1999). The first generation of CRM was psychological with a focus on psychological testing as well as developing general attributes such as leadership (Helmreich, Merritt & Wilhelm 1999). There is no clear definition of appropriate behavior on the learning outcomes of CRM training. CRM is also integrated with a simulation training called Line-Oriented Flight Training (LOFT). During these humble beginnings, there are still many resistance to CRM training because they feel that the program is trying to manipulate their personalities (Foushee & Helmreich 1993).

The second generation of CRM training was held by NASA in 1986 (Orlady & Foushee 1987). Currently, many airlines have implemented CRM programs. The term 'crew' is used instead of 'cockpit' because research believes that other flight personnel would need such skills as well. It also starts adding more skills into its core programs like team building, decision making.

The third generation of CRM training that occurred in the 1990s showed a lot of improvement. Human factors problems have been accepted and CRM problems are addressed with attention to the automation of the flight deck (Helmreich, Merritt & Wilhelm 1999). CRM has been extended to other aviation personnel such as cabin crew, engineers.

The fourth generation CRM training emphasizes integration and proceduralization. One of the main introductions to CRM training in this period is a cultural perspective from various regions. CRM training must be integrated with the local culture / organization to have an optimal effect on performance (Helmreich, Merritt & Wilhelm 1999).

The fifth generation of CRM training from CRM is moving towards a universal rationale (Helmreich, Merritt & Wilhelm 1999). It is also recognized by many that CRM training is a three-line countermeasure for human error. The focus shifts to basic human performance constraints which in the sense of reducing human error. Organizational culture has also become one of the major concerns in CRM in recent years as it advances security to another

level. If the company culture has 'safety first', with CRM training, the result will prevent less human error (Helmreich & Merritt 2000). Again, Culture does not affect its ultimate goal of safe and efficient flight. Environmental factors can determine the level of air safety in various parts of the world (Helmreich, Kanki & Wiener 1993). After briefly understanding the evolution of CRM training as well as the three main skill groups, we can conclude that CRM does work to increase security. CRM has influenced or influenced the growth and development of civil aviation in many ways.

First, the topic of human factors is added to pilot training. The human factor has been recognized as a 'core technology' in aviation. The ICAO Assembly set the foundation for the human factors program in 1986. In 1989, ICAO revised ANNEX 1 which since then requires all contract country pilots to become familiar with 'human performance and limitations' In 1997, when the European Joint Aviation Regulations (JARs)) to be effective, CRM is mandatory for all professional pilots and those studying for their license (McAllister 1997). As CRM evolved to the present day, it is recognized as mandatory training for all pilots, controllers and even other flight personnel.

Second, with CRM regulations and their utility to reduce errors, flight training in airlines, flight schools, and military aviation has changed dramatically. For example, airline pilot training now focuses on training technical skills as well as behavioral and resource management skills to fly safely and efficiently in today's environment. Pilots must know about the human strengths, limitations and performance of the small group they will use to reduce errors (Orlady 1993). CRM research has also led to changes in pilot selection. Modern pilot options now focus on the cognitive and psychomotor skills of individuals, then their personality factors.

Third, CRM provides error prevention measures, so that Safety in flight equals money for the company. Although CRM training is expensive to undertake especially annually for personnel, it minimizes the likelihood that any company will have an accident (McAllister 1997). By economic comparison, the cost of training compared to the cost of an airplane like the A380 is worth more. Another major indirect cost is customer reaction to safety training. If the public thinks that a particular airline is 'unsafe' they will boycott that airline and suffer a financial loss on sales. Therefore, CRM and other safety programs are actually cost effective and will ultimately save / generate revenue for airlines.

CRM has now become an intangible topic in flight training. It actually started two decades ago. CRM has been further divided into five generations. It evolved as a programmatic concern with only emphasis on changing individual styles and correcting deficient behavior in the first generation, to the second generation with more core skills such as decision making. The term cockpit was changed to crew during this era because they realized that the rest of the aviation community also needed CRM training. The third generation underwent major developments such as incorporating the concept of the human factor into its program. The fourth generation

integrates organizational culture into its context. Until now, the fifth generation CRM training is still developing and consistently being monitored for any changes to improve safety. CRM training is now shifting its focus to the limitations of human performance compared to the psychological first generation. The output of the actions taken is compliance with the action plan, ATC requests and standard operating procedures. Aviation safety (i.e. the decision to only take one approach and divert if unsuccessful) was the result.

D. Conclusion

CRM training has progressed dramatically. This has helped the aviation industry to be safer in all aspects of the industry. Because errors are unavoidable, CRM research will continue to change and develop with the aim of reducing more errors in human performance to move up to another level of aviation safety. As CRM research continues, many regulatory and government agencies such as JAR, ICAO, NASA and FAA have all recognized the potential benefits of CRM and they have implemented rules for including CRM and human factors as one of its core modules for most aviation personnel training worldwide. . CRM has globalized into an in-flight necessity. Second, training for aircraft, aviation schools and the military shifted their focus from mostly technical skills to technical skills and equitable resources for pilots and other aviation personnel. One of the main influences of CRM is the process of selecting pilots in airlines and schools. The selection criteria shift from personality factors to the applicants' cognitive and psychomotor abilities. With CRM training to reduce errors, it directly means having more advantages for airlines. Security is money. With a lower accident rate, airlines will cash in more money than the cost of the plane. With CRM training, they can somehow attract market share which allows airlines to gain more profit. CRM and other safety programs are actually cost effective and will ultimately save / generate revenue for airlines.

In short, safety is the top priority in aviation even if it is safer than traveling on the highway. The human factor was of great concern since the early days of aviation as 75% of in-flight accidents are caused by 'pilot error'. CRM is an application that reduces errors made by humans. CRM training aims to ensure that all flight personnel have an effective team performance consisting of technical proficiency and interpersonal skills. CRM courses around the world are similar in content which have three main skill groups namely communication and decision-making skills, team building and workload. By acquiring the knowledge taught in a CRM program, slips or mistakes will be greatly reduced to improve in-flight safety.

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