

Evolution of human factors in crew resource management report

[Engineering](#), [Aviation](#)



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Executive Summary

Most aspects of aviation have radically changed since the advent of the first aircrafts in the late 19th century. With increasing technology in flight development, crew management protocols have also been changing ever since (Helmreich, Merritt, & Wilhelm, 1999. pp23-24). However, the last 50 years has witnessed the greatest improvement in the way crew management is carried out in various aviation settings. This paper shall determine the evolution of crew resource management considering all the factors that have changed in one way or the other, culminating into the modern aviation management protocols. Validation of the crew resource management, in addition to cockpit management is discussed in the paper (Karwowski, 2011pp 42-45). In addition, limitations in the CRM field of aviation such as lack of cultural generality shall also be discussed. There is also consideration of the changing framework which emphasizes of error management and treatment in order to increase the awareness of the CRM and its concepts. Human behavioral strategies that are normally taught in CRM are defined within the context of the evolved strategies in aviation; however, this has come because of years of changing in the trend of airline management. These have sometimes been affected by major occasions such as accidents; change in technology and sometimes due to threats of terrorist attacks (Karwowski, 2011 p. 47).

This paper will determine the trends that the modern CRM training methods have followed since 1950s, considering the prevailing human factors and human related conditions that led to each generation of CRM (Helmreich, Merritt, & Wilhelm, 1999 p. 121). In addition, it will determine strengths and weaknesses of each CRM generation from the first to the fourth. The paper has also made conclusions based on the discussion in order to draw important information that could be of use in understanding and appreciating the evolution of CRM and human factors (Sian, Robertson, & Watson, 2007 p. 98).

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Introduction

Human factors have had a great impact on the airline aviation industry throughout the history of the field. In all aviation settings, human factors must be understood in details, and thus a detailed description of how the industry is impacted on by the human factors must be provided to trainees in airline aviation. Beginning from the first inception of flight, human factors have continuously been investigated whenever a major occasion happens, and have been a major concept of study ever since (Sian, Robertson, & Watson, 2007 p. 106). Since flight is a result of man made inception, human related failure is a major factor that any CRM strives to avoid. Despite these advances, CRM has not always been so successful; rather it has been changing since the inception of the first flight. However, the major change in this field has occurred since 1950s and 1960s, with its peak being in 1980s and 1990s (Orlady, & Orlady, 2009 p. 56). Historical evidences reveal that

about 50 years ago, address of human factors in commercial aviation was done too late, thus contributing to major automatic problems (Orlady, & Orlady, 2009 pp. 56-57).

Engineering of human factors, which is the major cause of the changes that has occurred in the CRM, has been taking place since 1960s, driven by the application of the principles of human performance, models, techniques, measurements and system design (Orlady, & Orlady, 2009 pp 61-62). Over the time, aviation industry has been characterized by radical changes in an effort to ensure that human factors such as cognitive and physical capabilities as well as limitations are recognized in aviation industry. With the greatest workload placed on pilots, players in aviation industry realized the need to define the limit of workload each crew could be assigned to, and thus this led to the determination of human factors including physical, social and cognitive factors (Orlady, & Orlady, 2009 p 103).

The beginning of the crew resource management as a part of training and management in aviation industry can be traced back to 1960s in the United States of America, where a workshop named resource management on the flight deck was held under the sponsorship of aeronautics and space administration (Sian, Robertson, & Watson, 2007 p. 113). It was an outgrowth of NASA research on the causes of flight accidents. This workshop highlighted the human factors as some of the major causes of errors in almost all accidents in the world. This meeting also applied the cockpit resource management aimed at reducing pilot errors through the use of human resources in a better manner. Since then, CRM became a topic coined

from these two original versions, and especially rough 1980s and 1990s (Sian, Robertson, & Watson, 2007 p. 117).

Analysis and discussion

Beginning in 1970s, CRM was recognized and increasingly applied in both training and overall management. CRM training programs then proliferated not only in America, but throughout the world. In addition, approaches to this field also increasingly changed, creating what is now known as the generations of CRM. CRM also got integrated in military training, and has followed its own path, different but related to the public and commercial CRM and its evolution (Sian, Robertson, & Watson, 2007 p. 123).

The first generation of CRM was the cockpit resource management, initiated in the 1970s. Cockpit training programs were developed in constant consultations with other personnel who had earlier undeveloped other training programs for commercial corporations in other fields apart from aviation. Human resource management experts in various fields were being recruited in the think tanks in order to develop high quality training (Sian, Robertson, & Watson, 2007 p. 124) The major such a program was developed in the United States and Europe.

The program, commonly known as the United Program, was modeled in a manner that represented earlier human resource management training in other fields known as the Managerial Grid. This program had been developed earlier by psychologists Jane Mouton and Blake Robert in early 1960s. It was being conducted in an intensive workshop or seminar setting. Among the

major activity in this program was to diagnose the managerial style, where the trainees were allowed to discuss the ways they would think are good for diagnosing failures in management of the cockpit human resources (Orlady, & Orlady, 2009 pp 71-73)

There were also other training programs in this era which also borrowed much from the human resources management training approaches in other fields. They tried to emphasize on individual styles and correction of deficiencies in human behavior on an individual basis such as excessive authoritarian behavior of seniors and consequent assertiveness by their juniors. In the United States of America, the national transport safety board supported this emphasis in, late 1970s, and singled out the failure of captains in accepting advices from their junior members of the crew (Orlady, & Orlady, 2009 pp 71-73).

This was referred as the ' Wrong Stuff'. In addition, it singled out the lack of commitments and assertiveness by flight engineers in both commercial and military flights engineers as a major causal factor in various crashes in the 1970s, among them the infamous 1978 United Airlines crash. The first generation courses of the CRM were mainly psychological their nature, and mainly focused on psychological testing like leadership and its concepts. General strategies of the interpersonal behaviors were advocated for, but which did not provide with clear definitions of the required behavior within the cockpit (Orlady, & Orlady, 2009 pp 71-73).

It had been reported that most cockpit crew members employed gaming activities in addition to other behavior which are unacceptable in any other workplace, especially risky jobs such as flights. In this era, it was also realized a single training for each crew member was not enough; neither was the annual training enough for the cockpit crew, and therefore it was declared that all members of the crew must undergo at least two training sessions every year, and which must be comprehensive and elaborate (Orlady, & Orlady, 2009 pp 86-87).

In addition, full mission simulator training sessions were also integrated with classroom training. This would allow crew members to practice some interpersonal skills devoid of jeopardy. Despite these developments, most of these early courses encountered great resistance from some pilots not only in America, but also in other parts of the world. These pilots denounced these strategies as charm schools, observing them as strategies aimed at manipulating them.

The second generation of the crew resource management started with NASA's efforts to transform flight industry in the United States of America and other efforts in Europe. In 1986, NASA held a workshop for the flight industry. By the mid 1980s, most airlines in the United States had already initiated CRM training programs. In this particular meeting by NASA, the workshop concluded that explicit CRM training could disappear as a separate training component if it was embedded in the flight training as well as operations.

Also at that particular time, relatively new generation of CRM courses was emerging. The cockpit crew resource management replaces the former cockpit management through the dropping of the word cockpit and adopting the word crew. Delta airlines was the first commercial flight corporation to include these new training programs in the United States of America in late 1980s.

It dealt with more classification of the specific concepts of aviation that were related to flight operations, which became more modular and team oriented in its use. Intensive seminars employed basic trainings, which included concepts based on team building, situation awareness, and stress management and briefing strategies. Decision making strategies and processes were addressed through specific modules, which also attempted to break down chain of errors that had been shown to result into flight catastrophes throughout the world.

Despite this improvements, of the courses still relied on other exercises that were not related to aviation especially when demonstrating concepts. At this time, there was a wide acceptance of these training requirements than in the first generation CRM. However, criticism was still observed, and most of these critics argued that the training was laced with notions of synergy and the use of irrelevant physics jargon, which could not have helped the flight crew much. In most parts of the world, this generation is still in use.

The third generation started in the 1990s, where the CRM training proceeded in multiple paths towards developing a relatively new method of training the

crew members. There was great focus on the characteristics of the aviation system which crew members were supposed to function. Such factors included input and cultural factors such as company culture in dealing with human resources and determination of workers safety measures. At this time, there were efforts aimed at integrating CRM with other technical training programs and a focus on the specific skills and other behaviors that crew members must use to function most effectively. Several airlines in the world had begun including modules that would address CRM issues within the process of automation of flight deck.

Human factor issues at this time were recognized more than any other time before. There was also an accompanying initiation of CRM advanced training for other personnel including the check airmen who were responsible for reinforcing, training as well as evaluation of other technical human factors. CRM was also targeting other employees within the flight industry. Flight attendants, dispatchers and maintenance personnel began to be included in the training programs. In addition, airlines developed joint CRM training programs for their cabin crew members.

Other specialized CRM training protocols were also increasingly being developed to ensure that new captains adhere to command and information sourcing from their juniors. This has focused on the leadership roles which accompanied their command. The third generation CRM was widely accepted, and very little resistance by any one group was observed. However, it was observed to have an impact on the previous methodologies,

especially because it diluted the original focus on the attempt to reduce human error in flights.

The fourth generation CRM began in the mid 1990s, and was mainly based on integration and proceduralization. In the United States of America, the federal aviation administration changed the previous type of training through the introduction of new methods.

The FAA initiated its advanced qualification program in 1990. The program is voluntary and allows air carriers to develop some innovative training programs that easily fit the needs of each specific airline organization. In line with this initiative, each carrier that participates would be required to provide both LOFT and CRM for their flight crews and integrate the concepts of CRM with technical training. Most airlines in the United States of America began positioning themselves for AQP and moving from the older models required by the FAA (Helmreich, Merritt, & Wilhelm, 1999).

Carriers are also required to complete some detailed analysis of the requirements in training for each of its crew. They are also required to develop other programs aimed at addressing human factors in CRM issues for each aspect of training. Moreover, there is a requirement that special training protocols for those professional charged with certification of crew members and formal evaluation of the crew members in full mission.

Several airlines began to proceduralize the concepts that were involved through the addition of the specific behaviors of crew members for their checklists. The ultimate aim is to ensure that decisions and other actions are

informed through consideration of the bottom lines, while the basics of the CRM protocols are always observed even in non-standard situations in America and other nations (Helmreich, Merritt, & Wilhelm, 1999).

The forth CRM generation also addresses the surface workers in addition to crew members. These personnel are trained to solve emergency situations caused by human errors whether in the cabin or elsewhere. In this case, CRM is developed into an integral part of each training program for all persons in the industry, but differs with the persons being trained. The goal of making CRM explicit training move forward or be integrated with other methods is now being discussed.

Although there are not verifiable empirical data on this issue, most airlines in developed nations argue that the AQP approach has yielded impressive improvements in training and qualifications of cabin crew members and other experts in the field (Helmreich, Merritt, & Wilhelm, 1999). However, the fact is the situation might be very complex and the resolution could never be straightforward. There should be an examination of what has been accomplished and what has not in the past two decades that CRM has been emphasized on rather than considering the latest iteration that CRM may have caused (Harris, Muir, & Helen, 2005).

Conclusion

The contemporary Crew management resource management is a result of a long term evolution of management practices which began in 1950s. The evolution was characterized with recognition of human factors that used to

cause failure within the crew, and most of the time caused flight accidents. The fourth generation CRM began in the mid 1990s, and was mainly based on integration and proceduralization (Harris, Muir, & Helen, 2005). In the United States of America, the federal aviation administration changed the previous type of training through the introduction of new methods

In addition, several experts were consulted within the line of developing high quality training protocols for members, and most of these persons were mainly drawn from other fields of commerce (Harris, Muir, & Helen, 2005). As at now it is important to note that the modern CRM and its associated protocols are quite effective, especially considering that other programs used for training supportive staff has been included in the process (Harris, 2004).

The forth generation CRM can be described as being effective in various ways, especially when one considers that technology is being integrated with CRM (Salas, Maurino, & Daniel, 2010). The fundamental question of whether CRM is fulfilling its intended purpose of promoting security and efficiency in flight industry does to have a straight or absolute answer, mainly because human factors are still not well established within the training programs. Even if they are established, there are still some areas that need improvement, given the most flight accidents today are still being attributed to poor human coordination and human errors that sometimes are thought to have been addressed within crew and supportive staff training (Harris, 2004).

In addition, it is important to note that the fourth generation CRM is complicated with an increased need to train crew member tactics for dealing with difficult situations. For instance, in the modern world, several threats on the flight industry are real. An example is the increased risk of terrorism that has been common since 2001. Crew members are sometimes required to have other skills such as defense skills to deal with rogue passengers and terrorists (Baur, 2011). Most airlines in developed nations argue that the AQP approach has yielded impressive improvements in training and qualifications of cabin crew members and other experts in the field (Harris, 2004). However, the fact is the situation might be very complex and the resolution could never be straightforward (Harris, 2004). There should be an examination of what has been accomplished and what has not in the past two decades that CRM has been emphasized on rather than considering the latest iteration that CRM may have caused (Baur, 2011).

Sometimes they are required to take martial arts skills and other psychological training to detect any attempts of terrorism among their passengers. With this regard, it could be argued that the fourth generation CRM is being replaced by the fifth generation as time goes on, and one cannot clearly define the thin line that separates the two generations (Baur, 2011).

Recommendations

The trend through which CRM has gone through in its evolution from the early primitive type that was based on individual knowledge of geography and other tactics has been a long journey, and efforts have been applied in this development. This with time and new challenges, each system changed

from one stage to another, and at now it is not correct to say that the fourth generation is the ultimate CRM training methods that should be taken as absolute (Salas, Maurino, & Daniel, 2010 p 129).

There must be research conducted constantly with time to determine the prevailing conditions such as threats and technology, and include them in new and improved CRM protocols of training. In addition, the modern trend at which technology is driving the flight industry requires that each crew member get the first hand information on the new methods being developed each and every time. This means that modern CRM training protocols should be tailored towards technological progress (Helmreich, Merritt, & Wilhelm, 1999. Pp 41-43).

Crew members as well as other supportive members should receive constant training to ensure that they are aware of any security issues occurring. Of particular importance is the need to have information and communication technology integrated within the training program in order to allow crew members get the first-hand information on the situations in the field even when they are at long distances from their flight base (Salas, Maurino, & Daniel, 2010 p 134). This will promote communication channels between crew members and between them and other flight staff in other areas, and to share ideas between flight crews and other staff.

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