

Analysis of CRM Training in the Commercial Pilot License Training Stage for Student Pilots—Taking L3 Flight Training School as an Example

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Abstract: CRM training is one of the compulsory courses for every student pilot, especially in commercial pilot license training stage. This paper introduces the course and teaching method of CRM in L3 flight training school. Combined with the author's flight experience in L3 flight training school in the United States, it analyses the main factors for obtaining CRM in commercial pilot license training, and discusses the common problems encountered by pilots due to lack of CRM training. This paper proposes some targeted programme from the acquisition of pre-flight information, flight technical ability, crew communication, enhancement of flight situational awareness, and improvement of Crew Resource Management capabilities. At last, the paper provides some references for student pilots of flight safety and improving Crew Resource Management capabilities.

Keywords: Student Pilot, Commercial Pilot License Training, CRM, Flight Training School

1. Introduction

With the rapid development of the civil aviation industry, the reliability of aircraft and its equipment has become very high. The cause of flight accidents is no longer just the problem of aircraft and equipment. The behavior and technical ability of aircraft operators represented by flight crews have become the main cause of accidents. Almost all flight accidents are related to flight crews, such as lack of situational awareness, negligence, inappropriate operation, poor flight skills, etc. The core of Crew Resource Management is to mobilize people's subjective initiative, strengthen coordination and cooperation between crews, create good communication and an equal and friendly environment, and effectively integrate all resources available to pilots to maintain maximum safety and work efficiency [1]. In Crew Resource Management, a high level of personal technical ability is the basis for safe operation. On this basis, crew collaboration is a powerful guarantee for correcting individual mistakes and improving safety.

Therefore, CRM training is very important in the development stage of pilot training [2]. During the commercial pilot license training stage, student pilots have already accumulated private and instrument training, and in the commercial pilot license training stage, they will add some knowledge about airline operations and simulate emergency situations such as single engine failure. Therefore, it is the best time for student pilots to accumulate CRM ability in the commercial pilot license training stage.

2. Overview of CRM Training in a Commercial Pilot License

L3 flight training school is located in Orlando Sanford, Florida, on the southeastern coast of the United States.

L3 flight training school is one of the best flight training schools in the United States. It was originally affiliated to Delta Air Lines and is now independently operated by L3 Harris Technologies, which is a global simulator manufacturer. L3 flight training school has attracted a large number of Chinese airlines to send trainees for training. In strict accordance with the training standards for commercial transport pilot training, L3 has trained a large number of outstanding pilots for China's civil aviation and has made great contributions to the development of China's civil aviation.

The training goal of L3 is to enable every graduate student to quickly adapt to the airline crew flying. In response to the requirements of the Civil Aviation Organization of China and the International Civil Aviation Organization, the flight training school itself has a unique CRM training

model. CRM topics are covered in private license, instrument rating, and commercial pilot license training. The main training topics include:

- (1) Basic concepts of Crew Resource Management;
- (2) Standard operating procedures and implementation checklists;
- (3) Good communication and workload management for the crew;
- (4) Situational awareness, especially for dual-engine commercial pilot license training;
- (5) Pre-flight preparations and practical decisions in flight situations;
- (6) Communication and collaboration in actual flight;
- (7) Analysis and research on accident cases.

The training content of CRM of L3 flight training school is shown in Figure 1.

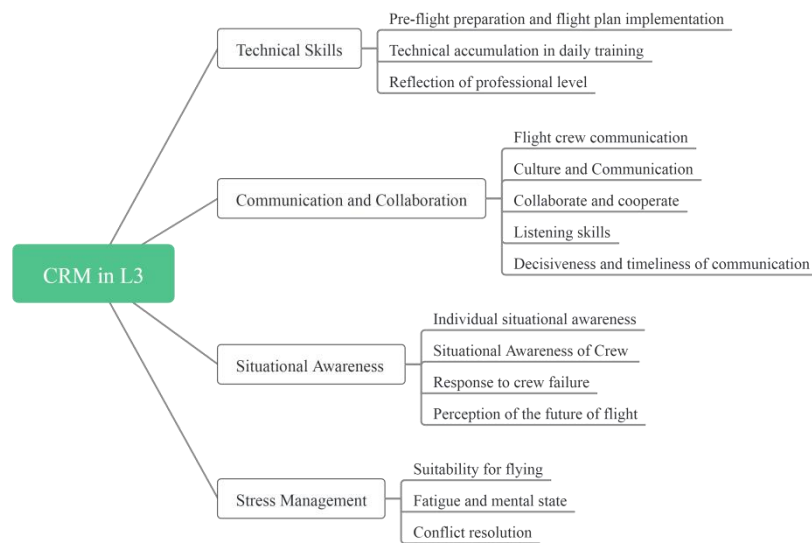


Figure 1: RM training content of L3 flight training school

Through commercial pilot license training CRM training, student pilots can learn about the knowledge of single crew and teamwork, and form skills and styles that are conducive to future work, thereby improving flight safety. Most aviation accidents are caused by human error, although sometimes maintenance and control errors, mainly flight crew errors.

In most cases, the improper management of crew resources is manifested as failure of cooperation and communication among crew members. In the process of commercial pilot license training two-person crew training, it is mainly manifested as improper handling of the relationship between instructors and trainees, or in the training, the instructors leave it alone and let the students operate at will. Some investigative reports indicate that the vast majority of fatal approach and landing accidents are related to pilots' lack of training in CRM at the cadet stage.

3. Scope and Training Objectives of Commercial Pilot License CRM Training

Most aviation accidents are related to the lack of relevant CRM training for flight crews during the cadet stage. Through CRM training, skills and attitudes that are conducive to crew members' collaboration can be formed, which can effectively improve the team's work performance [3].

3.1 Crew Human Resource Management

Human resource management training is the focus of CRM training. In the commercial pilot license training stage, the most important human resource is the crew. The crew members in this stage are instructors and trainees, just like the captain and co-pilot in future airline flights [4]. After entering the commercial pilot license training stage, the students should take the lead, communicate with the

instructors effectively, and arrange in-flight tasks. A clear division of labor can help crew members better receive information from all aspects, and can deal with emergencies more quickly. A pleasant crew atmosphere and good communication will lay the foundation for the safety of each flight.

During the flight, instructors and students should actively communicate and actively participate in crew cooperation, so as to obtain good crew human resource management. As far as L3 is concerned, some simulated flight crews will be added to commercial pilot license training, and the instructors will give the students more power. Therefore, commercial pilot license training is the best time to develop CRM awareness. When encountering an urgent potential danger in flight, both the instructor and the trainee need to ask questions and discuss in time, and then make decisions.

3.2 Acquisition of Flight Information

Flight information refers to various materials that can help pilots effectively carry out safety flight plans and make correct flight decisions, including air route weather information, route maps, airport approach maps, and checklists[5].

Solid professional theoretical knowledge is one of the main sources for student pilots to obtain safety flight information. There are two main ways to obtain it: the professional theoretical courses of domestic flight academies and flight training schools abroad have laid a solid foundation for the future flight training; with the accumulation of flight hours and the growth of flight experience, students can accumulate more in actual training. In order to quickly and accurately obtain the necessary information in flight, student pilots must strictly abide by the regulations in the flight information and the operation manual during training.

Pilots must strictly implement the checklist in each flight, which is also an extremely important part of ensuring flight safety. Correct use of the checklist can avoid some simple mistakes in student pilot training and ensure that instructors and students are in a good flying environment. Student pilots should know how to use the checklist effectively, clarify the crew members, and who is operating the aircraft, so as to avoid losing the aircraft attitude due to all immersed in the checklist, which may lead to aviation accidents.

3.3 Use of Airborne Equipment

The purpose of the use of airborne equipment is to enable the crew to operate the aircraft in a complex environment. These include communication equipment, attitude indicator displays, equipment data indicators and aircraft protection devices. Cultivating good operating habits at the student stage can improve the efficiency of cockpit equipment management for student pilots to ensure flight quality and safety. The following suggestions are very important.

When you start to operate the aircraft, please adjust each instrument to the display mode that you are familiar with and used to, so that you can get the required information in the shortest time. Reasonable allocation of time and energy to manage the instruments in the cockpit, when using a current frequency, can be switched to the next frequency in time, which is convenient to establish effective communication in a short time. Use different airborne navigation and positioning equipment to prevent single equipment failure. In an emergency event, if there is an instrument or system failure, the pilot should be able to timely and accurately determine the source of the failure, make an effective solution, and use the instructions of other instruments or spare instruments to control the aircraft.

3.4 Planning of Consumables

In flight training, consumables mainly include fuel, time and personal energy. Student pilots should establish the concept of time and fuel early. When preparing for the flight, students should make an appropriate plan according to the flight time, clarify the time and fuel consumption of each flight stage, and should also take into account the influence of various external factors, such as the upwind and downwind on the route, and possible emergencies wait, consider emergency fuel and alternate fuel. Most students are easily misled by their daily flying habits and the stable weather at the airport at that time, thinking that they do not need to choose an alternate airport during flight training, and finally formulate an unreasonable fuel plan. If you encounter bad weather, you will put yourself in a more dangerous situation.

4. Main Content of CRM Training in Commercial License Training

4.1 Pre-Flight Information Collection

Pre-flight information collection is the main factor that can reduce crew errors and is one of the main factors affecting CRM training [6]. Pilots must collect and inquire various information about the flight route before each flight. This requires special attention to the implementation of the pre-flight personal checklist and risk management checklist. The pre-flight personal checklist is for the pilot's self requirement, and the implementation of the risk management checklist is a comprehensive reflection of the pilot, aircraft, environmental factors and external pressure.

Execution of the Pre-Flight Personal Checklist "I'M SAFE Checklist":

- (1) I-illness (disease)
- (2) M-Medication (drugs)
- (3) S-Stress (pressure)
- (4) A-Alcohol (alcohol content)
- (5) F-Fatigue (degree of physical fatigue)
- (6) E-Emotion (personal emotion)

Risk Management Checklist "PAVE Checklist":

- (1) P-Pilot (Pilot)

The pilots will conduct self-examination, including their own physical condition, mental fatigue and other factors to determine whether they are competent for the flight.

- (2) A-Aircraft (Aircraft)

When preparing for the flight, the pilot needs to analyze and judge the airworthiness of the aircraft, whether the equipment is normal, whether the performance is good, etc., and decide whether to continue the flight.

- (3) V-Environment (Environmental factors)

The environment includes weather conditions on the route, obstacles, and the use of airports or runways.

- (4) E-External pressure

For example, pilots have important tasks to participate in, and other external pressures.

4.2 Situational Awareness

In commercial license training, instructors teach students about situational awareness during flight training. In the private pilot license training stage, the student pilots must spend a lot of time on simple aircraft manipulations, and have little time to take into account the surrounding conditions, weather and observation of other aircrafts, and their situational awareness are relatively low at this time.

In the commercial pilot license training stage, through the accumulation of flight hours, the pilot's flight skills have been greatly improved. It only takes a little time and energy to complete the flight action and control the aircraft well. So that the pilots can have more time to monitor the various instruments in the aircraft, and have more time for the training of situational awareness. In order to improve the students' situational awareness, the instructor will simulate some emergency situations that may occur in the flight route, and cultivate the students' time allocation ability, cooperation ability and situational awareness level in the event of an emergency.

4.3 Technical Skills

Flight technical ability is the basic condition for evaluating whether a pilot's ability is qualified, and it can directly affect the crew's resource management ability [7].

Civil Aviation of China has very strict requirements for pilots. Taking student pilots as an example, from the initial selection process, many items must be inspected during selection, both physical and

psychological. From the perspective of the training process of the aviation school, it not only focuses on the training of flight technical ability, but also on the training of pilots' psychological quality and emergency response ability. Chinese civil aviation pilots graduated from different aviation schools and have different training experiences, so the flight experience and control skills of student pilots are also different. Generally speaking, flight students have the less flight experience, and their flight skills and operating experiences are relatively weak. Airline transport pilots and flight instructors have more flight time, and their ability to deal with problems encountered during aircraft operation is relatively strong. This is the impact of long CRM training.

4.4 Crew Communication

Communication is an important tool for CRM. The information transfer in the process of crew communication should be concise, accurate and timely. The significance of communication in commercial flight is more important.

In the process of communication, both the instructors and the students should be active subjects participating in the process. The instructors will teach the information to the students through language and actions, so that a complete communication process can be formed in this teaching, and both parties in the communication can actively participate in it.

Communication is not simply a process of information exchange. Instructors and students should influence and understand each other through communication. Instructors can efficiently transmit information to students. At the same time, students can effectively master what they have learned, so that the attitudes and behaviors of both parties can be consistent and emotionally stronger Harmony, thereby changing the relationship between the two sides.

Commercial flight training is a special stage, and it is the best time to cultivate crew communication. Good cockpit communication can improve the work efficiency of the cockpit, which is conducive to the teaching of instructors and the learning of students, and can also cultivate students' Crew Resource Management. The poor communication will weaken the performance of the cockpit, cause misunderstandings and mistakes, not conducive to establishing a normal teaching relationship with instructors and students, and even hinder the safety of flight. Therefore, the learning of cockpit communication is also an essential item in commercial flight training.

5. Suggestions for Improving the Effect of CRM Training

5.1 Pay Attention to the Technical Training of Pilots

From the accident analysis, many unsafe incidents are related to flight technology, such as improper use of equipment, heavy landing, overrunning of the runway, deviation from the runway, etc. At present, many airlines mainly have two problems, one is the lack of flight experience, and the other is insufficient flight training, and the training quality needs to be improved. These problems need to be solved.

With the continuous development of civil aviation industry science and technology, more and more automated systems have been introduced into the cockpit. These automated systems include autopilot, auto navigation, flight management and automatic monitoring systems. The use of automated system has greatly improved the safety factor of flight and reduced the pilot's workload. However, for flying, no matter how advanced and intelligent the aircraft technology is, designers and pilots must understand that advanced automation systems cannot replace the pilot's work. At any time, the principle and awareness of manual operation of the aircraft must be fully guaranteed, and the technical training and practical ability training of pilots are always at the center of the flight.

5.2 Improve Situational Awareness

A solid knowledge of aviation theory is the premise for student pilots to establish situational awareness. With the rapid development of the aviation industry, high risk and complexity has become synonymous of this special industry. With the rapid development of aviation technology, the degree of automation of aircraft is higher and higher, and its advanced nature and complexity are also higher and higher. A qualified pilot who wants to obtain a high level of crew situational awareness must have solid theoretical knowledge of aviation. If there is no solid theoretical knowledge, then situational awareness

will be impossible.

Second, student pilots should establish good cockpit situational awareness through commercial pilot license training flight training. On the one hand, they face emergencies independently in simulated flight, and on the other hand, they cultivate the captain's awareness. Every flight training is a good opportunity to accumulate experience. Through the training of situational awareness, students will appear very calm when facing the transition of aircraft type training, such as from PA-44 to B-737, and they only need to be familiar with the characteristics of the type to get started quickly. This is because situational awareness has a good foundation and accumulation. In commercial pilot license training, situational awareness is the premise, and students gradually transition from a student pilot to a qualified pilot by learning the procedures of a two-person crew.

5.3 Effective Crew Communication

Effective crew communication can greatly improve the efficiency of pilot work, and SOP communication must be adhered while ensuring accurate and appropriate information. SOP communication is very effective in normal flight situations, which can greatly reduce errors and mistakes. Through standard shouting and checklist implementation, the phenomenon of "mistakes and forgets" of student pilots can be effectively avoided.

Facing instructors, students should also improve their psychological quality, so that they are not nervous when facing teachers, and can extract important information from instructors' words and operations. Seek ways to better communicate with the instructors, identify problems and propose solutions in the communication. No matter how strict the instructor is, students must understand that these strict requirements are for flight safety and technical excellence. It is a compulsory course for students to learn to adjust their mentality to communicate with their instructors.

6. Conclusion

CRM is very important for flight safety. Situational awareness, crew communication, and flight technology included in CRM are all crucial links for flight. The lack of any link will greatly reduce the safety of the entire flight. Therefore, we must strengthen our understanding of the importance of CRM training, strengthen the research and innovation of CRM training, and strive to institutionalize CRM training. By synthesizing the influencing factors of various aspects and working together in multiple ways and multiple aspects, the flight unsafe incidents caused by insufficient CRM training can be reduced, thereby improving and ensuring flight safety.

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