Study on the Training of Risk Prevention and Control Ability of Flight Trainees

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Abstract. With the rapid development of civil aviation, civil aviation safety has become a topic of concern. The core of civil aviation safety lies in risk management. How to reduce the risk to a reasonable and feasible low level before the accident happens is the focus of civil aviation. The pilots' risk prevention and control ability is the key element of safety management. Based on the training stage of trainer aircraft, this paper analyses the ways and methods to strengthen the risk awareness and risk prevention and control ability of pilots, which has a strong guiding role for pilots to establish flight risk awareness.

Introduction

Risk concept is an integral part of safety management. Aviation industry faces various risks every day. Many risks may endanger the safety of passengers and even pose a threat to the aviation industry. Pilots have a strong sense of risk and a strong ability of risk prevention and control, which is of great significance for reducing risk level and ensuring flight safety. Pilots should establish risk awareness and develop risk prevention ability when they are in the trainee stage.

Risk and Risk Prediction

Risk refers to the combination of the possibility and seriousness of the consequences of a particular dangerous situation. It is a comprehensive measure of the danger, the possibility of potential accidents, the consequences of accidents and the severity of accidents. Risk is used to describe future random events, i.e. the existence of undesirable event states in the future and the possibility and consequences of undesirable events transforming into accidents. The risk in flight safety refers to the possibility and seriousness of hazards (such as human factors, dangerous weather, aircraft losses, aircraft environmental damage, etc.). The index to measure the risk is risk rate (R), which is equal to the product of probability of accident (P) and severity of accident loss (S), that is, the product of severity and possibility, that is, R=P*S. The number of serious accidents or accident symptoms per unit time can be used to measure the flight safety risk.

Risk prediction refers to collecting all kinds of information, analyzing comprehensively and predicting risks correctly according to the training mission situation; defining the key links and possible risks of each flight safety according to their own technical mastery, course practice characteristics, flight support, meteorological changes, etc., anticipating all-round and highlighting the key points; at the same time, they can quickly identify risk signs and corrections in flight. Determine the trend of risk development. It can be seen that risk prediction includes three capability points: risk prediction, risk prevention and risk identification.

The Significance of Developing Risk Prediction Ability

The ability of risk prediction should be trained from three aspects: risk prediction and assessment, taking measures to deal with risks and identifying risk symptoms, so that pilots can identify all kinds of unfavorable factors and potential dangers in flight system, make accurate assessment of risks, take measures to eliminate hidden dangers and avoid risks, anticipate comprehensively, focus prominently and take specific measures for equipment inspection. The procedure is correct, the

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project is comprehensive and without omission; the risk symptoms are identified quickly in the execution of tasks, the risk development trend is predicted correctly, the disposal is timely and correct, and the risk grade and loss are minimized, thus ensuring flight safety.

The main idea of modern flight safety management is to adhere to the principle of "safety first, prevention first". The prevention of flight accidents is to take active measures on the basis of prediction so as to change all kinds of unhealthy tendencies and results in the organization and implementation of flights and better ensure flight safety. Prediction and prevention of flight accidents is an important part of flight safety management, a constructive and initiative work, and an effective way to prevent flight accidents.

Methods and Ways to Cultivate the Key Ability of Risk Prevention and Control

The key ability of risk prevention and control includes risk prediction ability, risk prevention ability and risk identification ability.

First, the Ability to Predict Risks. Forecasting is to explore the possible development trend of things based on the experience and knowledge accumulated in the past, and make estimates and evaluations in order to regulate their own behavior and reduce the uncertainty of future events. Risk prediction is a work to analyze and evaluate the conditions and factors that may cause flight accidents in the future organization and implementation of flights, and to point out the development outcomes in advance. Flight accident prediction is an important part of flight safety management, a practical step to adhere to the principle of "prevention first", and an effective way to prevent flight accidents.

Here are the basic methods.

Collecting information conscientiously. Data collection includes flight missions, fleet personnel, various safeguards and social environment. Flight time, duration, content and emphasis of mission implementation, difficulty of course practice, ideological status and technical level of fleet personnel, old degree of aircraft and ground support equipment, influence of weather change on flight, influence of social environment on pilots, etc.

Prediction at different levels. Flight safety prediction should be divided into different levels, adopt different prediction methods and contents, and forecast separately. The aviation schools and airlines mainly forecast the flight safety situation, possible problems endangering flight safety and possible accidents. According to the flight mission, meteorological conditions, pilots'technical level and other aspects, the flight fleet focuses on predicting the potential risks of this flight and what measures to avoid risks.

The following are commonly used forecasting methods.

The conference investigation method, also known as brainstorming method, meets to investigate, analyze and study the security situation. This method is easy to exchange information, to reach consensus, to learn from each other's strengths and make up for the weaknesses, to make prediction more accurate, and to put forward improvement measures that are feasible and more conducive to implementation.

Expert analysis method, also known as Delphi method, is to investigate a certain number of experts who have in-depth study and understanding of the predicted objects.

Fault tree prediction method, using directed logic tree which depicts the result to the cause, carries on the logical analysis and calculation to the accident, reveals the cause and the rule of the accident, determines the probability of the accident and the summary of the basic events, and analyses the relationship between the accident and the basic events causing the accident.

Second, Risk Prevention Capacity. Prevention is to take proactive preventive measures on the basis of prediction, so as to change adverse trends and results, and better safeguard flight safety risk prevention is to avoid flight accidents, the sum of all activities carried out before the accident, aiming at discovering and eliminating or avoiding accidents. If the bowknot model is applied, it is the left half of the whole model. The main contents include: establishing flight safety management institutions and flight safety research institutions; promulgating flight safety regulations; carrying out flight safety forecasting and prediction activities; formulating flight accident prevention

measures; carrying out flight safety education, etc. The reasons leading to flight accidents are complex, but from the point of view of the event chain theory of flight accidents, many accidents often have some common "chains". Finding out these common chains, starting from the aspects of organization and management, equipment safety engineering technology, cutting off the accident chain can avoid these accidents.

The following are the main ways to prevent flight accidents.

Play the role of documents and regulations. According to Annex 1, 6, 8, 11, 13, 14 of the International Civil Aviation Convention and the relevant documents of ICAO, as part of the National Security Program (SSP), each State Party shall oblige training organizations, airlines, maintenance organizations, model design agencies and aircraft manufacturers that have been approved and face safety risks in providing services. Air traffic control agencies and qualified airports shall implement the safety management system accepted by member states. The 2009 edition of ICAO Doc9859 divides the framework of safety management system into four components: safety policy and objectives, safety risk management, safety assurance and safety promotion, and 12 elements of management and commitment, safety responsibility, etc. Each aviation school and airline company should strictly implement the rules and regulations for preventing flight accidents within the framework of documents, constantly improve the rules and regulations for preventing flight accidents, regularly study the rules and regulations for its fleet personnel and other organizations, and regularly supervise and inspect the implementation of the rules and regulations.

Analysis of flight safety situation. The main task is to find problems and formulate measures. Whether the flight safety situation is good or bad, regular or irregular safety situation analysis is conducive to maintaining a clear mind, can clearly ensure the achievements or problems of flight safety in the prevention of flight accidents, formulate or improve measures to prevent flight accidents, so as to make the prevention of flight accidents more active.

Carry out safety foresight activities. Flight safety anticipation is a regular activity to anticipate possible problems in flight activities and to propose preventive measures. The purpose of carrying out flight safety anticipation activities is to make the safety work focus clear, problems clear, countermeasures clear, and enhance confidence in ensuring flight safety.

Adopt scientific training methods. The most commonly used is the flight training simulator. Flight simulator training is an effective means to reduce aircraft handling errors, pilots'delusions or inappropriate loss of attention, as well as aircraft entering complex or unknown state accidents. Another advantage of flight training simulator is that it can carry out some special disposal training which can not be carried out in actual flight, such as the approach and landing of ground gale, flight control when the flight management system fails, etc. The successful disposal of the windshield falling off accident of Sichuan Airlines Airlines is due to the long-term experience of the commander of the aircraft in military aircraft piloting and the rich experience of flying without relying on autopilot equipment.

Thirdly, Risk Identification Ability. It is to adopt active and passive methods to quickly identify potential safety hazards and risk symptoms, correctly judge the development trend of risk, and then take timely and correct disposal measures to minimize the risk level and loss, so as to ensure flight safety. Each flight activity is carried out in a certain environment, and is an organic activity involving people, aircraft and various facilities. The flight system of " Human-Machine-Environment " is an open system, which is also influenced by other factors and social environment.

Risk identification is to study from five aspects: human, machine, environment, task and guarantee.

"Human" is a kind of person who directly or indirectly participates in flight activities. Ideological factors, occupying the primary position, should have the basis of quality, improve flight quality and ensure the basic quality of flight safety. Physical factors, grasp, use and play the basis of technology. Psychological factors, such as people's perception, memory, thinking, attention, emotion, personality and so on, affect a person's psychological readiness for various situations that

may occur. Ability factors are mainly manifested in three aspects: professional quality, learning and understanding ability and non-technical ability.

"Machine" is the general name of aircraft and its onboard equipment. Power devices, such as engine test procedures, engine working conditions, temperature and pressure operating range, residual oil situation; engine asthma, smoke, speed, intake pressure sudden drop and other abnormal working conditions are the risk signs that may develop into engine shutdown. Control system, ground acceptance of aircraft front flaps, ailerons, rudders, elevators inspection, aircraft control system inspection before starting. Airborne electronic equipment and special equipment, such as horizon recovery, radio communication, generator power failure signal indication, etc.

"Environment" is the aggregation of various external conditions that affect and restrict flight safety in the process of the existence and development of flight system. Atmospheric environment, including clouds, visibility and wind in flight area, are the three most common meteorological factors affecting flight activities. The obvious meteorological characteristics and significant differences of flight in different seasons and periods are clarified. Geographical environment refers to the geographical characteristics and clearance of airports and flight areas. The ecological environment, especially the activities of birds, should enhance the awareness of bird strikes prevention and effectively implement the measures of bird strikes. The influence of space environment, flight area, route and other air flight environment on flight activities, such as the space activities of civil aviation and various aircraft.

Tasks are specific tasks such as flights or teaching and training.

Guarantee is the field service support such as pilotage, flight control, communication and navigation, radar information, meteorology, aviation life-saving and so on, which directly serves flight activities.

Teaching Contents of Training Risk Prediction Ability

First, Risk Prediction. According to the weather in the flying area, airport, aircraft condition, technical level, physical and mental condition and other comprehensive factors, the ground should make comprehensive safety precautions against class exercises and sorties scheduled for the same day or group of flying days.

Second, Risk Prevention. We should make sure of the specific conditions of the aircraft, engine and cockpit equipment, such as the use method, matters needing attention, and interrelation, and make pertinent anticipation and preparation. Procedures and methods of disposal should be specific and skilled, and research should be strengthened. The more specific the basic contents such as division of work between front and rear cabins, operation and data parameters, the better the accuracy of thorough research will be. In addition, we should make full use of the risks that the simulator may encounter so that it can experience the changes of mental state in an environment quite close to the reality, experience the characteristics when the risks occur, master the disposal procedures skillfully, firmly grasp the key points of disposal, and improve the ability to predict the risks.

Third, Risk Identification. Ground preparation and cockpit practice before flight should clearly and firmly remember the basic qualities such as working performance of equipments, working conditions under different working conditions and working performance beyond the limit. In flight implementation, we must continuously monitor and control the working conditions of each system. We must not let off doubts. The earlier the risk discovery is, the more active the safety factor is.

The Teaching Method of Training the Ability of Risk Prediction

Trainer training stage is mainly based on human, Machine, environment, mission, security and other factors to carry out safety prediction, effective risk prediction, and can correctly judge and decisively deal with all kinds of risks, in order to lay the foundation for ensuring flight safety.

Risk prevention is mainly about flight safety and risk. Safety and risk are twin concepts describing the normalization level of system motion from both positive and negative aspects. That

is, high safety level means low risk, while high risk means low safety level. Flight safety risk prediction is to identify all kinds of adverse factors and potential dangers in flight system, make an accurate assessment of the risk, take measures to eliminate hidden dangers and avoid risks, so as to ensure flight safety. Therefore, the realization of risk prediction can reduce the occurrence of security problems and achieve the normal movement of security. It can be said that strengthening flight safety risk prediction is the urgent need of the current situation and task faced by flight, and it has a positive role and practical significance in promoting the safety development of flight training.

Firstly, we should Constantly Renew Our Concept and Establish the Concept of Flight Safety Risk Prediction. Ideological change is the most important and key factor to promote the development of flight safety. Only by breaking the traditional thinking mode and getting out of the misunderstanding of thinking, can we accurately grasp the essence of flight safety and truly realize flight safety risk prediction.

Secondly, the Use of Refined Management Model, the Full Implementation of Flight Safety Risk Prediction. Fine management is through the systematization of rules and the refinement of processes, so that the organizational management units can operate accurately, coordinately and efficiently, and minimize the resources occupied by management and reduce management costs. Fine management is introduced into flight safety work. Fine prediction model of flight safety risk is innovated through real-time monitoring of the state of human-aircraft-loop factors, standardized operation and standardized management.

Third, Improve the Risk Assessment System to Ensure the Quality of Flight Safety Risk Prediction. Flight safety risk assessment is an important means and measure to ensure flight safety. It identifies and analyses inherent and potential hazards of flight safety by means of mathematical statistics, makes qualitative and quantitative safety assessment, determines the risk level of the system, evades or reduces safety risks. The main task is to pre-control the equipments for the first flight, and to ensure that the flight plan is reasonable, the flight preparation is adequate, and the time, schedule, quality and safety are coordinated.

Deepen the transformation of the results of risk assessment. Based on the evaluation results, the core causes of the problems should be judged and safety measures formulated on the basis of qualitative analysis; the good aspects and existing problems of the evaluation should be collected and sorted out in time, and useful experience should be accumulated to provide reference for the next evaluation; and the evaluation is also a process of self-safety awareness, safety prevention ability and comprehensive quality. Risk assessment should not be limited to finding out how many problems, but should pay attention to improving their ability and quality, and regard evaluation as an effective means of eliminating hidden dangers and avoiding risks, so that it can be transformed into a goal pursuit to meet the needs of safety work.

Conclusion

The high-risk civil aviation flight profession puts forward high standards for pilots'aviation safety awareness and prevention ability. In the training stage of trainer aircraft, strengthening the training of risk awareness and risk prevention and control ability will lay a good foundation for the career growth of pilots. In the future, pilots can effectively prevent risks in flight activities such as flight missions, which is of great significance to ensure flight safety.

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