

Study on Pilots' Psychological Adjustment to Special Situation Stress during Flight

Liu Tao, Li Yonggang

College of Aviation Foundation, Naval Aviation University, Yantai, Shandong, 26400, China
274198316@qq.com

Abstract: Flight special situation refers to the adverse situation that suddenly occurs in flight and directly or indirectly threatens flight safety. Flight special situation is one of the important factors affecting flight safety. In this study, by combing the psychological response under flight special circumstances, the key factors of stress psychological adjustment of flight special circumstances were analyzed, and the stress psychological adjustment methods of pilots 'flight special circumstances were summarized from three dimensions : pre-flight stress psychological education, stress adjustment in flight special circumstances and psychological adjustment after flight special circumstances, in order to provide some theoretical support and practical reference for pilots 'flight special circumstances disposal and training.

Keywords: pilot; flight special situation; stress psychology; psychological adjustment

1. Introduction

In the flight working state, pilots are in a special aviation environment with high complexity, high rhythm and high risk for a long time. Their physiology and psychology are in a high-intensity working state, which is easy to cause flight psychological stress. Especially in the flight special situation state, it is easy to induce flight stress, which has a great impact on flight safety. According to American expert research statistics, when pilots encounter danger in the air, whether civil aviation or military pilots, 90 % of them will have transitional tension.^[1] Therefore, it is of great practical significance for pilots to master the correct flight stress adjustment methods and ensure the safety of flight training by studying the psychological and physiological response mechanism of pilots under flight conditions, exploring the psychological process of pilots ' stress under flight conditions, and summarizing the methods of psychological adjustment of flight stress under flight conditions.

2. Psychological Reaction Under Flight Special Situation

When a flight special situation occurs, it usually poses a threat to the pilot and the aircraft. The pilot cannot determine the flight situation and fault judgment immediately and accurately, and cannot choose the special situation disposal method and make the correct decision in time. Under the influence of the uncertain factors of the flight environment, it is bound to affect the pilot's psychology. The impact on the pilot's physiology and psychology is comprehensive through sorting and analysis, mainly manifested as follows:

2.1 Adaptive response

Whether the pilot discovers the flight special situation in advance or suddenly realizes that he is in a special situation, the pilot's nerve center enters a state of excitement immediately according to the general stress psychological process, especially when he suddenly realizes that he is in a special flight situation. The activation of such excitement will inevitably trigger the physical response of the pilot trainees. The sensory organs of the body, such as visual, auditory and vestibular sensation, will explore the source of the stimulation. The brain begins to judge the motivation of the special situation and judge the flight state comprehensively. The physiological and psychological state of the body begins to change, such as the breadth and concentration of at tension, blood pressure, and pulse rise. The pilot's body enters the biological adaptive response gradually. Psychological stress is a normal psychological performance of pilots in flight work. Moderate psychological stress is conducive to pilots' better and

more effective mobilization of flight knowledge, plan measures, energy and other resources to complete the flight task and proper special situations.

2.2 Information Processing and Response

When the pilot realizes that the aircraft has entered the special situation, the pilot needs to mobilize the brain center immediately, combined the basic principles of flight and the special situation handling plans, conducted flight situational awareness comprehensively, made analysis and response quickly, and analyzes and judges the situational changes of the aircraft continuously. For example, in flight special situations, whether pilots get enough decision support information or not, when they need to make a decision after comprehensive information processing, it is often necessary to choose one of two or more decisions, and there is uncertainty in the decision results. Therefore, when a special situation occurs, a highly integrated and focused information processing and response is required.

2.3 Transitional Stress

The excessive tension of pilots under special circumstances usually refers to three psychological states: stress, stress response and excessive excitement. In flight situations, moderate tension is conducive to the disposal of flight situations. Too low tension reduces the efficiency of flight situation disposal, and excessive tension will affect the pilot's disposal, and even endanger flight safety directly. The transition tension is mainly manifested in three stages: mainly including the arousal period, the impedance period, and exhaustion period^[2]. In the case of flight special situations, due to the unskilled handling technology of aircraft special situations, flight fatigue and other factors, the pilot's first thinking is confused and rigid, which affects the situation prediction and decision-making of special circumstances. The breadth of attention is reduced or the attention is excessively concentrated. The body response action is not coordinated. The action is too fierce and too fast, and the excessive tension that cannot be controlled by itself is the most serious psychological state of "shock" (see Table 1).

Table 1 Transition tension mental performance of flight special situation

No.	Type	Performance	Note
1	arousal period	flabbergasted, overwhelmed, impulsive, quick-acting, thoughtless, caring about one thing and losing another, and have an overstressed emotional response.	
2	impedance period	Most people can resist the natural development of excessive tension, and through self-regulation, the psychological recovery to a more normal state of tension.	
3	exhaustion period	Severe fear, delusions and hallucinations, partial or total loss of memory, mental impairment, stuttering, indecisiveness, lack of confidence; panic, cannot respond to; impatience and lack of self-control; bizarre actions, disregard for consequences; susceptible to suggestion, lack of determination, etc.	

3. The key Factors of Psychological Adjustment to Flight Special Situation

3.1 Finger-End Effect

The width of the maximum in the thumb curve is called the fingertip effect^[3].

When the pilot performs the task, the brain, nerve center and other systems enter the state of excitement gradually and the excited domain gradually increases. The pilot gradually forms a psychological working state to adapt to the flight environment. A series of psychological reactions such as perceptual acuity, attention concentration, thinking flexibility, and rapid action accuracy have a mobilization effect. These reactions are a psychological adaptability of the pilot in the flight working state. When the psychological adaptation effect reaches the maximum, the pilot's psychological state is in the best working stage. At this stage, the pilot's flight situation judgment ability and special situation handling ability are in the strongest state. This stage refers to the end effect (see Figure 1). The fingertip effect is an important indicator to evaluate the pilot's flight ability and special handling ability.

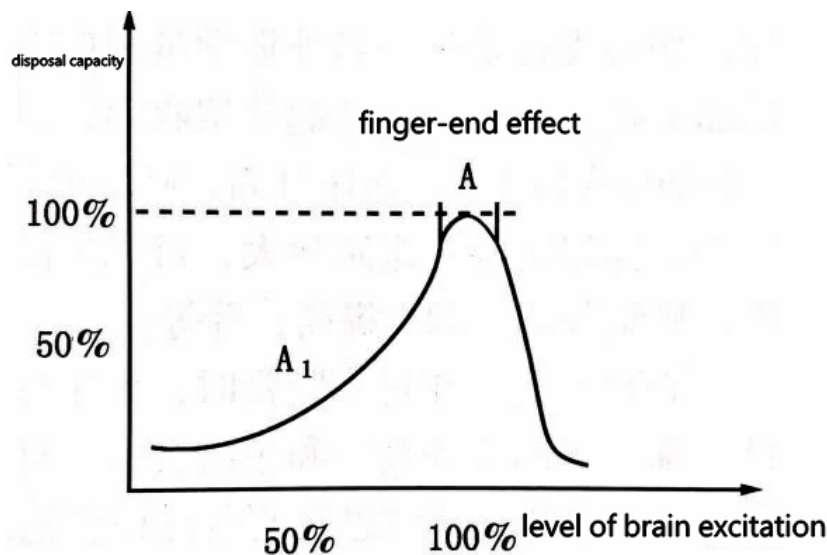


Figure 1 Schematic Diagram of Finger-end Effect

3.2 Basic Psychological Characteristics of Personality

From the flight point of view, from the perspective of flight, it mainly refers to the pilot's accurate flight situation awareness ability, rapid and accurate thinking and analysis ability, the ability to use existing knowledge and experience to process flight-related information, and the ability to respond quickly and accurately in the flight working state. The basic psychological characteristics of personality shown by pilots during flight. For example, impulsive and calm pilots, impulsive pilots generally have the advantages of quick response, quick thinking, and quick decision, but they also have insufficient information collection and are prone to errors. The calm pilot has the advantages of careful thinking and strong analysis ability, but also has the disadvantages of slow decision speed and many scruples. However, in the actual flight situation, it is not one-sided to evaluate that impulsive and calm are the basic psychological characteristics of the pilots who should have the disposition of the situation. The actual flight environment is also an important factor to determine the effect of the disposition of the situation.

3.3 Thinking and Reaction Ability

When preparing for flight, pilots should carry out the necessary special situation disposal training. The common disposal methods of flight special situations are generally not difficult actions of flight technology in terms of disposal process and action. As long as the pilot follows the correct disposal process and changes the flight action, the general special circumstances can be handled correctly. However, in fact, it often occurs after all kinds of accidents and flight accidents. To explore the reasons, one is that the pilot's judgment of the flight situation is not accurate or not timely, and the flight height and speed in the flight environment, the flight status of the aircraft, the changing and unpredictable reasons of the external environment of the flight, resulting in the pilot's response to the situation is not accurate enough; secondly, the pilot's psychological fluctuation is large, which affects the fine manipulation and precise operation of the special handling action, resulting in the lack of special handling and affecting the actual effect of special handling.

Training strain thinking and premonition ability: In dealing with flight risks, in addition to requiring pilots to have independent, intelligent and flexible, creative, good at decision-making and rapid response and other psychological qualities, they must also have special skills in specific judgments. The significant feature of this ability is that pilots can predict possible problems based on their own flight experience, knowledge of danger analysis, aircraft status and instrument trends, and droplet anomalies in flight (see Figure 2). It can quickly process unclear or incomplete information to make it clear, can be good at finding hidden symptoms of danger, and can change their attention with the development of danger. It can actively find out the substantive problems in many information, and quickly form decisions through reasoning and judgment. In order to achieve the above points, in addition to strengthening the relevant theoretical education and continuously studying the experience and lessons of other pilots, it is necessary to often study and practice the disposal methods of the

danger in the simulator and actual flight. Some countries believe that if the pilot exercises on the simulator, such as the instructor does not often give the “danger” to the students, it is easy to reduce the effective attention of the students, the rigid thinking, and the psychological preparation of the danger is reduced.

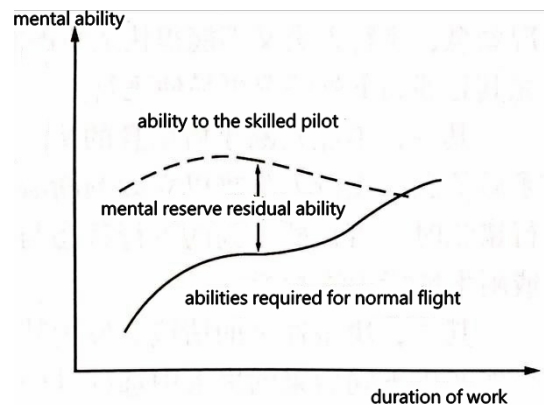


Figure 2 Relational Graph between Mental Thinking Ability and Job Duration of Pilots

4. Psychological Adaptation of Flight Special Situation

In order to effectively improve the adaptability and optimal stress state of pilots' stress psychology under flight special circumstances, avoid psychological imbalance, cause stress disorder, and ensure flight safety, the psychological adjustment method of flight special circumstances stress should follow the basic law of flight special circumstances psychology and the actual psychological stress of pilots. The psychological adjustment of flight special circumstances stress generally includes three aspects: pre-flight stress psychological education, stress psychological adaptation in flight special circumstances and psychological counseling after special circumstances.

4.1 Pre-flight Stress Psychological Education

Pre-flight stress psychological education is a necessary prerequisite for enhancing stress psychological adaptation under special circumstances and strengthen the prevention of psychological stress disorders. Scientific, targeted and personalized stress psychological education and training before flight or flight preparation can improve the psychological quality of pilots comprehensively and enhance the level of stress psychological adaptation.

4.1.1 Strengthen Ideological and Political Education and Establish Firm Flight Beliefs

Integrating ideological and political education into the education and training of flight preparation stage is conducive to cultivating pilots' solid flight belief, brave fighting will, strong fighting quality, high fighting enthusiasm and strong ideological and political consciousness, creating a strong spiritual pillar for pilots, forming a strong spiritual force, overcoming the bad psychology of fear of war and danger, and laying a solid foundation for pilots' flight stress psychology in advance.

4.1.2 Carry out Psychological Adjustment Training and Create Solid Psychological Quality

Psychological adjustment training is one of the important contents in the preparation stage of flight training, and it is also a necessary link to build a solid psychological quality of pilots. Through psychological adjustment training, pilots are prepared in advance. Through the simulation training of flight situation, we can understand the possible flight situation, mastering the disposal method of flight situation, mobilizing the pilot to simulate the psychological state and stress experience under the special situation, feeling the psychological state under the special situation, testing the application of the special situation disposal method, and cultivate the psychological stress adjustment ability of the pilot under the special situation.

4.1.3 Focus on Psychological Relaxation Training and Cultivate Personalized Stress Adjustment Ability

Pilots must have different degrees of psychological tension in flight situations. Psychological relaxation is an important means to relieve the tension of pilots' psychological stress^[4]. Relevant

research have shown that mastering the methods and means of psychological relaxation can effectively reduce the excessive stress of pilots after flight. Psychological relaxation training is mainly divided into two categories according to the different types of stress: one is the physiological stress control method. Excessive stress response is mainly reflected in physiological tension. Common relaxation methods include abdominal breathing relaxation, mindfulness decompression training, and progressive muscle relaxation. The second is the psychological stress control method. Excessive stress is mainly caused by negative cognition.

Mainly through monitoring self-speech method, task-based prompt speech method, etc., change the unreasonable beliefs timely that lead to emotional and behavioral disorders.

4.2 Stress Adjustment in Flight Special Situations

The occurrence of flight special circumstances generally has the characteristics of suddenness, high risk coefficient and strong psychological stress stimulation. If the special circumstances are not handled in time or improperly handled, it is easy to cause flight accidents and threaten the life safety of pilots. Therefore, when the pilot is in a flight situation, it often has a huge impact on the pilot's psychology and physiology. Therefore, pilots should also master the necessary self-stress adjustment methods on the basis of being familiar with the emergency plan.

4.2.1 Distract Attention

Pilots can use the method of diverting attention when the flight time is allowed. Shifting attention is to emphasize the transfer of attention to guide the transfer of thinking, reducing the probability of pilots in the psychological stress alert period, helping pilots adjust physiologically and psychologically, helping to enter the psychological stress resistance period faster, so as to achieve the purpose of adjusting the psychological and physiological stress state. Commonly used methods include deep breathing with eyes closed, moderate physical exercise, transferring instrument sight and observing outside the cabin.

4.2.2 Concentration

When in a flight situation, pilots have to deal with a large amount of internal and external information in a short time, including positive information such as aircraft flight situation judgment and flight control action process, as well as negative information such as personal safety concerns and personal flight career. Positive information helps pilots to deal with flight information reasonably and effectively, while negative information will lead to greater psychological stress response of pilots and affect the effect of flight information disposal. Therefore, the pilot should actively focus on and concentrate on the handling of the flight situation, so as to effectively control and deal with the flight situation.

4.2.3 Self-encouragement

A lot of practice has proved that people in a state of psychological stress, the use of speech, thinking and willpower can effectively regulate and control the psychological changes of stress. Self-encouraging information can not only effectively regulate the psychology under stress, but also play a positive role in maintaining quick thinking and accurate operation. Under the special circumstances of flight, self-encouragement can effectively promote flight to quickly adjust the psychological state of stress, and devote themselves to the handling of special circumstances of flight as soon as possible, which has a positive impact on the handling of special circumstances of flight.

4.3 Psychological Adjustment after a Flight Special Situation

After the pilot's flight situation is handled, some of the direct stressors will be eliminated in a short time, but because of the different psychological adjustment ability, some pilots have psychological problems and will not be eliminated in a short time. Therefore, the psychological adjustment after the flight has become a necessary process to ensure the mental health of pilots. It is of great practical significance to ensure the mental health of pilots and ensure the safety of subsequent flights.

4.3.1 Carry out Psychological Screening Actively

Identifying the stressors of psychological problems is a prerequisite for psychological adjustment. It is suggested to carry out psychological screening at three levels: general psychological stress, severe psychological stress and psychological stress disorder. The unit organizes psychological professionals

to carry out psychological screening in an all-round way. For pilots with serious psychological stress and psychological stress disorder, a follow-up observation mechanism should be established. Normalized observation, regular heart-to-heart talk, and targeted psychological adjustment programs should be formulated.

4.3.2 Carry out Psychological Adjustment Solidly

Combined with psychological screening, actively carry out psychological adjustment. According to the individualized psychological adjustment program, the process and psychological feelings of the pilot's flight situation are accurately understood, and targeted adjustment methods are adopted to effectively vent the negative emotions of the pilot, reducing the impact of stress response, and restore the mental health balance as soon as possible. Providing targeted adjustment strategies for pilots and master personalized psychological adjustment methods in line with their own characteristics.

4.3.3 Establish a Psychological Tracking and Evaluation Mechanism

The recovery of psychological state after special circumstances is determined by the individual psychological characteristics of pilots. Under normal circumstances, after severe stress stimulation, pilots will experience psychological stress response both physically and mentally. After a period of time, the psychological stress response will be alleviated or restored to the psychological balance. There are also individual pilots who will maintain a long-term state of serious psychological stress response, stress response regularity, repeated fluctuations and so on. Therefore, the establishment of psychological tracking and evaluation mechanism is an important link to ensure the mental health of pilots.

5. Conclusion

This study only analyzed the psychological response of flight personnel under special flight conditions from the psychological level, sorted out the key factors affecting the psychological adjustment of flight special stress, and summarized the methods and suggestions for the psychological adjustment of flight special stress. Therefore, the environmental impact and organizational plan that do not belong to the psychological category are not specifically introduced here.

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