

## **The formation process of flying skills during flight training abroad - a case study on Chinese pilots**

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**Abstract:** Flight training abroad is an important way for China to train civil aviation pilots at present. This paper made an Empirical study on the flying skills forming processes of two hundred Chinese students in IASCO flying school. This paper introduces the general process of flight training abroad for student pilots, through the analysis of the actual test of student pilots, studies the different requirements for flying motor skills and mental skills at different stages of flight training. Then, analyze the subjective factors and objective factors that affecting the formation of flying skills. At last, the paper put forwards the relevant measures to improve the flying skills from the perspectives of students, instructors, flying school, airlines and so on.

**Keywords:** Flight training, Skills, Flying skills, Formation, Influence factors

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### **INTRODUCTION**

At present, the total capacity to train civil aviation pilots in China is very limited. Poor low altitude opens policy, imperfect general aviation infrastructure, rarely airport and many other factors contributed to the high operating costs for China's aviation academy. Compared with America, Canada and other aviation developed countries, the development disparity is obvious. Therefore, a large number of China's civil aviation flying cadets were sent abroad for flight training. For China's airlines, flight training abroad has been a very mature pilot training method [1].

Due to the problems such as cultural differences, language barrier, different educational concept and so on, flying cadets who flight training abroad will face more pressure and difficulties [2]. However, flight training abroad will be one of the important channels for Chinese flying cadets to obtain pilot's license for a long time in the future. So it is very necessary to pay attention to their flight training. The ultimate goal of flight training is to make the flying cadets form good flying skills. Through the study on the formation and master process of flying skills for flying cadets flight training abroad, we can make flying cadets master flying skills faster in flight training, save training time and improve the training effect. Furthermore, it is of great significance to reduce the flight elimination rate.

### **OVERVIEW OF FLYING SKILLS**

In psychology, skills refer to the actions which are highly skilled and can be easy to accomplish according to certain procedures. Flying skills refer to the reasonable organization of physical quality and psychological quality which can complete the flight mission successfully, and it is the combination of motor skills and mental skills[3]. The important characteristics of flying skills are accurate, rapid, and instinctive.

#### **Flying Motor Skills**

Flying motor skills of pilot refer to the pilot through a series of reasonable operations to control the aircraft attitude, and achieve the desired airspeed, altitude and heading. The formation of flying motor skills is gradually improved and is a gradual process, which from a simple action to a complex action, from a single local action to combination of coherent action, and form the action which need the attention to the action of automation.

#### **Flying Mental Skills**

Flying mental skills of pilot refer to the mental activities that the pilot can complete the flight operation smoothly, including observation, comprehension, memory, thinking, etc. [4]. The formation of mental skills can be divided into three stages: input of knowledge, knowledge assimilation and knowledge operation. The three stages are the constantly improved and perfected process of flight theory knowledge; finally it will form a complete cognitive structure of flight, so we can promptly and accurately examine the

flight information, understanding the nature of problem, seeking the best disposal options and strategy to solve the flight problems.

### **Relationship between Flying Motor Skills and Mental Skills**

The differences between flying motor skills and mental skills mainly manifests in the activity structure and object. The activity objects of flying motor skills are the control facilities of aircraft, and the activity objects of mental skills are the pilot's brain. The activity structure of flying motor skills is serial, and the intermediate process cannot be omitted. The activity structure of mental skills is implemented by using internal language, which is non-linear and can be highly omitted. The formation process of both flying motor skills and mental skills is from simple to complex, from individual to overall, gradually become improved and more perfect [5].

In flight training, mental skills can promote the development of motor skills, the process of flying cadets learning motor skills need to think and summary constantly, so good mental skills can help flying cadets grasp the motor skills faster. The flying cadets with good motor skills in flight training can spend less energy to control the aircraft, and have more energy to think and observe problems, which will be conducive to the formation of mental skills. On the other hand, good motor skills could make the flying cadets produce complacency emotions, so as to relax the learning of theoretical knowledge, make its reluctance to observe and think, which will harmful to the formation of mental skills.

### **A CASE STUDY ON FORMATION PROCESS OF FLYING SKILLS IN IASCO FLYING SCHOOL**

IASCO flying school is one of the main flying schools approved by China's civil aviation administration that China flying cadets flight training abroad. Every year, there is a large number of Chinese civil aviation flying cadets train flying skills in IASCO. IASCO flying school is certain representativeness in the numerous certainly flying schools abroad. This paper mainly studies IASCO as an example.

### **Brief Introduction of Flight Training Process in IASCO**

In a year or so, the flying cadets need to train and obtain three licenses: private license, instrument regulation and commercial license. Then complete the initial experience and training of high-performance aircraft. Three licenses are from easy to difficult, in this process, the flying skills of flying cadets will be improved and perfected.

In private license training process, the flying cadets need to understand, recognition and familiar with the aircraft. For the flying cadets who flight training

abroad, this process has the highest elimination rate. Private license training process in IASCO can be divided into three stages, the first stage is all kinds of flight training for solo flight; The second stage is the ferry flight training; The third stage is the training aimed at cadets' weaknesses, and preparation for license exam. According to the three stages of a private license, flying cadets can get basic flying skills, and able to carry out independently private flight operations.

Instrument stage is one of the most important stages in the process of flight training. It also can be divided into three stages. Instrument flight training is the flight training that aims at low visibility weather. Through instrument training, the pilot can be able to rely solely on the instrument rather than the external reference to complete the flight mission. Because instrument flight stage involves the transformation of instrument information, flight procedures, go around determination and other kinds of problems which need psychological participation. So this stage training can greatly improve the cadets' flying skills, especially mental skills.

Compared with the above two training stages, the time of commercial license training is relatively short. Its training content is the combination of private and instrument. The main difference is the aircraft turned into twin-engine with retractable landing gear and adjustable propeller. The flying cadets need a period of time to adapt the change, because of the previous flight experience, through the transfer of motor skills, the formation of flying skills in this stage is relatively easy.

In addition to the above three license training stages, there is a high performance aircraft training stage in IASCO. At this stage, the cadets' motor skills have reached a relatively high level, therefore this stage mainly training cadets' mental skills. The training content mainly is crew communication and collaboration, and decision-making ability copes with the crisis. Through high-performance aircraft flying training, cadets' mental skills will be improved greatly, in order to meet the co-pilot training requirements that the cadets back home and join the airline.

### **Analysis on the Examination Results of Flying Cadets**

In flying school, the flying skills condition of flying cadets will eventually present through the examination results. The follows are 200 cadets' actual examination results, including Shandong Airlines, Shanghai Airlines, China international Airlines and Sichuan Airlines, each 50 students. In this paper, we mainly analyze private license and instrument stage which the difficulty is relatively large.

**Analysis on the private license examination results**

As shown in table 1, we can see that the examination passing results in private license stage are relatively large. In each stage, only a few cadets can pass the exam at the first time, most cadets will pass in the

second test, few people will pass the exam in the third, fourth, even fifth time. However, in private license examination, the first time pass rate will become relatively high.

**Table-1: Results of private license examination**

Number of pass	First stage	Second stage	Third stage	Licensure examination
First time	31	57	47	97
Second time	95	103	82	91
Third time	39	24	36	10
Fourth time	20	15	32	2
Fifth time	15	1	3	0

From the stage, the first stage start from scratch, and is a new skill structure, so most of the cadets think the first stage is one of the hardest stage. In the first stage, the cadets will face the maximum problems, and there will be many times failure. The second stage is a transitional stage. This stage involves some mental skills learning, and some students master mental skills more quickly, so the first time pass rate is higher than the first stage. The cadets who make serious mistakes will be decreased. The third stage is the review and consolidation of the first and second stage, including more content. Moreover it is the last exam in flying school before the final license exam, so it is relatively

strict, thus the first time pass rate is not high. This stage will have more test items. Many cadets may catch one and lose another, and may can't pass the exam repeatedly.

When the flying school has confidence in the cadets, they will be recommended to take the license exam, so the pass rate of license exam is ideal compared with the former several stages.

Tables 2 to table 4 are the analysis of fail reasons in private license stage.

**Table-2: Fail reasons in the first stage of private license**

Number of Failure	Takeoff and landing	Maneuver flight	Radiotelephony communication	Aerodrome movement	Navigation using
First time (169)	144	28	89	75	9
Second time (74)	48	4	6	4	3
Third time (35)	31	1	2	1	1
Fourth time (15)	13	1	1	0	0

**Table-3: Fail reasons in the second stage of private license**

Number of Failure	Takeoff and landing	Maneuver flight	Radiotelephony communication	Aerodrome movement	Navigation using
First time (143)	107	24	15	62	52
Second time (40)	33	2	1	19	12
Third time (16)	11	1	0	5	3
Fourth time (1)	1	0	0	0	0

**Table-4: Fail reasons in the third stage of private license**

Number of Failure	Takeoff and landing	Maneuver flight	Radiotelephony communication	Aerodrome movement	Navigation using
First time (153)	132	14	5	15	8
Second time (71)	63	2	3	12	4
Third time (35)	28	1	1	2	1
Fourth time (3)	3	0	0	0	0

In order to facilitate analysis, takeoff and landing, maneuver flight can be classified as motor skills, navigation using, aerodrome movement and radiotelephony communication are classified as mental

skills. Therefore, the main causes of failure in private license stage are unskilled motor skills.

From table 2 and table 4, we can see that the first stage 144 cadets fail due to takeoff and landing,

132 cadets still fail in the third stage. This seems to be unreasonable. The reason is that, in the first stage, the examination of takeoff and landing is the normal takeoff and landing, and undemanding. In the third stage, the examination of takeoff and landing is varied and complex, and demanding.

Navigation using and aerodrome movement, etc. involve more mental skills, even if the cadet doesn't pass the first time, with the deepening of the study and understanding, he will be relatively easy to pass in the subsequent exam. But the failure rate such as taking off or landing operation, etc. which involved more motor skills is still high in the later training stage. Therefore, the course involving mental skills is relatively easy to

improve, while the course involving more motor skills needs long training time to improve it.

**Analysis on the instrument examination results**

Instrument training and examination mainly involves the mental skills. The three stages of instrument training are also from simple to complex, the last license examination is also a comprehensive one. Table 5 shows that, in the instrument stage, the examination results are quite optimistic. The main reason is that, on one hand, most of the poorly trained cadets have been eliminated; on the other hand, the level of difficulty of each course in instrument training is equally, so the pass rate of the license examination is better than private license stage.

**Table-5: Results of instrument examination**

Number of pass	First stage	Second stage	Third stage	Licensure examination
First time	195	101	80	105
Second time	5	64	75	85
Third time	0	25	24	8
Fourth time	0	10	21	2

Here we don't do a concrete analysis on the failure factors. The exam content including radiotelephony communication, holding procedure, approach procedure and missed approach procedure, etc. The elimination rate in instrument stage is low, because it involves more mental skills factors, so as long as more thinking and practice, the instrument stage will be more easily than other stages.

**FACTORS AFFECTING THE FORMATION OF FLYING SKILLS**

The factors affecting the formation of flying skills can be summed up as the subjective factors and objective factors. Subjective factors include learning ability, manipulating ability and personality traits of the cadets. Objective factors include teaching equipment of flying school, flight course arrangement, instructors teaching ability, other cadets and flight environment, etc.

**Subjective Factors**

**Personality factors**

A good flying cadet should have the following good character traits, including hard-working, thinking more, good interpersonal, being honest and responsible, perseverance, etc. On the contrary, if a flying cadet does not have the personality that the pilot should have, the formation of the flying skills will be relatively slow.

**Learning capacity**

The flying cadets studying flying skills abroad, its formation speed is closely related to the flying cadets' learning capacity. The formation of skills is linked together and step by step. The cadets with poor learning capacity will be unable to keep up with the course arrangement and fail to grasp the present skills

that should be grasped. Under the circumstances, the learning of subsequent flight skills will be affected, resulting in delay of flight skills.

**Manipulation ability**

In the process of flight training, memorizing the flight procedures is relatively simple, however, it is difficult to ensure the rationality and reliability of manipulating according to flight procedures. In general, cadets often can easily memorize the flight procedures, but the cultivation of manipulation feeling needs a relatively long process. Further, manipulation ability has great individual differences, some cadets need a long time to master it.

**Objective Factors**

**Teaching facilities**

Teaching facilities of flying school include teaching classroom, flight simulator, training aircraft, etc. Whether the teaching facilities are well-equipped or not closely related to the formation speed of flying skills. The simulators and trainers which are closely related to actual flight scene can better promote the positive transfer of flying skills.

**Course arrangement**

Flying cadets are trained flying skills according to the course arrangement, scientific and reasonable course arrangement can improve the learning efficiency of cadets and make them master the flying skills more quickly.

**Instructors teaching ability and behaviour**

The flying skills of cadets are taught by the instructors, so the instructors teaching ability and

behaviour will influence cadets flying skills to a large extent [6]. In general, the flying cadets who taught by experienced and conscientious instructors will learn flying skills faster. On the other hand, irresponsible instructors will perform a negative effect, and even become the immediate cause of some cadets elimination.

#### **Study of other flying cadets**

Under normal circumstances, the flying cadets were sent to study flying skills abroad in group. If the cadets study together compare with each other's and showing off themselves, this will lead to the complacency of leading cadets and the impatiencere of relatively backward cadets, so as to have a negative effect on the formation of flying skills [7].

#### **Flight environment**

Flight environment, including the weather, terrain, air traffic situation and airport equipment, etc. Objectively, the flight environment of each flying school is different. Flight training is greatly affected by the flight environment, therefore the training schedule of the flying school which has a good flight environment will be faster.

#### **RELEVANT MEASURES TO IMPROVE THE FLYING SKILLS**

##### **For Flying Cadets**

- Love flying career, building up the faith of flight, make full mental preparation of the obstacles may encounter during flight training abroad.
- Working hard in the process of flight training and thinking more.
- Follow the rules, strictly follow the requirements of flight operations during flying training, form a good concept of safe flight.

##### **For Instructors**

- Understanding the cultural difference between America and China.
- Be serious and responsible and give meticulous guidance to them.
- Be patient, teach the cadets in accordance with their aptitude.
- Believing the cadets' ability and giving the sufficient initiative to them.
- Don't compare your cadet's training grade to others, treating to them impartially.

##### **For Flying School**

- Purchasing more advanced flight simulator and training aircraft and should ensure the matching of them.
- Ensure the daily maintenance of training aircraft and ensure the consistency of aircraft performance as far as possible.
- Improve the teaching system according to the characteristics of Chinese cadets. Arranging the teaching courses reasonably and regulating the

cadets training schedule from a macroscopic perspective. ensure the consistency of the ground and flight course to the cadets on different levels.

#### **For Airlines**

- To strengthen the selection of flying cadets, make the unqualified cadets postpone training abroad, especially pay attention to the cadets who do not love flying itself to reduce unnecessary flight elimination.
- Sending someone to visit the abroad flying school regularly and investigating the training situation of cadets.
- To discuss the cadets elimination with flying school and give more opportunities to the cadets whose training schedule temporarily slow.

#### **CONCLUSION**

Flying skills are not only the most basic but also one of the most important skills for flying cadets. The requirement of flying skills in different stages of flight training is a matter of emphasis, private license stage pay more attention to the development of flying motor skills, while instrument stage and subsequent stage pay more attention to the training of flying mental skills. At the same time, flying skills level of different cadets is different, its formation is affected by many factors, only take various measures can ensure better flight training effect and make the cadets master flying skills better and faster.

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