

# Teaching Exploration and Practice of Aviation Distress Search and Rescue Exercise Based on Autonomous Confrontation Mode

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**Abstract.** In order to improve the students' ability of comprehensive use of aviation search and rescue equipment, the autonomous confrontation mode is adopted in aviation search and rescue equipment training to carry out aviation distress search and rescue exercise. First, this paper discusses the teaching connotation of the autonomous confrontation mode. And then according to the characteristics of combat search and rescue, an aviation distress search and rescue exercise is constructed based on the autonomous confrontation mode, which adheres to the requirements of actual combat, follows the step-by-step teaching rules, and cultivates students' higher-order thinking ability. The exercise and teaching are carried out with "real roles, real equipment, real cases and real situations" design. Finally, the practice proves that this exercise and teaching mode has demonstrated the meaning of learning, enhanced the self-sense of learning, improved the efficacy of learning, and achieved the expected effect.

**Keywords:** Autonomous confrontation; Combat search and rescue; Comprehensive exercise; Practical teaching

## 1 Introduction

Combat search and rescue refers to reporting, locating, identifying, rescuing the people in distress, and returning the people in distress to their control areas in the event of resistance or the risk of resistance.

Compared with the peacetime search and rescue operations, it has two obvious characteristics: first, the implementation area is usually far away from their own control range, and the impact of unknown environment is more complicated; Second, the search and rescue countermeasures of the enemy will bring obvious impact on the search and rescue operations, which will complicate the restrictions on the rules, organization and tactics in the search and rescue operations. Third, the need to coordinate combat forces that have never worked together against the enemy makes joint operations more complicated. The aviation distress search and rescue exercise creates a real combat atmosphere according to the characteristics of combat search and rescue, aiming to train the students to use aviation search and rescue equipment and improve their combat search and rescue ability. As a practical teaching activity in aviation search and rescue equipment training, the autonomous confrontation mode of aviation distress search and

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rescue exercise can enable students to adapt to the environment in a short time, test the skills learned in real combat, and improve the ability to deal with complex situations and emergencies. By combining theory with practice, the exercise scenarios are set up step by step to improve the students' comprehensive application ability of aviation search and rescue equipment.

## **2 Teaching connotation of autonomous confrontation mode**

The autonomous confrontation mode is that the instructors only provide the situation, and the participating students carry out combat operations on their own, and the students are divided into pilots in distress, search and rescue party (Red side), and arresting party (Blue sides), which are jointly implemented by all parties[1].Its connotation will be shown in the following aspects:

### **2.1 Autonomy is the concrete embodiment of learning-centered**

During the exercise, the instructors formulate implementation rules, provide the equipment used by all parties, and set search and rescue scenarios. The Red and Blue members test their own equipment respectively, and independently agreed on search and rescue tactics, arrest strategies, etc.

### **2.2 Confrontation is the teaching performance of combat characteristics**

By constructing a confrontational teaching environment, the confrontational practice teaching shortens the distance between the classroom and the actual combat and stimulates the students' desire for victory and internal drive through the combat-focused teaching[2].The basic steps of aviation search and rescue operation mainly include four steps: search plan and search operation, determining the timing of rescue, maintaining continuous contact with rescued personnel and implementing rescue. In combat search and rescue, the relationship between search and rescue and arrest parties is a confrontational game. The search and rescue party overcomes the influence of unknown environment, and effectively uses distress alarm equipment, search positioning equipment, and communication equipment to try to conduct successful rescue operation. The arresting party takes advantage of the terrain, uses interference and monitoring equipment to search for the other party's pilot in distress, and arrests the search and rescue party and the pilot in distress.

## **3 Construction basis of the exercise based on the autonomous confrontation mode**

Autonomous confrontation is not a new theory or practice, but a theory and practice based on adversarial exercises. The aviation distress search and rescue exercise is based on the premise that the students have mastered the process of aviation search and rescue operations, the division of responsibilities, and the use of equipment. It takes the possible space-time conditions in the combat search and rescue as the background, takes the hypothetical flight personnel in distress as the target, and reflects the changes under the confrontation conditions. Based on the changes, the students are directly involved in the actual search and rescue in the simulated actual combat environment to participate in the action. The basis for the construction of the exercise based on the autonomous confrontation mode is embodied in the following three points:

### **3.1 Keeping close to actual combat requirements and focusing on preparing for war**

Preparing for war is the fundamental duty of the armed forces, which require that the army can prepare for war in peacetime and command to win in wartime[3]. The success of search and rescue affects the combat effectiveness and combat momentum of the army. The purpose of the exercise is to practice. In the setting of training content, the sense of actual combat is enhanced. Students can not only feel the actual combat atmosphere in a realistic environment and a tense rhythm, but also experience the importance of “role” in the fierce confrontation. The practical exercise not only focuses on actual combat exercise, but also organically combines the training for equipment usage, tactics and coordination together.

### **3.2 Following the rules of step-by-step teaching**

In the teaching process of aviation distress search and rescue exercise, instructors organize teaching and practice from the actual situation, set up subjects according to the methods of theory before practice, laying foundation before application, single before complex[4], so as to finally improve the comprehensive combat search and rescue ability. In teaching practice, the subject connection shall be reasonable, and the technical and tactical content shall be synthesized and converted closely.

### **3.3 Focusing on cultivating higher-order thinking skills**

The process of thinking is the core stage of the cognitive process, and creative thinking is the highest form of thinking[5]. At the same time, Chinese new era education policy clearly puts forward that education should promote the development of students' ability, and the key is to cultivate students' higher-order thinking ability. As an advanced stage of aviation search and rescue equipment training, the goal of aviation distress search and rescue exercise is to improve the students' technical application and tactical application ability of combat search and rescue equipment. Specifically, it is to cultivate students' ability to analyze problems, solve problems and deal with special situations in combat search and rescue operations, that is, to cultivate students' higher-order thinking. The most basic way to cultivate higher-order thinking is the “problem solving” method, that is, through the reasonable design of combat tasks by instructors, students independently constructing knowledge in the process of solving problems, and forming higher-order thinking through such a learning process. Before the implementation of the practical teaching, the instructors carefully design the subjects, and the knowledge points of the course are implied in the search and rescue tasks. After the subjects are issued, the students are grouped, discusses the scheme, coordinates with each other, achieves knowledge construction in action, and completes the cultivation of students' higher-order thinking.

## **4 Practical teaching design and implementation**

The practical exercise teaching is carried out by adopting the concept of “real roles, real equipment, real cases, real situations”. The teaching content is divided into a number of progressive combat tasks. Students play their roles in the exercise and determine the implementation plan through “back to back” discussion. After the completion of each task, all staff jointly carried out a review analysis.

## 4.1 Design ideas

The aviation distress search and rescue practical teaching based on the autonomous confrontation mode is carried out through three steps, that is “the early stage--the implementation stage--the final stage”, which emphasizes planning for the early stage, and having rules for the implementation stage an end for the final stage as shown in figure 1.

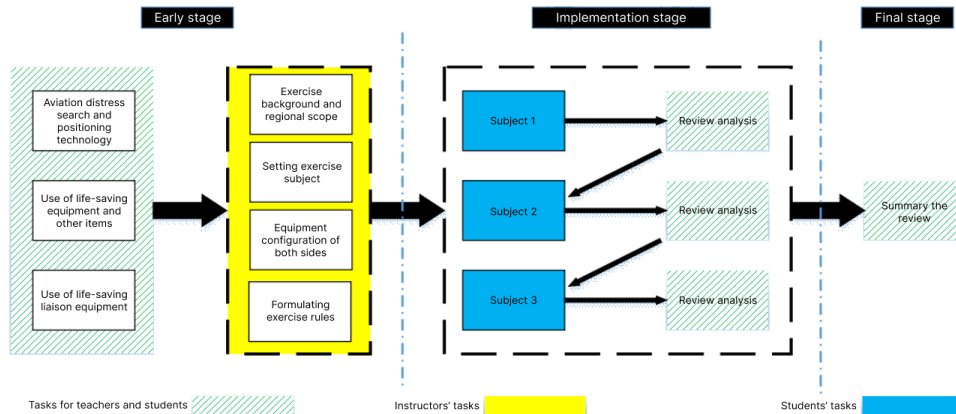


Fig 1. Exercise Design Idea

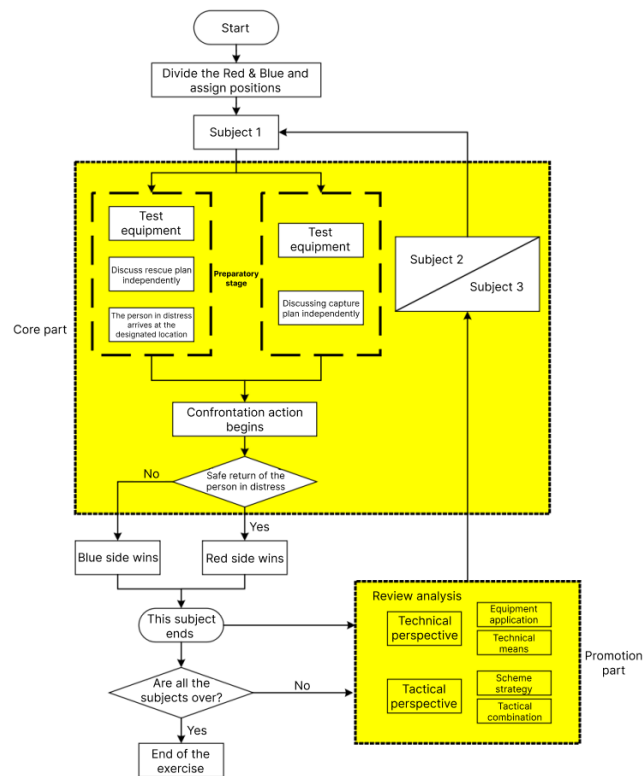
“Early stage”: The instructors and students shall jointly complete the use of aviation distress search and positioning technology, life-saving equipment and other items, and life-saving liaison equipment. According to the learning situation and construction basis, the instructors assumes that the background is: the pilot of Red side is in distress and parachutes into the Blue side’s territory, and the exercise subjects are gradually set. The Red side is equipped with communication and life-saving equipment, while the Blue side is equipped with communication and spectrum monitoring equipment. The exercise rules are formulated as follows: (1) when the Red side first finds the pilot in distress, or the pilot in distress return by themselves, the Red side wins, and the exercise is over; (2) The Blue side can capture the search and rescue team and the pilot in distress. When the pilot in distress is captured, the Blue side wins and the exercise is over; If the blue side captures the search and rescue team personnel, they can implement countermeasures and other means for the arrested personnel; (3) “back-to-back” discussion means each party discusses their own plan and the other party is not allowed to listen; (4) The rescue/arrest tasks can only rely on the equipment, other things shouldn’t be informed in advance.

“Implementation stage”: The three subjects are carried out in turn. After receiving the task, the two sides separately discuss the search and rescue and arrest plan, test the equipment, and carry out exercises according to the rules. After each subject is finished, the instructors and students jointly conduct a review analysis of the subject.

“Final stage”: At last, both instructors and students summarize and review the exercise.

## 4.2 Practicing the implementation process

“Autonomous” and “confrontation” always run through the whole exercise process. The implementation process of aviation distress search and rescue exercise in autonomous confrontation mode is shown in Figure 2. From the beginning of the division of the "Red side and Blue side", the confrontation mode starts. The purpose of Red side is to conduct rescue, and the Blue side is to capture the Red side, which is the core part of this exercise and is carried out through three subjects. After receiving the tasks, the students will discuss the tasks independently. First, personnel for each position shall be determined according to the equipment, the search and rescue commander/arrest commander is selected, and then the rescue or arrest plan shall be discussed according to the scenarios of the subjects, which is a comprehensive application of the skills and equipment that students have learned in the early stage. When all was ready, the confrontations between Red and Blue sides begin; The results of the exercise are judged on whether the people in distress return safely. After the end of each subject, the instructors and students jointly analyze the subject from the technical and tactical perspective, including equipment application, technical means, program strategy, tactical cooperation, etc. The review analysis is a process of improving the overall search and rescue capability, while summing up successful experiences and reasons for failure can help students improve the scheme for the next subject, and strive to win in the confrontation actions.



**Fig 2.** Implementation process of aviation distress search and rescue exercise based on autonomous confrontation mode

## 5 Practical teaching result evaluation

After two teaching classes practice, the teaching method of aviation distress search and rescue exercise based on autonomous confrontation mode has achieved remarkable teaching effect. Through informal discussion and communication, experience survey etc., the results are shown in Table 1. The students' participation and recognition in class practice are higher.

**Table 1.** Investigation item

Investigation item	Student acceptance				
	>90%	89-80%	79-70%	69-60%	<60%
Classroom practice participation	29	0	0	0	0
Mastery of professional core technology	21	8	0	0	0
Mastery of tactics	20	9	0	0	0
Teaching pertinence	29	1	0	0	0
Improvement of search and rescue capability	22	7	0	0	0

### 5.1 Highlighting the sense of meaning of learning

The acquisition and establishment of the sense of meaning of learning is the value starting standard to measure the quality of teaching[6]. The sense of meaning of learning refers to the students' inquiry into the ultimate purpose of learning activities, learning content and learning process. As the subject of teaching activities, students seek the meaning connection between themselves and knowledge in the exercise, and constantly pursue and create the meaning of self-growth through the cognitive process and the emotional process. The sense of meaning makes the students devote themselves into the teaching process, and show strong participation in the aspect of movement, thinking, emotion, etc.

### 5.2 Enhancing the self-sense of learning

The self-sense of learning is the process standard for measuring the quality of classroom teaching[7]. The self-sense of learning refers to the self-cognition, self-awakening and self-consciousness that students experience in the process of learning as the students' understanding of knowledge deepens[8].

The fundamental value of the teaching process is to improve self-awareness through knowledge learning, to achieve self-understanding, confirmation and promotion. Based on the autonomous-confrontation mode, the practice teaching emphasizes that teaching activities not only treat knowledge as the object and purpose, but also take students' self-growth as the object and purpose. Teaching needs to establish the meaning connection between knowledge and students' self, and return from knowledge to students' self, which is the fundamental implication of "teaching returning to the life world".

### 5.3 Improving the sense of learning efficacy

The sense of learning efficacy refers to the effective experience of students through cognitive and emotional processes in the learning process, which is a result standard or outcome standard of teaching activities[9]. Whether the teaching process can arouse the students' desire to learn, whether it can encourage students to participate in the teaching process in an all-round way, whether it is accompanied by rich emotional experience, and whether the students' can really learn, comprehend, and gain from what they have learned are the basic dimensions of testing the effectiveness of classroom teaching. In the teaching process, by setting subjects and rules reasonably, students are guided to obtain positive efficiency and effectiveness experience[10]. The advantages of students in the learning process are found through the review analysis, and students are encouraged to obtain achievement experience, which improves their learning efficacy in the classroom teaching process.

## 6 Conclusion

Guided by the autonomous confrontation mode, this paper explores the teaching process of aviation distress search and rescue exercise based on the autonomous confrontation mode. The practice shows that the students in this mode have a high degree of participation, satisfaction and recognition, and has achieved good results. This kind of teaching mode helps the instructors improve the teaching's scientific nature. Therefore, it has certain promotion value.

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