

# Research on the Development and Design of the Autonomous Learning Platform of Aviation Safety Management Course

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**Abstract:** In the Internet era, how to improve the teaching quality of courses, especially practical training courses, is an important issue that needs to be solved urgently. In order to further improve the teaching quality of practical training courses, we should not only pay attention to the reform of teaching design and mode, but also pay attention to the innovation of learning form. This paper takes the development and design of "Independent Learning and Simulation Training Platform for Airport Emergency Rescue Management" as an example, and discusses and exchanges from five aspects, including design principles, teaching design analysis, basic content design, innovative design and reflection, in order to better improve the learning effect and teaching quality.

## 1. Introduction

"Aviation Safety Management" is an important course in the field of professional and technical study, which aims at cultivating the professional ability of airport emergency rescue jobs for the major of airport operation management in higher vocational colleges. Aviation safety management aims to develop students' comprehensive professional ability by completing the learning tasks from typical job tasks of professional posts, training students with aviation safety theory knowledge and professional abilities such as airport emergency rescue, and obtaining working process knowledge, promoting the improvement of students' key abilities and professional qualities.

At present, the practical teaching in vocational colleges is generally faced with problems such as rough teaching design, low quality, poor teaching effect and large limitation of teaching methods. In order to better adapt to the background of information age, vocational training curriculum teaching, create information-based learning space for students, and improve the quality of practical training teaching. In this paper, the development and design of self-learning platform for airport emergency rescue management in the course of Air Safety Management is taken as an example to discuss and communicate. In addition, the work "Independent Learning and Simulation Training Platform for Airport Emergency Rescue Management" also won the second prize of Courseware of Higher Education Group in the 23rd National Teacher Education and Teaching Information Exchange Activity.

## 2. Design principles of autonomous learning platform

Safety is the primary productivity of civil aviation, and emergency drills are an important part of safety management. Meet the national requirements for the development of a strong civil aviation country. According to the classification statistics of total loss accidents in the world from 1991 to 2010, the largest number of accidents are aircraft running off the runway. Emergency rescue is one part of the skill appraisal of "Airport Operation Commander" of civil aviation. Civil Aviation Order No.45 requires that all civil aviation units, including air traffic controllers, airports, airlines, etc., should regularly organize and implement emergency drills to test the feasibility and completeness of emergency plans of each unit. Desktop exercise is the most effective form of exercise to test the emergency rescue plan with the lowest cost and the highest operability. Based on the above, the teaching theme is extracted as "aircraft runway desktop drill". The self-learning and simulation training

platform of airport emergency rescue management is developed and designed with four class hours of desktop exercise teaching unit.

### 3. Analysis of teaching design of autonomous learning platform

#### 3.1 Analysis of teaching objectives

According to the professional teaching standards of higher vocational schools, three teaching objectives of knowledge, ability and quality of autonomous learning platform are determined. See Table 1 below for details.

Table 1. Three teaching objectives of autonomous learning platform.

Knowledge target	Capability goal	Quality goal
Understand the basic concepts of desktop exercises; Master the implementation method of desktop exercise; Master the rescue procedures of each unit.	Be able to write exercise plans; be able to evaluate the effects of tabletop exercises; be able to organize and implement tabletop exercises according to the requirements of professional positions	Strengthen the morality of the people, consolidate the "four consciousnesses" and strengthen the "four self-confidences"; Develop a sense of teamwork, time management and strict adherence to rules

#### 3.2 Analysis of the key and difficult points in Teaching

The teaching focus of the teaching unit of Desktop Exercises is to draw up emergency rescue desktop exercises and individual drills according to the national professional standards of Operation Commanders and the requirements of first-level, second-level and third-level identification knowledge and ability of operation commanders, and to direct and implement the emergency rescue desktop exercises of the department. Combined with the data of students' expectations and questions collected interactively before class, the key points of this teaching unit are summarized as follows: the implementation method of desktop exercises.

The teaching difficulty of "Desktop Exercise" teaching unit lies in the talent training program. One of the requirements of students' professional skills: when an aircraft has an accident or emergency, it has the ability to release information and instructions to various rescue units and coordinate and direct emergency rescue. This requires students to master the rescue and disposal procedures of each unit, but the knowledge points are boring written articles of association, and the incident cases are all emergencies, so they cannot enter the scene. Therefore, the teaching difficulties are determined as follows: rescue and disposal procedures of each unit.

### 4. Basic content design of autonomous learning platform

#### 4.1 Module I design - define and function of desktop drill

Desktop drill, also known as command post deduction, is a comprehensive non-actual combat drill organized by airport management agencies or relevant units participating in emergency rescue, with the participation of various rescue units, aiming at a certain type of simulated emergencies or a combination of several types of emergencies.

#### 4.2 Module 2 design - clear definition of runway event

The accident/accident symptom data reporting system of ICAO, Flight Safety Foundation and International Air Transport Association are defined as: the aircraft on the runway deviates from the runway from the side or rushes out of the runway from the end. Generally speaking, it is unintentional behavior for aircraft to deviate/run off the runway, but it may also be intentional behavior, such as intentionally deviating from the runway in order to reduce losses.

### **4.3 Module 3 design - define the implementation process of desktop exercise**

#### **4.3.1 Set up a drilling working group**

The drill working group is responsible for organizing and implementing the whole drill work, coordinating the work of various departments and dealing with unexpected situations, and is the general planner and commander in chief of the drill work. The main work includes drill planning, writing drill plan and evaluation plan, organizing and implementing drill, evaluating and commenting, and submitting summary report, etc.

#### **4.3.2 Select exercise subjects**

① Selected based on the operating characteristics of the airport and physical environment; ② Selected based on the operating mode of major airlines; ③ Selected based on the airport's recent key emergency work targets; ④ Selected based on the global civil aviation accident big data

#### **4.3.3 Determine exercise scenarios**

Determining the drill scenario is the basis for compiling the emergency drill script. Set a specific situation by writing a walkthrough script. A practical script provides the main direction for the development of the drill, provides necessary guidance for the observers, and promotes the whole process of the drill.

#### **4.3.4 Organization and Implementation**

According to the drill plan planned in the early stage, each department will arrive at the designated place on time according to the contents and requirements of the plan, and carry out emergency rescue information transmission and emergency rescue disposal procedures according to the requirements of the emergency rescue plan.

First, in the aspect of emergency rescue information transmission drills, it mainly means that in emergency rescue work, information transmission is the first link, which determines whether the follow-up emergency rescue work is timely and accurate. Specifically, it includes three aspects: information transmission between unit and tower, information transmission between tower and airport command center, information transmission between airport emergency rescue command center and rescue support unit, information transmission between airport and superior management unit and other support units.

Second, the drill of emergency rescue procedures and emergency rescue site disposal are the core of rescue work, which are related to the safety of personnel and the normal operation of hardware facilities such as aircraft, runway system and special equipment. All departments (such as air traffic control station, commander in chief, firefighting and medical rescue) should strictly follow the disposal procedures in the plan, cooperate with the on-site instructions of the command center and commander in chief, and conscientiously do all the disposal work.

### **5. Innovative design of autonomous learning platform**

Self-regulated learning platform serves students and needs innovative design to improve students' learning effect. The self-learning platform develops the core content of course teaching into a simulated game module. The module develops simulated games according to three aspects: situation setting, information transmission and on-site rescue, and also integrates error correction function. If students make a wrong choice during simulation training, they can't start training again in the next step.

#### **5.1 Situation setting**

According to the teaching content, the following scenario is designed. After landing on runway 05, TD2018, B2018 and B738 of Tiandi Airlines rushed out of the runway in C10 area, the nose landing gear was broken, the engine smoked, the crew released the emergency slide to implement the

emergency evacuation procedure, and all units were dispatched urgently. There were 8 crew members, 130 passengers and 1 third class guard VIP, causing 3 passengers seriously injured and 5 passengers slightly injured. The airport started the emergency plan for aircraft runway incident.

## 5.2 Information transfer

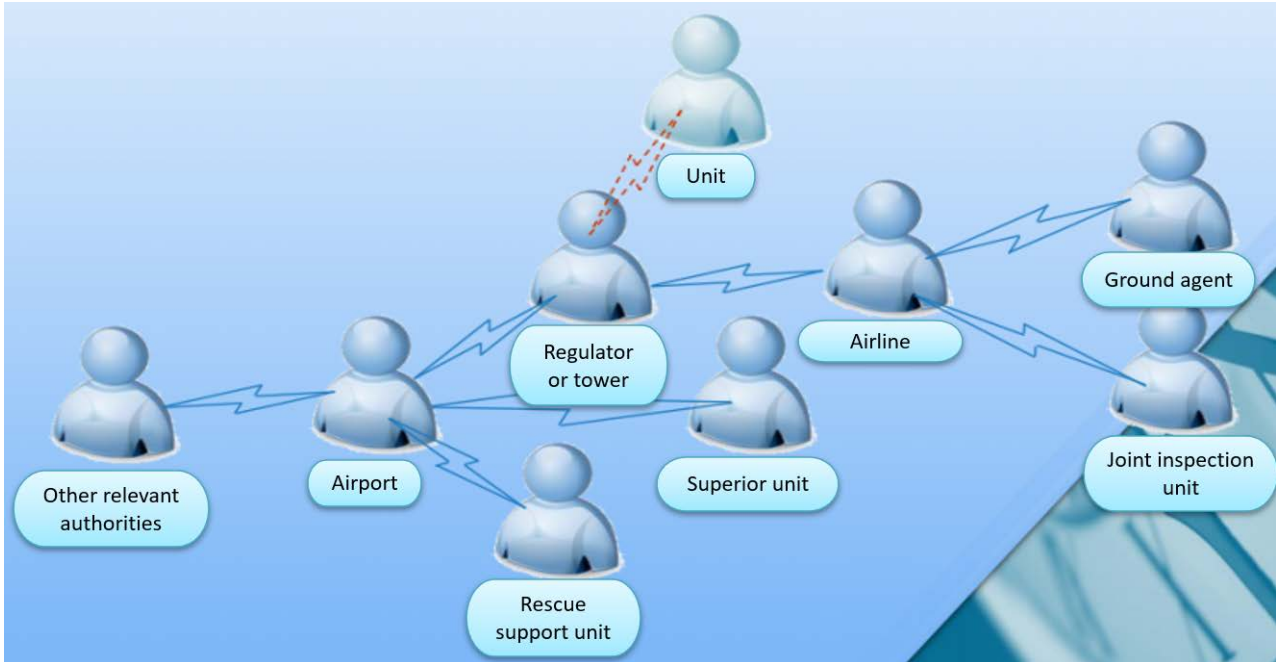


Figure 1. Flow chart of information transmission.

According to the flow of Figure 1, set up the corresponding modules for students to drag and draw the correct information transmission diagram.

The flight crew reported the uncontrolled landing of the tower aircraft and the damage of the aircraft, and requested the airport emergency rescue.

According to the intention of the crew, the tower observed the situation of the aircraft on the spot and reported it to the airport emergency rescue command center. The contents are as follows: Flight TD2018, B2018, B738, ran out of the runway in C10 area after landing on runway 05, and the nose landing gear was broken and the engine smoked. The unit releases the emergency slide to implement the emergency evacuation procedure, and all units are dispatched urgently. There are 8 crew members, 130 passengers and 1 third-level guard, causing serious injuries to 3 passengers and minor injuries to 5 passengers. There are eighth-class dangerous goods such as sulfuric acid. The crew requested emergency rescue.

The airport emergency rescue command center informed all rescue units, the notification content: flight TD2018, B2018, B738, used runway 05 and then rushed out of the runway in C10 area. The nose landing gear is broken, the engine smokes, the crew releases the emergency slide to implement the emergency evacuation procedure, and all units are dispatched urgently. There are 8 crew members, 130 passengers and 1 third-level guard, causing 3 passengers to be seriously injured and 5 passengers to be slightly injured. There is the eighth dangerous goods sulfuric acid. Start the emergency plan of airport aircraft rushing out of runway, and all units will be dispatched immediately according to the plan.

## 5.3 Simulated scene rescue

According to the responsibilities, the specific matters and steps that each department is responsible for are summarized and defined, as shown in Table 2 below (taking the air traffic control station, the general commander and the command center as examples). See fig. 2 and fig. 3 for specific design effect.

Table 2. Specific matters and steps are summarized and defined.

Responsible department	Responsible items and steps
Air traffic control station	<ul style="list-style-type: none"> <li>① When receiving emergency information about an aircraft crash, notify the fire and command center in a timely manner according to the information transmission procedures.</li> <li>② The aircraft rushed out of the runway, and adjusted and directed the take-off and landing and ground taxiing routes of other aircraft entering and leaving the port in time according to the location of the crash.</li> <li>③ If the aircraft rushes out of the runway outside the field, the relevant information on the scene of the aircraft rushing out of the runway shall be explained in detail based on the information obtained.</li> <li>④ According to the information provided by the command center, timely release the "Notice of Navigation".</li> <li>⑤ Maintain communication with the command center and keep abreast of the progress of rescue work.</li> <li>⑥ Record the disposal process in detail.</li> </ul>
Commander in chief	<ul style="list-style-type: none"> <li>① After receiving the report from the command center, immediately rush to the scene to be responsible for the overall command of the rescue work.</li> <li>② When the superior leader arrives at the command position, report to him the rescue work and the required resources. According to the instructions of superiors and in combination with the actual situation, carry out the command of rescue operations.</li> <li>③ According to the report of the command center, decide whether to close the airport.</li> <li>④ According to the report of the command center, decide whether or not the agreement unit support is needed.</li> <li>⑤ According to the progress of on-site rescue work, decide whether to allow journalists to enter the scene for interviews and filming.</li> <li>⑥ After the completion of the aircraft crash site investigation and evidence collection, according to the command center report, give instructions to remove the damaged aircraft.</li> <li>⑦ Designate a person to be responsible for press releases related to rescue work.</li> <li>⑧ After the rescue work is finished, according to the command center report, give an instruction to end the rescue work.</li> </ul>
Command centre	<ul style="list-style-type: none"> <li>① After receiving the notification from the air traffic control station, according to the information transmission procedures, promptly and accurately notify the members of the emergency rescue leading group and relevant rescue support departments to rush to the scene of the aircraft crash.</li> <li>② Quickly rush to the scene of the aircraft crash, set up a command post at a suitable position (upwind of the accident scene) from the scene of the aircraft crash, and erect a red flag with the words "command post".</li> <li>③ Before the commander-in-chief arrives at the scene of the aircraft crash, the duty manager shall be responsible for on-site command work.</li> <li>④ Assist the commander-in-chief in organizing and coordinating the rescue work of aircraft crashes.</li> <li>⑤ According to the emergency scene situation and the commander's instructions, notify the public security to implement control of the relevant passages near the scene.</li> <li>⑥ According to the location of the aircraft crash, the degree of damage to the site and other facilities, the commander-in-chief is asked to decide whether to close the airport and provide relevant materials for the issuance of the "Notice of Navigation" to the air traffic control station.</li> <li>⑦ According to the instructions of the commander-in-chief, give instructions to the aircraft operator or his agent or maintenance to move the damaged aircraft.</li> <li>⑧ According to the commander-in-chief's instructions, the rescue work was announced to be over.</li> <li>⑨ Record the disposal process in detail. Collect and summarize relevant information and data in the rescue process, and fill in relevant record sheets.</li> </ul>

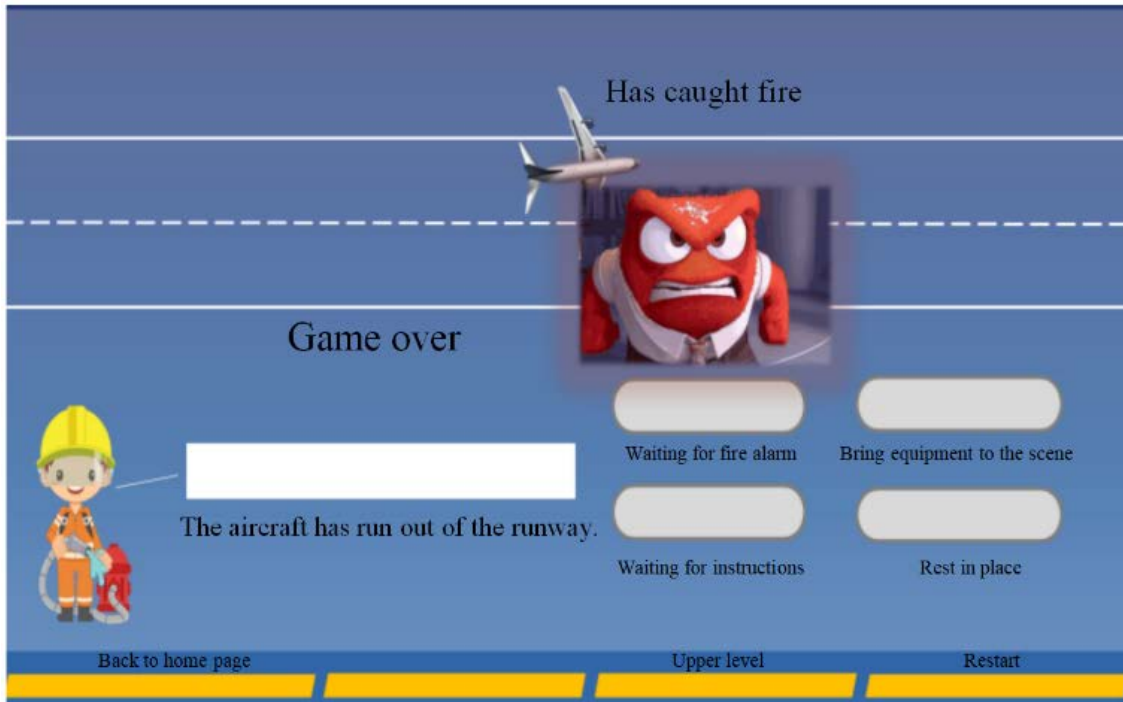


Figure 2. Role selection page.

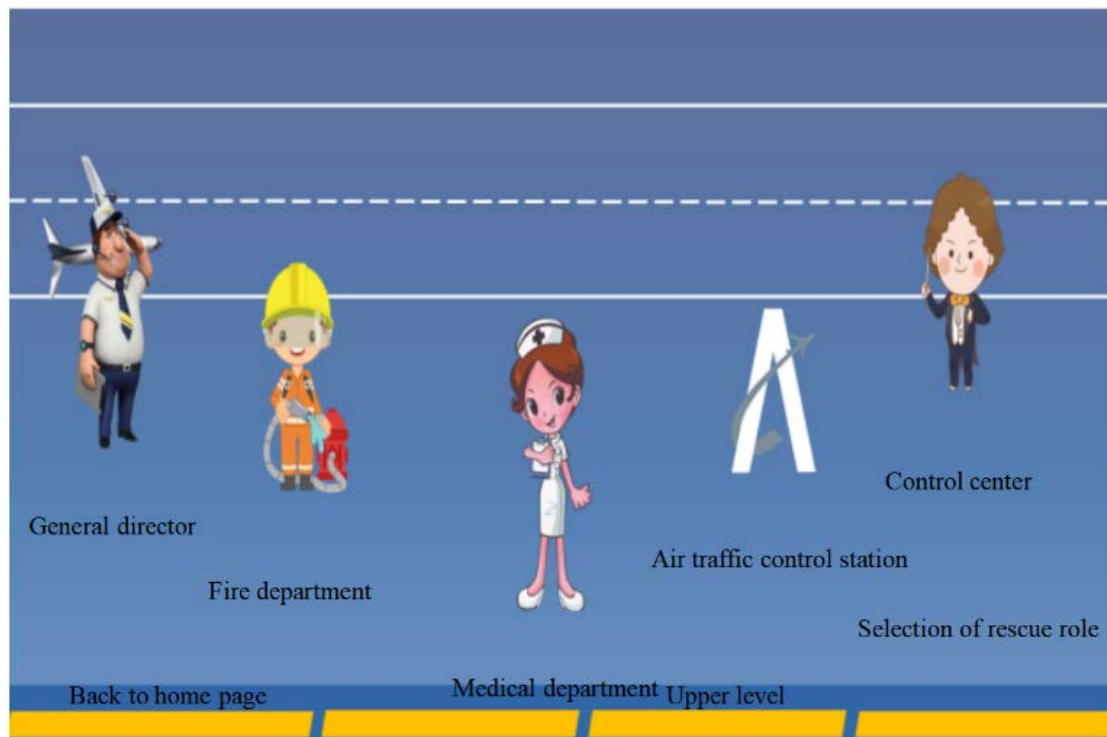


Figure 3. Simulation game error correction page.

## 6. Conclusions and thoughts

(1) Teachers should participate in all aspects and give good guidance. Autonomous learning platform can improve the learning effect of students, but it is also inseparable from the full participation of teachers. Because autonomous learning platform is a virtual platform after all, and the situation in the actual combat drill is dynamic and diverse, therefore, desktop drill should focus on the following seven aspects. ①whether the drill objective is clear. ②whether the scenario is supported by the plan; if there is no plan support, whether the overall responsibility of each unit is clear. ③whether there are

links missing or unreasonable in the plan. ④Whether the participating units are familiar with the plan. ⑤ Cooperation of participating units in the exercise. ⑥whether the participating units can flexibly respond to emergencies. ⑦ In case of extreme situation, whether the drill party takes the protection of passengers' life safety as the first principle.

(2) Set up pre-class questionnaire to understand students' expectation. According to the results of pre-class questionnaire survey, 62% of the students are most looking forward to the learning content of emergency rescue procedures, and teachers can dynamically adjust teaching resources in teaching according to the survey results.

(3) Set up online tests to consolidate learning achievements. Students are tested online by setting objective questions (multiple choice questions and true or false questions). If we can judge the review focus intuitively, we can consolidate our learning knowledge. Through the independent learning and simulation training platform of airport emergency rescue management, the teaching has achieved good results. Students' awareness of autonomous learning becomes stronger, their participation in class is higher, and they become the main body of learning in class. After class, the consolidation and promotion effect is good, which has great promotion significance for other courses of this major.

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