BRICS 2022 CHINA

2022 BRICS Skills Competition

(BRICS Future Skills Challenge)

TECHNICAL DESCRIPTION

Drone Operating (Offline)

Contents

1 Introduction

1.1 Skill competition name and description

1.1.1 The name of the skill competition

Drone Operating

1.1.2 Skill Competition Description

The organization of the offline competition in the Drone Operating event of the BRICS Skills Competition is based on the competition platform built by the UAV student examination platform. The machine assembly and debugging system, the UAV maintenance and damage determination system and the UAV fine inspection software system are composed of parts. The competitors need to pass the computer, the UAV power test bench, the multi-rotor UAV assembly and debugging training system, and the unmanned aerial vehicle. The man-machine maintenance and damage assessment system, the UAV refined inspection software, the reconnaissance UAV and the emergency rescue UAV completed the offline operation assessment. The offline competition of the Drone Operating is a single-competitor competition.

Drone Operating skills include several aspects: theoretical and professional ability assessment, UAV virtual simulation flight control, UAV system selection, UAV installation and maintenance, UAV refined inspection and UAV reconnaissance with the rescue.

Drone operation professionals need to have the following job skills:

(1) Be able to understand the structure and basic working principles of common UAVs, be proficient in the theoretical knowledge and operating specifications of Drone Operatings, and complete the theoretical and basic knowledge tests through the online test answering platform.

(2) Be able to use UAV simulation flight software to perform flight simulation control of different models, complete the operation of relevant flight subjects according to the flight action requirements of the simulation software, and complete the unmanned flight according to the flight requirements of different UAV application scenarios. The applied flight subjects of aircraft flight simulation control.

(3) Be able to understand the professional knowledge and skills related to the application of UAV installation and maintenance technology, and be able to conduct comparative

experiments based on the competition equipment on the field and the provided UAV system parameters and accessories, and finally select the UAV system that meets the requirements of the competition. The optimal configuration of parameters completes the selection and design of the UAV system, and can complete the UAV assembly, debugging and flight stability test according to the UAV accessories provided by the arena according to the requirements of the competition task, and can complete the UAV assembly, debugging and flight stability test according to the UAV daily maintenance knowledge. , Combined with the fault phenomenon shown by the competition equipment, find the fault location through the detection tool and describe the troubleshooting method, and then give the daily maintenance measures.

(4) According to the customer's business needs, the UAV refined inspection software system can be used to make the UAV refined inspection model, and the UAV refined inspection flight mission route can be carried out according to the refined inspection standard requirements. completed the pre-implementation task planning of the refined inspection project.

(5) According to the requirements of the competition task book, reconnaissance drones can be used to fly through obstacles in complex environments, and then after reaching the target position, they can collect useful information and clues to collect evidence, find out the targets that need reconnaissance, and then use rescue drones. The man-machine flies to the rescue material delivery location for accurate delivery of relief materials.

1.2 Relevance and importance of this document

This document contains the criteria required for this skills competition, as well as information on the evaluation principles, methods and procedures governing the competition.

Every expert and competitor must know and understand this technical note.

In the event of any conflict between technical descriptions in different languages, the English version shall prevail.

2 Skill standard

2.1 General Description of Skill Standards

Skills standards set out knowledge, understanding and specific skills that represent international best practice in technical and professional performance. It will reflect a global

consensus on what a relevant job role or occupation represents in industry and business.

The skills competition is designed to reflect international best practice as described by this skills standard, and to what extent it can be achieved. As such, the standard is a guide to the training and preparation required for skill competitions.

The standard is divided into different sections with titles and reference numbers.

Each section is assigned a percentage of the total score to indicate its relative importance in the criteria. This is often called a "weight". The total score for all percentages is 100. Weights determine the distribution of points in the grading scale.

Through competition questions, the scoring scheme only evaluates the skills listed in the criteria. They will reflect the standard as fully as possible within the constraints of the skill competition.

The scoring scheme will be based on the points assigned in the criteria to the extent practical. A 5% change is allowed, but must not change the weight assigned by the standard specification.

2.2 Skill Standard

Part		Weights(%)
1	**Work organization and management**	**5**
	Competitors need to know and understand: – Principles and methods of safe work execution; – The purpose, use, care and maintenance of all equipment and materials and their effect on safety; – Environmental and safety principles and their application to good housekeeping in the workplace; – principles and methods of work organization, control and management; – Principles of communication and cooperation; – The extent and limitations of the roles, responsibilities and obligations of individuals and others individually or collectively; – Parameters to be followed when planning activities; – Principles and techniques of time management.	
	Competitors should be able to: – Prepare and maintain a safe, clean and efficient work area;	

	– Be prepared for the task at hand, including due consideration of OHS; – Schedule work to maximize efficiency and minimize schedule interruptions; – Apply (or exceed) OSH standards relevant to the environment, equipment and materials; – Restore the work area to an appropriate state; – Provide and receive feedback and support.	
2	**Communication Skills**	**5**
	Competitors need to know and understand: – Time requirements for each competition task – Competition document structure and content; – Competition arrangement and scoring rules;	
	Competitors should be able to: – Understand the task; – It is useful to emphasize the positive nature of the project; – Articulate and protect your design decisions; – Express ideas clearly; – Observe the time; – Follow the rules of the game.	
3	**UAV theory and professional ability assessment**	**10**
	Competitors need to know and understand: – System structure of UAV platform; – The main functions of the UAV platform; – Basic knowledge of UAV application in common scenarios; – UAV flight control principle; – Safe operation of UAV flight; – Knowledge of parameter settings related to UAV autonomous flight operations; – Knowledge of drone control and communication;	
	Competitors should be able to: – Complete the theory test questions on the theory assessment platform; – Answer the questions related to the UAV system structure correctly; – Answer the questions related to the application of basic knowledge in	

	common scenarios correctly; – Complete the test questions of the drone flight safety operation test;	
4	**UAV virtual simulation flight control**	**20**
	Competitors need to know and understand: – UAV virtual simulation software installation; – The method of controlling the UAV simulation flight through the remote control; – UAV power inspection standard process and methods; – UAV security flight control method; – A method to quickly pass through complex flight environments; – Inspection procedures and methods for different towers.	
	Competitors should be able to: – Install and debug the software according to the virtual simulation software operation manual; – Use the remote control to complete the flight related to the power inspection flight subjects; – Use the remote control to accurately capture high-definition photos of each location of the tower; – Use the remote control to quickly complete the flight operation according to the security flight subjects; – Choose the right model for racing in different complex environment tracks.	
5	**UAV installation and maintenance technology**	**25**
	Competitors need to know and understand: – Multi-rotor UAV flight platform architecture; – Ability to design and select the power system of UAV; – UAV welding technology, UAV component fixing knowledge; – UAV assembly and debugging process; – Precautions for UAV assembly and debugging; – Knowledge of UAV flight control parameters debugging; – Knowledge and precautions related to UAV flight testing; – Common failure manifestations of UAV; – Knowledge of common fault detection and troubleshooting of UAV.	

	Competitors should be able to: – Carry out the UAV system selection design experiment according to the task; – Select the optimal system configuration according to the experimental data of the UAV dynamic test comparison experiment; – Using UAV assembly and debugging tools to assemble UAV related components; – Check the specification and correctness of UAV assembly; – Use flight control debugging software to debug UAV flight control parameters; – After the debugging is completed, the UAV flight stability test is carried out; – Adjust the flight control parameters according to the test results to ensure flight stability; – Analyze the possible failure locations of the UAV according to the phenomena displayed by the UAV maintenance and damage assessment system; – Using professional detection tools to detect the fault location of UAV and determine the fault location; – According to the test results and the maintenance and damage assessment task work card provided in the task book, write down the troubleshooting method and give effective measures for daily maintenance to eliminate the failure.	
6	**UAV refined inspection application technology**	**20**
	Competitors need to know and understand: – The process and method of UAV refined inspection 3D model making; – Notes and related settings for UAV 3D modeling using the material photos provided by the competition; – How to carry out refined inspection route planning based on the 3D model; – Refine the position where the inspection needs to be photographed; – Precautions for refined inspection task planning; – How to check the quality of refined inspection task planning.	
	Competitors should be able to:	

	– Proficient in using UAV 3D modeling software; – Use photo materials and modeling software to make 3D models; – Check the quality of the 3D model, and carry out refined inspection and shooting route planning according to the model; – Check the waypoints and shooting actions in the planned 3D route and save the screenshots；	
7	**UAV emergency rescue application technology**	**15**
	Competitors need to know and understand: – Flight control skills of inspection and reconnaissance UAVs in complex flight environment; – Knowledge of the use of UAV heat source detection technology; – UAV rescue scene panorama shooting skills; – Precise drop of UAV rescue supplies.	
	Competitors should be able to: – Controlling inspection and reconnaissance drones for flight control in complex environments; – Using the task load carried by the UAV for target detection and search; – Control rescue drones and use mission payloads for precise delivery of rescue materials;	

3 Scoring Scheme

3.1 Scoring method

The scoring of this competition will be completed offline by the referee team. If a competitor cheats or violates other rules during the competition, the referee will deal with the violation according to the competitor's violation. If the circumstances are serious, the score will be cancelled.

3.2 Scoring Rules

1. The person with the highest overall score is ranked first;

2. If the total score is the same, in the order of Module C, Module D, Module E, Module B, and Module A, the highest score in the module is ranked first. For details of each module, please refer to 4.2 of this article.

When the above two rules cannot be ranked, the competitor with the shortest cumulative game time will be ranked first.

3.3 Evaluation basis

During the competition design process, the selection of criteria and evaluation methods will be determined through the scoring scheme and competition questions.

Evaluation basis, including but not limited to:

- Basic knowledge and operational safety knowledge of UAV industry
- The correctness and standardization of UAV flight control
- Normativeness of flight control for the application of UAV power inspection industry
- Application proficiency in using UAV virtual simulation flight platform
- The correctness of the specification and optimal parameter configuration of the UAV system selection experimental platform
- UAV assembly and debugging steps specification and correctness
- The rationality of UAV flight parameter setting and the stability of UAV flight test
- The completeness and standardization of the work card for the UAV maintenance and damage assessment task
- Accuracy and standardization of 3D modeling for UAV refined inspection
- Correctness and standardization of route planning for UAV refined inspection tasks
- Flight platform and task load application proficiency of inspection and reconnaissance UAVs
- Standardization of the installation and commissioning of UAV loads for the delivery of emergency rescue materials
- Accuracy of relief material delivery
- Completion time of each competition question

4 Competition questions

4.1 Common Precautions

Whether it is a single module or a series of independent or linked modules, competition questions can evaluate the application of the knowledge, skills and behaviors defined in the Skill Specification.

Combined with the scoring scheme, the purpose of the contest questions is to provide a comprehensive, balanced and realistic opportunity for evaluation and scoring against the criteria. The relationship between competition questions and grading schemes and standards will be a key indicator of quality, just as standards are related to actual job performance.

Contest questions do not include aspects outside the criteria, nor do they affect the balance of scoring within the criteria.

The assessment of knowledge and understanding in the competition questions is carried out only through its application in practical work.

4.2 Competition Task Format/Framework

The competition task is composed of five relatively independent and related modules:

Module A: UAV Theory and Vocational Ability Assessment

Module B: UAV Virtual Simulation Flight Control

Module C: UAV Assembly and Maintenance Technology

Module D: UAV refined inspection application technology

Module E: UAV Emergency Rescue Application Technology

4.3 Time allocation and score weighting of competition questions

Module	Time（min）	Weights（%）
Module A: UAV Theory and Vocational Ability Assessment	90	15
Module B: UAV Virtual Simulation Flight Control	120	20
Module C: UAV Assembly and Maintenance Technology	210	30
Module D: UAV refined inspection application technology	120	20

Module	Time（min）	Weights（%）
Module E: UAV Emergency Rescue Application Technology	60	15
Total	600	100

4.4 The contents and requirements of each module

The content of the competition covers UAV theory and professional ability, UAV virtual simulation flight control, UAV system selection, UAV assembly and debugging, UAV flight test, UAV maintenance and damage determination, 3D modeling, no Human-machine refined inspection task planning, UAV reconnaissance, UAV rescue, etc., comprehensively examine the comprehensive ability of the competitors in Drone Operating and application and industry application.

Module A UAV theory and professional ability: The assessment focuses on UAV system structure, UAV safe flight, UAV flight principle, UAV mission planning, UAV assembly and debugging, etc.;

Module B UAV virtual simulation flight control: It is based on the UAV control technology, in the UAV virtual simulation flight control software platform to collect the power inspection and rectangular cruise operation routes of the two types of towers, the tension tower and the cat head tower Operation, stable hovering operation, UAV multi-dimensional operation flight, over-the-horizon operation flight, security flight operation, and racing flight are the key points of the assessment;

Module C UAV installation, adjustment and maintenance technology: The assessment focuses on UAV system selection and design, UAV assembly, UAV debugging, UAV maintenance and damage assessment;

Module D: UAV refined inspection application technology: The assessment focuses on three-dimensional model making and three-dimensional refined route planning through the UAV refined inspection software platform;

Module E UAV emergency rescue application technology: It is to carry out reconnaissance and target information acquisition under UAV load conditions, UAV flight operation, and accurate UAV rescue materials through UAV platforms with different

application directions and different mission loads. Contents such as delivery are the focus of the assessment;

Number	Module name	Scope of work
A	UAV Theory and Vocational Ability Assessment	1 Complete the test paper consisting of 100 randomly selected multiple-choice questions on the online test platform; 2 Comply with the rules of the online theory test;
B	UAV Virtual Simulation Flight Control	1 Debug the remote control and other equipment on the virtual simulation control platform; 2 Collect the power inspection photos of the two types of towers, the tension tower and the cat head tower, through the remote control; 3 In the A-speed flight mode, complete the rectangular cruise operation route operation; 4 Complete the flight assessment of stable hovering operations; 5. Complete the multi-dimensional operation flight assessment of UAV; 6 flight assessment for over-the-horizon operations; 7 Use the remote control to complete the security flight operation; 8 Racing flight: It is divided into 6 levels, which are completed in sequence from the first level to the end of the last level;
C	UAV Assembly and Maintenance Technology	1 Carry out the UAV system selection design experiment according to the task; 2 Select the optimal system configuration according to the experimental data of the UAV dynamic test comparison experiment analysis; 3 Use the drone assembly and debugging tool to assemble the

		drone-related components; 4 Check the standardization and correctness of UAV assembly; 5 Use the flight control debugging software to debug the UAV flight control parameters; 6 After the debugging is completed, the UAV flight stability test is carried out; 7 Adjust the flight control parameters according to the test results to ensure flight stability; 8 According to the phenomenon displayed by the UAV maintenance and damage assessment system, analyze the possible location of the UAV failure; 9 Use professional detection tools to detect and determine the fault location of the UAV; 10 According to the test results and the maintenance and damage assessment task work card provided by the task book, write down the troubleshooting method and give effective measures to eliminate the failure in daily maintenance;
D	UAV refined inspection application technology	1 Proficiency in using UAV 3D modeling software; 2 Use photo materials and modeling software to make 3D models; 3 Check the quality of the 3D model, and carry out refined inspection and shooting route planning according to the model; 4 Check the waypoints and shooting actions in the planned 3D route and save the screenshots.
E	UAV Emergency Rescue Application Technology	1 Control inspection and reconnaissance drones for flight control in complex environments; 2 Use the task load carried by the UAV for target detection and search; 3 Control the rescue drone and use the mission payload for

		precise delivery of rescue materials;

4.5 Competition project announcement

Competition sample project will be announced through the website.

4.6 Changes to the competition questions

Before the official competition, 30% of the competition sample project will be changed.

5 Skills Management and Communication

5.1 Expert Group

The skills expert group is composed of chief experts, deputy chief experts and expert members, and is responsible for further revision of the technical documents and daily skills management of this competition.

5.2 Discussion Forum

For questions about software and hardware preparation, test environment deployment, etc. before the competition, participants can enter the forum section of the Drone Operating technology training platform technical training competition platform for feedback. The training exchanges, pre-competition, in-competition and post-competition exchanges will also be carried out through the forum.

The online communication will be conducted using the instant messaging tool WeChat or QQ group, and the method of holding the offline discussion forum will be uniformly announced by the organizing committee of the meeting time.

6 Safety requirements

6.1Organization

1. Set up a competition safety guarantee team, and the team leader is the director of the competition organizing committee. The members are held by those responsible for the safety of each arena. A person in charge of safety is designated for each arena, who is fully responsible for the safety of the arena. In the event of an accident, he is responsible for

mobilizing rescue teams and professional rescuers, and arranging the evacuation of people in the arena.

2. Establish a coordination mechanism with relevant departments such as public security, fire protection, judicial administration, transportation, health, food, quality inspection, etc. to ensure the safety of the competition, formulate emergency plans, and deal with emergencies in a timely manner. Set up a dedicated line for medical staff, firefighters and security personnel to determine the contact person of the other party, and the person in charge of site safety will contact each other. The layout of the competition venue and the use of equipment are strictly in accordance with the safety construction regulations. The site layout is divided into areas, evacuation channels are set according to safety requirements, and safety evacuation channels and route diagrams are posted on prominent positions on the wall.

6.2 Event Safety Management

1. The installation of competition equipment and facilities shall be constructed in strict accordance with the safety construction standards, and the power wiring and electrical installation shall be constructed in accordance with the specifications.

2. Install fire extinguishers according to fire safety requirements, and designate responsible persons to use them in emergency.

3. The regulations, regulations and qualification certificate requirements for relevant occupational safety in the country (or industry) shall be specified in the competition regulations.

4. The Organizing Committee will conduct safety training for all referees and staff of this event before the competition. According to the "Labor Law of the People's Republic of China" and other laws and regulations, establish a sound safety accident prevention system, train competitors before the competition, and avoid personal injury accidents.

5. The Organizing Committee will establish a special plan to ensure the safety of the competition proposition, storage, distribution, recycling and judging process.

6.3 Competition environment safety management

1. Before the competition, the Organizing Committee will organize special personnel to inspect the competition site, accommodation and transportation security, and make clear requirements for safety work. The layout of the arena and the equipment and equipment in the arena conform to the relevant national safety regulations. And conduct field simulation

simulation tests to find possible problems. Before the competition, the organizer shall eliminate potential safety hazards in accordance with the requirements of the competition organizing committee.

2. Set up a cordon around the arena to prevent unrelated personnel from entering and accidents. In the competition site, refer to the requirements of the relevant occupational positions to provide the necessary labor protection for the competitors. In the dangerous operation link, the referee must check and confirm that the equipment is normal before the competition, and strictly prevent the competitors from making mistakes during the competition.

3. In order to ensure the smooth progress of this competition, the host college will establish a corresponding security system during the competition, which will be implemented by the security, campus environment and health and medical security teams.

(1) During the competition, all vehicles and personnel entering the competition area must enter with a voucher and show it to the staff.

(2) Before the start of the competition, competitors should carefully read the "Entry Instructions" and the emergency evacuation map posted in the venue.

(3) The referee shall supervise and complete the entire process of inspection before the electrical control system is energized, and promptly remind and stop any hidden dangers in operation.

(4) Each competition equipment uses an independent power supply to ensure safety. competitors should save the computer in time to avoid data loss caused by sudden power failure.

(5) During the competition, the competitors should strictly abide by the safety operation rules. In case of emergency, they should immediately cut off the power supply and exit in an orderly manner under the arrangement of the staff.

(6) All types of personnel must strictly abide by the rules of the arena, and are strictly prohibited from bringing in items prohibited by the competition.

(7) Security personnel shall promptly notify the personnel in charge of the stadium when they discover potential safety hazards.

(8) Smoking is strictly prohibited in the competition venue, and security personnel are not allowed to lend their certificates to others.

(9) If there is a safety problem, under the command of the security personnel, quickly evacuate the scene according to the emergency evacuation route.

4. The event organizing committee, together with the organizer, should set up a complete set of signs and increase the number of guiding personnel in the area where the crowd is dense and the traffic and people are interlaced. It is also necessary to open up alternate channels.

5. During the competition, the organizer of the competition will manage the key positions in the competition venue, increase its strength, and establish a safety management log.

6. When the competitors enter the competition position and the staff of the competition referees enter the workplace, the competition organizer must remind and urge the competitors and the staff of competition judges to strictly prohibit the carrying of communication, photographing and recording equipment, and it is forbidden to carry unauthorized equipment. Recording equipment, and security inspection equipment to conduct security inspections for personnel entering important areas of the arena.

6.4 Guarantee of living conditions

1. During the competition, the competition organizer will arrange the food and accommodation for the competitors and instructors. The organizer must respect the religious beliefs and cultural customs of the ethnic minority competitors, and arrange the food and daily life of the ethnic minorities competitors and teachers according to the relevant national and religious policies of the state.

2. The accommodation arranged during the competition requires the qualification of hotel and accommodation operation license.

3. The organizing committee of the competition area is responsible for the traffic safety of organized visits and viewing activities during the competition. The event organizing committee and the organizer must ensure the traffic safety of the competitors, instructors, referees and staff during the competition.

4. In addition to necessary safety isolation measures, strictly abide by relevant national laws and regulations to protect personal privacy and personal freedom.

6.5 Team Responsibilities

1. When organizing teams, each participating unit must arrange to purchase personal accident insurance for the competitors during the competition.

2. After each unit is formed, it must formulate relevant management systems and conduct safety education for all competitors and instructors.

3. Each participating team must strengthen the safety management of the participants and connect with the safety management of the arena.

4. Teams who have vehicles must enter and leave the arena with the certificates issued by the Organizing Committee, drive along the designated routes, and park at designated locations.

6.6 Emergency treatment

In the event of an accident during the competition, the finder should report it to the competition organizing committee as soon as possible, and take measures to prevent the situation from escalating. The Organizing Committee of the competition should immediately start the plan to solve it. Competitions with major safety issues will be suspended by the Organizing Committee of the competition area. After the event, the Organizing Committee of the competition area should issue a detailed report.

6.7 Penalties

1. If there is a major safety accident in the event, the organizer's qualification to host the event will be suspended.

2. If a major safety accident is caused by the participating team, the award qualification will be cancelled.

3. If a team has a major potential safety accident, if the warning or warning by the venue staff is invalid, its qualification to continue the competition will be disqualified.

4. If the event staff violates the rules, they will be held accountable according to the corresponding system. If the circumstances are serious and cause a major safety accident, the judicial organ shall investigate the corresponding legal responsibility.

7 Materials and Equipment

7.1 Infrastructure List

The infrastructure list details all the equipment and facilities that the participants need to prepare, see "2022 BRICS Skills Competition Offline Competition Drone Operating Infrastructure List".

7.2 Competitor's Toolbox

Entrants are provided by the competition organizers.

7.3 List of Competition Equipment

7.3.1 Technical Platform

Number	Platform name	Quantity	Remarks

1	Computer	1	
2	UAV virtual simulation flight control system	1	
3	UAV power test platform	1	
4	Multi-rotor UAV assembly and debugging training system	1	
5	UAV maintenance loss assessment training system	1	
6	UAV refined inspection software platform	1	
7	Reconnaissance drone flight platform	1	
8	Emergency rescue drone flight platform	1	
9	Emergency rescue PTZ camera	1	
10	Emergency rescue throwing system	1	

7.3.2 Specifications

Number	Platform name	Specifications
1	Computer	1. Chipset: Intel 2. Processor: Intel Core I5-10600KF six cores twelve threads 4.1GHZ main frequency 3. Memory: 16G DDR4 3200 4. Graphics card: RTX2060Super 8G memory 5. Hard drive: 512GB SSD M.2 solid state drive 6 Input devices: AOC original USB mouse and keyboard set 7. Network card: motherboard integrated 1000M adaptive Ethernet card 8. Motherboard slots: 1 M.2 2230 slot; 1 M.2 2280 slot; 2 PCIE3*16 slots; 1 PCIE3*1 slot 9. Ports: Front 6 USB; Rear: 1 VGA port; 1 DP port; 4 USB2.0 ports 10. Chassis: Xianma 20L, support tool-free disassembly 11. Power supply: 500W energy efficient power supply 12. Sound card and audio: motherboard integrated sound card 13. Operating system: win10 Professional Edition

		14 Displays: (21.5 widescreen 16:9 LED backlit IPS LCD display, three sides ultra-narrow bezel, VGA, HDMI 1920*1080)
2	UAV virtual simulation flight control system	(1) The simulation function shall have at least: 1. Flight mode: positioning mode, attitude mode, motion mode; 2. Simulation perspective: follow perspective, pilot perspective, image transmission perspective, FPV perspective, third-person perspective; 3. Environmental simulation: wind disturbance, weather, light, electromagnetic interference; 4. Other simulations: image transmission distance, battery life, minimap, virtual joystick; 5. Control settings: EXP curve, gain, sensitivity, joystick mode; 6. Practical simulation: forest rescue, power inspection application, assessment simulation, etc.; 7. Training simulation: hovering training, route training, free training and other test levels. (2) Teaching function: 1. Basic teaching: a basic teaching course for UAV students. In this course, students can learn basic UAV joystick control technology, how to use the gimbal for shooting, how to use UAV for flight and planning, and understand various flight modes; 2. Free mode: In the free mode scene, students can practice freely according to their needs. Novices no longer have to worry about safety accidents caused by unfamiliarity with drone products, and practice product operations in virtual scenes. The free training mode will also provide a variety of auxiliary functions to assist in the development of regular training. The currently supported auxiliary functions are: flight trajectory assistance for route training, hover assistance judgment for hover training, and wind power. Self-service adjustment of parameters such as disturbance; 3. Flight skills assessment: hover assessment, flight route

		assessment, and application skills assessment. 4. Competitive competition system: Through the competitive competition system, the original boring exercises can be made interesting, enhance the interest in learning, stimulate the enthusiasm for learning, and can also hold simulated flight competitions through the system to improve the competition awareness among students. 5. Software operating environment: support Windows 10 system; 6. Minimum installation environment requirements: Central Processing Unit (CPU): G4560; Graphics Processing Unit (GPU): GeForce GTX 1050 Ti; Video memory (VRAM): 4GB; Memory (RAM): 16GB; Hard Disk (HDD): 80GB Free.
3	UAV power test platform	technical parameter 1. Use environment support: 0°C to 40°C; storage temperature: -20 to +60°C; 2. Storage humidity≤90%, use humidity≤80%; 3. The output voltage of the equipment power supply is DC0V-24V (adjustable), and the maximum output current is ≥15A; 4. It can support the testing of propellers above 11 inches; 5. Voltage and current test and measurement module: the voltage range measurement range supports 6V-28V; the voltage resolution is not less than 0.01V; 6. The voltage accuracy is not less than 0.1%+0.1%FS, the current range supports 0A-30A; the current resolution is not less than 0.01A; the current accuracy is not less than 0.2%+0.2%FS 7. The maximum range of tensile force measurement is not less than 2.5KG; the resolution is not less than 1gf; the sensor accuracy is not less than 0.1%+0.1%FS 8. The torque measurement range is not less than 1N•M; the resolution is not less than 0.001N•M; the sensor accuracy is

		not less than 0.2%+0.2%FS; 9. Commutation speed measurement range (two-stage motor): support 60RPM-150000RPM; accuracy not less than 0.05%±0.05%FS; resolution not less than 1RPM; 10. Regarding temperature measurement, the temperature range of the infrared motor is not less than -70°C to +350°C; the resolution is not less than 0.1°C, and the error of the temperature measurement accuracy of the infrared motor is not greater than ±0.5°C; the ambient temperature range is not less than -40°C to + 125℃, the resolution is not less than 0.1℃; the measurement accuracy error of ambient temperature is not more than ±0.5℃; Supporting software functions The upper computer control software supporting the UAV power system experimental teaching platform is connected with the power system test bench to realize the measurement and data processing of the UAV power system. 1. Software installation and operating environment requirements Software operation: support running under Windows10 system environment; 2. The UAV power test equipment is suitable for the static or dynamic tension (thrust) test of the UAV and model aircraft power system. It can simultaneously measure the power system tension, power consumption and efficiency, engine power consumption and efficiency, propeller efficiency, etc. data. Support real-time test data display, real-time data chart display, device information display; real-time data storage; 3. Support data analysis function, you can read the historical data of the test bench into the chart to view the relevant curves. And the data is processed, and the average and extreme value filtering of the data is carried out according to the acquisition frequency. 4. The data analysis interface can load log data, and the data can be loaded according to the selection, which can achieve an intuitive display effect;

		5. The test mode includes at least three test modes: growth, loop, and custom; 6. The test software has the function of throttle locking, which can not accept the command control of the output throttle during the throttle locking period; 7. Constant speed control function, the special software of the test bench can control the constant speed of 30%-MAX according to the given maximum speed, and the control accuracy is not less than 1%+0.5%F.S 8. The test bench special software can perform over-range alarm on the host computer (PC) according to the user's settings. The alarm sound is transmitted through the PC audio to remind the tester to exceed the preset value, prevent over-range testing, and avoid permanent damage to the test bench. 9. The power test teaching equipment must meet the following data: (1) Voltage (V): the power supply voltage of the power system of the test bench (2) Current (A): The current consumed by the power system, excluding the current consumed by the test bench. (3) Tensile force (g): The tensile force sensor of the test bench collects the change value of the tensile force to the "zero" tensile force. (4) Torque (N·M): Multiply the value collected by the torque sensor of the test bench by the force arm (N·M). (5) Real-time power (W): the power consumed by the power system of the test bench at the current time. (6) Speed (rpm): the number of revolutions per minute of the motor at the current moment. (7) Motor temperature (°C): the temperature of the motor at the current moment. (8) Throttle input (%): The throttle percentage corresponding to the duty cycle of the PWM input channel at the current moment is just the detected input quantity. At this time, the throttle output on the test bench has nothing to do with this

		value. (9) Motor output (W): refers to the output power of a complete set of power system in the current state of the electrical adjustment of the motor. Torque × Speed. (10) Motor efficiency (%): The motor efficiency refers to the overall efficiency of the motor and ESC. Motor output/system input (real-time power). (11) Propeller force efficiency (g/w): in the current state, the efficiency of the propeller's pulling force corresponding to the motor output. (12) System force efficiency: The pulling force generated by the propeller in the current state corresponds to the efficiency of the system input.
4	Multi-rotor UAV assembly and debugging training system	1. The rack layout is "X"; the wheelbase of the fuselage is ≥450mm 2. Body material: carbon fiber and aviation aluminum parts 3. The maximum flight time shall not be less than 15 minutes, and the maximum take-off weight is more than 1.5kg 4. Working environment temperature -10~40℃ 5. The maximum ascending speed is ≥4m\s; the maximum descending speed is ≤5m\s; the maximum level flight speed is ≥7m\s 6. Maximum withstand wind speed ≥8m\s; hovering accuracy, vertical ±0.5m, horizontal ±1m (GPS status) 7. Usage scenarios; indoor and outdoor 8. The maximum pitch angle is not less than 35°; 9. The control method is the least supported: remote control control, ground station control, airborne computer control, etc. 10. The lower center plate of the body is designed with a PCB circuit board, the electronic circuit is a buried design, and the PCB circuit board has an obvious signal line serial number identification to prevent the installation line sequence error during assembly and debugging. The connection plug adopts a plug-in design to ensure the

		reusability of more than 100 times. 11. Do not expose the internal circuit directly. Equipped with ABS plastic detachable shell to ensure the waterproofness and aesthetics of the electronic components of the equipment, and easy to disassemble 12. A QR code icon is attached to the fuselage. By scanning the QR code icon, you can view the assembly video of this model on the mobile terminal. 13. Equipped with various types of hexagon socket tool sets, needle nose pliers, wire strippers and other tools to provide support for training tasks such as UAV disassembly, maintenance, etc. The details of the tools are as follows: 1) 1 M1.5 socket head screwdriver 2) 1 M2.0 hexagon socket screwdriver 3) 1 M2.5 socket head screwdriver 4) 1 M3.0 hex screwdriver 5) 1 flat-blade screwdriver 6) 1 Phillips screwdriver 7) 1 diagonal pliers 8) 1 wire stripper 9) 1 wallpaper knife 10) 1 set of soldering iron stand 11) 1 roll of solder wire 12) 1 box of rosin 13) 1 50W electric soldering iron 14) 1 power battery tester 15) Multimeter set 1 16) 1 horizontal measuring column 17) 1 file 18) Screw glue 1 box 19) 1 banana head soldering station 20) 1 test pen 21) 1 USB tuning cable

		22) 1 hot melt glue gun
5	UAV maintenance loss assessment training system	1. The composition of the power system is as follows: the motor type is required to be a brushless motor, the stator size is not less than 23mm, the kv value is not less than 1000KV, the ESC type is required to be a brushless ESC, the continuous working current is not less than 30A, and the maximum instantaneous current is not less than 30A. Less than 40A, suitable for 2S ~ 6S batteries, the power battery type requirements are: lithium battery, the capacity is not less than 2200mah; the discharge rate is not less than 25C; 2. Remote control operating frequency: 2400MHz~2483.5MHz; the number of channels is not less than 8; it supports wide voltage input; at least supports SUS, PWM signal output, the system power consumption should not be greater than 80mA; the transmission rate is not less than 38kbps; the remote control system has a signal Transmit indicator light, the modulation mode supports at least GFSK mode; and the remote control has at least one three-stage switch and no less than one second-stage switch; 3. Flight control system: The flight mode supports at least fixed-point mode, fixed-altitude mode, mission mode and return-to-home mode; the internal flight control requires an integrated buzzer, free from an external buzzer module; FLASH storage ≥ 8MB, power supply range 4.8~5.5 V; The flight controller supports multi-rotor aircraft with wheelbases ranging from 250mm to 1800mm; the sensor modules include at least an airspeed sensor module, a magnetic compass sensor module, a barometric altimeter module, a magnetic compass and an accelerometer module, a gyro sensor module, a gyro and Accelerometer sensor module, CAN bus module, sound alarm module, colorful indicator light module, low dropout power supply module, flight data storage module, level conversion module, parameter storage module, main controller module, input and output controller module, etc.; Set the serial port to include at least: digital serial port, RTK serial port, GPS serial port, external compass, optical flow serial port: TFMINI serial port, etc.; the flight control system requires high-performance

		STM32H743VIT6 processor, main frequency ≥480Mhz, with double-precision floating-point hardware Processor; flight control system requires: magnetic compass correction, single-parameter adjustment, multi-sensor fusion and other functions; 4. The UAV maintenance loss assessment training box requires a main power switch on the fault point setting panel, as well as a power supply fault switch on the distribution board; the switch panel is a lock-type design; 5. The UAV maintenance and damage assessment training box is required to be able to restore the composition of the quadrotor UAV system, and it is required to be able to visually display the connection method of the UAV's internal circuits 6. The UAV maintenance and damage assessment training box can at least set a variety of different UAV faults with one click. All fault detection and damage assessment procedures are in full compliance with the real situation, and all faults can be recovered within one minute; 7. When the fault point is set, it can perfectly show the occurrence of the real fault and the detection and maintenance; 8. Capable of functional testing of UAV system components; 9. At least the fault setting of the power system, flight control system, body structure and other parts can be realized; 10. It contains UAV flight control system, power system, receiving system, fault control system, etc.;
6	UAV refined inspection software platform	1. Support real-time 3D reconstruction: the data collected by the UAV can be visualized, and high-precision, high-density color point clouds can be generated in real time to meet the display and precise measurement needs of scenes such as accident sites, engineering monitoring, and power line patrols; 2. Support real-time mapping: 2D mapping aerial photography tasks, support real-time generation of 2D orthophotos, realize mapping while flying, and can make corresponding optimizations for different scenarios such as

		farmland and cities; 3. The software can also perform high-precision post-processing mapping, including 2D orthophotos and 3D models, including map tiles, orthophotos and digital surface models (the industry-wide GeoTiff format based on UTM projection is used by default). As well as multi-level of detail models (supports .osgb, .b3dm and .S3MB model formats), single texture models (.ply and .obj formats) and point clouds (.las format). 4. Support automatic segmentation of 3D reconstruction: when the number of photos used for reconstruction is greater than the number of photos supported by the current computer configuration (memory), the algorithm automatically enters the segmentation process to meet the reconstruction needs; 5. Support automatic 2D/3D reconstruction: For the photos taken by the aircraft, 2D/3D reconstruction is automatically completed, and all parameters are built-in; 6. Modeling efficiency: It can perform fast 3D modeling, and the high-precision 3D reconstruction of 100 photos by a PC with an ordinary 1080Ti configuration takes no more than 1 hour; 7. Support multi-spectral reconstruction: the software supports real-time NDVI and 2D multi-spectral post-processing reconstruction, which can generate ortho-mosaic results of each band image and indices calculated according to the ortho-mosaic results of each band image, such as NDVI, NDRE, LCI , GNDVI, OSAVI. 8. Support multi-task superposition display of 2D orthophoto map: The generated 2D models can be superimposed and displayed, and the loading efficiency is in seconds; 9. Photo positioning function: (1) You can view all the corresponding photo points of the model; (2) Click anywhere on the model, the corresponding photo point will be highlighted, and the original image of each photo point will be displayed. Display, select any original image, the corresponding photo point of the image will be highlighted again.

		10. Support image control point management and output coordinate system setting. The software has built-in rich coordinate systems for achievements. You can select the corresponding coordinate system according to project requirements, and support the generation of quality reports to ensure that the task results meet the accuracy requirements of the project. 11. The software supports two-dimensional and three-dimensional measurement, including measuring the coordinates, distance, area, volume and other key data of the target object, and saves the measurement results, which can provide data support for further analysis and decision-making. 12. Support one-click to open task folder: support to open the folder corresponding to the task through the task more options in the task library or the shortcut key; 13. Support the seamless import of result data into SuperMap, Wish3D, EPS, SV360, MapMatrix, ShareGIS and many other third-party GIS and mapping software. 14. The software has a variety of route planning functions, such as waypoint flight, mapping aerial photography, oblique photography, ribbon routes, etc.; 15. In the oblique photography mode, the software will automatically plan 5 groups of routes according to the selected target area: 1 group of orthophoto routes and 4 groups of inclined routes of different angles. A comprehensive perspective helps to build a higher-precision real-world 3D model, and supports setting the tilt gimbal angle, GSD, flight speed, overlap and other related parameters; 16. The software provides three ways to add boundary points, such as map point, KML file import, and aircraft point, and it can work normally without network. During the planning process, the interface will display important information such as estimated flight time, estimated number of photos and area; 17. For large-area strip route planning, the software can

		automatically cut and plan routes in sections. At the same time, the user can freely adjust the width of the strip, plan the route reasonably, and improve the operation efficiency; 18. Waypoint flight needs to support setting a wealth of waypoint actions for each waypoint separately, support timed photos between waypoint flight tasks and waypoints, and can adjust the flight altitude, flight speed, flight direction, gimbal pitch angle and other parameters of the waypoint. . For refined flight missions, you can also import the built 2D orthomap or 3D model for waypoint planning; 19. 3D route planning: (1) Route planning can be done on the 3D model or point cloud; (2) Automatic video recording and timing photos can be set in the 3D route planning; 20. Refinement inspection: Set the shooting target based on the model or point cloud, and can automatically generate the shooting route to realize the automation of the inspection process.
7	Reconnaissance drone flight platform	1. Frame type: foldable structure; wheelbase ≥ 600mm; 2. The weight of the whole machine (including the battery) ≥ 3500g, the maximum take-off weight ≥ 3000g; 3. The maximum hovering flight time is greater than or equal to 32 minutes; the maximum endurance time is greater than 36 minutes; 4. The maximum ascending speed is not less than 5m/s; the maximum descending speed is not less than 4m/s; 5. The maximum horizontal flight speed is not less than 20m/s; the maximum wind resistance level is not less than 12m/s; 6. Support the maximum take-off altitude ≥5000m; 7. The fuselage of the aircraft can support folding, and the size of the folded fuselage is ≤370×255×205mm; 8. The protection level of the fuselage is ≥IP55; it must support working in the environment of -20℃～50℃; 9. The gimbal type must be a three-axis mechanically stabilized gimbal; the controllable rotation range in the pitch direction supports -120° to +45°;

		10. Zoom camera: The image sensor is 1/2" CMOS, and the effective pixels are not less than 48 million; the focal length of the lens supports adjustable 21-75mm; the aperture supports f/2.8-f/4.2 adjustable; 11. Wide-angle camera: the image sensor is 1/2" CMOS, the effective pixel is not less than 12 million; the focal length of the lens is not less than 4.5 mm; 12. Thermal imaging camera: the equivalent focal length is not less than 40mm; the resolution is not less than 640×512@30HZ; 13. Laser module: wavelength ≥ 900nm, maximum laser power ≥ 3.0mW; measurement range supports between 3 ~ 1200m; 14. Vision system: The fuselage requires binocular vision and near-infrared sensors in no less than 6 directions, with omnidirectional obstacle avoidance function, built-in ADS-B signal receiver, which can timely warn surrounding manned aircraft information; obstacles Object perception range: between 0.6 to 38 m forward; between 0.5 to 33 m from up, down, left, right and rear; 15. Infrared sensing system: obstacle sensing range is between 0.1 and 10 m; 16. The effective lighting distance of LED fill light is not less than 3m; lighting method: always on; 17. The size of the remote control display screen is ≥6.5 inches, and the screen type is required to be a touch LCD screen; the resolution is ≥1920×1200, and the maximum brightness is not less than 1200cd/m2; Work under temperature; the remote control must support the use of built-in battery and external battery at the same time, and the longest battery life is not less than 5.5 hours; 18. The aircraft must support switching between 2.400~2.4835GHz and 5.725~5.850GHz frequency bands; 19. The aircraft supports dual-battery power supply mode. If a single battery fails, another set of batteries can keep the drone running.

		Normal operation to ensure the safe return of the aircraft, intelligent flight battery capacity ≥ 5800mah, energy ≥ 130Wh, voltage ≥ 25.2V; battery type requirements are lithium batteries; 20. The aircraft systems and sensors are required to adopt a redundant design, including but not limited to flight control sensor redundancy, sensing system redundancy, power system dual-link redundancy, dual intelligent battery redundancy, image transmission link redundancy, etc.; 21. Flight battery charging management system: support charging the flight battery and the remote control battery at the same time, support input voltage 100-240V AC, output power greater than 500W, no-load power consumption <8W, the number of USB ports is not less than 2, flight battery The charging management system supports at least two types of standby mode and storage mode, and has but not limited to short-circuit protection, over-voltage protection, over-current protection, over-temperature protection and other protection functions; 22. Support user data encryption transmission function, and support cloud data storage, one-click clear log log and other functions;
8	Emergency rescue drone flight platform	1. Overall basic parameters of the aircraft 1) The symmetrical wheelbase of the fuselage is greater than or equal to 800mm; 2) The requirements for the deployment method of the arm are: foldable; the installation method of the tripod: quick release and installation; the fuselage has a flight status indicator; 3) The maximum load of the aircraft is greater than or equal to 2.65kg, and the maximum take-off weight is greater than or equal to 9.0kg; 4) Operating frequency: 2.4GHz～2.4835GHz; 5.725GHz～5.580GHz; 5) Hovering accuracy: ±0.1m (when visual positioning is working normally), ±0.5m (when GPS is working normally)

		6) Maximum rotation angular velocity: pitch axis ≥ 300°/s, pan axis ≥ 100°/s; 7) The maximum ascending speed ≥ 6m/s, the maximum descending speed ≥ 5m/s; the maximum level flight speed ≥ 23m/s; 8) Maximum flight altitude ≥5000m; 9) Maximum withstand wind speed ≥ 13m/s; 10) Protection class ≥IP45 (refer to IEC60529 standard); 11) Maximum flight time (no load): not less than 50 minutes; 12) Maximum image transmission distance (no occlusion, no interference) ≥ 15 kilometers; 13) RTK: The aircraft has RTK positioning and orientation capabilities, and can use RTK orientation to fly safely in an environment where the compass is disturbed; 14) Working environment temperature support: -20 to 50℃; 2. Remote control system 1) Operating frequency: 2.4GHz～2.4835GHz; the system adopts Android system; 2) The remote control has a built-in bright touch screen, and the size is not less than 5 inches; 3) It has Bluetooth and satellite positioning functions, and can support connection to the Internet through Wi-Fi or 4G wireless network card; 4) The remote control supports at least working with the built-in battery, and also supports working with the built-in battery and the external battery; 5) There are no less than three ways to use the remote control to control the aircraft; the remote control has an aircraft mode switch; 6) Remote control storage space: ROM≥30GB; 7) The battery type of the remote control must be LiPo, and the battery life should not be less than 2.5 hours; and the charging time should be less than 3 hours; (3) Visual perception system

		1) Obstacle perception range of the visual system: the perception range of front, back, left and right is 0.7m to 30m; the up and down perception range is 0.6m to 30m; 2) The obstacle sensing range of the infrared sensing system is 0.05~7.5m; 3) The effective lighting distance of the fill light is ≥5m; the lighting mode is always on; 4) The resolution of the FPV camera is not less than 960p; the frame rate is ≥30fps; 3. Aircraft functional requirements: 1) The aircraft must at least have the function of returning to home automatically, and there are no less than three ways of returning to home; 2) The aircraft at least has the function of landing protection; 3) The aircraft has at least the function of flight data recording. All flight data can be stored in the aircraft. Keep the aircraft turned on and connected to the computer, and the flight data can be exported through the corresponding software. 4) The propeller blades must have obvious positive and negative markings; 5) The aircraft needs to have a built-in RTK module, which can provide strong anti-electromagnetic interference ability and ensure reliable flight in complex strong magnetic interference environment; 6) The aircraft needs to provide no less than 3 PSDK expansion interfaces, and the external power supply capacity of the PSDK expansion interfaces is ≥17V; 7) The aircraft supports at least the advanced dual control mode, which is suitable for two people to control one aircraft at the same time; 8) At least two channels of 1080p image transmission are supported; 9) The aircraft supporting software APP, at least supports the functions of route planning and automatic operation;

		10) Have an aircraft health management system: at least include modules such as abnormality diagnosis, log management, and maintenance guidance; 11) Equipped with a geo-fencing system, which can provide real-time airspace information, as well as information related to flight safety and flight restrictions to achieve flight restrictions in special areas;
9	Emergency rescue PTZ camera	1. Waterproof grade ≥IP44, eye safety grade ≥Class 1M; 2. The storage temperature of the device supports -20°C to 60°C; 3. The installation method of the gimbal is detachable; 4. The angle jitter of the gimbal is ≤±0.01°; 5. Zoom camera image sensor 1\1.7 CMOS, effective pixels not less than 20 million; 6. There are no less than two exposure methods, and support program automatic exposure and manual exposure; 7. Support spot metering, center-weighted metering two metering modes, and support metering lock; 8. The fastest speed of the electronic shutter is not less than 8000/s; 9. Photo shooting ISO range supports photos: 100 ~ 25600; 10. The video resolution is not less than 3840x2160 @30fps; 11. Expends MP4 video shooting format, supports JPEG photo shooting format; 12. The effective pixel of the wide-angle camera is not less than 12 million; 13. The video recording resolution of the wide-angle camera is not less than 1920×1080@30fps; 14. Thermal imaging camera sensor type is uncooled vanadium oxide (VOx) microbolometer; 15. Support 1x, 2x, 4x, 8x digital zoom; 16. The thermal imaging camera video shooting resolution is not less than 640 × 512 @ 30 Hz; 17. The temperature measurement method supports point

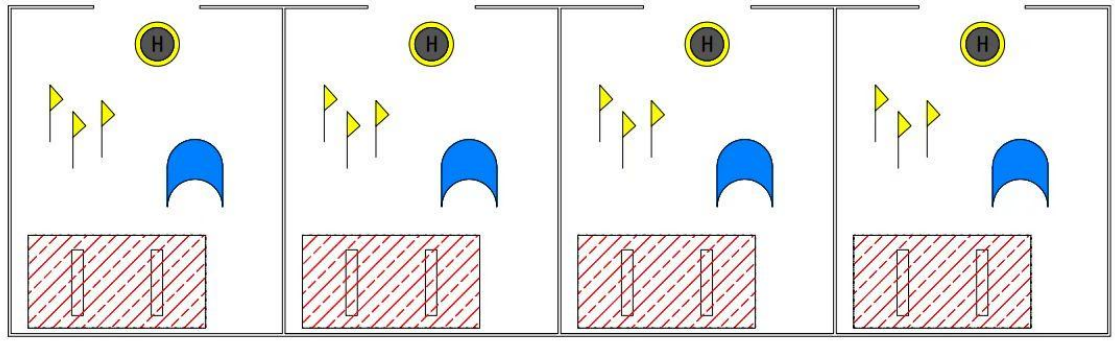
		temperature measurement and regional temperature measurement; 18. Thermal imaging camera supports high temperature alarm function; 19. Sensitivity (NETD) ≤ 50 mK @ f/1.0 20. The wavelength of the laser rangefinder is not less than 905 nm; 21. The measuring range of the laser rangefinder is not less than 1200 m; 22. The hybrid optical zoom ratio of high-performance drone gimbal camera is not less than 23 times 23. Support linkage shooting mode, zoom, wide-angle, thermal imaging cameras take photos/records at the same time; 24. The maximum zoom factor is not less than 200 times; 25. It has the function of pointing and aligning, you can double-click the point of interest on the screen of the wide-angle/thermal imaging camera, and the system automatically rotates the gimbal to place the point of interest in the center of the zoom camera screen; 26. The zoom camera supports shooting night scene mode; 27. Supports ultra-clear matrix photo mode, you can select an area on the screen of the wide-angle camera, the system will use the wide-angle camera to take a photo, and automatically rotate the gimbal, and use the zoom camera to use the current zoom factor to take several 2000 shots of the selected area. Megapixel photos. All photos will be stored in a subfolder of the SD card and will generate an HTML file that can be opened with a browser on a computer to view all wide-angle and zoom photos. 28. Supports mobile storage devices with a maximum capacity of 128 GB; 29. Support pointing and alignment function, ultra-clear matrix shooting function, and night scene shooting mode; 30. The focus mode supports manual focus, automatic continuous focus, and automatic single-point focus mode;

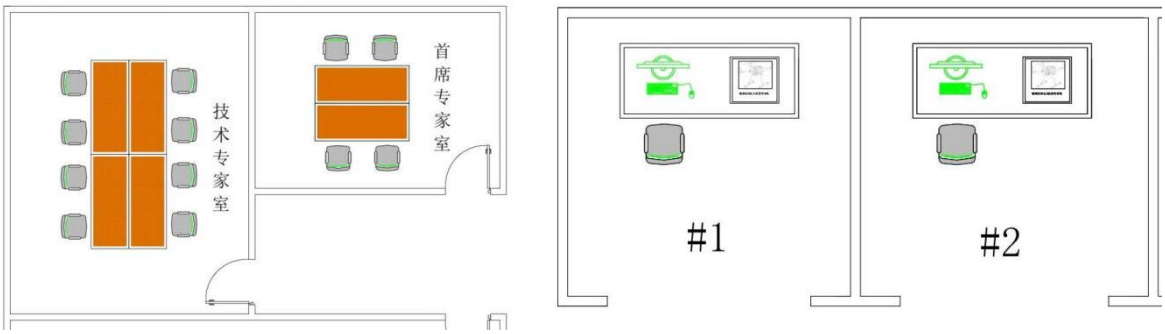
		31. The infrared thermal imaging camera provides functions such as color palette, isotherm, spot temperature measurement, and digital zoom.
10	Emergency rescue throwing system	1. Weight: ≤200g; 2. Size: ≥50mm×50mm×50mm; 3. Number of mounts: ≤4; 4. Total load weight: ≥20kg; 5. Single hook load weight: ≥5kg; 6. Delivery method: support single-point delivery, one-click full delivery; 7. Support quick release installation.

7.4 Materials and Equipment Prohibited in Skilled Areas

Any materials and equipment carried by the entrant should be declared (presented) to the expert. Experts may prohibit the use of any item that is irrelevant to the performance of the mission or that may give a competitor an unfair advantage.

7.5 Suggested Play Area and Workstation Layout





8 Skill specific rules

Skill-specific rules cannot contradict or take precedence over the rules of the game. They will provide specific details and clarity on different aspects, which vary by skill competition. They include, but are not limited to, personal computing devices, data storage devices, Internet access, work procedures, and document management and distribution.

Topics/Tasks	Skill-specific rules
Technology used - USB, memory card	1) Participants can only use the memory card provided by the competition organizer. 2) It is forbidden to take the memory card or any other portable storage device out of the workshop. 3) Memory cards or other portable storage devices must be at the end of each day 4) Leave it to the Chief Expert or Deputy Chief Expert for safe storage.
Technology used: personal laptops, tablets and mobile phones	1) Experts and interpreters can use personal laptops, tablets and mobile phones. 2) Competitors are not allowed to bring personal laptops, tablets or mobile phones into the workshop.
Using Technology - Personal Camera	Competitors, experts and interpreters may use personal photo and video equipment in the workshop only after the competition questions have been completed or with the consent of the chief expert.
Evaluation of competition questions	1) For each workstation (module), a competent expert with the highest professional level in the field is assigned by the chief expert. The expert controls OHS compliance, the completion or non-completion of contest points, which can only be assessed while the entrant completes the task. The designated experts are solely responsible for the fairness of the entrant's assessment. 2) If at the workstation, the Competitor and the Expert are from the same organization, the Expert may be changed once during the duration of the module.
Make 30% changes in contest questions	During the introduction of the 30% change (on day C-2), the specialist must do the following: According to the equipment and software provided by the competition sponsor (all modules): - Assembly drawings (or photos) of the updated installation; - Update electrical and pneumatic schematics; - Update mission point descriptions provided by contest sponsors regarding device software and hardware characteristics.
Competitors experience technical issues during mission completion	1） In the event of a technical problem (not due to the entrant's fault) during the implementation of the competition question, the entrant will receive additional time equal to the time from the discovery of the defect to the complete elimination of the defect. 2） If a technical problem is found to be caused by the entrant's fault, the

	entrant will not receive additional time.
PPE	Personal protective equipment such as safety clothing, steel-toed shoes, gloves, etc., shall be prepared by the participants.