2026

BRICS SKILLS COMPETITION
(BRICS+ FUTURE SKILLS & TECH CHALLENGE)

Low-altitude Intelligent Aircraft Application
BRICS-FS-64

Test Project
(International Final_Offline)

June , 2026

Table of Contents

1. Competition Format

Two-person team competition

2. Competition Content

This competition consists of 3 modules, and contestants are required to complete all competition modules in sequence. During the competition, contestants will be provided with unified competition question documents, competition equipment, basic equipment operation instruction documents, as well as data sources or other technical basic conditions required to ensure the independence and fairness of each task module. The competition content includes the following task modules:

Module 1: UAV Comprehensive Theoretical Assessment Module

Module 2: Intelligent Aircraft Development and Application Module

Module 3: UAV Multi-Industry Application Simulation Flight Module

Competition tasks and scoring standards can only be changed if the work cannot be completed on site and approved by the chief expert.

Contestants who fail to comply with occupational health and safety environmental requirements, or put themselves and other contestants at risk, will be disqualified from the competition.

After the contestants complete the module, the results will be scored.

3. Project Modules and Time Requirements

3.1 Project Modules and Time Requirements

The Low-Altitude Intelligent Aircraft Application event consists of 3 modules, which are required to be completed within 6 hours. The specific module names and time requirements are shown in Table 1.

Table 1 List of Project Modules and Time Requirements

No.	Module Name	Completion Time
1	UAV Comprehensive Theoretical Assessment Module	60 min
2	Intelligent Aircraft Development and Application Module	180 min
3	UAV Multi-Industry Application Simulation Flight Module	120 min

3.2 Task Content

Module 1: UAV Comprehensive Theoretical Assessment Module (60 min)

(1) Task Background

The low-altitude economy is becoming a new track for global technology and

industrial competition. In China, this field has been written into national development plans for many consecutive years. From "new growth engine" to "strategic emerging industry" and then to "emerging pillar industry", it clearly outlines the trajectory of the accelerated rise of the low-altitude economy. As the core carrier of the low-altitude economy, intelligent aircraft are deeply integrated into thousands of industries such as logistics transportation, emergency rescue, smart cities, and environmental monitoring, changing production and life in an unprecedented way.

The BRICS Vocational Skills Competition is a top competitive platform built for young skilled talents in BRICS countries. Here, technology and standards are mutually learned, and innovation and craftsmanship are integrated. As the opening of the "Low-Altitude Intelligent Aircraft Application" event of this competition, this module returns to the professional origin — no matter how advanced the flight algorithm is or how powerful the intelligent system is, solid theoretical foundation and rigorous safety awareness are always the foundation for every intelligent aircraft practitioner.

This task aims to help contestants test their professional literacy through systematic theoretical assessment, consolidate the foundation of safe flight, meet the follow-up practical challenges with more solid confidence, and grow into high-quality technical and skilled talents leading the low-altitude intelligent era. Contestants are required to answer the theoretical and vocational ability assessment questions provided on site to verify their professional theory and vocational ability.

(2) Key Assessment Content

UAV flight principles, UAV structure and systems, UAV assembly and debugging, UAV inspection and maintenance, UAV control technology, UAV industry application knowledge, safety production and professional literacy, etc.

(3) Task Description

The question types include single-choice questions and 3D animation operation questions.

Among them, the 3D animation operation questions require contestants to complete operations such as judging the assembly sequence of UAV components, identifying fault points, and adjusting flight attitude in a 3D virtual environment. The specific question bank content is as follows:

1.UAV flight principles: Basics of aerodynamics, lift and drag, flight stability, multi-rotor UAV flight principles, etc.

2.UAV structure and systems: Fuselage structure, power systems (motors, ESCs, propellers), communication systems, navigation systems, etc.

3.UAV assembly and debugging: Mechanical assembly process, electrical connection specifications, ground station parameter settings, sensor calibration, etc.

4.UAV inspection and maintenance: Common fault diagnosis methods, hardware inspection processes, maintenance tools and methods, etc.

5.UAV control technology: Remote controller operation, flight mode switching, emergency handling methods, etc.

6.UAV industry application knowledge: Aerial surveying and mapping, agricultural plant protection, power inspection, emergency rescue, etc.

(4) Task Content

Log in to the SR-EX1 UAV New Form Intelligent Examination System using the designated account and password for the competition, enter the assessment module, select the only test paper to answer. There are 100 questions in total, with a full score of 100 points.

(5) Scoring Method

This module is automatically scored by the SR-EX1 UAV New Form Intelligent Examination System without intervention from referee experts. The system will display the score immediately after submission and record the answering time.

Module 2: Intelligent Aircraft Development and Application Module (180 min)

(1) Task Background

At present, the global low-altitude economy is moving from "being able to fly" to "being used well". BRICS countries have an increasingly urgent demand for intelligent aircraft development talents — they not only need to know how to assemble and debug, but also be able to write underlying drivers, optimize control algorithms, and endow machines with the visual ability to "understand the world".

This module is oriented to this industrial demand, and tests contestants' full-process engineering capabilities from hardware assembly, sensor development, intelligent recognition to flight verification through a complete development practical task.

From laboratory prototypes to front-line industry applications, the value of intelligent aircraft is ultimately reflected in reliable execution in real scenarios. Here, code dances with rotors. Contestants will personally endow UAVs with perception and intelligence, and witness their works complete challenges on the real flight field. This is not only a competition of skills, but also a refinement of innovation ability. Only by transforming theory into practice and turning creativity into functions can we become engineering and technical talents leading the era of intelligent aircraft.

(2) Key Assessment Content

Intelligent sensor assembly and debugging, intelligent aircraft inspection and maintenance, intelligent sensor application development, aircraft intelligent recognition function development, aircraft mission payload intelligent control, aircraft intelligent flight application, etc.

(3) Task Description

The core competitiveness of intelligent aircraft comes from the completeness and reliability of its "perception-decision-execution" closed loop. In actual industry application scenarios, the accurate collection of sensor data, the rapid response of visual recognition algorithms, the autonomous planning of motion trajectories, and the linkage control of mission payloads jointly determine whether UAVs can complete high-value operation tasks in complex environments.

This module requires contestants to complete the standardized installation of UAV landing gear, link system and other hardware structures within the specified time based on the SR450K multi-rotor UAV intelligent development training platform; use the basic framework in the code base to independently write programs to realize the functions of ultrasonic, optical flow and other sensors on the UAV, ensuring that the flight controller can obtain accurate height fixing, positioning and obstacle avoidance information in real time. On this basis, develop a visual recognition program to detect and track specified targets, and control mission payloads such as droppers to perform corresponding actions according to the recognition results.

After completing ground assembly, debugging and sensor development, contestants should raise their hands to report to the referee and go to the flight test site to correctly install propellers and batteries for flight test to verify normal sensor data and correct flight mode settings, ensuring that the UAV can be safely unlocked and hover stably; then develop and run the motion control program to make the UAV complete automatic cruise flight according to the preset quadrilateral trajectory; finally, control the intelligent UAV integrating all development results to complete intelligent delivery operations in the designated task area.

The entire development and debugging process must strictly follow safety operation specifications, focusing on code standardization, comment clarity, and rationality of parameter configuration. Contestants need to record key debugging data and submit a complete development result package after flight verification.

(4) Task Content

Contestants need to complete the assembly, development and application of intelligent aircraft based on the SR450K multi-rotor UAV intelligent development training platform, computer with parameter adjustment and development software, supporting tools and consumables provided on site, including the following contents:

1.Complete the installation of landing gear and link system of the multi-rotor UAV intelligent development training platform;

A. Complete the landing gear assembly. The landing gear is a T-shaped structure, locked and fixed with set screws, and installed on the corresponding base under the UAV; the installation process must strictly comply with the screw assembly process specifications. If the landing gear loses its function due to improper operation by the contestant, flight test is not allowed.

B. Complete the installation of the receiver and data transmission, and correctly connect the wiring harness according to the interface instructions on the PCB board; if the equipment is damaged due to improper operation by the contestant, flight test is not allowed.

2.Independently write code to complete sensor development and realize functions in the flight controller according to technical documents;

A. Independently write code to complete the lidar function development according to technical documents, so that the measured height value can be displayed in the flight controller ground station for height control; if the height value cannot be displayed, flight test is not allowed.

B. Independently write code to complete the optical flow function development

according to technical documents, so that the measured position information can be displayed in the flight controller ground station for positioning; if the position information cannot be displayed, flight test is not allowed.

C. Independently write code to complete the ultrasonic function development according to technical documents, so that the measured distance value can be displayed in the flight controller ground station.

3.Independently write code to complete intelligent recognition function development and realize intelligent control of payload according to technical documents;

A. Independently write code to complete visual recognition function development according to technical documents, so that the recognition frame is displayed when the camera is aimed at the corresponding QR code.

B. Independently write code to complete intelligent payload control development according to technical documents, so that when the camera is aimed at the corresponding QR code, the corresponding steering gear is driven. If the contestant judges that this development is completed and can be scored, they can raise their hand to signal the referee to score this item separately.

4.Correctly install propellers and batteries and complete flight test;

A. If the contestant judges that all sensor development of the UAV is completed and meets the flight test conditions, they can raise their hand to apply for flight test to the referee. The referee will first conduct acceptance scoring on the UAV structure assembly and sensor development parts, and inform the contestant whether the UAV

is qualified for flight test. If the contestant's UAV is not qualified for flight test, the contestant's competition in this module ends; if the contestant's UAV is qualified for flight test, the propeller installation and power battery installation should be completed in the flight test site. If the propeller is installed incorrectly, flight test is not allowed, and the contestant's competition in this module ends.

B. The contestant controls the UAV to take off using Position mode. Pay attention to the UAV power-on sequence and safety operation specifications. After takeoff, maintain a flight height of 1m, release the control stick and hover for 30s to prove that the UAV has realized automatic height fixing and positioning. If height fixing and positioning cannot be realized, or collision occurs during flight test, or the safety officer takes over control under the referee's order, the flight test fails.

C. After the flight test is completed, if the contestant needs to return to the development station to continue completing other development projects, the propeller should be removed in the flight site; if the contestant has completed other development projects at this moment, they can apply to the referee to perform subsequent flights directly without returning to the development station.

D. If the contestant cannot operate the UAV to take off within 5 minutes, it will be regarded as a flight test failure. All those who fail the flight test or are not allowed to conduct flight test will be regarded as the end of the contestant's competition in this module.

5.After completing the flight test, independently write code to complete the quadrilateral automatic motion trajectory development and perform automatic flight according to technical documents. Before performing this task flight, the contestant

can apply to the referee to use a new battery to perform this task flight according to the remaining power of the power battery in hand;

A. Complete the development of a square closed route motion with a side length of 1 m. Note that this function cannot be realized using the route planning function of the ground station.

B. After completing the development, you can raise your hand to apply to the referee for flight, and complete the propeller and power battery installation according to the standards during flight test. If the propeller is installed incorrectly, flight is not allowed, and the contestant's competition in this module ends; if the propeller is installed correctly, flight is allowed. The contestant should reasonably place the UAV at any position in the site, then switch the flight mode to perform automatic flight. During the UAV flight, the contestant is not allowed to touch the remote controller. If the UAV collides or the safety officer takes over control under the referee's order, the contestant's competition in this module ends.

C. If the contestant cannot operate the UAV to take off within 5 minutes, it will be regarded as the failure of this flight, and the contestant can return to the station to complete other projects.

6.After completing the flight test, control the intelligent UAV to complete intelligent delivery operations; Before performing this task flight, the contestant can apply to the referee to use a new battery to perform this task flight according to the remaining power of the power battery in hand. There are two ways to complete this task: Method 1 is that the contestant chooses to manually control the UAV flight and complete the intelligent delivery operation. This method has lower difficulty but

lower score; Method 2 is that the contestant innovates independently, writes the motion path, and completes the intelligent delivery operation through automatic flight. This method has higher difficulty but higher score.

Method 1:

A.After independently writing code to complete development according to technical documents, you can raise your hand to apply to the referee for flight, and complete the propeller and power battery installation according to the standards during flight test. If the propeller is installed incorrectly, flight is not allowed, and the contestant's competition in this module ends; if the propeller is installed correctly, flight is allowed.

B.The contestant should place the UAV on the takeoff and landing point, then manually control the UAV to fly freely, complete the material delivery task, and land safely. If the UAV collides or the safety officer takes over control under the referee's order, the contestant's competition in this module ends.

C. If the contestant cannot operate the UAV to take off within 5 minutes, it will be regarded as the failure of this flight, and the contestant can return to the station to complete other projects.

Method 2:

A.After independently writing code to complete development according to technical documents, you can raise your hand to apply to the referee for flight, and complete the propeller and power battery installation according to the standards

during flight test. If the propeller is installed incorrectly, flight is not allowed, and the contestant's competition in this module ends; if the propeller is installed correctly, flight is allowed.

B.The contestant should place the UAV on the takeoff and landing point, then switch the flight mode to perform automatic flight, complete the material delivery task, and land safely. During the entire flight process, the contestant is not allowed to touch the remote controller. If the contestant applies to use the remote controller for manual operation during flight, the scoring will be processed according to the scoring method of Method 1. If the UAV collides or the safety officer takes over control under the referee's order, the contestant's competition in this module ends.

C.If the contestant cannot operate the UAV to take off within 5 minutes, it will be regarded as the failure of this flight, and the contestant can return to the station to complete other projects.

(5) Scoring Method

The on-site referee will conduct comprehensive scoring based on the contestant's task completion degree, function realization quality and flight performance.

Scoring is divided into three stages: Stage 1 is pre-flight test scoring, Stage 2 is flight test scoring, Stage 3 is automatic flight scoring and intelligent delivery task scoring. The specific scoring methods are as follows:

Stage 1: The contestant raises their hand to signal the referee that the flight test can be carried out. The referee scores the completed landing gear, link system installation and sensor development, and gives supplementary time for the time used

during scoring;

Stage 2: The contestant performs the flight test, and the referee scores during the contestant's operation;

Stage 3: The contestant performs automatic flight and intelligent delivery operations, and the referee scores during the contestant's operation.

Module 3: UAV Multi-Industry Application Simulation Flight Module (120 min)

(1) Task Background

The low-altitude economy has become the frontier of global emerging industry competition. In China, this field is listed as a national strategic development direction, and application scenarios from emergency rescue, logistics transportation to public security law enforcement, water conservancy inspection, forestry monitoring have deeply penetrated into all aspects of social governance and public services. However, the rapid development of UAV technology also puts forward higher requirements for practitioners. Compared with complex and delicate control capabilities, the mastery of intelligent UAV functions and the ability to use intelligent UAVs to complete industry tasks will receive more attention.

This module relies on the UAV multi-industry mission flight virtual simulation training and assessment system, and builds a highly immersive, full-process simulation operation environment based on real industry cases and authoritative standards. Contestants will face challenges covering six major industries and various typical tasks, and complete the complete operation process from mission planning, flight execution to data post-processing.

This is not only a competition of control technology, but also a comprehensive test of respect for the safety bottom line and emergency response capabilities. Here, virtual is actual combat. Through international competition on the same stage, young skilled talents from all countries will jointly explore the "general skill language" in the era of low-altitude intelligence, and promote standard mutual recognition and talent co-cultivation in the UAV industry application field among BRICS countries.

(2) Key Assessment Content

① Correct assembly of UAV and payload The system includes ≥4 different types of mainstream industry-level UAVs, with corresponding matching UAV mission payload simulation models, covering gimbal cameras, infrared cameras, loudspeakers, lighting lamps, gas collection devices, water sampling devices, dropping devices, fire extinguishing bomb devices, etc. All payload functions, operation logic and operation effects are completely matched with the real industry application; the system assesses the assembly content of each UAV and payload, which needs to complete the steps according to the correct assembly sequence and requirements;

② Precise control and obstacle avoidance capability Controlled by a real remote controller, based on high-precision physics engine and high-precision flight control algorithm, it assesses the precise hovering, route tracking and dynamic obstacle avoidance capabilities in complex environments; flight control stability, fixed-point photography and delivery capabilities.

③ Mission planning and execution efficiency Rationality of route design, accuracy of flight parameter settings and payload parameter settings, and timeliness of task completion.

④ Data collection and processing Image collection quality, validity of evidence chain, intelligent recognition accuracy, image processing and sharing, timeliness of data upload.

(3) Task Description

This system takes intelligent UAV application as the core, and builds a "scenario-based task + virtual-real combined training" system. Contestants need to complete typical tasks in industries such as UAV basic control training, mountain search and rescue, medical transportation, investigation and evidence collection, and reservoir inspection through the virtual simulation platform, master the full-process operation and key technologies, and evaluate the skill level through the intelligent assessment system.

(4) Task Content

① UAV basic control Task

Task cases: Triangle area image collection, hexahedron image collection, heat source target collection, material dropping.

Core content: Contestants perform high-precision target locking and collection in the designated area, master gimbal fine control, payload release timing and complex obstacle avoidance skills.

② Emergency rescue Task

Typical scenarios: Mountain search and rescue, forest fire rescue, high-rise building rescue.

Core content: Preparatory work, including correct assembly and parameter debugging of UAV and rescue payloads (such as loudspeakers, thermal imaging, droppers). Practical operations include rapid search and positioning in different environments, evaluating flight control accuracy, and ensuring the timeliness and quality of information collection.

③ Logistics transportation Task

Typical scenarios: Cross-regional transportation of medical materials, material supply in mountainous areas.

Core content: Loading and planning include payload assembly and balance verification according to cargo weight and center of gravity. Route execution includes planning the optimal cross-domain route, assessing the stability, obstacle avoidance capability and safe and accurate delivery rate of goods during flight.

④ Public law enforcement Task

Typical scenarios: On-site investigation and evidence collection, public security patrol.

Core content: Rapid deployment and takeoff for emergency tasks. Shoot the accident/crime scene from multiple angles to ensure clear and complete pictures; use the loudspeaker for on-site management, which complies with law enforcement recording specifications throughout the process. It also includes the creation of patrol

projects and custom flight areas, drawing area survey routes and refined waypoint routes for refined patrol tasks.

⑤ Geological and environmental protection Task

Typical scenarios: Water sampling, air monitoring

Core content: Complete pre-operation preparations for UAV, including assembly of sampling and monitoring equipment; correctly set flight parameters and check equipment status according to the task book, then start the UAV to fly to the designated sampling point, perform water sampling operation and return to the takeoff and landing point safely; plan the monitoring route according to the task book, conduct systematic pre-flight inspection, set air monitoring payload parameters, perform the preset route flight task, and ensure the real-time accuracy of equipment status and data collection during the process.

(5) Scoring Method

The system has assessment and automatic scoring functions without intervention from referee experts. The system will display the score immediately after submission and record the answering time; contestants can enter the "assessment mode" of the system for assessment through the assigned account.

The specific task score allocation is as follows:

Task Name	**Score**
UAV Basic Control Training	20
Emergency Rescue	20
Public Law Enforcement	20
Logistics Transportation	20
Geological and Environmental Protection	20

4. Weight of Each Module in Total Score

Module	Module Name	Score	Weight in Total Score (%)
1	UAV Comprehensive Theoretical Assessment	100	10
2	Intelligent UAV Development and Application Module	100	50
3	UAV Multi-Industry Application Simulation Flight Module	100	40
Total	Total	Total	100