

“Smart Aerospace Mastery”

Invitation Letter for the 11th China Graduate Future Flight Vehicle Innovation Competition

To All Graduate Education Institutions,

In accordance with the arrangements of China Graduate Innovation and Practice Series Competitions, we hereby notify the details concerning the 11th China Graduate Future Flight Vehicle Innovation Competition, themed "Smart Aerospace Mastery," as follows:

I. Competition Overview

"The China Graduate Future Flight Vehicle Innovation Competition" (hereinafter referred to as the "Competition") is one of the flagship events within the "China Graduate Innovation and Practice Series Competitions". It is under the guidance of the Department of Degree Management and Graduate Education of the Ministry of Education, organized by the Chinese Society of Academic Degrees and Graduate Education (CSADGE), in conjunction with the Children and Youth Science Center of China Association for Science and Technology (CAST), and co-hosted by the Chinese Society of Astronautics (CSA) and the Chinese Society of Aeronautics and Astronautics (CSAA). Adhering to the philosophy of “Innovation Reshapes the Future”, the Competition focuses on flight vehicle technological innovation, aiming to enhance graduate students' capabilities in scientific research, engineering practice, and

interdisciplinary collaboration within the aerospace field. This edition of the Competition is hosted by the Zhuhai Municipal People's Government, in collaboration with Beijing Institute of Technology, Zhuhai.

II. Participation Eligibility

1. Students affiliated with Chinese higher education/research institutions (including Hong Kong, Macau, and Taiwan regions):

- Current graduate students
- Undergraduate students holding valid graduate program admission offers

2. International Participants:

- Current graduate students at overseas universities
- International graduate students currently enrolled at Chinese universities

3. Extended Eligibility: Full-time academic/professional staff at higher education/research institutions within 1 year of graduate graduation

4. Corporate Track Provision: Corporate professionals expressly encouraged to participate (eligibility extended to those within 5 years of graduate graduation)

Teams are encouraged to compete in a team format. Each team may consist of up to 5 members, with cross-institutional collaboration permitted. Sino-foreign student teams are strongly encouraged. This edition features an Interdisciplinary Track, promoting participation from

multi-disciplinary teams (interdisciplinary teams may include up to 8 members).

III. Theme, Topics, and Submission Requirements

(1) Theme

Smart Aerospace Mastery

(2) Challenge Topics

1. Regular track

1.1 Overall and Subsystem Design of Aviation Aircraft

Overall design of various types of aircraft flying in the atmosphere. And the design of new configurations, layouts, materials, structures, payloads, and control subsystems for aviation aircraft.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e0259da7ac8>

1.2 Integrated and Subsystem Design of Spacecraft

This encompasses the overall design and mission planning for flights in Earth's atmosphere, Earth orbital space, cis-lunar space, and deep space, as well as the design of subsystems such as new configurations, materials, propulsion systems, and payloads.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e03207a7ad9>

1.3 Key Technologies of Propulsion Systems for Future Flight Vehicle

To meet the demand for new power systems in future flight vehicle (including aircraft, spacecraft, missiles, rockets, etc.), analyze application scenario, develop and verify the key technologies of the overall design, subsystem (such as power, thrusters, etc.), core components (such as cathodes, nozzles, valves, etc.), testing devices, simulation models, and other aspects for various new propulsion systems.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e045e8f7aec>

1.4 Special Topic on New Energy Aircraft Technology

To address the technical requirements of long-endurance, high-payload, and high-energy-efficiency for aircraft, this research focuses on novel energy applications including solar energy, hydrogen energy, laser power transmission, microwave power transmission, and advanced energy storage batteries. The study encompasses aircraft system design technology, energy/structure integration technology, hybrid energy propulsion technology, and energy management technology. The outcomes should include completed technical solution design demonstrations or prototype designs.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e05f4287b02>

1.5 Aerospace Flight Vehicles for Efficient Transportation

Focusing on typical scenarios such as global high-speed reaching and large-scale space entry and exit, the concept and application mode of a new type of aerospace transportation flight vehicle that supports efficient cross domain flight and efficient round-trip into space are proposed. The overall scheme of the flight vehicle system, as well as the demonstration and design of subsystems such as aerodynamics, power, structure and mechanisms, thermal protection, navigation and guidance, and decision control should be accomplished.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e066e607b0f>

1.6 Special Topic on Air-Water Cross-Medium Vehicles

This topic focuses on the integrated operation scenarios of air and water, and proposes a concept and application mode of an aircraft with the ability to enter and exit water multiple times. The key tasks include the overall design of the aircraft, the layout of air/water dynamics coupling, cross-media power conversion, pressure-resistant and anti-corrosion materials, biomimetic variant mechanisms, cross-media communication and navigation, etc. These technologies aim to meet the

requirements of military-civilian integration scenarios such as low-altitude surface inspection and underwater detection and rescue, promoting the innovative development of air-sea collaborative equipment.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e06e2ad7b17>

1.7 Deep Space Probe Design

The overall design of the spacecraft for the exploration of the moon, planets, and small bodies, as well as the design of subsystems such as landing and takeoff, surface attachment and locomotion, autonomous perception and mission planning, and payload. Provide the technical scheme or the prototype.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e0860227b22>

1.8 Cooperative Technology of Unmanned Aerial Vehicle (UAV) Swarm

For future cooperative operation scenarios of unmanned aerial vehicle (UAV) swarms, satellite constellations, cross-domain/cross-medium swarms, and manned/unmanned swarms, design technical solutions for mission cooperative, intelligent cooperative

sensing, cooperative navigation and positioning, cooperative mission decision-making, cooperative mission planning, cooperative guidance and control, as well as swarm health monitoring and effectiveness evaluation.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e08e30f7b28>

1.9 Microsat Design and Application Technologies

Microsat are widely utilized in fields such as Earth observation, communication, scientific research, and technology validation. In anticipation of future large-scale deployment and on-orbit applications of small satellites, it is essential to design the overall architecture, subsystems, and application scenarios, including on-orbit remote sensing communication, situational awareness, on-orbit services, and data processing.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e0957a77b35>

2 Challenge Track

2.1 Air-Ground Collaborative Intelligent Obstacle Avoidance and Inspection Technology

This track focuses on the development of autonomous control systems for unmanned aerial vehicles (UAVs) and ground vehicles, with

applications in autonomous collision avoidance innovation and line inspection (e.g., urban power transmission lines, elevated traffic routes, underground utility tunnels, etc.). The tasks include autonomous UAV takeoff, UAV/ground vehicle autonomous inspection, collaborative path planning and obstacle avoidance, and UAV precision landing to achieve coordinated inspection missions.

The competition consists of a single-round final with no preliminary rounds, and interruptions during the event are not permitted.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e0a9f767b41>

2.2 Dynamic Programming and Decision-Making for Multi-Target Visit in Low Earth Orbit (LEO) Region

The technology for multi-target visit in LEO region is a key capability for on-orbit services, environmental remediation, debris removal, and situational awareness missions. Spacecraft platforms based on electric propulsion are an important means to achieve low-cost and high-efficiency multi-target visits. As the demand for autonomous space operations increases, the ability to perform efficient dynamic planning within a short time frame becomes a critical metric for evaluating planning algorithms. Against this backdrop, a challenge competition titled “Dynamic Programming and Decision-Making for Multi-Target Visit in

Low Earth Orbit Region” is organized. Participating teams are required, on the provided computing platform, to generate multi-target visit strategies within a given timeframe, based on randomly generated initial conditions of the spacecraft platform, control parameters, space target database and initial states, using their own designed dynamic programming and decision algorithms, followed by feasibility verification.

This competition does not have a preliminary round and takes place during the final. It employs a single-round format, meaning each pair of teams will compete once, and each match consists of three games against each other.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e0ba1047b4b>

2.3 Unmanned Fighter Aircraft Virtual Combat

A 2v2 air combat simulation in a virtual environment will be conducted for key airspace defense and attack. The competition uses a specific type of unmanned fighter jet as the platform, equipped with airborne radar, short-range air-to-air missiles, and a virtual cannon. Each team will load their intelligent algorithm into a self-provided embedded computing device (connected via USB to a simulation server). The algorithm controls one aircraft by receiving server-provided information

and sending commands for aircraft maneuvers, radar operation, and weapon usage. This semi-physical simulation aims to guide future real-flight tests of intelligent computing devices

This track operates without preliminary rounds and runs concurrently with the final rounds. The competition adopts a single round-robin system, wherein every participating team competes against each other exactly once. Rankings are determined by overall win rate. In cases of identical win rates, the ranking is decided based on head-to-head results.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e1acf687bc0>

3 Cross-disciplinary Track

3.1 Exploration of Emerging Low-Altitude Economy Models

1) Task Description

This track focuses on the innovative design of low-altitude aircraft and the exploration of practical and groundbreaking functions for low-altitude flight operations across various scenarios, such as transportation and logistics, tourism and cultural experiences, and emergency response. Participants are encouraged to develop novel business models — such as shared aerial mobility platforms, integrated three-dimensional transportation systems, and aerial logistics networks—

to promote the low-altitude economy as a new engine for high-quality development. The track consists of two sub-directions:

Low-Altitude Transportation: Centered around low-altitude airspace, this direction leverages a variety of manned and unmanned aerial vehicles (UAVs) to propose innovative and high value-added transportation models. These may include, but are not limited to, Urban Air Mobility (UAM), regional air transport, integrated multi-modal transportation systems, low-altitude cargo delivery, and aerial tourism. This direction focuses on the innovation of transportation modes, the effectiveness in addressing traditional transportation safety and efficiency issues, and the impact on promoting industrial chain development and economic growth.

Applied Economics: This direction focuses on novel mechanisms for value realization in the low-altitude economy, such as securitization of airspace usage rights, flight data ownership and trading, and carbon credit derivatives. It encourages the development of blockchain-based distributed clearing systems, risk hedging tools, and inclusive financing solutions, while constructing a full-cycle financial support system spanning aircraft development, operation, and recycling. This direction emphasizes the following: (1) Thematic Relevance: Research problems should be clearly defined, such as focusing on the intelligent evolution of drone logistics industry clusters or pricing models for low-altitude economic data assets, avoiding overly broad discussions. The study must

cover the intelligent evolution of low-altitude economic industry clusters, including technological, policy, and market dimensions, while addressing innovations or restructuring of financial infrastructure, such as payment and settlement systems, insurance, and supply chain finance. Additionally, the work should analyze the interplay between industrial evolution and financial needs, such as how financial tools support industry development or how industrial changes create new financial demands, supported by specific cases or data. (2) Innovation: Innovation is evaluated across three levels: theoretical, technical, and model-based. For theoretical innovation, the work should propose new models or frameworks, such as complex network evolution models for low-altitude economic industry clusters or financialized pricing algorithms for airspace resources. For technical innovation, cutting-edge technologies like blockchain, AI, or digital twins should be applied to solve practical problems, with demonstrated technical feasibility. Model innovation focuses on novel business designs or financial instruments, such as drone logistics accounts receivable securitization or low-altitude carbon trading derivatives. Innovation is graded as follows: breakthrough innovations address industry gaps; incremental innovations optimize existing solutions with efficiency improvements of over 30%; conventional solutions with minimal innovation score lower. (3) Methodological and Logical Rigor: Research methods must be scientifically robust with sufficient data support. Data

sources should be credible, such as enterprise cases, government reports, or simulation data, with clear indications of data volume and acquisition methods. Analytical tools should employ quantitative methods, such as system dynamics modeling, econometric analysis, or Monte Carlo simulations. Logical rigor requires a complete argumentative chain from problem definition to analysis, solutions, and validation, avoiding logical gaps. The work should reflect interdisciplinary integration, combining approaches from economics, finance, and engineering.

(4) Practical Value and Feasibility: The potential for real-world implementation is a key evaluation criterion. Industrial applicability must align with actual demands, such as evidence of collaboration intentions or pilot plans with local governments or enterprises. Economic feasibility should be demonstrated through cost-benefit analysis, such as a return on investment (ROI) exceeding 15% or operational cost reductions of over 20%. Policy compliance must adhere to current regulations, such as those from the Civil Aviation Administration of China (CAAC) or FAA. Scalability evaluates whether the solution can be replicated in other regions or scenarios, such as expanding from drone logistics to urban air mobility.

(5) Presentation and Collaboration: The quality of presentation and team execution are equally important. Reports or pitches must be logically clear, with professional visuals, such as dynamic visualizations or comparative case tables. During Q&A, teams must respond accurately

to judges' questions, demonstrating deep project understanding. For team collaboration, members should come from diverse disciplines (e.g., economics, engineering, finance) with clearly defined roles.

Design Direction: Innovate around low-altitude economy and aviation themes, proposing new practical functions, enhancing flight experiences, and shaping innovative lifestyles. Develop related aircraft and business models, presented through product design schemes and corresponding business strategies. Evaluation criteria include (1) **Innovativeness:** The design solution examines whether it creates new and valuable functions, enjoyment, experiences, or lifestyles. (2) **Feasibility of the business model:** The business model is comprehensively and thoroughly constructed, ensuring that all stakeholders receive corresponding value. The model demonstrates a relatively strong feasibility for generating profit. (3) **Cultural and Social Worth:** The design possesses positive and meaningful cultural and social value. (4) **Aesthetic value:** The design solution demonstrates a high level of aesthetic value.

This track encourages interdisciplinary teams from fields such as Transportation Information Engineering & Control, Applied Economics, Aerospace Science & Technology, Design, and Law. The goal is to collaboratively advance greater breakthroughs in technological innovation, application expansion, and industrial development for future aircraft.

2) Competition Rules

Entries cover multiple themes such as (but not limited to): integrating design with flight performance, economic applications of low-altitude flight, and new low-altitude transportation models. Submissions can be concept designs or physical prototypes.

3) Evaluation Criteria

Innovation

Functional Breakthrough: Creates entirely new application scenarios.

Revolutionary Experience: Human-machine interaction design enables unique flight experiences.

Model Disruption: Reconstructs industry value chains.

Technical Integration: Level of cross-disciplinary innovation.

Business Model

Value Network Integrity: Includes fair profit-sharing mechanisms for all stakeholders (airspace management, infrastructure providers, operators).

Robust Profit Model: Cost-benefit analysis accounts for hidden costs (e.g., airworthiness certification, insurance).

Scenario Scalability: Base platform supports functional expansion.

Risk Controllability: Plans address policy/regulation changes and airspace conflicts.

Cultural & Social Value

Social Equity: Ensures flight rights for diverse groups.

Cultural Integration: Design language reflects regional characteristics.

Eco-Friendliness: Meets environmental standards (e.g., noise reduction, energy recycling).

Ethical Foresight: Addresses privacy protection and AI ethics.

Aesthetic Value

Form Expression: Design language aligns with functional purpose.

Material Expression: Visual impact of surface treatments on new composite materials.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e1b91477bc9>

4 Corporate Track

4.1 eVTOL Power System Configuration Design

The research includes, but is not limited to, the following three directions:

1) Pure Electric eVTOL Configuration: Under fixed payload conditions, study different aircraft configurations (such as multirotor, ducted fan, compound wing) to minimize battery capacity and maximize range.

2) Hybrid Power Architecture for eVTOL: Study hybrid power schemes, including power configurations (range extender, parallel hybrid, battery-engine configuration, fuel type) and aircraft configurations, to propose efficient power systems for long-endurance eVTOLs.

3) Motor Drive System Structure for eVTOL: Focus on multicopter or ducted electric drive systems, and study motor, controller, structure, and process under air or liquid cooling conditions, aiming for the highest torque-to-weight ratio and system efficiency.

Registration Link:

<https://cpipc.acge.org.cn/platformEnWebsite/fillRegister/2c90801896f7594701973e1c49117bd5>

(3) Submission Requirements

Entries are categorized as creative or physical.

All registered teams shall electronically submit the project report through the designated competition portal no later than 10:00 PM (Beijing Time), September 1, 2025. The report shall include:

- Innovation differentiation matrix;
- Comparative technological advantage analysis;
- Technical implementation blueprint.

The project report serves as the definitive evaluation material for the competition. Supplementary materials — including design specifications, digital models, animations, videos, and research documentation, etc. —

may be submitted alongside the project report. For entries containing physical prototypes:

- Preliminary Stage: Video documentation is required.
- Final Stage: On-site physical demonstration or video presentation (where applicable) is mandatory.

The competition prohibits submissions containing classified materials or works embroiled in intellectual property disputes. Participants shall bear full legal liability for any violations thereof. Previously awarded entries from past competitions, if lacking substantial innovation, will be deemed substantially similar derivatives. Such works, upon expert validation, shall be disqualified from award eligibility.

IV. Competition Schedule

The Competition consists of two stages: a preliminary round and a final round. Preliminary Round will be conducted through online assessment. Final Round requires on-site defense and physical demonstrations. (Note: Challenge Track will not implement Preliminary Round.)

- 31 May 2025: Official competition announcement released.
- 31 May - 31 August 2025: Online registration.

The registration for competing teams will close on August 31 at 10:00 PM (Beijing Time). The registration link can be found in the introduction section for each challenge topic.

- 31 May - 1 September 2025: Eligibility review & preliminary submission.

The submission deadline for preliminary round entries is September 1 at 10:00 PM (Beijing Time). The submission link will be sent via email to the address you provided during system registration. For any questions, please contact the contest organizer at grd@bitzh.edu.cn.

- 2 - 19 September 2025: Remote evaluation of entries by expert panels.
- 26 September - 9 October 2025: Finalist shortlist published.
- Early November 2025: On-site finals at Beijing Institute of Technology, Zhuhai.

V. Awards

This edition of the Competition will recognize outstanding entries with the following awards: First Prize (with the top 3 winners receiving the Champion, First Runner-up, and Second Runner-up awards respectively), Second Prize, and Third Prize for the participating entries. Additionally, an "Outstanding Organizing Unit" award will be selected and presented to eligible organizing entities.

1. Prizes:

- Champion: CNY 50,000 per entry
- 1st Runner-up: CNY 40,000 per entry
- 2nd Runner-up: CNY 30,000 per entry

- First Prize: CNY 10,000 per entry (excluding the top three ranked entries)
- Second Prize: CNY 3,000 per entry
- Third Prize: Honorary certificate (no monetary reward).

2. Award Quantities:

The exact number of awards in each category will be dynamically determined based on the total number of qualified submissions received, ensuring proportional representation of excellence.

VI. Additional Information

For detailed information on entry submission requirements, appeal and arbitration procedures, disciplinary actions, intellectual property rights and confidentiality, competition schedule, and other relevant matters, please refer to the "Guidebook for the 11th China Graduate Future Flight Vehicle Innovation Competition - "Smart Aerospace Mastery" (Attachment 2). The Organizing Committee of China Graduate Future Flight Vehicle Innovation Competition reserves final authority on rule interpretation and adjustments.

For subsequent updates and details regarding the Competition, please stay tuned to the official website and WeChat official account.

1. Official Website: <https://cpipc.acge.org.cn/cw/hp/3>

2. Contact Email: grd@bitzh.edu.cn

3. WeChat Official Account QR Code:



Graduate Education at BIT, Zhuhai



WeChat Official Account

4. Staff and Contact Information for the 11th Competition:

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The Organizing Committee of
China Graduate Future Flight Vehicle Innovation Competition



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