Product Manual

Shenzhen United Aircraft Technology Co., Ltd.

Leading the Time with UAV
Winning the Future with Intelligent Manufacturing

联合飞机
United Aircraft

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01

Company Profile

Shenzhen United Aircraft Technology Co., Ltd.

Company Profile

Shenzhen United Aircraft Technology Co., Ltd.

Founded in 2014, Shenzhen United Aircraft Technology Co., Ltd. (hereinafter referred to as "the Company") is a national high-tech enterprise located in Apollo Future Technology Industrial Park, Longgang District, Shenzhen. The Company is engaged in the R&D, design, production and sales of high-end intelligent equipment such as UAV, one of the key strategic emerging industries supported by the state.

The Company covers an area of 24,000 square meters, with a total floor area of 44,200 square meters, which allows it to develop various UAV products at the same time and function as an R&D and production base integrating UAV R&D and test, general assembly, testing, and system joint debugging.

The Company has launched the arrangement of industrial system in Beijing, Shenzhen, Anhui, Shaanxi, etc. to carry out comprehensive UAV technical services such as R&D, production, operation, sales and after-sales service of UAV and airborne equipment for the purpose of forging a UAV industry cluster with international influence.

02

Core Advantages

Core Advantages

Overview of UAV System

The Company has undertaken the development of multiple UAV systems, which enables it to provide land-based/sea-based UAV system with: 1) overall structure design, 2) TTC link/satellite link integration, 3) design and integration of multiple payloads (electro-optical pod, radar, communication relay, surveillance, electronic reconnaissance, suspension, agricultural plant protection, fire-fighting & rescue equipment, etc.); 4) design, integration and development of portable control station/vehicular (mobile) control station, shipborne control base station, and fixed control station, R&D; 5) integration of ground/shipborne integrated sustainment facility. The Company' s rich experience in development of multiple UAV systems allows it to deliver systematic solutions for different users.

Overview of Full-Range Unmanned Helicopter Platforms

The Company is able to independently carry out the R&D of unmanned helicopter platforms of different structures and configurations such as single-rotor/coaxial dual-rotor/tilt-rotor/composite structure and new structure ranging from overall design, aerodynamic, strength, structure, rotor, transmission, control, power, flight control, avionics, electrical, hydraulic, software, testing, test flight, to airworthiness, etc. It can develop unmanned helicopter platforms upon users' request, and modify and customize the manned helicopters to unmanned ones.

HeliAP Automatic Flight Control System

HeliAP is an advanced multi-redundancy automatic flight control system independently developed by the Company. It has adopted advanced algorithms such as H∞ control algorithm, active disturbance rejection control algorithm and distributed PEM identification algorithm, and integrated functions such as flight control, flight management, servo control, avionics system management, and electrical system management. Precise trajectory control of HeliAP has facilitated different flight modes such as automatic patrol flight, suspension stable flight, and autonomous take-off and landing.

Electronic Control Coaxial Control System

As a patented technology of the Company, the electronic sub-control and in-axial control technology applied in the electronic control coaxial control system has realized a coaxial helicopter control system that is lightweight, intelligent and highly reliable. In the early development of coaxial helicopter, the control of rotor was realized by means of off-axial control, which requires complex mechanical hinges for transmission of rotor control torque, disadvantaged by numerous mechanical parts, complicated maintenance, and low reliability. The complex mechanical structure is directly exposed to the incoming airflow, increasing the parasite drag power. The application of in-axial control contributes to a decrease in the number of parts by 50% and a reduction in the weight by 40%, which can greatly reduce the failure rate and enhance the stability and reliability of the system. No complex mechanical structure is applied on the periphery of the main shaft, thus it is of lower resistance than traditional control, and higher flight speed. Electronic sub-control is adopted to avoid mechanical linkage between the upper and lower rotors, enabling independent control of the propeller-blade angle of rotor. Software configuration is adopted to realize flexible control of propeller blade such as collective pitch differential, collective pitch synchronization, periodic variable pitch and periodic variable pitch differential, which facilitates dynamic adjustment of the control relationship based on the relative position of the blades, effectively prevents the risk of blade interruption, and realizes intelligent control of propeller blades.

03

UAV Series

TA-Q12 Multi-Rotor UAV (formerly TD168 Multi-Rotor UAV)	09
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TA-Q12

Multi-Rotor UAV （formerly TD168 Multi-Rotor UAV ）

- Modular design. It has the characteristics of fast and flexible storage, transportation and disassembly.
- Intelligent design. It has the functions of autonomous take-off and landing, autonomous waypoint point flight, autonomous hovering, self-adaptive environment and so on.
- Integrated avionics design. It has the characteristics of more convenient operation, flexible flight and more efficient energy efficiency.
- Waterproof with carbon fiber. It has the characteristics of light weight, rain proof and electronic equipment protection.

TA-Q12

Multi-Rotor UAV （formerly TD168 Multi-Rotor UAV）


Ground control station


Payload

TA-Q12 multi-rotor UAV (TD168) is equipped with high-precision integrated navigation equipment to achieve centimeter-level UAV position information. Carrying visible/IR/laser ranging three-light photoelectric pod can truly achieve high-precision target positioning and real-time transmission of target images. It can perform reconnaissance, patrol, search and rescue and other tasks, with the characteristics of fast deployment time, long operation distance, long flight time and simple maintenance.

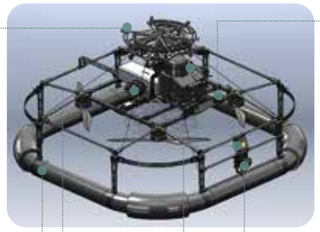
It is mainly applied in air patrol reconnaissance & surveillance, target tracking & search, road monitoring, power line inspection, agricultural remote sensing, forest fire prevention, aerial surveillance, security & protection, marine surveillance, search and rescue, border/coastal guard reconnaissance, and other tasks.

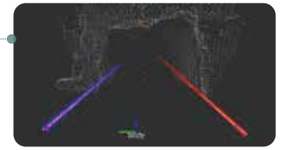
Performance Index			
Airframe dimension	Dimension(extended) 1.2m ×1.2m (L × W)	Dimension (folded)	52cm ×52cm
		Service ceiling	5,500m
Spread of axles	1.1m	Control radius	15km
Maximum endurance	90 minutes (no-load) 70 minutes (payload of 1.5kg) 50 minutes (payload of 3.5kg)	Maximum level speed	20m/s
		wind-resistance	wind-resistance level 4 (8m/s)
		Takeoff and landing mode	Vertical takeoff and landing

TA-Q3

Pipeline Inspection Micro UAV

Rope recovery





Autonomous flight through vision and lidar navigation

Floating on the water

Gas sensors for CH_4, SO_2, H_2S, O_2

Active lighting

4K wide-angle detection camera

As a type of micro UAV specially designed for autonomous flight in sewage and rainwater pipelines that are dark and lack of GPS signal, TA-Q3 pipeline inspection micro UAV realizes autonomous flight through vision and lidar navigation, and data collection with devices such as gas sensors for CH_4, SO_2, H_2S, O_2 and 4K wide-angle detection cameras. Its functions such as “One-key Start”, “One-key Separation”, etc. facilitate ground operation and downstream recovery, and the independently developed software for analysis of inspection result compatible with the UAV platform assists position calibration of photo data, defects tagging, data filtering, and automatic generation of inspection reports compatible with webpage or MS word.

Performance Index			
Dimension	647 ×767 × 435mm	Security function	Autonomous obstacle avoidance, battery-low return and landing, floating on the water, rotor protection
Weight (including battery)	2.9kg		
Flight speed (auto)	1m/s		
Flight duration	12 minutes	Detection Sensor System	Camera resolution: 4,208 × 3,120 LED lighting ⩾ 2,400 lumens
Navigation Sensor System	Binocular vision + 7 ranging sensors	Applicable minimum pipe section	2m (width)× 1.5m (height) or 2.4m (diameter)
Applicable Minimum Drain Cover Diameter	0.7m	Applicable maximum pipe length	500m

TA-Q3

Pipeline Inspection Micro UAV

TA-Q4

Warehouse Inspection Micro UAV

As a type of micro UAV that ensures autonomous inspection and inventory of warehouses, TA-Q4 warehouse inspection micro UAV facilitates real-time three-dimensional navigation and warehouse marking, intelligent cargo pallet data scanning, etc.

- More efficient: only 15 minutes per channel compared with the traditional 4-hour manual operation.
- More economical: only one supervisor required to manage the entire warehouse with low energy consumption.
- High accuracy: accurate and consistent results to completely avoid human error.
- Safety guarantee: no work-at-height, minimizing hazardous or dangerous conditions

Performance Index			
Dimension	862× 852 × 501mm	Security function	Autonomous obstacle avoidance, battery -low return and landing, rotor protection
Weight (including battery)	4.3kg		
Flight speed (auto)	2m/s	Detection Sensor System	Camera resolution: 4,208 × 3,120; LED lighting ⩾ 2,400 lumens
Flight duration	22 minutes		
Navigation Sensor System	Binocular Vision + Lidar	Applicable Minimum Drain Cover Diameter	0.9m
Applicable minimum pipe section	3m (W) × 2.5m (H) or 3.6m (diameter)	Applicable maximum pipe length	2,000m

TA-Q4
Warehouse Inspection Micro UAV

TD5

Coaxial Unmanned Helicopter

Aeroengine, titanium alloy airframe structure, carbon fiber composite rotor and casing deliver adaptability to high temperature environment and rainproof performance.

Small fuselage, flexibility, vertical take-off and landing, spot hovering, high flight speed, strong wind-resistance, less demanding on take-off and landing zone, and no risk of tail rotor failure, etc.

Integrated flight control and avionics system are adopted to ensure safe operation in complex urban electromagnetic environments.

With flight control capabilities such as full autonomous take-off and landing, high-precision spot hovering, autonomous route flight, emergency return, orbiting and climbing around the building, and regional automatic patrol flight.

Maximum takeoff weight

cruising speed

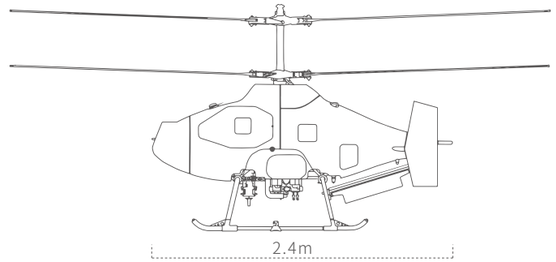
service ceiling

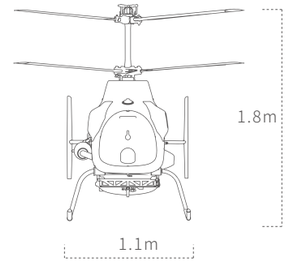
mission radius

maximum level speed

TD5

Coaxial Unmanned Helicopter





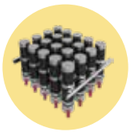
By adopting a coaxial dual-rotor configuration, the TD5 coaxial unmanned helicopter is characterized by small fuselage, flexibility, vertical take-off and landing, spot hovering, high flight speed, strong wind-resistance, less demanding on take-off and landing zone, and no risk of tail rotor failure, which enables taking off and landing, and application in limited environments such as urban buildings and mountainous areas.

By adopting a special aeroengine, titanium alloy airframe structure, carbon fiber composite rotor and casing, the TD5 coaxial unmanned helicopter has excellent adaptability to high temperature environment and rainproof performance; the integrated flight control and avionics system ensures safe operation in complex urban electromagnetic environments; advanced algorithms such as H∞ control algorithm, active disturbance rejection control algorithm and distributed PEM identification algorithm adopted in the flight control system enables flight control capabilities such as full autonomous take-off and landing, high-precision spot hovering, autonomous route flight, emergency return, orbiting and climbing around the building, and regional automatic patrol flight.


Visible light/IR pod


horizontally-launched fire extinguishing bombs


air-dropped fire-fighting robots


vertical air-dropped fire extinguishing bombs


air-dropped emergency relief supplies


water hose sprinkler extinguishing modules

System Performance Index			
Airframe dimension	2.4×1.1×1.8m (L×W×H)	Cruising speed	90km/h
Maximum takeoff weight(MTOW)	320kg	Mission radius	100km
Maximum hovering height without ground effect	1000m	Maximum endurance	4H (payload of 30kg)
Service ceiling	3000m	Range	360km (load of 30kg)
Maximum payload	100kg(Endurance of 1.5h)	Wind-resistance	Wind-resistance level 7(14m/s)
Maximum level speed	120km/h	Takeoff and landing mode	Vertical takeoff and landing

TD220

Coaxial Unmanned Helicopter

Heavy payload, long endurance, compact structure and small airframe ensure adaptability to a variety of terrain environments.

International advanced flight control system is adopted to deliver functions such as autonomous take-off and landing, autonomous route flight, precise spot hovering, one-key return, and automatic return upon linkdown, ensuring convenient and efficient control and safe and reliable airframe.

Modular design and coaxial reverse blade structure avoid the risk of tail rotor failure, and ensure high safety and simple maintenance.

Precision control, high accuracy, advanced performance and strong stability.

Maximum payload

Maximum takeoff weight(MTOW)

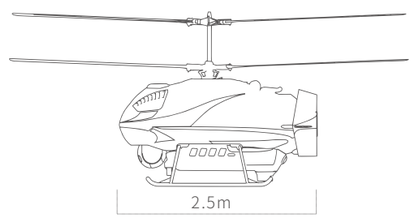
Service ceiling

Mission radius

Maximum level speed

TD220

Coaxial Unmanned Helicopter



As a general minitype unmanned helicopter platform that is of advanced automation, reliable, safe, and highly expandable capacity, TD220 coaxial unmanned helicopter is available to industrial customization, taking the lead in China as one with heavy load, long endurance, high ceiling, small size and strong environmental adaptability.

TD220 coaxial unmanned helicopter is available to professional applications such as takeoff test, police patrol, disaster assessment, power line inspection, pipeline and river inspection, aerial geophysical exploration, aerial surveillance, minefield detection, communication relay, intelligence reconnaissance, aerial photography, environmental monitoring, customs anti-smuggling, anti-terrorism, integration of reconnaissance/attack, (battle) field reconnaissance and logistics sustainment.

System Performance Index			
Airframe dimension	2.5×1.1×1.8m (L×W×H)	Mission radius	150km
Maximum takeoff weight(MTOW)	350kg	Cruising speed	80km/h
Maximum payload	50kg	Endurance	>4H (payload of 50kg) 5H (payload of 35kg)
Service ceiling	3500m		
Maximum hovering height without ground effect	2500m	Wind-resistance	Wind-resistance level 6 (12m/s)
Maximum level speed	100km/h	Takeoff and landing mode	Vertical takeoff and landing

TD450

Coaxial Unmanned Helicopter

- Turbocharged piston engine delivers strong power, long service life and good high-altitude characteristics.
- The use of hingeless rotors, combined with the electronically controlled sub-control rotor control technology ensures simplified operating mechanism, lighter weight, higher reliability, and lower maintenance cost.
- HeliAP flight control system with dual-redundancy and EMC ensures high control accuracy and good stability.
- Interfaces are reserved to enable the platform with extensive adaptability, scalability and upgrading, adaptive to a variety of task scenarios.

Maximum takeoff weight(MTOW)

Cruising speed

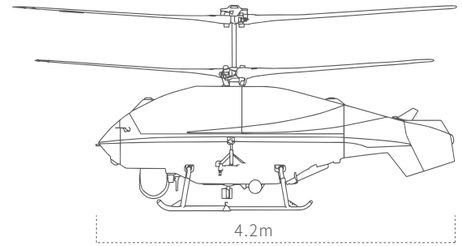
Service ceiling

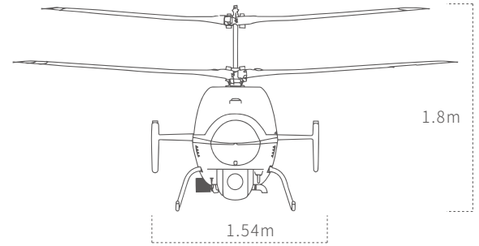
Mission radius

Maximum level speed

TD450

Coaxial Unmanned Helicopter





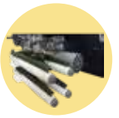
The TD450 coaxial unmanned helicopter is characterized by advanced automation, extensive capacity, high reliability and safety, etc., and provided with excellent overall aerodynamic design and system configuration that ensures better flight performance of the platform and wider scope of industry customization.

The areas of application are mainly national defense, marine patrol, anti-smuggling, fire protection, power line inspection, public security, aerial surveillance, aerial photography, geological exploration, environmental monitoring, agricultural plant protection, scientific research, etc. Typical and common interfaces are reserved to ensure extensive adaptability, scalability and upgrading of the platform: equipment such as electro-optical pod, air communication relay equipment, synthetic aperture radar, IR imager, zoom digital cameras, laser range finders, etc for a variety of task scenarios.


Electro-optical pod


communication relay equipment


SAR radar


weapon equipment


pesticide spraying rod

etc

System Performance Index			
Airframe dimension	4.2×1.54×1.8m (L×W×H)	Wind-resistance	Wind-resistance level 6 (12m/s)
Maximum takeoff weight (MTOW)	550kg	Cruising speed	90-120km/h
Hovering height without ground effect	5000m	Mission radius	300km
Service ceiling	6500m	Endurance	4h (configured with 80kg of payload) 8h (configured with 35kg of payload)
Maximum payload	120kg		
Maximum level speed	150km/h	Takeoff and landing mode	Vertical takeoff and landing

UAV modification design technology based on manned aerial vehicle (helicopter)

Sophisticated and stable platform: the aircraft platform is sophisticated and stable, highly developed in technology, low in modification cost, and high in economic efficiency. Most navigable aircrafts are provided with airworthiness certification and of high safety;

Design of flight control system with high reliability: Redundancy fault-tolerant technology is adopted for the development and design of flight control and management system, wherein the key components are configured by the redundancy flight control and management system such as two redundancy/three redundancy/-four redundancy (flight control and management computer, servo controller, steering and main sensor), which ensures relatively high security of the aircraft safety-critical system, and enables accident-free flying through fault-tolerant reconstruction in case of critical failure;

Advantage for maintenance and security: almost the same security system and spares supply as the original manned aerial vehicle can be applied to ensure developed sustainment system and reusable team. The newly developed flight control system adopts two-level maintenance system to develop equipment for maintenance and testing, wherein the mean time to repair (MTTR) of basic-level maintenance is < 1.5h. The mounting, connection, and performance of the line replaceable unit (LRU) and shop replaceable unit (SRU)of the system are interchangeable.

Strong payload capacity: various equipment or supplies can be carried and transported in the UAV cockpit modified from manned aerial vehicle with a heavy payload capacity; meanwhile, general mechanical and data interfaces are reserved to leverage the heavy payload capacity for flexible configuration with multiple payload equipment (such as electro-optical pod, IR thermal imager, video tracker, etc.), so as to facilitate extensive industrial application.

Sophisticate and stable platform

design of highly reliable flight control system

advantages for maintenance and security

strong payload capacity

UAV modification design technology based on manned aerial vehicle (helicopter)

The key to the design of the UAV modification based on manned aerial vehicle is the application of redundancy flight control and management system for flight control and unified coordination and control of airborne equipment to ensure autonomous control of the overall aircraft system. Meanwhile, safety analysis and evaluation of UAV system is performed to ensure compliance of modified UAV system with the key index of reliability and safety.

Compared with UAV, manned aerial vehicle has the technical characteristics of more diversified types of products, much refined pedigrees, and more sophisticated platforms. The UAV modified from manned aerial vehicle can give full play to the sophisticated and stable advantages of existing aircraft platforms, effectively reduce the development cost of medium and large-sized UAV, and quickly establish UAV (fixed-wing/helicopter) products of heavy payload capacity, pedigree, multi-purpose, mitigate the risk of casualties in high-risk battlefield environments. Meanwhile, it can also ensure the sustainability of a large number of conventional aircraft after the "end of service life", and improve the operational efficiency of the equipment throughout its life cycle.

The UAV modified from manned aerial vehicle is applicable to all kinds of medium and large-sized helicopters or fixed-wing aircraft, which facilitates the establishment of stable autonomous flight platform, and configuration with adaptive payload equipment to quickly develop the capability of industry application.

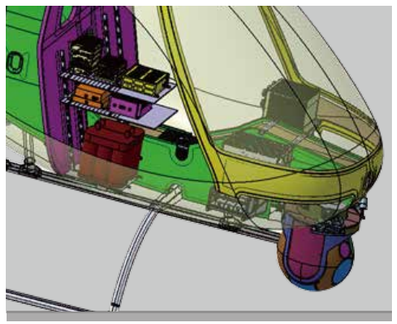
Flight control and management computer

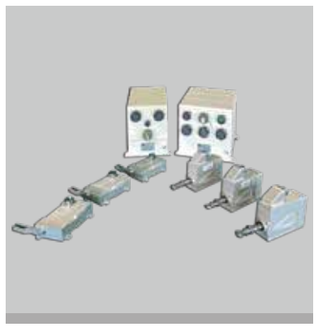
servo controller

linear steering

rotary steering

inertial navigation sensor





04

Ground Equipment

Vehicular/Ground Control Station 25

Accommodation Cabin 27

Ground Sustainment Power Supply 29

Unmanned Helicopter Simulation Training System 31

Vehicular/Ground Control Station

The control station is a built-in station structure that integrates the control cabin, ground data terminal and unmanned helicopter, with high integration of products and strong maneuverability;

Good compatibility of data link equipment;

Redundancy configuration: realize mutual backup of each functional unit through hardware equipment such as functional software backup and computer backup; the power supply can be either mains input or built-in diesel genset;

High level of product standardization, serialization, generalization, and scalability, ensures adaptability to different UAV systems;

Vehicular/Ground Control Station

The vehicular/ground control station (hereinafter referred to as the control station) is mainly composed of software and hardware, wherein the software mainly covers flight control, navigation, data link and payload, etc., while the hardware mainly covers cabin, ground data terminal, power supply and distribution equipment, and display console, etc., and is optional with carrier truck (vehicle) and communication, etc. The front part of the control station is the link cabin and the diesel genset cabin, the middle part is the control cabin, and the rear part is the unmanned helicopter transport cabin. The control station focuses on networked information transmission and rapid system response capability, with integration of flight monitoring, mission monitoring, and UAV loading. The control station is equipped with UAV system to perform missions such as reconnaissance and surveillance.

Length	6,700mm (without underframe)	Remote control and telemetry bit rate	Uplink command: 38.4kbps Downlink data: 38.4kbps (single telemetry), 1.92Mbps, 3.84Mbps, 7.68Mbps
Width	2500mm	Number of mission routes	1 to 20
Height	2,500mm (without underframe)	Operational frequency range	Optional with frequency range C, L, U
Weight	5,500 kg (without underframe)	Storage temperature	-55°C to +65°C
Data transmission distance	100km to 200km, the transmission distance varies with the selected link equipment	Operating temperature	Outside the cabin: -40°C to +55°C Inside the cabin: -20°C to +55°C

Accommodation Cabin

Diversified operating modes are available to meet different needs such as office and meeting.

Customized design is available upon user's request.

Accommodation Cabin

Adaptability design of salt spray, mold, damp and heat according to the environmental conditions in coastal areas, and reinforcing design for typhoon environment in coastal areas.

The accommodation cabin is a shelter product used for conference and rest of field staff, which is mainly composed of cabin, air conditioner, TV and related office facilities, etc., and can be equipped with carrier truck (vehicle) and various types of communication products (optical) to ensure wider application.

The front part of the cabin is the equipment cabin, and the rear part is the work cabin, which is available for both work and rest, and effectively meets the needs of personnel meetings and rest during field operation of the UAV system.

Performance Parameters			
Air Conditioner	Large 2P heating and cooling air conditioner	**Length**	6.7m
TV	75 inches (projection screen)	**Width**	2.5m
Operating mode	Meeting, Office	**Height**	2.5m
Other configurations	Sofa, foldable chair (4-6 people), pre-inserted board, drop-leaf table	**Weight**	3,000kg

UAV Simulation Training System

High-fidelity simulation of various customized unmanned helicopters, fixed-wing, VTOL fixed-wing, tilt rotary-wing and other UAV based on the technology of virtual reality;

Open software architecture that facilitates transplantation and application, and immediate adaptation to the user-customized UAV/UGV/tank and other system-related dynamic models and 3D contour models through interface adaptation to establish a corresponding training system;

Enable the simulation and effect presentation of various weather scenarios, including the simulation of natural weather such as cloud, fog, rain, snow, sandstorm, and wind;

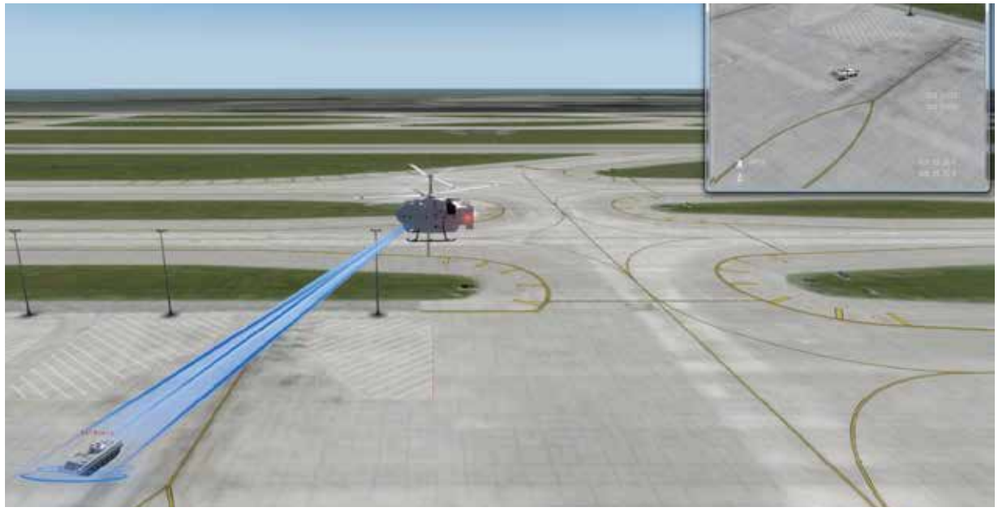
Support switching between day and night flight conditions at any time in 24-hour for convenient rendering of night mission drill;

Capable of various functions for training management such as instructing and training course setting, initial condition definition, instructor scoring, and trainee performance recording and management;

Provided with capacity of inputing typical system failures of UAV to simulate the real response upon special failures of the aircraft for developing emergency response capacity of operators;

Equipped with simulation function of UAV airborne electro-optical pod to simulate operation from ground level to control the electro-optical equipment for target searching, tracking, locking, etc.;

UAV Simulation Training System



The UAV simulation training system is a simulation system for simulating UAV flight missions. Simulation of the environment where the UAV is located enables the trainees for unmanned helicopter control to experience the whole process of training in the simulated environment, and simulate the use of airborne equipment for operations such as target reconnaissance, tracking, positioning, attacking, etc., so as to ensure economical training and drill. The UAV simulation training system is characterized by safe, economical, controllable, repeatable, risk-free, unlimited by climatic conditions and site space, which facilitates both routine operation training and emergency response capacity of pilots, enjoying extensive application in the training and development of ground operators for various medium and large-sized UAV systems.

Ground Sustainment Power Supply

- 1,200Wh large capacity that provides long-lasting endurance for ground operation;
- Equipped with low temperature LED liquid crystal display for accurate display of power, voltage and battery status;
- Operational in wide temperature range, adaptable to application in various low temperature and high temperature scenarios;
- High safety coefficient that equipts battery status with self-check and alarm protection in modes such as overcurrent, short circuit, overcharge, wrong reverse connection, etc.;
- Trolley-case embedded design that facilitates transportation and field use, and is highly portable;
- Long service life, with 80% of rated capacity available after more than 2,000 times of cycles.

Ground Sustainment Power Supply

The ground sustainment power supply system is a ground DC power supply system used for the daily maintenance of the UAV, providing 28V DC power supply for the UAV airborne equipment. The product is mainly composed of power host, charging adapter and power supply cable, which provides DC power sustainment for the UAV when the engine is not started to generate power, and meets the power demands during operation processes such as pre-flight and post-flight inspection, flight parameter configuration, data download, and daily maintenance.

Overall dimension	460mm ×220mm× 325mm (L×W× H)
Rated Capacity	1,200Wh
Output Voltage	24VDC-30VDC
Output Current	30A (continuous)
Weight	-40°C to 50°C
Normal Temperature (25 °C) Operating Hours	Operate for 2h with continuous 15A discharge
Low Temperature (-40 °C) Operating Temperature	Operate for 1h with continuous 15A discharge
Cycle Life	2,000 times

05

Airborne Equipment

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Multi-Redundancy Flight Control Computer

The flight control computer adopts the architecture with LVDS serial backplane bus as the core to realize dual redundancy configuration of CPU, interface and power supply through resource configuration, and employs fault tolerant master-standby operating mode to allow operation with one-time fault. The latest self-monitoring pair processor is adopted as the core processor to deliver higher computing credibility to the processing module.

- High safety, great reliability, miniaturization, diversified interface configuration
- Latest self-monitoring processor with up to 300Mhz of main frequency and built-in L1cache
- 100M high-bandwidth serial LVDS backplane bus
- PUBIT, IFBIT, GBIT detection with extensive coverage
- Built-in ultra-large capacity data storage device and file management system

Dual Redundancy Servo Controller

Oriented to servo control of electromechanical steering or other electric mechanisms based on brushless DC motor (BLDC) and permanent magnet synchronous motor (PMSM) in aircraft rudder system and mission system.

Main control architecture of advanced digital processor and programmable logic device, advanced digital servo technology (current, speed and position control), as well as advanced motor control algorithm (FOC) are adopted to enable servo system application with heavy payload capacity, high precision and quick dynamic response.

Power range	Power supply 28VDC, power ⩽ 500w
Flexible sensor applications	Hall, encoder, resolver, LVDT/RVDT, etc.
High precision position control	⩽1%F.S
Wide range speed control	50 ~ 20,000 rpm (limited by motor)
Redundancy design with high reliability	
Perfect status monitoring and protection mechanism	

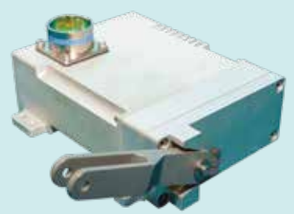
Dual Redundancy Electric Servo Steering

Linear steering

The steering is a hermetic linear electric steering configured with electrical dual redundancy and mechanical single redundancy. The electrical dual redundancy configuration adopts dual winding brushless motor and dual redundancy LVDT linear position sensor. The mechanical transmission is enabled by spur gear reducer and ball screw linear output, while the dual redundancy brushless motor in master/standby operation mode is provided with dual redundancy sine and cosine rotary transformer to realize FOC control of dual redundancy brushless motor.

Maximum speed	⩾55mm/s	Position accuracy	1%
Rated output force	60kg	Frequency range	5Hz
Stroke	±30mm	Electrical dual redundancy	linear motion of output shaft

Rotary Steering



The steering is a hermetic rotary steering configured with electrical dual redundancy and mechanical single redundancy. The electrical dual redundancy configuration adopts dual winding brushless motor and dual redundancy RVDT angular position sensor, while the mechanical transmission adopts spur gear reducer for deceleration, and one mechanical output shaft. The dual redundancy brushless motor in master/standby operation mode is provided with dual redundancy sine and cosine resolver to realize FOC control of dual redundancy brushless motor.

Maximum speed	⩾80°/s	Position accuracy	1%
Output torque	18N•m	Frequency band	5Hz
Stroke	±30°	Electrical dual redundancy	rotary motion of output shaft

270V Dual Redundancy Steering Servo System

Dual Redundancy Servo Controller

Dual Redundancy Electric Steering

The 270V dual redundancy steering servo system consists of one dual redundancy servo controller and two sets of dual redundancy electric steering, which is supplied with 28VDC control power and 270V power consumption through the vehicular power, realizes data communication with the host computer through RS422 bus and CAN bus, and receives the position command sent by the host computer and the feedback from the internal sensor of the steering, so as to control the servo operation of the steering position. Meanwhile status information and data information such as steering position, speed and current can also be fed back to the host computer. It is applicable to the flight control actuation system of medium and large-sized UAV to operate the servo control of the steering surface.

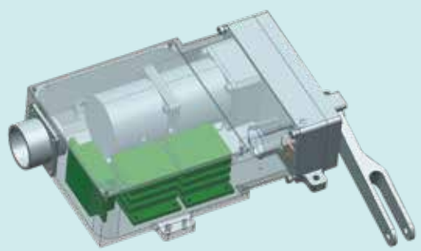
Benefits of electric application:

- Ensure the application of high-power electromechanical actuation system for medium and large-sized UAV
- Improve the safety and reliability of the system through redundancy configuration
- Enhance system maintainability by whole-electronic control instead of centralized hydraulic actuation
- Improve the energy conversion efficiency of the control system

Technical indicators:

Powered by	28VDC control power, 270VDC power consumption	Electrical stroke	±55mm
Dual system	Amplitude ±3mm, frequency ⩾5Hz	Maximum speed	⩾120mm/s
Rated output force	⩾10,000N	Maximum output force	⩾15,000N
Mechanical stroke	±60mm	Single system	Amplitude ±3mm, frequency ⩾3Hz
Redundancy configuration	Electrical dual redundancy, master/master control, integrated operating mode of steering speed	Steady-state accuracy	±1%FS

Dexterous Actuator



Such product integrates the control unit with the actuating unit, and adopts an electrical dual redundancy structure with comparative monitoring, which is of compact structure facilitating mounting and maintenance, and has the advantages of high reliability and high safety, ensuring actuation at low and medium power, such as UAV, spacecraft and missile rudder.

Benefits for application:

- Lower the cost of small and medium-sized steering application systems
- Reduce size and lower weight
- Improve the safety and reliability of small and medium-sized steering application systems

Technical indicators:

Operating voltage	28VDC	Weight	About 1.2kg
Stroke	±30°	Rocker arm length	72mm
Output shaft backlash	⩽0.8°	Frequency band	5Hz (plus or minus 1.5°, no-load)
Maximum speed	No-load ⩾80°/s	Input command interface	RS422 × 2
Output torque	18N•m (relative to 40°/s angular velocity of output shaft)		

06

Composites Series

High strength - composites aviation parts series 43

High speed - composites rotor series 44

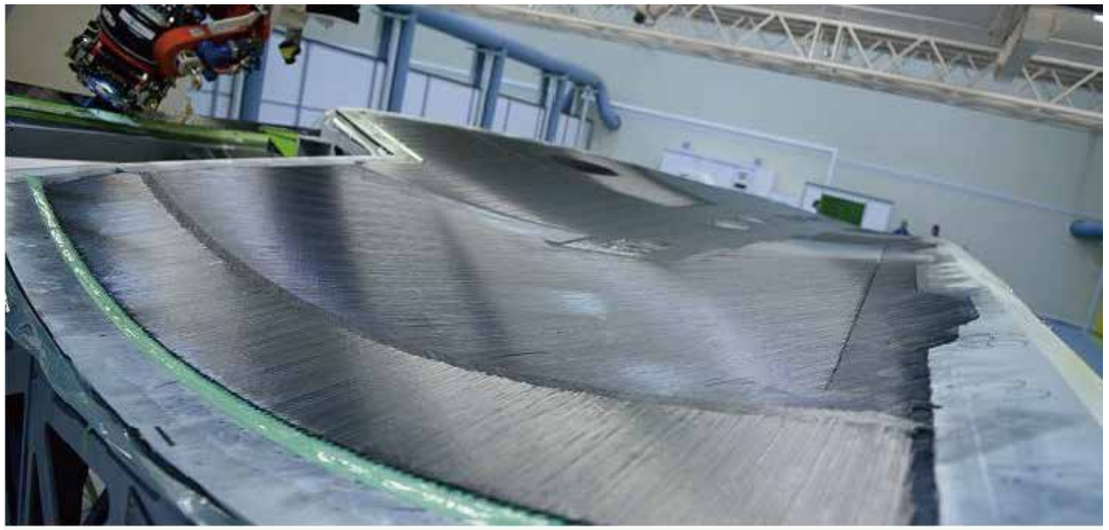
High speed - composites missile series 46

High reliability - composites customized parts series 46

High strength - composites aviation parts series

The composites with advantages of high specific strength, high specific stiffness, designable performance, good fatigue resistance and corrosion resistance are increasingly prevalent in a wide range of aerocrafts, contributing to the lightweight, high performance, and structure-function integration, wherein technologies and processes such as co-curing, co-bonding, secondary bonding or liquid molding of composites have significantly reduced the number of parts and fasteners, enjoying extensive application in fuselage and wing components.

UAV casing



Large aircraft wing

High Speed - Composites Rotor Series

The composites with advantages of high strength, high toughness, low specific gravity, corrosion resistance and fatigue resistance are suitable for application in helicopter rotor, fixed wing and multi-rotor aircraft blade, engine blade, etc., delivering longer service life and lighter weight. When combined with other material characteristics, advanced airfoil and aerodynamic layout design, they not only guarantee the required performance of high power and low noise, but also ensure good environmental adaptability, high safety and reliability, and strong integrated sustainment capabilities.

Bearingless Rotor Blade

As one of the major symbols of the fourth-generation helicopter, the bearingless rotor adopts composites flexible beam, which completely eliminates the hinge and bearing of the traditional rotor, and the flapping, oscillating and pitch-changing motion of the blade, which instead depends on the elastic deformation of propeller hub support arm and the blade. It has the advantages of highly efficient control, simple structure, low propeller hub resistance and good maintainability.

Performance Parameters	6m bearingless rotor blade	Rotor configuration	Coaxial bearingless rotor blade
Rotor diameter	6m	Upper and lower rotor spacing	8.5%D

Rotor speed	540RPM	Propeller hub radius	67mm
Blade chord length	175mm (0.3R-0.95R)	Blade weight	8.5kg/piece

Hingeless rotor blades

Coaxial hingeless rotor configuration and low-resistance high-efficiency design are adopted to deliver high efficiency in forward flight and hovering. The rotor system adopts lightweight design technology to ensure less parts, longer service life, and convenient maintenance. Compared with the rotor system of single-rotor with tail rotor, it adopts no tail transmission, tail reducer or tail rotor, which is of compact structure and small fuselage adaptable to confined shipborne space. Strong crosswind-resistance with hovering efficiency increased by 8-15%. There are no flapping hinges or oscillating hinges but variable-pitch hinges. Both flapping and oscillating directions are placed with fixed supports. The blade is rigidly connected to the propeller hub, and the flapping and oscillating motions are achieved by elastic deformation of the propeller root.

Performance Parameters	4.6m Hingeless rotor blades	Rotor configuration	Hingeless rotor
Rotor diameter	4.6m	Upper and lower rotor spacing	465mm
Rotor speed	720RPM	Propeller hub radius	239mm
Blade chord length	130mm (0.16R-0.95R)	Blade weight	2.64kg/piece

High Speed - Composites Missile Body Series

According to analysis on literature data, every reduction of 1kg in the mass of aircrafts such as rockets and relevant engines can increase the rocket range by 20km. The lightweight structure, low cost, high heat resistance and high temperature resistance of composites have enjoyed high demand in the aviation market and rocket area, and is widely applicable to missile body & wing, tail fin, radome, air inlet, etc.

High reliability - composites customized parts series

Carbon fiber composite is typical of advanced composites, which has the advantages of high strength, light weight, corrosion resistance, fatigue resistance, and low creep, and has become an ideal substitute for traditional metals, suitable for parts and components of various mechanical equipment, delivering special application effect such as low energy consumption, convenience, long service life and good load bearing capacity.