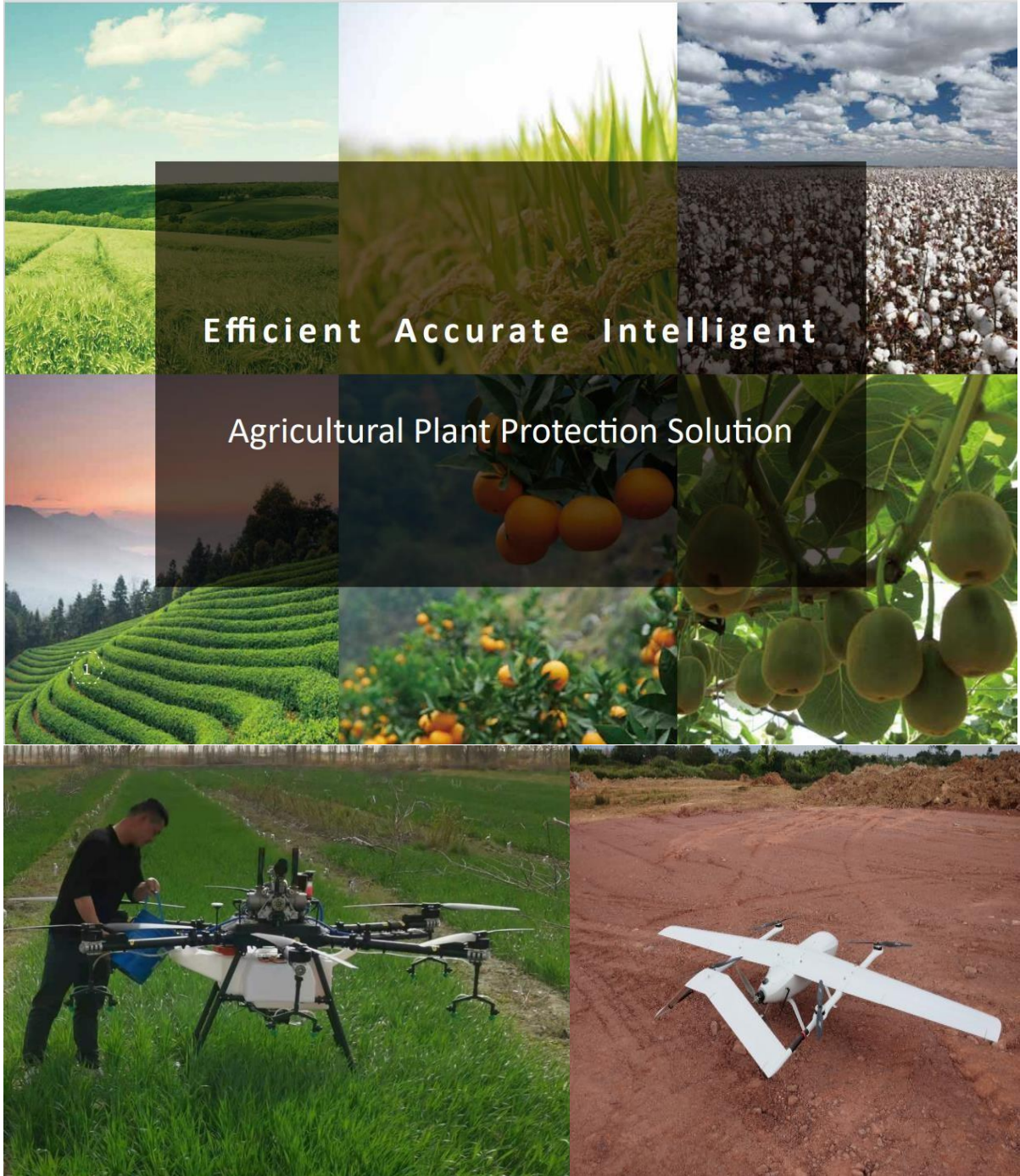




Surveying Drone





Company introduction

In January 2014, our company Changfeng was committed to becoming the world's leading supplier of industrial-grade UAV system application solutions. We continue to innovate around the needs of customers, and UAV products based on high-performance control systems are widely used in military and civilian fields.

The world's first fuel-driven direct-drive multi-rotor UAV independently developed by the company, as a leading research result, was invited to participate in the 2016 National "Twelfth Five-Year" Science and Technology Innovation Achievement Exhibition.

The company has successively won the third place in the 2015 First Innovation and Entrepreneurship Competition and Maker Competition, The First place of 2016 Dark Horse Entrepreneurship Competition in Shenzhen Division, the 2016 Chengdu Jingronghui "Most Investment Value Award", the 2016 China Innovation and Entrepreneurship Competition Robot Maker Competition, the second place in the country, the 2017 Innovation List, the most potential project and other honors.





Certification

- National High-Tech Enterprise
- GB/T29490-2013 "Intellectual Property Management System Certification Certificate" ISO 9001:2015 "Quality Management System Certification Certificate"
- "Civil Unmanned Aircraft System Pilot Training Organization"
- "Civil Unmanned Aircraft Operation Permit"

Social duties

- Director Unit of Shenzhen UAV Industry Association
- Vice-chairman unit of "Agricultural Development and Equipment"
- magazine under the charge of the Ministry of Agriculture
- Founding member of Shenzhen Youth CEO





User cases:

Part customers of Domestic

- PetroChina Eastern Geophysical Prospecting
- Hefei Institute of Optics and Mechanics
- 207 Institute of Aerospace Science and Technology
- Shijiazhuang Tiansheng Arms Factory
- Shanghai State-owned Assets Supervision and Administration Commission Shangshi Agricultural Group
- Changqing Oilfield Petroleum Pipeline Inspection
- Shanxi Diop Technology Aviation Surveying and Mapping

Part customer of Foreign

- Marussa Corporation, Japan
- Japan Ecocoku Co., Ltd.
- New Zealand evcotech
- Poland
- German Siemens engineer
- Dubai

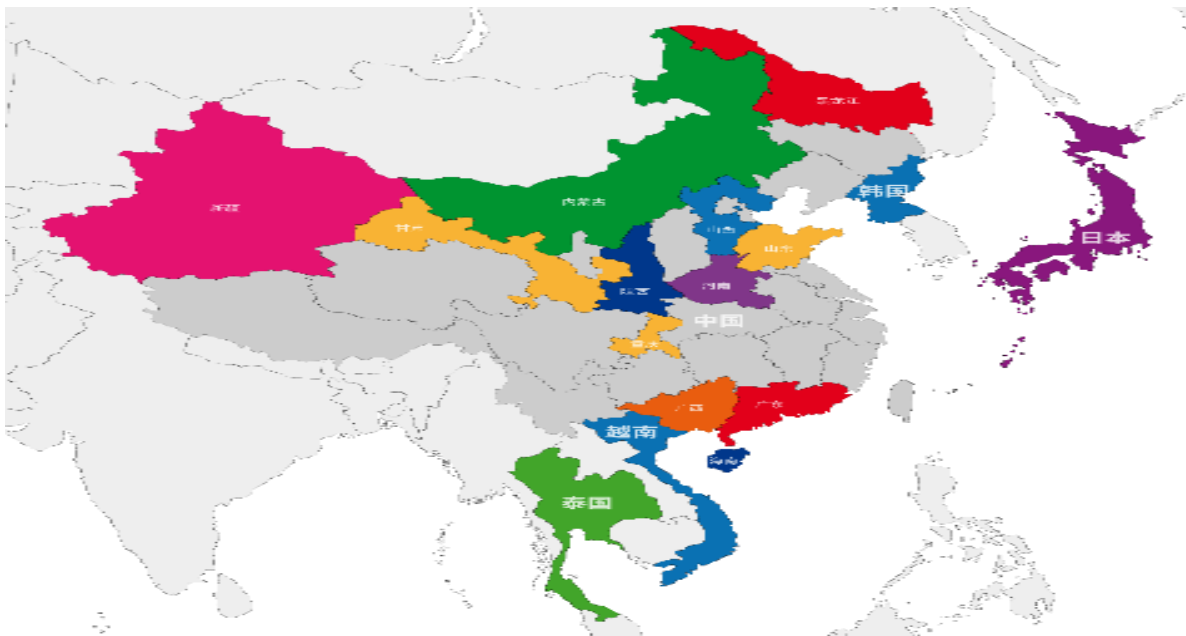


FIGURE 0-1 AGENCY SALES CHANNELS COVER 12 DOMESTIC PROVINCES AND CITIES AND 4 FOREIGN COUNTRIES



Survey drone



○ Introduction

The pure electric vertical take-off and landing fixed-wing UAV system is a high-performance pure electric UAV system developed for use scenarios such as patrol and surveillance applications in aeronautics and light vehicles.

The drone uses carbon fiber composite material to process the body, with a maximum take-off weight of 20kg. The UAV adopts a large aspect ratio wing design, and uses a large lift-to-drag ratio and excellent aerodynamic performance to match the wing body fusion layout. The high-performance aerodynamic design makes the UAV possess excellent flight performance. The rear wing adopts an inverted V tail layout that shares the structure with the vertical take-off and landing support rod; the fuselage is designed with three equipment compartments, which can be customized by users to meet the different needs of different users. This model adopts a tool-less disassembly design for the whole machine, which can be quickly installed and disassembled by a single person in three minutes. The hanging power system is equipped with an active propeller stopping mechanism, which keeps the hanging propeller at a low resistance position in the fixed-wing flight state, and also avoids damage to the power propeller during the operation of the UAV.

The UAV system is equipped with high-performance UAV flight control, GPS/Beidou multifrequency satellite positioning equipment, high-performance starlight night vision zoom video pod, digital high-definition digital image integrated data link system, 4G digital image transmission system; Users need to add or upgrade Beidou RTK high-precision satellite positioning receivers, high-performance infrared/visible light ranging video pods, intelligent airborne computers, multi-purpose photoelectric ranging sensors, machine vision sensors and other



equipment. It is suitable for users in military, police, border defense, environmental law enforcement and other fields to conduct day and night target inspections, regional air patrols, target identification and tracking.

The UAV system has high reliability and convenient operability; it can carry a load of up to 3kg for operation, and has the characteristics of fully autonomous operation, providing users with more convenient and reliable operation, more flexible applications, and easier operation for operators Training requirements. The system can be used in military inspection and monitoring, aerial photogrammetry, disaster monitoring and evaluation, forest fire protection and urban fire protection, land and resource surveys and other fields.

The UAV adopts a four-rotor and modular separable fixed-wing design and material with composite carbon fiber, has fully autonomous take-off and landing capabilities, and has a large power redundancy; it has sufficient power reserve and control margin for take-off and landing operations in strong winds and bad weather. Support UAVs to complete flight missions in complex and harsh environments. This flight platform has ample power and a cruising speed of up to 90km/h. It satisfies the working conditions of $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$ and meets the needs of use in hot and humid environments.

This UAV system adopts our company's self-developed and advanced high-reliability flight control avionics equipment, supports GPS and Beidou joint positioning, and can upgrade Beidou RTK differential high-precision satellite positioning equipment according to customer needs; supports fully automatic Flight missions, high-precision positioning and control, high bandwidth networking communication. According to the special needs of different users, our company can provide supporting software and hardware development services, assist users to install and carry designated hardware equipment, and carry out software and hardware development and debugging such as visual target recognition and multi-machine collaborative development.

○ Characteristics

1. Layout form

Conventional separable fixed wing combined with quad-rotor layout form, simple and reliable structure with IP54 standard

2. Practical and efficient

VTOL fixed-wing UAV has the characteristics of stable wind resistance of level 6, long 80 minutes of flight time, maximum of 65-90 km/h fast speed and 100 km long distance with 3500 ASL

3. Autonomous system

Full autonomous system including intelligent return, geofencing, breakpoint return, with multiple type of payload and smart gimbal controller makes the UAV to be full autonomous.



4. Power source

Electrical Li-Po for VTOL, combined with 4-liter capacity of gasoline for cruise allows so much potentials and the design is setup to smartly recharge during flight. The redundant Li-Po with smart battery management can also easily be swapped for recharge.

5. Vertical take-off and landing

VTOL technology greatly reduce the requirements for take-off and landing sites and airspace.

6. Compact system

No complicated auxiliary equipment is required, transportation, deployment, maintenance, and withdrawal are simplified

7. Flight controller

Redundant IMU such-as gyro/compass/barometer/magnetometer combined with multiple gnss system lets manual or autonomous system to be robust.

○ Flight control system

Power supply: DC9~60V

Power consumption: <5W

Enclosure: IP66 protected

Storage temperature: -55°C~+85°C

Working temperature: -25°C~+60°C

Working humidity: 0 to 95% relative humidity non-condensing at 60° C

Enabled data encoding with secured boot loader

Mechanical vibration: in line with the national military standard GBT2423.10_2008 standard

Mechanical shock: in line with the national military standard GJB150.18A-2009 standard

Control frequency: 400Hz

Satellite positioning frequency: 10Hz

Satellite positioning frequency band: GPSL1, L2, Beidou B1, B2, B3 (optional)

Positioning accuracy: 0.3m

System startup time: typical <30s

Track control accuracy: horizontal $\leq 2m$, vertical $\leq 4m$;

Attitude control accuracy: pitch angle $\leq 2^\circ$, roll angle $\leq 2^\circ$, yaw angle $\leq 2^\circ$

Full autonomous system including

1 Geofencing

2 breakpoint return

3 intelligent return to home



○ Data link

Digital HD Data

Link:

Working frequency: 2.4GHz

RC distance: 3km

Secure data link: 50KM range

Encryption system : AES

○ Software

Masking functionality

Mosaic rendering

3D mapping

Image coregistration

Geocorrection capability

Geo tagging

Atmospheric correction

Image extraction statistics

Real-time telemetry data



○ Ground control system

Model: G20

Device type: remote control tablet

Processor: quad core intel core i7

RAM: 6GB

Storage space: 128GB

Graphics: Intel HD Graphics 620

Network: 1 Gigabit Ethernet port

System: Windows/Android

Integrated 14 VDC joystick

Multi-touch display

Screen size: 13 inches

Resolution: 1920*1080, 4K

Brightness: 1000ccd/m2

Touch screen 10-point capacitive touch screen

Battery: 16.8V 12AH

Power display: computer system display/led power

Interface: ethernet/wifi/Bluetooth/LTE/USB-C

Charging time: 3-4 hours

Redundant battery

Working time: 3-4 hours

Size: 462*256*70mm

Weight: 6.9kg

Support antenna configuration

Working temperature: -20°C ~ +70°C

Storage temperature: -40°C ~ +85°C

External interface: 2*USB 2.0/2*USB 3.0/1*LAN/1*HDMI

Remote control and other parameters

Joystick 2*Potentiometer Joystick+2*Return Hall Joystick

Shift lever: 6 * three gears

Parameter tuning method: host computer

Image access: HDMI or network port

Internal reserved space: 170*90*27mm

Output power supply: 12V

Antenna interface: 2*external N head

IP 65 and Rugged casing



FIGURE 0-1 INTEGRATED JOYSTICK/COMPUTER GCS



LIDAR Imaging camera

Host weight: 1Kg

Integrated intelligent controller

Accuracy: 3cm

System measurement accuracy: plane 10cm;
elevation 5cm (at altitude of 50m)

Distance accuracy: 3cm@200m Range: 450m
(80% reflectivity, 0 klx);

Control method: One-key collection or remote
control via M300 remote control

Scanning field of view:
360° (horizontal)*41.3° (vertical)

Dot frequency: 720,000 points/sec (three
echoes)

Built-in camera pixels: 24 million

Working voltage: DC 12~14V

Working temperature: -20°C~+50°C

Storage temperature: -20°C~+65°C

Protection level: IP64

Storage capacity: 256GB

Data copy method: Ethernet, TYPE-C, the
highest copy speed is 160M/S

Power: 32W

Combined navigation parameters:

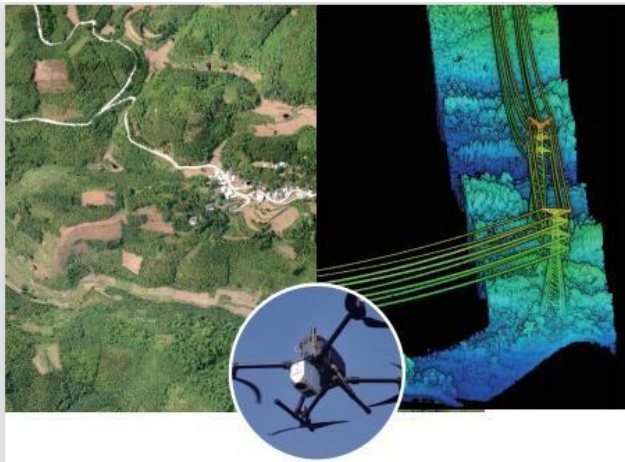
GNSS: GPS, GLONASS, BEIDOU, GALILEO
sampling frequency 5HZ

IMU update frequency: 600HZ Max

Position accuracy (post-processing) Plane:
0.01m; Elevation: 0.02m

Heading accuracy (post-processing): 0.04°

Roll accuracy/pitch accuracy (post-processing):
0.01°





○ Multispectral Aerial Camera

Dimensions: 190*160*86mm

Number of camera: 5 camera with thermal imaging

Image resolution: 6000*4000 pixels

Total pixels: 140 million pixels

Sensor type: Exmor APS HD CMOS

Lens focal length: 25mm

Observable range: 8 bands

Center wavelength projection rate: greater than 85%

Data reading method: Hub

Rated voltage: 7.4VDC

Trigger mode: pulse trigger

POS: Record camera position information during exposure

Weight: about 1.4kg

Pixel size: 3.9um

The shortest exposure interval: 1S

Sensor size: 23.5*15.6mm

Field of view range: 50*35

Cut-off wavelength transmittance: less than 0.1%

Structural performance: integration of lens and body

Maximum instantaneous power: 40W



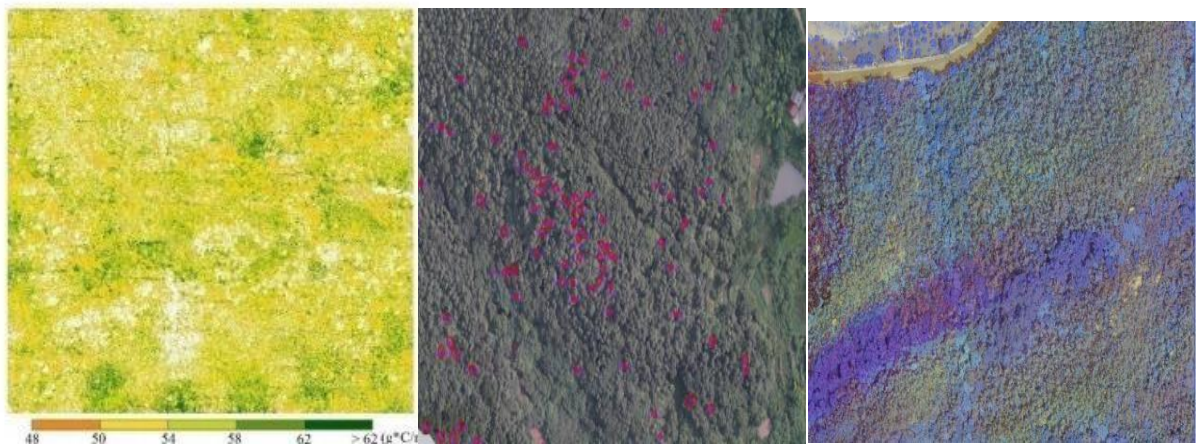
FIGURE 0-1 MULTISPECTRAL CAMERA



Characteristics:

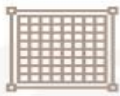
- ✈ High resolution, up to 24 million pixels per band;
- ◆ The band is adjustable, and can be matched with different bands and different numbers of spectral lenses according to application requirements;
- ◆ The information on different spectral bands of the same object can be obtained at the same time, and the work efficiency is high;
- ◆ Dimensions can be customized according to cabin capacity;
- ◆ High aerial survey efficiency (10cm resolution effectively covers 30-40 square kilometers per hour);
- ◆ High identification accuracy, the ground resolution is about 8cm at an altitude of 500 meters;
- ◆ Easy to match remote sensing images to form large-area remote sensing images;
- ◆ With high-precision geographic information, it can be measured;
- ◆ Low cost, small weight, easy to carry and operate the drone

Application picture:





RGB Camera



42.4million pixels



Full frame 35.7*23.8mm



Interchangeable lens



Take photos and videos



RTK POS



3D and Ortho

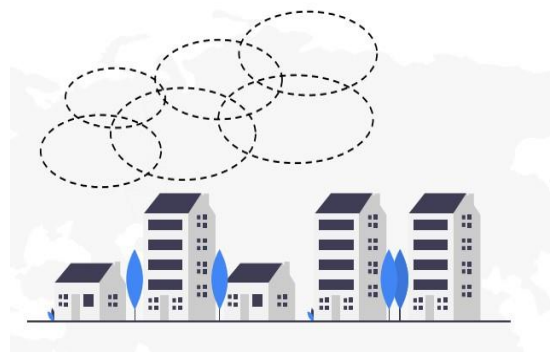
Route planning software

Imitation route

Regional cross-surrounding imitating ground, belt-shaped cross-ring imitating ground

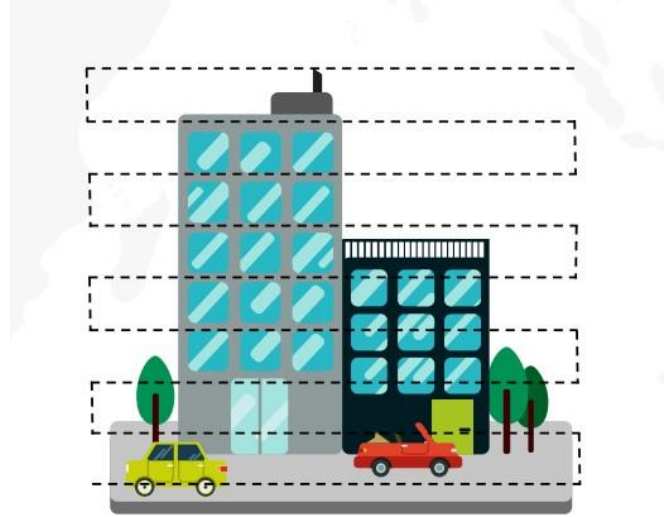
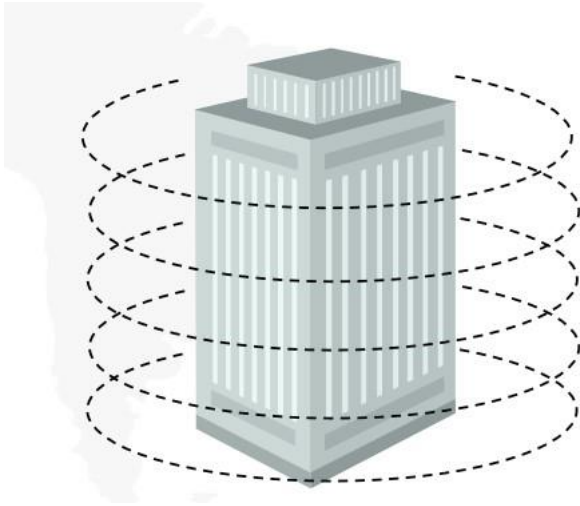
Cross-circle course

Surround shooting to achieve multi-angle tilt effect





<p>Single-point circumnavigation</p> <p>Generate fixed-point multi-layer circumnavigation routes, suitable for shooting single-family buildings</p>	<p>Horizontal elevation route</p> <p>Generate vertical route along the horizontal direction, suitable for shooting regular geometric surfaces</p>
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Technical data

Function classification	Core functions	Data
Host parameters	Effective Pixels	6100W/4200W
	Camera frame	Full frame
	Lens focal length	35mm
	Sensor size	35.7×23.8mm/35.9×24.0mm
	storage	256GB
	Data export speed	Max 300M/S
	Data interface	type-c (USB 3.1)
	Lens inspection parameters	Double inspection (opt format)
	Support drone platform	Fixed wing
	Camera size (length, width and height)	130×80×50mm



	Single camera (including gimbal weight)	360g (680g)
	PTZ interface	skyport V2.0
camera function	Photo resolution	9600×6400/7925×5304
	ISO sensitivity	automatic
	Minimum exposure interval	0.6 seconds
	Photo format	JPEG
	Shutter speed adjustment	support
	Mode switch	support
Video function	Video shooting function	support
	Video format	MPEG-4
	Video resolution	4K
Surveying and mapping configuration	Time Fusion Algorithm	Time sync technology
	POS configuration	Real-time RTK
	IMU configuration	Dual IMU
	Image transmission display	1080P
	Camera working status	Ground station real-time display
	Photo accumulation	support
	Parameter adjustment	support
Preprocessing software function	Data preview	automatic
Other	Memory format	automatic
	Export data by order	automatic
	POS write photos	automatic
	IMU write photos	automatic



	Removal of waste pieces on the ground	automatic
	Eliminate waste pieces outside the test area	automatic
	block export	automatic
	KML export	automatic
	Photo rename	automatic
	Data consolidation for multiple flights	automatic
	One-click landscape photo	automatic

○ Main technical data

Item	Performance	Item	Performance
Aircraft category	Compound wing drone capable of vertical takeoff and landing	power system	Customized dedicated motor
Empty weight	<5kg	Cruise battery	Customized special battery
Aircraft material	Fully composite material for autoclave forming	Flying speed	65-100km/h
Take-off and landing method	Vertical take-off and landing	Cruising speed	75-90km/h
Maximum takeoff weight	20kg	Wind resistance (face wind)	Level 6
Load	3kg	Life time (depending on load)	>120min



Dimensions	<p>The wingspan is 3.2m, the length of the aircraft is 1.70m, and the length of the fuselage is 1.12m.</p> <p>Body: Carbon fiber composite PVC foam sandwich</p> <p>Wing: Kevlar composite PVC foam sandwich</p> <p>Vertical take-off and landing arm: 3K carbon fiber</p>
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Website: <http://www.cfuas.com/#>