

Hybrid VTOL UAV

SparkleTech

www.sparkleuav.com





VTOL Drone

P-SHARK VTOL Hybrid system

We designed the P-Shark VTOL based on the success platform of FireFly (FF) which carry forward the most efficient of its kind.

That means low stall speeds, high max efficiency, a large payload capacity and hot swap features, retract nose gear, built in component compartment and the long endurance gasoline engine power system.

This equates to less energy expended and more time in the air.

Product Introduction

- Ideal combination of high energy density gasoline and high efficiency electric motor
- Complete composite construction using carbon fibre and Kevlar on a rigid honeycomb core structure
- New fuselage design concept that conceals all avionics cables
- Robust structure engineered to industrial quality
- Redundant power system for flight controller to maximize safety
- Compatible with PC-based, full-featured, open source autopilot system
- High durability gasoline engine from Germany
- Built in 5.2 L fuel tank
- Easy to assemble in the field, no need for expert skill
- VTOL to suit virtually any mission





WING (Forward swept wing)

The forward swept wing means its leading edge and trailing edge are swept forward, that is, the sweep angle is an acute angle.

The tip string is in front of the root string, and the left and right wings are projected in a plan view to form a V shape.

Since the airflow on the forward swept wing points to the wing root, the airflow is first split from the wing root at high angle of attack, which fundamentally overcomes the wing tip stall problem, so the low speed performance is excellent, the lift being increased and at the same time improving the aerodynamic efficiency of the wing panel.

Compared to the swept wing, the forward swept wing has four main advantages:

- 1) **Structural advantages.** The forward swept wing structure ensures a better connection between the wing and the fuselage and reasonably distributes the pressure by the wing and the nose landing gear. These advantages are difficult or impossible to achieve by other methods, which greatly improve the aerodynamic performance of the maneuvering, especially at low speeds.
- 2) **Maneuverability advantage.** The forward swept wing technology allows the aircraft to have very good aerodynamic performance at subsonic flight, greatly improving its maneuverability while high pitch flight.
- 3) **Takeoff and landing advantage.** Compared with the normal swept-wing aircraft of the same wing area, the forward-swept aircraft has a higher lift and a 30% increase in payload capacity, thus reducing the wing area and size, reducing the drag and aircraft structural weight; reducing the weight for balancing, improves the low-speed maneuverability, shortens the take-off landing distance. According to USA aviation specialist calculation, if the F-16 fighter uses the forward swept wing structure, it can increase the turning velocity by 14%, increase the combat radius by 34%, and shorten the takeoff and landing distance by 35%.
- 4) **Controllable advantages.** The use of the forward swept wing structure can improve the controllability of the aircraft at low speeds, improve the aerodynamic performance in all flight conditions, reduce the stall speed, and ensure that the aircraft is not easy to enter the tail spin, thus greatly improving the safety and reliability of the aircraft.



FUSELAGE

The trapezoidal shape of the fuselage minimizes the fuselage to wing interaction, drag and interference.

It was designed with a high pressure region in the nose and a low pressure region behind the wing, on top and below the motor mounting area.

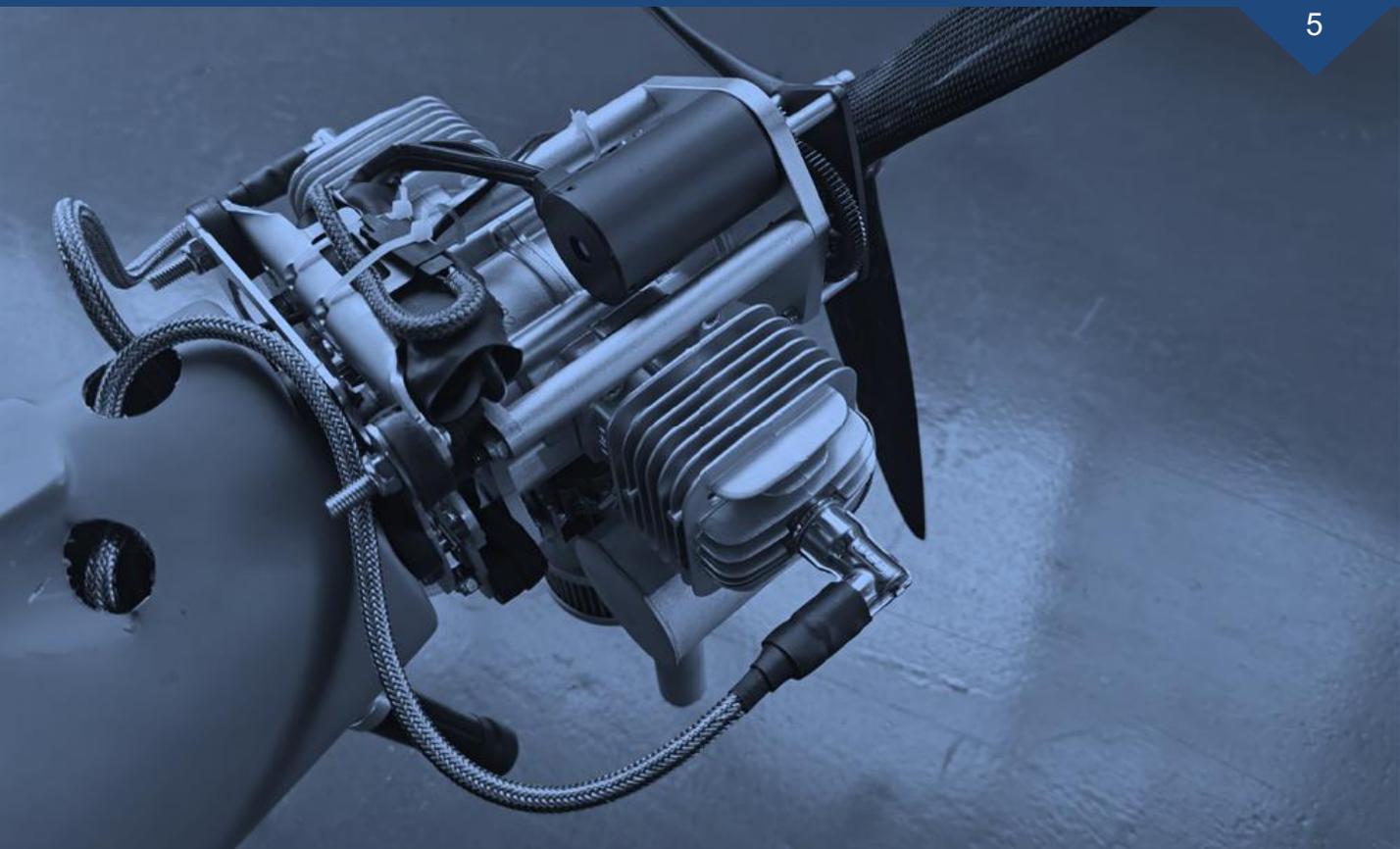
This acts to create a pressure differential, essentially "pulling" air through the fuselage. The layout allows for smarter cooling, by cooling off lower temperature components towards the front, and higher temperature components in the rear (motor).

The cooling exhaust placement was purposely in an area with turbulent airflow, so as to not disturb the otherwise laminar airflow over the rest of the fuselage

VTOL FEATURES

Implement the mature quad motor concept achieve vertical takeoff and landing eliminating the restriction of the runway requirement in the field.

The quad motor also provide the maximum fail safe protection against any malfunctions situation during the mission.



ENGINE

Horsepower: 7-HP/8500rpm

RPM: 1400-8500 RPM

Idle speed: 1400 rpm

Static Thrust: 33.5 lb Pulling Force at 100 meters; 30 lb Pulling Force at 1800 meters

Displacement: 61cc

Bore and Stroke: 36mm×30mm

Compression Ratio: 7.6:1

Weight: Engine - 55 oz(1560g)

Exhaust - 6.0 oz (200g)

Ignition - 6.7 oz (190g)

Total - 4.2 lbs (1950g)

Fuel: 30:1 mix ratio

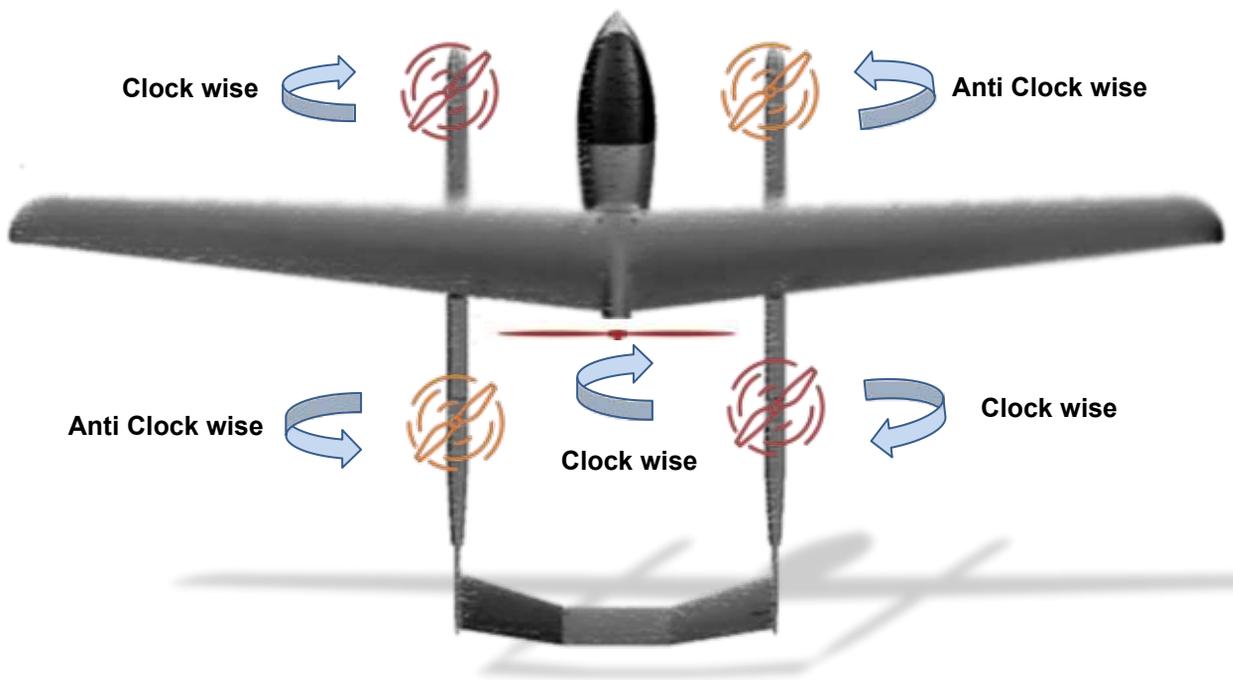
Ignition: 4.8 – 8.4 volts

Replacement Sparkplug: NGK CM6 or equivalent

Includes: Electronic ignition, mufflers
(2), spark plug & engine standoffs



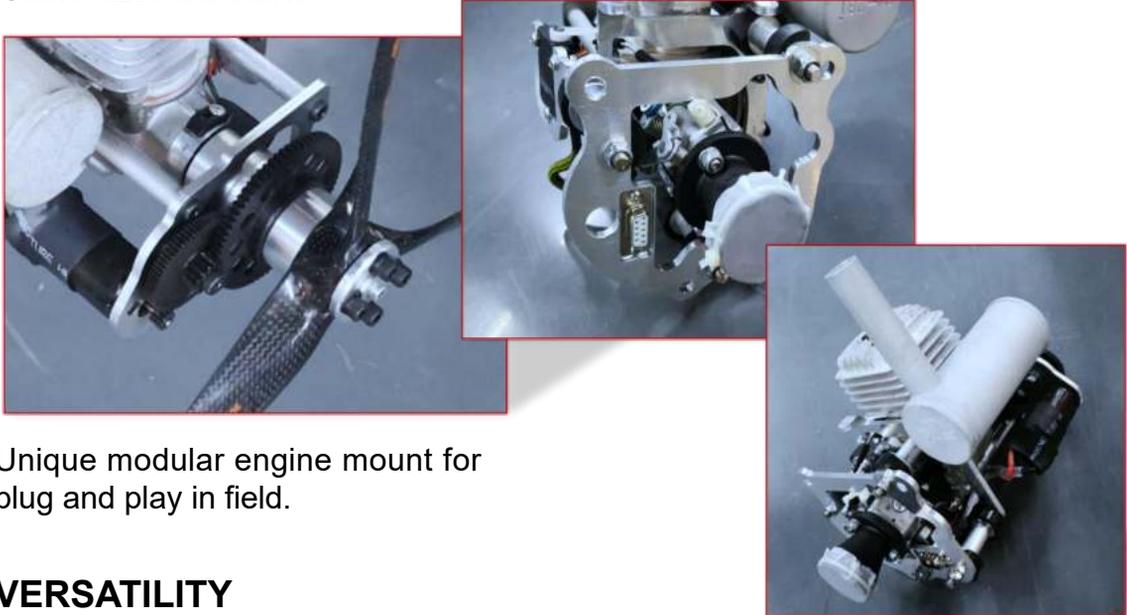
Awesome VTOL system eliminate the restriction of take off and landing condition
This system being well proved for the reliability of thousands hour flight.
Simple, reliable and easy of maintenance is the goal at anytime.



SHARK
VTOL DRONE



Customize Auto starter



Unique modular engine mount for plug and play in field.

VERSATILITY

Our transformative design allows for dynamic use, making each system truly unique.

You can use the P-Shark VTOL for search and rescue missions, inspections of pipelines, photography, filmmaking, thermal imaging, 3D terrain mapping, precision agriculture, surveillance, reconnaissance, FPV, live video links, humanitarian aid, fun and much, much more.

CAPABILITY

We are committed to integrating efficient design with modern technology in a robust, entirely composite platform.

The P-Shark fly for over 5 hours, reach speeds of up to 120 km/h.

The P-Shark allow you to fly autonomously, capture stunning HD photos and video, complete aerial surveys, monitor crop health, and wirelessly transmit live video.

This is all achieved with incredible accuracy of an on board autopilot system.



TELEMETRY SYSTEM

Microhard P400 telemetry module being used for data linkage.

Range <50km at line of sight in open area with 1.8m fiberglass antenna setting up at 2m tripod.



AUTOPILOT SYSTEM S40

S40 is the full autonomous flight controller and navigation system specifically designed for compound UAVs VTOL (vertical takeoff and landing fixed wing), which is also suitable for an air with the conventional fixed wing & quadrotor configuration.

It internally integrates the flight control computer and micro-assembly navigation system (GPS/INS).

Simply one-key action, it is capable of enabling automatic takeoff, landing, hovering, circling, homing, altitude holding and parachute opening.

Meanwhile, it is also capable of various autonomous cruise functions based on the pre-set route.

Besides, S60 has the flight status monitoring & alarm functions and a sophisticated emergency protection mechanism, to ensure operational safety of the system.

SCOPE OF APPLICATION

Hybrid UAV with fixed-wing + quadrotor configuration, including the fixed wing aircraft with conventional tail and V-tail and flying wing and the quad rotor aircraft with "X" configuration.

Conventional fixed-wing(plane) UAV, with conventional tail, V-tail and flying wing;





AUTOPILOT SYSTEM S40

System features

Sensor configuration:

- GPS/MINS combined navigation integrated micro-system provides the navigation and control information covering 3D position, three-axis attitude, three-axis velocity and three-axis acceleration.
- Integrated pneumatic altimeter, with resolution ratio of 0.1m and range of -500~10,000m;
- Integrated difference-pressure air speedometer, with resolution ratio of 1m/s and range of 0~100m/s;
- 2-circuit pulse-width engine speed measurement, with resolution ratio of 1rpm;
- Dedicated voltage/current measurement module, with voltage range of 0~52V and current range of 0~200A;

Flight control:

- It supports three types of UAVs: fixed-wing(plane), multi-rotor and hybrid(vertical takeoff and landing) UAVs;
- For control of hybrid UAV, the flight mode can be switched by the RC remotely or automatically;
- Flight control modes: manual (by the RC remote controller), semi-auto (attitude and throttle lever are controlled by the RC remote controller) and full-auto(flight in the preset route);
- It is suited for aileron, elevator, rudder, throttle, parachute opening, shutter and other servo control, with refresh frequency of 50Hz;
- It is suited for quad rotor and other conventional multi-rotor UAVs power motor control, with refresh frequency of 200Hz;
- With one-key action, it can enable takeoff, landing, hovering, circling, altitude hold, parachute opening and other functions, for easy operation of the user;
- When a fix-wing UAV swerves, the elevator enables feed-forward compensation to avoid altitude decrease;
- When a multi-rotor UAV hovers, it automatically maintains its nose heading (or the course angle can be changed remotely); during flight in a route, the aircraft nose is automatically aligned with the route direction;
- Sophisticated flight status monitoring and automatic protection;



AUTOPILOT SYSTEM S40

System features

Mission navigation:

- It provides 8 user routes and each route can contain 800 way points;
- It can automatically generate the circling route and the circling point, circling radius and circling rounds are programmable;
- It can automatically generate the homing route; or the user may plot the homing route and homing is automatically executed in the route plotted by users;
- The longitude, latitude, altitude, speed and mission of flight segment are programmable;
- For altitude control modes of the flight segment, normal control, gradient control, circling ascension/descension before arrival and circling ascension/descension after arrival, etc. can be selected.
- After reaching a way point, it can automatically switch to circling, homing or landing mode;
- It can enable parachute opening and camera shutter control upon arrival at a way point;
- It can execute regular-interval photographing mission in a flight segment;

Protection:

- Protection against low voltage, low oil level and low rotation speed;
- Protection against abnormal attitude;
- Protection against abnormal altitude;
- Protection against low accuracy of GPS positioning;
- Protection against failure of combined navigation system;
- Protection against breach of maximum control radius;
- Protection against breach of safety limit of the route;
- Protection against overtime communication outage;
- 100 emergency landing points can be preset so that the aircraft can land at the nearest landing point in case of an emergency;
- Protection can be executed as automatic homing, automatic landing or parachute opening;

Remote Controller:

- It is compatible with the conventional Sbus interfaced RC remote controller and receiver;
- The manual/autonomous modes can be switched by the RC remote controller;
- The fixed-wing and multi-rotor modes can be switched by the RC remote controller;
- The FailSafe status of the RC remote controller is under monitoring;
- The RC remote controller can be used for registration of the control surfaces;
- The RC remote controller can execute unlocking, to prevent mis operation of the motor;



AUTOPILOT SYSTEM S40

System features

Airborne data recording:

- Flight information and mission information are recorded and downloaded separately;
- The recording frequency and downloading frequency are selectable in the range of 1Hz~10Hz;
- Flight information recording time can be 9 hours;
- 7000 mission information logs can be recorded (on photographing locations);

Ground station software:

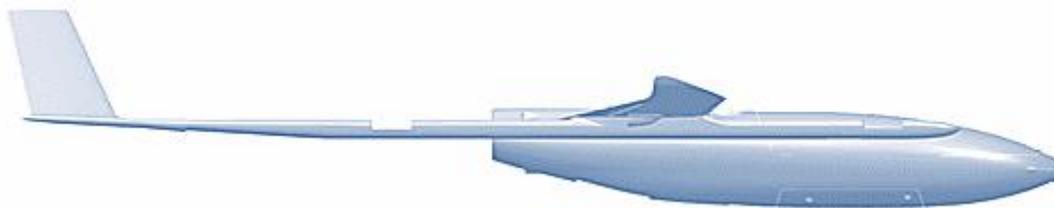
- Supporting multisource online electronic map with error compensation, MAPX and background pictures;
- Complete and practical preflight check process prompt;
- Irregular multi-monitoring area automatic mapping route planning function;
- Legible and comprehensible flight instruments;
- Easy execution of key commands; protection against mis operation;
- Adjustment of integrated control parameters, calibration of sensors, protection configuration, etc. ;
- Display, alerting, recording and playback of telemetry data; the formats of the log files are compatible with Office;
- The ground station software is capable of fine adjustment of the horizontal position, altitude and course of multi-rotor UAV, without remote control of the RC remote controller;

Data link interface:

- Electrical standard: RS-232C;
- Baud rate: several optional Baud rates, default 115200, N, 8, 1;

Physical parameter:

- Dimensions: 109mm*56mm*53mm (L*W*H);
- Weight: 130g
- Power supply: 300mA@4.5V~9.0VDC.
- Working temperature: -20~55 degrees Celsius



- Complete composite construction using carbon fiber and Kevlar on a rigid honeycomb core structure
- New fuselage design concept that conceals all avionics cables
- Robust structure engineered to industrial quality
- Dual battery system to maximize safety
- Compatible with PC-based, full-featured, open source autopilot system
- Easy to assemble in the field, no need for expert skill
- VTOL to suit virtually any mission

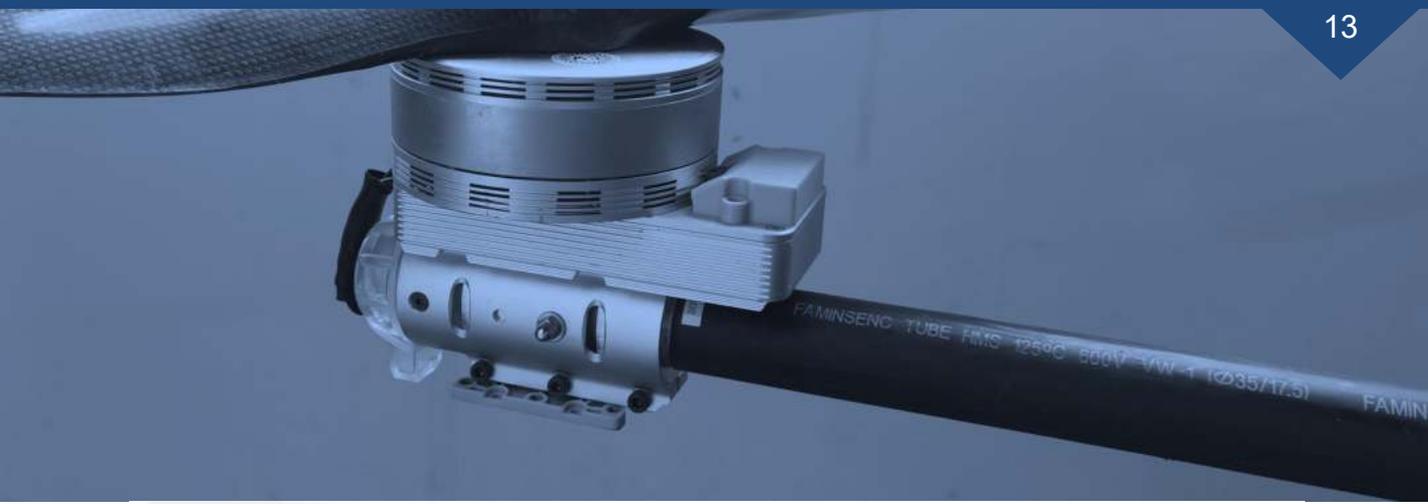
The Pro Shark VTOL is designed to be the most efficient in its class.

The large wingspan and heavy loading design make it outstanding of the similar range of drone in the market. With our innovative design approach and abundant experience, not only have we achieved high efficiency, low stall speed, extended cruise window and large payload capacity, we have also incorporated the detachable payload compartment located at the CG position. It means the payload changed will not affect the balance and make it flexible to adopt any difference payload for mission.

The powerful quad-rotor technology is now very mature. It enables vertical take-off and landing and eliminates the restriction of runway requirement in the field. The quad-rotor also provides maximum failsafe protection against any malfunctioning situation during mission.

The propulsion system provide variable options. Pure battery power, gasoline engine or even electric generator are available.

Long endurance and mission range are achieved through the smart choice and integration of high efficiency DC motors, Lithium battery and sophisticated electronic speed control systems.



40Kg

MTOW

20:1 ~ 23:1

Glide ratio (L / D)

4490mm

Wing Span

2400mm

Length

3 to 10 Kg

Payload

60Km

Control Radius

6.5Ltr

Gasoline Fuel Tank

14,800Ft

Maximum Ceiling

>5Hrs (Hybrid)

Endurance
(at 10Kg Payload)

>3Hrs (Motor)

Endurance
(at 3Kg Payload)

100Km/h

Cruising Speed

120Km/h

Maximum Speed

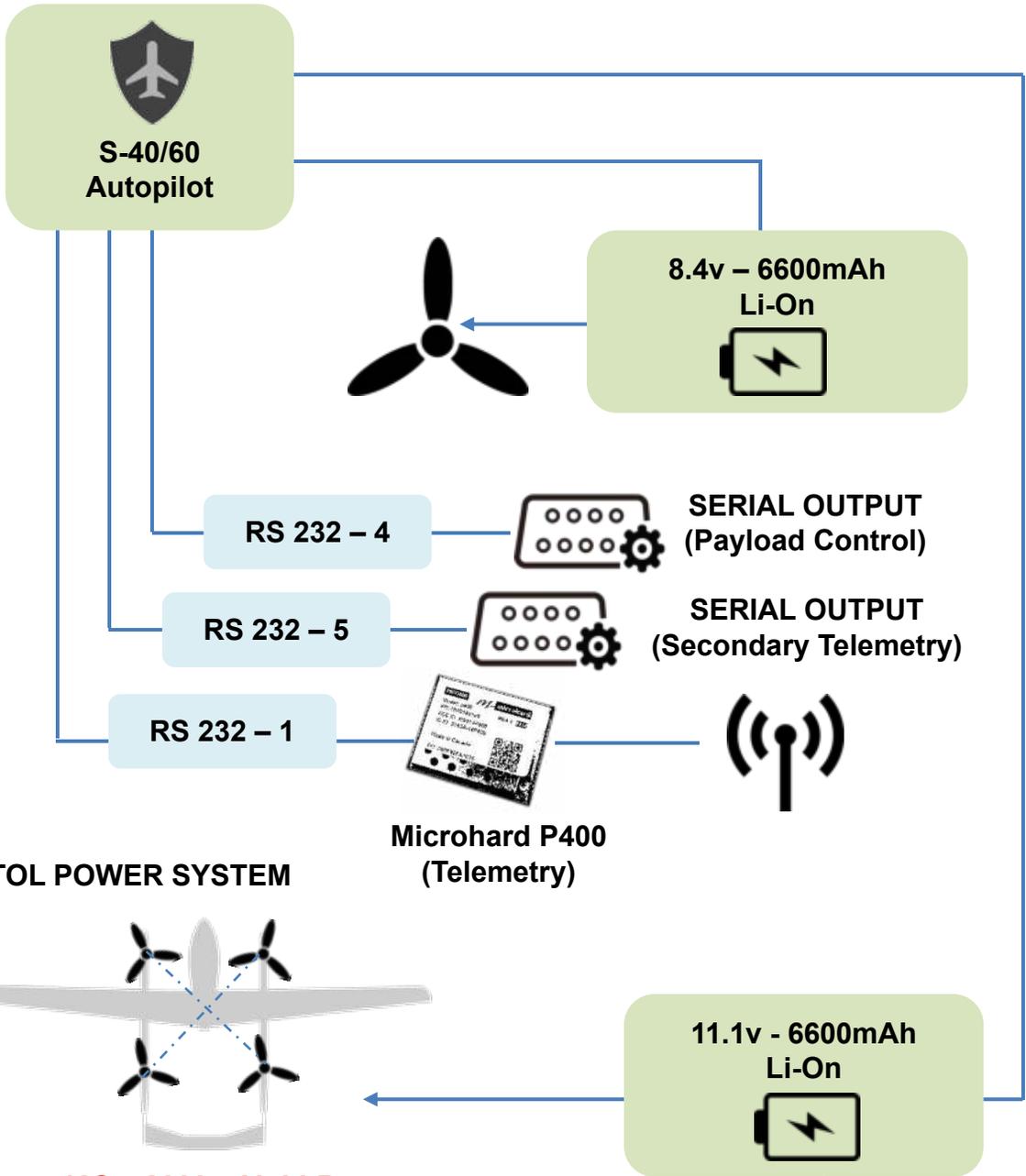
65Km/h

Stall speed

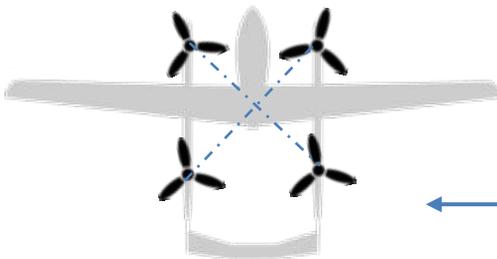
10x10

Runway

POWER SYSTEM (DIAGRAM)



VTOL POWER SYSTEM



12S - 8000mAh Li-Po

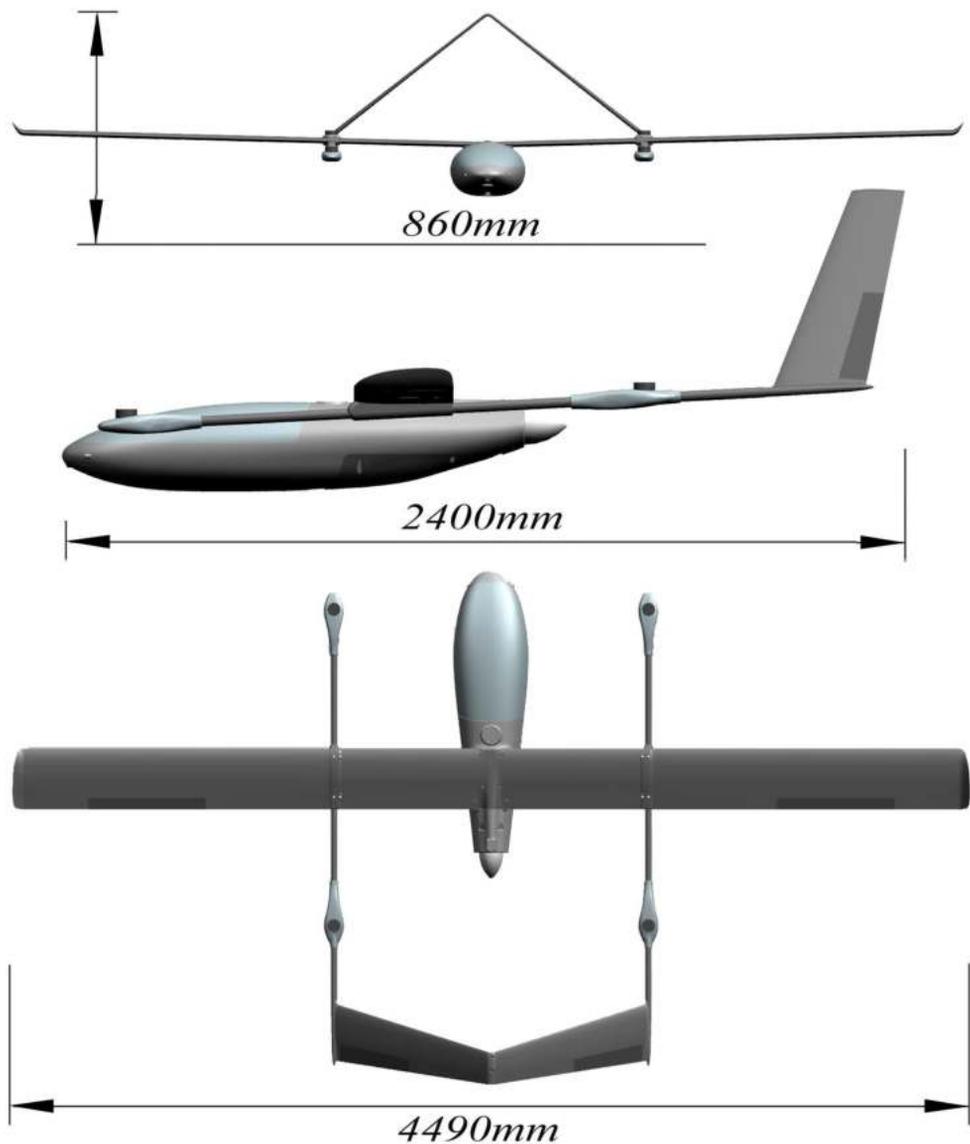
Redundance power supply system ensure the maximum safety factor against any failure of electrical issue in flight.



Special design of avionics arrangement eliminating the miss-operation by operator

The design improved the stall speed as well as higher lift and a 30% increase in payload capacity, thus reducing the drag and aircraft structural weight

TAIL: Inverted /---\ design improves efficiency while decreasing drag.



TS01C

30x optical zoom

n×360° continuous rotation

Tracking velocity: 30 pixels/frame

Detector pixel number: 1920×1080

Uncooled infrared imaging



Visible light zoom camera	
Working band	0.4μm ~ 0.9μm
Number of detector pixels	1920×1080
focal distance	4.3 mm ~ 129 mm, optical 30x continuous zoom
Continuous zoom horizontal field of view	63.7° ~ 2.3°
video output	HD-SDI、1080P、30Hz
thermal imaging	
Working band	8μm ~ 14μm
Number of detector pixels	640×512
Pixel size	12um
NETD	50mk
focal distance	25mm/F1.0
viewing angle	17.4°×14°
video output	HD-SDI、1080P、30Hz
Physical and electrical performance parameters	
measure	≤Φ120mm×171mm
weight	≤950g
Working temperature	-20°C ~ 60°C
communication interface	1-way RS422
Video interface	1-way HD-SDI
Tracking performance indicators	
Pixel deviation update rate	50hz
Tracking speed	30 pixels/frame
Minimum target contrast	8%
Minimum target imaging size	4×3 pixels
In the case of rolling, rapid reduction or enlargement of target imaging, it can track without slipping or losing Lost ability	
It has the ability to automatically recapture the target after the short-term occlusion of clouds and ground scenes is eliminated	



Ground Control Station

FPV video screen

Diversity receiver 5.8Ghz integrated.
 HD LED screen of 10.1" high definition, high contrast and anti-glare.
 Resolution: 1366 × 768
 Aspect ratio: 16: 9
 Brightness: 550cd / m2
 Contrast: 800: 1.
 Controlled temperature.
 Speakers.
 1 Audio/Video output with RCA connector.

D4 Transmitter

5th generation radio.
 Multi band ICM: 866Mhz, 868Mhz, 902, 915Mhz, 950Mhz or 433Mhz (optional).
 Power: 500 or 1000mW
 Sensitivity: -110 or -116dBm
 Modulation: 50 or 100Kb. FHSS (Frequency Hopping Spread Spectrum).
 Controlled temperature.

Embedded PC

Windows 10
 Processor: Intel Quad Core of 1.8GHz
 4GB RAM and 64GB flash
 Touch screen 7".
 Mini Keyboard Bluetooth.
 USB 3.0.
 USB 2.0.
 HDMI
 Ethernet 100Mbps (Optional).
 Wifi.
 Bluetooth 4.0.

Suitcase

Robust, dustproof, water resistant (IP67 certified).
 Temperature controlled with fans.
 Certified with STANAG 4280, DEF STAN 81-41 and ATA 300 standards.
 Automatic air pressure compensation valve.
 Temperature resistant from -30 ° to + 80 ° C.
 Rubber handle.
 2 eyelets for padlocks (Ø 7.62 millimeters).
 Optional accessories: transport belt.
 Dimensions: 36.5 x 29.4 x 17 centimeters

RC Control

Radio Control independent of the PC.
 Processor RC control.
 Processor each RC Joysticks.
 Start-up Key.
 Digital voltmeter.
 Output 11,1V power
 Fuse 5A.
 OLED Mini Displays.
 Rotary encoders.
 Rotary encoders with push buttons.
 Joystick Radio Control.

Battery

Lipo 3S/11.1V/5Ah.
 Duration approx: 2'5-3h.
 Charger 1A.
 Input 12-24V.

Flysky FS-PL18 Paladin 2.4G 18CH Radio Transmitter Receiver



Product Name: **FS-PL18**
 Product color: black
 Support Model: Glider Fixed Wing Helicopter Crossing Engineer Vehicle
 Working current: 130 mA
 Language: Chinese/English
 Charging Interface: Micro USB/Wireless Charging
 Low Voltage Alarm: <3.7V
 Brand name: Flysky
 Support for firmware updates: Yes
 Simulator: Built-in USB simulator
 Duration: More than 8 hours
 Antenna type: dual antenna
 Working temperature: - 15 C - + 60 C
 Signal output: ibus/sbus/PPM/PWM signal output is optional
 Frequency: 2.4 GHz
 Model memory: 20
 Working Voltage: 5V DC
 Display screen: 3.5 inch TFT LCD, 320*480
 Fuselage weight: 946g
 Working humidity: 20-95%
 Channel resolution: 4096
 Power input: 1 * 3.7V 4300mAh Lipo battery
 Wireless Protocol: AFHDS3

Flysky FS-PL18 Paladin 2.4G 18CH Radio Transmitter Receiver



Number of channels: 18

AFHDS 3 protocol: low delay (< 5ms), long distance, strong anti-jamming ability

Emission power: <20 dBm

Remote control distance: > 3000m

Size: 214*39*192mm

Receiver High Voltage Support: FTr10 (3.5-12V) can directly return battery voltage to remote control display

Charging time: 6H@5V/2A (USB connection) 7H@5V/2A (wireless charging)

Data Interface: USB. Bluetooth Interface (USART). Headset Port (PPM)

Package includes:

PL18 remote control *1

FTr10 receiver *1

FRM301 high frequency head *1

Fs-ftr16s receiver *1

Sunshade cap * 1

Hand glue * 2

Double handle *2

Micro USB cable * 1

Nub switch assembly *2

APPENDIX 1



Pre-flight Checking List

Ground Station _____ Maintenance _____ Flight Date _____

Flight Environment			
Weather _____	<input type="checkbox"/>	Wind Speed _____	<input type="checkbox"/>
		Wind Direction _____	<input type="checkbox"/>
UAV Inspection			
Are the connecting screws secure?	<input type="checkbox"/>	Is the wing locking pin secure?	<input type="checkbox"/>
Hover motor/propeller is good?	<input type="checkbox"/>	Is the motor mount secure?	<input type="checkbox"/>
Are the servo control surfaces being intact?	<input type="checkbox"/>	Is cruise fly propeller intact?	<input type="checkbox"/>
Is the centre of gravity normal?	<input type="checkbox"/>	Oil Level _____	<input type="checkbox"/>
Ground Station Inspection (without power)			
Whether the output of the remote control correct?	<input type="checkbox"/>	Whether the posture is correct?	<input type="checkbox"/>
Magnetic compass calibrated?	<input type="checkbox"/>	Whether the flight plan is correct?	<input type="checkbox"/>
Magnetic Inspection: _____		Compass	<input type="checkbox"/>
Ground Station Inspection (with power)			
Main Power _____ V		Autopilot Power _____ V	<input type="checkbox"/>
Hovering Power Supply _____ V			
No. of GPS satellite: _____	<input type="checkbox"/>		
Whether the manual radio control command correct?	<input type="checkbox"/>	Whether the hovering propeller and motor is oriented in the correct?	<input type="checkbox"/>
		Will the airspeed increase when pressing the pitot tube?	<input type="checkbox"/>
	<input type="checkbox"/>		<input type="checkbox"/>
	<input type="checkbox"/>		<input type="checkbox"/>

OPTIONAL

COLIBRI 2 CAMERA



The Colibri2 is a dual EO-IR stabilized camera built for professionals needing a quality camera for day and night use. Weighing in at 180 grams [6.3 oz], the Colibri2 offers excellent image quality and sharpness to capture detailed imagery, such as license plates and faces.

Zoom : x20 + x2 digital (total x40)
 FOV : 60° WFOV – 3° WFOV – 1.5° DFOV
 Thermal Resolution : 640x480
 Pitch FOR: -45° to +90°
 Roll FOR: -180° to +180°
 Weight : 180 grams [6.3 oz.]
 Dimensions : 53mm [2.099"] x Height=81mm [3.2"]



Aeronav (Optional)



The core of the Aeronav is a reliable Panasonic Toughpad, a professional tablet that helps drive efficiency and productivity in ways that were never previously possible; Aeronav is capable of operating outdoors in a variety of extreme and remote environments.

The Aeronav is especially suitable for field application in markets such as aviation, defense, or construction due to its capability to perform under exposure to extreme and constantly changing environments.

Since its release in 2015, we have continuously improved Aeronav's performance in close cooperation with our more than 100 customers worldwide. The Aeronav is a well-proven, secure, and reliable solution, which is easily extendable with your hardware and software requirements. Its production version can be delivered fully customized according to **your specifications, including custom software, firmware, engraving, joystick configuration, and radio/control modules.**

The Aeronav is combined with the Panasonic Toughpad, incorporating an 800cd/m² IPSa display. The capacitive 10-finger multi-touch display and digitizer pen makes it extremely user-friendly.

The Aeronav runs on Windows 10 Pro, Windows 8, or Ubuntu and is equipped with the Intel® Core™ i5 Processor. It also benefits from connectivity options to ensure data is available to the user whenever needed.

Compatible with;



