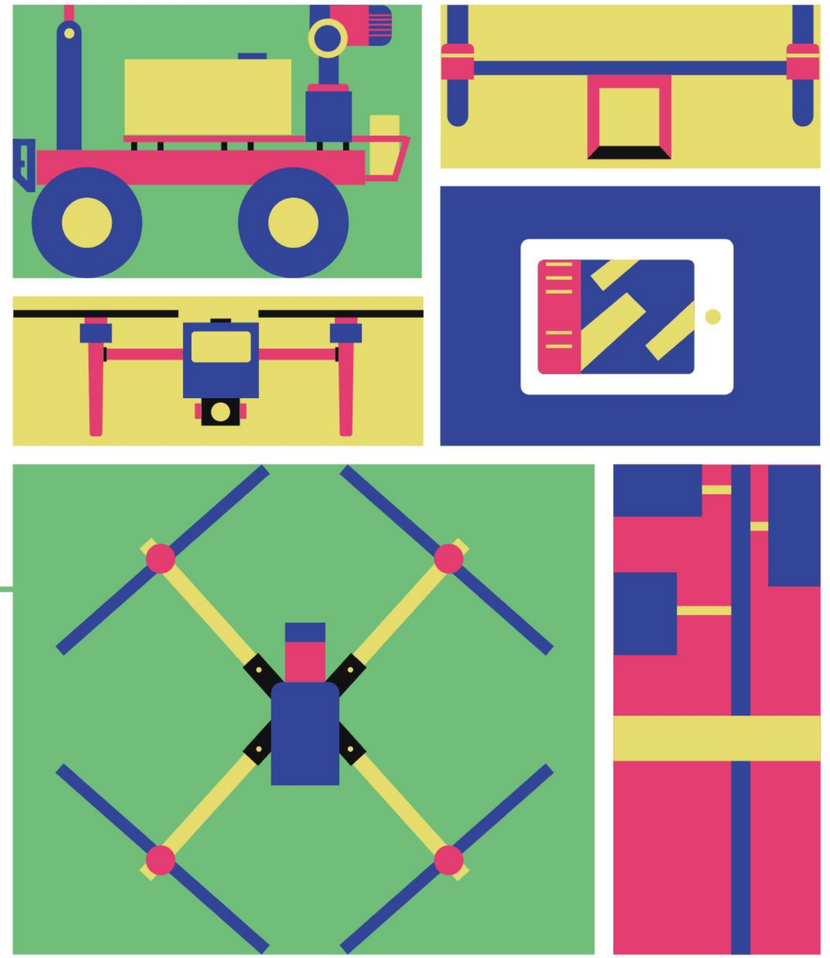
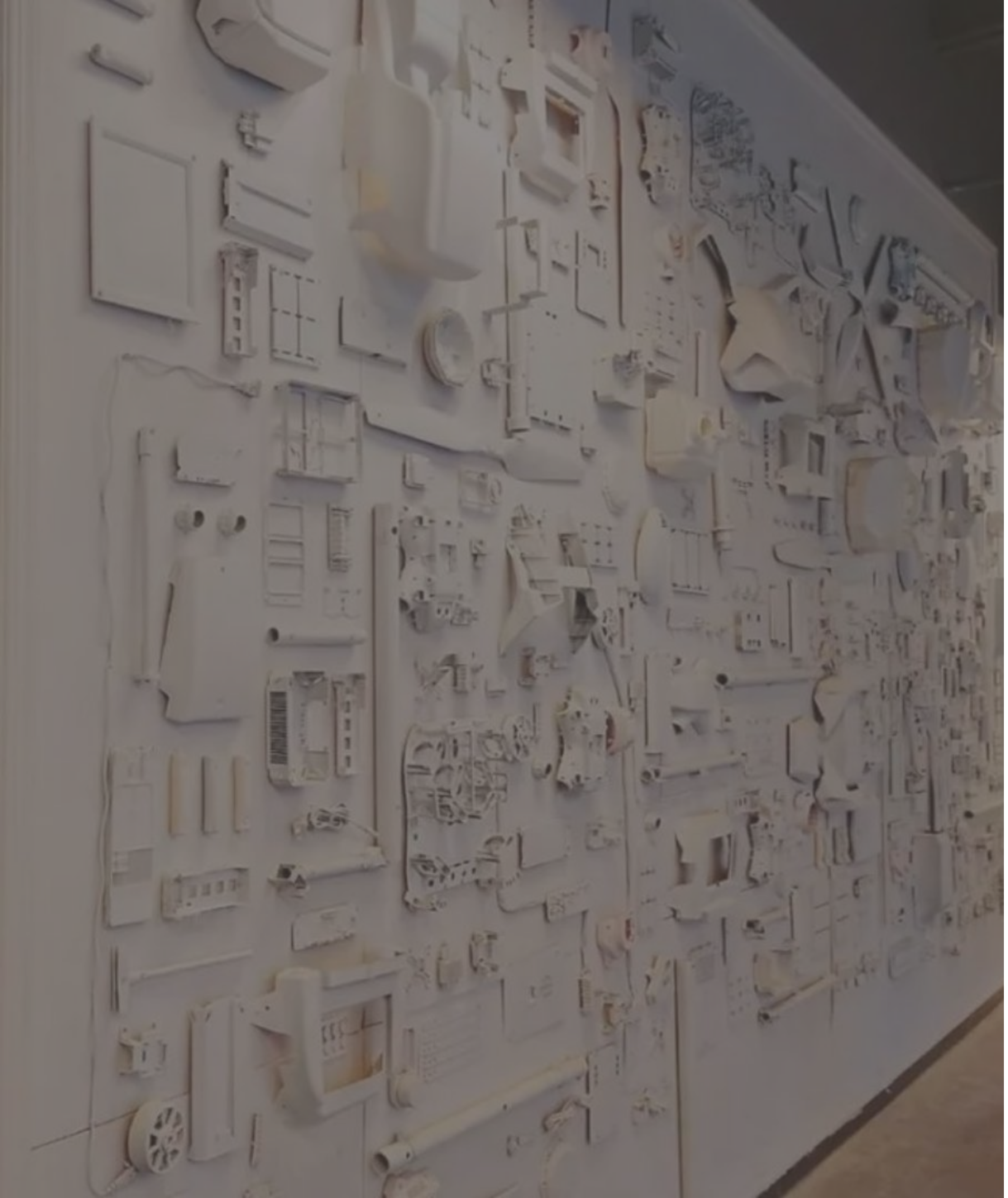
XAG ACADEMY
GLOBAL TRAINING
PROGRAM

XAG

Drone Principles, D&A and Troubleshooting





01 | Core of Drone Systems Overview

02 | Fault Diagnosis Methods and Recurring Problems

03 | Preventive Maintenance and Three-level Inspection System

01 Core of Drone Systems Overview

XAG P150 Max Agricultural Drone

Drone Platform

Payload System

Two core systems

- **Drone platform:** a basic flight carrier, which can fly independently even without the payload system.
- **Payload system:** RevoSpray 5 (spraying), RevoCast 5 (spreading), RevoSling 2 (transport) work in synergy with the drone platform, which supports quick and easy removal and installation.

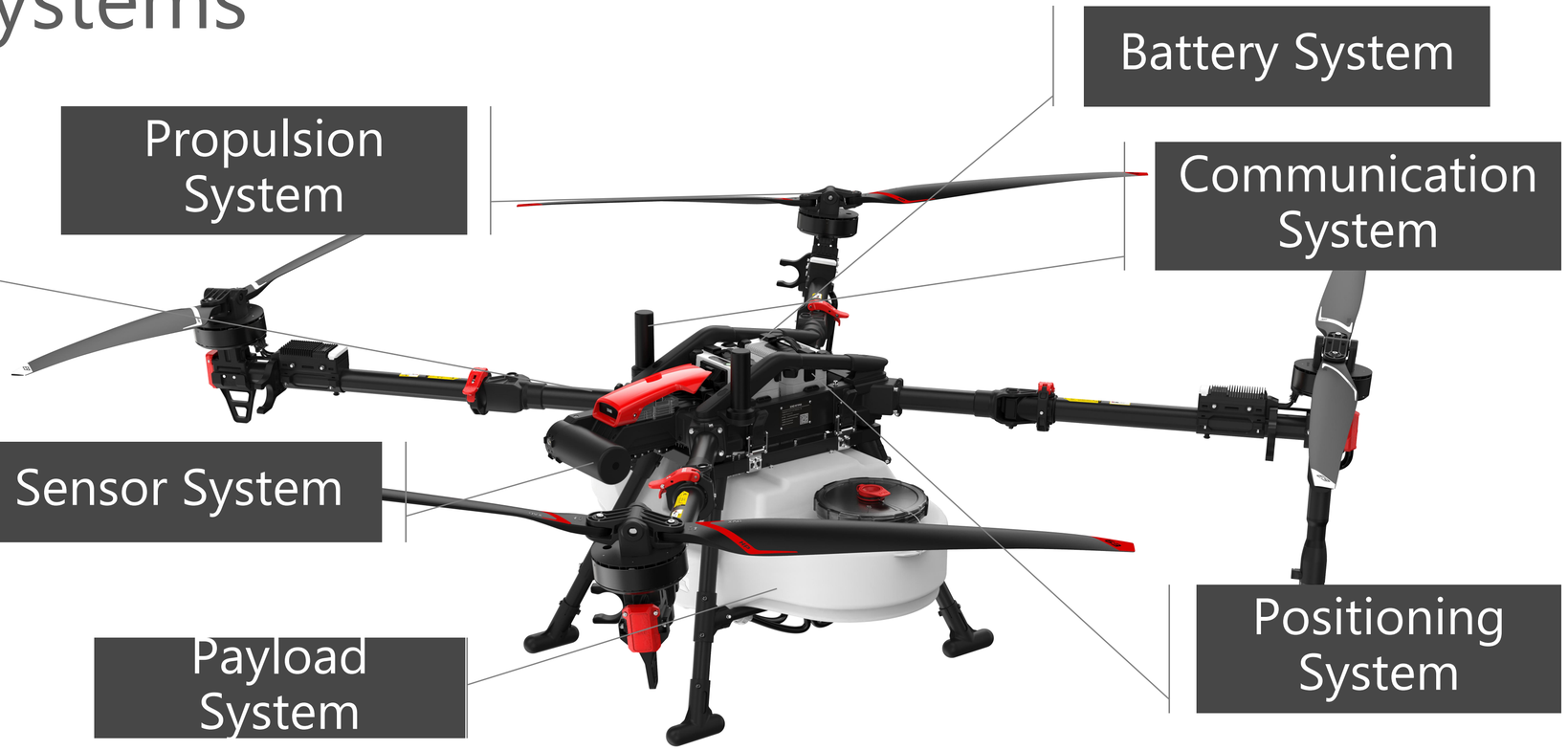
XAG P150 Max Agricultural Drone

RevoSpray

RevoSling

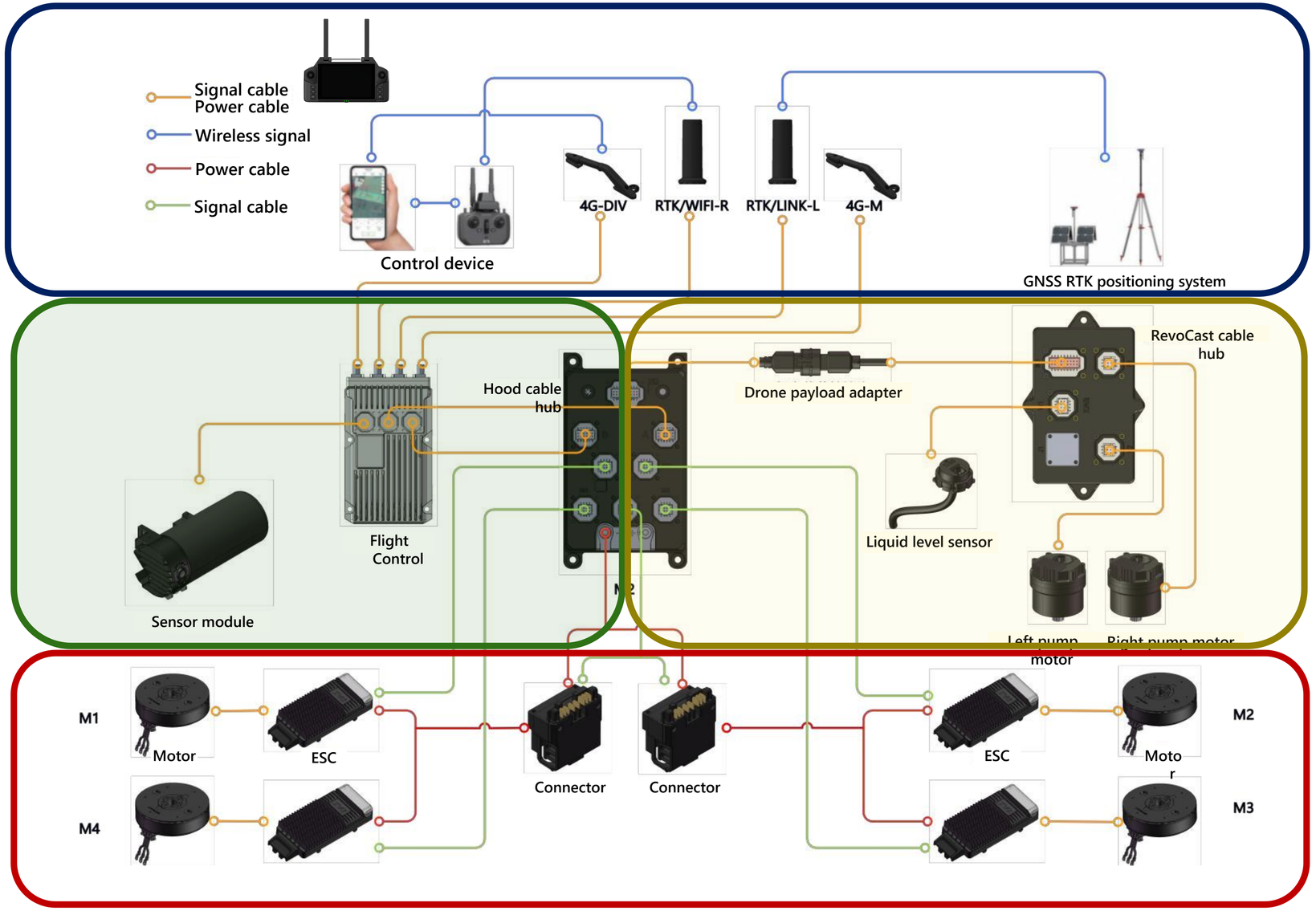
RevoCast

Agricultural Drone Systems



Flight control ("brain" of the drone)
Functions: Receive commands, fuse sensor data, output control signals, support autonomous takeoff/landing, route flight, obstacle avoidance, and precision spraying/spreading.
Key dependencies: It relies on the sensor system (radars and FPV camera) to achieve environmental sensing, and the positioning system to achieve high-precision positioning.

Connection Diagram of System Modules (RevoSpray)



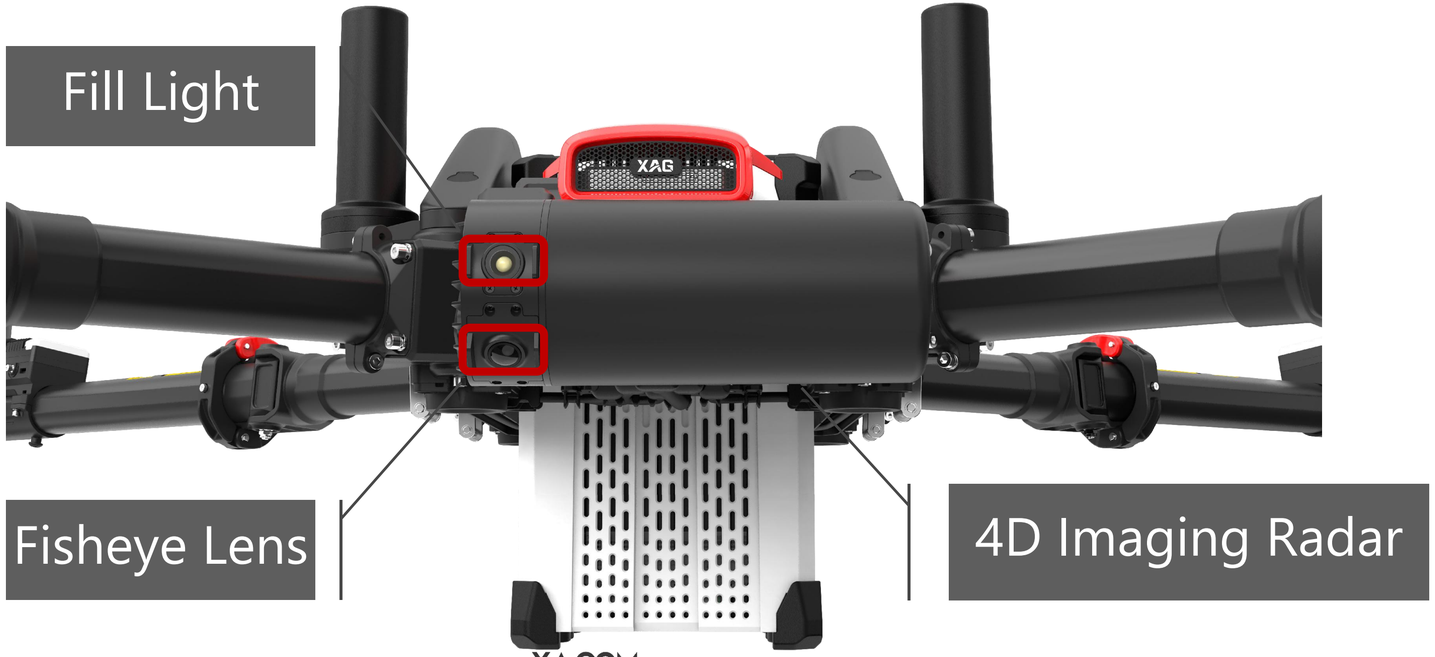
Sensor System

The sensor system is used for environmental monitoring and data transmission.

The 360-degree rotary radar detects the distance and speed of obstacles by emitting and receiving radio waves.

Fisheye lens cameras are the primary tools for the drone's visual perception. They capture high-resolution images, transmit them in real time for display, and enable virtual gimbal effects. When used with supplementary lights during night operations, they produce clear images.

The Flight Control module features aerial survey functions, with a single aerial survey area of up to 20 hectares.



Sensor System

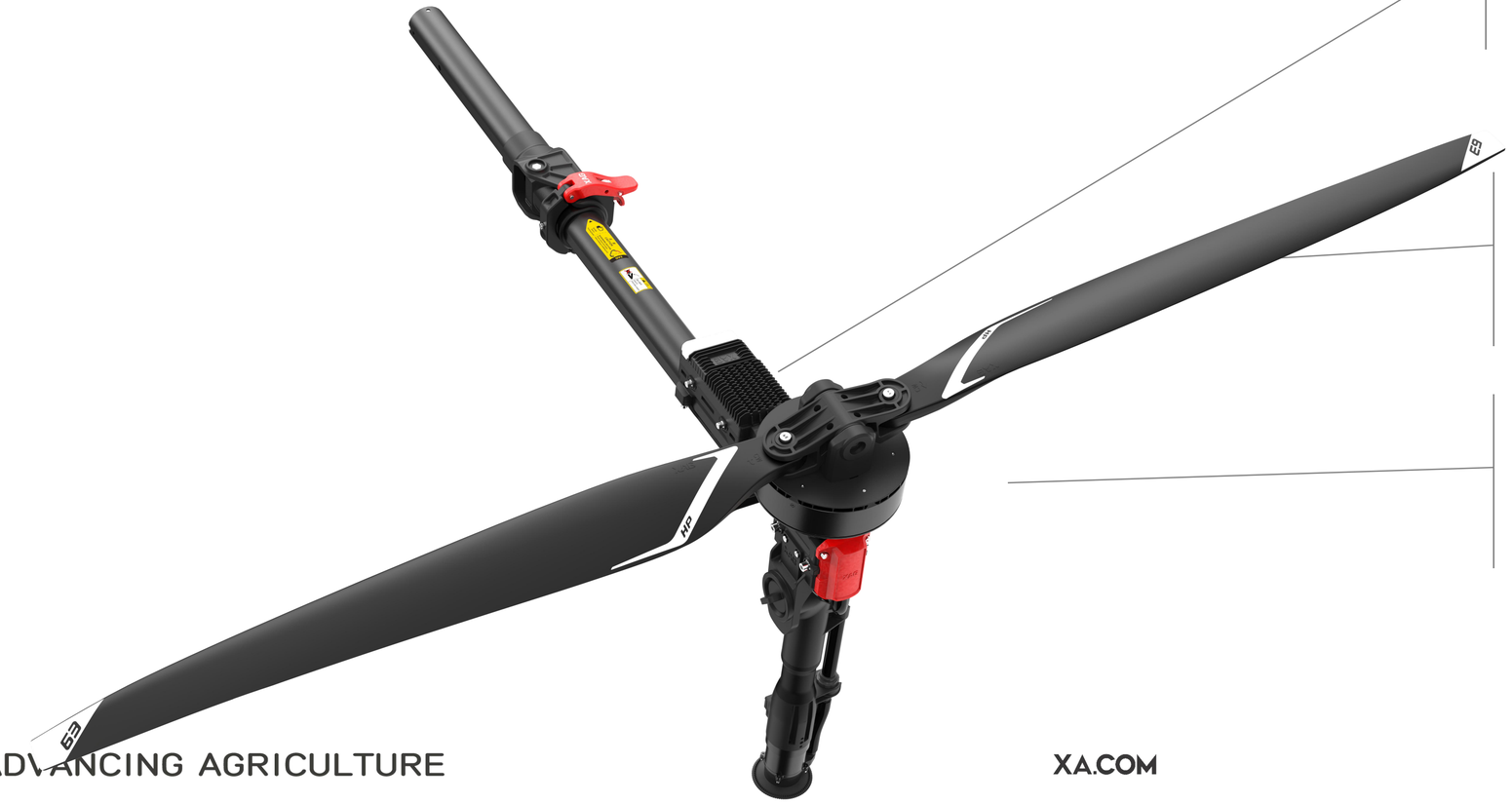
The FPV camera and 4D imaging radar enable environmental perception, feed the information back to the Flight Control, thus supporting the Flight Control in achieving intelligent regulation.

FPV camera

4D imaging radar

Propulsion System

The propulsion system provides power required for flight and is the core to achieve flight. It mainly consists of the cable hub, main ESC, main motor, and propellers, and outputs power for the drone.

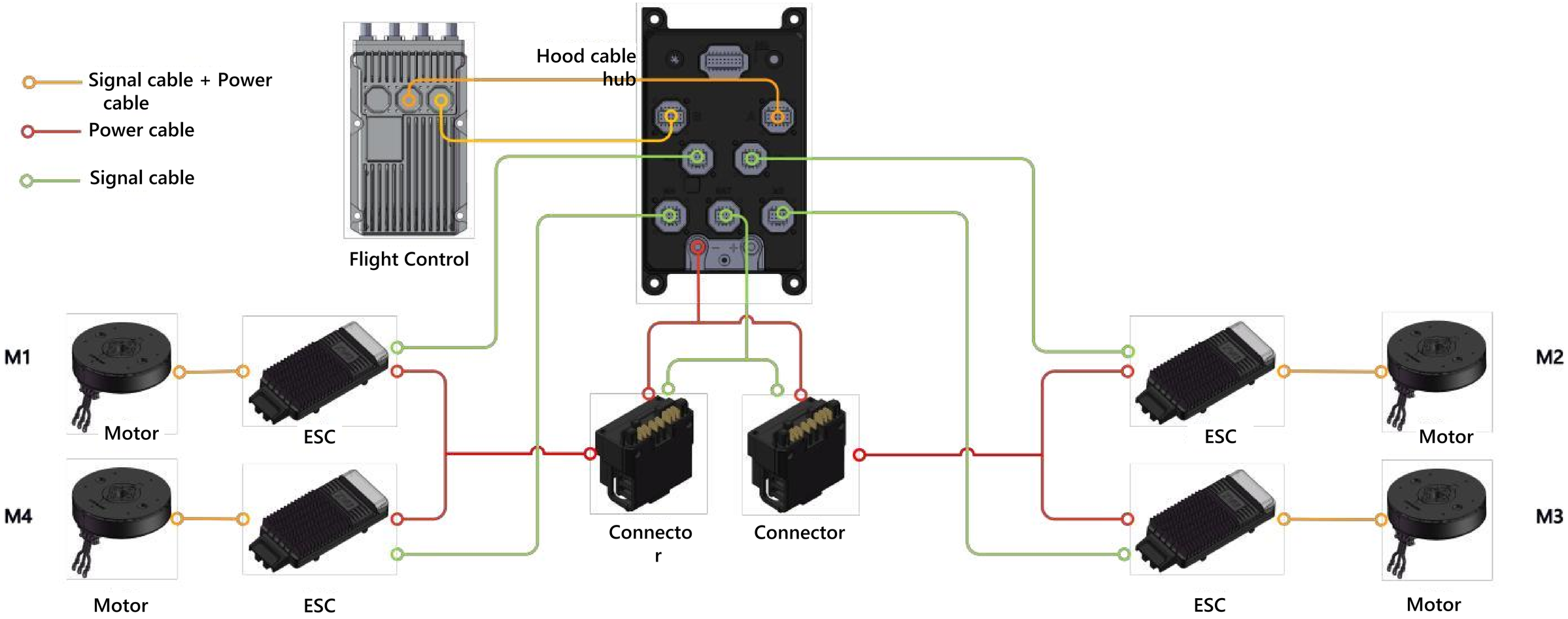


ESC

Propeller

Motor

Propulsion System



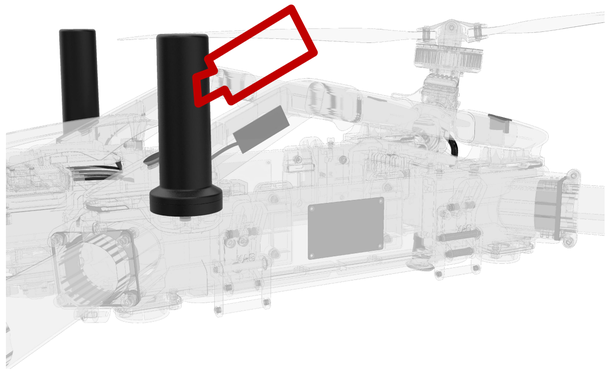
Positioning System & Communication System

The positioning system includes an omnidirectional antenna, which provides Wi-Fi and RTK functions and delivers the drone's precise real-time position.

The communication system is responsible for signal data transmission and reception. It contains a 4G module built into the handle.

XRTK7 integrates point marking and portable base functions, addressing high-precision positioning and long-distance communication issues in weak or no-signal environments.

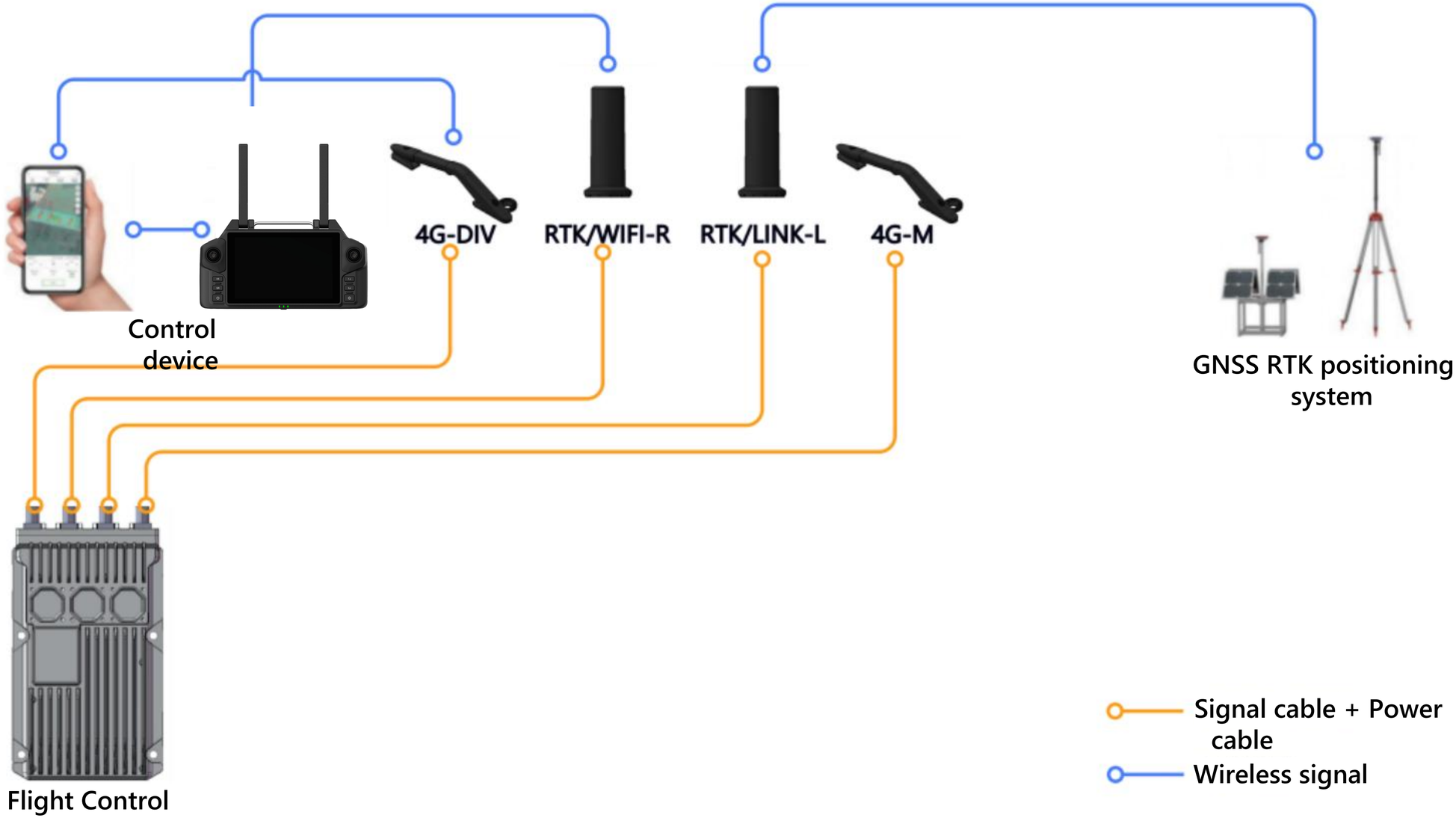
Omnidirectional antenna
(including Wi-Fi and RTK)



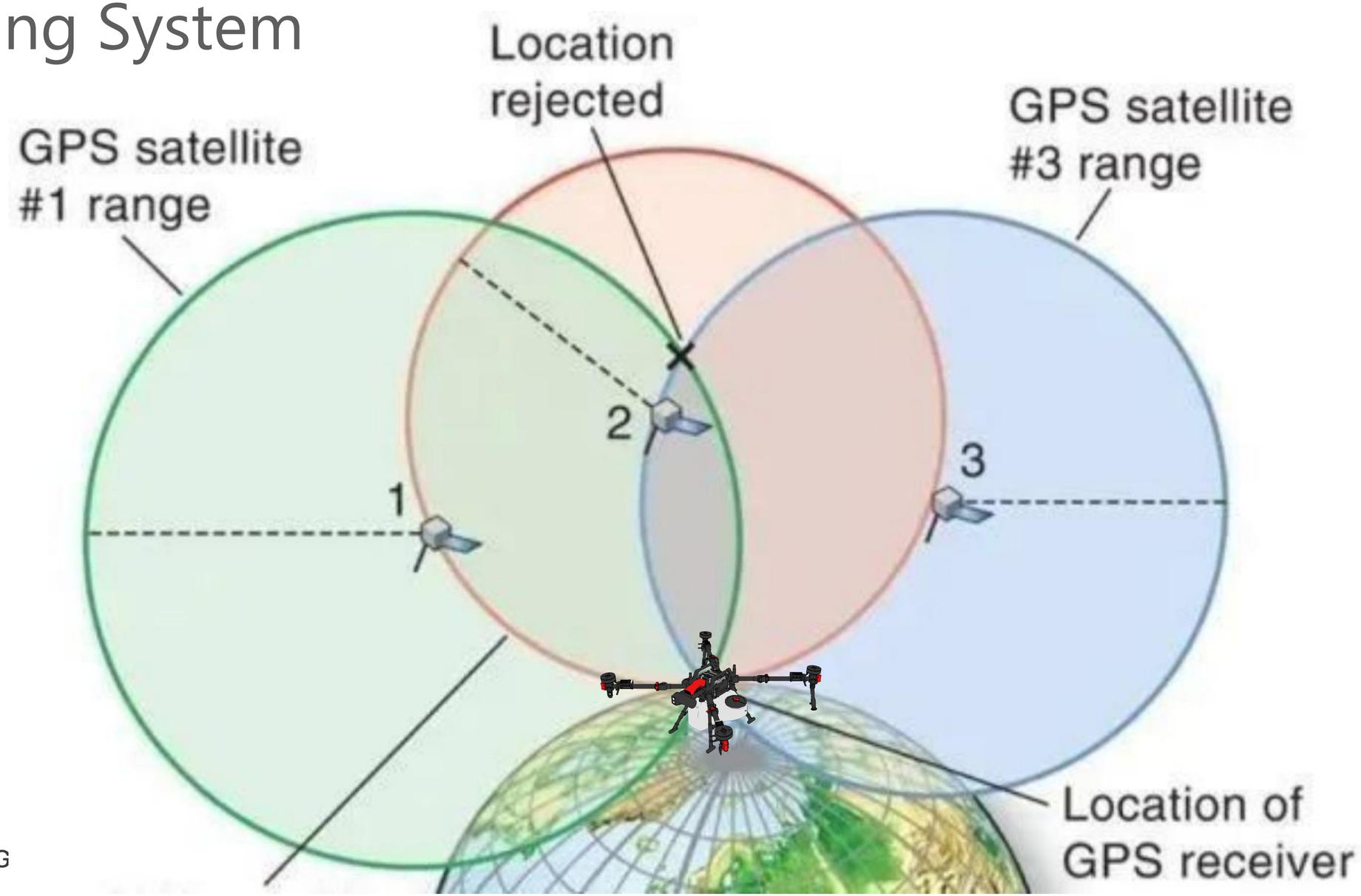
4G antenna

XRTK7

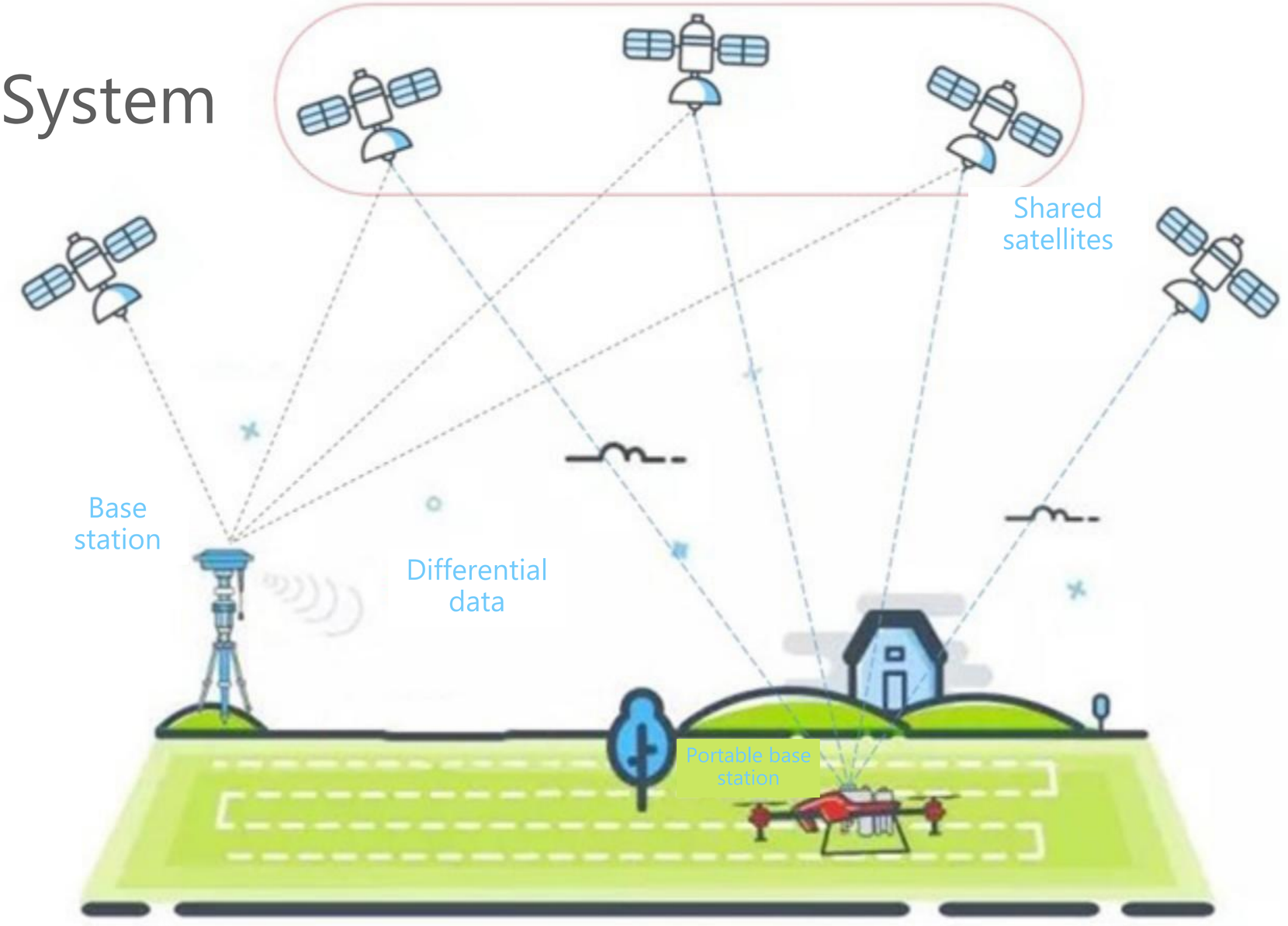
Positioning System & Communication System



Positioning System



Positioning System



Spraying System

P150 Max Spraying System - RevoSpray is used for precise pesticide spraying, mainly consisting of the following components:

Liquid tank: Stores pesticides needed for spraying, coming standard with 75 L capacity.

Spraying hose: Connects the liquid tank and the nozzles, responsible for delivering liquid from the tank to the nozzle.

Flexible impeller pump: A high-efficiency pump that enables uniform pesticide spraying.

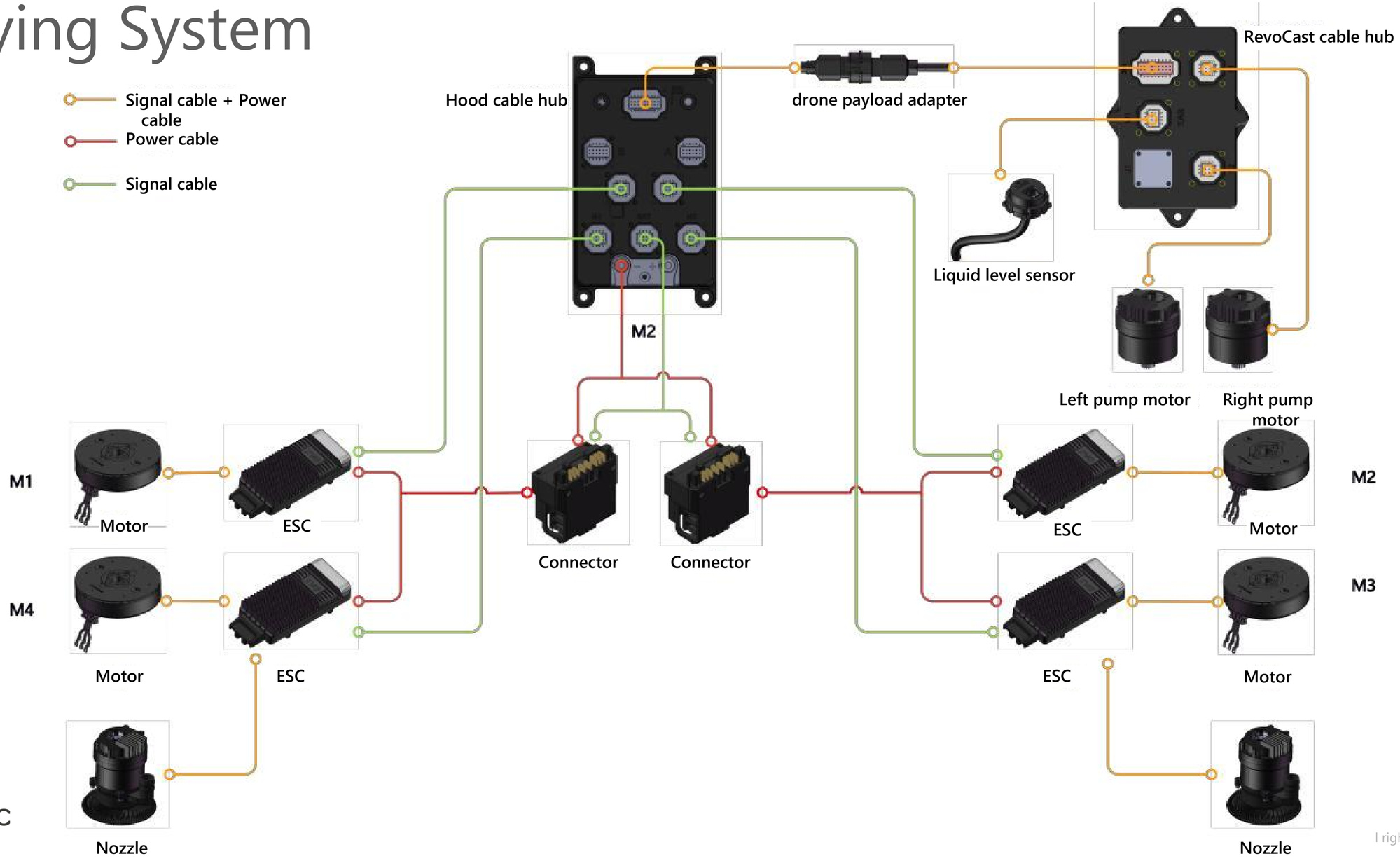
High-performance nozzle: Atomizes liquid into fine particles, ensuring uniform coverage of pesticide on crop surfaces and improving pesticide utilization.

The advanced atomization technology of XAG can precisely control droplet size to achieve the optimal spraying effect.

Spraying System

The centrifugal nozzle consists of a centrifugal motor and a centrifugal spray disc. The motor provides the centrifugal force for atomization, delivering high torque during high-speed rotation. The centrifugal spray disc provides an acceleration channel, ensuring that water droplets do not spill while passing through the channel, thereby achieving effective atomization.

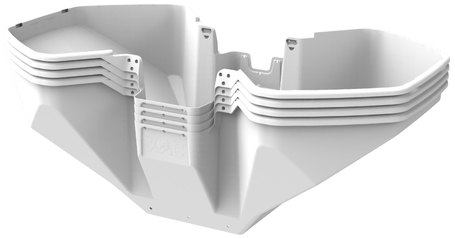
Spraying System

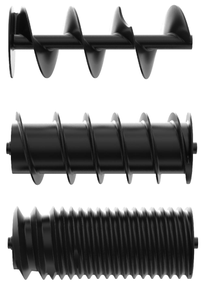


ADVANC

Spreading System

The P150 Max Spreading System mainly consists of a granule container, screw feeder, and spread disc, enabling precise spreading of seeds and solid fertilizers to desired locations. The extra-large 115 L granule container enables a max load of 80 kg. It features three screw feeder sizes (large, medium, and small) to meet diverse operation needs. The oscillating vertical spreading allows for even distribution of the granules without clumping or adhesion, meeting the needs of precise spreading.

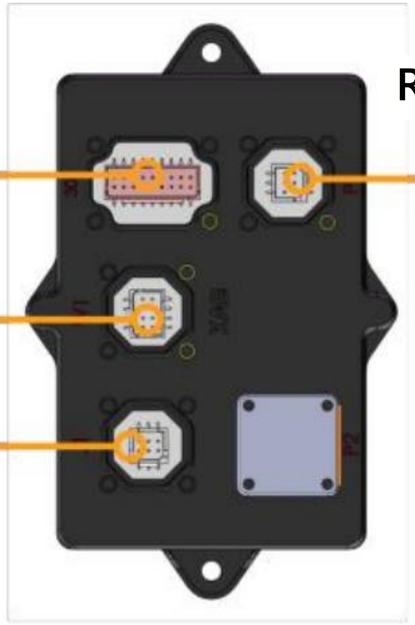




Spreading System

Hood cable hub

drone payload adapter



RevoCast cable hub

Granule level sensor

Screw feeder motor

Spread disc motor

Signal cable + Power cable

Power cable

Transport System

The P150 Max transport system mainly has two transport modes: RevoSling,

The RevoSling system adopts the smart hook, supporting one-handed operation with the maximum payload of 80 kg.

The transport system also supports two-point shuttle mode, with straight-shuttle and route-recorded shuttle, which reduces the operator's workload.

02 Fault Diagnosis Methods and Recurring Problems

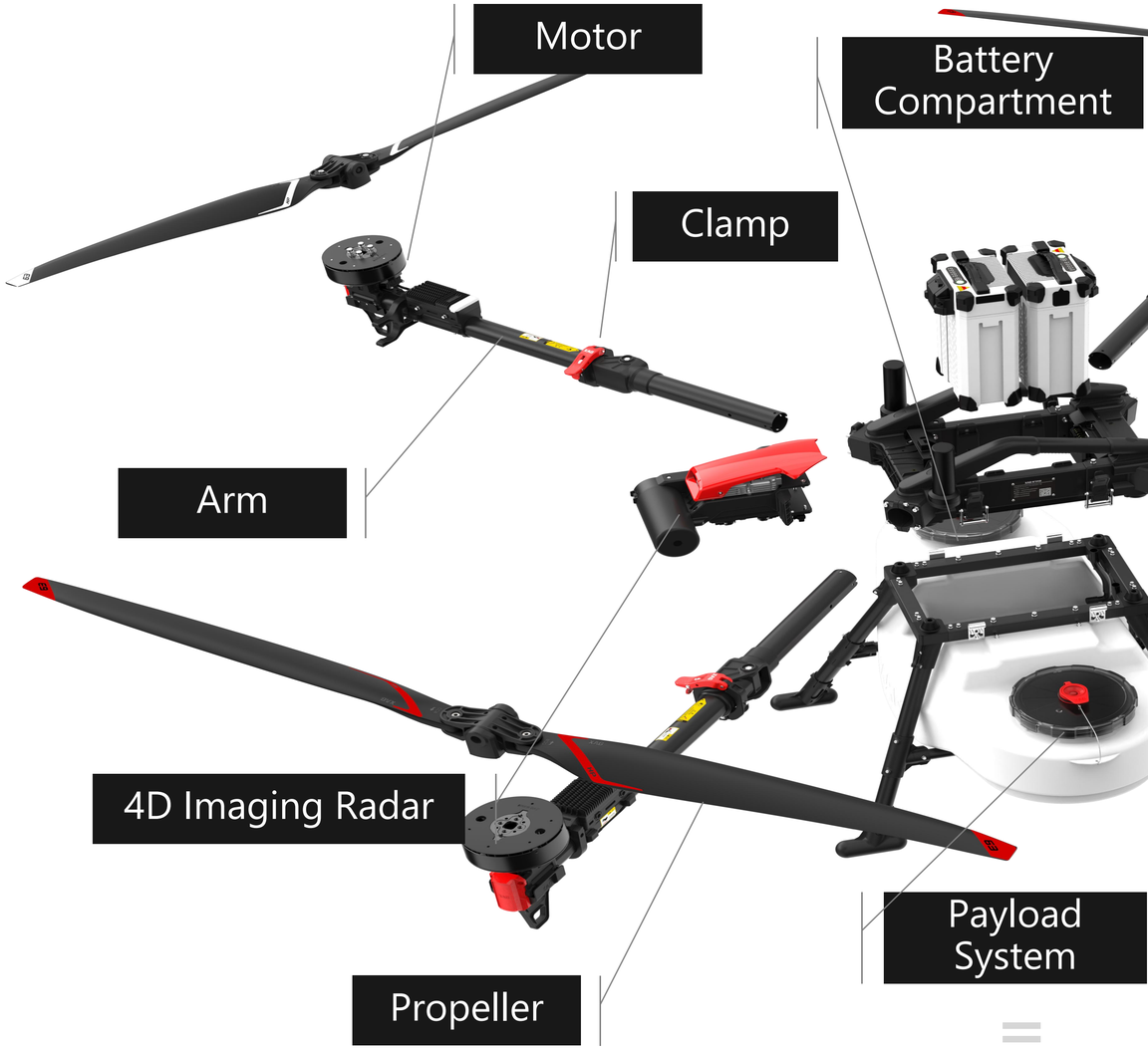
Basic Diagnostic Principles

From outside to inside, and from easy to difficult:

- About 40% of malfunctions are caused by externally visible factors, such as loose cables, physical damage, or oxidized interfaces.
- Appearance inspection and interface check should be prioritized to avoid direct disassembly of core modules.

Tools to use:

- Xcare Tool app: indoor/outdoor testing to generate diagnostic reports
- Motor tester: independent testing of motor status with light signal feedback



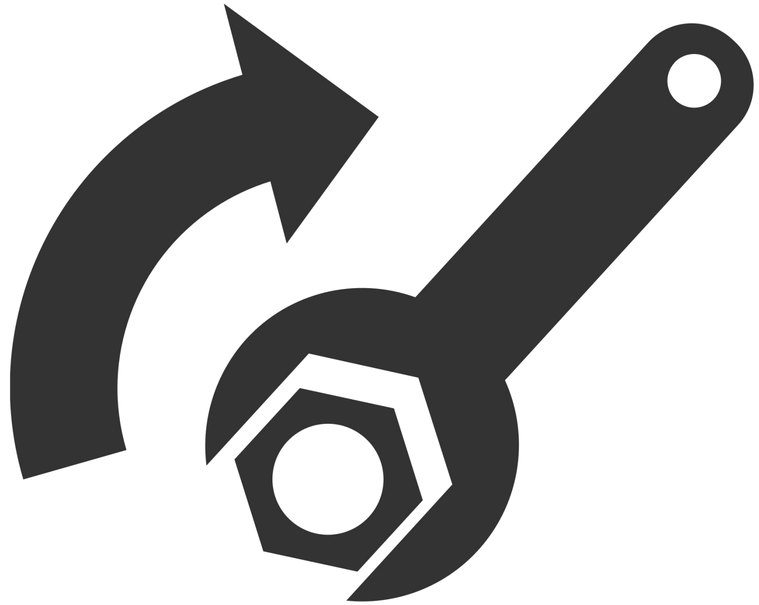
Key Points for Maintenance

Fasteners:

- All screws should first be pre-tightened by hand, and then tightened with torque tools according to the specified torque values.
- Never use excessive torque to avoid fastener thread stripping or breakthrough.

Modular assembly and disassembly:

- It is recommended to assemble/disassemble by functional modules to avoid interface damage due to rough operation.



XCare Tool App

The XCare Tool App is an automated diagnostic tool developed for XAG's intelligent agricultural equipment. Once a repair order has been submitted, the app enables both indoor standalone testing and outdoor flight testing of agricultural UAVs, without requiring disassembly.

Operating System: Android (including Android-based systems such as HarmonyOS, MIUI, etc.; not available for iOS)

Full-System Testing Overview

Full-system testing applies to UAVs capable of normal startup and is divided into indoor and outdoor testing. Before use, the equipment must have a properly submitted repair order. Authorization is granted only after the order is submitted and assigned to an engineer.

- Indoor testing should be used when the UAV is intact and powers on normally.
- Outdoor testing should be used after repairs are completed and the UAV has successfully passed indoor diagnostics and test.

设备检修界面

设备详情：点击头像，查看设备当前状态
室内一键检修：点击进入室内测试界面
室外测试：点击进入室外测试界面
更换飞控：点击进入飞控配置

电调配置：点击进入电调配置
固件升级：点击查看固件版本及固件升级
产品信息修改：可进行产品信息修改
归还使用权限：将无人机权限归还给使用者

Arm-to-Crossbeam Removal Guide

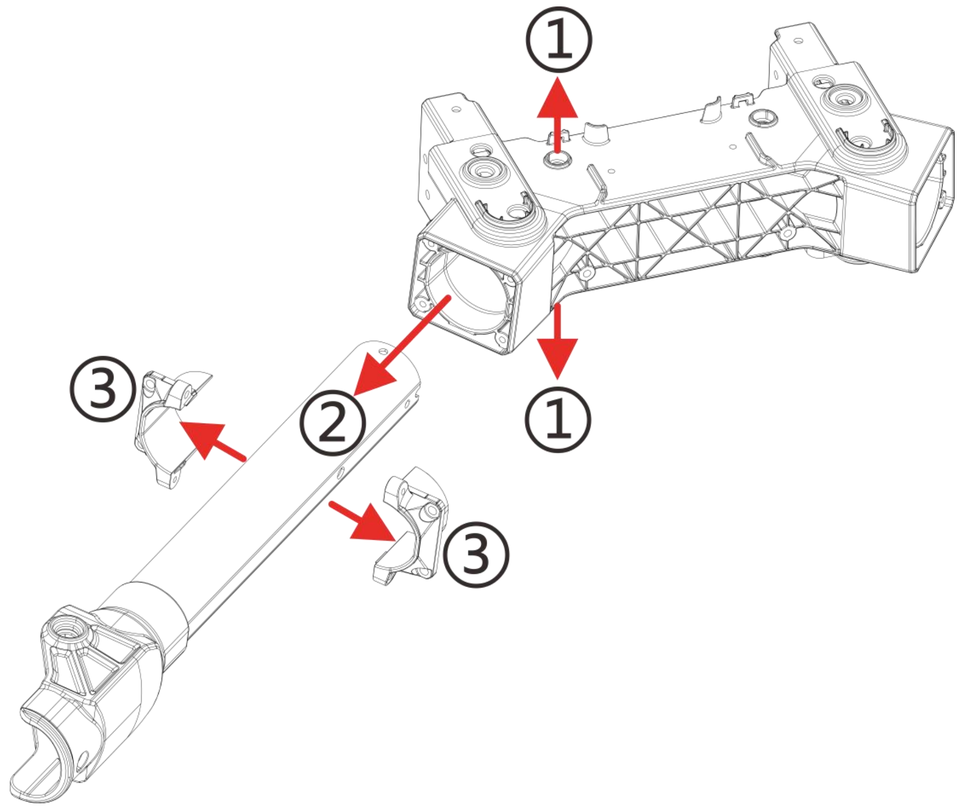
Disassembly Sequence

1.First, remove the two screws on the upper and lower sides of the drone crossbeam.

2.Remove the four M5 × 20 screws at the front where the arm connects to the drone. Then pull the arm outward to detach it.

3.Pull the arm outward to separate it completely (ensure the motor cables and positive/negative connectors inside the arm are disconnected before removal).

4.Finally, remove the two M5 × 20 screws on the upper and lower sides of the arm’ s half-flange, then separate the half-flange.



Disassembly and Assembly Notes

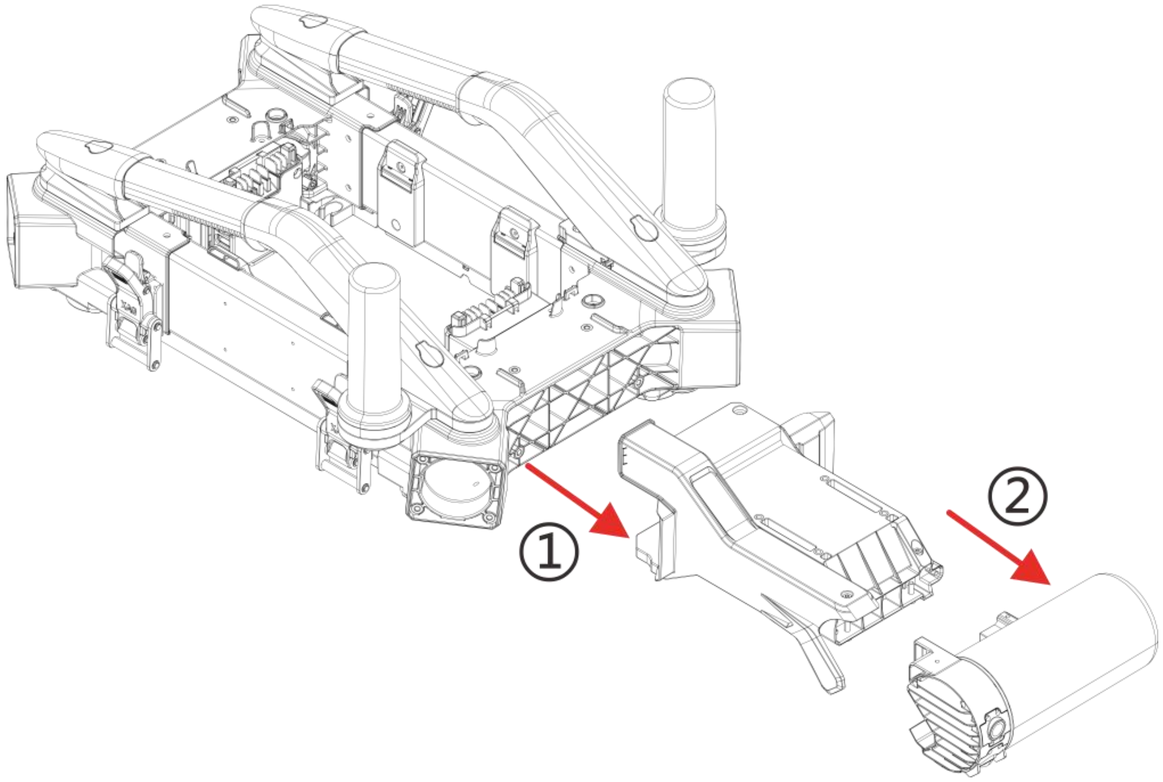
- Before disassembly, ensure the motor cable connectors, hub board connectors, and positive/negative connectors are fully disconnected.
- If separation is difficult during disassembly, clean the parts to remove dirt or corrosion; do not strike with hard objects.
- During assembly, strictly follow the diagonal fastening principle.
- After installation, check the assembly angle to ensure the arm is free of twisting, deformation, and is properly fastened

Hood and Sensor System Removal Guide

Disassembly Sequence

1.First, remove the four M5 × 20 screws connecting the hood frame to the drone crossbeam (note: disconnect the two-sensor system plugs from the hub board beforehand).

2.Next, remove the four M4 × 14 × 8 screws securing the sensor system to the hood.



Disassembly and Assembly Notes

- When removing or installing the hood, disconnect the two sensor system plugs from the hub board beforehand.
- Screws for the flight control system and its cables must be tightened using the diagonal tightening method.
- When routing the harness from the top of the hood down to the hub box, use cable ties to bundle and secure the wires.

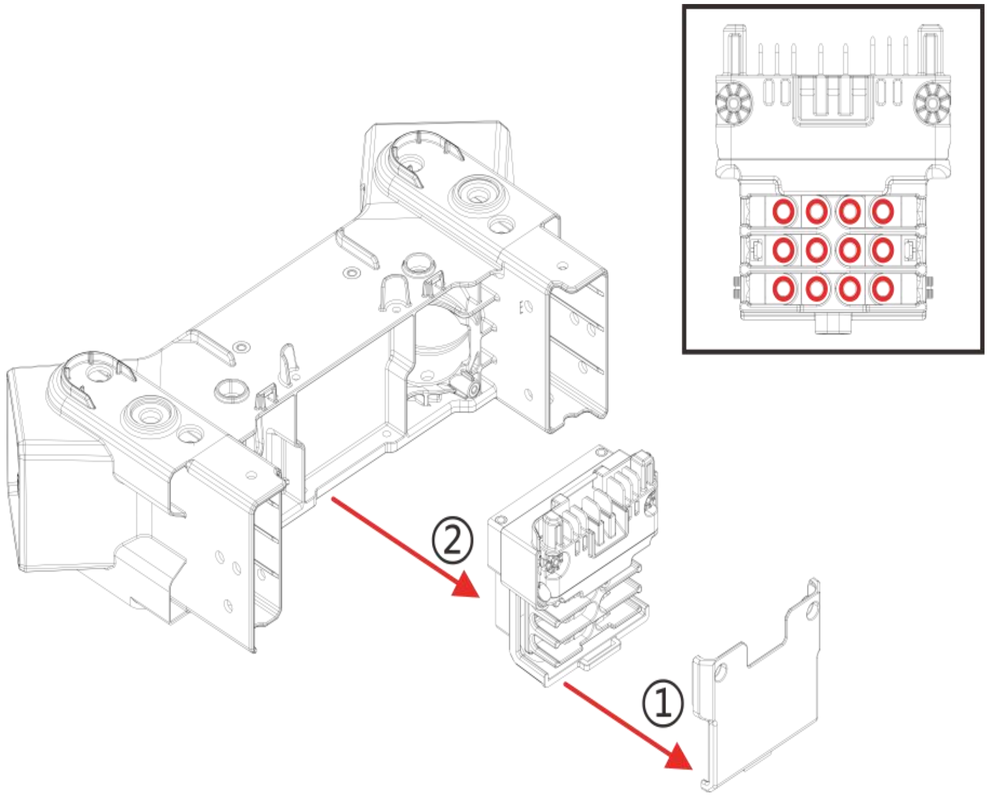
Power Socket Removal Guide

Disassembly Sequence

1.First, remove the four null screws securing the battery tail socket rear housing to the crossbeam (note: disconnect the battery tail socket plug from the hub board beforehand).

2.Next, remove the two M3 × 8 screws from the upper part of the battery tail socket front housing.

3.Finally, disconnect the positive and negative motor connectors at the battery tail socket in sequence (be sure to note the correct positions of the positive and negative motor connectors).



Disassembly and Assembly Notes

- During disassembly and assembly, take care to protect the tail socket contact tabs to avoid damage.
- During installation, ensure that the power positive/negative bus board corresponds correctly with the ESC power supply wires; reversed polarity may cause severe equipment damage.
- Take care to protect the bus board tabs during disassembly and assembly, otherwise overheating or burnout may occur.

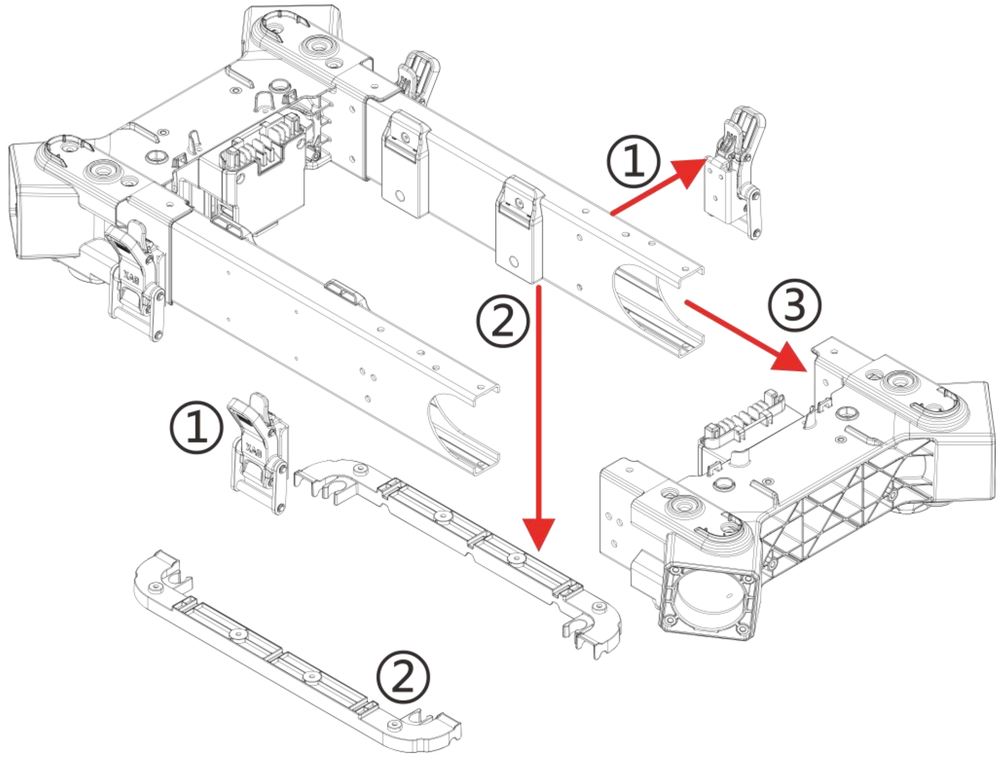
Crossbeam-to-Side Beam Removal Guide

Disassembly Sequence

1.First, remove the three M5 × 14 screws securing the quick-release latch to the side beam, then take off the latch (four in total, two on each side).

2.Next, remove the two M4 × 8 screws connecting the wiring duct to the underside of the side beam, then remove the duct (same procedure for both sides).

3.Then, remove the four M5 × 14 screws at the front of the crossbeam-to-side beam joint (top and bottom), along with the four M5 × 14 screws at the rear of the side beam (top, bottom, and inner side) (same procedure for both sides).



Disassembly and Assembly Notes

- When removing or installing the wiring duct, first remove or restore the nylon ties securing the cables, and carefully manage cable routing.
- Fasteners for the latches and drone assembly must be tightened strictly in accordance with torque control requirements, otherwise excessive vibration or instability of the UAV may occur.

Main Motor Precision Removal Guide

Disassembly Sequence

1.Use a hex screwdriver to remove the main motor bearing cover plate, then separate the motor shaft circlip with snap ring pliers.

2.Pull out the main motor outer rotor (a three-jaw puller can be used for extraction).

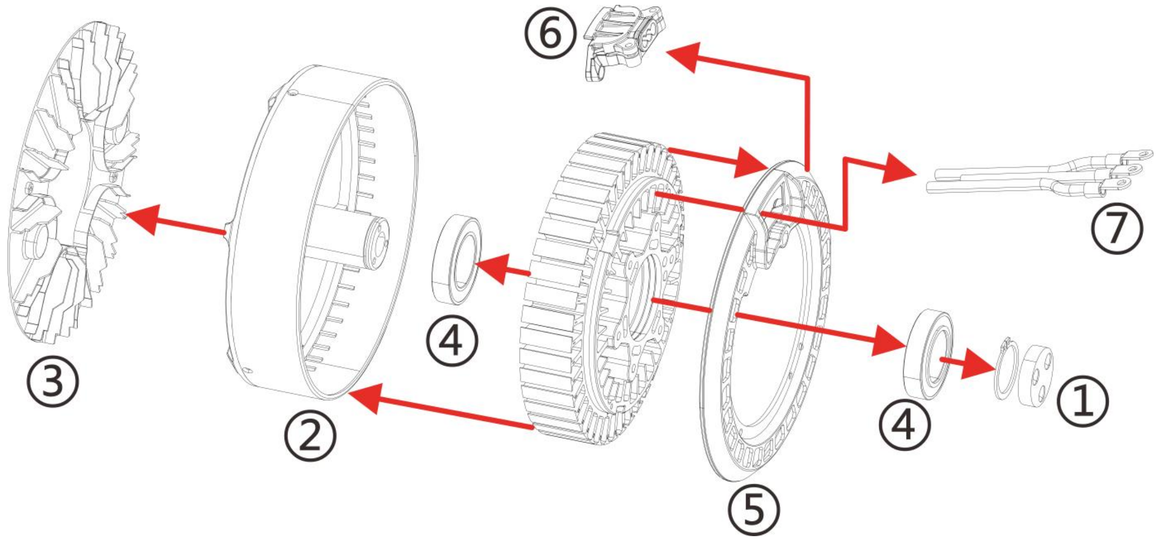
3.Use a hex screwdriver to remove the main motor heat dissipation cover (if the cover is damaged, only this step is required).

4.Use a three-jaw puller to separate the main motor bearing (steps 1 and 2 must be completed beforehand).

5.Use a hex screwdriver to remove the screws securing the motor retaining ring and the three-phase wire protective cover, then detach the retaining ring.

6.Remove the screws securing the three-phase wire protective cover, then detach the cover.

7.Cut the Three-Phase Wires with wire cutters to disconnect them from the motor.



Key Points for Maintenance

Negative example 1:
The propeller clamps are not fixed properly, which causes uneven stress. This fault results in clamp detaching from the propeller and drone crash.

Negative example 3:
During maintenance, insufficient attention was paid to the plugs and their sealing rings, allowing liquid (water or pesticide) to seep in during flight. This fault caused flight control short circuit and drone crash.

Negative example 2:
The ESC screws are not fastened properly, which causes sparks at the ESC during flight. This fault leads to an ESC short circuit and drone crash.

03 Preventive Maintenance and Three-level Inspection System

Maintenance Principle: Prevention over Repair

The purpose of maintenance is to avoid natural damage and reduce the risk of in-flight malfunctions (e.g., crashes or injuries) through proactive intervention.
It is found in China that most non-collision damages are caused by "lack of care for device" or "lack of maintenance".
Focus on high-load parts, moving parts, and electrical interfaces

Maintenance Categories

Periodic maintenance:

- For high-load/moving components (including propellers, motors, connectors, propeller clamp bearings, and landing gears).
- The maintenance work includes wear check, cleaning, and lubrication.

Scenario-based maintenance:

- Before long-term storage: Thorough cleaning, emptying, anti-rust and moisture-proof treatment.
- Before reuse: overall functional testing, firmware upgrade, and replacement of aged parts.

Periodic Maintenance System: Detailed Description of A/B/C Checks

A-Check

After **accumulative 50 flight hours**, necessary checks beyond the regular app check guidelines must be performed to ensure the safety and reliability of the device.

B-Check

After **an accumulative 100 flight hours**, must perform a critical check on the premise of completing A-Check. Specifically, check components including motor bearings, propeller clamp bearings, fasteners at critical drone locations, and consumable parts of the load system, and replace them as needed.

C-Check

After **an accumulative 150 flight hours**, must perform a critical check on the premise of completing B-Check. Specifically, check fasteners at critical drone locations and consumable parts of the load system, replace key components, and calibrate the deformation of external frame structural parts (e.g., drone arms).
The device continues to operate after the completion of the C-check. The maintenance procedure should be restarted from the A-check after reaching 200 flight hours

Check purpose: Ensure normal operation of all drone components and maintain flight safety.

Maintenance Before Long-term Storage: Anti-rust, Cleaning, and Protective Measures

01

Thorough cleaning after operation

Clean off liquid residue immediately after each operation to prevent solidification that may cause component jamming.

02

Drone cleaning and check

Clean the drone with a soft cloth, check for signs of damage or corrosion, and address any identified issues promptly.

03

Replacement of used lubricating oil and lubrication

Drain used lubricating oil and replace it with fresh oil to ensure moving parts are fully lubricated for less wear.

04

Overall protective measures

Before storage, take dust-proof and moisture-proof measures: either by using protective covers or by storing it in a dry and ventilated area.

04 | Quiz

Quiz

Q1: If the drone exhibits severe vibration during flight, what could be the cause and how should it be resolved?

- Possible causes: deformed propeller or loose motor base
- Troubleshooting: Replace the propeller, and tighten screws in the motor base

Q2: When a "no signal from ESC" alarm appears, explain your troubleshooting approach.

- Appearance inspection: Check the connecting cables and plugs between the Flight Control and the central cable hub first for any visible physical damage, loose defect, or disconnection.
- Stepwise check: If no defects are found in appearance inspection, check the signal cables and ports between the cable hub and the ESC.
- Tools to use: Use the "Xcare Tool" app for indoor testing or use a motor tester to conduct independent testing of the ESC, to further identify malfunction points in cables, plugs, the ESC, or the cable hub.

THE END