

**AIRWOOD**

PRODUCT MANUAL

## ABOUT US

UAVI Technology (Shen Zhen) Limited is a Shen Zhen company focused on providing the best products and solutions for STEAM education. Our goals are to develop smart devices focused on the education and entertainment markets, while providing detailed plans and technical support for our corporate clients.

Airwood specializes in its unique education program incorporating hardware design, software development, and wooden parts assembly. We combine theory with practice and product, and bring state-of-the-art technology to students and teachers at a relatively low price, thereby being one a kind in the education market.

## PRODUCT INTRODUCTION

Designed for the STEAM education market, the AIRWOOD DIY drone is a series of easily controlled wooden quadcopters with a 2.4 GHz 6-axis gyro, graphics embedded programming, and extension modules. The electronic parts are universal to all our drones. Users can assemble their own wood frames and easily assemble it into a drone.

## GENERAL SAFETY INSTRUCTIONS

Unlike general toys, improper usage may result in personal injuries, property damage, or even violation of the law. Please read the manual carefully and follow our guidelines. Our company will not be responsible for any consequence caused by failing to comply to our guidelines.

## WARNING

AIRWOOD is a recreational and educational aviation model. The pilot should always keep the drone in sight when flying.

The use of drones shall comply with the local civil aviation regulations. The site of use must be suitable for flight and ensure the safety of other people, animal and property.

Drones may not be allowed in public areas such as train stations, airports or public roads. When using drones indoors, be careful not to collide with other objects.

In flight, the drone's propellers can cause damage to people, animals or objects. Do not touch flying drones and please be careful by keeping a safe distance away from an operating drone.

Our drones can only be used with AIRWOOD drone accessories.

If sand particles or dust enters the electrical parts, the drone may not be able to operate normally.

Do not use drones in severe weather conditions such as rain, strong winds and snow, or at nights when visibility is low.

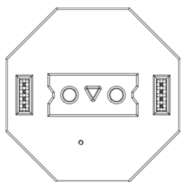
Stay away from high-voltage wires, buildings, parking lots or other potentially dangerous areas.

Keep away from liquid substances when using the device. Do not place drones near water or in moist areas, which may cause irreversible damage.

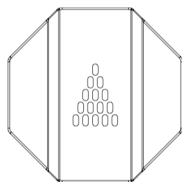
Avoid sun exposure.

For more information, please visit [WWW.UAVI-TECH.COM](http://WWW.UAVI-TECH.COM) or call the customer service hotline **0086-400-688-0803**

## PARTS DESCRIPTION

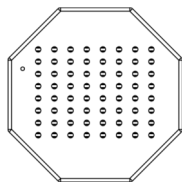


FC X 1



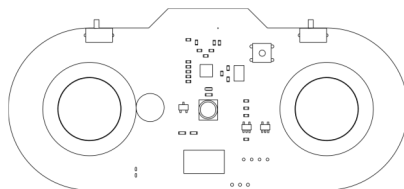
CAMERA X 1

Optional

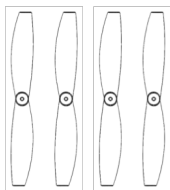


PROGRAMMING MODULE X

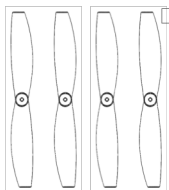
1



CONTROLLER BOARD X 1

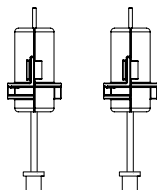


ROTOR BLADES (CCW) X 4

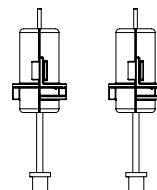


ROTOR BLADES (CW) X 4

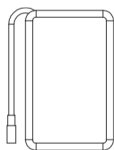
Optional



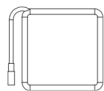
MOTORS (CCW) X 2



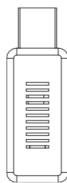
MOTORS (CW) X 2



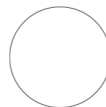
DRONE BATTERY X 1



CONTROLLER BATTERY X 1



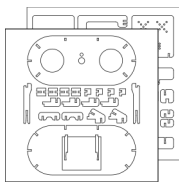
CHARGER X 1



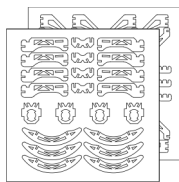
HOOK&LOOP X 2



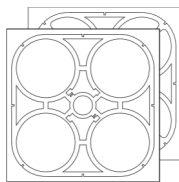
MANUAL X 1



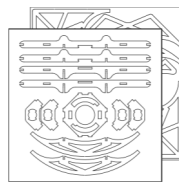
CONTROLLER FRAME X 1  
WITH  
INSTRUCTIONS



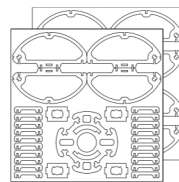
NINJA FRAME X 1  
WITH  
INSTRUCTIONS



CUBEE FRAME X 1  
WITH  
INSTRUCTIONS

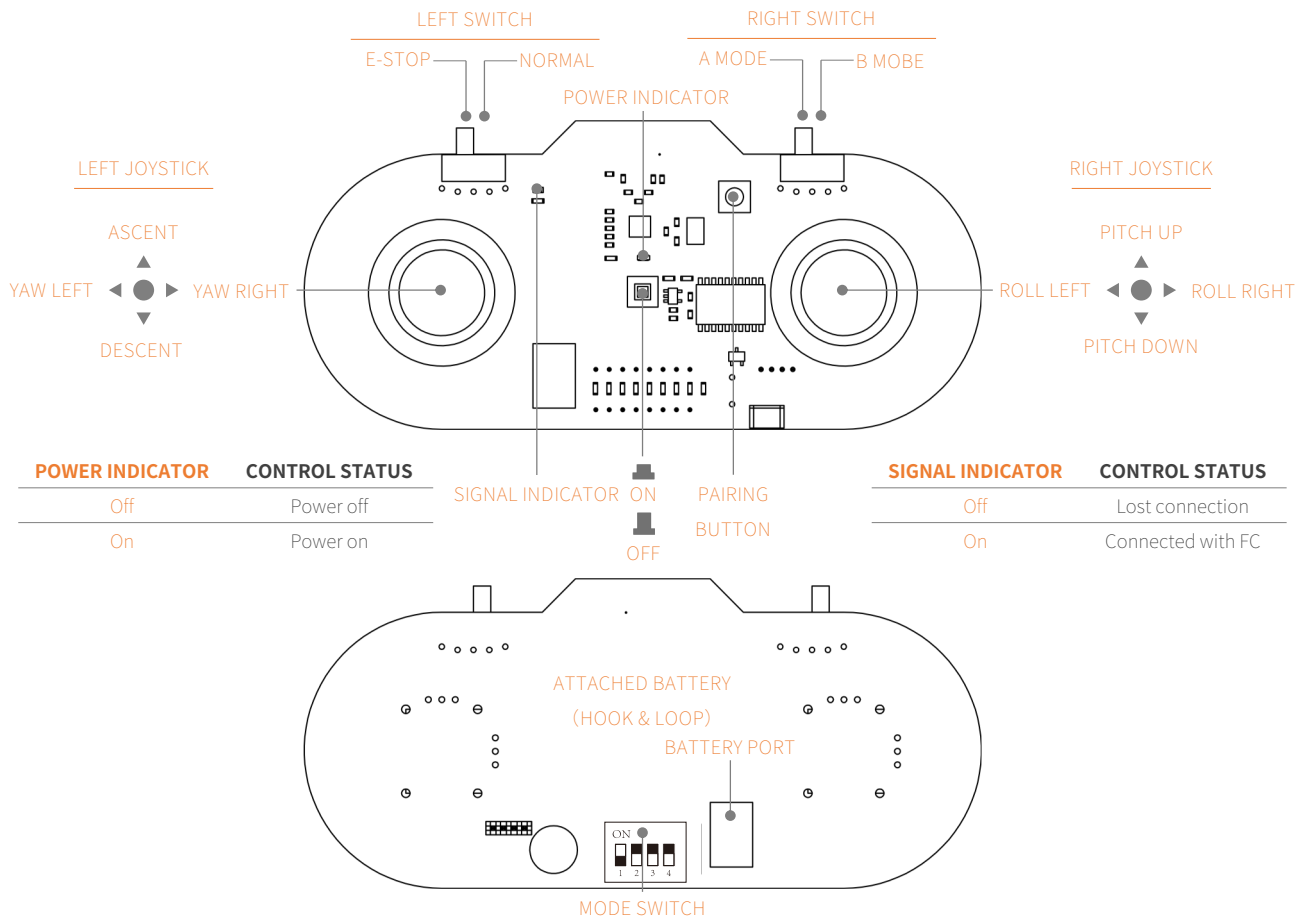


TAICHI FRAME X 1  
WITH  
INSTRUCTIONS



SOPHON FRAME X 1  
WITH  
INSTRUCTIONS

## CONTROLLER INSTRUCTIONS



POWER INDICATOR	CONTROL STATUS
Off	Power off
On	Power on

SIGNAL INDICATOR	CONTROL STATUS
ON	PAIRING
OFF	BUTTON

SIGNAL INDICATOR	CONTROL STATUS
Off	Lost connection
On	Connected with FC

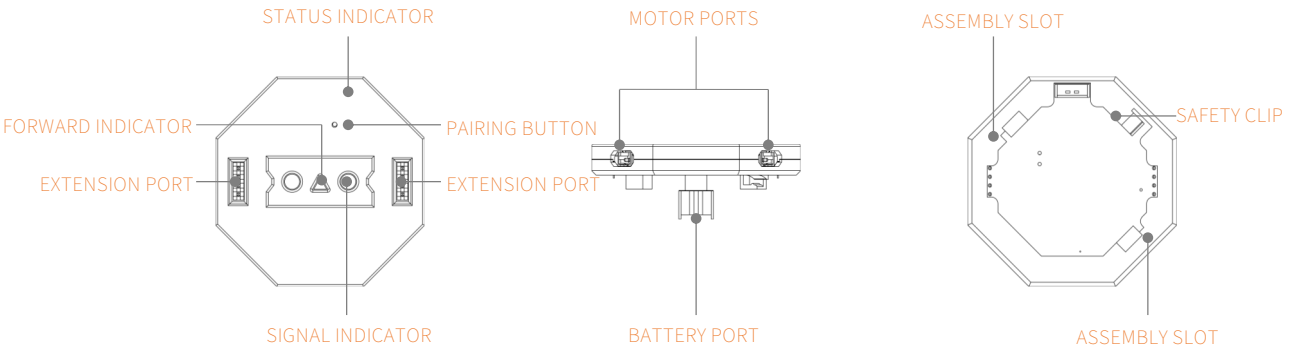
Flight mode will be decided by MODE SWITCH and RIGHT SWITCH together. (The toggles' positions are white in the picture) below

MODE SWITCH	STANDARD I	BEGINNER	STANDARD II	PROGRAM
A MODE	NORMAL	NORMAL	NORMAL	STOP
B MODE	HEADLESS	HEADLESS	HEADLESS	START

Please refer to P15 for MODE DESCRIPTIONS

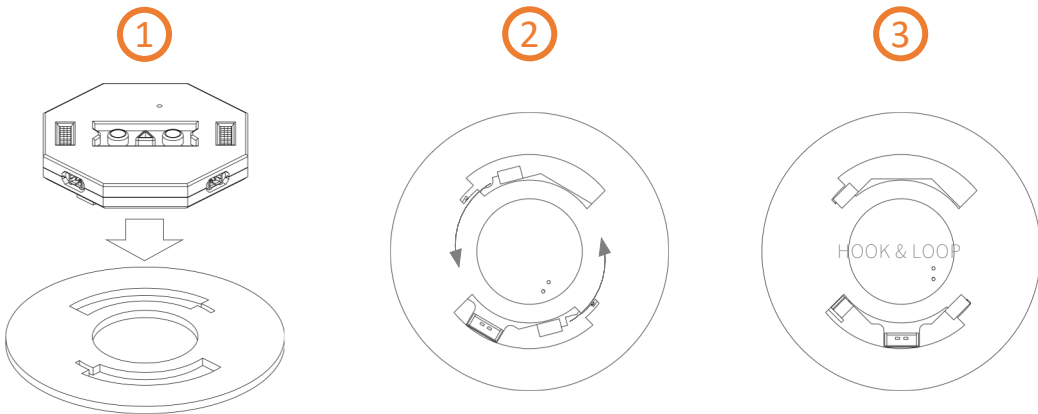
✳️For first flight, it is recommended to use Beginner Mode

## FC INSTRUCTIONS



INDICATOR STATUS	OFF	FLASH	ON
STATUS INDICATOR	Standby	Calibration & Verification	Unlocked
SIGNAL INDICATOR	Connected to FC	Waiting for pairing	Lost connection

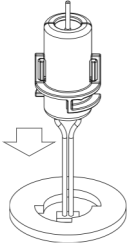
## ASSEMBLY INSTRUCTIONS



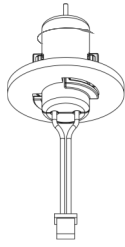
Attach HOOK & LOOP to the bottom of FC

## MOTOR ASSEMBLY INSTRUCTIONS

①



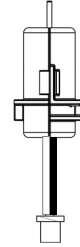
②



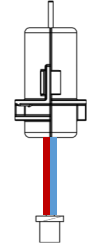
③



!

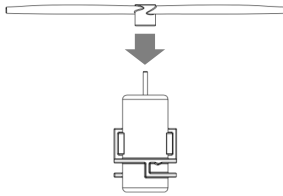


White & Black Wire  
CCW Rotation

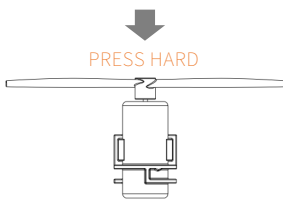


Red & Blue Wire  
CW Rotation

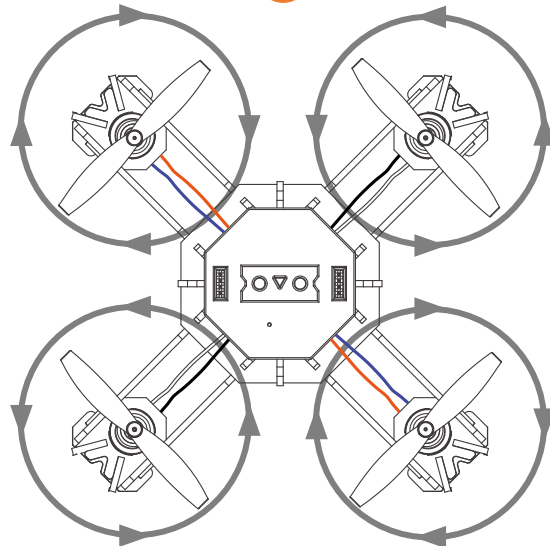
⑤



⑥



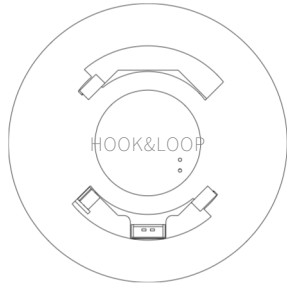
⑦



PLEASE BE AWARE OF THE POSITIONS OF DIFFERENT MOTORS

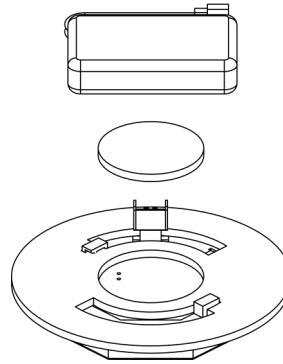
## BATTERY ASSEMBLY INSTRUCTIONS

1



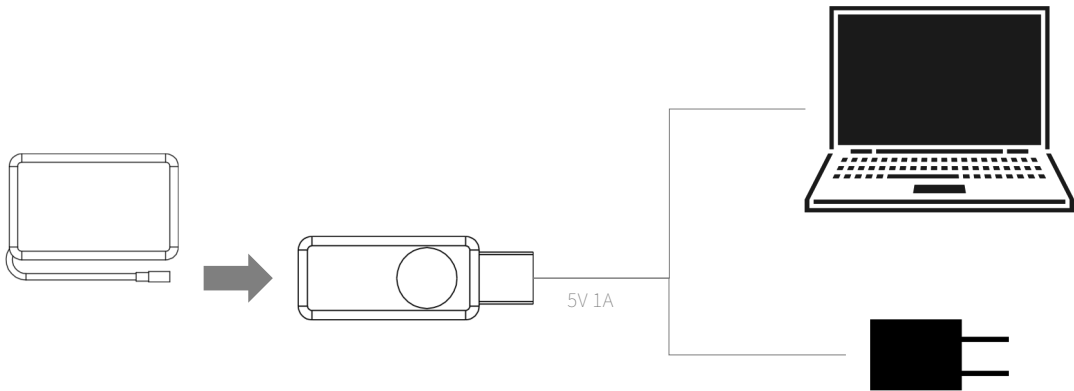
Attach HOOK & LOOP to the bottom of the FC

2



Attach the other side of the HOOK & LOOP to the drone battery

## CHARGER

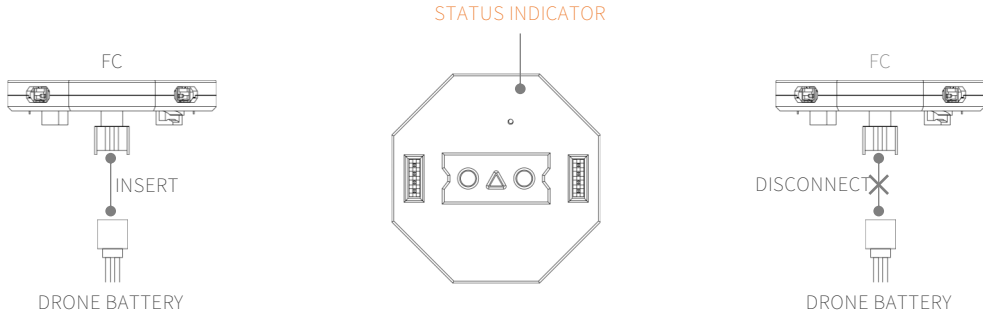


INDICATOR	OFF	RED	BLUE
CHARGER STATUS	No power or Inactive	Charging	Full



# OPERATING INSTRUCTIONS

## ON / OFF - DRONE

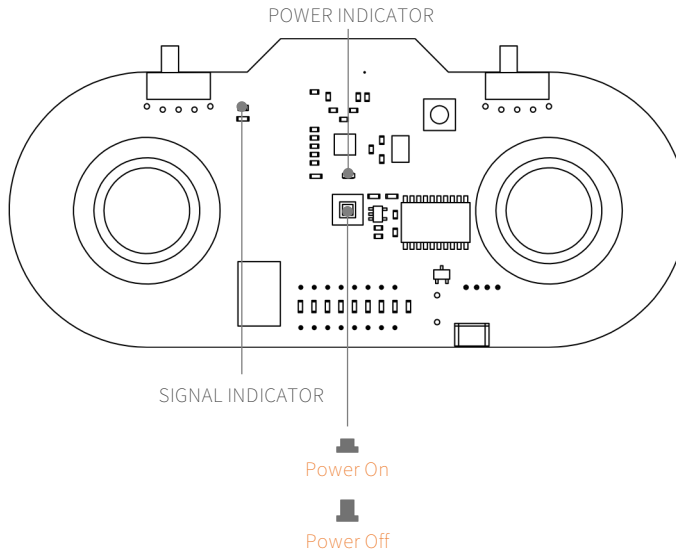


Connect the battery cable  
to power on the FC

Status indicator will flash for  
several seconds after powering  
on

Disconnect battery cable to  
power off

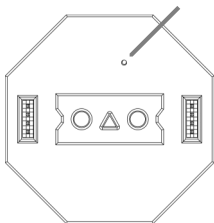
## ON / OFF - CONTROLLER



## PAIRING

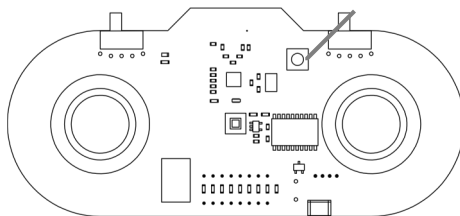
Power on the FC and controller. Check if the Signal Indicators are working normally. If the Signal Indicator on the FC is ON, or the Signal Indicator on the controller is OFF, you need to repair the connection with the following steps. (The FC and controller has been paired by default.)

①



Power on the FC and hold the button shown above until the signal indicator flashes

②



Hold the button on the controller until the buzzer beeps and the Signal Indicator of the FC goes out

③

Restart the controller  
If pairing has been successful, the signal indicator on the controller will be ON and the signal indicator on the FC will be off  
If unsuccessful, repeat steps 1-3.

## CALIBRATION

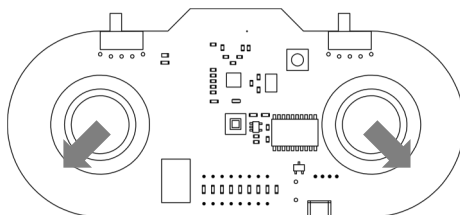
If the drone drifts uncontrollably after initializing, the following steps can be taken to reset the horizontal calibration. (The drone has been calibrated by default.)

①



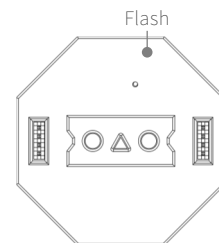
Power on and Place the drone on a **FLAT SURFACE**

②



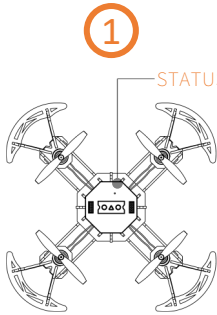
Push the joystick as shown above Until the Status Indicator on the FC flashes

③

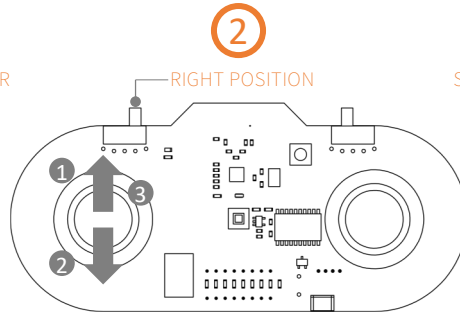


Wait for 3 seconds for calibration to be completed  
If the problem still persists, please check the evenness of the ground and recalibrate

## UNLOCK AND TAKE OFF



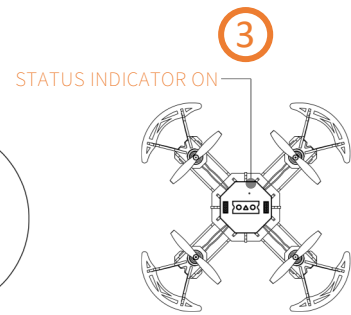
Power on and  
Place drone on a **FLAT SURFACE**



Make sure the Left Switch is in 'right' position

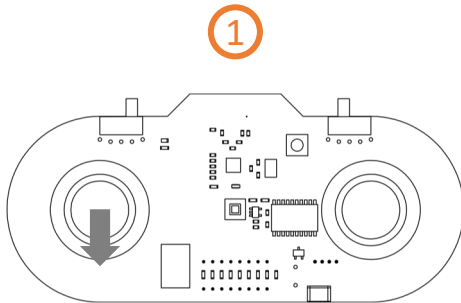
- 1 Push left analog stick UP
- 2 After 1 second pull the analog back down

Drone has been unlocked if motors and Status Indicator are on

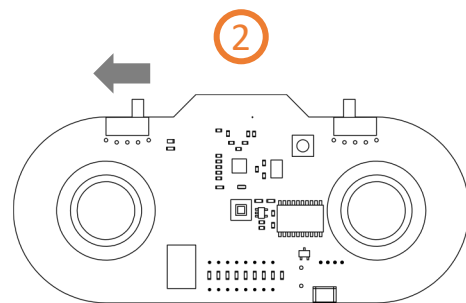


When Status Indicator is on **3**  
Slowly push up the left stick to take off

## LAND AND E-STOP

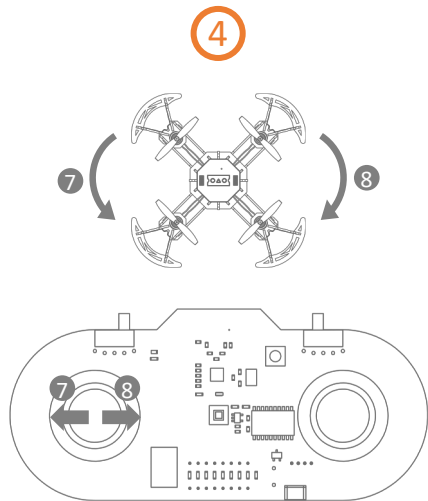
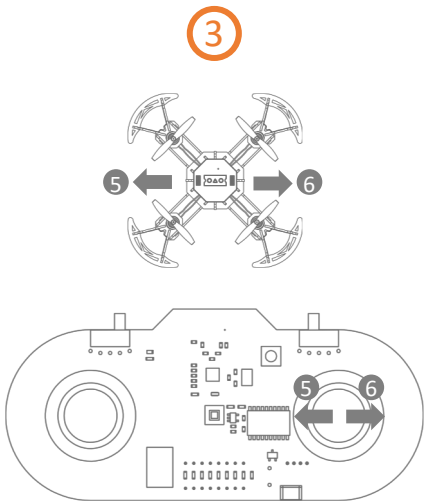
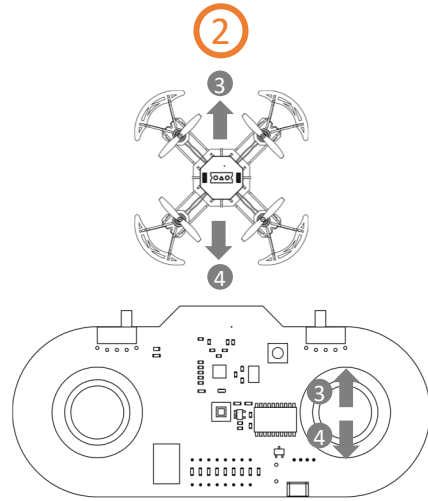
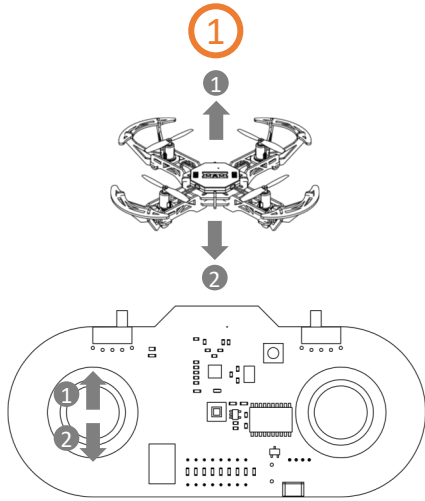


Pull left joystick down  
Drone will gradually land



For emergency landing,  
Turn Left Switch back to left position  
And the drone will stop immediately

## FLIGHT CONTROL



# Flight Modes, Preparation, and Training

## **FLIGHT MODES**

### **BEGINNER**

Under beginner mode, the FC will limit the altitude and speed of its flight to a very low level. This mode is recommended for training purposes in open spaces indoors.

### **STANDARD**

Under standard mode, the flying speed is limited to a normal level and limitless on altitude. Can be flown outdoors with Level 2 winds or less.

### **SPORT**

Drone sensitivity is increased. Under the constant-altitude mode, flight speed is also significantly increased. Recommended for flying in large, open spaces.

### **PRO**

The left throttle of the remote directly controls the amount of drone throttle up and down, and there is no limits to speed. Recommended for competitions. Please only use this mode after being familiar with the controls.

### **MODE I**

The left analog's up and down controls the throttle (corresponding to height change); left and right controls yawing (corresponding to the direction the drone is facing). The right analog's up and down controls pitching (corresponding to forward and backward movement); left and right controls rolling (corresponding to horizontal movement).

### **MODE II**

The left analog's up and down controls pitching (corresponding to forward and backward movement); left and right controls yawing (corresponding to the direction the drone is facing). The right analog's up and down controls throttle (corresponding to height change); left and right controls rolling (corresponding to horizontal movement).

### **PROGRAM**

The program mode requires the additional programming module. In program mode, with the Left Switch in right position, the FC will execute the program written into the module's memory.

If no programming module is present, or if the Right Switch is in left position, the drone will fly under standard mode (headless).

### **NORMAL**

Horizontal movement of the aircraft takes its own coordinate system as reference point. In other words, pushing the right analog the controller up will cause the drone to fly forward in the direction its "head" is facing.

### **HEADLESS**

Horizontal movement of the aircraft takes the geographical coordinate system as reference point. In other words, pushing the right analog up, regardless of which direction the "head" of the drone is currently facing, the drone will fly in the direction that it first faced when taking off.

## PREPARATIONS AND PRECAUTIONS

### BATTERY INSPECTION

Pre-takeoff, please check if the amount of battery will suffice for the flight. Plan your flight routes accordingly. Post-flight, please check remaining battery and charge when low to preserve a good battery health. If the battery is unused for a long period of time, charge (or discharge) to 50% power until recharging.

### MOTOR INSPECTION

Under normal circumstances, an inspection of motors and rotor blades is required pre-takeoff:

- ① After assembling the drone, carefully check if the motors are correctly installed and if the rotor blades are installed accordingly to the motors.
- ② Pull gently on the rotor blades to check if they are firmly mounted to the motors.
- ③ Turn the rotor blades once check if it rotates smoothly without contacting other structures.
- ④ Unlock the drone, and the rotor blades will slowly turn. Recheck if the rotor blades are rotating in the same direction as their motors, and confirm that its rotation is not interfered.
- ⑤ Takeoff after performing the checks above.

### SIGNAL INSPECTION

Since the drone's flight is dependent on its controller, it is critical that the pilot ensures the functionality of the signal connection. The signal precautions are as following:

- ① The drone should not be flown near parking lots, transmission towers, base stations, and other places with strong electromagnetic forces.
- ② The controller and FC cannot be mounted or attached with metal coverings, which shields and hinders signal transmission.
- ③ The drone has to be at least 20 cm away from magnets, phones, and other strong electromagnets;
- ④ An open area with a diameter of 50 meters can only contain 10 drones at once to avoid signal disruptions.

### CRASH HANDLING

During flights, drones may crash due to controlling faults or changes in environment. As UAVI uses DIY designs as drone frames, serious crashes (from an height of over 2 meters due to E-landing, crashing, etc.) should be treated to the following instructions.

- ① Check if wooden parts are loosened and reinstall any that has fallen off. If the frame has been damaged, please replace with spare parts (if available), or re-attach the parts with strong glue.
- ② Disconnect the battery and reconnect to restart the self-inspection procedure of FC.
- ③ Check the drone level after takeoff. If the drift is serious, it needs to be recalibrated.



## TRAINING

**Flight training requires 3-5m of empty space, and the drone should at all times be at least 1 meter away from other people**

### **TRAINING COURSE 1: HOVER CONTROL IN BEGINNER MODE (HEADLESS)**

- ① Switch to the Beginner flight mode and the Right Switch to the right position.
- ② After unlocking the drone, gently push the left joystick upwards and release immediately. The drone will automatically take off and hover at an altitude of about 1 meter.
- ③ Without touching the left joystick, use the right joystick to fly the drone forward, backward, left, and right.
- ④ Try to control the drone within a radius of 50cm.
- ⑤ Taking a full battery as one exercise, repeat this exercise 2-3 times.

### **TRAINING COURSE 2: MOVEMENT CONTROL IN BEGINNER MODE (HEADLESS)**

- ① Switch to the Beginner flight mode and the Right Switch to the right position.
- ② After unlocking the drone, gently push the left joystick upwards and release immediately. The drone will automatically take off and hover at an altitude of about 1 meter.
- ③ Without touching the left joystick, use the right joystick to fly the drone around..
- ④ Perform figure eights within the radius of 3-5 meters.
- ⑤ Taking a full battery as one exercise, repeat this exercise 2-3 times.

### **TRAINING COURSE 3: VARIABLE HEIGHT HOVER CONTROL IN STANDARD MODE (HEADLESS)**

- ① Switch to the Standard flight mode and the Right Switch to the right position.
- ② After unlocking the drone, gently push the left joystick upwards and release immediately. The drone will automatically take off and hover at an altitude of about 1 meter.
- ③ Gently push the left joystick up and down and release when the drone is at a desired height. Control the drone to fly around continuously using the right joystick.
- ④ Try to maintain the drone within a radius of 50cm.
- ⑤ Taking a full battery as one exercise, repeat this exercise 2-3 times.

### **TRAINING COURSE 4: VARIABLE HEIGHT DISPLACEMENT CONTROL IN STANDARD MODE (HEADLESS)**

- ① Switch to the Standard flight mode and the Right Switch to the right position.
- ② After unlocking the drone, gently push the left joystick upwards and release immediately. The drone will automatically take off and hover at an altitude of about 1 meter.
- ③ Use the left joystick to control the altitude of the flight, and use the right joystick to control the drone fly around;
- ④ Control drone to fly in a circular wave-like pattern of alternating heights within a radius of 3-5m.
- ⑤ Taking a full battery as one exercise, repeat this exercise 2-3 times.

### **TRAINING COURSE 4: MOVEMENT CONTROL IN STANDARD MODE (NORMAL)**

- ① Switch to the Standard flight mode and the Right Switch to the right position.
- ② After unlocking the drone, gently push the left joystick upwards and release immediately. The drone will automatically take off and hover at an altitude of about 1 meter.
- ③ At a constant altitude, use the right joystick to control the horizontal movement, and the x-axis of the left joystick to control the yawing.
- ④ Control the drone to fly in a square within a radius of 3m to 5m, while keeping the nose pointing straight ahead.
- ⑤ Taking a full battery as one exercise, repeat this exercise 2-3 times.

## PRODUCT PARAMETERS

### PACKAGE

Model: UV202  
Name: Airwood

### CONTROLLER

Operating Frequency: 2.400-2.4835 GHz  
Max Transmission Distance: 50m  
Transmission Power: 1mW (0dBm)  
Battery: 250mah

### DRONE

Weight: 75-80g  
Max Dimensions: 200X200X46mm  
Max Diagonal Distance: 245mm  
Max Ascent Speed: 2m/s  
Max Descent Speed: 2m/s  
Max Hovering Time: 8mins  
Battery: 800mah  
Operating Temperature Range: 0°C-40°C  
Max Wind Speed Resistance: 2m/s  
Hovering Accuracy Range:  $\pm 0.1m$

### CHARGER

Input: DC 5V  
Output: 4.2V = 1 A  
Rated Power: 5W

## COMMON PROBLEMS AND SOLUTIONS

### Common Problems

1. The drone spins around uncontrollably.
2. The blue LED flashes slowly, and the drone can not be armed.
3. The drone drifts in one direction after taking off.
4. The signal LED lights up.
5. The drone is not responding to the controller within range.
6. The wooden part is broken.
7. If there are any questions, please contact customer service.

### Solutions

- The motors and rotor blades may be installed in wrong directions  
Place the drone on a flat surface and refer to the calibration procedure.
- Place the drone on a flat surface and refer to the calibration procedure.  
Refer to the pairing procedure.  
Please check if the flying environment is free of signal interference and drone is in range with the remote control.  
Replaceable parts can be replaced or affixed with wood glue.

## QUICK FACTS ON UAV

## WHAT ARE DRONES?

We hear the term drones a lot. Some says commercial drones that we can buy at the supermarket are not real drones. They are only miniature quadcopters models. Others believe that only the American drones deployed in Syria are real drones; the rest are simply toys.

Whether or not commercial drones can be classified as actual 'drones' have aroused great debate amongst drones lovers. So what really is a 'drone' ?

### DEFINITION

Drones, aka UAV (Unmanned aerial vehicle), are flying devices that do not transport humans and operates by inbuilt programming and wireless control.

#### WIRELESS CONTROL

Controlled by either men or computer devices.

**EMBEDDED PROGRAMMING**—Pre-programmed into the hardware of the drone and processed by a CPU chip.

**UNMANNED**—Unmanned simply means “does not transport humans,” but is still controlled by humans over a wireless connection

### TYPES OF DRONES

According to the definitions above, any aerial device satisfying the three characteristics are considered Drones or UAV. Thus, commercial drones can also be classified as drones. Now let's look at specific types of drones.

UAVs vary greatly, and here we will only look at the common categories of drones, including Unmanned Airships, Fixed Wing drones, Multirotor drones, Biomimetic drones, etc.

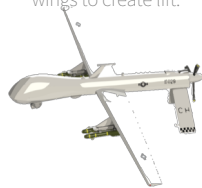
#### UNMANNED AIRSHIPS

The inner of the airship is typically filled with gases less dense than air, such as Helium and Hydrogen, and utilizes propellers to control its flight.



#### FIXED WING DRONES

Fixed wing drones have similar appearances to conventional airplanes, and accordingly uses the difference of pressure above and beneath the wings to create lift.



#### MULTIROTOR DRONES

Multirotor drones utilizes the lift created by rotors to rise, and uses the different angular velocities to control the direction of the drone. Multirotor drones are also ones commonly used by hobbyists and professionals.



#### BIOMIMETIC DRONES

Biomimetic Drones mimics the flapping motion of birds and insects when they fly. They are much more agile than multirotor and fixed wing drones.



## WHAT CAN DRONES ACHIEVE?

As technology gradually infiltrates our lives, drones are beginning to display its unique advantages in various fields. Its powerful functionalities also gets rid its perception as a 'toy.' Instead, it is a fruitful technology embodying both entertainment and practical use.

So, what are drones used for?

### Remote controlled flying

As a product, drones satisfy the demand for remote controlled aerial devices. Drones are generally easier to operate compared to conventional toy planes due to its incorporation of GPS stabiling systems, hovering abilities, and first person immersive view.



### Video Shooting

The most common use of commercial drones is its photo taking capabilities. Through an wholly unique perspective, drones are able to leave its users awing at the wonders of magnificent views.



### Pest control

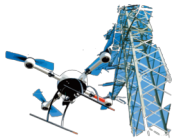
A great field for drones is agriculture.

UAV can disperse pesticides, fertilizer, seeds, as well as study and record the growth periods of crops. Drones can also be used to monitor livestock growth and health status.



### Patrol

Drones armed with HD infra-red sensors and GPS are capable of power line patrolling and inspection, sending live stream video data to engineers on the other end.



### POSTAL SERVICE

Ever imagined Uber eats flown by

Drones? Doing so not only decreases the labor costs, but is also able to reach distant places.

Many postal services in several countries around the world have attempted drone deliveries.



### MILITARY

Currently the most advanced field of drone usage, militaries use drones mostly due to its hiding capabilities, cost efficiencies, and not having to risk soldiers' lives.



### OTHER USES

Drones are undoubtedly the most popular contemporary technological inventions. Other uses of drones includes but is not limited to traffic controlling, disaster reliefs, forest fire protection, mapping, scientific researches, telecommunications, and etc. As the technology further solidifies and its usages proliferate, drones will ultimately become an ubiquitous sight in our lives.

## History of UAV

Flying has always been a lustful dream for humans, for our ancestors have devised everything from legends and myths to calculations and theories to achieve this end. Here is a brief history on the flight of man:

### Man's initial dream of Moon Travels

According to Chinese legends, Chang'e and her husband ate the pill of immortality and rose to the Moon Palace. This story had been first dated in 1500 BC.



### Earliest aerial device

Kites or "paper birds" first originated in early China and now have over 2000 years of history. The National Air and Space Museum in Washington DC also cites the earliest aviation models as Chinese Kites and Rockets



### First man to reach the sky

Approaching the end of the 14<sup>th</sup> century, Wan Hu of the Ming Dynasty hand held a big kite while sitting on a chair attached to 47 rockets. Despite his careful planning, the rockets unfortunately exploding – sending him into the skies at the cost of his life.



### Man's first plane

1903, December 17<sup>th</sup> was when the Wright Brothers successfully flew their model plane, leaving their mark on history as the fathers of airplanes.



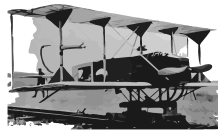
### First UAV

1916 September 12<sup>th</sup> was when the first UAV was flown in the US. As their were serious control errors, the plane was never put into use in wars.



### First balancing UAV

In the following year 1917, Peter Hewitt and Elmer Sperry invented the first airplane that balanced itself with a gyroscope.



### MOST ADVANCED DRONE – GLOBAL HAWK

Northrop Grumman RQ-4 Global Hawk is an unmanned surveillance aircraft is currently the most advanced UAV in the world. It can survey up to 100000 square km of terrain a day.



### MOST ADVANCED CHINESE DRONE

Currently, the most advanced Chinese UAV is the Gui Zhou Soar Dragon, used in reconnaissance and possible anti-shipping missions.



# Designing your own drone

## Introduction to Airwood Designing

Airwood DIY labs allows users to design their own drones by drawing a blue print following the instructions below. Ensuing, users can give us their designs by offline workshops or by purchasing our DIY package online and we will manufacture your own unique drone.

### Steps to designing

- 1、 Please use a black inked pen or marker pen on graph paper. The graph paper' s squares should be smaller than 2 mm. Template A as a pre-designed framed with positions to place the FC and motors. Template B is a completely empty template to start from scratch.
- 2、 Please take a photo of the design on a flat surface, or mail it to one of our processing shops. (Please contact or workshops or customer service)

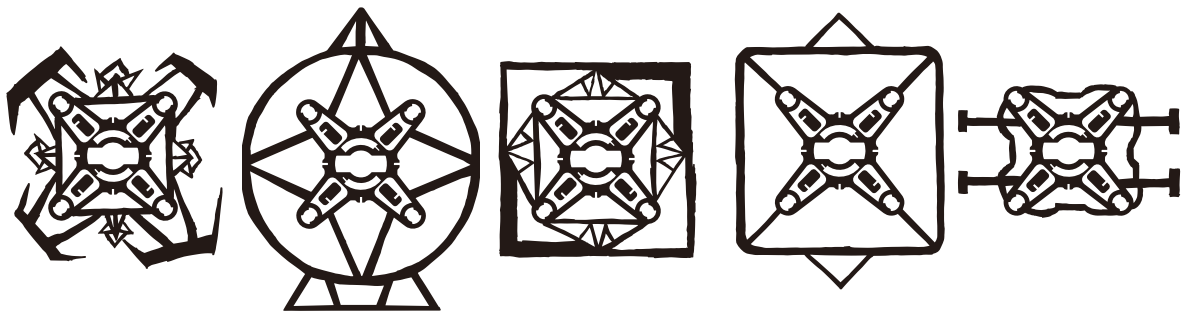
### Design requirements

- 1、 Black shaded parts of the design will be wooden parts of the same shape and size;
- 2、 Please keep your design within the borders of the paper without touching the markings on the four corners;
- 3、 Grey areas will be designated areas for electronic parts – motors, FC. Please do not draw grey areas unless you have special needs;
- 4、 If the a wooden part is connected, the black shaded areas must be interconnected, or it will be processed into separated pieces;
- 5、 The circular dotted lines are the rotation paths of rotors. There should not be too many wooden parts within the circle for fears of decreasing lift;
- 6、 3D structures can be connected by interlocking 2 mm connectors. Please refer to the mortise (hole like structure) in Template A.

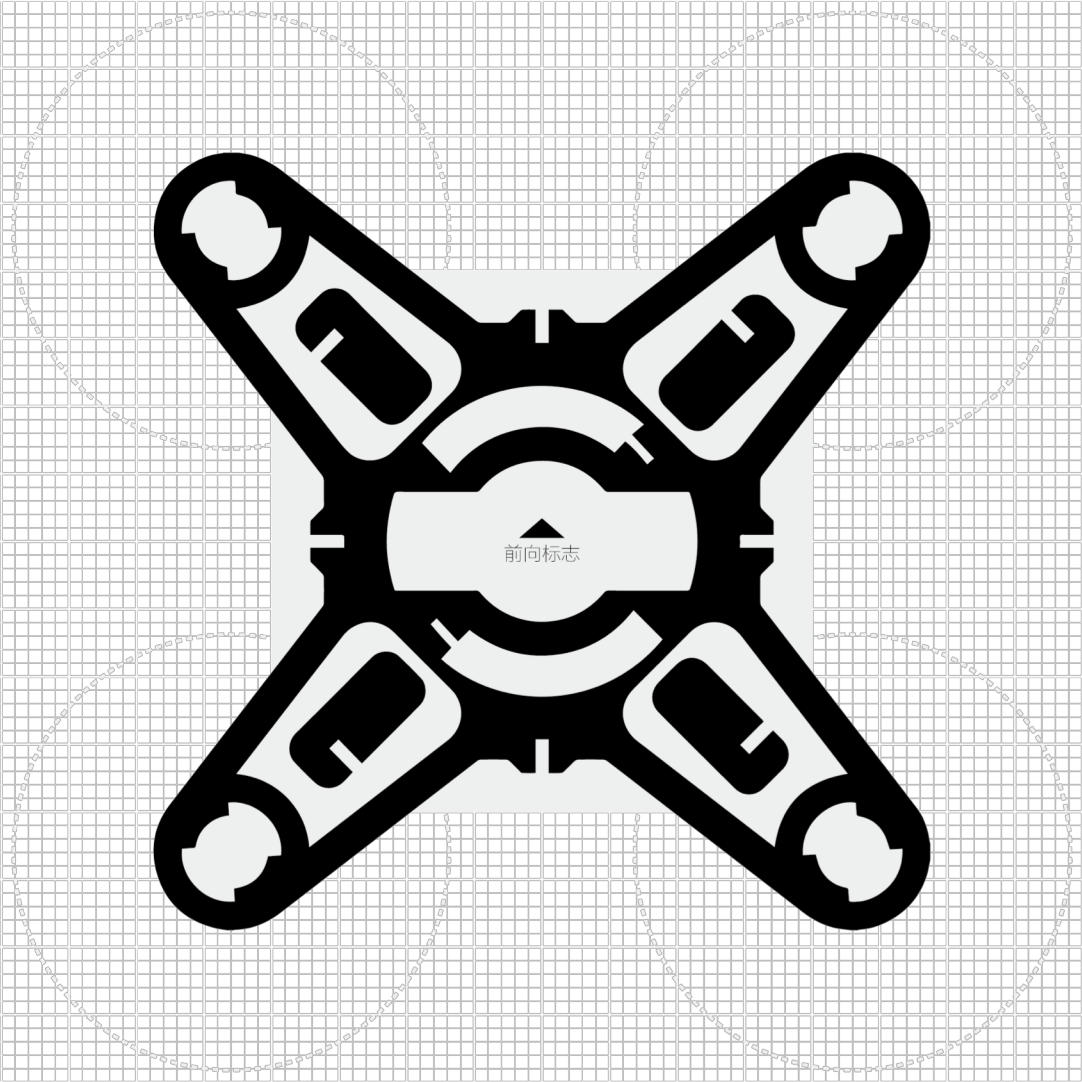
### Advanced tips

- 1、 Light weight is critical to drone designs. Try to keep surface area as small as possible. Density of wood planks: 0.6g/cm<sup>3</sup>, depth of wood planks: 0.2cm. Maximum weight capacity of the drone: 90g. Weight of electronic parts (motor, FC, battery): 60g.
- 2、 Thin planks are structurally weak; it is recommended that pressure points should have a width or 5cm or greater. A materials resistance to bending is called Flexural Strength, calculated by (specimen breaking load × distance between pivots) / (sectional area × length of material)
- 3、 Symmetry can improve performance and stability.

### Sample Designs







前向标志

TEMPLATE B





UAVI Technology (Shen Zhen) Limited