H145M Super Scale 470 Size GPS Stabilized Helicopter

SKU: HSM-470-R-H145M-HC



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Introduction

Thank you for purchasing the RotorScale H145M Super Scale 470 Size GPS Stabilized Helicopter! The H145M 470 is a remote-controlled scale helicopter capable of hovering and other general scale helicopter flight and can automatically return home. The helicopter features an electronic flight control system that makes flying as easy and intuitive as operating a camera drone.

While unpacking your RotorScale helicopter, you should look over and verify all parts are included, as well as check over all mechanics for proper installation at the factory. Verify all screws and nuts are tight and properly installed, and that all other mechanics like the belt, servos and other components are properly installed and aligned.

Specifications

Flying Weight	1400g (3 pounds 2 ounces) without battery
Main Rotor Diameter	745mm (29.3 inches)
Tail Rotor Diameter	86mm (3.4 inches)
Overall Size (L x W x H)	840 x 250 x 260mm (33.1 x 9.8 x 10.2 inches)
Electronic Speed Control	60A, 2-in-1 ESC
Recommended Battery	4S 4000-5000mAh LiPo Battery with XT-60 connector.
Skill Level	Beginner/Intermediate

Required Tools, Adhesives and Additional Components

- 2.5mm Hex Driver/Allen Key
- #1 Phillips Screwdriver
- 15-minute Epoxy
- Masking Tape (for temporarily holding parts in place while glue is curing)
- 4 x AA Batteries for the transmitter

Product Components



1. Radio Control (Transmitter)
2. Charger and Power Cords
3. Helicopter fuselage with mechanics
4. Main rotor blades
5. Scale parts, fasteners, and additional accessories

Safety

Please note that this product is not intended to be used as a toy. The rotor blade tips can achieve speeds exceeding 500 km/h (311 mph) during flight, which can cause significant damage to property, or serious injury to animals and people, up to and including death. Additionally, in the event of a malfunction, an uncontrolled descent could occur, causing the product to fall uncontrollably. **As such, it is imperative that the product be flown only at a designated radio controlled flying site, such as a Federally Recognized Identification Area (USA) or other similar locations.** Please follow all local laws when flying this product. Exercise extreme caution and thoroughly read the entire instruction manual before operating this product. Familiarize yourself with all features to ensure proper and safe usage. Improper use can result in damage to the product, personal property, and may lead to serious injury or death. Basic mechanical skills are required to operate this product, and you should always use caution and common sense. Do not use incompatible components or make modifications beyond the instructions provided by Motion RC. The manual contains critical information regarding safety, operation, and maintenance, and it is essential to follow all instructions and warnings carefully to avoid injury, property damage, or worse. Children should not use this product without direct adult supervision. Always ensure the helicopter is operated in a safe, responsible manner.

General Safety Guidelines

- Always maintain a safe distance around your helicopter in all directions during operation to avoid injuries or collisions. The rotor blades pose a serious threat.
- Operate in open spaces. Fly only in clear, open areas free of obstacles like buildings, power lines, trees, or people. Avoid flying near water, crowds, or traffic.
- Always keep the helicopter in sight. Always maintain visual line-of-sight with the helicopter during flight. Avoid flying higher than 120 meters (400ft) to remain within safe operational boundaries.
- Always fly in compliance with local regulations.
- Never allow children to operate the helicopter without direct adult supervision. This product is not a toy and improper use can lead to serious injury or damage.
- Avoid using the product near flammable materials. The battery and other electrical components can generate heat during operation.
- Do not modify the product in any way. Any unauthorized modifications could damage the product, invalidate the warranty or result in dangerous malfunction of the product.
- Check weather conditions before flight. Avoid flying in rainy, windy or foggy conditions as they can interfere with the proper function of the helicopter.

Lithium Polymer Batteries

- Only use a charger that is specifically designed for lithium polymer batteries.
- Never charge batteries unattended. You should constantly observe the charging process and immediately react to any potential problems that may occur.
- Batteries should be placed on a heat-resistant, non-flammable surface during charging.

- If you see the battery balloon or swell, stop charging immediately. Disconnect the battery and observe it in a safe place away from flammable materials inside a fireproof container for approximately 60 minutes. Continuing to charge a battery that has begun to swell could result in fire and/or explosion. Never use or attempt to charge a battery that is swollen or ballooned.
- Certain LiPo chargers may not work properly and may cause them to charge LiPos incorrectly or at an improper rate. It is your responsibility solely to assure the charger you purchased works properly. Always monitor the charging process to assure batteries are being charged properly. Failure to do so may result in fire and/or explosion.
- Never open the battery covering, modify the battery connector, or short the wire leads of a battery. These actions can result in fire and/or explosion.
- Never puncture a battery or store it near sharp or pointed objects or surfaces. A punctured battery can result in fire.
- If the battery is involved in a crash, put the battery in a safe fireproof area and observe for 60 minutes. It is highly recommended that batteries involved in a crash are removed from service.
- Internal damage not obvious to the naked eye can result in fire.

BEFORE CHARGING

- Please read the charger instruction manual completely before charging your battery.
- Always check the voltage of batteries before charging to ensure they are at or above the minimum safe starting voltage. Never charge a battery pack which is below 3.7V per cell. For example, a 3 cell (3S) pack should not be charged if it is below 11.1V. If the starting voltage is below recommended levels, then the batteries have been over discharged or have experienced a failure and should NOT be charged.
- Ensure each cell's voltage is within 0.1V of the others. Do not attempt to charge a battery with imbalanced cells.
- Always inspect the battery for any type of damage before charging. Look for any damaged leads, connectors, broken shrink wrap, swelling of cells, or other irregularities. Do not use the battery if you find any of the above issues with your pack.
- Ensure you are using battery charge leads which are compatible with the connector on your battery.
- Check the polarity of the battery cable and charger lead carefully before the connection to avoid any short circuit.
- Always verify the charger is in good condition before use. A poor-quality charger can be dangerous. It is solely your responsibility to assure that the charger you use works properly. Failure to do so may result in a fire and/or explosion.
- If your battery develops a distinct smell, often sweet or acrid, this can be a sign of internal damage. Discontinue use immediately and do not charge.

CHARGING

- Always charge batteries in an isolated area on a heat-resistant, non-flammable surface (such as concrete) outside of buildings and away from flammable materials, liquids, and surfaces.
- Never charge batteries that are hot to the touch. The battery temperature should be the same as the ambient temperature before charging.
- Always select LiPo balance charging. This requires the use of the white JST/XH balance connector for all charging.
- Make sure to set the charger to the correct number of cells and voltage shown on the battery label.
- The charger should never be set to charge batteries at a rate greater than 1C (One (1) times the capacity of batteries in amp hours).
- Never charge LiPo batteries over 4.2V per cell. Over charging a LiPo battery for an extended period can result in fire and/or explosion.
- Never charge multiple battery packs together in series. Charge each pack individually.
- Use suitable and good quality chargers with proper certification marks (UL Listed, etc.). Never use inexpensive and low-quality chargers.
- Always disconnect the battery connector from the charger's charging cable first. Do not remove the charger's charging cable from the charger first because its exposed leads could contact each other, causing a potentially dangerous short in the battery attached to it.

BATTERY STORAGE

- Store at room temperature between 40 and 80 °F (4 to 27 °C). Storage at higher temperatures may result in failure and fire.
- Always store batteries between 3.75V and 3.9V per cell. Storage at higher or lower voltages may result in damage.
- Never store loose batteries together, the terminals may contact one another causing a short circuit.
- Always store LiPo batteries in a safe fireproof container away from flammable materials.
- Never store batteries in extreme temperatures or direct sunlight.

DISCHARGING

- Never discharge LiPo batteries at rates higher than specified C rating on the label.
- Never allow the temperature of batteries to exceed 140 °F (60 °C) during discharge. Adequate cooling for batteries is required, especially when discharging at or near maximum rates.
- Never discharge battery to a level below 3V per cell under load or 3.7V per cell resting.
- Do not run the battery down to the ESC cutoff voltage. Operating an RC product to the point that its motor stops working will result in irreparable damage to the battery. The ESC cutoff voltage is for the safety of the aircraft and bystanders. When the battery is discharged this far, it should be removed from service.
- Never leave battery unattended during the discharging process.

Assembly

Installation of the side weapons

Remove from packaging

Both side weapons and the fasteners set are securely packaged. Please remove both the machine gun and the rocket pod, which are preassembled as show from their packaging. Locate the mounting screws and washers for the next step.



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Installation of the Scale Ordnance Set

In order to hold the fuselage securely in place, we recommend placing it upside down on a work stand so that the belly is exposed. If you do not have a work stand, you can place it upside down into the packaging foam. Then attach the armament from below directly onto the pre-drilled mounting holes. Use two screws and washers per side as shown to securely attach them onto the fuselage. The ordnance should appear like the images below once installed.



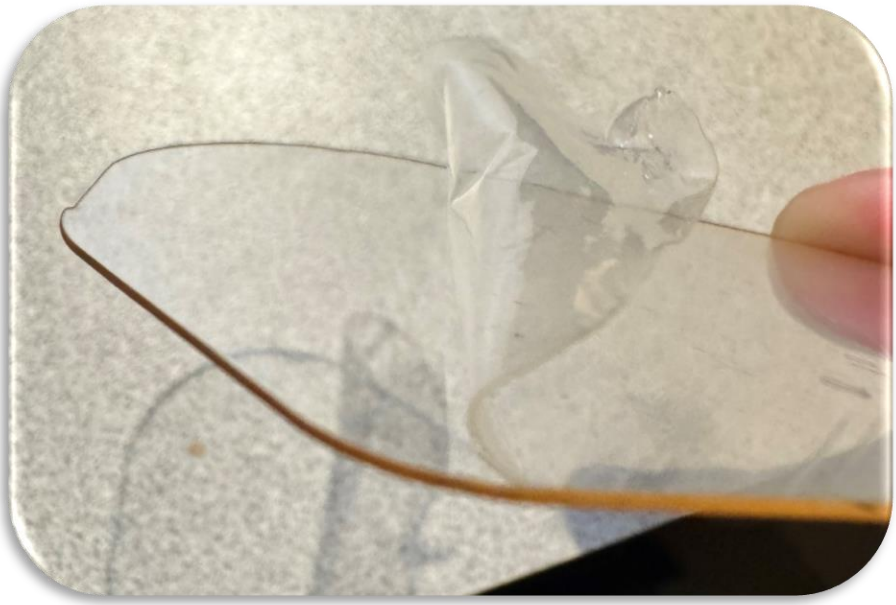

AIRBUS



Installation of Windows

There are additional clear windows included with your helicopter that are not preinstalled. If you wish to install these, please follow the steps below.

1. Locate the proper location for each window.
2. Remove the clear protective film from each of the windows, noting that this protective film is on both sides of the plastic windows.
3. Test fit the windows and use a pencil to mark the openings on the windows.
4. Lightly scuff the area outside of the marks made in step 3. This will prepare them to better accept glue.
5. Place the hatch or area you are gluing the windows on their side, with the window opening you are gluing facing down. You may need to use a blanket or towels to help hold them in position. Use a glue safe for clear plastics, such as a canopy glue, foam type cement, epoxy or similar and apply a small amount around the area marked in step 3. Secure the windows to the inside of the canopy or fuselage and let the glue fully cure. Be sure to wipe away any excess glue that oozes out.



Installation of Main Rotor Blades

Install the main rotor blades using a 2.5mm hex driver, and the provided screws and lock nuts. Be sure to note the proper orientation of the rotor blades. When viewing the helicopter from above, the rotor blades spin clockwise. Align the more rounded edge of the blades forward in this clockwise rotation. This more rounded edge of the blade should also be mounted toward the linkage that attaches the blade grip to the swashplate.

Be sure to properly tighten the screws. To prevent any issues with the helicopter, you want the blades to be snug, but not tight. If you pick the helicopter up and hold it on its side with the blades parallel to the ground, the blades should not drop toward the ground. Similarly, if you try to shake the helicopter slightly in this position, the blades should fall toward the ground.

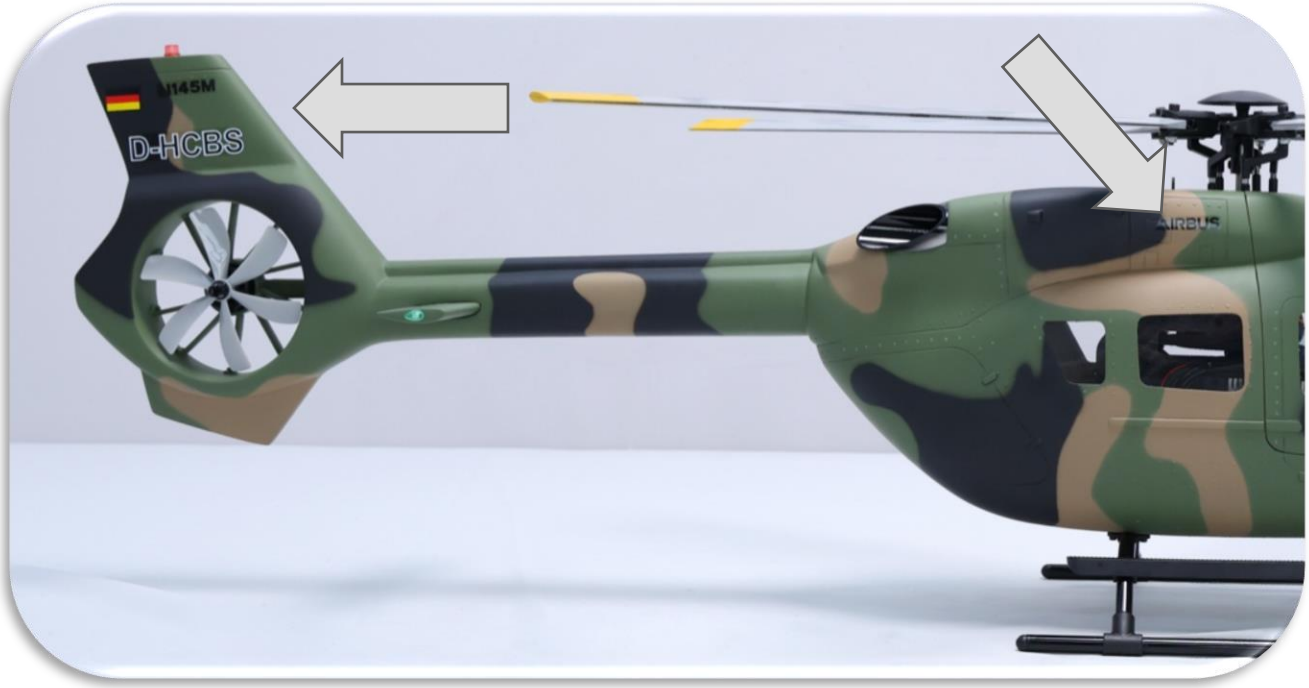




Decal Installation

The decals included with your helicopter should be applied according to the images below. Note that they are a water transfer type and have a pink application film that must be removed from them once applied and the decals are fully dry.

1. Prepare a small dish of water. Soak the decal in the water for approximately 1 minute **or until the decal easily slides off the backing.**
2. Apply the decal to the desired location and adjust its position as required.
3. Once set let the decals completely dry overnight, then carefully remove the pink application film.



Familiarization

Before you prepare for your first flight, please familiarize yourself with the Flight Modes and basic transmitter functions of your RotorScale 470 helicopter.

Flight Modes

The helicopter comes standard with 3 flight modes to adapt to a wide range of skill levels – GPS Mode, Angle Mode, and Manual Mode.

GPS Mode

GPS Mode is the simplest mode most suitable for beginners. In this mode, the helicopter will maintain its altitude and position for you, leaving it up to you to simply push the helicopter around the sky. Very similarly to a camera drone.

The right stick will control the helicopter's position. Move it forward, and the helicopter will fly forward. Move it left, and the helicopter will slide left.

The left stick will control the yaw (nose) position with left and right movements, and altitude with up and down movements. To climb, push the stick up. To turn the nose to the left, push the stick to the left and it will continue turning the nose to the left until you release the stick.

GPS mode can also be used as a recovery mode if you get into trouble when flying in Angle or Manual Modes. Simply flip the switch back to GPS mode with the sticks neutralized, and the helicopter will attempt to right itself as quickly as possible.

Note: If you takeoff in GPS Mode, the Return to Home function is active and able to be used.

Angle Mode

Angle Mode is an intermediate mode that bridges the gap between flying in GPS mode and flying like a normal helicopter in Manual mode. In this mode, the helicopter will still maintain its own altitude, but will no longer maintain its position, meaning it will drift with the wind. However, the helicopter will still level the main rotor when you center the right stick, and if you hold the stick full forward or full backward, the helicopter will only bank to approximately a 25-degree angle preventing you from getting upside down or in a bad position. The helicopter is significantly faster in this mode than in GPS mode, so be sure to use caution when flying as you can now overspeed the helicopter.

Note: If you takeoff in Angle Mode, the Return To Home function WILL NOT work. You must takeoff in GPS Mode for this feature to be available.

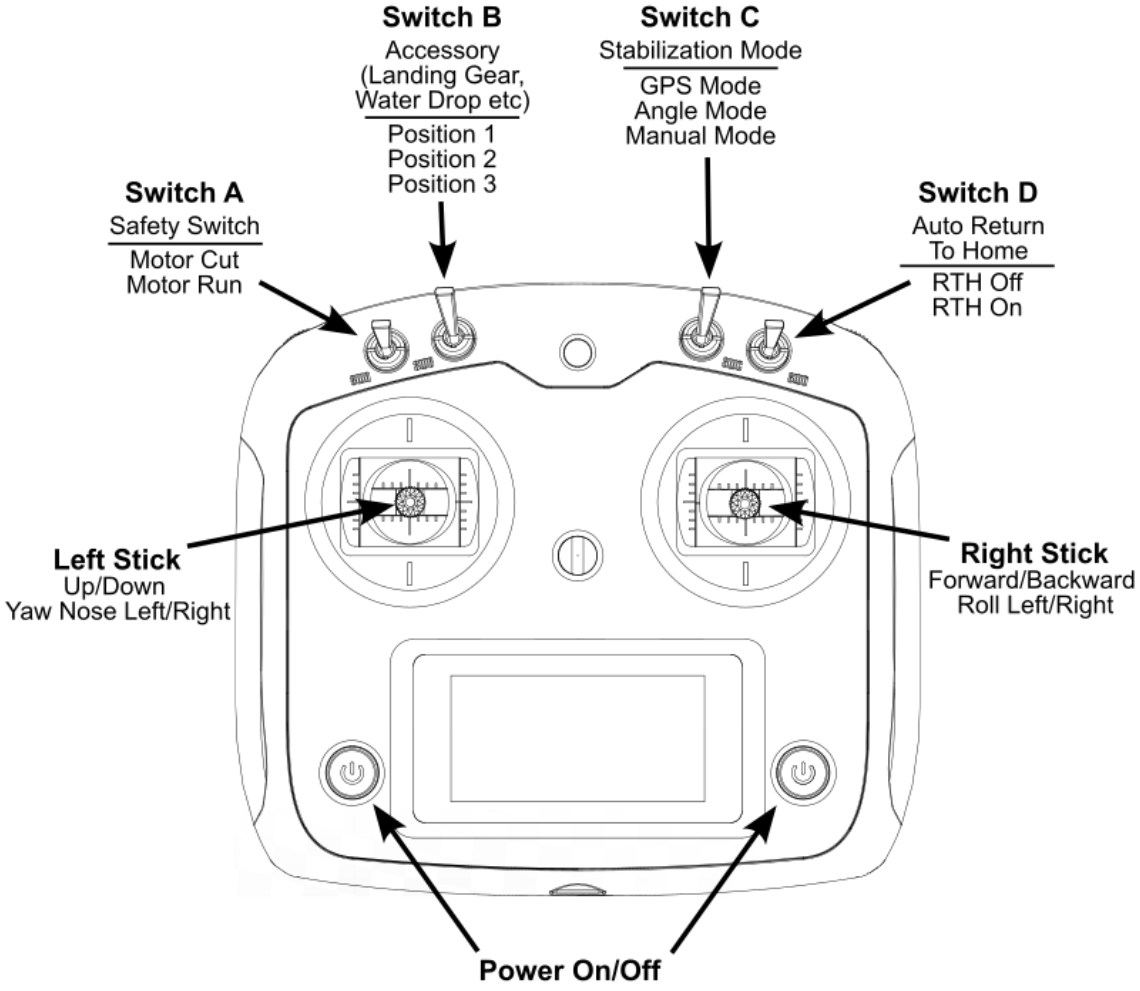
Manual Mode

Manual mode flies like a normal RC helicopter without GPS stabilization. This means you have full control of the helicopter with no bank or pitch limits, and the helicopter will no longer level itself when you return the sticks to neutral. In manual mode, the pilot now has control of the pitch of the main blades and the user must maintain altitude as well as position.

Note: If you switch from GPS mode or Angle Mode to Manual Mode, the helicopter will drop in altitude until you correct it with the left stick. An easy way to help mitigate this effect is to initiate a climb in GPS mode, and while climbing, switch into Manual Mode.

Note: If you takeoff in Manual Mode, the Return To Home function WILL NOT work. You must takeoff in GPS Mode for this feature to be available.

Transmitter System



Switch A

This is the motor run/cut and safety switch. If any trouble occurs during flight, moving this switch to CUT will immediately cut power, and the helicopter will fall from the sky. The motor will not run unless the run/cut switch is in the Run position.

Switch B

This is your accessory switch. This switch controls any accessory that may be installed on the helicopter. For example, this switch controls the retractable landing gear on the Airwolf, and the water drop system on the Bell 206.

Switch C

This switch selects which type of mode you are flying in. GPS Mode (for beginners), Angle Mode (for intermediate pilots), and Manual Mode (for expert pilots)



Switch D

This switch controls the automatic return to home function of the helicopter. Moving this into the Return to Home (RTH) position will make the helicopter return to the point in which you armed the helicopter.

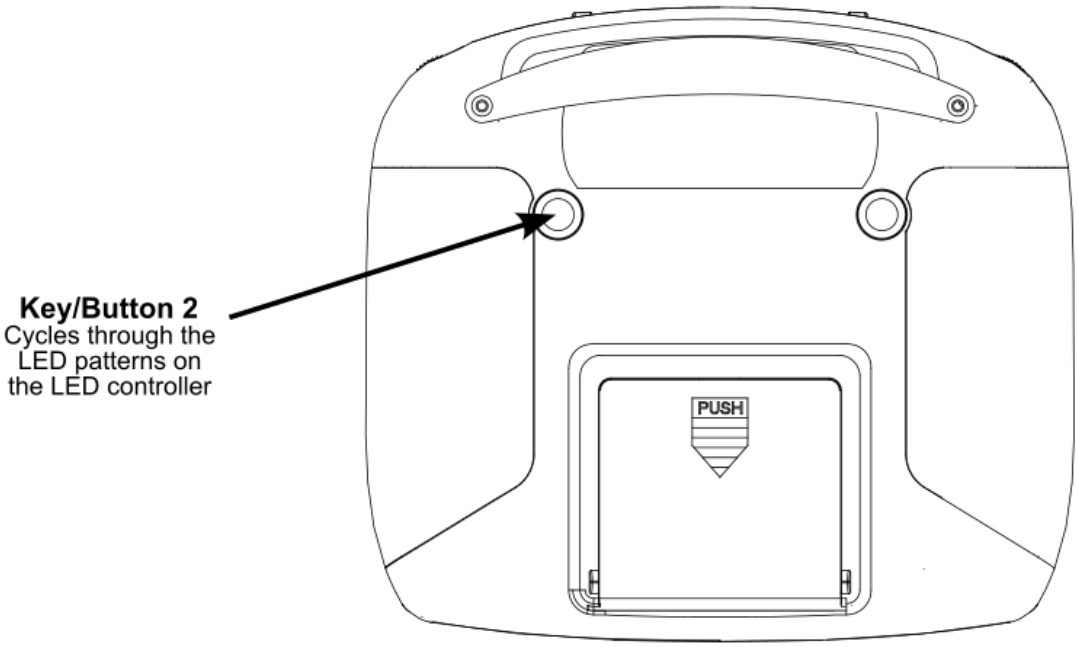


Left Stick

This joystick controls the basic up/down position of the helicopter, as well as the yaw or rotational nose direction of the helicopter.

Right Stick

This joystick controls the basic positional movement of the helicopter. Moving the stick forward will navigate the helicopter forward and moving it to the side will slide the helicopter to the side.

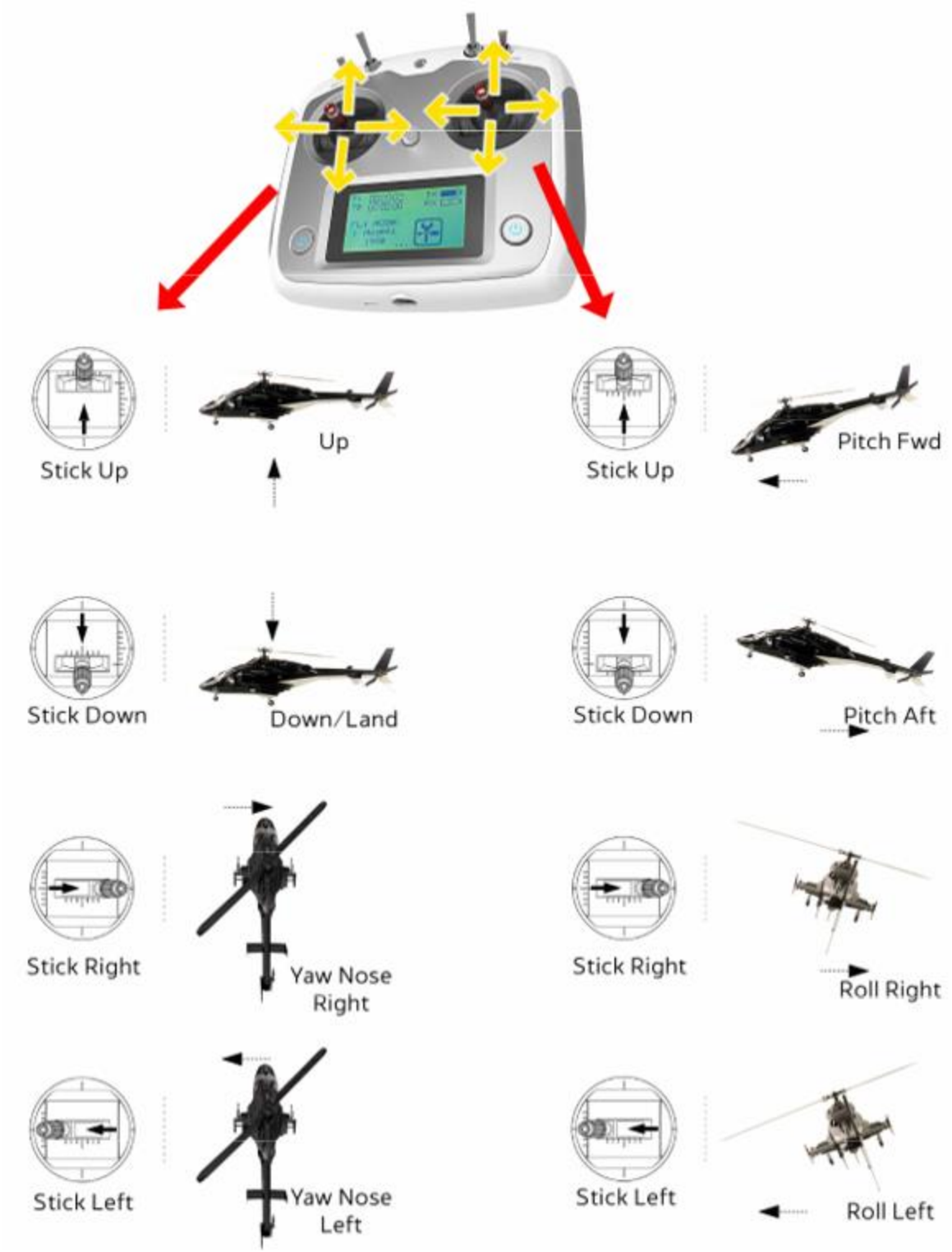


Key/Button 2
This button controls the LED sequence of the LED controller. Pressing the button will cycle through 8 different LED patterns.

Transmitter Notes:
There is an RX (receiver) voltage indicator on the transmitter screen. **This is NOT an indication of your flight battery voltage.**

There is text at the bottom left of the transmitter screen that says, “Fly Mode:”. This does not change when you move the Flight Mode switch. Do not alter this setting, as it will reset your transmitter’s parameters, requiring the transmitter to need to be reset up for the helicopter for it to function properly. The transmitter comes properly programmed from the factory, and there are no additional changes you need to make.

Flight Controls
Reference the image on the next page for the basic control function of the helicopter.


Stick Up
Up
Stick Up
Pitch Fwd
Stick Down
Down/Land
Stick Down
Pitch Aft
Stick Right
Yaw Nose Right
Stick Right
Roll Right
Stick Left
Yaw Nose Left
Stick Left
Roll Left

Preparing for Flight

Pre-Flight Checks

Before each flight, it is extremely important to perform a pre-flight check to ensure the airworthiness of the helicopter. Look and verify that all the mechanics and electronics systems are ready for flight. It is up to the user to ensure proper airworthiness.

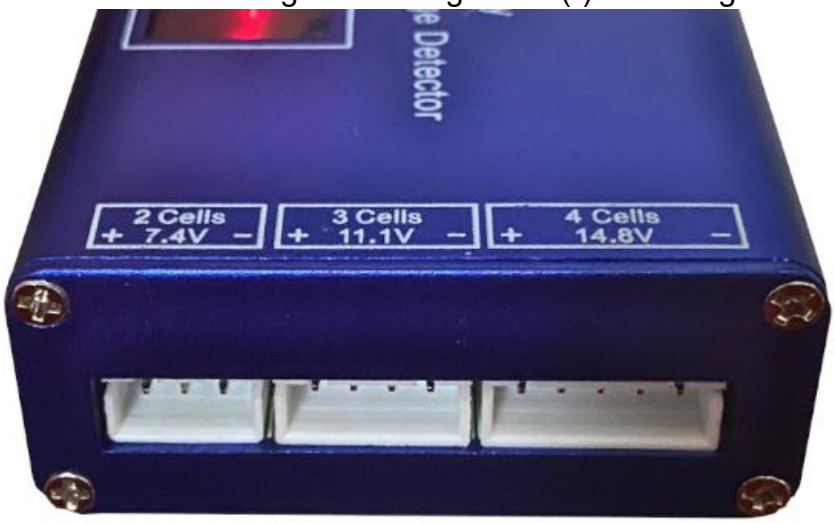
1. Main Blades
    - Check for any nicks, cracks or other causes for concern
    - Check blade grip screws for proper tension of rotor blades
2. Main Rotor Head
    - Inspect for loose screws and ball studs
    - Verify blade grips are tightly secured to the rotor head and cannot be pulled away from it.
    - Verify ball linkages are not worn, loose or cracked
3. Gears
    - Check for wear and missing teeth on the main gear
    - Check for proper belt alignment
    - Check for proper belt tension
4. Frame & Fuselage
    - Inspect for missing and loose screws
5. Servos and Wiring
    - Check for fraying and loose connections
    - Check servos are securely seated and attached
    - Check servo arms are attached securely
6. Tail Rotor
    - Inspect for any nicks, cracks or other causes for concern
    - Inspect for loose tail rotor nut
    - Inspect for free movement of tail motor

Charging The Flight Battery

The battery charger included with your helicopter can be powered by using the included wall-mounted power supply for 100-240V, or by a separate 12V DC input via the alligator style clip adapter that is included.

1. Connect the power supply to the wall outlet if using AC power, or the alligator clips to the 12V DC power source if using 12V DC.
2. Connect the barrel plug to the barrel port on your charger. You should see three red dashes when the charger is powered up.
3. Connect your flight battery to the charger using the white balance plug on the battery.

   Note that there are 3 different plugs on the charger [2-cell (2S), 3-cell (3S) and 4-cell (4S)]. Be sure to plug the balance tab of the battery into the larger, 4-cell (4S) balance port on the charger. Also, be sure to note the proper polarity of the balance plug as well. The polarity is marked on the charger – black goes to (-) and red goes to (+).



4. Once connected, charging will begin. The LCD screen will cycle through different cell voltages, and total (ALL) voltage of the battery. Once the battery is fully charged, the charger will emit a repeating tone, and the LCD will display FUL to indicate the battery is fully charged.
5. Disconnect the battery from the charger and disconnect the charger from the wall or power source once charging is complete.

Using the Transmitter

Powering On the Transmitter

To power on the transmitter, you must first install four AA batteries.

1. Remove the back cover by sliding the cover down.
2. Install the batteries, being sure to note proper polarity/orientation. The polarity is noted in the battery compartment.
3. Reinstall the back cover by sliding it up into position.

To power on the transmitter, please follow the steps below.

1. Ensure all switches are in their up position.
2. Press and hold both power buttons for two seconds. The radio will power on.
    a. If you see a warning indicating switches are not in the up position, correct the switch position(s), and the radio will proceed.
3. **Once the radio has powered on, move the Run/Cut switch (Switch A) to the CUT position.** This will prepare the radio for the helicopter to power on and ensures additional levels of safety.

To power off the transmitter, press and hold both power buttons for two seconds. The transmitter will power off. Note that the transmitter will not power off if the helicopter is powered on. First, remove power from the helicopter, and then you can power down the transmitter.

Always power on the transmitter before plugging in the flight battery, and always unplug the flight battery before powering off the transmitter.

Installing the Flight Battery

Center of Gravity

Before flying the model, it is important to verify that the helicopter has a proper center of gravity (CG). Adjust the position of the battery on the battery tray so that the helicopter is balanced with the main blades level when you pick it up by the dome-shaped rotor cap on top of the rotor head. and let it hang freely. You can mark the position of the battery by putting a mark on the battery tray with a permanent marker using a reference point, like the rear edge of the battery.



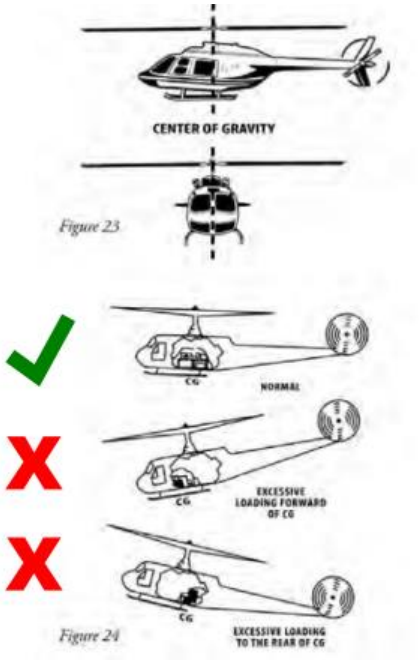


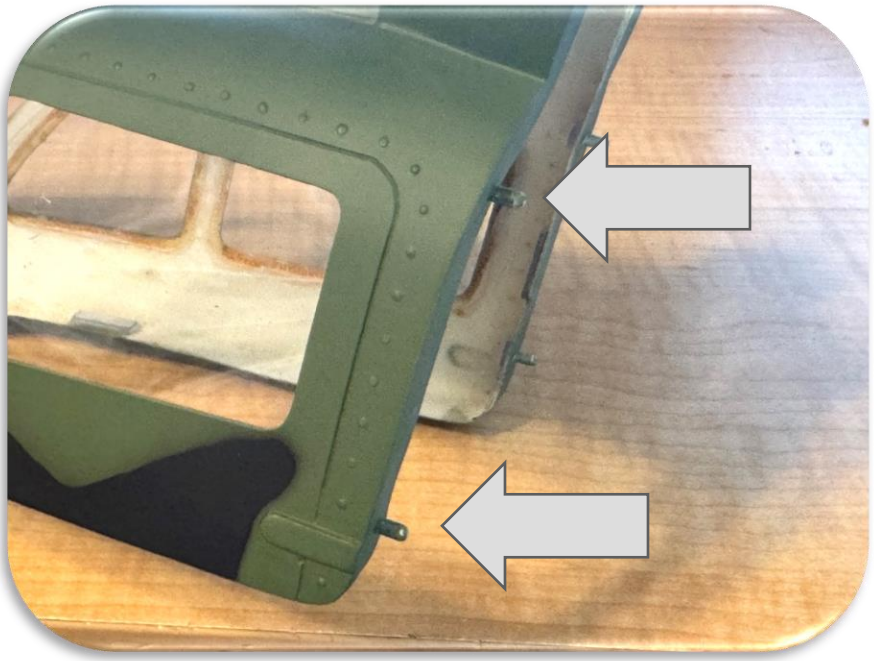
Figure 23

Figure 24



How to install the battery

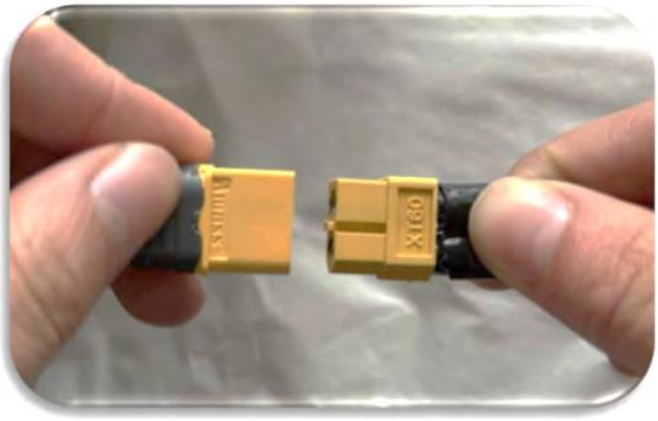
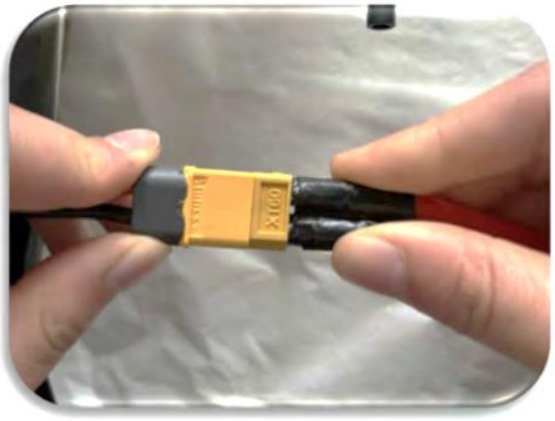
1. Start by removing the battery hatch from the helicopter to gain access to the model's interior. The hatch is magnetic and has two pins on each side of the fuselage. Simply lift the hatch from the front, and pull it away from the fuselage as you lift up.



2. Install the battery on its mounting plate as shown in the image and secure it with hook and loop strap by strapping it down with a little bit of tension. For added security, you can add adhesive-backed hook and loop tape to both the battery and the mounting plate.



3. With the transmitter powered on, plug the yellow XT-60 connector of the battery into the yellow XT-60 connector in the helicopter. This connector is located on the right side of the helicopter if viewed as the pilot in the helicopter.

4. Keep the helicopter motionless until it has completed it's bootup sequence. It will start flashing yellow followed by a brief light blue double flash, and then a rapid blue and red flash before settling to a light blue double flash. The light blue double flash indicates the system is looking for GPS signal.

Arming and Flying the Helicopter

Arming the Helicopter

1. After powering up the helicopter, place the helicopter in a safe and open takeoff location away from people, trees, buildings, and other potential hazards. Ensure that the motor cut switch is placed in cut, your flight mode switch is placed in GPS mode, and your return home switch is placed in the off position.
2. Once powered up, you will need to wait for the system to acquire GPS signal to be able to arm and fly the helicopter. Ensure the helicopter is in an open area, away from buildings, trees, concrete and metal structures and other similar obstacles. Provide at least an area of 30 meters (100 feet) x 30 meters (100 feet) to allow for GPS acquisition. On your first power up, you may have to wait five or more minutes for the system to acquire GPS signal. Subsequent power ups will usually be much quicker, approximately one to two minutes.
3. Watch the LED on the flight controller. A light blue double flash indicates that the system is trying to acquire a strong enough GPS signal for flight. Once strong GPS data is acquired, the LED will change to a single green flash. At this point, you can install the canopy and walk to your piloting position.
4. Once the LED turns to a flashing green, you can arm the helicopter by moving the left stick down and to the right. Hold the stick in this position for approximately 5 seconds, and the LED will change to solid green, and you are ready for flight.

   Important: Where the helicopter is located when you complete this arming sequence with the stick position movement is where the Return Home point is set. If you select return to home in flight, it will return to this point to land.



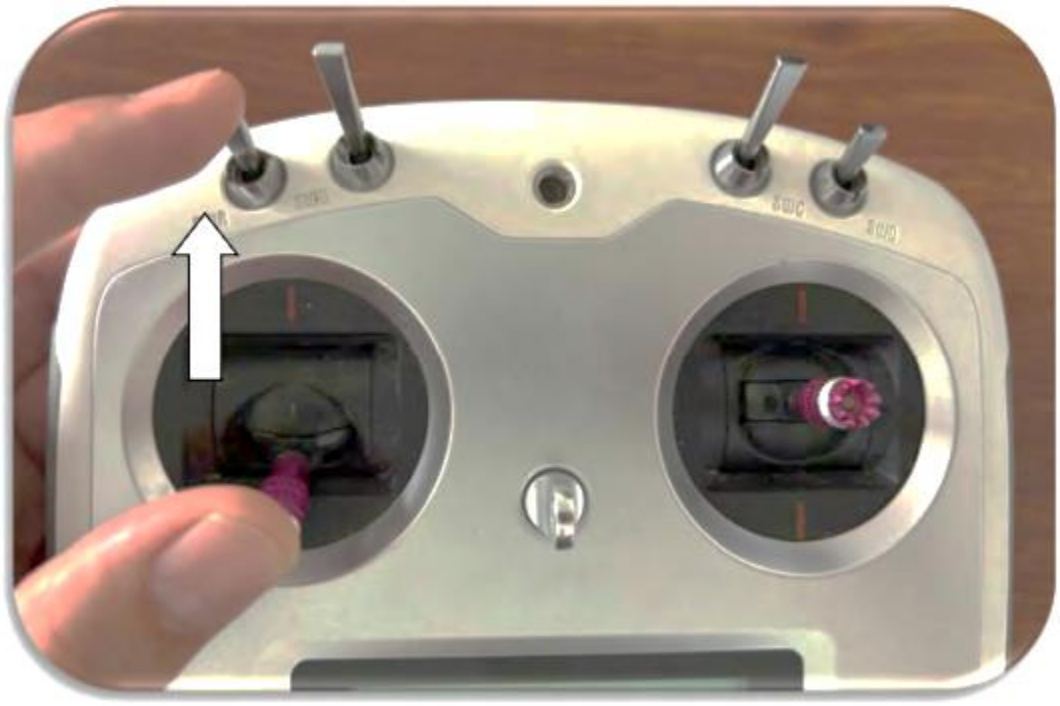


5. Once the Led changes to solid green and the helicopter is armed, you have approximately 15 seconds to start the motors. If the motors are not started within the

time frame, the system will timeout, the LED will return to flashing green and you will need to rearm again with the stick command. You do not have to cycle the power on the helicopter to rearm.

Starting the Motors and Takeoff

Once the helicopter is armed, you can start the motors by moving the Run/Cut switch into the Run position. The helicopter main blades will begin to turn and speed up. The tail rotor may or may not turn at this time.



Once you have moved the switch to the run position, let the helicopter completely spool up. Listen to the rotor sound. Once you hear a consistent speed, usually indicated by an unchanging pitch or sound, the helicopter has completely spooled up.

After the helicopter has fully spooled, gently push the left stick up, and hold it there until the helicopter takes off and reaches a height of *at least* 1 meter (3 feet). If the helicopter is too close to the ground, you can get into rotor wash (wind from the rotor blades) that bounces off the ground and can cause some instability. At this point, it is up to you to experiment with flying the helicopter!

Important: Do NOT let the helicopter sit on the ground for more than a couple seconds while running the motors at full speeds. Resonate vibrations from the helicopter and through the ground combined with rotor wash from the main blades can sometimes cause tip-over crashes.



Flight Time when Flying the Helicopter
The RotorScale 470 helicopters can fly for approximately 8 minutes on a single charge of the included flight battery. Flight times can vary depending upon flying style, and battery used so we recommend starting out with a limit of 8 minutes. The transmitter does have a timer function if you wish to add a timer. If doing so, we suggest adding your timer to the Run position of the Run/Cut switch, so the timer will automatically start when you move the switch into the run position.

If you fly for too long, the helicopter will recognize the battery voltage is too low and initiate a return to home. **DO NOT** fly to this automatic return home feature, as doing so can damage the battery.

Landing the Helicopter
There are two methods to land the helicopter – landing it yourself or using the Return Home Function of the stabilization system.

Self-Controlled Landing
If you wish to land the helicopter yourself, simply move the helicopter to a safe landing area, and lower the left stick to lower the helicopter. **As soon as the helicopter touches down, move the Run/Cut switch into the Cut position to shut the motors down.**

Important: Do NOT let the helicopter sit on the ground for more than a couple seconds while running the motors at full speeds. Resonate vibrations from the helicopter and through the ground can sometimes cause tip-over crashes. Once you land, be sure to quickly shut down the motors using the cut switch.



Return to Home
If you wish to use the Return to Home (RTH) function to land the helicopter, remember that it will return and land in the location where it was armed before flight, and you must takeoff in GPS Mode. While in flight, simply move the Return Home switch from the off position to the RTH position. Depending on the helicopter's position and altitude when this is initiated, the helicopter will either begin a slow climb or descent to about 9 meters (30 feet). Once it reaches this altitude, it will rotate the nose to point to the landing point and begin moving forward to that position.

Note: During these first two phases of Return to Home, you will not have control over the helicopter. However, you can cancel Return to Home at any time by simply moving the Return

to Home switch back into the off position, and the system will default to the Flight Mode selected by your Flight Mode switch.

Once the helicopter has reached the landing point, it will turn the nose into the original arming position and begin a slow descent toward the ground. During the descent, you have some limited control over the position of the helicopter. If the helicopter is going to land in a rough spot or on a clump of grass or similar unsafe area, you can alter its position with the right stick, or change the heading with the left stick. **If you need to abort the landing, simply move the Return Home switch back into the Off position, and you can resume flying the helicopter.**

Otherwise, the helicopter will continue its descent until it reaches the ground. Once it reaches the ground and lands, it will shut down the motors automatically. To takeoff again after using Return to Home, you will need to put the Return Home switch back into the Off position, move the Run/Cut switch to the Cut position and rearm the helicopter.

Return to Home Safety Features

This helicopter has some built-in safety features that will automatically activate Return to Home, even if the switch is not in the RTH position.

Loss of Signal

If the helicopter had taken off in GPS mode, and the transmitter signal is interrupted for more than 3 seconds, the flight control system will enter the Return to Home mode. It will take control of the helicopter and automatically land and shut off the motors unless interrupted by the user. *Interruption of this is only possible if the radio signal returns to normal AND the user cycles the Return to Home switch to RTH and back to the Off position.*

Low Voltage Return to Home

If the helicopter had taken off in GPS mode, and the flight controller detects that the flight battery has too low voltage, the controller will enter the Return to Home mode. This is purely a safety feature and is only intended as an attempt to save the helicopter in a low voltage situation. It will not save the battery. **DO NOT intentionally fly to Low Voltage Return home as doing so can damage your battery.** Set a timer for approximately 8 minutes, and land when the timer goes off.

LED Lighting System

The helicopter comes equipped with a pre-installed LED lighting system, which has its own dedicated controller. The system is powered by the 7.4V BEC supply through the bridged rail on the main controller and is connected to channel 6. The LED controller can be controlled by the transmitter. The right-hand side button on the back side of the radio can be used to cycle through 8 different patterns. The light pattern always starts on the same pattern mode on power up. The controller is separate from the main controller and can be controlled immediately.

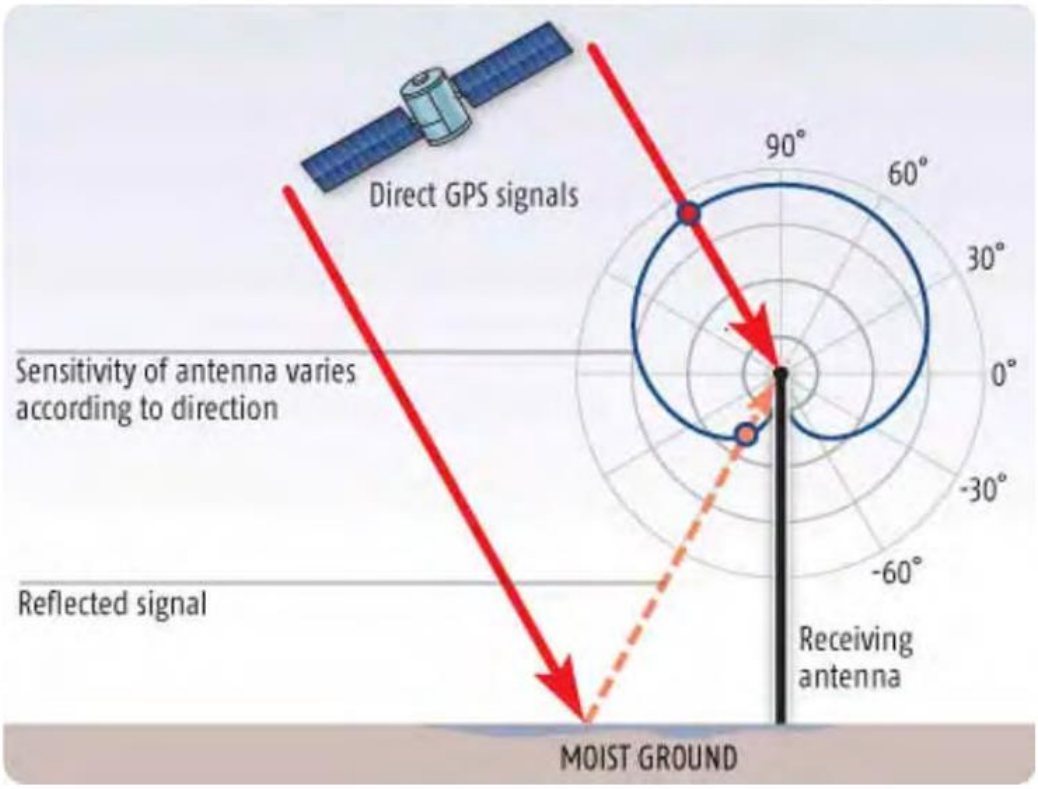




Near-Ground GPS Interference

We advise against hovering within 3 feet (1 meter) of the ground in GPS mode for extended periods. GPS relies on signals from multiple satellites, calculating position based on the time it takes for these signals to reach the receiver. However, when flying close to the ground, these signals can reflect off surfaces, such as moist gravel or concrete, and bounce back to the receiver causing inaccurate readings.

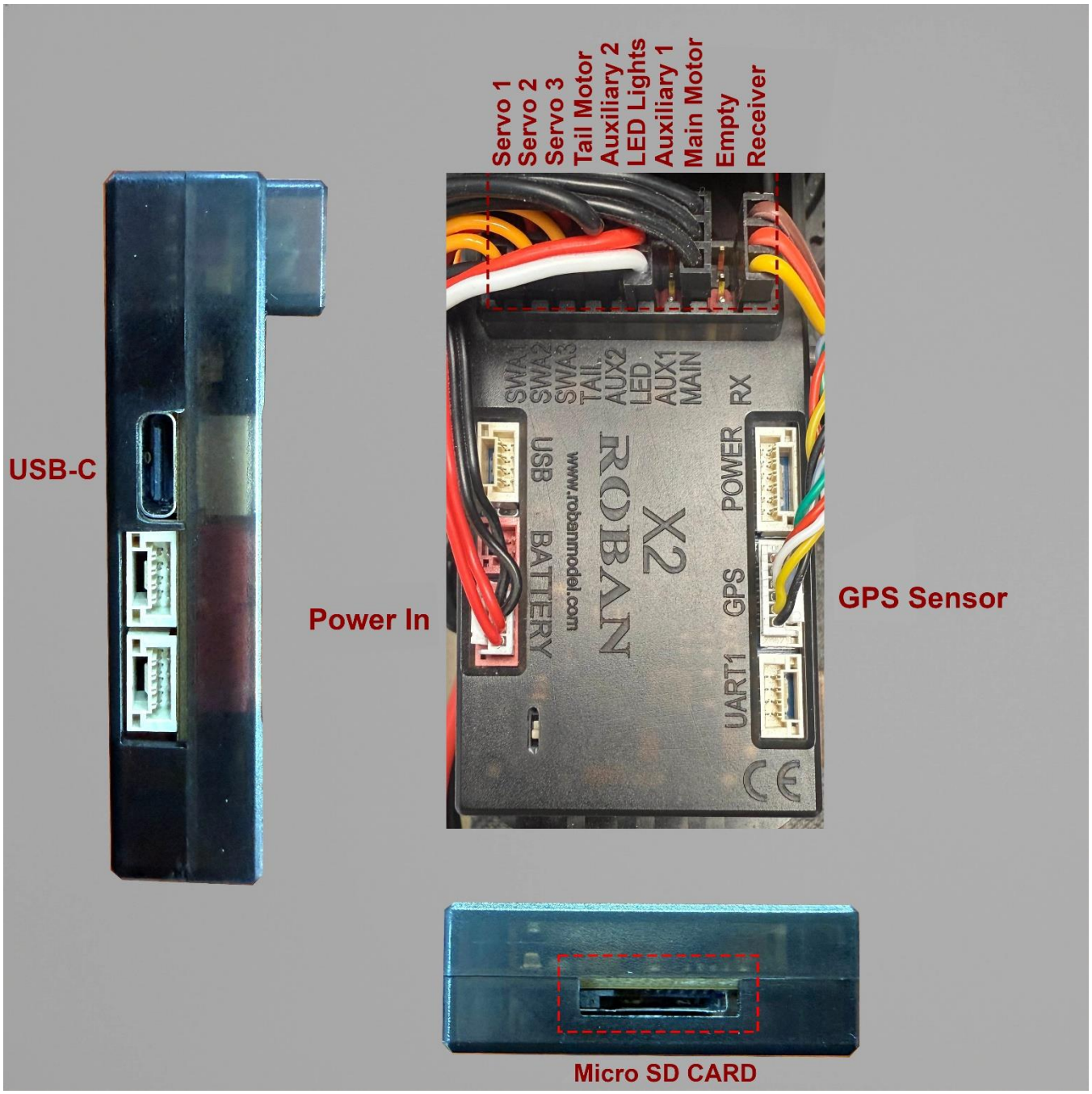
For this reason, we strongly advise against operating in GPS mode near the ground, except during takeoff and landing.



Electronic Components and Documentation

Controller Ports and Description

Please reference the image below for a basic diagram of the flight controller. Reference this in case you need to remove any connectors for repairs or maintenance.



Flight Controller Port Wiring Table

Port Name	Connected To
Port 1	Swash Servo 1 (Powered by Main Motor ESC)
Port 2	Swash Servo 2 (Powered by Main Motor ESC)
Port 3	Swash Servo 3 (Powered by Main Motor ESC)
Port 4	Tail Motor ESC
Port 5	Transmitter-Controlled Accessory (Retracts, Water Drop etc.)
Port 6	LED Light Controller
Port 7	Empty
Port 8	Main Motor ESC (7.4V DC Input from ESC)
Port 9	Empty
Port 10	Receiver Serial Input

The Servo and ESC channels share a common power and ground connection, but do not have their own internal power supply. Instead, the ESC supplies power to the servos through a 7.4V DC battery eliminator circuit (BEC) in a high-voltage (7.4V) configuration.

Note that the power connector is NOT polarity-protected.

All ports are common for power and ground and must be supplied with power from an external source, such as the ESC.

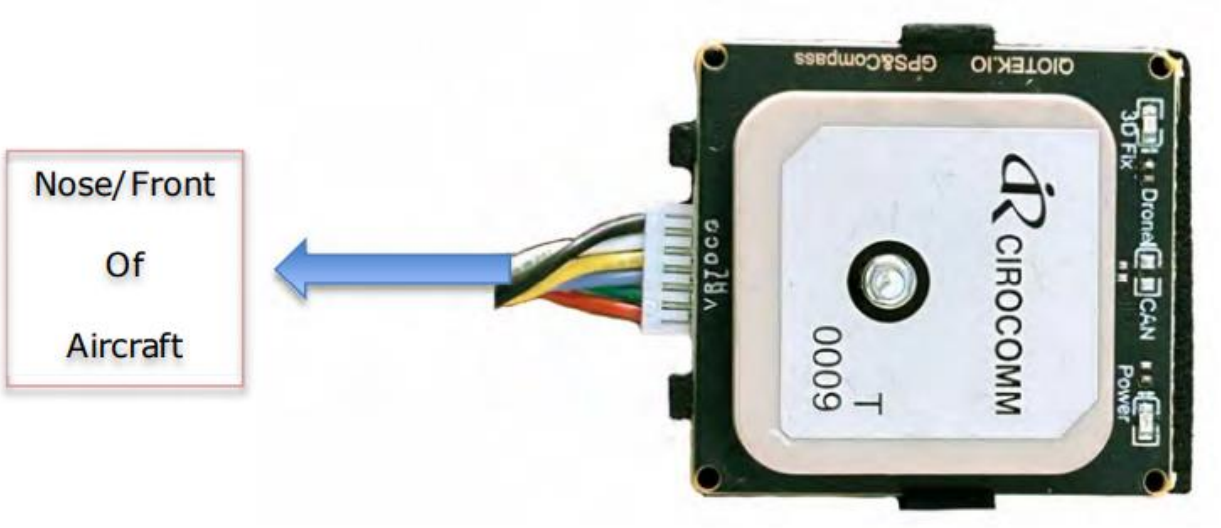
Flight Controller Status Light Descriptions

Reference the chart below for specific LED status descriptions.

Flight Mode	LED	LED Status	Meaning
Angle/Manual Mode	🔴	*Slow flashing red*	GPS position is not yet available. The helicopter may still be flown in Angle or Manual Mode once all other pre-arm requirements are satisfied.
Angle/Manual Mode	🟢	*Flashing green*	Helicopter is ready to arm. A valid GPS position is not required for these flight modes. Flashing green does not mean aquired GPS, unless in GPS mode.
GPS Mode	🔵	*Double-flashing blue*	GPS position is not yet valid for GPS Mode. Wait for the GPS position to become valid before attempting to arm.
GPS Mode	🟢	*Flashing green*	GPS position is valid and the helicopter is ready to arm in GPS Mode.
GPS Mode	🟢🟢	*Fast Flashing green*	GPS position is valid with additional position data and is ready to arm in GPS Mode.
Any Mode	🟡	*Double-flashing yellow*	A pre-arm safety check has failed. The helicopter will not arm until the issue is resolved.
Any Mode	🔴🔵	*Flashing red and blue*	Flight controller is initializing. Keep the helicopter stationary during initialization.
All Modes	🟢	*Solid green*	Helicopter is armed.

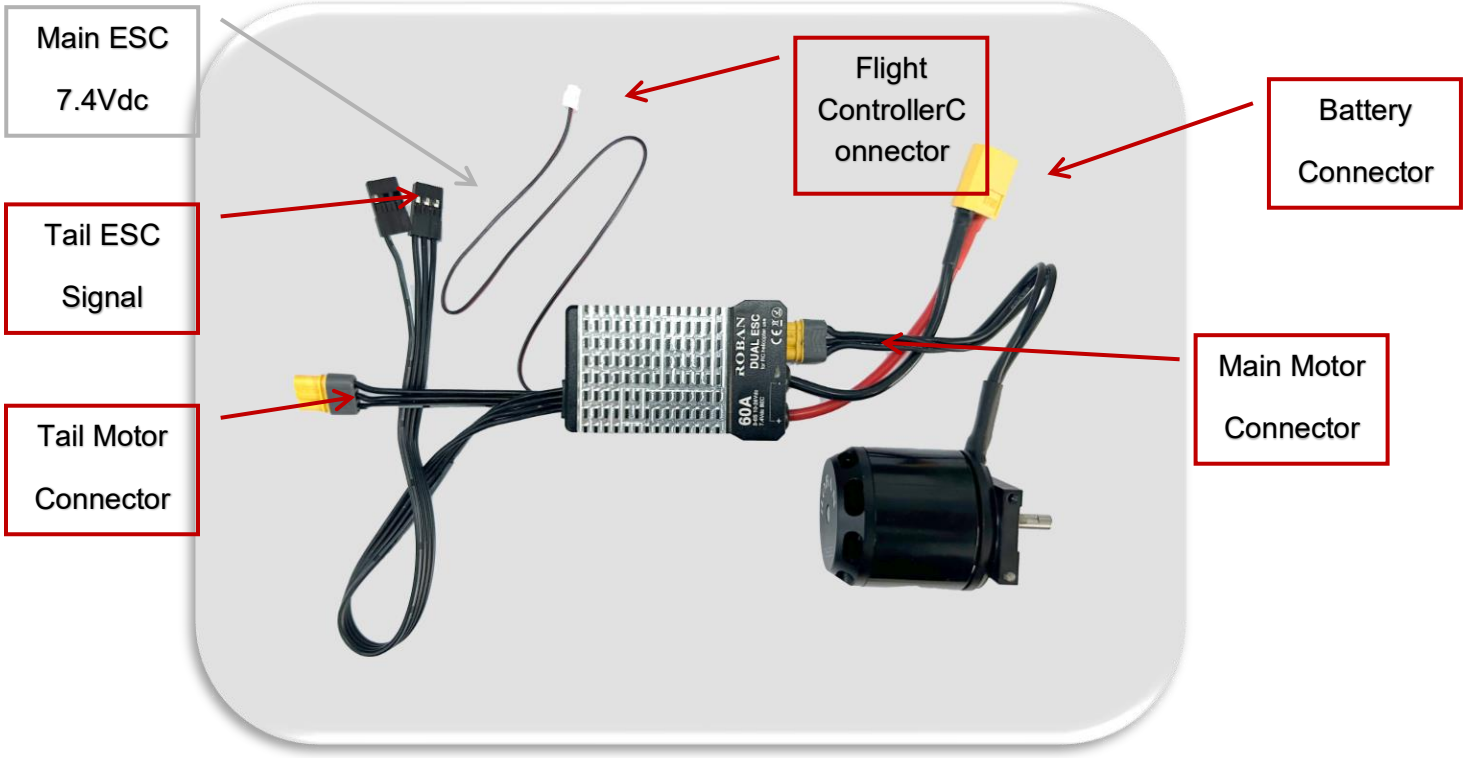
GPS Sensor

The GPS sensor is a U-blox M10N unit with an onboard magnetometer, which is the only magnetometer used in the system. It is installed in the tail boom to avoid magnetic interference from the main motor. For optimal performance, ensure the antenna is level and properly aligned, with the plug facing toward the nose of the aircraft. The unit is preinstalled and doesn't require any maintenance. The unit is automatically configured during bootup of the controller.



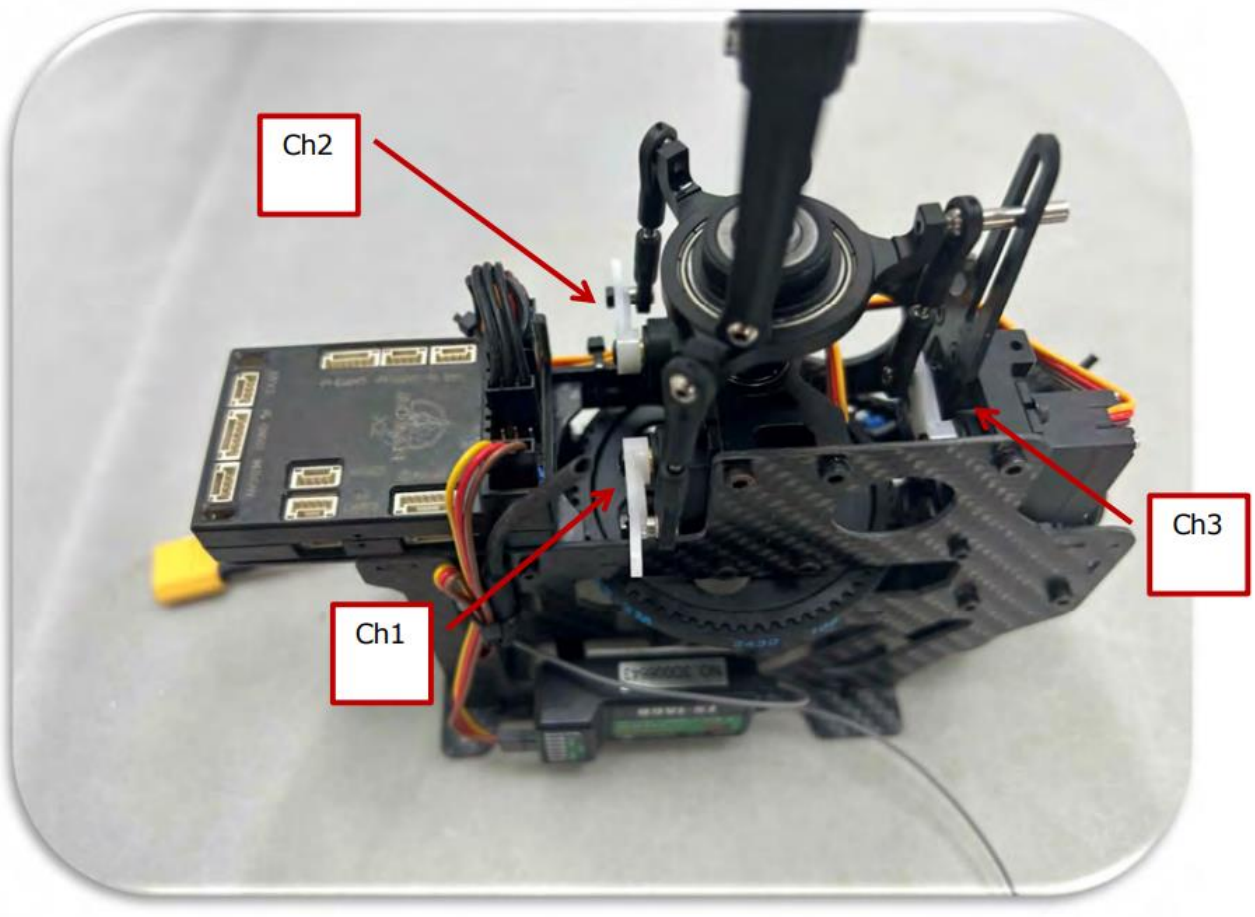
Dual channel ESC

The supplied ESC is a dual-channel unit, consisting of a helicopter-governor-type main ESC and a fast-responding BLHeli-type tail rotor ESC. Both are physically separated and operate independently, each controlled by its own MCU within the controller. Additionally, the ESC includes a DC-DC buck step-down voltage converter that supplies 7.4V DC to the servos through the controller's bridged connectors, spanning channels 1 through 8. Below is the wiring schematic:



Swash Servo Designations and Wiring

The swashplate servos are connected to the ports 1-3 of the flight controller. The servos are high-voltage (7.4V DC), which are powered by the dual ESC connected on channel 8.



Troubleshooting

We've provided some basic troubleshooting steps you can take if you run into some common questions or problems that may arise. See the information below for specific issues and possible resolutions.

Double Blue Flash Only – Helicopter Won't Arm

The double blue flash on the flight controller typically indicates that the system is trying to acquire a clear GPS signal. If you are not getting to a green flashing LED, try the possible solutions below:

1. Not enough time has passed – sometimes this process can take several minutes, especially if flying the model for the first time, or at a new flying site. Try waiting for up to 7 minutes for the system to find GPS data.
2. Poor environment for GPS acquisition. This means you could be indoors where GPS is hard to find, near large buildings or concrete walls or similar obstacles that may obstruct the system from finding GPS data.
3. Other interfering electronics are nearby. Check and make sure electronics other than those in the helicopter are not near the flight controller and GPS system, as they can affect the performance of the system.
4. Motor Run/Cut switch in the CUT position. The system won't allow arming with the switch in the RUN position. Make sure the switch is in cut and wait a few minutes to see if it allows arming.
5. Return Home switch in the OFF position. The system won't allow arming with the Return Home switch in the RTH/On position. Move the switch to the OFF position and wait a couple more minutes to see if it allows the system to arm. If you just completed a landing using Return to Home, you'll need to rearm the system, as well as move the switch to the off position.
6. Minor compass error. The compass looks for an acceptable range - occasionally, the system may be just outside of that range, and simply moving the helicopter 2 meters (6 feet) away or simply rotating the helicopter slightly at its location will help resolve the error and for it acquire GPS.
7. Battery voltage too low. The system will not allow you to arm the helicopter if the battery voltage is below a certain threshold. Put in a fully charged battery and try again.
8. Ensure the GPS unit is connected. The GPS will not work without being plugged in.
9. Transmitter powered on and connected to the receiver. The system will not allow flight without the transmitter powered on and connected to the receiver.

Non-Commanded Movement

If the helicopter flies off in a direction on its own, here are some things to check:

1. Battery Voltage – If your battery voltage is too low, the flight controller will automatically initiate a return to home landing. The helicopter will climb to approximately 30 feet (10 meters) and navigate back to the point where it was armed. Once it reaches the point it was armed, it will begin a slow decent to landing. This function is normal and is intended

to save the helicopter in case of a low battery. Do not fly to this point, as it will damage your battery. Instead, setup a timer for approximately 8 minutes, and fly to the timer instead.

2. Return home switch moved to RTH. If the Return to Home switch is moved to the RTH position, it will begin a return to the home point. This can often be bumped accidentally, so verify the switch is in the OFF position.

Lost Power In Flight

If the helicopter seems to lose power during flight, check for the following possible causes:

1. Is the Run/Cut switch in the CUT position? This can be easily bumped and moved into the cut position. If this happens, the helicopter will lose power and fall to the ground.
2. What is the battery voltage? A loss of a battery cell, or poor-quality battery can cause the helicopter to lose power and fall to the ground. Ensure you are using new, quality batteries from a known good source.
3. Check for loose or poor connections. Is the battery lead secured well to the ESC lead? Do the connectors appear in good shape? Is the power wire going from the ESC into the front of the flight controller fully seated and plugged in well?
4. Is the main drive belt in good condition and properly engaged? If the main drive belt comes off the main gear, or is slipping or in otherwise poor condition, it can cause the helicopter to lose power and fall to the ground.

Replacement Parts

You can find all of the spare parts for your helicopter online at Motion RC:
https://motionrc.com (North America)
https://motionrc.eu (Europe)

Internal Spare Parts

Spare Part SKU	Description
RSH-450-SP023	RotorScale 450 Size Rotor Spindle, 4-Blade (1)
RSH-450-SP024	RotorScale 450 Size Main Blade Grip (1)
RSH-450-SP026	RotorScale 450 Size Upper Swash Linkage Set
RSH-470-SP001	RotorScale 470 Size Main Shaft
RSH-470-SP003-5B	RotorScale 470 Size Rotor Head, 5-Blade
RSH-470-SP007V2-5B	RotorScale 470 Size Swashplate, 5-Blade
RSH-470-SP008	RotorScale 470 Size Servo Mount A
RSH-470-SP009	RotorScale 470 Size Servo Mount B
RSH-470-SP0010V2	RotorScale 470 Size Main Gear/Pulley
RSH-470-SP011	RotorScale 470 Size Main Shaft Bearing Block
RSH-470-SP012V2	RotorScale 470 Size Lower Linkages
RSH-470-SP013	RotorScale 470 Size Bearing Set
RSH-470-SP014	RotorScale 470 Size Main Shaft Locking Collar
RSH-470-SP015V2	RotorScale 470 Size Main Frame Spacer
RSH-470-SP016	RotorScale 470 Size Main Drive Belt
RSH-470-SP017	RotorScale 470 Size Lower Swash Bracket
RSH-470-SP018	RotorScale 470 Size Flight Controller Mount
RSH-470-SP019	RotorScale 470 Size Main Frame Bottom
RSH-470-SP020	RotorScale 470 Size Tail Motor
RSH-470-SP021	RotorScale 470 Size Main Frame Set
RSH-470-SP023	RotorScale 470 Size Servo Horn Set
RSH-470-SP028	RotorScale 470 Size Main Motor with Mount
RSH-470-SP031	RotorScale 470 Size Dual ESC, 5-Blade
RSH-470-SP032V2	RotorScale 470 Size Motor Belt Pulley
RSH-470-SP033	RotorScale 470 Size Belt Tensioner
RSH-470-SP034	RotorScale 470 Size Belt Tensioner Spring
RSH-470-SP035	RotorScale 470 Size Hardware Set
RSH-470-SP036	RotorScale 470 Size GPS Sensor
RSH-470-SP037-MG	RotorScale 470 Size H145M Flight Controller
RSH-470-SP038	RotorScale 470 Size 4S 5200mAh Battery
RSH-470-SP039	RotorScale 470 Size 20W Balance Charger
RSH-470-SP040	RotorScale 470 Size Rotor Head Button Cap
RSH-470-SP041	RotorScale 470 Size Battery Velcro Strap
RSH-470-SP042	RotorScale 470 Size Servo

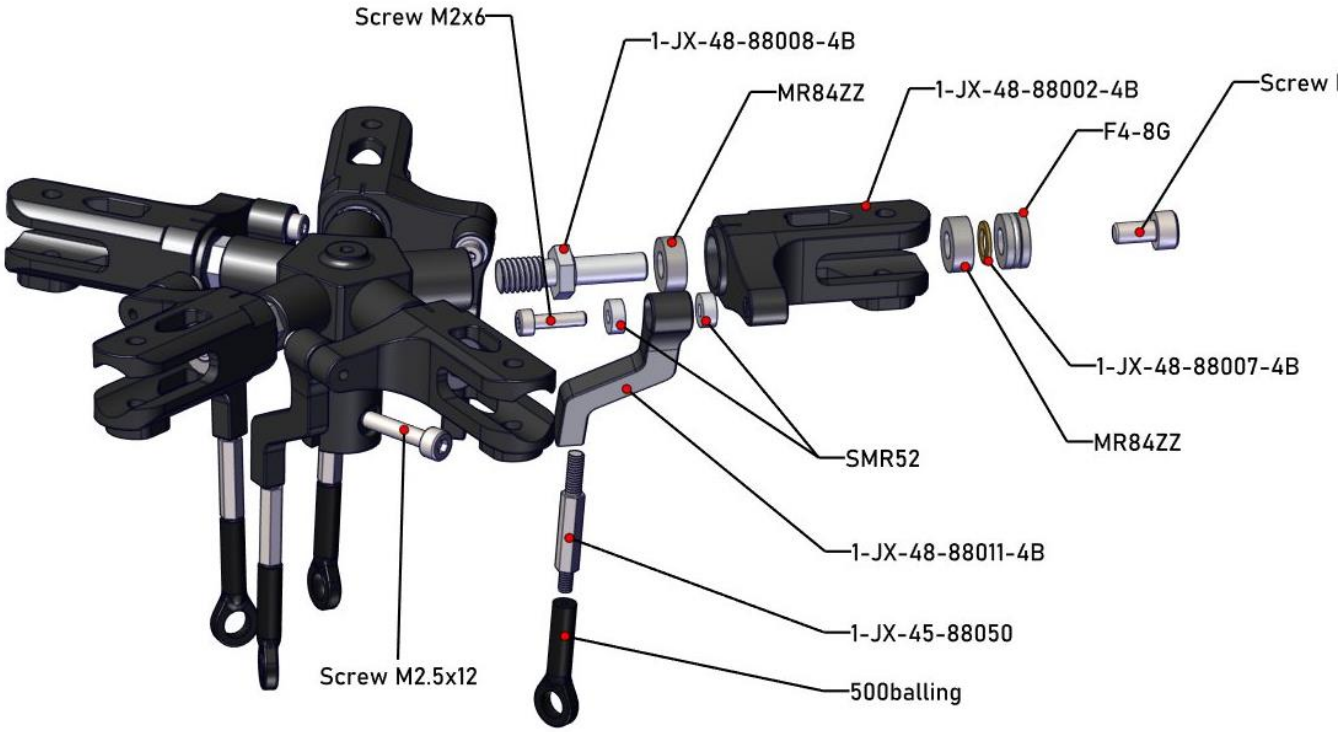
RSH-470-SP044	RotorScale 470 Size Receiver Connection Wire
RSH-470-SP047	RotorScale 470 Size 2.4GHz Transmitter and Receiver
RSH-470-SP048	RotorScale 470 2.4GHz Receiver

External Spare Parts

Spare Part SKU	Description
RSH-EC470LPJ001	RotorScale 470 Size H145M Canopy HatchL
RSH-EC470LPJ002	RotorScale 470 Size H145M Front Window Set
RSH-EC470LPJ003	RotorScale 470 Size H145M Complete Window Set
RSH-EC470LPJ004	RotorScale 470 Size H145M Tail wing set
RSH-EC470LPJ005	RotorScale 470 Size H145M Landing Gear Skids
RSH-EC470LPJ006	RotorScale 470 Size H145M Landing Gear Steps
RSH-EC470LPJ007	RotorScale 470 Size H145M Decal Set
RSH-EC470LPJ008	RotorScale 470 Size H145M Tail Rotor
RSH-EC470LPJ009	RotorScale 470 Size H145M Main Blade Set
RSH-EC470LPJ010	RotorScale 470 Size H145M Tail Motor with wire
RSH-EC470LPJ011	RotorScale 470 Size H145M LED Set
RSH-EC470LPJ012	RotorScale 470 Size H145M Complete Fuselage Set, with LEDs
RSH-EC470LPJ014	RotorScale 470 Size H145M Complete Weapon Set

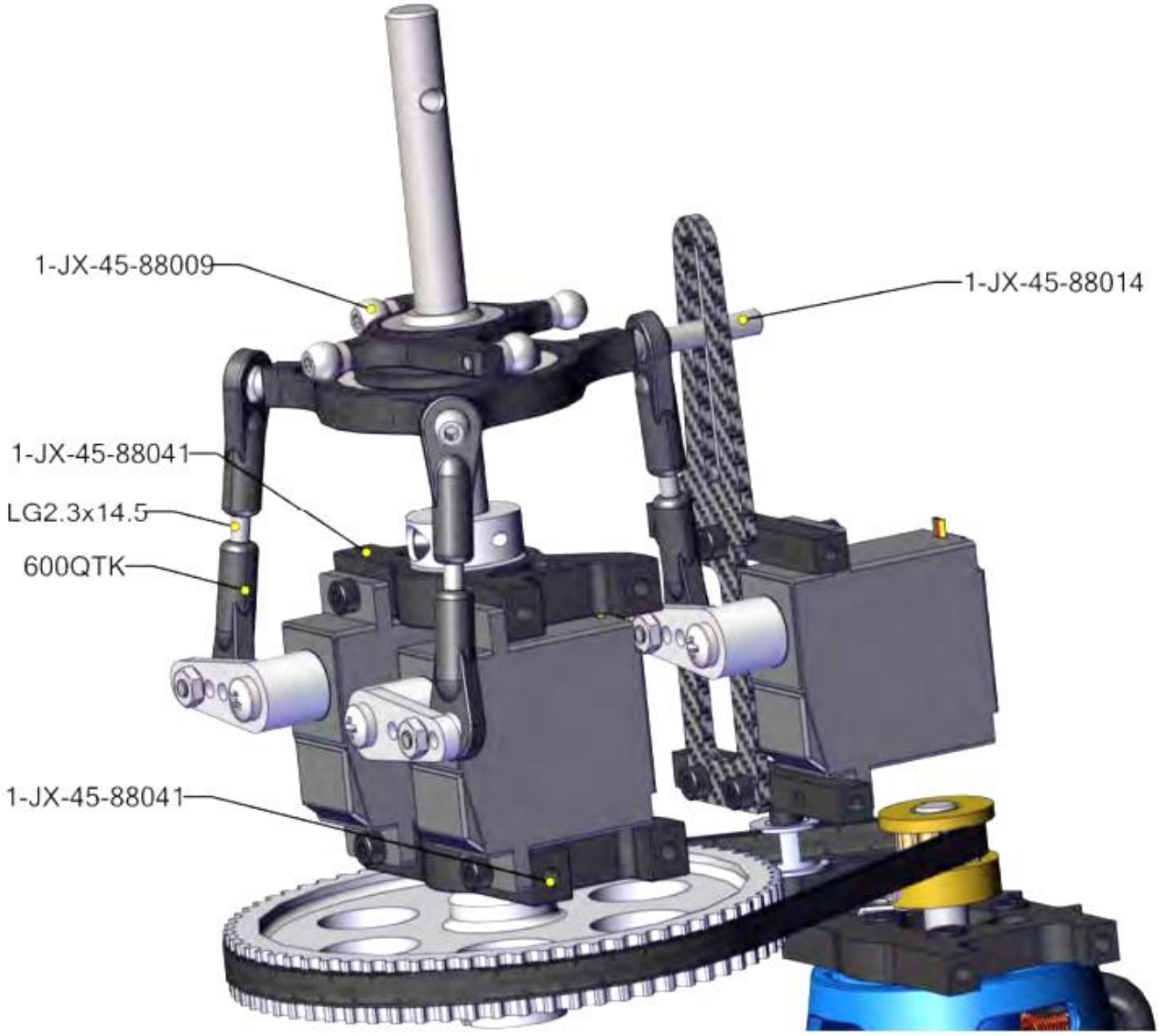
Exploded Parts Diagrams

Upper Mechanics

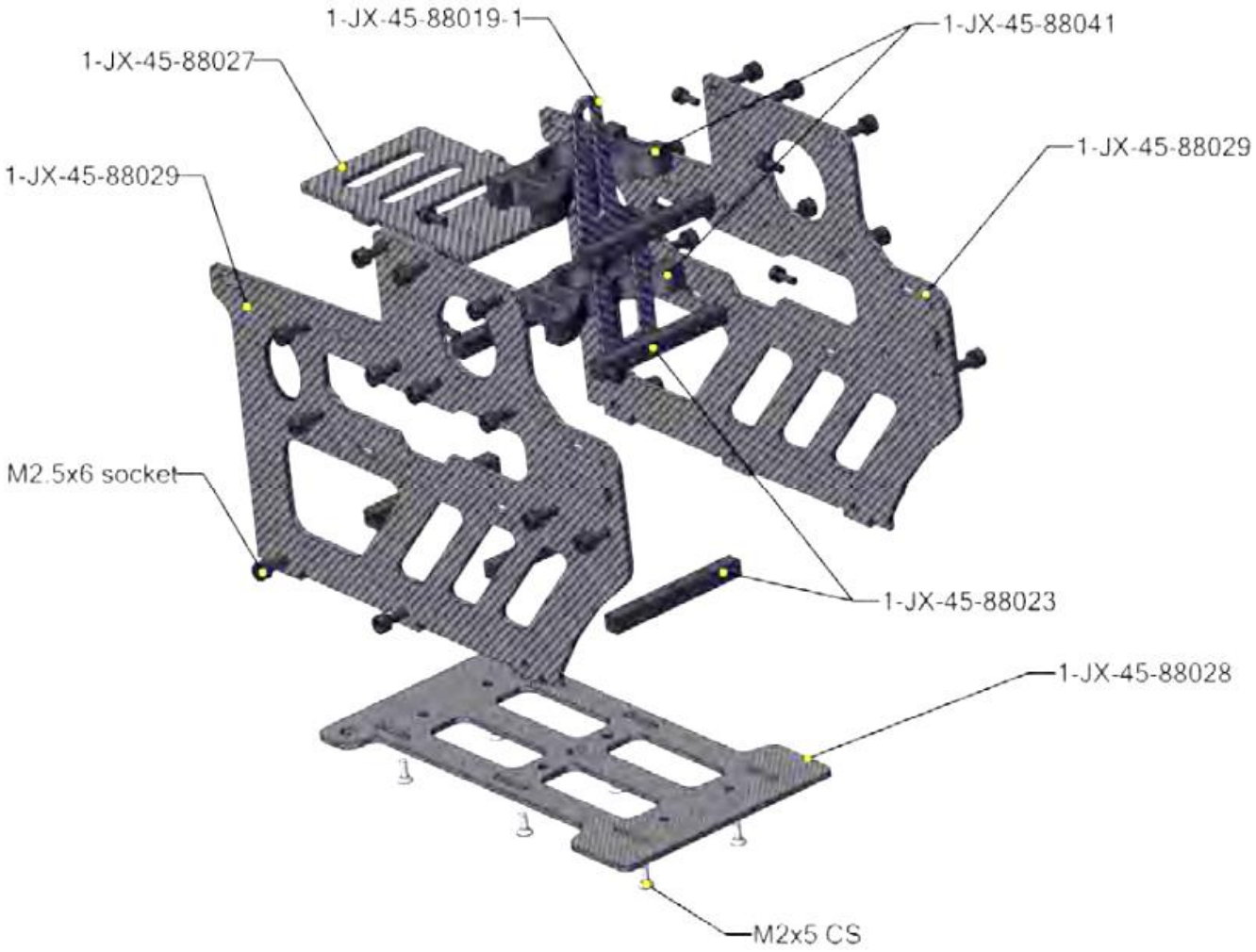




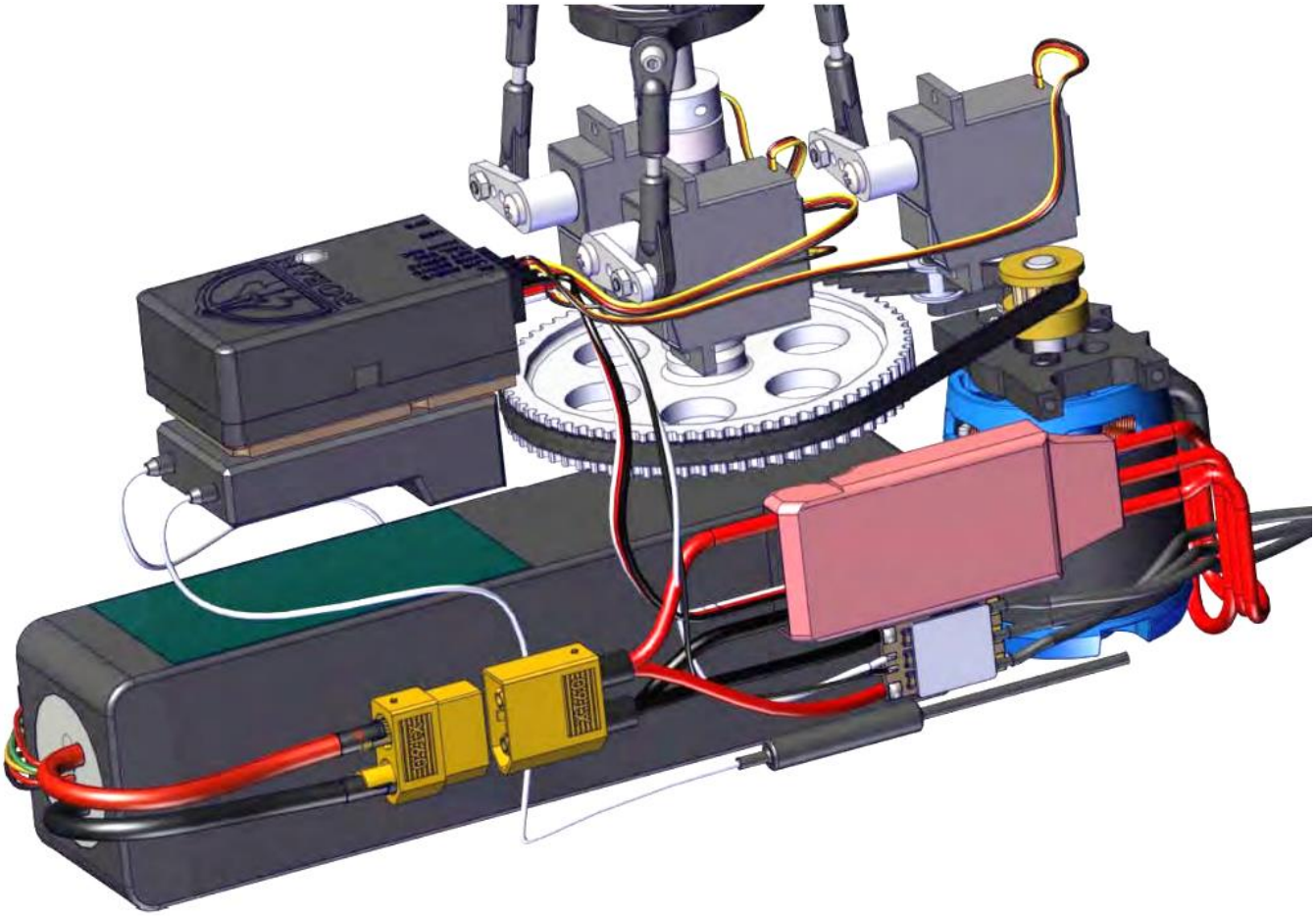
Lower Mechanics



Main Frames


1-JX-45-88019-1
1-JX-45-88041
1-JX-45-88027
1-JX-45-88029
1-JX-45-88029
M2.5x6 socket
1-JX-45-88023
1-JX-45-88028
M2x5 CS

Electronics



Product Compliance

FCC Information

FCC ID: Transmitter: N4ZFLYSKYI6S, Receiver: N4ZFLYSKYIA10

Supplier's Declaration of Conformity

RotorScale H145M 470 (HSM-470-R-H145M-HC)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



Motion RC, LLC, Gurnee, IL 60031
motionrc.com (USA)
motionrc.eu (Europe)

Compliance Information for the European Union:

RotorScale H145M 470 (HSM-470-R-H145M-HC)

Hereby, Motion RC LLC declares that the device is in compliance with the following: EU Low Voltage Directive 2014/35/EU, EU EMC Directive 2014/30/EU, EU Radio Equipment Directive 2014/53/EU, RoHS 2 Directive 2011/65/EU, RoHS 3 Directive - Amending 2011/65/EU Annex II 2015/863

NOTE: This product contains batteries that are covered under the 2006/66/EC European Directive, which cannot be disposed of with normal household waste. Please follow local regulations. The full text of the EU declaration of conformity is available at the following internet address: https://www.robanmodel.com/content/rendercompliance

Wireless Frequency Range and Wireless Output Power:
FlySky Transmitter 6157A-KATY1T, 2478 MHz 17.7dBm
FlySky FS-iAB6 Receiver 6157A-WACO1T, 2404 – 2476 MHz 1.43dBm

WEEE NOTICE: This appliance is labeled in accordance with European Directive 2012/19/EU concerning waste of electrical and electronic equipment (WEEE). This label indicates that this product should not be disposed of with household waste. It should be deposited at an appropriate facility to enable recovery and recycling. EU Manufacturer of Record: Roban Model Limited, Shiwan, Huizhou, Guangdong, PR China



Software Licensing and Attribution:

The controller used in this product is based on software licensed under the Creative Commons Attribution-ShareAlike 3.0 (CC BY-SA 3.0) license. As per the license requirements, we provide the following attribution details:

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- Title: ArduCopter Heli

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