

Aretas Aerial  
**V650 USER MANUAL**

**Aretas Aerial**

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Aretas Aerial



## RADIO CONTROL TRANSMITTER

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## 2.1 Safety Note

1. This craft is a sophisticated mechanical device which requires the undivided attention of the operator. Operation of this craft involves the monitoring and maintenance of multiple integrated systems. Irresponsible usage can result in significant property damage, serious or even fatal physical injury.
2. Aretas Aerial accepts no liability for injuries or damage associated with this product, as it's safe usage is contingent on the operator's responsible usage.
3. This product is suitable only for trained UAV pilots and is not recommended for use by minors.
4. Each flight should be approved according to your local regulations. Aretas Aerial accepts no responsibility for fines associated with the unlawful usage of this craft.

## 2.2 Safety Measures

There are many hazards to keep in mind when operating or choosing to operate this craft. The operator is responsible for flight area, flight safety, and pre-flight checks and maintenance. Pilot is responsible for operating within the confines of the local AHJ (authority having jurisdiction).

1. People or Objects at a distance. It is more difficult to monitor flight speed and accuracy of maneuvers when craft is at a distance. Maintain safe distances from people and obstacles.
2. Operate at a reasonable altitude. No higher than 90 m (300 ft).
3. Keep line of sight with craft at all times.
4. Monitor Weather. Avoid flying in rain, lightning, or high winds as operational ability and electrical systems could be compromised.
5. Utilize this craft for its intended purpose. Do not try to operate beyond its restrictions and capabilities.
6. Pilot Condition. Operate only while in suitable physical and mental condition. Exhaustion, Inebriation, Illness, Inability to focus are all reasons to avoid operation. Extended periods of flight are not recommended, as operation can be stressful and level of awareness may diminish.
7. Refrain from Solo Flight. A spotter is recommended and may be required in some jurisdictions during all flights to improve situational awareness.

## 2.2 Safety Measures (continued)

8. Distance from propellers. The carbon fibre blades are spinning at high RPM and can cause significant damage or injuries. Be sure blades are not powered up unless at a safe distance from people and objects.
9. Temperature. Keep craft and its parts away from elevated heat levels. Excessive temperature may damage electronics and low temperatures affect LiPo battery capacity, and will shorten flight times.
10. Avoid moisture & humidity. The UAV should be kept in a dry location, away from vapour, water sources and weather exposure. Moisture can damage the electrical systems and be cause for failure during operation.
11. Be aware of Regulations and No Fly Zones in your area.
12. Short circuits, crash impact and improper charging can cause catastrophic failure of high capacity LiPo batteries used by this UAV. Be sure to study safe LiPo handling and charging procedures. Pay close attention for exposed power wires as they can short if they contact the conductive carbon fiber frame parts.

## 2.3 Training Note

Learning the operation of radio controlled UAVs requires a lot of patience and practice. Practice and fly within your capabilities and plan on improving slowly. Excessive repetition and increasing your movement training in small increments is highly recommended.

Study and Memorize all controls and maneuverability. If practising with other crafts, keep in mind each vehicle operates in a different manner and do not all have the same capabilities.

### 3.1 Pre-Flight/Post-Flight Checklist Introduction

These steps have been designed and organized system by system to assist you in establishing safe routines and rigorous maintenance habits.

Please follow all steps in order.

### 3.2 Pre-Flight S1 - Radio Controlled Transmitter

Please follow all steps in order.

1. Ensure all switches are in Up Position.



2. Make certain the Throttle Stick is in Full Down position.
3. Turn on Radio Control Transmitter. Screen and power indicator should light up and display radio status.
4. Verify battery Voltage on display in 7.5 volts or greater.



### 3.3 Pre-Flight S2 - Ground Station (if applicable)

1. Mount Ground Station monitor to tripod.
2. Flex or turn Antenna so that antenna is vertical.
3. Affix battery to ground station and attach power connector. Ground Station will beep and red indicator should illuminate on monitor.
4. Press Power button on Monitor.

### 3.4 Pre-Flight S3 - UAV Procedure

1. Carefully remove UAV from case. **Pay special attention to the camera wires at front of aircraft. DO NOT over rotate camera stabilizer or tangle camera wires.**
2. Unfold landing gear into down position (clips will make a positive click).
3. Place UAV on level surface.
4. Unfold Arms into "X" position (clips will make a positive click).

### 3.4 Pre-Flight S3 - UAV Procedures (continued)

5. Raise GPS Antenna posts to vertical position, and ensure it is secured in place.

**\*\*\*ATTENTION\*\*\* IF ANTENNA IS NOT SECURE, DO NOT FLY.**

6. Ensure propellers on each corner are mounted in the correct direction (see markings on blade or refer diagram on pg. 12).
7. Turn on Camera. Press record button.
8. VERIFY THE FOLLOWING:
  - a. Motors spin smoothly and freely.
  - b. Arms and Landing gear are fully secured in expanded position.
  - c. Camera stabilizer moves freely and wires are not caught.
  - d. All visible connectors are firmly seated.
  - e. Video antenna is connected soundly.
9. Attach flight battery to battery tray located at bottom of UAV. Use Velcro straps to secure in place.
10. Plug in flight battery. The Following is expected:
  - a. Flight computer on UAV will play startup chime.
  - b. Motor controllers on UAV will play startup chime.
  - c. After startup, motor controllers will beep at regular intervals.
  - d. Camera stabilizer will initiate and level itself.
  - e. Hardware arm button on UAV will flash red.
11. Verify the Radio Control:
  - a. Flip switch "SG" on Transmitter and verify that video switches from Camera to FLIR transmission.
  - b. Turn RS slider and verify that camera tilts up and down on command.

### 3.5 Pre-Flight S4 - Final Steps for Takeoff

1. Confirm that your craft is on a level surface and not resting on a loose surface, such as gravel, sand, pine needles, etc. Loose particles will be blown by the wash from propellers and may cause obstruction in motors or chip/damage frame or craft components. A clean platform or the top of your hardshell case is suggested in problem areas.

### 3.5 Pre-Flight S4 - Final Steps for Takeoff (continued)

2. Verify the following:
  - a. Battery Voltage is near full capacity (4.2V per cell, ex: 6S is 25.2V).
  - b. GPS Satellite count is greater than 7.
  - c. Mode is set to your desired take-off mode.
  - d. Motors are reacting to Esc's, they should have a slight tick movement happening when disarmed.
  - e. Your Pre-Flight checklist has been completed.
  - f. Your flight mode switch is reacting.
  - g. Gimbal controls (if applicable) are reacting.

**\*\*\*ATTENTION\*\*\***

**DO NOT TAKE OFF WITHOUT GPS LOCK  
DO NOT TAKE OFF WITH A LOW GPS COUNT**

### 3.6 Pre-Flight S5 - Takeoff

1. Press Hardware arm button firmly and hold.
2. The following should be expected.
  - a. Flashing red light will turn to solid red.
  - b. Motor controllers will stop beeping.
  - c. Status LED will be solid green.
3. Do a final check of your surroundings and prepare for takeoff.
4. Arm the UAV by pulling your throttle stick down and to the right. Motors will now spin up.
5. Follow procedures from your Pre-Flight/Post Flight check sheet. This section should be memorized before flight and become routine.
6. When preparing for landing follow procedure from Pre-Flight/Post Flight check sheet, this section should be memorized as well before flight, and become routine.

**UAV is now ready for takeoff. FLY RESPONSIBLY.**

## 4.1 Post-Flight S1 - UAV Takedown

### Once on the Ground

1. Disarm the UAV by moving the throttle stick all the way down and to the left. Motors will stop spinning. Do not turn off Radio Control Transmitter while UAV is powered as the craft may go into fail-safe mode.
2. Press Safety switch to lock motors, then disconnect flight battery. Remove Velcro straps and detach battery from UAV.
3. Check battery voltage- Battery voltage should be ABOVE 3.3V per cell. If battery is lower it may indicate the pack has been drawn too low and there may be damage.

Damage to pack is indicated by:

- a. The pack is hot after flight.
- b. Battery is puffing (cells feel like they are slightly inflated and not firm).
- c. Low voltage (below 3.3V per cell, or ESPECIALLY lower than 3V per cell).

If you think the battery is damaged, store it in flameproof container. Do NOT recharge damaged batteries. Seek out proper disposal procedures.

4. Verify the UAV has not sustained any damage.
  - a. Motors spin smoothly and freely.
  - b. Camera stabilizer moves freely and wires are not caught.
  - c. All visible connectors are firmly seated.
  - d. There is no impact damage to propellers, frame or landing gear.
5. Carefully remove any dust or debris that may have accumulated on craft during flight or landing.
6. Turn off camera.
7. Carefully fold arms, remove propellers.
8. Undo GPS antenna and lower posts into horizontal position.
9. Fold landing gear up.
10. Delicately place the UAV into its hardshell case. Pay special attention to the camera wires at front of aircraft. Do NOT over rotate camera stabilizer or allow wires to tangle.



## 4.2 Post-Flight S2 - Ground Station (if applicable)

1. Disconnect battery from ground station.
2. Check Ground Station battery voltage. Charge if 4.0V per cell (12V total) or lower.
3. Flex Antenna straight to allow unit to properly fit into case.
4. Place Ground Station into hard shell case.

## 4.3 Post-Flight S3 - Radio Transmitter

1. Turn off Radio Control Transmitter.
2. Flip all switches to UP position.
3. Assure Throttle stick is in full DOWN position.
4. Place Transmitter into the hard shell case.

## 4.4 Pre-Flight/Post - Flight Notice

Pre-Flight & Post-Flight checks and procedures are essential in the prevention of incidents and for the proper maintenance. Any damage or injury caused by the neglect of these procedures and maintenance routines is the sole responsibility of the operator.

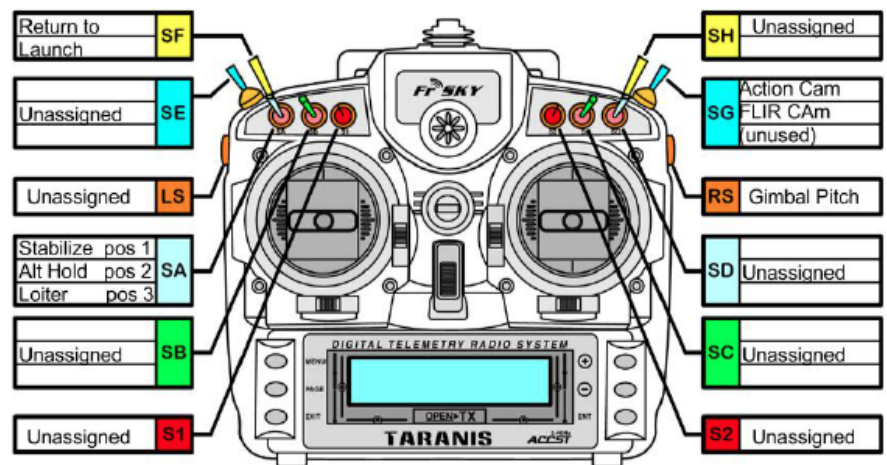
## 5.1 Flight Controls

It is of the utmost importance that any person with the intent of piloting spend due time memorizing all control functions assigned to the Radio Controlled Transmitter. Piloting is a complicated process and any uncertainty about operations should be eliminated before first flight is initiated.

Not all switches available on transmitter have been assigned. All unassigned switches should be left in the full UP position.

## 5.2 Radio Control Transmitter Overview

\* this image shows Aretas Aerials standard set up. All transmitter switch functions can be moved to any position for your preferred customization. If changed it is suggested to document it and replace this image. If your craft has additional controlled payloads switch placement will be discussed directly with client and custom map will be provided.

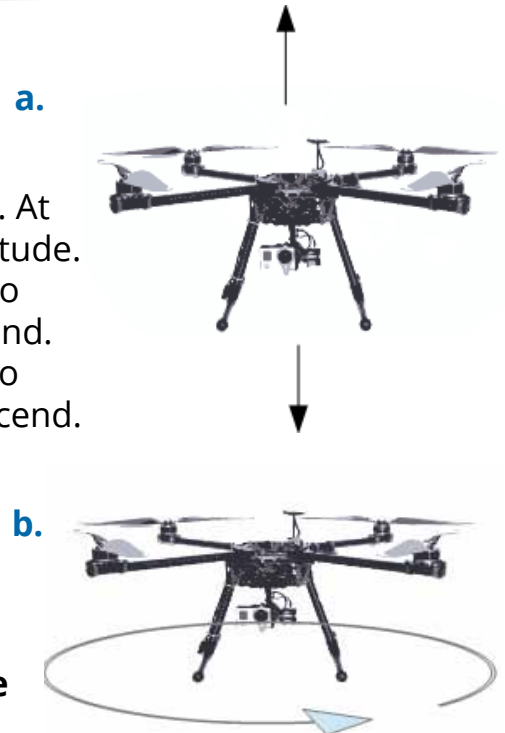


### 5.3 Transmitter Specific Control Functions

#### 1. Throttle/Yaw Toggle

- a. Throttle stick controls the altitude of the craft. This is controlled by moving the left stick on its vertical axis. At 50% the craft will attempt to maintain its current altitude. Moving the stick above 50% will command the UAV to ascend. The higher the throttle, the faster it will ascend. Moving the stick below 50% will command the UAV to descend. The lower the throttle, the faster it will descend.
- b. Yaw controls which direction the front of the craft is facing. The front of the craft being the face with colored motor mounts. This is controlled by moving the left stick on its horizontal axis.

**\*\*\*ATTENTION\*\*\* Rotating the craft can complicate directional controls. Use this function only in a fashion that is suitable to your piloting skill level.**



2. Directional Controls. The right stick controls the directional movement of the craft. Forwards and Reverse are controlled by moving the right stick on its vertical axis. Left and Right are controlled by moving the right stick on its horizontal axis. These controls are in relation to the orientation of the craft, please heed the above warning.



3. Flight Mode. This is a three position switch on the front face of the Transmitter. The switch changes the UAV flight mode. The Switch is programmable to different flight modes through your mission planning software. It is suggested to have Loiter or AltHold as one of your main flight modes. A Return to Launch function is set on a separate switch located on the top of the Transmitter.

LOITER (LOIT): Flight computer will attempt to maintain current location, heading, altitude. The pilot may control altitude and direction in this mode, however when sticks are released in their centered position the vehicle should slow to a stop and hold position. This feature relies on multiple sensors and while it is a very gentle flight mode performance may vary due to magnetic interference or changes in GPS strength.

### 5.3 Transmitter Specific Control Functions (continued)

ALTITUDE HOLD (ALTH): UAV will hold altitude but not horizontal location. In this mode, wind will move UAV and momentum will continue to move UAV when sticks are released in their centered position. This mode will ignore GPS data.

**\*\*\*Attention\*\*\* Neither mode is considered to be an autopilot function. The Operator's hands should always remain on the controls pilot should be looking at the craft during flight.**

4. Arming/Disarming
  - a. Disarming . Pull the throttle stick downwards and to the left.
  - b. Arming. Pull the throttle stick downwards and to the right.

### 6.1 Maintenance Note

To ensure your craft is performing at its optimum level, thorough maintenance is required. This is an important part of UAV ownership as it helps to combat any unnecessary safety issues and prevents situations that are beyond piloting correction.

Be sure to consistently go through quality checks of your craft. Be extra fastidious after rough landings, tip overs, and impacts. Contact support if you have any questions about the condition of the unit.

### 6.2 Propeller Maintenance

1. The propellers are the most commonly worn or damaged part of the craft. It is essential to inspect them after each flight. A damaged propeller can create dangerous vibrations or even cause catastrophic failure if unnoticed crack becomes fully fractured mid-flight.
2. Replacement. The propellers are connected using M3 hex screws and hub plates. Simply remove hex screws and plate, lift off damaged/old propeller, place new propeller onto motor post, reposition hub plate and fastened hex screws back in proper place.

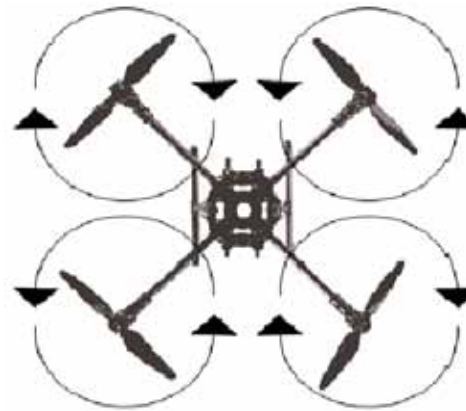
## 6.2 Propeller Maintenance (continued)

3. Propeller Direction. All propellers are directional, it is imperative that the propeller attached is of the proper Clockwise/Counter-Clockwise direction. The raised side of the blade should always face the direction of rotation.

**Fig. A - Propeller directions**



**Fig. B - Propeller orientation**



## 6.3 Frame and Arms Maintenance

Be sure to thoroughly check craft on a regular basis for damage, loose fasteners and damaged wiring.

## 6.4 Motors Maintenance

The brushless motors equipped on this UAV have an incredible potential lifespan of up to 10,000 flying hours. That being said, proper care is needed to achieve maximum lifespan. As airflow from the propellers (also known as wash) is capable of stirring up dust and debris it is important to constantly check before and after usage that the motors remain unobstructed. To check this simply turn them manually while craft is disarmed and verify that they turn smoothly and freely.

Parts of the motor are magnetic so be sure not to expose them to any small metal fibres or flakes.

## 6.5 Transmitter Maintenance

Before flights always ensure that all buttons, switches, and transmitter sticks are functioning and have full range of motion. As with any type of remote or controller, gradual wear and tear is unavoidable. Store transmitter in a dry, safe location. Avoid exposure to food, beverages, sand and dust.

## 7.1 No Fly Zones & Restrictions

No Fly Zones include Airports, Military Bases, Aerodromes, Prisons, and National Borders. Other No Fly Zones may be in effect in your region. Be aware of your local restrictions, and hazardous locations in your area.

Operator is responsible for safe and lawful usage of craft. Research your local restrictions and be sure to apply for exemptions where necessary.

## 8.1 Online Resources

- For Sales, Repairs, General Inquiries: <http://www.aretasaerial.com/>
- For LiPo Battery Disposal: <http://konarcflyers.com/LiPo-Disposal.pdf>
- FrSky Taranis: <http://open-txu.org/>

For Restrictions Information:

- Transport Canada Guidelines <http://www.tc.gc.ca/eng/civilaviation/standards/general-recavi-uav-2265.htm>
- Federal Aviation Administration, USA <https://www.faa.gov/uas/>
- General Info Regarding Safe Piloting: <http://knowbeforeyoufly.org/>

For Software:

- Mission Planner: <http://ardupilot.org/planner/docs/common-install-mission-planner.html>
- BaseCam gimbal: <https://www.basecamelectronics.com/downloads/>