HawkEye
Flying Camera System
V3.0
Release 1.0
01/21/2011

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Introduction

The Tetracam HawkEye is a low speed short endurance aerial vehicle tailored to the needs of farmers and agronomists managing relatively small (one square mile or less) plots of land. The HawkEye can carry any of the family of light weight Tetracam Agricultural Digital Cameras to capture complete aerial panoramas of a section of farmland or forest. The resulting NIR / Visible light images can be analyzed to determine the relative health of plants in the area surveyed. When equipped with the MCA series of narrow band pass filter cameras, the HawkEye system can also be used to identify chemical and mineral variations in the landscape by the relative absorption spectra in the images.

The HawkEye has been designed to be a docile platform that is easy to operate for someone who has little experience with flying radio controlled aircraft. The HawkEye has only two controls: Power which controls altitude, and the roll servo which turns the aircraft right or left. The forward speed of the Hawkeye is determined by the chute and wind conditions only. In general, a HawkEye cannot be "stalled" like a conventional winged aircraft. The low speed, high visibility and simplicity of control allow the operator to think less about flying the aircraft, and more about taking useful pictures for later ground analysis.

Warranty Period

Exclusive Warranty- Tetracam Inc., (Tetracam) warranties that the Products purchased (the "Product") will be free from defects in materials and workmanship at the date of purchase by the Purchaser.

Limited Warranty

(a) This warranty is limited to the original Purchaser ("Purchaser") and is not transferable. REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE PURCHASER. This warranty covers only those Products purchased from an authorized Tetracam dealer. Third party transactions are not covered by this warranty. Proof of purchase is required for warranty claims. Further, Tetracam reserves the right to change or modify this warranty without notice and disclaims all other warranties, express or implied. (b) Limitations- TETRACAM MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NONINFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCT. THE PURCHASER ACKNOWLEDGES THAT THEY ALONE HAVE DETERMINED THAT THE PRODUCT WILL SUITABLY MEET THE REQUIREMENTS OF THE PURCHASER'S INTENDED USE.
(c) Purchaser Remedy- Tetracam's sole obligation hereunder shall be that Tetracam will, at its option, (i) repair or (ii) replace, any Product determined by Tetracam to be defective. In the event of a defect, these are the Purchaser's exclusive remedies. Tetracam reserves the right to inspect any and all equipment involved in a warranty claim. Repair or replacement decisions are at the sole discretion of Tetracam. This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or modification of or to any part of the Product. This warranty does not cover damage due to improper installation, operation, maintenance, or attempted repair by anyone other than Tetracam. Return of any goods by Purchaser must be approved in writing by Tetracam before shipment.

Damage Limits

TETRACAM SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCT, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY. Further, in no event shall the liability of Tetracam exceed the individual price of the Product on which liability is asserted. As Tetracam has no control over use, setup, final assembly, modification or misuse, no liability shall be assumed nor accepted for any resulting damage or injury. By the act of use, setup or assembly, the user accepts all resulting liability. If you as the Purchaser or user are not prepared to accept the liability associated with the use of this Product, you are advised to return this Product immediately in new and unused condition to the place of purchase. Law: These Terms are governed by California law (without regard to conflict of law principals).

Safety, Precautions and Warnings

This is a sophisticated hobby Product and not a toy. It must be operated with caution and common sense and requires some basic mechanical ability. Failure to operate this Product in a safe and responsible manner could result in injury or damage to the Product or other property. This Product is not intended for use by children. The Product manual contains instructions for safety, operation and maintenance. It is essential to read and follow all the instructions and warnings in the manual, prior to assembly, setup or use, in order to operate correctly and avoid damage or injury.

This model is controlled by a radio signal that is subject to interference from many sources outside your control. This interference can cause momentary loss of control so it is advisable to always keep a safe distance in all directions around your model, as this margin will help to avoid collisions or injury.

- Always operate your model in an open area away from cars, traffic, or people.
- Avoid operating your model in the street where injury or damage can occur.
- Never operate the model into the street or populated areas for any reason.
- Never operate your model with low transmitter batteries.
- Carefully follow the directions and warnings for this and any optional support equipment (chargers, rechargeable battery packs, etc.) that you use.
- Keep all chemicals, small parts and anything electrical out of the reach of children.
- Moisture causes damage to electronics. Avoid water exposure to all equipment not specifically designed and protected for this purpose.

HawkEye System Architecture

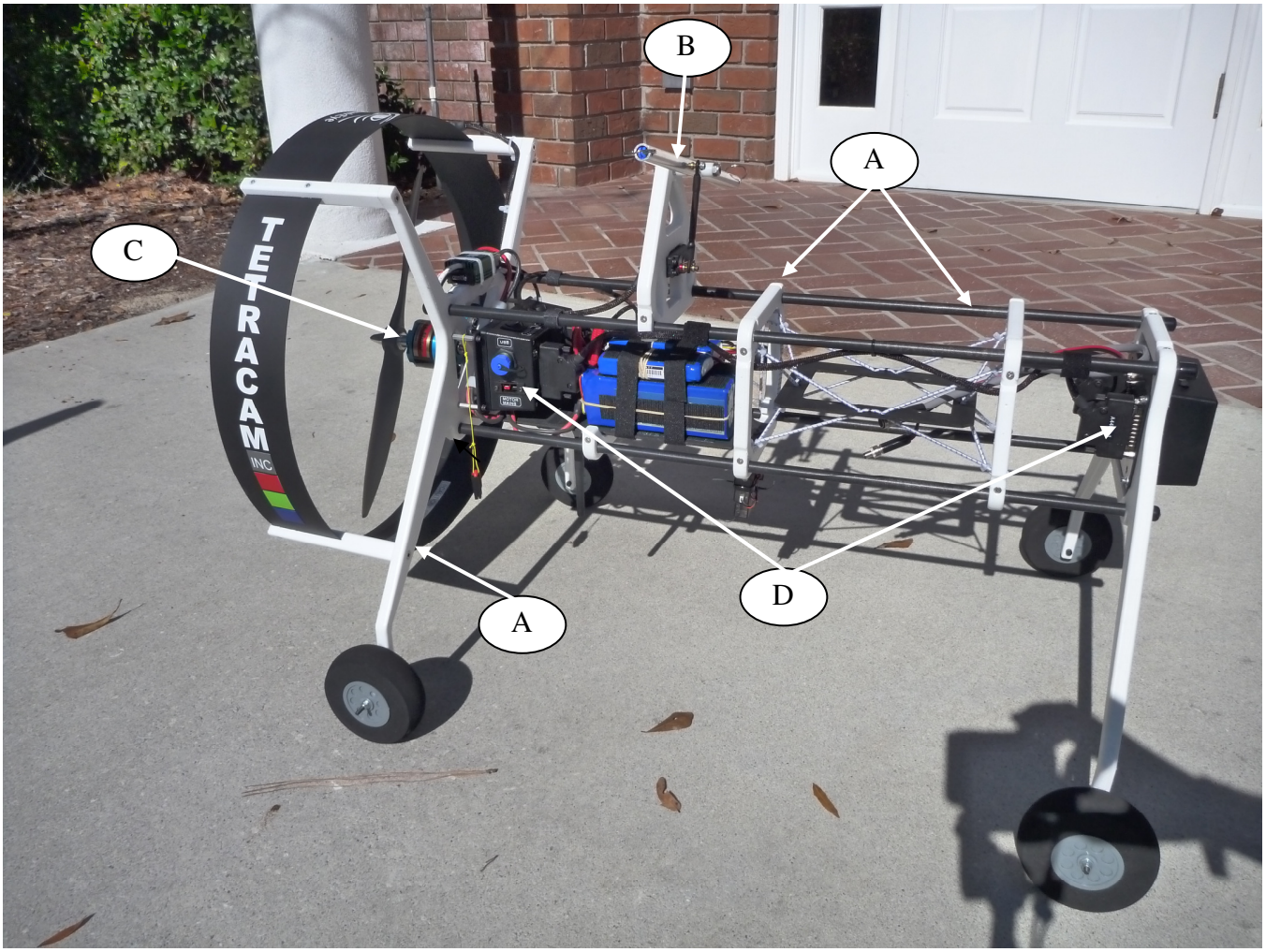
The Hawkeye system is made up of these major elements:

- The HawkEye Airframe
- The Parafoil / Wing / Chute
- The Radio Control system
- The Ground station
- A Camera / Payload system for taking pictures

HawkEye Airframe

The airframe is made up of the following four main systems:

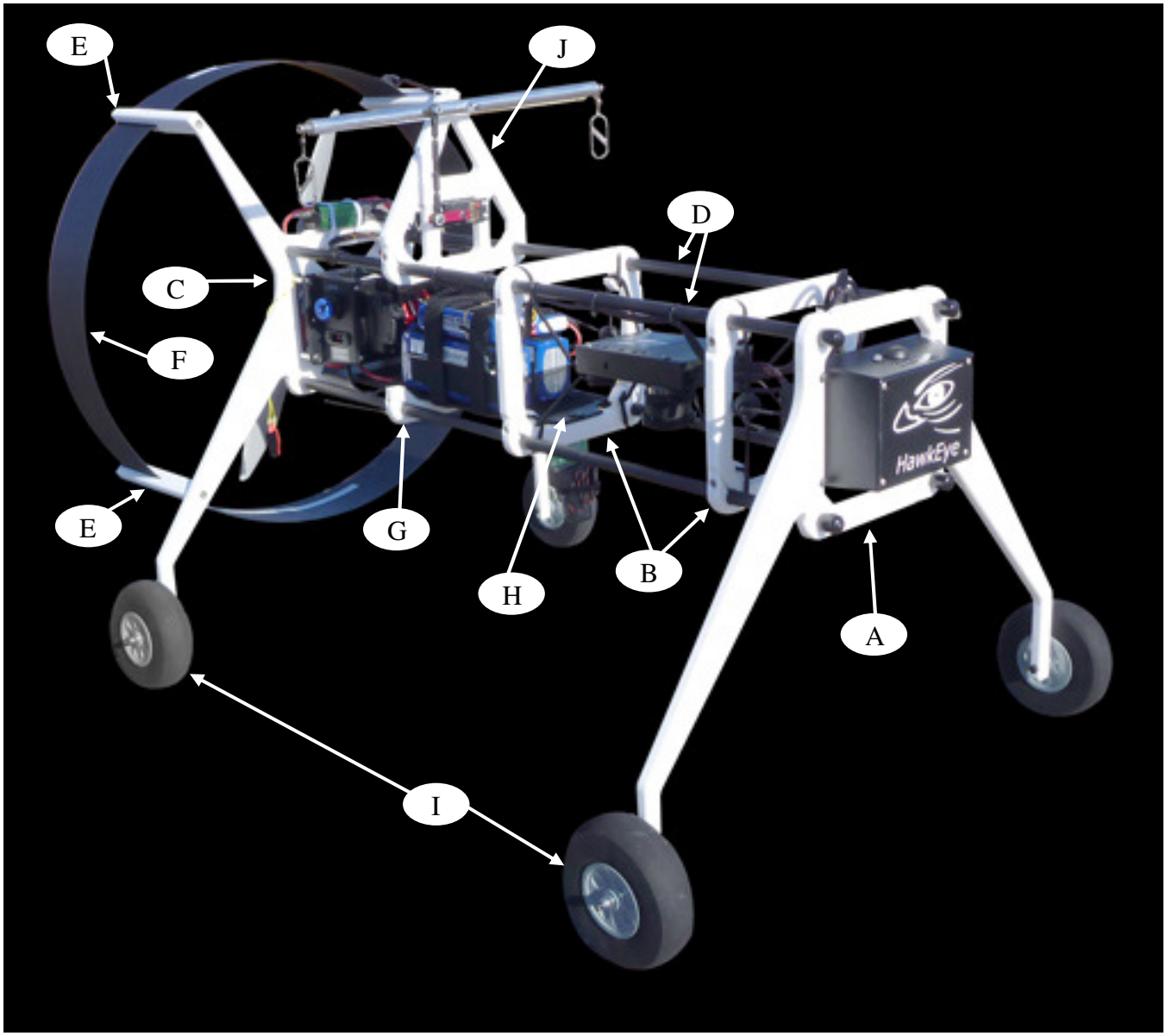
A) The modular airframe structure
B) A flight control system for steering the Hawkeye aloft
C) Brushless motor system for propulsion and managing altitude
D) An Electrical system for distributing power and signals



Modular Airframe Structure

The Modular airframe was designed to allow for easy assembly, maintenance, and field repair. The Airframe structure consists of the following components.

A. Front Bulkhead (1)
B. Inside Bulkhead (2)
C. Rear Bulkhead (1)
D. Composite Main Tubes (4)
E. Prop ring stanchions (4)
F. Composite Prop Ring (1)
G. Cross Brace (1)
H. Plywood Floor (1)
I. Wheels (4)
J. Steering Block (1)

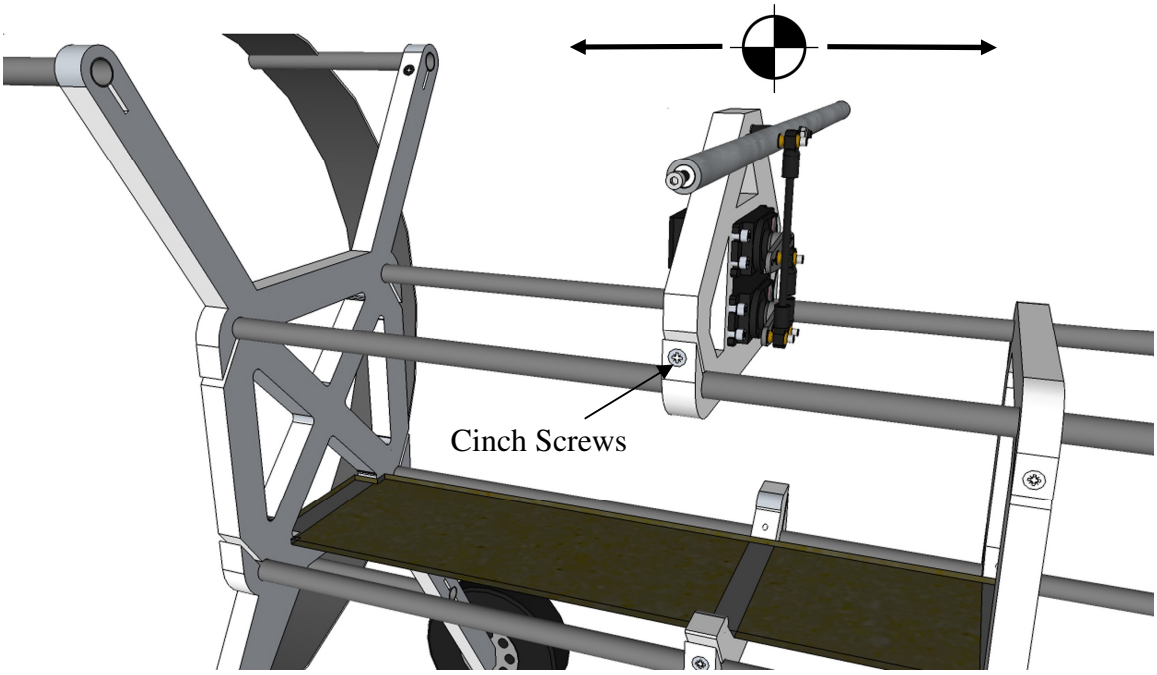


Flight Control System

Steering control for the Hawkeye uses a 12” aluminum steering bar coupled to a titanium geared high torque servo, mounted in an adjustable steering block. The parafoil wing attaches and supports the entire buggy at the bar ends. The high travel of the steering bar allows control of the parafoil wing during take off and landings. While under flight the buggy shifts laterally under the pivot point resulting in a side to side weight shift of the buggy. This weight shift allows for responsive yet smooth steering without inducing drag on the parafoil wing.

The steering system bulkhead is designed to allow for adjustment of the Center of Gravity (CG) of the HawkEye buggy, so the aircraft can be properly balanced while using different payloads and batteries. Moving the steering assembly forward will shift the CG back (nose up), and moving the assembly backwards will shift the CG forward (nose down). Proper balance can be checked by suspending the buggy off the ground from the steering bar. When properly balanced, the airframe should have a slight nose down attitude of 2 to 5 degrees with respect to the ground, with all equipment and batteries installed.

To adjust the position of the steering assembly, loosen the cinch screws on the sides and slide the steering assembly to desired position and retighten cinch screws. (Note: DO NOT OVER TIGHTEN SCREWS.)



Brushless Motor System

Basic Overview

The HawkEye uses a HiMaxx HC5018-530 brushless outrunner motor that is controlled by an electronic speed controller (ESC). The ESC has a high current DC input (2 wires) and a three phase AC output (3 wires). This system automatically calibrates itself on power up and requires no maintenance or adjustments when operated within its limits.

HiMaxx brushless motors are almost maintenance free, so minimal care is required for long life. Keep the motor clean and free of dust and dirt, especially the bearings. Dirty bearings wear quickly. Lubricate the bearings regularly with light oil. Do not immerse the motor in water or solvents. Always use balanced propellers to reduce loads on bearings, to reduce noise, and reduce stress on the airframe. If the motor is replaced or removed care should be taken to ensure that the wires are wired for proper rotation during operation. The rotation of the motor can be reversed by simply switching any two of the 3 wires leading to the brushless motor from the ESC. (Note: make sure power is disconnected from the ESC before removing or swapping motor wire leads or serious damage can occur to the ESC.)

ESC

The ESC used on the HawkEye is the Castle Creations Phoenix Ice 100. This controller was chosen for its high quality, reliability and features. The controller is set at the factory for Auto Lipo detect/cutoff operation and is tuned for optimum outrunner performance.

Data Logging

Ice brings another incredibly useful feature, extensive data logging capabilities. The controller is able to measure and record many parameters at sample rates that you choose between 10 samples per second and 1 sample per second. Data points include:

- Battery Voltage
- Battery Ripple
- Battery Current
- Controller Temperature
- Controller Input Throttle
- Controller Motor Power Output
- Motor RPM

This data is stored directly in the controller and may be accessed once the run is over using the Castle Link USB adapter (sold separately) and Castle Link software (available free at castlecreations.com). The Max Log Size is 21,504 bytes, everything takes one byte except for motor rpm which takes two.

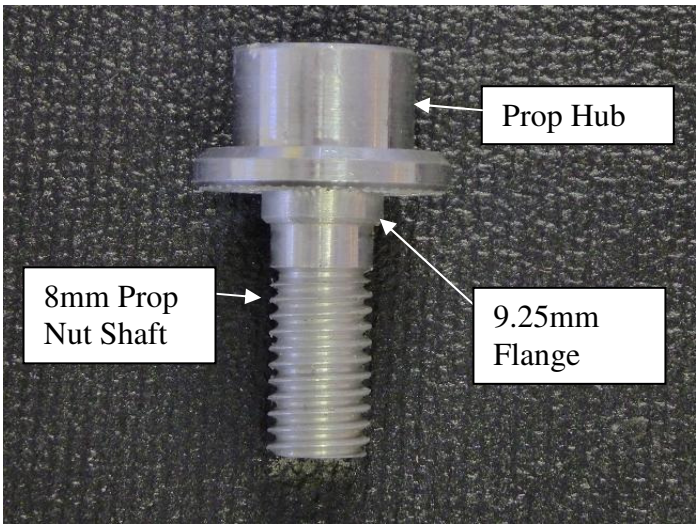
- Logging 'Battery Current' at only a 1 sample / second - 358 minutes of logging time (almost 6 hrs)
- Logging 'Motor RPM' at only 1 sample / second - 179 minutes of logging time
- Logging everything at only 1 sample / second - 44 minutes of logging time
- Logging everything at 10 samples / second - 4 minutes and 28 seconds

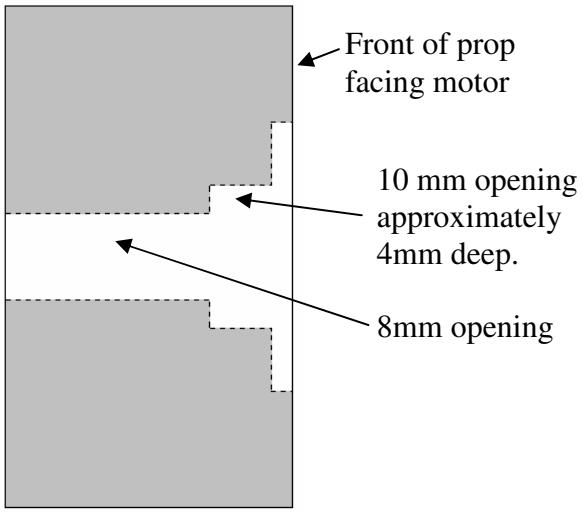
The Phoenix ICE manual can be downloaded directly from Castle Creations website at http://www.castlecreations.com/support/documents/Phoenix_User_Guide.pdf

Propeller Installation and Maintenance

Basic Overview

The HawkEye comes outfitted with an APC brand standard composite hobby propeller. Although you can experiment with different types and sizes, we have found that the 15X6 Sport Prop is the best prop available for the HawkEye's current motor configuration. The prop is mounted on an aluminum collet style prop adapter. This prop adapter fits a motor shaft of 6mm and has a prop shaft size of 8mm. This collet comes standard with the Himax HC5018-530 brushless motor. The included APC props are already balanced and come pre-reamed to the proper 8mm shaft size. Replacement props however will need to be reamed since the stock APC 15X6 prop shaft hole is 5/16". We recommend using a proper prop reamer instead of a 8mm drill bit to ream the necessary hole size. Drill bits have a tendency to not center as accurately which will lead to balancing issues. Please note that the prop will need a bit larger hole to be counter sunk on the front side of the prop (approximately 10mm). This will allow the prop to clear the flange on the prop nut shaft and seat flush against the prop nut hub. Failure to provide clearance for this flange will result in he prop nut NOT BEING SECURELY FASTEN TO THE MOTOR SHAFT.





Balancing Propellers

A significant amount of effort is put into making sure that all APC propellers are as close to being perfectly balanced as possible before they are shipped. Therefore, it is unlikely that a balance correction will be required. For more information on proper balancing procedure, please visit the prop balancing page located at the APC website at: http://www.apcprop.com/v/html/balancing.html

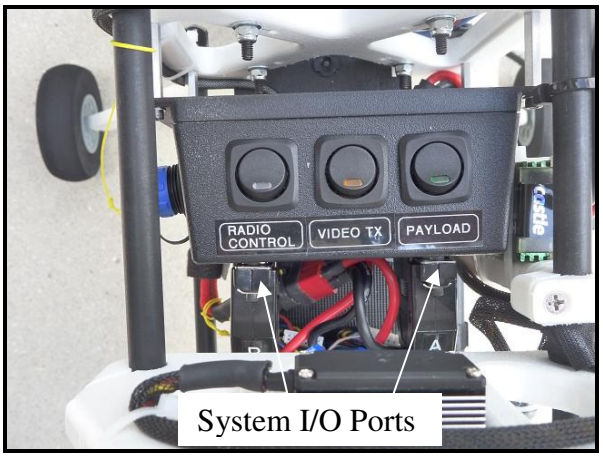
Propeller Installation

The HawkEye prop adapter can be tightened or loosened by inserting a small Allen wrench or screwdriver in the predrilled hole located on the end of the prop nut. The diameter of the tool should fit as close as possible to the hole without having to force it in. With the tool inserted all the way through the aluminum prop nut, hold the prop with a rag or small towel and turn the prop nut counter-clockwise to loosen or clockwise to tighten. The nut should be tightened snuggly so the prop collar cinches the motor shaft, but not too tight to strip the threads. (CAUTION: Never operate the HawkEye with an improper or damaged prop adapter! Personal and or property damage may occur.)

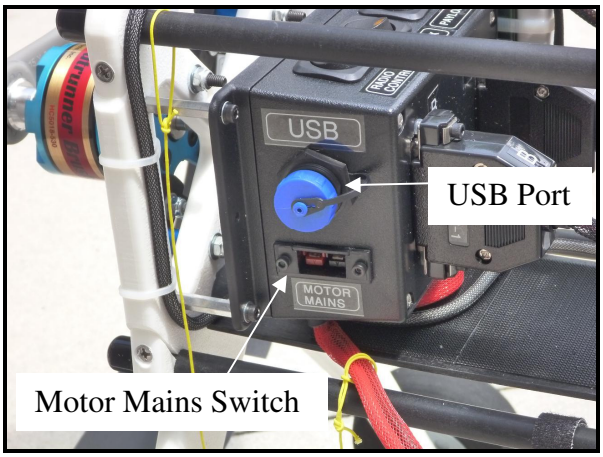
Electrical Systems

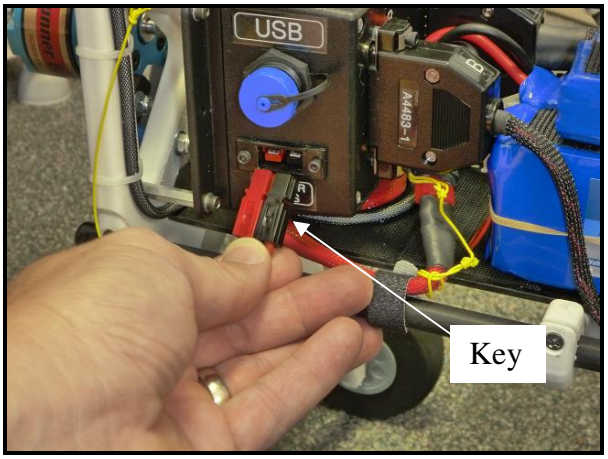
Main Control Box (MCB)

The MCB has four power switches that control power to all onboard electronics, including payload, video transmitter, Radio Control flight electronics, and the motor system. On the front of the MCB are two I/O ports. The I/O ports connect to the main wiring harnesses to allow distribution of all signals to the rest of the electrical system.



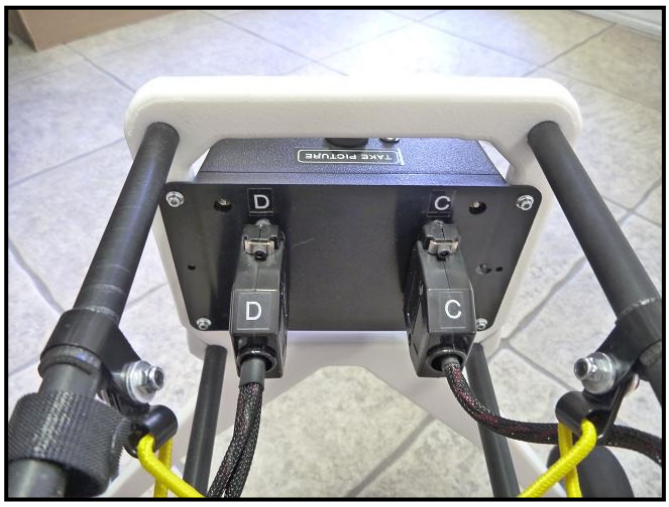
The left side of the MCB has a panel mounted Mini USB connector with dust cap and the motor mains switch. The USB port allows retrieving of the data logged on the Data Logger as well as connections to the Eagle Tree Ground Station Software for programming of the features for the OSD (On Screen Display) system. (See Ground station section for more details on the OSD system.)
The motor mains switch is a detachable link system. The "key" is what completes the circuit therefore energizing the electronic speed control and motor.



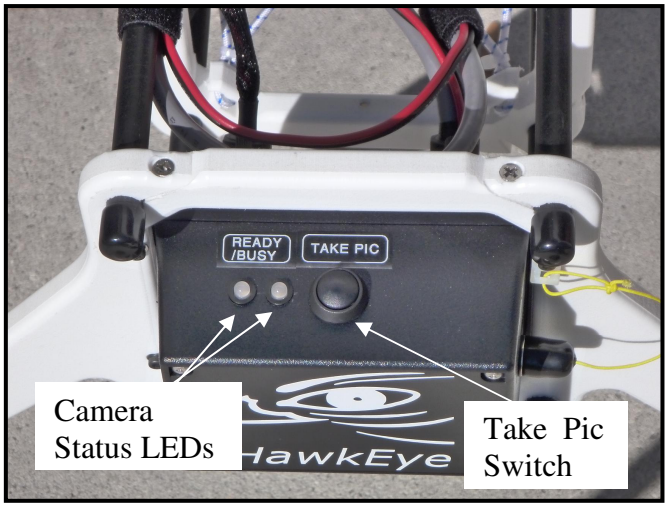


Payload Interface Box

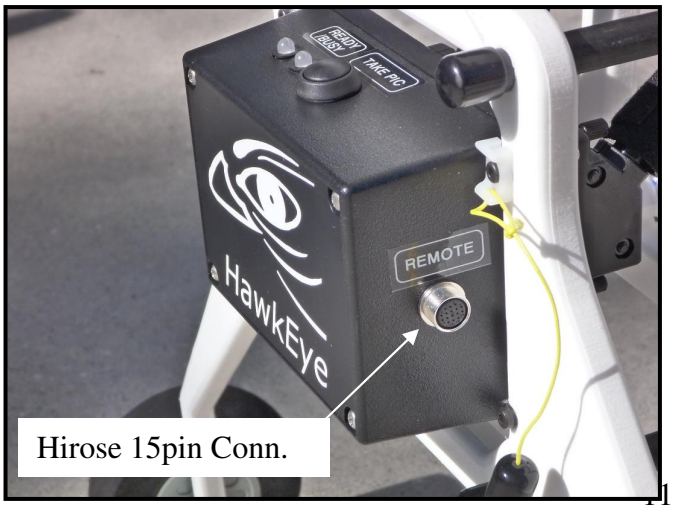
The Payload Interface Box (PIB) is located on the front bulkhead. The rear side has two I/O ports. The IO ports are labeled and the corresponding connectors and harness should match the markings on the box. The connection labeled “C” is for the connection that connects the front PIB to the rear MCB. The connection labeled “D” is for the payload/camera connection. NOTE: The payload/camera harness will vary depending on which camera is being operated on board the HawkEye.



The top side of the PIB features a take picture switch and camera status LEDs.



The side of the PIB has a 15 pin Hirose connector that allows the user to use the Tetracam remote control box for the camera in use. Note: The remote box is an optional accessory except it is part of standard equipment for the Mini MCA series cameras.

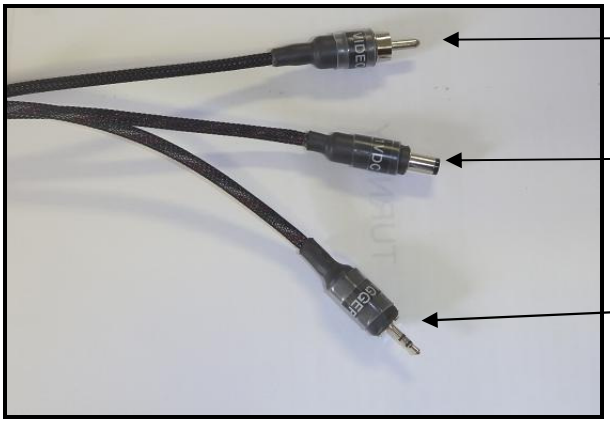


The Payload Harness (D)

(ADC Lite).

The payload harness for the ADC Lite (A4485) has the three labeled connectors necessary to connect your ADC Air Lite camera to the HawkEye system. These connections include:

- 11.1VDC coaxial power plug for powering the camera (Note: This plug is energized when the "payload" switch is turned on at the MCB.)
- Video input connector via male RCA plug for live video output from the camera sent to the MCB and the video transmitter.
- Trigger connection 3/32" Tip, Ring Sleeve (TRS) plug for the remote camera status LED and camera trigger switch located on the top of the PIB.



Video In (male RCA plug)

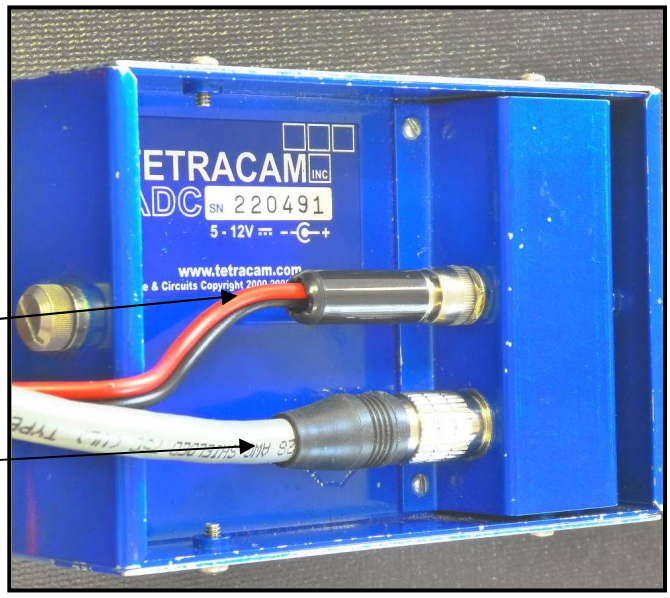
11.1VDC Out (coaxial power plug)

Remote camera trigger (3/32 TRS plug)

(Mini MCA)

The payload harness for the Mini MCA series camera (A4486) has the two connectors necessary to connect your Mini MCA series camera to the HawkEye system. These connections include:

- 11.1VDC locking coaxial power plug for powering the camera (Note: This plug is energized when the "payload" switch is turned on at the MCB.)
- 15 Pin Hirose connector harness to supply all camera functions and communications between the PIB and the camera



Batteries – General

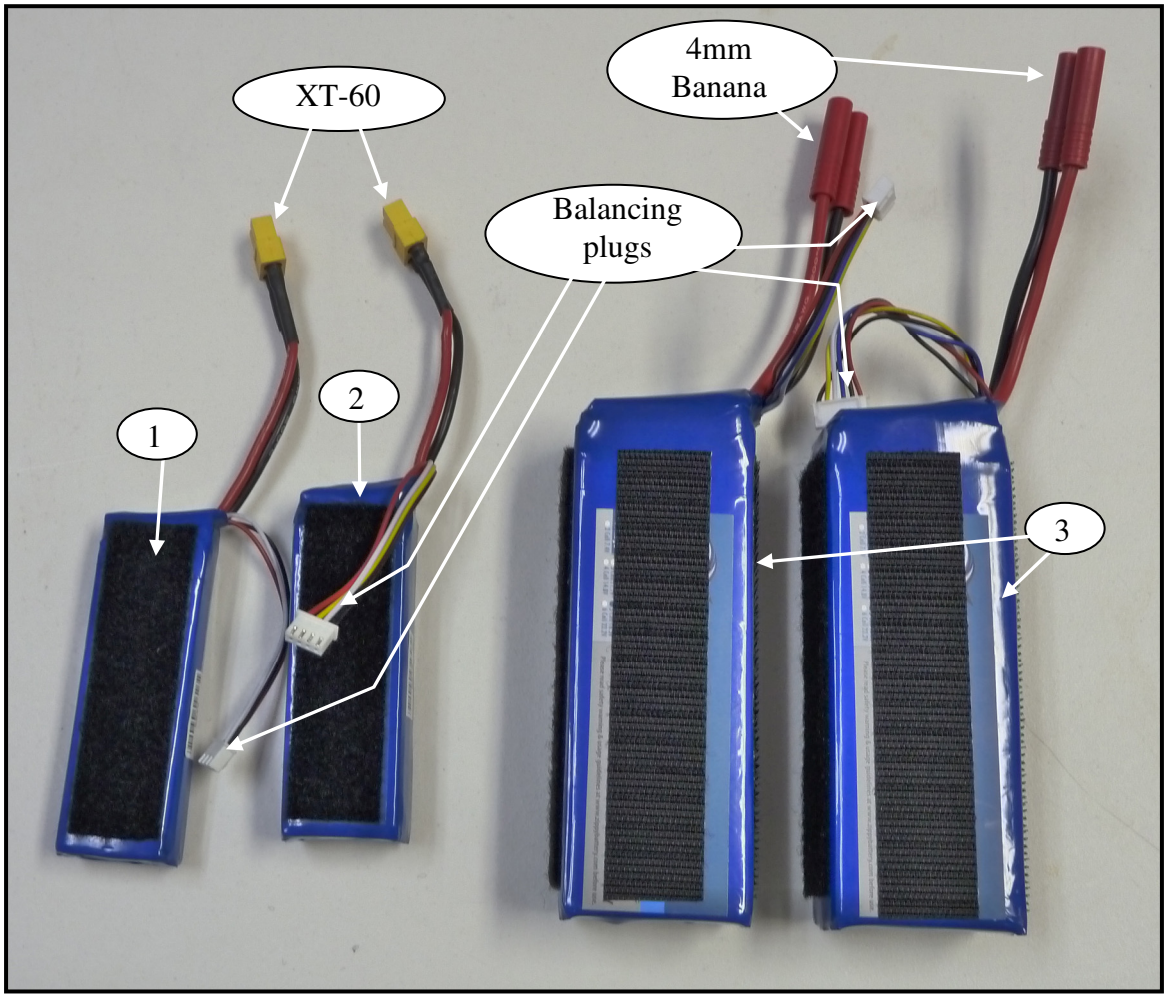
The Hawkeye uses a total of four separate battery packs that are made up of 3 different pack configurations, to power the electrical systems. The three different packs are as follows.

1. 7.4V 2200mAh, lithium polymer battery (2 cell configuration, with yellow XT-60 connector). This battery is used to power the RC receiver and servos, the OSD modules and GPS receiver.

2. 11.1V 2200mAh, lithium polymer battery (3 cell configuration, with yellow XT-60 connector). This battery is used to power the various payloads or on board cameras, and video transmitter.

3. 18.5V 4400mAh, lithium polymer battery (marked in red at the 4mm Dual Banana connectors). This battery is used to power the brushless motor for propulsion. NOTE: 2 of these packs will be used in parallel in order to increase the capacity of the propulsion system to 8800mAh.

All the battery packs have balancing plugs installed. These plugs allow the chargers to monitor and properly charge all the individual cells in each of the multi cell battery packs. This charging process extends the life of the batteries as well as keeps the batteries at their optimum charge capacities.

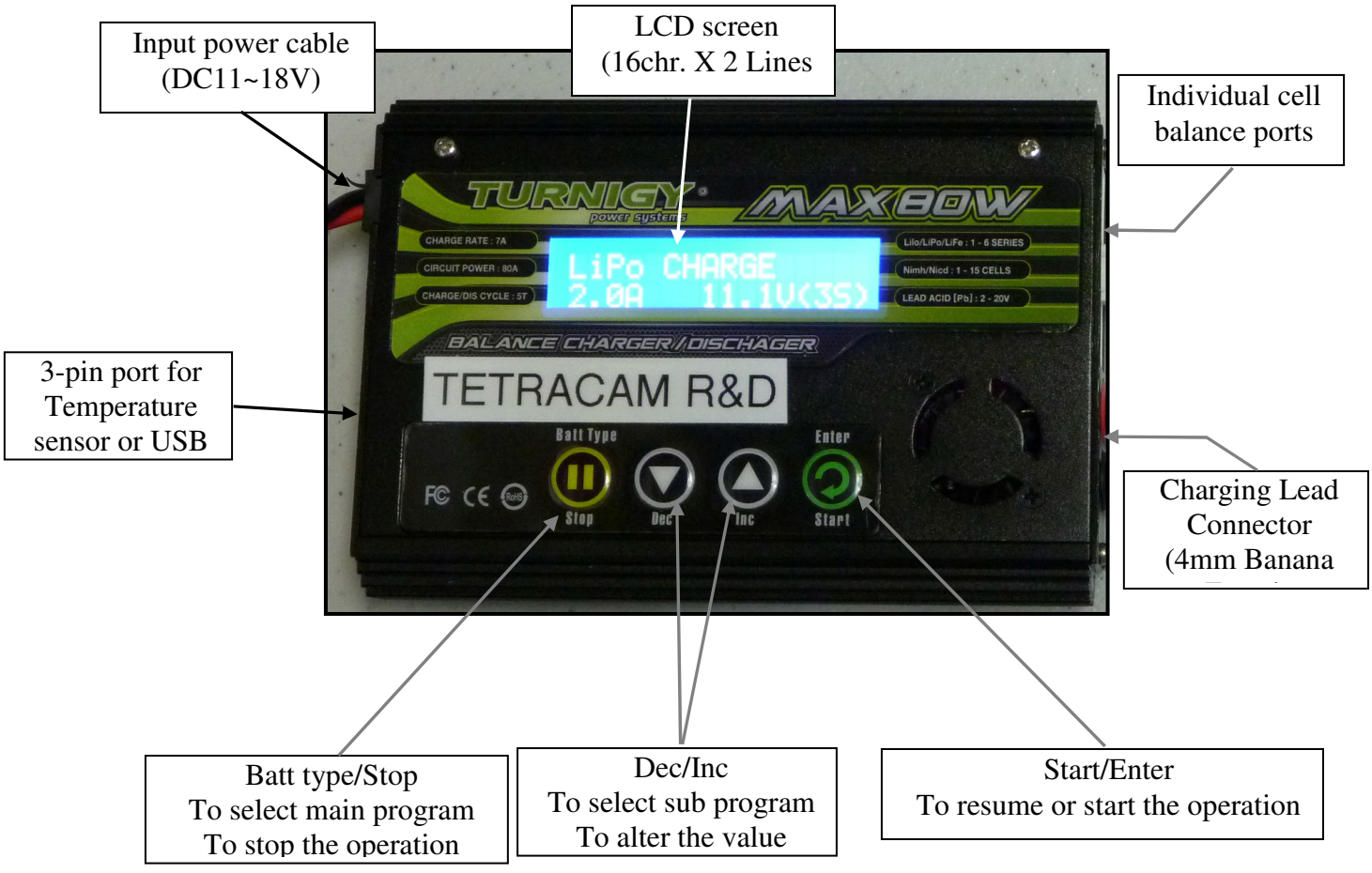


Operating Instructions

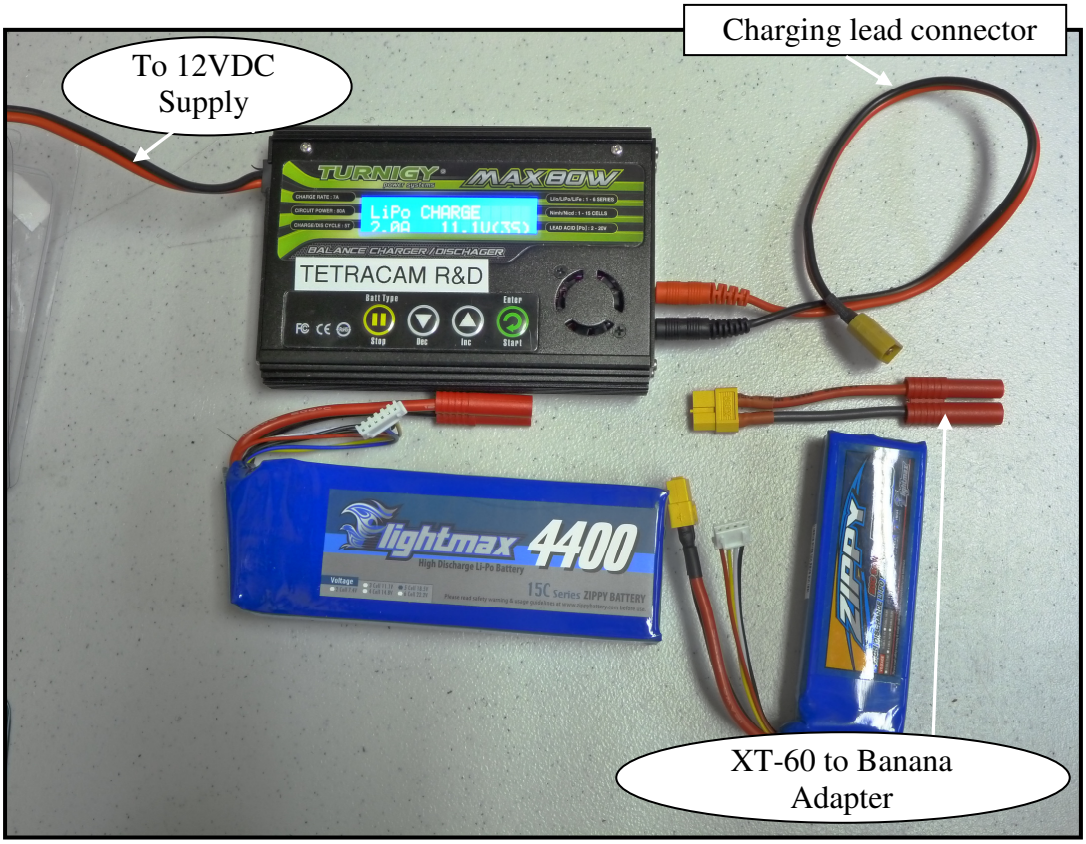
Battery Charging Instructions (Basics)

This section describes in brief overview the basics of the Charger supplied with your HawkEye aircraft. Please read the complete charger manual for complete details about the functionality and features of this charger. The manual can be found on the documentation CD or downloaded from the following link.
http://www.tetracam.com/pdf/HawkEye/Turnigy_MAX80W.pdf

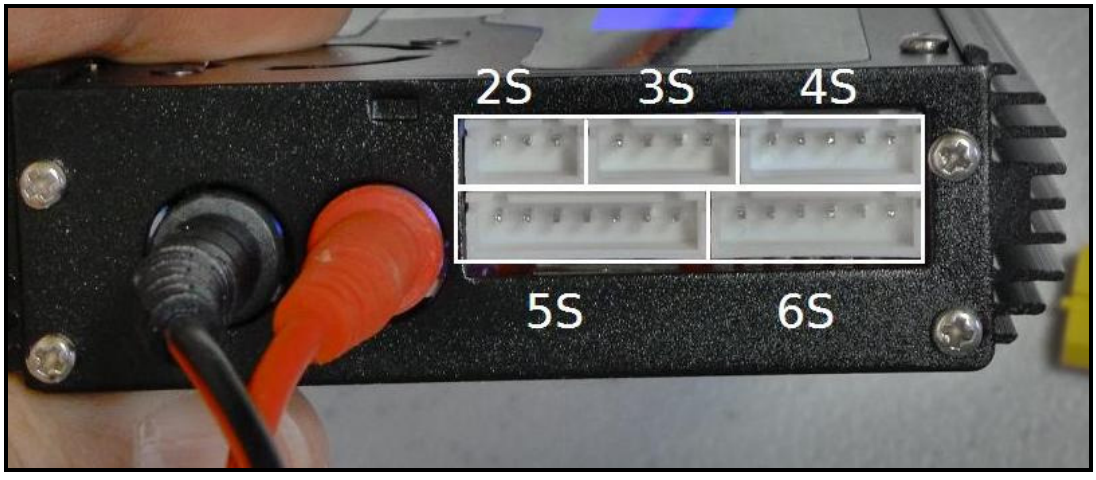
BATTERY CHARGING NOTICE!!!
ALWAYS CHARGE ON A CONCRETE OR NON FLAMABLE SURFACE WHERE THERE ARE NO FLAMMABLE OBJECTS WITHIN 10 FEET (3 METERS) OF THE CHARGING AREA. NEVER USE A CHARGE RATE ABOVE 2C. NEVER DISASSEMBLE OR MODIFY PACK WIRING IN ANY WAY OR PUNCTURE CELLS. THE MAXIMUM DISCHARGE RATE OR LOAD MUSTNEVER BE EXCEEDED.



Step 1.
Connect the charger 12V input leads to a reliable and stable 12V DC 10A or more power source. Once the charger is powered up, determine which battery will be charged. If you are charging the larger batteries that use the banana connectors you will need to use the supplied XT-60 to banana adapter. Connect the battery's main connector to the charging lead connector.



Next, connect the balancing plug on the battery to the appropriate port on the side of the charger. Choose and connect the correct charge lead for the battery you wish to charge. The two 2200mAh batteries will use the XT-60 style connector and the two large 4400mAh batteries will use the 4mm Banana plug.



Step 2.

Setting up the charger for the proper batteries.

Press the up arrow “INC” button until you see the “LiPo BALANCE” mode.

Then press the green start button once to select the proper charge current. The current value will flash while waiting for your input. Select 2.1 Amps for the 2200mAh batteries. Select 4.3 Amps for the 4400mAh batteries.

Press the green “ENTER/START” button again to toggle to the voltage or cell count. Make sure you select the correct cell count / voltage for the pack you will be charging.

Step 3.
Starting the charge process.

Once you have selected the proper chemistry, charge rate and voltage, press AND hold the green “ENTER/START’ button and the charger will check the current configuration.

When asked to “CONFIRM“ or “CANCEL” you will see two values on the top line. The “R” indicates what the charger sees as an attached battery pack. The “S” is the setting you chose in step 2 above. Make sure that the two values match. Otherwise the charger will not properly charge the attached battery pack. If correct, press “ENTER/START” button.

The charger will begin charging after confirmation and the following window will appear. From left to right here is what is being displayed.

Li2S means you are charging a 2S LiPo pack

This field indicates the present charging current being sent to the battery.

This field displays the present battery pack voltage

This field indicates the elapsed time of the present charge cycle.

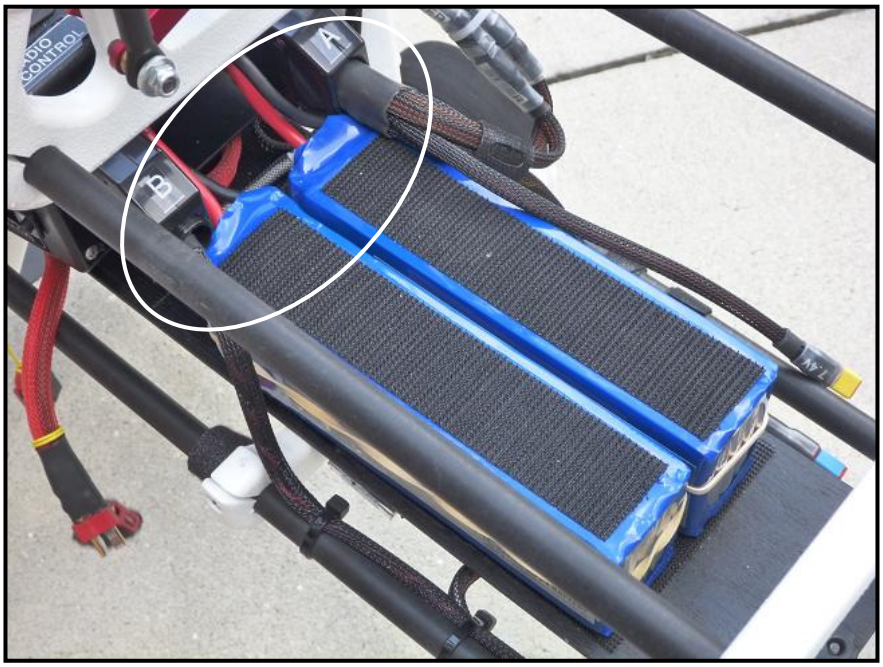
This field indicates how many milliamps the battery has been charged. NOTE: keep track of these numbers as you recharge your batteries. They will give you an indication of how discharged your batteries are after flights. You should try to keep from depleting your packs past the 90% range of the packs capacity.

The charger will beep at the end of the charge cycle indicating that the battery is fully charged.

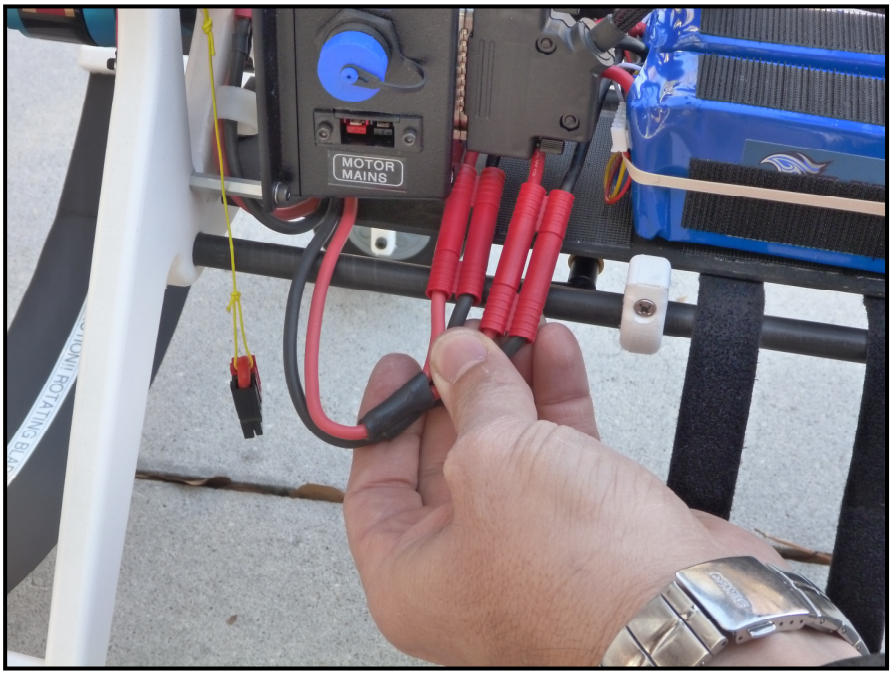
The words FULL will flash in the LixS field. Repeat these steps for the other battery packs while observing the different cell counts and charge currents.

Batteries – Installation.

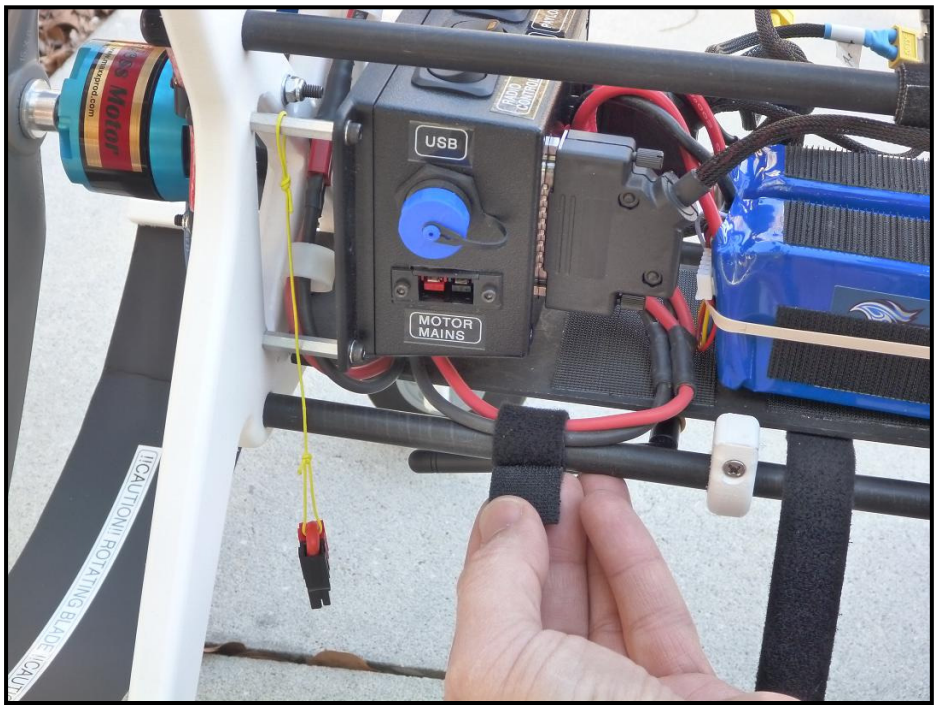
Step 1.
Install the two 4400mAh motor batteries first on the battery tray, Velcro loop side down, as close to the I/O Port connectors as possible, without touching the connector backshells. The batteries will be held on the tray with the installed Velcro



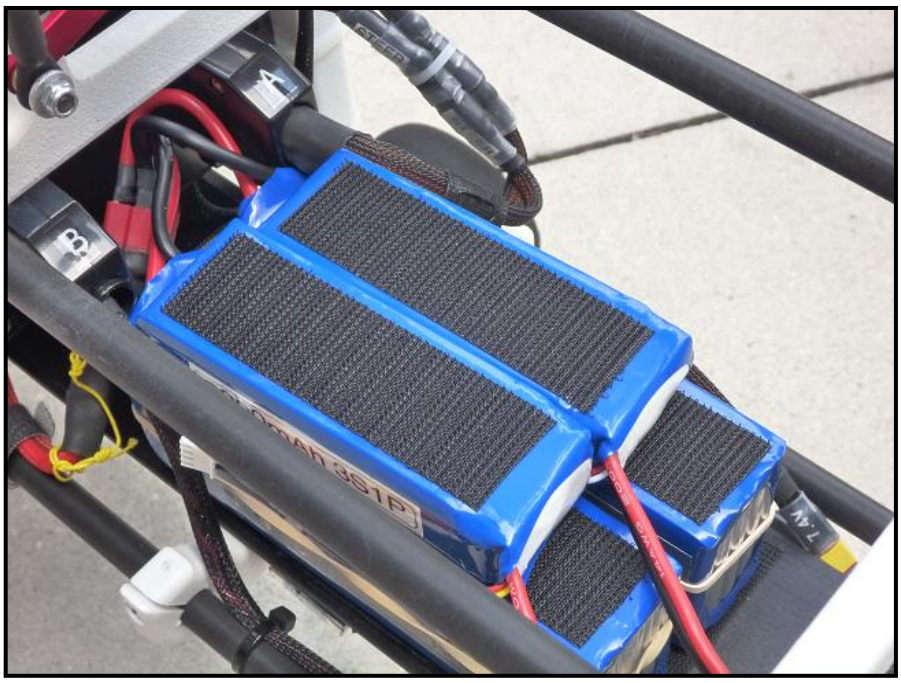
Step 2.
Connect the two batteries to the supplied Y connector so both batteries are connected and the Y connector exits the right side of the aircraft underneath the I/O ports. **NOTE: Caution should be taken while connecting the two packs to the Y adapter. When one pack is connected the open side of the Y connector is live and should not be shorted or come in contact with any conductive surface, jewelry or tools. Always disconnect both batteries from the Y adapter, never leave only one battery connected at anytime**.



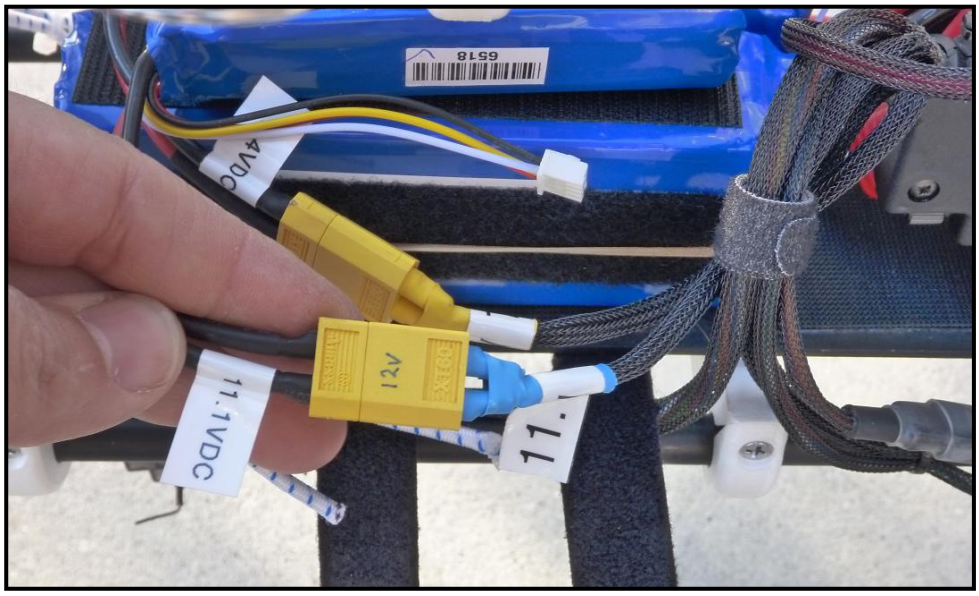
Step 3.
Push the assembled cable assembly under the I/O ports and secure with the supplied Velcro strap



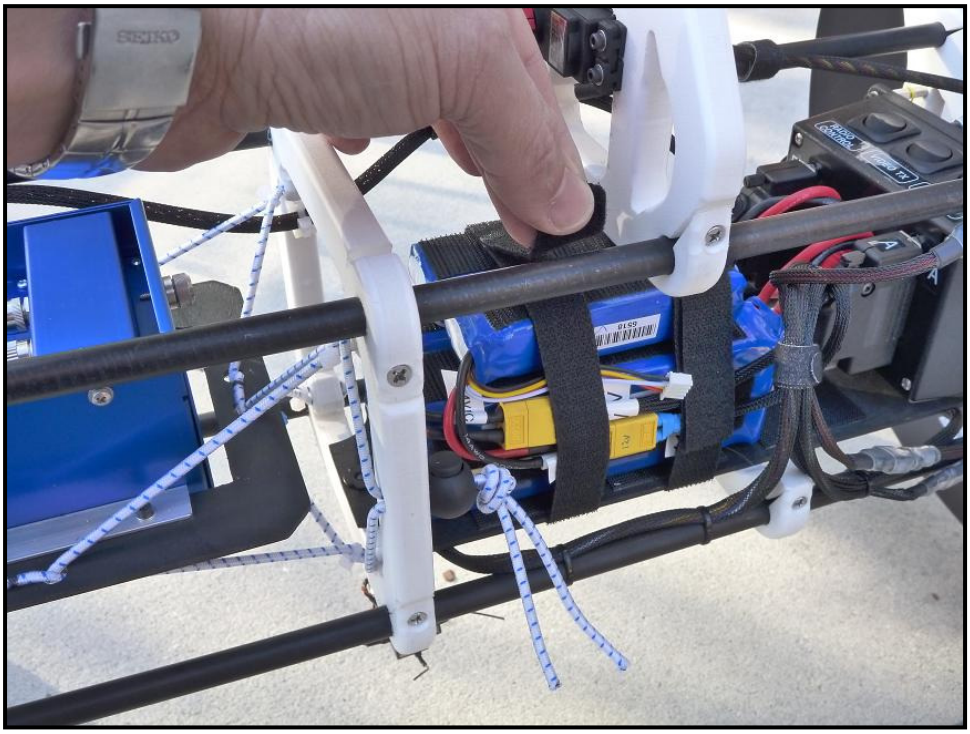
Step 4.
Install the two smaller packs (7.4V and 11.1V) on top of the two larger batteries (4400mAh)



Step 6.
Connect the flight and payload batteries observing the voltage labels.(7.4v to 7.4v, 11.1V to 11.1V etc.)

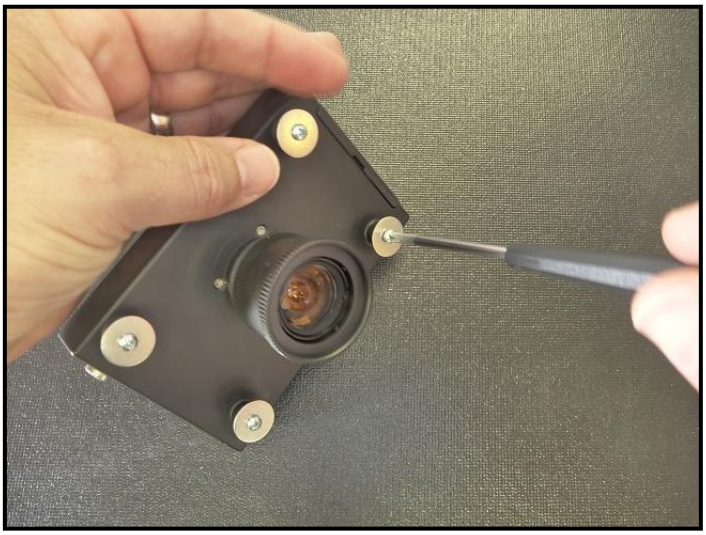


Step 7
Secure the batteries by using the two attached Velcro straps. Route the straps around the stacked batteries and make sure to include all battery wires and charge leads.

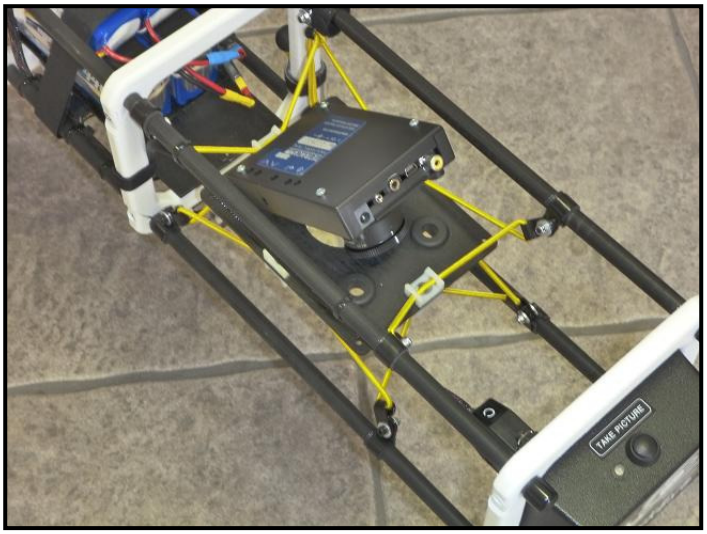


Camera Installation – ADC Lite

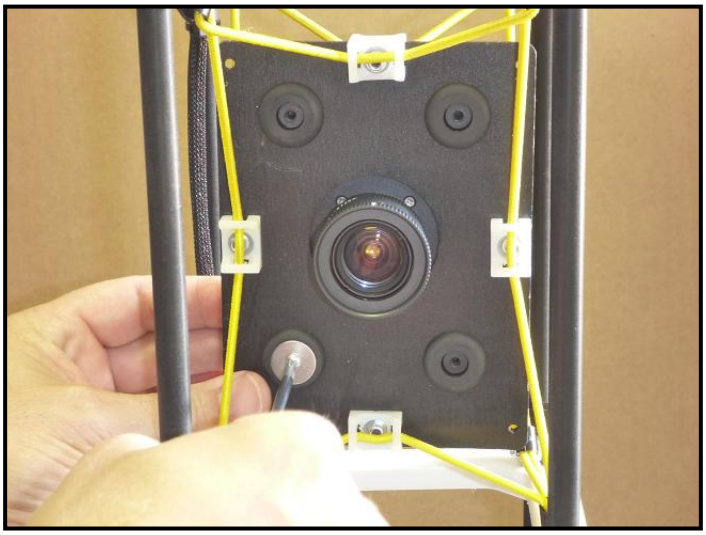
Step1.
Locate the ADC Air camera that came with your HawkEye purchase. Remove the 4 mounting screws and washers located on the face of the camera.



Step 2.
Install the camera in the camera mount. The camera connectors should face the front of the buggy.

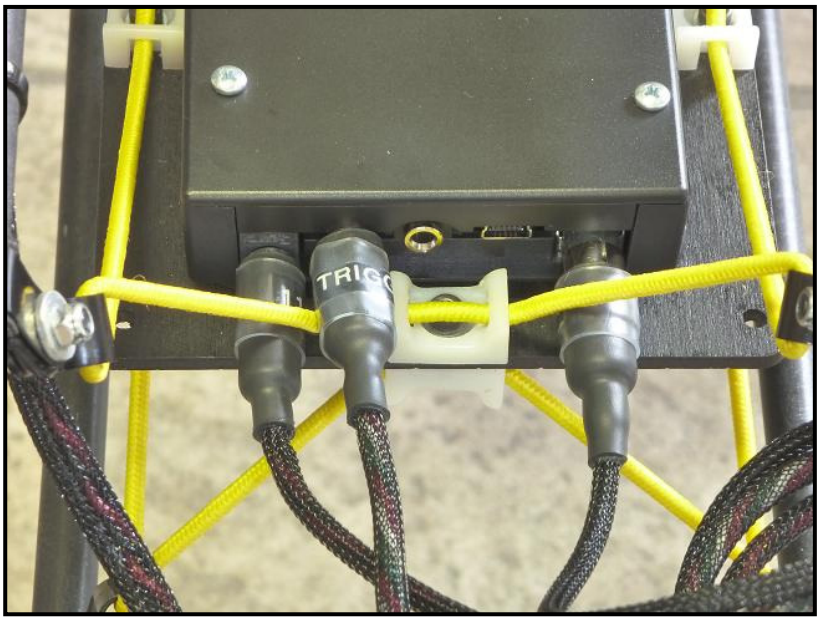


Step 3.
After placing the camera in the mount, replace all 4 screws and washers on the camera body. CAUTION! DO NOT OVER TIGHTEN THE SCREWS



Step 4.
Connect the 3 wire leads coming from the payload harness (D) to the camera as shown here.
Note the trigger plug will be connected on the top side of the bungee cord suspension.

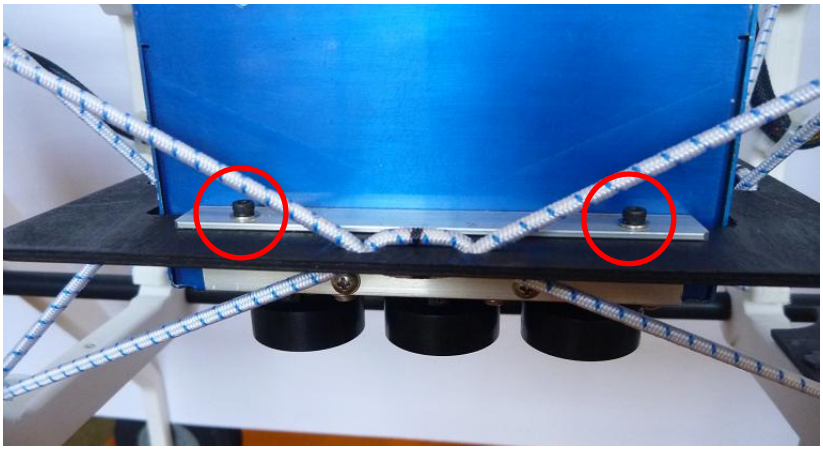
The camera is now mounted and ready to use.



Camera Installation – Mini MCA

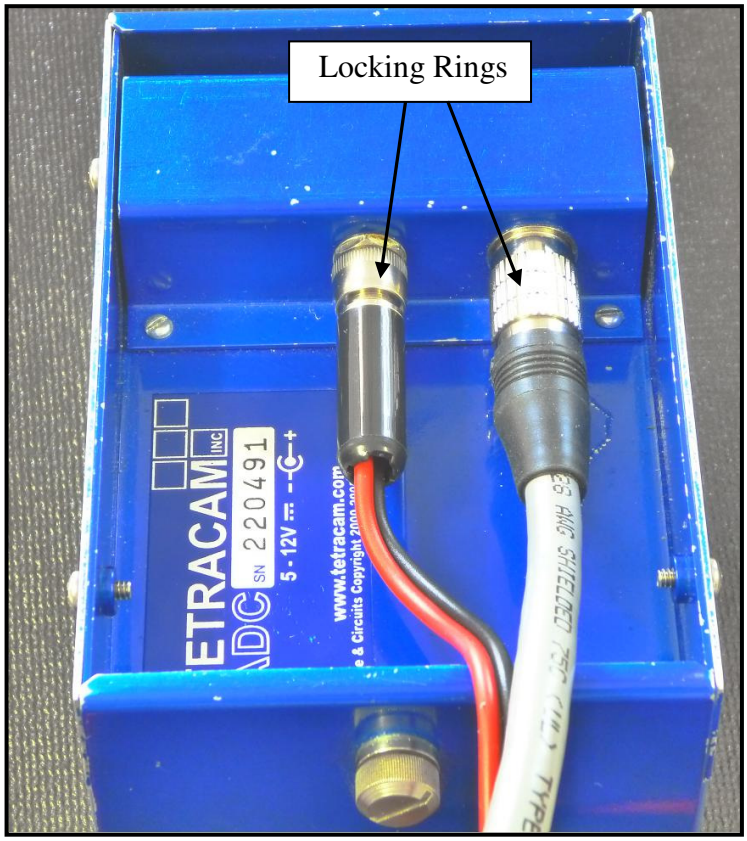
Step 1

If your Mini MCA has not already been installed, place the camera into the shock mount ring as pictured below. Use the four supplied machine screws to fasten the camera L brackets to the ring. The machine screws can be found pre-mounted on the shock ring.



Step 2

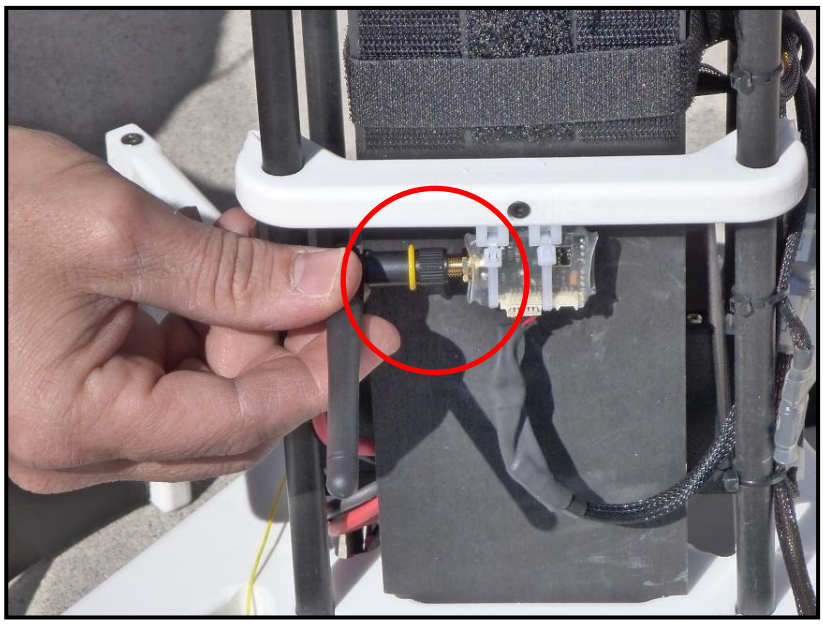
CAUTION!! Please make sure the PAYLOAD switch is in the OFF position before making connections. Connect the Mini MCA wire harness to the following connectors as shown. Take care when connecting the 15-pin Hirose connector and make sure you observe the position of the keyed slot. Make sure to secure the locking rings on both the power and Hirose connectors.



Video Transmitter

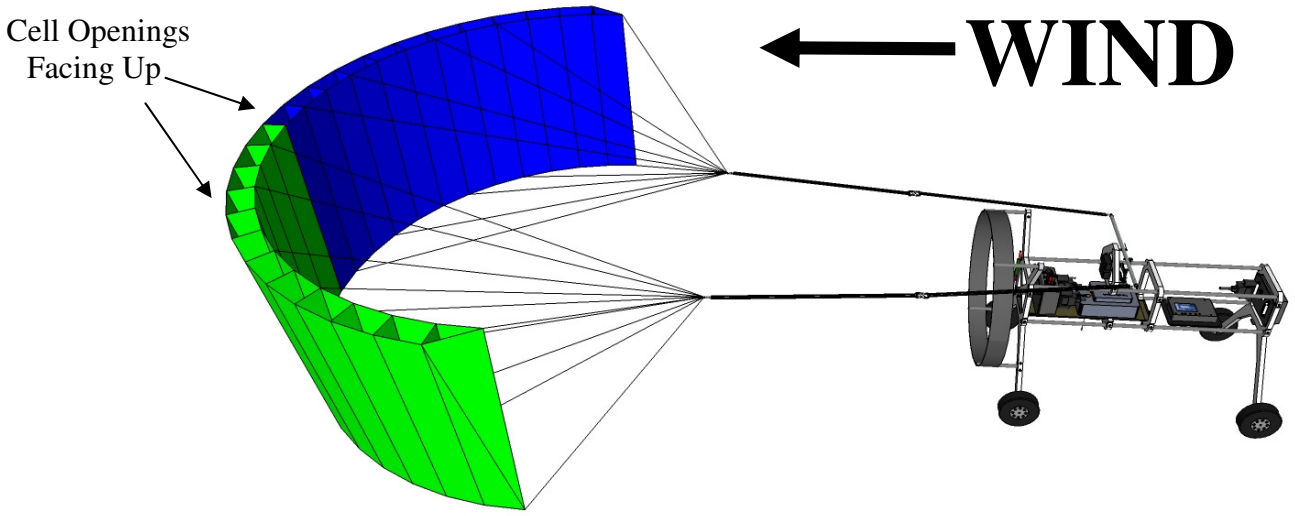
The video transmitter is located underneath the main battery tray. There is no setup necessary since the video transmitter is pre wired to the system.

However, the antenna should be rotated to point straight down before use. When transporting the HawkEye or during storage, the antenna should be rotated back underneath the battery tray to protect the antenna from damage. Before each flight make sure that the SMA connector is tight once the antenna is in the down position.



Hooking up the parafoil wing

Lay the parachute down wind behind the buggy. Open the chute so the strings are on top of the chute while it is laying flat on the ground. Place the chute cell openings (front of the chute) so that they are facing away from the buggy. Detach the chute cords from the holding loops located on the chute and close the swivel hooks so they do not accidentally get hooked on to other strings during flight.



Extend the yellow Kevlar cord with the S-Biner clips attached and clip them to the swivels or rings on the steering bar.

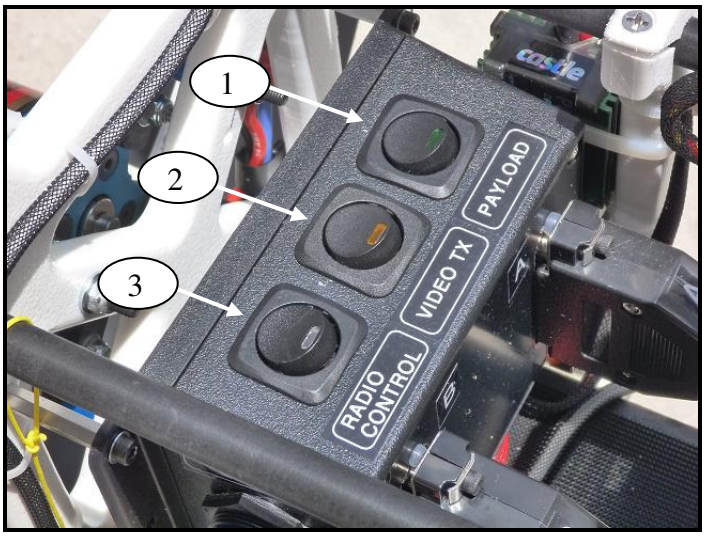
Powering up the Hawkeye

Power up sequence

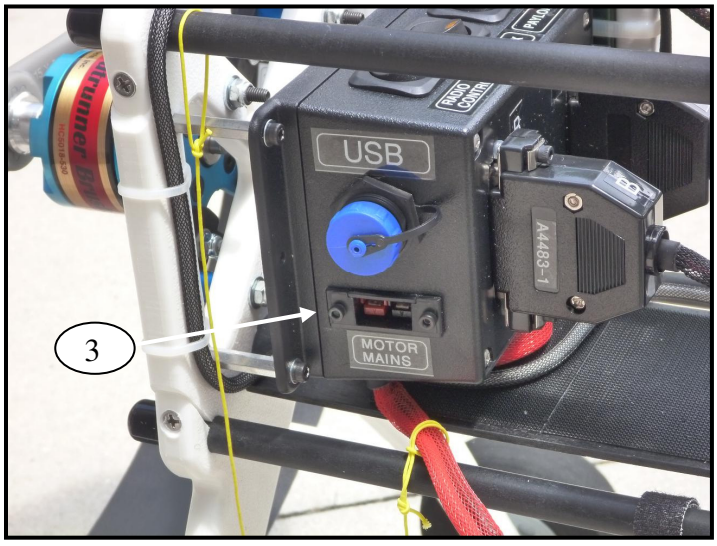
First power up the RC transmitter and make sure you have a full charge on the transmitter.
The transmitter should be set to Model#1 labeled "HawkEye1". If not please refer to the transmitter manual for instructions on how to choose the model needed. All programming is done at the Tetracam factory and should not need any further adjustments.

The power up sequence on the MCB is as follows:

1. Payload 12V → 2.Video TX → 3.Radio Control → 4.Motor Mains.
   The LED indicators on the rocker switches will be illuminated when the switches are in the on position.



The Motor Mains switch is turned on by inserting the high current jumper switch into the rectangular receptacle marked "Motor Mains". When the Motor Mains is powered up, you will hear the ESC beep five times to indicate that it recognizes the 5 cell batteries. Then the five tones will be followed by a confirmation tone.



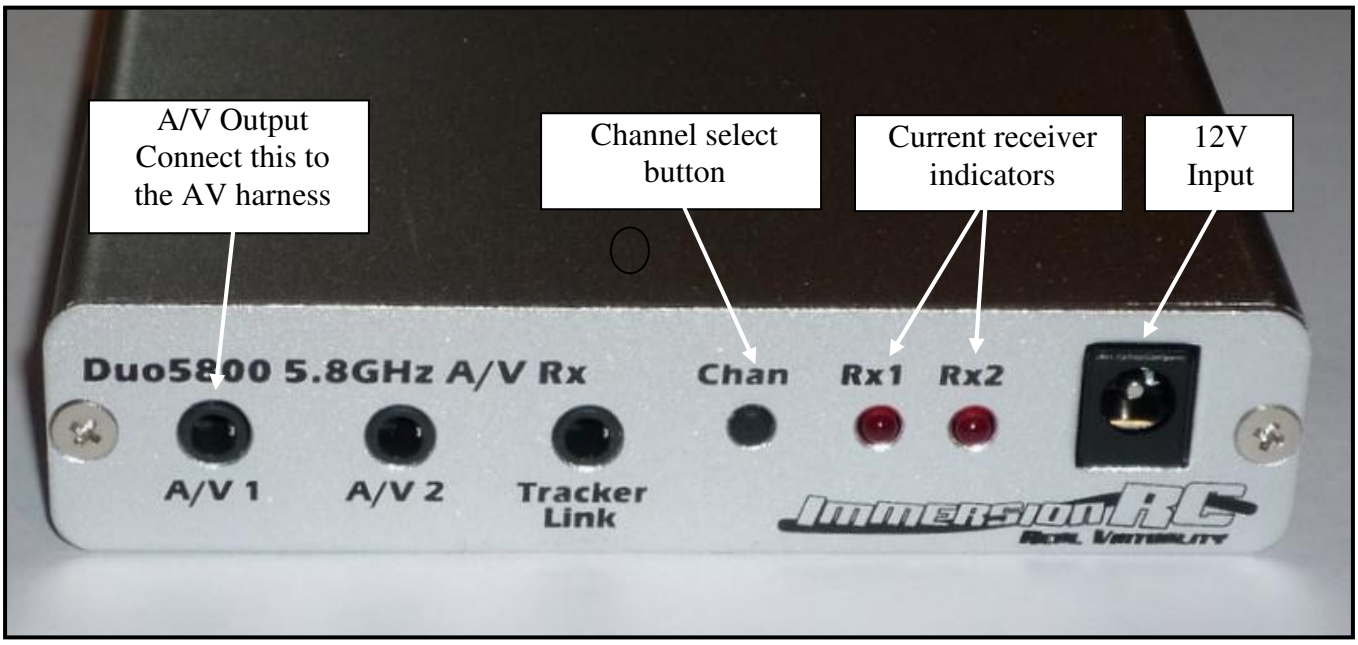
Video Receiver

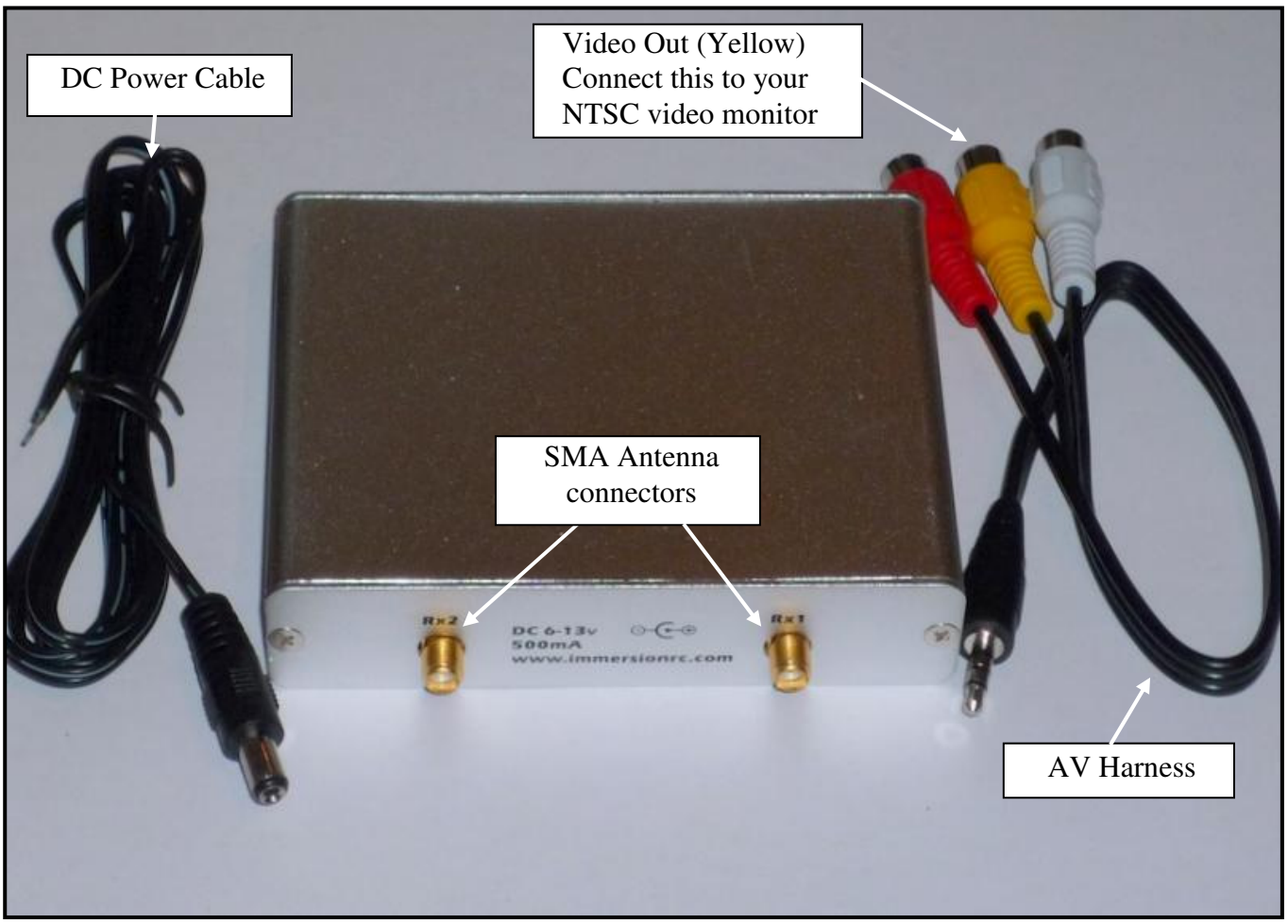
Hooking up the video receiver.

First make sure to connect the two patch antennas to the aluminum antenna bar as shown below. CAUTION: DO NOT OVER TIGHTEN SCREWS!! Screws should be snug and not too tight. NOTE!! The antennas can be damaged by over tightening the screws.

Repeat this for the second patch antenna.

Connect the video receiver to an NTSC video monitor using the Yellow RCA jack on the Audio Video harness. Power the video receiver by connecting the supplied DC power cable to a reliable 12VDC power source. Make sure the receiver is set to the same channel as the video transmitter located on the HawkEye. The audio connection is not necessary at this time. NOTE: The video TX and RX have been synchronized at the Tetracam factory. Therefore there should be no need to set the channels on the video system.





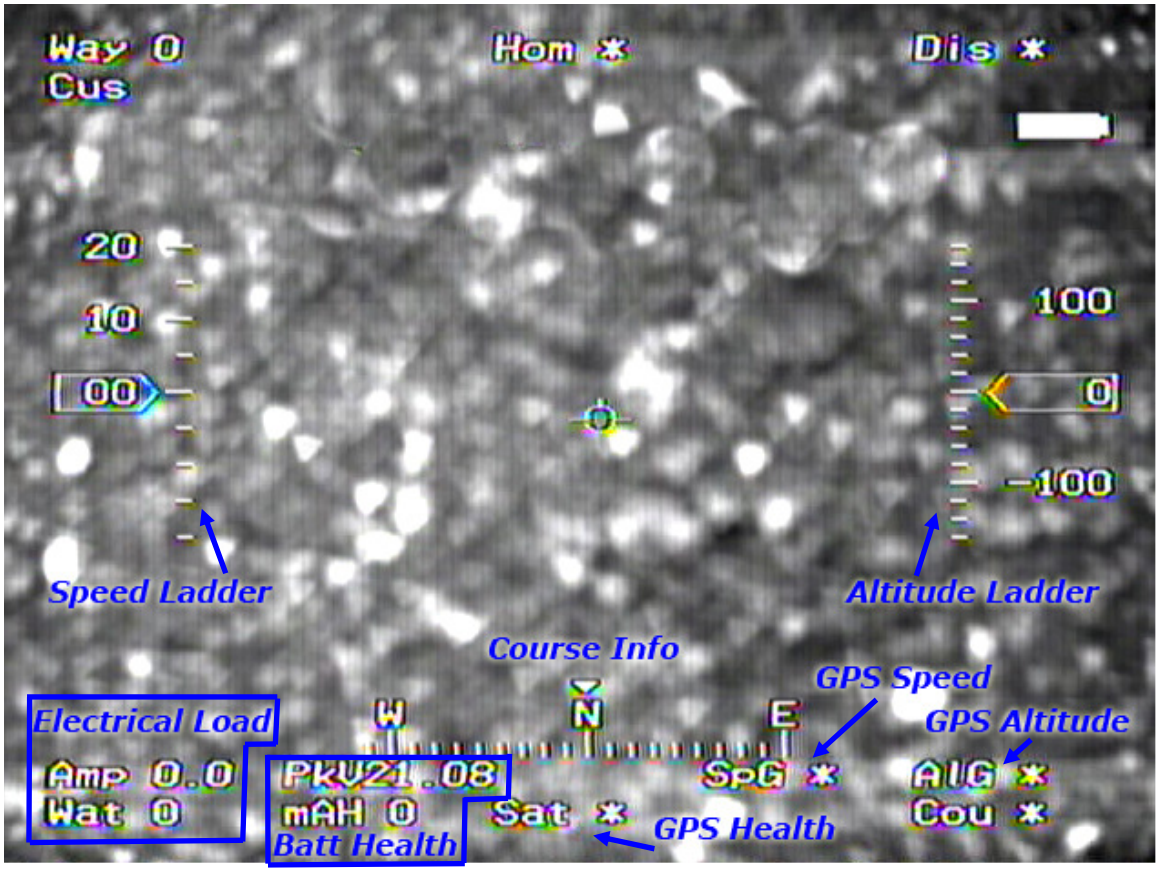
OSD System

After the video receiver is turned on, power up the HawkEye as per the instructions in the section (Powering up the HawkEye section. After the HawkEye is properly turned on, you should see the following splash screen on your video monitor.

NOTE: If you fail to see the OSD power up screen, power down the HawkEye and repeat the power up sequence.

The OSD Screen

When the OSD screen is first brought up, the OSD will need to sit idle for at least 30 seconds. This is a programmed wait period in order to allow the GPS receiver to acquire proper position and altitude information. During that time the words "Acquiring GPS Fix" will be displayed on the lower portion of the OSD screen. After the GPS has locked, you should see something similar to the following screen. Please keep in mind that the position of the data projected on the screen may look different on your monitor. This is due to where the data was configured to be displayed in the OSD firmware. For instructions and more information regarding the OSD system please look at the OSD manual provided at: http://www.eagletreesystems.com/support/manuals/osdpro.pdf.



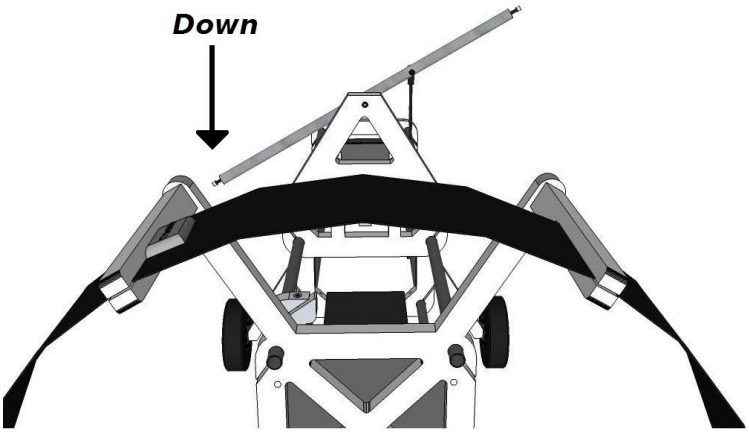
EagleTree Systems OSD:

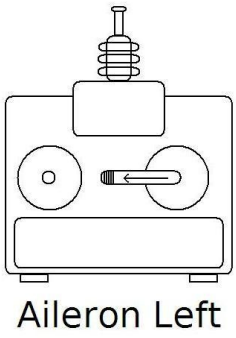
Download the software to configure and download the data from the eLogger:
http://www.eagletreesystems.com/Support/apps.htm

Pre Flight Check List.

Check all hardware for loose or missing nuts or screws. This includes:

- Wheels and respective hardware
- Screws at the end of the steering bar
- Pivot bolt and nut for the steering bar
- Make sure prop is properly mounted and balanced
- Radio Control battery fully charged
- Payload battery fully charged
- Motor batteries fully charged and Y adapter securely connected
- RC Transmitter fully charged
- Battery strap installed and tight
- Parachute clips securely fastened to swivels
- Parachute lines tangle free and suspension lines free and clear from prop
- ADC camera properly connected and ALL 4 screws installed and snug tight
- Make sure that the OSD is showing GPS data correctly before taking off
- The OSD voltage should be greater than 20V before starting, mAh should be near 0, Amps should be less than 1 Amp
- Check for proper steering from RC transmitter input. Standing behind the buggy when left aileron stick is applied, left side of steering bar will swing DOWN.
- Check prop rotation. (motor should turn clockwise while standing behind the buggy)

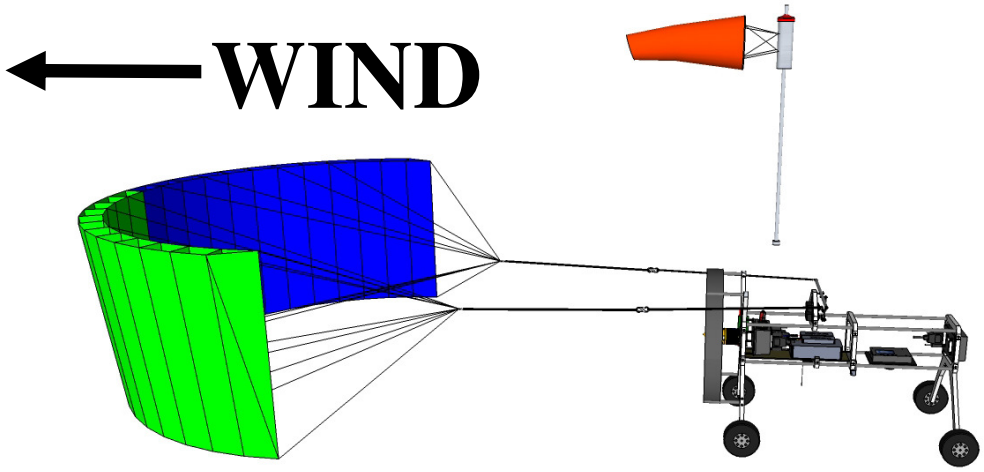




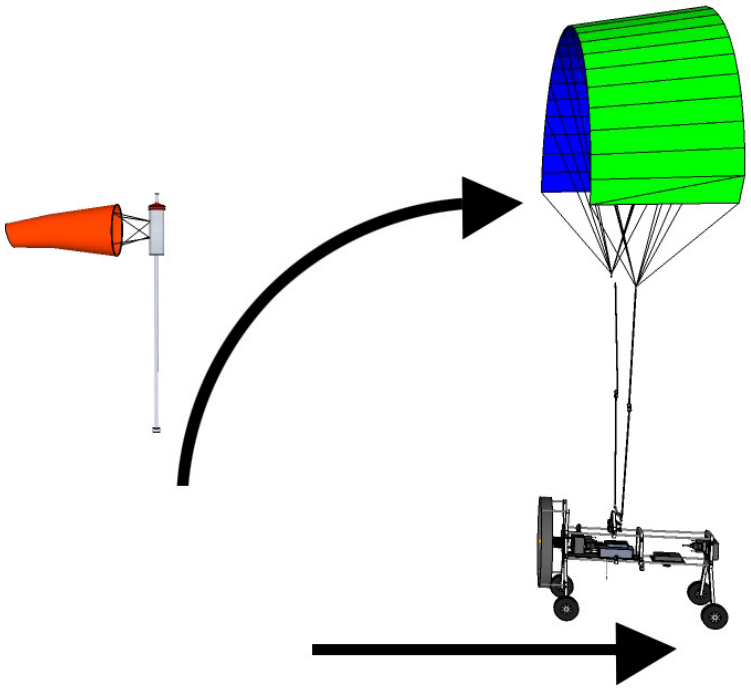
Range check

Range check
Always range check the radio system per the
radio manufacturer's instructions before the initial test flight and
periodically afterwards. (These instructions can be found in the DX7 manual located in the lid of your black transmitter case.)

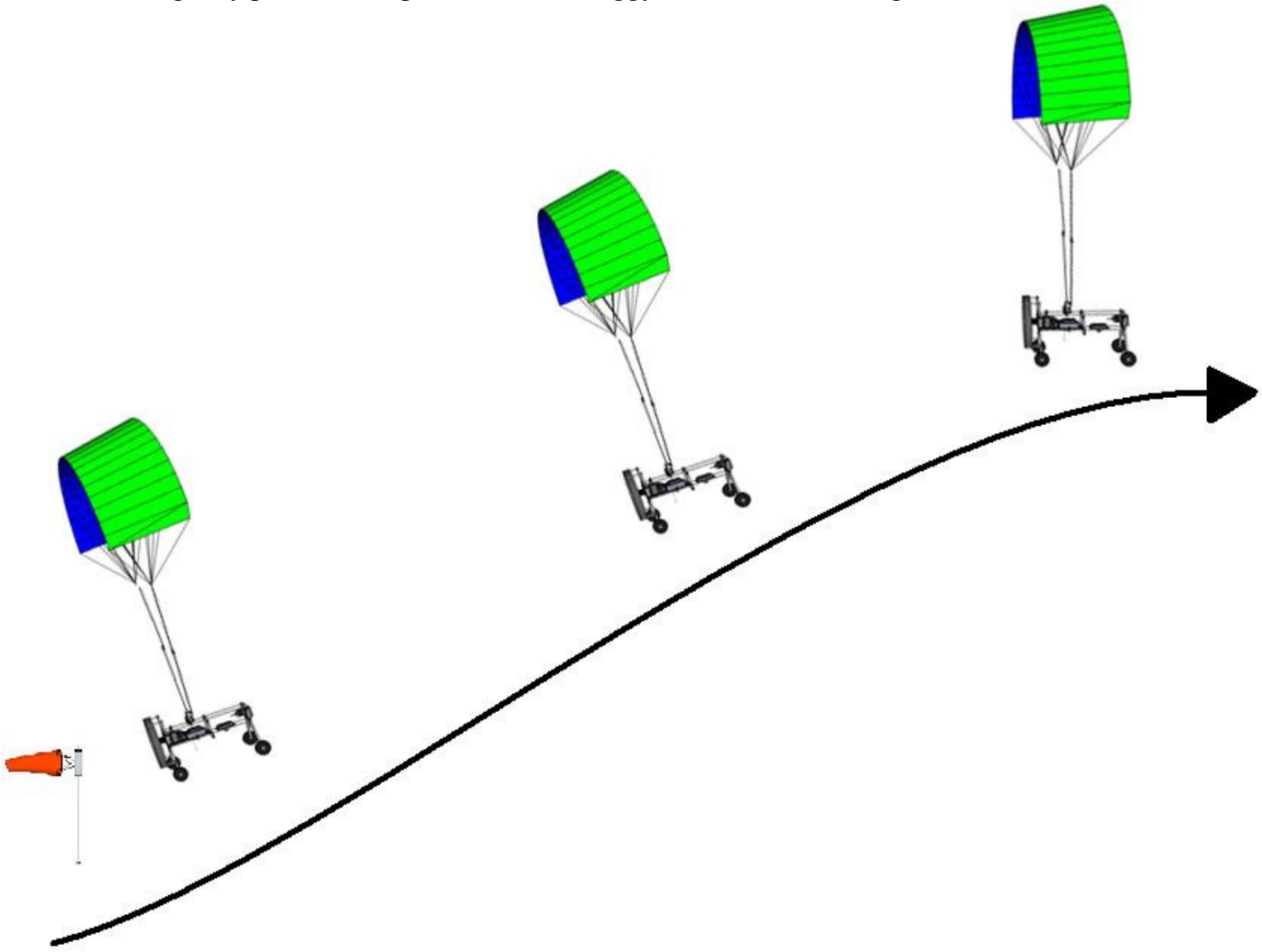
Taking Off
Point the HawkEye into the wind with chute attached and system powered on.



Gently increase the throttle stick on transmitter. Be careful not to apply too much power.
As the parachute inflates, gradually increase throttle until buggy starts to roll forward.
After buggy is moving, the parachute should rotate and come up above the buggy.
NOTE: It may be necessary to hold the chute on both sides while rolling in order to allow air to fill the chute. This is usually the case if operating the HawkEye in low to no wind conditions.



When the chute is flying over the buggy, increase power until buggy comes up off the ground. When the buggy is off the ground, STOP increasing power. Allow the aircraft to climb out smoothly. You can steer the chute while climbing out, but do not turn too sharply! Continue climbing until desired altitude is reached. Then gently pull back on power until the buggy becomes level in flight.

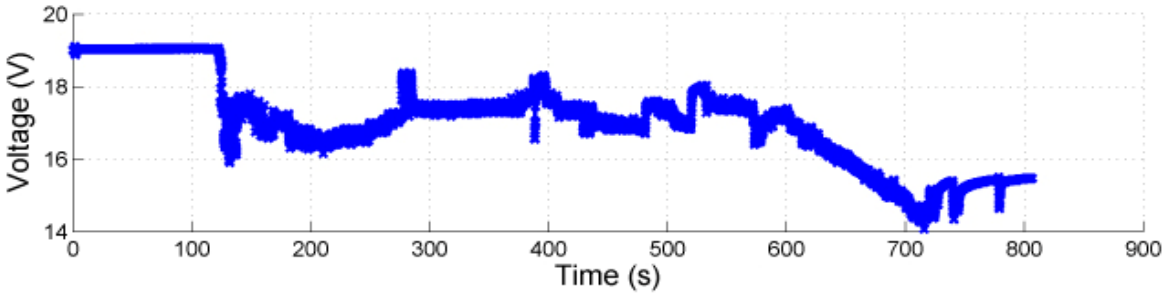


NOTE: depending on wind conditions, the buggy may never become completely level in flight, while flying fast enough to keep from loosing altitude. Please refer to the take off example videos on the "HawkEye Flight Samples" DVD

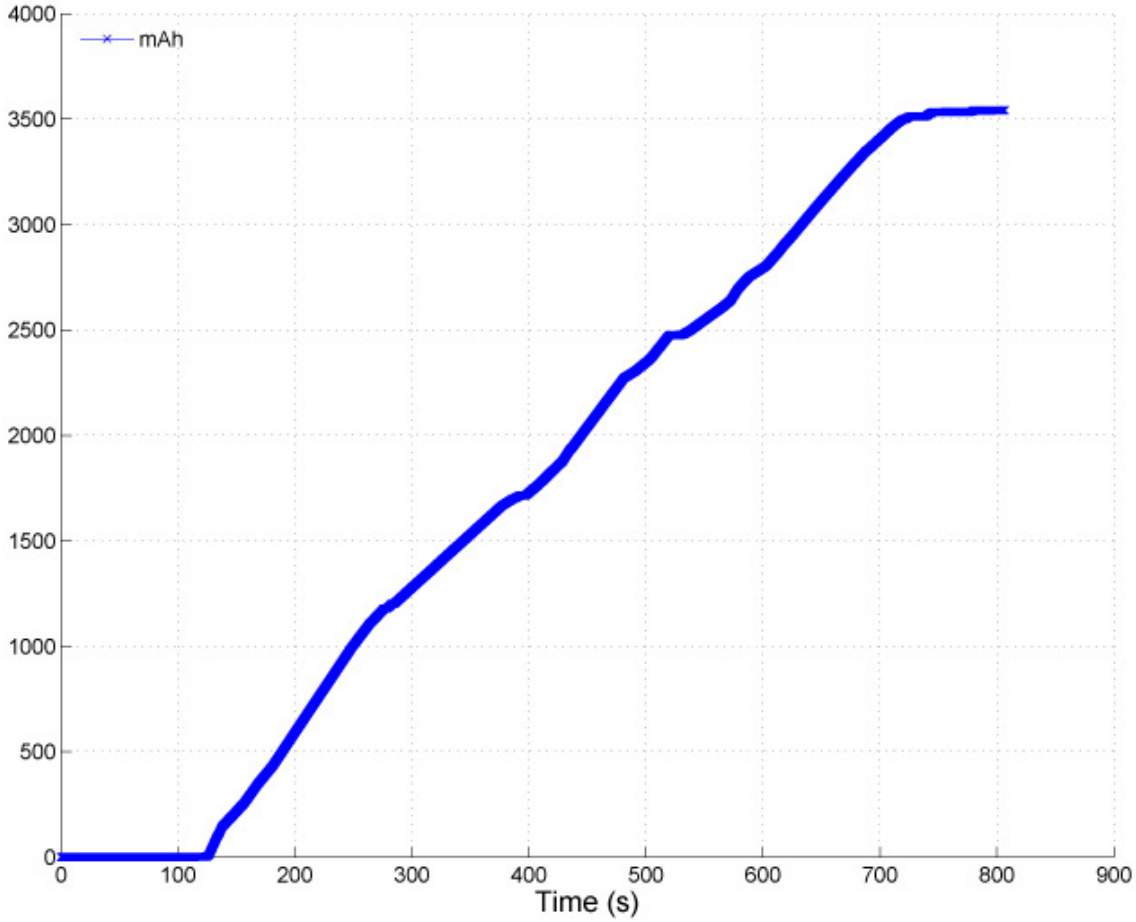
Flight Duration

While flying the Hawkeye, make sure to pay attention to the amount of mAh used, and pack voltage in the battery health section of the OSD screen. Safe practice is to land the aircraft at about 6000mAh or if the pack voltage drops to 16.5V. Allow the remaining 2000mAh and 1.5V (down to 15V) for landing and reserves. Note: to keep from damaging the batteries, it is recommended that the pack voltage not drop below 15V. The ESC controlling the motor has a cutoff at 15V specifically to keep this from happening.

Typical Voltage curve of a flight lasting 800 seconds (13.3Min)



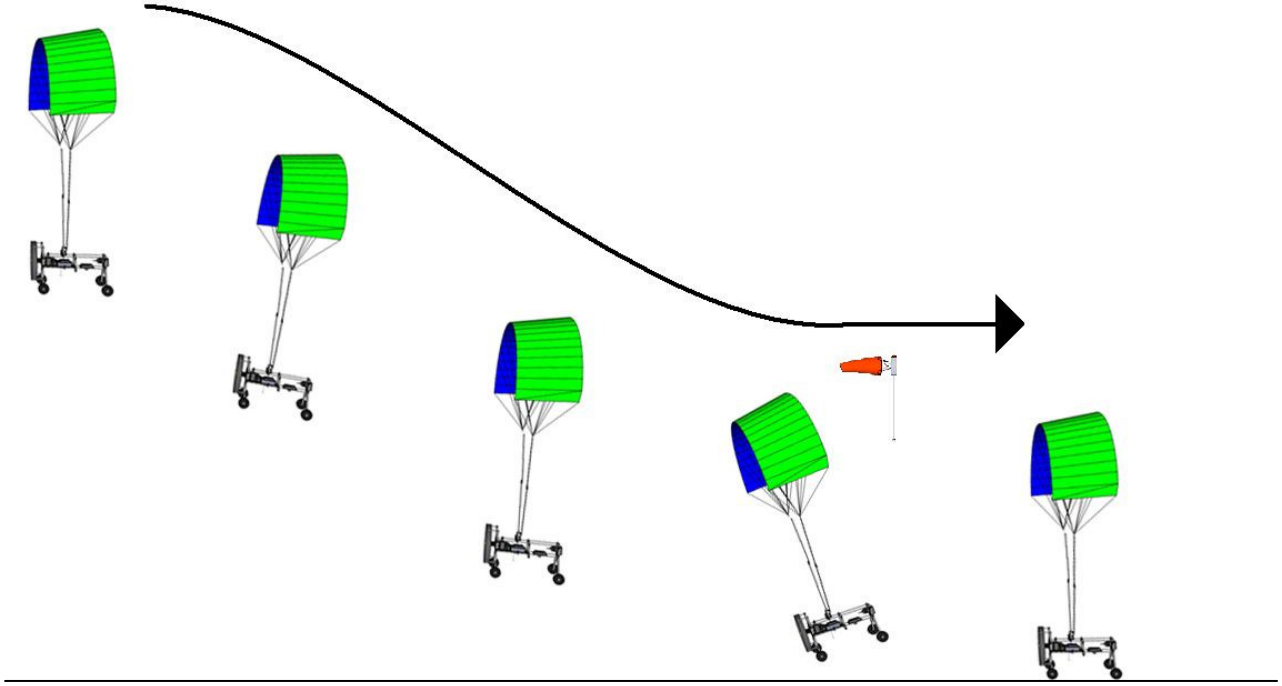
Typical battery capacity consumption curve of a flight lasting 800 seconds (13.3Min)



Landing

When you are ready to land the HawkEye remember that you should always try to land into the wind. This will allow you to slow the aircraft down and execute a safe landing.
The power off sink rate will vary depending on amount of head wind and total weight of the aircraft. The heavier the aircraft is, the faster the sink rate will be.
You should be landing at a voltage of around 17.5V. The speed controller will cut out at 15V and voltage drops when under load. Another measure is that there should be about 6000mAh consumed indicated on the OSD when the flight batteries are almost completely consumed.

A. Line the aircraft up to land straight down your runway.
B. Then slowly reduce power in order to reduce altitude.
C. Adjust your power setting to adjust the sink rate.
D. When you are about 10ft off the ground slowly apply a power pulse to rotate the aircraft in order to flair the buggy right before touchdown.
E. when the buggy is a 2ft or less reduce the power and let the buggy touch down gently



2011 Official AMA National Model Aircraft Safety Code

Academy of Model Aeronautics National Model Aircraft Safety Code

Effective January 1, 2011

A. **GENERAL**: A model aircraft is a non-human-carrying aircraft capable of sustained flight in the atmosphere. It may not exceed limitations of this code and is intended exclusively for sport, recreation and/or competition. All model flights must be conducted in accordance with this safety code and any additional rules specific to the flying site.

1. Model aircraft will not be flown:

(a) In a careless or reckless manner.

(b) At a location where model aircraft activities are prohibited.

2. Model aircraft pilots will:

(a) Yield the right of way to all man carrying aircraft.

(b) See and avoid all aircraft and a spotter must be used when appropriate. (AMA Document #540-D-See and Avoid Guidance.)

(c) Not fly higher than approximately 400 feet above ground level within three (3) miles of an airport, without notifying the airport operator.

(d) Not interfere with operations and traffic patterns at any airport, heliport or seaplane base except where there is a mixed use agreement.

(e) Not exceed a takeoff weight, including fuel, of 55 pounds unless in compliance with the AMA Large Model Aircraft program. (AMA Document 520-A)

(f) Ensure the aircraft is identified with the name and address or AMA number of the owner on the inside or affixed to the outside of the model aircraft. (This does not apply to model aircraft flown indoors).

(g) Not operate aircraft with metal-blade propellers or with gaseous boosts except for helicopters operated under the provisions of AMA Document #555.

(h) Not operate model aircraft while under the influence of alcohol or while using any drug which could adversely affect the pilot's ability to safely control the model.

(i) Not operate model aircraft carrying pyrotechnic devices which explode or burn, or any device which propels a projectile or drops any object that creates a hazard to persons or property.

Exceptions:

· Free Flight fuses or devices that burn producing smoke and are securely attached to the model aircraft during flight.

· Rocket motors (using solid propellant) up to a G-series size may be used provided they remain attached to the model during flight. Model rockets may be flown in accordance with the National Model Rocketry Safety Code but may not be launched from model aircraft.

· Officially designated AMA Air Show Teams (AST) are authorized to use devices and practices as defined within the Team AMA Program
Document (AMA Document #718).

(j) Not operate a turbine-powered aircraft, unless in compliance with the AMA turbine regulations. (AMA Document #510-A).

3. Model aircraft will not be flown in AMA sanctioned events, air shows or model demonstrations unless:

(a) The aircraft, control system and pilot skills have successfully demonstrated all maneuvers intended or anticipated prior to the specific event.

(b) An inexperienced pilot is assisted by an experienced pilot.

4. When and where required by rule, helmets must be properly worn and fastened. They must be OSHA, DOT, ANSI, SNELL or NOCSAE approved or
comply with comparable standards.

B. ***RADIO CONTROL (RC)***

1. All pilots shall avoid flying directly over unprotected people, vessels, vehicles or structures and shall avoid endangerment of life and property of others.

2. A successful radio equipment ground-range check in accordance with manufacturer's recommendations will be completed before the first flight of a new or repaired model aircraft.

3. At all flying sites a safety line(s) must be established in front of which all flying takes place (AMA Document #706- Recommended Field Layout):
(a) Only personnel associated with flying the model aircraft are allowed at or in front of the safety line.
(b) At air shows or demonstrations, a straight safety line must be established.
(c) An area away from the safety line must be maintained for spectators.
(d) Intentional flying behind the safety line is prohibited.
4. RC model aircraft must use the radio-control frequencies currently allowed by the Federal Communications Commission (FCC). Only individuals properly
licensed by the FCC are authorized to operate equipment on Amateur Band frequencies.
5. RC model aircraft will not operate within three (3) miles of any pre-existing flying site without a frequency-management agreement (AMA Documents #922-
Testing for RF Interference; #923- Frequency Management Agreement)
6. With the exception of events flown under official AMA Competition Regulations, excluding takeoff and landing, no powered model may be flown outdoors
closer than 25 feet to any individual, except for the pilot and the pilot's helper(s) located at the flight line.
7. Under no circumstances may a pilot or other person touch a model aircraft in flight while it is still under power, except to divert it from striking an individual.
This does not apply to model aircraft flown indoors.
8. RC night flying requires a lighting system providing the pilot with a clear view of the model’s attitude and orientation at all times.
9. The pilot of a RC model aircraft shall:
(a) Maintain control during the entire flight, maintaining visual contact without enhancement other than by corrective lenses prescribed for the pilot.
(b) Fly using the assistance of a camera or First-Person View (FPV) only in accordance with the procedures outlined in AMA Document #550.