

# ECILOP EASY / ECILOP STEREO

## Assembling manual and Force Servo modification

Ecilop Easy is a quadcopter designed for aerial filming and photography. Counterbalanced camera mount and a new type of servo drives are used. Four different camera mounts are included. Mass of the camera must be under 600g.

### Technical data:

Dimensions without propellers - 0.5x0.5x0.4 m.

Weight of the frame is 0,6 kg

The full flight weight 2,0 – 3,0 kg.

### Content:

- 2 – 5            Completion (Ecilop Easy kit, Force Servo version)
- 6 – 11          Assembly instruction
- 12              Ecilop Stereo
- 13 – 14        Force Servo upgrade

### Links:

Parts & upgrades: <http://www.myresearch.company/ee-parts.phtml>

Force Servo configuration process: <http://youtu.be/WOZkC4Q6Cqk>

Demo flight: <http://youtu.be/a0LOVGwukpQ>

3D Sample: <http://youtu.be/40YdmRPuosk>

Force Servo benefits: [http://www.myresearch.company/f-servo\\_vs\\_direct\\_drive.phtml](http://www.myresearch.company/f-servo_vs_direct_drive.phtml)

Gimbal setup examples: <https://vimeo.com/82165658>

Example of configuration : <https://vimeo.com/77561077>

F-Servo test: <http://youtu.be/4pBnEhLAtBw>

Accuracy test: <http://youtu.be/1g3fAj4FIKs>

Frequently Asked Questions: [http://www.myresearch.company/data/ecilop\\_faq.phtml](http://www.myresearch.company/data/ecilop_faq.phtml)

Discussion thread: <http://www.rcgroups.com/forums/showthread.php?t=1640731>



**The package contains:**

Main frame



Antennas frame



Vibration dampers



Axial unit



Equipment platform



Axial fixers



Springs 0.4 N/mm (weak)



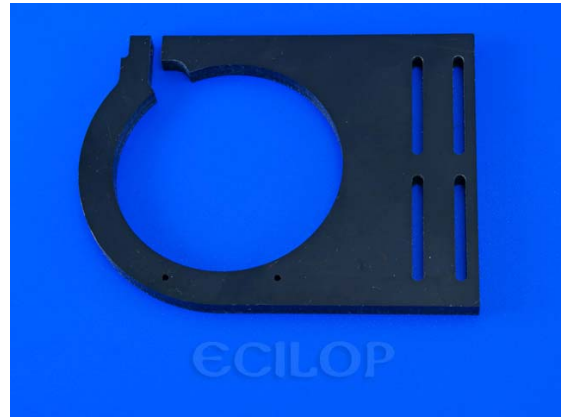
Springs 1.0 N/mm (default)



Balance beam stands



NEX-7 camera lock



Servo screws



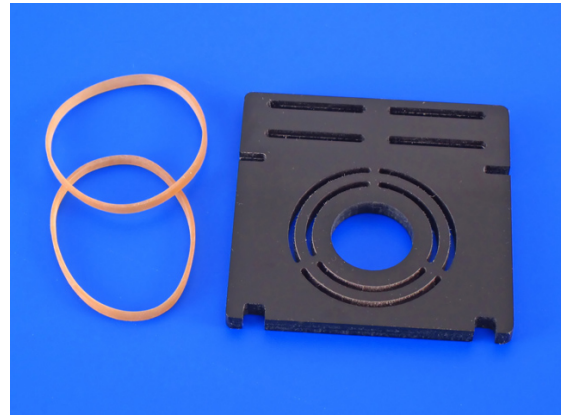
Tripod type camera fixer (upside down)



Camera mount screws



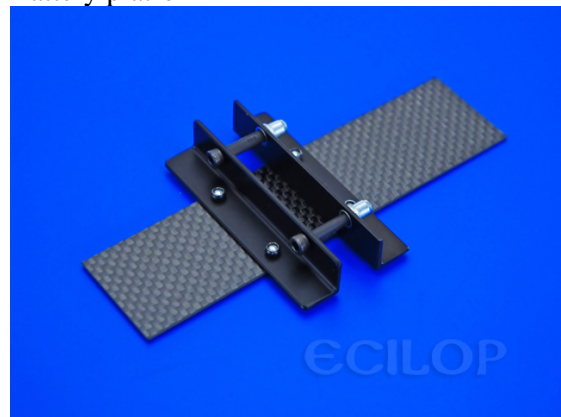
Small camera fixer



NEX camera lock



Battery platform





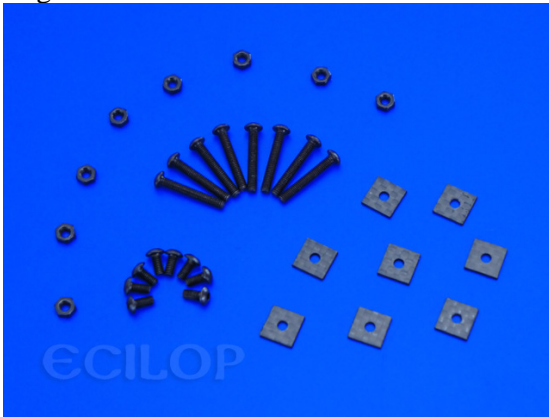
Engine stands



Landing skids



Engine fixers



Skid fixers



Chassis stands



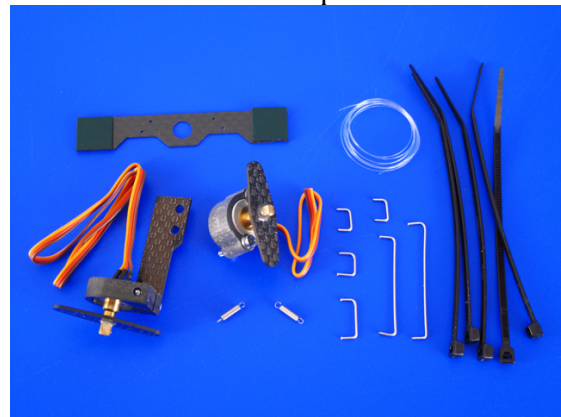
Power distribution wires



Chassis fixers



Force servo modification parts



## Tail LED



## Fixture elements



## Spare parts



## Certificate



## You will need the following additional components (not included):

A digital camera (Sony NEX-x is recommended);

A remote control unit (Futaba T8J or a different model);

Quadcopter flight controller with a camera stabilization function (DJI NAZA or a different model);

Gimbal controller (Tarot ZYX-GS or a different model);

Two park-size servos (MKS DS8910 or a different model);

Four engines; the distance between mounting screws should be 19 mm (MT3506-25 or a different model);

Four propellers; maximal diameter 14" (APC12x3.8 or a different model)

Four speed controllers (T-Motor ESC 18A or a different model);

A battery (5000mAh 4S 25C or a different 3-5S model)

A video transmitter (FOXTECH 5.8G 200mw or a different model)

Video goggles with a receiver (Fat Shark or a different model)

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## Dihedral angle gasket (optional part)

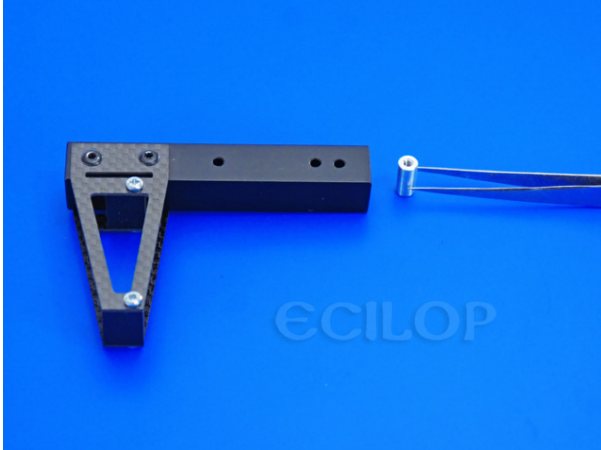
Thanks to the engine tilt, the camera's vertical field of view is increased. The tilt also makes the aircraft more stable. However, the effect of this stabilization is very weak compared with active stabilization found in any multi-copter. Spacer size - 25x12x3mm; Distance between mounting holes - 19mm; Diameter of the center hole - 7.5mm; Dihedral angle - 6deg.





## Assembly instruction

Install the camera tilt axis lock into the axial unit.



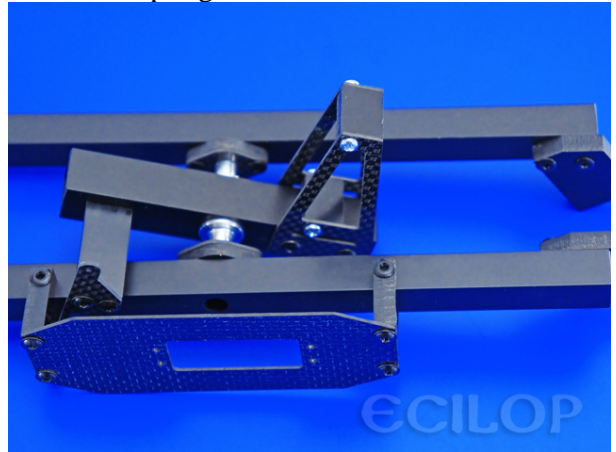
Use bolts to fasten two fixers of the camera's second tilt axis. Use moderate torque.



Fasten two balance beam stands using two screwdrivers on its opposite sides. Medium strength threadlocker must be applied.



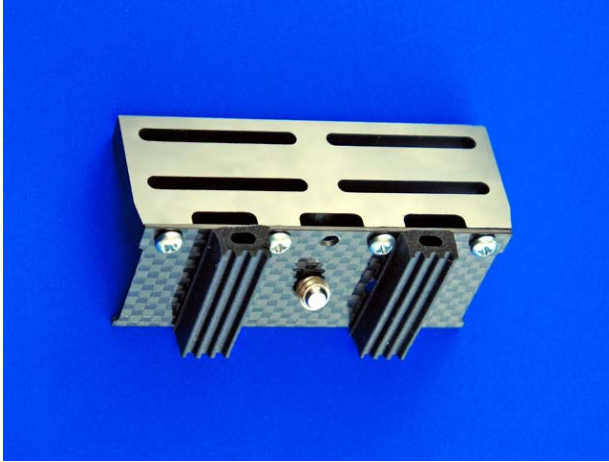
Fasten the springs holder.



Fasten the camera lock, but leave the bolts a bit loose.



The universal camera fixture allows you to install any camera on the drone. The camera is fixated with a regular tripod screw and should be flipped vertically. The ratio of the mass of the camera to the mass of the battery should be in the range of 0.9 - 1.35 (mass of the camera divided by the mass of the battery). It is not recommended to use cameras heavier than 600 grams.

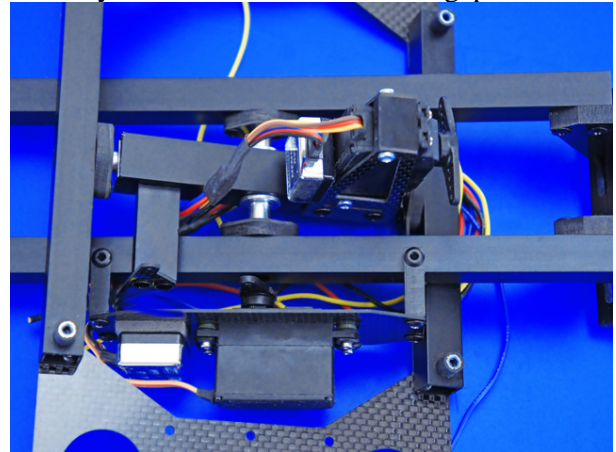


This camera fixture allows you to install any small camera on the drone.

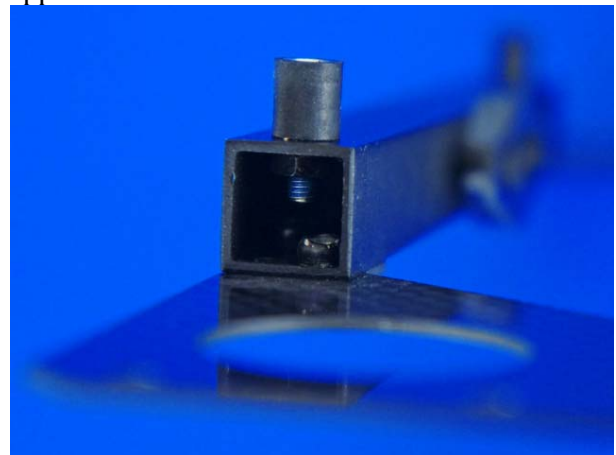


Prepare a modified Force Servo drives. (information is listed below)

Install and fasten the servo gears. Install under the servo nylon washers to increase the gap if needed.



Attach dampers to the equipment platform using nuts. Medium strength threadlocker must be applied.





Bolt up the axial unit to ball bearings on the equipment platform. Use washers if you need to fill the gaps. Medium strength threadlocker must be applied.



Loosen the bolts on the locks and tighten them up again. This operation will help you eliminate the slight deviation of the locks from the rotation axis. Medium strength threadlocker must be applied.



Bolt up the chassis stands to the engine stands.



Bolt up the engine stands to the main frame. Notice the holes on the sides of stands: 6 mm holes must face forward and backward, while chassis stands must be oriented to the left and to the right. Medium strength threadlocker must be applied.





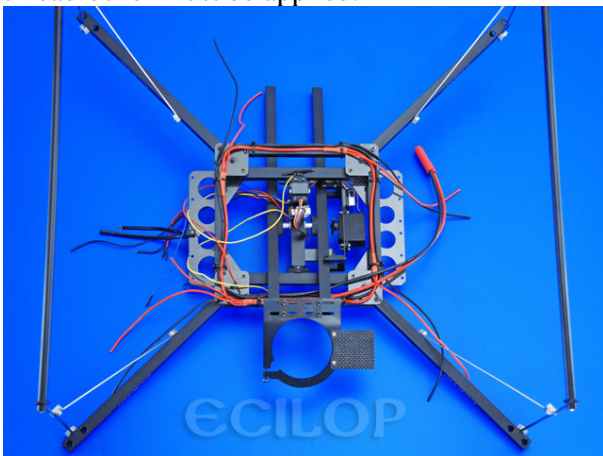
Put rubber rings on the landing skids. Install the chassis stand locks into the landing skids. Use an epoxy or cyanoacrylate adhesive to hold them in place.



Fasten the landing skids on the chassis stands. Medium strength threadlocker must be applied.



Attach the electronic equipment platform to the main frame. Hold the rubber dampers with pliers when screwing the bolts. Medium strength threadlocker must be applied.



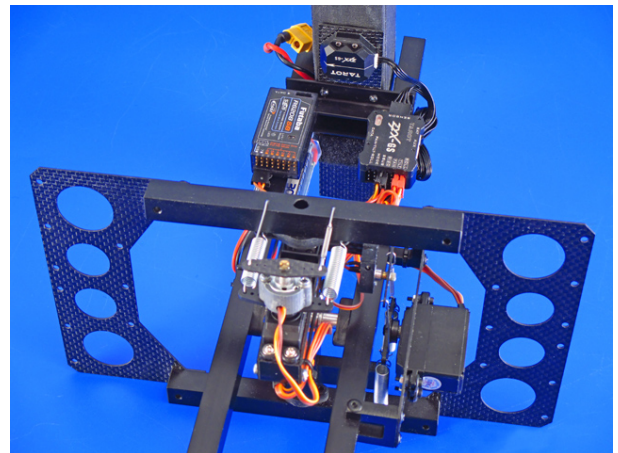
Bolt up the engines. Medium strength threadlocker must be applied.



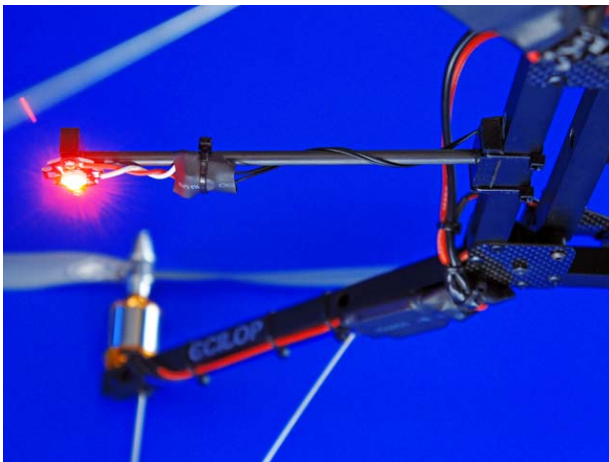
Assemble and fasten the frame for the receiver's antennas.



Install the electronic equipment: a receiver, an autopilot, speed controllers, gimbal controller, a voltage stabilizer, an OSD module, a video transmitter. The servo-mechanisms are connected to the gimbal controller, the controller is connected to the receiver. Wires must not rub or tap into gyroscope. The cables connecting the moving parts of the drone must be soft and bent into a loop. The cables must pose minimal obstruction to the rotation of structural elements. Use a separate power switch for onboard electronics.



The LED is powered through an inverter. 3S-5S Li-Po battery can be used as a power source. Connection polarity does not matter. Power source: 11-24V AC/DC. 1. Assemble the LED mount using cyanoacrylate glue. Screw on the LED using isolation washers. Fixate the LED mount and wires on the aircraft frame. Connect to the power source.



Take the lens off the camera. Fasten the camera body on the gimbal. Install the lens.

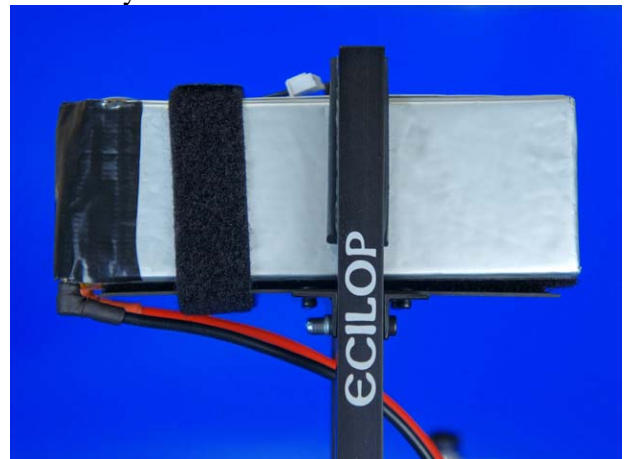


Install the battery platform on the balance beams.

Glue the soft edge padding to the balance beam stands to ensure close contact with the battery. Select thick or thin spacers, depending on the thickness of your battery.

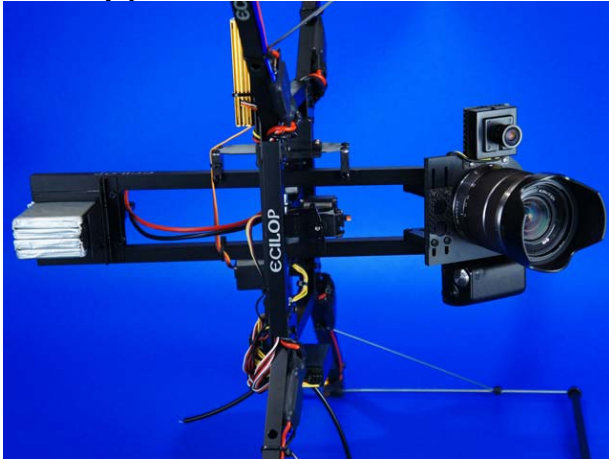


Use peel-n-stick bands to lock the battery in place. To help the battery cable bend, move the battery connector from the cable to the body of the battery.





Put the drone on the side. Move the battery along the balance beam stands to achieve a perfect balance. Lock the battery platform in the necessary position.



Put the drone on the landing skids. Move the battery forward and backward to reach acceptable balance in the lengthwise direction. If necessary, turn the battery platform. Mark the right fixation position on the battery. Always use identical batteries.



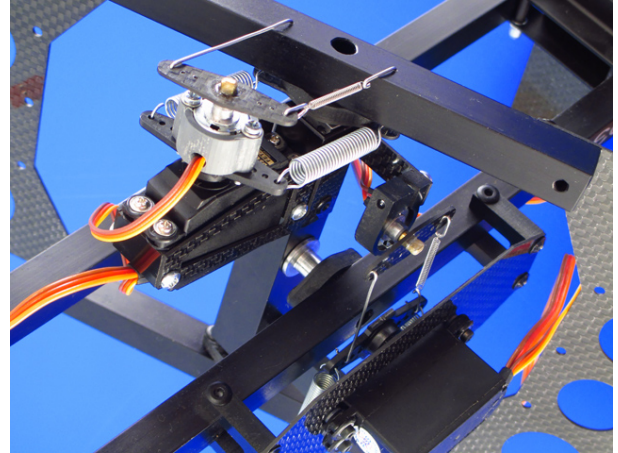
Loosen the camera lock bolts. Move the camera left and right to reach optimal balance in the lateral direction. Lock the camera in the necessary position.



Install the springs between the servo gear and the frame.

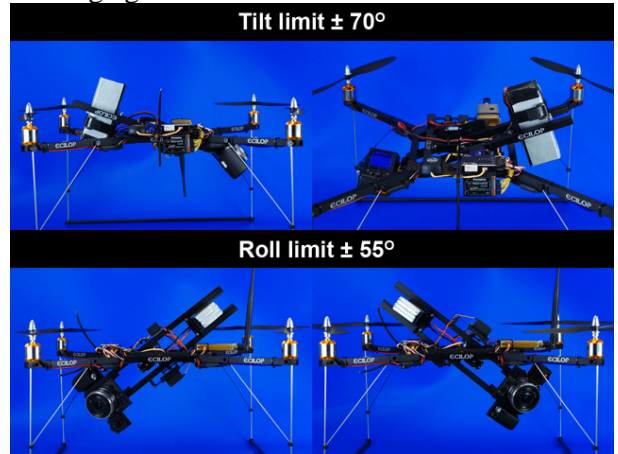
Springs Ecilop V1209 1.0N/mm (stronger, default) - This type of springs is used in most cases.

Springs Ecilop V1209 0.4N/mm (weaker, optional) - With these springs installed, the inertial stabilization effect is stronger, but some swaying may occur. These springs require more precise adjustment of the camera mount and the use of softer cables and faster servo gears.



Configure the electronic equipment as specified in the manual for your additional equipment.

Install all the servos, springs and links as shown in this video. Make sure that all joints can be rotated easily, are not jammed and are not rubbing against each other.



Install the rotors and check the drone in mid-air.

You can detach the landing skids and engine stands for transportation.

## ECILOP STEREO Assembling manual

To assemble the Ecilop Stereo, use the instructions for assembling Ecilop Easy. For storage and transportation, glue together the wood stand (use wood glue). You can varnish the stand after it has been glued.



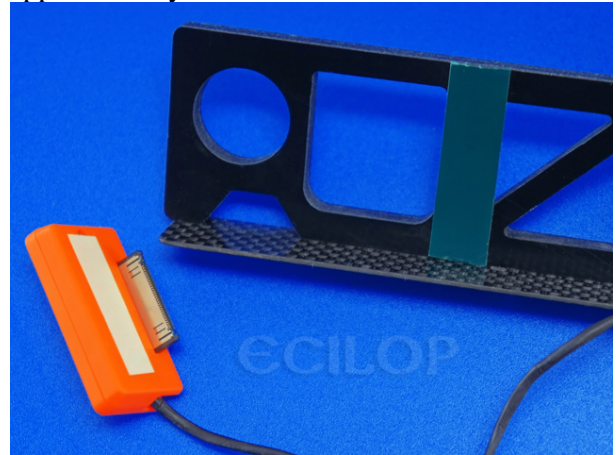
The GoPro cameras are attached to the platform with straps. The camera synchronization cable must be extended to 35 cm.



Use slim double sided sticky tape for fixing camera socket.



I recommend sticking soft gaskets of 1 mm thickness as it is shown on the picture. Thanks to those camera directions will intersect in approximately 7 m. distance.



### How to work with two cameras without a synchronization cable.

Manually enable recording on both cameras. Clap loudly before starting. Once finished, import both videos into a single SONY Vegas Movie Studio project. Soundtrack visualization will help synchronize the two files. After synchronization, join both channels into a single one in a stereo mode.



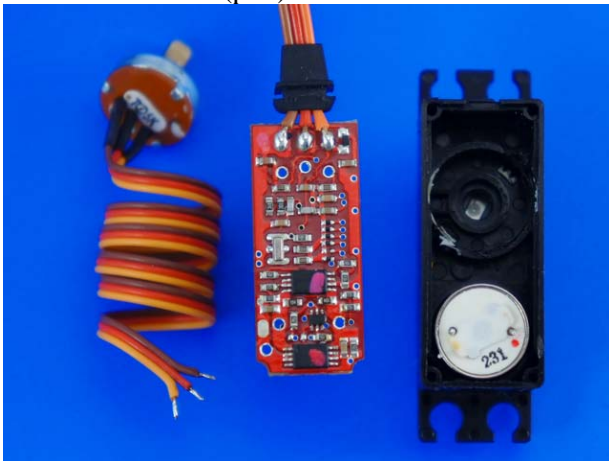


## Force Servo modification

1. Dismantle the servo drives and unplug the internal potentiometers.



2. Note the position of contacts of the original potentiometer in the servo drive. Solder the wires of external potentiometers paying attention to wire colors (see the image for reference). Do not turn the servo on until the fishing line or metal rods are not fixed (p. 7)

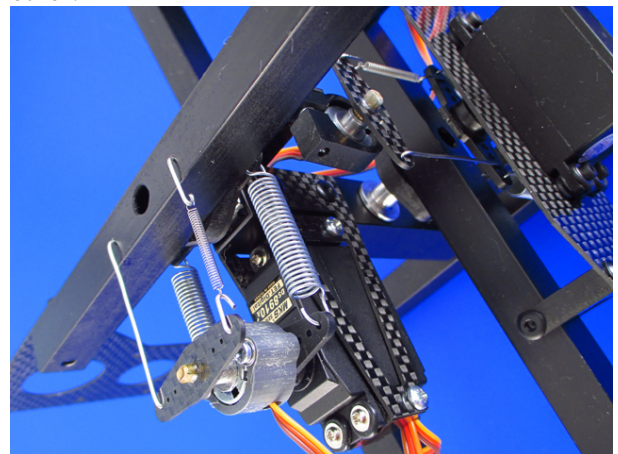


3-A. Installation of the Force Servo with a metal rods. Drill a 1mm holes in the equipment frame (if you have an older frame).

3-B. Installation of the Force Servo with a fishing line (alternative solution). Fasten the line fixture onto the frame.

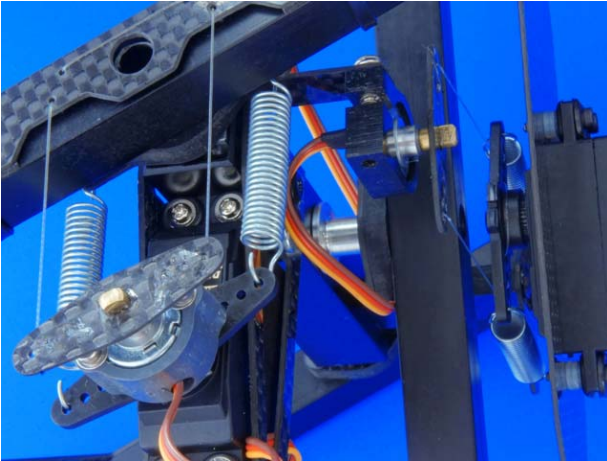
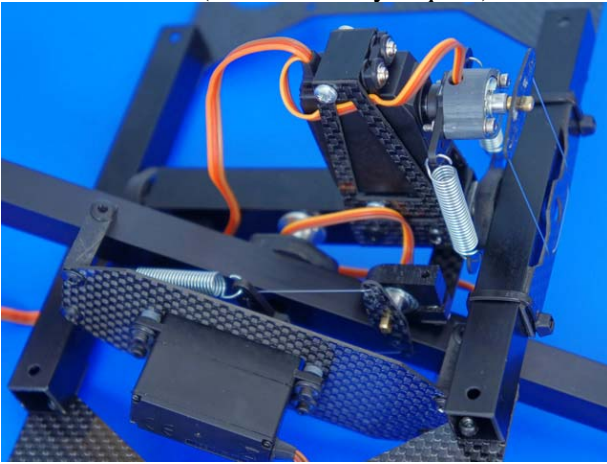


Install all the servos, springs and links as shown. Make sure that all joints can be rotated easily, are not jammed and are not rubbing against each other.

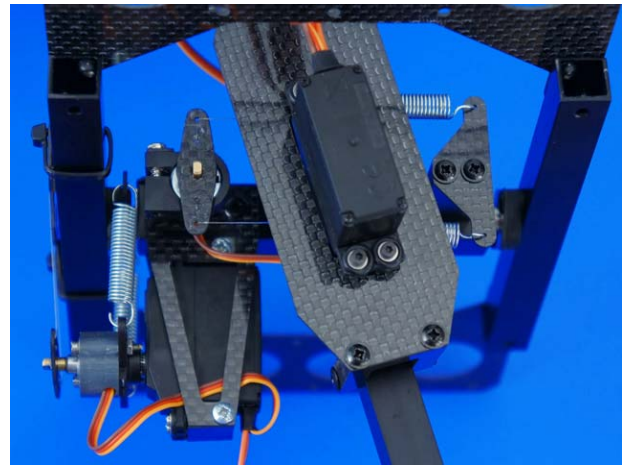




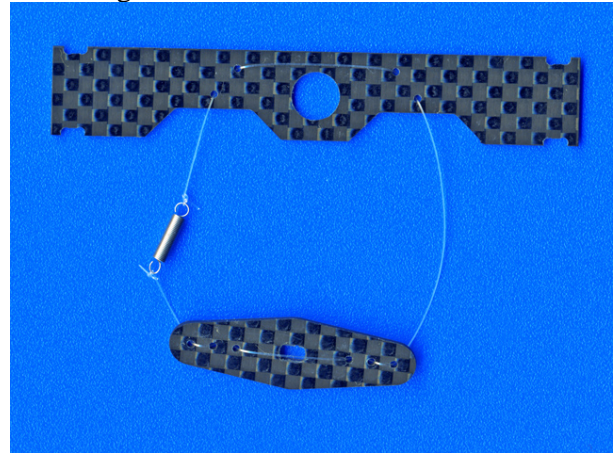
4. Fasten the potentiometer on the arm of the Roll axis servo drive (2mm drill may require).



5. Fasten the potentiometer on the axial block of the Tilt axis.



6. Tie the ends of the line to the spring. The spring is installed only on one side of the arm. The spring must be stretched to be 15-25mm long (free length - 10mm). \* With time, the line may stretch and the tension will be gone. To prevent this from happening, you need to install a spring that will guarantee constant tension.



7. Pull the line through the holes in the arms. Balance the potentiometer arm. Tighten the line and secure the loose end with a drop of instant glue.

