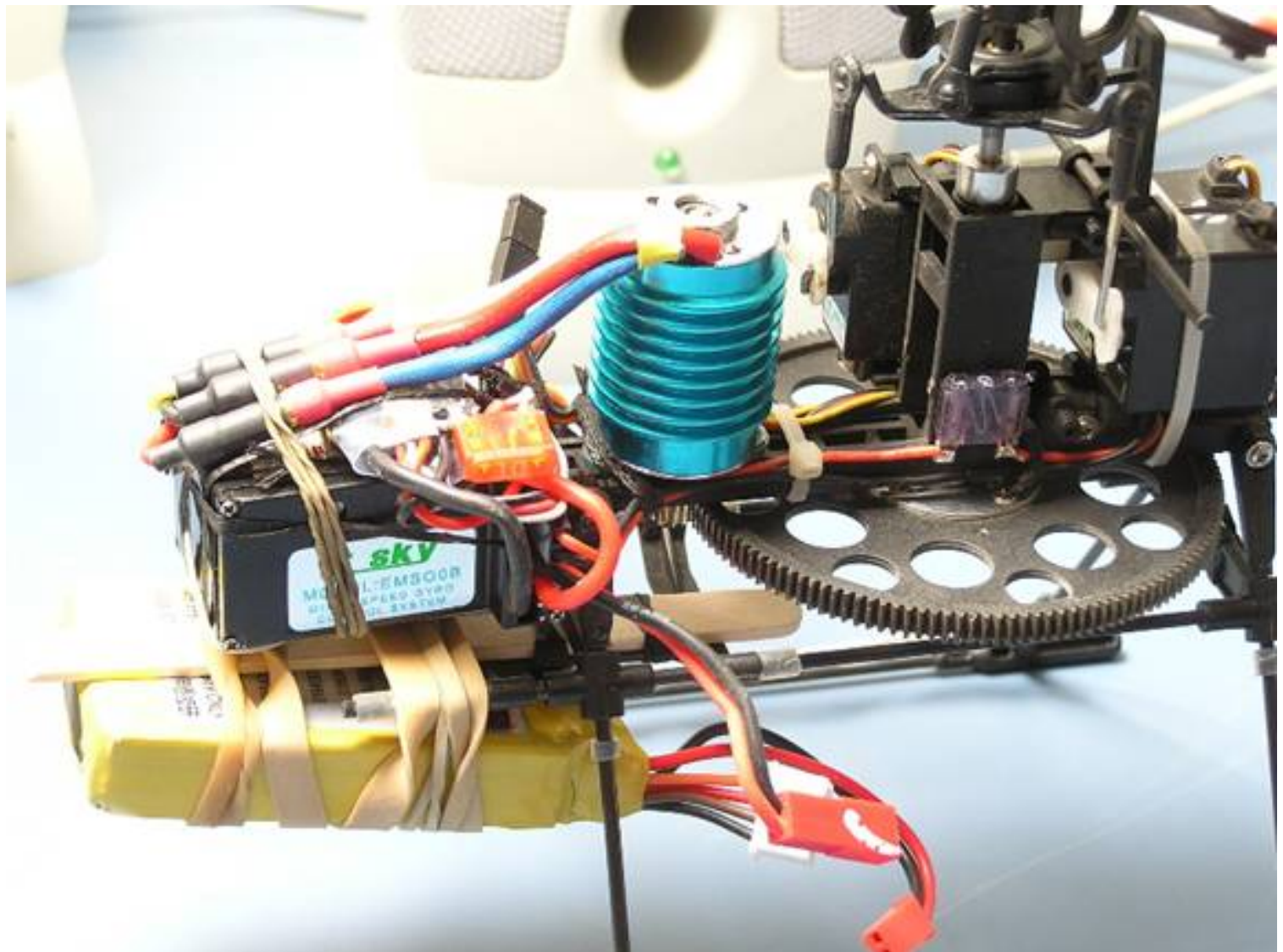


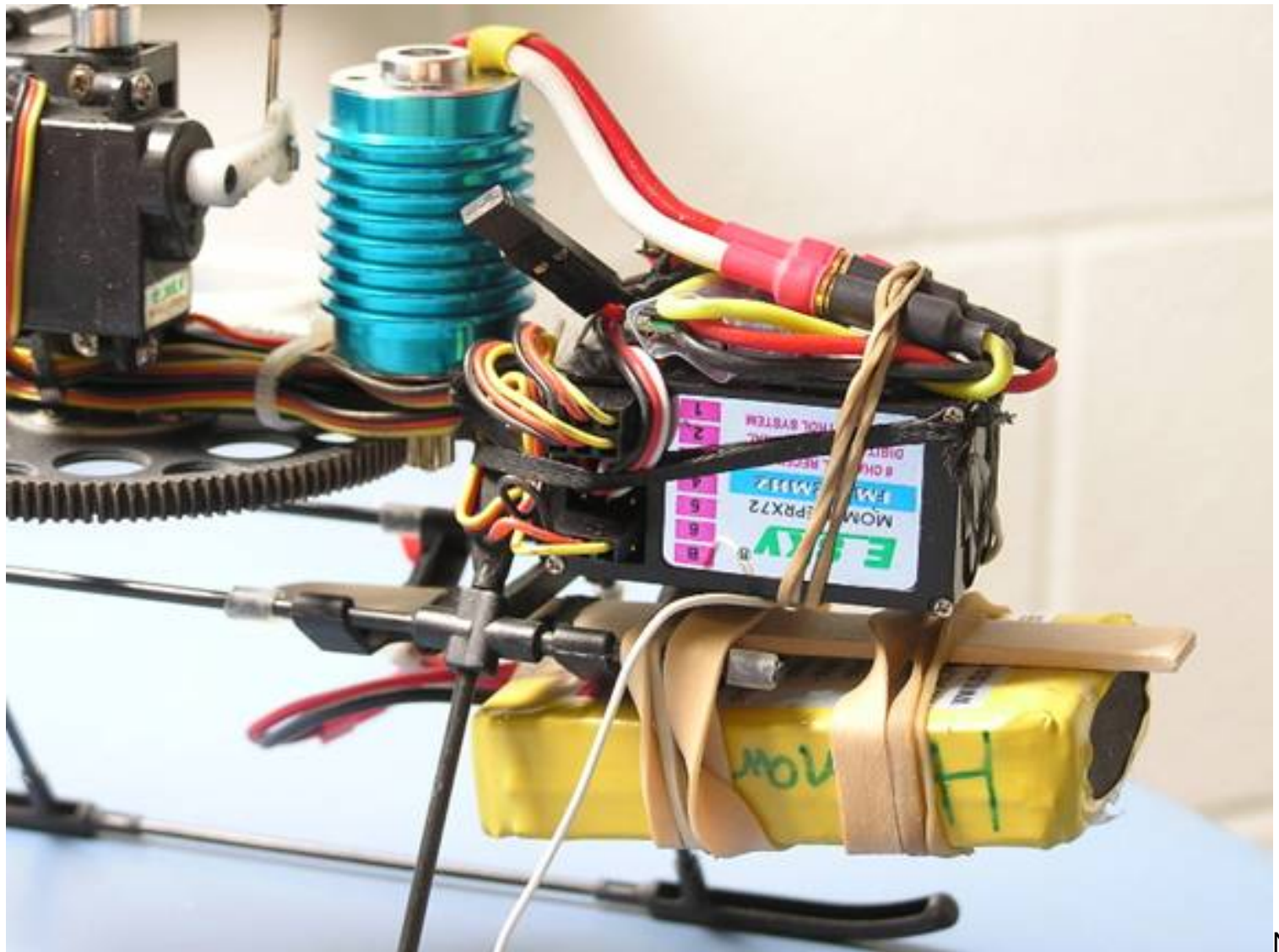
Upgrading your Mini Electric Helicopter to a Brushless Motor

(E-Sky Honeybee, 3D, CP2, E-flight Blade, Century Hummingbird CP or 3D
or any other brand that uses the 4 or 5 in 1 controller)

This is one of the modifications that we came up with and perfected while serving in Iraq as part of the unit- F Company 238th Aviation Maintenance. Our mission was Army Helicopter maintenance and support. After 10-14 hour days of heavy maintenance on Army Blackhawk and Chinook helicopters we would end the night with an hour or two of flying our little helicopters in the hangar or under the large towering maintenance lights on the tarmac. At last count there was 14 of us in our group that had various versions of this little helicopter.

To complete this modification you will need a suitable brushless motor and brushless motor speed controller, a pinion gear (get one from an old brushed motor), as well as mounting screws and a few tools like a good fine tipped soldering iron. Keep in mind that with any modification to your helicopters- that lighter is better. The lighter your finished helicopter is- the better your system performance and the longer your flight times will be. This motor and pinion specifications for this modification are assuming you have upgraded to using a 900-1500mah 3 Cell 11.1volt LiPo battery to power your helicopter.



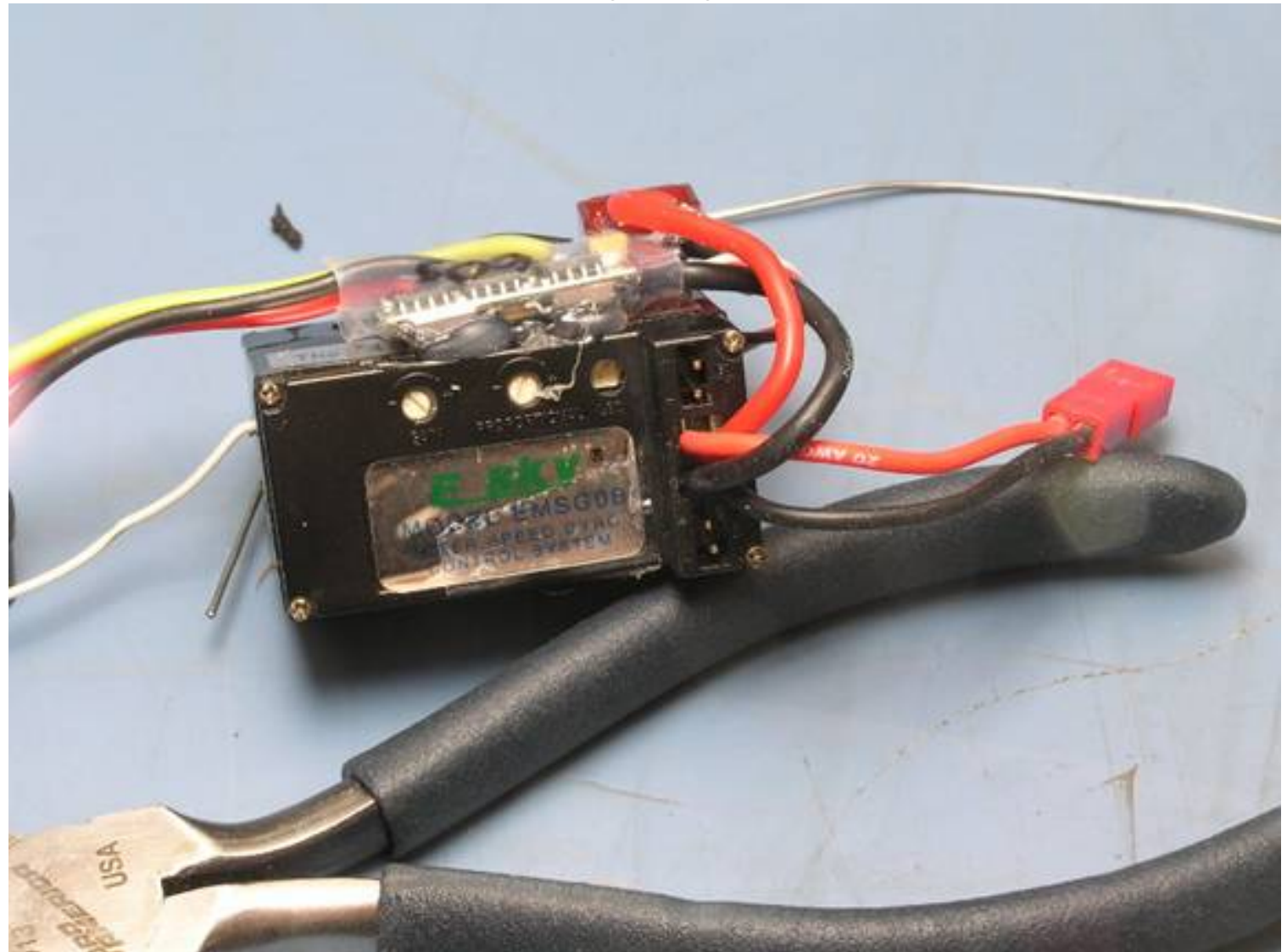


Now

let's begin this project. To connect up your brushless speed controller you will have to take apart your receiver module. You will notice there are actually two halves. One side is the 6 channel receiver and the other side is the gyro, power regulator and brushed motor speed control.

Power for your Brushless Motor Controller

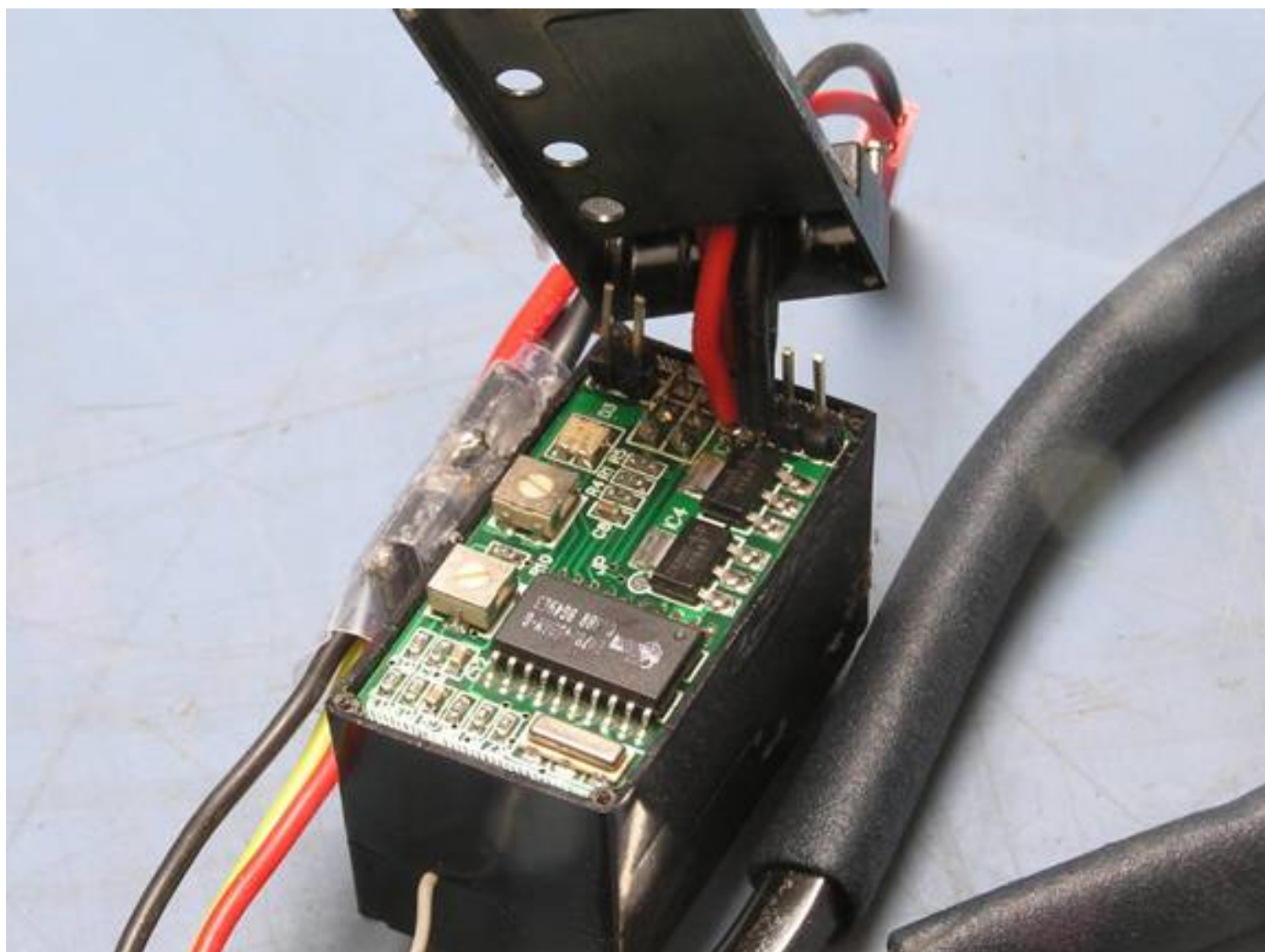
The method used to provide power for your brushless controller can be seen in the next few photos. This method was used so you would not have to change wiring on your battery pack connector.



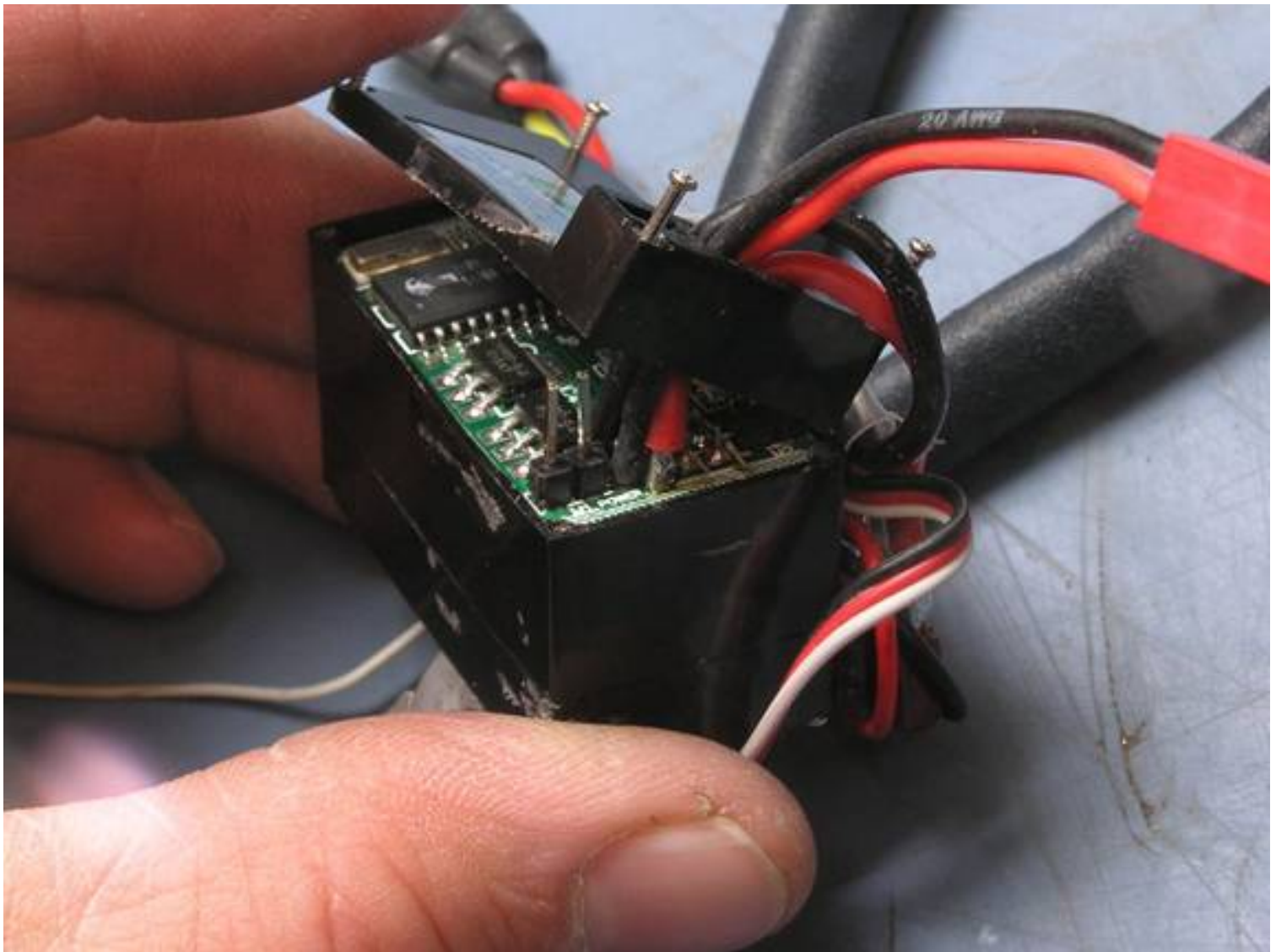
This picture shows the power/gyro control side of your All in One Controller

While you have your electronics module apart it might be nice to take a tour of your all in one receiver/gyro/ motor control unit. If you look close (once you have the module apart) you can see that it is the channel 3 and 4 signals that are passed to the other half of your 4 in 1 controller (this should make sense when you take your 4 in 1 controller apart and see the two halves). Power is padded through to the receiver by the middle pin in the connectors. The other two pins are channel signals and ground. The gyro and brushed motor control half of the receiver takes these signals from the receiver and turns them into voltages and currents to run the main and tail motors. This part of the module It doesn't care if you have a motor connected to the brushed outputs- that is why we can just add the brushless motor modification and don't have to change anything else on the gyro half of the all in 1 unit.

Next let's get to the business of modifying your all in 1 controller. You will need to use a very fine soldering iron and solder to connect up and solder the new power (Black- ground and Red- Positive) wires to the pads. The following photos should help:



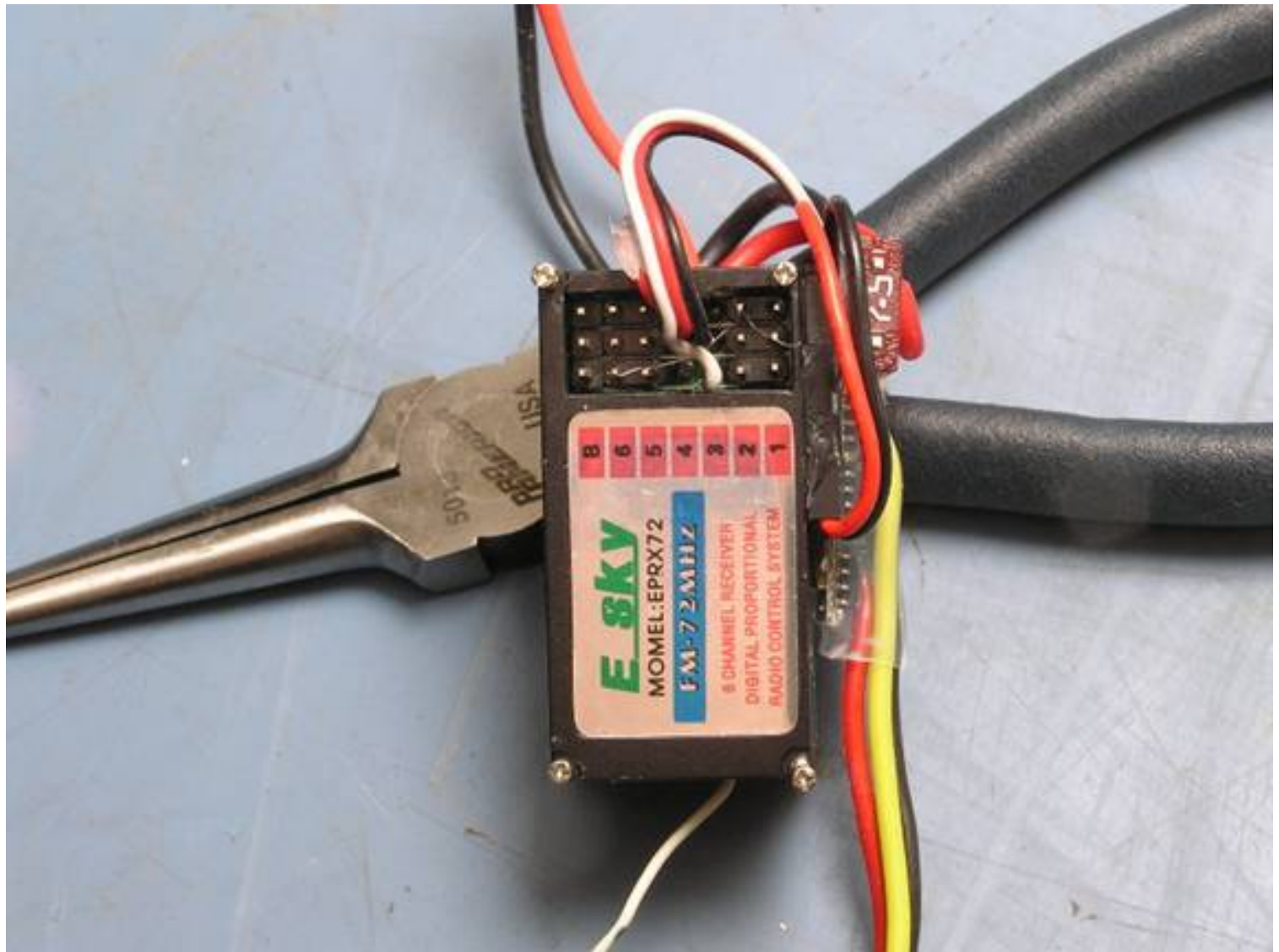
This is the first view of the connections you will need to make to power your brushless motor speed controller.



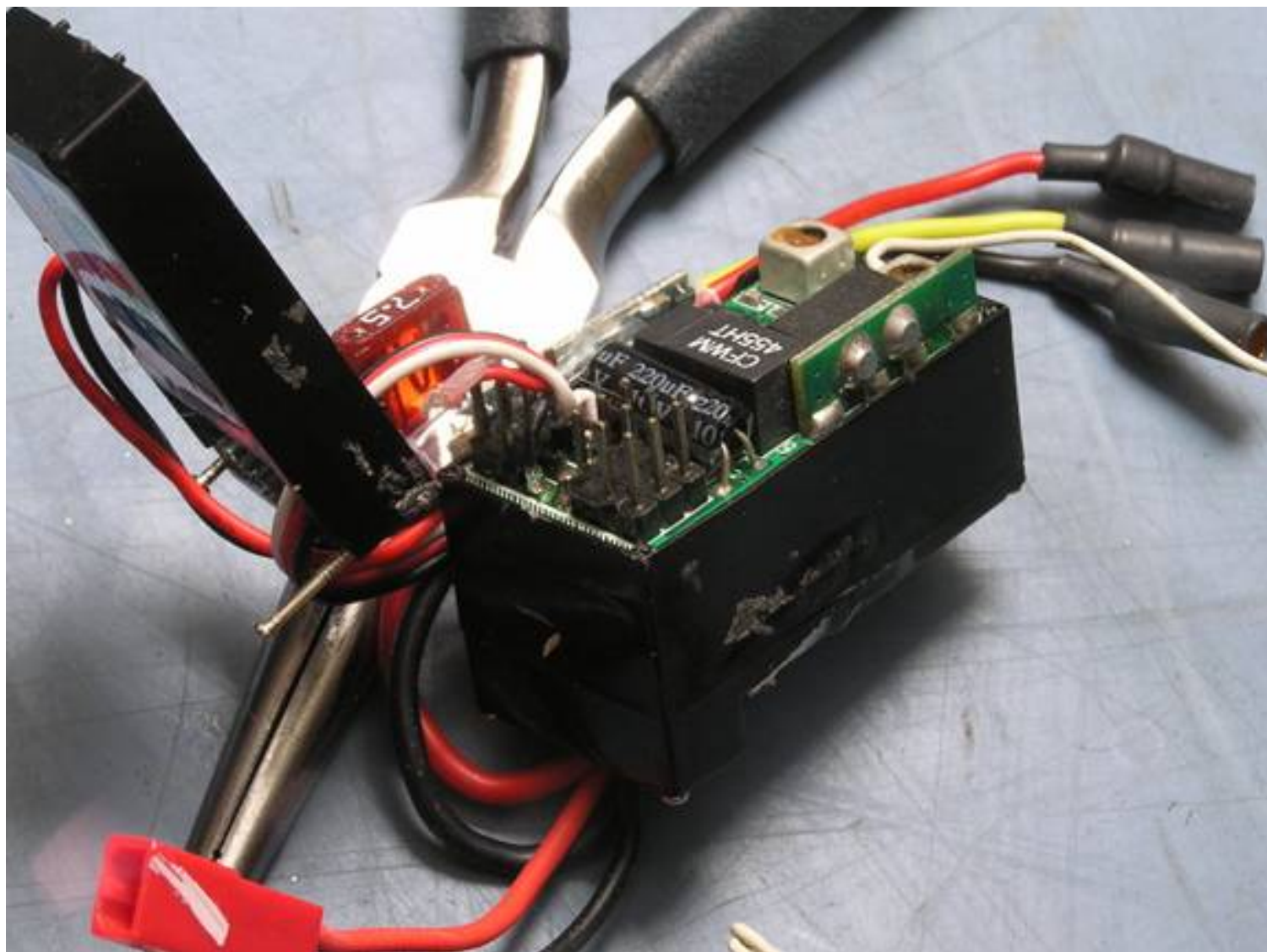
You will want to solder your brushless motor control power wires on the silver pads for the red and black wires. Be very careful not to bridge any solder to any adjacent connection points. Double check your work before closing everything up.

Getting Transmitter signals to your Brushless Motor Controller

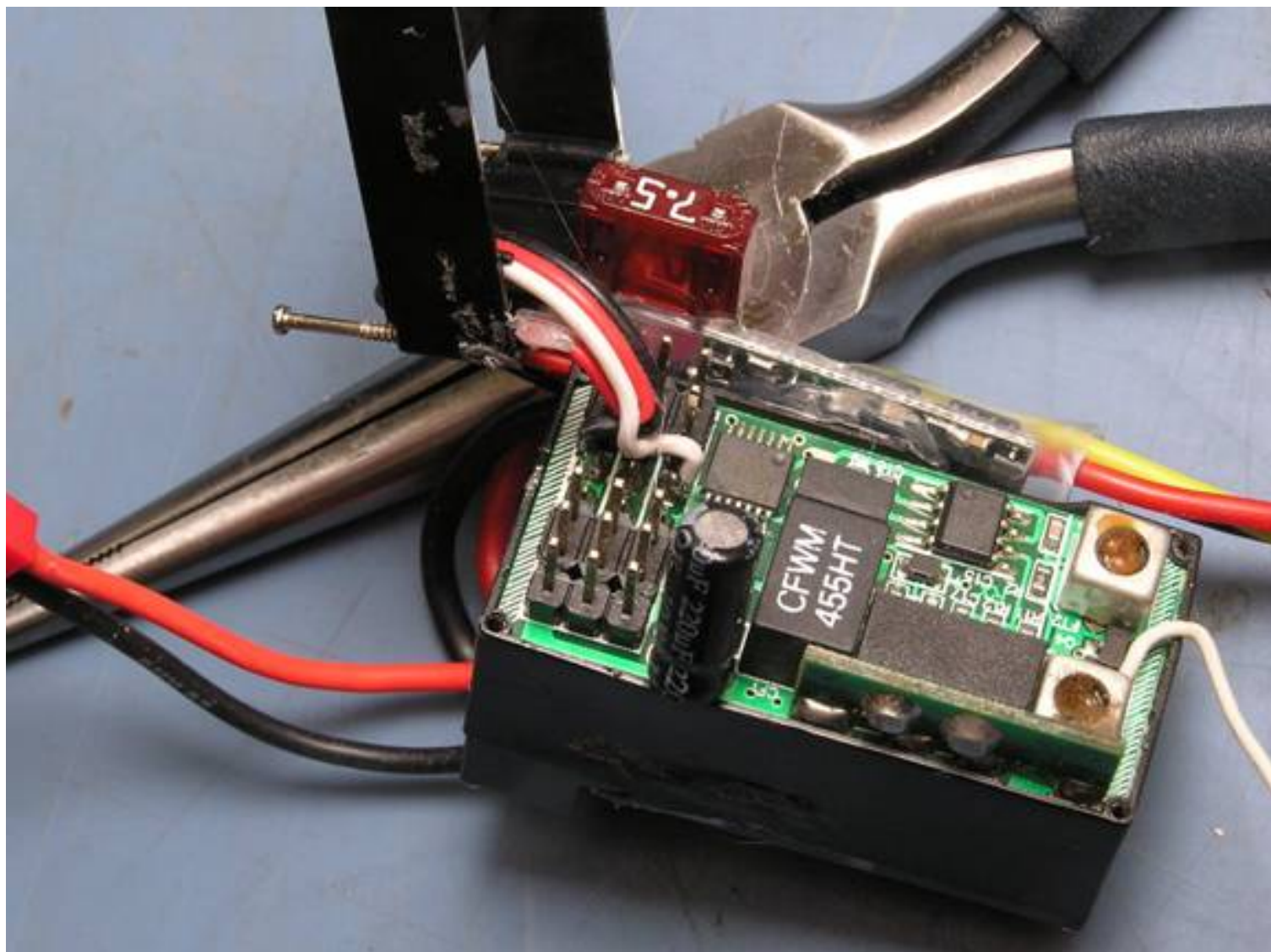
To get the throttle signals from your receiver to your Brushless Motor controller you will need to open up the other side of your all in 1 receiver. On your brushless motor controller find the 3 wire signal cable. It is usually made up of a red (power), black (ground) and white or orange cable (signal) with a connector on the end. See the photo of the receiver channel side of your All in One Controller. For this part of the modification you will need to connect the black and signal wire to the solder point pins on Channel 3 on your receiver (the throttle channel). See the photo below:



Notice the red, white and black wire signal cable coming from the brushless speed controller to channel 3 on the receiver.



This is an inside view of where to solder on your throttle channel (channel 3) signal wires



This

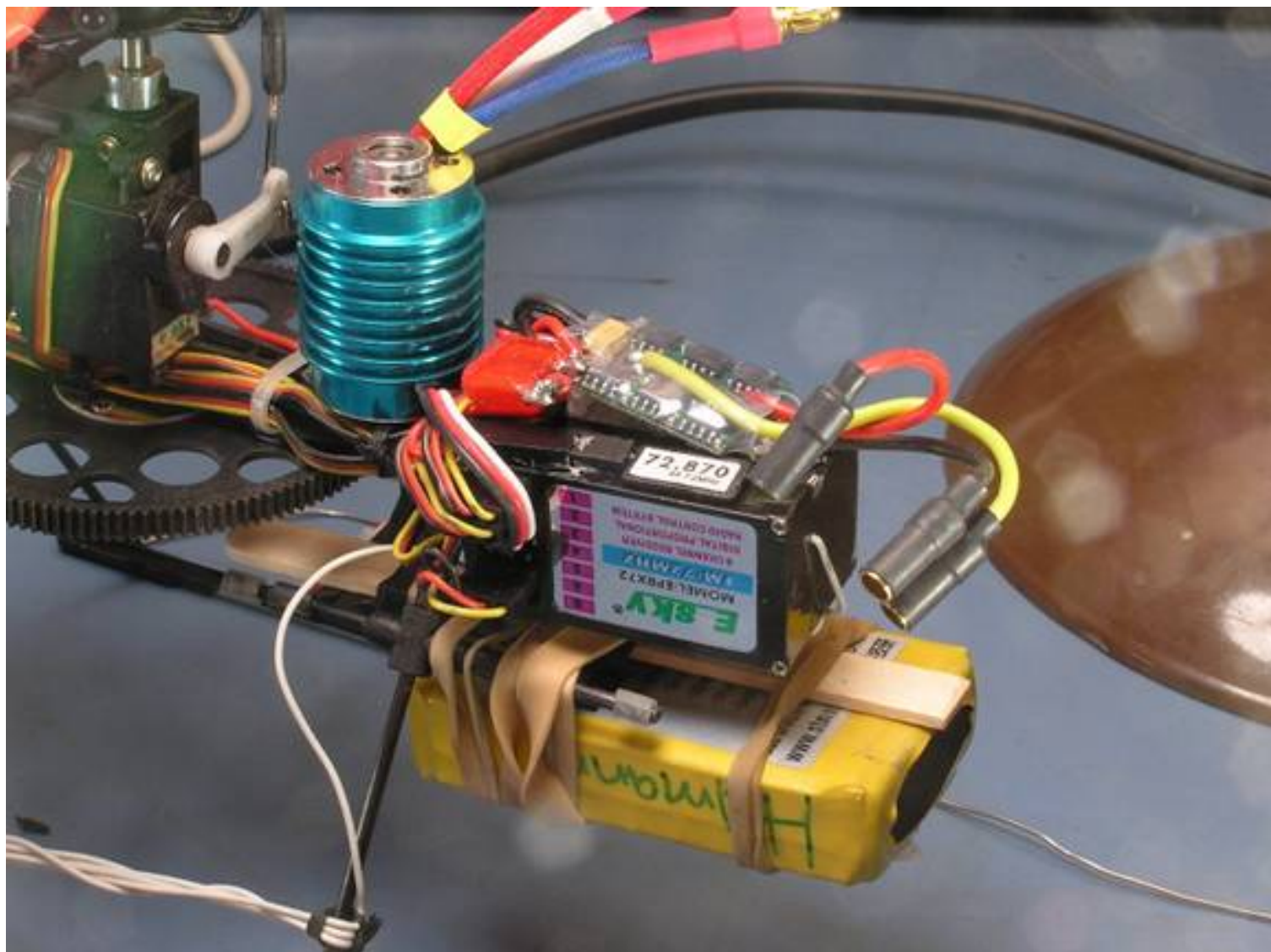
is another closer view of the connections made. Notice only the ground (black) and signal (white) wires are connected. Leave the red wire disconnected as power is already provided to the receiver by the other half of your all in one controller (Gyro, power, main/tail rotor module). **Be very careful not to bridge any solder connections.** Double check your work. In the **photo above** you can see that it is okay to temporarily bend the capacitor up so you can gain better access to connect your signal wire (the yellow, white or orange wire).

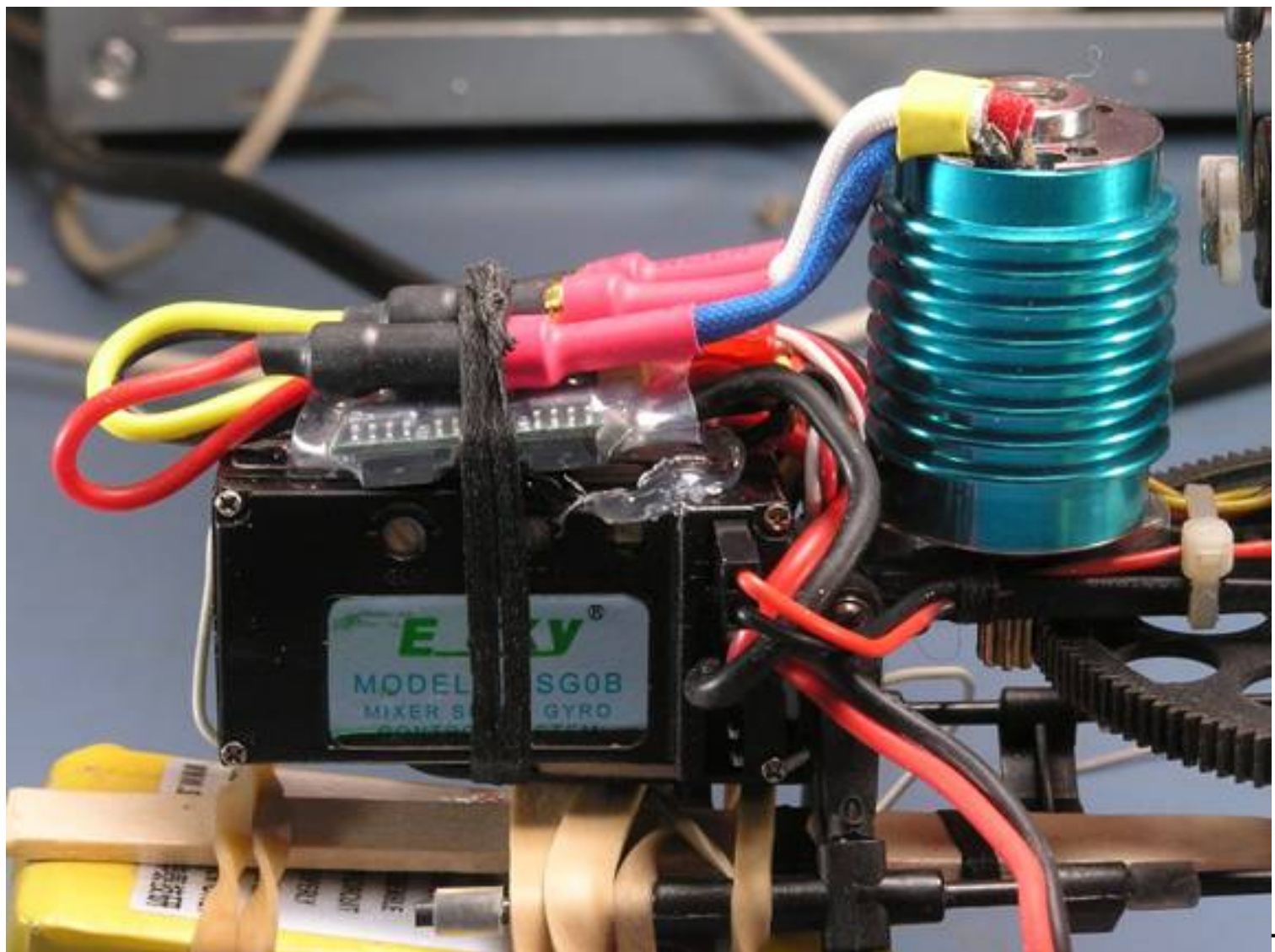


If

you are not very good at soldering you can get a friend to do it for you or perhaps an electronic repair shop will solder the connections for you at a nominal charge. If you want to send it to me (I am now back in the United States) I can certainly do the mod for you for about 15 bucks plus shipping.

The final assembly can be seen in the following photos





This

photo shows the left side of the final assembly.

This is a photo of the right side showing the electronics and brushless motor mounted in the helicopter...

The motors used in the photos are an H-N 36S brushless motor (B20-30-26S) which is a 3600 KV motor. Another choice with very similar ratings would be a Himax HA2015. From testing we have found that an 8 tooth pinion gear is the best choice (just use a pinion puller to take one off an old motor) as that turns the rotor head at about 1800-2100 RPM for normal flight. When mounting your motor make sure the mounting screws are not too long and end up contacting the internal wiring in the motor. This can cause some unexpected heating problems or could damage your motor, Brushless controller, wiring or battery. The brushless electronic speed controller is a BMC 10-N which weighs handles 10 Amps continuous and 13 Amp surge and weighs only 9 grams. Normal flying motor current measured in our tests was 4-6 Amps which gives a continuous flight time of about 12-14 minutes.

You may have noticed in the pictures that there are a couple of fuses installed on helicopters in the photos.

This is a different modification that we added after a number of us flying our Model Helicopters in Iraq (and yes occasionally crashing). There were a number of guys that kept burning up all in 1 controller, motors and tearing up gears- not much fun. We work on Army Blackhawk and Chinook Helicopters during the day and didn't want to spend all our time waiting on the mail for parts and repairing our little model helicopters, so to protect the motors, main gear and the expensive speed and all in 1 controllers- one we incorporated using inexpensive and very lightweight automotive mini-blade fuses. In a crash or hard contact with something the fuses will instantly blow protecting your high dollar electronics and parts. If you want detailed information about how and why this works and how to add this modification to your helicopter- just email me at ScottHelmann@msn.com

As always if you have questions don't be afraid to ask! Happy Flying!

SSG Scott Helmann

Avionics and Helicopter Mechanic/Tech

South Dakota Army National Guard

(Now back from Iraq- Thanks for all your support!)