RC Nerf Tank

Most of the parts and skills used in this project are from my fighting robot hobby. It might seem like a complex project but anyone with basic handy-person skills and willing to do the research could build a similar machine.

The Baseplate

I dug through my scrap bins until I found this 18" x 14" x 0.1" aluminium sheet. My work is neighbours with a machine shop and they let me help myself to anything in their scrap bins . 90% of the metal in this project is recycled from those bins!

I decided to try and fit everything inside this sheet, it was just about the perfect size in the end.

Turret assembly

The main weapon is going to be a modified Nerf Vulcan. It needs a place to mount and it needs to be able to pan back and forth, that's where the turret will come into play.

I found a pulley like disk in the scrap metal bin which will be the base for the gun. I actually have about 8 of these disks that they scrapped for some reason. A lazy Susan bearing will allow it to spin fairly smoothly and a chunk of 2.5" aluminium square tubing will act as the 'tower'. It just so happened that the bearing mounting holes lined up perfectly with the walls of the square tube.

I machined some long round stand-offs that will hold the standard Hitec servo that will spin the turret. I used a home-made wheel from one of my old robot projects as the drive pulley. A large elastic band will be the belt, its not the smoothest belt solution but it does self tension.

Drive motors

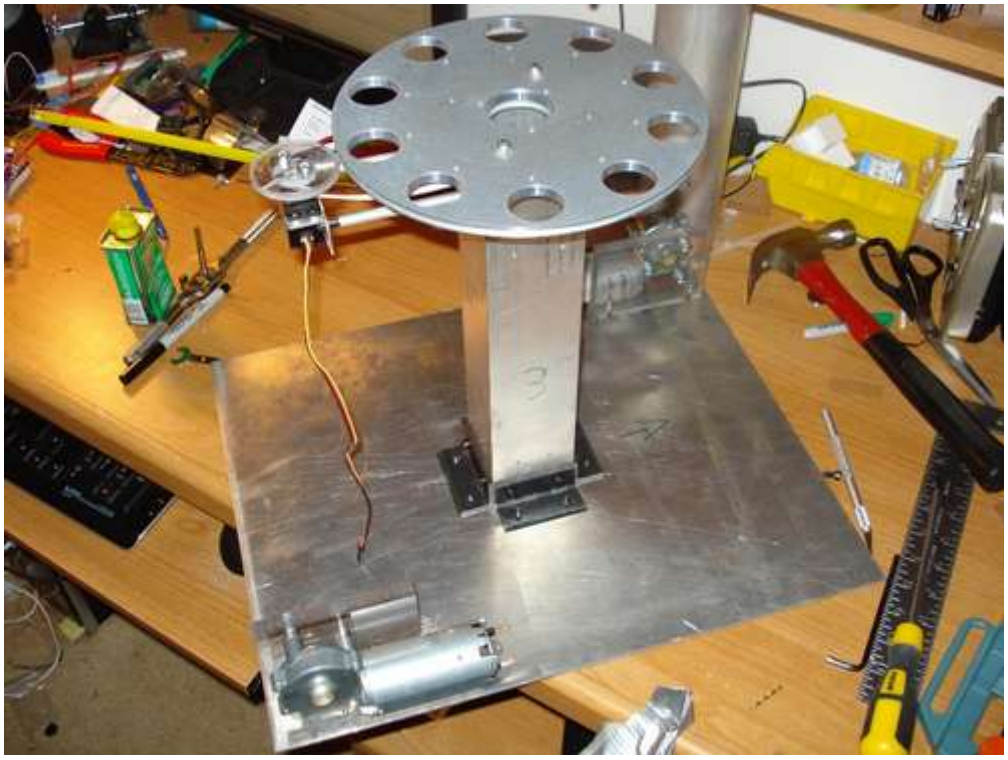
To move the tank I went looking as the local hardware surplus store. I found a pair of 24V 'Valco' gearmotors for $15 each. They spin at about 50rpm, are made in Germany, and have a 8mm hex bore instead of a shaft.

They are bolted to some 3" x 4" blocks I cut out of 0.5" polycarbonate.

Mounting turret and motors to the base

I centred the turret and use some 1" x 1" x 0.125" steel angle stock to bolt it down.

I tapped holes in the polycarbonate blocks and screwed the motors to the baseplate. Polycarbonate is one of my favourite materials, mostly because its clear so its very easy to line holes up and is much, much stronger than acrylic.



Drive shafts

I had to make some custom shafts to mount the wheels to. I was originally just going to modify some allen keys of the right size but I ended up getting some 5/16" stainless steel hex bar. I turned the end down in my lathe and cut 1/4-20 threads on the end. Screws on both sides of the motor keep the shaft from moving out of place.

Attaching the wheels

The wheels are stock tires from a Traxxas E-Maxx monster truck. The wheels were donated by some friends who had upgraded their truck to fancier wheels. I made up some more blocks and shafts to mount the other wheels and supported them with bronze bushings.

They attach to the shafts with a 1/4" locknut and a rubber backed washer to keep the wheels from slipping.

Mounting the Vulcan

I decided to use magnets to mount the gun to the turret. The benefits of this are the gun is easy to remove and I don't have to drill that many holes into the thin nerf plastic.

I'm using a powerful magnet I got out of a computer hard drive, I screwed a thin piece of steel to the turret that will act as the anchor for the magnet.

Modifying the Vulcan

I needed a way to pull the trigger remotely, and like the turret I'm going to use a servo.

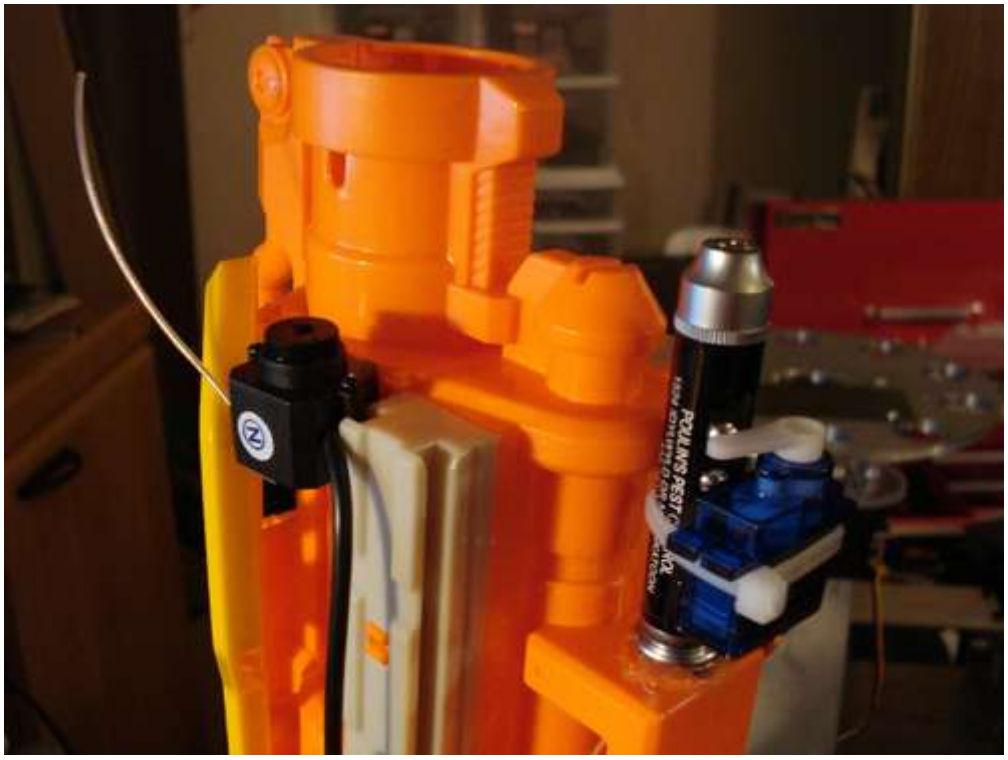
For anyone wanting to build remote controlled projects servos are the way to go. You can modify them to spin 360 degrees or leave them stock if you just need a back and forth motion. You can get a RC transmitter, receiver, and servos fairly inexpensively if you shop around a bit.

I mounted the servo to the gun with a small aluminium mount and tapped threads directly into the nerf plastic, it seems to hold up okay and the servo easily pulls the trigger.

Adding the camera and laser

I got the wireless camera system from a place called China Vasion for less than $30. It doesn't have the greatest range or quality in the world but its tiny and the price was right. To mount it I just popped into into place on one of the 'tactical' side rails of the gun. These rails would normally hold various nerf accessories.

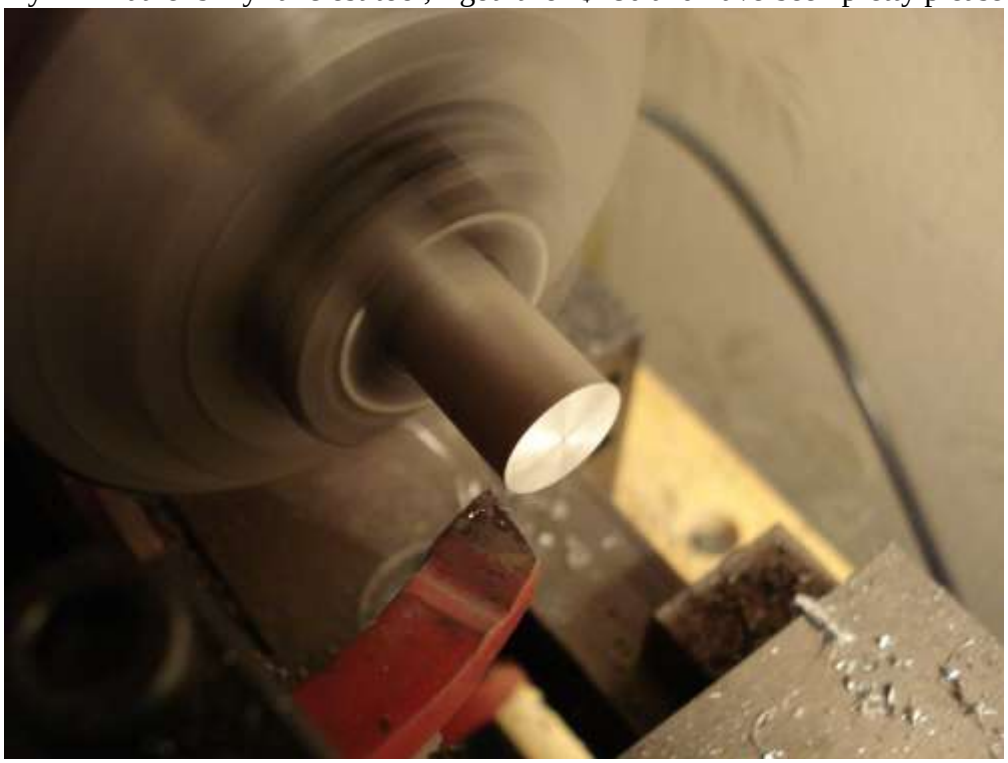
I got the laser pointer from a local pest control place as a free gift type thing. I was having a heck of a time trying to mount it and I'm pretty displeased with the final result, even though it works reliably. I simply cable tied a mini servo to push down on the laser button. The laser has a magnet built into the base of it, so I just glued another magnet to the front of the gun to mount them together. I will have to come up with an improved mounting method for the next version.



Mounting the battery

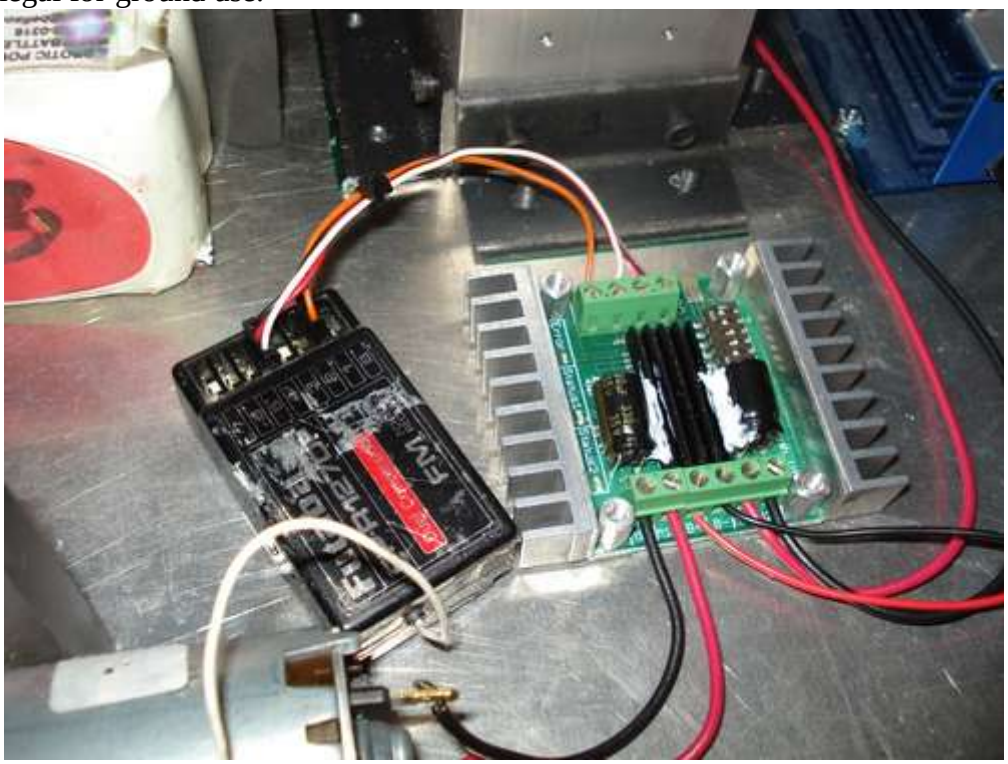
The main system battery is a 24V 3000mAh 'Battlepack' NiCad. To mount it I machined some aluminum standoffs on my lathe and then used a strip of polycarbonate to hold it down. Some foam acts as shock absorbing material.

My mini lathe is my fanciest tool, I got it for $480 and have been pretty pleased with it.



12Main electronics

To control the drive motors I'm using a Sabretooth 2X10 speed controller from Dimension Engineering. The receiver is a standard Futaba 7 channel unit. Its tuned for 75Mhz and is legal for ground use.



Stiffening the frame

I added some 4" x 0.125" aluminium flat bars across the wheel mount to stiffen the frame up and hopefully keep stuff from bending. I will be using these are the mounting point for the armour panels.

Adding armor panels.

I cut up some more of that 0.1" scrap aluminum to act as the armor panels. The jigsaw does a really nice job as these and is pretty accurate too if you have a steady hand. Cutting fluid really helps out for this type of thing, I used a few drops of A-9 aluminum cutting fluid and it literally cuts twice as fast, plus its easier on your power tools and your blades.

They bolt onto some 0.5" thick polycarbonate triangles that also allow the front and back panels to slope.

The sound system

I like adding sound to things.

Shown here is a pair of 100W speakers I got from a surplus electronics store for $20. I wish I would have shopped around a bit because I found some similar ones for half the price later on.

The amplifier is from an electric go kart I made a few years back that had a similar sound system. I think I got it from radio shack originally.

To control the tunes I'm using my old 1st generation iPod nano. The battery is pretty much gone and you only get about 2-3 hours on a charge but its more than enough for this project.

Mounting the speakers

I used a jigsaw to cut the holes in the side armor panels. The cuts were pretty rough around the edges but the speakers cover that up nicely. :P

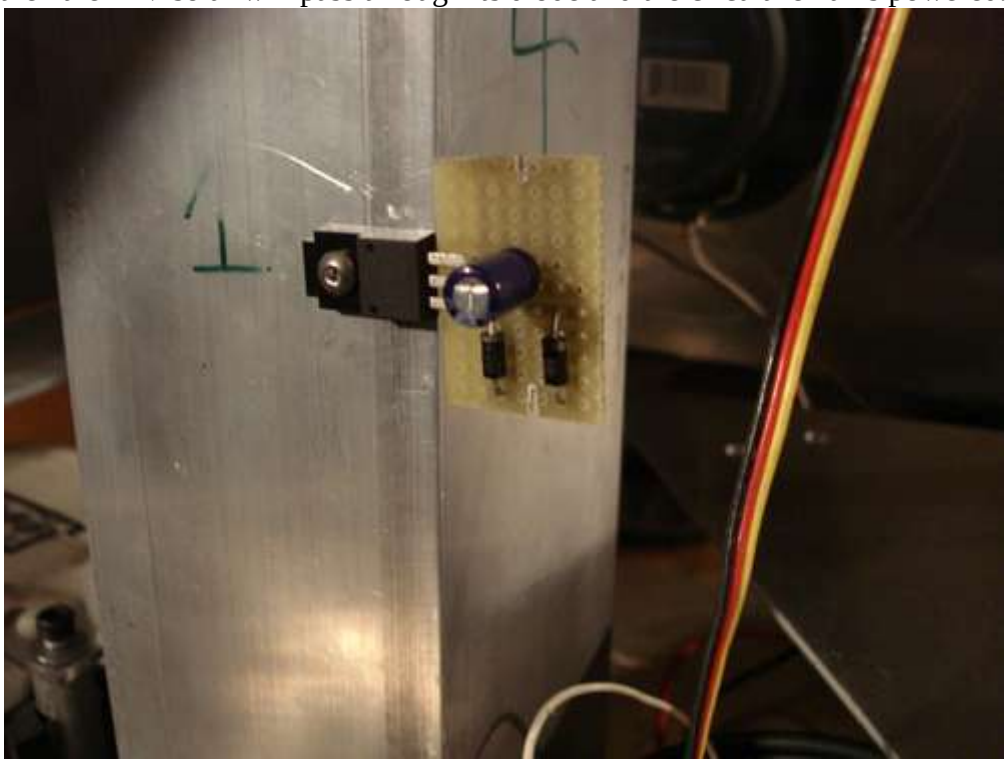
Best part is now I can listen to tunes as I work!

Camera voltage regulator

The wireless camera runs off 9V nominally, going any higher will probably fry it. I wanted to hook it up to the main 24V battery so I built this regulator circuit to run it.

Its basically a 9V voltage regulator, a support capacitor, and two diodes. I designed it so that I can hook both the 24V battery up to it as well as the solar backup system. If the 24V battery dies or the robot loses power the camera will automatically switch over to the solar power so I can see where it is.

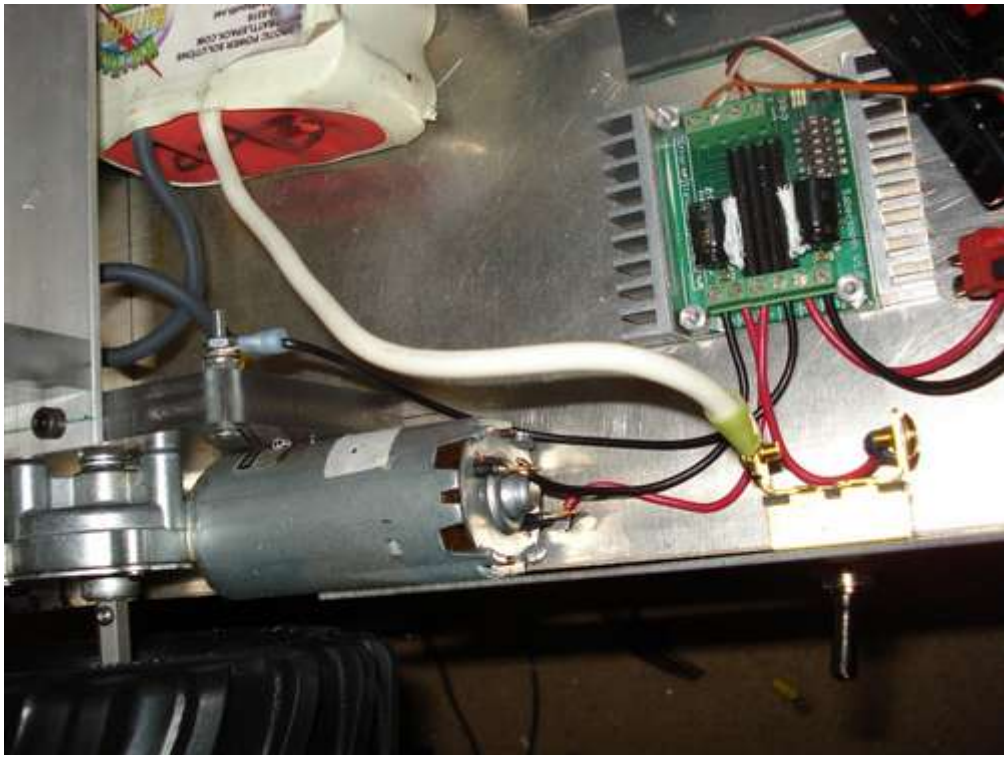
I added this ultimate paint schematic to show the circuit. Since the power supplies (24v battery and 12v solar) share common ground and are not wired in series you won't ever see 36V. The nature of diodes means only the side with the highest voltage (normally the battery) will pass through. If the 24V drops below 12V (really really dead) or gets shut off somehow then the 12V solar will pass through its diode and the circuit remains powered.



Adding a power switch

To turn the tank on and off I'm using a automotive store switch I got for $4. Its rated for 35A so it should be more than enough for what I need. I mounted it on the bottom side panels between the wheels where it hopefully will not get switched off accidentally.

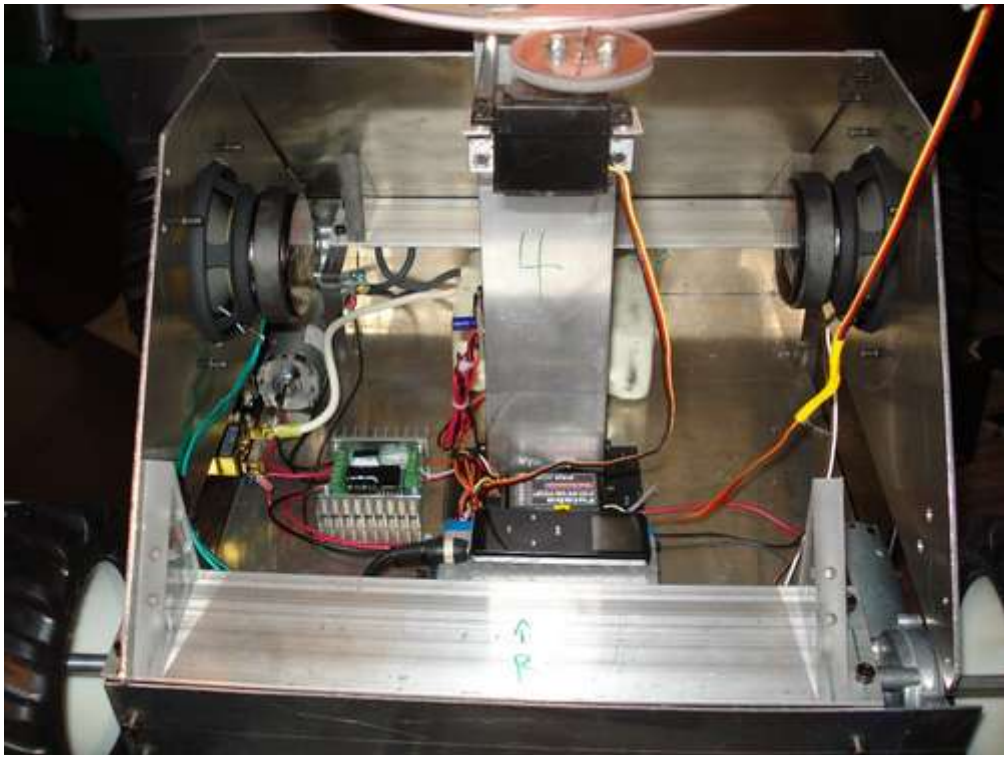
You can also see the grounding stud in the polycarbonate motor mount to tie the negative battery wires together.



Wiring

I hate wiring things, I'm not very good at it and I don't enjoy it very much. But it has to be done so...

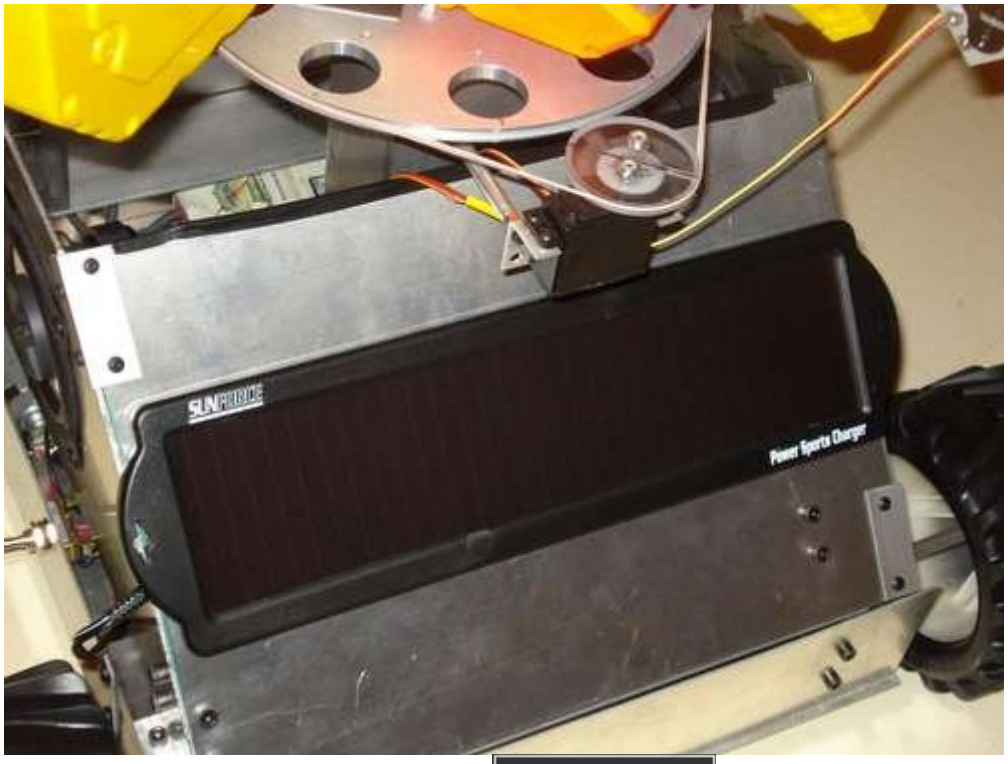
Here is a shot of the insides, its prettystraight forward and a little messy as I cut most of the wires extra long just in case. I had to extend the servo wires attached to the guns so I went to the local hobby store and bought a small roll of 3 conductor servo wire and spliced it to the existing cable.



Adding the solar panel

I wanted the solar panel to act as a charger but its only designed to charge 12V lead acid batteries like you would find in a motorbike or ATV. I'm going to look into building a 24V charging circuit for the next version.

For now the panel acts with the voltage regulator to act as an emergency backup power system for the camera in case something goes wrong. If the main battery dies or power is somehow lost the system will switch over to solar for the camera. That way I can at least see where the tank is and whats happening to it. I mounted it with adhesive backed velcro which is great stuff for mounting things you might want to remove often.



LOADING

Wireless setup

These are the parts that let me view the camera from my computer.

The laptop is nice since its mobile but I can use any computer that I install the drivers for the video capture adapter to.

The silver box is the receiver that came with the camera. It needs a 12 volt power supply to run which also comes with the camera kit. (not shown)

The black box lets me convert the TV component cables to USB to use with a computer. Its a Sabrent USB Audio Video Capture Adapter that I got from Tiger Direct.

Final product

There she is, just before her first real test. For the most part it works well but there are some things that will need upgrading in the future. To see it run check out the video in the very first step. Thanks for reading!