

SPA3DT

After a summer of thrashing the original SPA3D, I decided to make my next one a little tougher. Thanks to all the feedback and flight reports on the forums, this is what I came up with. The "T" in SPA3DT stands for "Tubular" but I also like "Tank" so take your pick! To build this airplane, you must be very familiar with the original [SPA3D](#) plans and Instructions. All I am presenting here is a photo essay of what I did differently on this airplane, to give you more ideas to work with. Fuselage length, wing measurements, tail measurements and engine mount measurements are all identical to the original SPA3D. The square aluminum fuselage material I used is much harder to work with than the original SPA3D's "U" channel. It is also harder to find and more expensive, but the result is a very clean, very tough airplane with no flex and much better high speed performance. At the same time, this airplane retains the original SPA3D's awesome slow flight performance, and the all up flying weight is identical to the original at 4 pounds 8 ounces. For power I'm using a beat up TT Pro .46 and a GP 10 ounce fuel tank. I've flown this airplane with several different prop sizes and brands, and my favorite for this engine/airplane combination is the APC 12 x 4. Hover is at slightly more than half throttle, with plenty of power for vertical climb outs and all the tricks you can think of!



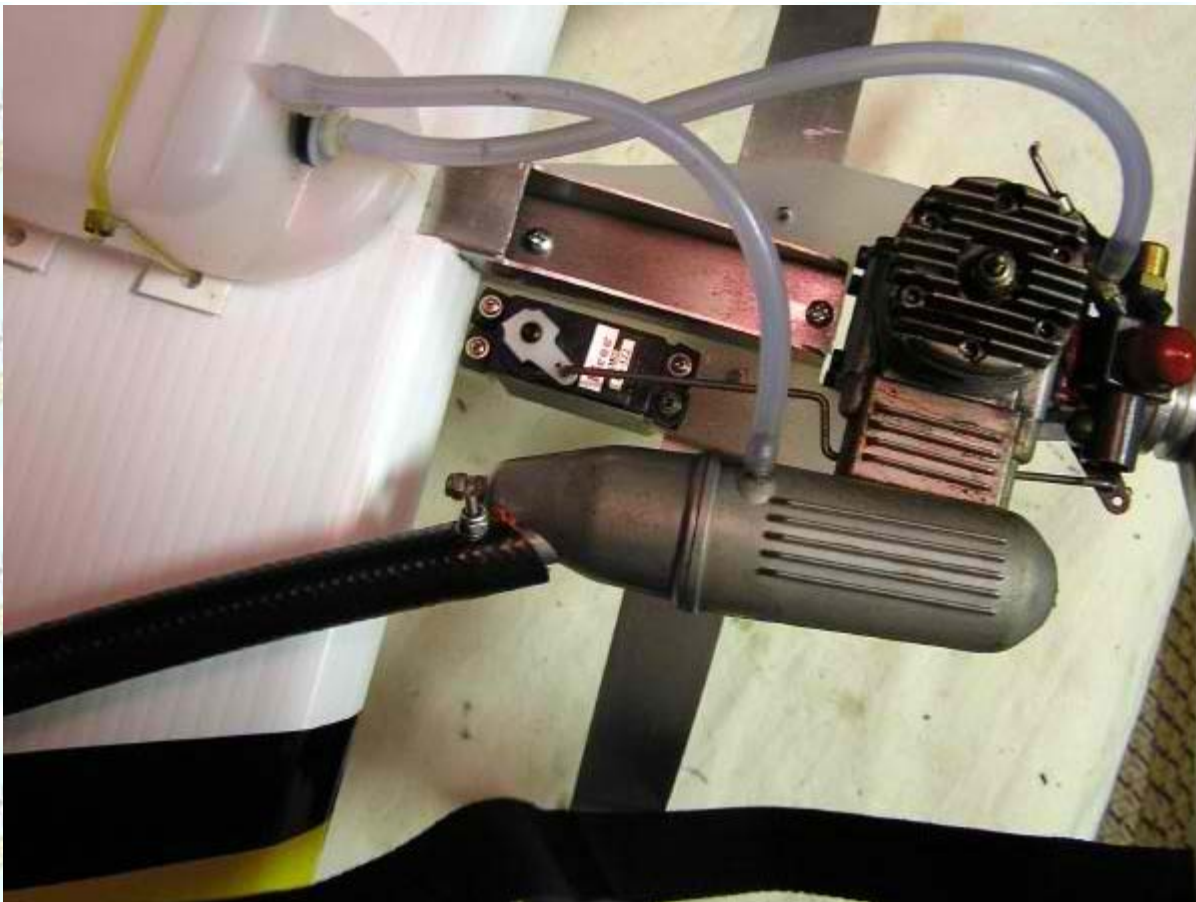
The fuselage material is a 36" long x 1" square x 1/16" thick section of aluminum tubing. I found it at TSC's for \$9.50 for the 36" piece. Cool, it comes in the exact length for the airplane! Some LOWES also carry it. Since 36" of the tubing is approximately 2 1/2 ounces heavier than the original SPA3D's "U" channel fuselage, you will notice that I have eliminated the Coroplast profile fuselage to save weight. For the landing gear I used a 20" long x 1" wide x 1/8" thick piece of aircraft grade T6 aluminum. It is shaped on a sheet metal roller where I work. It is light, very springy and VERY tough!



In the picture below you will notice that I tapered the front of the aluminum tubing fuselage for access to mount the engine mount, as well as shave off some weight. This taper is 3" long, and goes to a wall height of 1/2" at the front of the fuselage. I accomplished this using a hack saw, then cleaning it up with a dremel stone, and finally removing the burrs with a flat file. As with the original SPA3D, the fuselage is secured to the engine mount with #6 x 3/4" self tapping screws into 1/16" pilot holes. The landing gear and engine are also mounted to the engine mount using these screws. I cannot stress enough that the kitchen cutting board you use for the engine mount must say POLY on the label. The best brand (and the one I use exclusively!) is "American Chef" and is available at Wal-Mart.



Another thing I did differently from the original SPA3D is switch places between the throttle servo and the landing gear mount location. Although I have never broken a cutting board engine mount, I've read reports on the forums where mounts had broken between the throttle servo cut-out and engine cut-out. By switching these, there is much more "meat" behind the engine for a tougher mount. You will also notice that I have shaved some dead weight off of the corners of the engine mount, especially a very large piece from the left rear. You may also notice the nice camera strap hanging in the picture below.



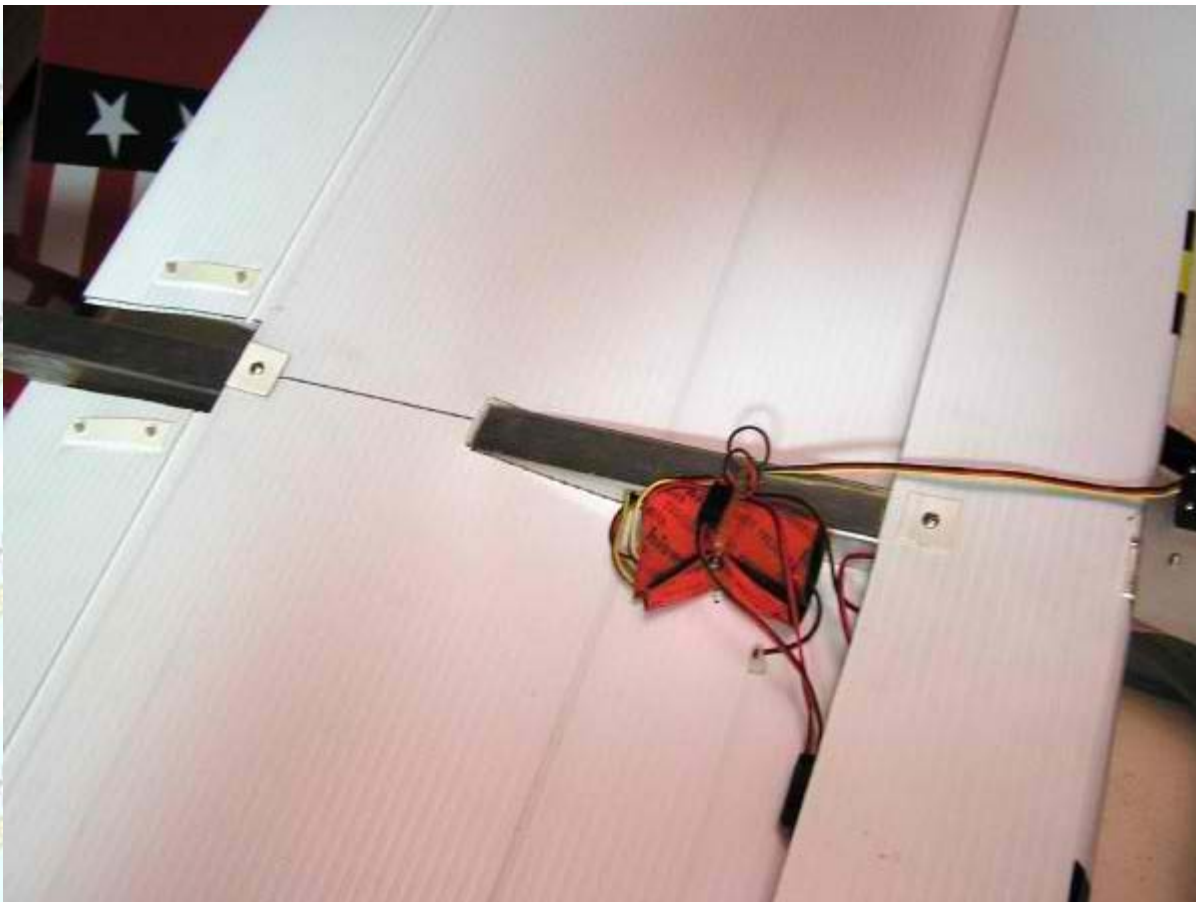
The picture below shows the rear fuselage taper to facilitate tail mounting and shave off some more weight. This taper is 8" long and goes to a wall height of 1/2" at the rear of the fuselage. You will also notice that I moved the vertical stab/rudder 2" further forward than the original SPA3D. The ONLY reason I did this was because I think it looks cooler. Another very helpfull hint here is to add a few drops of CA glue to the tail mount PVC doublers before screwing them down. This will keep the Coroplast holes from elongating and pulling out from hard dirt doinkers.



The picture below shows what I believe is the single most important improvement to this airplane. A poster named Coasty at [Spadworld](#) came up with this idea and it is brilliant! First of all, the wing's fuselage cut-out needs to be enlarged to 1" wide to accommodate the wider fuselage. Then note that the forward 18" piece of $5/32$ " music wire spar no longer runs in the wing flute just forward of the fuselage cut-out. It is now positioned 1" back from the forward edge of the cut-out, and **RUNS THROUGH** the fuselage! To accomplish this, I cut the wing out and positioned it on the airplane and marked for the location of the hole. The hole is near the top edge of the aluminum tubing. I then removed the wing and drilled the $5/32$ " hole through the fuselage **USING A DRILL PRESS** to make sure it was straight and square. When installing the wing on the fuselage, I used a $1/8$ " piece of music wire as a "drift" to knock the $5/32$ " music wire spar in place, through the fuselage, centered in the wing.



The picture below shows the other two wing mount locations. One securing the wing trailing edge and the other securing the forward lower wing. I used PVC doublers and #6 x 1/2" self tapping screws. I drilled the holes in the aluminum slightly undersized, and self tapped the screws right into the aluminum. They aren't going anywhere! Again, a couple drops of CA glue on the doublers before tightening the screws down, will help prevent the holes in the Coroplast from elongating on hard weed floppers. I would also like to note that I increased the length of the rear 5/32" music wire spar, that runs in the wing flute just in front of the ailerons, to the full 36" wing span. You can see this clearly in some of the overview pictures on this page. This gives the ailerons more support and the wing less opposing flex. Make sure the rear 5/32" music wire spar is in place before tightening down the rear wing mount screw. I put the wing on it's side on the floor and pounded it in with a hammer.



The picture below shows the hardest part of building this airplane. The servo cut-outs in the aluminum fuselage. Once I determined where I wanted them, I used the servos to mark the cut-out locations. I then drilled a hole in the corner of each cut-out. I then used a Dremel cut-off wheel to cut between the corner holes. Using a servo for test fitting, I cleaned up the holes with a Dremel stone until the servos fit in the cut-outs. I then took the burrs off with a flat file. Then, using a servo as a template, I drilled for the servo screws using a 1/16" drill bit. Then, using servo screws, and working gently in and out with a drop of oil, I carefully tapped each hole. This was fun because I broke several servo screws doing this, but was able to get the broken pieces out of the hole with small vice grips. You will notice when you go to put your servos in, that the bottom of the servo rests on the bottom inside of the fuselage slightly before the servo ear grommets contact the top of the fuselage. No problem, I tightened the servo screws down anyways, and the grommets made contact with a little flex, and the servos are nice and tight. I did check the servo screws between every flight on the first afternoon of flying, and they didn't loosen up at all. You will also notice that there is juuuust enough room between the servo and the inside side wall of the fuselage for the servo wires to run. This also made for a headache trying to get the servos in. I ended up scotch taping the wires to the inner side of the fuselage while installing the servos, then pulling the tape out once the servos were in place. Even though I don't drink, by this time I was ready for a beer...so I had a Pepsi and a cigarette instead. You will also notice in this picture that I increased the base length of the aileron control horns to 2 1/4" for a bigger "footprint" and less control surface flex.



The picture below goes with the picture above, because you cannot install the servos until you route the wires through the fuselage. You will notice that the wires exit the fuselage through a hole just below the forward 5/32" music wire spar. To make the hole, I drilled two 1/4" holes next to each other and then connected them into an oval with a dremel stone. Make sure you smooth and deburr this hole really well so that it doesn't cut through your servo wires. To route the wires, I held the airplane on it's nose as I put the servos in their cut-outs. I then used a piece of coat hanger with a small hook bent on the end to grab the wires and pull them out of the hole. You have to hold your glutes just right, squint a little, roll your tounge and cuss a lot, but you can get it. This picture also shows the battery installation with double sided foam mounting tape, as well as the switch location I used. The Rx is simply mounted with a zip-tie to the fuselage and the antenna routes down a flute out to the wing tip.



The picture below proves that the wing's leading edge doesn't have to be perfect. Also, since the fuselage has a larger O.D. you will need to create 8 flutes for the leading edge instead of 5 flutes on the original SPA3D. Make sure that the first of the folded flutes is still at 5" from the top edge of the Coroplast, so this means that you will be adding the three extra flutes to be folded, to the side closest to the top edge of the Coroplast, on the SPA3D wing layout drawing. Also the wing leading edge fuselage hole will need to be enlarged to 1" wide x 8 flutes long. The wing tip coat hanger clips also need to be enlarged to 1" wide.

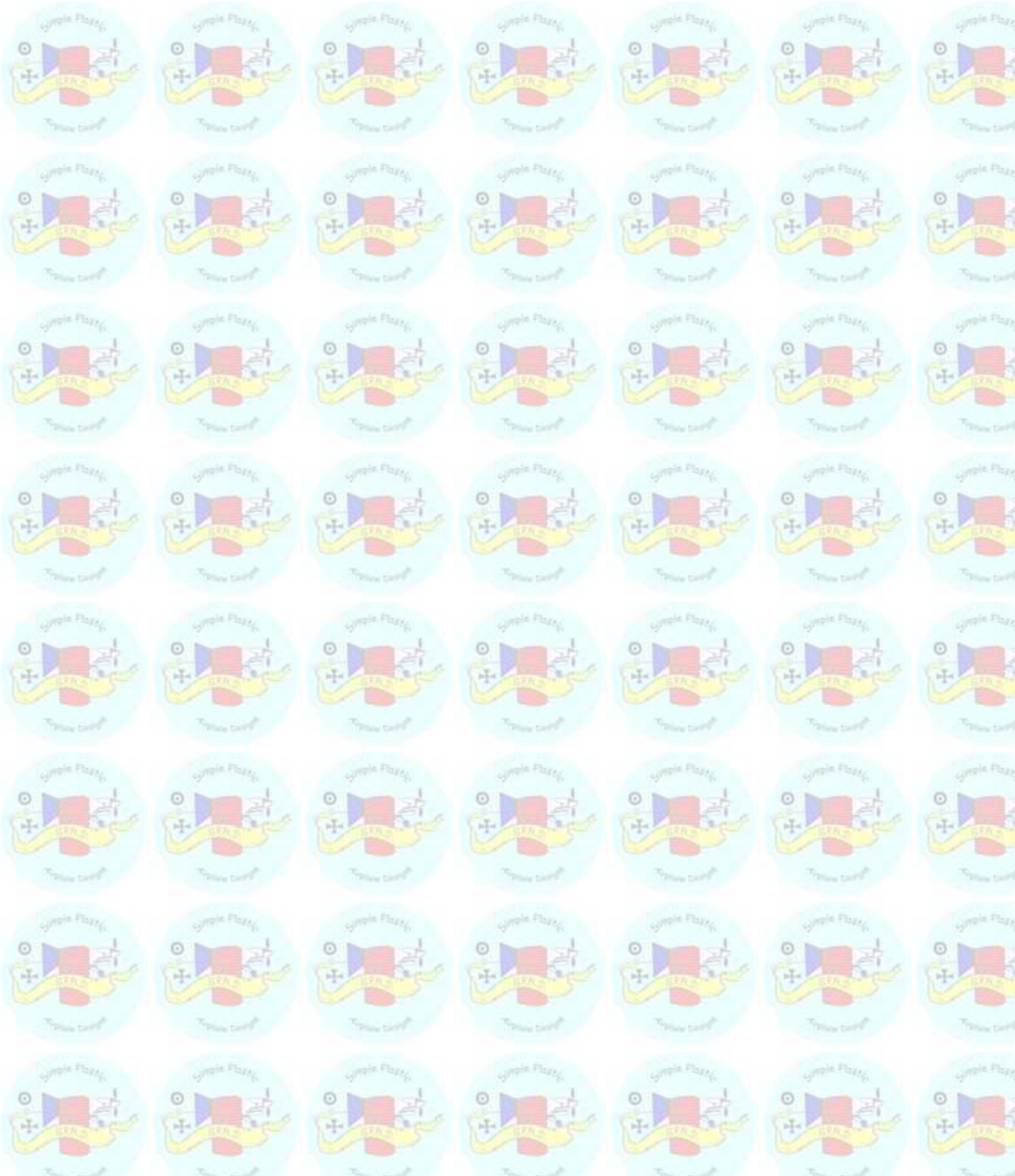


You may have noticed while viewing these pictures that I am using pushrods that have a Z-bend at both ends. I simply make them slightly longer than needed, and then put a "zig-zag" in the middle. To adjust them, I take the servo arm off, and make the "zig-zag" sharper or shallower using pliers. I started doing this about a year ago when Kraut crashed an airplane because a clevis end stripped out. Not only that, but I can buy a bunch of music wire and not have to worry about needing anything else to rig my plane out with. I LOVE this method, it doesn't get any simpler, and there is nothing to break or strip out. All the pushrods on this airplane are made from 3/32" music wire. Making the Z-bends is TOUGH, but well worth the effort. I have been scolded several times for running such long single wire pushrods, but this is usually by conventional builders with very little grasp of what we do, and with no knowledge of how tough and stiff the music wire really is! It is PLENTY stiff and strong enough to run the control surfaces in any normal flight you could ever put this airplane through, while at the same time, will bow slightly in a hard tail touch or dirt nap cartwheel...so that your servo will survive and your plane will fly on! Do this with a conventional wood-soft metal-clevis pushrods, and you will break, bend, or strip out something, and it could be the end of your flying afternoon. I rigged this airplane out just like my original SPA3D with as much throw as I could get on all the control surfaces. The CG range on this airplane is between 6" and 7" from the leading edge (set with an empty tank), depending on how radical you want it to fly. I currently have mine set at 6 1/4" and like it. I hope this photo essay has given you enough information to give you some good ideas for building your next SPA3D type airplane, and if you have further questions, please ask them at [Spadworld](#) or any of the other fine Spad forums listed on the [Spad home page](#).



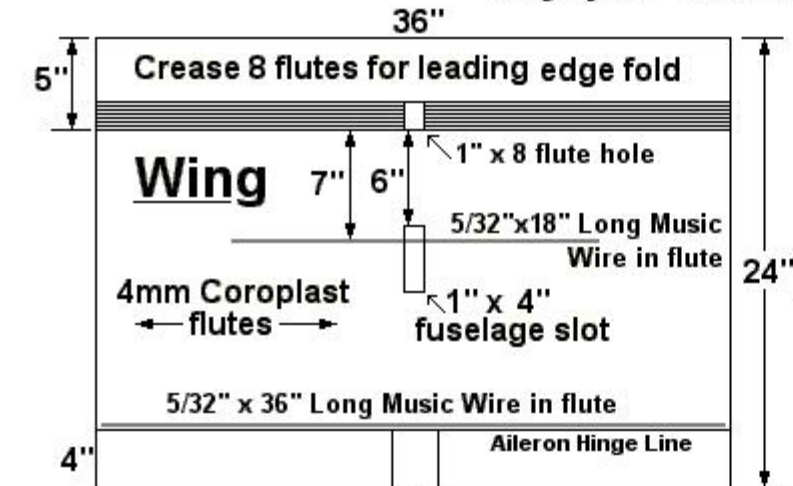
And last but not least, below is the reference drawing for measurements. I added this drawing to the page after doing the photo essay above, so it has all the necessary

modifications mentioned. I hope you have fun with this airplane, and don't get too mad at me while you're making servo cut-outs and snaking your wires through the fuselage :)

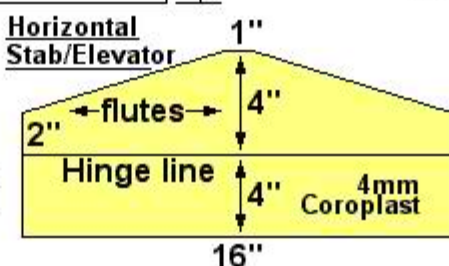
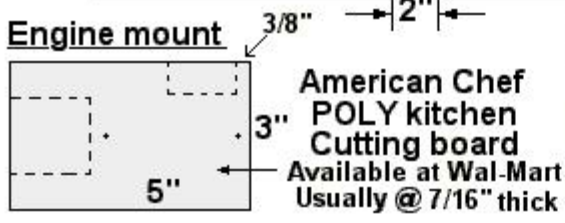
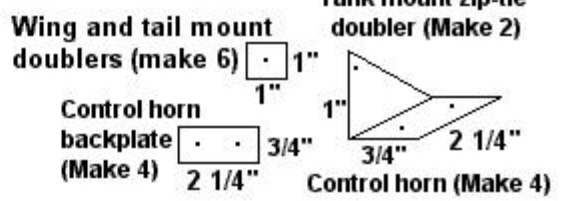


SPA3DT <http://www.spadtothebone.com>

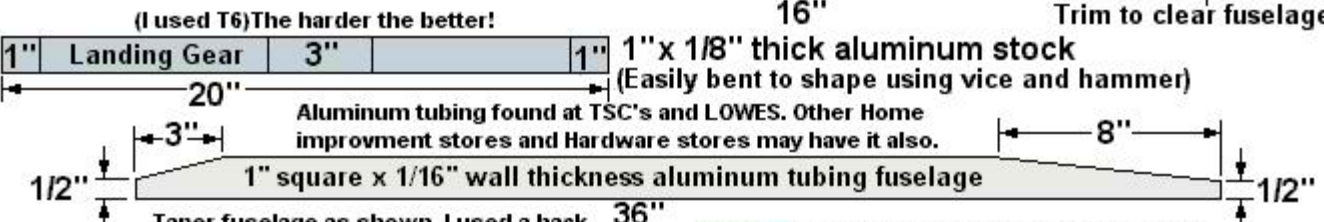
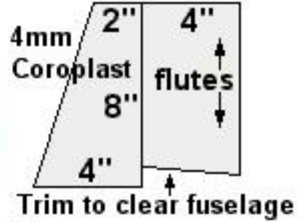
Design by Dean "Tattoo" Tuinstra



PVC Parts

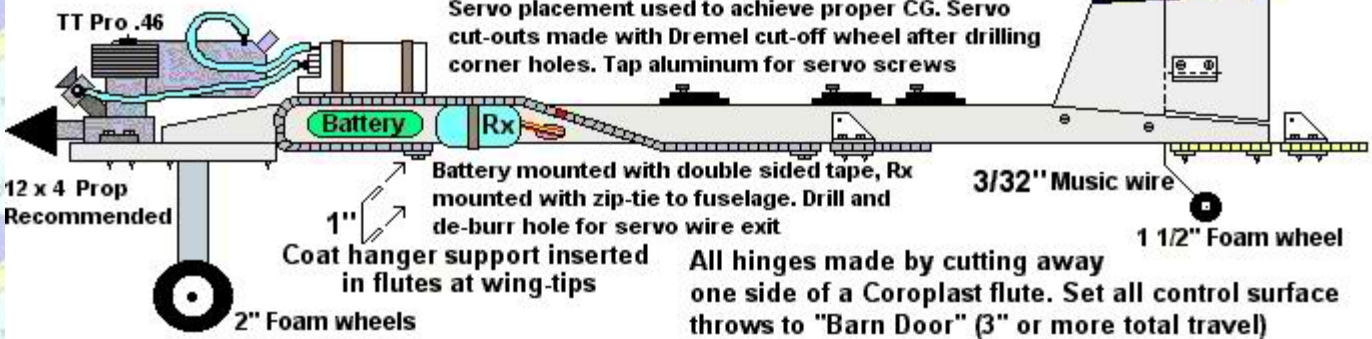
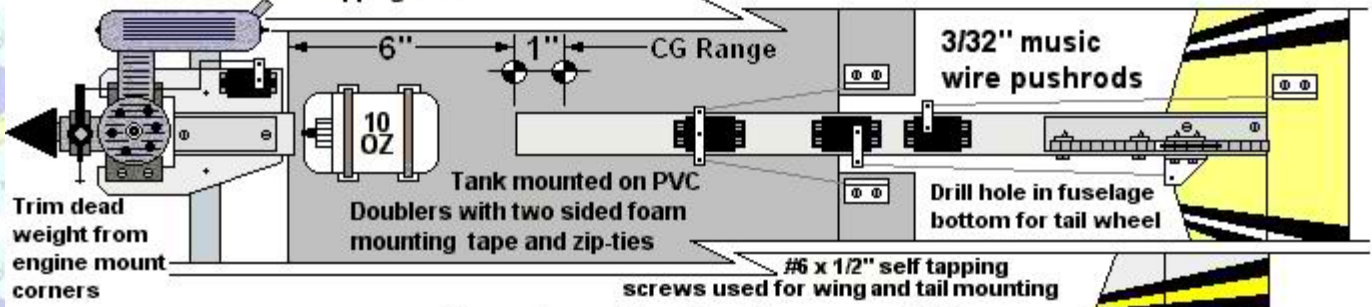


Vertical Stab/Rudder



Note! Forward wing music wire spar runs THROUGH the fuselage (signified by red flute in side view drawing)

Engine, Mount, and landing gear are mounted with #6x3/4" self tapping screws



Make sure ailerons are set parallel to fuselage for neutral. They must NOT droop at all! Slight reflex is OK. Make sure landing gear have toe-in. This airplane is a wild ride, so get help unless you are an experience pilot! Follow all AMA safety guidelines. Use caution and common sense with full throttle. Fly first flight at half throttle or less until trimmed out. AND HAVE FUN :)