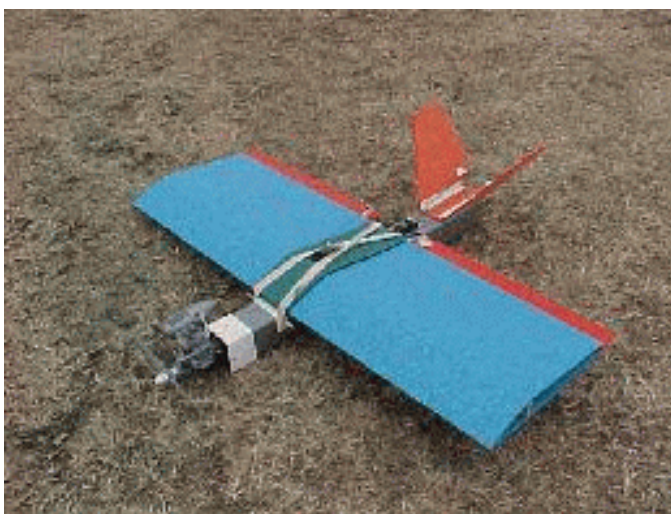


SPAD

Simple Plastic Airplane Design



SPAD Defender



The Defender is our second entry for an RCCA legal open "B" class combat plane. This little "scraper" has some significant improvements over the Dynamo. The Defender uses standard radio gear and a bearing .25. All out weight comes in at 2 lbs. 12 oz. Flight characteristics are outstanding!

Type: Combat

Wingspan: 36"

Length: 24"

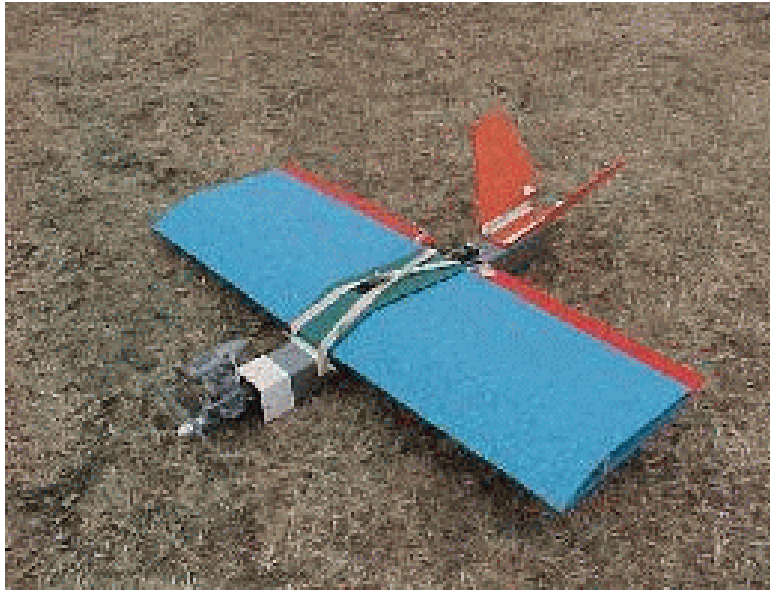
Engine: .25 - .30

Channels: 3 - Elevator, Ailerons & Throttle

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SPAD Defender Building Instructions



The Defender is a scrappy little budget entry into RCCA legal "B" open class combat competition. The prototype was equipped with a ThunderTiger® Pro .25™, a 4 oz. fuel tank, and a standard sized Hitec® flight pack. All Coroplast® parts are made from 4mm Coroplast®. It weighed in at 2.9 lbs. and is an excellent way to get involved for a minimum amount of money. Flight performance is outstanding, and will provide any pilot with a good entry level plane with which to get in the mix. The Defender, as well as these instructions, are recommended for experienced pilots/builders. If you are new to building with PVC and Coroplast, please review the "hints and tips" section of this website!

Fuselage:

The Defender fuselage is constructed from a 24" piece of Coroplast® with the flutes running in the lengthwise direction. The fuselage is folded into a square "tube" to fit the inside diameter of the PVC gutter pipe. Since the inside diameter of the gutter pipe can vary, we did not put a width dimension on the fuselage layout drawing. Determine this dimension, and the location of the corner folds, by using a thin strip of scrap Coroplast® and fold it to achieve a square which will provide a snug fit into the inside diameter of the gutter pipe you will be using. Once you have determined the width, and locations of the corner fold locations, use your "experimental" scrap piece to layout your fuselage. Be sure to "flame" all areas of gutter pipe and Coroplast® to be glued, with a propane or butane torch prior to gluing with medium CA. We have also found that scoring and folding two flutes for each fuselage fold works great. 1/2" plywood is used for the firewall, and a 2" piece of PVC gutter pipe is used as a "cow" for firewall strength. There is no down or right thrust. The firewall is cut

to the inside diameter of the gutter pipe, and is mounted flush with the front edge of the "cowl". The firewall is mounted with four #6 x 1/2" self tapping screws, one on each side of the "cowl". Be carefull not to hit an engine mount screw, throttle pushrod, or fuel line. The fuselage is glued into the "cowl" with the foreward edge butted up against the firewall. The wing hold down reinforcements are made from a 3/4" wide piece of PVC gutter pipe. The easiest way to make them is to cut a 3/4" piece off of your stick of gutter pipe, then cut it in two! Once they are glued in place, use the fuselage flutes as a guide and drill for the wing hold down dowells two flutes from the top edge of the fuselage. Cut out the radio access hole as shown on the fuselage drawing. The engine is centered on the firewall. The fuel tank is wrapped in foam to achieve a snug fit inside the fuselage. For combat streamer attachment, we simply glue a small piece of PVC scrap to the left side of the rear fuselage, and drill a small hole in it.

Wing:

You have two choices to use for your Defender wing. The wing shown in the wing drawing was used on the prototype. It is constructed from one piece of Coroplast® with the flutes running in the spanwise direction. A 36 inch standard yardstick is used for the spar, with four one inch pieces of yardstick used for spar supports, as shown on the drawing. The ailerons are hinged simply by cutting away one side of the Coroplast® flute! For a more rigid wing, with the flutes running in the chordwise direction, simply build a Dominator wing (see the Dominator wing building instructions and drawing), as all chordwise dimensions are the same. Just cut it down to a 36 inch span! Use the Defender spar configuration, and please note that the wing center reinforcement is used only on the top to save weight. We leave the wing tips open, also to save weight. Flame the plastic and use medium CA for all glue areas. **USE SMALL 1/8" DROPS EVERY INCH OR SO. A BEAD OF GLUE MAY NOT WORK! USING TOO MUCH GLUE IS THE BIGGEST MISTAKE HERE!** Cut a hole just aft of the spar for a snug aileron servo fit, with the ears of the servo resting on the plastic. Secure the servo in place using a zip-tie, and zip-tie doubler as shown in the drawing. Fabricate aileron control horns from scrap PVC, and glue in place. Flame the horns and ailerons before gluing! This is VERY important, as we don't use screws or backplates to save weight! Cut a small hole in the bottom of the wing aft of the servo for the aileron servo lead to pass through. Insert a 5/23" dowel into the foreward most, and aft flute of the wing center reinforcement to prevent the wing rubberbands from crushing the Coroplast®. We feel that the spanwise flute wing may be slightly stronger, and is certainly easier to build. However, the reason we like the chordwise flute wing, is because the nature of the leading edge fold creates ridges,

which greatly aid in grabbing your enemy's streamer or leader string! The chordwise flute wing is also less prone to wing rubberband crush.

Tail:

The Defender tail is cut from a 16 1/2" x 7" piece of Coroplast® as shown in the tail drawing. Score and fold the center section as shown on the drawing, and hinge the elevators by cutting away one side of the Coroplast® flutes. Fabricate two 4" x 1" PVC tail doublers, and bend them to a 45 degree angle using a propane or butane torch. Glue the doublers in place to achieve the Defender's V-tail. Fabricate two elevator control horns from scrap PVC. Glue the horns in place, and glue the tail to the fuselage using medium CA. Flame the tail, horns, doublers, and fuselage before gluing! This is VERY important, as we are not using backplates or screws to save weight!

Radio Installation:

The elevator servo is mounted to the top of the fuselage using standard servo screws. Cut a servo hole, and use a piece of PVC for the aft mount, and mount the forward side of the servo to the rear PVC wing hold dowel reinforcement. The throttle servo is stuck in place inside the fuselage using double sided foam mounting tape. You may wish to reinforce the throttle servo mounting using a PVC doubler and zip-tie, similar to the aileron servo mounting in the wing. The battery and receiver are simply stuck in place using double sided foam mounting tape. Use the battery positioning to achieve the proper CG. Your Defender should balance level at the forward top spar line! Slightly nose heavy is OK, tail heavy is UNACCEPTABLE and DANGEROUS! Your antenna can be routed out through the fuselage by poking a small hole in a Coroplast® flute near your receiver, and running the antenna down the flute, and it will exit out the back of the fuselage. Mount your switch where convenient along the side of the fuselage. Use two pushrods, originating from the same side of the servo, for elevator control. Keep in mind that you will have to drill your elevator horn holes to compensate for differing travels, when using two pushrods. Or you may wish to fabricate a "wishbone" pushrod for your elevators. Rig your ailerons and elevators and throttle to your satisfaction. The Defender ailerons are very responsive, so be ready for it! The nature of a V-tail makes the elevators less responsive than a conventional elevator, so they can be rigged with a considerable amount of throw!

NOTE: When rigging your ailerons, ensure that the bottom of the ailerons are parallel to the top of the fuselage! Do not allow them to droop (like flaps)! If your ailerons droop, they will drastically affect pitch trim!

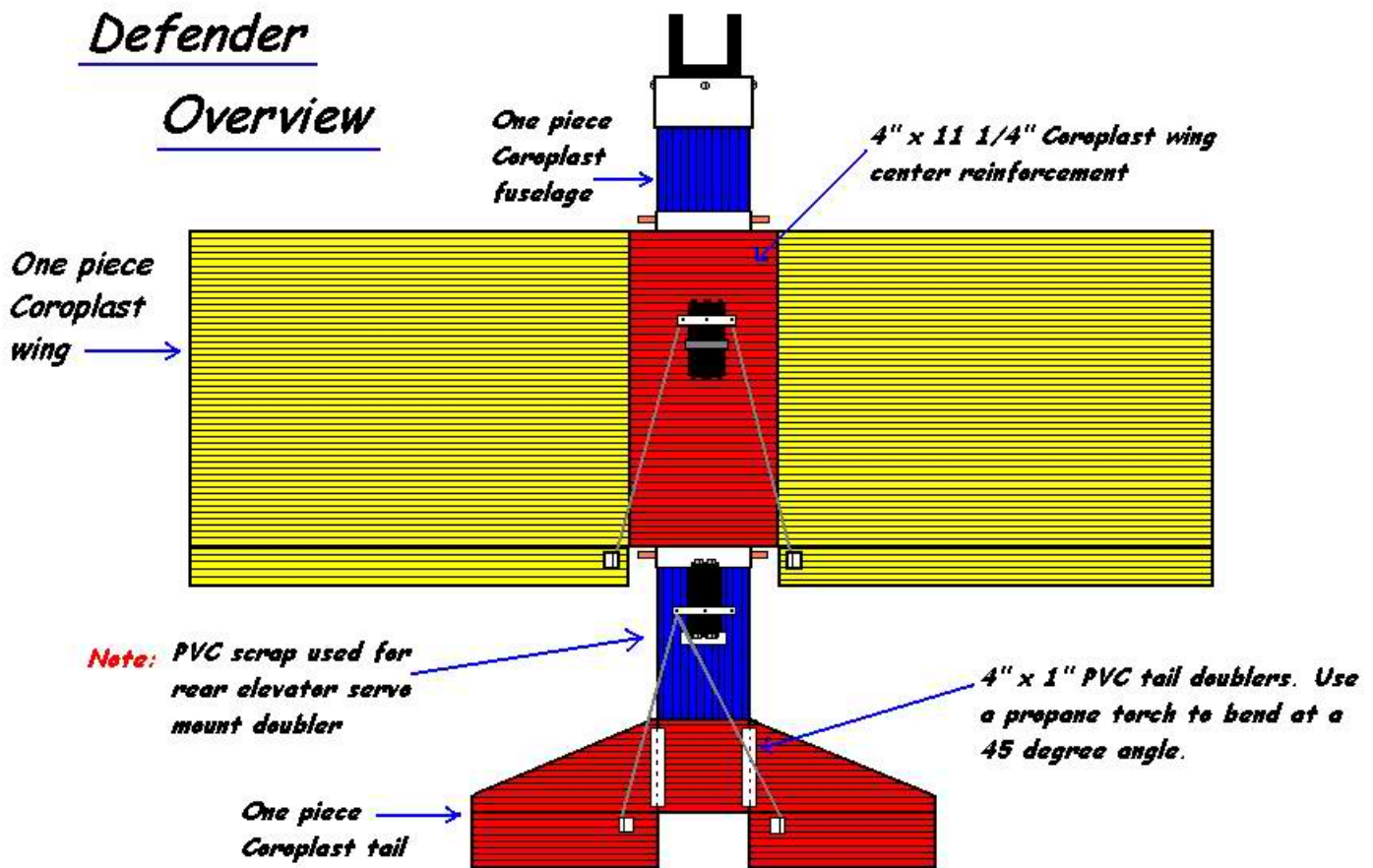
Flying the Defender:

Make sure your throttle is rigged to shut your engine OFF for landing, and your prop is clocked to stop in the horizontal position. ALWAYS FOLLOW ALL AMA SAFETY RULES AND REGULATIONS! If you plan to enter an RCCA sanctioned combat event (open class B), weigh your Defender to assure that it falls under the 3.5 lb. weight limit. Mount your wing with at least 12 (6 per side) #64 rubber bands! The ThunderTiger® Pro .25™ was plenty of power for our Defender prototype, and at full throttle, it climbed out perfectly with a slight hand launch. The Defender will perform any maneuver a combat pilot could desire, and float in for a gentle dead stick landing after engine shutdown. If your enemies are balsa or foam, they better hope they don't get in your way! IF YOU ARE NEW TO COMBAT, AND HAVE NOT FLOWN THIS TYPE OF AIRCRAFT BEFORE, PLEASE ENLIST THE HELP OF A QUALIFIED INSTRUCTOR! It is also highly recommended that you add some bold graphics to the top of your wing for in flight orientation!

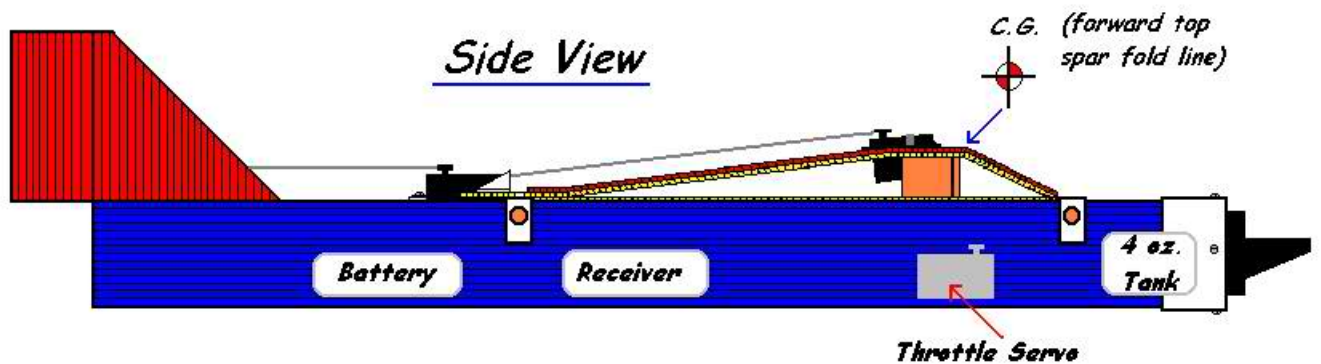
[\[Defender\]](#) [\[Build\]](#) [\[Overview\]](#) [\[Wing\]](#) [\[Fuse\]](#)

Defender

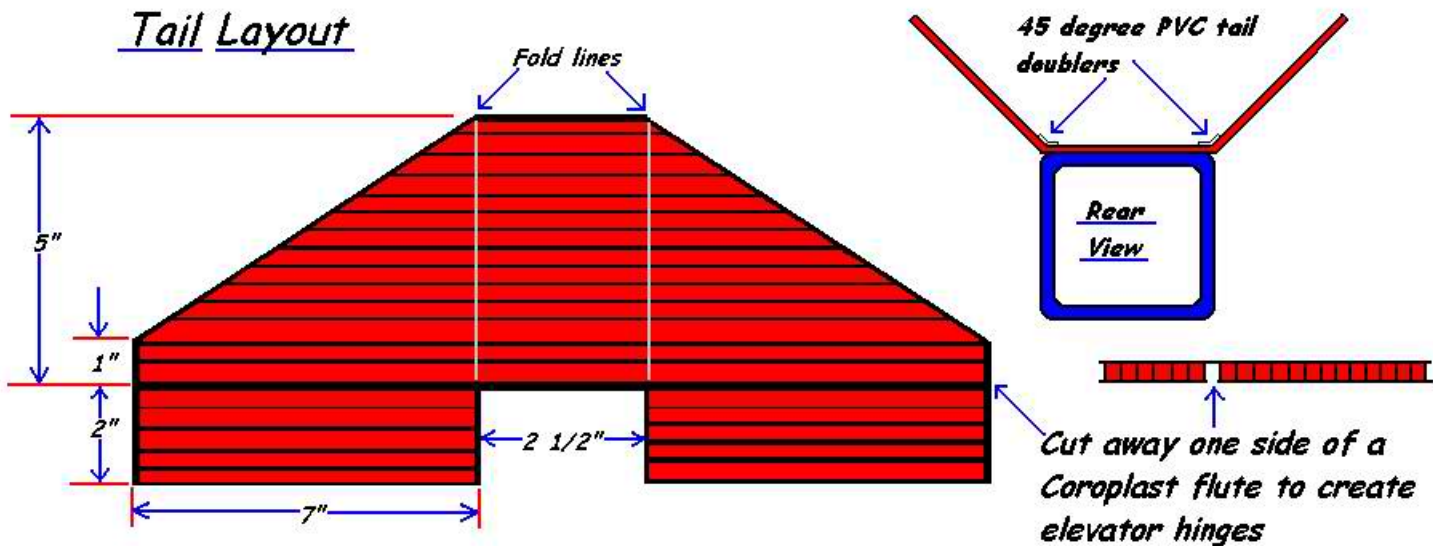
Overview



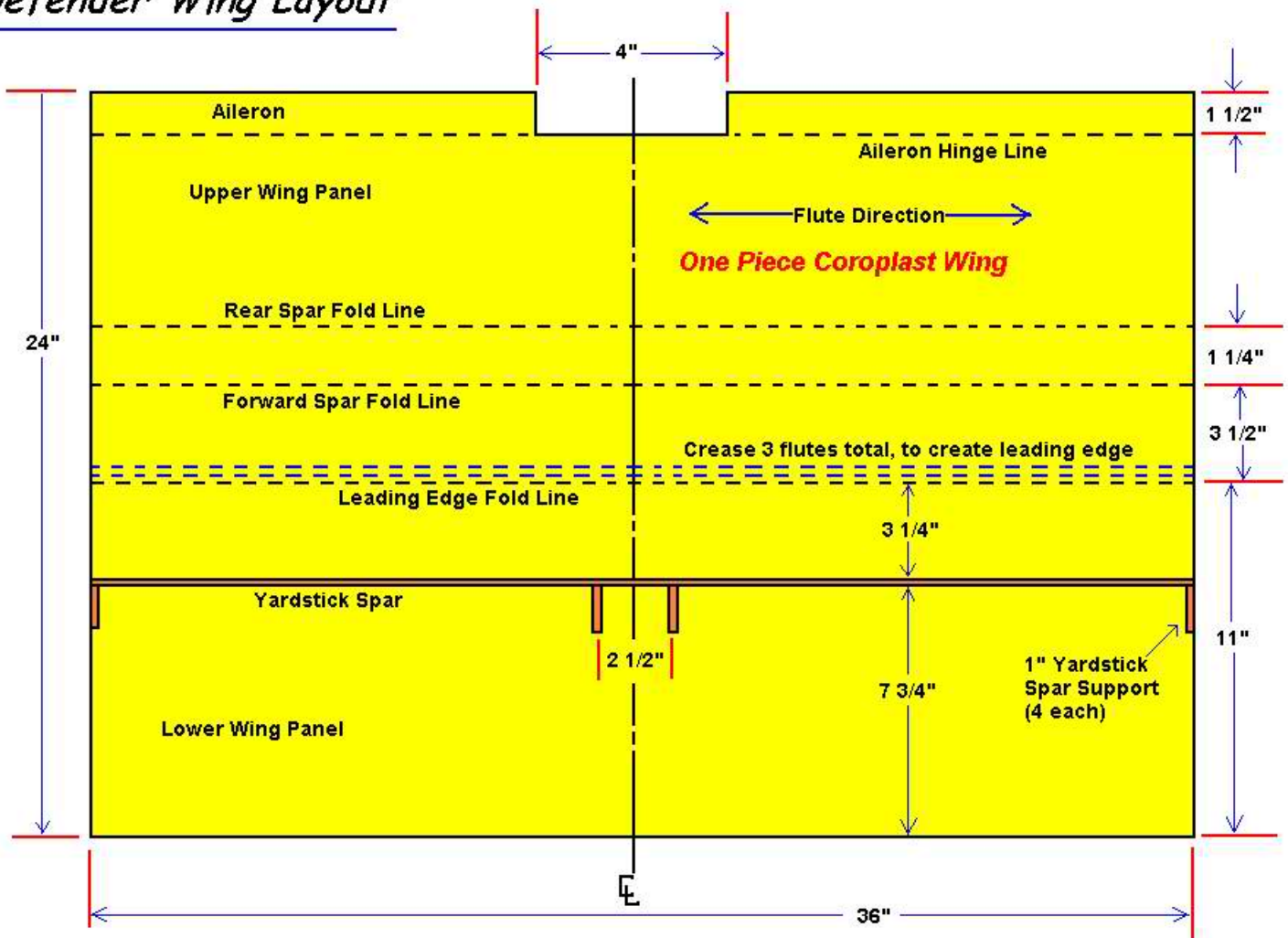
Side View



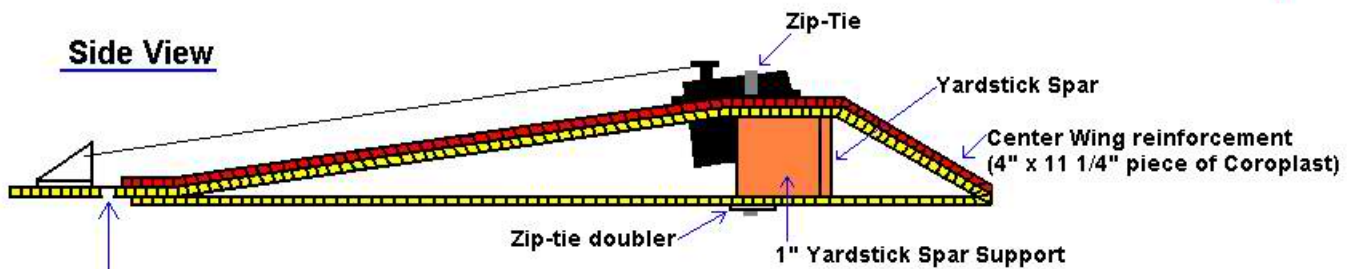
Tail Layout



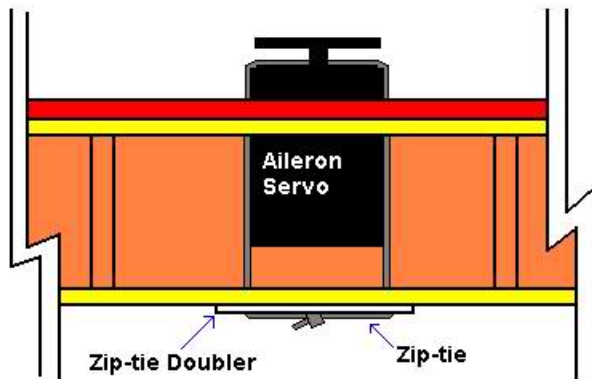
Defender Wing Layout



Side View

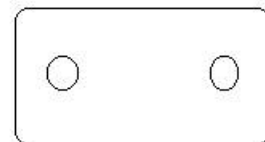


Aileron hinges created by cutting away one side of a Coroplast flute



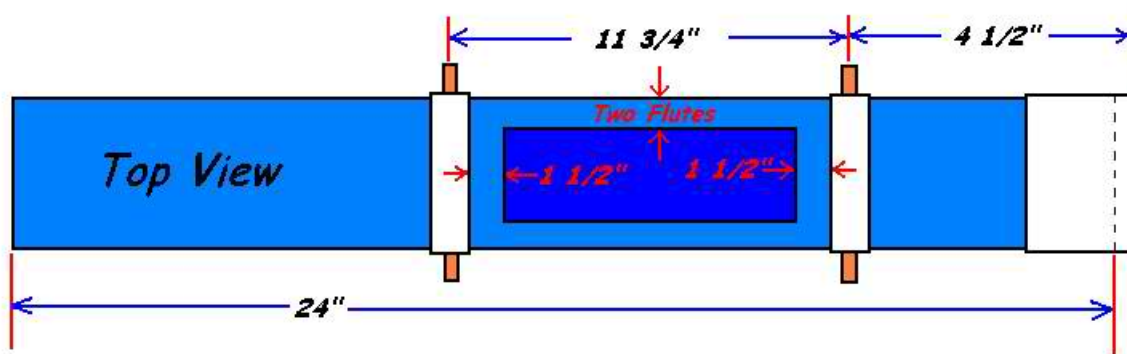
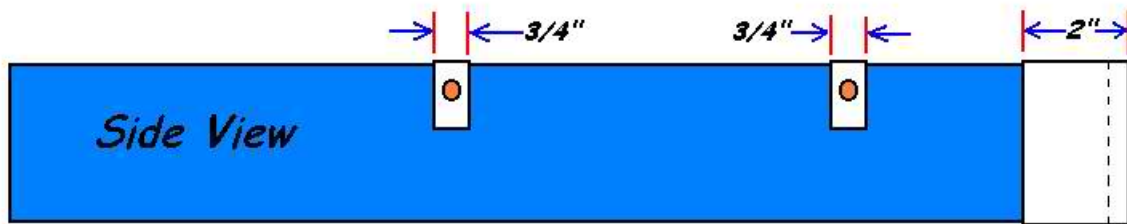
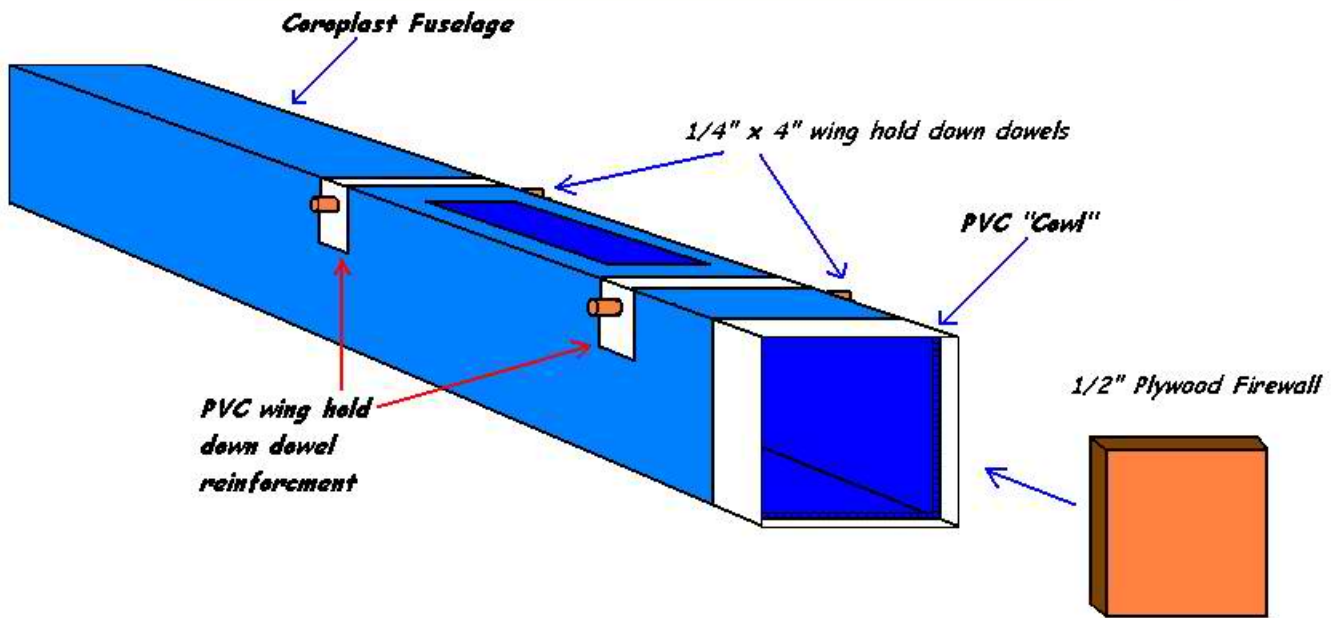
Aileron Servo Installation

Rear View

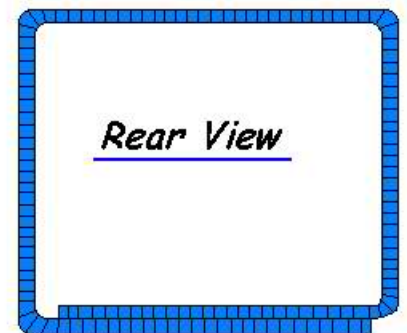
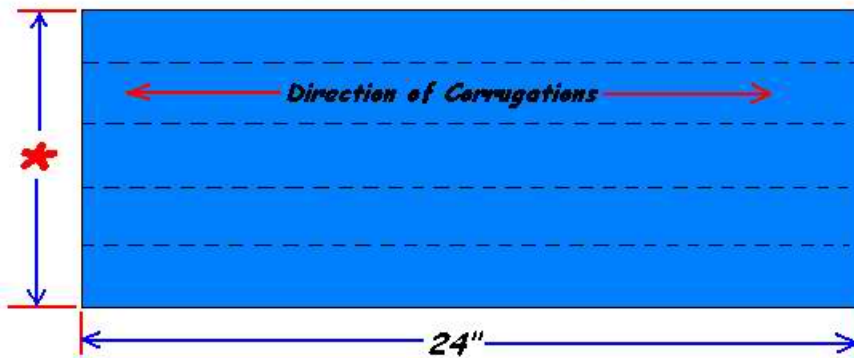


Fabricate zip-tie doubler from scrap PVC, dimensions will be determined by the size of servo you are using

Defender Fuselage



Fuselage Layout



* Use a piece of scrap Coroplast to determine this dimension (see instructions)