



PHANTOM X-1 STRUT BRACED WING ASSEMBLY MANUAL

**Phantom Aeronautics LLC
2010 Hov-Aire Dr
Three Rivers, MI 49093
PH: 269-271-4568
EMAIL: erik.pederson@att.net**

Version 8.1.2021

Introduction

This manual describes the process to install the strut braced wing kit on a Phantom X-1. For this installation you are re-building the wing of the aircraft. Some of the components from your existing wing will be re-used on the new wing. The following items are re-used.

- Wing Coverings
- W08 and W09 - Wing Ribs
- Ailerons
- W07 Wing Tip Compression Tube
- Various nuts, bolts, washers and other hardware

Measuring the Wing

It is important that the angle of the wings be measured. Then during installation of the strut braced wings, they can be positioned at the same angle.

Determine the location where you are going to be performing your work. Locate the plane on as much of a level surface as possible. Mark where all of the tires are located. You will need to return the plane to this location during final setup of the strut braced wing.

Measure the height above the ground for the outboard leading-edge wing tip and the outboard trailing-edge wing tip. It does not matter exactly where you measure, but you must measure to the same point upon installation of the new wing. So, make sure you record the location and the vertical height above the ground for that particular location.

A plum bob is a useful tool in this instance to insure you are measuring perpendicular from the ground to the wing tip.

Removal of Existing Wing

STEP 1: Disconnect the aileron control cables from the aileron control horn. Be sure to save the hardware, it will be re-used.

STEP 2: Remove the ailerons from the main wing. Be sure to save the hardware, it will be re-used.

STEP 3: Open up the center of the wing fabric using the velcro opening and underside wing zippers. Remove any wiring or pitot tube tubing from inside the wing. Disconnect the center straps so that the wing coverings are independent of each other

STEP 4: Remove W08 and W09 wing ribs from the pockets in the wing fabric. Inspect these ribs to ensure the plastic rib tips and rib heels are not broken. Replace them as necessary.

STEP 5: Loosen the black sliders on the upper wing wires. You should be able to slide these up toward the top of the king post. This will loosen the wing wires.

STEP 6: Support the wing tips, with wing stands.

STEP 7: Disconnect the lower wing wires from the spreader bar down by the main cockpit

STEP 8: Disconnect the upper wing wires from the top of the king post. This can be done by lowering the rear of the king post down to facilitate access to the top of the king post. Remove king post from the plane. This will no longer be needed.

STEP 9: Disconnect the wing wires from the main wing. This will require some awkward reaching inside the wing to access bolt and nut heads

STEP 10: Remove the W07 wing tip compression tube. Save this tube and hardware. It will be needed again.

STEP 11: Slide the wing fabric off the wing structure. Be careful not to rip the fabric.

STEP 12: Unbolt the spars from the keel tube and remove the wing structure. Save all of the hardware. Some of this will be needed again.

Your wings should now be completely removed from the plane and the re-construction can begin. This is also a good time to inspect the brackets or any other hardware that may not be normally accessible. It is always good to check the structural integrity of the plane.

Building the New Wing Structure

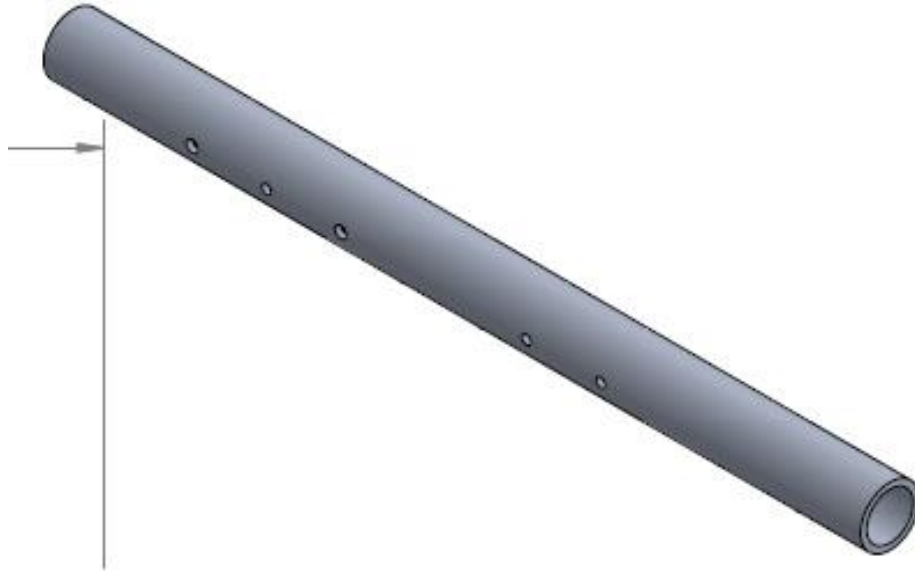
The new wing structure is designed to be assembled independent of being mounted on the aircraft. Figure 1 shows the layout of the wing structure and associated hardware. The following Assembly Steps should be utilized to construct the wing structure

STEP 1: find a flat surface to layout the leading edge and trailing edge wing spars. The wing spars come in two sections each. The leading edge is 1.75" in diameter, the trailing edge is 1.625" in diameter. There is a long and short section to each spar.

STEP 2: Find the Wing Root Sleeves, they will look like the following image and will insert into the root of the long spar. The two holes will line up with the holes on the wing spars



STEP 3: Find the Wing Spar Splice Sleeve, they will look like the following image and will insert into the outboard end of the long spar tube. The short spar tube will also slide over this splice making it one long spar. The holes on the spar will line up with the holes in the splicing sleeve



STEP 4: Bolt the S-1750-1250-25-150R and S-1750-1250-25-175R Compression tube inserts to the main spar. These components are shown in the following image. The hardware used for this is shown in Figure 2. The Leading-Edge Spar utilizes AN4-25A, W4 and N4's. The bolt head should be facing toward the outside of the wing (i.e. the nut should be on the inside of the compression tube insert). The trailing edge spar utilizes AN43B-24A, W4 and N4's for the compression tube insert closest to the wing root. Use AN4-24A, N4 and W4 for the compression tube inserts for the two in the middle of the wing. The eye bolt should be facing toward the trailing edge of the wing. The head of the bolt should be facing toward the outboard side of the wing.



STEP 5: Install 2 of the AN4-20A and N4's to hold the trailing-edge spar extension to the splicing tube. Install 2 of the AN4-21A and N4's to hold the leading-edge spar extension to the splicing tube. Do not install other bolts on the trailing edge spar. These will be installed at a later time after the wing coverings are in place.

STEP 6: Insert the 3 inner most wing compression tubes into the compression tube inserts. Bolt the tubes and CA5 drag wires into place using AN4-16A, W4 and N4's as shown in Figure 1. If the tubes are in the right location the CA5 drag wires should be tight. If they are loose, they can be twisted up to 3 times in the direction of the spiral on the wire. If this does not tighten the wires, then you have the compression tubes in the wrong location. Do not install the wing tip compression tube at this time, this needs to remain out to facilitate installation of the wing coverings in a later step. On the second compression tube from root be sure to slide 3 of the U-shaped Jury Strut attachment brackets over the compression tube before bolting into place. This is shown in the following image. These will be used in a later step to bolt the jury struts in place.



STEP 7: Mount each wing structure to the keel tube brackets using the hardware that was removed from your old wing. Support wings with wing stands.

STEP 8: Re-install your wing coverings over the wing structure.

STEP 9: Cinch and velcro the center of the wing fabric so that it is tight, and the overlapping fabric completely covers the velcro

STEP 10: Ensure the trailing edge aileron velcro is centered on the rear spar and all other fabric looks to be in the correct location

STEP 11: Insert Upper and Lower wing ribs back into the wing fabric. This will tighten the wing fabric up. Before proceeding to the next step make sure you are satisfied with how the wing

fabric is laying. This is the time to fix wrinkles or misalignment issues. It is more difficult after the next step.

STEP 12: Burn holes in the fabric using a hot knife or soldering iron for the remaining hole locations on the trailing edge spar

STEP 13: Install remaining hardware shown in Figure 2 on trailing edge spar including AN43B bolts

STEP 14: Install wing strut mounting brackets using AN5-22A and AN5-23A bolts as show in figure two. You will need to burn a slit in the wing fabric to insert the inboard strut brackets.

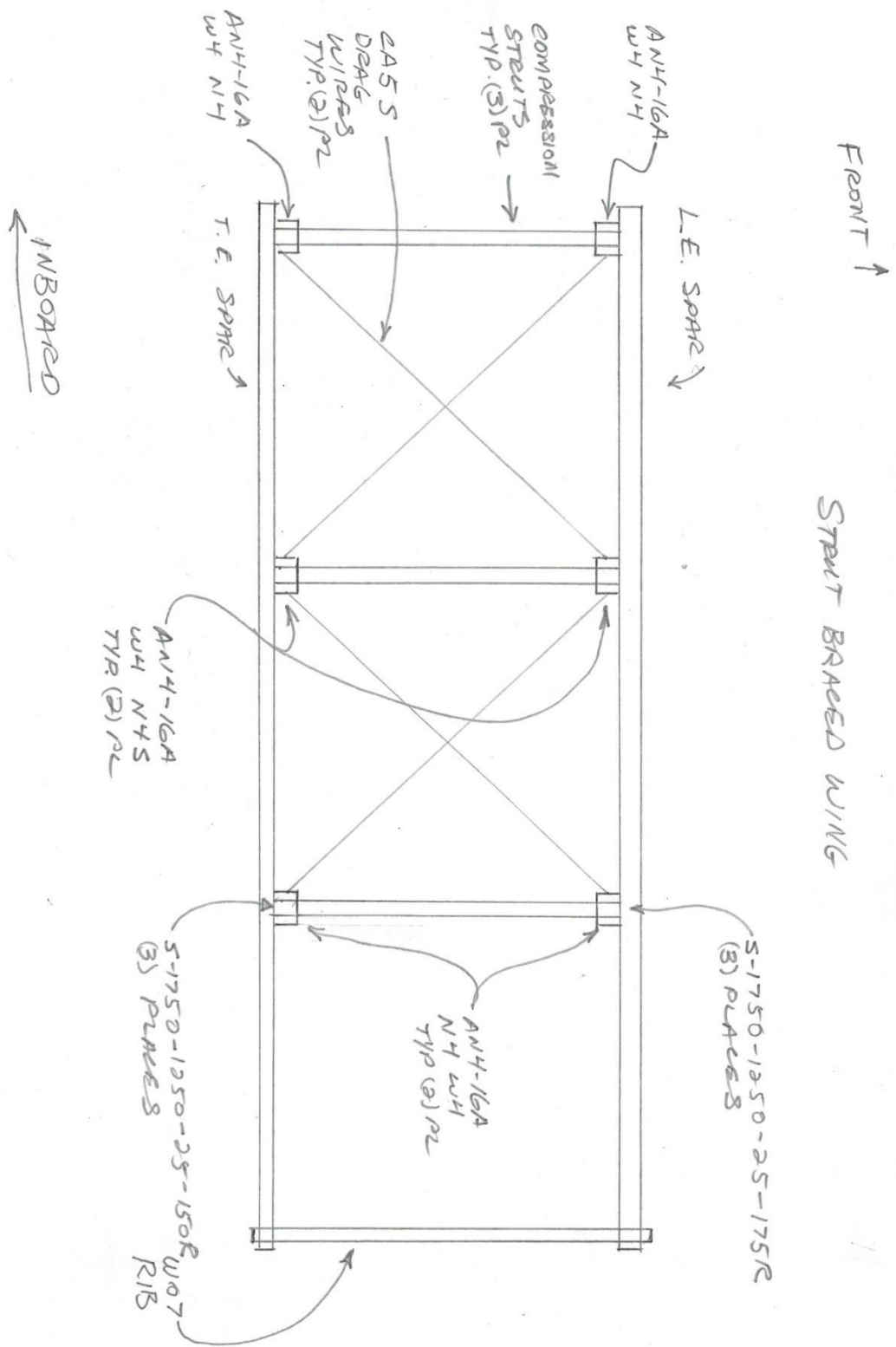
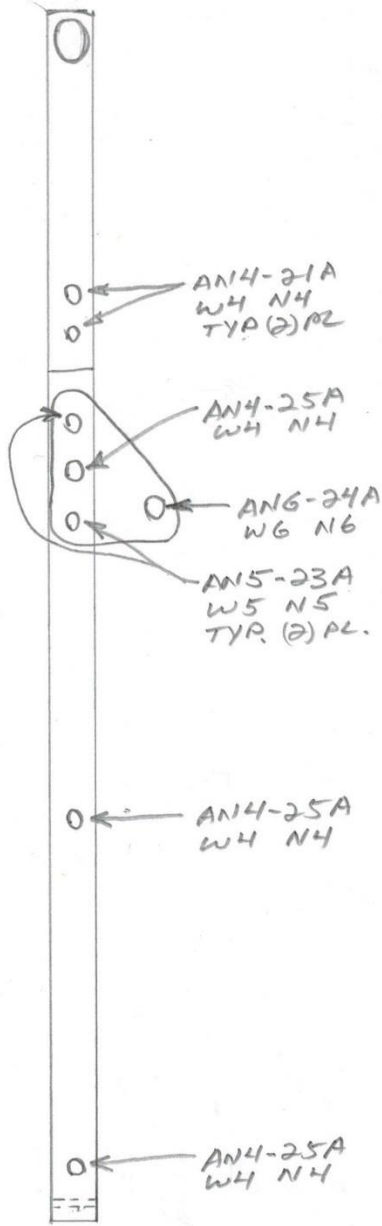


Figure 1- Wing Assembly

L.E. WING SPAR

← INBOARD



T.E. WING SPAR

← INBOARD

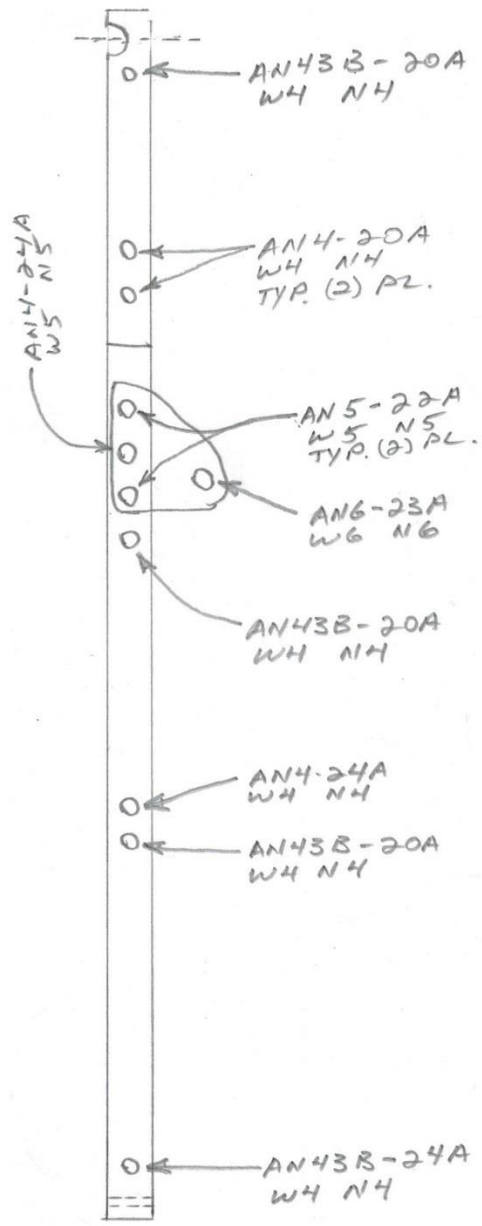
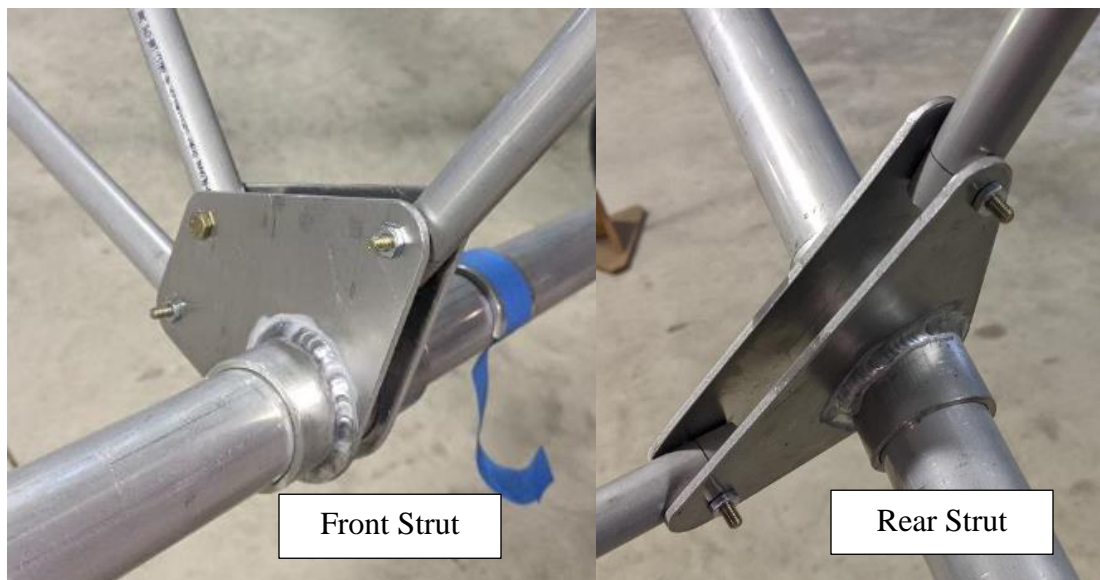


Figure 2- Wing Structure

Building the Wing Struts

STEP 1: Locate the long wing struts. They are all identical and are the same length.

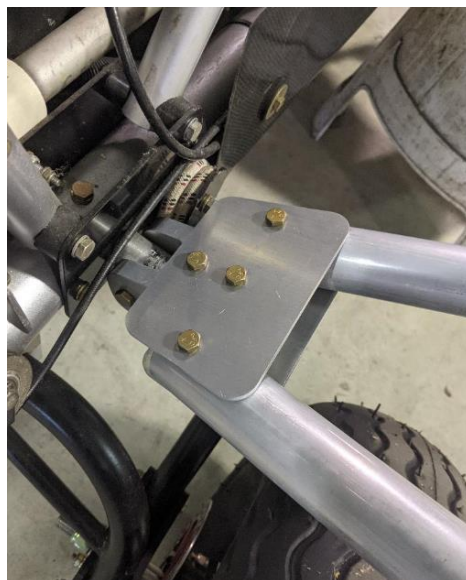
STEP 2: Install the jury strut welded assemblies on the wing struts themselves. The front and rear jury strut attachment plates are shown in the following images. Slide them about halfway down the wing strut, they will sit approximately 62 inches from the inboard end or 52 inches from the outboard end. They should line up such that a jury strut can be bolted between the front and rear strut. If not, then flip them from left wing and right wing until they line up correctly. The plates themselves should point up toward the second inner most compression tube that has the u-shaped brackets that you installed earlier in the wing assembly process. Figure 4 will provide guidance on the proper orientation.



STEP 3: Ensure the strut insert, rod end and stop nut are installed at the outboard end of the strut. It should look like the following image. Once installed on the aircraft the rod end is adjustable to allow the wing angles to be set correctly.



STEP 4: Locate the W51 Strut attachment plates and W50 Strut attachment blocks. Bolt together using the hardware shown in Figure 3. Install the plates onto the inboard end of the wing struts. The installation should look like the following image. Install only 4 of the AN4-21A bolts to start with. You should end up with only one bolt in each of the wing strut. The second bolt will be installed after the strut is attached to the wing. The final hole has a 3/16" pilot hole which will need to be drilled to match the strut after the struts are installed on the aircraft wing.



STEP 5: Bolt the W50 Strut Attachment Block and strut assembly to the C13 Spreader Bar using the AN4-23A bolt and hardware shown in Figure 3. It should look like the above image.

STEP 6: Bolt the Rod end to the wing strut attachment plates on the main wing. Use the enclosed spacers and AN6-23A, AN6-24A, W5, N6 hardware to attach the rod end to the plates. Do this for the front and rear struts. Figure 2 will assist you with the hardware locations.

This completes the wing strut installation.

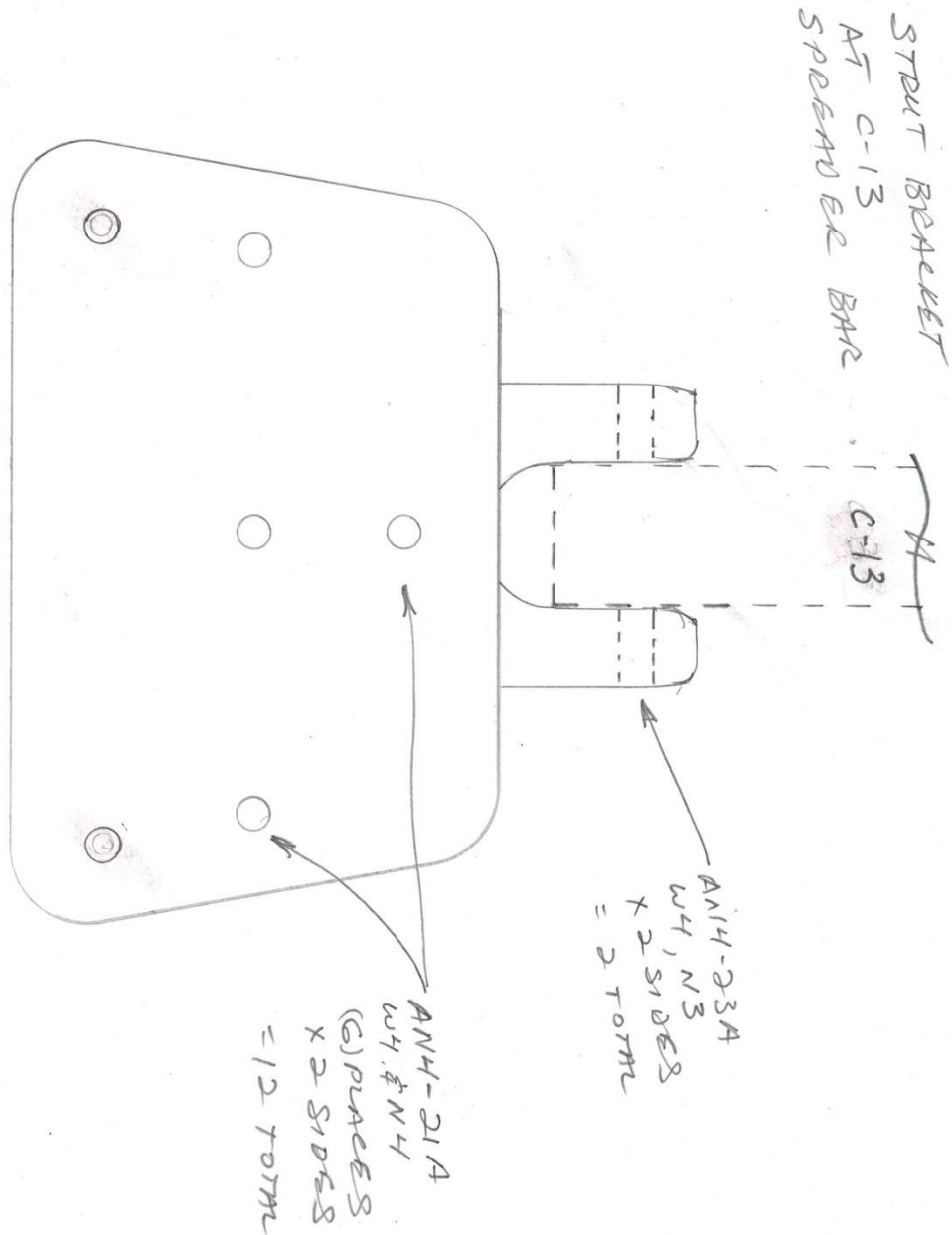


Figure 3- Wing Strut Attachment Block and Plates

Jury Strut Installation

STEP 1: Bolt the jury struts into place as shown in Figure 4. This will only work one way. The lengths of the tubes are sized to correctly bolt to each bracket. Keep the hardware loose until all of the struts have been installed and then tighten into location.

STEP 2: For attachment to the U-shaped brackets on the compression tube you will need to use a hot knife or soldering iron to cut slits in the wing fabric to facilitate installation. Make sure you pay attention to the orientation of the jury struts in relation to the Leading Edge (LE) and Trailing Edge (TE) spars.

STEP 3: Install the remaining two bolts on the wing strut attachment points near the cockpit. You will need to drill the holes to ensure proper alignment. A pilot hole is provided to help. Reference Figure 3 for the remaining bolt locations.

STEP 4: Measure the height of the wing tips utilizing the measurements and aircraft location that you setup at the beginning of this project. The wings will need to be in the correct location or else the roll and stall characteristics will not be correct. You may adjust the angle using the threaded rod ends on the wing struts. Make sure you have at least 2 diameters of threaded rod length inserted into the strut. Once angles are set tighten the lock nuts down to prevent movement of the rod ends.

STEP 5: Re-install ailerons using the hardware from your previous wing. Re-install the control cables.

The installation is now complete.

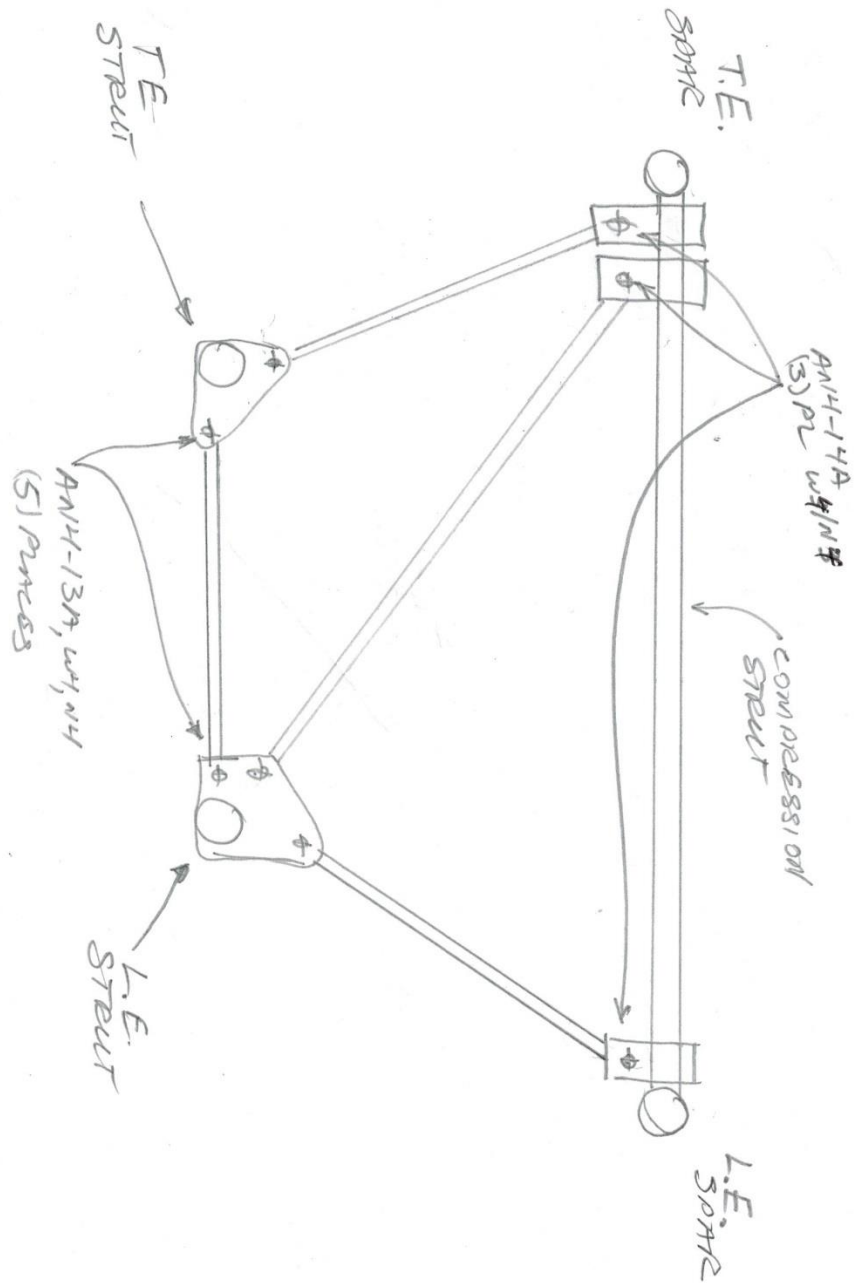


Figure 4- Jury Strut Installation