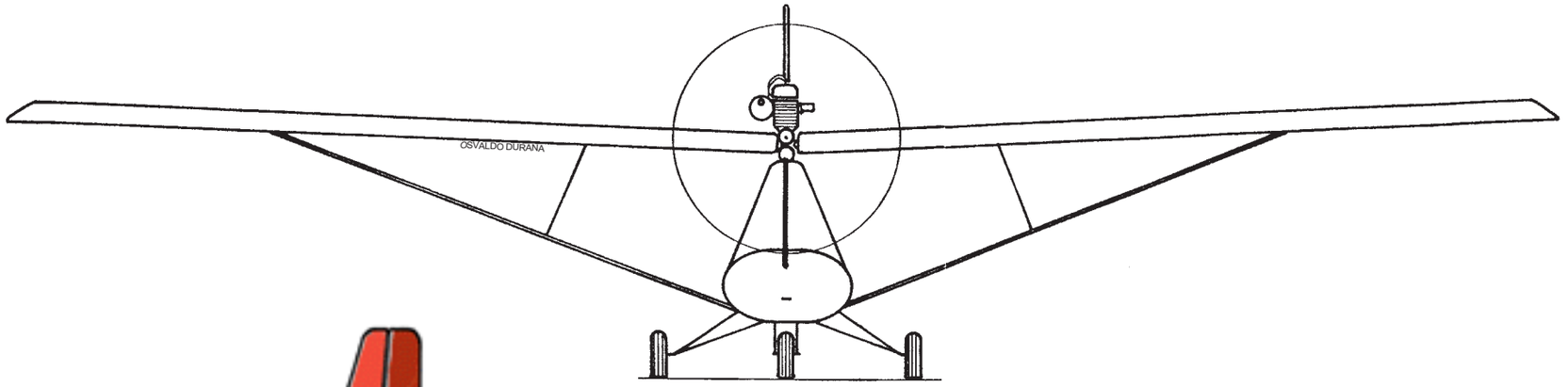
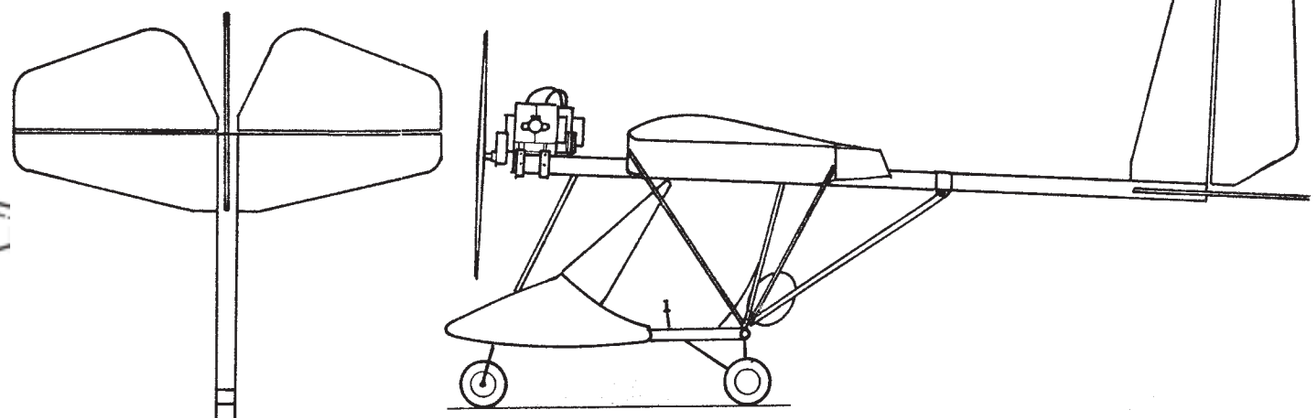
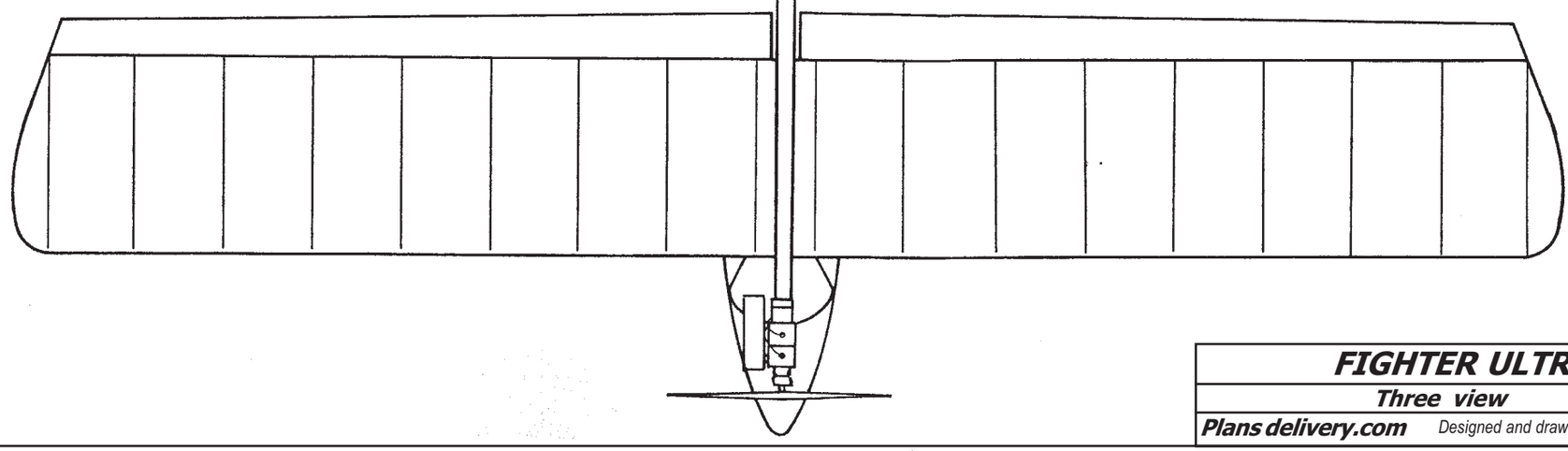




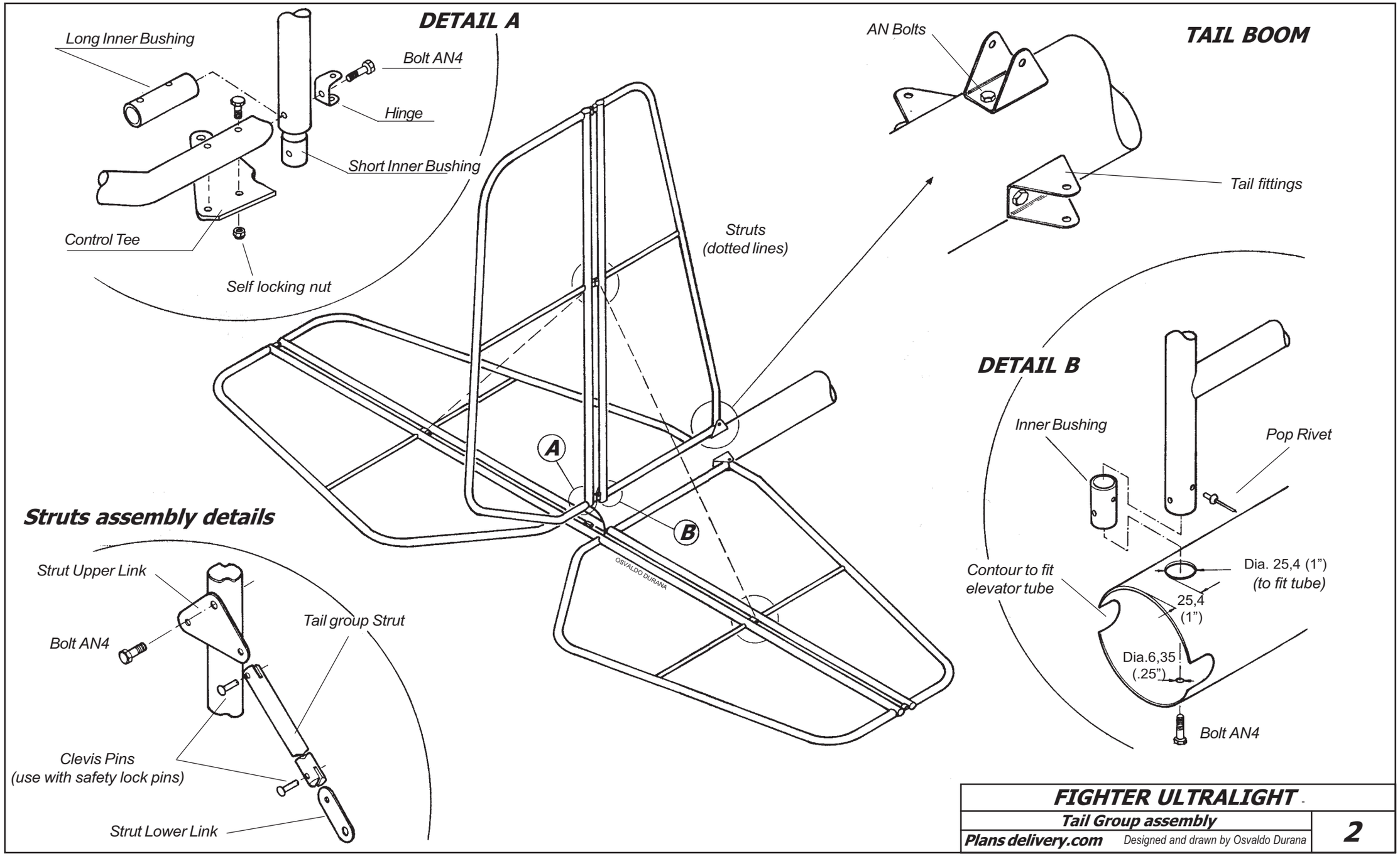


FIGHTER ULTRALIGHT

Three view

Plans delivery.com Designed and drawn by Osvaldo Durana

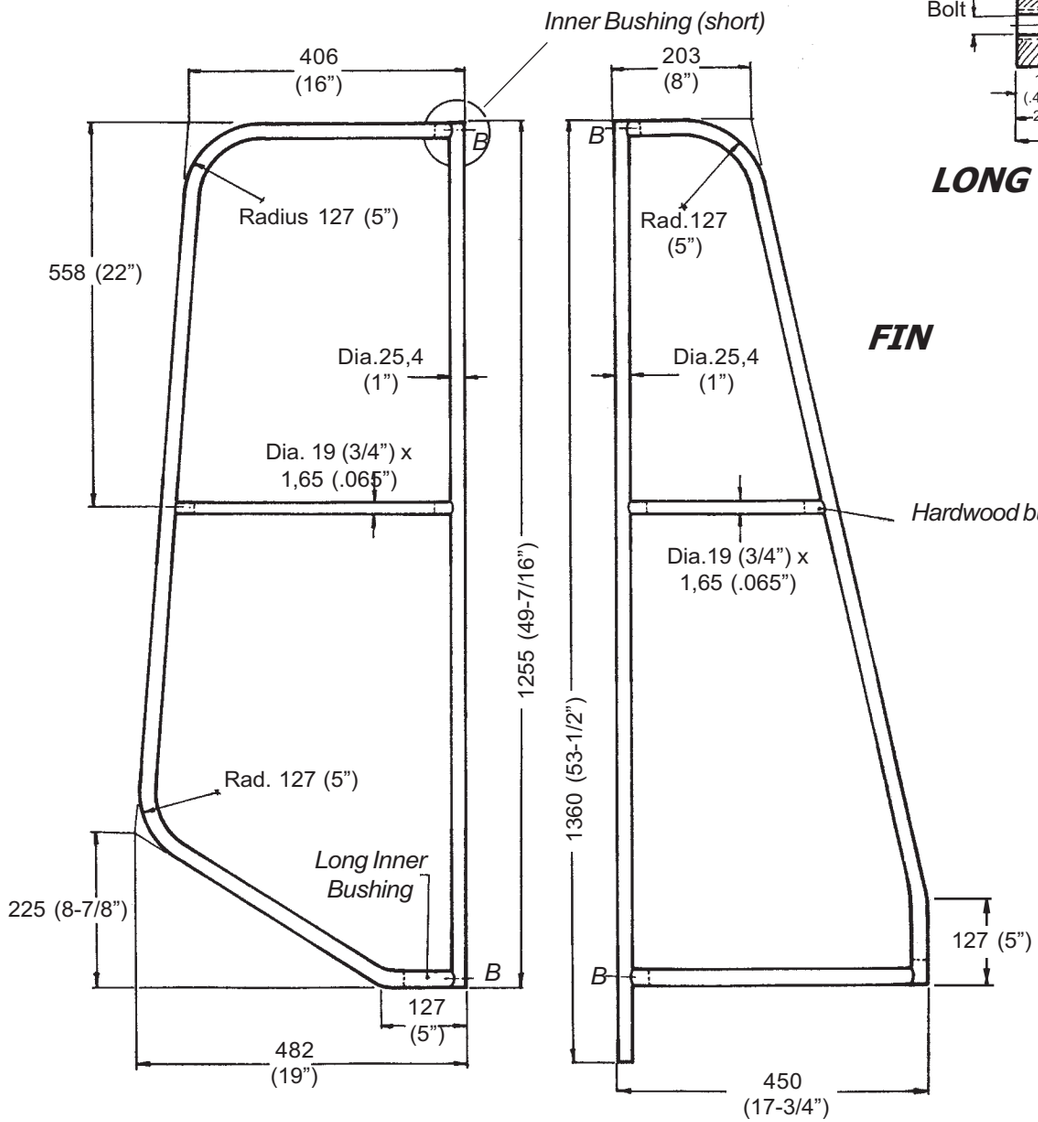
1



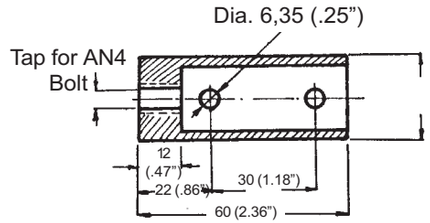
FIGHTER ULTRALIGHT	
Tail Group assembly	2
Plans delivery.com Designed and drawn by Osvaldo Durana	

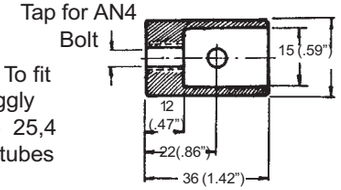
RUDDER .

Built with aluminum alloy tubes 6061-T6 - Diameter 1" - wall thickness .065"



SHORT BUSHING



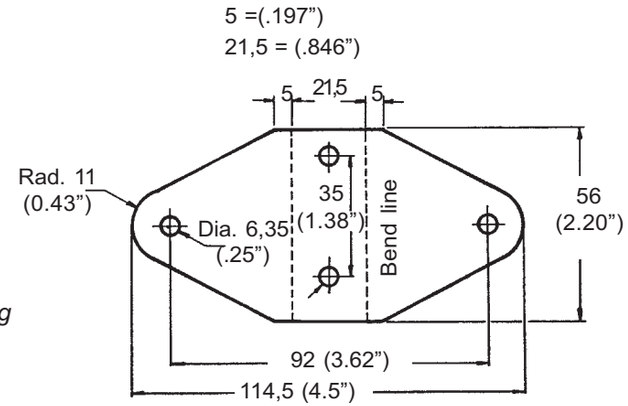


Material Aluminum

LONG BUSHING

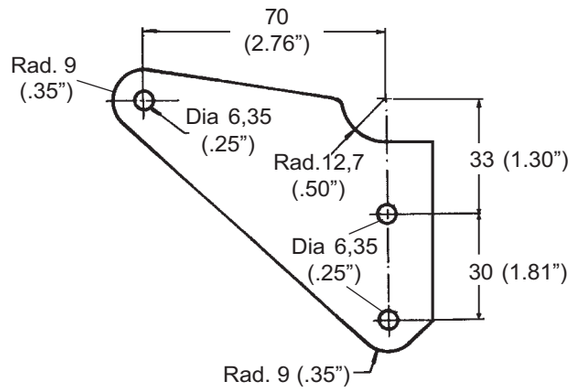
FIN

TAIL GROUP FITTING



Material
304 Stainless Steel
1,5 (.063") thickness
3 Required.

CONTROL TEE

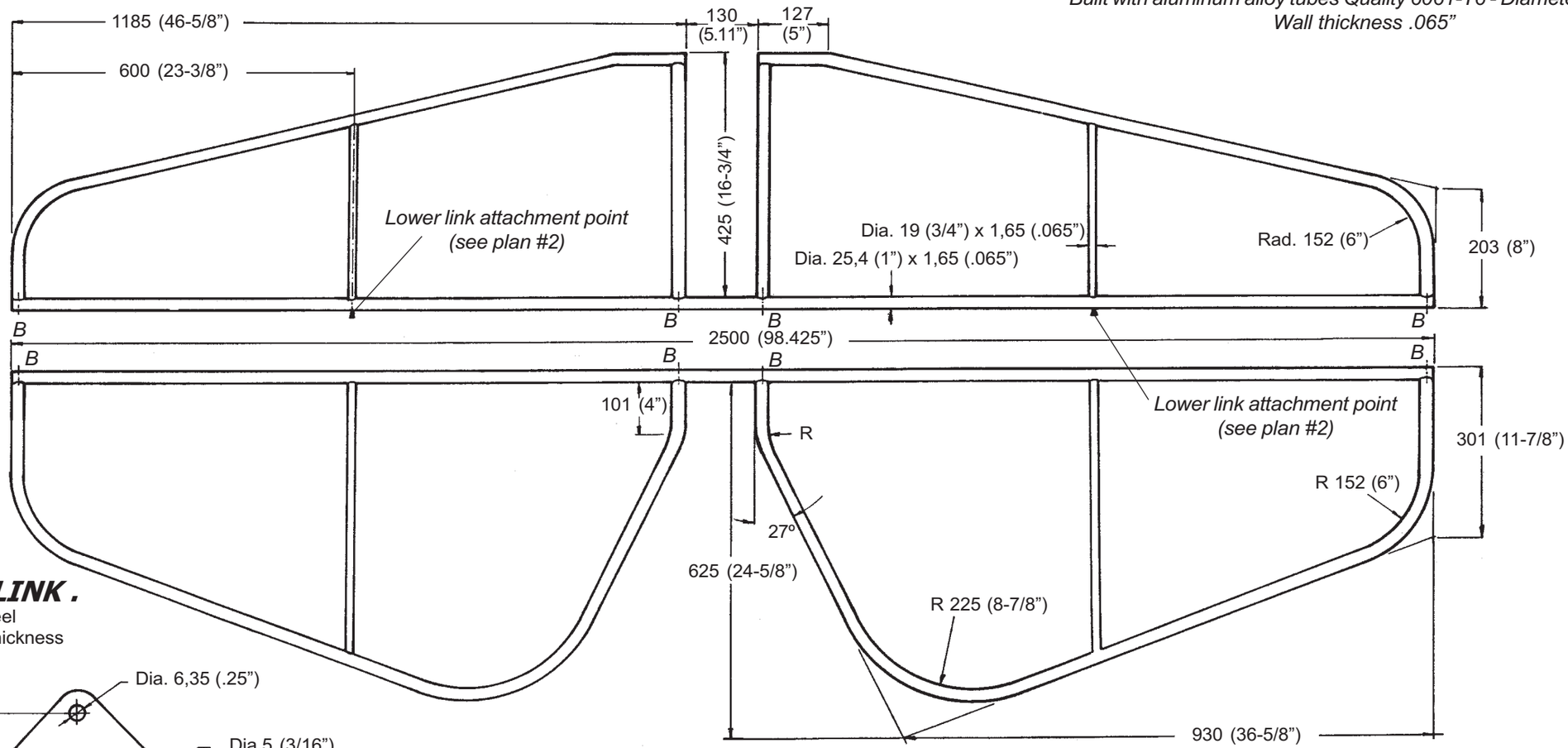


2024-T3 Aluminum
5 (.190") Thickness
1 Required

FIGHTER ULTRALIGHT -	
Tail Group /Rudder	3
Plans delivery.com Designed and drawn by Osvaldo Durana	

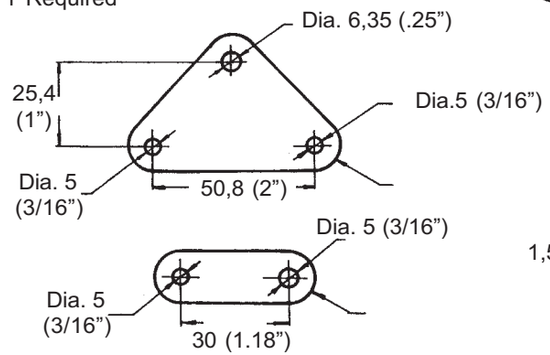
ELEVATOR .

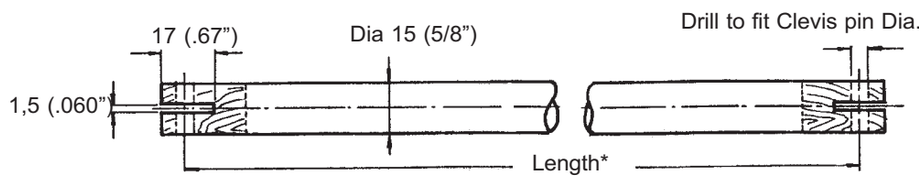
Built with aluminum alloy tubes Quality 6061-T6 - Diameter 25,4 (1”)
Wall thickness .065”



UPPER LINK .

Stainless Steel
1,5 (.063”) Thickness
1 Required





TAIL GROUP STRUTS .

Aluminum tube Dia. 15 (5/8”) x 1.65 (.065”)
2 Required

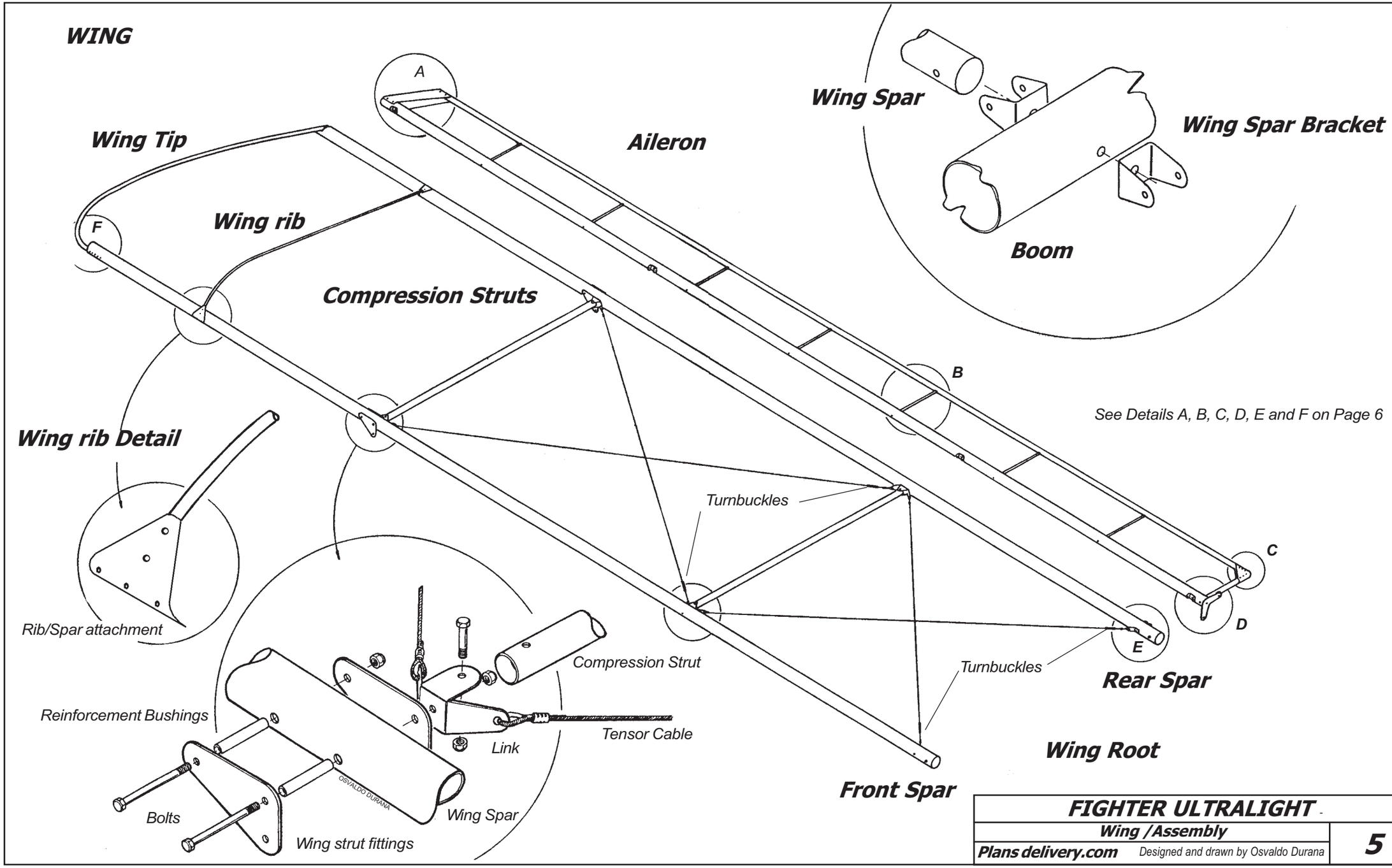
LOWER LINK .

Stainless Steel 1,5 (.063”)
2 Required

** Once the tail group is built and assembled, align it and take the exact measurement of the struts*

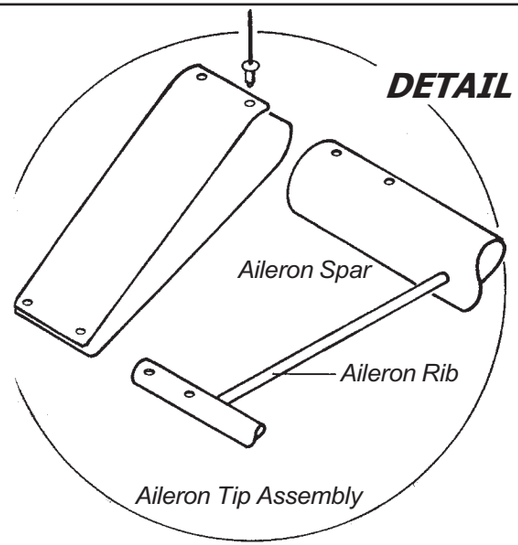
FIGHTER ULTRALIGHT -
Tail Group /Elevator
Plans delivery.com Designed and drawn by Osvaldo Durana
4

WING



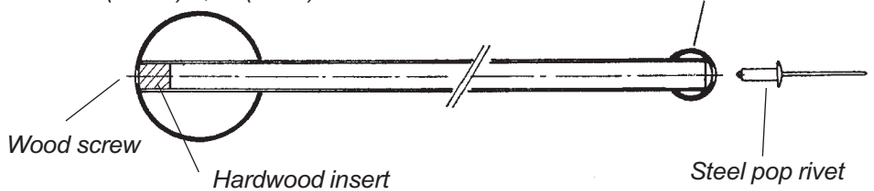
FIGHTER ULTRALIGHT	
Wing /Assembly	5
Plans delivery.com Designed and drawn by Osvaldo Durana	

DETAIL A

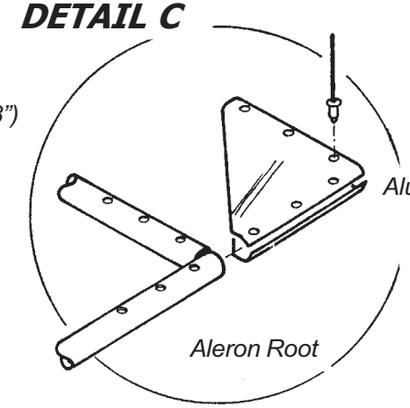


DETAIL B

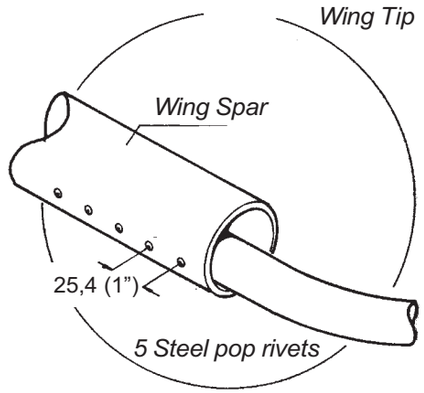
Aileron Ribs Aluminum tube Dia. 9,5
(3/8") 0,90 (.035") Wall Thk



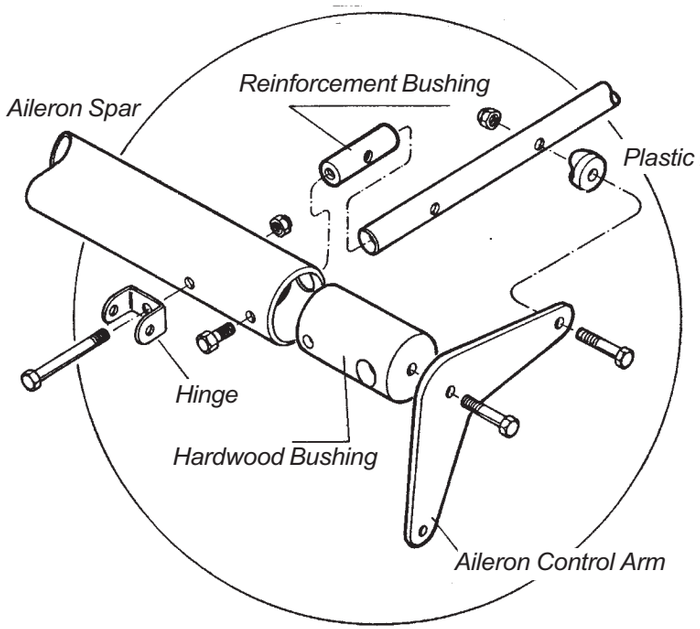
DETAIL C



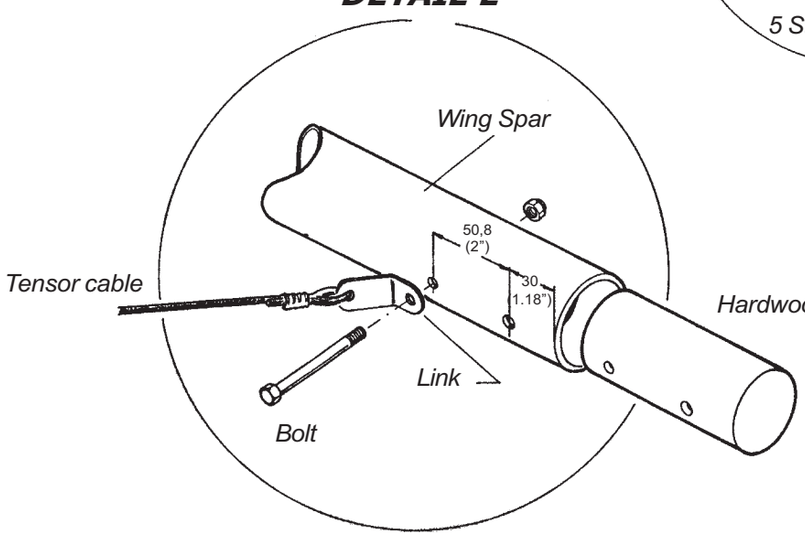
DETAIL F



DETAIL D



DETAIL E



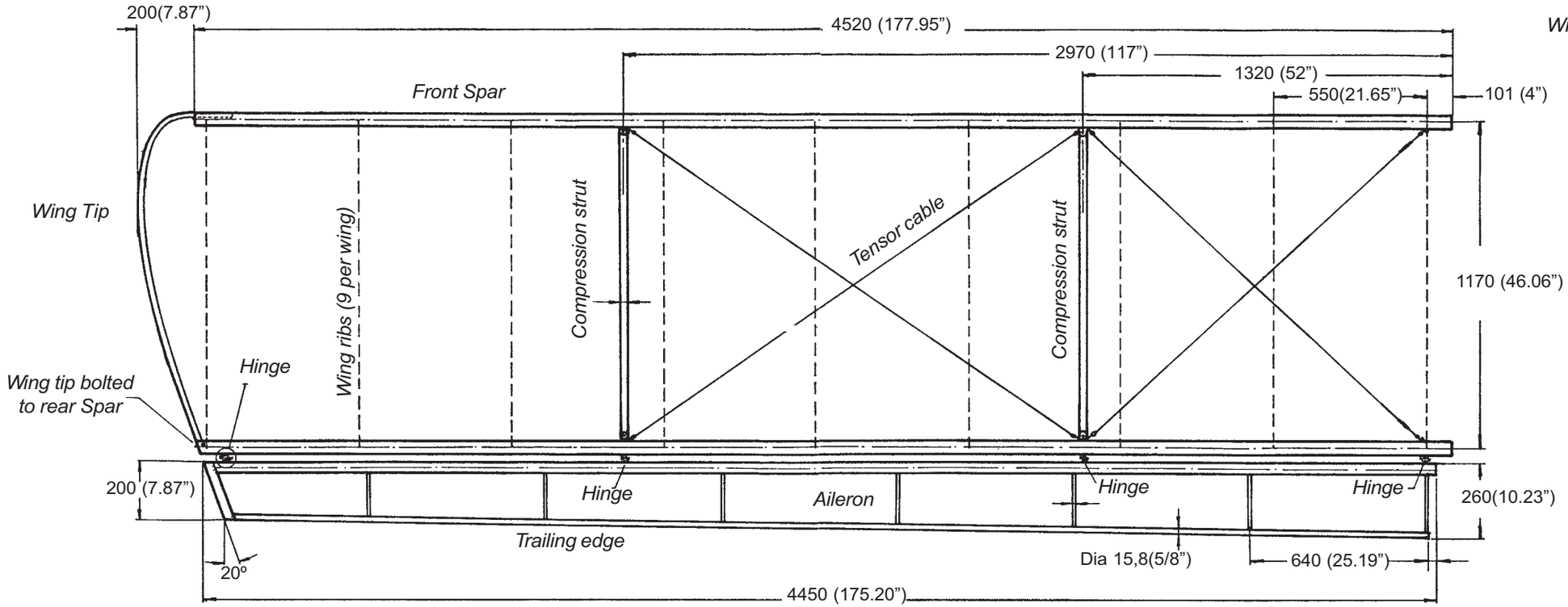
Hardwood inner reinforcement
101(4") long.
4 Reqd.

FIGHTER ULTRALIGHT	
Wing /Details	6
Plans delivery.com Designed and drawn by Osvaldo Durana	

Wing .

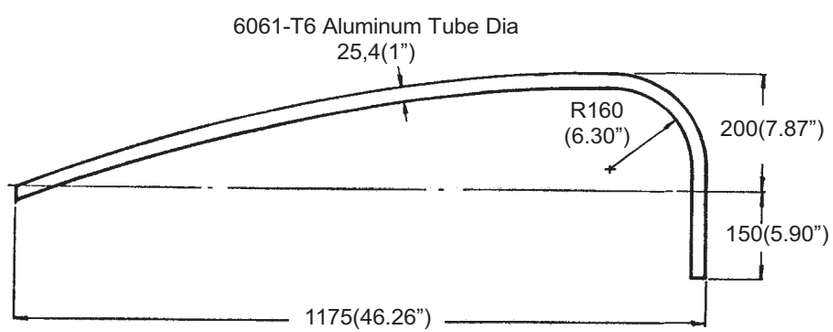
Top view

Spars: 2024-T3 Diameter 50,8 (2") -1,65 (.065") wall thickness - Compression Struts 2024-T3 Aluminum tube Dia 25,4 (1") - 1,65 (.065")Wall Thk



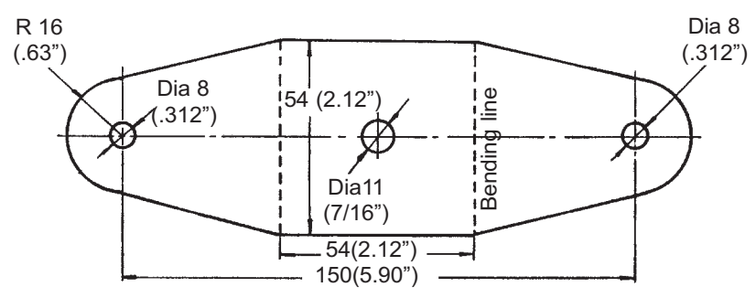
Wing Tip .

2 Required



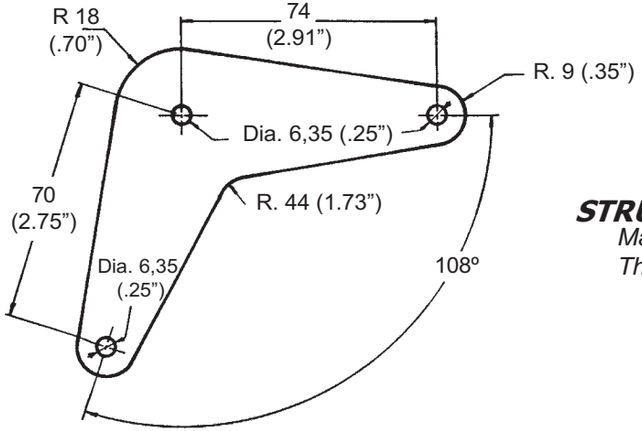
Wing Brackets .

Mat: Stainless Steel - 2,5 (.100") Thick - 4 Required



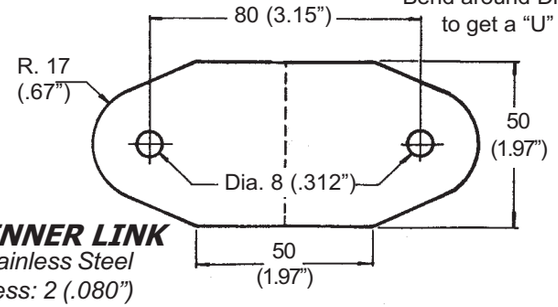
FIGHTER ULTRALIGHT	
Wing /Construction Details	7
Plans delivery.com Designed and drawn by Osvaldo Durana	

AILERON CONTROL ARM



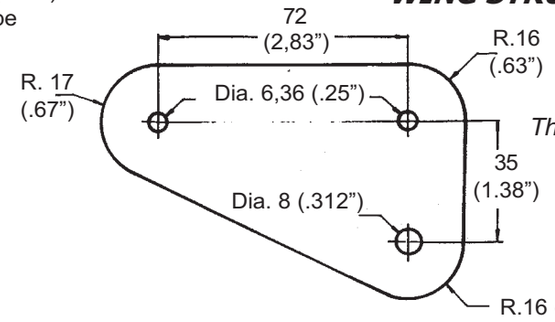
Material 2024-T3 aluminum Thickness 5 (.190") 2 Required

STRUT INNER LINK

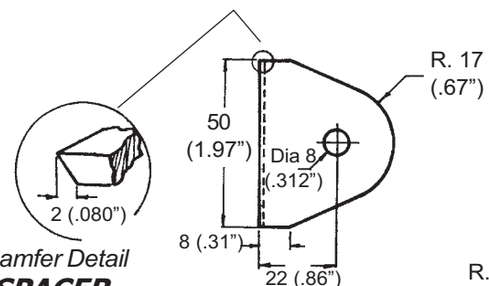


Mat: Stainless Steel
Thickness: 2 (.080")
4 Required

WING STRUT FITTING



2024-T3 Alum.
Thickness: 5 (.190")
8 Required

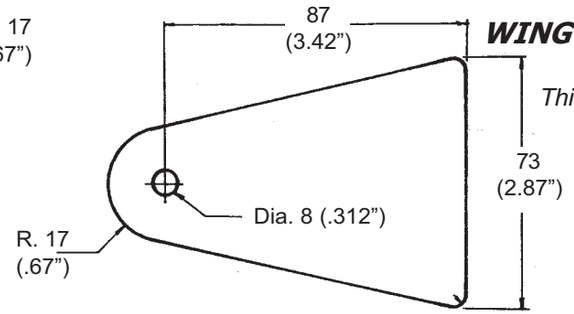


Chamfer Detail

SPACER

Mat: Steel
2 (.080") Thick.8 Required

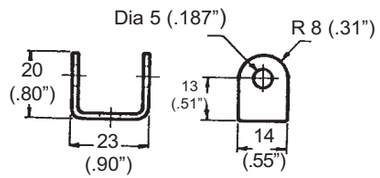
WING STRUT TIP

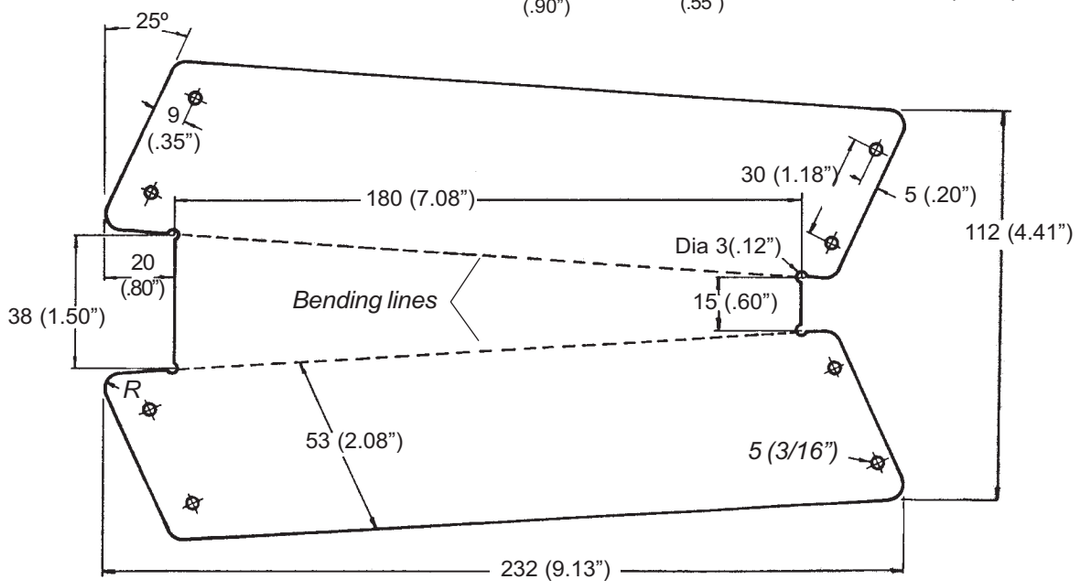


4130 Steel
Thickness: 2 (.80")
8 Required

HINGES

Mat: Stainless Steel 1,5 (.063") Thick
14 Required

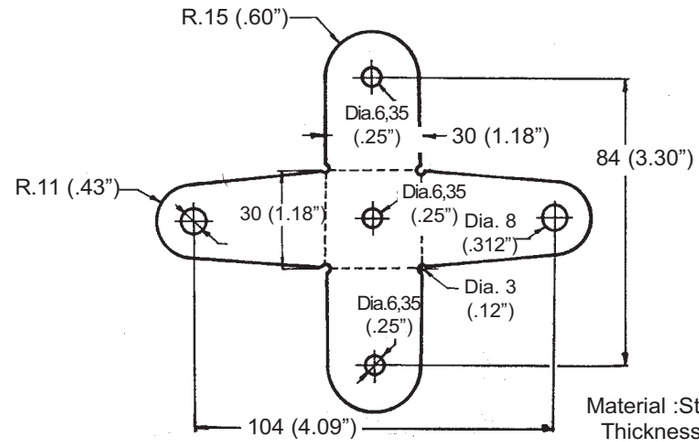




AILERON TIP

Mat: Aluminum sheet 2024-T3 - 0,7 (.025") Thick - 2 Required

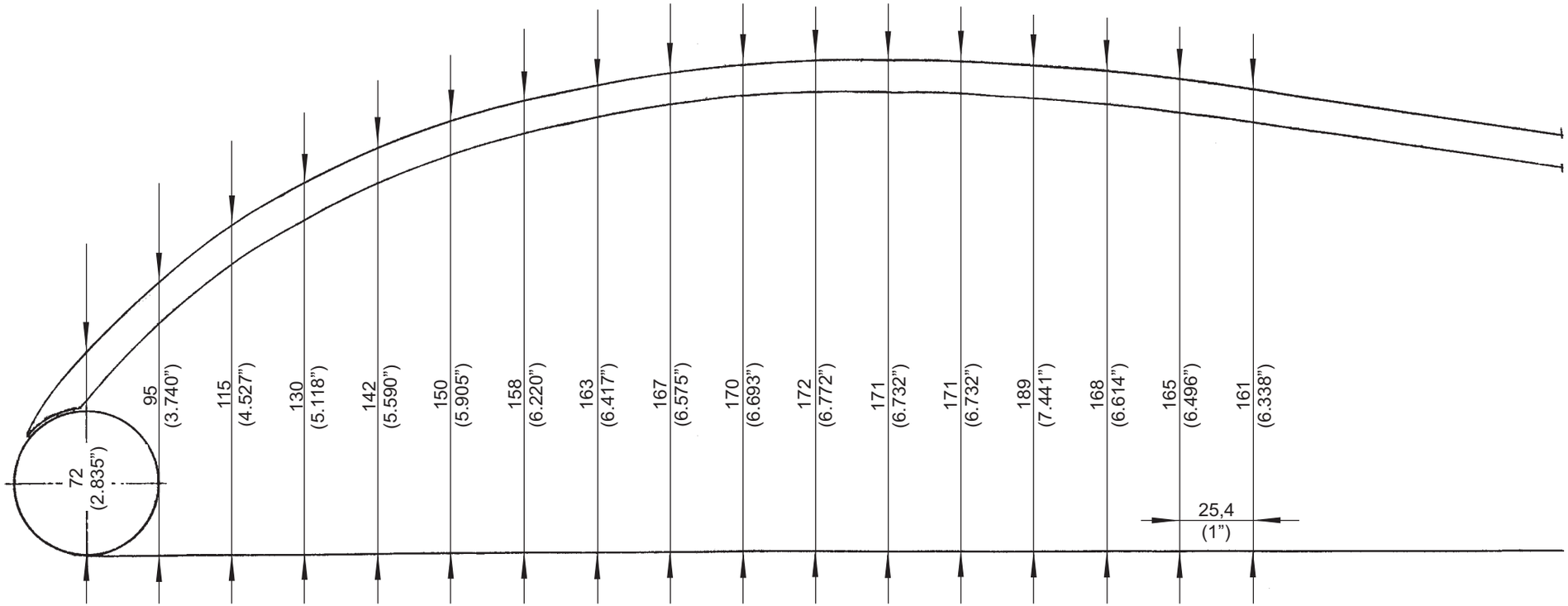
LINK



Bend 90º upward by dotted lines

Material :Stainless Steel
Thickness 1,5 (.063")
8 Required

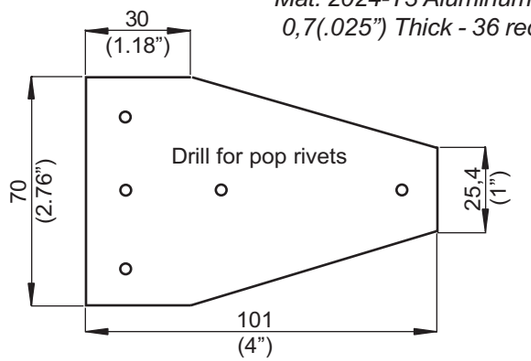
FIGHTER ULTRALIGHT -	
Wing /Construction Details	
Plans delivery.com *Designed and drawn by Osvaldo Durana*	**8**

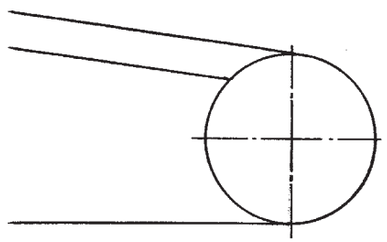


Wing ribs are made from aluminum alloy tubes Dia. 9.52 (3/8") .035 wall thickness riveted from leading edge spar to trailing edge spar.

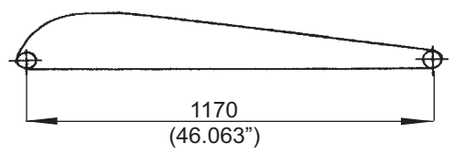
Wing Rib Attachment

Mat: 2024-T3 Aluminum Sheet
0,7(.025") Thick - 36 required



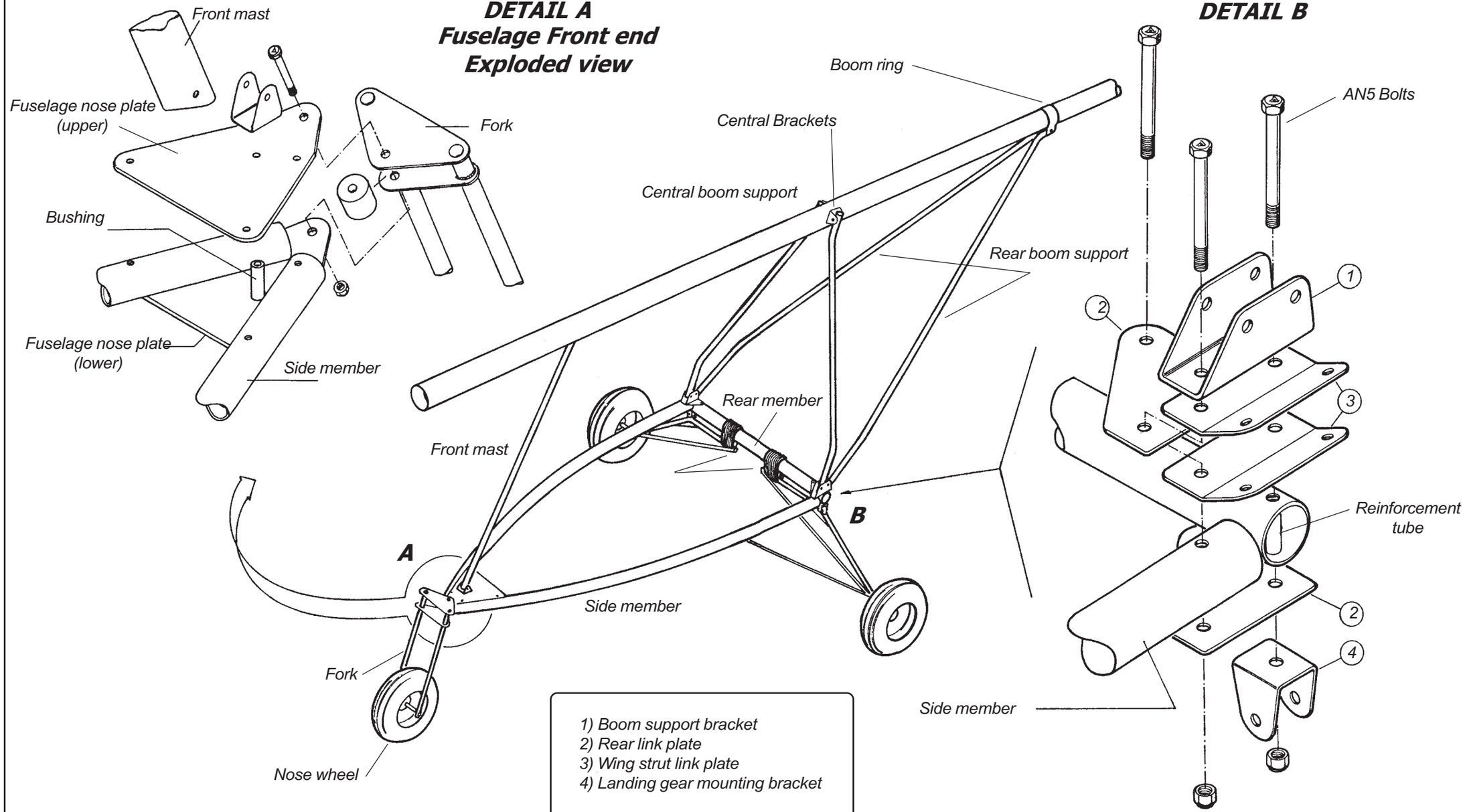


Detail rear spar



FIGHTER ULTRALIGHT -		
Wing /Airfoil-Wing rib		***9***
Plans delivery.com	*Designed and drawn by Osvaldo Durana*	

DETAIL A
Fuselage Front end
Exploded view



DETAIL B

FIGHTER ULTRALIGHT

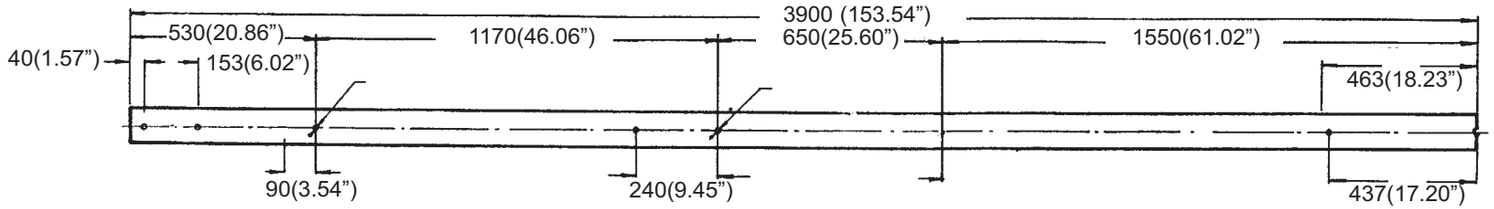
Fuselage/Cockpit - Assembly Details

Plans delivery.com Designed and drawn by Osvaldo Durana

10

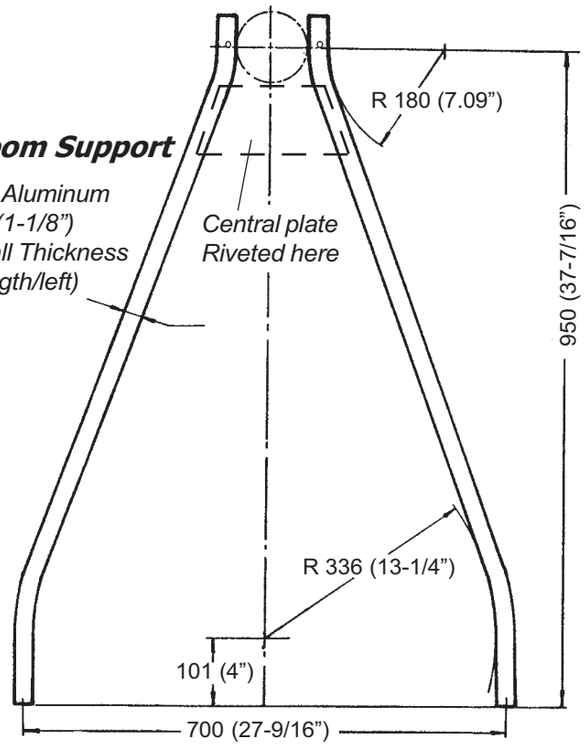
Boom

Mat: 6063-T3 Aluminum Tube
Dia 101 (4”) 2 (.078) Wall Thk



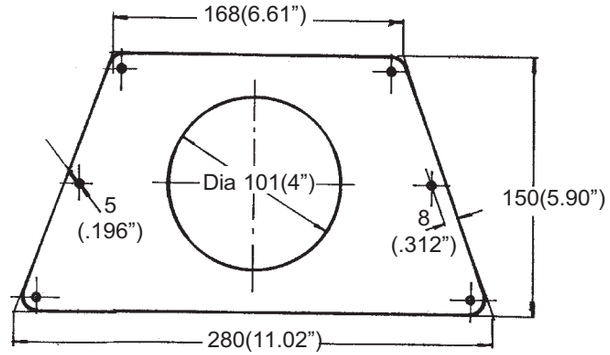
Central Boom Support

Mat: 6061-T6 Aluminum tubes Dia 28 (1-1/8”) 1,5 (.058”) wall Thickness 2 Required (rigth/left)



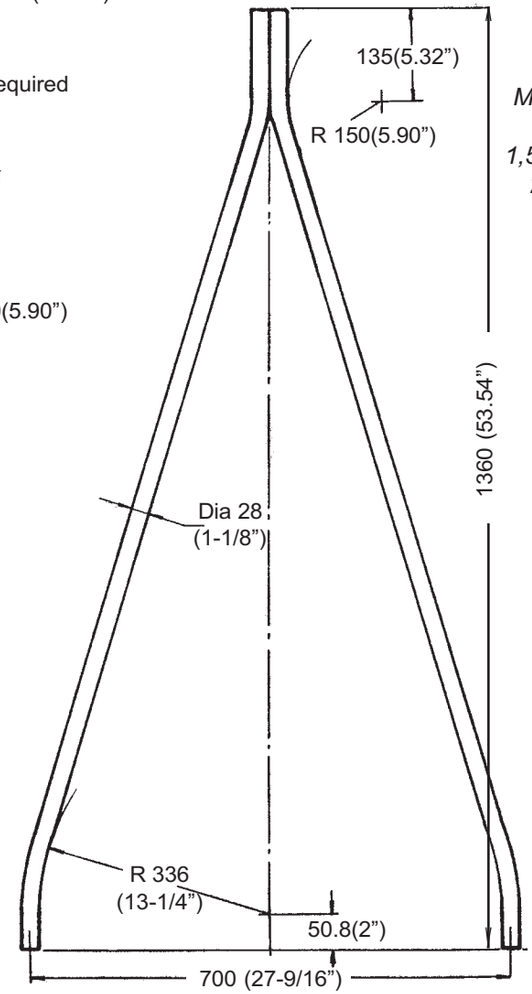
Central Plate

Mat: 2024-T3 Aluminum 5(.190”) thick - 1 Required



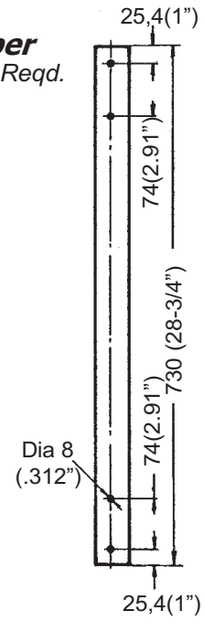
Rear Boom Support

Mat: 6061-T6 Aluminum tubes Dia 28 (1-1/8”) 1,5 (.058”) wall Thickness 2 Required (rigth/left)



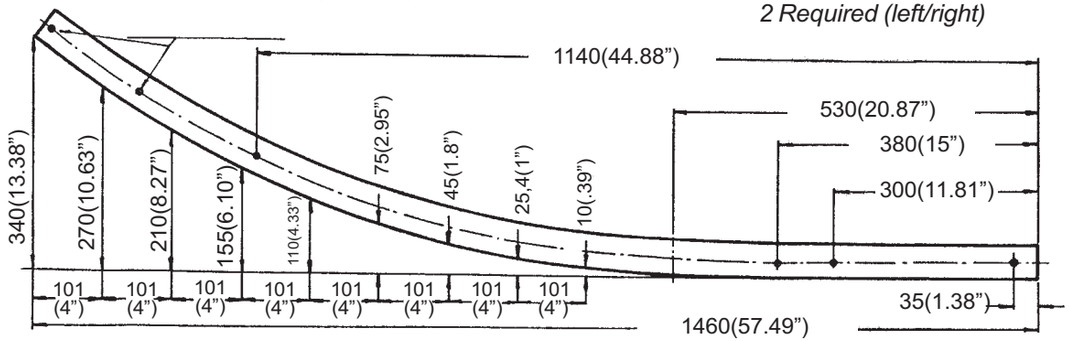
Fuselage Rear Member

Mat: same as side member-1 Reqd.



Fuselage Side Member

Mat: 2024-T3 Aluminum tubes Dia 50,8 (2”) 1,65 (.065”) Wall Thickness 2 Required (left/right)



FIGHTER ULTRALIGHT

Boom / Fuselage components

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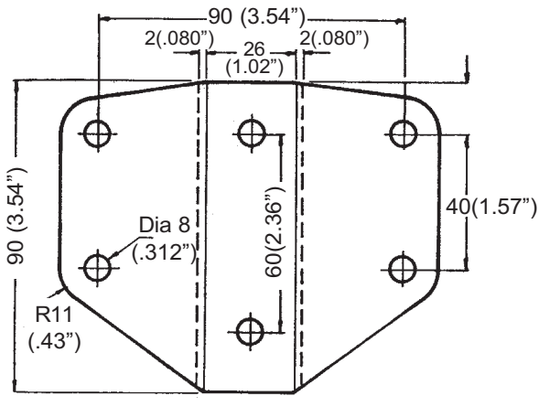
11

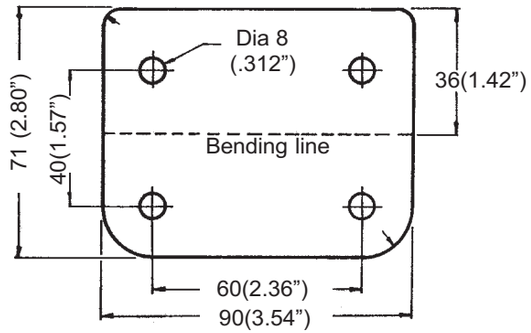


Boom support bracket

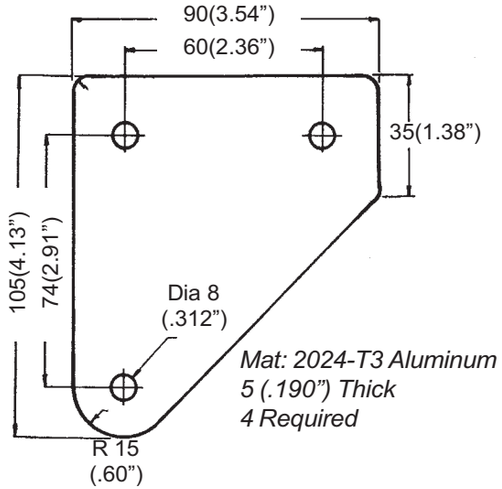
Mat: Stainless Steel 2 (.080") Thick -2 required

Wing Strut Link

Mat: Stainless Steel -2 (0.80") Thick -4 Required



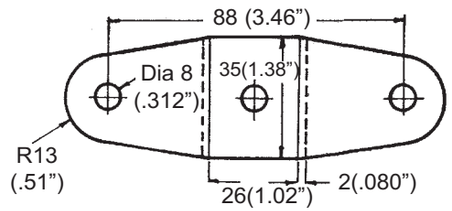
Rear Link Plate



Mat: 2024-T3 Aluminum
5 (.190") Thick
4 Required

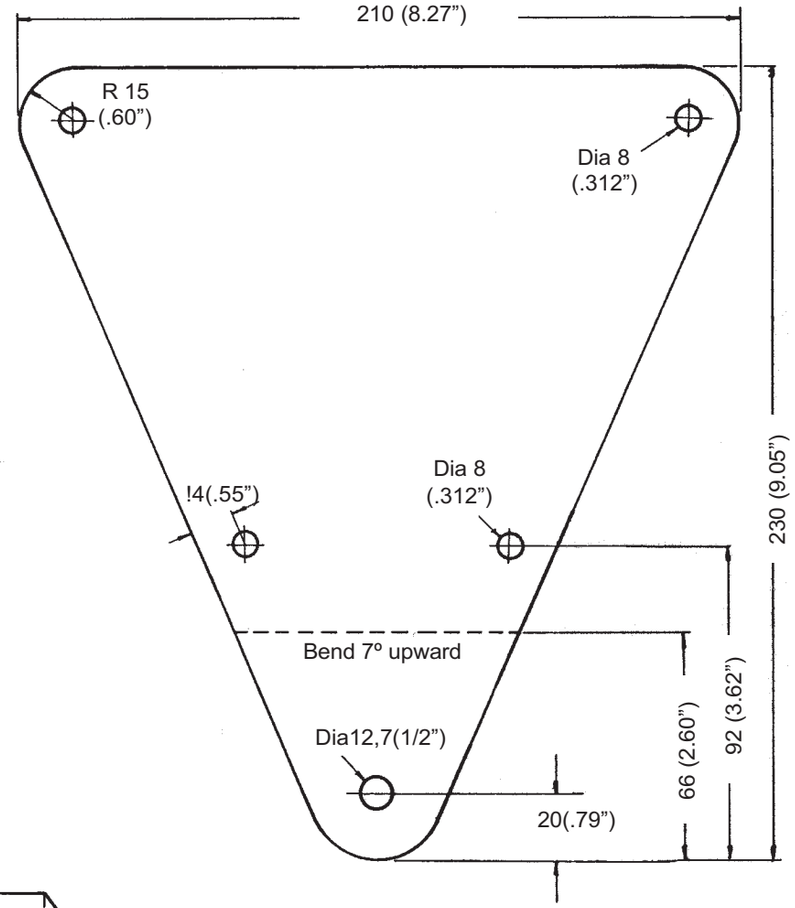
Landing Gear Bracket

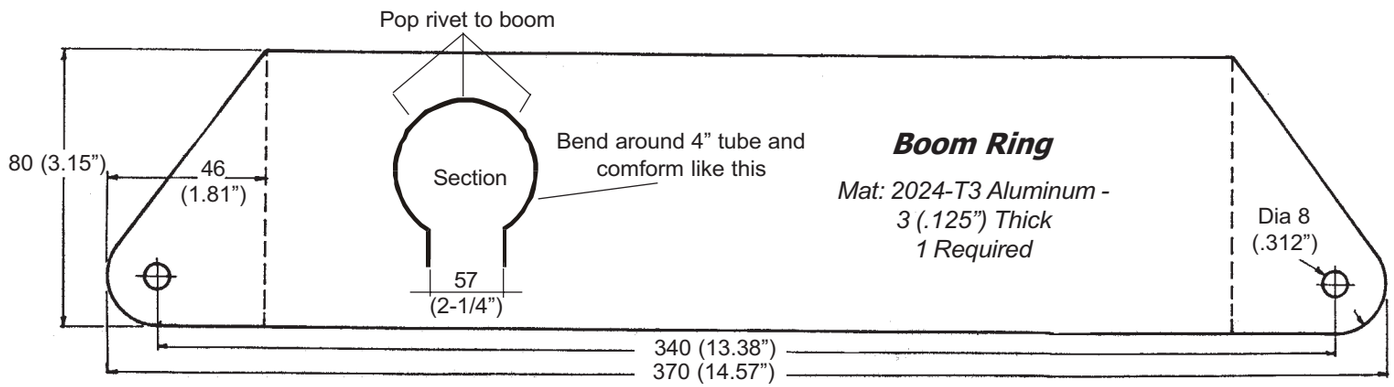
Mat: Stainless Steel
2 (.080") Thick - 2 Required



Fuselage Nose Plate

Mat: 2024-T3 Aluminum 5 (.190") Thick 2 Required
(Upper/Lower see instructions)



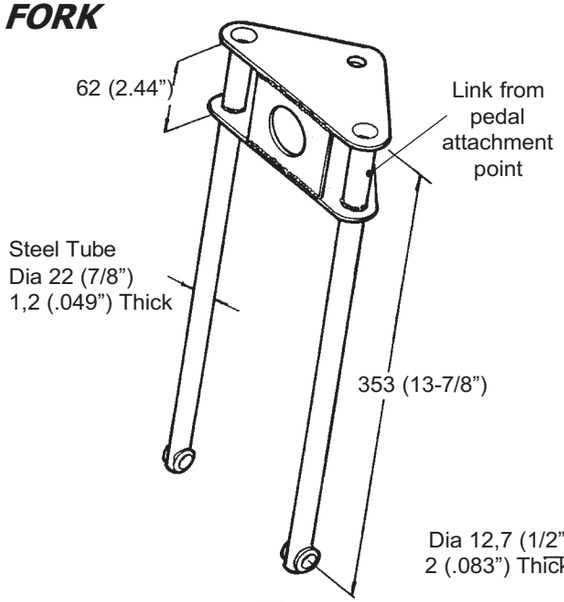


Boom Ring

Mat: 2024-T3 Aluminum -
3 (.125") Thick
1 Required

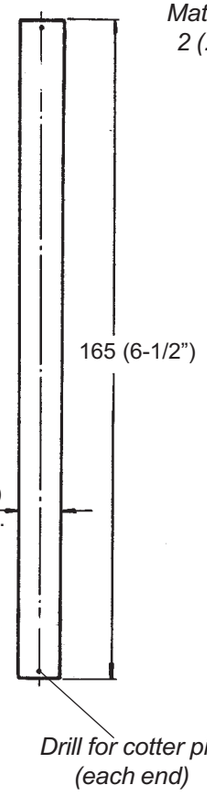
FIGHTER ULTRALIGHT	
Fuselage brackets	12
Plans delivery.com Designed and drawn by Osvaldo Durana	

FORK



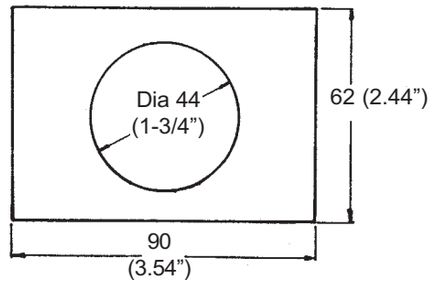
FRONT AXLE

Mat: Steel tube
2 (.83") Thick

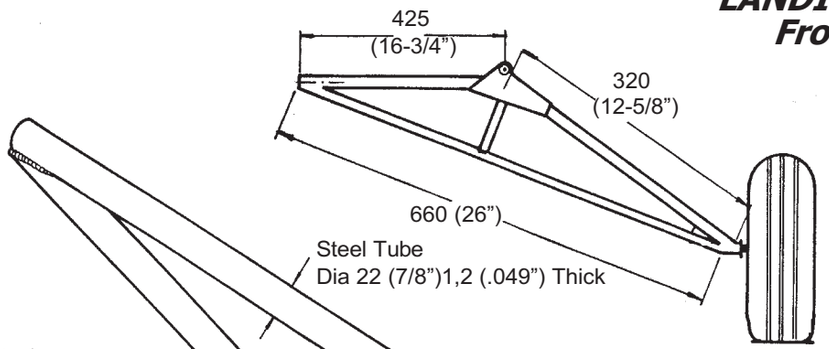


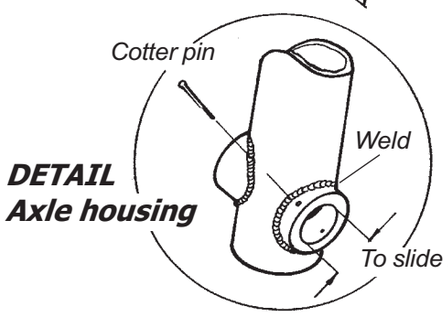
FRONT FITTING

Mat: Steel
2,5 (.100") Thick



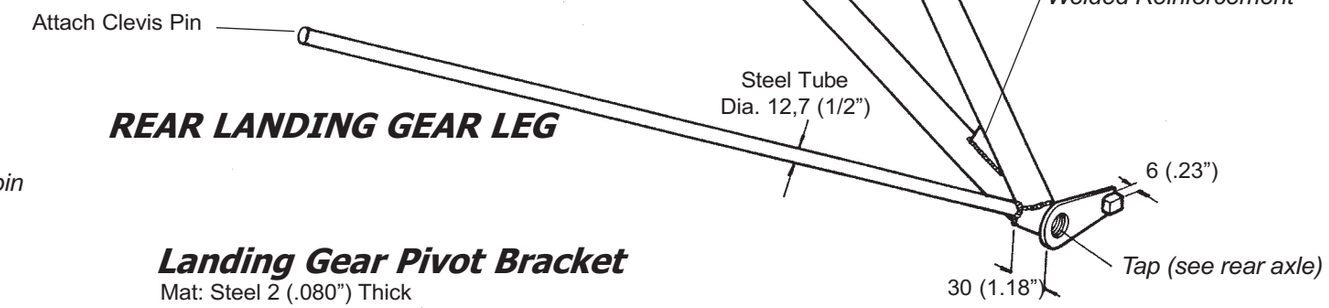
LANDING GEAR
Front View





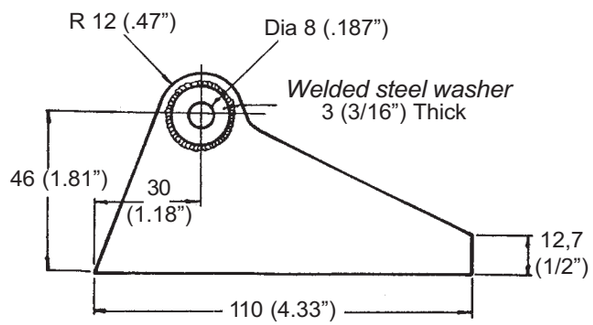
DETAIL
Axle housing

REAR LANDING GEAR LEG



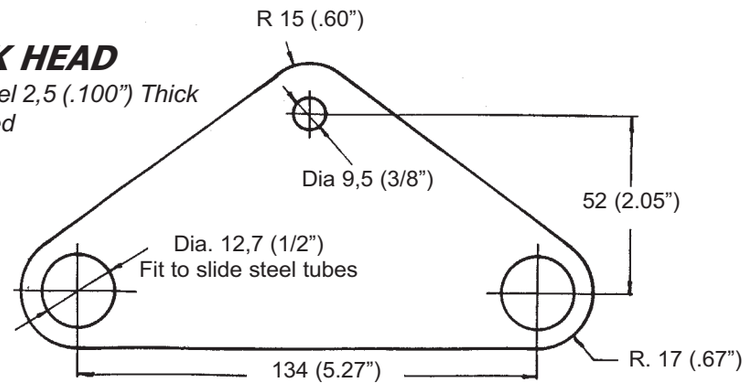
Landing Gear Pivot Bracket

Mat: Steel 2 (.080") Thick
4 required

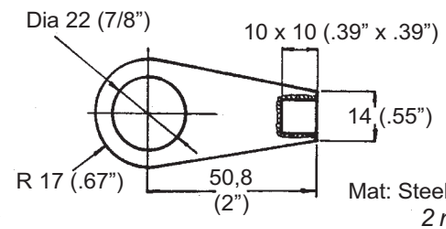


FORK HEAD

Mat: Steel 2,5 (.100") Thick
2 required



Brake Attachment Fitting



Mat: Steel 2 (.080") Thick
2 required

FIGHTER ULTRALIGHT

Landing Gear

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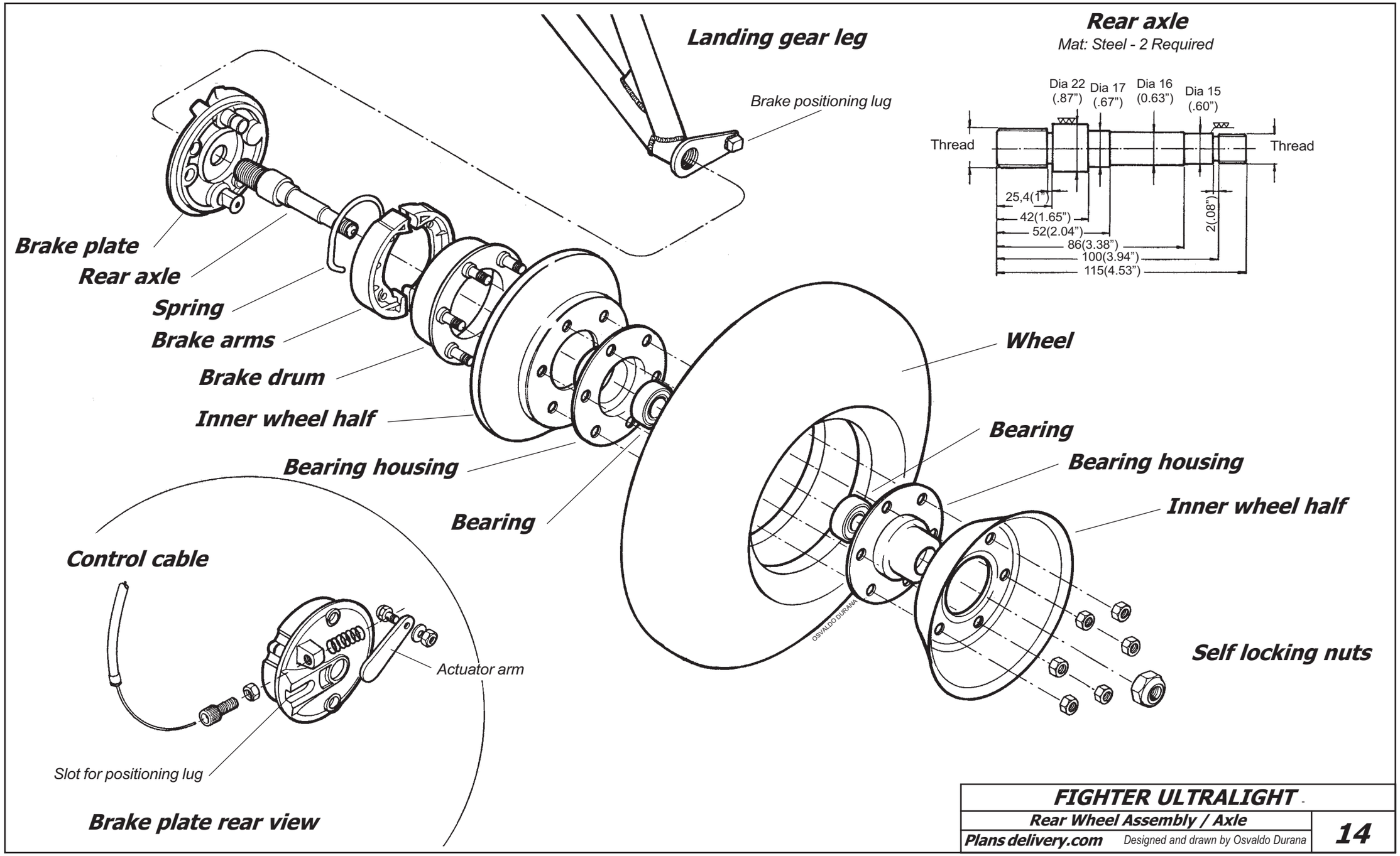

Rear axle

Mat: Steel - 2 Required

FIGHTER ULTRALIGHT	
Rear Wheel Assembly / Axle	14
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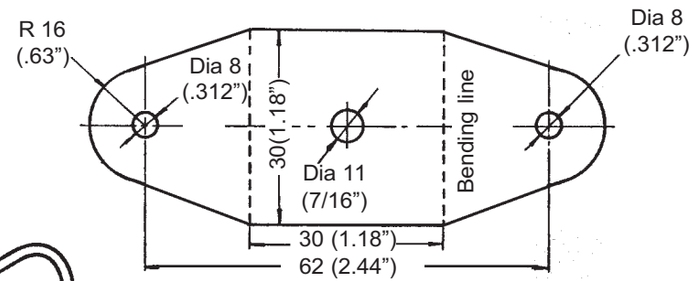
Central Bracket

Mat: Stainless steel - 2,5 (.100") Thick 2 Required



FIGHTER ULTRALIGHT -	
Fuselage /Tail Boom Assembled	**15**
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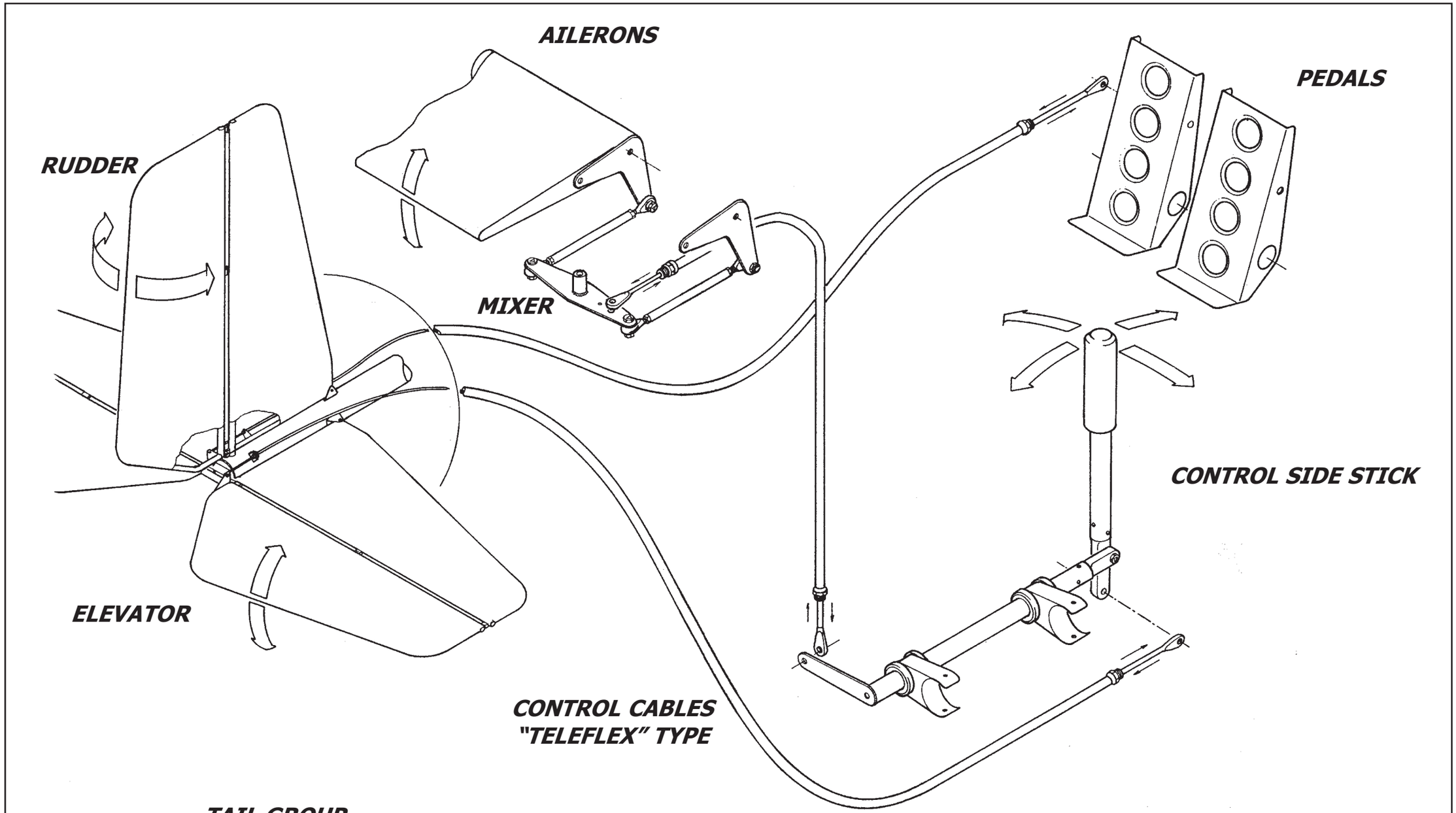

FIGHTER ULTRALIGHT	
Control System	16
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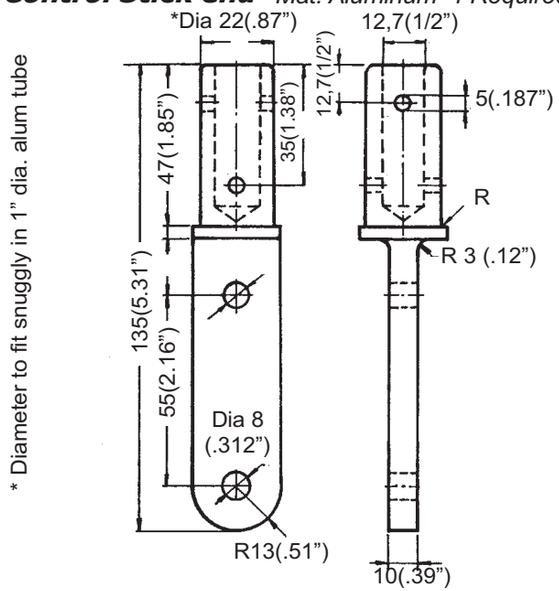
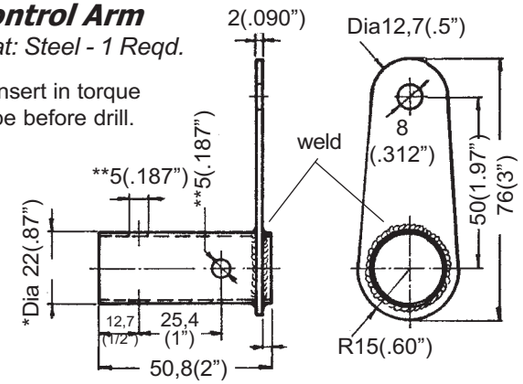
Control Stick end
Mat: Aluminum- 1 Required

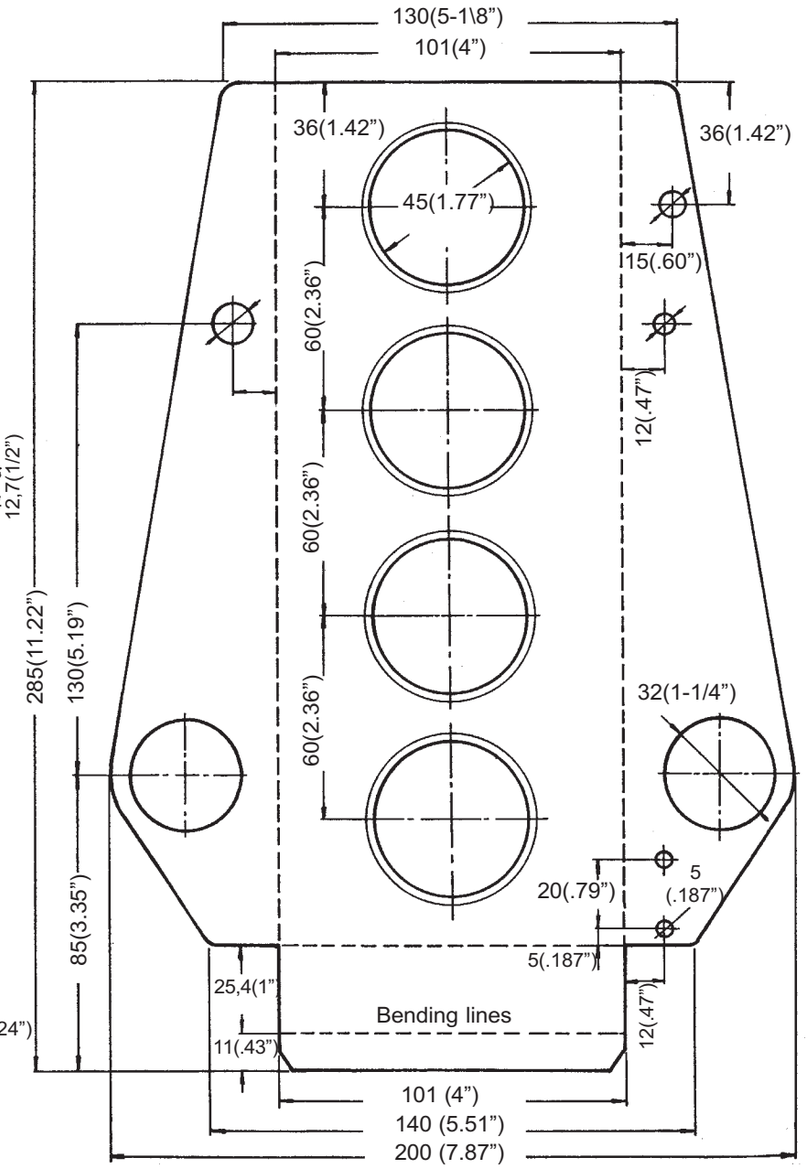


Control Arm
Mat: Steel - 1 Reqd.

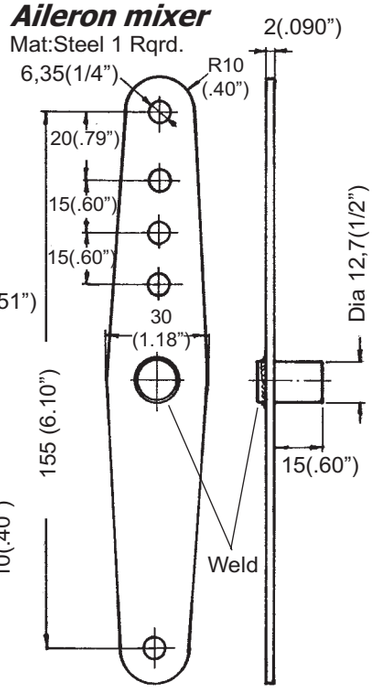
** Insert in torque tube before drill.



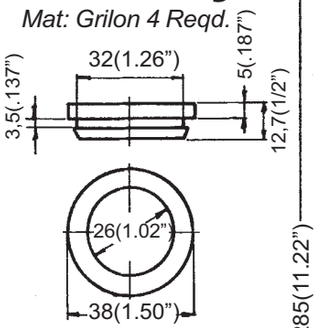
Pedal
Mat: Aluminum sheet 3(.125) thick. -2 Required



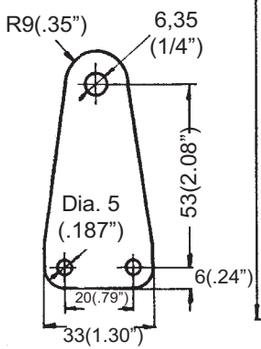
Aileron mixer
Mat:Steel 1 Rqrd.



Pedal Bushing
Mat: Grilon 4 Reqd.

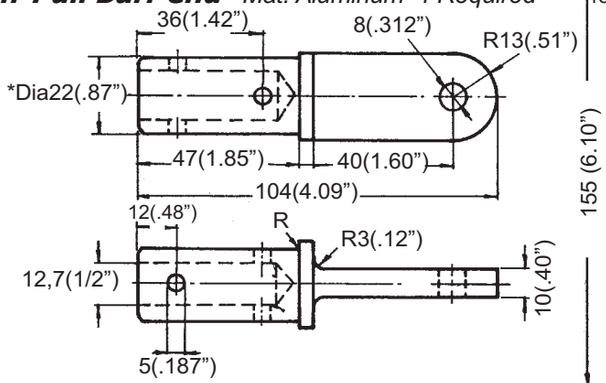


Pedal Tang

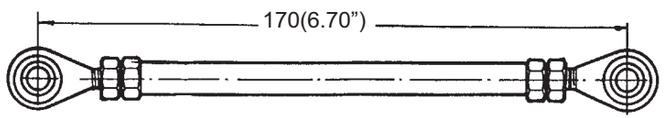


Mat: S.Steel 2(.090")
2 Required

Push-Pull Barr end
Mat: Aluminum- 1 Required



Aileron Control Link
Mat steel tube Dia 11(7/16") - 2 Required



Rod End Bearings
Male thread

Tap tubes 1/4-28 thread or weld nut at both ends

FIGHTER ULTRALIGHT	
Control components	
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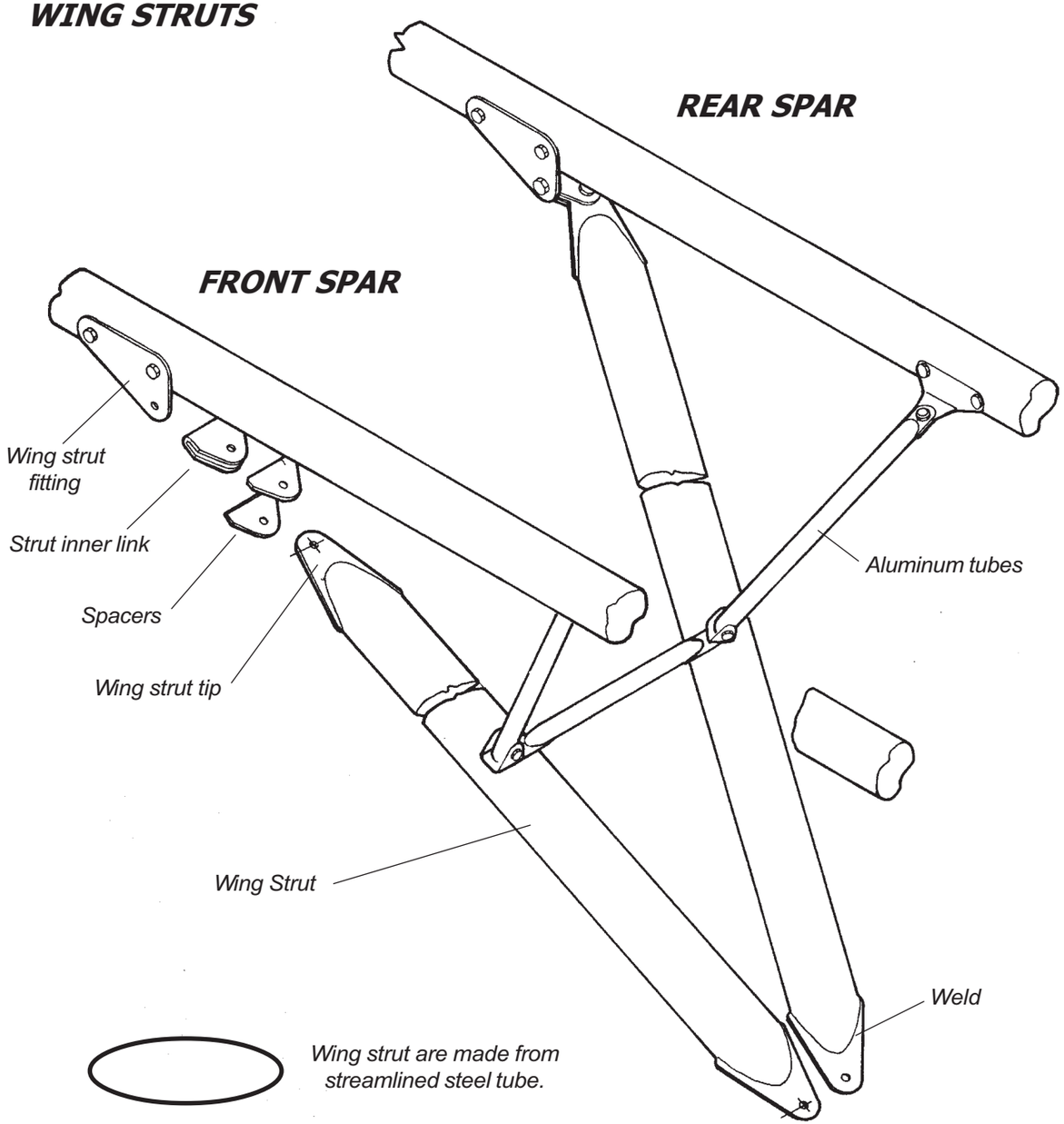
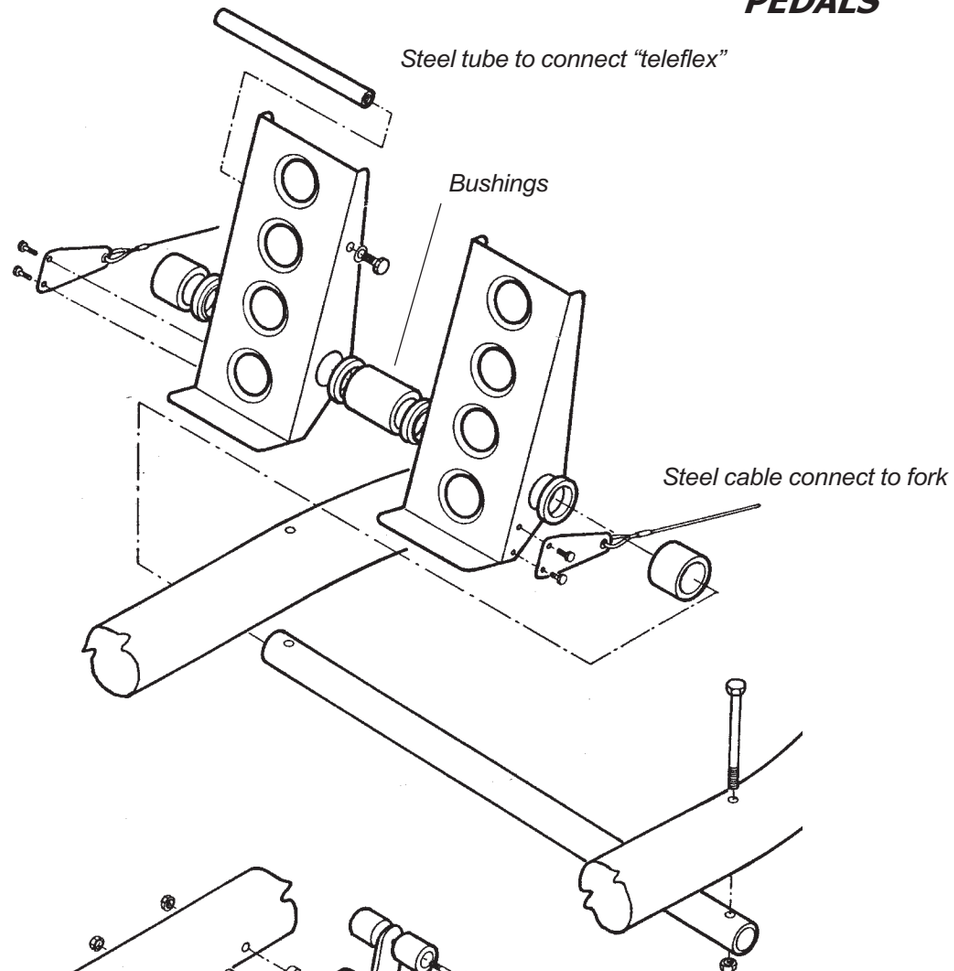
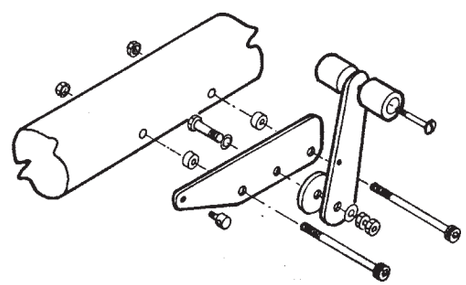
WING STRUTS



PEDALS





THROTTLE ASSY

FIGHTER ULTRALIGHT

Wing Struts / Pedals Assembly

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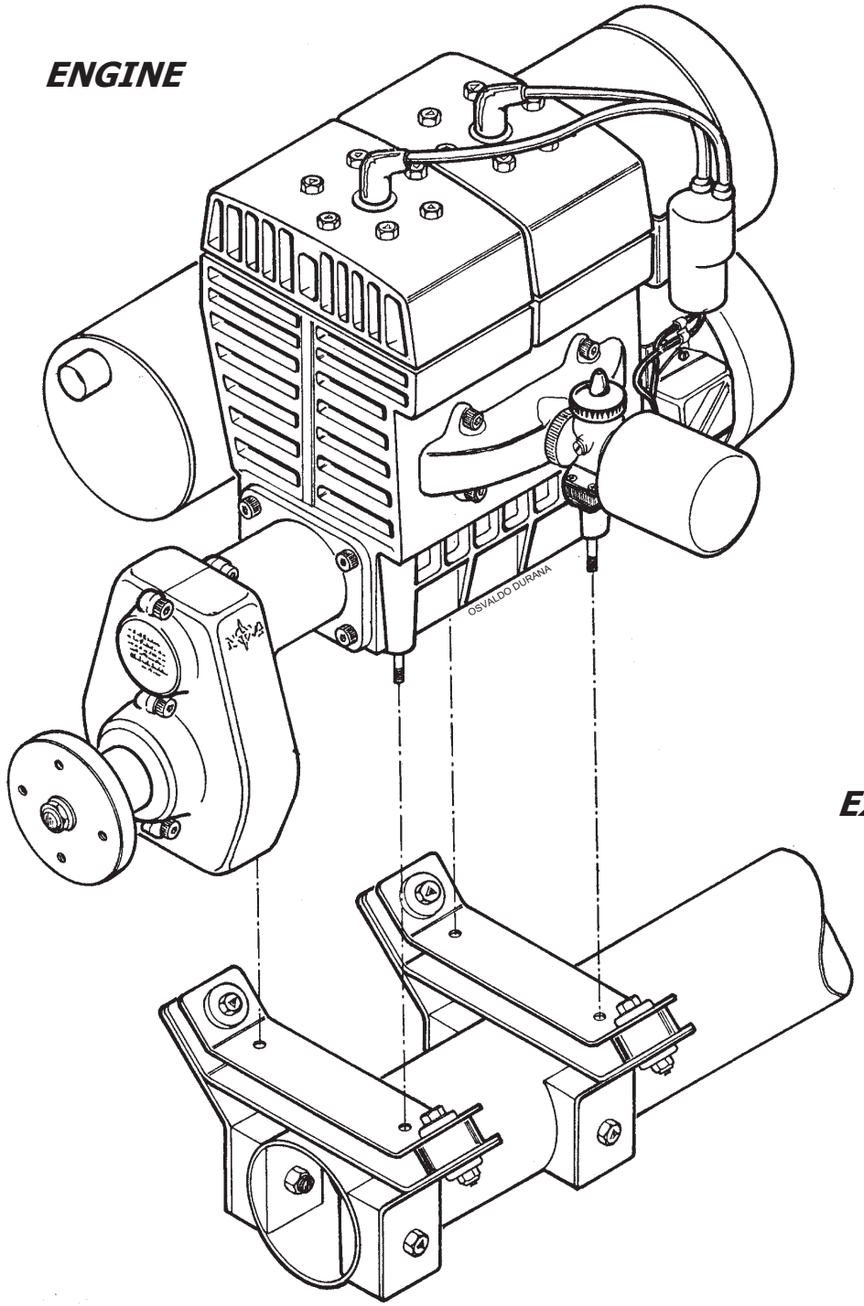
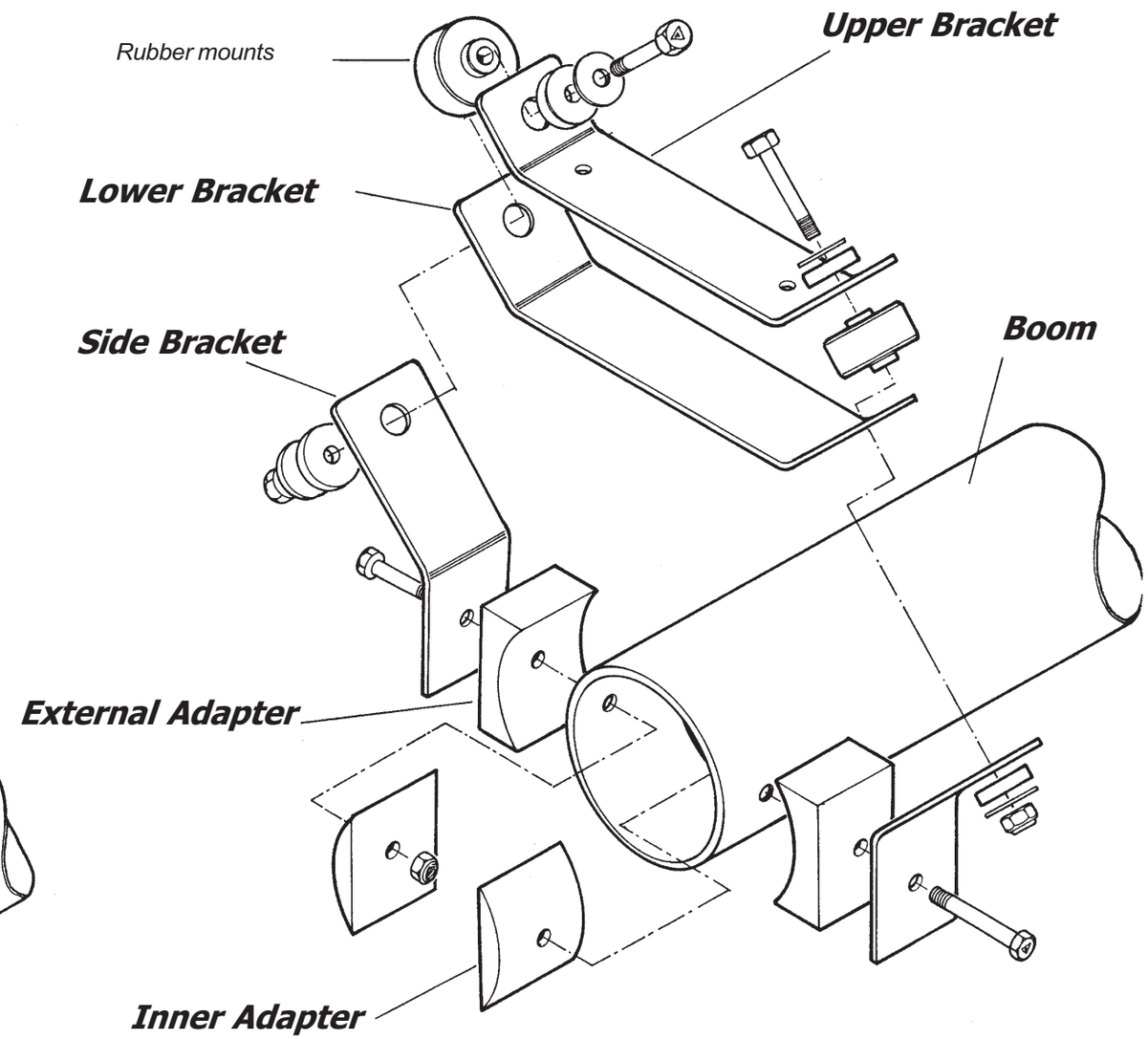
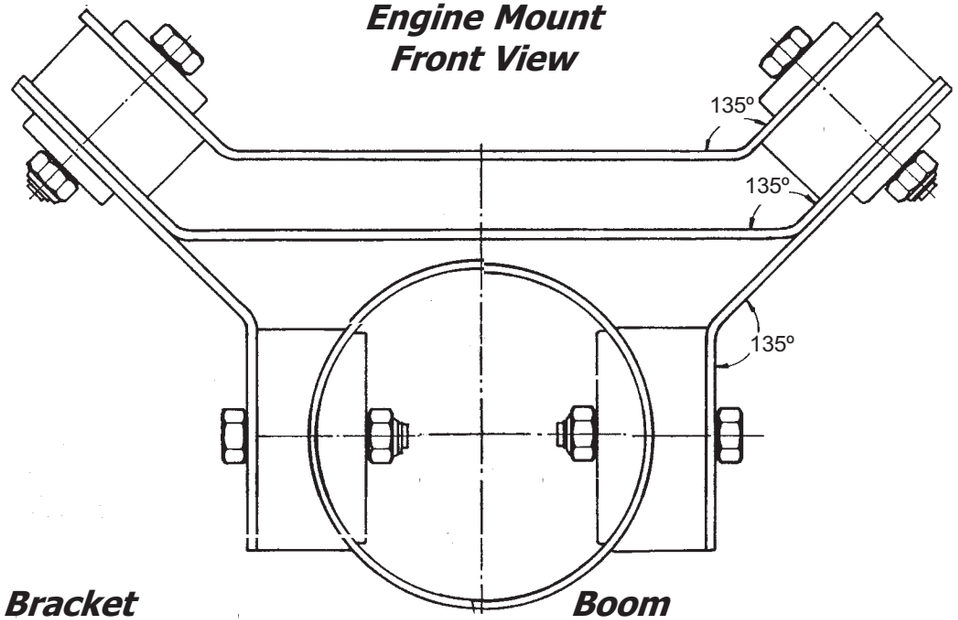




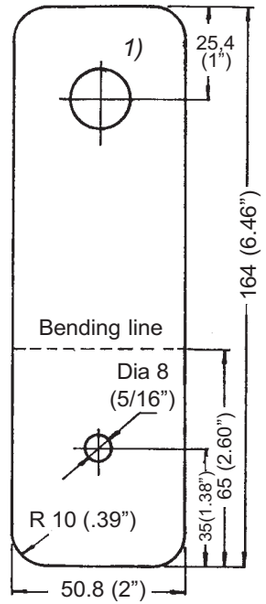
FIGHTER ULTRALIGHT	
Engine Mount Assembly	19
Plans delivery.com Designed and drawn by Osvaldo Durana	

Engine Mount Front View



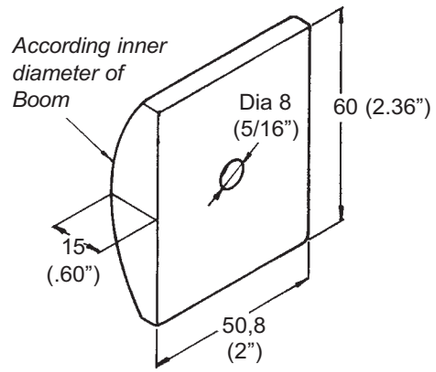
Side Bracket

Mat: Stainless Steel
3 (1/8") Thick
2 Required



Inner Adapter

Mat: Aluminum 2 required

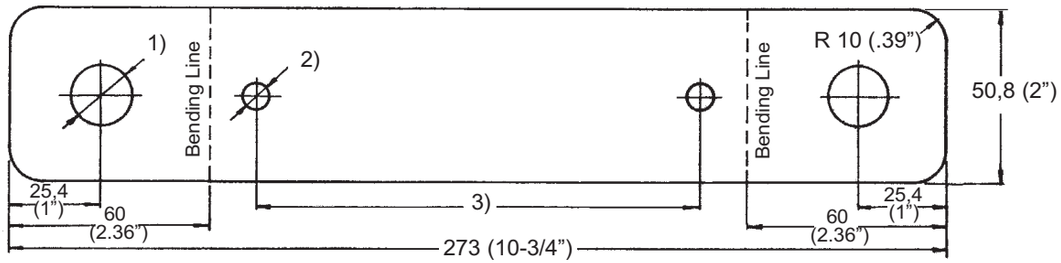


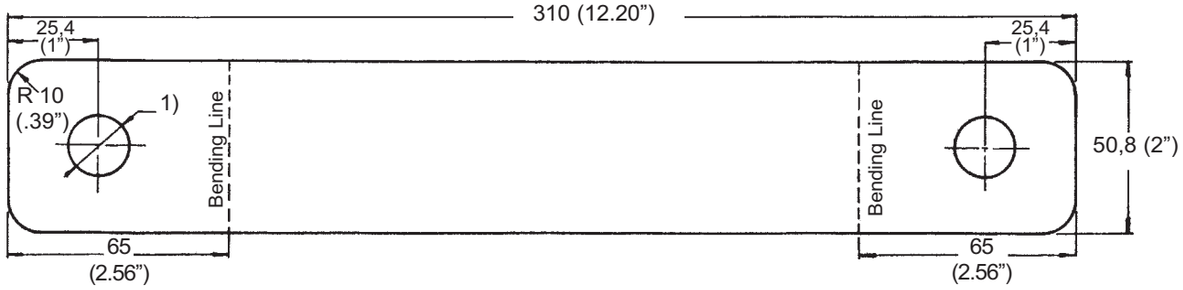
Upper Bracket

Mat: Stainless Steel
3 (1/8") Thick
2 Required

Boom

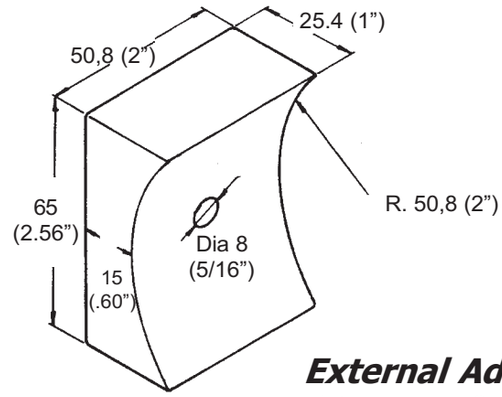
Aluminum tube Dia. 101 (4")





NOTE

1) Diameter according Rubber mounts
2) Diameter according engine bolts
3) Length according engine



External Adapter

Mat: Aluminum 2 Required

FIGHTER ULTRALIGHT

Engine Mount Details

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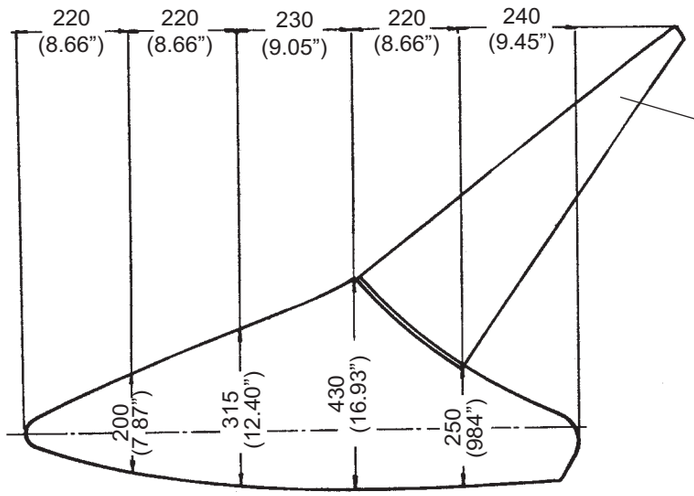

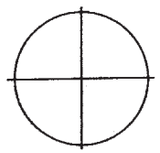

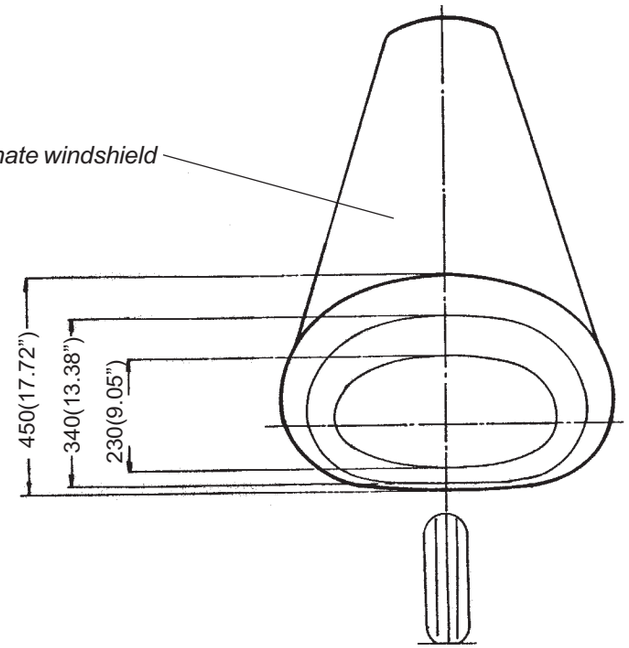

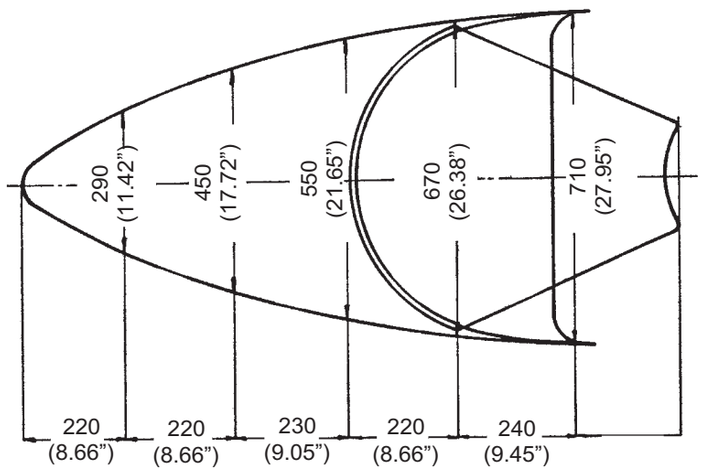

FIGHTER ULTRALIGHT	
Cockpit Enclosure Three view	21
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Fighter Ultralight
Building guidelines

Welcome! You are about to get involve in one of the most rewarding projects that you can make with your own hands:
An ultralight aircraft that will bring you hours of excitement and fun!
Before starting, take a moment to study the plans, so you can understand the whole project and how each part are made and assembled.

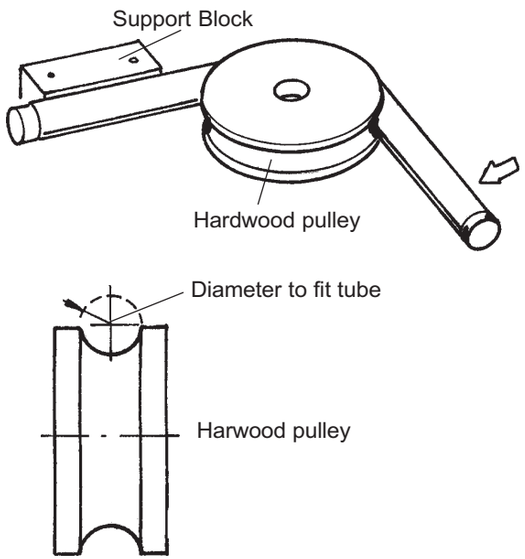
Building process

It is recommendable to start with the tail group; this will give you the experience needed to continue with more demanding or complex parts.

Your workshop and tools
This ultralight can be build in an average home garage, however more space will be required to assemble the complete aircraft.
Put special attention to illumination of your work area, working in a poorly illuminated area will get you tired sooner and also prone to commit mistakes (some of them can be costly and some dangerous)
Keep your shop clean and organized, which will save you time and effort.
Equipment needed:
A strong worktable is a definitive must.
Measuring tools:
Venier caliper, metallic ruler, measuring tape, square, center punch, felt point marker pen.
Hand tools:
Hammer, hacksaw with several spare blades (with different number of teeth per inch, to cut aluminum and steel) pop riveter, files (flat and round, 2nd and smooth cut) pliers, aviation snips, combination wrenches, deburring tool, reamers.
Equip your worktable with a medium size vise to hold the parts been made.
Drill and drill bits, a bench drill press can also be a great addition to your shop.

Don't forget the safety equipment like eye protectors, gloves, and respirators, always protect your eyes when drilling or working with power tools.
Well, you got the space, the tools, get some raw material and start...

Building the Tail group
This is the best starting point, especially to those of you who need to gain practice in mechanical constructions.
In the page #2 you can see the tail group assembly and how it is fasten to the boom tube.
In page # 3 you have all specifications needed for building each element.
Begin with the fin, it's the simplest part of the tail group.
Bending the tubes
If you don't have a tube bender, you can make your own bending jig
Using a hardwood pulley as depicted in the following drawing.



Fasten the pulley and the support block to your worktable.
Before cutting the tubes to be bend, be sure to allow material in excess.
Insert a plug into one of the tube ends, pour dry sand inside the tube, tap gently to compact the sand inside and place another plug on the other end, the sand helps to avoid deformation in the tube when it is bend.
Once the tube is placed in the bending jig, secure it against the pulley with the support block and start bending it very slowly, don't try to bend it in one stroke, you will get wrinkles in the whole bend.
The bending is made little by little moving the tube forward in small increments till the curve is complete.
Draw the desire curve as a guide in the floor or in a board and use it to check the progress of the curve, placing the tube frequently against the drawing. Try not to over-bend the tubes, it will be almost impossible to un-bend.
The most difficult part of this operation is to obtain symmetric o equal curves as the ones required in the elevator, but don't dismay, with some practice you will be able to create good curves.
After cutting the tubes to the required length use a small round file or a deburring tool to clean the inside part of the tube.

The brackets are made from stainless steel sheet, this material is very tough and you will need well sharpened drill bits to make the holes, make them smaller than the diameter required, then use a reamer in order to enlarge the holes at the right size (the bolts should fit snuggly)
Draw the contour of each bracket in the steel sheet, mark the holes with a punch marker, cut along the lines, clean the cuts with a file and bend as needed, only then make the required holes.

In every assembly check the lengths of the bolts, once tighten with a nut (self locking nuts) only two o three fillets of the thread should be visible.
If you want to assemble provisory the parts don't use self-locking nuts, but remember to replace them when the assembly is definitive.

Use only stainless steel pop rivets; the aluminum rivets will not have the strength needed.

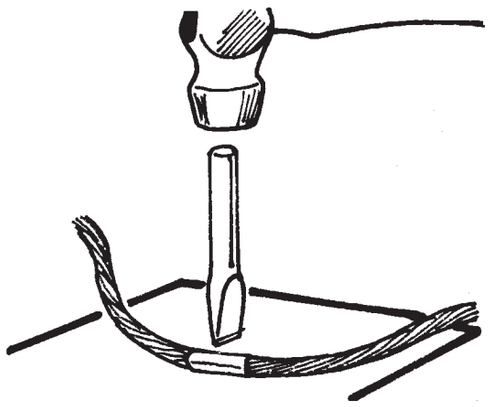
The elevator is linked to the rudder with two struts, which give strength to the tail and help to maintain the rudder and the elevator at 90 degrees from each other. You will have to verify the length of each strut (they should be identical) measuring it once the tail group is finished and assembled.

The wing
As you study the pages # 5; 6 and 7 you will realize that the wing is not as complex as it may seem.
I recommend you to start with the compression struts, these parts are made from 1" diameter aluminum alloy tubes, cut them at the indicated length and then make the stainless steel links (page 8)

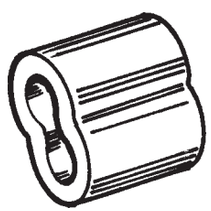
After cutting the spars and prior to start assembling the wing it is advisable to get a large board where you can place and assembly the complete wing, since the dimension of each wing is more large than the average worktables, you can enlarge the working surface of your table or bench, by placing a particle board over it.
It's a good idea to nail wood blocks to the table in order to secure the wing spars and other wing elements being added to the assembly.

Page 5 shows the wing strut fittings bolted into the spar with two reinforcement bushing, which are made from aluminum tubes.
(Read Reinforcement bushing)

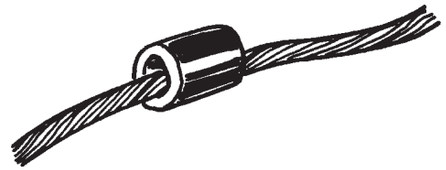
Once the spars and compression struts are bolted together, you can connect them with the tensor cables which will give the wing an extraordinary rigidity
The wing tip tube is riveted to the main spar as indicated in page 6 (detail F) and bolted to the rear spar.
Tensor cables
The following drawings show you step by step how to make them.
The cable used is 1/8" x 1 x 19 steel cable that can be galvanized or stainless.
(Diameter 1/8" x one strand of 19 wires)
Be sure to measure correctly each cable before cutting them.



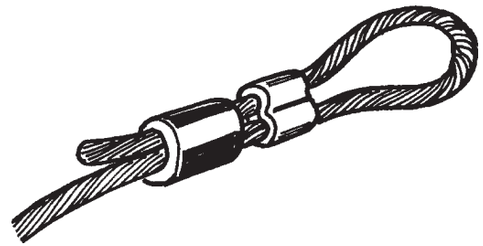
To cut the cable, wrap it with electrical tape and cut it with chisel and hammer (never cut them with a welding torch, doing this could modify their mechanical properties)



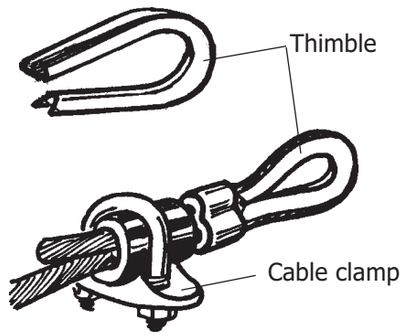
This is a Nicopress sleeve that will be use to assemble the cables.

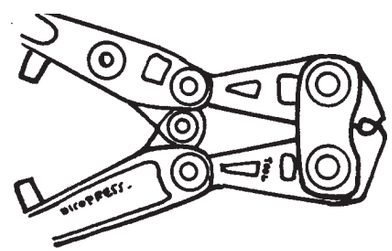


At the end of the cable, slide a short piece of rubber hose.
Now slide the nicopress sleeve, make a loop with the cable and pass the end of the cable again through the nicopress and the hose.



In the eye formed by the cable, put a thimble and adjust all the assembly, you can use a cable clamp to keep them in place.





Nicopress Tool

Now with the Nicopress Tool, you can compress the nicopress sleeve (usually making three grooves along sleeve's length), after that you can take away the cable clamp and the hose.

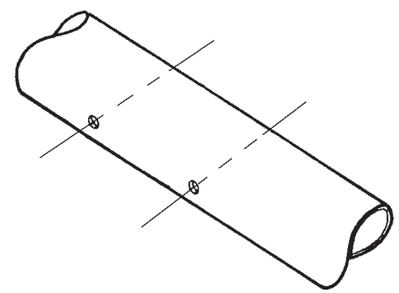
Now you can start making the wing ribs, according to the drawing in page 9, to make all ribs equal, cut a pattern from a ½ inch wood slab and use it to bend the ribs.
Cut the end of every rib as shown in page 9 to fit over the main spar.
9 ribs are required for each half wing, and are riveted to the spars with the attaching fitting (made from aluminum sheet)
Use a square to align each rib at 90 degrees from the spars and perpendicular to the span.

Ailerons
Measure and cut to the required length the aileron spar from an aluminum tube diameter 38 (1-1/2") mark the position of every aileron rib and drill a small hole through the spar, enlarge the hole in the inboard face of the spar to accept the aluminum rib (3/8" diameter tube) the trailing edge tube is fastened to the ribs with pop rivets.
Once finished, place the aileron next to the wing in the right position, mark the position of each hinge, drill and bolt them in place.

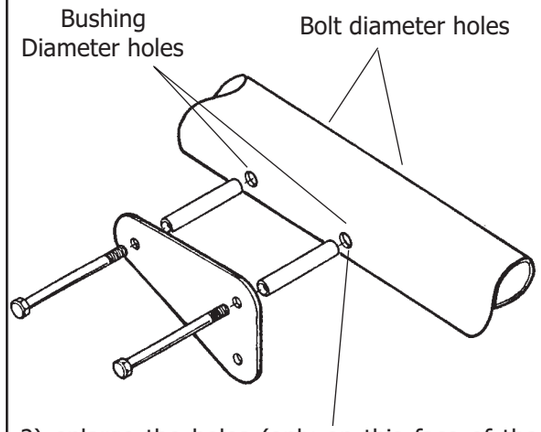
Cockpit chassis
Now you can start with the cockpit chassis, cutting and bending the side members, using the bending method previously explained (you will need to make another hardwood pulley to accept the 2" diameter tube)
Cut the straight rear member and make all brackets and plates as explained in page 10 ;11 and 12.
Fuselage nose plate (two are needed: upper and lower) make the upper first, fasten it to the side members as depicted in page 10 and using a cardboard as a template trace the lower plate which will be a little longer in order to accept the fork. (it could be convenient to have the fork already made)
Once the chassis is made and all the parts bolted together you can cut and bend the 1-1/8" aluminum tubes that will support the boom (page 11)
Rear boom support use an aluminum ring (page 12) to attach the boom (don't forget to rivet it to the boom)
The central boom support tubes (page 11) are attached to the boom using steel brackets (page 15 Central brackets)
Be careful when making the holes in the boom, have the tail group in place before attaching the chassis, this will help to keep the assembly aligned.
Finally measure and cut the front mast, you can use a streamlined aluminum tube, and two stainless steel brackets to connect the mast with the boom tube and the chassis.

Reinforcement bushings
When tubes are to be bolted, to avoid been flattened when the bolt union is tighten, you can insert a short piece of hardwood or Nylon turned to fit the inside diameter of the tube.
In some instances the reinforcement can be achieved using small aluminum tube as bushing.
e.g. for a 5/16" bolt (AN5) use as a bushing a 3/8" x .028 wall thickness tube
for a 7/16" bolt (AN7) you can use a ½" x .028 wall thickness tube.

Wing Spar (page 5)



1) make the required holes through the spar (use a drill bit = bolt size)



2) enlarge the holes (only on this face of the spar) to insert the reinforcement bushings, complete the assembly.

Engine mount

The drawing in page 19 and 20 are self explanatory, according to the engine selected you will have to vary the position of some holes (our prototype used a Rotax engine)

The design of this mount allows it to slide over the boom tube, don't bolt to it now, when the airplane is finished you will have to calculate the weight and balance in order to place the center of gravity in the right position (between 25% and 30 % of the wing chord) allowing the engine to be able to slide forward or backward will help to achieve the right C.G. position.

Landing gear

Page 13 shows all the components of this sturdy landing gear, almost all parts are made from steel tubing which are welded using oxyacetylene or TIG /MIG process, if you don't have the equipment or the knowledge to do the welding find a welding shop in your area and get your gear welded.

The EAA have several good books about welding that can guide you through this process.

Page 14 shows the wheel and brake assembly, the brakes of this craft were taken from a small motorcycle, you should search for some available within your zone.

Attaching the wing

Once finished the main groups, and before to cover the wings, attach them to the boom tube, make a couple of wing supports out of wood to place the wings in the right position, verify the dihedral angle (2,5 degrees) and then take the measure of each wing strut.

Control system

This aircraft employ a flexible push-pull control system often called "Teleflex" which simplified the task and it's very reliable.

Covering

This aircraft is covered with Dacron fabric (wings and tail group, even there are good books that shows step by step how to cover your airplane we are preparing an e-booklet that will show how to do it, if you are interested, please send us a mail.

Fuel Tank

There are many models ready made, attach it to the central support tubes behind the seat.

A word of caution

Warning! the set of plans and the instructions provided here are for educational and recreational purposes only, nor the designer neither Plans Delivery.com can be responsible for injures, property damages or even the death to someone following the indications given here.

Flying could be a dangerous activity if is not done with the expertise and knowledge required, we advise you to take flying lessons prior to attempt to fly in any aerial vehicle, been this experimental, ultralight or a home built creation.

Working with power tools, paints, solvents and related chemicals also can be dangerous to people and property if not done properly.

We advise you to use eye, body protection and follow manufacturers recommendations.

This is just a general guideline to help you to tackle this project, more information about specifically subjects like welding, covering or working with composites/fiberglass can be find at your local library .

Abundant material and help can be found at the Experimental Aircraft Association (www.eaa.org)

Updated Mar-20-2001