COMPLETE DRAWINGS OF THE

SORRELL SNS-2 "GUPPY"

The enclosed drawings and information show the Sorrell SNS-2 "Guppy" as built by Hobie Sorrell. The drawings are true to the original "Guppy".

Additionally, we have included the designer's ideas of suggested alternate materials or methods, in a few areas (listed as second choices, or labeled "alternate"). The "Guppy" is a very successful airplane exactly as it was built, and the alternates shown are only intended to reduce the cost or the difficulty of building slightly.

We are including written information to increase the clarity of the drawings and to explain some methods of construction. This information doesn't cover every aspect of aircraft construction, but should make the drawings complete. Using these drawings and normal aircraft building techniques, you should be able to build a duplicate of the Sorrell "Guppy".

We suggest that you join the EAA if you are not yet a member, as this organization and its' local chapters will provide you with lots of help and a wealth of information about homebuilding. EAA makes available many books which will help with your project.

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BUILDERS AGREEMENT

The recipient, by accepting these drawings, agrees to construct pieces for only one Sorrell SNS-2 "Guppy", this aircraft to be assigned

SERIAL # 196.

These drawings become a part of that airplane's permanent records.

The recipient further agrees not to reproduce these drawings, except with the permission of the designer.

It is further agreed and understood by the recipient of these drawings that the supplier of the drawings and the designer make no warrantee, expressed or implied, as to the quality or safety of any aircraft constructed using these drawings.

The above conditions extend to and are a part of any subsequent sale of said aircraft, whether in partially completed or completed form.

Sorrell SNS-2 "Guppy"

Designer-builder	Hobie Sorrell
Span	21' 3"
Length	15' 5"
Height	5' 2"
Weight empty	330#
Weight gross	575#
Fuel capacity	5.5 gal.
Wing chord	36" (37" lower wing with aileron)
Wing area	129 sq. ft.
Dihedral	1.5 inches each side
Incidence	2 degrees upper, 3 degrees lower
Stagger	minus 11 inches
Engine	OMC (Outboard Marine Corp.) Cushman model 200 (4 cycle)
Horsepower	18 at 3600 rpm (redline 4000 rpm)
Weight	90# including prop, as converted
Displacment	43.16 cu. in.
Fuel consumption	2 gph at 1/3 throttle cruise
Carburetors	Mikuni (Yamaha) M 24-26 (2 required) (main jet is #56 drill, .046")
Fuel pump	engine driven (backs up gravity at low fuel)
Magneto	Fairbanks Morse CW type 20 FMX-1 2B7-1 (from a 2 cyl. Wisconsin engine)
Propeller diameter	48"
Pitch	9.5 degrees at tips, 12 degrees at 12" in from tips (non helical)
Blade width	4 7/16 inches
Static rpm	3100 about
Landing gear	Wittman steel rod type
Main wheels	5" magnesium "go-cart" wheels
Main tires	5.00 X 5 tires (used Bonanza nose tires)
Main tubes	6" "go-cart" inner tubes
Tailwheel	2 1/4 inch solid caster tire with a 1/4" bore brass bushing
Fuselage	all wood structure
Wings	all wood structure, aluminum fittings
Tail	4130 steel tubing
Covering	1.7 oz. dacron, lightly doped
Other steel tubing	wing lift struts, engine mount, cockpit controls, windshield frame,and elevator push pull tube, wing tips

The Guppy airframe is all wood structure, covered with 1.7 oz. dacron fabric, with the following exceptions; the stick and rudder pedals, engine mount, windshield frame, and wing lift and jury struts are welded steel tubing; the landing gear legs and tail wheel spring are 6150 spring steel rod; most attatch fittings (wing, gear, engine mount) are aluminum plate; wing drag member is a 3/4" X .058, 6061 T-6 aluminum tube; and the ailerons are sheet aluminum pop rivetted to an aluminum tube.

The fuselage uses "DeHavilland" type spruce and plywood construction. The wings are single spar with 1/32" plywood D tube at the leading edge, single strut braced. Wing ribs are solid sawed 1/4" balsa web with 1/8" X 7/8" spruce cap strips. The plans also show sawed 1/4" plywood and built up stick and gusset ribs as alternates to the balsa.

The airplane was designed to approximately a load factor of 6 Gs. It should be flown as a "normal category" aircraft would be, to a flight limit load factor of 4 Gs. The Guppy is not aerobatic.

The wings on the prototype are not designed to be foldable. They are fastened on just like a T-Craft or a Champ's wings.

Any builder who wishes to build an ultra-light must be very weight conscious, as pounds take away climb. The Guppy uses only normal building techniques to achieve light weight and, built to plans, will be satisfactorilly light.

Hobie estimates the cost for materials for the airframe at $500 "with a little scrounging" he says. Engine cost could be from $200 to about $900, depending on the many variables. Hobie spent about 750 hours building the Guppy, including time spent converting the Cushman engine.

Many people have asked me about pilot size. I am 6'2" tall and weigh 165#, and find the guppy cockpit very comfortable. It would accomodate someone bigger than I am. I have flown it with a 200# load (me plus my 3 year old son) and performance was still quite satisfactory, although somewhat reduced.

Cockpit entry is accomplished by a step on top of the left wing root, and over the left side of the cockpit. The top and left side forward window hinges to the right, allowing easy access.

The Cushman engine has proven very reliable and very satisfactory in 10 years of service. The airplane with the Cushman engine will outperform some well known designs with 36 hp. VW engines.

The engine runs quite smoothly (about like a 65 hp. Continental) except at about 1800 rpm. only, it has a vibration zone. This is noticed only while taxiing, and requires opening and closing the throttle to maintain proper taxi speed on grass. It is not a factor in flight or at idle.

I cruise the engine at about 3400 rpm. with the throttle 1/3 open. This gives about 65 mph. and uses about 2 gph.

OMC Cushman is currently manufacturing these engines, and there should be used units available around the country. They are found in Cushman "Trucksters" and "Dumpsters" used by police departments (metermaids) and park departments and post offices, as well as in industry for plant transportation. They are also found at large airports used by airline mechanics and service people.

Write to Cushman Motors, Box 82409, Lincoln Nebraska 68501, for the name of the nearest dealer, if you could not find it in the yellow pages.

The engine conversion is quite simple. It merely requires removing most engine accessories,(except the oil filter and fuel pump) and fabricating the magneto mount, turning the magneto coupler and two carburetor adaptors from small blocks of aluminum, and turning a steel prop hub and an aluminum distributor shaft support on a lathe.

Carburetors are from a Yamaha motorcycle and use the motorcycle cables. The magneto is a common Fairbanks Morse 2 cylinder clockwise unit. The engine mount is made with 1/2" X .035 steel tubing and Cushman engine mount parts. It is similar to a Cessna 170 mount (only much smaller). Due to their location on the heads, the carburetors never ice up. We have never had any sort of problems with this engine. (Guppy has about 200 hours total time.)

Alternatives

Hobie considers the airplane suitable for engines up to 36 hp and 120# weight, if properly converted. (However, the Aeronca engines are awfully shakey, and 2 strokes are difficult to operate reliably.)

He has started, and I hope to finish soon, a conversion of an Onan engine which is rated at 25 hp at 3600 rpm. This engine weighs 1# less than the Cushman converted and looks very promising. (Onan builds electric power plants and welders, among other things.)

The old 36 hp VW engine could be used, but would require careful conversion to keep it light. Parts for these engines are available from J. C. Witney in Chicago.

The previous two engines are the only ones Hobie wishes to suggest as alternatives at this time. These are only suggestions, as the Cushman is the only one flown in the Guppy so far.

The original Guppy is built with spruce and exterior 1/8" luan mahogany door skin plywood in the fuselage. Aircraft quality fir, or upland or Canadian hemlock, and 3/32" marine plywood or 3/32" aircraft plywood are satisfactory substitutes.

Flying The Guppy

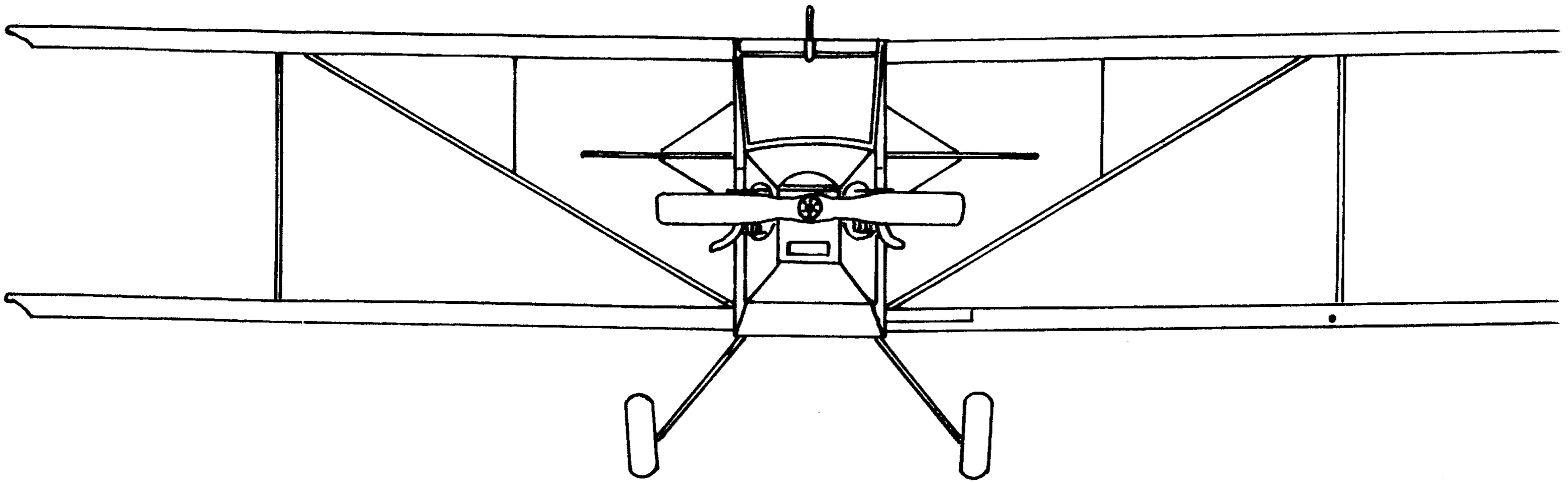
A few additional words about flying the Guppy may be useful. Please refer to my article in the October 1977 issue of "Sport Aviation" for my original comments.

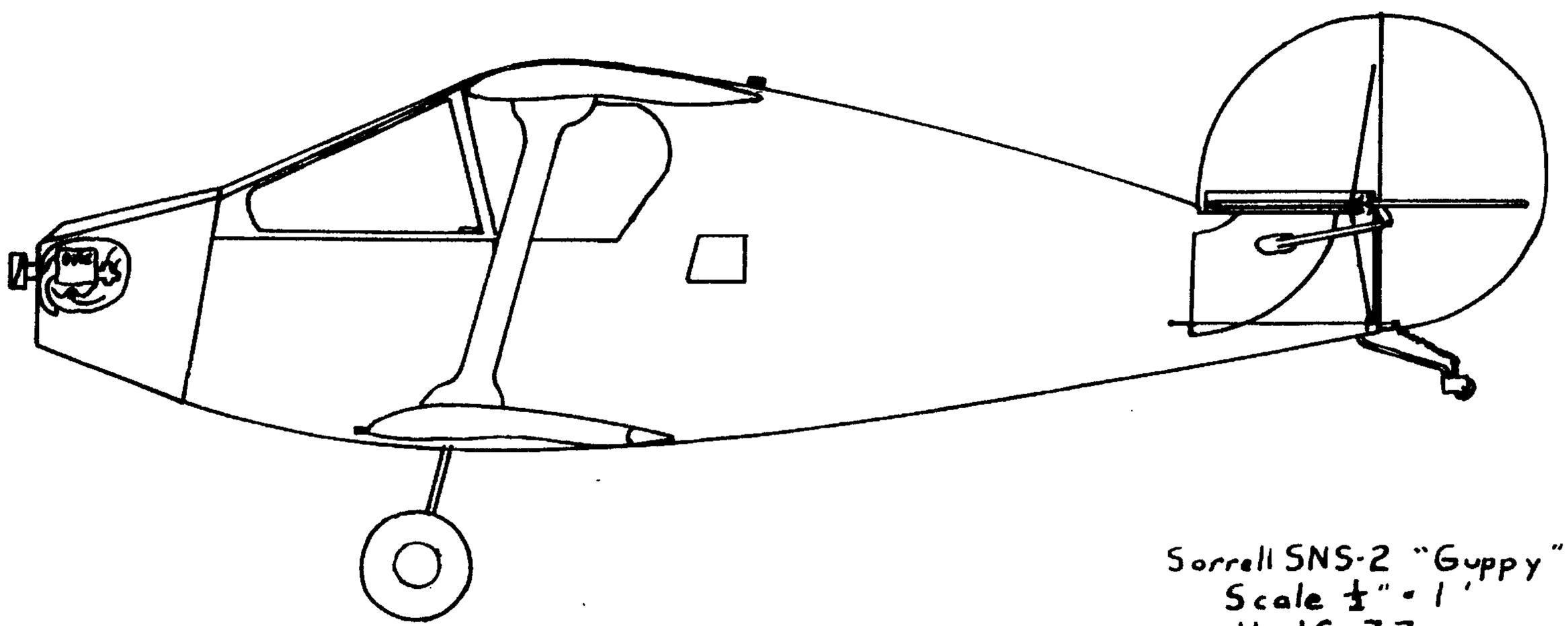
The airplane is very controllable, yet it is not at all quick. It is definitely a rudder airplane, due to significant adverse yaw, and neutral stability in yaw, but because of its low speed, it is baby carriage like in its "difficulty" rating. Installation of a skid ball is a big help in slip and skid control. (Hobie dismantled a turn and bank from an old Waco for the Guppies skid ball.)

Several people have asked if there is any difficulty operating with no brakes. I was also concerned before I first flew the Guppy, but I have since flown it in many different conditions (crosswinds, gusts, tall grass, pavement, soft fields, etc.) and have found it no problem. When I first flew it out of Hobie's 900' airstrip, the airplane presented no difficulty taking off or stopping.

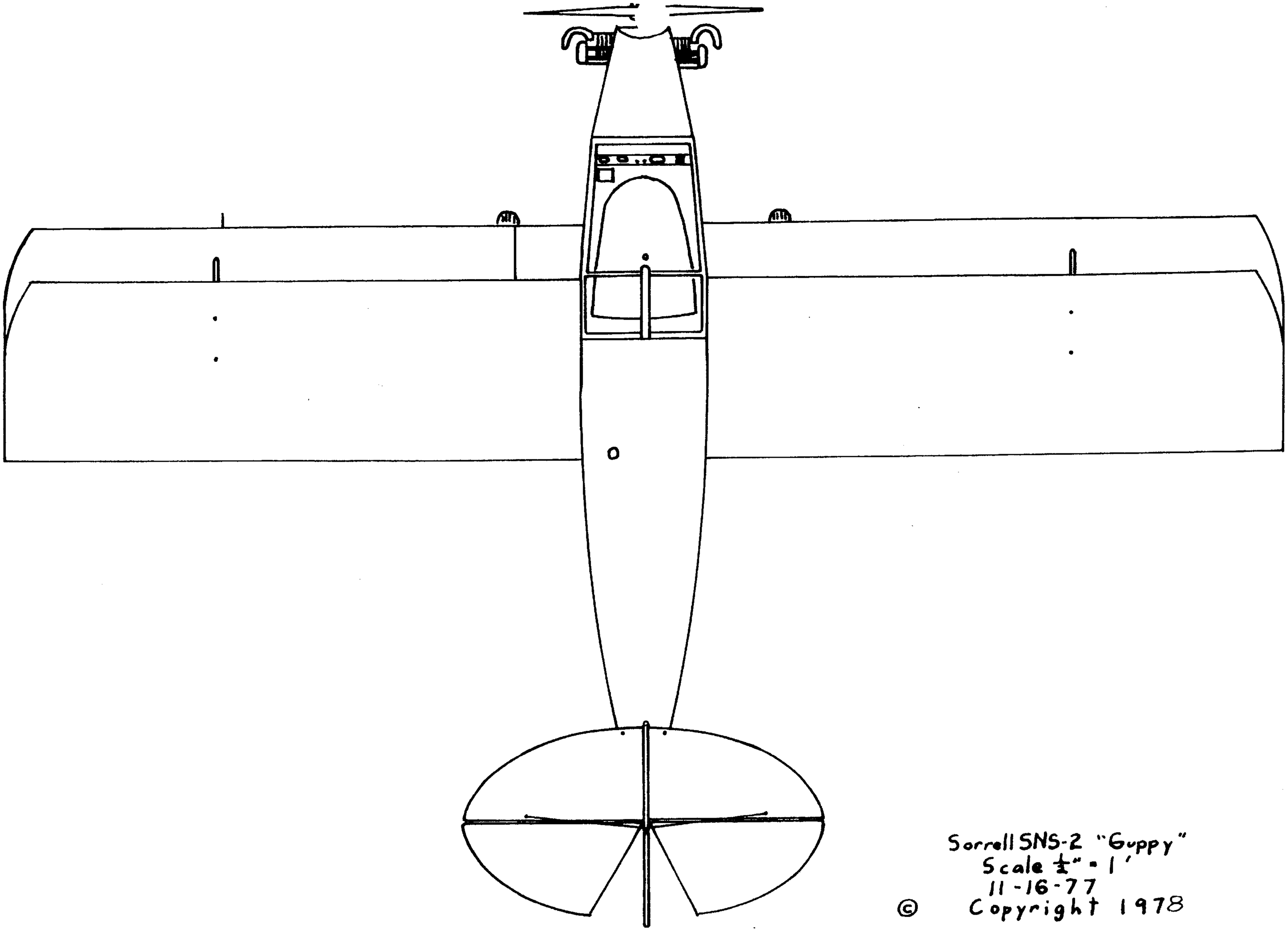
If I am operating on pavement, I don't land downwind, and if I wish to stop on pavement while taxiing downwind, I either put one tire in the grass, or turn into the wind, or I turn off the engine! There are no other problems as long as I plan ahead a little.

The Guppy rates as a very easy airplane to fly and only requires the pilot to be gentle and modest in his demands. It will reward him with economical, useful performance.

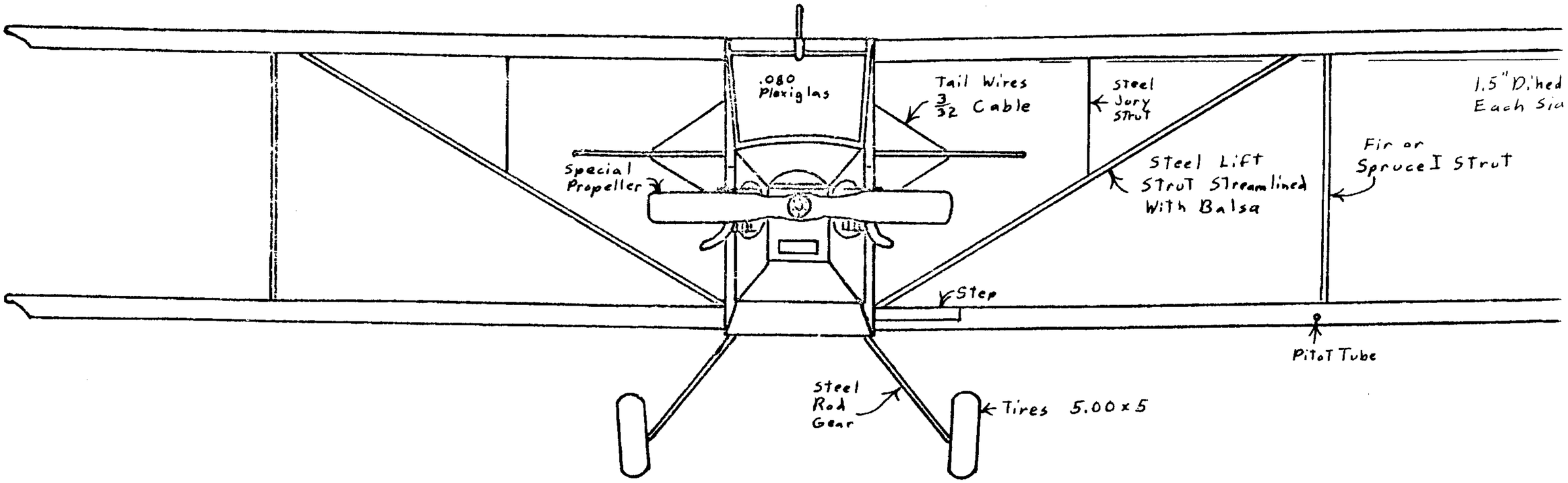


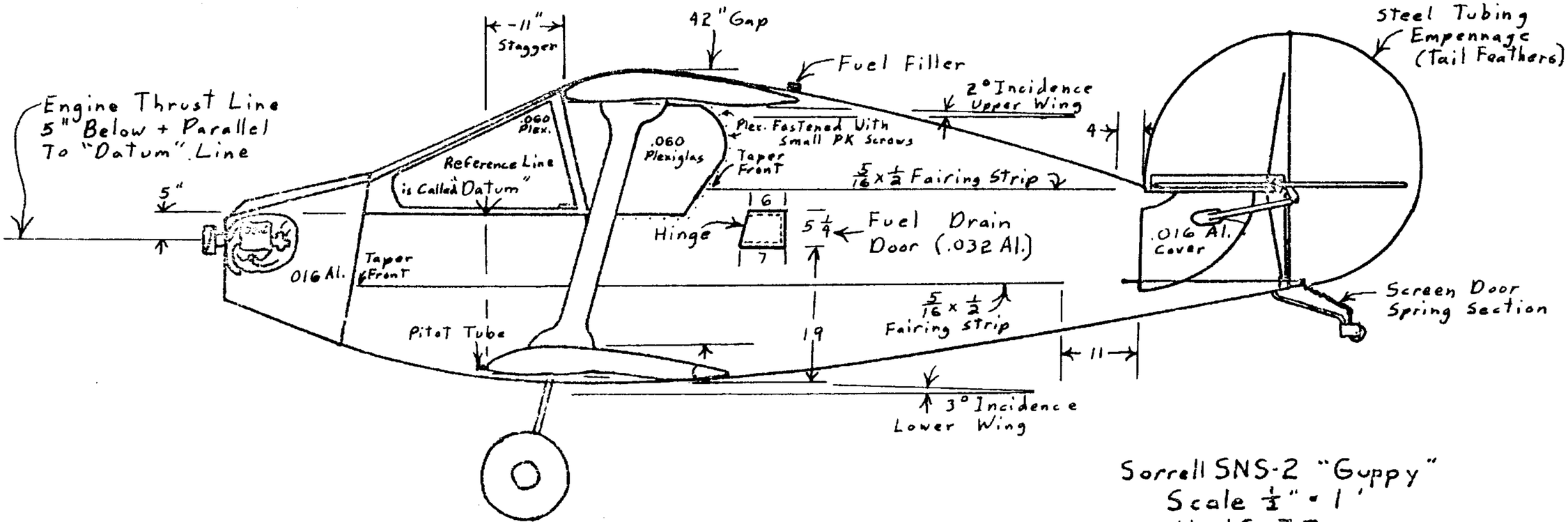


Sorrell SNS-2 "Guppy"
Scale ¼" = 1'
11-16-77



Sorrell SNS-2 "Guppy"
Scale ½" = 1'
11-16-77





Sorrell SNS-2 "Guppy"
Scale 1/4" = 1'
11-16-77

Drawing

Sorrell SNS-2 "Guppy"
Fuselage Layout (Dimensions When Flat)
Scale 3/4" = 1' or 1/16" = 1"
Measure To Outside Except Where Noted By ℄

Note!
Dimensions in Bracket.
Add 5/16" To Determine
Longeron Center Lin

99 1/2
81 1/16
62 1/2
41 5/16

℄ ℄ ℄ ℄ ℄

Top Ref. Line
[3/4]
Note A
15" Radius
Note B
[3 1/2]
[7/4]
[12 5/8]
[18 7/8]
[19 3/8]
[19 3/8]

48"
4 1/4"
"Datum" Line
20"
Note A
24
14 1/8
[14 1/2]
[9 1/4]
[4 11/16]
[1 3/4]
(3)
[1 5/8]
[3/4]
[9/16]
Base Line

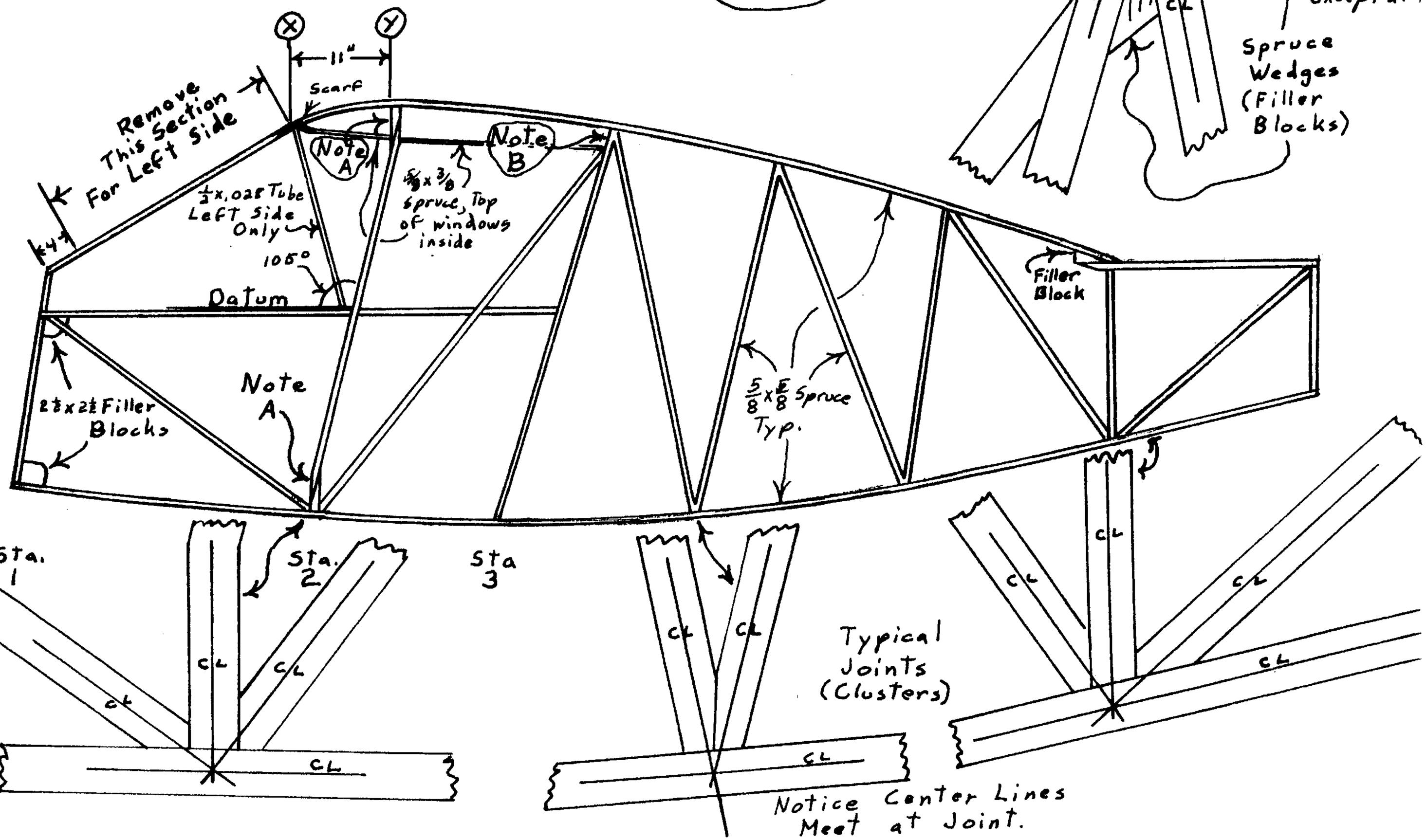
Top Front
℄
℄
℄
℄
℄
Rear

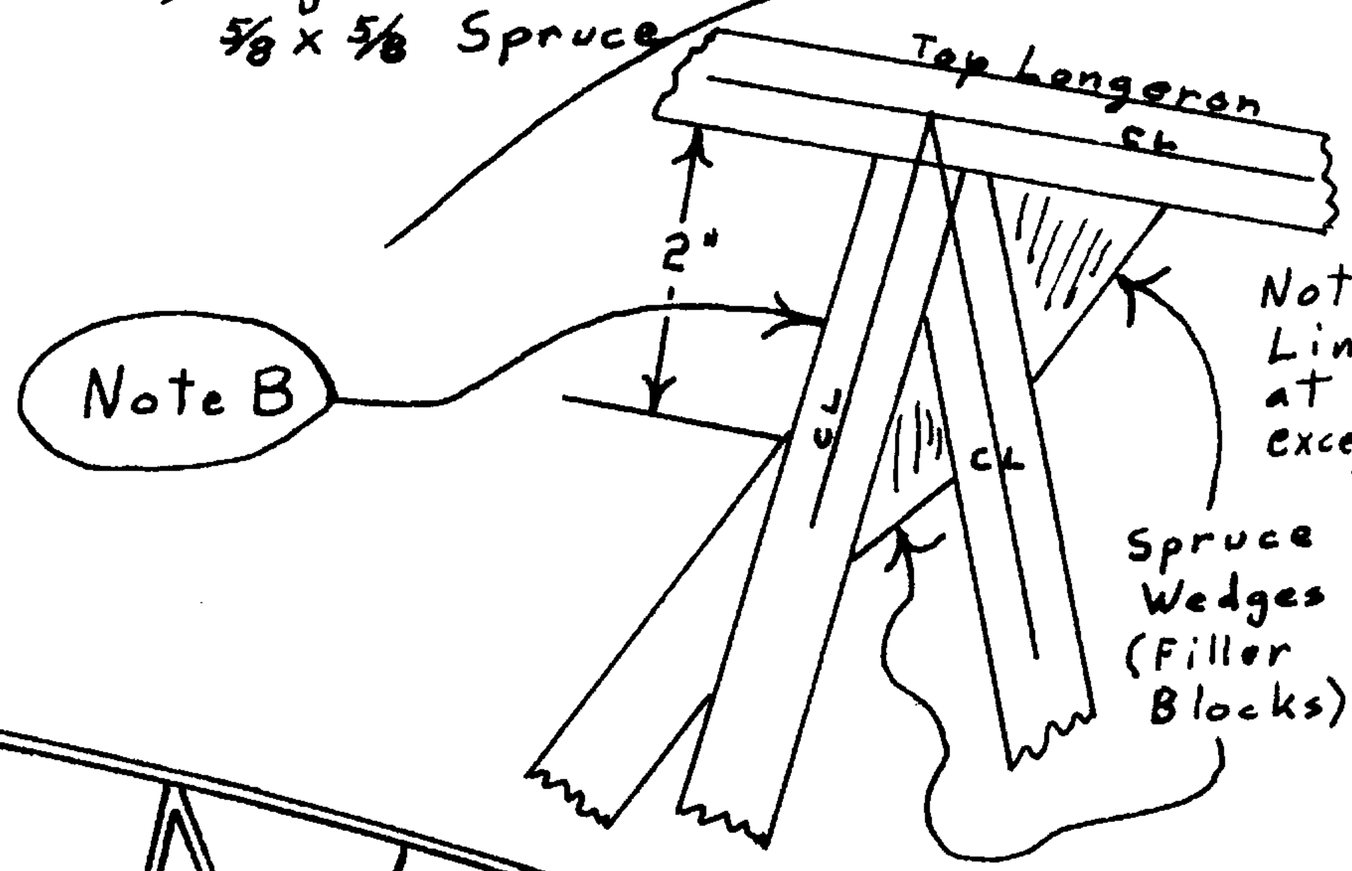
28 3/4
49 1/4
71 3/4
94 3/8
117 5/8
140"

Section Showing Side, Longerons + Vertical Members

5/8 x 5/8 Spruce

To Allow Bending of Top Longeron Between ⊗ And ⊗, Bandsaw 3 Slots Lengthwise, And Fill With 1/32" Plywood Strips.





93°

105°

|| to Datum
(See Page 4)

This creates
3° Incidence
For Lower Wing

Note A
Ref. Drawing #5

STa. 2 Vertical
Member, Bottom

12°

12°

2 11/16

Layout Center
Line

5/8

5/16

Bottom
Longeron

STa. 2

1 5/8 To Baseline
(See Drawing #4

To Upper
Layout Line

1/4

Drawin

5/16

Top Longeron

Layout C.
Line

13°

13°

2 5/8

STa. 2 Vertical
Member, Top

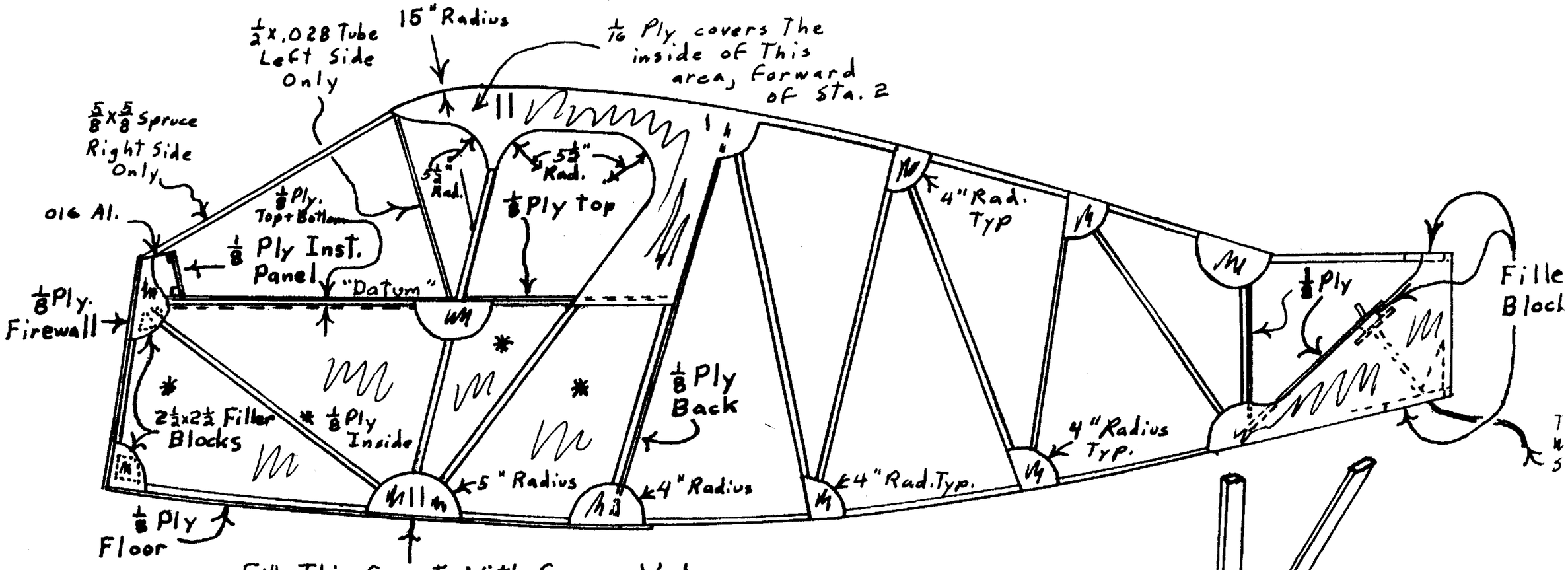
This creat
2° Inciden
For Upper W

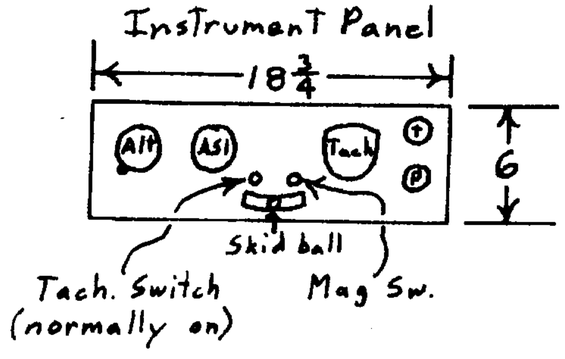
92°

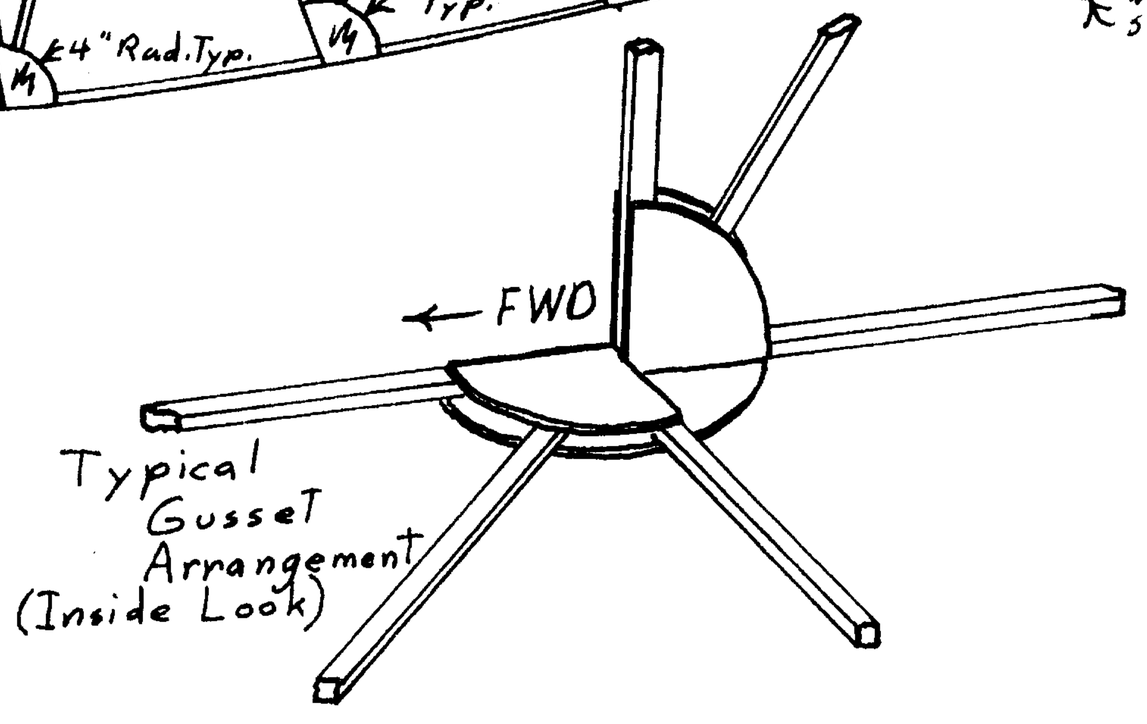
105°

|| To Datum
(See Drawing #5)

Section Showing Gusset (1/8 Ply. Typ.)
View of Left Side







Drawing # 8
Fuselage Structure, Top + Bottom

Top Looking Down (Cockpit Roof Removed)

Longeron

This Arrangement 8 places (Top + Bottom)

Upright

Cross member

Filler Block Typ.

Sta 2

Gusset On Bottom

8

6

$4\frac{1}{4}$

2

$1\frac{3}{4}$

$9\frac{1}{4}$

See Above

$\frac{1}{8}$ Ply Roof

$\frac{5}{16} \times \frac{7}{8}$ Spruce Stiffners

PLY

$\frac{1}{2} \times \frac{5}{8}$ Spruce

PLY

A

Bottom Ply Between Firewall + Sta. 2 Only

A

$6\frac{3}{4}$

See Above

Sta 2

$10\frac{1}{2}$

.016 Al. Inspection Cover Over This Opening

Bottom Looking Up

1 x 1 Spruce Inside Bottom

$\frac{5}{8} \times 3$ Spruce inside Floor Sandwich

See Above

$\frac{3}{4}$

20"

24"

24"

Drawing # 10
Statior 2 Bulkh

Sta 2
Vertical Member
Side View

1/16 Ply
1/8 Birch Plywood
1/16 Ply
7/8 x 3 1/4 Spruce
Section Thru "C"
1 1/4
E
Forward
Filler Block
Note G
This 1/16 Ply Becomes One Layer After 2" More
75°
1/16 Ply Typ. (Some on Top)
1/16 Birch Ply
Note G
1/16 Birch Ply Typ.
4"
Section Thru "D"
Filler Block
7/8 x 3 1/4
1 1/4
E
1/16 Ply
1/16 Ply
1/8 Birch Plywood

"C"
Sta #2
Front View
6"
1/16 Birch Ply. Typ.
7/8 x 3 1/4 Spruce
E
E
"Cross Fuselage Board"
1/16 Ply typ
Sta 2
Vertical Member
1/8 Spruce Filler
1/8 PLY.
5/8
1 3/8
"Cross Fuselage Board"
1 1/8 x 2
5/8 Spruce
5/8 x 3 3/4 Spruce
7/8 x 3 1/4 Spruce
E
"D"

Note (E)
1/4 x 5/8 x 3 1/4 Spruce Filler Blo.
to Bring Strut to 7/8 Thickness
(8 places, Rear Side of Bu

1/2 x 3/8 Spruce
Floor Forward of Bulk head
1/16 Ply
1/2" Balsa or Foam
1/8 Ply
Lower Longer

Drawing # 1
Station # E
+ Wing Attac
Fittings

4 Forward Fittings Only

$\frac{3}{8}$ TYP.

$\frac{5}{8}$

$\frac{3}{16}$ TYP.

$1\frac{1}{4}$

2

$2\frac{1}{4}$

5

$\frac{3}{8}$

$\frac{1}{4}$" Final Drill On Assembly

Wing Fittings
$\frac{1}{8}$ Aluminum 8 Required
4 Top Fwd., 4 Rear

$\frac{3}{16}$ TYP

$1\frac{3}{8}$

$2\frac{1}{4}$

$\frac{3}{8}$ TYP.

Rear Wing Fitting
Washers $\frac{1}{16}$ Al.
4 Required
Drill on Assembly

STa. # 2

$20\frac{1}{2}$

$20\frac{1}{4}$

$18\frac{1}{4}$

2

$1\frac{1}{8} \times 2$ (Finish To Provide Stick Control Stop)

3" x 3" x $\frac{5}{16}$ Oak Pad

$9\frac{1}{2}$

$\frac{3}{4}$

$3\frac{5}{16}$

$5\frac{1}{8}$

$2\frac{7}{8}$

50°

$133\frac{1}{2}°$

$3\frac{1}{2}°$ Camber

$6\frac{3}{4}$

$\frac{3}{4}$

$\frac{1}{4}$

2

$\frac{3}{8}$ Typ.

$4\frac{1}{2}$

$\frac{3}{8}$

$\frac{3}{16}$ Hole 6 Places

$1\frac{3}{4}$

$2\frac{1}{2}$

$2\frac{1}{4}$

$1\frac{11}{16}$

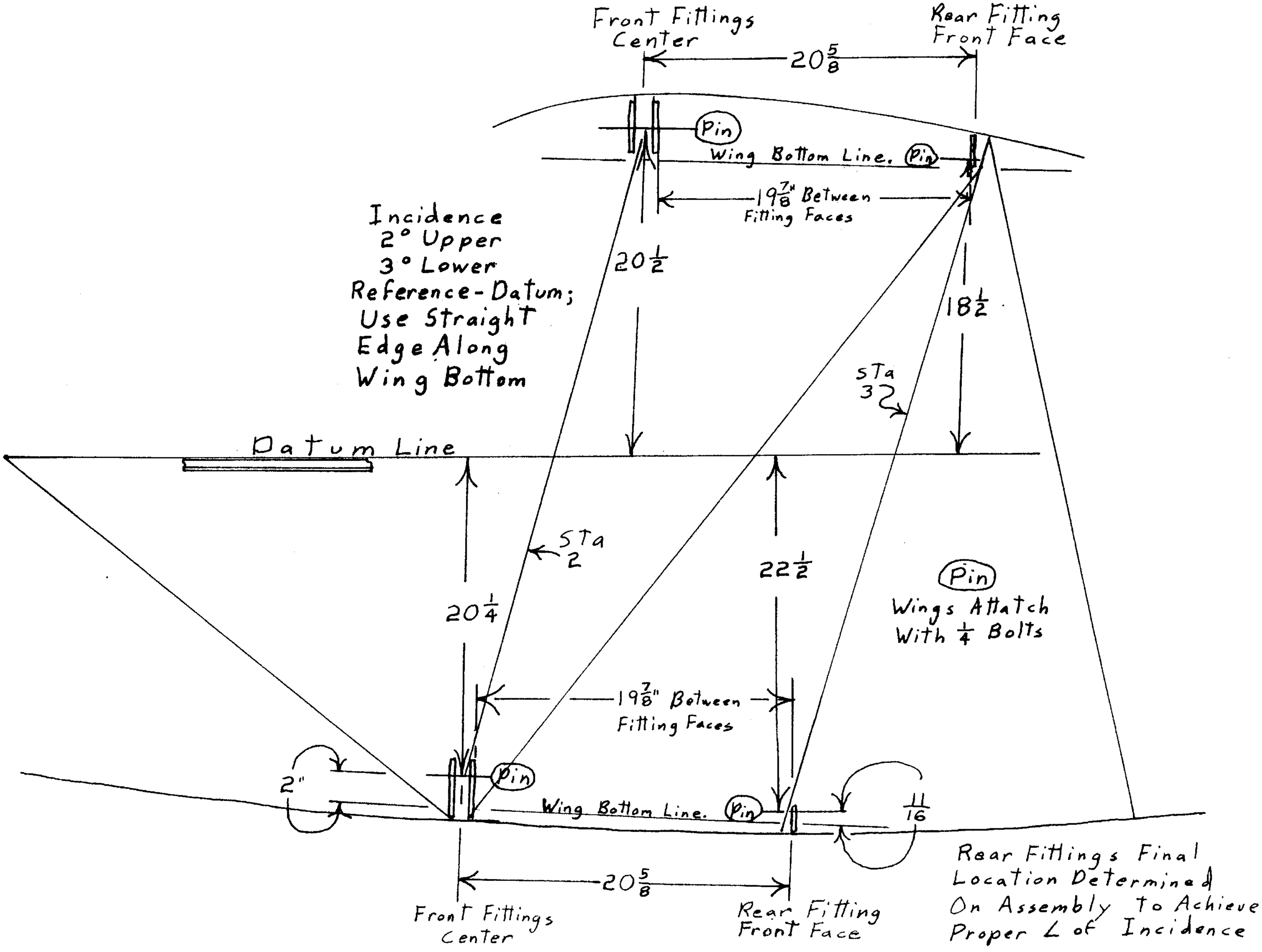
$4\frac{3}{8}$

Lower Forward Wing Fitti
4 Required $\frac{1}{8}$ Alumin
202

All Wing Fittings Are Bolted And Epoxyed In Place

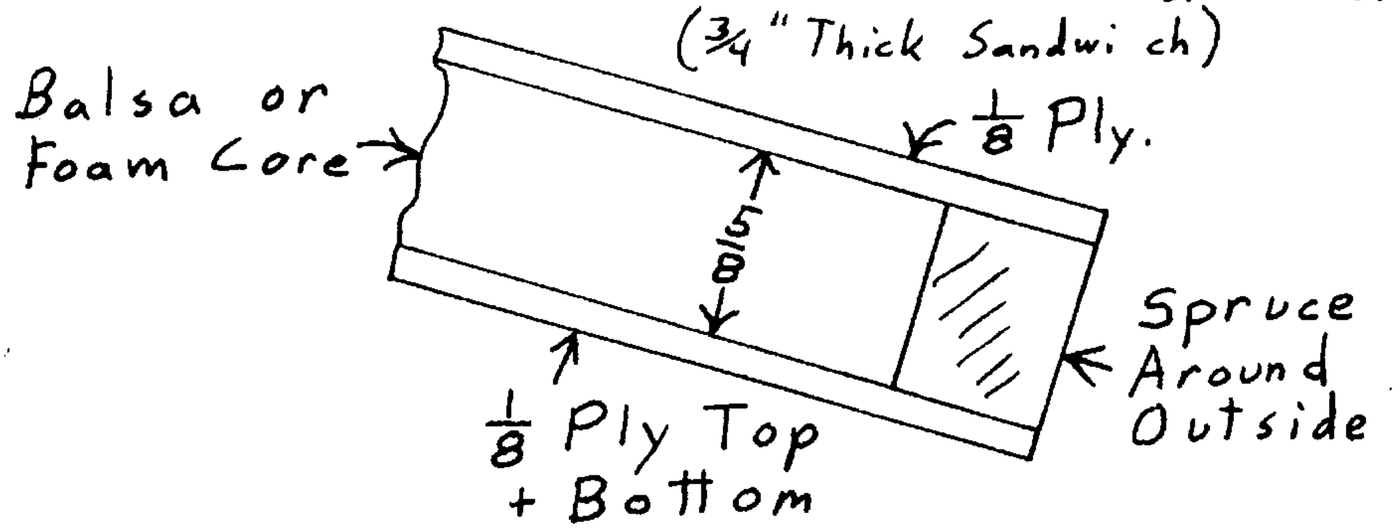
Drawing # 12

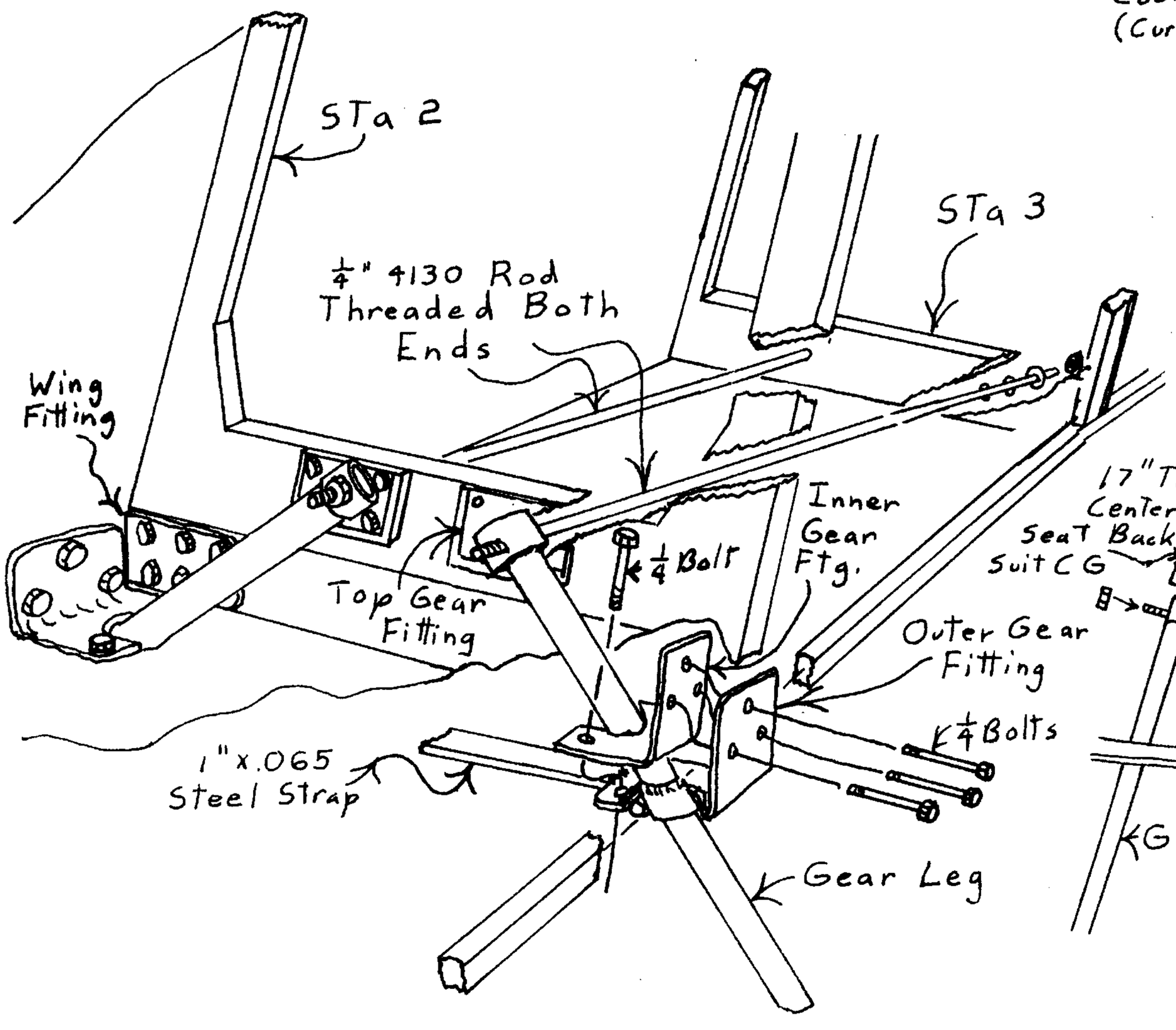
Wing Attatch Positions Layout



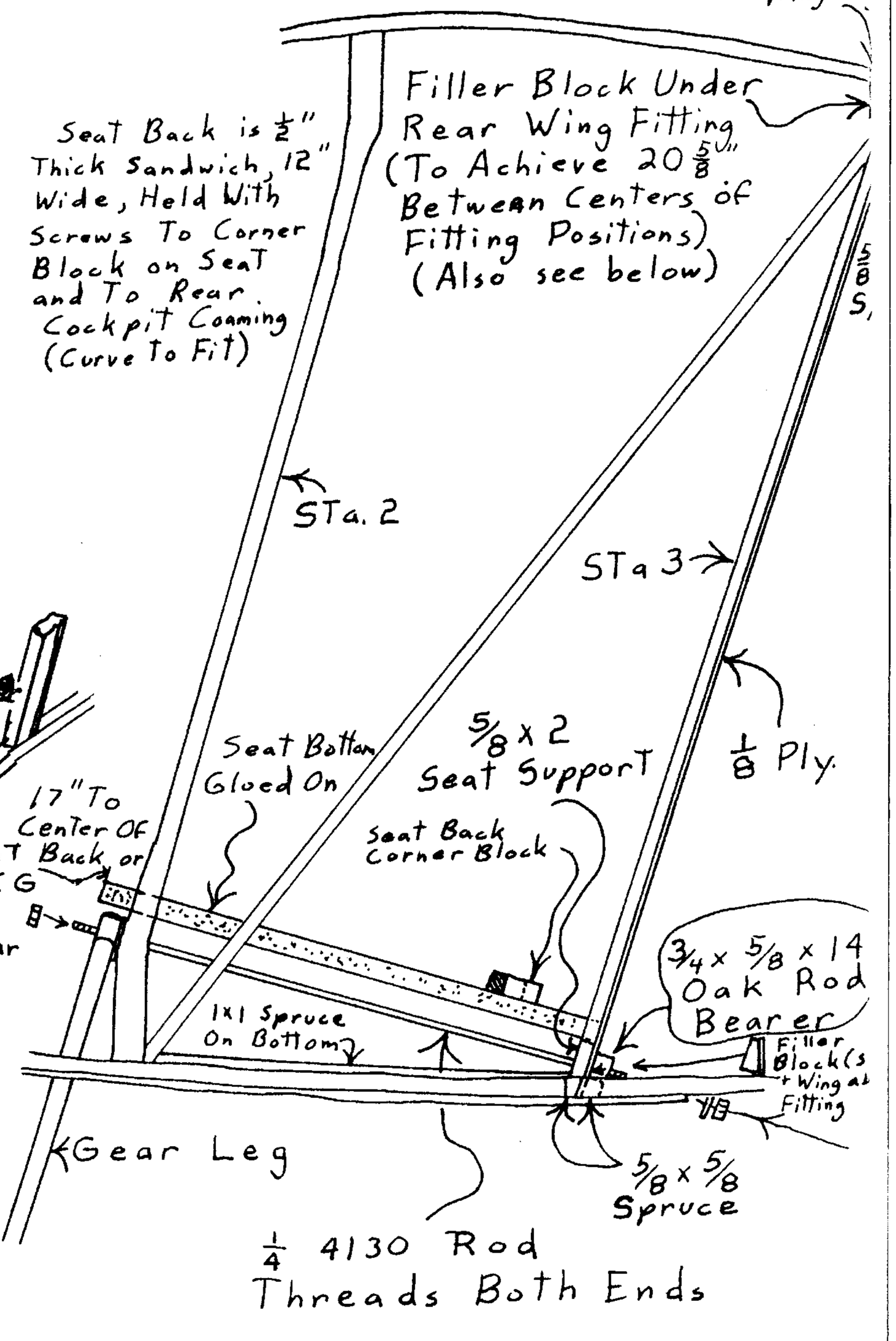
Gear Box + Seat

Seat Cross Section
Overall Size $13\frac{1}{2} \times 22\frac{1}{2}$
($\frac{3}{4}$" Thick Sandwich)





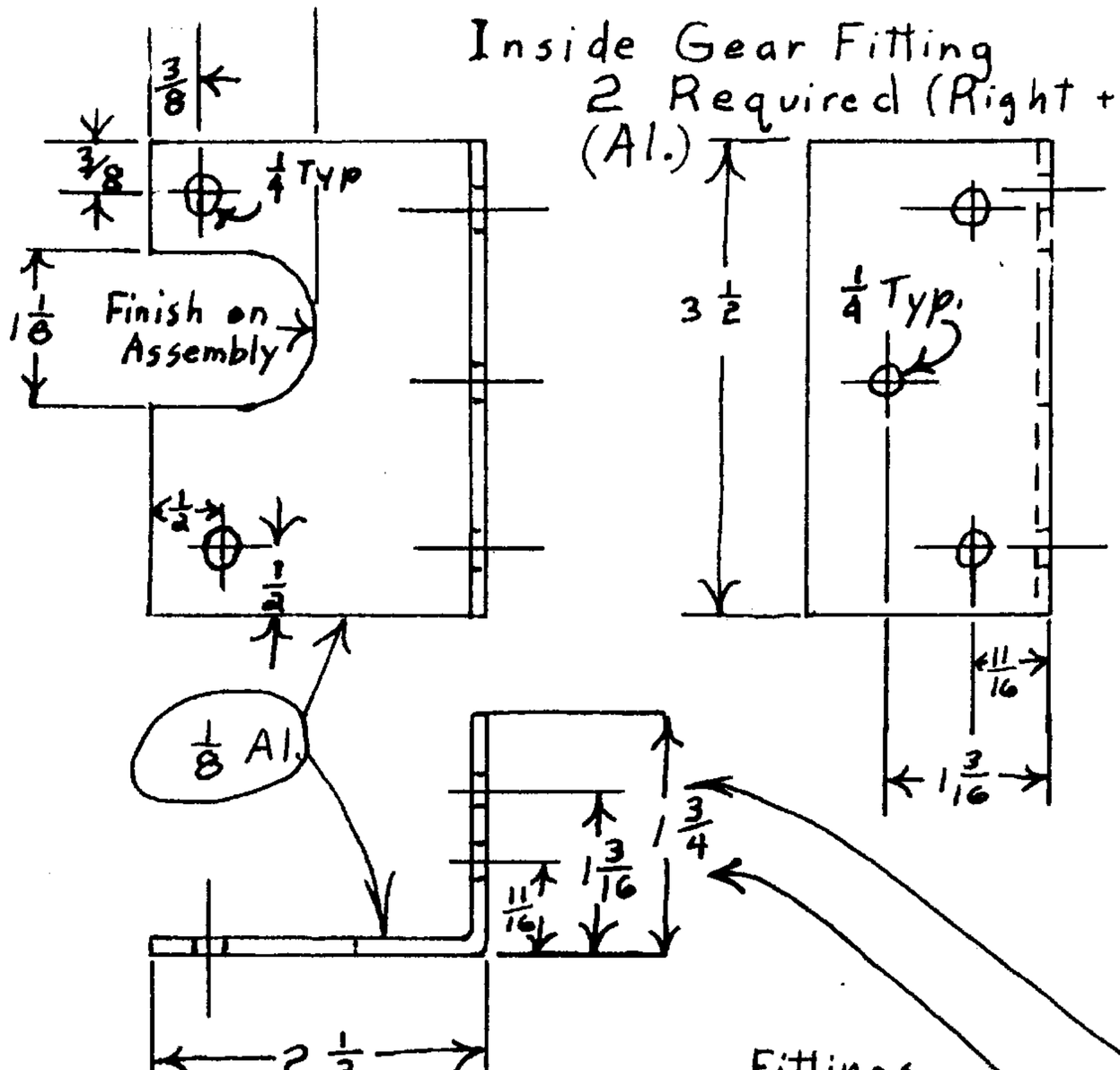
Seat Back is $\frac{1}{2}$" Thick Sandwich, 12" Wide, Held With Screws To Corner Block on Seat and To Rear Cockpit Coaming (Curve To Fit)



Gear Attach Fittings — Drawing

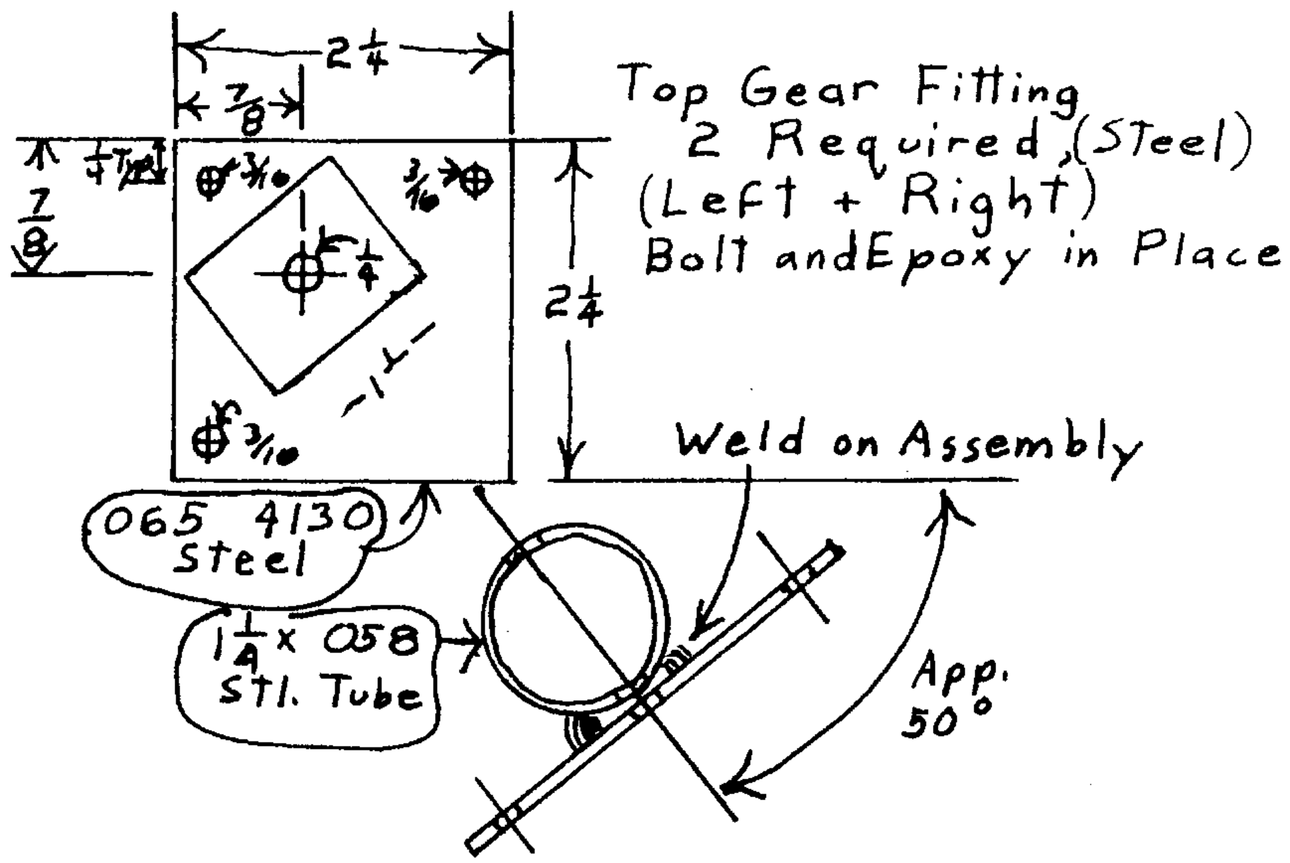
Scale $\frac{1}{2}$" = 1"

Inside Gear Fitting
2 Required (Right + Left)
(Al.)

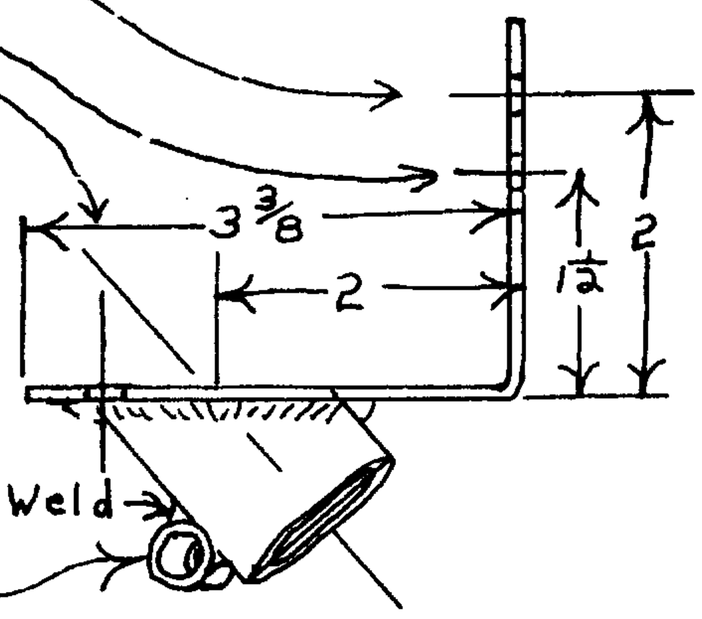


Fittings Come Together As Shown

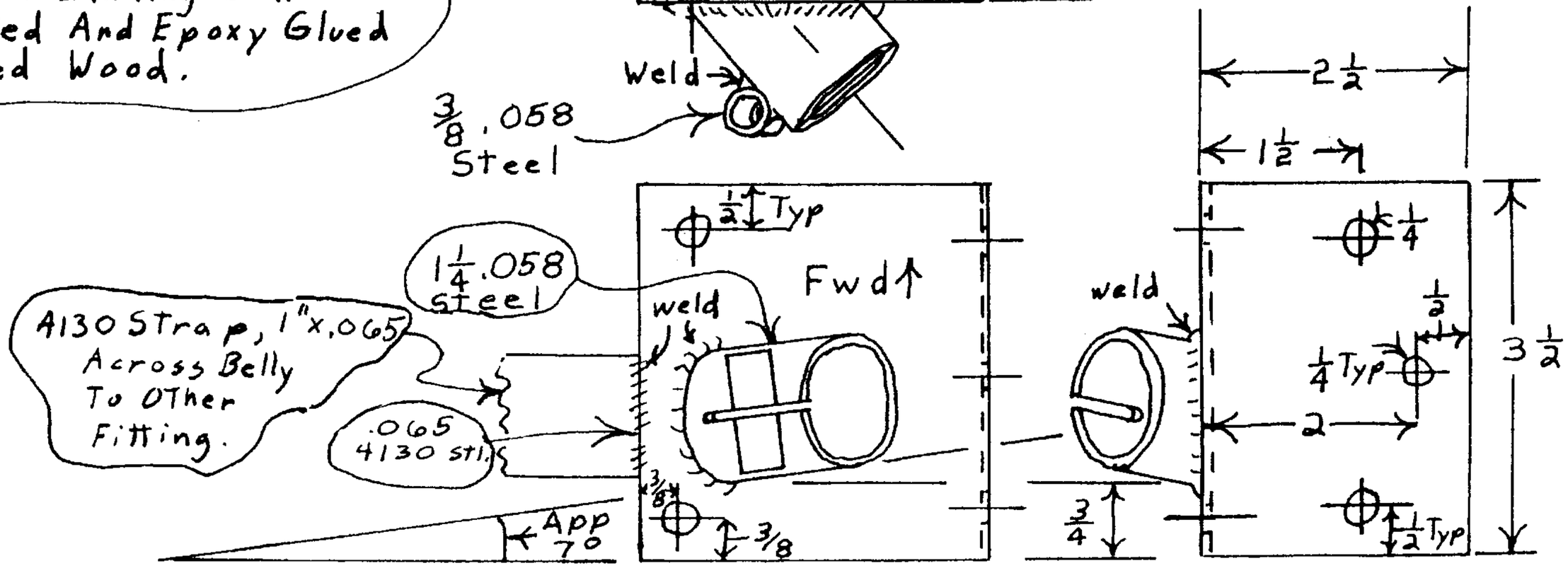
Top Gear Fitting
2 Required, (Steel)
(Left + Right)
Bolt and Epoxy in Place



Outside Gear Fitting
2 Required
Weld on Assembly
(Right + Left)
(Steel)



All Wing And Landing Gear Fittings Bolted And Epoxy Glued To Unfinished Wood.

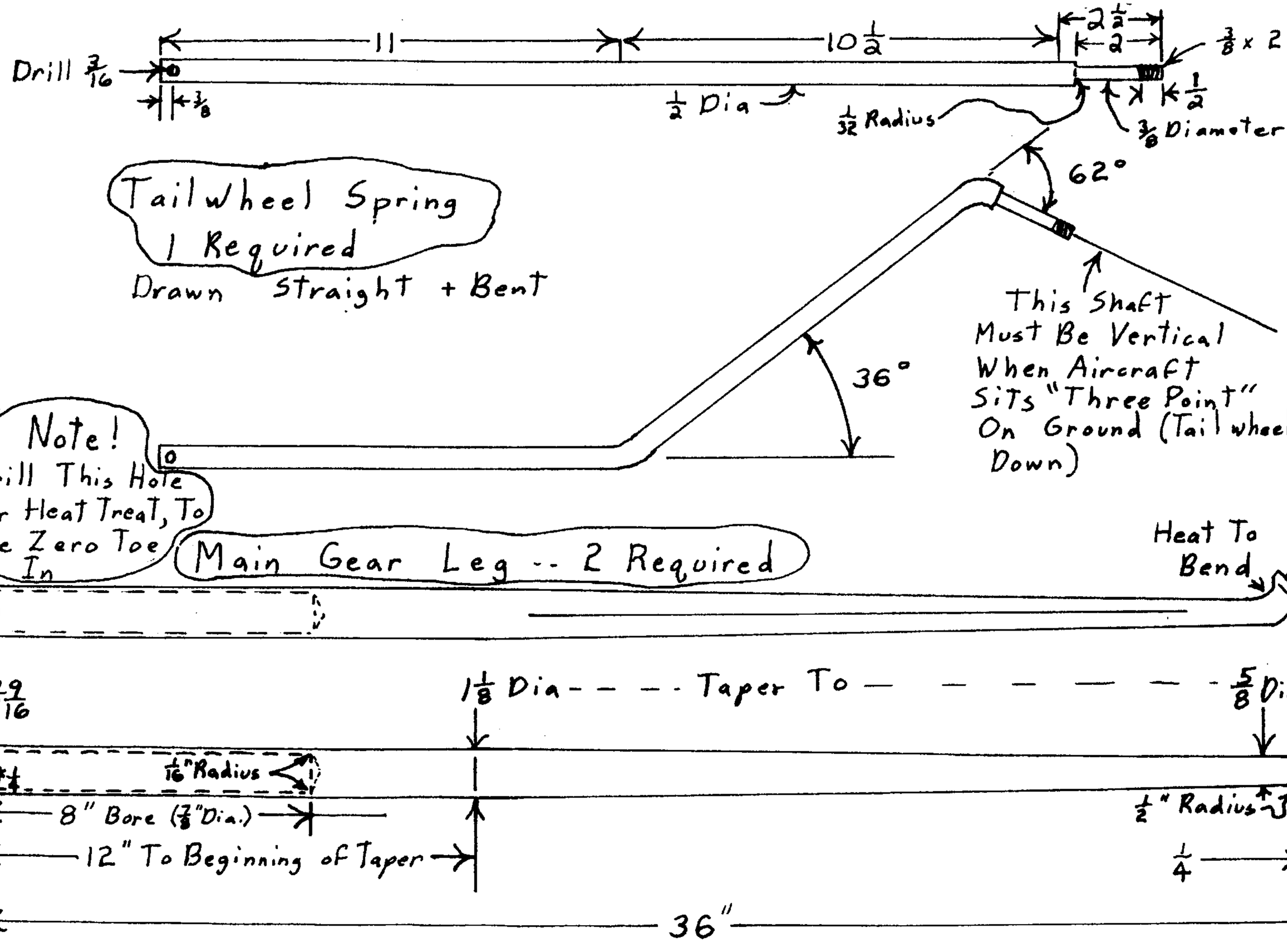


Drawing [illegible]

Main Landing Gear Legs And Tail Wheel Spring

6150 or 4340 Steel

Machine, Heat To Bend, Heat Treat To 45-50 Rockwell,
(Main Gear Only Then Drill ¼" Top Hole For Zero Toe In)



Drawing # 16

Tailwheel And Spring Assembl,

Screen Door Spring for Steering

Tail - Wheel Assembly

2

1½

3/8 x 058 Tubing

Washer

5/8 x .120 Tubing

1½

1¾

1/16" Steel

¼

2⅜" Tire

3/8 x 24

Double Nuts To Attatch

1½

Tail Spring

Spacer

Spacer

3/16 Bolt

3/16 Aircraft Eyebolts

Top Spring Fix

Inspt. Hole

¾

4 Filler Block

10"

Section Thru Center

Cross Strut For Vert. Stab. Attatch 1¾ x 5/8

Filler Block For Stab Attatch 2 Hi x 2½ L. x ⅝"

2¾

Center Knee Block

4½

10°

Filler Block 25°

Filler Block 6

3/16 TYP

2¼ Typ.

Bottom Pad (⅛ Al.)

Fuselage Opening Brace Tube ½ x .028 Steel Tubing (May Be Replaced With ⅝ x ⅝ Spruce Adequately Installed)

1 ⅜ x .040 Al. Strip 1 ¼ (Open Width) x 29" Piano Hinge Under

Mount Automobile Compass Under

.030 Al

.080 Plexiglass

1 ⅜ x .030 Al. Strip Over

.030 Al. Over

Hinge, Al. Strips, And Plexiglass Fastened On Frame With Pop Rivets

Frame Of ½ x .028 Steel Tubing To Fit Fuselage Opening

.060 Plexiglass

Latch Handle

.030 Al. Cover

View Of Canopy Latch (Left Side) From Inside Cockpit

.040 Steel

⅝ x .028 Tube

¼ x .035

Latch Handle ¼ x .035 Tube x 2"

Top View Of Latch Mechanism Only

To Unlatch, Slide Pin Forward →

⅝ x .040

Washer

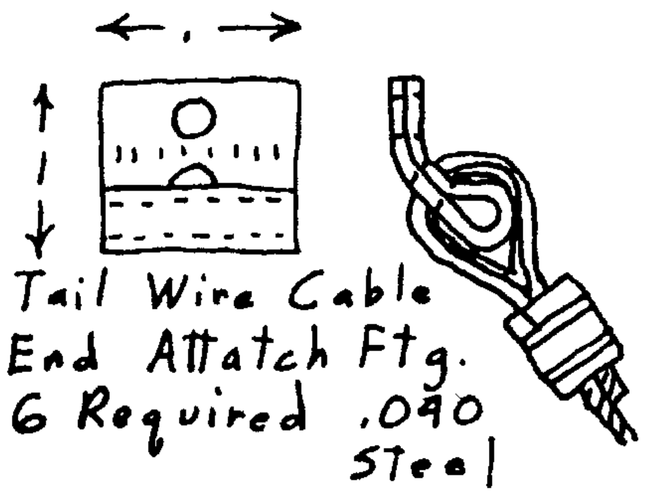
Cotter Pin

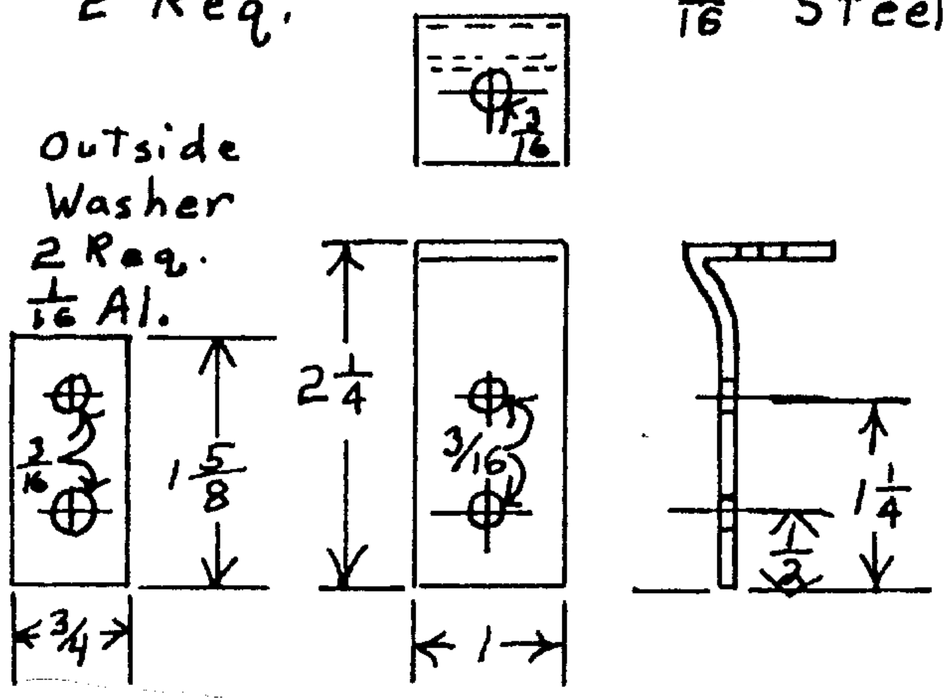
Spring

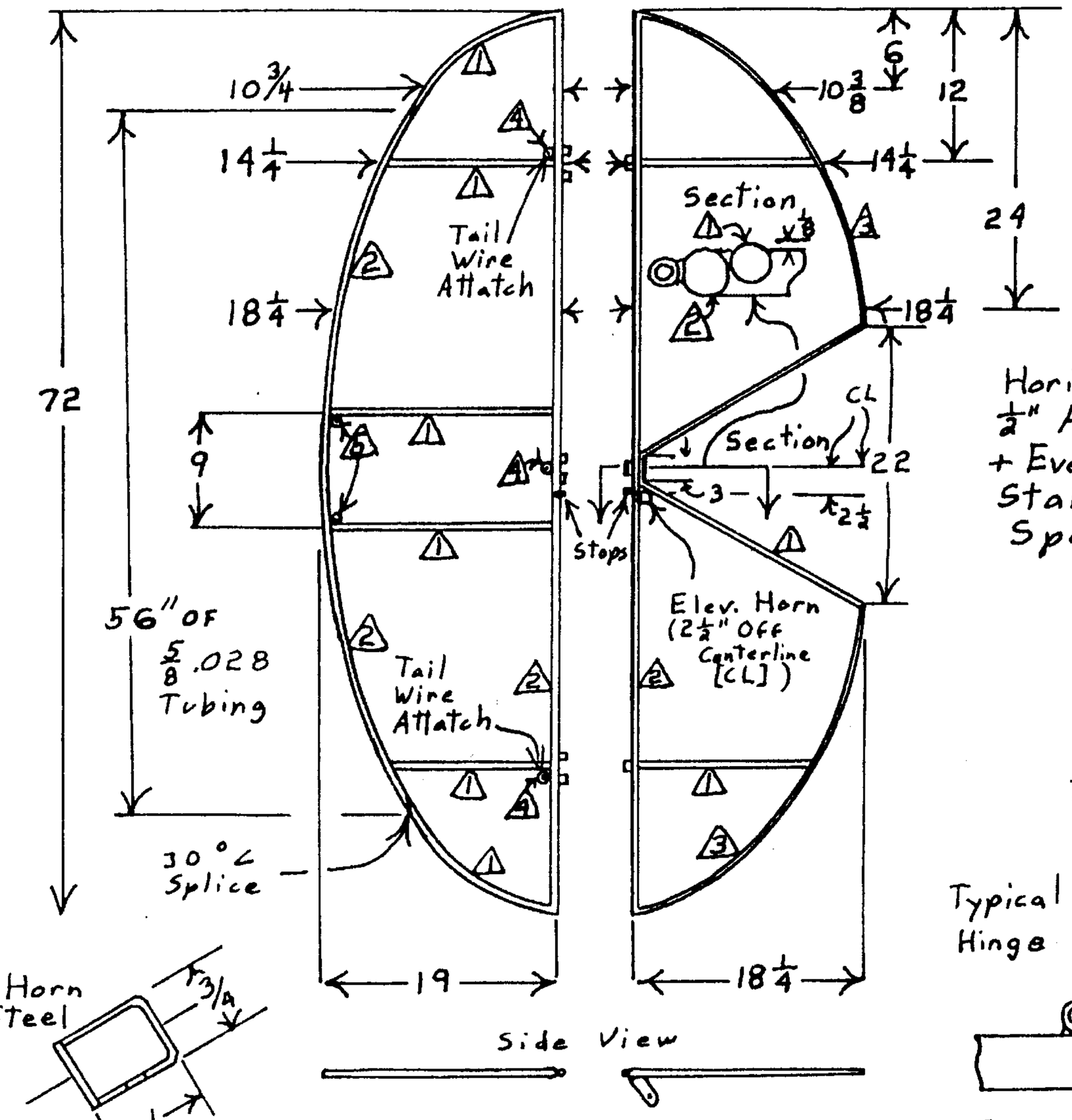
Front Pin Slides Under ⅝ x .040 Steel Strip Bent to Hat Section

⅜" Dia Pin Welded On

Horizonal Tail

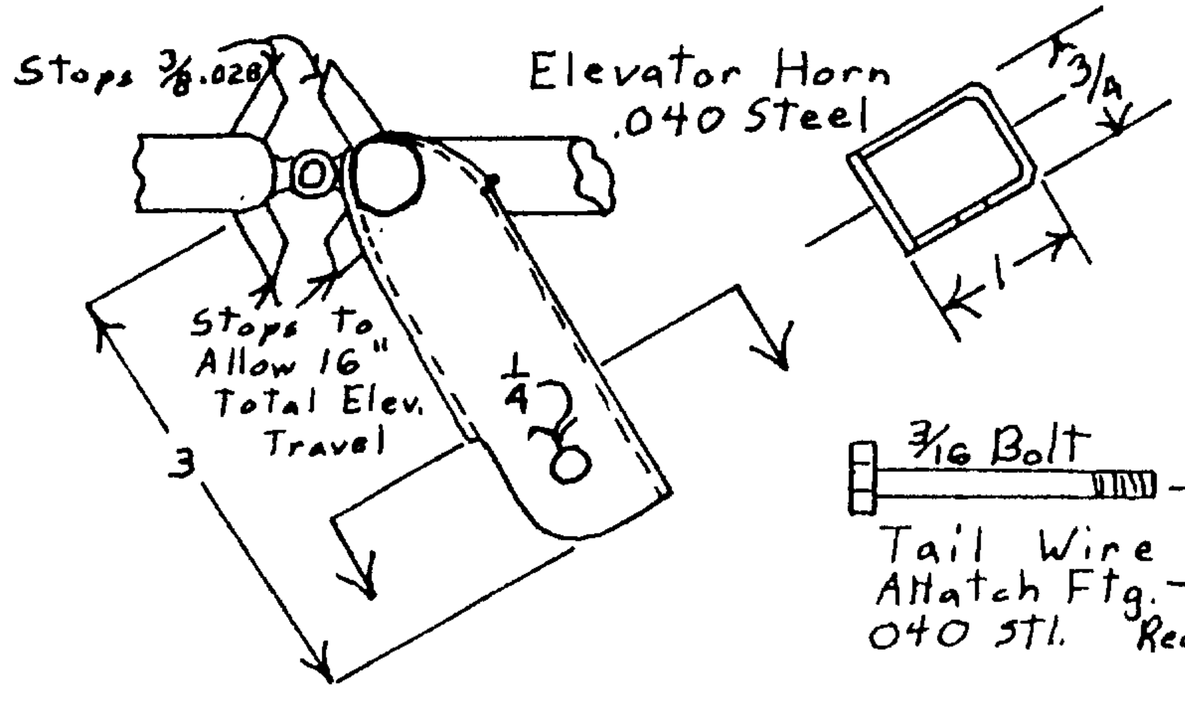


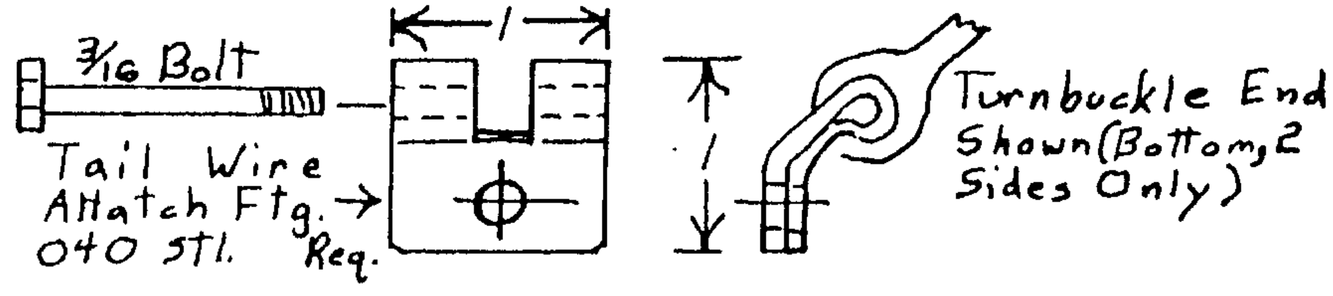


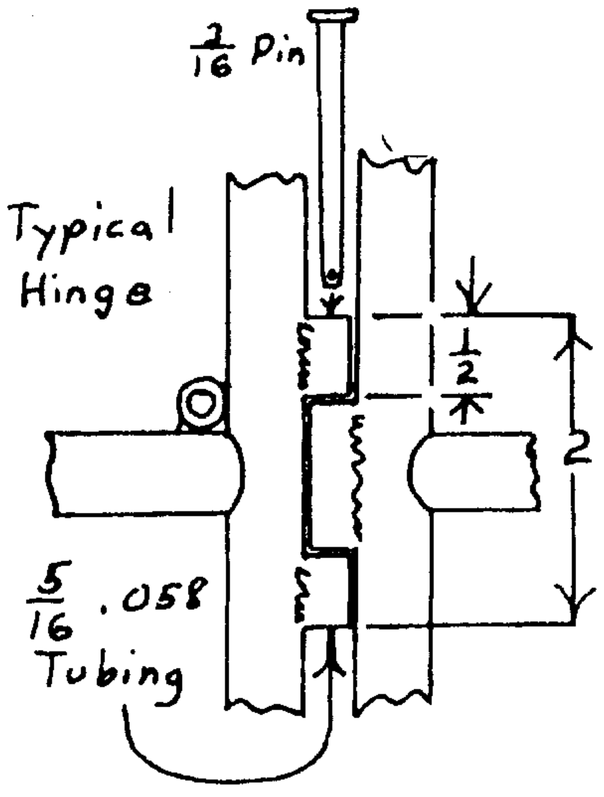


Horiz. Stab Is Placed 1/2" Above Top Longe + Evenly Between Ver Stab Front + Rear Spars.

(Elevator Horn is 2 1/2" From Center of Elevator)



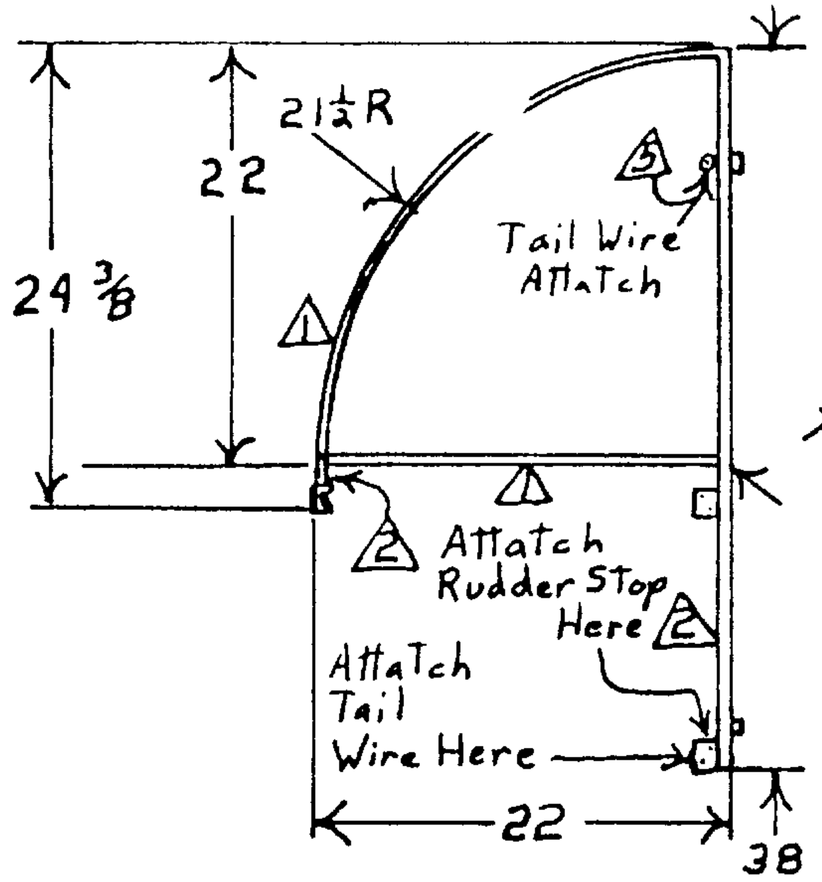


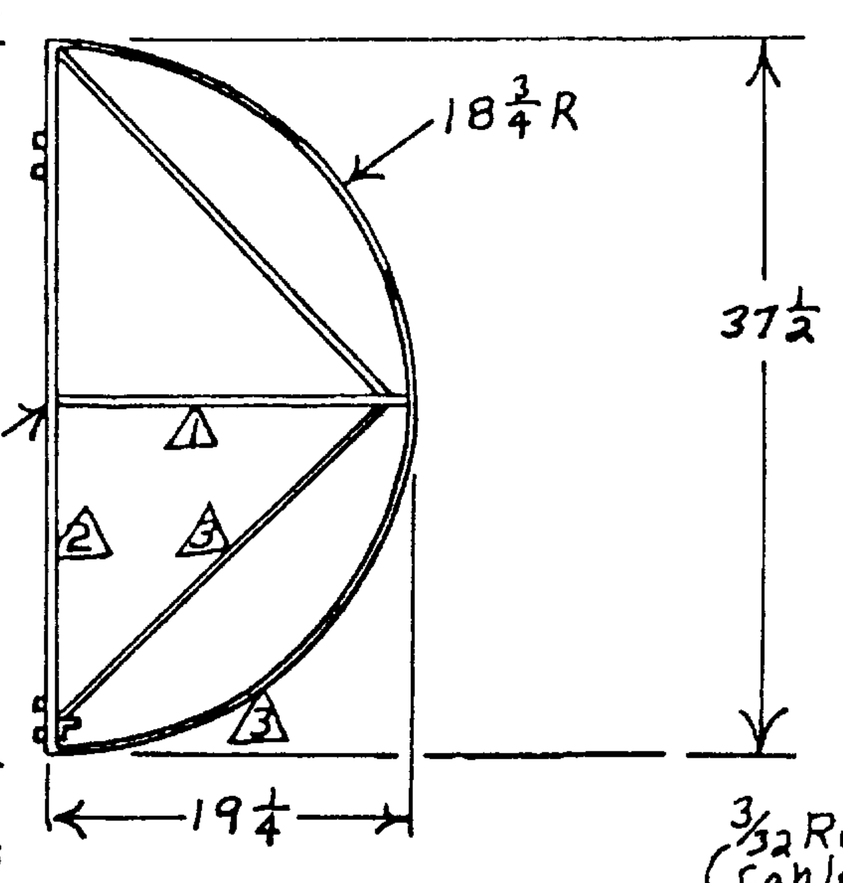


Drawing # 14
Vertical Tail

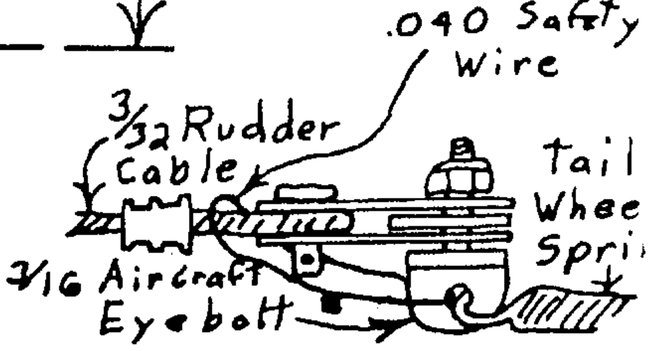
Tubing Size Key (Steel)

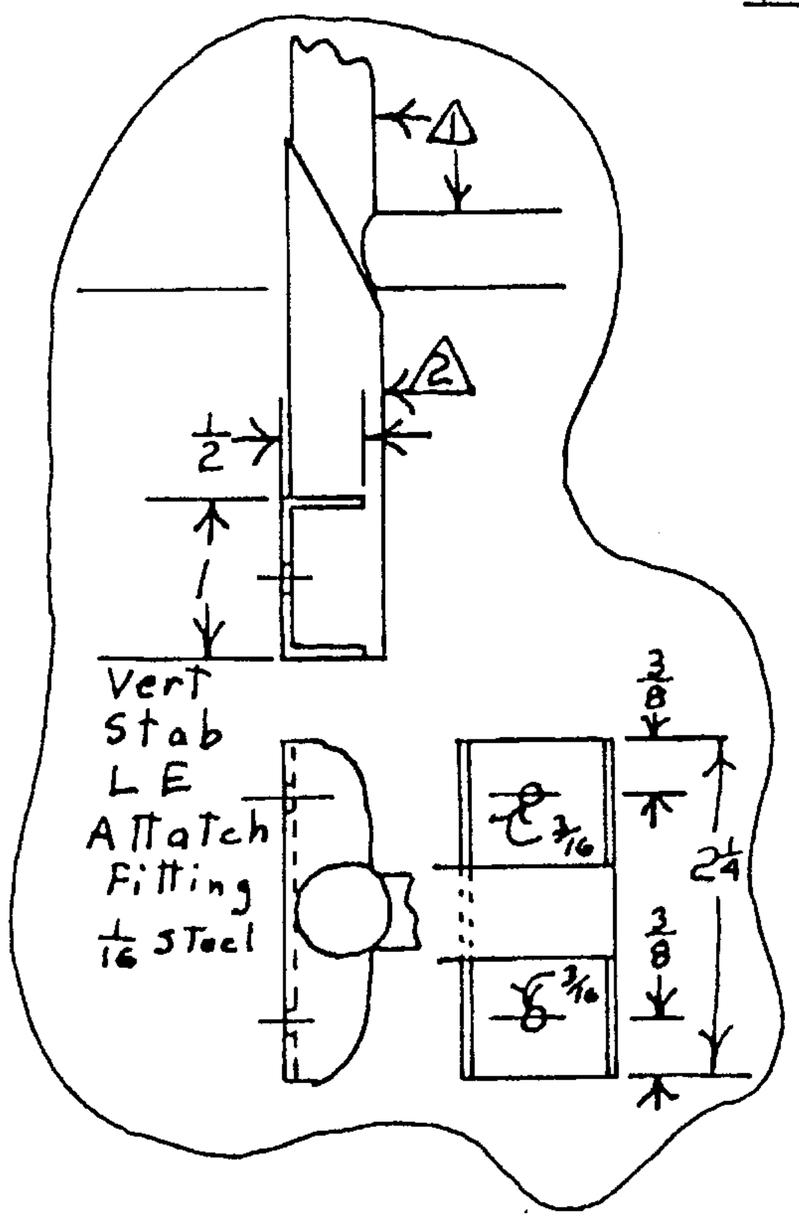
1 ½ .028	4 5/16 .058 x ½
2 5/8 .028	5 5/16 .058 x 5/8
3 3/8 .028	

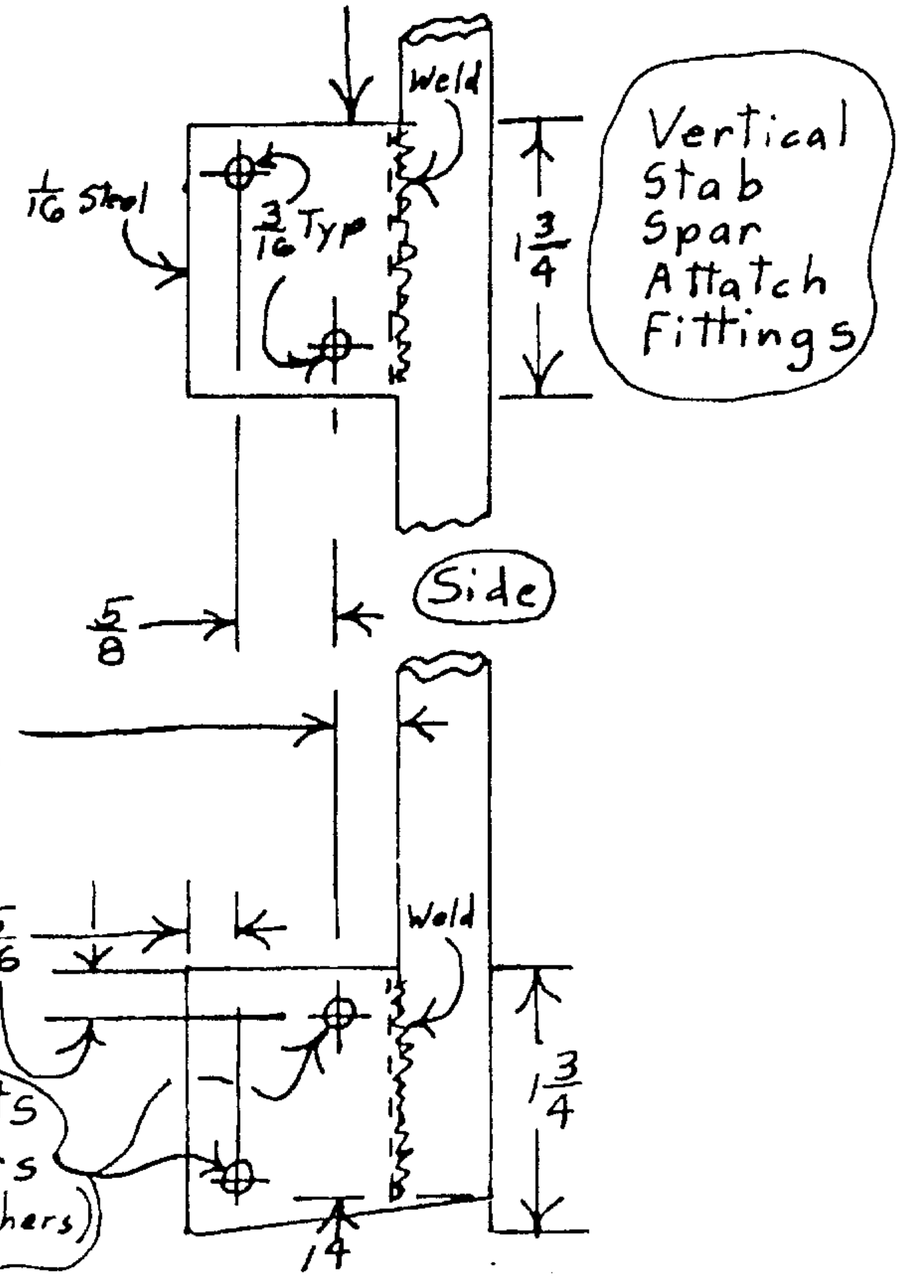


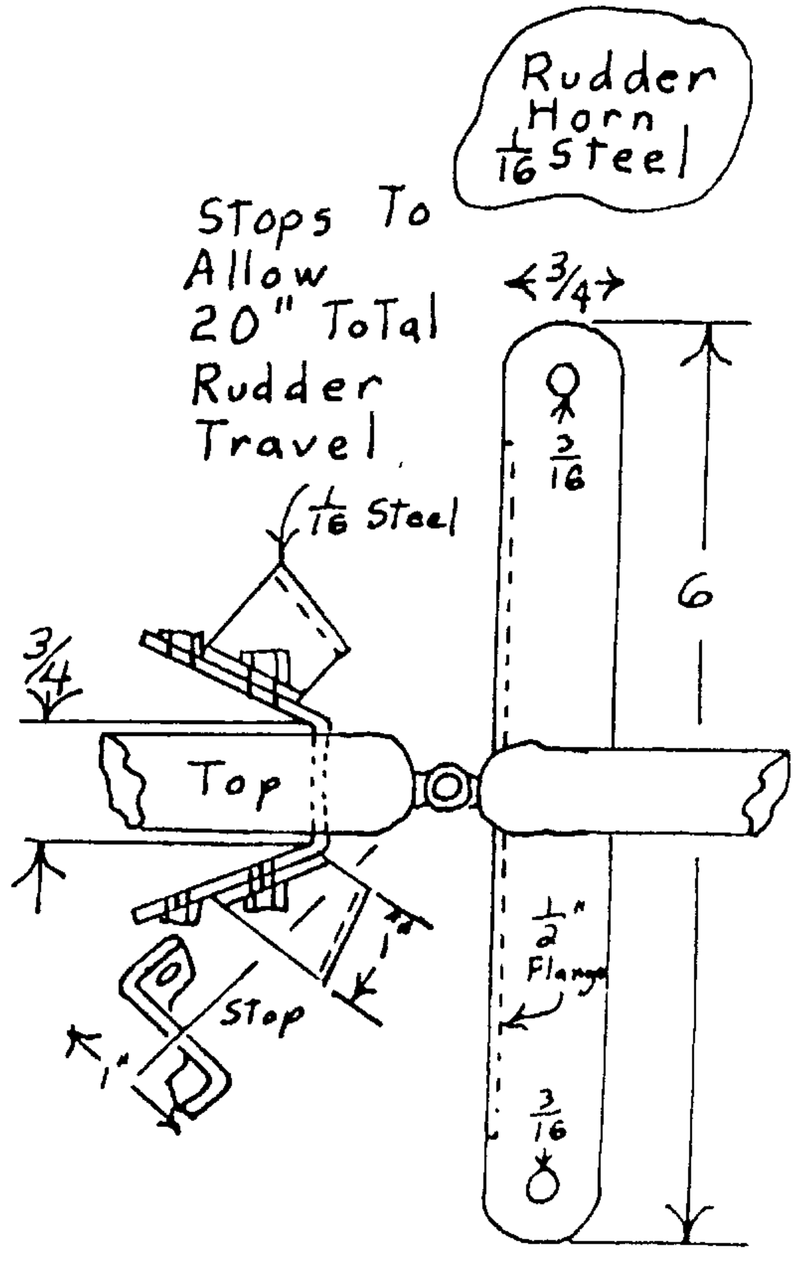


Top View



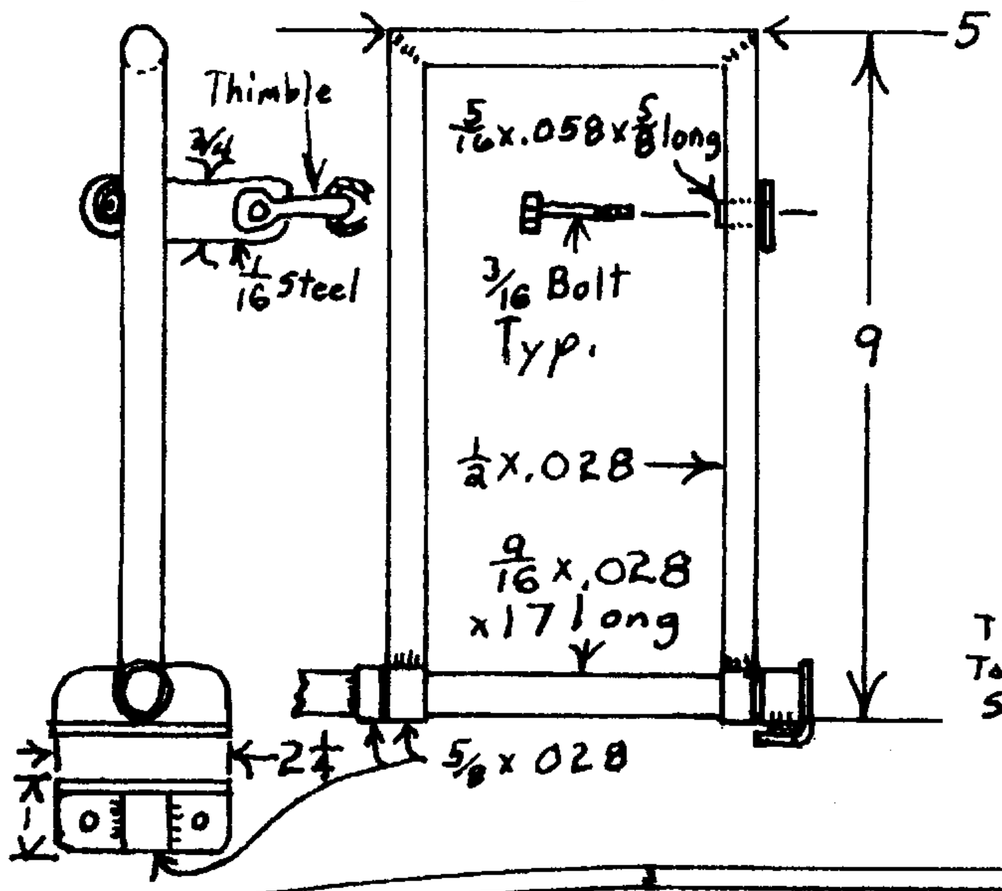




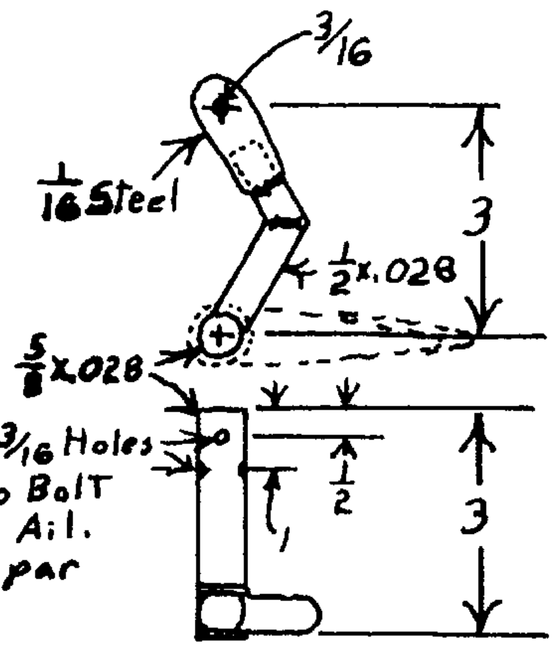


Drawing ... Control ... yout

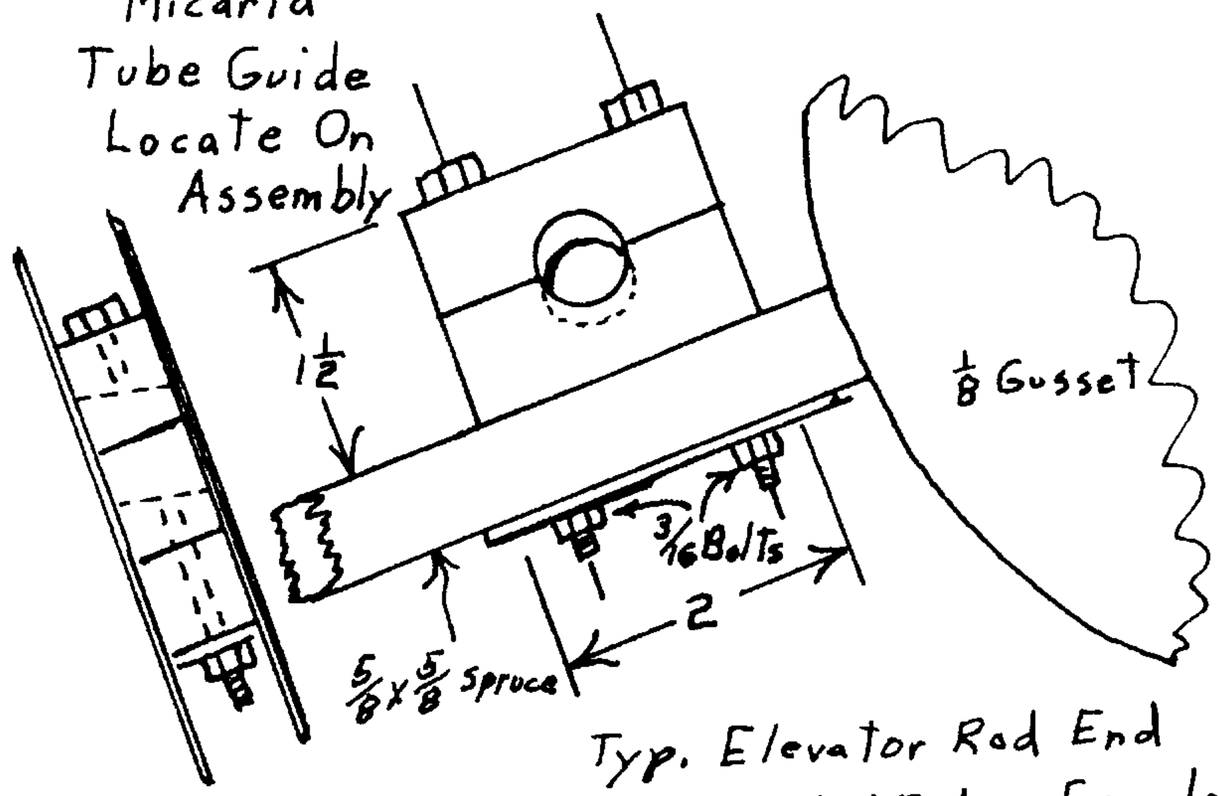
Rudder Pedal (Right)



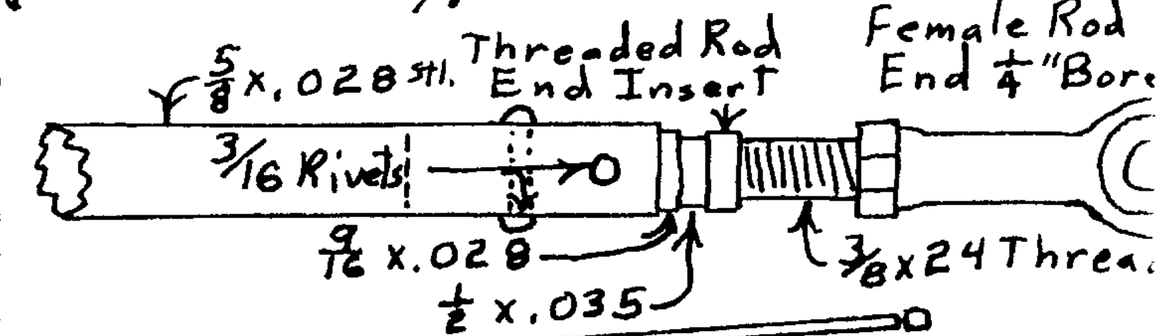
Aileron Horn 2 Required

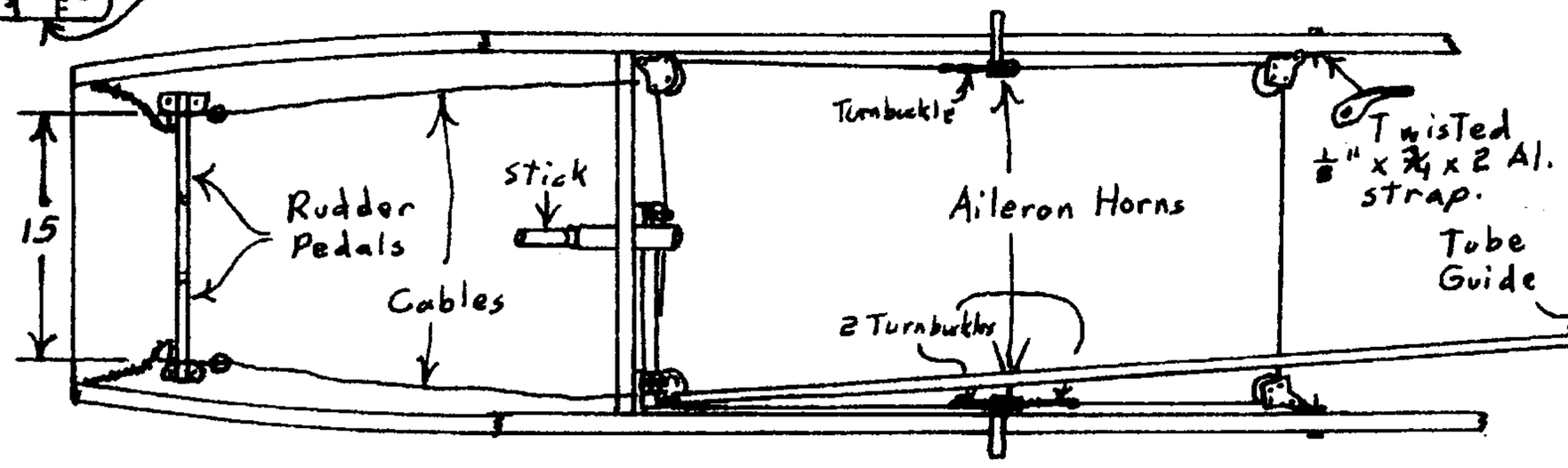


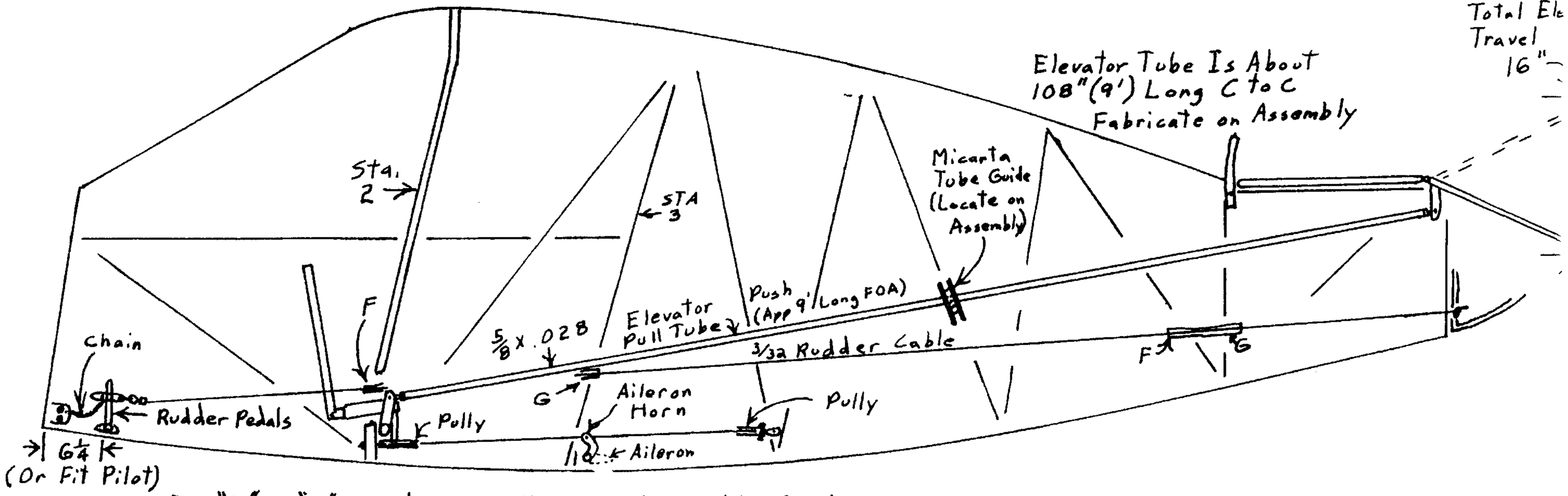
Micarta Tube Guide Locate On Assembly



Typ. Elevator Rod End





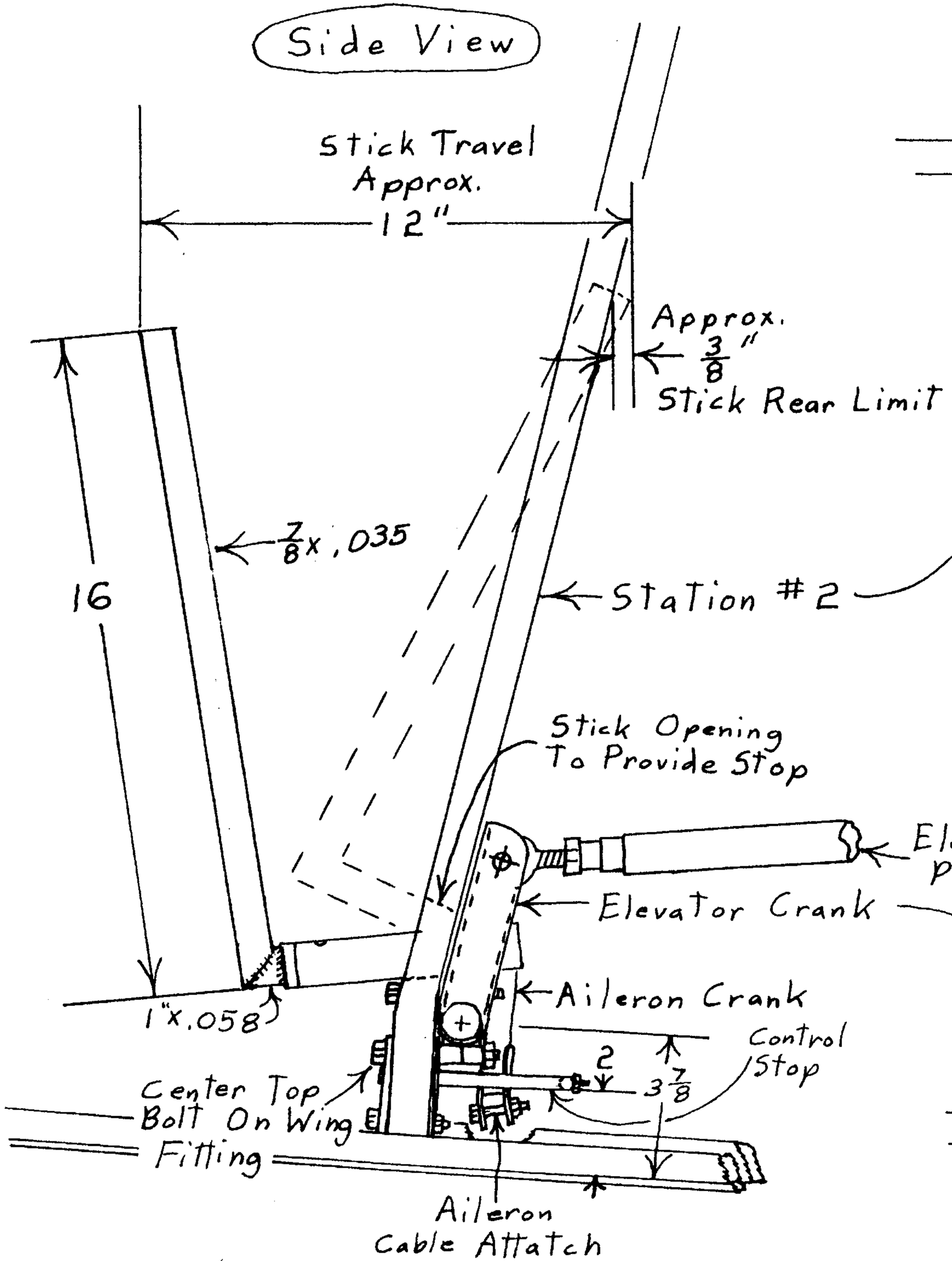


From "F" to "G" Is 1/4" OD White PVC Pipe Cable Guide

Drawing # 2

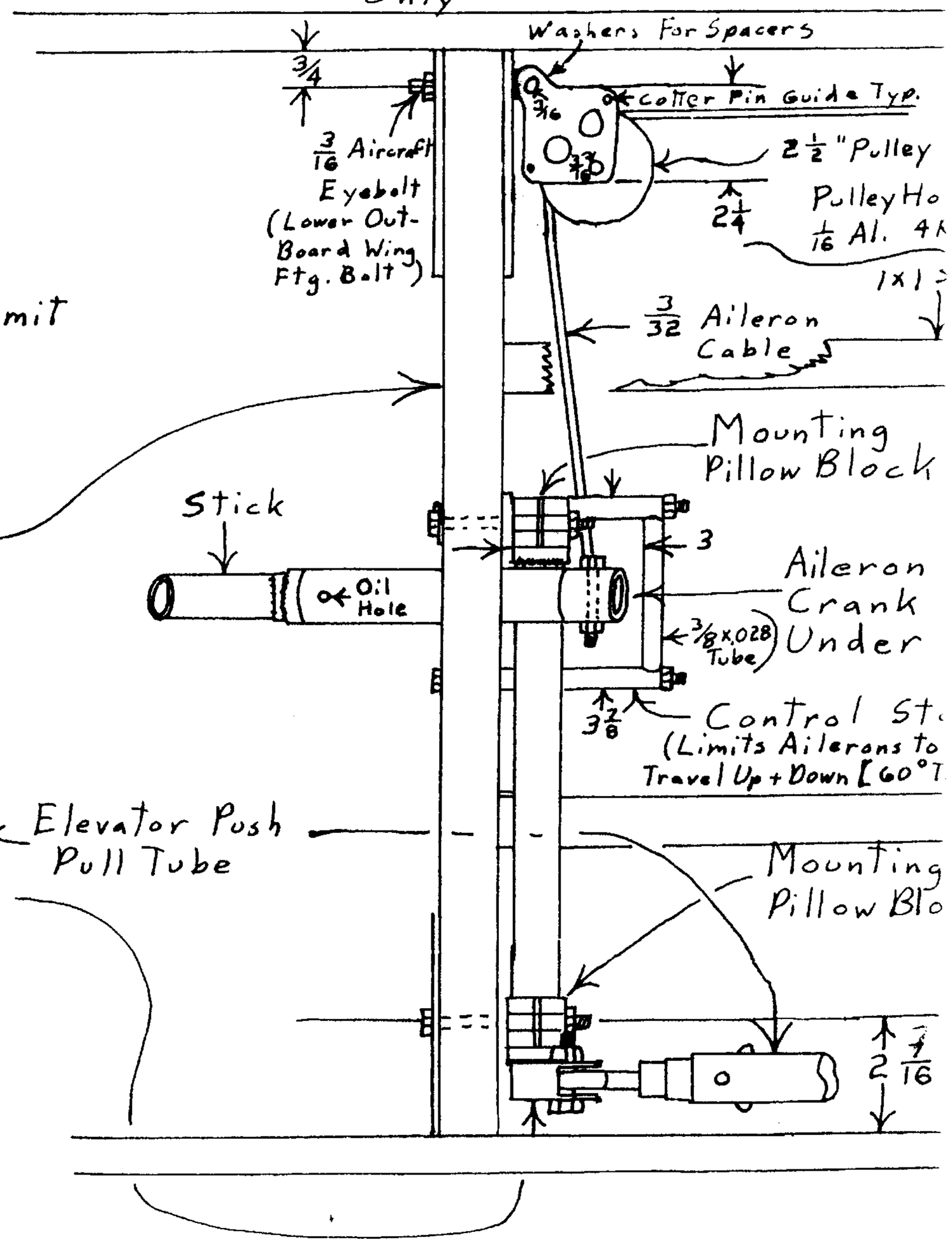
Cock Pit Control Stick

Side View



Top View

Showing Right Aileron Cable Only



Drawing * 2

Cockpit Control Stick Exploded Views

Top

$\frac{5}{16}$ .058 x $\frac{9}{16}$

Rear

1"

Typical Pillow Block Half Made From $1\frac{1}{8}$ x .058 Tubing 1" Long

C.L.

$4\frac{1}{2}$

1" x.058 Tube

$12\frac{1}{2}$ Depends On Wing Fitting Top Center Hole Position

$9\frac{3}{8}$

$1\frac{1}{8}$ x .058 $\frac{1}{4}$" Long

$\frac{3}{4}$

Note
All Bolts In Cont. System Are $\frac{3}{16}$ Exc. Where Noted (ie. Elev. Rod Ends.) Movin Bolts Must Be Drille. Castellated Nuts + Cott

Typical Control Cable End

$\frac{3}{32}$ Cable

Nicopress Sleeve

Cable Bushing ($\frac{3}{16}$ Bore)

$\frac{7}{8}$ x .035

16

Stick

Elevator Push Pull Tube

Elevator Crank

1"

$\frac{1}{4}$" ID Rod End

.040 Steel

Aileron Crank

Side End

$1\frac{1}{8}$ x .058 x 1" Long

$1\frac{1}{8}$ x 058 x $\frac{1}{4}$

1 x .058

$1\frac{1}{8}$ x .058

$\frac{1}{4}$

4"

4

$\frac{5}{8}$ x .035

Typical pillow Block Half Side

$\frac{3}{16}$

$\frac{3}{16}$ Dia

weld

7

$\frac{5}{16}$ x 058 Tubing $\frac{9}{16}$ Long

$1\frac{1}{2}$"

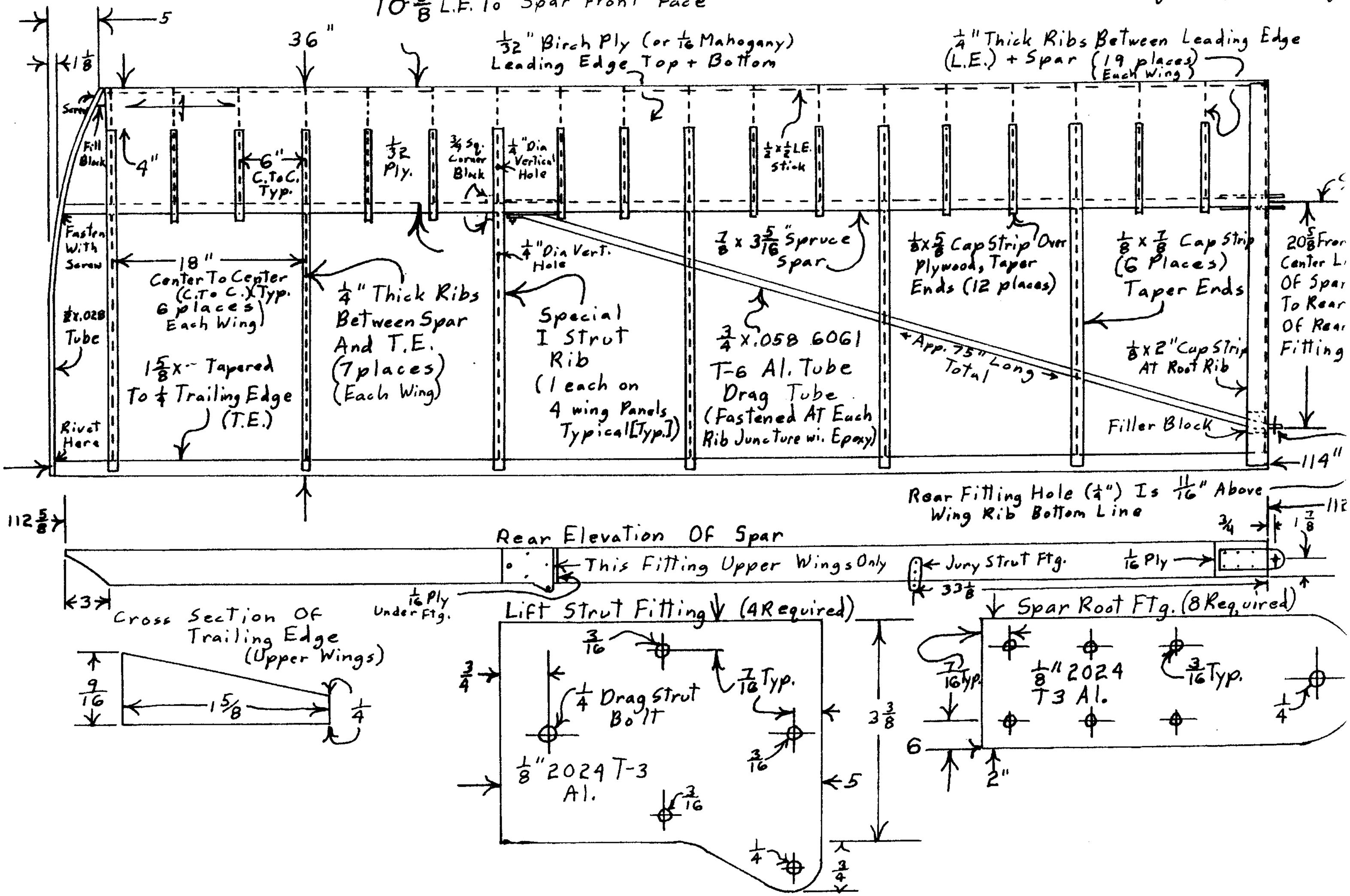
1" x .058

$\frac{3}{16}$ Bolt

$\frac{1}{16}$ Steel

Side View Without Elevator Crank

Drawing # 23
Upper Wing Panels
2 Required, Left + Rig



Drawing: L 1

Lower Wing Panels

2 Required, Left + Right

Top View Showing Limited Inner Structure

37

32 3/8

Pitot Tube (Left Wing Only)

Screw

Fill Blk

Screw

Screw

1/32 Ply.

12 x 12 1/16 Birch Step Over L.E. Ply. Left Wing Only

1/2 Dia x .060 x 1" Long Al. Spacer Placed Here (Typ 4 Places) Wing To Fuselage Bolts Pass Thru.

1/8 x 2" Cap Strip Typical Over All Root Ribs

Aileron Hinge Typ. 3 places Each Wing

4 1/2

Spruce Rear False Spar

Filler Block

114

3/4 x .058 Al. (6061 T-6) Tube

Ail. Spar

.016 Al. Skin

1 1/2

Aileron

1/16 Al.

2"

Rear False Spar

3/16 O

Ail. Hinge

3/16 Typ

Ail Hinge

Ail. Spar

Ail. Spar

1/8" Pop Rivets

3/4

1" OD Nylon Bushing 1" Long

2 3/8

1/2

1

No Ribs In Ailerons Except Ends

Aileron

.016 Sheet Al.

Aileron Skin Must Curve Out Slightly For Good Roll Control

Trailing Edge Must Have At Least 1/8" Radius

Section Thru

View Inboard Section of Aileron Hinge Setup Typical 3 places Each Wing

Rear False Spar Section

1 1/16

7/8

7/8

Note Taper Rear Of Rib To Fair With 7/8" False Spar Rear Height.

Lower Wing Spar Section At Drag Tube Connection.

1/16 Ply + 1/8 Al. Both Sides Of Spar

I Strut Rib

1/16 Birch Ply Typ. 4 pl. Epoxy On

1/4

1 1/2

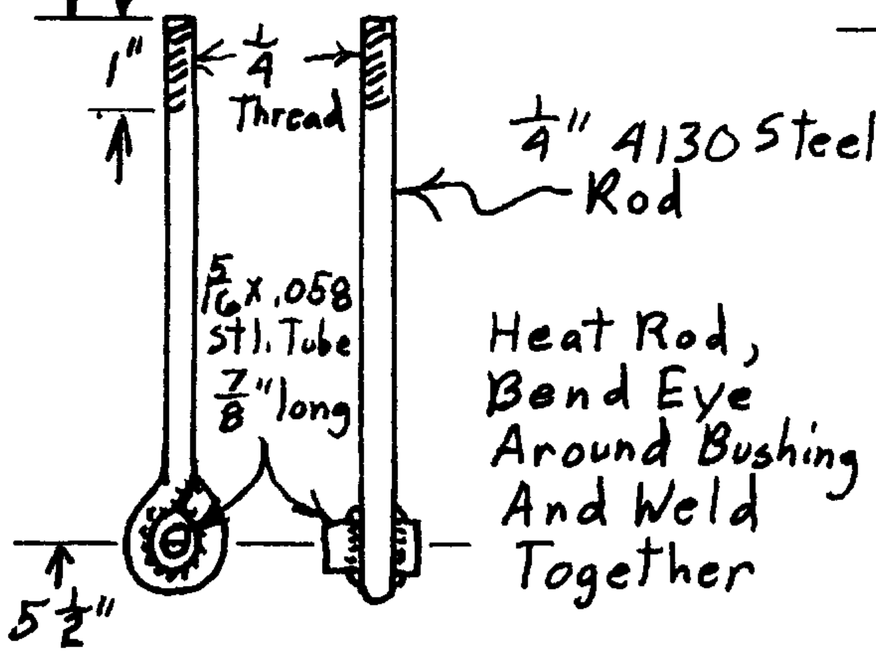
1/8 Al Typ 4 pl. Epoxy On

1 1/2

2

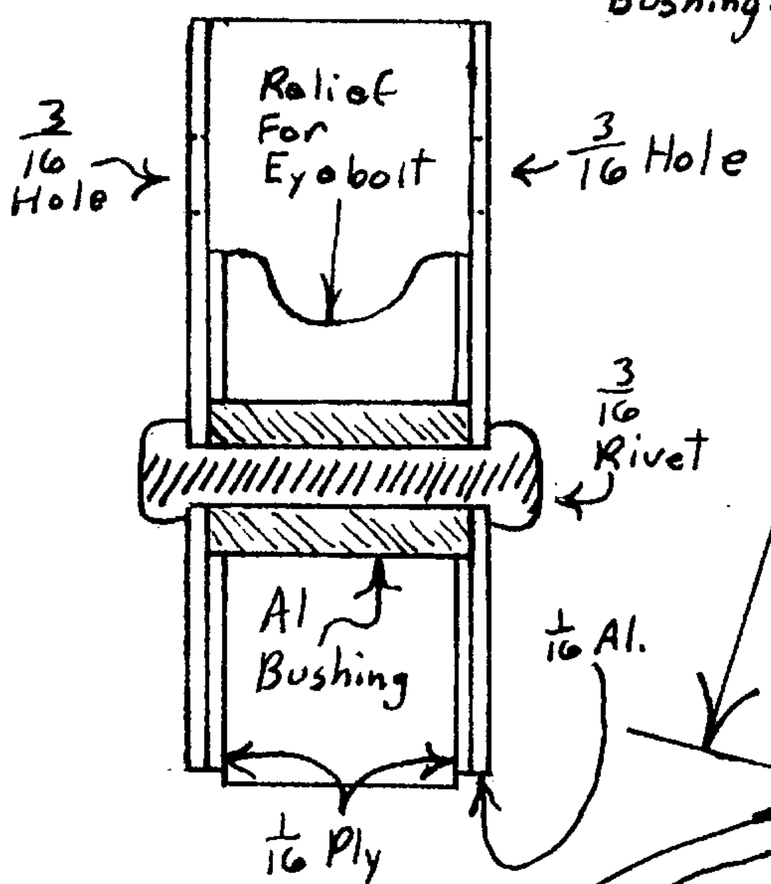
Drawing # 25
Inner Wing Strut
2 Required

Fabricated Eyebolt
8 Required

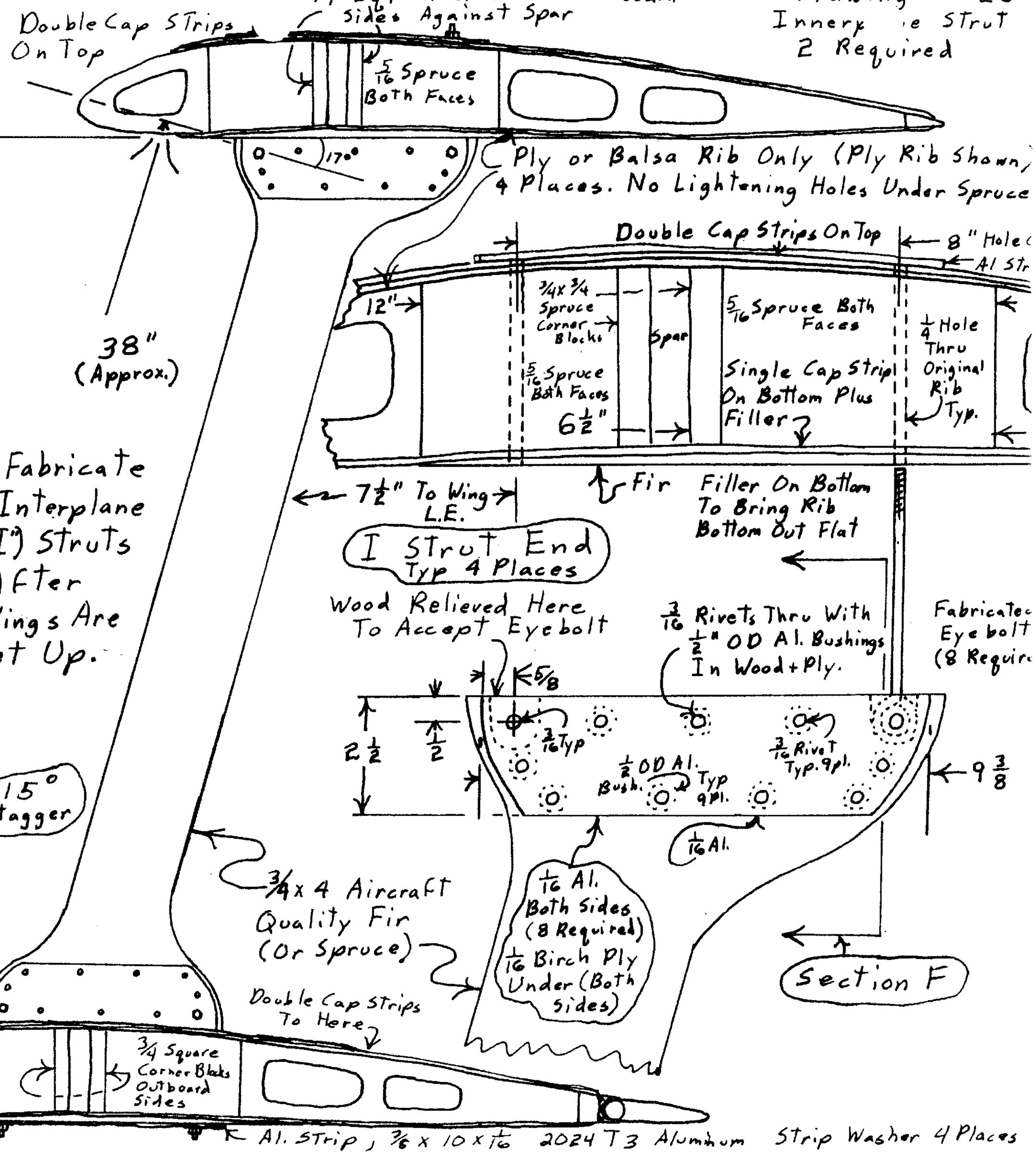


Section F

I Strut End Cutaway Showing Eyebolt Relief And 3/16 Rivet With 1/2 OD Al Bushing.

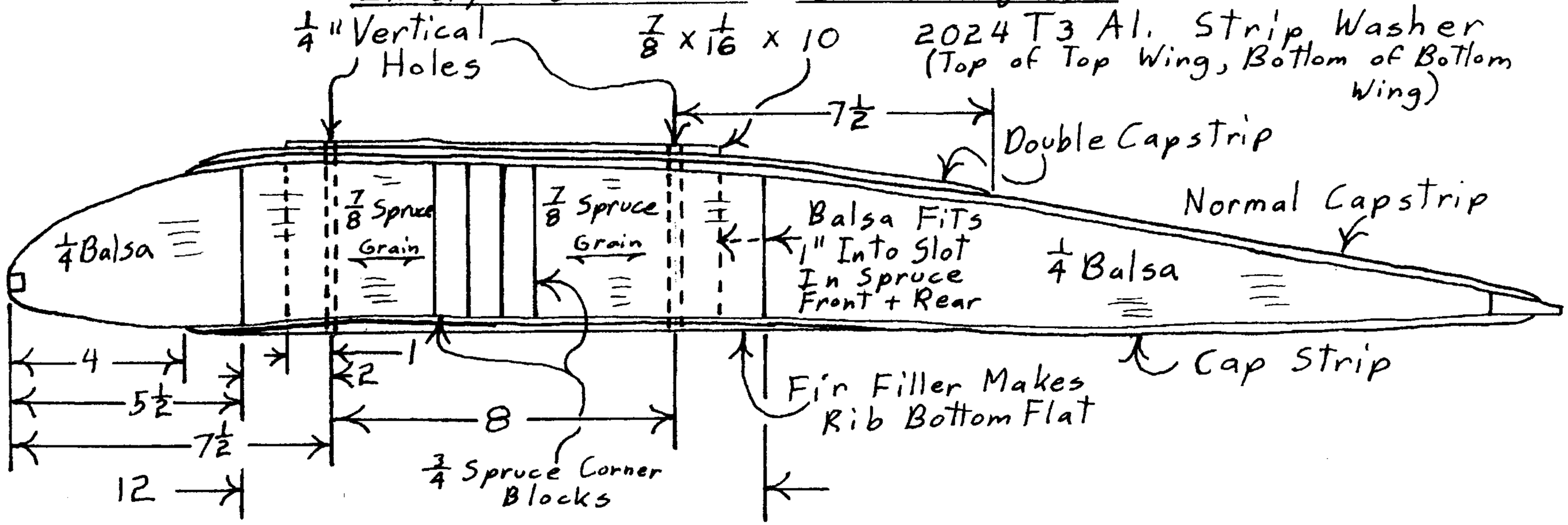


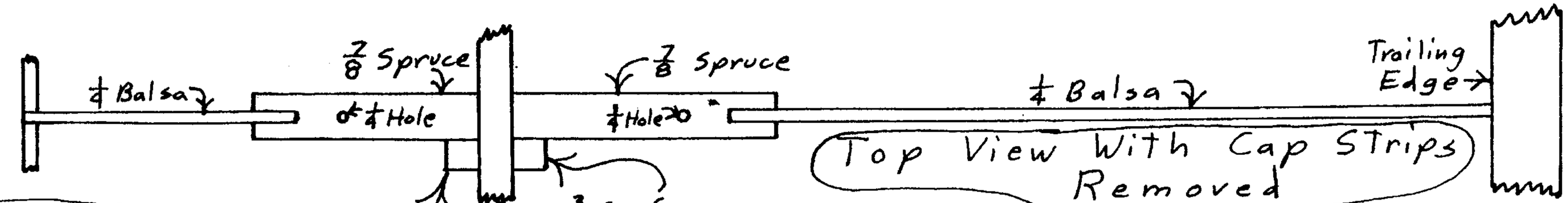
Fabricate Interplane ("I") Struts After Wings Are Set Up.

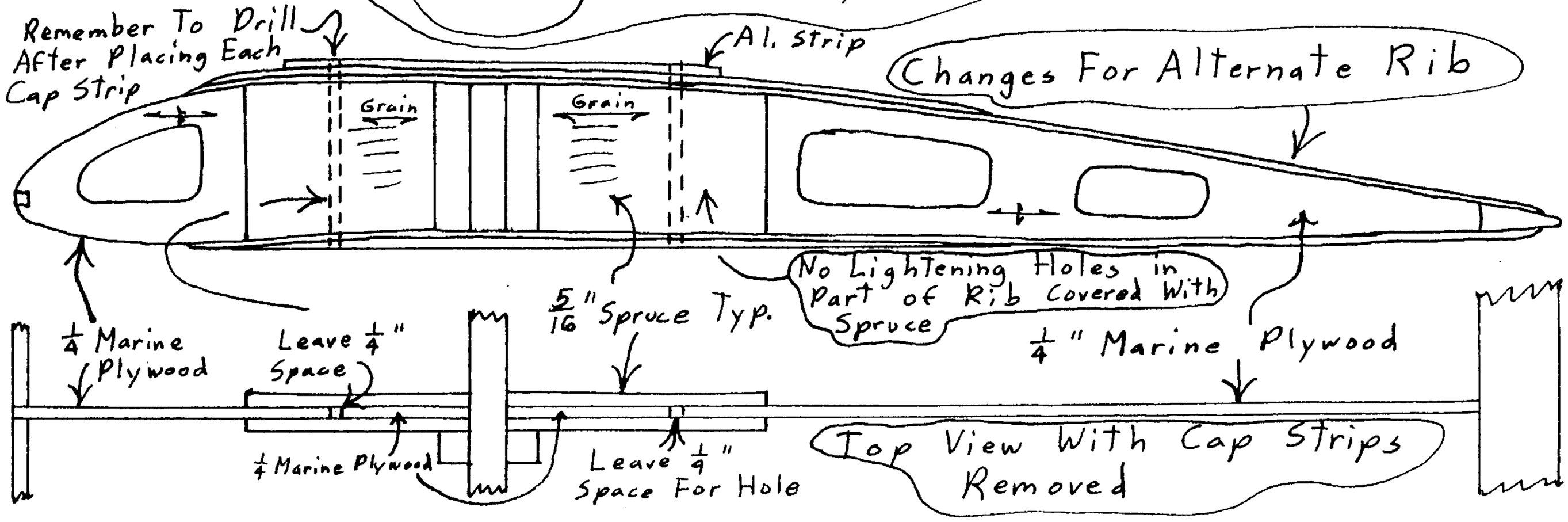


Drawing # 26

Interplane Strut Rib 4 Required







Drawing # 21
Rib + Struts

Guppy Rib, As Installed

1/32 Ply.

1/4 x 1/4 Spruce

Spar

1/4 Balsa

7/8 x 1/8 Spruce Typ. All Types Of Ribs

1/2 x 1/2 Spruce

1/32 Ply Typical All Types

5" 5" 5"

This + Marks About Where The Drag Strut Passes Through The Rib (Typ. All Rib Types; 3 Places)

Front Rib (7C Required)

10 5/8

Rear Rib (28 Required)

Cutouts As On Full Sized Template

Spar

1/8 Ply

Typical 1/8 Ply Gusset Where Dr. Strut Passes Thru Rib. Glue To Rib + Epoxy

Marine Ply.

2"

Strut; Place on Both Sides Of Rib; Typical All Rib Types.

Suggested 1/4"-Marine Ply Rib

1/4 x 1/4 Spruce

1/32 Birch Ply Gussets Approx 1" x 1"

Suggested Built Up Rib

Spruce Filler

Spar

0" 4" 7 1/2" 10 5/8" 17 1/2" 22 1/2" 28" 31 1/2"

Rig Wings With 1.5 Inches Dihedral Each Si

(Wing Lift Strut) 2 Required Build After Setting Up Top Wings.

39 1/2

78 1/4 Approx. (Measured From Centers Of Bolt Holes)

Lift Strut is 1" x .035 Steel Tubing Streamlined With Balsa Wrapped With Fabric And Painted With Polyester Resin

Jury Strut Ftg. .040 Steel 2 Req.

3/8 x .058 x 1 1/4" Long Tube Typical Both Ends

Jury Struts Are 3/8 x .028 Steel Tube 18" Long, Both Ends Flattened And Drilled For A 3/16 Bolt

9°

Typical Strut End

1/16 Steel

3/8 x .058 x 1 Tube

Cross Section Of Strut

1 1/4

3

Balsa

1" x .035 Steel Tubing

3/16

1 3/4

1"

Jury Strut Spar Fitting 1/8" Al. 2 Req. One On Rear Of Each Top Spar.

3

3/16 Typ

1

Wing Drag Tube, Wing Strut Support, Top Views

Drawing # 28

Top Wing

Bottom Wing

$\frac{1}{8}$ x 2" Cap Strips

Wing Root Rib

$1\frac{3}{4}$ x 2 x Full Rib Height Filler Block

$\frac{3}{16}$" Bolt Thru Block + Tube

Split Block Here To Install Tube

Wing Drag Tube

Epoxy Block Around Drag Tube And Inside Of Rib + Cap strips

It is 20" From This Face To The Rear Face Of The Main Spar Aft Fitting

Filler Block Epoxy in Cap Strips And Around Tube

$\frac{3}{16}$ Bolt Thru Block, Tube, + Ail. Spar

It measures 20" From Rear Face To Rear Face Of Wing Fittings

$\frac{3}{4}$

Aileron Spar

Washer Typ

$\frac{1}{8}$ Groove In Ail Spar

Counter Sink

$\frac{3}{4}$ x .058 6061 T6 Al. Tube

Slot

$\frac{3}{16}$ Hole

$\frac{1}{4}$ Bolt Hole

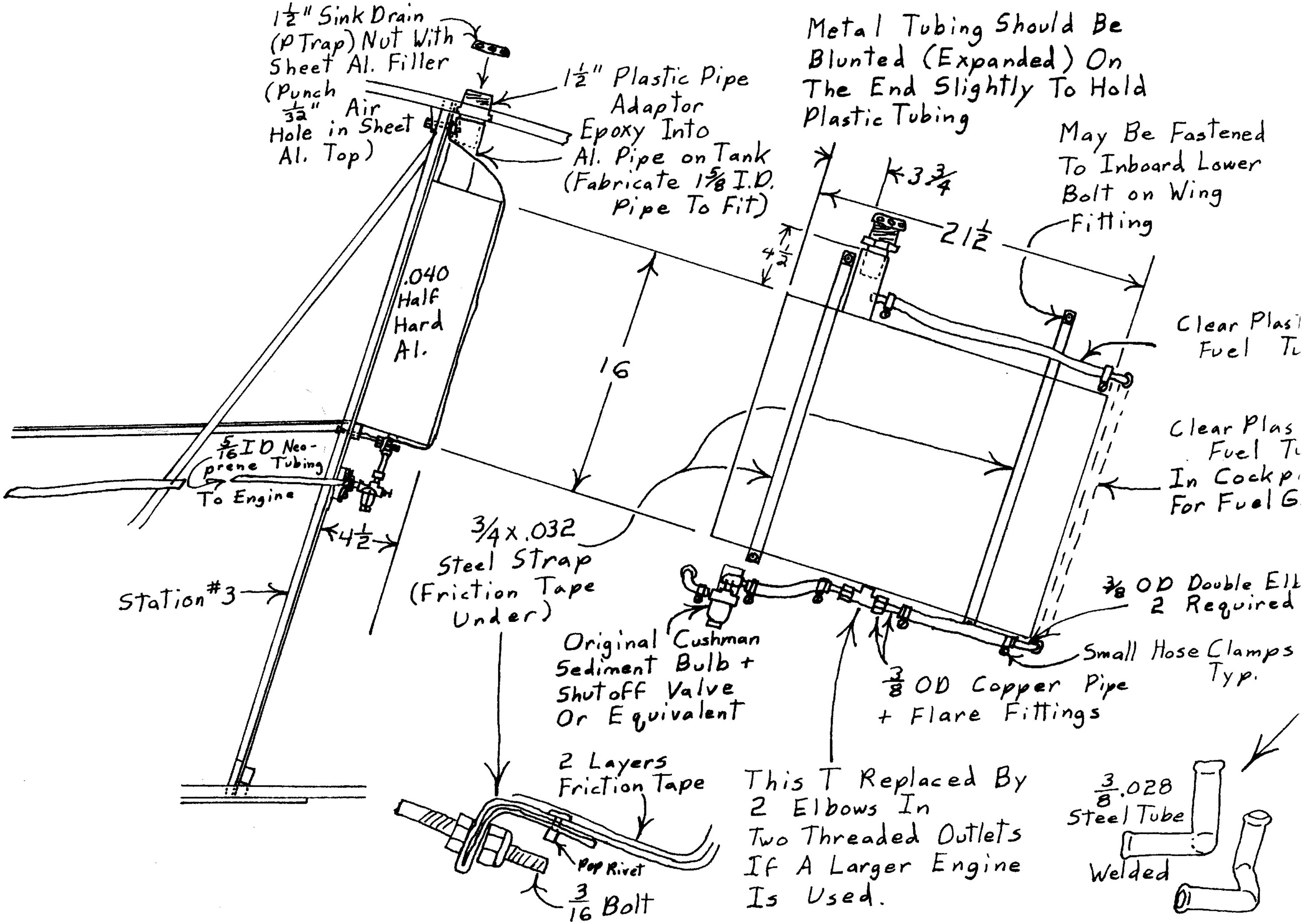
$\frac{1}{8}$" Pop Rivet (Typ 4 places)

$\frac{5}{8}$ x .058 x 4 Al Tube 6061 T6

How To Terminate Drag Tube (Typ 8 Places)

1. Slide 4" of $\frac{5}{8}$ x .058 6061 T6 Al. Tube Into Strut End + Rivet In
2. Drill $\frac{3}{16}$" Hole + Cut Slot
3. Flatten Carefully with Wood Hammer
4. Drill $\frac{1}{4}$" Bolt Hole On Assembly.

Drawing # 29
Fuel Tank

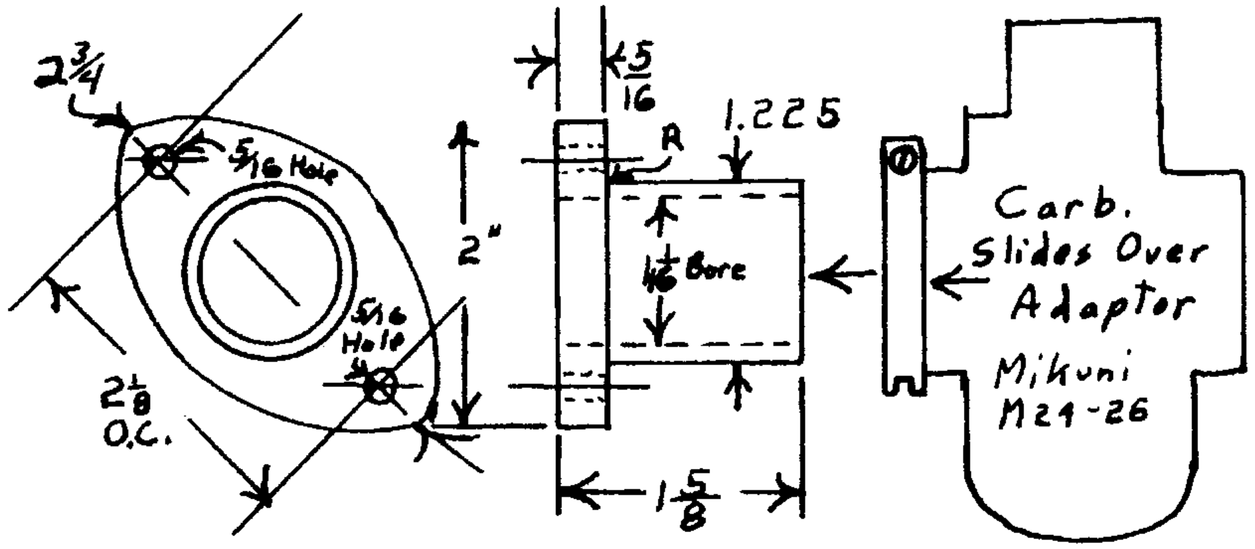


Drawing # 30

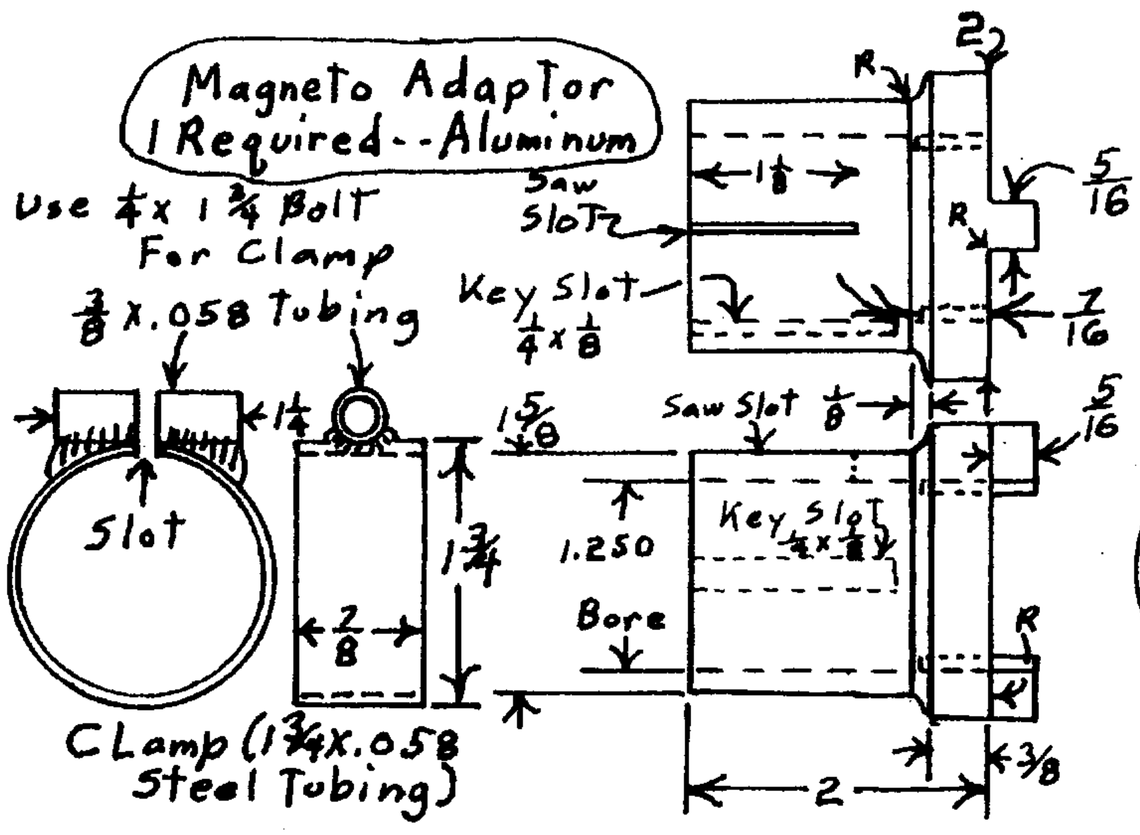
Engine Parts Req ing Lathe h

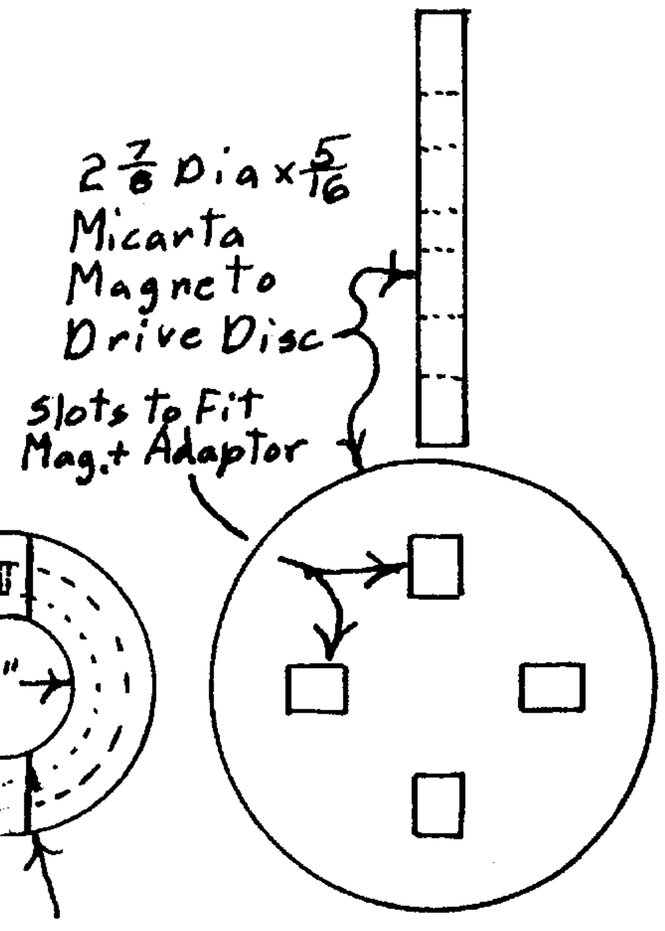
All Inside Corners 1/32" Radius Except As Noted

Carburetor Adaptor
2 Required -- Aluminum

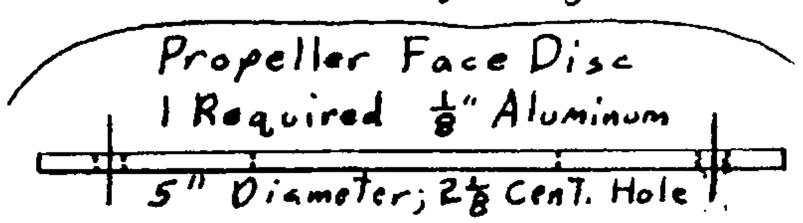


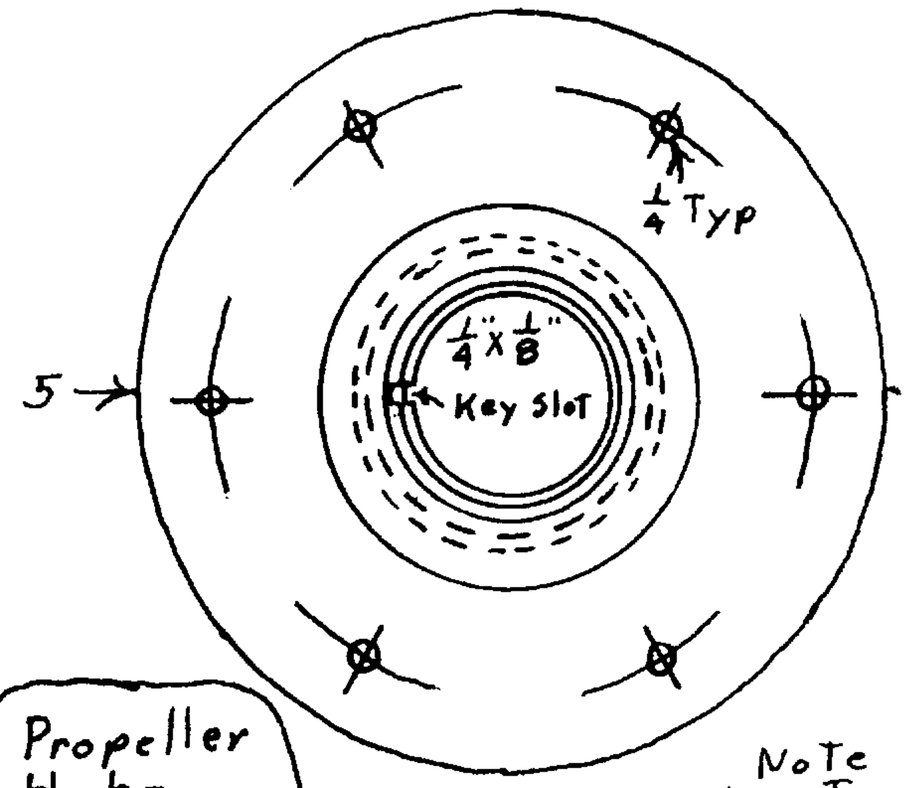
Magneto Adaptor
1 Required -- Aluminum





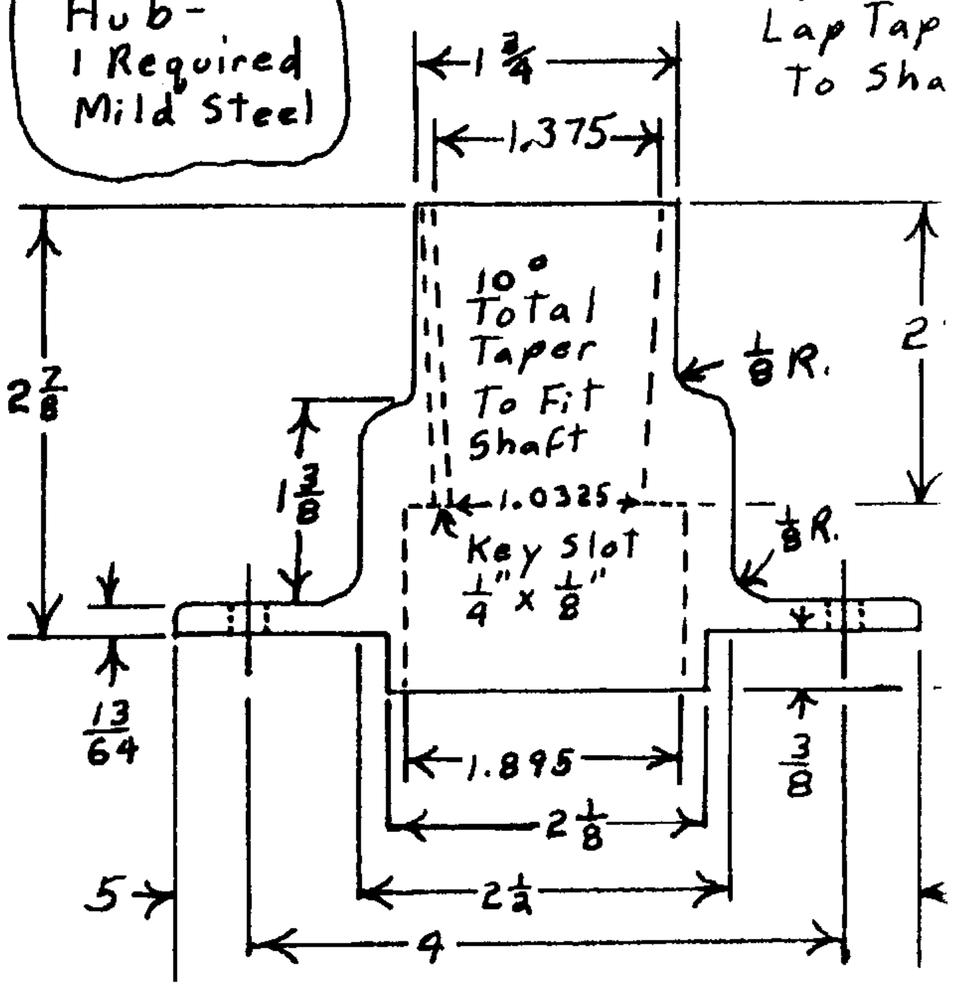
Propeller Face Disc
1 Required 1/8" Aluminum



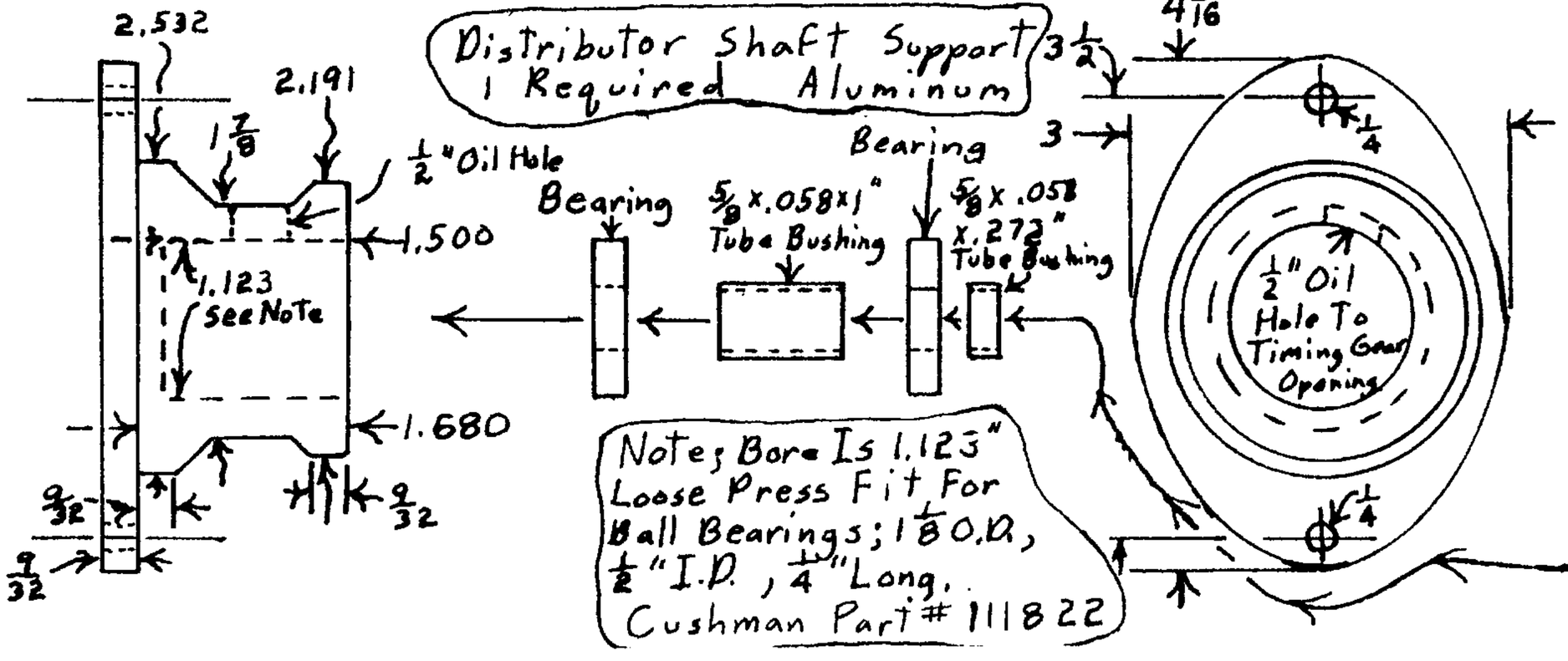


Propeller Hub -
1 Required Mild Steel

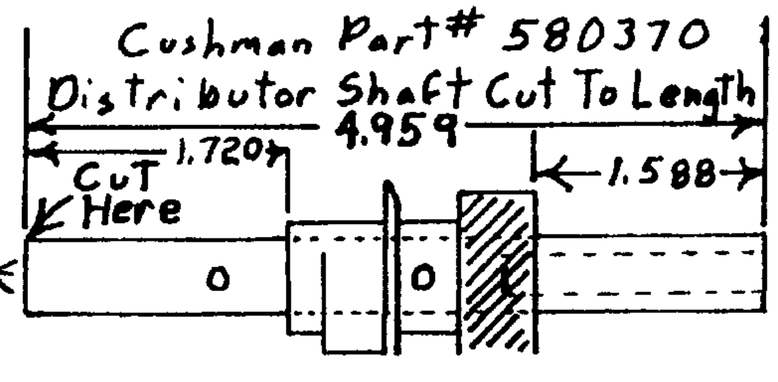
Note Lap Tap To Sha



Distributor Shaft Support
1 Required Aluminum

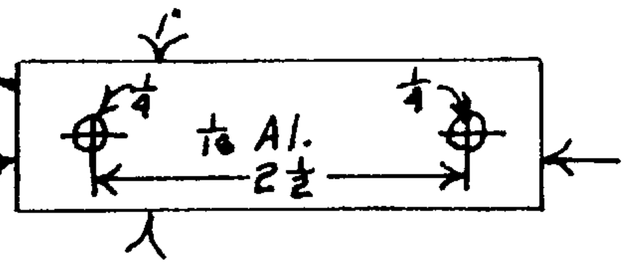


Notes; Bore Is 1.123" Loose Press Fit For Ball Bearings; 1" O.D., 1/2" I.D., 1/4" Long. Cushman Part # 111822

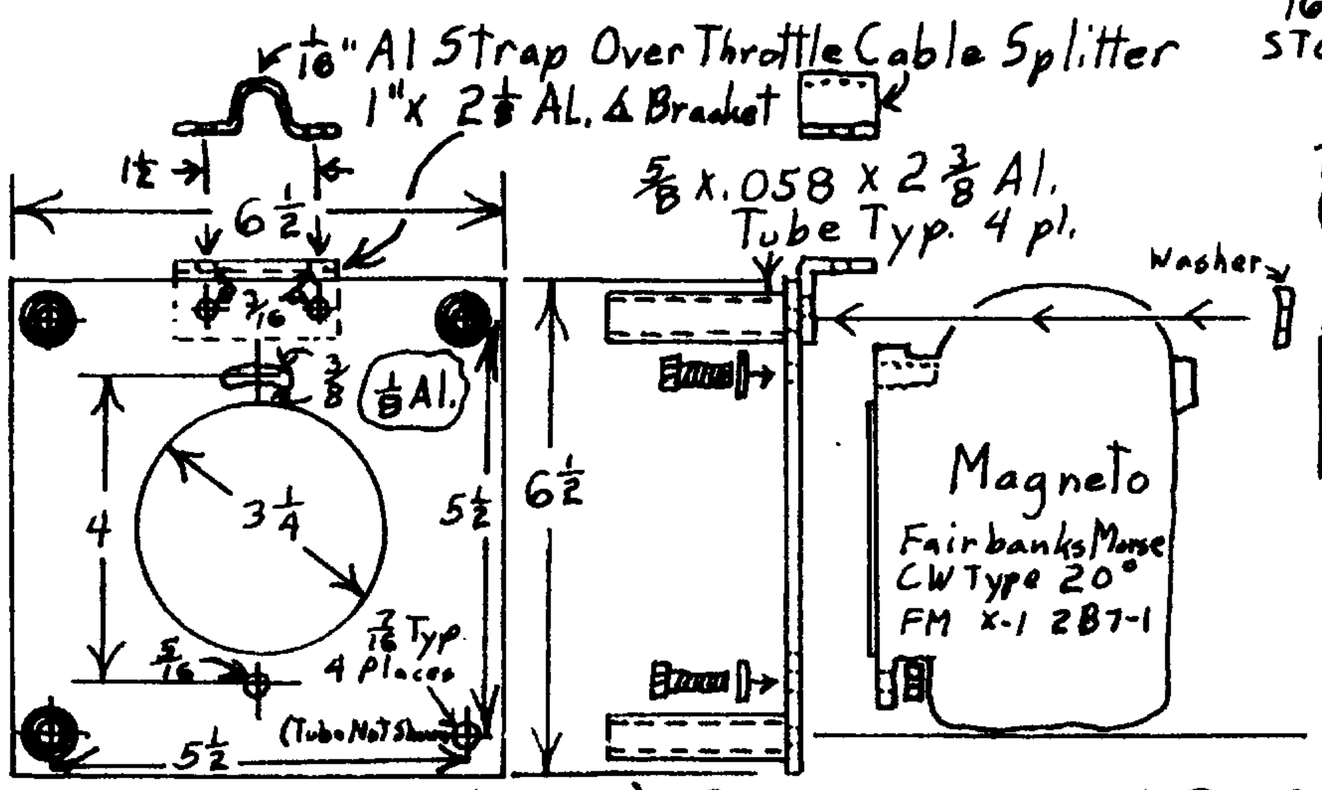


Drawing # 31
Engine Conversion
Engine + Magneto Mounts

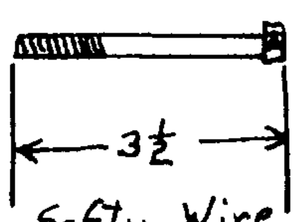
Rear Main Seal Keepers
2 Required -- Use 1/4" Drilled Head Bolts
Place Over Outter Part of Seal



Magneto Mount



7/16 x 14 Threaded Stock + Nut (Drilled)
or
7/16 x 14 Bolt (Drilled Head)
4 Places



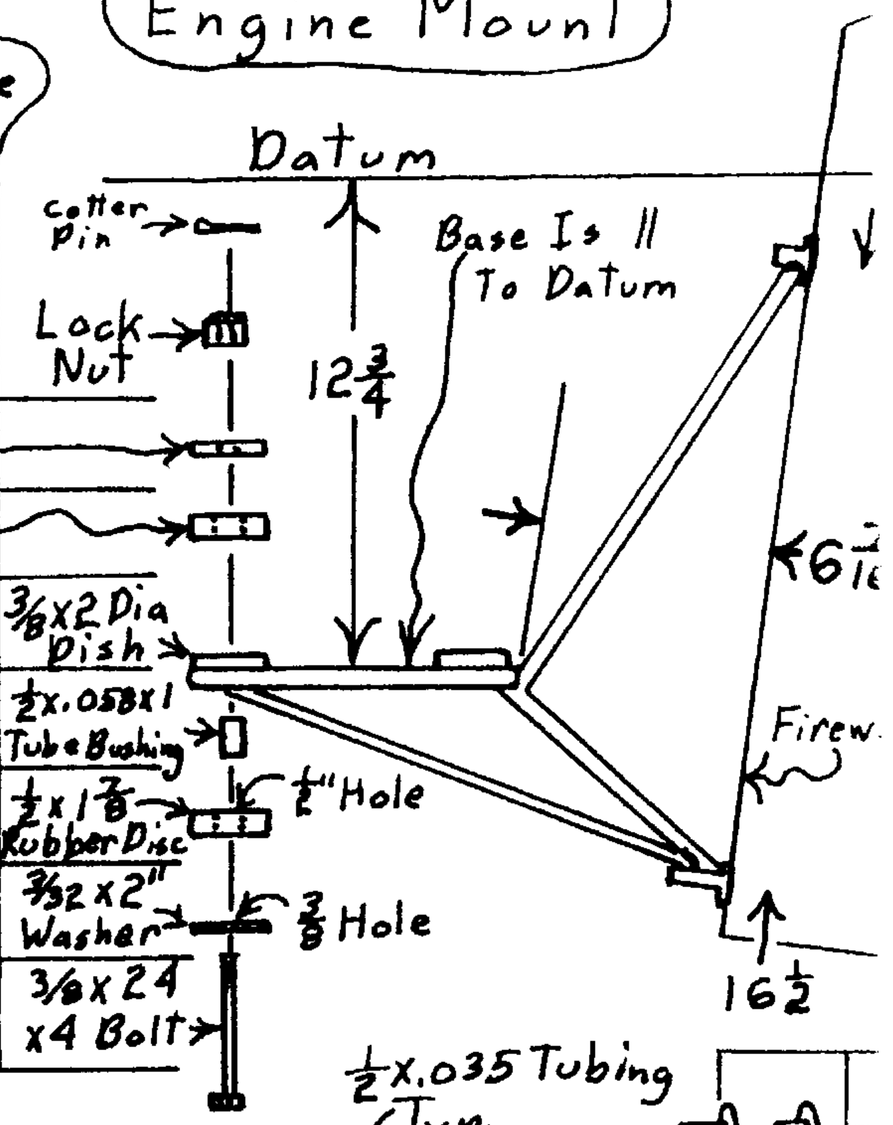
Safty Wire These Bolt Heads

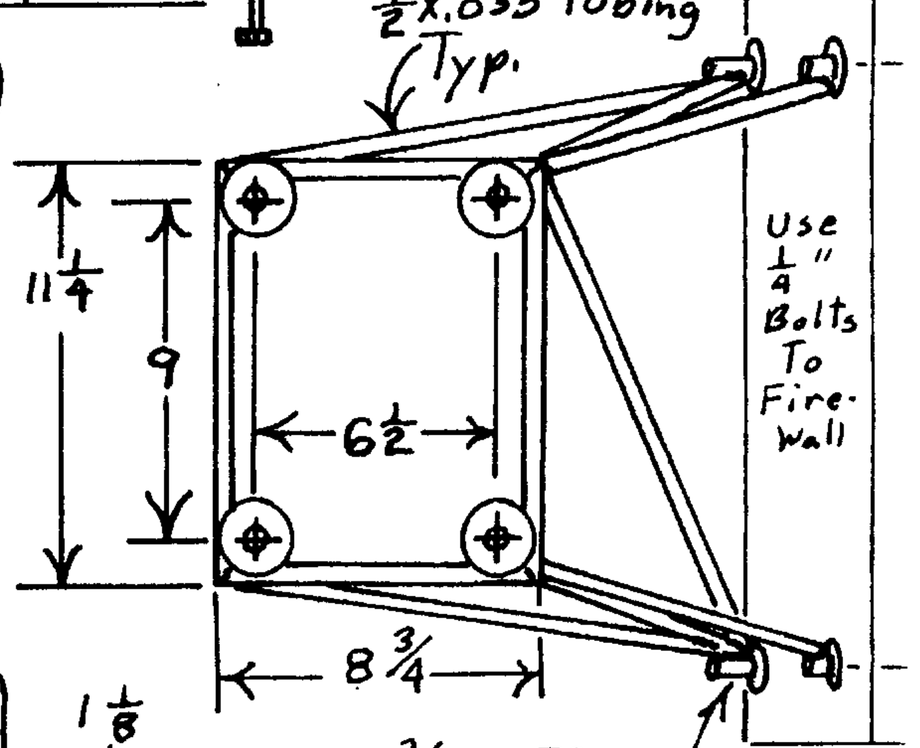
Ignition Timing (Initial); Impulse Snaps At Top Dead Center
This Gives 20° BTDC Timing

Typical Engine Attatchment

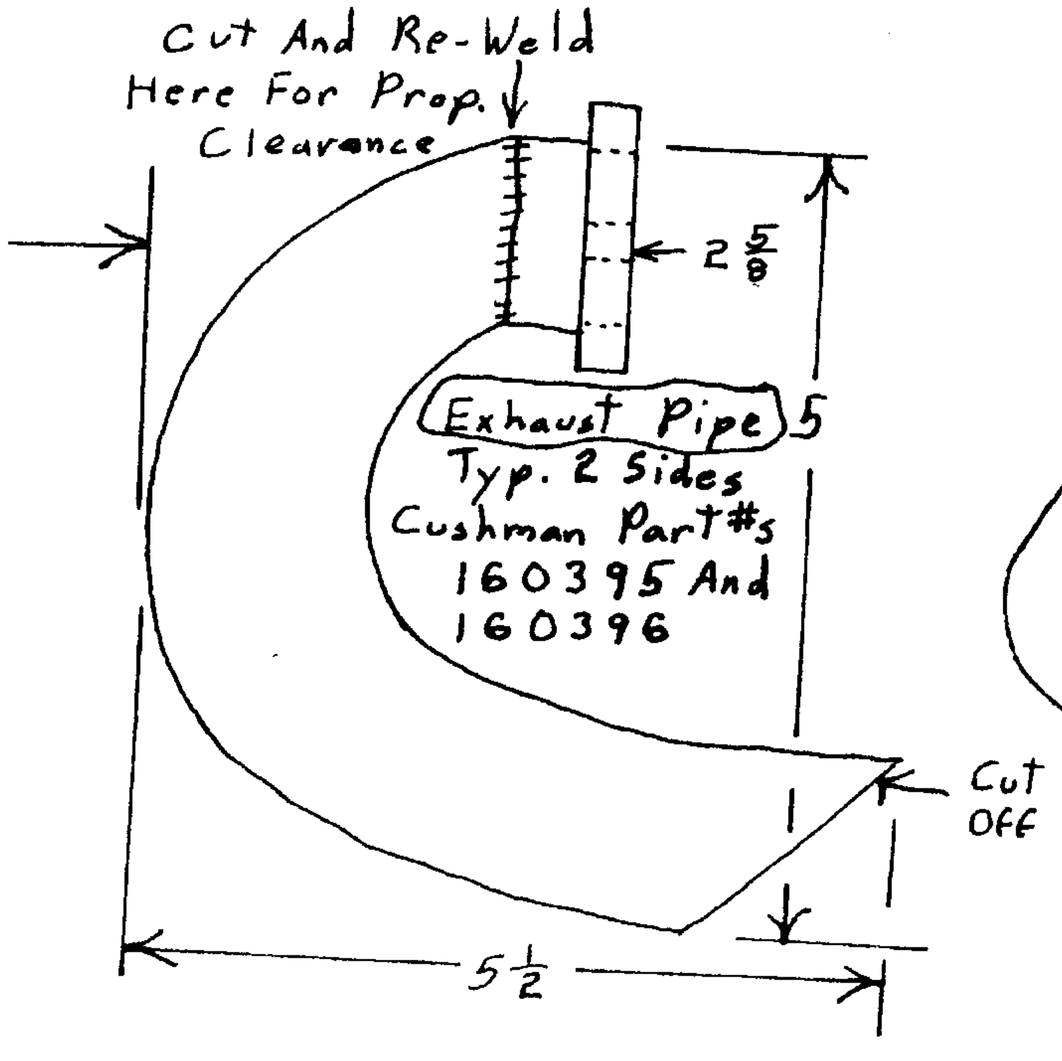
Quant. Needed	Cushman Number	
4	Aircraft Castellated	Lock Nut
4	809174	
4	806493	
4	809242	3/8 x 2 Dia Dish
4	808959	1/2 x .058 x 1 Tube Bushing
4	806493 Modified	1/2 x 1 3/8 Rubber Disc
4	809174 Modified	3/32 x 2" Washer
4	Aircraft Drilled shank	3/8 x 24 x 4 Bolt

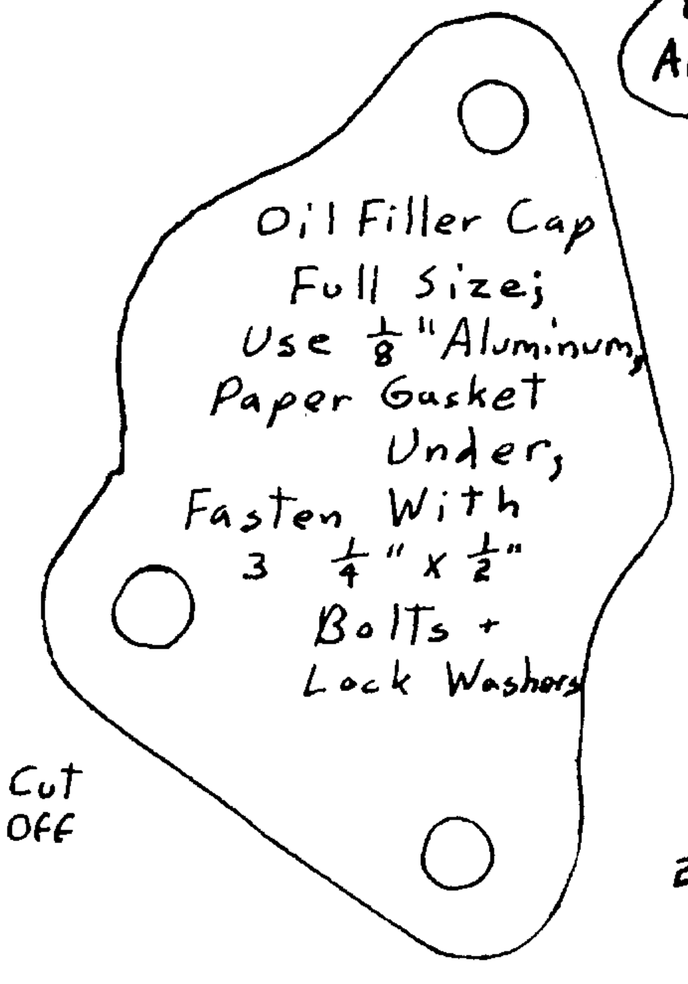
Engine Mount



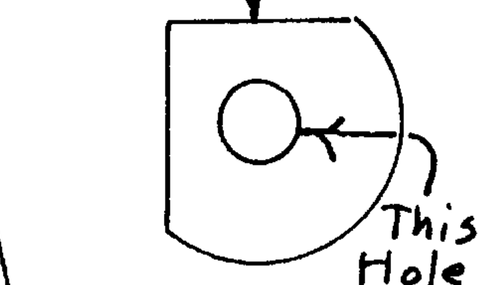


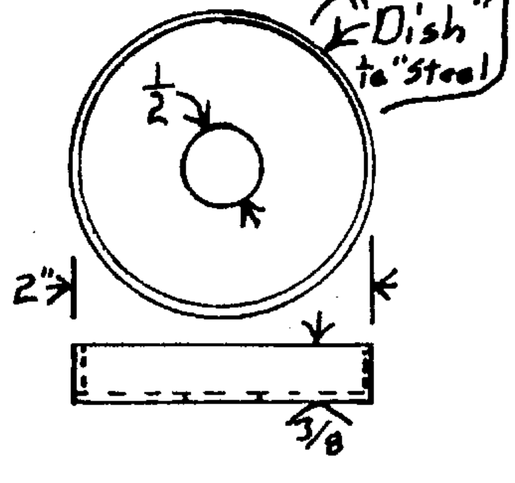
Cut And Re-Weld Here For Prop. Clearance





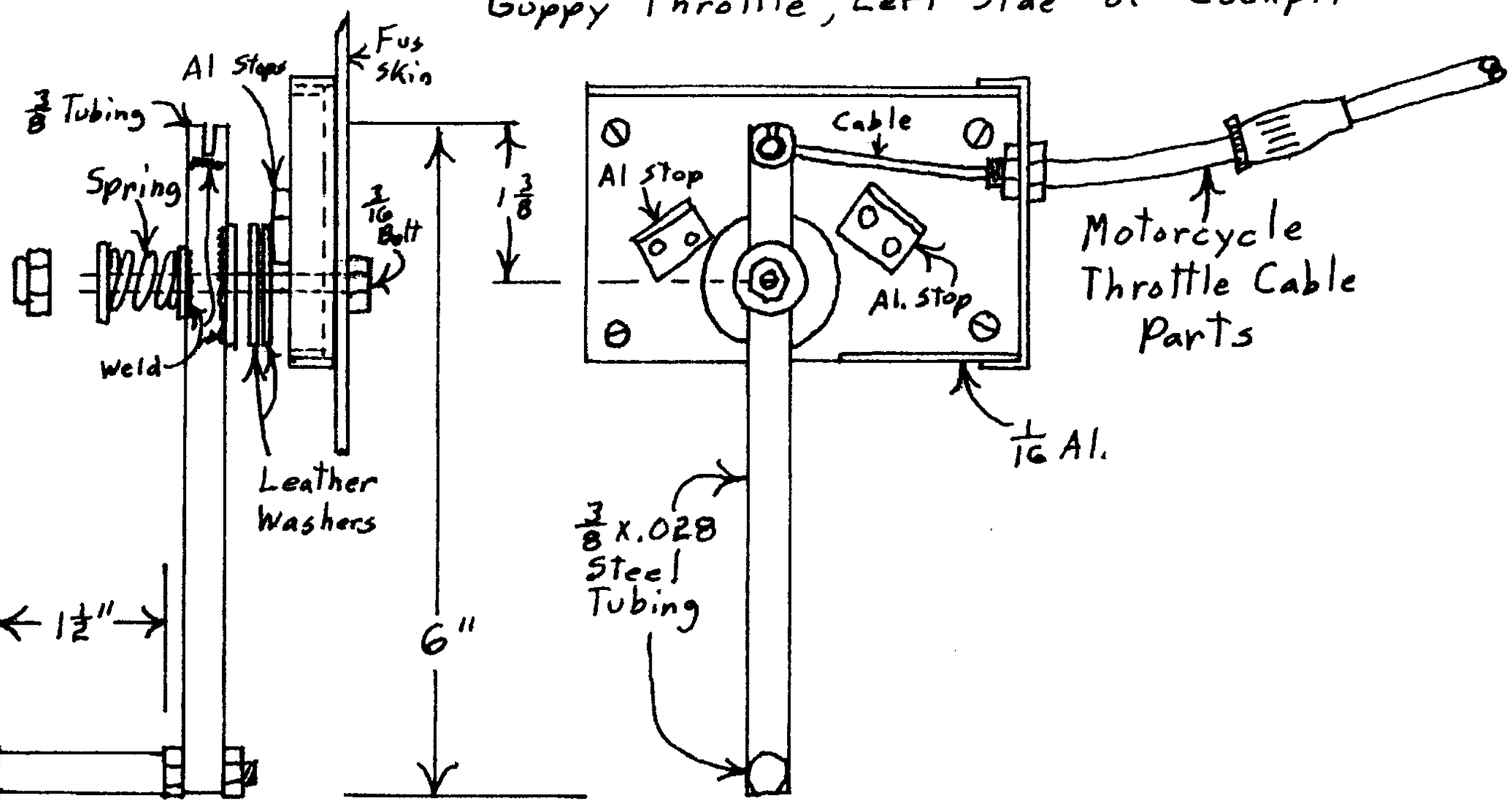
Top View Of 806493 Modified And 809174 Mod.



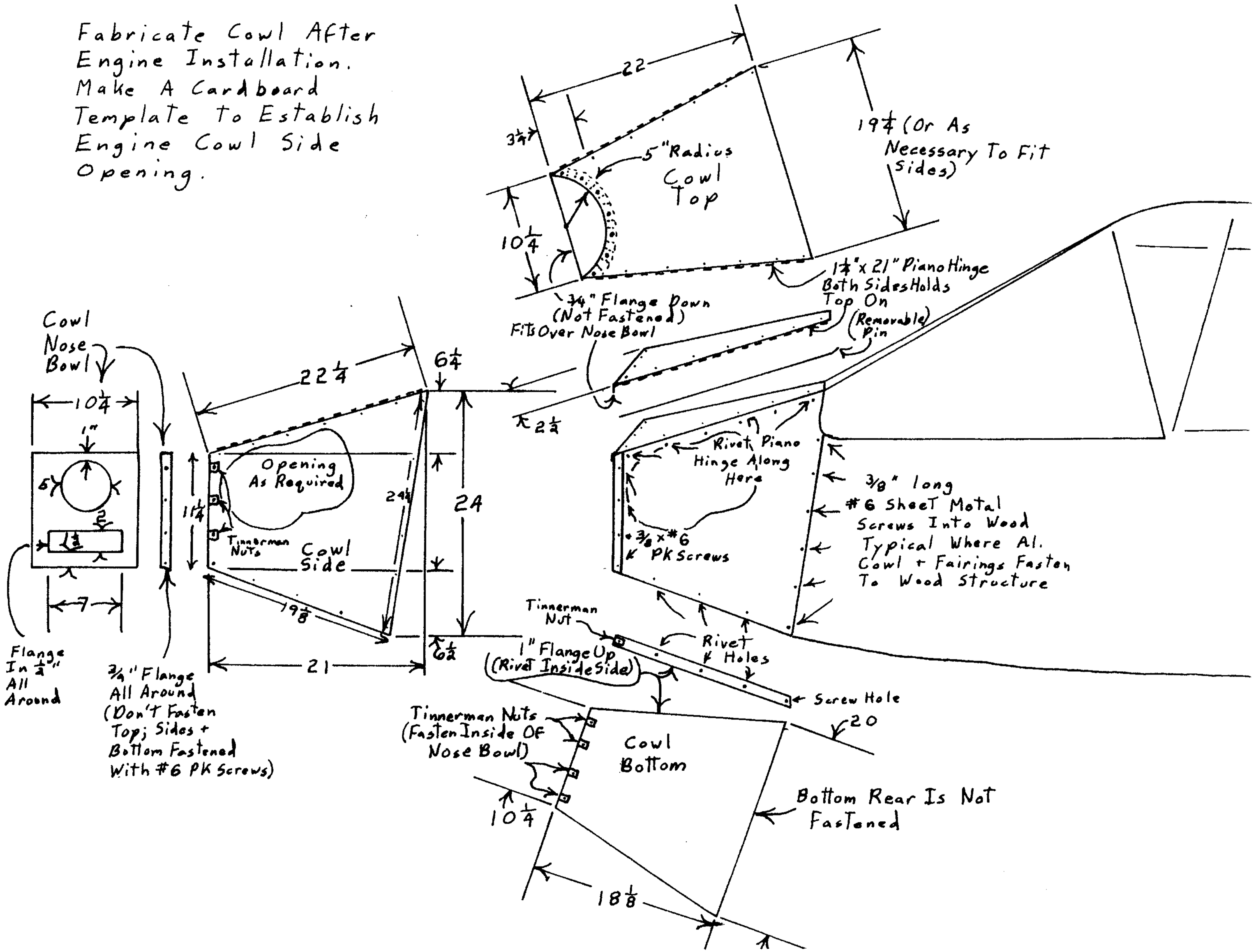


Drawing # 3C
Thro e

Guppy Throttle, Left Side of Cockpit



Fabricate Cowl After Engine Installation. Make A Cardboard Template to Establish Engine Cowl Side Opening.



Drawing # 34
Guppy Pr ller For
Cushman Engine

Stations (Also Inches From Center)

0 3.5 5 6 8 10 12 14 16 18 20 22 24

Tip Tapered All Around

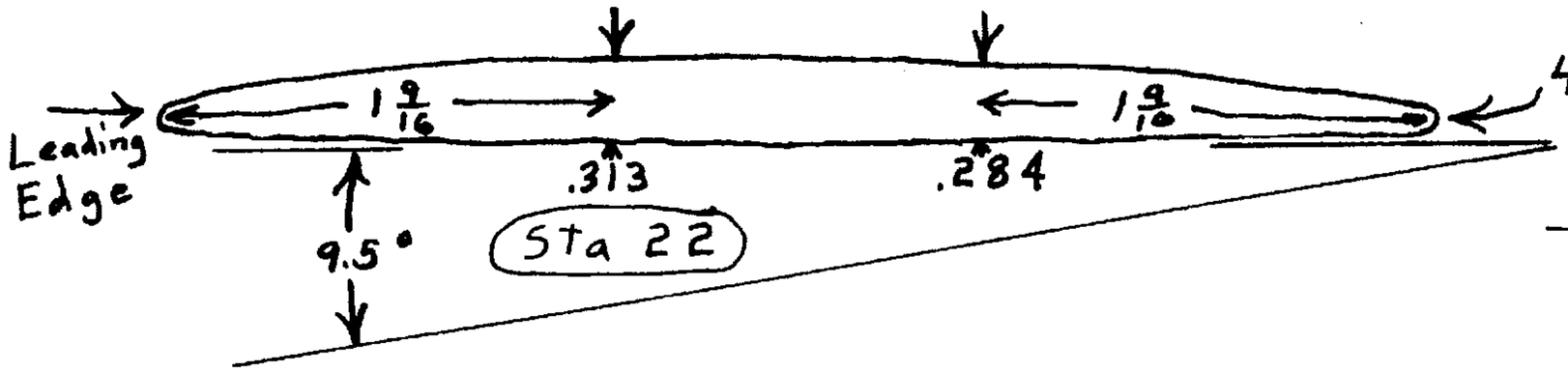
4"
5"
2 1/8"
48"
5 1/8"

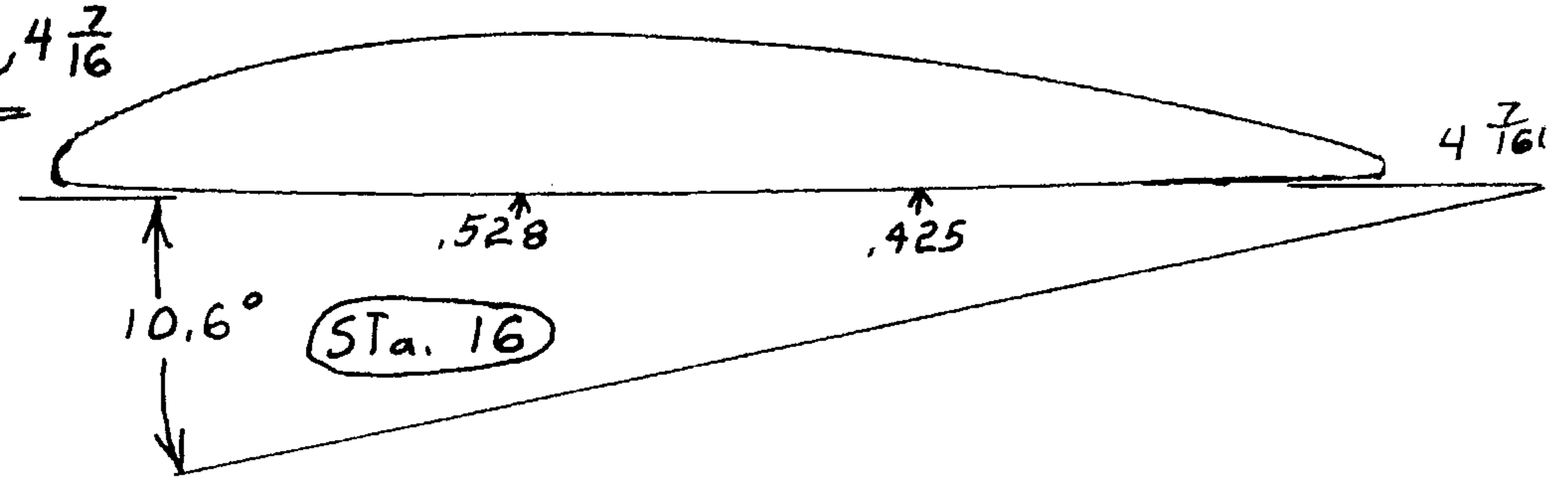
3 3/8" 4 3/8" 4 13/32" 4 7/16" 4 7/16"

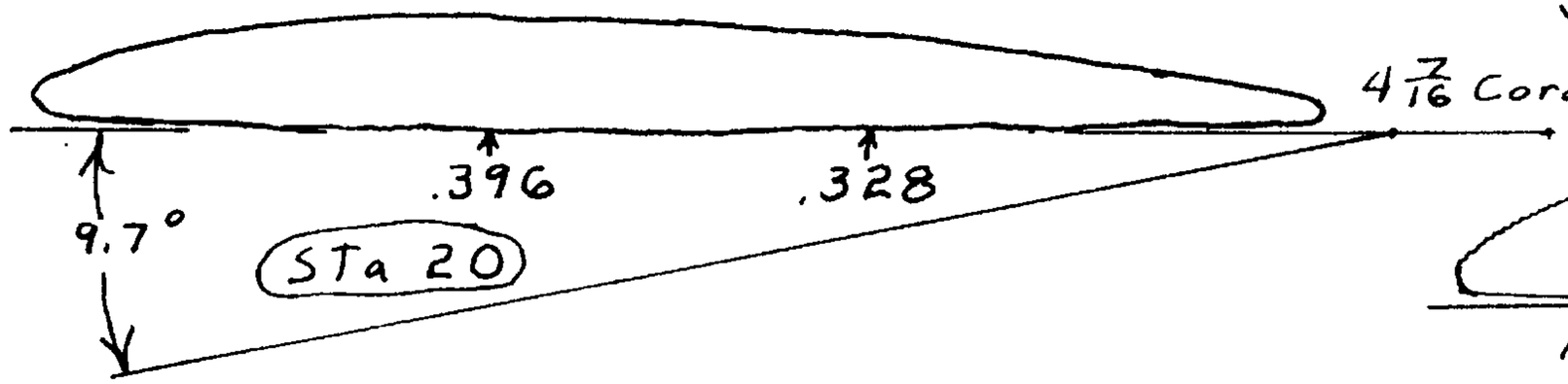
Cord Measurement

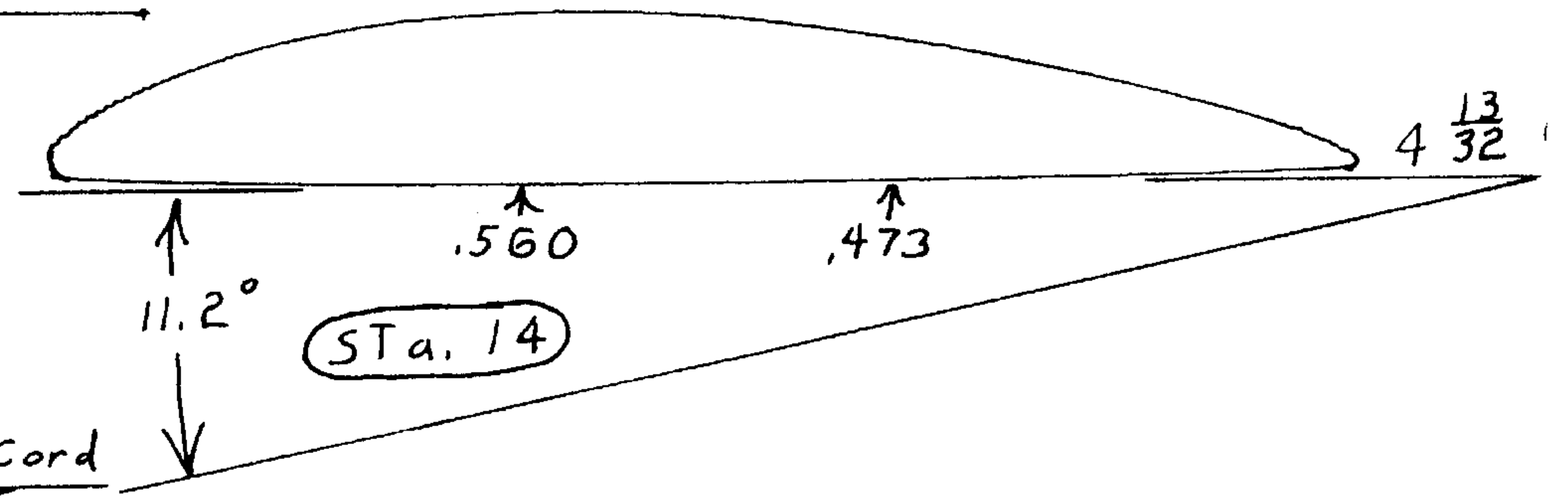
2"

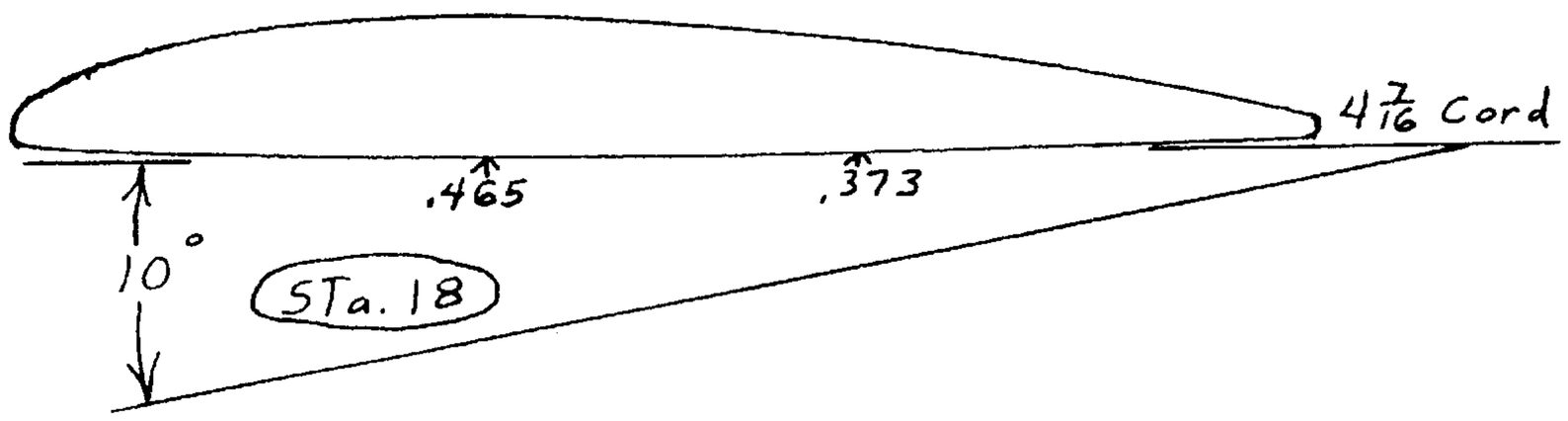
Note Tip Tapers Thus (Shown About Full Size)



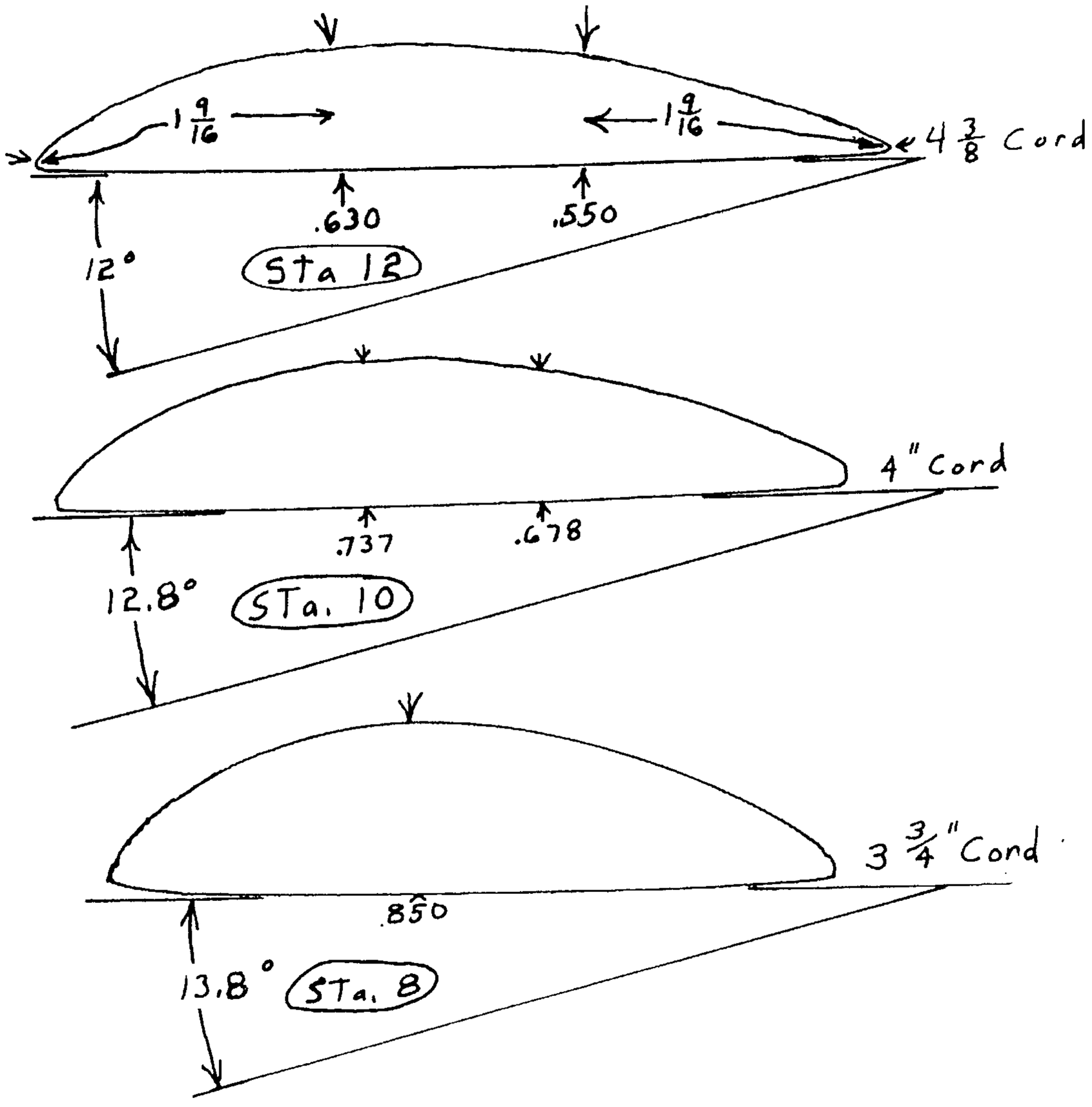


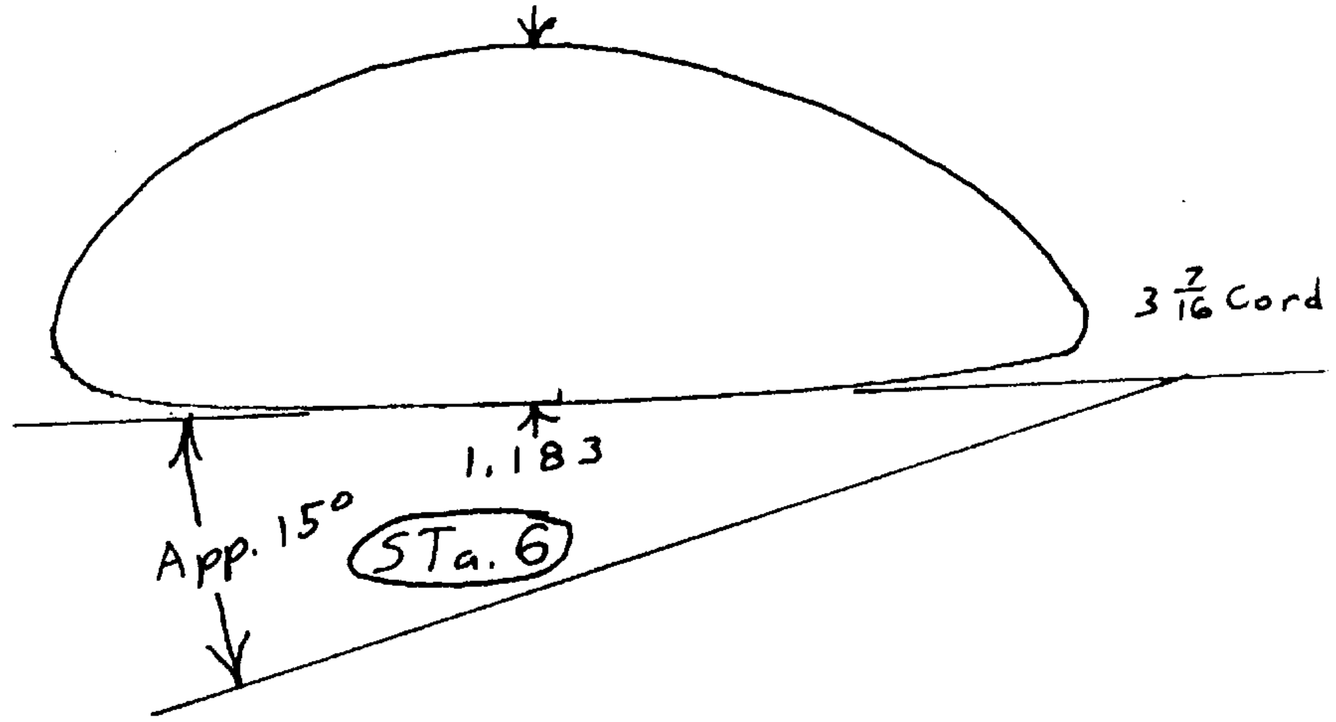






Drawing # 33
Guppy Propeller For
Cushman Engine
More Sections





These Drawings And Dimensions Are Approximate

Notice The Bottom Curves Out About 1/16"
Forward Thicknesses Are 1 9/16" From Leading Edg
Aft Thicknesses (IF Shown) Are 1 9/16 From Trailing Edg
Notice This Propeller Is Not Helical
This Prop Is The Best One So Far For The Cush
Leading + Trailing Edges Of The Prop
(Especially The Outer 6") Must Be
As Sharp As Is Structurally
Feasable.

General construction information

In these plans, the first listed material is true to the original Guppy, second listed materials are designer suggested alternates.

All wood must be aircraft quality.

All plywood is aircraft type unless shown on the drawings as"1/8 ply" only. This plywood can be 1/8" exterior door plywood (luan mahogany), or 3/32" marine plywood, or aircraft 3/32" plywood.

Steel tubing shown is aircraft seamless 4130 steel tubing.

Douglas fir,or Canadian or upland hemlock, are satisfactory substitutes for spruce if they are of aircraft quality. Fir is slightly heavier than spruce, however.

Always use aircraft nuts and bolts, and always safety them. The cost of aircraft nuts and bolts is very nearly the same as lesser substitutes, and other hardware is not worth the trouble.

Where specific material specifications are shown (ie. 2024 T-3 Al.), these are aircraft materials and specifications.

The Guppy is covered with 1.7 oz. Stits Polyfibre using Stits materials thru the silver, then a light coating of butyrate dope. The fabric is glued on (no ribstitching).

Hobie used Weldwood plastic resin glue throughout the Guppy, except where epoxy is specified he used two part epoxy glue. All metal fittings, where they are against wood, are epoxy glued to the bare wood before finishing (in addition to being bolted).

Use cement coated 20 guage aircraft nails where required. Use 1/2" long nails through 1/8" plywood, 3/8" long nails through 1/16" plywood, and 1/4" long nails through 1/32" plywood.

You can rip spruce members to finished size with a good table saw and either a Sears "Kromedge plytooth blade"(cat. #9-32448), or a Sears "free smooth cut combination" cabinet makers hollow ground blade (cat. #9-32644). This latter blade makes the smoothest cuts, but requires a perfectly aligned saw blade(it must be parallel to the rip fence).

While building the Guppy be careful not to add any unnecessary weight, as only a few pounds decrease the performance noticeably.

If you have questions, first double check the plans, as most information is shown only once in the plans, and not always where you expect it (ie. aileron control horns are with the cockpit controls, not the ailerons).

Fuselage Construction Drawing Numbers 1 through 13 and 17

Dwg. 4. All layout work (fuselage and wings) can be accomplished on a 4' by 12' table, braced so it is fairly level and firm. Notice the layout dimensions measure to the outside of the longerons, and to the centers of the internal members' terminations.

Dwg 4, 5, &6. Notes A and B show nonstandard ends of vertical members. In note A, ends become nearly vertical to conform to spar faces. Note B requires the forward vertical member top to terminate below the top longeron to allow room for the rear top wing fuselage fitting. See also dwg. 10 & 12 for Note A clarification.

Dwg. 6. These spruce members'ends conform to the spar positions, thus helping establish the wing incidence of 3 degrees lower wing incidence and 2 degrees upper wing incidence.

Dwg. 7 & 8. All wood structure is glued and nailed in the normal aircraft manner. Small 1/8" thick wood sticks between gussets fill the longeron outer edges and fill around openings to eliminate bumps in fabric.

Dwg. 10. Note E means build the vertical member ends aft side out 1/4" so they are the same thickness as the cross fuselage boards.

Dwg. 11 & 13. The rear wing attatch fittings in the fuselage consist of a single 1/8" thick fitting at each of four positions, to fasten to the wing drag tube end. The top fittings are on the forward side of station #3 and the bottom fittings are on the aft side of station #3. The front faces of these fittings are exactly 20 5/8" aft of of the center of the spar fittings on station #2. Square 1/16" aluminum washers (dwg 11) are placed on the side of station #3opposite each respective rear wing fitting.

Dwg. 12. Wing pin positions shown are accurate if the wings are built to the drawings; final holes should be drilled after your wings are built and checked for fit.

Dwg. 13. Notice the 1" by 1" spruce longitudinal members on the floor under the seat (also see dwg #8).

Seatbelt hardware is fastened to a lower rear fuselage wing fitting bolt. Shoulder harness should be fastened to an upper rear fuselage wing fitting bolt.

Pitot tube, static line (run into a wing panel), and rudder cable guides are 3/16" inside diameter nylon tubing, available at swimming pool suppliers.

Dwg. #15. Main gear legs and tailwheel spring are fabricated as follows;

1. Use 6150 steel (4340 steel is an alternate).
2. Machine part while straight per drawing (note, be very careful you have a smooth finish, and radius all corners, so cracks don't start).
3. Heat red hot to bend per drawing.
4. Heat treat to 45 to 50 rockwell.
5. Main gear only; drill 1/4" top hole after heat treat, to establish zero toe in (eyeball axles parallel to lower wing leading edge).

Dwg. #18 & #19. The simplest way to build the tail hinges shown in the plans is to weld the 5/16" X .058" tubes to scrap pieces of 9/16"or 5/8" tubing, then cut away all except the 1/3 circumfrence of the tube with the hinge attached. Carefully weld this in its proper place on the controls' spar.

The horizontal stabilizer can be adjusted with washers to trim in pitch. Trim for hands off with one half tank of fuel.

Dwg. 19. Loop .040 safety wire loosly through the aft rudder cable end and the rudder horn eyebolt eye, for a fail-safe rudder control system.

You could use plain 1/16" by 3/4" steel straps to attatch tail brace wires to their positions.

The Guppy has a second electrical switch on the instrument panel marked normal (switch normally closed) and alternate. This switch disconnects the tachometer and the magneto switch from the magneto if a short should occur in the tach. or the mag. switch. I have never experienced a failure of this type, but consider the switch worthwhile due to single ignition.

The fuel guage is a section of clear plastic automotive fuel line. Fuel guage and tank outlet plumbing is 3/8" ID. Fuel line to the Cushman engine is 5/16" ID flexable tubing.

Dwg. 29. The sediment bulb and fuel drain should be located as shown in the plans with a Cushman engine installation, as this is the low point in the system when the airplane is sitting on the ground. You may wish to make the fuel shutoff valve accessable in the cockpit, however the Guppy does not have this feature. You should not have more than one fuel shutoff valve, however.

Dwg. 23. The wing tips are made with 1/2" by .028" steel tubing. They are attatched with wood screws at the leading edge, the spar end, and the aileron spar. They are nested in a round groove at these points. Glue a filler block at the leading edge to the outer rib, and provide the groove in this block. Provide grooves in the tips of the main spars and the aileron spars. The trailing edge of the tip tube, top wings only, is split and spread apart so as to fit around the wing trailing edge piece. At this position only, the tip tube is attatched with rivets.

Dwg 32 & 33. The propeller shown in the plans is the best one tried so far with the Cushman engine. It is quite different from conventional propeller design, and is superior to more conventional designs which have been tried.

The center of gravity with the pilot and a full fuel tank should be at the 30% of mean aerodynamic chord point. This point is 5.5" aft of the upper wing leading edge, with the datum (cockpit coaming) level. The cg must never be behind this point. The cg should be checked before flight by balancing the loaded airplane (pilot and full fuel aboard) on a sawhorse using a cradle under the bottom longerons. (Cut 2 2X4s, each about 3 feet long, so they have a curve which fits evenly under the bottom longerons.)

The original Guppy is built with no scarf joints. All plywood joints are instead merely lapped. The laps are at least 12 times as wide as the plywood is thick. These joints, of course, may be scarfed in the normal manner.

Dwg. 24. Aileron hinge bushings are made from a 1" plastic pipe T. Turn them to 1" O.D. and cut to 1" lengths. They are adjusted for tightness and made installable by cutting a slot in them, as required to make fridicative.

Dwg. 24. Aileron hinge inner straps are formed with a hardwood block with a cross section similar to the aileron spar, only with a 1/2" radius groove in the end. Squeeze the aluminum strap into the groove with a 1" diameter rod, closing the parts in a vise. Then bend the ends of the strap over the block to complete the part.

Wing Construction Dwg. 23 to 28.

The Guppy airfoil is a Grant X-10 modified. This is a model aircraft airfoil. The plans include a full size template of the Guppy rib.

The ribs are built in two pieces, broken at the spar (notice the rib template contains the spar). Four wings will require 28 rear rib sections and 76 nose rib sections.

Dwg 27. The Guppy uses 1/4" hard balsa for the main ribs. Two other types of ribs will be discussed later.

7/8" by 1/8" spruce cap strips cover the ribs from the trailing edge to almost the leading edge, top and bottom.

1/32" plywood covers the entire leading edge and the top and bottom of the spar, covering over the nose ribs and under the above mentioned cap strips. The distance is 24 1/4"-- buy 50" by 50" plywood sheets.

Wing root ribs are the same as main ribs, only they are covered with a 2" by 1/8" cap strip.

Dwg. 28. The wing drag tube at the root rib passes through a 1 3/4" by 2" by rib depth, spruce block. This block is glued to the root rib and inside the root cap strip. It is also epoxy glued around the drag tube. Finally, a 3/16" bolt passes through the block and the drag tube, in a fore and aft direction. This explanation covers the upper wing drag tube /root rib attatchment.

Lower wing drag tube / root rib attatchment is similar to the upper one, except the spruce filler block also fastens to the aileron spar. The drag tube actually fits back into the aileron spar about 1/8". The 3/16" bolt is countersunk in the aileron spar.

Dwg. 26. Four special ribs are required, one at each interplane strut attatch position. Drill the vertical 1/4" holes before wing assembly. Notice that this rib has 3/4" square corner blocks, on the outboard sides only to leave room for the lift strut and drag tube fittings. Notice also the double cap strips and the aluminum strip washers.

Dwg. 26. You may choose to use the alternate style, special interplane strut rib. Notice it is 3 laminations, and that you can eliminate drilling the vertical 1/4" holes by leaving a 1/4" gap, as shown, inside the laminated portion of the rib. Also notice that the 1/4" marine plywood portion does not have any lightening holes in the laminated portion.

Dwg. 27. Two alternate rib styles are shown. If you choose the built up spruce and gusset ribs, use 1/4" plywood or balsa ribs for the root position and in the special I strut rib. Also note that all 3 rib styles require the 7/8" X 1/8" cap-strips around the outside.

A Wing Assembly Method

Cut spar to shape.

Attatch fittings to spar.

Install 1/4" square corner blocks next to each rib position on both sides of spar (3/4" square corner blocks on the outboard side of interplane strut ribs only).

Lay spar with the aft face down on the table. Be sure spar is straight and true.

Attatch leading edge ribs, with glue and nails, against spar and corner blocks, and install remaining corner blocks. Make sure rib leading edges are perfectly in line using the 1/2" square leading edge member.

After front rib glue dries, place spar on its front face. Use 1X4 material which extends beyond table edge, so front ribs can point down past the table. Be sure the top of these 1X4s allow spar to be perfectly straight.

Install trailing edge ribs as above, beginning at tip. Check trailing edge for straightness during assembly. Also confirm that drag tube will fit during wing rib assembly.

Slip drag tube and 1/8" plywood gussets into position in ribs and attatch to spar fitting.

Lay the wing flat on the table. Place thin strips of wood under the spar so your wing is supported under the front ribs,the spar, and the trailing edge ribs.

Prefabricate nailing strips for spar and rib leading edge attatchment, enough for one wing (1/2" X 3/32" or 1/2" X 1/8" strips).

Saturate the 1/32" plywood outer surface with water. This will cause it to expand and curve to fit. Attatch the plywood (face grain spanwise) with glue and nailing strips to the top of the spar and the top of the front ribs, and allow to dry. Overlap at ribs 1 1/2" or scarf at the ribs, to join plywood pieces. After it dries, remove the nailing strips.

Build 3 curved cradles to support top of ribs while fastening lower leading edge. Turn wing upside down and place it (nice and straight) on the cradles. Place one cradle at tip, one at root, and one moves to each nailing position for support. Align cradles so there is no twist in the wing.

Run a 1/4" drill through the front I strut eyebolt hole and through the top skin, before it disappears.

Re-wet the outer surface of the plywood and form it around nose ribs. Wrap string or webbing around leading edge and spar to help form curve.

Use extra water at leading edge to make curve.

When you are sure of a good fit, remove string, apply glue, reattatch string and work nailing strips around to spar, starting from leading edge (very important-- leading edge plywood must extend the full width of the spar, top and bottom -- distance is about 24 1/4").

After glue dries, remove nailing strips (split strips off, then pull nails).

Attatch bottom cap strips and trailing edge or aileron spar.

Turn right side up and attatch top cap strips. Don't forget to drill I strut eyebolt holes after each operation to eliminate blind hunting, and keep things fridicative.

Material Alternates

The following are materials suggested as alternates by Hobie Sorrell, the designer. They are based on his experience and have been used extensively in other airplanes. They are not, however, found in the original Guppy.

Where 1/8" ply. is designated, you may use 1/8" luan mahogany door skin plywood as on the Guppy, or substitute 3/32" mahogany aircraft plywood or 3/32" marine plywood.

Where spruce is designated, you may wish to substitute good, aircraft quality Douglas fir, or Canadian or upland hemlock (fir is heavier and stronger,slightly, than spruce). Spruce is traditional for aircraft use because it is very consistant and is available with a straight grain.

Either balsa or hard foam may be used in the floor and seat cores.

Three types of wing ribs are shown (Guppy uses balsa).

Spruce could be used to replace most tubing in the Guppy. It could be used for tail feathers, windshield frame and opening brace, wing tip bows, and wing internal drag tubes.

Square spruce with an outside dimension equal to the OD of the tube replaced is approximately equal in strength to that steel tube with an .o28" wall. (ie. 5/8" X 5/8" spruce equals 5/8" X .028" steel tubing.)

Curves in spruce can be made by laminating thin (1/8" to 1/16" thick) spruce strips together in a jig.

Spruce construction requires adequate gusseting to transmit loads.

See Pietenpol plans for spruce construction techniques (write to Mr. Pietenpol, Spring Valley Minnesota, for his plans, or buy the "1933 Flying And Glider Manual" copy from the EAA.

Test Flying The Guppy

When you test fly the new Guppy, the following suggestions may be helpful.

Recent experience in an Aeronca Champ, or equivalent, is a reasonable example of how the Guppy handles.

First of all, before you fly, be triple sure everything is right (actually check the cg, make sure the engine will run with the tailwheel in a hole, safety everything, check controls for proper direction and travel, remove all tools, etc.)

Test flying would best be done in a long, unobstructed, fairly smooth grass field, if available (grass is more forgiving of steering errors and will stop you sooner when you close the throttle). A long paved strip is fine, but do your high speed runs into the wind until you have confidence in the airplane.

Make sure your main gear has zero toe in, and that your tailwheel pivot shaft is vertical. Do plenty of taxiing to gain confidence in the airplanes ground handling. Be very careful if you taxi with the tail up, as when you cut the power, you have very little rudder authority. Never taxi fast with a tailwind.

Do not consider your airspeed indicator as accurate until you have some flight experience with it.

When you are actually ready to fly your Guppy, remember that this is a modest performance airplane, and you will be starting with an untested example. Don't be to demanding, especially during your first flights.

The Guppy will climb at its' normal cruise speed (65 mph) so don't be afraid to climb it to fast at first. On the other hand, trying to climb near the stall is very dangerous, especially when you have very little power available to assist in stall recovery.

Remember, the wing must exceed a certain angle of attack (about 15 degrees) to stall, so just climb at a shallow angle of attack until you gain confidence in your aircraft and instruments. Just let it climb as it will, rather than trying to force it to climb.

In flight you can expect to use lots of rudder to properly coordinate turns, but this should be no problem. Be smooth in your control applications, as roughness on the controls reduces your available performance.

Stall recovery, if your center of gravity is at or forward of 30% of mean aerodynamic chord (5 1/2" aft of top wing leading edge), is normal, similar to a Champ. Notice what your Guppy indicates at the stall.

Flying the Guppy in many ways is similar to flying a sailplane. Think about the movement of the air and use it to your advantage. During your approach for landing, keep a good speed above a stall until you are very close to the ground. Since the Guppy is very light for its' size, it will slow down quickly when you flare out. You don't want to slow down quickly until you are close to the ground and ready to land, so don't.

To achieve a perfect 3 point landing, you have to add a slight burst of power just as your stick is all the way back.

The biggest hazard in this type of airplane is stalling near the ground, due to low performance and lack of available power for a quick recovery. So keep your demands modest until you know what your new airplane will do.

Hobie Sorrell's original "Guppy" performs as follows;

Engine and prop static rpm	3100
Liftoff speed	40 mph ias
Stall speed	30 mph ias
Normal climb speed	50 mph ias
Normal glide speed	50 mph ias
Normal climb rate	270 to 350 feet per min.
Ceiling	8,900' to 10,200'

(takes one hour-- must be climbed at less than full throttle after 6000' to lean carbs.)

These figures are approximate, since they were not derived under formal flight test conditions. Remember, don't trust your airspeed indicator until you have flight tested it adequately.

Hobie Sorrell's original "Guppy" operates within the following flight limits

Aerobatics	prohibited
Intentional spins	prohibited
Flight limit load factor	4 gs.
Never exceed speed	90 mph cas
Engine redline	4000 rpm
Center of gravity aft limit	30% of mac

The Guppy has been spun, and required normal recovery technique. The aircraft has flown approximately 200 hours and behaves in a normal way. Since testing has not been exhaustive we have chosen conservative limitations.

Cushman Engine Parts List (may not be complete)

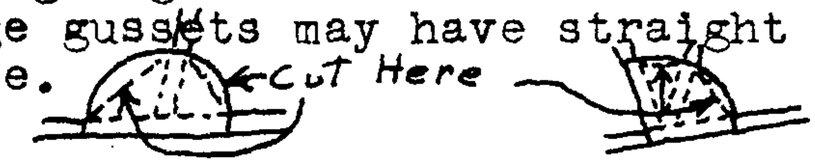
Quant.	Description	Cushman Part No.
1	Truckster engine model 200 parts book	
1	Truckster engine model 200 owners manual	
1	Model 200 engine short block	
2	valve cover	111731
2	gasket	111716
4	nut	800217
4	nut gasket	111828
4	rocker arm	111669
2	shaft	111668
2	spring	111727
4	cap	111728
4	bushing	111743
4	pushrod	111730
4	tappet	111733
4	tubes	111752
8	O rings	111751
2	retainer	111759
2	screw	306487
13	1/4 lockwasher	306396
4	screw	111732
8	nut	307842
4	5/16 lockwasher	306325
4	5/16 washer	309948
1	front exhaust pipe	160395
1	" " "	160396
1	flywheel key	111807
1	rear key	307662
1	crankshaft nut	305134
1	washer	308008
1	relief valve housing	111793
1	screw	111791
1	gasket	111783
1	spring	111827
1	relief valve	111790
1	gasket	111792
1	screw	303459
5	screw	306418
1	oil strainer	111720
1	retainer	111860
1	gasket	111726
1	cover	111721
4	1/4 lockwasher	304145
4	screw	306487
1	oil filter	111836
1	fuel pump	111723
2	gasket	111779
1	block	111890
2	screw	800229
1	distributor shaft	580370
1	gear	111755
1	pin	306966
2	bearing	111822
8	washer	809174
8	engine mount disc	806493
4	retainer (dish)	809242
4	spacer	808959
4	3/8 X 24 4"bolts, drilled shank	
4	3/8 X 24 castillated aircraft nuts	
4	cotter pins	
1	magneto Fairbanks Morse CW type 20° FM X-1 2B7	
2	carburetors Mikuni M 24-26	
1	3 1/4" X 5" dia. mild steel for prop hub	
2	2 3/4" X 1 5/8" aluminum for carb. bases	
1	2 5/16" X 2" dia. aluminum for mag. adaptor	
1"	1 3/4" X .058" wall steel tubing for mag. adaptor clamp	
1 1/4"	3/8" X .058" wall steel tubing for above	
1	4 1/16" X 2" aluminum for distributor shaft support	
2"	5/8" X .058" wall steel tubing for dist. shaft spacers	
1	5/16" X 2 7/8" dia. micarta for mag. drive disc	

Limited Bill Of Materials (Not Complete)

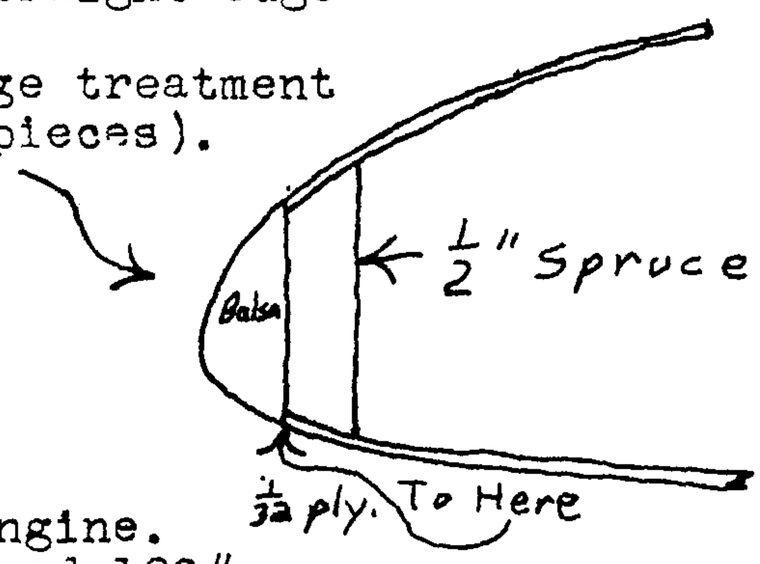
Quantity	Description
2 sheets	4' X 8' sheets 1/8" luan mahogany exterior door plywood or equivalent
5 sheets	50" X 50" sheets 1/32" (1 mm.) birch plywood
1 sheet	50" X 50" sheet 1/16" birch plywood
200 lin. ft.	5/8" X 5/8" spruce for fuselage members
4	7/8" X 3 3/8" X 112 5/8" spruce spars
4 lin. ft.	7/8" X 3 1/4" spruce cross fus. boards
2 lin. ft.	5/8" X 3 3/4" spruce " " "
2	9/16" X 1 5/8" X 114" spruce trailing edge
2	7/8" X 1 1/16" X 114" spruce aileron spars
4 lin. ft.	7/8" X 3 1/2" spruce I strut ribs or alternate
4	3/4" X 4" aircraft quality fir I struts (or Spruce)
52	1/8" X 7/8" X 32" spruce cap strips
8	1/8" X 2" X 36" spruce wing root cap strips
96	1/8" X 5/8" X 9 1/4" spruce cap strips
28	1/4" X 3 1/2" X 36" hard balsa ribs or alternate
1	3/4" X 5/8" X 14" oak gear box rod bearer
8 sq. ft.	1/2" balsa or hard foam for floor and seat sandwich
45'	3/32" aircraft cable
3	aircraft turnbuckles
2	1 1/8" dia. X 36" long 6150 steel gear legs
1	1/2" dia. X 24" long 6150 steel tail spring
9 lin. ft.	1/4" dia. 4130 steel rod
4	3/16" X 1 3/4" X 1 1/2" aluminum angle 1 5/8" long
30 sq. ft.	.016" aluminum sheet
7 sq. ft.	.040" half hard aluminum sheet for fuel tank
4 sq. ft.	1/8" 2024 T-3 aluminum plate for fittings
2 1/2 sq. ft.	1/16" 2024 T-3 aluminum
4 each	3/4" X .058" wall 6061 T-6 aluminum tubes 76" long
4 lin. ft.	5/8" X .058" wall " " " "
2 each	3/4" X .058" wall " " " " (ail.)
1 sq. ft.	.065" 4130 steel plate
1/2 sq. ft.	.040" 4130 steel plate
56 lin. ft.	1/2" X .028" 4130 aircraft steel tubing
13 lin. ft.	1/2" X .035" "
34 lin. ft.	5/8" X .028" "
17 lin. ft.	3/8" X .028" "
3'	1/4" X .035" "
1"	5/16" X .028" "
2'	5/16" X .058" "
1'	3/8" X .058" "
2'	9/16" X .028" "
1 1/2'	7/8" X .035" "
2'	1" X .058" "
8"	1 1/8" X .058" "
6"	1 1/4 X .058" "
14'	1" X .035" "
2"	5/8" X .058" " also listed with engine parts
1"	1 3/4" X .058" " " " " " "

Add to drawings

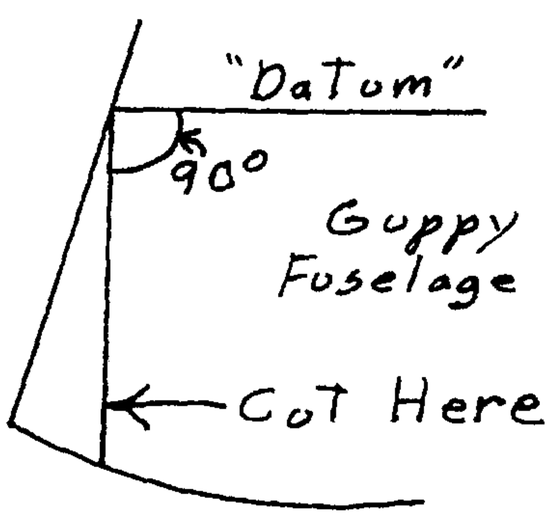
1. The enclosed rib pattern contains the spars and trailing edge, but does not contain the 1/8"X7/8" cap strips.
2. Drawing #3; Guppy has 2 ground adjustable trim tabs of .020" aluminum, 2"X4", pop riveted on the rudder and elevator trailing edges.
3. Drawing #7; Fuselage gussets may have straight lines to reduce weight, ie.

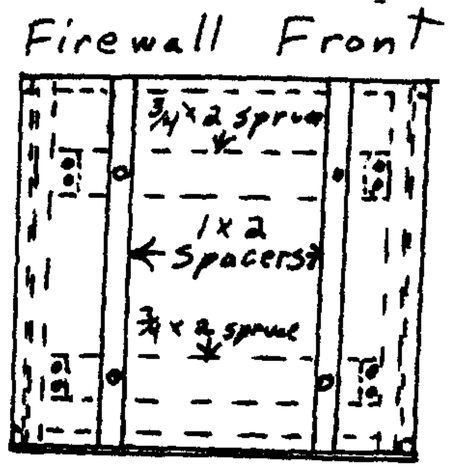


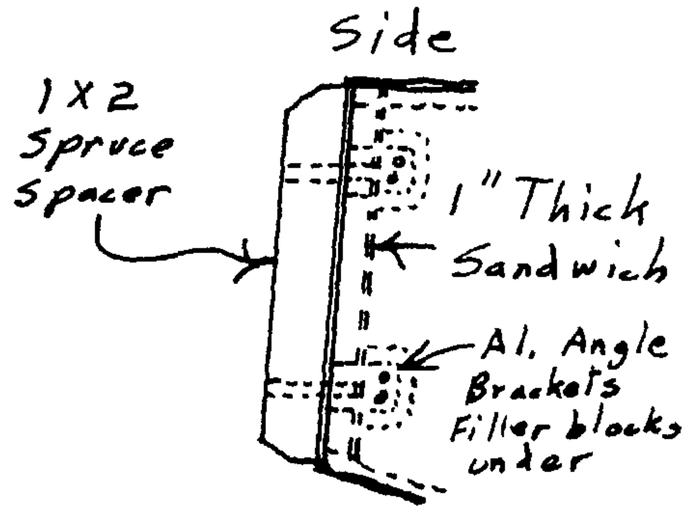
4. Drawing #15; H. C. Lange Rt. #1 Merrill Wisc. 54452 will build landing gear legs of a simpler design, similar to the latest Hyperbipe gear. This method is cheaper to machine, interchangeable, and designer approved.
5. Drawing #23 & 24; Wing butt gap is 1 1/2" wide. It is covered with an .020" aluminum fairing, held with screws.
6. Drawing #24 & 28; Drag tubes and aileron spars on the Sorrell Guppy are made with boat awning material, of the stated specification.
7. Drawing #26; Spars are vertical to a straight edge held against the rib bottom.
8. Drawing #27; Alternate wing leading edge treatment (allows use of 24" wide 1/32" plywood pieces).



9. I'm starting work on the Onan engine conversion--will send plans when it is finished. I just test flew my Dormoy Bathtub and it works great!
10. Suggested VW. conversion information;
    a. Convert an old model, 36 hp. engine.
    b. Total engine weight not to exceed 120#.
    c. Make the firewall vertical, ref. "datum", beginning at front of "datum".
    d. Firewall becomes a 1" thick sandwich with 1/8" ply both sides, 3/4" balsa or foam core, 3/4"X3/4" spruce all around. It also contains 3/4"X 2" spruce cross members, bolted to fuselage sides with al. angle brackets, as for the Cushman mount. Engine bolts pass through these cross members.
    e. 1"X 2" vertical spruce spacers accept the engine bolts also. Put stepped metal washers between bell housing and vertical spruce spacers.







"Guppy Drawings Changes and Additions, 6/22/79"

Add to drawings

1. Window plexiglass is attatched with small sheet metal screws and pop rivets, where appropriate.
2. Seat bottom is glued down after control assembly, as it is a structural part of the gear box.
3. The Cushman engine used in the Guppy is now known as the "Cushman 218".
4. The propeller tips are not cut off flat, but are tapered off just like the outer trailing edge of the prop.
5. Hobie Sorrell suggests the following order for fuselage assembly;
    1. Build sides complete with gussets on both sides and plywood installed, except no tailpost.
    2. Build bulkhead #3 and nail on back of #3 verticals.
    3. Build #2 bulkhead in fuselage in the following order; vertical members, cross pieces, gussets.
    4. Build a dummy firewall and use nailing strips to temporarilyhold nose together.
    5. Apply external (bottom) floor. (1/8" plywood)
    6. Install gunwale (middle longitudenal members), followed by the top piece (1/8" ply. at the datum).
    7. Remove dummy firewall for access. Turn fuselage upside down and install bottom skin on datum area.
    8. Turn upright and install cross piece in floor in front of station #2 (5/8" X 3" spruce).
    9. Put temporary diagonal brace in firewall position.
    10. Pull tail together. Tail post is installed after longerons are tapered to fit and pulled together.
    11. Build cross members and diagonals.
    12. Install firewall after completing control and seat and landing gear installation.

Several months ago my friend Don Mangold from Albuquerque flew the Guppy for the first time. He was pleased with the performance, but was concerned that some pilots may be suprised during their first flight by the Guppy's yaw characteristics. Don suggested that I remind the builders of this characteristic, in order to reduce suprises on the first flight.

Don felt as I do that although this condition does not detract fron the airplane, it is different and you (the builders) should be made aware of it. The condition I am refering to is the Guppy's lack of stability in yaw, when the pilot takes his feet off of the rudder pedals, and the airplanes need for proper rudder usage to keep coordinated (ie step on the ball).

I do not plan to change my Guppy in the future as I do not consider the characteristic a problem. A pilot is used to it within a few minutes, and will find the lack of yaw stability allows the Guppy to be very responsive, and very tollerent of gusts and cross winds (unlike many very light airplanes). I understand many float planes display the tendancy, and of course airplanes with no fin,such as the Fokker Triplane, would have zero yaw stability.

If, after flying the Guppy for a while, you decide you require more stability in yaw, you can increase the vertical fin area, or put small fins (perhaps 12" in diameter) on the tips of the horizontal stabilizer, so it will look like an early 14-13 Bellanca Crusair (or a Lockeed Constellation!).

Photograph Description

1. Left rear quarter, top view of Cushman engine

2. Left rear quarter, lower view of Cushman engine

3. (Clockwise) cowl top, cowl sides and bottom, left rear fuselage side access panel, belly (just behind seat) access panel.

4. "Easy entry".

5. Instrument panel

6. Rudder pedals, looking forward

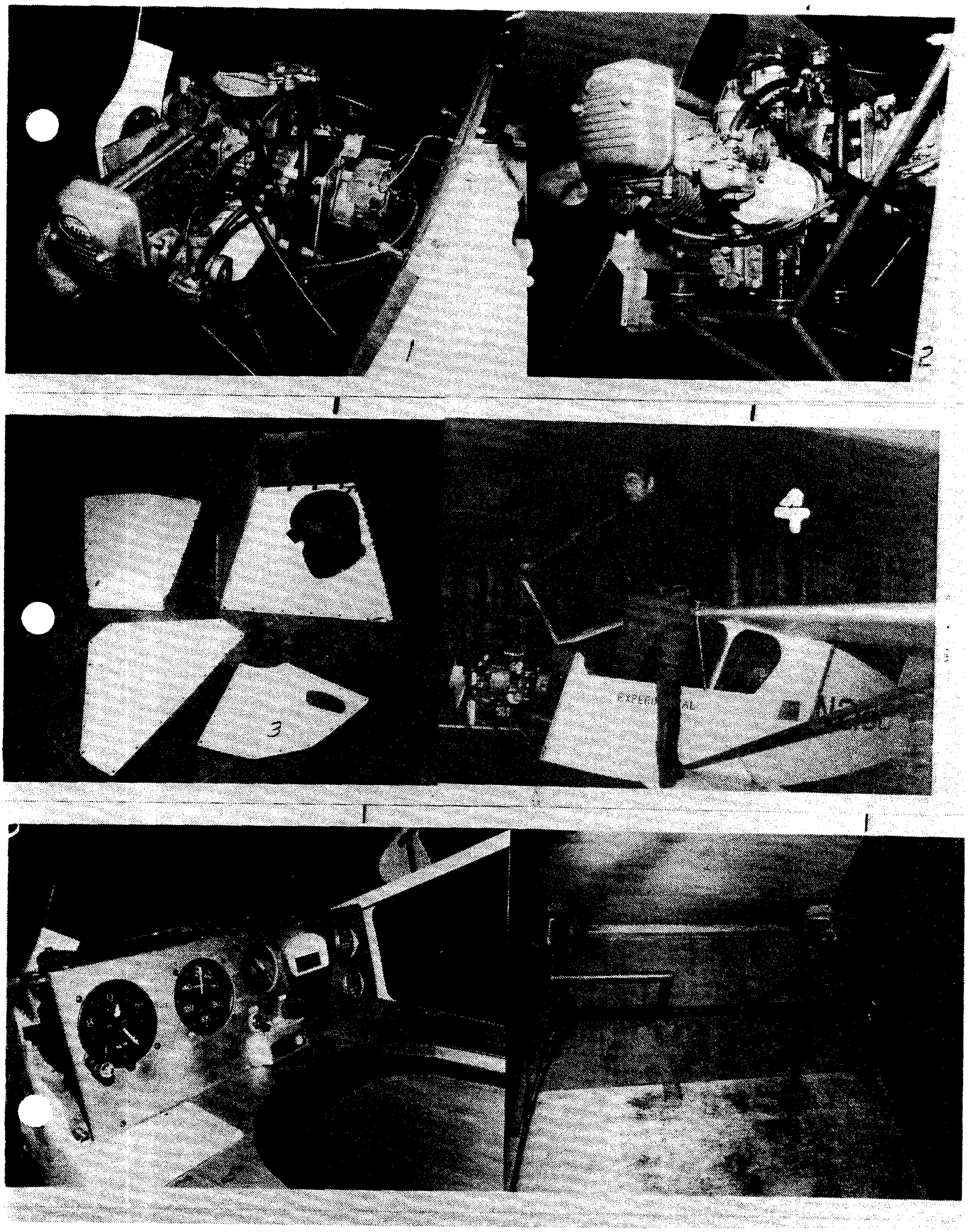
7. Seat and inside main gear attatchment, looking aft

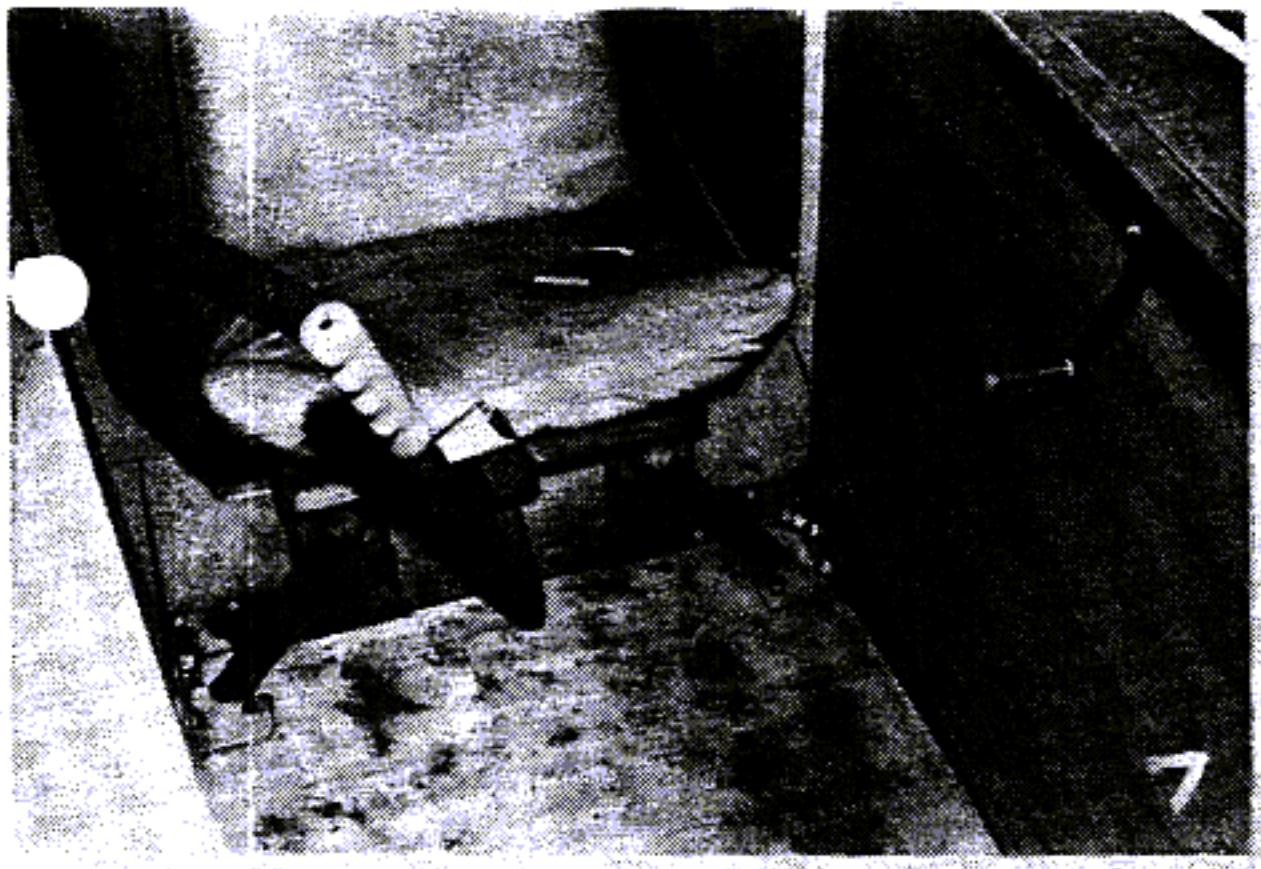
8. Sediment bulb and fuel shutoff access

9. Aileron horn and elevator control rod, looking through belly access opening

10. View aft in tail cone

11. View straight up, looking at bottom of fuel tank through belly access opening. Plywood panel in picture is station 3 behind seat.





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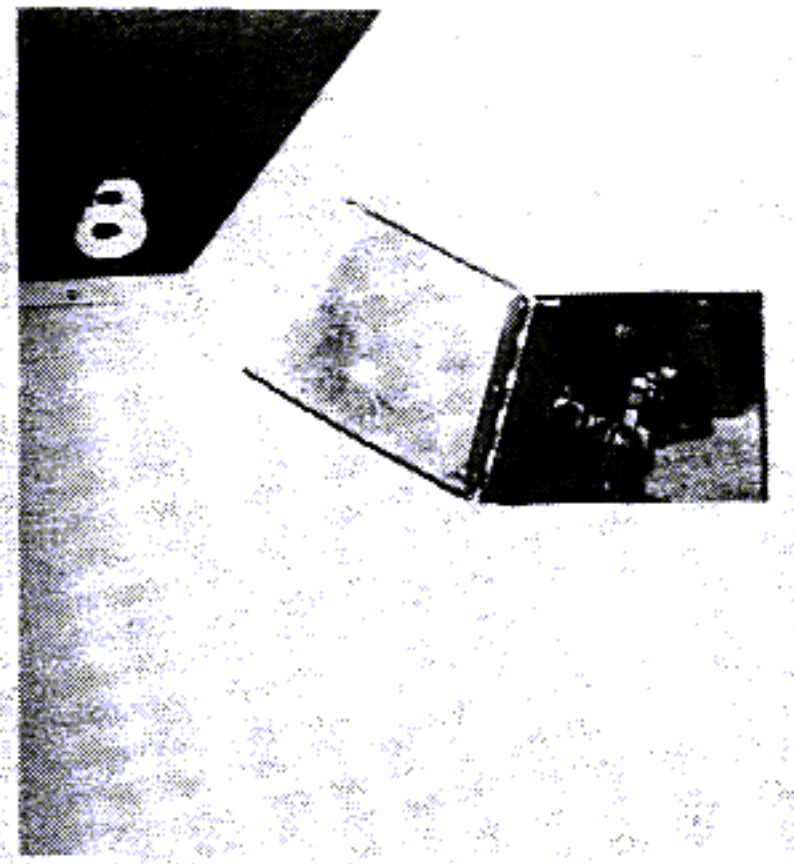

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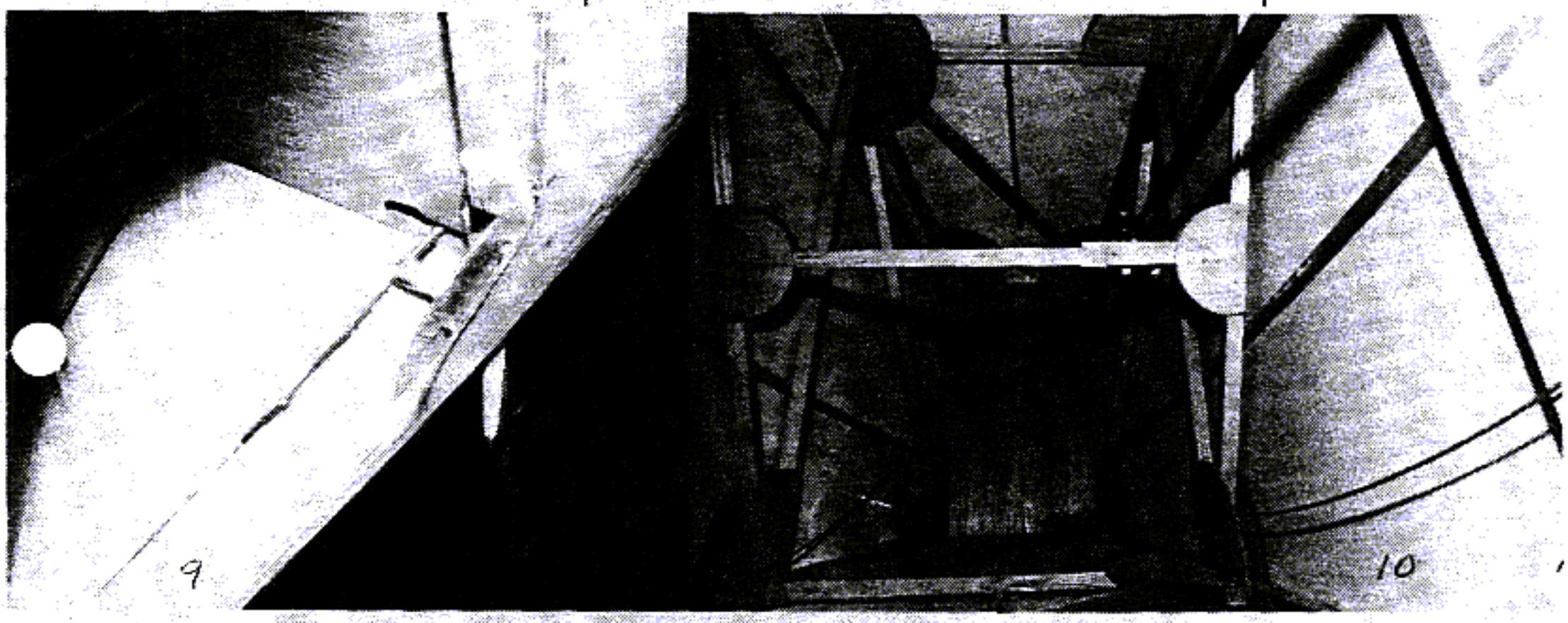

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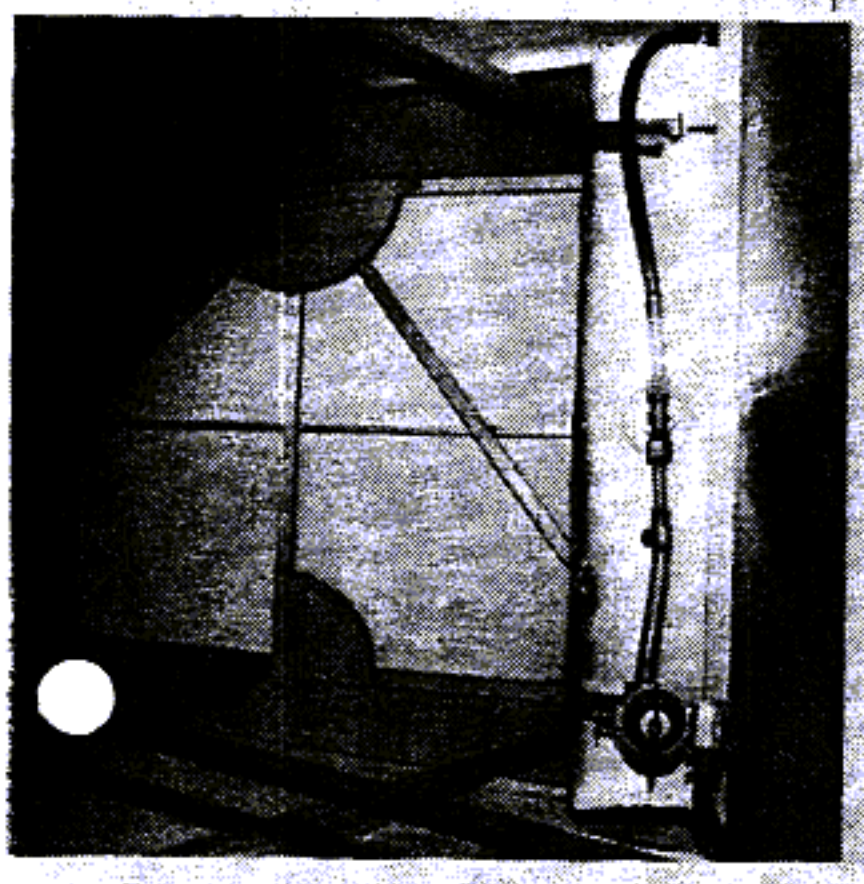

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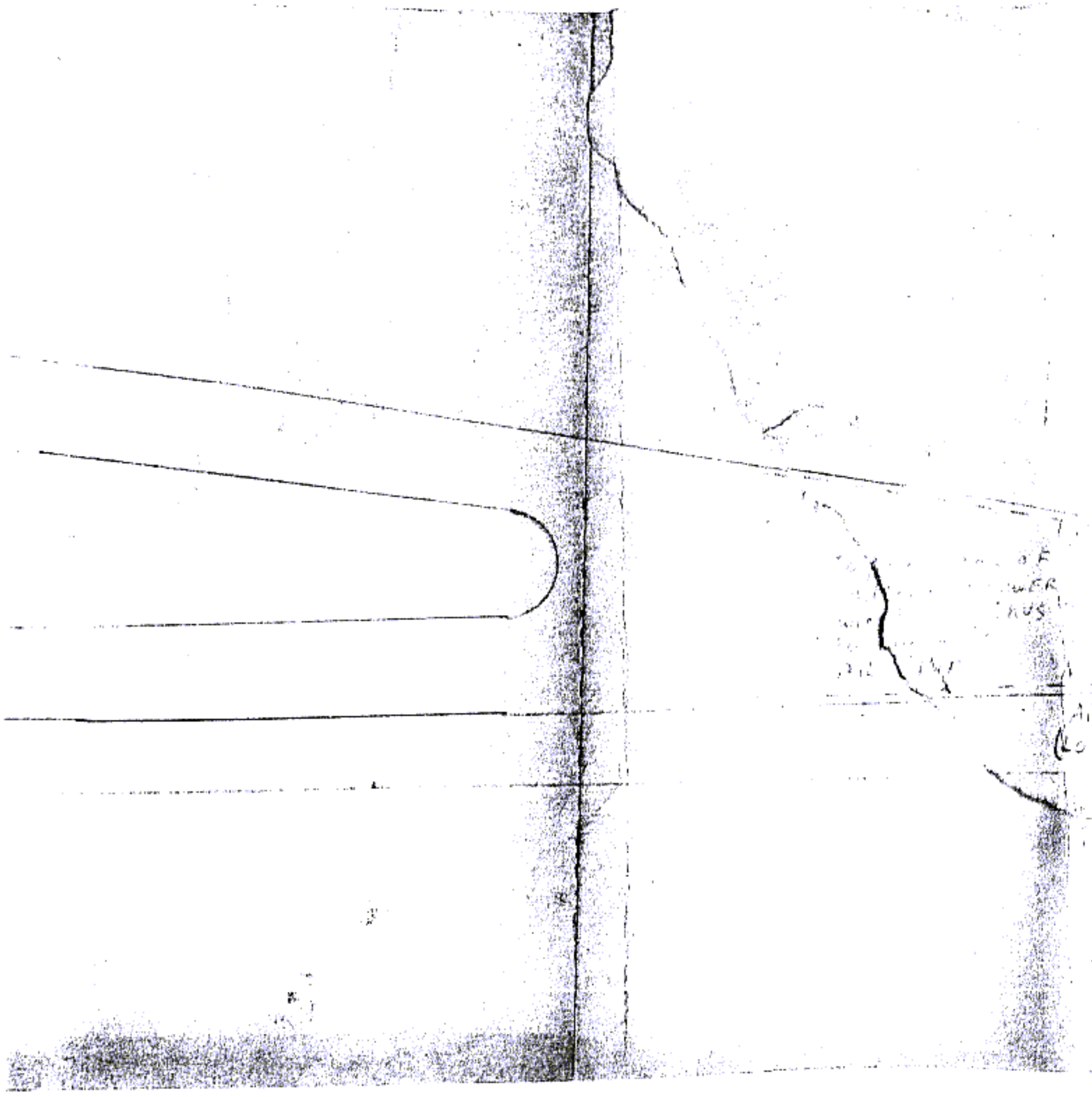
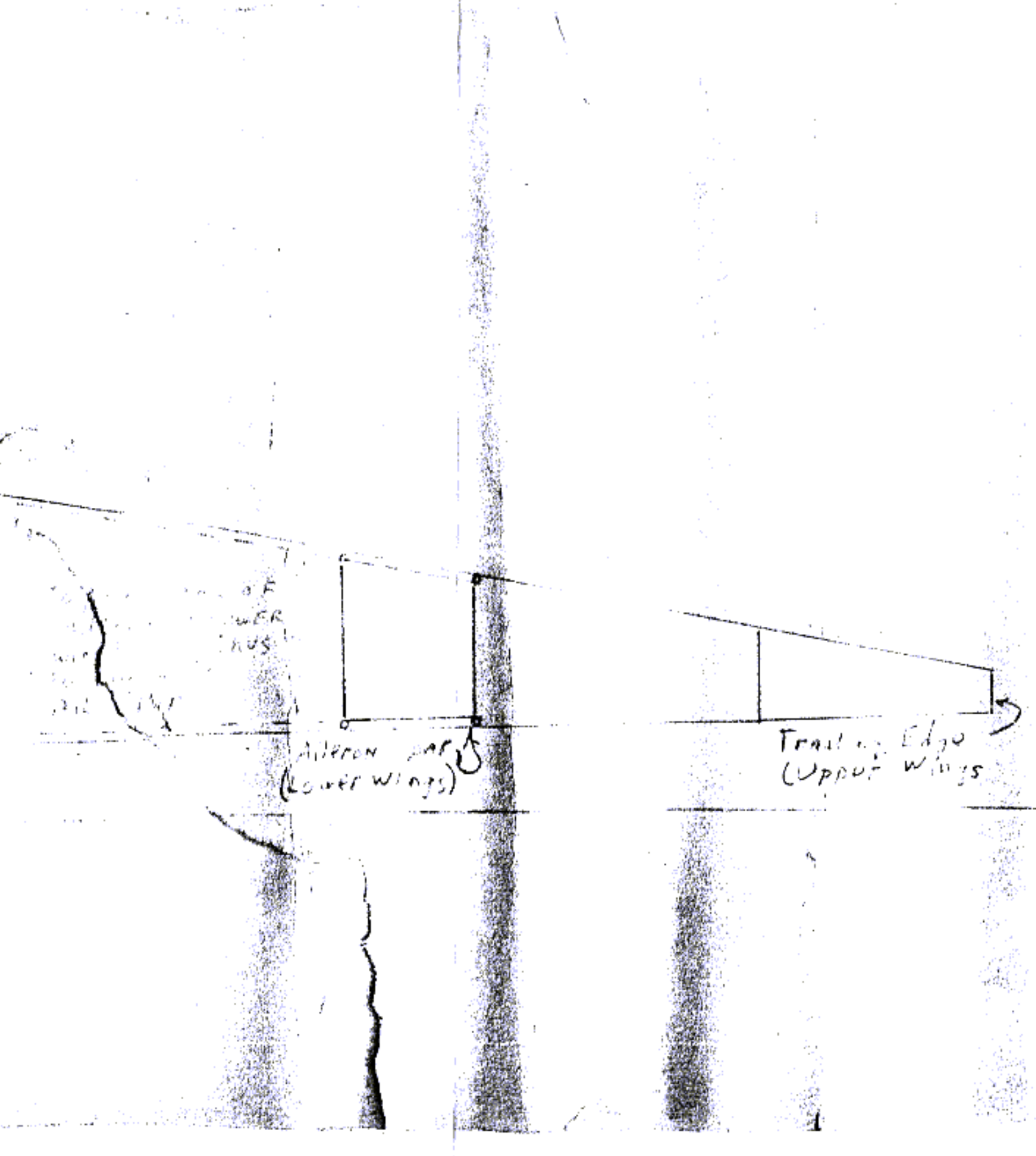
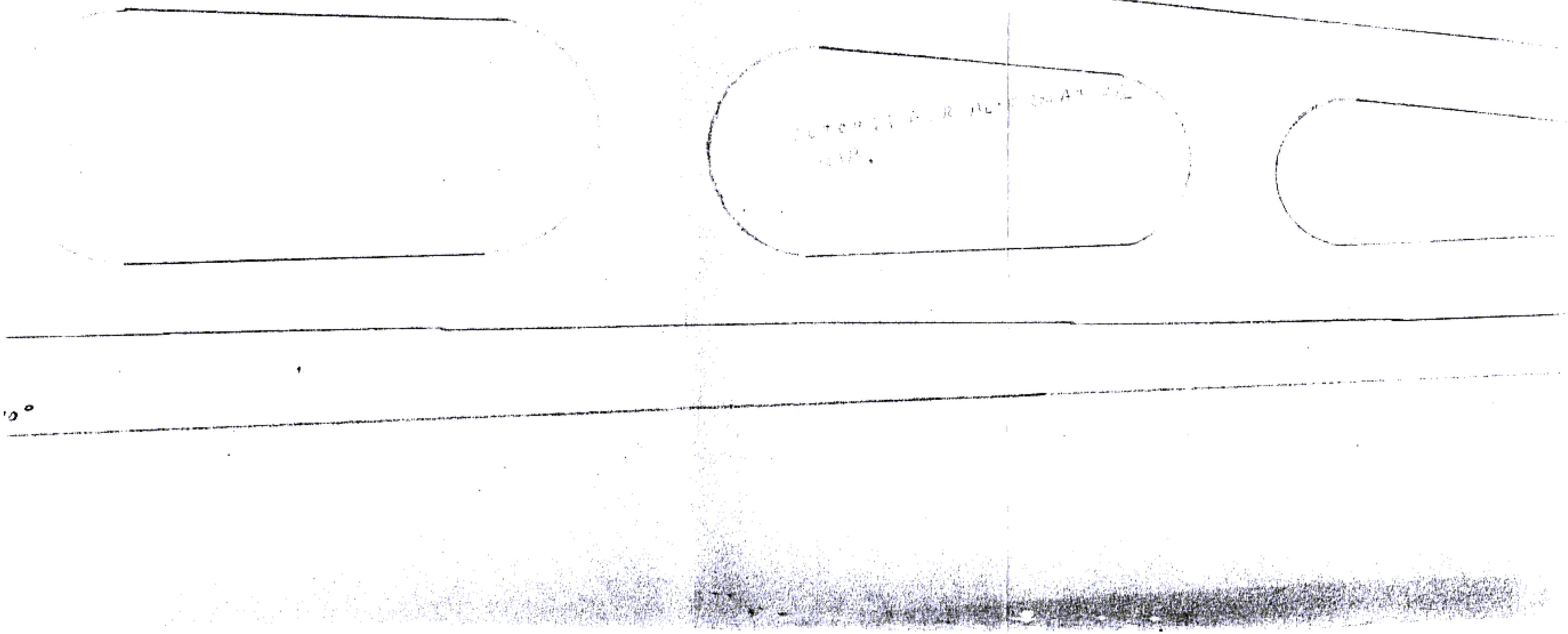
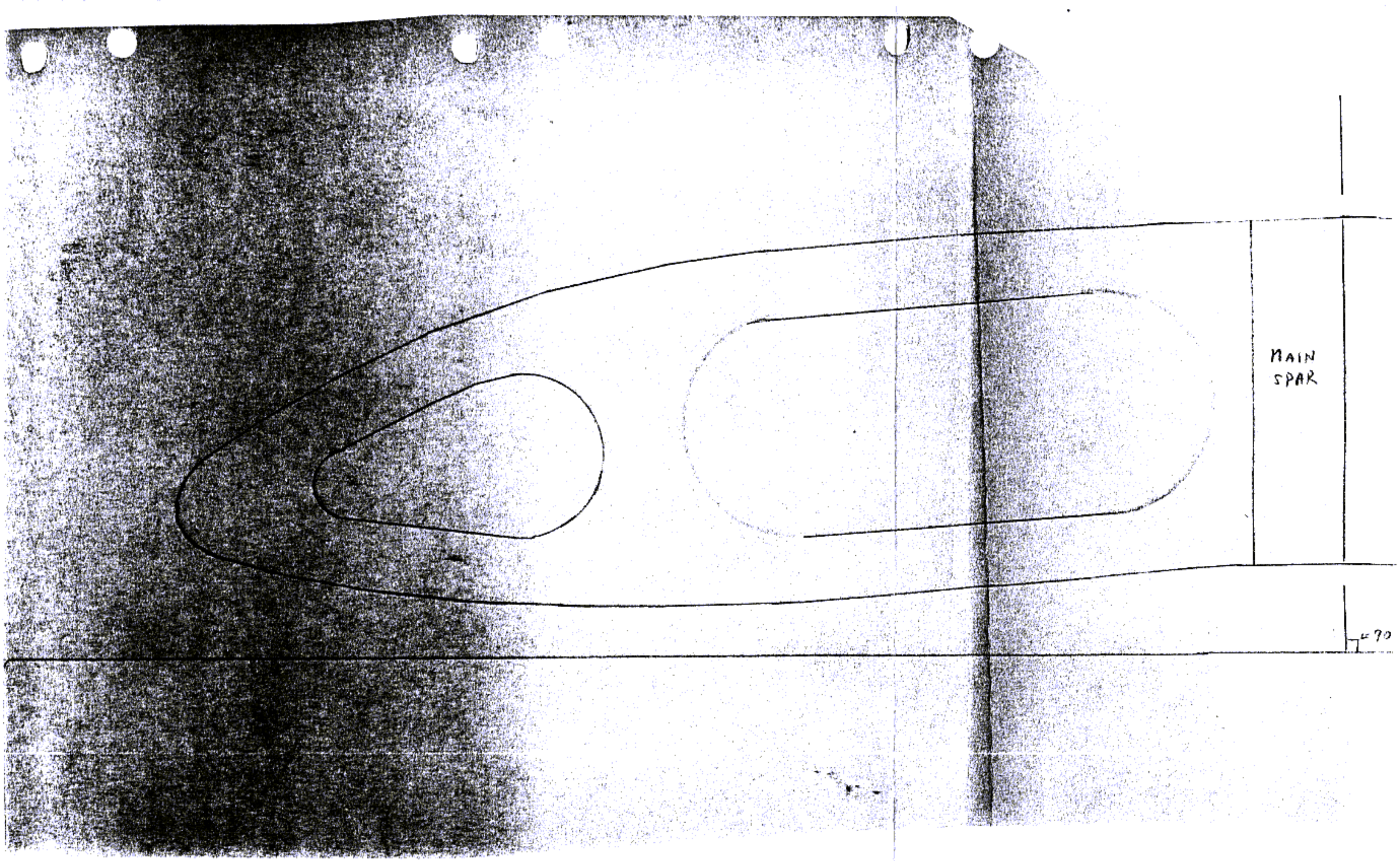



Aileron
(Lower wings)
Trailing Edge
(Upper wings

Guppy Wing Rib Template




MAIN
SPAR
4.70