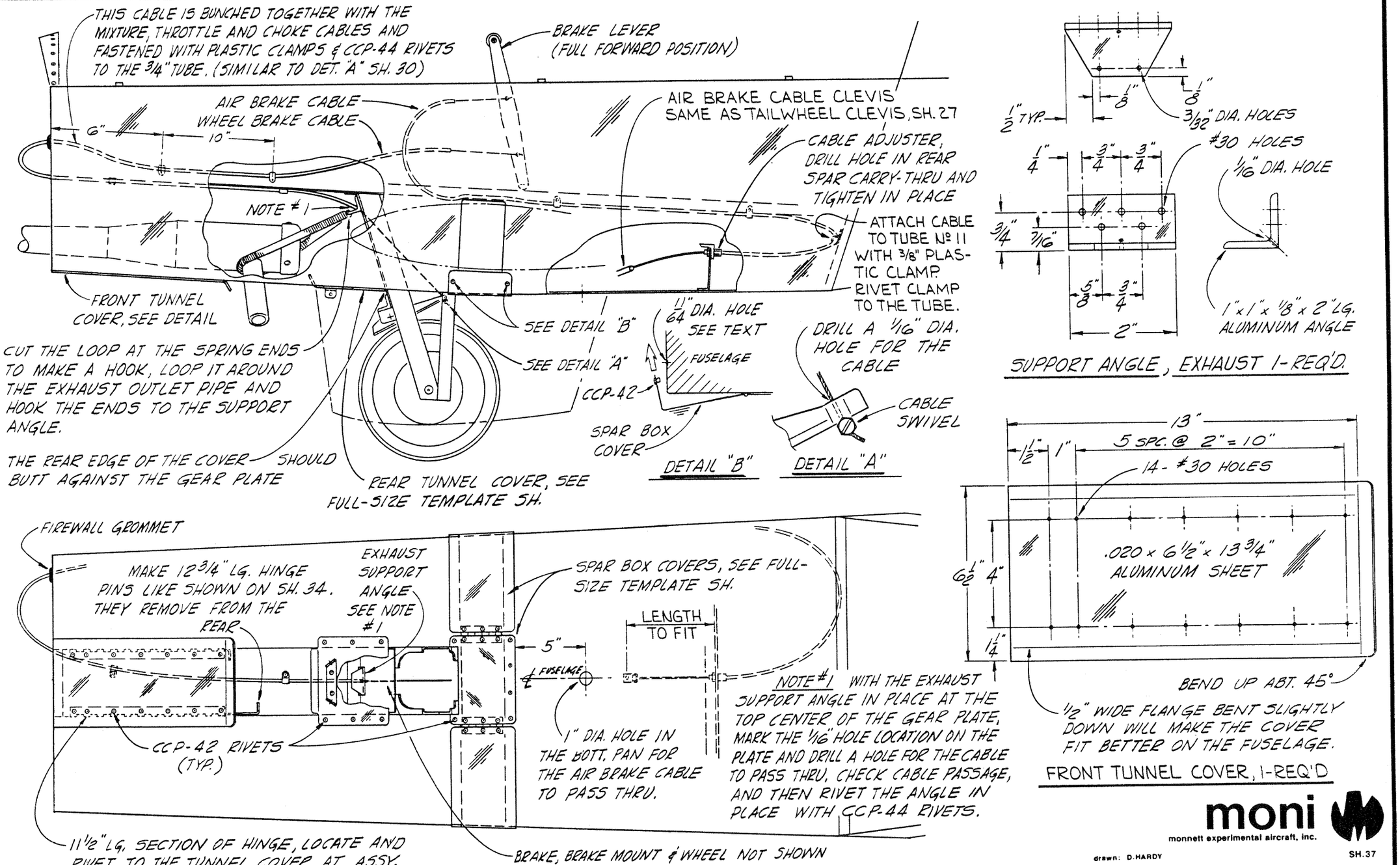
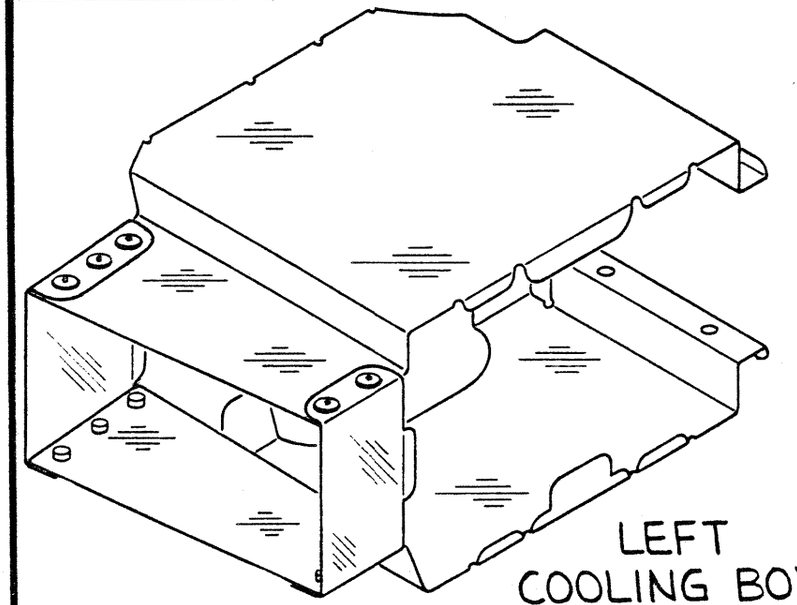


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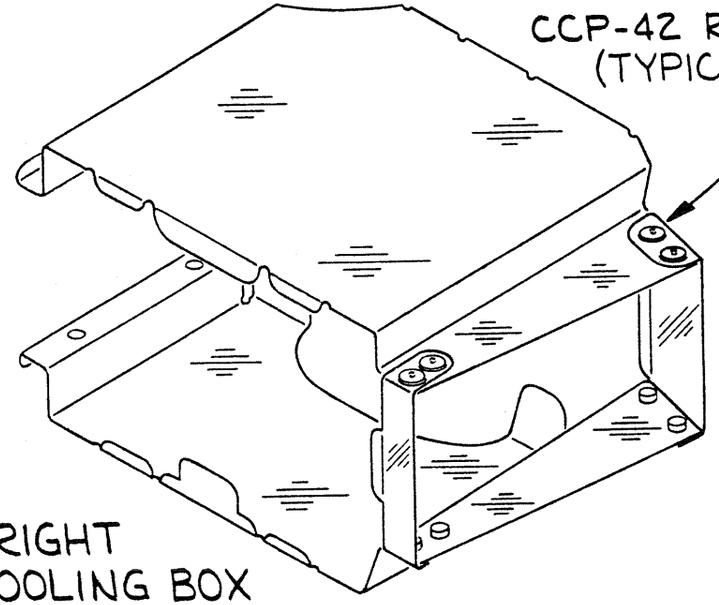
SH.37

rev. A

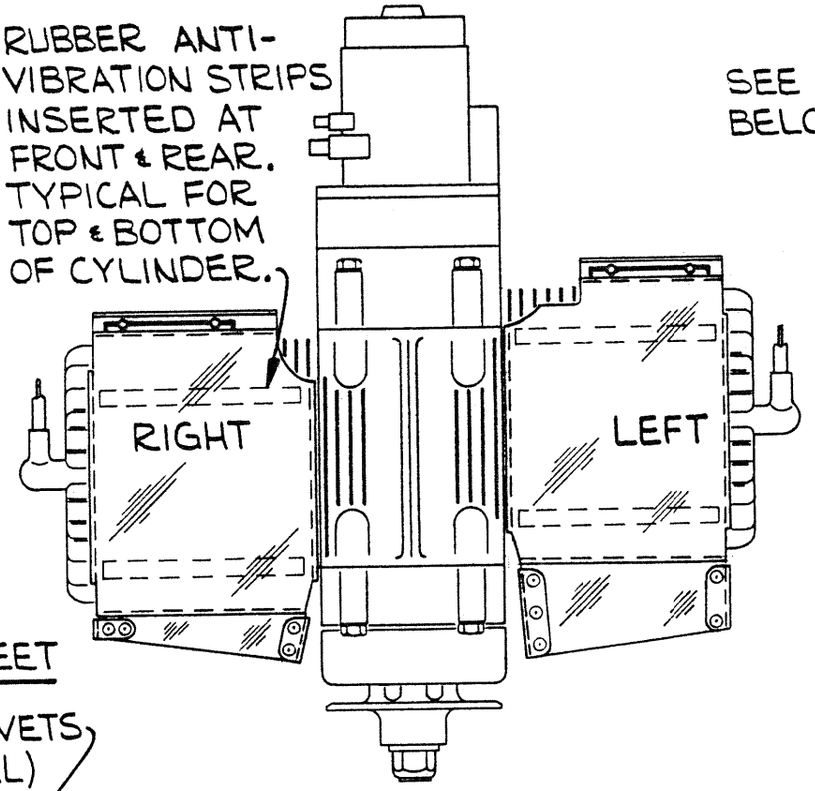


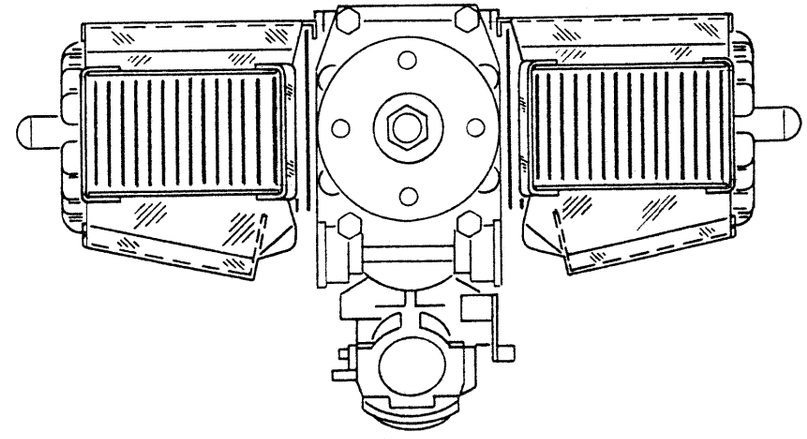
LEFT
COOLING BOX

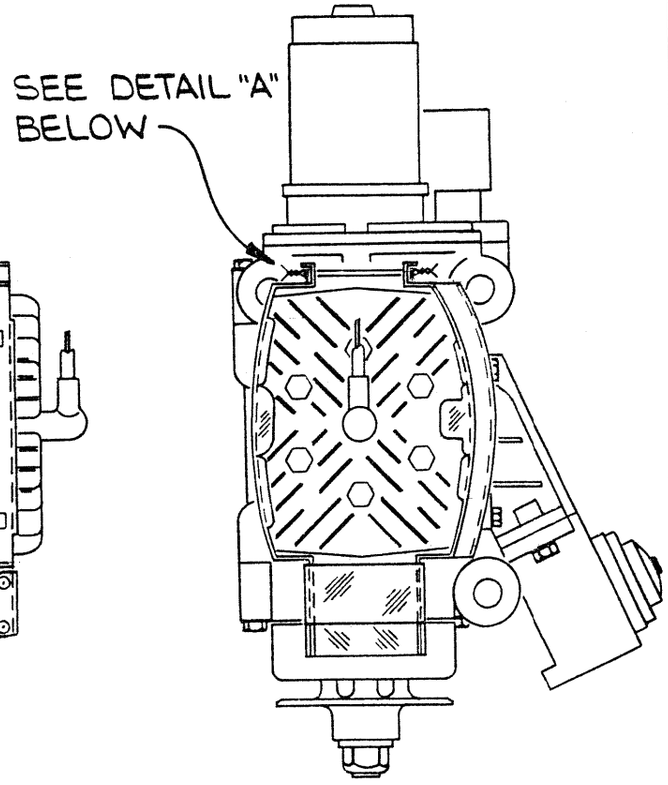
SEE FULL-SIZE TEMPLATE SHEET

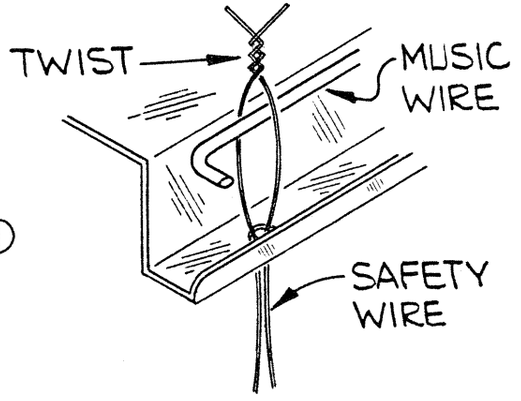


RIGHT
COOLING BOX







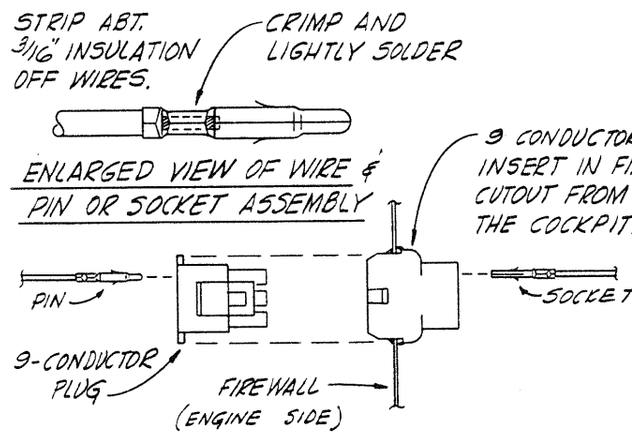


DETAIL "A"
(TYP.)

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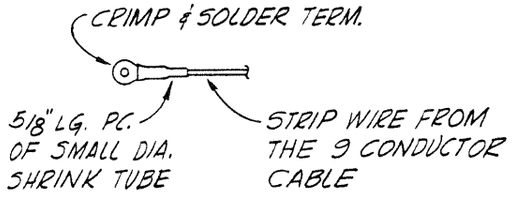
FIREWALL ELECTRICAL PLUG ASSEMBLY

CABLE ASSEMBLY NOTE

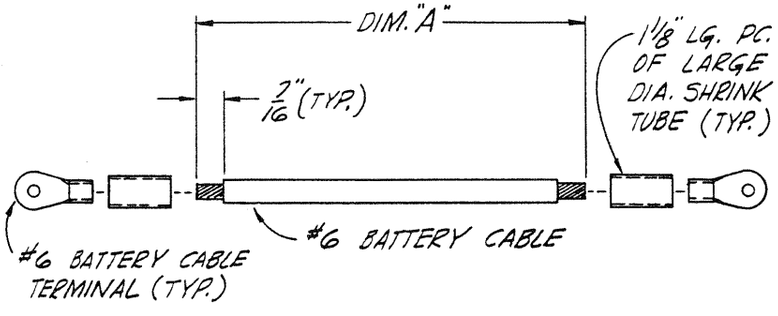
ASSEMBLE, CRIMP AND SOLDER THE TERMINALS TO THE CABLE ENDS. SLIP THE SHRINK TUBE IN POSITION AND SHRINK USING A HAIR DRYER OR SOLDERING IRON TO SHRINK THE TUBE.



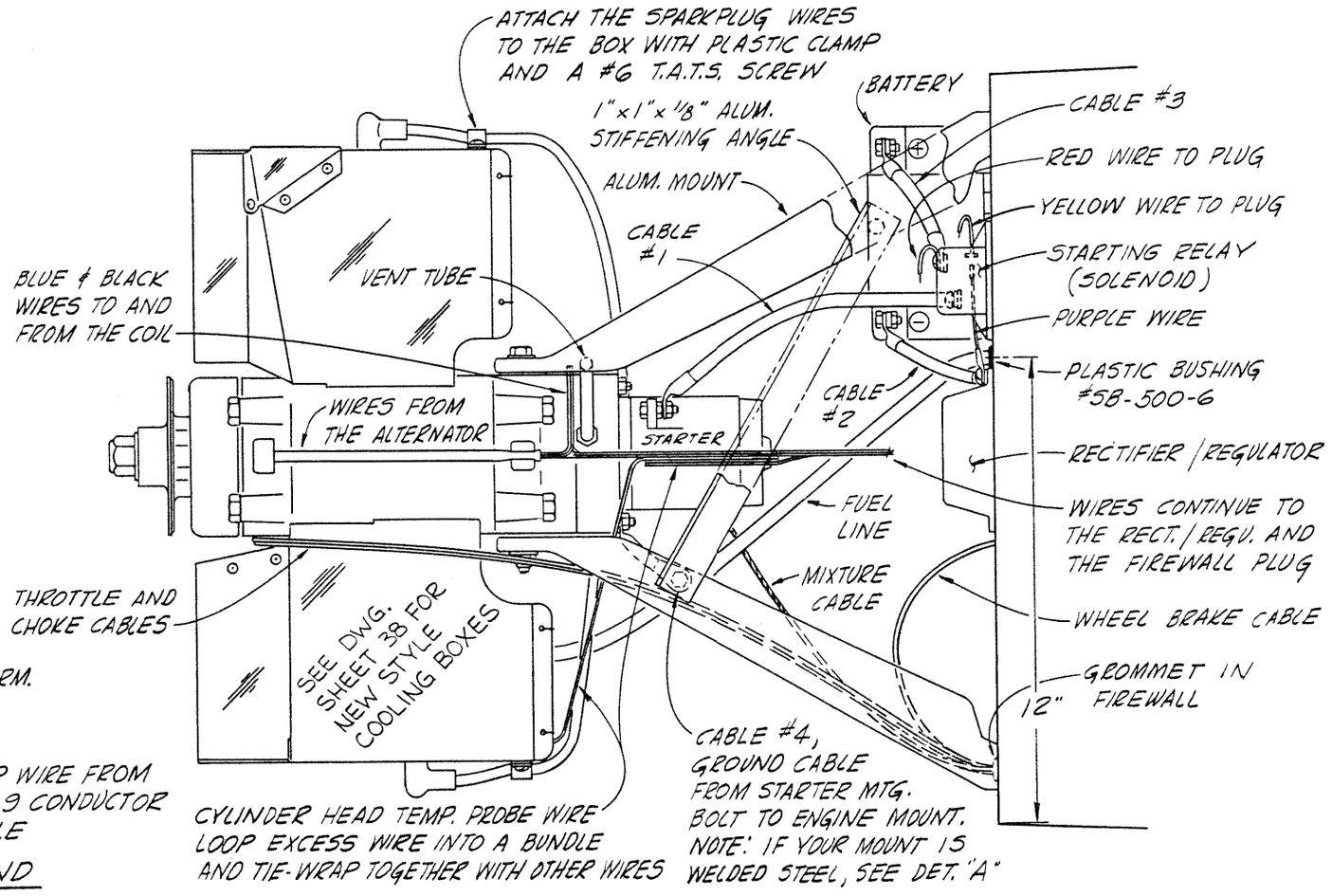
CABLE END WITH SHRINK TUBE IN PLACE



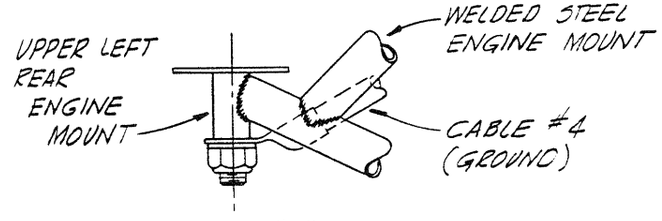
TYPICAL WIRE END



TYPICAL CABLE ASSEMBLY



CABLE Nº	DIM. "A"	DESCRIPTION
#1	12"	STARTER TO SOLENOID
#2	8"	BATTERY TO REGULATOR (-)
#3	7"	BATTERY TO STARTER RELAY (+)
#4	5"	GROUND CABLE



DETAIL "A"

WELDED STEEL ENG. MOUNT

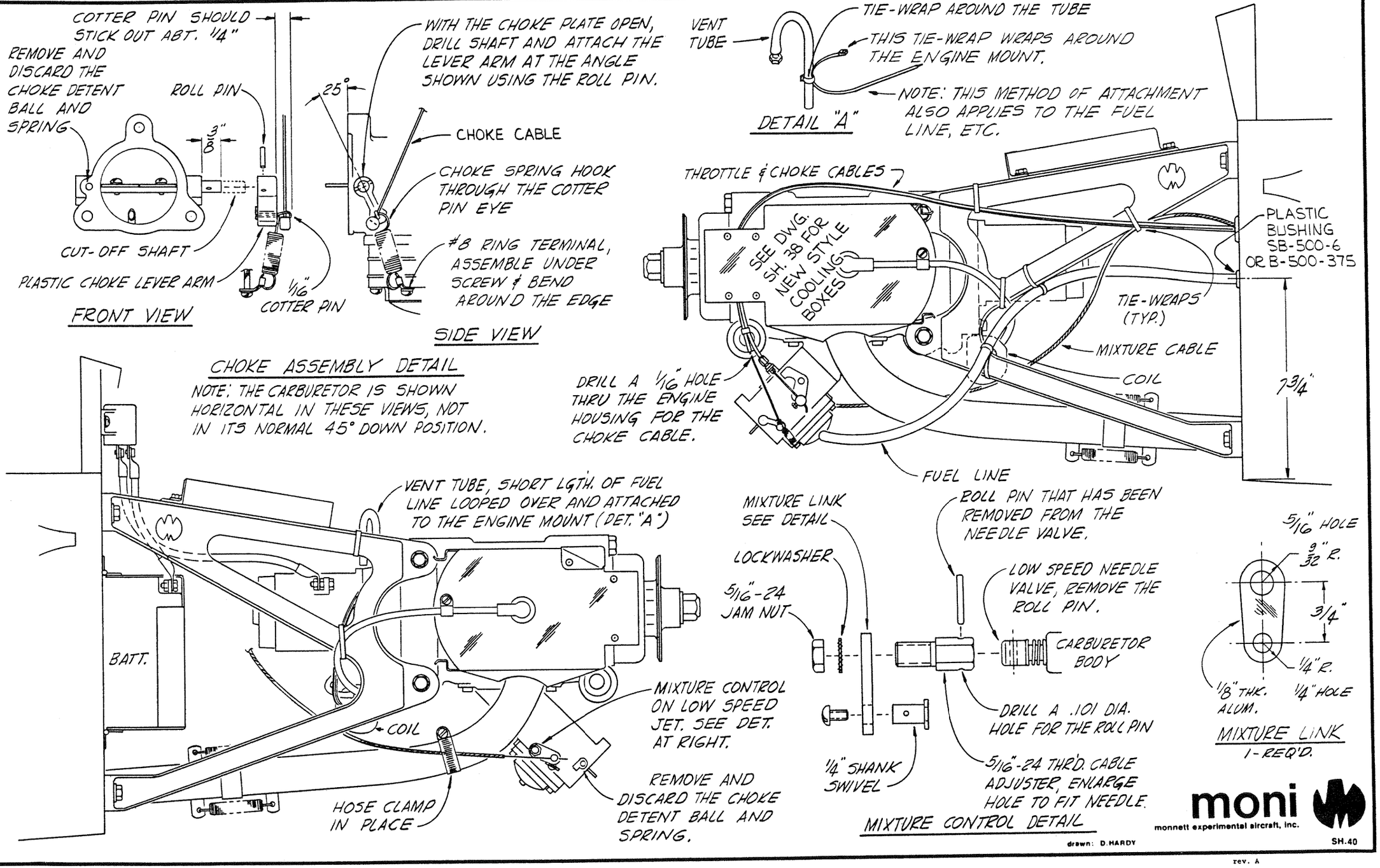
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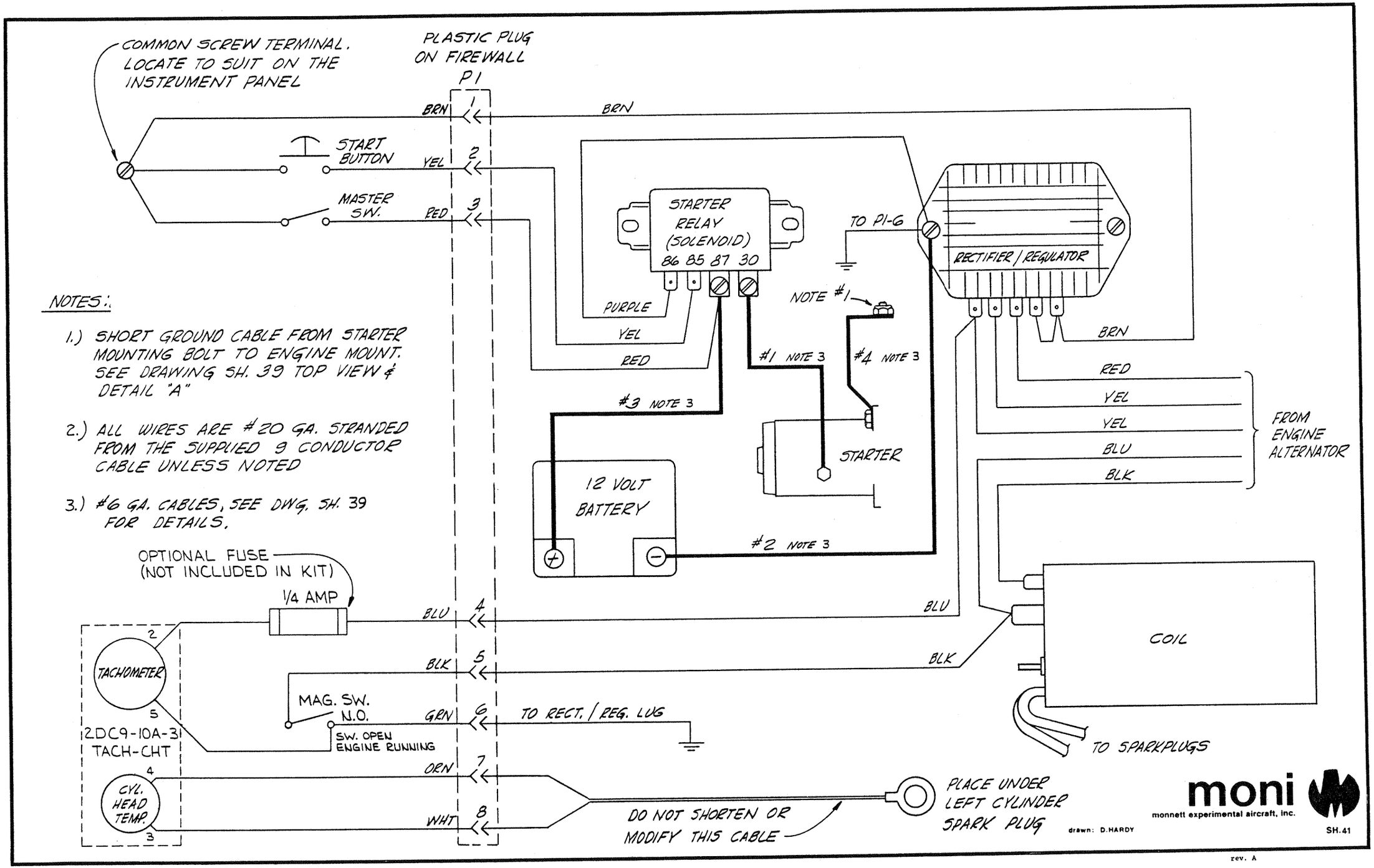
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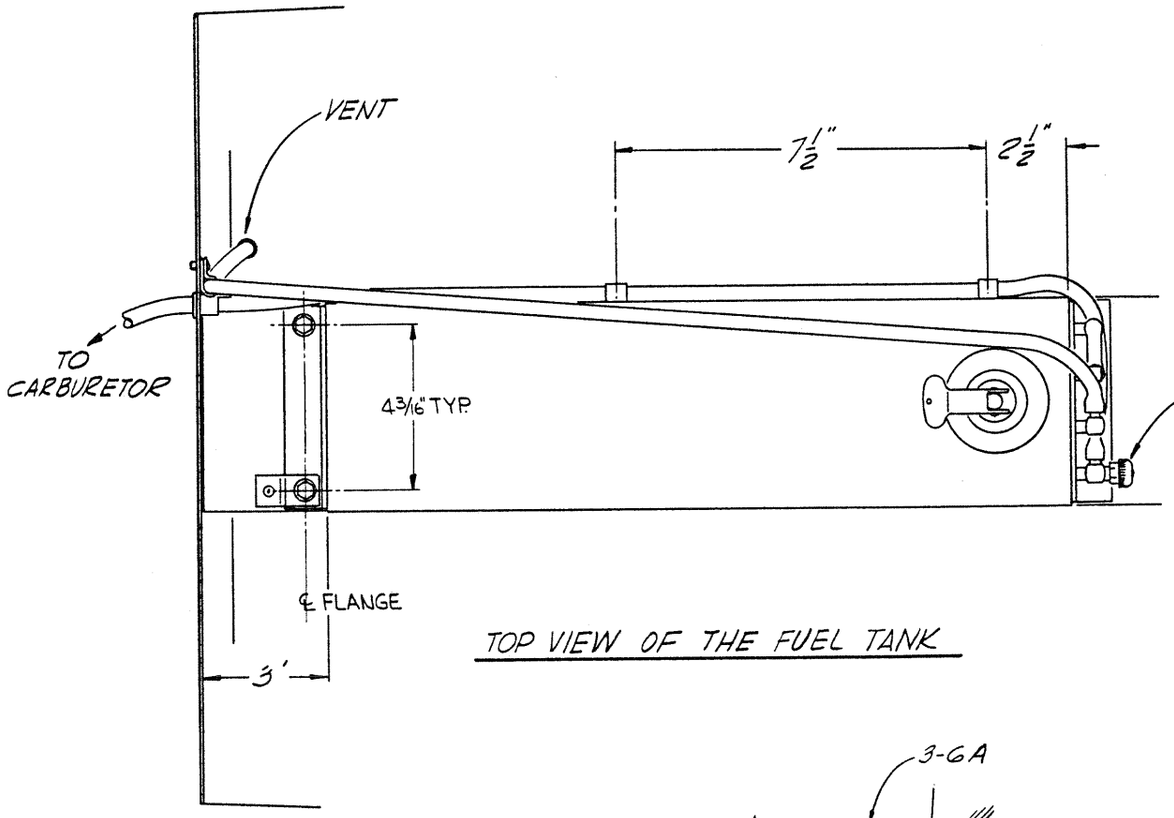
drawn: D.HARDY

SH.39

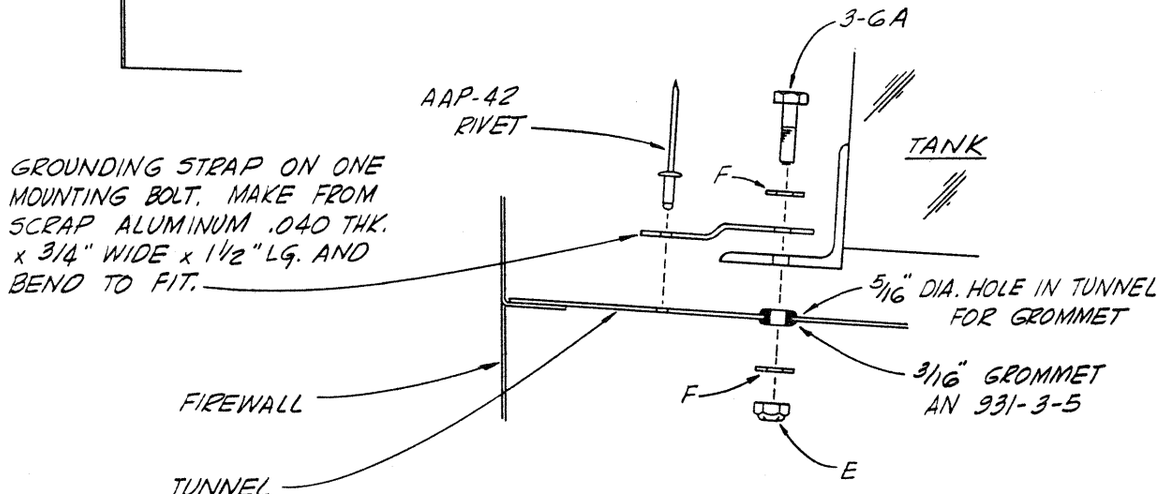
rev. A


COTTER PIN SHOULD STICK OUT ABT. 1/4"
REMOVE AND DISCARD THE CHOKE DETENT BALL AND SPRING
ROLL PIN
3/8"
CUT-OFF SHAFT
PLASTIC CHOKE LEVER ARM
1/16" COTTER PIN
FRONT VIEW
25°
WITH THE CHOKE PLATE OPEN, DRILL SHAFT AND ATTACH THE LEVER ARM AT THE ANGLE SHOWN USING THE ROLL PIN.
CHOKE CABLE
CHOKE SPRING HOOK THROUGH THE COTTER PIN EYE
#8 RING TERMINAL, ASSEMBLE UNDER SCREW & BEND AROUND THE EDGE
SIDE VIEW
VENT TUBE
TIE-WRAP AROUND THE TUBE
THIS TIE-WRAP WRAPS AROUND THE ENGINE MOUNT.
NOTE: THIS METHOD OF ATTACHMENT ALSO APPLIES TO THE FUEL LINE, ETC.
DETAIL "A"
THROTTLE & CHOKE CABLES
SEE DWG. SH. 38 FOR NEW STYLE COOLING BOXES
PLASTIC BUSHING SB-500-6 OR B-500-375
TIE-WRAPS (TYP.)
MIXTURE CABLE
COIL
7 3/4"
DRILL A 1/16" HOLE THRU THE ENGINE HOUSING FOR THE CHOKE CABLE.
FUEL LINE
CHOKE ASSEMBLY DETAIL
NOTE: THE CARBURETOR IS SHOWN HORIZONTAL IN THESE VIEWS, NOT IN ITS NORMAL 45° DOWN POSITION.
VENT TUBE, SHORT LGTH. OF FUEL LINE LOOPED OVER AND ATTACHED TO THE ENGINE MOUNT (DET. "A")
BATT.
COIL
MIXTURE CONTROL ON LOW SPEED JET. SEE DET. AT RIGHT.
REMOVE AND DISCARD THE CHOKE DETENT BALL AND SPRING.
HOSE CLAMP IN PLACE
MIXTURE LINK SEE DETAIL
LOCKWASHER
5/16"-24 JAM NUT
1/4" SHANK SWIVEL
ROLL PIN THAT HAS BEEN REMOVED FROM THE NEEDLE VALVE.
LOW SPEED NEEDLE VALVE, REMOVE THE ROLL PIN.
CARBURETOR BODY
DRILL A .101 DIA. HOLE FOR THE ROLL PIN
5/16"-24 THR'D. CABLE ADJUSTER, ENLARGE HOLE TO FIT NEEDLE.
MIXTURE CONTROL DETAIL
5/16" HOLE
9/32" R.
3/4"
1/4" R.
1/8" THK. ALUM.
1/4" HOLE
MIXTURE LINK
1-REQ'D.
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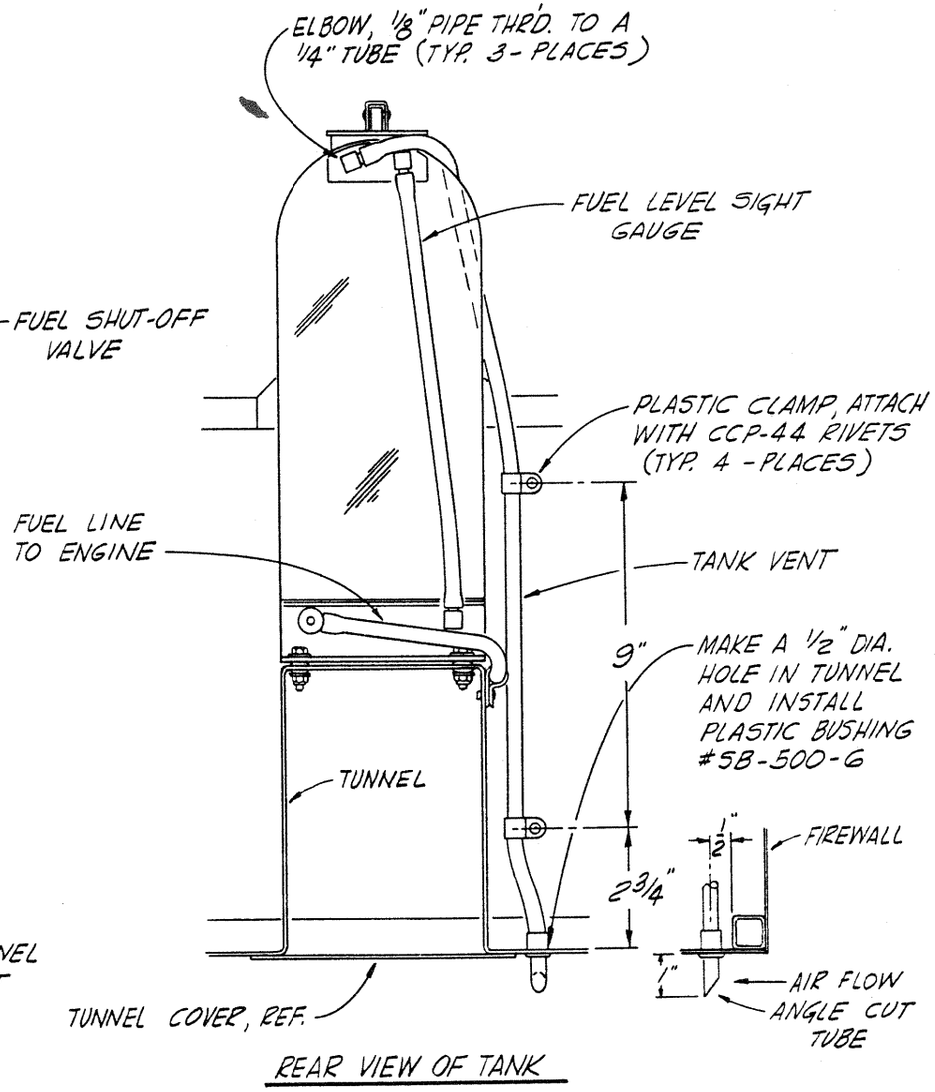

COMMON SCREW TERMINAL. LOCATE TO SUIT ON THE INSTRUMENT PANEL
PLASTIC PLUG ON FIREWALL
P1
BRN
1
BRN
START BUTTON
YEL
2
MASTER SW.
RED
3
STARTER RELAY (SOLENOID)
86 85 87 30
TO P1-6
RECTIFIER / REGULATOR
NOTE #1
PURPLE
YEL
RED
#1 NOTE 3
#4 NOTE 3
#3 NOTE 3
BRN
RED
YEL
YEL
BLU
BLK
FROM ENGINE ALTERNATOR
STARTER
12 VOLT BATTERY
#2 NOTE 3
NOTES:
1.) SHORT GROUND CABLE FROM STARTER MOUNTING BOLT TO ENGINE MOUNT. SEE DRAWING SH. 39 TOP VIEW & DETAIL "A"
2.) ALL WIRES ARE #20 GA. STRANDED FROM THE SUPPLIED 9 CONDUCTOR CABLE UNLESS NOTED
3.) #6 GA. CABLES, SEE DWG. SH. 39 FOR DETAILS.
OPTIONAL FUSE (NOT INCLUDED IN KIT)
1/4 AMP
BLU
4
BLU
COIL
2
TACHOMETER
5
BLK
5
BLK
MAG. SW. N.O.
SW. OPEN ENGINE RUNNING
GRN
6
TO RECT. / REG. LUG
2DC9-10A-3 TACH-CHT
4
CYL. HEAD TEMP.
3
ORN
7
WHT
8
DO NOT SHORTEN OR MODIFY THIS CABLE
PLACE UNDER LEFT CYLINDER SPARK PLUG
TO SPARKPLUGS
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SH. 41
rev. A



TOP VIEW OF THE FUEL TANK



TYPICAL TANK MOUNT



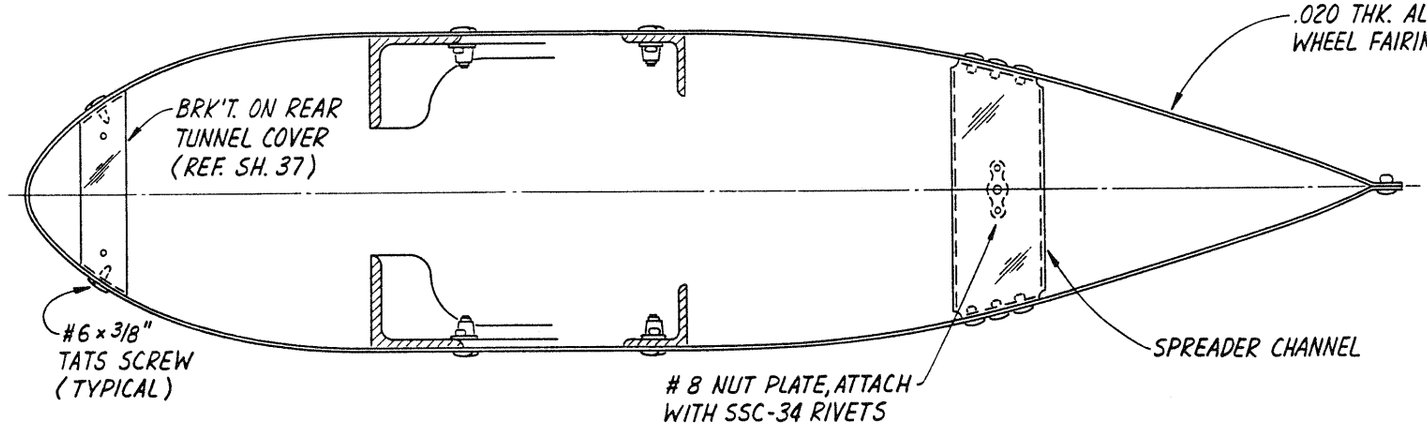
REAR VIEW OF TANK

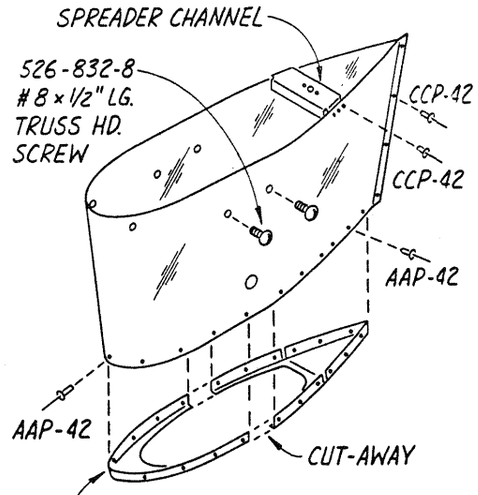
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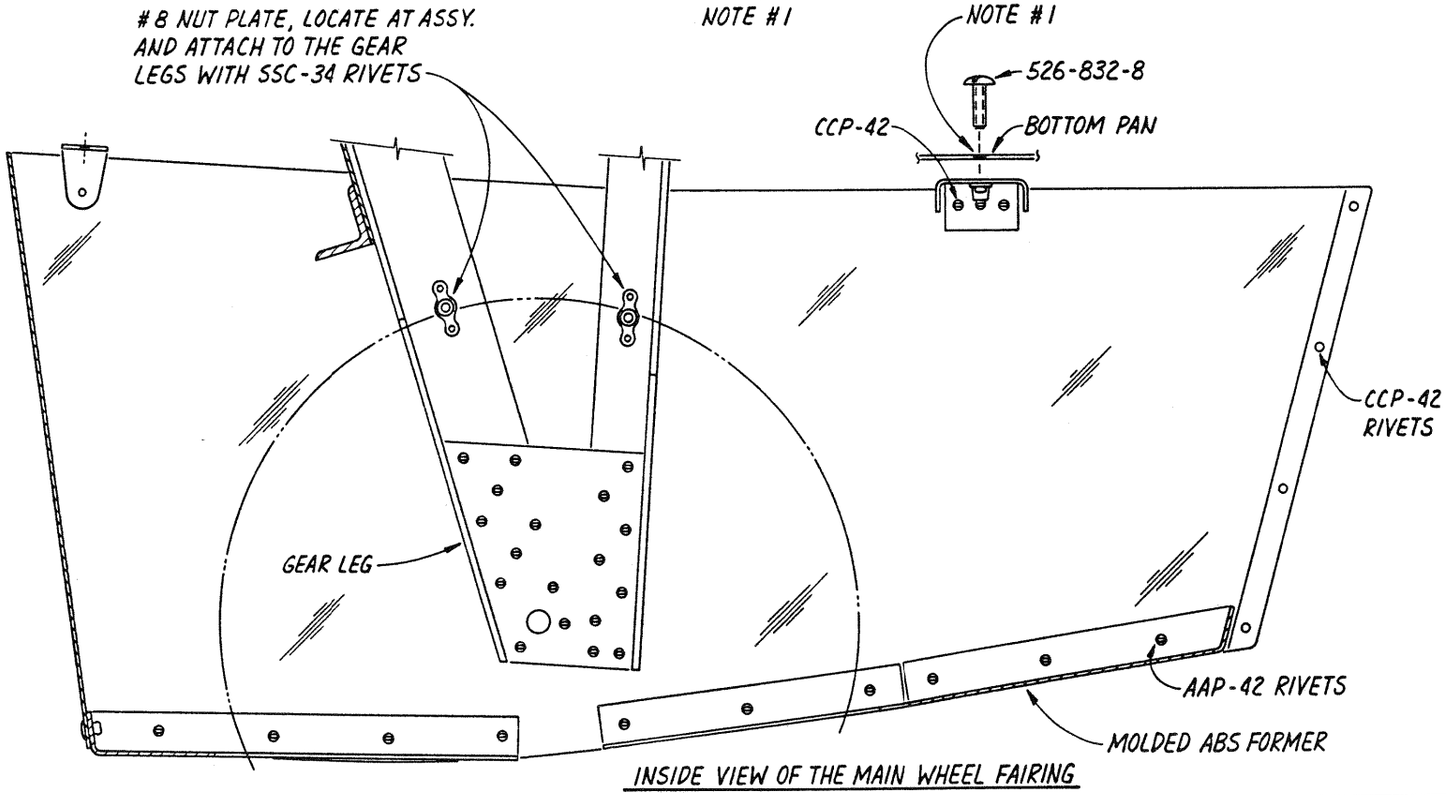
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SH.42

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INSIDE VIEW OF THE MAIN WHEEL FAIRING

NOTES:

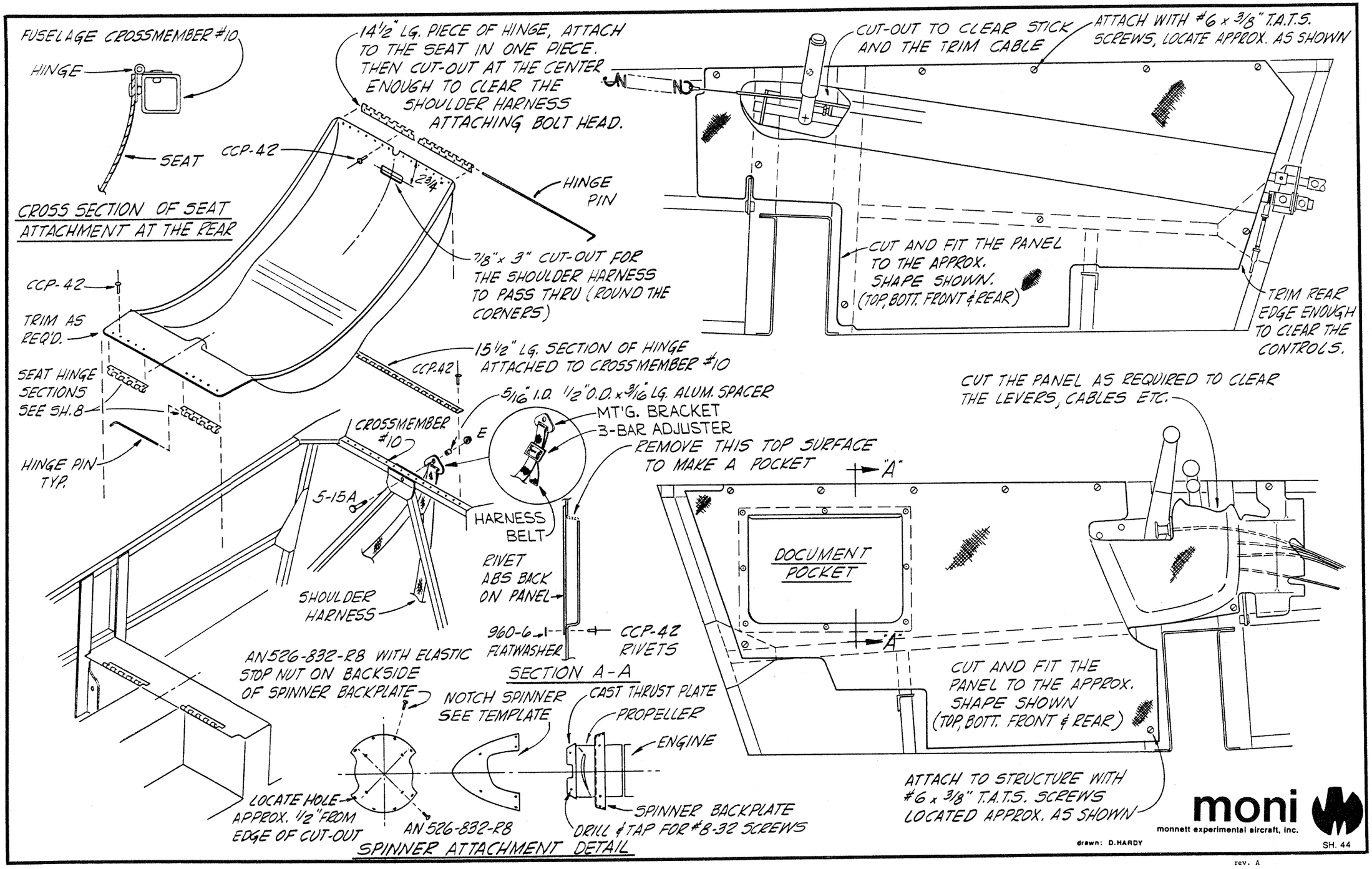
#1 LOCATE DURING ASSY. A 3/16" DIA. HOLE IN THE BOTTOM PAN FOR ATTACHING THE FAIRING.

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SH. 43

rev. B

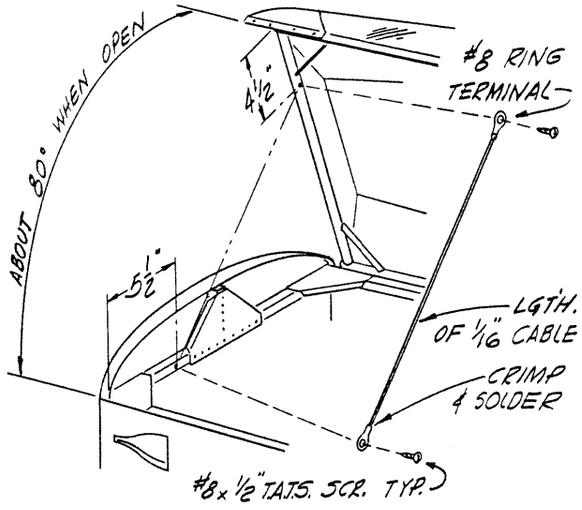


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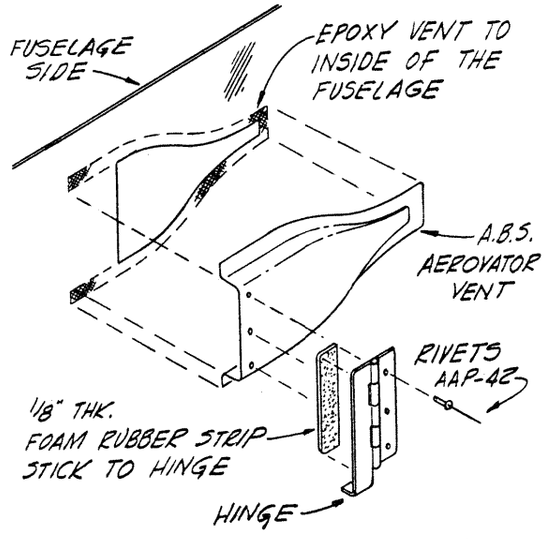
drawn: D.HARDY

SH. 44

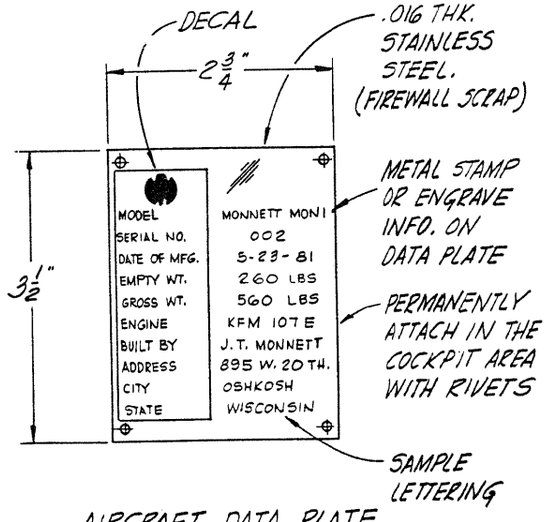
rev. A



CANOPY RESTRAIN CABLE



AIR VENT INSTALLATION



AIRCRAFT DATA PLATE

INSTRUMENT MARKING

AIRSPEED

RED LINE --- 150 MPH VNE

YELLOW ARC .. 105 - 150 MPH

GREEN ARC .. * 38 - 105 MPH

NARROW WHITE ARC (INSIDE OF GREEN ARC) - * 38 - 105 MPH

TACHOMETER

RED LINE --- 6250 RPM

CYL. HEAD TEMP.

RED LINE (MAX.) .. 435 °F

* STALL SPEED MUST BE DETERMINED BY FLIGHT TESTING INDIVIDUAL MONI

CONTROL SURFACE MOVEMENT

MEASURED AT THE TRAILING EDGE FROM THE NEUTRAL POSITION

AILERONS

15/16" UP 1 1/16" DOWN

RUDDER / VATORS

ELEVATOR: 2" UP & 2" DOWN

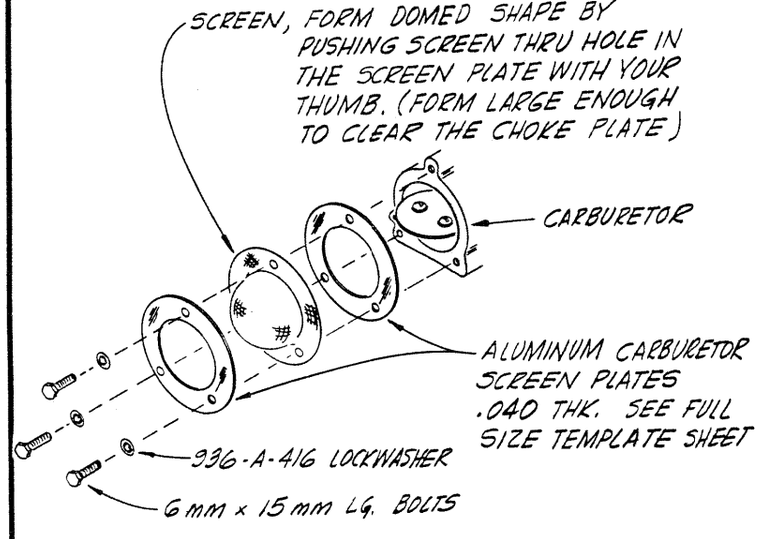
RUDDER: 2" UP & 2" DOWN

FULL DEFLECTION OF RUDDER & ELEVATOR YIELDS APPROX. 4" OF TOTAL TRAVEL FOR ONE SURFACE

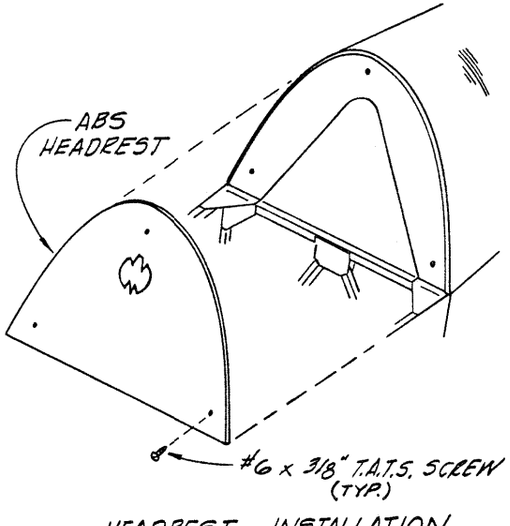
AIR BRAKE DOORS

ABOUT 75° OPEN FROM ℄ OF FUSELAGE

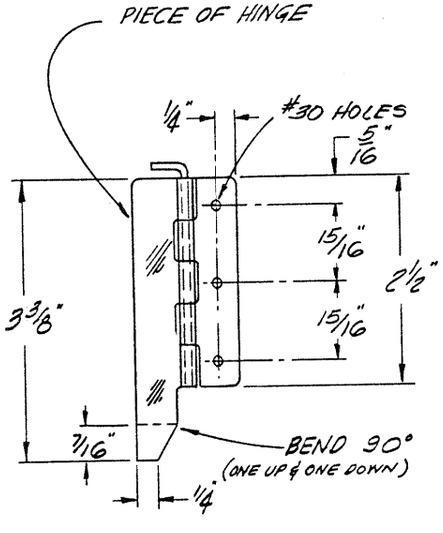
(DIMENSIONS SHOWN ARE APPROX.)



CARBURETOR SCREEN INSTALLATION



HEADREST INSTALLATION



AIR VENT HINGE DETAIL

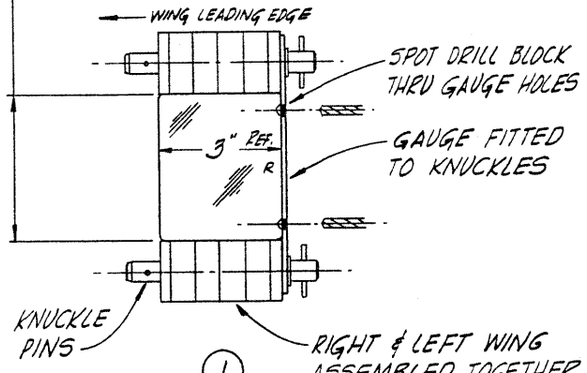
2- REQ'D.

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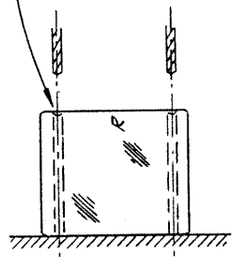
drawn: D.HARDY

CUT THE 3/4" x 3" ALUM. SPACER BLOCK TO A TIGHT FIT BETWEEN THE TOP AND BOTTOM KNUCKLES. (SEE NOTE #1)



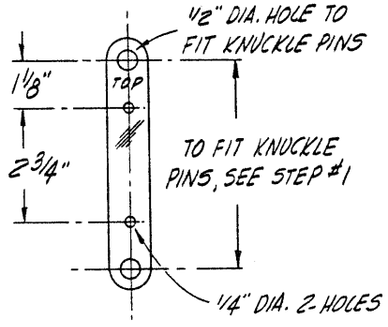
1

USING A DRILL PRESS DRILL 1/4" DIA. HOLES THRU THE BLOCK



2

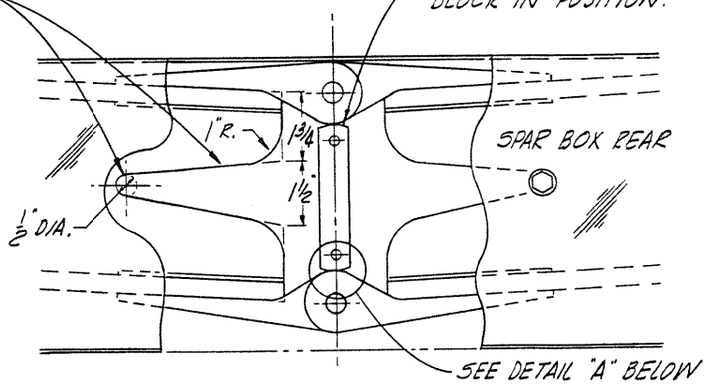
1/8" THK. ALUM. OR SCRAP STEEL



DRILLING GAUGE

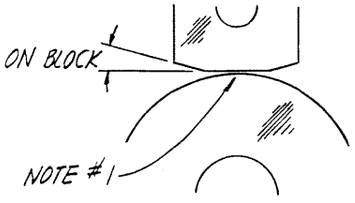
SEE TEXT FOR SPAR NOTCHING

3/4" x 3" ALUM. SPACER BLOCK IN POSITION.



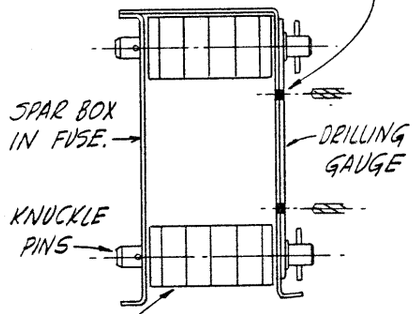
VIEW FROM THE REAR OF THE SPAR BOX LOOKING FORWARD

CUT A SLIGHT LEAD-IN ON BLOCK



DETAIL "A"

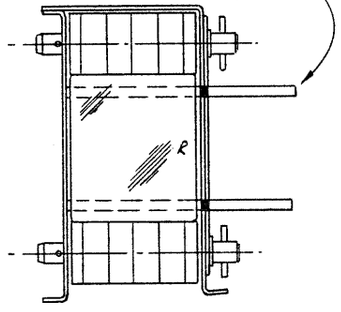
DRILL HOLES IN SPAR BOX REAR USING THE GAUGE AS A GUIDE



3

BOTH WINGS ASSEMBLED IN THE FUSELAGE

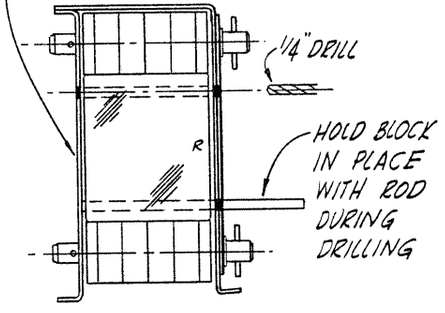
1/4" DIA. RODS (NOT INCL. IN KIT) USED TO HOLD THE BLOCKS IN PLACE WHILE ASSEMBLING THE WINGS & DRILLING THE HOLES



4

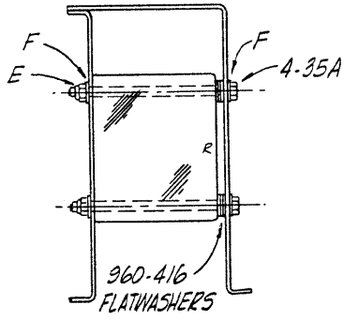
REMOVE ONE WING, POSITION THE SPACER BLOCK BETWEEN THE KNUCKLES AND INSERT THE RODS. NOW RE-ASSEMBLE THE WING USING RODS TO HOLD BLOCK IN PLACE.

SPAR BOX FRONT



5

REMOVE ONE ROD AT A TIME, AND USING THE BLOCK HOLE AS A GUIDE, CAREFULLY DRILL THE SPAR BOX FRONT HOLE. RE-INSTALL THE ROD THRU BOTH THE FRONT AND REAR SPAR BOX HOLES, THEN REPEAT FOR THE BOTTOM HOLE.



6

BOLT THE BLOCK IN PLACE USING WASHERS AS SPACERS, QTY. AS REQUIRED.

NOTE #1

AFTER STEP #5 IS COMPLETED THE SPACER BLOCK SHOULD BE FILED TO GIVE YOU ABOUT .005 CLEARANCE BETWEEN IT AND THE KNUCKLES. (TYP. BOTH ENDS) THIS IS HELPFUL WHEN ASSEMBLING THE WINGS.

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EMPTY WEIGHT C.G. (NO PILOT, NO FUEL)			TABLE #1
ITEM	WEIGHT (LBS.)	ARM	MOMENT
MAIN WHEEL			
TAIL WHEEL			
-TOTALS- WEIGHT AND MOMENT	A	-----	B

TOTAL MOMENT ÷ TOTAL WEIGHT = E.W.C.G.

C.G. WITH PILOT (NO FUEL)			TABLE #2
ITEM	WEIGHT (LBS.)	ARM	MOMENT
MAIN WHEEL			
TAIL WHEEL			
-TOTALS- WEIGHT AND MOMENT	A	-----	B

TOTAL MOMENT ÷ TOTAL WEIGHT = C.G. WITH PILOT

CALCULATION FOR PILOT C.G. ARM			TABLE #3
TOTAL WT. WITH PILOT (TABLE 2A)		TOTAL MOMENT WITH PILOT (TABLE 2B)	
TOTAL EMPTY WT. (TABLE 1A)	—	TOTAL EMPTY WT. MOMENT (TABLE 1B)	—
TOTAL WEIGHT DIFFERENCE		TOTAL MOMENT DIFFERENCE	

TOTAL MOMENT DIFF. ÷ TOTAL WT. DIFF. = PILOT C.G. ARM

C.G. WITH PILOT AND BALLAST (NO FUEL)			TABLE #4
ITEM	WEIGHT (LBS.)	ARM	MOMENT
TOTALS FROM TABLE 2 (A AND B)			
BALLAST		17.6"	
-TOTALS- WEIGHT AND MOMENT		-----	

TOTAL MOMENT ÷ TOTAL WEIGHT = C.G.

- MAXIMUM GROSS WEIGHT ---------- 560 LBS.
- MAXIMUM GROSS AEROBATIC WEIGHT ----- 500 LBS.
- INTENTIONAL SPINS PROHIBITED BEYOND AFT AEROBATIC C.G. LIMIT

WEIGHT AND BALANCE FORMULA

WEIGHT x ARM = MOMENT ---------- W x A = M

TOTAL MOMENT ÷ TOTAL WEIGHT = CENTER OF GRAVITY --- $\frac{TM}{TW}$ = C.G.

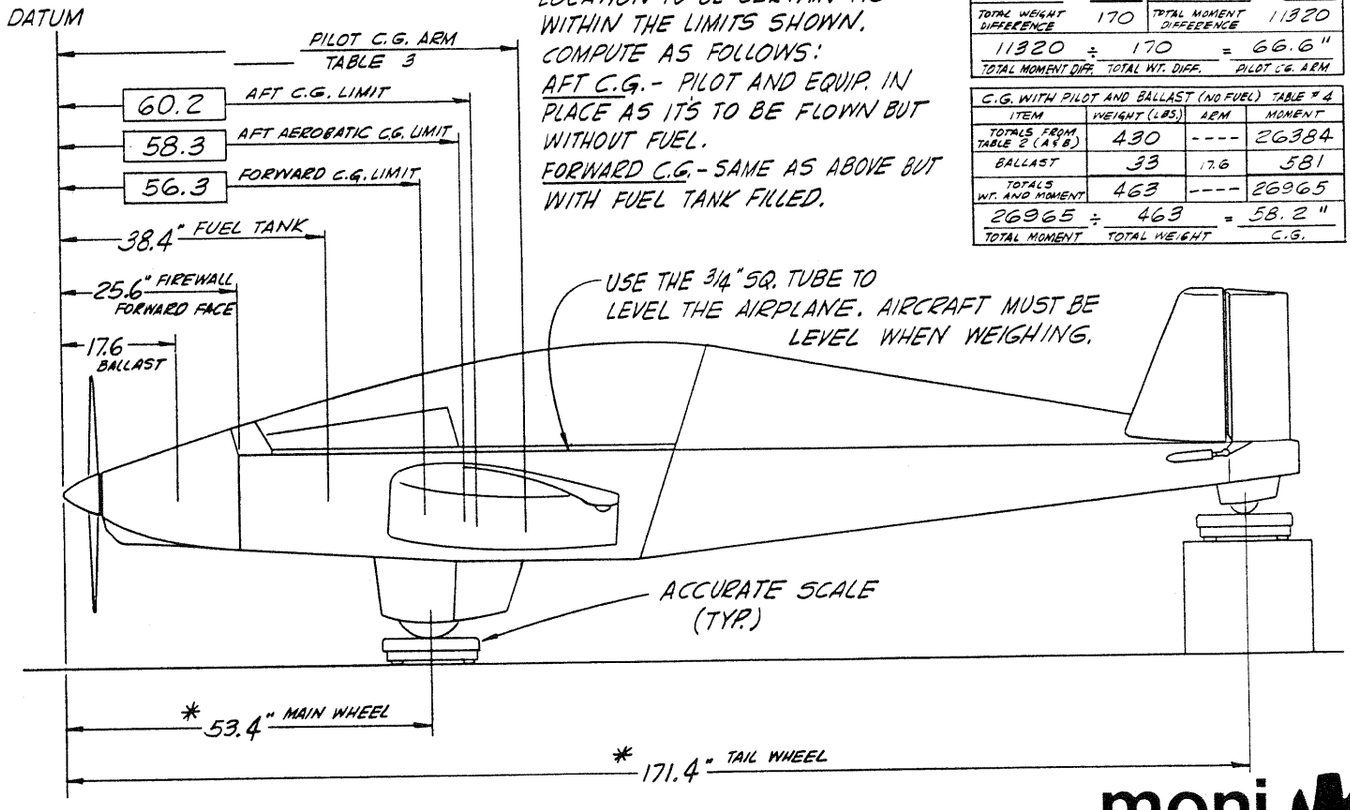
WEIGHT = TOTAL WEIGHT OF PLACED OBJECT

ARM = NUMBER OF INCHES WEIGHT CENTER IS PLACED AFT OF DATUM

BEFORE FLYING THE MONI AND WITH THE BALLAST IN PLACE CHECK THE GROSS WEIGHT AND C.G. LOCATION TO BE CERTAIN ITS WITHIN THE LIMITS SHOWN. COMPUTE AS FOLLOWS:

AFT C.G. - PILOT AND EQUIP. IN PLACE AS ITS TO BE FLOWN BUT WITHOUT FUEL.

FORWARD C.G. - SAME AS ABOVE BUT WITH FUEL TANK FILLED.



* VERIFY THESE DIMENSIONS WHEN WEIGHING THE AIRPLANE

SAMPLE WEIGHT AND BALANCE

EMPTY WEIGHT C.G. (NO PILOT, NO FUEL)			TABLE #1
ITEM	WEIGHT (LBS.)	ARM	MOMENT
MAIN WHEEL	250	53.4	13350
TAIL WHEEL	10	171.4	1714
-TOTALS- WT. AND MOMENT	A 260	----	B 15064

15064 (TOTAL MOMENT) ÷ 260 (TOTAL WEIGHT) = 57.94" E.W.C.G.

C.G. WITH PILOT (NO FUEL)			TABLE #2
ITEM	WEIGHT (LBS.)	ARM	MOMENT
MAIN WHEEL	401	53.4	21413
TAIL WHEEL	29	171.4	4971
-TOTALS- WT. AND MOMENT	A 430	----	B 26384

26384 (TOTAL MOMENT) ÷ 430 (TOTAL WEIGHT) = 61.36" C.G. WITH PILOT *

CALCULATIONS FOR THE PILOT C.G. ARM			TABLE #3
TOTAL WT. WITH PILOT (TABLE 2A)	430	TOTAL MOMENT WITH PILOT (TABLE 2B)	26384
TOTAL EMPTY WT. (TABLE 1A)	- 260	TOTAL EMPTY WT. MOMENT (TABLE 1B)	- 15064
TOTAL WEIGHT DIFFERENCE	170	TOTAL MOMENT DIFFERENCE	11320

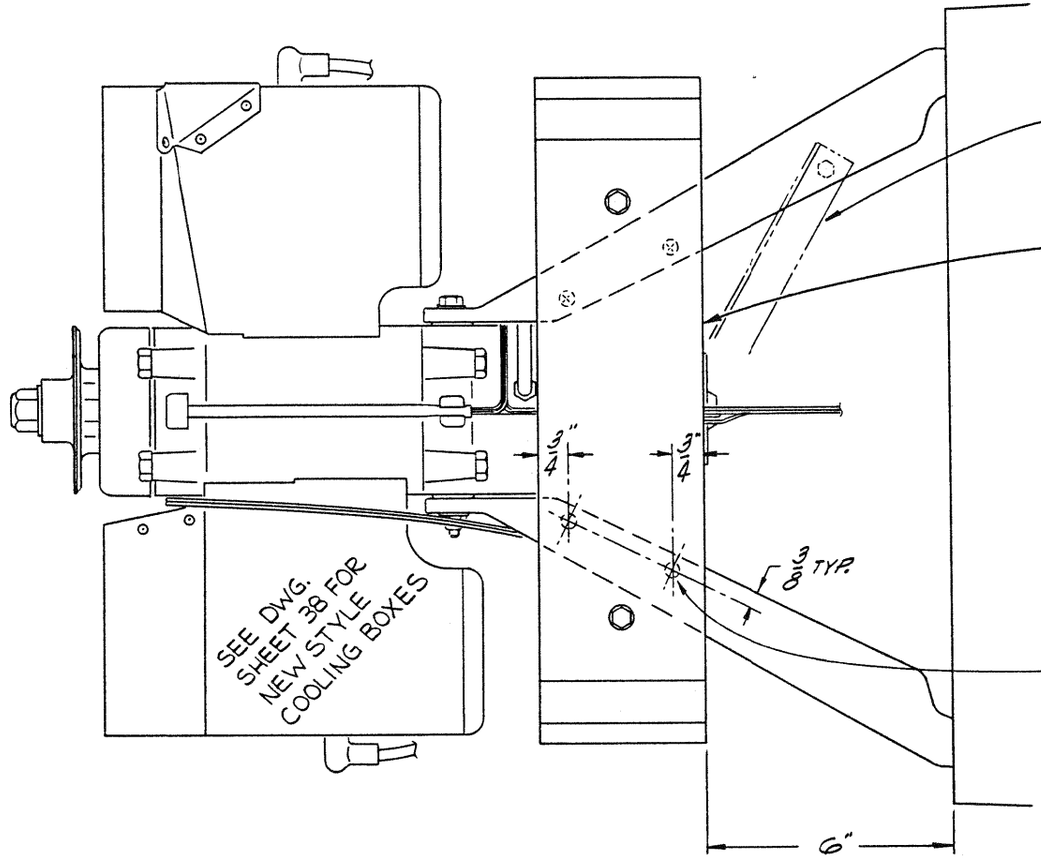
11320 (TOTAL MOMENT DIFF.) ÷ 170 (TOTAL WT. DIFF.) = 66.6" PILOT C.G. ARM

C.G. WITH PILOT AND BALLAST (NO FUEL)			TABLE #4
ITEM	WEIGHT (LBS.)	ARM	MOMENT
TOTALS FROM TABLE 2 (A & B)	430	----	26384
BALLAST	33	17.6	581
TOTALS WT. AND MOMENT	463	----	26965

26965 (TOTAL MOMENT) ÷ 463 (TOTAL WEIGHT) = 58.2" C.G.

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REMOVE ANGLE WHEN ADDING BALLAST BARS

SUGGESTED BALLAST METHOD - 1/2" THK. x 4" WIDE STEEL BARS BOLTED TO THE ENGINE MOUNT.

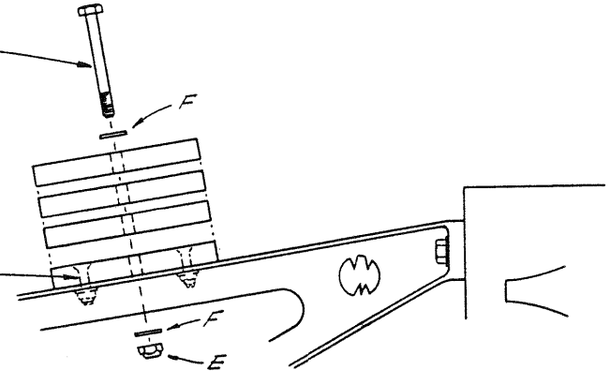
THE TOTAL WEIGHT OF THE BARS IS DETERMINED FROM THE WEIGHT AND BALANCE SHEET. (1/2" THK. x 4" WIDE STEEL BAR WEIGHS 6.8 LBS. PER FT. OF LGTH.) SEE DETAIL BELOW FOR MAXIMUM LGTH. OF BARS.

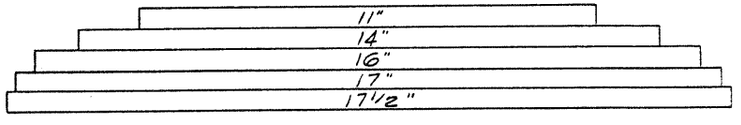
THE BALLAST BARS ARE NOT INCLUDED IN THE KIT, AND THE QUANTITY NECESSARY SHOULD BE PURCHASED LOCALLY BY THE BUILDER.

DRILL MOUNT AT ASSEMBLY FOR THE BALLAST ATTACHING SCREWS.

AN4-__ A BOLT, LGTH. AS REQ'D. (NOT INCLUDED IN KIT)

DRILL AND COUNTERSINK (100°) THE FIRST BAR FOR #507-1032 MACHINE SCREWS AND ATTACH TO CLAMPS USING A FLATWASHER AND ELASTIC LOCKNUT.





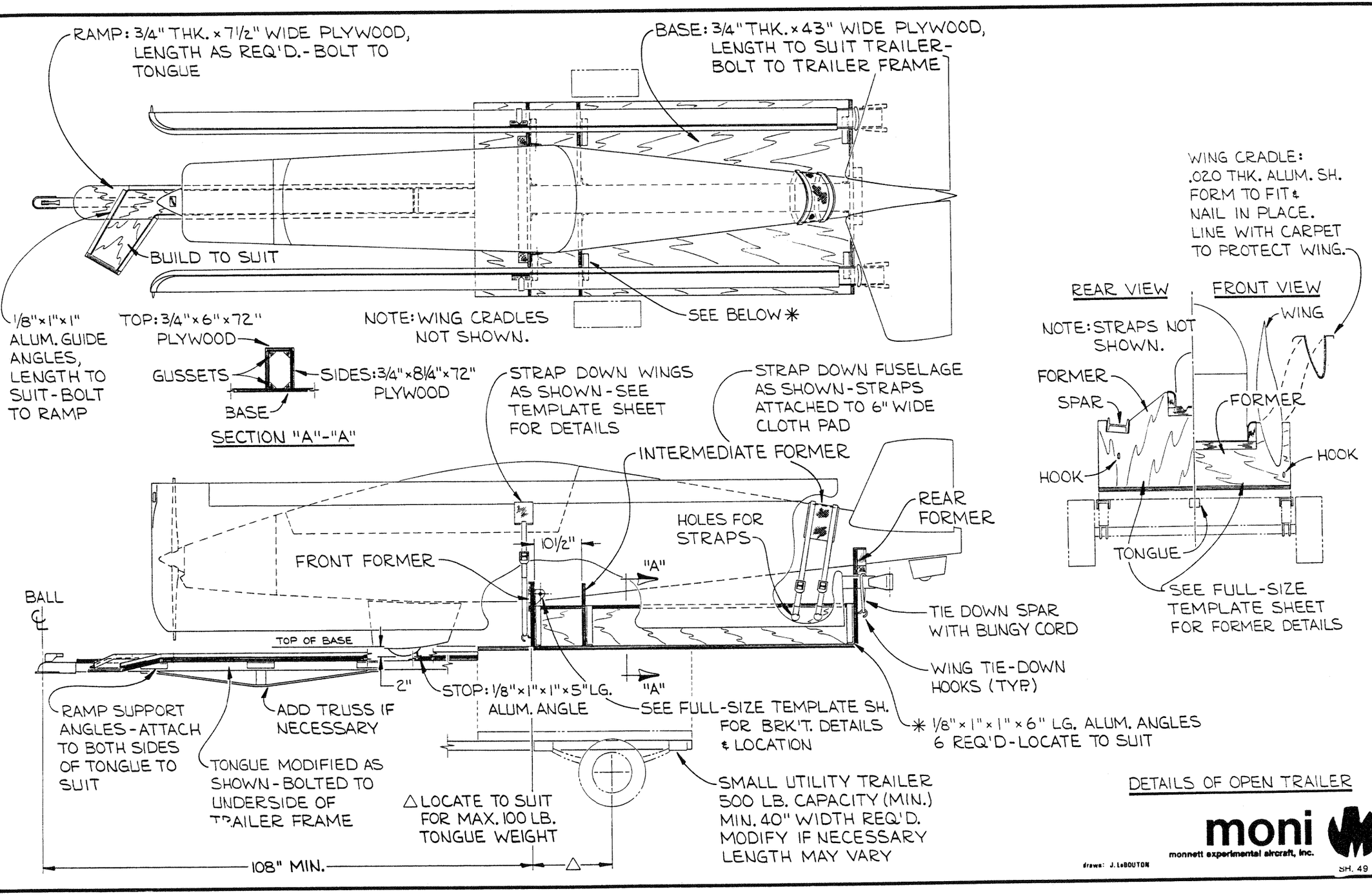
MAXIMUM LENGTH BALLAST BARS CAN BE AND STILL CLEAR THE COWLING.

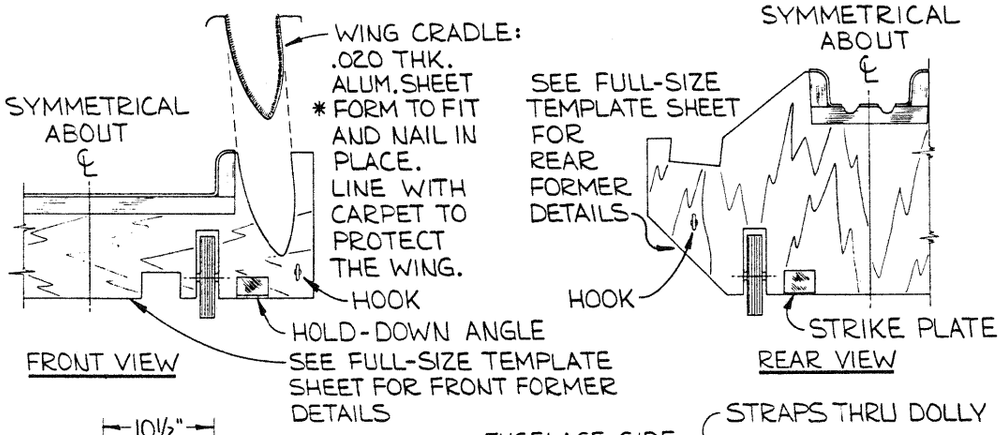
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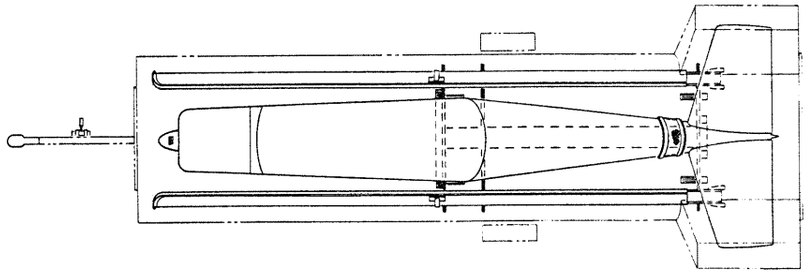
drawn: D.HARDY

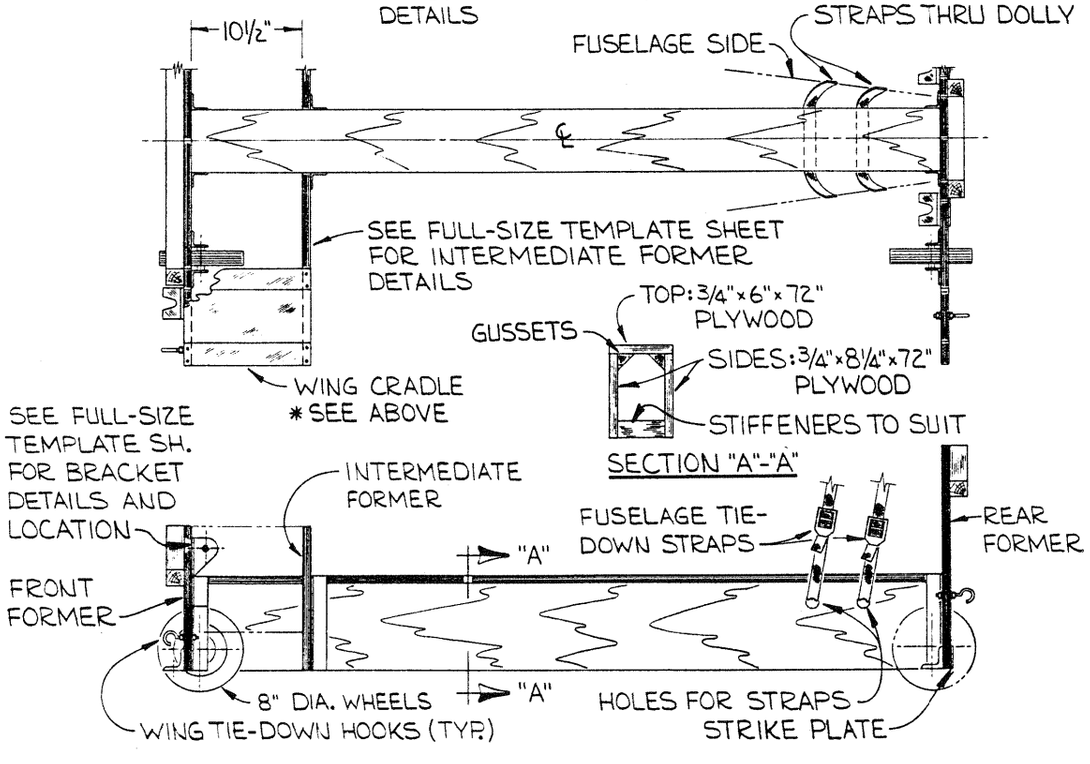
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rev. A

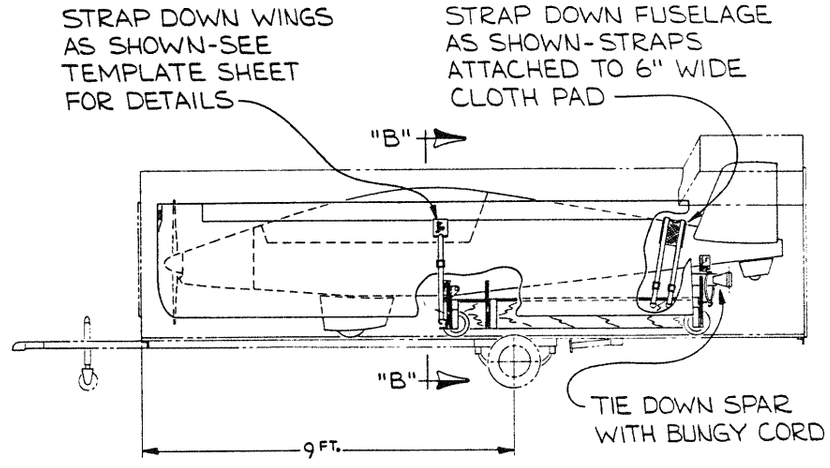

RAMP: 3/4" THK. x 7 1/2" WIDE PLYWOOD, LENGTH AS REQ'D. - BOLT TO TONGUE
BASE: 3/4" THK. x 43" WIDE PLYWOOD, LENGTH TO SUIT TRAILER - BOLT TO TRAILER FRAME
BUILD TO SUIT
1/8" x 1" x 1" ALUM. GUIDE ANGLES, LENGTH TO SUIT - BOLT TO RAMP
TOP: 3/4" x 6" x 72" PLYWOOD
GUSSETS
SIDES: 3/4" x 8 1/4" x 72" PLYWOOD
BASE
SECTION "A"-"A"
NOTE: WING CRADLES NOT SHOWN.
SEE BELOW *
WING CRADLE: .020 THK. ALUM. SH. FORM TO FIT & NAIL IN PLACE. LINE WITH CARPET TO PROTECT WING.
REAR VIEW
FRONT VIEW
NOTE: STRAPS NOT SHOWN.
WING
FORMER
SPAR
FORMER
HOOK
HOOK
TONGUE
SEE FULL-SIZE TEMPLATE SHEET FOR FORMER DETAILS
STRAP DOWN WINGS AS SHOWN - SEE TEMPLATE SHEET FOR DETAILS
STRAP DOWN FUSELAGE AS SHOWN - STRAPS ATTACHED TO 6" WIDE CLOTH PAD
INTERMEDIATE FORMER
REAR FORMER
HOLES FOR STRAPS
FRONT FORMER
10 1/2"
"A"
BALL
TOP OF BASE
2"
STOP: 1/8" x 1" x 1" x 5" LG. ALUM. ANGLE
"A"
SEE FULL-SIZE TEMPLATE SH. FOR BRK'T. DETAILS & LOCATION
TIE DOWN SPAR WITH BUNGY CORD
WING TIE-DOWN HOOKS (TYP.)
* 1/8" x 1" x 1" x 6" LG. ALUM. ANGLES 6 REQ'D - LOCATE TO SUIT
RAMP SUPPORT ANGLES - ATTACH TO BOTH SIDES OF TONGUE TO SUIT
ADD TRUSS IF NECESSARY
TONGUE MODIFIED AS SHOWN - BOLTED TO UNDERSIDE OF TRAILER FRAME
△ LOCATE TO SUIT FOR MAX. 100 LB. TONGUE WEIGHT
SMALL UTILITY TRAILER 500 LB. CAPACITY (MIN.) MIN. 40" WIDTH REQ'D. MODIFY IF NECESSARY LENGTH MAY VARY
108" MIN.
DETAILS OF OPEN TRAILER
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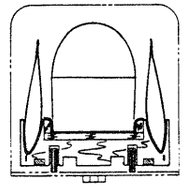




DETAILS OF DOLLY FOR ENCLOSED TRAILER



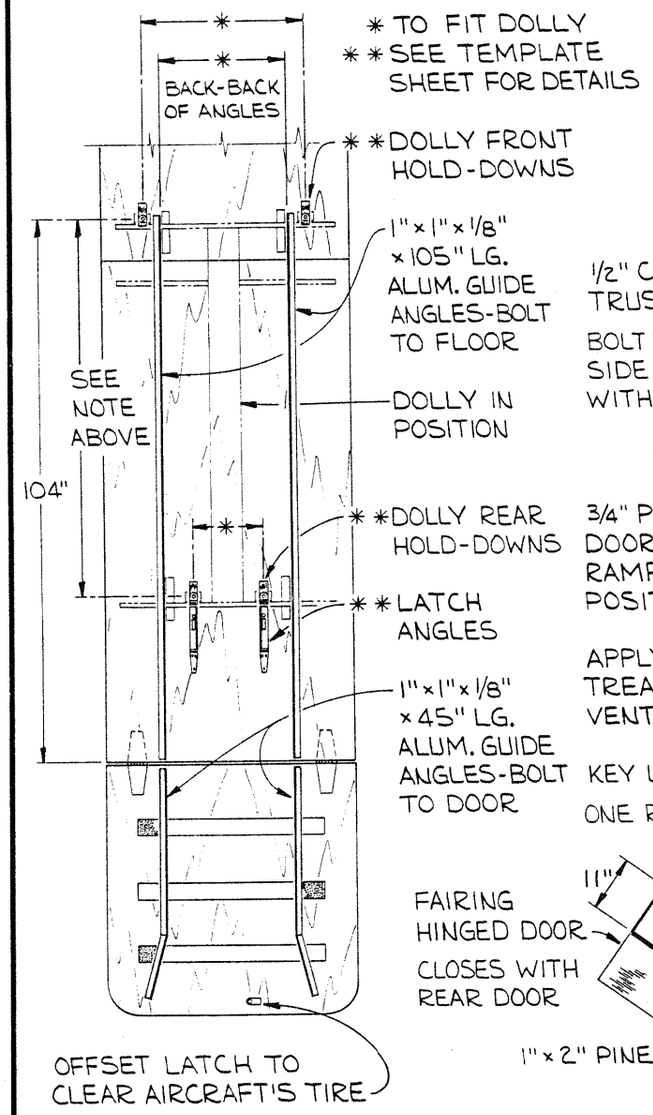
DOLLY SHOWN INSIDE TRAILER



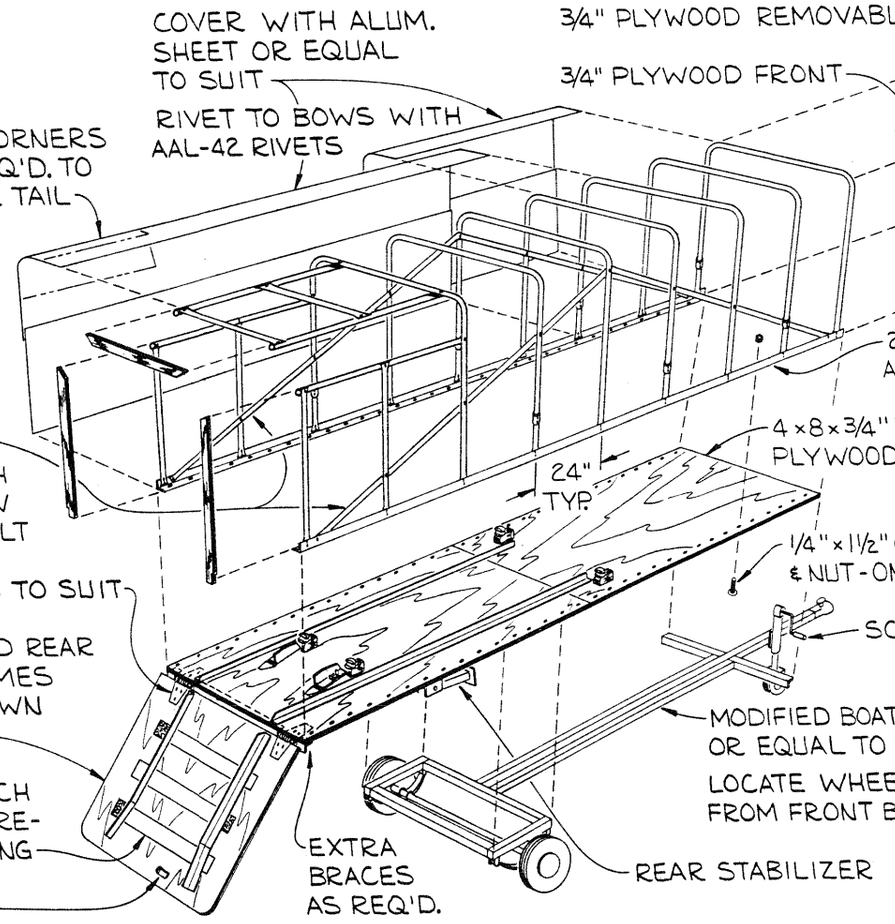
SECTION "B"-"B"

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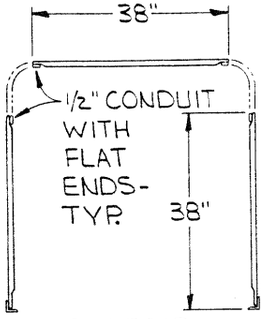
NOTE: WITH DOLLY IN POSITION AGAINST FRONT HOLD-DOWNS, LOCATE & INSTALL REAR HOLD-DOWNS TO SUIT.



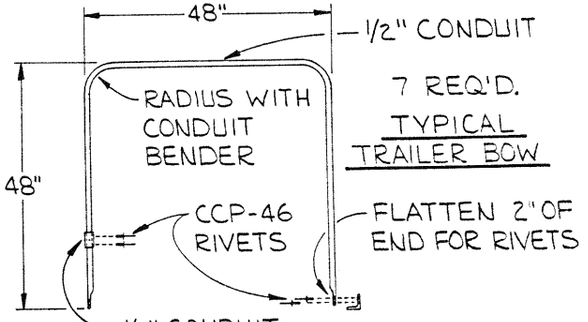
TRAILER FLOOR DETAIL



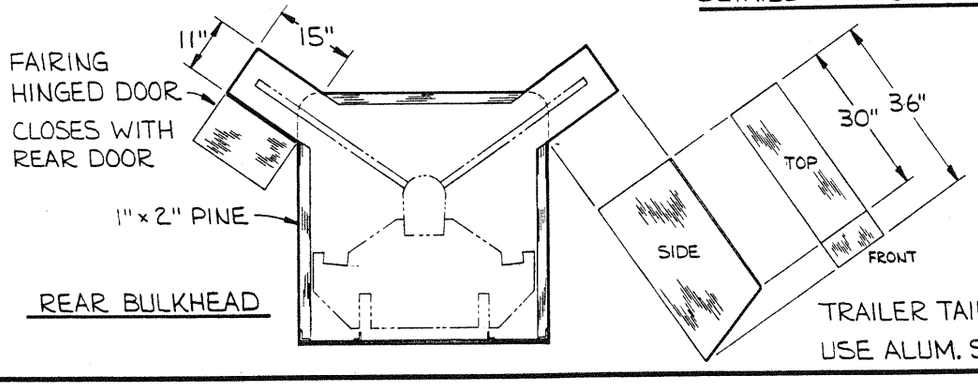
DETAILS OF ENCLOSED TRAILER



2 REQ'D.
MODIFIED TRAILER BOW



7 REQ'D.
TYPICAL TRAILER BOW



REAR BULKHEAD

TRAILER TAIL FAIRING
USE ALUM. SHEET OR EQUAL

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Introduction

Congratulations, you have made a giant step towards realizing the dream of building and flying your own Moni.

The following plans and text are designed to take you through the various construction phases as simply and effortlessly as we can.

Before you begin construction, familiarize yourself with the plans and components. Note and update any corrections or additions to the plans and mark the drawing sheets clearly to avoid confusion later. Check and inventory the parts against the packing list. Notify M.E.A. of any discrepancies or irregularities not shown on the packing list within two weeks of receiving the kit.

If you are an inexperienced builder, take your time and double check your work. As you progress through the construction of the tail surfaces, you will have learned the basic techniques of metal working and your confidence will grow. Enjoy yourself and remember this experience will be as educational as it is fun.

Any deviations from or modifications to the plans on structural components is considered the sole responsibility of the builder. Monnett Experimental Aircraft, Inc. will not comment on, nor provide additional analysis on modifications undertaken by the builder.

Monnett Experimental Aircraft, Inc. reserves the right to amend Moni plans, specifications and manual as it becomes necessary.

It is highly recommended that you join and support the Experimental Aircraft Association and the Soaring Society of America.

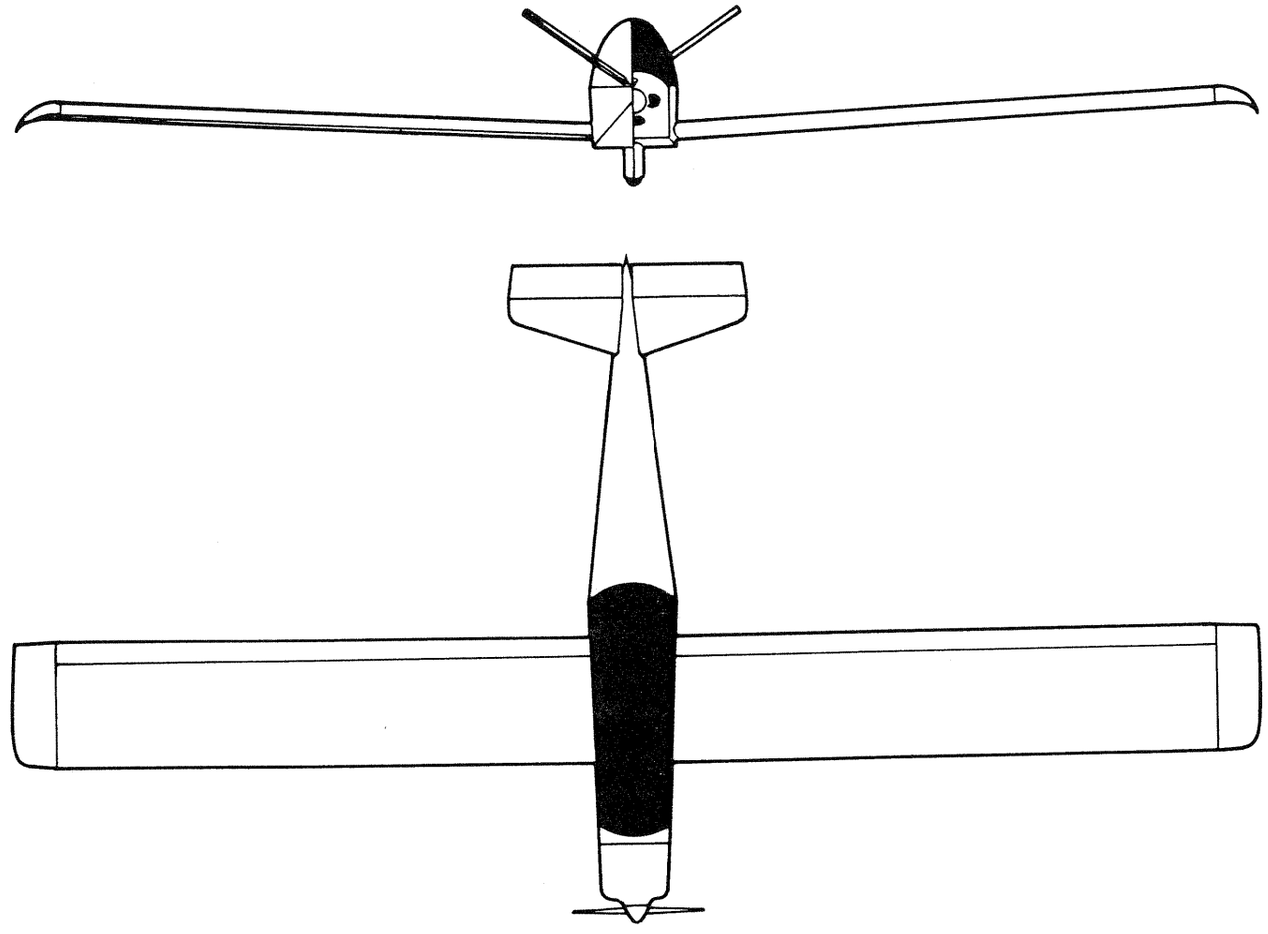
Now Do It!

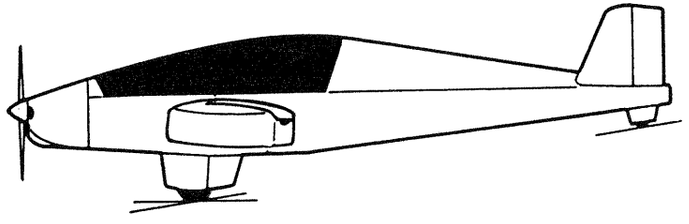
Moni Serial No. _____

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Specifications:

Span	27'6"
Length	14'7½"
Wing Area	75 sq. ft.
Empty Weight	260 lbs.
Gross Weight	560 lbs.
Useful Load	240 lbs.
Cockpit will accommodate a	6'4", 235 lb. pilot
Engine	KFM 107, 2 cyl., 22 hp., electric start
Fuel Capacity	4 gal.
Endurance (full throttle)	2 hr.
Top Speed (sea level)	120 m.p.h.
Range at 80 m.p.h. (economy cruise)	320 miles
Rate of Climb	500 ft./min.
Take Off Distance (turf)	400 ft.
Stall	38 m.p.h.
Cruising Speed 75% (sea level)	110 m.p.h.
Design Limits	+6, −4g's
Construction	All aluminum bonded and riveted





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Tools Required - Minimum

3/8" Variable Speed Reversible Drill
1 Set of Good Quality Drill Bits to 1/2" Diameter
#32 Drills
#30 Drills
3/32" Drills
100 1/8" Clecos
25 3/32" Clecos
1 pair of Cleco Forceps
120° Counter sink
Screw Drives
Plastic Mallet
Assorted Files - fine and medium, half round, round and flat.
Center Punch
Ball Pein Hammer
Hacksaw and Good Quality Blades (32 and 24 tooth)
Socket Wrench Set
Open End Wrench Set
Good Quality "pop" Rivet Gun
Dimple Die Set for 1/8" Rivets
Left and Right Hand Aviation Snips
14" Straight Metal Snips
Hand Seamer - Folding Tool (3" wide)
Scissors
Combination Square
Large Carpenter's Square
3 1/2" Hole Saw or Fly Cutter
"Flex-O-Grot" Medium Sanding Wheel (flapper type)
Tape Measure
Bench Vise

Access to:

Air Compressor
Drill Press
"DA" Air Sander

Adhesives

Rubber Cement
3M Weatherstrip Adhesive
Polyester body putty
Silicone rubber seal

Basic Metal Working Techniques

Moni is built using primarily two types of metal: aircraft grade aluminum and 4130 Chrome-Moly aircraft grade steel.

There are a few basic points to keep in mind when cutting and forming parts.

Aluminum sheet and chrome moly sheet stock has a grain, just as in wood. The grain is formed during the "mill" process of making the sheet. It is visable to the naked eye and will always run parallel to the length of the sheet. The mill prints identification lettering and numbers with the grain. If you have a small sheared piece of sheet stock, look for the lettering or very small parallel lines on the surface of the sheet. Those are grain marks.

Knowing the grain direction is important on the tempered sheet we use because we want to bend the parts at 90° to the grain whenever possible. Obviously, we can't do it all the time, particularly when there are multiple bends or long parts required.

On the small parts you have to build, the layout of the templates should be carefully done to allow the most sharp bends to be at 90° to the grain.

Since most of the formed parts you will be building can be cut out with tin snips, be careful not to "notch" the corners. Pay close attention to the radius' shown on the drawings, both in the cut outs and at the bends. Smooth edges, by filing and sanding, will eliminate stress risers and the possibility of cracks forming which could end in a structural failure.

Scratches:

Always work on a smooth, clean surface, especially when working with aluminum. Drill chips are your enemy. Surface scratches and gouges must be avoided. A gouge or scratch which can be felt with a finger nail must be sanded and polished out. Use 180 and 220 grit sandpaper to smooth the surface and edges where scratches appear. Some of the formed parts you have received may have some surface scratches. These are almost impossible to totally eliminate due to the forming process and all the handling. You must smooth those areas prior to finishing the part. Small surface scratches will be taken care of during the preparation for painting. A 3M "Scotch Brite" pad works well for them.

Alclad:

Generally the printed side of the aluminum sheet is kept on the inside of the structure. This is not a hard and fast rule, especially if you are going to paint the entire aircraft.

When laying out parts to cut, NEVER, NEVER use an awl or pointed object to scratch a mark unless it is going to be cut off. Never mark bend lines in this manner. When formed, the part will break sooner or later!

Treat each part as if it were a piece of jewelry and you'll be ok. Remember, there is no substitute for craftsmanship.

Priming Metal Surfaces - Aluminum

The following steps for priming aluminum surfaces are normally accomplished before spraying on the exterior paint finish. Although not normally even done by any of the major airframe manufacturers in this country, it can also be done on all the interior surfaces, protecting the aluminum from the corrosive action which is common along the ocean and around large cities. The ocean furnishes salt air and the cities sulphur dioxide, and both have an appetite for aluminum.

The aluminum is prepared for priming by polishing all of the surfaces with a medium grit scotch brite and then thoroughly cleaning the surface with lacquer thinner or M.E.K. The surfaces must be primed soon after they have been prepared, otherwise, a film of oxides will form, preventing a good bond. After cleaning with thinner, prosphoric etch could be used. The acid etch further cleans the aluminum but because of the mess involved most builders and even some paint shops do not bother with it. The recommended primer for aluminum is any brand of zinc chromate or zinc phosphate enamel primer available at most automotive supply stores in either quart cans or aerosal spray.

Apply it following the manufacturer's instructions. When priming aluminum, it is best to spray a wet, thin, transparent coat. Try to avoid heavy paint build up. You can paint the interior surfaces after the majority of the structure has been assembled, but before it is closed up and you still have access to the interior. You can also paint all of the pieces separately, just before riveting. If you go with the latter method, it is very important to keep your paint film as thin as possible, to avoid having a soft layer of material between riveted parts. If you are going to spray color coats over the primer, as you would for the exterior or possibly the cockpit area, be sure that the primer is compatible with the finish coat. If you will be spraying a more exotic type of paint, a more specialized primer coat may be required. Follow the paint manufacturer's recommendations.

Steel - Any steel part must be cleaned by sanding or grit blasting and cleaned up with lacquer thinner. Again, Zinc Chromate enamel is the standard primer even though there are vaious brands of epoxy primer on the market, some made especially for aircraft use. The epoxys are more durable than the standard primers and are therefore able to do a better job protecting the steel parts.

Riveting

Proper hole preparation is imporant for good rivet joints.

3/32" cherry rivets require a #40 drilled hole.

All 1/8" rivets are set in #30 drilled holes.

If the rivet is a flush type and the parts are to be "dimpled" so the head sets flush on the surface, we use a "step" drill process.

Initial holes for alignment are drilled with a number 32 drill. A 1/8" cleco will fit tightly into the hole. After all the holes are drilled, the parts are disassembled, deburred and then dimpled with the dimple die and a #6 penny finishing nail as a mandrel. The dimpling will expand the hole by stretching. A touch-up with a #30 drill will bring it to size. The part can now be prepared, primed and re-assembled with clecos. It is ready to rivet.

On parts such as the fuselage where the skin is flush riveted to the solid framework of square tubing or aluminum angle, drill #32 holes for alignment. Disassemble. Dimple the skin and counter sink the tubing. The counter sunk holes should be done slowly. Check the fit by placing a rivet in the hole. The head should just fit flush. Try a few samples on scrap material until you get the hang of it. Ream the holes to #30.

The sizes and description of the rivets are determined by the following chart:

Cherry N Rivets

	DIA. GRIP		
AAP-42	1/8 x 1/8	Protruding head	Aluminum
AAP-44	1/8 x 1/4	Protruding head	Aluminum
AAP-46	1/8 x 3/8	Protruding head	Aluminum
AAC-42	1/8 x 1/8	Flush head	Aluminum
AAC-44	1/8 x 1/4	Flush head	Aluminum
AAL-42	1/8 x 1/8	Large head	Aluminum
AAL-44	1/8 x 1/4	Large head	Aluminum
CCP-42	1/8 x 1/8	Protruding head	Stainless
CCP-44	1/8 x 1/4	Protruding head	Stainless
CCP-46	1/8 x 3/8	Protruding head	Stainless
CCC-42	1/8 x 1/8	Flush head	Stainless
CCC-44	1/8 x 1/4	Flush head	Stainless
CCC-46	1/8 x 3/8	Flush head	Stainless
SSC-32	3/32 x 1/8	Flush head	Steel
SSC-34	3/32 x 1/4	Flush head	Steel
SSP-32	3/32 x 1/8	Protruding head	Steel
SSP-34	3/32 x 1/4	Protruding head	Steel

Aluminum cherry rivets are used on "nonstructural" parts whereas stainless steel rivets are used in all areas where maximum strength is required.

In a few areas we use standard "AD" type rivets (main wheel fairing, tail cone, etc.). We cut the rivets so 1 1/2 X the diameter is protruding through the hole. Using a ball pien hammer and the flat of a vise or bucking bar (or another hammer head) drive the rivet with several blows. The formed head will flatten slightly. The new "head" should end up 1 1/2 X the diameter wide and 1/2 times the diameter high.

Example: On a 1/8 rivet, the rivet will protrude 3/16" out of the hole, and when formed the head will be 3/16" in diameter and 1/16" high.

Bonding Techniques

The key word in bonding is **clean!** Throughout the process from initial preparation through final clean up after bonding you will have to maintain absolute cleanliness in order to insure acceptable bonds. This cannot be stressed enough! The presence of one fingerprint on a bond line could cause failure of the joint so follow these instructions carefully.

You will need:

Two rolls of white paper towel (no colors or borders!)
M.E.K. (Methyl Ethyl Ketone) or a good grade of lacquer thinner.
"3M Scotch Brite" medium grade (Scotch Brite "scuff pads" are available at automotive paint dealers).
White cotton gloves (cheap ones) Clean!
"Throw-a-way" rubber gloves (Available at paint stores).
Paper Hot Cups (non waxed type!)
Small mixing sticks or equal.
Epoxy scale (as shown or a good small scale).
Small Zip-Loc bags or equal.
Several clean coffee cans.
Good detergent soap for washing hands.
A fire-proof waste container for storing used thinner-soaked paper towels.
"DA" sander with 180 grit disks (Aluminum Oxide).

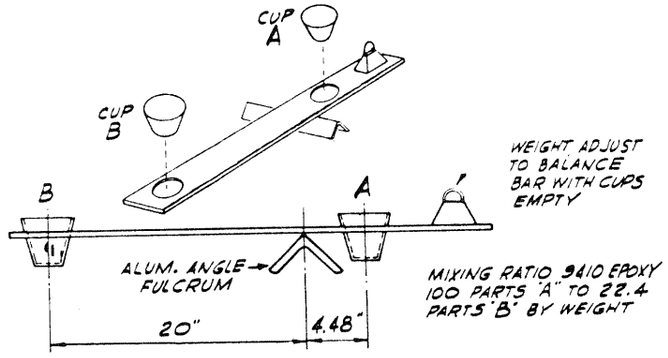
Once you have the parts to be bonded properly fitted and trimmed, thoroughly clean the surfaces to be bonded with a new paper towel soaked in M.E.K. Clean the adjacent areas to help avoiding contamination of the bonding area. Remember, grease or oily substances are your arch enemy!

Mark the bonding areas with a felt-tipped pen. For instance, when the wing ribs and spar will contact the skin on the inside surfaces of the skin. Obviously, you will not have to mark the spar caps or the rib flanges.

Use a DA with 180 grit paper to thoroughly roughen the bonding areas. The areas should be roughened 1/4" to 1/2" on each side of the bond area where possible. The old adage more is better than not enough. NOTE: When preparing the skins for the wings, place the skins on a smooth padded surface. Do not put the skin in the wing fixture to do the sanding. The vigorous sanding will "burnish" the bonding area around the cradles which will show up as ridges on the skin surfaces after bonding.

Thoroughly swab and dry the bonding areas again using more M.E.K. and clean paper towels. Don't you dare use any previously used towels!

Clean again! NOTE: Repeat steps above if the cleaned surfaces are exposed more than three hours! Mix the epoxy using the scale to measure out the proper amount. (See bonding wings.) Balance the scale with an empty cup at each station. Fill the "A" cup with the amount of epoxy part "A" you'll need to do the job, add enough part "B" to cup "B" to again balance the scale, carefully pour B to A and mix. CAUTION! Do not spill, splash, or splatter the part "B" catalyst. Contact with your eyes will certainly mean permanent damage! BE EXTREMELY CAREFUL WITH THE CATALYST, WEAR SAFETY GLASSES AND RUBBER GLOVES WHEN MIXING THE HYSOL AND AVOID EYE AND SKIN CONTACT. The mixing will go slowly at first because the "A" is very thick and the "B" is thin. Try folding in about half of the "B" until the two parts start to mix then add the remainder of the "B".



Fill a small Zip-Loc bag with the mixture. (Several bags will be necessary for bonding the skins.) It would be wise to measure out several smaller batches in separate cups so your helper can mix them as you need them. This will "buy" you more time since the thermal build-up in large masses of the epoxy speeds up its cure time. A little organization helps here!

Snip a bottom corner of the bag. Only enough should be trimmed off the corner to allow the epoxy to form a 3/16" bead as it is squeezed out.

Apply the epoxy to the horizontal surfaces first. Although the epoxy is very thixotrophic, it will have some tendency to run. It is only necessary to produce strength. Clean up excess epoxy with a layer of thinner.

Allow the parts to cure for at least 24 hours at 70°F. before removing the parts from the fixtures or clamps.

NOTE: NEVER CHILL OR FREEZE THE EPOXY to retard the cure time! Condensation will cause moisture to be absorbed into the epoxy and prevent a good bond.

NOTES ON INSPECTING BONDS:

When a bond is completed and the epoxy is cured only a visual inspection can be performed.

The F.A.A. inspector should look over the bonded area for evidence that the bond line of the aluminum has been thoroughly scuffed and cleaned. There should be a nice little fillet, much like a welding fillet, around the edges of the bonded parts. A check should be made to see that all of the anti-peel rivets have been installed in nose and trailing edge ribs.

A little more epoxy is more desirable than not enough as long as one does not get carried away! Blobs or drips should be wiped away where accessible.

Sample bond strips are of little value unless you have access to lab test equipment.

Epoxy Shelf Life

EA 9410 has a shelf life of one year from shipment date when stored at 77° F.

The life is increased by at least 50 percent if it is stored at 40° F. (Refrigerator temperature). The bonding epoxy should be used within one year for best results. If you store your epoxy more than 12 months at 77° F. or 18 months at 40° F. we recommend that you replace it.

Building Your Work Table

The most efficient working surface for Moni builders is a table 24" X 150". (See fuselage drawings.) Both the fuselage and the wing will be constructed on it. It must be ridged and free of warps.

We use 2 1/2 sheets of 3/4" or 5/8" thick particle board or plywood for the surfaces. Two straight 12' 6" X 2" X 4" boards are used as the backbone. Using 2" X 4" cross members every 24" we nail together the basic ladder structure.

Sheet both sides with particle board. Stagger the butt joints so that one 2' X 8' length is on one end of the top and the other on the opposite end of the bottom.

Use "Elmers" glue and finishing nails set below the surface for attaching the particle board.

Check before final nailing to make sure you haven't built in a warp or twist.

A minimum of three "sawhorse" style leg units should be used to support the surface at a comfortable working height.

Shims may be used between the legs and floor to insure a level, flat surface!

By constructing the bench in this manner, you can do all your fuselage layout and drilling on one side and then "flip" the top and permanently attach the wing rib cradles for the wing jig. It is well worth the time to build the table accurately instead of trying to "jury rig" something more flimsy. Remember, the table must support about 800 to 1000 pounds during the wing bonding process!

Full Size Template Sheets

Carefully stick down the pattern sheets or individual parterns on the sheet stock. (See FT Sheets and Drawing SH. 1) Use "3M Sprayment" or rubber cement applyed to either the pattern sheet or the sheet stock.

Cut out and trim each piece to the line. Smooth the edges with files paying attention to inside radii. Leave the paper pattern in place until you complete forming and drilling. All holes can be drilled unless noted.

Form the bends shown using a padded vise of flat bending pliers. Bends should have approximately a 1/8" inside radius.

Building the Tail Surfaces

If you have not worked with aluminum construction before, the tail surfaces are an excellent place to start. They involve all of the basic building techniques used in Moni except bonding. When they are completed, the rest of the construction should follow a similar and now familiar procedure.

Take your time with the first surface and triple check each move. This will save you considerable time and money in the long run.

Study sheets 1 through 6. Sheet 2 depicts the sequence for building the surfaces. Before you start cutting parts or drilling you must pay close attention to drawing sheet 4. The dimensions shown on drawing sheet 4 must be adhered to.

Lay the partial sheet of .020 Alclad skin material on a padded surface. Using the skin blank dimensions on sheet 2, lay out the two tail surface skins in the position shown on sheet 1. Use full size templates for the tail cone, main wheel fairing and the tail wheel fairing.

These parts should be cut out to rough size using 14" straight snips wherever possible.

Save the larger scrap pieces and store where they will not get scratched. You'll need them later.

Cut out and finish the front and rear spar attach brackets as well as the front and rear spar channels. Mark each so you won't get them mixed up later.

Go to drawing sheet 5.

Cut out parts for rear bulkhead, rear bulkhead plate, rear spar cap plate, former F-4 and doubler. Follow step by step as shown on sheet 5.

Align the respective spar attach brackets with their channels and drill the holes. Use clecos to assure alignment.

Disassemble and "deburr".

Reassemble and rivet where necessary. Do not rivet where ribs will be.

Measure and locate ribs. They will be drilled and clecoed in place. Double check. Disassemble and "deburr". Cleco back together and rivet.

Find the full size tail surface leading edge template and glue it to a piece of 1/8" masonite or aluminum scrap. Make the template.

Moni Stabilizer Skins

Making the skins in accordance with the dimensions given in the plans will leave you with an oversized piece after it is formed. This is to allow for some error during the forming process. Fit the skin to the structure using the dimensions shown for leading edge and tip spacing. After the skin has been clecoed in place, mark the rear spar position and remove the skins to trim off the excess material. The excess material at the root end will be trimmed off later, if necessary, when the tail is fitted to the fuselage.

On a padded surface, curl the surface skin trailing edge to trailing edge and tape as shown on sheet 2. Use a length of 2" x 4" to set the leading edge radi. Align the board parallel to the leading edge and push down evenly. Go slow on the first one until you get the "feel". Remember, the skin will have a good deal of spring back. The leading edge radi is not very critical on the tail surface, but getting it close will be good practice for the wing skin to come later.

Working again on your flat building table, follow the rest of the sequence for the tail surface. The rest should be self explanatory.

When building and assembling the structure for the stabilizer, the dimensions call our on SH.4 (for correct positioning of the front spar relative to the rear spar) of the drawings must be adhered to. This is somewhat difficult while also trying to fit the skin. Filament type adhesive packing tape (or any strong tape) applied in a "X" pattern across the structure will help it retain its shape until you're ready to start drilling. Check your dimensions again for a final time before drilling.

Tail, Plastic Tips

Install the ABS plastic tips in the same manner that the drawings show for the wing tips. That is, using an aluminum strip for backing material inside of the plastic. The ruddervator surface will have to be attached to the stabilizer so that the tip may be lined up and positioned correctly. Only cleco the tip in place, do not rivet until the pitot tub has been hooked up to the block, or the veriometer installed.

Care must be used when cutting out the A.B.S. tips so that you do not tear the material. They should be scuff sanded before final installation. This will help in preparation for painting later on.

Building the Tunnel, Spar Box and Gear Assembly

Study drawing sheet 7 through sheet 10.

Carefully layout and cut out the necessary landing gear parts. The spar box front and rear and the tunnel may have to be adjusted to fit. Again, double check before you cut or drill. The tunnel assembly is the heart of the Moni fuselage!

Assemble left and right gear leg assemblies.

Fit the leg assemblies into the tunnel and check alignment. Make sure they are parallel and the axle line will be 90° to the tunnel centerline. The axle bolt and spacer tubes may be installed to aid alignment. The spar box front may now be fitted to the tunnel. The gear plate and brake mount assembly should be fitted at this time. Re-check all alignments.

The seat hinges and spar box rear will not be drilled until you have progressed to the fuselage sides for fitting.

Spar Box Assembly

Reference sheet 14, note 1 of the Moni plans. The tubes that are referred to by the note are the short 3/4 inch square tubes that get sandwiched between the fuselage side skin and thee wing attach angles. The location and dimensions for these tubes are indicated on the fuselage layout shown on the previous pages.

When riveting these tubes in place, it is advantageour to rivet them to the spar box sections, outside of the fuselage. Then insert the spar box assembly (with tubes) into the fuselage and finish riveting the assembly in place. If the tubes are riveted to the fuselage side skins first, it only makes it more difficult to rivet the spar box assembly in place due to working in a confined area (inside the spar box).

Fuselage

Lay out two fuselage side skins on one full size .020 Alclad sheet as shown on sheet 1. Check the dimensions on sheet 11. Note the 1/4" taper on the top aft section that extends forward to the bend line. The fuselage bottom skin (sheet 9) is cut to size later. You may want to omit the access cut outs until after the bottom skin is fitted to the fuselage to check dimensions and clearance.

The dimensions in the plans for thee bottom skin are accurate, but you should measure you own fuselage before actually cutting the skin out. Stand the assembled fuselage sides upright and join them with stations 1,2 and 5. Frequently take measurements to insure that the fuselages sides are symmetrical from the fuselage center line and that the sides are angles inward equally (vertically), lay a straight edge along the botton mongeron from station 2 to 5, and then determine the necessary width to stations 3 and 4. Now you can layout the botton skin as per the plans or modify the dimension, if necessary, to fit your fuselage.

Forward Access Panel

In its original configuration, it is very difficult to obtain access to the mixer assembly, tailwheel springs, etc., after the turtle deck is installed. An acess panel may be added to the fuselage bottom skin in the area to facilitate maintenance.

The size of the cutout shall be no larger than a 5" x 8" rectangle, with the corners having a 1 1/2" radius, and no closer that 1" to the mixer mount channel. An inspection hole of this size will not require a skin doubler.

The panel cover should be large enough to extend at least 1/2" beyond the perimeter of the sheet metal screws or machine screws and nut plates may be used. The panel cover can be made from .020" aluminum.

The bottom pan may now be cut out of the partial sheet. Remember to allow for the 3/4" side flanges shown on sheet 11. Fit and cleco it in place.

The 3/4" square tubing may be fitted and double-sided taped into position.

The skin and tubes must be flipped for drilling as shown. Remember the rules for hole drilling and sizing covered on page T5. Do not rivet the side skin at this time.

When you have completed the work on sheet 12, move to sheet 13.

The fuselage side bend is slight. It can be accomplished by aligning the bend line on the edge of your work table. Clamp it down using some "c" clamps and a 1" x 4" or 2" x 4" at the bend line so you do not mar the surface. Use another 2" x 4" to press down outside of the bench edge to "fold" the skin. Check the angle to match the angle drawn on the work table top shown on sheet 8. Repeat for the other side.

Now you can go about the job of attaching all of the brackets, main spar fittings, and etc.

NOTE: The 5/16" hole in Bracket #7 is for the dolly attachment.

Sheet 14.

Now it will start looking like something!

Again, check your work table to make sure it is free of warps or twists. The alignment of your fuselage depends on it. Pay attention to the centerlines and check the assembly for "symmetry".

As you are working on sheet 14, study the sections on sheet 15. Remember, they are shown as you are working on them and viewing from the front of the fuselage looking back towards the tail.

Sheet 16.

Time Out!

You must go directly to sheet 17. Do not pass go etc., etc.! Set your fuselage aside so that you can build your spars and spar fittings for the wings. This is where a drill press will come in handy.

NOTE: The "A" holes shown in the cross section view are used later as guides to drill the holes for the 5/16" fast pins. See Text Sheets T-21 and T-22.

Sheet 17.

The extruded spar caps must be straightened at the roots where they contact and are bolted to the main spar fittings. This can be accomplished by using two large "c" clamps and the spar backing plates to "pull" the caps flat against the spar fittings. "Overforming" will be necessary because of the "spring back" of the caps. The AN-3 mounting bolts MUST NOT be used to pull the caps straight because they can be over stressed and cracked. See note on method on sheet 17.

Bending Spar Caps

On SH. 17, it is important to keep the rod directly over the center of the spar web to ensure equal bending of caps. One method is to bend up a shallow "U" channel from thin steel sheet, and braze or sodder the rod to the center of it. (See Figure 1). The large "C" clamps need only to be placed 5" outboard from the root edge, one on each side. Use the wedge shaped backing plates (as shown on SH. 17) to prevent damage caused by the clamps. Tighten the clamps evenly, frequently using a small square to check that the flanges will be 90° to the web. The flanges will have to be over bent approximately 1/16", and will then spring back to their correct position.

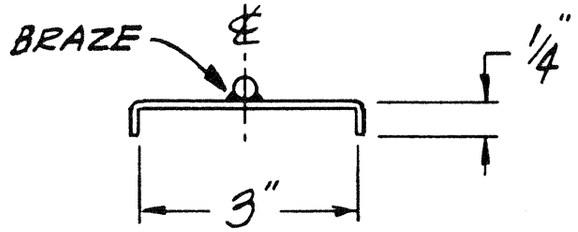


FIG. 1

Clear your bench. Lay the spar extrusions flat on the work surface. Mark the lightening hole locations and center punch. Double check the layout! Using a hand electric drill, drill 1/8" pilot holes for the hole saw.

A drill press will speed the hole cutting. Cut a wood spacer block approximately 1½" x 4" x 12" to fit under the spar web on the drill press table. Temporary supports for the spar will have to be used to support the ends of the spar not resting on the table when you are drilling.

It would be good to have a helper during this operation. The spar should be clamped to the drill press table for each hole. Use a good grade of aluminum cutting oil (Do-All #360) to cool and lubricate the hole saw. You should use a medium speed and flood area being cut. Do not hog the cutter or overheat it otherwise you will damage the teeth. The actual hole size may be slightly larger than 3½"; this will be no problem. Be careful not to scratch the spar. Take care to clean the chips off the cutting table and the work surface.

After the lightening holes are cut, mark and cut the spar root angle. This can be done with a hand hacksaw but is best accomplished with a band saw. Finish sanding the holes smoothly with #220 wet or dry paper. I have used a "flapper sanding drum" and an electric drill to do the job with very good results. The edges of the holes must be radiused slightly to avoid nicks which can be stress risers.

All of the saw marks on the edge of the spar caps must be removed and sanded smooth. A "Stanley Sureform" tool drawn down the edge of the cap will quickly remove the saw marks. Filing with a good aluminum file and block sanding with #220 grit will finish the job. Hand work cannot be avoided here. Remember, this is the main beam of the wing. You don't want it to crack!

Main Spar Fittings

Trim the edges of the fittings as shown. File smooth and sand all the saw and die marks. Trial fit the fittings together and to the spar. Radius the spar caps at the root end to accept the fittings so they lay flat on the cap. A piece of 3/8" tubing or a 3" long x 3/8" common bolt will temporarily pin the fittings together. Align the fittings for the ½" pins in pairs using a drill press as shown.

Step drill and ream the main spar pin holes to fit the ½" diameter Quick pins. Maximum hole diameter must not exceed .500? "Mic" your pins and ream to .003 maxiumum oversize. Grease the pins when installing to avoid "galling" the hole bore!

Block the spars to the dihedral angle shown. The space between the web centerlines must be held to the dimension shown.

There are several ways to go about fitting the spars and fittings together. You may want to attach the fittings to the lower caps first, then block the spars to the proper angle and attach the top fittings, or attach the upper and lower fittings to one spar then locate and drill the other spar when it is blocked in position. The spar backing plates must be clamped into position during the drilling operation. The holes for the fitting attach must be step drilled. Start with a #30 drill and work your way up to the 3/16" drill. The bolts must fit tightly in the hole. It would be wise to drill a test piece to check the fit of the bolts. The bolts should have to be tapped into place.

Clean up and finish bolting the fittings in place.

Make the two spar mounting blocks. Locate them carefully as per detail "A".

Fitting the Ribs

Sheet 18

Locate all the wing rib centerline locations on the main spars. Use the steps shown to locate and drill the ribs to match the spar. The ribs will have to be trimmed to fit and clear the spar caps. (The root rib will be clearanced the most.) NOTE: File and sand the trimmed edges of the ribs to eliminate any roughness left from the snips. NOTE: The root and tip nose rib has a guide to locate the skin leading edge.

The tip wheel assembly can wait. This makes a good evening project.

Rear Spars

Sheet 19

Carefully trim the rear spar blanks to length. Make the two rear spar fittings. Locate and drill the rear spar fittings in the rear spar channel. Cleco only. This fitting must be removed to locate the hole in the fuselage side after the wing is complete.

Locate the rear rib attach holes on the centerline of the rear spar. Make certain you are using the correct rear spar! Drill the #30 holes in the rear spar. Cleco in place. Check your dimensions again!

Disassemble the wing ribs from the spars.

Wing Assembly

Cut out the wing fixture cradles as shown using the full size rib cradle template provided or purchase the precision cut set from M.E.A. Assemble the cradles on your work table as shown. Care must be taken to make sure the fixture is assembled true! It will determine the alignment of your wing, so double check for squareness and levelness.

Cover each "cradle" upper surface with 3/4" x 1/4" foam weather strip tape available at your local building supply house. You'll need about 31 feet.

Make two 1" x 2" pine "blankets" from twenty-four 1" x 2" x 6' pine furring strips. We used polypropylene lawn chair webbing stapled in strips across 12 pieces of the boards in three places to hold the group together for easier handling. Duct tape also works well. The two blankets will be used end to end along the span of the wing to distribute the weight when bonding. The boards should be evenly spaced to cover the entire "chord" of the wing skin.

Forming the Wing Skin

Make the wing leading edge template as you did on the tail. Carefully unroll the wing skins. Work on a clean, padded surface. Clean cardboard or carpeting works best. You do not want to scratch or otherwise damage the skin. Lay skin aside.

Method #1

Tape the two main spar extrusions together root to tip to form one long beam 12 feet long. You are going to use the spars to form the wing skin leading edge radius. Pad the caps on one side of the beam. Masking tape will work. Make the leading edge template. Roll the skin from trailing edge to trailing edge. Match the trailing edges. This usually takes two people to do the job.

Drill and cleco with 1/8" clecos every 8 to 10 inches about 1/4" in from the trailing edge along its length. Use a magic marker to mark three short lines on each end of the skin's top surface for keeping the beam parallel to the trailing edge during the forming operation. These lines should be 24", 26" and 28" from the trailing edge.

Place the beam on top of the skin at the 24" mark. You should have one person in the middle and one at each end of the skin to help in forming. Press down evenly on the beam until the top of the skin touches the bottom.

Move the beam forward to the next mark. Push down again. Check the leading edge radius. Move to the forward mark. Push down a little at a time, checking the radius with the leading edge template each time you push down. Remember, the aluminum has a great deal of spring back. You may have to move the beam right on the leading edge radius when doing the final forming. Work carefully! The skin should take on a natural airfoil shape. The root and tip of the skin will tend to take a sharper radius than the middle. A set of 2" x 4" blocks on each end of the skin will prevent the ends from overforming while you "set" the middle radi.

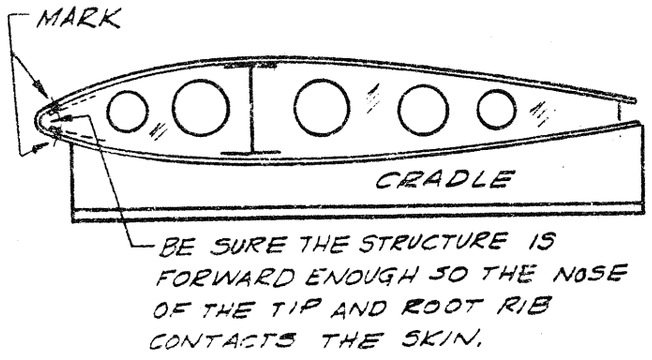
Remove the clecos from the wing skin. It will spring open slightly. Repeat for the other skin.

Method #2

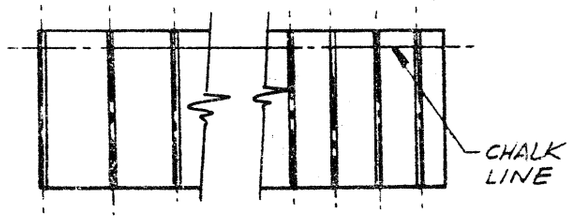
Now, there is a better way! Using a few simple household supplies, you can vacuum form your skin without fear of leaving any evidence of your labor on the aluminum (foot prints, knee dents, scratches, etc.). Just fold the skin double as required, but instead of using clecos to hold the trailing edge together, use nylon or mylar tape. (Masking tape can be used, just put an extra layer on so that it doesn't surprise you by suddenly returning to its previous shape.) Next, seal up the ends using **large** plastic garbage bags taped to the skin. The bags must be so large as to insure that they do not offer any resistance whatsoever when the skins get drawn together. Otherwise, you can end up with a misformed wing skin. In the plastic on one end, cut a small hole near the leading edge. Into this hole insert the suction tube from you vacuum cleaner and seal it up with tape. Turn on the switch and watch the skins draw together! If you're using a powerful vacuum, it may be possible to over form the radius, but by operating the switch on/off, you can control the whole process fairly easily. If you vacuum cleaner is a bit on the anemic side, then a small amount of help with a 2 x 4 may be necessary. In either case, check the radius using a rib or a template as you progress.

Reassemble the wing ribs to the spars and rivet together. NOTE: Rivet sizes are indicated on the drawings. Repeat for other wing.

Position the spar/rib structure inside the formed skin and mark the location of the root and tip rib holes on the skin.



Snap a chalk line between the root and tip rib marks, both upper and lower surfaces. Shift the structure back so you can drill (#32) the nose skin holes along this line without hitting the ribs. After drilling, align the skin holes with rib holes and cleco in place.



You can mark all the other rib rivet hole locations on the top surface of the wing. Check the hole locations against a rib to be sure they miss the rib flutes. Adjust if necessary. See drawing 19-A for rivet spacing. DO NOT MARK SPAR HOLES AT THIS TIME.

Remove the skin and drill (#32) all the skin holes. Re-assemble the skin to the structure with clecos in the nose rib holes.

You can now drill the ribs through the holes in the skin working from the front to the rear, aligning the line of the rib flange beneath the skin hole to be sure it's in the proper position before drilling. This is important! Drill (#32) and cleco in place, stopping when you reach the main spar.

Before continuing, apply a strip of masking tape on the skin, lengthwise, above the main spar and mark the rivet locations on this strip. Carefully drill a few locations along this length and check to be sure they are in the proper location relative to the spar web. **Do not** drill into the web of the spar.

Drill (#32) all the spar holes and then continue drilling the rib holes until you reach the rear spar. Cleco in place as you go. Now drill the rear spar holes through the skin and cleco.

You now turn the wing over in the fixture and repeat the process for the bottom side of the wing½

You must add 7 taller particle board forms to the cradle so the clecos in the top surface will clear. See drawing 19.

Spoilers

Locate spoiler cut out in the top skin of each wing panel. Double check location. Use the template for the cut out.

Modify the "center" rib as shown using the template provided.

Cut and fit the necessary stiffeners, fittings, and clip brackets. (By the time you're at this stage of construction the prints should be self explanatory.)

Assemble the spoiler with clecos and check alignment and check for smooth operation of the hinge. Remove, disassemble, prime, reassemble and final rivet the spoiler door. Do not rivet hinge to skin until final riveting of the wing skin!

The pulley system should be carefully aligned to allow smooth operation. Care in routing the cables and housing will reduce the control forces required to open the spoiler.

Since the spoiler is on the top surface, a good deal of force (return spring) is required to keep the door closed during flight. Adjust and balance both springs (equal force on each spring) so the door is difficult to pry up with your fingers. (You will have to adjust during initial test flights so there is enough tension on the springs at high speeds.)

Cables will be adjusted so that the last 1/4 of the spoiler travel will apply the wheel brake. (As in most sailplanes.)

Now disassemble and dimple the holes, with the exception of the top row of holes on the rear spar. These holes should only be clecoed in place. The aileron must be fitted to the wing before dimpling or riveting these holes. Countersink the spar hole and ream all holes to #30.

Zinc chromate prime the structure and inside surface of the skin.

Cleco the skin back on the structure and rivet, removing clecos as you progress. Remember, do not rivet the top row of rivets in the rear spar.

F.A.A. Inspection

The Final Inspection covers (tail cone, headrest, etc.) must be removed. You must have:

* The aircraft registration.
* The weight and balance data.
* The aircraft log with entries stating that the airplane has passed previous inspections, by yourself or other qualified persons. Keep a photographic record of the various stages of construction.

If the airplane passes the final inspection, you will be issued an Airworthiness Certificate and Operations Limitations. The "Ops Limitations" will state that the aircraft must be operated within a given area for a specified number of flights or hours for test purposes.

After the flight test period is satisfied, the aircraft will again be inspected and the operation limitations revised to permit flight outside of the flight test area.

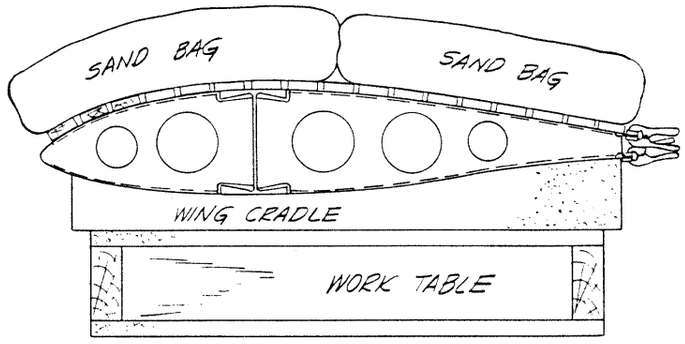
Only annual inspections will be necessary to keep the aircraft airworthy. If you apply for an Airman's Repair Certificate, you will be able to perform all subsequent annual inspections.

It should be noted that the inspections are for YOUR welfare. The presentation of the plane becomes important. If it looks good, is shown in a neat shop (i.e. clean) the impression on the inspector will be favorable. Cooperation is important. The "Golden Rule" often applies, nuff said!

For more detailed information about your final inspection, contact the FAA office in your area, they can furnish you with the necessary forms and applications. Also request copies of any advisory circulars, or information booklets that cover the certification and operation of amateur-build aircraft.

Bonding the Wing Panels

Set up and level your wing fixture. Slip one skin onto the fixture in approximate alignment. Carefully slip the wing assembly into place. The root and tip ribs will locate the leading edge.

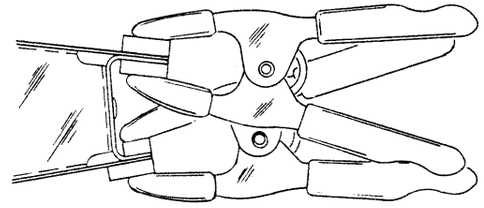


Carefully bring the top skin down on the assembly. Place the 1 x 2 blanket over the top skin. Weight with sand bags. Check through each end of the wing to make sure the skin is in contact with the ribs. Check the rear spar for straightness (parallel to leading edge). Using a drill template, align the nose ribs and drill the skin and rib. Cleco in place the top and bottom of the nose rib.

Pull the assembly rearward so you have access to drill the bottom rear rib holes using a #32 drill, these holes will be dimpled later. Also drill the bottom trailing edge holes at this time using a #30 drill. Cleco and mark top and bottom rear skin trim lines.

Remove everything from the fixture except the skin. Trim the trailing edge of skin leaving it about 1/32" longer than marked.

Dimple all the CCC rivet holes in the ribs and wing skins. NOTE: The root of the wing skin must be trimmed to an approximate fit to the fuselage before bonding. This can be accomplished by transferring measurements using the centerline of the fuselage as a reference. Leave enough material for final trimming! Make 4 trailing edge clamping bars 12 ft. long as shown. Cover them with nylon packing tape to prevent them from being bonded to the wing. You can use aluminum or steel bar stock or even good wood strips.



Place the skin and rib assembly back in the fixture. Mark all the bond areas of the skin. Remove from the fixture. Proceed with preparing the skin and rib assembly for bonding as outlined in the "Bonding Techniques" section.

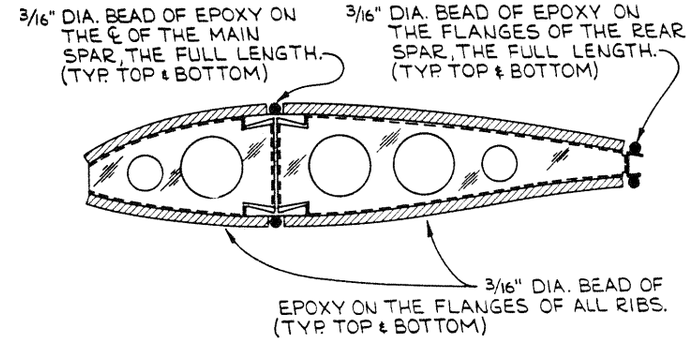
Measure or weigh out several batches of epoxy and have them ready to mix. You will need approximately 1/2 quart for each wing panel. Divide the 1/2 quart into four smaller batches to simplify mixing.

Have two helpers ready and explain what you are going to do! A "dry run" will help get things organized. Remember, don't panic! You will have sufficient time to complete the bonding operation.

Place the cleaned wing skin in the fixture with the trailing edge of the bottom skin pulled rearward so you have access to the rivet holes. Lay the rib spar assembly upside down on two saw horses near the wing fixture and in approximate alignment with it so it will be a simple flip and slip to move the ribs and skin into the fixture. Mix 1/2 of the epoxy (14 oz.) and put it into the Zip-Loc bags. Apply the epoxy to the bottom of the wing ribs and along the full length of both the main and rear spars. See drawing sheet 19A. Try to keep the beads 3/16" in diameter. Work swiftly.

You and your helper can now flip the rib assembly and slip it into the skin. Try not to have the epoxy come in contact with the skin until the ribs are in position. Install the bottom leading and trailing edge rib rivets. NOTE: In the rear spar, you only install the two outer rivets during bonding. The other eleven are added after the bonding is completed so there is no interference with trailing edge clamps. Wipe off excess epoxy from the trailing edge. Apply epoxy to the top of the ribs and along the full length of both the main and rear spars. See drawing sheet 19A. Pull the top skin down on the ribs. Install the leading edge rivets on the top skin. Lay the 1 x 2 blankets on the top skin. Check alignment.

Weight the top of the wing blankets with sand bags. Look through the ends to make sure the skin contacts the ribs. Adjust your weights accordingly. Clamp up the trailing edge using spring clamps and the clamping bars.



EPOXY APPLICATION

(SIZE OF EPOXY BEADS EXAGGERATED)

Your helpers should be cleaning up excess epoxy along the trailing edge. Make sure the skin is laying flat on the rear spar flanges. Clean yourself up and check everything again! You won't be able to do anything about misalignments in the morning!

Let the epoxy cure at least 24 hours at 70°F. Allow longer if you're working area is cooler! Remove the bags and 1 x 2's. Fantastic!!!!!!!!!!

File excess epoxy off. Use a sureform or file to straighten the trailing edge.

Rear Spar Carry-Thur Assembly
Sheet 29

Make the carry-thru angle as shown using the full size template to locate the eight #30 holes.

Assemble them along with the aileron torque tubes, 5/8" x 3/4" lg. sleeve and flatwasher to the carry-thru angle holding them in place with one cleco in each angle. NOTE: Do not rivet the sleeve to the torque tube at this time or install the aileron torque tube horns.

Clamp everything in alignment and back drill the bearing angles thru the #30 holes in the carry-thru angle, installing clecos as you go.

Removing one cleco at a time, enlarge the hole and install the bolts one at a time.

Make the carry-thru attach brackets. Locate and attach them (see dwg. 20) to the 3/4" square aluminum tubes with clecos. Do not rivet them at this time.

Control Assembly

Study drawing sheets 21 thru 28.

Carefully layout and fabricate the necessary control parts per the details.

General construction note: When fabricating parts that work together, i.e. front and rear guide brackets, fit the holes to the tubes so they rotate or slide smoothly without excessive play. Also, fit all bolts, bearings, etc. Don't be too hasty to rivet. Cleco the parts together. Check dimensions, fit, and operation as an assembly before riveting.

Build the system from the control stick progressively back to the tail. Then from the torque tube horn to the aileron torque tube horns.

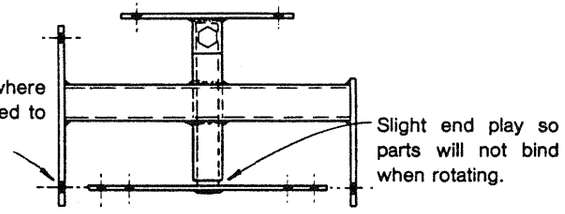
The rear spar carry-thru should be clamped to the carry-thru attaching brackets in the approximate position shown on sheets 20 and 29.

You can now fabricate and fit the .040 thick aluminum angle stiffening plate, bellcrank mount and bellcrank in place. Cleco only, do not rivet.

It should be noted at this time that you cannot determine the length of the #2 roll links and finish the control system until the skinned wing is fitted to the fuselage. See sheet 29.

Assemble the stick, control stick slide tube, roll torque tube, etc., together and attach to the fuselage frame as shown on SH. 21.

Assemble the mixer together as shown below, greasing the rotating parts.



Mount the mixer in fuselage. See sheets 14, 22 and 23. With the stick, mixer and ruddervator in their neutral positions, determine the length of the pitch rod and tail surface push rods. Fabricate them as shown on SH. 27 and install in place.

Assemble the rudder pedals and mounts and attach to the fuselage floor as shown on SH. 21 or to suit.

Attach cable guides to the fuselage frame. Thread cables thru bushings and attach to pedals and mixer. NOTE: Due to manufacturing tolerances, there may be a slight difference in the cable lengths. If so, adjust the hole location in one pedal adjusting link.

Assemble the tailwheel cable to the mixer with the 5/8" x 4 1/2" springs pre-loaded to the dimension shown.

Assemble the engine and brake controls to the fuselage frame as shown on SH. 24 and 25. Cut the friction washers from the 2" square piece of leather supplied. They are 5/16" I.D. x 7/8" O.D.

The front hole for the brake lever detent pin is drilled with the lever full forward against the mixture cable bracket.

The four control cables running forward, are gathered together and pass thru a grommet in the 5/8" dia. hole in the firewall. See engine installation.

Drawing
Sheet 29

Pass this up for now, we will come back after the turtledeck is installed.

Wing Pins and Ailerons

Sheet 29

The following method of mating the wings to the fuselage will guarantee a good pin fit and the correct angle of incidence.

The ailerons and hinges are asembled as shown on SH. 29 "Section thru Aileron". When riveting the hinge and aileron together, be certain it is straight, not twisted, and the same thickness for the full length. The thickness is determined by the root and tip rib. The tip rib can be riveted at this time, but the root rib is attached later, after the inboard end of the aileron is trimmed to fit.

Attach the ailerons to the wing with only three clecos, one at each end of the hinge and on in the middle.

What you need to do is complete the fuselage construction including the control system and turtledeck. The fuselage bottom pan, rear spar carry-thru and support brackets should only be clecoed in-place and the canopy will have to be removed. The engine may or may not be installed at this time.

The wings must be completed including attaching the main fitting and bonding. The ailerons and spar tang should be installed with a minimum number of clecos.

Now, find the time and space to mate the wings to the fuselage for the drilling of the side quick pins. Turn the fuselage upside down. Rest the top longerons on a sturdy saw horse in the area of the wing attach angles. The rear of the fuselage should be supported by a saw horse with much padding, located immediately in front of the tail surfaces. If the engine is installed, you may need an additional saw horse under the longerons near the firewall. Make sure the fuselage cannot shift and then remove the bottom pan, but leave the rear spar carry-thru assembly clamped in place. The vertical slot for the rear spar tang and aileron torque tube must be cut into the fuselage side skin using the rear spar carry-thru and fig. 2 as reference for its location.

After removing the ailerons, turn the wings upside down, insert them into the fuselage and pin the halves together with the 1/2 inch main pins. If necessary, enlarge the 3/4" hole in the spar box so that the material does not interfere with the pin. Simply allow the wing assembly to rest on the aluminum spacer blocks in the spar box and center the wing position relative to the fuselage. The rear spar tangs should fit nicely into the slot and rear spar carry-thru. If the tang is too long on one side or both which prevents the wings from fitting square to the fuselage, simply remove the tang and trim off the end as necessary. Check for squareness by sighting down the main spar and also by measuring from the tailwheel to the wing tip on both sides. If the rear spar carry-thru must be adjusted fore or aft, new support brackets can be made or the carry-thru can be shifted slightly and the holes drilled for the 1/4" bolt. Double check it all. Everything should fit without binding. See Note 1.

NOTE #1: For smooth operation, the hinge pin and torque tube should be on the same center line. Check by drilling a small hole in the fuselage skin. Pull the hinge pin out enough to pass through this hole and visually check alignment. Adjust the hinge, carry-thru and wing as required.

The rear spar tangs and rear spar carry-thru should all be riveted/bolted in place. Clamp or block the rear spar and tang in its proper vertical position relative to the carry-thru. Please check to see that both sides are the same, measuring up from top longeron. Drill the holes for the rear spar pins. A high quality 1/4 inch drill is sufficient since they are approximately .002 inch undersized, or if you have the tools, you may drill it undersize and ream to fit. Insert the rear pins.

You can now determine how long the ailerons should be and trim them to length, allowing a clearance gap at each end as shown on SH. 29 now fit and cleco the aileron root rib in place.

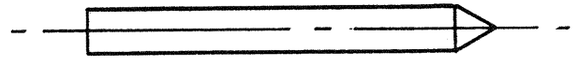
Fit and rivet the 1/4" thk. aluminum drive plate to the root rib while the rib is still attached to the aileron with clecos. Counter sink the drive plate for the rivet heads, typ. both ailerons.

The front 5/16" dia. pin holes are drilled as follows. Drill partially into the spar blocks. Remove the wings and blocks and bolt them together (less spar). Drill them through in a drill press. Reinstall the blocks and wings and finish drilling into the front angle. A normal fit for the fast pins is .003 loose with a loose fit of .005 inch being the maximum allowable.

Applying a liberal amount of general purpose grease to the pins will greatly improve their ability to slide in and out, but by now you will have already figured that out. Cleco the ailerons into position and check for side clearance against the fuselage so that the hinge pin is on the approximate center line of the aileron torque tubes. If the aileron position does not have to be altered after drilling for the aileron pins, you may rivet them into position after drilling for the aileron pins.

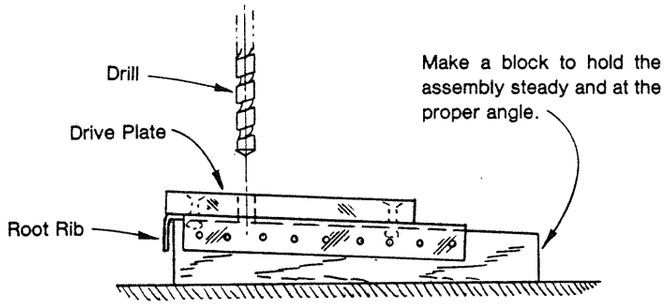
To mark the position for the aileron pins, make a scribe as shown and insert it through the bushing from the inside. Press it against the aileron end block while moving the aileron up and down scribing an arc. Remove the ailerons.

NOTE #2: With everything in place per Note #1, make a concentric point on a 1/4" dia. rod.



Scribe

Remove the rib and drive plate assembly from the aileron. Drill and ream a 1/4" dia. hole where the scribe line intersects the middle of the plate. See sketch below.



Cleco the assembly to the aileron. Cleco ailerons to the wing and check by installing the avibank pin. Then rivet rib in place.

The aileron horn and sleeve can now be positioned and attached as follows: with the aileron in neutral (lay a straight edge across the top of the aileron and rear edge of the wing) and the horns in the approximate position shown on SH. 20, drill, rivet and bolt the sleeve and horns in position.

With this installed and the control system in neutral, measure the length between the bellcrank and torque tube horns.

Make the #2 roll links to this dimension and install in place.

Adjust the ailerons to a neutral position with the short push-pull rods. The neutral position of the ailerons can be found by laying a flexible ruler on the top surface of the wing/aileron and adjusting the aileron postion so that the curve continues smoothly from the wing to aileron. There should be a slight concave shape to the bottom surface in that area. The neutral position of the stick, etc., can be easily checked by visually noting that the roll horn bell crank is square with the fuselage side. Note drawings. Occasionally check the fit of the bottom pan during this process to determine that the fuselage has not shifted.

Finally, remove the wings, rivet the bottom pan in place, and if desired, turn the fuselage right side up.

Now you know the pins will/should almost always fit when ever the plane is assembled. When installing the wings, the main side pins will go in much easier if the rear pins are installed first.

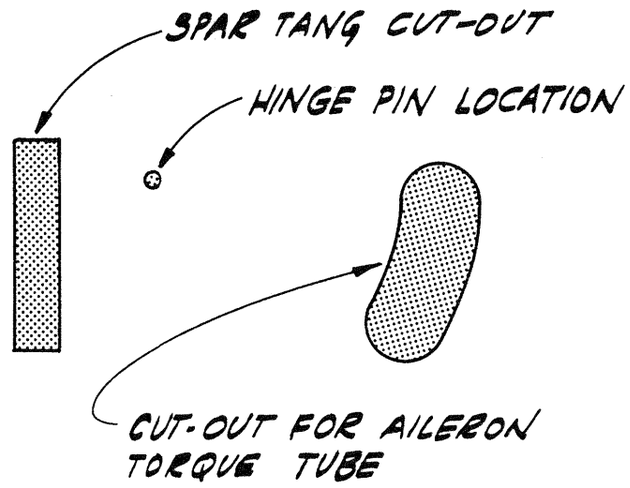


FIG. 2

Trace a couple of patterns from Fig. 2 and use them to cut the holes in the fuselage. Before cutting, double check the location with the actual parts.

Static Air System

Sheet 30

The system is straight forward and installed as shown on SH. 30.

The pitot tube is made from 1/4" O.D. .035 wall 6061T6 aluminum tube about 8" long.

The pitot tube block is attached to the tail tip rib with CCC-44 rivets approximately as shown on SH. 4. Make a hole in the leading edge of the skin for the tube to pass thru and plug into this block. If you make it a good fit, you can remove it when not flying, avoiding possible damage from an accidental bumping.

Slip the vinyl tube over the stub pipe at the rear of the block. Run it around the corner and down the rear surface of the spar and through the rear former. If the tail surfaces are ever removed, just cut the tube near the rear bulkhead, then just re-assemble with a short piece of 1/4" aluminum tube on the inside.

Locate and drill holes for the plastic clamps in the spar and spar attaching bracket, being careful not to drill the holes closer than 1/4" to the edge of the spar attaching bracket.

Run the tube along the inside of the top longeron as shown on SH. 30, securing it in place with tie wraps. CAUTION! Do not pull the tie wrap so tight it distortes the longeron.

Connect vinyl tubes to the static ports (SH. 13), tee them together as shown and run forward to the instruments at the panel.

Attach the tubes to the instrument panel with plastic clamps and rivets to suit.

The opening and closing of the canopy must be taken into account when attaching the vinyl tubes to the panel and the fuselage.

Turtledeck Assembly

Sheets 31 and 32

Assemble former #2 as detailed on SH. 31. It may be best to leave a little extra of tube #14 at the bottom, to be trimmed later, when fitting the former to brack #4.

Rivet bracket #4 in place on each side of the fuselage. See detail "A" SH. 31.

Bolt the tail surfaces to former #4 and #5. This will establish the forward position of former #4 and it can now be drilled in position and riveted to the longerons.

Make some measurements of where the tail spars will be passing thru the turtledeck skin. These will be used later to notch the skin.

Remove and set aside the tail surfaces. They will be re-fitted later, before riveting the turtledeck in place.

Rivet formers #2 and #3 in place and adjust all former flanges. (See Note in lower right hand corner of SH. 31.)

Drape the turtledeck skin (cut out per SH. 1) over the fuselage formers and tape or weight it in place. Be certain former #2 has not moved from the proper slope and #3 and #4 are straight up.

Mark the inside surface of the skin at the front former, across the top surface at the rear of the fuselage and the horizontal datum line along each side.

Remove the skin and draw a trim line 3/4" below the horizontal datum line along each side. Trim the front, rear and sides at the trim lines marked.

Using a sheet metal brake or bending it over the edge of a table, bend edge down slightly along the datum line.

Now, before assembling the skin in place for drilling, you must make a pattern for drilling formers #3 and #4. One method is to put a strip of masking tape over the flanges of each former and slightly overlaping the fuselage side skin. Mark the center of the tabs and the edge of the side skins on the tape with ball point pen. Remove the tape and set aside.

Install the turtledeck skin in place slipping the skin between the fuselage skin and the top longeron as shown on SH. 32. Check fit and correct if necessary. Make sure all the formers are in the proper position and the skin is tight against them.

You can now locate, drill and cleco formers #2 and #5, starting at the top and working down to the sides. **Be certain** that the turtledeck skin is tight against the longerons while drilling, taping it in place works well.

Now, carefully drill the turtledeck skin along the top longeron, clecoing as you go. Do not enlarge the longeron holes.

You now use the measurement taken earlier and mark the notches for the tail spars on the skin. Remove the skin, cut out the notches, and dimple all the holes in the skin and formers #2 and #5.

Now re-assemble the skin inplace using clecos in all the holes.

Bolt the tails in place, adjusting the size of the notches as required. There should be a minimum of about 1/32" clearance around the spars. At this time you can also trim the tail skins where they meet the fuselage, about 1/16" clearance is fine.

Take the masking tape strips you previously marked the tab locations on (of former #3 and #4) and reposition them across the top of the skin. Drill the rivet holes thru the skin and former tabs, clecoing each hole as you go. Be careful drilling so you don't miss a tab.

Remove the tail and turtledeck skin, dimple the skin and formers.

Re-assemble everything with clecos, checking fit, then final rivet, removing clecos as you go.

Cowling Assembly

Sheets 33 and 34

Fit and rivet brackets #13 to the top front corners of the fuselage. NOTE: The right side bracket is not riveted to the side tube at this time. The canopy hinge goes under the bracket before riveting (See SH. 35 Note #2)

Fit the firewall (trimming if necessary) and hinges to the fuselage using clecos. See section "A-A" on full size template sheet. The battery and box can now be fitted to the firewall before mounting the engine. Remove after fitting.

If you have the 1/4" dia. engine mounting holes in the X-moly brackets (See SH. 15 Station #1) you can back drill the firewall through these holes. If not, lay the holes out on the firewall and drill everything from the front.

Now add the 3 1/4" lg. piece of tube and bracket #12 to the top rear center of the firewall (SH. 33 "Inside view of firewall").

Install the engine in place as shown (SH. 33, 39, 40). With the aluminum mount you must bolt a scrap piece of 1 x 1 x 1/8 aluminum angle across the top of the mounts. (See SH. 39) This stiffens the assembly until it's replaced by the ballast bars.

The front edge of the aluminum mount may also interfere with the engine. If so, grind or file as necessary to clear.

You must also cut away some of the engine cooling fin at the top left to clear the mounting bolt nut.

The cowling is fitted to the fuselage as follows: tape the two halves together and cut the front hole using the 4 5/8" dia. full size template.

Text Note: #1

Cut this hole initially to about 4 5/8" dia. so it is a close fit on the engine alternator housing (use full size template). This will keep the cowl centered as your fitting it to the firewall and attaching the hinges.

After everything is riveted in place, enlarge the hole to 5 1/8" (use full size template) to allow clearance for the rotating alternator.

CAUTION! Do not make the initial hole a tight fit on the alternator. If you do, the cowl could become distorted while attaching the hinges and shift off center when the hole is enlarged.

Trim the rear edge of the cowling a little at a time, checking frequently until it fits the fuselage and you have approximately a 1/8" gap at the spinner back plate. Masking tape can be used to hold the cowl to the fuselage and the seams together while checking the fit.

At this time you can bend the top tabs of the firewall to conform to the approximate shape of the cowling, keeping in mind the .020 thk. aluminum firewall top wrap (see full size template) fits on top of the tabs, under the rear lip of the cowling, (see detail "A" SH. 33) and follows the line of the cowling.

NOTE: When the top wrap is in place it is not as wide as the fuselage at the front corner, about 1/8" narrower on each side to allow for the canopy thickness. This will give you a smooth flush fit of the canopy at the front sides.

With the cowling removed and still taped together at the seams, fit drill and cleco the top and bottom seam hinges in place.

With their pins, attach the side and bottom firewall hinges to the hinge halves already riveted to the firewall.

Install the cowling, securely taping it in place on the sides and bottom. NOTE: A small hole is located and drilled in the firewall to allow the hinge pin to pass thru it.

Carefully remove one half, leaving the other half taped in place. You can now spot, back drill and cleco a couple of rivet holes in the cowl for the side and bottom hinges.

Re-install and tape in place the other cowl half. Remove the one just drilled and repeat the drilling process for the second half.

With both halves removed, drill all remaining rivet holes and rivet the hinges in place.

Install the #8 nut plate and screw in front, cut-out carburetor and front hole using templates and the cooling air inlets.

Seal any opening along the top of the firewall by applying silicone sealer on the inside (rear) surface of the firewall.

Canopy Installation

Sheets 35 and 36

Attach the hinge to the right side of the fuselage with the upright leg flush with the outside surface of the fuselage skin. The front of the hinge is slipped under bracket #13 and riveted through the bracket.

The frame is fitted and assembled on the fuselage as follows: shim under the side tubes to the gaps shown and clamp in place on top of the fuselage. You should have scrap ABS plastic strips on the outside of the tubes and the .020 aluminum strip on the left side. This will simulate the finished width of the canopy. (See sections on SH. 35 and Note #1.) Now determine the length of the cross tubes, riveting them in place with the front and rear canopy brackets.

Make and install the latch as shown on SH. 36. For smooth operation it may be necessary to slightly enlarge the rear of the keeper pin holes as a lead-in for the latch pins.

Fit, trim and cleco the instrument panel in place at this time as shown on SH. 35.

Cut the black ABS canopy joggle to fit the headrest former and rivet it in place. (See detail "B" on SH. 36.)

Strip the protective coating off of the canopy. Carefully set the canopy over the fuselage. Have a helper! Using masking tape and sighting through the canopy mark the front, rear and side trim lines. (The edge of the tape becomes the trim line.)

When working with your canopy, take care not to scratch it. Keep your hands clean and the metal chips swept up. The first thing you must do to your canopy is trim the excess material away from the outside. One of the safest methods we have found for cutting our canopies is to use a dremel tool or a high speed die grinder with either a small buzz saw blade or a thin abrasive cut-off disc.

Continue fitting and checking the fit at the front, rear and sides trimming as required.**

The front must be pulled down to conform to the shape of the cowling. The 1/8" x 3/4" x 8" aluminum bar under the front helps keep the assembly flat so it blends into the cowl line.

NOTE: It is important to remember that when drilling plexiglass it is advisable to use a dull drill bit, drill at high speed, and use very little pressure since it is easy to chip or crack the plastic. Drill all your holes 1/8" and use clecos to hold it all in position until you are done.

When everything is fitting to your satisfaction, you can drill the holes along the sides, add the aluminum side strip and cleco in place. Be sure the front edge is fitting the cowl properly before drilling the sides. Tape the nose wrap in place to be sure.

You can now open the canopy and sandwich the front edge as shown on SH. 36 "Canopy nose assembly."

Add the 3/8" x 3/8" x .040 x l l/2" long handle to the canopy left side and the scrap aluminum filler to the rear right side. (See detail SH. 36.)

** When the trimming and fitting is finished, block sand the edge of the cut with 180 grit "wet or dry" to a smooth edge. This will prevent cracks from starting.

Sheet 37 Text

General Note: The cables should be routed with smooth turns wherever possible and not anchored tightly on a curve.

The air brake cable runs from the brake lever (see SH. 25) down along the frame (attach with plastic clamps and CCP-44 Rivets as shown) to a cable adjuster located in the center of the spar carry-thru angle. NOTE: if your spar carry-thru angle has a rivet in this location, drill the rivet out, enlarge the hole to 5/16" and install the cable adjuster.

The cable extends about 4" out of the adjuster and has a clevis on the end. This end is attached later to the pull cable from the air brake doors.

Route the wheel brake cable as shown. See detail "A" and Note #1. The brake scrubber casting should be just clear of the tire when the brake lever is full forward.

The tire should be inflated to 38 to 40 pounds of pressure.

Make the tunnel and spar box covers as detailed on SH. 37 and full size template sheet.

The covers should be fitted to the fuselage using clecos to hold them in place until you're sure everything is fitting properly. Then you can do your riveting.

The outer ends of the spar box covers are marked and bent to fit against the side of the fuselage. With them held up in position, drill a 1/8" hole at the front and rear of each side, through the cover, side skin and 3/4" square tube. (Be sure you miss the rivet heads under the cover.) Lower the covers and install a CCP-42 rivet in each hole. (See detail "B") Now enlarge the holes in the fuselage to 11/64" dia.

When the cover is closed, the rivet shanks drop into these holes holding the cover in place.

NOTE: We also use 1" wide vinyl tape to fair in the wing to the fuselage, this also holds the cover closed.

Cooling Box

Sheet 38 Text

Make the cooling boxes from the full size template sheets. It may take a little cut, bend and fit to get them in place and fitting properly. Take your time. You may even want to make a heavy paper pattern for trial fit.

Engine Mech. and Elect. Installation

Sheet 39, 40, 41

At one end of the cable install a contact socket on each wire and insert the contacts into the cap half of the connector. (See detail, SH. 39) Install the connector in the firewall and route the cable to the hinge side of the canopy tube (attaching to the tube as shown on SH. 35) up to the instruments.

Wire the instruments and switches per SH. 41 routing the wire in a neat manner under the instrument panel to suit. Locate the common screw terminal where it will not be accidently shorted to ground.

Install all the wires on the engine side of the firewall in a neat manner securing them in place with tie-wraps as necessary.

All the heavy cables are made per SH. 39 and the small wires made to fit using wire stripped out of the remaining 9 conductor cable.

Route the mechanical cables, fuel line, etc., as shown on the drawings securing them in place with tie-wraps. Make sure the fuel line is not touching the exhaust pipe or the inside of the cowling.

Modify the carburetor choke and the mixture low speed needle valve as shown on Dwg. SH. 40.

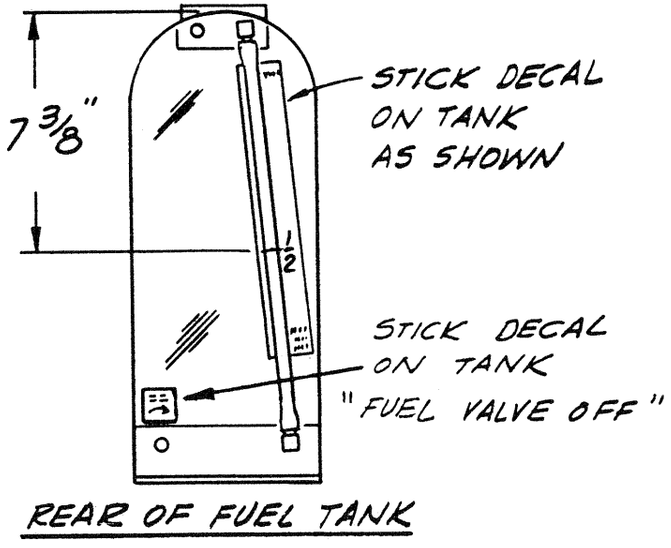
First the engine should be adjusted to run as outlined in the KFM manual. Then the mixture control should be installed as detailed. When the mixture control is pulled, it should screw the low speed jet in, leaning out the mixture.

Fuel Tank Installation

Sheet 42

Install the fuel tank as shown on the drawing routing the lines approximately as shown. As an option, you can install hose clamps at the fitting connections.

Apply the decal underneath and to the right of the fuel level sight gauge tube as shown below.



Main Wheel Fairing

Sheet 43

Tape the front of the full size templates together and use this pattern to cut out the fairing blank. See plans SH. 1. NOTE: Do not make the cut outs for the doors at this time.

Wrap the fairing around the gear legs holding it in place with the axle bolt. Cleco the spreader channel to both the fairing and the bottom pan. Cleco the rear edge together.

Cut and fit the molded ABS bottom former and cleco it in place. Now mark the gear legs for the #8 screws using the holes in the fairing as guides.

Remove and disassemble the fairing. Add the #8 nut plates to the gear legs, cut out the gear door openings and install the hinges on the fairing.

Fabricate the doors and stiffening angles but do not rivet the arms to the angle before re-assembling the unit in order to check the curve and fit of the doors.

When you're satisified with the fit and the opening and closing of the doors, you can rivet everything together including the arms, swivels and cables.

Install the fiaring in place and add the return spring.

Connect the cable inside the airplane and adjust as necessary so that the doors are approximately 75° open when the handle is in the rear position.

Seat Installation

Sheet 44

Trim the seat as required to fit into the fuselage.

Rivet the hinge to the rear edge of the seat and replace the seat in fuselage.

Drill and cleco the hinge to the #10 cross member.

Install the hinges on the front edge of the seat, trimming the seat if necessary.

Remove the seat. Cut a hole for the shoulder harness and notch the rear edge to clear the bolt head.

A.B.S. Side Panels

The drawing shows approximate shape and cut outs for the panels. Cut to fit making sure the controls are free from interference and screw the panels in place.

Spinner

Notch and install the spinner as shown in detail being careful to keep the edges of the notch smooth.

Sheet 45

Install the canopy restraining cable per details. The amount the canopy swings open can be adjusted to suit.

Install the air vents per the detail. If necessary, modify the bent end slightly to allow it to open and close smothly.

Make and install the carburetor screen using the full size templates and screen provided.

Install the ABS headrest per detail.

Make the aircraft data plate as shown or an alternate method is to apply the decal on the firewall and metal stamp the information on the firewall. NOTE: Keep the information in the same sequence as shown.

Knuckle Spacer Block

Sheet 46

The aluminum spacer block is bolted into the fuselage spar box as shown on the drawing. Follow steps 1 thru 6.

Step 6 shows spacer washers to fill the gap between the block and spar box. You could make a spacer 3/4" wide x 3" long to fit in this space as an alternative to the washers. Either method is acceptable.

Spar Notching

With the wing assembled in the fuselage and using the 3/16" dia. holes in the rear of the spar box as a guide, drill a 1/4" dia. hole (square to the spar box) thru the spar box rear, spar web and spar box front. Typical for each wing.

Remove the wings and enlarge the hole in the wing spar to 1/2" dia. being careful to keep the same center as the 1/4" hole. Now you can notch both spars as shown.

To complete the assembly you must now return to plans SH. 7.

Cut two lengths of 1/4" I.D. x 1/2" O.D. aluminum tube to fit inside the spar box and bolt together with #4 bolts as shown on SH. 7.

Ballast Bars

Sheet 48

The proper amount of bar cannot be determined until the Moni is finished and the weight and balance completed.

After this determination has been made, the bar is attached per the drawing.

NOTE: On the aluminum engine mount installation, the stiffening angle is removed when bars are installed.

Prime and finish paint the bars for a good looking installation.

Trailer and Dolly

Sheets 49, 50, 51

The design and construction shown is offered as a suggested method of building and not intended to be the best or only method.

We have included some full size templates and detail that should be helpful during the construction.

None of the dolly or trailer materials are included in the Moni kit. They must be purchased separately from the local building supply store.