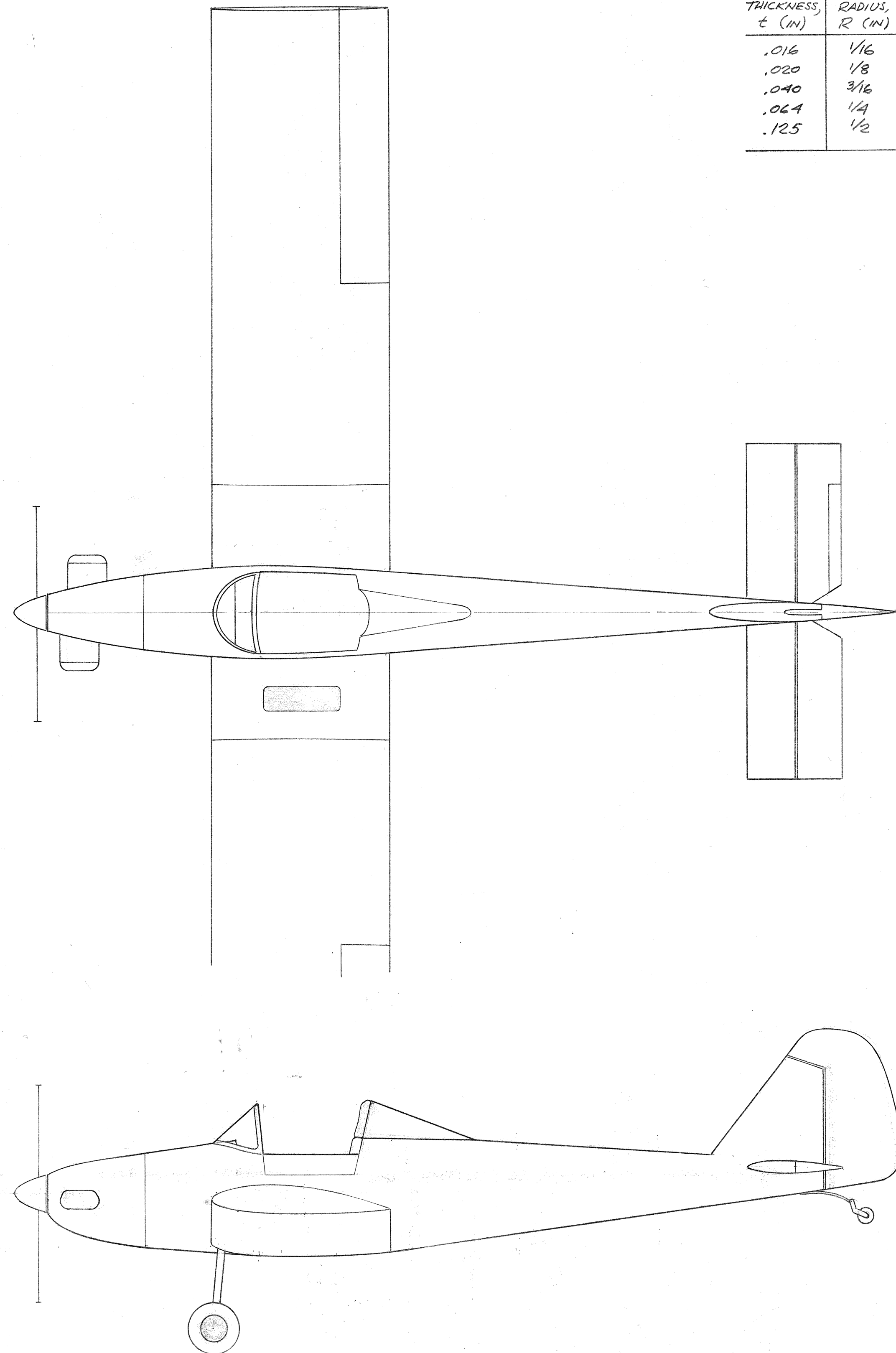
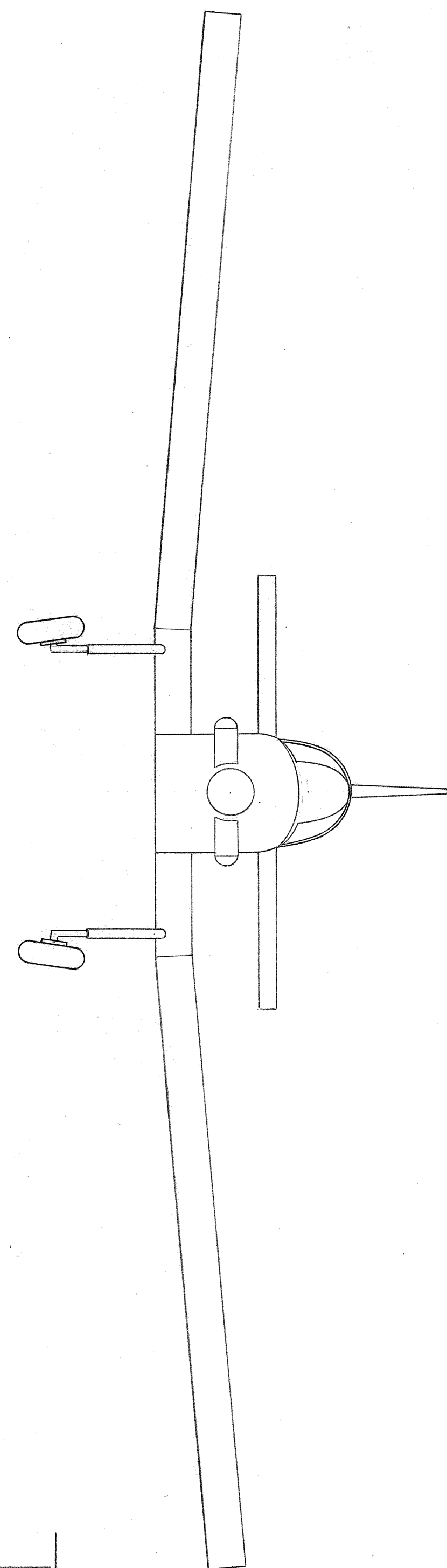
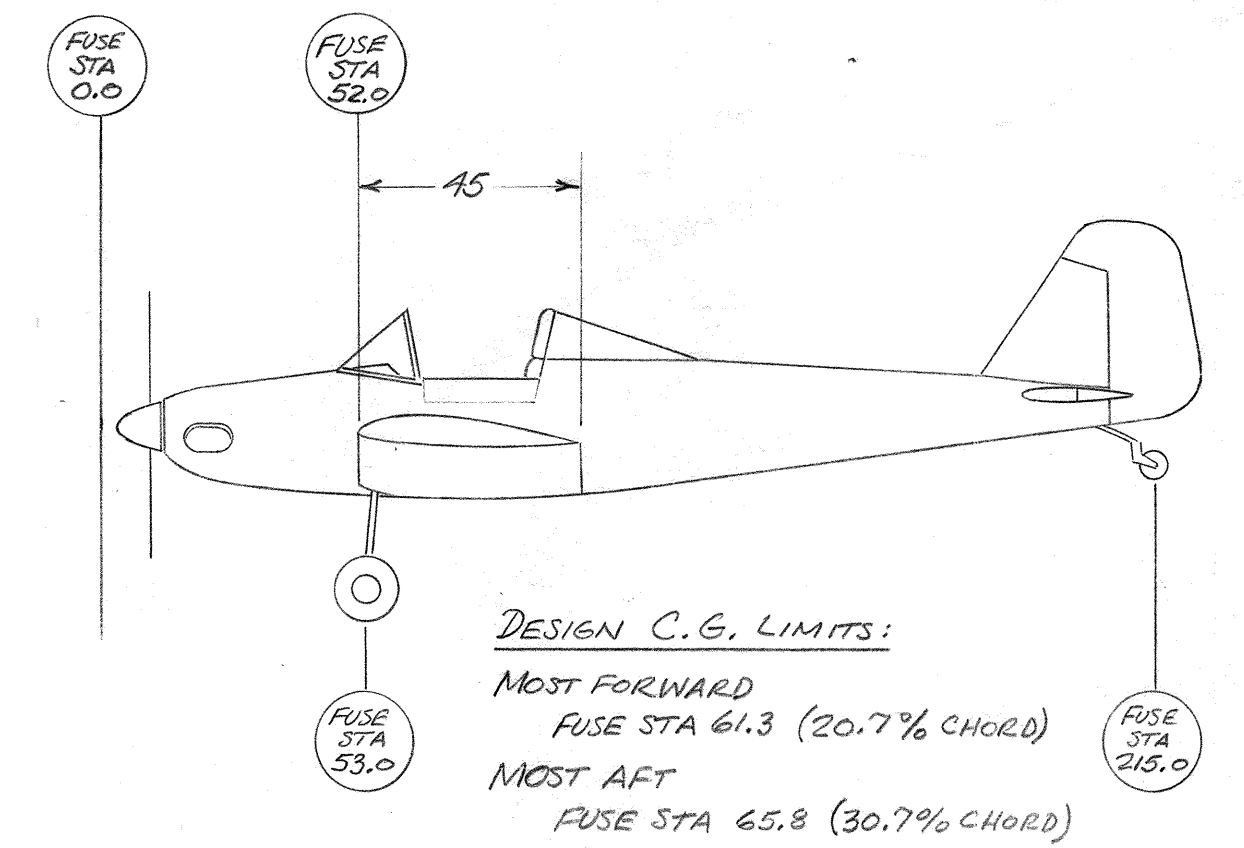
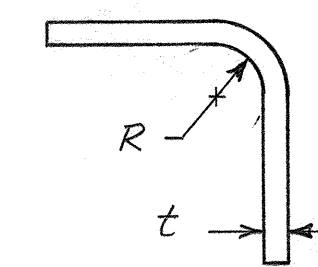


BEND RADIUS FOR  
2024-T3 ALUMINUM SHEET &  
4130(NORMALIZED) STEEL SHEET

THICKNESS, t (IN)	RADIUS, R (IN)
.016	1/16
.020	1/8
.040	3/16
.064	1/4
.125	1/2



DRAWINGS

GROUP	COMPONENT
00	GEN'L ARRANGEMENT, SPEC.
10	FORWARD FUSELAGE
20	WING CENTER SECTION
30	AFT FUSELAGE
40	TAIL
50	WING PANELS
60	LANDING GEAR
70	ENGINE INSTALLATION

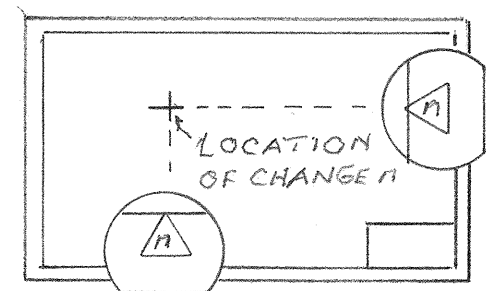
SPECIFICATIONS

EMPTY WEIGHT	456 LBS
OIL (2 1/2 QTS @ 2 LBS/QT)	5 LBS
FUEL (9.8 GAL @ 6 LBS/GAL)	59 LBS
PILOT	130 LBS
BAGGAGE	20 LBS
GROSS WEIGHT	720 LBS *

\* LIMIT LOAD FACTOR IS 4.4 g's AT 720 LBS,  
ULTIMATE LOAD FACTOR IS 6.6 g's AT 720 LBS

WING SPAN	25 FT 0 IN
WING AREA	94 SQ FT
LENGTH OVERALL	18 FT 6 IN
1 SEAT	
ENGINE	VOLKSWAGEN 1500 (53 HP)
PROPELLER	54" DIAMETER, 30" OR 32" PITCH
V <sub>STALL</sub>	38 MPH
V <sub>CRUISE</sub>	90 MPH
V <sub>MAX</sub>	115 MPH
V <sub>NE</sub> (NEVER EXCEED SPEED)	162 MPH
RATE OF CLIMB (S.L. STD DAY)	850 FPM

DATE	NO.	PLAN	CHANGE
3/27/21	15	50.04	STALL CHARACTERISTICS
7/29/16	14	60.01	CORRECT PART NO REF
	13	50.04	DELETE WEDGES
	12	50.03	CORRECT PART NO REF
	11	50.03	CHANGE WASH-OUT ANGLE
	10	40.03	ALTERNATIVE TAB CONSTR
	9	40.01	CORRECT DIMENS 40.02B
	8	30.02	ADD DIMENS. - DOUBLER
	7	20.02	CORRECT PART REF
	6	10.05	FUEL TANK. MANY CHANGES
	5	10.04	FUEL VALVE ACCESS
	4	10.04	ADD MISSING DIMENSIONS
	3	10.03	THROTTLE STOP NOTE
	2	10.02	ANCHOR NUTS
9/30/15	1	00.01	ADD CHANGE BLOCK

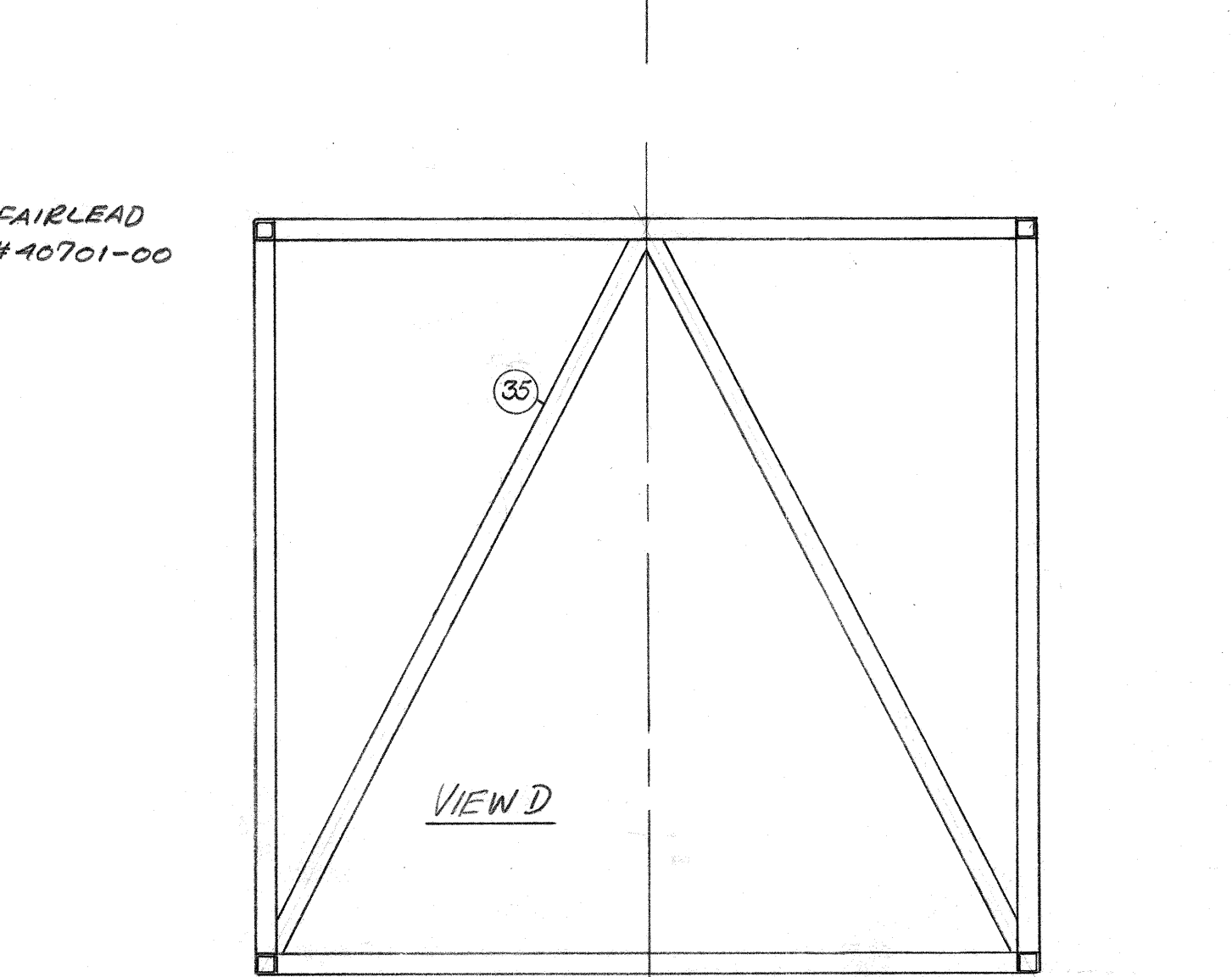
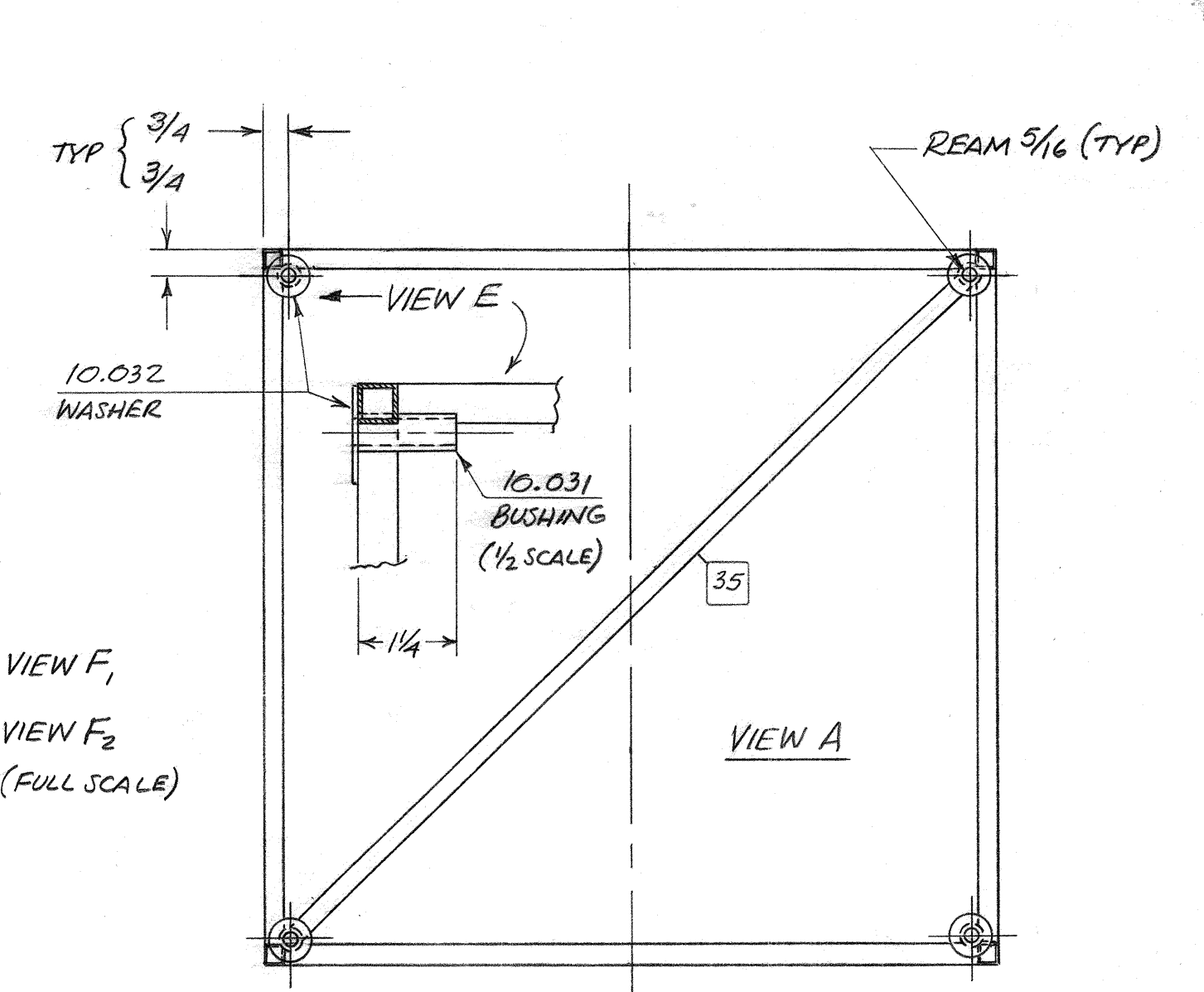
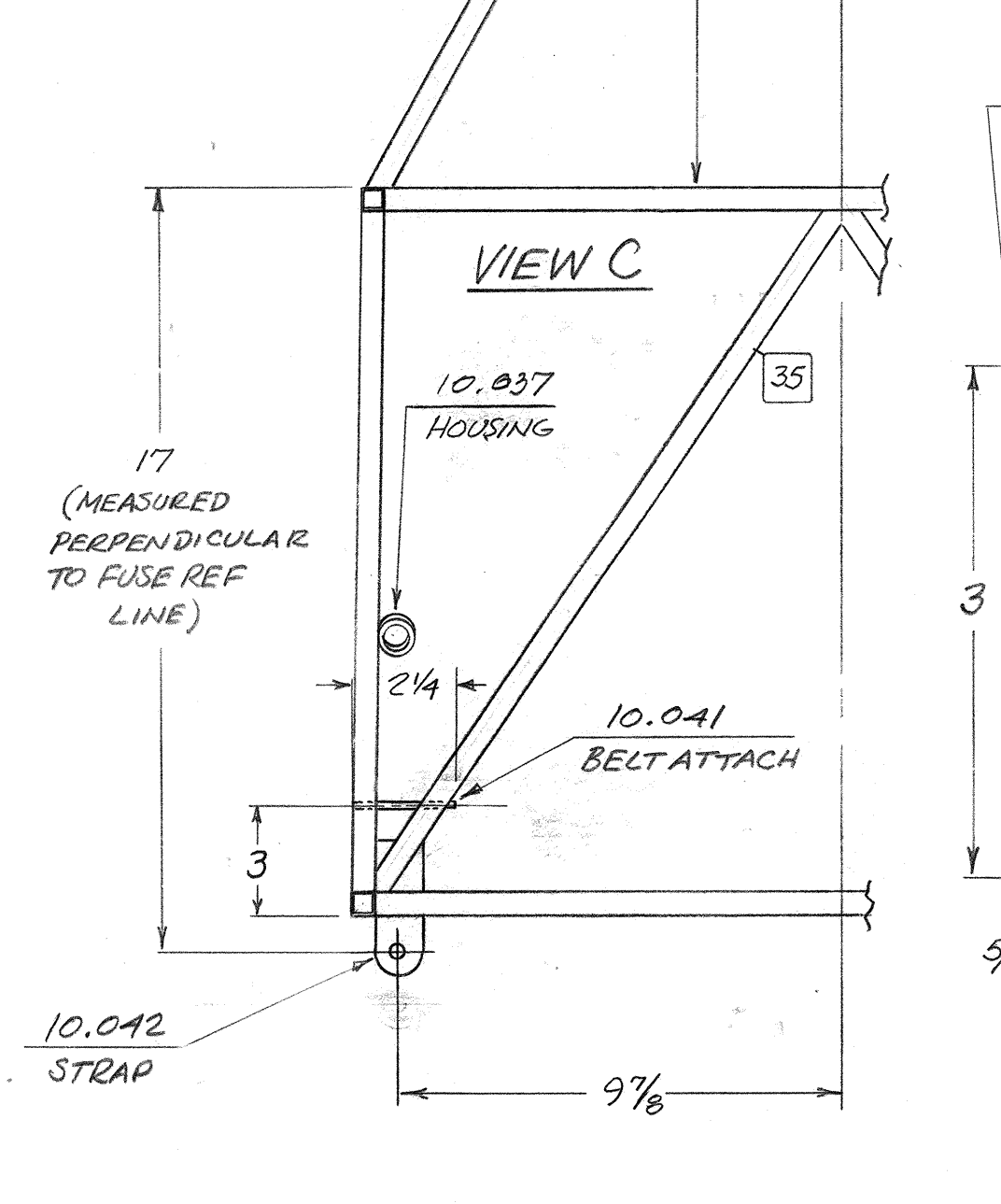
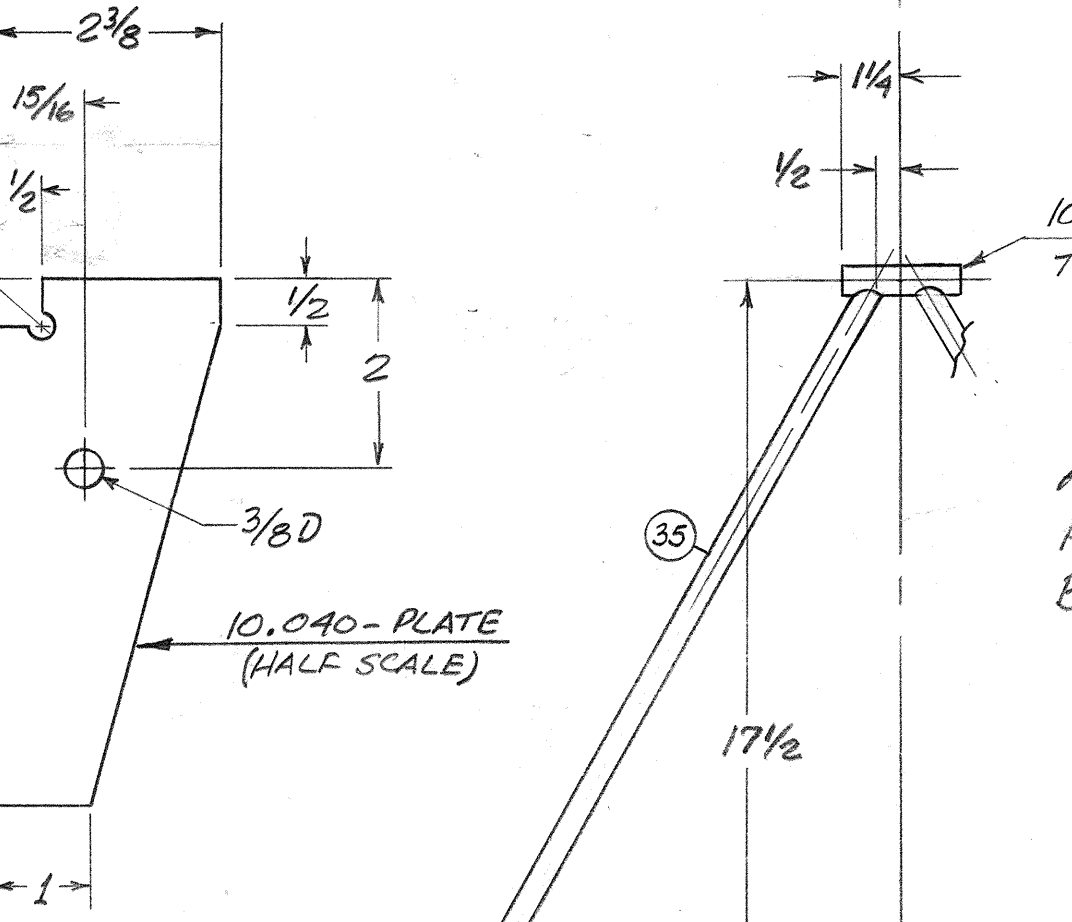
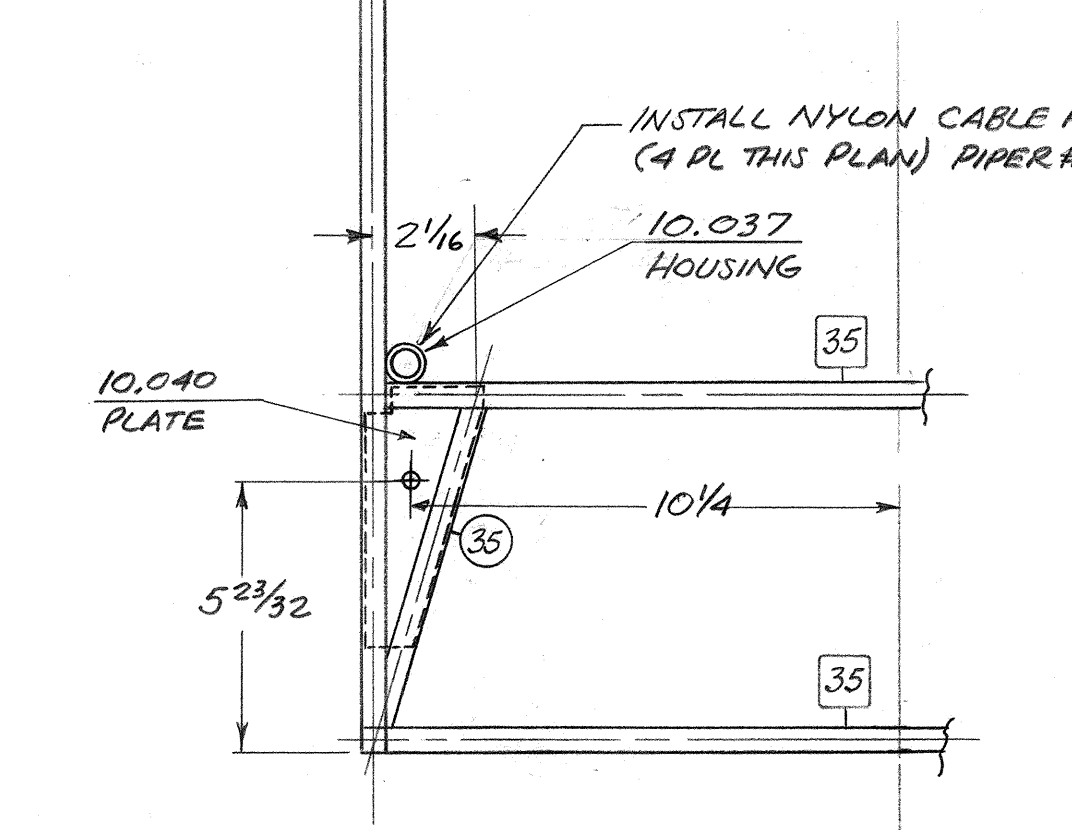
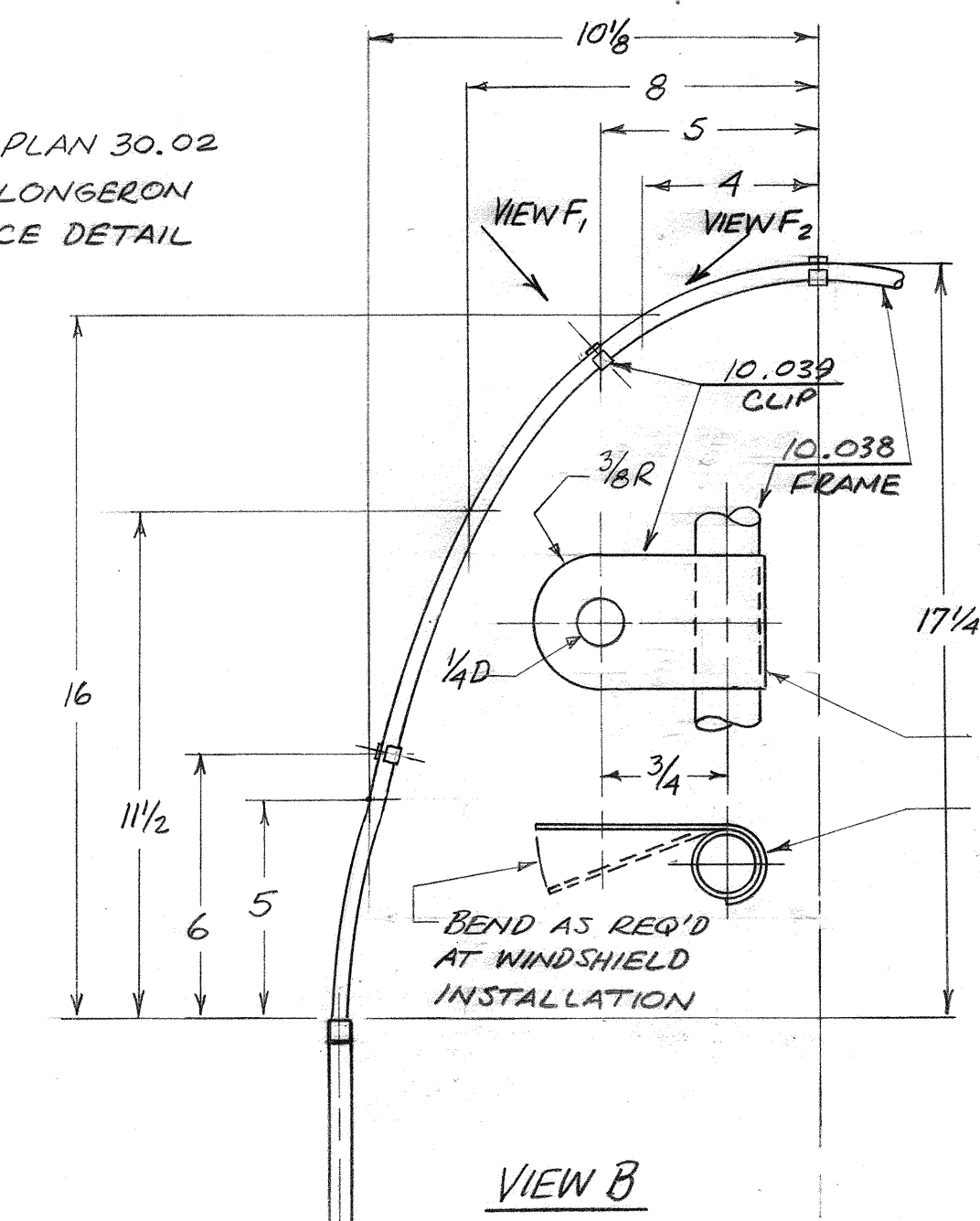
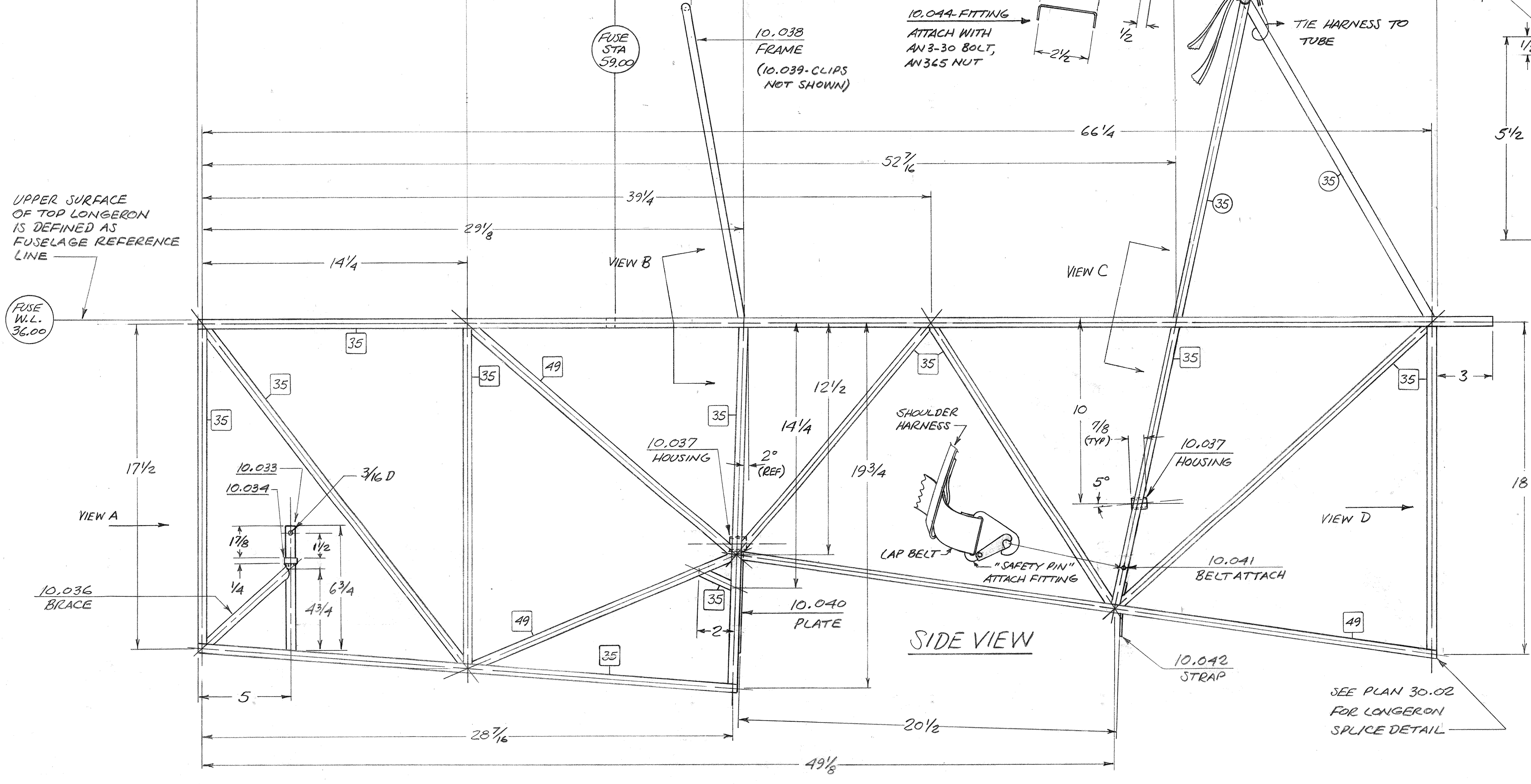
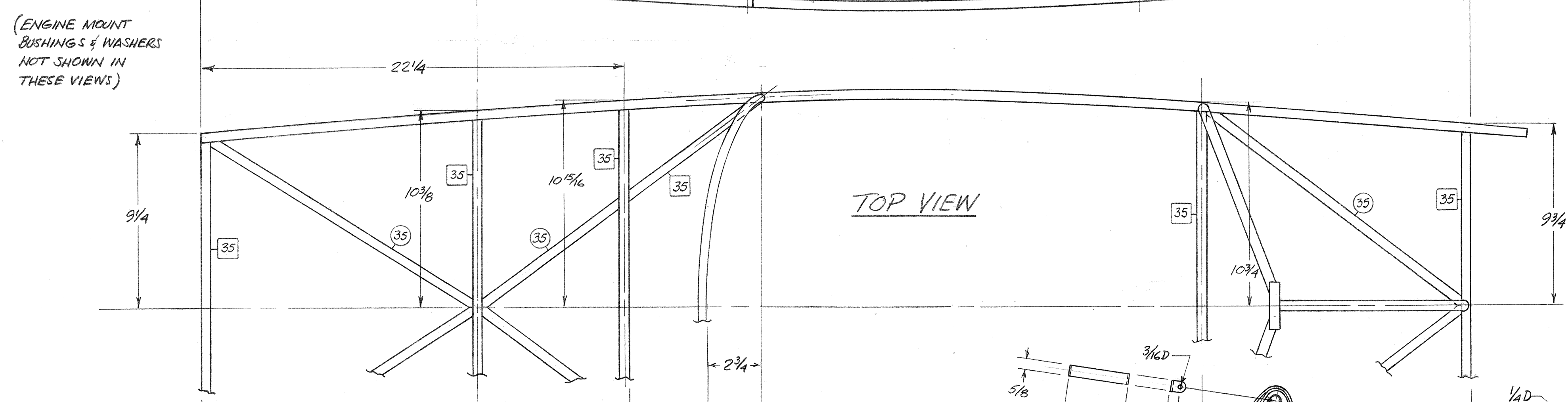
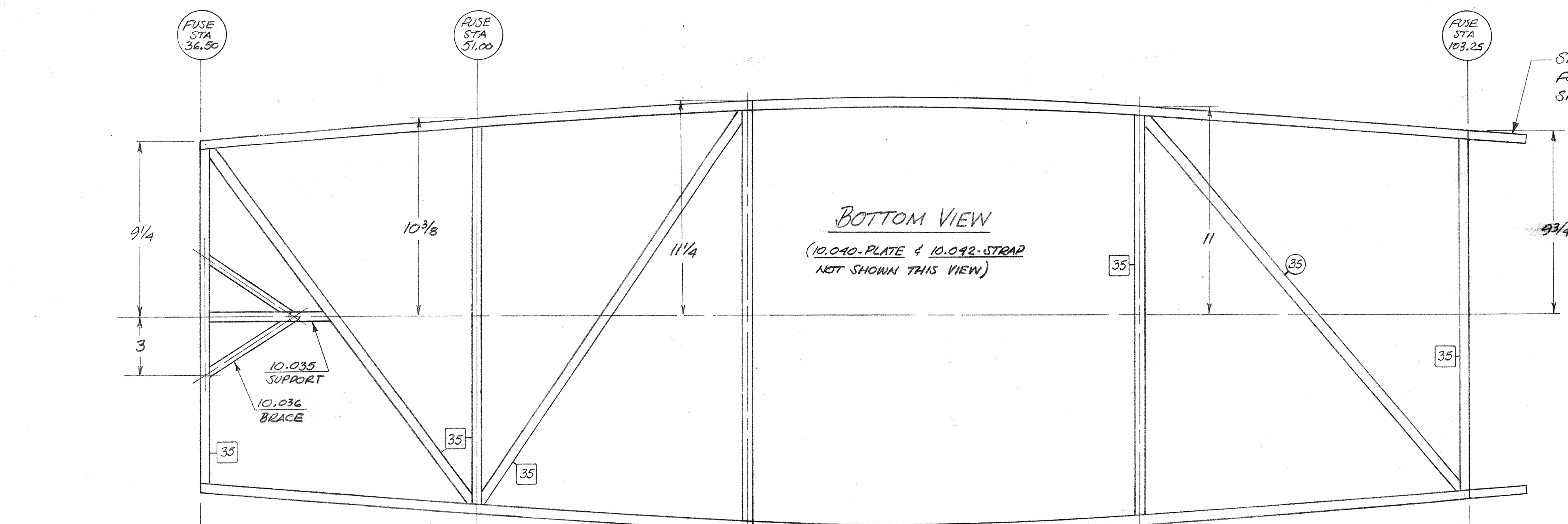


THESE PLANS HAVE BEEN PURCHASED BY \_\_\_\_\_

WHO IS GRANTED PERMISSION TO CONSTRUCT  
ONE (1) S-21 AIRCRAFT, SERIAL NO. \_\_\_\_\_

BY HIS ACCEPTANCE OF THESE PLANS, THE PURCHASER AGREES THAT:  
• THESE PLANS WILL NOT BE REPRODUCED,  
• NO DEVIATION FROM THESE PLANS WILL BE MADE WITHOUT FIRST SECURING WRITTEN APPROVAL FROM MACDONALD AIRCRAFT CO.,  
• THE PLANS SELLER IS NOT TO BE HELD LIABLE FOR ANY ACCIDENT RESULTING FROM OPERATION OF THE AIRCRAFT CONSTRUCTED FROM THESE PLANS.

MACDONALD AIRCRAFT Co. 24 LONDON LN, SAVANNAH GA 31410		
GENERAL ARRANGEMENT DWG; SPECIFICATIONS		
SCALE: 1/20	APPROVED BY: RA Mac Donald	DRAWN BY: RMacD
DATE: 8/73		REVISED
MACDONALD S-21		
DRAWING NUMBER		S-21/00.01



\* OR USE AN 970-4 WASHER

PART NO.	NO. PER ACFT	PART NAME	MATERIAL
10.044	1	SHOULDER HARNESS RETENTION FITTING	2024-T3 .063 THK SHEET
10.043	1	SHOULDER HARNESS ATTACH TUBE	4130 5/8 x .035 STEEL TUBE
10.042	2	AFT WING ATTACH STRAP	4130 .063 THK STEEL SHEET
10.041	2	SEAT BELT ATTACH FITTING	4130 1/4 DIAM STEEL ROD
10.040	2	FORWARD WING ATTACH PLATE	4130 .063 THK STEEL SHEET
10.039	5	WINDSHIELD CLIP	MILD 1/32 THK STEEL (APPROX)
10.038	1	WINDSHIELD FRAME	4130 3/8 x .035 STEEL TUBING
10.037	4	RUDDER CABLE FAIRLEAD HOUSING	4130 7/8 x .058 STEEL TUBING
10.036	2	RUDDER BAR SHAFT BRACE	4130 1/2 x .035 STEEL TUBING
10.035	1	RUDDER BAR SHAFT SUPPORT	4130 50 ST. TUBING 1/2 x 1/2 x .035
10.034	1	LOWER RUDDER BAR RETAINER	4130 3/4 x .058 STEEL TUBING
10.033	1	RUDDER BAR MOUNTING SHAFT	4130 5/8 x .049 STEEL TUBING
10.032	4	ENGINE MOUNT ATTACH WASHER	4130 1 1/4 O.D. x 5/16 I.D. STEEL WASHERS
10.031	4	ENGINE MOUNT ATTACH BUSHING	4130 1/2 O.D. x 5/16 I.D. STEEL BUSHINGS

ALL PARTS THIS PLAN ASSEMBLED BY GAS WELDING

SOME PARTS OF THE FUSELAGE TRUSS STRUCTURE ARE NOT NUMBERED. MATERIALS USED FOR THESE PARTS ARE INDICATED ON THE PLAN THUSLY:

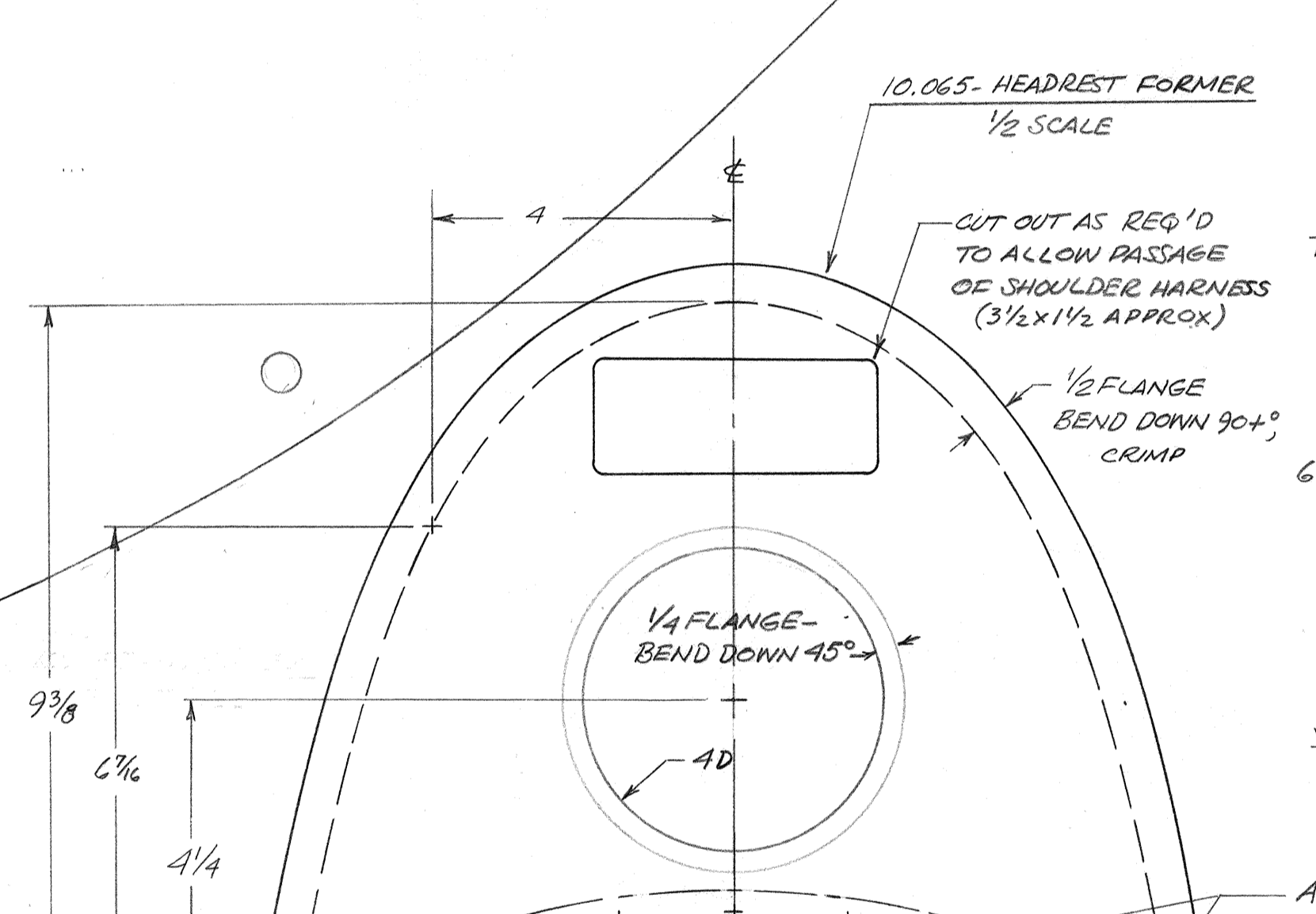
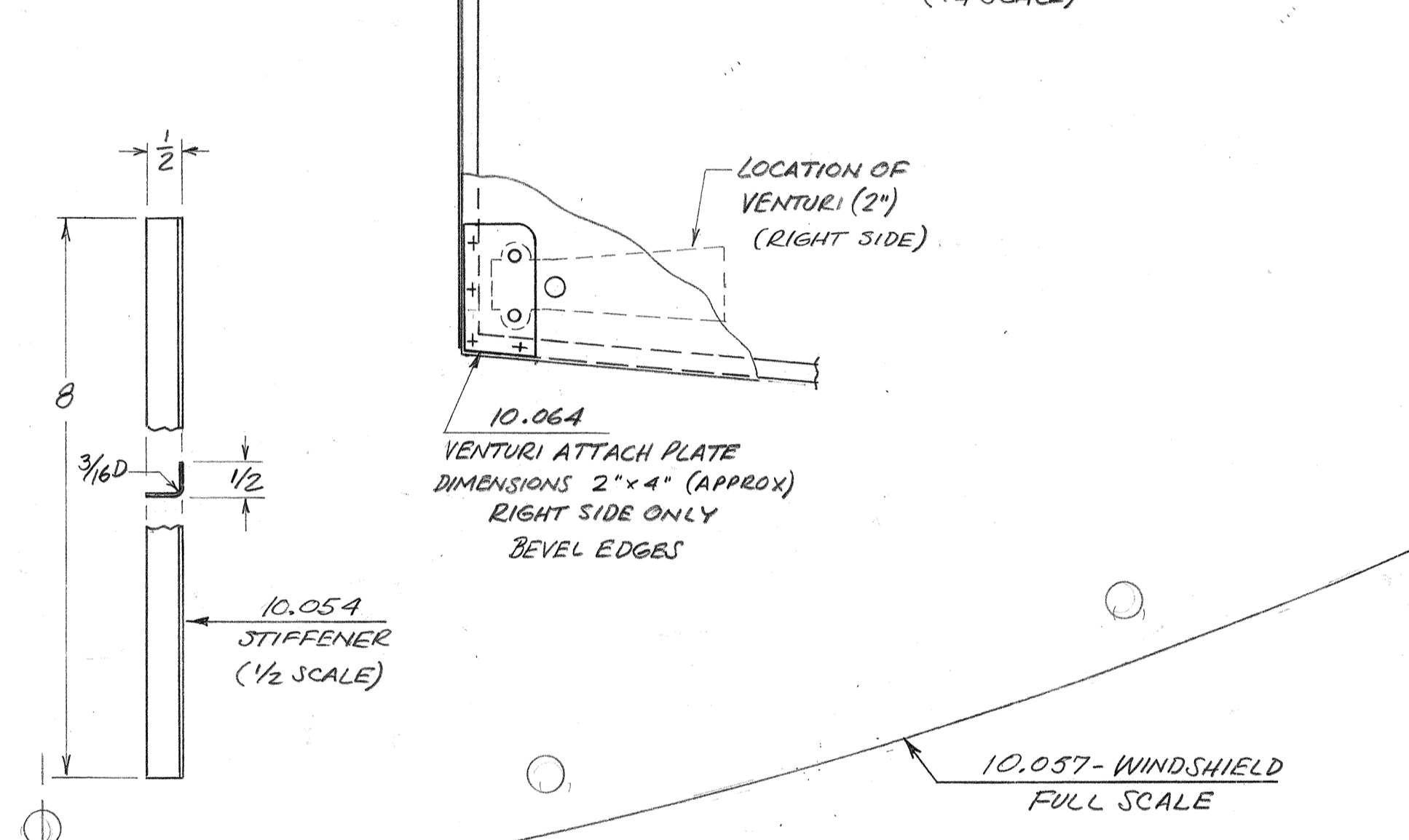
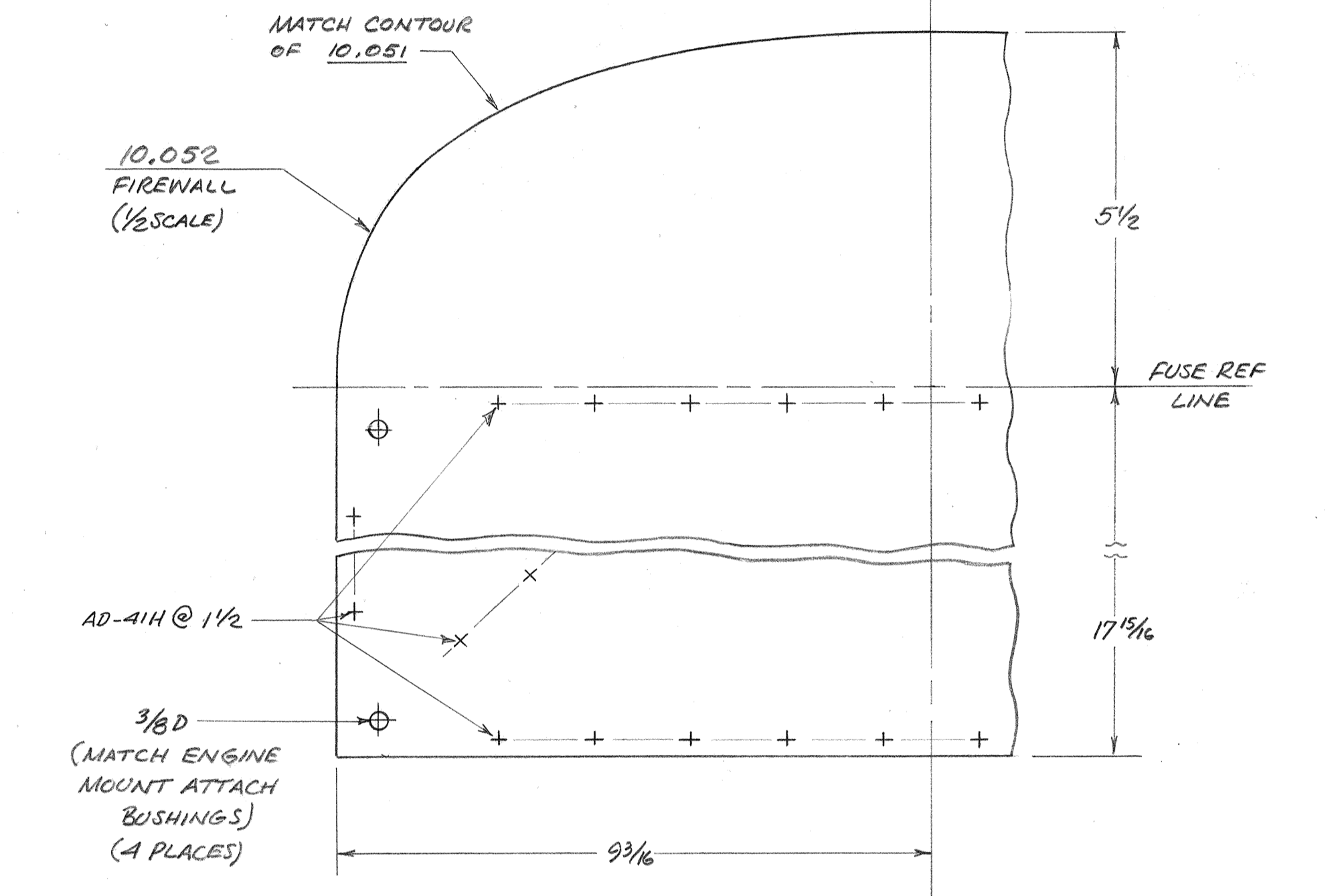
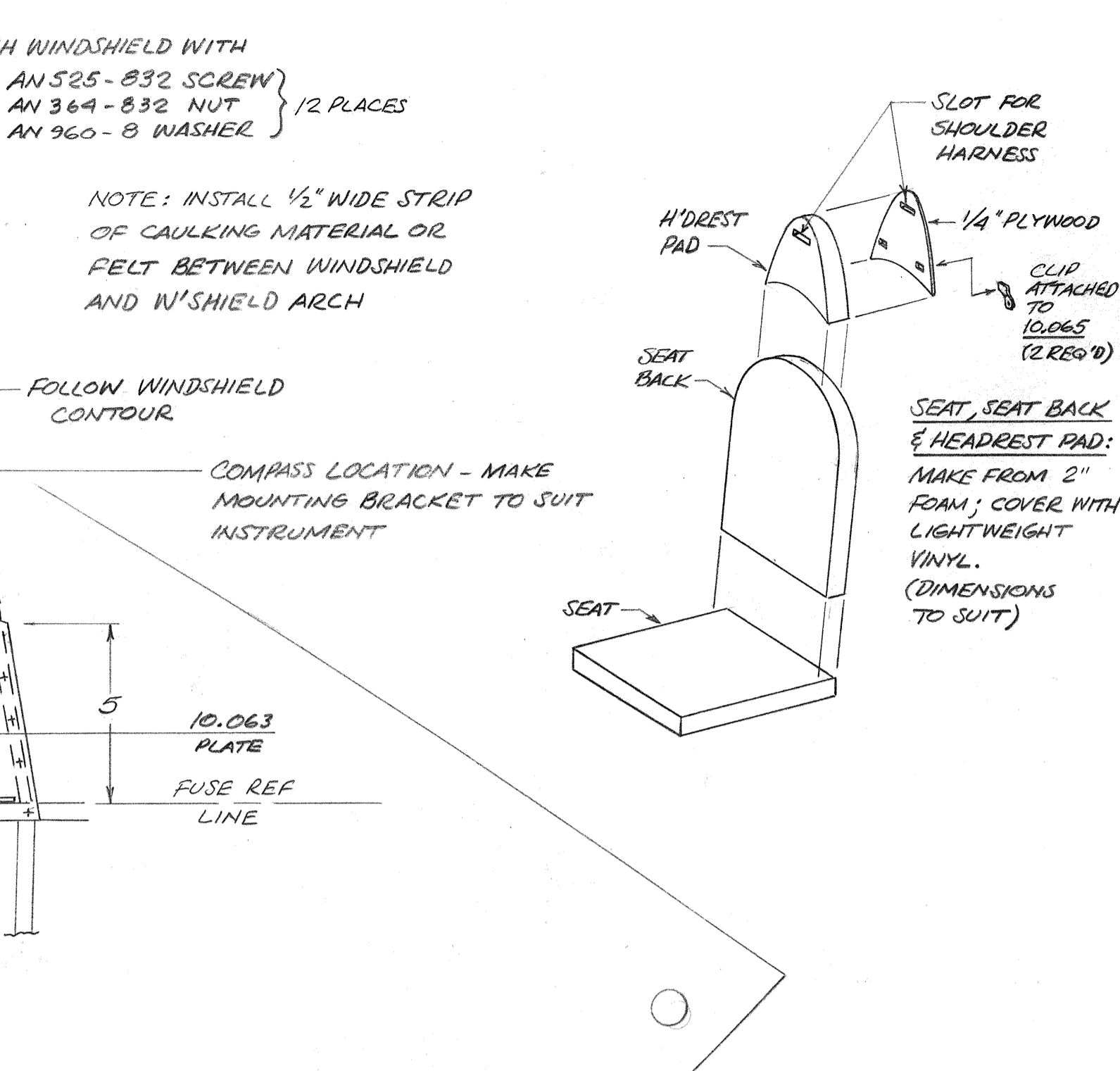
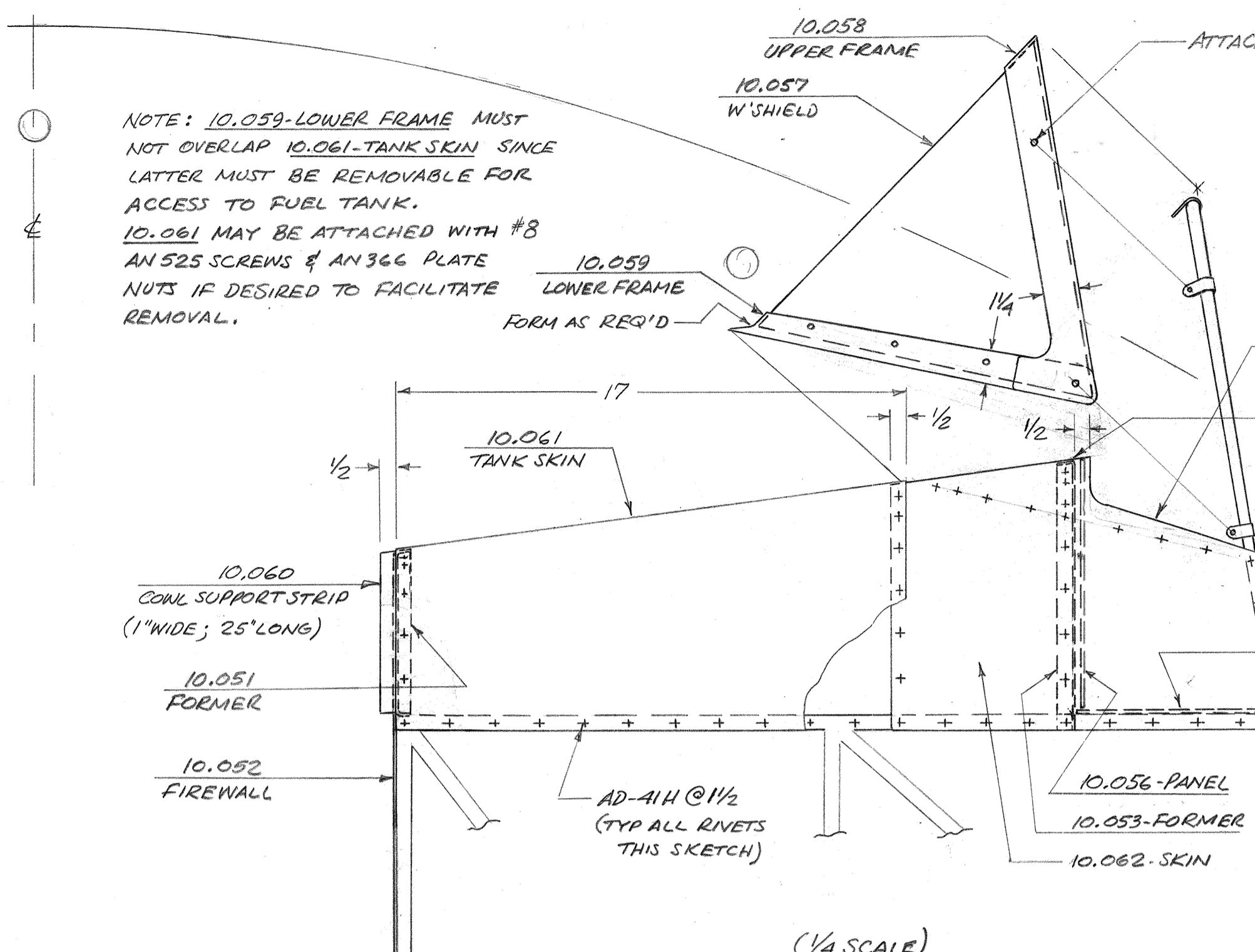
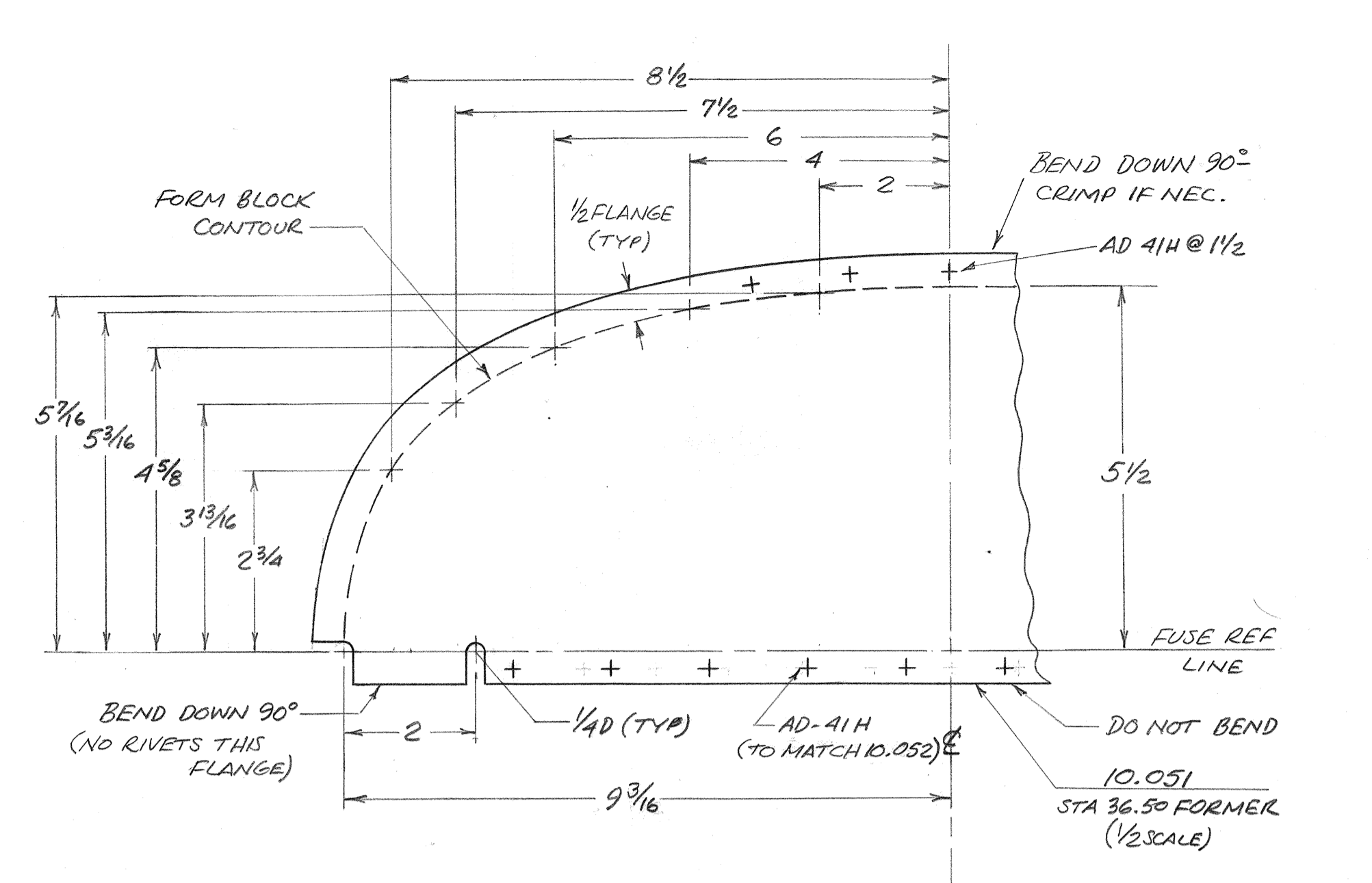
Symbol	Material	Quantity
35	1/2 x 1/2 x .035 SQUARE TUBING (4130)	80 FT
49	1/2 x 1/2 x .049 SQUARE TUBING (4130)	14 FT
35	1/2 x .035 ROUND TUBING (4130)	20 FT

**FUSELAGE TRUSS STRUCTURE**

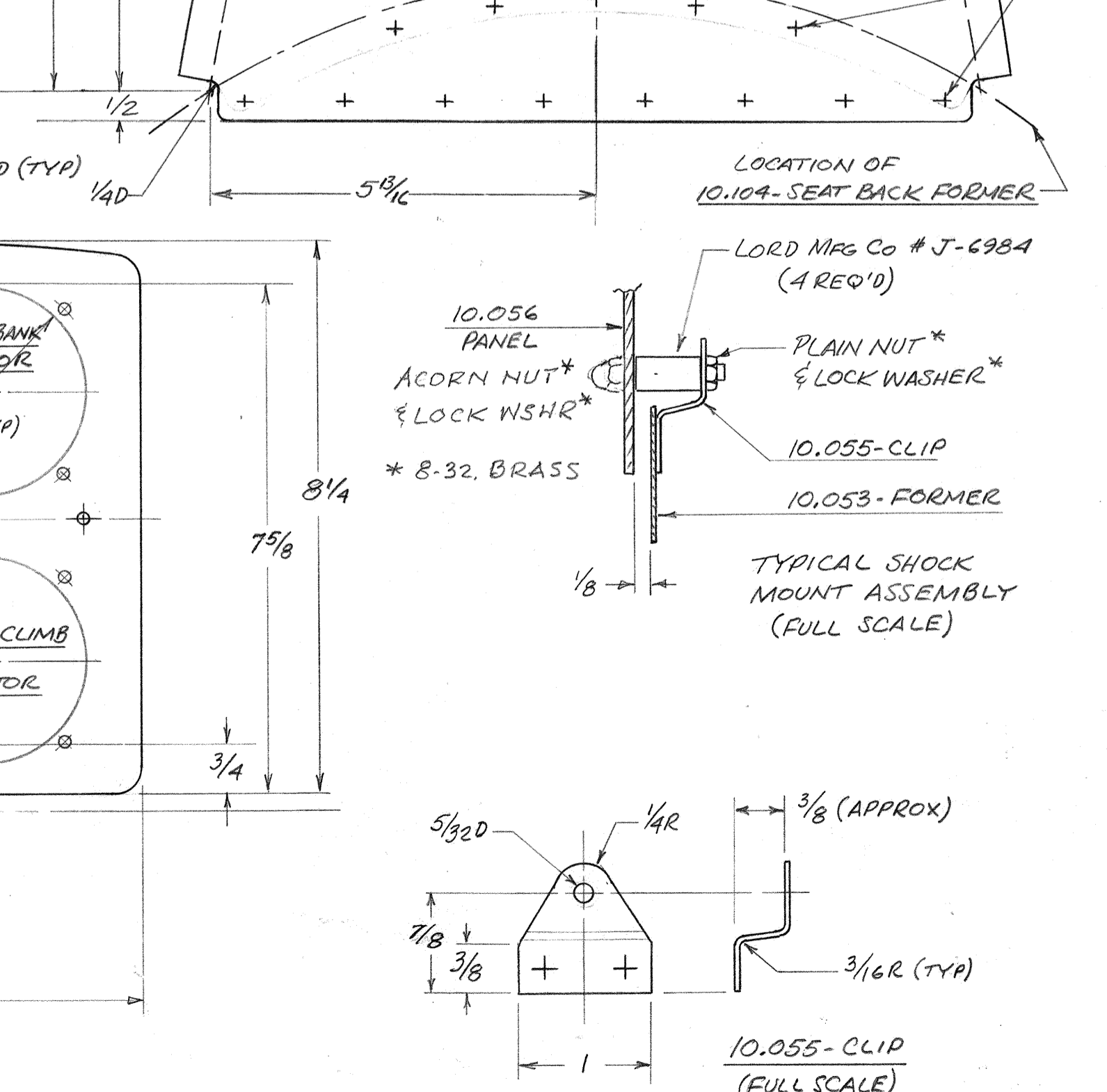
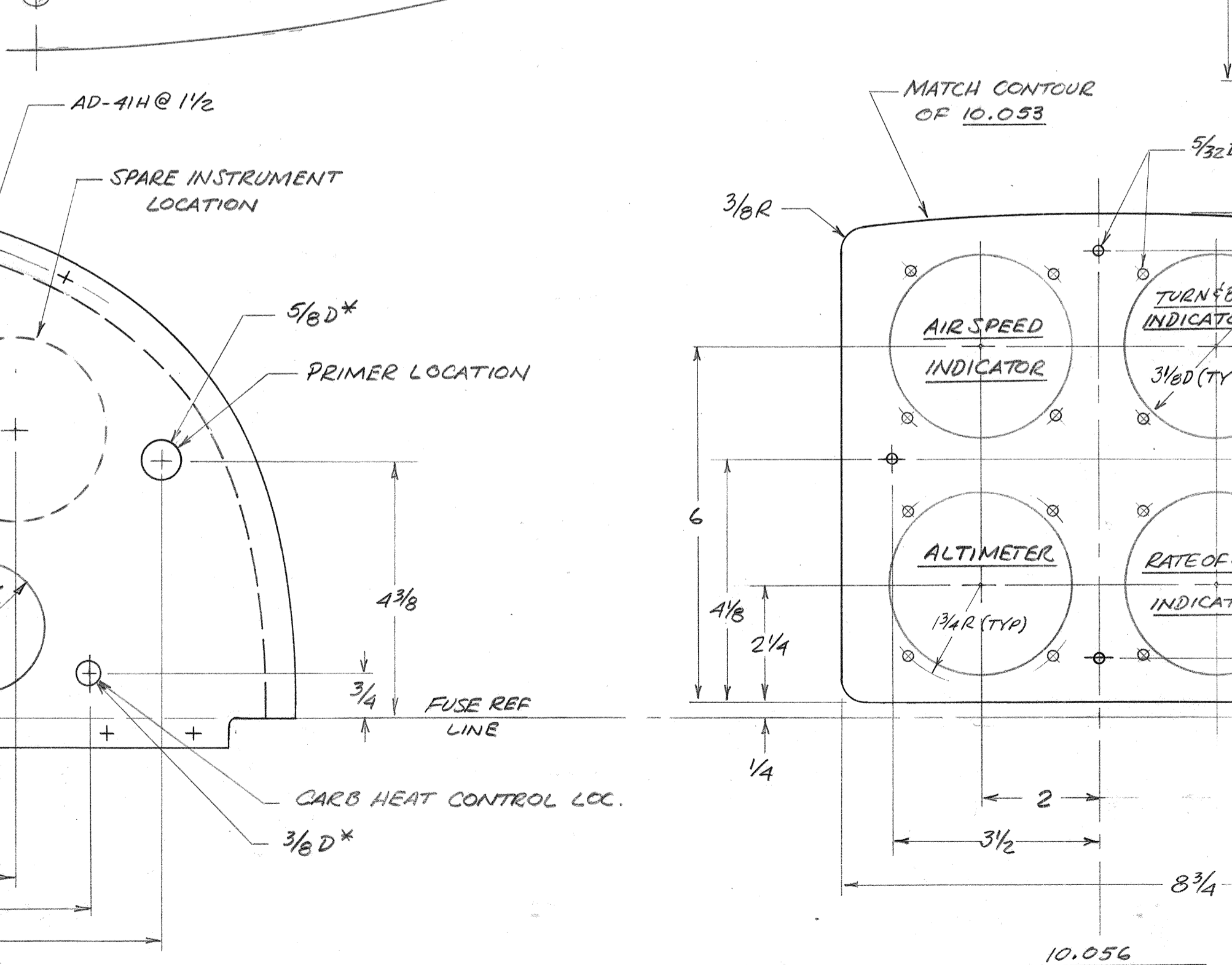
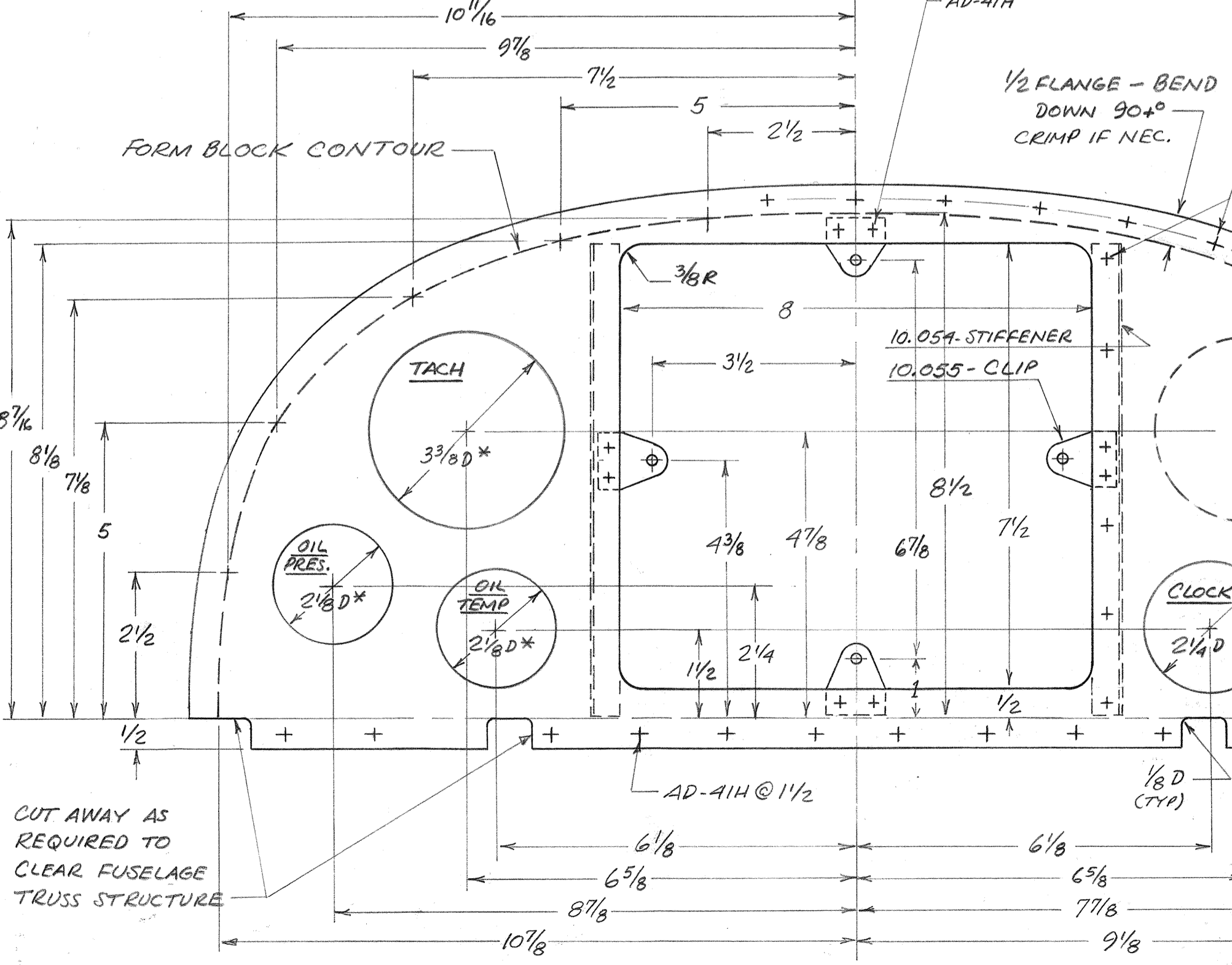
SCALE: 1/4" = NOTED  
 DATE: NOV 73  
 APPROVED BY: R.A. MacDonald  
 DRAWN BY: R.M. Mac  
 REVISED

MAC DONALD S-21

DRAWING NUMBER: S-21/10.01



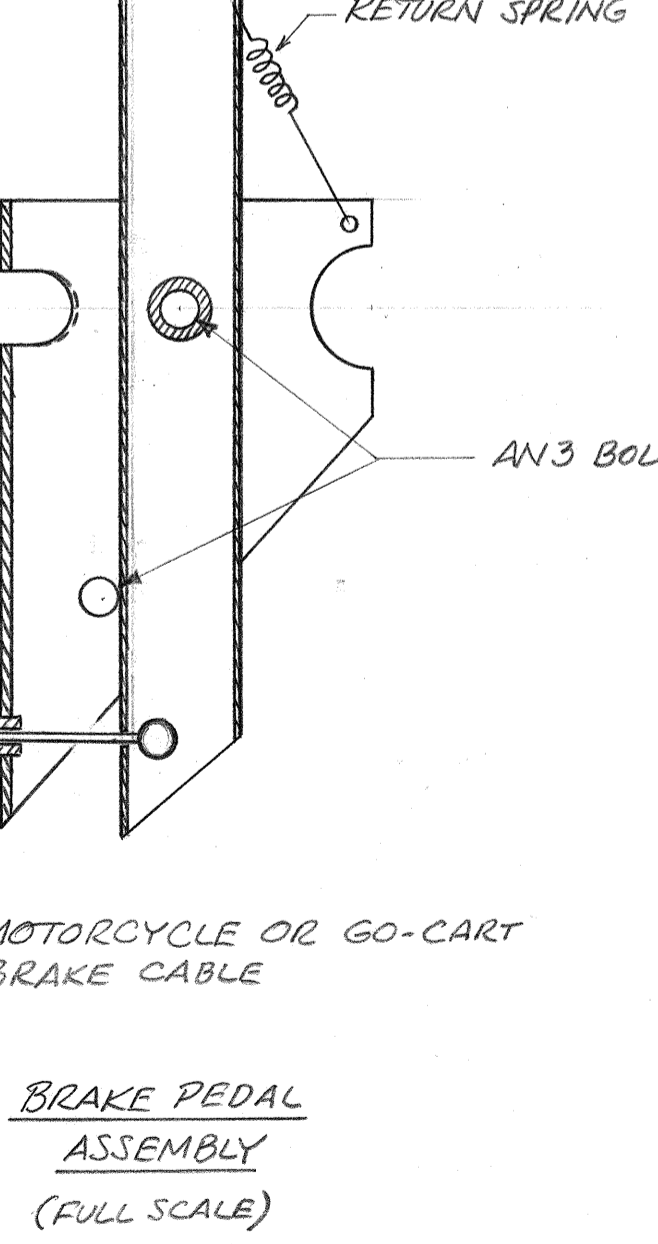
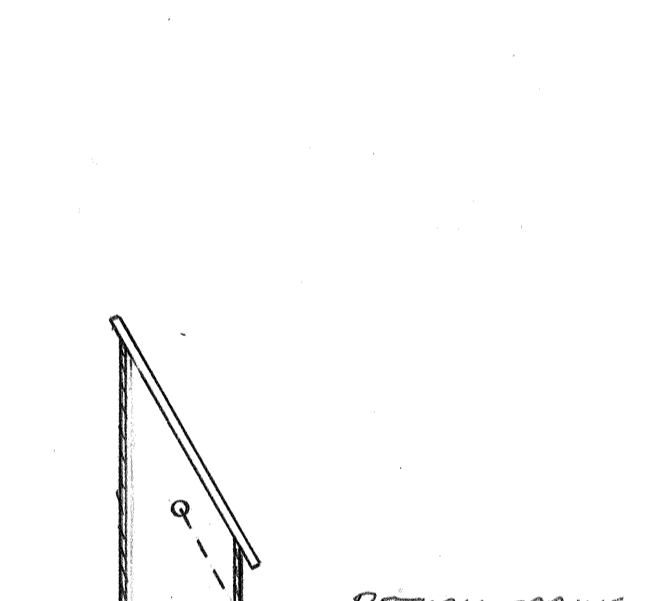
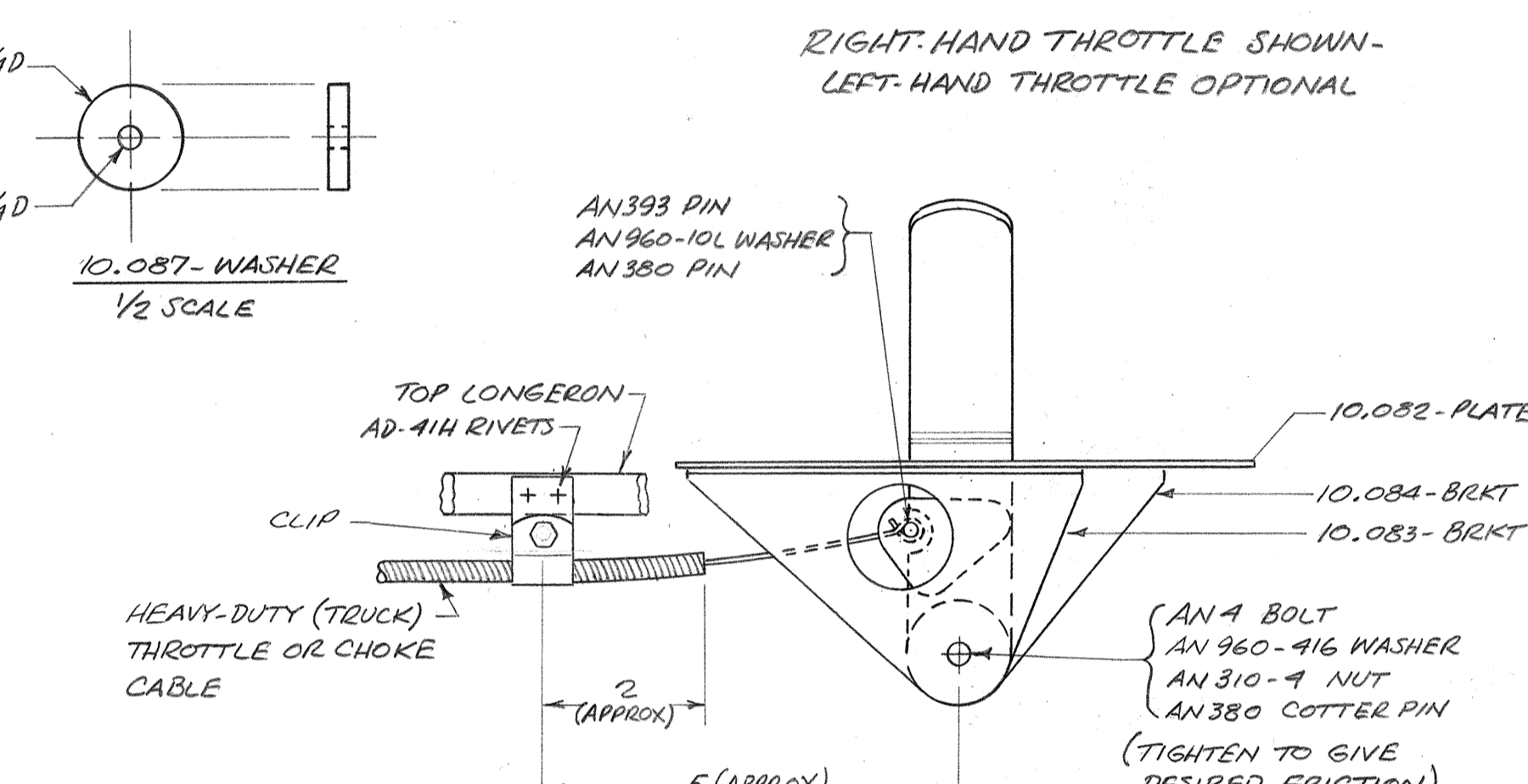
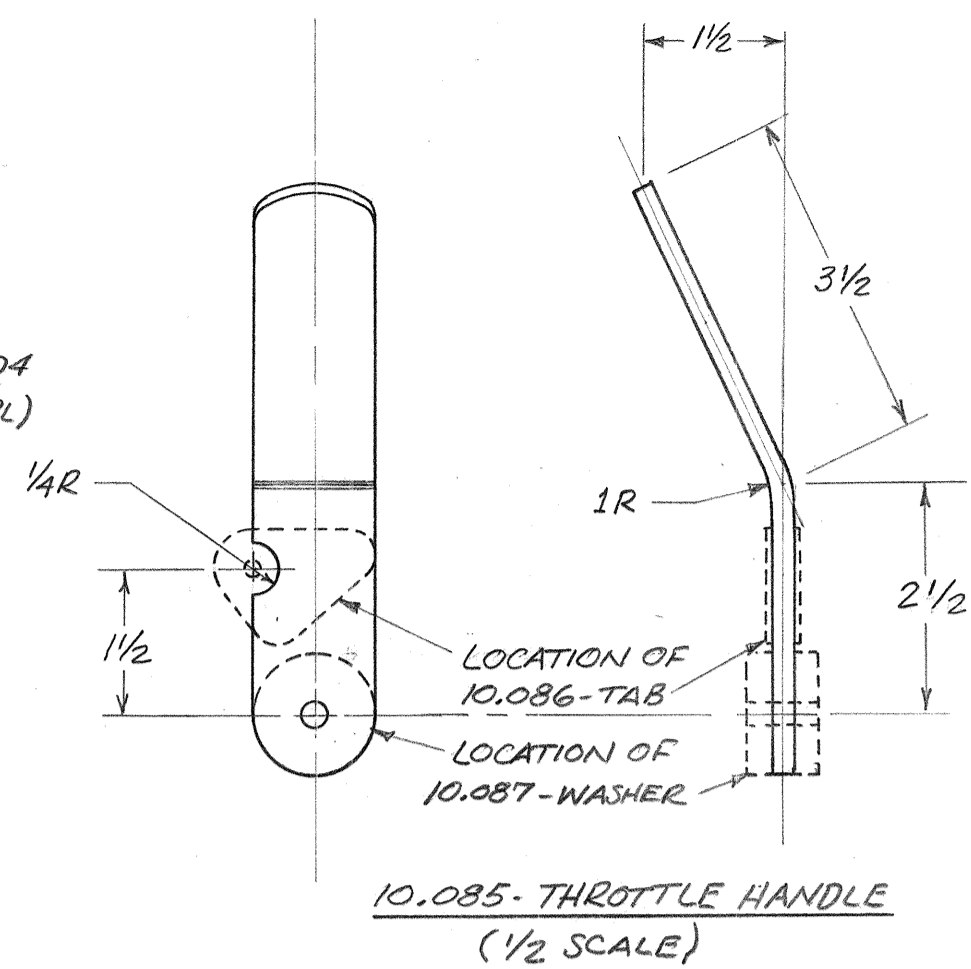
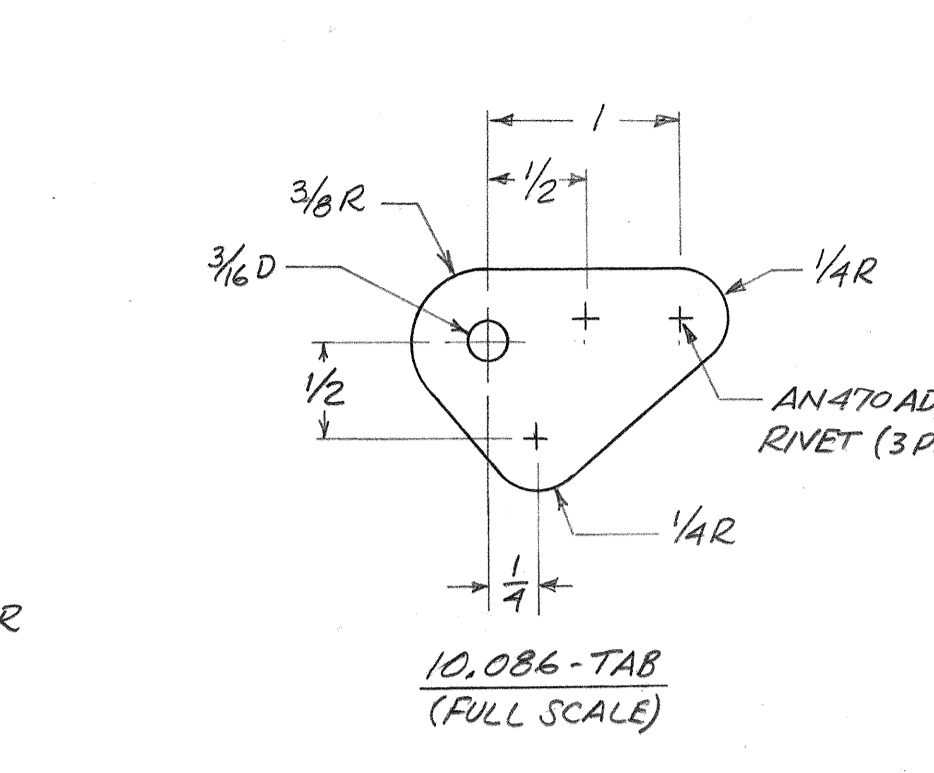
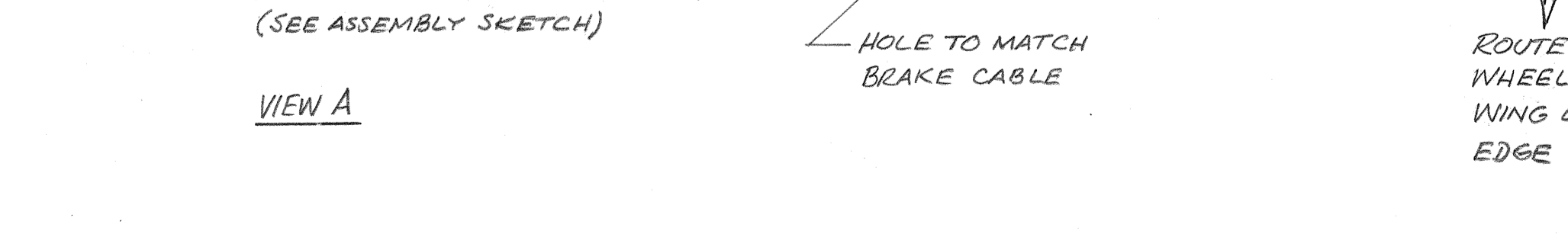
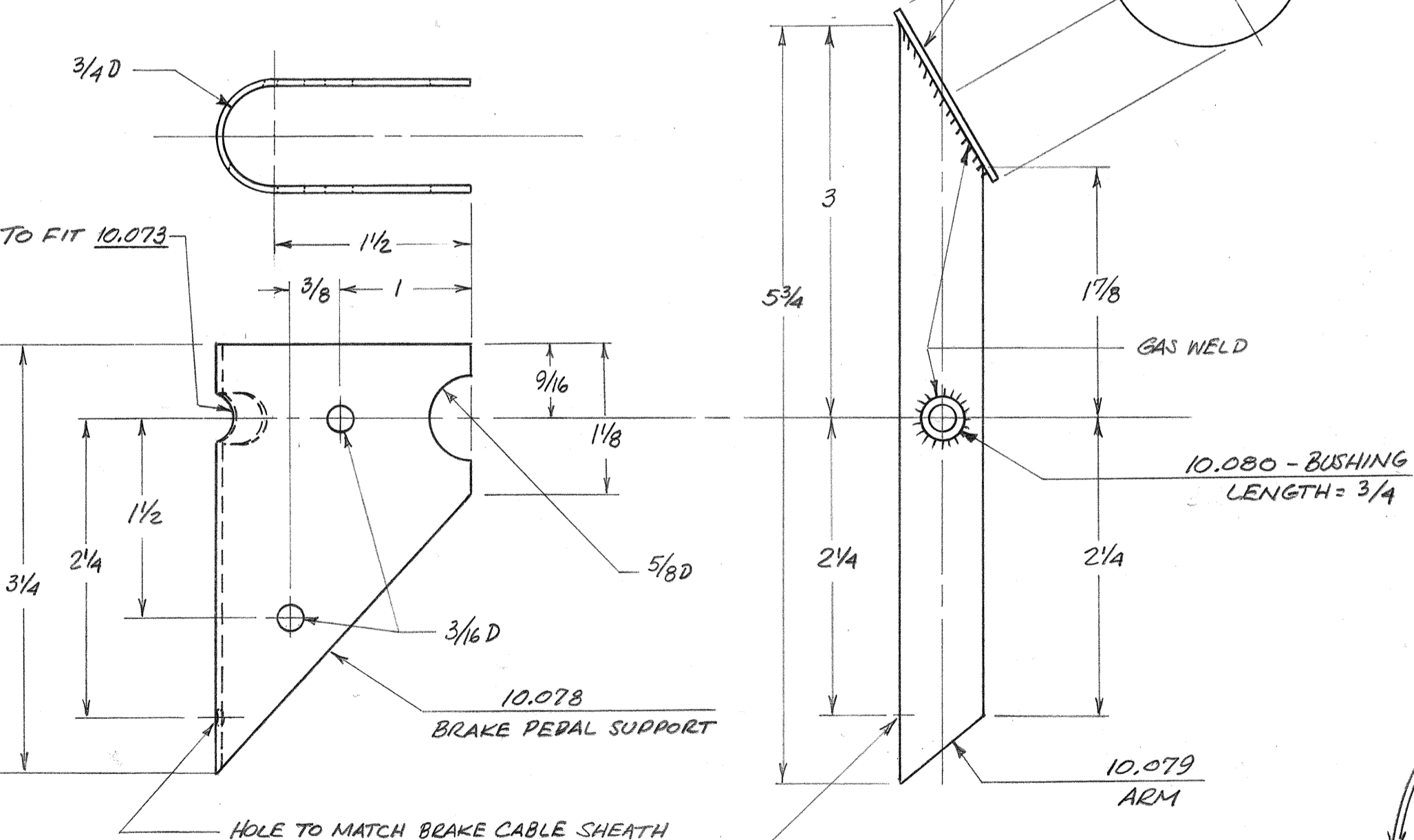
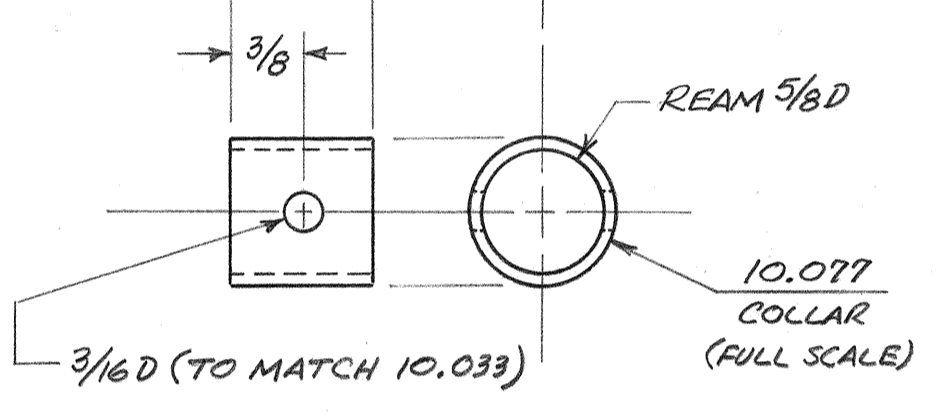
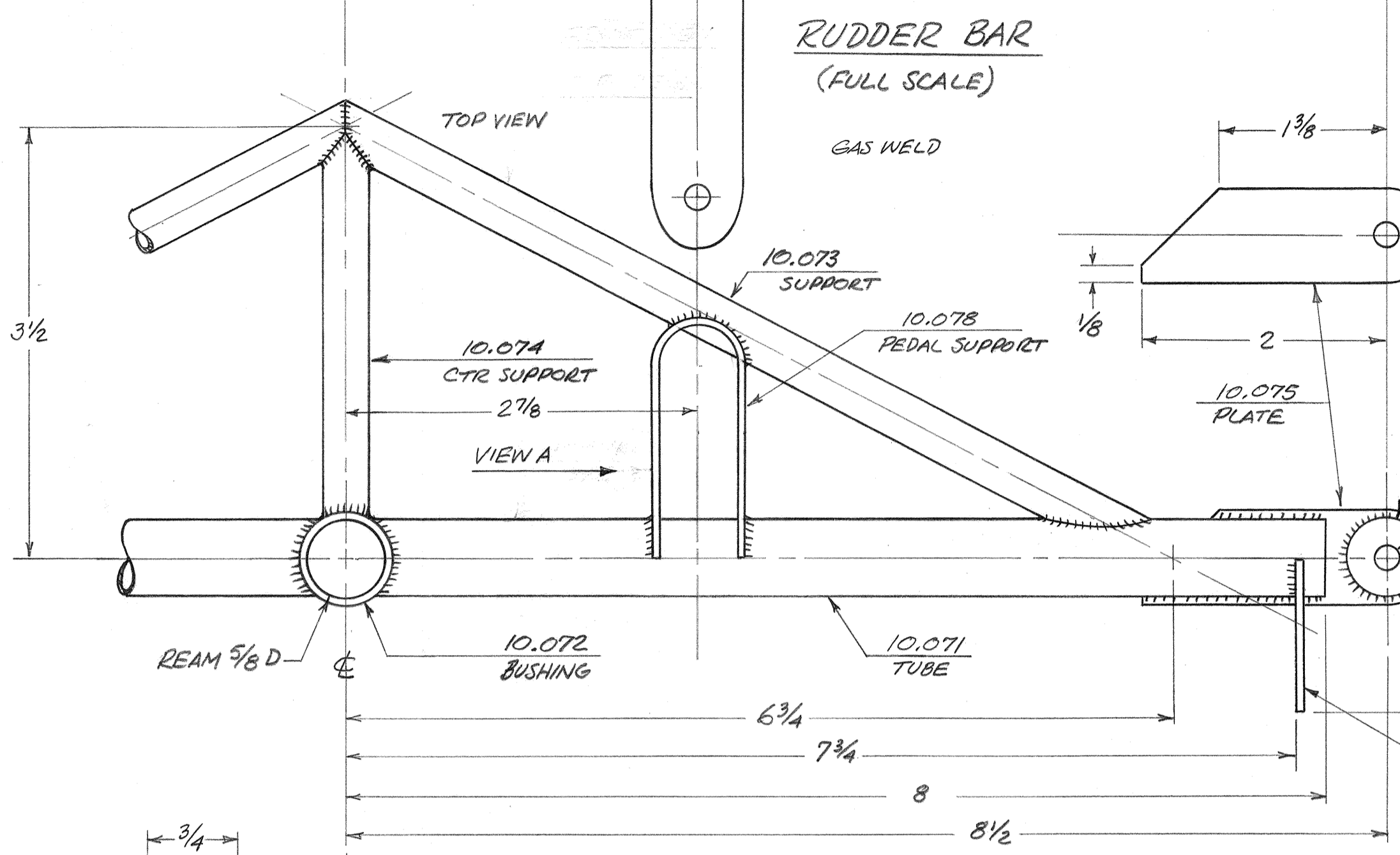
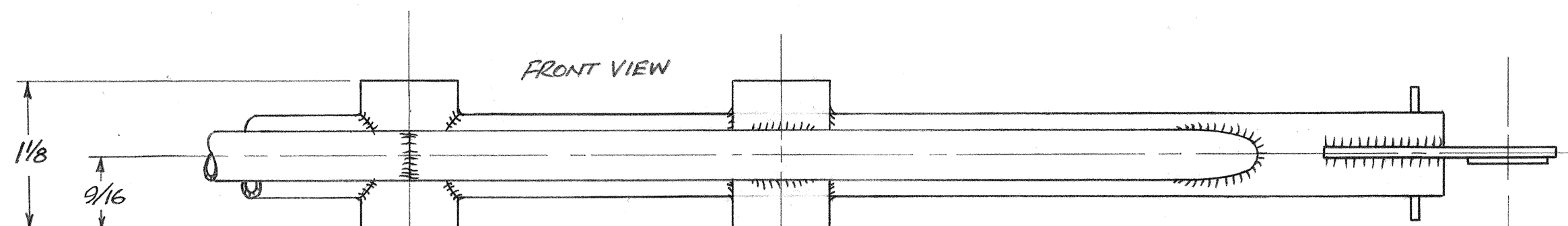
INSTRUMENT OR CONTROL	REMARKS	CARRY PRES. LINES DOWN ALONG DIAGONAL BETW. PSE STA'S 51.0 & 55.0 ON RHS. THEN OUT THRU CTR SECT L.E. DO NOT USE COCKPIT AS SOURCE OF STATIC PRES.
AIR SPEED INDICATOR	USE CERTIFIED INSTR. ONLY, RANGE 0-200 MPH REDLINE AT 162 MPH	
ALTIMETER (SENSITIVE)	USE CERTIFIED INSTR. ONLY.	
RATE OF CLIMB INDICATOR	RANGE ± 2000 FPM (2 REQ'D)	
TURN & BANK INDICATOR	USE VACUUM REGULATOR (ADJUSTED TO 2" HG PRESSURE) MOUNTED ON CROSSMEM. AT FUSE STA. 59.00	
TACHOMETER	PROTOTYPE USES SUN ELECTRIC CORP. MODEL SST-705 (0-5000 RPM) ELECTRONIC TACH WITH SUN MODEL EB-6A TRANSMITTER. MECHANICAL TACH MAY BE USED ALTERNATIVELY.	
OIL PRESSURE GAUGE	STEWART-WARNER CORP. MODEL D-360 AD (RANGE 0-80 PSI), PROTOTYPE REDLINED AT 10 PSI (MIN), 55 PSI (MAX)	
OIL TEMPERATURE GAUGE	STEWART-WARNER MODEL D-361 A (RANGE 0-270°F), PROTOTYPE REDLINED AT 220°F (MAX)	
CLOCK	STD AIRCRAFT 8-DAY MECHANICAL	
COMPASS	USE ANY SUITABLE AIRCRAFT UNIT SUCH AS AIRPATH MODEL C-2300	
PRIMER	USE STD AIRCRAFT PRIMER	
CARB HEAT CONTROL	USE AUTOMOTIVE CHOKE CONTROL CABLE	



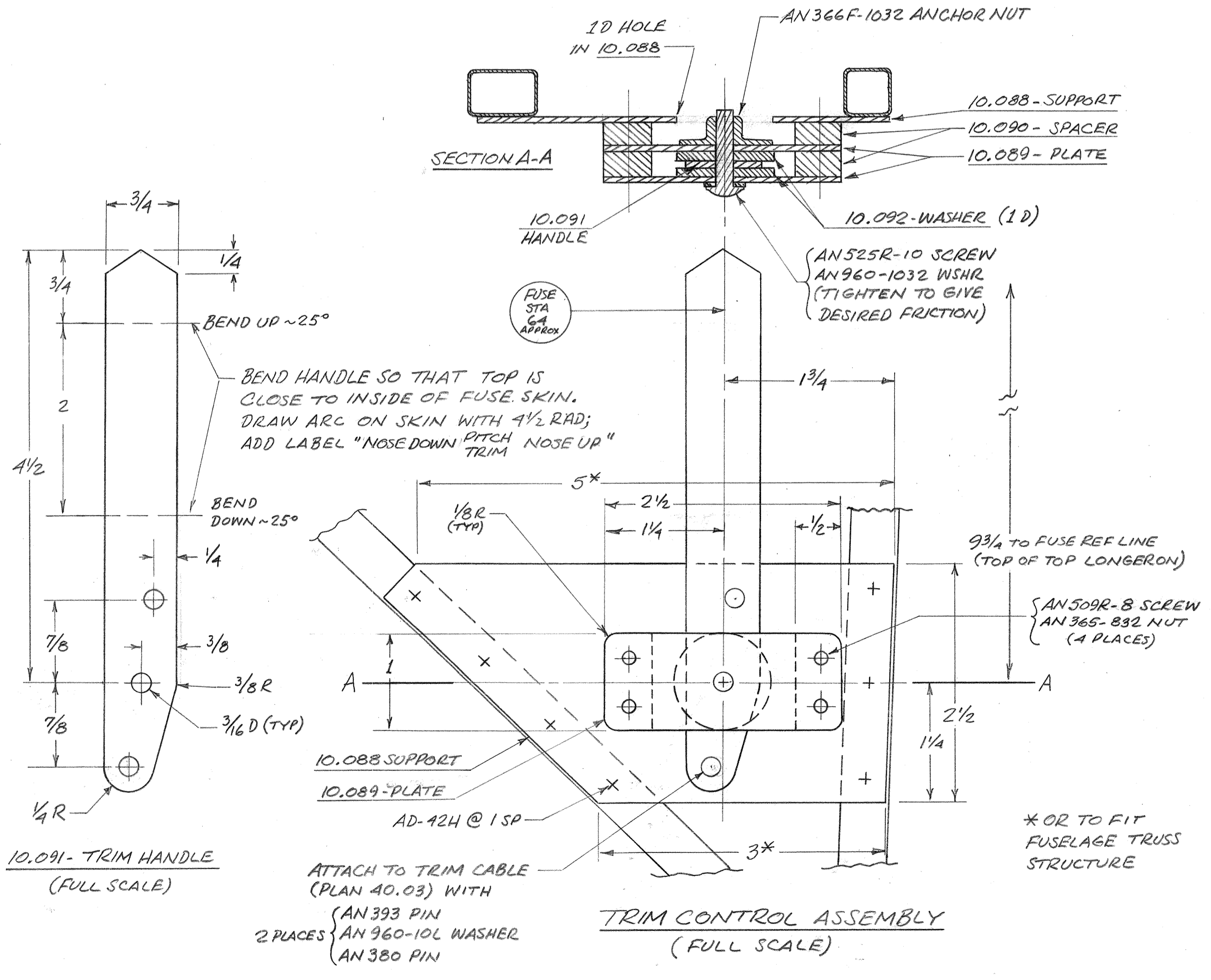
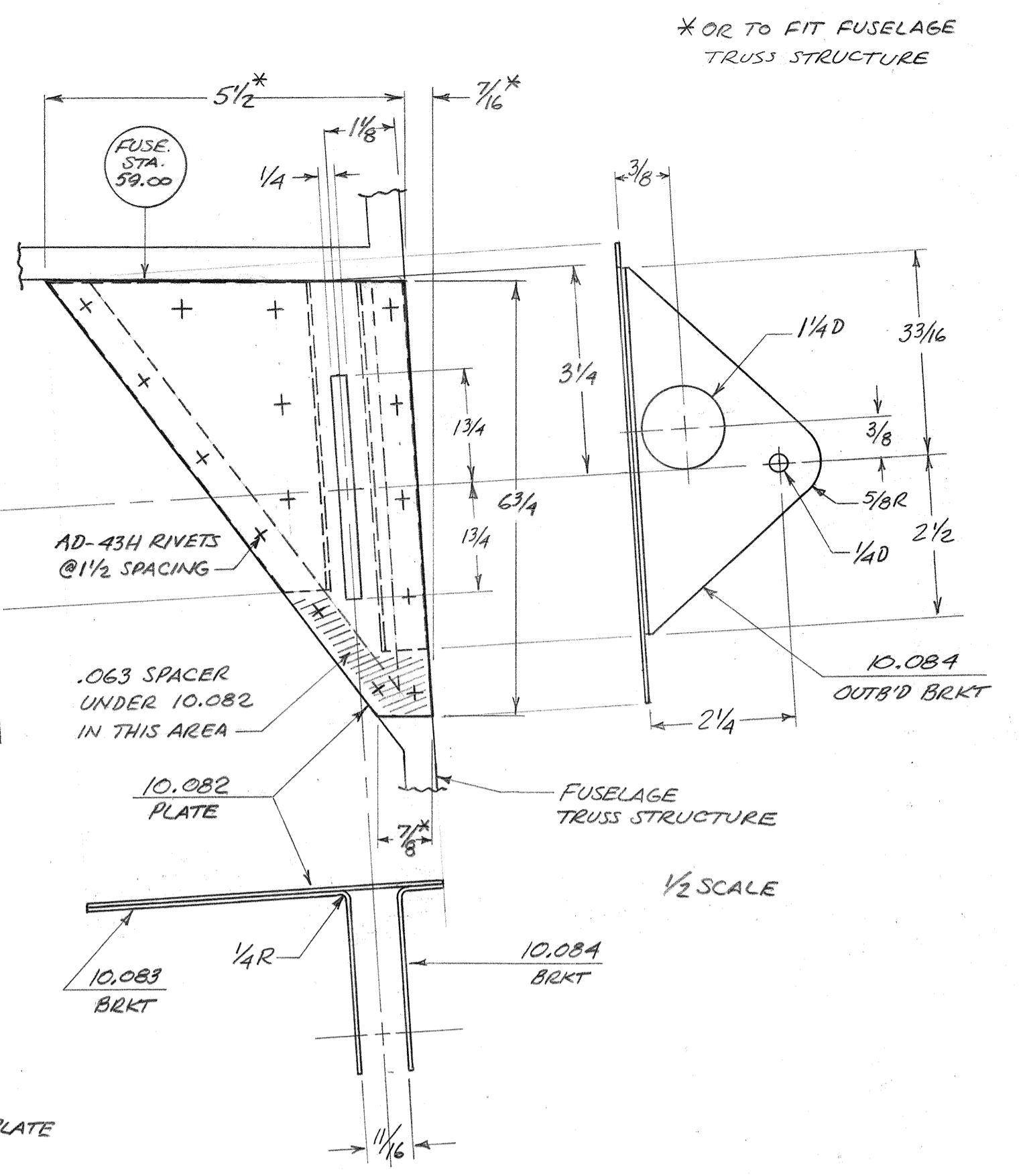
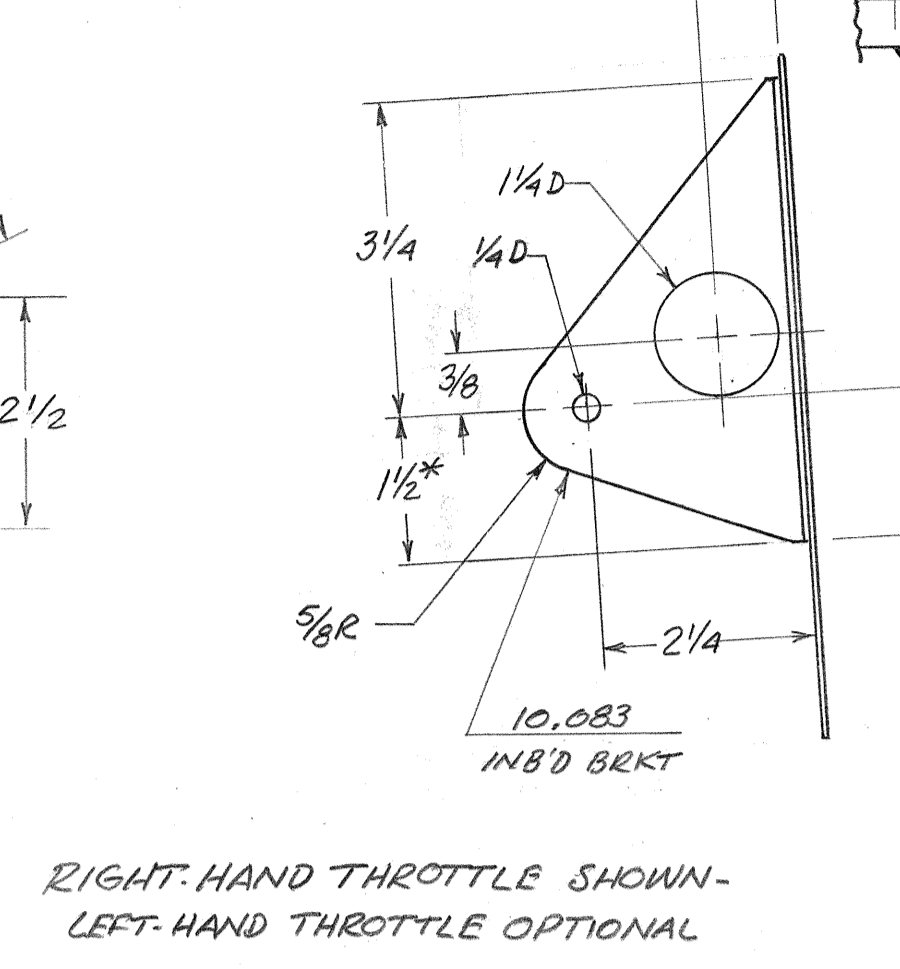
PART NO.	NO. PER ACFT	PART NAME	MATERIAL
10.065	1	HEADREST FORMER	2024-T3 SHEET .020 THK
10.064	1	VENTURI ATTACHMENT DOUBLER PLATE	2024-T3 SHEET .040 THK
10.063	1	MAGNETO SWITCH MOUNTING PLATE	2024-T3 SHEET .040 THK
10.062	1	INSTRUMENT BAY SKIN	2024-T3 SHEET .020 THK
10.061	1	FUEL TANK SKIN	2024-T3 SHEET .020 THK
10.060	1	COWL SUPPORT STRIP	2024-T3 SHEET .020 THK
10.059	1	LOWER WINDSHIELD FRAME	SOFT ALUMINUM .020 THK
10.058	1	UPPER WINDSHIELD FRAME	SOFT ALUMINUM .020 THK
10.057	1	WINDSHIELD	PLEXIGLAS 3/32 THK
10.056	1	SHOCK MOUNTED PANEL	2024-T3 SHEET .063 THK
10.055	4	SHOCK PANEL MOUNTING CLIP	2024-T3 SHEET .040 THK
10.054	2	PANEL STIFFENER	2024-T3 SHEET .040 THK
10.053	1	PANEL FORMER STA 59.00	2024-T3 SHEET .040 THK
10.052	1	FIREWALL	STAINLESS OR GALVANIZED STEEL; .020 OR .025 THK
10.051	1	FORMER, STA 36.50	2024-T3 SHEET .020 THK

NOTE: THIS LAYOUT USED WHEN THROTTLE IS INSTALLED FOR RIGHT HAND OPERATION. IF L.H. THROTTLE IS INSTALLED, REVERSE ALL INSTRUMENT AND CONTROL LOCATIONS ON 10.053

PANEL, WINDSHIELD, FIREWALL, SKINS  
 SCALE: AS NOTED  
 DATE: 12/73  
 APPROVED BY: R Mac Donald  
 DRAWN BY: R Mac  
 REVISED  
 MAC DONALD S-21  
 DRAWING NUMBER: 10.02

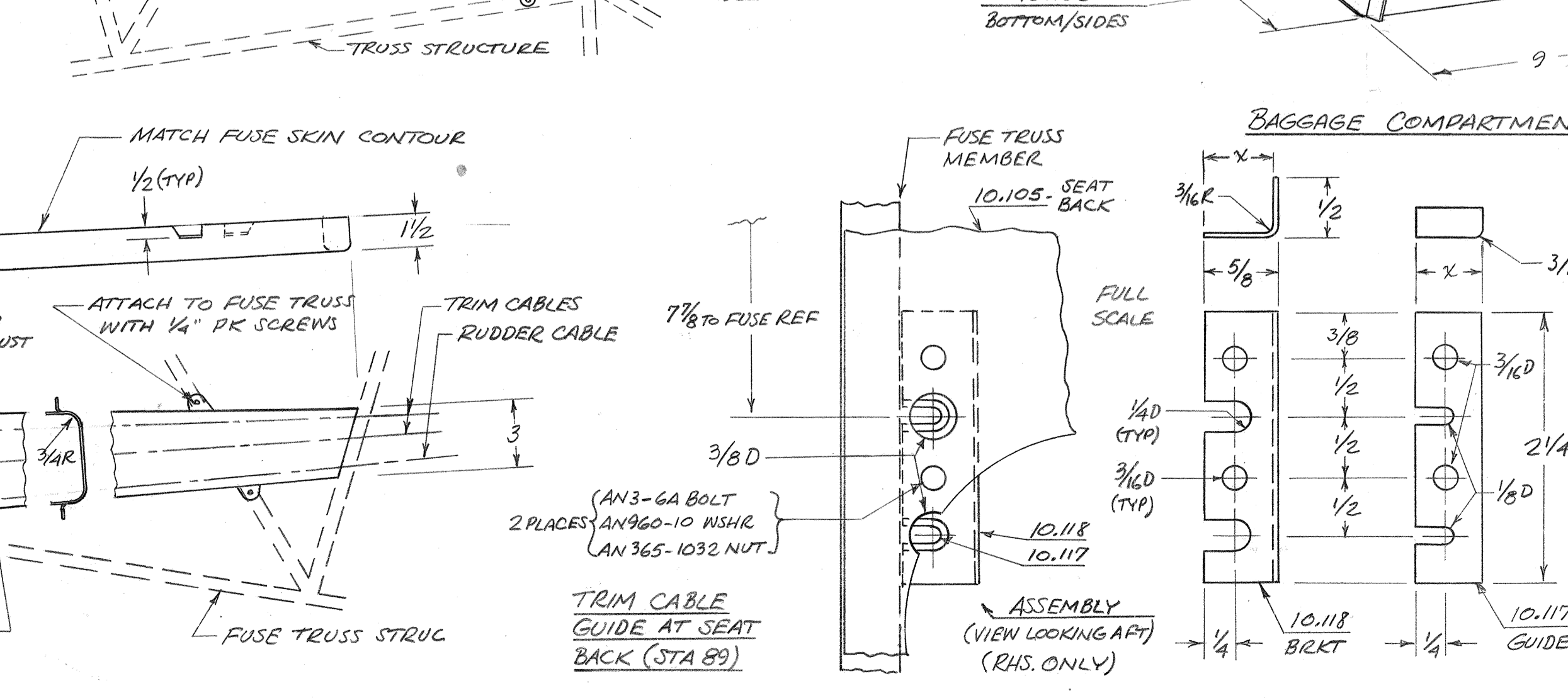
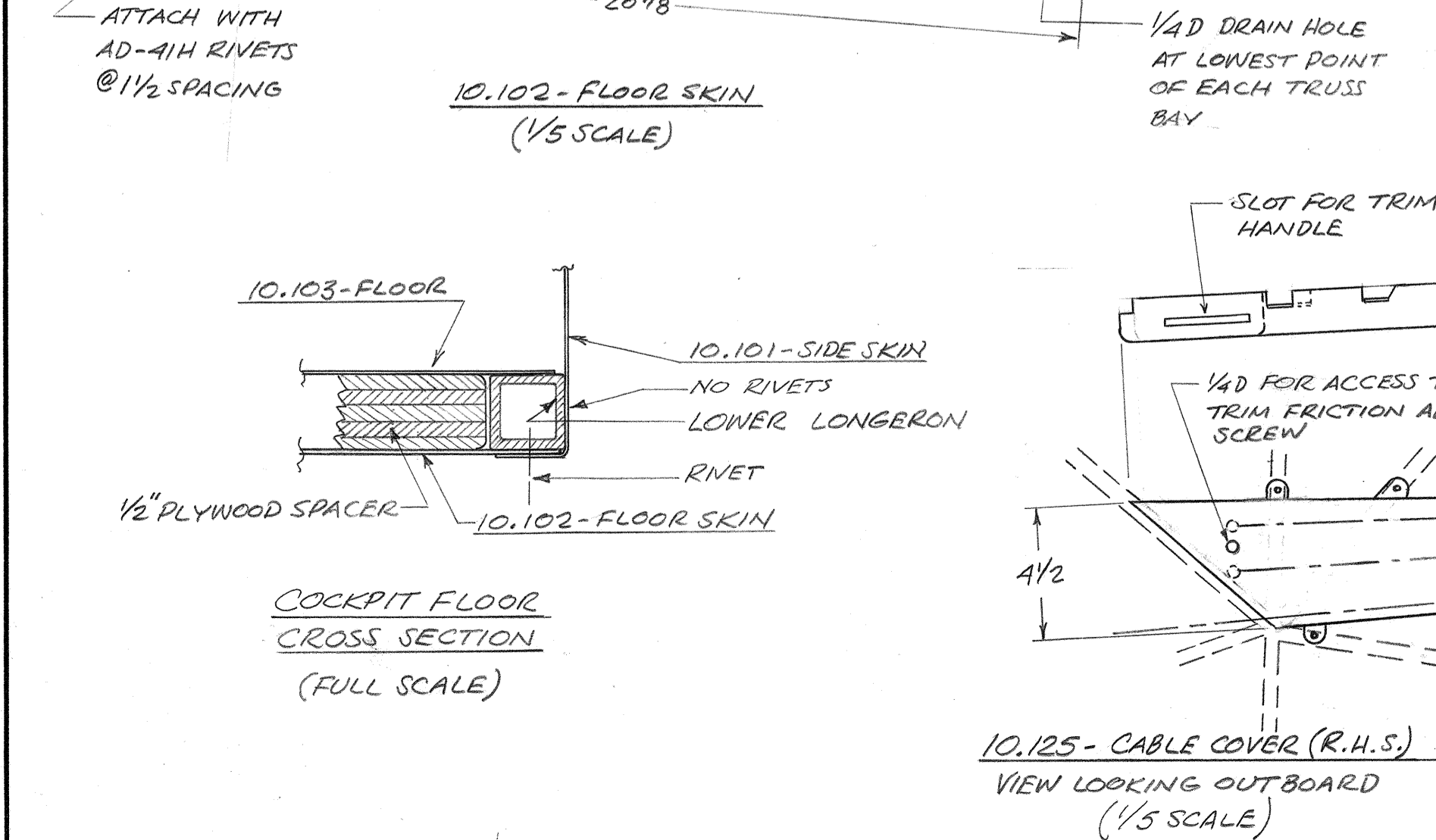
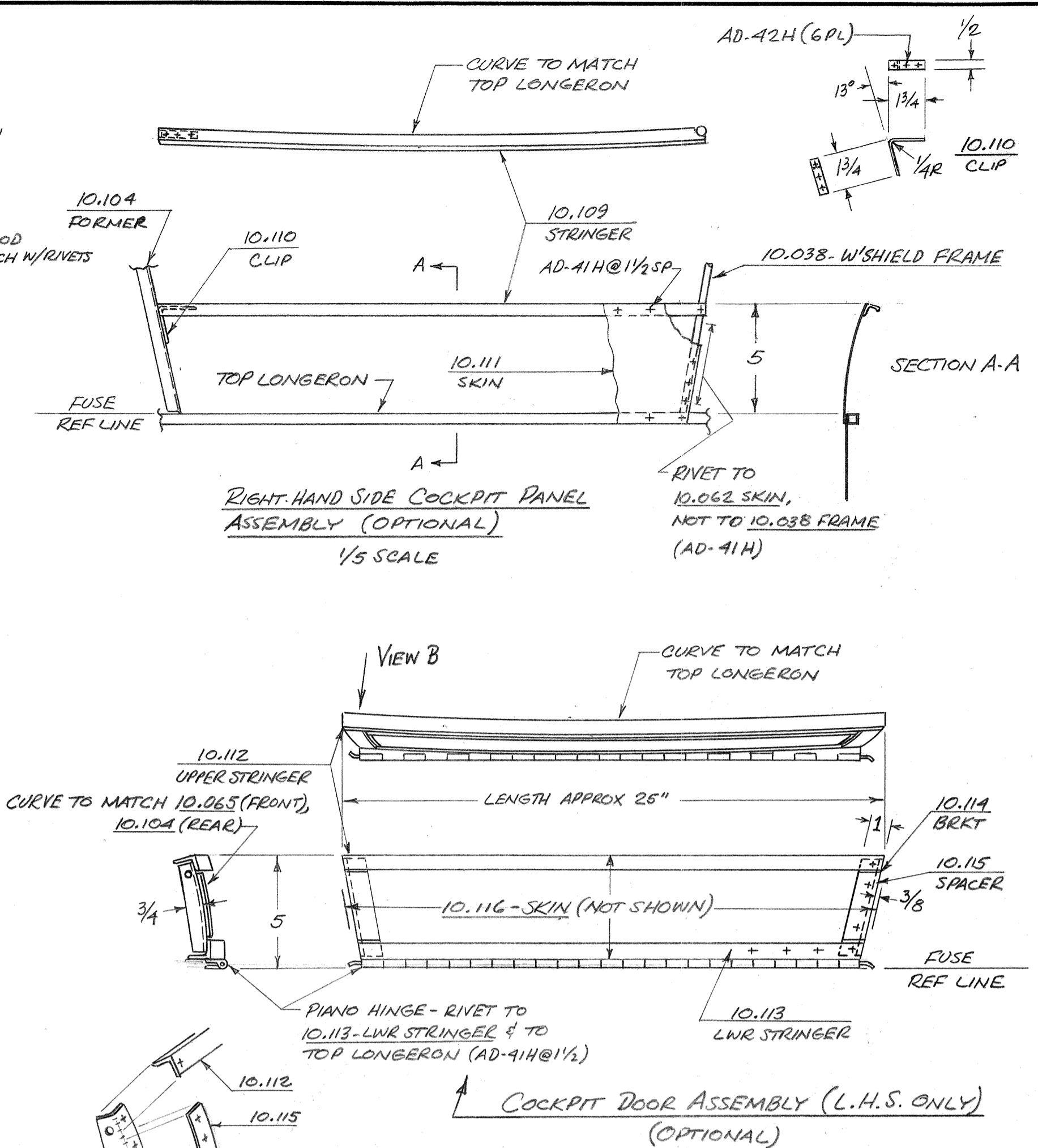
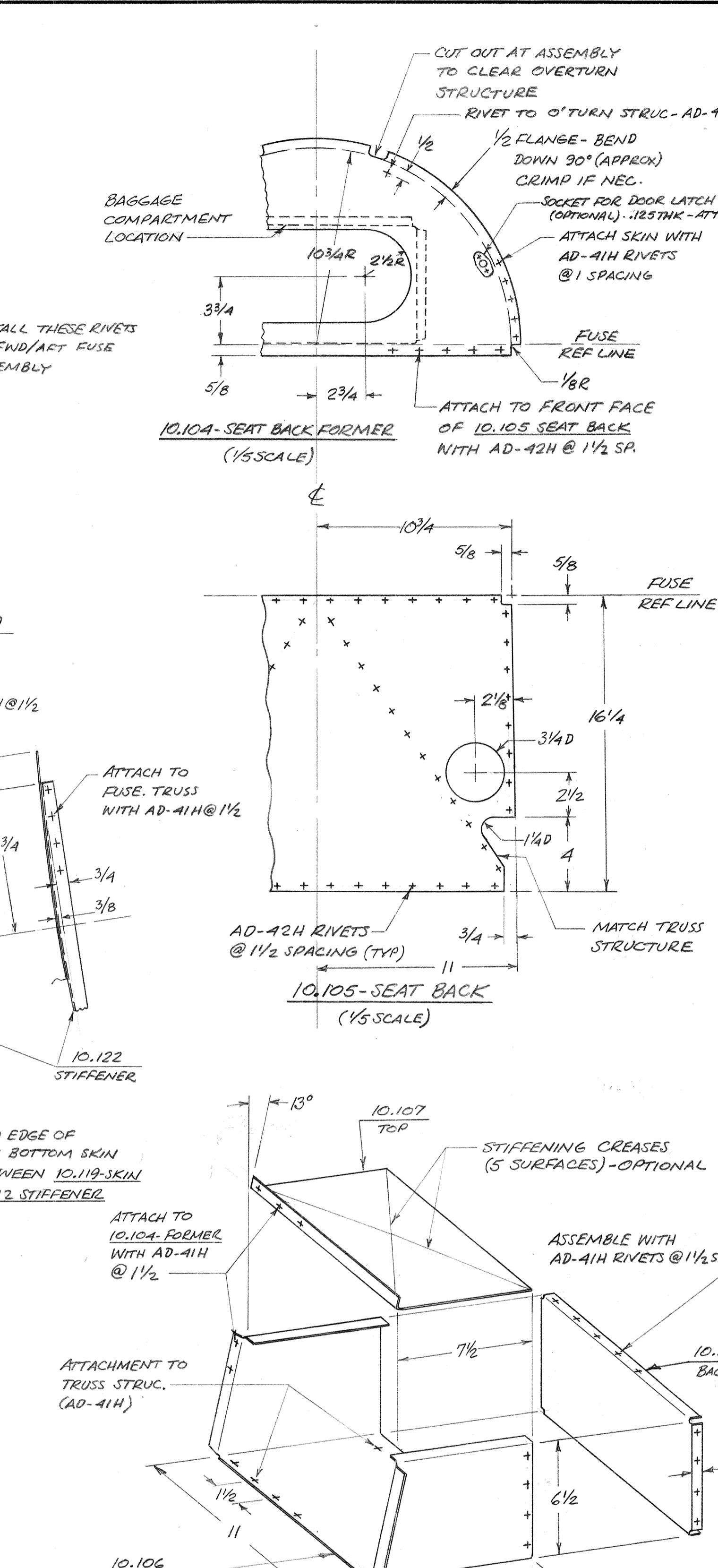
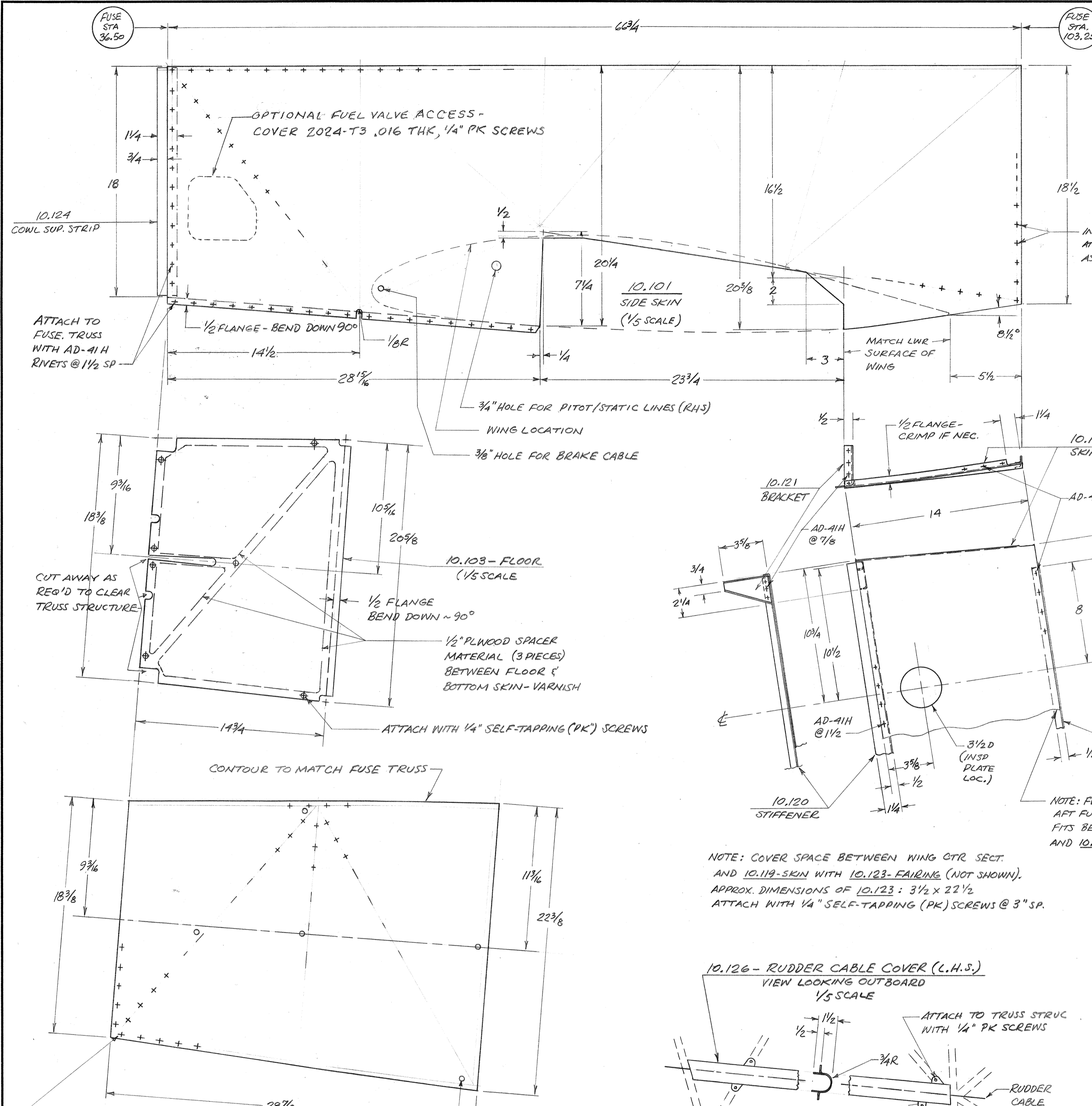


NOTE: THROTTLE "OPEN" STOP MUST BE AT THROTTLE HANDLE (TO PREVENT BUCKLING OF THROTTLE WIRE); THROTTLE "CLOSE" STOP MUST BE AT CARBURETOR.



PART NO.	QTY	PART NAME	MATERIAL
10.092	2	TRIM CONTROL FRICTION WASHER	PHENOLIC OR FIBER 3/32 THK
10.091	1	TRIM CONTROL HANDLE	2024-T3 SHEET .063 THK
10.090	4	TRIM CONTROL SPACER	PHENOLIC OR ALUM. 1/4 THK
10.089	2	TRIM CONTROL PLATE	2024-T3 SHEET .063 THK
10.088	1	TRIM CONTROL SUPPORT	2024-T3 SHEET .063 THK
10.087	2	THROTTLE FRICTION WASHERS	PHENOLIC OR FIBER 1/4 THK
10.086	2	THROTTLE TAB	2024-T3 SHEET .063 THK
10.085	1	THROTTLE HANDLE	2024-T3 SHEET 3/16 THK
10.084	1	OUTBOARD THROTTLE BRACKET	2024-T3 SHEET .063 THK
10.083	1	INBOARD THROTTLE BRACKET	2024-T3 SHEET .063 THK
10.082	1	THROTTLE MOUNTING PLATE	2024-T3 SHEET .063 THK
10.081	2	BRAKE PEDAL FOOT PAD	STEEL SHEET .063 THK
10.080	2	BRAKE PEDAL BUSHING	MILD TUBE 5/16 OD x 3/16 ID
10.079	2	BRAKE PEDAL ARM	4130 STEEL TUBE 5/8 x .035
10.078	2	BRAKE PEDAL SUPPORT	4130 STEEL SHEET .063 THK
10.077	1	RUDDER BAR RETAINING COLLAR	4130 STEEL TUBE 3/4 x .065
10.076	2	RUDDER BAR FOOT STOP	4130 STEEL SHEET .063 THK
10.075	2	RUDDER BAR CABLE ATTACH PLATE	4130 STEEL SHEET .063 THK
10.074	1	RUDDER BAR CENTER SUPPORT	4130 STEEL TUBE 3/8 x .035
10.073	2	RUDDER BAR SUPPORT	4130 STEEL TUBE 3/8 x .035
10.072	1	RUDDER BAR BUSHING	4130 STEEL TUBE 3/4 x .065
10.071	2	RUDDER BAR TUBE	4130 STEEL TUBE 5/8 x .035

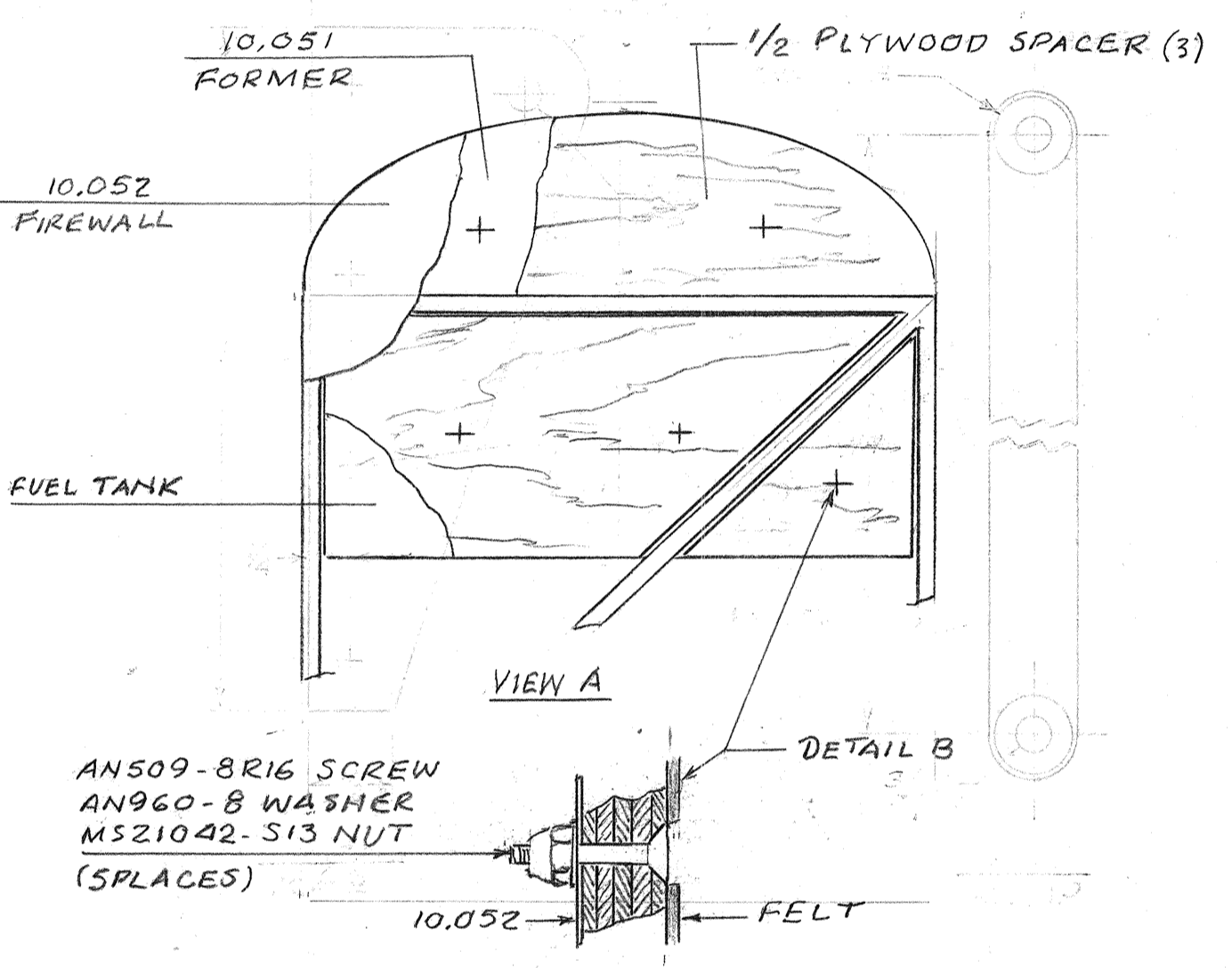
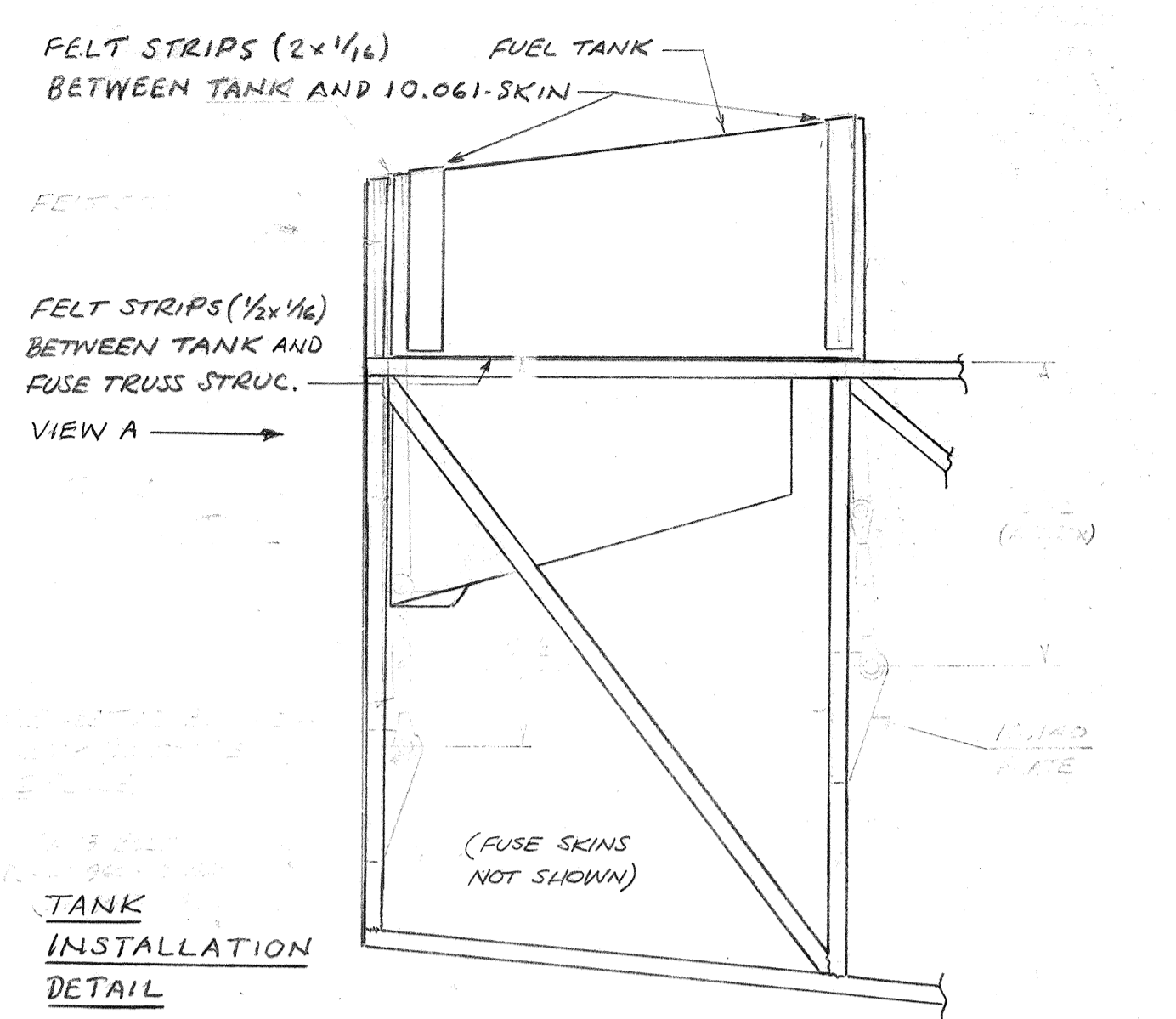
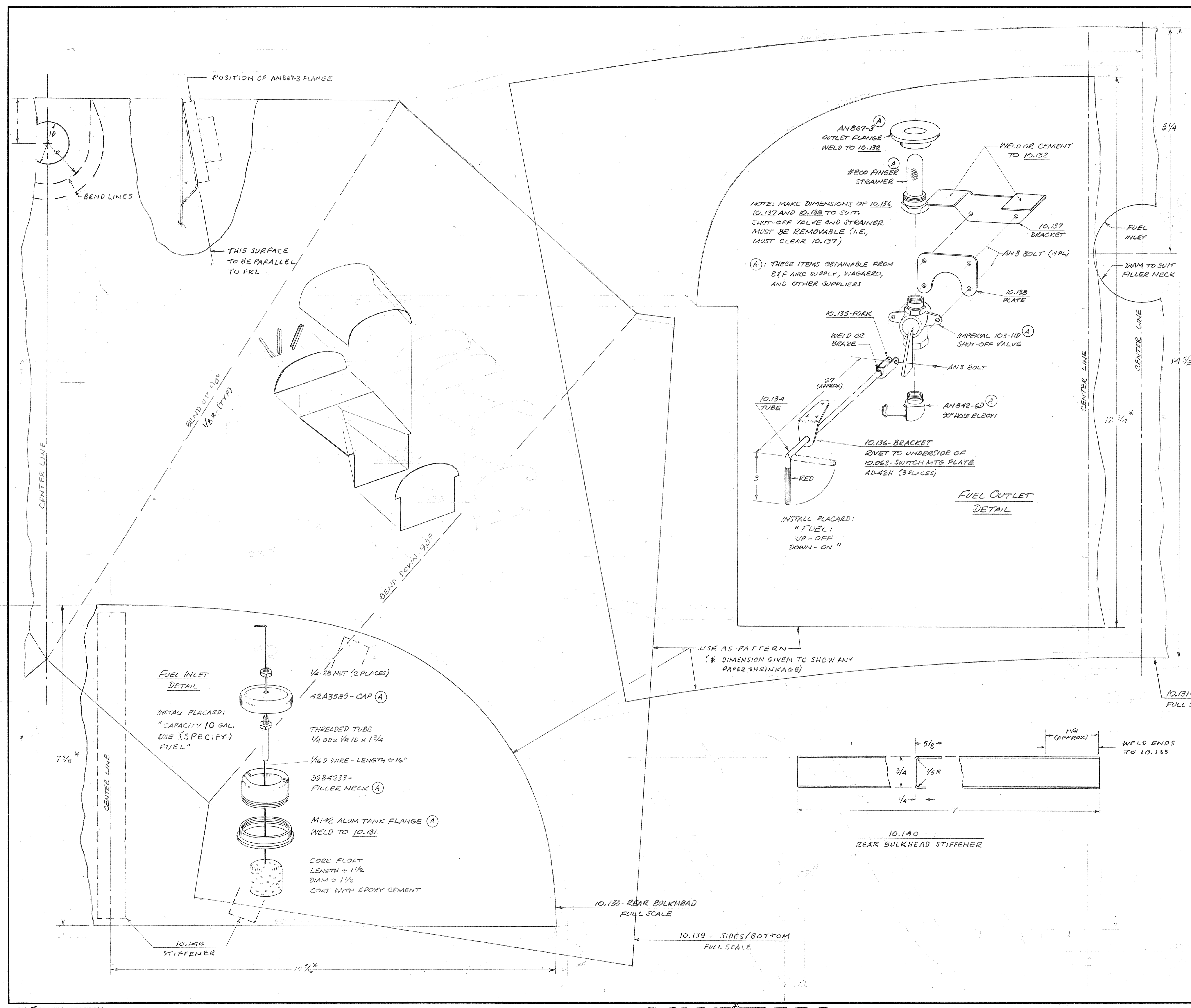
SCALE: AS NOTED		APPROVED BY:	DRAWN BY:
DATE: JAN 74		RA Mac Donald	R Mac D
			REVISION
<b>MAC DONALD S-21</b>			
			DRAWING NUMBER
			10.03



PART NO.	QUANTITY	PART NAME	MATERIAL
10.116	1	DOOR SKIN	2024-T3 SHEET .020 THK
10.115	2	DOOR SPACER	2024-T3 SHEET .040 THK
10.114	2	DOOR END BRACKET	2024-T3 SHEET .040 THK
10.113	1	LOWER DOOR STRINGER	2024 OR EXTR ANGLE 6061-T6 3/4x3/8x.040
10.112	1	UPPER DOOR STRINGER	2024 OR EXTR ANGLE 6061-T6 3/4x3/8x.040
10.111	1	RHS COCKPIT PANEL SKIN	2024-T3 SHEET .020 THK
10.110	1	RHS COCKPIT PANEL CLIP	2024-T3 SHEET .063 THK
10.109	1	RHS COCKPIT PANEL STRINGER	2024 OR EXTR ANGLE 6061-T6 3/4x3/8x.040
10.108	1	BAG. COMP. BACK	2024-T3 SHEET .016 THK
10.107	1	BAG. COMP. TOP	2024-T3 SHEET .016 THK
10.106	1	BAG. COMP. BOTTOM SIDES	2024-T3 SHEET .016 THK
10.105	1	SEAT BACK	2024-T3 SHEET .040 THK
10.104	1	SEAT BACK FORMER (STA 89)	2024-T3 SHEET .020 THK
10.103	1	COCKPIT FLOOR	2024-T3 SHEET .020 THK
10.102	1	COCKPIT FLOOR SKIN	2024-T3 SHEET .040 THK
10.101	2	FWD FUSELAGE SIDE SKIN	2024-T3 SHEET .016 THK
10.126	1	RUDDER CABLE COVER (LEFT HAND SIDE)	2024-T3 SHEET .016 THK
10.125	1	RUDDER/TRIM CABLE COVER (RIGHT HAND SIDE)	2024-T3 SHEET .016 THK
10.124	2	COWL SUPPORT STRIP (SIDE)	2024-T3 SHEET .020 THK
10.123	1	WING-FUSE FAIRING	2024-T3 SHEET .020 THK
10.122	1	SKIN STIFFENER STA. 103.25	2024-T3 SHEET .020 THK
10.121	2	SKIN STIFFENER STA. 89.25	2024-T3 SHEET .020 THK
10.120	1	FUSE BOTTOM SKIN STA. 89.25	2024-T3 SHEET .020 THK
10.119	1	TRIM CABLE GUIDE BRACKET STA 89	2024-T3 SHEET .040 THK
10.118	1	TRIM CABLE GUIDE STA 89	PHENOLIC SHEET 1/8 THK

SCALE:	APPROVED BY:	DRAWN BY:
AS NOTED	RAMacDonald	RAMacDonald
DATE: MAR 74		

FORWARD FUSELAGE COMPONENTS	
SCALE: AS NOTED	APPROVED BY: RAMacDonald
DATE: MAR 74	DRAWN BY: RAMacDonald
MAC DONALD S-22	
DRAWING NUMBER	
10.04	

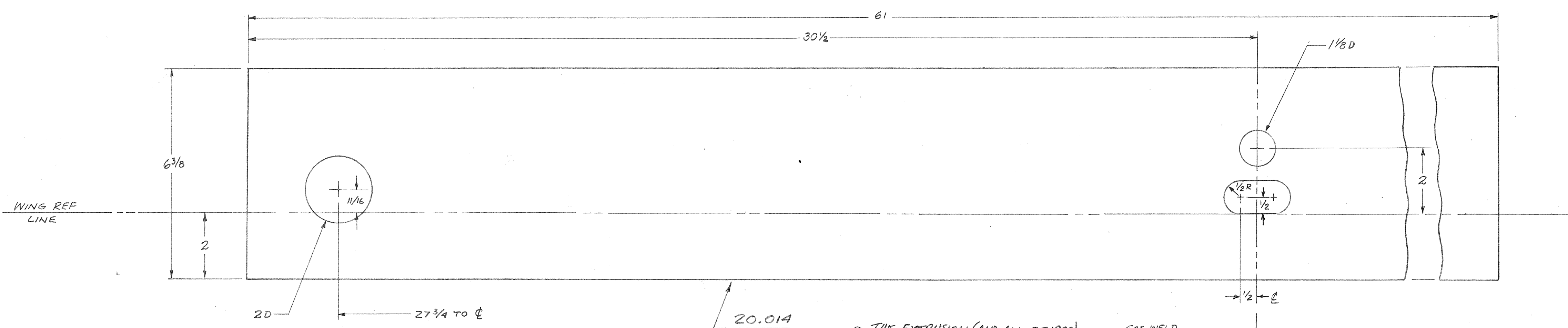


- NOTES:
1. ASSEMBLE TANK BY HELIARC WELDING
  2. USE OF SEALANT ("SLOSHING COMPOUND") IS RECOMMENDED.
  3. AFTER INSTALLATION, PRESSURE-TEST TANK TO 3.5 PSI (97 INCHES OF WATER)

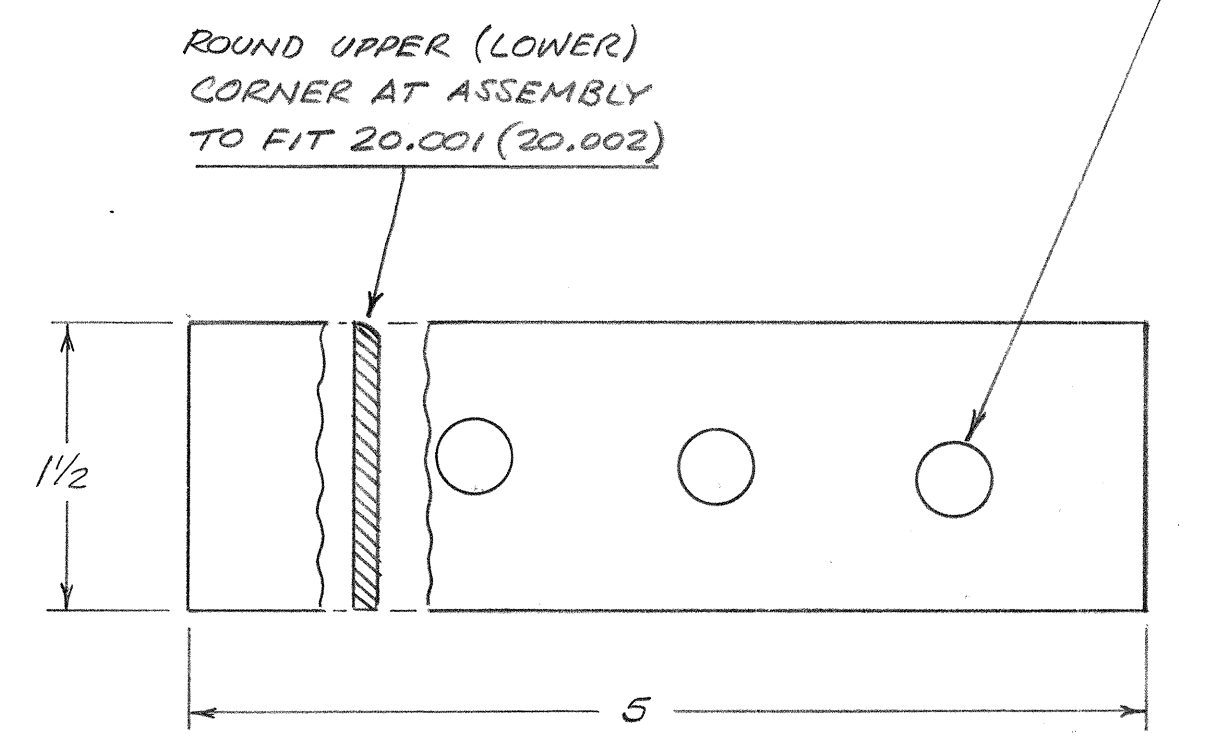
10.140	3	REAR BULKHEAD STIFFENER	5052H-34 .040 THK SHEET
10.139	1	FUEL TANK SIDES/BOTTOM	5052H-34 .040 THK SHEET
10.138	1	VALVE SUPPORT PLATE	2024-T3 .063 THK SHEET
10.137	1	VALVE SUPPORT BRACKET	2024-T3 .063 THK SHEET
10.136	1	FUEL SHUT-OFF BRACKET	3003-H14 .063 THK SHEET
10.135	1	FUEL SHUT-OFF FORK	4130 .063 THK STEEL SHEET
10.134	1	FUEL SHUT-OFF EXTENSION TUBE	4130 1/4 x .035 STEEL TUBE
10.133	1	FUEL TANK REAR BULKHEAD	5052H-34 .040 THK SHEET
10.132	1	FUEL TANK FRONT	5052H-34 .040 THK SHEET
10.131	1	FUEL TANK TOP SKIN	5052H-34 .040 THK SHEET
PART NO.	NO. PER ACFT	PART NAME	MATERIAL

**FUEL SYSTEM**

SCALE: FULL	APPROVED BY: RMacDonald	DRAWN BY: RMacD.
DATE: MAR 74		REVISED
MAC DONALD S-21		
		DRAWING NUMBER
		10.05



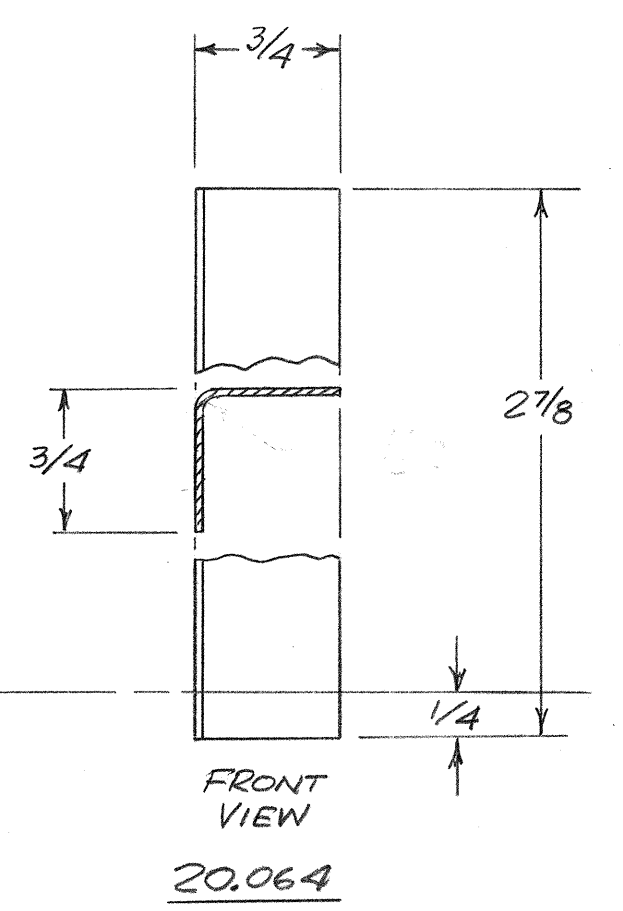
3/8 D (3 PLACES)  
LOCATION ESTABLISHED  
AT ASSEMBLY AS SHOWN  
ON PLAN 20.06



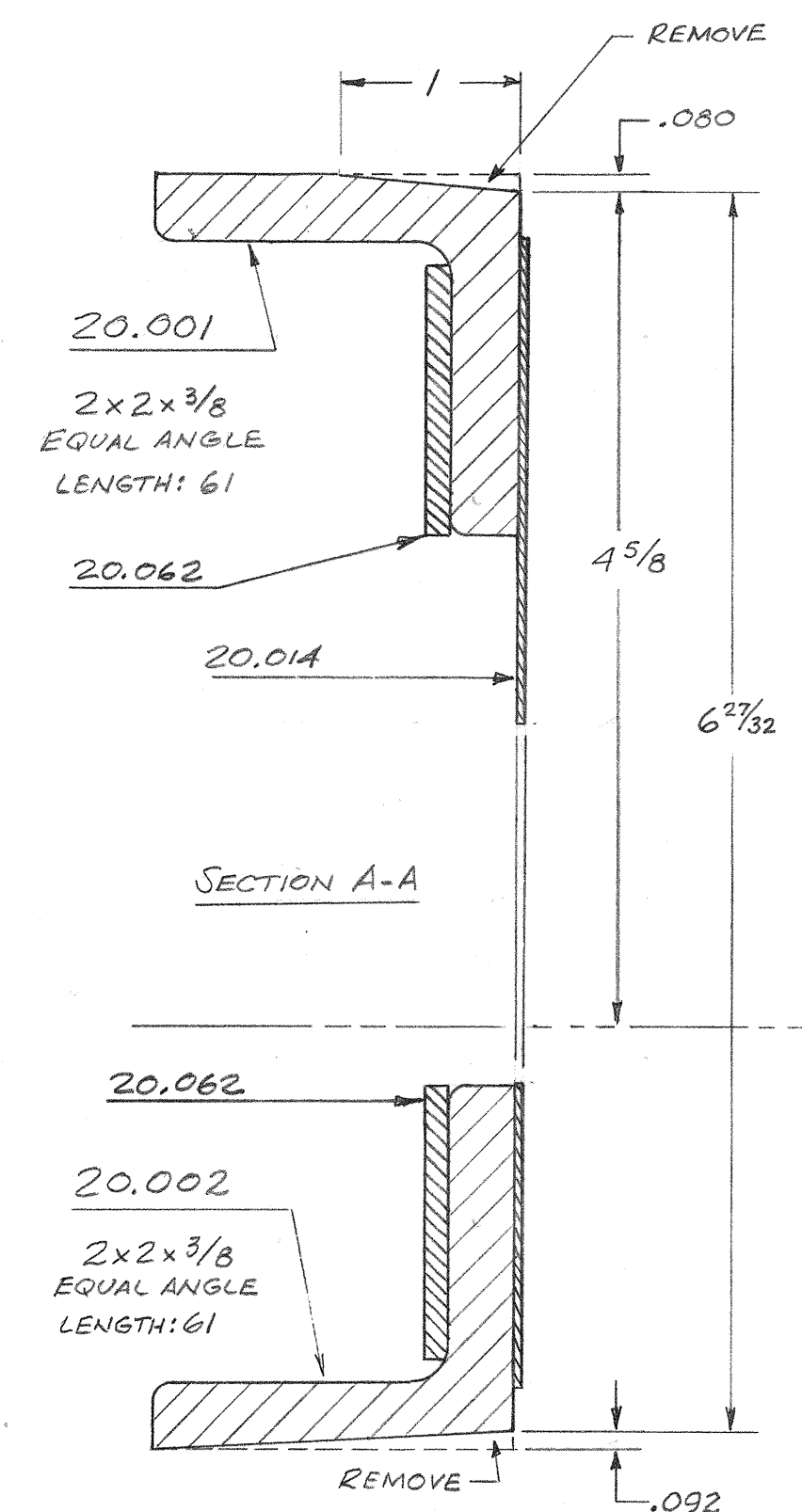
ROUND UPPER (LOWER)  
CORNER AT ASSEMBLY  
TO FIT 20.001 (20.002)

20.062  
FULL SCALE

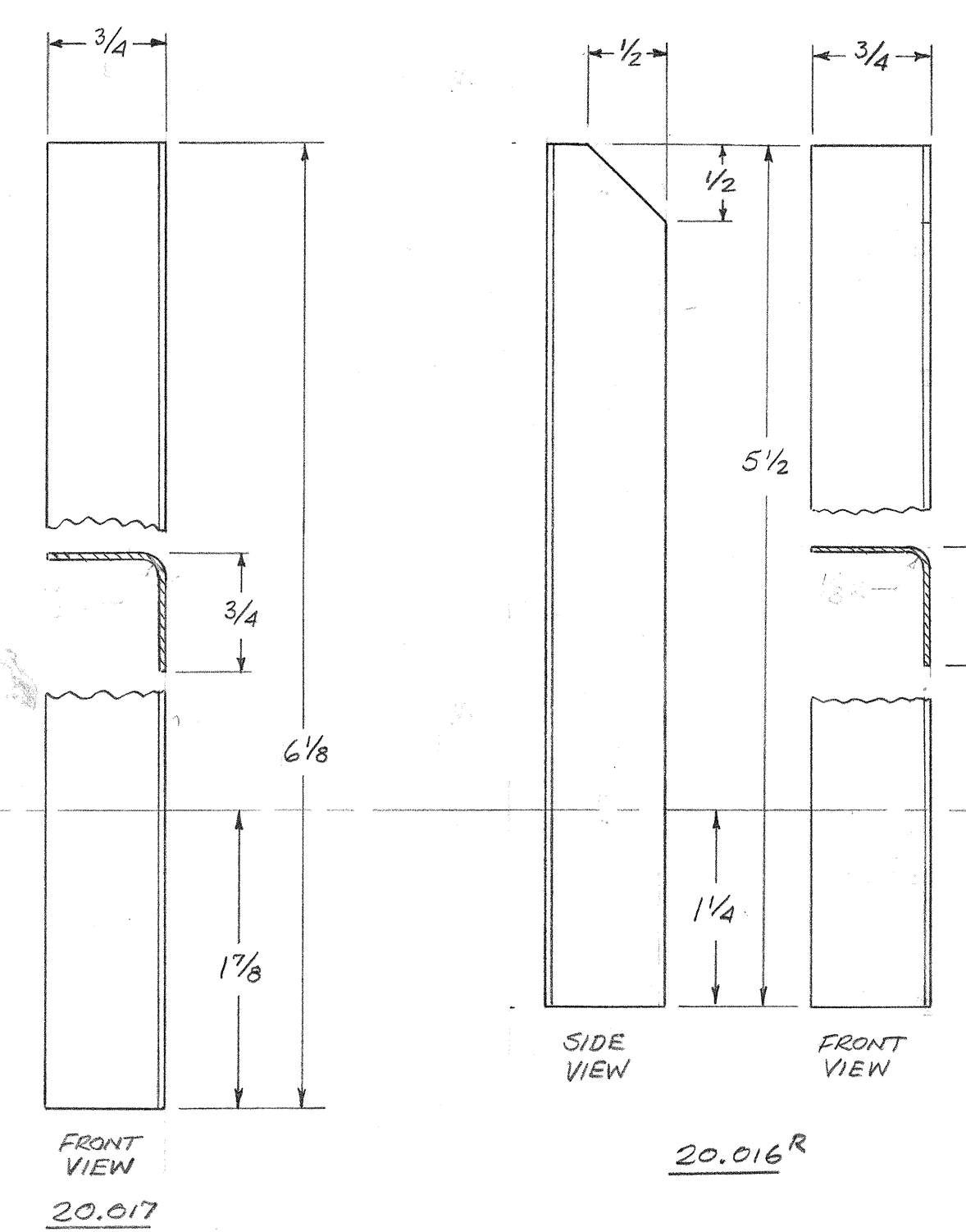
NOTE: CUT SLOTS (3/16 WIDE)  
AT ASSEMBLY FOR ALERON  
STOP BOLT AS SHOWN ON  
PLAN 20.05.



FRONT VIEW  
20.064

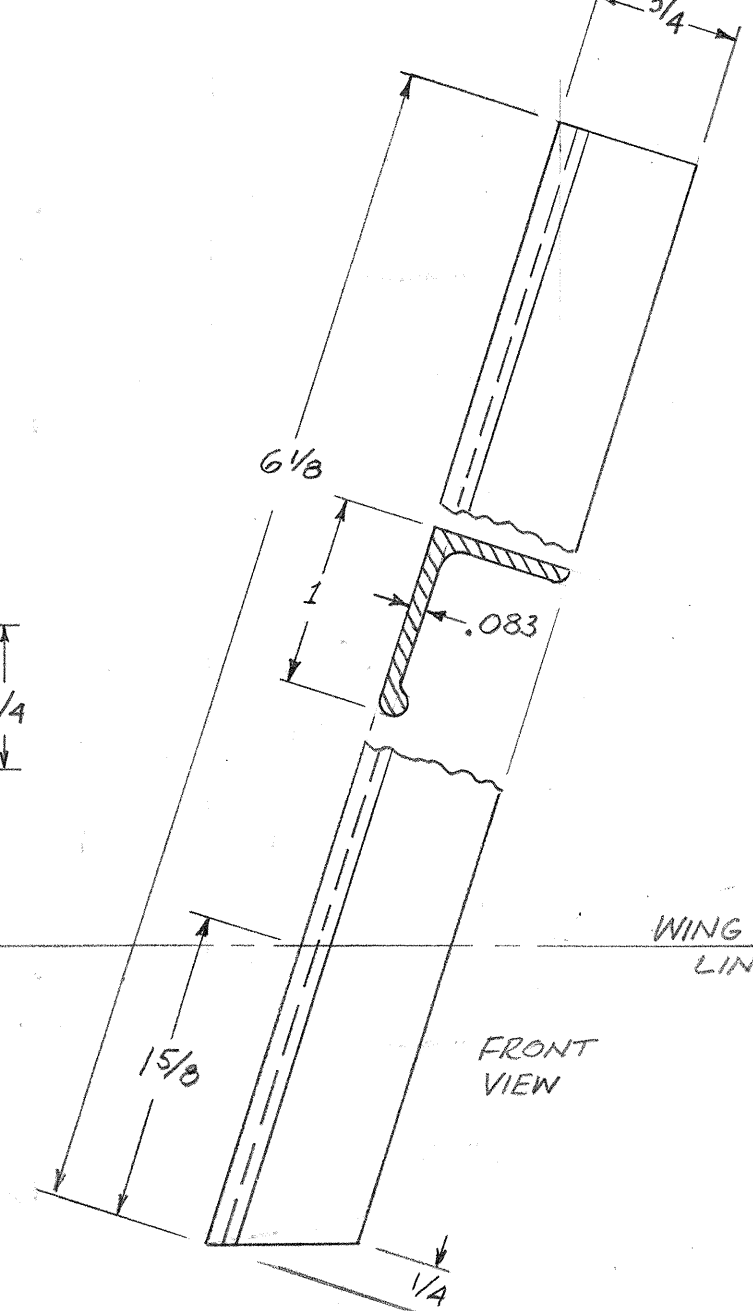


SECTION A-A

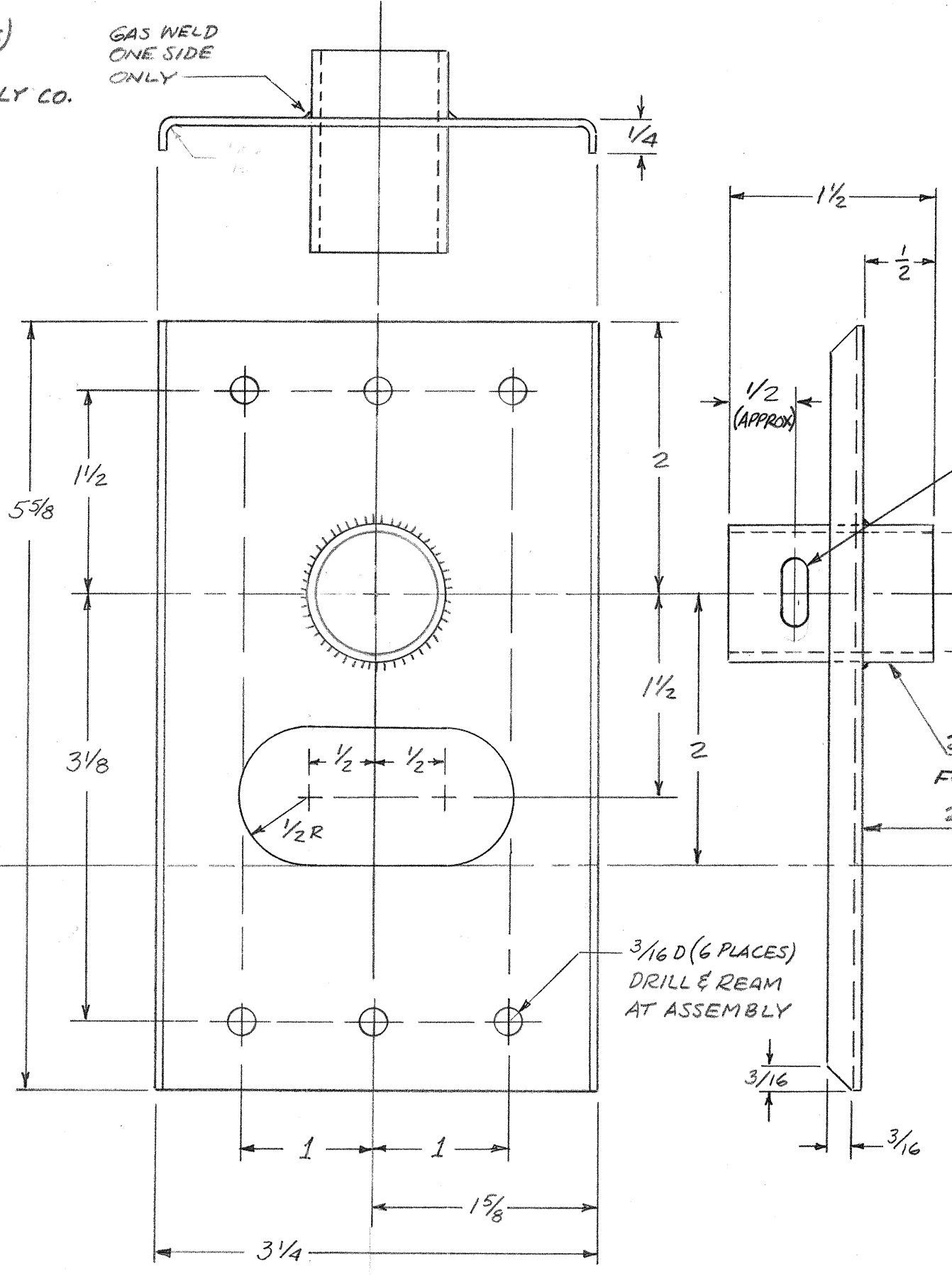


SIDE VIEW  
FRONT VIEW  
20.016<sup>R</sup>

THIS EXTRUSION (AND ALL OTHERS)  
OBTAINABLE FROM:  
FACTORY STEEL & METAL SUPPLY CO.  
14020 OAKLAND AVE  
DETROIT, MICH 48203  
PHONE: 883-6300



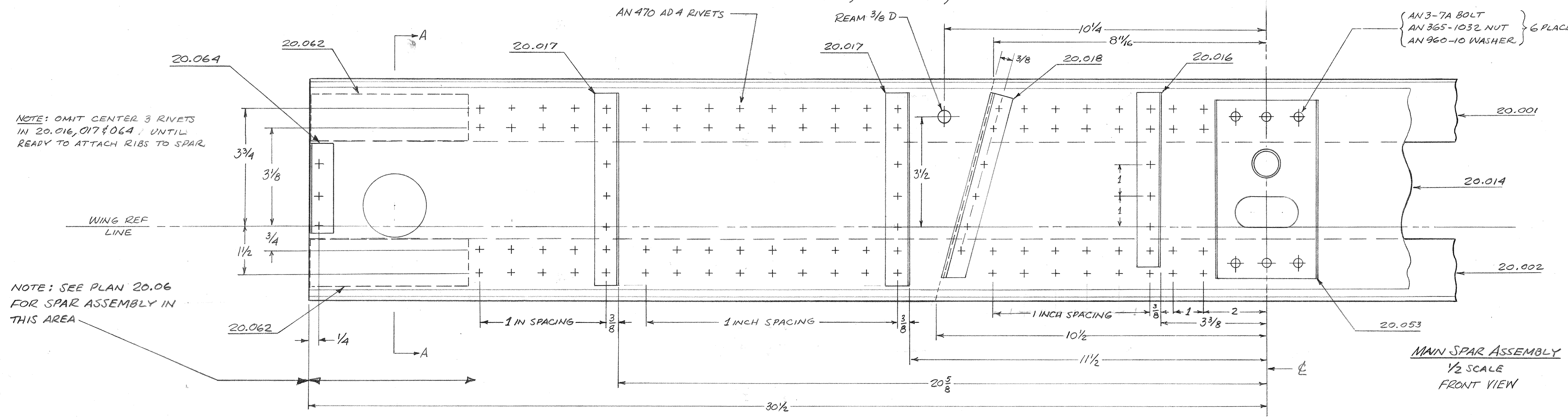
FRONT VIEW  
20.018<sup>R</sup>  
(ALTERNATE MATERIAL:  
2024-T3 ALUM ALLOY  
SHEET, .080 OR .090 THK)



20.054  
FULL SCALE  
20.053

3/16 D (6 PLACES)  
DRILL & REAM  
AT ASSEMBLY

{ AN 3-7A BOLT  
AN 365-1032 NUT  
AN 960-10 WASHER } 6 PLACES



MAIN SPAR ASSEMBLY  
1/2 SCALE  
FRONT VIEW

NOTE: OMIT CENTER 3 RIVETS  
IN 20.016, 017 & 064 UNTIL  
READY TO ATTACH RIBS TO SPAR

NOTE: SEE PLAN 20.06  
FOR SPAR ASSEMBLY IN  
THIS AREA

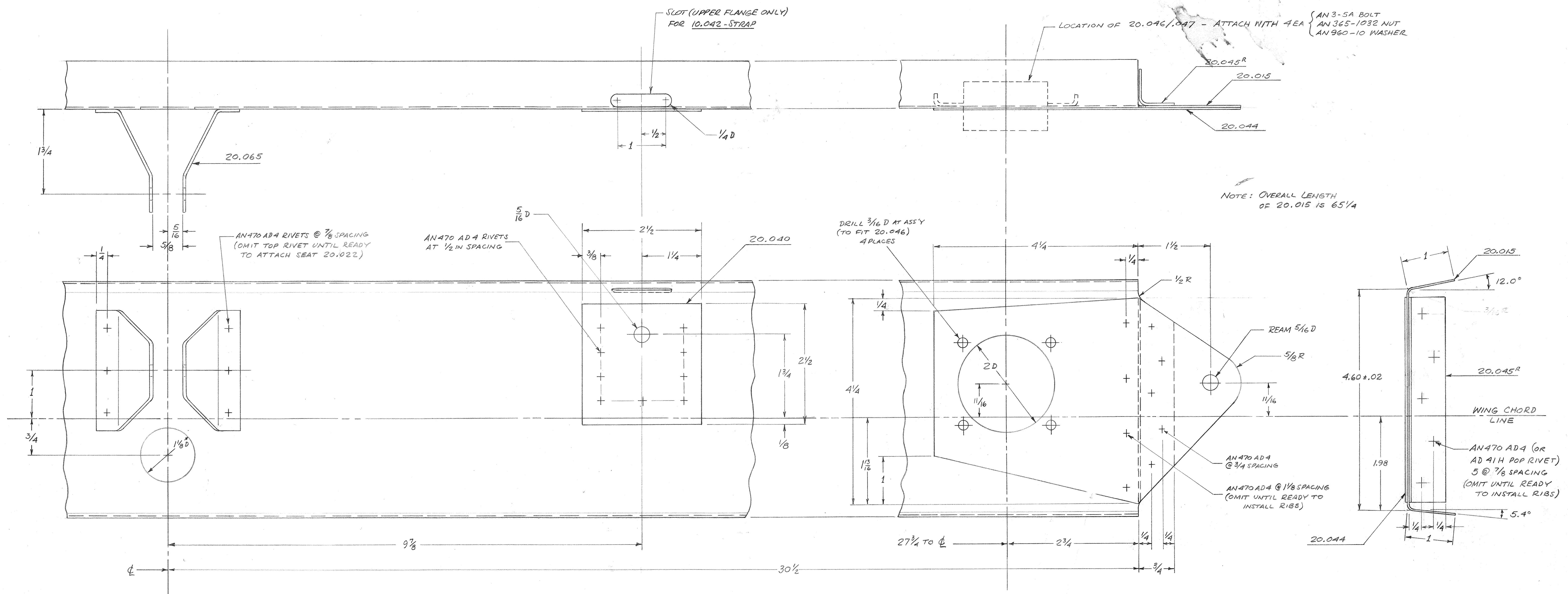
PART NUMBER	NO. PER AIRCRAFT	PART NAME	MATERIAL
20.064	2	FWD SPAR UPRIGHT (RIB 9)	2024-T3 ALUM ALLOY .040 THK
20.062	4	WING RETENTION FITTING SPACER	2024-T3 ALUM SHEET .125 THK
20.054	1	TORQUE TUBE FWD SUPPORT TUBE	4130 STEEL TUBE 1x .065
20.053	1	TORQUE TUBE FWD SUPPORT PLATE	4130 SHEET STEEL .063 THK
20.018 <sup>R</sup>	2	FWD SPAR UPRIGHT (ATTACH FUSE)	ALUM ALLOY EXTRUSION
20.017	4	FWD SPAR UPRIGHT (RIB 3)	2024-T3 ALUM ALLOY .040 THK
20.016 <sup>R</sup>	2	FWD SPAR UPRIGHT (RIB 1)	2024-T3 ALUM ALLOY .040 THK
20.014	1	CTR SECT SPAR WEB	2024-T3 .040 THK
20.002	1	CTR SECT LOWER CAP	6061-T6 ALUM ALLOY EXTRUSION
20.001	1	CTR SECT UPPER CAP	6061-T6 ALUM ALLOY EXTRUSION

CENTER SECTION - MAIN SPAR ASS'Y

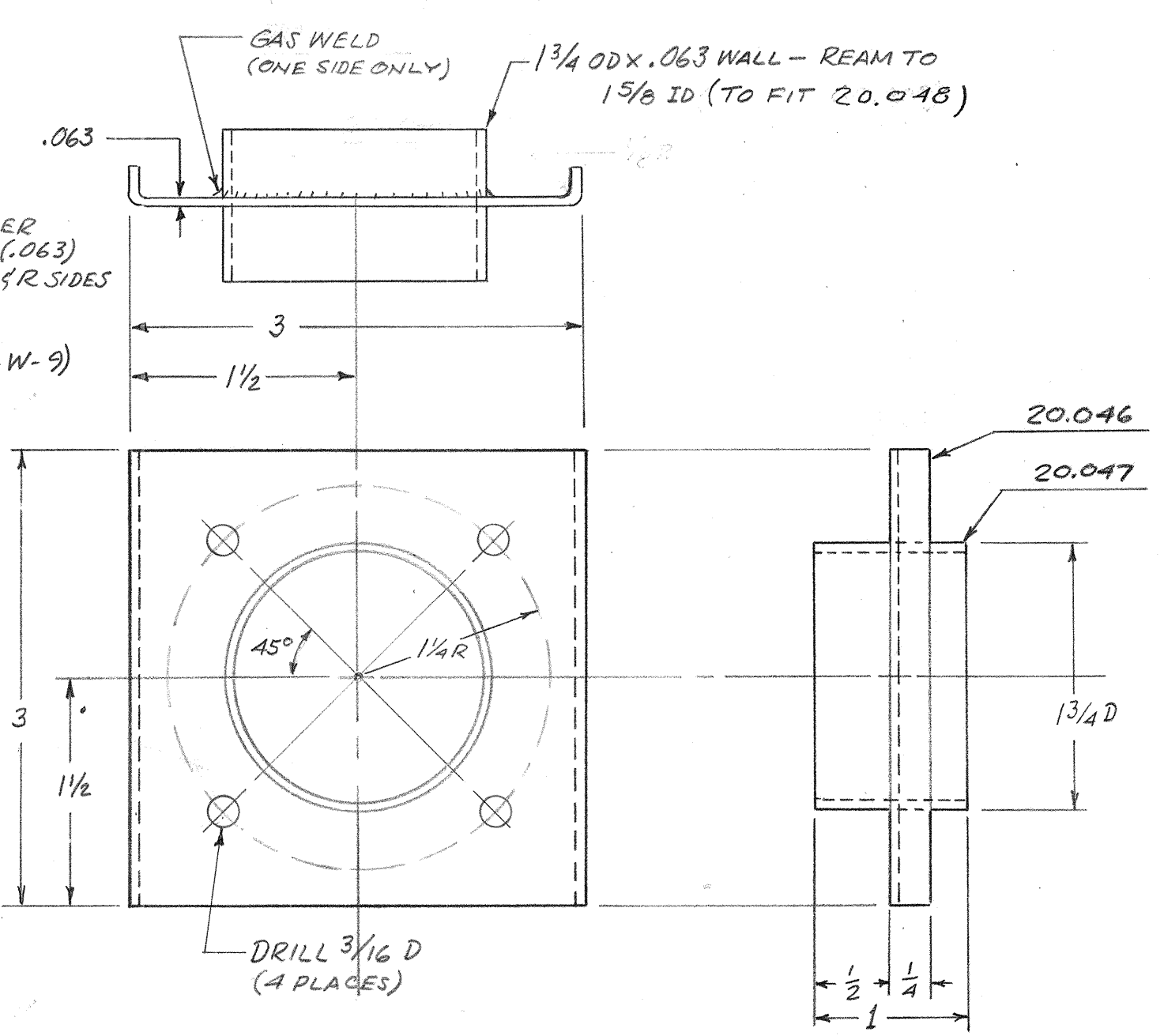
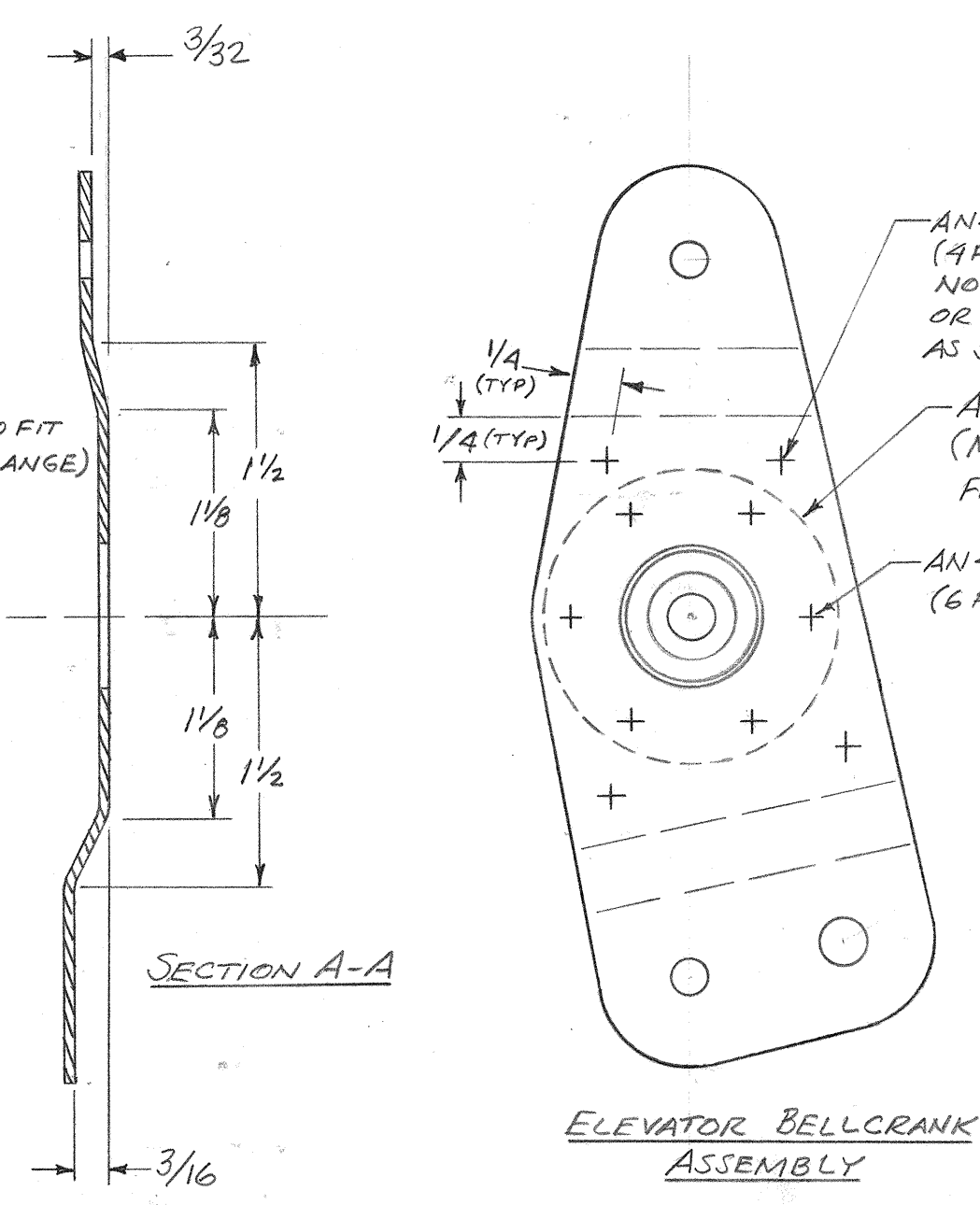
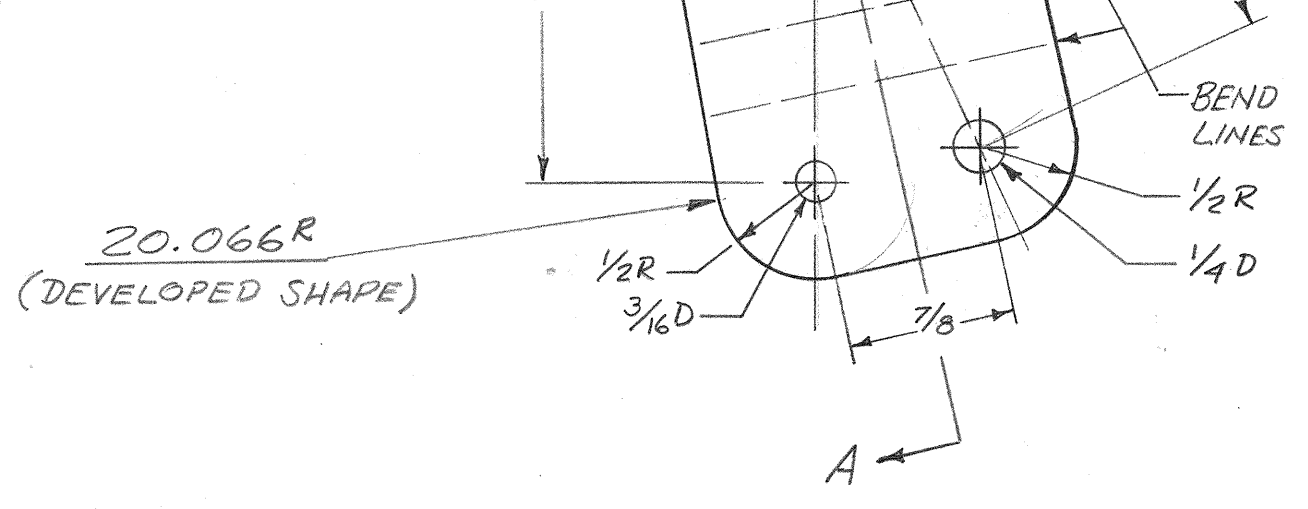
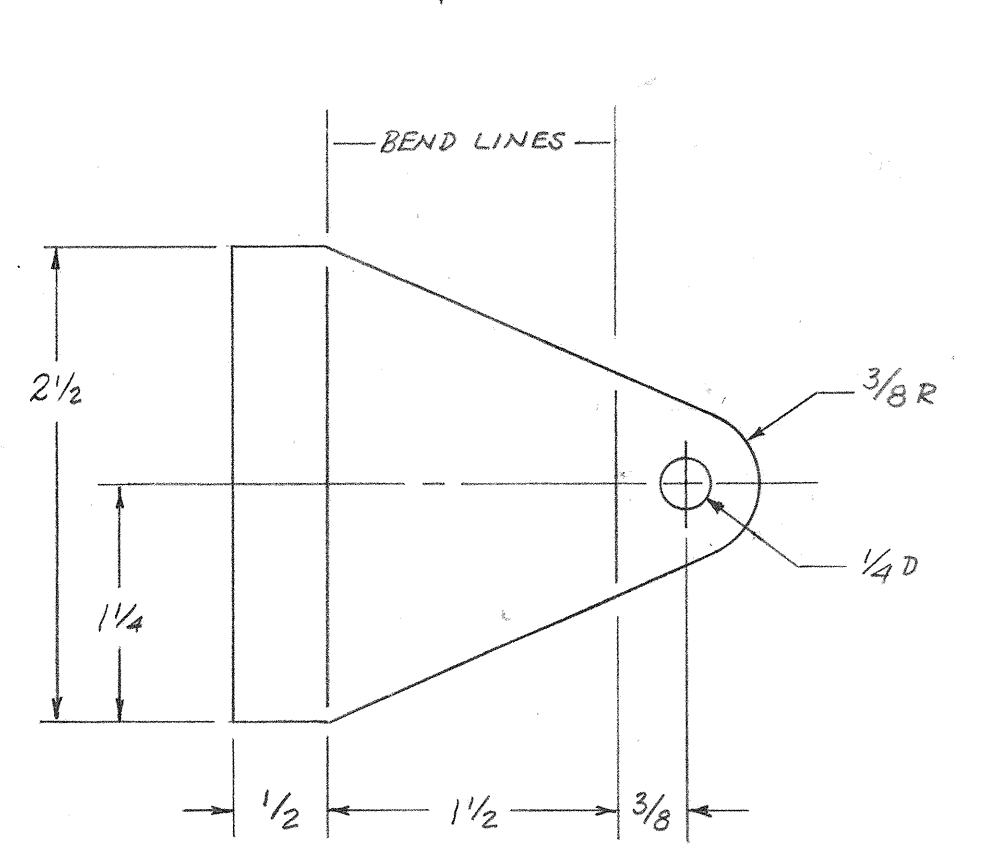
SCALE: AS NOTED  
DATE: 5/17/72  
APPROVED BY: R. MacDonald  
DRAWN BY: R. MacDonald

MAC DONALD S-21

DRAWING NUMBER  
S-21/20.01



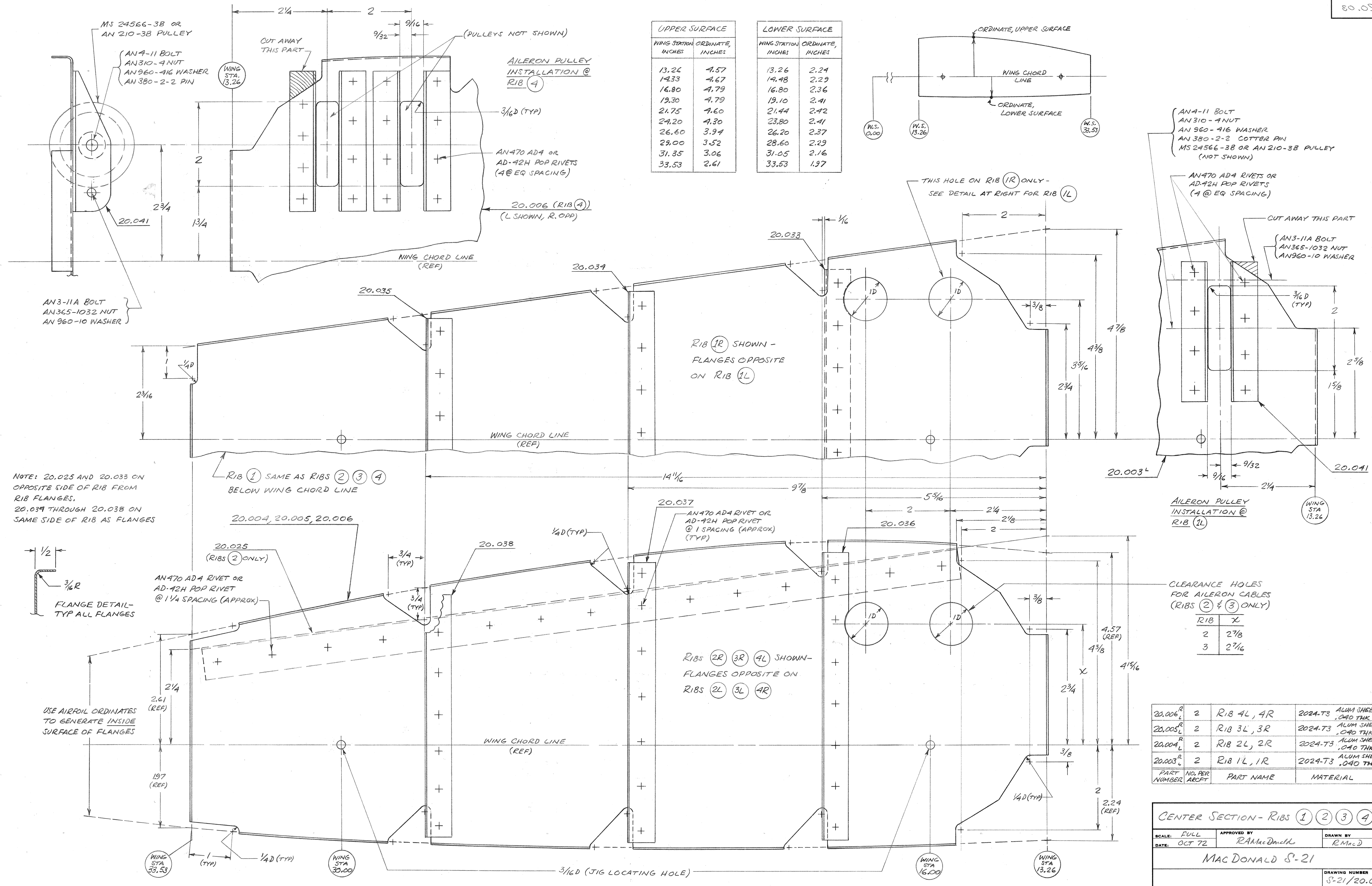
NOTE: OVERALL LENGTH OF 20.015 IS 65 1/4



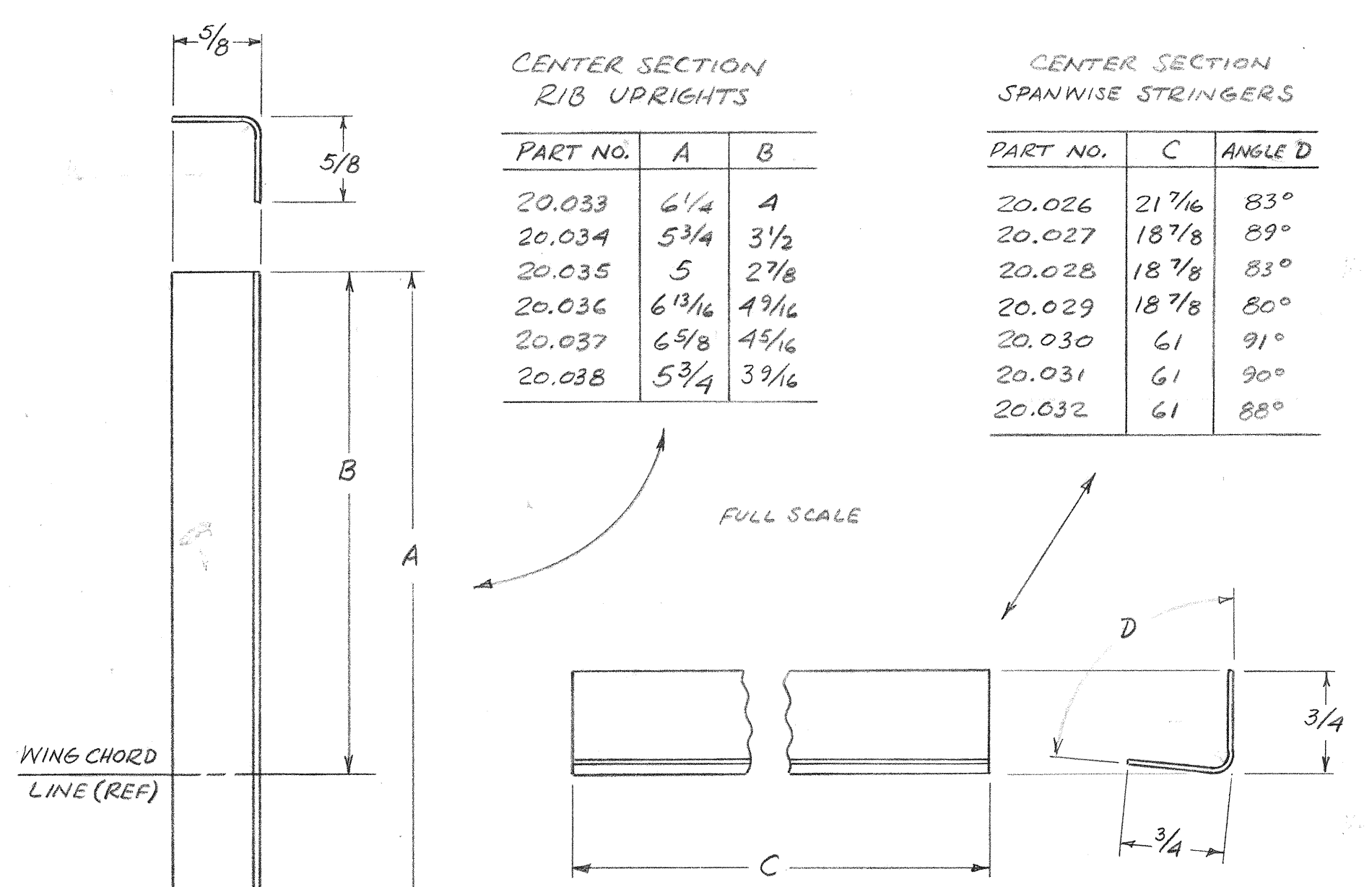
PART NUMBER	NO. PER AIRCRAFT	PART NAME	MATERIAL
20.066 <sup>R</sup>	2	ELEV BELLCRANK HALF	2024-T3 ALUM ALLOY .063 THK
20.065	2	ELEV BELLCRANK BRKT	2024-T3 ALUM ALLOY .063 THK
20.047	2	AFT LNDG GEAR ATTACH TUBE	4130 STEEL TUBE 1 3/4 ODX .063
20.046	2	AFT LNDG GEAR ATTACH PLATE	4130 STEEL SHEET .063 THK
20.045 <sup>R</sup>	2	WING PANEL ATTACH REINS ANGLE	2024-T3 ALUM SHEET .040 THK
20.044	2	WING PANEL ATTACHMENT DOUBLER	2024-T3 ALUM ALLOY .040 THK
20.040	2	FUSE ATTACH DOUBLER	2024-T3 ALUM ALLOY .040 THK
20.015	1	CTE SECT APT SPAR	2024-T3 ALUM ALLOY .040 THK

CENTER SECTION-REAR SPAR ASS'Y  
 SCALE: V1  
 DATE: 9-14-72  
 APPROVED BY: RAN MacDonnell  
 DRAWN BY: R MacD  
 MAC DONALD S-21  
 DRAWING NUMBER: 20.02





UPPER SURFACE		LOWER SURFACE	
WING STATION INCHES	ORDINATE INCHES	WING STATION INCHES	ORDINATE INCHES
13.26	4.57	13.26	2.24
14.33	4.67	14.48	2.29
16.80	4.79	16.80	2.36
19.30	4.79	19.10	2.41
21.75	4.60	21.44	2.42
24.20	4.30	23.80	2.41
26.60	3.94	26.20	2.37
29.00	3.52	28.60	2.29
31.35	3.06	31.05	2.16
33.53	2.61	33.53	1.97



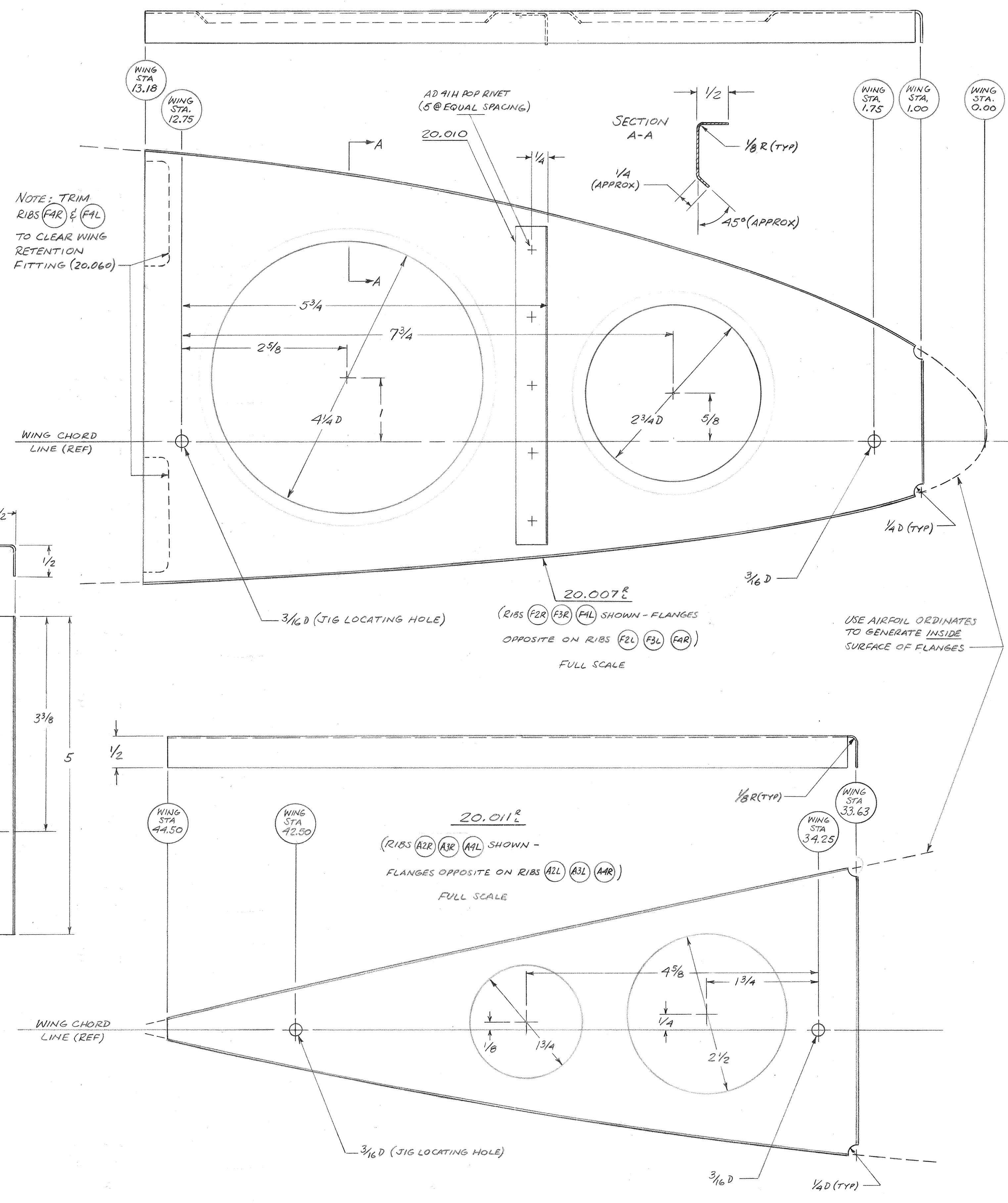
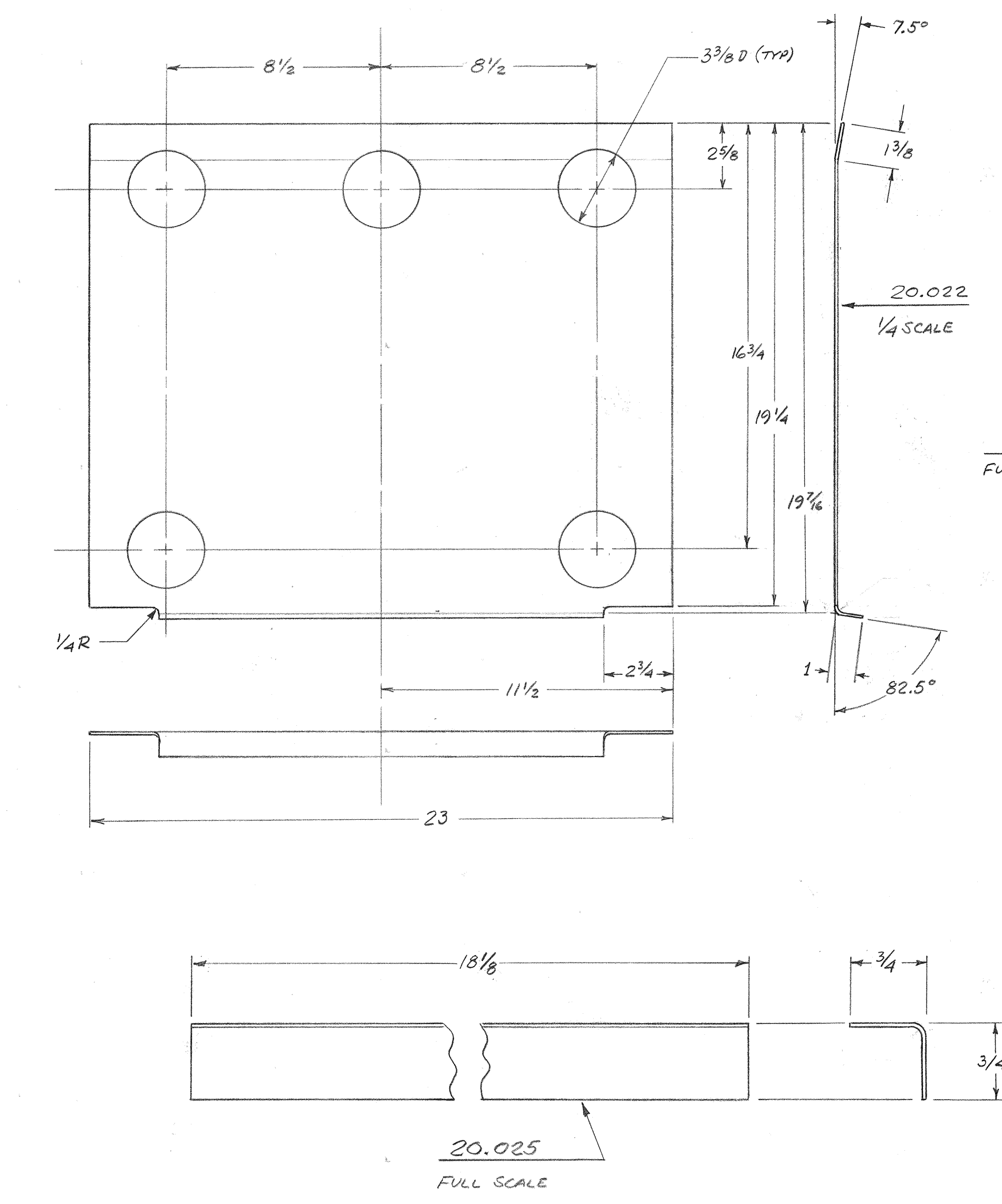
**CENTER SECTION RIB UPRIGHTS**

PART NO.	A	B
20.033	6 1/4	A
20.034	5 3/4	3 1/2
20.035	5	2 7/8
20.036	6 13/16	4 9/16
20.037	6 5/8	4 5/16
20.038	5 3/4	3 9/16

**CENTER SECTION SPANWISE STRINGERS**

PART NO.	C	ANGLE D
20.026	21 7/16	83°
20.027	18 7/8	89°
20.028	18 7/8	83°
20.029	18 7/8	80°
20.030	61	91°
20.031	61	90°
20.032	61	88°



**LEADING EDGE RIBS**

UPPER SURFACE		LOWER SURFACE	
WING STA, INCHES	ORDINATE, INCHES	WING STA, INCHES	ORDINATE, INCHES
0	0	0	0
.11	.63	.37	.50
.22	.77	.50	.58
.44	.99	.76	.71
1.01	1.41	1.39	.93
2.19	2.04	2.61	1.21
3.39	2.54	3.82	1.42
4.59	2.94	5.02	1.59
7.01	3.60	7.40	1.85
9.44	4.08	9.76	2.04
11.88	4.43	12.12	2.18
13.26	4.57	13.26	2.24

L.E. RADIUS = .74 IN SLOPE OF L.E. RAD THRU LE = .232

**TRAILING EDGE RIBS**

UPPER SURFACE		LOWER SURFACE	
WING STA, INCHES	ORDINATE, INCHES	WING STA, INCHES	ORDINATE, INCHES
33.63	2.57	33.63	1.95
36.0	2.06	36.0	1.68
38.0	1.64	38.0	1.38
40.0	1.18	40.0	1.04
42.5	.62	42.5	.57
45.0	.05	45.0	.05

20.038	6		
20.037	6		
20.036	6		
20.035	2		
20.034	2		
20.033	2	CTR SECT RIB UPRIGHT	
20.032	1		
20.031	1		
20.030	1		
20.029	2		
20.028	2		
20.027	2		
20.026	3	CTR SECT SPANWISE STRINGER	
20.025	2	SEAT STRINGER	
20.022	1	SEAT	2024-T3 ALUM ALLOY .040 THK
20.011 <sup>L</sup>	6	CTR SECT T.E. RIB	2024-T3 ALUM ALLOY .020 THK
20.010	6	L.E. RIB STIFFENER	2024-T3 ALUM ALLOY .020 THK
20.007 <sup>L</sup>	6	CTR SECT L.E. RIB	2024-T3 ALUM ALLOY .020 THK
PART NUMBER	NO. PER AIRCRAFT	PART NAME	MATERIAL

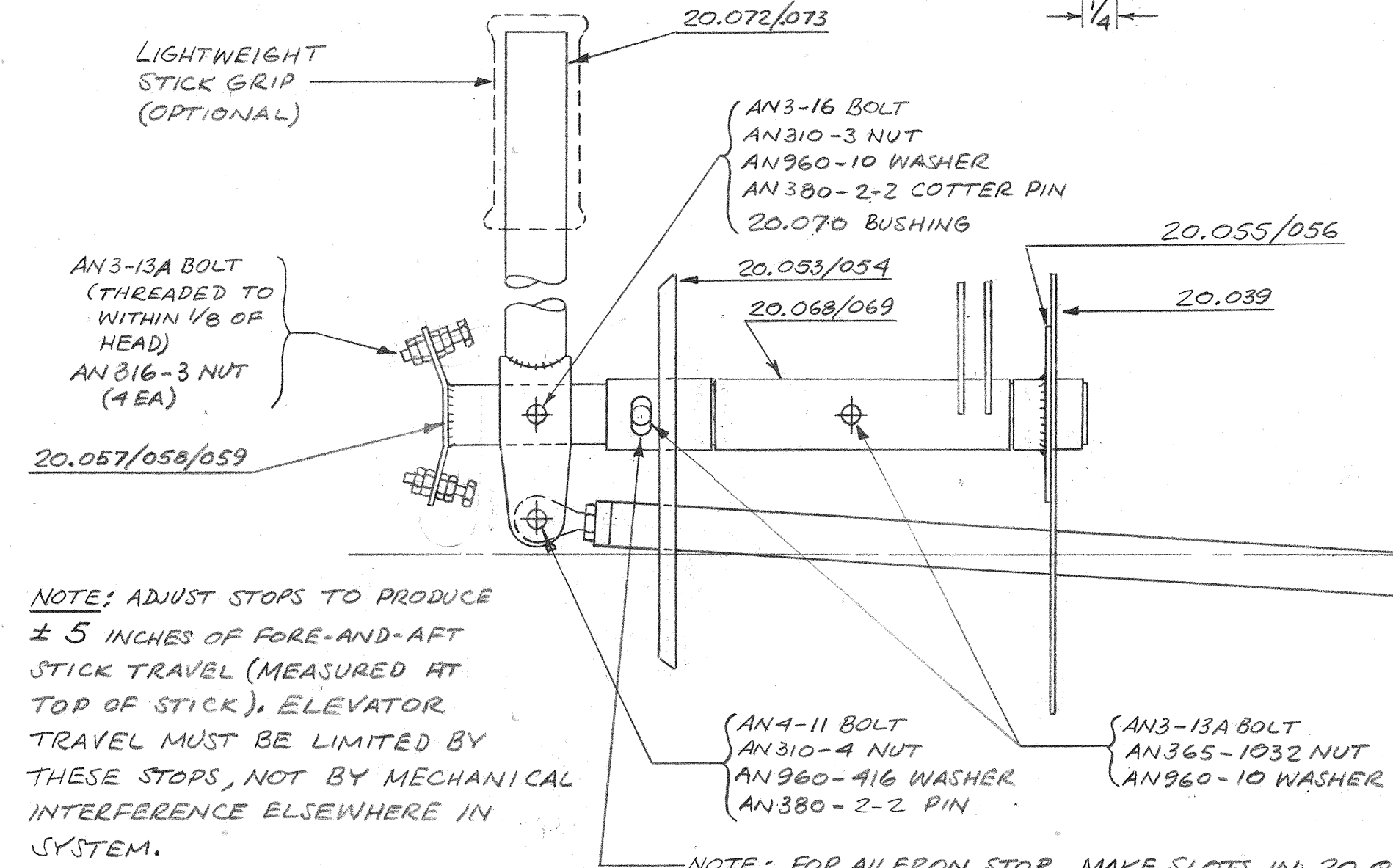
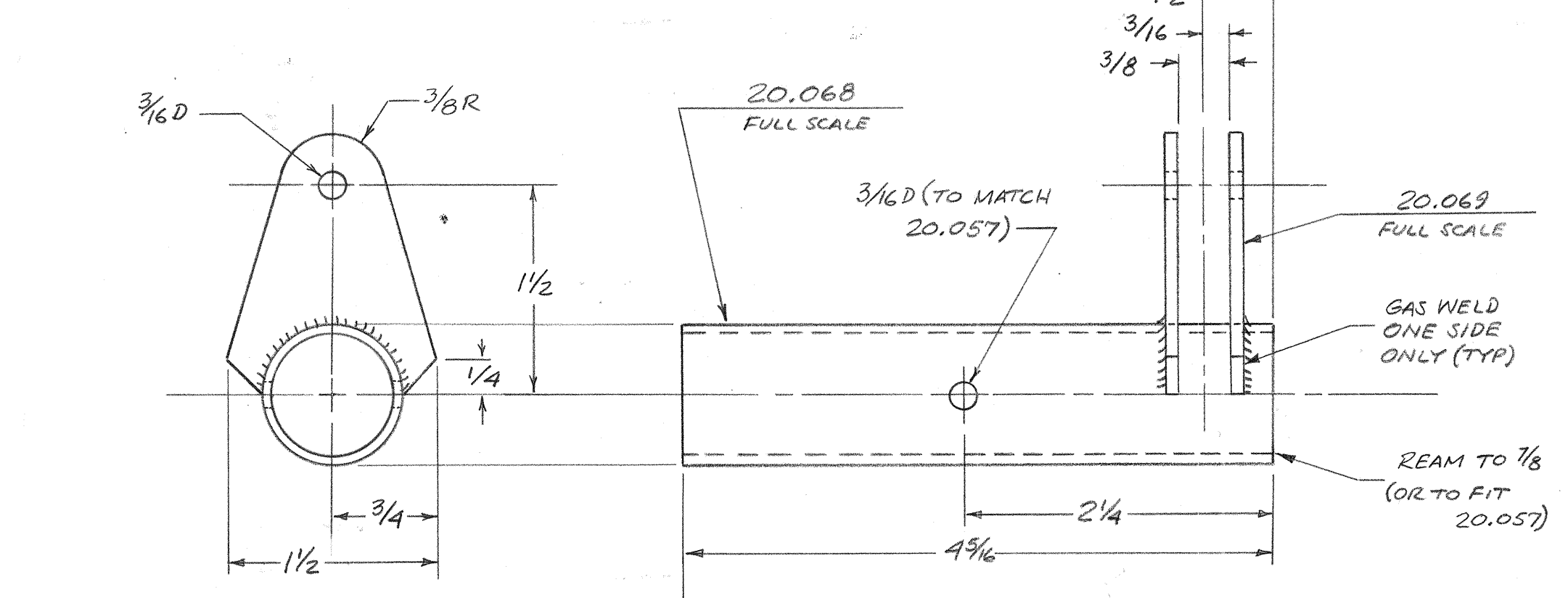
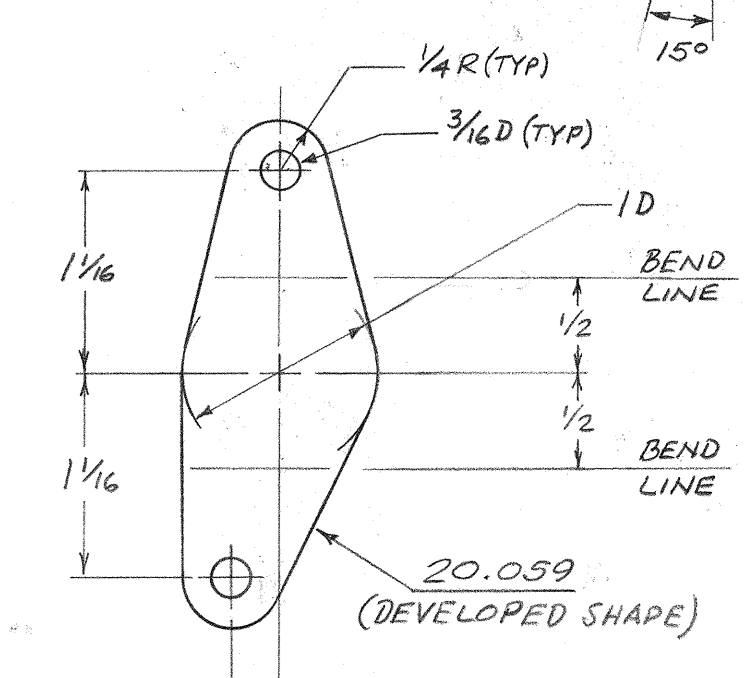
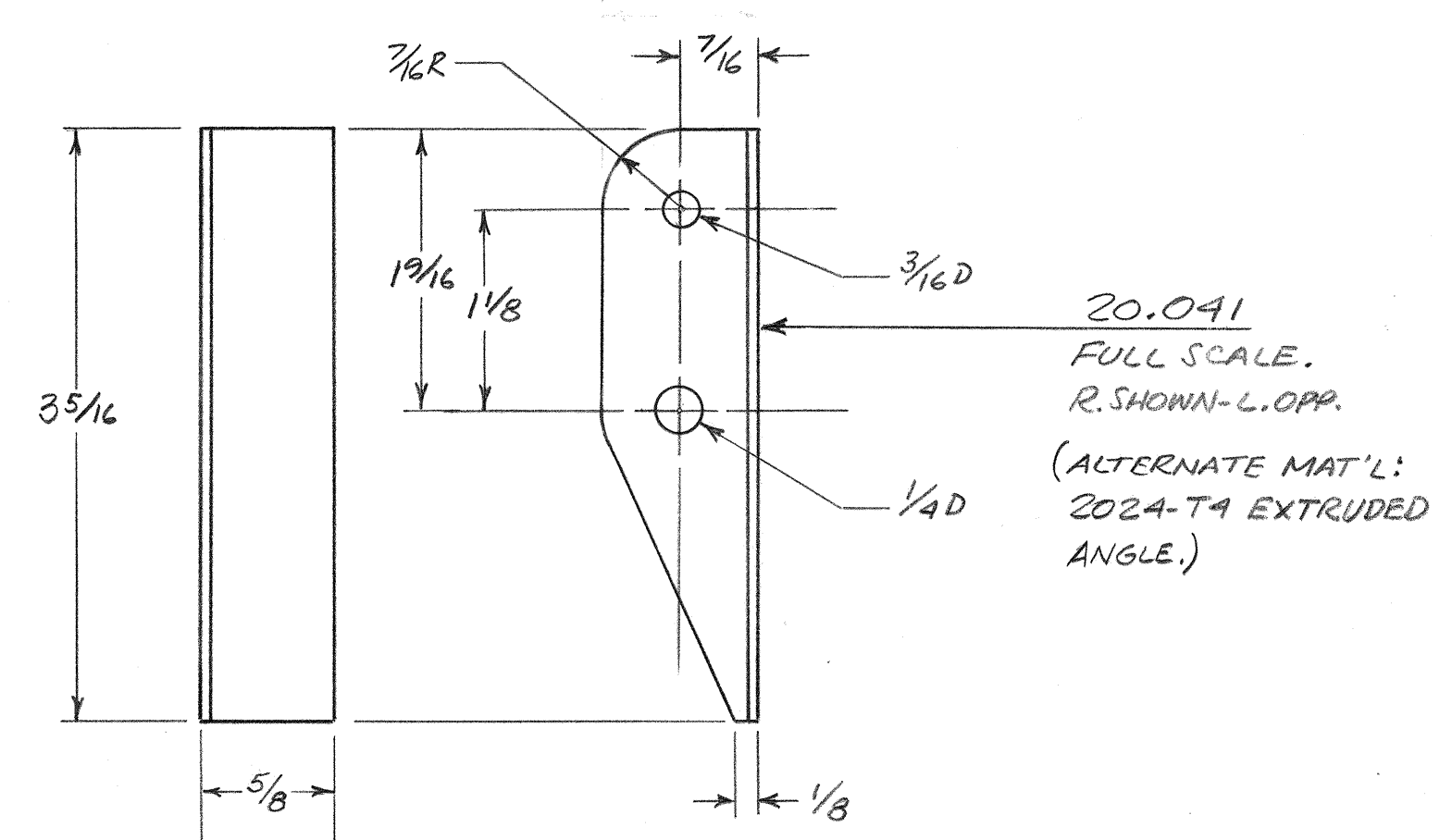
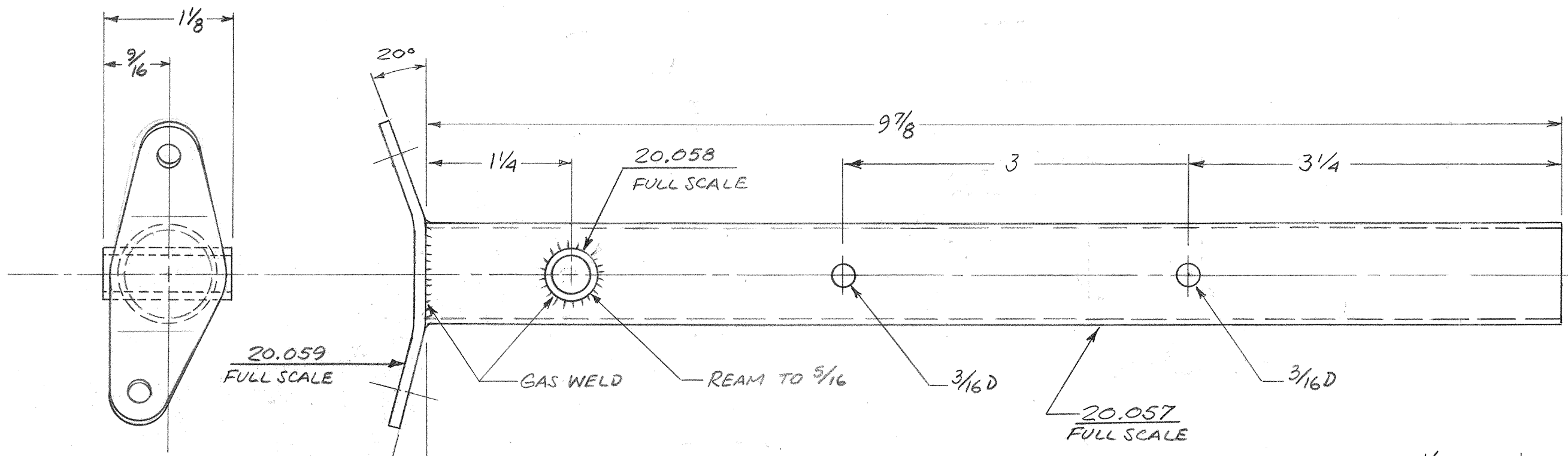
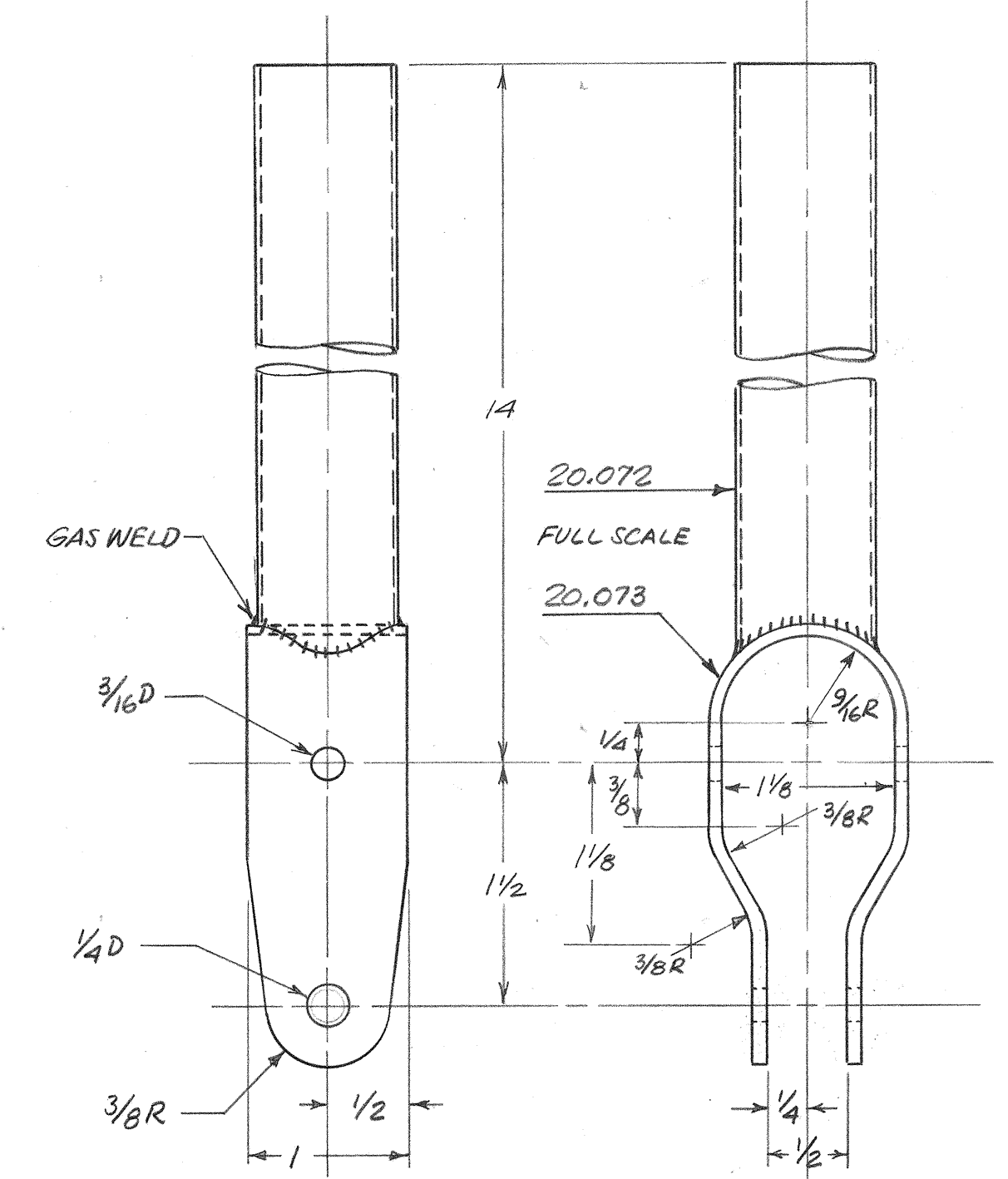
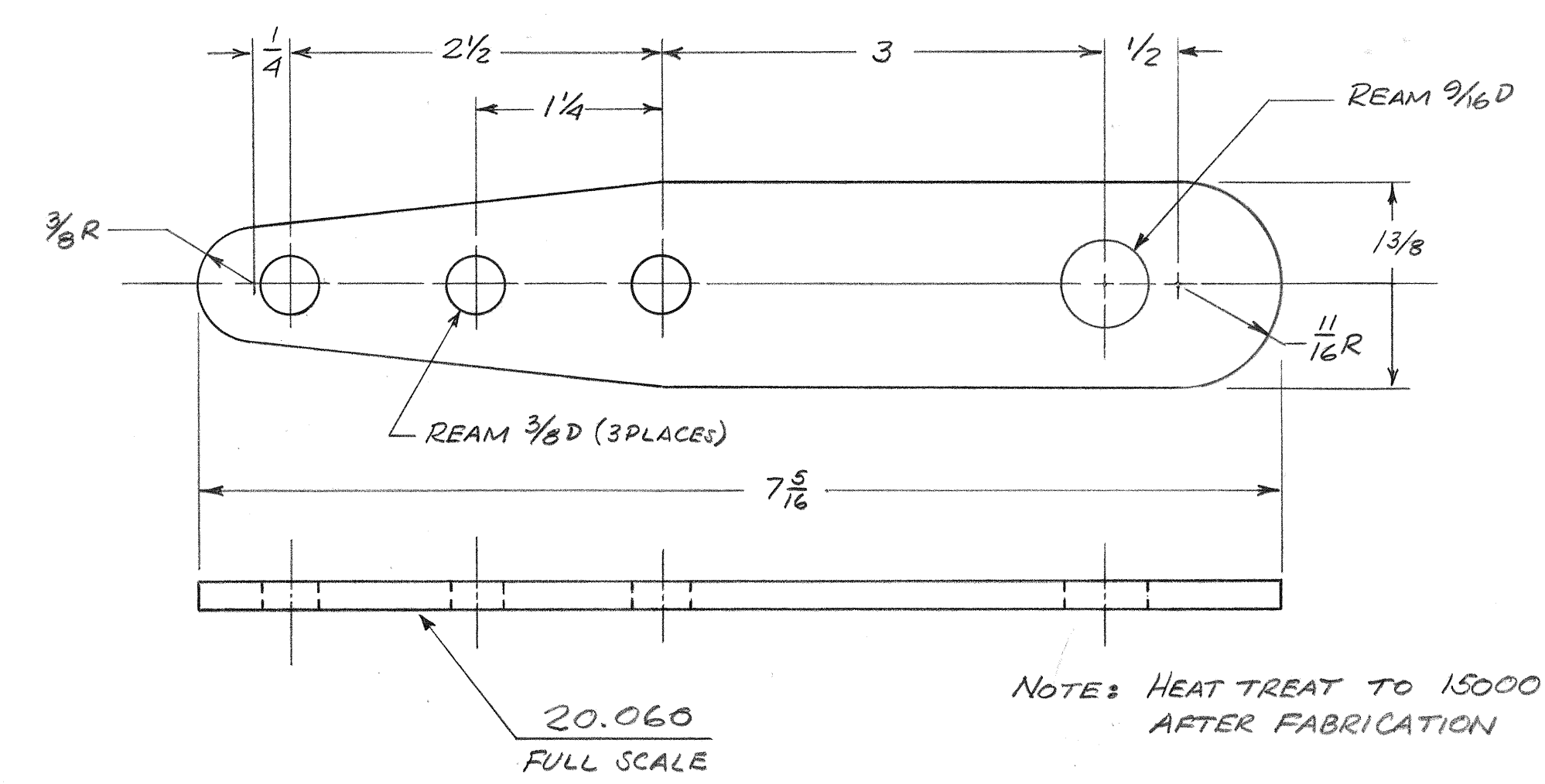
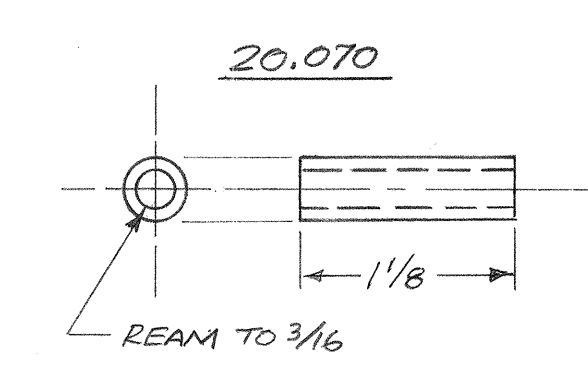
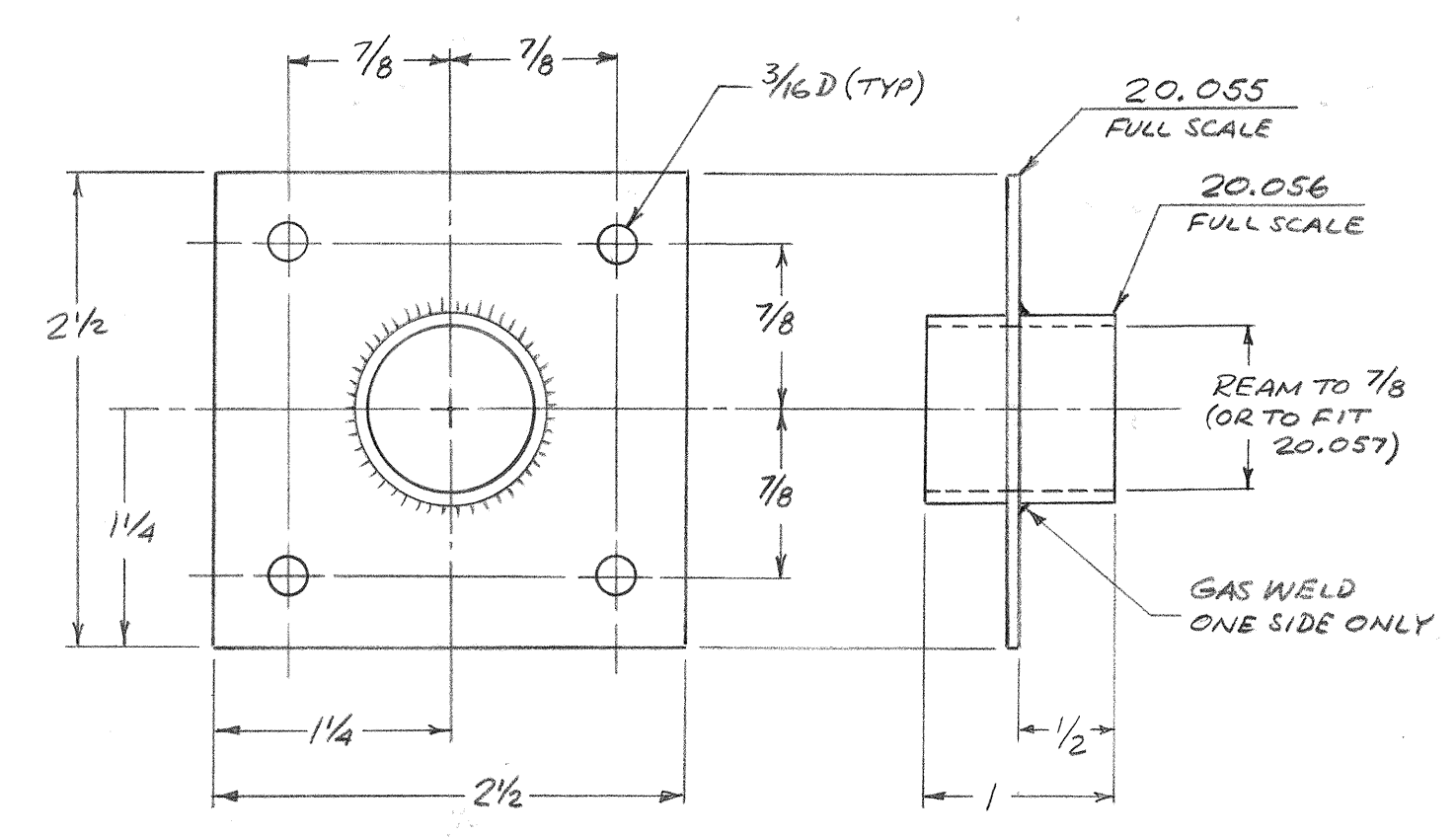
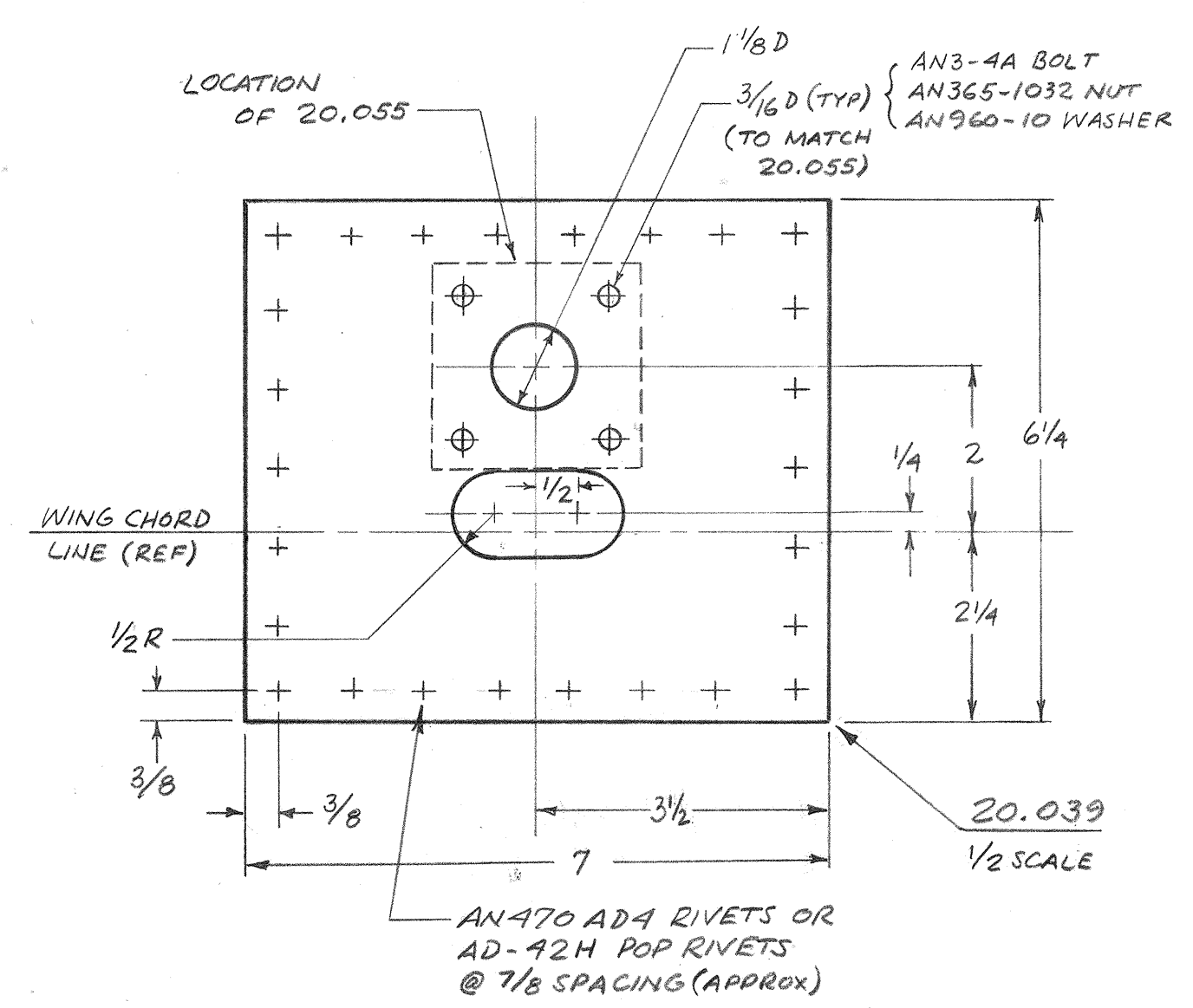
**CENTER SECTION - RIBS, STRINGERS, UPRIGHTS, SEAT**

SCALE: AS NOTED    APPROVED BY: RAMacDonald    DRAWN BY: RMacD

DATE: 9/22/72

MACDONALD S-21

DRAWING NUMBER: 821/20.04



NOTE: ADJUST STOPS TO PRODUCE ± 5 INCHES OF FORE-AND-AFT STICK TRAVEL (MEASURED AT TOP OF STICK), ELEVATOR TRAVEL MUST BE LIMITED BY THESE STOPS, NOT BY MECHANICAL INTERFERENCE ELSEWHERE IN SYSTEM.

NOTE: FOR AILERON STOP, MAKE SLOTS IN 20.054. SLOT LENGTH IS TO BE SUCH THAT BOLT STRIKING ENDS OF SLOT LIMITS LATERAL STICK TRAVEL (MEASURED AT TOP OF STICK) TO ± 5 INCHES. AILERON TRAVEL MUST NOT BE LIMITED BY MECHANICAL INTERFERENCE ELSEWHERE IN SYSTEM.

\* SAME AS 50.039

PART NUMBER	NO. PER AIRCRAFT	PART NAME	MATERIAL
20.075	2	ELEVATOR PUSHROD END *	4130 STEEL ROD
20.074	1	ELEVATOR PUSHROD TUBE	4130 STEEL TUBE 5/8 X .035
20.073	1	CONTROL STICK STRAP	4130 SHEET STEEL .090 THK
20.072	1	CONTROL STICK	4130 STEEL TUBE 7/8 X .035
20.070	1	CONTROL STICK BUSHING	1025 STEEL TUBE 5/16 X .065
20.069	2	AILERON CONTROL HORN LUG	4130 SHEET STEEL .090 THK
20.068	1	AILERON CONTROL HORN TUBE	4130 STEEL TUBE 1 X .065
20.060	16	WING RETENTION FITTING	4130 STEEL SHEET .188 THK
20.059	1	ELEVATOR STOP SUPPORT	4130 STEEL SHEET .090 THK
20.058	1	CONTR SYST TORQUE TUBE BUSHING	1025 STEEL TUBE 7/16 X .065
20.057	1	CONTROL SYSTEM TORQUE TUBE	4130 STEEL TUBE 7/8 X .065
20.056	1	AFT TORQUE TUBE SUPPORT TUBE	4130 STEEL TUBE 1 X .065
20.055	1	AFT TORQUE TUBE SUPPORT PLATE	4130 SHEET STEEL .065 THK
20.041	10	AILERON PULLEY BRACKET	2024-T3 ALUM ALLOY .063 THK
20.039	1	AFT TORQUE TUBE SUPPORT WEB	2024-T3 ALUM ALLOY .063 THK

CENTER SECTION - CONTROL SYST. PARTS, WING RETENTION FTGS

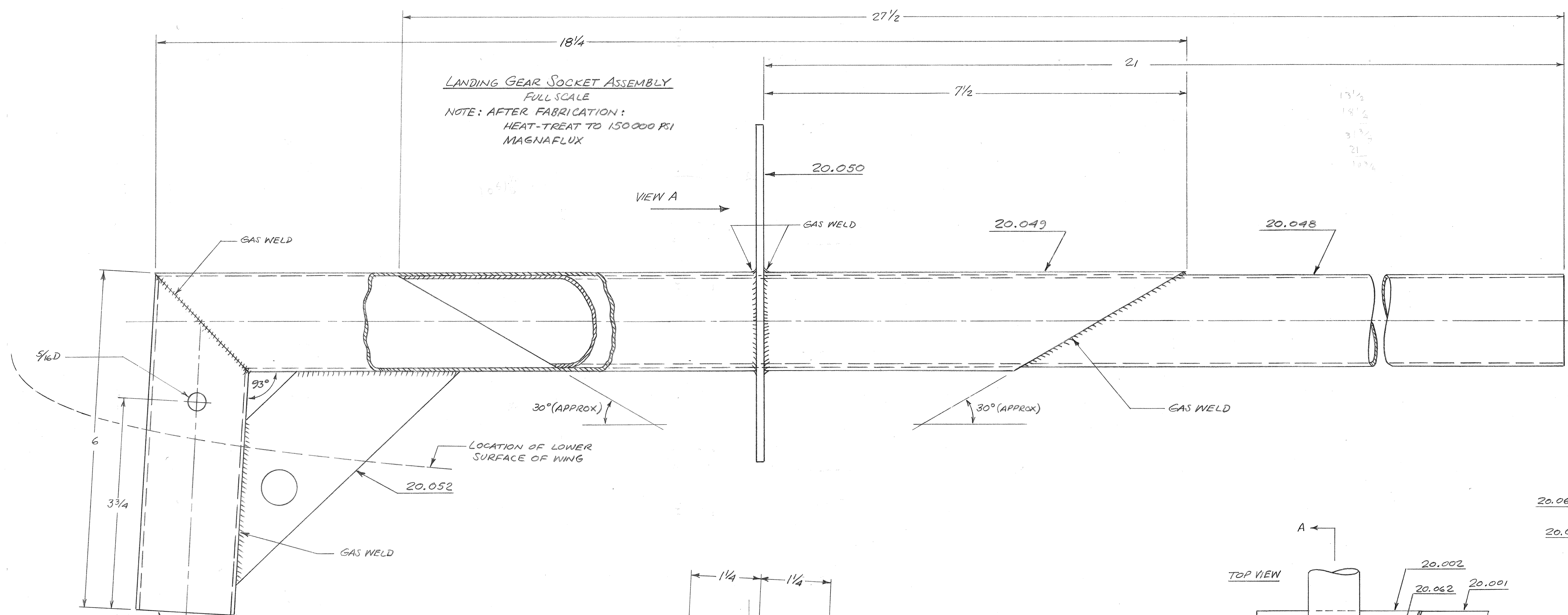
SCALE: AS NOTED      APPROVED BY: RAMacDonald      DRAWN BY: RMacD

DATE: 9/72

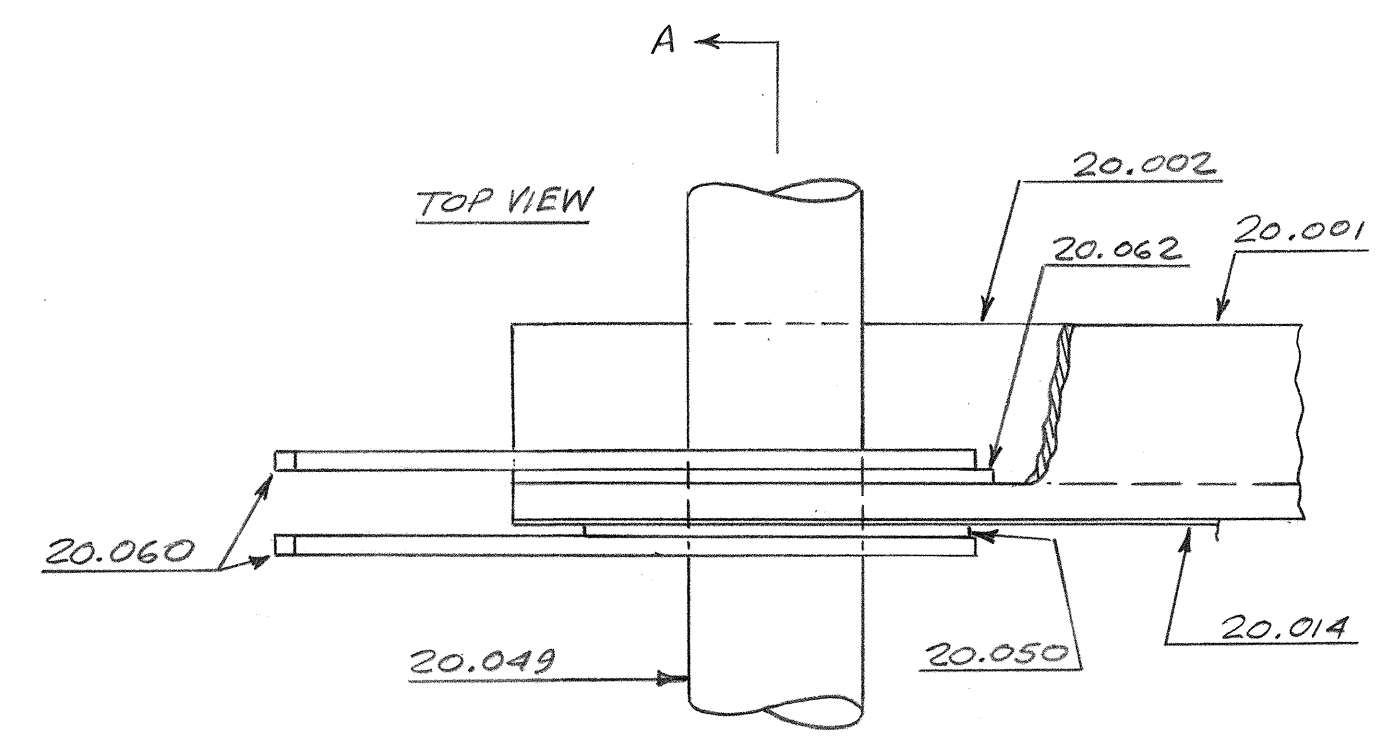
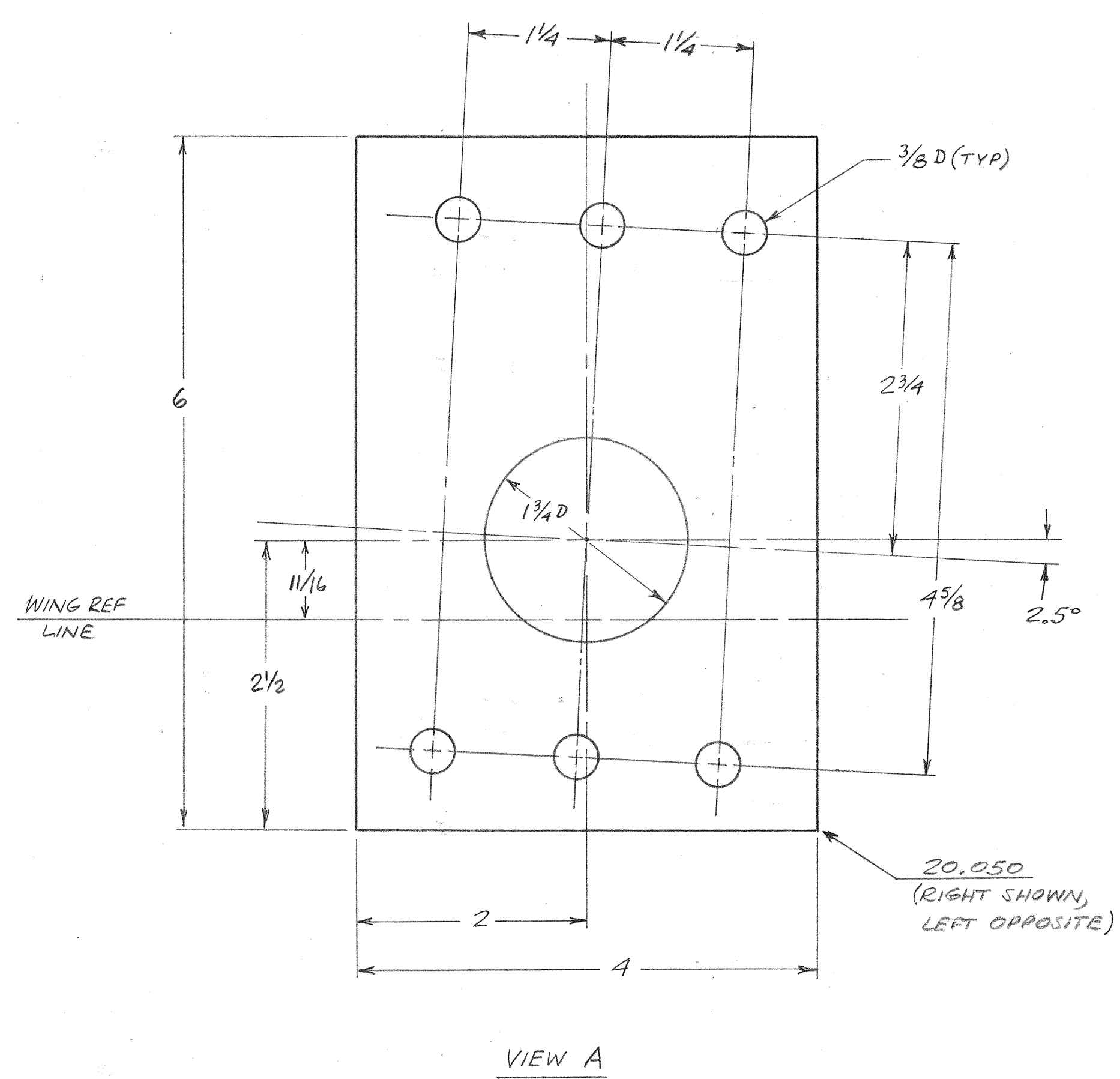
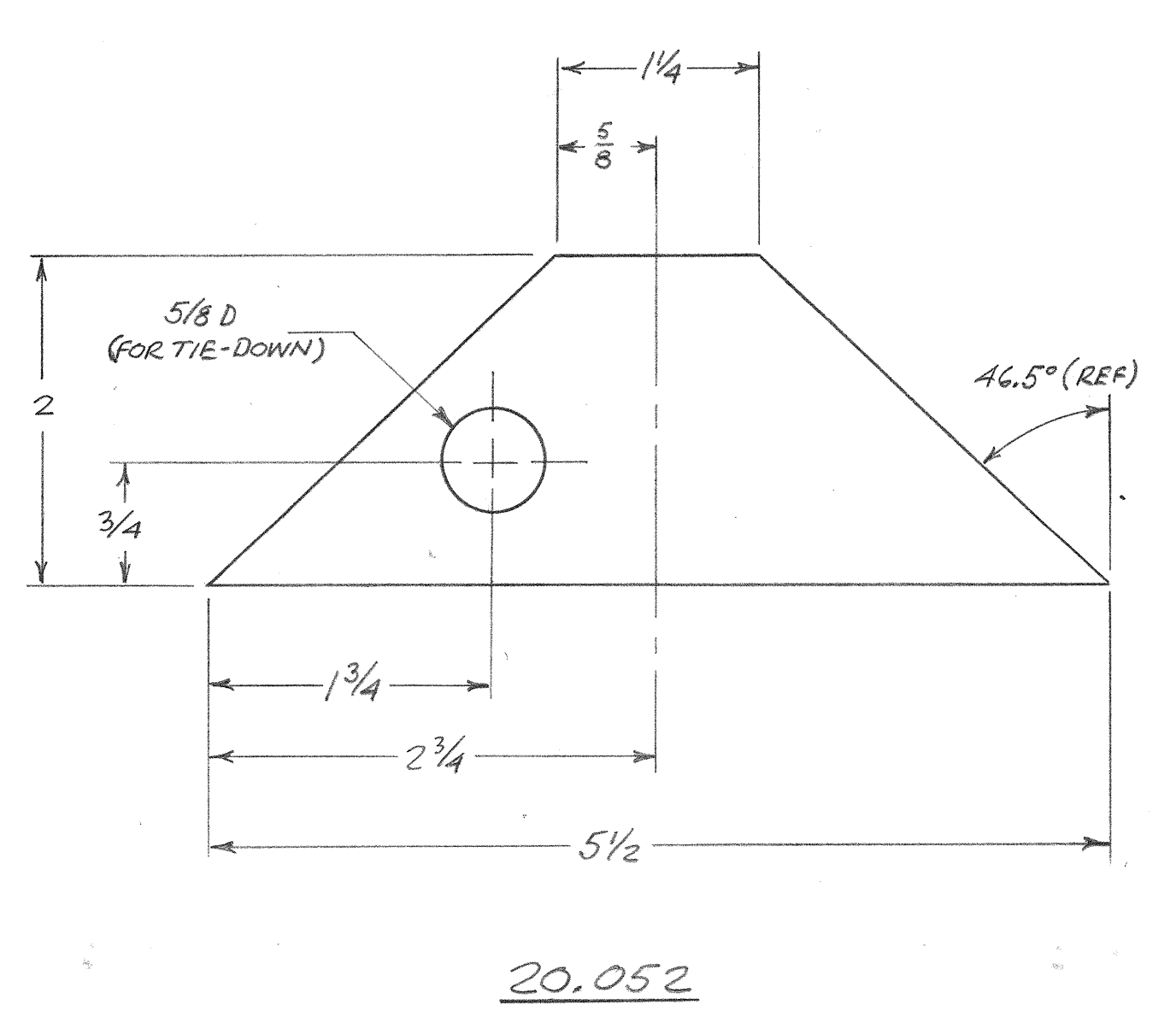
MAC DONALD S-21

DRAWING NUMBER: 3/1/20.05

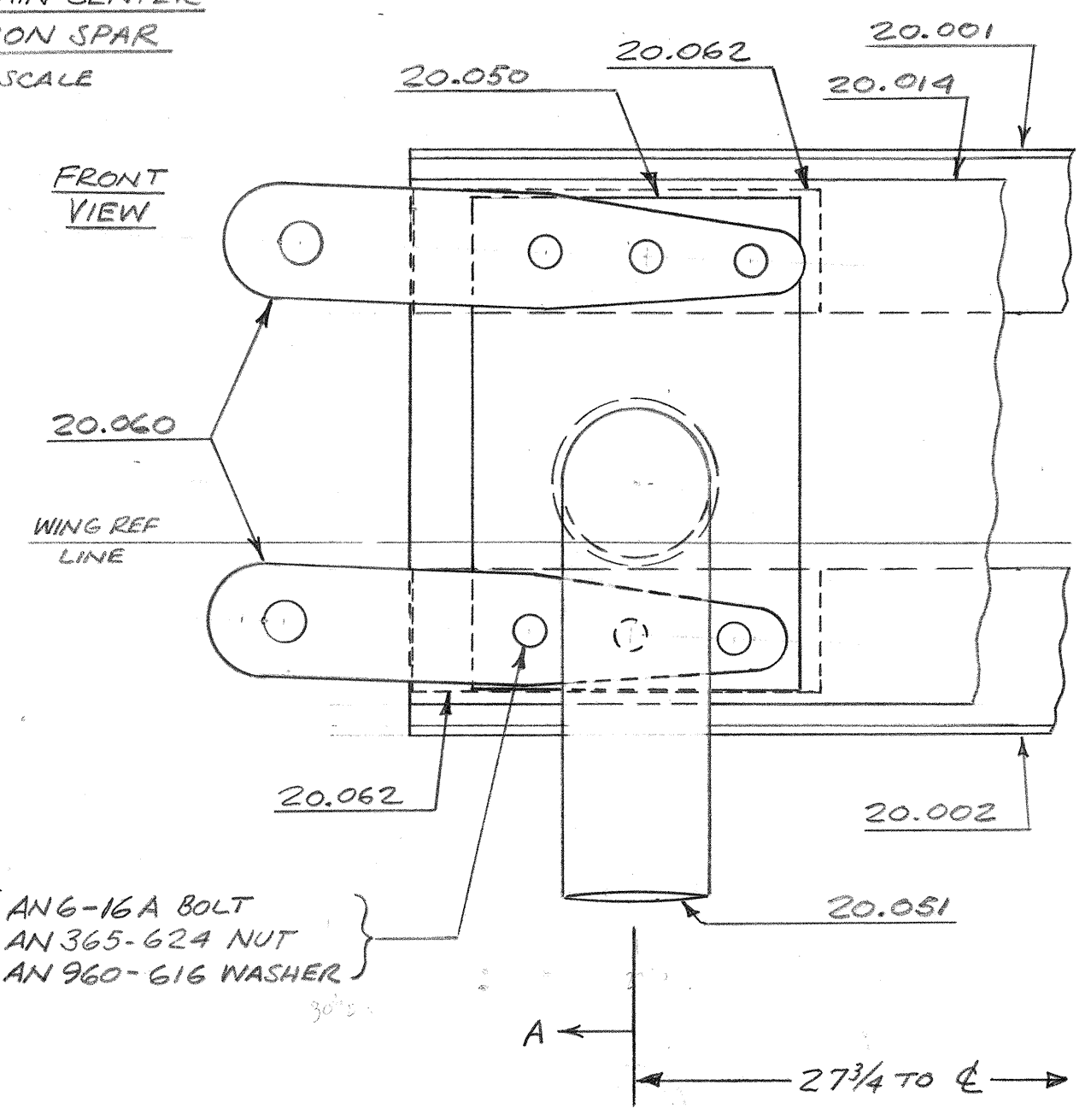
**LANDING GEAR SOCKET ASSEMBLY**  
 FULL SCALE  
 NOTE: AFTER FABRICATION:  
 HEAT-TREAT TO 150,000 PSI  
 MAGNAFLUX



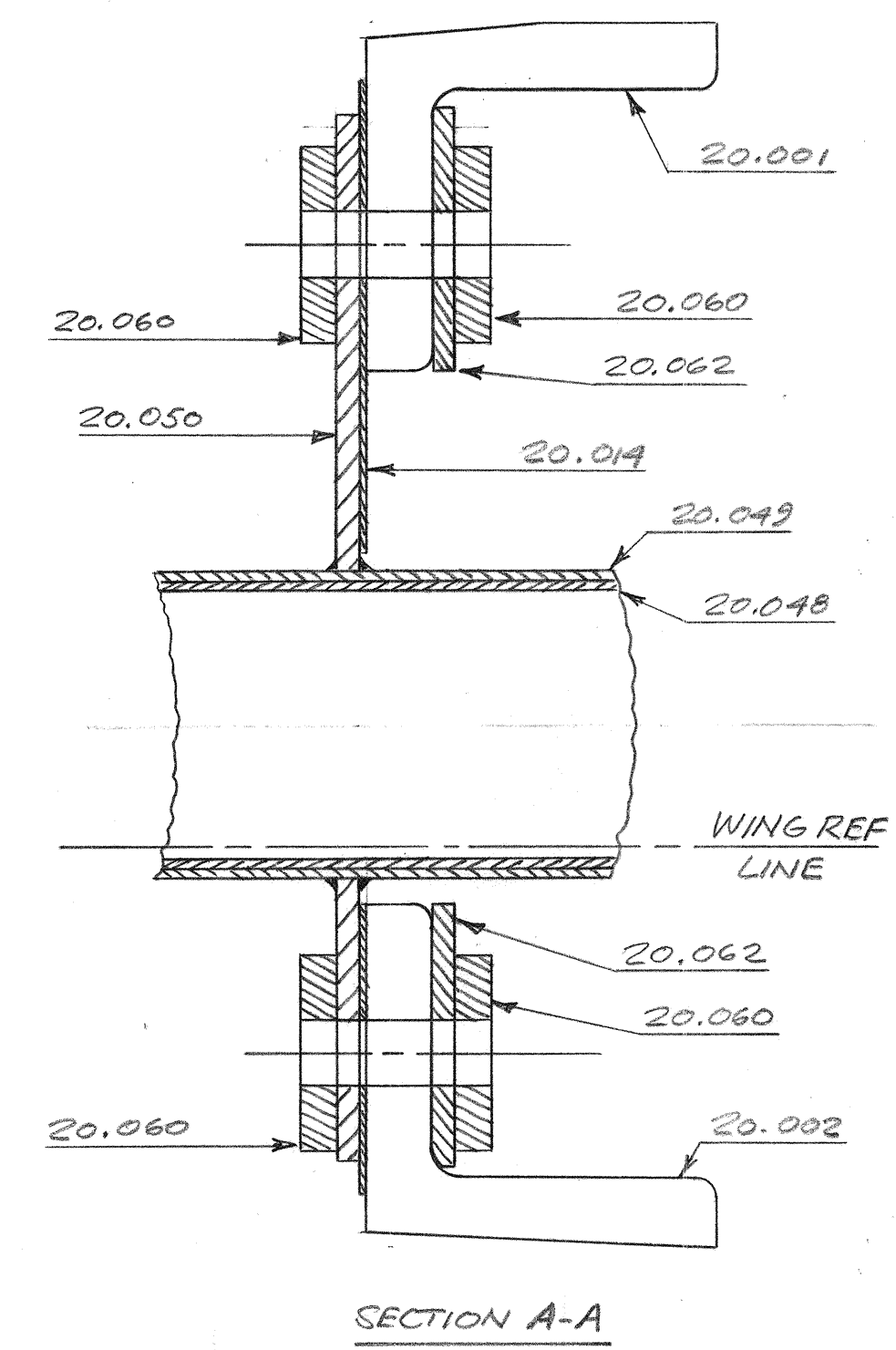
REAM TO 1 5/8 (OR TO FIT L.G. LEG) FOR DEPTH OF 4 1/4



DETAIL OF END OF MAIN CENTER SECTION SPAR  
 1/2 SCALE



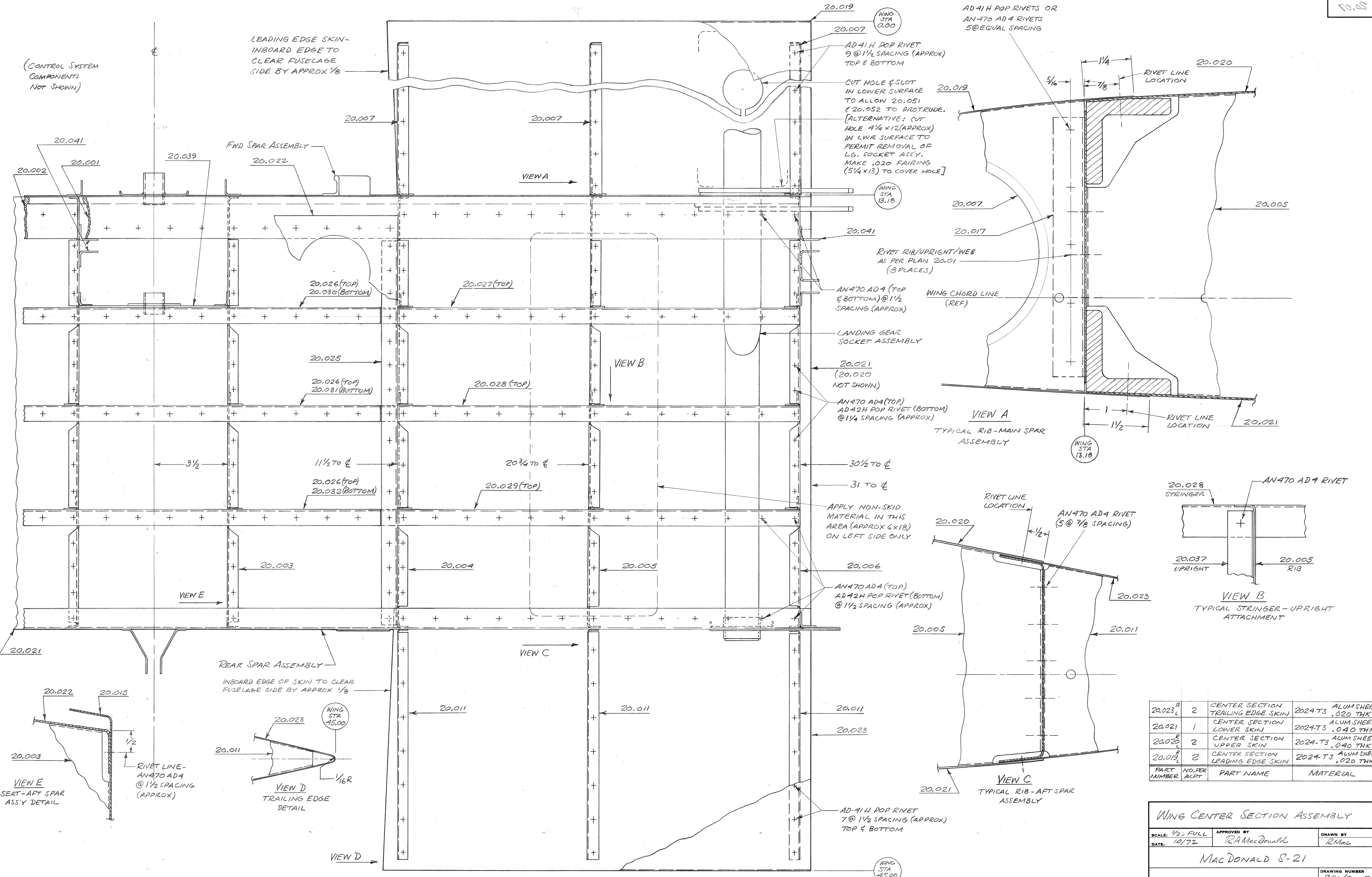
6 PLACES { ANG-16A BOLT  
 AN 365-624 NUT  
 AN 960-616 WASHER }



PART NUMBER	NO. PER ASSEMBLY	PART NAME	MATERIAL
20.052	2	L.G. REINFORCING GUSSET	4130 SHEET STEEL .125 THK
20.051	2	L.G. STRUT SOCKET	4130 STEEL TUBE 1.3/4 X .065
20.050	2	FWD L.G. ATTACH PLATE	4130 SHEET STEEL .125 THK
20.049	2	FWD HORIZ L.G. TUBE	4130 STEEL TUBE 1 3/4 X .065
20.048	2	AFT HORIZ L.G. TUBE	4130 STEEL TUBE 1 5/8 X .065

CENTER SECTION LNDG GEAR SOCKET ASS'Y, MAIN SPAR ASSEMBLY DETAIL

SCALE: AS NOTED  
 DATE: 10/72  
 APPROVED BY: R.A. MacDonald  
 DRAWN BY: R.MacD  
 MACDONALD S-21  
 DRAWING NUMBER: S-21/20.06



PART NUMBER	NO. PER ACFT	PART NAME	MATERIAL
20.023 <sup>R</sup>	2	CENTER SECTION TRAILING EDGE SKIN	2024-T3 ALUM SHEET .020 THK
20.021	1	CENTER SECTION LOWER SKIN	2024-T3 ALUM SHEET .040 THK
20.020 <sup>B</sup>	2	CENTER SECTION UPPER SKIN	2024-T3 ALUM SHEET .040 THK
20.019 <sup>R</sup>	2	CENTER SECTION LEADING EDGE SKIN	2024-T3 ALUM SHEET .020 THK

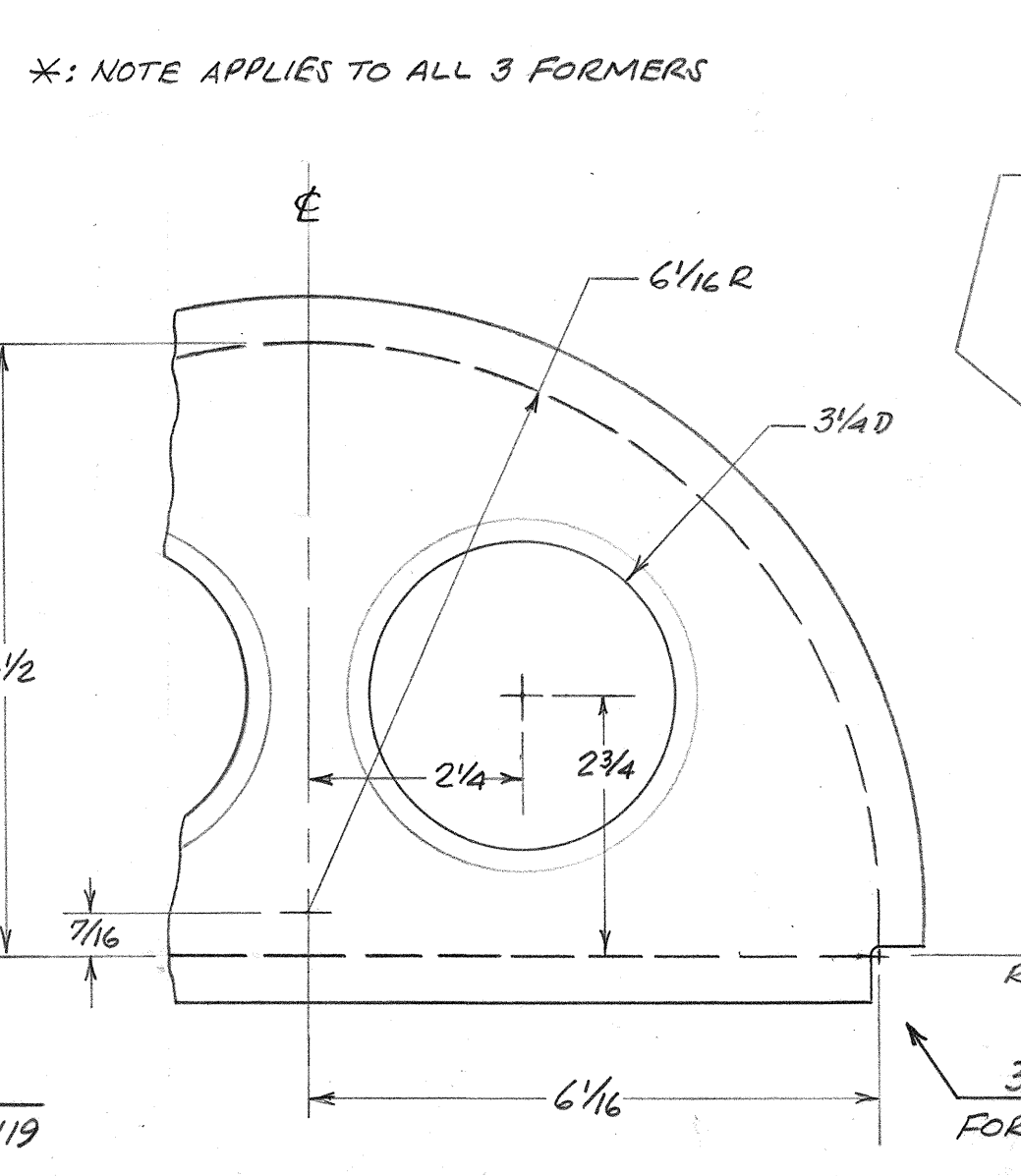
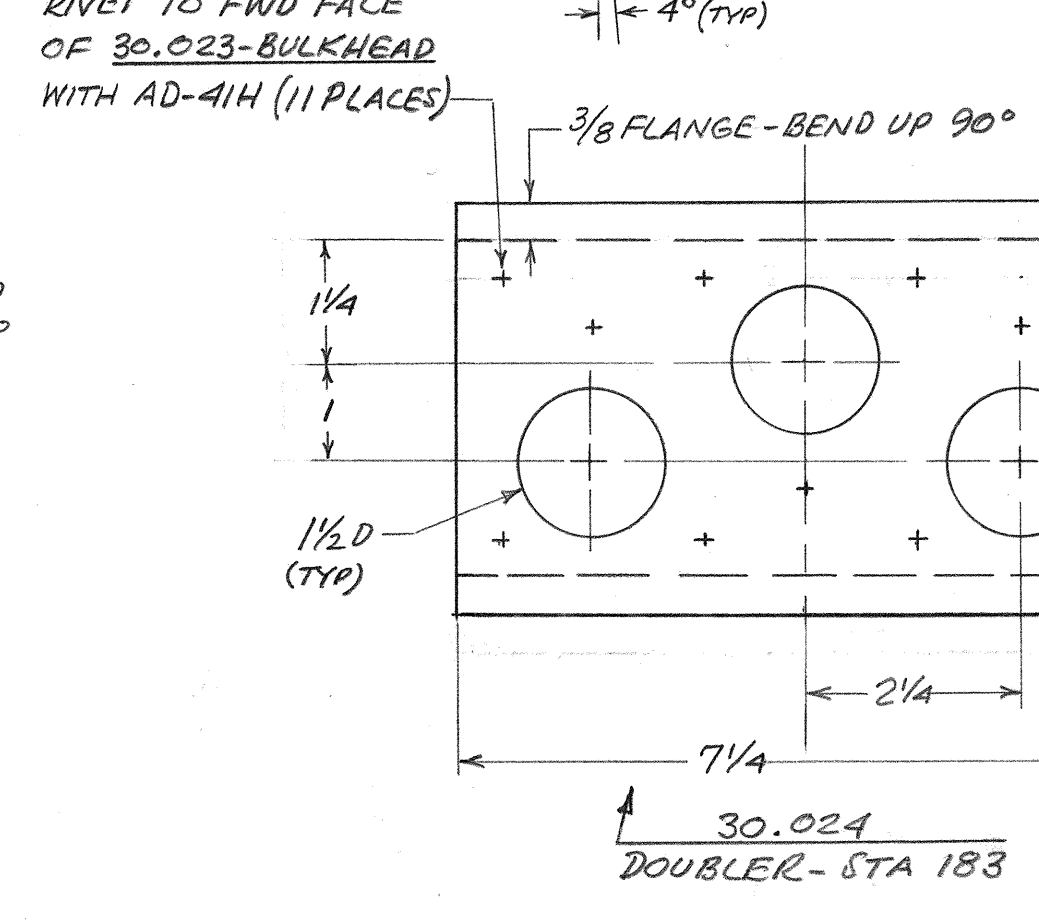
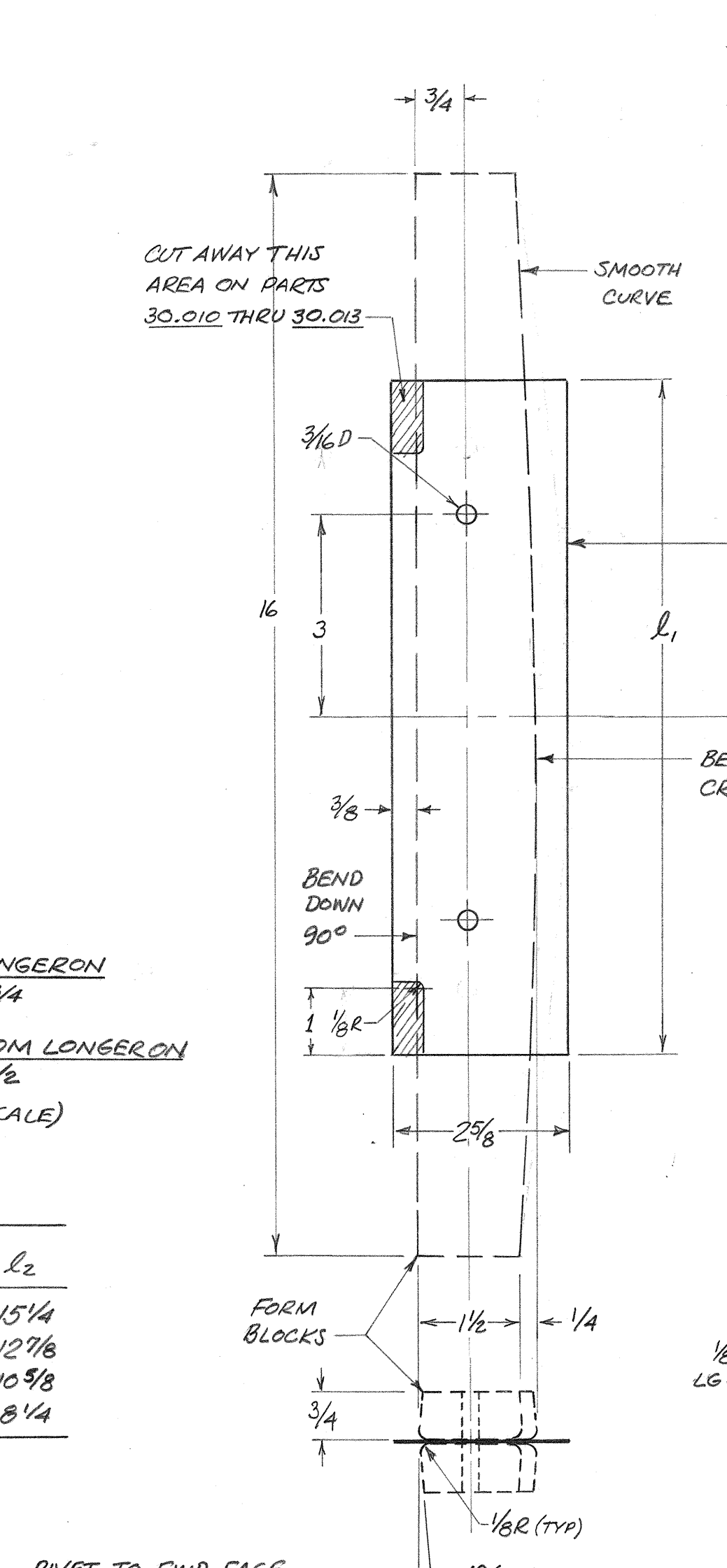
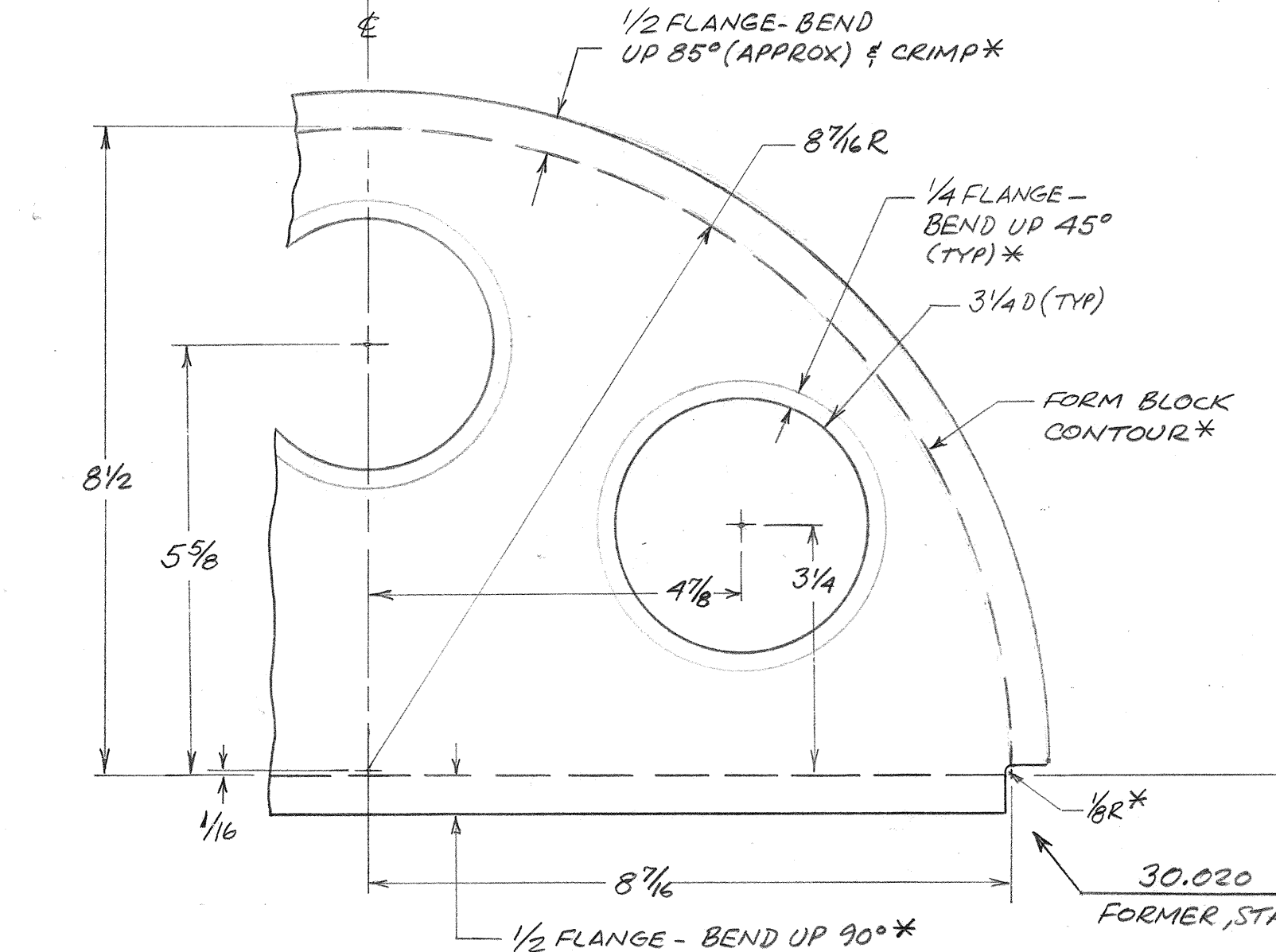
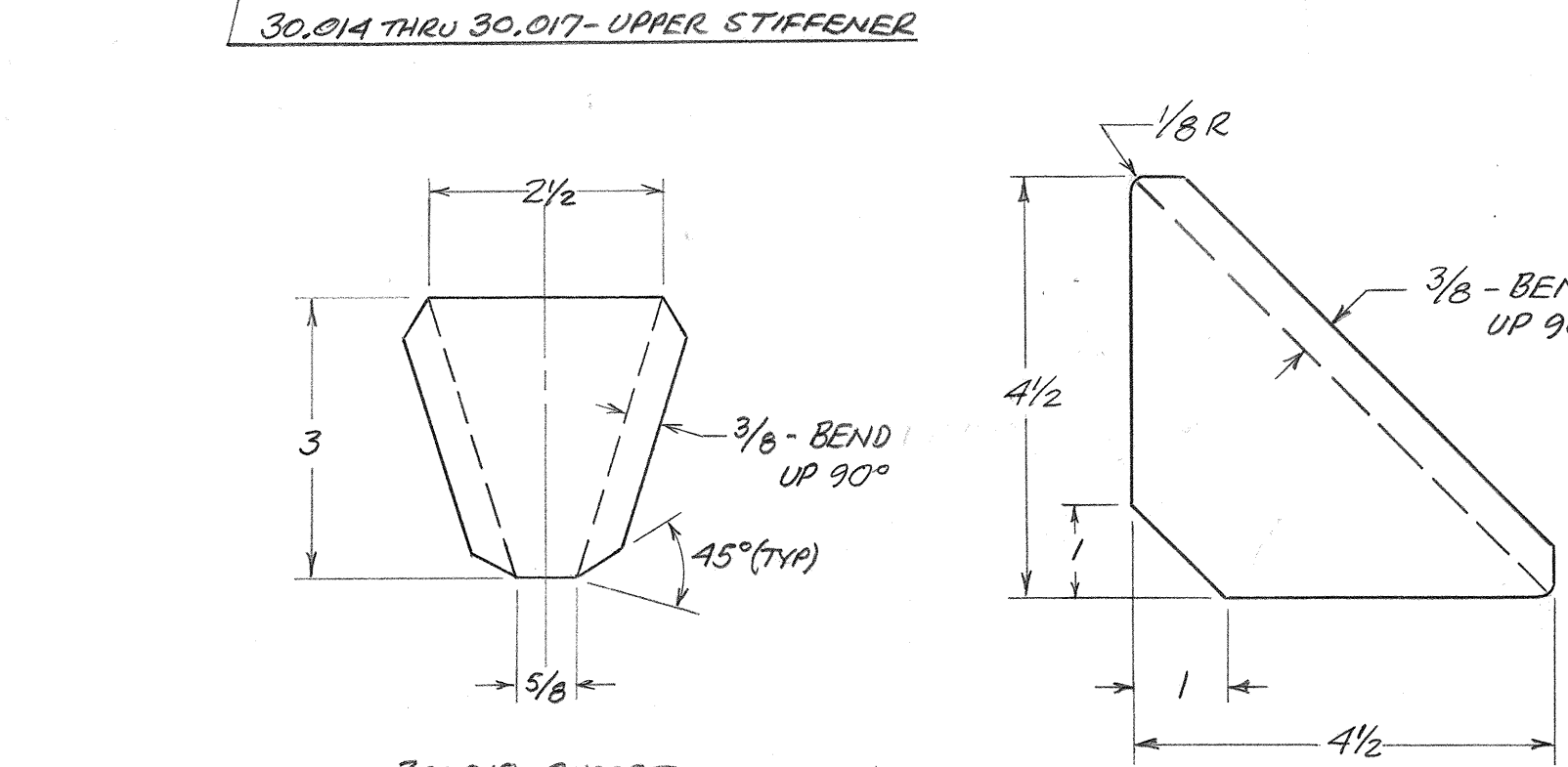
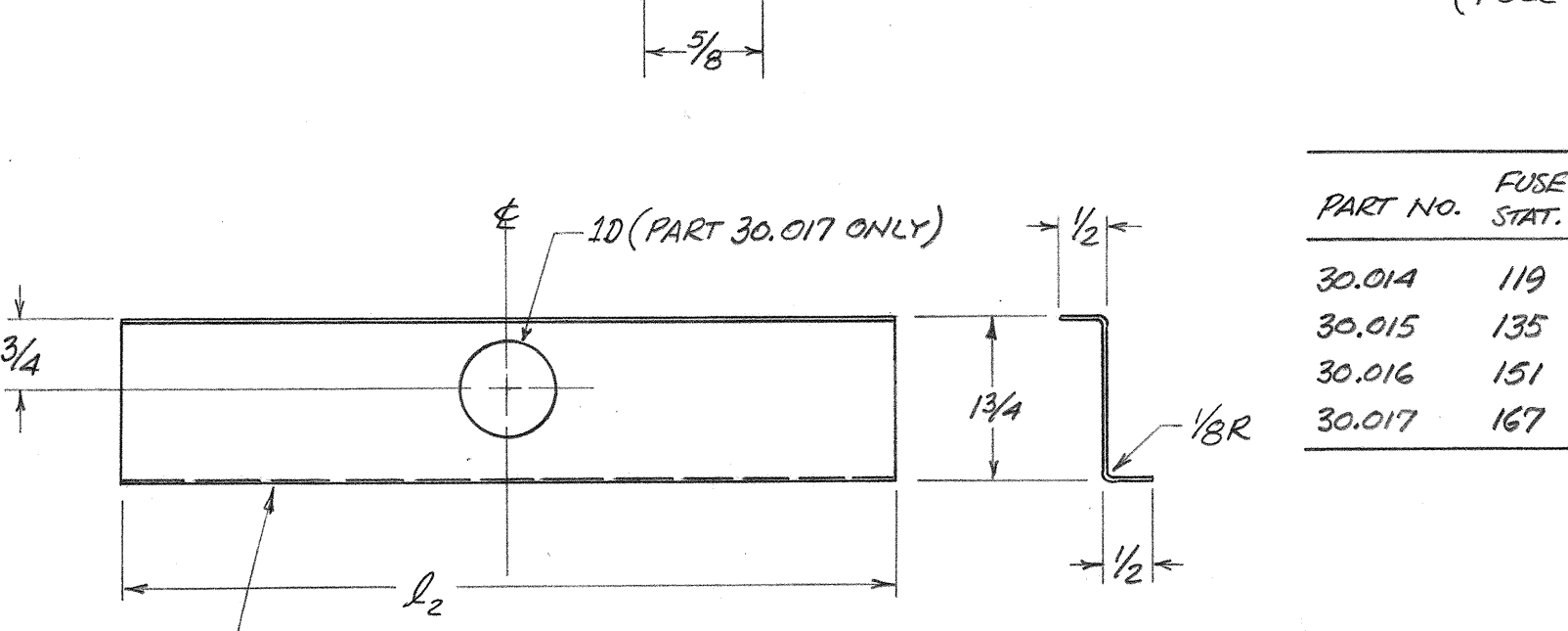
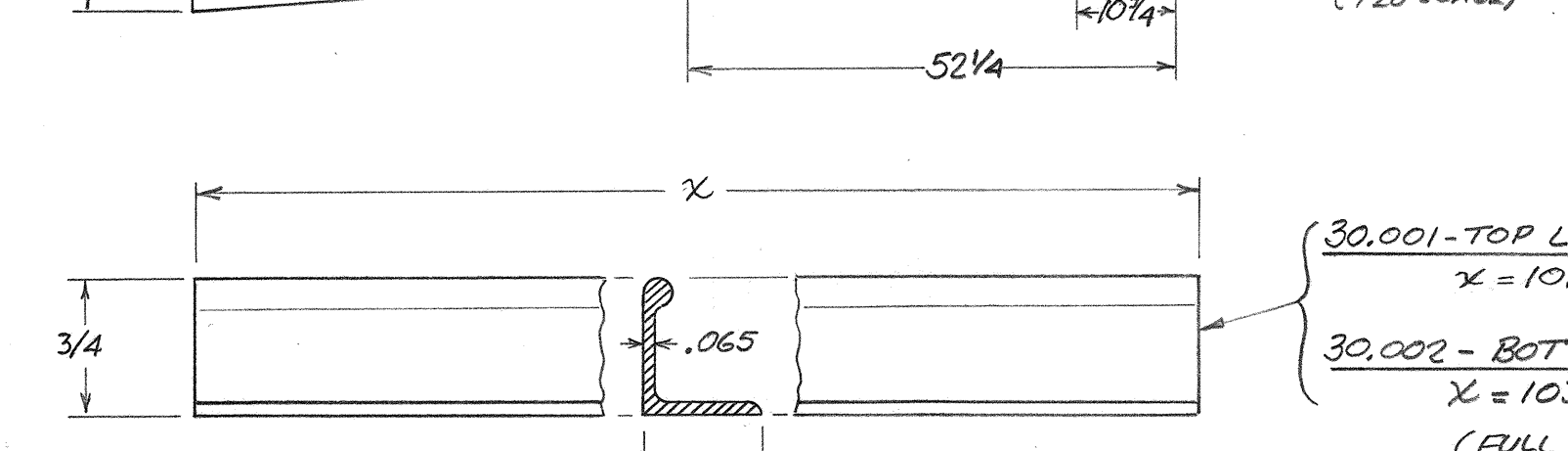
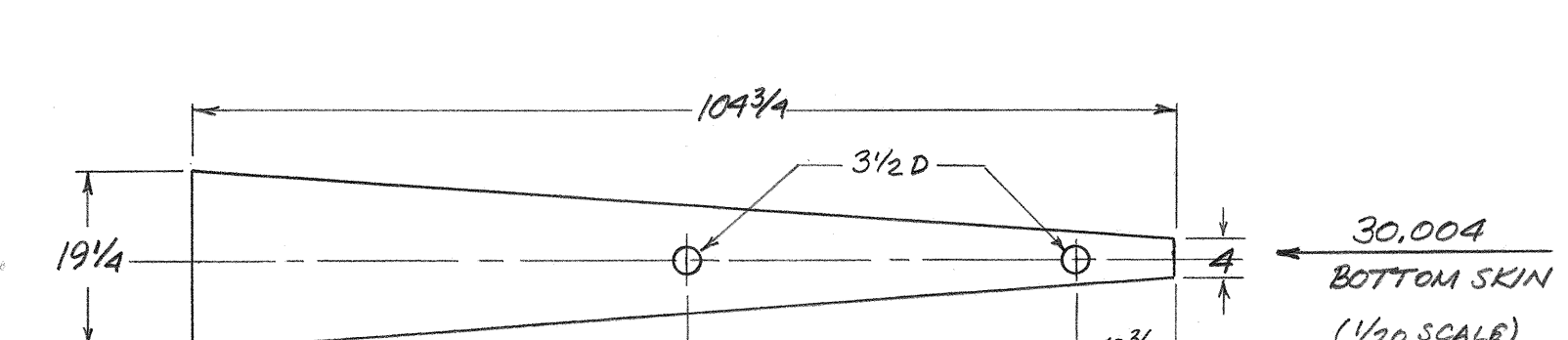
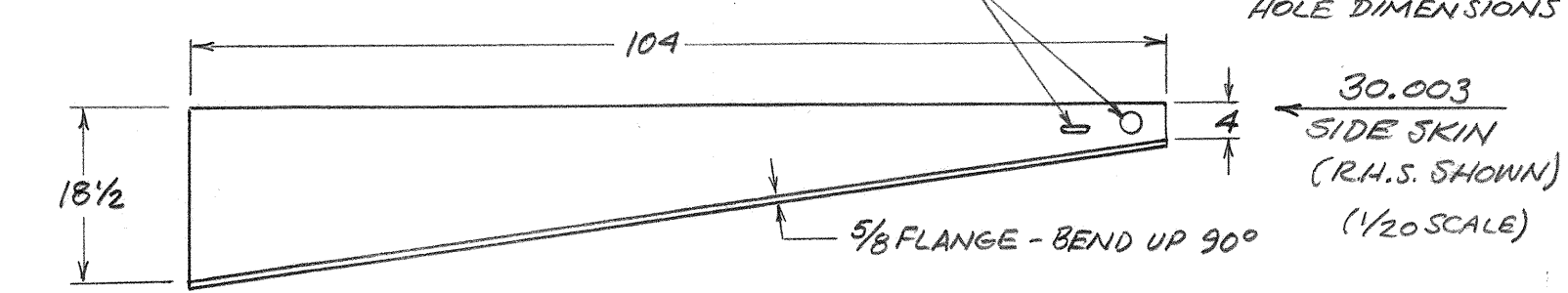
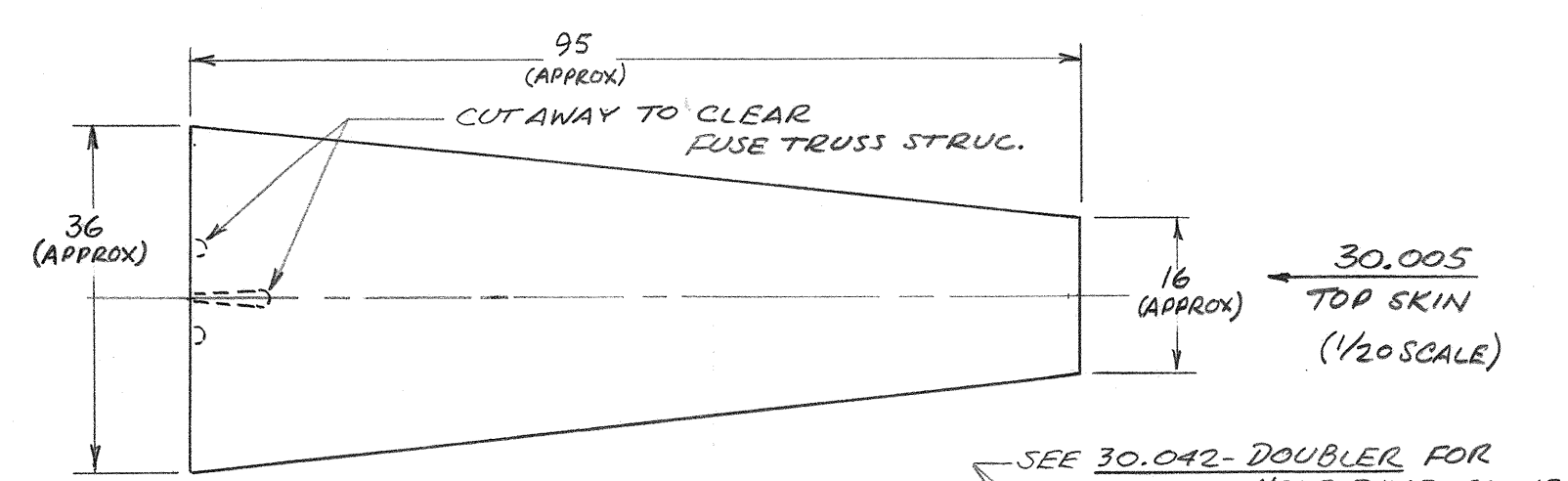
**WING CENTER SECTION ASSEMBLY**

SCALE: 1/2" FULL  
 DATE: 10/72

APPROVED BY: RMacDonald  
 DRAWN BY: RMac

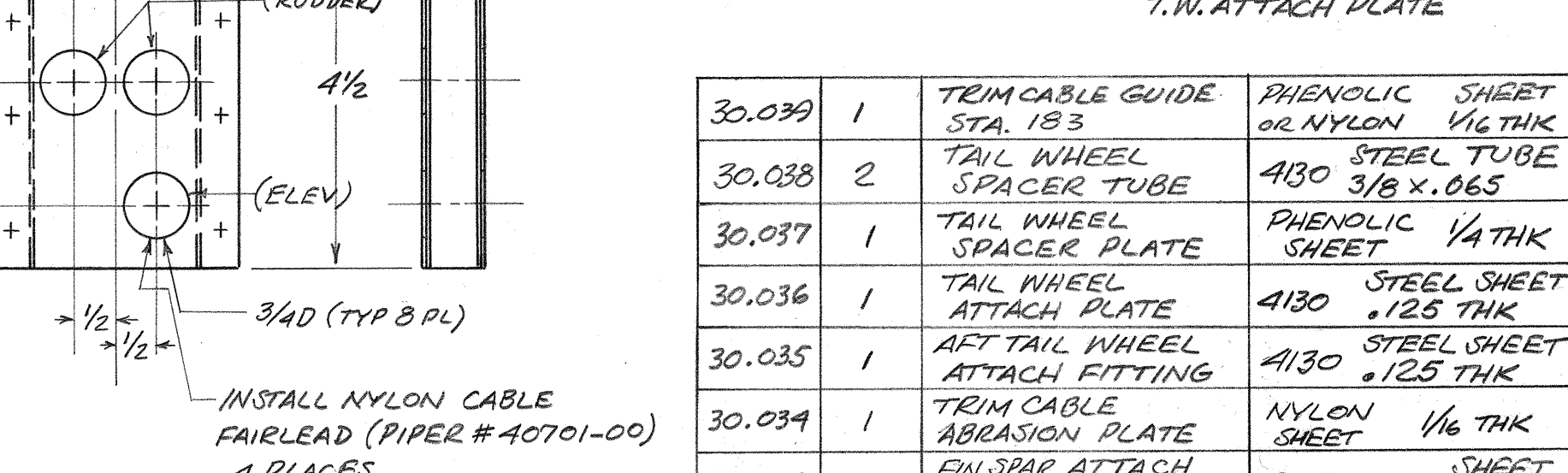
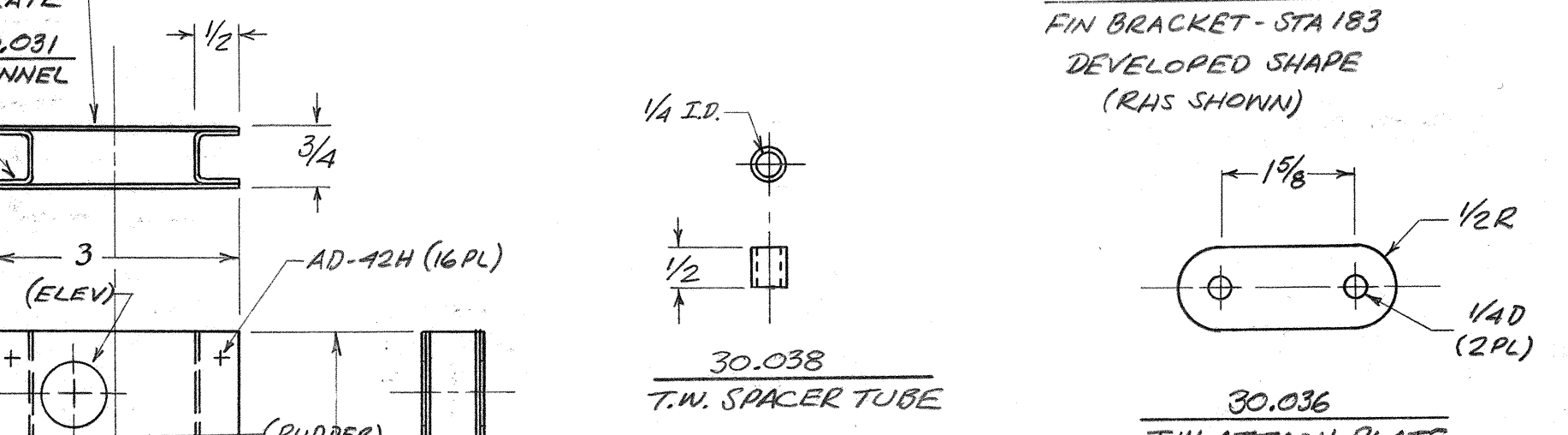
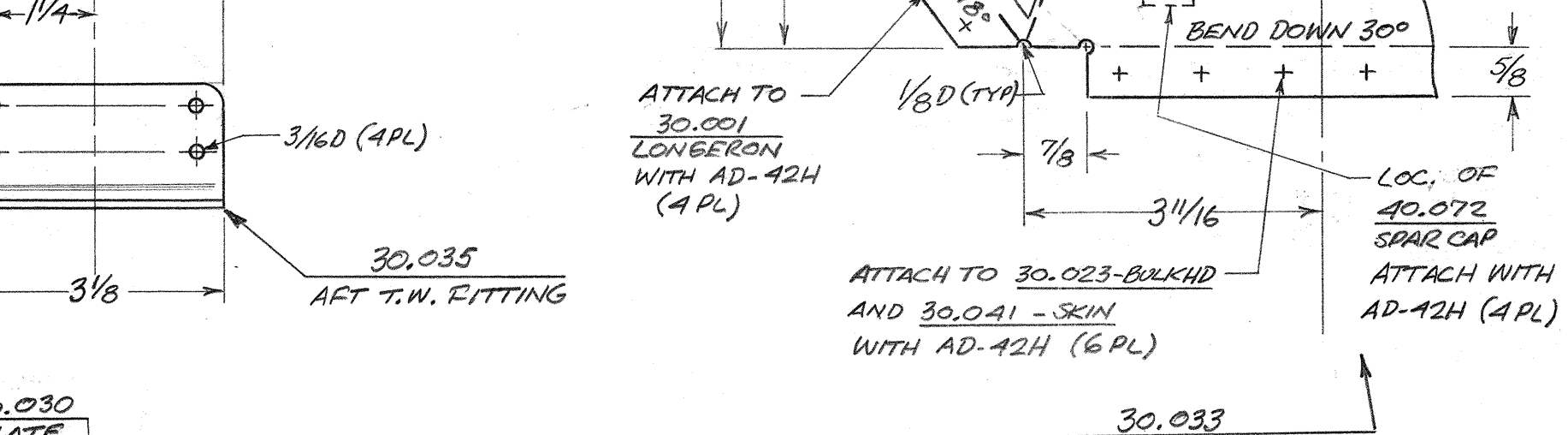
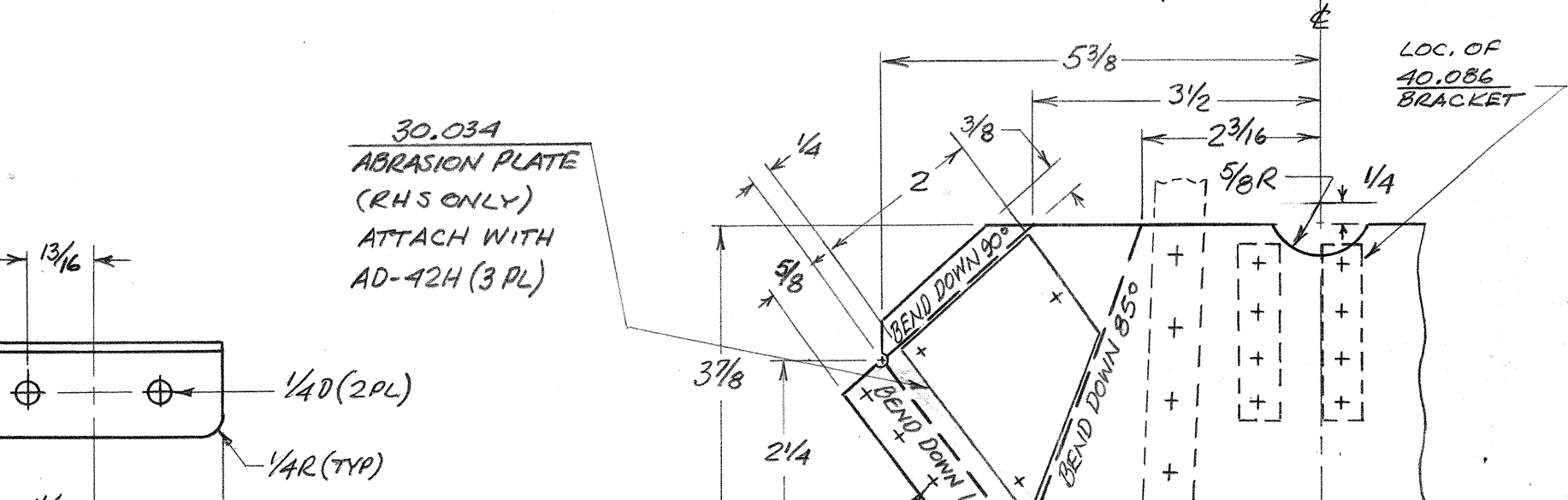
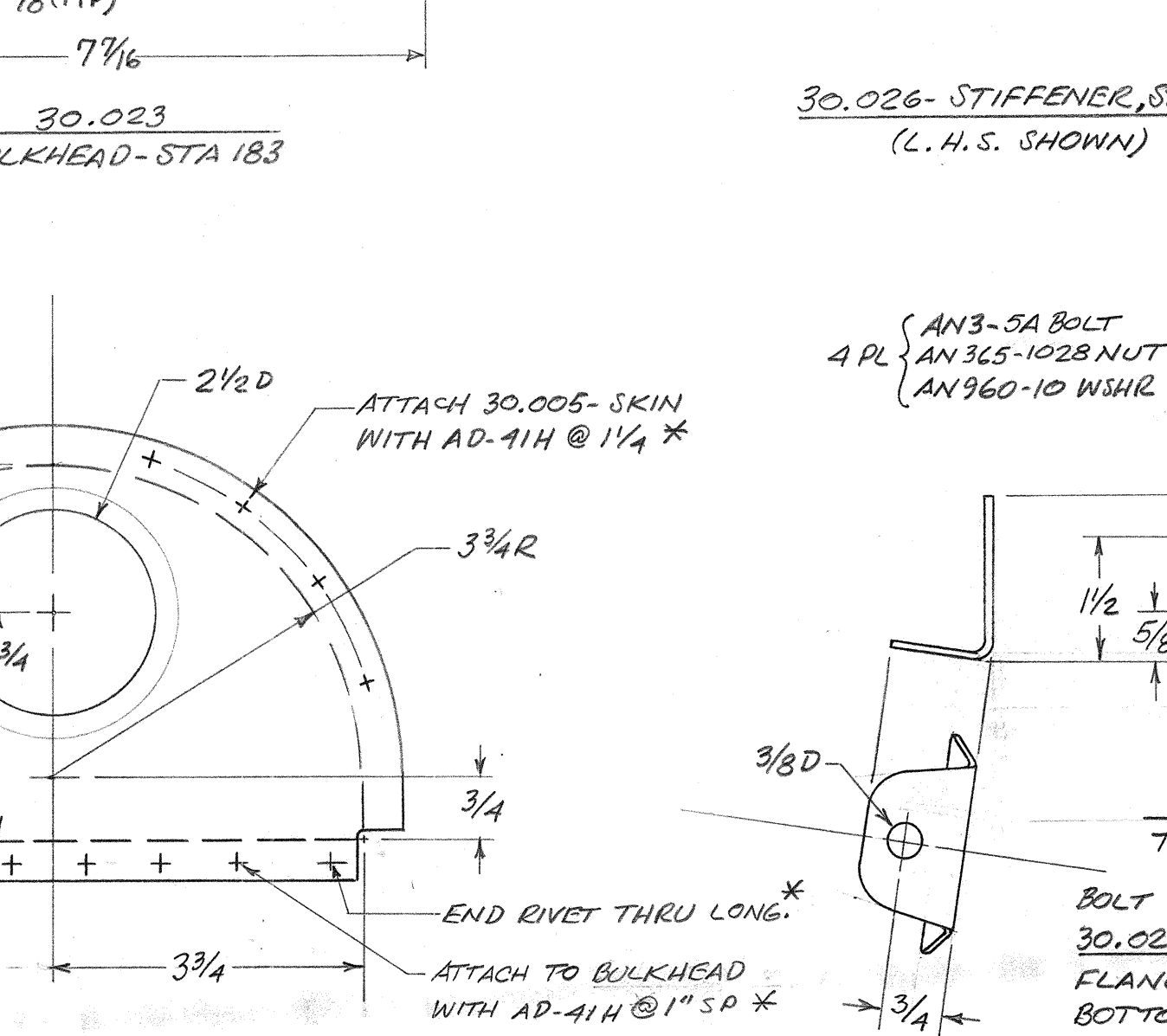
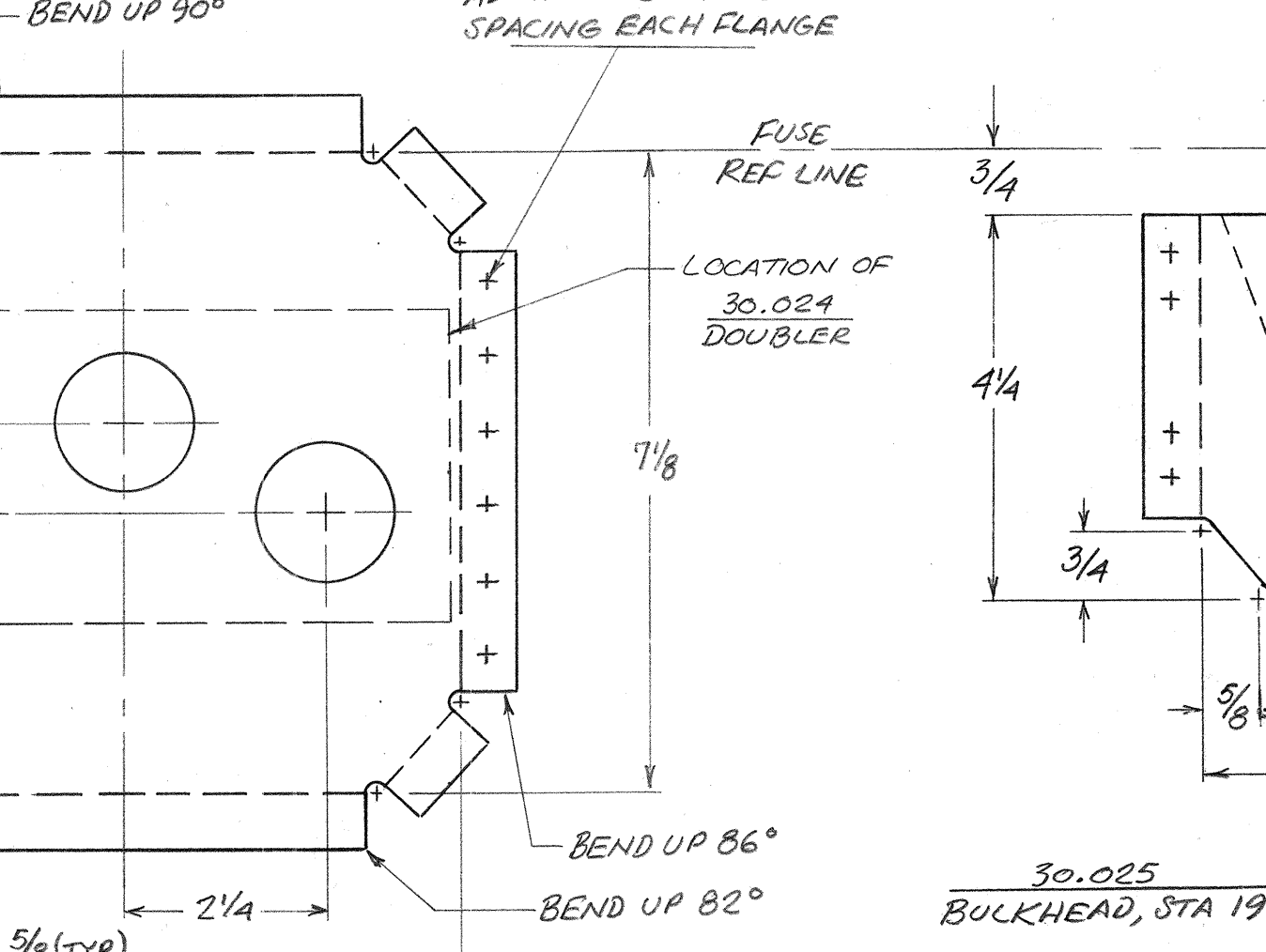
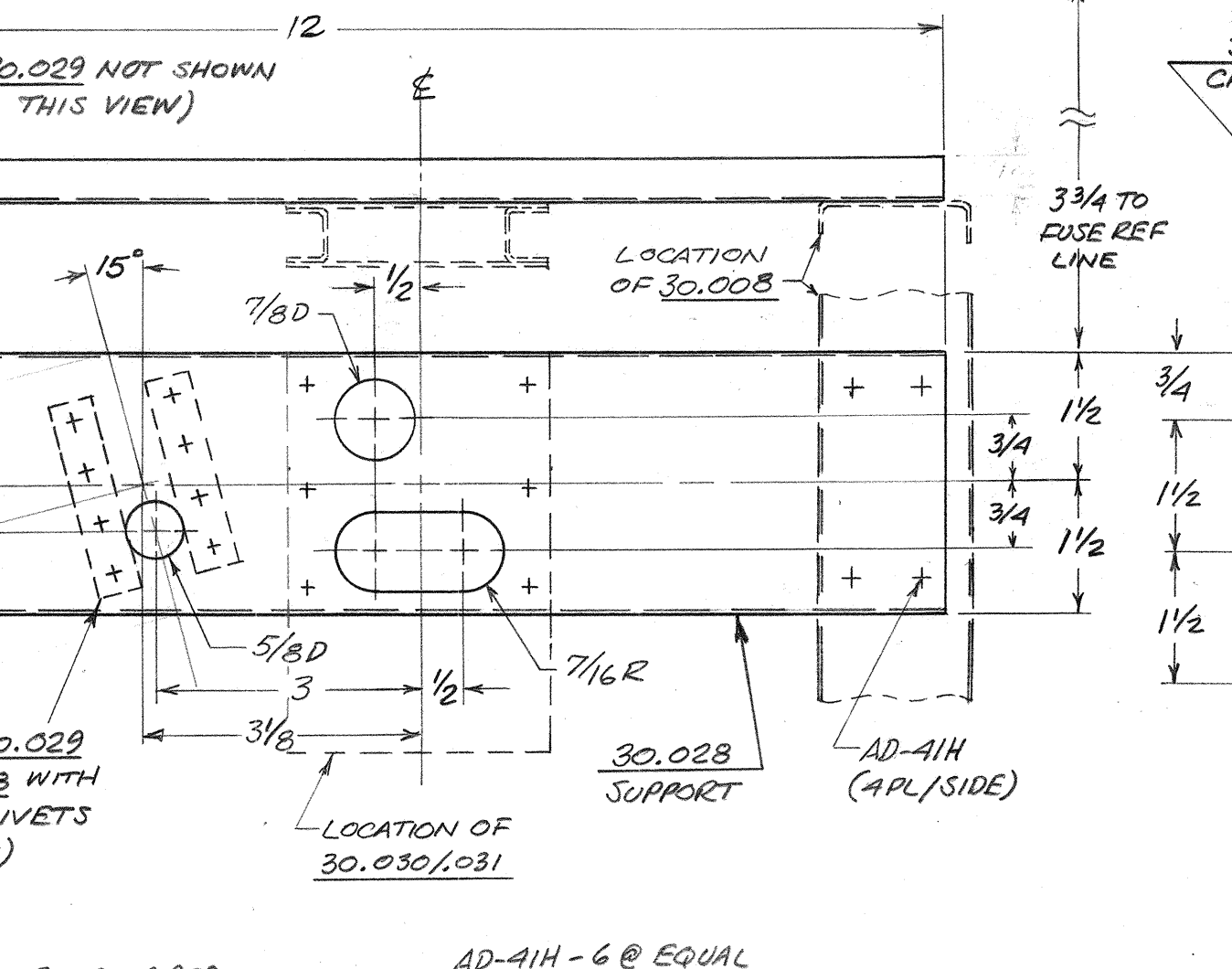
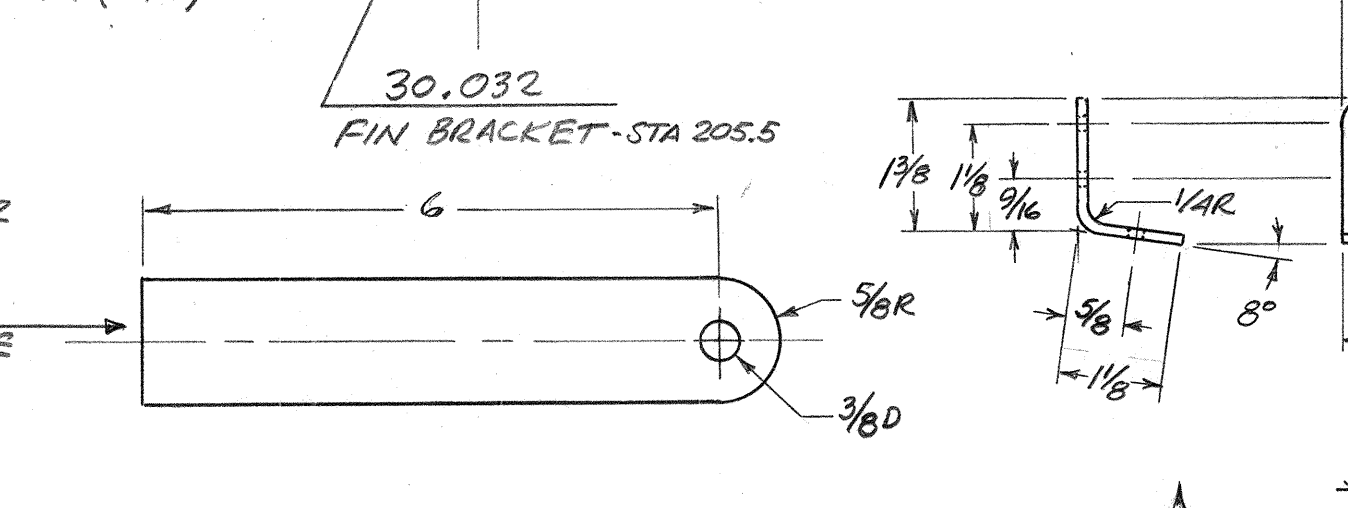
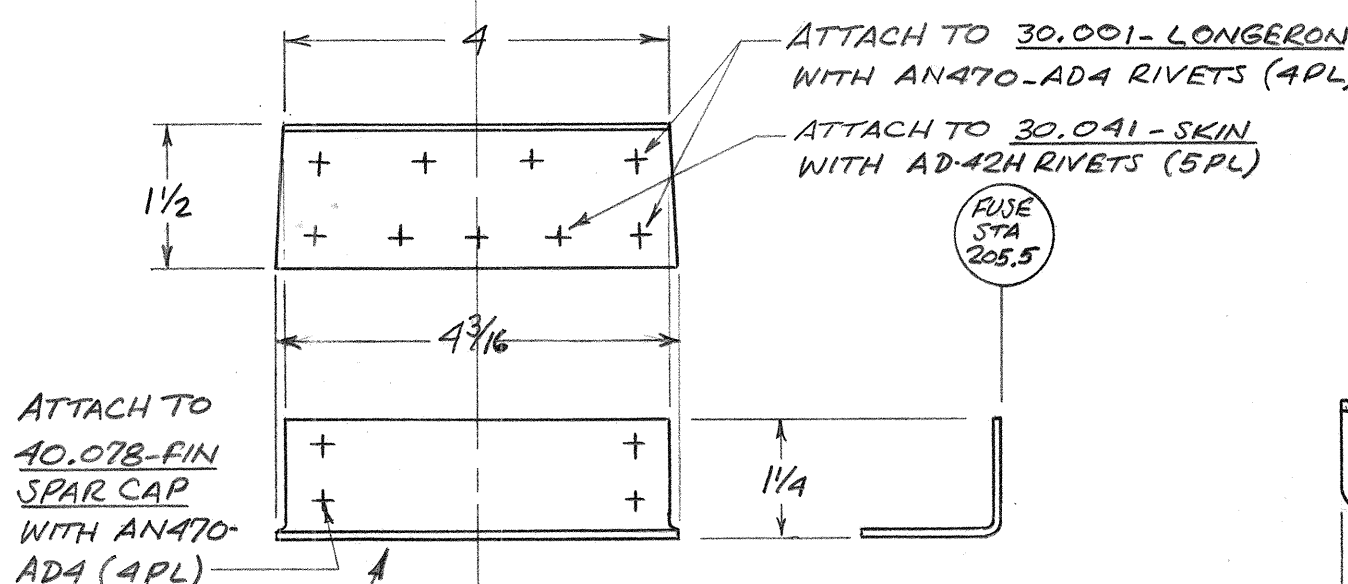
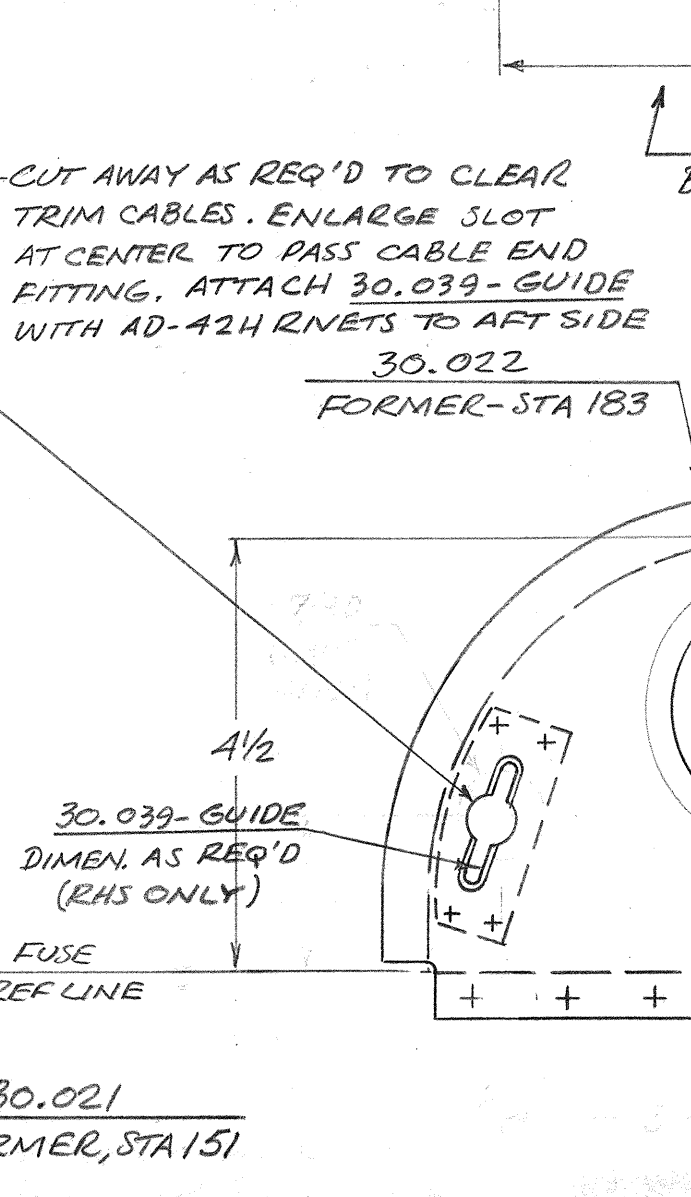
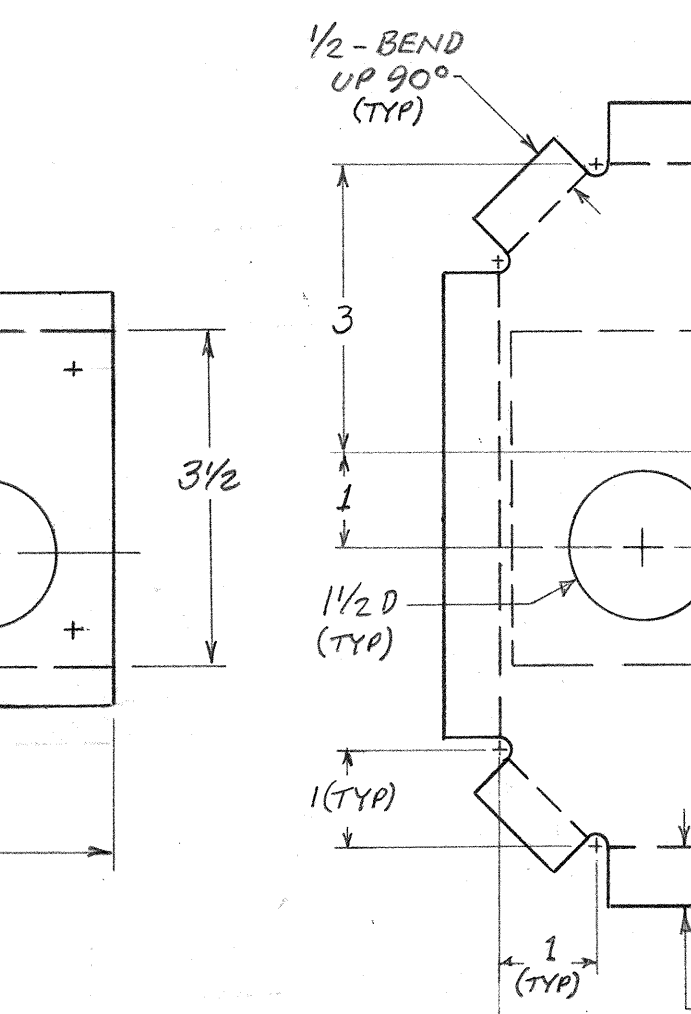
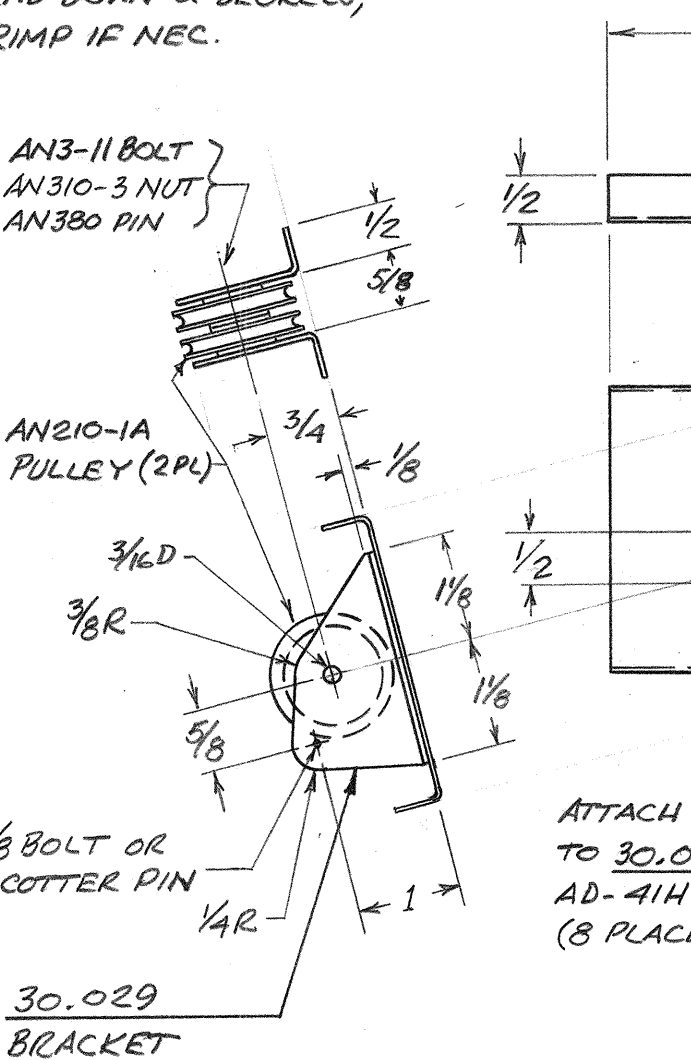
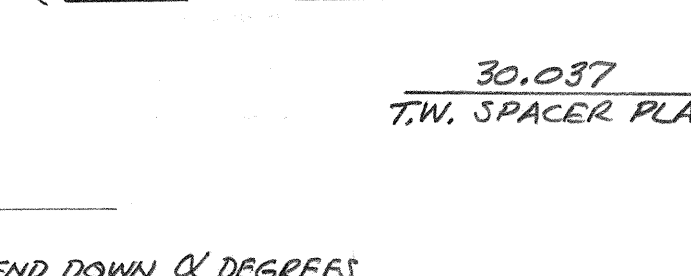
MAC DONALD S-21

DRAWING NUMBER: S21/20.07



PART NO.	NO. REQ'D	FUSE STAT.	L <sub>1</sub>	α
30.006	2	119	14 9/8	86°
.007	2	135	12 3/8	
.008	2	151	10 1/8	
.009	2	167	7 7/8	
.010	1	119	15 1/2	82°
.011	1	135	13 3/8	
.012	1	151	10 3/4	
.013	1	167	8 1/2	

TOTAL OF 12 PARTS MADE ON THESE FORM BLOCKS



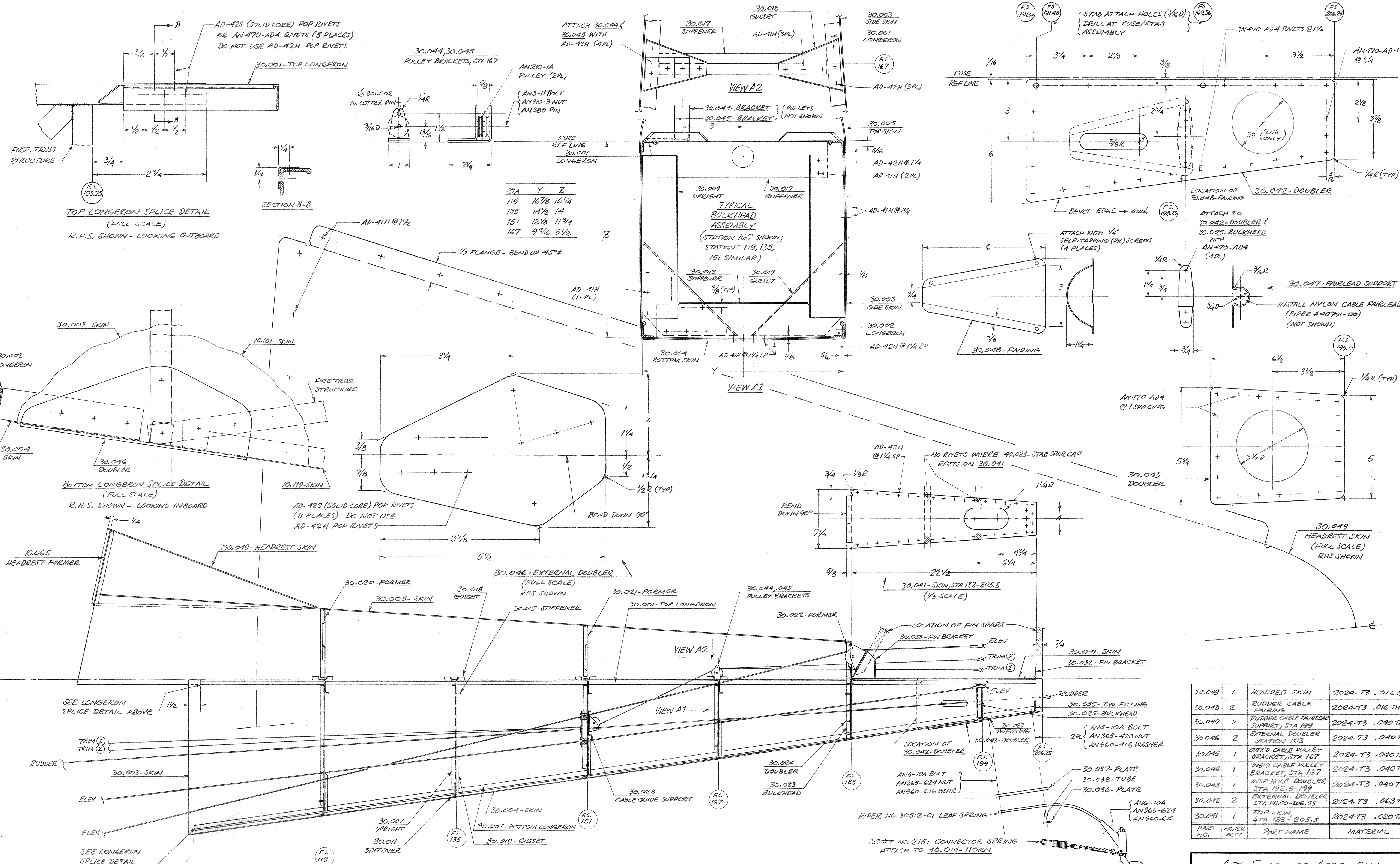
\*: NOTE APPLIES TO ALL 3 FORMERS

CUT AWAY AS REQ'D TO CLEAR TRIM CABLES. ENLARGE SLOT AT CENTER TO PASS CABLE END FITTING. ATTACH 30.039-GUIDE WITH AD-42H RIVETS TO AFT SIDE

PART NO.	NO. PER ACFT	PART NAME	MATERIAL
30.039	1	TRIM CABLE GUIDE STA. 183	PHENOLIC SHEET OR NYLON 1/4 THK
30.038	2	TAIL WHEEL SPACER TUBE	STEEL TUBE 430 3/8 X .065
30.037	1	TAIL WHEEL SPACER PLATE	PHENOLIC SHEET 1/4 THK
30.036	1	TAIL WHEEL ATTACH PLATE	430 STEEL SHEET .125 THK
30.035	1	AFT TAIL WHEEL ATTACH FITTING	430 STEEL SHEET .125 THK
30.034	1	TRIM CABLE ABRASION PLATE	NYLON SHEET 1/6 THK
30.033	1	FIN SPAR ATTACH BRACKET, STA 183	2024-T3 SHEET .040 THK
30.032	1	FIN SPAR ATTACH BRACKET, STA 205.5	2024-T3 SHEET .063 THK
30.031	2	CABLE GUIDE CHANNEL, STA 151	2024-T3 SHEET .040 THK
30.030	2	CABLE GUIDE PLATE, STA 151	2024-T3 SHEET .040 THK
30.029	2	TRIM CABLE PULLEY BRACKET, STA 151	2024-T3 SHEET .040 THK
30.028	1	CABLE GUIDE SUPPORT, STA 151	2024-T3 SHEET .020 THK
30.027	1	FWD TAIL WHEEL ATTACH FITTING	4130 STEEL SHEET .125 THK
30.026	2	BULKHEAD STIFFENER STATION 129	2024-T3 SHEET .063 THK
30.025	1	BULKHEAD STATION 199	2024-T3 SHEET .063 THK
30.024	1	DOUBLER STATION 183	2024-T3 SHEET .020 THK
30.023	1	BULKHEAD STATION 183	2024-T3 SHEET .020 THK
30.022	1	FORMER STATION 183	2024-T3 SHEET .020 THK
30.021	1	FORMER STATION 151	2024-T3 SHEET .020 THK
30.020	1	FORMER STATION 119	2024-T3 SHEET .020 THK
30.019	8	TRIANGULAR GUSSET	2024-T3 SHEET .020 THK
30.018	8	TRAPEZOIDAL GUSSET	2024-T3 SHEET .020 THK
30.017	1EA	UPPER TRANSVERSE STIFFENER	2024-T3 SHEET .020 THK
30.016	1EA	LOWER TRANSVERSE STIFFENER	2024-T3 SHEET .020 THK
30.015	2EA	UPRIGHTS	2024-T3 SHEET .020 THK
30.014	1	AFT FUSELAGE TOP SKIN	2024-T3 SHEET .020 THK
30.013	1	AFT FUSELAGE BOTTOM SKIN	2024-T3 SHEET .020 THK
30.012	2	AFT FUSELAGE SIDE SKIN	2024-T3 SHEET .020 THK
30.011	2	AFT FUSELAGE BOTTOM LONGERON	2024-T351 BULB ANGLE EXTRUSION
30.010	2	AFT FUSELAGE TOP LONGERON	2024-T351 BULB ANGLE EXTRUSION

**AFT FUSELAGE COMPONENTS**

SCALE: 1/2" = NOTED APPROVED BY: R MacDonnell DRAWN BY: R Mac  
 DATE: MAR 74 REVISED  
 MAC DONALD S-21  
 DRAWING NUMBER 30.01



STA	Y	Z
119	16 7/8	16 1/4
135	14 1/2	14
151	12 1/8	11 3/4
167	9 9/16	9 1/2

PART NO.	NO. PER ACFT	PART NAME	MATERIAL
30.049	1	HEADREST SKIN	2024-T3 .016 THK
30.048	2	RUDDER CABLE FAIRING	2024-T3 .016 THK
30.047	2	RUDDER CABLE FAIRLEAD SUPPORT, STA 199	2024-T3 .040 THK
30.046	2	EXTERNAL DOUBLER STATION 103	2024-T3 .040 THK
30.045	1	OUT'D CABLE PULLEY BRACKET, STA 167	2024-T3 .040 THK
30.044	1	INB'D CABLE PULLEY BRACKET, STA 167	2024-T3 .040 THK
30.043	1	INSP HOLE DOUBLER STA 192.5-199	2024-T3 .040 THK
30.042	2	EXTERNAL DOUBLER STA 191.20-206.25	2024-T3 .063 THK
30.041	1	TOP SKIN, STA 183-205.5	2024-T3 .020 THK

**AFT FUSELAGE ASSEMBLY**

SCALE: 1/2" = 1'-0" NOTED      APPROVED BY: *RAMacDonald*      DRAWN BY: *RAMac*

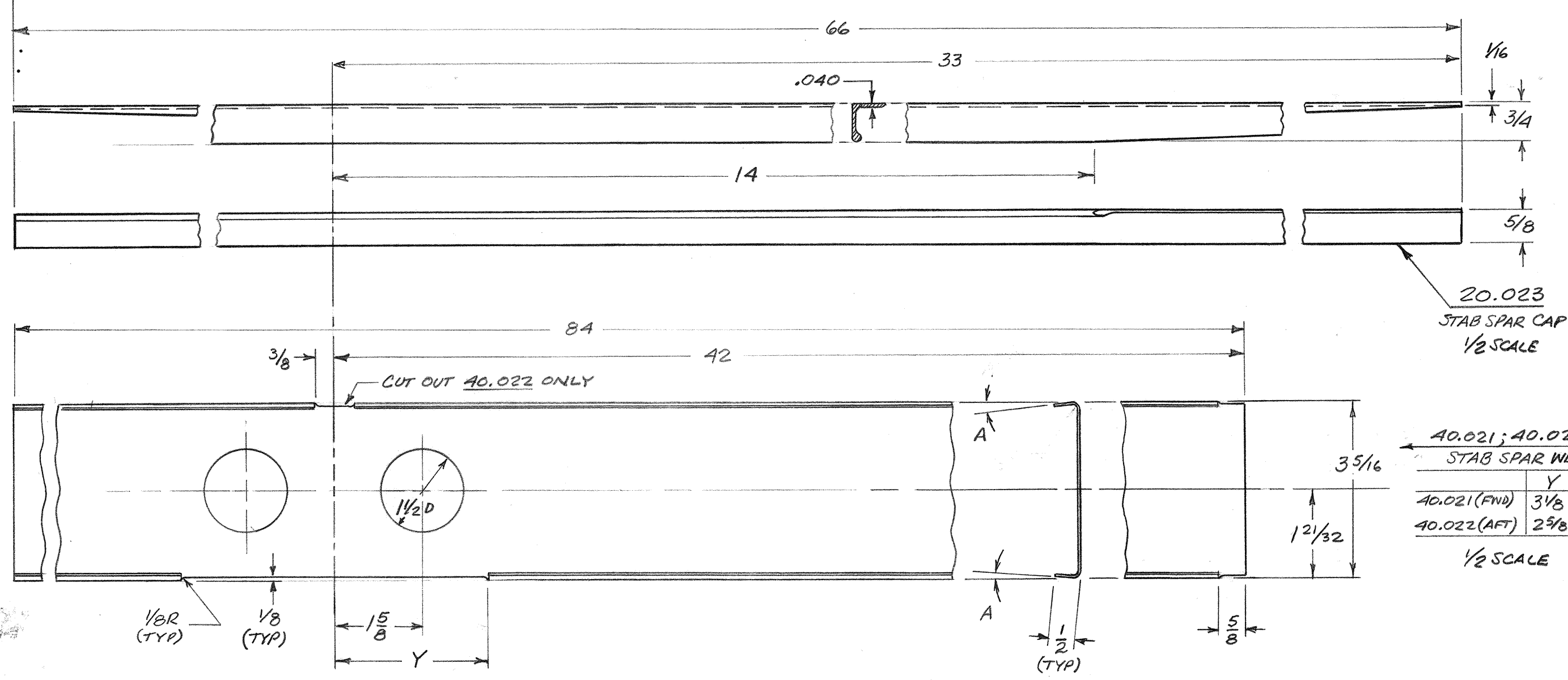
DATE: MAR 74      REVISIONS:      REVISIONS:

MACDONALD S-21

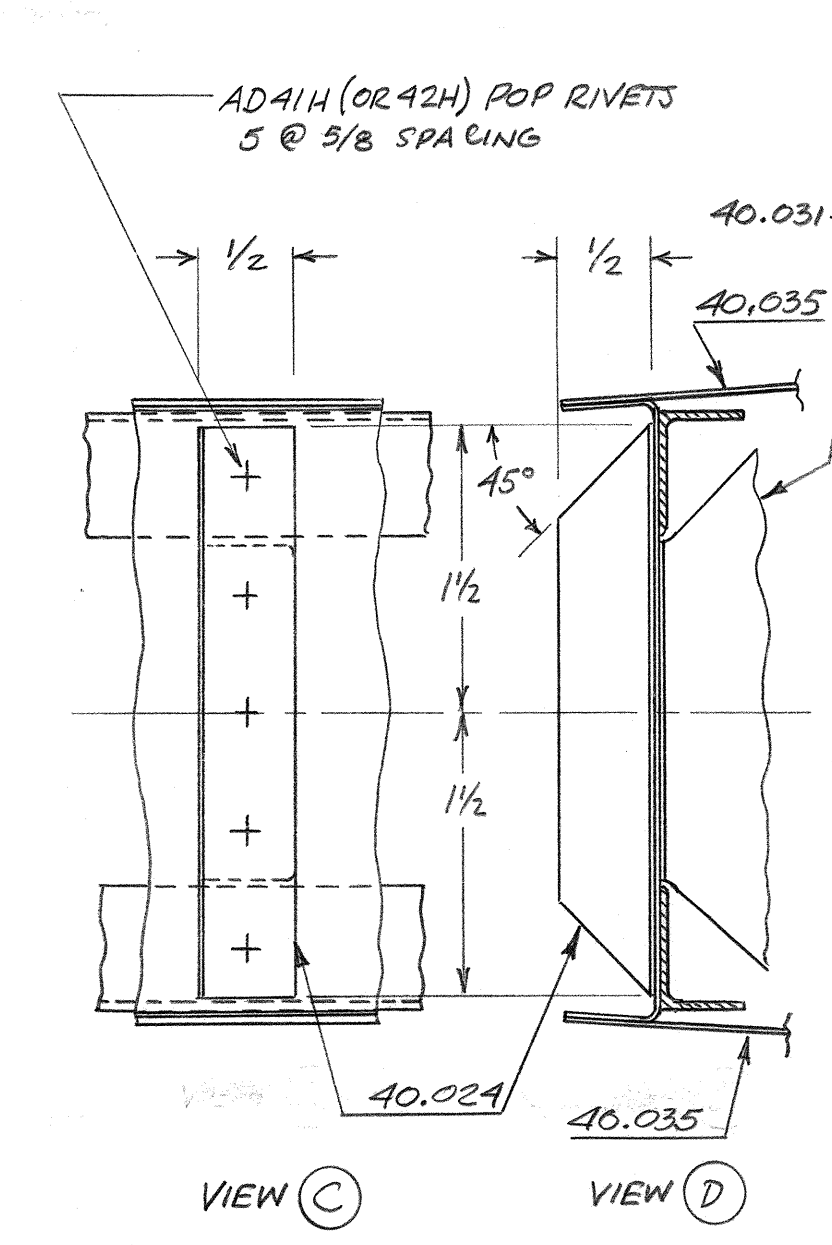
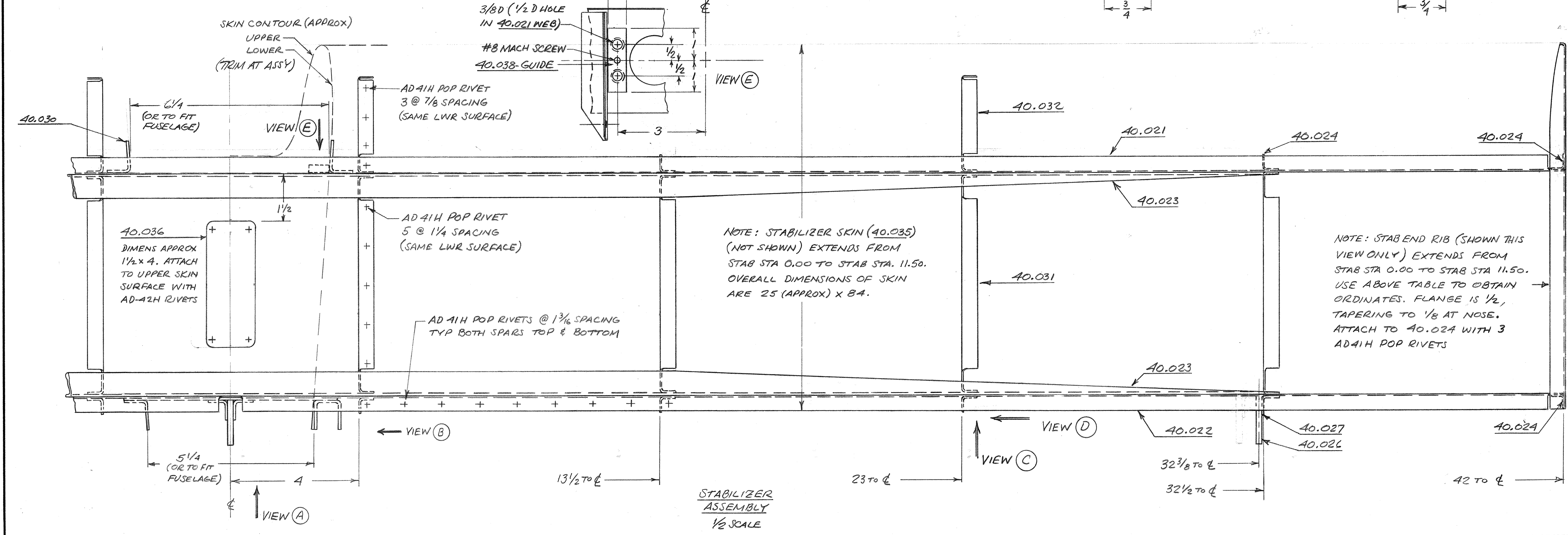
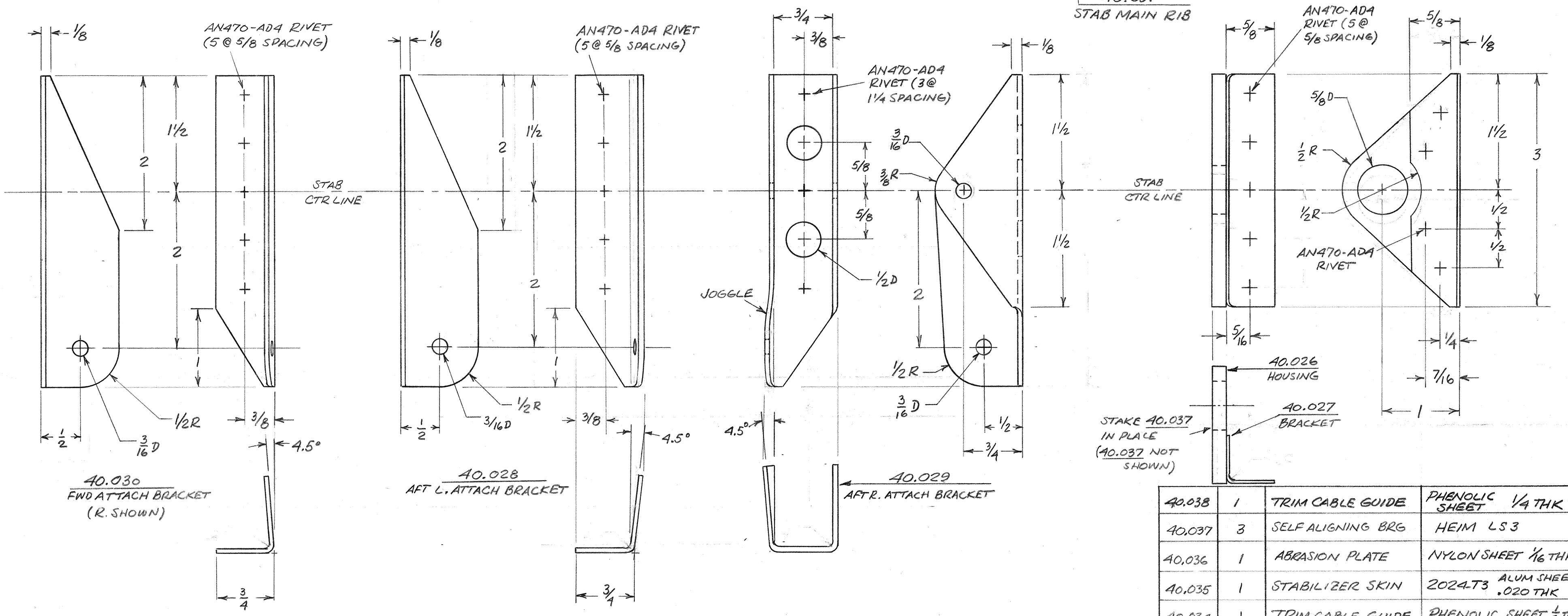
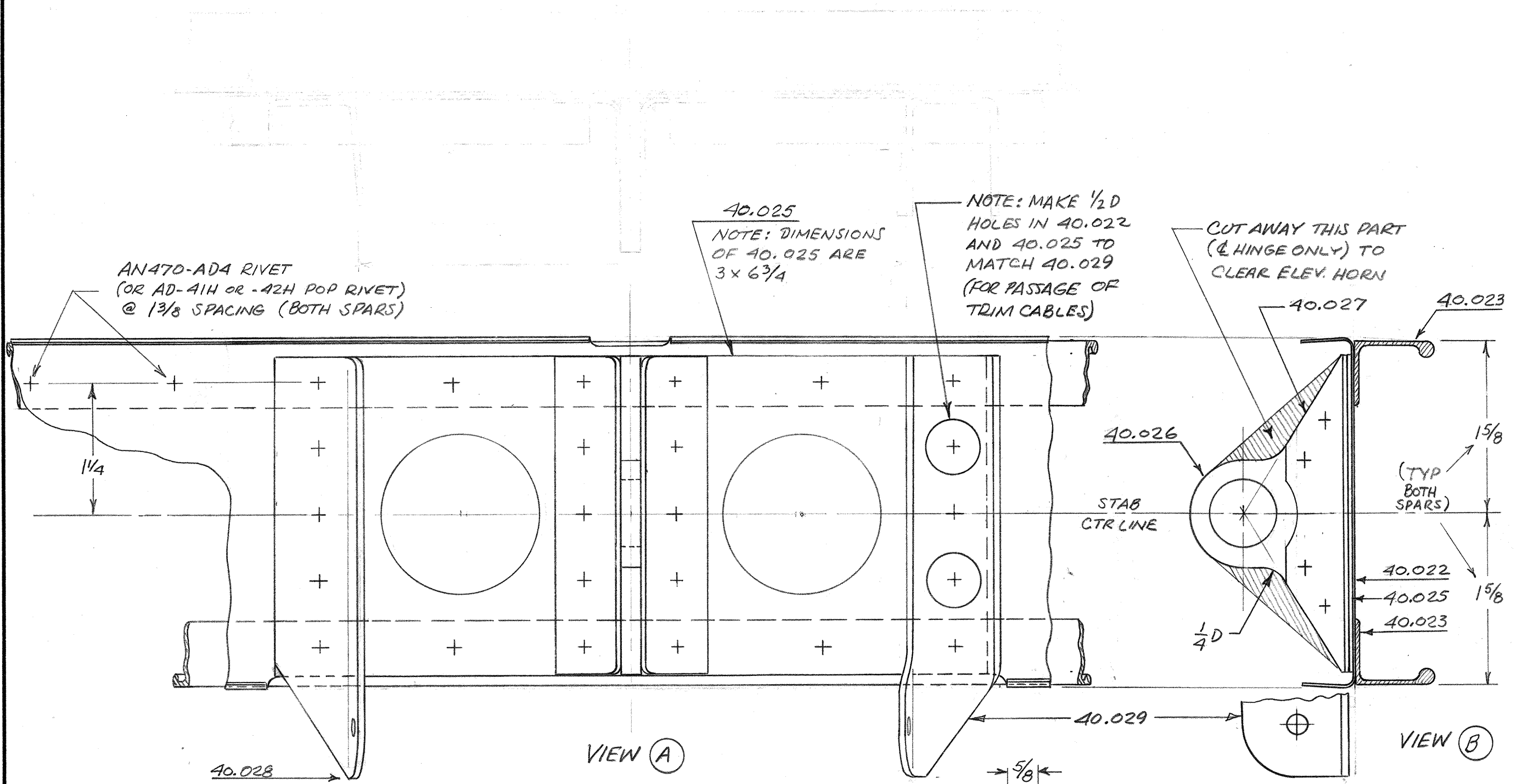
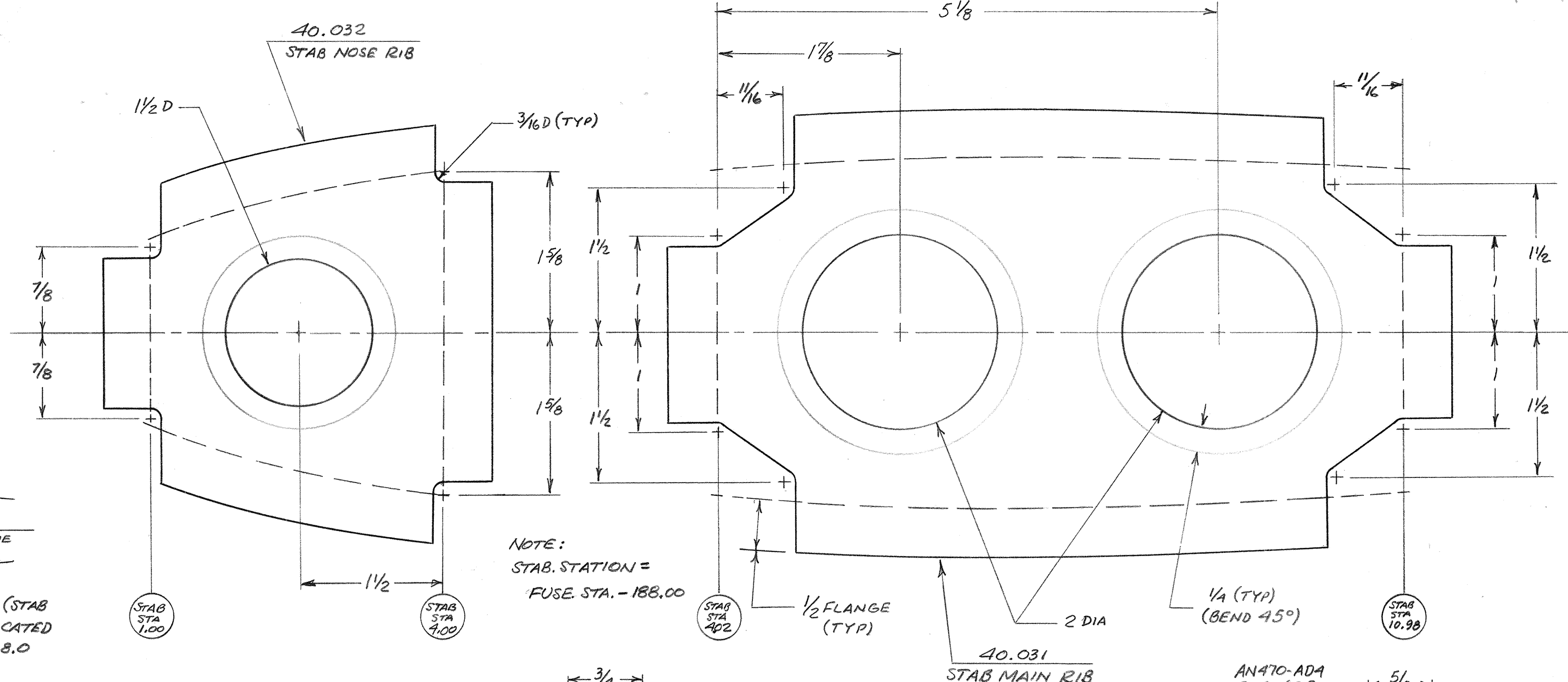
DRAWING NUMBER  
30.02

4x1.50 TAIL WHEEL (1/4" SPRING)  
OBTAIN FROM:  
AVIATION INDUSTRIES  
114 BRYANT  
OJAZ, CAL 93023

**AFT FUSELAGE ASSEMBLY  
INBOARD PROFILE  
(1/5 SCALE)**



NACA 0015 AIRFOIL	
STAB STATION, INCHES	ORDINATE, INCHES
0	0
.3	±.54
.6	±.79
1.2	±1.07
1.8	±1.26
2.4	±1.41
3.6	±1.60
4.8	±1.72
6.0	±1.78
7.2	±1.80
9.6	±1.74
12.0	±1.59
LEADING EDGE RADIUS = .60 IN	



PART NUMBER	NO. PER AIRCRAFT	PART NAME	MATERIAL
40.038	1	TRIM CABLE GUIDE	PHENOLIC SHEET 1/4 THK
40.037	3	SELF ALIGNING BRG	HEIM LS 3
40.036	1	ABRASION PLATE	NYLON SHEET 1/16 THK
40.035	1	STABILIZER SKIN	2024-T3 ALUM SHEET .020 THK
40.034	1	TRIM CABLE GUIDE	PHENOLIC SHEET 1/4 THK
40.033	2	STAB END RIB	2024-T3 ALUM SHEET .020 THK
40.032	4	STAB NOSE RIB	2024-T3 ALUM SHEET .020 THK
40.031	8	STAB MAIN RIB	2024-T3 ALUM SHEET .020 THK
40.030	2	FWD STAB ATTACH BRACKET	2024-T3 ALUM SHEET .063 THK
40.029	1	AFT R. ATTACH BRACKET	2024-T3 ALUM SHEET .063 THK
40.028	1	AFT L. ATTACH BRACKET	2024-T3 ALUM SHEET .063 THK
40.027	4	STAB HINGE BRACKET	2024-T3 ALUM SHEET .040 THK
40.026	3	STAB HINGE BRG HOUSING	2024-T3 ALUM SHEET .1875 THK
40.025	1	STAB AFT SPAR DOUBLER	2024-T3 ALUM SHEET .020 THK
40.024	14	STAB SPAR UPRIGHTS	2024-T3 ALUM SHEET .020 THK
40.023	4	STAB SPAR CAPS	2024-T351 ALUM ALLOY EXTRUSION .020 THK
40.022	1	STAB AFT SPAR WEB	2024-T3 ALUM SHEET .020 THK
40.021	1	STAB FWD SPAR WEB	2024-T3 ALUM SHEET .020 THK

\* ALTERNATE MAT'L: 2024-T3 ALUM SHEET .040 THK

**STABILIZER**

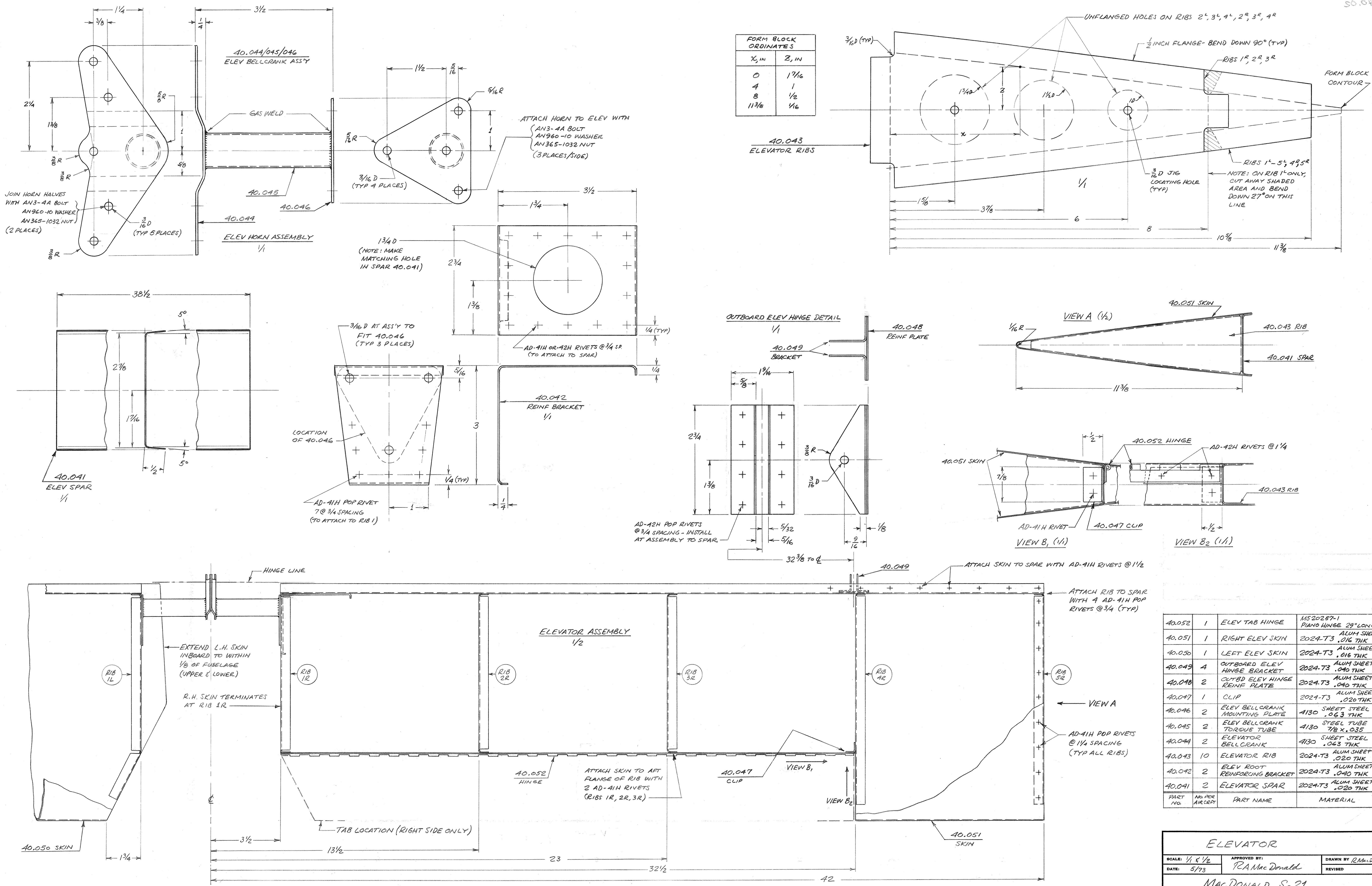
SCALE: FULL (NOTED) APPROVED BY: *RAN MacDonald* DRAWN BY: *R MacDonald*

DATE: 5/73 REVISION:

MACDONALD S-21

DRAWING NUMBER: 40-01





FORM BLOCK ORDINATES	
X, IN	Z, IN
0	17/16
4	1
8	1/2
11 3/8	1/16

PART NO.	NO PER AIRCRAFT	PART NAME	MATERIAL
40.052	1	ELEV TAB HINGE	MS20257-1 PIANO HINGE 29" LONG
40.051	1	RIGHT ELEV SKIN	ALUM SHEET 2024-T3 .016 THK
40.050	1	LEFT ELEV SKIN	ALUM SHEET 2024-T3 .016 THK
40.049	4	OUTBOARD ELEV HINGE BRACKET	ALUM SHEET 2024-T3 .040 THK
40.048	2	OUTBD ELEV HINGE REINF PLATE	ALUM SHEET 2024-T3 .040 THK
40.047	1	CLIP	ALUM SHEET 2024-T3 .020 THK
40.046	2	ELEV BELLCRANK MOUNTING PLATE	4130 SHEET STEEL .063 THK
40.045	2	ELEV BELLCRANK TORQUE TUBE	4130 STEEL TUBE 7/8 X .035
40.044	2	ELEVATOR BELLCRANK	4130 SHEET STEEL .063 THK
40.043	10	ELEVATOR RIB	2024-T3 ALUM SHEET .020 THK
40.042	2	ELEV ROOT REINFORCING BRACKET	2024-T3 ALUM SHEET .040 THK
40.041	2	ELEVATOR SPAR	2024-T3 ALUM SHEET .020 THK

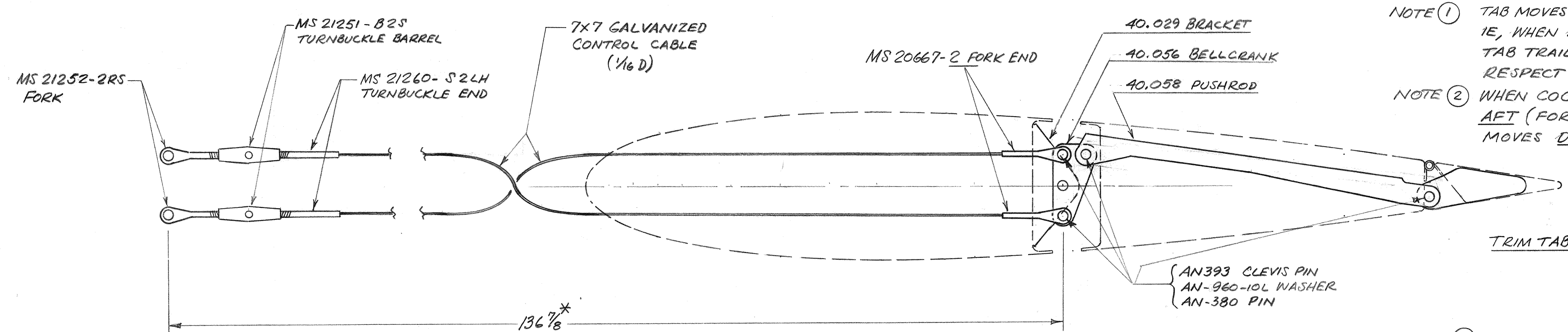
**ELEVATOR**

SCALE: 1/4" = 1/2"      APPROVED BY: PRA Mac Donald      DRAWN BY: R.M.L.D.

DATE: 5/73      REVISED

**MAC DONALD S-21**

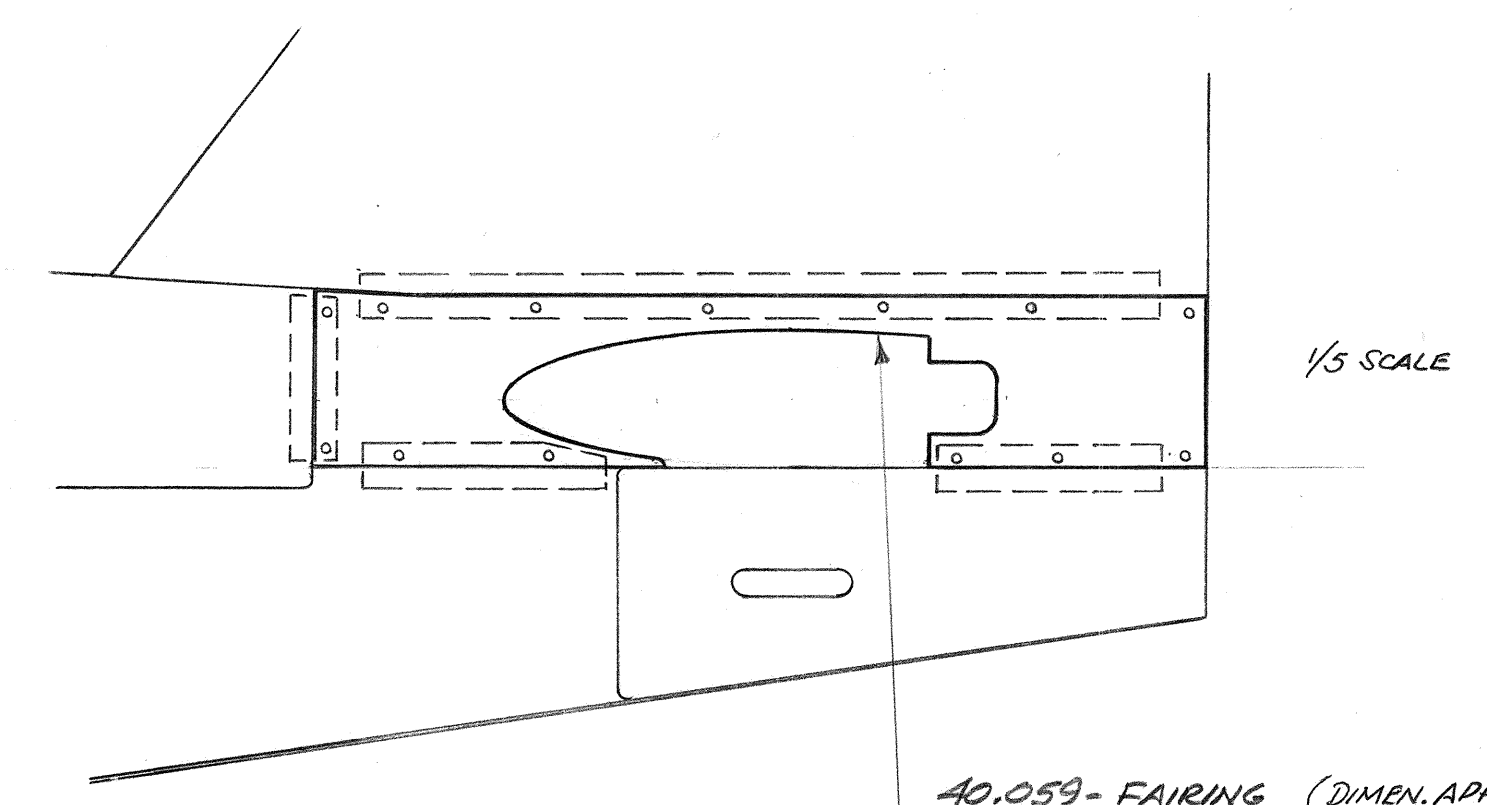
DRAWING NUMBER  
**40-02**



NOTE ① TAB MOVES SAME DIRECTION AS ELEVATOR; IE, WHEN ELEV TRAILING EDGE MOVES DOWN, TAB TRAILING EDGE MOVES DOWN WITH RESPECT TO ELEVATOR.

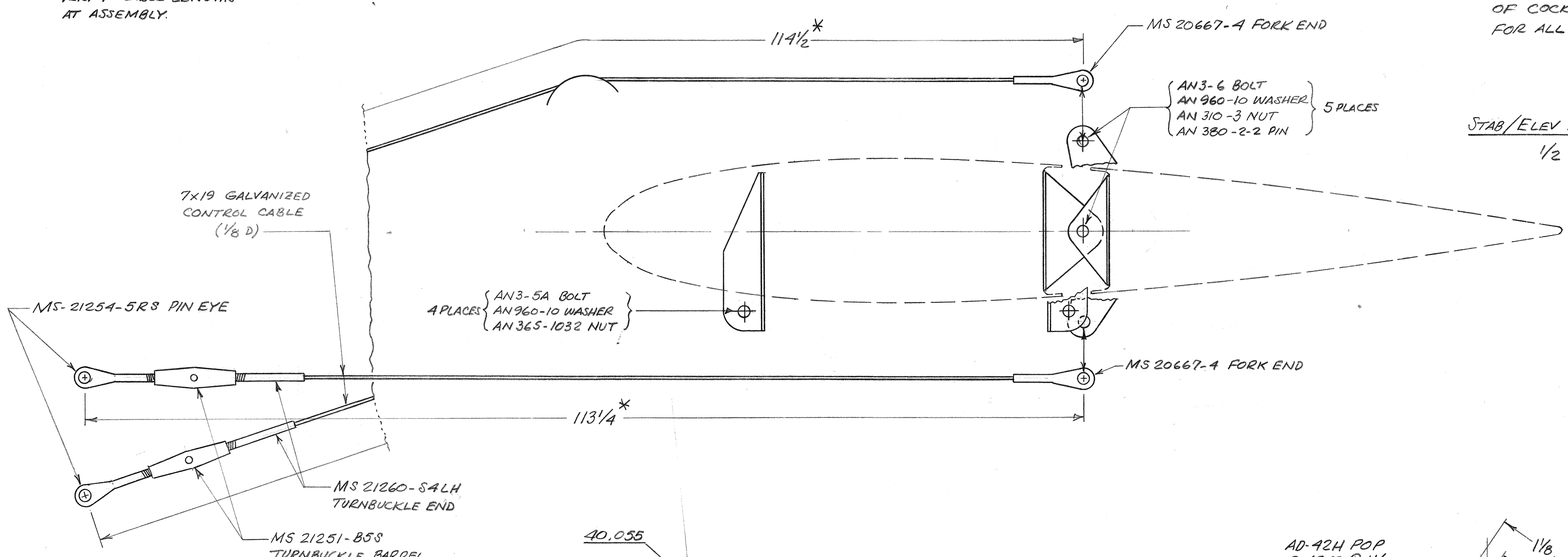
NOTE ② WHEN COCKPIT PITCH TRIM CONTROL IS MOVED AFT (FOR NOSE-UP TRIM), TAB TRAILING EDGE MOVES DOWN.

TRIM TAB LINKAGE ASSEMBLY  
1/2



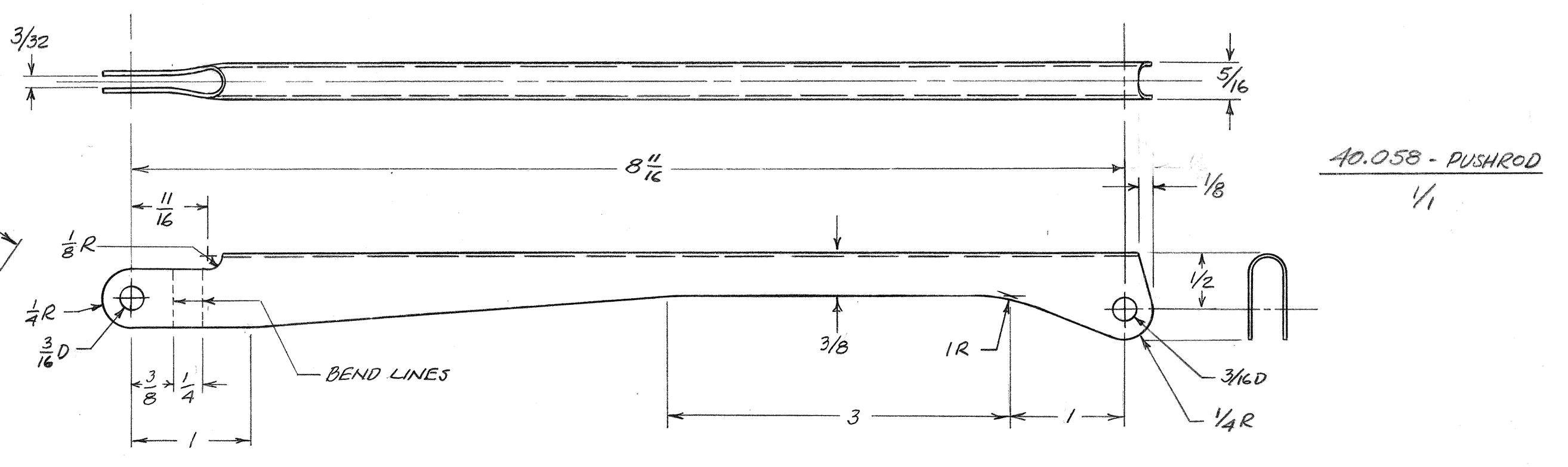
40.059 - FAIRING (DIMEN. APPROX. 5x24)  
ATTACH WITH 1/4" SELF-TAPPING SCREWS TO TABS (SHOWN WITH DOTTED LINES ABOVE) WHICH ARE INSTALLED UNDER ADJACENT SKINS.

\* VERIFY CABLE LENGTHS AT ASSEMBLY.

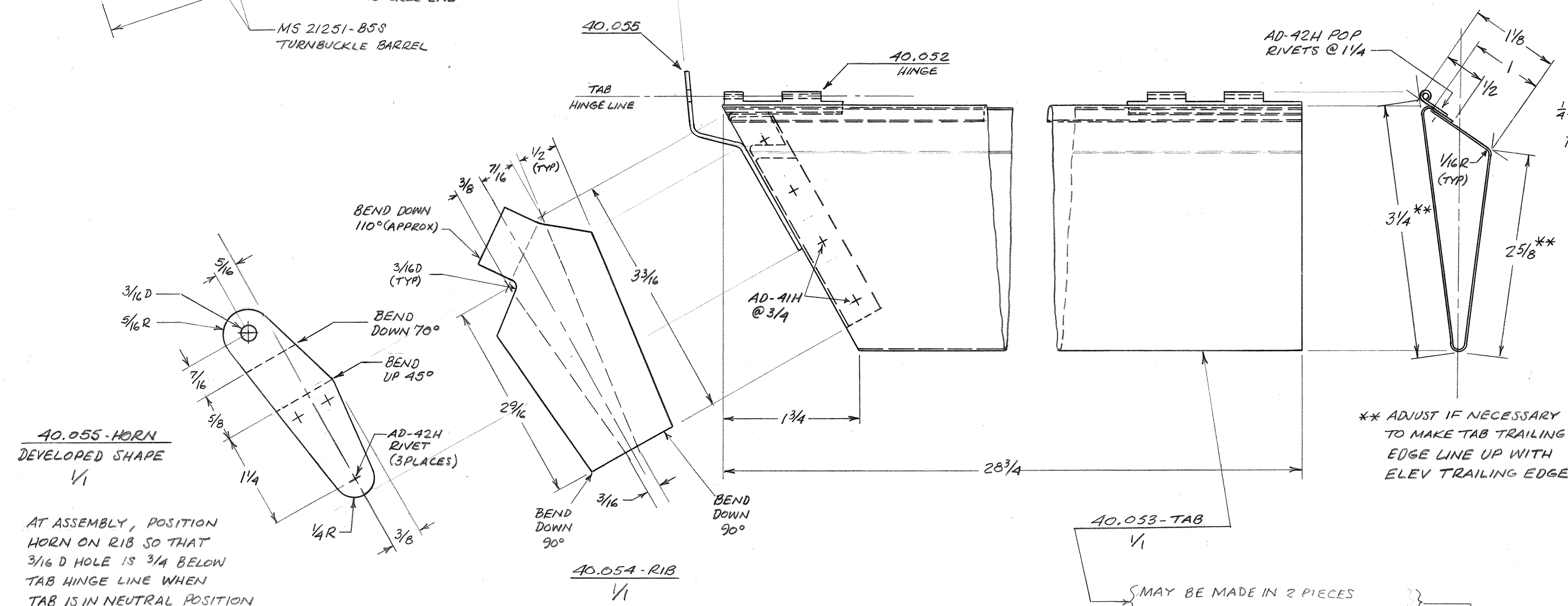


NOTE ③ TRIM TAB TRAVEL MUST EXCEED ELEVATOR TRAVEL; IE, ELEV MUST BE ABLE TO BE MOVED THROUGH ITS ENTIRE TRAVEL WITHOUT CAUSING MOTION OF COCKPIT PITCH TRIM CONTROL HANDLE FOR ALL PITCH TRIM HANDLE SETTINGS.

STAB/ELEV ASSEMBLY  
1/2



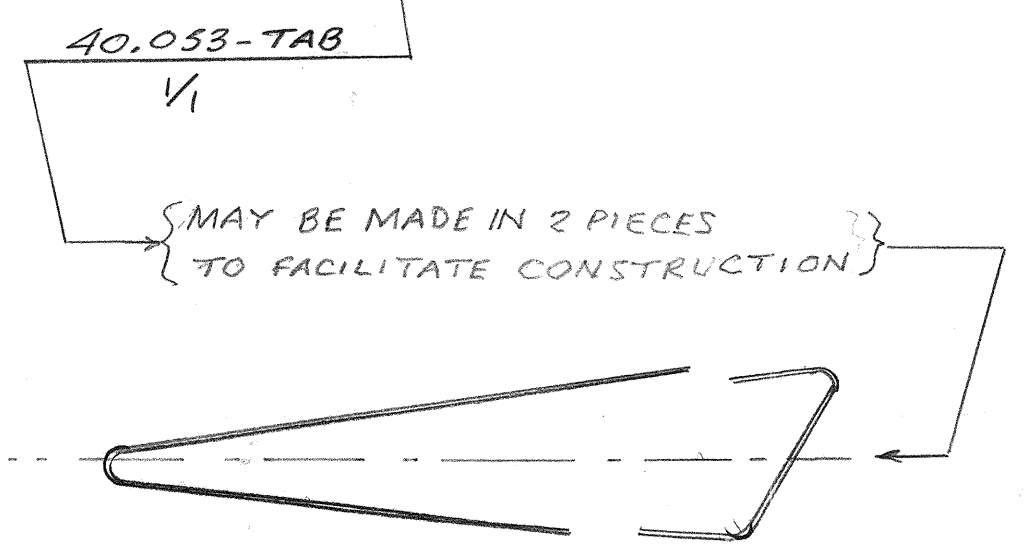
40.058 - PUSHROD  
1/1



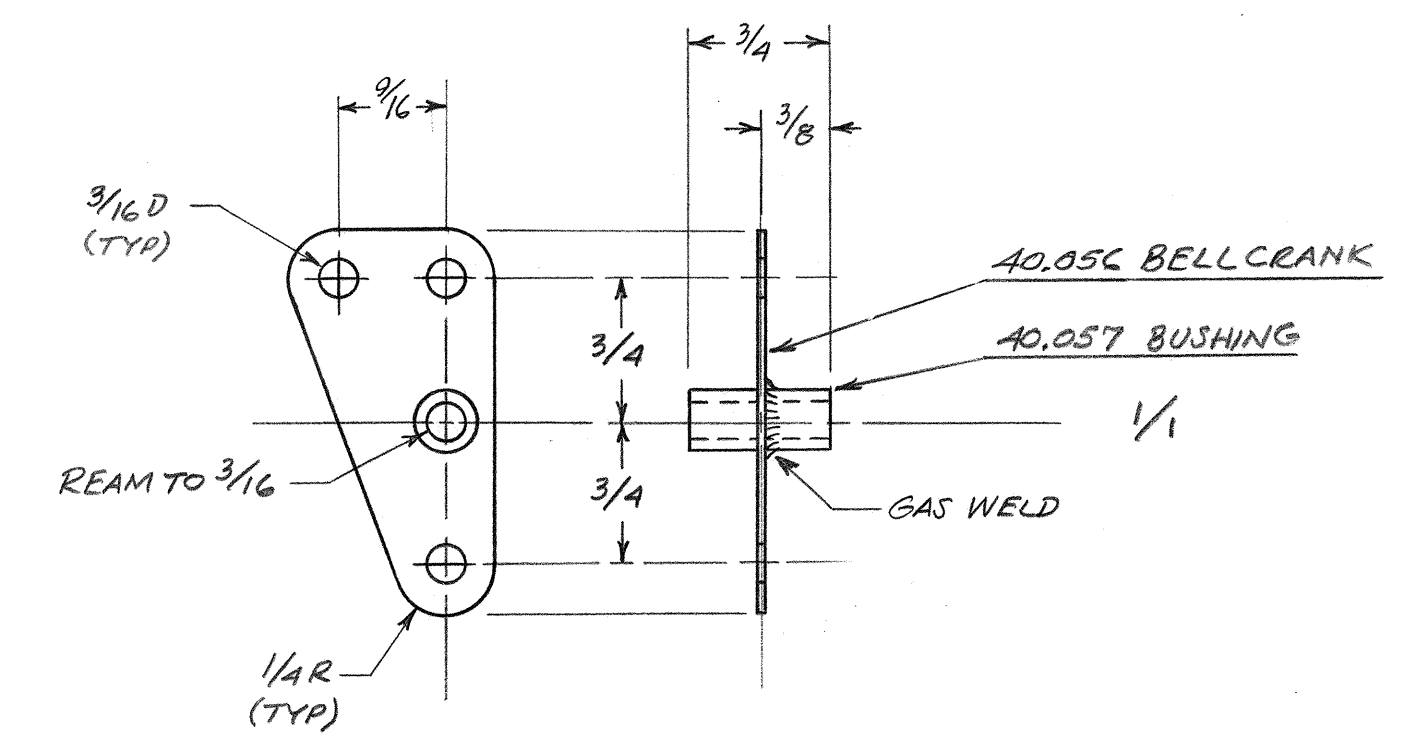
40.055 - HORN DEVELOPED SHAPE  
1/1

AT ASSEMBLY, POSITION HORN ON RIB SO THAT 3/16 D HOLE IS 3/4 BELOW TAB HINGE LINE WHEN TAB IS IN NEUTRAL POSITION

40.054 - RIB  
1/1



40.053 - TAB  
1/1

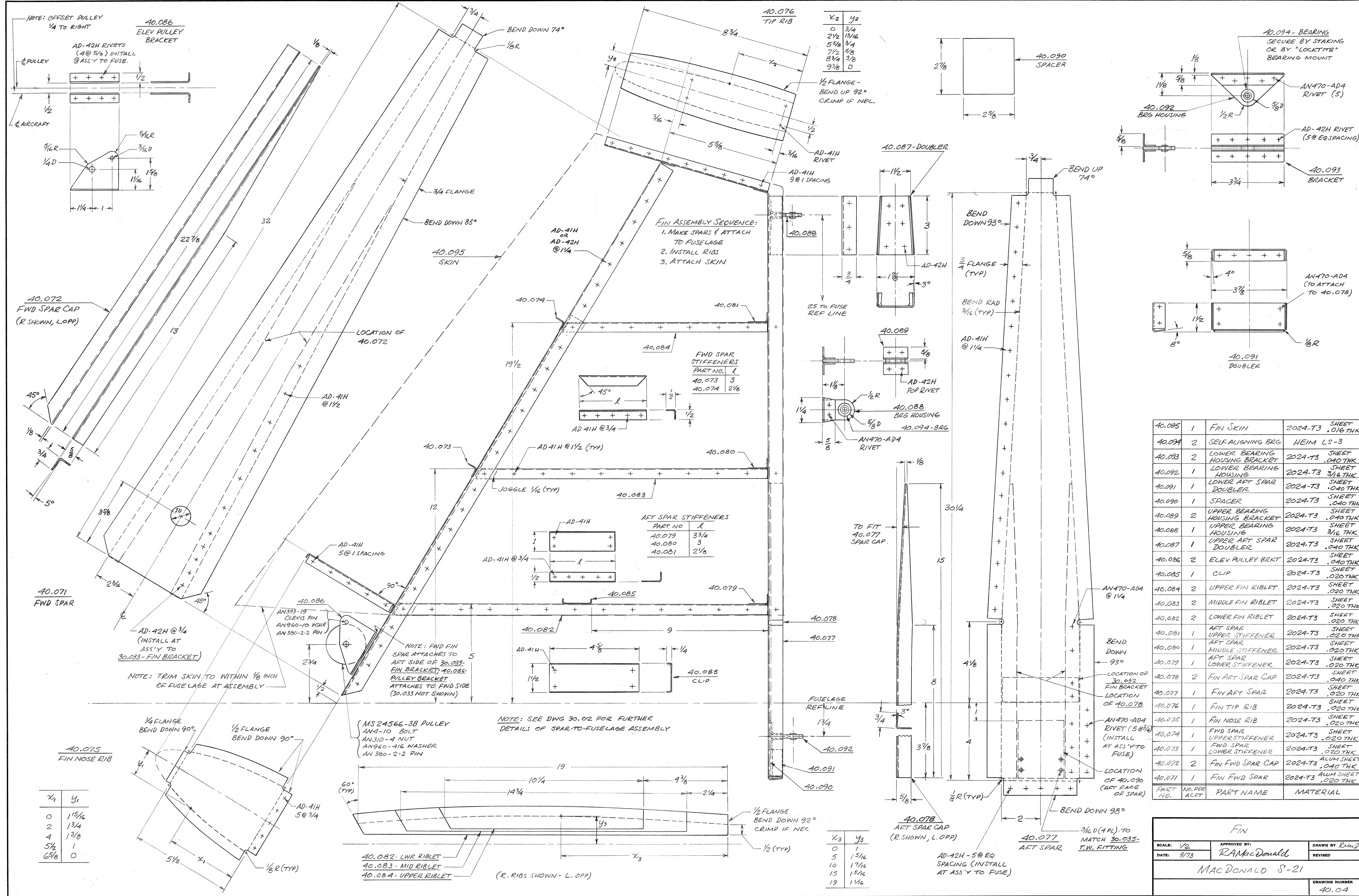


40.056 - TAB BELLCRANK  
1/1

PART NO.	NO PER ACFT	PART NAME	MATERIAL
40.059	2	STAB FAIRING	2024-T3 ALUM SHEET .016 THK
40.058	1	ELEV TAB PUSHROD	2024-T3 ALUM SHEET .040 THK
40.057	1	TAB BELLCRANK BUSHING	4130 STEEL TUBE 1.025 5/16 X .065
40.056	1	TAB BELLCRANK	STEEL SHEET A130 .063 THK
40.055	1	ELEV TAB HORN	2024-T3 ALUM SHEET .063 THK
40.054	1	ELEV TAB RIB	2024-T3 ALUM SHEET .016 THK
40.053	1	ELEVATOR TRIM & ANTI-SERVO TAB	2024-T3 ALUM SHEET .016 THK
40.052	1	ELEV TAB HINGE	(SEE DWG 40.02)

TRIM TAB; STAB/ELEV/TAB ASSEMBLY

SCALE: 1/1, 1/2  
DATE: 8/73  
APPROVED BY: R.A. MacDonald  
DRAWN BY: R.Mac  
REVISOR:  
MAC DONALD S-21  
DRAWING NUMBER: S-21/40.03



X2	Y2
0	3/4
2 1/2	13/16
5 5/8	3/4
7 1/2	5/8
8 3/4	3/8
9 3/8	0

**FWD SPAR STIFFENERS**

PART NO.	L
40.073	3
40.074	2 1/8

**AFT SPAR STIFFENERS**

PART NO.	L
40.079	3 3/4
40.080	3
40.081	2 1/8

PART NO.	NO. PER ACFT	PART NAME	MATERIAL
40.095	1	FIN SKIN	2024-T3 SHEET .016 THK
40.094	2	SELF-ALIGNING BRG	HEIM LS-3
40.093	2	LOWER BEARING HOUSING BRACKET	2024-T3 SHEET .040 THK
40.092	1	LOWER BEARING HOUSING	2024-T3 SHEET 3/16 THK
40.091	1	LOWER AFT SPAR DOUBLER	2024-T3 SHEET .040 THK
40.090	1	SPACER	2024-T3 SHEET .040 THK
40.089	2	UPPER BEARING HOUSING BRACKET	2024-T3 SHEET .040 THK
40.088	1	UPPER BEARING HOUSING	2024-T3 SHEET 3/16 THK
40.087	1	UPPER AFT SPAR DOUBLER	2024-T3 SHEET .040 THK
40.086	2	ELEV PULLEY BRKT	2024-T3 SHEET .040 THK
40.085	1	CLIP	2024-T3 SHEET .020 THK
40.084	2	UPPER FIN RIBLET	2024-T3 SHEET .020 THK
40.083	2	MIDDLE FIN RIBLET	2024-T3 SHEET .020 THK
40.082	2	LOWER FIN RIBLET	2024-T3 SHEET .020 THK
40.081	1	AFT SPAR UPPER STIFFENER	2024-T3 SHEET .020 THK
40.080	1	AFT SPAR MIDDLE STIFFENER	2024-T3 SHEET .020 THK
40.079	1	AFT SPAR LOWER STIFFENER	2024-T3 SHEET .020 THK
40.078	2	FIN AFT SPAR CAP	2024-T3 SHEET .040 THK
40.077	1	FIN AFT SPAR	2024-T3 SHEET .020 THK
40.076	1	FIN TIP RIB	2024-T3 SHEET .020 THK
40.075	1	FIN NOSE RIB	2024-T3 SHEET .020 THK
40.074	1	FWD SPAR UPPER STIFFENER	2024-T3 SHEET .020 THK
40.073	1	FWD SPAR LOWER STIFFENER	2024-T3 SHEET .020 THK
40.072	2	FIN FWD SPAR CAP	ALUM SHEET .040 THK
40.071	1	FIN FWD SPAR	ALUM SHEET .020 THK

**FIN**

SCALE: 1/2" = 1"

DATE: 9/73

APPROVED BY: *RAN MacDonald*

DRAWN BY: *RAN MacDonald*

REVISED

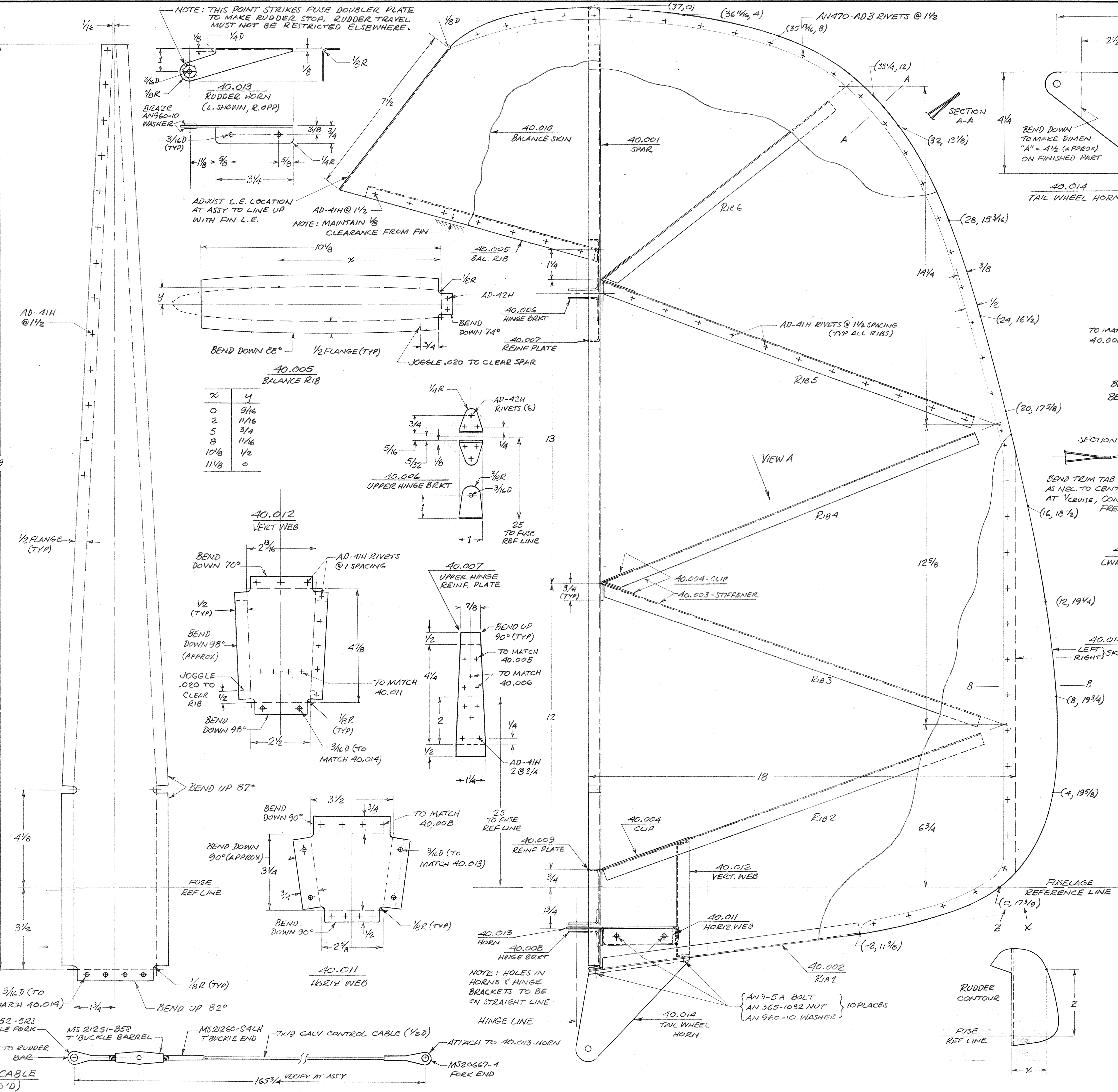
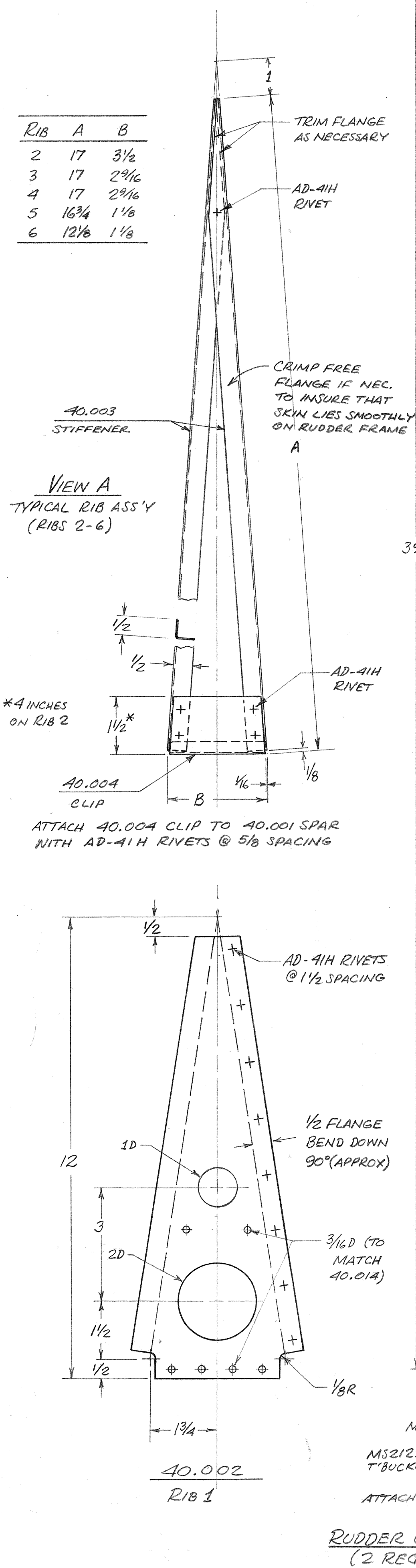
MACDONALD S-21

DRAWING NUMBER  
40.04

MAT'L THICKNESS	BEND RADIUS
.020	1/8
.040	3/16

RIB	A	B
2	17	3 1/2
3	17	2 9/16
4	17	2 9/16
5	16 3/4	1 1/8
6	12 1/8	1 1/8

VIEW A  
TYPICAL RIB ASS'Y  
(RIBS 2-6)



40.005  
BALANCE RIB

X	Y
0	9/16
2	11/16
5	3/4
8	11/16
10 1/8	1/2
11 1/8	0

PART NO.	NO. PER ACFT	PART NAME	MATERIAL
40.015	2	SKIN	2024-T3 SHEET .016 THK
40.014	1	TAIL WHEEL HORN	2024-T3 SHEET 1/8 THK
40.013	2	RUDDER HORN	A130 SHEET STEEL .050 THK
40.012	1	VERT HORN SUPPORT WEB	2024-T3 SHEET .020 THK
40.011	1	HORIZ HORN SUPPORT WEB	2024-T3 SHEET .040 THK
40.010	1	BALANCE SKIN	2024-T3 SHEET .020 THK
40.009	1	LOWER HINGE REINF. PLATE	2024-T3 SHEET .040 THK
40.008	2	LOWER HINGE BRACKET	2024-T3 SHEET .040 THK
40.007	1	UPPER HINGE REINF. PLATE	2024-T3 SHEET .040 THK
40.006	2	UPPER HINGE BRACKET	2024-T3 SHEET .040 THK
40.005	1	BALANCE RIB	2024-T3 SHEET .020 THK
40.004	5	CLIP	2024-T3 SHEET .020 THK
40.003	10	STIFFENER	2024-T3 SHEET .020 THK
40.002	1	RIB 1	2024-T3 SHEET .020 THK
40.001	1	RUDDER SPAR	2024-T3 SHEET .020 THK

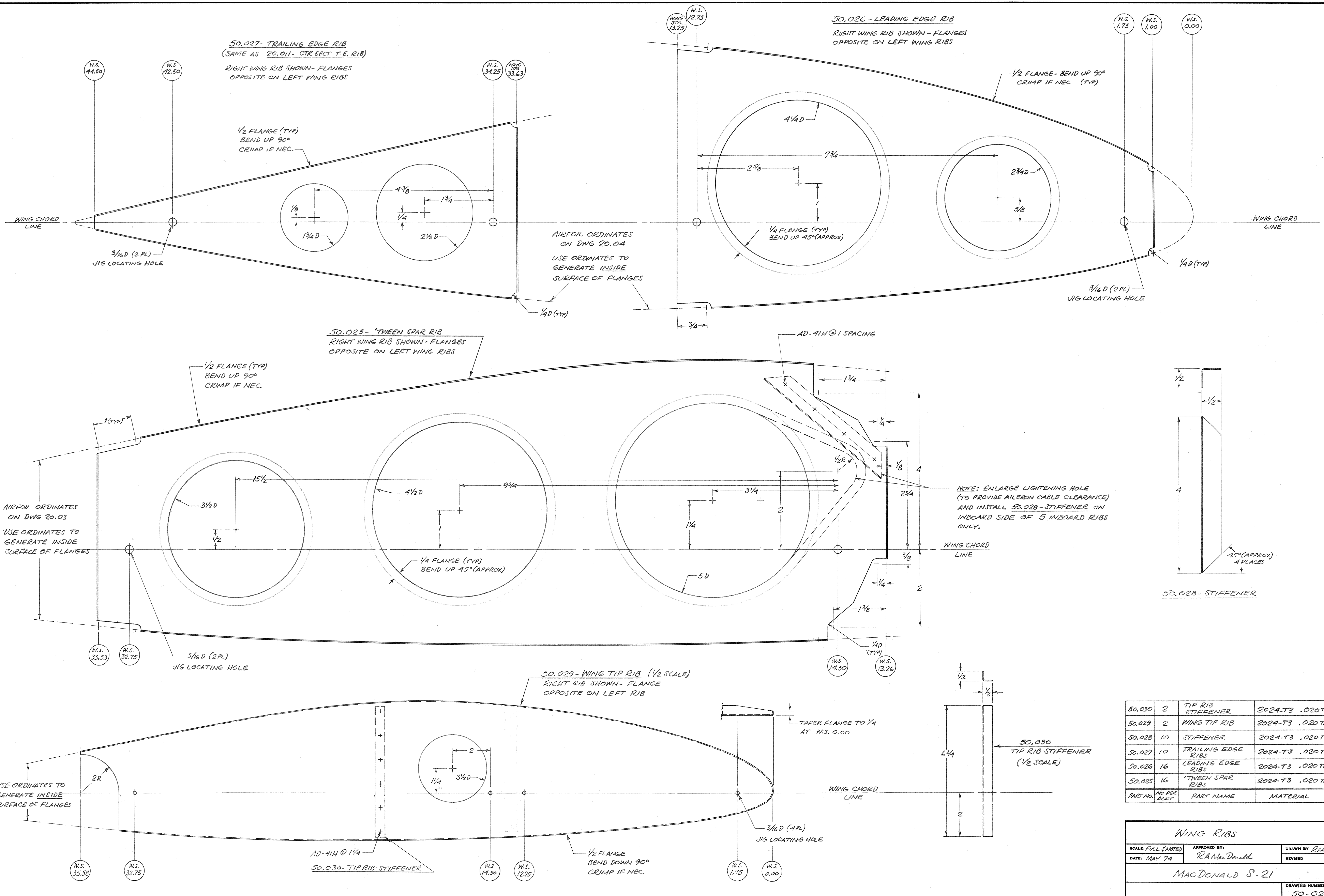
**RUDDER**

SCALE: 1/2      APPROVED BY: RA MacDonald      DRAWN BY: RMacD  
DATE: 11/73      REVISED

**MAC DONALD S-21**

DRAWING NUMBER  
40.05

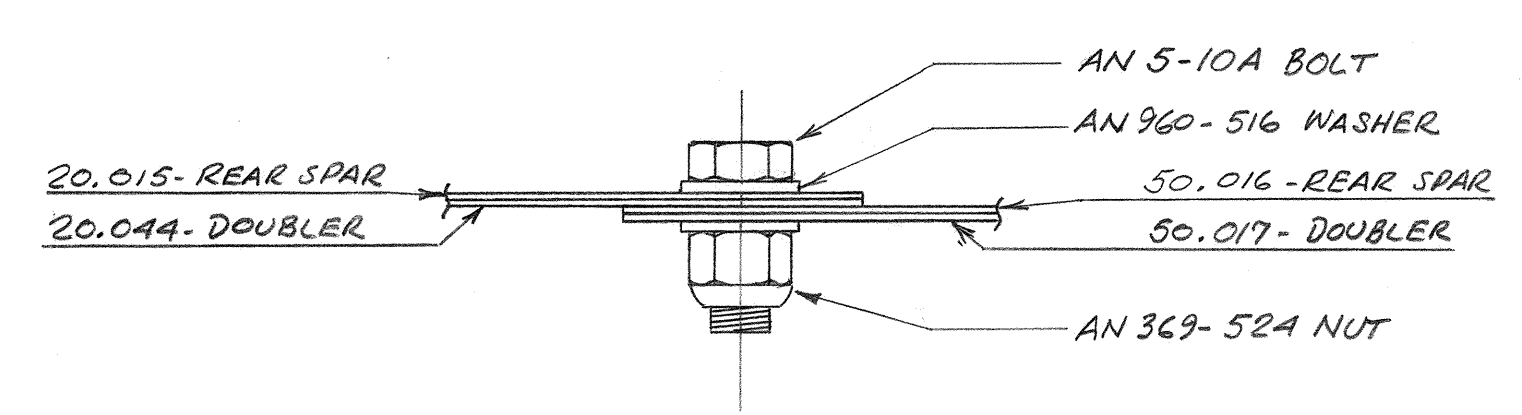
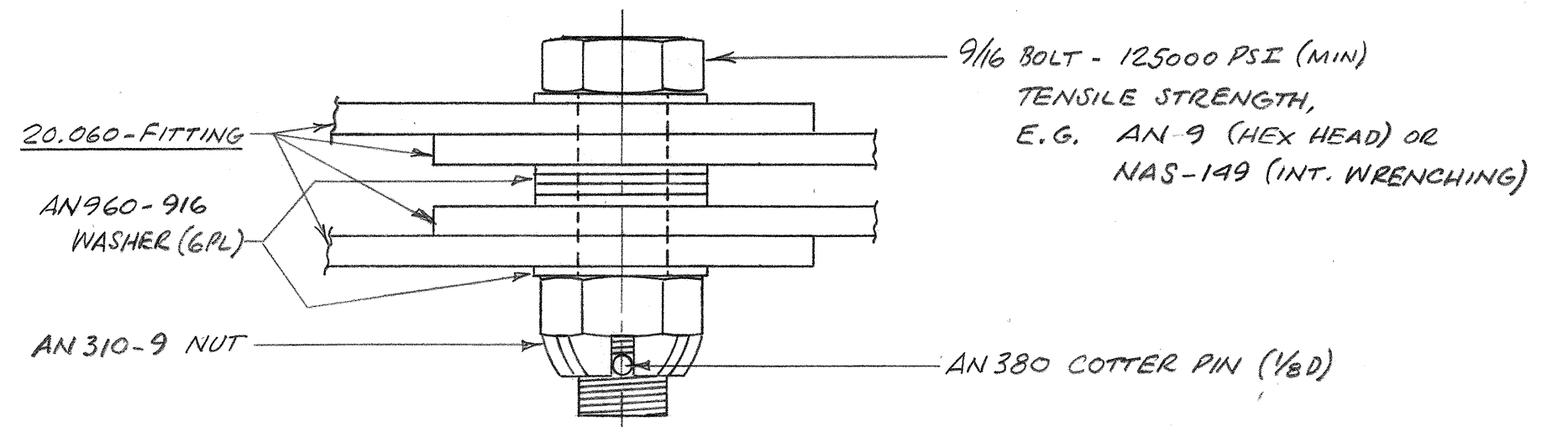
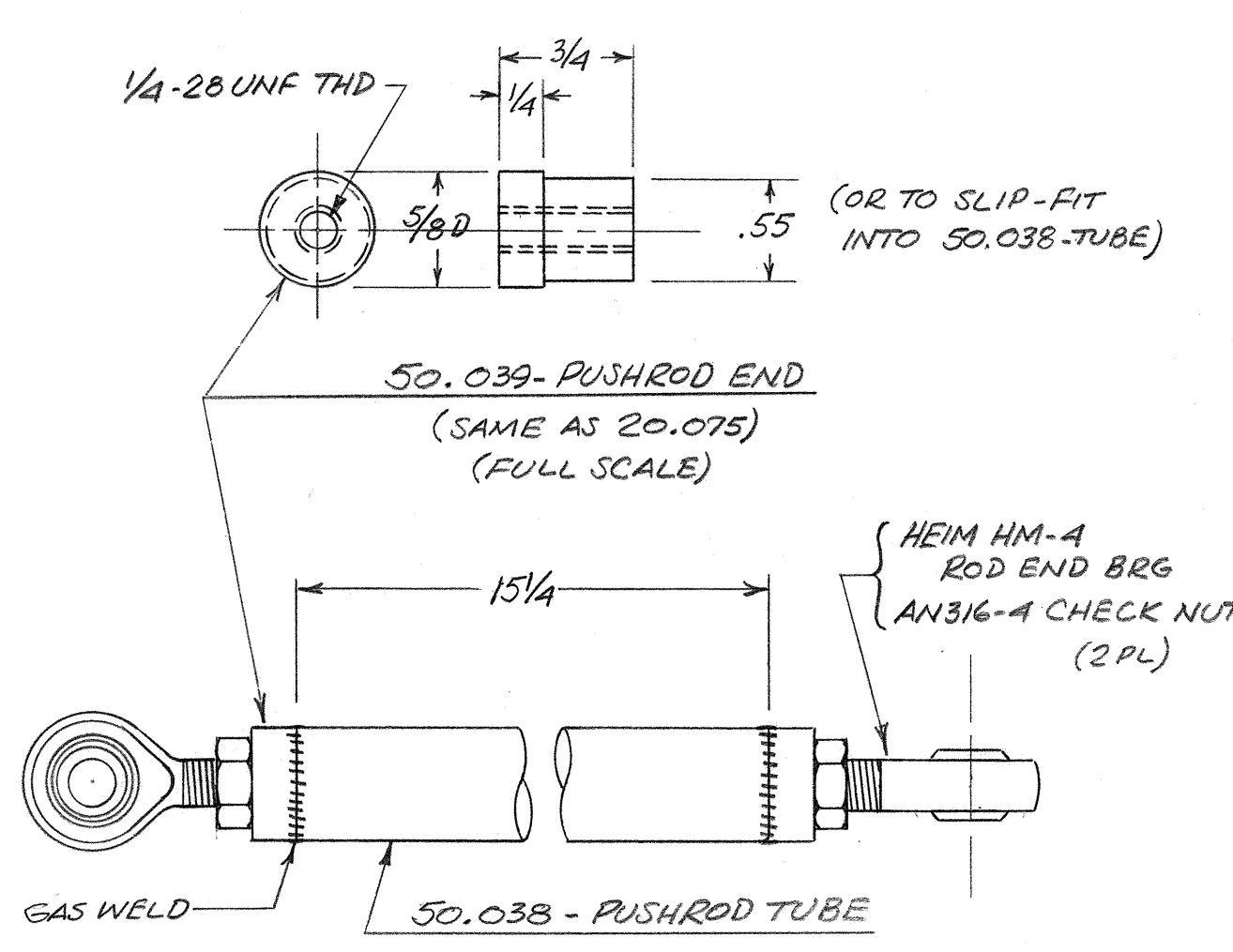
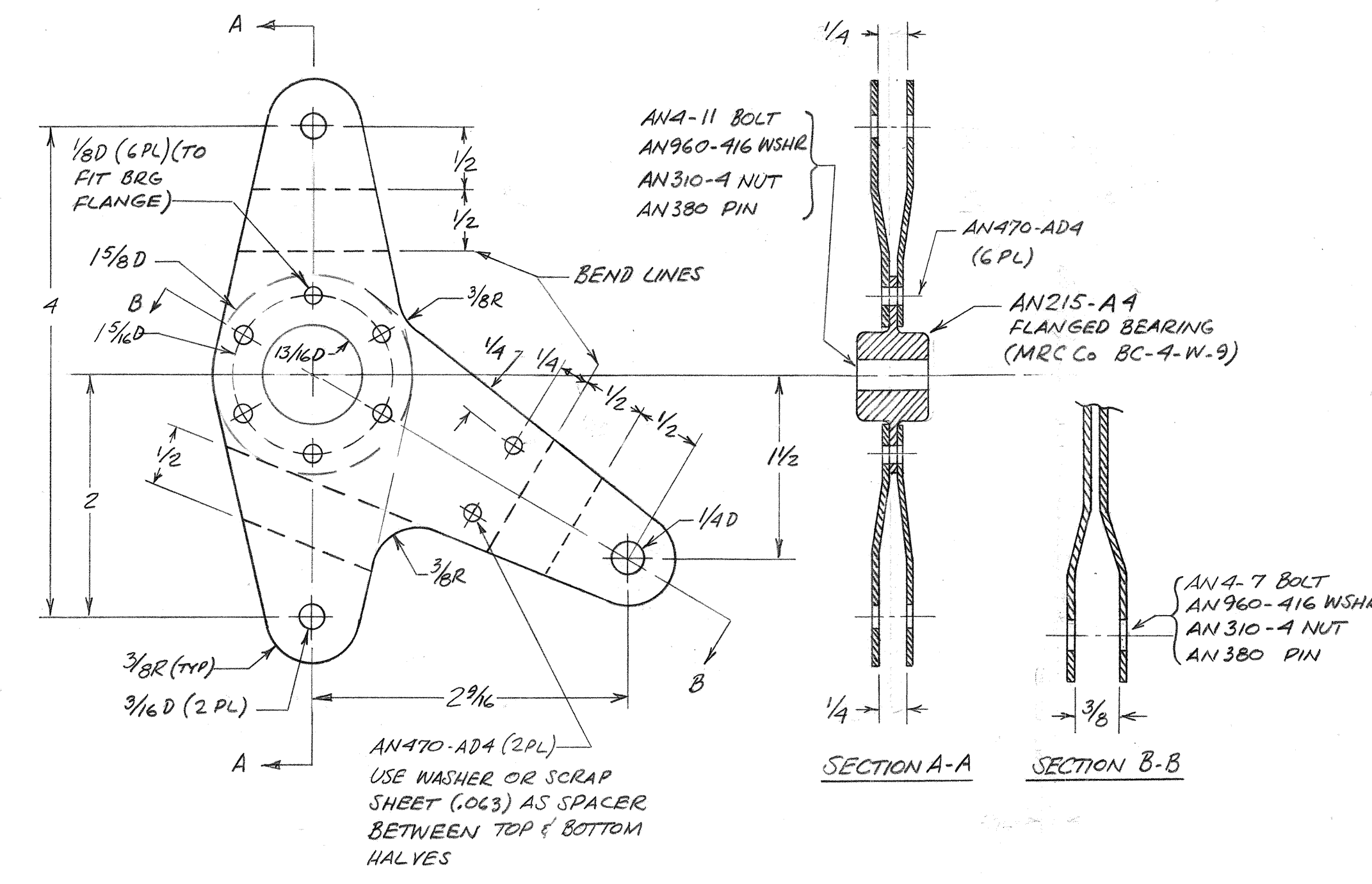
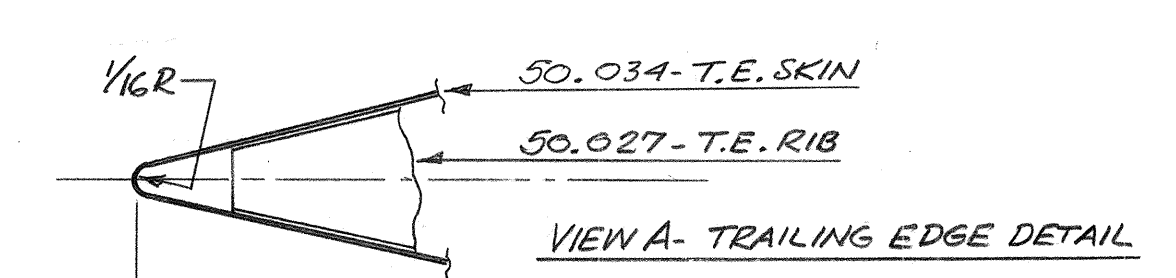
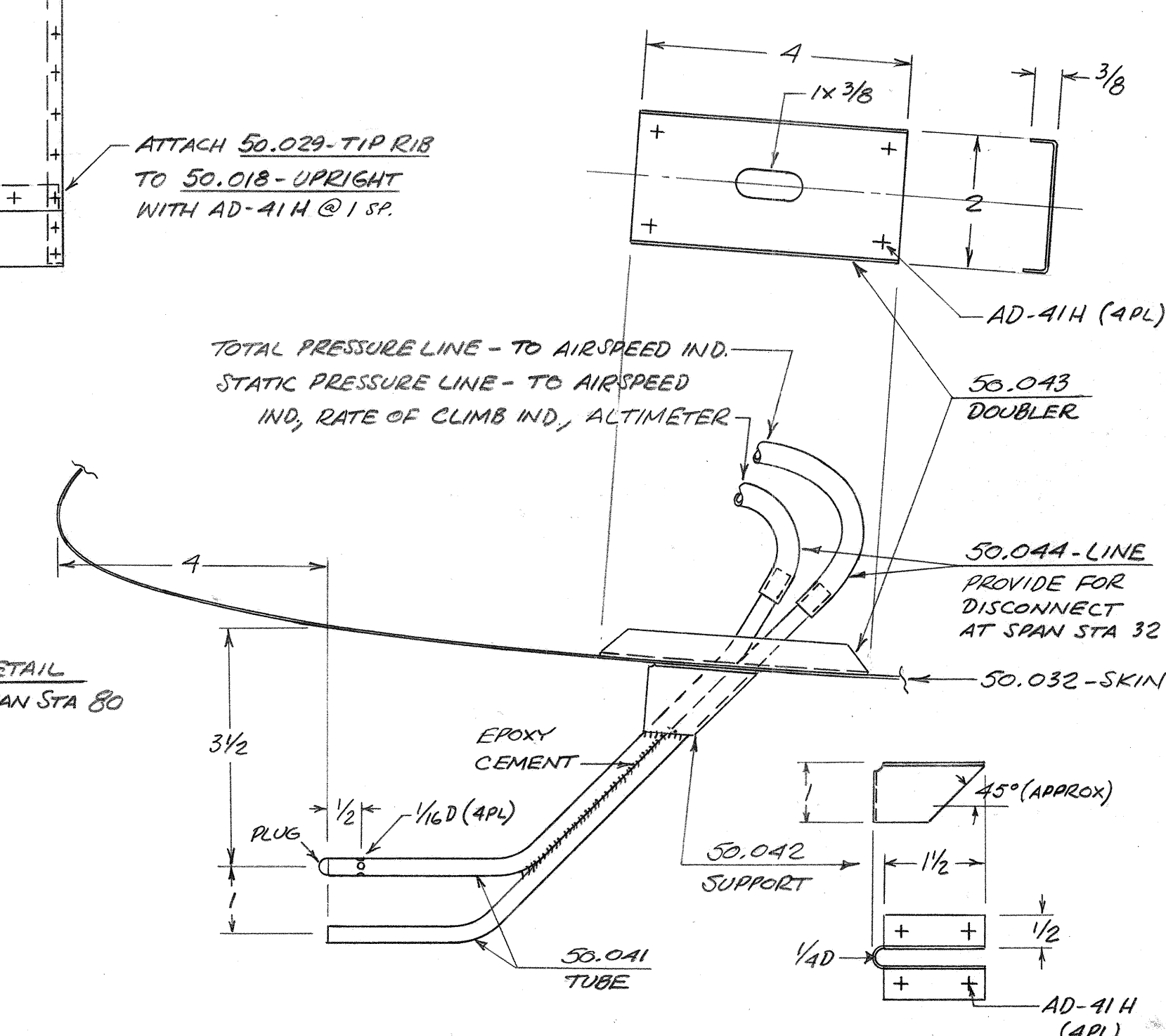
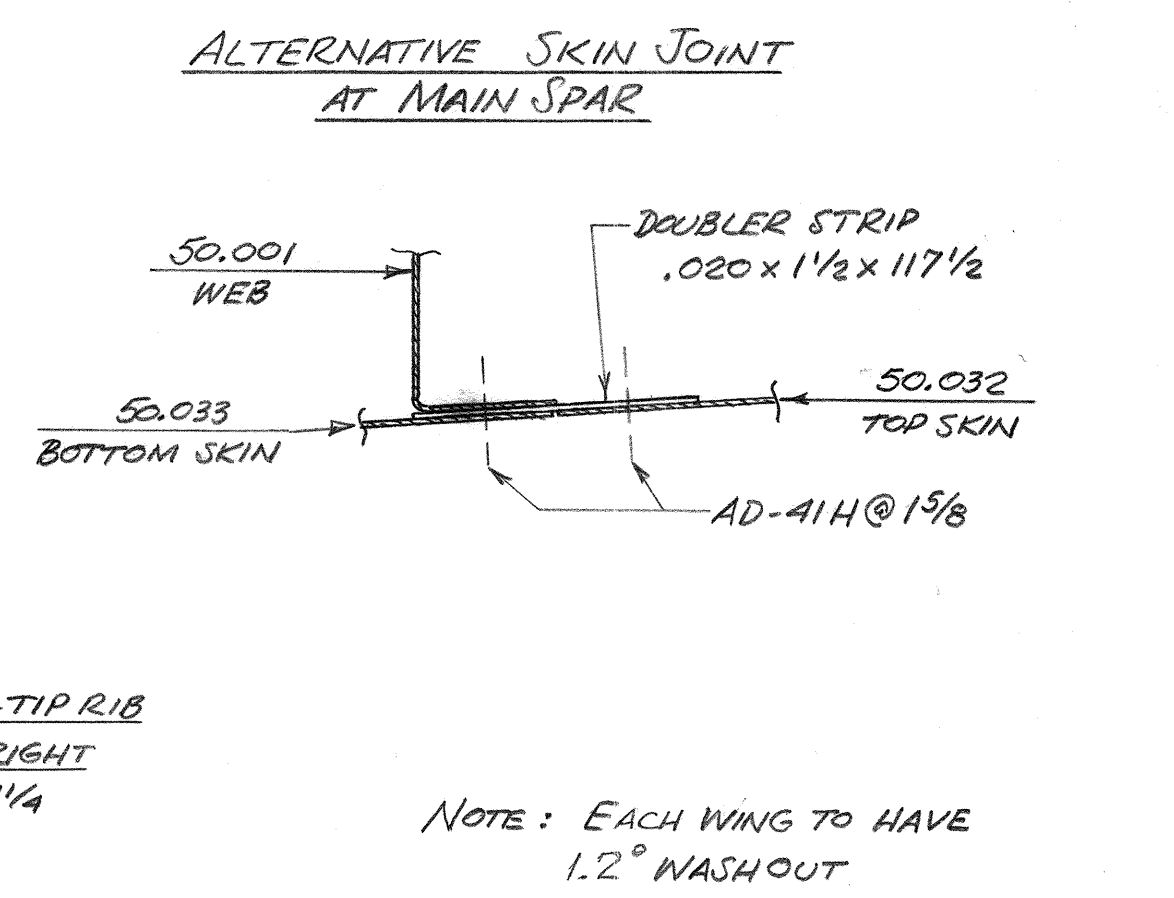
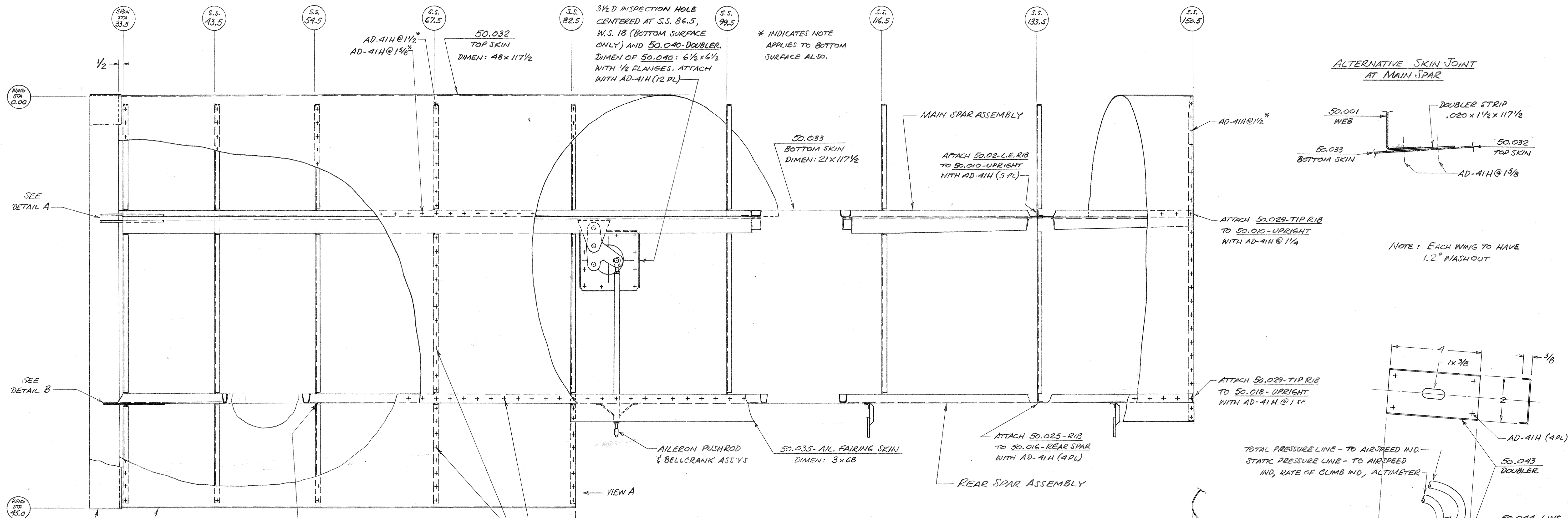




50.030	2	TIP RIB STIFFENER	2024-T3 .020 THK
50.029	2	WING TIP RIB	2024-T3 .020 THK
50.028	10	STIFFENER	2024-T3 .020 THK
50.027	10	TRAILING EDGE RIBS	2024-T3 .020 THK
50.026	16	LEADING EDGE RIBS	2024-T3 .020 THK
50.025	16	'TWEEN SPAR RIBS	2024-T3 .020 THK
PART NO.	NO PER ACFT	PART NAME	MATERIAL

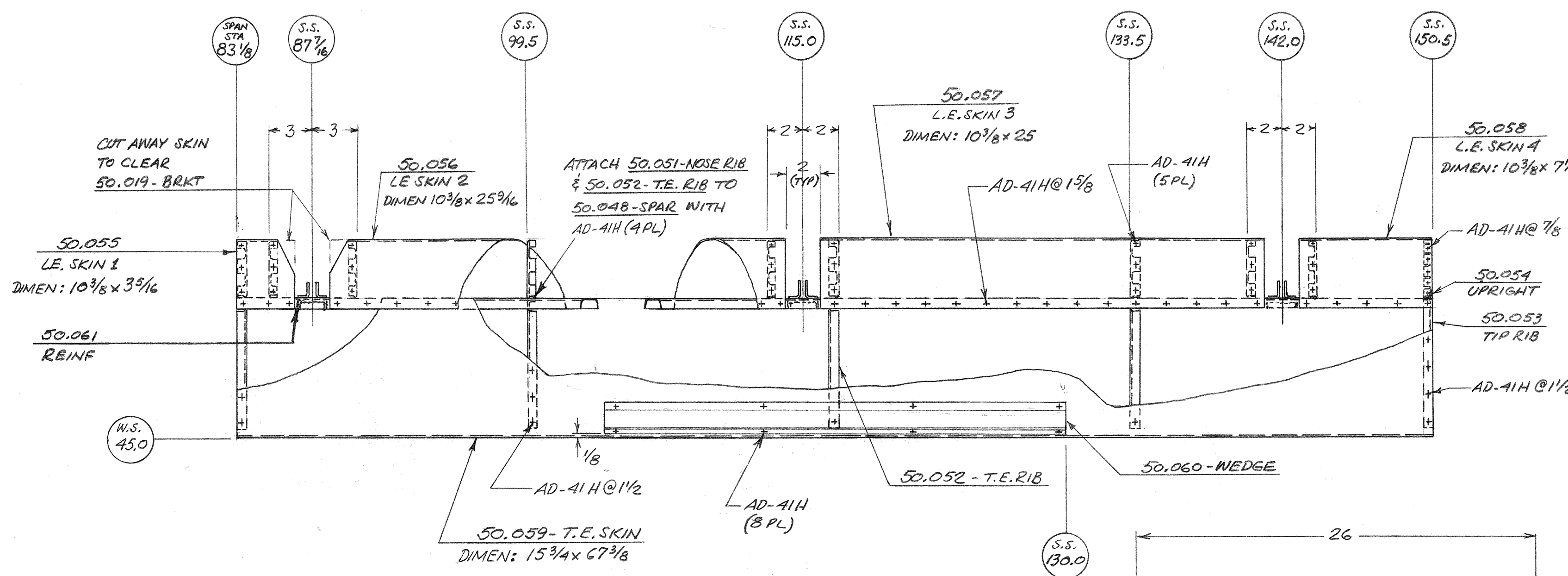
**WING RIBS**

SCALE: FULL ENDED	APPROVED BY: RA Mac Donald	DRAWN BY: RMac
DATE: MAY 74		REVISED
MACDONALD S-21		
		DRAWING NUMBER 50-02

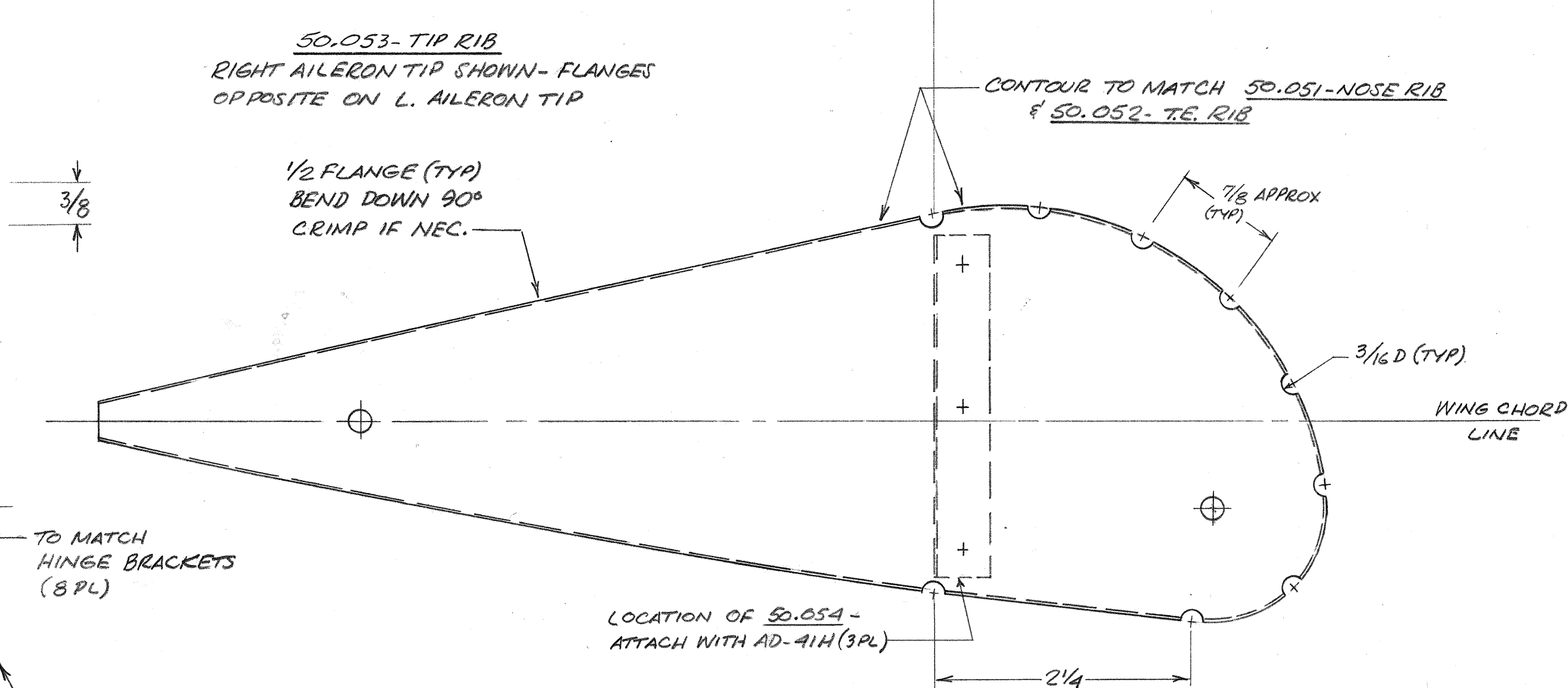
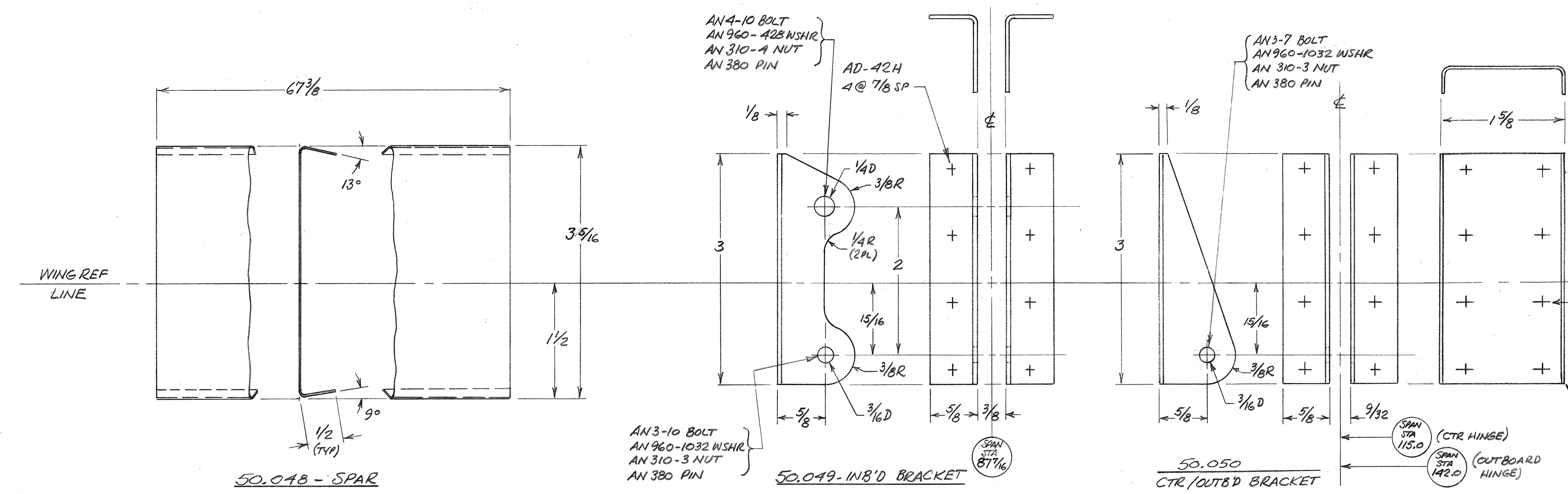
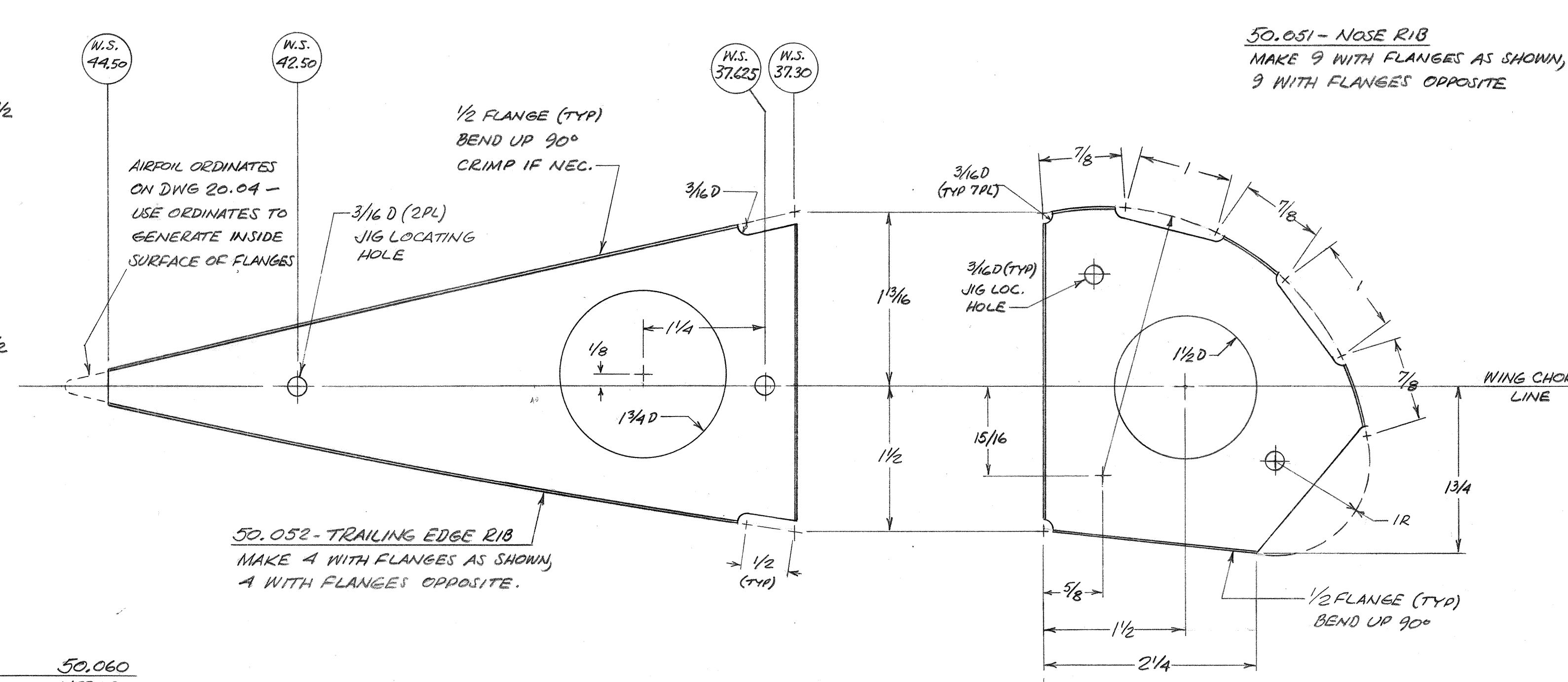
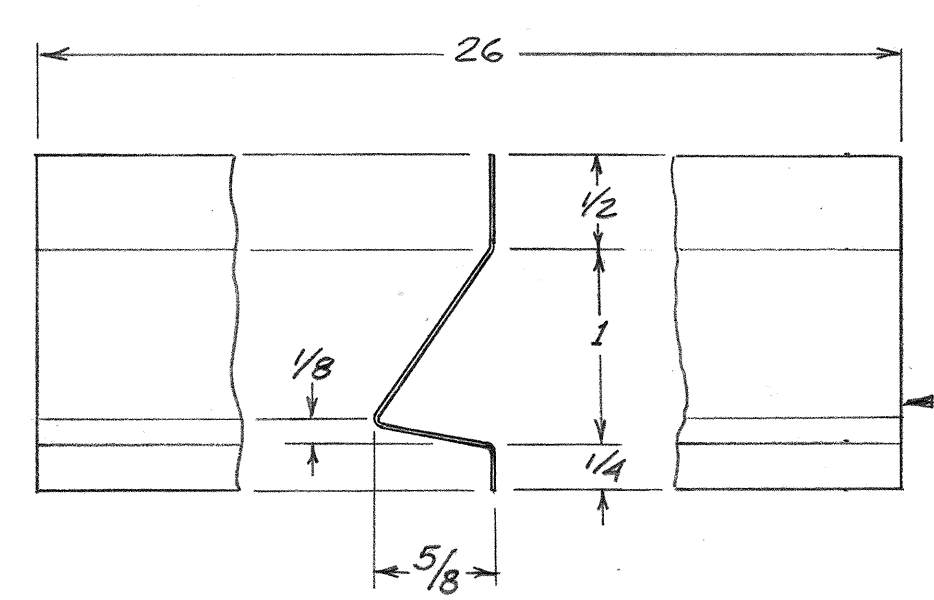


PART NO.	NO PER ACFT	PART NAME	MATERIAL
50.044	2	PITOT TUBE PRESSURE LINES	NEOPRENE OR NYLON TUBING 1/4 I.D.
50.043	1	PITOT TUBE DOUBLER	2024-T3 .020 THK
50.042	1	PITOT TUBE SUPPORT	2024-T3 .020 THK
50.041	2	PITOT HEAD TUBE	ALUM TUBE 1/40.0 x 1/32 WALL
50.040	2	INSPECTION HOLE DOUBLER	2024-T3 .020 THK
50.039	4	AILERON PUSHROD END	4130 STEEL ROD
50.038	2	AILERON PUSHROD TUBE	4130 5/8 x .035
50.037	4	AILERON BELLCRANK HALF	2024-T3 .063 THK
50.036	2	CTR SECT- OUTER PANEL FAIRING STRIP	2024-T3 .020 THK
50.035	2	AILERON FAIRING SKIN	2024-T3 .020 THK
50.034	2	TRAILING EDGE SKIN	2024-T3 .020 THK
50.033	2	BOTTOM SKIN	2024-T3 .020 THK
50.032	2	TOP SKIN	2024-T3 .020 THK

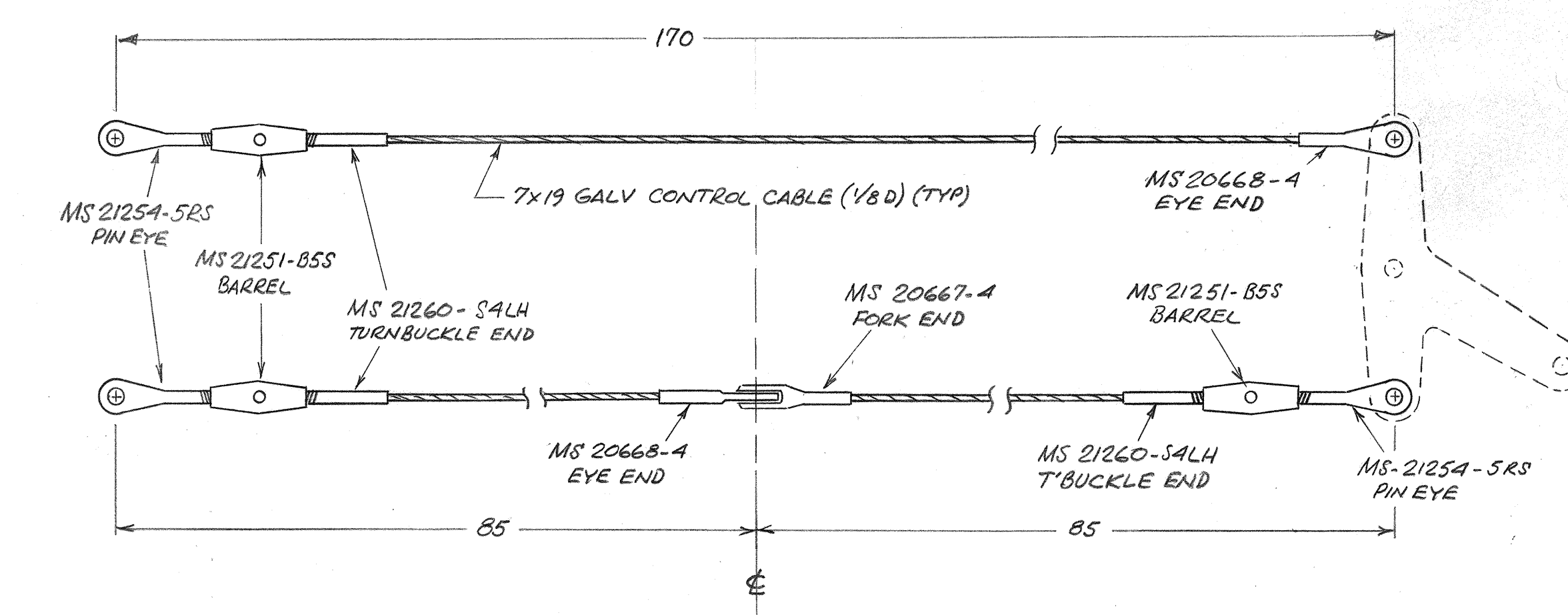
WING ASSEMBLY		
SCALE: 1/8" NOTED	APPROVED BY: RAN MacDonell	DRAWN BY: RAN Mac
DATE: MAY 74		REVISED
MACDONALD S-21		
	DRAWING NUMBER	50.03



**AILERON ASSEMBLY**  
(1/5 SCALE)  
RIGHT SHOWN - LEFT OPP.



**AILERON CABLES**  
VERIFY LENGTHS BEFORE FABRICATING  
(1/2 SCALE)



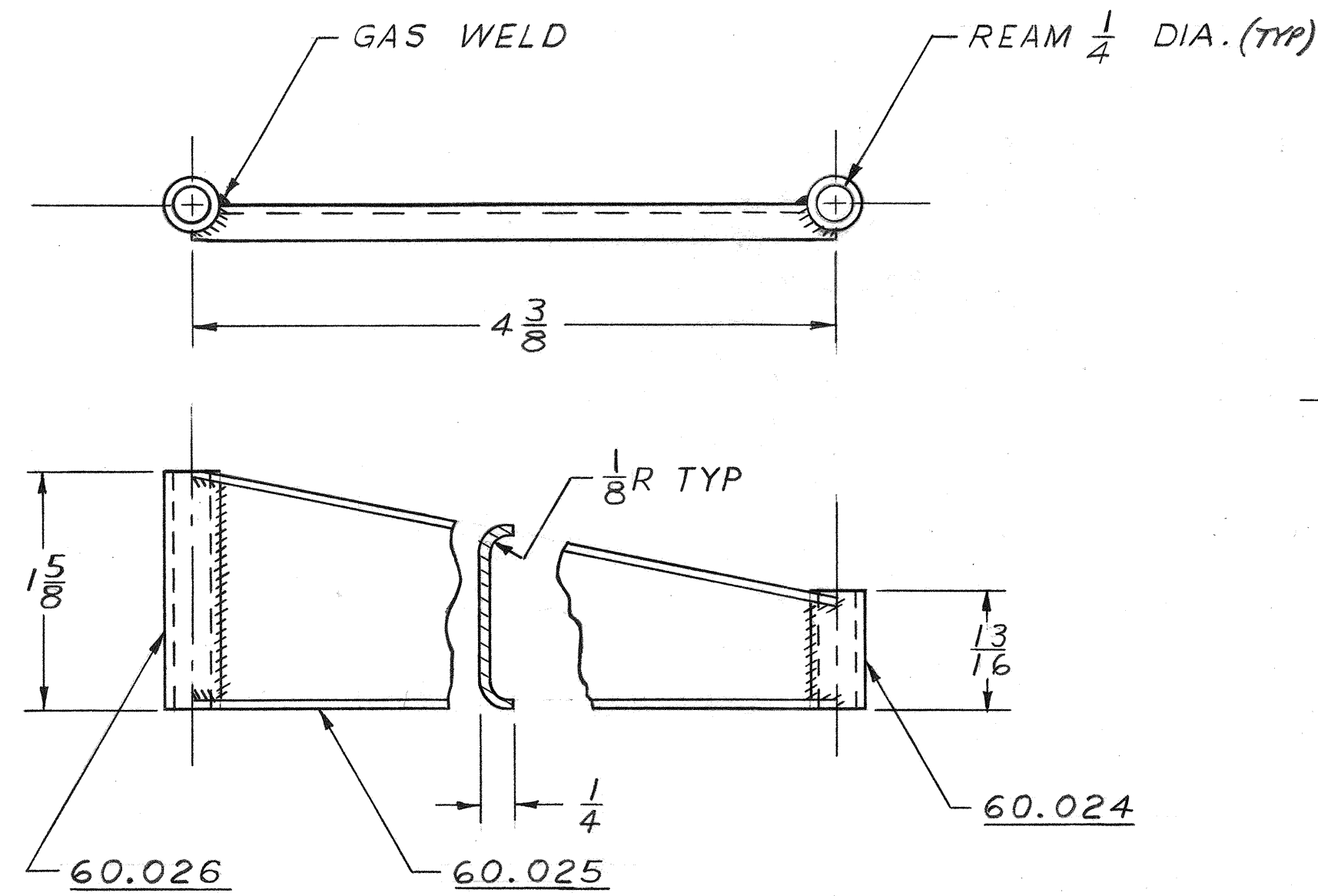
**IMPORTANT:**  
AIRCRAFT TO STALL IN STRAIGHT AND LEVEL FLIGHT (BOTH POWER ON AND POWER OFF) AND IN ACCELERATED (TURNING) FLIGHT WITHOUT WING DROP AND WITH AIRCRAFT RESPONSIVE TO SMALL AILERON INPUTS.  
DEPARTURE IN ROLL WITH LARGE AILERON INPUTS ACCEPTABLE.  
STALL CHARACTERISTICS MAY BE MODIFIED BY USE OF VORTEX GENERATORS (VGs) AHEAD OF AILERONS, ON INBOARD PORTION OF WING, AND ON STABILIZER.  
VGs AVAILABLE FROM AIRCRAFT SPRUCE AND SPECIALTY (E.G. STOLSPEED VORTEX GENERATORS, PN 06-04457), AND ELSEWHERE.  
INSTALLATION INSTRUCTIONS SUPPLIED WITH VG KITS.

50.061	6	HINGE BRKT REINF	2024-T3 .046 THK
50.060	2	WEDGE	2024-T3 .016 THK
50.059	2	TRAILING EDGE SKIN	2024-T3 .016 THK
50.058	2	L.E. SKIN, SEG. 4	2024-T3 .016 THK
50.057	2	L.E. SKIN, SEG. 3	2024-T3 .016 THK
50.056	2	L.E. SKIN, SEG. 2	2024-T3 .016 THK
50.055	2	L.E. SKIN, SEGMENT 1	2024-T3 .016 THK
50.054	2	AILERON TIP UPRIGHT	2024-T3 .016 THK
50.053	2	AILERON TIP RIB	2024-T3 .016 THK
50.052	8	AILERON TRAILING EDGE RIB	2024-T3 .016 THK
50.051	18	AILERON NOSE RIB	2024-T3 .016 THK
50.050	8	CTR/OUTBD AILERON HINGE BRACKET	2024-T3 .063 THK
50.049	4	INBOARD AILERON HINGE BRACKET	2024-T3 .063 THK
50.048	2	AILERON SPAR	2024-T3 .020 THK
PART NO.	NO PER ACFT	PART NAME	MATERIAL

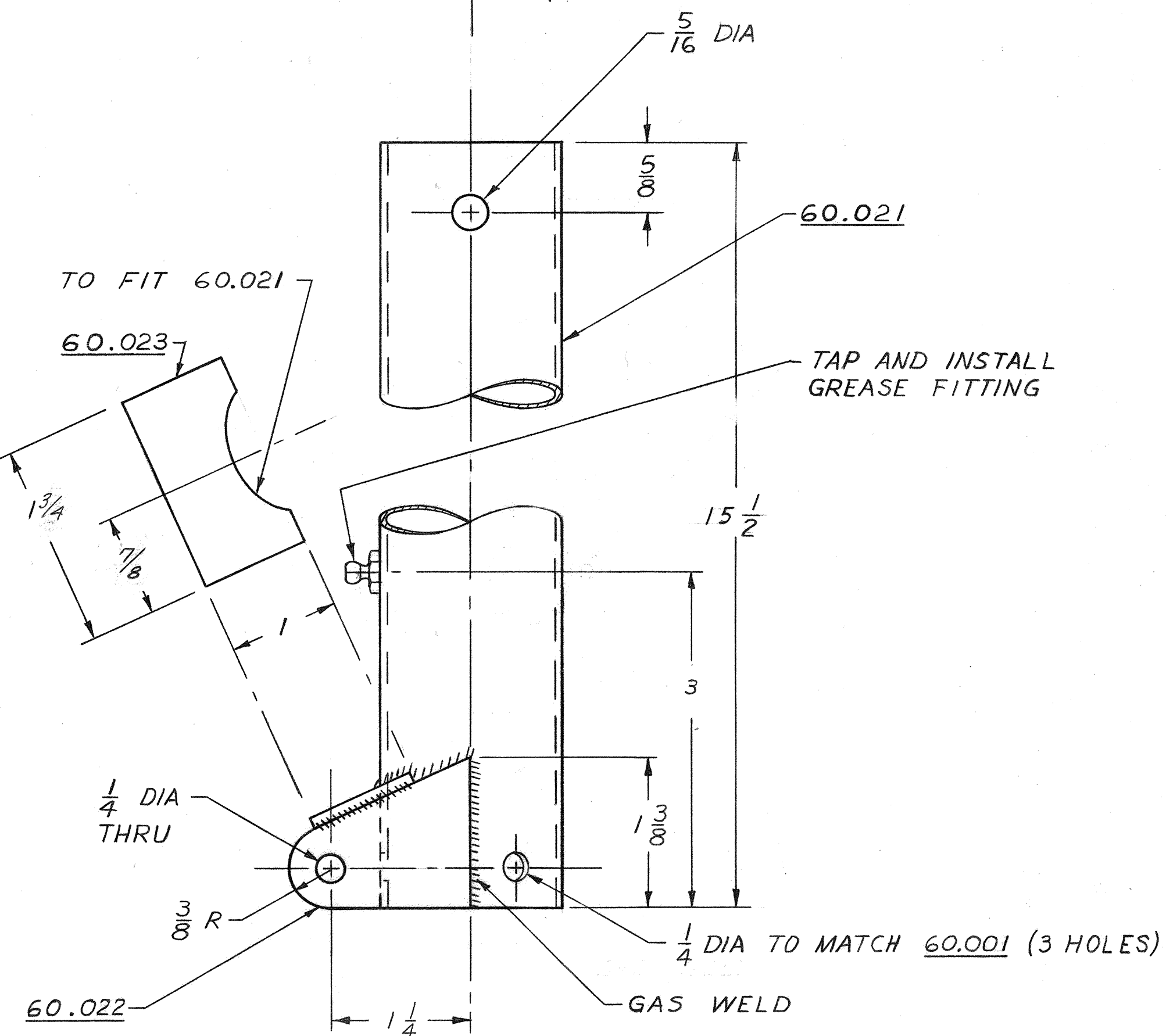
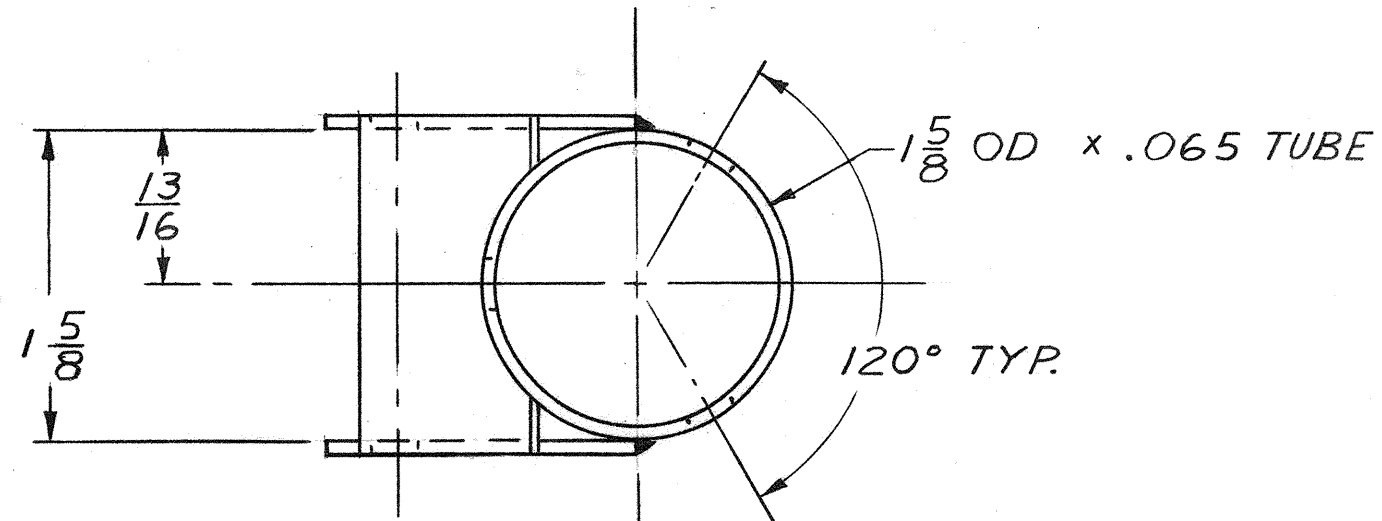
**AILERONS**

SCALE: FULL/NOTED APPROVED BY: *RAMacDonald* DRAWN BY: RMac  
DATE: MAY 74 REVISIONS: REVISIONS  
MAC DONALD S-21  
DRAWING NUMBER: 50.04



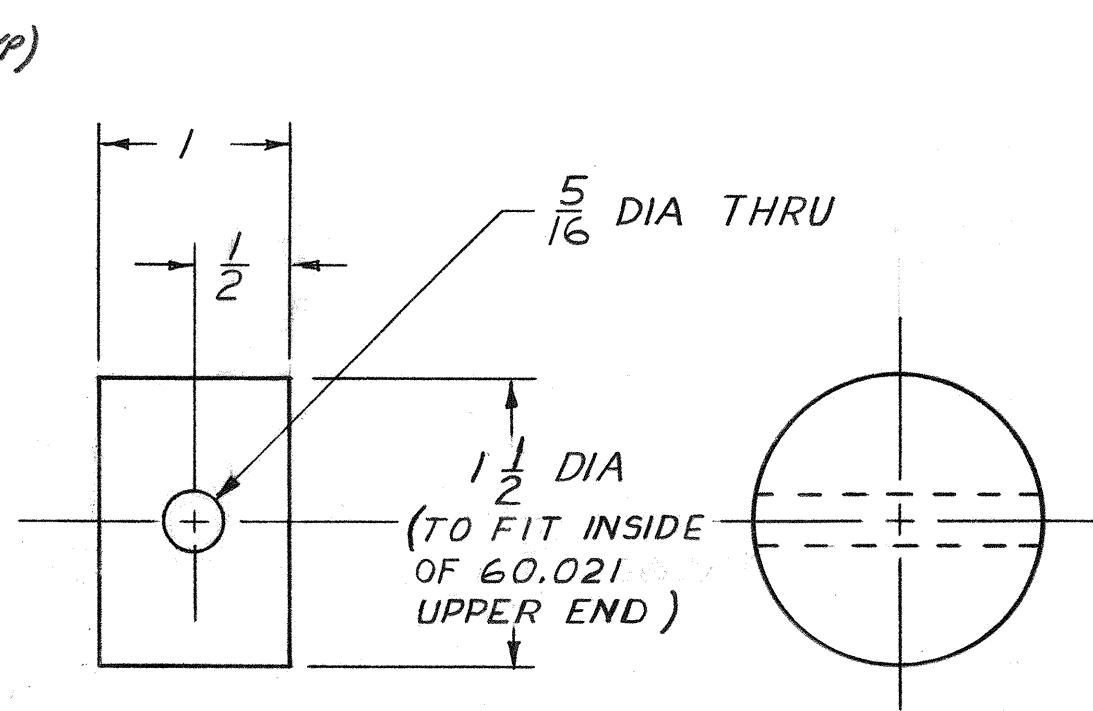


LANDING GEAR SCISSORS  
4 REQD (2 RT. & 2 LFT. ~ RT. SHOWN)

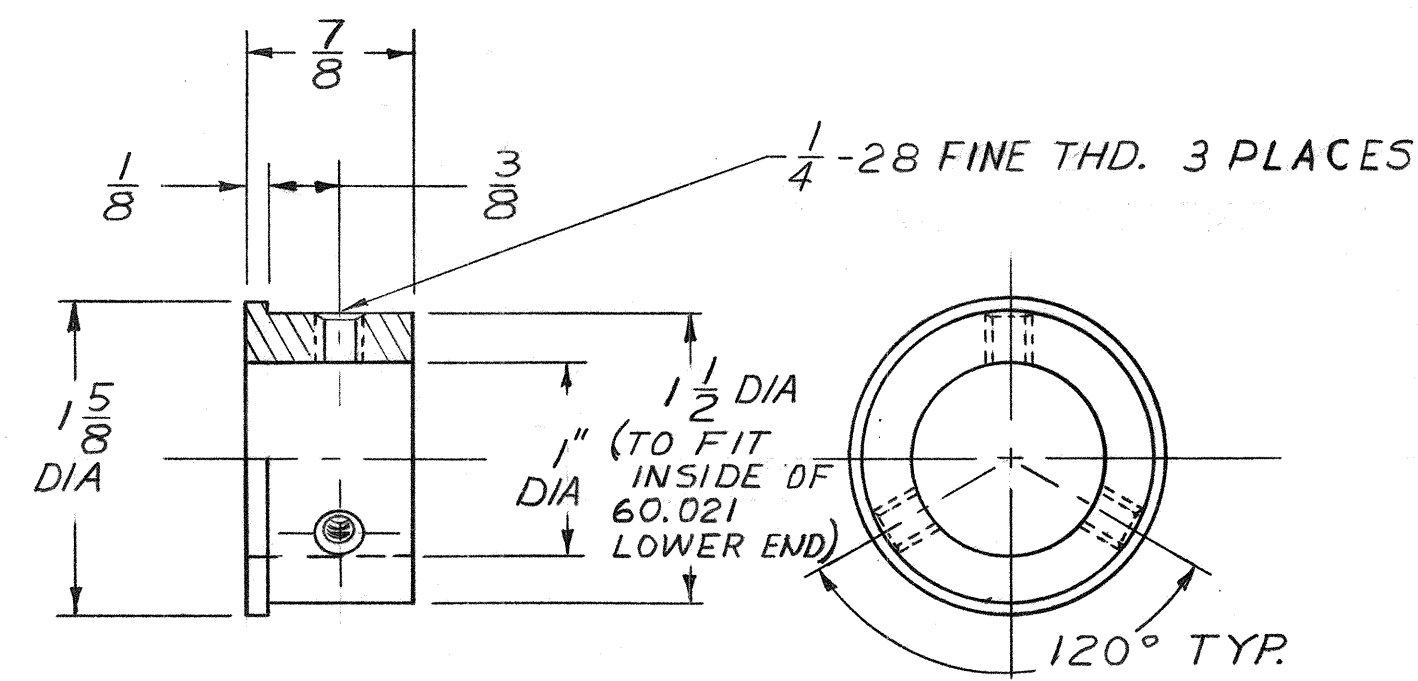


FIXED STRUT ASSEMBLY  
2 REQD

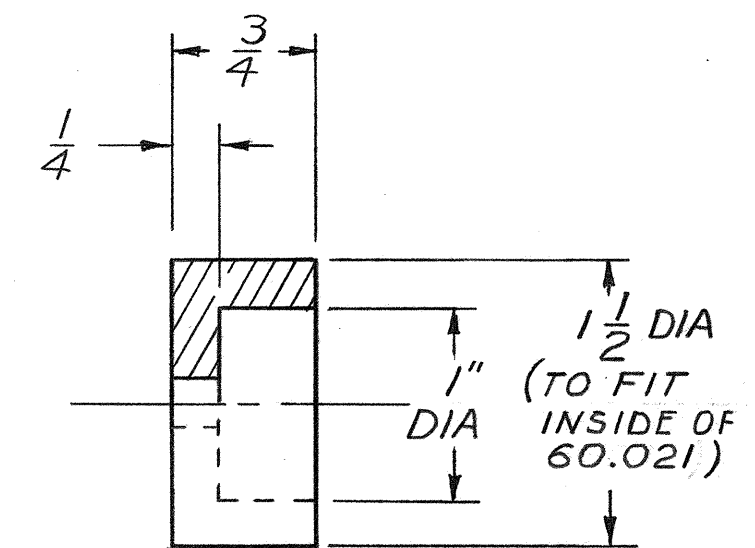
NOTE: AFTER FABRICATION:  
1. HEAT TREAT TO 150,000 PSI  
2. MAGNAFLUX  
3. BORE OR HONE I.D. OF TUBE TO PROVIDE A SMOOTH SLIDING FIT WITH 60.003



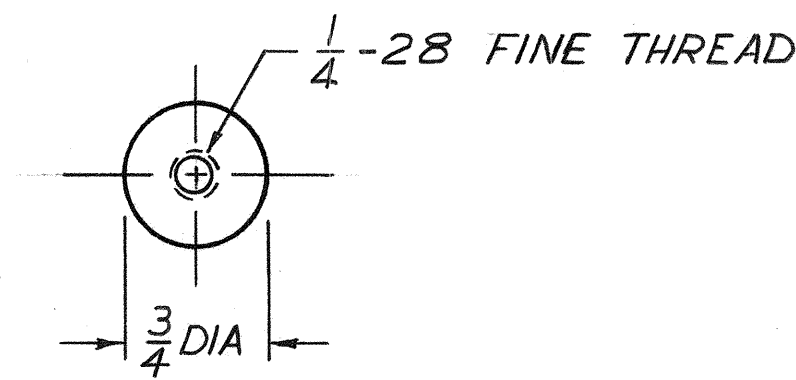
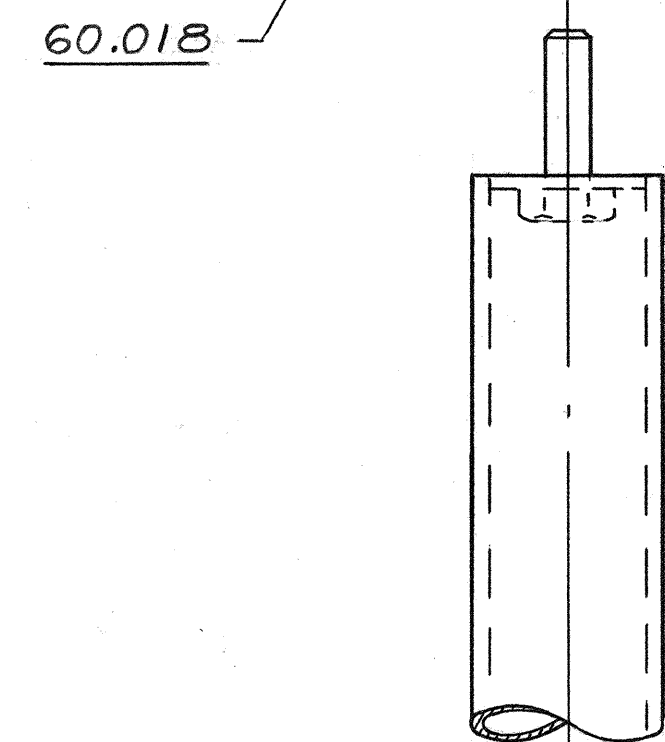
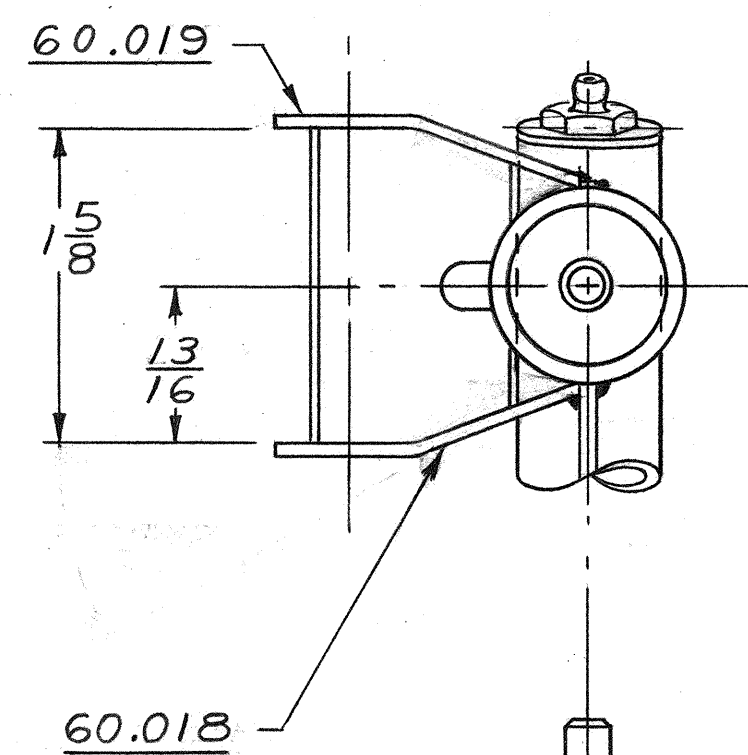
60.005 2 REQD



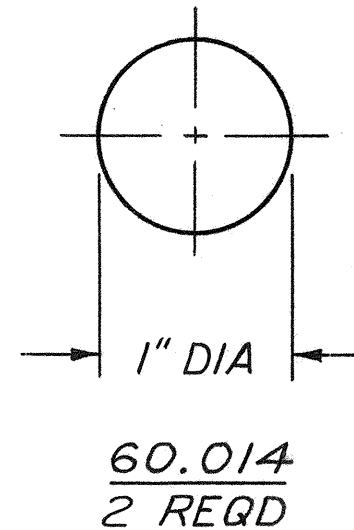
60.001 2 REQD



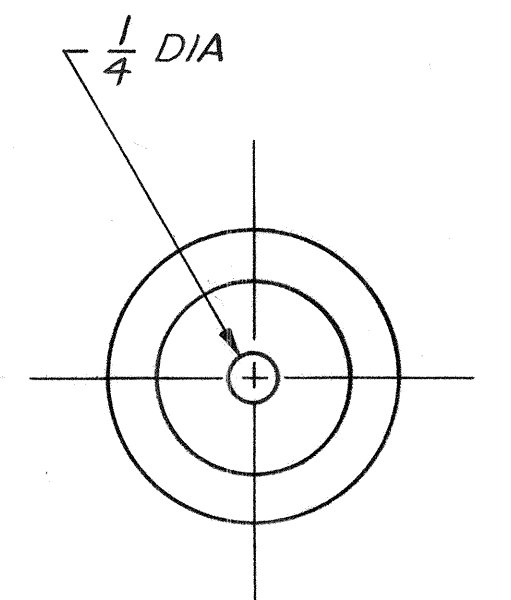
60.003 2 REQD



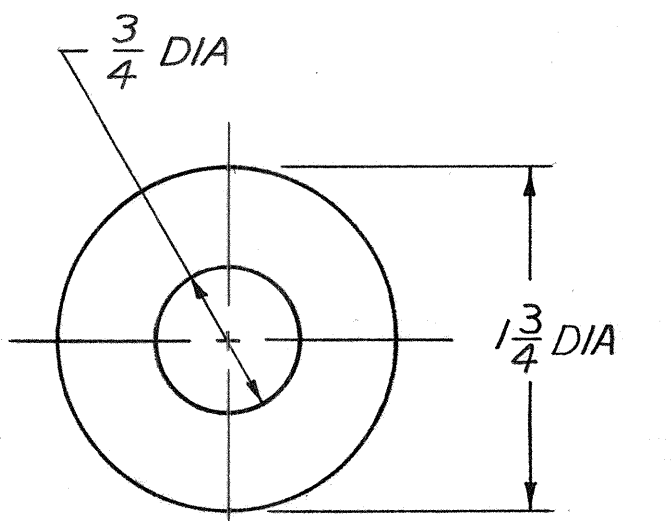
60.015 2 REQD



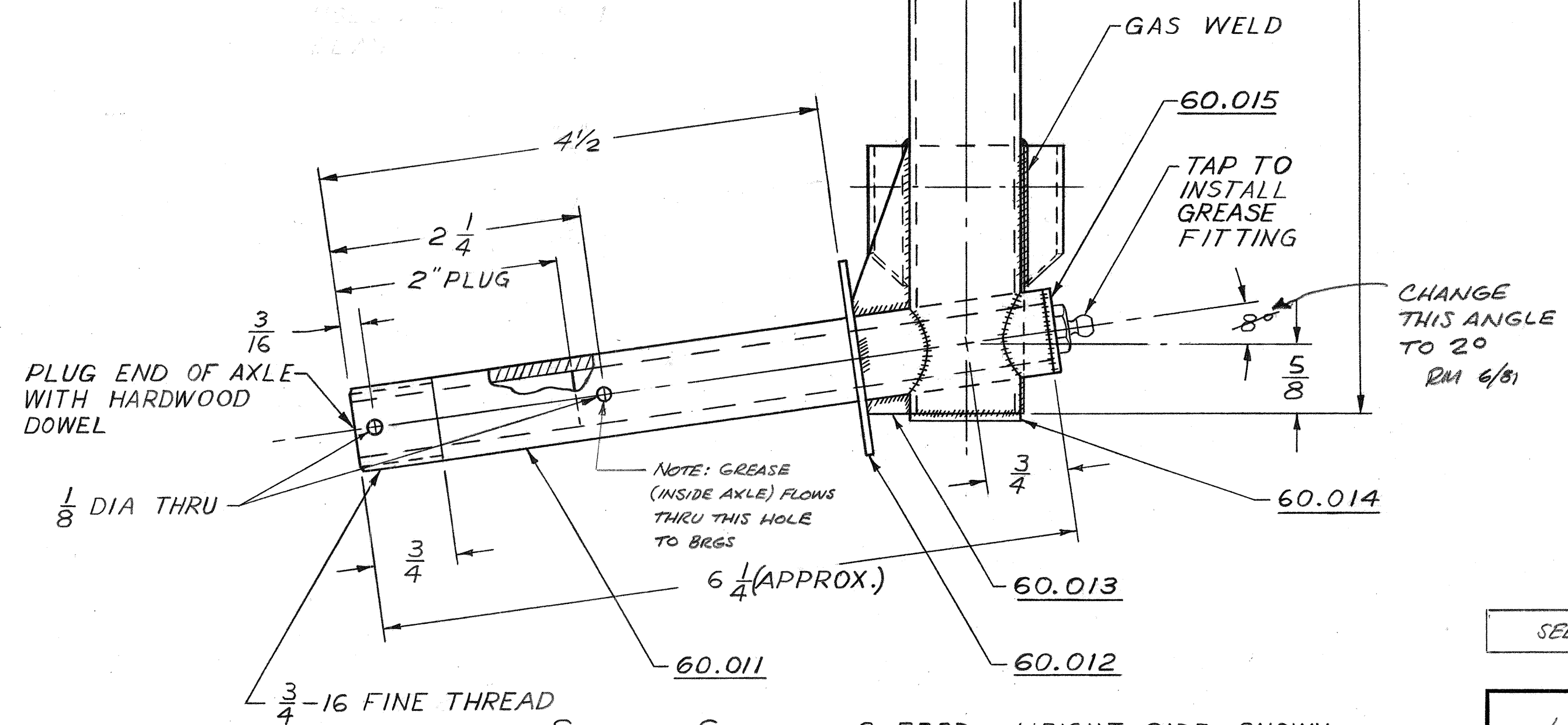
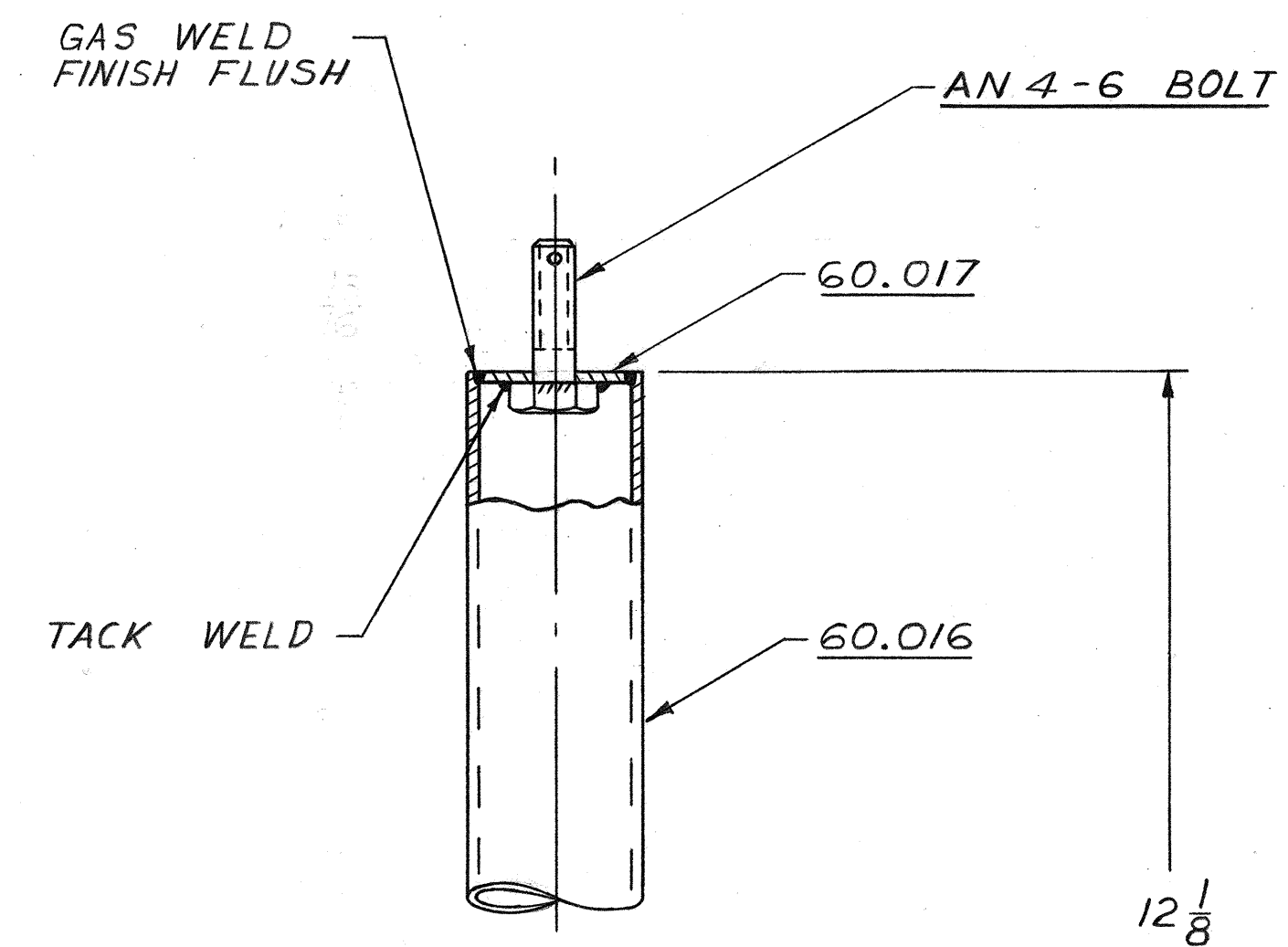
60.014 2 REQD



60.017 2 REQD

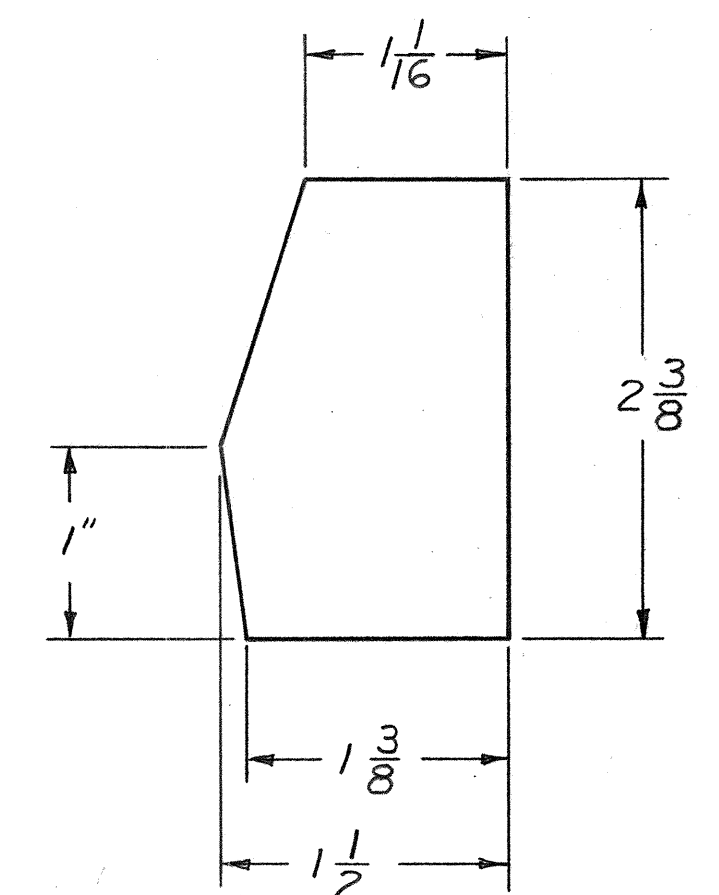


60.012 2 REQD



SLIDING STRUT 2 REQD 1 RIGHT SIDE SHOWN 1 LEFT SIDE OPPOSITE

NOTE: AFTER FABRICATION:  
1. HEAT TREAT TO 150,000 PSI  
2. MAGNAFLUX



60.013 2 REQD

SEE PLAN 60.02 FOR PARTS LIST

LANDING GEAR COMPONENTS

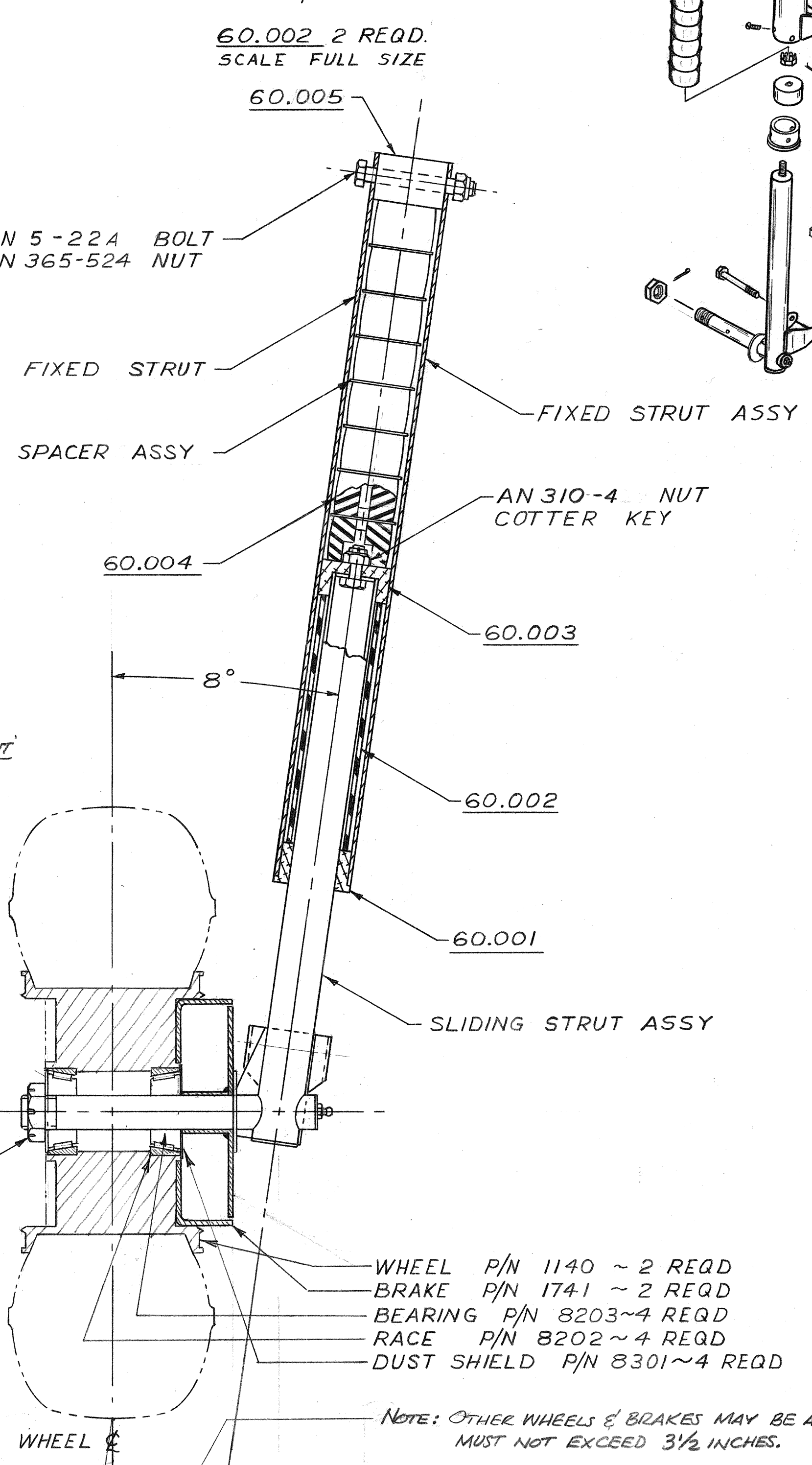
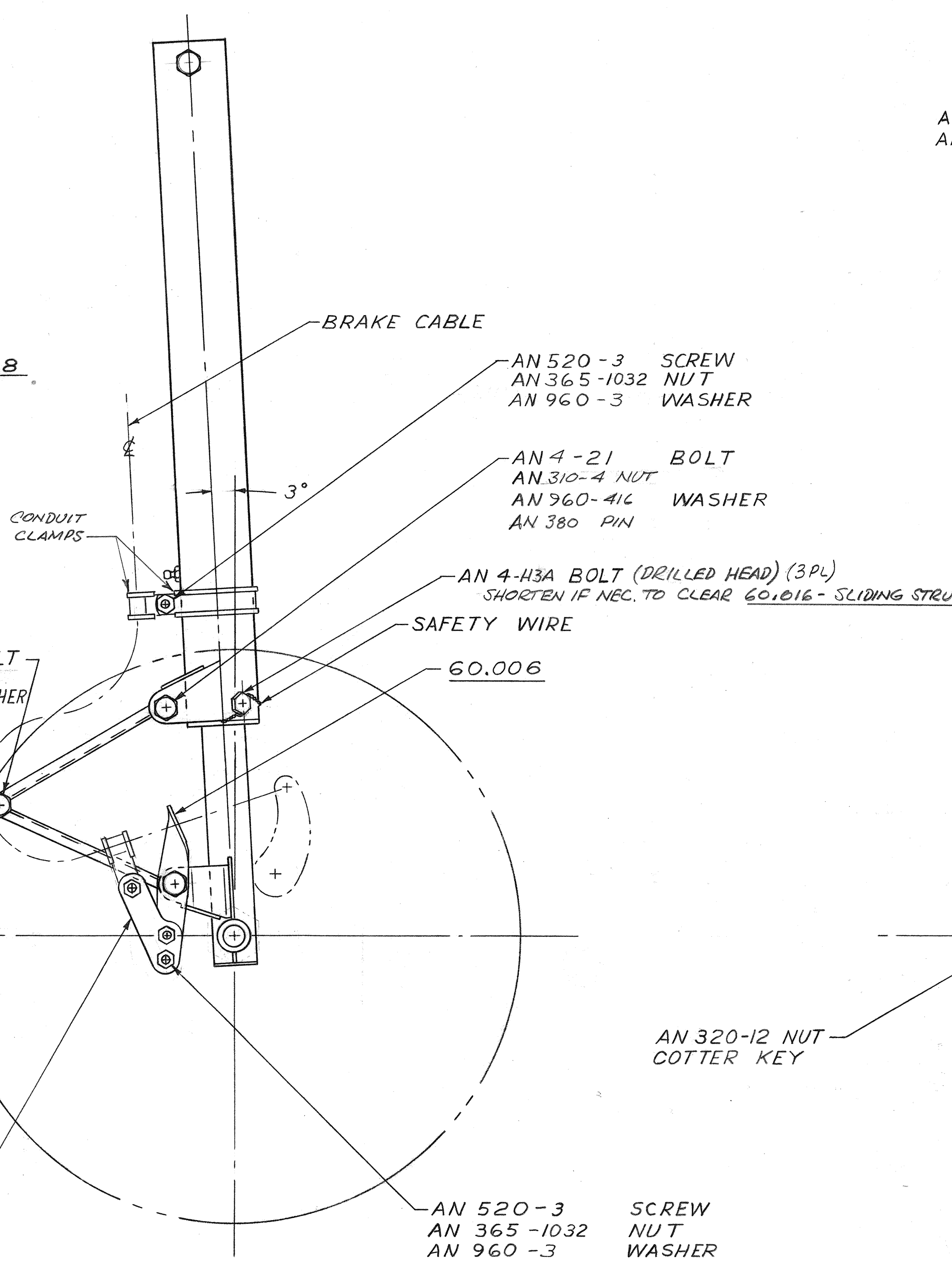
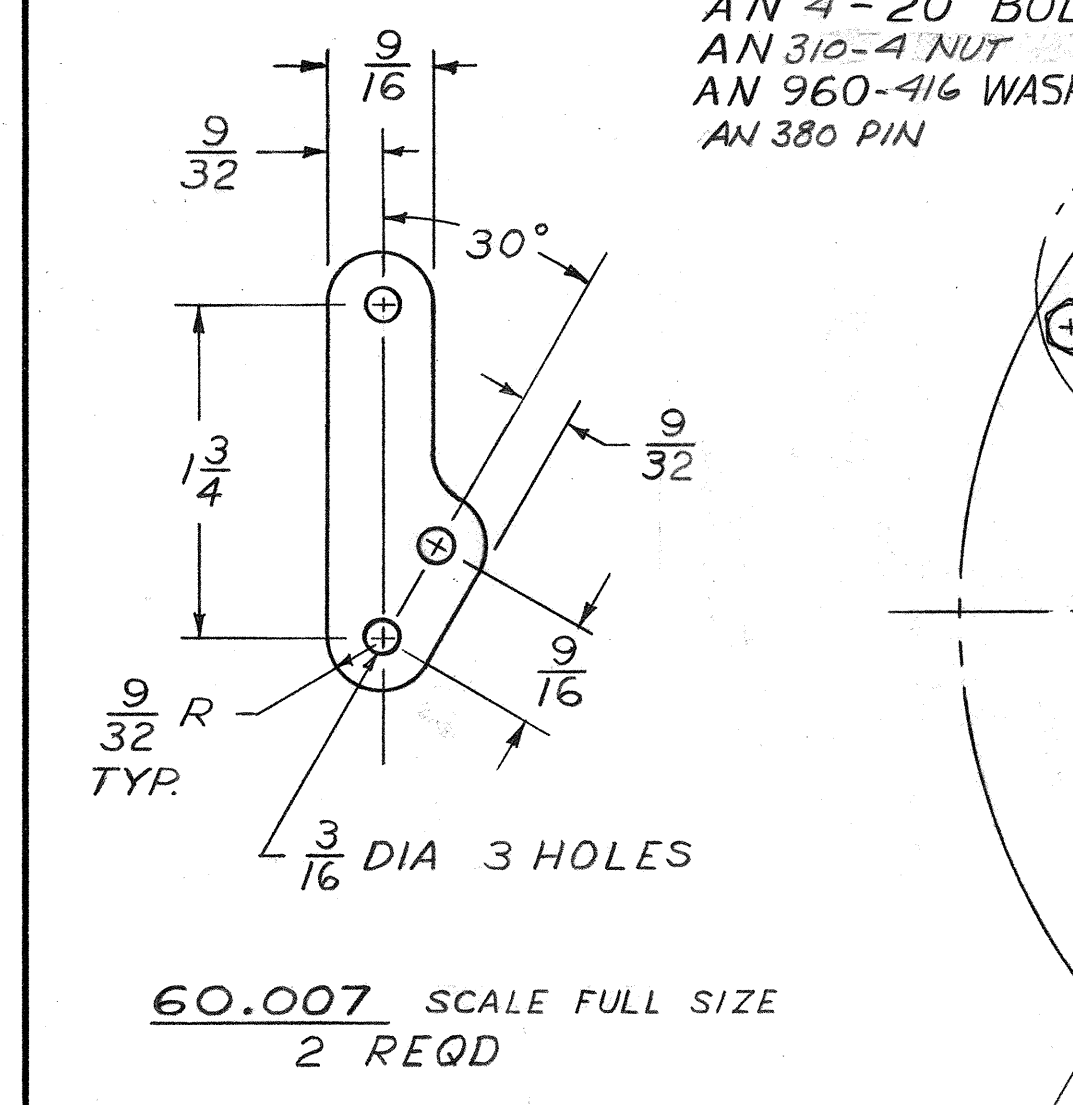
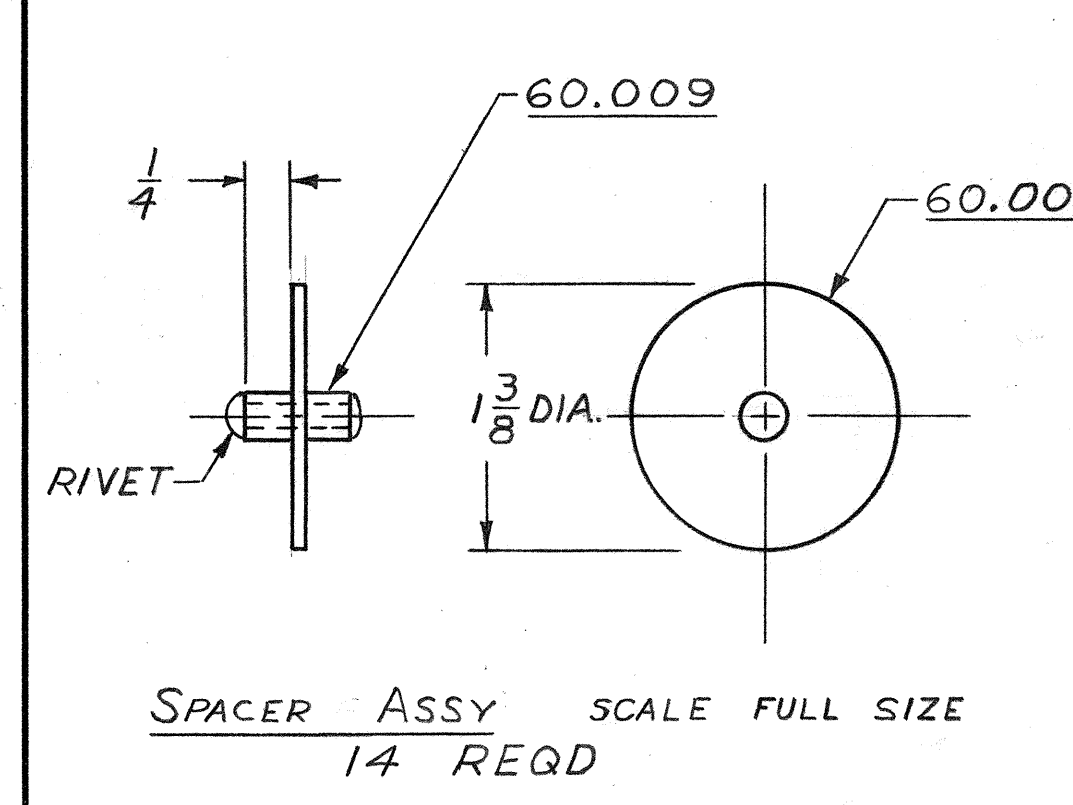
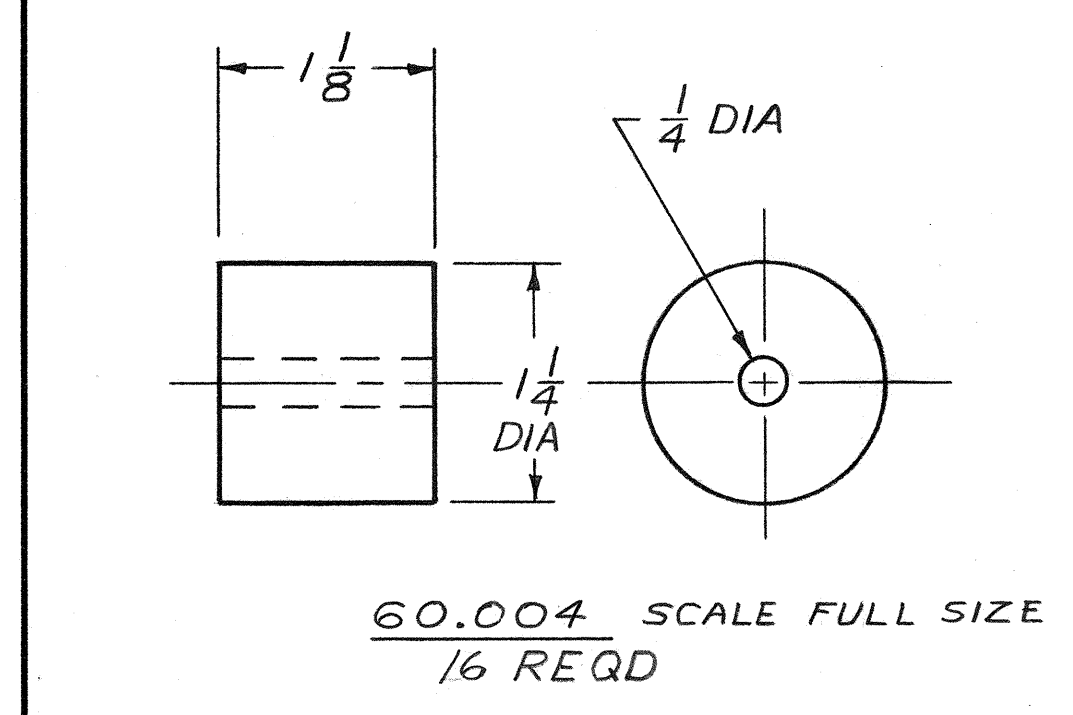
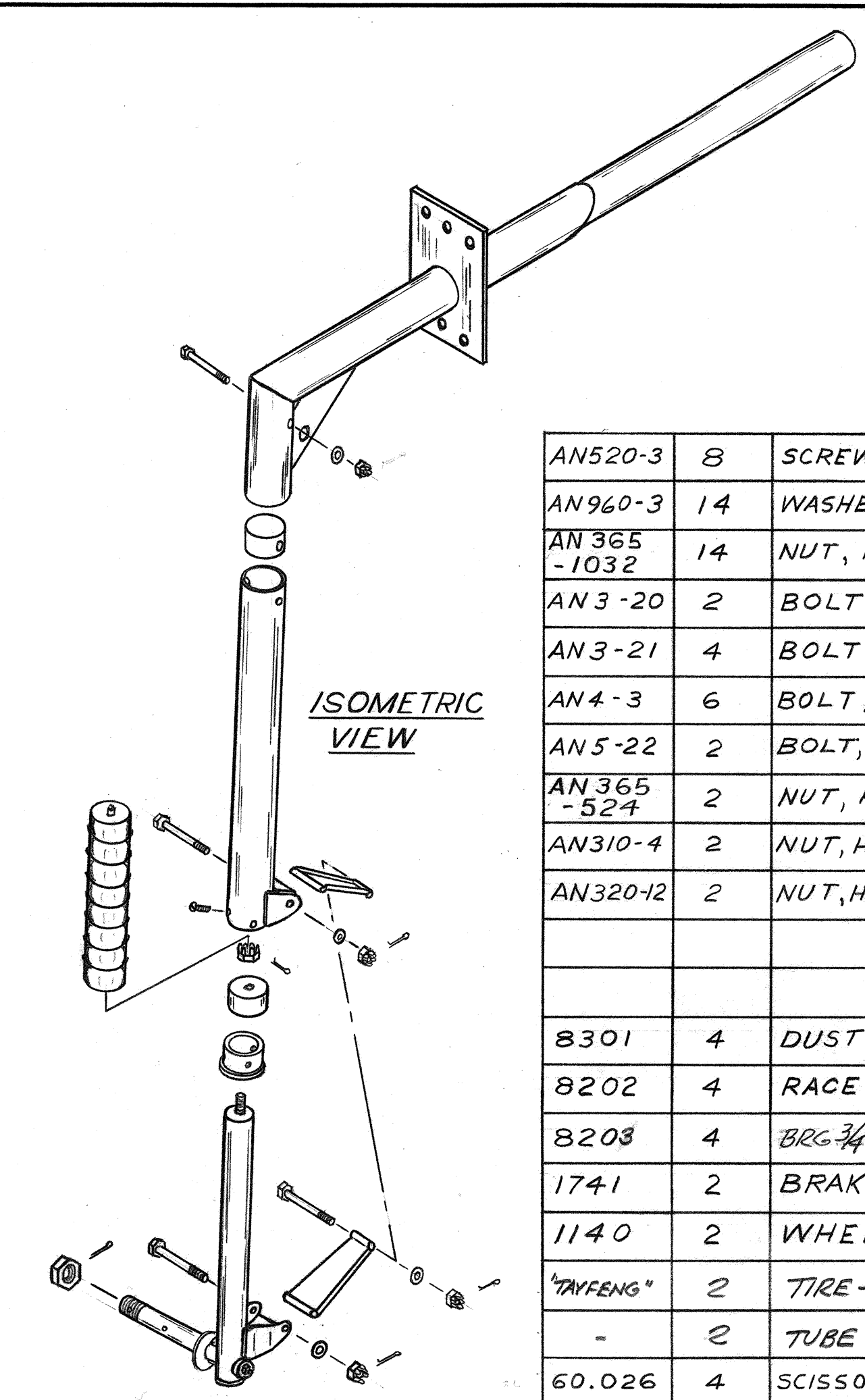
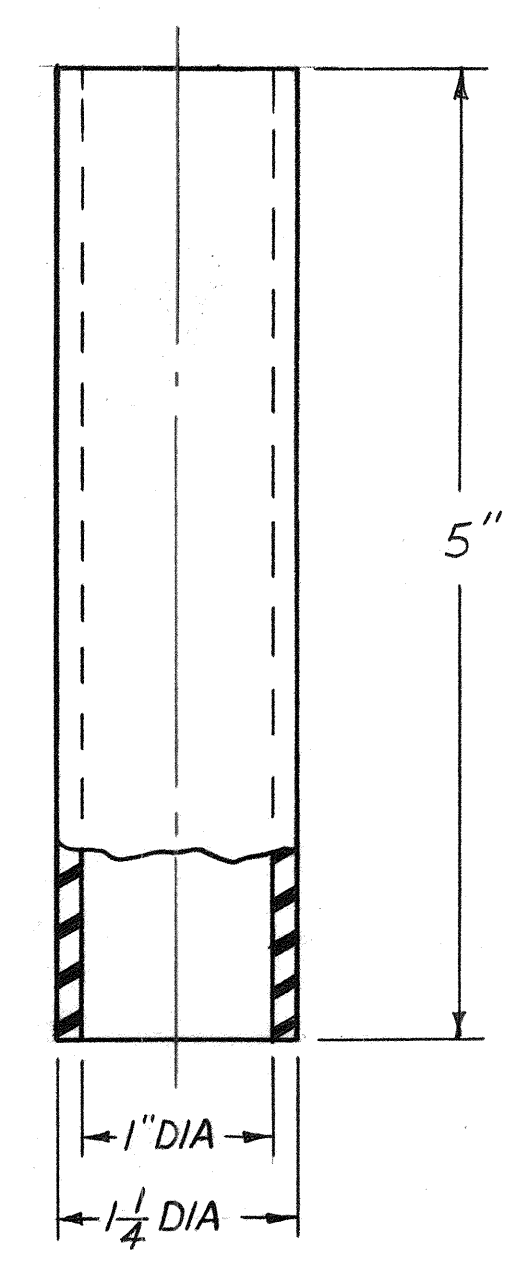
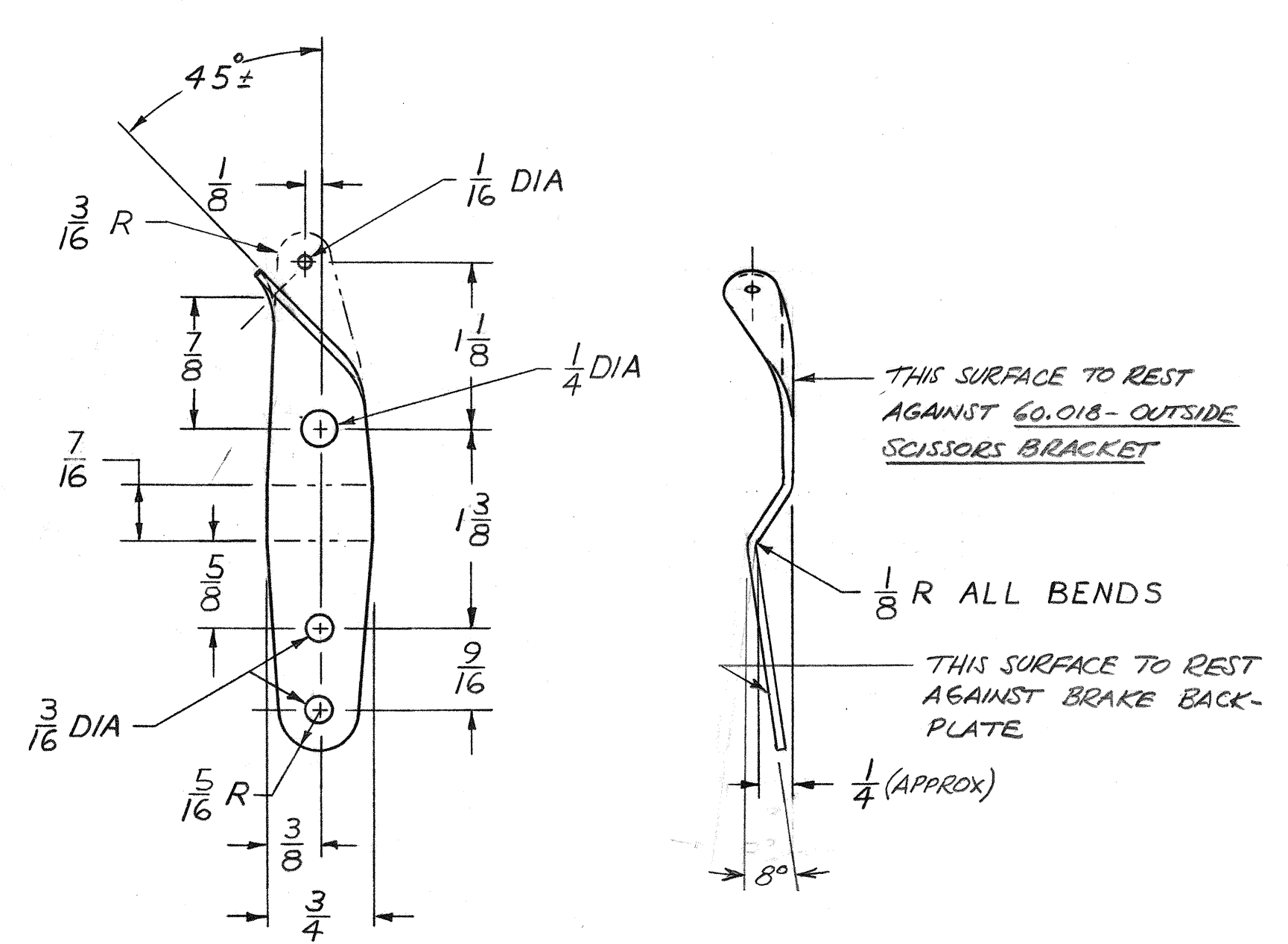
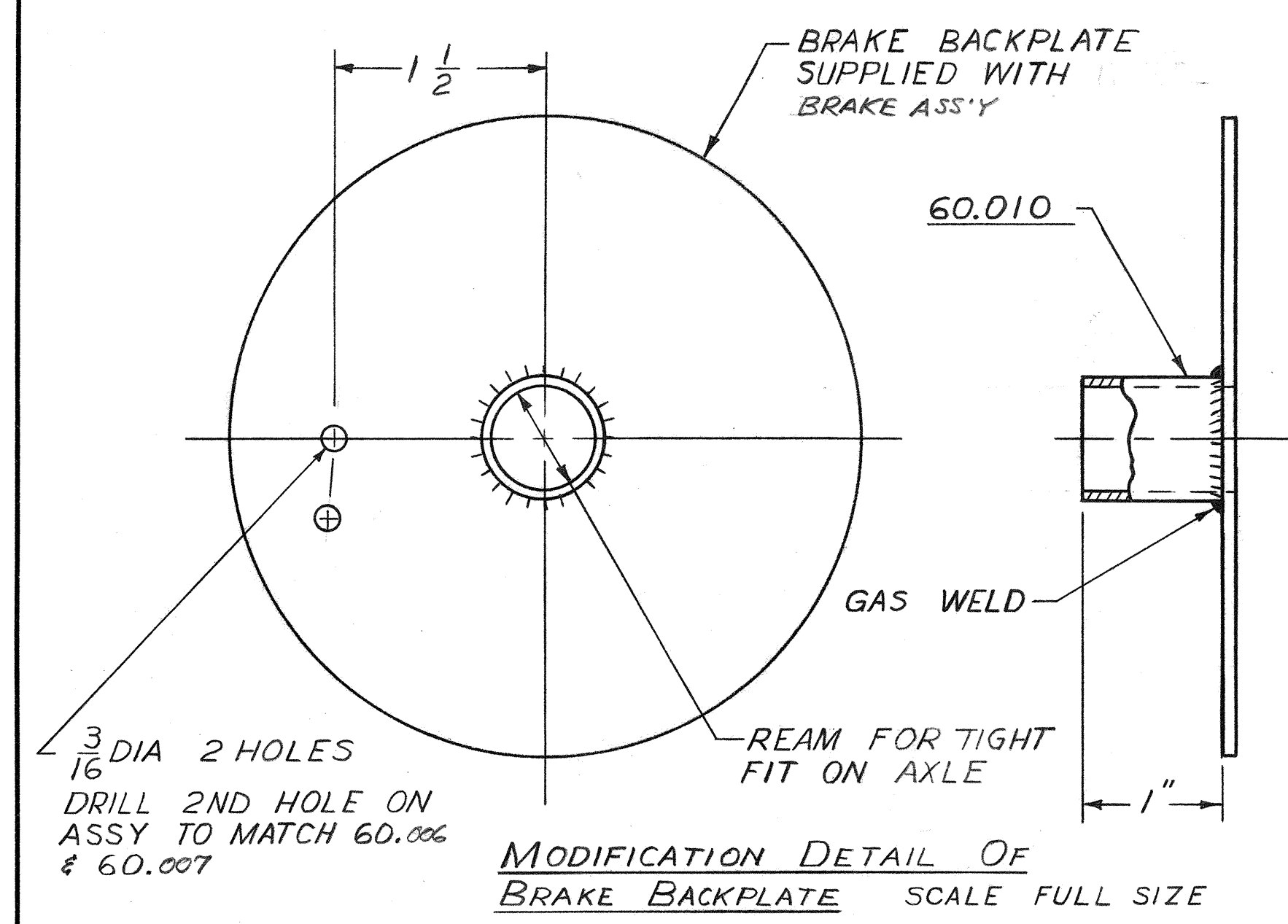
SCALE: FULL  
DATE: 4-4-73

APPROVED BY: RAMacDonald  
DRAWN BY: D.GREEN

REVISION

MACDONALD S-21

DRAWING NUMBER  
60.01

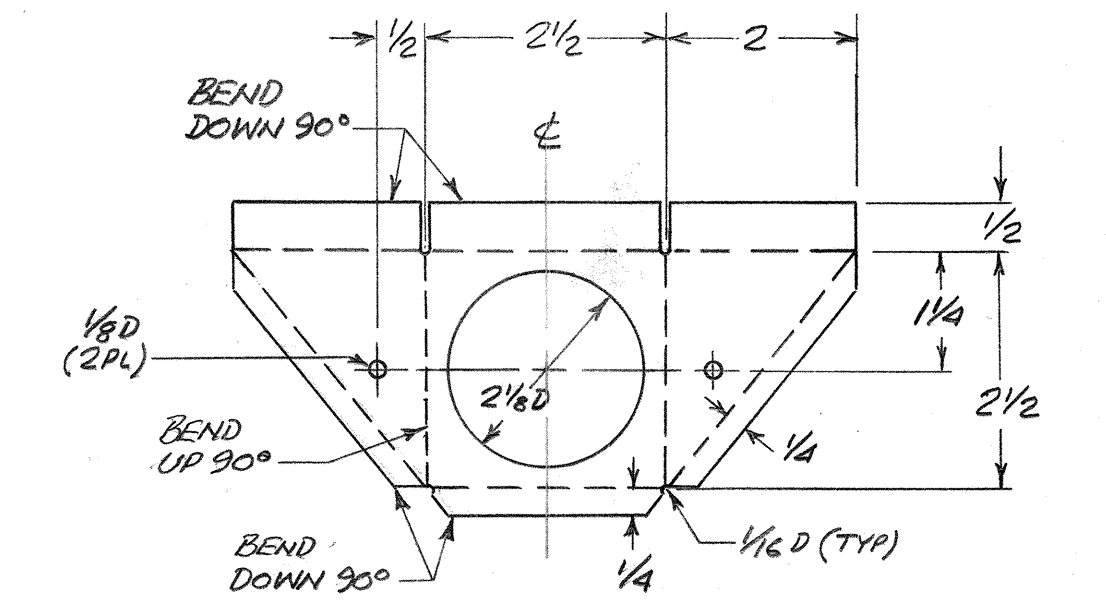
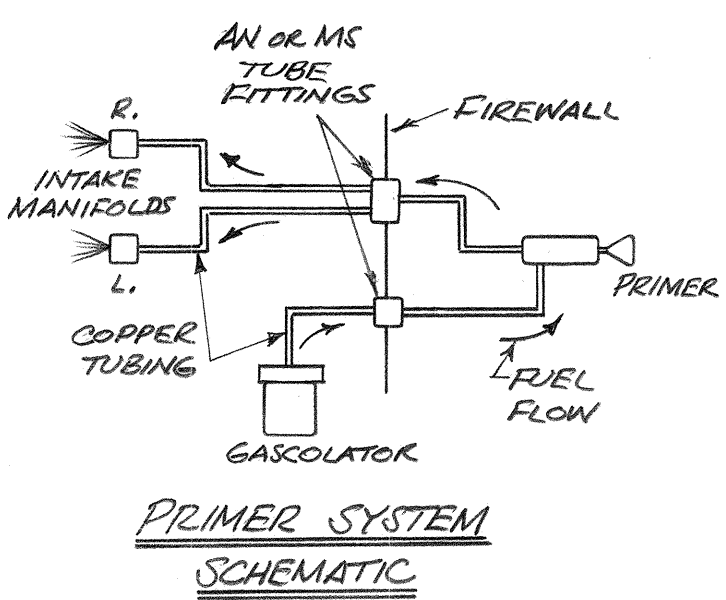
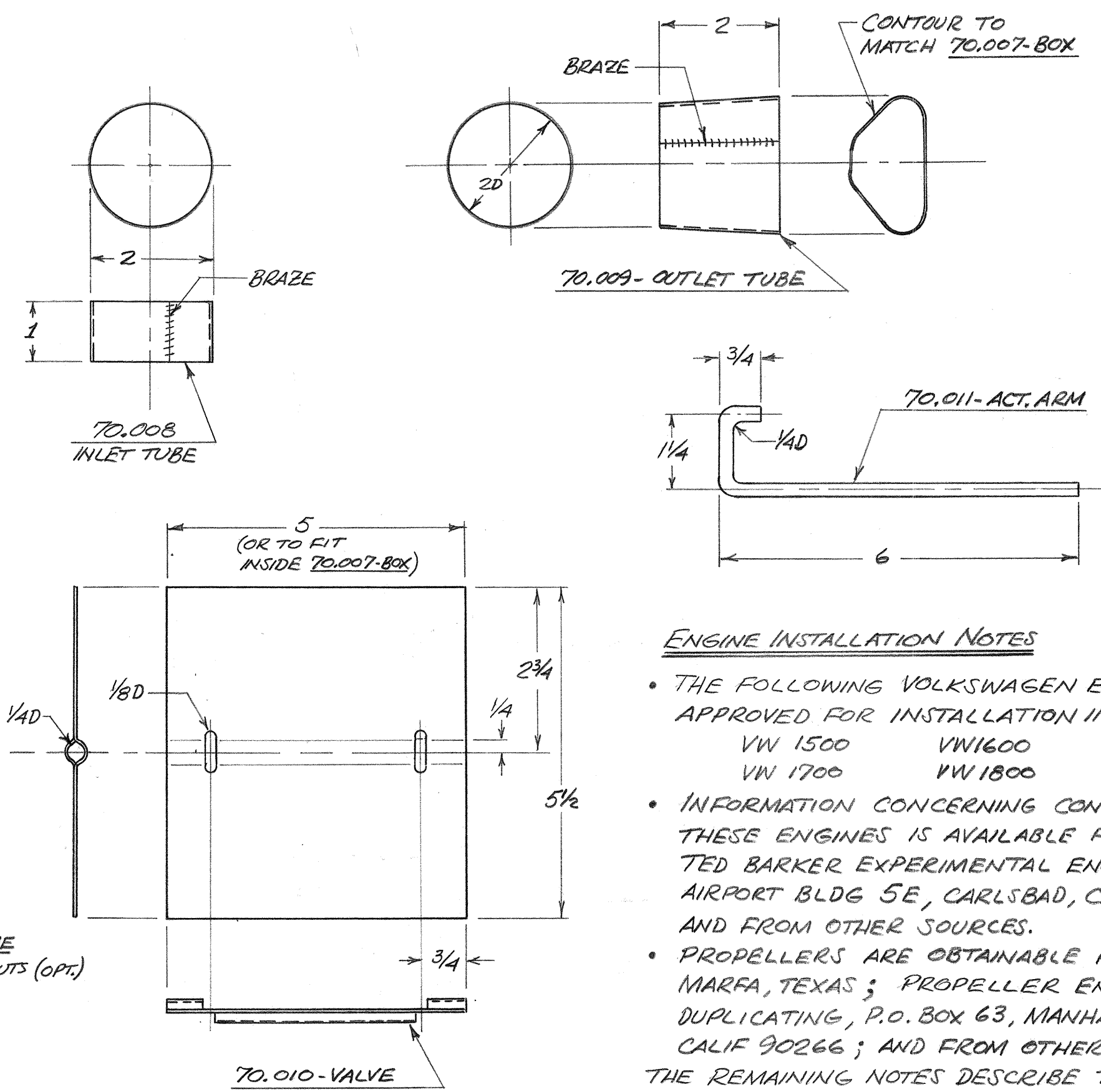
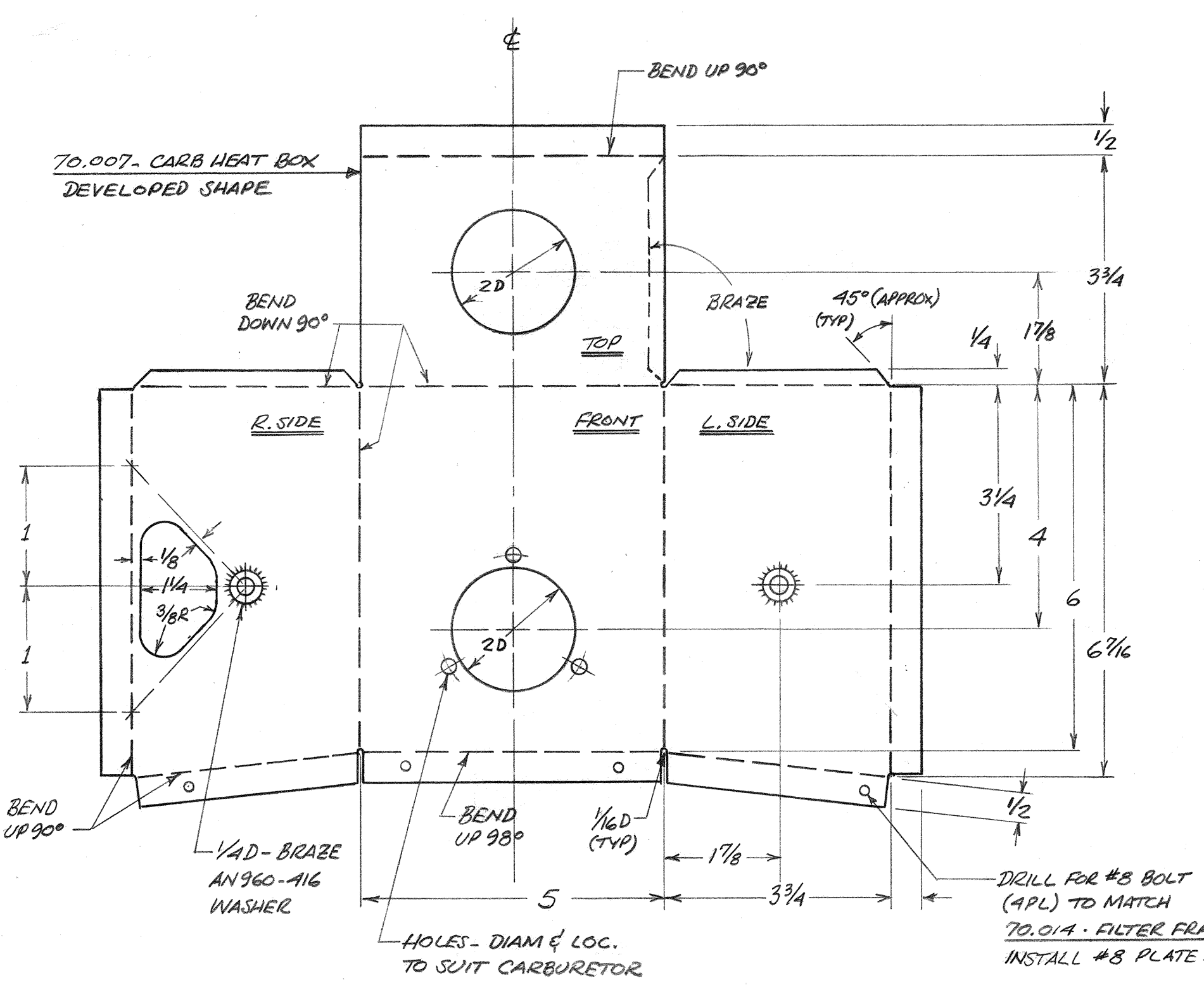


AN520-3	8	SCREW, MACH. PHILLIPS HD	#10-32 FINE THD x 1/2 LG
AN960-3	14	WASHER, FLAT	#10
AN365-1032	14	NUT, HEX SELF LOCK	#10-32 FINE THD
AN3-20	2	BOLT, HEX HD	#10-32 FINE THD x 2 1/32 LG
AN3-21	4	BOLT, HEX HD	#10-32 FINE THD x 2 5/32 LG
AN4-3	6	BOLT, HEX HD	1/4-28 FINE THD x 15/32 LG
AN5-22	2	BOLT, HEX, DRILLED HD.	5/16-24 FINE THD x 2 11/32 LG
AN365-524	2	NUT, HEX SELF LOCK	5/16-24 FINE THD
AN310-4	2	NUT, HEX CASTLE	1/4-28 FINE THD
AN320-12	2	NUT, HEX, CASTLE SHEAR	3/4-16 FINE THD
8301	4	DUST SHIELD	THESE PARTS MAY BE PURCHASED FROM:
8202	4	RACE, BEARING	AZUSA ENGINEERING INC.
8203	4	BRG. 3/4 BORE (TIMKEN ROLLER)	PO BOX N
1741	2	BRAKE, MECHANICAL	AZUSA, CALIF. 91702
1140	2	WHEEL (5")	
"YAFENG"	2	TIRE - 4.00x5 APLY RATING	
-	2	TUBE	
60.026	4	SCISSORS BUSHING, LONG	1020 STL. TUBE 3/8 OD x .065 WALL x 1 5/8 LG
60.025	4	SCISSORS WEB	4130 STL. SHT .065
60.024	4	SCISSORS BUSHING, SHORT	1020 STL. TUBE 3/8 OD x .065 WALL x 1 1/8 LG
60.023	2	SCISSORS BRKT. REINFORCE.	4130 STL. SHT .090
60.022	4	FIXED STRUT SCISSORS BRACKET	4130 STL. SHT .090
60.021	2	FIXED STRUT	4130 STL. TUBE 1 5/8 OD x .065 WALL x 15 1/2 LG
60.020	2	SCISSORS BRKT, REINFORCE	4130 STL. SHT .090
60.019	2	INSIDE SCISSORS BRKT.	4130 STL. SHT .090
60.018	2	OUTSIDE SCISSORS BRKT.	4130 STL. SHT .090
60.017	2	PLUG, UPPER	4130 STL. SHT .063
60.016	2	SLIDING STRUT	1" OD x .090 WALL x 12 1/8 LG
60.015	2	PLUG, AXLE	4130 STL. SHT .063
60.014	2	PLUG, LOWER	4130 STL. SHT .063
60.013	2	GUSSET	4130 STL. SHT .090
60.012	2	BRAKE POSITIONING WASHER	4130 STL. SHT .063
60.011	2	AXLE	4130 STL. TUBE 3/4 OD x .125 WALL x 6 1/4 LG
60.010	2	BEARING RACE POSITIONER	4130 STL. TUBE 7/8 OD x .065 WALL x 1" LG
60.009	28	SHOCK ABSORBER GUIDE	ALUM. TUBE 1/4 OD x .049 WALL x 1/4 LG
60.008	14	SHOCK ABSORBER SPACER	2024-T3 ALUM .063
60.007	2	BRAKE CABLE BRKT.	4130 STL. SHT .063
60.006	2	BRAKE POSITIONING BRACKET	4130 STL. SHT .063
60.005	2	PLUG	2024-T351 ALUM 1 1/2 DIA x 1" LG
60.004	16	SHOCK ABSORBING RUBBERS	NEOPRENE MED HARD 1 1/4 OD x 1/4 ID x 1 1/8 LG
60.003	2	UPPER BUSHING	BEARING BRONZE 1 1/2 OD x 3/4 LG
60.002	2	REBOUND STOP	NEOPRENE HOSE 1 1/4 OD x 1" ID x 5" LG
60.001	2	LOWER BUSHING	BEARING BRONZE 1 5/8 OD x 7/8 LG

LANDING GEAR ASSEMBLY			
SCALE: 1/2 & NOTED	APPROVED BY:	DRAWN BY D. GREEN	
DATE: 4-4-73	RAMacDonald	REVISED	
MAC DONALD S21			
			DRAWING NUMBER
			S-21/60.02

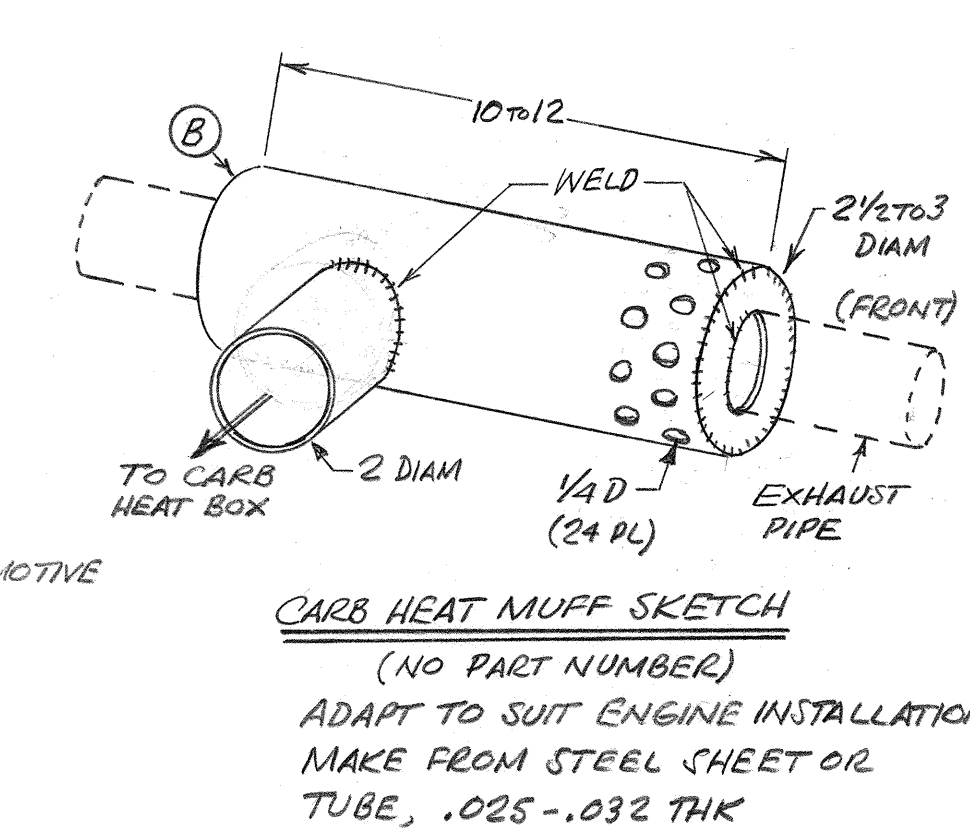
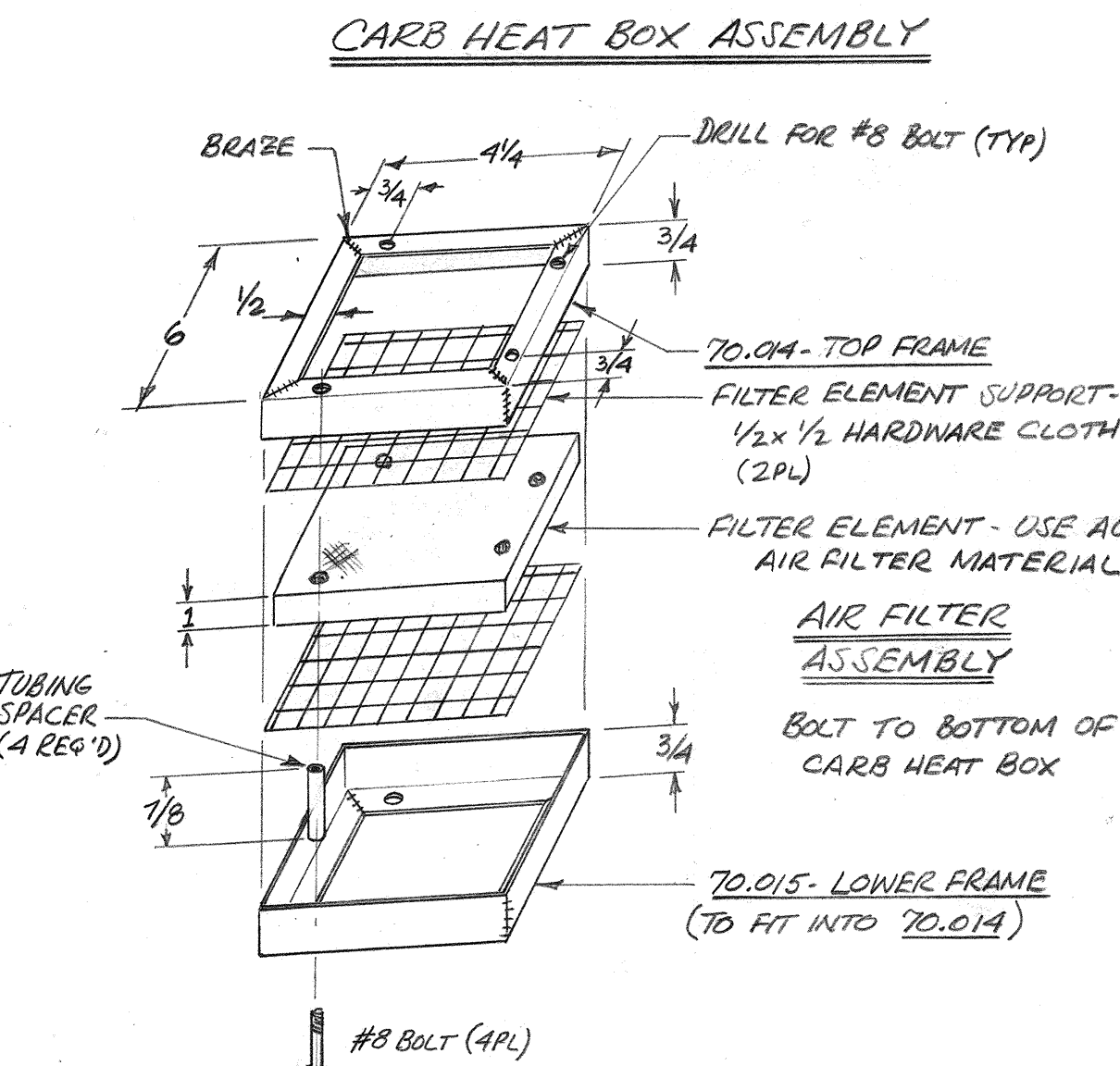
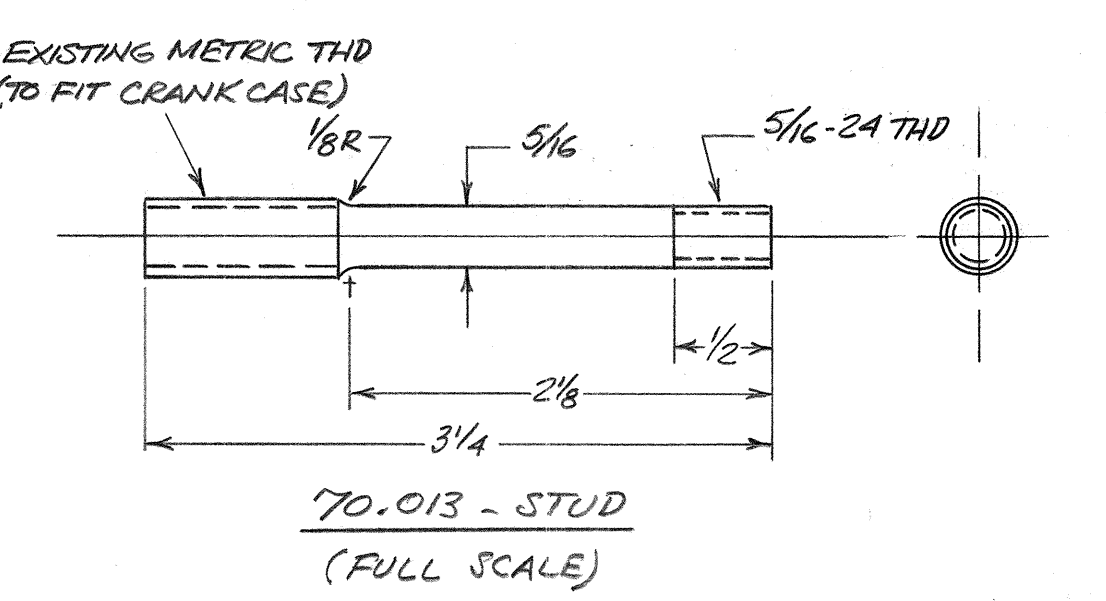
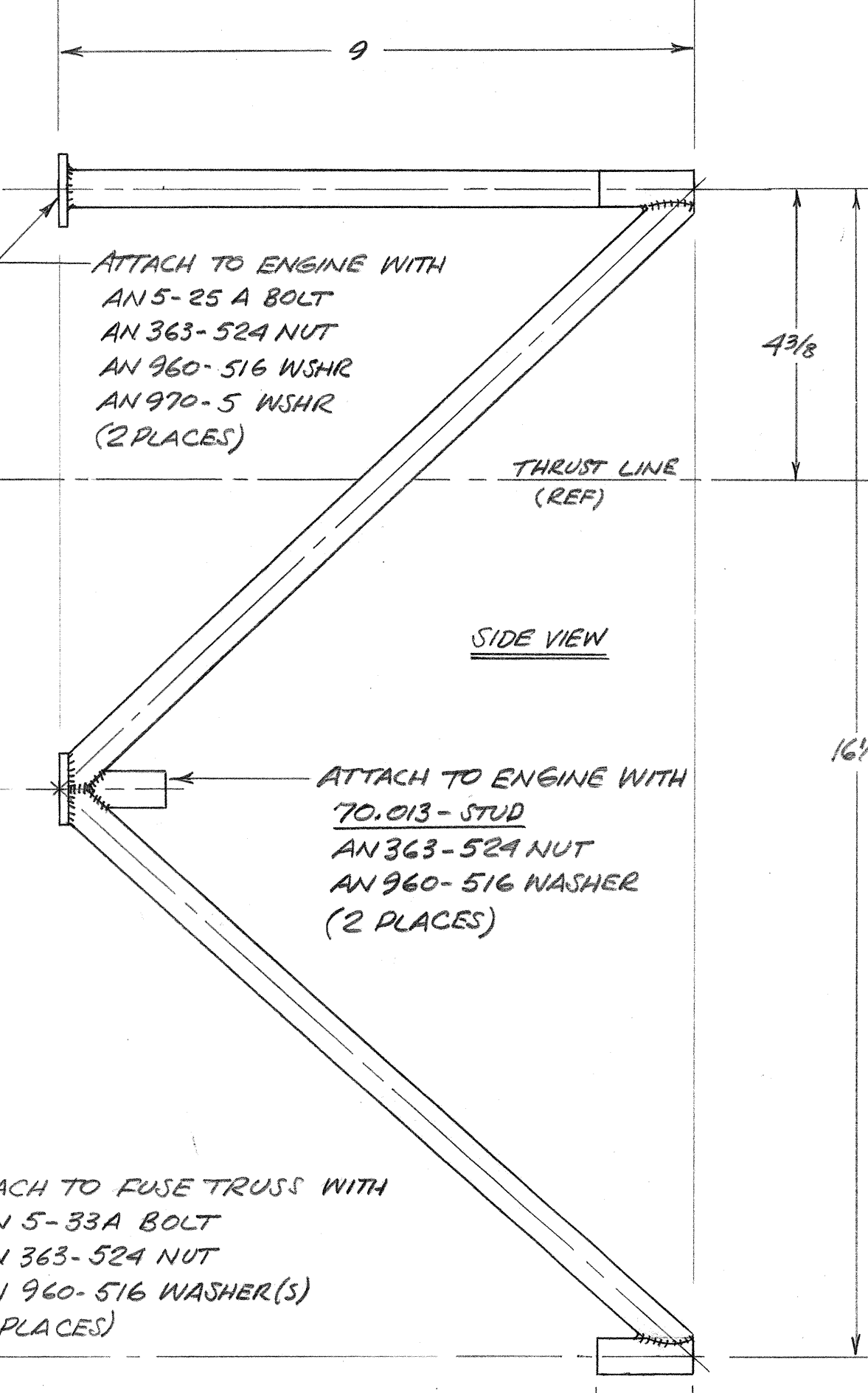
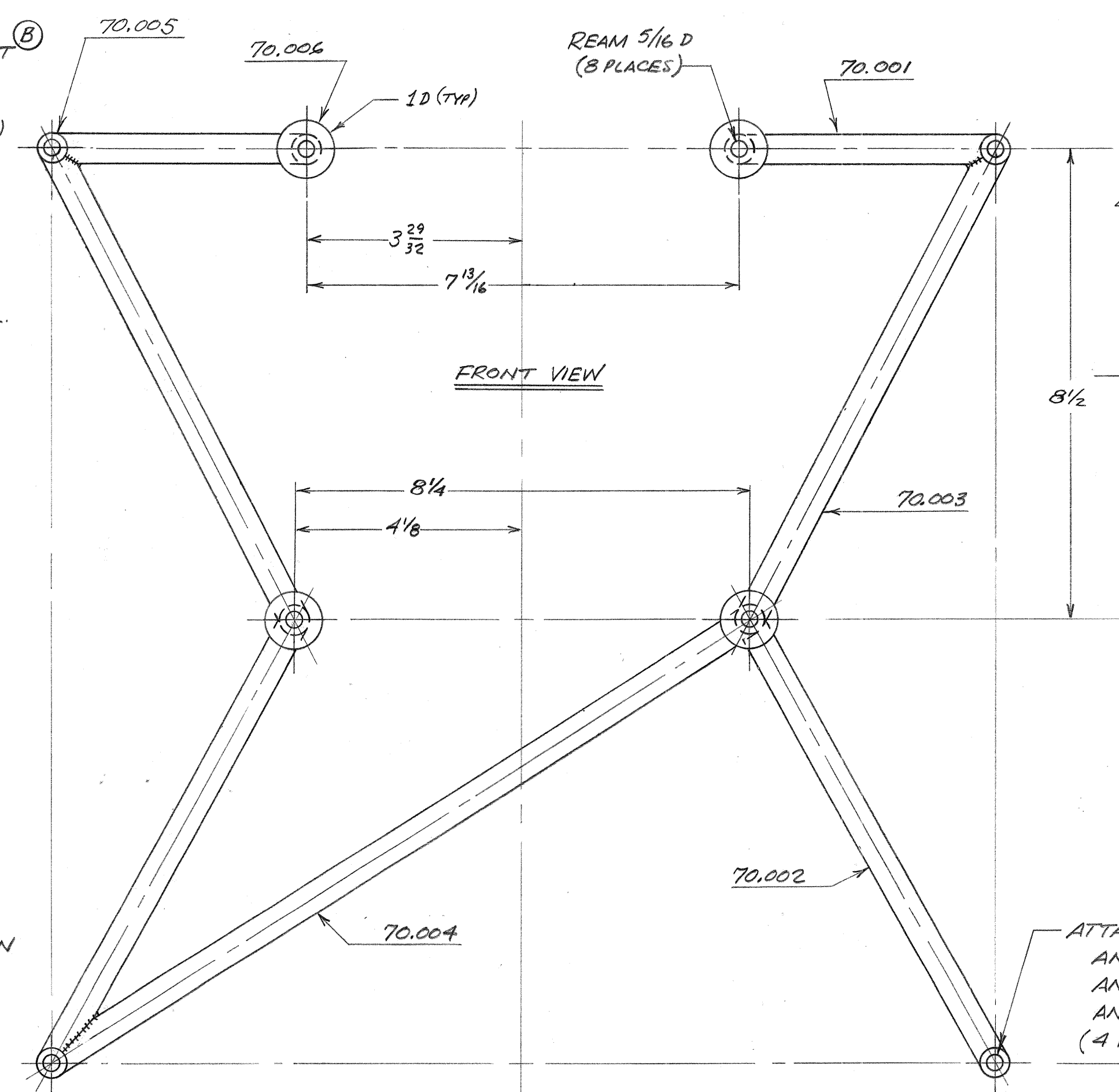
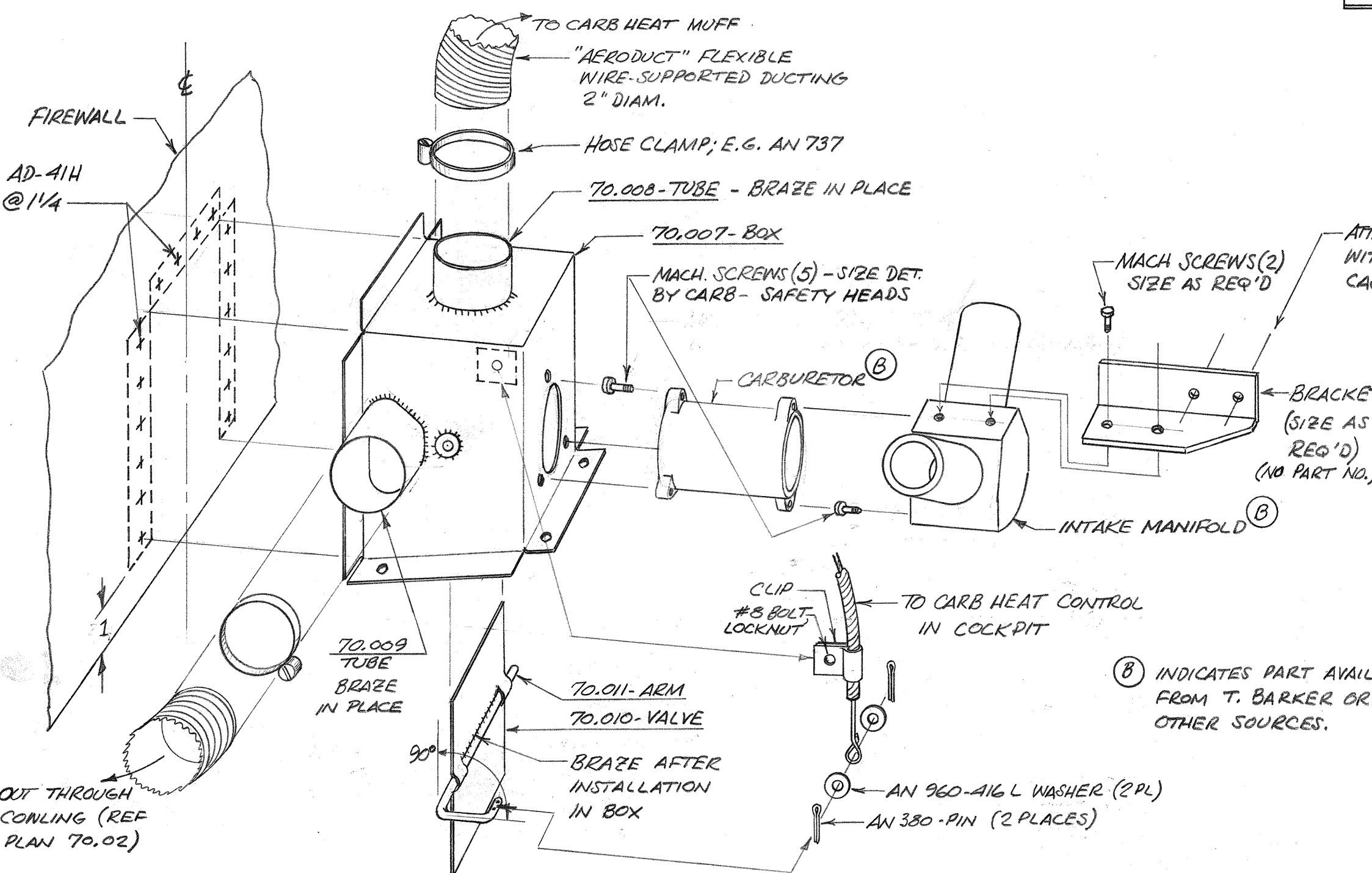
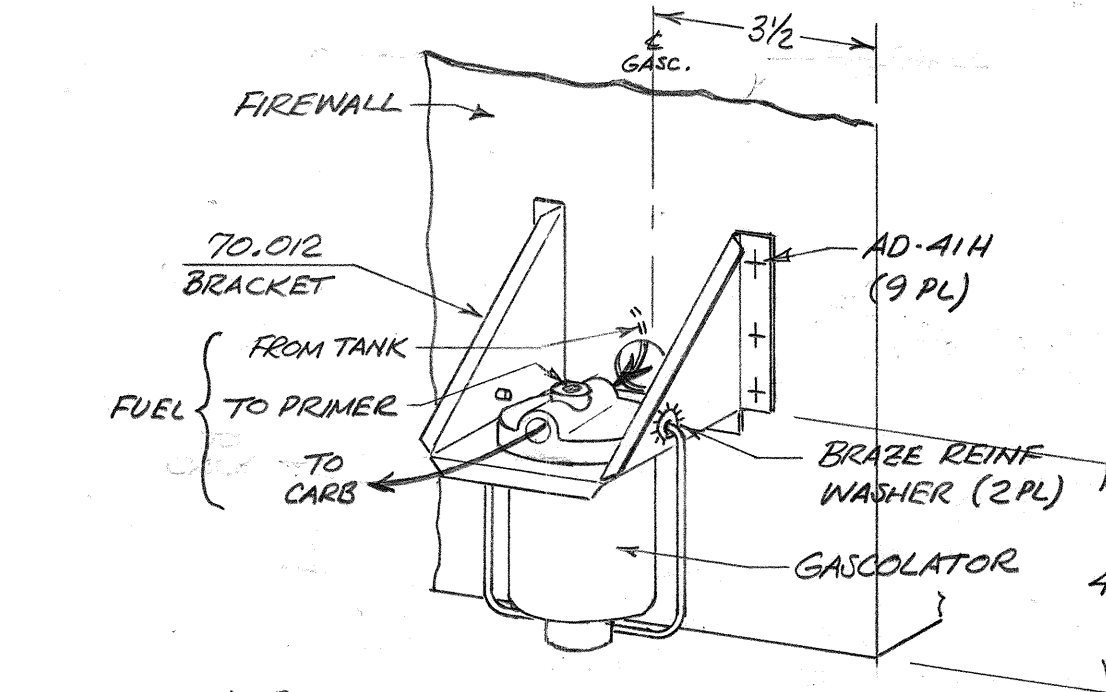
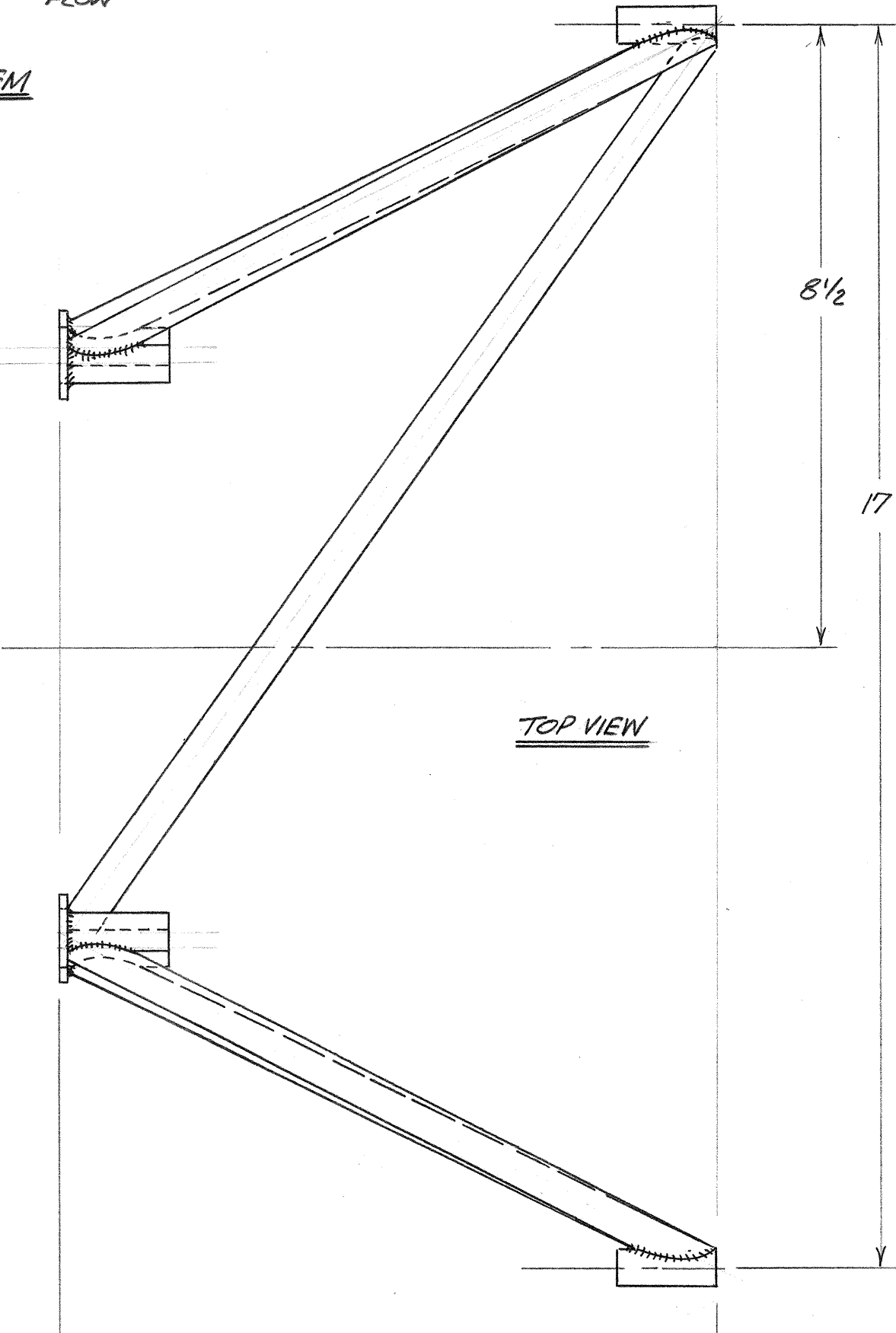
NOTE: OTHER WHEELS & BRAKES MAY BE ADAPTED, BUT DIMENSION "A" MUST NOT EXCEED 3 1/2 INCHES.

NOTE: INSTALLATION OF HYDRAULIC BRAKES IS NOT RECOMMENDED.



**ENGINE INSTALLATION NOTES**

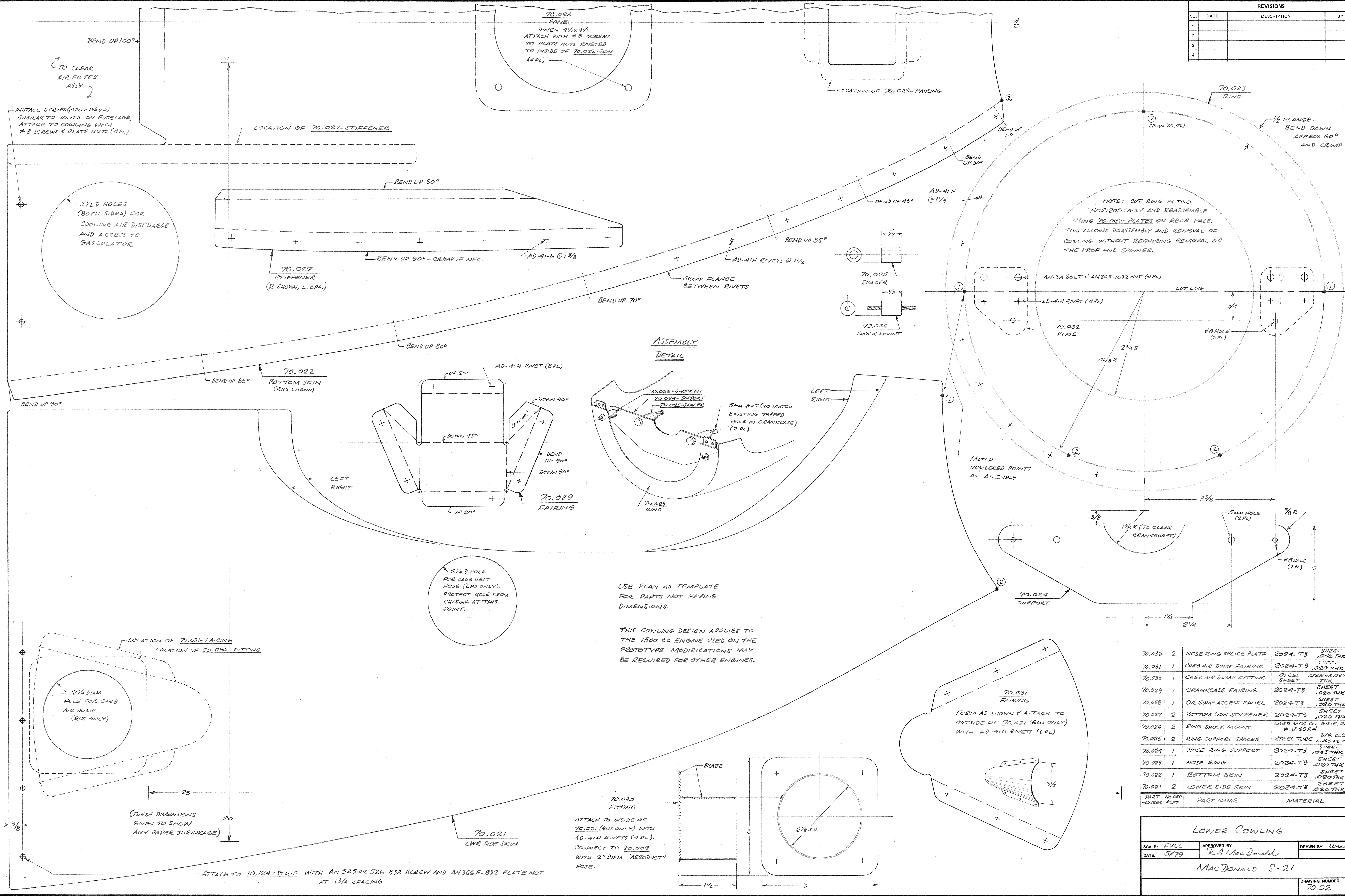
- THE FOLLOWING VOLKSWAGEN ENGINES ARE APPROVED FOR INSTALLATION IN THE S-21:
  - VW 1500 VW1600
  - VW 1700 VW 1800
- INFORMATION CONCERNING CONVERSION OF THESE ENGINES IS AVAILABLE FROM TED BARKER EXPERIMENTAL ENGINES, PALOMAR AIRPORT BLDG 5E, CARLSBAD, CALIF 92008; AND FROM OTHER SOURCES.
- PROPELLERS ARE OBTAINABLE FROM RAY HEY, MARFA, TEXAS; PROPELLER ENGINEERING DUPLICATING, P.O. BOX 63, MANHATTAN BEACH, CALIF 90266; AND FROM OTHER SOURCES.
- THE REMAINING NOTES DESCRIBE THE PROTOTYPE'S ENGINE INSTALLATION:
  - ENGINE: VW 1500 (BARKER CONVERSION)
  - CARBURETOR: BENDIX ZENITH (WITH CHOKE REMOVED)
  - MAGNETO: (1) BENDIX SARN-21 (WITH IMPULSE COUPLER)
  - OIL COOLER: NONE
  - PROPELLER:
    - FOR OPT. CLIMB: DIAM = 53", PITCH = 30"
    - FOR OPT. CRUISE: DIAM = 53", PITCH = 32"



PART NO.	QTY	PART NAME	MATERIAL
70.015	1	LOWER AIR FILTER FRAME	STEEL .025 OR .032 SHEET THK
70.014	1	TOP AIR FILTER FRAME	STEEL .025 OR .032 SHEET THK
70.013	2	LOWER ENGINE ATTACH STUD	VW CYL HOLD-DOWN STUD (DIAM=9mm=.354")
70.012	1	GASOLATOR MOUNTING BRACKET	STEEL .025 OR .032 SHEET THK
70.011	1	CARB HEAT VALVE ACTUATING ARM	4130 STEEL 1/4 D ROD
70.010	1	CARB HEAT VALVE	STEEL .025 OR .032 SHEET THK
70.009	1	CARB HEAT OUTLET TUBE	STEEL .025 OR .032 SHEET THK
70.008	1	CARB HEAT INLET TUBE	STEEL .025 OR .032 SHEET THK
70.007	1	CARB HEAT BOX	STEEL .025 OR .032 SHEET THK
70.006	4	ENG. MOUNT WASHER	4130 SHEET STEEL 1/8 THK
70.005	8	ENG. MOUNT BUSHING	4130 STEEL TUBE 1/2 O.D. x 5/16 I.D.
70.004	1	ENG. MOUNT TENSION MEMBER	4130 STEEL 1/2 x .035 TUBE
70.003	2	ENG. MOUNT DIAGONAL MEMBER	4130 STEEL 1/2 x .035 TUBE
70.002	2	ENG. MOUNT COMPRESSION MBR	4130 STEEL 1/2 x .049 TUBE
70.001	2	ENG. MOUNT TENSION MEMBER	4130 STEEL 1/2 x .035 TUBE

ENGINE MOUNT ; ENGINE INST. DETAILS			
SCALE: 1/2 ENOTED	APPROVED BY:	DRAWN BY ZMac	
DATE: 7/74	RA MacDonald	REVISED	
MAC DONALD S-21			
			DRAWING NUMBER
			70.01

REVISIONS			
NO.	DATE	DESCRIPTION	BY
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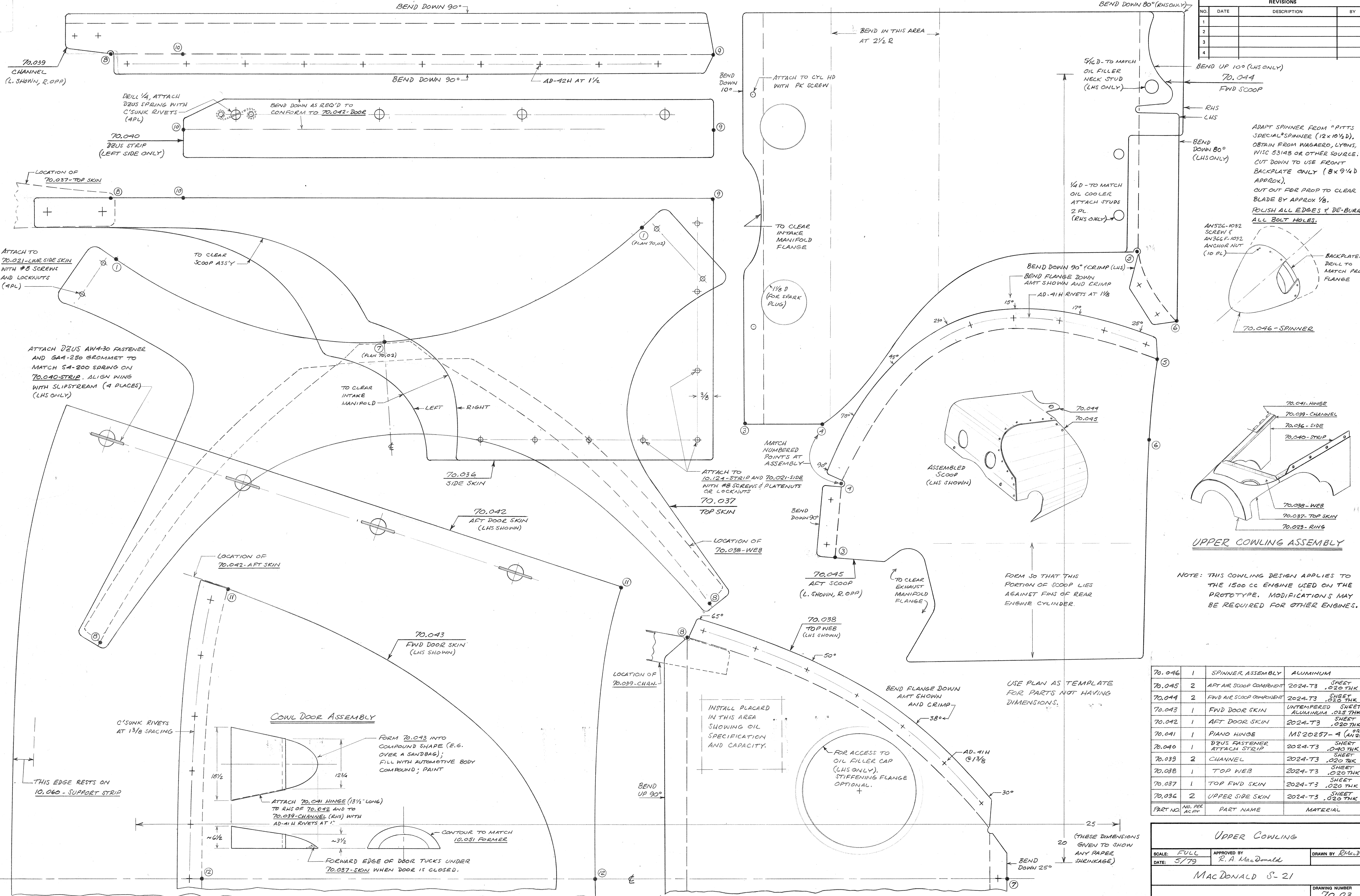
PART NUMBER	QTY	PART NAME	MATERIAL
70.032	2	NOSE RING SPLICE PLATE	2024-T3 SHEET .040 THK
70.031	1	CARB AIR DUMP FAIRING	2024-T3 SHEET .020 THK
70.030	1	CARB AIR DUMP FITTING	STEEL SHEET .025 OR .032 THK
70.029	1	CRANKCASE FAIRING	2024-T3 SHEET .020 THK
70.028	1	OIL SUMP ACCESS PANEL	2024-T3 SHEET .020 THK
70.027	2	BOTTOM SKIN STIFFENER	2024-T3 SHEET .020 THK
70.026	2	RING SHOCK MOUNT	LORD MFG CO, ERIE, PA # J6284
70.025	2	RING SUPPORT SPACER	STEEL TUBE X .063 IN O.D. # 163
70.024	1	NOSE RING SUPPORT	2024-T3 .063 THK SHEET
70.023	1	NOSE RING	2024-T3 SHEET .020 THK
70.022	1	BOTTOM SKIN	2024-T3 SHEET .020 THK
70.021	2	LOWER SIDE SKIN	2024-T3 .020 THK SHEET

**LOWER COWLING**

SCALE: FULL DATE: 5/79 APPROVED BY: R.A. MacDonald DRAWN BY: R.MacD

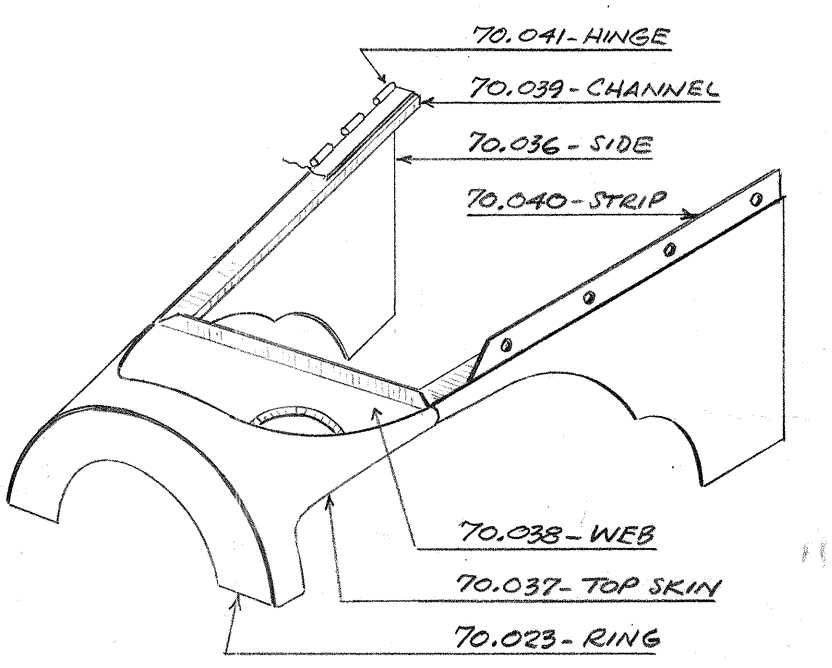
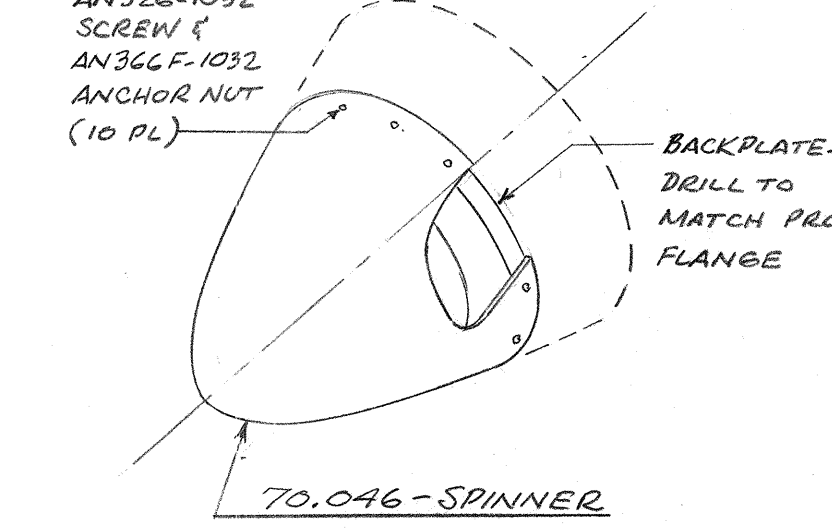
MACDONALD S-21

DRAWING NUMBER 70.02



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ADAPT SPINNER FROM "PITTS SPECIAL" SPINNER (12x10 1/2 D), OBTAIN FROM WAGAERO, LYONS, WISC 53148 OR OTHER SOURCE. CUT DOWN TO USE FRONT BACKPLATE ONLY (8x9 1/4 D APPROX), CUT OUT FOR PROP TO CLEAR BLADE BY APPROX 1/8. POLISH ALL EDGES & DE-BURR ALL BOLT HOLES.



UPPER COWLING ASSEMBLY

NOTE: THIS COWLING DESIGN APPLIES TO THE 1500 CC ENGINE USED ON THE PROTOTYPE. MODIFICATIONS MAY BE REQUIRED FOR OTHER ENGINES.

PART NO.	NO. PER ACFT	PART NAME	MATERIAL
70.046	1	SPINNER ASSEMBLY	ALUMINUM
70.045	2	AFT AIR SCOOP COMPONENT	2024-T3 .020 THK SHEET
70.044	2	FWD AIR SCOOP COMPONENT	2024-T3 .020 THK SHEET
70.043	1	FWD DOOR SKIN	UNTEMPERED SHEET ALUMINUM .020 THK
70.042	1	AFT DOOR SKIN	2024-T3 .020 THK SHEET
70.041	1	PIANO HINGE	MS20257-4 (AN257)
70.040	1	DEUS FASTENER ATTACH STRIP	2024-T3 .040 THK SHEET
70.039	2	CHANNEL	2024-T3 .020 THK SHEET
70.038	1	TOP WEB	2024-T3 .020 THK SHEET
70.037	1	TOP FWD SKIN	2024-T3 .020 THK SHEET
70.036	2	UPPER SIDE SKIN	2024-T3 .020 THK SHEET

Upper Cowling

SCALE: FULL DATE: 5/79 APPROVED BY: R.A. MacDonald DRAWN BY: R.McD

MACDONALD S-21

DRAWING NUMBER: 70.03