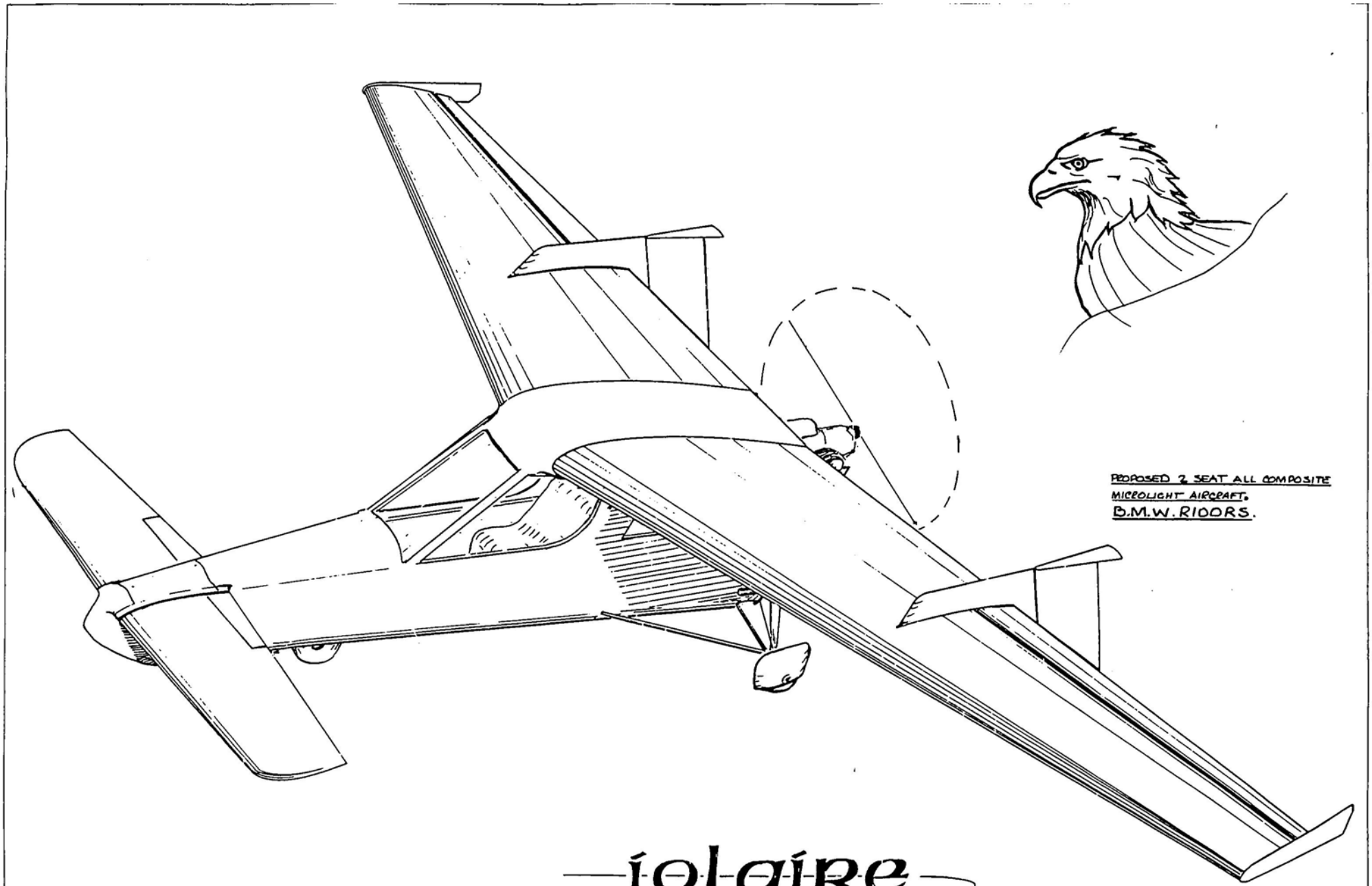


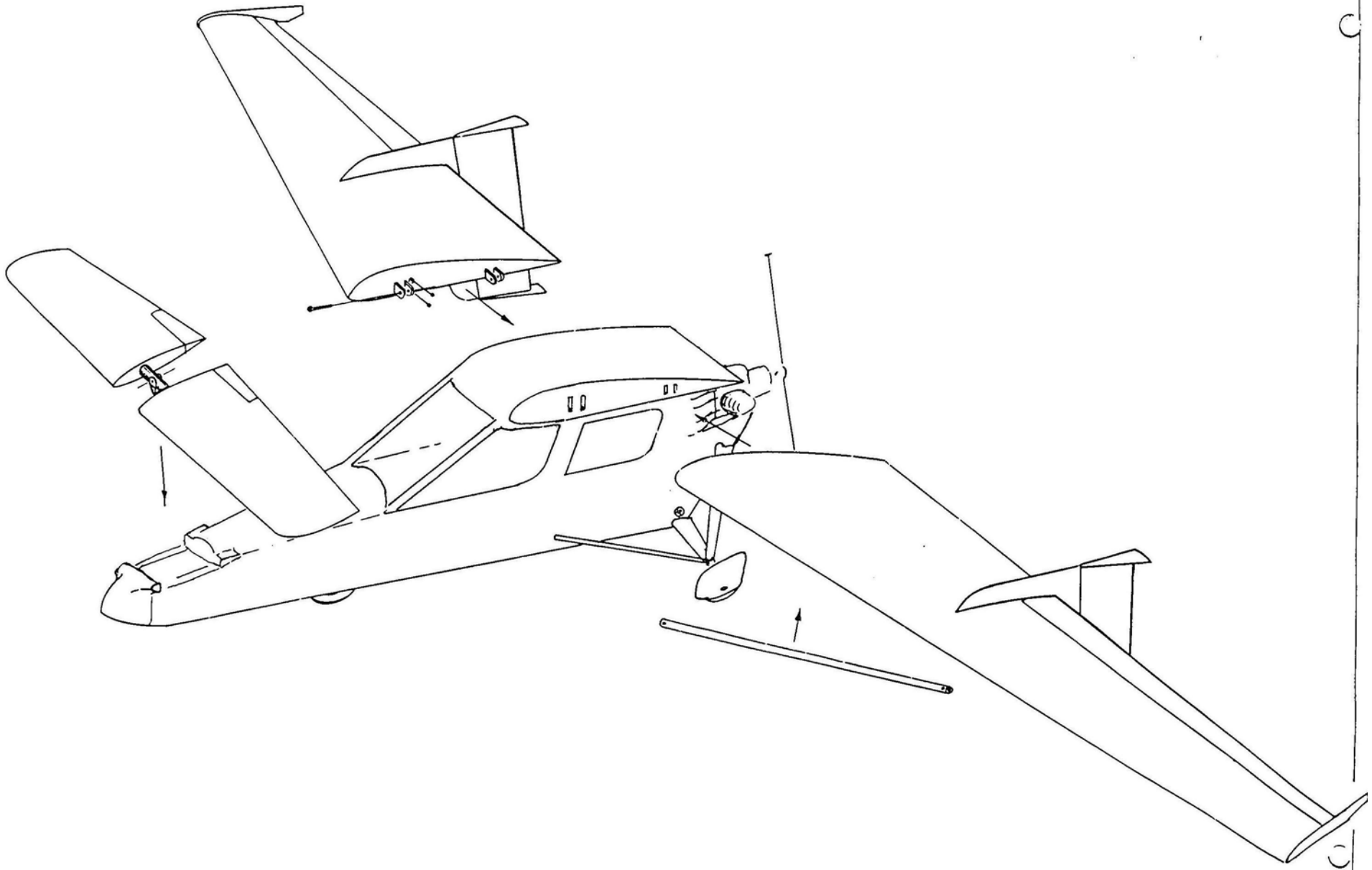
PROPOSED 2 SEAT ALL COMPOSITE MICROLIGHT AIRCRAFT.
B.M.W. RIDERS.

iolaire

B.M.W.

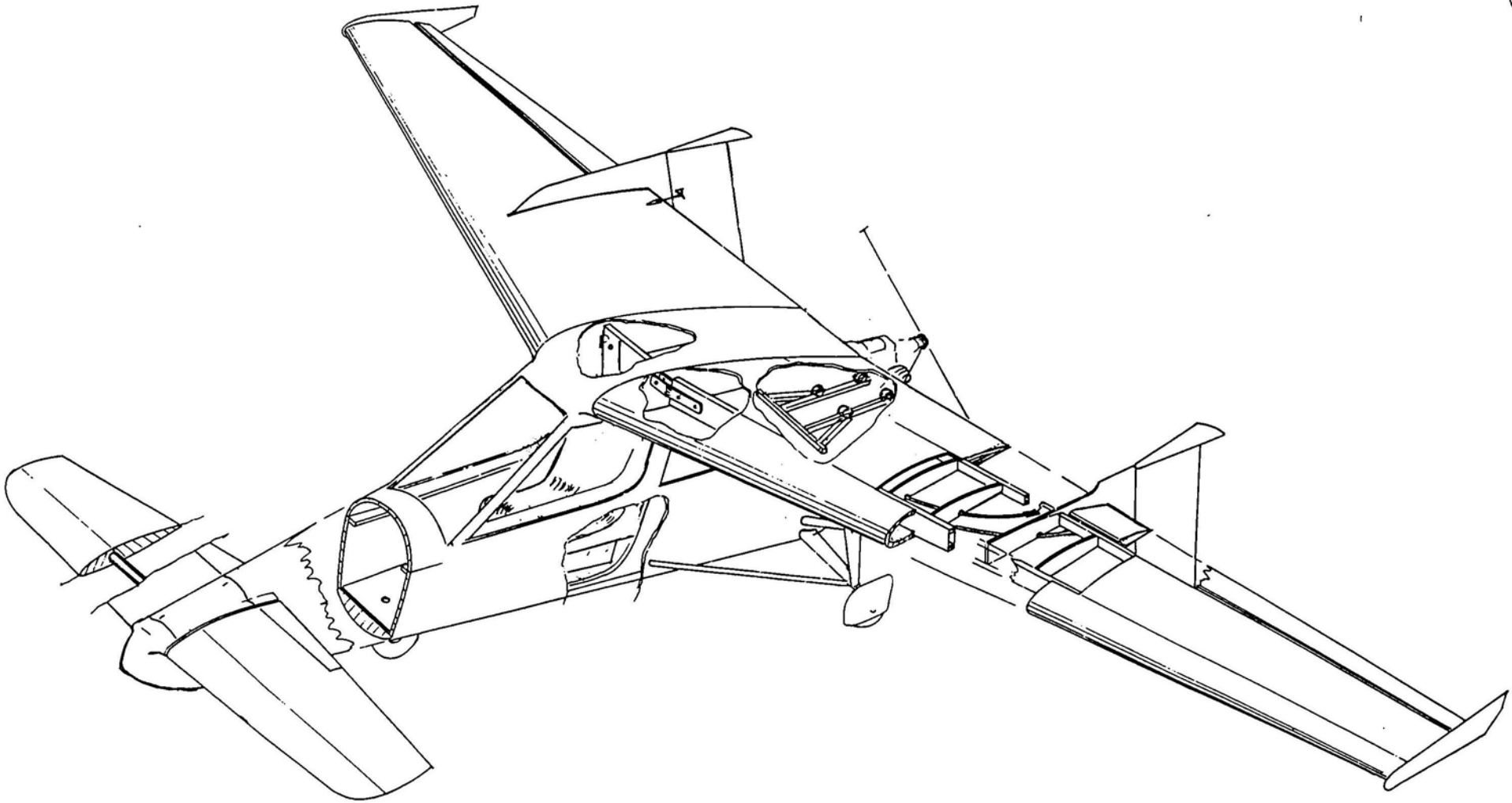
L1-G1

H. LORIMER 24 MAY '96



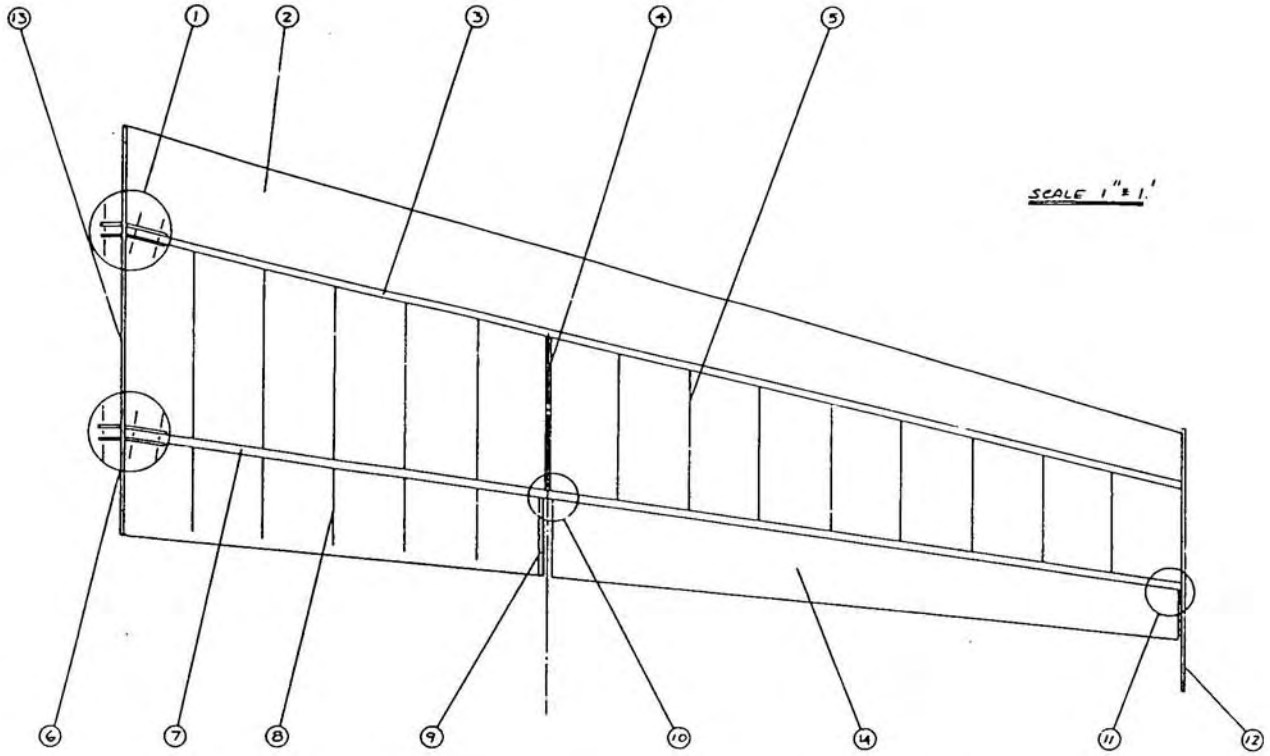
L1-G2

H.LORIMER 23 MAY '94



L1-G3

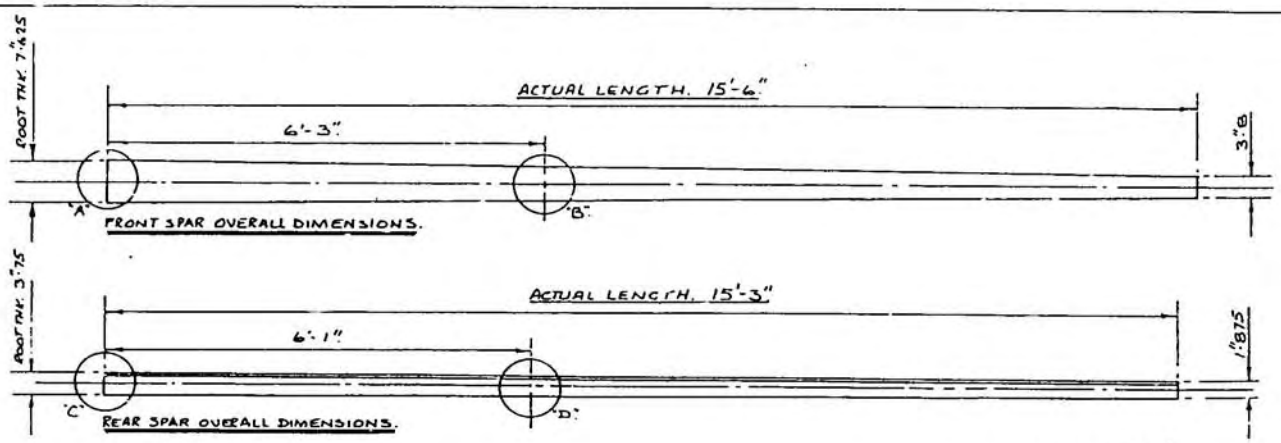
H.LORIMER 23MAY'94.



SCALE 1" = 1'

1. WING MOUNTING PLATES. (FWD). SEE DRG. NO. L1-W1
2. WING LEADING EDGE. SHAPED BLUE FOAM.
3. WING SPAR (FWD) SEE DRG. BELOW.
4. HARD POINT WOOD RIB. FIN MOUNTING.
5. WING RIB (TYPICAL) 0"5 THK BLUE FOAM.
6. WING MOUNTING PLATES (REAR) SEE DRG. NO. L1-W1.
7. REAR WING SPAR. SEE DRG. BELOW.
8. MINOR (REAR) RIB. 0"5 THK. FOAM.
9. WING TRAILING EDGE END PLATE". FIN MOUNTING.
10. AILERON HINGE. SEE DRG. (INBOARD).
11. AILERON HINGE. SEE DRG (OUTBOARD.)
12. WING TIP PLATE. PLYWOOD. SEE DRG. NO. L1-A1.
13. WING ROOT END PLATE TO NACA 4412.
14. AILERON.

WING C.A.



SCALE 1" = 1'

"A" SPAR (FWD.) ROOT DETAIL. SEE DRG. NO.

"B" STRUT & FIN HARD POINT MTG SEE DRG. NO.

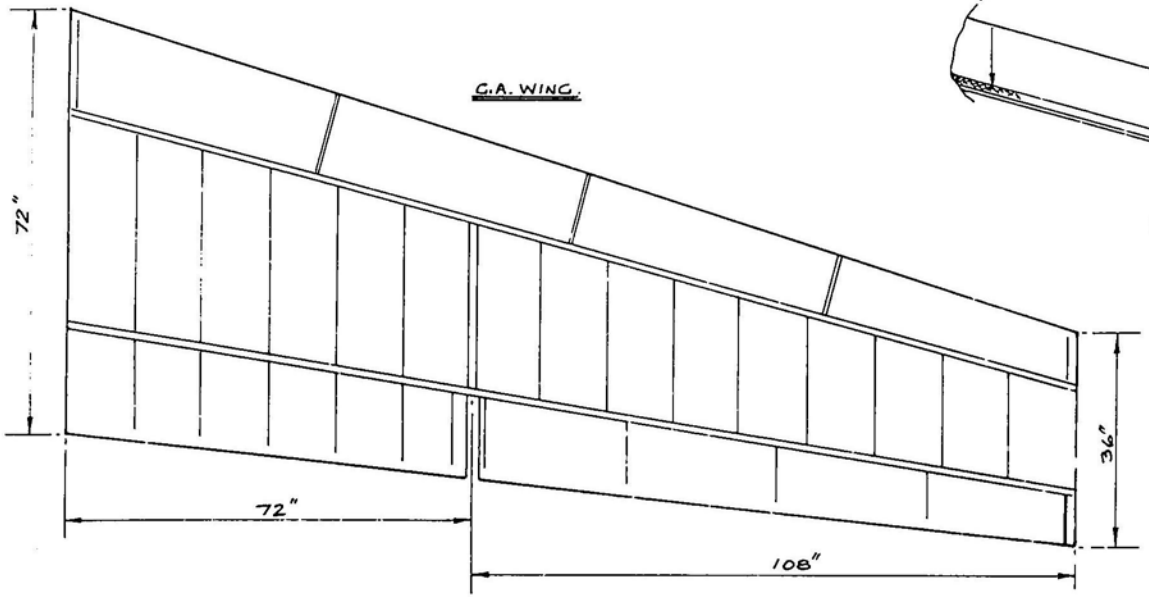
"C" SPAR (REAR) ROOT DETAIL. SEE DRG. NO.

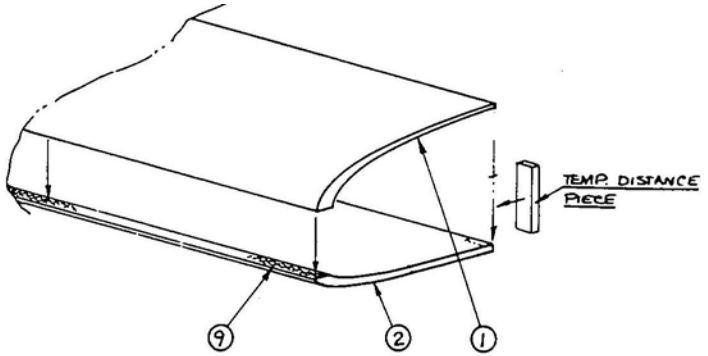
"D" STRUT & FIN HARD POINT, MTG. SEE DRG. NO.

WING SPAR DIMENSIONS.

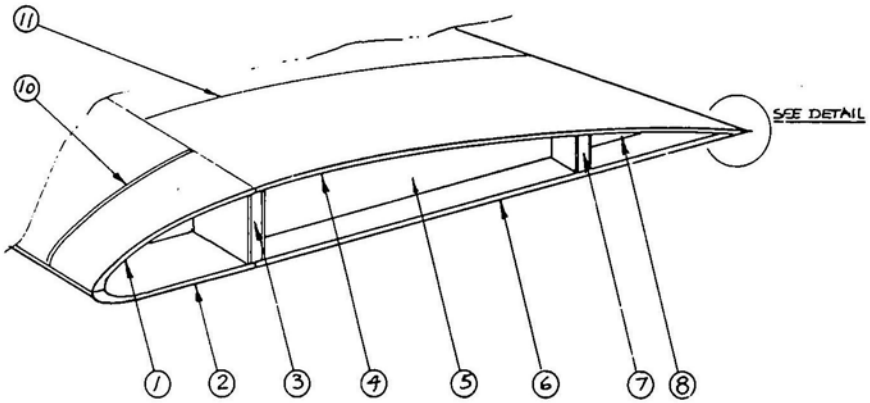
L1-W1

H. LORIMER. 15 JUNE.

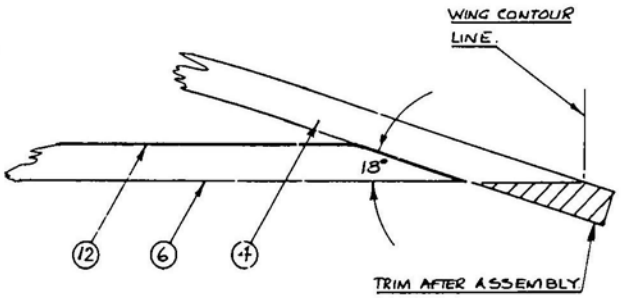




L/E "D" ASSEMBLY DETAIL.



WING STRUCTURE (TYPICAL).



TYPICAL T/E DETAIL.

1	L/E "D" UPPER.
2	L/E "D" LOWER.
3	MAIN SPAR (ASSEMBLY)
4	UPPER PANEL. 0°5 THK. FOAM.
5	RIB (TYPICAL) 0°5 THK FOAM.
6	LOWER PANEL 0°6 THK FOAM.
7	REAR SPAR (ASSEMBLY)
8	REAR MINOR T/E RIB. 0°5 THK. FOAM.
9	GLASS CLOTH TAPE IN JOINT.
10	L/E BOXING PLATE. 0°5 THK FOAM.
11	UPPER PANEL JOIN (ON A RIB)
12	INNER GLASS TO REAR OF "6"

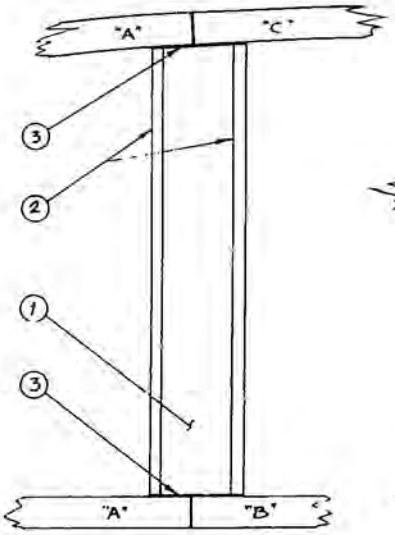
L1-W2 H. LORIMER. JUN. '97.

"A" ——— L/E "D" SECTION.

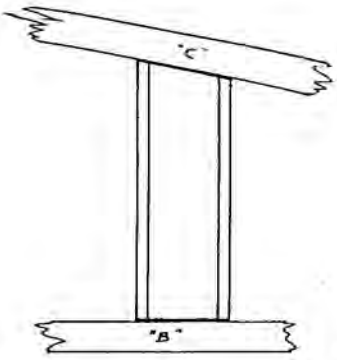
"B" ——— LOWER (MAIN) PLATE. 0"·5 THK. FOAM SHEET.

"C" ——— UPPER (CLOSING) PLATE. 0"·5 THK. FOAM SHEET.

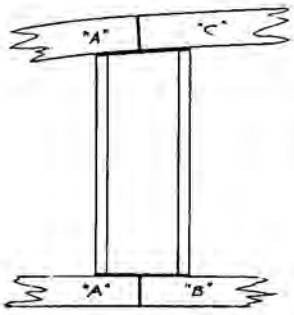
BOTH SPARS ARE 4MM PLY / 1" THK FOAM / 4MM PLY SANDWICH.



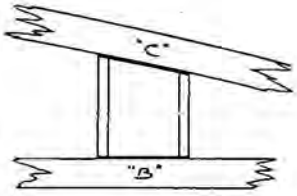
MAIN SPAR (ROOT)
TOP ANGLE 3°



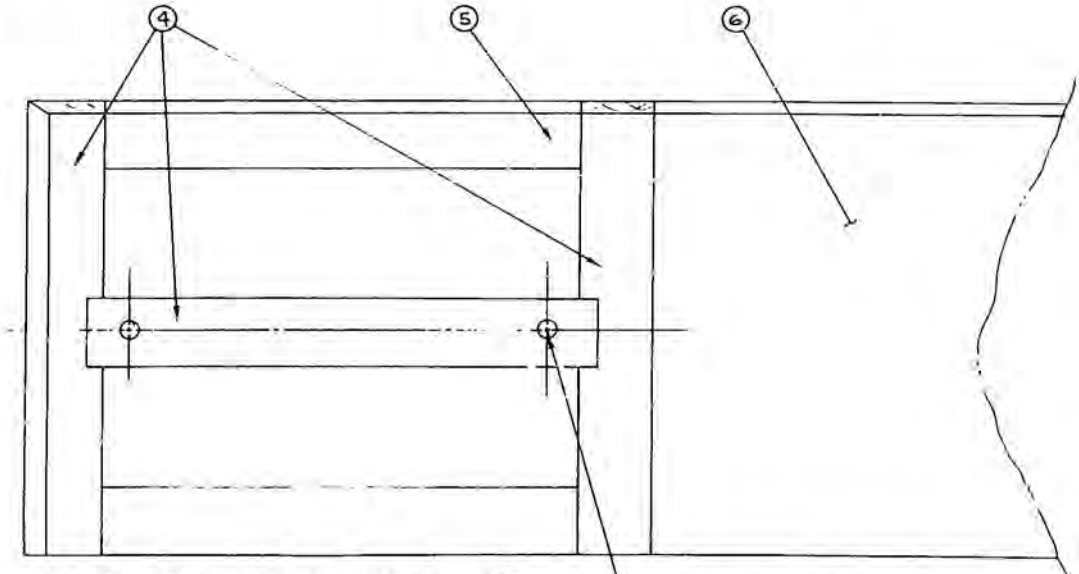
REAR SPAR (ROOT)
TOP ANGLE 12°



MAIN SPAR (TIP)
TOP ANGLE 3°

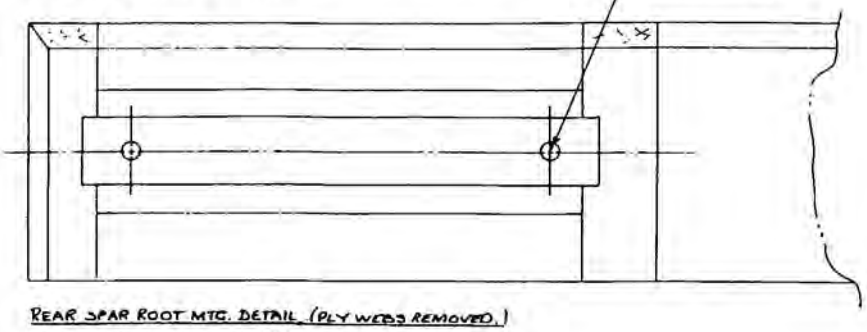


REAR SPAR (TIP)
TOP ANGLE 12°



MAIN SPAR ROOT MTG. DETAIL. (PLY WEBS REMOVED.)
END TAPER DUE TO SWEEPBACK.

HOLES CENTRES LIFTED FROM MTG. TONGUES ON ASSEMBLY.

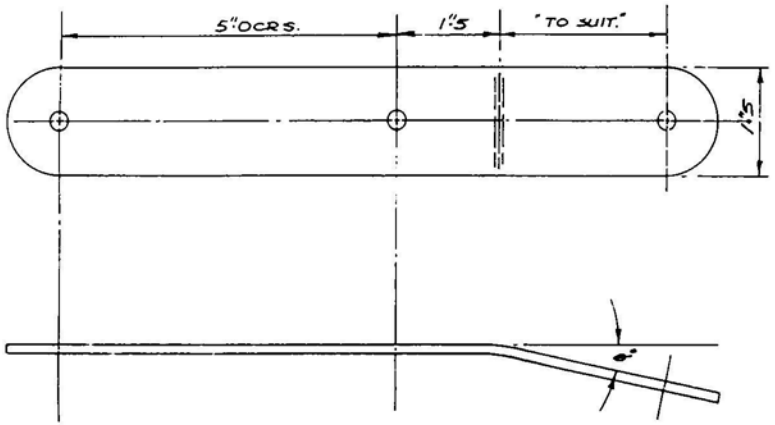


REAR SPAR ROOT MTG. DETAIL. (PLY WEBS REMOVED.)
END TAPER DUE TO SWEEPBACK.

"A"	SHAPED L/E "D" SECTION FOAM.
"B"	0"·5THK. FOAM LOWER PLATE.
"C"	0"·5THK FOAM UPPER PANEL.
1&6	1"·0THK FOAM SPAR SANDWICH CORE
2	4MM PLY SPAR WEBS.
3	DOUBLE LAYER GLASS TAPE
4	1"·0 x 1"·0 SPRUCE MTG. FRAME.
5	1"·0 x 1"·0 FOAM FILLER.
6#1	1"·0 THK. FOAM & PAR SANDWICH CORE.

L1-W3.

HILDEBRAND JUN '97.

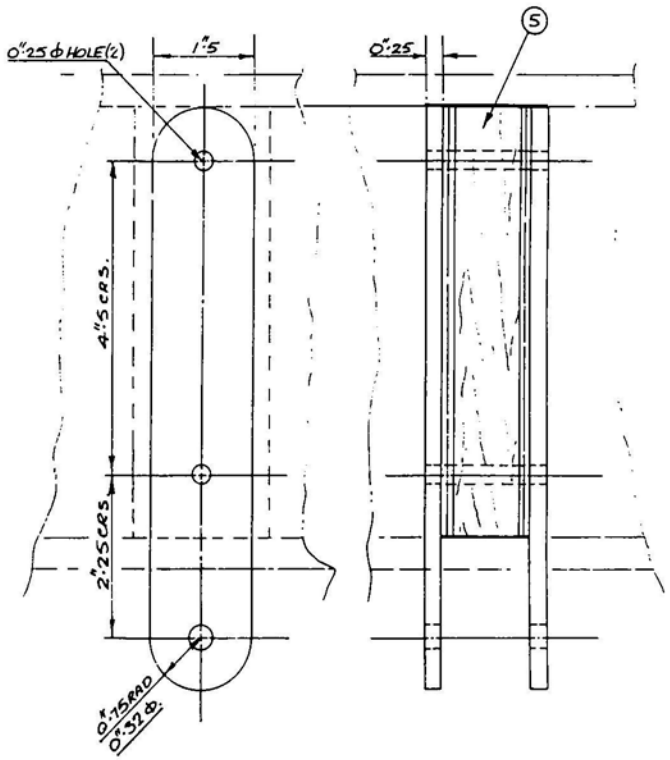


DETAIL OF MOUNTING TONGUES.

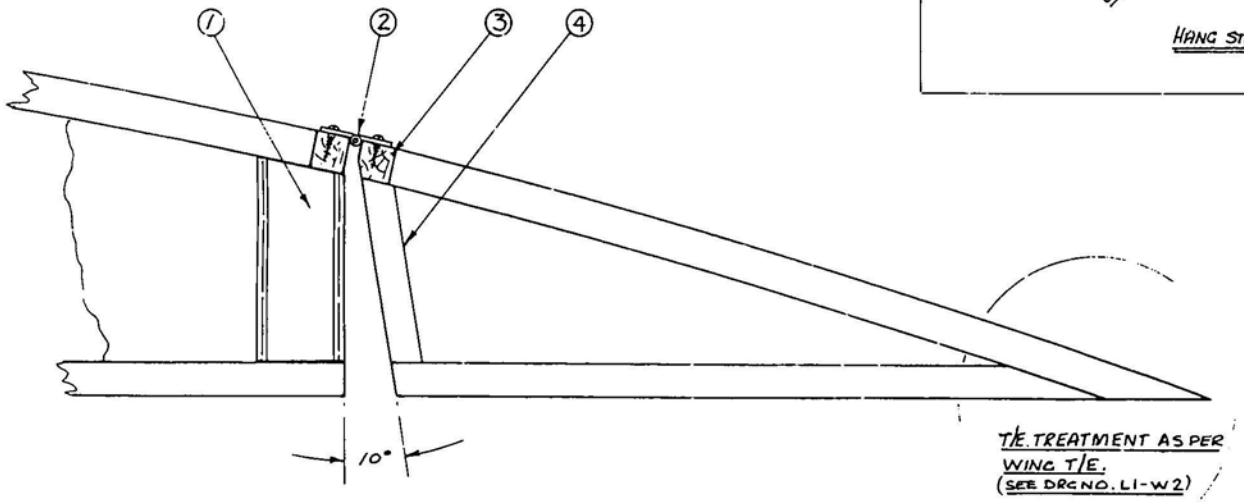
i) MAINSPAR TONGUES 4 OFF. $\theta^\circ = 12^\circ$

ii) REARSPAR TONGUES 4 OFF $\theta^\circ = 6^\circ$

iii) 'TO SUIT' DIMENSION TO BE DETERMINED ON FINAL ASSEMBLY.



HANG STRAP (STRUT ANCHOR) DETAIL.

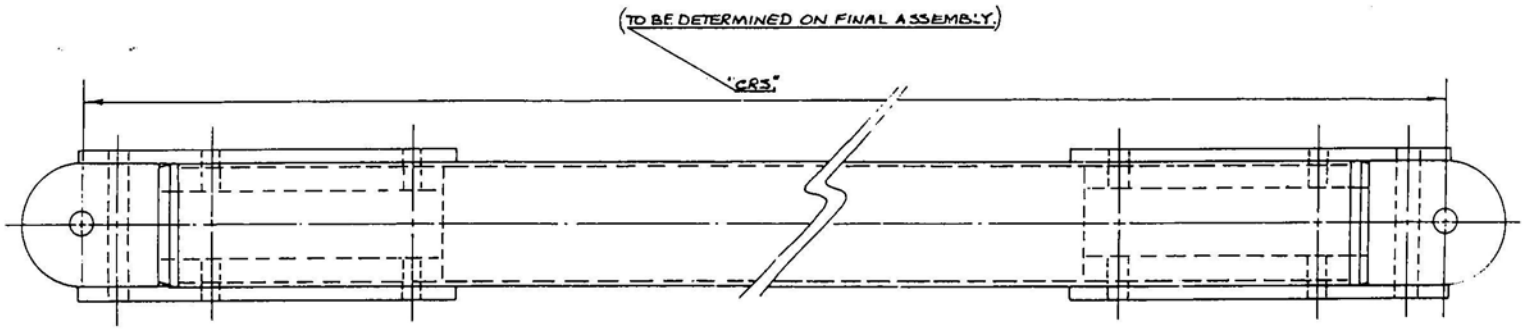


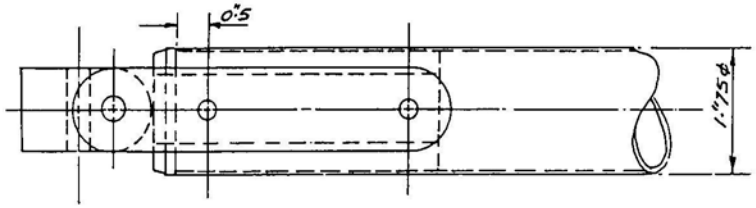
TYPICAL AILERON SECTION AND HINGE DETAIL

T/E TREATMENT AS PER WING T/E. (SEE DRG NO. L1-W2)

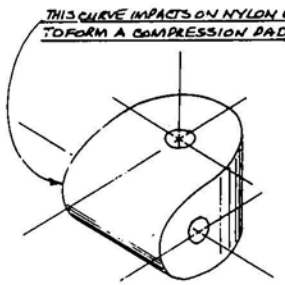
1	REAR WING SPAR.
2	PIANO HINGE. 30 OFF @ 18"0 LONG.
3	0"5 x 0"5 SPRUCE HINGE ANCHOR.
4	AILERON SLOPING L/E PLATE.
5	STRUT ANCHOR HARD POINT 2"0 x 1"0
6	
7	
8	

L1-W5 H. LORIMER 9 JUN. '97.

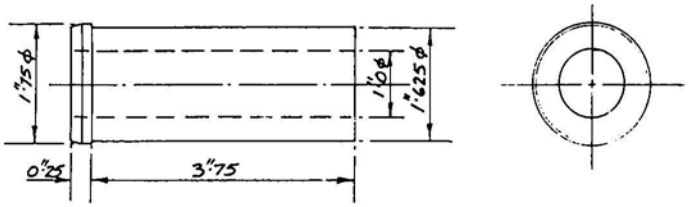




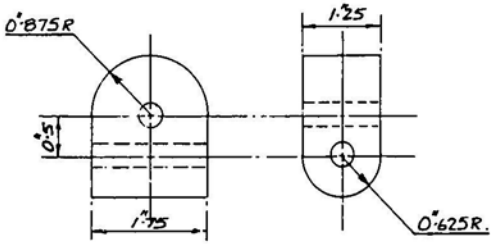
G.A. WING STRUT.



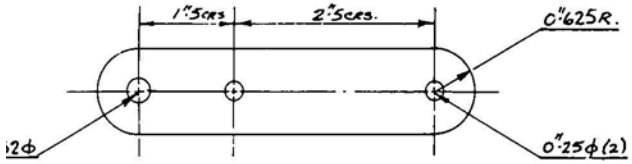
THIS SLEEVE IMPACTS ON NYLON 66 END SLEEVE TO FORM A COMPRESSION PAD.



DETAIL ANTI CRUSH (NYLON) END SLEEVE.

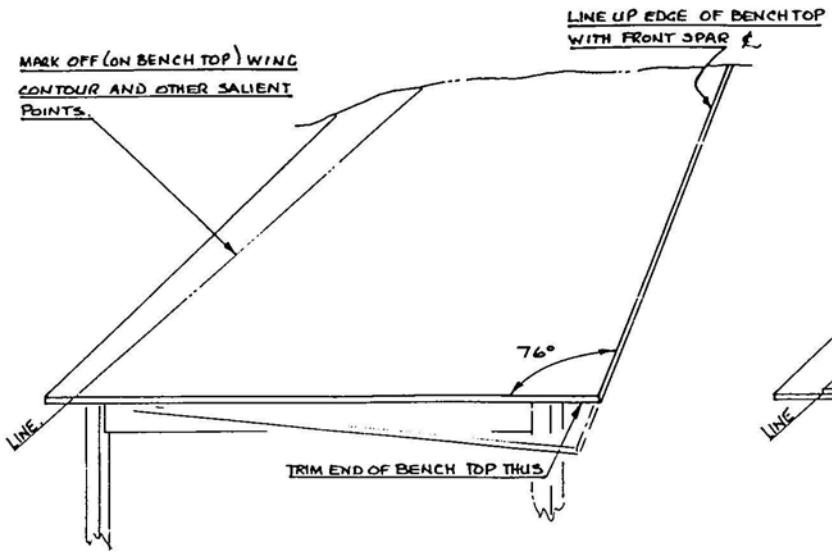


DETAIL SWIVEL KNUCKLES.
HOLES ARE BOTH 0"·32 ϕ.

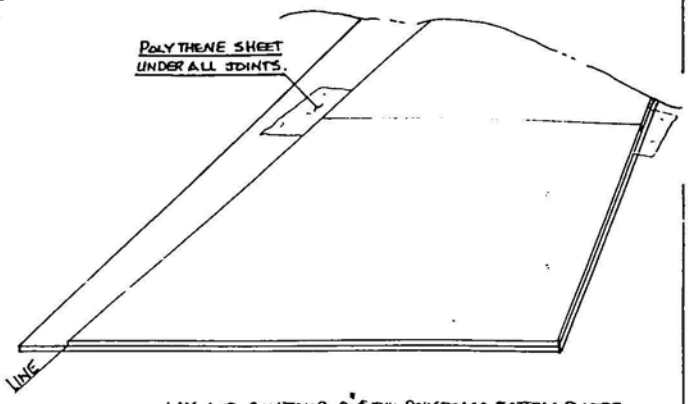


DETAIL DOUBLER STRAPS.
0"·1875 THK. DURAL.

L1-W6 H. LORIMER. JUN. '97

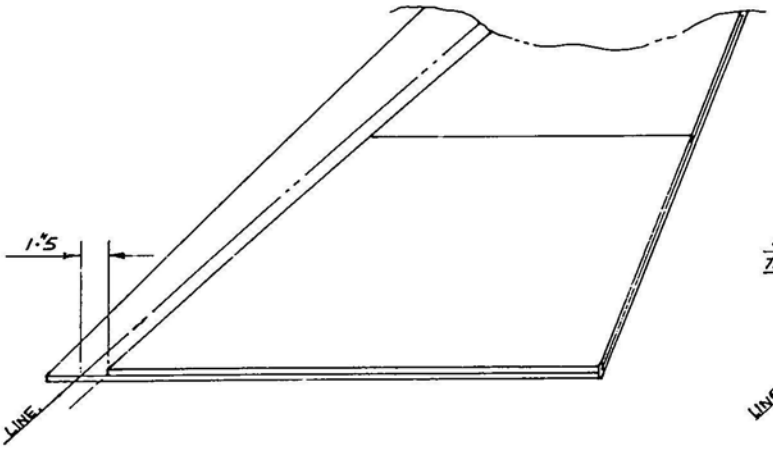


A.

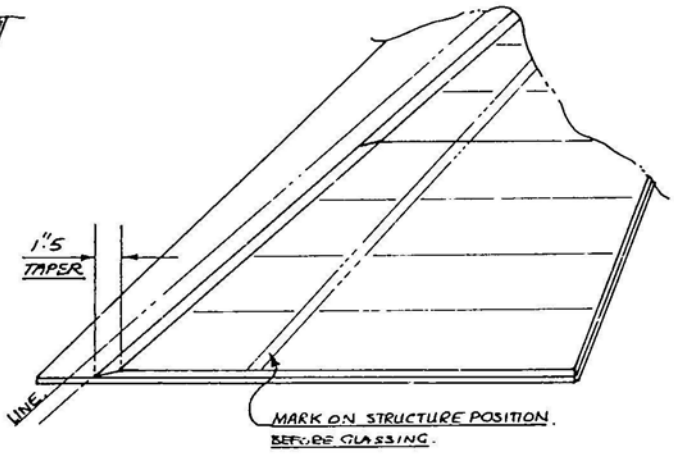


LAY AND CONTOUR 0·5 THK POLYFOAM BOTTOM PLATES

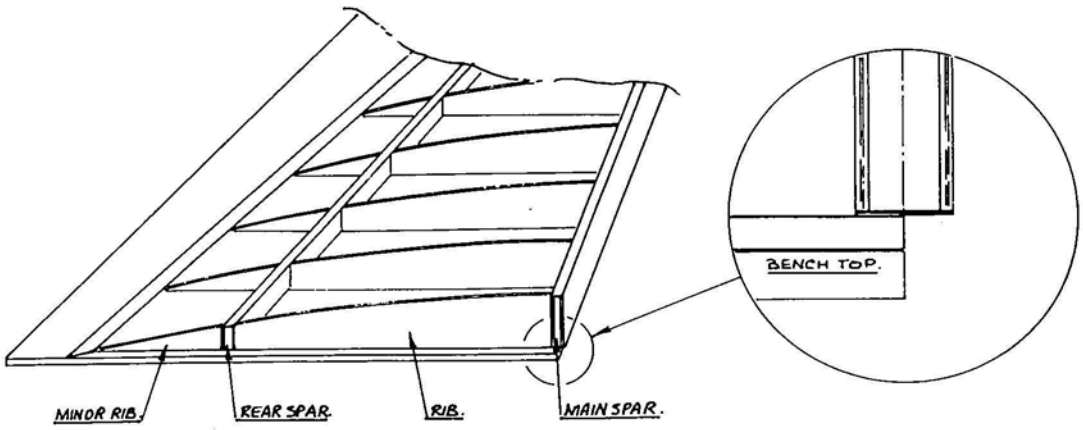
B.



C.

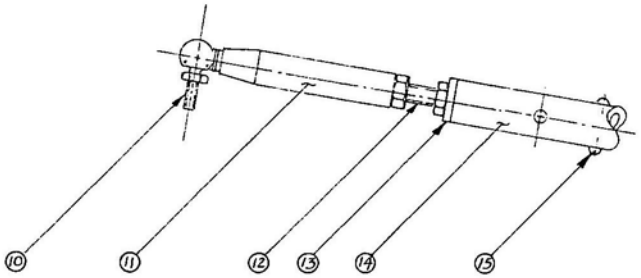


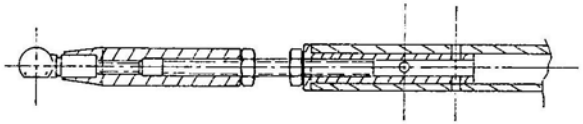
D.



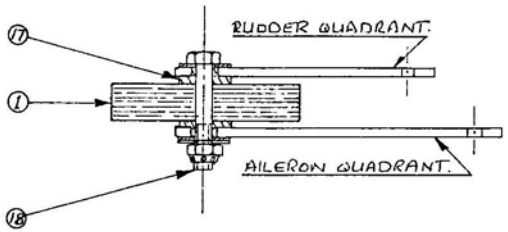
E.

L1-W 7 H.L.

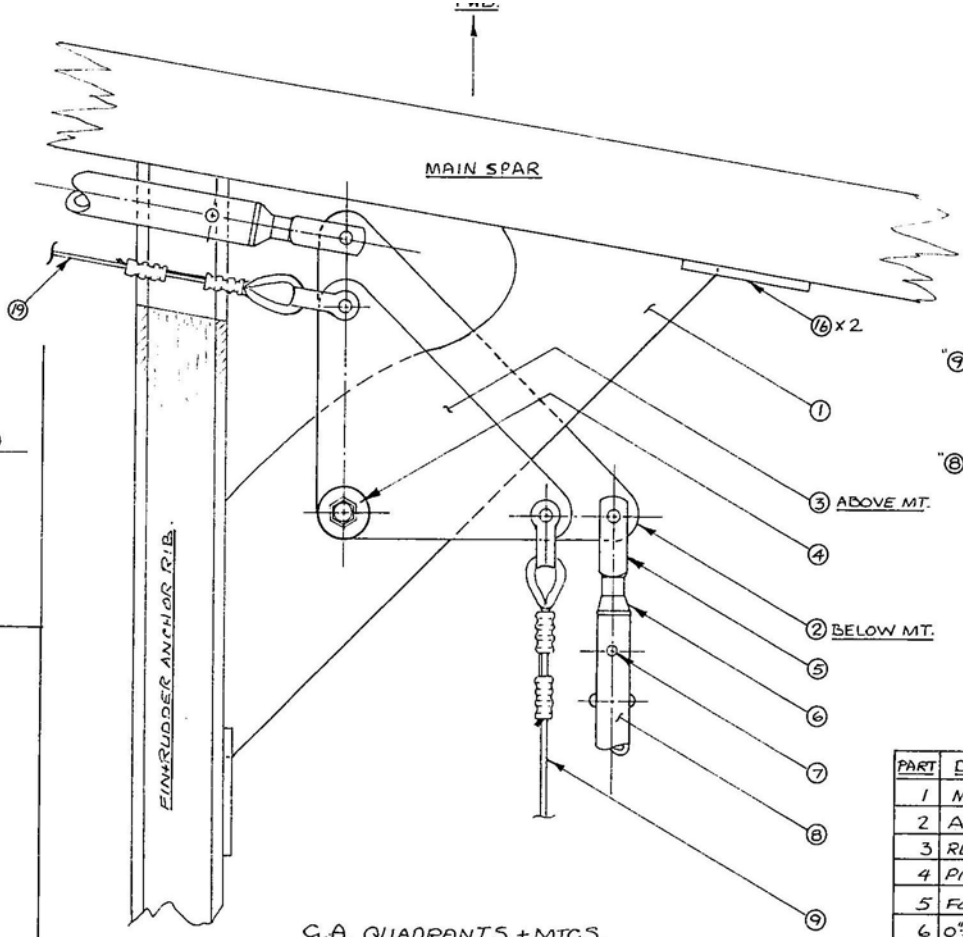




INNER AILERON OPERATING ROD END.
(ADJUSTABLE.)



DETAIL OF ④
SECTION THRU' PIVOT.

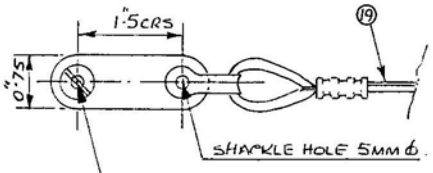


G.A. QUADRANTS + MTGS.

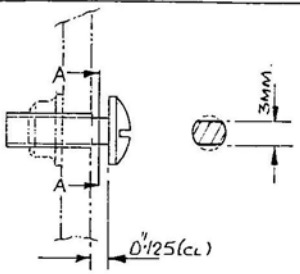
"⑨" DOUBLE SWAGED 2·5MM STAINLESS STEEL CABLE. C/W THIMBLES AND SHACKLES BOTH ENDS.

"⑧" 0"·5 ϕ THICKWALLED TUBE OPN. ROD. INNER END FORK OUTEREND BALL JOINT TO AILERON HORN.

PART	DESCRIPTION.
1	MOUNTING PLATE. 0"·5 THK. PLYWOOD.
2	AILERON QUADRANT. 10SWG. 6082 T6
3	RUDDER QUADRANT. 10SWG. 6082 T6.
4	PIVOT & BRG. 0"·25 ϕ. BOLT.
5	FORK END.
6	0"·5 O.D. TAPPED END PLUG.
7	RIVIT 3MM ϕ SN. HD.
8	0"·5 ϕ O.D. THICKWALL TUBE 6082 T6.
9	LOOP ENDED 2·5MM ϕ S.S. CABLE.
10	INNER BALL JOINT END.
11	INNER ADJUSTING ROD. TAPPED. 6082 T6.
12	THREADED ROD. M6. + LOCK NUTS.
13	END PLUG. TAPPED & COUNTER BORED.
14	PUSH ROD 0"·625 ϕ THK. WALLED TUBE 6082 T6
15	RIVIT 4MM ϕ SN. HD.
16	LOCATING / STOP PLATES.
17	STEPPED BRG. DIST PCE. BRASS.
18	0"·25 ϕ BOLT. NUT & WASHERS.
19	INNER RUDDER OPN. CABLE.

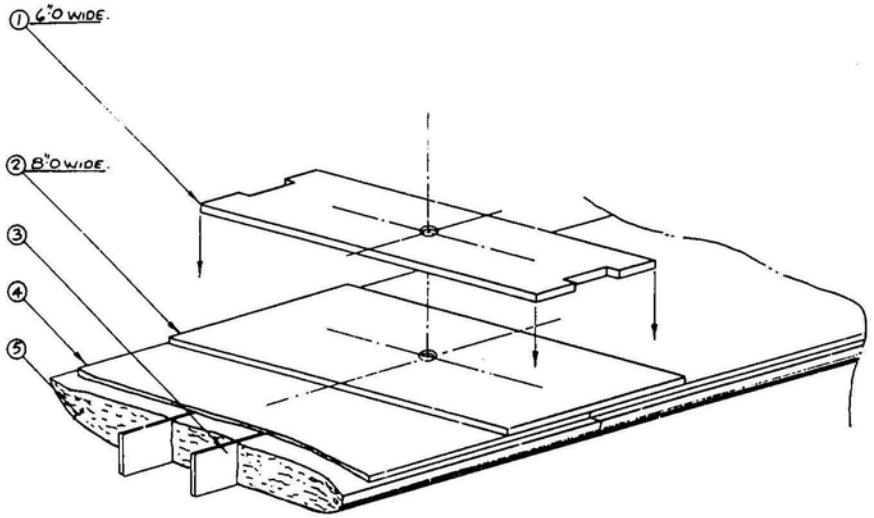


INNER MOUNTING PLATE (RUDDER) 10SWG. 6082 T6.

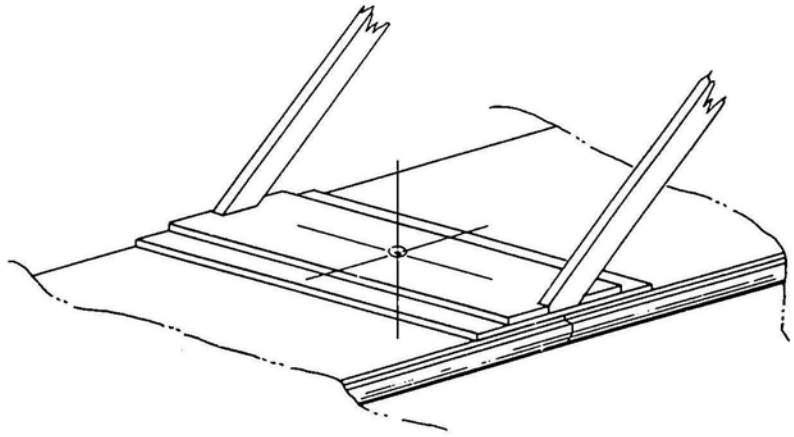


CONNECTING BOLT.
MODIFICATION.

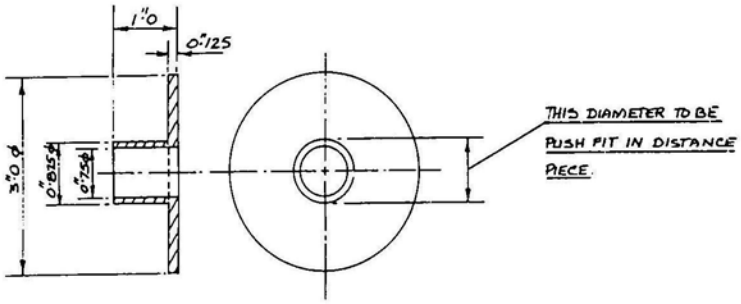
L1 - C2.
H. LORIMER JUN. '00



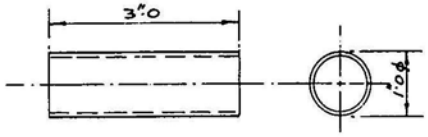
FLOOR JOINT AND NOSEWHEEL DOUBLERS.



NOSEWHEEL MOUNTING AND CABIN L.E. STRUT BOTTOM LOCATION.



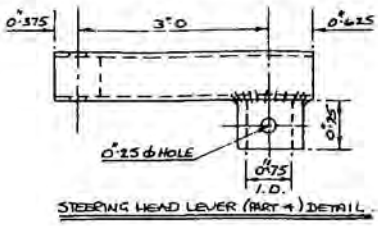
BUSH/STRESS PAD DETAIL (NYLON.)



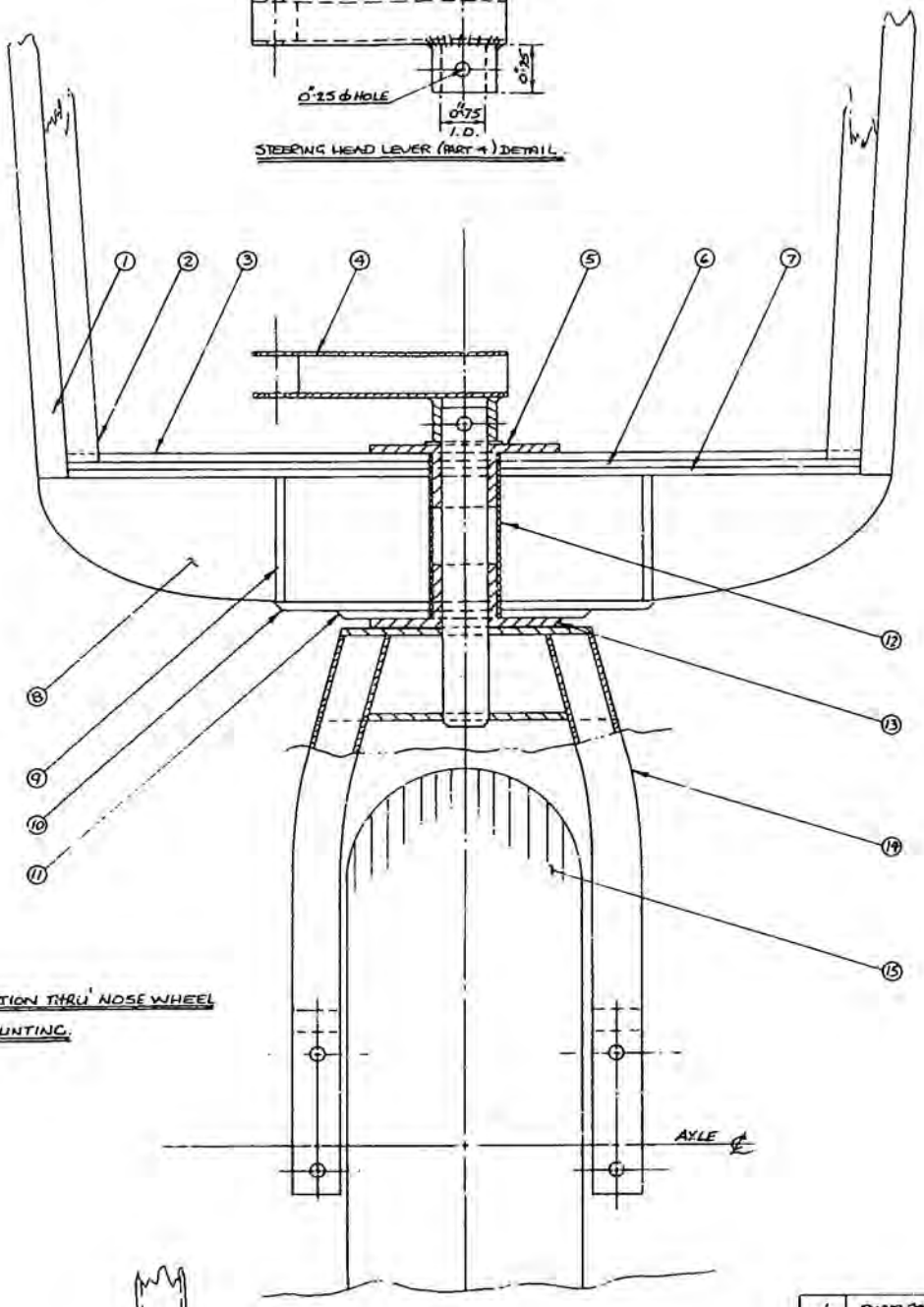
DISTANCE PIECE. (DURAL TUBE.)

1	UPPER DOUBLER PLATE (LOOFTOP) 4MM PLY
2	DOUBLER PLATE. 4MM PLY.
3	JOINTING TONGUES. 4MM PLY.
4	FUSELAGE FLOOR. 4MM PLY.
5	FUSELAGE BOTTOM. 50MM THK. FOAM.
6	
7	
8	

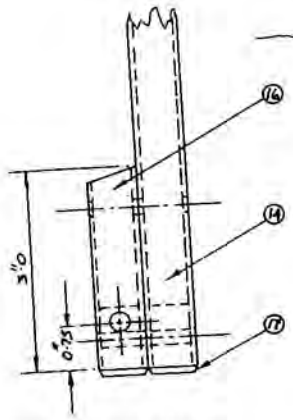
L1-F6. H. LORIMER. 18 JUN. '97.



STEERING HEAD LEVER (PART 4) DETAIL.



SECTION THRU' NOSE WHEEL MOUNTING.

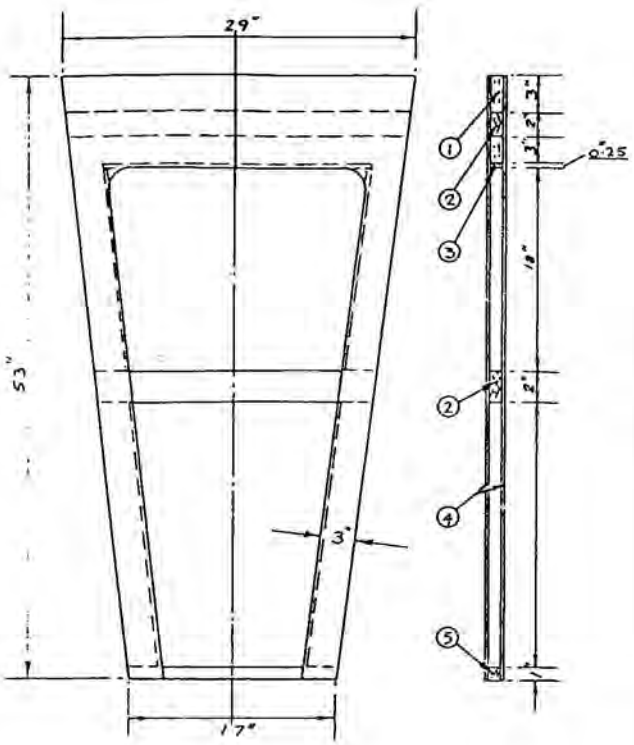


FORK END TREATMENT

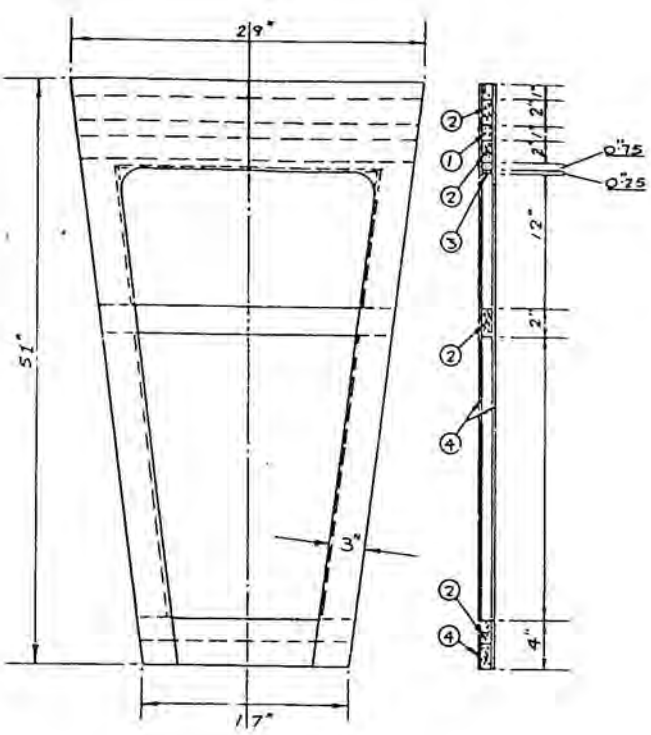
1	FUSELAGE SIDE. 0"5THK FOAM.
2	CABIN L.E. STRUT.
3	UPPER DOUBLER / LOCATOR PLATE. 4MM PLY.
4	STEERING HEAD LEVER. 0"75x0"75 TUBE.
5	UPPER BUSH. NYLON.
6	DOUBLER PLATE. 4MM PLY.
7	FLOOR. 4MM PLY.
8	FUSELAGE BASE. 2"0THK. FOAM.
9	JOINTING TONGUE. 4MM PLY.
10	LOWER. INNER DOUBLER. 4MM PLY.
11	LOWER. OUTER DOUBLER. 4MM PLY.
12	DISTANCE PIECE. 1"0 O/D. DURAL TUBE.
13	LOWER BUSH. NYLON.
14	U/C FORK ASSEMBLY.
15	U/C WHEEL AND TYRE.
16	U/C FORK DOUBLER. (CASTOR PLATE)
17	NYLON PLUG

L1-F7

H. LORIMER. 18JUN. '97.

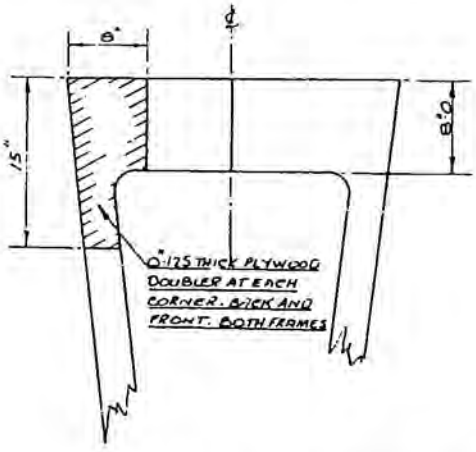


FRONT FUSELAGE FRAME. (SCALE 1"=6")

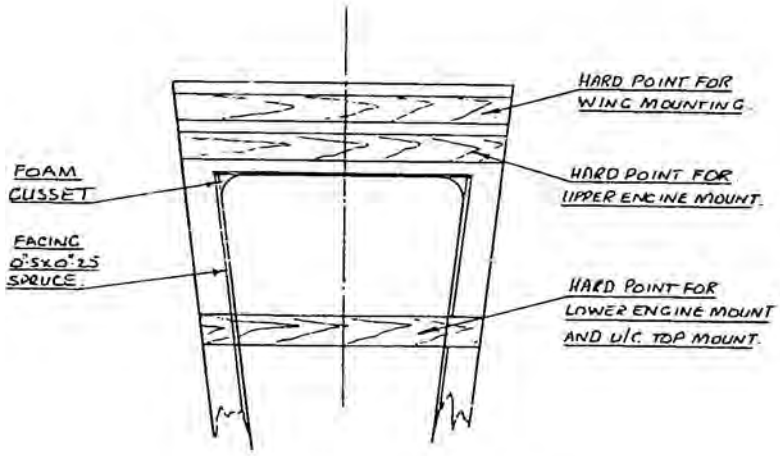


REAR FUSELAGE FRAME. (SCALE 1"=6")

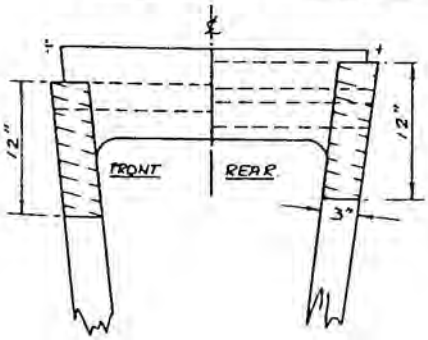
1. 0·5 THICK FOAM SANDWICH CORE (TYPICAL).
2. 0·5 THICK x 2·0 WIDE SPRUCE.
3. 0·5 x 0·25 SPRUCE FACINGS.
4. 0·125 THICK PLYWOOD FRAME FACINGS.
5. 0·5 x 1·0 SPRUCE STIFFENER.



TOP CORNER DOUBLER DETAIL. TYPE "A"



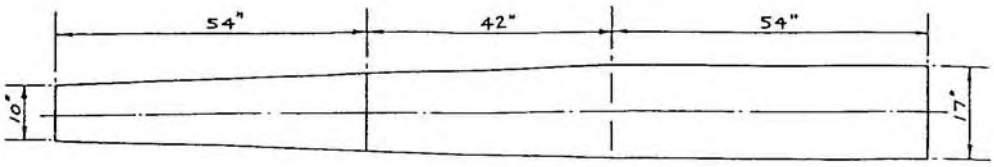
REAR FRAME DETAIL. (BUILD UP)



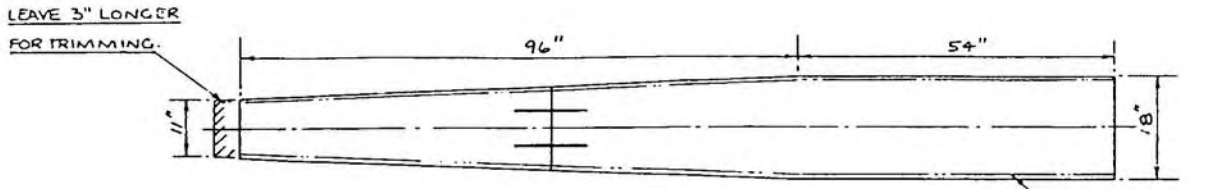
TOP CORNER DOUBLER DETAIL. TYPE "B"
SHOWN. POSITION. DIMENSIONS.
SEE CORNERS OF FRAMES REMOVED TO ACCEPT WING ROOT FRAMES AFTER ASSY.
ALL DOUBLERS FROM 0·125 THICK PLYWOOD.

L1-F8

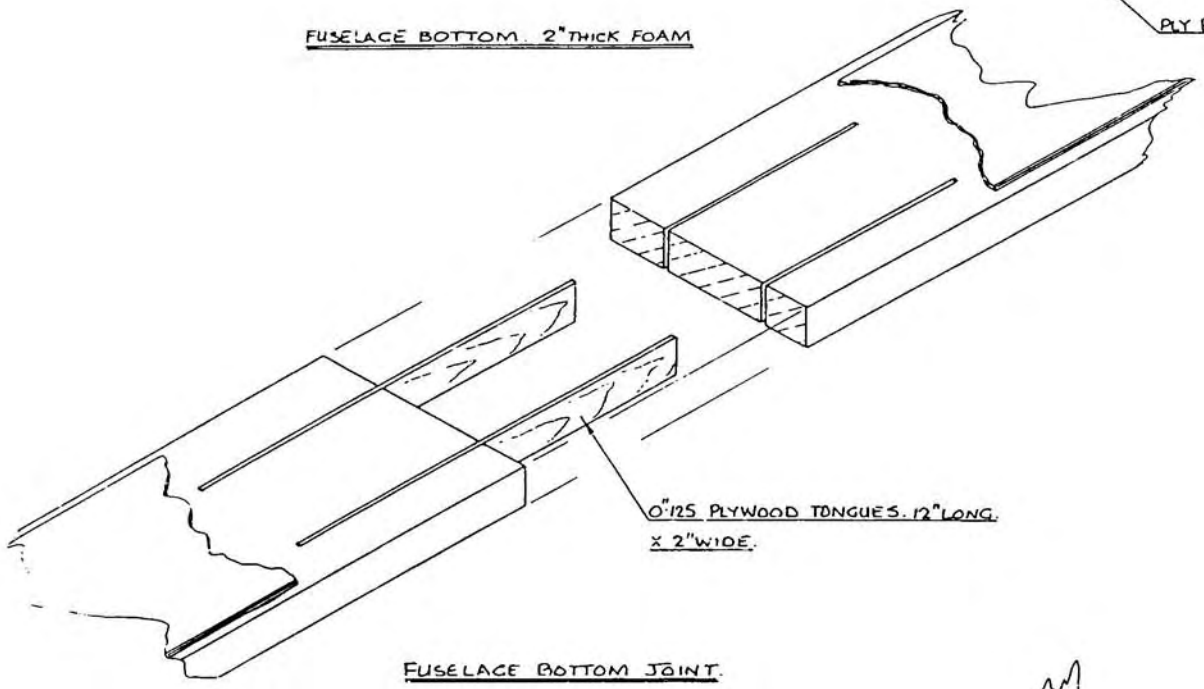
H. LORIMER.
5 DEC '94.



FUSELAGE FLOOR. 0"125 THK. PLYWOOD.

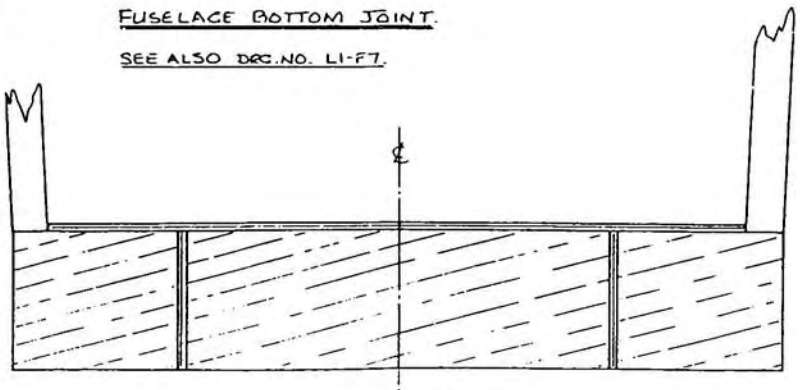


FUSELAGE BOTTOM. 2" THICK FOAM



FUSELAGE BOTTOM JOINT.

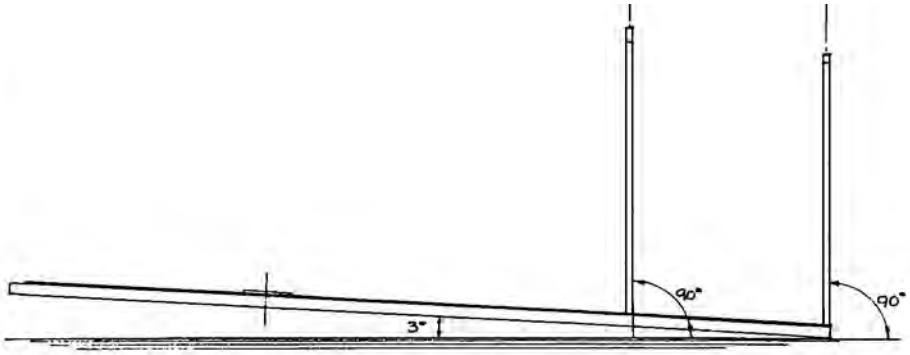
SEE ALSO DRG. NO. L1-F7.



TYPICAL SECTION THRU' FLOOR (JOINT.)

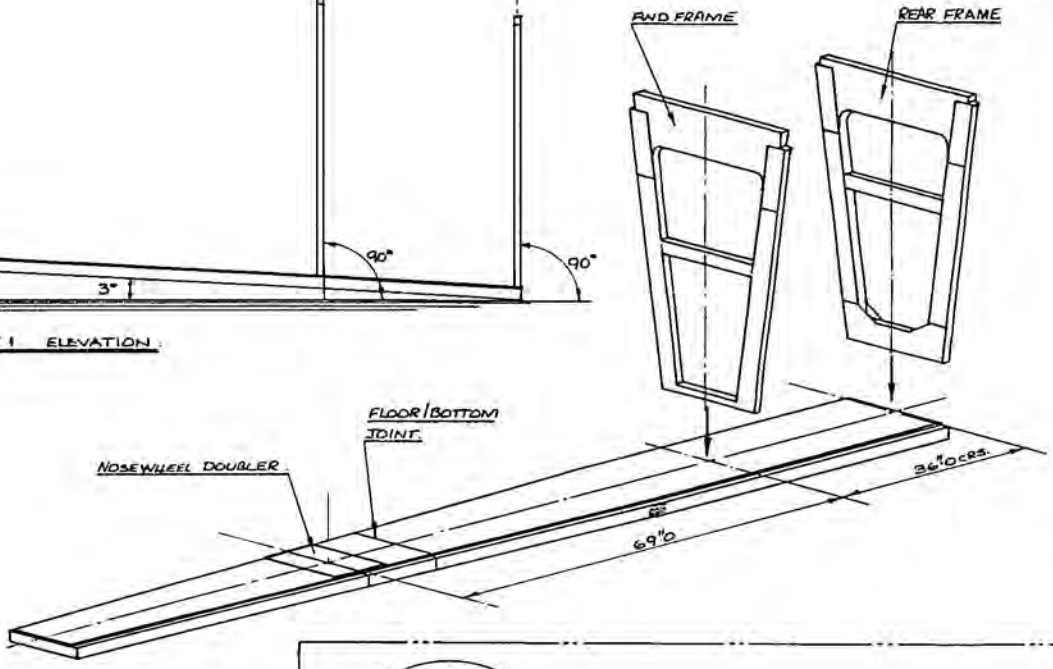
L1-F9

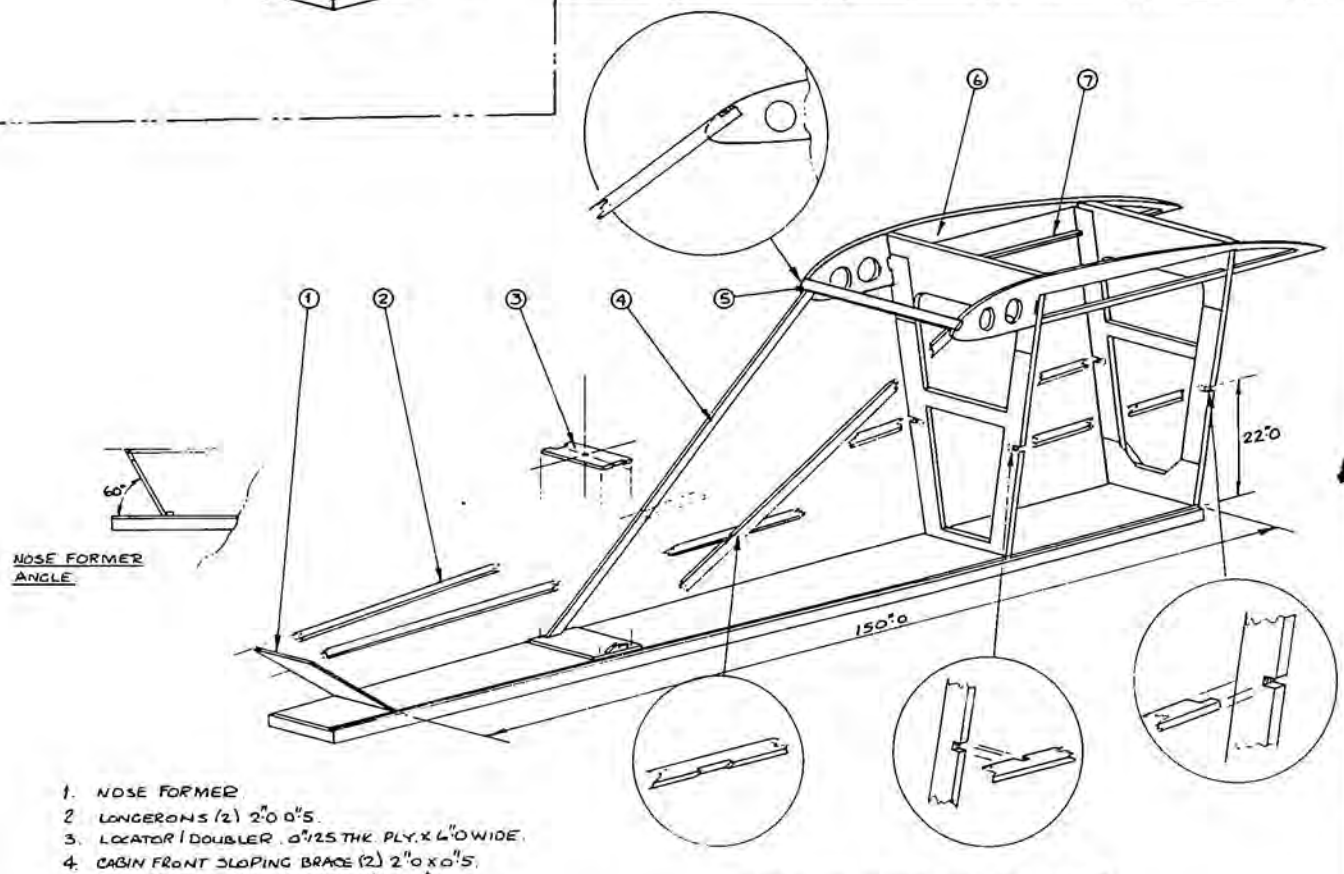
HLORIMER 20JAN95



FUSELAGE ASSY. STAGE 1 ELEVATION.

* NOTE FLOOR ANGLE.





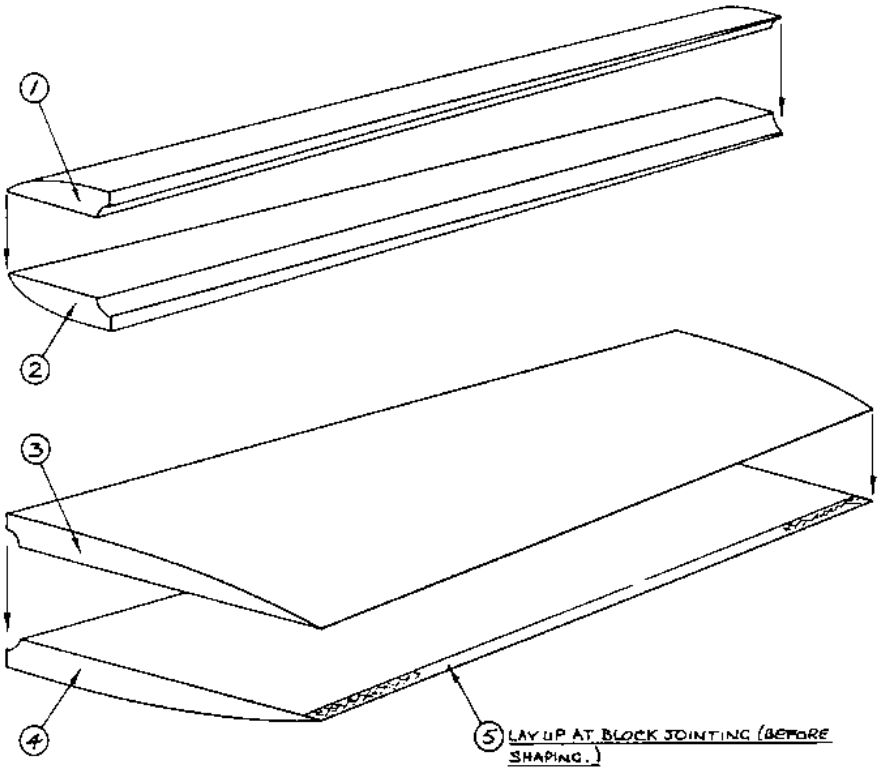
NOSE FORMER ANGLE.

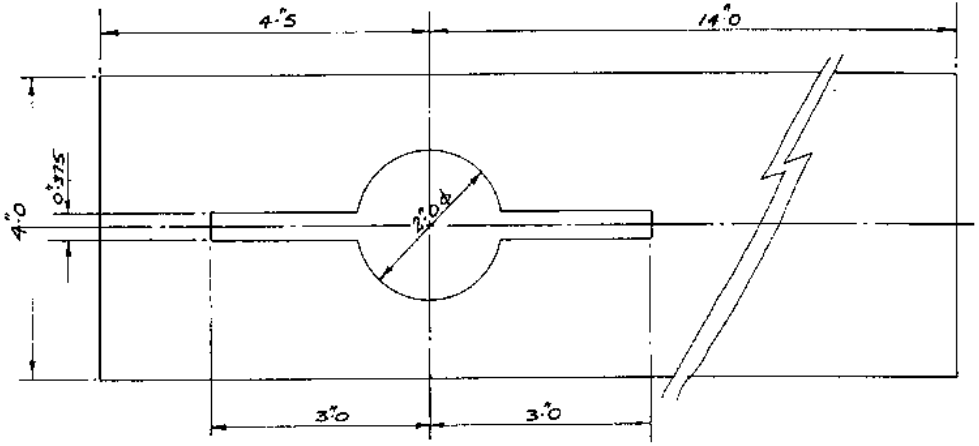
1. NOSE FORMER
2. LONGERONS (2) 2"0 0"S.
3. LOCATOR/DOUBLER .0"125 THK. PLY. X 6"0 WIDE.
4. CABIN FRONT SLOPING BRACE (2) 2"0 X 0"S.
5. ROOT PLATE CROSS MEMBER 2"0 X 0"S.
6. ROOT PLATE (2) SANDWICH. PLY-FOAM-PLY.
7. FRAME BRACE (2) 1"0 X 0"S.

METHOD OF ASSEMBLY - FUSELAGE.

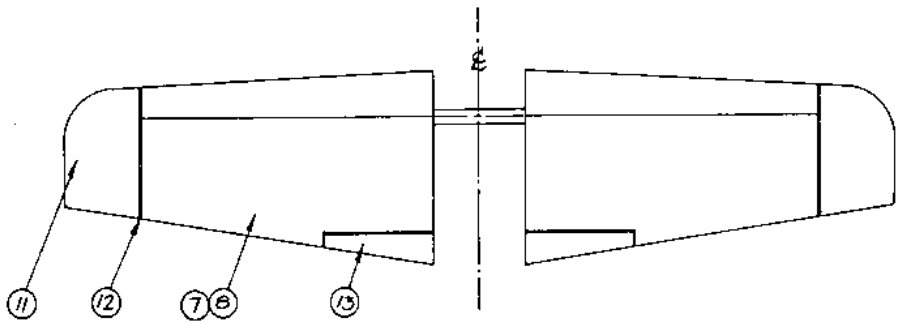
L1-F10

U. LORIMER 1 FEB '95.

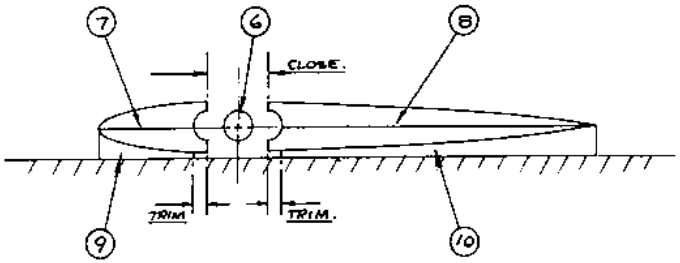




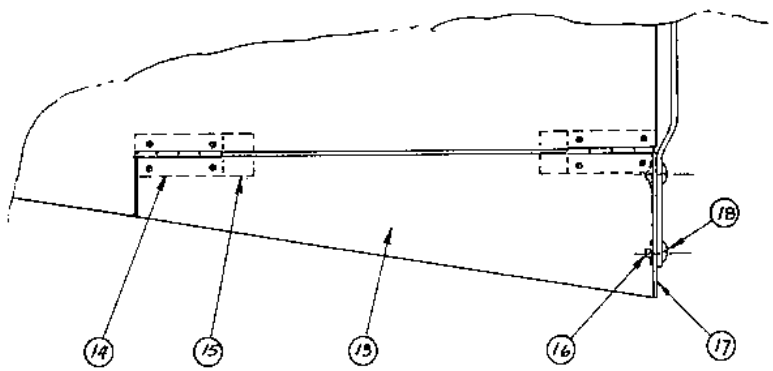
BASIC TORQUE PLATE.



CANARD G.A.



CANARD ASSEMBLY.



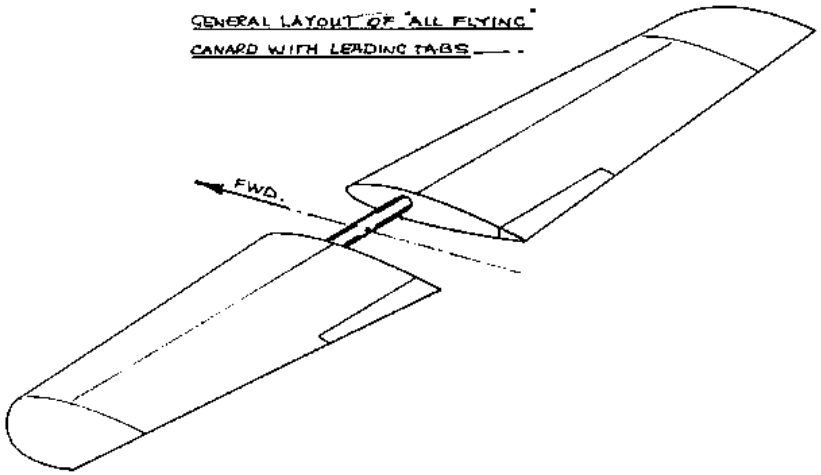
TAB DETAIL.

1	L/E. UPPER FOAM BLOCK.
2	L/E LOWER FOAM BLOCK.
3	T/E UPPER FOAM BLOCK.
4	T/E LOWER FOAM BLOCK.
5	GLASS FIBRE T/E TAPE. 1"5 WIDE.
6	CANARD SPAR ASSEMBLY.
7	L/E ASSY.
8	T/E ASSY.
9	OFFCUT FOAM BLOCK. (L/E)
10	OFFCUT FOAM BLOCK (T/E)
11	SHAPED TIP.
12	TORQUE PLATE (RIB) 4MM PLY.
13	LEADING TAB. 18"0 LONG X 6"0 AT ROOT.
14	HINGE. 5"0 LONG X 0"5 WIDE. (4)
15	BLOCK INSERT (SLOTTED) WOOD 4"0 LG
16	FLOATING ANCHOR NUT (4)
17	TAB END PLATE. 4MM PLY.
18	MUSH HEAD SCREWS (4)

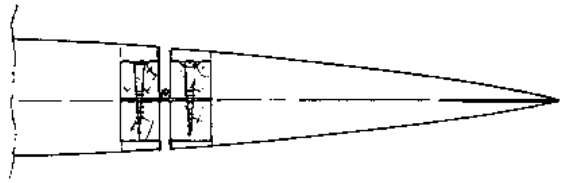
L1-S2

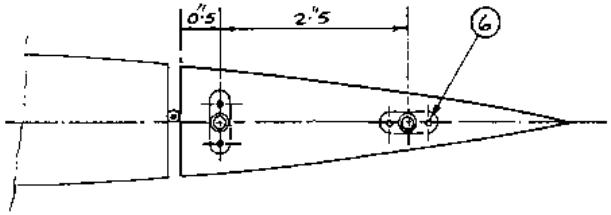
H. LORIMER 1 JUN. '97

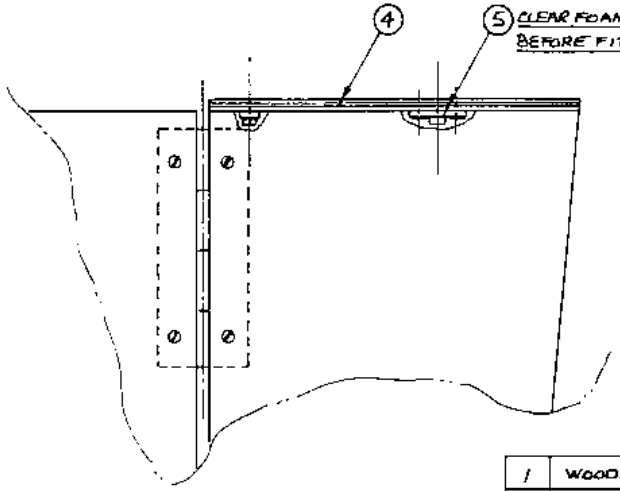
GENERAL LAYOUT OF "ALL FLYING" CANARD WITH LEADING TABS



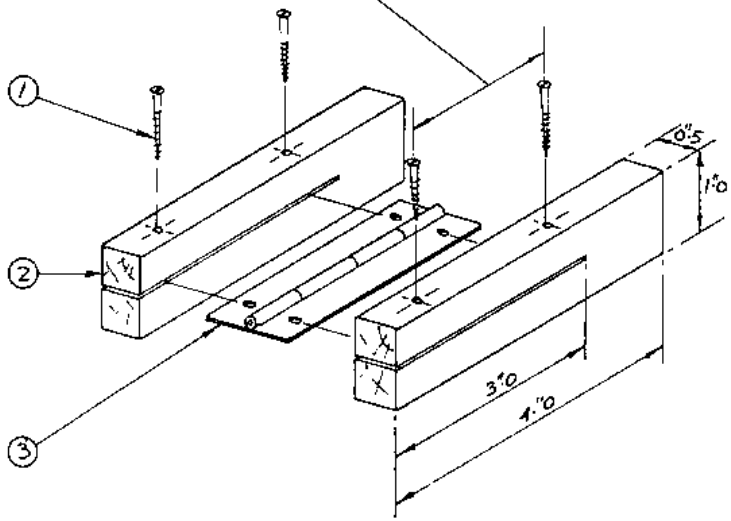
SINK MOUNTING BLOCKS INTO FOAM BEFORE COVERING WITH GLASS CLOTH.







SCREW PITCH TO SUIT HINGE HOLES.

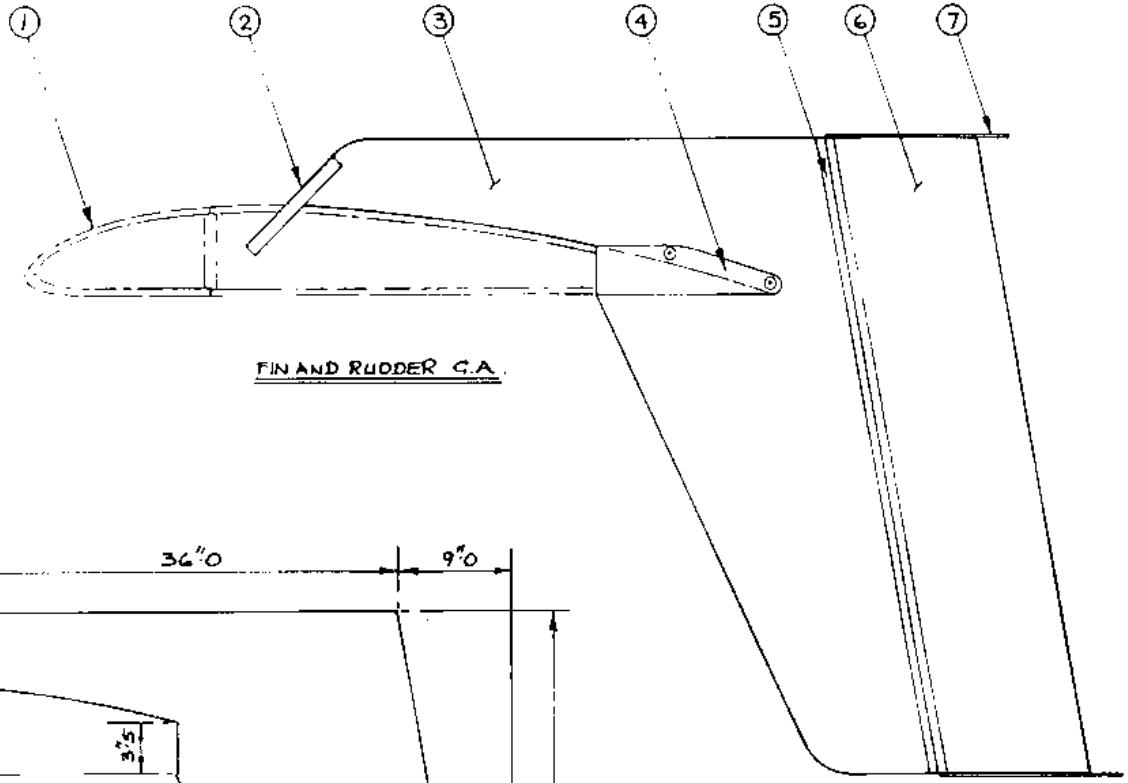


TAB HINGE DETAIL

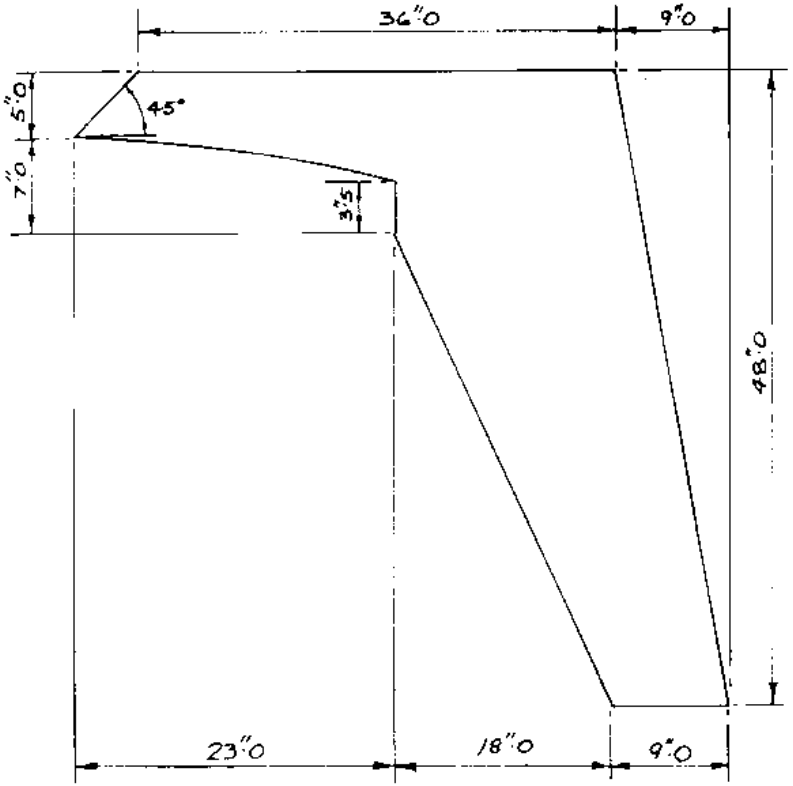
1	WOODSCREW. 1"x 4 ———	16 OFF.
2	MOUNTING BLOCKS. SLOTTED.	8 OFF.
3	HINGE. 3" LONG x 1/2" WIDE	4 OFF.
4	TAB ROOT END PLATE. 4MM PLY	2 OFF.
5	FLOATING ANCHOR NUT (7/16" Ø)	4 OFF
6	3/32" CSK POP RIVET	8 OFF
7		
8		
9		

L1-S3

H. LORIMER 2 JUN '97

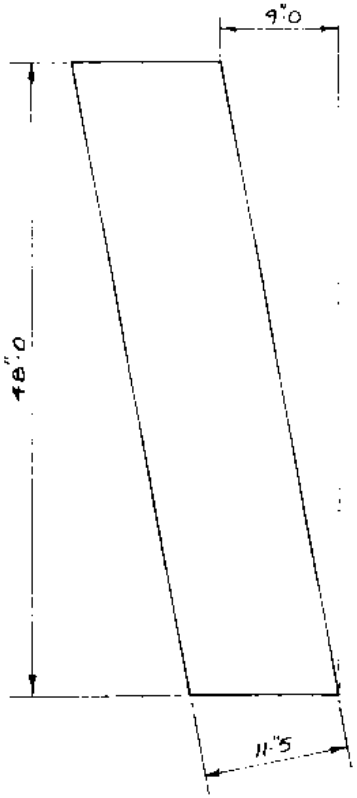


FIN AND RUDDER C.A.

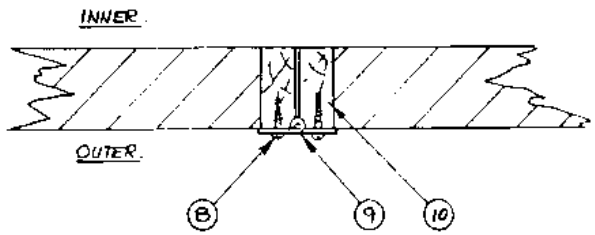


FIN DIMENSIONS — FOAM 1"0 THK.

* LIFT CURVE CONTOUR FROM WING SECTION AT RIB NO. 7.



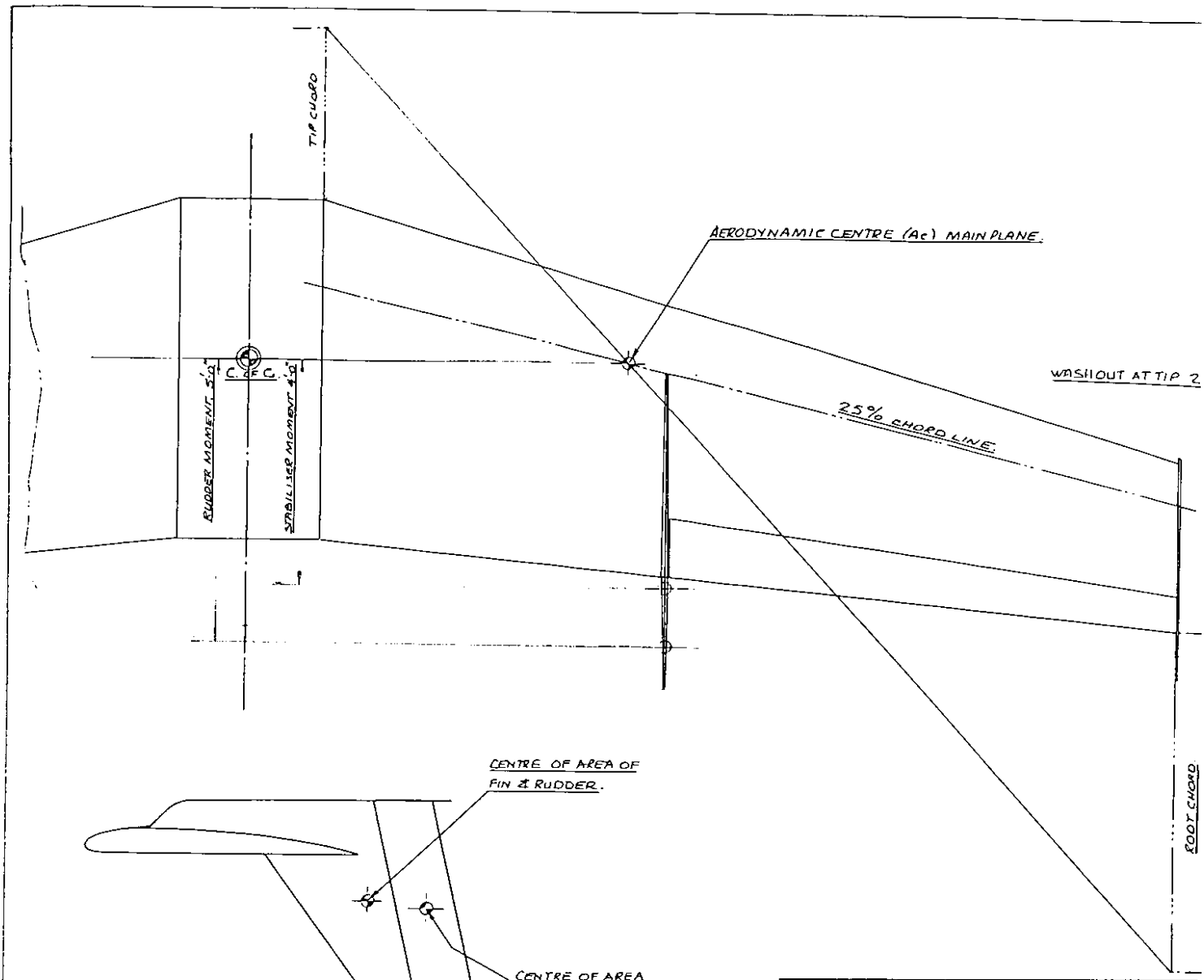
RUDDER DIMENSIONS — FOAM 1"0 THK

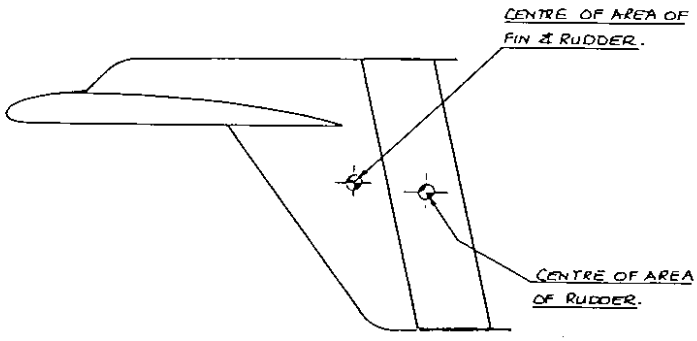


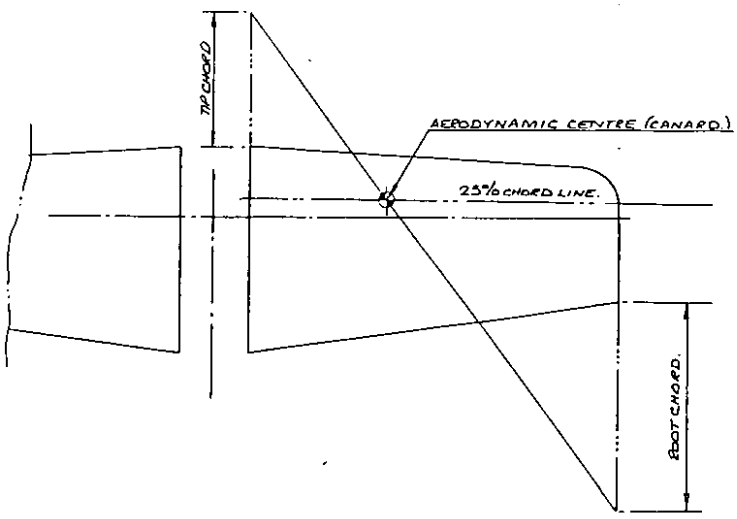
1	WING SECTION AT RIB NO. 7
2	FIN L/E LOCATING PIN 1"0 ϕALUM. x 9"OLC.
3	FIN
4	4MM DOUBLERS FOR MOUNTING (PLY)
5	PIANO HINGE. FULL LENGTH x 0"5 FLAP
6	RUDDER.
7	4MM PLY TIP PLATE.
8	MUSH HEAD WOOD SCREWS. 0"75 x 4
9	FULL LENGTH PIANO HINGE (AS PER (5))
10	MOUNTING STRIPS. SPRUCE. 0"5 x 1"0

L1-S4

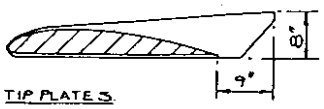
H.LORIMER. JUN '97







SCALE 1" = 1'



TIP PLATE S.

TO DETERMINE CANARD MOMENT.

APPLY STABILISER VOLUME COEFFICIENT FORMULA

$$\bar{V} = \frac{A_S \times \bar{L}}{A_W \times \bar{C}_H}$$

WHERE $\bar{V}$ = VOLUME COEFFICIENT.

A_S = NETT AREA OF STABILISER (CANARD).

$\bar{L}$ = DIST. BETWEEN AERODYNAMIC CENTRES OF WING AND CANARD.

A_W = NETT AREA OF MAINPLANE.

$\bar{C}_H$ = AVERAGE CHORD OF MAINPLANE.

VOLUME COEFFICIENT RANGE 0·35 TO 0·55

∴ AVERAGE $\bar{V}$ = 0·45.

$$\therefore 0{\cdot}45 = \frac{10 \times \left[\frac{3+2}{2}\right] \times \bar{L}}{30 \times \left[\frac{6+3}{2}\right] \times \left[\frac{4+3}{2}\right]}$$

∴ $\bar{L}$ = 10·9 FEET

WING AREA (NETT.) = 135 SQUARE FEET.

CANARD AREA (NETT) = 25 SQUARE FEET.

FIN & RUDDER AREA (TOT) = 19 SQUARE FEET.

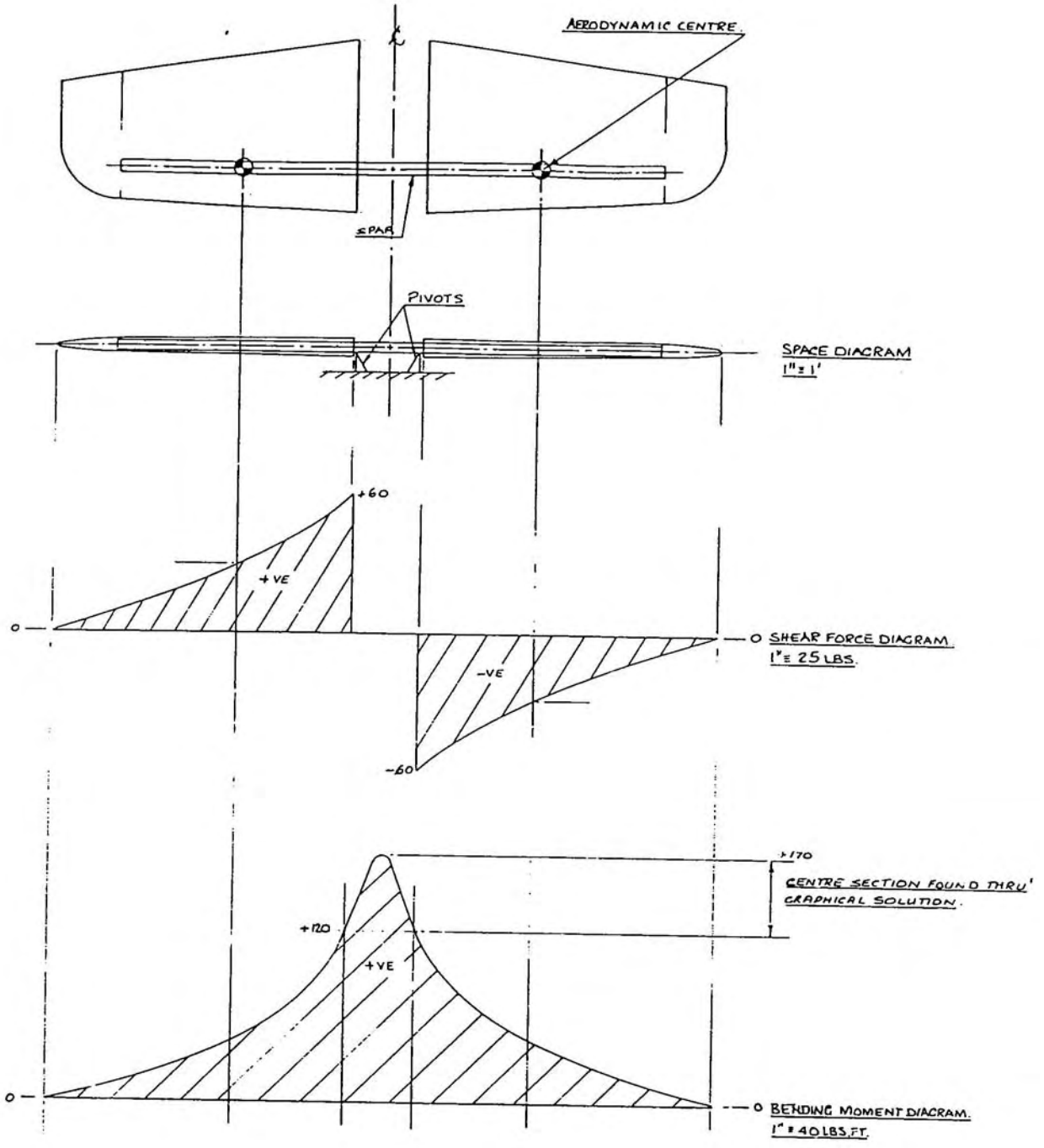
RUDDER AREA (TOT.) = 8 SQUARE FEET.

AILERON AREA (TOT) = 14·6 SQUARE FEET.

TIP PLATE AREA (TOT. NETT.) = 2 SQUARE FEET.

L9-A

H LORIMER


AERODYNAMIC CENTRE.
℄
℄ SPAR
PIVOTS
SPACE DIAGRAM
1" = 1'
+60
+VE
0
0 SHEAR FORCE DIAGRAM.
1" = 25 LBS.
-VE
-60
+170
CENTRE SECTION FOUND THRU' GRAPHICAL SOLUTION.
+110
+VE
0
0 BENDING MOMENT DIAGRAM.
1" = 40 LBS. FT.