TECHNICAL MEMORANDUMS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 214

THE "TURKEY BUZZARD" GLIDER

By Roy G. Miller and B. T. Brown.

(One of Winners of Glider Design Competition conducted by "Flight")

Taken from "Flight" April 12, 19, 26,

and May 3, 1923

June, 1923

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General Description.

The "Turkey Buzzard" is a semi-internally braced monoplane (Fig. 1). The wing is placed above the fuselage for two important aerodynamical reasons: first, because this position minimizes the mutual interference between the wing and the fuselage, and, second, useful lifting surface is utilized with the wing passing over the fuselage instead of through it. Structural simplicity is maintained by not breaking the fuselage fairing and the wing profile. The short lift-struts greatly reduce the weight of the wing beams, and do not offer much head resistance.

The plan form of the wing is tapered to improve the aerodynamical efficiency and to reduce the structural weight. The profile is tapered solely for aerodynamical reasons.

The ribs employed are of stiff paper, reinforced with wood capstrips and stiffeners which are cemented on by means of dope. This type of rib is extremely light and strong. An experimental rib of six-foot chord weighed only 0.22 lb and stood a test load of 264 lbs before breaking. This corresponds to a load factor of about 25 g

* Taken from "Flight," April 12, 19, 26, and May 3, 1923.

on a glider as lightly loaded as the "Turkey Buzzard."

The fuselage fairing is a modification of an airship form.

No fixed tail surfaces are used. The movable tail surfaces are internally braced and are balanced. For ease of construction the rudder is made with the same profile as the elevators.

The wing and tail surfaces are each provided with two sets of drag bracing, one near the upper surface and one near the lower surface. The two spars and drag bracing form a box truss which is very effective in resisting torsion and also increases the strength of the wing by equalizing the distribution of load between the front and rear spars.

The efficiency of the ailerons is improved by cementing strips of sheet rubber over the cracks at the hinges (Fig. 8). This feature is less desirable in the case of the rudder, since it is necessary to remove the rudder more often.

The landing gear consists of two main skids, placed well forward of the center of gravity. The tail skid follows more or less conventional practice.

Performance Characteristics.

The Göttingen 426 airfoil is used over the middle 14 feet of the span. (The thick section is carried one rib station beyond the parallel portion of the wing to relieve the abrupt bend in the flanges.)

Chord of parallel wing = 75 inches.

Chord of wing at 7 ft. from the center = 72 inches.

Area of Göttingen 426 = $\frac{75 \times 12}{12} + \frac{75 + 72}{12}$ = 87 sq.ft.

The balance of the wing is tapered down to the Sloane curve at 1 ft from the tip.

Chord of Sloane curve = 48 inches.

Area of tapered portion = 172 - 87 = 85 sq.ft.

$\frac{72}{48 + 72}$ x 85 = 51 sq.ft. of tapered portion to be taken as Göttingen 426.

87 + 51 = 138 sq.ft., total Göttingen 426.

$\frac{48}{48 + 72}$ x 85 = 34 sq.ft., area of Sloane curve.

The equivalent aspect ratio of the wing is based upon the chord at the tip. Area = 172 sq.ft.; chord at the tip = 4 ft; aspect ratio = $\frac{172}{4}$ = 10.7.

Corrections for aspect ratio will be made according to R & M 450. Since both airfoils under consideration were tested at very high values of LV ratio no correction will be made for scale (Fig. 2).

Table I.

Göttingen No. 426.

Angle of attack	L_c			D_c		
	As tested (A.R.=5)	Corrected (A.R.=10.7)	Times 138	As tested (A.R.=5)	Corrected (A.R.=10.7)	Times 138
-2^o	.18	.20	27.6	.010	.0082	1.132
0	.25	.28	38.6	.013	.0108	1.490
2	.32	.36	49.7	.019	.0162	2.235
4	.39	.44	60.7	.025	.0210	2.90
6	.46	.52	71.7	.033	.0276	3.81
8	.53	.60	82.8	.043	.0352	4.85
10	.59	.66	91.0	.054	.0438	6.05
12	.64	.72	99.3	.068	.0552	7.61
14	.64	.72	99.3	.084	.0682	9.40

Table I (Cont.)

S l o a n e

Angle of attack	L_c			D_c		
	As tested (A.R.=6)	Corrected (A.R.=10.7)	Times 34	As Tested (A.R.=6)	Corrected (A.R.-10.7)	Times 34
-2^o	.010	.015	.51	.006	.00515	.175
0	.095	.102	3.47	.005	.00429	.146
2	.19	.203	6.90	.008	.00687	.234
4	.27	.292	9.93	.013	.0112	.381
6	.34	.370	12.60	.022	.0192	.852
8	.40	.440	14.97	.033	.0288	.978
10	.45	.490	16.67	.050	.0422	1.434
12	.50	.516	17.55	.073	.0640	2.18
14	.53	.546	18.57	.102	.0867	2.95

Table 1 (Cont.)

Totals.

Angle of attack	L_c	D_c	D_c +.4994	L/D
- 2°	28.11	1.307	1.8064	15.6
0	42.07	1.636	2.1354	19.7
2	56.60	2.469	2.9684	19.1
4	70.63	3.281	3.7804	18.7
6	84.30	4.663	5.1614	16.4
8	97.77	5.828	6.3274	15.4
10	107.67	7.484	7.9834	13.5
12	116.85	9.79	10.2894	11.4
14	117.87	12.35	12.8494	9.2

Structural Drag.

1. Lift struts: 7/8 in. diameter by 73 in. long; frontal area of 4 struts = $\frac{7 \times 73 \times 4}{8 \times 144}$ = 1.78 sq.ft.; resistance coefficient = .04 (absolute) for faired tube

$$.04 \times 1.78 = .071.$$

2. Center section struts: 1/2 in. diameter by 18 in. long; frontal area of four struts = $\frac{18 \times 4}{2 \times 144}$ = .25 sq.ft.; resistance coefficient = .04

$$.04 \times .25 = .010.$$

3. External wires: 5/64 in. cable by 24 in. long; frontal area of four cables = $\frac{5 \times 24 \times 4}{64 \times 144}$ = .00868 sq.ft.; resistance coefficient = .60

$$.60 \times .00868 = .0052.$$

4. Fuselage: Frontal area = 4 sq.ft.; resistance coefficient for airship form = .0343; the resistance of the fuselage will be assumed to be $1\frac{1}{2}$ times that of the airship form

$$.0343 \times 1.5 \times 4 = .2058.$$

5. Landing gear: Exposed portion of torque tube = $\frac{46 \times 1.75}{144}$ = .559 sq.ft.; resistance coefficient for faired tube = .040.

$$.040 \times .559 = .0224.$$

Skids: 1 in. by 20 in.; frontal area of three skids = $\frac{20 \times 3}{144}$ = .417 sq.ft.; resistance coefficient = .060

$$.060 \times .417 = .025.$$

Total for landing gear: .0224 + .025 = .0474.

6. Tail surfaces: Area = 32 sq.ft.; minimum drag coefficient for Göttingen 410 = .005

$$.005 \times 32 = .160.$$

Summation of structural drag:

$$.071 + .010 + .0052 + .2058 + .0474 + .160 = .4994.$$

Weight Estimate.

Detailed weight statement based on the following unit weights:

Spruce	.0156	lb/cu.in.
Basswood	.0156	"
Hickory	.0289	"
Steel	.2841	"
1/16-in. 3-ply mahogany	.20	lb/sq.ft.
Fabric	.03	"

Weight Estimate (Cont.)

		lbs.
Wing Group.		
Spars	13.5	
Ribs	6.0	
Drag bracing	3.0	
Fittings	2.0	
Fabric	10.4	
Compression ribs	1.2	
Aileron spars	2.0	
Aileron hinges	1.0	
Lift struts	9.0	
		48.1
Fuselage.		
Struts	2.45	
Longerons	8.4	
Tension straps	3.85	
Fairing strips	2.1	
Plywood fairing seat and floor	3.6	
Fabric	3.8	
Fittings (wing and tail plane)	2.0	
Glue and nails	2.0	
		28.2

Weight Estimate (Cont.)

Horizontal Tail Surfaces.

Ribs	1.56	
Spars	3.50	
Special rib	.32	
Fabric	1.32	
Glue and nails	.30	
		7.00
Rudder: Weight is proportional to area of horizontal surface		3.2

Landing Gear.

Torque tube	6.0	
Skids (three)	6.8	
Horns, fittings and cord	2.0	
		14.8

Controls.

Stick	.55	
Pulleys	.83	
		1.38
Total dead weight		102.7 lbs.

The stress analysis was based on an original dead weight estimate of 150 lbs., which was purposely made high in order to ensure an ample factor of safety. Using the dead weight as calculated above and the live load of 150 lbs. kept the same, the low speed load factor will be 4.8 instead of 4, and in the diving condition will be 3.7 instead of 3.08 (Fig. 3).

Fuselage.

The fuselage is a modification of an airship form with corners rounded, as shown in Fig. 4, to conform to sine curve.

The cross-sectional area at each station is proportional to the cross-sectional area of an airship hull but the shape of the cross-section is modified to suit structural considerations as shown in Figs. 5 and 6.

Wing Ribs.

Drawing (Fig. 7) shows a typical rib, with the dimensions of the various ribs indicated in tabular form. Rib No.10 is the Göttingen No. 426 section. The flanges, or "cap strips" are of spruce, and are doped to the cartridge paper web. Spruce stiffeners are placed vertically between upper and lower flanges at suitable intervals, and always against front and rear faces of the wing spars where these intersect the ribs.

In the case of the compression ribs a further strengthening is provided by horizontal fore-and-aft compression members of spruce, running outside the vertical stiffeners, and lashed to them.

Wing Spars.

Another set of drawings shows the general lay-out of the wing, and gives details of the wing spars (Figs. 9 and 10).

The dimensions of the tapering portion of the spar are given in the small table at the top of Fig. 9.

The trailing edge is formed by braided cord of "fish-line." The internal drag bracing is piano wire.

Fittings.

The wing design calls for practically no metal fittings. The few fittings required for the internal drag bracing are of the simplest form, i.e., plain strips of sheet steel of light gage, passed through slots in the spar webs and having their ends splayed out at the required angle. One such fitting is shown in Fig. 11 dealing with the fitting for the "A" struts which secures the center section of the wing to the fuselage.

On another drawing (Fig. 15) is shown one of the very simple fittings by means of which the lift struts are attached to the wing spars.

Ailerons.

The ailerons (Fig. 8) are of a construction similar to that of the wings. The ribs are similar to the main ribs, except for No. 4, shown in the drawing, which carries the ailerons horn. This rib is made up of two pieces of mahogany, placed one on each side of the rib, and having between them a spruce filler glued in and lightened as shown by dotted line. The hinges are formed of three-ply plates, of spade shape as indicated in the drawings, with a continuous hinge pin formed of a 1/4-inch wood dowel rod, over which is forced a length of 1/4-inch tube to form a bearing surface at the hinge points. Similarly a metal bush in the form of an eyelet is formed on the three-ply plates providing the hinges.

Elevator.

In general design the elevator is of similar construction to that of the wing (Figs. 12 and 13). The ribs are similar to the wing ribs in construction, with the exception of the center rib, which has a three-ply web in place of the thick paper webs. The section used is Göttingen No. 410, and the dimensions of the various ribs are given in the accompanying table. It should be pointed out that the section is a symmetrical one, i.e., biconvex, and that the dimensions given in the table are half-depths.

The elevator crank lever or "horn" is in the form of two plates placed one on each side of the central rib (Detail A, Fig. 13), and attached at corner blocks and packing pieces by small bolts. The elevators are mounted on the sides of the fuselage, as indicated in the side view (Figs. 1, 5 and 14). The corresponding bearings on the front spar of the elevator are shown in the elevator, (Detail B, Fig. 13). The stern post of the fuselage is detachable, so as to admit of the elevator being put into place (Fig. 5).

Rudder.

No construction drawing is provided for the rudder, since the construction is so nearly like that of the elevators. Spars similar to those in the elevatorsare used. The lower ends are drawn down to fair-in with the fuselage. Ribs 2 to 6 inclusive of the elevator are duplicated on the rudder. Ribs 2 and 3 have the noses cut off. The horns are similar to those used for the elevators, and are

attached to rib No. 3. All the ribs are of a construction similar to those employed in the wing.

Landing Gear.

The landing gear consists of two skids placed well forward of the center of gravity, (Figs. 16 and 17). They are mounted on the ends of a torque tube, which transmits the rotational deflections to a shock absorber located within the fuselage. This tube is of steel and runs across the bottom of the fuselage, through bearings on the lower longerons. This arrangement permits quite a wide track for the landing skids.

Tail Skid.

The tail skid is of hickory, and is of the usual swivelling type (Fig. 14). The fitting is attached centrally to a cross-beam or strut of the fuselage. The arrangement of swivel fitting, rubber shock absorbers and "snubber" should be clear from the drawing.

Controls.

The control stick is tubular in form (Fig. 15), and the foot bar of the usual type.

Fig.1

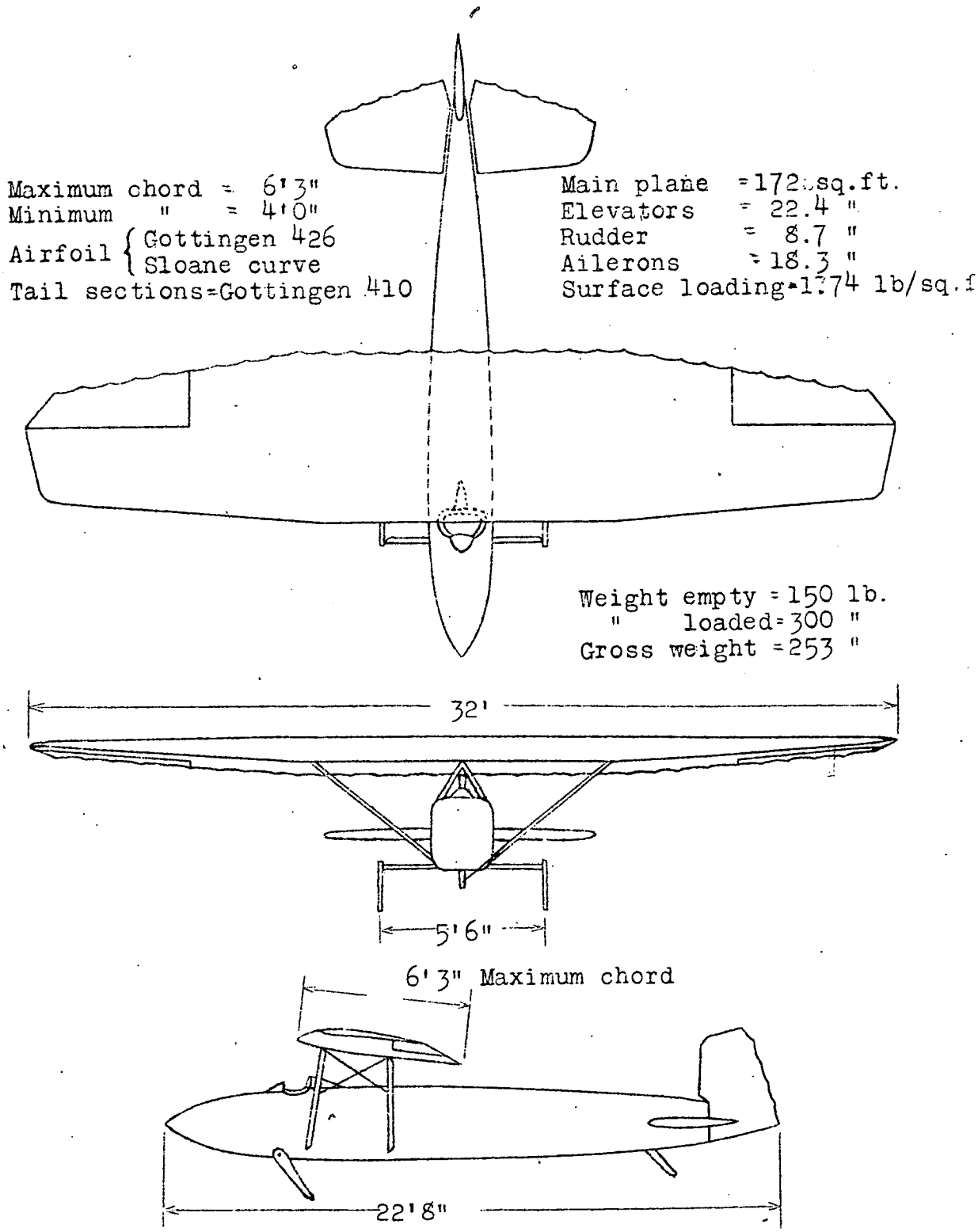
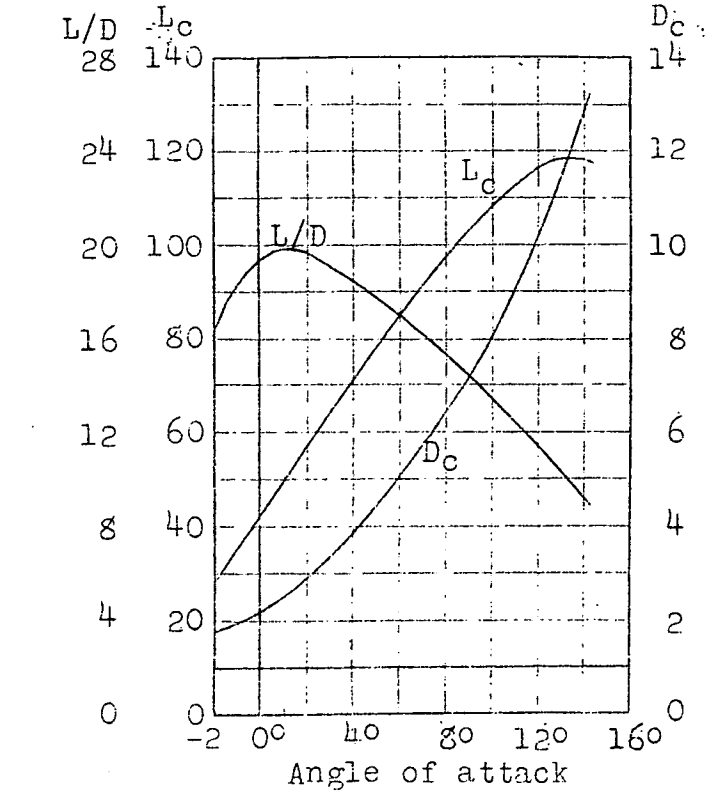


Fig. 1 Plan and elevation of the Turkey Buzzard Glider.

Fig.2



See Table I for individual characteristics of the Gottingen 426 and the Sloane airfoils.

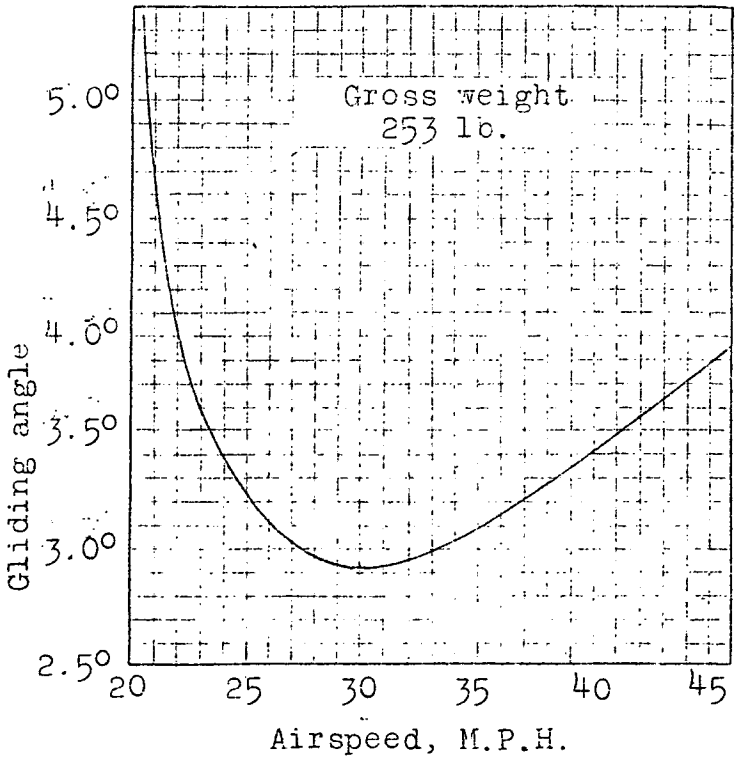


Fig.2 Aerodynamic characteristics and gliding angles of the "Turkey Buzzard Glider".

Fig.3

a = 240.0 in.		i = Nose	
b = 198.0 "		j = Leading edge	
c = 186.0 "		k = Control and landing gear	16.18 lb.
d = 48.0 "		m = Pilot	150.00 "
e = 34.0 "		n = Wings	48.10 "
f = 24.5 "		p = Fuselage	28.20 "
g = 8.0 "		q = Horizontal tale surface	7.00 "
h = 4.0 "		r = Rudder	3.20 "
		s = Tail post	

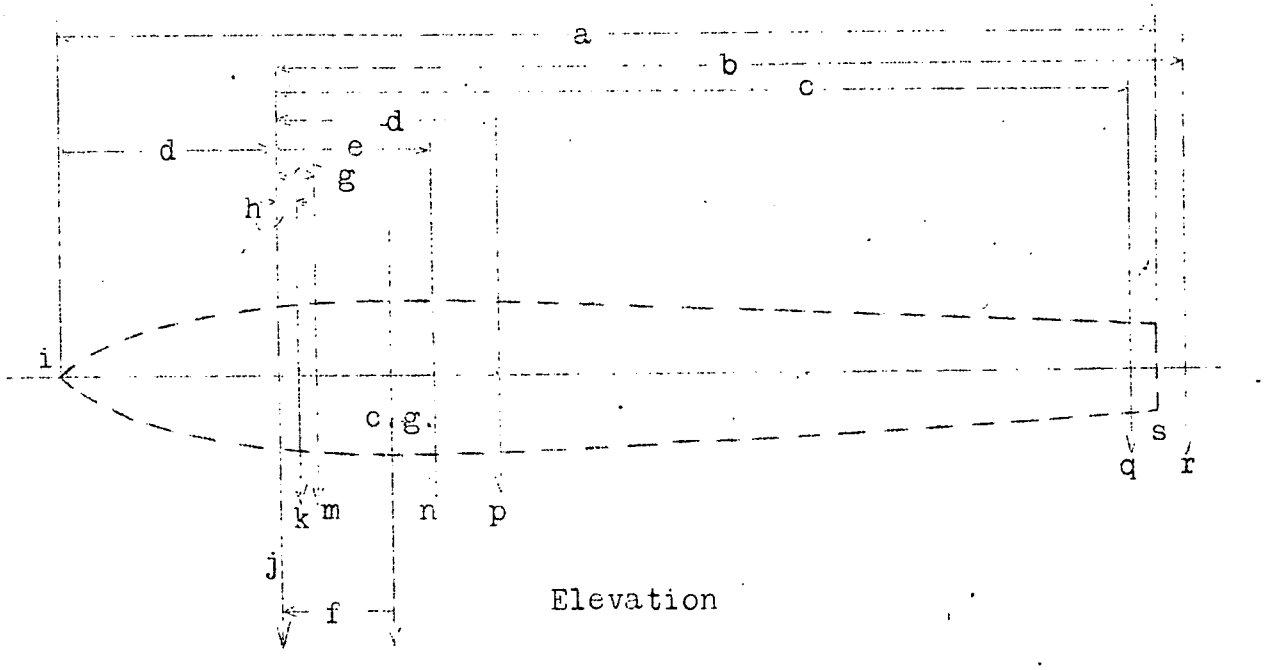
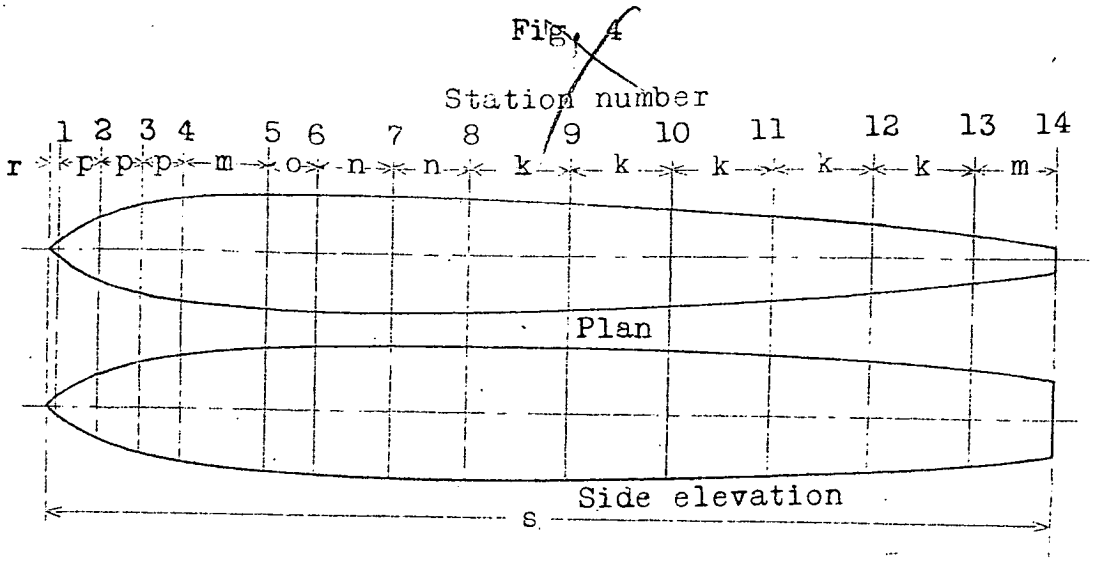
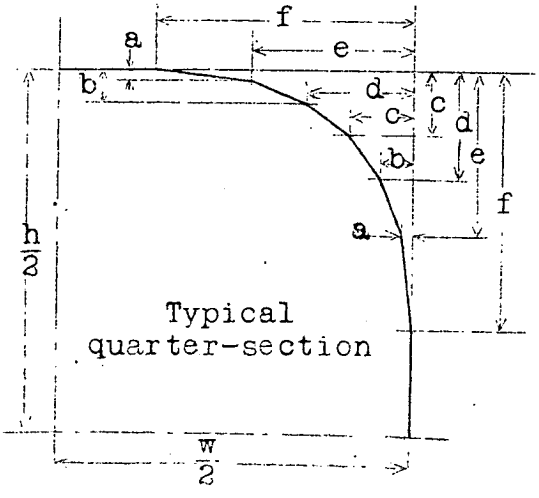


Fig.3 Balance diagram. By taking longitudinal moments about the leading edge, the c.g. of the glider is found to fall at 24.5" aft of the leading edge.



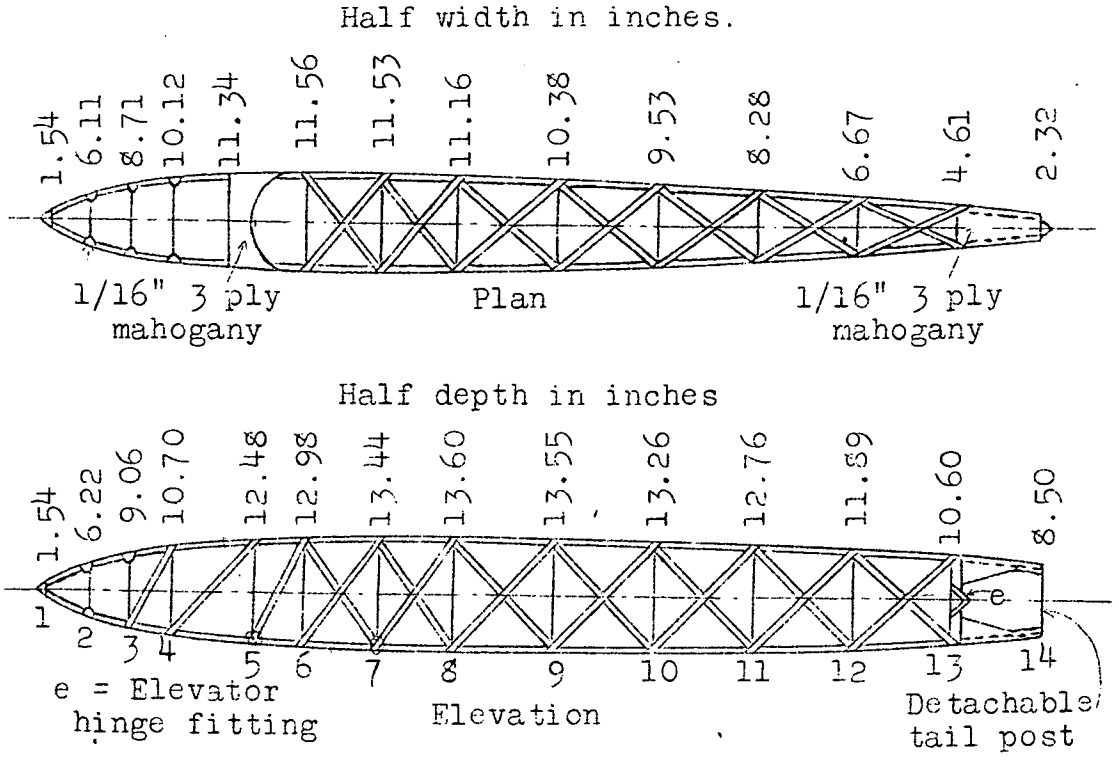
k=24"
m=20"
n=18"
o=12"
p=10"
r= 2"
s=240"



Sta. No.	Dist. from nose	$\frac{w}{2}$	$\frac{h}{2}$	a	b	c	d	e	f
1	2"	1.87	1.87	.05	0.17	0.33	0.56	0.87	1.37
2	12"	7.45	7.56	.21	0.69	1.34	2.24	3.46	5.46
3	22"	10.63	10.98	.30	0.99	1.92	3.21	4.93	7.79
4	32	12.33	12.91	.35	1.13	2.21	3.71	5.72	9.04
5	52	13.83	14.97	.39	1.29	2.49	4.17	6.41	10.14
6	64	14.11	15.53	.40	1.30	2.55	4.25	6.55	10.34
7	82	14.08	15.99	.40	1.30	2.54	4.24	6.53	10.31
8	100	13.62	16.06	.38	1.26	2.46	4.10	6.32	9.98
9	124	12.68	15.85	.36	1.17	2.29	3.82	5.88	9.29
10	148	11.63	15.36	.33	1.07	2.10	3.50	5.39	8.52
11	172	10.13	14.61	.28	0.93	1.83	3.05	4.69	7.42
12	196	8.14	13.36	.23	0.75	1.47	2.45	3.77	5.97
13	220	5.62	11.62	.16	0.52	1.01	1.69	2.61	4.12
14	240	2.82	9.00	.08	0.26	0.51	0.85	1.31	2.07

Fig. 4 Lines of the fuselage with dimensions for corners

Fig.5



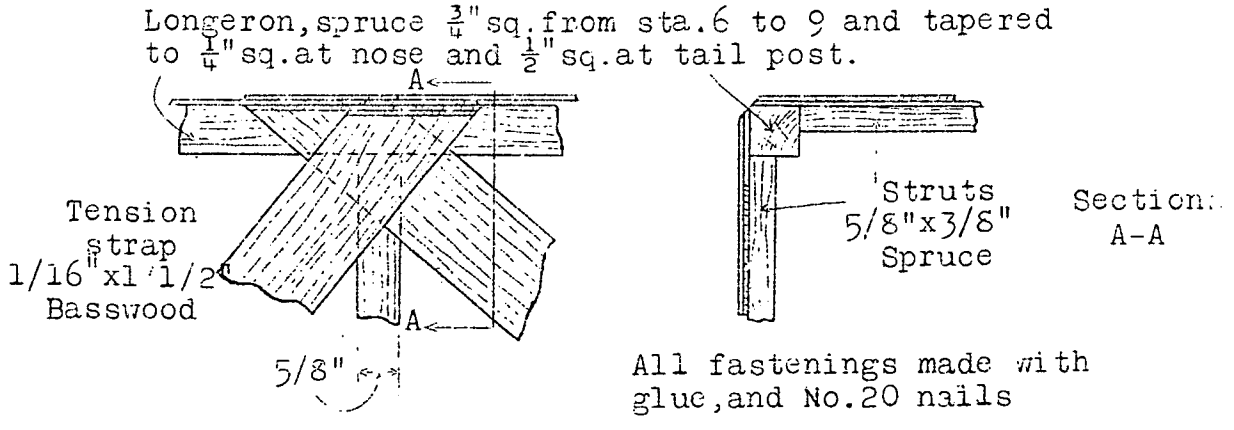
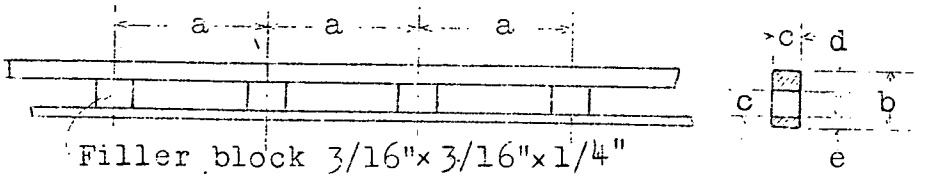


Fig.5 Details and assembly of fuselage.

Fig.6

a = 2"
b = 3/8"
c = 3/16"
d = 1/8"
e = 1/16"



Enlarged drawing of fairing strip.
(Basswood)

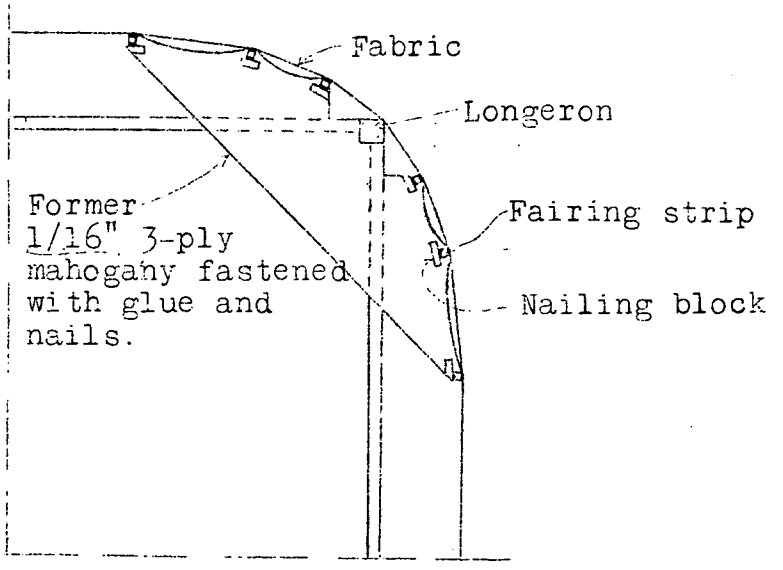
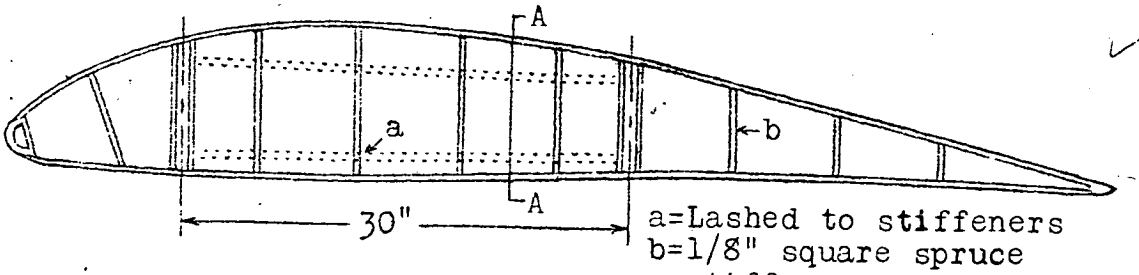
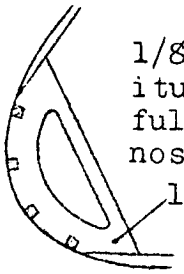


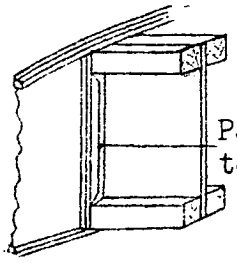
Fig.6 Details of fuselage showing longitudinal fairing strips.

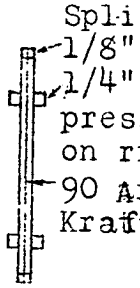


a=Lashed to stiffeners
b=1/8" square spruce stiffeners



Detail of nose





A-A

Table II

Dimensions given are in inches

Dist. from L.E.	Upper ord.	Lower ord.	Dist. from L.E.	Upper ord.	Lower ord.
Rib No.1			Rib No.2		
0.00	0.34	.34	0.00	0.52	.52
0.60	0.87	.14	0.64	1.20	.20
1.20	1.22	.05	1.28	1.60	.09
2.40	1.65	.00	2.55	2.13	.01
3.60	1.92	.04	3.83	2.46	.02
4.80	2.11	.07	5.10	2.72	.05
7.20	2.35	.19	7.66	3.06	.10
9.60	2.52	.22	10.20	3.32	.16
14.40	2.70	.30	15.30	3.54	.20
19.20	2.70	.27	20.40	3.54	.20
24.00	2.53	.23	25.50	3.27	.18
28.80	2.30	.19	30.60	2.89	.14
33.60	1.98	.17	35.70	2.39	.13
38.40	1.57	.10	40.80	1.81	.10
43.20	1.02	.07	45.90	1.09	.03
45.60	0.65	.04	48.40	0.63	.00
48.00	0.10	.10	51.00	0.10	.10
Rib No.3			Rib No.4		
0.00	0.70	.70	0.00	0.92	.92
0.68	1.50	.24	0.71	1.85	.33
1.35	1.96	.11	1.43	2.37	.19
2.70	2.57	.03	2.85	3.08	.06
4.05	3.00	.00	4.28	3.57	.04
5.40	3.31	.00	5.70	3.97	.02
8.11	3.77	.05	8.55	4.54	.01
10.80	4.10	.06	11.40	4.93	.00
16.20	4.40	.10	17.10	5.28	.03
21.60	4.36	.11	22.80	5.18	.05
27.00	3.97	.14	28.50	4.73	.12
32.40	3.47	.15	34.20	4.10	.17
37.80	2.84	.17	39.90	3.29	.20
43.20	2.11	.14	45.60	2.40	.19
48.60	1.20	.08	51.30	1.35	.11
51.30	0.71	.02	54.10	0.77	.04
54.00	0.10	.10	57.00	0.10	.10

Table continued on next page

Fig. 7 Detail and assembly of typical rib with table of ordinates for all ribs.

Fig.7 continued

Table II

(Continued)

Dimensions given are in indhes

Dist. from L.E.	Upper ord.	Lower ord.	Dist. from L.E.	Upper ord.	Lower ord.	Dist. from L.E.	Upper ord.	Lower ord.
Rib No.5			Rib No.6			Rib No.7		
0.00	1.20	1.20	0.00	1.47	1.47	0.00	1.80	1.80
0.75	2.29	.52	0.79	2.70	.68	0.83	3.15	.90
1.50	2.85	.34	1.58	3.33	.48	1.65	3.84	.67
3.00	3.67	.18	3.15	4.22	.28	3.30	4.81	.44
4.50	4.22	.11	4.72	4.88	.20	4.95	5.54	.32
6.00	4.67	.08	6.30	5.37	.15	6.60	6.10	.23
9.00	5.34	.05	9.45	6.16	.08	9.90	7.00	.12
12.00	5.80	.00	12.60	6.70	.03	13.20	7.60	.03
18.00	6.23	.00	18.90	7.16	.00	19.80	8.12	.00
24.00	6.08	.05	25.20	6.99	.07	26.40	7.88	.07
30.00	5.50	.12	31.60	6.29	.14	33.00	7.09	.16
36.00	4.74	.20	37.80	5.38	.26	39.60	6.06	.33
42.00	3.78	.26	44.20	4.29	.33	46.20	4.78	.40
48.00	2.70	.25	50.40	3.04	.35	52.80	3.34	.42
54.00	1.47	.13	56.70	1.66	.21	59.40	1.78	.27
57.00	0.80	.04	59.80	0.92	.10	62.70	0.97	.11
60.00	0.10	.10	63.00	0.10	.10	66.00	0.10	.10
Rib No.8			Rib No.9			Rib No.10		
0.00	2.13	2.13	0.00	2.45	2.45	0.00	2.53	2.53
0.86	3.63	1.10	0.90	4.08	1.30	0.94	4.28	1.37
1.73	4.37	.84	1.80	4.86	1.00	1.88	5.09	1.11
3.45	5.42	.60	3.60	6.01	.73	3.75	6.27	.83
5.17	6.22	.45	5.40	6.90	.50	5.62	7.17	.60
6.90	6.86	.36	7.20	7.60	.47	7.50	7.89	.46
10.34	7.84	.18	10.80	8.66	.25	11.25	8.64	.43
13.80	8.52	.08	14.40	9.42	.10	15.00	9.83	.16
20.70	9.08	.00	21.60	10.05	.00	22.50	10.49	.00
27.60	8.81	.09	28.80	9.72	.10	30.00	10.14	.10
34.50	7.93	.21	36.00	8.70	.23	37.50	9.08	.23
41.40	6.73	.40	43.20	7.36	.45	45.00	7.66	.45
48.30	5.28	.48	50.40	5.80	.56	52.50	6.02	.60
55.20	3.70	.50	57.60	4.03	.59	60.00	4.20	.62
62.10	1.94	.32	64.80	2.10	.39	67.50	2.19	.41
65.50	1.07	.15	68.40	1.13	.20	71.25	1.20	.19
69.00	0.10	.10	72.00	0.10	.10	75.00	0.10	.10

Fig. 8

a=12"
b=11 1/32"
c= 3/32"
d= 1/2"
e=59 3/32"
f=11 1/32"
h= 1/2"
i= 3/32"
j=1"

A 1/4" dowel with 1/8" 22 B.W.G. tubes forced over it at the hinge points is used for a continous hinge pin.

Spar ordinates

Rib	Upper	Lower
6	3.04	0.00
5	3.07	0.65
4	3.35	1.32
3	3.50	1.93
2	3.71	2.54
1	3.86	3.04

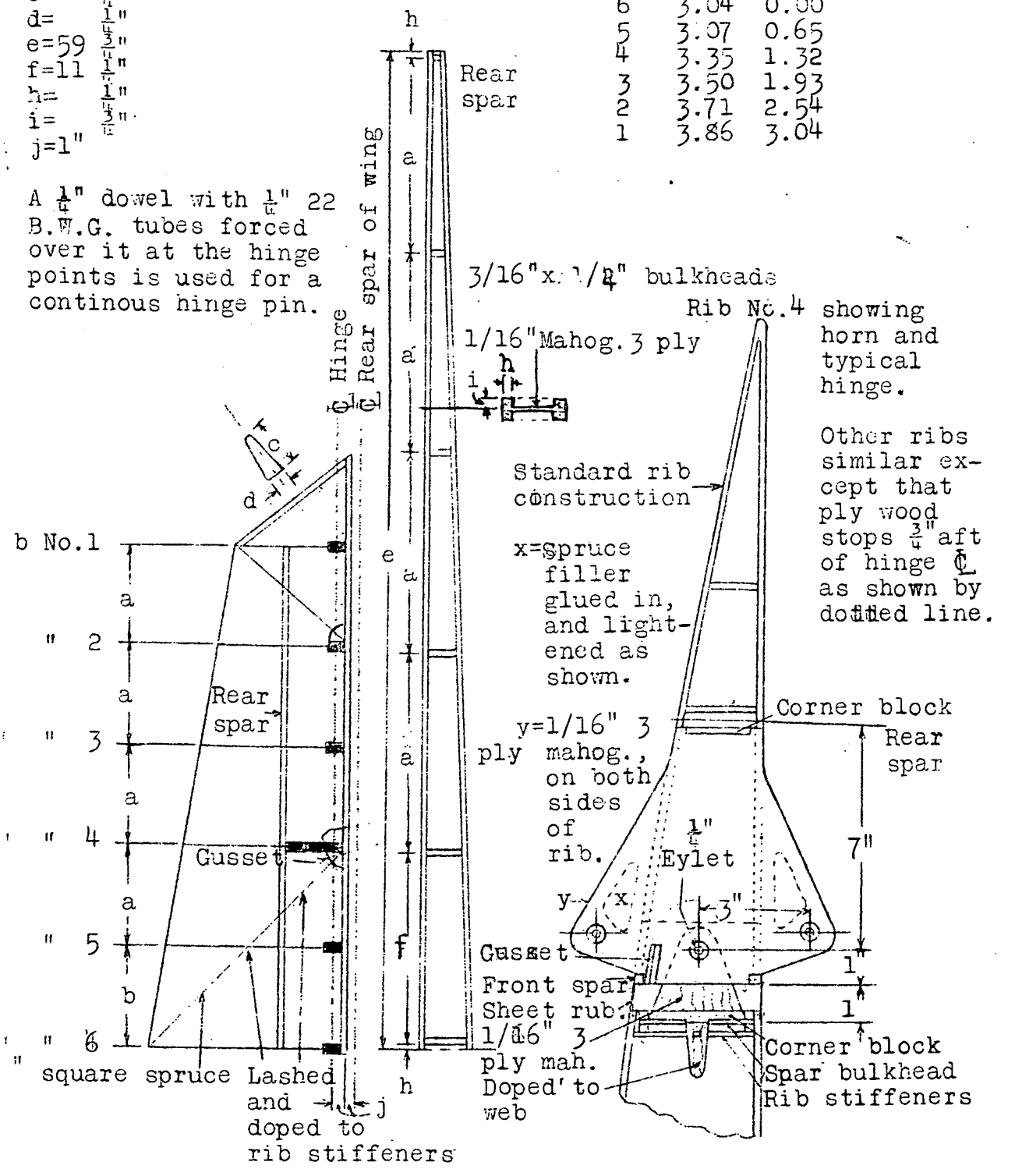


Fig. 8 Detail and assembly of aileron

Fig. 9

Rib sta.	Front Upper	Front Lower	Rear Upper	Rear Lower
Tip	6.73	6.61	6.86	6.74
1	7.37	5.96	7.55	6.06
2	7.60	5.46	7.55	5.48
3	7.73	4.86	7.55	4.88
4	7.91	4.24	7.55	4.23
5	7.99	3.50	7.55	3.49
6	8.16	2.81	7.55	2.81
7	8.30	2.04	7.55	2.05
8	8.42	1.23	7.55	1.29
9	8.52	0.42	7.55	0.46
10	8.60	0.00	7.55	0.00

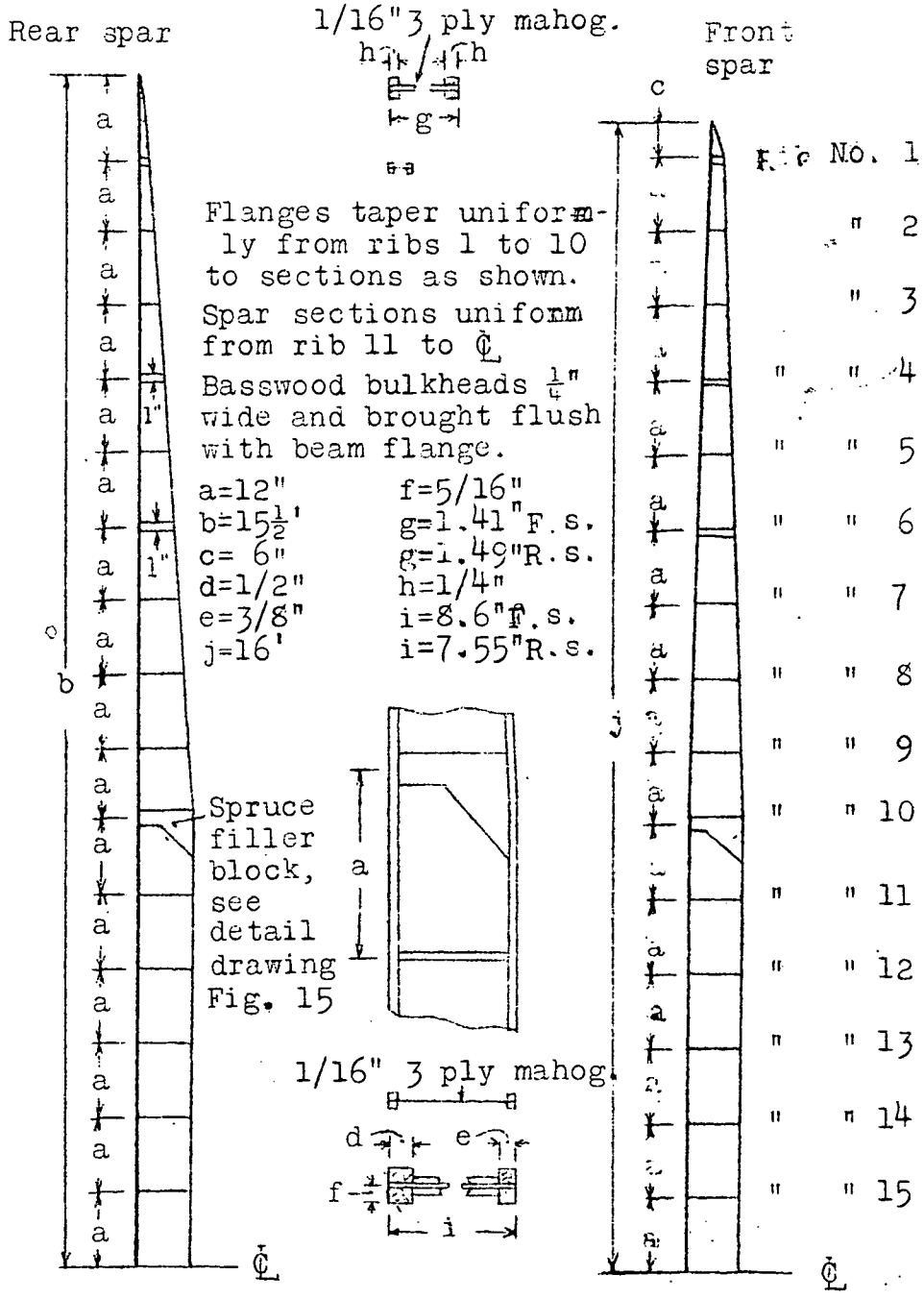


Fig. 9 Detail and assembly of wing spars.

Fig. 10

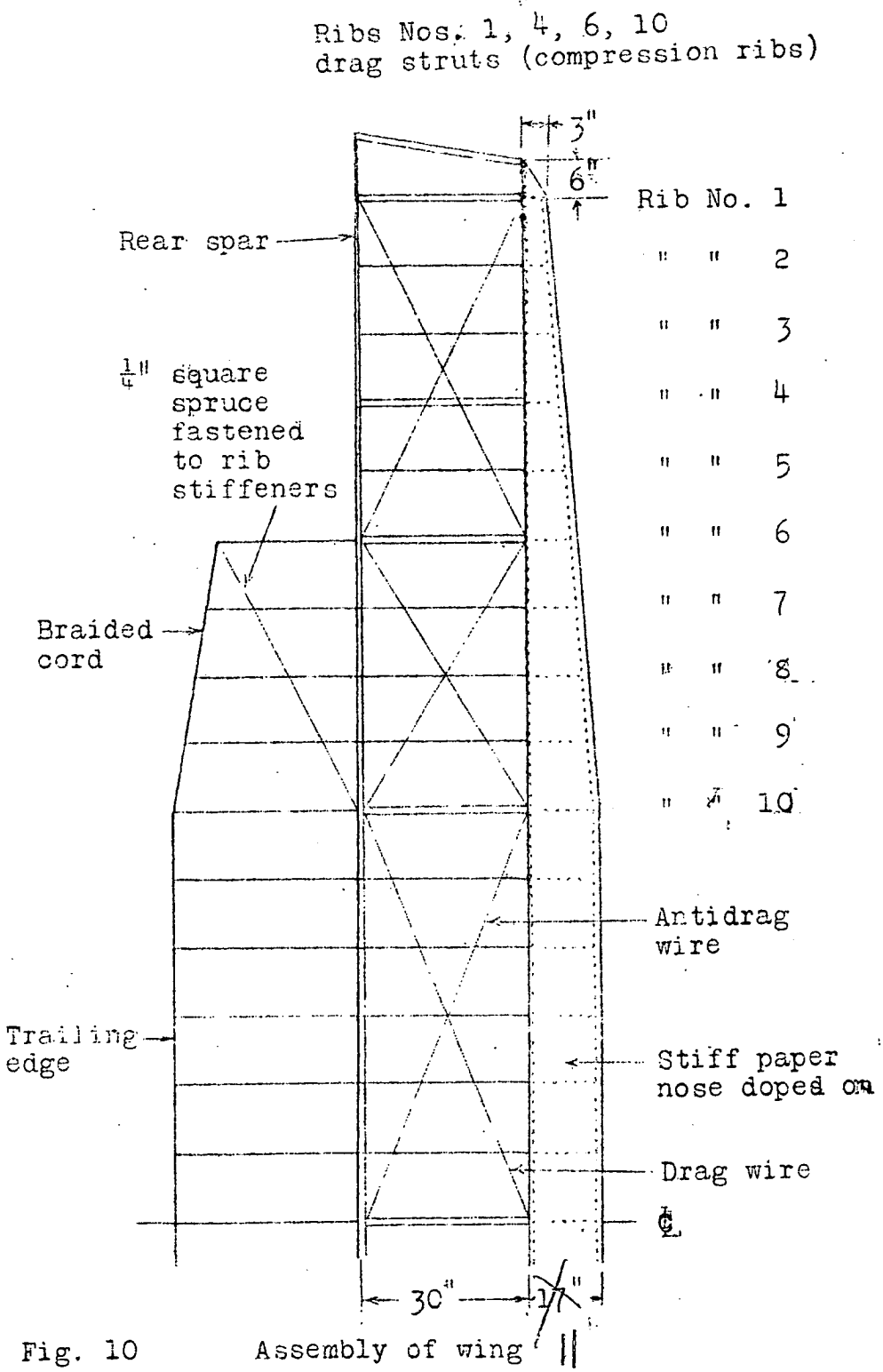
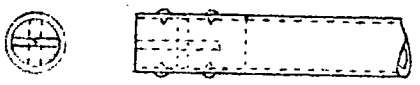


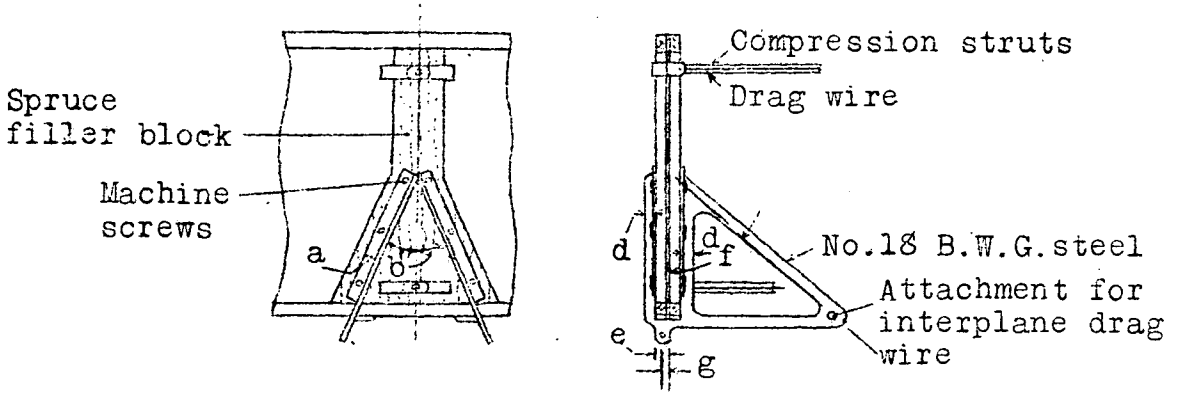
Fig. 10 Assembly of wing

Fig. 11



Slotted hard wood block screwed
in plate and drilled on assembly

End fitting on struts



a=5/16"
b=24°
d=1/4"

e=.45"
f=52° Front } True
f=47° Rear } angle

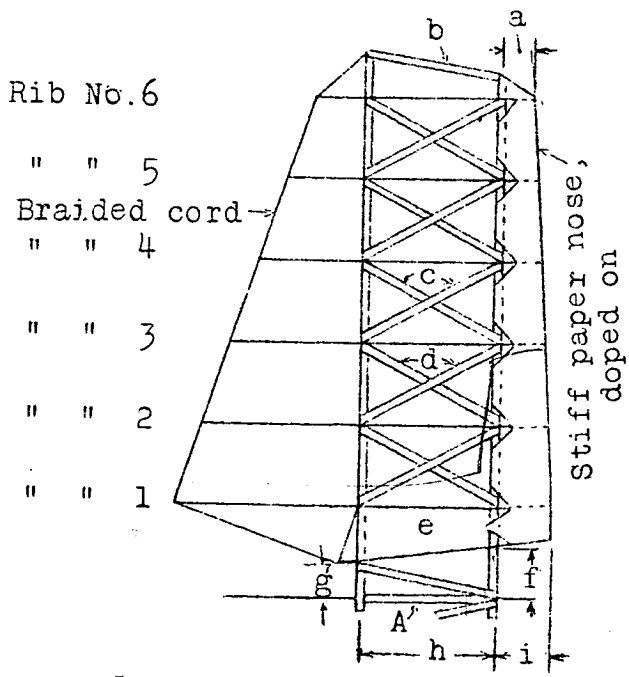
g=1.7° Front fitting
g= 6° Rear fitting

Wing spar fitting for "A" strut

Fig. 11 Wing spar fitting for "A" struts, and end fitting for tubular lift struts.

Fig. 12

Per cent of chord	Distance in inches from L.E. Rib	from ℄± No.1	Distance in inches from L.E. Rib	from ℄± No.2	Distance in inches from L.E. Rib	from ℄± No.3	Distance in inches from L.E. Rib	from ℄± No.4
0.00	0.00	0.00	00.00	0.00	0.00	0.00	0.00	0.00
1.25	0.53	1.10	0.48	1.07	0.44	0.98	0.39	0.81
2.50	1.05	1.55	0.96	1.50	0.87	1.36	0.78	1.13
5.00	2.10	2.12	1.92	2.06	1.74	1.86	1.56	1.54
7.50	3.15	2.50	2.88	2.43	2.61	2.20	2.34	1.83
10.00	4.20	2.77	3.84	2.71	3.50	2.43	3.12	2.04
15.00	6.30	3.14	5.76	3.05	5.22	2.74	4.68	2.50
20.00	8.40	3.34	7.68	3.25	6.96	2.94	6.24	2.46
30.00	12.60	3.44	11.52	3.34	10.44	3.02	9.36	2.51
40.00	16.80	3.20	15.36	3.10	13.92	2.80	12.48	2.34
50.00	21.00	2.74	19.20	2.67	17.40	2.42	15.60	2.00
60.00	25.20	2.23	23.04	2.17	20.88	1.95	18.72	1.64
70.00	29.40	1.62	26.88	1.56	24.36	1.41	21.84	1.18
80.00	33.60	1.01	30.72	0.98	27.84	0.89	24.96	0.74
90.00	37.80	0.45	34.56	0.44	31.32	0.40	28.08	0.34
95.00	39.90	0.23	36.48	0.22	33.06	0.20	29.64	0.18
-- --	41.90	0.09	38.30	0.08	34.70	0.08	31.10	0.07
100.00	42.00	0.00	38.40	0.00	34.80	0.00	31.20	0.00



%	Rib No.5		Rib No.6	
0.00	0.00	0.00	0.00	0.00
1.25	0.35	0.58	0.30	0.32
2.50	0.69	0.82	0.60	0.44
5.00	1.38	1.12	1.20	0.60
7.50	2.07	1.34	1.80	0.71
10.00	2.76	1.49	2.40	0.80
15.00	4.14	1.69	3.60	0.91
20.00	5.52	1.79	4.80	0.96
30.00	8.28	1.82	7.20	0.98
40.00	11.04	1.70	9.60	0.92
50.00	13.80	1.45	12.00	0.80
60.00	16.56	1.18	14.40	0.64
70.00	19.32	0.84	16.80	0.48
80.00	22.08	0.54	19.20	0.29
90.00	24.84	0.24	21.60	0.13
95.00	26.22	0.12	22.80	0.07
-- --	27.50	0.06	23.90	0.03
100.00	27.60	0.00	24.00	0.00

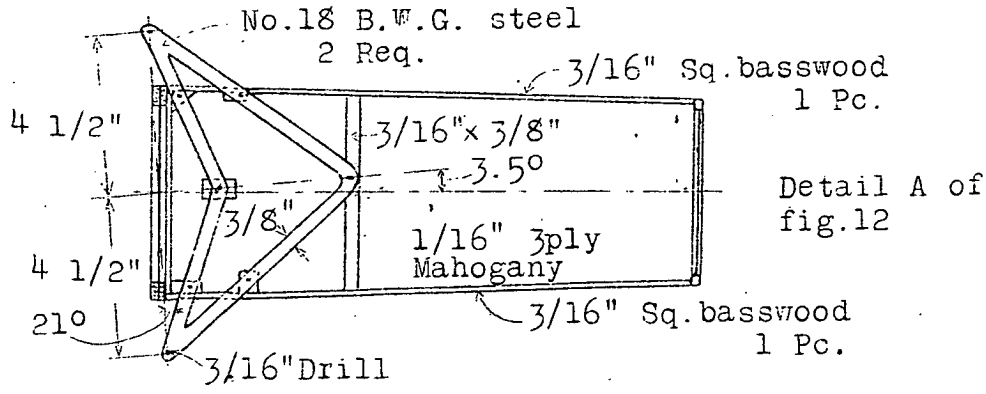
Note-The front spar is at 15 per cent of chord.

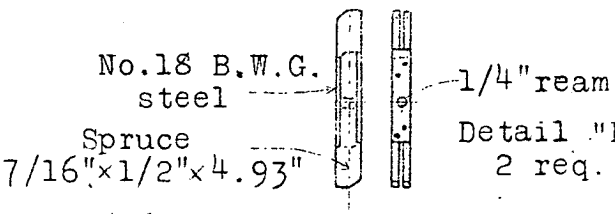
a=3.6"
b=1/16"x3/4" basswood
c=1/16"x1/2" basswood
d=1/16"x3/4" basswood
e=1/16" 3 ply mahogany

f=5 5/8"
g=3 7/8"
h=1' 3"
i=6.3"

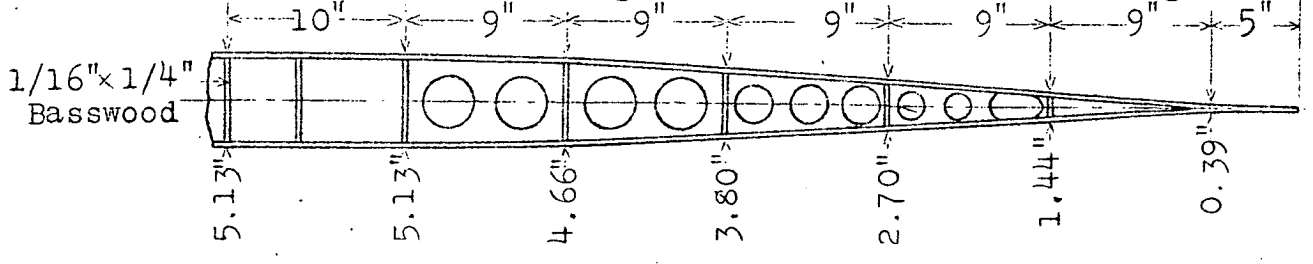
Fig. 12 Assembly and rib ordinates of elevator

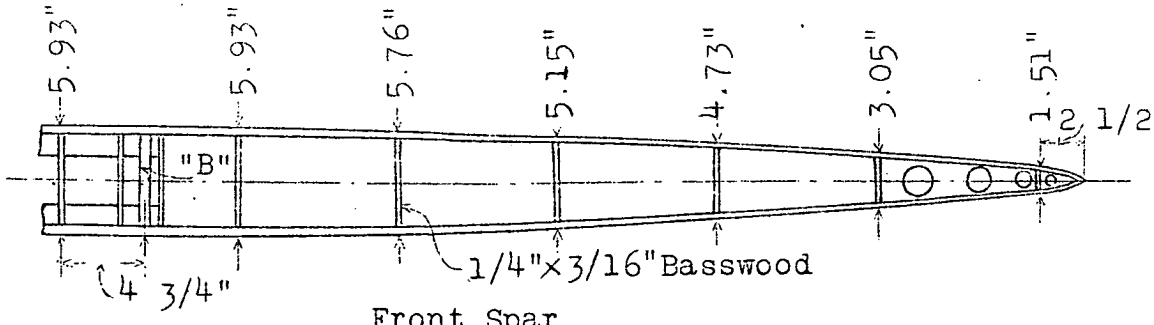
Fig.13





Rear spar - 1/16" 3ply mahogany web. Split flanges,each half 1/16"x1/4"basswood.Fastenings to be made with nails and glue.





Front Spar

1/16" 3ply mahogany web. Split flanges of spruce,each half to be 3/16" 1/2"at the middle and tapered to 3/16"square at the ends.

Fig.13 Details and assembly of spars and horn of elevator.

Fig.14

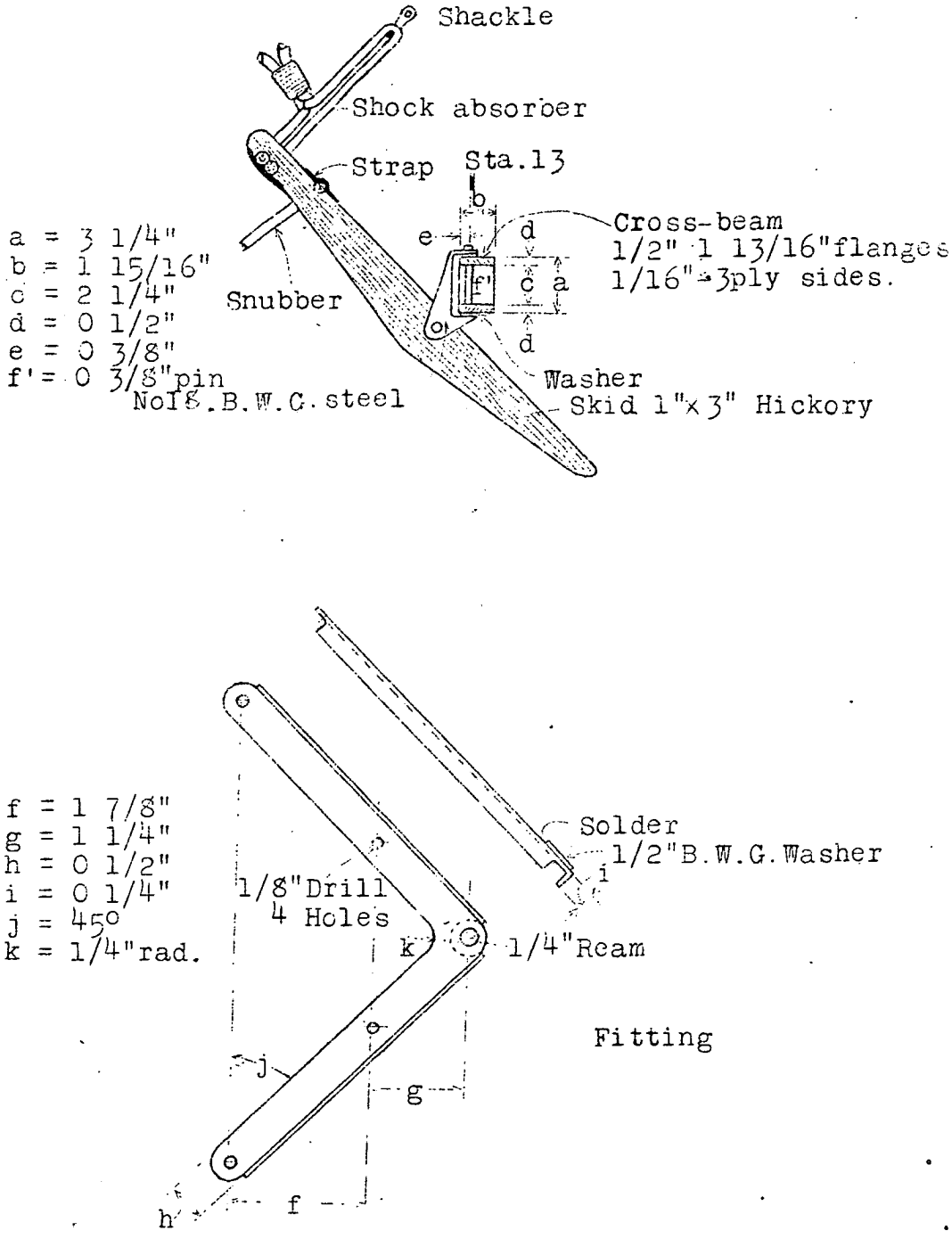
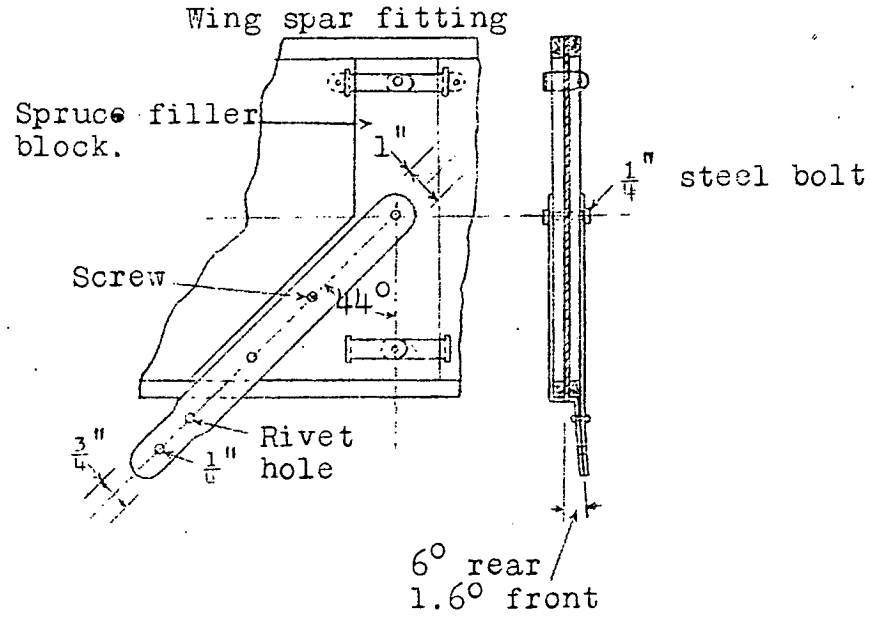


Fig.14 Tail skid and elevator hinge fitting.

Fig.15.



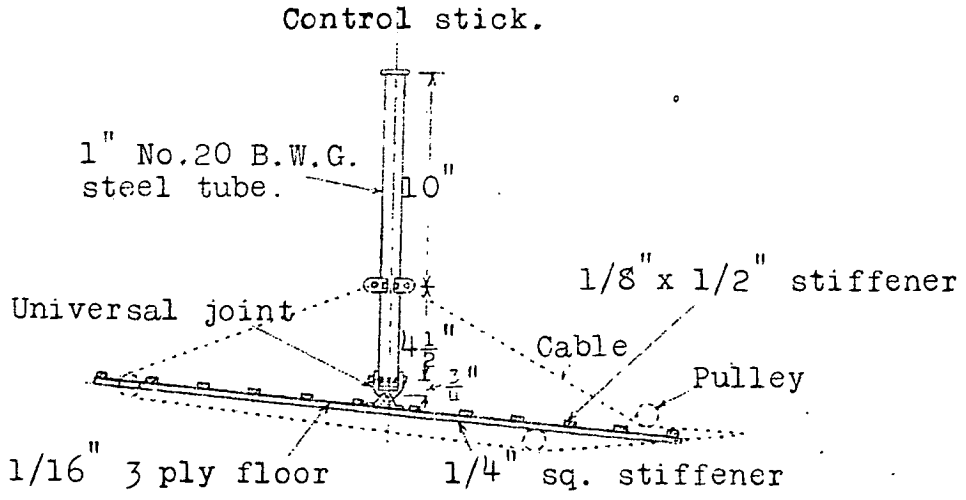
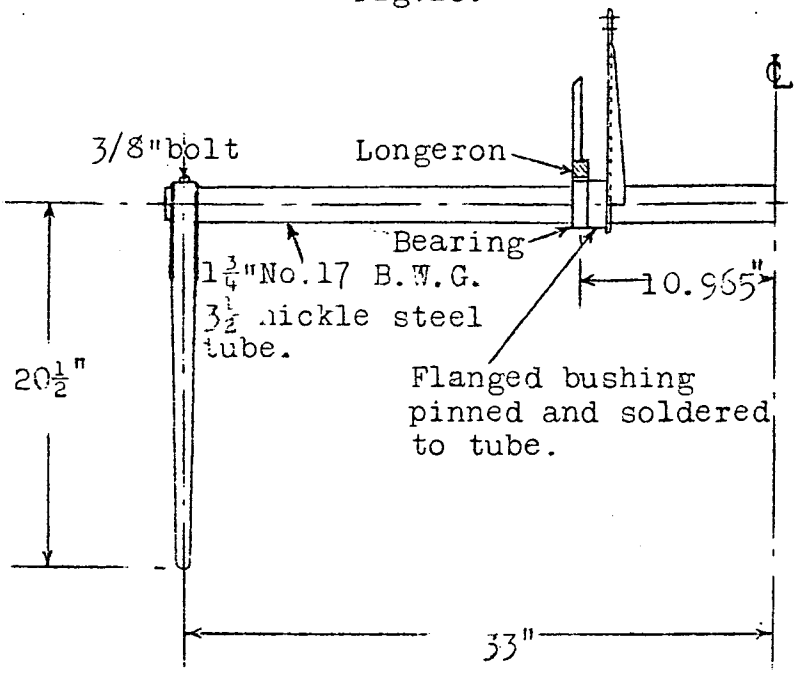


Fig.15. Wing spar lift strut fitting and control stick.

Fig.16.



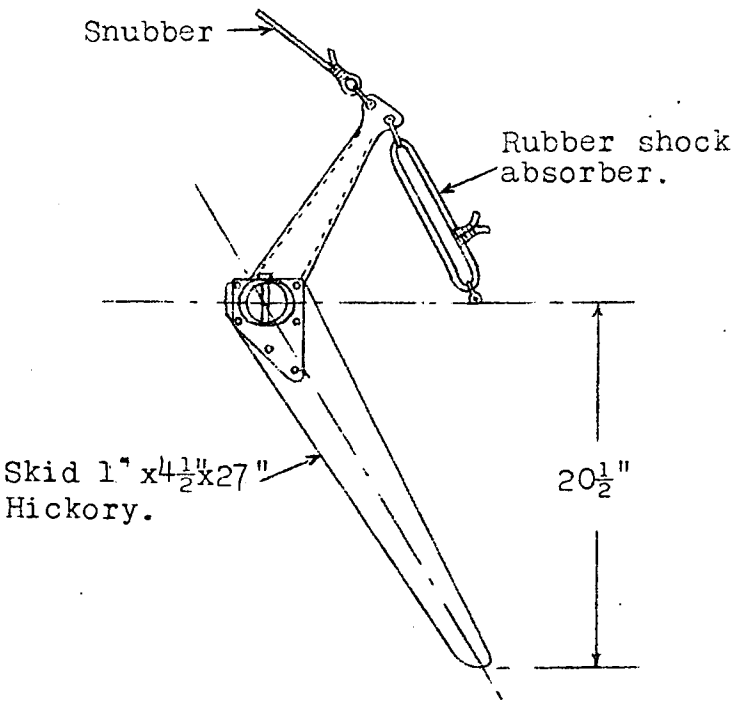
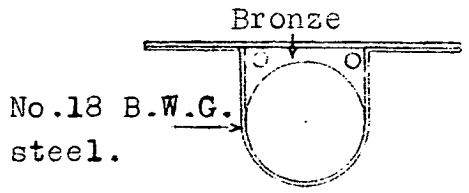
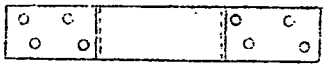


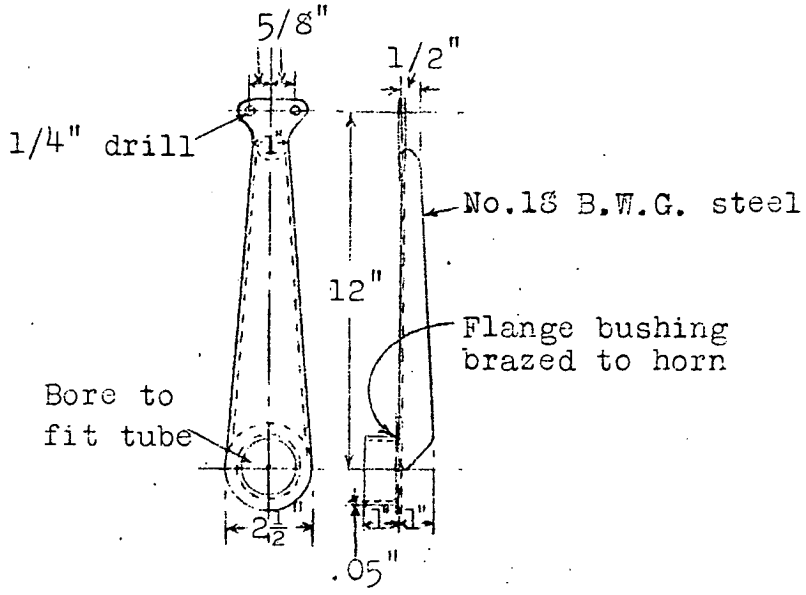
Fig.16. Assembly of landing gear.

Fig.17.





Bearing 2 required



Horn 2 required

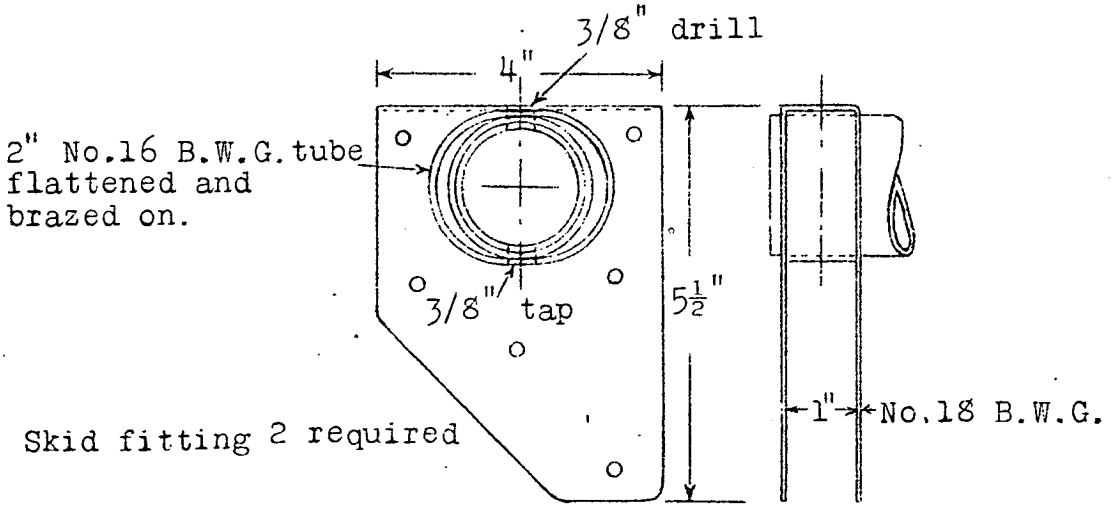


Fig.17. Details of landing gear.