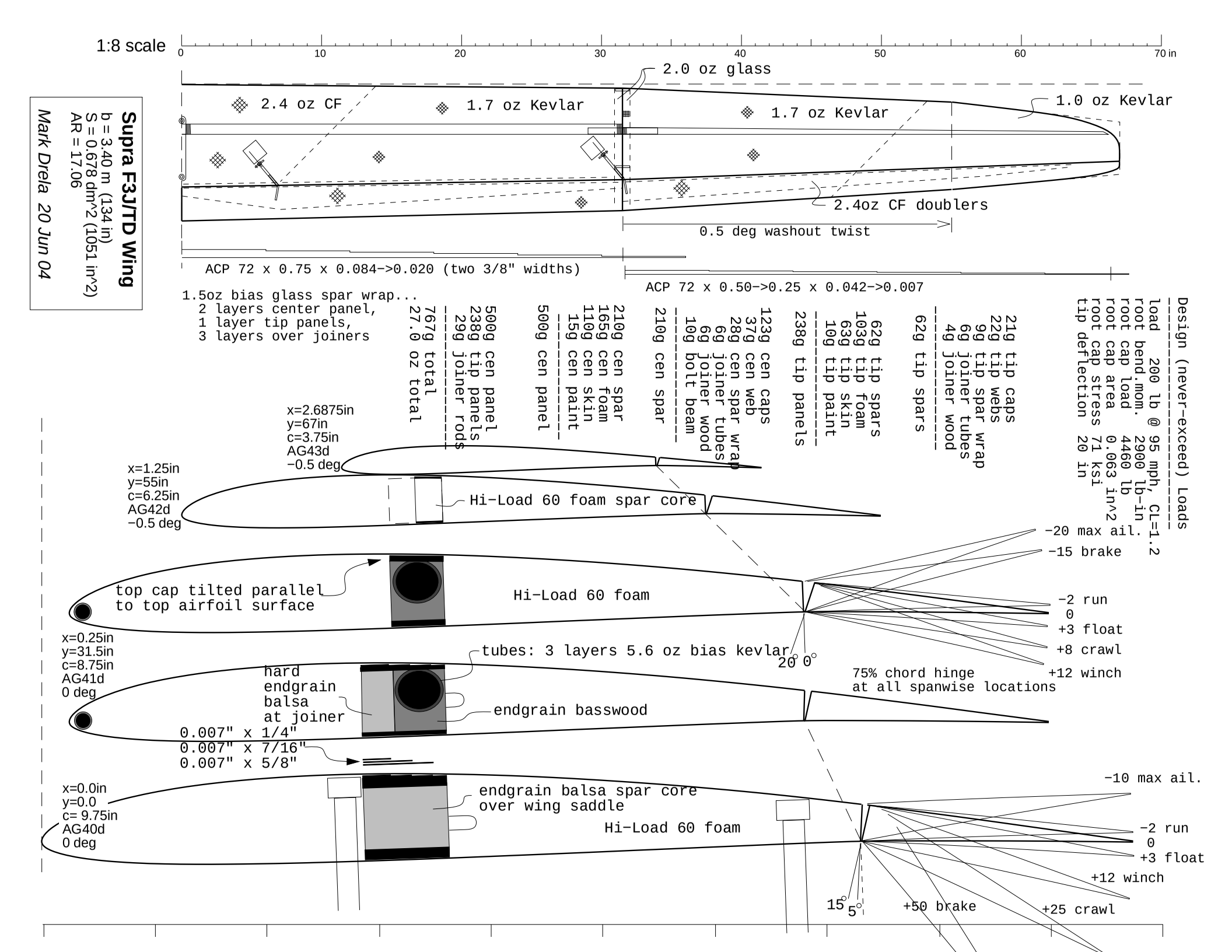
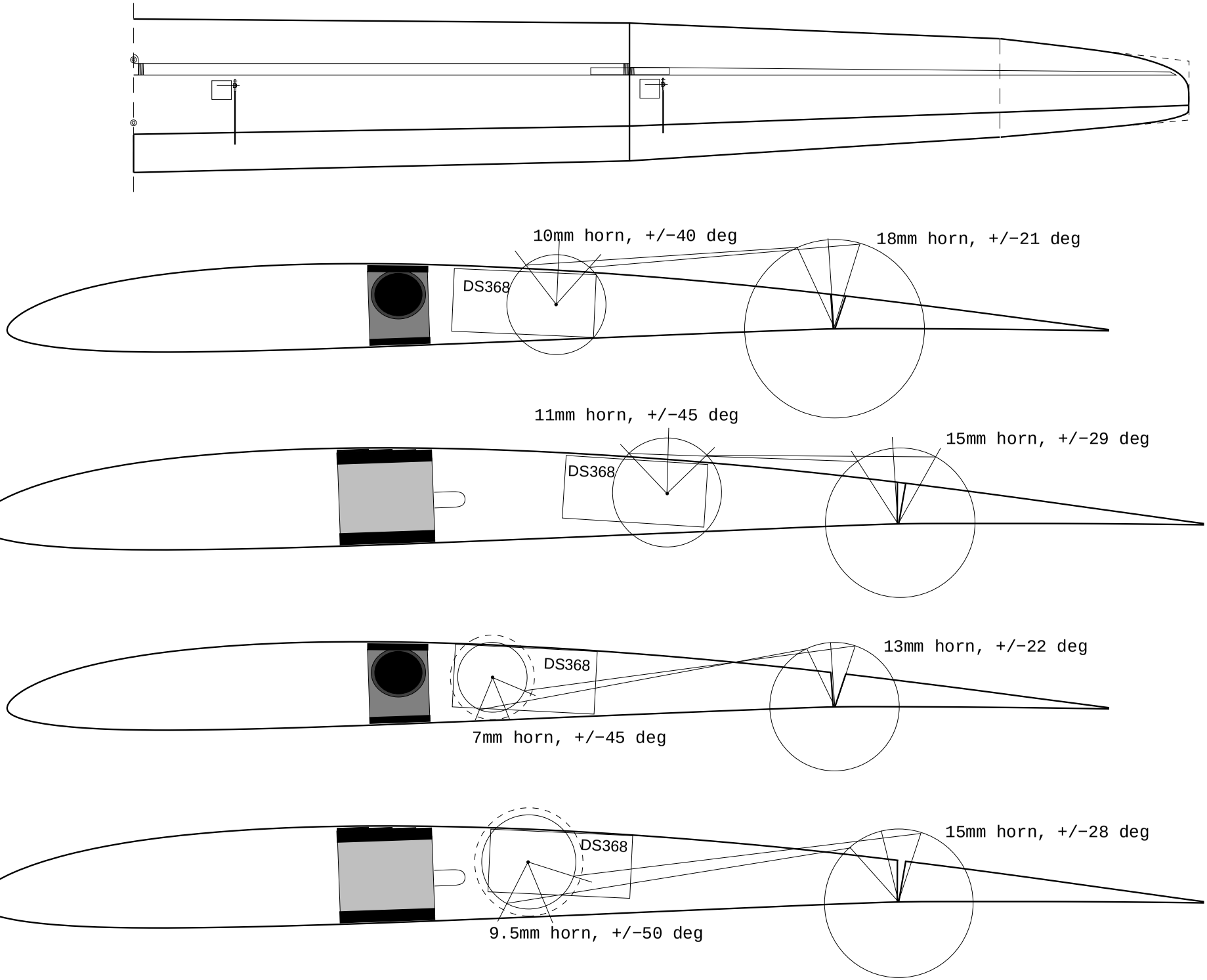
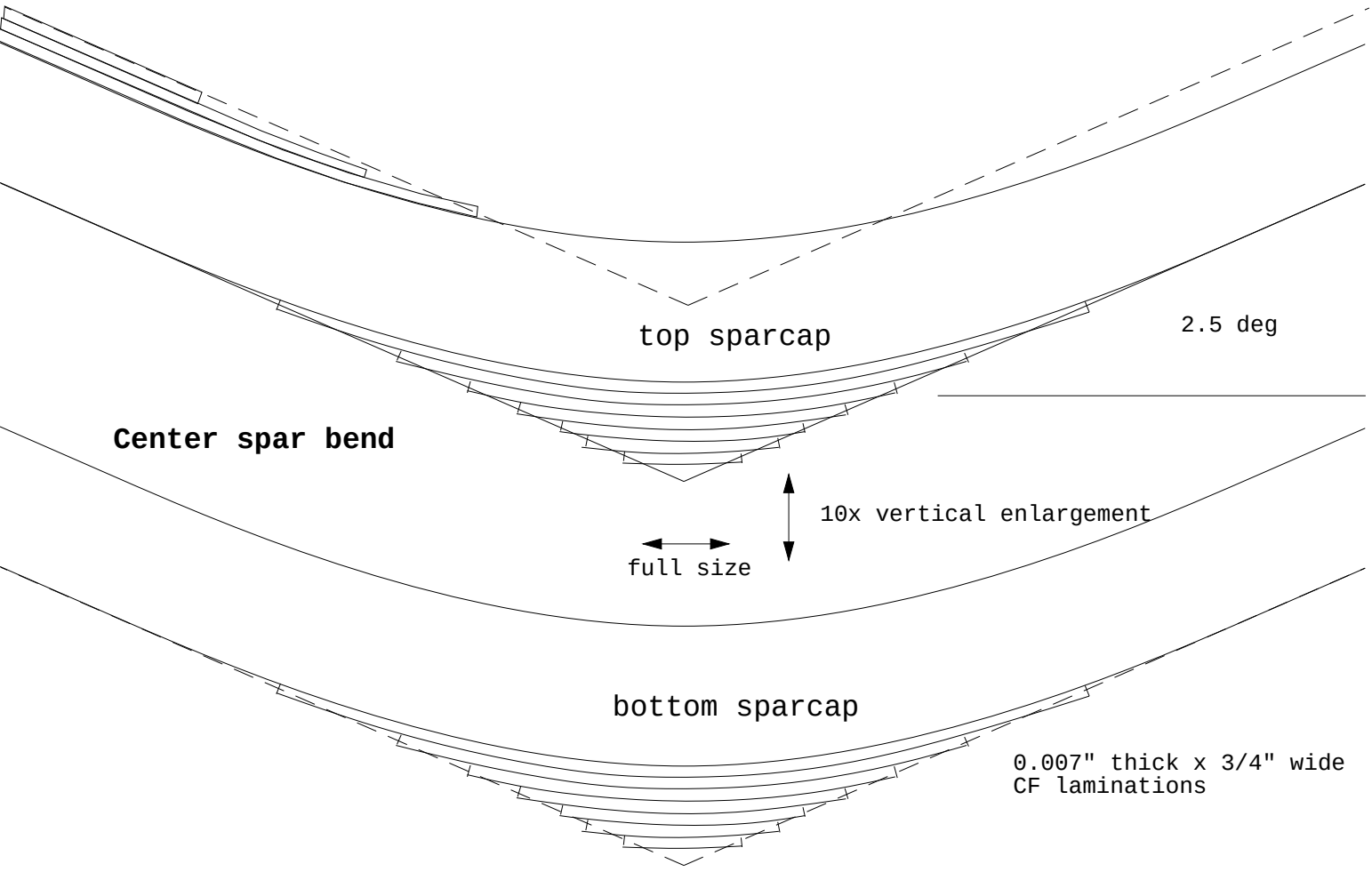
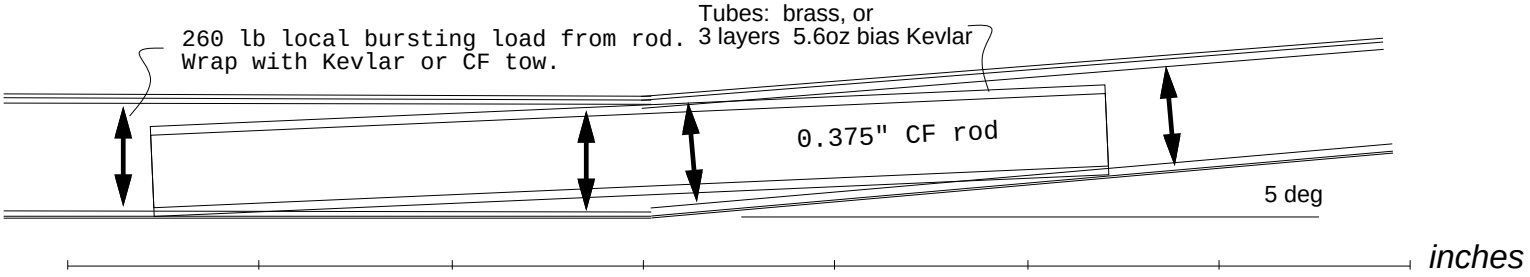

1:8 scale
0
10
20
30
40
50
60
70 in
Supra F3J/TD Wing
b = 3.40 m (134 in)
S = 0.678 dm^2 (1051 in^2)
AR = 17.06
Mark Drela 20 Jun 04
2.0 oz glass
2.4 oz CF
1.7 oz Kevlar
1.7 oz Kevlar
1.0 oz Kevlar
2.4oz CF doublers
0.5 deg washout twist
ACP 72 x 0.75 x 0.084->0.020 (two 3/8" widths)
ACP 72 x 0.50->0.25 x 0.042->0.007
1.5oz bias glass spar wrap...
2 layers center panel,
1 layer tip panels,
3 layers over joiners
767g total
27.0 oz total
500g cen panel
238g tip panels
29g joiner rods
500g cen panel
210g cen spar
165g cen foam
110g cen skin
15g cen paint
123g cen caps
37g cen web
28g cen spar wrap
6g joiner tubes
6g joiner wood
10g bolt beam
238g tip panels
62g tip spars
103g tip foam
63g tip skin
10g tip paint
62g tip spars
21g tip caps
22g tip webs
9g tip spar wrap
6g joiner tubes
4g joiner wood
Design (never-exceed) Loads
load 200 lb @ 95 mph, CL=1.2
root bend.mom. 2900 lb-in
root cap load 4460 lb
root cap area 0.063 in^2
root cap stress 71 ksi
tip deflection 20 in
x=2.6875in
y=67in
c=3.75in
AG43d
-0.5 deg
x=1.25in
y=55in
c=6.25in
AG42d
-0.5 deg
Hi-Load 60 foam spar core
top cap tilted parallel
to top airfoil surface
Hi-Load 60 foam
x=0.25in
y=31.5in
c=8.75in
AG41d
0 deg
tubes: 3 layers 5.6 oz bias kevlar
hard
endgrain
balsa
at joiner
endgrain basswood
0.007" x 1/4"
0.007" x 7/16"
0.007" x 5/8"
x=0.0in
y=0.0
c= 9.75in
AG40d
0 deg
endgrain balsa spar core
over wing saddle
Hi-Load 60 foam
-20 max ail.
-15 brake
-2 run
0
+3 float
+8 crawl
+12 winch
20°
0°
75% chord hinge
at all spanwise locations
-10 max ail.
-2 run
0
+3 float
+12 winch
+25 crawl
+50 brake
15°
5°

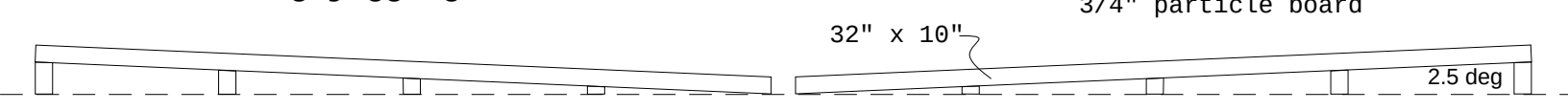

10mm horn, +/−40 deg
18mm horn, +/−21 deg
DS368
11mm horn, +/−45 deg
15mm horn, +/−29 deg
DS368
13mm horn, +/−22 deg
DS368
7mm horn, +/−45 deg
15mm horn, +/−28 deg
DS368
9.5mm horn, +/−50 deg



Wing joiner



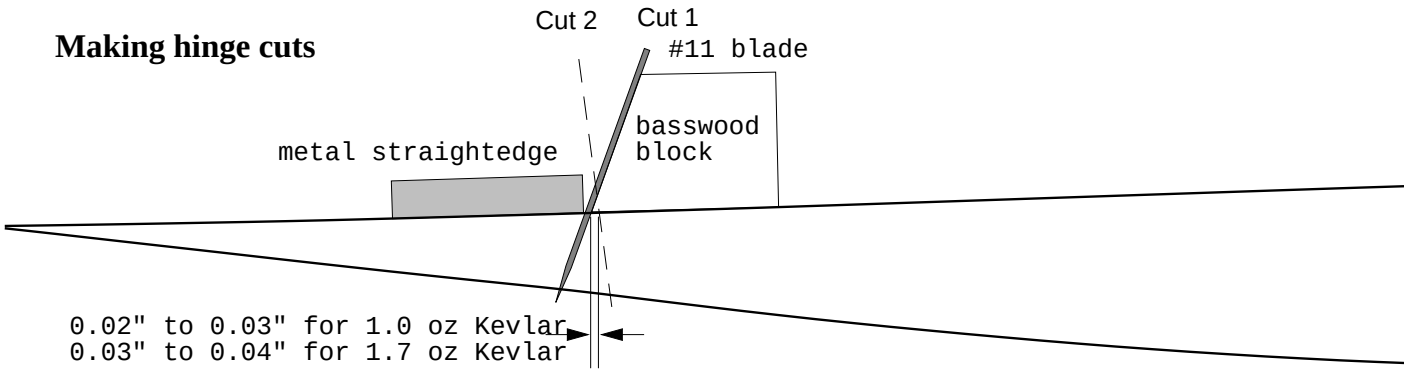
Building/jigging boards



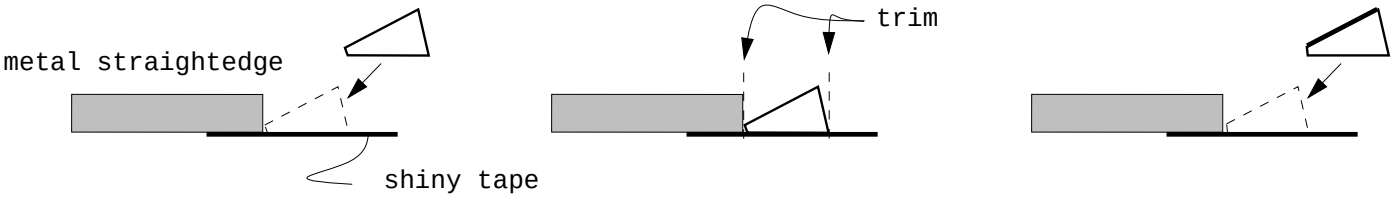
Integral Hinges for Bagged Wings

Mark Drela
10 July 04

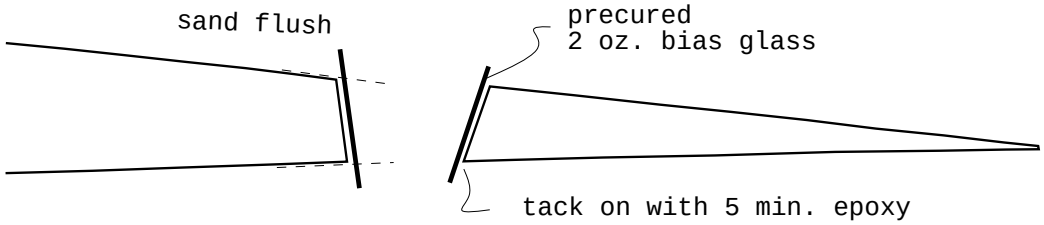
Making hinge cuts



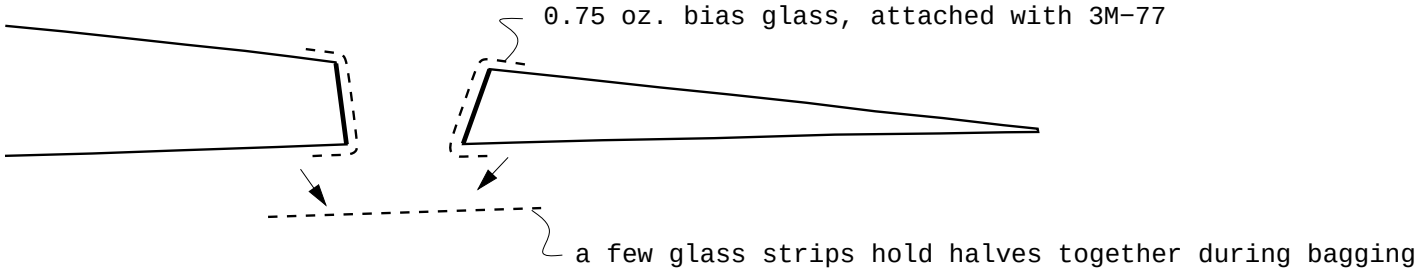
Covering hinge cutout sides with tape



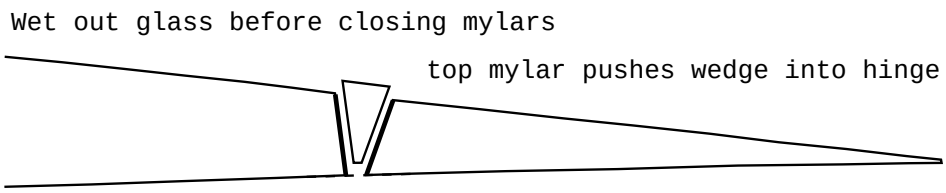
Facing hinge facets



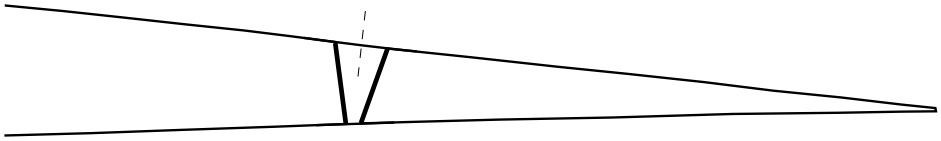
Glassing



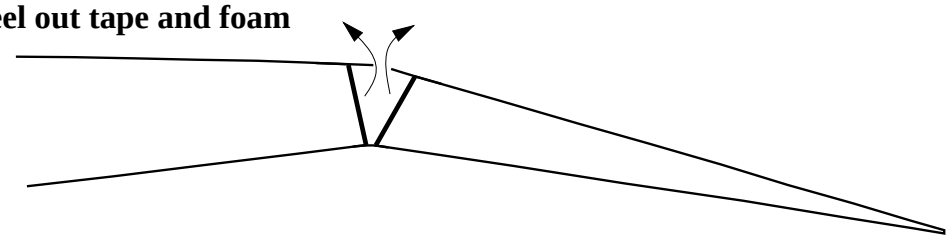
In−bag hinge layup



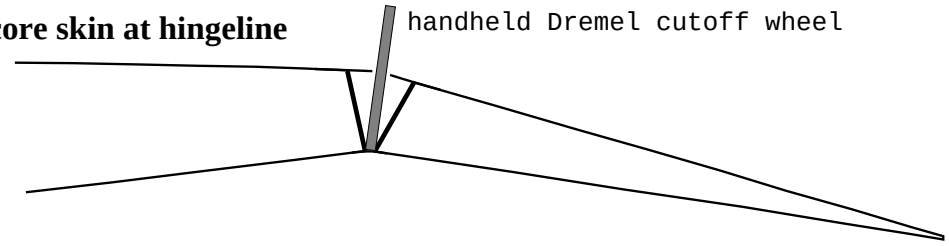
Cut hinge gap skin



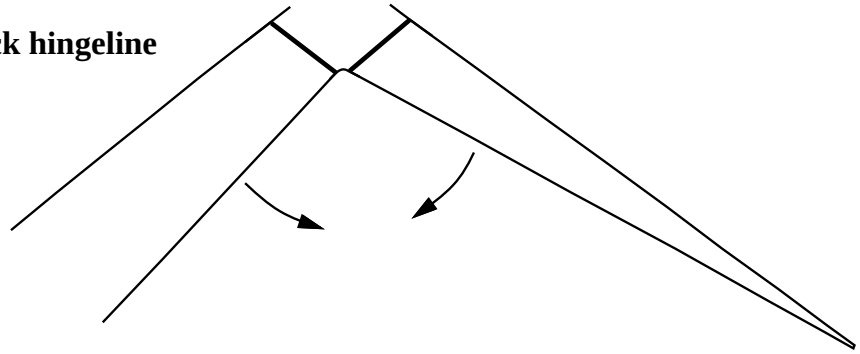
Peel out tape and foam



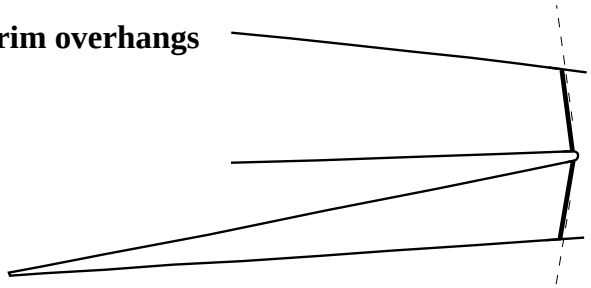
Score skin at hingeline



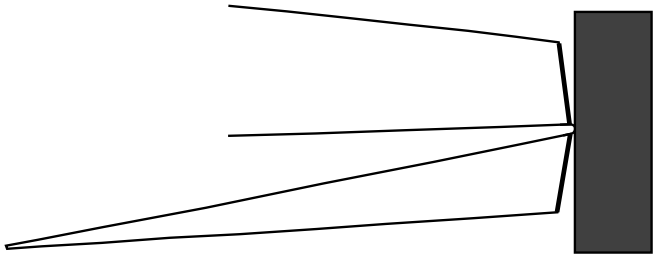
Crack hingeline



Trim overhangs



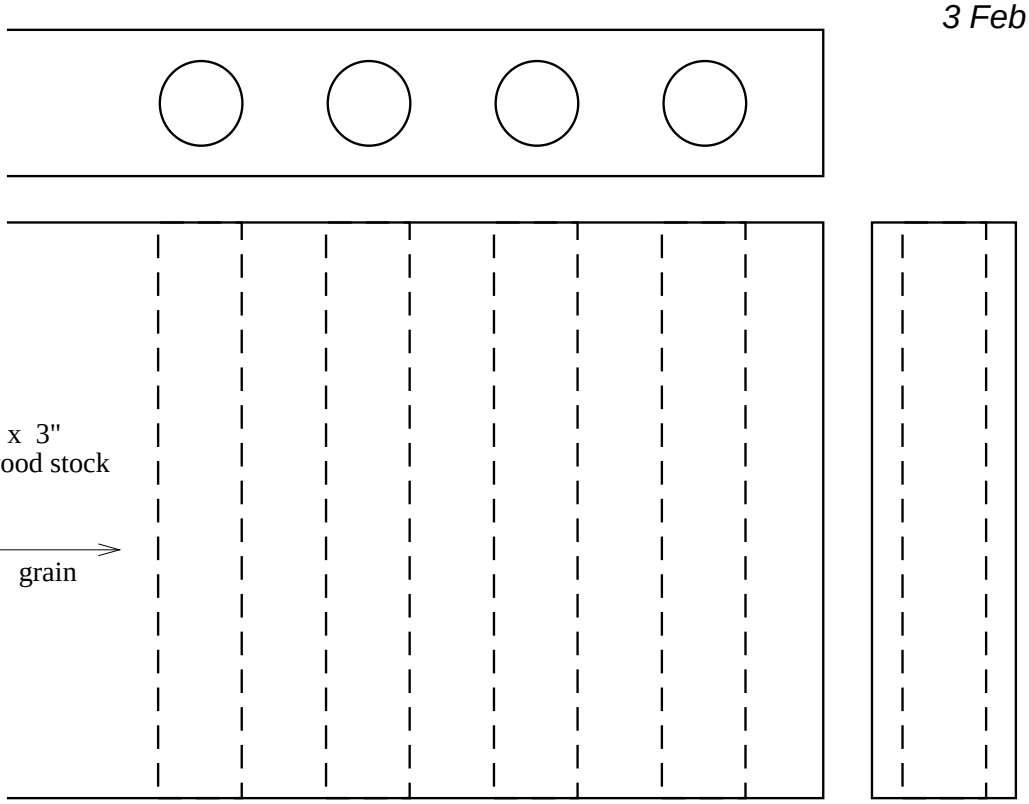
Sand hingeline to soften hinge (optional)



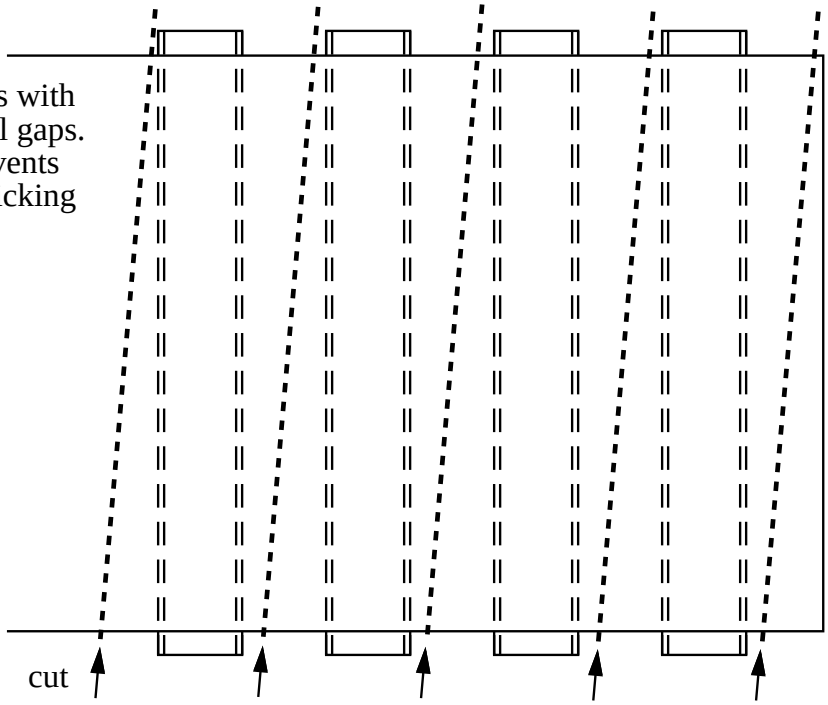
Bubble Dancer Joiner Block Construction

M. Drela

3 Feb 05



1) Drill holes
with drill press



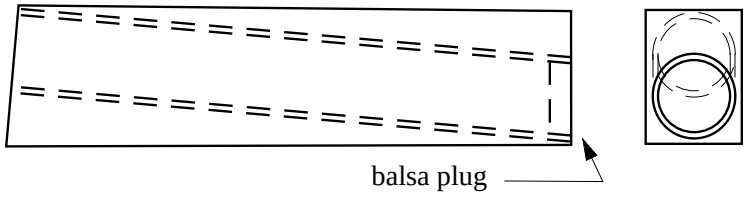
2) Glue in joiner tubes with
excess epoxy to fill all gaps.
Thickened epoxy prevents
excessive endgrain wicking

3) Cut up wood
with 5 degree cuts

4) Belt−sand height to match
balsa web heights.

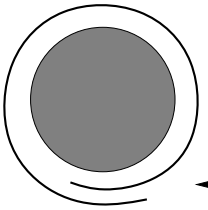
5) Belt−sand ends to 0 deg.
and 5 deg bevels.

6) Belt−sand to 1/2" width



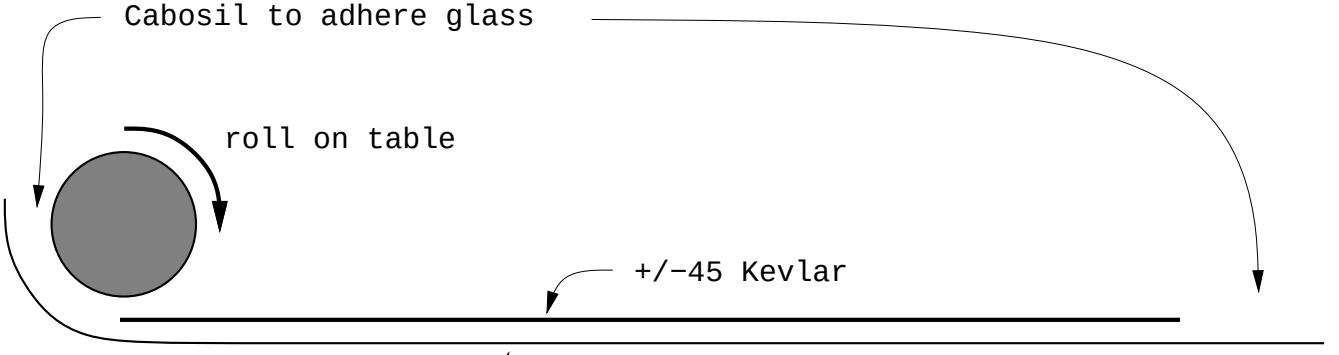
Rolling Kevlar Joiner Housing Tubes

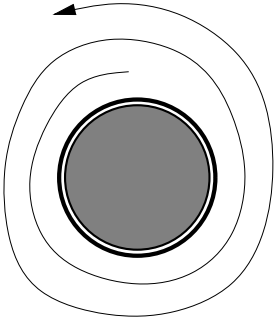
MD 5 May 02



1/2 mil waxed Mylar around joiner rod,
applied with vaseline

put overlap on bottom as shown

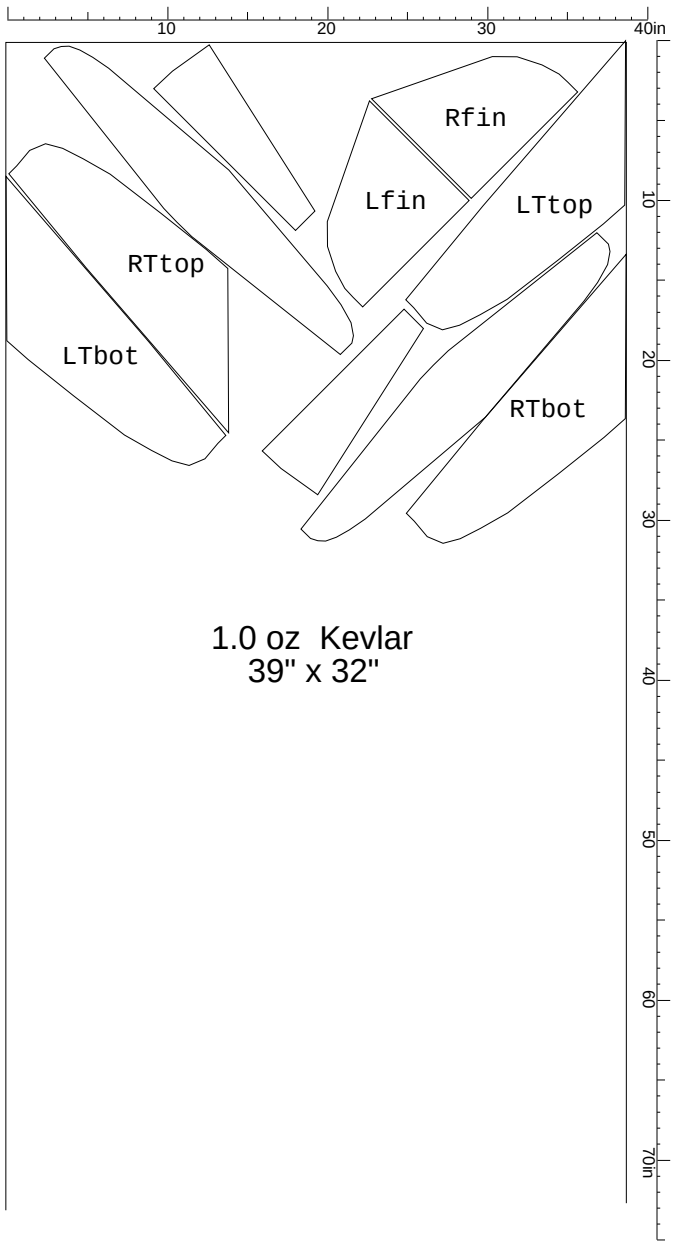




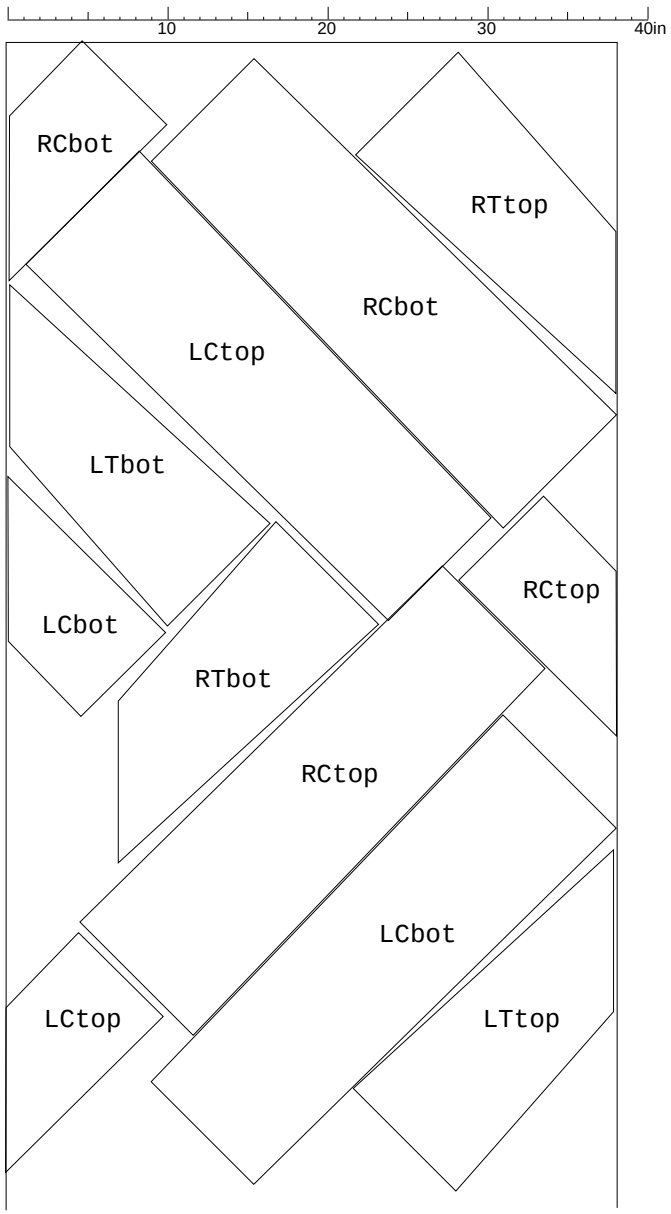
Spiral wrap with 1" wide 1 mil polyethylene strip
(note direction)

Spiral wrap tightly with stretchy tape
(masking, electrical...) for compaction,
or use vacuum bag

When cured, slide everything off on vaseline layer,
and twist out the mylar (that's why the wax was used)



1.0 oz Kevlar
39" x 32"

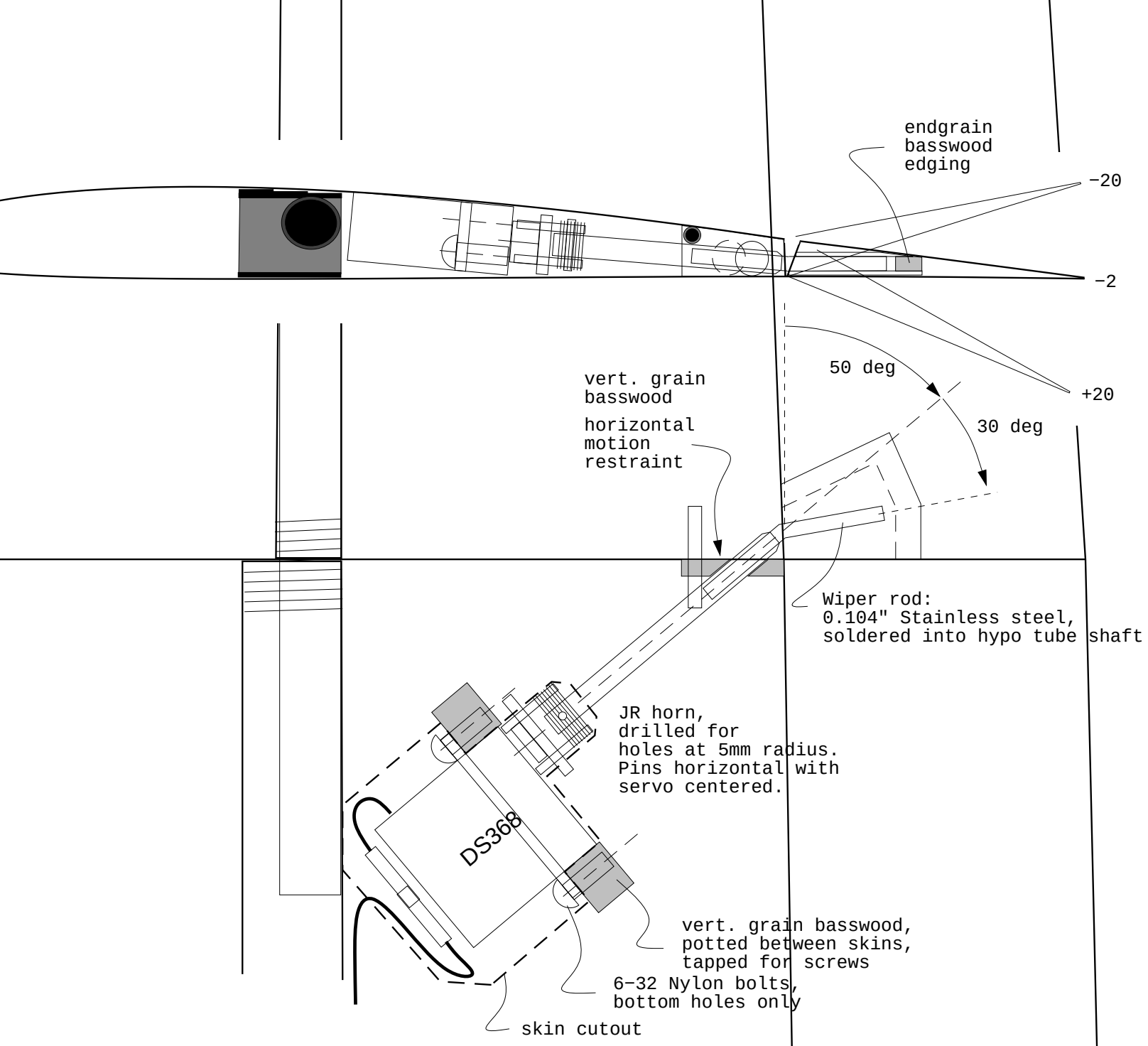


1.7 oz Kevlar
38" x 72"

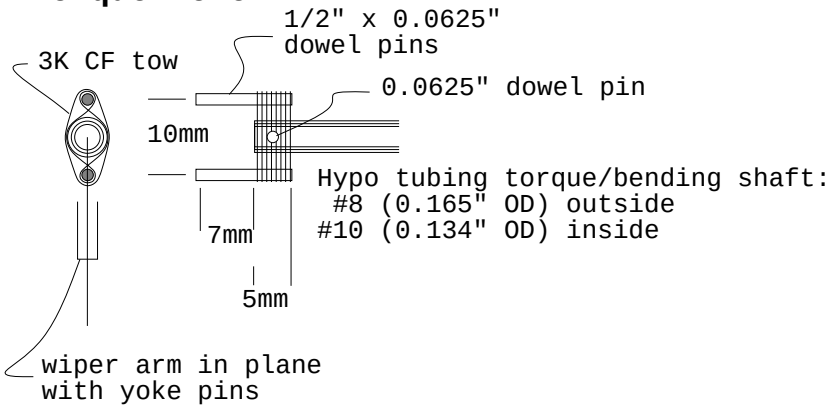
Kevlar doublers used
in lieu of 2.4 oz CF

Supra F3J/TD 3.4m
Kevlar Patterns

MD 12 Apr 04



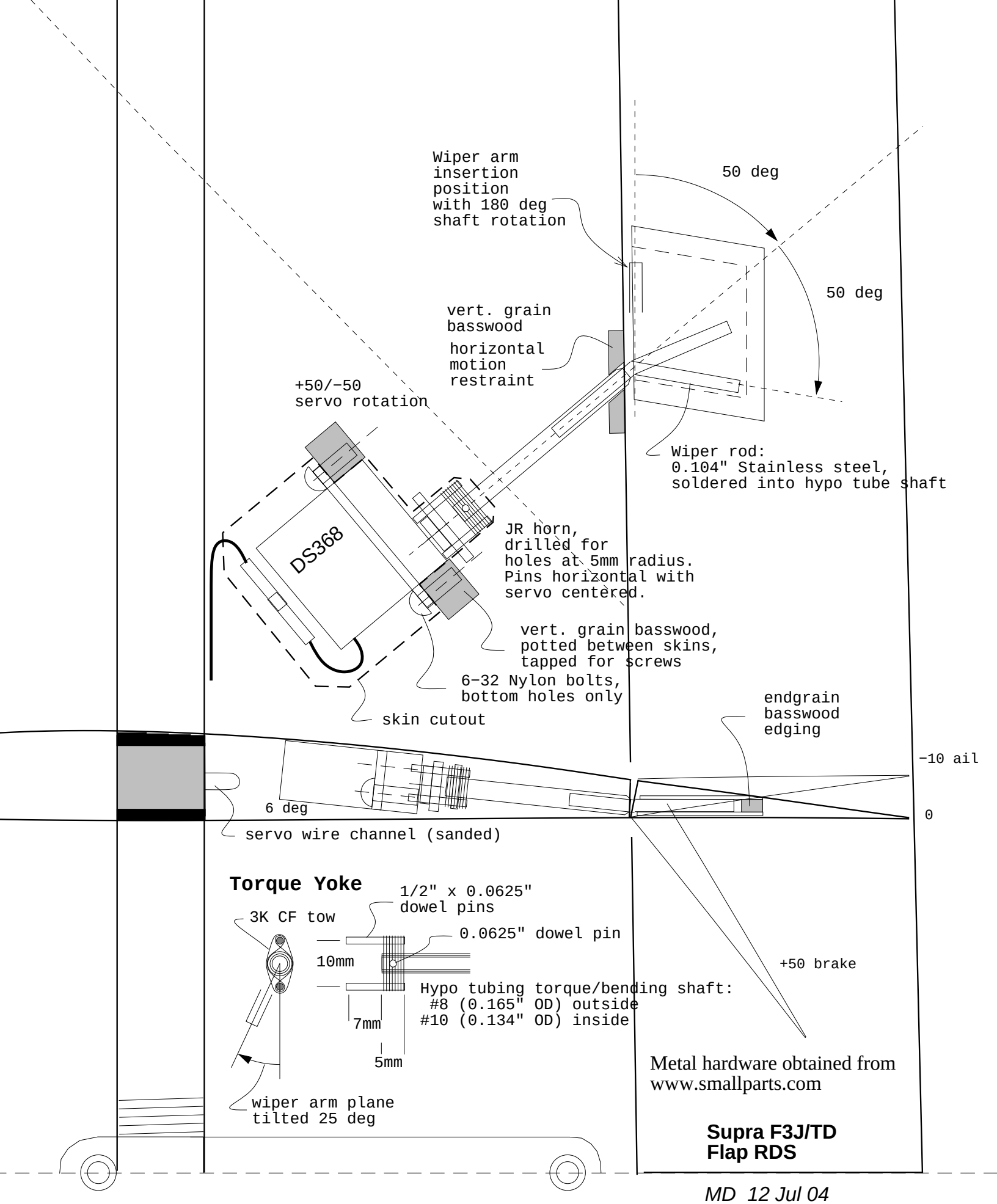
Torque Yoke

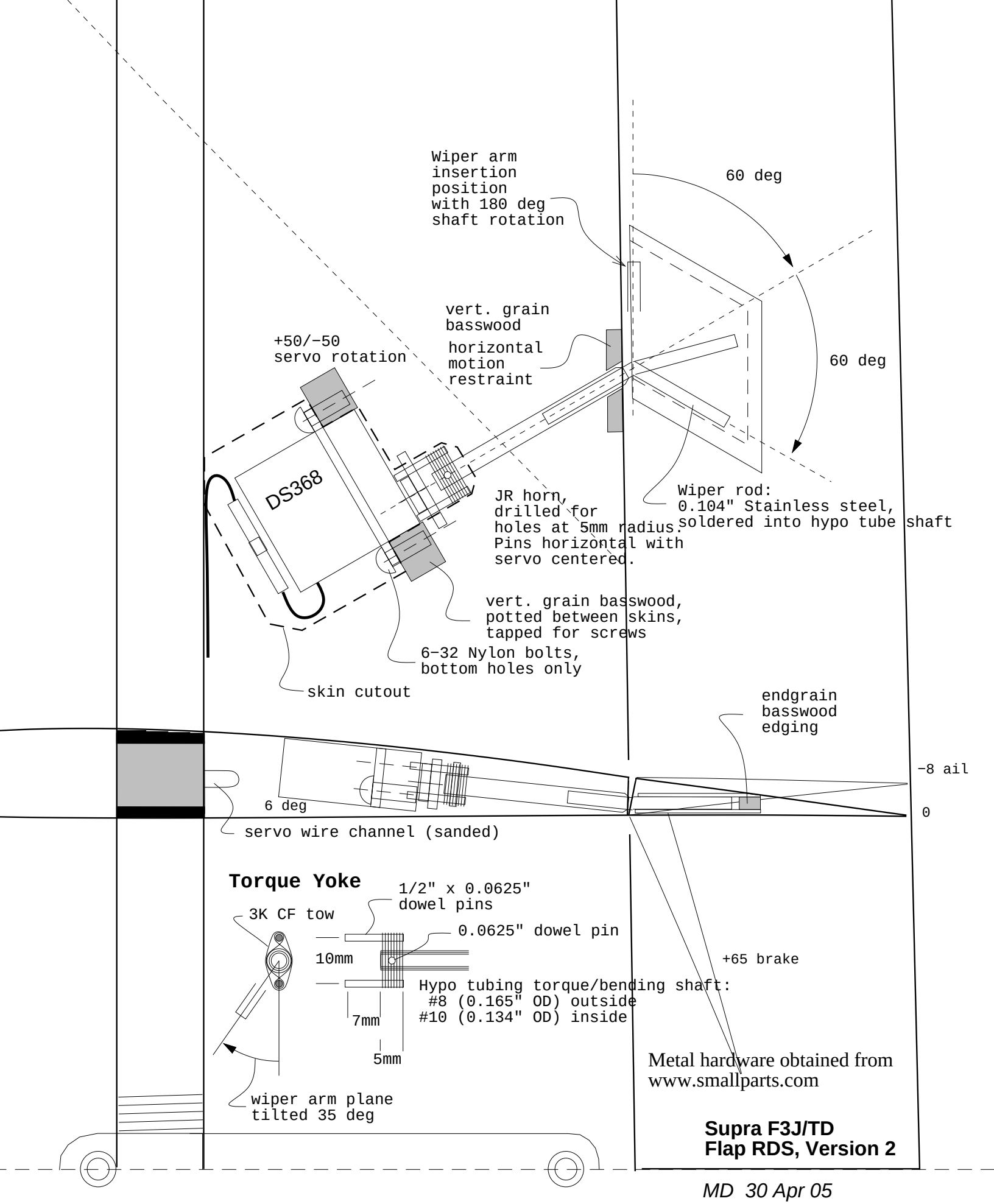


Metal hardware obtained from
www.smallparts.com

Supra F3J/TD
Aileron RDS

MD 12 Jul 04

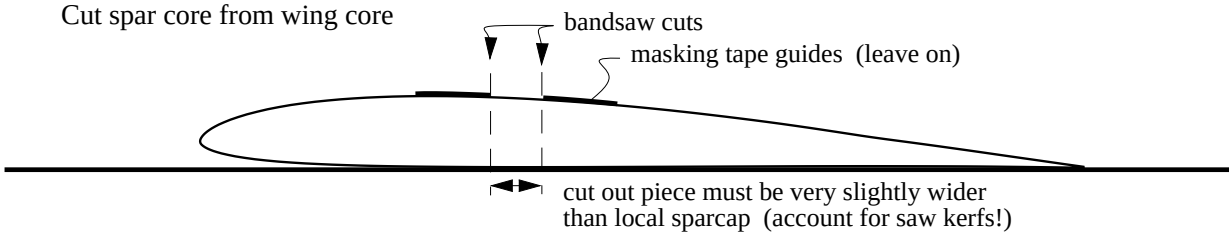

Wiper arm
insertion
position
with 180 deg
shaft rotation
50 deg
50 deg
vert. grain
basswood
horizontal
motion
restraint
+50/−50
servo rotation
Wiper rod:
0.104" Stainless steel,
soldered into hypo tube shaft
DS368
JR horn,
drilled for
holes at 5mm radius.
Pins horizontal with
servo centered.
vert. grain basswood,
potted between skins,
tapped for screws
6−32 Nylon bolts,
bottom holes only
skin cutout
endgrain
basswood
edging
−10 ail
6 deg
0
servo wire channel (sanded)
Torque Yoke
1/2" x 0.0625"
dowel pins
3K CF tow
0.0625" dowel pin
10mm
Hypo tubing torque/bending shaft:
#8 (0.165" OD) outside
#10 (0.134" OD) inside
7mm
5mm
+50 brake
wiper arm plane
tilted 25 deg
Metal hardware obtained from
www.smallparts.com
Supra F3J/TD
Flap RDS
MD 12 Jul 04


Wiper arm
insertion
position
with 180 deg
shaft rotation
60 deg
60 deg
vert. grain
basswood
horizontal
motion
restraint
+50/−50
servo rotation
DS368
JR horn,
drilled for
holes at 5mm radius.
Pins horizontal with
servo centered.
Wiper rod:
0.104" Stainless steel,
soldered into hypo tube shaft
vert. grain basswood,
potted between skins,
tapped for screws
6−32 Nylon bolts,
bottom holes only
skin cutout
endgrain
basswood
edging
−8 ail
0
6 deg
servo wire channel (sanded)
Torque Yoke
1/2" x 0.0625"
dowel pins
3K CF tow
0.0625" dowel pin
10mm
+65 brake
Hypo tubing torque/bending shaft:
#8 (0.165" OD) outside
#10 (0.134" OD) inside
7mm
5mm
wiper arm plane
tilted 35 deg
Metal hardware obtained from
www.smallparts.com
Supra F3J/TD
Flap RDS, Version 2
MD 30 Apr 05

Wrapped−Spar Construction with Bagged Wings

MD 12 July 04

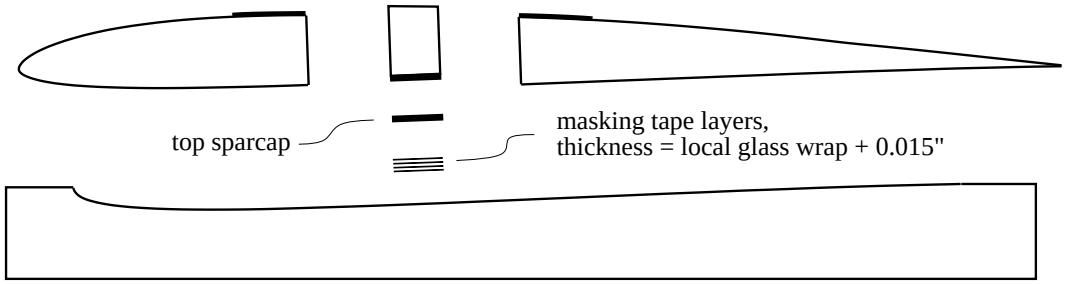
Cut spar core from wing core



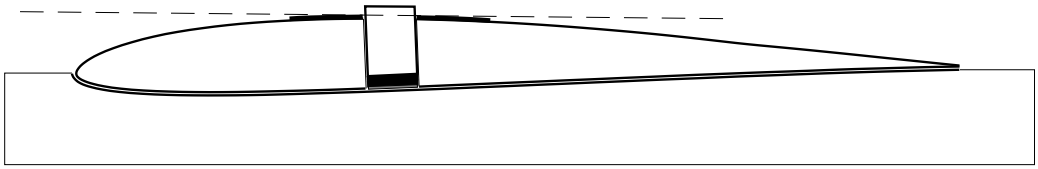
Glue foam cutout to bottom sparcap,
including prefabbed joiner boxes.

Bond with foam is not critical (sparse 5 min epoxy OK).
Bond with joiner boxes is critical (gap−free slow epoxy essential).

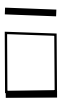
Stack pieces in foam bed:



Sand spar core and joiners flush with top of wing core



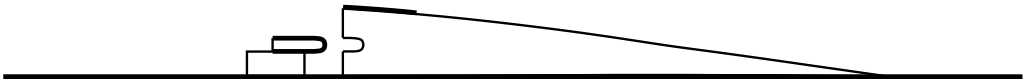
Glue on top sparcap



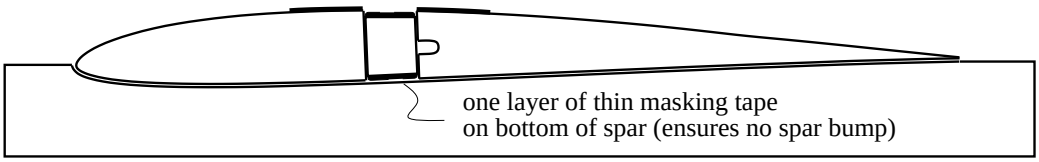
Round off cap edges
(can be done beforehand)

Wrap spar with glass,
wet out & bag

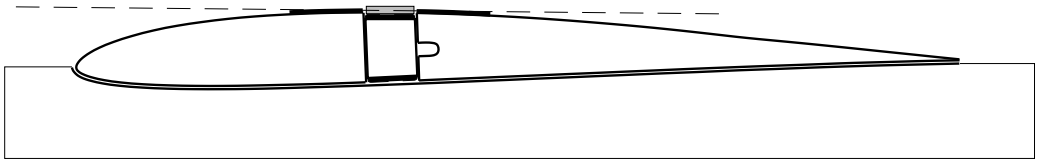
Sand servo wire channel



Tack−glue cores onto spar (bond quality not critical)

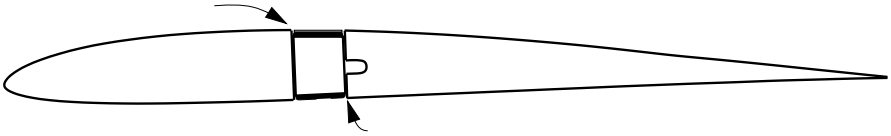


Glue on medium A−grain 1/32" balsa strip, sand flush (very little will be left)



Fill corner voids with Micro−fill, sand foam and fill flush with spar

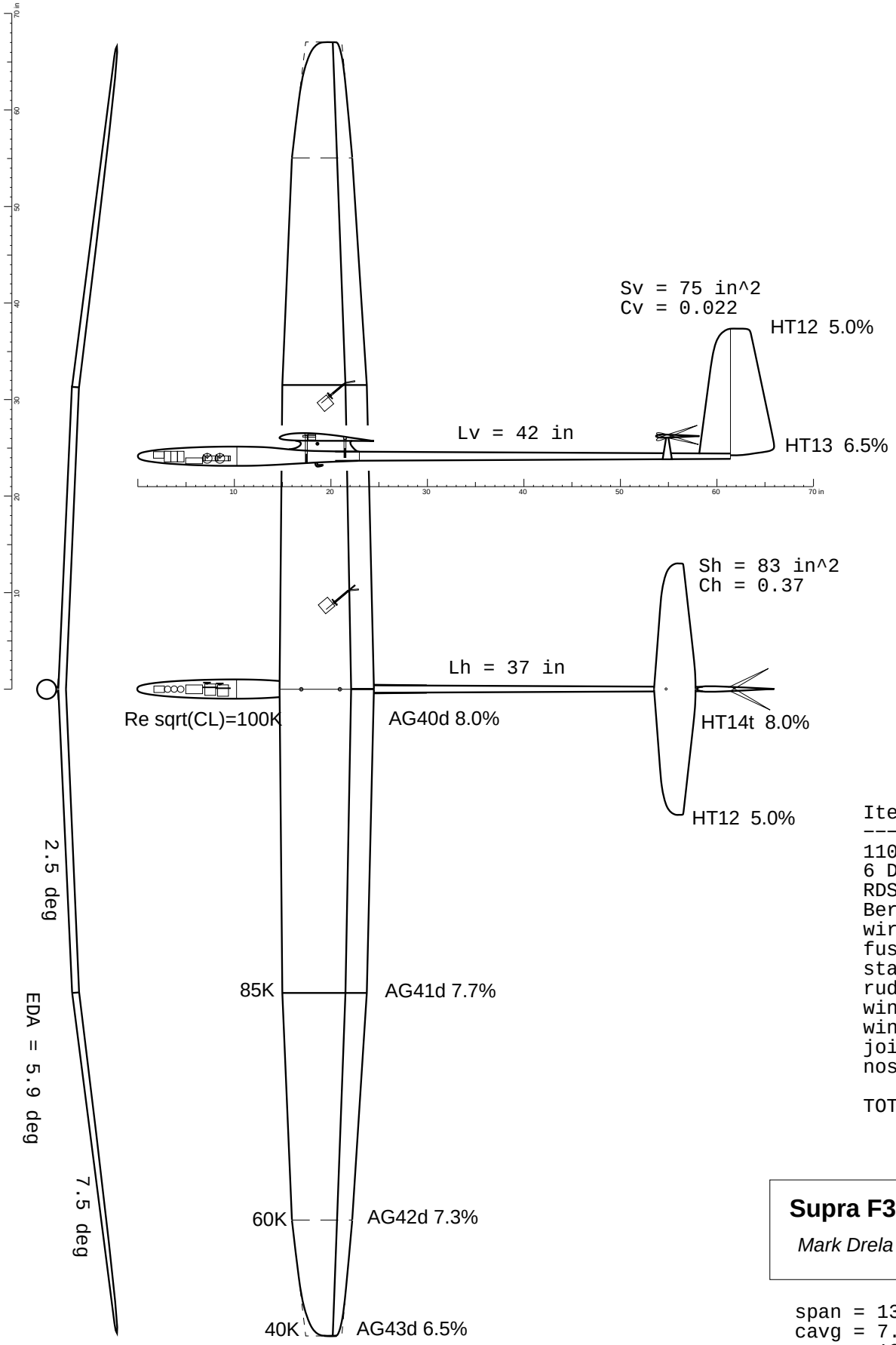
Slight sanding into glass on sparcaps is tolerable (assuming cap edges are well rounded)



Cut and prepare for integral hinge (optional).

This step can be done first, to reduce risk of spar work loss due to bad hinge cut.

Bag wing as usual.



Item weights

1100mAh	90 g
6 DS386	138 g
RDS	29 g
Berg-6	19 g
wiring	25 g
fuse	238 g
stab	24 g
rudder	30 g
wing cen.	500 g
wing tips	238 g
joiners	29 g
nosewt.	10 g
TOTAL	1370 g
	48 oz

Supra F3J/TD 3.4m

Mark Drela 10 July 04

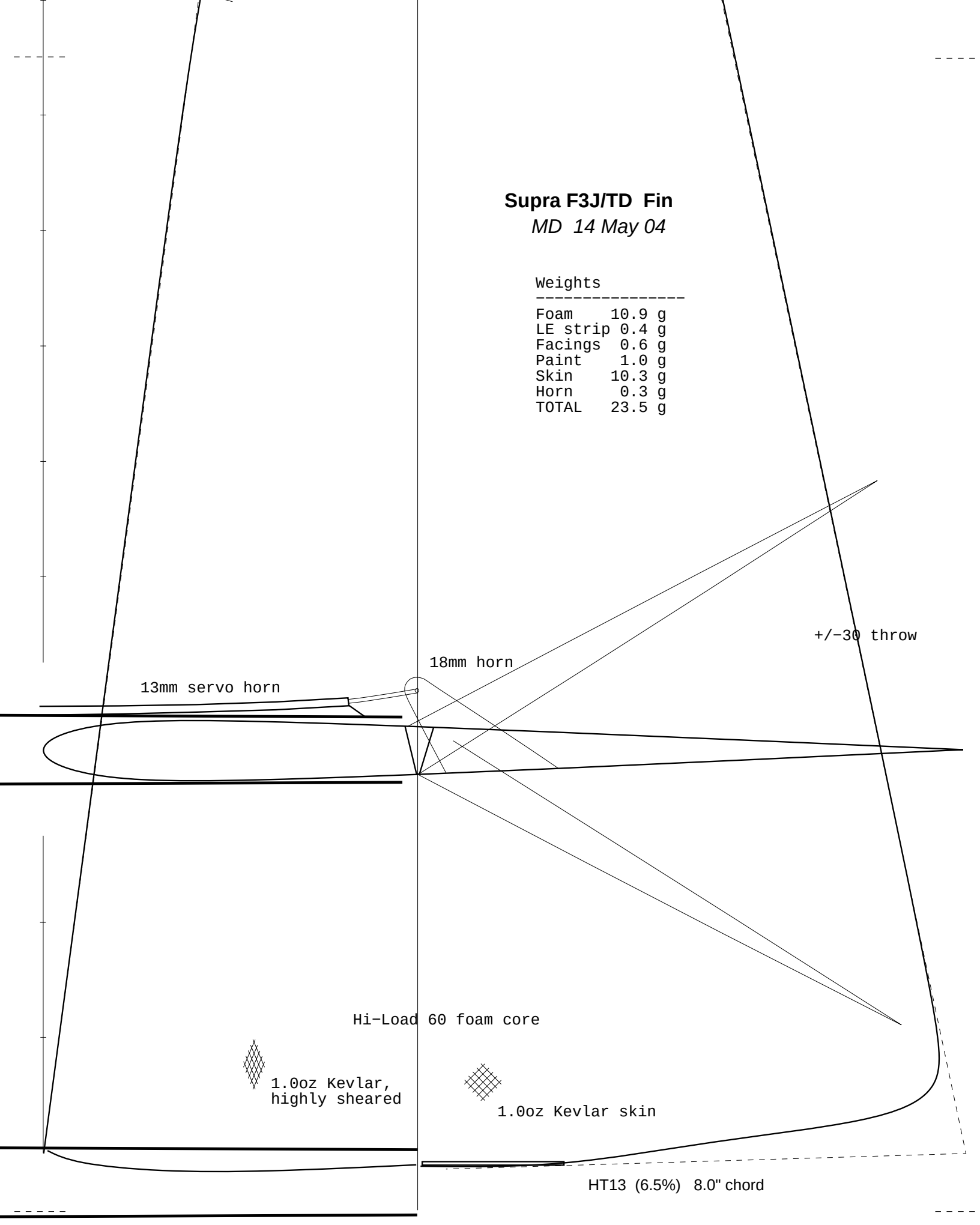
span = 134 in
cavg = 7.95 in
area = 1052 in^2
A.R. = 17.1
mass = 48 oz min
= 64 oz max
W/S = 6.6 oz/ft^2 min
= 8.8 oz/ft^2 max

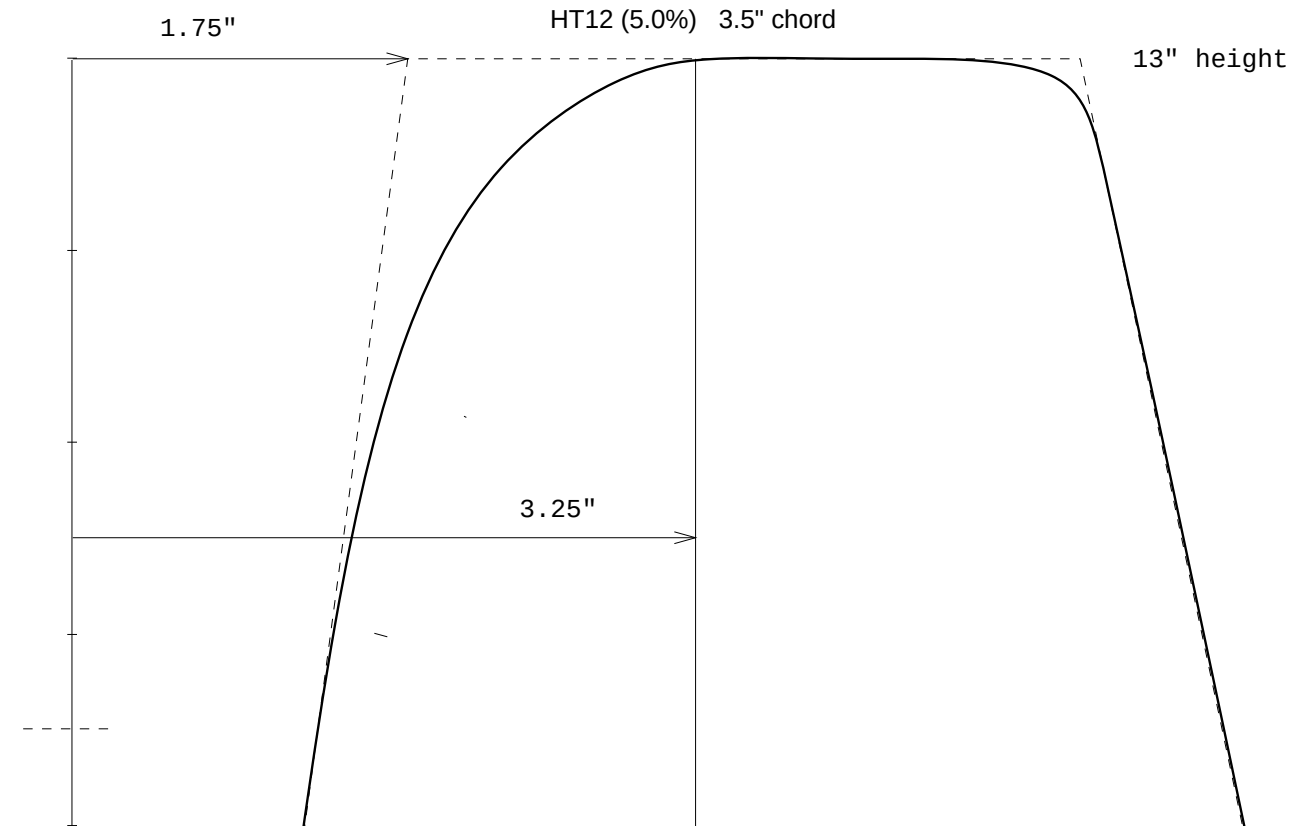
Supra F3J/TD Fin

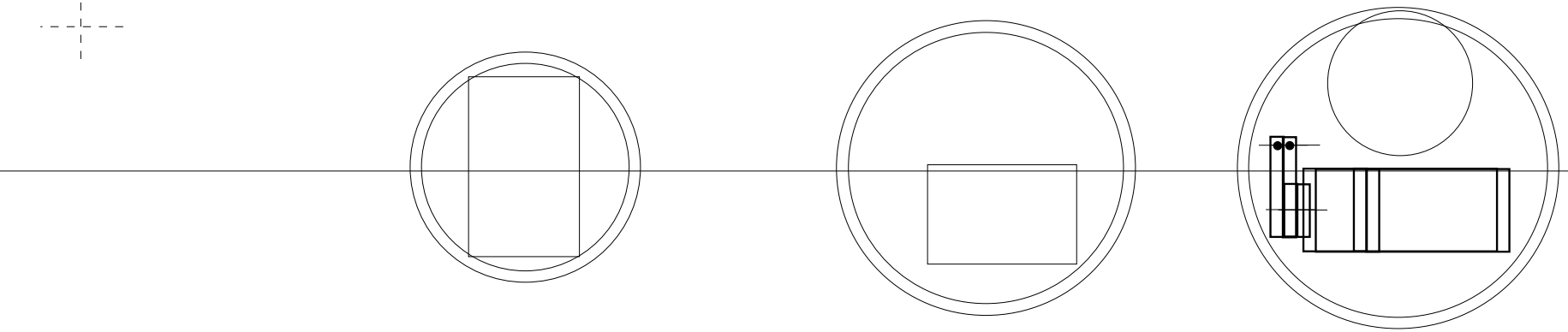
MD 14 May 04

Weights

Foam	10.9 g
LE strip	0.4 g
Facings	0.6 g
Paint	1.0 g
Skin	10.3 g
Horn	0.3 g
TOTAL	23.5 g




1.75"
HT12 (5.0%) 3.5" chord
13" height
3.25"



109g shell
23g nosecone
11g towhook
10g bulkheads/nuts
8g bolts
14g pushrods
56g boom
3g V-mount
238g TOTAL fuselage

F3B Fuselage

M.Drela 09 Sep 02

2/3A NimH
1100 mAh
3.0 oz
6A max

nosecone

−15 −10 −5

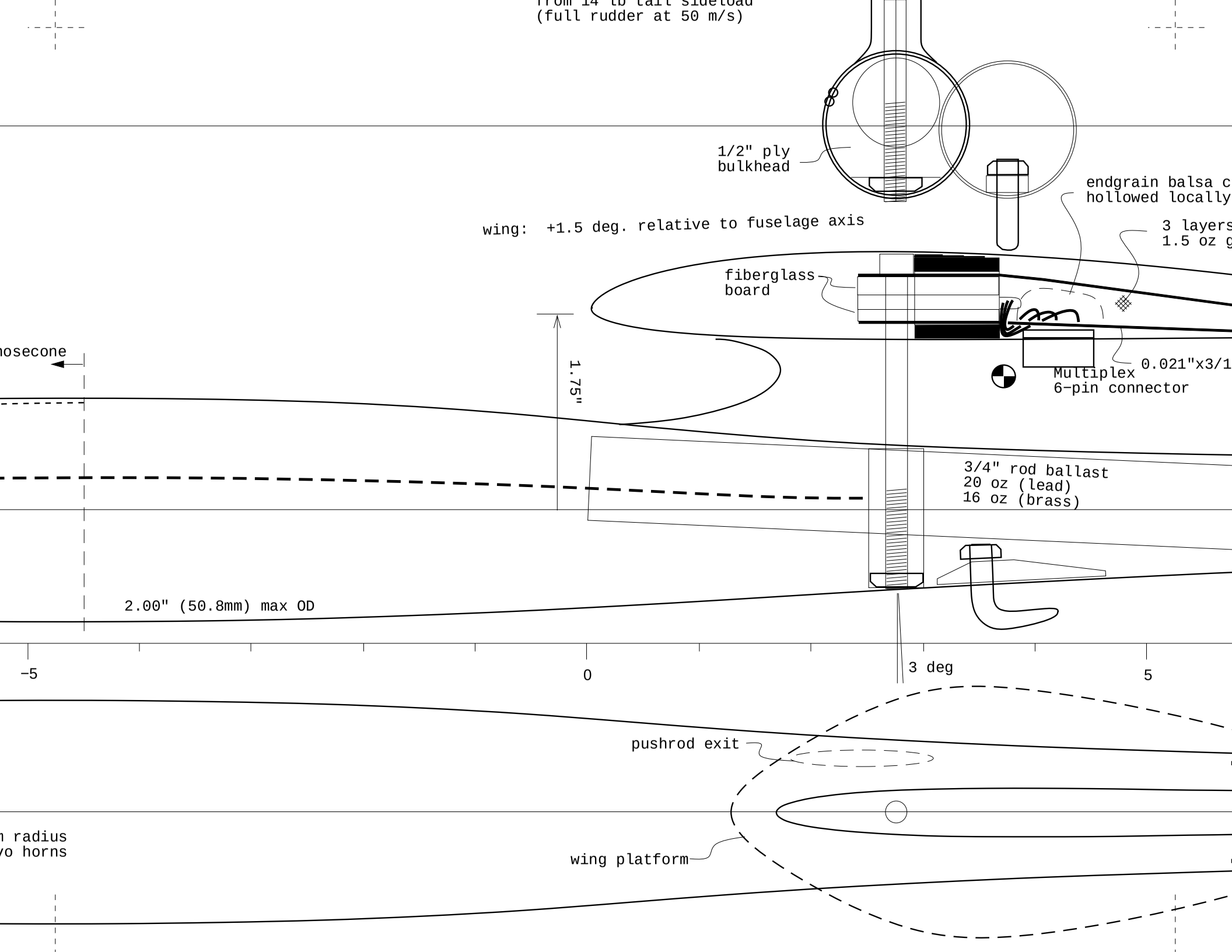
switch

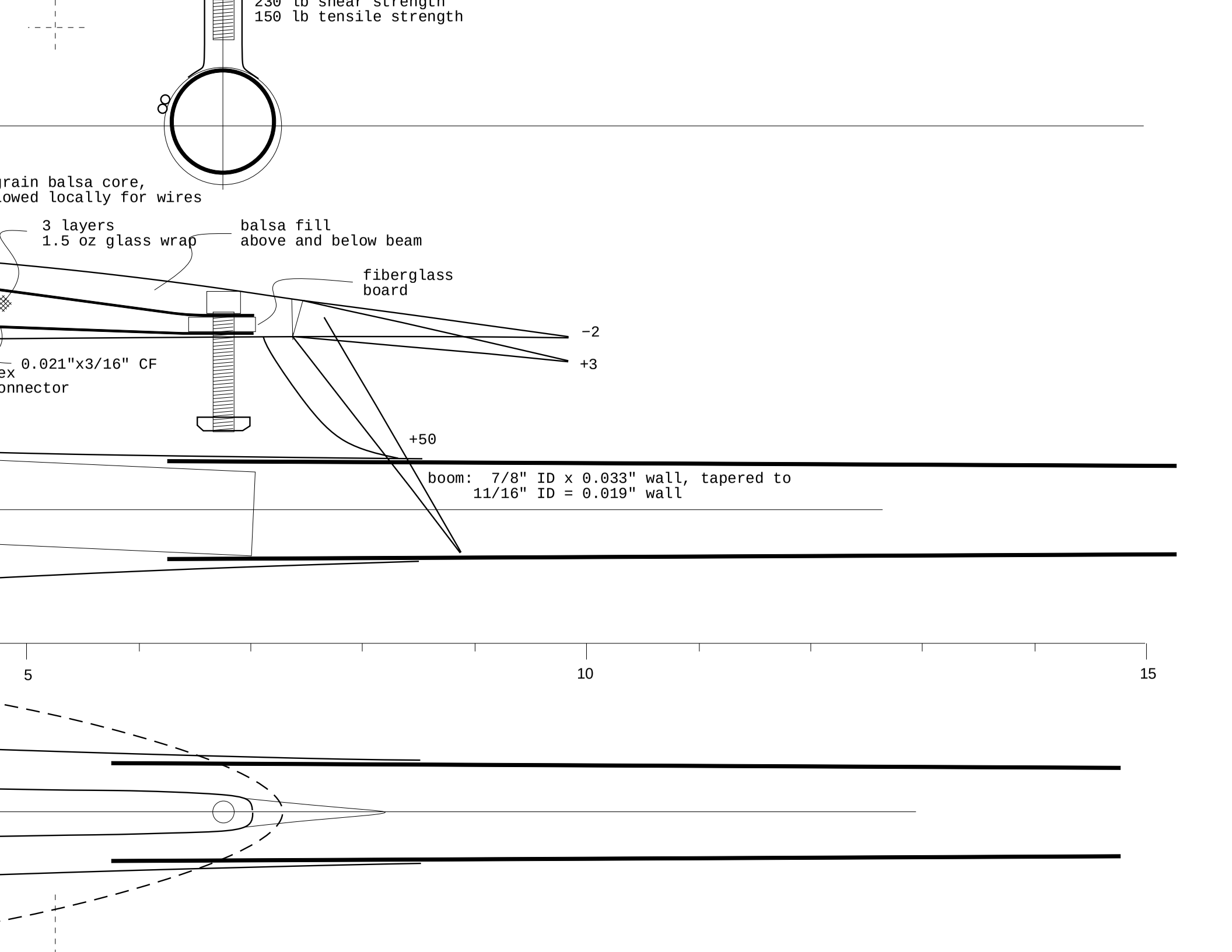
RX

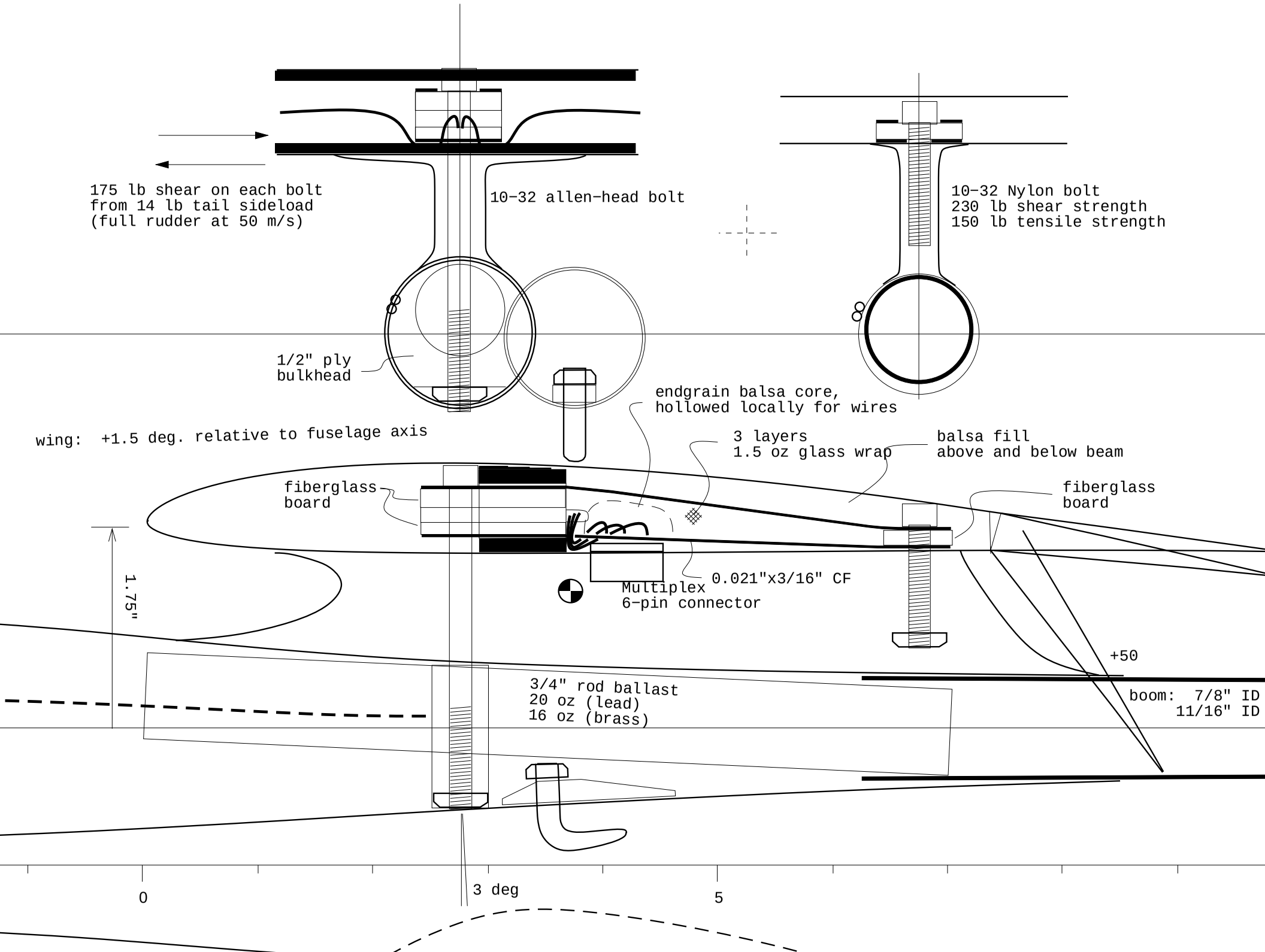
DS368
0.80oz

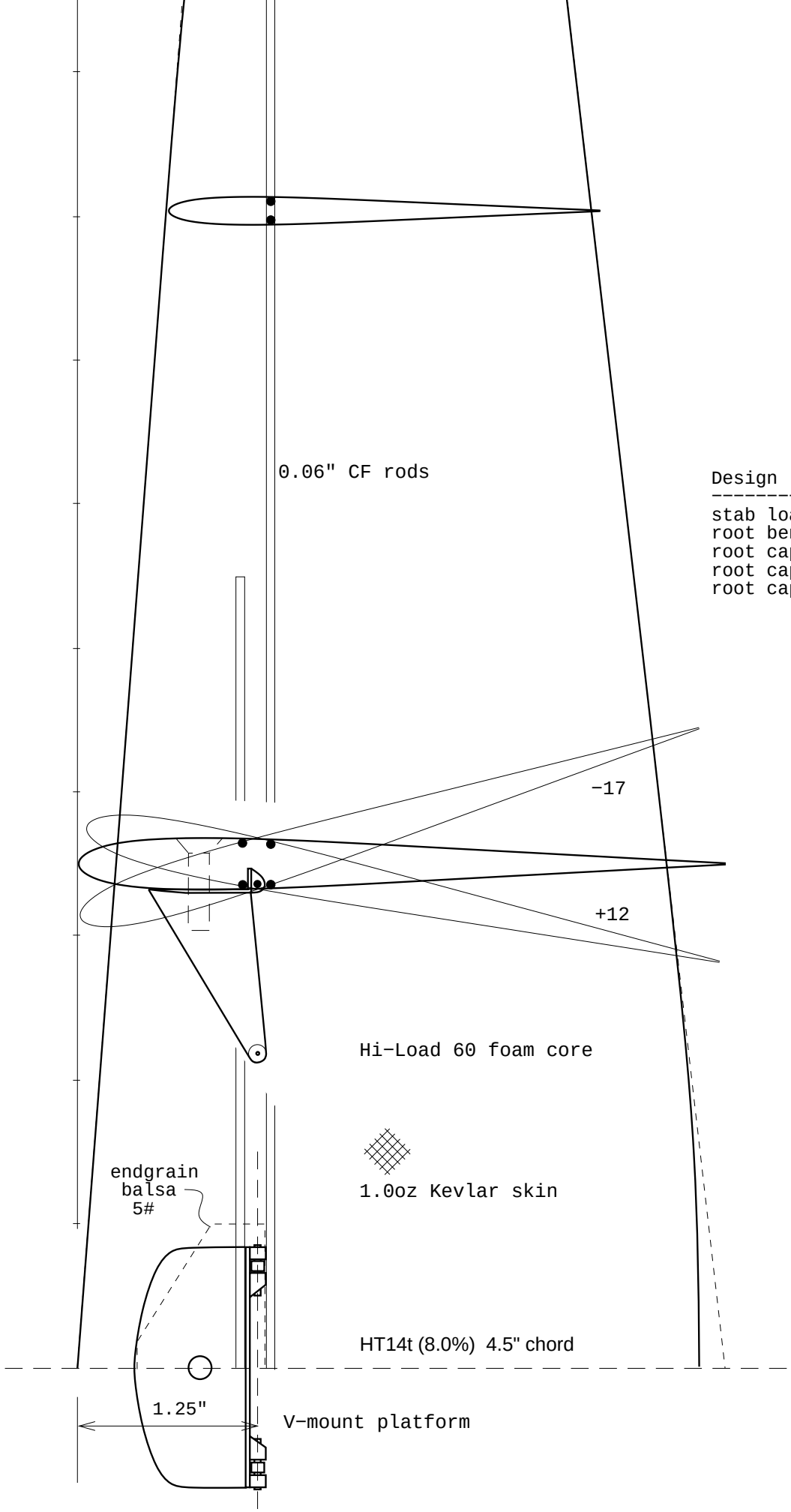
13mm radius
servo horns

7.5mm radius


from 14 lb tail sideload
(full rudder at 50 m/s)
1/2" ply
bulkhead
endgrain balsa c
hollowed locally
3 layers
1.5 oz g
wing: +1.5 deg. relative to fuselage axis
fiberglass
board
0.021"x3/1
Multiplex
6-pin connector
nosecone
1.75"
3/4" rod ballast
20 oz (lead)
16 oz (brass)
2.00" (50.8mm) max OD
-5
0
3 deg
5
pushrod exit
n radius
vo horns
wing platform


230 lb shear strength
150 lb tensile strength
grain balsa core,
lowed locally for wires
3 layers
1.5 oz glass wrap
balsa fill
above and below beam
fiberglass
board
−2
+3
0.021"x3/16" CF
ex
onnector
+50
boom: 7/8" ID x 0.033" wall, tapered to
11/16" ID = 0.019" wall
5
10
15


175 lb shear on each bolt
from 14 lb tail sideload
(full rudder at 50 m/s)
10-32 allen-head bolt
10-32 Nylon bolt
230 lb shear strength
150 lb tensile strength
1/2" ply
bulkhead
endgrain balsa core,
hollowed locally for wires
wing: +1.5 deg. relative to fuselage axis
3 layers
1.5 oz glass wrap
balsa fill
above and below beam
fiberglass
board
fiberglass
board
1.75"
0.021"x3/16" CF
Multiplex
6-pin connector
+50
3/4" rod ballast
20 oz (lead)
16 oz (brass)
boom: 7/8" ID
11/16" ID
0
3 deg
5



Design (never−exceed) Loads

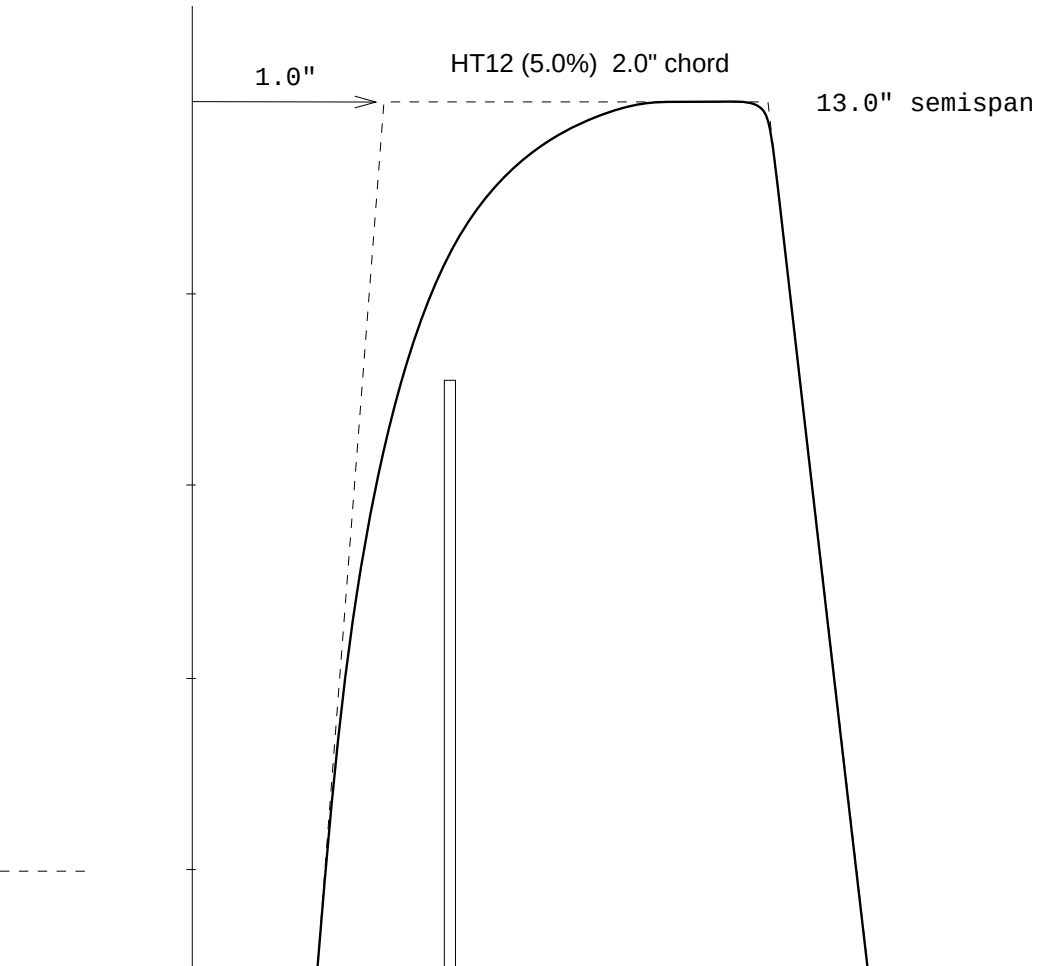
stab load	15 lb @ 100 mph, CL=1.0
root bend.mom.	43 lb−in
root cap load	140 lb
root cap area	0.00565 in^2
root cap stress	25 ksi

Weights

Spars	5.0 g
Foam	8.4 g
Balsa	0.4 g
LE strip	0.8 g
Paint	0.8 g
Skin	9.0 g
TOTAL	24.4 g

Supra F3J/TD Stab

MD 14 May 04


1.0"
HT12 (5.0%) 2.0" chord
13.0" semispan