R1145MS Dihedral Canard (Bent Option)

Vance Atkinson (TX) - Eleven years ago I replaced my GU canard with the R1145MS dihedral canard. I looked for any available information as I was on my own for this swap.

I happened across John Roncz at OSH. After asking about the pitfalls of the swap he suggested I put a certain amount of dihedral in the canard. "This" he said. "would reduce airframe drag." How so?, I sez. The master designer further explained that the wingtip vortices hitting the main wing would now mostly flow over the wing allowing less turbulence to destroy lift. He had run across this while playing around on his computer. Thus the bent front wing.

After building and installing the new canard, I noticed these changes in my COZY. Top speed increased about 2 kts, (hard to measure that). Rotational speed is 68 kts fully loaded (1800 lbs), there is no DEAD spot in the elevators during low speed or landing, (this is a function of correct elevator position in relation to the fixed canard), on landing. The nose doesn't slam down when out of airspeed (but does come down twice as fast as the old canard and finally, roll rate is slightly increased, but stable in cruise. If there are no air pockets that upset the roll rate more than 2 degrees either side of level, the plane will fly straight for very long periods.

The MAIN reason for building this canard was to avoid the heavy pitching in rain. Believe me, here in Texas, they have some BIG rain drops. Some of them tore off the paint on an entire winglet while navigating around here.

All in all, it is a worthwhile project, IF, you're willing to invest a few bucks and some time. I built mine in two weeks. I've built 3 canards before. Hardware for this canard is not cheap and if you fabricate some or all of the pieces, it ain't easy.

ED: I made my own hardware using a MUCH easier system. It has over 2000 hours on it with no problem. (See CSA Oct 90 p. 28, CSA Jan 91 p. 26, CSA Oct 91 p.10)

The dihedral is not really the correct term for the bent canard, it really is a polyhedral canard and the flat center section is buried in the nose giving the illusion of dihedral. I did this for ease of mounting hardware. There are now several of these flying on Longs, a few on Cozys but none on Velocities and VEZs that I know of. If you're building for a Long-EZ use the original span called for in the R1145MS plans and the original incidence. If, for a Cozy, use the span I call out and increase the incidence one-half degrees. Try it, you'll like it.

Following are some tips on how I built my canard. These are not hard and fast rules, just a general view of construction on adapting the R1145MS canard to the Cozy. You can build it straight or bent. I bought some Brock parts and built the rest. Featherlite, 707-895-2718, cut the cores. Alpha Plastics, 713-780-0023, in TX doesn't cut cores but will sell the foam billets at a good price.

If you have already built the standard Cozy canard you will be in good shape for the new one. In fact, you'll find the R1145MS is quite a bit easier in several areas. If you haven't built any canard be sure to read the standard Cozy plans, then the Long-EZ addendum, then my notes. All I have done is embellish on the dihedral aspect and how to make the new canard work and fit. Please call if you don't understand a particular sequence.

This airfoil works well in rain. With a fully loaded plane, I can rotate at 68 kts. I do have one degree positive angle of attack when measured on the fuselage. This means the nose sits noticeably higher than the tail when loaded. If your aircraft doesn't sit the same, rotational speed and distance will increase with this canard! The Cozy must have a positive angle of attack, sitting on the ground, loaded with full fuel and passengers ready to go. If yours doesn't, cut 1.5" more off the main gear strut. This makes about one degree rise on the nose.

I gained 1-2 kts on my conversion, have dive tested to 220 KIAS, noticed increased roll rate, no pitch change in light to moderate rain and slight pitch down (trimable) in heavy rain. I have stall tested the canard in every configuration I can think of with no departures. Demonstrated ceiling on my Cozy, at 1550 lbs with the new canard, is 23,000'.

Brock Parts:

2 ea. NC-CLT lift tabs, 2 ea. CL-1 plate, 7 ea. NC-3 Hinges, 1 ea. NC-5A Pitch trim, 7 ea. NC-2 hinge inserts, 2 ea. NC-6 plugs, 2 ea. CS-10 lead weights, 2 ea. CS-11 lead weights, 2 ea. NC-7 hinge jigs

Modified Brock parts:

L/H elev. torque tube, R/H elev. torque tube (order 2 left hand elevator torque tubes, must cut one more square hole in one tube. OR make your own as I did. It will require a vertical mill to plunge square holes or very very careful filing and fitting.

Parts you make:

2 ea. NC-12A equivalent, 2 ea. bushings that fit between universal joint and elevator torque tube.

1. Add ½ degree more incidence as done in plans to the canard. This is Nat's recommendation to insure that the canard stalls first.

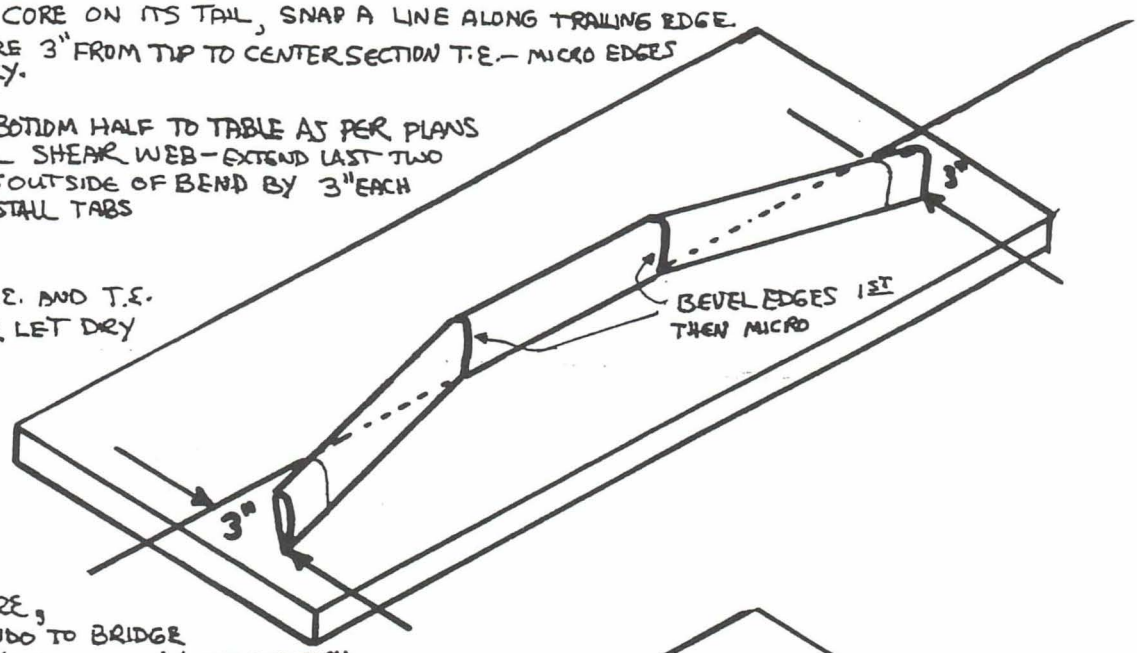
2. While you have the elevators jigged on the canard with the elevator positioning blocks, temporarily "Hot Stuff" them in place, break away the jigs and check elevator travel, if OK (mine were not) re-install jigs and flox everything. If travel is not OK, adjust jigs to allow full control travel.

3. Because of the increased angle of incidence of the new canard, the center section may be above the sloping nose profile. Trial fit your foam core before glassing. Sand the airfoil down on center section if required.

① STAND CORE ON ITS TAIL, SNAP A LINE ALONG TRAILING EDGE. MEASURE 3" FROM TIP TO CENTER SECTION T.E.— MICRO EDGES LET DRY.

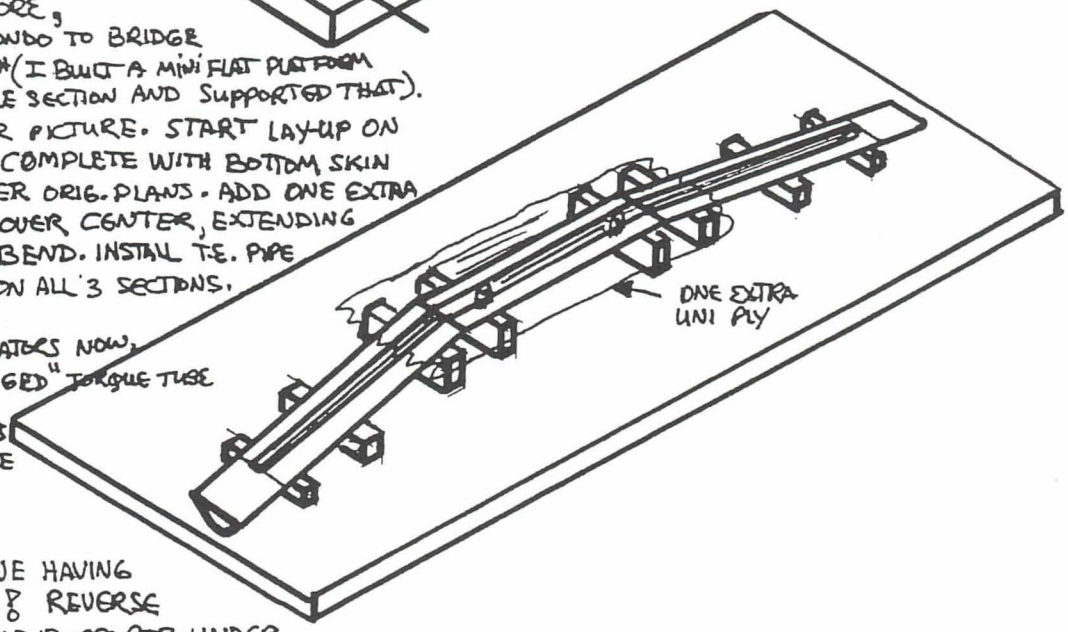
② BONDO BOTTOM HALF TO TABLE AS PER PLANS INSTALL SHEAR WEB—EXTEND LAST TWO WEB PLYS OUTSIDE OF BEND BY 3" EACH END. INSTALL TABS

③ MICRO L.E. AND T.E. TOGETHER LET DRY



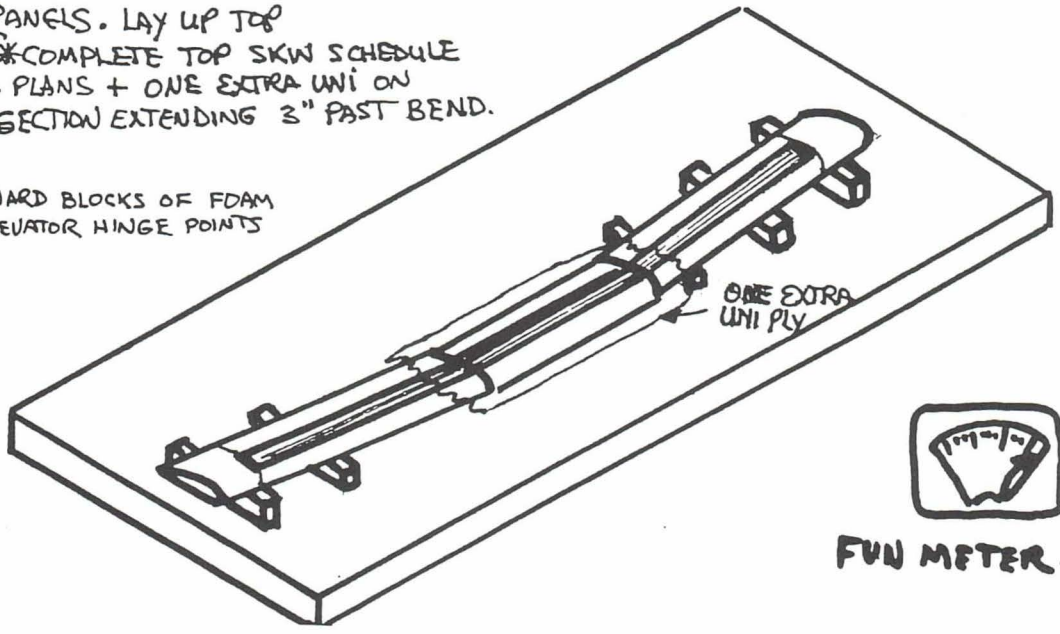
④ REMOVE CORE, INVERT, BONDO TO BRIDGE UNDERNEATH (I BUILT A MINI FLAT PLATFORM UNDER CORE SECTION AND SUPPORTED THAT). SEE COLOR PICTURE. START LAY-UP ON SPAR CAP. COMPLETE WITH BOTTOM SKIN LAYUPS PER ORIG. PLANS. ADD ONE EXTRA UNI SKIN OVER CENTER, EXTENDING 3" PAST BEND. INSTALL T.E. PIPE STIFFNER ON ALL 3 SECTIONS.

⑤ BUILD ELEVATORS NOW, MATCH "PLUNGED" TORQUE TUBE HOLES TO HINGE POINTS IN FOAM CORE

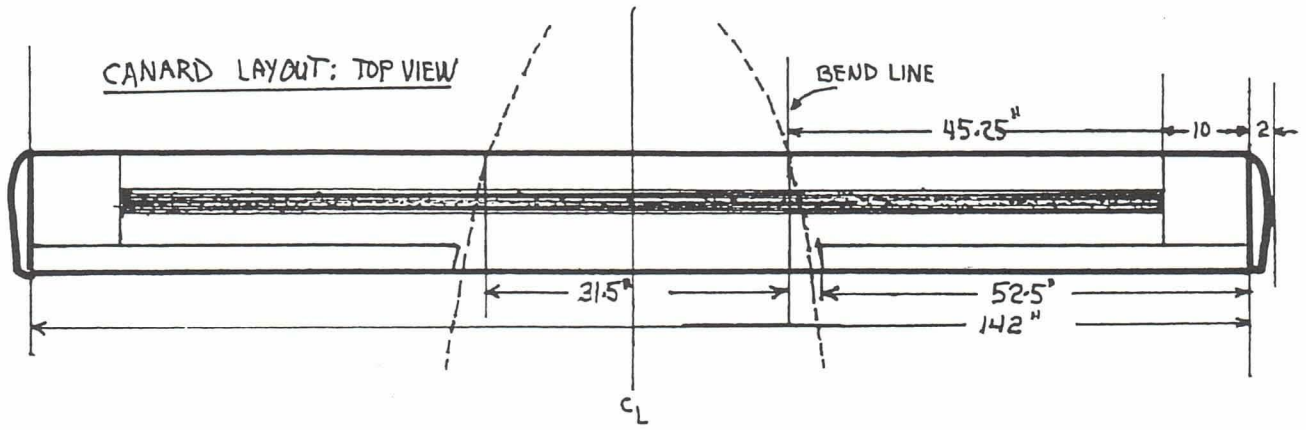


⑥ BOY ARE WE HAVING FUN NOW? REVERSE CORE, BUILD SUPPORTS UNDER OUTER PANELS. LAY UP TOP SPAR CAP* COMPLETE TOP SKIN SCHEDULE PER ORIG. PLANS + ONE EXTRA UNI ON CENTER SECTION EXTENDING 3" PAST BEND.

*BE SURE HARD BLOCKS OF FOAM MATCH ELEVATOR HINGE POINTS



FUN METER—PEGG

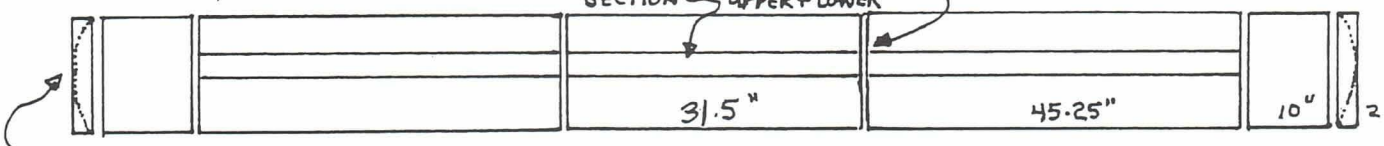


NOTE!

CANARD FOAM CUTS:

CUT SPAR DEPTH CONSTANT FROM END TO END ON CENTER SECTION — UPPER + LOWER

BEGIN NORMAL TAPER OF SPAR DEPTH TO TIP

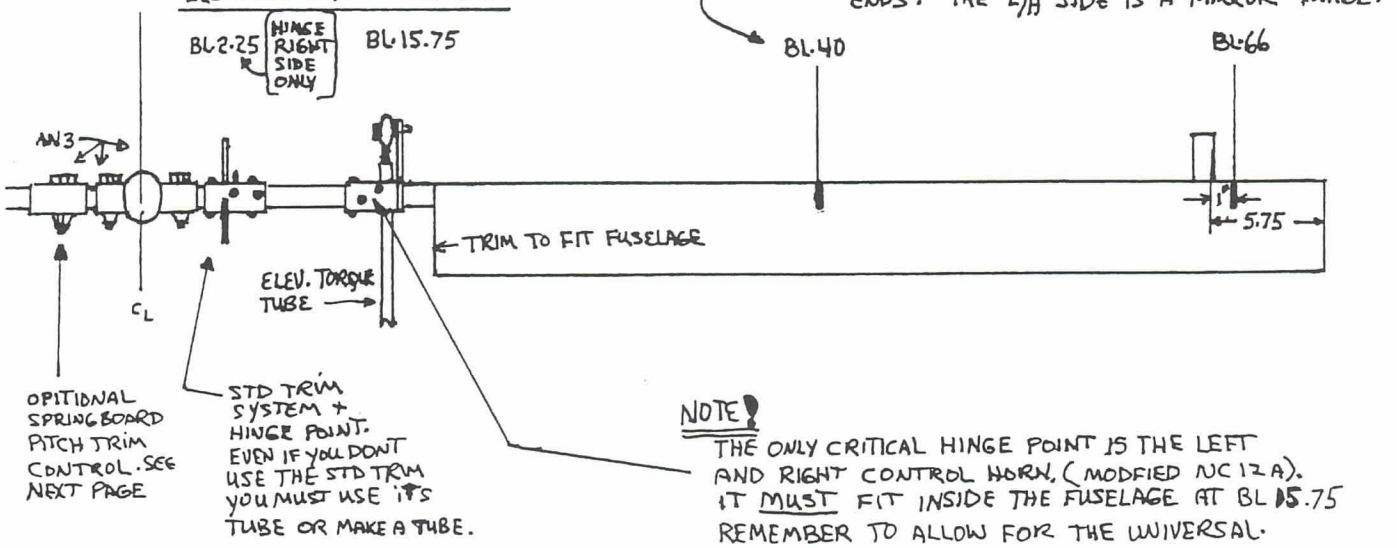


2" BLOCK FOR TIPS, OR USE RONCZ TIPS, YOUR CHOICE.

CUT ELEVATORS 55" EACH. TRIM TO FIT.

THESE ARE THE BL's I USED WHEN I MADE MY OWN TORQUE TUBE. YOU WILL HAVE TO ADJUST BROCKS TUBE TO APPROXIMATE THIS SIZE BY TRIMMING ONE OR BOTH ENDS. THE L/H SIDE IS A MIRROR IMAGE.

ELEVATOR LAYOUT - TOP VIEW



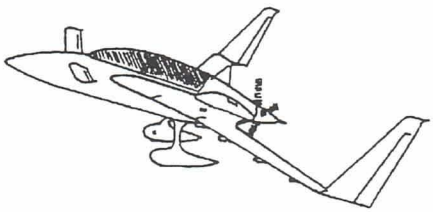
OPITIONAL SPRINGBOARD PITCH TRIM CONTROL. SEE NEXT PAGE

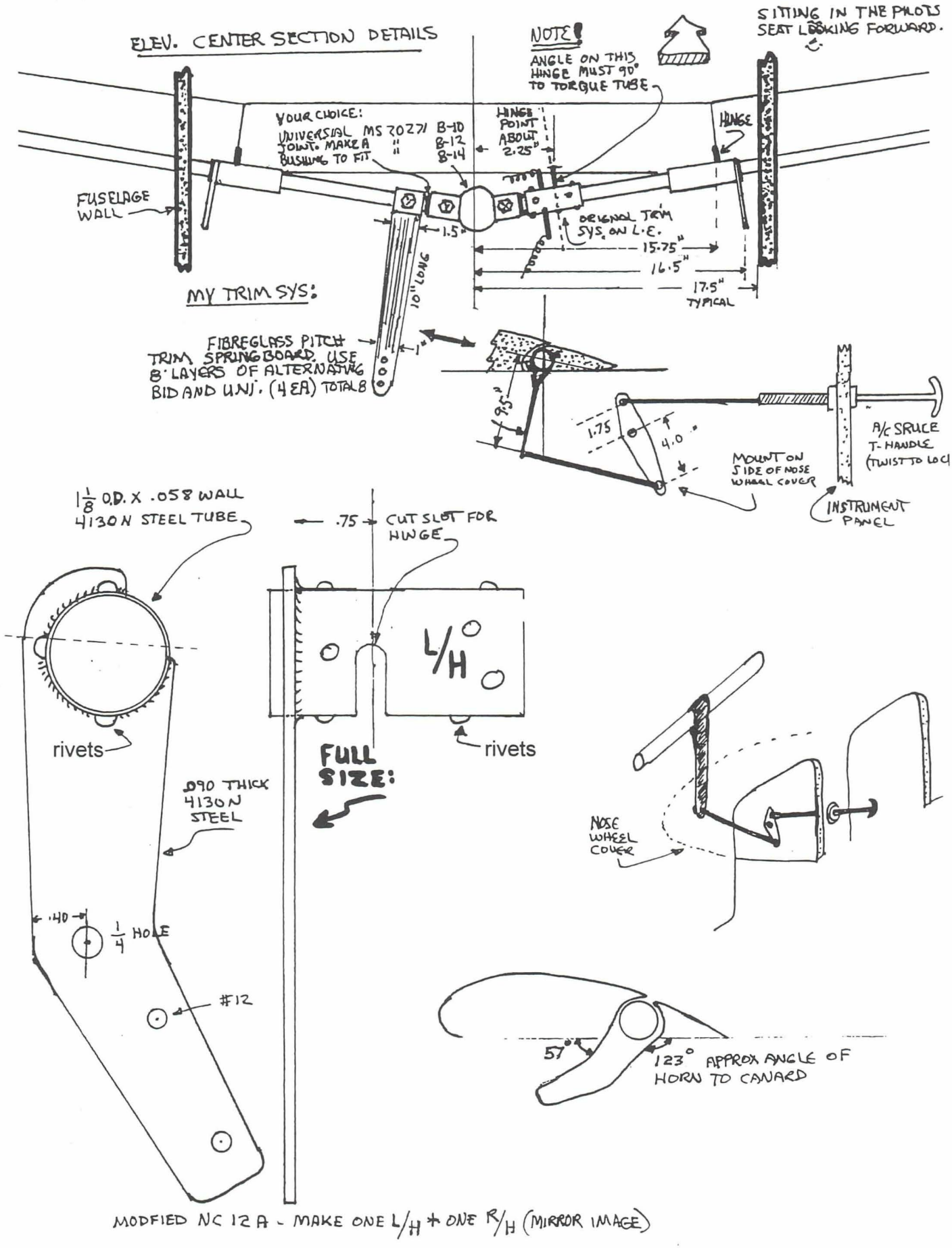
STD TRIM SYSTEM + HINGE POINT. EVEN IF YOU DONT USE THE STD TRIM YOU MUST USE IT'S TUBE OR MAKE A TUBE.

NOTE!

THE ONLY CRITICAL HINGE POINT IS THE LEFT AND RIGHT CONTROL HORN, (MODFIED NC 12A). IT MUST FIT INSIDE THE FUSELAGE AT BL 15.75 REMEMBER TO ALLOW FOR THE UNIVERSAL.

Fly Safely




ELEV. CENTER SECTION DETAILS
NOTE!
ANGLE ON THIS HINGE MUST 90° TO TORQUE TUBE
SITTING IN THE PILOTS SEAT LOOKING FORWARD.
YOUR CHOICE:
UNIVERSAL MS 20271 B-10
JOINT. MAKE A " B-12
BUSHING TO FIT " B-14
HINGE POINT ABOUT 2.25"
HINGE
FUSELAGE WALL
1.5"
ORIGINAL TRIM SYS. ON L.E.
15.75"
16.5"
17.5" TYPICAL
MY TRIM SYS:
10" LONG
FIBREGLASS PITCH TRIM SPRINGBOARD. USE 8 LAYERS OF ALTERNATING BID AND UNI. (4 EA) TOTAL 8
1"
9.5"
1.75
4.0
A/C SPRUCE T-HANDLE (TWIST TO LOCK)
MOUNT ON SIDE OF NOSE WHEEL COVER
INSTRUMENT PANEL
1 1/8 O.D. X .058 WALL 4130N STEEL TUBE
.75
CUT SLOT FOR HINGE
L/H
rivets
rivets
FULL SIZE:
.090 THICK 4130N STEEL
.140
1/4 HOLE
#12
NOSE WHEEL COVER
57°
123° APPROX ANGLE OF HORN TO CANARD
MODFIED NC 12 A - MAKE ONE L/H + ONE R/H (MIRROR IMAGE)