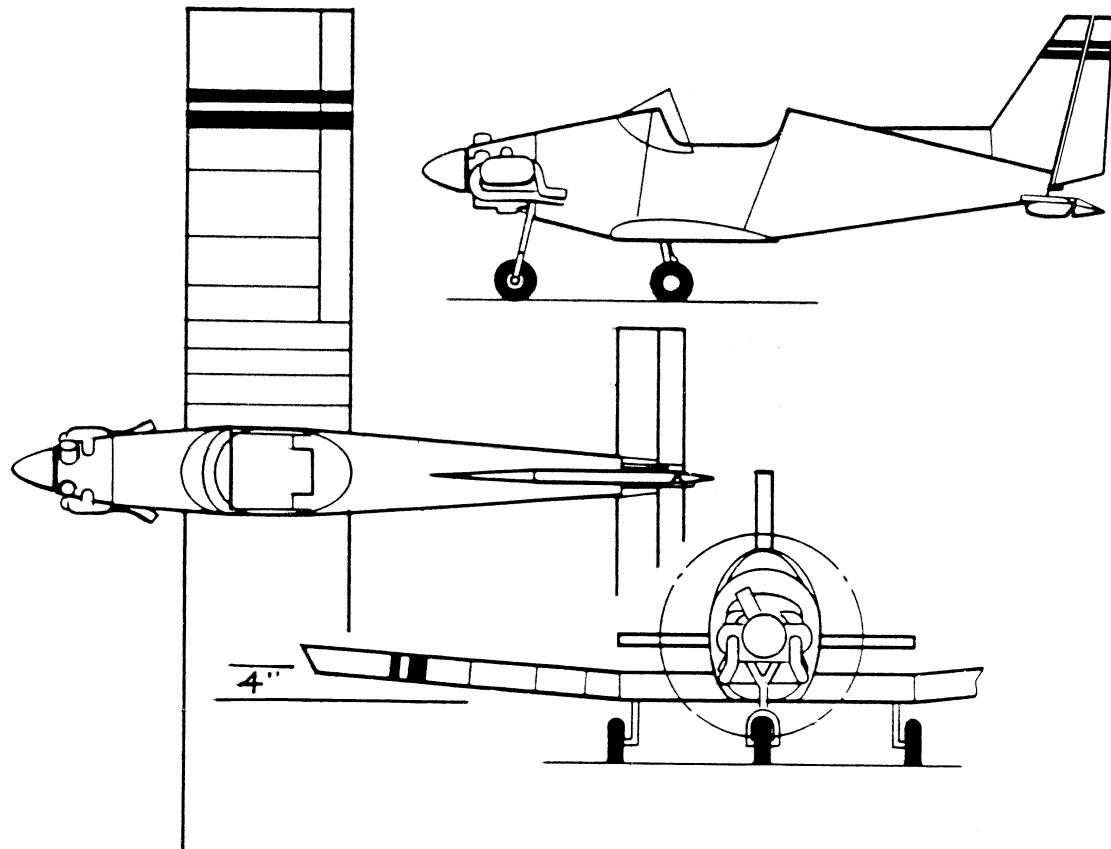


Teenie Two

N328WD



Manual constructed by
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Teenie Two Construction Manual

This is a part of the Teenie Two construction plans. Any deviation from the handbook or the construction drawings, and fabrication assembly or operation shall be regarded as willful negligence on the part of the user and will invalidate all performance predictions claimed. These plans grant the purchaser only a non-exclusive license to make and use one aircraft or its components solely for his personal experimental purposes. Manufacture or sale of any part of the Teenie Two for profit or reward by anyone other than the Teenie Company is prohibited. Violators will be prosecuted.

In the United States, the Federal Aviation Administration (FAA) is the sole licensing authority for aircraft, and should be consulted for applicable regulations before construction begins. The seller makes no warranty of any kind, expressed or implied, except the material sold hereunder shall be of seller standard quality. Buyer and user assume all risk and liability whatsoever resulting from the use of such materials.

We recommend only the VW engine conversion as used on the original Teenie Two. Although other conversions might work, our experience has been that the baffling and manifold are more important than simply adding a propeller to the VW engine. Therefore only a tried and proven system for the particular airframe must be used for the safest operation.

NOTE: The methods of construction outlined in this manual are protected and are not to be used on any other aircraft.

Special Construction Precautions.

AILERON control arm length behind bulkhead "C" is 3".

AILERONS: Control stick movement in cabin is 4" total right to left. Neutral position is 2" from right side skin. Ailerons move up 1" and down 1" total. During flight, about $\frac{1}{4}$ " movement of aileron is normal for turns or rough air. More aileron movement is needed only during strong crosswind landings or vertical bank turns.

CONTROL STICK linkage measurements are 11" total, $\frac{3}{4}$ " between mount hole and linkage hole.

CONTROL STICK location in cabin. Control stick and aileron torque tube is on the right side of cabin, mounted between bulkheads "B" and "C". The aileron movement of control stick is short enough not to interfere with the right side of pilot's leg. If control stick is mounted in center of cabin it will be difficult to enter and exit from cabin and will also cost at least 4" of headroom. Pilots flying Teenie Two have not experienced any difficulty with stick position. Left-hand pilots can mount stick on left side of cabin and reverse rudder control tubing.

SET BACK of main gear: Min. 6", Max 7" behind vertical front of .040 spar channel. Measured with plumb at ground level contact of wheel.

ELEVATOR from neutral up 3-1/4" and down 1-1/4". Adjust horizontal stabilizer for slight leading edge downward position to start. Control stick movement 4" forward and 6" rearward measured at top of stick.

NOSE GEAR LONG STEERING ARM dimensions between actuating holes is 5" total.

WINDSHIELD A full size pattern is on plans. It is advisable to make this simple windshield and fly T-2 a few hours first, then make a simple plexiglas sheet wrap over the cabin. That is most economical way. However a blown canopy is available from several sources but, costs a lot more.

METHOD OF INSTALLING TOP ANGLES FROM BULKHEAD "A" TO "C". Top angles fasten to bulkhead "C" and to instrument panel "B". Wrap a piece of wire or rope around forward ends and with a screwdriver, twist to pull together enough to fit firewall "A". They will slant downward and if the ends can't be pulled together enough, cut 2 or 3 places in horizontal part with hacksaw 2" ahead of instrument panel. Cut in as much as $\frac{3}{4}$ " if required to

give smooth curve to sides. Add a piece of angle .040, $\frac{1}{2}$ " wide and long enough to cover saw cuts at one end and 1" high at the other end to keep gas tank from sliding back against instruments; use two rivets.

GENERAL INFORMATION.

Please read and study this instruction booklet and plans thoroughly before starting construction or writing the designer.

This aircraft is just about the "most minimum" airplane you can build in metal. It is almost entirely handmade and with handheld tools, so great care should be taken in cutting, shaping and drilling each part.

Less than this might leave your airplane below minimum and lead to trouble with the Federal Aviation Administration, if not with your own life.

In putting together these instructions and plans I have tried to make them as simple as possible. I have tried to make them clear to a beginner, without talking down too much to a more experienced builder. In doing so, I have had to take some shortcuts. For instance, I give you a basic list of tools, but I have to assume that you know how to use them. I have been very specific about most materials and dimensions, yet when I am not specific I have to assume that common sense should tell you what to do. Otherwise, these instructions would run to hundreds of pages.

Some examples: When you cut or drill metal, smooth down the rough edges. When you bend metal over a wood template, smooth down the rough edges of the wood before bending the metal over it. I have not repeated this in the instructions each time I tell you to cut, drill or bend a piece of metal. Also, when mating the parts, the areas where metal touches metal should be sprayed or brushed with zinc chromate. Under certain conditions aluminum may corrode. The chromate will help prevent it. It's best to put it on at the last minute, just before you rivet or bolt two pieces together permanently, while the chromate is still wet. I have not repeated this each time you have to mate two pieces.

Perhaps the biggest problem, however, especially if you have not worked with metal before, is the metal itself. It can be contrary. My best advice is, "Be gentle!" A too-sharp bend in aluminum will make the aluminum hard at that point, and easily cracked. When bending aluminum, take it easy. Bend no more than 30°'s at a time, and no more than an inch or so at a time. In other words, when making a 90° bend, go over it at least three times, and bend no more than the width of the hammer with each stroke. Also, keep the strokes even, so that each complete pass down a strip will produce an evenly bent strip, with no waves in the metal.

WARNING!!!!!!

Note: Order of construction should be

- 1. Build entire 3 sections of wing and ailerons. Install both main top gear legs and bulkhead "B" and "C" sides before final top skins are riveted.**
- 2. Fuselage and nose gear.**
- 3. Tail group.**
- 4. All controls and connections.**
- 5. Instruments, gas tank, engine, windshield and cowling.**

WARNING!!!!!!

If you deviate from above sequence, expect to take a lot of extra time and work. In addition, it will not go together straight.

Even if this is your first attempt at building your own airplane there is enough flexibility built into design to accommodate even a rank beginner. Some details are deliberately vague, because if you follow them verbatim you might think there is no other way and you'll learn nothing. I have spent several years and much thought developing this "minimum design" and there is enough built-in variation, in dimensions and workmanship, to accommodate anyone who's reasonably conscientious. And for the more experienced builder, this is about as inexpensive as you can go in an all-metal craft.

All things being equal, however, it's best to come as close to the instructions as possible. And where extreme care should be taken I've said so. After all, the essential purpose of the experimental category under FAA regulations is "education and recreation". You'll get more education if you extend yourself in building your airplane, and you'll get more recreation from it if you build it as well as you can.

TOOLS YOU'LL NEED

HACKSAW

Need one that takes interchangeable blades, with

- 18-tooth blades (for wood)
- 24-tooth blades (for metal)

TIN SNIPS

One 14" duck-bill snips (for straight cuts and slight curves)

One right-cutting snips and one left-cutting snips (for short, sharp curves)

FILES

Large, coarse metal file (for rounding sharp edges on extruded angles)

Small, fine metal file (for smoothing extruded angles)

Sandpaper (for smoothing rough edges on aluminum sheets)

HAMMER

1lb. or 2lb., double-faced, plastic-tip hammer will do 99 percent of work. Use softer side for main bending, harder side for finishing.

DRILL

Variable-speed electric drill is best, with

1/8, 3/16, 1/4 and 3/8 steel bits

CLECO SET (used to hold metal together after drilling and before riveting)

Cleco pliers with at least 25 clecos, 1/8" hole size (available through standard aircraft supply catalogs). If clecos are not available, use No. 40 drill and self-tapping metal screws to hold while drilling. When ready to assemble, remove alternate screws, use No. 30 or 1/8" and drill.

POP RIVETS (regular rivets won't work on this design without extensive changes)

Standard Pop riveter, with

1000 1/8" diameter short-length steel rivets, 1/8" grip length.

500 1/8" diameter medium-length steel rivets, 1/4" grip length.

500 1/8" diameter long-length rivets, 3/8" grip length.

FUEL TANK

To filter sediment and drain water; use finger strainer at outlet, inside tank.

Saw off neck (with cap) from an automobile tank from a junk yard, drill and notch and bend flaps, pop rivet to top of your tank then soft-solder.

Drill hole in gas cap, put loose-fitting welding rod with cork at bottom and sharp bend at top through hole; file markings on rod for use as gas gauge; drill 1/8" hole off center for vent.

Add shutoff valve to bottom of tank and quick-drain filter between tank and carburetor (for draining water); this is very important.

Quick-drain filter should be at lowest point in fuel system.

ENGINE (prefer minimum of 53 hp, 1600 cc VW)

This airplane was built to accommodate any existing Volkswagen engines up to 65 horsepower; no other engine has been tried or should be used.

Ideally, if you have experience, you can purchase VW parts from a dealer, machine your own propeller hub and put the engine together yourself.

NUTS, BOLTS, AND BUSHINGS

I used certified aircraft bolts, Army-Navy specifications, and Shakeproof plastic lock nuts; moving bolts need cotter pins or other safety lock.

Various assortments, at reduced prices, are available from various aircraft supply houses.

INSTRUMENTS. (See full-size pattern)

These are the basic instruments required by FAA. Purchase your instruments (see Trade-A-Plane) before cutting holes in instrument panel. In general, put larger instruments in center of panel, and smaller instruments toward outer edges.

AIRSPEED INDICATOR

Includes pitot tube and tubing to indicator; pitot tube can be $\frac{1}{4}$ " diameter aluminum tubing.

Place pitot tube under leading edge of wing. Should be outside main landing gear and stick out 6" in front of wing and 4" below leading edge at center section outer rib.

$\frac{1}{4}$ " metal or plastic tubing to indicator should be used.

ALTIMETER (no hookup necessary)**COMPASS**

Just install, but as far away from tachometer (which has a magnet) as possible.

The following instruments are on our VW conversion plans: Oil-pressure gauge; Oil-temperature gauge; Tachometer.

RIVET SPACING AND METAL HANDLING

Be patient, be accurate in bending and drilling metal. If in doubt about spacing rivets where not specified, space as much as 2" apart on main spar on outer wing panels, for instance, but come down to 1" apart nearer wing roots.

Wing skin to ribs - 2" spacing. 1" spacing is preferable elsewhere, although you should come down even $\frac{1}{2}$ " apart near motor mount and around bulkhead "E". Clecos are used to maintain alignment for drilling or riveting. Use your own judgment about how many to install for each operation but it's best to cleco parts together at each end and as many at the center as is necessary. You'll learn as you go along, as the metal begins to ripple slightly, where to make exceptions to the general rule. A minimum of 25 clecos will be needed.

WINGS

OUTER PANELS

Ribs

Use .020 aluminum sheet.

First make plywood templates, tracing drawing in plans. Save the outer section of the plywood to use as clamp when fitting leading edges. Cut 23 blanks from aluminum stock to make ribs; 5 are for each outer panel. Allow at least $\frac{3}{4}$ " for tabs. The end rib in each outer panel becomes the wing tip, and can be made later, even after the rest of the airplane is complete.

Place all 23 ribs together between plywood templates, clamp together and drill at least two guide holes through them. Bolt everything together through these holes, then complete drilling, including remaining guide holes, flange holes (make sure you use holes indicated for outer panel) and holes around the edges where tabs will be made.

Remove ribs from templates. With tin snips, make tabs by cutting toward holes on slant as shown on drawing. Replace ribs, one at a time, between template. Bend tabs in one direction on one-half ribs and in opposite direction on other-half. They will be used on opposite panels, with tabs facing away from fuselage.

Remove rib, cut out main spar flange, starting with holes, and bend in same direction as rear tab, except center tab and rear tab should be bent same way as top and bottom tabs for panel end ribs. To bend the flange, make a small wood block that will fit flush against base of flange. Using guide holes, drill holes through block and bolt in place. Then bend flange over end of block.

To make outer rib (the wing tip), finish wing, then cut the end in such a way that the wing tip will be on a slant, at least 2" farther inboard at the bottom than at the top.

Cut the skin with a tin snips, and make a bent flange at the end of the main spar so it will fit snugly against the wing tip. Make a template, placing plywood or even cardboard pressed against the wing end. Proceed as with other ribs, except that no guide holes or spar flange have to be made. Tabs will fit inside, not outside, wing end.

MAIN SPAR

Use .040 aluminum sheet.

This is a major part and should be made with care. The spar should match up snugly with flange openings cut in ribs. It should slide in the ribs with a little friction. It will curve as much as 2" in 6-foot length when removed from 2 x 4s. Don't worry because curve is pulled out when ribs and angles are added. Cut spar to size, then place between 2 x 4s. Clamp together then begin tapping to make bends. When bent, slide ribs on and space them according to drawings. Drill two holes through each rib flange and spar, and cleco ribs in place.

Make aluminum angles. Use .040 aluminum sheet.

These cover hole in rib made by flange, and strengthen connection, mount vertical.

Make angles long enough to fit inside main spar on opposite side from flanges, and wide enough after bending to cover flange opening, and attach to spar and rib behind opening (about 3"). Bend to shape, drill and cleco. The extended angles can be put on and drilled along with operations described above, or afterward, using holes already drilled as guides. The extruded angles, 1/8" thickness on outer panels and 3/16" on inner panel, go on top and bottom, with lengths shown on plans. Toward the wing tip, the vertical sections are cut back as shown to reduce too much stiffness toward the outer edge. A little "flap" in the wing prevents cracking. Another way to do the same thing is to cut off the vertical section about 2" from the outer end, rounding off the corners, leaving a 2" horizontal lip. Toward the wing root of outer wing panels, the spar and the angles top and bottom, stick out 2" beyond the outer wing skin. This is your wing connection. First make a flange of the center web of the spar, between the top and bottom angles, and rivet it to the root rib. Now cut out the horizontal sections of the spar and angles, top and bottom, about 1/4" from the bend and about 2" deep, rounding off the corners, so the angles will slide neatly into the center section spar in the space cut out of rib.

BOTTOM SKIN AND REAR SPAR WEB

Use .020 aluminum sheet.

Cut to size, then make bends to create rear spar. Place between 2 x 4s and make smallest end first (about 3/4"), then larger bend. The first bend forms the overhanging lip on the trailing edge and the second bend is made to fit neatly on rear edge of ribs. Now begin drilling, clecoing and riveting, using your own judgement. I prefer drilling and clecoing front holes on each rib, then working toward center, starting at main spar.

LEADING EDGE

Use .020 aluminum sheet.

Cut to size to overlap both top and bottom of main spar, C-clamp 2 x 4s to center of sheet, lengthwise. Work on carpet or cardboard to prevent scratches.

With 2 x 4s firmly in place, pretend the metal is a 6-foot long envelope, and you're trying to bend the flap over. Kneel at the center, take the piece in both hands by one edge, and rest the other edge on the floor. Now push down gently, firm enough to start it bending, but not enough to crease it; about 45°. Remove 2 x 4s and place one on top. Now finish folding. The 2 x 4s will keep top edge from developing waves. Push to bend about 90°, but no more. Place piece on ribs, clamping in place with plywood pieces left over from making rib templates. Be *sure* leading edge radius bend matches rib shape.

Just prior to drilling leading edge skin you should make pencil marks along tabs on ribs. These lines, made with straight edge or string, and close to bend in tabs as possible (about 3/16"), will help you line up the ribs for drilling blind through leading edge. Don't drill yet. Sight along leading edge lengthwise, and line up tabs again, drawing pencil marks for each set of tabs. (You can do this easily because ribs are exposed at either end.) Now you can start drilling, because tabs will be cross-marked. Even so, you may miss one or two on each rib. Ribs, in spite of being riveted to main spar, still have some play in them at this point. Tap rib into place until pencil mark on it lines up under hole drilled in leading edge skin. Drill through, and cleco. When you have lined up and clecoed at least two tabs, the rest of the tabs will fall into place. Drill and cleco rest of the tabs through leading edge, except through spar. Top skin has to slip under this. It is riveted after wing is mostly finished and plumbed straight.

TOP SKIN

Use .020 aluminum sheet.

This skin underlaps, not overlaps, leading edge skin. Slip skin under leading edge, and mark top skin the same way, lengthwise, as the leading edge. Line up rear of each rib. Drill and cleco in front, and pencil in line on top skin.

AILERONS

Use .020 aluminum sheet.

Use 2 x 4s again, clamped near the center of the cut piece, then start bending. But this time go ahead and make a sharp crease for the trailing edge. In fact, after you take the boards off, use one of the 2 x 4s to press down on the trailing edge to crease down the bent edge firmly. You may need help to jump on the 2 x 4s to bend edge thin enough. Spread the leading edges apart slightly, slip a 2 x 4 between them and spread out sides. Clamp 2 x 4s together with about 3/4" showing; tap this strip down, then do the same with the other edge, tapping it up so the two strips overlap as shown in the drawing. The dimensions of the ailerons should match up neatly with the trailing edge of the wing, including slanted outer end cap. Rivet the piano hinges to ailerons and trailing edge.

EXTRUDED ANGLE

Rear spar attach point for outer wing panels.

Use 1" x 1-1/2" x 1/8". Its length should extend beyond second rib only from wing root. Angle should stick out 2" beyond rear skin. This is your connection to rear spar of center section. Cut notch in horizontal top section of angle 2" deep, so angle will fit neatly into space made by spacers on center section rear spar. Angle is held by rivets that hold aileron strip hinge (inboard) and two inboard rib tabs. After you have completed the outer panels, you should know a lot more about metal than when you started. I won't go into as much detail for the rest of the airplane, because much of the cutting, bending, lining up and drilling follow patterns already established.

CENTER SECTION

The center section, basically, is what supports your airplane in the air. Everything else is attached to it or depends on it for support, so great care should be taken in its construction. Generally, the center section is made just about the same way as the outer panels, except that you use a full-length 1/8" angle for rear spar. And the main gear and fuselage are attached to the center section.

RIBS

Use .020 aluminum sheet. Use 13 that you've previously cut out.

Bend tabs one way on six, and in the opposite direction on others. On outer ribs, tabs will face in toward fuselage. Use guide holes on drawing for center section. Actually, except for the flange holes, offset, and rear tab, these could have been made along with the first 13 ribs. NOTE: The main spar opening is spaced forward by thickness of outer wing spar.

MAIN SPAR

Use .040 aluminum sheet and 3/16" extruded angle.

NOTE: Bulkheads "B" and "C" sides should be made and drilled before skin is attached. Remove and rivet after skinning. Bend main spar to fit rib snugly. Make two 6-foot angles for top and bottom of spar, and use four 6-inch angles, two for each end.

Make enough flat aluminum spaces (5/8" total, approximately) to accommodate 2" protrusion of outer panel spar and angles, and cut out notch in top and bottom of center-section spar and angles to accommodate this 2" protrusion. Use two bolts, top and bottom, to bolt together 6" angle, spacers and 6" angle. Brace outer two bolts with vertical extruded angle as shown. Top inner bolt also goes through top tube of landing gear. Holes for taper pins and bolts are about 2-1/2" apart, but make sure all holes are centered away from any edges by at least one bolt diameter.

REAR SPAR, CENTER SECTION

Make like outer panels, from bends on bottom skin. Use .020 aluminum sheet and 1/8" extruded angle. Make rear spar to size and shape shown, and rivet 6' section of 1/8" extruded angle to top at same time trailing edge is attached. Bulkhead "C" and safety belt attach to rear spar, so you need the extra strength on top. Also, bolt 6" sections of 1/8" angles, outer end. You'll need about 1/4" of spacers. Use two 3/16" bolts to bolt together. Taper-pin hole and two boltholes will be about 1" apart.

TRAILING EDGE, CENTERSECTION

Bend like aileron but only one bed. Front edge of top slides under top skin, back edges. Same rivets hold top skin, 1/8" angles, and flange bent on bottom skin to top of trailing edge. Bottom of trailing edge is lapped 1/2" outside on bottom skin and riveted, using 2" spacing.

REMOVABLE WINGS

For removable wings, make notches in horizontal sections of spars and angles as shown in drawings, and slide the outer panel into place. It should fit snugly. Tilt the outer-panel wing up 4" (measured with straight edge or string across bottom of center wing, for level) and prop it there while you drill your taper-pin holes. Use a No. 8 reamer, and ream just enough so a No. 8 taper pin goes through all angles yet still sticks out far enough behind for springs to be effective; about 1/2" of the tip should show at most. Use two No. 8 taper pins, 5" long on main spar, one No. 8 taper pin, 5" long on rear spar, and two 1/4" diameter springs.

AILERON CONTROL HORN LINK

3 views are shown on planes. They take sideways movement from control stick and convert that movement to front and back movement to make aileron move up 1" and down 3/4".

ACCESS DOOR

For removable wing, cut an access door in bottom skin large enough to accommodate your hand when slipping the taper pins in place for flight. The taper pins slip in from the rear on the main spar, and from the front on the rear spar, so you can reach all three from the same door. Hinge door or use inspection cover plate. No wing walk is used because of weight, extra work, and drag of bracing. A 2" square of nonslip wing-walk grit can be painted on rear spar to use as step. I simply taped a 2" piece of coarse sandpaper over rear spar at rib intersection, close to fuselage.

FUSELAGE

BOTTOM SKIN

Use .020 aluminum sheet.

Bottom skin is 6' long, and tapered back to match bulkheads, with enough left over at each side to bend $\frac{3}{4}$ " flanges, as shown in drawing. While attaching to center section, you will have to support rear end of bottom skin with T-bar or some other brace. Bulkhead "C" and top skin of center wing are all riveted to rear spar. A supporting piece should be made for bottom skin using .040 aluminum sheet. Make aluminum .040 angle long enough to reach across bottom skin from first rivet at trailing edge on one side, then cross bottom skin at 45° angle to opposite side of fuselage at bulkhead "D". This cross-bar will help prevent bottom skin from buckling on hard landings. Also, two gussets, one on each side, should be installed on fuselage skin C-D at point where bottom skin meets trailing edge. These will give added support to fuselage in this area. About 3" high they should extend about 6" on either side of bend, or far enough forward to meet bulkhead "C", and about same distance behind trailing edge. Bend flange on flat upper edge of gusset for added strength. Rivet to bulkhead "C" and along bottom of skin C-D. See full-size pattern in drawings.

BULKHEAD "A"

Use .016 stainless steel, 20 gauge.

This is the firewall and is made of different material than the other bulkheads. Make a template from plans, then make bulkhead. Crimp at corners. Use 3/16" extruded angles for cross braces as shown, riveting to firewall with as close as $\frac{1}{2}$ " spacing. Make bolt holes for mounting engine as shown. Be sure to use stress gussets under extruded angle; see full-size pattern.

BULKHEAD "B"

Use .040 aluminum sheet, and make aluminum angles by bending inside edges forward on side pieces as per drawings.

This is the instrument-panel bulkhead, and can be made from the plans as shown. Bend tabs forward, away from cockpit, to prevent any sharp edges showing. Cut out holes for instruments, after measuring instruments carefully, with special cutout drill mounted on your electric drill (called a circle cutter), or drill holes and use tin snips and round file to smooth holes.

BULKHEAD "C"

Use .040 aluminum sheet.

This is the bulkhead behind the pilot, and can be made from drawings as shown, bending tabs toward front on side pieces, toward rear on top piece. Height is flexible, and can be made to suit pilot. Bulkhead "C" is riveted to front surface of rear spar of center section. Cut hole on top skin forward of rear spar in order to rivet "C" sides, and cover hole with plate. Safety belt bracket is also bolted to rear spar. Cut hole in trailing edge top skin, behind rear spar, for aileron control arm.

BULKHEAD "D"

Use .040 aluminum sheet and .040 angles.

If "C" is built higher than plans, make sides of "D" to match. Support rear of fuselage with T-bar made of wood strips when riveting; this insures proper kickup as measured from flat bottom of wing.

BULKHEAD "E"

Use .040 aluminum sheet.

Make from plans as shown, or wait until fuselage is complete and make your own template from final shape of D-D.

FUSELAGE SKIN

Fuselage skin is cut to fit bulkheads, and in all cases it overlaps front to rear or top to bottom. All skins are identified by bulkhead letters.

SKIN A-B

BOTTOM SKIN

Use .020 aluminum sheet.

First install extruded angles (1/8"), pulling together forward ends to attach to angles on firewall, as shown. The bottom angles are installed with horizontal sections on bottom, and the top angles with the horizontal sections on top, to match with the angles on the firewall, as shown. Now attach to firewall, propping it up. Cut bottom skin from template and bend, using technique described earlier, and cleco to wing, angles and firewall. The others are cut to fit bulkheads as you go along.

SIDE SKINS

Use .020 aluminum sheet.

Cut to fit, and overlap bottom sheet.

TOP SKIN A TO B

Use .020 aluminum sheet.

Cut to fit, but drill separate holes for installing and use metal screws. This will give you easier access to fuel tank. Overlap side skins, and cut out hole for fuel tank filler neck.

SKIN B-C

Use .020 aluminum sheet.

This is your cockpit skin. Space ribs under side skin while wing is constructed, to match bulkheads. Do this before wing is skinned.

SKIN C-D

Use .020 aluminum sheet.

This is the most important skin in the fuselage, and probably should be installed first, as it may shape the rest of the fuselage. Wrap between bulkheads "C" and "D", exactly 3' wide all the way around, and begin drilling and clecoing from top center and down each side, one hole at a time. Watch to see that fuselage isn't twisted out of shape. One clue is whether rear of bottom skin lifts off T-bar support on one side or the other as skin is drilled and fastened.

SKIN D-E

Use .020 aluminum sheet. One piece wrap around.

Small gussets, made of 1/8" aluminum cut from scrap angles, should be used to reinforce spot where bolt for control surfaces goes through. They can be installed inside skin D-E before these skins are installed, or outside after fuselage is complete.

LANDING GEAR

All 75 hours of test flying were made from rough sod field.

NOSE GEAR

Use 1-1/2' .058 tubing for top, and 1-3/8" for bottom with neoprene hose, well greased, plus spring. Bottom rod is cut, shaped and welded as shown. This is a tricycle-gearred plane, so the nose wheel is tilted forward as per drawings, measured from lower edge of firewall. Nose gear tubing size behind the engine is 1" .095 wall. It measures 8-1/2" below bottom engine mount boltholes to end of weld of the 1-1/2" tubing.

MAIN GEAR

Use same materials as nose gear.

The major gear tubing length is 11" at the top and 9" at the bottom. Top of top tube is cut as shown to fit neatly against top extruded angles on main spar, and is bolted to top inner spacer-bolt. Lock plate is welded to top tube as shown and bolted to bottom horizontal angles and spacers on main spar. Lock plate is against bottom skin, outside flush as per drawings. Main gear is tilted behind center of gravity 6" behind main spar at ground contact point. Set up gear so bottom of wing is level and 15" from ground.

SHOCK ABSORBER

Neoprene can be obtained from industrial supply house. Saturated with grease, it gives enough shock-absorbing quality in a plane the size of the Teenie to absorb the initial shock without transferring most to the airplane. Use Cadillac valve spring as per drawings. Put the bolt holes all the way through so they hold the tubing solidly, but ride up and down in the slot in the bottom rod. The slot is larger on nose gear to allow bottom tube to rotate enough for turning. You can use bushings around the bolts, after signs of wear, if any. The top and bottom bolts hold the neoprene hose in place, the middle bolt lets it ride up and down in the slot without wheel twisting.

TAIL ASSEMBLY

The tail assembly can be put on after the airplane is complete. It's better to make the control surfaces to fit the airplane rather than vice versa. Generally, they can be shaped the same way you made the aileron trailing edges.

VERTICAL STABILIZER

Use .020 aluminum sheet. (.040 for vertical spar.)

Use pieces for vertical stabilizer spar, as shown, bending of aluminum angles. Cut and shape vertical stabilizer spar to fit. Add a small clip of .040 bent to 90°, with 2 rivets at each end to fasten front edge of stabilizer to skin before dorsal fin is added.

RUDDER

Use .020 aluminum sheet.

Bend and shape as you did ailerons, to dimensions shown. Attach to vertical stabilizer spar with piano hinges 6" long, rivet 1" spacing. Rudder horn length is 2-7/8" from hinge to bolt. Offset of rudder push-pull tube at rudder bar is 3" to 4" to meet rudder movement dimensions of 4" each side of center.

DORSAL FIN

Use .020 aluminum sheet.

This is an important piece, absorbing some of the loads on the vertical stabilizer and eliminating another bulkhead. When riveting to bulkhead "D" it's best to follow this order of overlap: Starting from the bottom, bulkhead "D" tab,

lips from two skins D-E, skin C-D, and dorsal fin on top. The dorsal fin should have 6 rivets per side on vertical stabilizer and 2" rivet spacing on fuselage, to distribute load, plus .040 tab inside as per drawings.

ELEVATOR

Use .020 aluminum sheet and bend same as ailerons, be sure and build control horn as per drawings. Mount to horizontal stabilizer with 3 strip hinges, 1" rivet spacing.

HORIZONTAL STABILIZER CONNECTIONS

Use 1" x 1-1/2" x 1/8" extruded angle 2-1/2' and .020 channel inside for spar. Hacksaw to shape and file down, smoothing to shapes shown. This eliminates excess weight. Add turn-buckles for adjustment as per drawings.

RUDDER AND ELEVATOR ALUMINUM PUSH-PULL TUBES

They are flattened to 3/8" thick for about 1-1/2" at rear ends. A slot 1/4" wide is cut on one edge about 1" long so they will slide over the control horns. A 1/4" diameter hole is drilled through both sides and control horns. At least 1/2" edge distance from hole edge to outside edge should be maintained. The tube is removed from over control horn and the 1/4" hole in horn is drilled to 3/8" diameter. **BALL JOINTS SHOULD NOT BE USED ON REAR ENDS IN PLACE OF SLOTS.**

A piece of Teflon or neoprene 3/8" diameter is drilled 1/4" which makes a tube which is cut about 1/8" long. This is the bearing to use in control horn. A flat piece of Teflon or neoprene with 1/4" hole is used on each side as a washer between horn and tube. This forms a fail-safe joint at low cost, which is self-lubricated and will allow a slight universal movement. If slack develops, a slight tightening of 1/4" bolt will remove it. In fact, Teflon or neoprene can be used at any wear or bushed surface on Teenie if desired.

Front ends are flattened just enough to fit universal ball joint ends with 1/4" bolt holes, maintaining 1/2" from edge of bolthole to end of tube. Tubes may have to be bent slightly at center to clear bulkhead "D" sides.

CLAMPS

Three C-clamps, 6" or 8"

2 x 4's

Two pieces fir, 7' long.

TAPER REAMER

Optional, but necessary for removable wings. You can rent or borrow a set.
Get No. 8 reamer, and No. 8 5" long 15 to 1 taper pins, 6 each.

ALUMINUM SHEETS

10 sheets, 3 x 12', .020 thickness, 2024-T3 Alclad (for skin, ribs, control surfaces)
1 sheet, 4 x 12', .040 thickness, 2024-T3 Alclad (for main spar, bulkheads, control surfaces spars, self-bent .040 aluminum angles)

STEEL SHEET

1 sheet, 9 x 19", .090 thickness 4130 chromolly (for main-gear mount, control bearing plates)

EXTRUDED ANGLES

75', 1-1/2 x 1-1/2 x 1/8" thick, 6061-T6 structural aluminum angle.

(Basically, the extruded angles are used for stiffness, to keep the other metal from bending. File down and smooth the sharp edge at the outside center point of the angles before placing against the softer bends in the aluminum. File radius to match bends. Also, you will note that you have to make some angles yourself. All are made of aluminum.)

To avoid confusion, I will refer to the angles you make as "aluminum angles" and the angles you purchase as "extruded angles".)

STEEL TUBING MATERIAL

8', $\frac{1}{2}$ " diameter, .035 wall 4130 chromoloy steel tubing.
5', $\frac{3}{4}$ " diameter, .035 wall 4130 chromoloy steel tubing.
7', $\frac{5}{8}$ " diameter, .035 wall 4130 chromoloy steel tubing.
3', $1\frac{1}{2}$ " diameter, .058 wall 4130 chromoloy steel tubing.
3', $1\frac{3}{8}$ " diameter, .058 wall 4130 chromoloy steel tubing.
1', $7/8$ " diameter, .058 wall 4130 chromoloy steel tubing.
1', $3/4$ " diameter, .120 wall 4130 chromoloy steel tubing.
5', 1" diameter, .095 wall 4130 chromoloy steel tubing.

ALUMINUM TUBING

Two 8' long, 1" diameter, .049 wall half-hard aluminum tubing for rudder and elevator push-pull rods, cut to length when installing. (Get at Sears or local hardware Reynolds aluminum rack.)

FIREWALL

22" x 16" .016 stainless.

HINGES

9 piano or strip hinges, 1-1/2" wide ($3/4$ " each side) cut to 6" lengths.
Steel cadmium plated hinges are least expensive.
But can use machined aluminum aircraft hinges.

FUEL TANK

Use galvanized sheet steel, usually gutter flashing, 28 gauge; drill and rivet sections together, using 2" spacing, then soft solder seams together.
Make sure drain outlet is at bottom front.
DO NOT USE FIBERGLASS!

A piece of angle 1" x 1-1/2" x 1/8", is used from firewall. Alongside bottom rudder bar bearing, it extends back to where bottom skin rivets to bottom of wing leading edge. At the center rib, about 3" of the vertical part is cut off. Rivet to center rib nose skin.

ADDITIONAL INFORMATION

FEDERAL AVIATION ADMINISTRATION

An inspector from the FAA must examine your airplane before it can be certified for flight.

CENTER OF GRAVITY TEST

The FAA will require a center-of-gravity (CG) test. There are several ways of doing it, but here is a simple test I used. Take two 2 x 6 planks and make a cross of them; the fore-and-aft plank on the bottom, the side-to-side plank on top. Nail them together lying flat. Place the plane on the planks, the main gear on the side-to-side plank. Using the main gear as a guide, mark the spot where the main-spar web should fall, using a plumb line. Chock the wheels. Take the plane off. Place a $3/4$ " straight piece of pipe under the planks and under the mark spotting the main-spar web. Now balance the planks so that they ride evenly on the pipe under the mark, either by weighing down either the fore or aft end of the bottom plank, or by sawing off either its fore and aft ends. This will give the planks neutral balance. Now put the plane back on in the same spot, and run two tests. At maximum load – with large pilot, baggage and minimum fuel (1/3 tank) – the plane and the planks should balance no more than 1" behind main spar center web. At minimum load – a 135-lb. pilot, full fuel tank, no baggage, and largest VW engine – it should

balance no more than 3" in front of the center web mark. In other words, the CG limits are 1" behind the main spar to 3" forward of the main spar, or anywhere in between.

NOTE: THE ABOVE METHOD IS ONLY SAFE WEIGHT AND BALANCE TO USE ON THIS AIRPLANE. IF BUILT TO PLANS, THE CG WILL BE WITHIN LIMITS.

FLIGHT PRECAUTIONS

AILERONS

Should be leveled with bottom of wing at the tips by laying a straight edge along bottom of wing 1' inboard of tips. The straight edge should extend a foot or two behind ailerons. A spirit level should show any difference in twist between wings.

LANDING

Start a flare-out as you come across a fence at runway end. The glide should be maintained without pulling on stick until the wing is down into ground effect, or 3 to 5 feet high. A fairly quick flare-out will touch main gear; relaxing the stick slightly will lower nose gear onto runway. 10% above stall will give a quick and smooth touch-down without ballooning or the necessity to kill off excess speed. During 20 or 30 mile cross-wind or rough thermals, a slightly higher approach speed should be used. Avoid unnecessary quick movements close to ground with elevator. This plane is so stable it will sink without any tendency to drop off on higher wing when in full stall, which may mislead you into thinking it is still flying if the flare is too high or above ground effect. This causes a hard drop landing but a slight increase of throttle or slight relaxing of stick will catch the flare.

I will be glad to answer any questions regarding the construction of this airplane from purchasers of plans; however, we will not answer questions on design changes.

NOTE: ANY ALTERATIONS TO THIS AIRCRAFT DESIGN DOES NOT MAKE IT A NEW DESIGN TO MARKET UNDER A DIFFERENT NAME. ANY ATTEMPT TO DO SO WILL BE DEALT WITH. CHANGING ENGINES, WHEELS, OR MINOR AIRFRAME AND COSMETIC ALTERATIONS, DOES NOT ENTITLE ANYONE TO THE PROPRIETORY AIRFRAME DESIGN. PROVEN FO 30 YEARS.

Finally, although great pains have been taken to design plans to make this minimum airplane as safe as possible, neither myself nor the suppliers of materials can assume any liability for the construction or use of any airplane based on these plans.

Calvin Y. Parker

ANNOUNCEMENTS

The fuselage skins from Bulkhead "C" to "D" will be easier to build by making them in three (3) pieces. Bend $\frac{3}{4}$ " flanges inside top edge of lower pieces at baggage compartment. Lap top skin over and rivet. Won't look as good, but a lot less work.

A WORD ON RIVETS:

The Teenie Two is designed to have full strength using Hollow steel rivets – cadmium or zinc plated (which is same corrosion protection that is used on aircraft bolts) and dipped in zinc chromate or Aluminum paint and push them in and pop with tool, wipe off excess paint before it dries. I used zinc chromate on all bottom surfaces and painted in Red with Sears Alkyd paint in spray cans, also used Alum. paint on top rivets, because I wanted the Teenie Two to look Aluminum.

We reserve the right to discontinue or change design without obligation to update plans sold in the past.

There have been NO crackups by airframes built according to our plans. All reported accidents have been pilot error and illogical overweight alterations.

The only allowable alteration is widening cabin 1" each side at Bulkhead "B" and "C". Adjust width of Bulkhead "D" to fit. Adding canopy, cowl and wheel fairing is NOT an alteration and is allowable. A finger strainer screen MUST be used in all gas tanks at fuel outlet.

There have been some complaints from inspectors about the spar warping or curving after bending with 2 x 4s and 2 lbs. plastic hammer. The ribs also look warped. But be assured that this is normal and all will pull out as ribs and bottom skin is added to spar.

Shoulder Harness Hard Points are at bottom back corners of baggage compartment. A 3" piece of 1/8" aluminum or steel is riveted to backside, lapped under corner. At least $\frac{1}{4}$ " bolt with washers are used to hold shoulder harness.

WARNINGS!

THE VERTICAL .040 BENT ANGLES ON REAR OF MAIN SPAR CHANNELS TO HOLD RIBS IS ABOUT 5 $\frac{1}{2}$ " LONG. THERE IS NO NEED FOR A CENTER RIVET EXCEPT LAST 2 RIBS ON OUTER WING TIPS.

Build wings first. Then instrument panel sides should be attached to forward face of main spar by cutting slots in top of leading edge skin. Rivet by drilling from rear after skin is cut from seat bottom.

THE T-2 LANDING GEAR IS DESIGNED TO BEND ON AN EXTRA HARD LANDING. IT IS A SAFETY FACTOR TO WING DAMAGE. THE CENTER WING IS PART OF GEAR DESIGN. IT IS THE LIGHTEST AND LEAST EXPENSIVE TYPE FOR THIS AIRPLANE.

IT IS ALSO A LIMITED MOVEMENT SHOCK TO CONTROL BOUNCE, AND THE SLOT ACTS AS A CROSSWIND GEAR. DO NOT MAKE ANY CHANGES IF YOU EXPECT TO HANDLE THIS SIZE AIRCRAFT.

THE WHEELS WE USE ARE THE PROPER SIZE RATIO FOR ROUGH FIELDS. ALUMINUM WHEELS SHOULD NOT BE SUBSTITUTED BECAUSE SIDE LOADS ARE MOST IMPORTANT.

THE CONTROL SYSTEM IS A LITTLE QUICK, BUT IS NOT TRICKY. IT IS DESIGNED THAT WAY FOR AEROBATICS AND HAVE CONTROL UNDER SEVERE FLIGHT CONDITIONS. NO NOT DEVIATE FROM LINKAGE RATIOS LISTED IN PLANS.

MY TEENIE TWO HAS HANDLED 60 MPH CROSSWIND SQUALLS AND ROUGH GRASS FIELDS FOR 30 YEARS, BUT WILL NOT IF ANY CHANGES ARE MADE.

Horizontal stabilizer mount angles should be long enough to set leading edge behind and touching Bulkhead "E". Bottom of stabilizer is level with bottom skin.

Slant of horizontal stabilizer should be adjusted before first flights – so a line drawn through center of end cap will reach top of wing between front main and rear spars. This will assure a reference level to adjust the elevator up and down limits.

Nose Gear: Welded patches shown on plans are not needed as shown by field experience and the nose gear is designed to fold at steering arm.

Nose gear steering arm linkage may be easier to hook up if fork is rotated to put steering arm on front. Cut slot so sides will limit steering to match rudder movement limits.

Rudder bar is 4" from bottom skin at firewall.

Aileron end caps will have longer life and be safer if bent from .035 steel. Control arm tabs are welded on before final installation of end caps.

Aileron bell crank outboard ends are inboard of aileron end cap. Cut short angle and skin at bottom to clear movement as shown on plans.

Bottom angles between Bulkhead "A" and "B" at top of main spar:

The rear end vertical side is cut back 1-1/2", which will leave a horizontal tab. The horizontal tab is then trimmed to $\frac{1}{2}$ " wide, which is then fitted in the notch in "B" side level to top of main spar. Two (2) rivets are used to fasten to top main spar to hold until skins are riveted on. Bend ends to align flat.

Bulkhead "D", Top Pattern, is narrow by width of the tabs. Bend line should be at the tab width. Then add $\frac{3}{4}$ " each side for tabs to match straight line between Bulkhead "C" and "E".

Control Stops. Downward movement of ailerons and elevator is limited by balance weights touching rear spars. Hole cut in top of trailing edge where aileron actuating arm goes down behind seat will limit movement. In fact, $\frac{3}{4}$ " up and 1" down are the usual limits because of the limited movement of arm. Elevator up limits are set at control stick bottom. Rudder movement is limited by rudder bar touching firewall on each side.

ADDENDUM June 9, 1989

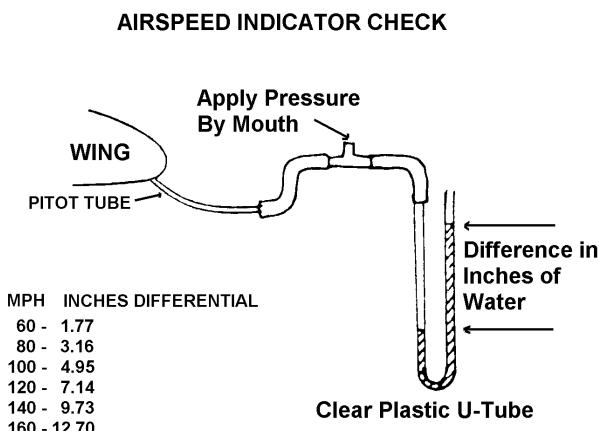
I have long been a great fan of doing things on the cheap. The sole purpose of building homebuilt aircraft is to get all the flying that you are after to show up reasonably well using the minimum possible time, cost, and effort.

I have seen countless projects ruined or changed into something entirely different and totally out of control by trying to redesign a proven design.

One of the main features of this design is utilizing the minimum sheet sizes. Measure wing skins first by using rib drawing.

Wing ribs are made from leftovers after cutting skins.

Build all three wings first. Before final riveting, skin bottoms, leading edges, and tops, join together and cut slot ahead of main spar at instrument panel sides. Drill and rivet from backside of main spar at seat bottom opening.



As stated on these blueprints and instruction book, these prints are a permit to build one airplane. The prints must be kept with the completed airplane and have a valid serial number and are not to be sold or copied and sold.

That is why others advertising used or new Teenie Two plans is not valid.

I will not talk about building unless you have a serial number.

A fee will be charged for paperwork to transfer serial number from one person to another.

To eliminate using 4 rod ends and a lot of welding, flatten ends of $\frac{1}{2}$ " .035 chromolly tubing that is used from rear of control stick to push-pull aileron cranks. Flatten $\frac{3}{4}$ " in vice with taper. Use nylon or teflon rod $\frac{3}{8}$ " diameter drilled $\frac{3}{16}$ " to fill in after wear or slack shows up in future.

ADDENDUM Nov 2, 1993

Page 7 Plans – Aileron horn horizontal arm should clear rear spar taper pin.

Main Gear on sheet 6 – Upper shock bolt is shown close to top end of inside tube. Drawing is half scale and looks close to top end of inside tube. It should be high enough to clear inside tube by $\frac{1}{2}$ ".

Nose gear shock and steering damper hose should be tight fit on bolt in slots.

Steering arm should be turned to front of strut.

Springs in push tubes should be of strong enough to control steering on bumps in rough fields.

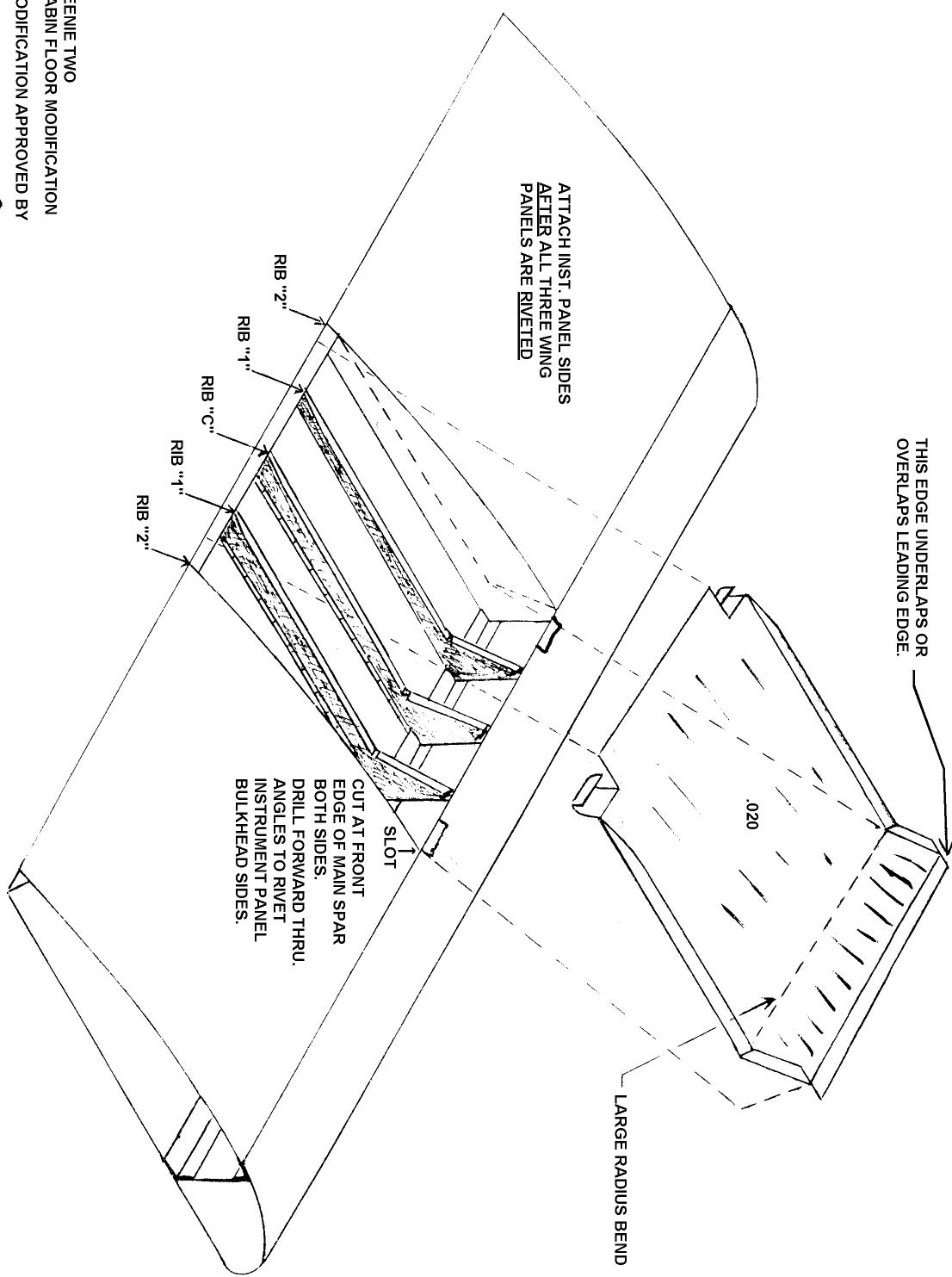
Steering bushing on bottom of rudder tube is drilled $\frac{3}{4}$ " apart and should be $\frac{3}{4}$ " from center of vertical tube.

Elevator horn on sheet 7 is vertical and tube hole is 2" high and 1" behind elevator hinge pin. With elevator horizontal position.

WIND SHIELD PATTERN

On page 3 of plans drawings are not marked clear. The arrow is pointing up on full size windshield pattern.

Mark off and point arrow down on plans pattern. It will fit both ways, but will not match the headrest curve on bulkhead C. Unless turned the right way. Then the .090 lexan will fit for winter cabin closure.

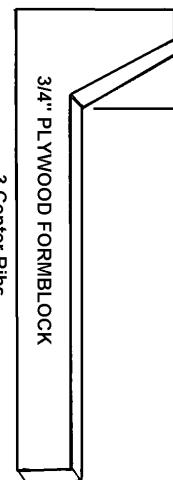


TEENIE TWO
CABIN FLOOR MODIFICATION
MODIFICATION APPROVED BY

C. Parker

DRWG. BY R.W.S. 6/25/73
MOD. 12-1-91

4" MEASURED FROM REAR EDGE
OF MAIN SPAR TOP



3/4" PLYWOOD FORMBLOCK

3 Center Ribs

- TEENIE TWO CABIN FLOOR MODIFICATION**
1. CUT TOP WING SKINS FLUSH WITH RIB "2" AND MAIN SPAR
 2. CUT DOWN THREE RIBS "1" & "C" ALLOWING FOR FLANGE.
LEAVE RIBS OUT AND PUT IN SUPPORTS AFTER CUTOUT.
 3. BEND FLANGE USING 3/4 PLY FORMBLOCK.
 4. MAKE BOTTOM PAN AS PER DWG. USE DIMENSIONS OF YOUR ACFT.
 5. RIVET WITH 2" SPACING EXCEPT MAIN SPAR 1" SPACING
 6. USE 1/4" "AN" BOLT FOR SEAT BELT.

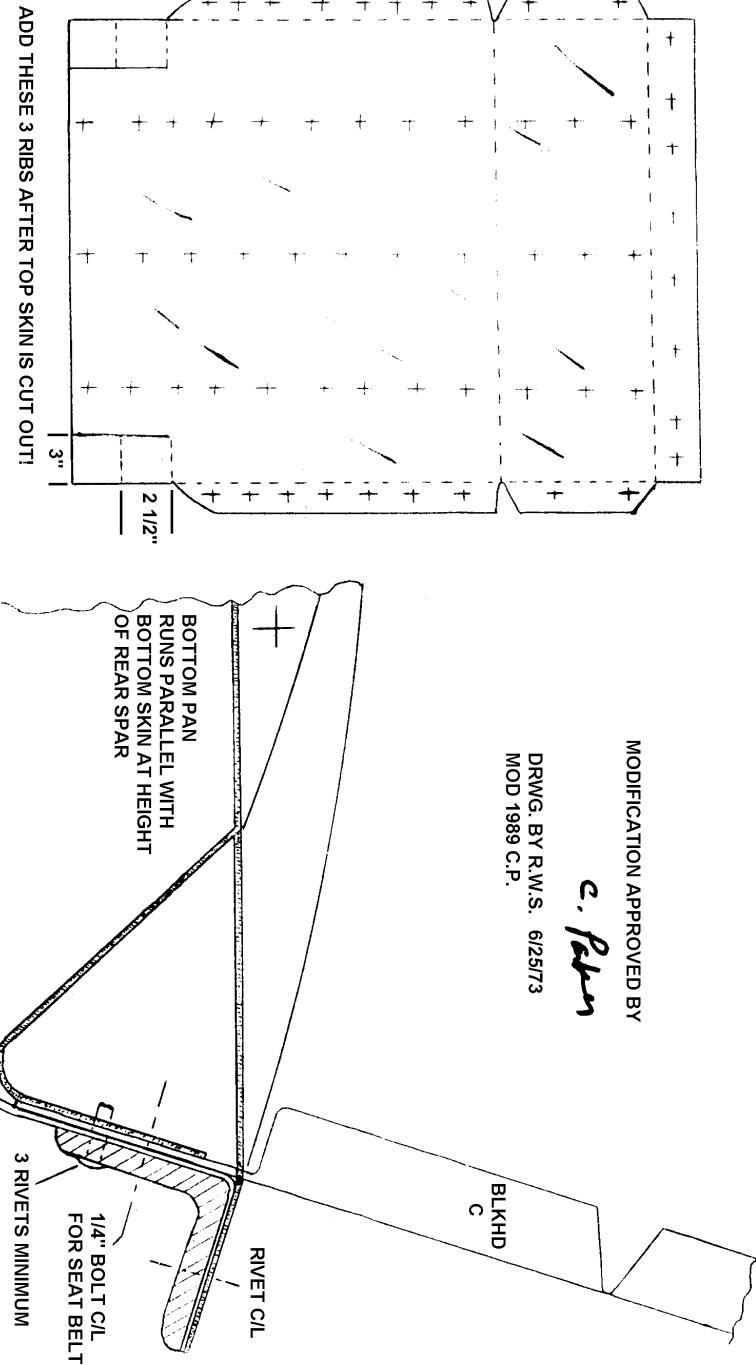
MODIFICATION APPROVED BY

C. Parker

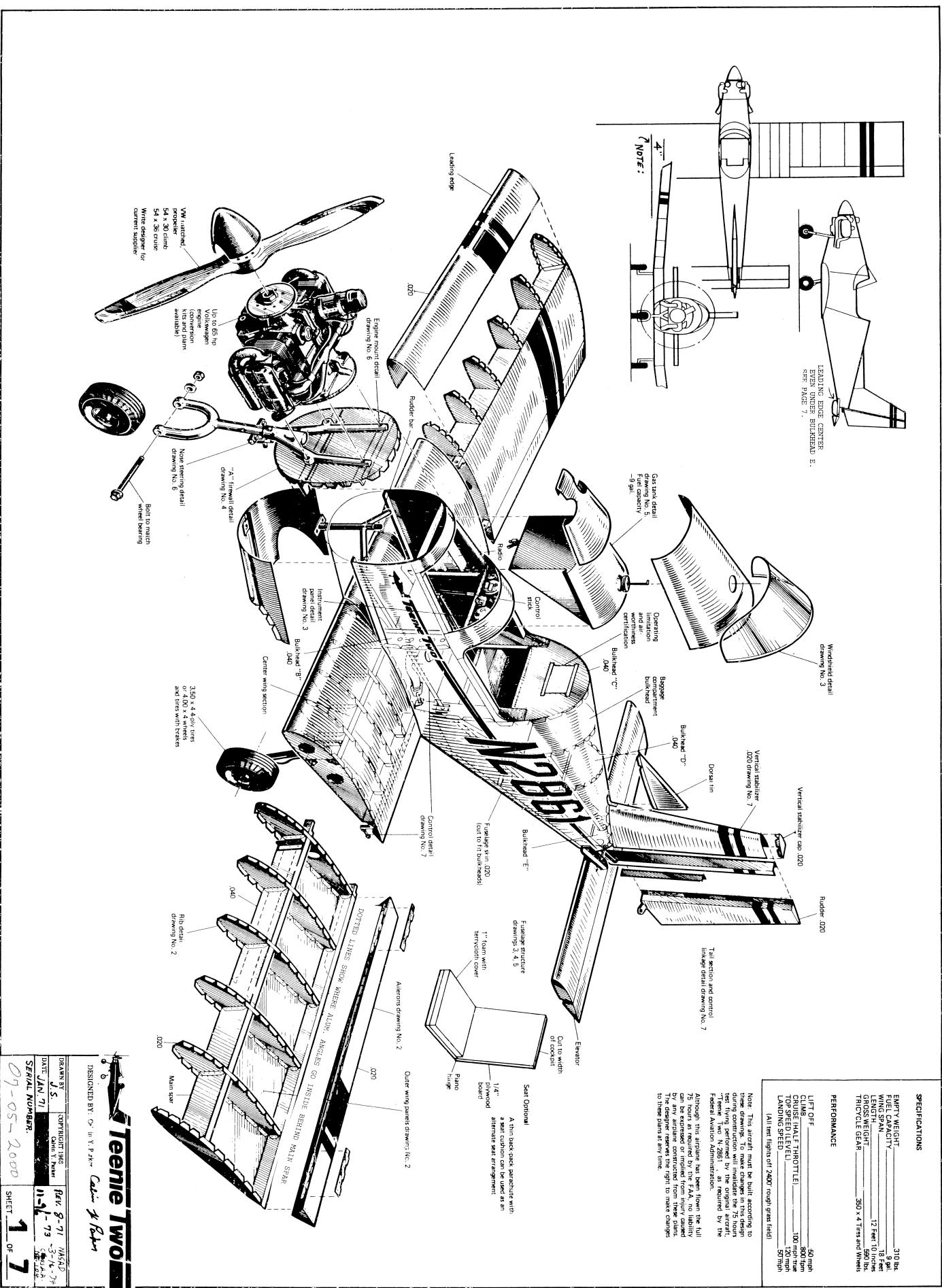
DRWG. BY R.W.S. 6/25/73
MOD 1989 C.P.

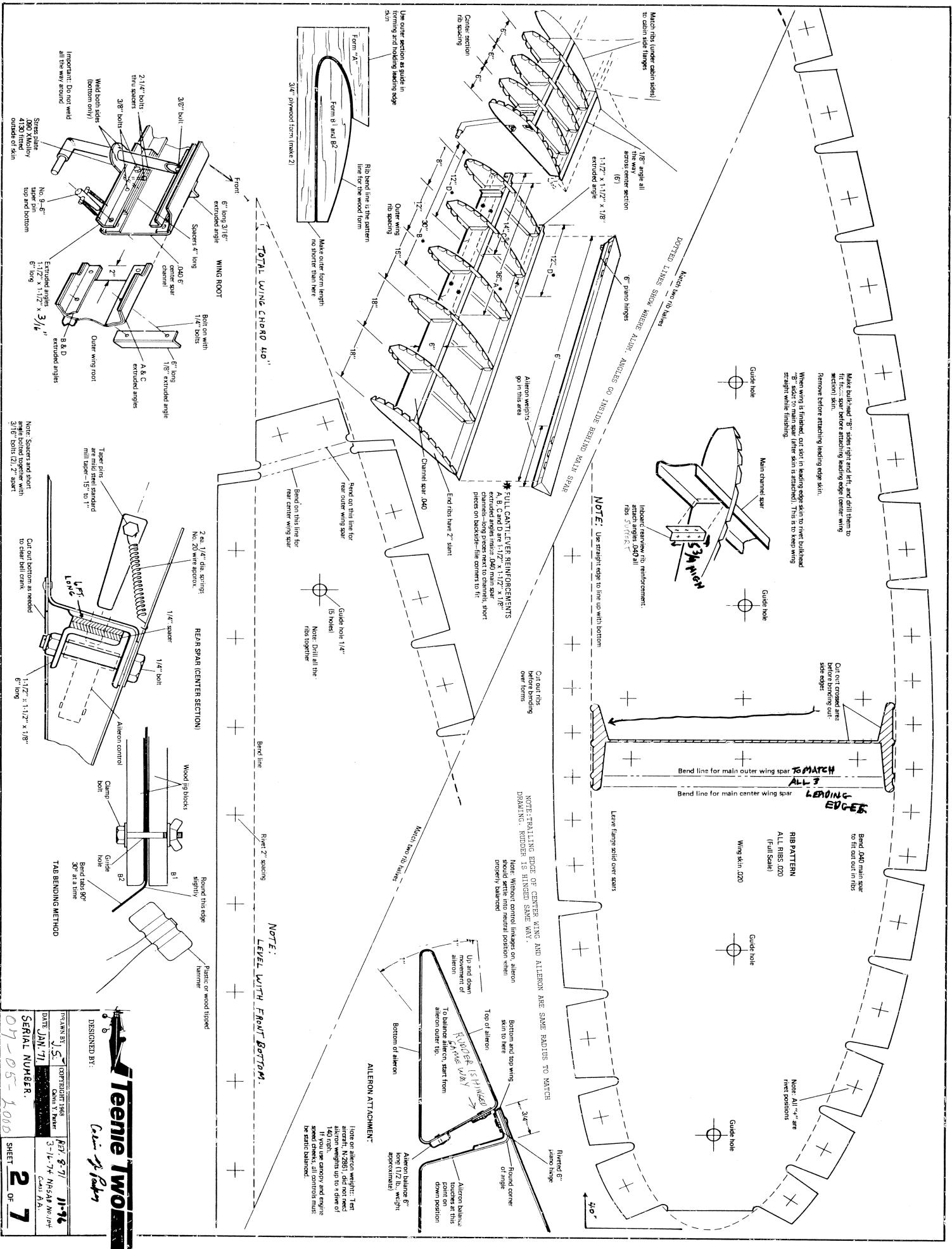
BLKHD
C

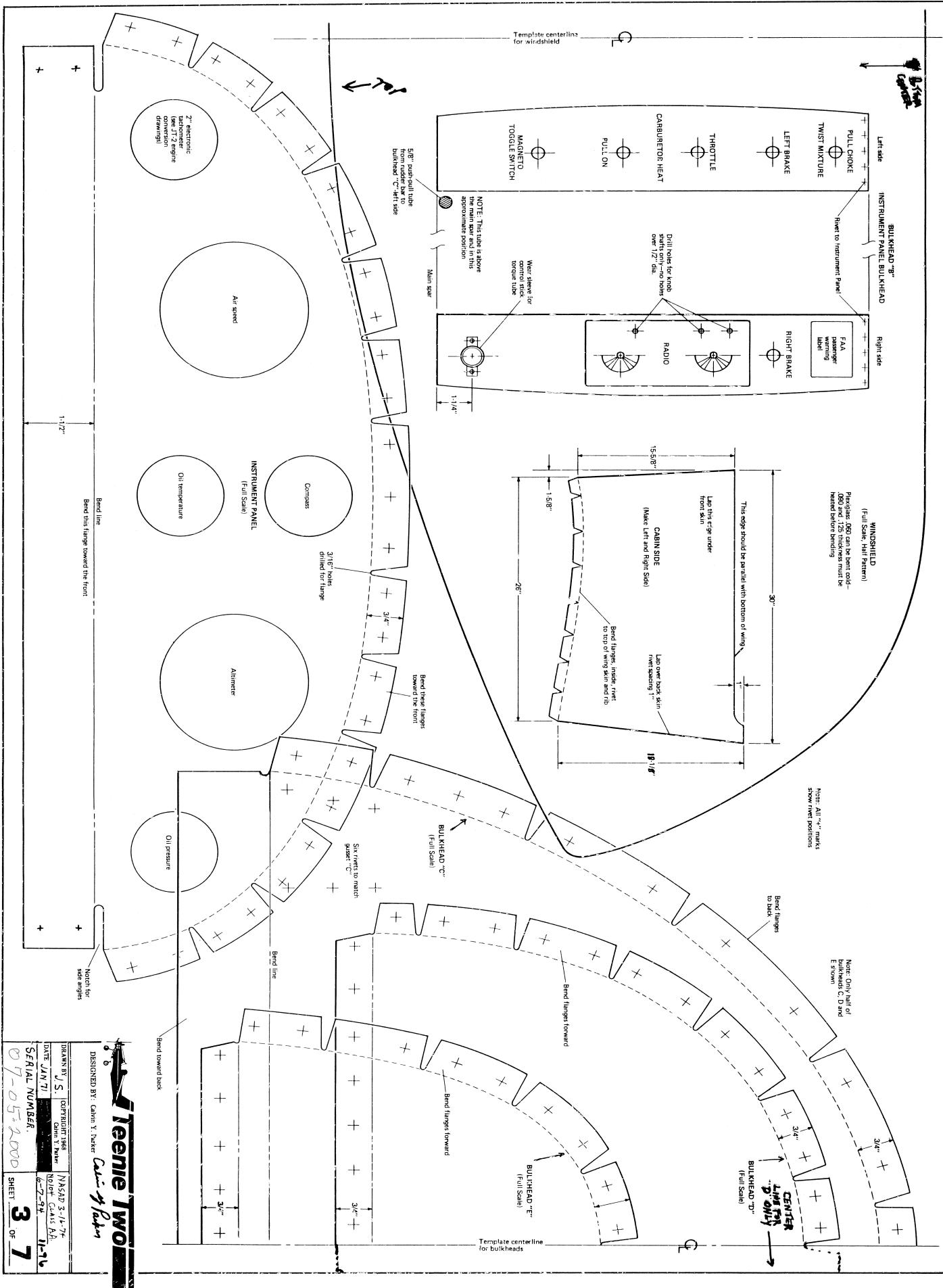
RIVET C/L

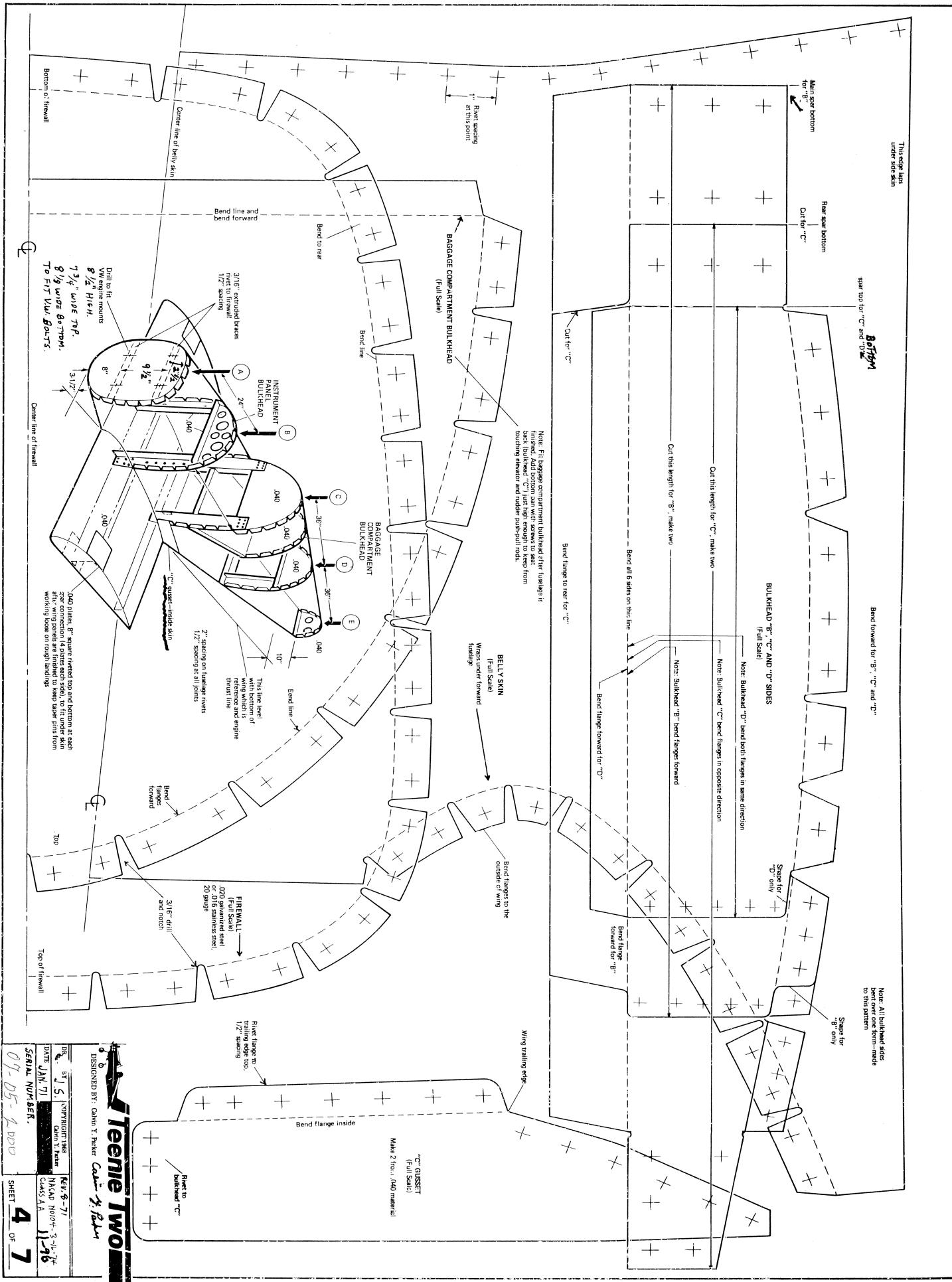


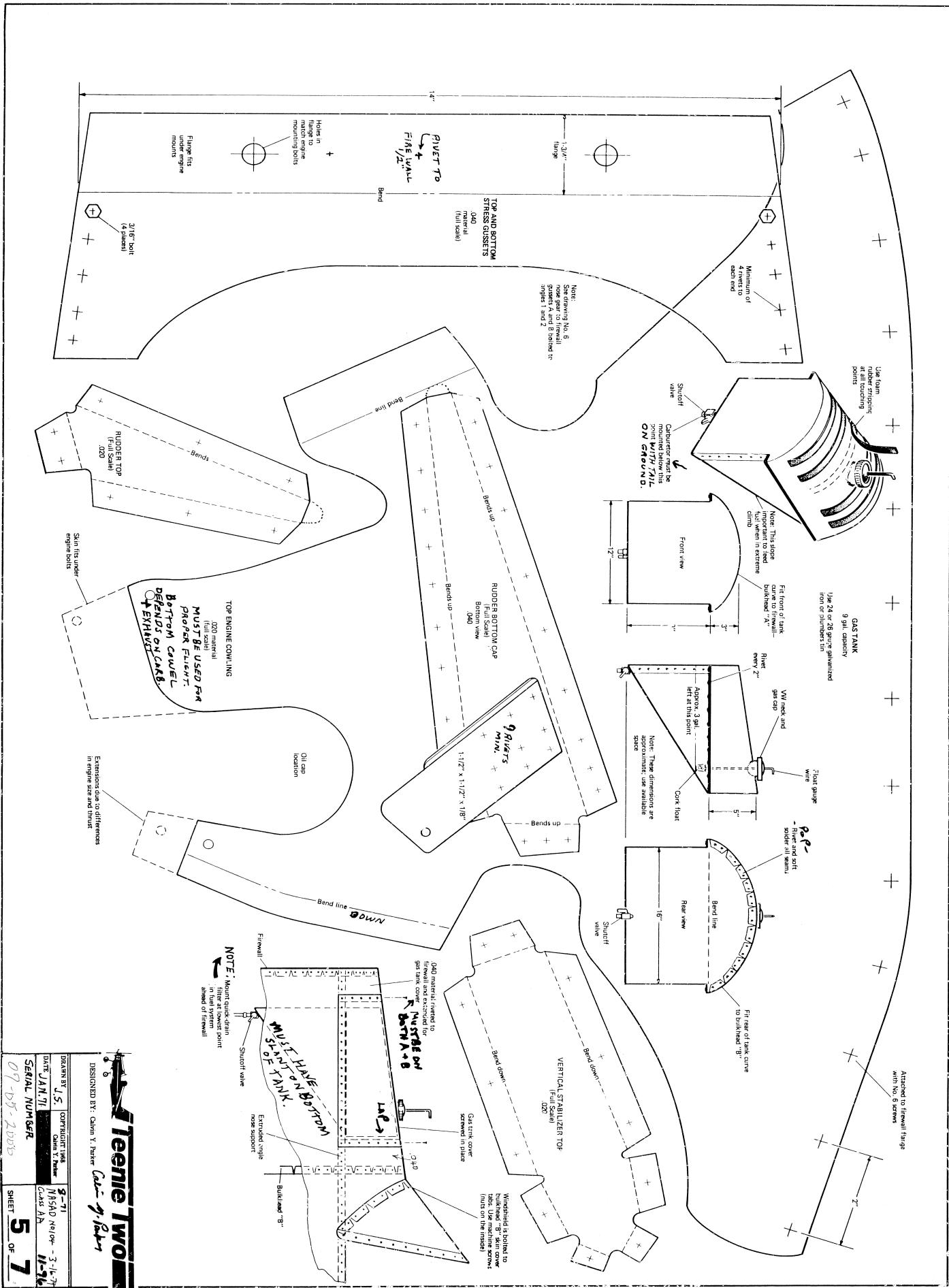
DWGS. ARE NOT TO SCALE

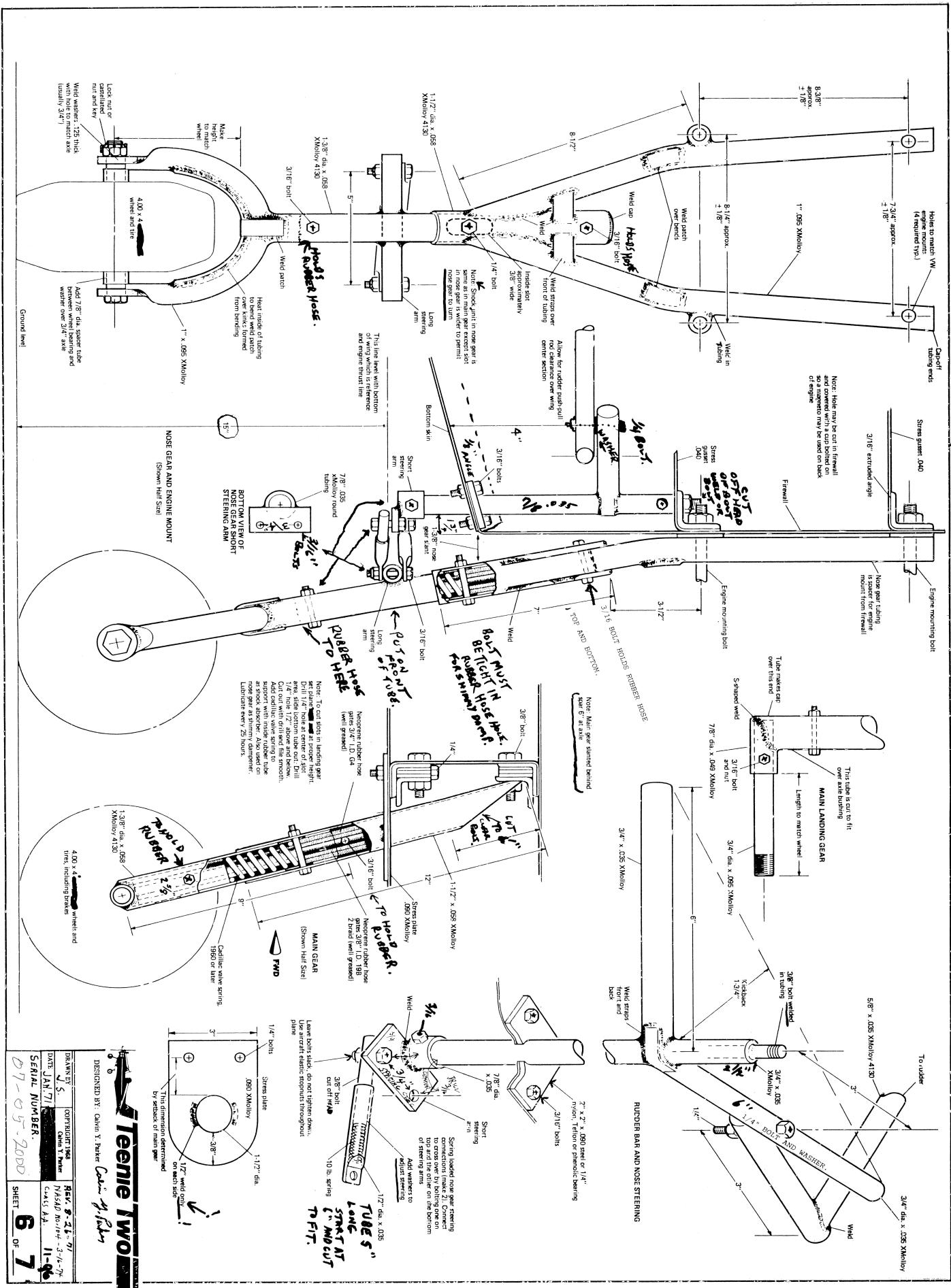


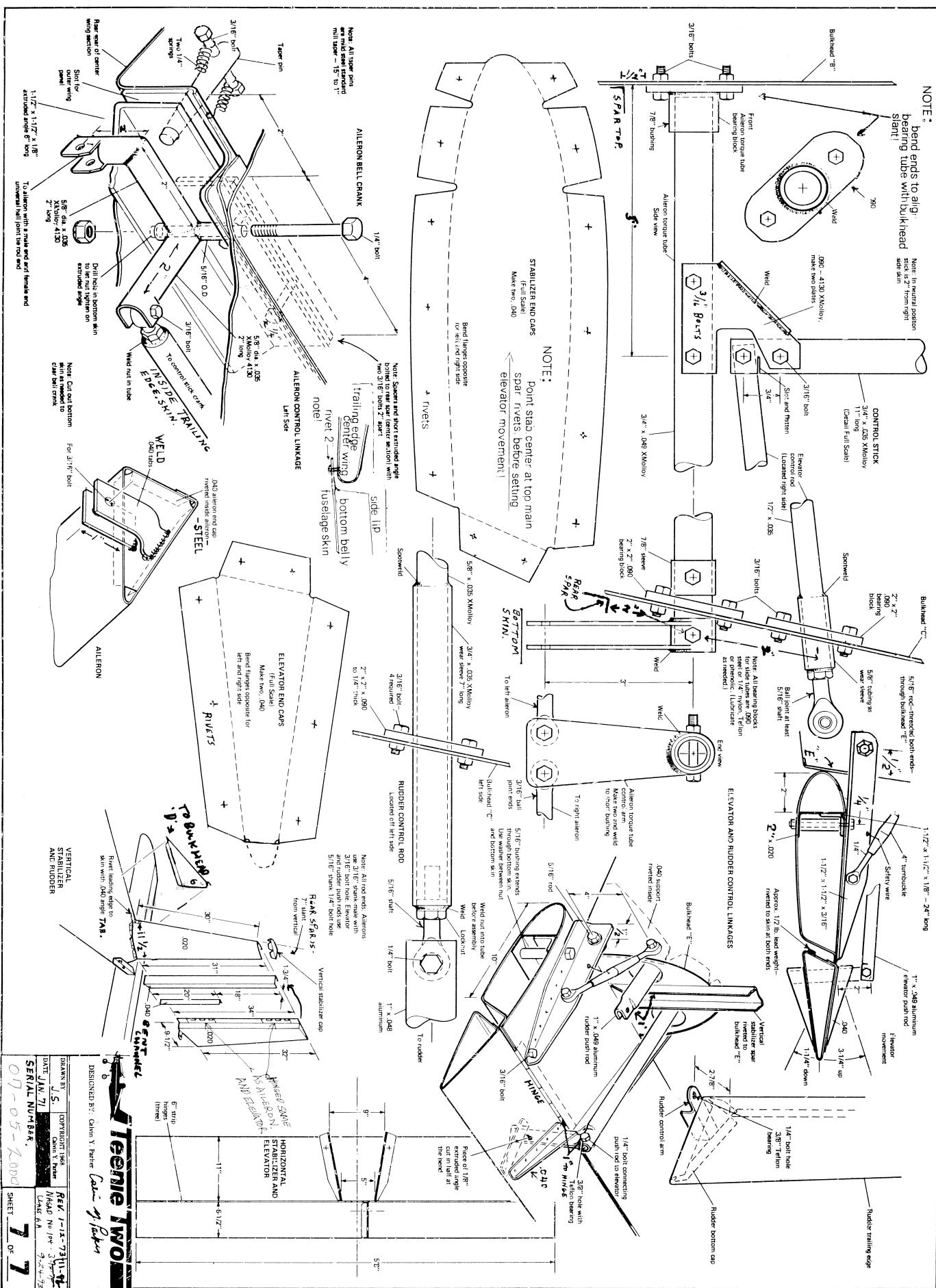












NOTE: Hooks are bent past center so pull will not open

