

PUSHCART

An out-of-the-rut 1/2A sport model featuring a mix of traditional and unconventional construction, by one of the most innovative designers in the hobby.

BY ROY L. CLOUGH, JR.

Didn't you ever, right in the middle of a well-considered and carefully planned project, start to daydream about some other intriguing but totally different configuration?

Did the notion nag you by floating details of various components before your mind's eye? Did you finally try to relieve the pressure by taking a few minutes from your main squeeze to glue a few pieces together?

Then did you push the new assembly to the back of the bench while you turned back to the main job at hand?

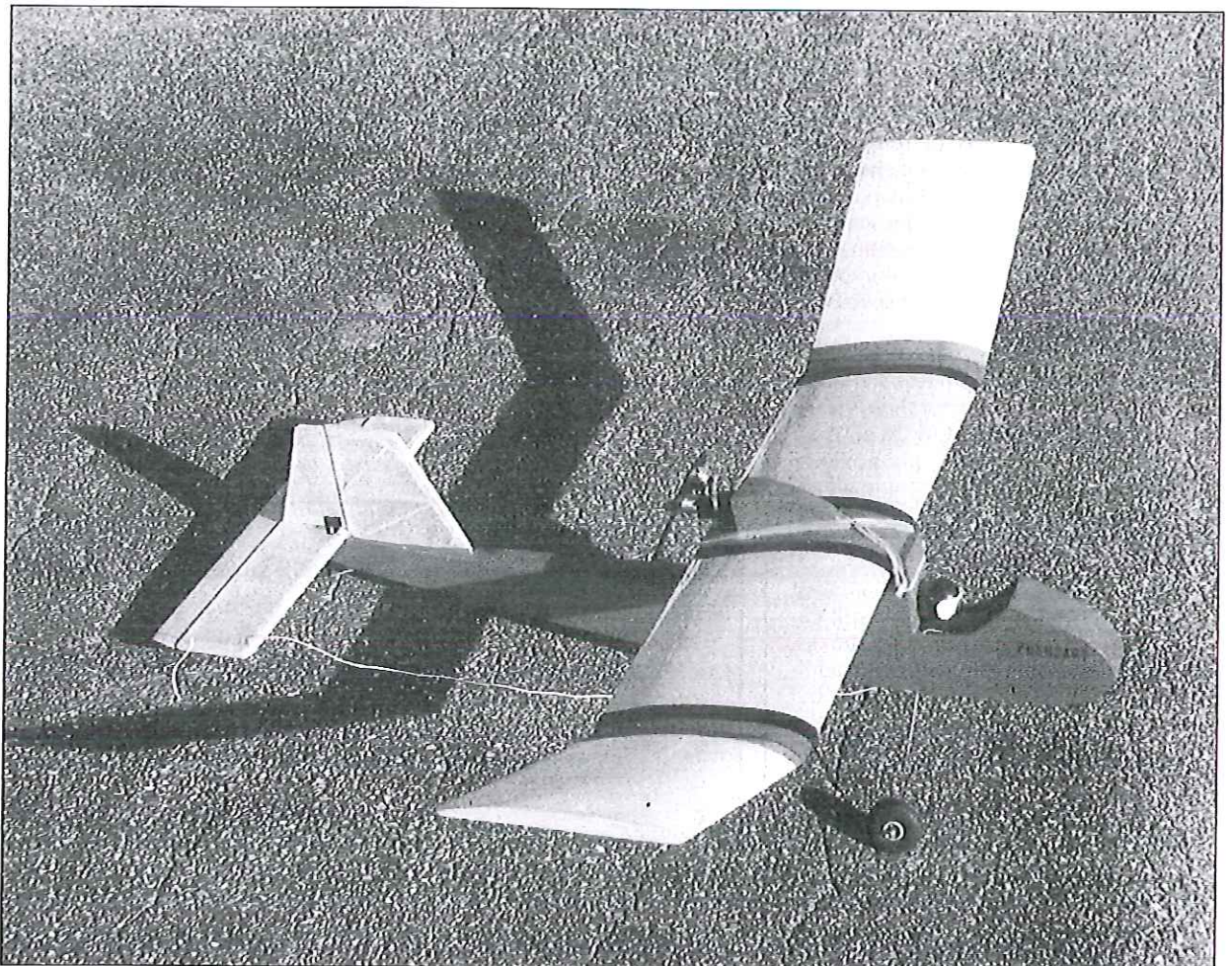
Me too.

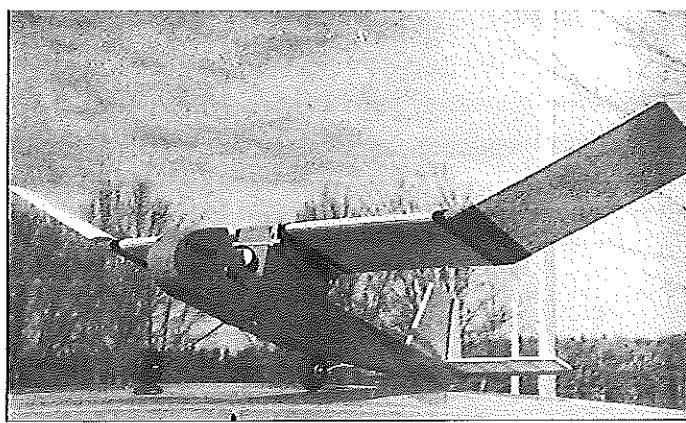
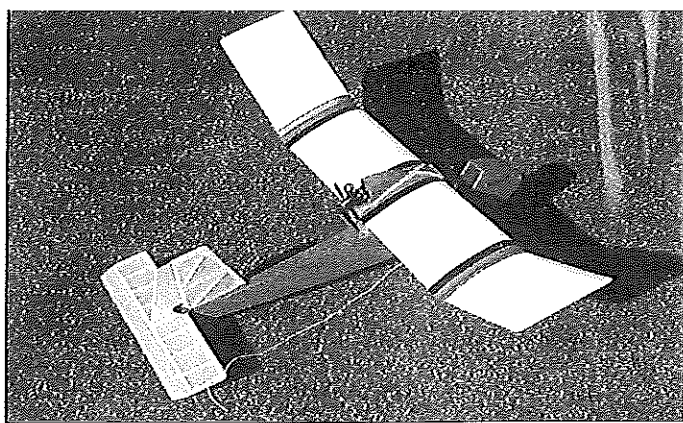
I suspect the malady is as common to scratch-builders as toenails. Partial yielding to the urge is no cure. Once started, the thing just sits there demanding further resolution. So, every so often you sneak a little time to sketch details and assemble

another component. Eventually, maybe months down the road, you find you've built another airplane on the back of the bench while waiting for the glue to dry on the one in front. The day I started Pushcart, I hadn't intended to—I was working on something else and let my mind wander.

I'd long wanted a good conventional pusher along the classic lines of the 1931 Curtiss-Wright Junior, or the more recent Woody Pusher homebuilt. But not exactly like those. I was doing this for fun and didn't want to mess around aligning a cabane. The 1935 BAC Drone's shoulder-wing was more to my taste. The model also would have to be a taildragger. It's more fun taking off with your tail in the air and greasing on three-point landings.

I had a bargain two-channel





Two views of an earlier version of the Pushcart. For safety's sake, the designer recommends fitting the engine with a left-hand prop so you can retain the use of the stock Cox spring starter. Fuselage is a simple sheet balsa box and will accommodate standard-size radio gear with ease.

radio outfit kicking around, so I gave the model enough wing and internal volume to haul a bigger battery and those inexpensive standard-size servos. Open cockpit, of course, but sunroofed against the drag of the usual foxhole, and staffed by Pong the Puissant, my long-suffering test pilot and victim of 50-odd years of design meanderings.

Thus jelled Pushcart:

Major masses, radio equipment and engine, are divided between the wing and the fuselage. Like on Wall Street, distribution cuts your losses in a major crunch. In line with this philosophy, the foam wing rests on friction strips of flat rubber so that it will stay put with fewer rubber bands but still knock off easily.

With the engine mounted on the wing, won't nosing over send the propeller chewing into the fuselage? Nope. Look closer. If the wing skates forward, the prop will hit the rearward-pointing hold-down dowel and stop.

CONSTRUCTION

The fuselage is 1/16 sheet balsa, edge-glued with CA where necessary to get the required width. There are two key bulkheads. The front one is 3/32 birch plywood, located at datum zero. The rear 1/8 balsa bulkhead holds the fuselage "boattail" formers and the rear dowel anchor. Note the use of appropriate battens and cross members to give the thin-skinned center section rigidity.

The landing gear is .078 wire; a bit rubbery but very shock absorbent. It is ruggedly sandwiched between the front bulkhead (B) and a plywood mounting plate (A).

I covered the fuselage the old-fashioned way—silksan sealed on with clear butyrate dope. This

was painted with Red Devil water-base latex, which, when absolutely dry, was sprayed with clear gloss butyrate. After all of this work, I decided that if I had to do the job over again I'd use MonoKote or some similar prod-

wood dowel pushrods tipped with easily bendable paper clip wire.

The fixed tail surfaces are stick balsa with silksan covering, watershrunk and tightened with butyrate dope. Again, nostalgia



The author's Pushcart coming in after a late afternoon flying session. This is the latest version, as shown on the plans, with the semi-enclosed cockpit and taller vertical slab.

uct. Suit yourself.

Pushcart was tested both with the cockpit completely open and completely canopied. The best arrangement was the compromise sunroof of acetate sheet supported by Teriyaki sticks. It permits easy access to the radio and battery.

I never hard-mount the battery or radio. The nose of the fuselage is lined with 1/2-inch urethane upholstery foam, against which rests the battery holder. Another layer of foam is between it and the receiver, which is held in place with more foam. This allows instant access with good protection in a crunch. The antenna is led down the inside of the fuselage and dangles out the rear.

Two Futaba S148 servos are mounted in the center section and are attached to the rudder and elevator with 1/8-inch hard-

be damned, iron-on film is better. The movable surfaces are 1/8 sheet balsa. The only revision made to the original Pushcart was a mainly cosmetic increase in fin area (compare the photos to the plan).

The wing is carved and sanded from 1-inch blue-gray builders' styrene insulating foam. Begin with a 4-foot slab of foam 7 inches wide. Make sure the edges are straight and true. Lay it on a flat surface and, with a razor blade guided by an angled block, cut a 1/4-inch V-groove along one edge. Wrap a small piece of 100-grit sandpaper around a short length of 1/4-inch dowel and enlarge and deepen the V-groove until the 3/8-inch hardwood dowel leading edge can be pushed into place. (You can control the diameter of the sandpaper-covered sizing dowel by the thick-

nesses of sandpaper you wrap around it.) When the fit is right, run a bead of white glue the full length of the groove and push the dowel into place. Rub more glue into any visible seams and allow to dry thoroughly—at least overnight. When dry, lay the wing on a wax-paper covered surface and, using UFO thick CA, glue a 1/8-inch hardwood dowel to the trailing edge.

Make a stiff cardboard airfoil template to guide you in carving the wing to shape. It is quite easy to shape the wing by slicing it with a big kitchen knife and finishing it off with 100-grit sandpaper, but foam seems to dull knives rapidly. I keep a roller-type, draw-through sharpener handy and touch up the blade often. Chefs and other professional knife wielders despise these hardened steel roller sharpeners for the very reason that makes them great for honing foam shaping knives: the rollers tend to leave a microscopically ragged sawtooth edge, and that's exactly what cuts foam best. Note that the dowel leading and trailing edge spars are very useful guides for the flat of the knife when shaping the leading and trailing edge tapers.

When sanding the foam, use a sanding block with light spanwise strokes. Circular or scouring motions tend to gouge and produce low areas. The airfoil shape should be smooth and regular, with the same section over the full span. Proceed with care and you just may decide, as many have, that this way of building wings is much easier than ribs, spars and sheeting. Wear a shop mask when sanding; styrene particles are no better for your lungs than any other kind of crud.

Now cut the wing apart at the dihedral breaks with a razor-

6931 2-4-3

saw or something similar. Be sure to cut the dihedral breaks with the angle equally divided between the two sections! This way, when the butts are glued together, the joint will be the same thickness on both sides. Refer to the plan.

CA glue 1/16 balsa joiners to the butt ends of the center section, and when set solid, glue the dihedralled outer panel butts to this. Don't omit the balsa joiner—it makes a much more rugged joint than foam-to-foam. When the assembly is set completely solid, poke three 3-inch lengths of bamboo Teriyaki sticks into the joint for added stiffness. You can pilot the holes with a sharpened length of stick in a hand drill; just don't break through the wing top surface! Squirt the holes full of white glue, shove the 3-inch lengths of stick in until the ends are just below the surface and wipe off the excess glue.

Assemble the engine nacelle to the top of the wing with CA glue. Let the assembly dry for a day or two before you cover the wing and nacelle all over with medium weight silkspan laid on with a 50/50 mix of white

glue and water. Allow another couple of days to dry and then paint with water-base latex paint in your favorite colors. Do not use regular model airplane dope or spray-on lacquers, as the fumes will erode the foam under the covering.

Accent stripes can be pressure-sensitive colored decorator tape. Once again, you could use iron-on film, something low temperature like EconoKote, which will be somewhat easier to apply. If you use film, wipe down the finished foam surface with a very thin white glue and water mix (say 10/1) and let it dry thoroughly. Be very careful to apply the film at the lowest temperature it will take. Film-covered foam is easy, but you may find it needs a careful touch of the heat gun now and then to retighten it.

Pushcart was tested with both the Cox Black Widow and the Texaco .049. The Black Widow has more power, but the Texaco runs longer. In either case, follow Cox's instructions to reposition the fuel line.

After flying Pushcart for two seasons, I happened to mentioned it to Big John Elliot, who

was working for Cox Hobbies at the time. He was happy that I found the performance of the engines satisfactory and had had no trouble with them even after quite a few hours of use, but he stressed that these engines are not set up for pusher operation. To take the thrust loads, Cox can supply a thin steel thrust washer that goes between the prop hub and the crankshaft journal. A self-addressed stamped envelope will bring a couple of thrust washers to Pushcart builders. Send to Customer Service, Cox Hobbies Inc., 350 West Rincon St., Corona, CA 91720-2004.

Any engine sprays oil mist, but with a pusher like this, the messiness is largely limited to the aft fuselage and tail surfaces. I've found rubbing alcohol to be the easiest and cheapest cleanup between flights.

Flying offers no problems, but if this is your first RC effort, have Pushcart test-hopped by an experienced pilot. If you have inadvertently built in any surprises, let them be discovered by somebody better able to deal with them.

When starting the engine or

adjusting the needle valve, it seems much easier to stick one's fingers into a spinning pusher prop. Hand flipping is a no-no. Invest in a couple of left-hand props so you can use the starter spring which comes with the engine. Failure to observe this precaution could cost up to half a box of Band-Aids and a week's supply of naughty words. Suitable left-hand propellers are available in 5-1/2 to 6-inch diameter and 3- to 4-inch pitch.

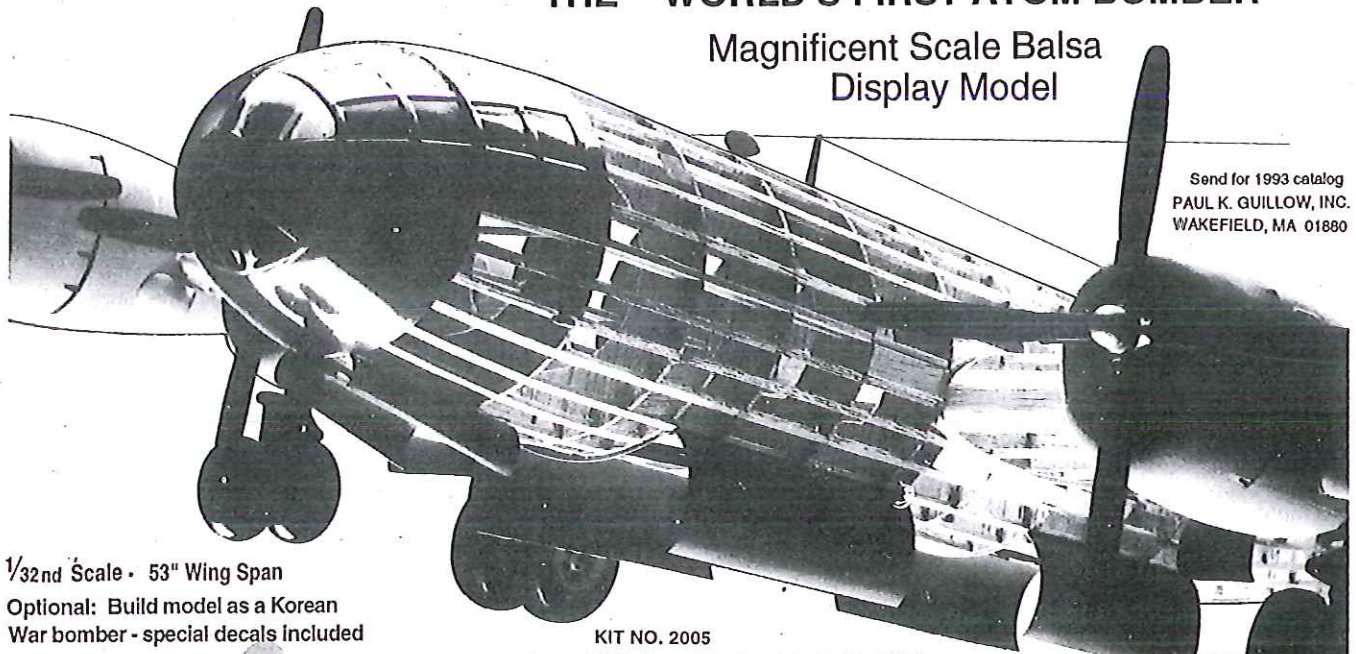
With wing and tail incidences correct and the balance point in the right place, you should be able to fly without cranking in much trim. When the engine stops, the model should not tend to pitch up or down to any great extent. If it does, adjust the thrustline with thin washers between the engine mounting lugs and the firewall.

Pushcart will loop, wingover, chandelle, etc. The glide is good and landings a lot of fun. Plan your flight to be circling at an altitude of 100 feet or so when the power quits. Set up a flat glide, double check the wind direction and kill off altitude with S-turns to land exactly where you wish. **MB**

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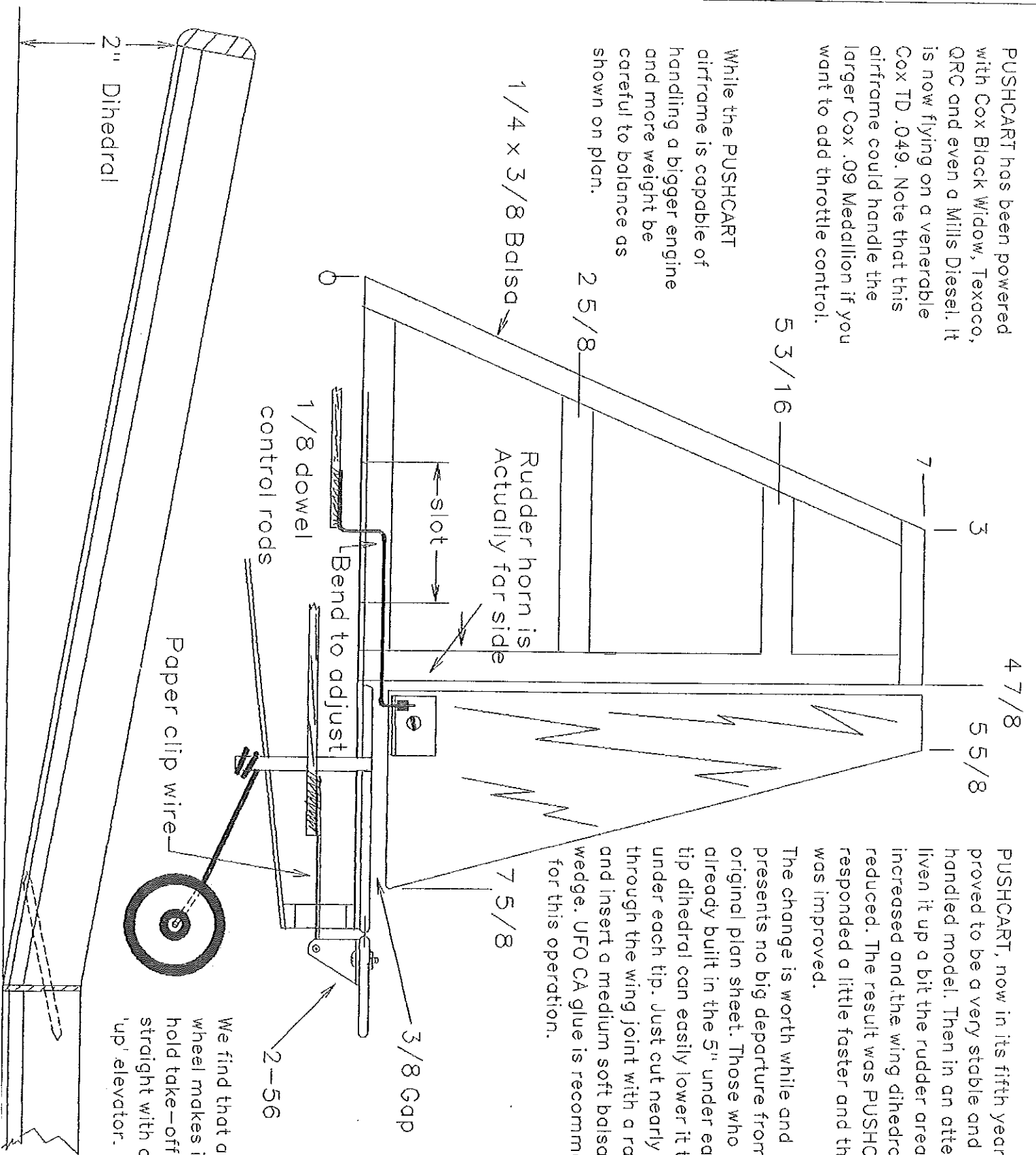
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PUSHCART has been powered with Cox Black Widow, Texaco, QRC and even a Mills Diesel. It is now flying on a venerable Cox TD .049. Note that this airframe could handle the larger Cox .09 Medallion if you want to add throttle control.

While the PUSHCART airframe is capable of handling a bigger engine and more weight be careful to balance as shown on plan.



PUSHCART, now in its fifth year (1994) proved to be a very stable and easily handled model. Then in an attempt to liven it up a bit the rudder area was increased and the wing dihedral reduced. The result was PUSHCART responded a little faster and the glide was improved.

The change is worth while and presents no big departure from the original plan sheet. Those who have already built in the 5" under each wing tip dihedral can easily lower it to 2" under each tip. Just cut nearly through the wing joint with a razor and insert a medium soft balsa wedge. UFO CA glue is recommended for this operation.

We find that a fixed tail wheel makes it easy to hold take-off run straight with a little 'up' elevator.