Who says a canard has to be a freak? This 40-powered sport and competition design will fly an excellent pattern.

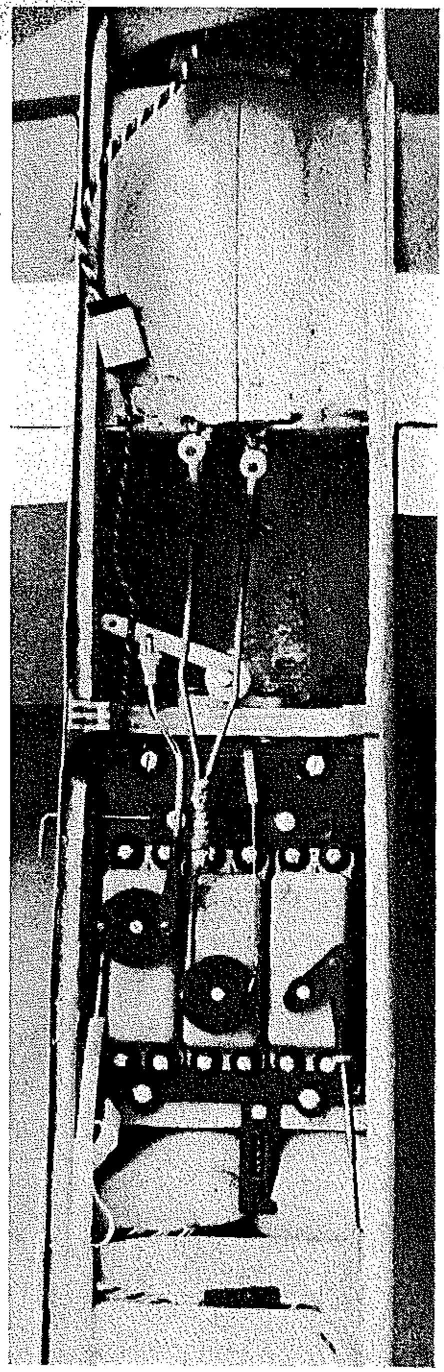
Milt Sanders

Editor's Note: The Zonker is not just another odd-ball design published merely to be different. Designed by two aeronautical engineers, it was perfected over a series of models. The article provides a good pilot briefing on how best to fly it. The fiberglass fuselage and foam wing cores are available commercially. Earlier models had a balsa fuselage so if you are into structural design a substitution is feasible. A few pictures show installation and gear system for retracts as used in a follow-on airplane. Be assured that your flying will not be compromised in any way if the uniqueness of this airplane appeals to you.

THERE IS a strange fellow in the comic strips with an unusual demeanor, who keeps his cool in ludicrous situations while making meaningful comments and contributions to his society. His contributions often seem offbeat, yet strike to the heart of a real life situation, allowing the reader to grasp added insight to life. I like to think of this design as being an unusual, but meaningful contribution to our sport and hence, named it after Zonker Harris, the incorrigible character in Doonsbury.

You may wonder what all the flap is about since canards (horizontal stabilizer in front of the main wing) have been around for a long time. In fact, the Wright Brothers original airplane was a canard. Wilbur and Orville found that some of the advantages provided by the "tail-first" configuration were exactly the ones needed to help the world's first successful powered airplane lift into the air at Kitty Hawk. Of course, they had other problems, and I imagine they must have dinged a few wing tips besides. They later changed to a more conventional configuration which was easier for them, and many others, to work with. In the modeling past, there have been canard gliders, free flights, sailplanes, control line, and RC powered ships, but most of them have been regarded as oddities. Today, I present to you the world's first, *competitive* canard pattern ship. The Zonker 40 is a competitive machine as well as a show-stopper for spectators. After 91 flights on my number 2 machine, people still walk up with obvious doubt on their faces, thinking, "Did I really see that fly?" Indeed it does!

Ever since seeing pictures of the B-70 Valkyrie in the air, the thought of such a graceful airplane has lingered in my mind.



Compact and well protected radio arrangement with easy access to all adjustments. Nylon tubing, brass cable to throttle, Goldenrod to rudder, and short wire rods to elevator and steering. Elevator linkage split for fine adjustment. Note battery in front, servos in front of receiver for better receiver protection during sudden stops. Be sure you check flight instructions before doing aerobatics.

This feeling was also growing in the mind of Charlie Bair, a schoolmate in grad school. We got together one day and decided that the challenge should be met. We set some goals to keep our designing on track: 1) it should be simple, 2) it should fly like a pattern ship, 3) it should look nice, and 4) it should not have any squirrelly tendencies. Since I am a flying qualities engineer (how to make airplanes fly well) and Charlie is a stability and control engineer (how to calculate flying qualities into dimensions for a design), and we both are modelers, we thought the challenge was within reach. We feel we made it, but you who build this model will be the final judge of that.

Aside from the challenge of designing a competitive canard, there must be a few advantages over a conventional airplane, else there would be little reason to fly a canard. The biggest advantage is that the wing and horizontal stabilizer (canard surface) work together. When a conventional ship (Phoenix, Kaos, Mach I) begins a climb, the lift on the tail has to decrease or push down to rotate the nose up and increase lift on the wing. The forces are opposing each other. For the Zonker 40, the lift on the canard surface must increase to raise the nose which increases lift from the wing. The lifting surfaces work together to both increase total lift, or both decrease total lift, whether in maneuvering flight or straight and level. The efficiency of the lifting surfaces is thus better than a conventional design.

Another advantage entails flinging all the oil and exhaust behind the ship rather than depositing it on your freshly waxed finish. The pusher installation is a natural for aircraft balance with the main lifting surface in the rear. Besides keeping that drag producing oil off the airplane, the absence of high-speed prop-wash over the airframe decreases drag. Propeller efficiency in pusher installations has also been documented as being greater than that of the same propeller in a tractor installation, so there lies another benefit.

With a hatch on top of the fuselage, virtually all of the innards are easily accessible, especially the nose wheel linkages. Previously, I have fiddled endlessly with nose wheel adjustments under fuel tanks and around batteries with lots of frustration and some hair loss. In the Zonker 40, steering adjustments are made with the airplane upright sitting on the gear, with no fuel tank or foam rubber around it. You can even start the engine and taxi around with the hatch off while making small steering trim adjustments. Elevator, rudder, and throttle trim adjustments can be made the same way, since those servos are right behind the nose gear and under the hatch. Removal of the wing allows direct, easy access to the tank and fuel line. No fumbling with fuel extensions through a "hidden" firewall; all is out in the open. The toughest spot is the rudder linkage, since that connects to the rudder horn in the engine compartment. However, once you get that connected, all trim adjustments can be made at the servo. An easy alternate is to cut an engine hatch, then even that last linkage is always accessible.

Many statements have been made about radio protection during mishaps (sudden, splintering stops). The Zonker is one of the few designs where you can put the battery in front, the servos next, and the receiver (well padded) behind all the heavy stuff

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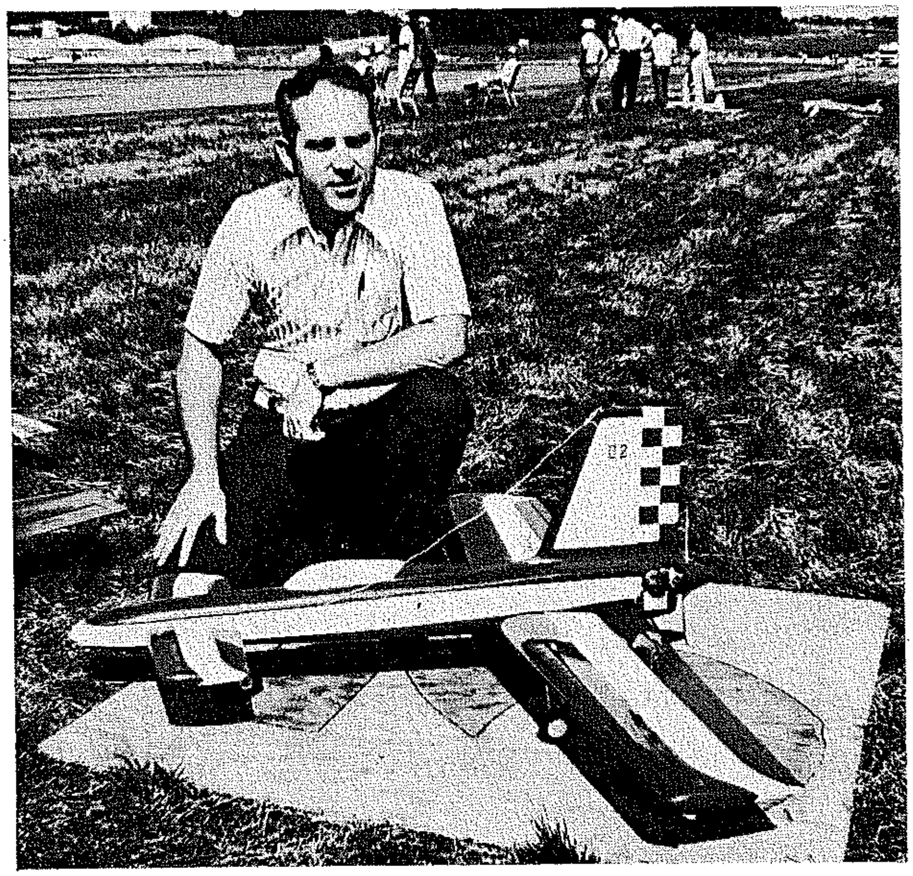


The author with the Zonker at the last Nats where quite a few people flipped at the sudden sight of it going "backwards" in pattern. Though glass fuse and foam wing, instructions include step-by-step built-up fuselage info.

where it has the best possibility of survival. In addition, the radio gear is up front away from the engine vibration (nice on retract nose gear as well). The main retracts and aileron servo are cushioned from vibration through the wing saddle and are not much closer to the firewall than a conventional airplane.

Propellers seem to have a habit of liking the Zonker 40 and lasting quite awhile. I find it hard to run into a tool box or battery with the prop, since it is in the back. Of course the design is not foolproof. I found that out when I lifted the nose up one day and ground the prop on the asphalt. Large rocks don't help too much either. Using larger wheels for flying off grass is recommended.

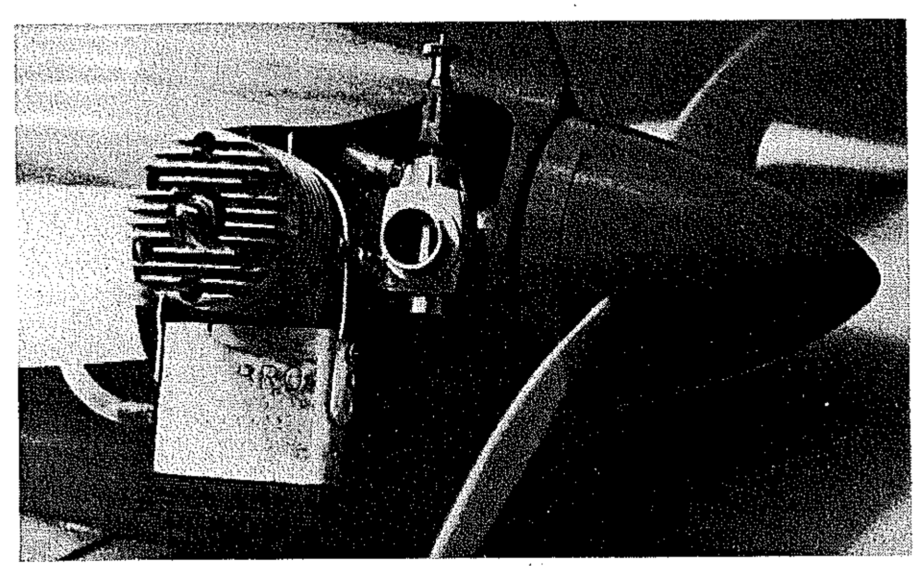
I have always disliked control horns, pushrods, kwik links, and the like, fluttering around in the breeze causing turbulence, drag, and just being unsightly. The Zonker has an advantage of a wider fuselage in the rear to enclose the rudder linkage. The elevators are in the front where the fuselage is wide enough to enclose those linkages too. In fact, you would have a more difficult time making *any* of the control horns external rather than internal. Pretty neat huh? So the airplane ends up with a very clean exterior with only cylinder head and muffler poking out. Fixed gear is shown in keeping with the goal of simplicity, however design provisions have been made for retracts.

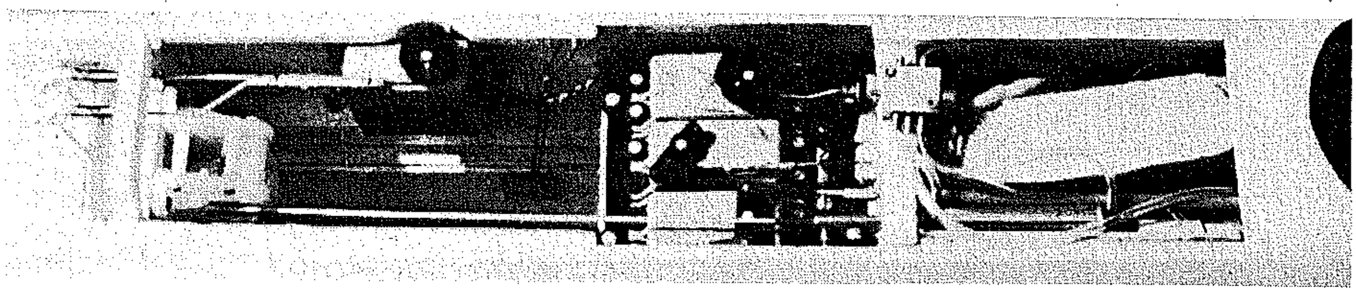
Symmetrical airfoils were chosen for both the wing and canard surfaces to provide similar performance both upright and inverted. NACA 4-digit airfoils were chosen since data necessary to calculate stability and predict stalling was readily available. These airfoils do not exhibit the pronounced "drag bucket" at low coefficients of lift and therefore simplify the design process. Another reason these airfoils were used is the availability of a computer program to draw them to specified chord lengths. Details on that may be found in the Aug. 76 issue of *Model Aviation* under Richard Perry's Navy Carrier column.

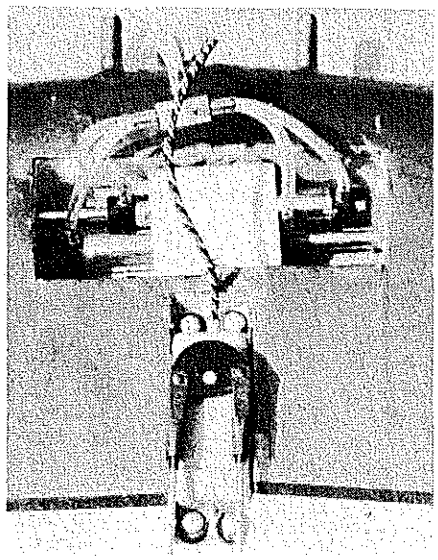
An 18% thick section was chosen to give adequate room for retracts with only a small drag increase. This section thickness provides about 1.7 inches maximum thickness at the point where the retractor fits. The 18% thickness was needed because the average chord is smaller than a lot of pattern ship wings due to the higher aspect ratio (6.2). The 18% section (NACA 0018) on the canard surface provides more lift before stalling and helps during low-speed maneuvers such as landing. The taper ratio is .7, mainly for structure, ease of construction, and looks. The most efficient and lowest induced drag would result from a .42 taper ratio. If you have ever tried to cut a foam wing with a .4 taper ratio, you would appreciate the current designs incorporating .6 to .8 ratios.

The canard surface was chosen to be 20% of the wing area which is close to the rule of thumb generally used for conventional airplanes. The distance from the wing to the canard was adjusted until the calculated CG fell just ahead of the wing. Many people think a canard is inherently unstable. This is not true. As long as any surfaces you stick up front are balanced sufficiently by surfaces in the back, the airplane is stable. The actual calculations are more complex, but that is the general idea. With

Below: DuBro muffler with new mounting strap and tapped for pressure. Engine rotated a bit to clear body. Entire head exposed for better cooling. Goldberg 2-1/2-in. spinner cut out for 10-6 Tornado pusher propeller.



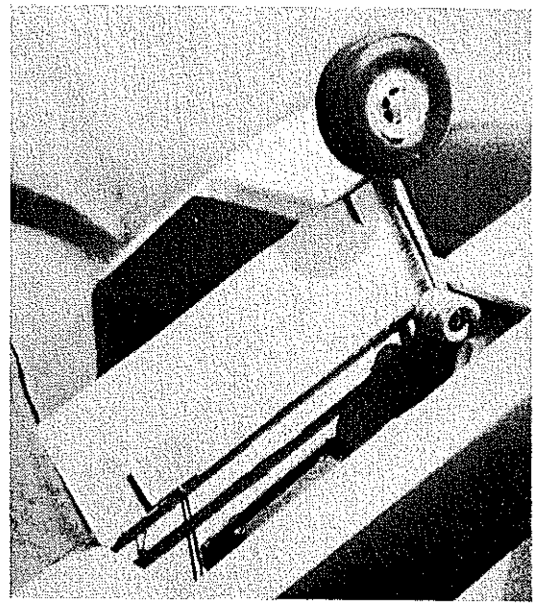




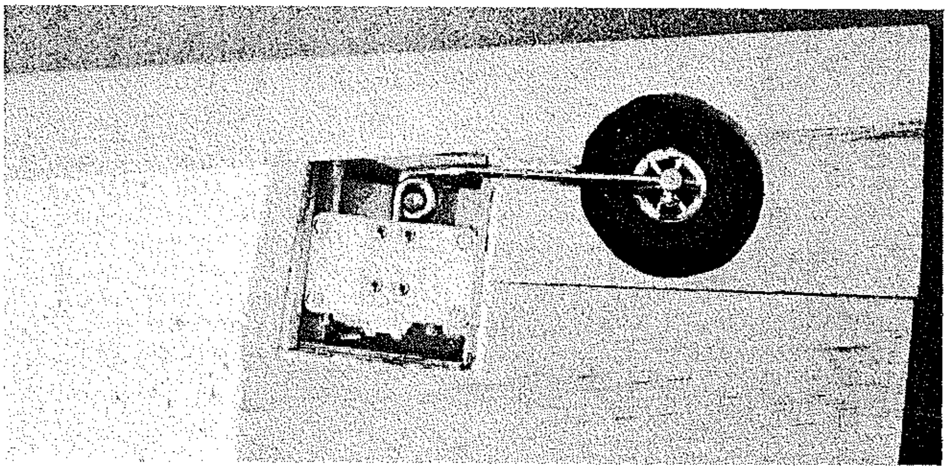
Above: Second balsa prototype was fitted with Goldberg retracts and Sonic Systems pressure cylinders. Note bulkhead was moved forward.

Left: Pressure retract cylinder arrangement in wing for main gear—model in plan has fixed gear. Servo moved rearward to allow for retract mounting; deepset to clear the tank.

Zonker



Right: Gear door closes off against airstream at high speeds. Simple one-door design allows gear to open door and rubber band to pull it shut. Airstream cannot pull it open.



Below: Goldberg retract for new fiberglass ship. Twin gear struts used rather than trike ones to move wheels forward closer to the CG. Plywood cover plate to be added. Balsa frame, capstrips, lighten weight, decrease balsa expense when using a plastic covering.

the CG just ahead of the wing, the distance from the CG to the vertical fin is a lot shorter than a conventional airplane. The necessary area of the fin was then calculated to make up for the shorter moment arm, hence the large size of the fin. An airfoil section (NACA 0009) was selected for the fin to make it more effective than a sheet of balsa. Effectiveness, as well as area, plays an important part in lateral stability.

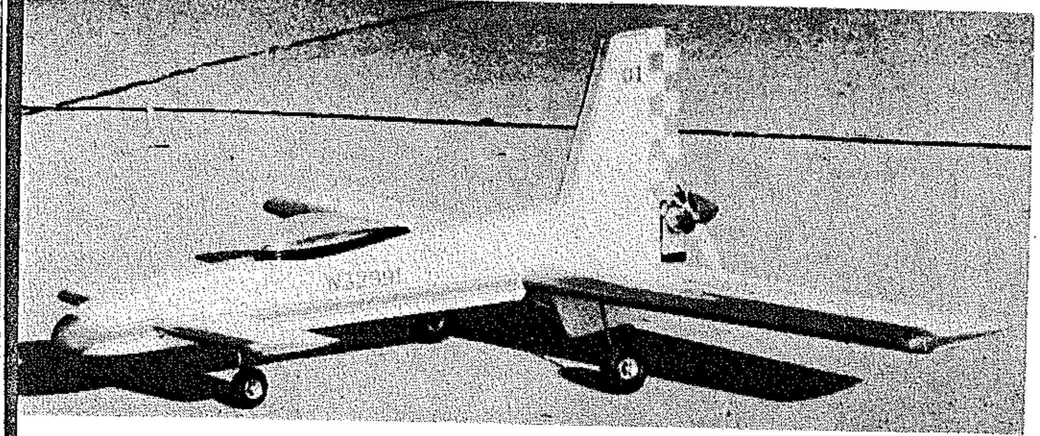
Some of you might consider engine cooling to be a problem. Those of you who enjoy extensive taxiing before takeoff (5-10 minutes) may overheat the engine, but I have not had a cooling problem in more than 9 hours running time on my O.S. Max Schneurle .40 using fuels from 5 to 22% nitro. I leisurely taxi my Zonker about 100 feet down the runway, turn around, stop, then takeoff. Sufficient air flows around the engine to keep it from overheating at idle power. While I am on the subject of engines, let me mention that plenty of available engines will work in this design. You should consider using one equipped with ball bearings since the thrust pushes the crankshaft toward the back plate, and a thrust washer running against a bronze bushing and aluminum case won't hold up as long as the ball bearings.

A couple of engines have left-hand crankshafts available which would let you use current tractor propellers in a wide variety of sizes. That would be perhaps the ideal case; however, Grish has 2- and 3-blade 10-6 pusher props. I use the 2-blade pusher on my Max .40 and am satisfied with that arrangement. Charlie runs the same prop on a regular Max .40 also with good results.

You will need a hot .40 for competition, but a standard .40 will haul it around nicely for sport flying.

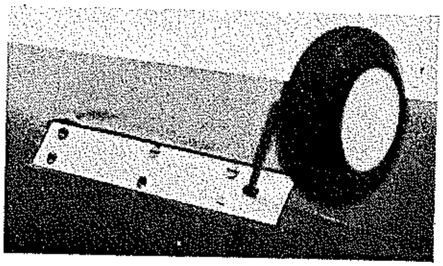
Mufflers are an additional consideration. The standard flow-through or expansion chamber just won't do when turned the proper direction to the air flow, because they extend into the prop arc. However, Slim Line, Murphy, Airfoil, and DuBro don't have that problem. Semco super expansion mufflers can also be used since they are shorter than a regular expansion. I had been using a DuBro, but recently tried a Slim Line. The Slim Line fits well, has no plates to clean, already has a pressure tap, and has a nice method to tighten the strap which keeps screws and potentially sharp edges away from the fuel line. These are also available in bolt-on types for a variety of engines. Some mufflers may require cutting away a small part of the aileron, but that part of the aileron is not very effective anyway. Though your selection of mufflers may be restricted, there are still plenty to choose from.

The fuel system is simple, straightforward, and above all, it works! Install the tank just like always, with the clunk toward the rear of the airplane. The fuel line must bend around the tank and go back to the engine, naturally, which means a longer fuel line than normal. I have had no fuel feed problems this way, but still keep the line as short as possible. Bending the brass tubing to face toward the rear outside the tank will help prevent fuel line kinking. Turning the tank around to face the engine



First balsa prototype model, cardboard covered foam wings, fixed gear. After a near disaster at high speed ventral fin was added beneath fuselage. Note straight fuse lines.

Below: The fixed gear mounting on the ship in plan. Note how the screw-on cover plate fits over the hardwood gear mounting blocks.



Above: Fixed nose gear reveals the Rocket City brake with short line routed to the nose down stick control. Very effective and simple.

has been tried and has caused problems as the tank begins to empty. Forward acceleration and gravity tend to push the fuel toward the rear of the airplane. With a reversed tank, sustained vertical maneuvers will cause fuel starvation and pilot frustration. In addition, picture yourself flying a touch-and-go, or go around. The airplane nose rises, the fuel runs to the rear of the tank uncovering the clunk, and the engine quits with the airplane a few feet in the air. That's a bad situation and can be avoided by using my suggested fuel tank installation.

I also use muffler pressure since my Schneurle .40 won't run without it and runs great with it. Again, the pressure line is longer than normal but shouldn't affect the running at all. Fuel tank sizes have been tried from 6 to 10 ozs. The 6 oz. is adequate for the Novice pattern using a hot Schneurle .40. The 10 oz. has given flights up to 18 minutes on the regular .40. There is plenty of room for either size. I use a rectangular, slant style (Pylon SS-6) and am pleased with that.

With all this discussion up to now, you may wonder what insurmountable problem I'm holding up my sleeve. There is a problem arising from the prop in the rear. It is not a big problem but may be uncomfortable until you adjust some of your flying techniques. Since the prop-wash does not flow over the control surfaces, these surfaces are not as effective at low speeds. On takeoff, the airplane must be moving fast enough for the canard surface to develop sufficient lift to get the nose up. This is compounded by the fact that the main gear are well behind the CG causing an extra load on the nose. Bending the main gear forward will solve this problem. Landing speeds are slow because the canard no longer has that load imposed by the main gear position, and can use its full lift to hold the nose off at slower speeds. But takeoffs will be a little longer due to the higher speed necessary for nose lift-off.

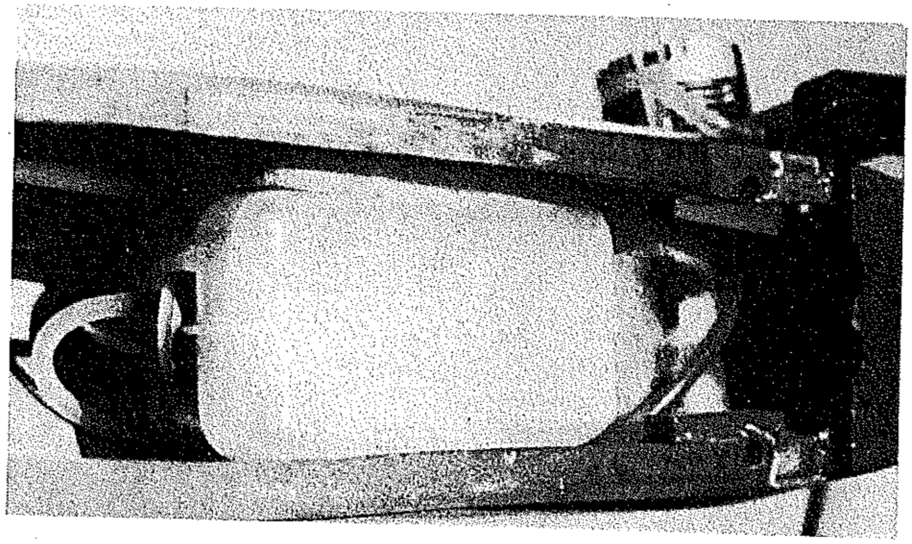
The stall turn is another maneuver requiring a little extra finesse to pull off in competition style. Holding power slightly above idle at the top of the maneuver helps to cure the flop-overs, even though the prop-wash doesn't flow across the rudder. The design is currently trimmed so the canard surface stalls before the main wing. With full back stick in slow flight, the canard stalls, the nose drops, then the canard surface starts flying again and the cycle continues. The nose hunts up and down in a gentle motion, sort of like a boat bouncing across some waves.

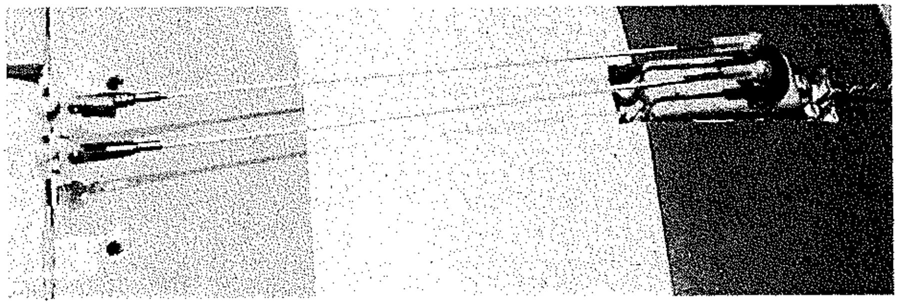
I have not found the Zonker 40 to be squirrelly airplane. One is uncomfortable flying an airplane "backwards," but after a number of flights, your body will relax and perception will become "normal" again. Having a different airplane is a heck of a lot of fun, and now that you have read about the advantages and disadvantages, you can either sit back and dream about all the fun you could have with one, or get busy, marshall your resources, and make that dream a reality.

Construction

As you contemplate this project, let me mention that fiberglass fuselages and foam cores are available from the author or you may shape your own fuselage out of balsa and cut the cores yourself (core templates are shown on the plans). (I have several extra fuselages and foam cores for the wings and canard. If there is interest, I will

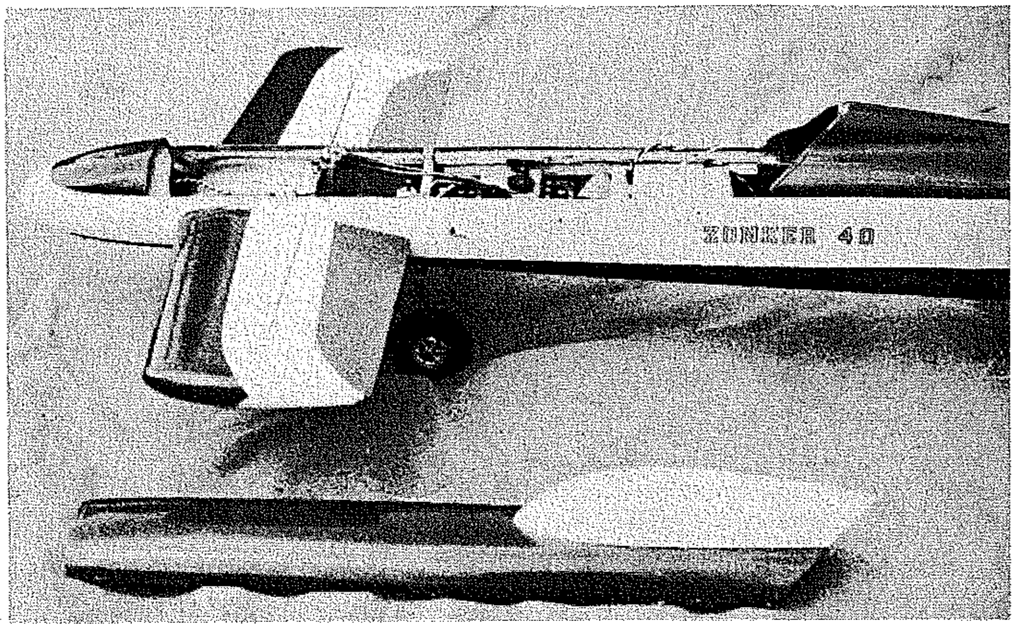
Below: Tank held in place by foam, one line to muffler for pressure, other to carb inlet. Wing mounting blocks glued inside saddle. Fiberglass saddle requires no reinforcement.





Left: Aileron servo arrangement. DuBro ball links shown to reduce aileron throw. Dowel pegs at leading edge insure proper alignment.

Below: Talk about access! Adjustments can be made without disassembling ship. You can even taxi with hatch off, since goop is behind the plane. When you pick it up with engine running don't tilt prop into the runway!



make more available at the following prices: glass fuselage with molded fin and installed bulkheads—$35 plus $2 shipping and handling; wing cores—$10 plus shipping ($1.00) when ordered separately; and canard cores—$2.50 plus $.50 shipping when ordered separately. The total package plus instructions is $47.50 plus $2 shipping and handling. Full-size plans can be ordered from *Model Aviation*.)

Balsa fuselages were used on the two prototypes, and I found that the fuselage shape was not critical. I would recommend that you stay close to the basic fuselage area distribution, and I want to emphasize that wing and canard sizes, placement, and sweep must not be changed. If you make any of those changes, you are on your own as far as stability and CG placement go. The size of the vertical fin has been determined by aero equations and really needs to be that big. I flew one with a slightly smaller fin with nearly disastrous results.

Fuselage; Canard Surface: To design and build a balsa fuselage, lay out a bulkhead size at the rear, tall enough and sufficiently wide for the engine/tank installation. Lay out another set of dimensions at the nose gear mounting point large enough to house the radio gear. These two bulkheads will determine the overall shape and taper of your fuselage. Determine the sizes of the nose bulkhead and one directly in front of the wing position. Either shape these bulkheads as rectangles or put curvature in the sides to get a nicer looking contour. The prototype fuselage was built with 1/2-sq. balsa longerons from front to back at each of the four corners of the bulkheads. This frame was then covered with 1/8 balsa and carved into a more rounded shape. The nose block was cut and sanded from a foam block and covered with fiberglass cloth and Hobbypoxy II. The engine was left exposed for easy access but can be cowled in with balsa blocks. The fin was cut from foam, covered, and epoxied directly onto the rear deck of the fuselage. A generous fillet was used for strength along with a 1/4 dowel running 2 inches up into the fin from inside the fuselage. A layer of fiberglass cloth was laid inside the fuselage under the fin to provide added strength. A top hatch was cut out to provide access to the radio compartment. The foam nose block was hollowed with a soldering gun for a snug battery fit.

Once the balsa fuselage has been designed or a fiberglass one acquired, the next step is the canard surface. This is worked on next to determine size and shape of the fuselage cut-outs. Determine the elevator hinge line according to the plans and draw additional lines 1/4 in. forward of and behind the hinge line to allow for the balsa facings. Cut along the additional lines with either a very sharp Xacto knife or a foam cutter. These cuts should be angled 15° away from the hinge line to allow 30° of elevator movement. Since the elevators are hinged at the top of the surface, this extra material must be cut out to allow downward movement of the elevators. After the elevators have been cut, determine how much would extend inside the fuselage and cut that much off. Glue on the balsa hinge facings and sand to the airfoil shape of the elevators when dry. Cover the cores with cardboard or 1/32 balsa. When using balsa, I cut 1/4 in. off the leading edge of the core, glue on 1/8 balsa, cover the core, and glue on another 1/8 balsa piece to make a strong, laminated leading edge. Be sure to mark the core pieces as you cut them apart so you can keep the elevators matched with the stabilizer pieces. Before proceeding further with the stab, mark the fuselage for the cut outs.

Set the fuselage upright on a flat table and insure the fin is vertical using a builder's square. On the fiberglass fuselage, the bottom just forward of the wing cut-out is straight and parallel to the wing chord to allow proper incidence alignment of the canard and wing. Take a fine felt-tip pen and lay it flat on wood blocks. Add or subtract blocks until the point is 1-1/2 in.

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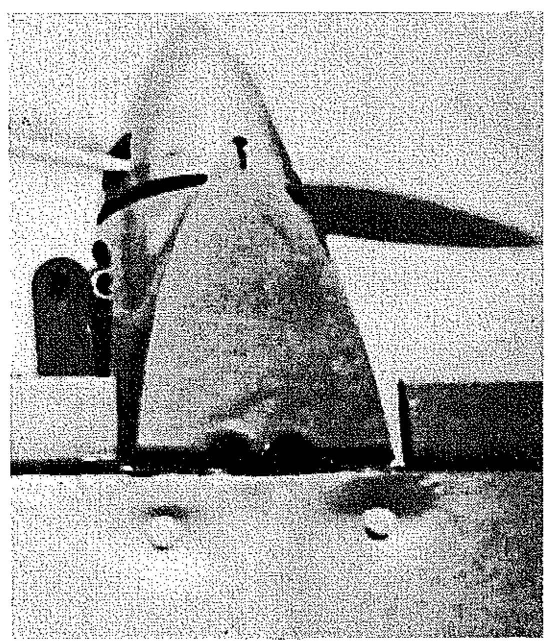
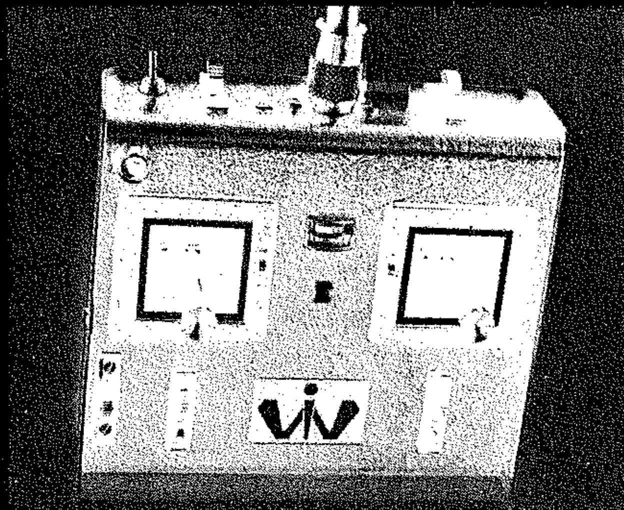


Two nylon bolts hold on wing—use supports in foam to avoid bolts denting wing. Cut-outs for aileron horns necessary for wing removal. Small hole in tail cone for fuel/oil drain.



RC Pylon Racing/Lane

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being run without any type of extractor or pipe. The Rossi's with a pipe, even though they have a slot cut in them, seem to turn better than the Rossi's without a pipe.

The Tucson club did a fine job of running the pylon event. The only complaints I heard were that there wasn't enough time between rounds. With each round only consisting of five heats, it only took about 30 minutes per round. If you had to do any repair between rounds, you were just out of luck!

It was unfortunate that another Q.M. contest was held the same weekend in Southern California. This type of contest scheduling doesn't help the Q.M. effort to gain in popularity. Tom Christopher won the event in California.

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Zonker/Sanders

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above the table surface. Now slide the blocks and pen along the table drawing a line on each side of the fuselage from the front bulkhead forward about 7 inches. If you made a balsa fuselage, do the same thing at the wing position shown on the plans, only lower the pen tip to 1 inch above the table. Check again to make sure the fuselage remained vertical.

Now take half of the stab, position it according to the plans, along the line you have drawn and trace the outline on the fuselage. Do this on both sides. For sport flying, adding about 2° of incidence while drawing the cut-out will help the longitudinal trim. I prefer the 0-0° set up myself. Proceed to make the fuselage cut-outs for the forward part of the stab only (the elevators do not extend into the fuselage). For fiberglass cut-outs I prefer to use the No. 199 high-speed steel cutter in my Dremel tool. It looks like the metal saw but is thicker and much smaller in diameter, making it easier to handle around curves. Remember to use goggles whenever cutting with your Dremel.

Glue the stab halves together and fit into the fuselage. Again, align the fin vertical to the table with the builder's square and carefully align the stab so that each tip is equidistant from the top of the fin and the same distance above the table. Small scraps of balsa may be used to hold the alignment while you spot glue it. Recheck alignment and glue it permanently, then add a fillet of micro-balloons. The stab tips may be added and sanded at this time. Also cut the elevators to the proper width and add balsa to cover the exposed foam on the ends and to accept the control horns. Cut the hinge slots and temporarily fit the hinges.

For either fuselage, the rudder may be worked on next. With the fiberglass fuselage, draw a line 2-3/4 in. from the fin trailing edge and parallel to it. Mark a line for the bottom cut-out on both sides and make the required cuts with the Dremel cutter. Cut and glue in balsa hinge posts in both the fin and the rudder pieces. For either balsa or glass fuselage, a sheet of balsa could be shaped or a balsa-covered foam core could be used to save weight. I used a foam core covered with 1/32 balsa. Use 1/2 balsa to cap the bottom of the rudder to provide a solid mounting for the rudder horn "a la" strip aileron type. The top of the rudder may be capped with 1/16 balsa. Bevel the forward edge of the rudder to allow 25-30° movement to either side. Trial fit the rudder linkage to make sure it works freely, before gluing in the balsa below the rudder cut-out. This linkage is a tight fit so take your time, plan carefully, and exercise some patience. The qwik link for this linkage will extend through the firewall, so drill a nice big hole to prevent hangups.

Wing: Construction is pretty much standard for foam wings. Begin by gluing 1/4 balsa to the trailing edge. Sand it down to fair in with the airfoil shape. Locate the landing gear block placement or cut-outs for retracts, and melt out those areas with

Zonker *(continued)*

a soldering gun. Be careful to control the temperature by squeezing the trigger on and off, and use wood blocks to cut straight lines and ensure proper depth. Glue in gear mounting blocks. Sand the cores lightly and cover with 1/16 balsa or your favorite material. Cut wing tips to rough shape, glue on, and sand to final shape.

Separate core blocks at the leading edge and put wings in the block halves. Shim up core tips with 1/4 scrap balsa for proper dihedral, sand wing root vertical for good fit, prick 10-15 holes in the foam with a nail to ensure a firmer glue joint, and epoxy the wing halves together.

Re-enforce the center section with a 4-in. wide piece of fiberglass and sand to feather the edges in when cured. Cut the ailerons to the proper length, sand to shape, cut hinge slots, and trial fit on wing. Trial fit aileron linkages at this time. Also cut aileron servo mounting hole and install servo mounts. Make this hole near the leading edge of the wing to keep the servo away from the fuel tank which mounts above the wing. After locating and drilling two 1/4 holes in the fuselage wing mounting bulkhead, place the wing in the wing saddle and mark the hole locations from inside the fuselage. Install 1/4 dowels in the wing. Glue maple blocks in the rear of the wing saddle for the rear wing mounts. Line up wing carefully, then drill wing and mounts with a pilot hole, tap maple blocks for 10-24 nylon bolts, and enlarge the wing holes for the bolts.

Make the engine cut-out at this time. Note as shown on the plans, that the engine is rotated so that the muffler clears the body side. Rotate just far enough to allow easy adjustment of the needle valve. Size and shape of the cut-out will be determined by the dimensions of your engine and carb, and amount of rotation. Once the cut-out is roughly shaped, you can fit the engine and mount in and make final cutting and shaping for muffler strap, carb clearance, etc.

To mount the engine, temporarily mount it on a radial engine mount such as Kraft, Tatone, etc. I have had good experiences with the Kraft KM-40. Depending on the size of the engine cut-out, you may have to insert the mount and the engine through the fuselage hole separately, then install two engine mounting bolts. Center the engine mount by using a 2½-in. spinner (the airplane was set up for a Carl Goldberg spinner), mark the holes on the firewall, and remove the engine and mount. Drill the mounting holes, fuel line, throttle linkage, and rudder linkage holes. Install the motor mount, position the engine on the mount for proper spinner clearance, and mark, drill, and tap the motor mount. Note that there is a slight amount of downthrust, which in a pusher means the engine is angled up when looking towards the rear of the airplane.

Hatch attachment is made easy by gluing a lip of glass cloth or balsa along the bottom of the hatch and cloth at the front. This effectively seals the forward fuselage against air entry. A single screw at the top rear will nicely hold the hatch down, and the front lip will keep that end from lifting. I recommend that you put a small rubber grommet under the hatch screw to act as a lockwasher. My screw and grommet have yet to come loose. Install pine strips along the lower edge of the hatch opening leaving sufficient clearance for the hatch lip to fit inside the body. I also installed a partial bulkhead at the rear of the hatch to keep it from spreading and to make it more rigid. The pine strips increase the strength and torsional rigidity of the fuselage when such a large hatch is used.

For finishing, fill the balsa grain, fill any holes, sand well, and I recommend priming with K&B primer. Sand that down with 400-grit wet or dry used dry. Then spray with one coat K&B super poxy of your primary color. Mask, and spray trim coats, rub down, and wax for a nice four-foot finish. Balance the airplane laterally by adding weight to a wing tip if necessary.

Finishing and Installation: Install radio as far forward as possible to aid balance.

Put the battery in the nose, the servos right behind the nose gear bulkhead, followed by the receiver. This provides very good crash protection and vibration isolation. Depending on your individual radio system and switch position, you may need an extension cable for either the battery or the aileron servo. My Kraft system will fit without an extension, but I have used one on the aileron servo for convenience. Install the aileron servo as far forward on the wing as possible to help this situation.

Set up the control surfaces so the rudder moves about 3/4 of an inch to either side, the elevators move 1/2 up (forward stick) and 5/8 of an inch down (back stick), and the ailerons move 3/16 of an inch both ways. Note that when the elevator moves down, it causes the nose to come up and the plane to climb. So double check that when you move the transmitter stick for the airplane to climb, the elevator trailing edge goes down! The remainder of the controls work in a conventional manner. When flying off of hard surfaces, a Rocket City brake on the nose gear helps immensely and is very easy to install. Connect it to work with forward stick (nose down pitch control). Adjust nose gear length so the airplane sits level on the ground (approximately the same height off the ground at the main gear position and the nose gear position). If you like to really slow it down for landing, extend the nose strut 1/2 to 1/4 inch. At the Nats, I was able to land and stop within the 100 foot circle without making a "screeching stop."

Flying: Since this is an unusual aircraft, let me share some solutions to potential problems and some warnings. Since the thrust line is above the wing, application of full power at a slow airspeed will push the nose down, and if the airplane is slow enough, full elevator won't hold it up. Therefore, if you bounce a landing or decide to go around from a bad approach, smoothly apply about 1/2 power until the airspeed builds up. Remember that the elevator is less effective at low airspeeds because no prop-wash blows over it. Be sure to fix or route the antenna so that it won't go into the prop if it comes loose from the top of the fin. The prop could jerk it loose near the receiver, causing a drastic and perhaps catastrophic loss of range.

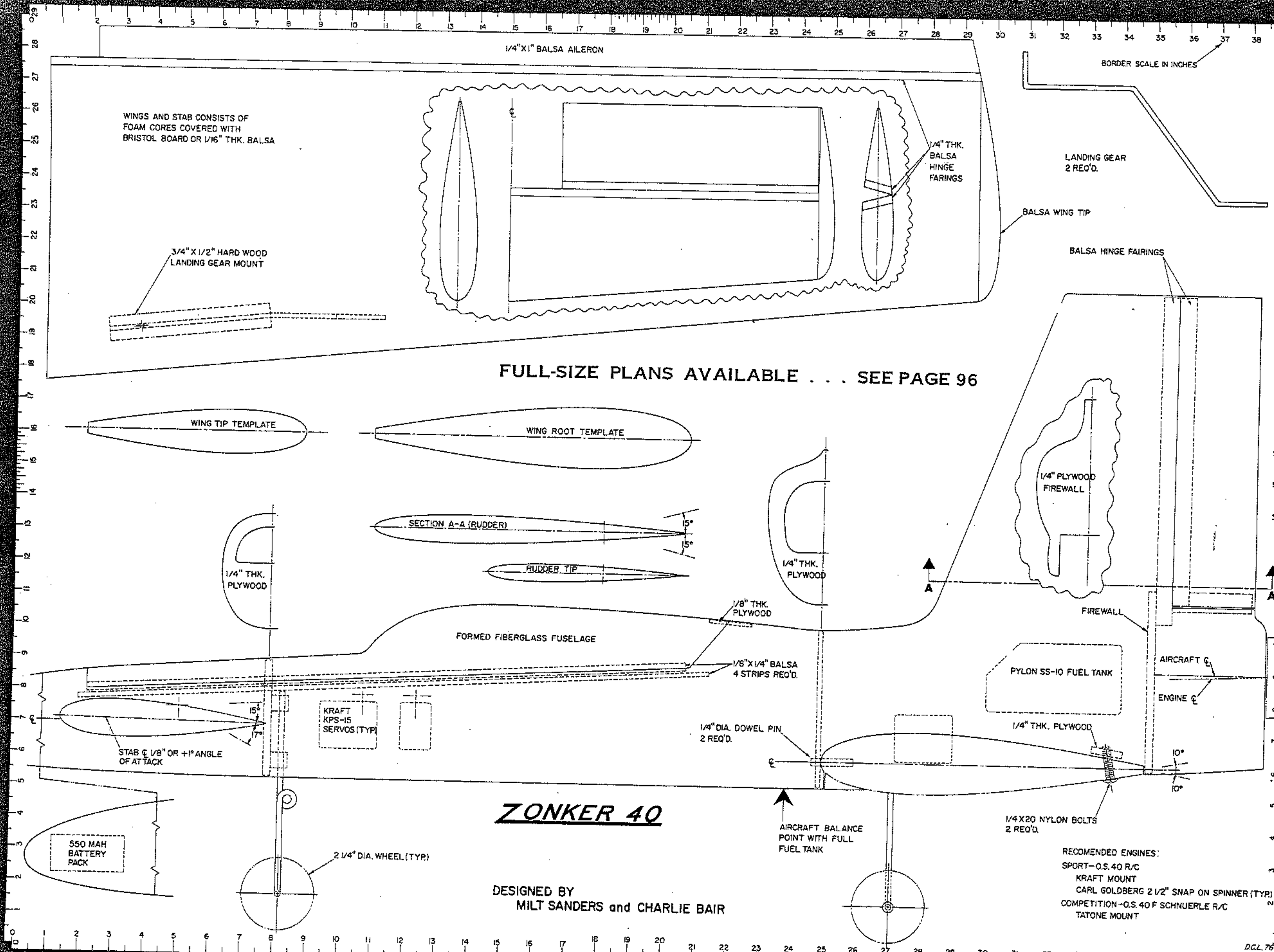
Check the aileron linkage with the wing installed (look through the fuselage with the hatch removed) to make sure the tank does not interfere with the aileron operation. If the ailerons jam in the air, cooly throttle back and say "Sayonara." After some rough ground handling, I started getting some flutter from the vertical fin at high speed. I found that the fuselage had worked loose at the top of the firewall. A piece of 1/8 balsa glued in the fin opening above the fuel tank cured this.

I would also advise against trying spins and snap-rolls—you may not recover the airplane, except in pieces. The airplane will not spin or snap in normal maneuvering with the control movements and CG range as recommended. If you goof something up or force it into a spin, the best mode of recovery is full throttle (to help lower the nose) and full down control. When the rotation stops, throttle back and gently pull out if sufficient altitude remains. One last warning, do not change the basic aerodynamic layout, like putting a fin on the front or doubling the size of the canard. This changes the required CG position and stability. Most modelers don't know any good rules of thumb applicable to canard airplanes.

Lest I end on a pessimistic note, I have had a very enjoyable time flying my Zonker 40 and investigating the things it will and will not do and making little improvements here and there. It is an unusual looking ship, but it is not a freak or oddity. It draws spectators, is highly maneuverable, aerodynamically sound, and has a first place trophy in Novice Pattern (the 5th contest I have ever entered). Two Zonker 40's up at the same time really add excitement to an air show. Anybody in or passing through the Dayton, Ohio area feel free to stop by for a demo flight.

If any of you build this design, I would like to hear of your experiences, including any problems. If you have any questions, feel free to write to the author at 1250 Adams Street, Fairborn, Ohio 45324.

Good luck with your Zonker 40!



1/4"X1" BALSA AILERON
BORDER SCALE IN INCHES
WINGS AND STAB CONSISTS OF
FOAM CORES COVERED WITH
BRISTOL BOARD OR 1/16" THK. BALSA
1/4" THK.
BALSA
HINGE
FARINGS
LANDING GEAR
2 REQ'D.
BALSA WING TIP
3/4"X1/2" HARD WOOD
LANDING GEAR MOUNT
BALSA HINGE FAIRINGS
FULL-SIZE PLANS AVAILABLE . . . SEE PAGE 96
WING TIP TEMPLATE
WING ROOT TEMPLATE
1/4" PLYWOOD
FIREWALL
SECTION A-A (RUDDER)
15°
15°
RUDDER TIP
1/4" THK.
PLYWOOD
1/4" THK.
PLYWOOD
1/8" THK.
PLYWOOD
FIREWALL
FORMED FIBERGLASS FUSELAGE
1/8"X1/4" BALSA
4 STRIPS REQ'D.
AIRCRAFT ℄
PYLON SS-10 FUEL TANK
ENGINE ℄
KRAFT
KPS-15
SERVOS (TYP)
15°
1°
STAB ℄ 1/8" OR +1° ANGLE
OF ATTACK
1/4" DIA. DOWEL PIN
2 REQ'D.
1/4" THK. PLYWOOD
10°
10°
ZONKER 40
AIRCRAFT BALANCE
POINT WITH FULL
FUEL TANK
1/4X20 NYLON BOLTS
2 REQ'D.
550 MAH
BATTERY
PACK
2 1/4" DIA. WHEEL (TYP.)
RECOMENDED ENGINES:
SPORT-O.S. 40 R/C
KRAFT MOUNT
CARL GOLDBERG 2 1/2" SNAP ON SPINNER (TYP.)
COMPETITION-O.S. 40 F SCHNUERLE R/C
TATONE MOUNT
DESIGNED BY
MILT SANDERS and CHARLIE BAIR
DCL 76