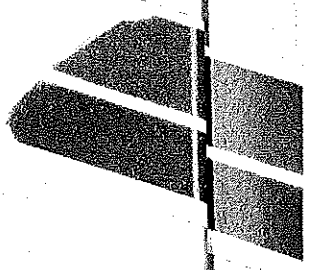
POTATO

Got your eye out for a simple FF model? We hashed out The Man so it would ap-peel to you!



■ **Jim Haught**

The free flight version of our trio is designed to be simple and rugged, yet have a bit of performance.

Potato Man had its genesis in the Grasshopper kit produced by Curt Stevens at Model Research Labs. Curt's thought was to scale up the old Baby ROG rubber-powered design of 50 years ago, add an engine to it (supplied with the kit!), and have a beginner's power model.

The two Potato Men have a chat. Two-year-old Bill loves to flip the prop and make the Potato Man "yand" (land).

I built a Grasshopper for display purposes, and saw several fly. While they did perform as advertised, I felt the design could be improved, and the performance enhanced, without making the model difficult to build.

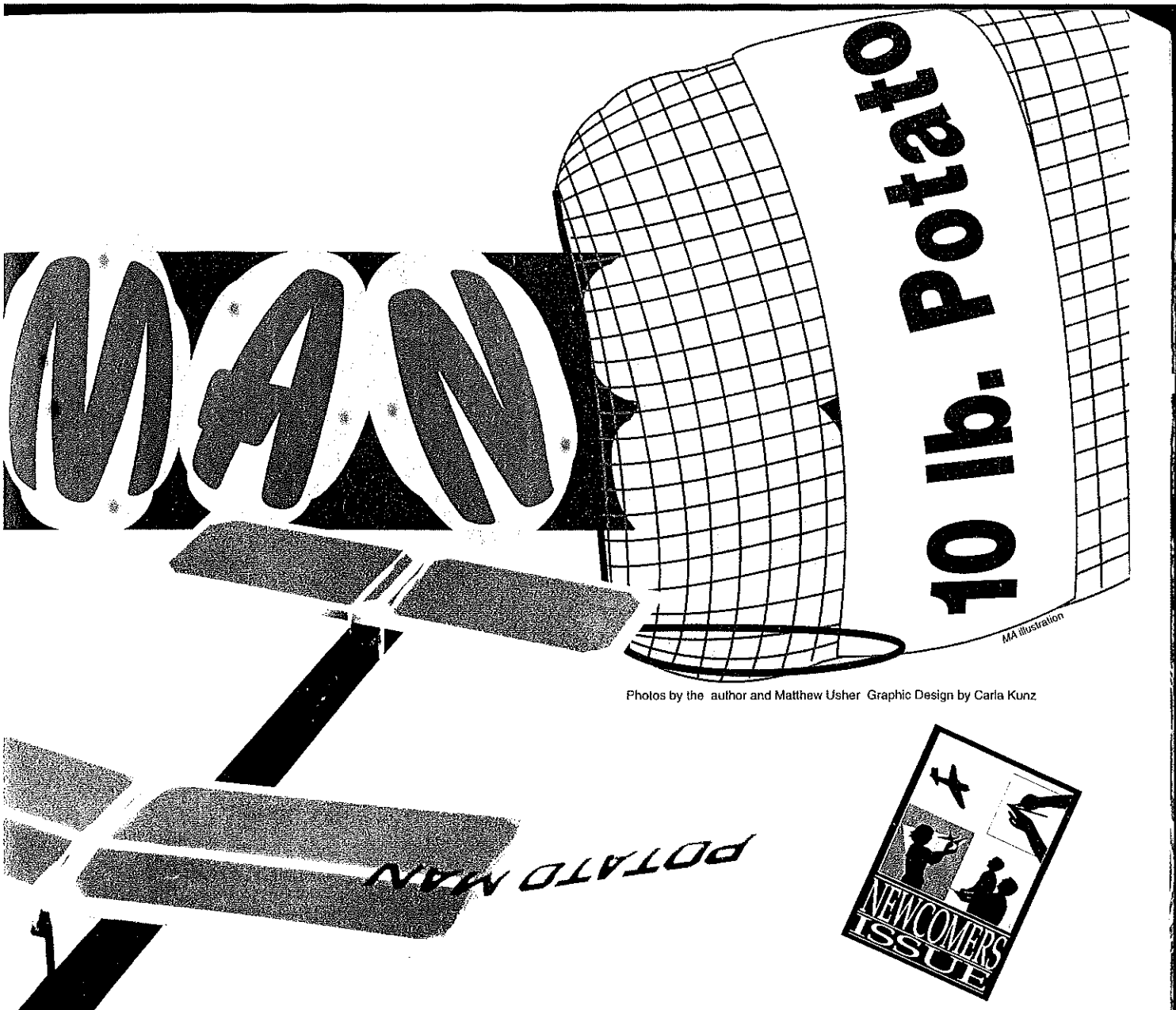
So with a nod to Curt, here's The Potato Man—nickname for our youngest son, Bill. The first time I picked him up, he felt "just like a sack of potatoes!"

CONSTRUCTION

Most of the framework is 3/8 square balsa. Buy about 10 sticks (36 inches long) and you'll have plenty to pick from and have a few spares on hand.

All wood sizes are stock; I recommend Sig balsa for its consistent quality. Virtually all materials needed to build this model (wheels, engine, wire) are available from Sig, if "one-stop shopping" is your goal.

I recommend Duco cement (available in hardware stores and some discount chains) or an aliphatic-resin-type glue (such as Sig-Bond or Titebond) for basic construction. Except for the firewall, epoxies are too heavy, and cyanoacrylates (CyAs) are too



Photos by the author and Matthew Usher Graphic Design by Carla Kunz

brittle for this type of construction.

Stabilizer: This is a good place to start because the pieces are easy to handle, and construction doesn't take long.

Somehow it's always easier to complete a model when you can look at part of it that's already finished!

Lay the plan out on a flat surface that will accept pins (Homasote from building-supply stores is excellent) and cover the working area with plastic food wrap so glue won't stick to it.

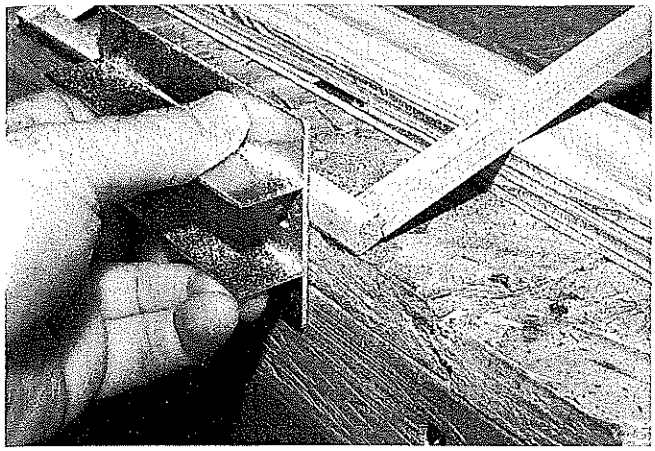
Mark one piece of the outline to length, and saw or cut straight through the wood. If you have access to a small miter box, it's easier to make square cuts; otherwise, do the best you can, and sand the corners square so you have solid glue joints.

Pin the first piece (it doesn't matter which piece you start with) in place on the plan, and continue marking, cutting, and pinning around the stab perimeter. Then carefully cut the center piece for a snug—but not forced—fit between the leading and trailing edges.

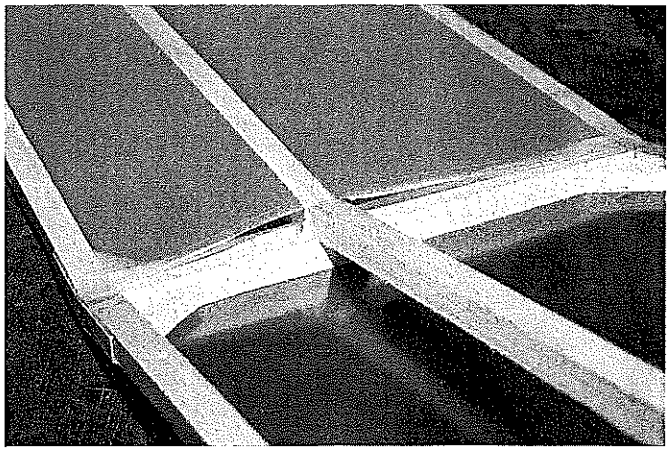
Now you have "kitted" your stab. The pieces can then be removed from the plan, glued at the joints, and repinned in place. Allow several hours (minimum) for the glue to dry before removing the stab from the plan.

Give the stab a light sanding with #320- or 400-grit paper to remove glue bumps and to smooth everything out. Set the stab framework aside until the wing structure has been completed.

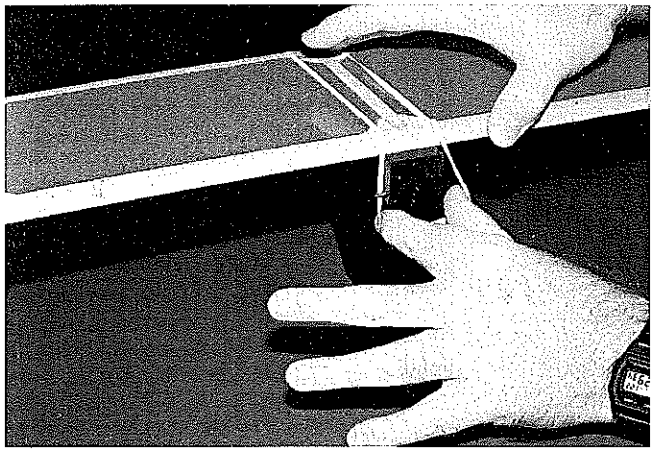
Wing: Potato Man features a four-panel (polyhedral) wing. This means more pieces to assemble and align, but I believe it's worth it for performance and stability. With the method I will describe, it really isn't any harder to build four panels—it just takes a



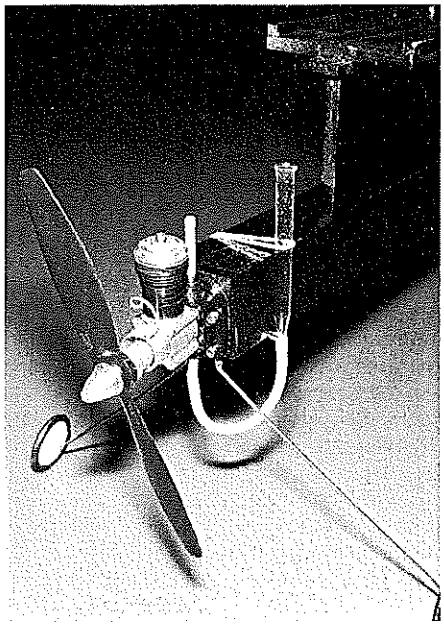
ihedral joints are made by propping up the appropriate panel ıd sanding a bevel into the dihedral rib—see text.



The MRL Mylar covering and top spar form a rudimentary "airfoil" as a simple means to enhance performance.



he stabilizer is held in place by a single #64 rubber band hooked round retaining dowels in the sturdy fuselage.



Eyedropper is held in place with a rubber band looped around the fuselage. Landing gear is long and "springy."

ttle longer.

The wing is actually built the same way ɔu did the stab—only there are four :ctangles to build instead of one. I suggest ıe same procedure: cut the parts for one :ctangle, line them up, and pin and glue :gether. Then proceed to the next panel, ıd so on until you have four rectangles.

Potato Man uses a wing spar to help ɔrm a rudimentary airfoil and add strength ı the structure. Cut four spar pieces to ngth and glue them to the top of each :ctangle in the indicated position. Allow ıe structure to dry thoroughly before ·oceeding.

ow it's time to join the panels. This :quires beveling the joints where the panels ıate. The easiest way to do this is to make ıe joint at 90° and bevel the other panel to ıe proper angle.

You'll need a sanding block—a T-bar ınder is excellent, or glue some medium-·it sandpaper to a hardwood block—and a ard surface with a straight edge that you ın sand against without "losing" the shape ? the edge.

Tip dihedral is added first. Sand the ıain-panel end rib (where the tip will tach) to a 90° angle to the bench. Then ock up the tip for the required angle, ıaking sure that the edge of the tip rib is flush with the edge of the sanding surface.

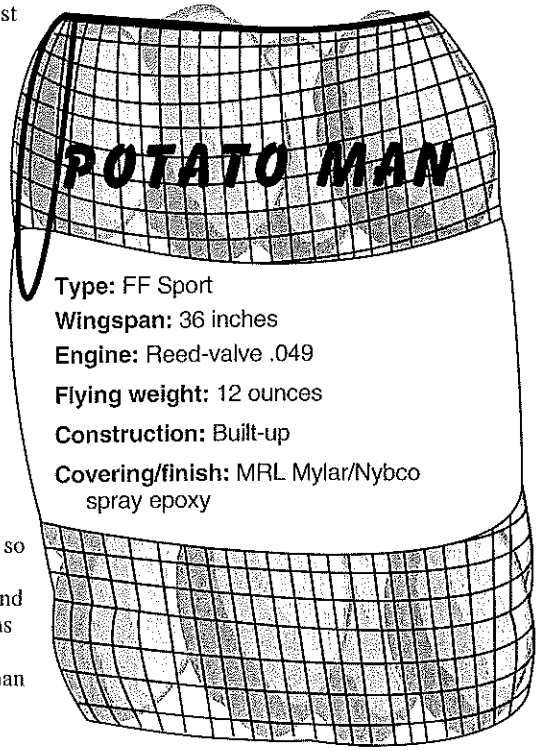
Pin or hold the tip in place, and sand the tip rib until the block "bottoms out" against your sanding surface. Repeat this process for the other tip and main panel.

Pin one main panel to the bench and glue the tip to it. Pin in place and allow to dry thoroughly. Repeat for the other tip and main panel. In fact, if your workbench is big enough, it's easiest to pin the main panels parallel to each other, and do both joints at the same time. You can be sure that the panels have equal dihedral this way; one block or shim can be used for both tips.

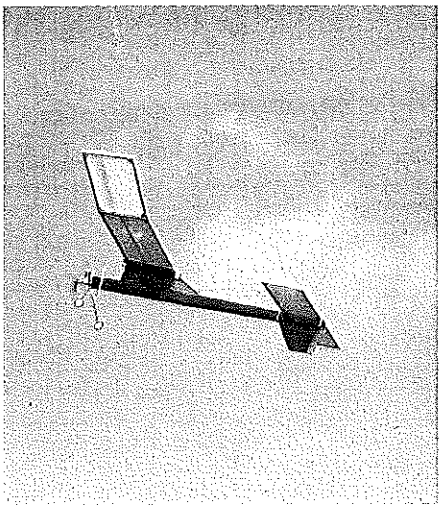
When the tip joints have dried, the main panels are joined in similar fashion.

It's advisable to add braces to the outside of these joints—they really come under stress on "awkward" landings! Braces are made by tracing the joint outline onto 1/32 plywood and trimming to fit. The braces need only cover an inch or so past the joint in each direction.

About that "airfoil:" I chose not to round off or taper the leading or trailing edges, as a way to hold the model's performance down a bit. I wanted more performance than the Grasshopper, but not so much that a dethermalizer (DT) would be required.



Type: FF Sport
Wingspan: 36 inches
Engine: Reed-valve .049
Flying weight: 12 ounces
Construction: Built-up
Covering/finish: MRL Mylar/Nybco spray epoxy



The engine will run 30 seconds or so on a full eyedropper tank. Climb pattern is a gentle nose-up right-hand spiral.

Keep the nose up, wings level, and launch slightly to the right of the wind. No mashed Potatoes, please!

Messing around with adjusting and lighting DT fuses is a lot to ask of a beginner, and there's more risk of losing the model. We don't want you to lose Potato Man—we want you out there *flying!*

Fuselage: It's a big, sturdy, box—designed to be tough more than light. The pieces fit together in such a way as to "trap" the pylon and rudder, so they will automatically be in alignment. This is one less thing to contend with as you proceed with construction.

The fuselage is built from the right side up. Pin the right side to the plan and add the bottom, top, and end pieces. Use scrap balsa in the pylon slot to hold the pieces apart the proper distance. (The rudder can be "built-in," but the pylon is left out, so it can be slid back and forth to determine the proper center of gravity [CG] position.)

As with the B-70, Potato Man's landing gear is "trapped" between the firewall and engine. It's much easier to mount the gear this way, and it's easily removed to straighten out the gear when/if it gets bent. The gear is intentionally thin and springy, for maximum cushioning effect, so it will probably get a bend in it now and then.

If you lack experience bending music wire, try practicing on an old coat hanger first. The wire is much softer, and will give you an idea of what to do. Start with one wheel "axle" and work your way around. With care and patience, it's not too hard.

Covering/Finish: The prototype's wing and stab were covered with Model Research Labs' iron-on clear Mylar (same as that used on the Grasshopper—available in rolls from MRL at 25108 Marguerite #160, Mission Viejo CA 92692). It's lighter than most iron-on coverings and is easier to handle. The fact that it's clear gives you unlimited color choices!

Start with the stab—a small, flat surface that's easy to work with. Cut a piece of material that's about an inch larger than the perimeter of the stab, and fire up your iron to a medium-heat setting.

(Some experimentation is required here—you want to be sure the material will attach itself to the structure, but you can't melt the film. An advantage with the MRL film is that the frosty appearance lets you see when the adhesive has been activated.)

Use the tip of the iron to tack the film down to the top of the framework—first in the corners, then in the center, and in progressively smaller areas. *Stay on the wood—do not attempt to shrink the "open" part of the covering yet.* Iron the film down around the front edges of the stab, and trim the excess film away.

Now it's time to add color. Your local department store has all kinds of spray enamels—even the $1/can stuff will work fine.

Turn the stab over, and spray the color on the bottom of the stab and the inside of the area you just covered. Allow to dry for several hours before adding the bottom covering.

Now the bottom of the stab can be covered with a piece of clear Mylar, just as you did the top—except that there will be no painting. Thus the paint is "trapped" inside, and is protected from fuel. That's why even the cheap paint will work!

After both surfaces have been covered, the open areas can be shrunk down smooth. Poke a couple of pinholes in each panel's covering to allow for a bit of ventilation, so hot air can escape from inside when you shrink the covering.

The wing is covered in the same manner—there are simply more pieces to work with.

I didn't want to complicate the building process by adding fill-in pieces to the dihedral and tip ribs, just for the sake of a smooth covering job; so the covering is simply "wrapped" around the ends of the tips, and overlapped against itself at the dihedral joints. Looks ugly, flies fine!

As with the B-70, this model's fuselage has Nybco brand spray epoxy as its only finish. It's great stuff—good color, and fuelproof up to the 25% nitro fuel we have used. It's also inexpensive (about $2.50 a can) and readily available (stocked by Wal-Mart stores in our area). Coverage is good, and recoating is possible after a few hours. I used black for its coverage capability (and my models have black fuselages anyway).

The wing should be "keyed" to maintain alignment over a series of flights. The 1/16 x 1/8 keys keep the wing on straight, but are small enough to allow some "give" on a cartwheel-type landing; they will either slide over the wing mount or simply shear off, and are easily replaced.

Place your handy drafting triangle against the side of the pylon and shift the wing until the leading edge is even with the edge of the triangle as you sight along it. Then mark the points where the wing leading and trailing edge contact the wing platform, scrape the covering away at these points, and glue the keys in place.

Flying: Begin with the classic hand-gliding session on a calm day or evening. You won't learn anything by trying to hand-glide in a breeze, so be patient enough to wait for good weather (even on windy days, there's often a calm period just before sundown).

Grasp the fuselage just behind the CG, hold the model level, take a fast walk forward, and gently push the model straight ahead.

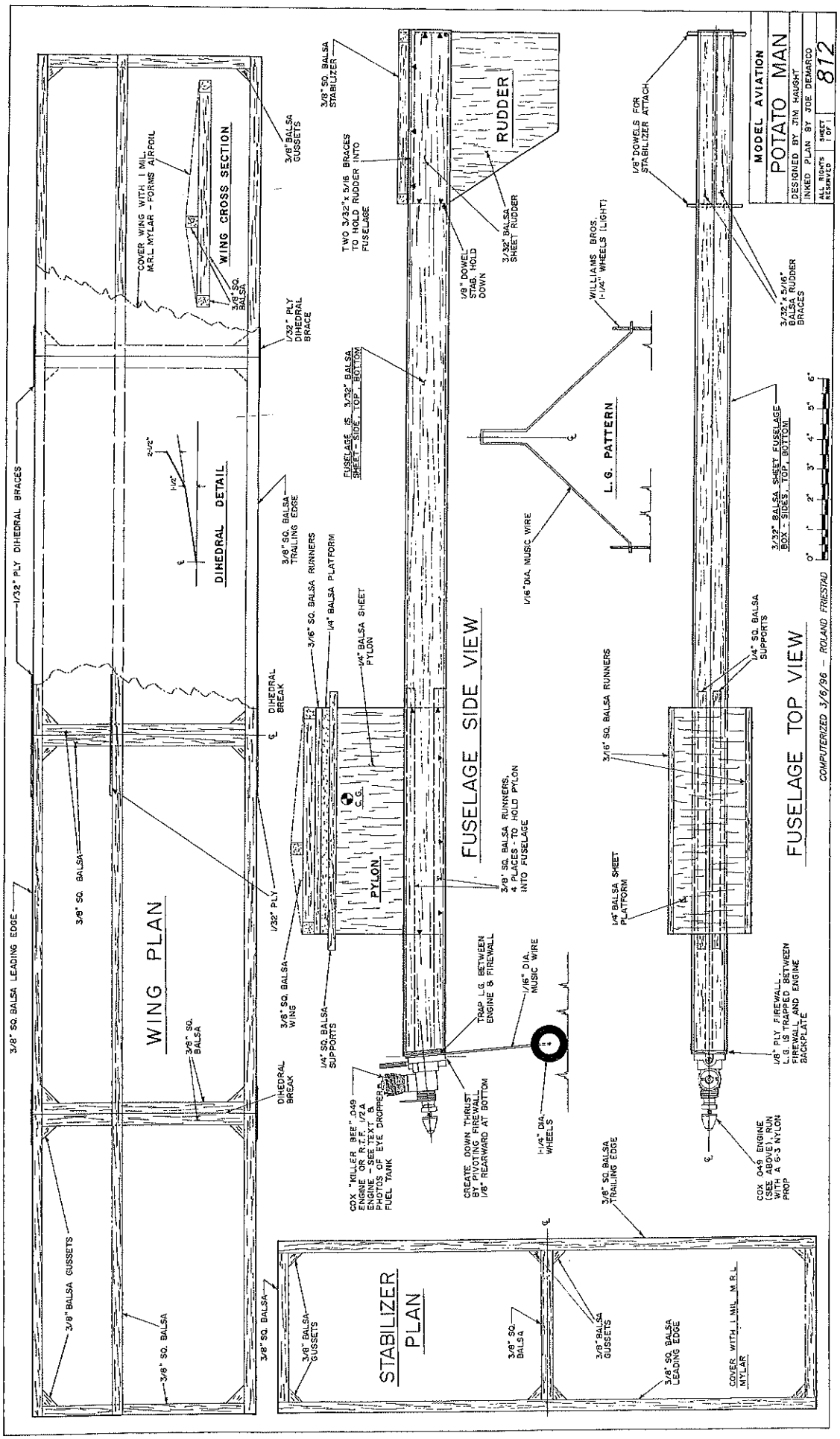
What you want to see is the model slowly settling to the ground perhaps 20 feet in front of you. If it doesn't, test-glide again to be sure an errant toss didn't affect the outcome. If the results are consistent, and the model stalls (pitches the nose up) or dives consistently, adjustments are in order.

A glide that is too steep (dive) can be corrected by adding a small shim (1/32 thick) between the fuselage and trailing edge of the stab. Cut the shim to match the width of the fuselage, and perhaps ½ inch wide. Hand glide at least twice more (for consistency's sake) and see if another shim is necessary. Repeat until you get the glide described above.

If the model stalls, reverse the shimming procedure by adding shims (one at a time) between the *leading edge* of the stab and the fuselage. Again, test-glide multiple times to be sure your launch is not affecting the result.

Once the glide is reasonably close to that described above, take a deep breath and prepare for powered flight.

Note: It's far better to have the model be a little "mushy" in the glide than to have a glide that's too steep. If the model glides steeply, it will likely dive under power; if the glide is mushy, the model may have too much right-turn tendency, but is much more


MODEL AVIATION
POTATO MAN
DESIGNED BY JIM HAUGHT
INKED PLAN BY JOE DEMARCO
812
ALL RIGHTS RESERVED
SHEET 1 OF 1
WING PLAN
WING CROSS SECTION
DIHEDRAL DETAIL
STABILIZER PLAN
FUSELAGE SIDE VIEW
FUSELAGE TOP VIEW
L.G. PATTERN
RUDDER
PYLON
COMPUTERIZED 3/6/96 - ROLAND FRIESTAD
3/8" SQ. BALSA LEADING EDGE
1/32" PLY DIHEDRAL BRACES
3/8" SQ. BALSA
3/8" BALSA GUSSETS
COVER WING WITH 1 MIL M.R.L MYLAR - FORMS AIRFOIL
3/8" SQ. BALSA
1/32" PLY DIHEDRAL BRACE
3/8" SQ. BALSA TRAILING EDGE
3/8" SQ. BALSA RUNNERS
1/4" BALSA PLATFORM
1/4" BALSA SHEET PYLON
DIHEDRAL BREAK
1/32" PLY
3/8" SQ. BALSA WING
1/4" SQ. BALSA SUPPORTS
3/8" SQ. BALSA GUSSETS
3/8" SQ. BALSA STABILIZER
TWO 3/32"x 5/16 BRACES TO HOLD RUDDER INTO FUSELAGE
3/32" BALSA SHEET RUDDER
1/8" DOWEL STAB HOLD DOWN
1/8" DOWELS FOR STABILIZER ATTACH
FUSELAGE IS 3/32" BALSA SHEET - SIDE, TOP, BOTTOM
WILLIAMS BROS. 1-1/4" WHEELS (LIGHT)
3/32"x 5/16" BALSA RUDDER BRACES
1/16" DIA. MUSIC WIRE
3/32" BALSA SHEET FUSELAGE BOX - SIDES, TOP, BOTTOM
3/8" SQ. BALSA RUNNERS, 4 PLACES - TO HOLD PYLON INTO FUSELAGE
3/16" SQ. BALSA RUNNERS
1/4" SQ. BALSA SUPPORTS
1/4" BALSA SHEET PLATFORM
TRAP L.G. BETWEEN ENGINE & FIREWALL
CREATE DOWN THRUST BY PIVOTING FIREWALL 1/8" REARWARD AT BOTTOM
1/16" DIA. MUSIC WIRE
1-1/4" DIA. WHEELS
COX "KILLER BEE" .049 ENGINE OR R.T.F. (A ENGINE - SEE TEXT & PHOTOS OF EYE DROPPER FUEL TANK
1/8" PLY FIREWALL, L.G. IS TRAPPED BETWEEN FIREWALL AND ENGINE BACKPLATE
COX .049 ENGINE (SEE ABOVE), RUN WITH A 6-3 NYLON PROP
3/8" SQ. BALSA TRAILING EDGE
3/8" BALSA GUSSETS
3/8" SQ. BALSA
3/8" SQ. BALSA LEADING EDGE
COVER WITH 1 MIL M.R.L MYLAR

likely to survive power testing. You may break a prop or two, but major damage is far less likely.

Test-run the engine to be sure you have a good needle-valve setting, and that it will "run out" a full eyedropper. My engine will run for about 30 seconds on a full eyedropper tank—and that's plenty for this model.

If you have starting problems, simply refill the tank before you crank up the engine again. And if you use a syringe to fill the tank, as I do, you can refill the eyedropper while the engine is running (with a little practice).

The first powered flights should be launched slightly to the right of the wind, with short engine runs—only a few seconds. I judged this on my model by launching when the fuel had just left the eyedropper; the fuel left in the line was good for a few seconds of power, and that's enough to let the model get high enough to see what it's doing.

Thrust adjustments on powered FF models are effective at low speeds—the early part of powered flight. As the model picks up speed, the flying surfaces have more effect and are used to adjust that part of the climb.

What you want is a gentle right-hand turn under power, with the nose up.

If the model wants to go immediately to the left (and there are no warps or misaligned parts) then a 1/32 shim of right thrust is needed. Glue a strip of 1/32 plywood perhaps 1/8 wide to the left side of the firewall, so the engine points more to the right (as viewed from the rear of the model, or in an imaginary cockpit).

Reverse the above adjustment if the model immediately heads too much to the right after launch. Potato Man's natural arrangement of forces (downthrust, underslung rudder, neutral thrustline) give a right-turn tendency anyway, so adjustment should be relatively simple; be patient and make one small adjustment at a time.

Do not increase the engine run length until you are satisfied that the model is climbing in a safe right-hand turn. Likewise, don't concern yourself with the transition from power to glide at this point, or even the glide itself (as long as it's relatively safe). The model isn't really high enough yet for a "normal" flight, so you won't get the proper reaction from it until you can give it a longer engine run.

When you are satisfied with the short engine runs, gradually increase the length of engine run (maybe three or four seconds at a time) and observe the model.

Now your thrust adjustments are less effective, and a tendency to turn too much one way or another is controlled by the rudder.

Sand or carve some 1/16 x 1/4 balsa to a triangular shape (like a piece of trailing-edge stock). Cut this into 1/2-inch lengths, and glue to the appropriate side of the rudder for power turn (blunt or "fat" edge toward the rear—see the rudder offset used on the XB-70). Start at the bottom of the rudder and use only one piece at a time.

Example: Model turns too tightly to the right with extended engine run, after initial climb was OK.

The solution is to give more left rudder by gluing a strip of rudder-trim material to the bottom of the left side of the rudder (again, viewed from the rear). Repeat as necessary, and add longer or shorter strips until the model continues to climb safely.

As with the thrust adjustments, reverse the above instructions if the climb is too tight to the right.

Above all, be patient with your power trimming. Take an extra flight or two if necessary to get a good look at what your model is doing. Haste really does make waste here!

As long as the power pattern is safe, the engine run can continue to be increased to suit your taste, the limitations of your flying field, or the size of the eyedropper.

At this point, normal powered free flight model trim would concentrate of fine-tuning the glide by tilting the stab for a nice, smooth circle. I chose not to do that with this model; like the blunt airfoil, I wanted to hold the performance back a bit to lessen the risk of losing the model. (And most models will have some sort of "natural" turn, anyway.)

Now you can fill the tank as much as you dare, and really have some fun. This spud's for you! ✈