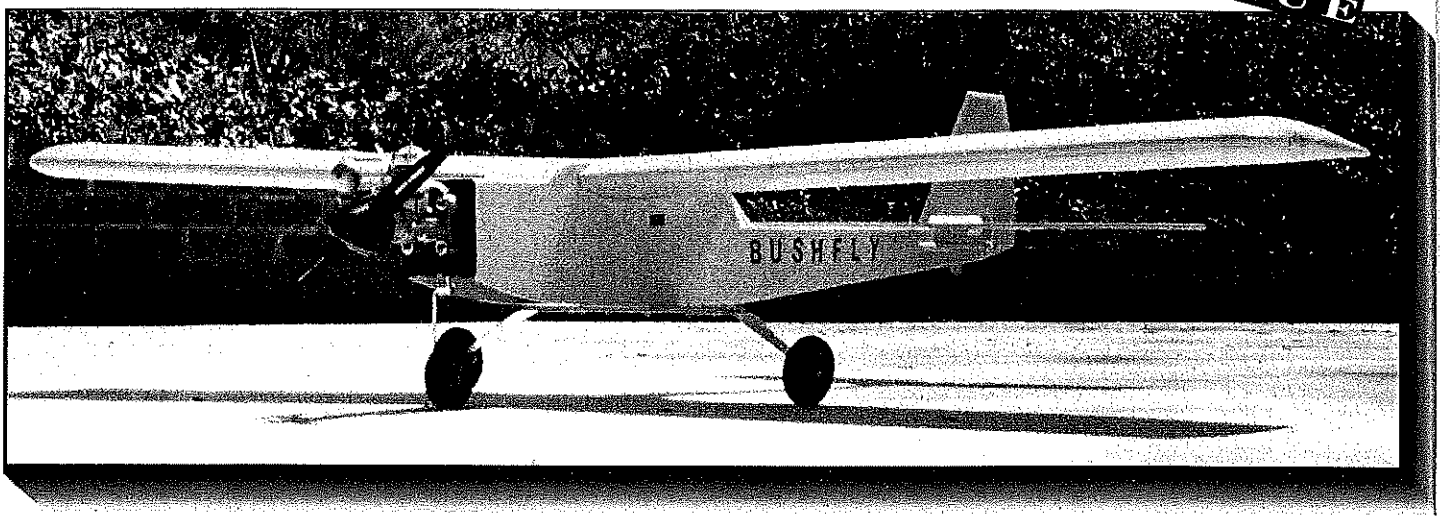
#832

Bushfly

■ Charles Day



Functional .46-powered model is "just for the fun of it"

FOR SOME FLIERS, participation at a relatively basic level of acrobatic skill is enough work to put into something that is supposed to be fun. The Bushfly was put together with this "just for the fun of it" fraternity in mind.

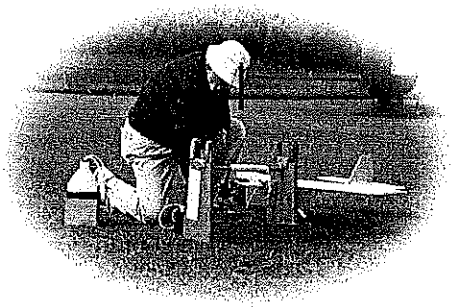
The absence of a cowl and the semi-ultralight configuration resulted from an effort to keep the model as simple as possible. However, structural details are as complicated as necessary to hold the finished product up to what I consider to be a reasonably decent standard of quality, based on observation and experiences at the field over the years.

One such detail is the 17-inch (wheel-to-wheel) stance of the main gear. Its purpose is to give to this high-wing trainer the same ground-handling stability as a low-wing model with the main gear mounted wide apart (as normally found on a Pattern model, for example). On an overshot landing, the Bushfly can be circled up while still at speed in the rollout without tipping up or grounding the prop.

Another feature that involves a little extra building effort is the 1/32 plywood inlay on both sides of the middle area of the elevator and bottom area of the rudder. This gives firm no-slop footing to the horns, adds strength in deflection where needed most, leaves the balsa core clear for easy hinge-slotting, and prevents warpage/splitting, but adds an insignificant amount of weight.

Bushfly uses scrap foam fillers in the open spaces of the center section of an otherwise fully sheeted frame wing. In this way we are borrowing the simplicity and fully bridged strength of a conventional foam-core wing at the root joint and center section, but without the weight of the glue coated on both sides of a conventionally constructed foam-core wing panel.

Bushfly weighs only about six pounds dry, give or take, including a soft engine mount, four standard servos, arrow-shaft-type linkage to elevator and rudder, 1/4 aircraft plywood landing gear spreader, a .46 engine with tank, 2 1/4-inch spinner, and prop.



CONSTRUCTION

As with any project, read all the way through the construction text and turn on your brain before studying the plans.

If you use thin cyanoacrylate (CyA) glue for fast assembly, put waxed paper under the work, lest you discover that the structure has glued itself down firmly to the workbench.

Some suppliers (Lone Star, for instance) sell 4-6-lb. very light sheet. Unless otherwise noted, all blocking and sheet in the Bushfly thicker than 1/8 is extra-light.

For a few pennies more, some suppliers will select "dead straight" pieces when requested, such as the 1/4 medium balsa for the stab and elevator.

Wing: Make a right and a left panel. Construct the frames integral with their bottom skins, gluing the individual framing members down to the skin as you build.

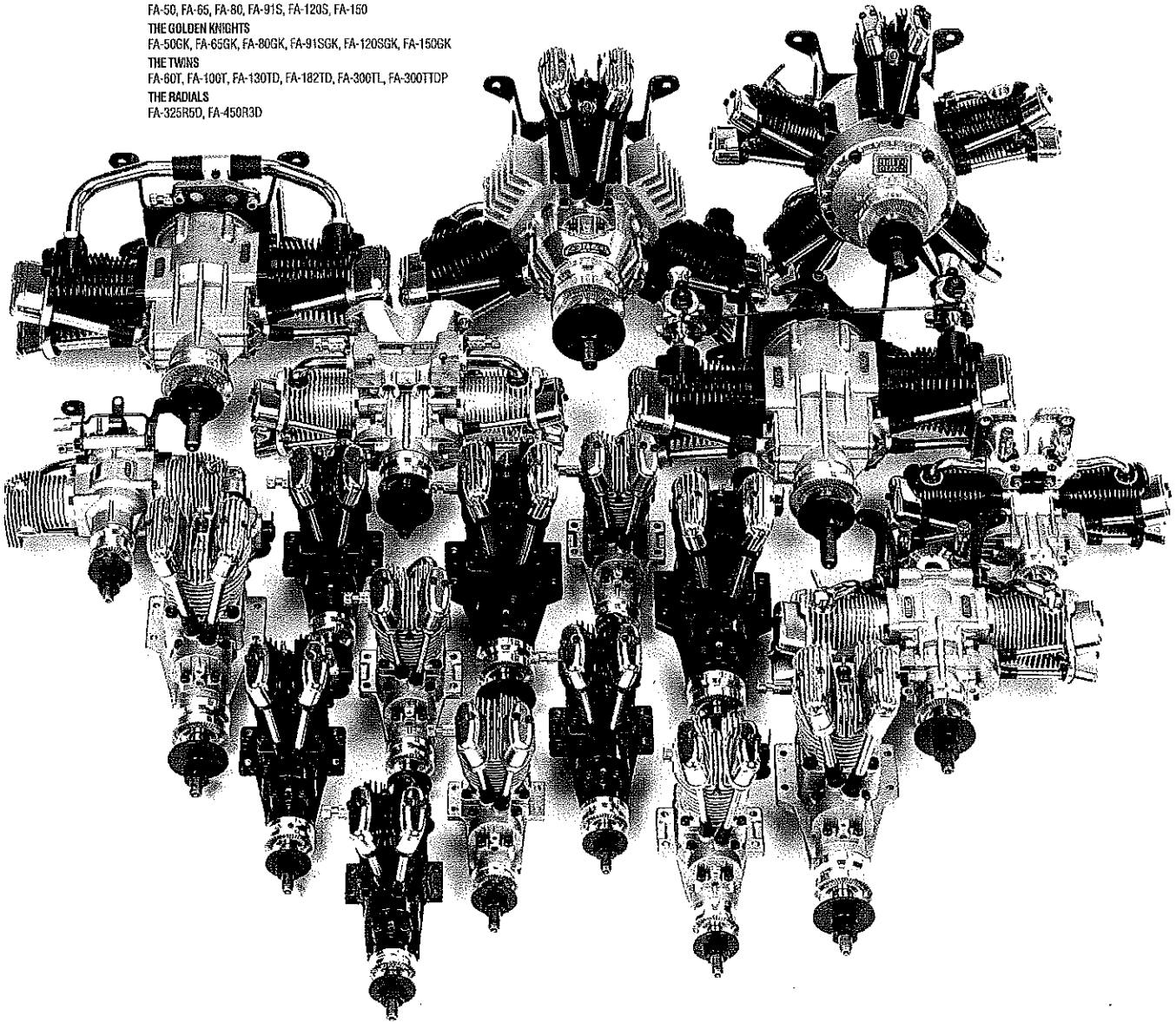
Trim the back edge of the skin with a sharp X-Acto knife and a metal straightedge at least 30 inches long. (If your supplier sands the wing skins down on the thin side, use 3/32; otherwise use 1/16.)

Make a rib template from stiff card stock or scrap 1/32 plywood. A sharp pair of tin snips makes short work of trimming thin plywood. The two ribs at the sides of the center section are cut from 3/16 light balsa; all the others are cut from medium-weight 3/32. When all are cut, stack them to make sure they match up. Notches for the spars in the first five inboard ribs are 1/8 deeper, to accept the 1/8 x 3/8 spar doublers.

The main spars are 3/16 x 3/8 hard, straight-grained balsa. Place the bottom spar and its doubler in position as you glue the ribs in place, then install the top spars. Notice that the back five inches of the

When you're ready for a 4-stroke, Saito's ready for you.

THE SINGLES
FA-50, FA-65, FA-80, FA-91S, FA-120S, FA-150
THE GOLDEN KNIGHTS
FA-50GK, FA-65GK, FA-80GK, FA-91SGK, FA-120SGK, FA-150GK
THE TWINS
FA-60T, FA-100T, FA-130TD, FA-182TD, FA-300TL, FA-300TTDP
THE RADIALS
FA-325R5D, FA-450R3D



Twenty engines and counting.

It's the kind of variety that's possible when an engine manufacturer devotes all of its energy to producing only one type of engine.

The four-stroke engine.

It's also the kind of variety that results from developing and perfecting innovative design concepts that pay off big for four-strokes of all sizes and all configurations.

Like building unique, hard chromed, distortion and leak free, one-piece cylinders for better heat dissipation and unmatched power-to-weight ratios.

Or mating the lightest-ever, high silicone pistons with super-strong rods and cranks for the kind of smooth-running durability that made it possible for Saito to be the first engine maker to offer a three year warranty.

So if you're ready for a four-stroke, see the Saitos at your dealer now. And if you're looking for a size or configuration of four-stroke that Saito doesn't produce, don't give up.

Chances are good you won't have to wait very long.

SAITO
THE 4-STROKE COMPANY™

Saito engines are distributed exclusively by Horizon Hobby Distributors, Inc.,
4105 Fieldstone Road, Champaign, Illinois 61821 (217) 355-9511

bottom wing surface is a flat plane. Weight the back five inches down on your flat workbench as you build for a twist-free wing panel. The 1/8 medium balsa front trimmer should match up closely to the front cut of each rib.

The back cut of each rib is butt-jointed against the trailing edge, which is glued flush with the back edge of the bottom skin. Leave 1¾ inches of skin, spars, and trailing edge extending from the root end of each panel for use in building the center section. Save the rib template for later use in laying out the wing saddle so it fits the wing and holds it at 0° incidence.

When assembling the two panels to form the one-piece wing, be aware that the center section is filled between framing members with scrap foam. These small pieces of foam can be blocked out with a hacksaw blade and sanded to contour with a coarse sanding paddle; hot-wire cutting is not necessary. When gluing foam or adjacent to it, use epoxy or aliphatic-resin glues; some glues are chemically incompatible with foam and will make a mess.

The 1¼ notch-back at the center section is faced with 1/16 plywood cut to match the dihedral and drilled to accommodate the 5/16 front hold-down dowel. Taper the back end of the dowel with a pencil sharpener. The tapered back end is anchored in a hole drilled in the front 1/16 plywood scab reinforcement where the spars meet at the root center. Predrill all holes in these plywood parts before gluing them in place.

The back scab at the root joint of the spars is 1/32 plywood and also serves as the front face of the aileron servo well. The back face of the well is also 1/32 plywood.

Set up the two panels on a jig, or otherwise supported, such that there is no twist within each panel and none from one to the other at the root joint when held at 0° incidence and at the correct dihedral angle.

Complete the center section, installing the dowel and foam fills. Be sure the bottom skins fit neatly at the root where the foam fills meet to form the root joint, which is glued with 30-minute epoxy.

Glue the 1/16 vertical-grained spar webbing in place before adding the top wing skin. Use slow-curing glue that will give you time to apply it to the top framing surfaces of an entire panel before placing the skin in position and taping it down to the top edge of the front trimmer. A fully sheeted wing will take a permanent, stiff set—including any twist—so be sure it is true.

Reinforce the center section with four-inch glass cloth and epoxy.

When rounding the leading edge of the wing panels it is a good idea to mark the line where the zero-incidence plane intersects with the front face (use a soft-lead pencil). Round up and down to that line to maintain the incidence integrity of the wing. Use the same principle to form the tips.

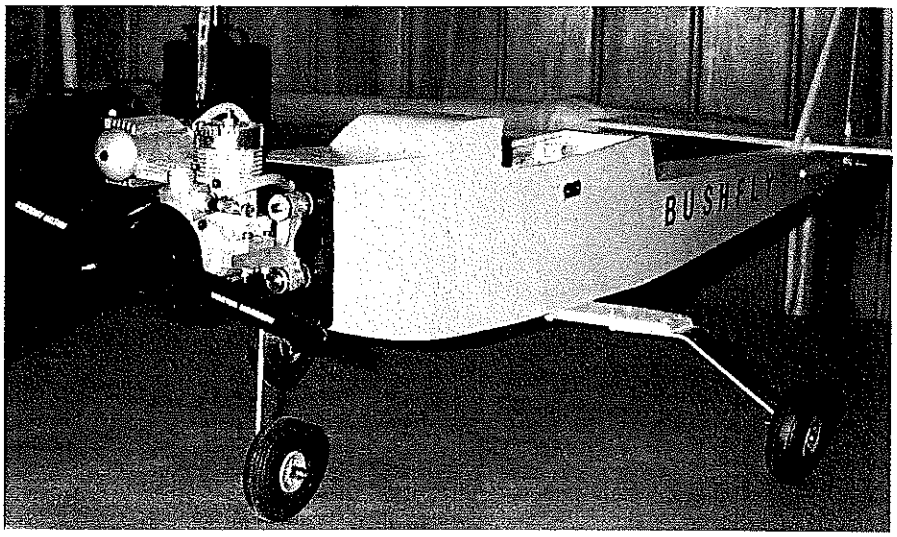
Adjustment of wing incidence can be done by shimming or sanding at the back edge of the wing saddle. Any such adjustment should be "feathered" at the front of the saddle, since the wing is fixed in non-adjustable position by the front hold-down dowel. Doublers are fitted maybe 1/8 inch below the saddle cut (with the possible need for adjustment in mind: Balsa sands easily; plywood doesn't).

The ailerons are cut from 3/8 x 2 aileron stock trimmed to 3/8 x 1¼. That will leave the trailing edge just a tad less than 3/16 thick. Leave it that way—it's good insurance against flutter. Use Goldberg (or equal) long, heavy-duty 1/8 aileron horn wires.

A 1/4-20 tap and drill set will be needed to put threaded holes in the rear hold-down blocks, which can be cut from 1/4 aircraft plywood or 3/8 maple.

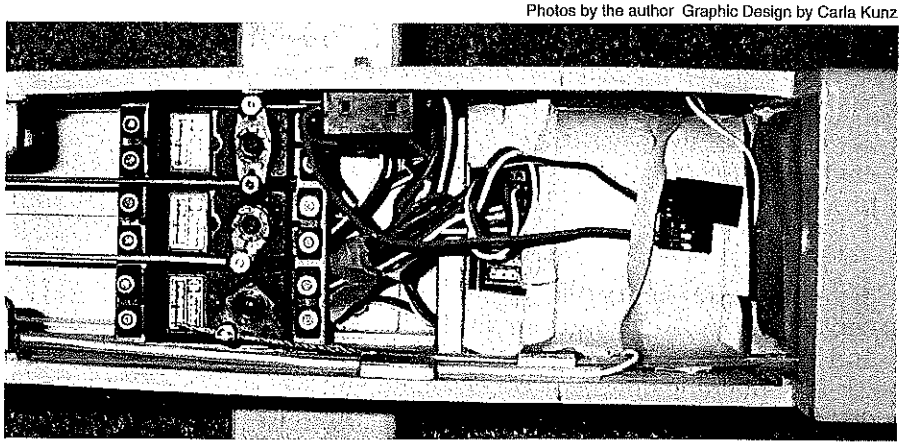
Tail Surfaces: The rudder and fin are cut from 3/8 sheet; the stab and elevator are 1/4 sheet. The inlays in the middle of the elevator and the bottom of the rudder are cut from 1/32 plywood. The plywood pieces are epoxied to the surfaces and held down securely with office binder clips while the epoxy cures.

Install the hinges on the elevator, rudder and ailerons. Slot the stab, fin, and wing so the control surfaces can be dry fitted. Note that there is a cut-out in the rudder to



With no cowl, a wide-stance main gear, slender tail section, and O.S. .46 on a soft mount, Bushfly is what the author calls a "utilitarian machine."

Photos by the author Graphic Design by Carla Kunz



Radio installation. Battery is under the receiver—they share a foam sleeve. Recharge and aileron connectors are stored under rubber band when not in use.

Bushfly

Type: RC Sport/trainer

Wingspan: 61 inches

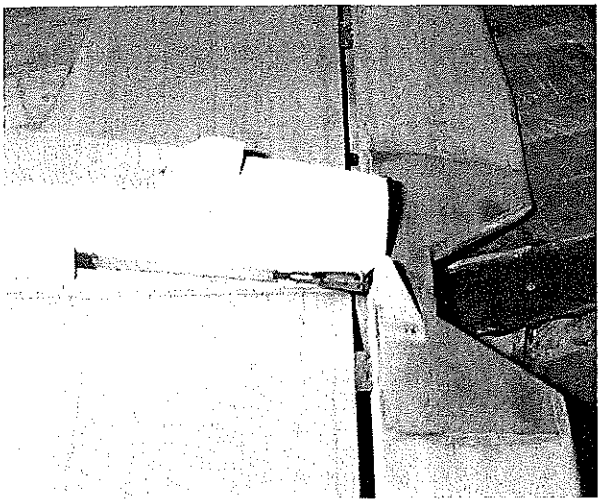
Engine: .40-.46 two-stroke

Functions: Throttle, elevator, rudder, ailerons

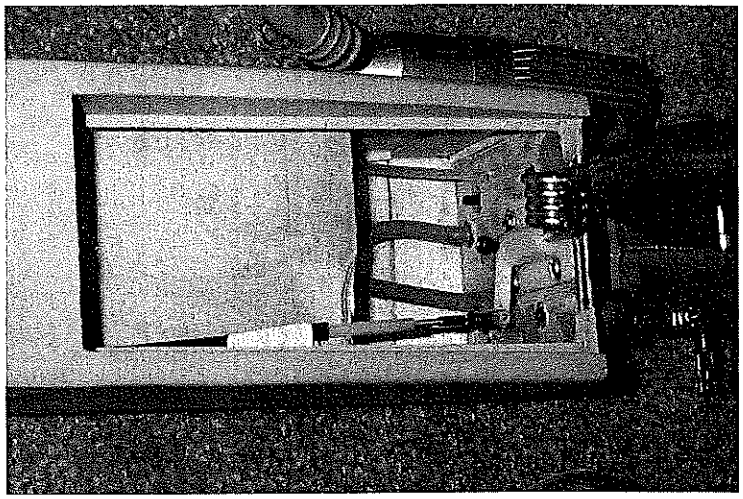
Flying weight: 6 pounds (approx.)

Construction: Built-up

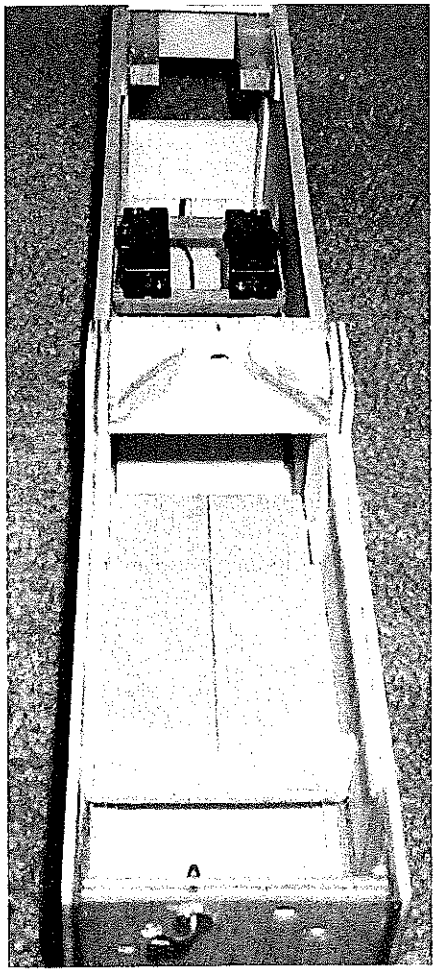
Covering/finish: Silkspan and dope



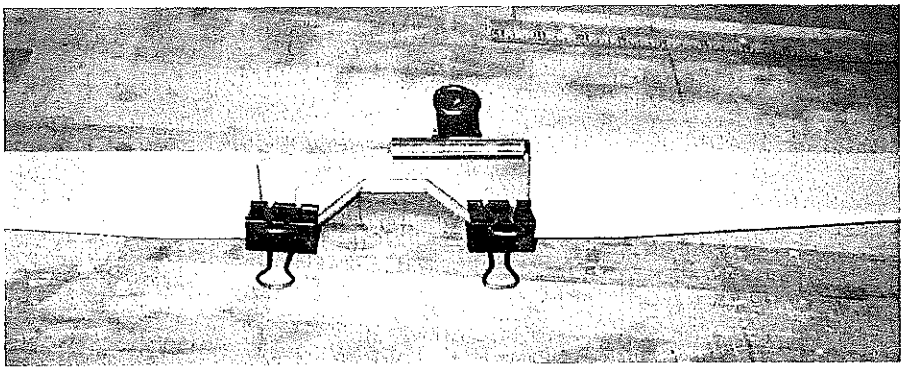
Dry-fitting of empennage in progress. Allows linkage to be installed so that it points directly at control horns.



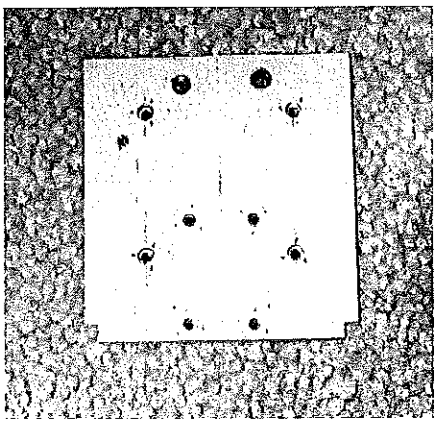
Hatch removed—lines and linkages exposed for service. Steering linkage entrapped but can slide horizontally as steering arm rotates.



Tank floor is 1/16 plywood, with a 1/4 balsa barrier at the front. Front wing hold-down dowel is 5/16 diameter.



Clips hold 1/32 plywood inlays in place on elevator until epoxy cures. Adds deflection strength in this important area and helps to link elevator sides.



All holes are drilled and blind nuts installed prior to attachment of firewall to fuselage.

accommodate the stab, which is actually one piece, but cut down at its center area to maybe an inch or so in width and reinforced with plywood inlays on both sides. Make sure the cutout in the rudder clears the elevator at full right and full left rudder. Use aliphatic glue to attach the hinges. It will not seize up the throw if it gets in the works. Pin Klett-type hinges with round toothpicks.

Checking the set in roll of the wing relative to the elevator is most accurately done by eyeballing the model from the rear to see that the elevator touches at both tips down in the dihedral-angle of the wing, using the trailing edge of the stab without elevator and the trailing edge of the wing without ailerons as the reference elements. This is another reason for dry fitting these parts before final hinging.

Fuselage: Cut the two side panels from 1/8 medium sheet balsa. Cut the 1/32 plywood doublers and epoxy to the inside faces of the side panels. Be sure to make a right side and a left side!

The plywood indications on the plans at the front and the back of the wing saddle are cut from 1/8 Lite Ply, and are the side portions of what amounts to formers at these two stations. Note from the plans that the crossmembers of these formers are cut from 1/4 light balsa sheet, except that hold-down structures are made from 1/4 aircraft plywood.

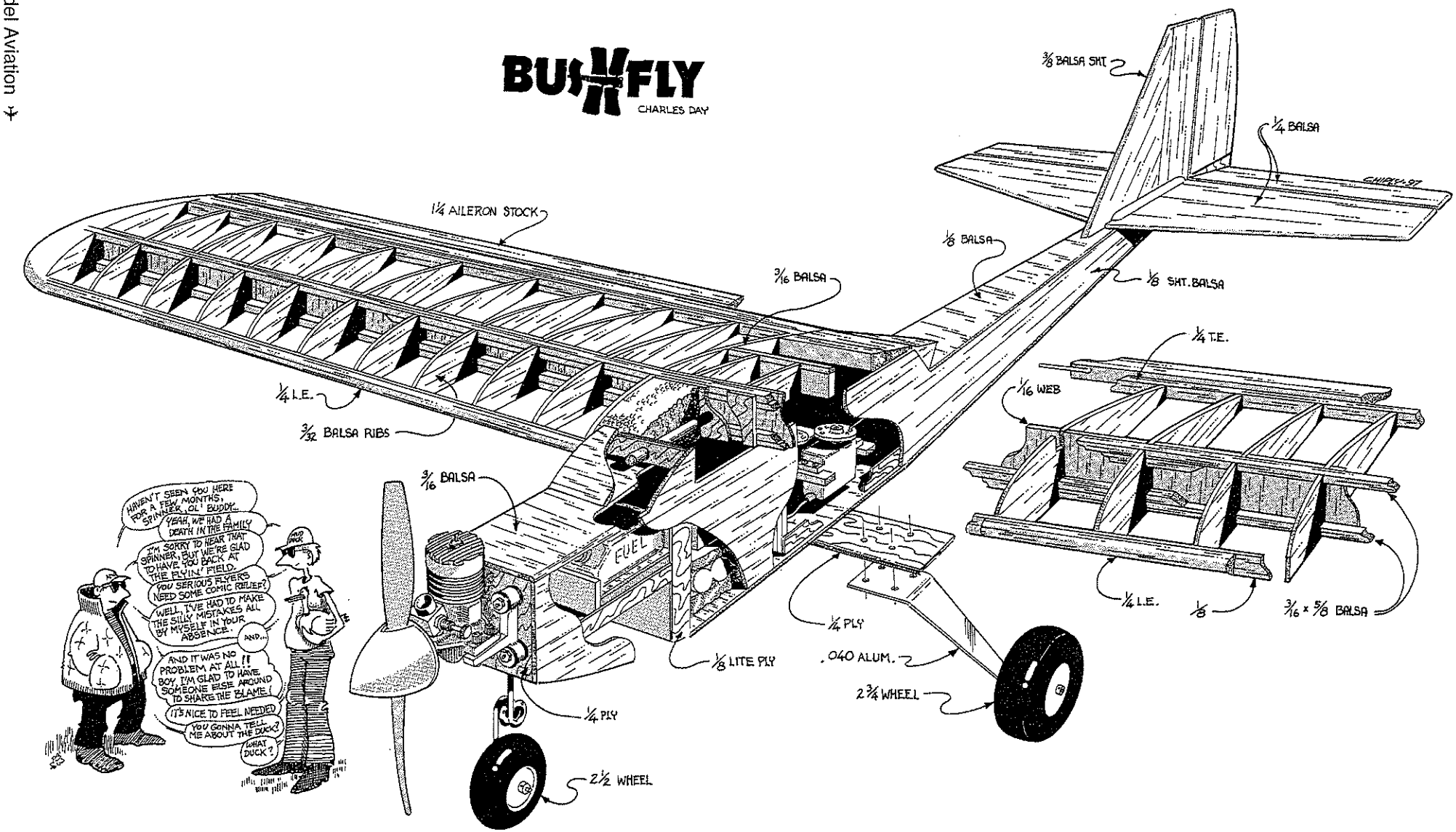
The battery bay is faced with 1/32 plywood inside.

The firewall of 1/4 aircraft plywood has a 1° downthrust built in. The sides and top of the firewall are beefed up with 1/16 plywood extending maybe an inch or so behind it and with an L extending under the fuel tank floor, the top edge of which serves as a cleat to support the 1/16 plywood floor. Note the front barrier restraining the tank and leaving a space of two inches between the front of the tank and the inside face of the firewall.

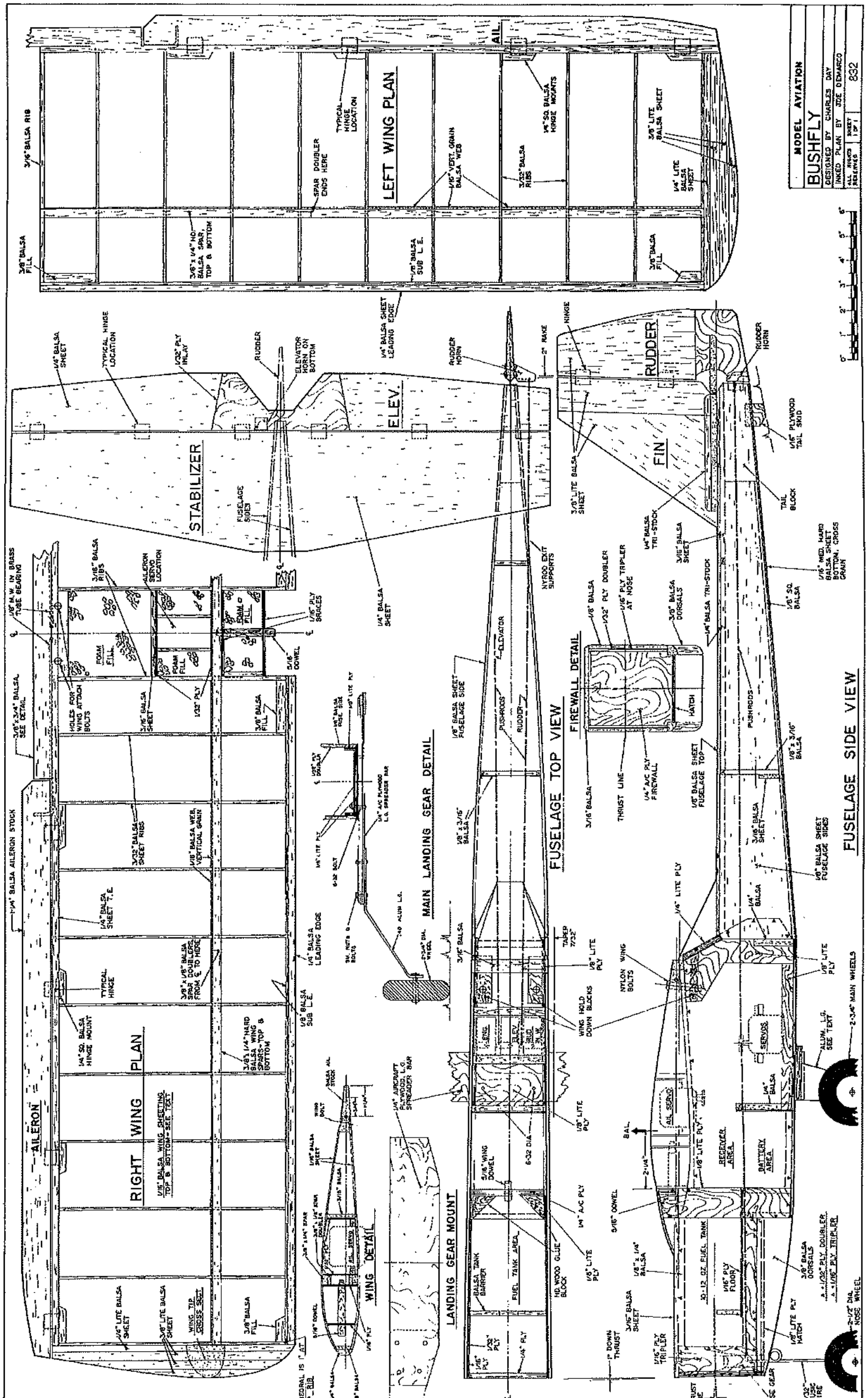
Be aware that the front end of the fuselage back as far as the doublers is gently tapered and that all the bending curvature is in the empennage, where there are no doublers to resist and distort it. The taper helps to keep the bending down to a

BUTTERFLY

CHARLES DAY



Full-Size Plans Available—see page 200



more graceful contour. The extra-long tail blocking gives the stab and fin a more solid base for gluing.

The main gear wheels are mounted on legs made by hacksawing a Great Planes .40-size aluminum gear into two parts, flattening the upper bends, rebending, and bolting the resulting legs to a ¼ x 2 aircraft plywood gear support. This is not exactly leisure building, and if you do not have a heavy duty vise and solid workbench, you may need a little help with this chore.

Those inlays in the middle area of the elevator and bottom of the rudder are cut from 1/32 plywood. The areas to be worked are sanded down 1/32 using a ruler as a guide to keep the edges of the cut-down area straight. The plywood pieces are epoxied on to the surfaces and held down securely in place with ordinary office binder clips until the epoxy has cured.

Before closing the belly of the empennage, install the elevator and rudder linkage. With the rudder and elevator dry fitted, the linkage can be installed pointing straight at the horns. If an inside antenna is desired, scavenge the tube from a flex-cable set and route it back through the length of the tail. The antenna will thread into it without binding.

Covering: The Bushfly was designed to permit the use of doped-on silkspan. For those not familiar with this material, it is not silk, but more like a fibrous tissue paper.

Give the balsa surfaces three coats of clear dope. Cut pieces of silkspan as needed to cover the surfaces. Just prior to applying each piece, wet it by touching it down onto wet paper towels on the bottom of a flat baking pan. With a soft bristle brush, paint the wet tissue onto the surface with clear dope. The dope strikes through the silkspan and sticks it to the surface, water and all.

When dry, the water evaporates, shrinking the silkspan to a tight, smooth surface that hides the grain in the wood surface and will not bag or wrinkle when the color coats are applied. For maximum lightness, go easy on the color coats. *Always apply dope in a well-ventilated workspace, like outdoors on a nice day.*

The battery and receiver are taped together with a couple of turns of masking tape, the receiver on top with terminals exposed, and a little piece of corrugated cardboard sandwiched between them. This pack is encased in a single foam-rubber sleeve and secured in a bay built into the fuselage for this purpose. This compact vibration protection for battery and receiver has been used many times over the years without any problems, electronic or otherwise.

The fuel tank is located back where the leverage arm from the center of fuel weight to the balance point is short as possible, to keep the balance point from creeping rearward as the fuel is burned off in flight. Wrap terrycloth toweling around the tank and tape it in place with continuous-coverage masking tape. This gives the unit a slick outside surface that slides nicely in place without bulking it up too large for the space, and gives adequate protection against fuel frothing. Note that the throttle linkage passes to the right of the tank and the steering linkage is under the tank floor, accessible through the 1/8 Lite Ply hatch under the nose.

Preflight: Be sure that the balance point is not significantly behind the point indicated on the plans: Tail-heavy is bad news.

Balance the model in roll by placing the skid on a tabletop, supporting the front end by the spinner, and adding weight to the high wingtip. This is normally needed to offset the imbalance of a side-mounted muffler.

Flying: I will spare you the enthusiasm of the designer for his own efforts. Built straight, the Bushfly will compare favorably with most other trainers of its size and power when it's up in the blue; and on the ground it is considerably less troublesome and more accommodating than most. ✈

Charles Day
6127 Knollwood Dr.
Falls Church VA 22041