world's smallest STITS jr

With a wing span of only 8 ft. 10 in., the tiny Stits makes a most unusual, but good flying, control-line scale subject for 29 power.

■ **Dee B. Mathews**

DESIGNED and built in 1950 by Ray Stits, Jr. of Battle Creek, Mich., the tiny Stits Jr. had a wing span of only 8 feet 10 inches—slightly more than the span of a man's outstretched arms. Overall length was 11 feet, and the total weight was 398 pounds. If statistics don't convey the unbelievable smallness of this aircraft, consider that the pilot could reach out either side of the cockpit and touch the ailerons, or that by twisting slightly, he could reach back and touch the tail surfaces. Twisting would have been a bit difficult, however, as the cockpit was only 16 inches wide.

The Stits took off in 500 feet, landed in 800, and had a climb rate of 850 feet per minute. Top speed was 170 mph, cruise 150, and the power was only a 85-hp Continental. When parked, a bag of rocks had to be placed in the cockpit to prevent noseovers.

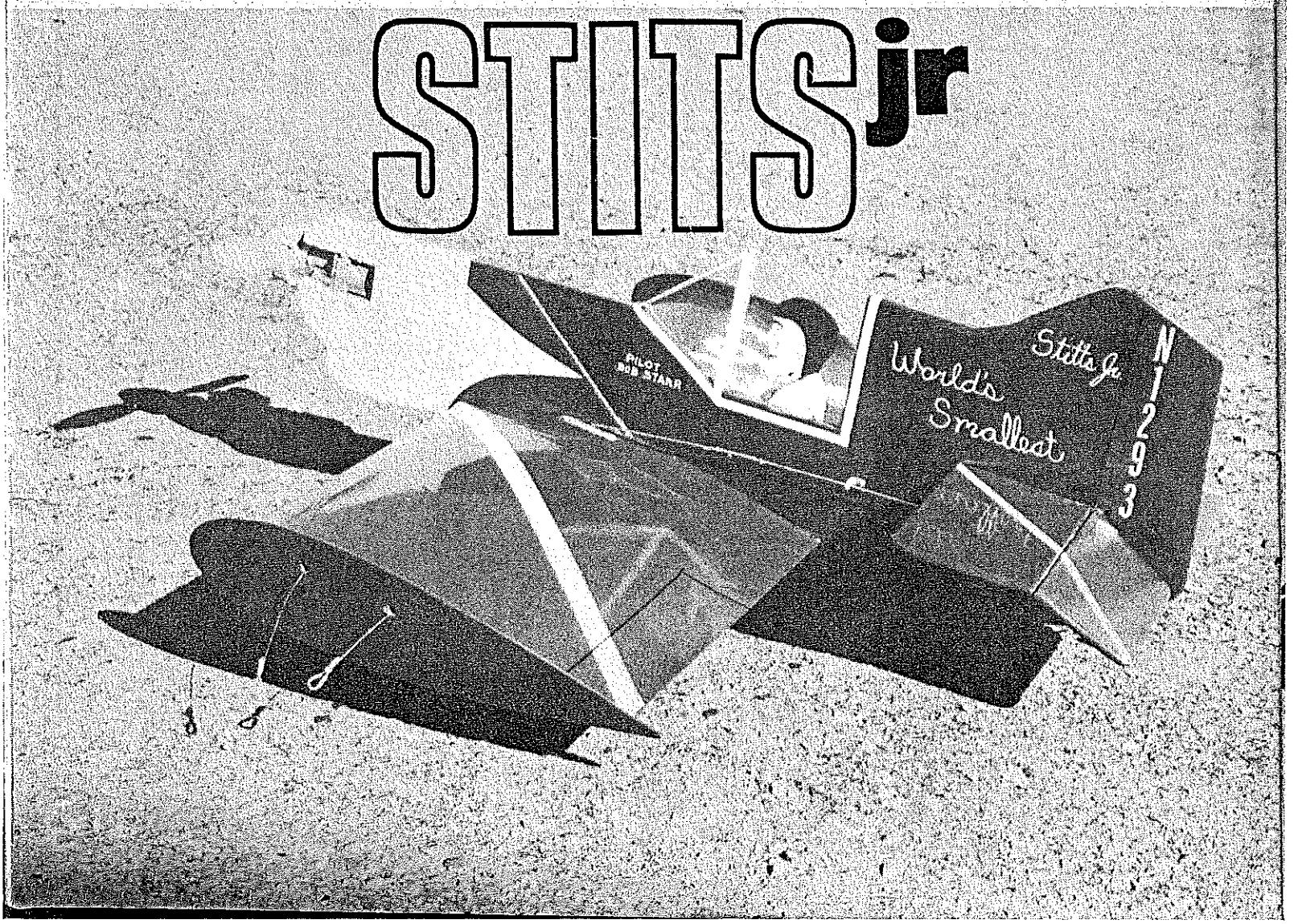
I hasten to assure the reader that this is not a put-on. This really is a model of a real aircraft; it *is* a scale model. Photos and drawings are available in *Mechanix Illustrated*, Nov. 1950, and *Air Trails*, May 1951.

When my copy of the June 1951 *Air Trails* arrived I was in the midst of college finals. Being a model airplane nut, my cramming came to a halt as I leafed through the pages. When I reached page 36 what met my eye was a delightful control-line Stits Jr. designed by Aubry Kochman. As soon as I finished my exams I was going to build that model!

Aubry's design was more difficult than the norm for that era. The fuselage was a box-center-crutch with sharp breaks at the motor cowl and behind the cabin. Unbelievably, the wings were made by inserting the leading and trailing edges into slots in the fuselage and building the panels out in space. The 1/16th sheet covering faired into the rudderpost, a relatively easy project in this day of instant glues, but very difficult with only Ambroid to work with. Kochman's engineering was vastly superior to most of his contemporaries, but it's remarkable that so many superior adhesives and improved techniques of construction are available 27 years later.

Before that summer ended I managed to get in a couple of marginal flights out of a sickly OR 29 then returned to campus for another year. That Fall my course load was so heavy that I had no time for flying models. As the semesters blended together, the little Stits languished in my grandmother's attic, alongside my Windy Joe and Akrobat—two RC designs by your editor—never to be flown again. Like its full-sized prototype, it was forgotten, pushed aside by newer projects.

Recently while a friend was leafing through my magazine collection, he came across the previously mentioned article, and casually inquired about the pencil marks and divider holes in the drawing. As I sat there remembering, inspiration hit me. Could a Stits be redone, using new techniques and materials? Would it be possible to produce a simple-to-build,



Flight shot of Ray Stits and "the world's smallest airplane," taken from an old magazine. Note how huge pilot appears in relation to plane.

good flying Stits, and still retain its unusual appearance? Could prevailing RC practices and hardware be used on a U.C. model? Off to the drawing board I went.

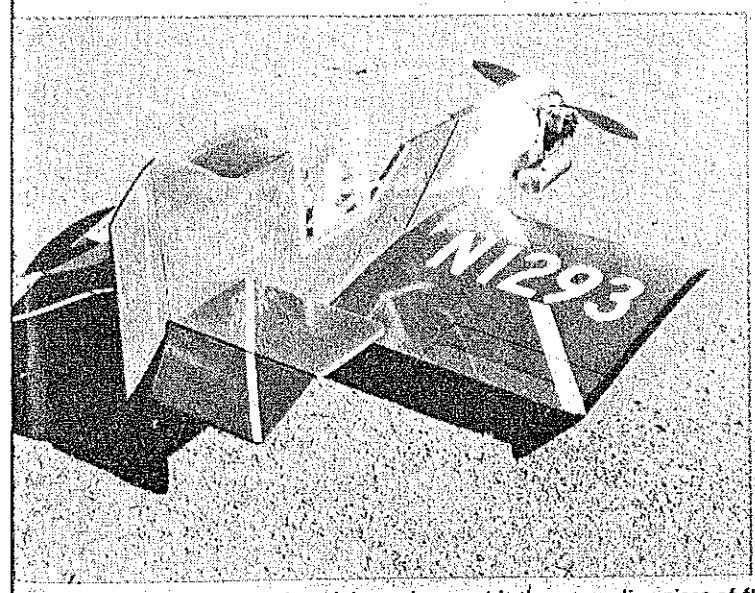
In order to utilize a commercial foam core, I enlarged the original design by 45%. Several weeks later I emerged from the basement work shop, known locally as "Daddy's Dungeon," with the sparkling creation. My wife scrutinized every detail and asked, "Didn't you leave off some pieces?" "Sure, Babe," said I, "You just can't recognize pure genius."

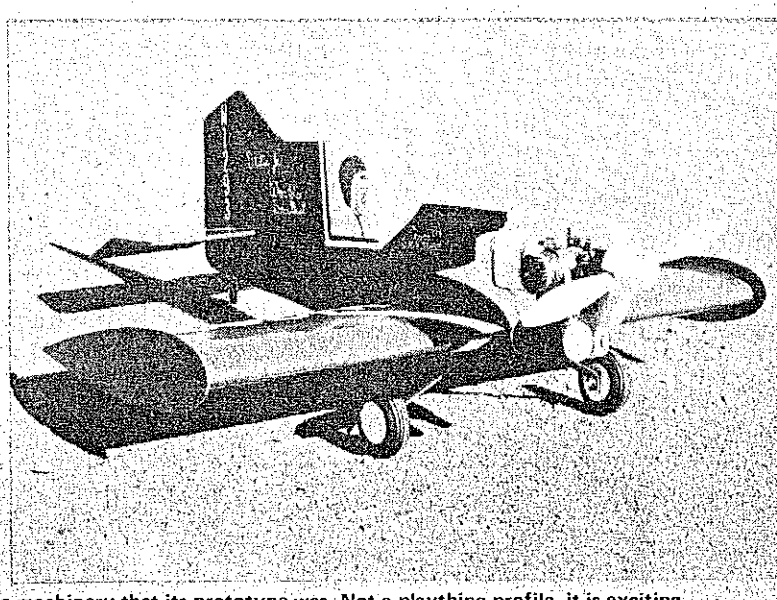
Off to the church parking lot we went. The old Enya roared to life and the old man picked up an E.Z. Just handle for the first time in many years. A wave of the hand and away she went, hop, hop, and flying. A loud whoop rent the Sunday afternoon calm as I shouted my joy over a darn good flying model. Several additional flights were made for the photographer, then I settled into an idyllic afternoon of enjoying this most extraordinary appearing model.

If you enjoy astounding your friends with your creative skills, the Stits Jr. is for you. Let's build one!

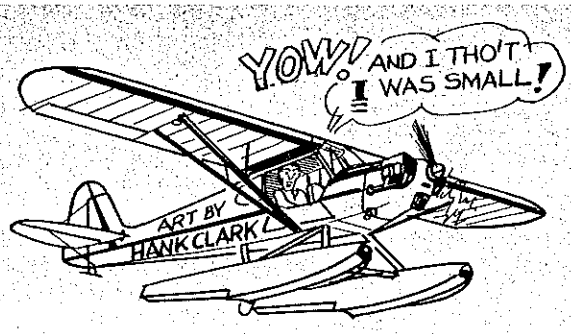
Wings: Shorten the wing core to the required length, marking a midline and noting that the inboard panel is one inch longer. Mark a left and a right panel to avoid messing up later on. Draw the guidelines for the bellcrank and line cut outs. Using a metal straightedge, run a pistol-grip soldering iron along the metal edge and watch the foam melt away. Cut a relieved area for the bellcrank ply mount. Tie a thin copper wire around the soldering tip as a depth guide. The floor area for the mount should be as flat as possible.

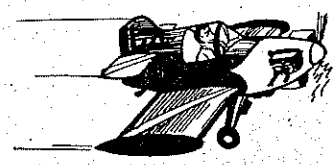
Install the ¼" ply mount with the bell-

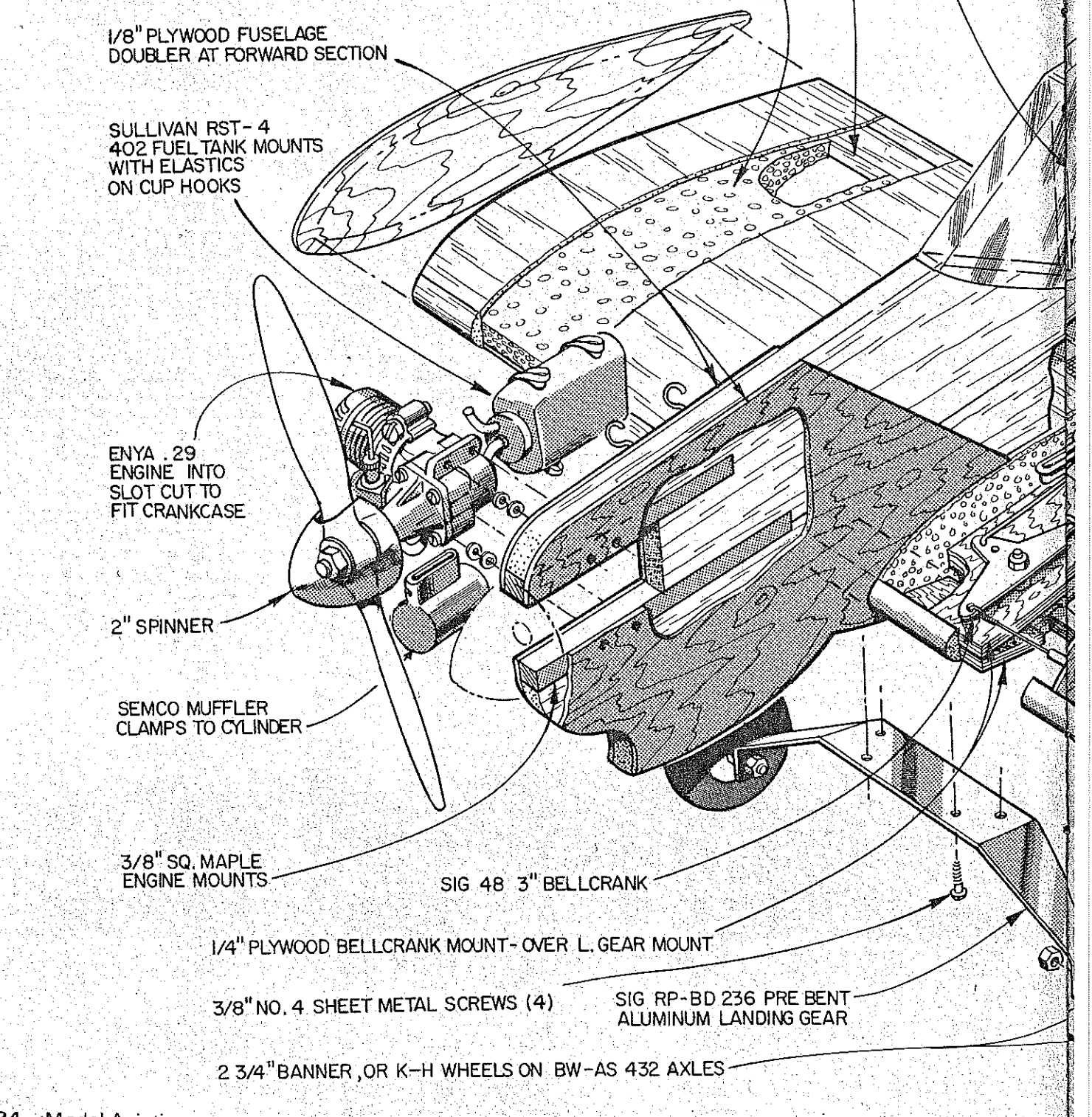


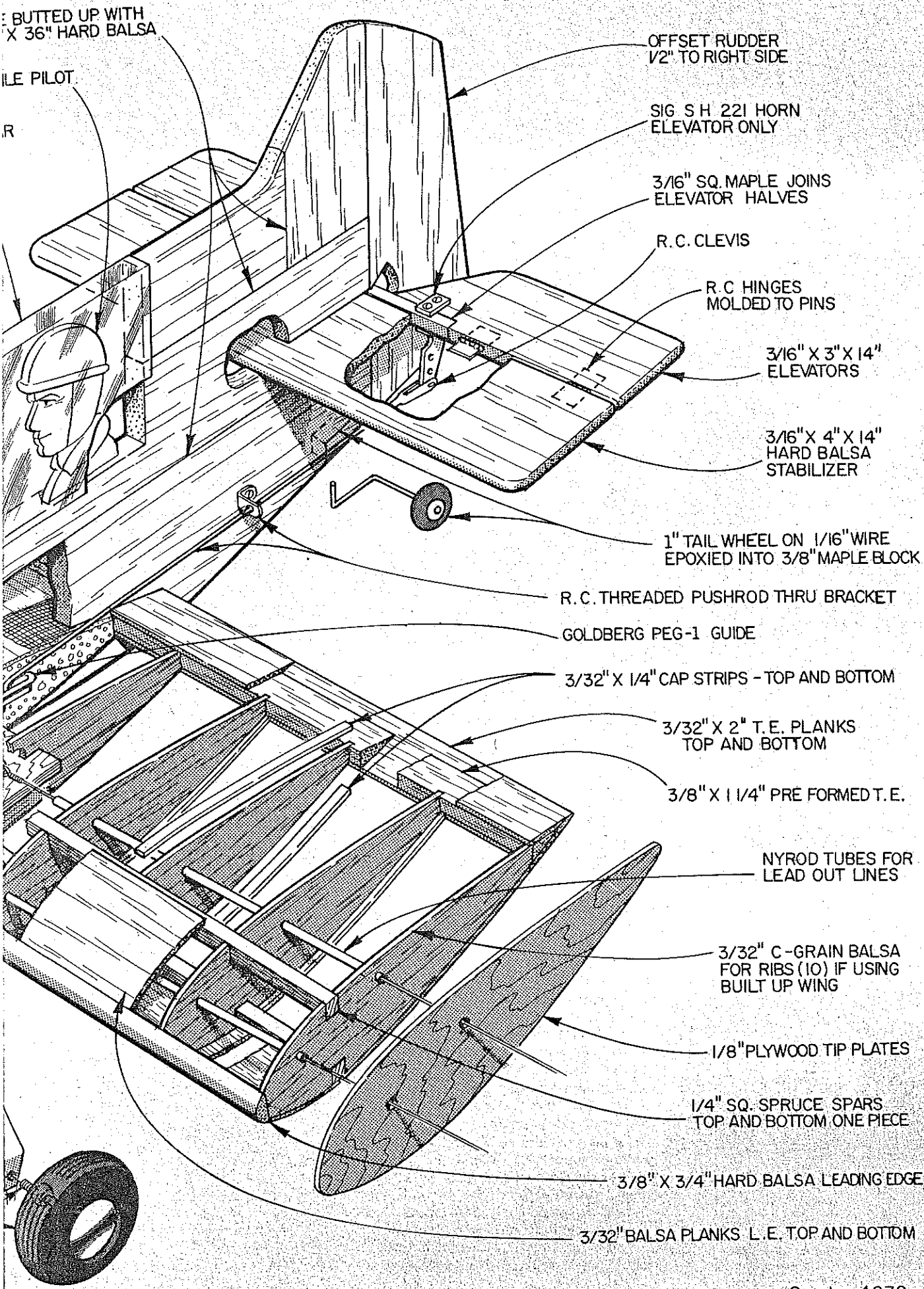


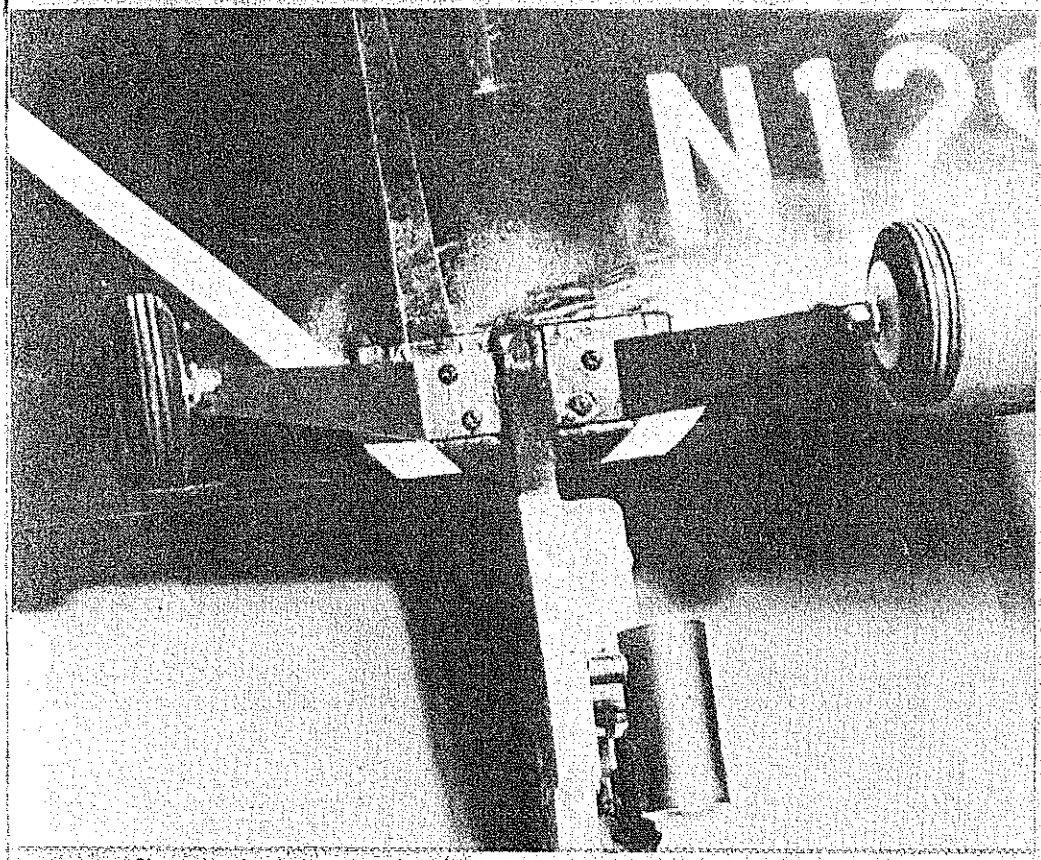
Going and coming, the miniature is every bit the astounding piece of flying machinery that its prototype was. Not a plaything profile, it is exciting when a 35 hauls it around. The real Stits spanned 8 ft. 10 in.—the pilot could touch the ailerons, or reach the tail surfaces.


YOW! AND I THO'T I WAS SMALL!
ART BY HANK CLARK




1/16" X 3/8" PLASTIC INSERT
PRE FORMED T.E. STRAIGHT THRU
FOAM WING CORE WITH 3/32" BALSA BONDED IN GRABBER CEMENT
1/8" PLYWOOD FUSELAGE DOUBLER AT FORWARD SECTION
SULLIVAN RST-4 402 FUEL TANK MOUNTS WITH ELASTICS ON CUP HOOKS
ENYA .29 ENGINE INTO SLOT CUT TO FIT CRANKCASE
2" SPINNER
SEMCO MUFFLER CLAMPS TO CYLINDER
3/8" SQ. MAPLE ENGINE MOUNTS
SIG 48 3" BELLCRANK
1/4" PLYWOOD BELLCRANK MOUNT-OVER L. GEAR MOUNT
3/8" NO. 4 SHEET METAL SCREWS (4)
SIG RP-BD 236 PRE BENT ALUMINUM LANDING GEAR
2 3/4" BANNER, OR K-H WHEELS ON BW-AS 432 AXLES


BUTTED UP WITH
X 36" HARD BALSA
ILE PILOT
R
OFFSET RUDDER
1/2" TO RIGHT SIDE
SIG S H 221 HORN
ELEVATOR ONLY
3/16" SQ. MAPLE JOINS
ELEVATOR HALVES
R.C. CLEVIS
R.C HINGES
MOLDED TO PINS
3/16" X 3" X 14"
ELEVATORS
3/16" X 4" X 14"
HARD BALSA
STABILIZER
1" TAIL WHEEL ON 1/16" WIRE
EPOXIED INTO 3/8" MAPLE BLOCK
R.C. THREADED PUSHROD THRU BRACKET
GOLDBERG PEG-1 GUIDE
3/32" X 1/4" CAP STRIPS - TOP AND BOTTOM
3/32" X 2" T.E. PLANKS
TOP AND BOTTOM
3/8" X 1 1/4" PRE FORMED T.E.
NYROD TUBES FOR
LEAD OUT LINES
3/32" C-GRAIN BALSA
FOR RIBS (10) IF USING
BUILT UP WING
1/8" PLYWOOD TIP PLATES
1/4" SQ. SPRUCE SPARS
TOP AND BOTTOM ONE PIECE
3/8" X 3/4" HARD BALSA LEADING EDGE
3/32" BALSA PLANKS L.E. TOP AND BOTTOM



Sheet metal gear attaches to hard block inlet into foam wing. Plans also shows built-up wing.

crank and leadout wires installed, using 5-minute epoxy. Run the braided leadouts through previously roughened outer Ny-rods, and epoxy into the slots. Leave some uncovered leadout near the bellcrank. The crank must move freely without binding. Fill the notch even with the foam surface with balsa scraps.

Build up scrap balsa frame around the bellcrank cutout, install the pushrod, and cap the whole thing with a balsa sheet roof. Carve and sand flush with the foam core.

True up the mating edges of light but firm 3/32" sheet; use the masking tape hinge technique to glue up a top and bottom sheet balsa wing cover. Note the inside bevel at the trailing edge. Place the preformed trailing edge stock onto the foam with epoxy, and contour to match the foam.

I used "Grabber" adhesive, but any good foam contact cement will do. After the contact sets, apply the sheet balsa, using a wax paper slip sheet pulled out toward the trailing edge as the balsa-to-foam face is pressed together. (Foam wing technique instructions are printed on the adhesive cans.)

Pull the trailing edge joint together with 5-minute epoxy, using clothes pins for clamps. Cut the leading edge from 3/8" balsa sheet, and epoxy it to the foam after it has been trued with a sanding block, and then carve it to shape.

Cut out the balsa and foam on the wing bottom immediately behind the leading edge to clear the landing gear block, and epoxy liberally. Sand and smooth the balsa sheeting and apply glass tape around the wing center section. Protect the control system by stuffing the clearance hole with tissue. Polyester resin or epoxy cement is rubbed into the tape for strength. Cut tip plates from Lite-Ply, drill left one for lead outs, notch right tip for lead weight, and install tip plates with 5-minute epoxy. Drill landing gear support block to match holes in pre-bent aluminum landing gear and screw together. The wing is installed *with* the gear in place.

Tail Feathers: Cut from C-grain, 3/16" thick balsa wood. Notch and epoxy elevator spruce joiner before cutting rudder notch. This joint is reinforced with glass and tape. The hinges are notched and trial fitted before sanding the stab to contour. Mark a midline on the stab and two parallel lines 3/16" on either side of it; these will be helpful when installing the stab.

Cut the rudder to outline from scrap generated in cutting out the fuselage.

Fuselage: The fuselage is cut from two pieces of 3 × 36 × 3/8" balsa with very little waste. I chose the 3/8" balsa over 1/2" to save weight and found it sufficiently strong. Cut the fuselage pattern from two pieces cut to length. Use the scrap ends to complete the cockpit and rudder post—note the grain directions!

True up the edges and splice the sheets together with 5-minute epoxy. Trace the outline onto the plank (carbon paper under the plans). Check the motor bearer width. If adjustment is needed to suit your engine, use the carbon paper marks as a parallel guide and draw new lines to fit.

Cut outline to the marks with a jig or coping saw. The plywood doublers are developed in the same manner, the maple bearers cut to length, and the whole busi-

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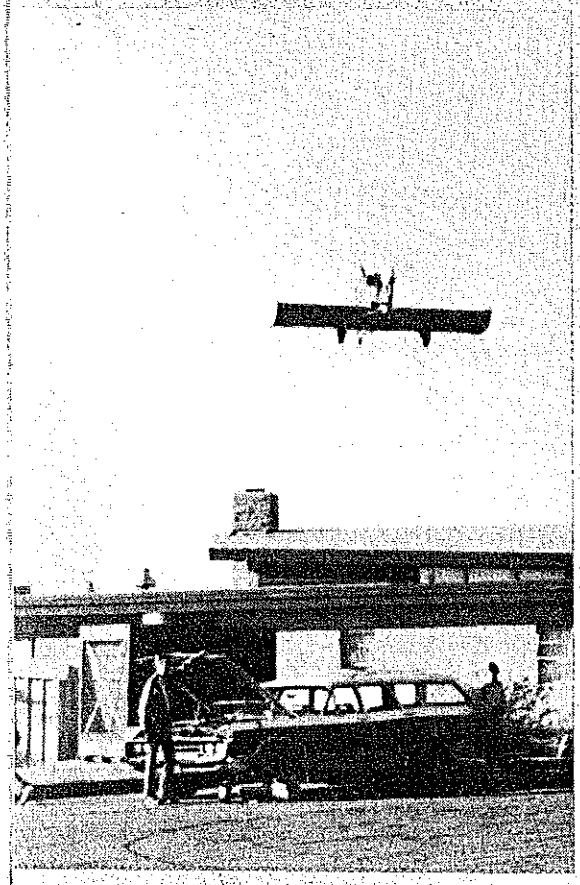
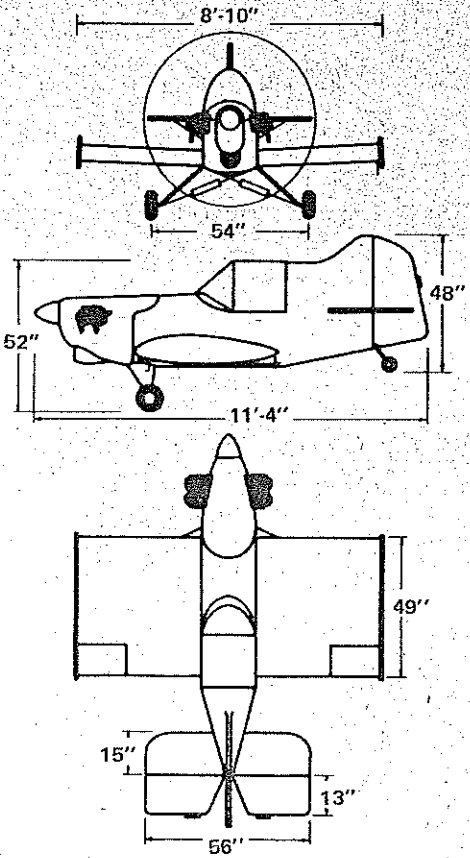
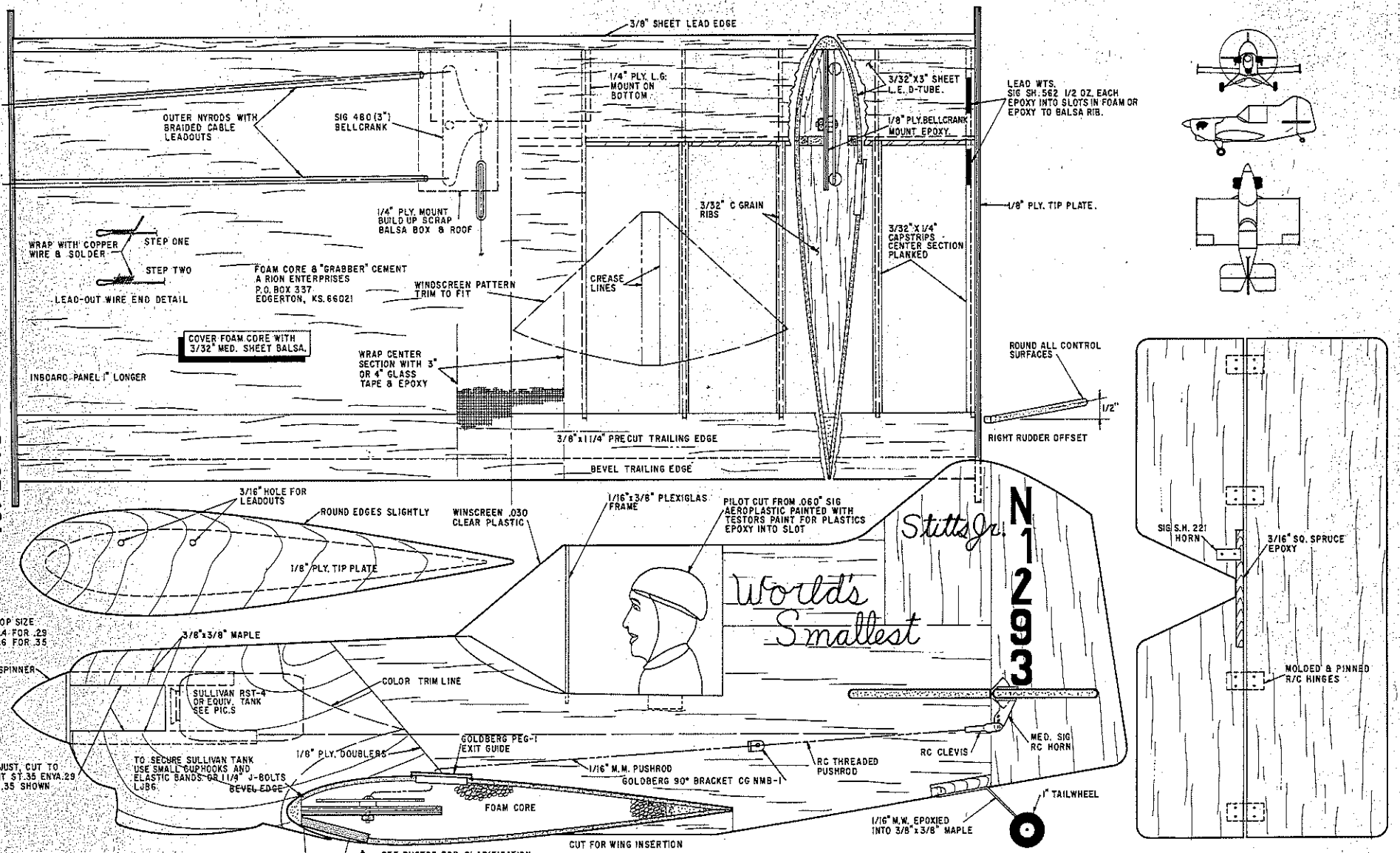


See what we mean? Wouldn't be surprised to see RCers get into this act! The extremely short-coupled tail, and stubby wings with big end plates, must intrigue all those who design.





1950 STITTS JR.

U-CONTROL FOR 25 35cu.in (4-6cc)
SPAN 27" CHORD 12 1/2 WEIGHT 52 oz.
SCALE 2 7/8" PER FOOT
DESIGNED BY DOC MATHEWS

FW 190 D-9

The qualities that make a model a NATS winner are the same ones that Sunday sport-scale fliers look for. Exceptional appearance to start with, of course. The FW 190's stark and sinister shape has always excited modelers. But even more important are friendly flying qualities. Our designs have always emphasized safety at low speeds, and the FW 190 has inherited the ability to fly from 80-90 mph right down to a near-hover for landing. The wide-track gear makes it an ideal first "tail-dragger."
Kit features: Full-size plans showing radio and retracting gear installation. Color schemes (and decals) for THREE different FW 190's. Separate 16-page instruction booklet with cutaway diagrams and in-depth flying hints. Diecut and machined balsa, nylon fittings, formed wire cowl, canopy, etc. Span: 65", Area: 730 Sq.", 4 to 6 channel, Engine: .60

PICA

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Stits Jr./Mathews

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ness epoxied together; use weights to keep everything flat on the building surface. After complete curing the fuselage is completed by drilling holes for the engine, the tank straps, etc. Epoxy the maple tail skid block into its notch. Adjust the wing cutout for a neat mating with the wing, by shaping with a wood file and sandpaper.

The small piece at the rear of the cut out must be removed during fitting, then repositioned when the wing is epoxied to the fuselage. Some custom fitting is almost unavoidable, since the landing gear will vary from one model to the next.

An ordinary paper box can be used as a mating jig; cut two chord-width slots on opposite sides (measure for equal depth and parallelism). Also cut front and back slot fuselage width. This jig will then hold the wing level and at right angles to the fuselage while the epoxy is setting.

It is not necessary to completely fill the mating gap; try for a good solid bite, without bubbles or voids, but actual filling of the complete gap is better accomplished with a second mix of microballoons and epoxy.

The stab and rudder are not installed until the fuselage is sanded to contour. Tack glue the rudder in place, sand it to taper, blend into the fuselage rear, then remove it. Epoxy the stabilizer into the slot, using the mentioned lines as a guide. The rudder is now permanently epoxied on, with offset sanded in.

Install the powerplant and the control system. I used a nylon horn and snap clevis for an adjustable system.

Finish: The prototype was finished using clear Monokote on the wings, three coats of clear nitrate dope on the wood parts and two thin coats of K&B Primer, sanded down with 380 no-fill paper. Protect any areas on which paint is unwanted with masking tape. The entire nose section is sprayed with White Perfect Paint, allowed to set for 48 hours, then masked off while the remainder of the model is sprayed with Perfect Royal Blue.

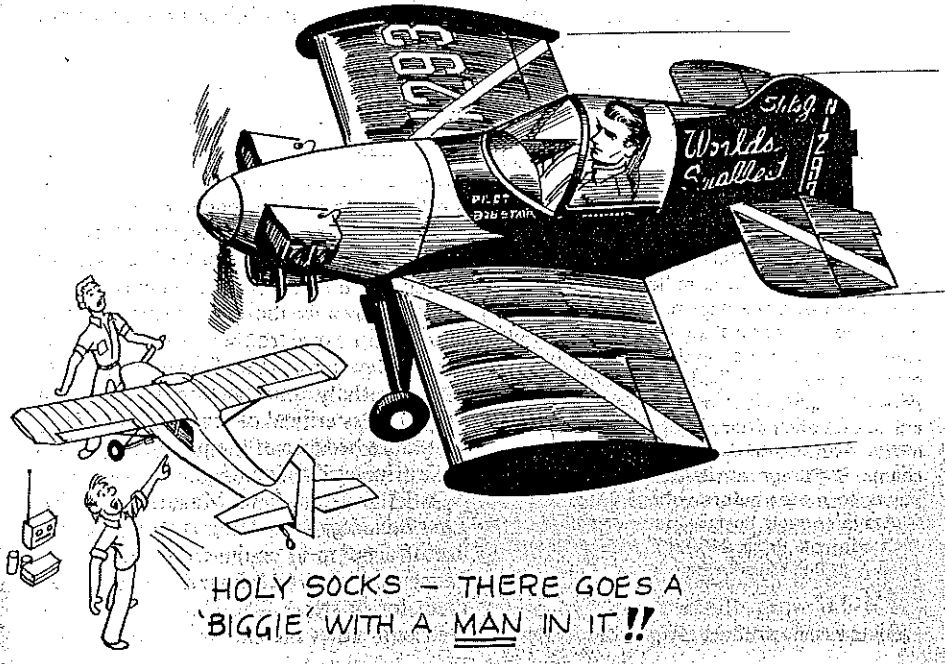
The wing numbers are vinyl items from an office supply. Rudder numbers are Sig Catalog items, stripes are vinyl trim tape, and the remainder of the lettering is done with a bow pen and Perfect Paint.

The drafting pen is dipped into a can of paint to a depth of about ¼", the exterior wiped off with a tissue, and the paint is "written" onto the surface. Practice a little on some old clunker in order to get a feel for rate of flow and line width.

The last two items placed onto the model are the pilot and the cockpit cover. My little pilot adds a certain novelty to a profile. He is cut from sheet styrene, painted with plastic model paint and epoxied into a slot cut into the balsa. I cut a ⅜" wide strip of Plexiglass for the window frame, and epoxied it into another slot. The wind screen sections are bent over a scrap of ⅜" balsa, trimmed to fit, and permanently installed with instant glue (Hot Stuff, etc.), or Wilhold R/C-56 glue.

Flying: Flight characteristics are rather surprising. With the C.G. as shown, two ounces of lead in the outboard wing, and the engine running at a brisk four-cycle, the model rolls about four feet, with a lot of up elevator, then literally leaps into the air. I do find it necessary to use up elevator at the release to prevent nose-overs, due to the location of the undercarriage. Line tension is remarkably good, verging on the excessive, but considering the huge side area, above-average line tension is desirable on windy days.

This little model never fails to elicit questions when it is flown, particularly once I reveal that it is nearly ¼th full size! I fly it just for the sheer joy of it. I never cease to be astounded at every flight. It does not look as if it could fly, yet it does so very well. Astound your friends and confuse your enemies. Have at it!



CL Aerobatics/Paul

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lighter, thinner wood for the tail sections and increasing stab area and/or moment length of currently available combat kits, thinning or otherwise lightening spars, leading edges, and trailing edges, progressively toward the tips and building in at least 10 degrees of engine offset for longer line flying, such machines can prove very useful as trainer/practice birds. If one

should tire of such a machine, a very effective solution might be to take it to a combat match and I can almost guarantee an instant cure of such an emotional state."

If this writer can ever pin Rich down to submitting one design which he feels is truly competitive, we may be able to get a set of plans for one of his COPA's which could be utilized by many of those beginners out there. However, as pointed out in the March, 1978 issue of *Model Aviation*, Rich does use basically the VooDoo type Half-A design, recommending at least 200 sq. in. of wing and 18 degrees of engine offset. He creates a tricycle landing gear for the craft and the whole thing weighs in at about 8 to 9 ounces!

Rich enclosed an "unreproduceable" sketch and plan of a proposed "Blazing 50" Half-A stunter which should make any SSF (remember, that's Serious Stunt Flier) drool. The Blazing 50 features a beautiful elliptical wing of 50-inch span and a matching stabilator. From the top view, the plane has many of the lines of Charley Mackey's svelte Starlight from 1967. But the side view looks like a Starship from 2001 with graceful fuselage and trike gear. The wing will have about 415 sq. in. and the total weight should be about 16 oz. Let's hope Rich can get this transformed to a flying model. It could be a beautiful stunter.

Rich also has some other hints to pass on: The new Glo Bees definitely give around a 1000 rpm increase on the Tee Dee in the air (from 21 to about 22.2 grand) but some of the smoothness of the engine run is sacrificed. The unavailable Testor 6 × 4 prop gives identical lap speeds as the Cox competition 6 × 3 prop and doesn't tend to overheat the engine in maneuvers as is sometimes the case on Magnum fuel with the Cox 6 × 3 competition prop.

On the subject of fuel systems Rich says, "Tatone makes small pen bladders that work very well for Half-A's. The pen bladder requires about 12 pounds to start then drops down to about 6 pounds, using a 2 oz. syringe and bathroom scales to measure pressure. The light weight, low cost, consistency, simplicity, and extra power availability of the pressure system is very desirable once the system is understood and is especially good for use with smaller engines on the light aircraft such as Half-A stunters."

Some concern has been expressed over the .008 lines used with Half-A. According to Rich you just need to take care of these fragile things. He has more problems with people walking on them than with breaks or unravelling. "The procedure I use in untwisting lines is to use the hand closest to the airplane to separate the lines with a wiping cloth. The other hand is used to twist and hold tension on the lines between the two hands to avoid allowing kinks to start. I have never gotten a kink using this procedure and the oil buildup on the lines is prevented," he says. Rich also uses what appears to be a quadruped wrap of the ends of the lines. He wraps 1/2 inch down the line from the clip, then wraps back to the clip; loops the .008 line around the clip again and wraps 1/4 inch down and back. After this he always uses epoxy or other glue to finish off the tapered end. A good set of unkinked lines should easily take 16 pounds of pull test. The .008 lines should be adequate in winds up to 25 mph at present Half-A power levels. Just to stay on the safe side Rich recommends switching to .012 lines in winds above 20 mph and going to 50 to 52 feet length.

Winston-Salem Control Line Championships: Les McDonald won this event, held June 17-18, flying his new I-beam wing Stiletto. The new Stiletto is 60 inches in span with 650 sq. in. of wing. Weight is 52 oz. The stabilizer is 32 in. in span with a root chord one inch thick. Very short flaps were used by Les in an effort to give better turning ability. Norm Whittle finished second, 470.0 to Les' 494.5. Third place went to Bob Galle, now living in New Jersey. Claus Maikis competed all the way from West Germany and finished seventh after having some trouble with his plane. Advanced PAMPA stunt was won by Vince Schnetzer of Miami, Florida with a Stiletto that beat out Les' for the best appearance points.

For information on stunt or PAMPA write Wynn Paul, 1640 Maywick Drive, Lexington, KY 40504.

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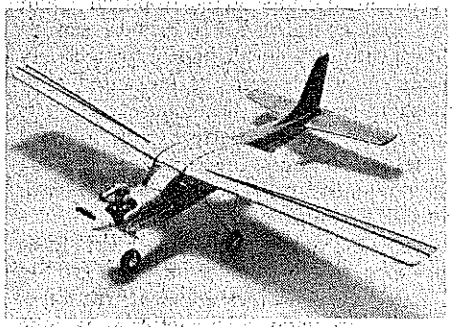

Ready-to-Fly Foam RC Planes: Available with either MRC-Enya 15, or MRC Mabuchi electric power system installed, these realistic planes assemble in an hour. Wing spans are 48", lengths, 32". **Trainer Hawk:** 15 engine factory installed, as are fuel tank, control rods, horns. Two-chan. radio (not included) controls nosewheel steering, rudder, elevator. Third channel, if desired, for throttle. Price $98.00. **Electra-Fli Trainer:** Electric power system in place —also horns, rods—designed for 2 chan. Electric system consists of motor, CVR (cutoff voltage regulator), 600 mah battery, fast charger operable from cigarette lighter—25 minutes when used with the system. Third channel can be added for control of CVR's microswitch which turns motor on and off in flight for conserving power and gliding periods between powered flight. CVR unit prevents overcharging, allows one battery to operate radio, servo, motor. Automatic cutoff to prevent deep discharge. CVR monitors battery voltage and cuts power to motor before voltage drops too low —always enough battery power to glide back with control. Price $189.95. **Model Rectifier Corp., 2500 Woodbridge Ave., Edison, NJ 08817.**

product review product review product review

CL Carrier/Perry

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Bill Lee (July 78 *MA*) and Don Jehlik (June 78 *MA*) gave good descriptions of various types of fuel tanks and their operations. Be sure to read their columns.

A close relative of the suction system is reported to be operating quite successfully in Arizona. Mike DelPonte is using a Perry pump carburetor without a pump on a Class I engine. To get a boost in tank pressure to help the large carb, Mike puts the tank vent in the exhaust stack. It obviously works, since Mike placed second at Buckeye, Arizona, this year with a 333. I haven't tried it yet, but this could turn out to be the best thing since sliced bread! Just be careful of unwanted fires in the exhaust stack.

The next step up in order of complexity is the pump system. There are two pumps readily available: Perry and Robart. The Robart SuperPumper MkII has a maximum output of three ounces per minute which might not satisfy some thirsty Class II engines. Robart's High Volume Pumper should be used if higher flow rates are required.

The Perry 900 series carburetors for pump systems have a plunger which changes the mixture settings during inverted flight with an upright engine installation. It is located under the screw which is adjacent to the fuel line connection. We don't need it, and it can cause problems in certain carburetor attitudes because of centrifugal force. Take the plunger out, or at least screw in the adjustment screw so that it can't cause trouble.

Pump systems work. They are harder to adjust initially than suction systems, but they are less critical of tank position. They cost more because of the pump, and this is their primary disadvantage.

A letter from Pete Mazur in the *Hi-Low-Landings* newsletter mentioned the use of a pump in conjunction with an exhaust restrictor (K&B and Semco make them for boaters). The idea is that as the restrictor slows the engine, the pump pro-