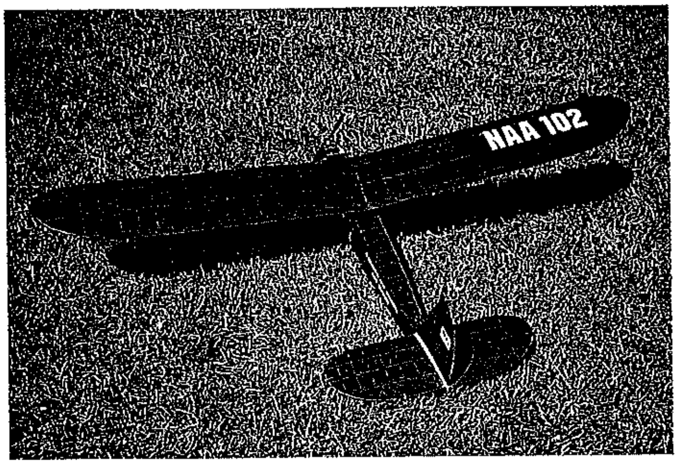
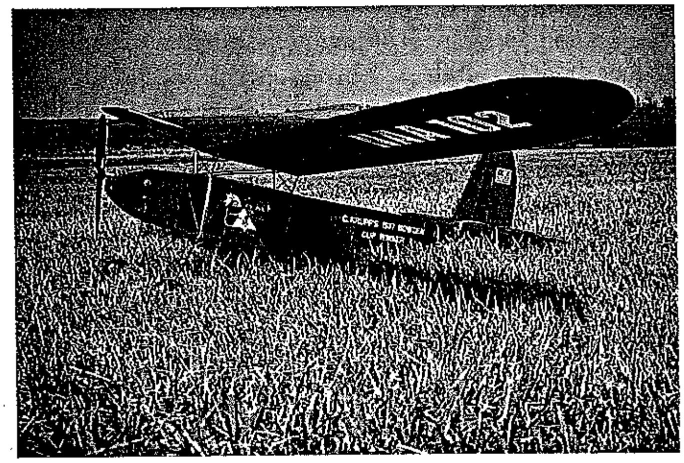
1937 BOWDEN TROPHY WINNER

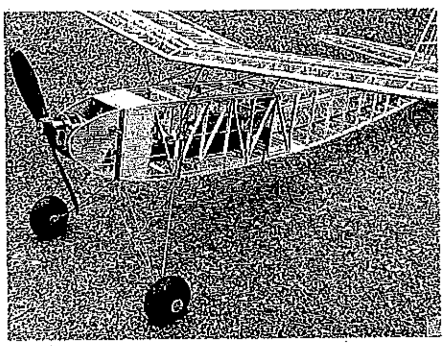
■ Bill Weaver



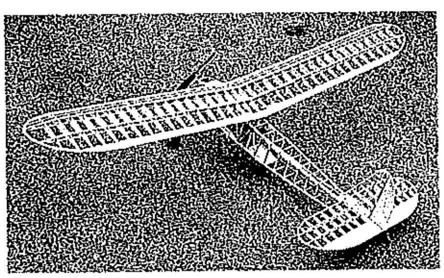
Six-foot-span model is three-fourths the size of the original Bowden winner. The rib and frame spacings are to scale.



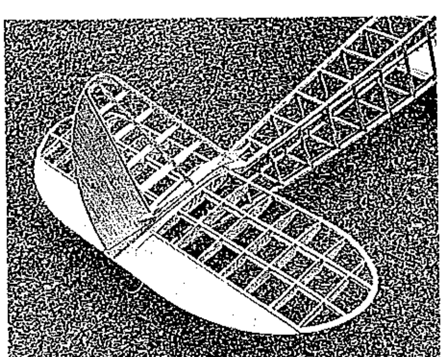
Parasol-mounted wings were popular on gas-powered models in the 1930s—they were supposed to be more stable.



Front view of the uncovered structure shows how the removable motor-radio unit fits into the fuselage.



Frame-and-covering structures are very strong for their weight. Light weight is important for Electric models.



Removable tail surface. Note the original (smaller) rudder area. Hinge line was later moved forward.

The 1937 Wakefield International contest for free flight rubber- powered models was held in England on Sunday, August 1, 1937. The event was won by Emanuel Fillon of France. However, the American Wakefield team of Alvie Dague, Dick Bodle, Herb Fish, Frank Zaic, and Henry Struck did not come home empty-handed.

The Bowden International Trophy contest for gas-powered models was won the next day by Herb Fish, flying a model designed and built by Carroll Krupp of Akron, Ohio.

The Bowden event was not a timed duration type, but was based on a complex set of rules involving the appearance of the model, a timed flight of 45-90 seconds, the controllability and stability of the plane, and the ability to take off and land undamaged.

At the end of the scheduled flying, four fliers, including Herb Fish, were tied for first place. They flew another round and two fell short—leaving Herb Fish and an Englishman. In the next round, the English plane landed a little hard and bent its landing gear, so the American plane won.

Plans for Krupp's winning model were included in Frank Zaic's 1938 Yearbook. This plan was reproduced, along with comments about the design, in Dr. D. B. Mathews' Old-Timers column in the June 1986 *Model Aviation*. The article revived my interest in this design.

Many successful contest gas models of the 1930s had a parasol (high-wing) mount with no fuselage cabin, such as Joe Kovel and Charlie Grant's famous K.G.s, Maxwell Bassett's Miss Philadelphia VI, and Chet Lanzo's Record Breaker.

Krupp's design is not only one of the prettiest of this type, with its graceful lines, but it also has sailplane-like proportions. I felt that its long wing would make it a good RC soarer.

Since I had a Kyosho Electric Airplane Prop Drive Unit (a 360 PT LeMans motor, a gear drive and a special 9 x 8 prop) available, I decided to build Krupp's airplane as an Electric antique for climbing, gliding (and, hopefully, soaring) sport flying. The result is this model, which has become my favorite fun flier.

I have become hooked on Electric flight because of the challenge of achieving an enjoyable-length flight from the limited power available in Ni-Cd batteries. It is the same challenge faced by the builders of rubber, compressed air, CO_2 and other stored-energy models.

With Electrics, it's back to the old rubber-powered design basics, to get the best out of the limited energy available. The larger the ratio of the stored energy source (motor Ni-Cds, rubber, etc.) to the total airplane weight, the longer and higher the model will fly.

The goal is to have a structure that is as light as possible, yet strong enough to support the power device's weight. The frame-and-covering construction used in the old gas and rubber models is light and strong; hence antique gas models make good subjects for climb-and-glide Electrics.

My calculations showed that a 3⁄4-size model would be about right for my 05 motor. Krupp's basic airframe structure is followed, using scale rib and fuselage frame spacing. Modifications included adding the RC control surfaces and the structural efficiency needed for Electric power's extra weight. Radio and motor battery access are a problem with a frame- and-covering fuselage that lacks a flush-mounted high or low wing to give an access opening when the wing is removed. I decided to make the nose section detachable, with a strong spar running back through the fuselage to which the radio system and the heavy motor battery are attached. It has worked well.

By disconnecting the control rods at the servos through a small hatch, and removing two screws at the firewall, the complete motor and radio unit can be removed for servicing. The only disadvantage is that the motor battery cannot be changed quickly, as when using precharged battery packs for continuous flying.

This is not a problem for me, as I usually fly other models while the battery in this airplane is being recharged. The complete six-foot-span airplane with landing gear weighs only 15 ounces when the motor-radio unit is removed.

CONSTRUCTION

A step-by-step construction sequence is beyond the scope of this article. Given the drawing, experienced builders will build this model utilizing their own methods.

General: Builders of rubber-powered contest models excel at building strong, light structures; I try to use some of their tricks.

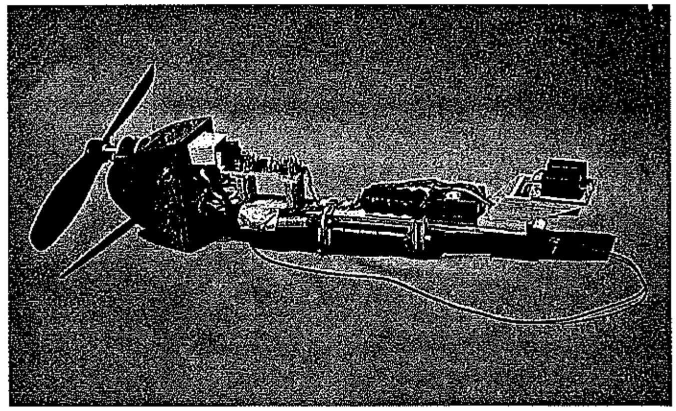
Use light contest grade (4-6 lb./cu. ft.) balsa for the sheet wood parts; hard balsa for the longerons and wing spars; and medium-to-light wood for the rest of the structure. Before starting construction I sort the balsa into three or four piles by weight, using the heaviest (normally the hardest and strongest) wood at the fuselage nose and near the center of the wing and tail surfaces, with the lightest toward the rear and tips.

White glue was used for practically all wood joints; I am allergic to cyanoacrylate (CyA) glue, which would have been faster and probably lighter. I recently tried Hot Stuff UFO glue with no problems, so I would use it if I was building this model now.

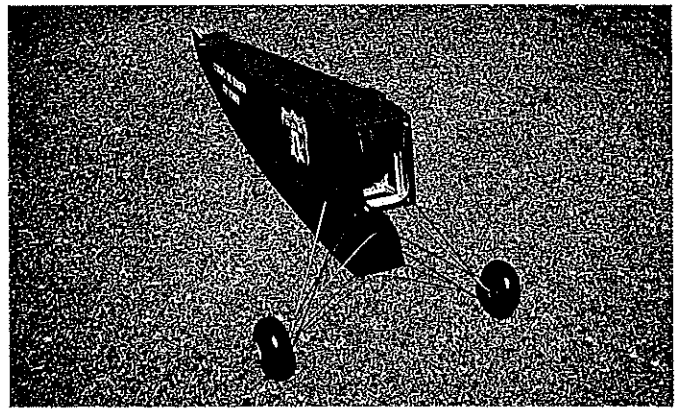
Build the complete model before covering. It will be much easier to make and fit the removable unit and control rods.

Fuselage: I use a perfectly flat building board covered with Homosote house wallboard, which is soft and takes pins and nails well. Cover the plan with plastic wrap or

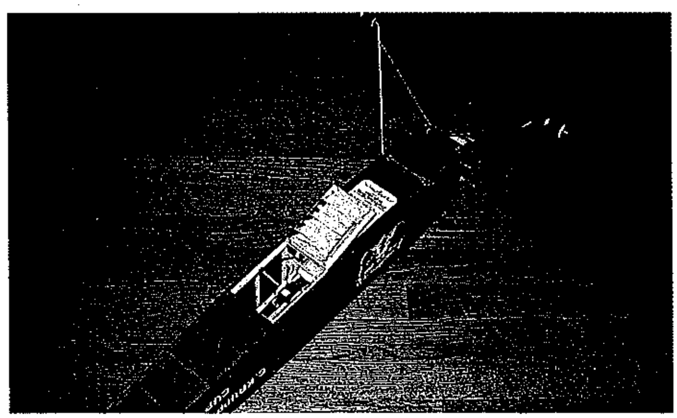
Continued on page 110



Removable motor-radio unit is easily removed for servicing. Radio equipment is attached to a strong spar.



Front view of fuselage with motor-radio assembly removed. Assembly is held in place with two screws and two dowels.



Bottom view with servo access door open. Pushrod clips are easily disconnected from rudder and elevator servos.

Bowden

Type: RC sport

Wingspan: 72 inches

Motor size and type: Geared 05 Electric

Number of channels: Three

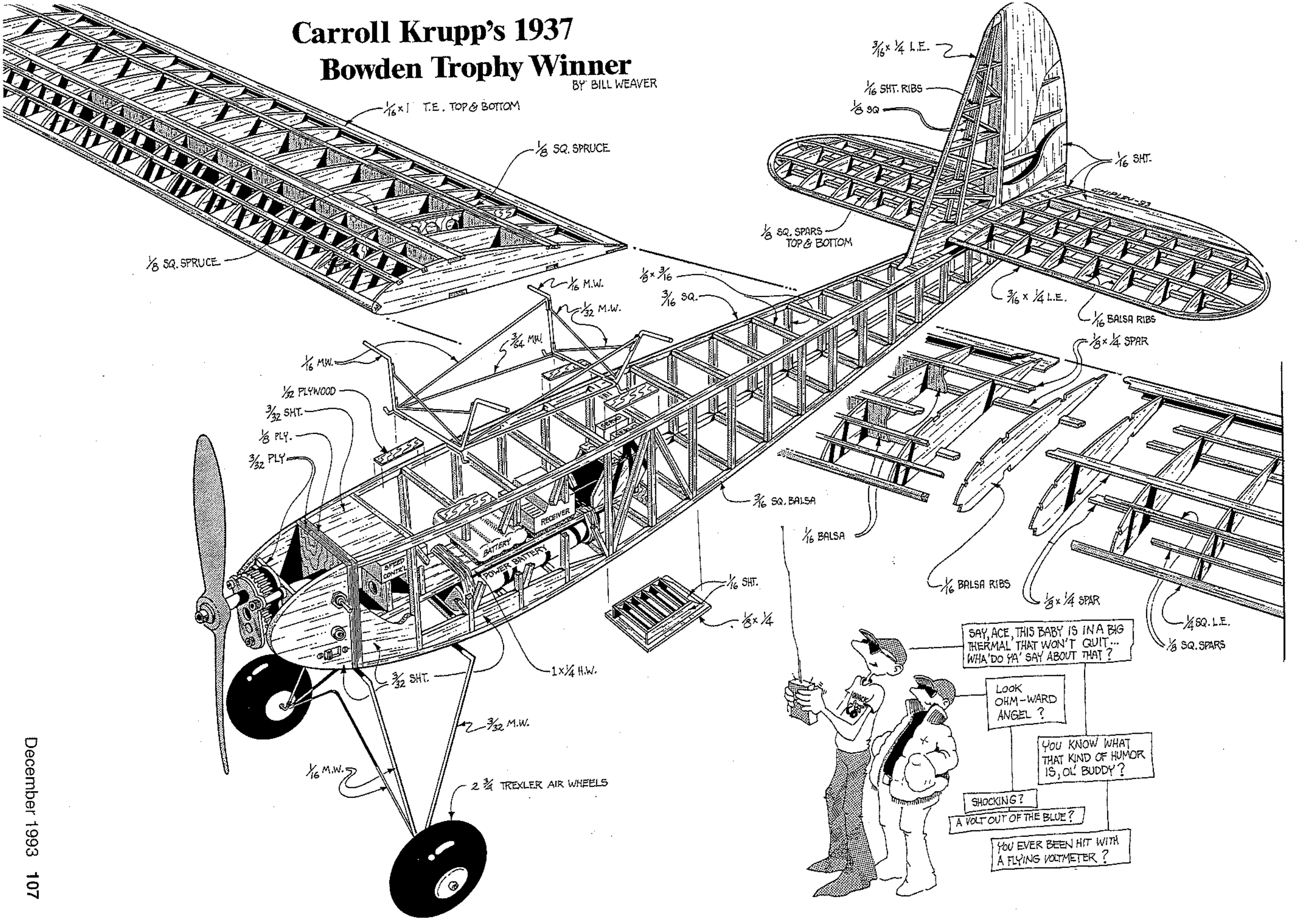
Flying weight: 41 ounces

Construction: Built-up

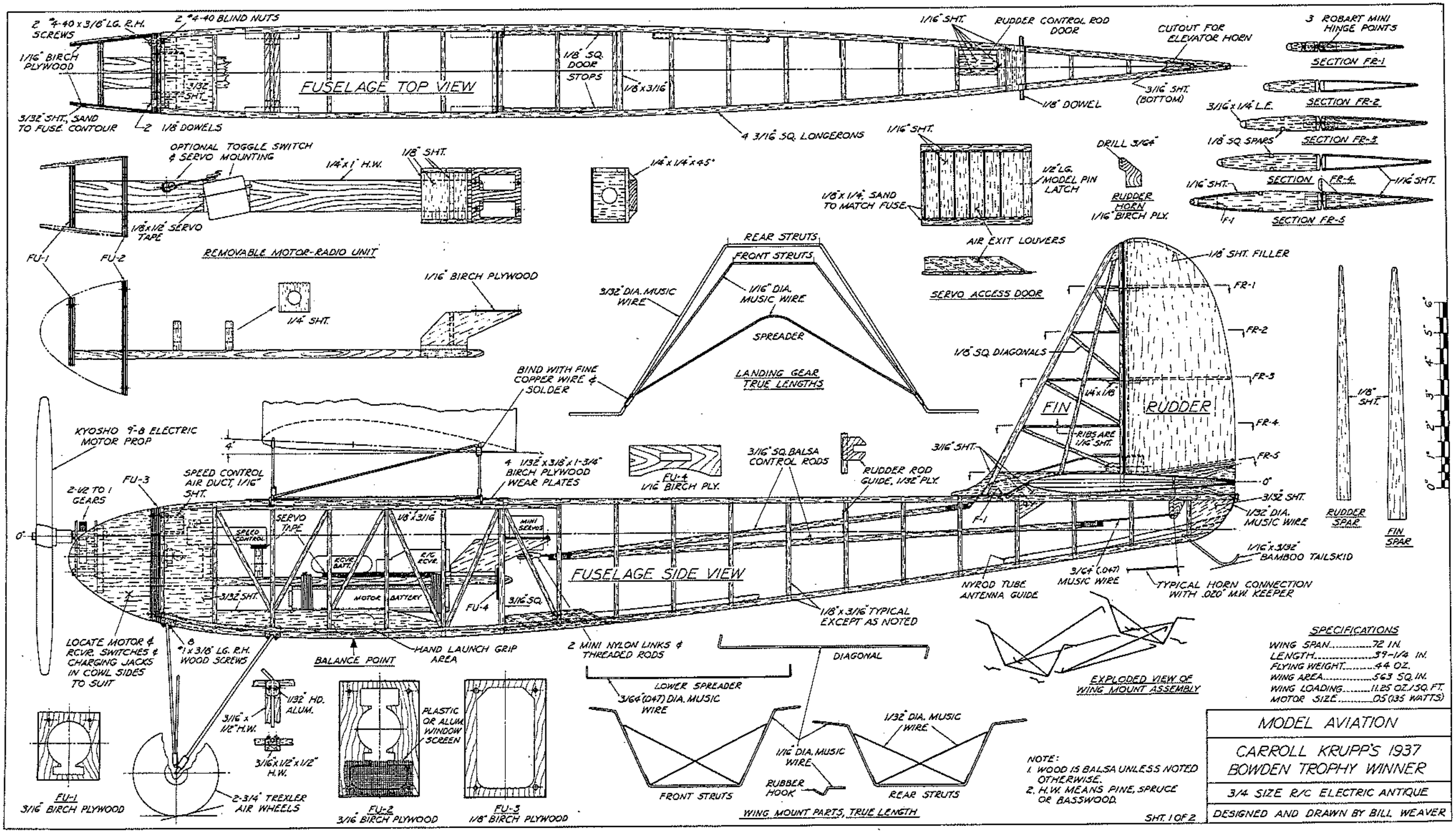
Covering/finish: Silk/Nitrate dope

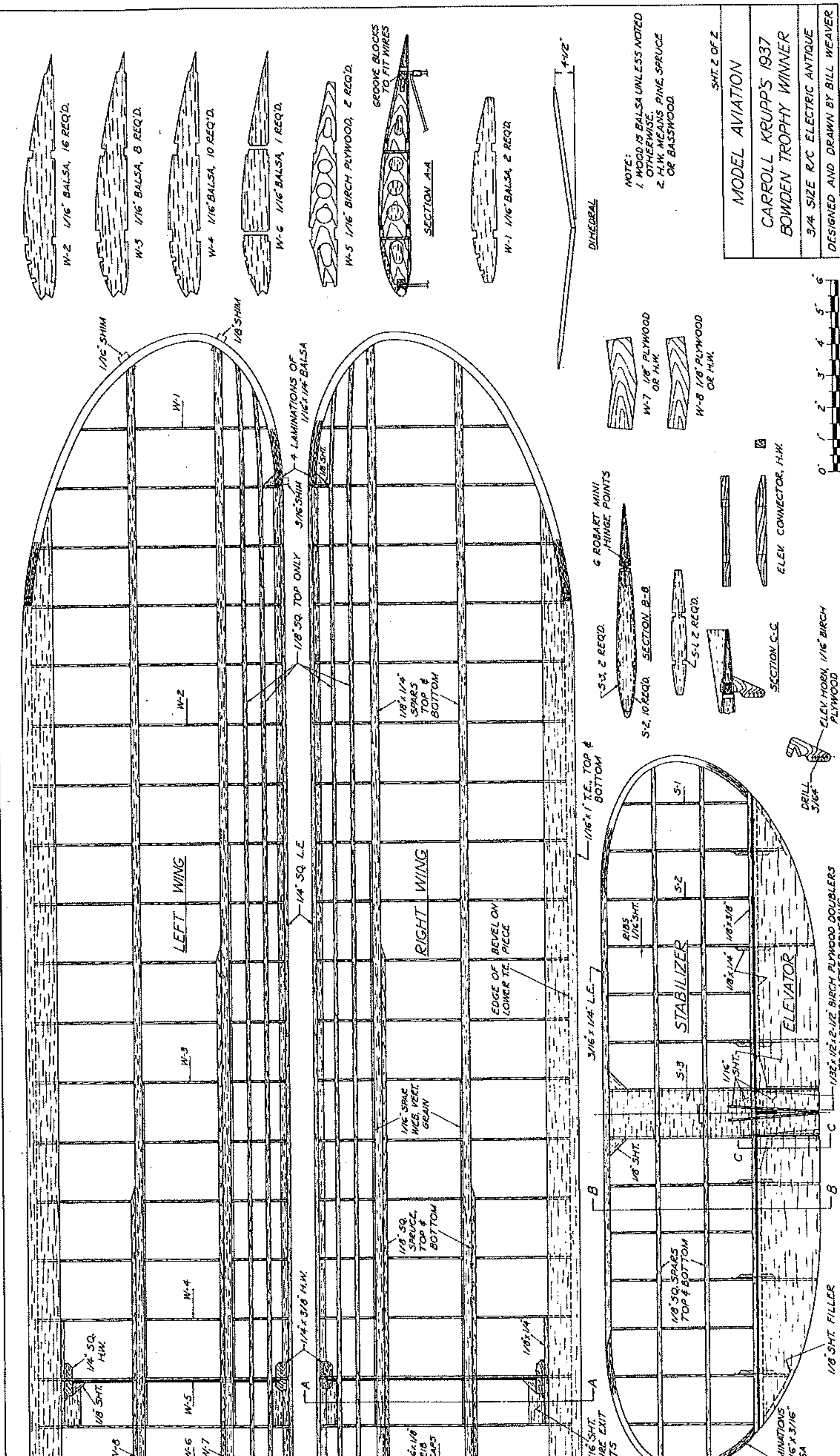
Carroll Krupp's 1937 Bowden Trophy Winner

BY BILL WEAVER



Full Size Plans Available-See Page 184




MODEL AVIATION
CARROLL KRUPP'S 1937
BOWDEN TROPHY WINNER
3/4 SIZE R/C ELECTRIC ANTIQUE
DESIGNED AND DRAWN BY BILL WEAVER
SHT. 2 OF 2
NOTE:
1. WOOD IS BALSA UNLESS NOTED OTHERWISE.
2. H.W. MEANS PINE, SPRUCE OR BASSWOOD.
W-2 1/16" BALSA, 16 REQ'D.
W-3 1/16" BALSA, 8 REQ'D.
W-4 1/16" BALSA, 10 REQ'D.
W-6 1/16" BALSA, 1 REQ'D.
W-5 1/16" BIRCH PLYWOOD, 2 REQ'D.
GROOVE BLOCKS TO FIT WIRES
SECTION A-A
W-1 1/16" BALSA, 2 REQ'D.
DIHEDRAL
4-1/2"
W-7 1/8" PLYWOOD OR H.W.
W-8 1/8" PLYWOOD OR H.W.
0" 1" 2" 3" 4" 5" 6"
1/16" SHIM
1/8" SHIM
4 LAMINATIONS OF 1/16" x 1/4" BALSA
1/8" SHT.
3/16" SHIM
1/8" SQ. TOP ONLY
1/8" x 1/4" SPARS TOP & BOTTOM
LEFT WING
RIGHT WING
1/4" SQ. L.E.
EDGE OF LOWER T.E.
BEVEL ON PIECE
1/16" SPAR WEB, VERT. GRAIN
1/8" SQ. SPRUCE, TOP & BOTTOM
1/4" x 3/8" H.W.
1/4" SQ. H.W.
1/8" SHT.
1/8" x 1/4"
1/16" x 1/8" RIB CAPS
1/16" SHT. AT WIRE EXIT POINTS
1/16" x 1" T.E., TOP & BOTTOM
W-1 W-2 W-3 W-4 W-5 W-6 W-7 W-8
A A
6 ROBART MINI HINGE POINTS
S-3, 2 REQ'D.
S-2, 10 REQ'D.
SECTION B-B
S-1, 2 REQ'D.
SECTION C-C
ELEV. CONNECTOR, H.W.
ELEV. HORN, 1/16" BIRCH PLYWOOD
DRILL 3/64"
3/16" x 1/4" L.E.
RIBS 1/16" SHT.
STABILIZER
ELEVATOR
1/8" x 3/8"
1/8" x 1/4"
1/16" SHT.
1/8" SHT.
1/32" x 1/2" x 2-1/2" BIRCH PLYWOOD DOUBLERS TOP & BOTTOM AFTER COVERING
1/8" SQ. SPARS TOP & BOTTOM
1/8" SHT. FILLER
3 LAMINATIONS OF 1/16" x 3/16" BALSA
S-1 S-2 S-3
B B C C

Bowden/Weaver

Continued from page 106

waxed paper.

Use one-inch-long 16-gauge brads along the longerons to hold them in place over the plans. The front half of the longerons and the ⅛ x 3⁄16 longeron doublers at the nose should be soaked in hot water and allowed to dry in the brad jig before the uprights are added. This will eliminate any tendency for the longerons to force the sides out of shape when removed from the building board.

I don't try to build one fuselage side atop the other when using large wood sizes; instead, when I make the first side, I make two of each upright. After removing the glued first side, replace the brads in their original holes. Add two more longerons and doublers, and glue in the already made uprights. If all the longerons have the same cross-section (and they should), the uprights will fit snugly, assuring that the second side is identical to the first.

A protractor-guided hand sanding block device can be a big help to make the uprights and diagonals have a neat, snug fit with the longerons. The pieces can be cut slightly long, and a few swipes with the sanding block will make them fit perfectly.

The lower opening in FU-2 is for motor battery cooling air, which will exit through the louvered servo door. I covered mine with window screen to keep out anything that might blow into the fuselage while landing or taking off. The upper opening directs cooling air to the speed-control cooling fins. Note that the lower longerons are cut away to clear the hardwood landing-gear attachment blocks.

I used a bamboo tail skid (a bit of bamboo seems appropriate for an antique) formed over a ¾-inch-diameter dowel using a heat gun. At a certain point, as the bamboo gets hot, it will soften like plastic, and if held until it cools the shape becomes permanent. Bend with the shiny side outward.

The small door just in front of the stabilizer allows the rudder control rod to be taken in or out of the fuselage. It is cut free on two sides after covering, and it allows the covering to act as a hinge on the long side. The servo access door also uses the covering as a hinge.

The thrustline shown is the scale centerline of the original Brown Jr. engine and is not raised by the gear box offset, as it might appear.

Wing: The wing structure is different from the original, except for the scale rib spacing. Bob Kopski's tapered-strength spar system was used for strength and lightness (see "All About Electrics, Part 8" in the April 1984 *Model Aviation*). Two ⅛-square turbulator spars were used instead of a sheet-covered leading edge.

The laminated tips are soaked in hot water and pulled around a form at least ¼ inch thick. Use a few inches of excess length to thumbtack the ends. When dry, paint with white glue and attach to the form again. I used a scrap of ⅜ fir plywood, bandsawed to contour, for my forms.

I traced all sheet parts on inexpensive tracing paper and stick them to the balsa sheet or templates with rubber cement. After the sheet part is cut (or the template is made) the paper tracing can be peeled off, and any leftover rubber cement will rub off the part or template.

If a thin plywood (or, preferably, aluminum) template is made of rib W-2, a full set of identical ribs can be cut from it. The spar notches can be enlarged to become ribs A-3 and A-4, to suit, at assembly. Drive a brad through the template near the leading and trailing edges, while backing up with wood. This will leave a toothed perforation which will keep the template from slipping.

The W-5 plywood rib reinforcement ties the wire mount attachment at the leading and trailing edges to the spars and thus to the whole wing. The spars and turbulator strips are not cracked, but are allowed to naturally bend down or up to the tips. Dampen the top spars at the last W-2 rib to assist this. Make the wire wing mount parts as accurately as possible. The 1/32 X bracing is tack-soldered to the front and rear struts. Bind the joints with fine wire (I used lamp-cord strands). It will be a little floppy at first, but as more pieces are added it will assume its finished shape. Some wrappings will have to be rewound to accommodate added parts.

When the mount is holding together with the wire wrappings, set it on a piece of wood to simulate the fuselage. Pin or tape the front and rear struts to the wood to hold the bottom in alignment. The wing-rubber attach hooks are shaped to allow the wing to cam itself off and release the rubber bands if the tip hits in a crash. Slide the hooks up snugly to the three-inch-wide piece, as they will align the wing to the fuselage; we don't want any slop here.

If everything looks square, start soldering. Use 4% silver, 96% tin, high-strength silver solder—made by Kester or Stay-Brite—both here and at the landing-gear joints. After soldering, attach a three-inch-wide piece of fine emery cloth to the wood piece. Rub the mount forward and back until any wrapping wire or solder bumps are smoothed off, and there are four small smooth flats that will sit, without rocking, on the fuselage wear plates.

The mount can now be attached to the wing at the leading and trailing edges; it should fit perfectly, giving a wing incidence of 4°. If necessary, bend the top ends of the struts parallel to the wing parts. Check that the wing is 90° to the fuselage before final gluing. The 1/16 sheet added around the wire where it exits the wing is gluing area to aid covering. This is also the purpose of the 1/8 caps at the wing center line.

The covered wing, including the wing mount, weighs 7¼ ounces.

Tail surfaces: The stabilizer and fin use the same construction methods as the wing. The elevator and rudder are very light contest-grade balsa sheet to eliminate warps and for simplified construction. The diagonals were added to the fin when the covering bowed the hinge line.

The Robart Mini Hinge Points are light, easy to install, and allow the surfaces to move easily and without friction. Don't glue them in until after covering. The hidden elevator horn is a little complicated, but is not as hard to make as it appears on paper.

Motor and RC Unit: The removable nose and radio-battery spar unit should accommodate most geared 05 motors and radio receivers. Adjust for elevator travel of +5/8 inch and rudder travel of +1¼ inches, measured at the trailing edge.

The motor battery is held to the spar by wrapping with 3/16 rubber-model motor strip. I used 16-gauge SR high-flex wire and Sermos connectors to wire the motor battery. The exact location of the battery is be determined when the model is balanced. Fit the wiring neatly into place and hold to the spar with wrappings of ½-inch-wide Scotch Magic tape.

The plans show the following radio and battery equipment: a Tower 500 standard-size receiver, two Tower TSS-10 microservos one Tower TSS-20 miniservo to operate the motor toggle switch, a SR Series 150, 175 mAh receiver battery and a SR EP Max Pack Series 1200 six-cell motor battery. This resulted in a flying weight of 44 ounces.

After the plans were completed, I installed a Futaba Attack 4NBL-E radio system. This has a combination receiver-speed control and two miniservos. Since the receiver operates from the motor battery, it eliminates the receiver battery. The speed control eliminates the motor-shutoff toggle switch and its servo.This installation saved three ounces, and the model's flying performance was enhanced. It also eliminated my concern that the small receiver battery (used because it was light) would be exhausted after several long flights.

The receiver-speed control combo is mounted in the cooling air, where the speed control is shown in the fuselage side view. Two Futaba aileron extensions can be used to connect the receiver to the servos.

Covering: For the antique effect, my model is covered with red heavyweight silk, with three coats of clear nitrate dope. It requires two square yards of covering material.

I have been using Coverite Balsarite to attach silk and tissue since I got some to use with Micafilm. Balsarite is a hot-melt quick-drying liquid that is brushed on the framework where the covering is to be adhered. Its advantage over the use of dope or glue for attaching is that by using a model sealing iron, the covering can be tacked in place in spots around the edges. The tacks can be softened with the iron, and the covering restuck to pull out slack or wrinkles.

When the silk is smooth, it can be permanently ironed down around the edges. The wing covering is slit to fit around the wing mount wires. The silk is then sprayed with water to shrink it tight, then doped. Dope will not loosen the Balsarite.

The best substitute for silk is Micafilm. It is very tough, almost as light as silk, has a translucent appearance, much the same as doped silk or tissue, and is available in many colors. Use the same covering technique with Balsarite as given above for silk.

My wing is perfectly flat, as was usual in the 1930s. The lack of washout has given me no tip stall troubles.

Final Assembly: The 1/32 plywood wing mount wear pads and the stabilizer trailing edge reinforcements are attached after covering. When attaching the lower stabilizer reinforcements, line up the rudder-stabilizer assembly with the airplane centerline and place them snugly against the fuselage to act as alignment keys when attaching or removing the tail assembly.

Adjust the battery on the spar to make the model balance at the point shown.

To install the motor-radio unit: The servo access door is taped open. With the fuselage held vertically, the radio antenna is dropped in until its end reaches the door. The fuselage is tilted so that the antenna end comes out of the door. Continue to lower the unit and engage the spar end in the FU-4 support.

Engage the nose firewall in the two 1/8 locating dowels and slip the nose into place. Install the two 4-40 screws.

The antenna can then be stuffed into its tube, the two control rod links attached to the servos and the door closed. I use a six-inch piece of .047 music wire with a 3/8-inch 90° bend at the end as a tool to open the links while supporting the servos with my fingers.

For support under the links when closing, use a six-inch length of 1/4 brass tubing with a 3/8 length flattened and bent to 90°. The wing is held on with three #33 rubberbands at the wing struts, front and rear, and the stabilizer with three #32

Continued on page 126

Scale plans, adding panel lines, and rivets. He also uses this method to check the size and placement of markings.

Hal Winters baffled us all with a slide-show questionnaire, which included model personalities, aircraft, model aircraft, aviation personalities, and other trivia. The whole affair was a blast, and I hope to see this type of social function again at the Nats.

It's time to start building next year's entries. I understand there is a bounty on Steve Ashby for next year's Nats. Is there anyone out there who can beat him in Sport Scale? Or will he be the national champion for the fifth year in a row? The challenge has been made! See you in Texas! ✈

Bowden/Weaver

Continued from page 113

rubber bands on each side.

FLYING

This model is not a clean sailplane; the drag of the landing gear, the wing struts, and the large frontal area necessitate additional power to achieve a reasonable climb. Use one of the hotter 05 motors. My LeMans 360PT motor draws 23 to 24 amps (about 140 watts) during the useful run of about 3½ minutes. This allows two climbs to well above the usual sailplane winch-launch height. In still air it will average eight-to-nine-minute flights. It has a good glide and will soar well in lift.

One of the characteristics of a high-wing parasol model is a tendency to be slow responding to rudder control, both going into and out of a turn. During test flights, I found that the model needed more rudder area for this reason. The rudder hinge line was moved forward one inch, giving more rudder area. The model is now easily kept under control, and is very stable longitudinally. At present, after five summers of flying, I am using the wing incidence and balance point shown on the plans.

The model's strength was tested during the first trial flights. While the radio and motor speed control tested perfectly during ground checks, in the air there was constant glitching, with control being erratic and the motor cutting off and on. I made several lucky flights with safe landings, but nothing I did to the radio, motor, or speed control helped. Finally, the model made a full-rudder spiral div into the ground, hitting on the nose and one wing tip. The wing flew off, as designed. The only damage was to one wingtip, a bent landing gear and prop shaft, and a few small dents in the nose cowl. It hit hard enough to cause the motor battery to move forward ⅜ inch, even though it was so tightly rubber-banded to the motor spar that it could not be moved by hand.

I gave up the speed control and tried a servo-operated *on-off* motor switch; all my radio problems disappeared. A speed control is not necessary for climb-and-glide flight, anyway. This is not to condemn speed controls in general, as I know many that work perfectly. It is probably something peculiar to my radio or motor setup that I should have worked out.

During subsequent flying I had

occasion to put the model into a long vertical dive, with wires whistling, to get out of a strong thermal that was about to make it disappear overhead. There was no fluttering, and the wing survived the dive and pullout okay.

Fine trimming to get the maximum climb and glide can go on forever; it's part of the challenge. The wing incidence can be increased by shimming under the front struts, and the wing can also be moved fore and aft. Adjust until you get the best glide angle with the elevator trim at neutral. Your model may require a slight up or down elevator trim to get the best climb. Since no down or right thrust was used on the original, I find that I need about 1/4 inch right trim at the rudder's trailing edge to control torque under full power.

Some changes are necessary to use this model in SAM competition: Make the rudder and elevator open-frame construction like the fin and stabilizer—not sheet wood as shown. Remove the turbulator spars and sheet the wing 1 1/4 inches behind the leading edge. Sheet the wingtips from rib W-1 outward, and sheet the center section three inches out from the centerline.

I encourage you power fliers to try soaring. It is like a lot of sports that look boring to the spectator but are exciting to the participant. Electric power is the quiet, clean way to get your soarer—either antique or sailplane—up to thermal-finding height. It is a perfect way to go for us old free flight thermal chasers who are losing our wide open spaces and young legs. ✈

CL Speed/Lee

Continued from page 73

feeling low, but Grandpa used instant glue and fiberglass and had the model back in flying condition. Mike put up three official flights, with the fastest being 133.78. The score won first place in Junior, barely ahead of Peter Brown, with his 133.18!

Three Seniors tried to fly, with David Van Allen, from Chandler, Arizona, was the only one to get an official time. Dave came to the Nats with Slugger Brown, and other Staten Island Speed Team members helping him.

Open fliers were at it with airplanes powered by a variety of engines. The Aloise Team was using one of the two ACE engines that Carlos built last year, while the rest of us had Rossis, O.S., and even a Nelson engine. The Aloise Team, Tommy Brown and Frank Garzon were first, second, and third - until Connie Aloise showed up. She arrived late, after flying to Evansville, Indiana, where Carlos picked her up.

Carlos processed her airplane in the morning. Connie started the engine as required by rules, Slugger flew it for her, and her first flight was a new .21 Sport Speed record of 152.44. A backup flight of the same speed clinched the record, as well as first place.

Connie uses one of the two ACE engines, and this one seems to develop massive amounts of power at lower rpm. During flight, the engine is much quieter than others, and I believe she is using a larger prop than the rest of us.