

DAVIS D1K

A. A. Lidberg

FROM THE GOLDEN AGE of aviation, the Davis D1K is a prime example of an open cockpit sport parasol monoplane. About 60 Davis D1's were built, powered with Kinner, LeBlond or Warner engines (thus D1K, D1L and D1W). According to pilots, the Davis had the performance of a pursuit plane; yet it was forgiving of heavy-handed fliers.

Our model, designed for the Telco CO-2 motor, is a great sport model for fun flying in small fields. Enough scale data is available to produce a respectable AMA Scale model if desired. With the built-in throttle of the Telco, it is possible to adjust power output to match a light, minimal airplane or a heavier, well detailed model. Scale references for this model are: *Model Builder*, February 1974, with Westburg drawings and photos; and *Air Trails*, Winter 1976, with the same Westburg drawings double size, and photos of different airplanes. The *Air Trails* issue also has color photos, with details

of the instrument panel.

Wing. Begin the wing by laminating the tips and center section curve with two layers of 1/32 x 3/32 bass (or 3 layers of balsa). My favorite method is to set up the shape desired with pins spaced about 1/4 in. apart. Two layers of basswood strips, lightly sanded for better gluing, are then pulled around the pin-template and pinned in place. Hot Stuff is applied to the joint between the strips, and the curved piece is almost immediately ready for sanding and use. An alternate method is to use waxed cardboard templates. Thin Titebond glue applied to the strips before wrapping works pretty well and allows sanding the resulting curved piece better than with white glue. Make up the L-shaped leading edge from a piece of 1/16 x 1/4, backed up with 1/16 x 1/4. Lay out the wing by pinning down the curved pieces, the leading edge and trailing edges. Add the bottom

Pleasing lines, classic appearance and good flying on CO-2 power—what more could you ask? The Davis is a great sport flier, or you can load on the detail and compete with it. 349

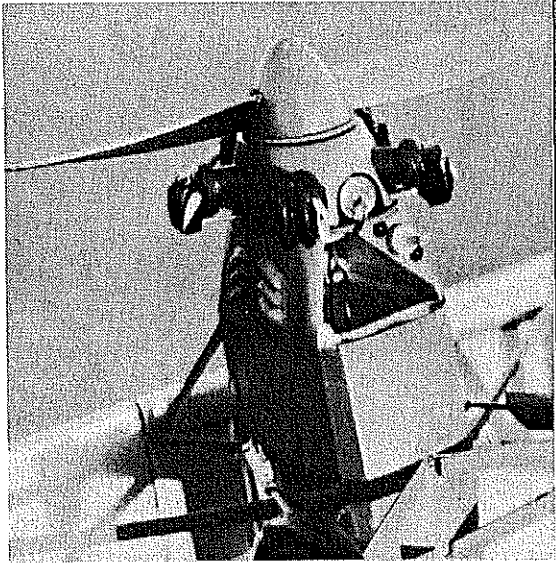
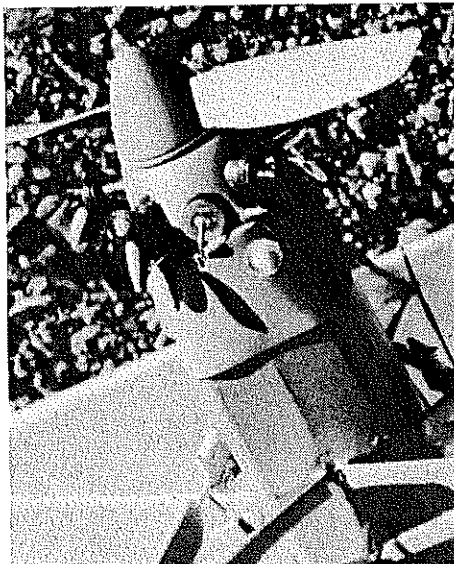
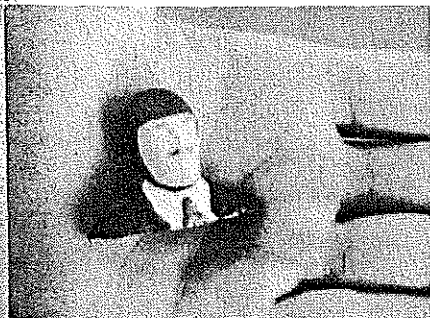
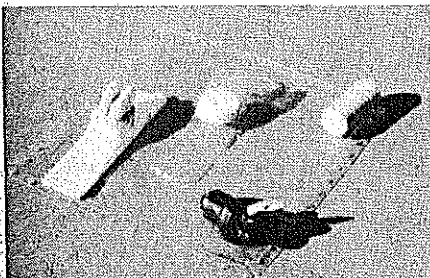
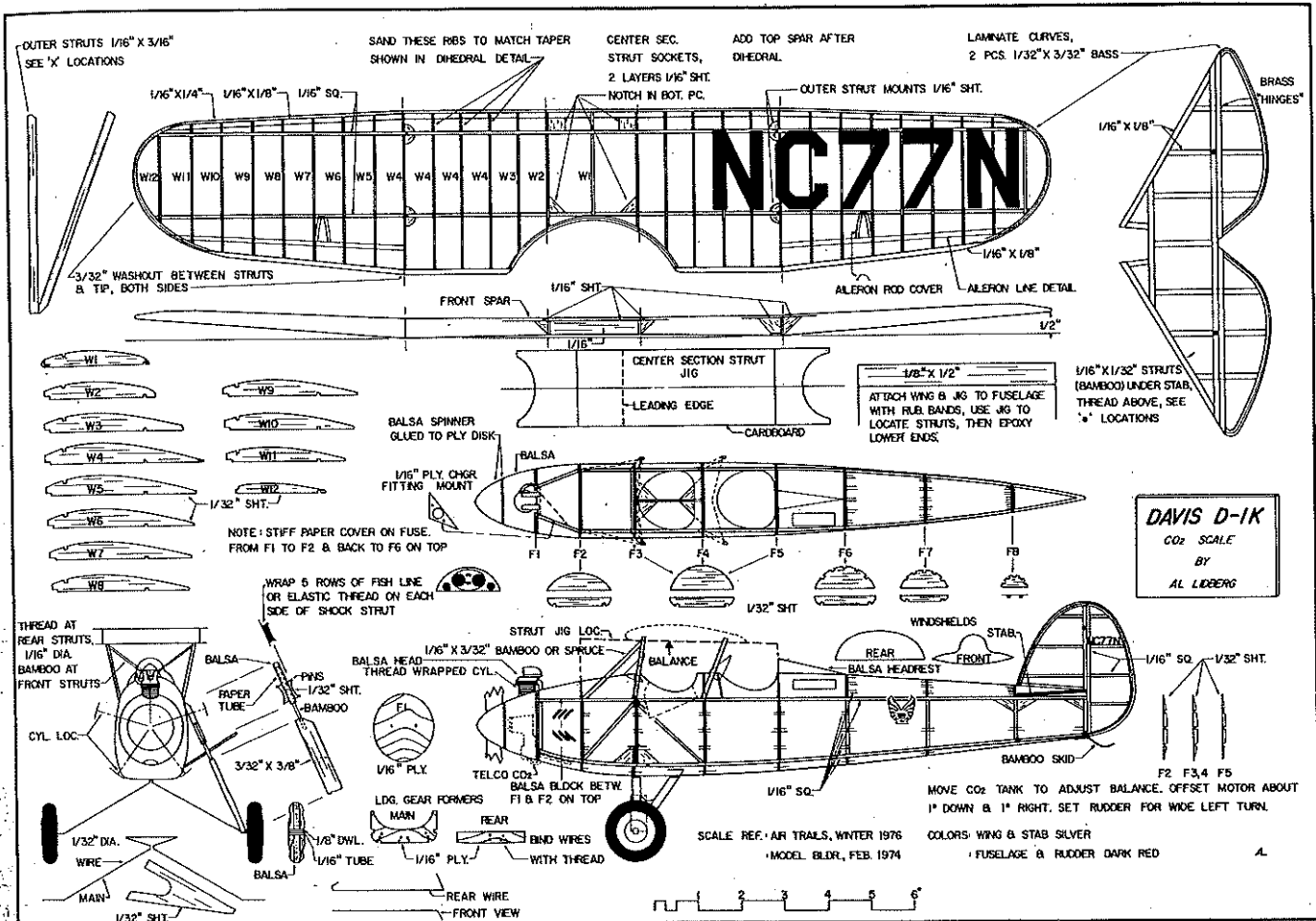
spar. Cut out the ribs. Just one W4 rib is shown, so a bit of sanding will be necessary to produce the taper shown in the dihedral detail drawing.

Fit each rib carefully—leave out the top spar for now. When dry, cut the wing apart at the four breaks. Block up the center section 1/16 in., and fit the inner panels to it. Now fit the outer panels with their dihedral. (The Davis wing has always intrigued me, but I put off the project because of the shapes involved. Looking at it closely, the wing wasn't nearly as complicated as I thought.) The top spar can now be added.

After the wing has been removed from the building board, add the center section filler, the required gussets, and the outer strut mounting. Eventually, the center section struts will fit up into sockets formed in the wing. Make the sockets from two gussets by cutting a 1/16 x 1/2 in. notch in one gusset and then adding a full gusset over it. The sockets perform two functions: positive wing location, and plenty of gluing surface for the struts. Sand the wing thoroughly to prepare for covering.

Fuselage. Begin by making two side frames from 1/16 sq. hard balsa. While these are

Here's a FF from aviation's Golden Age that you can have a real ball in building and flying. It can include lots of detail for AMA Scale competitions, or it can be simplified for sport flying. Telco CO-2 engine provides clean, quiet operation and variable-setting power capability.



Tack-gluing hatch in place, as in the left-hand photo, allows easy removal of engine and tank. At right, note triangular piece holding charge fitting in place with two nylon screws.

The pilot began life as a plastic cowboy in a drugstore. Reshaped and cut in half, figure was used in a Vacuform to make a lightweight head. A balsa mold was made for the Kinner engine head. In front of the molded pieces is a finished head with aluminum tube exhaust pipe.

are covered with high-gloss coated paper. You may be able to find a piece of this at a large printing shop. Ordinary file card stock (without lines) would work about as well with a couple of extra coats of dope.

Four pieces of paper are required. Work from the back and overlap slightly as you move forward for a bit of extra scale detail. Add an extra layer of paper to represent the luggage

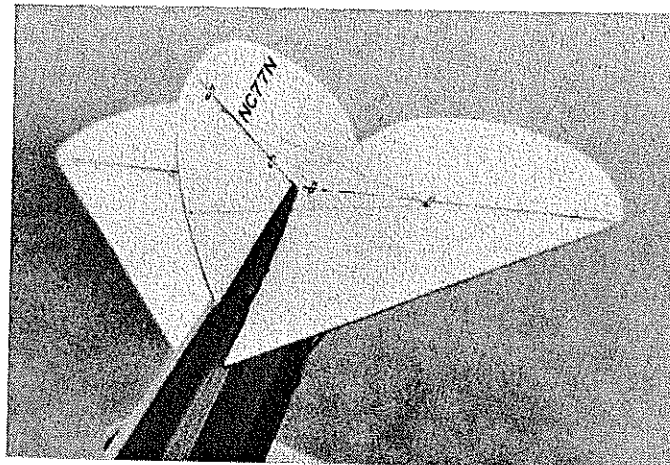
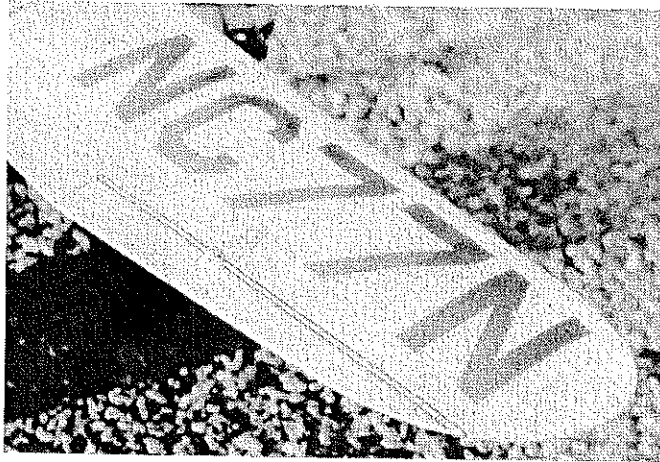
door (well, big enough for a lunch box, anyhow) and the door for the front cockpit. From the firewall back to F2, one piece of paper can be used to wrap all around. Arrange the seam to fall along a lower longeron to simplify the hatch.

Make up the cowl from scrap blocks to fit around the CO-2 motor. Cut a disk of 1/32 ply for the rear face of the spinner, and mount it on the crankshaft. Using the fuselage and the disk as guides, carve and sand the cowl to shape. My spinner was made by gluing a piece of 1/8-in. dowel into a block and then spinning the block on a MotoTool. Shaping was done with an X-

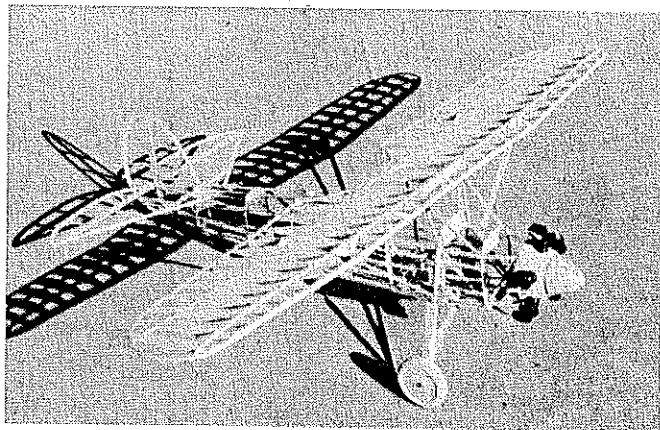
Acto blade and sandpaper. A clamped-down electric drill (or even a hand drill) works as well for this operation. Follow the spinner, and cut clearance for the Telco prop. A shim washer of 1/16 ply must be used between the prop and spinner disk due to the shape of the prop.

Kinner engine. The dummy radial engine is based on thread-wrapped balsa dowels for cylinders. Heads can be made from balsa. If you have a Vacuform, one good head can be made as a form and duplicated five times. The plastic head 'hats' can then be glued to balsa

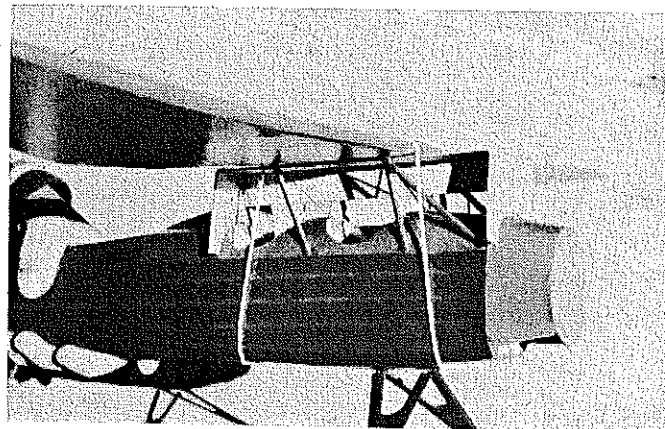
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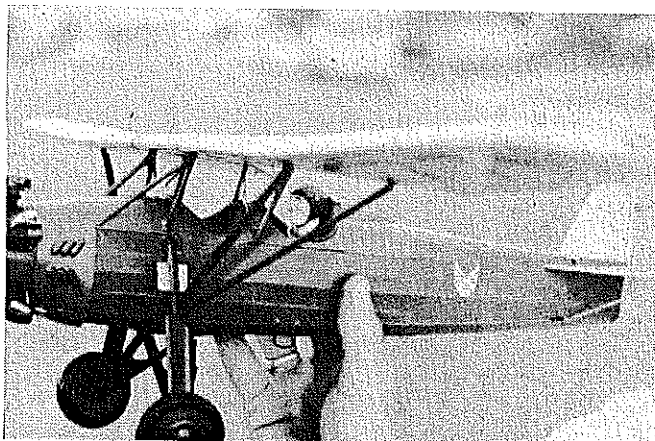
Left, license numbers are made from a stencil cut from adhesive drafting film and applied to the wing. Ailerons are outlined with India ink, control rod cover was Vacuformed. Right, rudder and stab hinges are inked in. Brass strips from paper fasteners make the hinges. All photos by the author.



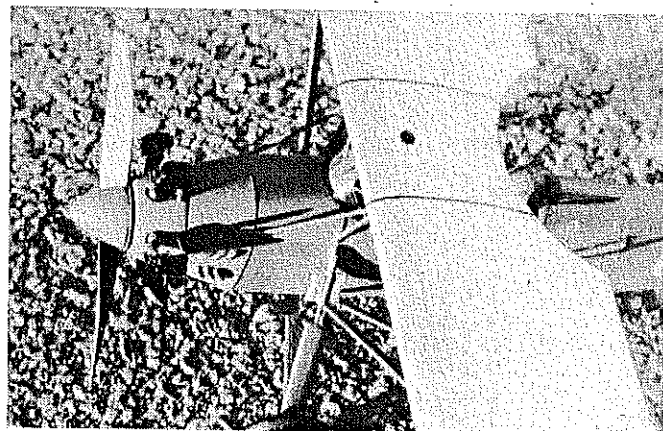
The bare bones of the matter. Rib spacing is scale, as are fin and rudder. Stabilizer has been enlarged slightly, but it doesn't show.



Center section strut jig is made of cardboard and balsa. It aligns the struts squarely. Upper ends of struts fit into sockets in the wing.



Like all open-cockpit models, this one just doesn't look right without a pilot. Note extra layer of card stock for luggage and cockpit doors.



Here are the dummy Kinner heads in place, with intake and exhaust pipes, pushrods, plugs, and wires. Louvers were Vacuformed and detailed with flat black paint. Shock struts are wrapped with fishing line.

drying, cut out all the formers, the plywood firewall, the charger fitting mount, and the landing gear formers. Pin the sides upside down over the top view, and put in cross braces between F2 and F5. Crack the sides at F2 so the forward part can be bent in to firewall width. Clamp and glue the tailposts together, and fill in the remaining cross braces.

Bend the main landing gear from 1/32 in. wire, and bind it to the main gear former with heavy thread. The rear struts should now be bent to shape and bound to the rear gear former. Glue the main gear former in place ahead of the upright, and then fit and glue in the rear gear former. Wrap the joint between the rear and main gear wires together with fine copper wire, and solder to keep them joined.

Add gussets to brace the landing gear formers. Make the balsa filler pieces for the landing gear wires, and epoxy them into place. When dry, remove the fuselage from the board; add the remaining formers, the stringers and the firewall.

The CO-2 motor and tank unit can now be temporarily fitted into place. Bend the tubing so that the tank lies under the balance point. If a solid mounting for the charger fitting is desired, tap 2-56 threads in the fitting. The holes are the right size. (A steel 2-56 screw can be made into a tap by filing a triangular-shaped groove over about six threads.) The fitting can then be held to the model with 2-56 nylon screws.

Because of the triangular shape of the fitting

mount, there's enough room for the tank, lines, and fitting to be pulled out through a hatch when desired. With a bit of trimming, larger tanks can also be used. Quite a bit of force (4 lb.!) is required for charging, so the nose section of the model needs some strengthening. Fill in between the firewall and former F2 on top with a soft balsa block, hollowed for lightness. Make up a similar block to go between the firewall and the main landing gear former. Tack glue this one in place so you'll be able to cut it out later to form the hatch.

After sanding, cover the body with tissue. Keep in mind that the upper and front portions will be covered later with stiff paper. Shrink the tissue, and give it a coat of very thin nitrate dope. On my model the top and front portions

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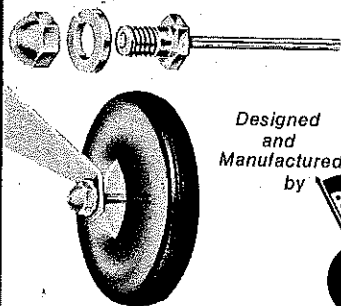
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model stooze, be absolutely sure that it is strong enough to hold the model! A good test would be to place a strong peg in the stooze, place a typical motor on the peg, and stretch-break the motor. If the stooze can withstand this, it will surely withstand normal wear and field usage, provided you have it safely anchored before hooking up the motor!

Mark your props! Unless you only have one prop of each design (or one prop for each different model) there is always the chance of grabbing the wrong prop in the heat of battle (no pun intended about summertime Nats events!), it is very advisable to have identifying marks on your props. Stan Chilton identifies his Easy B props with neat numbers showing in sequence (top to bottom) the prop number, weight, diameter and pitch, and wood thickness. Besides such comprehensive data on the item

itself, it is also a good idea to be sure that the prop number is recorded as part of the flight records of the model which uses that prop.

Stan's idea of using a rubber stamp for Easy B props adds essentially zero weight, but makes an indelible identification for the prop. A series of colored dots made by soft-tipped pens will do similarly for built-up microfilm-covered props, either coded to your own code or simply as an ID for the prop which refers to a written record elsewhere for the exact details.

Trim the tail feathers. Otto Rodenburg of the Netherlands uses an adjustable horizontal stabilizer. He gives credit to Dieter Siebenmann (Switzerland) for the basic tail layout, and advocates using some kind of adjustment for the stab. Changing the wing incidence often involves changes in the wing rigging, and it is otherwise difficult to make very small adjustments in

wing incidence in a manner which assures that the adjustment will hold reliably. In the case shown, the stab is permanently supported by a bipod at the leading edge, and the bottom of the fin is also stabilized by the stab leading edge. The stab pivots slightly around the joint at the bipod as the angle of attack is changed by sliding the rear stab post in the small tissue socket.

The very fine degree of elevation control which this adjustment affords is almost a luxury, and allows a model to be "fine-tuned" for minor changes in site conditions. One other point about this arrangement: the "underslung" mount for the stab lowers it enough to assure that the stab is out of the wing's downwash under almost any flight conditions.

Keep up with the rules proposals! About this time last year, we awoke to find we had to fly under very unpopular Easy B rules, at least for the rest of 1980 and all of 1981. My own investigations showed that we didn't do our part—we, as fliers, gave the Free Flight Contest Board almost no guidance with regard to the rules proposals they had to consider in the 1978-79 rules cycle.

We are now in the final stages of a new rules cycle, and rules now under consideration will become effective in 1982. Carefully examine all recent issues of *Model Aviation* (Competition Newsletter section), and continue to watch as the various cross-proposals are enacted. Contact the FFCB member for your district, and give him feedback on your desires! If you don't vote, it's not fair to complain about the election results.

Bud Tenny, P.O. Box 545, Richardson, TX 75080.

Davis D1K/Lidberg

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circles which are glued to the cylinders. Paint cylinder and head assemblies black before adding other details. If desired, add exhaust and intake pipes made from 1/16-in. aluminum tube and small strips of bamboo for pushrods. If you're up to it, glue thread to ¼-in. lengths of a straight pin to make spark plugs with wires. Drill holes in the cowl for each cylinder, but leave them out for now to permit painting the model.

Wheels for my model were turned to shape using the MotoTool. Epoxy a 1-in. length of ¼-in. dowel to three laminations of balsa. After the wheels are shaped, and while they revolve in the MotoTool, start a center hole with a 1/32-in. drill. Enlarge the hole to 1/16-in. dia. for the aluminum tube bearings.

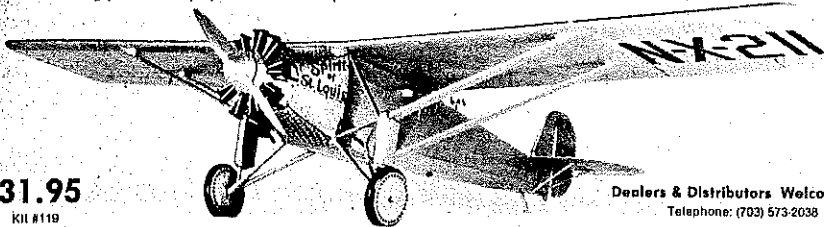
Center section struts. Assemble from bamboo (preferred) or spruce. Make up the cardboard strut jig as shown, and attach it to the fuselage with rubberbands. Then attach the wing with rubberbands, above the jig. The upper end of each strut fits into the wing sockets, and the lower end rests on the upper longerons. After carefully cutting through the stiff paper to expose the longerons for each strut, trim the struts to fit. When satisfied with the fit, epoxy the lower ends of the struts to the fuselage. After all struts are in place, the wing and jig are removed so the model can be painted.

Tail surfaces. Moveable elevators and rudder were selected for the Davis for two reasons: maximum scale points and flight adjustments.

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Because the wing and tail were to be glued on (the complexities of knock-off surfaces were not felt necessary on this size model), some means of adjustment for flight was necessary. Hinging the surfaces with pieces of brass strip from a 'paper fastener' serves the purpose well.

Laminate the curved outlines, and use medium hard balsa for the rest of the structure. After the surfaces have been removed from the board, separate them along the hinge lines, and make hinge slots with a thin razor saw. Insert the metal strips, and leave a little space at the hinge line to allow bending. Hot Stuff will hold the metal nicely.

Surface covering. To minimize warps during tissue shrinking, I used rubbing alcohol sprayed through an old hair spray pump bottle. Rubbing alcohol dries faster and shrinks less tightly than water. Cover the wing and tail with thin Japanese tissue. After shrinking, all tissue areas should receive a coat or two of well-thinned plasticized nitrate dope (10 drops of castor oil per ounce of uncut nitrate, then thin as needed).

Paint and trim. NC77N should have silver wings and stab with dark red fuselage and rudder. (Yes, I goofed and painted the rudder silver, but it looks nice that way!) Floquil model railroad paint provided both the colors (bright silver, caboose red), but it was mixed with nitrate dope to produce a glossier finish; straight Floquil is flat.

After letting the bottles of paint settle for a few days, the clear liquid was poured off and

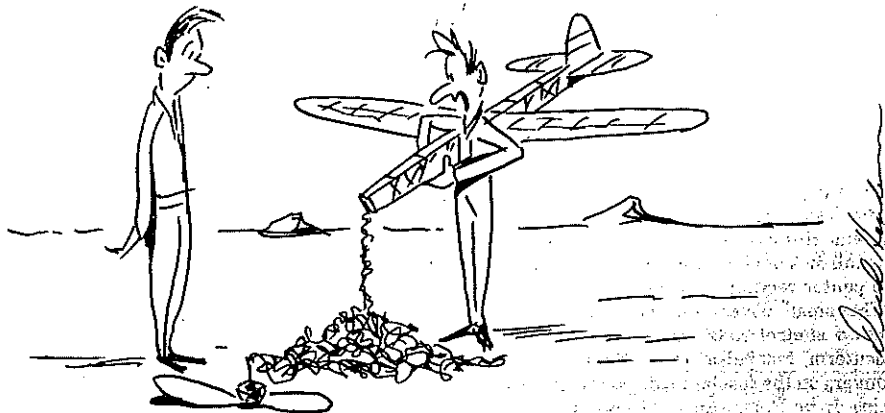
discarded. The bottles were then filled with nitrate thinner and shaken. This mixture was added to clear nitrate, and two or three coats were sprayed on with an inexpensive Badger airbrush. The ratio should be: 1/2 Floquil and thinner mix to 3/4 thinned plasticized nitrate clear. This begins to sound like something out of the alchemist's cookbook, but it is a workable way to produce lightweight solid colors.

A mask for the wing's NC numbers was cut from clear adhesive film (Zipatone, from a drafting supply store—could also use masking tape). After the mask is in place, lightly brush clear dope around each character to minimize color bleeding. Two thin coats of red are adequate. NC numbers on the rudder can be made from stick-on white letters, although silver ink used in a Leroy pen could produce better looking results. Xerox two copies of the Davis shield from the plan, and rubber-cement them in place.

The Telco prop should be painted flat black on the rear face and wood color on the front. Use enamel for this. After sanding and filling with a couple of coats of clear, the tires can also be painted flat black. If you're not up to doing the colored dope treatment, gray and red tissue could be used to make a lighter model, and one that's a bit quicker to build.

Details. After the stabilizer is glued in place (don't forget the triangular incidence block) thin bamboo struts are added to the underside. Thread rigging is then added between the fin and stabilizer on top. Add the small balsa filler pieces next to the fin. Bend the bamboo tailskid by heating it, and glue it on.

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| 2-56 x 1 | 12 |
| 3-48 x 1/4 | 12 |
| 3-48 x 1/2 | 12 |
| 3-48 x 1 | 12 |
| 4-40 x 1/4 | 12 |
| 4-40 x 1/2 | 12 |
| 4-40 x 1 | 8 |
| 6-32 x 1/4 | 12 |
| 6-32 x 1/2 | 8 |
| 6-32 x 1 | 8 |

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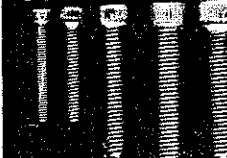
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| SIZE | AMT/BAG |
|----------|---------|
| #2 x 3/4 | 12 |
| #2 x 1 | 12 |
| #4 x 3/4 | 12 |
| #4 x 1 | 12 |
| #6 x 1/2 | 8 |
| #6 x 3/4 | 8 |
| #8 x 3/4 | 8 |
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| #2-56 x 3/4 | 4 |
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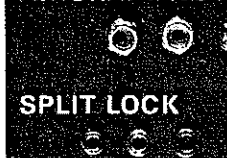
HEX NUTS



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| #4-40 | 12 |
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| #4-40 | 4 |
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|------|---------|
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| #3 | 12 |
| #4 | 12 |
| #6 | 12 |
| #8 | 12 |

WASHERS



| SIZE | AMT/BAG |
|------|---------|
| #2 | 12 |
| #3 | 12 |
| #4 | 12 |
| #6 | 12 |
| #8 | 12 |

FLAT WASHERS



| SIZE | AMT/BAG |
|------|---------|
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| #4 | 12 |
| #6 | 12 |
| #8 | 12 |

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The landing gear shock struts are made in two pieces for each side. The lower strut carries a bamboo or dowel piece which slides into the upper strut. It looks like the shock struts really work, but they are only decorative and are not necessary for flight.

Begin the upper strut by rolling up a paper tube. Four layers of notebook paper rolled around a 1/16-in. wire form the basic strut. Put white glue on the paper after the roll is started so that it will not stick to the wire. After a few minutes, make sure the paper tube is free of the wire. Make the bungee assembly using pins and 1/32 sheet as shown. After painting, wrap each side with five rows of elastic thread or fish line. Make the lower struts from balsa and bamboo. Check the fit of each strut pair, adjusting mating angles as needed, and epoxy in place.

Moving back up to the center section struts

again, the rear struts should be braced with thread down to the paper cover. The front struts are braced with thin bamboo strips. Make a paper pattern of each windshield and trial fit, adjusting where necessary.

Hot Stuff really works great for windshields and minimizes the glue glops. Cut some 1/16 strips of plastic electrical tape and use them to cover the joint at the base of each windshield. These strips are also used to simulate a joint at the wing ribs where the center section struts fit. A small disk of black tape serves as a gas cap on the center section.

The small covers on the wing where the aileron control rods exit were made using a Vacuform, but balsa scraps can also be used. Louvers on the fuselage side can be made from balsa or be Vacuformed. Outline the ailerons with India ink in a drafting pen.

Epoxy the wing in place, making sure each

center section strut is pushed all the way into its socket. Make up the outer struts, paint them red, and epoxy in place after you've checked to make sure the wing panels are straight in the space between center and outer struts.

Cut out the instrument panel, glue it to an extra former, and add to the rear cockpit. Electrical wire insulation (about #20) can be split to remove it from the wire and carefully slipped over the edges of the cockpits to make padded edges.

A pilot figure really helps a Scale model to look more realistic. My local supermarket toy counter yielded a plastic cowboy figure about 6 in. tall for 39¢. A few minutes' work with a knife and sandpaper converted the wide-brimmed hat to a shape closer in appearance to a leather flying helmet. The figure was sawed off at shoulder height to fit the model, but in solid plastic was much too heavy to use. Sawed laterally, the front and back halves were used in a Vacuform to produce an almost weightless figure. Other possibilities could include balsa or styrofoam carved and sanded to shape.

Flying. To save some wear and tear on your nerves and the model, leave off the spinner and radial engine for the first few flights. This will also allow you to adjust the Telco throttle. After you have the Davis flying to your satisfaction, these parts can be tack-glued in place. Very little weight is involved in these two items, but make sure the balance point doesn't shift when they are installed. If it has moved, adjust the tank location to compensate. When you're ready to go flying, stuff some pieces of foam rubber around the tank. If the model lands hard, the tank could wipe out a bit of structure unless padded or braced.

Make sure the balance point is at 1-1/16 in. back from the center section leading edge. Adjustment using the location of the CO-2 tank is a practical method, but be sure the tank ends up with its outlet elevated. If you try to run the motor with the tank nearly at or below horizontal, liquid CO-2 will freeze the line to the motor and shut it off.

Steam any warps out of the tail surfaces, and steam in 3/32-in. washout into the outer wing panels, outboard of the struts (you did take warps out before installing the struts, didn't you?). Trailing edge at tip should be 3/32-in. higher than leading edge.

Find a place to test glide that is softer than concrete for those first few glides. No, I don't usually have the legendary field of tall grass either, but do the best you can. Bend the tail surfaces if necessary to produce a flat fast glide with a wide (40-50 ft. dia.) left circle.

Start out with two layers of card stock behind one corner of the Telco case to aim the thrust line about 1° down and 1° right. Set the Telco throttle so that the motor runs about 60 seconds on the standard tank. This will not quite allow the model to climb, but it won't let it hit the ground very fast either if the trim is grossly bad. After all, we want scale flying for our Scale model, so take it easy and open the motor up in slow, easy stages until you get a shallow climbing turn. Holding the charger with its nozzle pointing up for a gas charge results in shorter runs for test purposes. Later, use the charger pointing down for longer flights.

With a 6cc tank (standard is 2½cc) my Davis flies a lot like an Indoor model, with power on all the time. It even lands with the prop turning; on very short dead grass, it will taxi on touch-down for 10 or 15 feet. Flights with the big tank last 1½ minutes or so, with the model eventually reaching 75 or 100 ft. in very leisurely turns. ROGs are fun, too, although you will have to

experiment with the throttle to get a bit of extra power (and a shorter run).

The Davis has turned out to be a really fun model. All the flying so far has taken place in a grass-covered schoolyard about a block long. Eventually we'll get out to the club flying field (Phoenix Model Airplane Club) for some contest flying. This field is known among local Scale flyers as 'the rock garden,' however, so this can wait!

If you haven't tried CO-2 flying yet, let me pass along a comment I overheard the last time we were out flying (me with a sport model, another modeler with a Scale model—both of us flying many, many flights). A fellow club member said, "Anything that is that much fun ought to be illegal!"

CL Aerobatics/Paul

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used. Dave Brown or Gene Martine: where are you?) The very good Martine-Baron handle is no longer produced because Gene Martine is justifiably terrified that he might be drawn into a lawsuit if some other negligent flier gets hurt. Mufflers are a sometime item: the Adamisin and Martine items are sometimes available; the Bob Paul muffler is available only when there is a full moon. There are some other good mufflers available, but in limited quantities.

Fortunately, we can get engines since we are adapting RC-type engines to Stunt. But, have you tried to get some decent balsa lately? It's a good thing that RC still uses glow plugs, propellers, and sometimes even paint, or we would have to go back to Champion spark plugs and ignition, carving our own props, and (ugh) plastic coverings. It was a sad day when Bob Hunt had to close the doors of Control Line Specialties, and thereby we saw the end to flap horns, landing gear blocks and wires, his very good Tru-Flite handles, foam wings, and many other specialty items—unfortunately, Bob had to feed and clothe his family.

Still, the biggest single accomplishment of the Precision Aerobatics Model Pilots Association is the ease of communication that has been available over the past eight years. The newsletter will continue to be printed, too, although there may occasionally be some lapses due to "real job" pressures. The support of *Model Aviation* magazine (by letting this writer ramble off about 1,000 words a month) is also very helpful to the individualized event of Stunt, so keep those letters coming with ideas, questions, pictures, and hints.

For information on Stunt and PAMPA, write Wynn Paul, 1640 Maywick Drive, Lexington, KY 40504.

CL Combat/Johnson

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the wing area.

You might want to spend some extra time building one of the exotic large models and use the Vipers as backups, although I bet you end up using the Vipers most of the time. The box that the kit came in was big enough for about six models, and that's what I'd suggest you buy. Work on the models each evening for about a week, and you'll have a half-dozen ready to go. I've seen a Slow Combat variation of this model and would assume that you could order some of the kits with the motor mount cut out for a .15, which would reduce the wing loading a lot. Everyone who's seen the kit really thinks it's well-engineered and finished. Some of the Los Angeles

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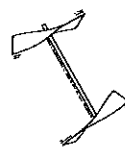
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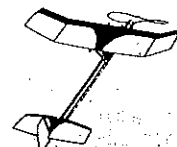
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