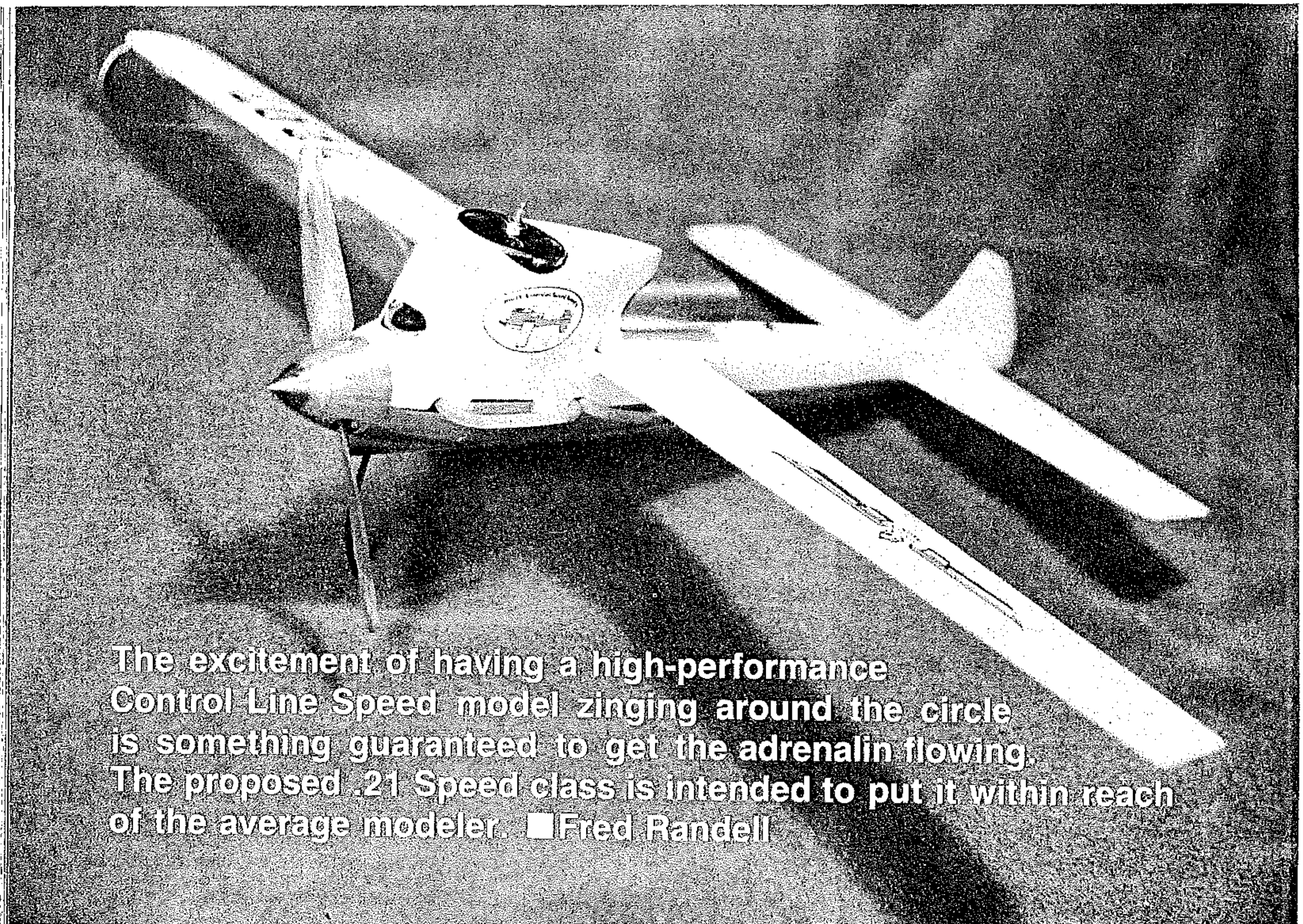

The excitement of having a high-performance Control Line Speed model zinging around the circle is something guaranteed to get the adrenalin flowing. The proposed .21 Speed class is intended to put it within reach of the average modeler. ■Fred Randell

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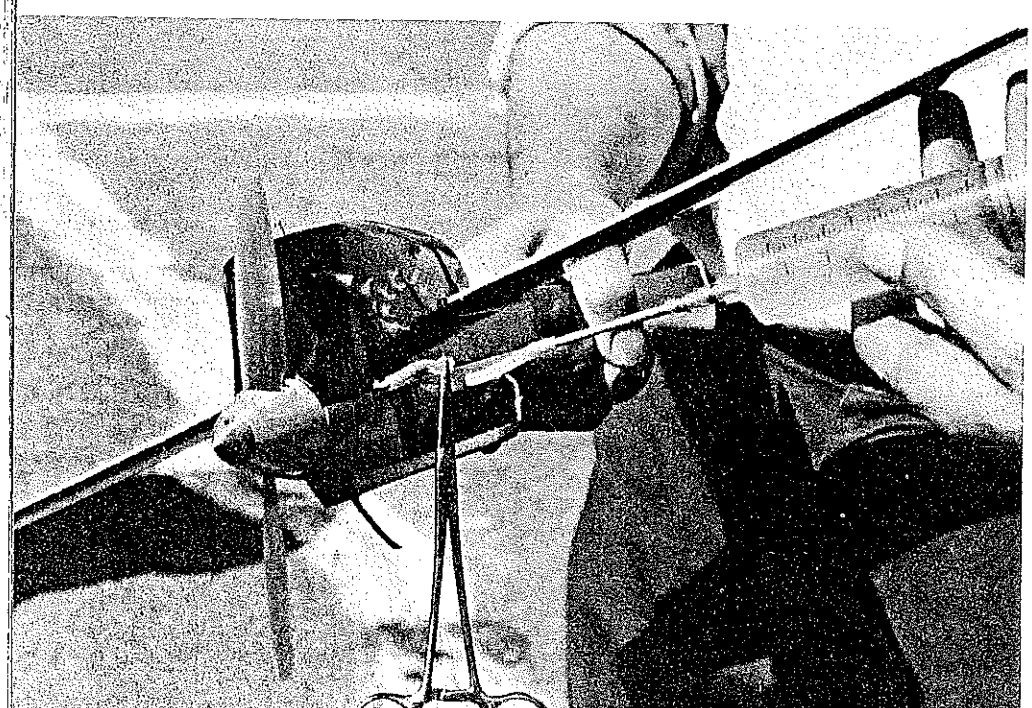
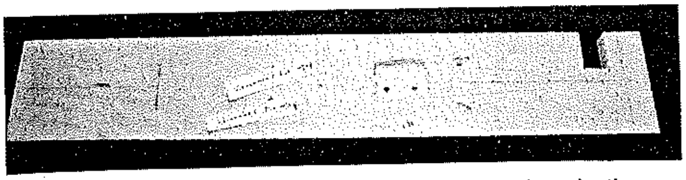
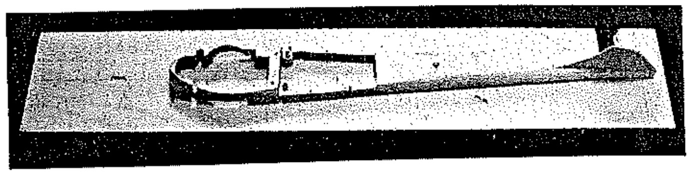


Top: Speed models like this one have traditionally been loaded with secrets known only to a select few within the Control Line Speed fraternity. Above: Hemostats pinch off the fuel line to the carburetor while the fuel bladder is filled with a hypodermic needle. A pressurized fuel system such as this is the simplest way to ensure a constant engine run throughout the flight.

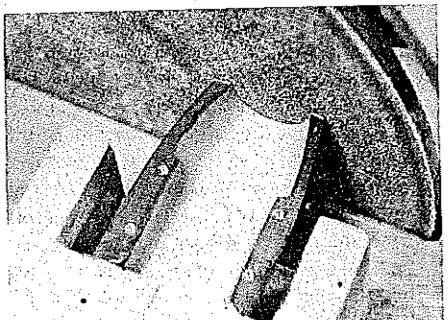
.21 Fun Speed

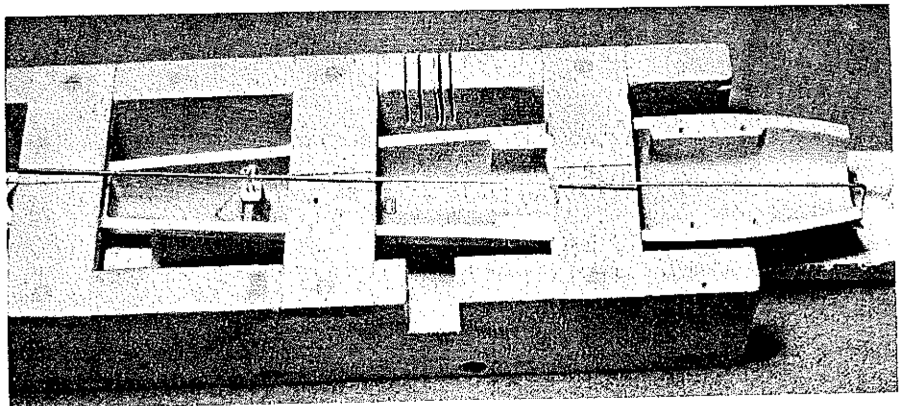
THE ART of building a pure Control Line Speed model has been a well-kept secret for a number of years. Speed modeling has been almost a mystique, known only to those of us who started with the category in its infancy, or to other fliers with whom we shared the secrets along the way. The time has come—in fact it's long overdue—to spread the word about our somewhat unconventional techniques and to initiate other modelers into the fun of truly scratch-building this type of model airplane.





Left: Our author constructed this alignment jig to help make the assembly of his model more accurate. It is made from a piece of cabinet-grade plywood and uses wooden pins to hold components in place during fitting and gluing. Right: The fuselage with rudder in place on the alignment jig. The cutout in the upper right-hand corner is to allow for elevator clearance while checking its movement and adjusting the pushrod.





Left: The rear pan hold-down counterbore operation. If you don't have a counterbore bit like this and can't find one locally, for $10 the author will make you one from a regular drill bit. Above: A scribe fitted through a piece of brass tubing in the rear boss is used to mark the reference line for grinding off the front end of the speed pan. (Text has additional details.) Below left: After the line is scribed onto the pan it is ground to that mark using a disc sander.

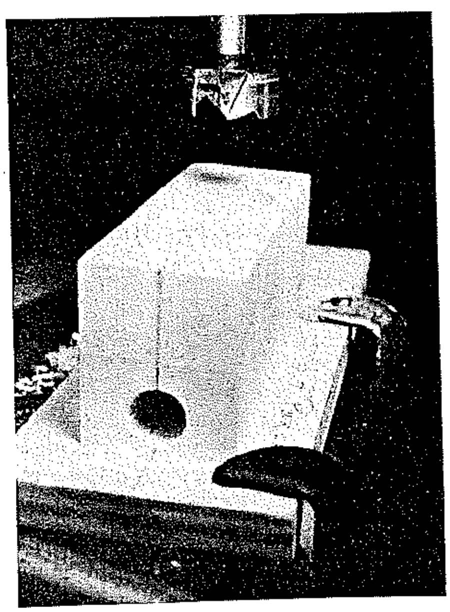
First, let's review the proposed rules for the .21 Sport Speed classification. Although these have been presented before in various publications, in each case some points were either left out or not addressed properly. The rules are as follows:

1) Intention—This event is intended to be a low-cost, low-keyed Speed class for novice fliers and to allow anyone who is physically able to pilot the model. Although open to anyone interested in Speed flying, the event is promoted chiefly for the benefit of newcomers, with the goal of introducing beginners to the class.

2) Engine—The engine shall be of .21-cu.-in. displacement and shall operate on an "open face" or minipipe exhaust system only. Modification of engines is permissible, but no hybrids or crossbreeding of engines are allowed.

3) Airplane—The model shall be of standard symmetrical design and outfitted with either upright or inverted engines. The fuselage shall be of standard full-fuselage design, with or without a speed pan. *No profiles!* The maximum amount of asymmetry from left wing to right shall be 1 in. The engine shall be fully cowled and the model attractively finished. No permanently attached landing gear is required, encouraging the use of a takeoff dolly instead; however, using a single-wheel gear is optional.

4) Lines and control system—The model shall operate on a two-wire control system only, with a minimum line diameter of .016 solid strand. Length shall be 60 ft., 0 in. measured from the centerline of the airplane to the centerline of the handle grip. The lines must be connected outside the wing tip of the model with Pylon Brand link connectors, Stock No. 149, 110-lb. test, or the equivalent. The lead-out wire shall be stranded cable, Pylon Brand No. 145 stainless steel or the equivalent.



The cowl block is made from medium-hard balsa, and a Fostner bit is used to drill the holes for the exhaust stack (facing out) and the cylinder head. After this it will be marked for carving and sanding to its airfoil shape.

5) Fuel—Contest-supplied 10% nitro maximum with 20% oil (½ castor and ½ synthetic recommended).

6) Timing—The model shall be timed for seven laps after three laps have been completed in the pylon. All other timing procedures shall follow those of AMA Class A Speed.

7) Propeller—May be of any manufacture, but shall be restricted to standard two-bladed design. *No single bladers.*

8) Fuel system—No restriction is placed on fuel delivery. Suction type, crankcase pressure type, or bladders are allowed.

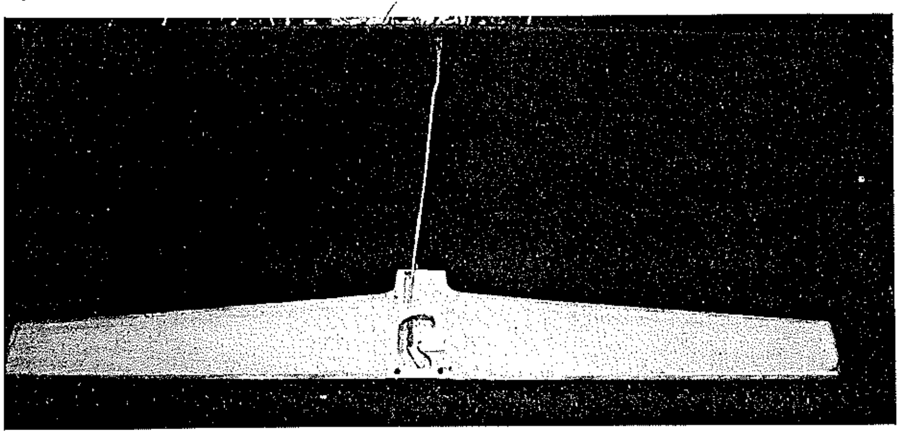
9) Pull test—The airplane and its control system shall withstand a pull test of 40 G's (2½ pounds per ounce of model weight).

Tools and materials. Since we have only a simple drawing with a minimum of dimensions for guidance, to achieve some semblance of squareness in the finished product we'll have to begin by making some tools to simplify building and supplement the hardware we have on hand. The tools to make are as follows:

1) Speed pan drilling fixture, as described on the plan and shown in an accompanying photo.

2) Alignment board (see photo) for the fuselage, wing, and tail. This is cabinet-grade plywood, approximately ¾ x 4 x 20 in., and finished on one face with birch, walnut, oak, or maple. You may be able to purchase this as scrap from your local lumberyard.

3) Sanding blocks and sanding dowels, made by gluing rubber inner tube material to suitable sanding blocks, then applying carpet tape (which is sticky on both sides) to the rubber. Pieces of sandpaper in appropri-



A look from underneath reveals the bellcrank and the 1/16 aluminum plate which retains the bellcrank. Also note the holes where the 5/32-dia. brass tubing goes to align the 4-40 hold-downs.

ate grits are held in place by the carpet tape. Model cement holds the sandpaper directly to the dowels.

4) Wooden swab sticks. May be purchased at most pharmacies or TV parts stores.

The standard tools and adhesives you'll need for the project are listed at the end of this article. There's no reason you can't use simple hand tools alone, but that will prolong your building time. It's worth your while to seek the help of someone with the appropriate power tools such as a drill press, band saw, disc sander, and lathe. Those of you who are still in school may find that the shop teachers are willing to assist with cutting and shaping some parts. Another source is a local cabinetmaker. Also, your local hobby shop should know of customers who own machine tools to help with the tough cuts; most model builders are more than willing to assist if asked.

For the most part, the required building materials listed below can be purchased from your local hobby shop or from advertisers in this magazine:

- One sheet basswood, 1/2 x 3 x 36 in., for the fuselage crutch
- Two sheets basswood, 1/4 x 3 x 36 in., for the wing and crutch top
- One sheet soft balsa, 1/4 x 3 x 36 in. (if you choose to laminate the cowl)
- One piece basswood, 1/16 x 3 x 36 in., for wing-and-fuselage-to-cowl spacer
- One sheet medium-grade balsa, 1/8 x 3 x 36 in., for stabilizer
- One piece mahogany, 1/8 x 2 x 12 in., cut into strips to outline the wing and stabilizer
- One piece each 3/32-I.D., 1/16-I.D., and 1/8-I.D. brass tubing
- One piece .057-in.-dia. music wire
- Two quick-disconnect clevises (such as Du-Bro)
- Two pushrods, threaded on one end
- Class A or B speed pan, Darp or equivalent brand
- Steel plate, 1/2 x 1 1/4 in. and .050 or .055 in. thick, for the bellcrank

A list of specialty parts suppliers in included at the end. Possibly, more complete and current information could be gotten by attending a local CL Speed contest and asking contestants where they obtain their supplies.

Construction begins with selection of the engine and speed pan. This Sport Speed model can be powered with any .21 cu.-in-(3.5cc) engine sold for aircraft use. Once you've chosen your engine and speed pan, begin fitting one to the other. First order of business is to obtain a flat surface on the pan to make it suitable for mounting the engine. A good method for achieving this is to use medium-grit sandpaper taped to a sheet of glass, which in turn is secured to your work surface with carpet tape. The flat side of the pan is moved back and forth against the sandpaper until no valleys remain.

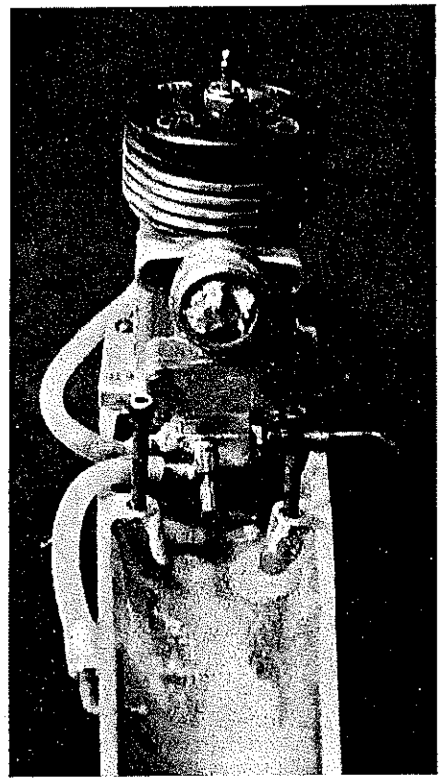
The problem of achieving squareness of the pan front end is solved with the scribe and grinding as sketched on the plan. Measure across the rear hold-down boss, mark the center, and drill with a No. 43 bit (we will tap it for 4-40 threads later). Cut a piece of music wire 12 in. long, grind a point on one end, and make a 90° bend 1/2 in. from the point.

Cut a 1/2-in. length of 3/32-in. brass tubing, then drill a 1/16 hole at a 90° angle to the tubing length and 1/8 in. from one end. Slip the 1/16 music wire into this hole; it should be a force fit. The brass tubing will now pivot in the No. 43 hole in the rear hold-down boss. Adjust the music wire length as necessary, and use the scribe to draw an arc at the front. Connect the extremities of the arc with a straight line, which becomes the reference for grinding off the pan front end.

Note: It is possible to adjust the length of the scribe fixture so that the scribed arc will produce a pan width to match the spinner size you plan to use. (The OPS spinner fits very well on a Rossi .21.) When the pan front is squared off, double layer it with masking tape to provide clearance for engine mounting.

Set your engine in place on the pan with spinner backplate just touching the masking tape, and check to see if the engine mounting lugs are flat on the pan. If not, use your Dremel tool and appropriate cutters to clear away any areas of the pan which may be keeping the engine from sitting flat in position.

To mount the engine, start by painting the area of the pan to be drilled and tapped with either layout fluid or model dope (blue or red) thinned 50-50. Place the engine in the pan with the spinner backplate just touching the masking tape on the front of the pan.



This Rossi .21 has been fitted with a homemade adapter for a K&B needle valve assembly. This particular pan is the Darp A pan with the second set of hold-downs ground away.

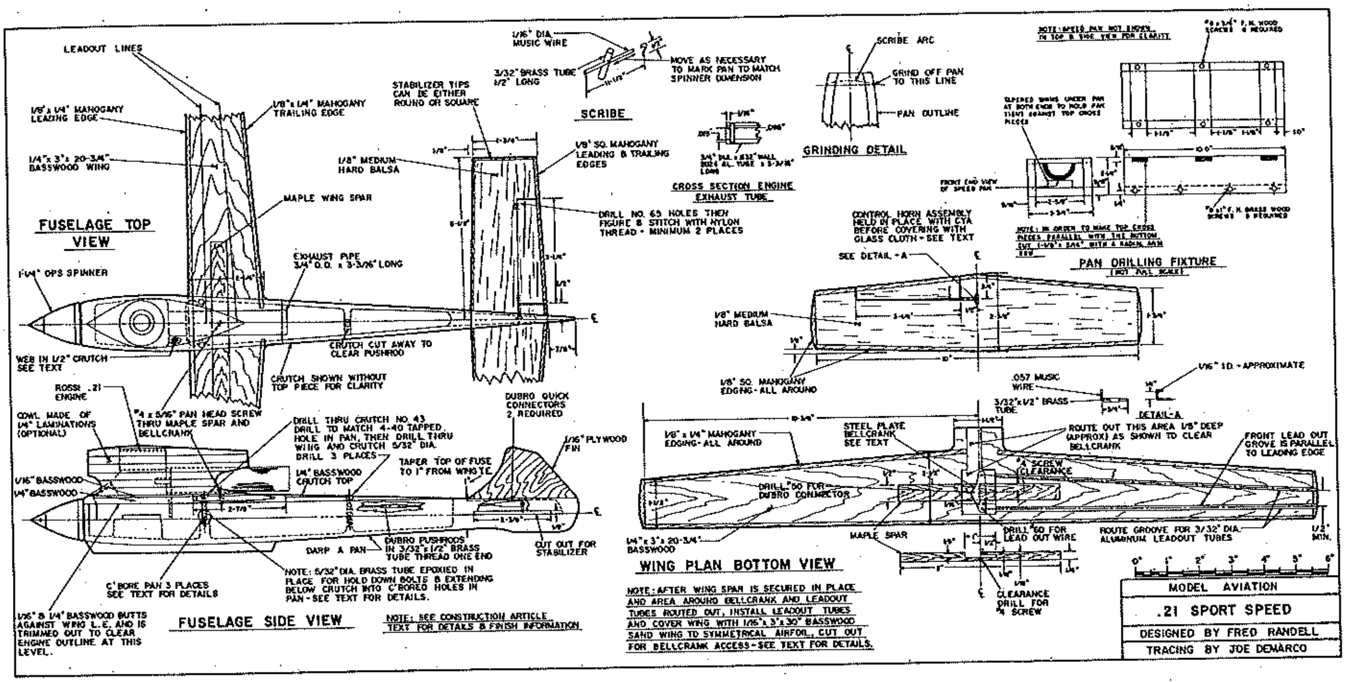
Select a drill bit that just fits through the mounting holes. With the engine in place on the pan (you can use a drop of cyanoacrylate (CyA) glue to hold it), insert the drill through the holes and rotate it a few times to make an impression in the paint. With all four hole centers marked, place the pan securely in a drill jig and very carefully center punch where the drill made its marks.

Using a drill press and No. 43 bit, drill the four holes at the center-punched marks 5/16 in. deep, then tap for 4-40 threads. Make sure you use a sharp (new) tap. If this process is new to you, get help and advice.

At this point you can also drill and tap the bosses for the airframe (top) hold-down bolts. You may want to counterbore for the brass alignment tubes that will be fitted through the fuselage later.

The counterbore procedure is an extra refinement that produces better fuselage alignment, and isn't necessary for holding the model together. A second counterbore procedure—countersinking the screw heads below the model surface—is also optional. I make the counterbores myself, and will be glad to do so for others. Just send the drill that you want to have ground, specify the desired pilot dimension, and include $10 per drill. My address is 659 Colony Rd., Box 7305, Canal Fulton, OH 44614.

The alignment fixture is made from a flat piece of cabinet-grade plywood and marked with a centerline. Make sure that the end of the board is square with one of its sides. Mark the centerline so that it runs parallel to that same side.



Full-Size Plans Available . . . See Page 188

Fuselage crutch. Mark a centerline on the wood you will be using for the crutch; mark a perpendicular line where the front of the pan will be. Center the pan over the centerline of the crutch; and trace the outline of the pan. Measure where the bosses of the pan occur, and leave equal amounts of wood in these areas.

Draw the outline of the bottom section of the engine crankcase in its proper relative position. Provide for 5⁄32-in. crutch walls all around (except that the crutch is left intact from the engine backplate to the wing leading edge for strength, and the hold-down bosses should have at least 3⁄32 in. of surrounding wall). Cut and sand the crutch outline to shape.

Mark both ends of the crutch to show the centerline. Place the crutch blank over the centerline of the alignment fixture, making sure that the wing side is up (with the pan side lying against the board).

The alignment pins should be installed about 3⁄32 in. in from the crutch sides and also on each side of the pan, two in the area of the engine mount and two in the area of the rear hold-down boss. Hold the crutch in place with a couple dabs of glue, then drill through the crutch and about ¼ in. into the fixture with a No. 43 bit. This size lets you press the wood swab sticks, cut off to about 3⁄32 in. above the fixture surface, into the fixture. Redrill the crutch with a No. 42 bit, a size which is large enough to allow the pins to slip into place while still holding the alignment.

Place ¼-in. socket setscrews into the pre-tapped hold-down bosses. With the setscrews barely extending above the surface of the pan, place the crutch carefully in alignment over the pan, and then press the two together to mark where the screw holes are to be drilled. Turn the crutch over, and drill with a No. 32 bit.

The beauty of the alignment fixture is that all the other pieces (wing, stab, cowl, etc.) can also be held temporarily in place with swab stick dowels. Various units can be removed and put back in place while maintaining perfect alignment overall. Also, many of the pieces can be carved, sanded, and fitted before they are fully assembled. Once the basic parts are assembled, it's an easy matter to install the control unit and adjust for freedom of movement and elevator travel before everything is permanently glued into place. The cutout in the alignment fixture clears the elevator once the position of the latter on the crutch is determined (see photo).

Now that the crutch can be removed and replaced without disturbing alignment, mark the inside of the crutch with at least 5⁄32-in. walls, *leaving a web between the wing leading edge and the engine backplate*, and then cut straight in from the tail *centerline*.

Saw the interior outline, noting that the side of the crutch where the rear hold-down will be located remains intact, while the opposite side where the pushrod will come through to the elevator is hollowed out (see top view drawing). Continue sawing to the front around the forward hold-down bosses and up to, but not including, the previously created web on the inside of the crutch walls, which is still left intact.

Drill a hole in the center of the engine mounting area. Working a jigsaw or coping saw blade through this hole, final shape the crutch interior outline so that it will just clear the engine.

Note: When the rudder is added it will be properly aligned, and the sides can then be reshaped before final assembly and gluing.

Make the wing spar as shown on the drawing from hard maple or an equivalent hardwood. Drill the bellcrank pivot hole in the

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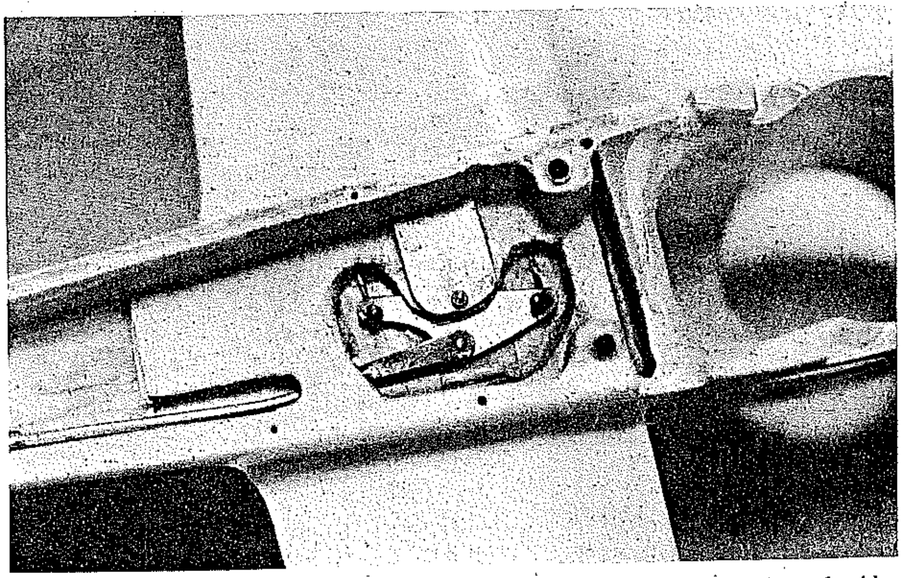

The lead-outs are placed through the bellcrank, knotted, and secured with a drop of solder. The aluminum plate is then tapped for the pivot screw and glued in. The two pieces of brass tubing extend from the top and mate with the counterbored holes located in the speed pan.

All of the Russians were using "minimal"-style models of about 38 to 40 in. wingspan. Both Pitskalev and Kalmykov used a construction technique wherein the rear fuselage and horizontal stabilizer are built onto the half-pan, with access to the pan being gained via a two-part top cowl. All the models exhibited very careful attention to the cooling of the header section of the tuned pipe. All used carbon-fiber propellers believed to be of varying pitch, ranging from 6.0 in. at the hub to 4.5 in. at the tip. An interesting feature of Kalmykov's and Pitskalev's engines was the use of a threaded collar to hold the head insert—which in Pitskalev's case was tightened down with a real vengeance.

The cylinder heads featured replaceable glow elements. They were also using thick-walled aluminum tuned pipes of large volume reaching a maximum inside diameter of 30mm.

The Hungarians were flying their familiar setups of an asymmetric, outboard-sidewinder model with narrow wing chord (2 in.) and a long wing of about 4-ft. span. They continue to use propellers having a wide chord and a thick section made of maple. Josef Mult and Sandor Segedi were using the new Moki S12 front-induction, rear-exhaust engine. It resembles a Rossi MK3.

The Hungarians placed fourth, sixth, and 12th for individual standings, which allowed them to capture second place in team standings.

The Chinese showed superb consistency, but they just weren't fast enough to place in the top 10. Yibo Ding placed 11th with a speed of 281.25 kph, followed by Shizhu Sun in 13th place with 276.92 kph and Lianli Ba in 16th place with 275.23 kph. The Chinese team was third in overall standing.

The Polish team had Andrej Rachwal in tenth place with a speed of 282.13 kph using a modified Rossi engine with a large-volume pipe. Tomasz Rachwal, son of Andrej, placed eighteenth with a speed of 272.73 kph. Tomasz was the youngest contestant (15 years of age), which entitled him to win a Riga motorbike. Tomasz Hojnacki placed 23rd with a speed of 267.45 kph. The Polish team captured fifth place in team standings.

The French team had Jean Magne and Roland Jarry at 17th and 32nd places with speeds of 274.18 and 254.23 kph, respectively.

The United Kingdom team included Peter Halman with his new model, which was completed in the three weeks just prior to the world championships. Peter had torn up his regular Speed model while test flying in England, and he spent the entire three weeks constructing a new model. Peter placed seventh in overall standing with a speed of 285.49 kph using the new Irvine .15 racing engine. Gordon Isles and Dick McGladdery placed 24th and 25th with speeds of 267.45 and 266.66 kph, respectively. The British team captured sixth place in team standings.

The top-placing American was Carl Dodge in ninth place with 283.10 kph. Jim Nightingale was 15th with 276.50 kph, and John Newton was 21st at a speed of 270.47 kph. John and Jim were using engines made up from Moki crankcases with their own inner parts.

Carl Dodge's engine setup was in many ways the most individual of all contestants. It was the only rear-induction engine at the world champs. In addition, he used a glow plug instead of a head insert. There was quite an audience when he stripped the engine to show fellow competitors. The Americans were fourth in team standing.

On a concluding note, I would like to congratulate all of the contestants and their performances. These championships showed that aeromodeling is a sport that can unite competitors from all countries, and that no matter how good, we all love talking about model airplanes.

Another highlight I almost forgot to mention was the closing banquet. The occasion offered everyone the opportunity to wish all a good-bye and to swap patches or goodies. This world championships will be one that holds fond memories for me in the meeting of many old friends and in the making of new ones.

My next Speed column will cover some of the technical issues associated with FAI Speed.

(Note: Tables of individual and team performances are included in the "Competition Newsletter" section of this month's issue. RMcM)

Fun Speed/Randell

Continued from page 69

approximate position shown.

Wing. Cut to shape as shown in the plan, taking care to make the spar cutout a close fit. Glue the spar in place (I use Elmer's glue). Glue 1/8 x 1/4-in. mahogany strips in place as shown, holding with lots of masking tape until dry.

Groove or rout the wing for 3/32-in. leadout tubing, then tack glue the tubes in place.

Make sure you have cleared away enough wood to provide for bellcrank travel (see drawing). Position the bellcrank as shown, with the connector in place and a short length of pushrod installed. Install the pivot screw, and check for freedom of movement.

Using a 1/16 x 3 x 36-in. basswood sheet, make a cutout that will allow access to the bellcrank as shown in an accompanying photo. Be sure that the cutout sheet is left solid at each tip. Glue it in place, trim it to outline, and carve it to a symmetrical airfoil section from root to tip. Do not carve the wing where it mounts on the crutch.

Note that the drawing shows this model set up for clockwise flying. Simply reverse the lead-out and spar positions in order to fly counterclockwise.

Stabilizer. Using 1/8-in. medium-hard balsa, build the stab as per the drawing, and finish with 3/4-oz. glass cloth. Attach the stabilizer with epoxy, but do not paint it. Temporarily stitch the elevator in place, secure the elevator horn in position as shown, and adhere with epoxy.

Position the stabilizer on the centerline of the alignment fixture board as shown, then put two alignment pins through the stabilizer centerline and into the fixture centerline.

Add the Qwik Link with the pushrod attached. If you haven't already made the cutout to clear the elevator, do so now. Cut the pushrods to length.

Wing-to-crutch assembly. Align the wing on the crutch centerline, and tack glue. Drill two holes (the location is up to you) for the alignment pins. With the flying surfaces pinned in place, adjust the bellcrank-to-elevator travel as follows:

With the bellcrank in a neutral position and the elevator *level*, cut the butt ends of the pushrods so that they do not quite meet. Insert a piece of 3/32-in. x 1/2-in.-long brass tubing, and solder. Minor adjustments can now be made by disconnecting the pushrods from the elevator horn and turning the clip in or out. (Now you can see why we just pin everything in place at first.)

Do final drilling for the brass sleeves in the crutch and wing with a 5/32 bit. The sleeves are epoxied in place through the wing and crutch, and then into the counterbored holes in the pan. Finish drill the rear hold-down after the final top piece has been pinned in place for shaping, and then glue.

To build up the fuselage, cut out a piece of 1/4-in. basswood to fit around the engine and from the wing leading edge forward to the end of the crutch (pin this in two places). Add a piece of 1/16 basswood in the same manner to bring the top of the crutch level with the top of the wing. Fit a piece of 1/4-in. basswood between the wing trailing edge and the end of the crutch, cut a slot in it to fit around the rudder, and pin in place.

Engine cowling. This is fashioned of 1 3/4 x 1 5/8 x 5-in. medium-hard balsa. Determine the cylinder and exhaust centerline relative to the engine's position on the crutch. Place the block in a vertical position (check both ways).

Drill a 1-in. hole for the exhaust as per the photo, making sure you drill into the area where the cylinder will be located. Drill another hole about 1/32 in. larger than the cylinder diameter. Draw the cowl outline as you desire, and then saw to shape. Install the engine in the pan mount, and place the crutch atop it. Position the cowl, relieving the cowl block as necessary to fit around the engine, and then pin the cowl to the crutch. (*Note:* If you use the option of tack gluing a series of 1/4-in. laminations together and then splitting them apart after preboring the cylinder and exhaust holes, you can carve away the interior in steps to more closely match the engine shape.)

With the cowl, crutch, and top pieces in place, but without the wing or stabilizer, the fuselage is ready to be carved and sanded to shape as per the drawing. Note that the configuration tapers from the wing trailing edge to where the rudder enters the crutch.

Final assembly. Cut the lead-outs to the desired length, tie a tight knot in one end, and secure with a drop of solder (see photo). Thread the lead-out cable through the holes in the bellcrank and out through the wing tip. Don't finish the ends yet, as you may want to pull the lines back inside the wing while you finish sand and paint.

Assemble the wing crutch and stab. With the assembly positioned on the alignment board, check all controls for freedom of movement and make certain there's elevator horn and pushrod clearance before gluing everything in place. Double-check that the cowling fits properly, and glue.

Epoxy the 5/32-in.-dia. brass tubes through the wing and crutch into the counterbore in the pan, allowing some of the tubing to protrude above the wing. When this is dry, counterbore below the surface so that the hold-down screw fits flush. Repeat the procedure for the rear hold-down screw.

The 3 3/16-in.-long x 3/4-in.-dia. tubing is just pushed in place on the engine exhaust extension. If you cut the groove in the approximate position shown in the drawing, no extra hold-down screws are necessary to secure the tubing.

Covering and finishing. Sand all surfaces with No. 220 production paper until smooth. Cover the entire model, with the exception of the stabilizer, with 3/4-oz. glass cloth, and adhere with K&B polyester resin. Cover small sections one at a time, overlapping the cloth as necessary. After the resin has fully cured, rough sand the high spots to even the surfaces, and apply a second coat of resin.

When that's thoroughly cured, wet sand the model with 220-grit wet-or-dry sandpaper. Apply two coats of Profill (from Aero Craft Products, 960 Brenner Ave., N.W., Massillon, OH 44646; tel. 216-833-0789), wet sanding after each application with 400-grit paper. Brush on Pactra Formula U for the final finish, and then stitch the elevator in place with nylon thread.

Your model is ready to be test flown and enjoyed. Hope your sojourn into the unique building methods of Control Line Speed has proven an interesting one. Return visits invited.

List of standard tools:

(a) Dremel Moto Tool with assorted cutters and grinders
(b) Various numbered and fractional drills as indicated in the drawing
(c) Electric hand drill
(d) Coping saw, jigsaw, or band saw
(e) X-Acto knife with various blades
(f) White glue, cyanoacrylate glue (CyA), and CyA debonder
(g) An assortment of wood files (whatever fits your hand)
(h) 4-40 tap and No. 43 drill bit

Speed pan suppliers:

- Nick Arpino, 301 Woodacres Rd., East Patchogue, NY 11772
- Des McAnelly, 47 Norwood St., Invercargill, New Zealand
- Herb's Speed & Racing, 1621 M St., Merced, CA 95340

FF Scale/Warner

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salt their publications with the great drawings Ken has included. If you can read it without getting excited, you should turn in your Captain Midnight Secret Decoder Badge!

To order the catalog, send your two clams to OTMS, P.O. Box 7334, Van Nuys, CA 91409. Support cottage industries!

Al Lidberg's latest Rubber Scale plan has some features which make it a super transition for the modeler who has built a few kit models and is ready to step up to something really classy. It's a 1940 Napier-Heston JA-5 racer which spans about 32 in. The things that make it exciting are the fact that it is not a done-to-death military subject that your fellow modelers just sort of ignore when it's brought to the field. Instead, it has a nice fat (but streamlined) fuselage with a big spinner and lots of room for rubber. Thrust adjustments and center-of-gravity are actually shown on the plan (the lack of which on most plans makes you wonder if the designer ever flew his prototype). There's also a knock-off wing mounting system similar to the one I showed you in the photo of my Taylorcraft/Auster in my March 1988 column. He shortened up the wire stubs to make it truly "knock-offable," whereas I prefer to use longer stubs which bend back a bit and absorb shock without actually coming off. You can start longer and trim 'em down as you fly until you get what works best for you.

Al's building and trimming booklet has some nice hints, too. The plan and booklet come with a catalog for $6 from A.A. Lidberg, 614 E. Fordham, Tempe, AZ 85283.

Hi-Line, Ltd, P.O. Box 341283, Bethesda, MD 20817, is the newest company in the exploding Mini-Electric field, and it is one of the best. The company has kept costs to the modeler down by providing "do-it-yourself" kits in which the buyer gets two motors and the materials to rewind the armatures and build the gear-drive (freewheeling). Hooking up everything requires using no more than a common pencil-type soldering iron and the ability to follow the step-by-step instructions.

A charger kit and Ni-Cd batteries are also available. The MEK-1 dual-motor kit features the high-quality carbon-brushed motor made for the Kodak disc-drive camera—a thing which many of you have purchased from surplus sales outfits but have not known what to do with.

Hi-Line has engineered the hopped-up motor for you and has provided the gears and wire to make it work for aeroplanes instead of cameras. The tiny, six-watt darlings are just the things you need for multiengined craft having wingspans ranging from the mid-twenties to the fortyish range. The 4.6:1 gear-down turns a 5-1.2-in.-diameter Williams Bros. CO_2 plastic prop (available from Peck-Polymers) at 4,500 rpm. A setup using one motor and its battery weighs only 1.5-1.8 oz.!

These are the motors powering the Nats-winning single- and multiengine Scale ships of Don Srull and Dave Rees with great success. Drop Hi-Line a letter and request more information. Be sure to include a large SASE.

Idiot-sheet judging versus Mooney judging: Back in the Sixties, the Flightmasters (Los Angeles, CA), sparked by Hal Osborne, got together an "idiot sheet" to use in judging rubber-powered Scale models. They ended up getting it adopted as the official AMA standard for the class. At the meeting attended by many of the top Scale modelers of that time, the one idea that was brought up over and over was that the official AMA rules should "protect" Joe Doe out in Podunk, IA from arbitrary decisions on the part of a Scale judge.

Our goal was to set up a series of categories based on various parts of the plane and give cer-

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