

Midwest Sport Racer

498



Our author poses with his racer. Classes such as this one, not requiring super high performance and/or expensive equipment and a machine shop for one to be competitive, are the bread and butter of CL Racing.

ANYONE who is interested in engines probably has thought about getting into some form of racing. I'm no different. Though I am primarily a Free Flighter, I grew up with a Control Line background thanks to my father. I still remember trying to get more than two laps from a Scientific Kingpin without crashing.

I fly in a lot of Free Flight contests. Just when I was beginning to feel that it would be nice to try something different, along came a good CL club, the Milwaukee Circle-masters. This wonderful group provided me with a fine flying field and the enthusiasm to

This category of Control Line Racing emphasizes fun at low cost with engine/plane set-ups that, with practice, can make almost anyone competitive.

■ John Lorbiecki

pursue a new aspect of modeling. From them I found out about Midwest Sport Racing, the basic rules for which follow:

The fuselage must be of the profile type and 18 in. long. The wing has a span of 34 in. and a chord of 6 in. A plain-bearing, non-Schnuerle .35 engine is required, together with a suction fuel system and 10%-nitro fuel. Races are for 100 laps with three planes in the circle; three pit stops are required.

It is a lot of fun to fly in this type of event. With these specs, model speeds typically are in the high 90 to low 100 mph range—a reasonable clip for a rookie to start.

The model presented here is a good example of the models that are flown in the Midwest, although much of the construction concept comes from my Free Flight background, particularly in FAI Power. This is very lightweight but strong enough to take much abuse. The wing is offset 4 in. for drag reduction (by enclosing that much

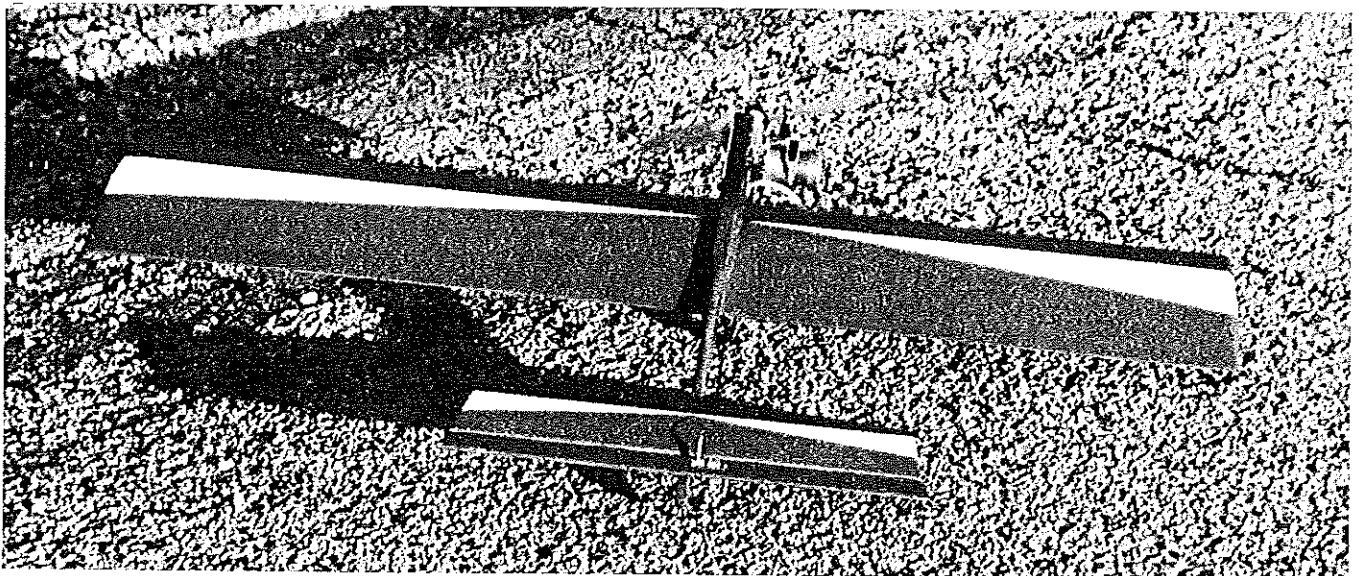
more of the lines within the wing), and a flat-bottom airfoil is used for ease of construction. (My thanks to a number of Midwest fliers, such as Larry Dziak, Jerry Meyers, and Billy Hughes, whose ideas were incorporated in this design. I must also give credit to fellow club members Roger Beltman and Gordie Teschendorf; they have been very free with advice learned the hard way and always willing to help the beginner even in the heat of competition.)

There is nothing unusual about the fuselage other than for the landing gear, which *must* be made of 2024-T3 aluminum. This type of gear strengthens the model's nose, and constructed and mounted as shown, the airplane can be landed at a high speed and taxied to the pitman. The gear can be cut out with a hacksaw and hand drill.

Construction notes. Everything except the doublers is glued with a thick cyanoacrylate (CyA) such as Gap Zap or Super Hot Stuff. To be truly competitive the model must be light *and* strong, so select the wood according to the job it must do. The engine you will use should be chosen at the beginning so that the fuselage can be made with the proper cutouts and mounting holes.

The wing is the best place to start, as everything is built around it. For the top and bottom $\frac{1}{16}$ -in. sheeting use A-grain balsa weighing 14 to 16 gm. for a $\frac{1}{16}$ x 3 x 36-in. piece. The pine spar, glued between the sheeting, should be straight-grained and strong. Use wax paper underneath the sheeting when gluing the spar to it.

The simple technique for constructing the wing is from the Hot Stuff Tips video-



Most evident in this shot is the offset in the wing. Borrowing from FAI CL Speed models, the lines are within the extended inner wing panel, lowering the overall drag on the lines. Simple paint scheme is attractive and easy to match should repairs become necessary.

tape put out by Satellite City. First, have at hand a firm, straight surface for building on (it need not be soft to accept pins, as pins won't be used). Use 3M 77 or Spraymount adhesive to hold the sheeting to the work surface. Cut the exact wingspan and chord from one of the balsa sheets that was prepared earlier. A sheet of wax paper is then cut so that it is about 4 in. longer than the span. Spray one side of the wax paper with the contact cement; put this side down on the building surface, taking care that there are no bulges or creases. Spray the wax paper once again with cement; after a few minutes, place the balsa sheeting directly on the wax paper. (Don't be alarmed. The sheeting is easily removed from the wax paper, and the contact cement that adheres to the sheeting can easily be rubbed off after the wing is constructed.)

Cut the leading edge to shape, and glue it in place. Using a square and ruler, mark the rib locations as shown on the plans (A felt-tip pen is good for this). Cut out the bellcrank platform, and mount the crank to

a sharp X-Acto knife, following the template as closely as possible. Using a drill or a sharpened piece of brass tubing, cut the holes for lead-outs into the ribs. Lay the ribs into position on the lower sheeting, and glue them. (Either the thin or thick CyA will work fine for this, but the thin type is easier to use because the rib can simply be held in place while the thin CyA is run into the joint.) Install the lead-outs and pushrod. Add the vertical-grain webbing as shown on the plans.

Use a large sanding block on the entire wing structure to remove any bumps or bulges. The wing tips should be in place before the sanding is completed; add the tip weight at this time. The trailing edge of the lower sheet should be slightly tapered with the sanding block for a good fit with the upper sheet.

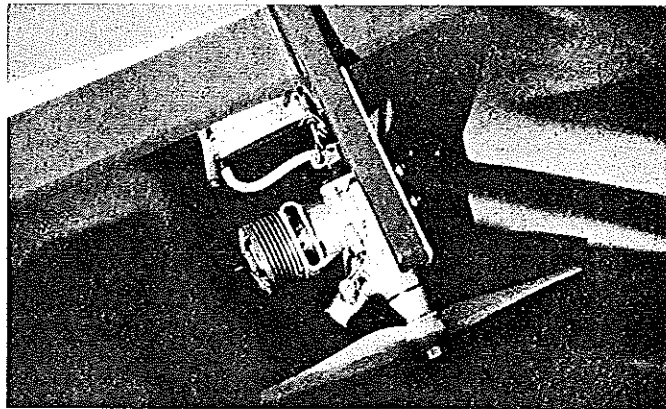
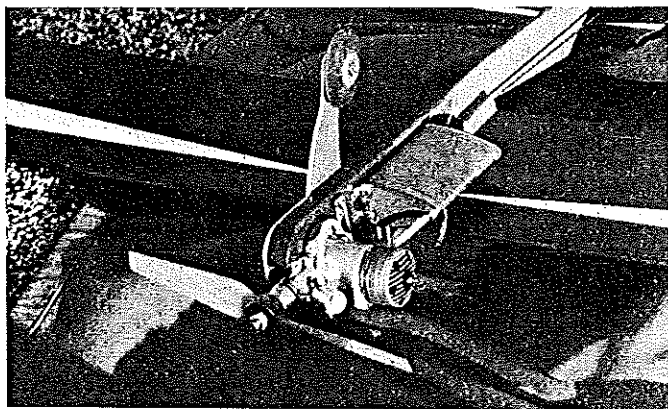
Prepare the upper sheeting, leaving excess stock on the chord and span. Using a metal straightedge, trim one side of the sheet and trial-fit it to the wing, the trimmed edge butted against the leading edge; trim as

palms of both hands, roll the sheeting into place across the chord, using pressure over all the areas where the CyA was applied. Slide your hands around on the sheet to assure that there are no loose joints. That's it! Sand the entire wing to final shape in preparation for fiberglassing.

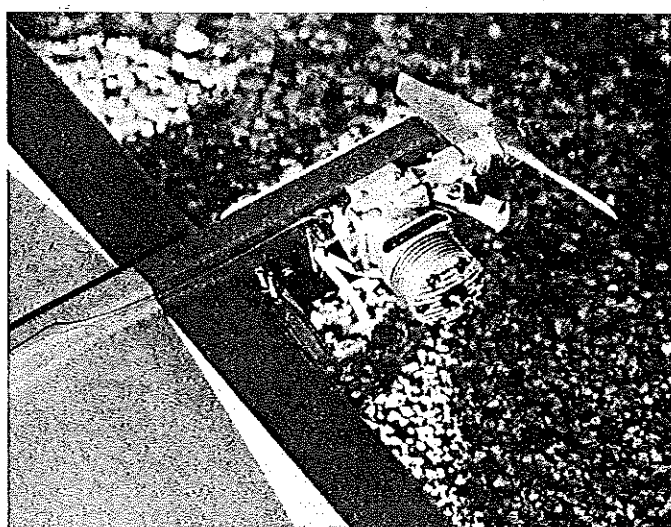
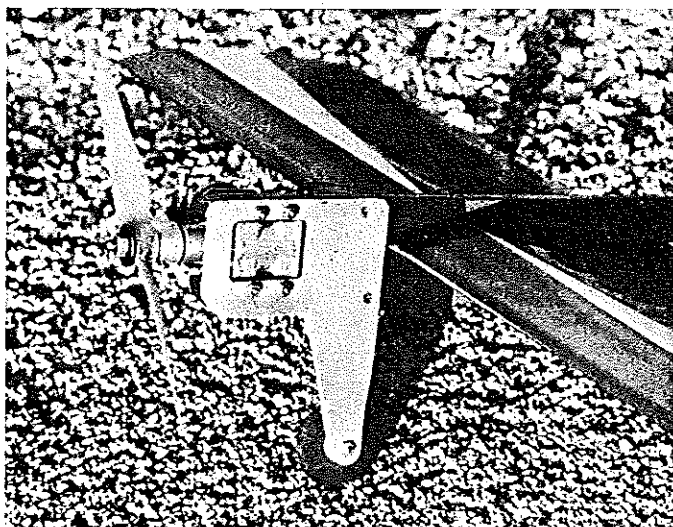
I used .6-oz. K&B fiberglass cloth glued in place with Hobbypoxy 2. If properly done, the entire fiberglassing process will add no more than 1.25 oz. of weight.

Cut a piece of cloth that will extend from tip to tip and wide enough to cover both the top and bottom. Mix the two beads of epoxy, approx. 2 in. long, which will be applied with a short, stiff-bristled acid brush (purchased from a hardware store at a low enough price to be used once and discarded). Also have at hand a heat source such as a MonoKote heat gun or hair drier.

Lay the cloth over the top of the wing. Starting at the trailing edge, apply about a half-brushful of epoxy to the wing through the fiberglass. Using the heat gun, warm the epoxy until it begins to flow. When the



Left: Offset landing gear is crucial for good handling on the ground and fast pitting. Right: Engine is side-mounted as per the rules. The extension on the carburetor helps provide the vacuum necessary for consistent runs on the required "suction only" fuel system.



Left: Details of the landing gear/engine mount plate. Easy fabrication and long, trouble-free life are its strong points. Right: Crankcase on the Series 75 K&B .35 has been reversed to facilitate priming. Tank vents and shutoff are in these positions to help speed up pit stops.

it using a flat-head screw. Decide at this point if the lead-outs are to be external or internal. (I use music wire of .048-in. dia. for lead-outs and recommend internal mounting for less drag.)

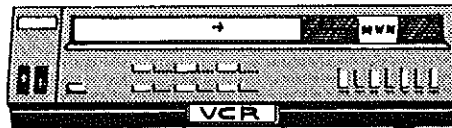
Make a master rib template from sheet aluminum. Cut out all the required ribs with

necessary to obtain a good fit.

The next step works like magic. Run a bead of thick CyA on every rib and joint that the top sheeting will touch and also a bead on the edge of the sheet where it will touch the leading edge. Slide the sheet into place at the leading edge. Then, using the

epoxy is heated enough, it will begin to run like water. Brush the glue around until there is no gloss; this is the important part of the process. Continue doing this over the entire structure. When complete, hang the wing by the lead-outs to cure overnight. After it has cured, trim away the excess cloth, and

RC VIDEO MAGAZINE PRESENTS . . .



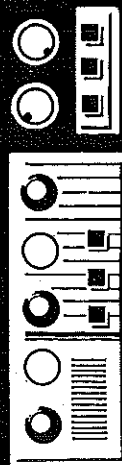
AN EXCITING LOOK at Radio Control modeling on video cassettes. Now as close as your VCR you can experience the excitement of NATS — Grand Masters Scale Finals — Tournament of Champions — Byrons Original Fan Fly and World War II reenactments and **MUCH, MUCH MORE.**

But this is only part of the programming included in these professionally prepared video tapes. Interviews with top flyers and master builders, product reviews and "how to" series on building and flying and product information supplied by manufacturers.

- With a one year subscription you will receive:
- four tapes a year (one every three months)
 - 60-120 minutes of programming; each issue containing multiple subjects
 - mailed directly to you

RC Video Magazine is the newest and most exciting way to experience the world of RC — **ORDER YOURS TODAY!**

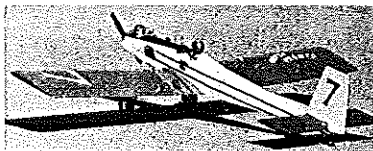
Send name, address and VCR format (Beta or VHS) and check or money order for \$90.00 + 6.00 postage and handling to **RC Video Magazine, Inc.**, P.O. Box 3578, Boulder, CO 80307. Or phone in your MasterCard or Visa order directly to (303) 443-7170.



DAVE ROBELEN'S PRONTO AND SUPER PRONTO

**HIGH QUALITY 48" SPAN KIT
FOR .09 TO .25 ENGINES**
FEATURES:

- A low wing design with high wing stability and excellent inverted performance
- Gentle for the novice — Fun for the expert with versatile performance
- 4-6 hour rapid-fire assembly even for a beginner
- Precision machine-cut SG balsa, plywood and spruce
- Rofed, full size plans showing the complete wing
- Step-by-step instructions for easy assembly
- Formed main landing gear
- Exceptional small field performance
- May be flown with 1 to 3 channels
- Tested, recommended and approved by *RC Modeler Magazine* and *Model Aviation* July, 1984



- If not at your dealer, order direct for post paid delivery
- Virginia residents add 4% sales tax

TIDEWATER HOBBY ENTERPRISES



Route 1, Box 241D
Lanexa, Virginia 23089
Phone (804) 966-5092

Pronto
Retail \$39.95
Super Pronto
Retail \$49.95

Dealer order from your distributor, if not in stock order direct

IF THE ENGINE IS GOING TO RUN, THIS WILL START IT!

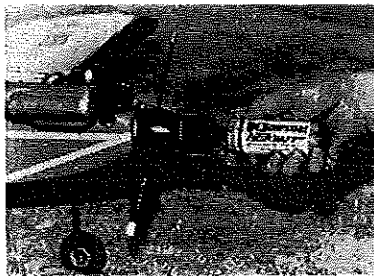
I burn 20 to 25 gallons of fuel a year and we share a grass field with gophers. Hot restarts on the runway were often difficult. I modified my electric starter with a NiCad pack but it was too heavy and awkward to carry to the runway. I wanted something small and light.

Bumpstart is 1 1/2" in diameter with a standard size drive cone, 6 1/2" long and weighs 10 1/4 oz. I did not want a battery to charge, so I designed it around a stainless steel spring. The spring is wound by turning the body and the drive cone in opposite directions four complete turns (three turns for .10 to .25 engines). A steel ratchet inside locks the spring tension.

To use the starter, fire the plug, hold the aircraft with one hand and "Bump" the drive cone rubber against the spinner or prop nut. The drive cone slides back, releases the spring energy and spins the engine.

Bumpstart does have some limitations. I like it best through the .10 to .50 size engines, but I "pit" start my pattern aircraft (Piped S.T., .61 ABC). Four cycle? Yes. C.W. rotation? No.

If you like the idea, see your hobby dealer or order direct.



Sincerely,
Chet Neukom 24983

P.S. I have retired my electric starter.
NEUKRAFT, INC.
921 12th St. N.E.
Jamestown, N.D. 58401
(701) 252-1092

List Price: \$34.95 U.S.
Check (allow time) or M.O.
Postage Paid
N.D. Res. Add 4%

testing for sound levels) the Belgian team members were suspected of a little hanky panky with their full-throttle tests. Why? It seems they were being tested at sound levels much lower than anyone else! There was good reason for it: Renaat Lemmens of Belgium has a new patented tuned pipe that does it. This was the most outstanding new piece of equipment at Flevohof.

Lemmens' pipe is constructed basically of carbon fiber with a liner of fiberglass. It is extremely light. The Belgians tested at 95-96dBA with it on the ground, and this is exceptional. Dave Brown brought one back and possibly may market the pipe in the U.S. Going price for it over there was \$38.00. Dean Pappas, columnist for *Flying Models*, got one for testing and reporting in *FM*. Be on the lookout for that report.

The 14th World Championships for F3A was a memorable event. The Organizing Committee and volunteers from the Royal Netherlands Aeronautical Association, plus the various clubs, deserve a lot of credit for a job well done. As with our own Academy, the Netherlands aeromodeling division is celebrating its 50th anniversary. What better way to publicize and celebrate the event than with a very successful World Championships?

Racer/Lorbiecki

Continued from page 78

from cracking under heavy use. *You must reinforce the wing-fuselage joint with fiberglass!*

Final assembly and finishing. Mount the engine, landing gear plate, fuel tank, and fuel shutoff. When satisfied with the fit of everything, unmount all the "hardware" and apply the finish.

The original was done in red, white, and blue Hobbypoxy. This kind of finish takes a little longer to apply, but it is durable and gives a nice shine. It is also very lightweight and easy to repaint if need be.

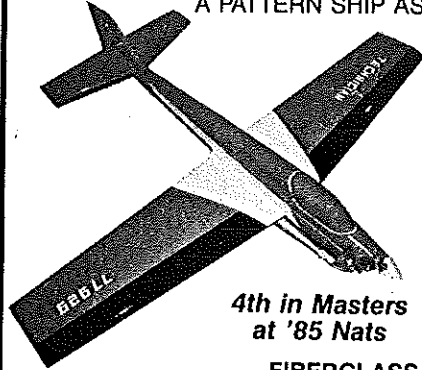
If you choose the method I used, first brush on a coat of clear Hobbypoxy. Lightly sand this coat, and apply another one. After this coat has cured, wet-sand the entire model with 320-grit wet/dry paper. After this final sanding, the surface should be glass-smooth. Note that the elevator is not yet installed.

Decide on the paint scheme you will use. A fancy pattern looks nice, but it is hard to match if the model needs to be repaired. Spray the base color over the entire model. Mask the areas for a second color with black electrical tape. Spray the epoxy after it has been heated slightly in a container of hot water (to make the paint more fluid and easier to spray). When painting is complete, let it cure for a day or two, then rub-out the finish with automotive rubbing compound. Waxing the model all over produces a nice, shiny finish that will last a long time.

Mount the elevator with your favorite

Continued on page 92

A PATTERN SHIP AS GOOD AS YOU ARE...



4th in Masters
at '85 Nats

MAYBE BETTER!

TECHNICIAN

The Technician is a totally functional design that combines great flying characteristics with ease of construction and good looks. A first quality kit throughout.

BASIC KIT: FIBERGLASS FUSELAGE, FOAM CORES,
BASIC HARDWARE PKG.

DELUXE KIT: ALL OF THE ABOVE PLUS ALL REQUIRED BALSAS
MOTOR MOUNT, AND HARDWARE.

BASIC KIT . . . \$ 94.95

DELUXE KIT . . . \$124.95

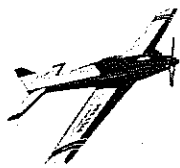
See Your Dealer First

DEALER
INQUIRIES INVITED

L & L MODEL PRODUCTS

MFG. BY:

(513) 385-0912 7342 Appleridge Court
Cincinnati, Ohio 45247



TARBaby

Especially for Turn-around this 850 sq. in., 1.20 4 cycle powered Ron Chidgey design is a smooth, solid performer. Rib templates are computer plotted. Plans and construction hints - \$11.95.



TRANSMITTER CASE

An inexpensive but rugged molded case to protect that expensive transmitter. For both two stick and single stick transmitters. Brown leather grain with aluminum trim and locking clasp. - \$18.95

WING TUBE & SOCKETS

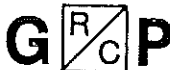


Aluminum alloy tubing for plug-in wings. Included is a pair of special slip-fit phenolic sockets to build into the wing structure. Now a size for all models.

7/8" dia. x 2' - \$ 8.95

1 1/4" dia. x 2' - \$ 9.95

1 1/2" dia. x 3' - \$14.95

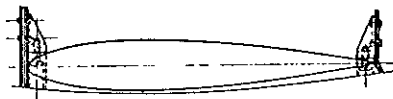


Gator R/C Products

3713 Pompano Dr.
Pensacola, FL 32514
Phone AC (904) 476-8639

NEW! WING MOUNTING SET

A wing mounting system developed by Ron Chidgey that is fast, neat, accurate and stays tight. Three nylon brackets, screws and machined wing blocks are included - \$6.95.



See Your Dealer Or Order Direct
Include \$1.50 Per Item for UPS

hinges. I used Klett hinges, and they worked very well. Mount the control horns—one for flight control, the other for the fuel shutoff—to the elevator. Hook up the pushrod, and make sure that the control system functions freely. Mount the shutoff, and hook it up to the proper horn. It should activate with the application of full-down elevator and should snap firmly when activated. Mount the engine and tank at this time. The final step is to mount the tail and wing skids, and the model is then ready to fly.

The engine is an important part of any racer. The rules for Midwest Sport Racing state that a production .35 engine must be used, and it must be loop-scavenged with a plain bearing and use all stock components internally. The predominate engine when this was written was the K&B .35 Series 75, the Supertigre .35C plain bearing being second.

The stock K&B is a good runner, and you may wish to start out with a stock unit. Here are a few tips, however, that should help it run better for racing events.

For a fast restart, it is important that the engine have a good fit between the piston ring and liner. Finding a good piston and liner set is fairly easy and can be done without tools. Take a stock liner and slide the ring into it, using the bottom of the piston to align the ring in the bore. Slide the ring to the topmost part of the liner where the piston will normally ride. Sight through the liner into the light and look for any gaps or light leaks around the ring. If there is a gap, try another liner/ring combination until a set can be found that allows no light to shine around the ring.

After a good ring has been found in this way, check its end gap with a feeler gauge. It should be between .002-.004 in. If it is more, the ring will not seal properly. If it is less, use a small file to remove material needed to get the proper gap.

After a good ring and liner assembly have been found, the lower part of the liner (about .25 in. above the exhaust port) should be relieved (or choked) to reduce the drag of the ring in the liner. An automotive brake hone and some lightweight oil can be used to do this. Run the electric drill at a slow speed, and stroke the liner up and down. Be careful not to go too far up the liner. The material being removed should only be .0015 to .0025 in. total. This step is not essential, though it helps. Clean all the parts thoroughly to remove the grit from the hone; *this is important!*

Reworking the crankshaft can result in a significant increase in power. The idea is to change the intake timing so that it closes at 62° after top dead center (TDC). You will need a 360° protractor, a vise, a small piece of music wire, and some kind of mechanical stop (the stop could be a depth micrometer, though such a tool is not required).

Mount the protractor to the crank. The music wire serves as a pointer, and it should be mounted to one of the engine's lugs. The

Electric Flight Technology is Now.

Astro Challenger Cobalt motor technology delivers unmatched flight performance. Pylon racers fly at 100 mph, Sailplanes climb over 1000 feet in one minute, and Quarter scale aircraft fly realistically. The age of electrics has come — easy, clean, simple and economical flying for SPORT AND COMPETITION in 05, 15, 25, and 40 sizes. Ask your Astro Flight Dealer for motors and complete systems or Order Direct — and join the QUIET REVOLUTION!

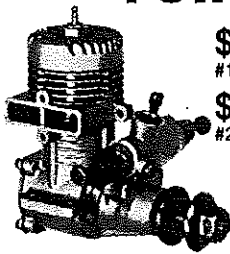
Cobalt 05 . . . \$75.00, 15 . . . \$100, 25 . . . \$125, 40 . . . \$150.

Flash! Astro cobalt 05 in "Fast Eddy" and flown by Larry Jolly sets electric speed record — 92.85 mph two-way average (Subject to FAI confirmation.)

ASTRO FLIGHT INC.

13311 Beach Ave. • Marina Del Rey, CA • 90292 • (213) 821-6242

FOX 19 BUSHING EXCEPTIONAL POWER



\$37.⁹⁵ CL
#11900

\$49.⁹⁵ RC
#21900

Bore..... .650
Stroke..... .600
Displacement..... .199
Weight..... .5 1/2 oz.
RPM with 8-4 prop..... 15,000
Fuel consumption .4 oz. min.

This Fox 19 is truly an exceptional baffle piston motor, easily the most powerful of the baffle motors and probably the most powerful of all bushing 19 motors. This superb performer has now been on the market long enough to be thoroughly debugged. American-made, featuring the Mark X series carburetor.

VISA and MasterCard Accepted

FOX MFG. CO.

5305 TOWSON AVE. FORT SMITH, AR 72901
(501) 646-1656

The Atom is Back!

Approx Wt. - 1.75 oz.
Displacement - .09 cu. in.
Bore - .5"
Stroke - .5"
Piston - Steel
Crank Case -
Magnesium Alloy
(Original)
Crankshaft Bearing -
Silicon Bronze
Cylinder - Chromally Steel
Approx RPM - 12,000 (with
Grey Cox 7" x 4" prop)



\$89⁹⁵ (Price guaranteed through 1985)
FOB Los Angeles, CA

Add \$2.50 shipping per engine
CA residents add 6% Sales Tax

Order Direct

The ATOM is one of the smallest Ignition engines ever produced. Designed by R. Arden with further developments by John Morrill of Simplex Engines.

**Limited Production Run
Delivery - 10 to 12 weeks ARO**

You will receive within 7 days of your order a confirming postcard to verify receipt of your order and give you the assigned engine number with your approximate delivery date.

Morrill-ADC, P.O. Box 1210
Simi Valley, CA 93062

CL Navy Carrier/Perry

Continued from page 75

have been difficult if the U-2 had remained aboard after the landing and been removed by crane after *America* returned to port.

For those of you who prefer Army Air Force aircraft (such as the P-39 and P-51) for our event, there is a twin-engine option. Although Doolittle's raiders didn't land their B-25s on a carrier, the Navy tested a modified Marine PBJ-1H (AAF equivalent was the B-25J) with a tail hook and catapult gear aboard the U.S.S. *Shangri-La* in 1944.

There has never been an abundance of kits available for the Class I and II Carrier events. With the phaseout of the Sterling Guardian kit, the problem is particularly acute. An alternative has been found, however, by at least two Carrier modelers who have converted the Royal Products 1/2A Radio Control Sport Scale kits for use as Class I/II Carrier models. Cam Martin flew his F4U Corsair at the Nats using an OS .40 FSR for Class I and an OS .45 FSR for Class II. The line also includes a Zero and a P-51.

Cam's modifications to the F4U adapt the kit to a larger engine, provide for the bellcrank mount and tail hook, and increase the strength in critical areas. The fuselage consists of plywood ring formers with 1/8-in.-square balsa stringers and 1/8-in. sheet covering. Cam replaced the balsa stringers with bass (spruce would also work well) and added additional stringers to approximately double the original number. He also added a stringer or two in the area which would be used for holding the model for a pull test. The 1/8-in. sheeting has developed some cracks aft of the cowl, and Cam suggests fiberglass reinforcement for that area.

The kit has a 1/4-in. plywood box for mounting the engine and radio equipment. Engine bearers were added to the inside of this box for an inverted engine installation. The fuel tank fits on top of the motor mounts; the bellcrank hangs below them with the lead-outs routed

above the wing to the line-slider near the tip. Cam used a nylon nose gear block for the tail hook mount and added plywood to both sides of one of the fuselage formers so that the hook could be bolted in.

The wing was modified much as the fuselage, with bass replacing the 1/4-in. balsa spars and 1/8-in. vertical-grain webbing added between the spars. The wing was mounted permanently to the fuselage, rather than being removable (as in the kit).

Tail surfaces are 1/8-in. sheet balsa and are adequate as long as the balsa is hard enough. One might consider increasing the thickness or using a carbon tape overlay to increase rigidity. The 1/4-in. dowel elevator-joiner should be replaced with a wire joiner, as is standard Control Line practice.

The end result of these efforts is a Class I or small-engine Class II model with about 230 square inches of wing area and a weight of about 2 1/2 pounds. If the Corsair is any indication, Royal has been very careful with scale dimensions in this series of kits. The only detectable deviations in the Corsair are in the thickness of the tail surfaces, where sheet balsa was used to simplify construction.

That's it for this time. Keep your hook dry.

Richard L. Perry, 7578 Vogels Way,
Springfield, VA 22153.

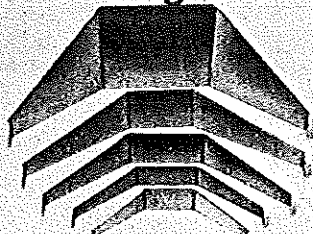
Racer/Lorbiecki

Continued from page 92

location of the protractor on the crank is not critical, but the pointer should be long enough to extend along the perimeter of the protractor. Set the stop at a point where the piston will contact it before reaching TDC. Hold the stop on the flange of the liner, and rotate the engine until the piston lightly touches the stop.

Note the reading on the protractor. Without moving the stop, rotate the crank the opposite direction until the piston lightly touches the stop. Note the number. Sub-

Landing Gear



Tired of wire gear bending back, losing proper toe-in and changing your model's ground handling characteristics? We have 6 sizes of rugged aluminum gear to fit all models. .09 to Giant scale.

Available at
your local
hobby shop.

GREAT PLANES
MODEL MANUFACTURING COMPANY

P.O. BOX 1271, URBANA, ILLINOIS 61801

NEW IMPROVED

Lighter Weight Model with more work Power.

★ WANDIT® ★ U.S. Patent No Des 2,766,683

Dealers Invited

(one year warranty!)

Wet or Dry
Stick on Abrasives

10 ft. CORD

A "Keen Machine" that gives exceptional sanding control for an excellent finish.

89.95 Basic incl. 1 flat Wand and 1 each of 6 grits

108.95 Builder Special incl. 2 flat, 1 half-round wand and 5 each of 6 grits

129.95 Deluxe includes 3 flat, 2 half round wands, 1 buff wand and 10 each of 6 grits

Additional Wands and Abrasives available.

WANDIT MANUFACTURING (214) 288-5789
P.O. Box 266 • Mesquite, Texas 75149

tract the bigger number from the smaller one, and divide the result by two. Add that number to the smaller number previously obtained, and the result is the number for TDC. This is the exact way to find TDC and actually is easier than it sounds.

To the number found as TDC, add 62. Then rotate the crank in the running direction until the protractor reads that number (i.e. TDC + 62). This will be the new timing mark. Using a scribe, scratch the crank through the venturi hole (scribe mark should be to the left side of the hole when viewing the engine from the front). Verify the scratch, and disassemble the engine.

Using a carbide burr, widen the intake opening in the crank until the scribe mark is just barely visible. Leave the corners radiused, and remove any bumps or other machine marks. This is all the work that will be done to the crank.

Slide the crank into the front housing. It should spin free with no side-to-side or up/down movement. If the crank is tight, it can be carefully lapped to the main bearing. Remember to clean both the housing and crank to remove all the residue from the lapping compound. If the fit is loose or if there is excessive movement vertically or horizontally, replace the bearing or acquire another front housing. Some people like to chrome the crank; feel free to have this done if a facility for doing it is available. End-play (fore and aft movement) should be minimized to about .011 to .015 in. by placing shims behind the thrust washer. If there is excessive end-play, the crank pin may hit the backplate.

To help stuff the crankcase and increase crankcase compression, I have manufactured a new backplate from bar stock. An easier way to do this is to cut a piece of aluminum that will fit into the cutout on the backplate and hold it into place with a rivet or two (this is a trick that Doc Anderson used to do with older STs).

The head should be set up so that there is about .012 in. clearance between the squishband (flat area of the head) and the flat of the piston. When the machine work has been done, remove all the sharp corners from the head to prevent detonation. Also check that the baffle of the piston has ample clearance in the slot of the head. If it turns

out that there is a problem with short glow plug life, the head may have to be jacked up .004 in. at a time to reduce the damage. The plug that has provided the best runs for us has been the K&B Long.

The hardest part of running an engine with a suction tank is in deciding which venturi to use. A large hole must be used to get the most power from an engine, but the large hole may introduce fuel draw problems.

The needle valve setup and the fuel tank also are critical. The hole in the spraybar should be enlarged to approx. .055 in. dia. and located so that it is about 15° below the lip of the venturi (I ran some manometer tests and found that maximum draw was at this angle).

The venturi that has worked well for me is one that extends out of the housing about .6 in. with the needle valve going through its centerline about .2 in. above the housing. The hole is .343 in. dia. with a venturi shape machined into it.

The fuel tank location is critical. Just .12 in. up or down can make all the difference between an engine run that is consistent throughout the full tank and one that is rich in the beginning and lean at the end. Experimentation is needed to get the best run out of whatever system is used.

Assemble the engine and test run it. Be careful to keep all the parts clean during assembly. The engine should flip over smartly. If it leaks by the ring, try running it before switching to another ring; some engines take a quart of fuel for proper seating. To test the engine, an 8-8 Rev-Up prop is a good one to use. Try for something around 16,000 rpm.

Flying. Cut a set of lines to match your airplane. Test run the engine and try the shutoff several times to be sure that it is functioning. Fill the tank and fly the model (always fill the tank for each takeoff, with the feed line as far forward as it is, the engine may stop before leaving the ground if the tank isn't full). If the engine is running rich, have the pilot fly a little high to see if it will go lean. If it is lean, shut it off and richen the needle setting before the ring seal is damaged. On each landing, practice catching the model and restarting it. Every

Continued on page 172

Fly QUIET Fly LIGHT

Fly VL-102 ELECTRIC PROPULSION SYSTEM

Send \$1.00 for Complete Illustrated CATALOG

FAST CHARGE

CONSISTENT PERFORMANCE

QUIET OPERATION—permits flying most anywhere, city parks, from yards, etc.

LIGHT WEIGHT—2 1/2 oz.—but powerful enough for models weighing up to 10 oz.

INSTANT STARTING—no priming, no continuous flipping of prop to start.

MORE EFFICIENT—lower rpm, lower running cost.

CLEANER—no fuel to mess up your plane.

V PRODUCTS
1874 ALABAMA AVENUE
CANDAS PARK, CALIF. 91304

CLEVELAND GIANTS!

NEW! FOR GIANT SCALE BUFFS!

START YOUR C-D PLANS COLLECTION NOW!
EARLY BIRDS—WARBIRD, COMBATUAL AND RACERS—PRIVATE JOBS—HOMERUNTS—JEETS

78 Conestoga PBYA \$42.	63 Curt J44 Jenny \$28.
104 Con. Cat PBYA \$56.	60 Vagti Cors FAU \$35.
96 Wright Navy Race \$48-	60 Vagti Cors FAU \$69-
52 W-Wms121 Red L \$36.	54 S.D. Demolite 21 \$48-
77 W-Wms121 Red L \$48-	72 Cor. 02U1/4 L&S \$45.
84 Fokker D.7 Fir. \$39-	62 Howard Race Iks \$46-
60 Howard Pace Race \$32-	77 Boing B. 17G Fort \$35.
70 Bayles Cox Bee. \$32-	103 Bee. B-17G Fort \$55.
60 Supermarine S.6B \$24.	68 Doug. O-46A Obs. \$32.
89 Supermarine S.6B \$32-	108 Sitor S-3B Amph \$49.
62 Curt. Hawk P-6E \$42.	60 Bee. 100 Sport \$36.
94 Cur. Hwk P-6E Fir. \$54-	90 Bee. 100 Sport \$49-
62 Lockheed Vega \$24.	70 Sitor S-3B Amph \$49.
74 Doolittle G.B. 11 \$48-	80 Martin 74 T4M-1 \$39.
93 Macaoupe Sport \$36-	75 H-Pge O-400 Bomb \$35.
80 Hall Spr Bulldog \$42-	100 H-Pge O-400 Bomb \$49.
107 Aerona C-3 Sp \$35-	68 B. Bonanza V Tail \$39.
61 Douglas O-38 Obs \$32.	77 Luscombe Sedan \$25.
122 Douglas O-38 Obs \$49-	71 N.A. High Bomb \$49.
24 Pagers Curt Race \$45-	65 M. Marauder B-26 \$49.
71 Martin B10 Bomb \$29.	81 DH Masquito Bb \$42.
78 Turner's W.W. Sec \$35-	108 DH Masquito Bomb \$55.
64 Cur. Gosh's F11C2 \$42.	98 Stear P117 Koydel \$50-
94 Cur. Gosh's F11C2 \$54-	99 N.B.K. Widow \$49.
66 DeHov Conestoga \$24.	71 Doug. DC-3 Tran. \$32.
62 How. Mr. Mulligan \$35.	95 Doug. DC-3 Tran. \$55.
94 How. Mr. Mulligan \$45-	86 Hawk Toraco 13 \$32-
63 Boing P-26A Fir \$36.	108 Cor. 02U1/4 L&S \$56-
84 Boing P-26A Fir \$48-	60 Douglas M-2 Mail \$24.
69 Waco C-6 Cabin \$36.	68 Britch Bulldog Fir \$30.
64 Beech C17-B Stag \$38.	59 Brown Race M.L.A. \$54-
64 Beech C17-B Stag \$49-	107 Grum Bearcat FF \$54-
55 Lock. 11 Electro \$30.	73 Travel Air 6000 \$24.
82 Lock. 11 Electro \$40.	107 West MB-1 Bom \$44.
62 Stinson T/W \$87 \$16.	91 Lindbergs NX-211 \$39.
81 Stinson T/W \$87 \$24.	108 Patch PT19 Fir \$39.
123 Stinson T/W \$87 \$28.	90 Waco Taper-Wing \$39-
59 Bristol Fir. F2-B \$20.	75 West'd Lysander \$32.
78 Bristol Fir. F2-B \$32.	100 West'd Lysander \$49.
118 Bristol Fir. F2-B \$45.	57 Ford Trimr. 4-AT \$28.
74 T.L. "Peco Spec" \$40-	78 Ford Trimr. 4-AT \$45.
63 Skyrocket XF3F-1 \$24.	114 Ford Trimr. 4-AT \$59.
63 Grum. F6F Hellcat \$28.	68 Brn-Winkle Bird \$45.
78 Lock Light's P-38 \$38.	93 Leaning C-2 Amph \$69.
56 Rep. Sea-Bee Am. \$24.	58 Grum. J2F Duck \$39.
74 Rep. Sea-Bee Amph. \$39.	78 Grum. J2F Duck \$58.
106 Piper J-3 Cub \$39-	55 Getha G-1V Bom \$22.
98 Lock Hudson Bomb \$38.	117 Getha G-1V Bom \$39.
63 Grum. F6F Hellcat \$28.	68 Brn-Winkle Bird \$45.
55 Heath Baby Bull's \$24-	54 Curt Swift XP314 \$28.

Not Sold Thru Dealers Prices subject to change

AFTER PRICE INDICATED QUARTER SIZE GIANT PLAN—OVER 1000 More, 50¢ Up. \$1.25 Patts. Always Incl. Add 10% to all orders for shipping & ins., etc. to U.S.A. Con. & Mex. Elsewhere its 15% (25% if by air). Pictorial catalog \$2.00 (includes Price List). Price list section alone \$1.00. If by air, foreign, add \$1.00.

CLEVELAND MODEL & SUPPLY Co.
EDWARD T. PACCAUD—AVIATIONS 3331 PATTEN—SINCE 1919
10307 B. DETROIT AVE. CLEVELAND, OHIO 44102
Phone to 3-15 P.M.—E.S.T. (OR D.S.T.) (216) 961-3600

BEER CAN BOMBERS

HIGH PERFORMANCE HAND LAUNCHED GLIDERS FROM LIGHTWEIGHT ALUMINUM BEVERAGE CANS. TWO FULL SIZE PATTERNS (YOUR CHOICE). ILLUSTRATED FABRICATION AND FLYING INSTRUCTIONS. 14 OR ADDITIONAL PATTERNS \$1.35 EACH OR SIX PACK (PICK 'EM) \$1.60

BOX 97 SOUTHEASTERN, PA 15335

RCB-1 DRIVER
RCB-2 SPYBAT
RCB-3 AEROCAT
RCB-4 SPYBAT
RCB-5 SPYBAT
RCB-6 SPYBAT
RCB-7 "COY"
RCB-8 JAGLET
RCB-9 SPYBAT

TOM'S TECHNIQUES

THERE ARE NO SECRETS

Plastic Film Finishes

Liquid Finishes

\$10.95 each

HARRY B. HIGLEY & SONS, INC.
P. O. BOX 532, GLENWOOD, ILL., 60425

FULL SIZE PLANS

- No. 497 **Manhattan Pieces** \$2.00
FF Indoor rubber cabin model is ideal for beginners. Span 20 1/2 in.
- No. 498 **Midwest Sport Racer** \$3.50
CL Simple, rugged profile racer for .35 engine. Span 36 in.
- No. 499 **4-60** \$12.75
RC Sportster for .60-size four-stroke engines spans 70 in. Two sheets.

- No. 193 **Sibella**: CL Short model (McDonald) winner 1976, 1980, 1982 FAI World Champ \$ 3.75
- No. 239 **Blue Birds**: RC Ken Willard's formation plane, 4-channel, .10 power \$ 3.75
- No. 262 **Crashmaster**: CL Crash-proof trainer, two sizes—.15-.30 and .35-.40 power \$ 1.25
- No. 302 **Mini F-16**: RC Sarpolus' .045 ducted fan sport flier for 2-channel. Balsa wings, tail, fuse structure \$ 2.75
- No. 310 **1930 Fleet Biplane**: RC Sport Scale for .35-.40, 4-channel. Wingspan 56 in. 1/4 scale. Two sheets \$ 6.25
- No. 314 **Drake II**: RC Ken Willard's flying boat for 3-channel, .15 power. Fly from land with removable gear \$ 3.75
- No. 328 **Taylor Cub**: RC Don Sruif's Schoolyard Scale for .049s, 2-3 channel. Spans 50 in. \$ 3.50
- No. 332 **Zephyr**: RC Small, 2-channel glider for hand-launch or tow, thermal, or slope soaring \$ 2.00
- No. 386 **Lasz 200**: RC Sport Scale replica of championship Aerobatic flier. Uses .40 power, 4-5 channel. Two sheets \$10.75
- No. 398 **Gas Bee R-1**: RC Hallike's latest 1/4-scale spans 75 in., weighs 15 lb., flies on .90 or larger. Four sheets (no doc.) \$22.25
- No. 414 **Electric Sparky**: RC electric-powered fun flier for .05 motor, 3-channel RC is scaled up 1939 rubber-power favorite \$ 8.50
- No. 422 **Scoutler**: RC Two-Meter Sailplane has won Nats event in 1982, 1983, plus many other contests \$ 5.50
- No. 430 **onside**: RC Zippy little Sportster for .10-.15 power and 3-channel RC \$ 4.00
- No. 433 **Watts Up**: RC Electric-powered glider for 2-3 channels, .035 motor spans 52 in. \$ 4.50
- No. 438 **Cruiser**: Embryo Endurance rubber-power fun ship has big-model characteristics \$ 2.00
- No. 440 **Cavalier**: RC Old-Timer-like new design has a huge wing for slow, easy flights. For .35 power, 3 channels. Two sheets \$17.25
- No. 444 **Firebolt**: RC pusher canard sport/pattern uses .40 pusher engine and 4-channel. Has swept-forward foam wings \$ 6.50
- No. 445 **Le Crail**: RC Electric-powered sport flier for .05 motors, 3-channels. Two versions: parasol or cabin \$ 5.50
- No. 447 **1/4 Miss America**: RC Old-Timer 1/4 Texaco model for .049 glow, 2-channels \$ 6.50
- No. 452 **Gas Bee Z**: RC Quarter-scale spans 7 1/2 in., uses .90 power. Four sheets \$16.00
- No. 453 **Smoothie Profile**: CL Profile rendition of Bob Palmer's super-Stunter of the early Fifties for .35 power \$ 5.50
- No. 454 **Sweet P-30**: FF Neat, slick-and-tissue Outdoor Rubber P-30-class model is a contest-winner \$ 2.00
- No. 457 **Spectra**: RC Electric-power for .05-size motor uses 3 different wings for sport, soaring, or aerobatics \$ 7.00
- No. 460 **4-40**: RC Shoulder-wing sport flier for 4-cycle, .40-size engine, 4 channels \$ 6.50
- No. 461 **Tristar Barnstomer**: CL Famous, unaltered Stunter of the late Forties. Uses .35 engine \$ 6.50
- No. 462 **Pamille PE**: FF Jumbo Rubber Scale of WW I Italian observation plane \$ 4.00
- No. 463 **Flathelminthes VI**: RC 1/4 Pylon racer uses lots of lite ply in built-up structure for strength, lightness \$ 4.75
- No. 465 **Blue Max II**: RC Fun-fly sportster for .40-size engines spans 52 in. Lightweight structure \$ 7.00
- No. 467 **Alco Sport**: FF Rubber Scale design won at the '83 Nats for designer Don Sruif. Wingspan is 26 in. \$ 2.50
- No. 468 **Smoothie**: CL Stunter for .29/.35 power. Design is based on hybrid Smoothie/Nober \$ 6.75
- No. 470 **Straker**: RC Mid-wing sportster uses .40/.45 four-stroke engine, spans 50 1/2 in., tail-dragger \$ 6.50
- No. 473 **Tucans**: RC Sport scale turboprop trainer spans 66 in., uses .60/.75 engines. Two sheets \$12.50
- No. 474 **Facer 15**: FF Nordic A-1 Towline Glider won the 1983 World Champs \$ 5.00
- No. 475 **Geophysical**: CL Slow Combat model uses geodesic wing construction, .36 engine. Two-sheet plan has all parts patterns \$ 4.00
- No. 476 **Mania 250**: FF competition 1/4 A plane has manta-ray-shaped wing, spans 43 in. \$ 5.00
- No. 477 **Mandarin**: CL Sport Stunter uses sport .15 engine, spans 35 in. \$ 3.25
- No. 478 **Buttercup**: RC Cute, elfin sportster uses micro 2-ch. RC or pulse-rudder. Spans 27 in., for .020-.035 power \$ 3.00
- No. 479 **Four-Stroke Reoster**: RC Sport/Aerobatics ship has 1920s styling, uses .90 4-stroke engine, spans 85 in. 2 sheets \$11.00
- No. 480 **Ridiculous**: CL Fabulous competition Stunter has 550 sq. in. wing area, flies on TD .049/.051, spans 47 1/2 in. \$ 6.00
- No. 481 **Europa**: RC Sailplane for FAI competition has fiberglass fuselage, foam wings, wing flaps, stabilator tail. Spans 110 in. \$ 7.00
- No. 482 **Golden-Ager**: RC Sport/Aerobatic model looks like a Golden Age sportster. For .60 engines, spans 62 in. \$ 7.50
- No. 483 **CGS Hawk Ultralight**: FF Outdoor "Gas" Scale plane uses CO-2 power, spans 29 in. \$ 3.00
- No. 484 **Aeronaica**: RC Quarter-Scale of '30s lightplane spans 9 ft., uses 1.2 cu. in. 2-cyl., 4-stroke engine, weighs 1 1/2 lb. Three sheets \$19.75
- No. 485 **Hawker Hunter**: CL Fun-scale of British jet fighter has 18 1/2-in. foam wing, uses 1/4 A power \$ 1.75
- No. 486 **Miles-Alwood Special**: RC Sport Scale of Golden Age air-racer uses .21 engine, spans 45 in. \$ 8.25
- No. 487 **Cap 21**: RC Scale Aerobatic plane for .40-size engine spans 62 in. Two sheets \$10.00
- No. 488 **MB-7**: FF Jumbo Rubber Scale of 1920-era Thomas Morse Scout biplane spans 37 in. \$ 5.00
- No. 489 **Underfaker**: CL Foam-winged Fast Combat plane for .36 engine spans either 45 in. or 47 in. \$ 5.00
- No. 490 **Weekender**: RC Low-wing sport flier for .20-size 4-stroke engine spans 47 1/2 in. \$ 5.75
- No. 491 **Yellow Peril**: CL Advanced trainer is all-balsa, spans 23 in., uses 1/4 A power \$ 3.25
- No. 492 **Circulator**: FF A-1 Towline Glider spans 51 in., uses fiberglass tail boom, circle-tow mechanism \$ 2.50
- No. 493 **Super Drone**: RC Shoulder-wing sport flier spans 68 in., uses .45-.60 engine. (Two sheets) \$12.75
- No. 494 **HAB00B**: CL Very lightweight sport/Stunter flies on wind power alone, or with .049-.15 power. Span 39 in. \$ 4.00
- No. 495 **FW-190**: RC Hand-launched, all-balsa scalelike sportster for .10-.15 engines and two RC channels. Spans 39 in. \$ 4.25
- No. 496 **P-47 Thunderbolt**: RC Other half of Dogfight Duo has similar characteristics to FW-190 \$ 4.25

Circle number(s) of plan(s) you wish to order:

	193	239	262	302	310	314	326
	332	386	398	414	422	430	433
	438	440	444	446	447	452	453
	454	457	460	461	462	463	465
	467	468	470	473	474	475	476
	477	478	479	480	481	482	483
	484	485	486	487	488	489	490
	491	492	493	494	495	496	497
	498	499					

Plan price includes first class postage for U.S. delivery (which is Air Mail over 300 miles).

For orders outside the U.S., please add \$2.50 for Air Mail or \$1.25 for surface mail.

Make check or money order (payable in U.S. funds) to Model Aviation, c/o AMA, 1810 Samuel Morse Dr., Reston, VA 22090. Please allow 3 to 6 weeks for delivery.

Please print carefully: Enclosed \$ _____

NAME _____

STREET _____

CITY _____

STATE _____ ZIP _____

little bit of practice is helpful. Watch some of the experts fly, and you'll see what I mean.

The best pitting I have seen so far is the two-man pit done by Jerry Meyer and a lot of the Slow Rat Race fliers. Jerry puts two brass pads behind the wing which are attached to the glow plug. The first pitman catches the model, fuels it, and resets the shutoff. While this is happening, the second pitman is holding the model and getting ready to attach the plug wires. As soon as fueling is complete, the plug wires are attached, and the first man flips the engine smartly. Once the engine has started, the flipper gets out of the way, and the model is released. This method gives a very good, quick pit stop.

Practice, practice, and more practice is the only way to improve your skills. It is best to practice in traffic, as well, so that the pilot gets used to going around another person, setting up for the landing, etc. This is my biggest drawback; I don't practice enough, and it shows.

You should do a lot of work to find the best prop for your particular setup. Fiberglass props seem to be the only way to go, and there is great variety available from Billy Hughes and others. Try 8 in. dia. by 7 1/2 to 8 in. pitch to start. A pitch gauge is a must for testing props so that you have some reference points to work from.

Here's a beginning. Build the model, practice with it, and experiment. If you have any questions, please feel free to write: John Lorbiecki, 1508 Valley View Dr., Hubertus, WI 53033.

Letters to the Editor

Continued from page 10

should have written so late, I don't understand. 'PE' Norman died in July 1964.

For many years his son, Marcus, carried on the great work started by the pioneer of ducted fans and Free Flight Scale with pendulum controls. Many of 'PE' Norman's hell-for-leather Free Flighters, such as the 1944 Natsneez, have become popular conversions to RC in honor of the great man. He is always well-remembered at the annual all-ducted-fan meet at RAF Abingdon.

We count ourselves fortunate that Marcus should be so very much like his pop—except for one thing. Marcus has now taken to full-scale aerobatics. For 'PE' a fast MG sports car was enough.

R.G. Moulton
Model & Allied Publications
England

We can only wonder, now, if Mr. Melcher was thinking of the anniversary of 'PE' Norman's death, which was July 5. Another noted modeler, S. C. "Cal" Smith of the U.S., passed away on the same date.

When responding to advertisers, mention that you read about them in Model Aviation

Full-size Plan List Available. A complete listing of all plans previously published in this magazine, through No. 489, may be obtained free of charge by writing (enclose stamped, pre-addressed envelope) Model Aviation, 1810 Samuel Morse Dr., Reston, VA 22090.