Pattern Plane

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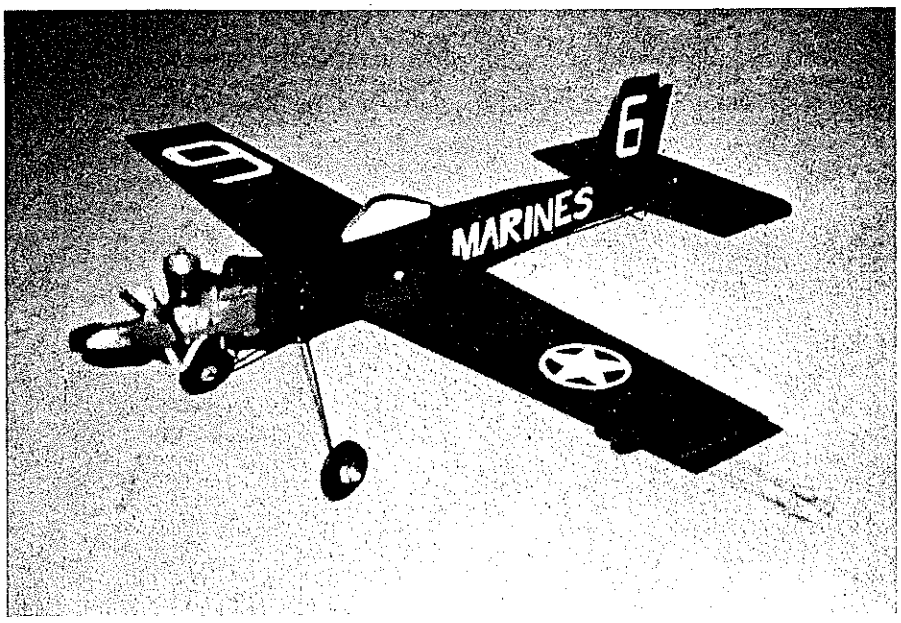
Here's an easy-to-build ½A Control Line sport model that lets the maker's creativity sing out. Just keep the proportions as per the plans.

■Craig Hampson

Don Hampson, the author's father, demonstrates hand-launching for the maiden flight of Mike DeCou's Dauntless Dipstick. At the controls is Mike's father, Wes. The flight was successful, and Mike can now fly on his own. They're at the Middlesex Modelers' field.

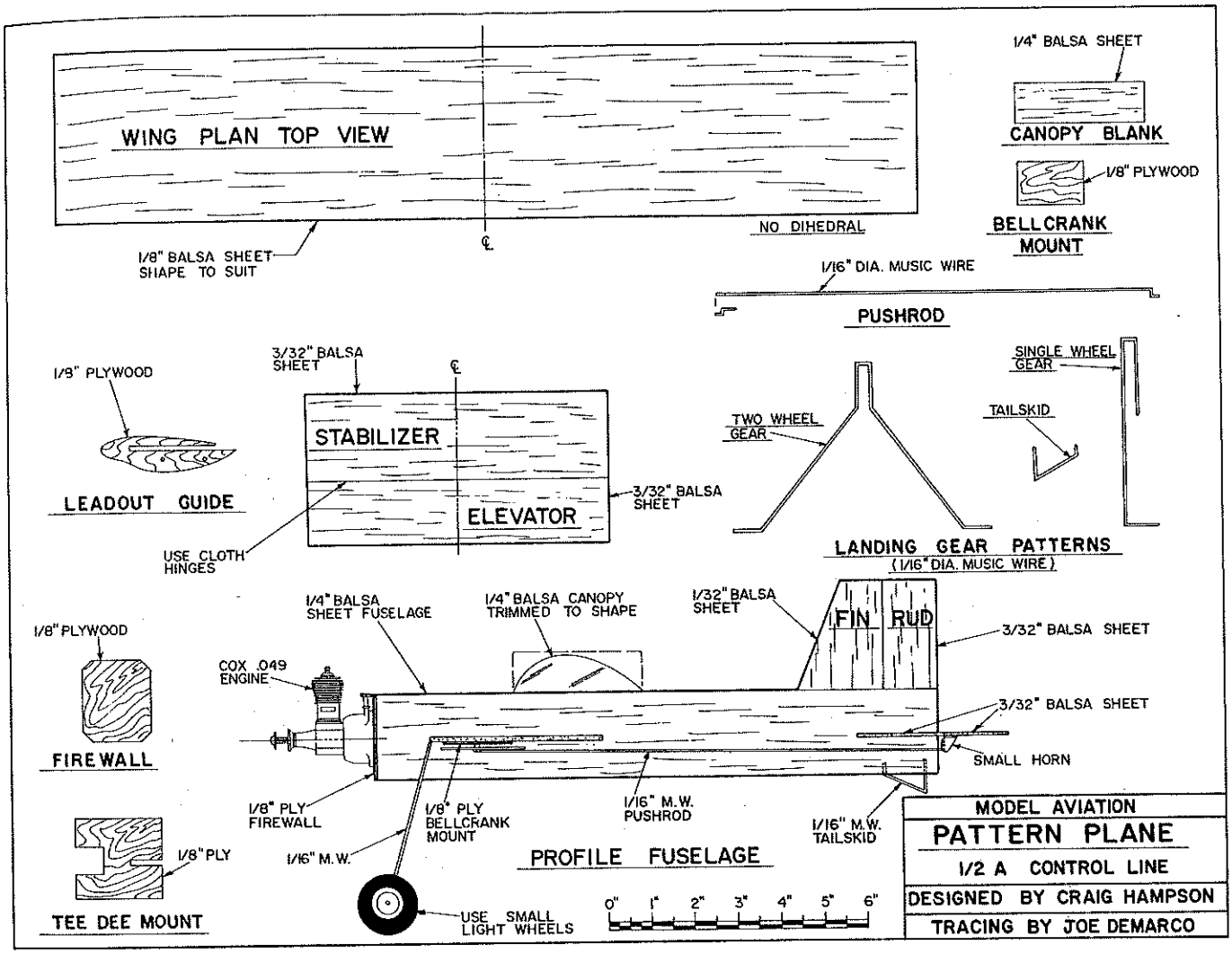
WHY IS THIS PLANE different? It's because you're the designer. Just draw an outline within the supplied dimensions to create a one-of-a-kind Control Line ship that will satisfy your own personal aesthetic and design philosophy.

If you've never scratch built before, this is an ideal model to begin with. It was developed to be a unique and easy-to-fly introduction to Control Line, simple to build, and inexpensive. Happily, it seems to have fulfilled those expectations—and then some. It has served as an introduction for Junior modelers and has helped many



This is the fourth in Craig Hampson's series of Pattern Planes. It is painted in colors used by the U.S. Marines in WW II. Finish is sprayed polyurethane paint. Vinyl transfer decals were cut with an X-Acto knife. Engine is a Cox TD .051 with a tank mount. Craig says the model flies great. It is somewhat aerobatic, though it is best as a beginner's training plane. This kind of plane can be built in less than a day with use of Hot Stuff glue. Photos by the author.

Matt Biskup, 14, starts his plane with the author's power panel. A simple, inexpensive 1½-volt hobby battery is all that is needed. Watch out for the engine running backwards; this can do bad things to your plane.

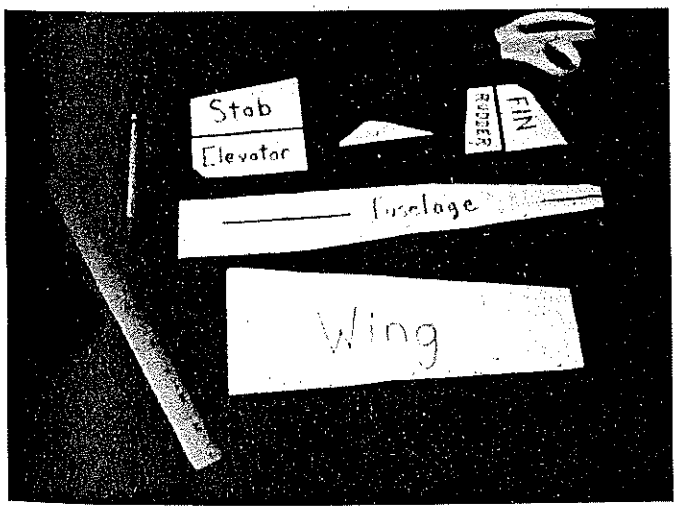


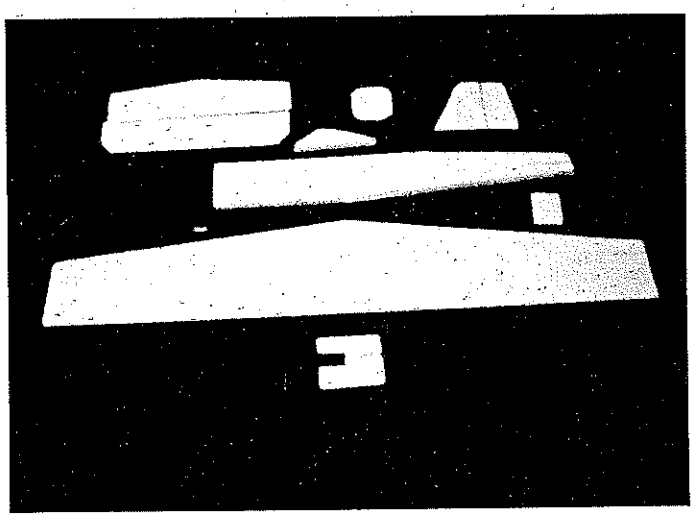
beginners learn to fly. It will perform mild aerobatics and even fly inverted (somewhat). It can be used in primitive forms of Combat and in races, too, and you can build one for under 10 dollars.

Materials List. Wing: ⅛ x 4 x 36-in. balsa sheet. Tail: 3/32 x 2 x 36-in. balsa sheet. Fuselage: ¼ x 2 x 36-in. balsa sheet, music wire 1/16 x 36-in. and .025 x 36-in. A ½A bellcrank, a control horn, wheels 1 to 1½ in. dia. (optional), 3/32 or ⅛-in. plywood scrap, and ½ x ½-in. triangular stock balsa.

Construction. Begin by drawing the patterns. I suggest you photocopy or trace the plans so that they can be used again another time. It might also be helpful to sketch your proposed plane on paper so that you get an idea of what it will look like. You might consider making it look like your favorite full-scale airplane, or maybe you'll find it's more fun to create your own.

First draw the wing outline onto the plans within the blank pattern. Popular shapes include tapers, double tapers, and elliptical planforms. Note, though, that the pattern is





Left: This is what a typical set of patterns looks like. Note that the patterns for the wing, stabilizer, and elevator are only for one side of these surfaces. After tracing one side with the pattern, flip over the pattern to get an exact match of the opposite shape on the other side. The wood that the pattern is being traced on, of course, is in one continuous piece. Right: The pieces cut out as per the patterns look like this. An X-Acto knife with a No. 11 blade is fine for cutting the balsa parts, but the plywood firewall, bellcrank mount, and lead-out guide are easier to cut out with a coping saw or scroll saw. The bottom piece in the picture is the optional beam mount for TD engines.

for only *half* of the wing and must be turned over for the other half. There are two restrictions: you must keep the 4-in. chord at the centerline and the 20-in. wingspan. Follow the same procedure for drawing the elevator and stabilizer patterns.

Draw the fin and rudder outlines in the blanks. These, like the stab and elevator, are made in two pieces (denoted by the arrows on the plans). Keep the base of the fin flat; you can round or taper the other edges. Next, draw in the fuselage outline.

Be sure to keep the wing and stabilizer cutout positions on the fuselage places as denoted on the plans. You'll need to maintain the height of the fuselage (2 in.) at the nose and the length as shown. If you want a cockpit, draw it within the proper blank pattern. I prefer canopy types, but open seats are fine, too. You might even want to add a pilot.

Building the plane will be much simpler if you make your own "kit." Cut out the patterns along the outlines that you drew, and trace them onto the appropriate piece of wood. For the half pattern pieces such as the wing, lay the pattern on the wood, top side up, with the outboard edge touching the edge of the wood. Trace the outline, and then flip the pattern over, keeping the centerline in the same position. Remember, the wing, stab, and elevator are one piece, not two.

Transfer the patterns for the plywood pieces, and then cut out all the parts. A hobby knife is fine for the balsa, but you'll need a coping saw or scroll saw for the hardwood parts.

My planes were assembled with cyanoacrylate (CyA) instant glue except where I've specifically noted otherwise. The first step is to glue the cockpit, if you have one,

Kevin Pomplun, 12, gave his Pattern Plane the appearance of an American fighter from WW II. His flies with a Testor's .049 for power. Cowl was made from the top of an aerosol spray can. This plane can be made to look like almost anything the builder wants.

Members of the 4-H Broken Props Model Airplane Club with planes built using the author's preliminary plans. L-R: Mike DeCou with his Dauntless Dipstick, Craig Hampson with his Vortex (the plane which kicked off this article), and Matt Siskup with his Japanese Fighter.

to the top of the fuselage in an appropriate position. Next, glue the plywood firewall to the nose of the fuselage. Make sure that fuselage and firewall are perpendicular to each other. Brace the firewall with triangular stock, and sand it smooth.

If you'd like to use a Cox Tee-Dee .049 or .051 engine with beam mounts, cut out the *alternate* mount, and glue it to the right side of the fuselage at the nose. Once it's affixed, you can cut the balsa from the engine area.

Choose the type of landing gear, if any, that you prefer to use, and bend the music wire as shown on the plans. For the single-wheel gear, drill a 1/16-in. hole through the triangular stock on each side of the fuselage where it meets the firewall. Slip the gear into the holes through the top so that the long leg comes out the bottom. Epoxy it in place, and make the 90° bend where the well fits on.

The two-wheel gear is a bit more complicated. Slip it through the wing slot, and bring it up to where the leading edge will be. Sew it in place at the point shown on the plans. Use copper wire, and then coat the wire with epoxy. You'll find that this setup is quite strong.

Slide the wing in place, and tack it there with CyA glue. Make sure that it is centered and square to the fuselage. Use an aliphatic glue such as Elmer's Carpenter to make fillets. These add strength and improve the appearance.

Glue the rudder to the fin with ¼ in. of right rudder built in. This serves to keep the flying lines tight. To hinge the elevator, pin the stab to a flat board or cardboard box, and set a piece of 1/16 music wire against the trailing edge. Smear the aliphatic glue on top of the elevator and stabilizer, and lay two large cloth hinges lengthwise over the top. Squeegee the glue through the cloth, and let it dry.

Glue the stabilizer into its slot, making sure that it is square and centered. Affix the vertical stabilizer so that the back of the rudder lines up with the back of the fuselage. Glue the plywood lead-out guide to the inboard wing (left side, looking from the back of the plane) about 1½ in. from the tip. To keep the plane level in flight, epoxy a washer under the tip of the outboard wing. Glue the bellcrank mount to the underside of the inboard wing so that the short side touches the fuselage. Glue the tail skid to the bottom of the rear of the fuselage.

Round all edges with fine sandpaper, and your plane is ready to paint. I suggest using a fuel-proof dope, though urethane is also acceptable. Do paint your plane, though. Otherwise the wood will get fuel-soaked and last no more than a day.

Add the elevator horn to the underside of the inboard half of the elevator so that the hole is over the hinge line. Drill a hole through the bellcrank mount and the wing where indicated, and test-fit the bellcrank. Attach the lead-outs (.025 wire), then permanently bolt the bellcrank in place. Be sure it moves freely. Set the elevator in neutral, and bend the ends of the lead-outs so that they are even with each other. The control throw can range anywhere from ¼ in. to 1 in. (for those strong-hearted pilots) up and down.

Use a control handle with Dacron lines. I would start with 25-ft. lengths and adjust as necessary. If the plane goes too fast, lengthen them. If it is too slow, shorten them.

Engine. These planes have been flown with just about every kind of ½A engine. Mount the engine of your choice with wood screws and a pair of washers so that the thrust line points to the outside of the flying circle. If you need a separate fuel tank, hold it to the fuselage with rubberbands. Finally, add the wheels. A diameter of 1 to 1½-in. is fine.

Flying. Select a calm day and an open grass field for the first test flights. Set out the lines, and test the controls. If you are a beginner, by all means try to enlist the help of an experienced pilot. Have a helper hold

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confused. Teach them.

Copies of this program should be available from AMA HQ on 5.25-inch, single-sided MS.DOS disks in the nine-sector format or via E-Mail. From that, you should be able to put it on a disk, make whatever small changes are necessary to suit your particular computer, and proceed to become an educator.

George M. Myers, 70 Froehlich Farm Rd., Hicksville, NY 11801.

CL Navy Carrier/Perry

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offers more potential for adjusting flap deflection to suit individual flying style and contest conditions. It also weighs more and produces more drag on exposed installations such as are common on Profile models. The disadvantages are slight, however, and are probably outweighed by the advantages when considering total performance and adaptability to different flying conditions.

Flaps function by changing the camber of the wing of which they are a part. They cause the wing to produce a higher lift coefficient for a given angle of attack. They also produce a negative pitching moment which causes the nose to pitch down. As flaps are deflected, drag increases, and the airflow around the tail is affected. All these factors combine in different ways for each airplane. The general tendency is toward "ballooning" or "floating" on most Carrier models, particularly Profiles.

The model may require some Down elevator as speeds increase above the stall. Higher speeds may also require attitudes which are more nose-down than the normal level-flight attitude. Because of these facts, ballooning tends to be caused more by the pilot's reluctance to apply more Down elevator than "normal" or to lower the nose below the "normal" attitude. The effect is enhanced by the fact that wind produces much larger relative changes in airspeed as the model moves around the circle in low speed flight. Compensating for these changes requires much greater change in angle of attack than at higher speeds.

The effects described above will vary with flap deflection; the greatest effect occurring in the first 30% of flap deflection on most models. Adjustable flap deflection can be useful in trimming a model to varying flight conditions. Less flap deflection will generally improve handling in windy conditions.

Some modelers like to use differential flap deflection to produce a rolling tendency away from the center of the circle. Increases in deflection beyond about 30% produce more drag while the other effects are increased relatively little by comparison. The effect is most pronounced, therefore, at lesser flap settings. At greater flap deflections the outward-rolling effect may be balanced by an increase in drag on the inboard wing which will try to move the nose toward the center of the circle.

The key to adequate rolling effect is to use differential flap settings only at lesser flap deflections or to use a separate aileron on the outboard wing which has a very large upward deflection to better balance the drag on the inboard and outboard wings.

Aileron movement can be accomplished by springs (or rubberbands) or by connecting horns on flap and aileron to a reversing bellcrank in the wing. The method I prefer produces less drag and weighs less than the horn-and-bellcrank method. The release mechanism which holds the aileron in place for high-speed flight consists of a piece of sheet brass soldered to a piece of tubing. The tubing rotates around a wire imbedded in the trailing edge of the wing at the hinge line (see photo). As the flap moves down, the brass sheet is allowed to rotate, thereby releasing the aileron.

Richard L. Perry, 10035 Deadwood Ave., Ellsworth AFB, SD 57706.

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the plane while you start the engine and run out to the handle. This plane will rise off ground, but I prefer a simple hand launch. A toss to the outside of the flying circle while keeping the lines tight is all it takes.

FF Old-Timers/Haught

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version from building chores, and a good pair of skis can be fabricated in fairly short order. Skis don't require all the trim adjustments of floats and permit more conventional chase systems. I personally find model engines a bit cantankerous in cold weather, so I leave all this winter fun up to my friends. But if you enjoy getting out in the winter, ski flying can provide the incentive.

There are other fun-type activities which can be added to sport or contest flying, and given the ingenuity of most Free Flighters, I'm sure that many more can be thought up. Most other modeling interests have them. There are the mass-