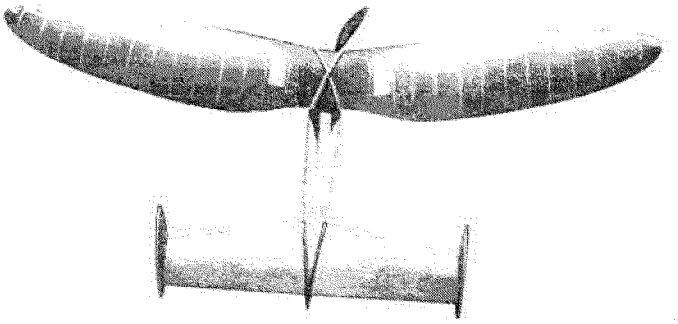
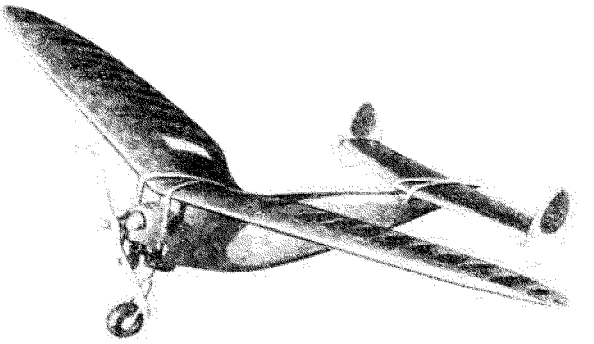


Twin rudders and large stabilizer give stability



This stable Class "C" one wheeler is a fine soarer

How To Build a Distinctive Stable One Wheeler that Will Turn In Consistent Winning Flights

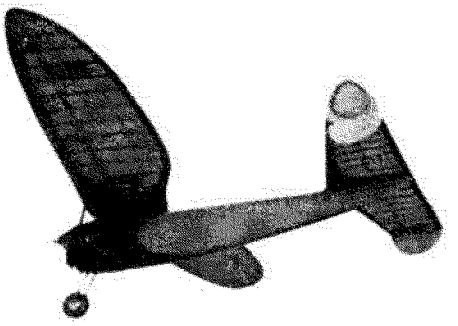
BUILDING THE FALCON

By PAUL PLECAN

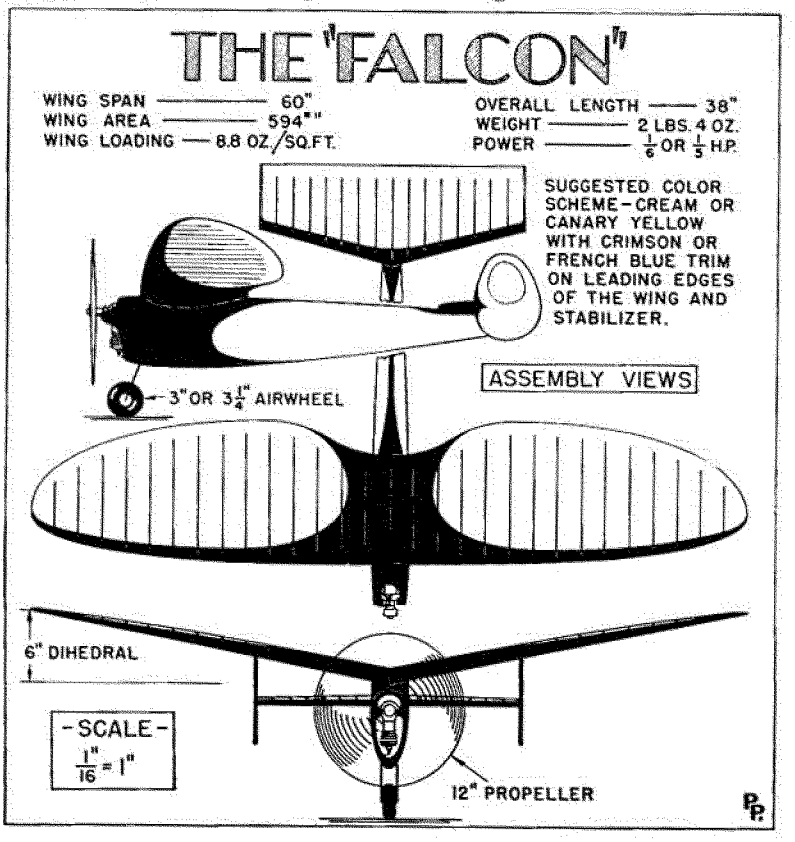
EVER since the days of Maxwell Bassett and Joe Kovel, gas model builders have all strived towards a common goal—a gas job that would be perfectly stable, climb like a sky rocket, and have a sinking speed so low that it would make a sailplane pilot turn "green with envy." Although this month's gas model is not the ultimate in perfection, it nevertheless incorporates many features that the author feels are necessary in a high-performance gas job.

First and most important is the wing. A moderate aspect ratio (6:1 or 7:1) is used for strength. Although a higher aspect ratio increases efficiency, it also makes the wing more susceptible to "folding in two" in violent, and sometimes accidental maneuvers. Elliptical tips are used to lessen tip vortices. Little area is used in the center section, as it is not very efficient due to its proximity to the turbulence around the fuselage and wing mount. The Grant X-10 airfoil is used in the wing where the chord and efficiency are greatest, modified Clark Y sections being used at the center and tips for least drag.

Since the fuselage is planked, it is light and strong. The clean design, plus the one-wheel landing gear, minimizes drag to a great extent. A large stabilizer is used in conjunction with a moderately long moment arm. To decrease tip vortices, and for general simplicity, twin rudders are used. The twin rudders give the needed ground stability, since the new rulings require that gas models land without nosing over or falling off on one wing tip.



In flight. Note the flat glide



A high thrust line, bellied-down fuselage and slightly parasol wing mount complete the requirements for stability. The one wheel placed far forward makes nose-overs or ground-loops almost impossible.

Construction of the model is simple, due to the fact that full size ribs, bulkheads and other parts are given. If you contemplate building a "Falcon," read through this article and study the plans to familiarize yourself with them before beginning construction.

Fuselage construction begins with the cutting out of all necessary bulkheads from 1/8" sheet stock. Do not forget to mark off horizontal and vertical centerlines on each bulkhead, because each one has to be sliced along the horizontal centerline before actual construction begins. Bulkhead 1A is 1/8" plywood, with only two holes (for motor bearers) cut into it. Bulkheads 1 and 2 are cut out as shown in sketch to make room for the rear end of the motor unit.

Draw a centerline on a board about 30" long and space off bulkheads 1 to 8. All the bottom halves of bulkheads 1 to 8 are now pinned to the board, followed by the cementing of the two 1/8" x 1" main planking strips on each side. Bulkheads 9 and 10 can now be cemented in place past the end of the board, since they project downwards past the bottom of the main planks. Their horizontal centerlines should be flush with the bottom edges of the main planks.

The pins holding the

(Continued on page 70)

Building the Falcon

(Continued from page 31)

bulkheads down should now be removed and transferred to the main planks, as they can not be removed later when the fuselage has been entirely planked. A triangle should be used now to make sure that all bulkheads are at right angles to the board, especially bulkhead 1.

The fuselage planking may be started now. The planking strips should be very soft and light for best results. Pin each strip to every bulkhead and use slightly thinned out cement to join the planks to each other and to the bulkheads. Plank alternate sides, not one side first and then the other. It will be necessary to taper the planks at the rear, since the fuselage is narrower there. Accuracy is not very important here as a hole can be plugged up with scrap wood and sanded down later. The fuselage should be left aside now to allow the cement to dry properly.

After removing the bottom half of the fuselage from the workbench, cement the top parts of each bulkhead in place. The top part of the fuselage should now be planked. Trim away the planking behind the top part of bulkhead 8 to allow the mounting of the stabilizer mount block. All the planking behind bulkhead 10 is now trimmed away and the tail fillet block cemented in place. After the cement has dried, these blocks can be carved and sanded to shape, but for the present, lay the work aside and allow it to dry.

The motor unit is next on the program. Figure 1 on the half-page drawing shows the first step. The rear ends of the hardwood engine bearers should be flush with the rear end of the 1/8" sheet hard balsa base. The outside edges should be flush with the sides of the 1/8" sheet. Bulkhead 1A should be cut to shape and cemented in place now, reinforced by two gussets in the rear as shown in Fig. 2A. The landing gear strut is now bent, as shown in the plans, and cemented in place. The top of the strut should be flush with the bottom edges of the engine bearers.

A new and light method of mounting landing gear struts on plywood has been evolved. Holes are drilled on each side of the wire when it has been cemented in place, and then fine copper wire is used to "sew" the wire to the plywood bulkhead. Two or three heavy coats of cement complete the landing gear mounting. The bottom ends of the struts are now pulled apart and the airwheel is mounted. Note that an inverted "U" wire piece is bound to the landing gear struts to keep them together in a "hot" landing. Figures 3 and 4 should clarify the cowling problem. Although an enclosed cowling may be used, the one illustrated is preferred since servicing and adjustments can be made so much easier.

The timer can be located in any position on the cowl, but the original was mounted in a hole carved into the cowl to accommodate the clockwork timer that was used. A compressed air type was also mounted at a later date and worked well.

The engine is now mounted so that the lengths of the hook-up wire may be determined. The coil is mounted directly behind 1A, and a hole is cut into the 1/8" sheet to accommodate it. After soldering longer leads to the coil, cement it in place. The condenser should be mounted somewhere inside the cowling, so that it will be near the ignition points for better electrical efficiency. A battery box is now constructed according to the dimensions given in the plans, but it is not cemented into place between the inner rear faces of the engine bearers. This will have to wait until test hops are made, when the position of the battery box may have to be changed. The engine is now removed to allow the cowl to be sanded, covered with silk and doped enough to make it oil-proof.

The stabilizer is so simple that a beginner without any experience at all could make it without trouble. All ribs are given on the full size rib drawing. All that is necessary is to lay out a line on a board and mark off 16 spaces of 1-3/8" each at right angles to this line. Pin a 1/4" x 3/8" spar to the line first mentioned, followed by the ribs in their proper places.

Leading and trailing edges are now cemented in place and allowed to dry before trimming and sanding to airfoil shape. A sheet 6" wide is prepared from two 3" widths of 3/16" stock, from which the rudders are cut. A graph of 1" squares is drawn with soft pencil onto the sheet, after which the curves are copied from the drawing. Be sure to cover and dope the stabilizer before mounting the rudders, as covering is difficult with the rudders in place. Although not shown, tailskids should be fitted to the rudders to prevent wear at this point.

A full size wing plan will have to be drawn in order to obtain the shape of the trailing edge parts. The drawing given is 1/4-full size, so any dimensions needed can be obtained by multiplying the dimension on the plans by four. After all the ribs, spar joiners and both spars have been cut out, they may be assembled on a flat surface. Be sure to use very soft balsa for the leading edge, as it must be bent to shape. If 1/2" x 3/4" stock is unavailable, two 1/4" x 3/4" strips may be used, one in front of the other. After propping up each wing panel about 6", the wing spar joiners should be cemented in place. The wing is now either double tissue, bamboo paper, or silk-covered. Do not forget to cement or dope the covering to the undercamber on the ribs. Spray one wing panel and lay the wing down on a flat surface so that the sprayed panel may be weighted down to prevent it from warping when drying. Ditto for the other panel. Use a wide brush in doping the wing in order not to leave streaks or brush marks.

Two wing mount pieces are cut out of 1/4" sheet as per the full size outline in the drawing. Both are cemented together on the bottom of the wing at the dihedral joint. Take care and see that they are not cemented onto the wing. With the incidence block in place, the wing mount should be cemented in place, braced on each side with 1/4" square balsa strips cemented in place. Tie the wing and stabilizer in place with rubber to check the line-up. If either wing tip droops in relation to the stabilizer when viewed from the front, change the 1/4"

Notes on Finishing

The model should first be clear doped, followed by a coat of light colored dope. Carborundum Wet-or-Dry 320-A waterproof sandpaper should be used now, in conjunction with water. The second coat of colored dope is now applied, and it should be diluted with a bit of thinner. If the equipment is available, the dope should be sprayed on. Use Wet-or-Dry 400-A from this coat on, and use plenty of water. Do not press hard when sanding, as the idea is not to wear away all the dope you have put on, but to brush off all minute ridges and to fill up the pores of the wood or silk. A third coat is brushed or sprayed on now, without being sanded. Allow this coat to dry well, then mask off the desired areas with Scotch Masking Tape. A small three-view with a suggested color scheme and outline is given in this article, but many will prefer to use their own ideas as to striping, scallops, etc. After two or three coats of the dark colored dope with intermediate sanding, the model should be left to dry overnight so that the dope will really harden. Simonize or some other polishing compound is then used according to the directions on the can.

Notes on Testing

For testing try to do the work in a large grassy field. Also try to have someone else along to catch the model if you launch it too hard in glide testing it. The first thing to do is to check the center of gravity. The model should balance in a level position when supported 1/2" behind the spar near the wing mount. In other words, the C.G. should be about 4 3/4" behind the leading edge of the wing. From a crouching position, heave the model away in a horizontal path. You will probably launch the model too slowly the first time, so do it again.

Make sure that the model attains flying speed this time. If it "mushes," remove the engine unit and move the battery box forward. If it dives, move the battery box backward. If the stall or dive is very persistent, then the stabilizer incidence will have to be increased or decreased. As soon as the glide is halfway decent, try an overhead launch in order to get a longer glide and to see if the model circles. Adjust the model to circle slightly to the right.

The first power hop should be made with the engine revving at the speed when it no longer "four cycles," but starts to "two cycle." (At this point the "chug-chug" changes to a whine.) In any case, don't let the model go with the engine just "ticking over," as the engine can cut out too easily at low revs. Don't let the model go with the engine wide open either, as it will be all over before you get a chance to see what has gone on.

Always hand-launch the model on test flights, as you give it additional altitude to recover if it stalls. If the model dives, it will merely make a "hot" landing. At this point it would help to have your assistant around, as gas models do funny things on their first power hops, due to unseen thrust offsets. Give the motor 10-15 seconds run, so you can get a chance to get under the model if something is wrong. A short engine run and a stall near the ground may mean a day at home repairing the model, so watch out. Correct any bugs now and give the motor a few more revs on the next flight.

Now that the model really gets some altitude, you can observe the climb and glide and make the necessary adjustments. Don't change the C.G., wing, stabilizer, or rudder adjustments at all once the model has been adjusted for a good glide. The power portion of the flight should be controlled with motor offset. Happy landings!

Contest Notes

If the "Falcon" is flown at a contest under N.A.A. rules, the following weights will have to be exceeded.

Since the wing area of the "Falcon" is 4 sq. ft., the minimum weight for contest flying should be 2 lbs. plus, in order to exceed the 8 oz. per sq. ft. minimum ruling.

With a Baby Cyclone (.363 cu. in. disp.) the minimum weight is 29 oz., but since the above wing loading has to be met, a 2 lbs. plus total weight will be required.

With a Gwin Aero or Mighty Midget (.45 cu. in. disp.), the minimum weight will have to be 2 lbs. 4 oz.

With a Hurlemann (.488 cu. in. disp.) or O. K. 49 (.49 cu. in.) the minimum weight will have to be 2 lbs. 8 oz.

All of the above mentioned motors are ideally suited to power the "Falcon" for sport or contest flying.