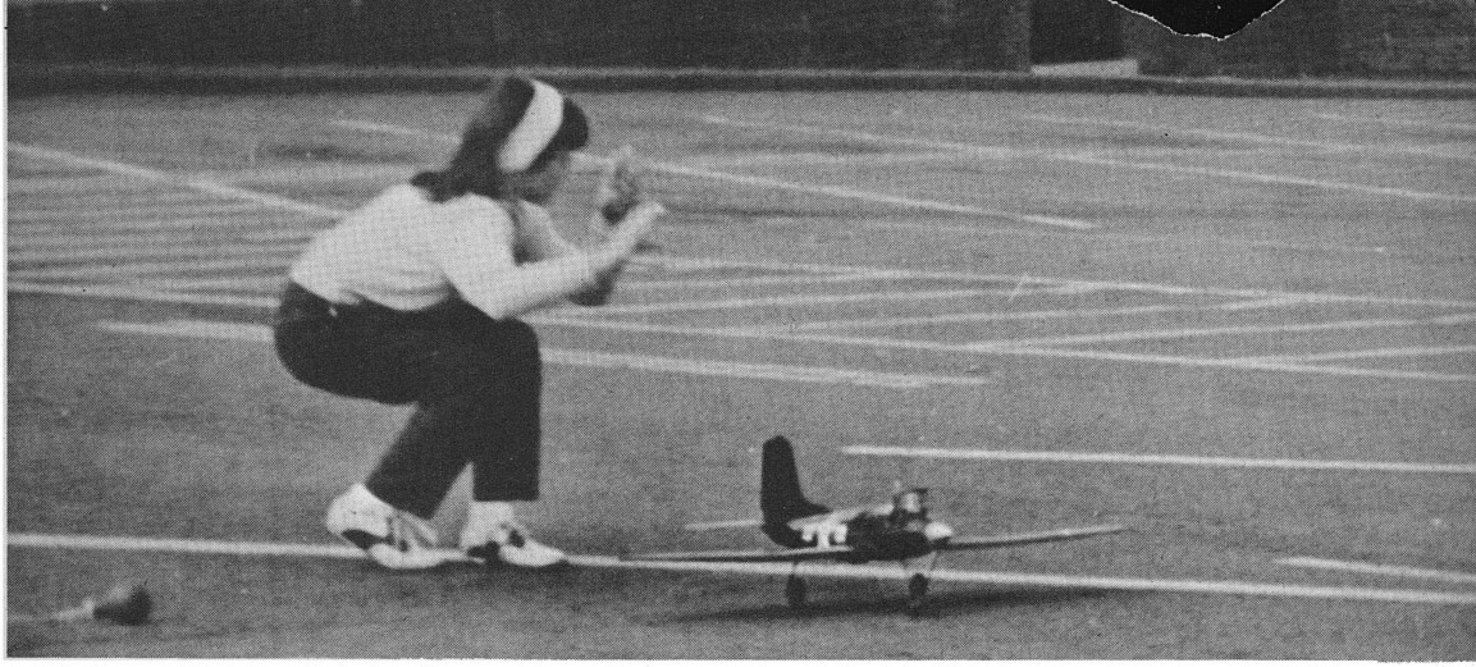
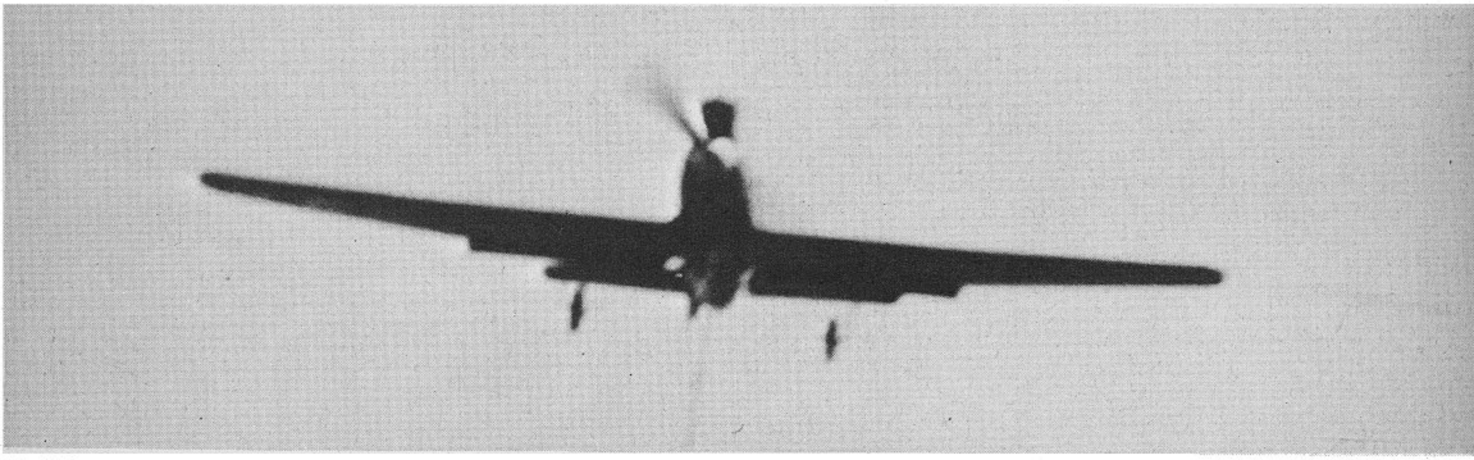


Author's ten-year-old daughter, Carol, shows the proper form performing good release for her dad. With McCoy 60 singing, it takes a lot of holding.

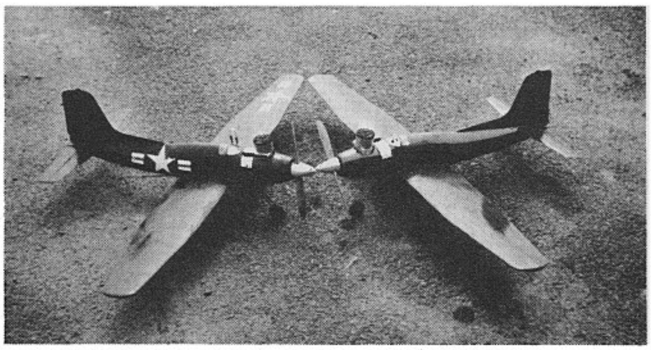


The high point in any Carrier flier's career is the slow speed approach with flaps down, hook down and ship lined up smartly with carrier deck.

SKYPIRATE

By BERNARD MALLON

LITTLE USED DOUGLAS XTB2D-1 SKYPIRATE IS EXCELLENT SUBJECT FOR CARRIER. BUILT AS PROPOSED, IT IS A WINNER.

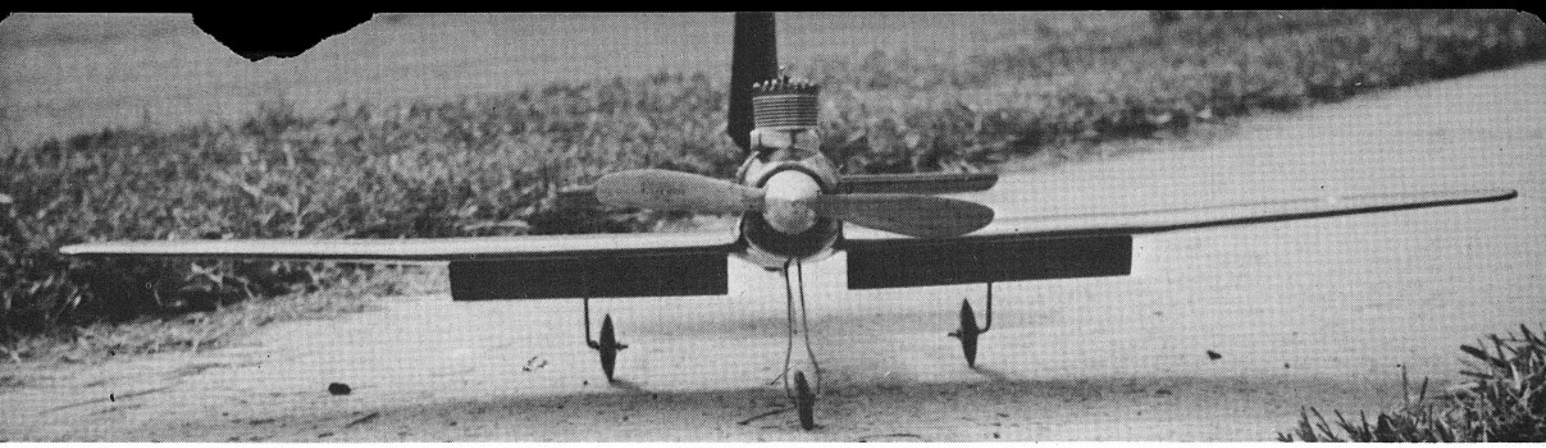


Author's Number one and two ships battle it out nose to nose. Decals do give Number one ship the advantage, smooth finish helps increase speed.

► The Douglas XTB2D-1 Skypirate, also known as the Devastator II, was one of that group of unlucky airplanes developed during World War 2, approaching the ultimate in piston-engined design, but doomed at birth by the end of the war and the fast-rising jet. The Skypirate was ordered by the Navy in October of 1943, and was intended for the big Midway class carriers. A large airplane, it had a wing-span of 70 feet and an overall length of 46 feet. Powered by the huge Pratt and Whitney XR-4360-8 "corncob" radial engine which turned a pair of counter-rotating propellers with 3,000 horsepower, the top speed was 340 mph at altitude, 312 mph with externally carried torpedo, and 75 mph at landing. The Skypirate could also carry up to 4,000 lbs. of bombs, and it didn't stop there. Four .50 caliber machine guns were standard in the wings, and plans called for three additional .50 caliber machine guns in remote turrets firing aft. Empty, she weight in at 18,400 lbs., and the maximum gross weight went up to 34,700 lbs.

All of this fire-power and explosive was to be handled by one pilot, although a crew of three could be carried, and he could use the full range of 2,900 miles for a scouting mission or 1,250 miles if a torpedo was being carried. As it turned out, only two of these unusual planes were built, BuAer numbers 36933 and 36934, before the imminent end of the Pacific war forced cancellation of the contract. They were flown early in 1945, but were foredoomed by the march of events.

The Skypirate was chosen for (*Continued on next page*)



Head on, nothing shows but flaps and engine. Rather hard to conceal a powerhouse the size of a McCoy .60 in the nose of a standard carrier.

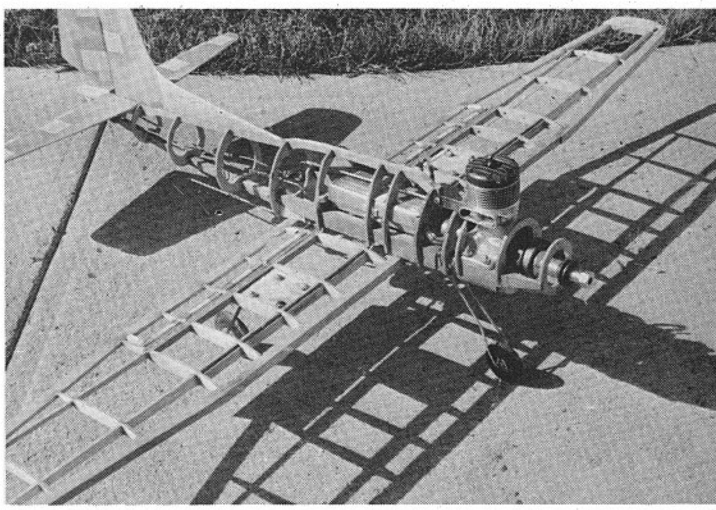
SKYPIRATE . . . Continued

modeling for a variety of reasons. It was unusual, as far as was known, it hadn't been reproduced in model form before, and it offered a rare combination of design features that could be used in a flying scale model more readily than those of most other military ships. Every scale modeler has had to come to grips with the fact that airplanes are designed to be a certain size, and they just don't scale down without a fight. Concessions must often be made to true scale, notably in the tail surfaces, and the flying characteristics invariably suffer. In the Skypirate, there was a huge wing, equally large tail surface, and a beautifully slim fuselage. No nit-picking research or point-stretching was necessary to prove that it was a carrier ship, and one variation even had a spinner to cover those two propeller hubs, so we were home free.

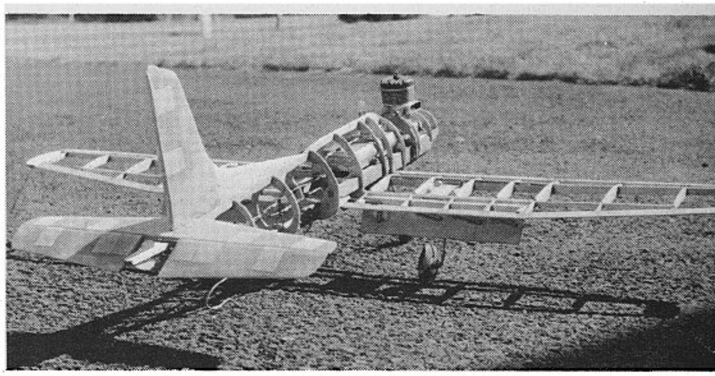
The model design began with determining the minimum fuselage diameter (for low frontal area) that would house the McCoy 60 and the four-ounce tank. The wingspan worked out to 40 inches, well within the maximum allowed by Navy carrier rules, but providing plenty of wing area for those slow-speed runs. Most of the carrier event ships used today (at least in class II) have an extremely high wing loading. This is not an insuperable handicap, if you stay on top of the game all of the time, but I, and I'm sure many others, have had that awful "sinking" feeling when I realized that I had let the speed drop one knot too far, and that bomb at the end of the lines was no longer flying, but falling. This sight is disconcerting, to say the least, and more important, even if you like to repair bent airplanes, it's disqualifying. As every carrier fan knows, all the flying circle outside of the deck is considered water, and to touch the ground, however lightly, is to legally crash (or ditch, if you're an incurable optimist). The Skypirate will actually glide at the slowest speed you'll ever fly.

The airfoil was drawn as thin as possible while still covering the spars, and the maximum thickness, is at about one-third of the chord, providing good lift characteristics. The design theory proved itself in flight after flight. We were able to hit 98 mph high speed and 23 mph low speed quite consistently. Under the Navy carrier scoring system, (1 point for each mph high speed, 3 points for each mph difference between low and high, 100 points for scale, and 100 points for an arrested landing on the first pass) this works to 523 points, very respectable when it is considered that the engine and all accessories were completely stock. The McCoy was not polished or altered in any way, and straight Thimble Drone Racing fuel was used for all flights.

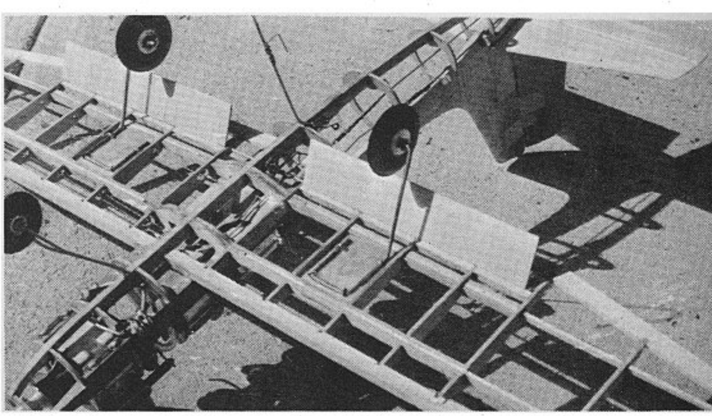
Our Skypirates used, of course, the McCoy 60, still unbeatable for class II carrier. An OK Cub long plug was standard; in spite of the claims for the bar-type plugs, they won't allow good high speed, even if, in theory, low speed will be aided. Also standard equipment was a 10/8 propeller and a 1½" diameter, long (*Continued on page* 38)



Minimum structure designed for adequate strength can keep the weight down on a carrier model. Low weight adds to speed and maneuverability.



Skeleton view of model without fuselage and wing covering shows how the structure was held to absolute minimums. Performance attests to strength.



Underneath view of skeleton shows flap and main gear attachment, also arresting hook. Strength most important here for arrested landings.

Skypirate

(*Continued from page* 13)

spinner. Our number one bird carried a four-ounce, Veco T-31E pressure tank, and the number two ship has the 3½ ounce equivalent, a Veco T-31D. Experience has shown that these capacities are excessive for the typical carrier contest flight, but consider for a moment the amount of time the average, or even the dedicated flier actually spends flying at contests. The great bulk of the flights made are practice flights, and a four or three and one-half ounce tank will allow as many as three complete carrier runs—takeoff, seven high-speed laps, time to slow down, seven low-speed laps, and approach. If you're lucky enough to have a paved surface to fly over, it is even possible to get the ship down for an instant (assuming no arresting lines) at the end of the low-speed run. This feat has been performed regularly, and is made relatively easy by virtue of the tough construction of the landing gear and the ample propeller clearance afforded.

An inverted Roberts 3-line bellcrank is recommended, and the various working features are built around this unit, but there is no reason why a separate third line cannot be used, if desired. The alternate shorter control arms of the Roberts bellcrank are used, and the excess length cut off. Gently file the cut ends so as to remove any sharp edges that might chafe the leadouts. Both of our McCoys have had the Vari-Speed exhaust throttle installed, and this setup can't be beat for simplicity. While the straight-line action is easy to hook up, more throw or a change of direction can be obtained by the use of a small bellcrank mounted on the firewall or the engine mounts. This was not found to be

(*Continued on page* 40)

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(*Continued from page* 38)

necessary in our experience.

Pressure is bled from the engine into the tank by replacing one of the rear crankcase bolts (6-32) with a pressure fitting. The left top bolt (facing forward) is the preferred one to replace. Fittings are available commercially, but our ships used 6-32 machine screws that had been drilled to about 1/16" inside diameter, and then this hole filled with solder and drilled open again with a 0.015" drill bit. A nut is brazed onto the fitting to regulate the depth of its entry into the crankcase.

One aid to high speed flight without unreasonable line pull was employed that is not recommended to the inexpert flier. Most control line ships have a greater or lesser amount of engine "out-thrust" to maintain good line tension. This was not considered necessary, due to the relatively large size of the carrier model, and, in fact, just the opposite was done. A very small amount of "in-thrust" was built in when the engine was installed, and it worked wonders on the flight characteristics. Not only did the ship travel very fast, but adequate line tension was maintained at all times without the unpleasantly heavy pull we have experienced with other .60-powered models. The angle of thrust used must be slightly less than that made by the airplane's center line and the circumference of the flight circle.

The best way to describe the engine, flap, rudder, and hook bird's nest is to refer the builder to the plans and diagrams. One sixteenth inch music wire is used throughout, and in spite of its complicated appearance, the mechanism is very easy to install. Note that in two places an overlap of the wire is deliberately built in, the reason is that this vastly simplifiies the proper setting of the various controls. The trick is to wrap the joint with soft copper wire, smear soldering flux over the whole thing, and solder. Minor adjustments can then be made by reheating the joint in question, setting the control, and holding for an instant until the solder hardens.

The first part to install is the engine control, as all the rest are dependent on this one. The flap control is next, and here a little cut and try may be necessary. The small loop in the control horn descending from the engine control wire is there for a reason: the sudden dropping of the flaps with the engine running at near full speed is liable to cause ballooning. The ¼" loop in the control horn delays flap extension until some speed has been lost, then they come down promptly to their full travel—about 50 degrees. This angle can be varied at will by either varying the length of the loop or the arm on the flap shaft. The same general remarks hold true for the control horn mounted on the rudder shaft, but here it is less critical, as the outward deflection and the drag caused by the rudder are all to the good for losing speed. The hook is the only part of this installation that is non-retractable, but it has no measurable effect on high speed flight. Again, these features were built into the Skypirate with practice in mind—the spring-loaded flaps used on most carrier ships work no better than ours, and have the disadvantage of cancelling out any further high speed laps once they have been extended. One more word on the control hookup. The U-shaped engine control rod was dictated by both the other mechanisms that work from it and the lack of space forward. Bracing wires were installed at the corners in the number two ship, but this was a precaution and is not considered necessary.

The construction of the Skypirate is conventional, but somewhat more rugged than you'll find in the average model. There's a good reason for this—carrier ships take quite a beating. They must carry a very powerful engine turning at top revs, must fly very fast, and are hauled to a stop with the engine running in their own length. Lightly built models will come unglued quickly with such treatment.

First cut the motor mounts from 12 inch pieces of ¾" by ⅜" stock. Pick the straight, hardest pieces you can find. Drill several lightening holes in the mounts, but not forward of bulkhead D. Next cut the top and bottom keels from ¼" pine. This wood is available from your lumber yard as lathing. Again, choose unwarped, straight-grained stock. While the outer edges of the keels can always be trimmed later, the slots must be cut accurately, as these serve to line up the bulkheads. Cut bulkheads A, B, D. E, F, G, H, and I from 3/32" aircraft-type plywood. Bulkhead C, the firewall, is of ⅛" plywood. Bulkheads B-1, B-2, and C-1 are cut from hard 3/32" balsa, and serve only to carry the fuselage shape. The cuts in the bulkheads for the motor mounts must be square to preserve the proper thrust line. The best course to follow is to cut the holes to approximate shape, true up the upper edge of the cut, and fit the mounts with that edge as the reference line. Cut the bellcrank platform from 3/32" plywood, and attach the bellcrank with the three leadouts already in place. This procedure is desirable because of the tight working space available once the tank is installed. Use aircraft-type nuts on the bellcrank mounting bolts, and as additional insurance, use a wirecutting pliers lightly on the threads just past the nuts when they are tightened. Make the leadouts about three feet long and secure them to the bellcrank with a crimping tool and sleeves. These are available from most sporting goods stores (they're used on fishing gear) and make a far neater job than the usual soldering, which is doubtful anyway on stainless steel wire. Don't make the loops in the outboard ends of the leadouts at this time.

Slide the firewall into its proper place on the mounts, and lay the tank in place. Mark the two spots where the fuel and pressure lines leave the tank, remove the firewall, and drill two 3/16" holes for the tubes and two ⅛" holes for the nose gear attachments. Now position bulkheads A through F on the motor mounts. Don't forget the fuel tank and the bell crank platform, both of which are locked into the frame by this part of the construction. Seal off the tank from sanding dust by two short pieces of tubing, one running from the feed to the pressure input, the other between the two filler vents on the top of the tank. Make sure that the mounts and the bulkheads are true, and then glue all joints. Let dry thoroughly and glue again. Fit the top and bottom keels in place, position bulkheads G, H, and I and the stabilizer platform (3/16″ hard balsa) between the keels, and glue thoroughly. Add the two balsa formers to the front of bulkhead A.

Cut the stabilizers, elevators, fin and rudder from hard 3/16″ balsa. Stabilizer-elevator and fin-rudder hinges are conventional over-and-under cloth tape. Bury the rudder and elevator control wires in the leading edges of their respective surfaces, cover with glue, and secure in place with additional tape over the wires and glued to either side of the control surface. Sand to final shape, install the elevator horn, and glue the stabilizer with attached elevators to the stabilizer platform. Check for zero incidence. Attach the vertical fin, and when dry, hinge the rudder with its control horn to the fin. The presence of the rudder horn makes attaching the fin and rudder as a unit difficult. Since the rudder stands free of the fuselage, small plywood fairings are placed on the inboard side of the fin, overlapping the rudder to permanently deflect the rudder about 3/16″ to the right (at the trailing edge). These are glued only to the fin. At this point the elevator control rod may be set up and soldered in place.

Now cut out the wing ribs, landing gear platforms and spar doublers, all of 3/32″ plywood. You'll need ten of the A ribs, and 2 each of the B, C, and D ribs. (If you have a power jig saw, a lot of time will be saved in cutting out all of these pieces. We used a sabre saw mounted upside down in a table, and while this tool was hardly designed for such light work, it was satisfactory.) Once again, make the spar cuts in the wing ribs, and the spars themselves, with good accuracy. The spars are cut from 3/32″ hard balsa, with the dihedral built in. Don't forget to cut the slots in the spar doublers for the gear platforms, and the holes in the wing ribs (left side only) for the leadout wires. An additional hole must be drilled in each of the wing ribs closest to the fuselage, for the flap shaft, and now is the time to bend that piece of wire and pass it through the two ribs. Make a trial fitting of the spars and doublers, and cut out the slot in the balsa spars for the gear platforms corresponding to those in the doublers. After pre-coating all surfaces with glue, place the pointed ends of the spars in the V-cuts of bulkheads D and E, arrange the spar doublers on either side of both spars, insert the gear platforms in the slots, and clamp everything together with as many clamps as you can lay your hands on. Sight from the front of the model to make sure that the front and rear spars are in alignment.

Set the ribs in place (cuts must be made in the top of the front (balsa) spars for the ribs, and this is better done when the spars have been assembled) and glue in place, sighting across the span from each side to make sure that no warp is being built into the wing. Double glue all joints. When the ribs are dry, cut the leading and trailing edges to length, make slots about 3/32″ deep for the rib ends in both, and glue in place, again checking for alignment. The sheet balsa covering will completely cover the trailing edges, but will butt against the leading edges, so center the ⅜″ square leading edges on the ribs. Now run the control leadouts through the holes in the left wing ribs, noting that, due to the shortened Roberts bellcrank, the down line and the engine control line cross within the wing. This is perfectly safe, and any friction caused is unnoticeable—after all, the difference in travel is only a matter of some two inches. The reason for this lies in a possible misinterpretation of the rules (by a contest official) that call for the engine control line to emerge from the model with or between the elevation control lines. Prepare the 5/16″ hard balsa wing tips. the left one of which has three 1/16″ I.D. aluminum tubes pressed into drilled holes (conforming to the angles at which the leadouts leave the wing) and flared at both ends. The flaring needn't be neat—the purpose is merely to anchor the tubes in the wing tips. Glue both wing tips in place.

Cut the wing flaps from 1/16″ plywood (aluminum may be used, but complicates the hinging), noting that the outboard flap is ¼″ shorter in span than the inboard flap (more insurance). Glue in the flap spars, which are nothing more than ¼″ square scraps, and hinge the flaps to the spars in the same manner as you have hinged the elevators and rudder. Stiffeners were added to the flaps in our ships (visible in the photos), but these are optional. The bottom of the trailing edges touching the retracted flaps must be sanded down to permit full retraction and a smooth airflow. Now install the landing gear, the engine, and the control mechanisms, as shown in the diagrams. Both the engine and elevator pushrods are attached to the Roberts unit by sharp right-angle bends in the wire passing downward through their respective holes in the bellcrank, and secured by washers soldered to the protruding tips. When this installation is completed, pull test the whole control setup at about 60 pounds. We accomplished this without help by lashing heavy electric wire around the frame (inside of the keels), securing this to a convenient pipe, and pulling on a ¼″ diameter rod passed through the now-completed loops in the leadouts. If anything is wrong, *now* is the time to discover it, before the ship is covered. We will not soon forget the time, with another carrier model, when the pull test was not made until the ship was completed. In seeking more clearance, we had bent down the arms of a Roberts bellcrank. The pull test disclosed that this had destroyed the geometry of the unit, and it bent out of shape and jammed the whole control system. This was a nice mess to correct on a finished model. When the integrity of the system has been established don't worry, the Roberts unit will easily handle that 60 pound pull .

Six inch width, 1/16″ medium balsa sheets were used to cover the wing. These sheets, except in the flap area, join one another aft to form the true trailing edge. Before covering the top outboard section of the right wing, glue about one ounce of lead into the wing just inboard of the tip. If possible, use a flat weight that will distribute the load over a wide area. The fuselage is covered with medium 3/32″ sheet balsa up to the firewall. The method is to soak the wood in water until pliable, place it against the fuselage area to be covered, and wind bias tape (used in sewing) or its equivalent tightly around the fuselage to force the wood to assume the proper shape as the glue dries. Forward of the firewall, the curves become too compound for this technique, and 3/32″ x 3/32″ planking strips are used. Don't forget to leave the engine hatch space on top open. Small pieces of hardwood are glued to the inside of the planking to accept the wood screws holding the aluminum hatch cover in place. Drill or punch a small hole in the left side

Skypirate

(*Continued from page* 45)

of the planking to receive the needle valve. Mount the spinner on the engine to act as a sanding guide, and start sanding. When the ship is smooth, paint on a coat of balsa fillercoat and sand again. Cover the entire ship with lightweight silk applied wet, and apply two coats of clear dope to all surfaces. Sand lightly, give it another coat of balsa fillercoat, sand again, and check for smoothness. Another coat of filler may be desired. One more coat of clear dope, another light sanding, and you're ready for the color coat. Put enough on to give good color and a smooth finish, but don't go overboard—pigmented dope adds weight. In our experience, the same effect can be had with one coat of Hobby-poxy as with 3 or 4 coats of colored dope. Our ships weighed just about 2¾ pounds, and there is little doubt that this figure can be shaved to about 2½ pounds.

If the Roberts control system is used, the leadouts are cut so that the engine control wire is 2⅛″ longer than the two elevator control wires with the Roberts unit set for high speed flight. The three flying wires are all cut to the same length, and care must be taken that the total distance from the center of the control handle to the *center of the model* is not less than 60 feet and not more than 60 feet 6 inches. Measure the distance from the center line of the Skypirate to the end of the leadouts (about 26″, depending on how much of the leadouts extends from the wingtip), measure the distance from the grip of the Roberts handle to the flying wire attaching points on the handle, and add these two figures. Subtract the result from 60′ 3″ (approx.) and you have the desired length for your wires.

The Skypirate has no bad habits that we have discovered. If the recommended

(*Continued on page* 48)

elevator horn length is used, there is quite a bit of elevator travel, and while we never got up the nerve to try it, we have no doubt that the ship can be looped. This maneuverability was deliberately built in to permit quick takeoffs and rapid changes of direction, but is rarely used. The McCoy starts quickly after a prime, and the engine should be revved to the ultimate before launching. A properly working pressure system will keep the engine running at any speed and in any position the ship will normally assume. If the engine quits repeatedly within half a lap of the deck, or slows down in flight, check the system for leaks. All the causes for such engine behavior will be found in the pressure system. If you're new to Navy carrier, be careful of over-controlling, especially at launch. You've got a ship that will be moving at a terrific rate of speed, and you can't give it full up and forget it for a couple of seconds. If you've been faithful in maintaining zero incidence in building, the Skypirate will fly as if on rails at all speeds. We found this to be so even with the decreased line pull obtained by our slightly inset engine. Make sure that the control handle is set for high speed flight before being launched, give the elevator a quick blip to get the ship off the deck, and level off for your fast run at about 15 feet(the rules say not over 20 feet). Count seven laps and push the Roberts trigger away from you to shift to low speed. Use your free hand to insure that the trigger is out of its full travel. By the second lap after completing your high speed run, the ship will have slowed enough for your low speed laps. Count seven completed laps again (it's easy to get confused at this point by starting your count of one when you *begin* timed, low speed flight—if you make this mistake, you will only have flown six laps when the count of seven comes up), and get lined up, with the help of your crew, for the landing. Approach the deck for landing at a low altitude, taking advantage of the Skypirate's superior flying characteristics, and fly gently onto the deck. If this is only practice, tighten up on the trigger and the ship will clean herself up for high speed flight again.

You have a model that will score well over 500 points consistently. Knowing your ship and engine will make the difference, and this knowledge is gained only by practice. Get to work, and good luck.