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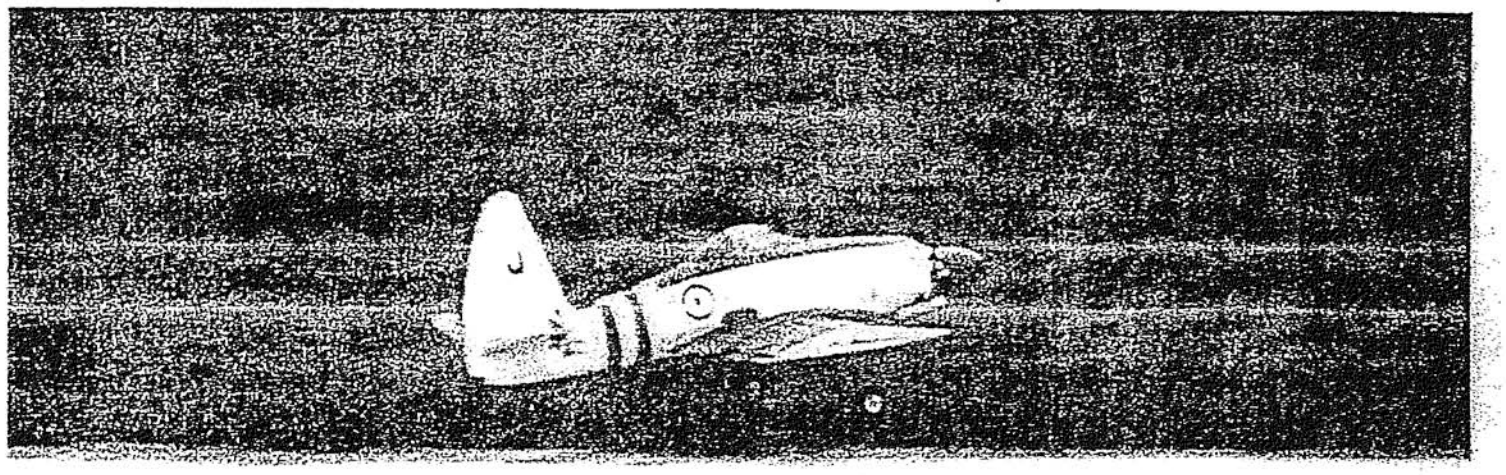
by Vance Mosher

THE WESTLAND WYVERN S.4



The last of the prop-driven fighters

The wyvern was a mythical monster with the front legs of a dragon and the barbed tail of a snake and, of course, it was one mean creature! The Westland Wyvern was the last fixed-wing aircraft design from the Westland Aircraft Co. and was one of the last prop-driven fighters. It was a very large airplane that was about the same weight as a DC-3 but larger than—and twice as powerful as—a P-47 Thunderbolt. Its twin, contra-rotating props certainly gave it the same mean appearance as its fictional predecessor.

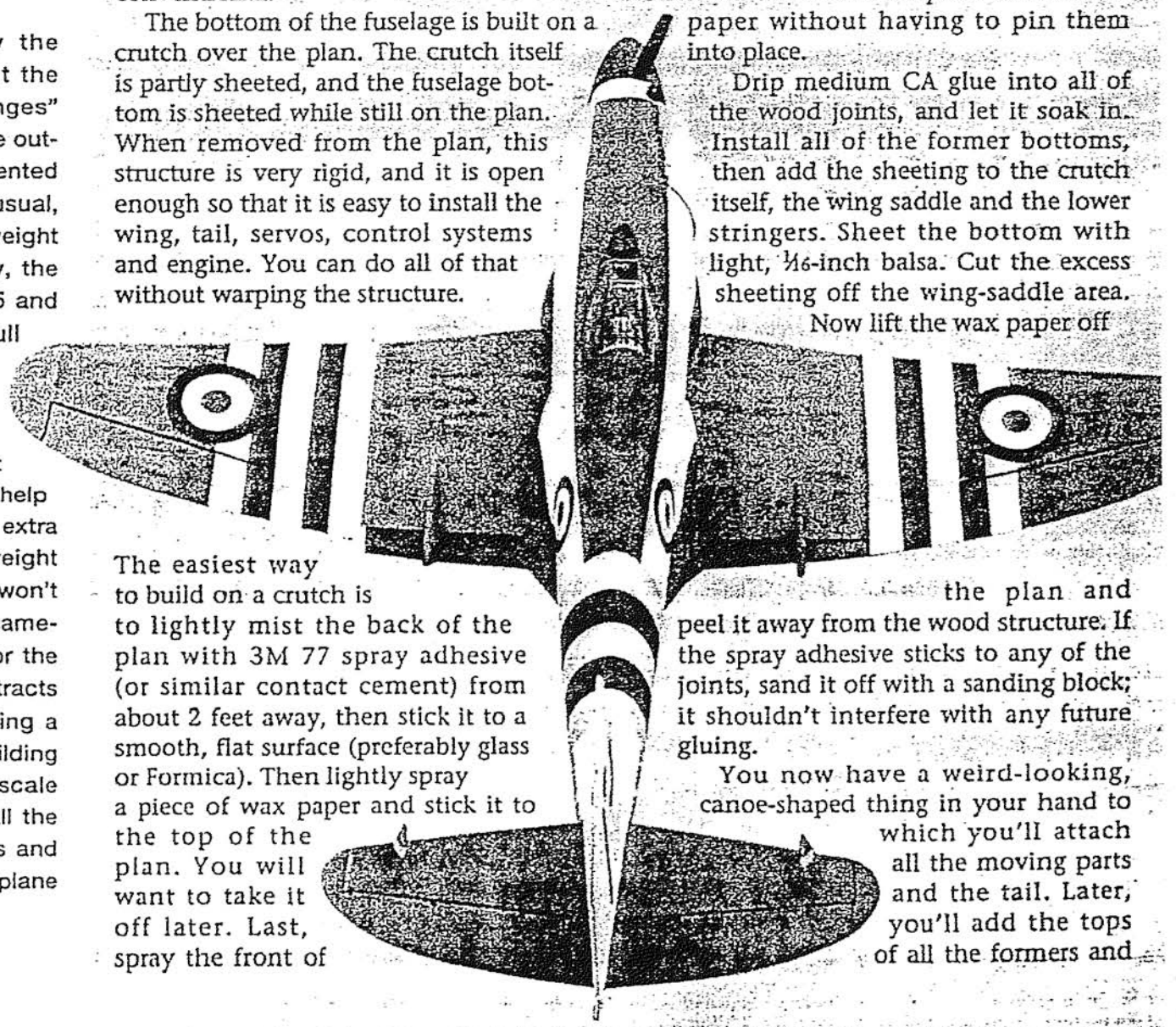
The Wyvern is a fairly complex aircraft in its all-out scale form. Don't worry about that, though; I designed this model to make everything as simple as possible. The only real requirement is that you want to build it.

There are ways to simplify the construction. You can leave out the flaps and retracts, use "easy hinges" and put all the control horns on the outside. In a simpler form than presented here, the airplane will still be unusual, will fly well and be lighter; and weight reduction is always good! Ideally, the airplane will be powered by a .15 and will weigh about 2 pounds. In full scale form, its weight should be kept to 2¼ pounds. Being heavier doesn't make the airplane harder to fly, but the power-to-weight ratio becomes marginal. It doesn't help to use a larger engine because the extra engine weight and the balance weight you would have to put in the tail won't improve performance (using the same-size wing). My recommendation for the sport flier is to forego the flaps, retracts and cockpit interior, thereby saving a couple of ounces and a lot of building time. If you do leave out all the scale stuff, you won't have to cut out all the weight-saving holes in the formers and ribs; that saves effort, too. The airplane is easy to land without any flaps.

CONSTRUCTION

The Wyvern fuselage and tail are built in "half-shell" construction. The wing is conventional.

The bottom of the fuselage is built on a crutch over the plan. The crutch itself is partly sheeted, and the fuselage bottom is sheeted while still on the plan. When removed from the plan, this structure is very rigid, and it is open enough so that it is easy to install the wing, tail, servos, control systems and engine. You can do all of that without warping the structure.

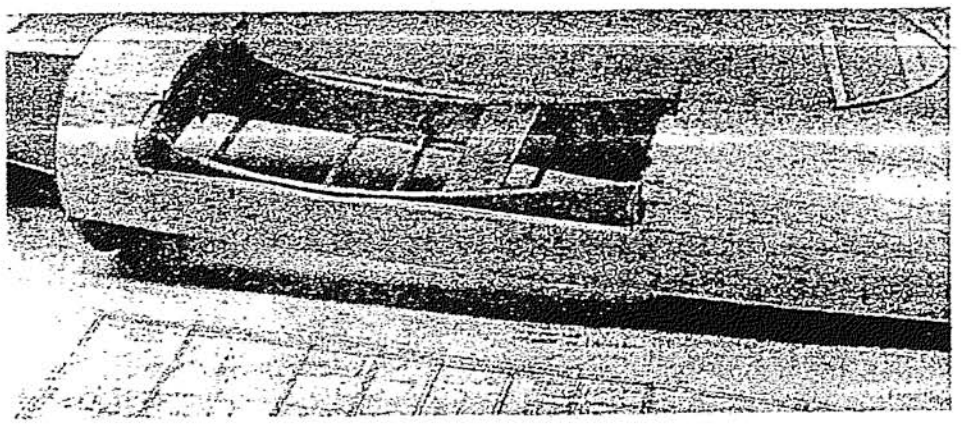


The easiest way to build on a crutch is to lightly mist the back of the plan with 3M 77 spray adhesive (or similar contact cement) from about 2 feet away, then stick it to a smooth, flat surface (preferably glass or Formica). Then lightly spray a piece of wax paper and stick it to the top of the plan. You will want to take it off later. Last, spray the front of the wax paper with a heavier coat of contact cement and let it dry for a few minutes. The final coat will allow you to stick all of the crutch parts to the wax paper without having to pin them into place.

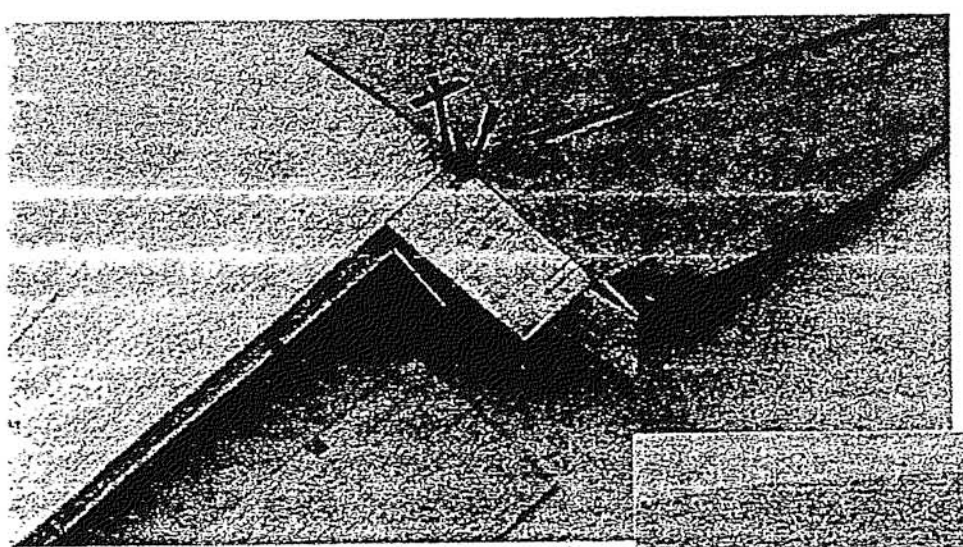
Drip medium CA glue into all of the wood joints, and let it soak in. Install all of the former bottoms, then add the sheeting to the crutch itself, the wing saddle and the lower stringers. Sheet the bottom with light, 1/16-inch balsa. Cut the excess sheeting off the wing-saddle area.

Now lift the wax paper off the plan and peel it away from the wood structure. If the spray adhesive sticks to any of the joints, sand it off with a sanding block; it shouldn't interfere with any future gluing.

You now have a weird-looking, canoe-shaped thing in your hand to which you'll attach all the moving parts and the tail. Later, you'll add the tops of all the formers and



The fuselage is built using a half-shell construction. First, the bottom half is built directly over the plan, then it's removed from the board so the top half can be installed.



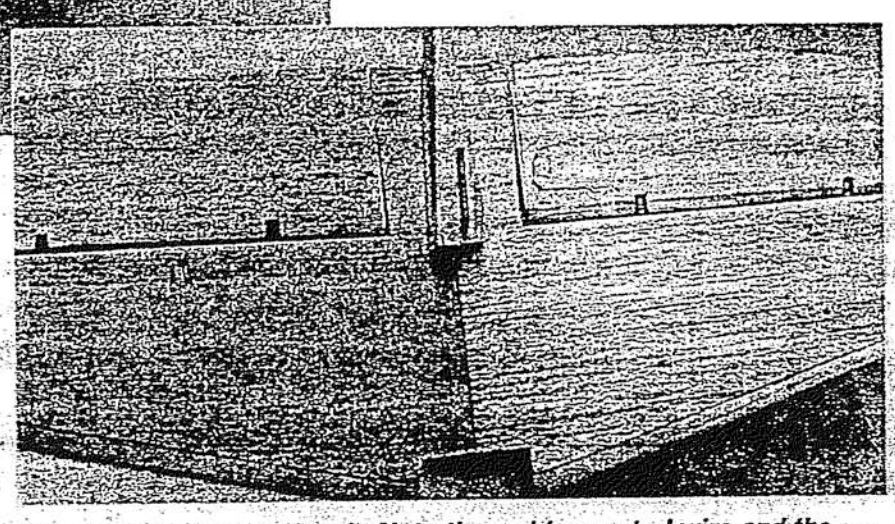
The tail surfaces are built with a sheet-core construction, and a fair amount of dihedral is added to the horizontal stab during construction.

TAIL

Because the surfaces are curved in all directions, I made the tail surfaces using sheet-core construction and built them flat over the plan. Once again, spray the wax paper and put it over the plan, then place the 1/32-inch core flat on the plan. The ribs are cut in halves lengthwise so the top half of each rib can be glued to the top of the core sheet. The sub leading edge is then added, as is the top half of the spar. After the spars have been contoured to match the rib profiles, the top of the surfaces is sheeted with 1/32-inch balsa. At this point, the structure is stiff enough to be picked up without warping. Prop up the stabilizer halves and fit and glue them together to form the dihedral shown on the plan. Then add the bottom rib halves and sheet the bottom surfaces. Add the LE last, and sand the whole thing to shape.

The fancy, scale-like, "buried" hinges shown on the plan are really nice, and they work very well; I recommend them for all scale stuff, suitably sized. They are actually easier to install than anything else except easy hinges. Cut little holes in the spars and shove the hinge supports into them. The 1/32-inch-i.d. plastic tubing shown for the scale hinges is from a "pull/pull" control-cable assembly, and it requires a 1/32-inch-diameter hinge wire. Be sure to bend the outer tip over for about an 1/8 inch so you can pull the hinge wire out of the surface.

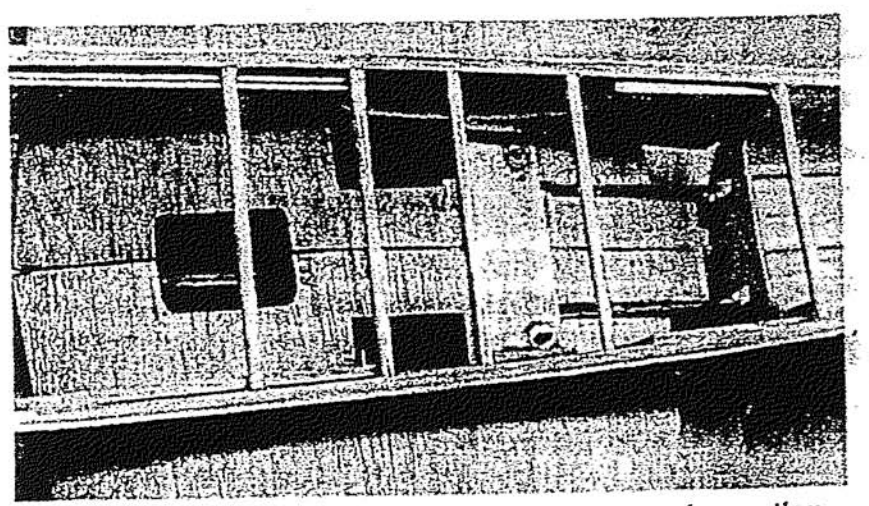
It's almost impossible to line up all the small sections of tubing if you install them one at a time, so install the tubing into the movable surfaces as one long piece with the hinge wire inserted in the tubing for stiffness; then pull out the wire, and notch the tubing later. After you've cut the notches, push the wire back into the movable surface and hang the hinge supports on the wire—one in each notch. Then push the hinge supports into the rear of the fixed surface until the movable surface is perfectly aligned. Put a drop of glue on each hinge support and pull out the hinge wire. You can reinstall the movable surface by lining up the hinges and pushing the wire back in at any time. It's really nice to be able to remove the control surfaces as needed for painting or adjustment. They also look just like real hinges.



Here's the completed stab. Note the rudder control wire and the scale-like, elevator-hinge arrangement. You can use simpler, conventional hinging if you prefer.

POWERPLANT

The new O.S.* .15 or the Norvel* .15 will both work with the Wyvern. Avoid heavier engines. This airplane is already nose-heavy, and lead doesn't fly well. The entire power system is mounted in a conical structure that is glued to the firewall; that makes installation easy. I used a 2-ounce tank, which gave 7 or 8 minutes of flight time. Again, you don't need more weight in the nose. After the engine mount has been glued to the firewall, hollow out a couple of styrene foam blocks to fit around it. The blocks should be the same length as the distance from the firewall to the back of the nose ring. Glue the balsa nose ring to the front of the blocks, centered on the engine, then sand the foam to blend in with the nose ring and the front of the fuselage. Cover the shaped foam with a couple of layers of 2-ounce glass cloth using epoxy resin. Sand smooth and cut a hatch out of the side of the cowl around the engine and back to the firewall. There will be a short section behind the muffler hole where the bottom seam goes. The top seam should be on the color-break line. Hollow out the hatch to about 3/16-inch thickness, cover the inside with a layer of glass cloth, and hinge it at the top edge with a couple of pinned hinges recessed into the foam to make the joint thin. Sand the bottom edge of the main cowl to the same thickness as the hatch. I use a snap fastener at the bottom of the hatch to hold it closed; this is a piece of canopy plastic formed into a question-mark shape. The straight tail section is glued to the inside of the hatch, and the bump on the other end points downward and fits over a piece of 1/8-inch-square wood that's rounded on the open side and glued to the bottom inside of the cowl. This simple latch allows you to open and close the hatch for fueling without



Here, you can see the wing-attachment blind nuts and mounting plate. Dowels secure the front of the wing to the forward fuselage bulkhead.

FLIGHT PERFORMANCE

The Westland Wyvern is a much smaller airplane than I am used to flying, so I was a bit concerned that it might be squirrelly. It isn't. The widely spaced landing gear and huge fin make takeoffs and landings very orderly. There is no particular yaw problem on takeoff, nor is there an abrupt leap into the air. It doesn't want to nose over into the grass during the takeoff run, either.

Flight characteristics are equally smooth. The airplane tracks well in all axes. Tiny little wingtips just aren't as stall-resistant as larger ones, so the stall strips on the inner LE should be kept sharp. At 36 ounces, this airplane is heavy. An ideal weight would be about 32 ounces—obtainable if you do not add the flaps and retractable landing gear. Stalls are not abrupt, even at the heavy weight, but lightening the model would make it much more spin-proof.

One big surprise was flap operation. When I first used the flaps, I had the Wyvern balanced nose-heavy, which seemed like a good idea on a new airplane. Fortunately, the model was up about 100 feet when the flaps were lowered; flap extension pointed the model's nose straight down! Adding about an ounce of lead to the aft fuselage after landing allowed the Wyvern to be controlled with the flaps down, but it isn't pleasant to handle in that way. Fortunately, you don't need the flaps to land the airplane, as it has very good landing characteristics with the flaps up, so I recommend leaving them off. They sure do look cool, though ....

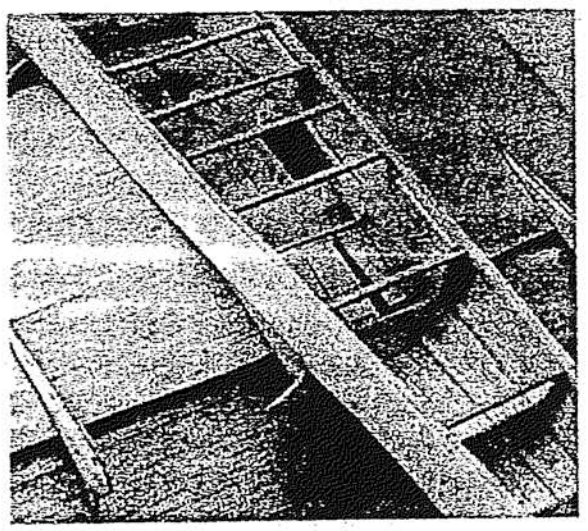
One other thing is important: a scale model needs an engine that doesn't lose a lot of power at less than peak rpm. The new Norvel .15 looks good; a new O.S. .15 would work fine at a lighter weight. The Wyvern just barely flew with a new O.S. .10. (That was where all the stall-testing took place.) If possible, run an 8x6 prop at about 12,500rpm, and you'll be OK.

any tools. You just pull the hatch open and push it closed. To make your latch fit properly, you can recess the foam behind the ⅛-inch square.

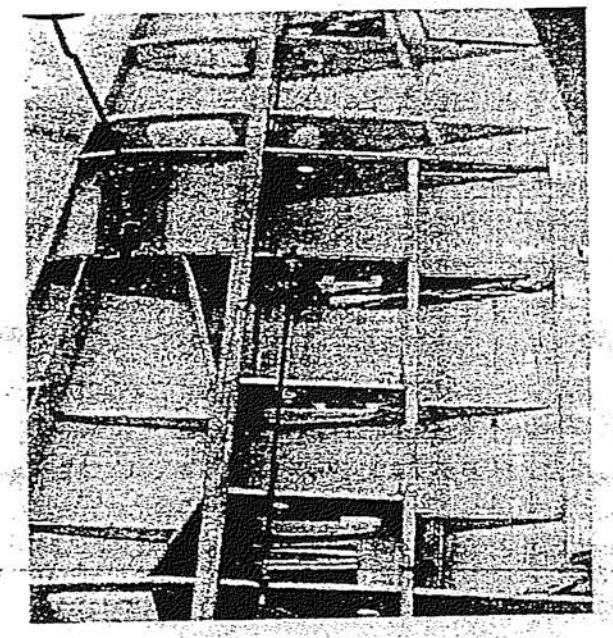
MECHANICS

I use microservos and Robart* micro retractable landing gear in this airplane. I am delighted with the little Hitec* servos I used. The retracts have small bumps protruding from the mechanism that stick out into the mounting rails, so installing them is a tedious cut-and-fit operation. To save weight and conserve space within the model, use a mini receiver and a 250mAh battery if you can.

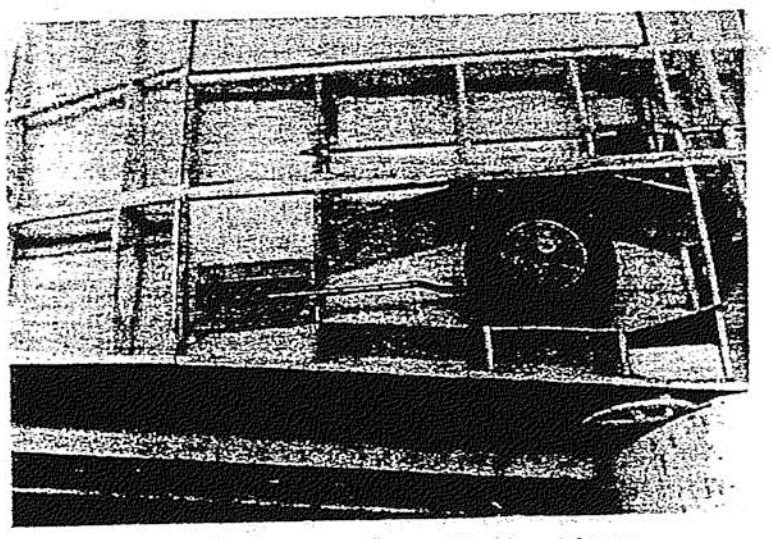
Note the servo locations shown on the plan. Do not move the servos any farther forward. Pushrods are all made from 1/32-inch wire, and their lengths are adjustable by using two pieces of overlapping wire and securing them together (at the correct length) with a 1/16-inch wheel collar. Be sure the front piece of wire is short enough to make the wheel collar visible in the wing opening.



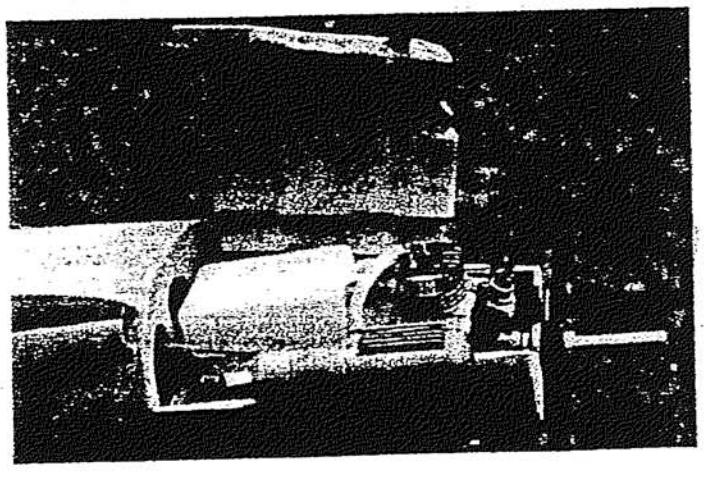
The flap arrangement is scale and rather unusual. To save weight and effort, you can elect not to build flaps into the wing; the model flies fine without them.



Here's a view of the flap drive mechanism; the flaps lower and extend simultaneously.



I used Robart mini retracts; here, they have been installed in the wing.



The engine cowl is hinged; it swings out of the way to allow access to the powerplant. Note that the fuel tank is mounted in front of the firewall. It's very easy to get to.

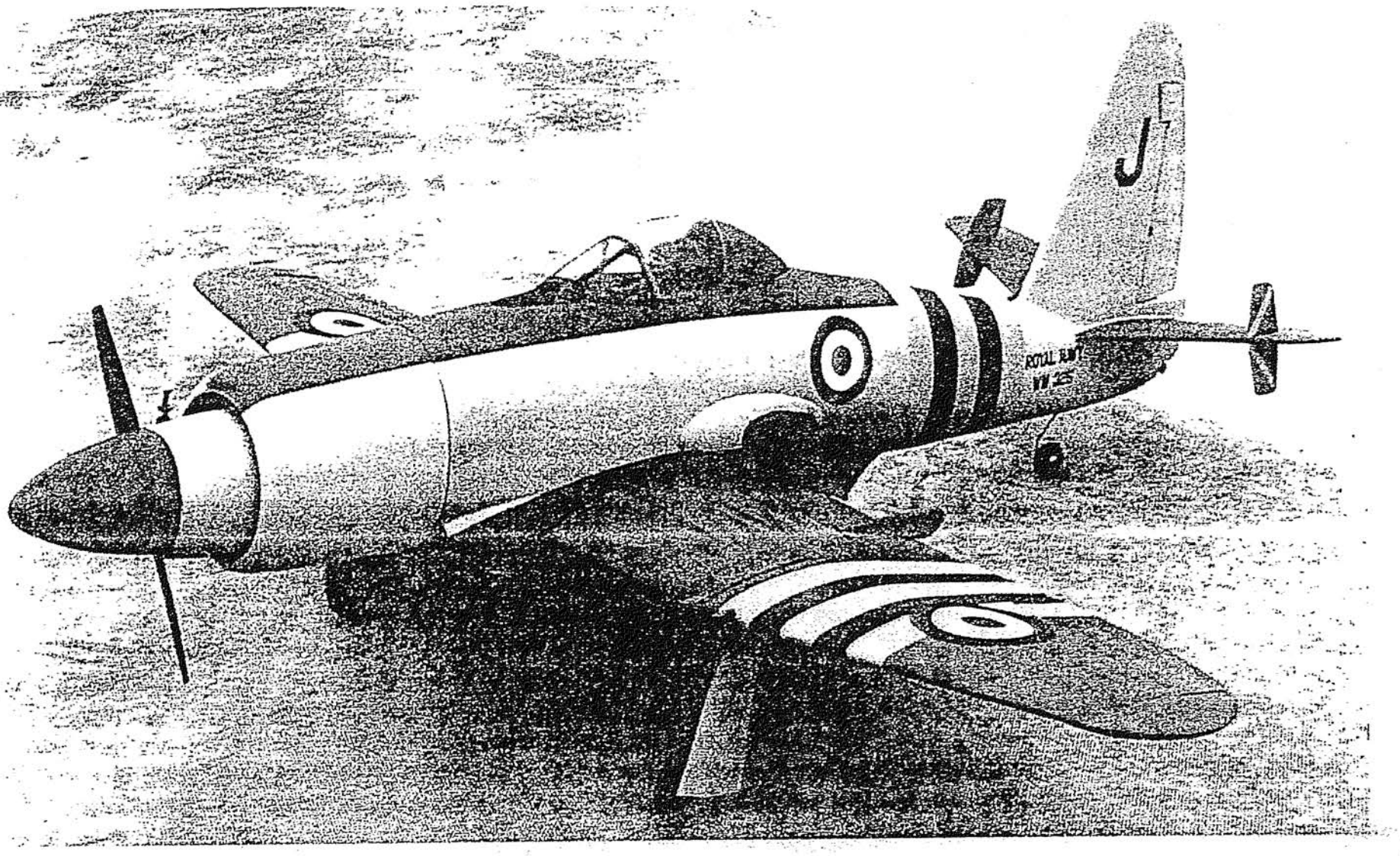
FINISHING

The entire airplane is covered with damp silkspan doped on with nitrate dope (Coverite* Primex or Sig* nitrate dope). Any other finishing method would probably be too heavy. Give the entire surface a couple of coats of thinned dope before putting on the silkspan. Don't use dripping-wet silkspan on the thin balsa, even after it has been doped; this will warp the wood badly! Use about three coats of dope over the silkspan, sand lightly and then spray the airplane with Cheveron* Perfect Paint. I used Extra Dark Sea Gray on top and Duck Egg Blue on the sides and bottom. The stripes and insignias are Floquil* model railroad paint (Dark Blue, Reefer White, Grimy Black, Reefer Yellow and Caboose Red). These colors are a perfect match for those used on the full-size Wyvern. They are all fuelproof, too, but since they are urethanes, give them a week to cure.

You can use a P-51D Mustang canopy instead of forming your own. My pilot was homemade out of styrene foam. The spinner was made from light balsa as described in my article, "How to Custom-Build a Scale Spinner" (July 1999 issue of *Model Airplane News*). Be sure all the controls work smoothly and in the right directions.

Also, be certain to balance the airplane as shown on the plan—right on the main spar! After that, go fly it. Take some pictures, too. Not everyone has a Wyvern. Good luck!

*Addresses are listed alphabetically in the Index of Manufacturers on page 142.



PHOTOS BY VANCE MOSHER

the top sheeting. Two skin sheets should cover the whole top section. The model has a really long nose, so be sure to put the battery in the tail just behind the wing. Set the stabilizer upside-down on the bench; then, after installing the stabilizer saddles on the top of the crutch, place the inverted fuselage over the stab. Level the fuselage bottom from side to side before you glue the stab into place.

Attach all of the control pushrods to the tail, and install the engine hardware before you add the top sheeting to the fuselage. The rudder actuator is inside the tail cone, so the fin and rudder can be added later. Leave the fuselage open until you build the wing so that you'll be able to reach the wing-mounting plate and blind nuts. In this way, you can also make sure that the wing-mounted servos don't interfere with the fuselage-mounted servos.

SPECIFICATIONS

Model: Westland Wyvern S.4

Type: 1/14 scale warbird

Wingspan: 36 in.

Length: 34 in.

Weight: 2 lb., 4 oz.

Wing area: 232 sq. in.

Wing loading: 22.36 oz./sq. ft.

Engine req'd: O.S. .15 2-stroke

Prop used: 8x6

Radio required: 4-channel (rudder, ailerons, elevator, throttle; flaps and retracts optional)

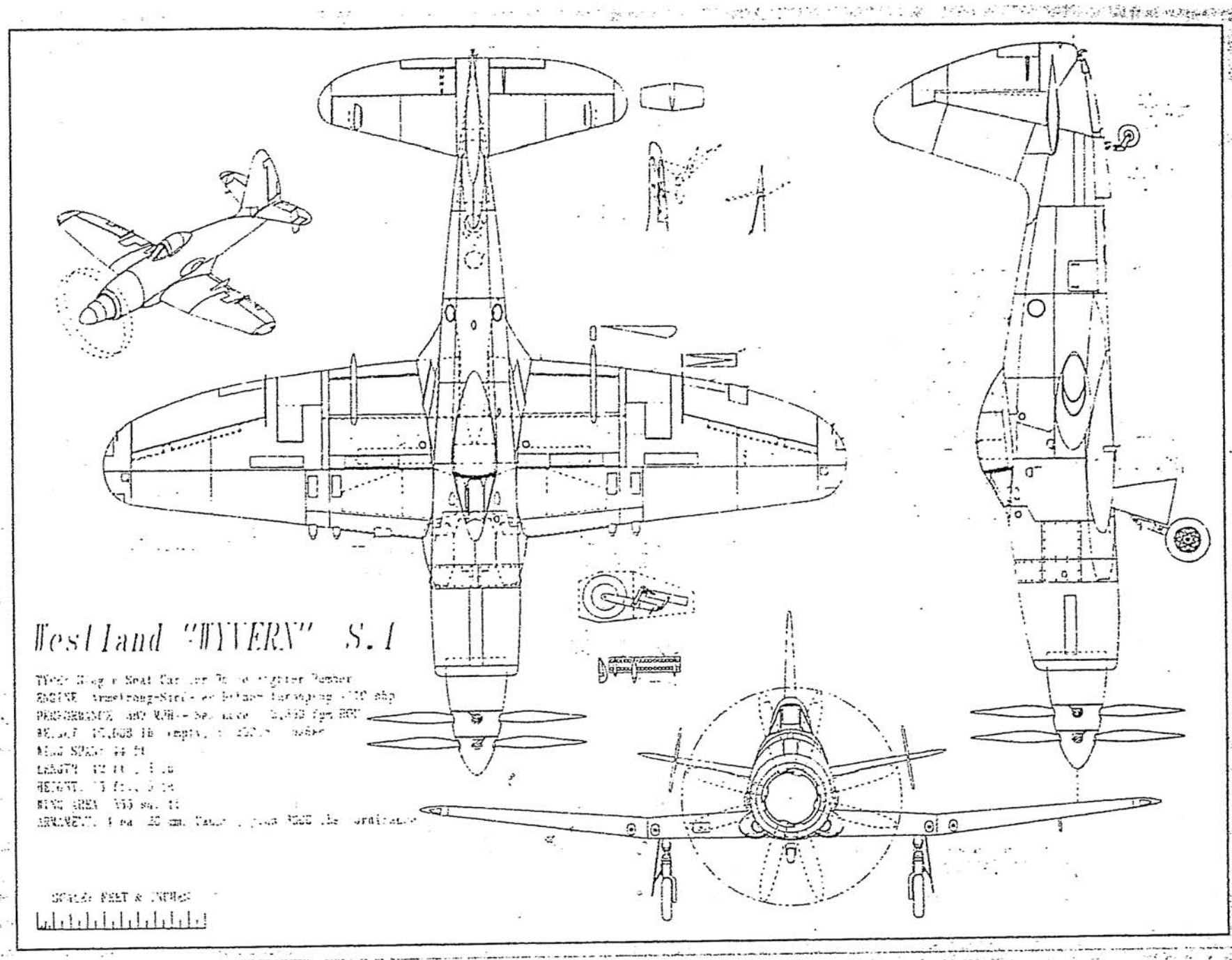
Comments: designed by Vance Mosher, the Westland Wyvern is an unusual scale project for someone interested in a smaller model. The model uses a half-shell construction for the fuselage and sheet-core construction for the tail surfaces. The wing is of conventional construction. The model is made with traditional balsa and ply.

WING

With the bottom spar placed flat on the plan, build the center section of the wing directly over it. Note the splices between the inner and outer spars; these save weight and help align the outer panels with the center section. Build the outer rib and spar assemblies separately, then splice them onto the center section at the correct dihedral angle.

Pick up the wing structure and sheet the bottom. Add all of the internal stuff, such as aileron pushrods and bellcranks, hold-down filler blocks and landing-gear plates. Cut open the wheel-well holes for the retracts (if used) in the bottom sheeting. Turn the partly sheeted wing right-side up and stick it back onto the plans. Put a 3/8-inch-square brace under the center rib TE. Put a 1/4-inch-square brace under the no. 6 rib at the wing dihedral joint. Lift the wingtip so there are 1 5/32 inches under the spar and 1 3/8 inches under the TE. This gives you a straight wing in the middle and the proper amount of washout at the wingtips. Sheet the top of the wing while it is still on the building board. Sheet the wing with fairly stiff 1/32-inch balsa.

To make the scale aileron hinges, I used 1/4x1/2-inch pieces of easy hinges. To further simplify the model, you could use a straight LE on the aileron; change it if you like. I made the aileron bellcranks from small triangles of 1/32-inch ply with the corners rounded off. They pivot around large, cutoff T-pins pushed into and glued to an 1/8-inch balsa block. To actuate the ailerons, I used 1/32-inch wire pushrods supported by holes in the ribs for wire bracing. The aileron horns are attached just under the top skin of the aileron's LE. A piece of 1/32-inch music wire sticks out of the aileron pocket through the rear spar and is bent at a 90-degree angle for 1/4 inch. The wire is inserted into a short piece of small neoprene tubing that's glued with a drop of CA to the top of the aileron's LE. This setup works fine but is fussy to do because of space limitations. I had to thin the bottom of the top wing sheeting to clear the neoprene tube. A simpler way is to use a standard control horn mounted externally.



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Westland Wyvern S.4
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WS: 36 in.; L: 34 in.; engine: .15 2-stroke; 3 sheets; LD 3. $24.95

TO ORDER THE FULL-SIZE PLAN, SEE PAGE 126.