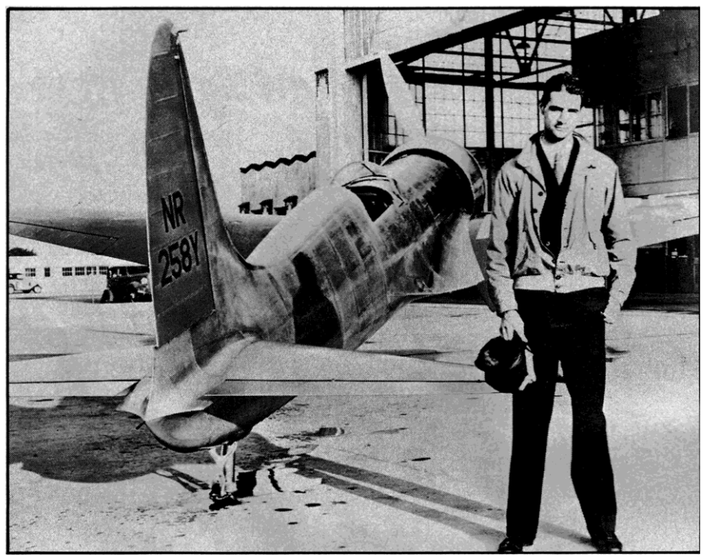
WHY DOESN'T SOMEONE BUILD...

Overhead view of the long wing version complete with corrected registration lettering. Although shown here with its canopy in place, the H-1 managed to break the world's speed record without benefit of the cover as it had been lost the day before.

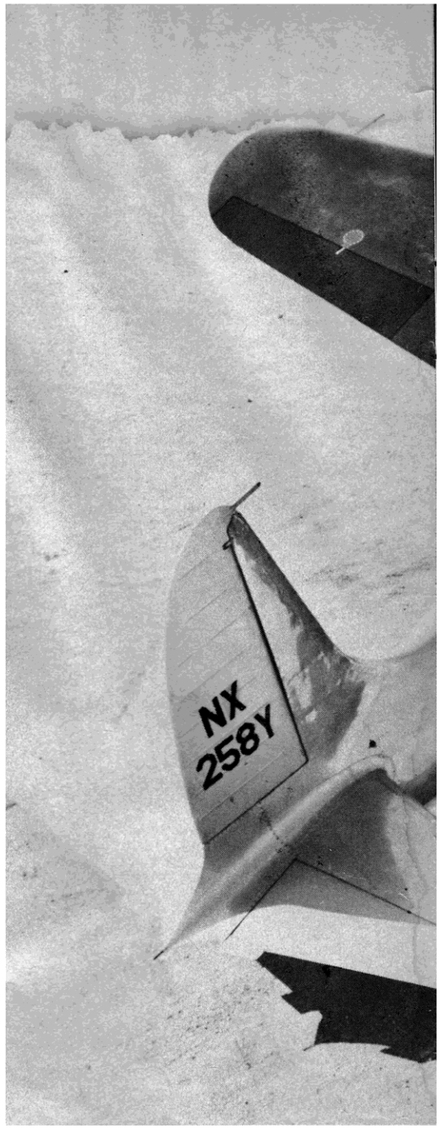
Tall, young, handsome and very, VERY rich, a lanky Texan named Howard Hughes stands beside his creation. Few other than aviation historians today realize that Hughes was an excellent pilot in his day.

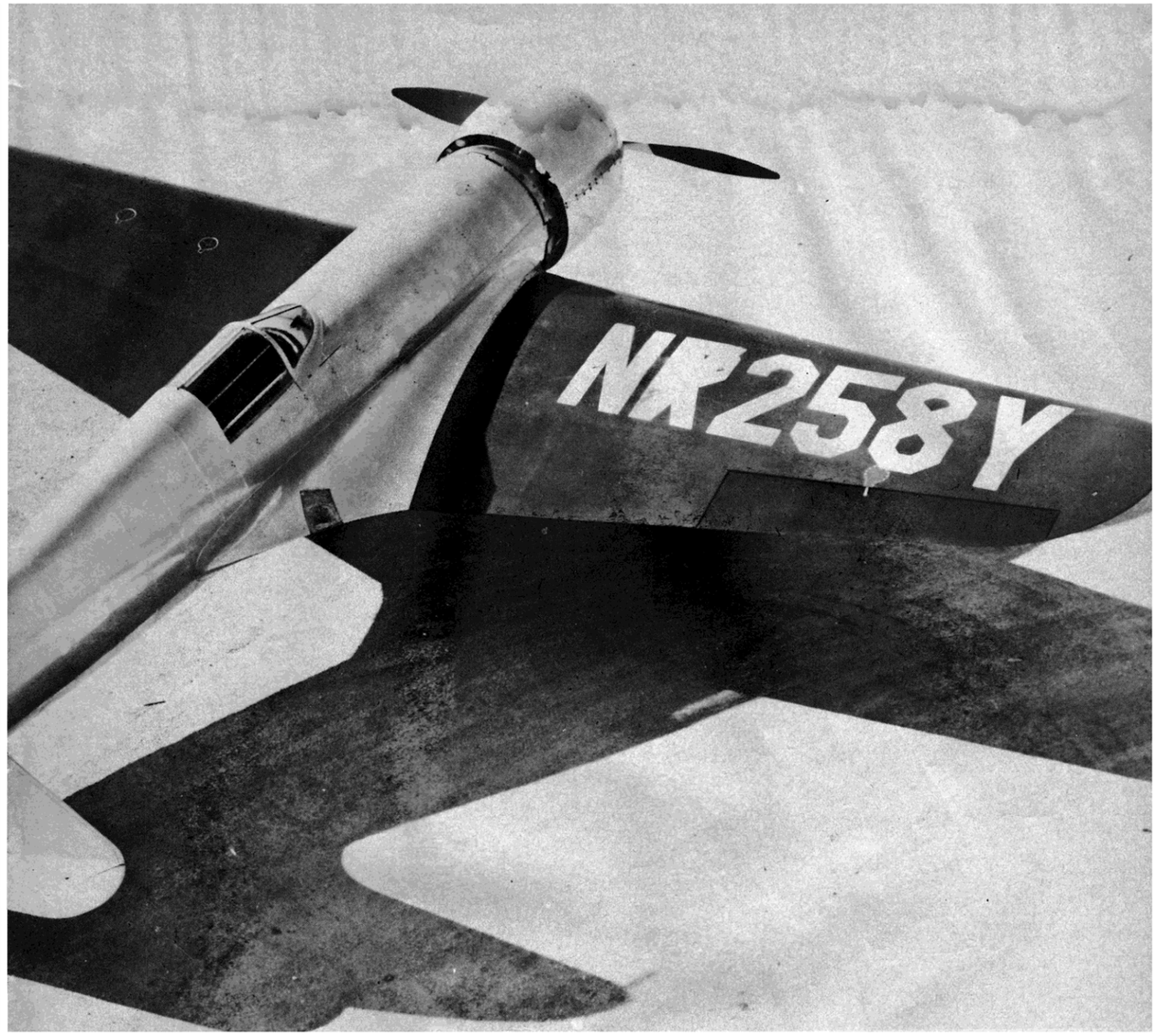


Although this airplane shattered the world's absolute speed record in 1935 as well as the coast-to-coast record in 1937 at the hands of none other than Howard Hughes himself and is thus more than deserving of attention from model builders, the design seems to have remained unexplored by radio control enthusiasts — until now.

By Col. John A. de Vries (USAF Ret.)

HOWARD HUGHES' H-1 RACER



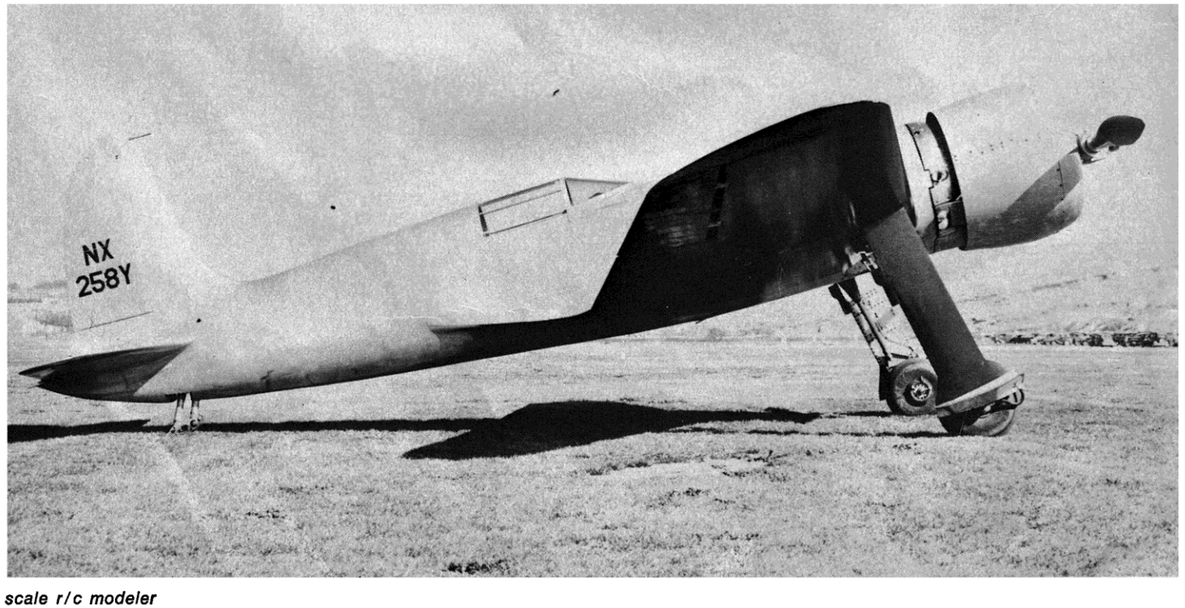


"THEY" SAY that the Hughes H-1 Racer made grown men cry! The year was 1936 and Howard Hughes let it be known that he intended to enter the H-1 in the National Air Races of that year. Although names aren't named, certain race pilots shed more than a few tears. After all, they couldn't compete with the almost-unlimited bankroll of the famous Hollywood millionaire! And —there may be some truth to the story, because the H-1 set an absolute World Speed Record of 351.79 mph on the 13th of September of 1935! Magnanimously, Mr. Hughes withdrew his racer from consideration in the late summer events (the National Air Races) at Cleveland—much to the relief of a lot of pilots. Of course, he had other plans for his speedster. On the 19th of January, 1937, he guided the H-1 on a non-stop Los Angeles to New York record of 7 hours, 28 minutes, 10 seconds—at an average speed of almost 330 mph!

Designed by Dick Palmer and G. E. Odekirk, a number of other aerodynamic geniuses had a hand in building the H-1. W. Curtis Rockefeller supervised wind tunnel testing at Caltech, Pasadena, while Carlton Stryker of Vultee did the stress analysis in his spare evenings. Since Palmer was also associated with Gerald Vultee, the H-1 bears a family resemblance to the aircraft of the latter. Stryker's contribution included the design of a strong, rigid fuselage keel that is credited with saving Howard Hughes' life. The landing gear refused to extend after the 3 km. record speed flight and a belly landing had to be made. Not incidentally, the record speed was attained without benefit of a cockpit cover. It had been lost the day before the attempt on a "warm-up" flight. So it is even more remarkable that the H-1 exceeded its design speed (350 mph) without a canopy! Hughes reported that the canopy-less plane was tail-heavy and unmanageable at speed—and that he had to come back on the throttle, using *less* than the 1000 horsepower available in the 14-cylinder Pratt & Whitney Twin Wasp. A Hamilton-Standard controllable pitch propeller was used.

Designed and built in only 18 months at a cost estimated to be $100,000, the Hughes H-1 sported *two* sets of wings. The shorter wing had a span of 25 feet and an area of 140 square feet. The longer wing, which mated to the same fuselage, had a 32-foot span. The short wing was used for the high-speed record attempts, the long wing (which was on the H-1 when it was donated to the Smithsonian recently) served for long-distance flights. Our model includes both wings, just like the one-and-only, world record setting prototype.

From a scale viewpoint, our R/C version of the H-1 maintains its accuracy down to the wing section used. The real racer used the NACA 23012 wing profile, shown on the plans. Our airfoils were computer lofted by the author's son, using data provided by Major Bill Edgington of the U.S. Air Force Academy. Trexler No. 10-G wheels/tires model the prototype's low pressure tires and Goldberg retracts tuck them away. The rudder and elevators show the scale number of ribs. We have chosen not to include wing flaps on the model although their out-



The H-1 was an exceptionally sturdy design as was graphicaly demonstrated by Hughes on the last of four measured course passes during the record breaking runs when, at the end of the final run, the engine quit and Hughes was forced to make a skidding, grinding, rock spewing belly landing in a plowed beet field. The airplane sustained only minor damage.

An official company photograph of the H-1 reveals the Hughes' belief that streamlining and attention to the smallest detail would allow the sleek racer to go faster than any other airplane in the world.

line is shown. The reason for this is that the ailerons drooped 20° when the flaps were lowered on the real H-1—and that would take a tricky bit of mechanism to accomplish on a model.

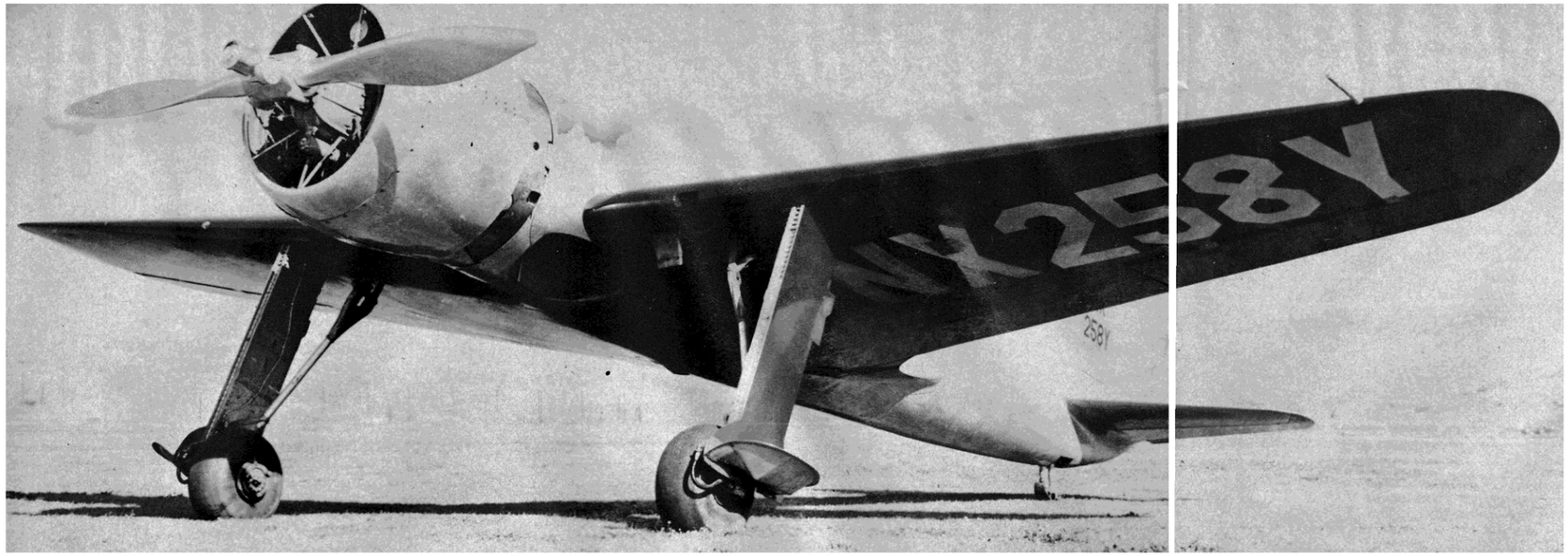
As nearly as we can tell, the only visible deviation from scale in our H-1 would be the fixed tail skid. The prototype aircraft had a skid that was retractable. Hughes believed in streamlining above all else! It would also be appropriate to point out that our model is designed to a scale of 1.9 inches to the foot.

CONSTRUCTION

WINGS: Discretion being the better part of valor, we suggest that the long wing H-1 be built to acquire some flying time on the model before bolting the short wing in place. Both wings fit the same fuselage so the added area of the long wing will be welcome on test flights. Incidentally, newsreel footage of the short-winged H-1 reveals it to be a very stable aircraft—probably because of its relatively large degree of dihedral.

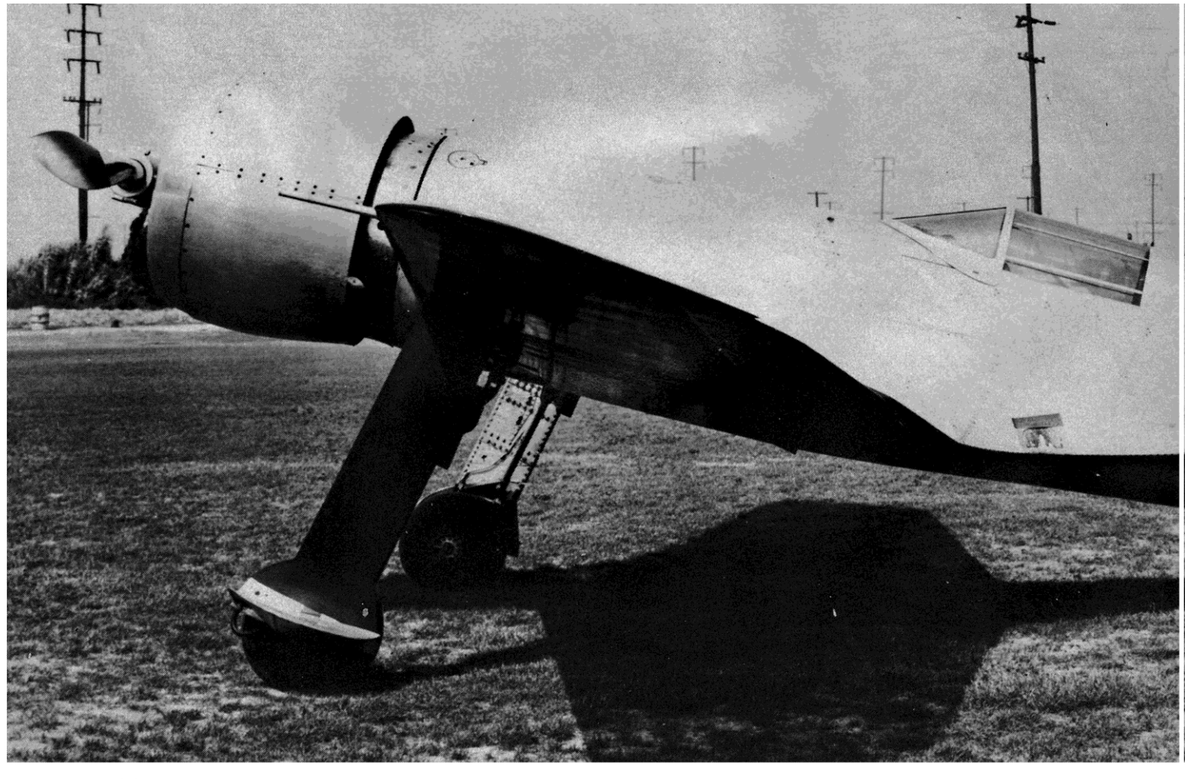
Construction of both wings is the same, with the exception of the aileron/wing tip treatment, so one set of instructions will serve. With a center wing chord of 17-11/16 inches, we've suggested a foam core wing (a half a sheet of balsa would be necessary for a single rib if we'd opted for a rib-and-spar wing!). Center section and "virtual" tip airfoils are shown on the plans and should be duplicated in plywood, aluminum sheet or very heavy cardboard—to guide the hot (cutting) wire. The templates are shown full thickness, since I don't know what covering material you contemplate using. Trim them as necessary to accommodate sheet balsa, chrome coated board or whatever you usually use to cover foam cores. Cut in 3/16ths of an inch of wash-out for the long wing and 1/4″ of wash-out in the short wing. Proper wire temperature is critical for cutting the Hughes wing. Because of the extreme taper in plan view, there may be some undesirable melting of the foam at the tips. Most of this will be trimmed off, however, since balsa blocks are suggested for finishing off the wing tips.

With cores in hand, rout the main spar slot, the landing gear wells and the grooves for either aileron Nyrods or torque tubes. Ailerons on the short



Although it has been suggested that the similarity between the H-1 and the Japanese Zero of a few years later was more than mere coincidence, the family resemblence between the racer and later Vultee products is quite pronounced. Are the landing gear reminiscent of the Fw-190?

The real beauty of the H-1 from an engineering-design standpoint was not that it was innovative, but rather that it carried to the fullest extent the state of aviation art of the day.



wing are a bit tiny so you may prefer to drive them with torque wires (inside nylon tubes or brass tubing) to achieve enough movement for control. Wires of 5/32nds are suggested for positive aileron action—thinner wires of the length shown may absorb too much twist.

The main spar is 1/4" plywood. Before installing it, the gear retract mechanism mounts should be located on it and epoxied into position. The assembled wing has a lot of dihedral so allow for this angle when fixing the gear supports. The gear legs are perpendicular to the ground (when viewed from the front) in the extended position. Fixing the gear to the spar before assembly of the wing halves simplifies this rather tricky alignment problem. Of course, if you prefer a fixed gear, ordinary hardwood blocks may be inlet into the bottom of the wing at the appropriate location. The scale tread was ten feet and you'll note from photographs of the real plane, an auxiliary strut braced the gear in the "down" position.

Join the core halves, insert and epoxy the main spar and install the aileron actuating system you prefer. The plans show balsa leading edges which are added after the wing is covered. If you're an "around-the-leading-edge" core-cutter, the leading edges aren't structurally necessary and may be omitted. The aileron spars and the wing tips *are* added after the wing is covered. The ailerons themselves may be cut from the covered cores or fashioned from balsa. In either case, four hinges per aileron are recommended and they're positioned above the aileron spar and beneath the wing covering. The ailerons of the prototype (as well as the rudder and elevators) were fabric covered, so silk might be a good choice as a movable surface covering. For either wing, consideration should be given to "sealing" the aileron hinge line to assure aileron effectiveness.

Next comes servo cut-outs and servo installation, a substantial fiberglass strip resined around the center section, hold-down dowel forward, and two wing screw holes, aft—the wing is completed after it is finish-sanded.

TAIL SURFACES: Nothing too complicated—construction is standard with one exception. The fin and stabilizer are covered with 1/16th balsa sheet which extends slightly beyond the hinge lines and "shrouds" them. The surfaces are built with rectangular rib blanks and then sanded to the streamlined cross-section shown on the drawings. The elevators and the rudder should be silked and then hinged to the fixed surfaces. These should then be sheeted, making sure that the movable surfaces aren't restricted. Note that there is plenty of room in the aft fuselage for "buried" control horns for both rudder and elevator. Adjustment for rudder and elevator push-rod length should be provided at the servo end of the rods.

COWL: Beg, borrow or cajole—but use a lathe to turn the cowl for *your* H-1! Use balsa blocks (epoxied together to save $'s) or bass wood and hollow the cowl after it's turned. The Hughes cowl is uniquely bell-shaped and is a thing of beauty if it's built correctly! And—there's plenty of room to hide a big .60 with a straight-type (Dubro) muffler inside. Incidentally, the cowl on the prototype was braced from the front of the Twin Wasp with six tubular struts (not shown on our drawings) that would add a beautiful touch to an AMA Scale version of our model. They're visible in most photographs of the front of the racer.

FUSELAGE: The model's fuselage is built on a stress-structure (rectangular balsa box) that ties wing, engine and tail surfaces together and holds the radio equipment and fuel tank. Otherwise, it's paper-mache covered foam blocks, glued between a few formers. Almost a quarter of the fuselage is massive wing filets.

To make the stress-structure, 3/16ths sheet balsa sides are joined with 1/8" sheet rectangular inner formers and a 1/4" plywood tail skid

mounting plate. Note that you may extend the fuselage sides, or trim them, to position the firewall properly for your engine/engine mount combination. Make sure that you establish a full 3/16ths inch of propeller clearance all around the cowling when you add a couple of degrees of right thrust and two degrees down. A .45 is probably as small an engine as you'd care to use—remember that $40.00+ engine servo can always back-off the power but it can't give you more than the engine is capable of. We recommend a good, healthy .60 for this model.

With the stress-structure box completed, the wings may be fitted to their saddle and the hardwood hold-down blocks epoxied in place. The tail surfaces are added next—epoxy them to the stress-structure. Titebond the formers to the "box" and fill in the cockpit with 1/8" sheet balsa to provide a base for a 2"-scale "Howard" later. Make the radio installation, set the fuel tank into place and bind the formed tail skid to its plywood mount. Now, fill in between all of the formers with foam blocks (they can be contact-cemented in place) and add the tail surface balsa fairing blocks. Have at it with your sanding sticks and "flow" the lines between formers as you remove the foam. There are few straight lines in the fuselage so refer to photographs as you sand the sleekness in.

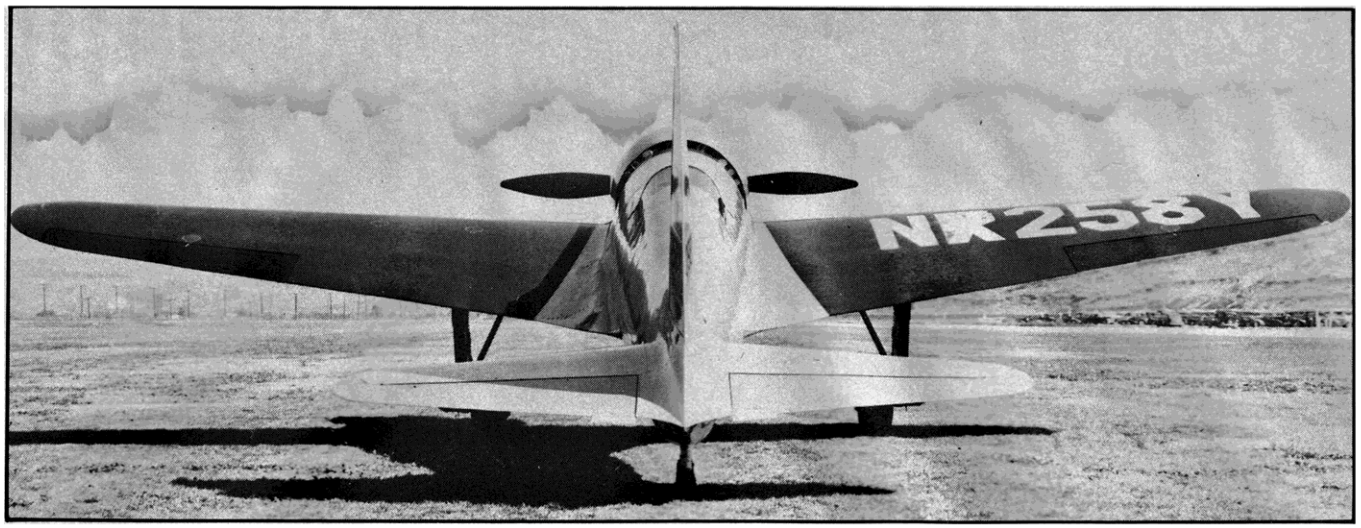
When everything looks "right," cut the wing filet base from 1/32nd (or 1/64th) plywood and epoxy it in place in the wing saddle. Fill in the angle between the base and the fuselage sides with bits of foam and cover the filets with resin/microballoons or Epoxylite to achieve the proper contours. Here, again, photographs of the prototype filets will help you achieve the right shape. More sanding and then you can complete this phase of construction by forming the rudder/stab filets. One of the advantages of a foam-faired R/C fuselage is that if it doesn't look right or you create a gross "ding," the offending foam can be cut out and replaced at little expense of either time or dollars!

The ultimate fuselage covering is made from paper bags! After a visit to your friendly supermarket, tear their bags into strips about 1-1/2 inches wide. Soak the strips in a shallow pan filled with Titebond, Elmers or other water-soluble glue thinned 50-50 with water. Apply the strips evenly to the exterior of the fuselage, including the filets (except the bottom of the wing filet where it will come in contact with the wing's upper surface). Don't forget to "paper" the part of the fuselage that is attached to the wing's *lower* center section and is removed with it. In all, two paper thicknesses over all will be required to provide a good sanding base when the strips dry thoroughly.

Sand the dried fuselage to final contour and apply a couple of coats of finishing resin. When it's sanded, you'll swear that the fuselage is just as smooth as a good fiberglass shell! Add a painted "Howard" to the cockpit after the base and interior of the "pit" have been colored either flat black or light green (zinc chromate). Develop a windshield pattern with stiff paper and, when it fits, cut one out of .030 buytrate clear plastic. The canopy is made from the same material, but it's a simple rectangular piece of plastic. "Hot Stuff" is ideal for holding the canopy and windshield in place—without developing glue smears.

FINISHING: Unless you prefer the more involved process of painting, we recommend that you cover your H-1 wings with an iron-on plastic covering. Both wings (short and long) were a true royal blue which contrasts nicely with white Monokote Trim license numbers. Since the rest of the model will be aluminum (and stainless-steel-colored) the fuselage and tail surfaces should be painted. With all of the sweeping fairings and filets, it'd take the world's greatest Monokote expert to do a good job of ironing-on any of the plastic films. Spray if you can—and use an automotive acrylic laquer, like Ditzler or Acme, to achieve the proper aluminum color. The first "bay" (strip around the fuselage) aft of the cowling should be painted to contrast with the rest of the fuselage —since it was stainless steel on the prototype.

DETAILS, DETAILS: Reinstall the radio, engine and all of the other things you've removed to finish the H-1 and make sure that they function



reliably. The cowl may be held in place with angle brackets or wood blocks—which ever you prefer. Check to make sure you have access to the glow plug and needle valve. If you're using retracts, you might consider installing a polarized plug in one of the wheel wells—connected with flexible wire to the glow plug, thus avoiding a hole in the cowl. You'll have to "pull" the cowling to change glow plugs, though. You might also want to consider locating your fuel filler at the scale location—it's shown on the drawings on the left upper forward part of the fuselage. And—balance the model at the point shown on the side view.

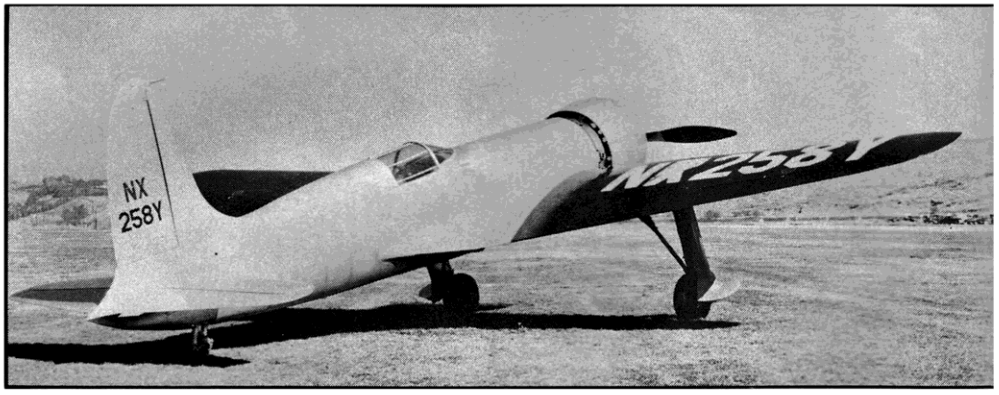
FLYING: Since a prototype model, built to our plans, hasn't been made, there isn't much we can say about the flying characteristics of the R/C H-1 other than that the long wing version should have plenty of lift and good stability. With the "stilty" landing gear, be sure to become thoroughly familiar with the airplane's taxing characteristics before flying. Easy does it even though the Trexlers will soak up a lot of the bumps. As noted earlier, try the long wing version first—unless you're the best flier in your R/C club (or *He'll* agree to test-fly the bird for you). There isn't a lot of aileron on the short-winged H-1, so assure adequate movement and treat them gingerly until you've observed their effect. There's plenty of rudder and elevator area and they have a long moment arm which will make them very effective. Again, easy does it.

THANKS: The author wishes to acknowledge the help and assistance furnished by Mr. Don L. Chase, Manager, Customer Relations, Hughes Aircraft Company in the preparation of this article. □

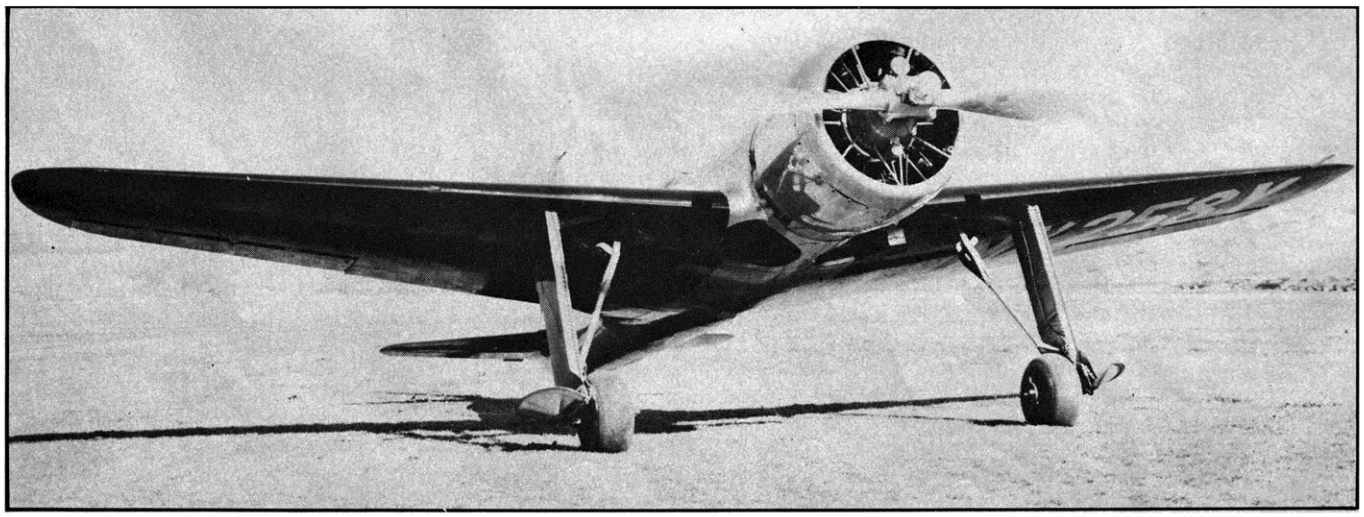
Hughes realized that protuberant screw and rivet heads would offer some, if only slight resistance to the airplane's movement through the air. With this in mind, he ordered that all screws were to be flathead and countersunk and rivet heads were to be flush wtih the airplane's skin.

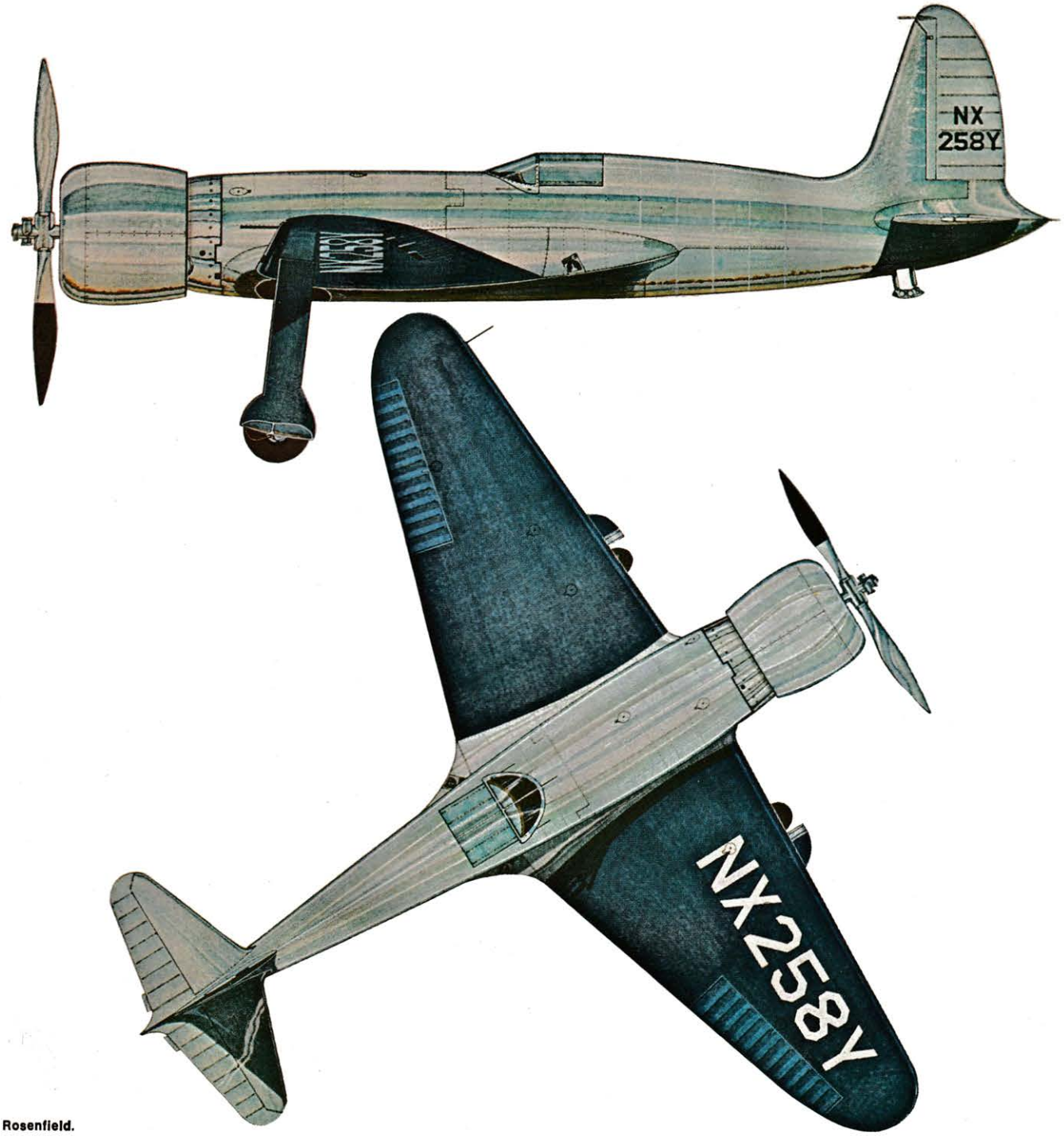
(Editor's note: For the complete story on the history of Howard Hughes' H-1 racer, be sure to read the article by Don Dwiggins, long time chronicler of Hughes' aviation exploits, in the April 1976 issue of *Air Classics* Magazine, sister publication to *Scale R/C Modeler*. □

The absolutely smooth and highly polished nature of the fuselage is clearly evident in this tail view of the H-1.



Detail on the landing gear brace and locking system can be seen in this three-quarter front view. Low pressure tires were required for a landing gear system which allowed for little shock absorbing.





Bill Rosenfield.