REALISTIC RC PATTERN DESIGN HAS LARGE SHAPELY FUSELAGE, ALL-FLYING STAB, BUILT-IN AILERONS, RETRACTS, AND ALL-BALSA CONSTRUCTION.

hot pants

by GERALD NELSON

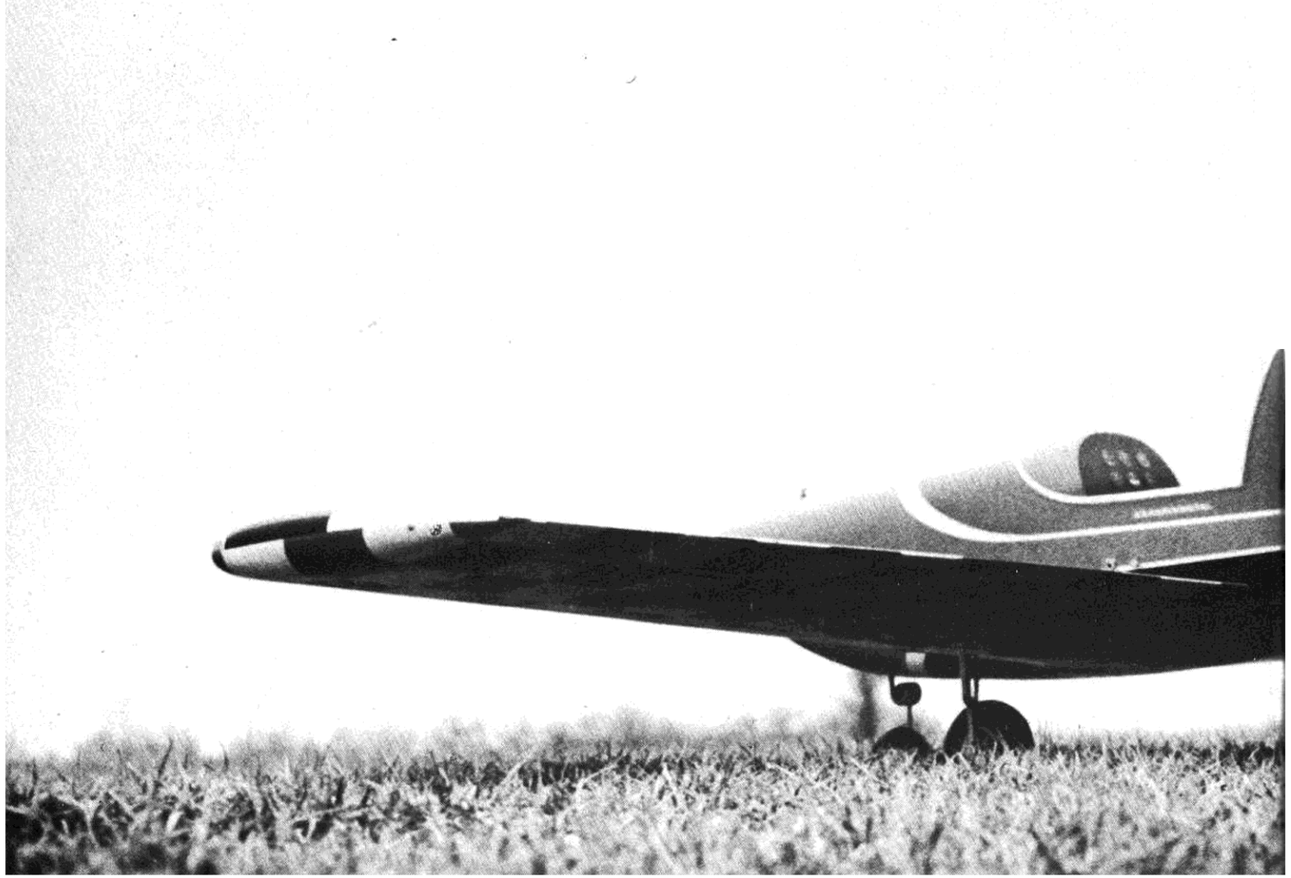
The total design concept of the Hot Pants includes two major considerations: performance and realism. Almost all of today's successful competition stunt models are designed entirely for all-out competition with no thought given to realism. Sure, many ships have a canopy placed somewhere, maybe even a pilot and instrument panel. However, if a full-size aircraft were to be built with the same proportions as these models, we would normally expect to find a 100-ft. span acrobatic aircraft. Today's full-size acrobatic aircraft are, of course, much smaller.

Taking a 25-ft. span of a full-size aircraft, typical of current full-scale acrobatic aircraft, and scaling it down to a five-ft. span, we would come up with a fuselage shape and cockpit size as presented here with the Hot Pants design. The additional width and height cause such minor extra drag that it becomes negligible. The by-product of the wider fuselage is that of Dutch roll elimination, the so-called Kwik-Fli wiggle. An obvious advantage of the larger fuselage is easy placement of the RC equipment—the four-abreast servo placement is quite functional.

Perhaps the most interesting design feature of this model is the flying stabilizer or stabilator. The entire horizontal stabilizer moves as one unit. The major reason for choosing this system of pitch control is that there is less aerodynamic drag. Deflecting the entire surface produces much less drag than the conventional deflected elevator/stabilizer combination. This type of stabilizer also produces a very positive control feel about the pitch axis at all airspeeds, so necessary for today's competition flying. A practical advantage is the ease of transporting the aircraft, since both stabilizer sections are easily removable. Yet another plus is one which I have not fully explored: because the stabilizer sections are removable, it would be simple to fabricate different types of stabilizers to test for the optimum design. Perhaps the unit should be smaller, thicker, highly tapered, semisymmetrical, and so on. As there would be no other variable other than the stabilizer, one could easily evaluate the test results.

There is no reason to be concerned over the servo power required to move the full pivoting stabilizer. As only a small amount of throw is required, an excellent mechanical advantage is obtained. The mechanics of the system shown are quite simple. During tests, more than twice the amount of elevator travel was tried; the pitch control was of course very sensitive. This did provide proof of servo power required. Ample power was available to drive the stabilizer. Reducing the travel to half the amount (now normal travel) increased the mechanical advantage of the system by a factor of two. In other words, we have more than twice the power needed to drive the stabilizer.

Perhaps another unusual design feature is the use of the regular type of ailerons. Certainly full-span ailerons would be quite satisfactory with this design, but the regular ailerons do offer some out-



standing features: they have a more positive feel, especially with 1972 Kraft servos and their improved resolution; one is easily able to check the neutral setting of the ailerons prior to flight; and they look like ailerons should (certainly a minor design point, but a valid one if realism is to be considered).

Construction

The construction of Hot Pants is straightforward. Start with the wing first, as the fuselage cannot be finished unless the wing is completed.

The wing can be built on two 3/16 dia. steel wire rods. The rod locations are shown on the ribs. The two rods are supported at each end by metal or wood brackets firmly attached to a rigid surface—a workbench top, for example. A precision level is used (placing it across the rods at each end, observing the reading) to line up the rods. By shimming one of the brackets before firmly securing it to the rigid surface, the need for an accurate building board is eliminated. The wing sheeting used on the original model was 3/32 thick (1/16 thick balsa can also be used).

Assuming the wire rod jig system is employed, proceed with the wing as follows: Glue plywood landing gear doublers to ribs 4 and 5. Locate the retractable landing gear unit mounting bearers before attaching to rib. Drawing shows proper location for Rom-Air landing gear system. Place ribs in approximate position on rods and mark rib locations on spars. Glue top and bottom spruce spars in place, as well as the two-in. wide trailing edge sheeting on bottom of rib. Glue leading edge in place and four- or six-in. wide trailing edge sheeting on top of ribs. (Note that the entire wing will eventually be sheeted, so keep the trailing edge joint straight by placing two pieces of 1/4 sq. on each side of the trailing edge, clamping them in place with clothespins.)

Shape upper leading edge flush with rib contour. Glue four-in. wide leading edge sheeting with rear edge of sheeting over the center of the main spar. (Leaving a portion of the spar exposed allows for easier attachment of the remaining sheeting.) Glue the remainder of the sheeting in place. Remove wire rods sufficiently to take the almost completed wing panel out of the jig, turn the panel over, and reinstall wire rods into the jig brackets. Install shear webs with grain vertical. Install 1/4" wing hold-down dowel gusset (grain is vertical). Then put in one-piece 3/32" sheet aileron gusset. Cut rib 7 completely through and locate where aileron is to be cut out. Cut through the top sheeting at aileron hinge line where possible between the ribs; however, do not cut the ribs. The ailerons will now be easily located when wing sheeting is finished.

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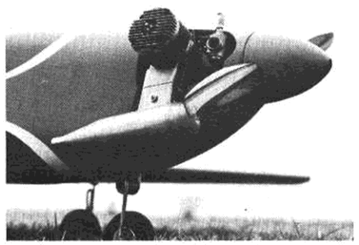
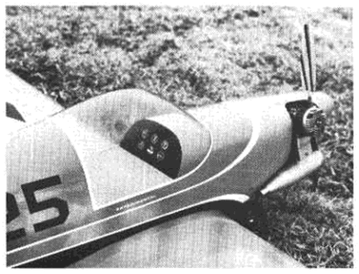
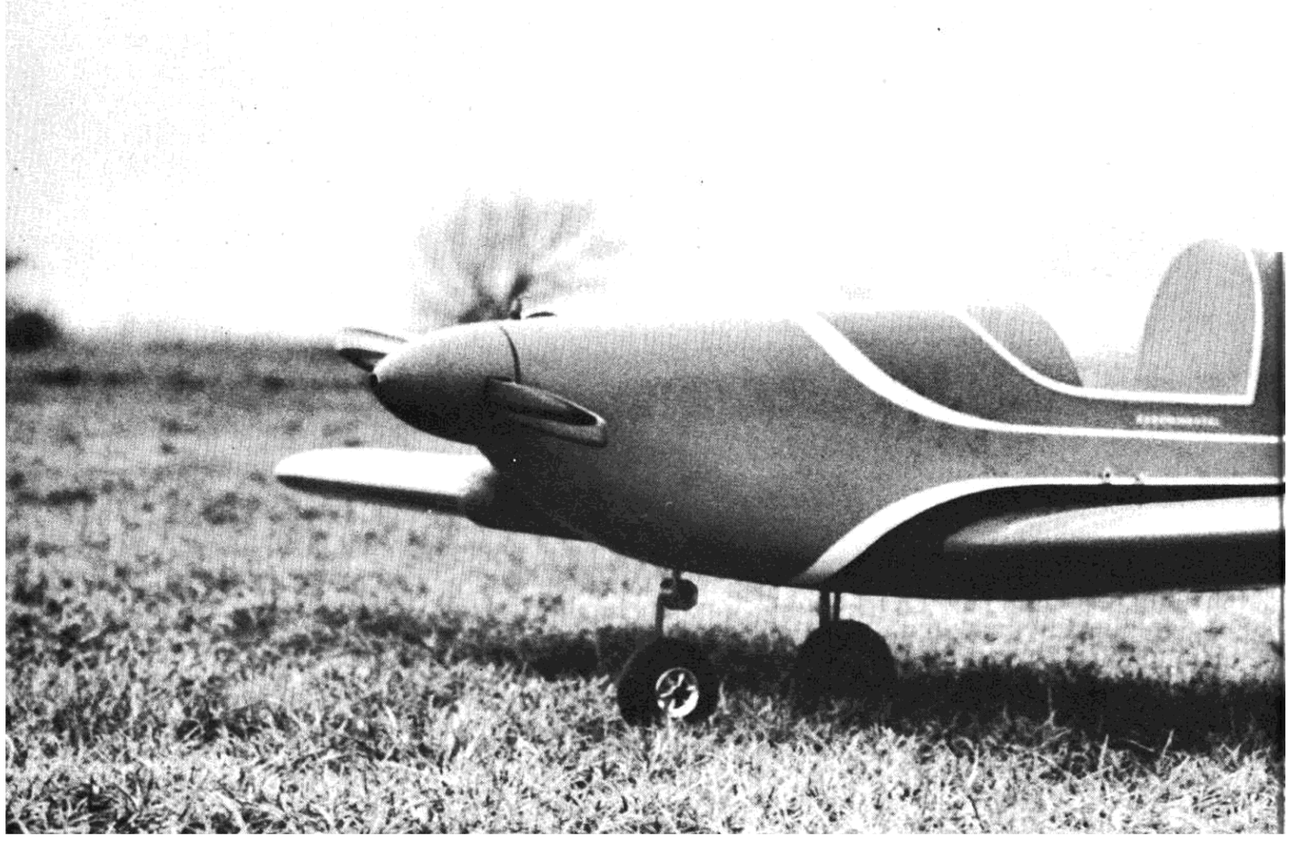
Stabilator is not a novelty—it reduces drag somewhat and can be removed for transport. Small movement requires little servo power.



Business end has an H.P. 61 engine with muffler extension piece. Use of exhaust pressure to the tank for smooth fuel feed is recommended.



The author forgot the pilot so he'll have to fly this plane from the ground. Large canopy is available from the author.



Hot Pants

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Now add balsa block filler at trailing edge of wing between ribs 1 and 2. (Use Hobbypoxy No. 4, which will fill any voids between the block and sheeting.) Install landing gear mounting bearers and temporarily mount landing gear retract unit. Make necessary cutouts in wing ribs as required for pressure hoses, pushrods, wire connectors, etc. Install aileron bellcrank on plywood plate and attach to wing; then add 1/16 dia. wire aileron pushrod flush with rib 1—this will enable you to find the neutral location of the aileron bellcrank when the wing is finished. The pushrod will be joined with matching pushrod from the other panel after the panels are joined. Install four-in. long 1/16 dia. wire aileron/aileron bellcrank pushrod. (A Du-Bro solder link is connected to aileron control horn after ailerons are hinged to wing panel). Attach Midwest 1/8 dia. one-piece hinges to mounting gussets. Sheet remainder of bottom of wing and remove panel from jig. Trim sheeting at root and tip ribs and trailing edge. Attach 1/8 x 1/4" spruce or hard balsa trailing edge and contour leading and trailing edge to correct shape.

Cut out aileron using the reference cuts previously made on top sheeting. Remove an additional 3/32" from the wing panel and aileron to allow for 3/32 sheeting to close rear of aileron cutout in wing and the front of the aileron. Noting bevel of lower aileron leading edge as shown on the drawing, remove bottom aileron sheeting as required. (Don't forget to allow for the 3/32 sheeting on the front of the aileron.) Install 3/32 sheet aileron root rib and 3/32 sheet aileron front sheeting. Add 1/4 dia. dowel, previously drilled and tapped for 8-32 thread for Rocket City dual-output servo screw. Drill 1/8 dia. holes for Midwest hinges and insert them into wing panel and ailerons, but do not glue hinges in place at this time. Tack glue tip in place. Carefully shape, rough sand, remove and hollow out as required and then install tip permanently. Cut out wheel well. Duplicate procedure for opposite wing panel.

Mount 5/16 sheet dihedral shim rib on the root of one wing panel (grain with chord). Bevel shim as required for correct dihedral. Join other wing panel to dihedral shim. Reinforce center section with six-in. wide fiberglass cloth and Hobbypoxy No. 1 glue. Cut out center section as required for aileron servo, and for retract servo if used. Install servo mount and servo tray; then join aileron pushrods with 1/16 ID brass tubing and solder in place. Bend short length of 1/16 wire as required to attach to pushrod and servo output arm (wrap with soft wire prior to soldering to aileron pushrod). Screw Rocket City double-ended servo output arm into aileron control horn bracket (see side view of aileron on drawing). Place Du-Bro solder link in position so that aileron is in a neutral position. Install wing hold-down dowels. Total aileron travel should be 3/8" up and 3/8" down. It is best to use rotary output arm servo so that total servo travel can be adjusted.

Cut the sides of the fuselage from Midwest 1/8" matching body sides. Add 1/32 plywood doublers with Hobbypoxy No. 4. Attach 3/16 sq. stringers. Cut bulkheads to shape and install. Insert 1/16 plywood tank floor, cutting out as required for nose gear installation before gluing in place. Fabricate 1/8" sheet rear fuselage top section. Cut to side view and top view shape and then tack glue solid nose, top, and bottom blocks in place. Mark spinner location, oversize 1/16", on front block. Carve and rough sand blocks to shape, then remove them and hollow as required. Install 5/16 square gussets, behind bulkhead No. F8, and 3/32 plywood stabilizer bearing block bracket.

Cut two Chopp nylon motor mounts, or one piece of 3/8 thick nylon, into two identical halves as shown on fuselage top view. Drill 15/64 dia. holes and ream to .250 dia. as shown on plans. The 1/4 dia. brass tube must fit into nylon blocks as perfectly as possible. Drill nylon block mounting holes. Fabricate 1/4" aluminum control horn. Drill and ream pivot rod hole to .250 dia. Main pivot rod as well as 1/8" drive pin must be tight fit into control horn.

Install pivot rod assembly into nylon bearing blocks—main pivot rod must rotate freely in blocks. Make elevator pushrod and attach to control horn. (Use a fiberglass pushrod with 1/16 wire end and solder a small washer for a keeper.) Cut out holes in bulkheads as required for pushrods. Attach control horn/bracket assembly to fuselage using No. 4 sheet metal screws. Add hardwood servo mount rails as required. Temporarily install rudder and elevator servos. Install 3/32 plywood elevator reducer bracket. Attach 3/8 x 1/2" maple bellcrank mounting block and then add Williams Bros. 30 degree bellcrank, as shown, prior to gluing mounting block in place. Attach 1/16 wire to end of stabilizer pushrod. Connect Du-Bro solder link to stabilizer pushrod and attach to reducer bellcrank as shown on plans. Mount Du-Bro KL49 Kwik-Link assembly from elevator servo to reducer bellcrank as shown on plans. Total stabilizer travel as measured at trailing edge root is 1/4" up and 1/4" down. Temporarily install nose gear retract unit on firewall as required, using blind mounting nuts in front of firewall so unit may be easily removed. Add hardwood firewall gussets. Cut away right side of front nose block as required for engine clearance.

The engine is mounted slightly less than 90 degrees, exhaust stack down, so that muffler will just clear against fuselage side. Note that muffler extension will probably be required. With fuselage vertical, nose up, place engine mounted on a metal motor mount on firewall in approximate position. Trim nose block as necessary to fit over engine; with nose block in position install muffler and spinner backplate. Trim nose block as required; then remove nose block and install right thrust shim washers behind motor mount with contact cement. Accurately locate engine on firewall with cowl, spinner backplate, and muffler installed. Mark mounting holes and attach motor mount with 6-32 socket head screws and large blind nuts. Permanently affix nose cowl. Remove nose gear retract unit. Attach bottom block and cut as required for nose gear installation and operation. Fit wing to fuselage; attach 1/32 plywood wing seat to fuselage. Hold wing seat in place with wing in position. Install bulkhead No. F2A—drill 1/4 dia. holes and fit to wing prior to gluing to fuselage. Wing should be in place while No. F2A is being attached to fuselage. Install 3/8 x 1/2 hardwood wing mounting brackets. With wing properly located on fuselage, drill 3/16 tap drill hole through wing and through mounting brackets. Tap mounting brackets for 3/16 nylon bolts. Drill out holes in wing for 3/16 bolt. Install remaining linkage for motor control, nose gear unit and gas tank. Add top block, cockpit floor and instrument panel. Plank bottom of fuselage. Paint inside of cockpit as required and put canopy in place. (Canopy can be obtained from designer for $3.50 postpaid.)

The fin and rudder are constructed according to drawing. The stabilizer is constructed in a similiar manner as the wing; however, instead of using the wire rod wing jig system, shims are installed under the ribs and spars to correctly position them during assembly. The 1/4 ID aluminum tube is held in place with epoxy (use ample epoxy especially at the root rib). After the sheeting is added, install 1/4 dia. dowel retainer screw bracket on the underside as shown on plans. (The No. 2 x 3/8 long sheet metal screw is a tight fit into the dowel.)

The original model weighed out at eight lb. dry. Using an HP61FR RC and a Pattern King 11-7 propeller, sufficient power is available to perform any maneuver including an extended top hat or vertical four-point rolls. No particular tricks are necessary to do the maneuvers, as the flying of the model is quite straightforward.