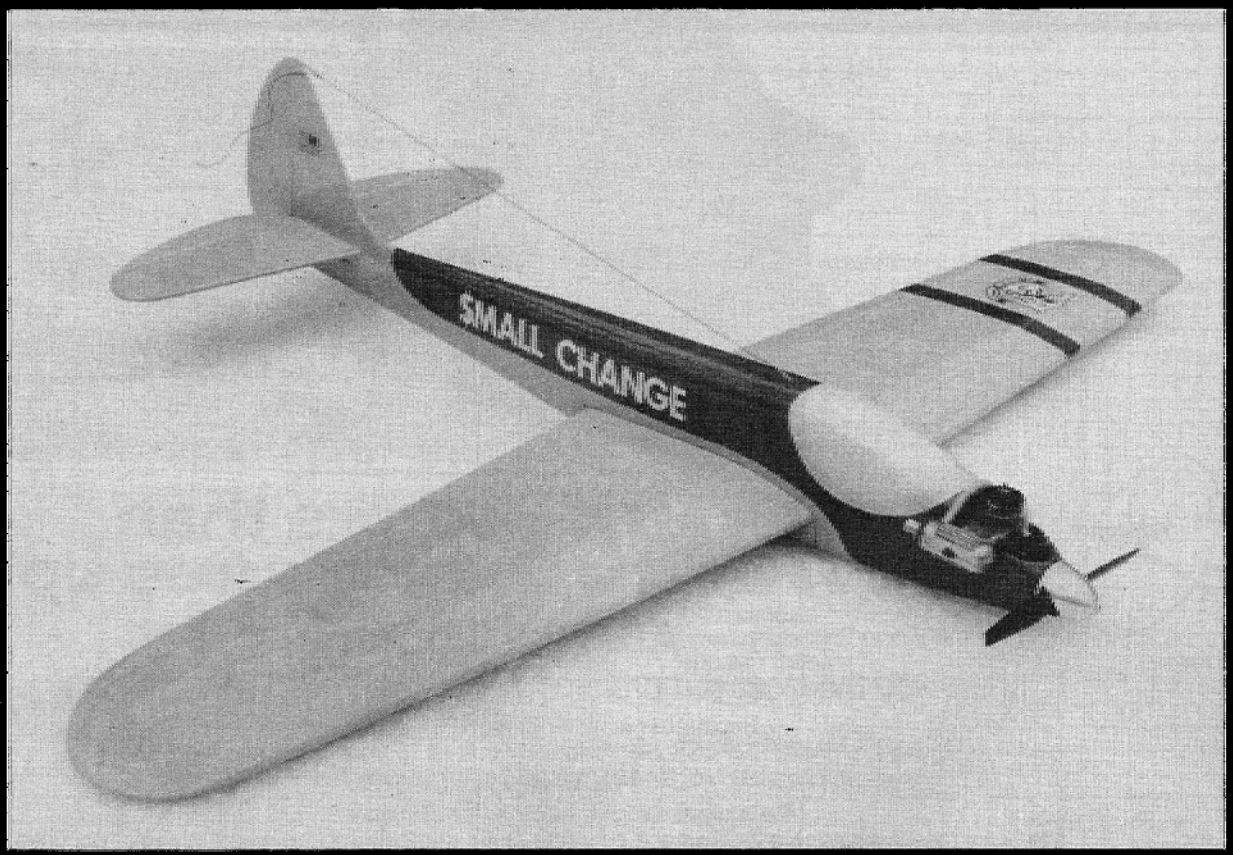
$MALL



By Bob Wallace

$mall Change . . . a small, inexpensive, easy to build and fly R/C aircraft that possesses pattern-like airborne characteristics. As can be seen in the accompanying photographs and reduced size plan sheet, $mall Change looks very much like a typical full size competition pattern ship with its landing gear retracted. However, there are significant differences. $mall Change can be built for about $15.00 to $20.00, powered with any .15 to .19 size R/C engine, and will accept any normal size airborne radio system components. Compare that with the price of the latest pattern kit with retracts, a thirsty "Brutus-Maximus" .61 ABC Schnuerle ported engine with its accompanying tuned pipe and fuel pumper unit, and the latest in super-duper sophisticated radio systems with all its nifty gadgetry!

This is certainly not intended to imply that $mall Change is the equal of a fully equipped competition pattern ship — obviously it is not! What is suggested is that surprisingly good pattern performance can be realized without the expenditure of a lot of hard-earned dollars!

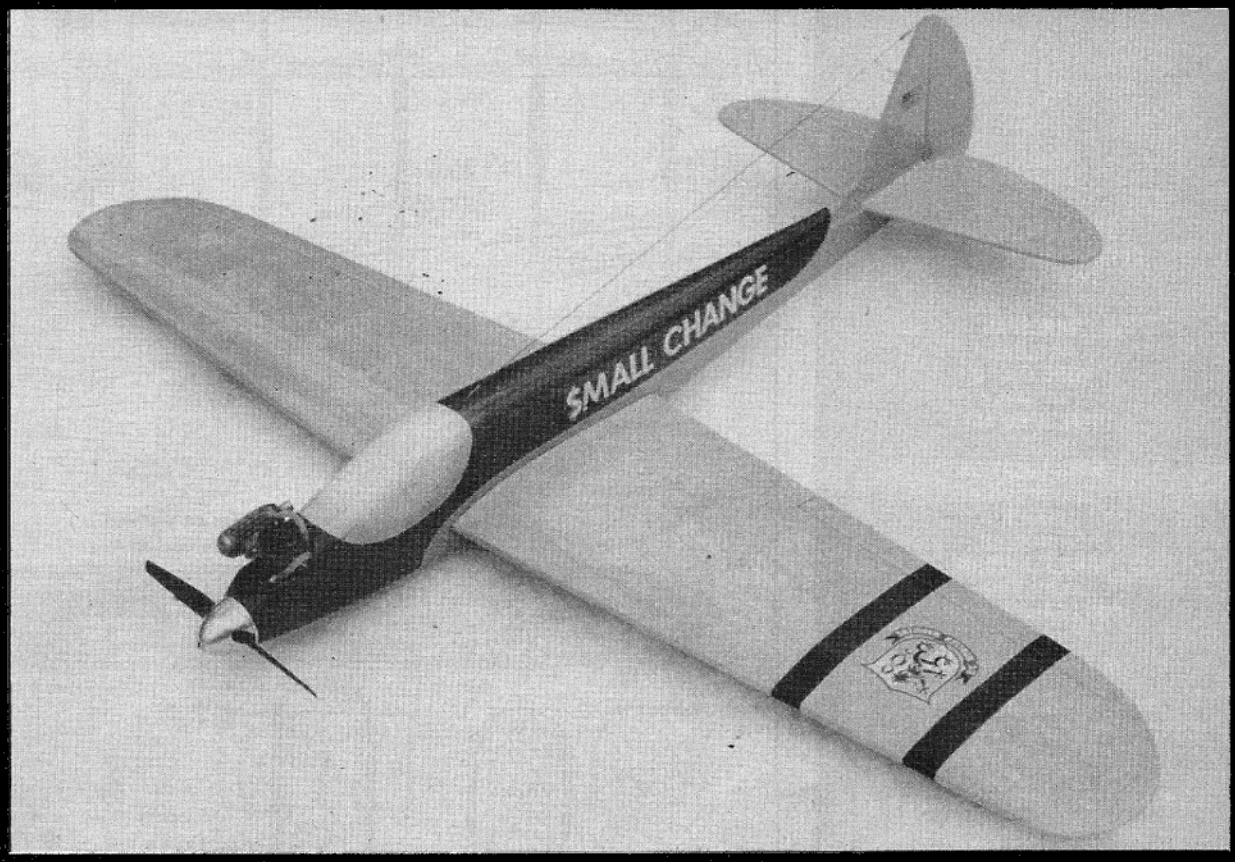
As the plan sheet indicates, the construction of $mall Change is very basic and well-within the capabilities of most R/C modelers. Even if you have never attempted to build from plans, $mall Change shouldn't pose any problems.

The sport flier who doesn't want to enter competition, yet has a "Walter Mitty" like yen to make like a Dave Brown or Hanno Prettner will hopefully find $mall Change especially intriguing. $mall Change is designed for hand launching and belly type landing on grassy (or snow covered) fields. Obviously, a more substantial skid or glider type belly landing wheel arrangement should be employed if landing on hard or rough surfaces is anticipated.

CONSTRUCTION

In building from plans, I believe the project is far more enjoyable if all the various parts are cut out before starting the actual assembly process. This creates "your own kit," so to speak, and seems to speed up the actual construction of the model. For the wing you will need 18 ribs (2 of each size) and the tip blocks. The plans show alignment tabs on each rib which serve as "legs," which insure that the wing panel thickness taper is correct when the wing panels are assembled on a flat surface. If a rod type wing jig is to be used, these tabs can be omitted. The elevators and rudder are simply cut from 1/4" sheet balsa. The fuselage sides, plywood doublers, and bulkhead formers are

CHANGE



also cut out at this time. Fuselage formers F2A, F2B, F3, and F4 are cut from a piece of 1/8" sheet that is actually two layers of 1/16" sheet balsa which are laminated cross grain prior to cutting. This laminated type of "balsa-ply" is easy to fabricate and much stronger than an equal thickness single piece of balsa of the same weight.

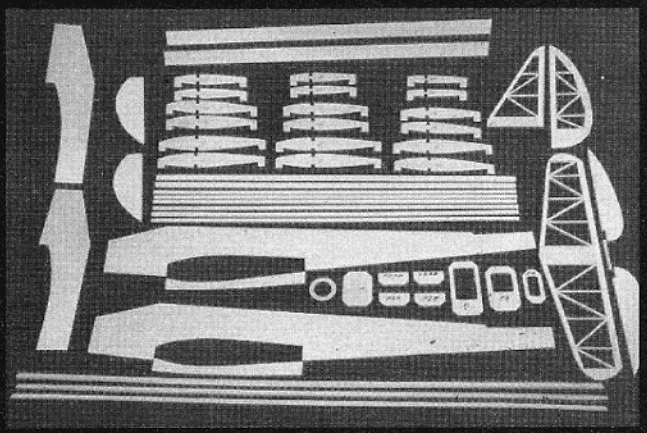
Wing:

The wing panels are assembled by pinning each wing rib in its proper position over the plan sheet, and lower 1/4" square main spar. The lower spar should be shimmed up into the notches in each wing rib. Pin the top 1/4" sq. spar in place and glue this sub-assembly together. Carl Goldberg's Super Jet cyanoacrylate glue was used to assemble our aircraft and is highly recommended. This fine adhesive is strong, quick, and does not add any measurable amount of weight to the airframe. It should be stressed here that keeping the $mall Change weight as low as possible will contribute greatly to its flying performance; therefore, the use of epoxy type glues for general construction is not recommended.

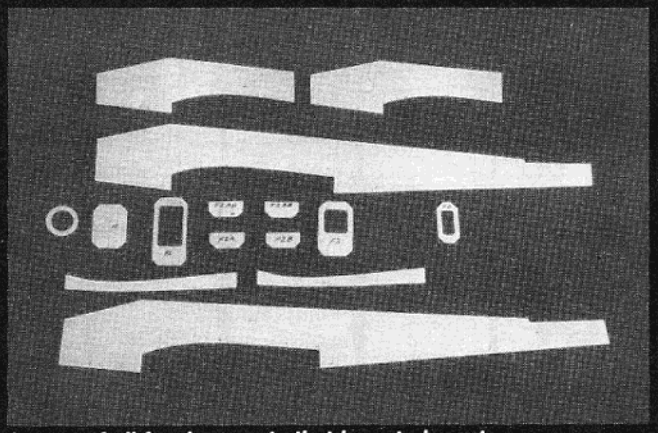
The 1/4" square leading and trailing edges are now pinned in place. Be sure that this assembly is straight and true, and then glue it in place. The top 1/16" balsa sheeting and rib capstrips are glued in place after first sanding the indicated angle into the top of the 1/4" square trailing edge. Each wing panel is now removed from the building board and the alignment tabs are trimmed off of each rib and the bottom taper is sanded into the 1/4" square trailing edge. The front wing bolt filler blocks are glued in place. Add the bottom 1/16" sheeting and rib capstrips. Glue the wing tip blocks in place. Tack glue the 3/8" x 1" aileron/trailing edge pieces in place and sand each wing to the proper airfoil and shape. Cut and fit the ailerons with hinges and torque rods in place.

If you want pattern-like flying characteristics, small size, inexpensive to build, then grab onto a set of plans for the $mall Change. It will go easy on your wallet and make you believe you're flying a .60 powered brute.

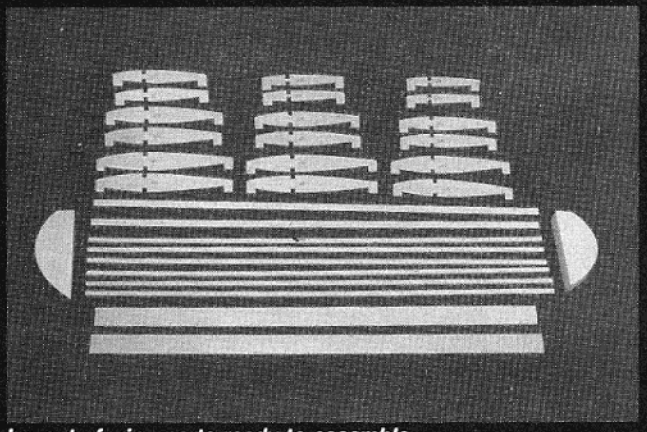
The fixed trailing edge pieces and torque rod assemblies are glued in place. Care should be exercised during this step to insure that the torque rods remain working freely and that they do not become glue-bound. Sand the center section rib (W1) of each wing panel to produce the proper dihedral angle and glue the two wing panels together at the indicated angle. The wing center section joint (top and bottom) is reinforced with a 3" wide strip of two ounce fiberglass cloth and polyester resin. Blot off all excess resin with a piece of paper towel or toilet tissue and set the wing aside in order to allow the resin to cure. When dry, the entire wing assembly should



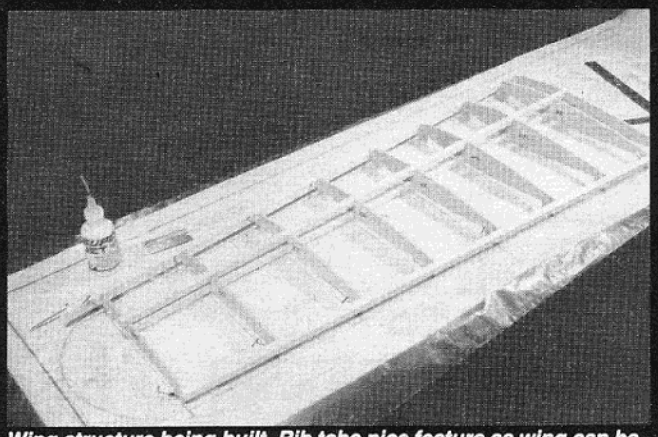
Shows a complete parts kit cut along with completed tail group.



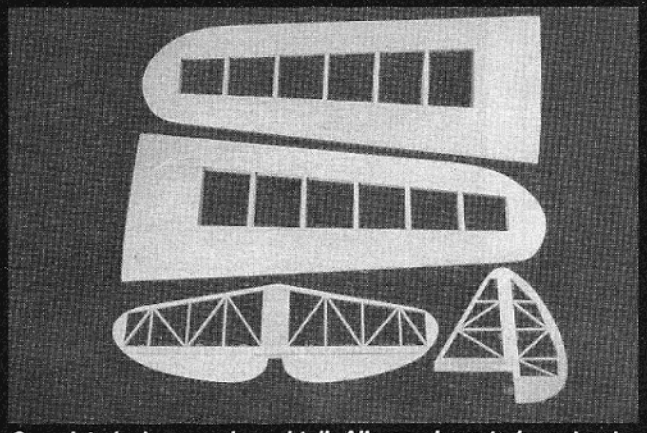
Layout of all fuselage parts that have to be cut.



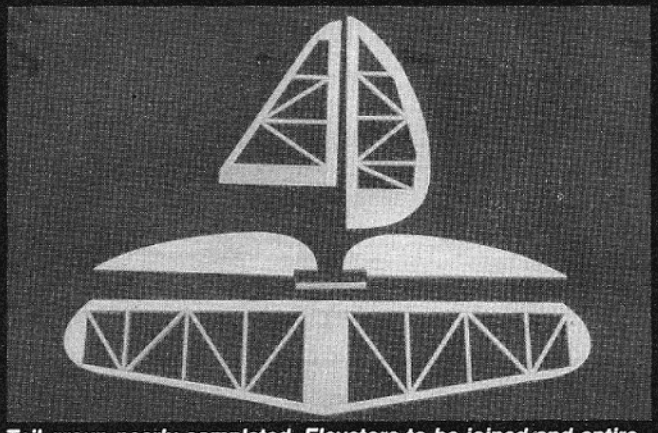
Layout of wing parts ready to assemble.



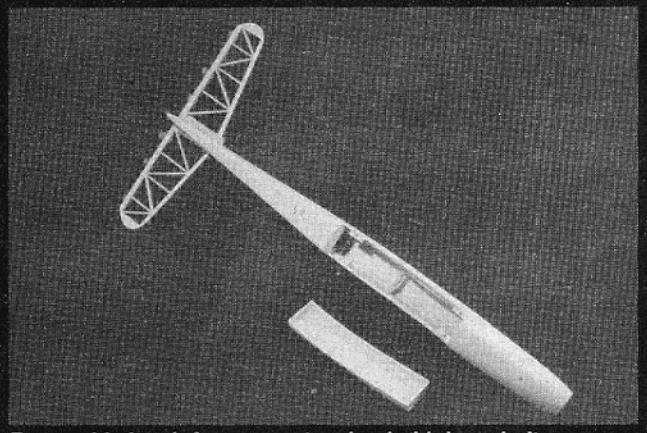
Wing structure being built. Rib tabs nice feature as wing can be built on flat surface.



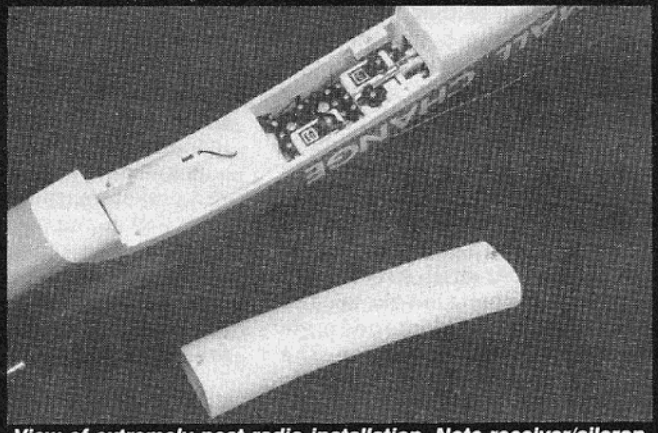
Completed wing panels and tail. Ailerons have to be cut out.



Tail group nearly completed. Elevators to be joined and entire structure sanded to shape.



Removable hatch for access to wing hold-down bolts.



View of extremely neat radio installation. Note receiver/aileron lead protruding through foam.

SMALL CHANGE
Designed By: Bob Wallace
TYPE AIRCRAFT
Sport Pattern
WINGSPAN
48 Inches
WING CHORD
7½" (Avg.)
TOTAL WING AREA
350 Sq. In.
WING LOCATION
Low Mid Wing
AIRFOIL
Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL EACH TIP
3/8"
O.A. FUSELAGE LENGTH
37¼ Inches
RADIO COMPARTMENT SIZE
(1.625" x (W)1-15/16" x (H)2.5" (Avg.)
STABILIZER SPAN
17¾ Inches
STABILIZER CHORD (Incl. elev.)
4½" (Avg.)
STABILIZER AREA
76 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
7¾ Inches
VERTICAL FIN WIDTH (Incl. rudder)
5" (Avg.)
REC. ENGINE SIZE
.15-.19
FUEL TANK SIZE
4 Oz.
LANDING GEAR
None
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Ail., Elev., Thrt., Rd.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa & Ply
Wing ..... Balsa
Empennage ..... Balsa
Wt. Ready To Fly ..... 40 Oz.
Wing Loading ..... 16.4 Oz./Sq. Ft.

be fine sanded. Cut the aileron servo openings into the wing and glue the servo mounting rails in place.

Tail Surfaces:

The tail surfaces are of conventional balsa sheet and built-up construction. The vertical fin, rudder, and stabilizer are built directly over the plan sheet (waxpaper or vinyl film covered). The elevators are simply cut from 1/4" sheet balsa. Optional lightening holes may be cut from the elevators, if desired. After temporarily installing all hinges, the tail surfaces are sanded smooth, and contoured as shown on the plan sheet.

Fuselage:

The fuselage is assembled by first gluing the 1/32" plywood doublers to each fuselage side. Be sure to make one right and one left hand side! Add the 3/8" triangular stock to each side. The fuselage formers are now glued in place. Bevel the 3/8" triangle stock at the tail as shown on the plan, and glue the drawn together fuselage sides securely at the tail. The fuselage curvature should be symmetrical.

After first sealing the engine exhaust, intake, and fuel fitting to prevent dust or any other foreign matter from entering it, the engine and engine mount are now bolted in place on the 1/4" plywood firewall (F1). The 1/2" fuselage top sheeting and 1/4" sheet nose blocks are now installed. Using the spinner as a positioning guide, glue the 1/16" plywood nose ring in place, leaving sufficient clearance between the spinner and ring so that no binding can occur. The nose bottom sheet is also glued in place and, using the plywood nose ring as a guide, the fuselage nose is shaped to the proper contour. The fuselage bottom sheeting is glued into place along with the wing mounting blocks and plate.

Position the wing into the wing saddle opening and drill the mounting holes. The proper drill size for the 10-24 nylon wing bolts is a No. 26. The holes in the mounting blocks and plate are now tapped with a 10-24 tap. The holes through the wing are enlarged to accept the 10-24 bolts. Bolt the wing in place and assemble the fuselage belly cover, beneath the wing. The 1/4" balsa bulkheads with 1/4" plywood screw inserts are glued to the wing. The fuselage is now completely shaped and sanded to the proper contour.

The tail surfaces are glued in place, after trimming them to insure that the wing and stabilizer are on a 0° incidence line, along with the engine which is on a 0° to 0° thrust line. The radio system components are now installed along with the pushrods, throttle cable, control horns, and fuel tank. Remove the engine, mount, fuel tank, and radio components and fine sand the entire aircraft in preparation for finishing.

Finishing:

While the $mall Change may be finished via a variety of finishing materials, the use of a heat shrinkable film-type covering for the wing and tail surfaces is highly recommended. Top Flite's EconoKote covering was used on the aircraft shown in this article. The fuselage was finished with Hobbypoxy primer and enamel after first sealing the wood grain with a coat of polyester resin. Film covering can also be used for finishing the fuselage if the builder prefers. A Westport International Variant radio system was reinstalled and our finished ready to fly (less fuel) $mall Change weighed in at a modest 2 pounds, 8 ounces. The engine that we used was a much-run, but reliable, K & B Veco .19 engine. A 225 mAh battery pack was also used in order to save a few ounces of weight, although a conventional 450 mAh battery pack can be used with no difficulty.

Flying:

Our initial test flights were conducted under typical winter (cold, raw, and windy) New England weather conditions. After first performing a radio check, and adjusting the engine needle valve and low speed idle, our $mall Change was launched into the wind. Here is where you might expect the overstated phase: "It flew like a dream, hands off, with no trim changes or control surface travel adjustments being required." Wrong! The $mall Change did, in fact, climb out smoothly. However, it was quickly suspected that our $mall Change was nose heavy, as a large amount of up trim was required for straight and level flight, and it seemed to have too much elevator surface travel. The ailerons required a "tad" of right trim, and the roll rate was just about the way we prefer it (not majestic — but not a flying corkscrew either). The suspected nose heavy condition was confirmed by simply rolling the aircraft inverted, where the dialed in up-trim caused the nose to pitch swiftly downward. After an uneventful landing, the elevator travel was reduced and the C.G. was moved forward by repositioning the receiver and battery pack and adding 1/4 ounce of lead to the tail. On the second flight the $mall Change proved to be an absolute pleasure to fly. All the usual aerobatic maneuvers were possible and, when stalled, there was no tendency to snap roll or to drop a wing tip. Landings were easily accomplished. Being a belly type landing aircraft, it is preferable to shut the engine off on the final approach, via the throttle trim lever. This prevents the prop from whacking the ground and also keeps any foreign matter from entering the engine, as the carburetor barrel is completely closed.

$mall Change is a "pint size," smooth flying, sport aircraft that is not only easy to build and fly, but one that is inexpensive in both of these aspects as well. I hope that you'll give it a try! □

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