COSMIC COYOTE

By Bob Wallace

The Cosmic Coyote is a sport pattern aircraft with a "racey" look. But don't let the sleek Formula One Racer's appearance fool you, for underneath this streamlined cosmetic veneer, lies a typical sport aircraft, in regard to flight characteristics. The Cosmic Coyote is designed to be powered by engines of .40-.45 cubic inches of displacement. A conventional .40 will haul it around the sky in fine style, while the installation of a more powerful Schnuerle type engine will produce a real swift and nimble "hot dogger." Being an avid Formula One flier, I have long yearned to build a sport aircraft with a "racer" look. I think that the Cosmic Coyote, with its cheek cowls, wheel pants, and clean lines accomplishes that goal. The basic airframe is, however, pure "Sunday Flier." The Cosmic Coyote is not intended as a beginner's or advanced beginner's project. It is, however, well within the capabilities of any RC'er who has had a reasonable amount of four control function building and flying experience. If you're tired of the usual box fuselage, constant chord wing, sport designs or the sport pattern aircraft that fly fine but don't resemble any known full size aircraft, then the Cosmic Coyote should be of interest to you.

Conventional construction methods and techniques are employed and all parts and materials are readily available, or can be fabricated. The cheek cowls, on the Cosmic Coyote shown in this article, were scavenged from "deceased" Formula One aircraft, that "the ground leaped up and grabbed." If you know a fellow RC'er who flys Formula One, it's a good bet that he will have several of these cowls in his "can't throw it out/may need it some day" junk box. The existing openings in these old

Bob is an avid Formula One flier and has created a sport aircraft that doesn't look like the "run of the mill" sport aircraft. Using a sport type .40 engine, it will perform in fine style.

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TYPE AIRCRAFT
Sport — Pattern
WINGSPAN
55½ Inches
WING CHORD
10¼ Inches (Avg.)
TOTAL WING AREA
572 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
Symmetrical
WING PLANFORM
Semi-Elliptical
DIHEDRAL EACH TIP
1¾ Inch
O.A. FUSELAGE LENGTH
40 Inches
RADIO COMPARTMENT AREA
(L) 12¼" x (W) 2¾" x (H) 2½"
STABILIZER SPAN
19¼ Inches
STABILIZER CHORD (incl. elev.)
5⅛ Inches (Avg.)
STABILIZER AREA
98 Sq. In.
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
6¼ Inches
VERTICAL FIN WIDTH (incl. rudder)
7¾ Inches (Max.)
REC. ENGINE SIZE
.40-.45 Cu. In.
FUEL TANK SIZE
8 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Elev., Ail., Throt., Rud.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa, Ply, Fiberglass
Wing ..... Foam and Balsa
Empennage ..... Balsa
Wt. Ready To Fly ..... 71 Oz.
Wing Loading ..... 17.8 Oz./Sq. Ft.

cheek cowls can easily be filled in and cowl reshaped to suit your needs. The other cowl alternatives are to purchase the commercially available ABS plastic type or to fashion them from fiberglass cloth and resin or from balsa.

The forward location of the landing gear is intended for flying from grass fields. If you are fortunate enough to have access to a hard surfaced take-off and landing area, the landing gear can be moved aft or reversed. This will reduce the tendency for the aircraft to "bounce" on landing. This is a minor point, but still one to consider.

If you have read this far, you must still be interested in perhaps building a Cosmic Coyote, so let's move into the construction details. Since this is not a beginner's design, the assembly portion of this article will not be in a step-by-step or part "A" to part "B" sequence. The builder will need or have access to a hot wire foam cutter. No other special tools or equipment are required. As an alternative to the foam wing, a built-up wing could be designed and utilized; using the foam wing templates as rib guides. As with any R/C aircraft construction project, the builder should first study the plan sheet thoroughly before starting assembly.

CONSTRUCTION

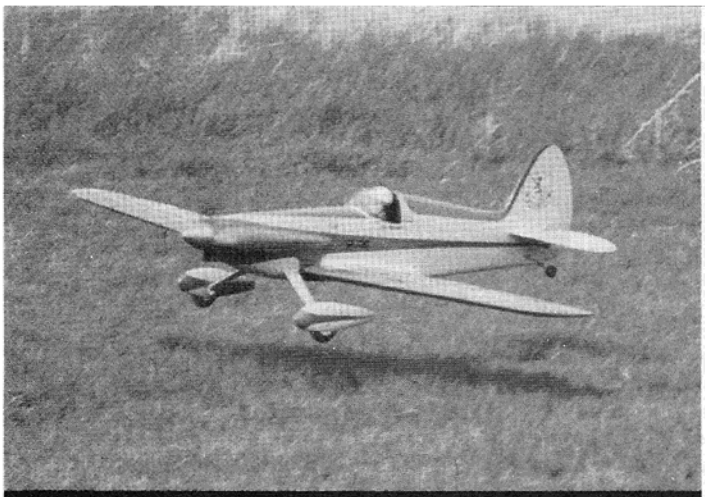
Wing:

As mentioned, a "hot wire" foam cutter is required to cut the cores. The wing is symmetrical and sheeted with 3/32" balsa. The 2" thick expanded bead polystyrene foam, used for the wing cores, is readily available through building supply outlets. It comes in 2' x 8' sheets and sells for about $4.00 per sheet. This foam is available in several densities so be sure to specify the lightest type (1 lb./csf).

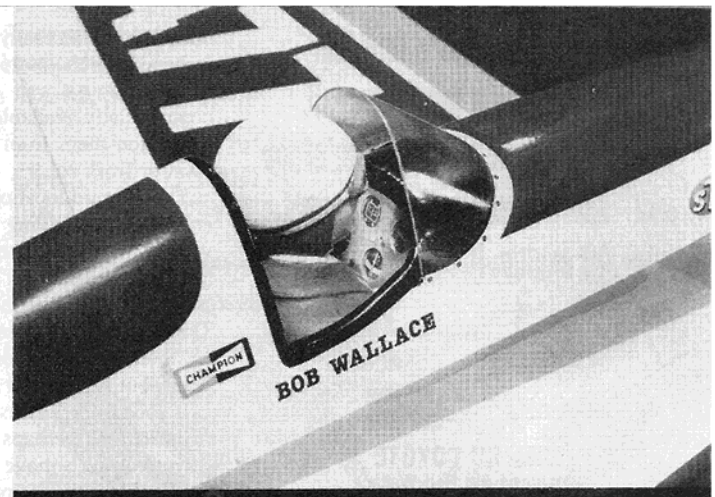
The foam wing blanks are cut to the basic plan outline and the airfoil is cut, using the root and tip templates as guides for the hot wire cutter. If this is your first attempt at cutting foam wing cores, and the assistance of a fellow modeler with foam cutting experience is not available to you, the foam cutting guide book listed in the RCM anthology book section of this magazine is heartily recommended.

After the foam cores are cut they should be lightly sanded with a long sanding block to remove any high spots or minor ridges and vacuumed clean. Be sure to save the foam core block scrap pieces as they will be used in the balsa wing skin application step.

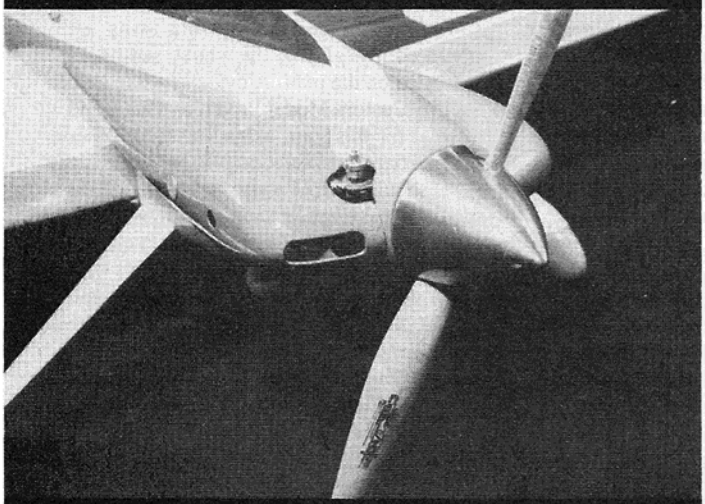
The 3/32" sheet balsa wing skins are prepared by gluing the sheet seams as indicated on the plan. A cyanoacrylate glue such as Custom Model Products' Fast Bond is ideal for this step, as well as most other balsa to balsa construction phases. The wing skins should be 1/4" oversize all around, to facilitate easy application. Sand the skins smooth and vacuum them clean. The wing skins may be adhered to the wing cores with either contact cement or epoxy. 3M brand spray type contact cement was used on the aircraft shown and, if you elect to use this method, both the wing skins and the foam cores should be given an even, uniform coat of adhesive. Allow both the cores and skins



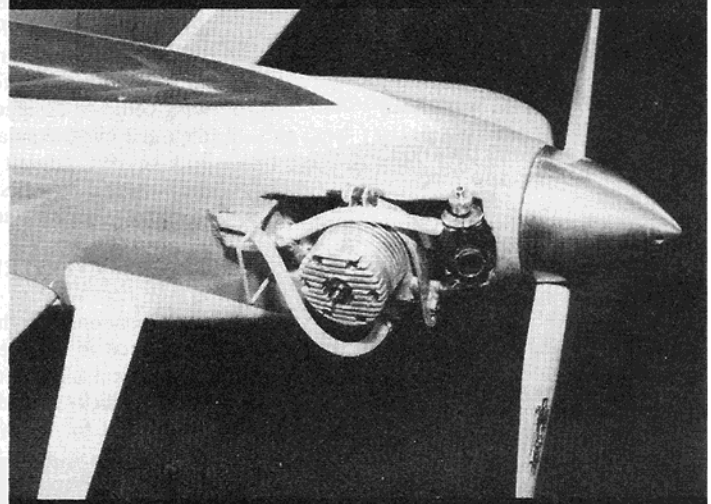
The Coyote builds into a beautiful sport model capable of most any maneuver.



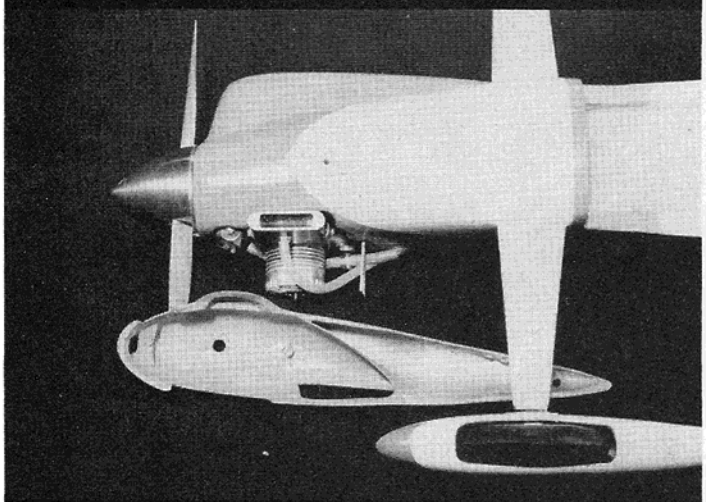
Cockpit detail adds realism to a well built model.



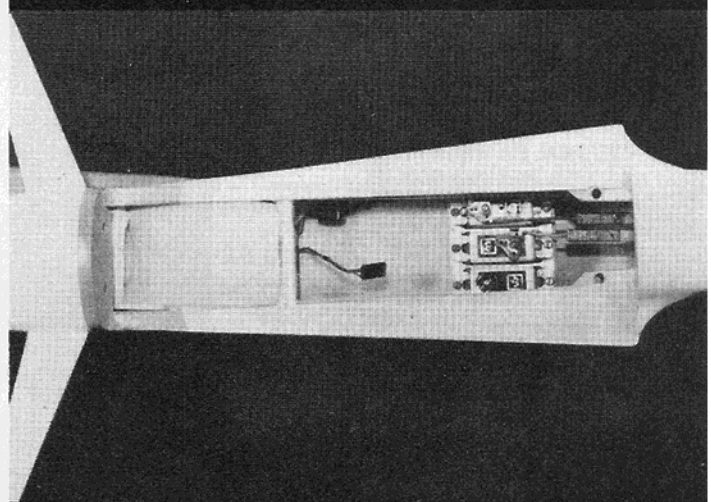
Excellent cowling arrangement hides the engine.



Note wire bracket for cowl hold-down.



Du-Bro muffler cut off short to completely fit inside cheek cowl.



Very neat servo installation. Plenty of room for most any radio.

to dry until they are dry to the touch (about 15 minutes). Avoid applying the skins to the foam cores too soon as solvents in the glue can be trapped and ultimately damage the foam. Apply the balsa skins to the foam cores and sandwich them in the scrap foam block pieces that they were originally cut from. Place a flat board over the sheeted cores and weight it down with something heavy such as a tool box. Allow the sheeted cores to dry overnight.

The excess wing skin sheeting is now trimmed and sanded with a long sanding block so that the balsa/foam exposed edges are smooth and straight.

The 3/8'' x 3/4'' balsa leading edges and the 1/2'' x 3/8'' trailing edge cap are now glued in place with either epoxy or aliphatic resin type glue. Tack glue the wing tip blocks and aileron/trailing edge stock in place. Cut and sand the wing panels to their proper outline and airfoil. Remove the tip blocks, hollow them out as shown, and re-glue permanently in place. Do not glue the tip blocks permanently to the aileron/trailing edge piece as these strips are now removed and the ailerons are cut from them. Install the aileron torque rod/horn system and hinges. Reinstall the trailing edge pieces and the ailerons. (If you intend to use film type covering on the wings, it is suggested that the ailerons be left removable in order to simplify covering them, before installing them permanently in place.) Block up the tip of each wing 1¾'' on a flat surface and sand the center section to the proper dihedral angle. Glue the two wing halves together with either epoxy or aliphatic resin type glue making sure that the wing is ''true'' with no warp or twist being built-in. When dry, the center section trailing edge should be cut and sanded to the outline shown on the plan. The center section should be reinforced with a 4'' wide strip of 6 ounce fiberglass cloth and thinned epoxy.

The servo well is now cut and lined with 1/16'' sheet balsa. Install the hardwood aileron servo mounting beams. Fine sand the entire wing and set it aside for now.

Tail Surfaces:

The tail surfaces are all cut from 1/4'' sheet balsa and shaped as indicated on the plan sheet, which is self-explanatory.

Fuselage:

Start by cutting the fuselage sides out of 3/16'' sheet balsa and all of the plywood and balsa formers. Mark the location of each former on the fuselage sides. Glue the 1/4'' square fuselage pieces to the fuselage sides as shown along with the 3/16'' sheet wing saddle doublers. Be sure you are making a left and a right hand side! Install formers F3 and F4. This step is made much easier if the fuselage sides are pre-moistened (on the outside) with warm water and ammonia, to make them more pliable. Sand the aft end of the fuselage sides to the proper beveled angle and glue them together after first checking the symmetry of the fuselage over the fuselage plan top view. Glue formers F5, F6, F7 and F8 in place.

The engine mount should be attached to F2 with 6-32 machine screws and blind nuts, after it has been drilled and tapped to accept your engine. Install former F2 with the engine mount attached, in place.

Glue the 3/8'' triangle stock pieces behind former F2. The 1/8'' plywood nose ring (former F1) is now installed. The fuselage top is sheeted with balsa as indicated on the plan sheet. Cut out the cockpit opening.

Glue the 1/8'' balsa sheet instrument panel and cockpit floor in place. Install the hardwood wing hold-down blocks and 1/32'' plywood wing fairing plates.

The finished wing should be used to hold the fairing plates in their proper position for gluing. This will insure that a good wing to saddle fit is obtained. The leading edge of the wing should now be drilled and the 1/4'' hardwood dowels glued in place with epoxy. Use the dowel holes in former F3 as guides to properly locate the dowels.

The landing gear plate (LGI) and the tail surfaces are now glued in place. Install the elevator and rudder pushrods along with the throttle control cable as it is easier to do this before the bottom sheeting and blocks are glued in place. After assuring yourself that the control rods and throttle cable function in a smooth frictionless manner, the bottom sheeting and nose block are glued in place.

The fuselage is now carved and rough sanded to its approximate contour. The opening to accept the engine is now cut in the fuselage right side and the engine is installed. (Be sure to seal all engine openings to keep dust and dirt out.)

Install the spinner back plate and use it as a guide in contouring the nose portion of the fuselage.

Install the cheek cowls. The left side cowl is glued in place permanently while the right side cowl is removable. Particular attention should be paid to the proper inner cowl cooling baffle and openings. The cooling air outlet opening for the engine should be at least three times larger than the intake. It is also recommended that a small angle deflector (1/64'' plywood) be installed inside the cowl at the inlet, which will direct at least one half of the incoming air over the head of the engine. Studying the photos of the cowl should help in regard to this construction phase.

The removable cheek cowl can be attached in a variety of ways, however, the method shown is simple and works well. The cowl is ''pinned'' to the fuselage at the rear by using two small pieces of brass tubing which telescope together. The larger diameter piece of tubing (3/16'' long) is glued into the fuselage side and the smaller diameter piece (about 3/8'' long) is epoxied inside the cowl. The cowl hold-down is made out of 1/16'' music wire which is bent into a ''U'' shape and fastened to the engine mount. The cowl is held securely in place by a Dzus fastener which locks onto the wire loop.

The fuselage fillets tail wheel bracket, can now be added. Bolt the wing in place and install the wing bottom block and contour it to the curvature of the fuselage.

The fuselage should now be fine sanded in preparation for finishing.

Finishing:

The finish of the aircraft is left to the builder since each of us has a preferred method or technique. The aircraft shown in the article was finished with one coat of polyester resin over the entire aircraft to seal the wood grain. After sanding, two additional coats of K & B Super Poxy primer were sprayed on and sanded after each coat. An additional coat of highly thinned out primer was sprayed on and wet sanded. The color coats were K & B Super Poxy and a final coat of K & B Super Poxy glossy clear was sprayed on after the trim lettering and decals were applied.

Our ready to fly (less fuel) Cosmic Coyote weighed in at 71 ounces.

Flying:

It would be nice to be able to report that the first test flight went without a hitch; as the saying goes ''it flew hands-off from the start, with no trim or control surface adjustments being required.'' To be truthful, it didn't work out quite that way!

The initial test flight was performed under less than ideal weather conditions --- temperature in the mid-twenties with a gusty wind of about 15 mph blowing --- well . . . at least it wasn't snowing!

After the usual radio and engine check, the Cosmic Coyote was topped off with fuel and the engine started.

The take-off and climb-out were, in fact, just about perfect; nice and straight and smooth. The only trim change necessary for hands-off straight and level flight was a bit of down elevator. Further in-flight testing indicated that the aileron travel could be reduced as the roll rate was rather quick. The recommended control surface travel limits are as follows: aileron — 3/16'' to 1/4'', elevator — 5/16'' to 3/8'', and rudder — 3/4''. Dimensions given are for each

direction and at the control surface's maximum width.

The remainder of the flight was uneventful and the aircraft displayed very satisfying flight characteristics, in spite of the windy, bumpy conditions. As the wind was a direct crosswind and rather strong, we elected to land directly into it, which meant landing across the normal landing area. The only obstacle to landing in this direction was a low barbed wire fence and high scruffy grass. The landing approach was entered and perhaps it was due to the slightly rich mixture setting combined with using a cold type plug, but after turning onto the final approach, the engine (which was throttled back to about 1/4 throttle) became very silent and the prop stationary. Being a "veteran" R/C pilot . . . it was "instantly concluded" that a "go around" would be somewhat difficult as the aircraft was only about 25' high downwind and still well short of the field.

As any R/C pilot knows (or soon learns), it is impossible to stretch an aircraft's glide and that it is a very poor practice to let the aircraft become situated well downwind at a low altitude. Add to this, the problem of an engine flame-out and you have all the credentials necessary to win the "R/C twit of the month award."

By the time it was apparent that making it over the fence and onto the landing area was going to be --- interesting! With altitude lessening and the fence looming ever higher, the urge to feed in up elevator was overpowering. The Cosmic Coyote aided by much inhaling, body english, and an ever tightening sphincter muscle; cleared the fence with inches to spare and a beautiful full flare landing was made. The only problem being that the aircraft was still 2½ to 3 feet off the ground! The Cosmic Coyote simply "plopped" to the frozen turf --- no snap roll or wing tip drop --- it just dropped vertically. The resultant "spot landing" was still hard enough to crack the landing gear and bottom nose block loose from the fuselage.

At this point, one does not exactly swagger over to retrieve one's aircraft. The walk could best be described as a head down, slink, accompanied by considerable muttering, relative to one's own ancestry.

This humbling account of R/C piloting ineptitude does, however, have one fortunate aspect in that, with such poor weather conditions prevailing at the time, there were only two other fellow RC'ers at the field to witness the landing debacle.

The damage was easily repaired and, on subsequent flights, the Cosmic Coyote has proven to be a real fun aircraft. It performs all the usual pattern maneuvers in a commendable fashion. In-flight speed is comparable to any .40 size sport pattern aircraft. The Cosmic Coyote has become my favorite sport flying aircraft and if you should decide to build one, hopefully it will become a favorite with you also.

The Cosmic Coyote, with its racer look, may even induce you to ultimately try your hand at the premier event in competition R/C modeling — **Formula One**! I sure hope so --- see you at the races. □

By H.E
RCModeler
July 1981