

CORKSCREW



This is not a trainer . . . unless you want to learn new wild and tortuous maneuvers that most people have never seen done with an R/C miniature aircraft!

TORTUOUS . . . yes, tortuous is the right description. Webster's dictionary includes "tortuous" in the definition of a corkscrew. A visiting northern modeler, Ed Izzo, watched it in flight here in sunny Florida and gasped . . . "It looks like it's trying to strangle itself!"

The design concept is very basic . . . use the minimum number of pieces in the right configuration to yield the maximum amount of flyability. (Ed. Note: See Don Lowe's column, page 197, RCM July 1982, for additional explanation of value of this design concept.) Because the piece count is so low, the prototype was completed in less than two weeks . . . and when it came unglued in flight (read on for details) and self destructed on the way to the ground, the second model was built and flown in only one week's time.

The exposed "sight gauge" fuel tank may seem odd, but it allows you to land, check your fuel supply and go off again if fuel is sufficient.

The simple shaped canopy came from my "Simple-Fly" design of ten years ago and is extremely functional, as it yields much room inside the fuselage for lots of foam around the receiver and battery pack, and it provides more lateral area for extended knife edge flying.

The large amount of hardwood in the front of the fuselage represents sufficient mass for needed vibration damping for today's high revving engines.

With an Enya .19 engine, the model is quite docile but it requires about three ounces of nose weight under the engine.

With an Enya .29, the model flies great but requires slight tail weight.

The best performance has been with a new Super Tigre X-.25 which required neither nose nor tail weight and with an 8" diameter 4" pitch balanced Master Air Screw prop turning over 16,000 rpm's.

Al Tuttle from Maui, Hawaii, was visiting Florida during the initial flights of the prototype and he tried his darndest to get the model away from me . . . he finally settled for a set of plans and a new X-.25 from the local hobby shop. So why don't you mail \$5.50 to R/C Modeler, P.O. Box 487, Sierra Madre, California 91024, and ask for plan #880 for the Corkscrew and get ready to build one too.

Inverted flight is just fine with this model, although tight outside loops

Loop, roll, and spin with a Corkscrew . . . and learn aerobatics

By Stu Richmond



Rest in peace.

Material List

- 3/8" x 3/4" maple motor mounts x 12"
- 5/16" hardwood dowel x 48" leading edge of wing
- 1/32" plywood 12" x 24" — fuselage
- 3/16" x 1/2" spruce, 4 pieces x 24" — wing spars
- 1/16" plywood 3" x 3" — aileron servo mount
- 1/8" plywood 3" x 5" — firewall, gear mount
- 3/16" plywood, scrap — tailwheel mount
- 1 1/2" balsa trailing edge, 2 pieces x 24"
- 1" balsa triangular stock x 18" — wing tips
- 3/16" dowel, 36" — pushrods, elevator connector, tank hold-down.
- 1/8" x 3" x 36" balsa 2 pieces, fuselage sides
- hard**
- 1/4" dowel x 9" — wing mounting
- 3/16" x 3" x 36" — tail surfaces
- 1/8" wire x 36" — gear, main
- 1/16" wire x 4" — gear, tail
- 1/8" x 3" x 36" balsa, 3 pieces, wing ribs, formers — medium
- 1/16" x 3" x 36" balsa — top and bottom of fuselage
- 1/4 lb. box of #64 rubberbands
- 2 — 2" wheels; 1 — 3/4" wheel
- 3/8" x 3/8" hardwood x 6", servo rails
- Tailwheel bracket, wheel collars, 1/8" clamps, screws, fuel tank, and misc. horns, hardware, engine bolts, etc., props, foam
- 1/4" plywood, 1" x 8" dihedral brace . . . no thinner
- Small bottle black fuelproof dope
- 2 rolls MonoKote, plus trim colors

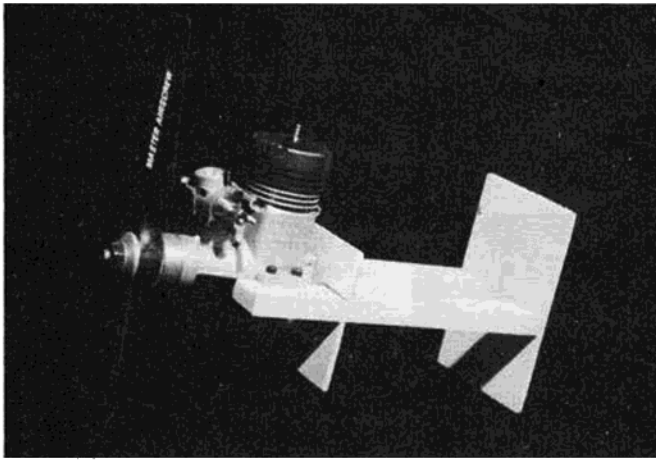
are difficult regardless of power used because of the flat bottomed airfoil. The biggest advantage of the airfoil is that its speed envelope is relatively great. Full power yields good speed, but idle power really lets the model slow down for a nice predictable sink rate. Aileron throw **must** be at least the movement dimension shown on the plans; elevator and rudder throw can be adjusted to suit your temperament. If you elect maximum rudder/elevator movements, you may enjoy learning and performing the below described new maneuvers.

On a paved surface, hold full "up" and "left" or "right" rudder and slowly advance the throttle and watch the model ground spin around and around . . . I can almost safely get to full throttle . . . this is a low down Corkscrew.

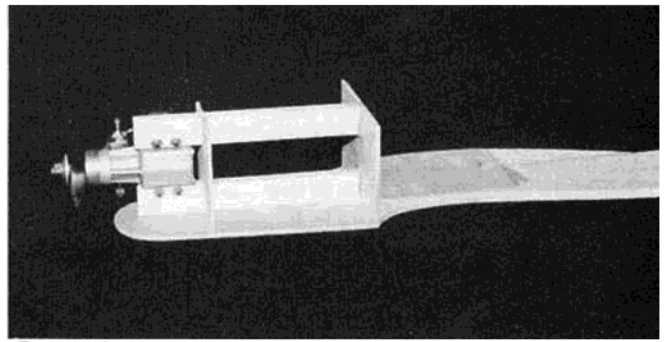
The model does beautiful **flat spins** with good recovery if the Center of Gravity is as shown on the plans. The amount of lateral area behind the Center of Gravity is just right for easy entry/exit from this stunt. Climb much higher than you think you need to and enter a tailspin **to the left** using full left aileron, full left rudder and full up elevator . . . and full throttle. Slowly move from left aileron to right aileron. **Very, very** slowly move from up elevator to neutral elevator and the spin will dramatically change from conventional to **flat** . . . and then continue moving the elevator to full "down" position and the rate of descent will slow considerably . . . a beautiful, graceful and dramatic stunt! Recovery will take 2-3-4 rotations after neutralizing all controls **if** full power is left on. If you reduce the power or the engine quits, it may flat spin all the way to the ground! The prop blast on the fin/rudder is required to recover from the flat spin safely and quickly.

Sideslips are a breeze. Set your throttle one click above full idle . . . put in full right rudder and gently and carefully add left aileron as will be required to keep the left wing down and forward. You will also have to add slight amounts of up elevator . . . be sure to straighten up before touchdown, 'cuz you can't land sideways without dinging up wingtips! A fun and realistic stunt.

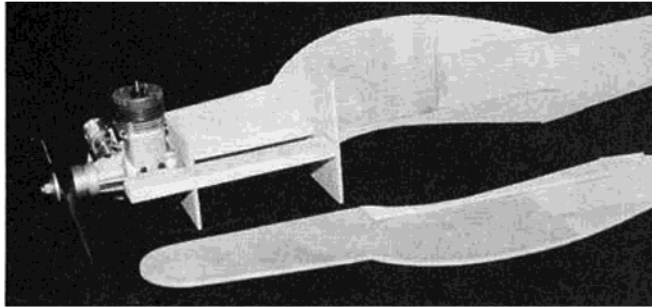
Corkscrew will knife-edge nicely with a .25-.29 eng. From level flight bring up the nose slightly, a roll to the right or left and opposite rudder is applied. If the model flies to the "top" side, add slight weight to the tail and decrease/lower the elevators a turn or two on the clevis. If it knife-edges to its "bottom" side, do just the opposite.



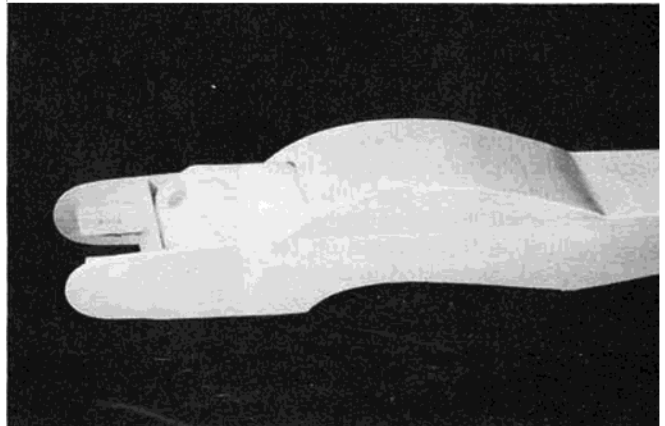
Bolt engine mounts to your engine. Add bulkheads "A" and "B" to make the engine mount sub-assembly.



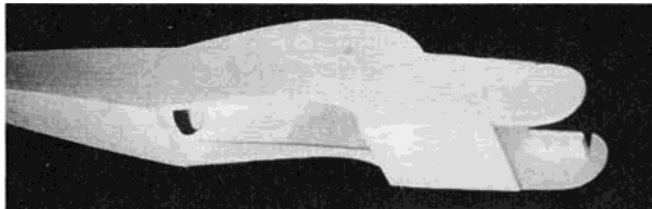
Epoxy glue the engine mount sub-assembly to one fuselage side.



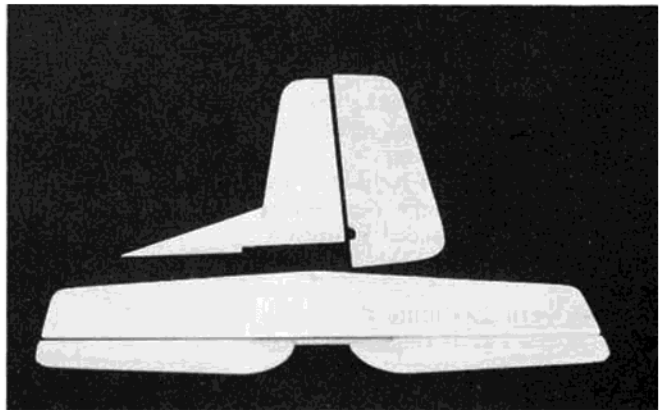
Epoxy glue the engine mount sub-assembly to the other fuselage side.



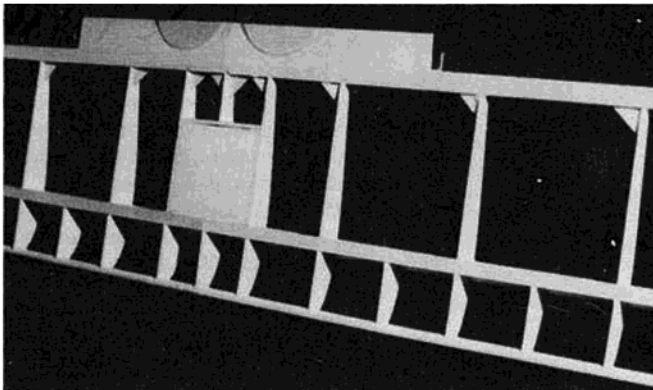
Top view of completed fuselage.



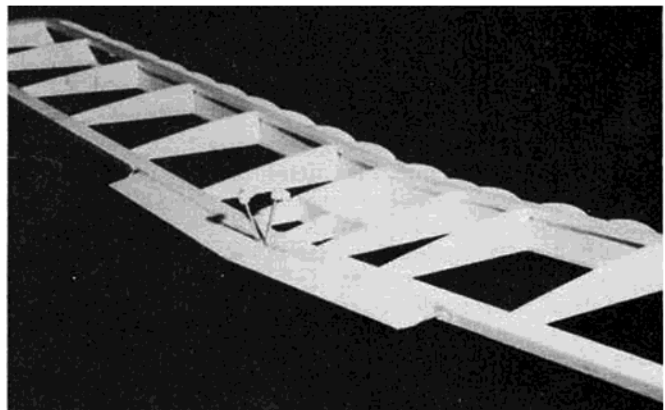
Bottom view of completed fuselage.



Finished tail surfaces.

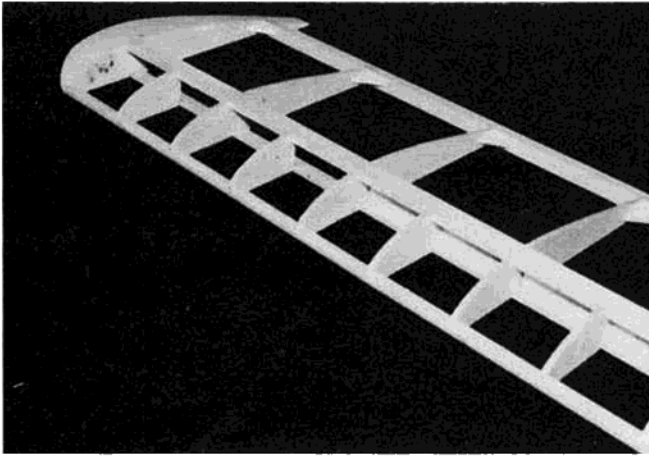


Underside of wing structure.

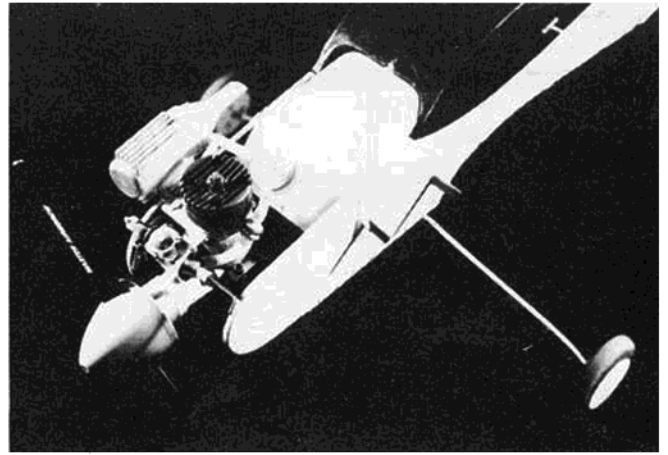


Completed structure of the right wing. Shape of the wingtip shows clearly.

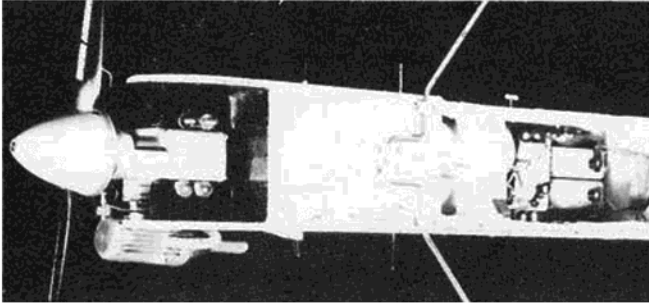
Extremely sturdy wing construction. Use epoxy glue only in the center section joints. Author used aliphatic resin glue on the prototype and it came unglued in flight during a high-stress Corkscrew maneuver. Read text for details!



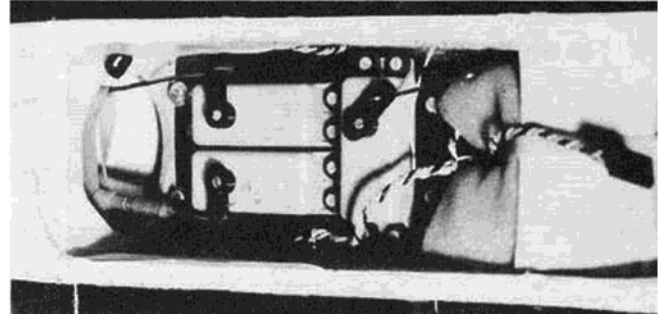
Structure of the right wing. Note the weight imbedded in the tip to balance the completed wing.



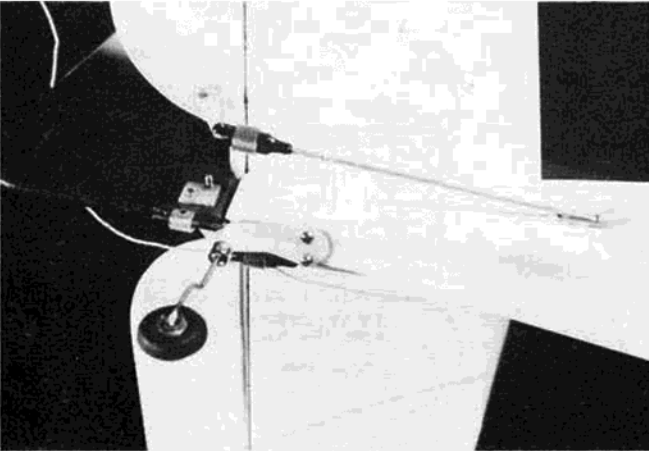
Front of fuselage. Sight gauge fuel tank mounting proves handy and simple.



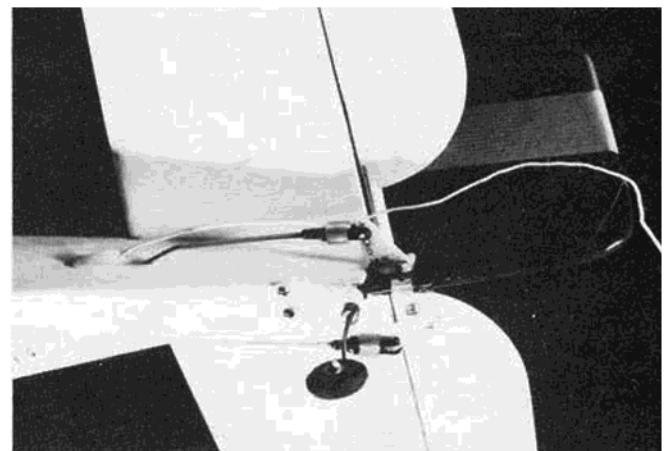
Underside of nose area. Typed identification says: "This miniature aircraft is being used for scientific research in flight dynamics. When found please return to . . . Reward." Use a spinner with a metal backplate to minimize vibration and to protect your engine in case of a crash.



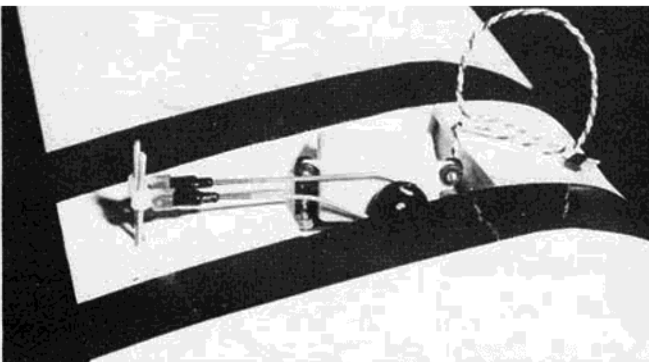
Corkscrew's servo installation of three KPS-14II servos in the mating nylon mounting tray. Strain relief button on the antenna wire shows, as does the rubberband looped gently around the elevator and rudder pushrods that prevents whipping of the pushrods that damages servos.



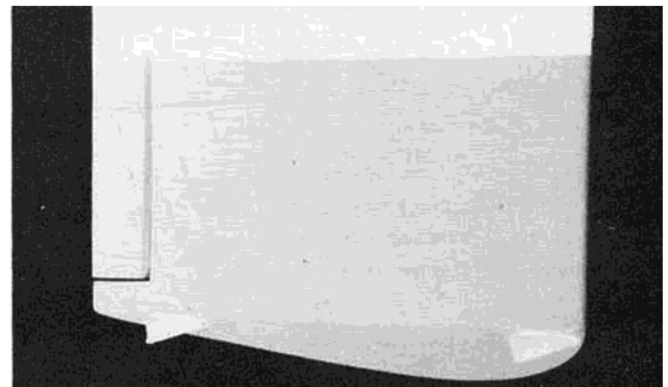
Underside of Corkscrew's tail, showing the absence of extraneous bends in the elevator pushrod.



Notice the thin strip of plastic that "captures" the tail wheel wire to yield positive ground steering.



Center section of completed wing, showing bends in pushrods to get necessary clearances. Shown is a KPS-14II servo in its black nylon mount.



Notice the use of two Carl Goldberg wing tips skids . . . a sure way to protect the wing tips.

CORKSCREW

Designed By: Stu Richmond

TYPE AIRCRAFT

Sport Aerobatic

WINGSPAN

49 Inches

WING CHORD

8 Inches

TOTAL WING AREA

388 Sq. In.

WING LOCATION

Low Wing

AIRFOIL

Flat Bottom

WING PLANFORM

Constant Chord

DIHEDRAL EACH TIP

1 1/2 Inches

O. A. FUSELAGE LENGTH

38 Inches

RADIO COMPARTMENT SIZE

(L)8" x (W)2 1/2" x (H)4"

STABILIZER SPAN

16 Inches

STABILIZER CHORD (inc. elev.)

4 1/2" (Avg.)

STABILIZER AREA

67 Sq. In.

STAB. AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

5 3/4 Inches

VERTICAL FIN WIDTH (inc. rud.)

5" (Avg.)

REC. ENGINE SIZE

.19-.30 Cu. In.

FUEL TANK SIZE

6 Oz.

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

4

CONTROL FUNCTIONS

Rud., Elev., Ail., Throt.

BASIC MATERIALS USED IN CONSTRUCTION

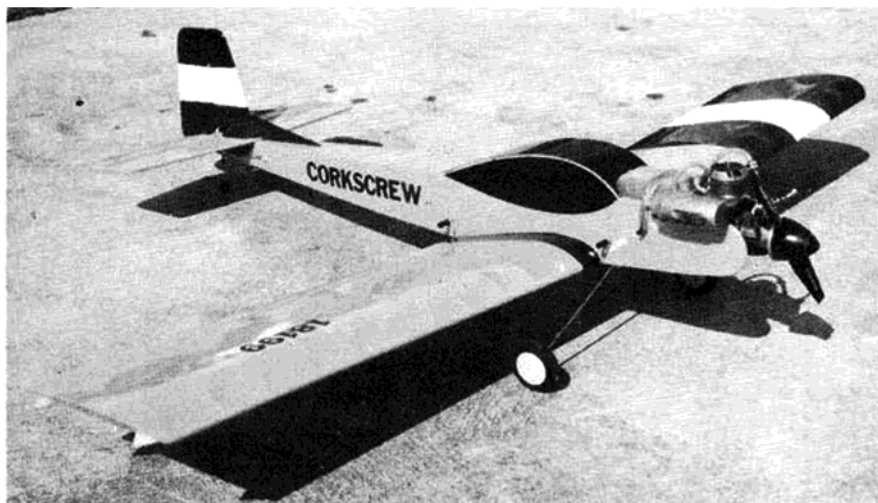
Fuselage Balsa & Ply

Wing Balsa, Ply & Hardwood

Empennage Balsa

Wt. Ready To Fly 52-56 Oz.

Wing Loading 19.3-20.8 Oz./Sq. Ft.



Corkscrew with Enya .29 and tail weight totals just 3 1/2 pounds.

These should be very minor adjustments . . . be patient and the model will knife-edge with minor elevator corrections. Because of the dihedral, you will have to use aileron correction, however.

Lomcevak is a Czechoslovakian word and in English it means "shake." In aerobatics it is used to describe a seldom seen maneuver in which the aircraft, in a fully stalled airborne status, actually tumbles "tail over nose" toward the ground. The Corkscrew, with the nose weight of the Enya .29 and about one ounce of counterbalancing clay on the tail, will balance at the rear edge of the wing spar. I have 3/4" of "up" and "down" elevator travel. Enter the Lomcevak from a steeply climbing "right rudder" knife-edge or from the top of a very large inside loop . . . enter the Lomcevak with full power and as airspeed has visibly decreased. Snap the controls to "down" elevator, "left" rudder, and "left" aileron and the Corkscrew will quickly stall, the tail will tumble over and around the nose one or two times as the model starts to fall toward the ground. If your balance and your control movements are correct and your Corkscrew still won't

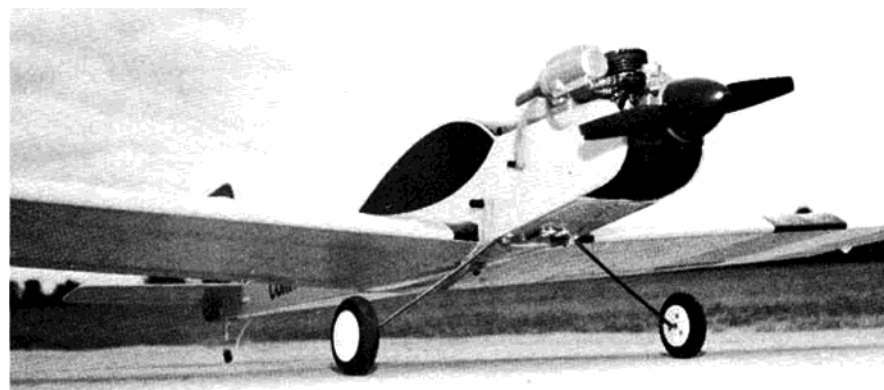
tumble, try adding 3 or 4 ounces of modeling clay or ballast at the Center of Gravity to make it stall more quickly/readily. This maneuver may/will take some intense practice. Remember, as you add weight to the Corkscrew, the performance of other maneuvers like knife edge flight will suffer.

And now for the Corkscrew maneuver, from which its name was derived. Climb high and, with full throttle, start a power dive vertically toward the ground over a non-spectator area. When at maximum terminal velocity (after 200'-300') and still with full throttle, quickly apply in unison full "left" rudder, full "left" aileron and full "up" elevator. The model will do ten or more near instant snap rolls in 3-4-5 seconds . . . while aiming straight down at the ground. Try it to the right as well, to see which direction is most tortuous. If your Corkscrew doesn't do this maneuver, your throws are insufficient or your servos or stomach are too weak! The original prototype Corkscrew was destroyed in flight when the 1/4" plywood dihedral brace, which was glued in place with aliphatic resin glue (not glued with epoxy) finally came unglued in flight while doing a corkscrew maneuver . . . and proceeded to re-kit itself on the way to the ground . . . shedding parts all the way!

If you build and enjoy the Corkscrew with its philosophy of minimum piece count/maximum flyability, watch for the SuperScrew and the TwinScrew designs that are on my drawing board now.

Let's build.

Procure all wood and hardware as shown on the plans. The best way to cut out the wood parts is to lay the appropriate piece of wood under the plans and with a pin, pin prick the



Super Tigre X-25 turns the 8/4 Master Airscrew well over 16,000 rpm's. Corkscrew has been flown with an Enya .19 and was quite docile, but well powered.

plan outline through the plan into the wood. Remove the wood, connect the pin prick holes with a ball point pen and cut out the piece of wood.

Cut out two fuselage sides.

Laminate plywood doublers to fuselage sides with 30 minute epoxy and set aside to dry. Use flat weights to assure good adhesion.

Cut engine mounts to size. You may have to alter the mounts slightly to accept your particular engine and so that the outside dimension across the maple engine mounts is as shown on the top view.

Drill engine mounting holes and bolt the engine mounts to your engine.

Cut out bulkheads "A" and "B" and epoxy in place.

Epoxy the above assembly to one fuselage side. When dry, epoxy to the other fuselage side.

Cut out and epoxy in place the 1/8" balsa fuselage triplers that help form the wing saddle.

Cut out and add bulkhead "C", glue together at rear ends of fuselage sides and add all remaining pieces to the fuselage.

Unbolt and remove your engine.

With a sanding block and 80 grit sandpaper, rough sand the fuselage.

With fine sandpaper, round all corners except where wing and tail will attach.

Paint gas tank area and engine area with 3-4 coats of fuelproof black dope.

Cover fuselage.

Cut out all tail parts, round edges and fine sand. Use cyanoacrylate glue to reinforce the elevator and rudder where the control horns will be attached. Epoxy the two elevators to the 3/16" connecting dowel. Cover.

Cut out wing ribs and assemble the wing over the plans.

Cut out the 1/4" plywood dihedral brace and, using 30 minute epoxy (**do not use aliphatic resin glue**), join the two wing panels. Add tips, carve to shape and sand to finish.

Cut out the ailerons as shown on the plans. Gouge out the balsa at the center section of the trailing edge for the Carl Goldberg #248 aileron horns to be recessed as shown on the fuselage side view. Add all gussets, aileron servo area parts, fine sand, cover and, with either Rocket City or Kraft #200-105 hinges, attach the covered ailerons and set aside.

Bend landing gear with aid of a strong vise; add wheels and screw in place on fuselage with 1/8" molded nylon gear brackets. The gear should have slight "toe in" on its axles, and the axles should be 1/4" to 1/2" behind the wing's leading edge if flying off pavement . . . or be about 1/2" in front of the leading edge if flying off grass.

Bend tail wheel gear; add parts and screw the finished assembly in place on fuselage. Drop epoxy inside the fuselage to "capture" the holes of the tail wheel bracket.

Cut away the stabilizer's covering where it mates with the fuselage and epoxy the stabilizer in place. Cut away covering from the top of stabilizer and fuselage and epoxy fin in place. Add triangular reinforcements to base of fin . . . they are needed. It's easiest to cover the reinforcements first; allow 1/16" overlap on the covering and later seal the covering down with the hot iron to both the stab and fin.

Hinge elevator to stabilizer. Hinge rudder to fin. Add control horns and the plastic band that goes under the bottom of the rudder to "capture" the tail wheel wire to assure ground steering.

Cut and pre-paint the wing dowels and gas tank hold-down dowels. Drill fuselage to accept them and glue in place.

Install engine using the down thrust wedges, servo rails and radio equipment.

Install tank and fuel line . . . use a fuel filter too.

Make and install pushrods and remaining linkages to the ailerons and carburetor. A nice touch is to use

Klett pushrod exit guides and two Carl Goldberg tip skids on each wingtip — one at the front and one at the back if you fly off pavement.

Add weight to the nose or tail to balance on the main spar.

Do not omit twisting the wingtips, per the plans . . . up at the tip's trailing or rear edges to get "washout" twisted in each wing. This prevents the wing from stalling at the tips on slow flight . . . and allows you to make very slow nose-high landings. Hold the wing on with eight criss-crossed #64 elastic bands.

Don't's:

1. Don't use soft pulpy wood except for the wingtips.

2. Don't use a smaller size of wood than the plans specify.

3. Don't omit the downthrust wedges under the engine.

4. Don't omit the washout twists in the wings.

5. Don't shorten or bend back the tail wheel gear . . . if you do, the tail will bounce on pavement and cause problems.

6. Don't use aliphatic resin glue (often called white glue), use epoxy for all major joints.

7. Don't forget to balance your props.

8. Don't substitute balsa wood for the hardwood wing spars. □

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