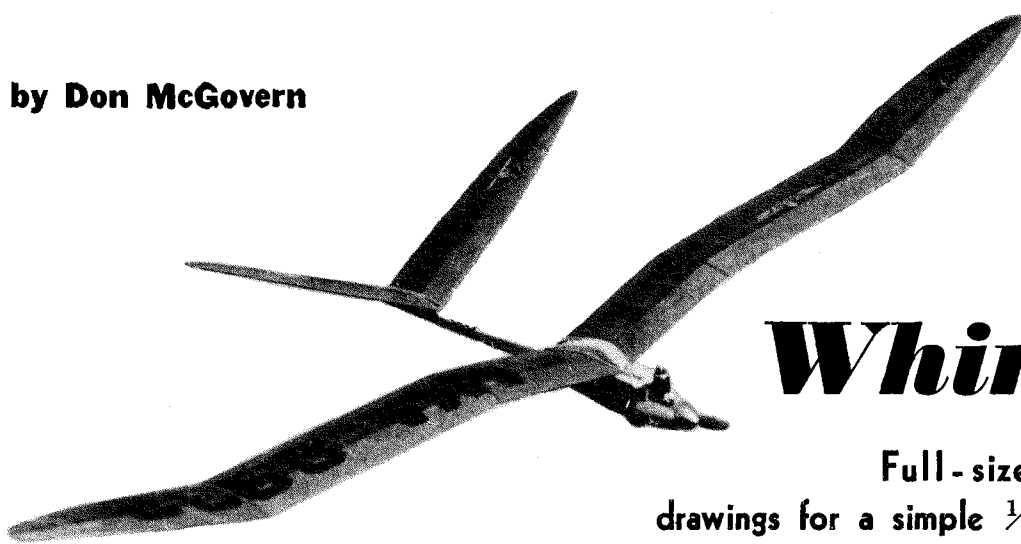


by Don McGovern



Whirlwind

Full-size plans and detailed drawings for a simple $\frac{1}{2}$ A-powered towliner

● "Scram, beat it, go away and don't bother me—I'm busy!"—and so another model builder sneaks out of drying the dinner dishes.

Of course this doesn't happen very often with the average addict—only about six nights a week. It's not really his fault either for, as a rule, he has something very important to do—such as almost anything.

The above simple-minded drool is especially true when the fiend in question is at the drawing board concocting a ship such as appears on these pages.

In our particular case, we were in a dither trying to find the most practical way of building a $\frac{1}{2}$ A-powered towliner. If you think this is a weird design, consider yourself fortunate, for we might've installed the power-plant over the wing in a nacelle, pusher no less.

However, to cut a long story short, the conventional tandem mounting was chosen, to simplify the lines, eliminate the need for a left-hand pitch prop, and at the same time, keep the center of gravity low.

Too many ships in our estimation look alike, and we felt that a combination gas-powered and towliner model was the perfect medium for experimentation. With this in mind, a polyhedral gull wing was incorporated in our design, for its bird-like appear-

ance and its beauty in the air.

Plenty of reserve strength was built into the wing, in spite of its very high aspect ratio. Four spars, along with gussets and planking, permit high-speed catapult launches with safety, as well as more than the usual number of bruises encountered on the field.

Thin-tail booms are notoriously weak, but not this one. Its hollow laminated construction makes it virtually unbreakable. To date we've never seen one built in this fashion snap under any conditions.

As an additional safeguard, a butterfly stabilizer was chosen, eliminating any twisting action on the tail boom when landing. Stabilizers of this type are never in direct contact with the ground, due to the severe dihedral.

All in all, it's a sturdy ship,

even though its slim lines and high aspect ratio may raise a questioning eyebrow here and there.

One word on rules before we go any further. The model as presented here may be flown as a Class D towline, with the engine used for weight only of course. The ship meets the weight rule, $L^2/200$ cross-section requirement, but may not of course be flown in a contest via catapult or hi-start (shock-cord) launching since it does not meet rules requirements.

As a gas job, it doesn't meet the A.M.A. contest rules on at least two points. In the first place, there is no three-point suspension with the belly wheel and that's the second point also. A belly wheel is not a landing gear, hence the model is not able to R.O.G.

Of course a one-wheel gear and skids may be employed if you so desire, but (Turn to Page 58)



This beautiful gull-wing towliner may be flown as a glider or as a free-flight gasie—no matter which way you fly it you're in for sport galore. Look over the simplified plans and start constructing it today!

WING CONSTRUCTION

1 IF PRE-TAPERED TRAILING EDGE STOCK IS UNAVAILABLE, CUT IT FROM 3/16" X 5/8" STRAIGHT-GRAINED WARP-FREE MEDIUM-HARD Balsa.

2 NEXT, CUT TO PANEL SIZES.

3 MARK OFF EACH RIB POSITION IN PENCIL, AND CUT NOTCHES 3/32" DEEP.

4 THESE NOTCHES ELIMINATE THE NEED FOR TRIANGULAR RIB GUSSETS.

5 LAY OUT THE WING PANEL BY PANEL, PIN THE TRAILING EDGE DOWN FIRST.

6 THIS TOLERANCE IS FOR THE 1/16" SHEETING REINFORCING THE WING, BOTH TOP AND BOTTOM AS IN FIGURE 18.

7 SELECTING THE RIGHT WOOD FOR SPARS IS ALWAYS IMPORTANT. USE THE HARDEST 1/8" SQUARES FOR THE GULL PANELS, AND SOFTER STOCK TOWARDS THE WINGTIPS. SLIP RIBS IN PLACE, PINNING AS SHOWN, TILT ALL END RIBS AS REQUIRED.

8 REMOVE PANELS FROM PLANS AND CLEAN UP EXCESS CEMENT WITH A RAZOR. WINGTIP MAY BE ADDED NEXT CUT L.E. AS SHOWN.

9 TOP SPARS AND LEADING EDGE ARE NOW ADDED. APPLY A DROP OF CEMENT TO EACH NOTCH, AND PIN IN ALIGNMENT.

10 THE 3/16" SHEET WITH WINGTIP MAY BE ADDED NEXT CUT L.E. AS SHOWN.

11 CUT ALL REQUIRED GUSSETS FROM 1/32" PLYWOOD. AN ORDINARY PAIR OF SCISSORS WILL DO THE JOB.

12 AFTER BEVELING ALL STRUCTURE ENDS, NOTCH RIBS AND CEMENT GUSSETS IN.

13 PRE-COAT ALL GUSSETS AT THE JUNCTION WITH THE CENTER SECTION PANELS.

14 DOUBLE SPAR GUSSETS REINFORCE THE GULL SECTION OF THE WING.

15 ADD SINGLE SPAR GUSSETS AT THE JUNCTION WITH THE CENTER SECTION PANELS.

16 CHECK ALL WING ANGLES WITH 3-VIEWS.

17 THE LEADING EDGE SHEETING IS CEMENTED TO THE LEADING EDGE FIRST, THEN TO EACH RIB AND TOP SPAR. NEXT ADD 1/16" X 3/16" CAPSTRIPS.

18 APPLY CEMENT FILM TO PANEL TO JOINTS.

FULL-SIZE LAYOUT FOR GULL AND CENTER SECTION PANELS

W-1 1/8" LEADING EDGE

W-2

G-1 4 REQ. G-2 1 REQ. 1/32" PLY GULL-CENTER GUSSET G-1 & G-2

G-1 IN GULL PANEL G-3 IN CENTER PANEL

G-1 IN GULL PANEL

G-1 IN GULL PANEL G-3 IN CENTER PANEL

G-1 IN GULL PANEL

G-2 IN GULL PANEL G-4 IN CENTER PANEL

WHIRLWIND Plate 1A

IN THE INTEREST OF CONSERVING SPACE, THE GULL WING PANEL HAS BEEN SUPERIMPOSED OVER THE CENTER PANEL. EL. NOTE BREAK BELOW.

1/16" X 3/16" CAPSTRIPS

NOTCH TRAILING EDGE FOR RIBS

CENTER PANEL GUSSET G-3 4 REQ. G-3 & G-4 1/32" PLY G-4 2 REQ.

G-3 IN GULL PANEL

GULL PANEL ENDS HERE CENTER PANEL DOES NOT BREAK AT THIS POINT.

PLAN FOR RIGHT-HAND CENTER PANEL BEGINS AT THIS POINT, AND EXTENDS ONTO ADJOINING PLATE.

1/16" SHEET LEADING EDGE PLANKING. USE SOFT PLIABLE Balsa.

ALL RIBS 1/16" SHEET

1/8" SQ. SPARS

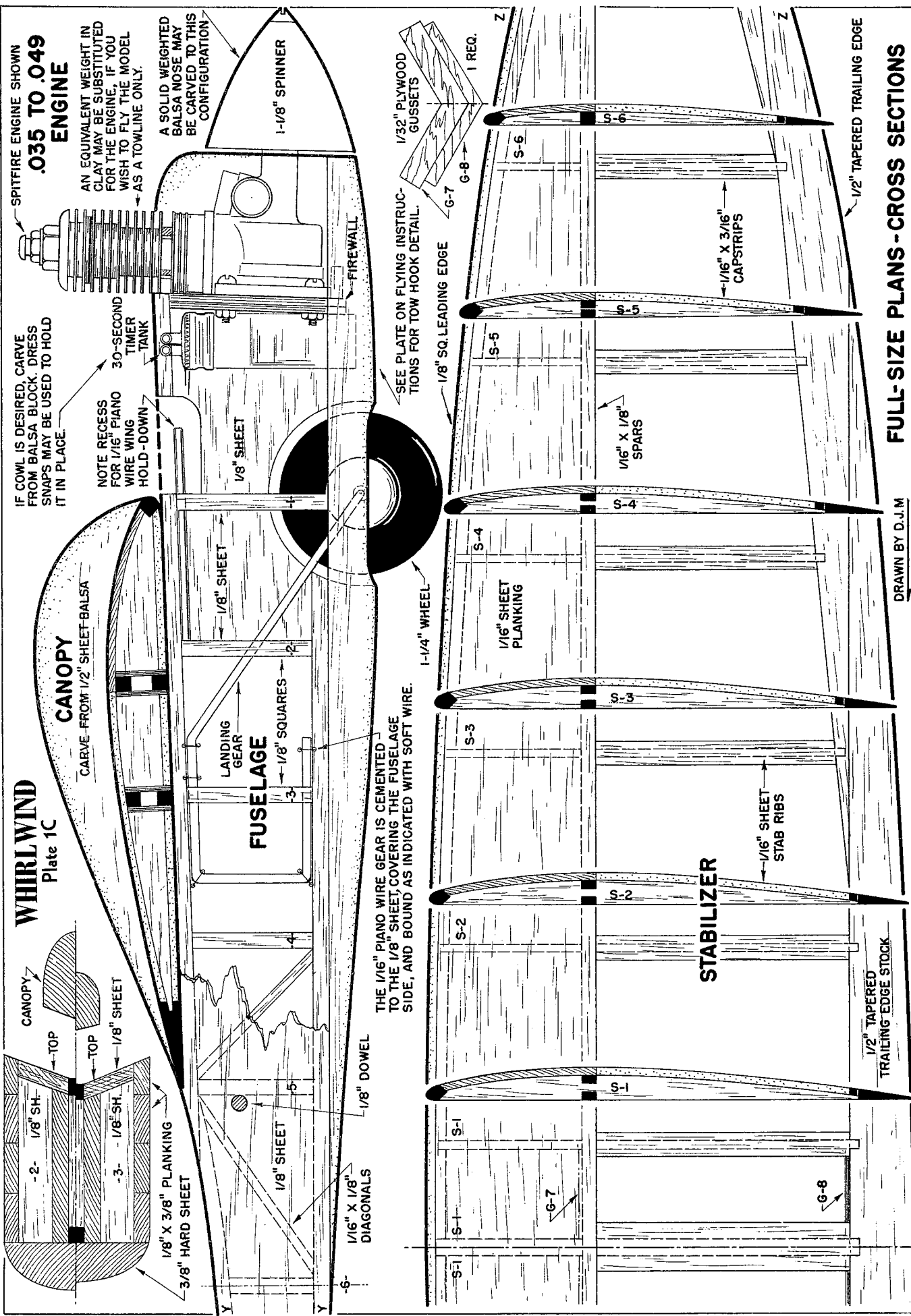
1/8" SQ. SPARS

1/32" PLY TIP SECTION GUSSET G-5 2 REQ. G-6 2 REQ. G-5 & G-6

1/16" X 3/16" CAPSTRIPS

5/8" TAPERED TRAILING EDGE

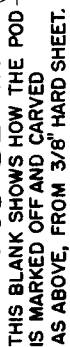
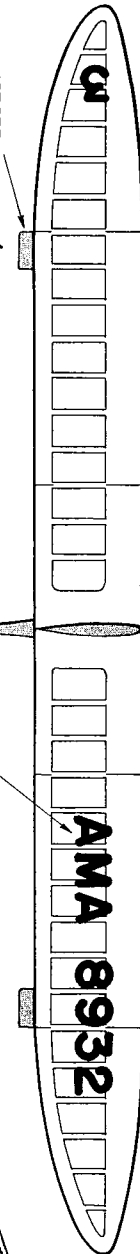
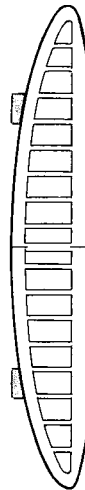
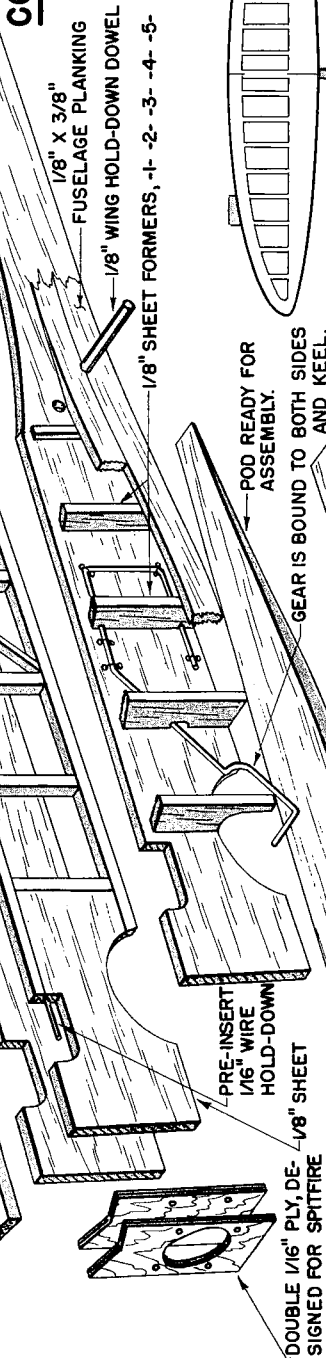
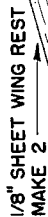
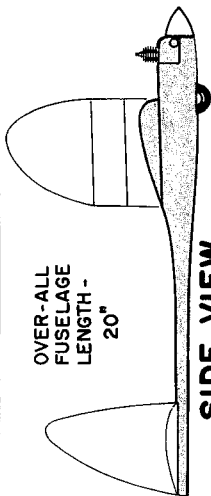
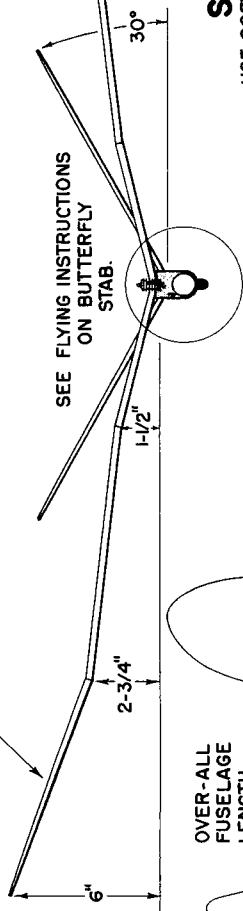
DRAWN BY D.J.M.



DRAWN BY D.J.M

FULL-SIZE PLANS - CROSS SECTIONS

EXPLODED FUSELAGE - THREE VIEW



CONSTRUCTION PROCEDURE

- I LAY OUT FUSELAGE KEEL DIRECTLY ON PLAN.
- II ADD UPRIGHTS, DIAGONALS AND 1/8" SHEET.
- III ROUGH-CUT THE 1/8" SHEET SIDES TO OUTLINE.
- IV CEMENT TO KEEL, PINNING TIGHTLY.
- V MARK OFF POD BLANK ON 3/8" HARD SHEET.
- VI ROUGH-CARVE POD AND CEMENT TO KEEL.
- VII CEMENT FIREWALL IN POD-NOTCH AND TO KEEL.
- VIII BIND GEAR TO SIDES AND KEEL.
- IX CEMENT TAIL REST IN PLACE.
- X ADD FORMERS -1 -2 -3 -4 -5-
- XI PLANK FUSELAGE WITH 1/8" X 3/8"
- XII CARVE BUBBLE CANOPY, COWL.
- XIII SAND FUSELAGE SMOOTH.

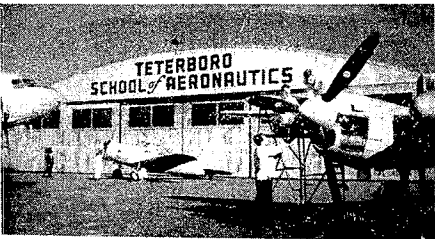
INSTALL ONE OR MORE TRIM-TABS IN THE POSITIONS INDICATED, ONLY IF NEEDED.

DRAWN BY DON MCGOVERN

EXPLODED FUSELAGE - 1/2 SCALE

THREE VIEW - 1/8 SCALE

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WHIRLWIND

(Continued from Page 14)

it's not worth the effort. In the first place, the 52" span and 6½ ounce weight precludes its use as a top-notch contest job, which can climb out of sight in a few seconds. This is a relatively low-powered sport sailplane, easy to build and fun to fly.

The plans themselves eliminate the need to delve too deeply into the finer points of construction here, for all of them are full-size, and the sketches, three-views and exploded fuselage structure should cover the majority of questions which may arise in the minds

of even the rankest beginners in the sport. Covering problems, warps, accessories and flying instructions also are illustrated.

WING: We suggest you start construction with the wing. The Bill of Materials lists the required material. You will note that the gull wing panel has been superimposed over the center section panel, so be sure your center section panel measures 10½" and not 4½". We have taken this one liberty in order that we might cover every detail of construction, adjusting and flying in the least possible space.

There are two main points to remember in constructing the flying surfaces. Select firm, (Turn to Page 60)

FINISHING TOUCHES

WHIRLWIND
Plate 3

THIN SHEET ALUMINUM

FORM FROM .045 WIRE

TOW HOOKS
MAKE THREE TOWHOOKS THIS SIZE, FOR INSTALLATION ON THE SIDE OF THE POD, AS SUGGESTED BELOW. PLACE HOOKS ON THE SIDE WHICH THE MODEL TURNS TOWARD IN THE GLIDE.

TRIM TABS
THE TAB ITSELF SHOULD MEASURE 1" X 2" FOR THE WING, AND 3/4" X 1-1/2", PLUS THE 3/8" PROTRUSIONS.

SKID
SKID IS 3/8" WIDE
FOR FLYING IN ROUGH TERRAIN, A SHEET METAL SKID MAY BE USED.

CRUMPLED TISSUE DRAGS TOWLINE OFF.
HOOK TO MODEL
100' THIN TOWLINE CORD.
75' CORD, 25' 3/16" FLAT RUBBER

TOWLINE - CATAPULT
EITHER A NORMAL TOWLINE OR A HI-START LAUNCH MAY BE USED.

COVERING TROUBLE
NOTE: TAUT TISSUE WILL ATTEMPT TO FIND THE SHORTEST DISTANCE BETWEEN TWO POINTS.

WARPED PANEL
SIGHT ALONG THE TRAILING EDGE OF DOPED WING FOR WARPS.
IF A WARP HAS DEVELOPED USE THE FOLLOWING REMEDY:
SOAK PANEL WITH HOT FAUCET WATER, OR —
STEAMING
SATURATE AREA WITH STEAM FROM A KETTLE FOR A MINUTE OR SO, UNTIL COVERING LOOSENS.

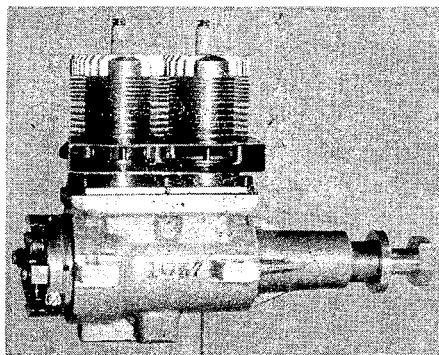
TWIST PANEL
GRASP THE PANEL FIRMLY, AND TWIST IT AN AMOUNT EQUAL TO THE WARP, IN THE OPPOSITE DIRECTION. DRY QUICKLY OVER WARM SURFACE. WHEN PRESSURE IS RELEASED, IT SPRINGS BACK TO NORMAL.

STRAIGHTENED
THE PANEL SHOULD NOW BE STRAIGHT. MAKE ANY MINOR ADJUSTMENTS NECESSARY

DRAWN BY D.J.M.

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WHIRLWIND

(Continued from Page 58)

straight-grained, warp-free balsa only, or a crash may be your reward. Warps thrive on a weak structure. The second point is to use a good grade of cement, neatly but liberally applied where needed.

You will find all gussets drawn full-size on the plans. Use 1/32" ply if available, otherwise 1/16". As soon as the gull panels are removed from the plan, clean the excess cement off the structure, and notch the ribs for the gussets. Note that the end ribs must be angled accordingly. After trimming for

a snug neat fit, cement the panels together, reinforcing them with the gussets, both on the spars and trailing edge.

In like manner, the other panels are cleaned up, beveled to the correct angle and cemented in place. When dry, the entire wing may be planked with the leading edge sheeting, cap-stripped and sanded as a unit. See the step-by-step sketches, which incidentally hold true for the stabilizer as well.

TAIL: While we're on the subject of the stabilizer, we'll discuss that part of the ship. Its large size necessitated our placing its tip on the adjoining plate. See the "Z-Z" alignment markers. Every stabilizer rib is full size, as well

FLYING INSTRUCTIONS

WHIRLWIND Plate 4

HOLD AT SHOULDER HEIGHT.

LAUNCH MODEL SMOOTHLY, WITH THE NOSE DOWN.

INCIDENCE

EITHER A STALL OR DIVE INDICATES A MINOR ADJUSTMENT OF INCIDENCE IS NEEDED.

HAND GLIDE

STALL

DIVE

CEMENT INCIDENCE IN PLACE

CORRECTIONS FOR DIVE—START BY ADDING 1/32" AT A TIME UNDER STAB.

CORRECTIONS FOR STALL—START BY ADDING 1/32" AT A TIME UNDER STAB.

ADJUSTING TURN

OTHER CONDITIONS BEING NORMAL, THE WHIRLWIND WILL GLIDE IN RIGHT CIRCLES WITH ADJUSTMENTS SHOWN.

NOTE TOW-HOOK ON SIDE OF MODEL FAVORED BY TURN.

TAB INCREASES LIFT OF INBOARD WING, PREVENTING A SPIRAL DIVE.

RUDDER

(AS VIEWED FROM REAR)

SEVERE RIGHT TURN—NO CHANGE IN INCIDENCE

LEFT TAB-UP TURNS MODEL TO RIGHT AND ADDS A BIT OF INCIDENCE IN SO DOING.

RIGHT TAB DOWN MAY BE USED WHEN MORE RIGHT RUDDER AND LESS INCIDENCE IS DESIRED.

COCKED WING

COCKING WING FORWARD HELPS TURN MODEL TO THE LEFT IN THIS CASE.

IN AN ACCELERATED FLIGHT ATTITUDE, A MODEL MAY SPIN IN INSTEAD OF CIRCLING. THE DEPRESSED TRIM-TAB HELPS PREVENT THIS.

A MODEL SHOULD STALL SLIGHTLY IN A PERFECTLY STRAIGHT GLIDE, FOR THE STALL WILL BE ELIMINATED BY ANY CIRCLING ADJUSTMENT.

TROUBLE-SHOOTING

FIGURE 1 SHOWS THE IDEAL, BUT HARD TO ACHIEVE PERFECT CLIMB ON THE HI-START, WHEREBY THE FORWARD SPEED AT THE POINT OF RELEASE CARRIES THE MODEL INTO A CLIMBING HALF-TURN.

FIGURE 2 SHOWS PREMATURE RELEASE. USE FORWARD HOOK.

FIGURE 3, DANGER, RELEASE HI-START.

FIGURE-1

FIG-3

FIG-2

DRAWN BY D.J.M.

as the gussets for the dihedral break. All in all, construction is a great deal simpler, but closely follows the wing.

If you have not already done so, add a secondary coat of cement to all joints in both the wing and butterfly stab, especially at the breaks (as in Figure 18), and at the trailing edge-rib joints. A final check and last sanding before covering is advised.

FUSELAGE: Now comes the fuselage, and that will be a cinch. All the hard work is behind you. Every cross-section is shown full-size. Keel-type construction eliminates the need of a top view.

The full-size fuselage plans align at "Y-Y" and a glance at the 1/2-scale exploded view of the fuselage will help you visualize the easy-to-build structure.

Start with the keel, built mainly of 1/8" square balsa. 1/8" sheet is used toward the front and rear as fill-in. Remove the keel from the plan when dry, and cement a sheet of soft 1/8" balsa on either side, pinning tightly. The excess may be trimmed when dry, although it appears pre-cut to shape in the exploded drawing. When trimming, remove a 1/8" strip under the wing to allow for the wing mount, as shown in the cross-sections.

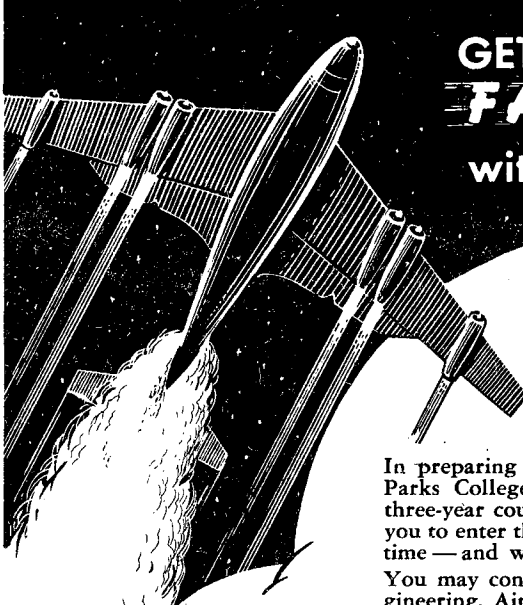
Next comes the pod blank, which may be shaped best from 3/8" x 2" hard sheet balsa. Mark off and then drill or jig-saw the wheel recess first. With a sharp model knife, carve the pod roughly to shape, and notch it for the firewall before cementing it to the keel and fuselage sides. A little pressure from a vise at this point will help make a tighter joint. The firewall butts against the keel and slips into the notch. 2° downthrust is built into the design.

The 1/16" wire gear is easily shaped around a 1 1/4" sponge rubber wheel. The latter is retained in place with washers soldered to the axle, before installation. The "U"-shaped section (as shown on the exploded plan) is the only part cemented and bound, allowing the leg to flex for shock-absorbing action. Use electrical wire, stripped of insulation, for binding purposes. A pin or piece of wire on the opposite side of the keel prevents the wire from pulling through the sheet balsa.

The dowel, 1/8" sheet formers, and 1/8" x 3/8" planking requires little cement, except that if you have never done any planking before, this is the time to start. It's ridiculously easy, and takes about 15 minutes at the most. Note how the ends are tapered and faired into the fuselage tail-boom.

The canopy is solid balsa, and was not shown in the exploded drawing for reasons of clarity. Pin-point the outline on 1/2" sheet, and streamline to shape as shown on the three-view. Bevel the edges for a flush fit on the wing gull break, but do not cement the canopy in place until the wing is covered.

The cowl, of questionable value, was built but not used much for actual flying. Small motors are just impractical when cowed. We (Turn to Page 63)



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Signed

FLYING MODELS

WHIRLWIND

(Continued from Page 61)

suggest instead that you replace the engine with a solid weighted balsa block if you wish to do extensive towline flying with the ship at a later date. The model may be flown as a towline at a moment's notice with the engine in place, but this still constitutes a dust and damage hazard to your engine if it is done as a matter of habit.

For the finishing touches and covering problems, we refer you once again to the illustrations on the subject.

The method shown for removing warps does a thorough job. With a well doped surface, hot faucet water proves as efficient as the steam, and possibly a more convenient way.

After dousing the warped part in either steam or hot water for a minute or so, remove and dry quickly with a towel, and hold it while twisting an equal amount in the direction opposite to the warp. We have found it best to dry it quickly, while holding it in this manner, over a radiator or a warm stove.

FLYING: As for actual flying, select a field with deep soft grass for testing. Trim the ship for a buoyant straight hand-glide, before attempting a power or towline flight. Use low power at first, or the forward hook in the case of a towline.

The towhooks should be permanently mounted on the side of the pod which the model favors when turning. This has a tendency to straighten out the climb under tow. For catapult or hi-start launches, stretch the rubber-line until taut and release in normal fashion. Once adjusted the climb is straight, swift and sure.

BILL OF MATERIALS	
(Balsa unless otherwise specified)	
2—1/16" x 2" x 36" (medium).....	Wing and stab ribs
3—1/16" x 2" x 36" (soft).....	Leading edge planking, capstrips
2—1/8" x 2" x 36" (soft).....	Fuselage sides, formers, tail-rest
1—3/16" x 2" x 6" (soft).....	Wing tips
1—3/8" x 2" x 10" (hard).....	Fuselage pod
1—1/2" x 2" x 5" (soft).....	Fuselage bubble canopy
2—3/16" x 5/8" x 36" (medium).....	Tapered trailing edges
1—1/8" x 1/2" x 36" (medium).....	Tapered trailing edge
12—1/8" x 1/8" x 36" (medium-hard).....	Wing spars, longerons, leading edges
2—1/16" x 1/8" x 36" (medium-hard).....	Diagonals, stab. spars
2—1/8" x 3/8" x 36" (soft).....	Fuselage planking
1/16" x 2" x 5" plywood for firewall; 1/32" x 6" x 12" plywood for gussets; 1/16" piano wire for gear; 1/4" sponge rubber wheel; 1/4" length of 1/8" dowel; 30-second timer tank, or conventional fuel shut-off timer; .045" wire for hooks, fittings; 1/8" dia. spinner; Assorted nuts, bolts, washers, string for dethermalizer; Cement, fuel-proof clear and colored dope; Decals; Covering material; 100' towline cord; 25 3/16" flat rubber; .045 engine or equivalent amount of clay for ballast.	

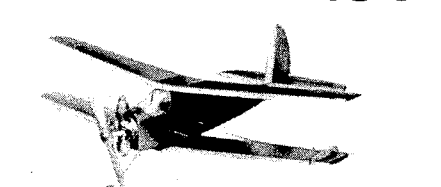
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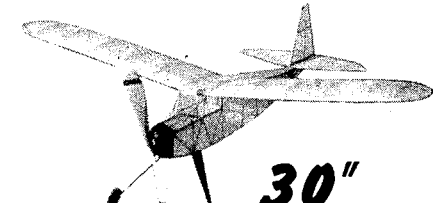
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