BILL DEAN'S Book of BALSA MODELS

by BILL DEAN

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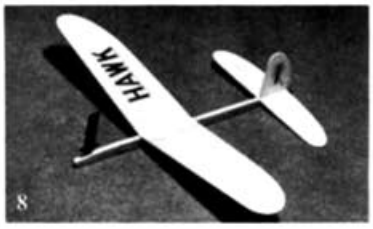

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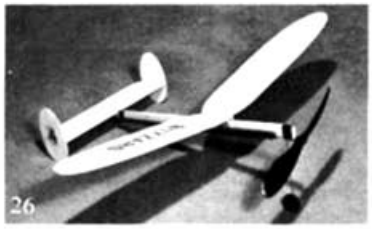
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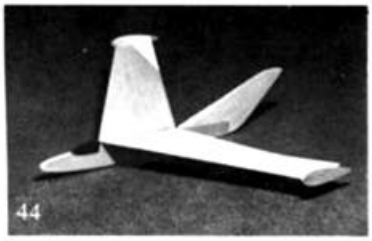
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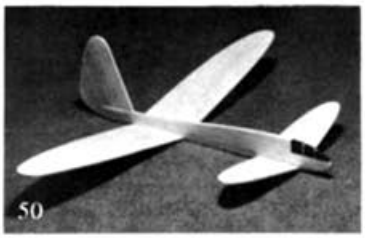
CONTENTS

All these models, and the Nomad boat illustrated opposite, are featured on the pages indicated.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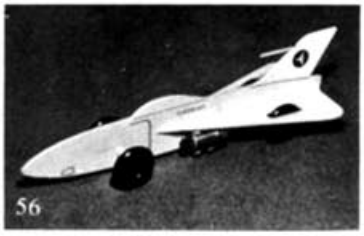
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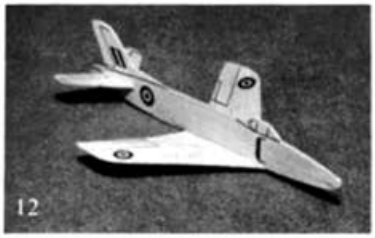
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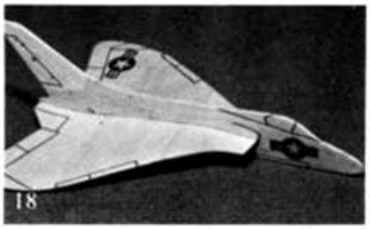
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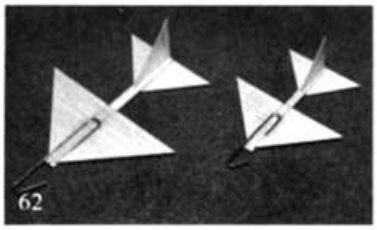
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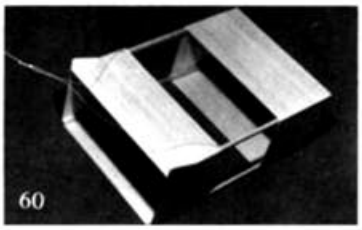
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HOW TO MAKE BALSA MODELS

MAKING models from *Balsa* is a fascinating pastime, which can be tackled with confidence by anyone, thanks to the easy-working qualities of this lightest of all woods. No expensive tools are required—just some old razor blades, sandpaper and a few other household odds and ends.

Since ' working ' models provide much more enjoyment than ones built purely for decorative purposes, all the designs in this book fall into this popular category. Several completely new building methods have been developed and extensive tests were carried out before the preparation of the final plans.

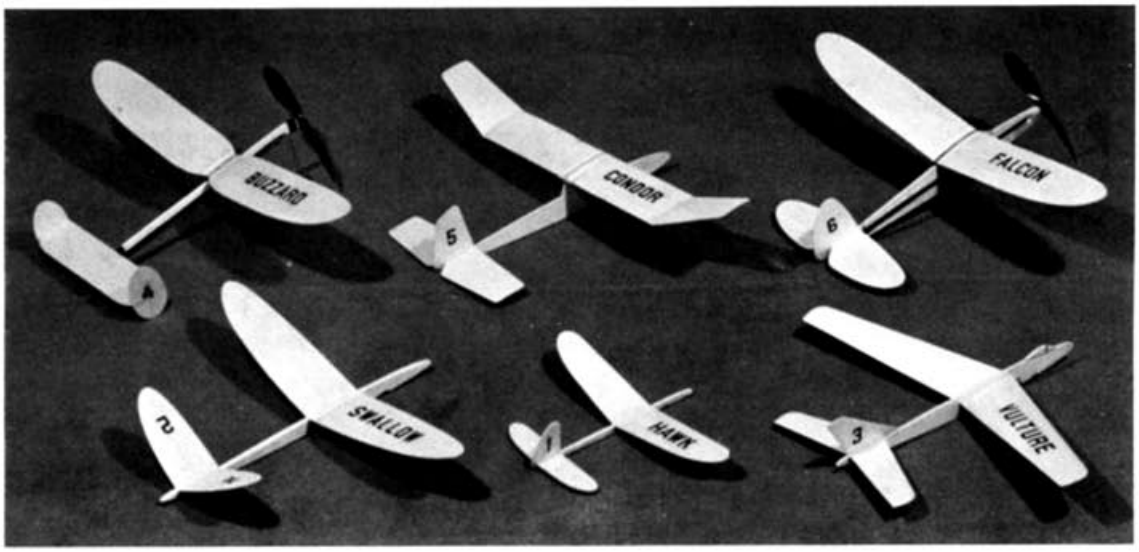
The all-sheet type of construction makes these models both simple to build and sturdy enough to stand up to plenty of hard knocks. Wherever possible, ready-made plastic parts (such as wheels and propellers), which are obtainable as standard accessories, have been specified. In fact, everything has been aimed at eliminating the usual stumbling blocks encountered by beginners. *The result—as handicraft teachers and experienced modellers will be quick to appreciate—is that these models are ideal for ' class ' or ' club building ' schemes.*

Model planes constitute over half of these designs—with gliders, rubber-powered, *Jetex*, flying scale and several unorthodox types being featured. If you are just starting to build models, your best plan is to make all six ' Trainer ' designs, which are lined up in the photo at the foot of this page. After completing these successfully, you will then have the building experience required to tackle any of the remaining dozen models—which include boats, cars, kites and even a ' space ship'.

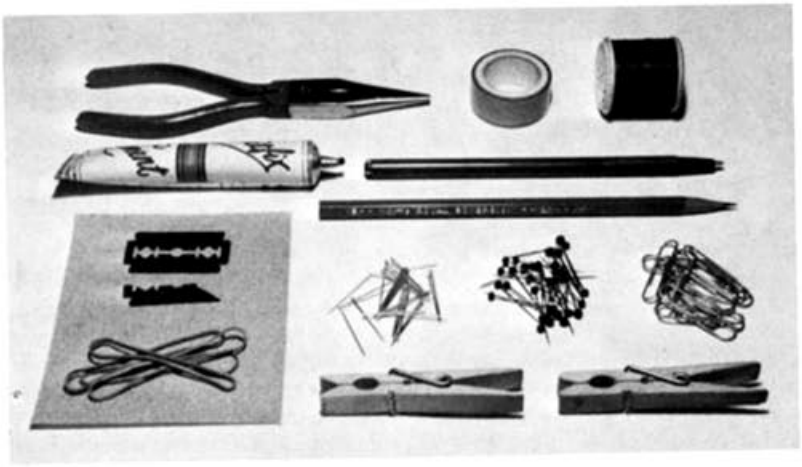
TOOLS AND EQUIPMENT

All the items needed to construct the models are listed and illustrated on the adjoining page. You need to buy a pair of PLIERS (1). TRANSPARENT TAPE (2) is useful for holding WAXED PAPER (3) in position over the plans, while tracing the patterns with a hard 3H PENCIL (4). STRONG THREAD (5) is used for binding certain parts—such as landing gear—in place.
certain parts—such as undercarriages—in place.

BALSA WOOD CEMENT (6) is a quick-drying adhesive, specially prepared for modelling enthusiasts. All markings and decorations are applied with a BALL-POINT PEN (7). Break a double-edged RAZOR BLADE (8) as shown—or use a model knife as a cutting tool. RUBBER BANDS (9) are used for both temporary bindings and holding detachable wings in place. FINE SANDPAPER



The models shown above comprise a complete ' Trainer Course ' and are featured on pages 8, 14, 20, 26, 31 and 36



YOU NEED ALL THESE ITEMS

1. Pliers
2. Transparent tape
3. Waxed paper*
4. 3H Pencil
5. Strong thread
6. Balsa wood cement
7. Ballpoint pen
8. Razor blades
9. Rubber bands
10. Fine sandpaper
11. Household pins
12. Modelling pins
13. Paper Clips
14. Clothes pins
15. Metal rule*

Not illustrated

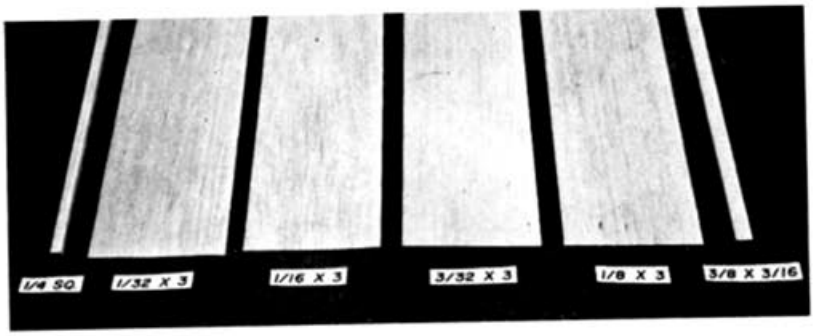
Whenever the designer went out testing models, he could always rely on having plenty of willing helpers! Here are: Clive Smith with FALCON, Peter Crocker with CIRRUS and Barry Sharp with NOMAD

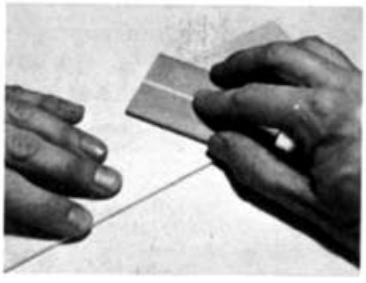
BALSA WOOD

Only the six sizes shown on the right are needed to make any of the eighteen different models.

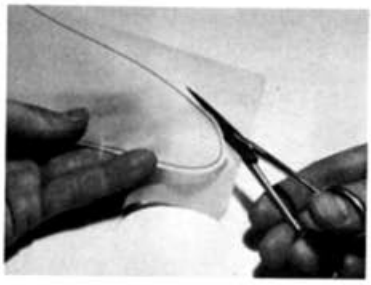
The grades required for each model are given in the material lists as:

MEDIUM SOFT (MS)
MEDIUM (M)
MEDIUM HARD (MH)

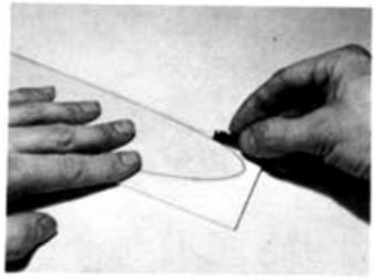




1 *Sandpaper the balsa sheet smooth before cutting out any parts.*



2 *Trace patterns on to waxed paper and cut out with scissors.*



3 *Cement patterns to balsa sheet—then cut out with a razor blade.*

(10) is required for sanding balsa—being cemented to scrap sheet as illustrated above.

HOUSEHOLD PINS (11), plastic-headed MODELING PINS (12) and PAPER CLIPS (13) are frequently needed during construction and for actual model fittings. CLOTHES PINS (14) make useful clamps for holding parts together while cement is drying—as shown in the photo on page 27. A METAL RULE (15), or similar straight-edge, provides a useful guide for the razor blade where straight cuts in balsa sheet are involved.

In addition to the above, a ½-in. wide brush will be needed for applying waterproof dope to the two boat models. There is no need to dope the other models, although this does of course afford them some protection in damp weather. However, when it's raining or wet underfoot, it's better not to fly model planes, since the trimming adjustments will soon become spoiled by warps. An old drawing board, smooth plank or kitchen table should be used for a building surface—after checking for flatness.

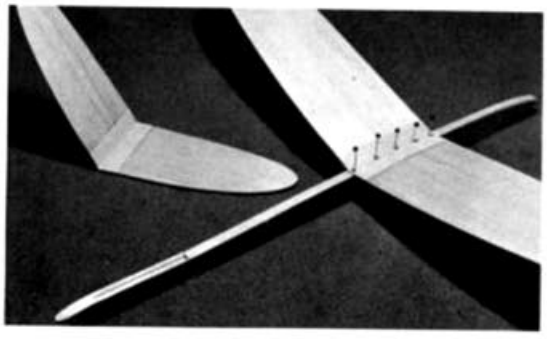
SELECTING BALSA

To ensure maximum economy in the use of balsa wood, only six different material sizes are specified in the plans throughout the entire book (see photo on previous page)—which means that pieces left over from one model may be used up on one of the others. Balsa is usually divided into five basic grades, ranging from 'hard' to 'soft', but only the *three middle ones* need concern us here. These are *medium-soft* (*MS*), *medium* (*M*) and *medium-hard* (*MH*)—the correct grades being specified in the 'Material Lists' in each case. Incidentally, Sig balsa was used for building all the design prototypes.

If you experience difficulty in picking out '*MS*,' '*M*' and '*MH*' wood, enlist the aid of a more experienced modeller in selecting the various pieces of strip and sheet. Although Balsa is only stocked in 36-in. and 48-in. lengths by most model shops, the more economical 18-in. lengths are obtainable direct from the Sig Mfg. Co.

GENERAL NOTES

Building time for the models varies from 15 minutes to 6 hours and the cost of materials from a few cents to just over a dollar (details being noted in the case of each design).

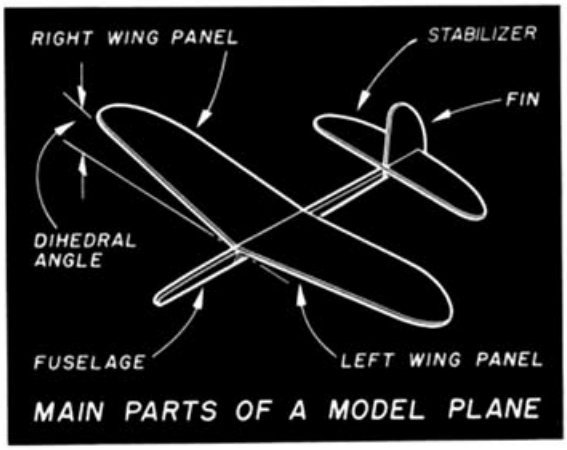


Modelling pins are useful aids when assembling parts.

Apply lettering and decorations with a ball-point pen.

Plans are given full size (except in one or two instances where this is not necessary)—with the actual patterns for the parts shown in *thin lines* and the assembly drawings shown in *thick lines*.

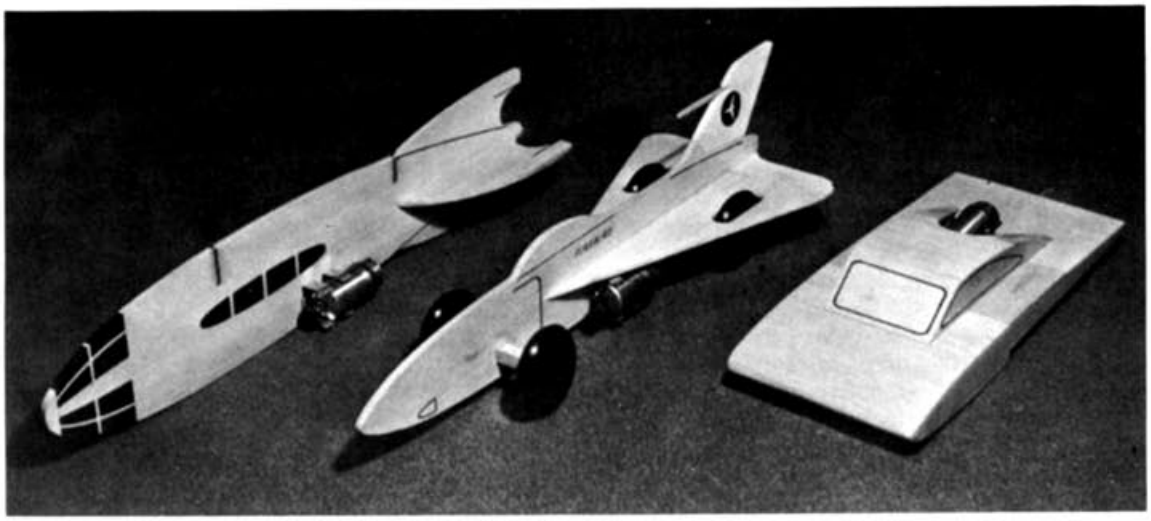
First, sandpaper the sheet perfectly smooth, then trace the patterns on to pieces of waxed paper and cut out with scissors, just clear of the pencil lines. Where a plan extends across two pages, and a break occurs, care should be taken, after tracing one side, to move the waxed paper over and so make a perfect joint. Squeeze cement along the pencil outlines only and quickly place the patterns in position over the appropriate thickness sheet (lining up the grain direction with that shown on the plan). Cut out with a sharp razor blade and peel off the patterns before they have a chance to stick firmly—lightly sanding to remove any traces of cement.



MAIN PARTS OF A MODEL PLANE

All markings—such as cabins, lettering or other decorations—are normally added before assembly. Trace these on to waxed paper, then mark them on the balsa parts with a soft pencil. Go over the lines with a ball-point pen, wiping the point frequently to remove any balsa dust that may cause a ragged line. Be careful not to smudge the wet ink lines with your fingers. In the case of parts which require repeated handling during assembly it is advisable to add the markings *after* assembly.

When sheet parts have to be pinned down flat and joined edge-to-edge, place strips of waxed paper under the joints to prevent the balsa sticking to the building board. End-grain joints (as occur with wing panels) will be much stronger if both ends are first given a thin coating of cement (and allowed to dry) before joining. Parts should be pinned together wherever possible, until the cement has had plenty of time to set—this being particularly applicable in the case of flying-surface fuselage joints. Finally, always build the models in the numbered sequence since this system has been planned to ensure rapid and trouble-free construction.



The SPACE SCOUT, FIREBIRD CAR and SWORDFISH SPEED BOAT are all powered by the same size Jetex motor

HAWK

TRAINER

SIMPLEST OF ALL MODEL PLANE TYPES, THIS 12-in. SPAN CATAPULT GLIDER LEADS OFF THE SERIES OF SIX "TRAINER" DESIGNS

BUILDING TIME: 2 HOURS

If you are a newcomer to model plane building, the ½-ounce *Hawk* glider should be your first choice, since it is by far the simplest design in the book. Construction time is only two or three hours and the completed model may be either hand-launched or catapulted into the air.

1. Start by tracing the full-size patterns (A, B, C, D and Z) on to waxed paper, then cement the 'A' one to a *medium* (*M*) strip of $\frac{3}{8} \times \frac{3}{16}$ in. and the others to *medium* (*M*) $\frac{1}{16}$ in. sheet. The grain direction should be as shown on the drawing.

2. Cut out the fuselage (A) with a sharp razor blade, taking particular care to make an accurate job of the angled cut-out for the stabilizer. Now cut out the sheet parts, using a metal ruler as a guide for the straight cuts. Pin the wing panel (B) to another piece of $\frac{1}{16}$-in. sheet and make an exact duplicate by using the first panel as a pattern. Note the two small cuts in the rear edge of the stabilizer (A).

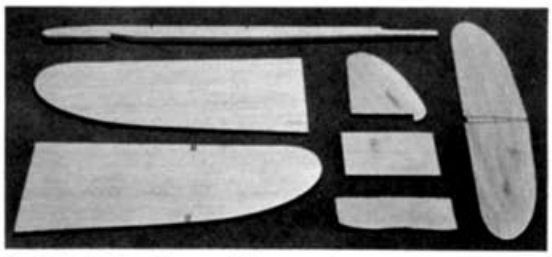
3. Place one wing panel flat on the building board, so that the root is flush with the edge. Using the building board edge as a guide, gently sand the wing root to a slight angle. Repeat for the other wing panel, then check carefully that the two root-faces match up when the panels are held together at the correct dihedral (or 'V') angle.

4. Mark the position of the dihedral packing (Z) on the underside of the right wing panel (with a pencil). Now pin the left panel down flat on the building board and join the other to it—packing up the latter with 'Z,' a shown in the top photo on page 10.

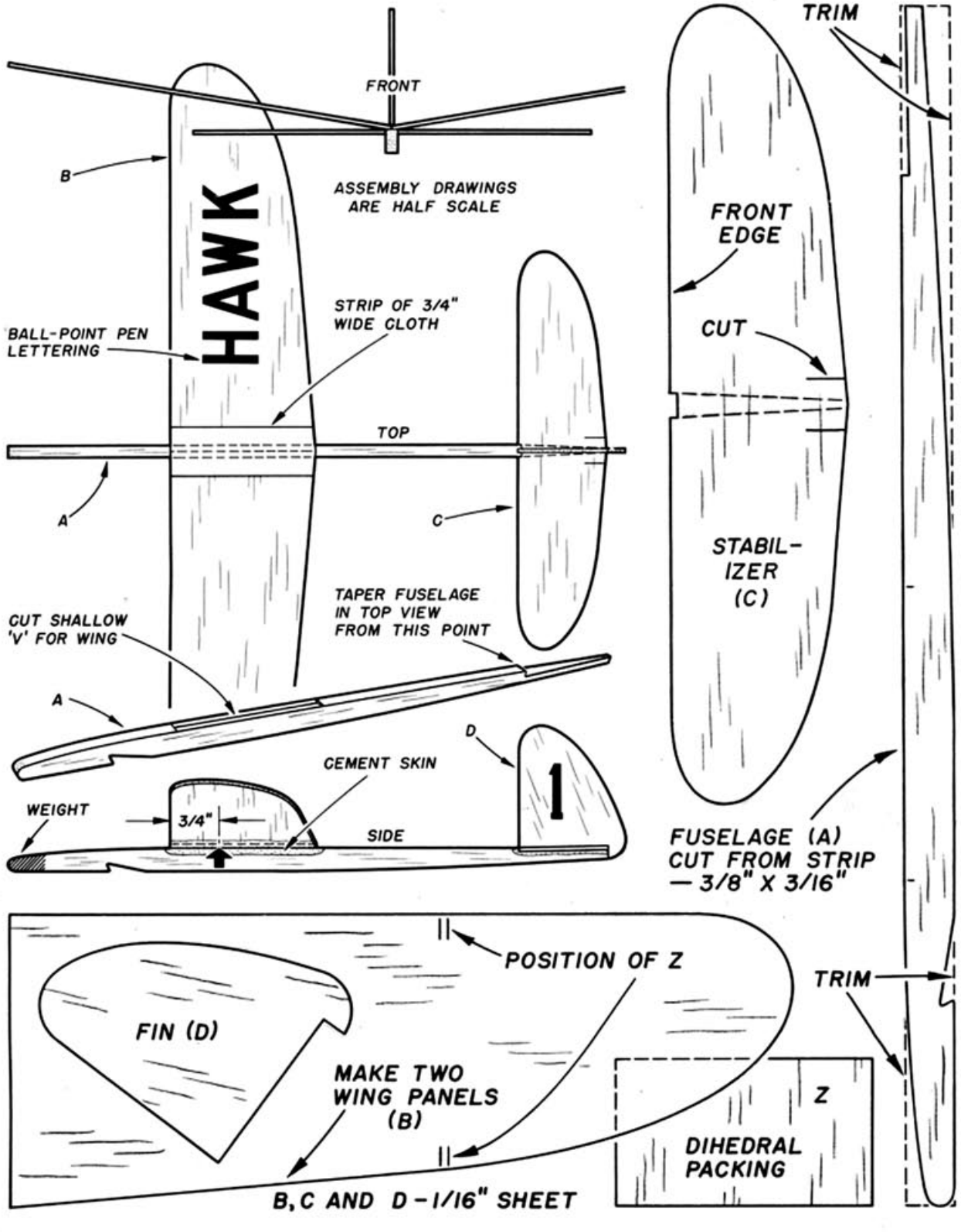
5. While the wing joint is drying, mark the wing position on the fuselage and cut a shallow 'V' (see drawing) to match the wing dihedral angle. Taper the fuselage end at the tailplane position—in the top view.

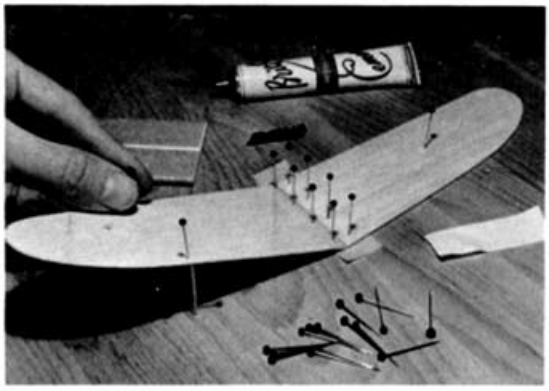
6. Cement the stabilizer to the fuselage, holding in place with pins and making sure that it lines up correctly in the top and front views. When dry, add the fin (D), checking that it is exactly at right angles to the tail plane.

7. Unpin the wing from the building board and cement to the fuselage, holding in place with pins and checking that it lines up with the fuselage in the top view and with the stabilizer in the front view. Reinforce the wing joint with a $\frac{3}{4}$-in. wide strip of cloth (cut from an old handkerchief).

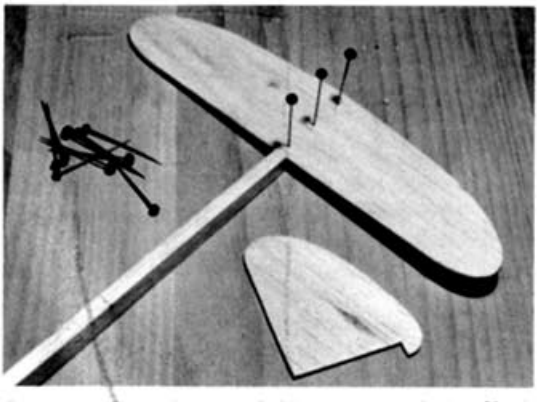


Here are all the parts—ready for cementing together. Note the pencil marks on fuselage, wings and stabilizer.

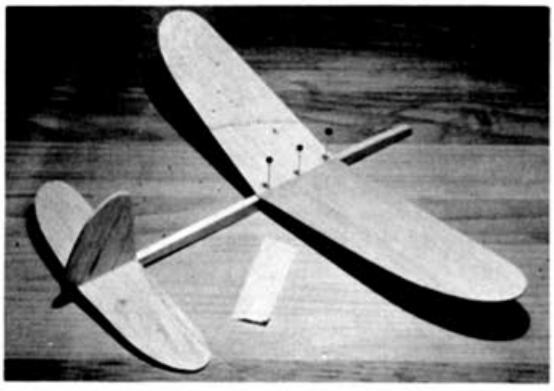

FRONT
B
HAWK
ASSEMBLY DRAWINGS ARE HALF SCALE
BALL-POINT PEN LETTERING
STRIP OF 3/4" WIDE CLOTH
TOP
A
C
TAPER FUSELAGE IN TOP VIEW FROM THIS POINT
CUT SHALLOW 'V' FOR WING
A
D
1
CEMENT SKIN
WEIGHT
3/4"
SIDE
TRIM
FRONT EDGE
CUT
STABIL-IZER (C)
FUSELAGE (A) CUT FROM STRIP — 3/8" X 3/16"
POSITION OF Z
TRIM
FIN (D)
MAKE TWO WING PANELS (B)
Z
DIHEDRAL PACKING
B, C AND D - 1/16" SHEET



Pin one wing panel down flat, then cement other to it—packing up latter with 'Z' to give correct dihedral.



Cement stabilizer to fuselage—holding in place with pins. Check correct alignment in top and side views.



Cement wing to fuselage, hold in place with pins until dry, then reinforce wing joint with a strip of cloth.

8. Strengthen the flying surfaces/fuselage joints with cement—and complete the model by weighting the nose with a piece of a used cement tube. Correct balance is achieved by pushing a pin into the top of the wing joint ($\frac{3}{4}$ in. back from the front edge) and adding weight until the model balances level when held by the pin, as in the photograph on the adjoining page.

FLYING

Trimming the *Hawk* is easy—provided that the model has been carefully made and balances at the correct point. Check for warps by inspecting the wing and stabilizer from the sides—correcting any faults by gently twisting the surfaces. Very windy weather should be avoided as it is impossible to trim models accurately in other than calm conditions.

Face directly into wind, holding the model at shoulder height (fuselage between thumb and forefinger, at balance point) and launch on a slightly downward flight path. If the model is adjusted correctly, it should glide steadily down to a point some 20 feet ahead. However, the model may possibly 'stall' or dive to the ground at too steep a gliding angle (see sketch on adjoining page).

Correct a 'stall' by adding a little more nose weight to the nose—or a dive by slightly bending up the rear edges of the stabilizer. A diving turn will occur if any small warps are present, but this may be corrected as follows. If the model turns to the *left* sharply, gently twist up the front edge of the *left* wing panel—and vice versa for a right turn.

However, a *slight* turn in either direction is desirable, to allow maximum duration to be obtained. If you are *right* handed, a *left* turning tendency is best. Once the glide is correct, hold the model at the balance point again

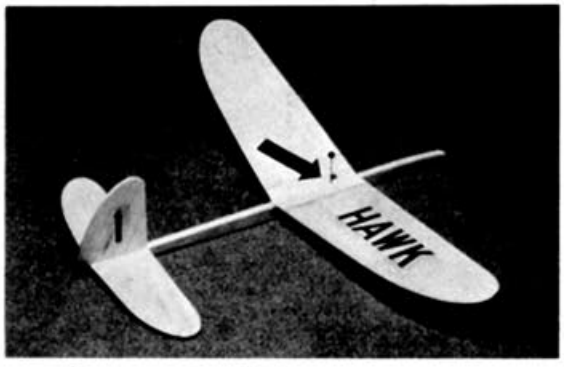
Hand launch the model as if you were throwing a ball or a javelin, with the wings tilted over to one side.

and throw upwards at a slight angle as hard as you can—in the same way as throwing a baseball or a javelin. The wings of the model being naturally tilted to the *right* during launching, the *left* trim of the model will result in an ' S ' shaped flight pattern.

As a change, the model may be launched by catapult—using a 4 × ¼-in. rubber band. Hold one end of the band between the thumb and forefinger of your left hand and loop the other end in the fuselage notch. Hold the model by the rear end of the fuselage, pull back to stretch the band and release with the wings tilted to the right—as demonstrated by Clive Smith in the heading photo on page 8. Launching with the wings level will give a loop, which is spectacular, but not the way to obtain the best flight duration.

If you are unlucky enough to hit a tree or other obstacle and damage the flying surfaces, save the piece and carefully cement it back in place again. Should any part be badly broken, remember that you can always make a replacement when you get home, so don't throw the whole model away.

Avoid flying over wet grass as dampness is the surest way of developing wing and stabilizer warps. Before setting out for the local park, it's a good idea to always slip a tube of cement and a few pins into your pocket—so that field repairs may be carried out.



Weight nose until model balances when held up by pin.

Other models in this ' Trainer ' Series are the *Swallow* Catapult/Towline Glider (14), *Vulture* Jetex Semi-Scale (20), *Buzzard* Rubber Model (26), *Condor* Towline Glider (31) and *Falcon* Cabin Rubber Model (36). Together, the six trainers comprise a complete course for beginners. Look for the 'delta insignia ' headings throughout the book.

MATERIAL LIST

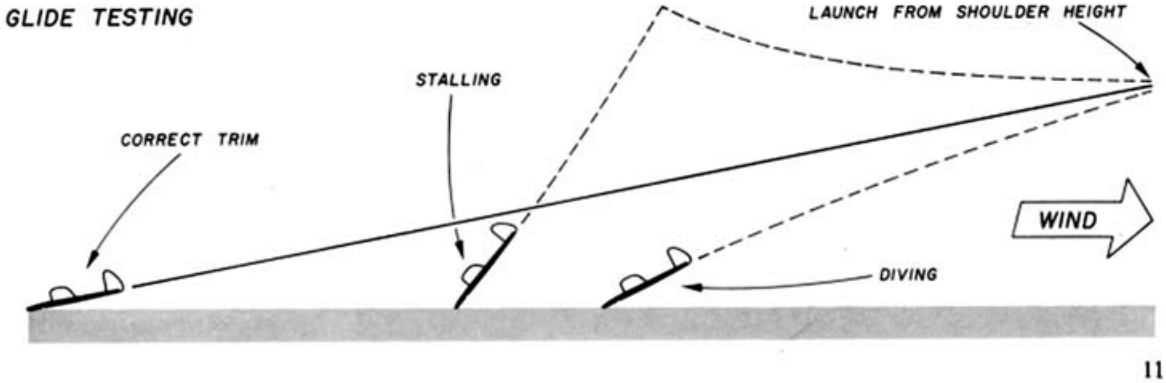
Sheet—$\frac{1}{16}$" × 3" × 18" (M) Strip—$\frac{1}{16}$" × $\frac{3}{8}$" × 12" (M)

TOTAL COST: About 20¢

1 *Correct a ' stall ' by adding more weight to the nose of the model.*

2 *Correct a dive by twisting up the rear edges of the stabilizer.*

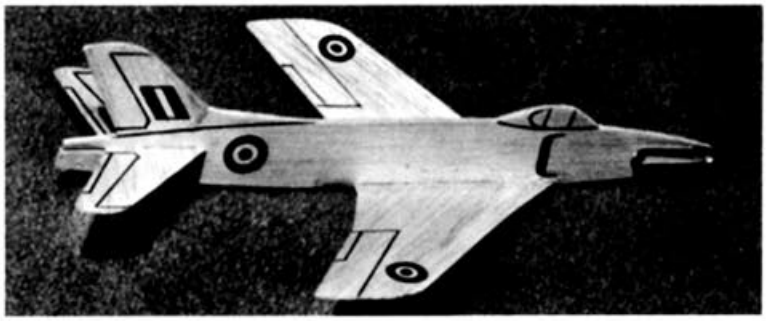
3 *Correct a left turn by twisting up front edge of the left wing.*



SWIFT

A SCALE GLIDER OF A BRITISH JET FIGHTER

BUILDING TIME:
2 HOURS



THE AVON jet-powered *Swift*, an R.A.F. British, is the subject for this 4½-in. span model, of which plans appear on the adjoining page. It is built up from sheet balsa and flies remarkably well in spite of its small size. A paper clip nose weight provides correct trim.

1. Trace the four patterns (A–D) on to waxed paper, then cement them to *medium* (*M*) $\frac{1}{32}$-in. and $\frac{1}{16}$-in. sheet, taking care that the wood grain follows the directions indicated. Cut out the parts and use 'B' as a pattern for the duplicate wing panel.

2. Now add all the markings (R.A.F. insignia, cockpit canopy, control-surface outlines, etc.), using a ball-point pen. The red portions of the R.A.F. markings may be filled in with a colored pencil. *Half-cut* through the stabilizer (C) at the centre, along dotted line.

3. Cement the two wing panels (B) together, propping up one tip 1 in. above the building board. While this is drying, carefully crack the stabilizer along the scoured line and squeeze cement in the gap. Pack up one stabilizer tip in the same way as for the wing, but only ¼ in. this time.

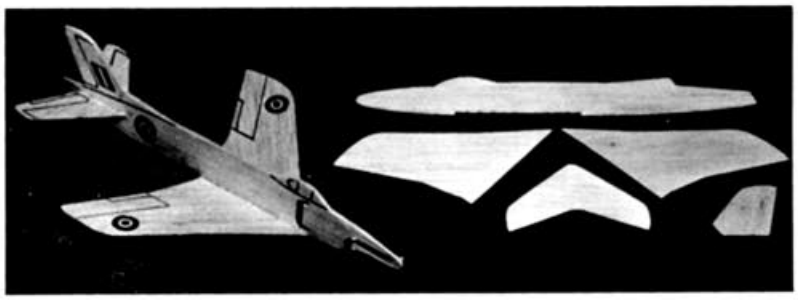
4. Begin assembly by cementing the wing to the fuselage (A), checking that it lines up correctly in the front and top views, then holding in place with pins until dry. Now slide the stabilizer in the rear slot, again making sure that it is in alignment with the other parts. Cement the fin to the fuselage, checking that it is vertical.

5. Weight the nose with a large paper clip (of the size drawn on the plan). Check that the balance is correct, by pushing a pin into the top of the fuselage, above the black arrow on the fuselage side view. When suspended by the pin, the model should hang level—in the same way as the *Hawk* on previous page.

FLYING

Test glide the model on a calm day outdoors—or, failing this, in a large room or hall. Hold the fuselage nose, just in front of the wing, between thumb and forefinger—and launch smoothly from shoulder height, with the nose pointing slightly downwards.

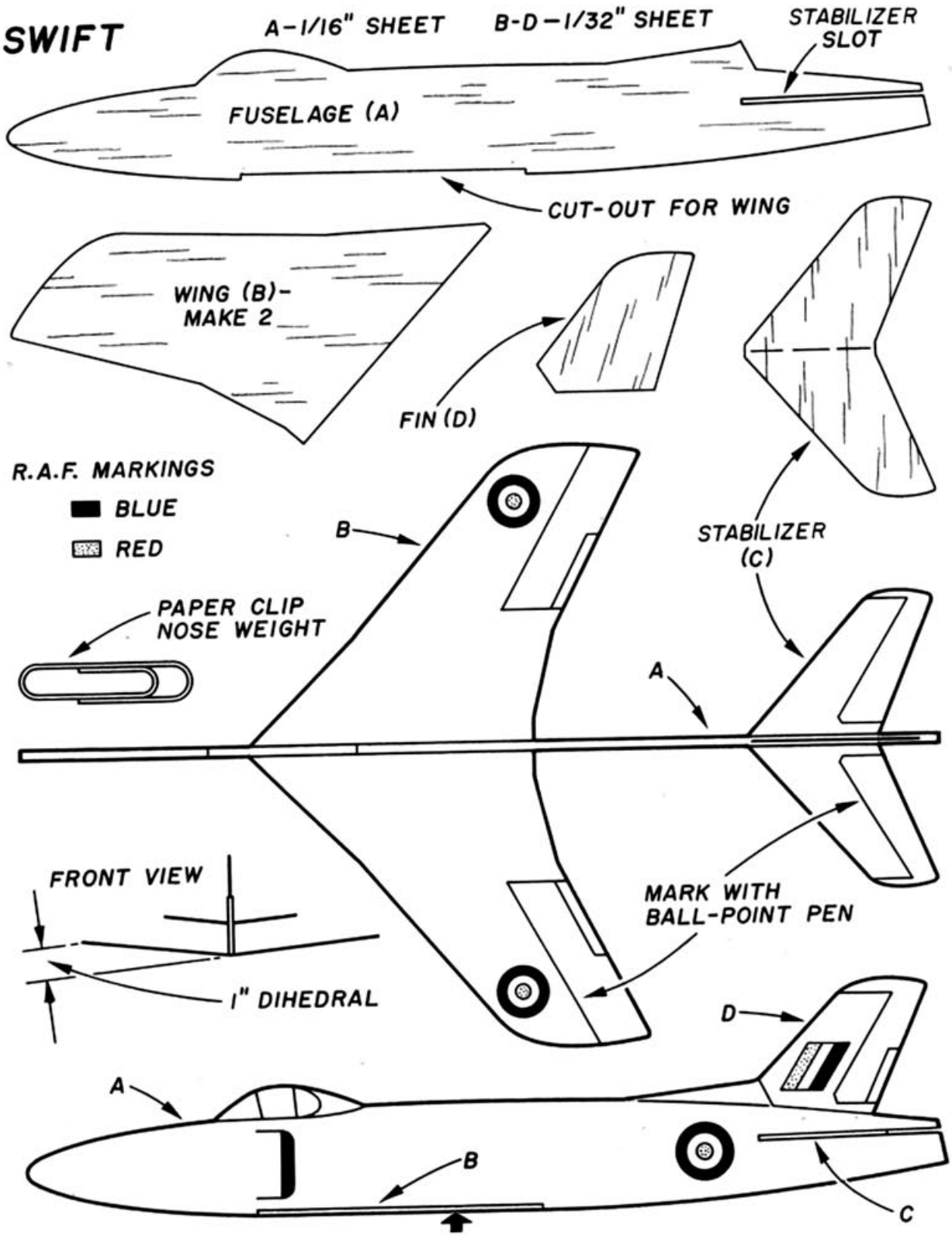
Correct a dive by bending up the rear edges of the stabilizer slightly. Correct a 'stall' by adding a small pin to the nose. If the model turns sharply off to one side, this will most likely be due to warps in the wings or stabilizer. A trimming tip worth noting is that a sharp turn may be cancelled out by bending up the *front edge* of the wing panel on the inside of the turn. When the model is gliding well, throw upwards as hard as you can, remembering that a straight launch gives a loop and the wings must be banked for a circling flight.



MATERIAL LIST

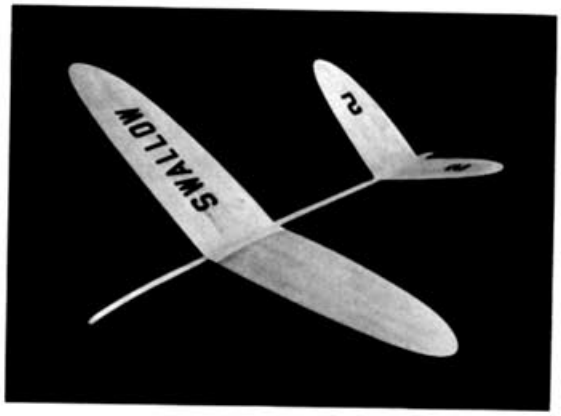
Sheet—$\frac{1}{32}$" × 3" × 6" (M)
Sheet—$\frac{1}{16}$" × 3" × 8" (M)
One large paper clip
TOTAL COST: About 15c

The model is made up from five pieces of sheet. Add markings before assembly.


SWIFT
A-1/16" SHEET
B-D-1/32" SHEET
STABILIZER SLOT
FUSELAGE (A)
CUT-OUT FOR WING
WING (B)- MAKE 2
FIN (D)
R.A.F. MARKINGS
BLUE
RED
B
STABILIZER (C)
PAPER CLIP NOSE WEIGHT
A
FRONT VIEW
1" DIHEDRAL
MARK WITH BALL-POINT PEN
D
A
B
C

SWALLOW

18-in. SPAN TOWLINE/CATAPULT LAUNCHED GLIDER



2 TRAINER

BUILDING TIME
4 HOURS

THE butterfly-tail *Swallow* is a highly efficient glider capable of flights of much longer duration than the smaller *Hawk*. The two factors mainly responsible for the increased performance are the airfoil-sectioned flying surfaces and the special towline/catapult launching method.

1. Trace all the parts (A, B, C, D, Y and Z), then attach them to the appropriate thickness sheet, noting the grain direction. Choose *medium-hard* (*MH*) balsa for the fuselage pieces (A and B) and *medium* (*M*) balsa for the flying surfaces (C and D). Cut out all the parts, then pin 'C' and 'D' to pieces of sheet and use them as patterns for the other panels.

2. The fuselage consists of three pieces of laminated sheet. Smear one side of the central core (A) with cement and pin it over the top of one of the rectangular sides (B), as shown in the center photo below.

3. Trace the 'trimming lines' on to the wing and stabilizer (top surfaces) and mark with a ball-point pen. Carve the sheet *outside* the trimming lines with a very sharp razor blade—to obtain the required airfoil section—then smooth down with the sanding sheet. Finally, complete the flying surface panels by sanding away the trimming lines.

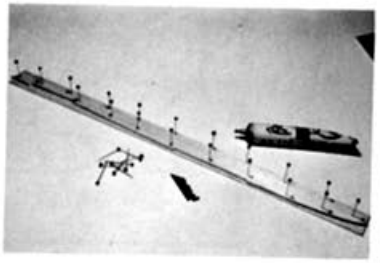
4. Unpin the fuselage assembly from the building board and carve away the surplus wood from the 'B' piece—with the exception that *no cut-outs should be made in 'B' for the flying surfaces*. Smear cement over the other face of 'A' and place it over the top of the second 'B' piece. Pin down to the building board and leave to dry.

5. Now turn back to the flying surfaces again. The roots of these must be shaped to the correct dihedral angles, so place the panels on the building board and sand them, using the building board edge as a guide (see photo 4 on adjoining page). Coat the end grain of the roots with cement—to provide the best possible joining faces.

6. Pin the right-hand wing panel down flat on the building board. Mark the position of the 'Z' dihedral packing on the *underside* of the left wing panel, then cement the two panels together, packing up with 'Z'.

7. Pin the right-hand stabilizer panel down flat on the building board. Pin the two 'Y' dihedral angles to it as

Shaped parts for SWALLOW. Note the trimming lines on flying surfaces.



Pin fuselage core (A) over one of 'B' sides Add other side later.

Join the flying surfaces together with aid of dihedral angle pieces.

shown in the photo, then cement the left panel to it—pinning securely to the upturned arms of the ' Y ' angle pieces.

8. Unpin the fuselage from the board and carve away the surplus wood from the second ' B ' side. Slightly 'vee' the top edges of the 'B' side pieces at the wing and stabilizer positions—to allow for the dihedral angles of the flying surfaces. Unpin the flying surfaces from the board and add 1-in. wide cloth patches to the central joints.

9. Squeeze cement in the fuselage 'vee' for the stabilizer. Pin the stabilizer in position and check that it lines up correctly in the top and front views before the cement has time to set—then install the wing in a similar manner. Smear plenty of cement around the fuselage/flying surface joints.

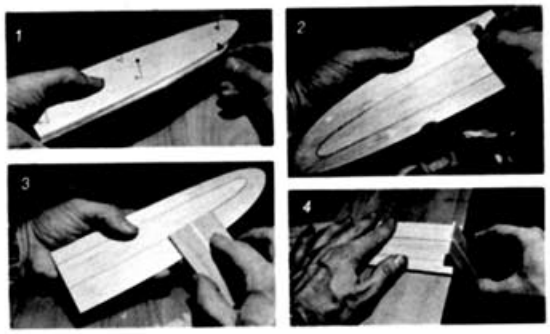
10. All that now remains is to push a pin into the wing at the central joint (above black arrow) and add nose weight until the model balances level. Make up the towline/catapult as described in the following paragraph.

11. Cut a 6-in. length from a piece of $\frac{3}{16}$-in. diameter hardwood dowel and sharpen one end like a pencil. Close to the other end, cut a shallow groove and tie a 10-ft. piece of $\frac{1}{8}$-in. flat model aircraft rubber in place. Tie a 20-ft. length of strong white thread to the other end of the rubber, then tie an extra large paper clip or small curtain ring to the other end of the thread. Finally, fasten a small piece of cloth (4 × 1 in.) to the thread, 6 in. from the paper clip.

FLYING

In view of their thickness, the flying surfaces are not likely to warp easily, but it's still a good idea to check them carefully before taking the model out to the flying field. Obtain the correct trim by gently test gliding into wind, from shoulder height, varying the amount of nose weight as required. Add a little more weight to correct a ' stall ' or take off a little if the model dives. When trimmed to the best gliding angle, the model should touch down at about 30 ft. away from the launching point.

Gently twist up one of the wing front edges to obtain a *wide* turn. Leave the stabilizer panels strictly alone, except to correct warps. Quite long flights can be obtained by hand launching, with the wings banked to obtain a circular flight pattern, but for maximum duration use the towline/catapult.



MAKING WING PANELS. 1. Cut second panel using first one as pattern. 2. Carve airfoil shape. 3. Finish with sandpaper. 4. Sand roots to correct dihedral.

Push the sharpened end of the dowel into the ground and lay out the rubber and thread *downwind*. Place the tow-ring in the fuselage notch and stretch back until the model is 40 ft. from the dowel-anchor. Hold the model on a level keel at a height of 2 ft. above the ground—then release. A loop will probably result, followed by a circling flight. Note the direction of the turn, then bank the wings *slightly* in the opposite direction for the next flight. This will give an ' S '-shaped flight pattern, with the model levelling out at a considerable height.

Providing the model does not turn too sharply, increase the stretch to about 50 ft. from the dowel-anchor. However, the wings must only be banked very slightly, as the increased launching speed will have a tendency to tighten up the turn.

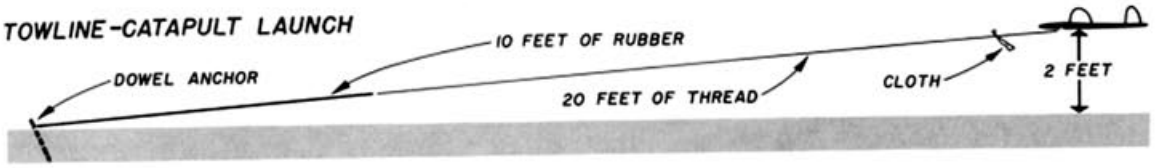
After a few tests, you will find that the longest flights *do not* always result from pulling back the line to the maximum amount. Good flights may also be obtained by gently hand launching into wind from the top of a hill or rising ground.

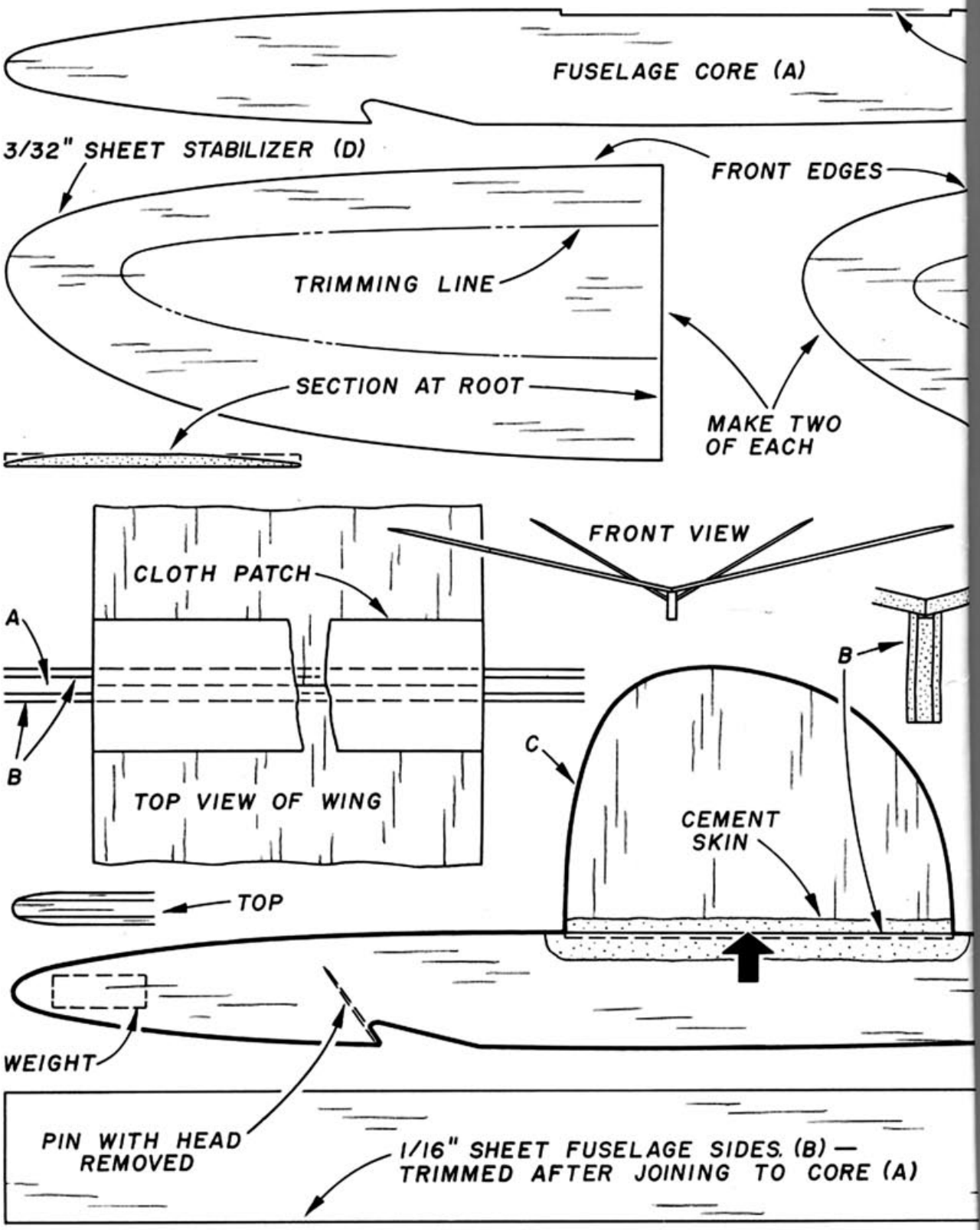
MATERIAL LIST

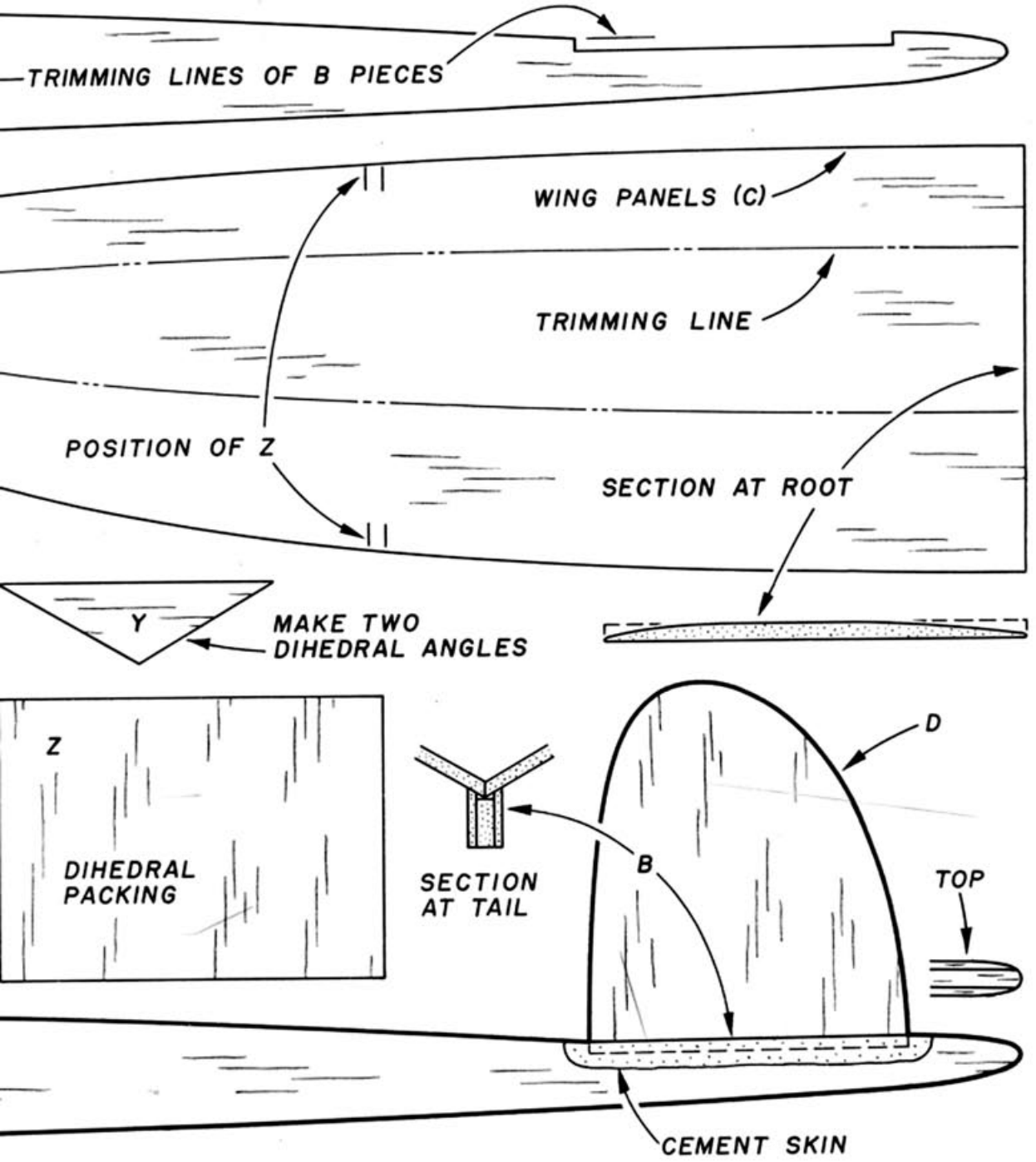
Sheet—$\frac{1}{16}$" × 3" × 18" (MH)
Sheet—$\frac{1}{16}$" × 3" × 12" (M)
Sheet—$\frac{1}{8}$" × 3" × 30" (M)*
*MH fuselage

6 in. of $\frac{3}{16}$" diameter dowel
10 ft. of $\frac{1}{8}$" rubber
20 ft. of strong thread

TOTAL COST: About 75¢




FUSELAGE CORE (A)
3/32" SHEET STABILIZER (D)
FRONT EDGES
TRIMMING LINE
SECTION AT ROOT
MAKE TWO OF EACH
FRONT VIEW
CLOTH PATCH
A
B
TOP VIEW OF WING
B
C
CEMENT SKIN
TOP
WEIGHT
PIN WITH HEAD REMOVED
1/16" SHEET FUSELAGE SIDES. (B) — TRIMMED AFTER JOINING TO CORE (A)



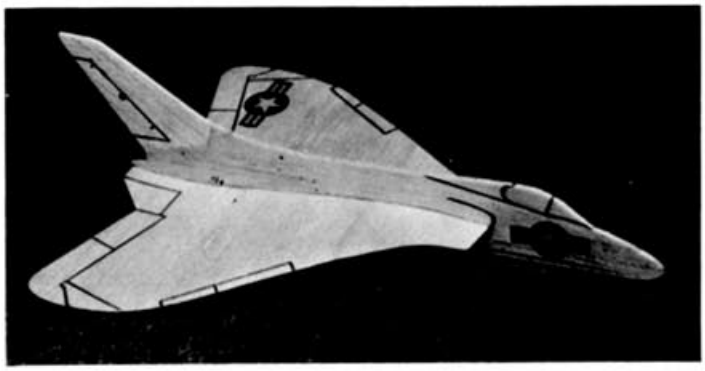
1/8" SHEET PARTS-EXCEPT FOR B AND D

SWALLOW

SKYRAY

A SCALE REPLICA OF THE DELTA-WING FIGHTER

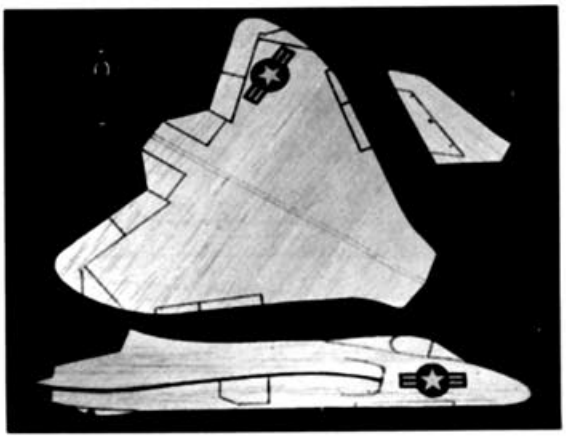
BUILDING TIME:
2 HOURS



IN SPITE of its strange appearance, the bat-winged Douglas Skyray makes a most efficient flying model. Plans for this 5-in. span glider have been based on data supplied by the Douglas Aircraft Company of California and the secret of the model's fine flying performance is due to the unique 'S' curved wing section.

1. Start by cementing two pieces of medium (*M*) $\frac{1}{32}$-in. sheet together (edge to edge) for the wing, pinning down flat until dry. Next, trace the three patterns (A–C) on to waxed paper and cement them to $\frac{1}{32}$-in. and $\frac{1}{16}$-in. sheet, noting the grain direction and using *medium* (*M*) sheet for the fuselage and fin.

2. Now draw the United States Air Force insignia (blue with red central stripes) on to writing paper, cut them out and cement them to the left wing and both sides of the fuselage. Add the other markings (cockpit canopy, control surface outlines, etc.), using a ball-point pen.



Draw insignia on paper, cut out and cement in place.

3. Begin the assembly by cementing the fin (B) to the fuselage (A)—making sure that it is upright. Handle with care to avoid smudging the ink markings. Draw in pencil lines on the upper and lower wing surfaces to mark the fuselage location.

4. Carefully slide the wing into the slot in the fuselage —slightly off-centre, so that the pencil locating lines are visible. Squeeze cement along the pencil lines, pull the wing across until it is central and then wipe away any surplus cement. Check that the wing is ' square ' to the fuselage and hold the ends of the latter together with pins until dry.

5. Weight the nose with a paper clip of the same size as shown on the plan, and the model will balance at about the point indicated by the black arrow on the fuselage side view.

FLYING

Test glide the model in calm conditions, launching from shoulder height. Hold by the lower part of the fuselage (at the balance point) and point the nose slightly downwards before releasing. This design's 'S' curved wing provides high lift and good stability.

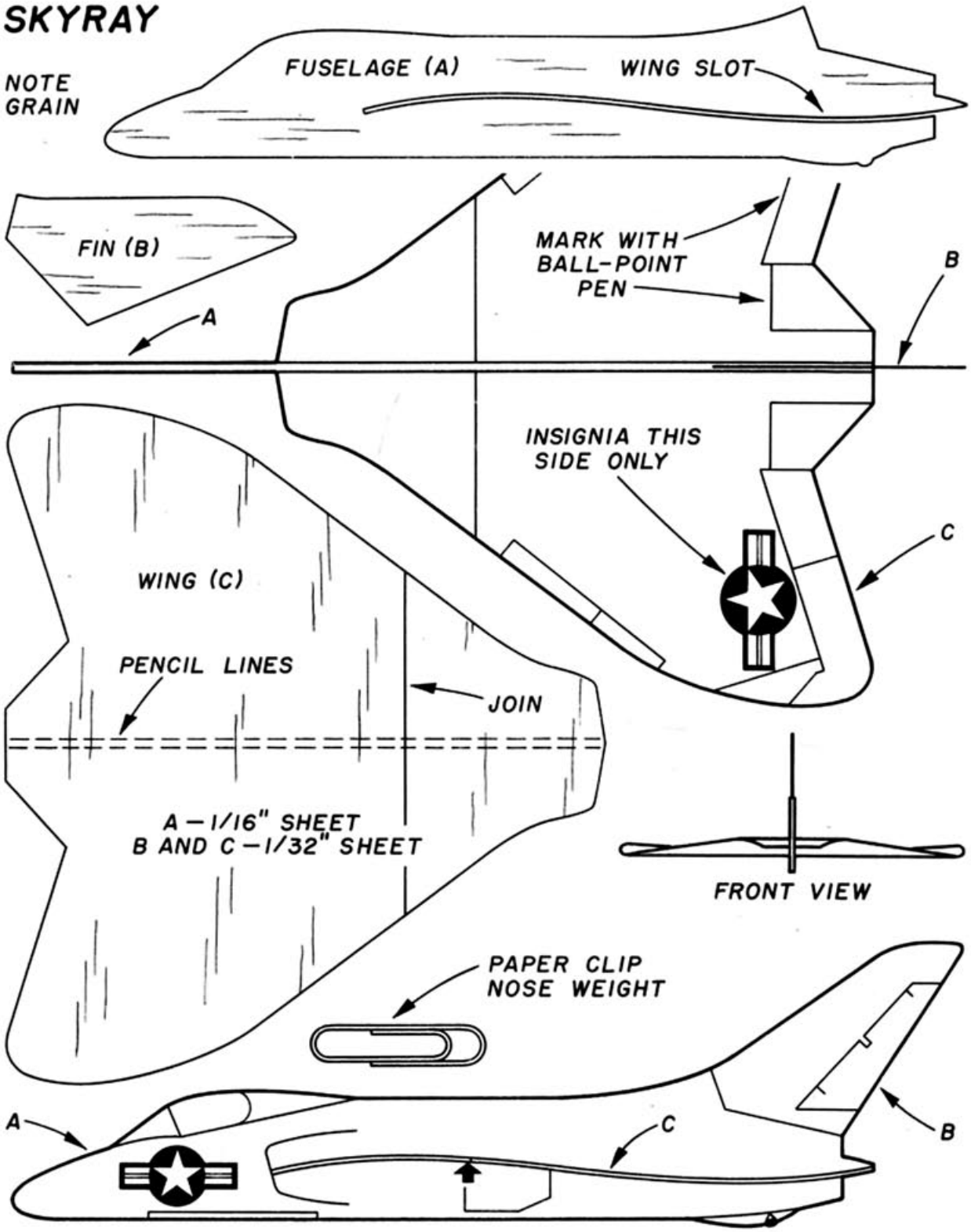
Trimming methods are *different* from conventional 'wing-and-stabilizer' models, but just as simple. If the model turns sharply, bend up the rear edge of the wing on the *outside* of the turn. Correct a dive by bending up both wing rear edges equally—and a 'stall' by adding a pin to the nose. Perfect loops or circling flights back to your hand are obtainable after a little practice.

MATERIAL LIST

Sheet—$\frac{1}{32}$" × 3" × 8" (*M*) Sheet—$\frac{1}{16}$" × 3" × 7" (*M*)

TOTAL COST: About 15c

SKYRAY


NOTE GRAIN
FUSELAGE (A)
WING SLOT
FIN (B)
A
MARK WITH BALL-POINT PEN
B
INSIGNIA THIS SIDE ONLY
C
WING (C)
PENCIL LINES
JOIN
A — 1/16" SHEET
B AND C — 1/32" SHEET
FRONT VIEW
PAPER CLIP NOSE WEIGHT
A
C
B

VULTURE

THIS SEMI-SCALE JET-PROPELLED MODEL IS CATAPULT LAUNCHED

BUILDING TIME: 4 HOURS

3 TRAINER

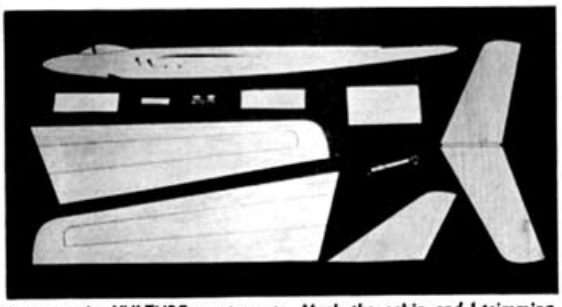
THIS graceful semi-scale fighter is propelled by a *Jetex* 50—a powerful little jet which has been specially developed for modeling use. Since there are no moving parts to go wrong with this motor, it can be easily operated (*with perfect safety*) by anyone. The *Vulture* climbs fast under power and, when the fuel pellet is expended, settles into a long floating glide. A notch is cut in the fuselage nose, so that catapult-aided launches may also be made.

1. Trace all the parts (A, B, C, D, E and Z), then attach them to $\frac{1}{16}$-in. and $\frac{1}{8}$-in. sheet (as specified on the plan) and note the grain direction. *Medium-hard* (*MH*) balsa is needed for the fuselage pieces (A and B) and *medium* (*M*) balsa for the flying surfaces (C, D and E). Cut out all the parts, pinning the right wing panel (C) to a piece of $\frac{1}{8}$-in. sheet and using it as a pattern for the left-hand panel.

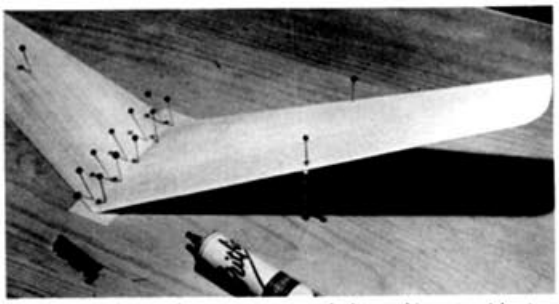
2. Carefully cut out the wedge-shaped portion from the top of the fuselage—then cut along the dotted line to make room for the wing. Now mark the positions of the screws and draw in the cabin with the aid of a ball-point pen. Break the head off a pin and push this up into the fuselage along the front edge of the catapult notch, as shown on the plan.

3. Trace the ' trimming lines ' on to the top surfaces of the wing panels and mark with a ball-point pen. Carve away the sheet *outside* the trimming lines with a very sharp razor blade—to obtain the correct aerofoil section (see side view at foot of the plan). Finish off with the sanding sheet, then carefully sand away the trimming lines.

4. Now shape the wing roots to the correct dihedral angles. Place the panels on the building board, so that the roots are flush with the edge, then sand them to the



Here are the VULTURE components. Mark the cabin and ' trimming lines ' with a ball-point pen at this stage.



Join wing panels together at correct angle by packing up with piece ' Z '. Hold in place with pins until dry.

required angle, using the building board edge as a guide (see *Swallow* construction photo (4) on page 15).

5. Pin the left-hand wing panel down flat on the building board. Mark the position of the ' Z ' dihedral packing on the underside of the right-wing panel, then join the latter to the other panel, packing up with 'Z'. The stabilizer (D) and fin (E) are left flat, but the outline edges may be rounded off slightly (for greater efficiency) if desired.

6. Cement the stabilizer in the rear fuselage cut-out (hold in place with pins) and make sure that it lines up correctly in the top and front views before the cement starts to set. Unpin the wing from the building board and sand ' flat ' on the underside at the central joint—then cement in the fuselage cut-out, checking alignment and again holding in place with pins.

7. When the cement holding the flying surfaces in position has set hard, remove the pins and replace the wedge-shaped fuselage portion over the wing. Cement the fin (E) to the fuselage and stabilizer, making sure that it is vertical to the latter.

8. Cement the small reinforcing piece ' B ' to the *left* side of the fuselage (looking from rear). While this is drying, cut two $2\frac{1}{4} \times \frac{3}{4}$-in. rectangles of asbestos paper and cement them to the *right* side of the fuselage and the underside of the *right* wing root (both shown in dotted lines on the plan). Screw the *Jetex* mounting clip to the *right* side of the fuselage (with turned-up tag facing forward)—checking that it is parallel to the underside of the wing.

9. Load the motor according to the maker's instructions, slide into the clip from the rear and check that the model balances level when held by a pin pushed into the top of the fuselage above the large black arrow. If the model is tail heavy, add a little weight to the nose. If nose heavy, this can be adjusted on the flying field, by altering the stabilizer setting.

10. The model is normally hand launched, but extra height maybe gained by using the same towline/catapult as specified for the *Swallow* glider, so turn back to page 15 for full details of how to make this. The illustrations in the adjoining column show the *Jetex* 50 before and after loading.

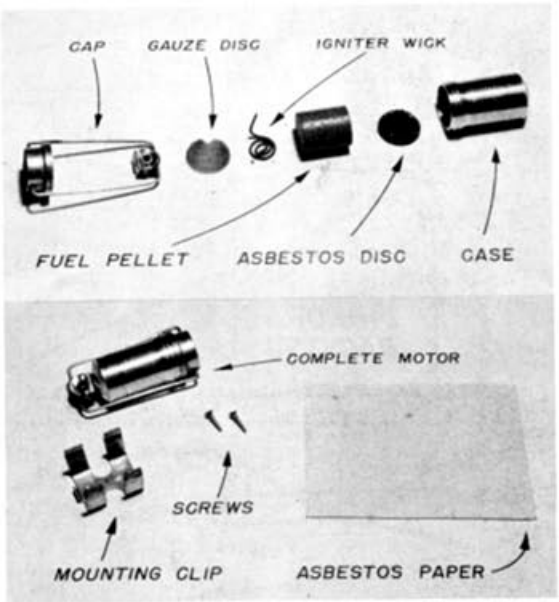
11. The cost of the motor ($1.00) has *not* been included in the *Vulture* material list, since it may also be used to power three other models in this book—the *Space Scout* on page 41, the *Swordfish* jet-boat on page 46 and the *Firebird* car on page 56. It is only necessary to fit a separate mounting clip to each one, then the motor may be switched from model to model. Long life and freedom from breakages are special *Jetex* features.

Cement flying surfaces to the fuselage, allow to dry, then replace piece of sheet over wing and add the fin.

FLYING

Start off by test gliding in the usual way, with the loaded *Jetex* motor in position. Add weight to the nose if the model shows any tendency to ' stall '. A dive may be corrected by slightly bending up the rear edges of the stabilizer. When the trim is correct, the model should glide on a steady downward path to a point about 30 feet ahead.

The offset motor will have a tendency to turn the model to the left, so counteract this by twisting up the *front edge of the left wing* to give a shallow *right* turn. Light the



JETEX 50—Powerplant for the swept-wing jet VULTURE.

igniter wick and wait for a full three seconds to allow the thrust to build up—before launching on a level keel into wind. The offset motor will still make the model turn *gently* to the left, but after the pellet is expended, the model will slide into an opposite turn to the right if the trim is correct. Counteract any sharp turning tendencies by twisting the wing leading edges—remembering that the model will turn *away* from the raised leading edge. Avoid using the fin for adjusting the turn.

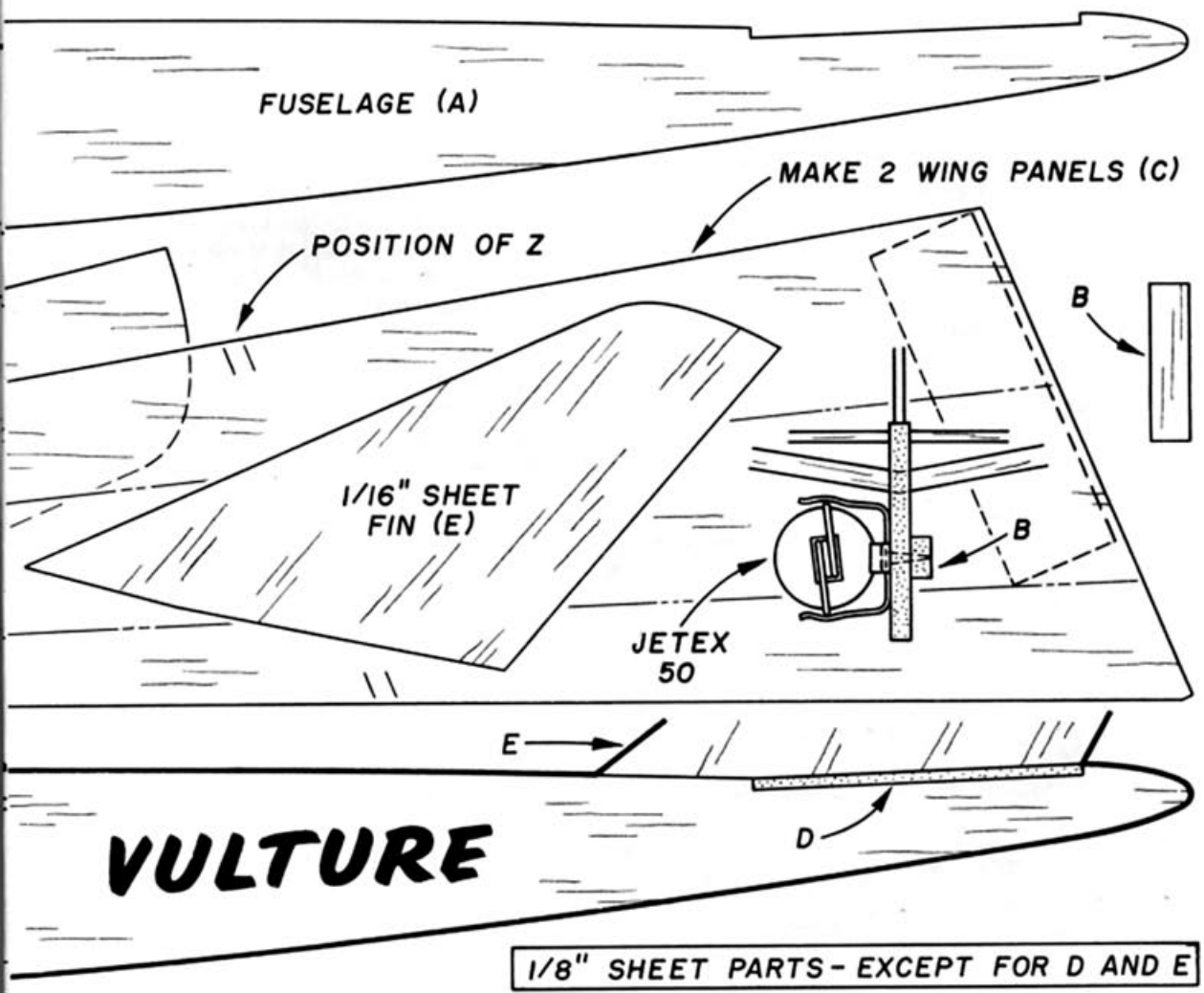
Up to 50 per cent longer duration can be obtained by using the towline/catapult. Place the tow-ring in the fuselage notch and stretch back until the model is 40 ft. from the dowel anchor. Get a friend to ignite the wick,

wait for three seconds, then release the fuselage end. The jet will develop maximum thrust as the model reaches the peak of its catapult climb and take it still higher.

Full instructions are given with the *Jetex* motor, but there are a couple of very important points worth repeating here. First, clean out the interior of the casing and the jet hole with the tools provided, after every couple of flights, as shown in the adjoining photos. This will prevent fuel pellets becoming jammed while loading or the efficiency of the motor being reduced by a partially blocked jet-hole. Finally, avoid handling the motor for a few minutes after the model has landed, as the casing gets quite hot during operation.

MATERIAL LIST

Sheet—$\frac{1}{16}$" × 3" × 12" (M)	6 in. of $\frac{1}{4}$" diameter dowel
Sheet—$\frac{1}{8}$" × 3" × 36" (M)*	10 ft. of $\frac{1}{8}$" rubber
Jetex 50 mounting clip	20 ft. of strong thread
*MH fuselage	TOTAL COST: About 90c



1/8" SHEET PARTS - EXCEPT FOR D AND E

BRITANNIA

SCALE GLIDER OF THE GIANT BRITISH TURBO-PROP AIRLINER

BUILDING TIME: 3 HOURS

THE four-engined *Bristol Britannia* has a range of 5,100 miles, a maximum cruising speed of 389 m.p.h. and can carry as many as 104 passengers within its spacious fuselage. Our 11-in. span replica of the famous airliner is made entirely from sheet balsa.

1. Start by tracing all the patterns (A–F), then attach them to medium (*M*) $\frac{1}{32}$-in. and $\frac{1}{16}$-in. sheet—noting the direction of the wood grain. Cut out the parts with a sharp razor blade, then pin ' D ', ' E ' and ' F ' to sheet and use them to make duplicates.

2. Carefully add the markings (cabin windows, doors, control surface outlines, etc.) with the aid of a ball-point pen, taking care not to smudge the ink. Now cut out the small pieces in the underside of the fuselage (A) and engine nacelles (E and F)—to accommodate the wing panels (D). Mark the centre of the stabilizer (C) with two pencil lines as indicated on the plan.

3. Join the two wing panels (D) at the center, propping up one tip $1\frac{1}{2}$ in. as shown in the sketch below. While this is drying, cement the fin (B) to the fuselage —check that it is upright, then apply cement to the stabilizer (C) and slide this into place (with the slot facing forward). Make sure the stabilizer lines up correctly in the top view and is 'square' to the fuselage in the front view.

4. Unpin the wing from the building board and cement it in the cut-out in the underside of the fuselage—using pins to hold firmly until quite dry. Check for correct alignment in the top and front views—in the same way as for the stabilizer. Now replace the small pieces in the underside of the engine nacelles and fuselage.

5. Push a pin into the top of the fuselage, immediately above the large black arrow drawn on the fuselage side view. Attach a large paper clip to the nose and check that the model balances level when held by the pin, adding more nose weight (a pin or two) if necessary.

FLYING

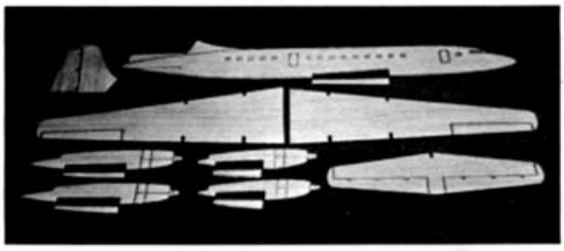
When correctly balanced—and provided the flying surfaces are unwarped—the model is ready for its first flight. Choose a dead calm day for test flying or, better still, fly the model in a large hall. Hold the fuselage (underneath the wing) between thumb and forefinger, and launch smoothly straight ahead, on a slightly downward flight path.

If the model dives, correct this by reducing the nose weight slightly. If it climbs steeply and then drops its nose sharply (' stalls ') add a little weight to the nose—say another pin. Correct a sharp turning tendency by bending up the *front edge* of the wing panel on the *inside* of the turn.

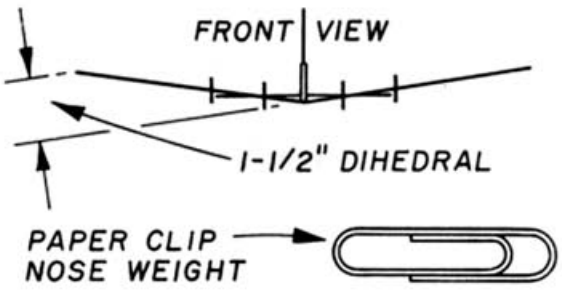
MATERIAL LIST

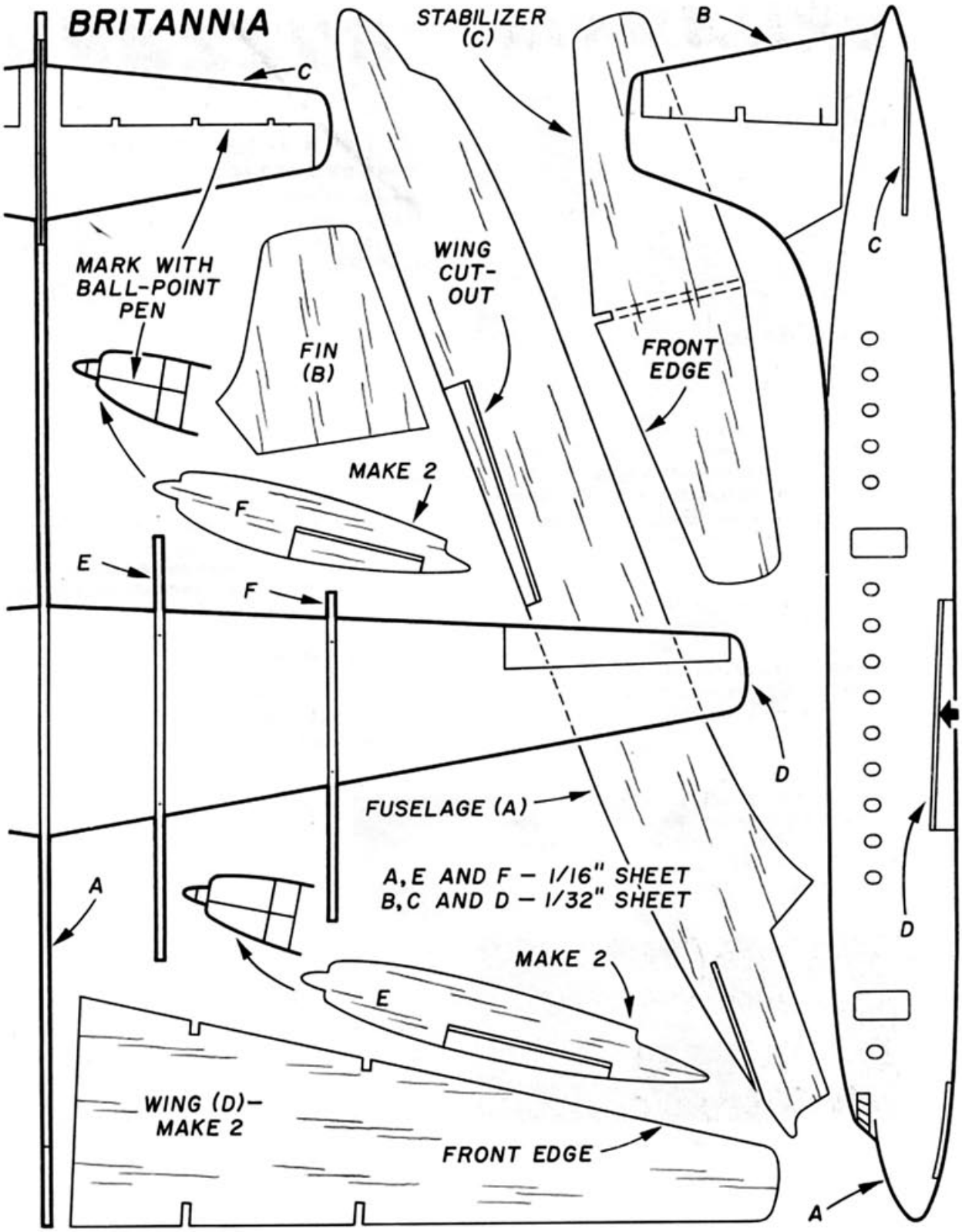
Sheet—$\frac{1}{32}$" × 3" × 10" (*M*) Sheet—$\frac{1}{16}$" × 3" × 10" (*M*)

TOTAL COST: About 20c



Add all markings with ball-point pen before assembly.




BRITANNIA
STABILIZER (C)
B
C
C
MARK WITH BALL-POINT PEN
WING CUT-OUT
FIN (B)
FRONT EDGE
MAKE 2
F
E
F
D
FUSELAGE (A)
A,E AND F – 1/16" SHEET
B,C AND D – 1/32" SHEET
A
MAKE 2
E
D
WING (D)– MAKE 2
FRONT EDGE
A

BUZZARD

22 INCH SPAN RUBBER POWERED 'STICK' MODEL

BUILDING TIME: 6 HOURS

4 TRAINER

AFTER building two or three of the simple designs in the earlier pages, you are now ready to tackle something a little more advanced—such as this rubber-powered 'stick-model'. The *Buzzard* is strong enough to stand up to plenty of rough treatment and has a fine flying performance. A ready-made plastic propeller is featured and the wings are detachable for easy carrying.

1. Cut out all sheet parts from $\frac{1}{16}$-in. and $\frac{1}{8}$-in. balsa, noting grain direction. The flying surfaces must be made from *medium-soft* (*MS*) balsa sheet—of the type which bends easily across the grain without splitting. All other sheet parts should be *medium* (*M*) balsa. Mark the two rib positions on the underside of each wing panel with a soft pencil—as indicated by the dotted lines on the plan on pages 28 and 29.

2. Curve the camber into the wing panels (A) as illustrated in the photo on opposite page and cement ribs (B and C) in place—holding firm with pins until dry. If the sheet is rather stiff and difficulty is encountered in fixing the ribs at the front and rear, use paper clips or clothes pins to hold them in place until the cement has set hard.

3. Pin one wing panel down to the building board, placing a piece of scrap $\frac{1}{8}$-in. sheet under the root end. Secure this panel with plenty of pins, then cement the other panel to it, propping up under rib 'C' with the 'Z' packing, to provide the correct dihedral—as sketched on the right of the plan.

4. Cut a length of *medium hard* (*MH*) balsa strip for the motor stick (D) and cement an extra (1 in. long) piece to the lower face at the front end. When dry, trim away

The twin-finned BUZZARD is capable of taking off under its own power from the ground. The detachable wing is held on with rubber bands.

Barry Smith hand-launching the model on a power flight. Maximum turns are 240.

the surplus at the nose and tail as indicated by the dotted lines.

5. Carefully cut a $\frac{1}{16}$-in. deep trough in the front of the motor stick to take the $\frac{1}{32}$-in. dia. nose bush and cement the latter in place. Bend the three wire parts with the aid of pliers—as indicated in the drawing and photo on page 30. *Do not* bend over the front end of the propeller shaft at this stage.

6. Press the landing gear leg against the side of the motor stick, to make an impression. Squeeze cement in the impression and hold the landing gear in place, while tightly binding it (and the nose bearing) to the stick with thread.

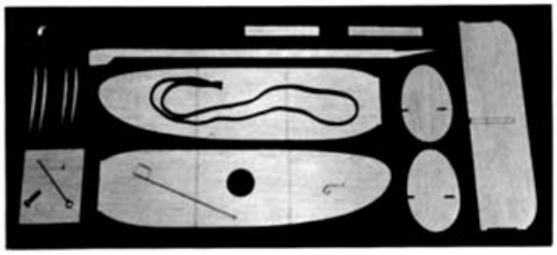
7. Insert the propeller shaft in the nose bearing, add the cup washer and the airscrew, then carefully bend over the front of the shaft to lock the assembly. Cement and bind the rear motor hook to the stick and retain the landing wheel with a large blob of balsa model cement (obtainable from your model shop). Cement the two wing mount pieces (E) to the sides of the motor stick, using clothes pins to hold them securely until dry (see photo on right).

8. Cement the fins (F) to the stabilizer (G), checking that the parts are square to each other in the front view. Reinforce the central wing joint with 1-in. wide strips of cloth (from an old handkerchief) on top and bottom. Smear cement on the wing, then press the cloth firmly in place and apply another coating of cement over the top. Now cement the stabilizer to the end of the motor stick—carefully checking the alignment in the top and front views.

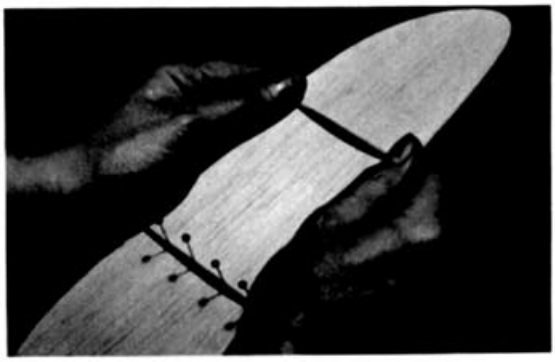
9. Chamfer the top edges of the wing mount pieces (E) to match the dihedral angle of the wing panels, then taper the sides as shown on the plan. Push two ordinary household pins into the top of the motor stick in front of and behind the wing. Hold the wing in place with two 3-in. rubber bands ($\frac{1}{16}$ in. wide), stretched from front to rear and back again.

10. The motor is made up from a 42-in. long piece of $\frac{1}{8}$-in. flat model aircraft rubber. Get a friend to hold the two ends (stretching the rubber) while you bind them together with thread, to form a loop. Place the bound end of the rubber over the rear motor hook and pass the other end through the propeller shaft hook and back again to the rear hook. The rubber will take more turns and last longer if you smear it with Rubber Lubricant after every half-dozen flights.

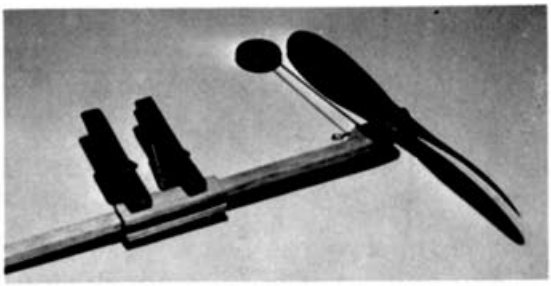
11. When assembled ready for flight, the model should balance level at the point indicated by the large black arrow. Push a pin into the wing (above the arrow) and check that the balance is correct. If tail heavy, add a



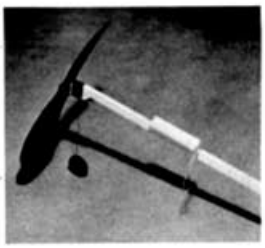
Mark ribs and fuselage positions on flying surfaces.



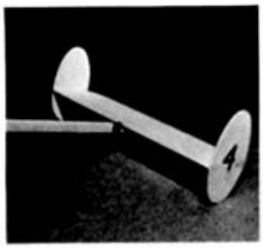
Camber outer portions of wing panels with sheet ribs.



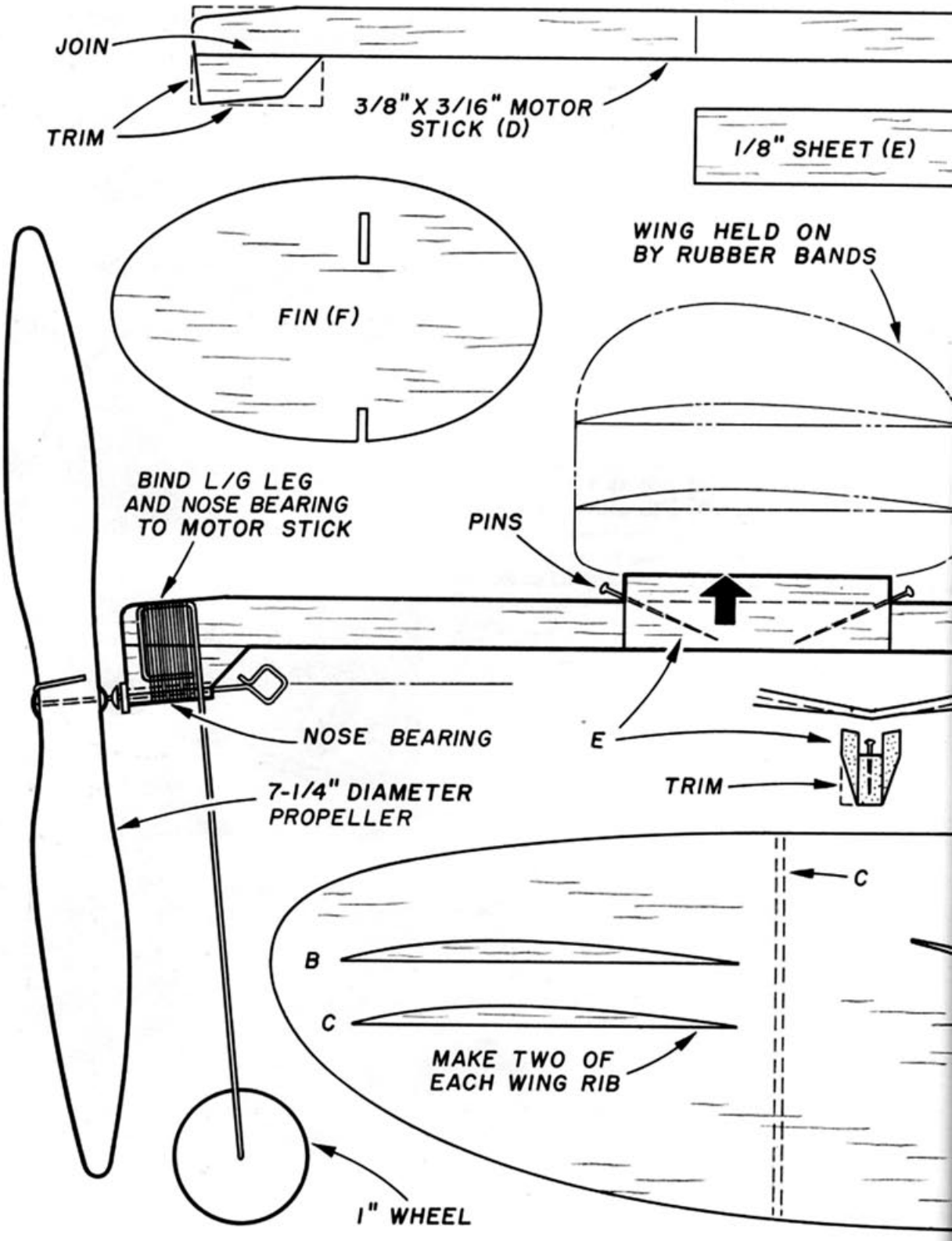
Use clothes pins to hold wing mount pieces in place.

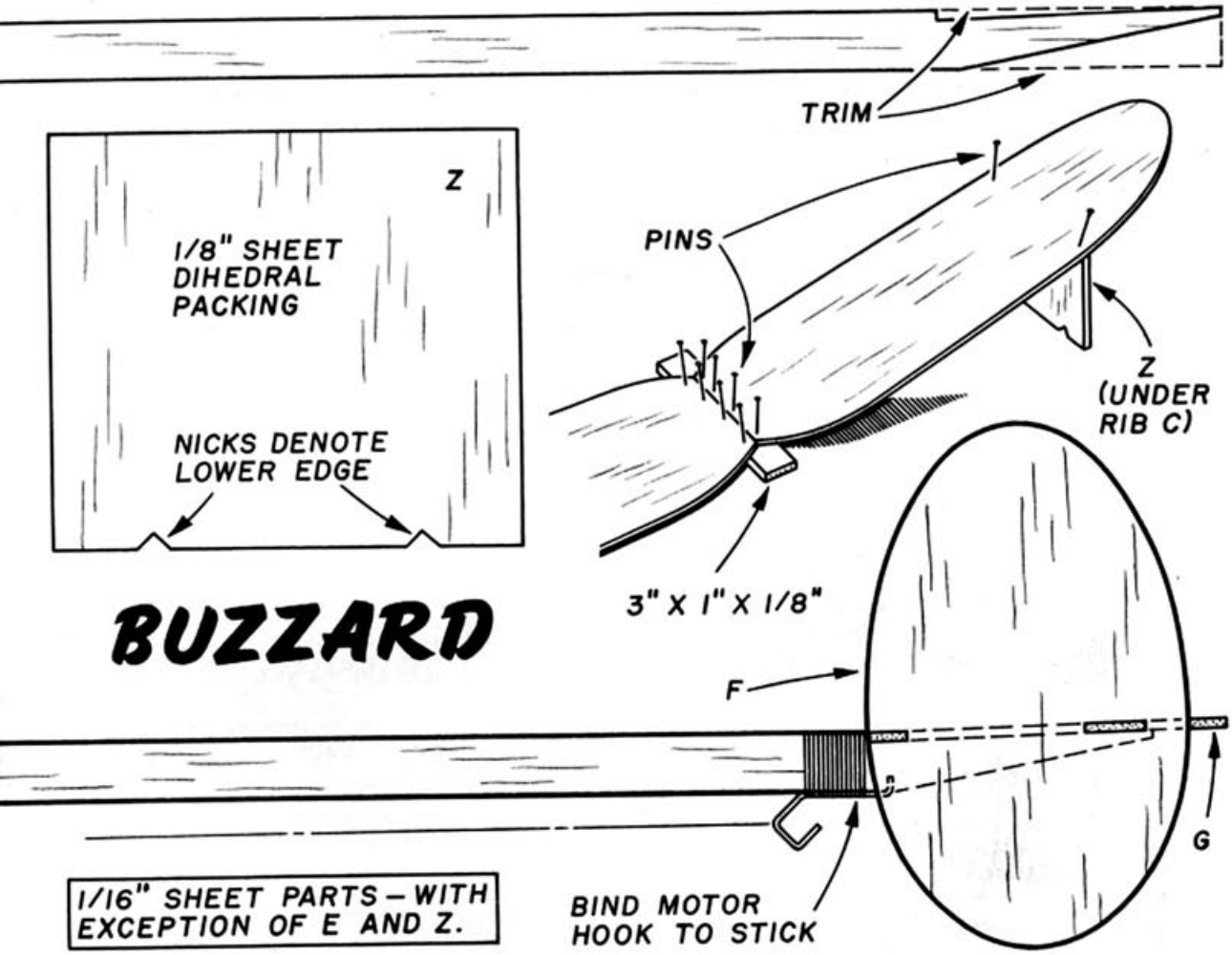


Bind L/G to side of the nose. Note Rubber band.



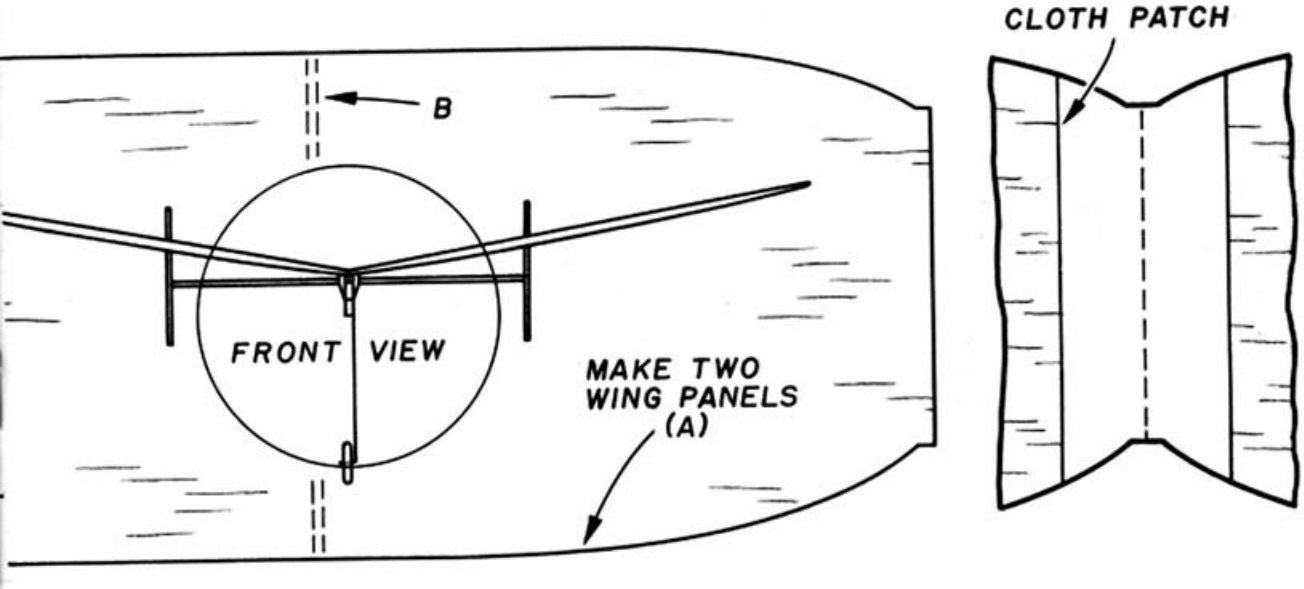
Bind rear hook to stick in front of stabilizer.

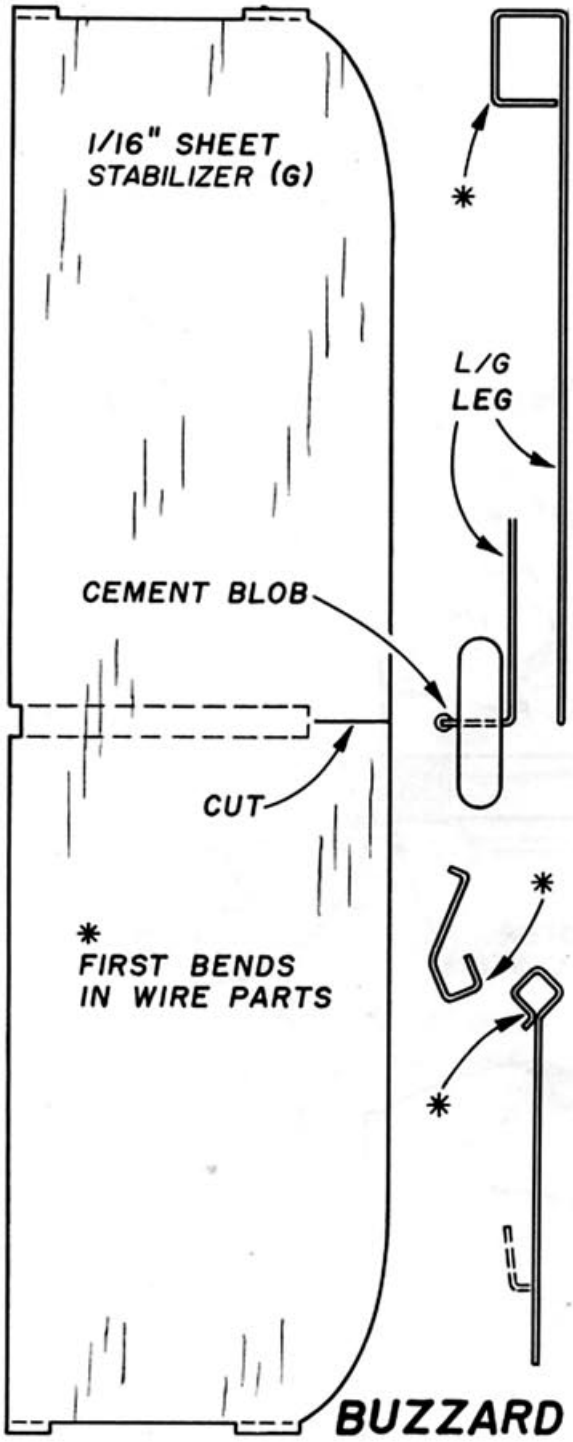

JOIN
TRIM
3/8" X 3/16" MOTOR STICK (D)
1/8" SHEET (E)
FIN (F)
WING HELD ON BY RUBBER BANDS
BIND L/G LEG AND NOSE BEARING TO MOTOR STICK
PINS
NOSE BEARING
E
TRIM
7-1/4" DIAMETER PROPELLER
C
B
C
MAKE TWO OF EACH WING RIB
1" WHEEL



BUZZARD

1/16" SHEET PARTS – WITH EXCEPTION OF E AND Z.





small piece of lead tube to the nose. If nose heavy, add weight to the tail (at rear hook).

12. Make sure that the flying surfaces are quite true, gently twisting out any warps, while holding the part over the steam from a kettle of boiling water. Put a drop of oil on the propeller shaft, make sure that the wings are on squarely, and you are all ready for that first flight.

FLYING

Once the propeller has stopped, a powered model behaves exactly the same way as a glider, so start off by checking that the glide trim is correct—testing over long grass. Leave the motor unwound and launch the model from shoulder height into wind. Correct a dive by bending up the rear edges of the stabilizer and a 'stall' by weighting the nose slightly. A sharp turn is corrected by twisting up the front edge of the wings on the inside of the turn.

The twisting action of the propeller will turn the model to the *left* under power, so the glide must be adjusted for a gentle *right* turn to compensate for this. Your model may already have a ' natural ' right glide, but if not, warp up the leading edge of the *left* wing slightly to achieve this.

When you are satisfied with the glide, wind up the motor 100 turns in a *clockwise* direction and again launch the model from shoulder height. If the model is trimmed correctly, it should circle *gently left* under power and then turn *right* on the glide. For the next flight, try 120 turns and increase the number by a further 20 for each successive flight until 240 has been reached. This is about the safe maximum if you want to avoid overstraining or breaking the motor. However, after the motor has been well run in (after 25-30 flights), it is safe to occasionally wind on 280 turns. Always carry a spare motor with you—in case of a breakage.

Take-offs from the ground are quite straightforward—in spite of the single leg landing gear—if you remember the following points. Make sure that the wheel runs freely, head the model directly into wind and choose a dead smooth surface free of any stones or tufts of grass. A slight breeze helps to give a quicker take-off, but avoid really windy days, since this kind of weather is far better suited to flying kites!

MATERIAL LIST

Sheet—1/16" x 3" x 36" (MS)	12 in. of 1/32" dia. gauge wire
Scrap sheet—1/16" and 1/8"	1" dia. plastic wheel
Strip—3/16" x 3/8" x 15" (MH)	1/32" dia. bush and washer
7" plastic propeller	42 in. of 1/8" rubber

TOTAL COST: About 90c

CONDOR

'PROFILE FUSELAGE' TOWLINE GLIDER OF 23 INCH WING SPAN

5 TRAINER

BUILDING TIME: 5 HOURS

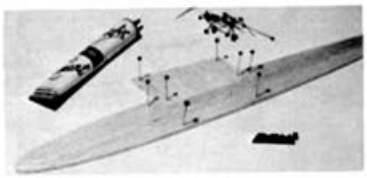
THE *Condor* is an advanced glider, capable of long flights of a minute or more, height being gained by towing up the model in much the same way as a kite. The tail surfaces are fixed to the fuselage, but the wing is detachable for safety in the event of a crash.

1. Cut out all balsa parts from $\frac{1}{16}$-in. *medium soft* (*MS*) and $\frac{1}{8}$in. *medium-hard* (*MH*) sheet as indicated—noting direction of grain. Balsa which curves easily across the grain must be used for the flying surfaces. Mark rib positions on wing panels (A and D) with a soft pencil. Bend wire tow-hook with aid of pliers, starting at front end.

2. Gently curve center wing panel (A) to obtain the camber as shown in the photo. Now cement ribs 'B' and ' C ' in place—holding firm with pins (and paper clips at ends if necessary) until dry. Curve camber into wing tip panels (D), then cement the outer ribs (E) in place —in the same way as for the center panel. The remaining ribs (C) are attached to the tips at an angle to allow for the tip dihedral, as detailed below.

3. Secure ' X ' to the building board with five pins, then cement the rib angle templates (Y) to it. Lightly attach the ' C ' ribs to the jig with *dabs of cement* on the ends of the ribs and at the ' Y ' templates. When dry, squeeze cement along the top edge of one of the ribs and place the appropriate tip panel in position, holding firm with pins until dry. Repeat the procedure for the other tip panel.

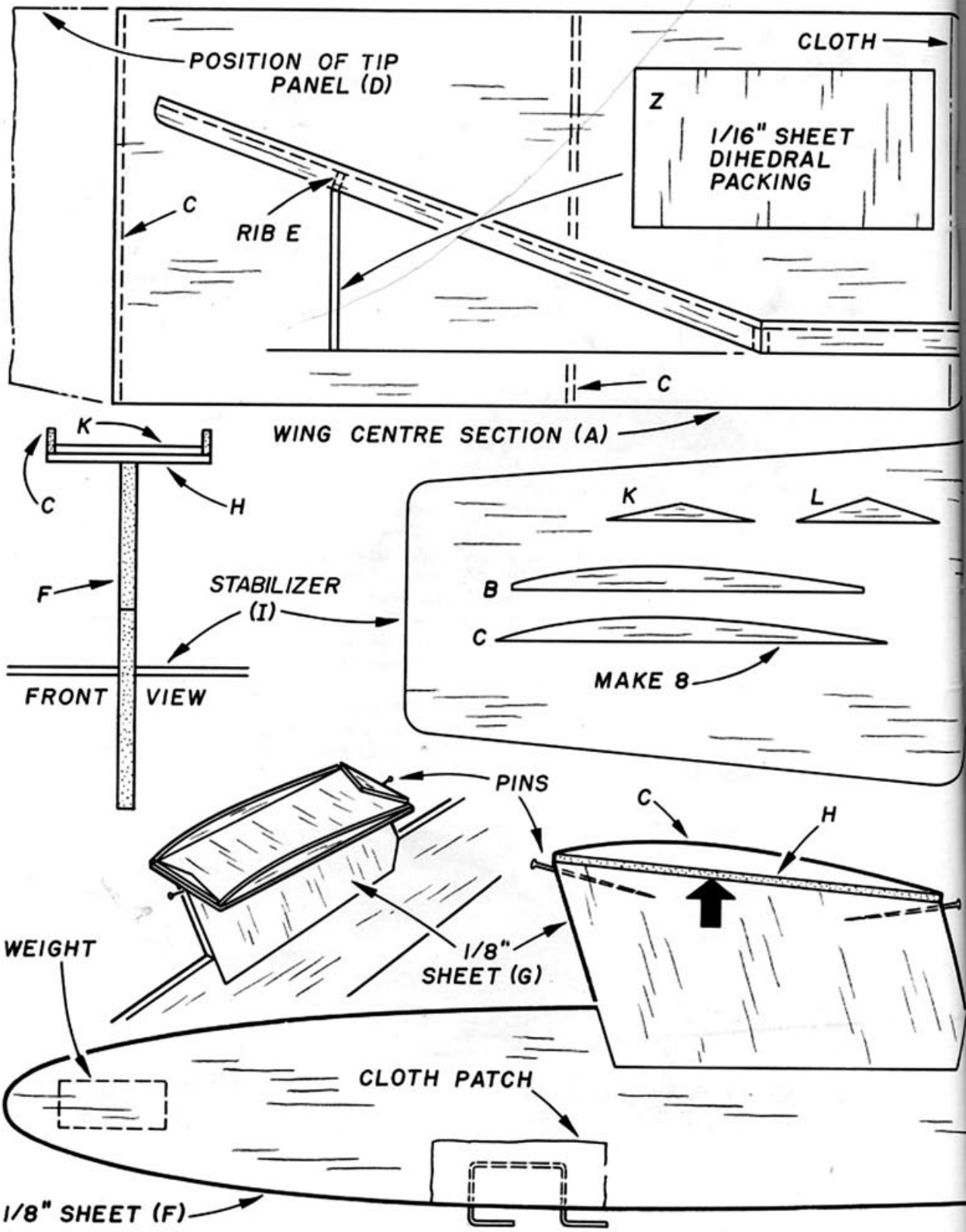
4. Pin the fuselage (F) down flat and cement ' G ' in the upper slot—also pinning down. Cement the two remaining ' C ' ribs to the outer edges of the wing platform (H). Mark the position of ' G ' on the underside of the wing platform (H). Unpin fuselage from building board and cement wing platform to ' G '—checking that the parts are square to each other in the front and top views.

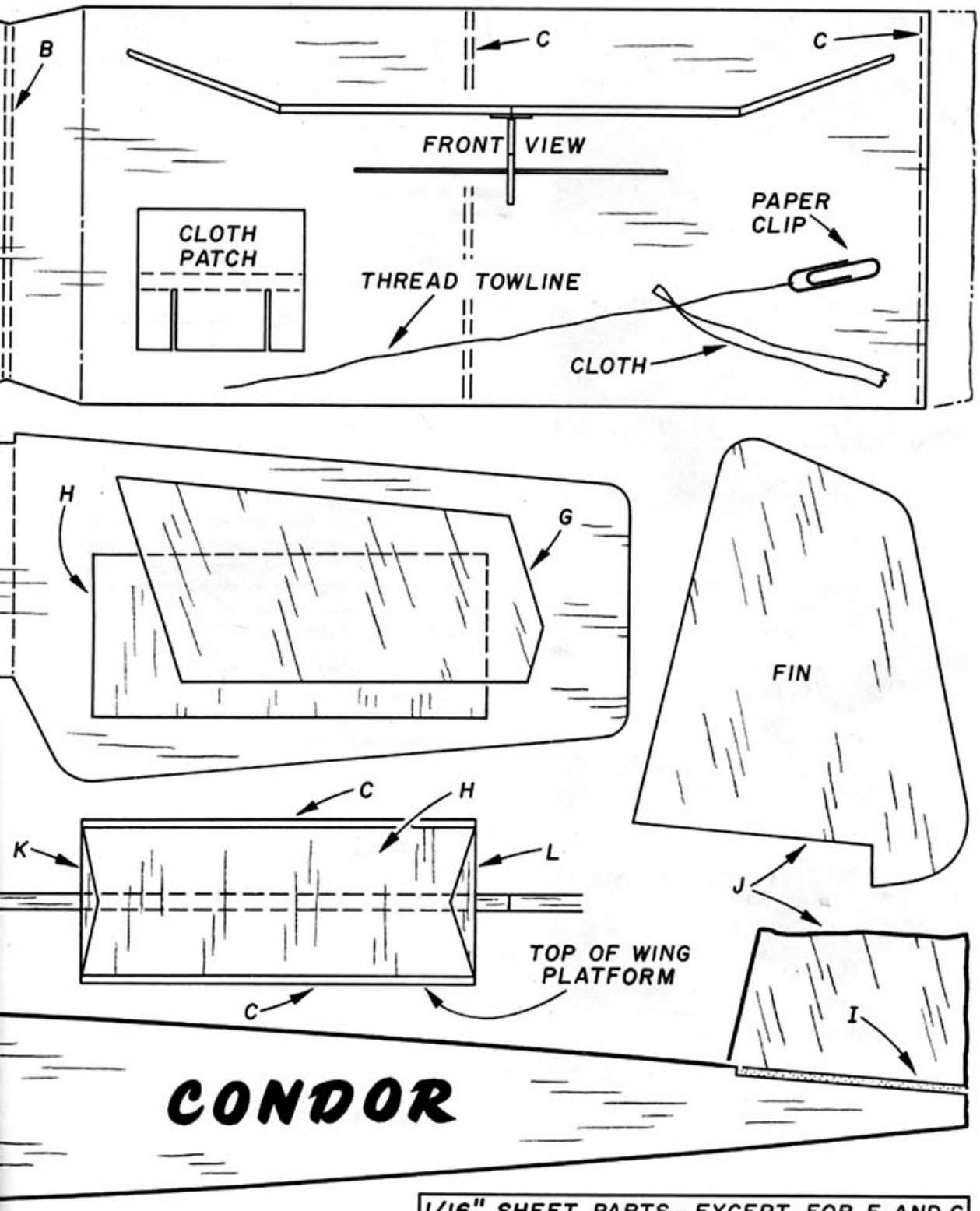


Cementing fuselage parts together.

Parts for making the 23-in. span model.

Completed CONDOR—ready for flight. Hold wing in place with rubber bands.

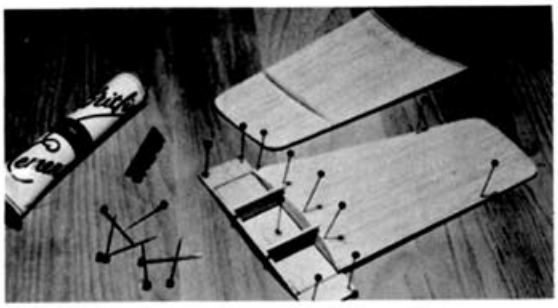

POSITION OF TIP PANEL (D)
CLOTH
Z
1/16" SHEET DIHEDRAL PACKING
C
RIB E
C
WING CENTRE SECTION (A)
K
C
H
F
STABILIZER (I)
FRONT VIEW
K
L
B
C
MAKE 8
PINS
C
H
WEIGHT
1/8" SHEET (G)
CLOTH PATCH
1/8" SHEET (F)



1/16" SHEET PARTS - EXCEPT FOR F AND G

The sheet wing panels must bend easily across grain.

Cement ' E ' ribs to the tip panels. Note use of pins.



Attach ' C ' tip panel ribs—with aid of assembly jig.

Join tip and main panels—packing up with ' Z ' piece.

5. Now remove all pins from the wing panels and pin the center panel to the building board. Join the tip panels to the center panel, propping up each one at the correct dihedral angle by means of the 'Z' packing under the ' E ' ribs. Smear plenty of cement over the joints—on top surfaces.

6. Press the tow-hook into position on the fuselage—to obtain an impression in the balsa wood, then squeeze cement in the impression and replace the tow-hook. When the cement has set, secure the wire with a cloth patch cut from an old handkerchief (see plan). Smear cement over the inner surface of the patch, then press into place—finally spreading another layer of cement over the top.

7. Pencil in the fuselage position on the underside of the stabilizer (1) and cement the latter in place. Check that the stabilizer lines up correctly in the top and front views, allow to dry, then add the fin—again checking alignment.

8. Pin the wing to the stabilizer (H) and make sure that it squares correctly up with the fuselage in the top view. Now cement the triangular keying pieces (K and L) to the platform and put aside to dry.

9. Push two ordinary household pins into the front and rear of 'G' (close to the top). Strengthen the wing center section with a $1\frac{1}{2}$-in. wide strip of cloth. Smear cement on the wing, then press the cloth firmly in place and apply another coating of cement over the top. Hold the wing in place with two 3-in. rubber bands ($\frac{1}{16}$ in. wide), stretched from front (leading edge) to rear and back again.

10. Add weight (old cement tube) to the nose to achieve correct balance. Push a pin into the top of the wing (over the large black arrow), then add nose weight so that the model balances level when suspended by this pin.

11. Check that the flying surfaces are quite true, correcting any warps by gently twisting over the steam from a kettle of boiling water. Fasten a large paper clip to one end of a 150-ft. length of strong *white* thread—then attach a small piece of cloth (4 × 1 in.) to the tow-line, 6 in. from the tow-ring.

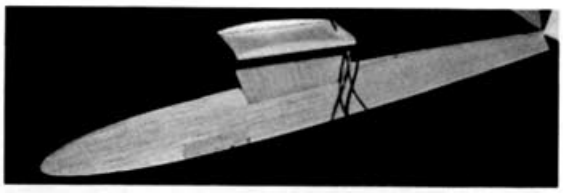
FLYING

Test glide from shoulder height—directly into wind. Correct a dive by gently bending up the rear edges of the tailplane. Correct a ' stall ' by adding a little more nose weight. A slight turn is desirable and, if this is not already present, the rear edge of the fin should be slightly twisted. If the model turns sharply, from the start, twist up the front edge of the wing on the *inside* of the turn.

When the glide is correct, get a friend to hold the model at shoulder height—pointing into wind. Place the paper clip on the *front* tow-hook and pay out the line upwind. When you are ready, give your friend a 'thumbs-up' signal to start walking forward. Keep pace with him and watch the model over your shoulder all the time.

Your helper should release the model smoothly as he feels the wings begin to lift—after which it should kite up to a height of about 125 ft. If the model veers off sharply to one side, *drop the line* at once to avoid a crash into the ground. However, if the model goes up straight, gently relax the tension on the tow-line at the top of the climb, so that the wind can blow the small piece of cloth backwards and pull the tow-ring free.

In a stiff breeze, you will be able to tow up the model without moving upwind at all. Be careful not to pull the model up too fast, since this puts a heavy strain on the wings. On calm days, hard running is needed to get the model up to a good height. Use the front hook for first tests and flying on windy days—and the rear hook for calm days only. As you gain experience, a longer tow-line of 200 ft. may be used.

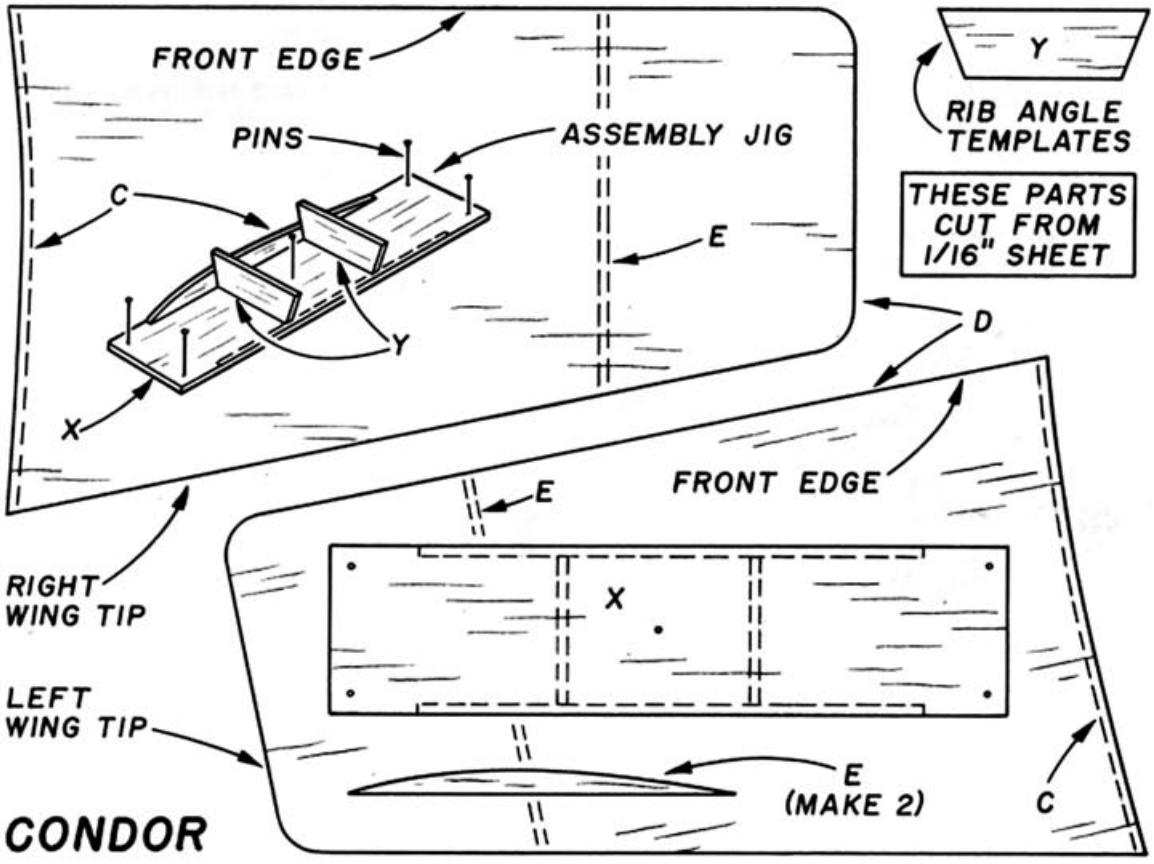


Detachable wing is retained by rubber band over top.

MATERIAL LIST

Sheet—1/16" x 3" x 36" (MS)
Sheet—1/8" x 3" x 18" (MH)
Scraps of 1/16" sheet
3 in. of 1/32" dia. wire
150 feet of strong white thread

TOTAL COST: About 75¢



FALCON

RUBBER-POWERED CABIN MODEL

6 TRAINER

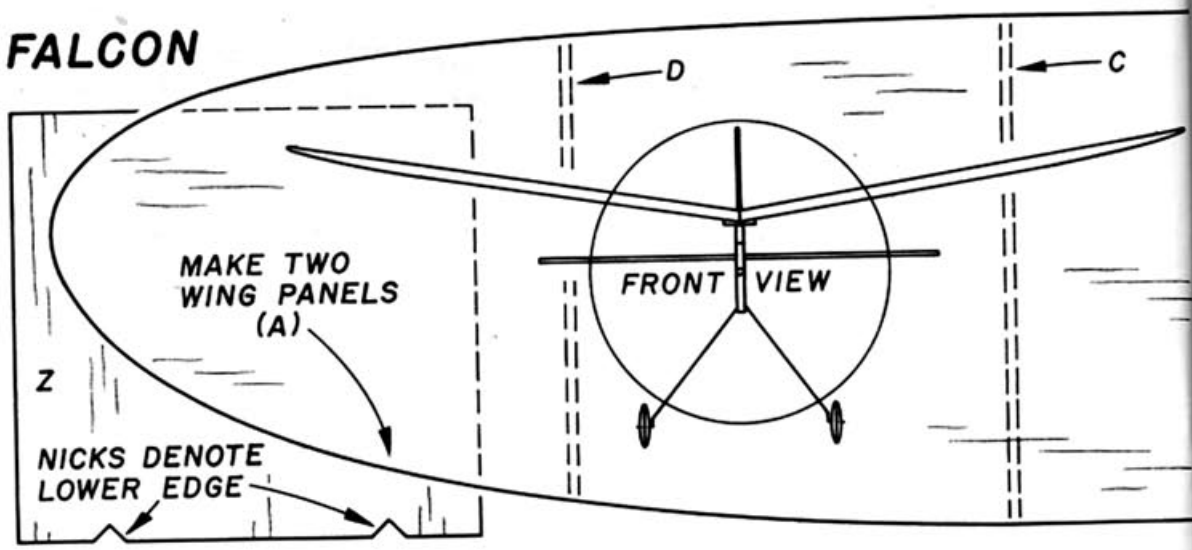
BUILDING TIME: 6 HOURS

By far the most popular type of rubber-powered model is the high-wing cabin monoplane. The profile-fuselage *Falcon* falls into this category and is the sixth and final model in the 'Trainer' Course which started with the *Hawk* hand-launched glider on page 8.

1. Cut out all balsa parts from $\frac{1}{16}$-in. and $\frac{1}{8}$-in. sheet, with the grain following the directions shown on the plan. Use *medium-soft* (*MS*) sheet, of the type which bends easily across the grain, for the flying surfaces. Fuselage parts should be cut from *medium-hard* (*MH*) sheet. Mark rib positions on the underside of the wing with a soft pencil and carefully draw in the cabin windows on the fuselage with a ball-point pen—before cementing any parts together.

2. Curve the camber into the wing panels (A) as illustrated and cement ribs 'C' and 'D' in place—holding firm with pins and paper clips until dry. The 'B' wing ribs must be attached to the wing roots at an angle—to allow for the tip dihedral. This procedure is simplified by means of an assembly jig, made up from parts 'X' and 'Y'.

3. Fasten 'X' to the building board with five pins, then cement the rib angle templates (Y) to it as shown. Lightly attach the 'B' ribs to the jig *with dabs of cement* on the ends of the ribs and at the 'Y' templates. When dry, squeeze cement along the top edges of the ribs and place the appropriate wing panels in position, holding firm with pins. The assembly jig is detailed on the main plan (pages 38 and 39).



4. Cement the two 'E' nose pieces to the fuselage (F), holding in place with pins until dry. Now squeeze cement in the front hole and screw the nose bearing in place. Bend the three parts to shape—starting at the bends indicated by *. Place the landing gear and rear motor-hook/tailskid in position and press the wire into the wood to make an impression. Squeeze cement into the grooves so formed and secure these wire parts with plenty of cement. Strengthen the landing gear fixing with pieces of cloth (cut from an old handkerchief) cemented over the wire.

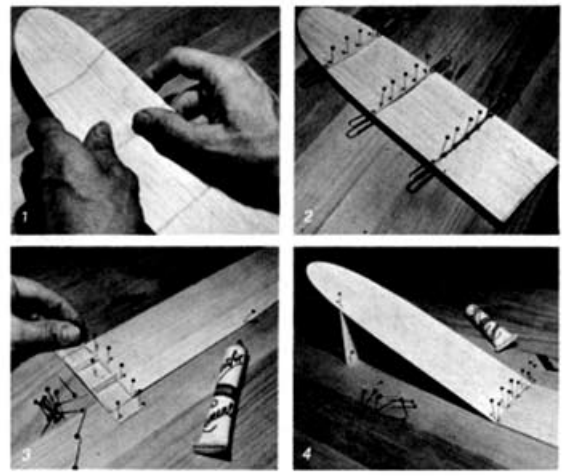
5. Unpin the wing panels and dihedral jig from the building board—carefully cutting the panels free. Now pin one panel down to the building board and cement the other panel to it, propping up the latter under the outermost ' C ' rib with the ' Z ' packing—to provide the correct dihedral.

6. Pencil in the fuselage position on the underside of the stabilizer (G) and cement the two together. Use pins to hold the stabilizer firm while the cement dries and see that it lines up correctly in the top and front views. When dry, cement the fin in place, again checking the alignment. Reinforce the central wing joint (on top) with a 1-in. wide strip of cloth.

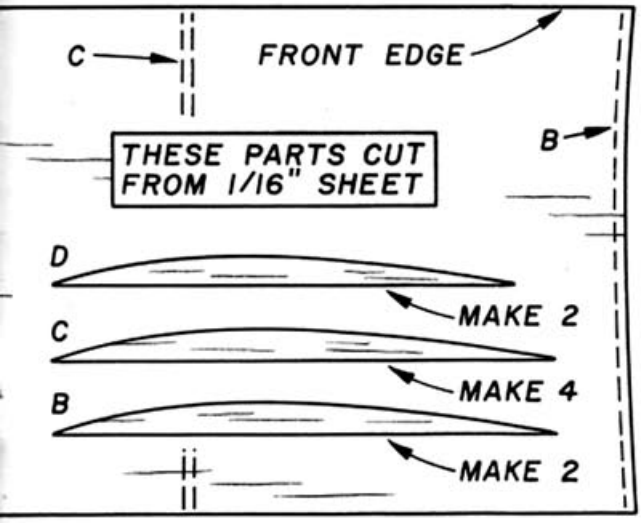
7. Cement the two ' J ' ribs to the top of the wing platform (I), pin down flat and then add the two small ' K ' pieces to the front and rear. When dry, cement this assembly to the fuselage, using pins to hold in place—and make sure that the two square up with each other in the front view.

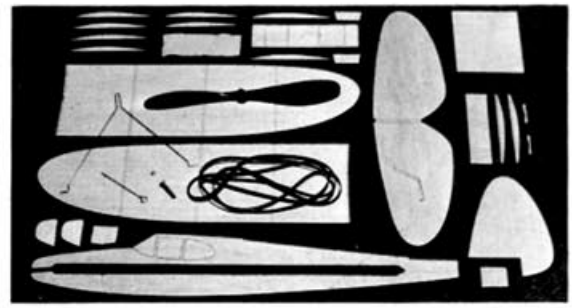
8. Round off the corners of the 'E' nose pieces. Now insert the propeller shaft in the nose bearing (from behind), add the cup washer and the propeller, then bend over the front of the shaft so that the motor hook is just clear of the back of the bearing and the 'E' pieces. Place wheels on axles and retain them with a blob of *Sig-ment*.

9. Push two ordinary household pins into the top of the fuselage, in front of and behind the wing platform. Hold the wing in place with two 3-in. rubber bands ($\frac{1}{16}$ in. wide)—stretched from front to rear and back again. Check that the wing seats firmly on the wing platform.



WING CONSTRUCTION. 1. Choose sheet that bends across grain. 2. Attcch outer ribs. 3. Add root ribs with aid of jig. 4. Join the panels, packing up with ' Z '.



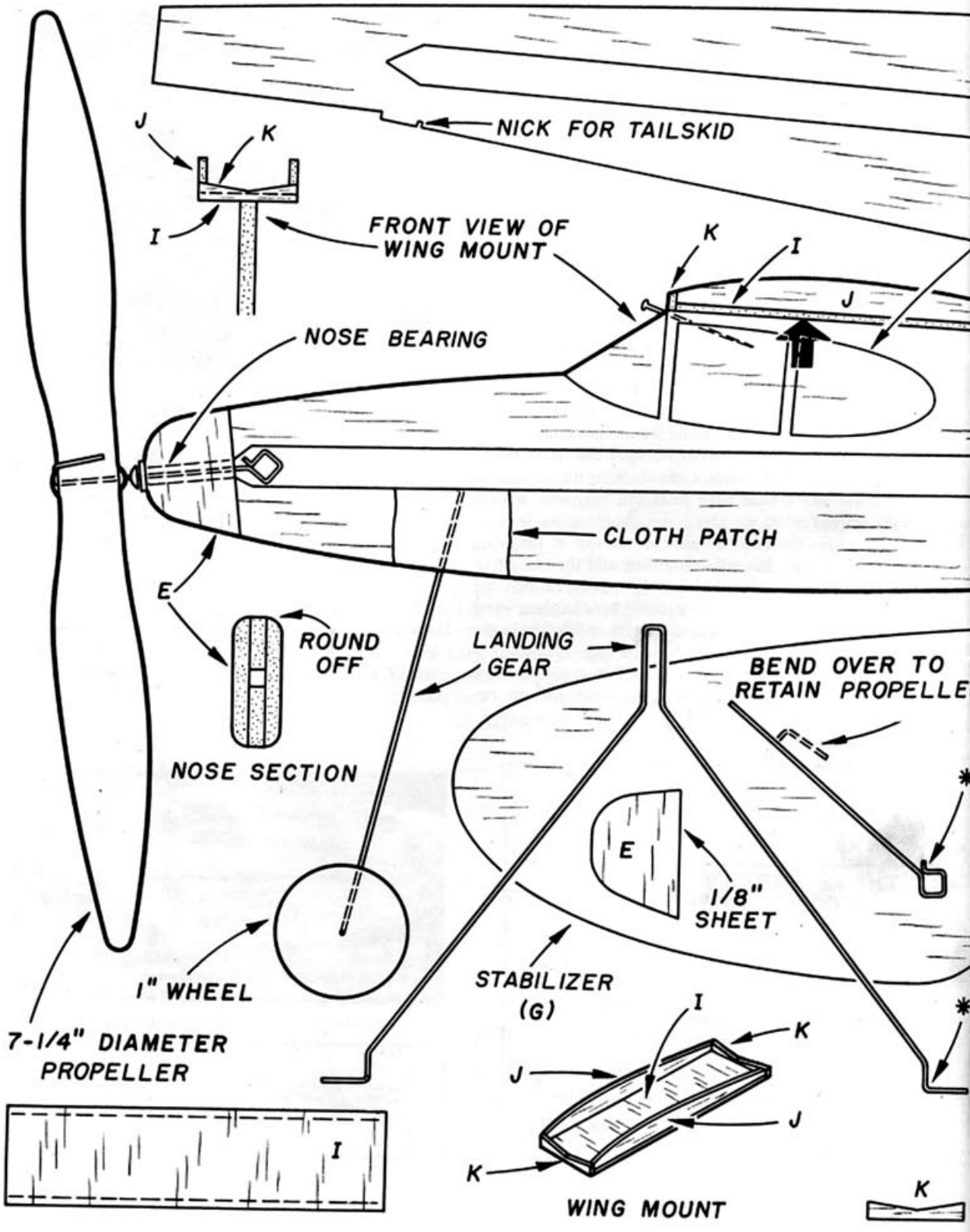


FALCON parts ready for assembly—including jig pieces.

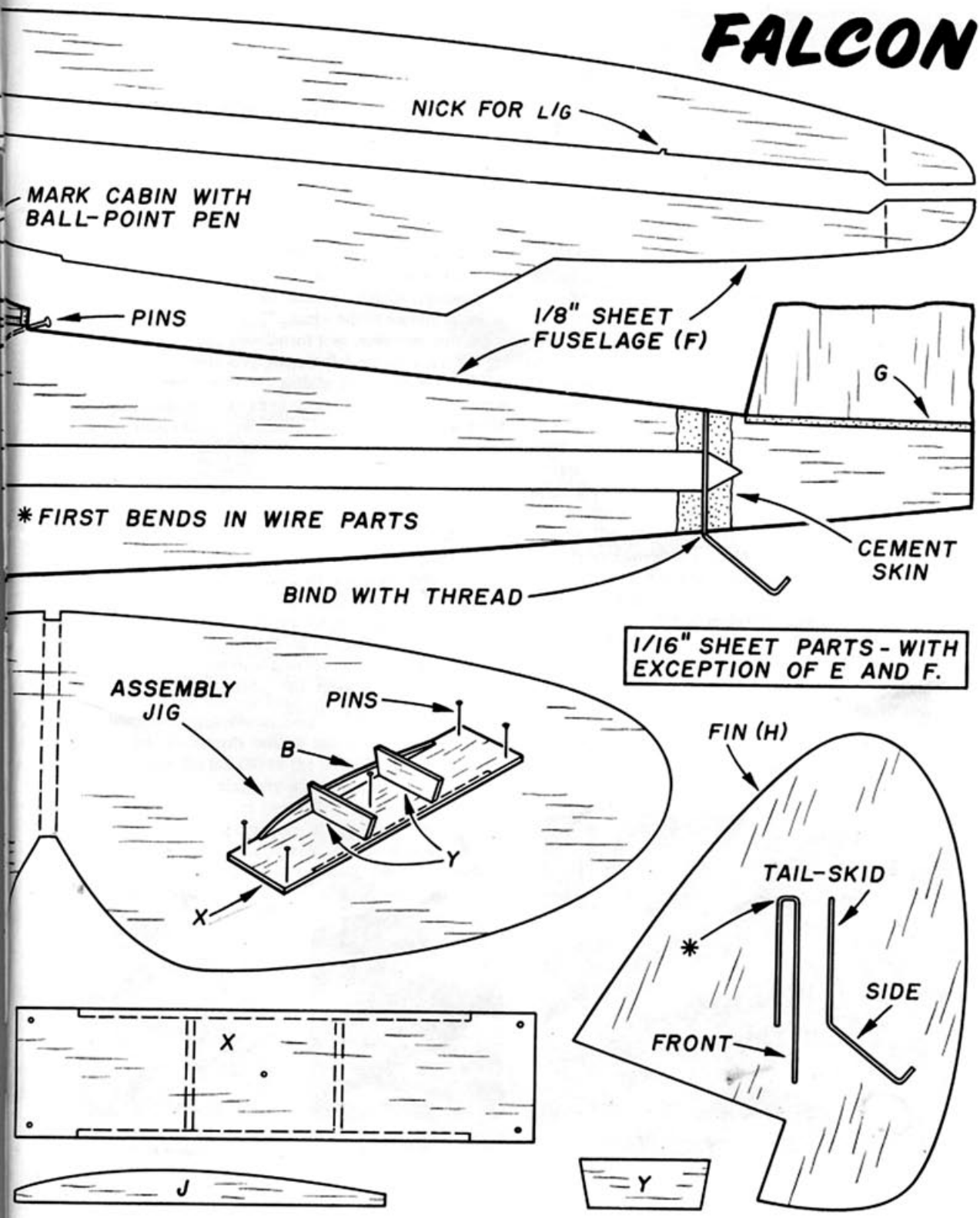
MATERIAL LIST

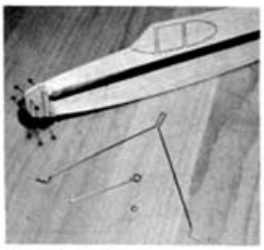
Sheet—1/16" x 3" x 36" (MS)
Sheet—1/8" x 3" x 18" (MH)
Scrap sheet—1/16" and 1/8"
7" plastic propeller
18 in. of 1/32" dia. wire
1" diameter plastic wheels
1/32" dia. bearing and washer
44in. of 1/8" rubber

TOTAL COST: About 90c

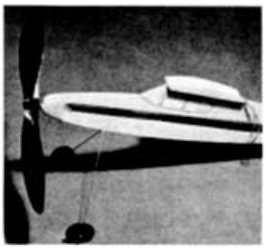

NICK FOR TAILSKID
J
K
I
FRONT VIEW OF WING MOUNT
K
I
J
NOSE BEARING
CLOTH PATCH
E
ROUND OFF
NOSE SECTION
LANDING GEAR
BEND OVER TO RETAIN PROPELLE
E
1/8" SHEET
1" WHEEL
7-1/4" DIAMETER PROPELLER
STABILIZER (G)
I
K
J
J
K
WING MOUNT
I
K

FALCON


NICK FOR L/G
MARK CABIN WITH BALL-POINT PEN
PINS
1/8" SHEET FUSELAGE (F)
G
*FIRST BENDS IN WIRE PARTS
CEMENT SKIN
BIND WITH THREAD
1/16" SHEET PARTS - WITH EXCEPTION OF E AND F.
ASSEMBLY JIG
PINS
B
Y
X
FIN (H)
TAIL-SKID
*
SIDE
FRONT
X
J
Y



Hold the 'E' pieces in place with model pins.



Retain wing by looping rubber band over top.

10. Make up the motor from a 44-in. piece of $\frac{1}{8}$-in. flat model aircraft rubber. Bind the ends together with thread to form a loop, while a friend stretches the rubber to ensure a tight binding. Smear the motor with Rubber Lubricant to preserve it and allow maximum turns to be wound on safely. Hold the loop of rubber so that the joint is in the middle, then pass one end behind the rear hook and loop both ends over the front hook.

11. After the motor has been installed and the wing attached, the model should balance level at approximately the point indicated. Push a pin into the wing at this point and check that the balance is correct. If the model is slightly tail heavy, add a small piece of lead tube to the nose. On the other hand, add weight to the tail (behind rear hook) if the model is nose heavy.

12. The model will not fly correctly unless the flying surfaces are quite true, so twist out any warps in the steam from a kettle of boiling water. Lubricate the motor, put a drop of oil on the propeller shaft, fasten the wing on with rubber bands and the *Falcon* is ready for test flying.

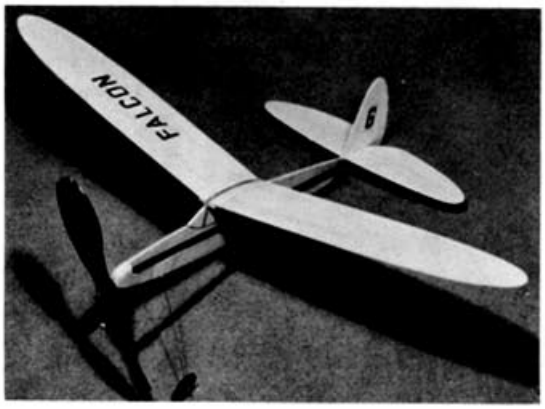
FLYING

Before trying any powered flights, glide-test the model over long grass—launching smoothly from shoulder height into wind. If the glide path is too steep, slightly bend up the rear edges of the stabilizer. If the glide is too shallow and a 'stall' results, add a little weight to the nose. Too sharp a turn may be corrected by bending up the wing leading edge on the *inside* of the turn.

As already explained in the flying instructions for the rubber-powered *Buzzard*, the propeller reaction turns this type of model to the left, so this must be compensated by adjusting the rudder for a gentle *right* turn. On full turns you will notice that the rubber motor twists the fuselage, slightly, so that the stabilizer is no longer perfectly square to the wings. There is no need to worry about this, however, as it fortunately provides a correcting influence to the left-turning propeller reaction.

After the model is gliding correctly (circling right), wind up the motor 110 turns in a clockwise direction and hand launch the model. A gentle *left circle* under power, followed by a *right circle* on the glide, should result. Increase the turns for each successive flight by a further 20 until a figure of 250 has been reached. A well-run-in motor will take as many as 290 turns, but this is an absolute maximum.

The model takes off from the ground in a most realistic manner, providing you fly from a good smooth surface and point the nose directly into wind. After winding fully, hold by one wing tip and the end of the uppermost propeller blade—then let go of them both at exactly the same moment. Finally, see that both wheels are revolving quite freely on the axles and lubricate the motor after every half-dozen flights or so.



Install the rubber motor in fuselage cut-out. Lubricate motor to enable maximum turns to be wound on.

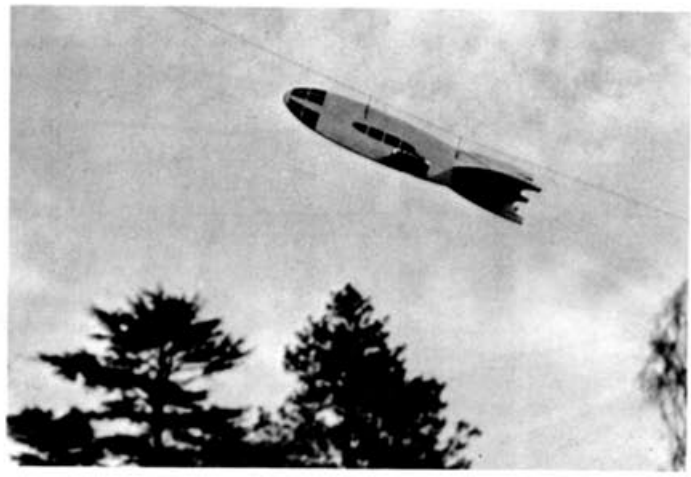
Launch smoothly straight ahead, facing into wind.

Clive Smith demonstrates correct launching method.

SPACE SCOUT

HERE'S ONE FOR THE SPACE SHIP FANS

BUILDING TIME:
3 HOURS



IN view of the ever-increasing interest in space adventure—it was felt that this book simply must include a working model of a typical 'space ship'. This little *Jetex* 50 powered craft is based on types similar to those appearing in science fiction stories—and is capable of speeds in excess of 60 m.p.h., along a 400-ft. line stretched between two trees.

1. Trace the three parts (A, B and C) on to *medium-hard* (*MH*) $\frac{1}{8}$-in. sheet balsa—with the grain direction as indicated. Cut out the parts and check that the tail (B) is a good fit in the rear slot of the body (A). Bend the wire parts (D and E) with a pair of pliers.

2. Mark the position of the wire parts and the motor clip screw-holes on the body—then trace on the cabin windows and other decorations with a soft pencil, going over them afterwards with a ball-point pen.

3. Cement the tail (B) to the body (A) and make sure that they line up squarely with each other in the rear view. When dry, pierce two holes for the clip retaining screws and cement the reinforcing piece 'C' to the left-hand side of the body (looking from rear).

4. Make two pin holes in the body to take the lower prongs of the 'D' and 'E' wire parts—then press the latter in place, smearing cement round them to make good strong joints.

5. Screw the mounting clip to the right-hand side of the body (with turned-up tag facing forward), then cement a 2 × 1-in. rectangle of asbestos paper immediately behind it.

OPERATING INSTRUCTIONS

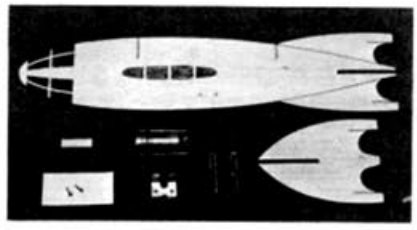
Stretch a length of fishing line between two suitable objects—such as trees or buildings—and tie a small piece of rag close to the 'destination' end of the line. The actual line-length will naturally depend on the space available, but use 400 ft. if possible. Loop the wire hooks over the line, light the motor igniter wick and the model will quickly gain speed and shoot along the line until it is stopped at the other end by the rag 'buffer' already mentioned.

Races may be run, by setting up parallel sets of lines—all models being released at the same instant, after allowing a couple of seconds for the thrust to build up. If the model is operated on a kite-line (see pages 60 and 62 for kites designs)—or a line stretched up the side of a hill—it will slide back to the 'release' end after the fuel is expended.

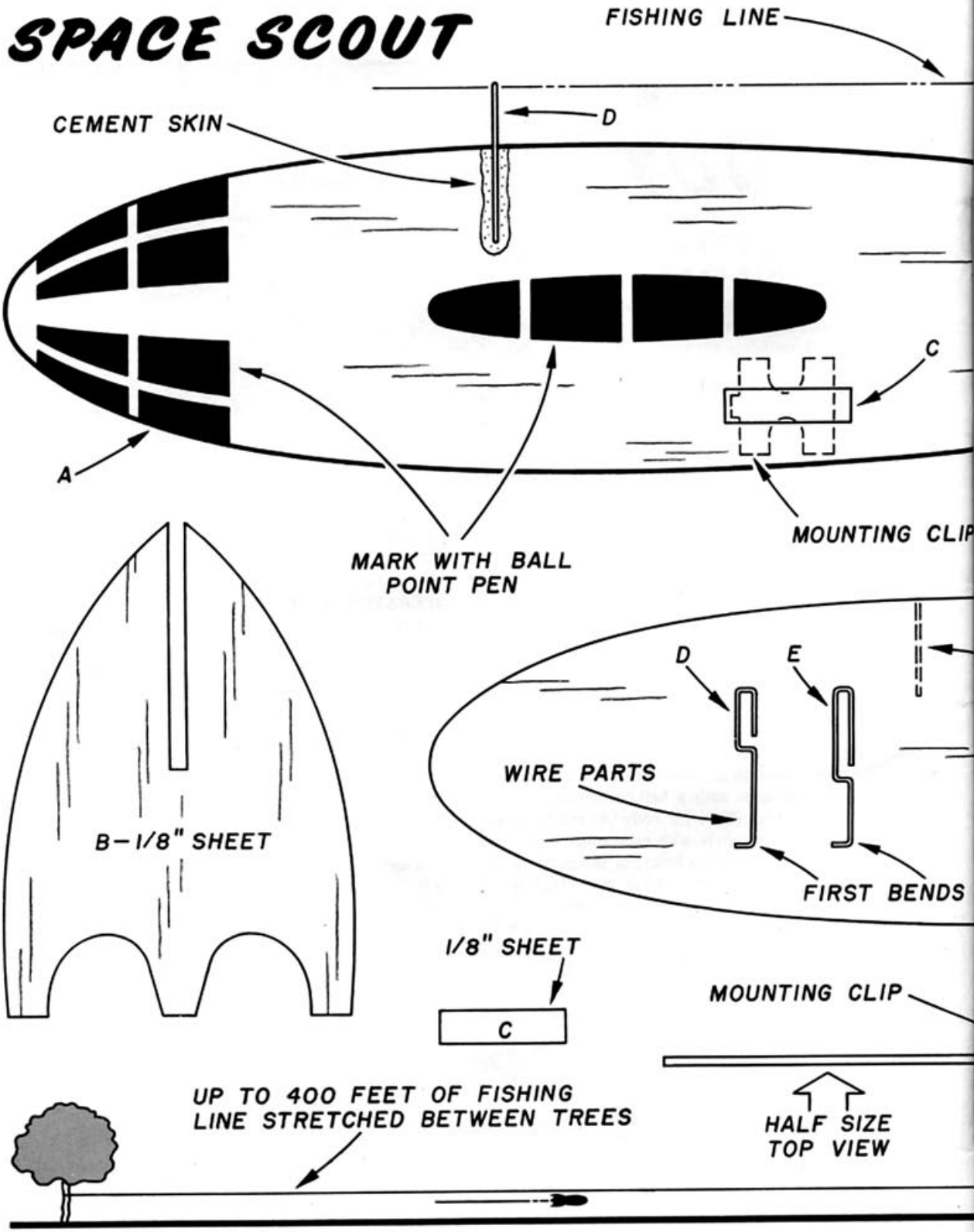
MATERIAL LIST

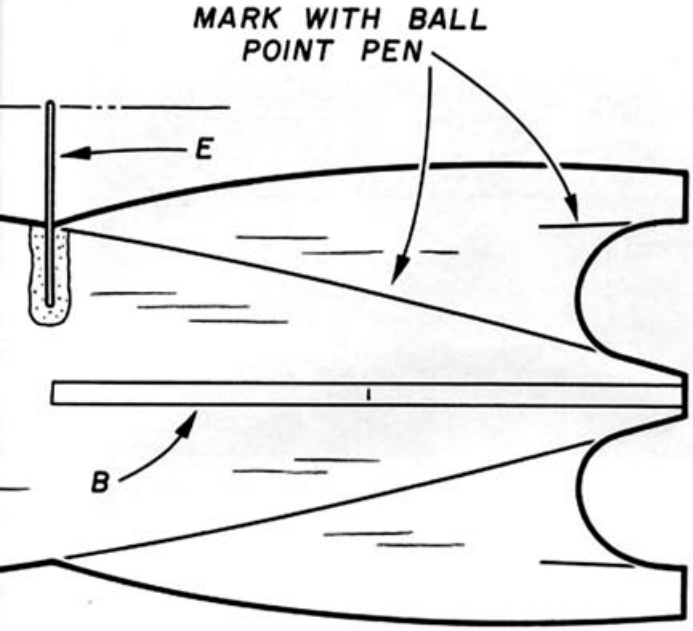
Sheet—1/8" x 3" x 18" (MH)
5 in. of 1/32" dia. wire
Jetex 50 mounting clip
TOTAL COST: About 40¢

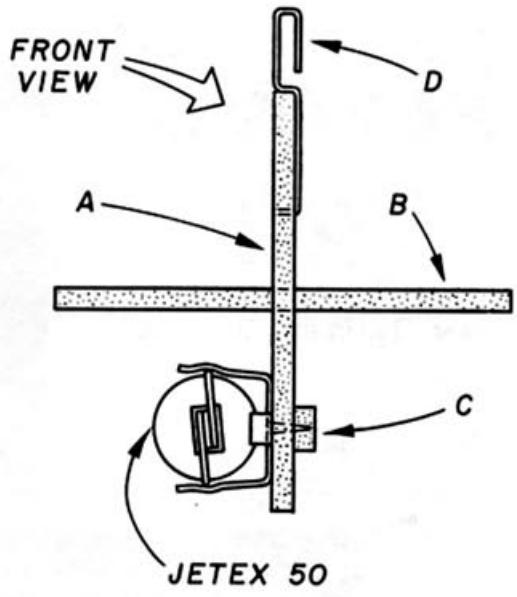
Only three piece $\frac{1}{8}$-ins. of sheet go to make up the 'Space Scout'.



SPACE SCOUT

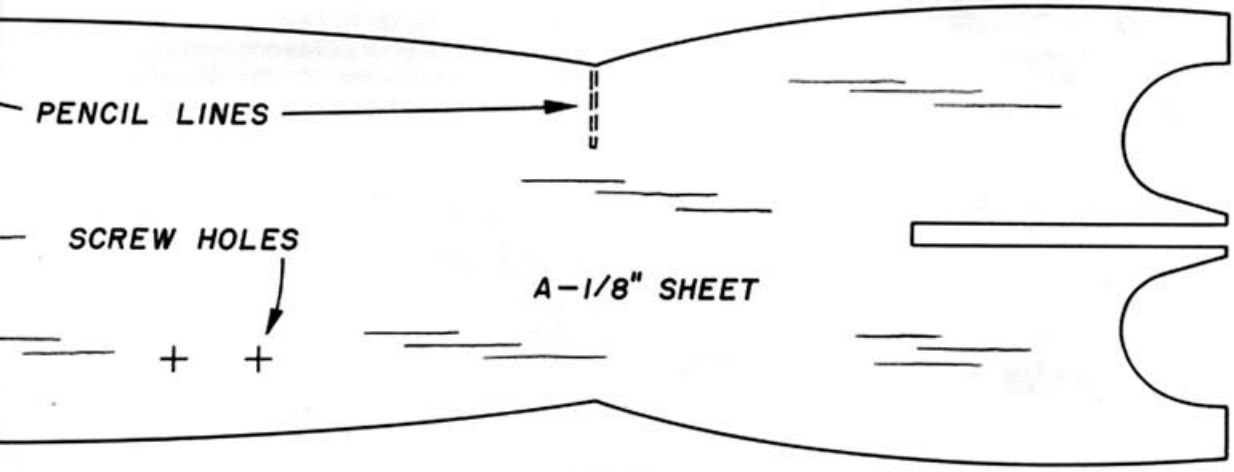

FISHING LINE
CEMENT SKIN
D
C
A
MOUNTING CLIP
MARK WITH BALL POINT PEN
D
E
WIRE PARTS
FIRST BENDS
B-1/8" SHEET
1/8" SHEET
C
MOUNTING CLIP
HALF SIZE TOP VIEW
UP TO 400 FEET OF FISHING LINE STRETCHED BETWEEN TREES

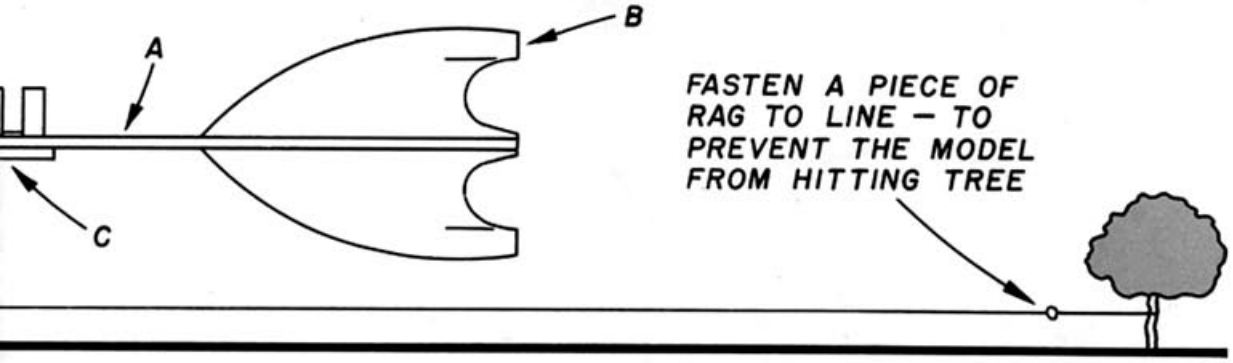




N OTHER SIDE

USE MEDIUM HARD BALSA FOR ALL PARTS

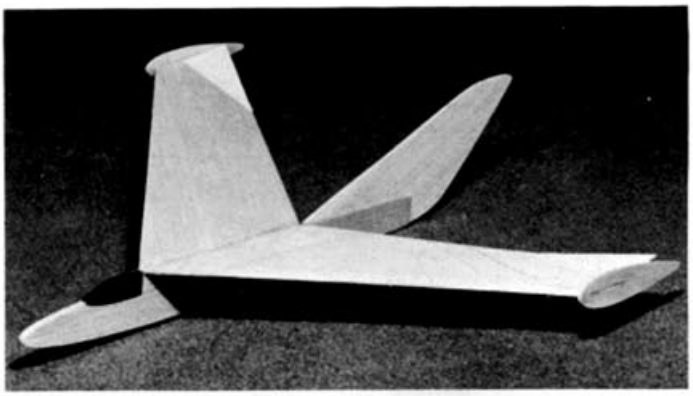




FLYING WING

A SEMI-SCALE 11 INCH SPAN TAILLESS GLIDER

BUILDING TIME:
3 HOURS

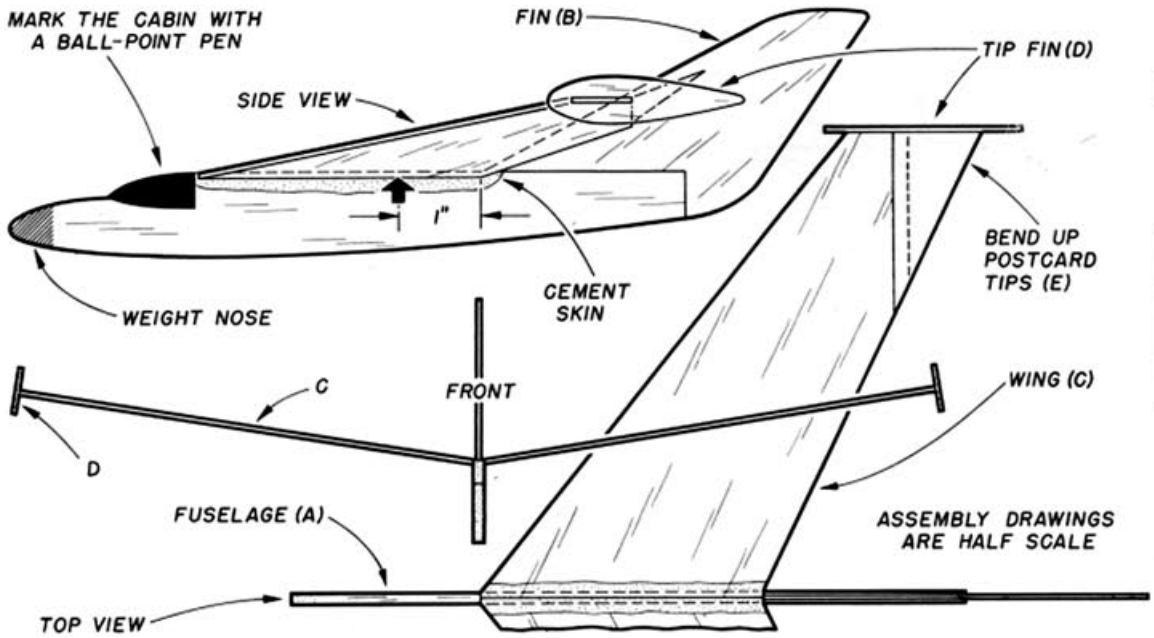


THIS *Flying Wing* or 'tailless' design is a typical example of one of the most unorthodox of all aircraft types. Although a stabilizer is normally used to provide fore-and-aft stability on conventional models, in this case the same effect has been obtained by sharply sweeping back the wings. The small tip fins on this particular design make the wing more efficient by preventing air from ' spilling ' off the ends.

A characteristic feature of *all* flying-wings, swept-back wing and delta designs, is that the ' balance ' point is always located well to the rear—as a study of the models on pages 12, 18 and 20 will show. In addition, swept-wings need very little dihedral and delta wings *none at all.*

1. Trace the A–D patterns on to waxed paper, cut them out, then cement them to medium (*M*) $\frac{1}{16}$ in. and medium hard (*MH*) $\frac{1}{8}$-in. sheet—noting the direction of the grain on the drawings. Cut out the parts, then use ' C ' as a pattern to make a duplicate wing panel.

2. Cut a rectangle from a postcard, then cut this in two diagonally to form the two wing tips (E). Draw in the cabin on the fuselage with a ball-point pen and mark the position of the $\frac{1}{16}$-in. sheet ' Z ' dihedral packing on the underside of the right-wing panel.



3. Sand the wing roots to a slight angle to allow for the dihedral, then pin the left-hand panel (C) down flat on the building board. Cement the right-hand panel (C) to it, propping up with the 'Z' packing and putting on one side until dry.

4. Cement the postcard tips (E) to the *top* of the wing tip rear edges—checking that the former are $\frac{1}{16}$ *in. inboard of the ends of the wings.* Now add the tip fans (D), so that they are at right angles to the wing panels as in the assembly drawing on opposite page.

5. Cement the fin (B) to the fuselage (A), then install the wing assembly. Use pins to hold the parts securely together until the cement has dried—and carefully check that the wings and fuselage line up correctly in the top and front views. Strengthen the wing/fuselage joints and the upper wing joint with a coating of cement (see assembly drawing on opposite page).

6. Push a pin into the top of the wing, 1 in. in front of the rear edge—above the large black arrow drawn on the fuselage side view. Now add weight to the nose (little is needed) until the model balances level when suspended from the pin.

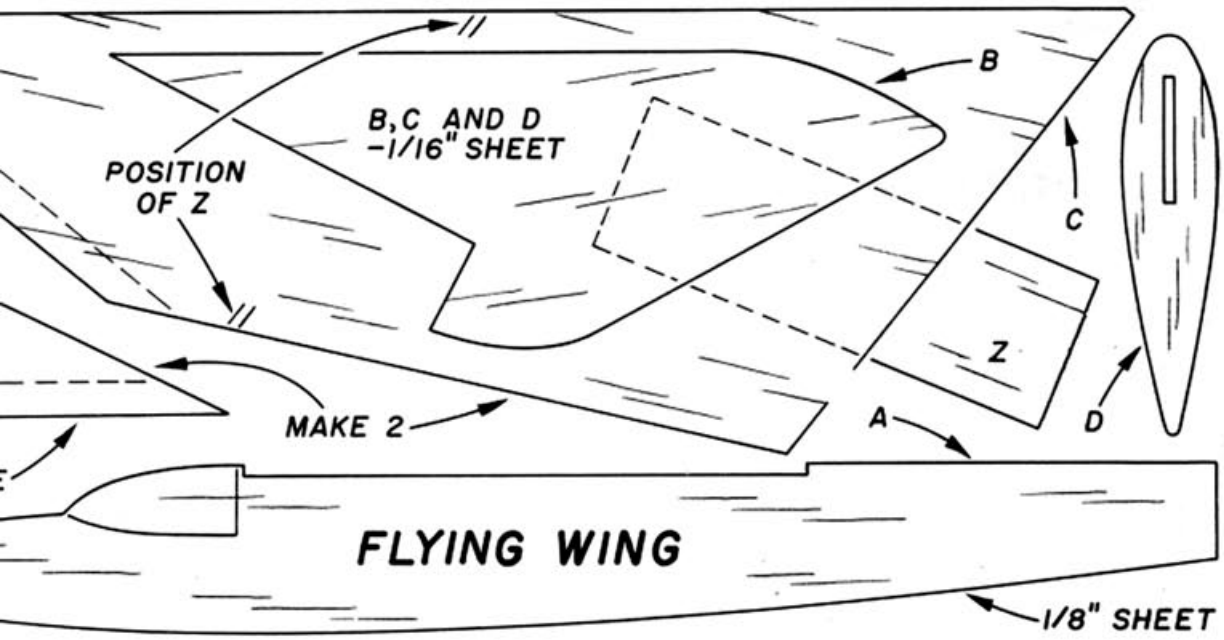
FLYING

Trimming is carried out by altering the angle of the postcard tips—no variation in nose weight being necessary if the balancing procedure detailed above has been followed. Start by bending up the rear edges of both wing tips about a $\frac{1}{4}$ in.—then face into wind and launch the model from shoulder height. If a dive occurs, bend up the tips more—if the model 'stalls', lower them slightly.

Turn adjustments are carried out by raising the tip on the same side as the required turn (right tip for right turn and left tip for left turn). When the trim is satisfactory, launch upwards as hard as you can, tilting the wings slightly to obtain a circular flight pattern for the best duration.

MATERIAL LIST	
Sheet—$\frac{1}{16}$" × 3" × 18" (M)	Sheet—$\frac{1}{32}$" × 3" × 9" (MH)
One postcard	TOTAL COST: About 30¢

Only eight parts go to make up this unorthodox model.



SWORDFISH

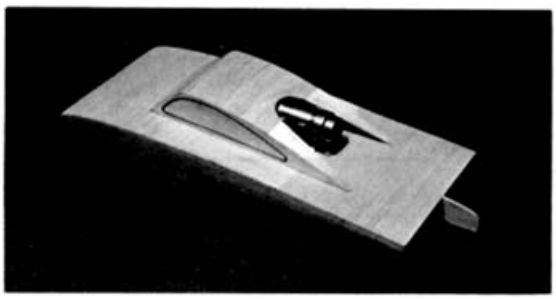
THIS SPEEDY JET-BOAT WEIGHS ONLY 1 OUNCE AND IS EASY TO MAKE

BUILDING TIME: 5 HOURS

THE most difficult part of building model speed boats is in the installation of the power plant and the shaft drive to the propeller. However, this problem does not arise in the case of the *Swordfish*, since propulsion is provided by a midget *Jetex* 50 unit. This sleek jet-boat is virtually unsinkable and will go faster than any conventional propeller-driven design of comparable size.

1. Trace all the parts, then attach ' A–G ' to $\frac{1}{8}$ in. and ' H ' to $\frac{1}{16}$-in. *medium* (*M*) sheet—noting the grain direction. Cut out all parts—pinning the combined ' A–G ' sides and ' H ' to sheet and using them as patterns to make duplicates.

2. Mark the position of formers ' C ' and ' D ' (in soft pencil) on the inner faces of the ' A–G ' parts—then cut along the dividing lines as indicated on the plan. Mark the cabin windows with a ball-point pen, on the outer face of the two ' G ' pieces. Pierce the screw holes in ' E.'



Complete model with loaded Jetex 50 motor in position.

3. Begin the assembly by building up the basic framework from parts ' A–D ' (see right of plan). Cement the side pieces (A) to the two ' C ' and ' D ' formers—holding firm with pins. Now add the two ' B ' pieces—noting that the front one is installed upright and the rear one flat.

4. When the cement has set hard, trim away the surplus material from the top and bottom of the front ' B ' piece —until it follows the contours of the side pieces (A). Cement the motor mount (E) in the slots provided in the two formers (C and D). Screw and cement the *Jetex* clip in place—making sure that the small turned-up tag is facing forward.

5. The entire framework is covered with $\frac{1}{16}$-in. sheet. Start with the area on top, on both sides of ' E '—with the sheet grain running *lengthwise*. Cut the pieces of sheet by the trial-and-error method and curve them downwards along the front edges (shown dotted on the pattern of former C). Parts of ' D ' project $\frac{1}{16}$ in. above the sheet covering, on both sides of the motor mount—to form locating points for cabin assembly.

6. Trim away any overlapping sheet, flush with the edges of ' C ' and ' D '—then add the rest of the upper sheeting, this time with the grain running *crosswise*. Use 2 in. wide pieces of sheet, working from the edges of formers ' C ' and ' D '. Allow at least an $\frac{1}{8}$ in. overlap at the sides, hold in place with pins (as detailed on left of plan) and trim away the surplus after the cement has set.

7. Cover in the underside with crosswise pieces of $\frac{1}{16}$ in. sheet (2 in. wide) and complete the hull construction by cementing part ' F ' to the front. When dry, sand ' F '

– until it merges with the side profile—and round off the front corners as shown on the plan.

8. Start the cabin by cementing the two ' G ' pieces to the top of the hull and the sides of the formers (C and D)—taking care not to smudge the cabin windows. Cut a rectangle of $\frac{1}{16}$-in. sheet to form the cabin front—and mark in the windshield with a ball-point pen before cementing in place.

9. Trace the pattern for the cabin top on to $\frac{1}{16}$-in. sheet, cut out and instal. Now add the small triangular ' H ' pieces to the rear edges of the cabin sides. Cut the rudder from $\frac{1}{16}$-in. sheet and cement it to the rear of the hull, at the centre. Cement a rectangle of asbestos paper to the sheeting just behind the motor clip to prevent damage from the jet blast.

10. Check the entire hull for any small gaps that might let in water—filling these with scrap slivers of balsa. Now waterproof the model by brushing on at least three or four coats of model plane clear dope—with a soft $\frac{1}{2}$-in. wide brush.

OPERATING INSTRUCTIONS

The *Swordfish* is best used in a shallow boating pool—in order that retrieving may be easily carried out. Load the motor according to the maker's instructions, slide it into the mounting clip and light the igniter wick. Place the model in the water, with the nose pointing in the direction you wish it to travel. As the jet thrust increases, speed builds up quickly, and since the complete model weighs only one ounce, it soon ' skims ' along on its ' step ', almost clear of the water.

If the model travels straight ahead, gently bend the rudder until the required amount of turn has been obtained. With practice, a wide sweeping turn can be executed, so that a full circle is completed just as the fuel charge expires. If used in a river or other deep water, it's a good idea to secure the *Swordfish* to one end of a 100-ft. length of strong white thread, so that it may be pulled back to the shore safely. Cement the thread to the bottom edge of the rudder and pull in slowly to avoid dragging the end of the boat under water.

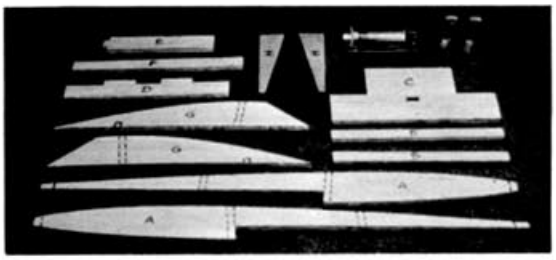
In the event of the motor becoming wet, dismantle and carefully dry all the parts before reloading with another fuel pellet. Bank-to-bank races between two or more of these speedy little models can be very exciting—with, say, a couple of fuel pellets as the first prize.

MATERIAL LIST

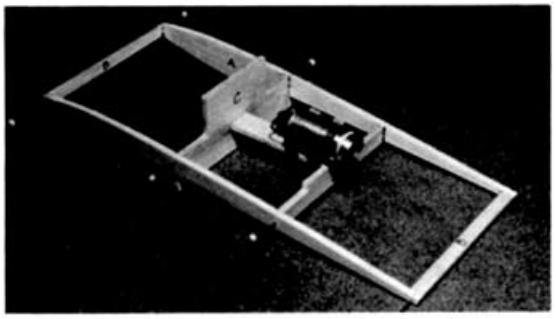
Sheet— $\frac{1}{16}$" × 3" × 30" (M) Sheet—$\frac{1}{8}$" × 3" × 12" (M)

Jetex 50 mounting clip

TOTAL COST: About 50c

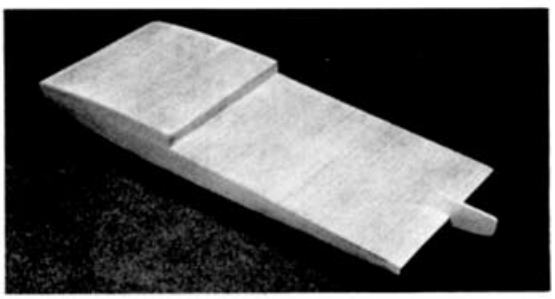


Cut out parts for the Swordfish. Mark in dotted lines.

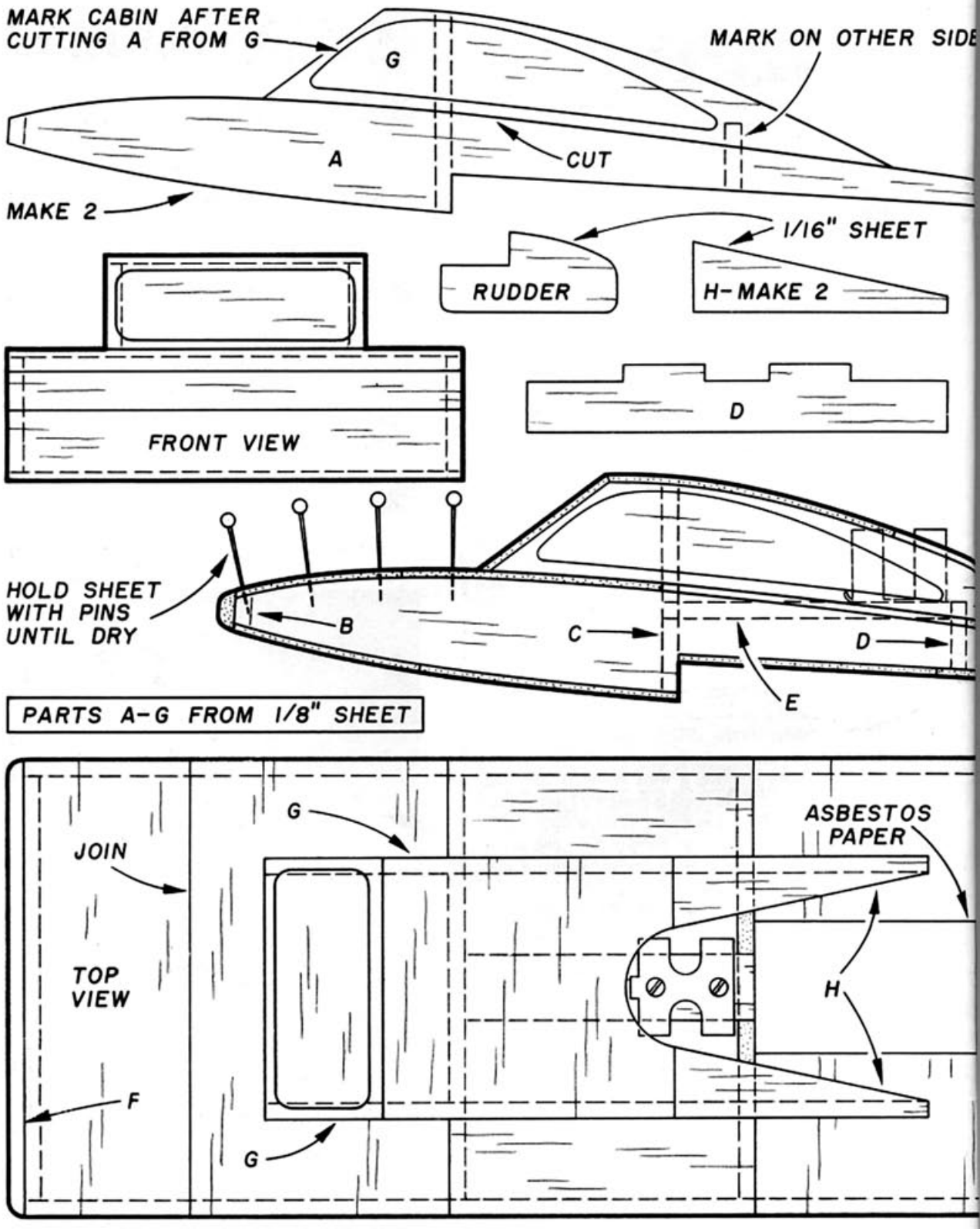


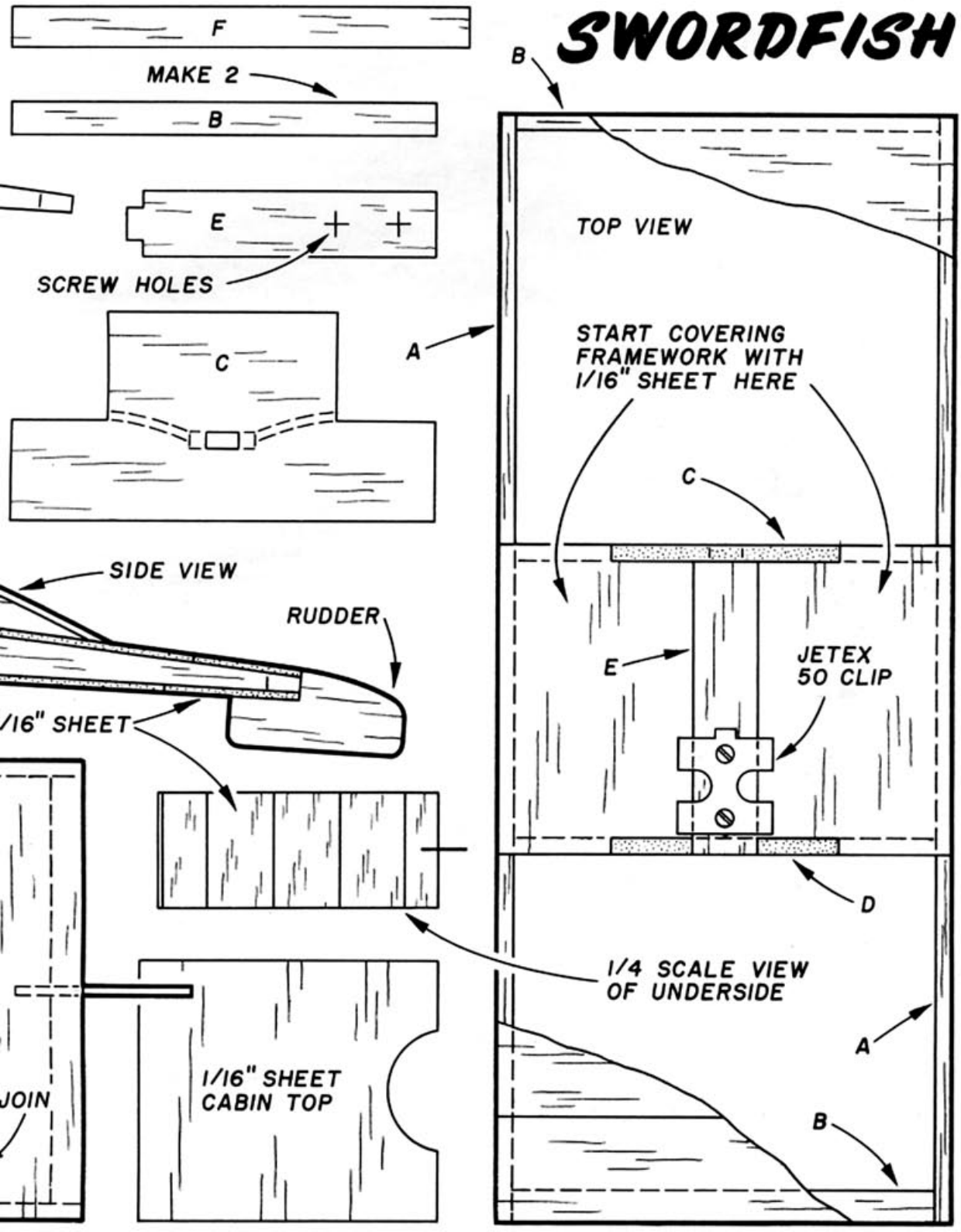
Build basic framework from parts ' A/D '. Screw on clip.

Cover top with sheet and draw windows on cabin pieces.



Sheet cover underside, then turn over and make cabin.

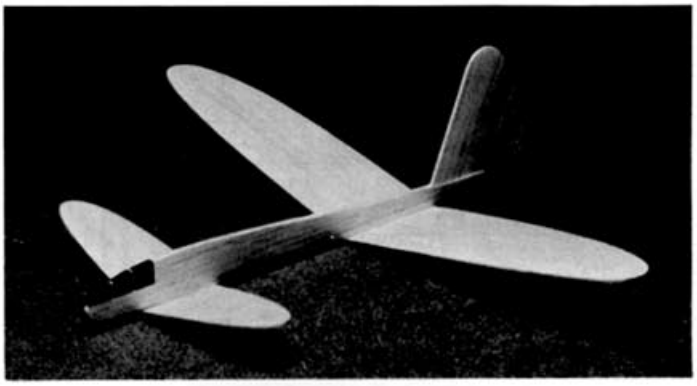

MARK CABIN AFTER CUTTING A FROM G
G
MARK ON OTHER SIDE
A
CUT
MAKE 2
1/16" SHEET
RUDDER
H-MAKE 2
FRONT VIEW
D
HOLD SHEET WITH PINS UNTIL DRY
B
C
D
E
PARTS A-G FROM 1/8" SHEET
G
JOIN
ASBESTOS PAPER
TOP VIEW
H
F
G


SWORDFISH
F
MAKE 2
B
E
SCREW HOLES
C
SIDE VIEW
RUDDER
/16" SHEET
JOIN
1/16" SHEET
CABIN TOP
B
TOP VIEW
A
START COVERING
FRAMEWORK WITH
1/16" SHEET HERE
C
E
JETEX
50 CLIP
D
1/4 SCALE VIEW
OF UNDERSIDE
A
B

CANARD GLIDER

AN UNORTHODOX DESIGN WHICH FLIES TAIL-FIRST

BUILDING TIME:
3 HOURS

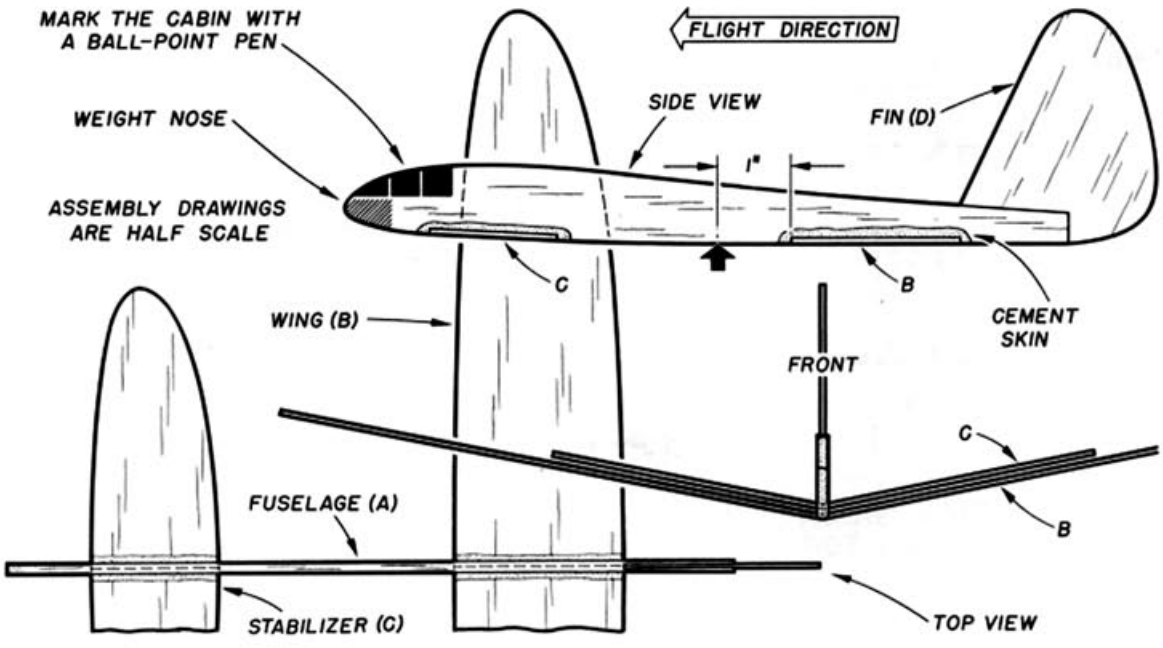


EVEN more unorthodox than the ' flying wing ' on page 44, is this *Canard* or ' tail-first ' design—which at first glance certainly looks rather like a normal glider with the fin stuck on the wrong end! However, in spite of its unusual layout, this tail-first model flies just as well as the conventional kind. In addition, the ' stall recovery ' is remarkably good—a feature of all models of this type.

1. Trace the four patterns (A–D) on to greaseproof paper, cut them out, then cement them to medium (*M*) $\frac{1}{16}$-in. and medium hard (*MH*) $\frac{1}{8}$-in. sheet—with the direction of the grain as indicated. Cut out the parts with a razor blade, then use ' B ' and ' C ' to make duplicate wing and stabilizer panels—carefully cutting round the outlines of the former.

2. Draw in the cabin with a ball-point pen and indicate the location of the $\frac{1}{16}$-in. sheet dihedral packing (Z) on the underside of the left wing and tailplane panels. Draw a pencil line across ' Z ', dividing it into equal parts horizontally.

3. Sand the wing and stabilizer roots to a slight angle to allow for the dihedral, then pin the right-hand wing panel (B) down flat on the building board. Cement the left-hand panel (B) to it, propping up with ' Z ' until dry. Next, repeat the process for the tailplane panels (C)—packing up the left-hand one with *half* of the ' Z ' dihedral



packing (see adjoining drawing)—after cutting in two along the dotted line.

4. Cement the fin (D) to the fuselage (A), making sure that it is upright. Note that in the assembly drawing side-view, only the location of the flying surfaces is shown—the dihedral being omitted for clarity.

5. Now join the wing to the fuselage, holding the two together with pins until the cement has dried—and carefully checking that the alignment is correct in the top and front views. Repeat the process for the stabilizer—then smear cement round the flying surfaces/fuselage joints as shown on the drawing.

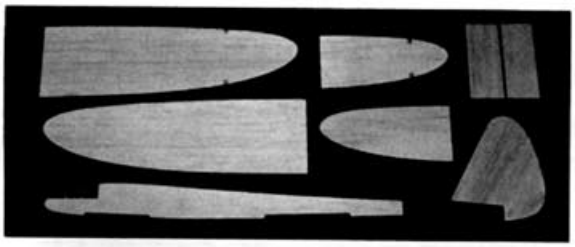
6. Unlike all other types, tail-first models always balance in *front* of the wing, not underneath it. Push a pin into the fuselage, 1 in. in front of the wing—above the large black arrow on the fuselage side view. A small amount of nose weight will be needed to make the model balance level when held by the pin—in the same way as with the other flying models in this book.

FLYING

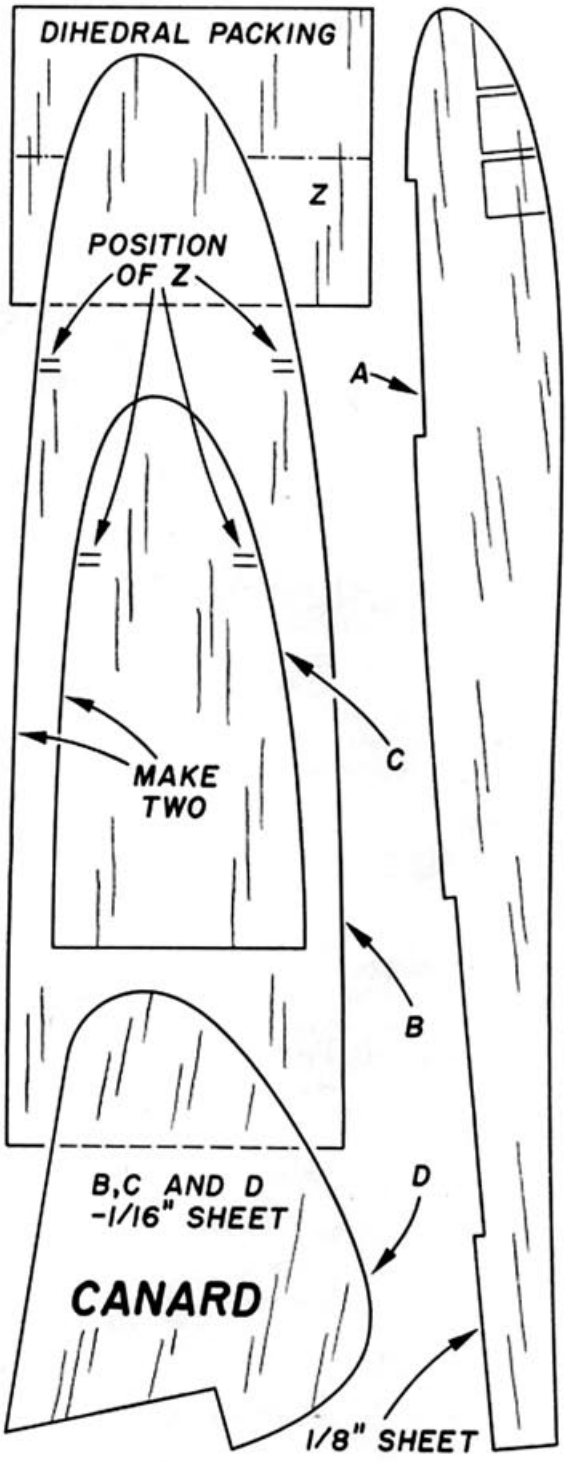
Adjust the flying trim by varying the amount of nose weight—adding a little if the model ' stalls ' and taking some off if it dives steeply into the ground. Hold the fuselage between thumb and forefinger, just in front of the wing and launch into wind on a slightly downward flight path.

Any tendency to dive off steeply to one side can usually be traced to warped flying surfaces. Adjust for a circle by gently bending the rear edge of the fin. When the trim is correct, throw upwards with the wings tilted (for a circling flight), to obtain the longest duration. Launching straight ahead will give a graceful loop, but a much shorter flight. In the case of difficult trimming, the first thing to check is that the balance point is exactly the same as that indicated on the left hand plan.

MATERIAL LIST	
Sheet—$\frac{1}{16}$" × 3" × 22" (M)	Sheet—$\frac{1}{32}$" × 3" × 9" (MH)
TOTAL COST: About 30¢	



Mark in the cabin on ' A ' before assembling the parts.



NOMAD

13-in. HIGH SAILING SLOOP

BUILDING TIME: 6 HOURS

JUST like all the other models in these pages, the *Nomad* is built mainly from balsa sheet. The interior of the hull is split into several watertight compartments—and the sails are easily replaceable should they become torn or dirty. When not in use, this little sloop makes a fine display model—cradled in its balsa wood stand.

Although built-up construction is featured, this is quite straightforward—with the basic framework being built flat on the building board. As illustrated in the photos on the adjoining page, the bulkheads are first cemented to the deck—and followed by the bottom, keel, dowel-mast and vertical grain side-sheeting.

1. Join three pieces of sheet together, edge to edge (pinning down until dry), to provide the cross-grain direction for the bottom (H.) Trace parts ' A–L ', then attach the ' A–J ' patterns to *medium* (*M*) $\frac{3}{32}$-in. sheet and the remainder to *medium hard* (*MH*) $\frac{1}{16}$-in. sheet. Cut out all parts with a sharp razor blade.

2. Cut the mast and boom from $\frac{1}{8}$ in. diameter dowel—and the jib (front sail) and mainsail (rear) from fairly thick tracing paper. Bend the ' U '-shaped boom connector from 20 gauge wire.

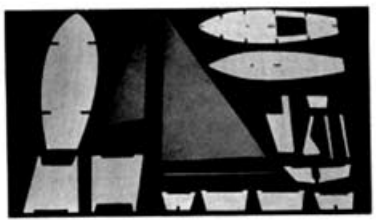
3. Begin the construction by pinning the deck (A) flat on the building board. Now cement bulkhead ' B ' in the front pair of slots, add part ' C '—then repeat the process for bulkheads ' D ' and part 'E '. Add the two remaining bulkheads (F and G).

4. When dry, remove enough of the pins to allow the bottom (H) to be attached. Align this by checking that the front of the mast hole and the rear of the rudder slot are level with the facing sides of bulkheads ' F ' and ' G '. Now cement the bottom in place, carefully checking alignment and holding firm with pins until dry. Cement the keel (I) in place—pushing the projecting strip through the slots cut in the bottom (H) and the deck (A).

5. Add the stern (J) next—after first carving its base to match the angle of the bottom (H) and slanting the rear end of the deck (A). When dry, gently sand the sides with the sanding sheet until the deck, bottom and bulkheads are level with each other—to provide a flat seating for the sheet sides. Cement the mast in the holes in ' A ' and ' H '.

6. Cut six $1\frac{1}{4}$-in. long pieces from the 3-in. wide $\frac{1}{16}$-in. sheet—for the sides. Cement the sheet in place (grain vertical), using plenty of pins to hold it firm. Start at the rear end and use smaller pieces at the front. When dry, trim off the surplus (top and bottom) with a sharp razor blade and sand the edges and sides smooth.

7. Brush on three coats of model plane clear dope—with a soft $\frac{1}{2}$in. wide brush—to make the hull waterproof. Slide the ' U '-shaped boom connector down the mast to a point $\frac{3}{4}$ in. above the deck—then squeeze the ends *gently* together to make a shallow groove in the dowel. Cut two grooves in opposite sides of the boom (at the mast end) and bind the 'U' connector to it with white thread.



Parts for model and stand. The sails are from tracing-paper.

8. Cement lengths of white thread to the three corners of the jib and the top corner of the mainsail. For a working model, the sails must be given a coat of clear dope, although the sails of a ' display ' model may be left as they are.

9. Fasten the mainsail to the mast top with thread, then to the mast and boom with 1¼-in. long strips of ½-in. wide transparent tape (see plan), after first soaping the mast so that the tape does not stick to it. Push a pin into the extreme front of the deck and another just in front of the mast. Tie the lower corner of the front sail to the front pin, then tie the upper corner to the mast. The remaining corner is tied to the other pin, leaving exactly 1½ in. of slack in the thread.

10. Make up the rudder assembly by cementing the two tiller pieces (K) together, with the rudder top (L) sandwiched between them. Simply cement the rudder to the stern for a ' display ' model. Open up a large paper clip, leaving the inner ' U '-shaped portion and bending the remainder to form the rudder-hinge as sketched. Several attempts may be needed to get the shape just right. Pierce a hole in the stern for the lower end of the rudder prong.

11. Secure the hinge to the rudder front edge with a ⅝ × ½ in. cloth patch (cut from an old handkerchief). Before the cement has time to set, make sure that the wire moves freely inside the cloth. When dry, cement the paper clip to the deck and the lower prong to the stern.

12. Pin a single strip of *very light* rubber (a piece from an old golf ball core is about the right thickness) to the front of the tiller—and secure the other end to the pin just forward of the mast. This rubber must be the exact length—neither stretched or slack. Push and cement a 1¾ in. long piece of 20 gauge wire into the rear of the tiller—then tie and cement a 2½ in. length of thread to the end of the wire and the end of the boom. Finally, weight the keel with 1¾ oz. of old cement tube, to keep the model upright in the water.

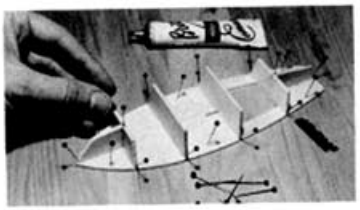
13. Parts for a simple stand (X, Y and Z) are drawn on the plan—but only the right half of the base (X) is given, so trace this to obtain the complete pattern. Cement the parts together, making sure that X and Y are vertical—then lightly sand the edges.

SAILING

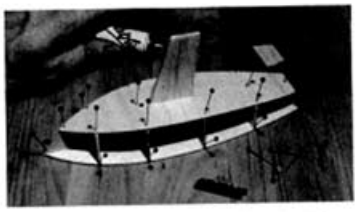
In view of its small size, the *Nomad* should only be sailed in very light winds. Sudden gusts have a tendency to twist the bow into the wind, but when this happens, opposite rudder is automatically applied by the increased tension on the boom thread—the rudder returning to neutral as the tension eases. Check that the rudder moves freely and always keep the sails as dry as possible, to avoid unsightly wrinkles.

MATERIAL LIST

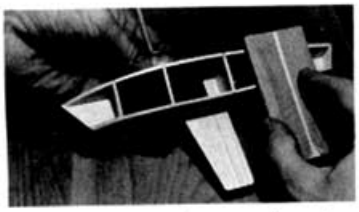
Sheet—1/32" × 3" × 18" (M)
Sheet—¼" × 3" × 18" (M)
Scraps of 1/16" sheet
18 in. of ⅛" diameter dowel
Sheet of tracing paper for sails
TOTAL COST: About 60c



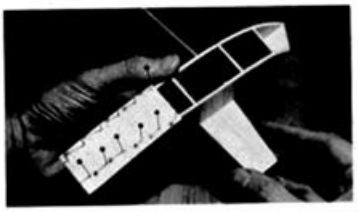
Start by pinning deck down flat and add formers (B, D, F, G)—also E and C.



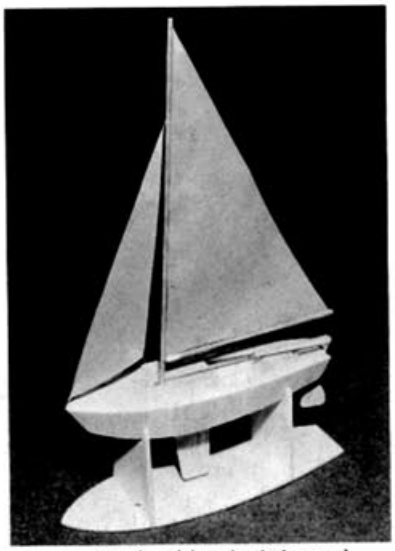
Now add bottom (H), followed by keel (I)—checking latter is vertical.



Cement the stern and mast in place, then sand the sides as illustrated.

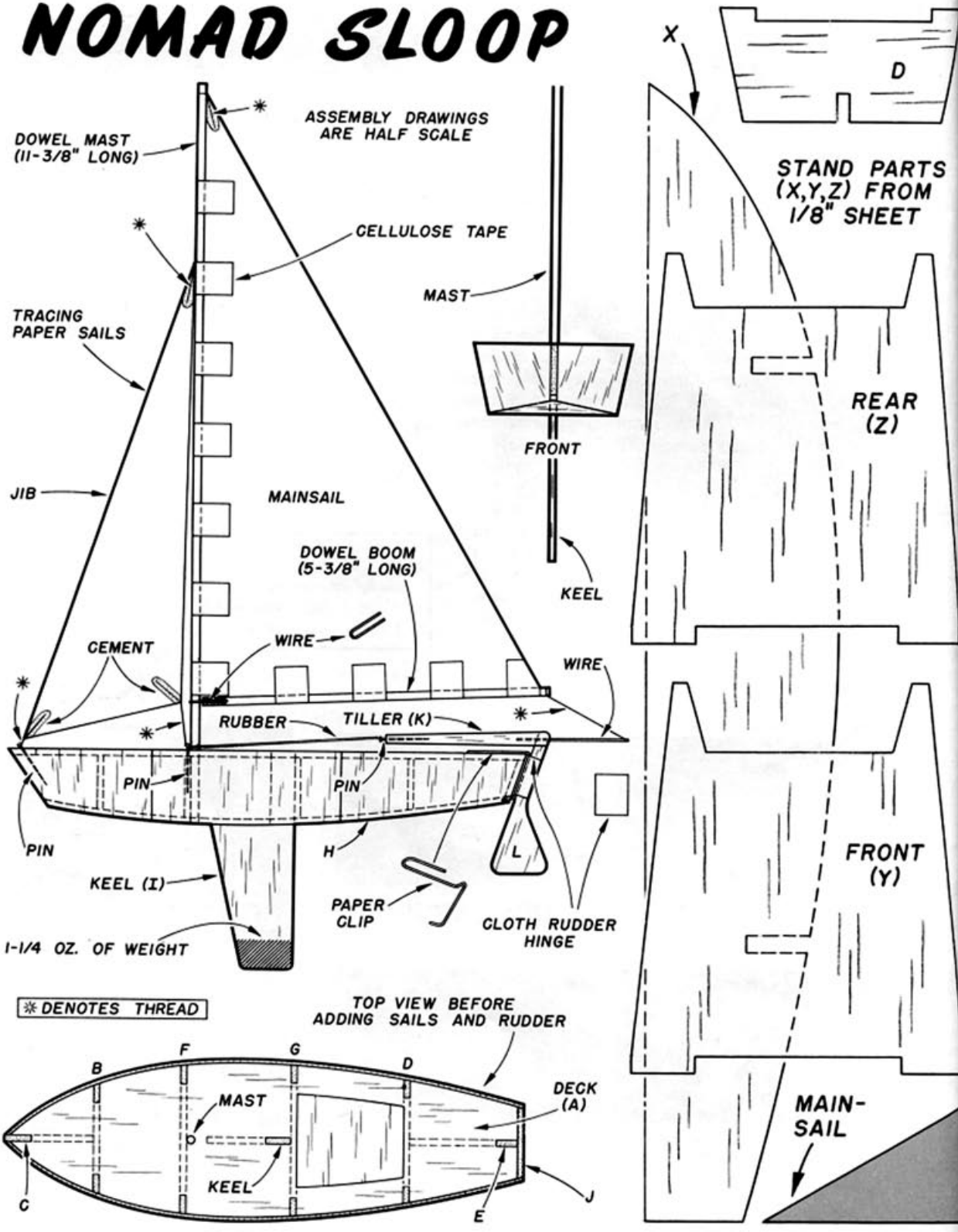


Cover the framework with 1/16-in. sheet—with grain running vertically.

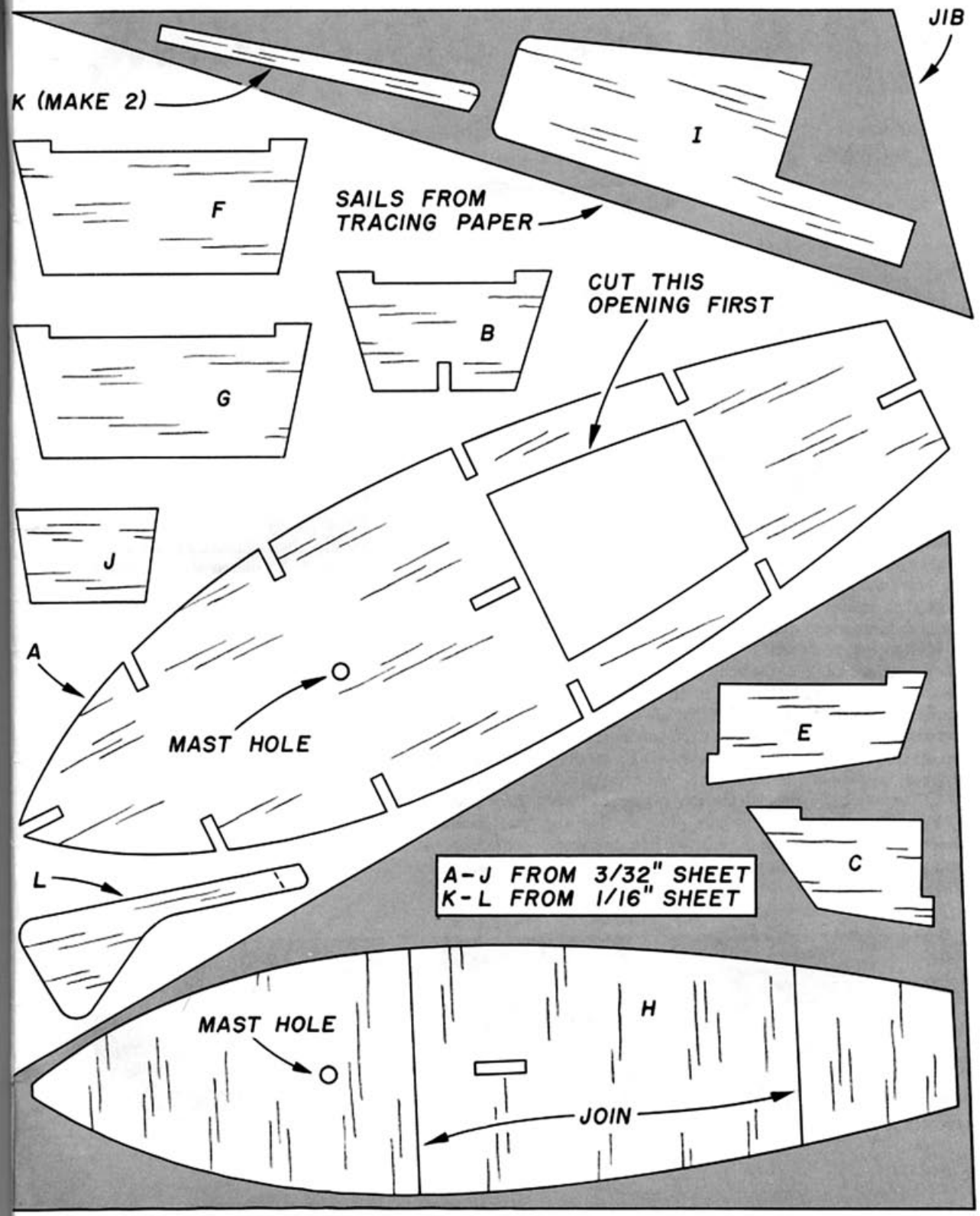


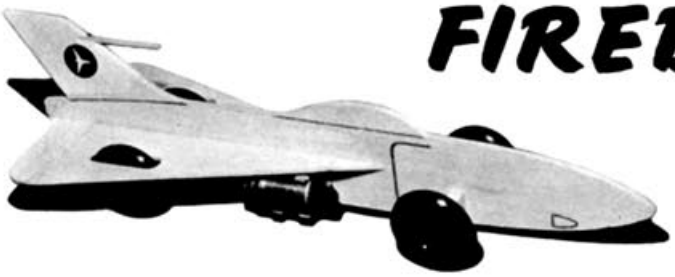
Completed model resting in its stand.

NOMAD SLOOP



✳ DENOTES THREAD


JIB
K (MAKE 2)
I
F
SAILS FROM
TRACING PAPER
CUT THIS
OPENING FIRST
B
G
J
A
MAST HOLE
E
C
A-J FROM 3/32" SHEET
K-L FROM 1/16" SHEET
L
MAST HOLE
H
JOIN



FIREBIRD CAR

JET-POWERED RACER

BUILDING TIME:
5 HOURS

GENERAL MOTORS *XP–21 Firebird* was the first gas-turbine car to be produced in the U.S.A. Powered by an engine developing 370 horsepower, this radical design featured 'flaps' set in stub-wings for additional braking efficiency—plus an aircraft-type fin to aid directional stability.

The model is powered by a *Jetex* 50 motor—which provides speeds of 15–20 m.p.h.—and may be run either tethered to a central ' pylon ' or in a straight line.

1. Trace the parts (A–E) on to *medium-hard* (*MH*) 3/32-in. and 1/8-in. sheet—with the grain direction as indicated on the plan. Cut these out and use pieces of 1/4-in. square strip (*MH*) for the axle pieces (F). Pierce holes centrally in the axle ends with a modelling pin.

2. Mark the motor clip screw holes on the body and the parallel locating lines on ' C ' and ' D '. Next, add the cabin, air intakes and other markings on the body and fin—using a ball-point pen.

3. Cement the fin (B) to the body (A), pinning the parts down flat. When dry, lift up and instal the axles (F)—making sure that they project an equal amount on both sides and are correctly aligned in the top and front views. Add the ' C ' and ' D ' stub-wing pieces—again carefully checking that they line up correctly.

4. Now attach the wheels (use any plastic 'balloon' type) to the axles with modelling pins, so that the wheels are up against the axle ends, yet free to revolve smoothly. Push two ordinary pins through the axles and body as shown in the front assembly view on the plan—to act as line guides for ' straight runs.' Cement the ' E ' wing pieces to ' C ', ' D ' and the body, enlarging the wheel cut-outs if necessary.

5. Pierce two holes for the clip retaining screws and cement the reinforcing piece ' G ' to the left-hand side of the body (looking from rear). Screw the mounting clip to the right-hand side of the body (with turned-up ' tag ' facing forward)—then cement 2-in. long pieces of asbestos paper to the wing and body behind the clip.

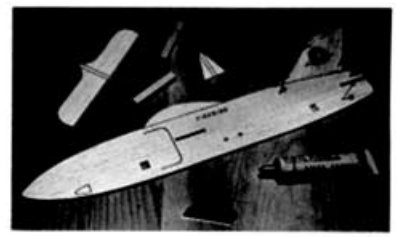
6. Finally, cement the match-stick in the fin-slot and trim away the lower corner of ' G '. The ' pylon ' is made up from four pieces of 1/8 in. sheet. Join two pieces edge-to-edge for ' X ', then cement ' Y ' on top of it and follow with ' Z '. Push a pin into the top, at the intersection of ' Y ' and ' Z ', leaving 1/4 in. projecting. Full size pylon patterns are given on the adjoining page and a photo of the completed unit appears below.

OPERATING INSTRUCTIONS

A *smooth hard surface* is essential for successful operation. For straight running, pass a 150-ft. length of thread through the ' guide-line ' pins (under the axles). Tie heavy weights to both ends or get a couple of friends to hold them taut—to provide a straight ' guide line '. If you have sufficient space, the car may be run ' free ', by offsetting the front axle slightly to provide a *large* diameter circle.

In this photo of the parts, those on the left are for the ' circuit pylon '.

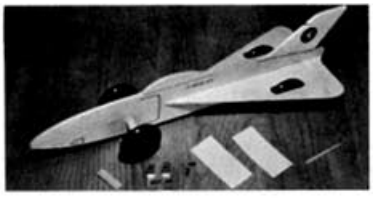
Push a pin into the pylon top—for the tether line.



Start the construction by cementing fin to fuselage pinning down flat.

1 *Final assembly: Cement the axles (F), 'D' and 'C' parts in place.*

2 *Pin wheels to the axles—then check that they revolve freely.*

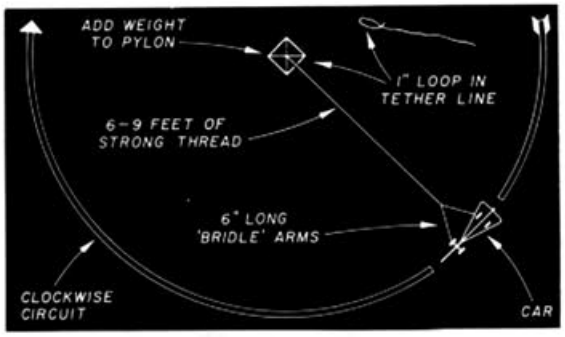


3 *Cement 'E' pieces to 'D' 'C' and fuselage. Install the motor clip.*

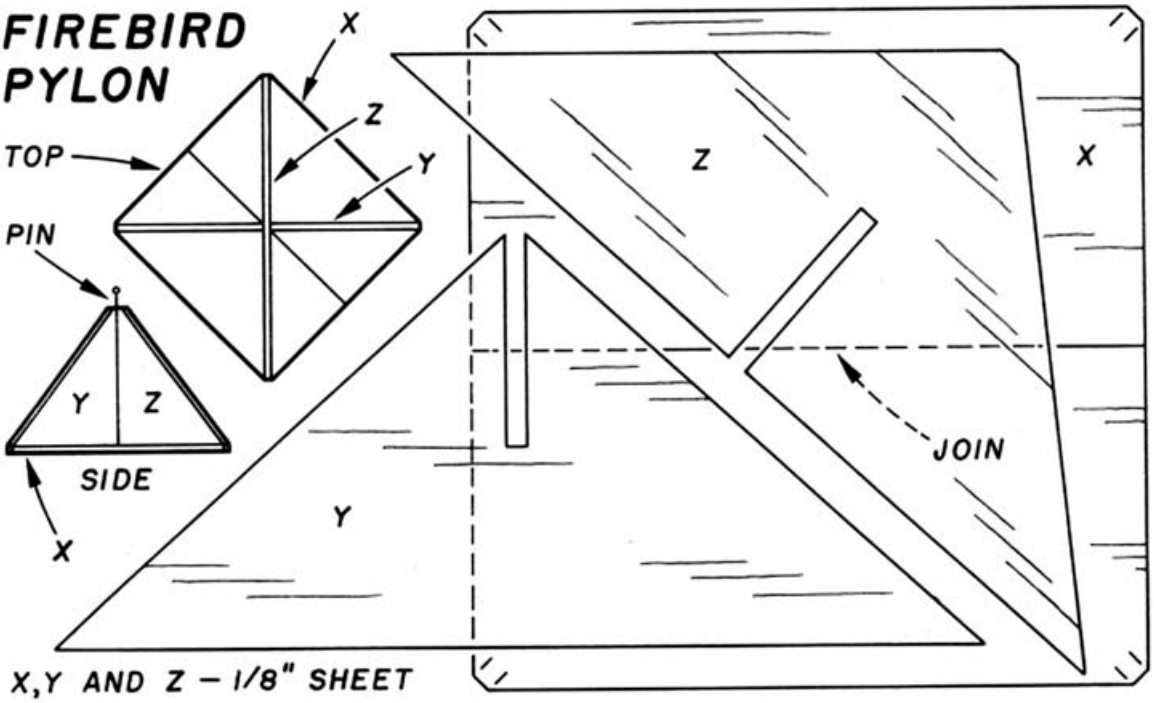
The best method of running the *Firebird* is to tether it to the pylon—as illustrated in the adjoining sketch. Make a small loop in the middle of an 18-in. length of thread and fasten the ends to the wheel retaining pins (to form 6-in. 'bridle' arms) *on the same side as the motor*. Tie the tether line to the 'bridle' loop and pull taut before putting a match to the *Jetex* igniter wick.

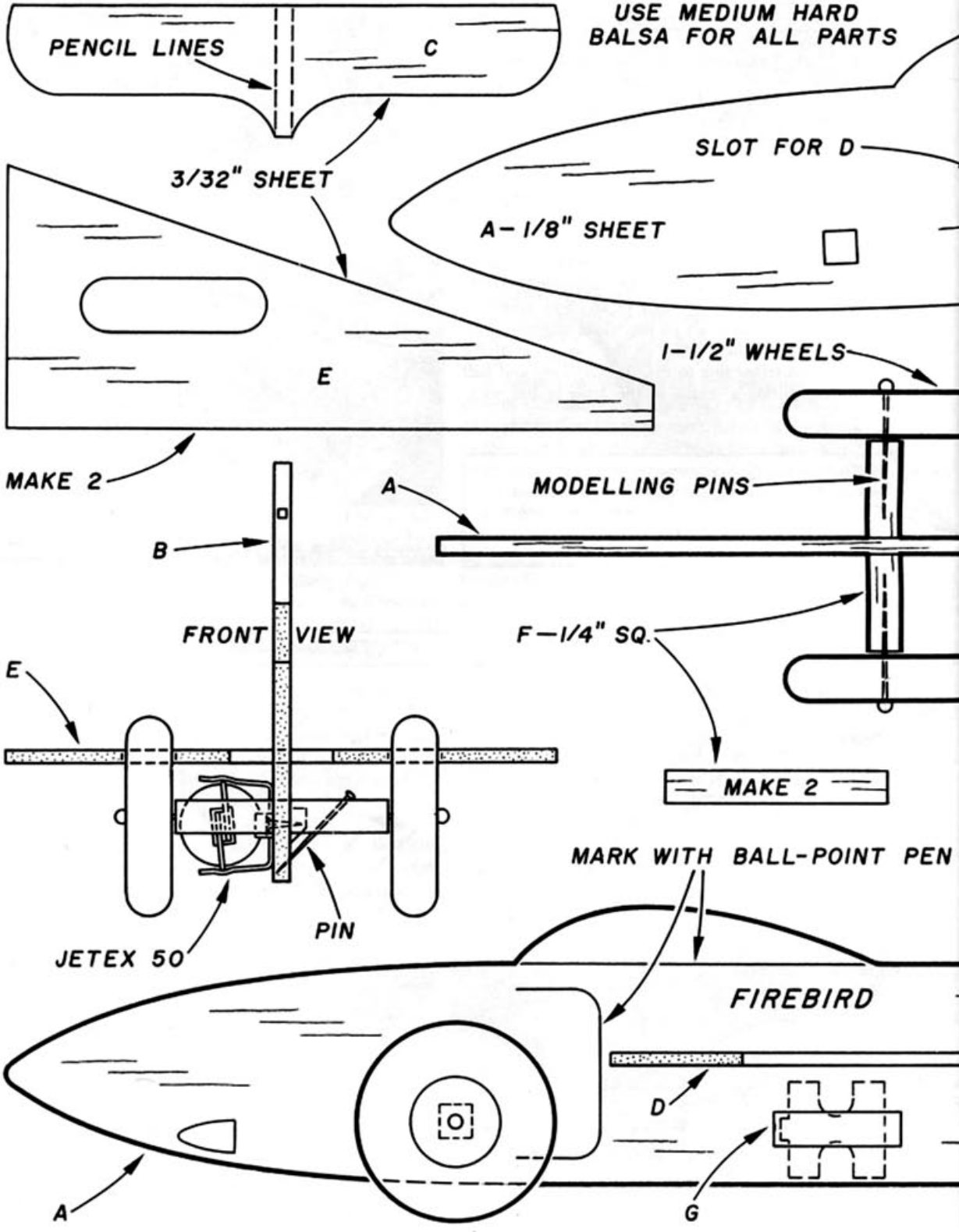
MATERIAL LIST

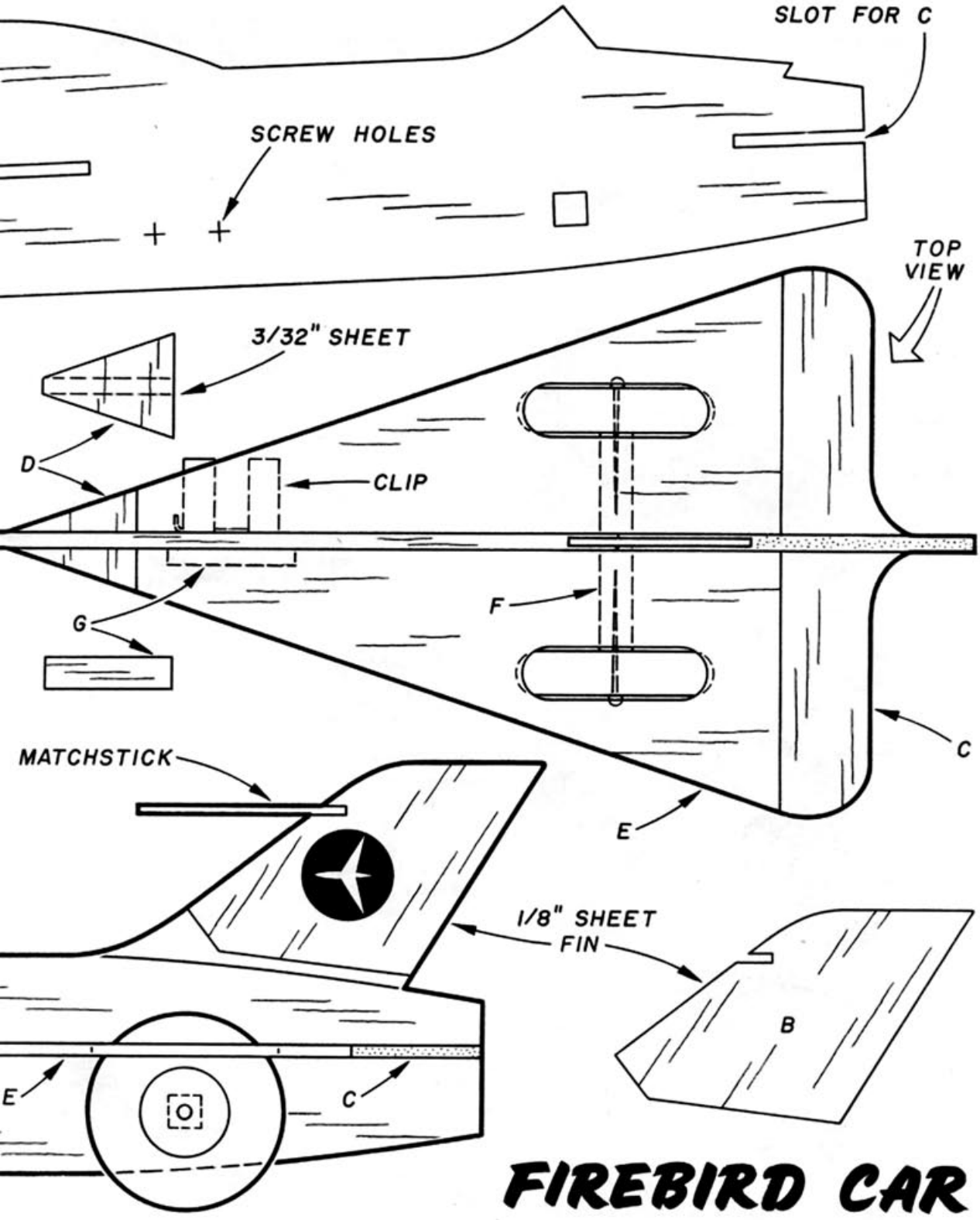
Sheet—1/32" × 3" × 8" (MH)
Sheet—1/16" × 3" × 27" (MH)
Strip—1/4" sq. × 4" (MH)
1 1/4" diameter plastic wheels (4)
Jetex 50 mounting clip
TOTAL COST: About 65¢



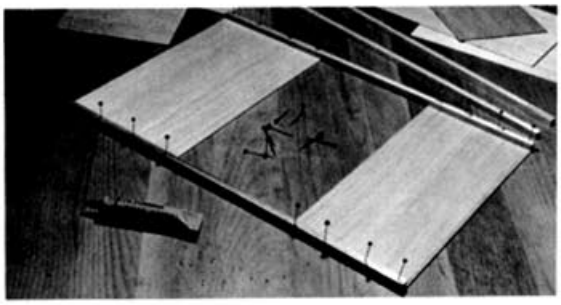
For circular operation, place the pylon on the ground and weight with several heavy objects. Make sure that the car's path is clear of stones.



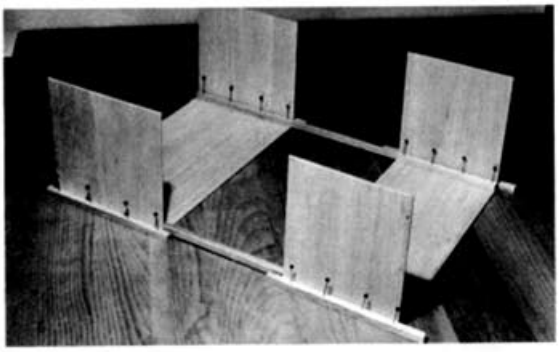

USE MEDIUM HARD BALSA FOR ALL PARTS
PENCIL LINES
C
3/32" SHEET
SLOT FOR D
A - 1/8" SHEET
E
1-1/2" WHEELS
MAKE 2
A
MODELLING PINS
B
FRONT VIEW
F - 1/4" SQ.
E
MAKE 2
MARK WITH BALL-POINT PEN
JETEX 50
PIN
FIREBIRD
D
A
G



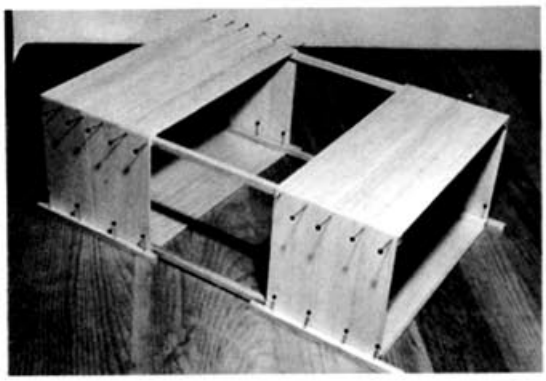
FIREBIRD CAR



Begin assembly by cementing and pinning two of the ¼" square × 13¾" spars on top of the horizontal sheet panels.



Cement vertical sheet panels to outside of horizontal frame—holding in place with scrap strip until dry.



Check side panels are upright, then cement the second horizontal frame between them—level with top edges.

MATERIAL LIST

Sheet (2)—1/16" × 3" × 36" (M)	Sheet—1/16" × 3" × 19" (M)
Strip (2)—¼" sq. × 36" (M)	Scrap pieces of ⅛" sheet
4 pieces of 1½" × 15" cloth	Scrap pieces of ⅛" square

Length of fishing line

TOTAL COST: About $1.10

CUMULUS

ALL-BALSA 1½-OUNCE BOX KITE

BUILDING TIME: 3 HOURS

ALTHOUGH a more advanced type than the one featured in the last couple of pages, the *Cumulus* kite is very easy to build—the ' box ' framework being quite rigid without the aid of internal bracing.

1. Start by cutting the 1/16-in. sheet panels from *medium* (*M*) 3-in. wide balsa (join 1½-in. pieces edge-to-edge). Cut *two* pieces to the length indicated for the combined ' A–B ' pattern, then separate ' A ' from ' B ' along the dotted line. Cut *four* ' C ' pieces.

2. The ' A1 ', ' B1 ' and ' C1 ' parts are the same width as ' A ', ' B ' and ' C ', but *longer*—as indicated on the plan. Cut *two* ' A1–B1 ' pieces, then separate ' A1 ' from ' B1 '. Cut *four* ' C1 ' pieces.

3. Mark which-is-which, then join these 16 pieces of sheet together in pairs, edge-to-edge and flat on the building board—' A ' to ' C ', ' B ' to ' C ', ' A1 ' to ' C1 ' and ' B1 ' to ' C1 ' (refer to plan). Cut four 13¾-in. long spars from ¼-in. square medium (*M*) strip.

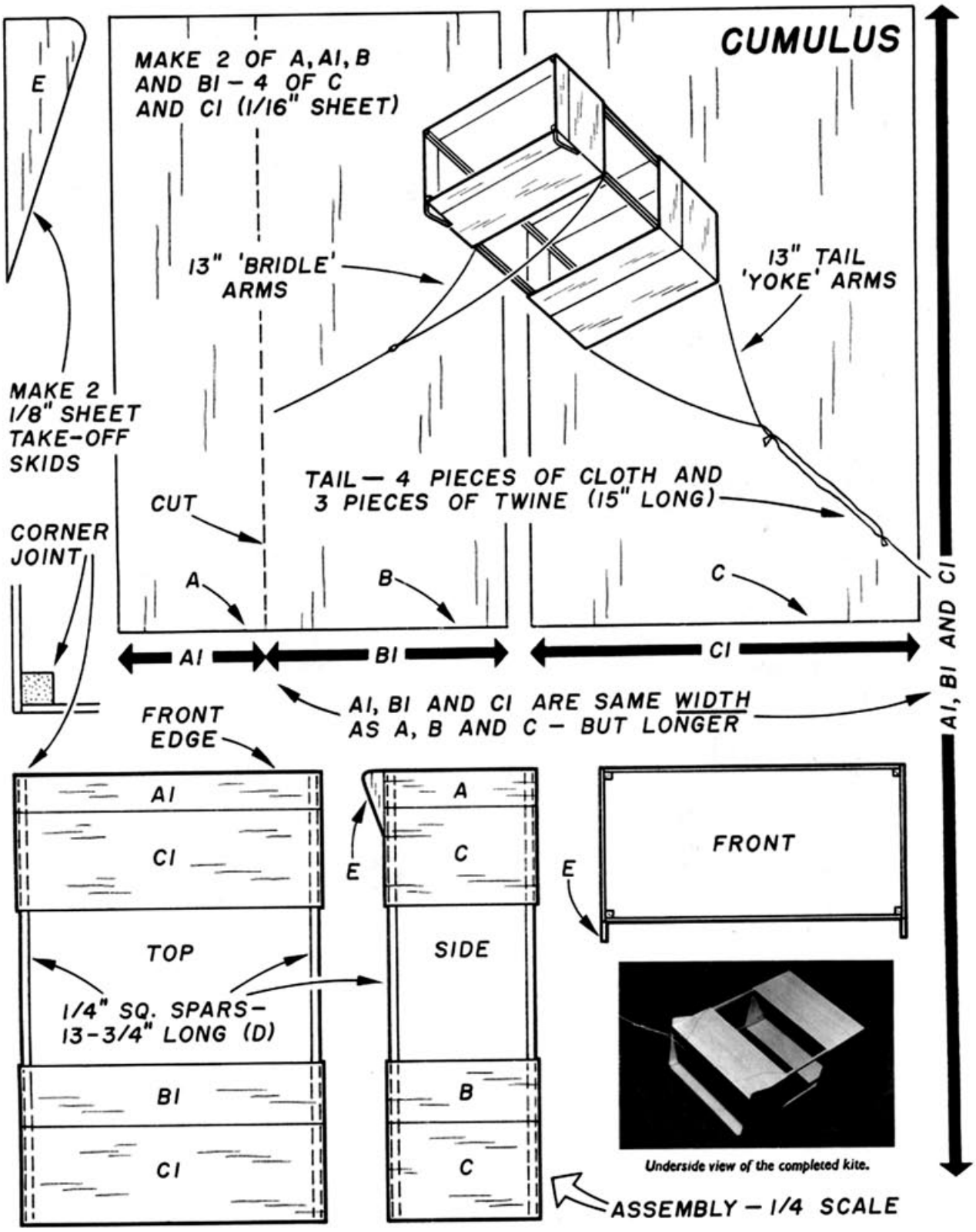
4. Begin the assembly by cementing two of the spars to one of the ' A1–C1 ' and one of the ' B1–C1 ' *horizontal* panels (flush with edges). Repeat the process with the other spars and horizontal panels. Next, cement the ' A–C ' and ' B–C ' *vertical* panels to the sides of the *first* horizontal frame—holding in place with scrap ¼-in. square strip and checking for correct alignment.

5. Complete the ' box ' by cementing the *second* horizontal frame between the vertical panels—level with the top edges. Cement the two take-off skids (E) in place.

6. Knot a 1-in. loop in a piece of twine and tie the ends to the lower spars (behind A–C panels), so that each ' bridle ' arm is 13 in. long. A tail is not normally needed, but in *very rough* conditions, a shortened version of the type used with the *Cirrus* (previous page) may be fitted for a greater margin of stability. See plan for details.

FLYING

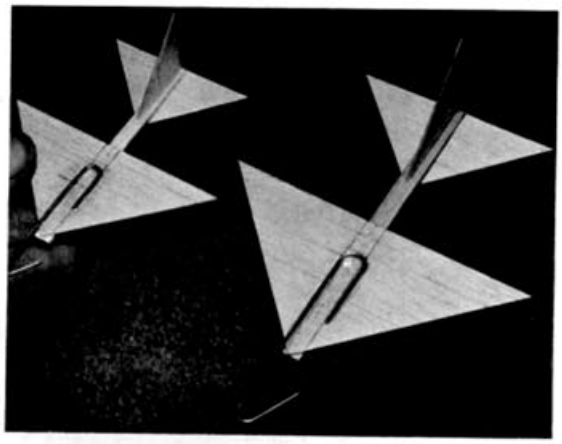
Use 250 ft. of strong fishing line for flying and either hand launch or take off from the ground by means of the ' skids '. A good way of absorbing the sudden stresses caused by heavy gusts of wind, is to add 6 ft. of ⅛ in. flat model aircraft rubber to the ' ground end ' of the kite line.



Underside view of the completed kite.

DART KITE-LAUNCHED MIDGET GLIDER

BUILDING TIME 15 MINUTES



THESE little kite-launched models cost only a few cents to make—patterns being provided for both 4-in. span (on left) and 3-in. span (on right—*shaded*) versions, to suit either large or small size paper clips. Cut out the four parts (A, B, C and D) from *medium* (*M*) sheet, then pencil the fuselage (D) location on the wing (A) and stabilizer (B). Taper the rear underside of the fuselage (C) as indicated by cross-shading.

Cement the wing *on top* of the fuselage, with pencil lines uppermost—then follow with the stabilizer (*underneath*), with the pencil lines again uppermost. Attach fin (C) to stabilizer, checking alignment. Finally, open up the inside ' U ' portion of the paper clip, bend to shape—and cement on top of the wing.

Test glide from shoulder height (indoors), correcting a dive by adding a drop of cement to the tail—or a ' stall ' by cement on the nose. Correct a steep turn with a *small* dab of cement on the *outside* wing tip.

Tie a 1-in. loop in the kite line near the ' bridle ' and get your helper to hook on the *Dart* before releasing the kite. When the kite is well up, a jerk on the line will shake the model free and allow it to glide back to earth.