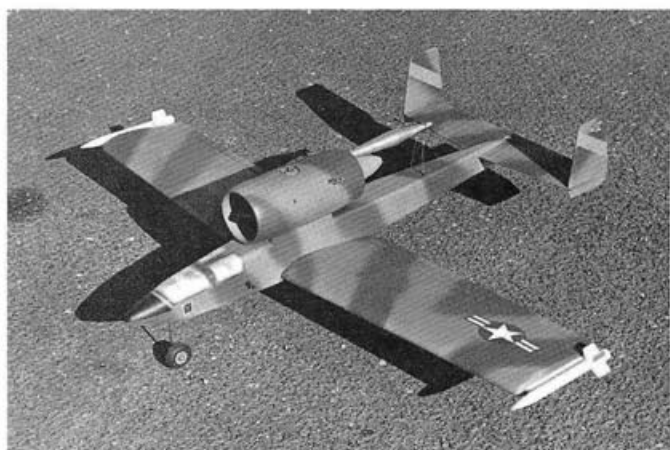


The Midwest Jetster .20 is a good ducted-fan trainer. It is stable in flight, yet can perform most aerobatic maneuvers. The model



on the left has an orange and cream finish, that on the right has dummy rockets and a military camouflage paint job.

CHAPTER 4

Building your first ducted-fan model

Your first ducted-fan model aircraft should be easy to build — and repair. It must be stable in flight, yet be able to perform aerobatics. One combination of aircraft, fan unit, and engine that meets these criteria is Midwest Products' Jetster .20 airplane, powered

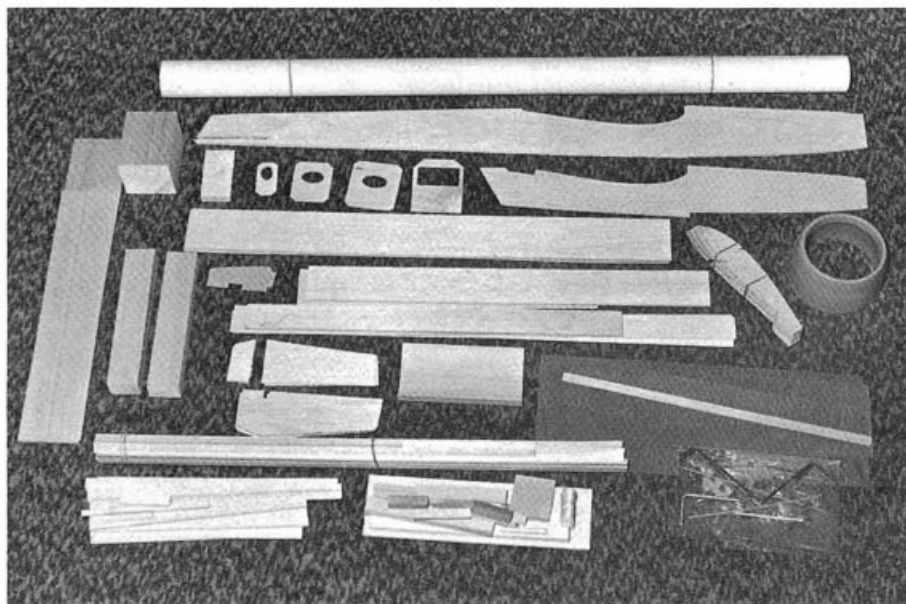
by the Axiflo RK-20B ducted-fan unit and the K&B 3.5 cc engine. Although it vaguely resembles German jet fighters of the 1940s, I designed the Jetster .20 as a non-scale model. It is built of balsa and plywood, with Monokote or Solarfilm covering, and can be assem-

bled quickly (typically in less than 50 hours) using familiar modelbuilding techniques.

The Jetster .20's wingspan is 48", large enough for good performance but small enough for easy transport. The ducted-fan unit is mounted externally, so engine starting is much simpler than with an internal fan unit. The K&B 3.5 cc engine is less expensive and burns less fuel than 7.5 cc or .60 engines, delivers more than 20,000 rpm "out of the box," and idles well. The Axiflo RK-20B ducted-fan unit is made of molded parts and can be assembled quickly. Use any four-channel RC system with lightweight servos.

Building the Jetster .20

The Jetster .20 plan is reproduced approximately one-third size on pages 20 and 21. Carefully read the plan in your kit until you know where each part goes and when it is to be added to the wing, fuselage, or tail. Assembly requires only common modelbuilding tools such as a hobby knife, modeling pins, sandpaper and sanding blocks, needle-nose pliers, screwdrivers, and a sealing gun or iron for the plastic covering. Your building board should be at least 10" wide and 36" long. Use a white glue such as Elmer's Glue-All or an aliphatic resin glue such as Frank-



Jetster kit parts ready for assembly. Study the plan and examine all parts until you know where each will be used.



The bottom wing spar and ribs are pinned to the building board through the plan, then the leading and trailing edge parts are added.



Most planking has been glued to the wing. Next, the wing halves will be trimmed, sanded, and joined together.

lin Titebond, except where the plan calls for contact cement or epoxy.

Wing

Cut out the portion of the plan sheet showing the wing sections, place it on your building board, and cover with waxed paper. Several wing ribs are reinforced with $\frac{3}{32}$ " birch plywood doublers; glue these doublers to the ribs. Pin the lower wing spar to the building board, install the ribs, and add the leading edge and top spar. The ribs have "feet" toward the trailing edge that hold each rib in alignment; cut off these feet before adding the planking on the bottom of the trailing edge.

Next, install the leading and trailing edge planking (moisten the wood to make it easier to bend), install the landing gear blocks, add cap strips to

the tops of the ribs, and glue the wing tip blocks in place. Carve and sand these blocks to shape. Check all parts for perfect alignment before and after gluing. Sand the leading and trailing edges until all surfaces are smooth.

Glue the V-shaped balsa wing dihedral wedge to one wing half, carve it to the shape of the airfoil, then glue the other wing half in place. Each wing half has 2" dihedral. Strengthen the wing center section with a piece of 4"-wide fiberglass cloth and slow-setting epoxy glue. Spread the glass cloth over the joint and force epoxy into it with a cardboard squeegee.

Install the aileron hardware, cut hinge slots in the trailing edge of the wing and the leading edge of the ailerons, and test fit the nylon hinges provided with the kit, but do not glue

them in place until after the wing has been covered.

Fuselage

Begin to build the fuselage by gluing sheet balsa doublers to the inside of the left and right fuselage side pieces. Then add the triangular corner braces as indicated on the plan. The fuselage sides are parallel between formers F-2 and F-3, so first glue these formers to one side, making sure they are perpendicular. Then glue F-2 and F-3 to the other side, pull the sides together at the nose and tail, and install the remaining formers. When doing this, set the pieces over the plan and check that both sides curve in equally.

Bolt the nylon nose landing gear block to former F-1 and glue on the balsa nose block. Install the hardwood mount for the Axiflo ducted-fan unit. Plank the top front of the fuselage with $\frac{3}{16}$ " sheet balsa and plank the top rear and bottom of the fuselage with $\frac{3}{32}$ " sheet balsa. Apply planking so that the grain runs crosswise to the long axis of the fuselage. Sand the fuselage to round all corners, making sure the nose block is attractively shaped.

The forward part of the wing is held to the fuselage by a $\frac{1}{4}$ " dowel, and the rear is fastened by two 8-32 nylon bolts that thread into hardwood blocks in the fuselage. Prepare these mounts per the instructions.

Tail

The vertical and horizontal stabilizers are made of sheet balsa. Sand the leading edges to a rounded shape, then glue the vertical stabilizers to the horizontal stabilizer so that they are parallel to each other and at right angles to the horizontal stabilizer. Cut hinge slots in the trailing edge of the horizontal stabilizer and the leading edge of the elevator and test fit the nylon hinges, but do not glue them in place until after the model has been covered and painted.

Joining the parts

After the wing, fuselage, and tail have been assembled, they must be joined together. Trim the wing saddle on the fuselage until the wing fits correctly, and prepare the nylon wing-mounting assemblies. Slide the tail into the slots in the fuselage, carefully check for proper alignment, and glue. Reinforce the tail/fuselage joints with a fillet of microballoons and 5-minute epoxy, shaping the mixture with your fingertip. The epoxy and microballoon fillet adds little weight, but vastly improves strength and appearance.

The Jetster .20 kit includes a molded plastic inlet duct and $\frac{3}{64}$ " plywood for the outlet of the ducted-fan unit. Use these, or buy a special short molded inlet and a molded outlet from Kress Technology. On my own models, I use

the Kress inlet and outlet and wrap the center portion of the fan with a cowling made of $\frac{1}{8}$ " plywood. The Axiflo RK-20B ducted-fan unit is held to the model by four 4-40 bolts that pass through hardwood bearers in the fuselage. Self-locking nuts with nylon inserts (aircraft fasteners) ensure that the unit can't shake loose.

Landing gear

Music wire landing gear struts come with the kit; 2" wheels must be purchased separately. I install a longer nose strut on my models to make the plane sit with the nose level with the ground — a big help in making smooth takeoffs. The steerable nose strut rests in nylon wheel bearings attached to former F-1.

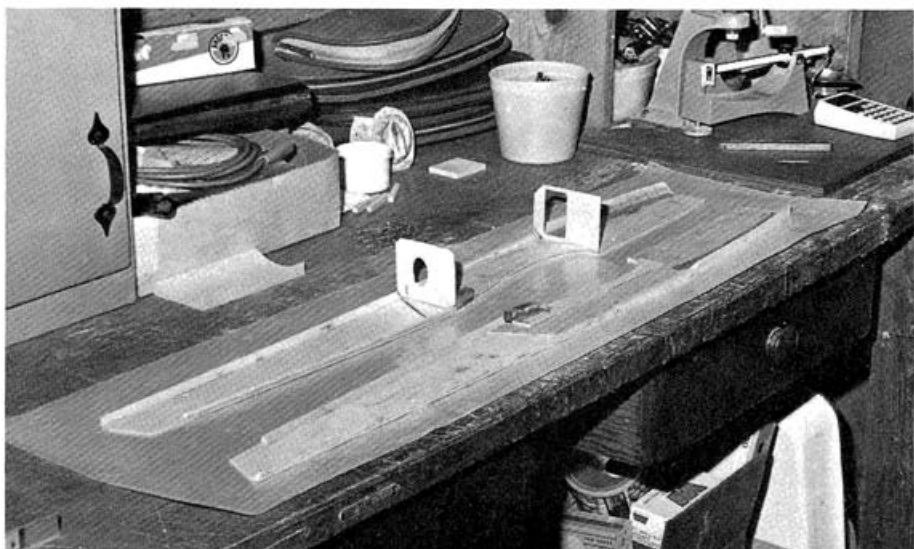
Radio installation

Any four-channel RC system with small servos can be used with the Jetster .20. I fly my latest version with a Royal Electronics Super Sport transmitter and receiver with RS-4 Bantam servos. Mount the aileron servo as deep into the wing as possible by cutting a hole in the center section planking and removing a section of the center ribs. Epoxy $\frac{1}{4}$ " plywood servo mounts into the wing and attach the servo with screws driven into these blocks.

Mount the throttle servo just behind former F-2; a wooden brace and a sheet metal clamp hold the throttle cable (a Nyrod) in place behind the servo. The elevator and nosewheel servos go side by side just ahead of former F-2. I use $\frac{1}{4}$ " dowel for the elevator pushrod and a piece of $\frac{1}{32}$ " wire inside a nylon tube for the nosewheel steering linkage. Put the battery pack as far forward as possible, for balance, leaving plenty of room for the receiver, which must be wrapped in soft foam rubber or plastic.

Covering and painting

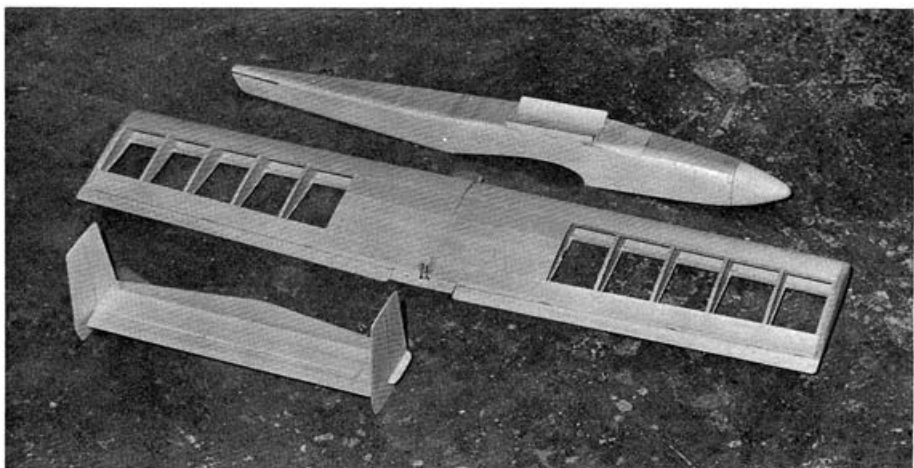
I covered the wing of my first Jetster with Monokote, and painted the rest of the model and the ducted-fan unit. For my latest Jetster, I decided to paint the entire model in a military-style camouflage scheme, so I covered the wing with Silkspun Coverite, a strong iron-on covering, and gave the model several coats of clear dope. Then I applied three coats of Sig sanding sealer to all wood parts, sanding after each coat. A coat of automobile primer came next, followed by color coats of gray on the bottom and dark brown and light brown on the upper surfaces. I drew in decorative panel lines with a drafting pen, airbrushed the canopy with light blue and black dope, and sprayed the entire model with several protective coats of clear flat dope. I then epoxied the elevator and aileron hinges in place and checked that they were securely fastened and could move freely.



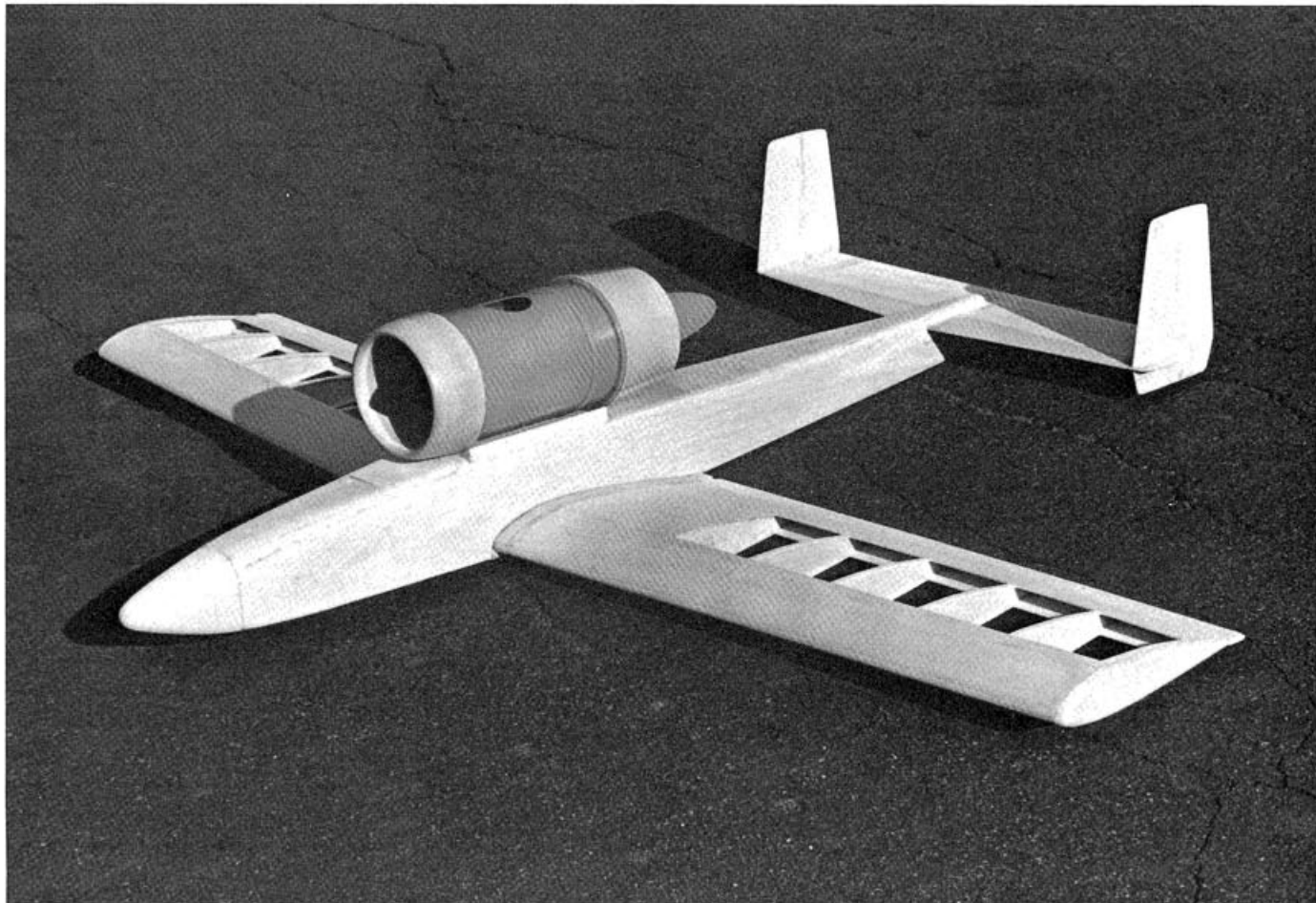
The first stage in fuselage construction: Doublers have been added to both sides, corner braces are in place, and formers F-2 and F-3 are positioned correctly.



All bulkheads have been installed in the fuselage and the sheet balsa tail surfaces have been assembled and sanded.



The three basic airframe sections are done; the tail assembly will be glued to the fuselage, and the wing bolts to the fuselage.



The completed airframe ready for covering and painting. The ducted-fan unit with molded inlet and tail pipe sits in place. To

reach this point took me only 18 working hours, but this was my second Jetster.

To further enhance the military appearance, I added dummy wing tip rockets. These are made from $\frac{3}{4}$ " kraft paper model rocket body tubes and balsa nose cones. The rockets are glued

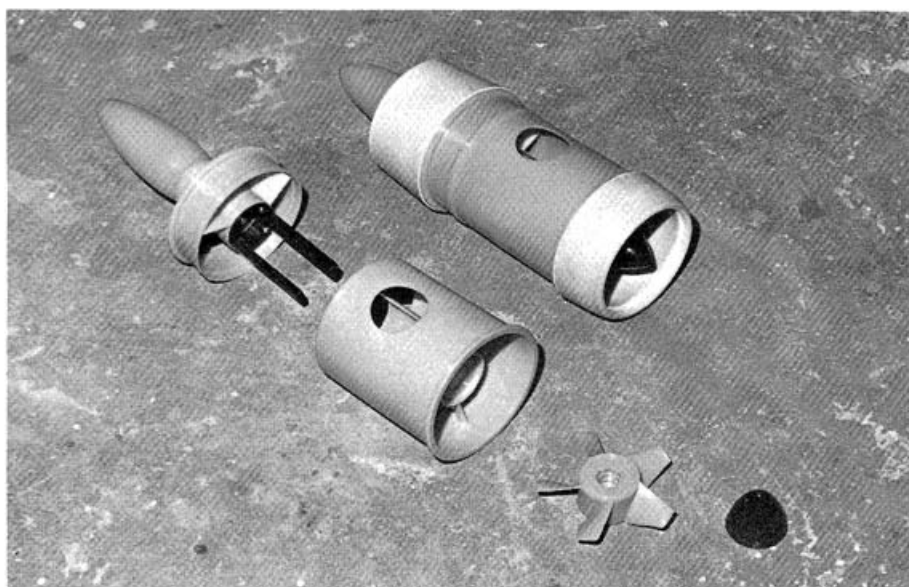
to balsa launching rails and are held to the model with double-sided foam mounting tape (servo tape) so that they will pop off when I make an inadvertent wing tip-low landing.

Installing the engine

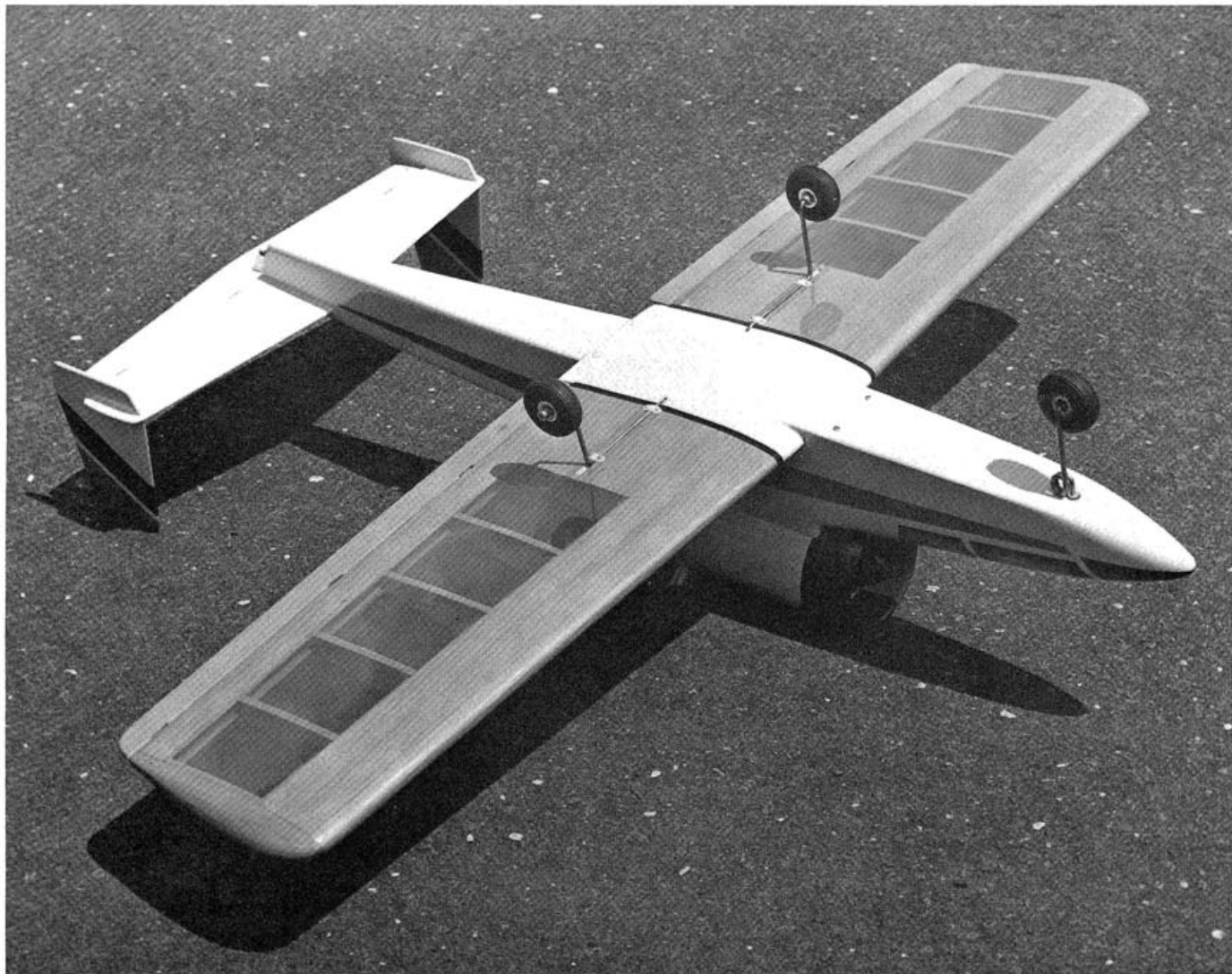
Drill bolt holes in the engine mount of the ducted-fan unit, and mount the engine. A Nyrod or other flexible cable inside a tube is fine for the throttle linkage; mount this to the fan unit with a small bracket and loop the Nyrod gracefully from the tail pipe to the fuselage-mounted throttle servo. The throttle arm on the carburetor must be repositioned so that the arm points up instead of down. Connect the throttle to the linkage with a nylon clevis and brass threaded adapter.

The $4\frac{1}{2}$ -ounce fuel tank furnished with the Axiflo RK-20B can be replaced with a $6\frac{1}{2}$ -ounce tank from Midwest. I've found that $4\frac{1}{2}$ ounces isn't much fuel for a thirsty Schnuerleported engine, and many of my Jetster .20 flights ended with dead-stick landings until I changed to the larger tank.

The stock muffler provided with the K&B engine can't be used in the Axiflo, but an exhaust extension is needed to route the exhaust above the fuel tank and out the tail pipe. Mac's Products produces an angled exhaust stack and tuned pipe that will do the job. You can use an open exhaust, but I recommend a muffler to cut down on the noise level of this screaming en-



The disassembled Axiflo RK-20B on the left shows the engine mount attached to the rear housing; when the engine is installed, the front portion slides in place and the fan is put on the engine. The RK-20B on the right has been fitted with molded inlet and tail pipe pieces by Kress Technology.



The Jetster .20 has conventional tricycle landing gear. A servo controls the steerable nosewheel.

engine and to provide a source of pressure for the fuel tank.

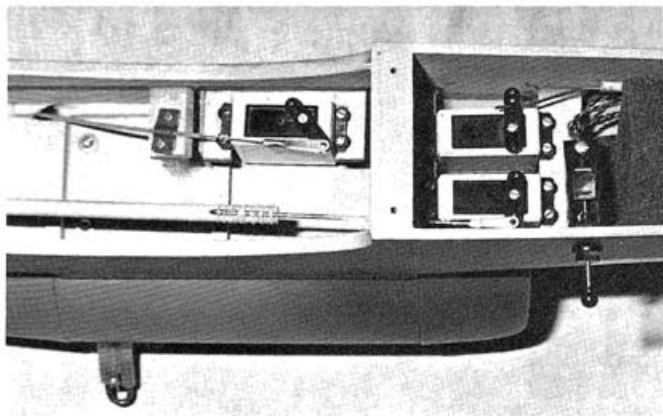
If you use a tuned pipe on this model, it's going to stick right out the tail pipe; there's no place else it can go. Support the end of the tuned pipe with

a music wire brace attached to the fuselage.

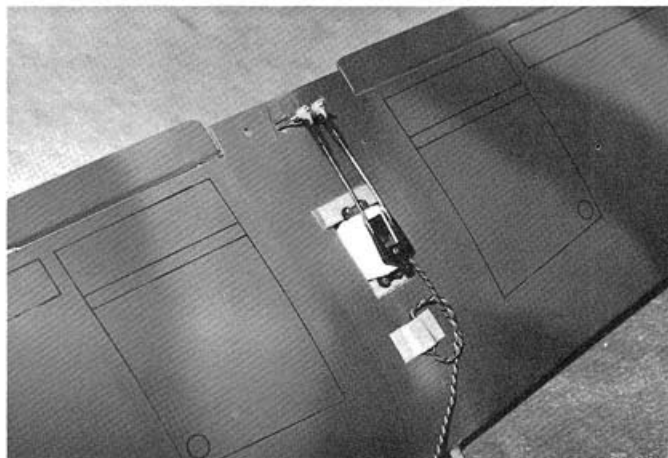
Balancing the model

Finally, balance the model. The correct balance point is shown on the

plan. If necessary, move the battery and receiver forward or add weight to the nose until the model balances correctly. Check once again that all parts are correctly aligned, and you're ready for your first flights.



Servo installation in the Jetster fuselage. The throttle servo is above the wing; a small clamp holds the throttle control cable in place, looping forward from the ducted-fan unit. The elevator servo and nosewheel servo are placed ahead of the wing; the receiver and battery pack go even farther forward.



Aileron servo installation in the Jetster wing. A servo extension cable with connector taped to the wing allows the servo to plug into the fuselage-mounted receiver.