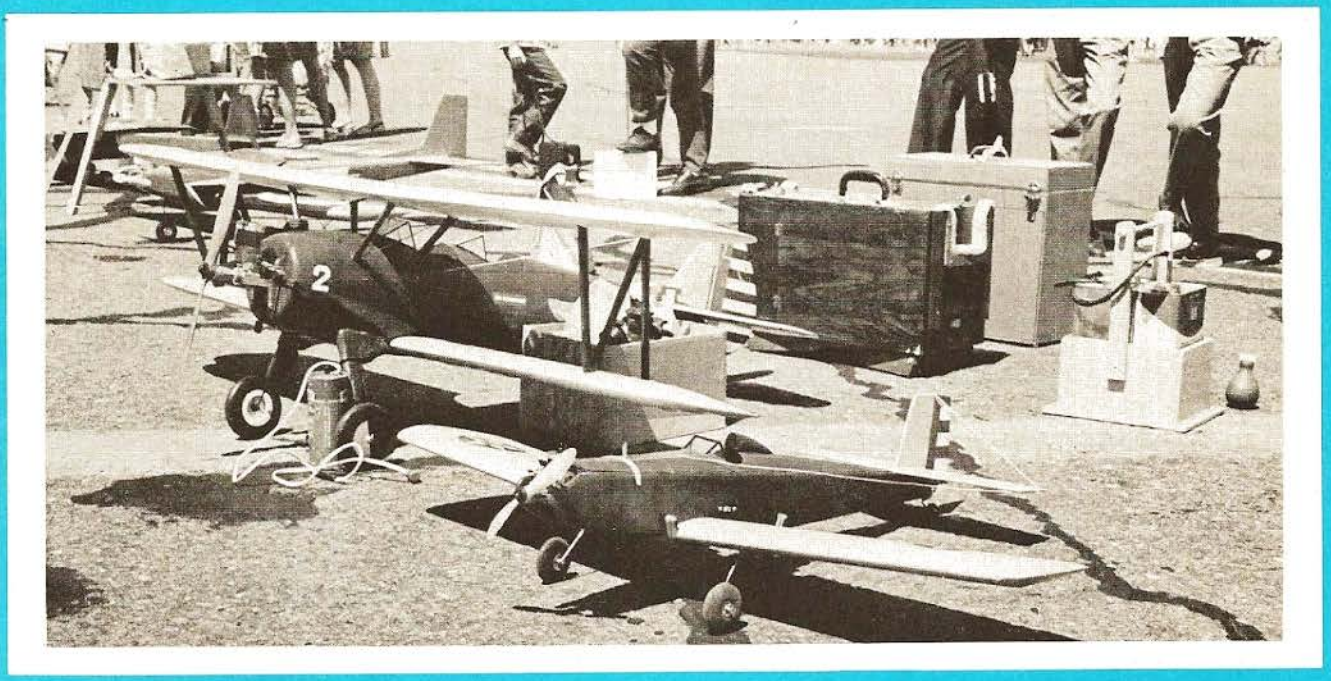


DIVIDER

The Airplane That Divides The Big Ones From The Small Ones.
By Lou Weihs.



The Divider, as the name implies, divides the big airplanes from the small ones. This is a small Sport-Stunt ship using the miniature proportional equipment, and it is capable of doing the full stunt pattern. You have to see it fly to believe it! Dave Butler of the Rancho Cordova Model Masters flew the original Divider at the 1968 50th Anniversary Armed Forces Day celebration at Mather AFB. He really amazed the other R/C fliers with the ship. Since that time several Dividers have been built, including three by RCM's editor who wouldn't release the plans during the past six years!

During one of the meetings of the Rancho Cordova Model Masters, I discussed small airplanes with an R/C Modeler who is well known around the California circuit. This man I truly admire for his superb flying skill. He was dead set against small airplanes for the following reasons:

1. They just don't fly well.
2. Little airplanes are harder to build; there are too many small parts.
3. Small engines are sensitive to needle valve adjustments.
4. Small engines do not idle well.
5. Little airplanes have cramped interiors and it is difficult to install the radio equipment in the proper place. The only good thing this fellow had to say about small size airplanes is that they are easy to transport.

In answer to this man's arguments:

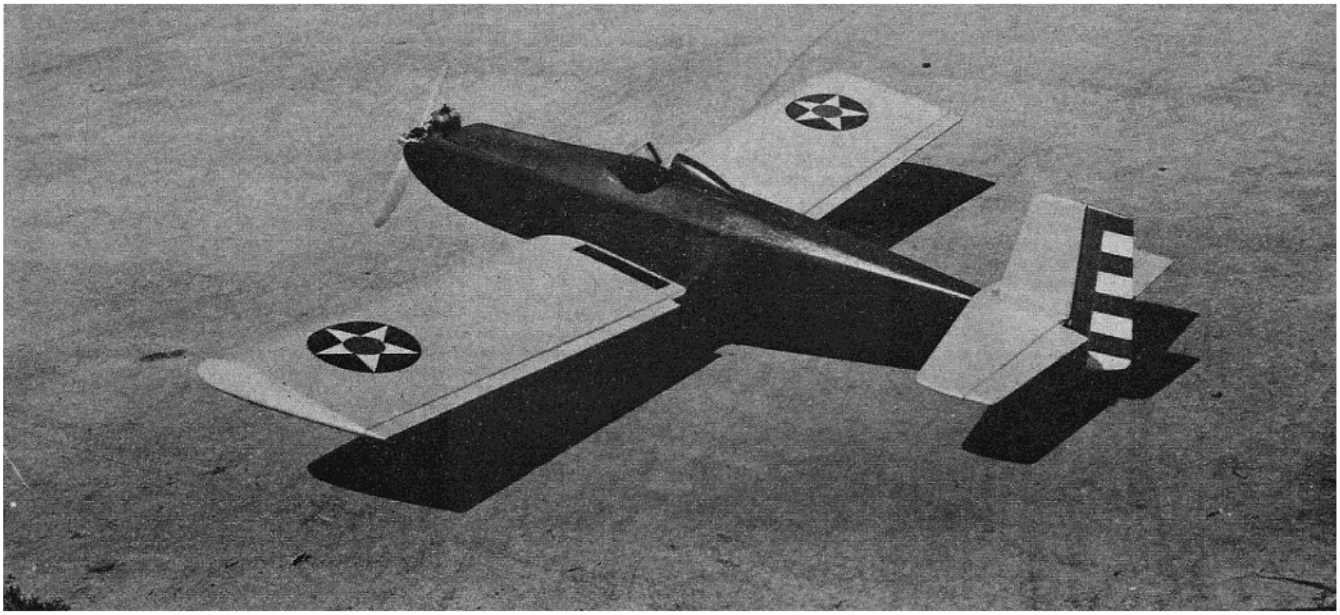
1. The Divider flies exceptionally well, better than many larger airplanes I have seen at the flying sites.

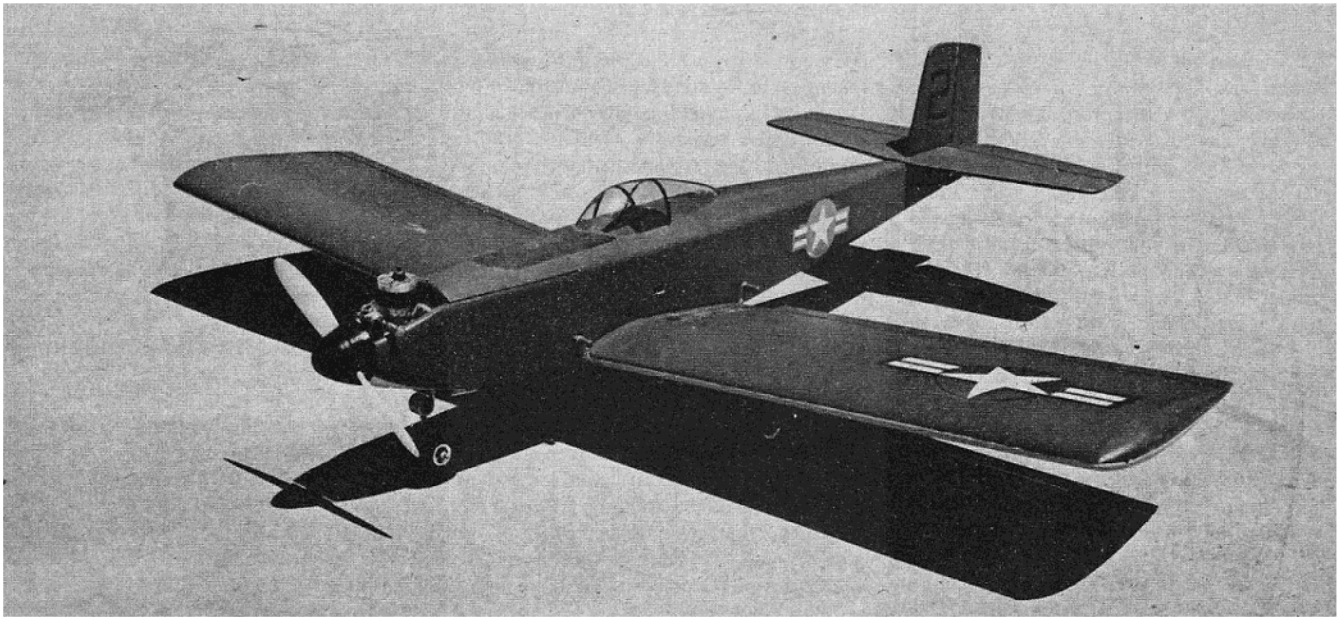
2. As for building, this model is a conventional, straightforward design, using hefty-size materials.

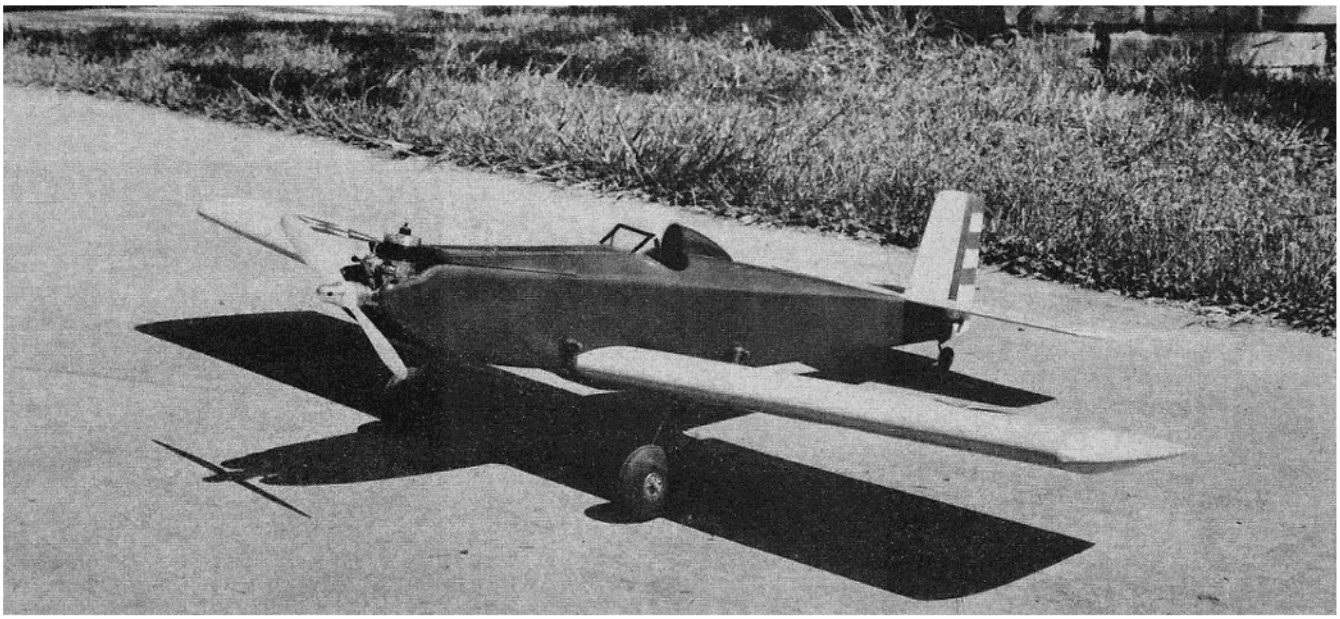
3-4. As for little engines, and speaking of the OS Max .19, it has ample power, idles exceptionally well, and does not seem to be critical about needle valve settings.

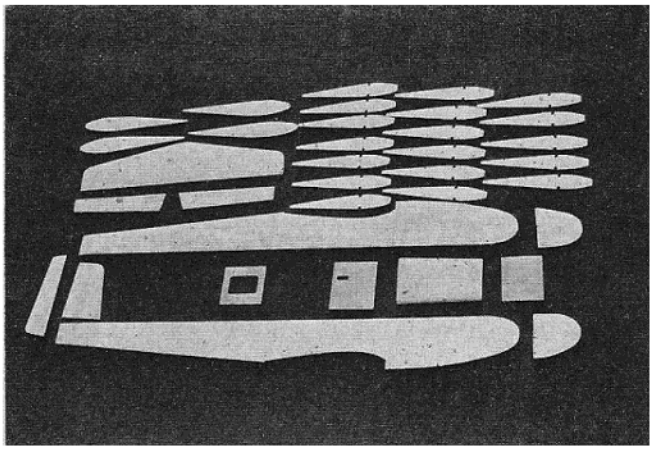
5. Cramped interior: This model is 3'' wide on the inside and will accommodate 3 Kraft KPS-9 servos side by side. With the batteries stowed in the tank compartment, there is still plenty of room, even for the ham-handed builder. To list several other plus factors, there is less building time; it uses less fuel, requires less space to fly; it is truly a fun airplane to fly, and as for cost, this model was built for substantially less than its larger cousins.

As for performance, I have long felt that the proper relationship between power and wing loading is the important factor and not the size of the airplane. The Divider grosses out a little over 3 lbs. and still has enough

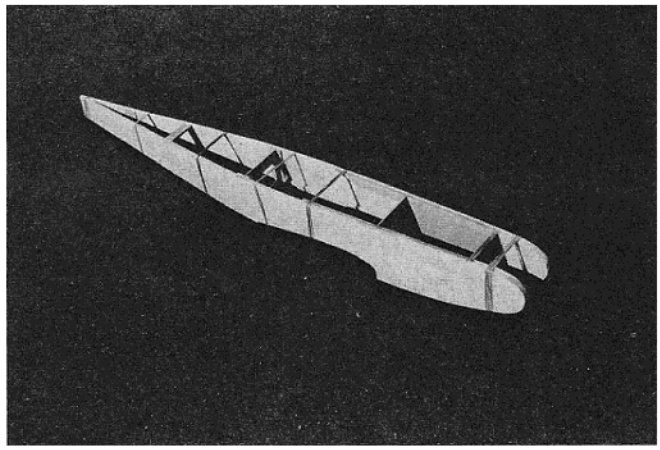








All the parts cut out, ready for assembly.



After cementing doublers, join the sides and bulkheads.

wing loading to provide a sufficient measure of grace.

The Divider has a 41½" wing span and the wing area is about 349 sq. in. The first model was built as a tail dragger, and the second has tri-gear, prop spinner, and a molded canopy for those who like the modern look. For the tricycle geared version, it may be necessary to place the battery pack aft of the forward bulkhead instead of in the tank compartment in order to keep the center of gravity within the proper limits. There is still plenty of room for this installation. Both airplanes have identical flight characteristics. Tail surfaces are generous and ensure excellent snap and spin maneuvers with instant recovery. Strip ailerons combined with a short span provide a fast rate of roll, if desired. However, the airplane can be flown through smooth five second slow rolls.

As for the force arrangement, everything is set up 0°-0°, except the thrust line has about 4° right thrust. I have always used right thrust settings, starting way back with ten cent rubber powered kits. In fact, the only things that I have built that flew and did not have right thrust were kites and gliders! The side thrust compensates for whatever it is supposed to — sprial prop wash, torque, gyro effect, crosswinds, etc., and the prop does not seem to mind the unequal blade loading at all! Actually, about the only time you can have equal propeller blade loading is in a static condition when the prop is turning and the airplane isn't moving. No aileron or rudder trim is required when changing airspeed with this model. The airplane will climb straight up for tail slide or wing-over maneuvers without any tendency to veer off the desired track.

Most full-size aircraft have an off-set vertical fin to compensate for the undersirable propeller effects, but the off-set thrust line idea has been around for quite awhile, also. The Ercoupe, Piper Pacer series, and Piper Cherokee are just a few that use off-set thrust. I read somewhere that a home builder of a Knight Twister had an airplane that was a "tiger by the tail" on take-off, and by offsetting the thrust line, he changed it into a gentle kitten.

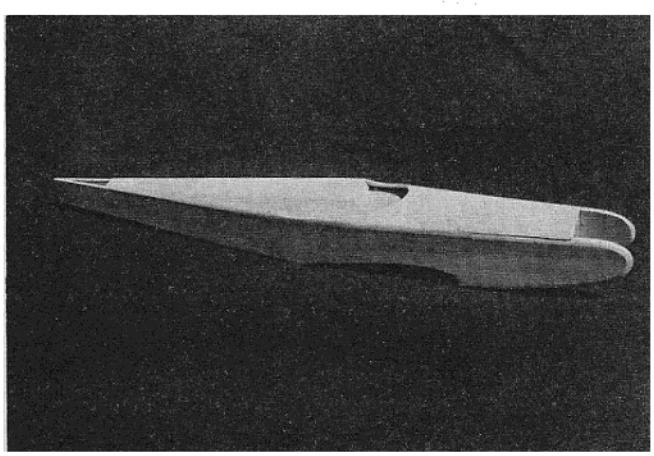
For those who shy away from the conventional gear set-up, there are two things that aid in handling this position — wheel axles under the leading edge of the wing, and tow the wheels in about three degrees. This will make for "no sweat" take-offs and landings, but will not stop the weathervaning effect when taxiing in a crosswind.

The airfoil is a semi-symmetrical section. I have nothing against the full symmetrical section except that most require jigging during the construction of the wing. This section is flat on the bottom from the main spar to the trailing edge, which permits building on a flat surface. In flight, I am unable to detect any difference in performance, either upright or inverted. Both inside and outside loops seem to be the same diameter.

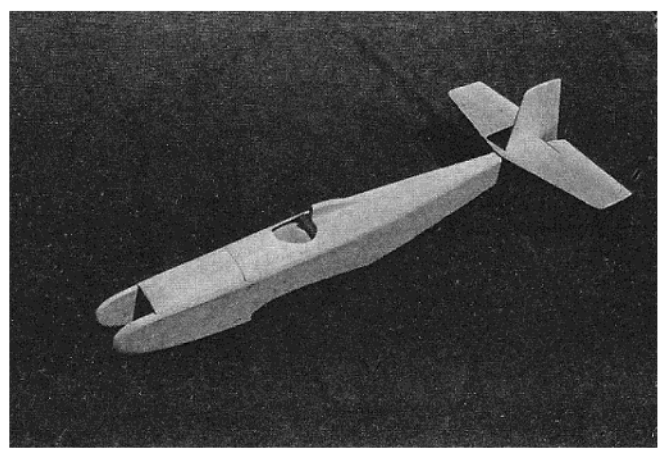
Construction

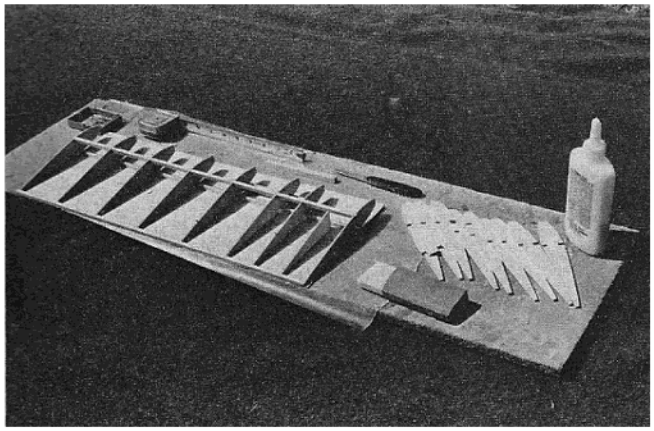
The building of this airplane is simple; however, you will save time by following the procedure as outlined. Make sure you have all the necessary materials on hand prior to starting the construction. Make thin cardboard templates of the wing ribs, tail surfaces, bulkheads, etc. Trace all parts on the proper size balsa and plywood with a ball-point pen. All the necessary parts can be cut out in two or three hours, depending

The assembled fuselage, ready for final sanding.

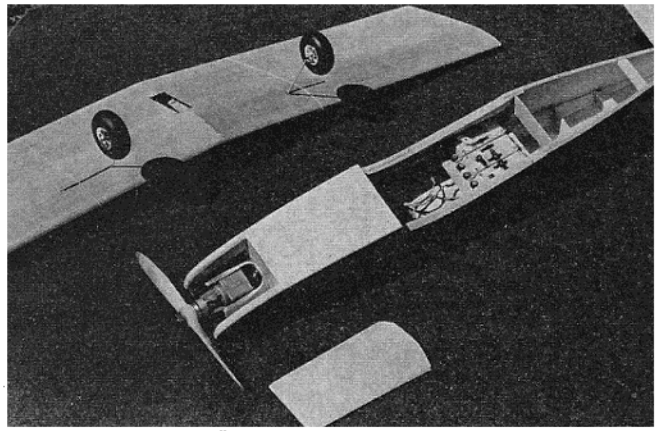


Divider fuselage with empennage added.





Wing panel assembled right on bottom skin.



The Divider with radio gear installed, but minus bottom sheeting.

on how fast you are with the knife and saw. Now you have pre-fabricated your own kit.

Fuselage

Use 3/16 inch medium balsa for the fuselage sides. Pin the sides together and sand to identical shape. Mark the location of the firewall, bulkheads and servo rail guides with a ballpoint pen. Note that the firewall location on the left side is about 1/8 of an inch forward of the right hand side. Glue the front top longeron, 3/32'' sheet balsa doublers, servo rail guides, and 1/32'' ply doublers at the rear section of the fuselage. When the glue is set up, assemble the two sides together by epoxying the forward and aft bulkheads in place. Make sure that the bulkheads and fuselage sides are perfectly square, as it will be difficult to make a change after the epoxy has set up. Install the firewall with epoxy, using rubber bands to keep the fuselage sides together. Wet the fuselage sides with water just aft of the rear bulkhead and let soak several minutes to facilitate bending. Glue the tail ends together, and glue the 3/16'' square cross members in place. Epoxy the 3/32'' plywood tank floor in place. The top of the fuselage is built up of formers and 3/32'' sheet balsa skins; however, you could use a 1'' soft balsa block carved to shape and hollowed out on the inside. The tank compartment cowl is made of 3/4'' soft balsa, or glue up two pieces of 3/8'' balsa and carve to shape. The bottom of the fuselage is skinned with 3/32'' balsa with the grain running crosswise. It is probably a good idea to leave this section open until after the elevator and rudder pushrods have been installed. Also, there is a piece of 3/32'' ply section just aft of the wing. Epoxy this piece in place after the wing has been fitted to the fuselage. Carve the headrest out of a soft balsa block and cut out the cockpit.

Wing

Built-up balsa construction was used on the original models but I see no reason why foam core wings could not be used. They should be very simple to build using the standard method. If you are going to use the balsa wing as shown on the plans, then proceed in the following manner:

DIVIDER MARK I & MARK II
Designed By: Lou Weihs

TYPE AIRCRAFT
General Sport, Comp. Trainer
WINGSPAN
41½ Inches
WING CHORD
8½ Inches
TOTAL WING AREA
349 Square Inches
WING LOCATION
Low Wing
AIRFOIL
Semi-Symetrical
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1½ Inches
O.A. FUSELAGE LENGTH
34½''; Prop to Rudder
RADIO COMPARTMENT AREA
(L) 8⅜'' X (W) 3'' X (H) 2¼''
STABILIZER SPAN
16 Inches
STABILIZER CHORD (incl. elev.)
4¼ Inches (average)
STABILIZER AREA
68 Square Inches
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top Of Fuselage
VERTICAL FIN HEIGHT
4⅜ Inches
VERTICAL FIN WIDTH (incl. rudder)
4⅝ Inches (average)
REC. ENGINE SIZE
.19 Cubic Inch
FUEL TANK SIZE
4 Ounce
LANDING GEAR
MK I (conv.) MK II (trike)
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rudder, Elevator, Throttle, Ailerons
BASIC MATERIALS USED IN CONSTRUCTION:
Fuselage .....Balsa, Ply and Spruce
Wing .....Balsa and Ply
Empennage .....Balsa and Ply

Weight Ready-To-Fly .....52 Oz.
Wing Loading .....21½ Oz./Sq. Ft.

Assemble four wing skins by gluing two sheets of 1/16'' x 4'' x 20'' balsa together lengthwise. Fit the two sheets together as close as possible and join together with a length of masking tape. Fold back the taped joint and apply a bead of glue along the entire length. Pin the sheets down on a flat surface and wipe off the excess glue with a rag. The wing is constructed in two panels and later joined together by inserting and gluing the 3/32'' ply dihedral brace in place. Take one of the skin panels and mark off the rib locations with a ballpoint pen. Starting at the tip, the wing rib spacing is at 3'' intervals, except the three ribs closest to the center section, which are spaced at 1-2/3'' intervals. Pin this sheet down on a flat surface and glue the 1/8'' square trailing edge in place. Mark off the location of the 3/16'' square bottom main spar and glue in place. Install all ribs and glue from the main spar aft to the trailing edge. Do not glue the front part of the ribs at this time. Note that the center section rib must be tipped-in slightly for the proper dihedral angle. Also note the first rib outboard of the center section. This rib must be shortened 3/32'' aft of the main spar in order to allow the dihedral brace to be slipped into place later on. The forward part of this rib must be reduced 1/8'' in height for the 1/16'' skin doublers in this area. Glue the 3/16'' square top spar in place and glue the 1/16'' sheet balsa spar webs in place on the forward side of the main spars. Sharp scissors will do an excellent job of cutting these spar webs.

The next step is to taper the 3/16'' x 1/2'' leading edge to fit the nose section of the ribs and glue in place. Run white glue on the skin where it will meet the ribs and leading edge, prop the skin up in place by placing small scrap balsa blocks under the skin, and pin the skin to the leading edge spar. Install the skin doublers at the center section, add the hinge blocks, gussets, hardwood landing gear blocks and braces, etc. When the glue is dry you are ready for the top skin.

Use white glue, and pin the top skin down in place making sure that the skin meets the L.E., spar, trailing edge, and all ribs in the proper manner. Assemble the opposite wing

panel in the same manner and join the two together by gluing at the center section and gluing the dihedral brace in place. Trim off the excess leading skin and glue the final 3/16" x 1/2" leading edge in place. Plane and sand the leading edge to final shape. Add the tip blocks, aileron linkage, ailerons, and cut out the center section to receive the servo. Install the servo mounts and add a fairing to the bottom of the wing if the servo protrudes through.

Tail Surfaces

This part couldn't be easier. Cut the parts out of 3/16" sheet balsa and sand to shape. Glue the 1/32" ply inserts on the rudder and elevator for the control horns. Hinge the parts together and epoxy the surfaces in place on the fuselage. Make sure the horizontal stabilizer is square on the fuselage, and that the vertical fin is aligned with the centerline of the fuselage.

At this time, install all radio gear, servos, engine, pushrods, and control linkage. Make sure everything works to perfection. Apply skin to the aft bottom of the fuselage.

Finish

The original models were finished in the following manner: Sand the entire model as smooth as possible. Apply one coat of balsa filler. Whey dry, sand with 400 and 600 wet-or-dry sandpaper. Cover the airplane with dry, medium weight silkspan. If there are any wrinkles in the silkspan, they should be removed with your wife's hot iron. If you are not married, just go out and buy some new silkspan without any wrinkles. Brush on several coats of clear dope to seal the silkspan and sand smooth. Spray on desired color finish. Add the windshield or canopy, decals, and landing gear. The airplane can be finished to suit the builder and Solarfilm or MonoKote should be an ideal finish. It just wasn't available locally when I built the two original models.

Flying

Check the trim of all control surfaces. The bottom of the ailerons are set flat with the bottom surface of the wing. All other control surfaces are set at zero. With this set-up, both of my airplanes fly "off the board" without any adjustments required. Please note that a light, short span wing with strip ailerons all add up to a rapid roll rate. With the Kraft KPS-9 servo, use the inside holes on the wheel output drive to keep the aileron deflection to a minimum. In flight, this airplane is very solid, and just like its big brothers — it goes where it is aimed. An 8/6 propeller is an excellent combination with the OS Max .19 engine, and the airplane really moves out at full throttle. With the engine throttled back and the airplane slowed down, it is very stable and it has a good rate of sink for the landing pattern and flare out.

The Divider is a pure delight to fly — so "have a ball" at a fraction of the cost!

MATERIALS

Fuselage sides, Tail surfaces, Wing L.E. — 3 sheets of 3/16" x 4" x 36" medium balsa.

Wing Skins — 8 sheets of 1/16" x 4" x 36" medium balsa.

Wing Ribs, Fuselage Skins — 3 sheets of 3/32" x 4" x 36" medium balsa.

Bulkheads, Firewall, Tank Compartment Floor — 1 sheet of 3/32" x 6" x 12" plywood.

Wing Spars — 4 lengths of 3/16" x 3/16" x 36".

Wing T.E. — 2 lengths of 1/8" x 1/8" x 36".

Ailerons — 2 lengths of 1/4" x 1" x 36" T.E. stock.

Wing Tips, Tank Cowl, Headrest — 1⅜" x 4" x 18" soft balsa.

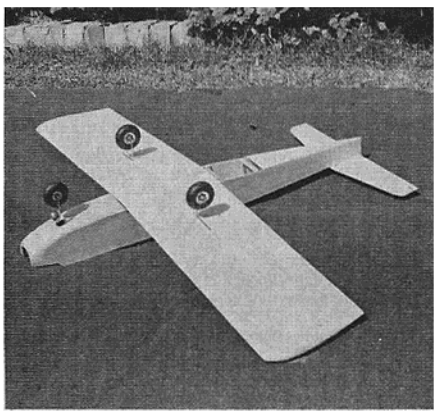
Landing Gear — 1 length of 1/8" music wire.

Pushrods — 1 length of 1/4" x 1/4" x 36" spruce.

Landing Gear, Blocks — 1 length of 3/8" x 3/8" x 12" hardwood.

Miscellaneous Items: Kraft-Hayes engine mount, wheels, 4 oz. fuel tank, nose wheel, strut, canopy, control hardware, nuts, bolts, and finishing materials.

View showing placement of gear for tricycle version.



After the flying had officially ended, Mike Bosch put on a demonstration flight that was just superb. He thrilled the spectators and contestants alike with true loops with his specially modified Kavan Jet Ranger. I heard comments from contestants such as "It was worth the 1000 mile trip here just to see Mike fly."

With good weather and lots of flying, the 1974 NATS was deemed lots of fun and very successful. Too bad there were not more entrants to enjoy the fellowship and acquire the knowledge that was available. I certainly hope that next year there will be lots more contestants sharing in the activities. □

From RCModeler Dec. 1974