

JUNKERS J-10 "TIN DONKEY"

By DICK ALLEN . . . One of Germany's best WW-I fighters also makes a forgiving scale model for low-time R/C pilots. Squarish lines make it easy and quick to build. Scale is 1.66"=1', for .45 to .60 size engines.

• My "Tin Donkey" is primarily a scale trainer. It's an honest airplane which is fun to fly.

There seems to be all too few scale models available which are both docile and rugged enough for someone who has built and flown only a few R/C planes. The J-10 is intended to safely satisfy that nearly universal urge to build a scale aircraft, once one has mastered ailerons and landings.

The square lines lend themselves to quick, accurate construction. The thick wing and stab airfoils give the J-10 model slow, stable landing approaches and excellent low-speed characteristics.

As an added bonus, it may be flown at the Rhinebeck and Western Front WW-I Jamboree meets, since the prototype first flew in 1918. Scale is 1.66 inches to the foot.

PHILOSOPHY

The model's fuselage and wing are exact scale (except that the model uses a constant thickness airfoil). The tail surfaces are slightly enlarged, since it is

intended to be a scale trainer. The author's model was built to a level consistent to the original intent of Sport Scale, but not to today's ridiculous standards. If you plan to fly this model in Sport Scale today you'd better use corrugated covering, raised seams, rivets, and a fully enclosed engine! Why can't there be a scale event one can compete in without having to build a museum piece?

PROTOTYPE

In 1910, Professor Hugo Junkers proposed the then-radical idea of an all-metal airplane. In World War I he pioneered the all-metal, low-wing monoplane. While his design concepts were far ahead of their time, wartime shortages resulted in many of his planes being overweight and underpowered. Despite lack of support from the German high command, he doggedly persisted, designing and building eleven different models during the course of the war.

The J-10 (military designation CL-1)

was a two-place ground attack version of the J-9 fighter. It mounted one or two Spandau machine guns above the engine and a Parabellum machine gun in the rear cockpit. It also carried stick grenades and small bombs deployed by the observer. A total of 47 J-10's were built before the war ended. It was undoubtedly the finest ground attack aircraft produced in Germany during World War I.

FUSELAGE

The fuselage is large and boxy, with lots of room for equipment, but note how the R/C equipment is all mounted well forward. The tank is mounted slightly to the left side so that the throttle servo may be mounted on the right side, under the removable cowl.

Note the liberal use of plywood and hardwood in the forward part of the fuselage. You'll probably need some lead weight behind former N-1 anyway, so you may as well put lots of "beef" in the area ahead of the wing. Note that N-1 and N-2 are made from 3/16 ply. They are screwed and glued to two pieces of shaped 3/8-in. bass, as are the plywood sides. Wet the outside of the plywood sides before bending them in to N1-N2. Coat entire inside of tank compartment and entire inside area forward of the firewall (F-1) with epoxy to seal out fuel. Don't forget to put the three holes in the bottom, forward of the firewall, to let oil and spilled fuel drain out.

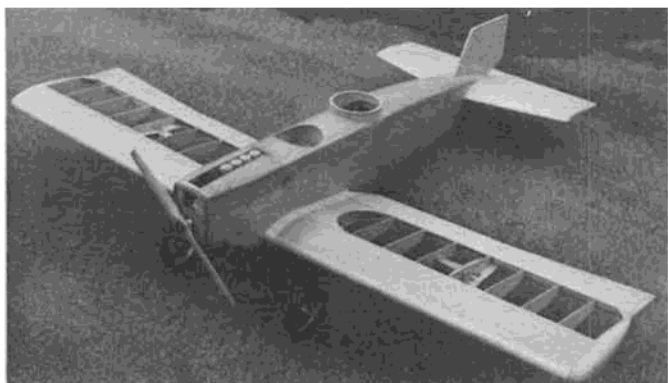
The rear turtle deck is a compound curve. It will be easier to glue on if it is first soaked in water for 20 minutes, then rubber-banded in place and allowed to dry overnight. Then remove and cut out a slot for the fin. Glue the rear turtle deck in place after the stab and fin have been glued to the fuselage.



The author's Junkers in the presence of some mighty fine company; the full-size WW-I replicas that fly regularly at Cole Palen's Aerodrome at Rhinebeck, New York!



Miniature A&P mechanic inspects structure prior to covering. Strong, no-tricks construction.



Completed fuselage is fiberglassed for extra strength and ding resistance. Nylon fabric covering used on wing.

The top 3/32 sheet is glued in place prior to making cockpit cutouts. The balsa ring surrounding the rear cockpit is first formed from two layers of 1/16 balsa on a four-inch diameter can. Make the ring one inch high, grain vertical. Slip the ring halfway off the end of the can and tape it to the can. Then tape a sheet of sandpaper to the top of the fuselage. Rub the ring back and forth until it conforms to the fuselage shape. Cut out the rear cockpit hole and then glue the balsa ring in place around it.

The removable cowl is balsa with plywood formers. It is held on with the homemade 1/4-turn fastener shown. It can easily be attached or removed, without tools, and with the engine running. Note the channel behind the engine where cooling air can exit up through the first two dummy cylinder heads.

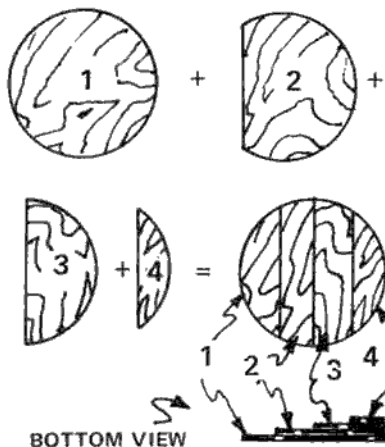
I covered my entire fuselage with K&B light glass cloth and resin. Keep the resin to a minimum behind the wing.

ENGINE INSTALLATION

My J-10 uses a Webra .61 Blackhead, which is more than adequate at the model's dry weight of 7 lbs., 5 oz.

With such a short nose, it is important to have the correct amount of right thrust (2.5°). Here's how to get it right:

1) Using a Tatone or similar motor mount as a pattern, cut out three disks of 1/32 plywood. Cut one in half, discarding one-half. Cut another in 1/4 and 3/4 segments. Then epoxy these three segments onto the complete disk and you



have a wedge cross-section disk which will give you approximately the correct amount of right thrust.

2) Hold the disk and motor mount temporarily against the firewall to mark the correct locations to drill and tap the motor mount for your engine.

3) Bolt the engine to the mount. Temporarily fasten the plywood wedge/disk to the motor mount with glue or double-stick tape.

4) Clamp the motor mount to the firewall in the location which places the front of the engine through the center of the hole in N-1.

5) Place a 12-inch prop on the engine and rotate it to exactly horizontal. Now pin a piece of 1/4 sq. spruce or balsa,

four feet long, to the top of the fin. Move the other end to the left prop tip and mark it. Now swing it over to the right prop tip and mark it again. The two marks should be 0.52 inches (1.3 cm) apart for the correct amount of right thrust (2.5°). If it's not right, shim or sand your disk until it is.

6) Mark and drill your firewall for 6-32 bolts and blind nuts. Attach motor mount permanently.

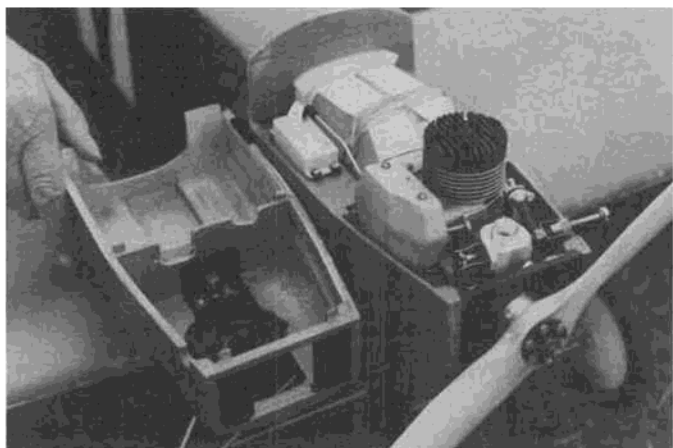
7) See the section on Flying for the final adjustment (if necessary).

8) The Tatone Exhaust Manifold (Cat. No. EM-5B) is a perfect fit in the J-10. Install a No. 2 sheet metal screw near the bottom of the exit pipes. The screw head will create a bulge in the neoprene tubing and keep it from slipping off. Tighten a wire loop around each neoprene tube above the screw head.

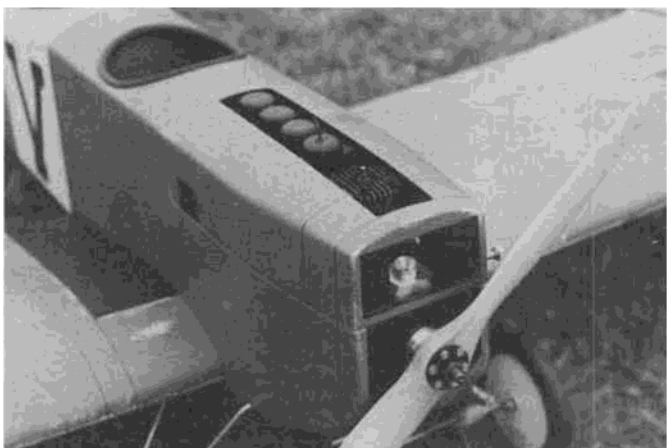
WING

The wing ribs have long flat sections between spars (top and bottom) to facilitate accurate building on a flat surface. The top and bottom "corners" are sanded off after assembly to blend into the i.e. sheeting.

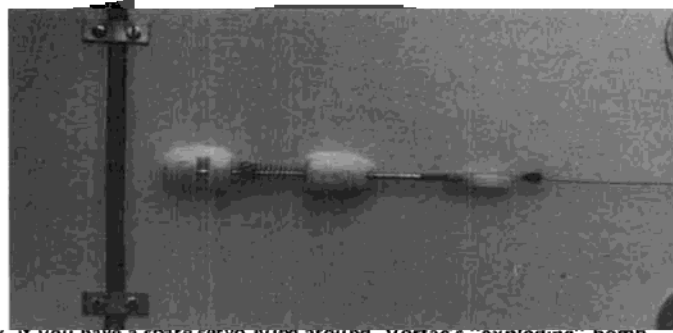
Each wing panel is built on a flat surface. First lay the lower trailing edge 3/32 sheet on the plans and glue the rear 1/8x1/4 spruce spar to it. Use a straight-edge to make sure the spar is absolutely straight. Then glue the ribs to the lower sheet and spar, using weights to hold them down. Glue in the front and rear spruce spars and the diagonal braces in the ailerons. Glue in a spruce block for



Webra .61 Blackhead, tank, and throttle servo all fit under the removable top cowl. Tatone manifold is a perfect fit.



Cowl is secured with a 1/4-turn latch (note wire on first dummy cylinder), makes for easy removal, even with the engine running.



Optional bomb drop is easy to make and a lot of fun, worth the extra work. If you have a spare servo lying around, Vortac's "exploding" bomb (makes a most realistic "explosion" when filled with four) and matching release mechanism could also be used.

the aileron horns. Leave off the two center ribs until after the wing halves are joined and the dihedral braces are in place.

Before gluing on the rear top 3/32 sheet, make a saw cut from the trailing edge to within 3/8 of an inch of its front edge at the aileron break. Note that since the wing is built on a flat surface, wash-out will automatically be built into the swept-back ailerons. Glue on the top leading edge sheet.

Now turn the wing over and let the rear of the trailing edge hang over the edge of the flat work surface (to provide clearance for the aileron washout). Glue on the bottom front spars and leading edge sheet with the center of the panel weighted down.

Let the assembly dry overnight. Then with a long sanding block, sand the leading edge of the sheets and ribs to a true, flat surface. Butt-glue the leading edge, join the wing panels, add center ribs, etc.

If you prefer a fully-sheeted wing, replace all W-3 ribs with W-2 ribs. Use very light 3/32 sheet and cover with silkspan instead of fabric.

Install (but do not glue) the front 1/4-inch dowels. Glue in after covering wing and fitting it to fuselage.

Do not cut out the ailerons until after the wing has been covered and given one or two coats of dope. Be careful when hinging the ailerons; it would be a real shame to reverse them and end up with wash-in (tips down) instead of wash-out!

The bomb drop is optional, but fun. A servo-operated cable pulls the spring-loaded release pin.

TAIL

Since the J-10 has such a short nose and long tail moment-arm, it is imperative to keep the tail light. The stab has no internal spars . . . just ribs, leading and trailing edge, and 1/16 sheeting. It's built like a foam stab without the foam. Sheeting is applied with the framework resting on 1/4x1/2 blocks. Please don't build the stab from a slab of 1/4-in. balsa. Flat stabs not only perform poorly, they definitely have no class. Make the elevator from the lightest piece of 3/8-in. balsa you can find.

The rudder is likewise made from very light 1/4-in. balsa. The fin is made from medium light 1/4-in. balsa.

Give the tail two or three coats of clear dope and cover with silkspan.

You may hinge the elevator/stab now, if you prefer, but do not hinge the rudder until the stab and fin are assembled to the fuselage and the steerable tailskid is in place.

Bolt on the wing to act as a reference, then glue the tail to its fuselage. Pushrods should be straight (no dog-legs).

LANDING GEAR

The landing gear is made from 5/32 music wire. Do not place wheels ahead of their position shown on the plans unless you like ground loops. One-half inch back would be better for use on paved runways.

To assemble, sandpaper the gear wires and wrap together well with tinned copper wire (about A.W.G. No. 22). Install the gear on the airplane and solder well with acid-core solder or silver solder. Remove the gear from the plane and wash off flux with solvent or soap and water. The spreader bar between wheels is not only scale-like, but functional. It will keep the wheels from going up through the wing on those occasional crash landings. It's made by sandwiching full-length 1/16-in. wires between two pieces of 1/8-in. hard balsa. Put strips of 1/16 plywood in front, between, and behind the wires before assembly. Form hooks on the ends of the wire to match the hooks soldered near the bottom of the gear (see photos). Wrap with nylon tape.

Attach the spreader bar to its landing gear with two No. 64 rubber bands at each of the four hooks. There should be very little give to this assembly.

My tailskid was made from 1/16 music wire, but I would recommend .078 wire as shown. Don't omit the top coil. The bottom loop is optional, but makes a

handy place to hang the fuselage from. The scale (non-steerable) tailskid is shown for you purists.

PILOTS

World War I airplanes just don't look right flying around without pilots. I made mine from Williams Brothers 2"=1' figures, which are actually a little too large but look just fine. The pilots' shoulders are glued to balsa torsos with Wilhold R/C 56 glue. Do not glue pilots into cockpits until after finish is applied.

FINISH

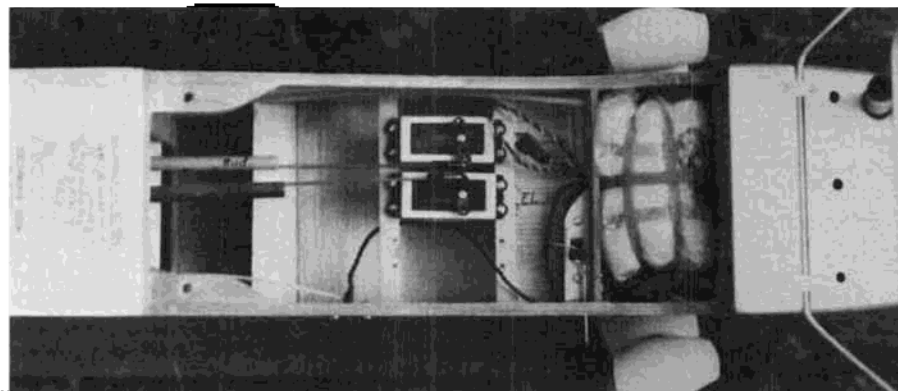
The wing was covered with nylon and given four coats of Aero Gloss clear dope. The tail was covered with silkspan and three coats of Aero Gloss. The resin and glass on the fuselage was brushed with K&B epoxy primer.

Wait three or four days for the dope (if used) to dry completely. Then the entire airplane is sprayed with Hobbyoxy colors, using the flat hardener. Next, put on the insignia using decals, black Monokote, or paint them on with Hobbyoxy. I used all three methods. Sand Monokote insignia with wet No. 400 paper prior to cutting out.

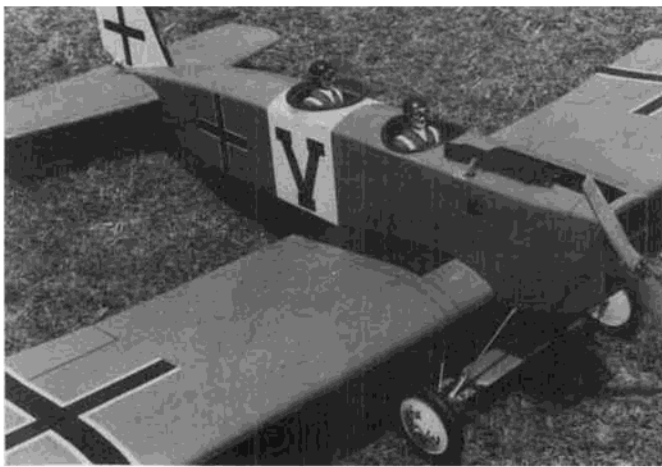
Ink on the seam lines using a permanent "Sharpie" felt-tip pen. If you have used decals, wipe on a thin protective coat of 5-minute Hobbyoxy. This must be spread on very thin within the first 30 seconds after mixing, while it is still very fluid. These areas will, of course, dry with a high gloss. Not to worry, however, as then the entire aircraft is sprayed with thinned (50%) Hobbyoxy clear/flat hardener to give a realistic, tough, and fuel-proof finish.

SET-UP

Balance at the C.G. indicated on the plans. Epoxy lead weights behind N-1



The J-10 has plenty of room for even the biggest radios. Bomb drop servo (not shown) fits beside elevator servo in middle, foam-wrapped receiver up forward.



Williams Bros. pilots and machine gun add the finishing touch. Realistic finish is Hobbypoxy with flat catalyst.



Dual landing gear spreaders are secured with heavy rubber bands, makes a rigid assembly. Tailskid is steerable.



Get that nose down! The Junkers all set up for a nice tailskid-first landing. Thick airfoil and built-in washout make it extremely docile and safe in slow-flying modes.

rather than on the firewall.

Check the left/right balance by picking up the plane by its engine shaft and tail cone. Add weights (wood screws, etc.) to wing tips if necessary.

Start with the following amounts of control surface movements, as measured at their trailing edges:

Elevator: 0.2 in. (5mm) up/down
 Rudder: 0.7 in. (18mm) right/left
 Ailerons: 0.6 in. (15mm) up
 0.5 in. (13mm) down

(Placing aileron horns 3/8 of an inch behind hinge line will give this differential movement.)

FLYING

If this is your first low-wing plane, it would be prudent to have your local "expert" take it off and trim it out. My J-10 required only slight adjustment of the aileron and elevator trim on its first flight.

I use full-up elevator to dig in the tailskid for the first few feet of the takeoff run. If you have the correct right thrust it will track straight into the wind. Then neutralize the elevator and let it gain speed. Slight up will ease it off in about 50 to 75 feet.

As a final check on your right thrust, trim your plane for straight and level hands-off flight at full power. Let it fly directly over your head at full power. As it's going straight away from you, suddenly chop the throttle to low idle. If the

plane turns to the right, it needs more right thrust, and vice-versa. Shim your plywood disk with IBM card stock between the disk and firewall if necessary. Then epoxy the disk to the firewall, bolting on the motor mount to keep it in place until dry.

Inside and outside loops are no problem. The small rudder is surprisingly effective, and it will do very good stall turns with no aileron correction. Rolls and inverted flight are docile.

Due to the thick airfoil and bulky fuselage, the landing approach can be fairly steep without gaining excessive speed. Slow flight characteristics are very good. If you've set it up as recommended, there is no way that it will spin or snap roll. I have forced mine into a spin, however, by approximately doubling rudder and up-elevator movement.

Viel Glück!!



SCALE REFERENCES

- 1) Profile Publications No. 187, "The Junkers Monoplanes."
- 2) *Air Classics Magazine*, May, 1979, "Junkers' Tin Donkeys."



The author with some of his WW-I birds and hardware earned at the Rhinebeck Jamboree in Sept. '79. Placques are real conversation pieces, feature genuine old aircraft instruments!