

.020 Replica Plan • The Toledo Show

flying **models**

\$1.00

47506
JULY 1977

R/C Boating

Stand-Off Scale
Fokker T-2



FM Kodachrome: Don McGovern



**A Canard
Controline
Stunter**



PHOTOGRAPHY: BOB ABERLE

A Stand-Off R/C Fokker T-2

Non-stop coast to coast, May 2, 1923. Simple in line, it makes an interesting ship for .40-.60 mills /Don Martin

While looking for a radio control Stand-Off Scale project recently, I attempted to find something out of the ordinary that hadn't been modeled before. My interest was in aircraft involved in history making "first" flights and to my surprise I found the choice in this category was narrowing down.

One airplane in this select group did stand out as being neglected by modelers, the Fokker T-2. This aircraft made the first successful non-stop flight across the United States on May 2, 1923. Powered by a 400 hp. Liberty engine it lifted 10,695 pounds off the runway at Roosevelt Field, Long Island, N.Y. and under the skillful guidance of Lieutenants John Macready and Oakley Kelly landed safely 26 hours and 50 minutes later at San Diego, California. Considering the lack of navigational aids and the relatively

primitive aircraft and engines of the day, this was truly a remarkable accomplishment.

Why then should the Fokker T-2 with this outstanding contribution to Aviation history be neglected as a subject for modeling? Perhaps one contributing factor is its very boxy design with proportions not readily suitable to a stable flying model. I have to admit I passed it by at first for this very reason, and perhaps it was that same reason that made me reconsider. Certainly it would be a challenge, so I decided to give it a try.

It was quite obvious that some modifications would have to be made, but since this was to be a Stand-Off Scale, it seemed feasible that a presentable model could be constructed. My first source of reference was an article in National Aeronautics for Spring 1973 which

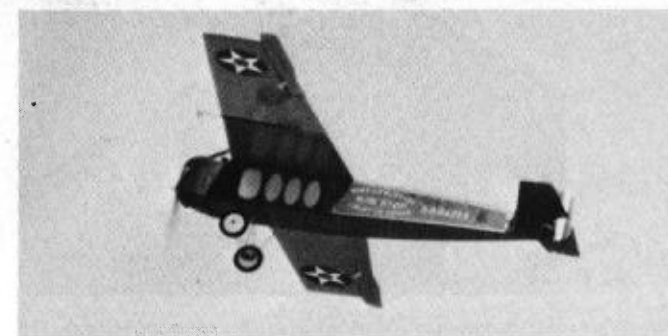
contained a reduced copy of blueprints obtainable through the Smithsonian Institution. I send for the drawings and these plus a borrowed copy of "Armchair Aviator" for July, 1973 featuring the T-2 story was all I needed to get started.

The size of the model was chosen to make use of an Enya .45 which had been sitting idle in the shop for some time. This gave me a fuselage large enough to contain most any size radio gear. Since I believe in making use of all equipment that is still in good working order I planned on utilizing an older Heath 3-channel receiver and some World Engines S4B servos. In fact, the transmitter for this rig is a Heath GD-47 modified for single stick and converted to 53.3 MHz.

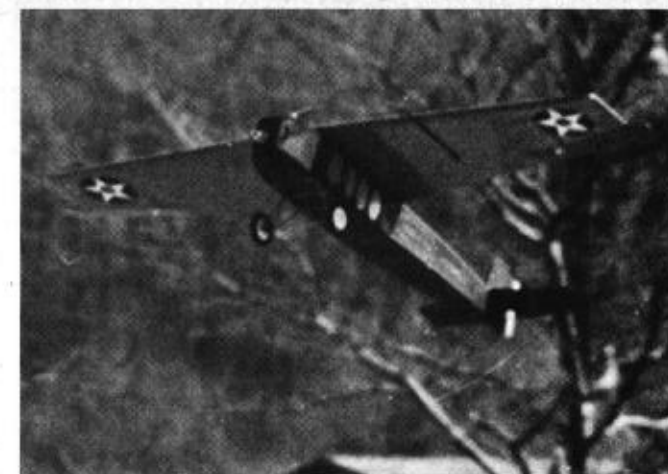
The major changes incorporated in the final design include lengthening the nose moment, enlarging all tail surfaces and the ailerons as well as changing the contour of the cowling to accommodate the Enya .45. All things considered the finished model measure up quite closely to my original expectations.

Construction

Let's start by building the wing spar. Yes, you read it correctly, the wing spar and if you will bear with me I think you will agree it is a simple way of building a wing. Trying to join two completed wing halves at the proper dihedral angle while fitting and gluing gussets plagued me from the beginning of my modeling career until I built my first gas model. The method



First flight. Climbing away. Sensitive to elevator, so don't overdo it. At right: Coming in to land, dead stick. It threw the prop at altitude. Facing page: A still-life scene, awaiting the moment to try its wings. Lower left: Sans cowering, historic Collect-Air photo of the full scale prototype captures the T-2 on the apron in 1923. It spanned the U.S.A. Beneath: Simple in line. Seen here before the finishing, an easy design.



used made wing construction so much easier I can't remember using any other method since then and the T-2 is no exception.

The entire main spar from tip to tip is made flat on the building board, complete with dihedral gussets before any other framework is added. This method will work with any type of dihedral and will present no problems even when using a wing jig.

Since it is impractical due to limited space on the plans to show more than half the wing on a plane this size it will be necessary to draw out the other half of the spar. I usually keep a roll of shelving paper on hand for this purpose and it shouldn't take more than 15 or 20 minutes to layout a workable drawing.

This done, cut to length the top $\frac{3}{8}$ "x $\frac{1}{2}$ " spars and pin in place on the plan. Next cut the center filler gussets from two thicknesses of $\frac{3}{16}$ " sheet to extend between the two R-3 ribs and the tip filler pieces to extend between R-9 and R-10. Then cut the bottom $\frac{3}{8}$ "x $\frac{1}{2}$ " spars to length and cement the whole thing together on the plan just as you would the built up side of an Old Timer fuselage. I use epoxy for this operation since this will be the heart of the wing. When the epoxy has cured remove the assembly from the plan and cut plywood gussets to fit over the center-section. Leave them a little large and trim them down later. Clamps will hold them securely in place. I used $\frac{3}{32}$ " plywood on each side of the

spar, but $\frac{1}{8}$ " on one side only would be sufficient. (I've been accused of being overly cautious, but I've yet to have two wing halves part in flight.)

While the epoxy on the gussets is curing, make up the bottom wing skins from three sheets of $\frac{1}{16}$ "x4" medium balsa. Cut them to extend from R-2 to R-10 and do not include ailerons at this time. The piece cut from the leading edge taper is used to fill out the trailing edge to complete the skin from three sheets. Now you are ready to make these parts look like a wing.

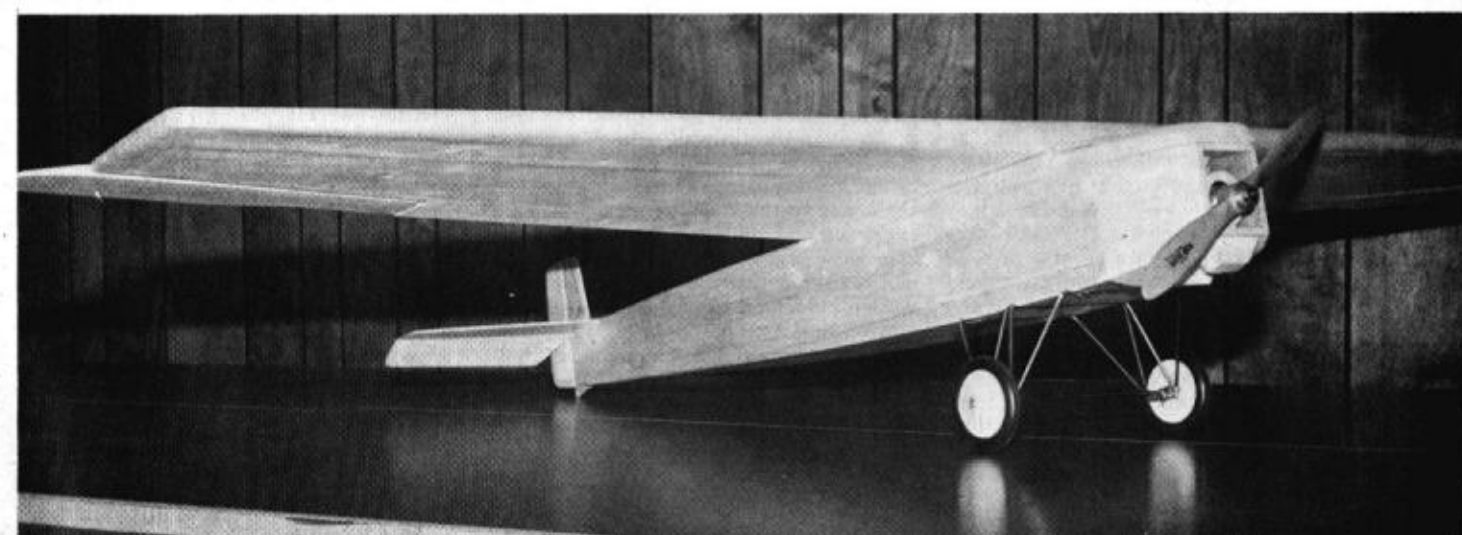
Since this is a flat bottom wing it will be built directly on the plans instead of in a jig. Taper some scrap balsa to go from nothing at R-7 to $\frac{5}{16}$ " at R-10 directly under the rear spar. Next cut three pieces tapering from the piece just used to nothing at the leading edge to fit under R-8, R-9, and R-10. When the bottom skin is placed on the plans over these pieces it will give the required wash-out in the tips. Pin the skin for one half down securely and then position the main spar assembly over it and glue and pin in place. The rib and spar lines have been extended on the plans to aid in their alignment with the skin in place. Now glue the rear bottom $\frac{3}{32}$ "x $\frac{1}{4}$ " spruce spar in position and also the $\frac{3}{8}$ "x1" leading edge and $\frac{3}{8}$ " triangle stock on top of the skin.

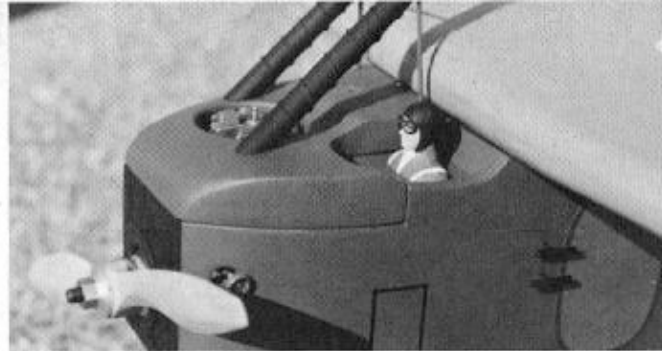
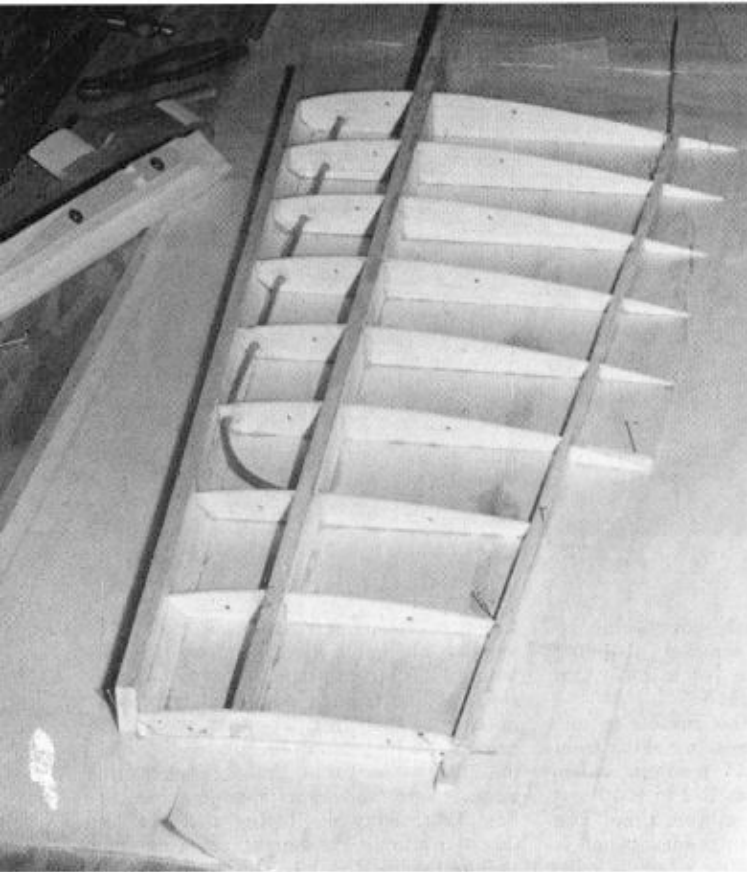
While this is setting up cut the root and tip rib templates from $\frac{1}{8}$ " plywood and the $\frac{3}{32}$ " sheet blanks for stacking and cutting the ribs. I tack-glued and bolted

these together and made progressively smaller blanks to conserve balsa. I also would like to recommend carving only the top, bottom, trailing edge and front spar notches at this time. The first stack I cut came out a little short on the leading edge due to the extreme taper. The leading edge length and rear spar notches are best trimmed while fitting the ribs and when trimming the height cut only from the bottom of the rib. Cut a filler piece to extend from R-7 to R-10 between the top and bottom rear spars and fit and glue all ribs in place and add the top rear spar.

Next glue in the $\frac{1}{16}$ " vertical grained webbing between the ribs at the main spar. Now mark off the ribs $\frac{3}{8}$ " up from the bottom skin and $2\frac{1}{4}$ " forward from the front of the spar. These will be the center of the holes for the Gold N' Rods for the aileron controls. Cut a scrap piece of $\frac{3}{16}$ " sheet balsa next to R-8 at the proper angle and make the holes in the ribs, webbing and bottom skin. I find a small round file works just great for this. Slide the flexible (red) Gold N' Rod through the holes making sure the inner piece is in place. This will prevent the outer section from breaking when making the bend. (I learned the hard way!) With the top raised up on the taper sections for washout, you should be able to push enough through the bottom skin to be trimmed off flush later. After epoxying this in place and checking all glue joints the top skin can be fitted and glued. This completes half of the wing.

PHOTOGRAPH COURTESY OF COLLECTAIR PHOTOS





How to get roasted, deafened and frozen in one breezy cross-country. The pilots of the era were worthy of your salute. **At left:** The wing takes on shape. Notice fully assembled spar, Gold-N-Rod installation, tip wedges for washout. **Beneath:** Du Bro Muff'l Aire minimizes non-scale departure.



Build the other half in the same manner and when completed the center-section skin can be fitted. Don't forget the $\frac{1}{16}$ " ply inserts and reinforcements for the wing hold-down bolts. The cut-out for the aileron servo will have to be tailored to your particular servo and favorite mount and linkage. A modified Goldberg aileron coupler worked fine for me. Glue the tip blocks on and put aside to dry.

The ailerons are made by cutting top and bottom skins and a tapered spar per the plan. Pin down the bottom skin, glue on ribs, spar and ply insert for the aileron horn screws and glue the top skin in place. Set aside to dry.

The Fuselage

Using $\frac{1}{8}$ "x3" medium sheet balsa make up the sides to the outline shown on plans. Cut the $\frac{1}{8}$ "x $\frac{1}{4}$ " spruce stringers and diagonals and glue in place. Now the $\frac{1}{32}$ " plywood doublers and epoxy in place. Don't forget to make a *left and right side*. Resist the temptation to beef up the fuselage aft of the wing. It is strong enough as shown and an effort must be made to keep the tail as light as possible since the T-2 has a long tail moment and short nose moment.

Cut out F-1, F-3 and F-4 and join the two fuselage sides with these bulkheads. When they are thoroughly dry pull the tail together and bevel the inside edges at the tail post to give a $\frac{3}{16}$ " thickness and glue. Use $\frac{1}{4}$ " square cross braces as shown from F-4 to the tail. F-1B should be epoxied at this point. Next fit the grooved landing gear blocks and filler pieces, then install F-2 and determine from the servos being used the location of the Gold N' Rod controls and fit and epoxy these in place. If a hidden antenna is desired, install an additional outer

Gold N' Rod section along one side of the fuselage. Cover the top and bottom with light $\frac{1}{8}$ " sheet balsa with grain running lengthwise.

At this point the engine mount should be fitted to the firewall and the holes drilled along with the tank outlet and vent holes. Install the blind mounting nuts for engine mount and epoxy them in place. Now cut out the bottom and side cowl blocks to rough shape and glue in place. When dry carve to the final shape, then build up the radiator screen. This is formed by sandwiching aluminum screening between two layers of $\frac{1}{32}$ " plywood with a third layer as a border around the screening. Once this is dry, sand the edges square and glue in place on the side and bottom cowl blocks. Now cut the top cowl block to shape. This may have to be altered to suit your particular engine and will be made removable. The plans show the location of a $\frac{3}{8}$ " diameter dowel insert which is drilled to accept the single 6-32 hold-down screw. Drill this hole and secure the blind mounting nut at this time.

Let's take time out now to test fit the engine in place. After drilling and tapping the mount for your favorite engine secure it to the firewall with 6-32 screws and lock washers. This can be done by using a long screwdriver through the shaft hole in the radiator screen. Tip the engine up and guide the shaft through the hole and "angle" it into place on the mount. Temporarily bolt it in place and mark off for the muffler cut-out. A Du Bro Muff'l Aire was found to be very suitable providing for a minimum of bulk hanging out of the cowlings. Remove the engine and mount and carefully make the muffler cut-out.

Now would be as good a time as any to

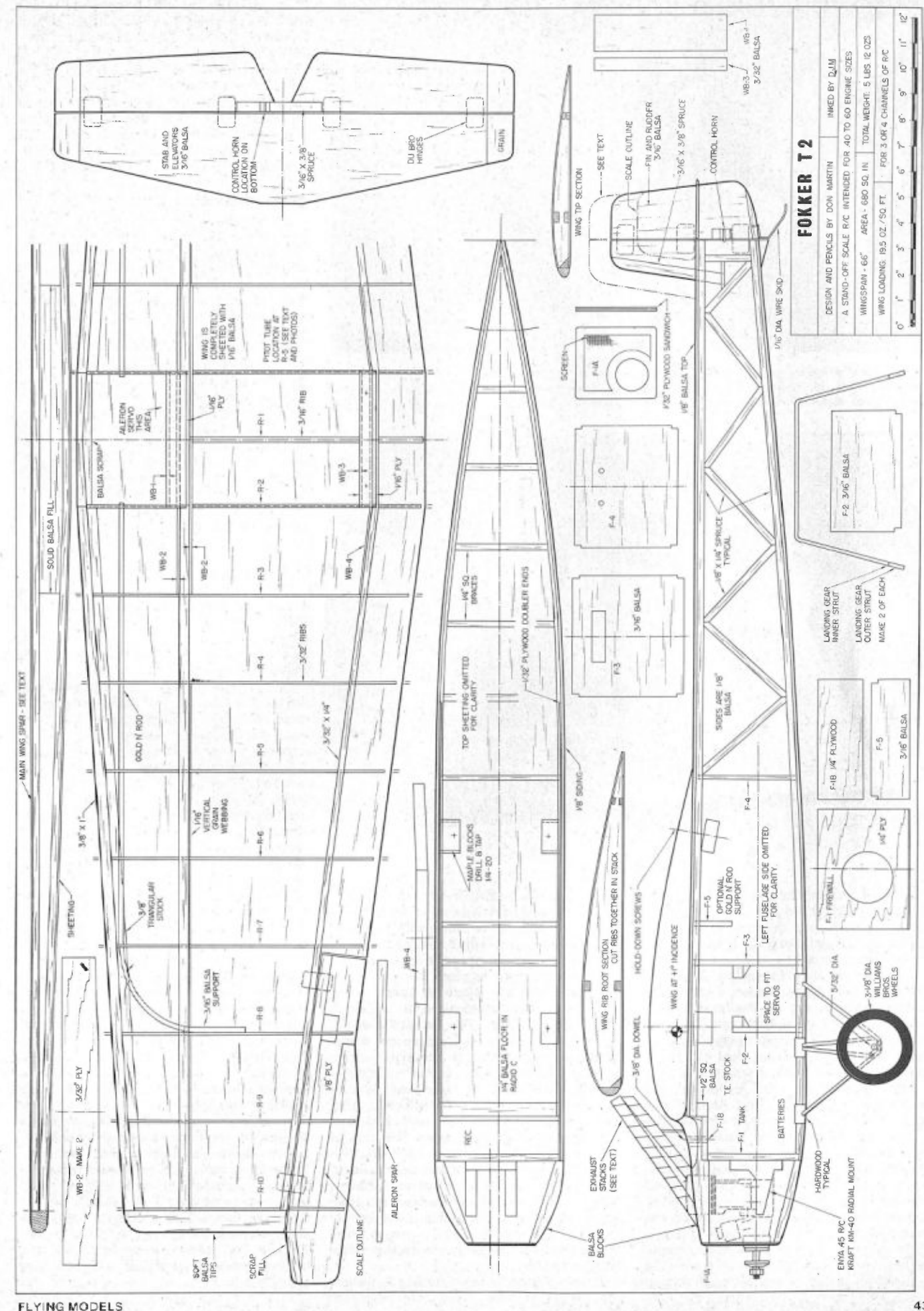
tackle the landing gear. Using $\frac{1}{8}$ " diameter wire make two identical outer struts and following the side view plans join the short bent ends with small pieces of brass tubing. The inner struts are bent in a similar manner, but are made to rest on top of this tubing with enough room between the ends for the $\frac{5}{32}$ " diameter axle to fit. This whole assembly is wrapped with wire and soldered. A torch or heavy duty iron is required for this and the results looks pretty much like the full size gear where the axle is wrapped on with bungee cord for shock absorbing. A simple jig is helpful while making this assembly.

The tail surfaces are built up of $\frac{3}{16}$ " sheet balsa using medium grade for the fixed surfaces and soft for the movable surfaces. Hardwood inserts are used as noted on the plans for control horn mounting and rudder leading edge and to join the two elevator sections. While the full scale plane had a full flying rudder it was felt a conventional fixed fin and movable rudder was more practical for the model.

Finishing

After carving the wing leading edge and tips to the proper shape and sanding these and all other surfaces smooth with #320 grit paper you are ready for final finishing.

The fuselage and tail were given two coats of nitrate dope over the bare wood, followed by two coats of K&B primer in preparation for epoxy painting. With winter weather and a confined working area I decided that brushing it on would be the better approach, but epoxies are not meant to be brushed on. I had just about convinced myself that I would have to wait until spring to finish the



FOKKER T2

DESIGN AND PERCIS BY DON MARTIN

INKED BY D.J.M.

A STAND-OFF SCALE R/C INTENDED FOR 40 TO 60 ENGINE SIZES

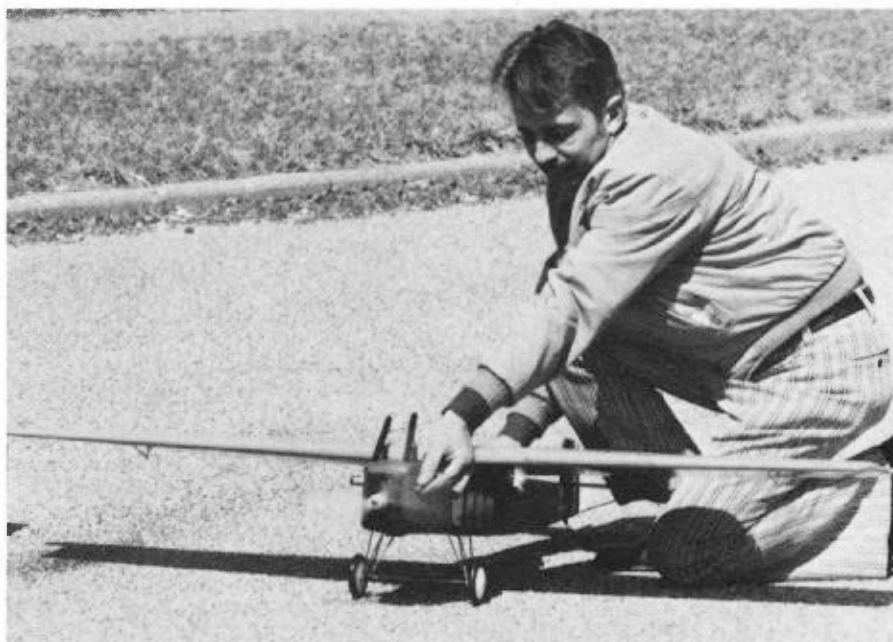
WINGSPAN - 66" AREA - 680 SQ. IN. TOTAL WEIGHT: 5 LBS 12 OZS

WING LOADING: 19.5 OZ./SQ. FT. FOR 3 OR 4 CHANNELS OF R/C

0" 1" 2" 3" 4" 5" 6" 7" 8" 9" 10" 12"



A good idea for a lot of test flights, as the scale rudder fin is very tiny to say the least, an enlarged fin was built with a slot within. It just slips over the scale fin for test purposes. One pin retains it. No stability troubles were encountered, but be wary in slow-flight range to be sure.



T-2 when I remembered reading a product report on R&S Products Perfect Paints with emphasis on their ability to be brushed on. A call to R&S Products confirmed these claims.

I wasted no time in getting a can of Perfect PC39 Army Green Camouflage paint and put a coat on the fuselage and tail. The results were amazing! The color was just right and brush marks were almost non-existent. The desired finish was accomplished with a second coat.

The windows are trim MonoKote and the gold striping is $\frac{1}{8}$ " Bridi Quik Stripe tape. Lettering is done with Presto Stik Vinyl Plastic Letters by Visu-Com Inc., available in any art supply stores.

From the information available the best I could determine was that plywood covered wings of this vintage were of an orange colored finish. After covering the wing with heavy white Silkspar I gave it three coats of nitrate dope, then orange Perfect paint was applied. One coat did the trick in this case and although it may

be a little too bright to be truly authentic, for this project it is quite acceptable. Apply the red, white and blue striping to the rudder and when everything is thoroughly dry, hinge the rudder, elevator and ailerons in place.

No attempt was made to super detail the model since after all it is a Stand-Off Scale project. The exhaust stacks were made from $\frac{7}{16}$ " diameter dowel wrapped with string to simulate corrugations. Braces are of $\frac{1}{16}$ " diameter dowel, all epoxied in place and painted black. The pitot tube was fashioned from $\frac{1}{8}$ " and $\frac{1}{16}$ " diameter dowel and fine wire for bracing. Tail braces are also of $\frac{1}{8}$ " dowel. Side vents were outlined with $\frac{1}{16}$ " black tape as were the approximate scale hinge lines of the control surfaces. The tailskid was placed further aft than scale to make it steerable for ease in ground handling. A Goldberg nylon tail wheel bracket was used to keep the strain off the rudder.

Before beginning any detailing however,

it is advisable to obtain a set of plans from the Smithsonian Institution, Fiscal Division, Section M, Washington, D.C. 20560. In addition, I consider a copy of "Armchair Aviator," July, 1973, with its many fine photos of the Fokker T-2, a valuable source of reference for scale detailing. This issue and also separate photo sets may be obtained from Mr. Leo J. Kohn, Collect-Air Photos, P.O. Box 14234, Milwaukee, Wisconsin, 53214.

Radio Installation

Placement of the radio will be largely determined by the equipment the builder has available. In general the batteries should fit either under or alongside the tank and right up the firewall with the receiver next to the tank as far forward as possible. Wrap each unit in foam for protection and also be sure to pack foam around the fuel tank. Mount the switch on a bulkhead or on the fuselage side bringing the actuating wire out the bottom of the fuselage preferably through the hardwood landing gear mount. Route the antenna along the side of the fuselage and push all the way into the Gold N' Rod outer section installed earlier for this purpose. I used an antenna connector by Sukarta Hobbies, Park Ridge, N.J. This handy gadget allows you to make a permanent antenna installation and simply unplug it to remove the receiver.

Flying Notes

The finished weight of the T-2 came out at 5 pounds 6 ounces and to get it to balance properly an additional 6 ounces weight was needed in nose. Even with this the wing loading comes out a very reasonable 19.5 ounces.

On the first flights I fitted an enlarged "slip-on" extension to the vertical fin since the scale sized fin seemed awfully small for adequate control. This will be trimmed down on successive flights until it is felt that the optimum size has been reached. The outline is shown on the plans. It is suggested that the builder use the same method if he has any doubts about the rudder size. Otherwise the T-2 showed no bad tendencies and the Enya .45 proved to be adequate power. Keep an adequate amount of control movement at first, especially rudder control. About $\frac{5}{8}$ " throw each way is suggested for a start. Not too much elevator seems to be the way to go, pending further flight tests.

As suggested earlier, this could be just the project to make use of that older R/C system and/or engine that doesn't quite have what it takes anymore for that hot pattern ship or pylon racer. The extremely fast control response and power required by today's planes in these two categories are not necessary for a Stand-Off Scale model of this type.

As a final note I would like to make a suggestion for those who are looking for a new challenge. Since a coast to coast flight by a radio control model is now a reality, perhaps the next logical step would be to re-create as closely as possible the actual historic flight of a full scale aircraft. Why not a scale model Fokker T-2 following as much as the original route as practical? Anyone care to try?