



ZLIN XII



By Dennis Tapsfield

Dennis has designed another prize winner, this time, the Zlin XII. Drawn at 23% of full size, this 91" span replica of the club/sport aircraft is fully aerobatic and the best part is, it only takes a .60 size 2-stroke to do it all.

I am sure we have all heard of the name Zlin, associated with aerobatic aircraft in particular, however, the subject of this model is a club type aircraft, of which about 100 were built in the period from 1935 to 1939. In this relatively short time of four years it became a very popular club/sport aircraft in Czechoslovakia. They were mainly powered by either a Walter Mikron engine or the Persy 2, a flat four side valve unit giving about 40 horsepower. This is not very much hp for a two seater aircraft, but it is, or was, quite a light aircraft weighing only around 700 lbs. empty. It had a

span of 10 metres (nearly 33 ft.), a wing area of 126 sq. ft., and a loaded weight of 1144 lbs. and was almost a powered glider with a wing loading of about 9 lbs. per sq. ft. It was very clean aerodynamically — its cruise speed of over 80 mph reflects this.

It was these factors, all taken from information appearing in the Czechoslovakian aviation magazines, together with a colour photograph of a recently rebuilt example, and a 3-view drawing from a book of Czechoslovakian aircraft 1918-1945 by Vaclav Nemecek, plus the fact that I had never seen the aircraft modeled,

that made me decide to build it. After doing a few sums, I decided on a scale of around 23%. This gave me a span of 91", a length of 70", a root chord of 20", and a tip chord of 7½" producing a wing area of about 8 sq. ft. I am using a Sport 60 2-stroke, a Merco 61. This is an engine I have favoured for many years, being ideal, in my view, for scale models. It swings a large propeller very well, is economical, has a reliable idle, and is light. As I was aiming for an all-up weight of 10 lbs. (I succeeded), this was essential. A 60 4-stroke would work fine if you prefer it. I know that a lot of fliers get



paranoid over tapered wings, but as this aircraft had a very good reputation for training and sport, I was determined not to be put off by it. As it happens, the model is a real pussycat all around. If power is slowly cut back and full elevator gradually applied at the same time, all it will do is very lazily lower a wing into a spiral descent (helped I'm sure by a 20 oz./sq. foot of wing loading). I was agreeably surprised. It is a real nice flying machine and, at 10 lbs. with the Merco 61, has power to spare. It will perform most manoeuvres, it will fly round a loop from level flight; stall turns, split "S" and inverted flight are all well within its envelope. It is interesting to note that such was the confidence inspired by the model that all of these manoeuvres plus some others, were performed by me on the very first flight, although the full size aircraft may not have been stressed for all these manoeuvres.

If you fancy building the Zlin XII, this is the way to do it.

CONSTRUCTION

Wing:

You can go for the foam wing if you wish, it is much easier than building a tapered wing such as this, but I'm sure

ZLIN XII
 Designed By:
 Dennis Tapfield
TYPE AIRCRAFT
 Scale (23%) Full Size
WINGSPAN
 91 Inches
WING CHORD
 12 1/4 Inches (Avg.)
TOTAL WING AREA
 1134 Sq. In.
WING LOCATION
 Low Wing
AIRFOIL
 Semi-Symmetrical
WING PLANFORM
 Taper
DIHEDRAL EACH TIP
 6 Inches
OVERALL FUSELAGE LENGTH
 69 Inches
RADIO COMPARTMENT SIZE
 (L) 5" X (W) 5" X (H) 4" Rear
STABILIZER SPAN
 26 Inches
STABILIZER CHORD (inc. elev.)
 8 Inches (Avg.)
STABILIZER AREA
 204 Sq. In.
STAB AIRFOIL SECTION
 Symmetrical
STABILIZER LOCATION
 Top of Fuselage
VERTICAL FIN HEIGHT
 13 Inches
VERTICAL FIN WIDTH (inc. rud.)
 9 Inches (Avg.)
REC. ENGINE SIZE
 60 2-stroke or 4-stroke
FUEL TANK SIZE
 10 Oz.
LANDING GEAR
 Conventional
REC. NO. OF CHANNELS
 4
CONTROL FUNCTIONS
 Rud., Elev., Ail., Throt.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Foam or Ply & Balsa
Empennage	Balsa
Weight, Ready To Fly	160 Ozs. (10 Lbs.)
Wing Loading	20 Oz./Sq. Ft.



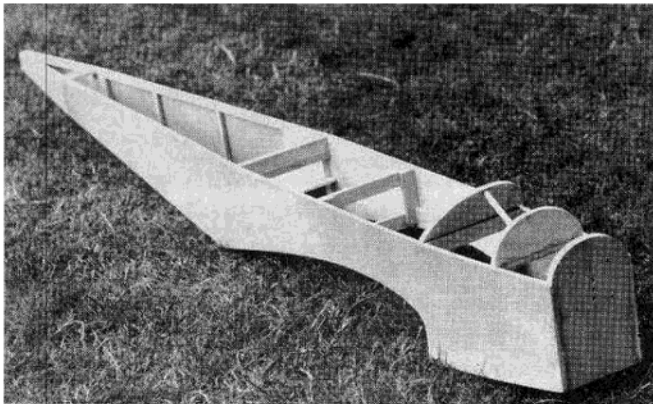
some of the purists among you will want to do it! You will find the drawings are really self explanatory. I built the wing in one piece to save weight, and suggest you do the same; if you need to build in two halves, you must use your favourite method.

Cut all the ribs from the material shown. Cut the tapered spars from hard 1/4" sheet balsa, pin the lower spar onto the drawing, and add the ribs. Do not forget the 5/8" shim piece where shown to support the ribs and produce the washout in the wing. Add the top spar, the webbing, and the inner part of the leading edge and allow to set. At this point, remove the 5/8" shim and the pins from the spar. Carefully roll the wing back onto the lower edge of the ribs until you are able to fit the trailing edge, the top rear spar, and aileron spar, having trimmed the ends of the ribs where necessary. When this is set, I usually finish building the wing "in the air" as it were. We all have our own methods.

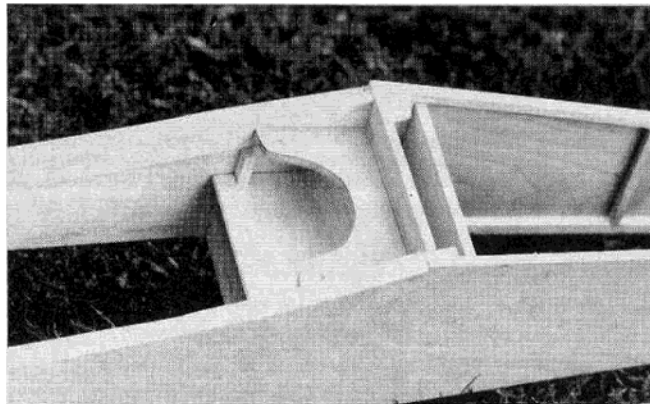
The 1/16" balsa wing skins should be made up and sanded smooth prior to covering the wings. If you are not sure how to make up the skins, proceed as follows: trim the edges of the 1/16" sheet balsa (you need 48" lengths for some of it) with a steel straightedge



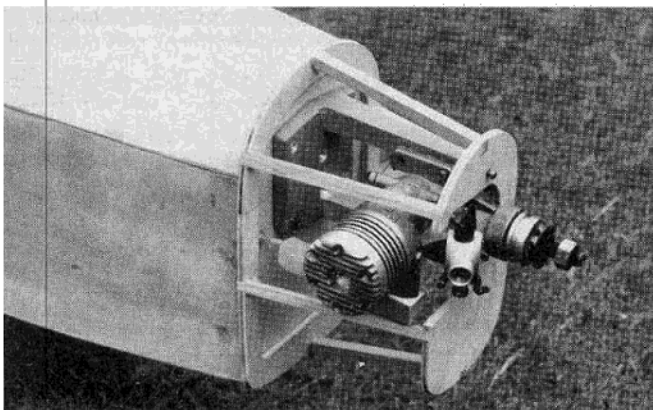
Full size Zlin XII reproduced from a color photo that appeared in one of the Czechoslovakian aviation magazines. We believe that the photographer was Vaclav Juki.



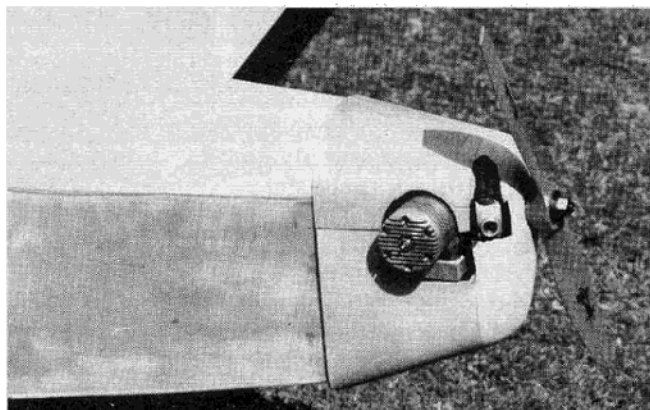
Basic fuselage box ready for turtledeck. Can be balsa covered foam or just balsa. 1/64" ply sides.



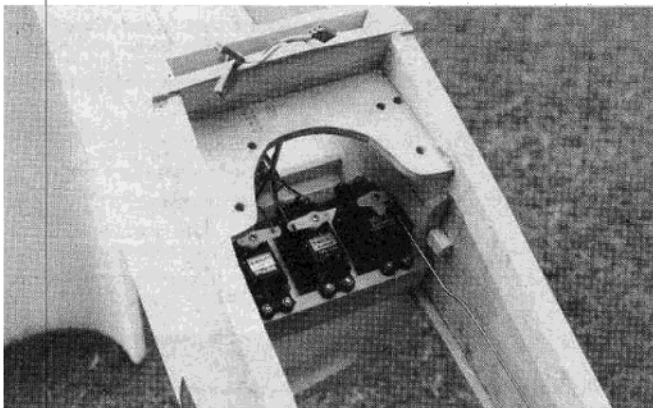
Shows rear wing mount for screws.



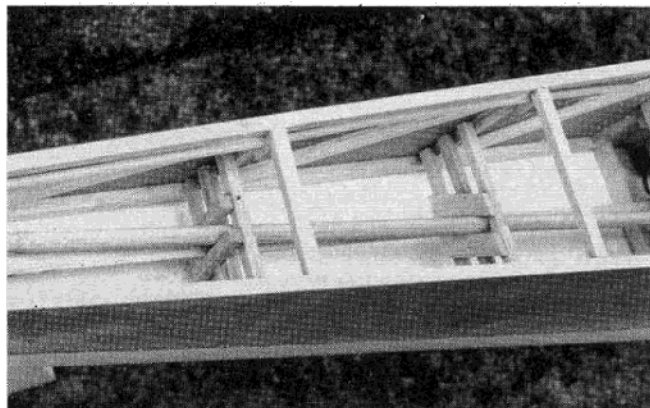
Author's old standby Merco .61 is ample power. Cowling is built-up and ply covered.



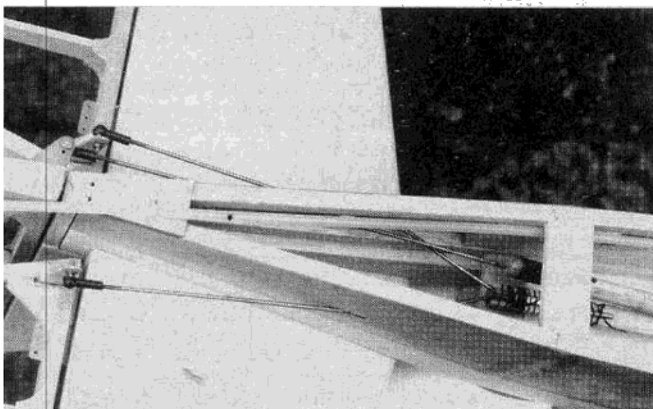
Complete cowled-in engine. Other side has a dummy cylinder.



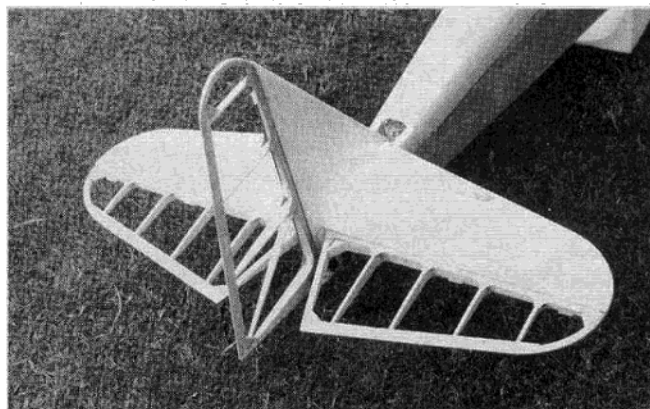
Rudder, elevator, and throttle servos are mounted under wing mount plate.



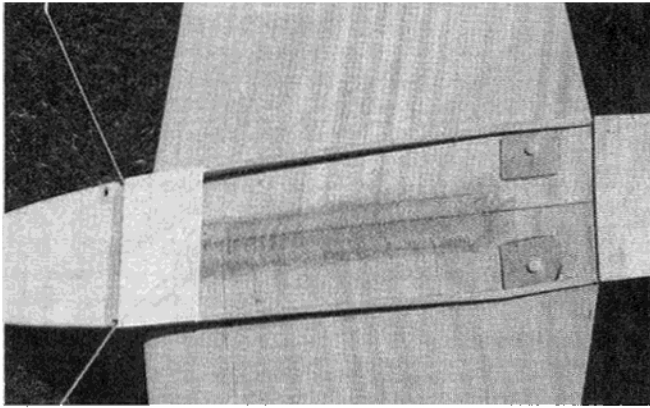
Dowel pushrods are braced to keep from flexing.



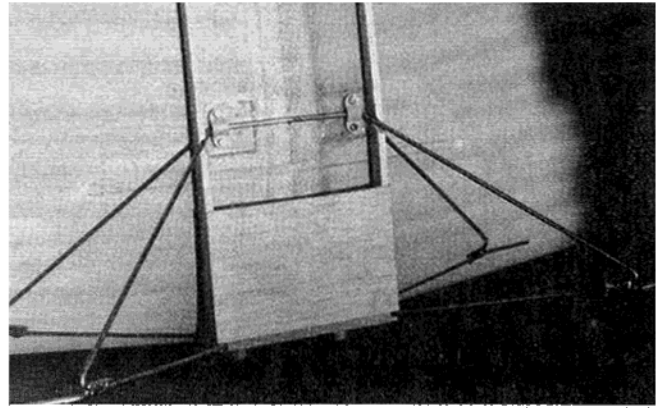
Exit at tail. Note that elevator is split with horn on both sides. Makes a better arrangement and finer tuning.



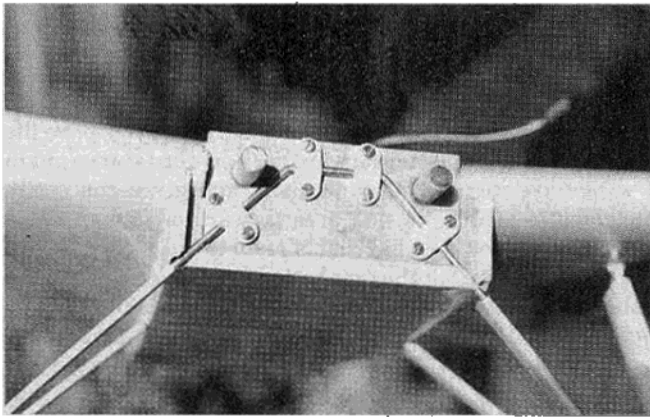
Tail is attached. Prototype has balsa covered foam turtledeck.



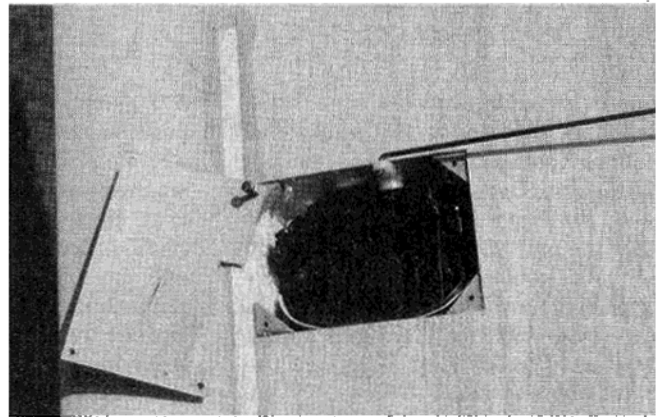
Wing fairing being added to bottom of wing. Landing gear is also being attached.



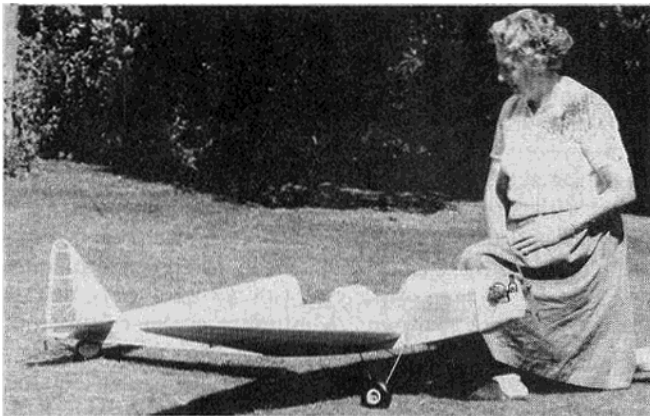
Rear leg of L/G in place.



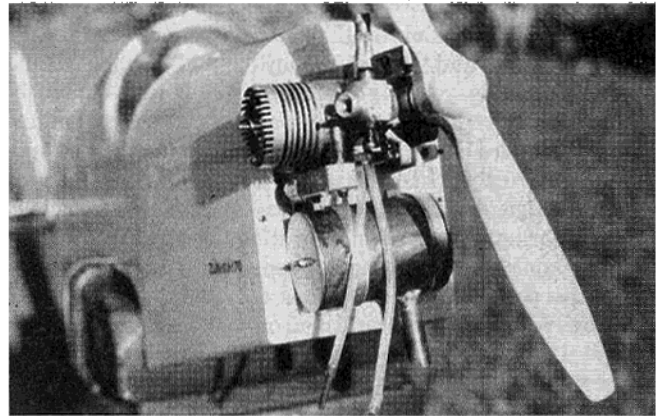
Shows how front L/G wire is attached with nylon clips.



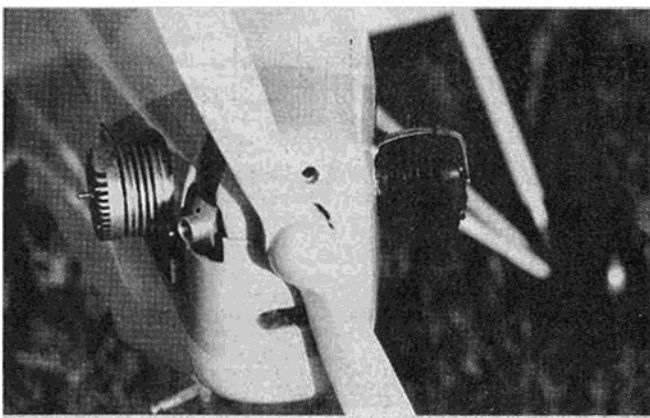
Aileron servo has removable plate. Servo wire and extension runs through 1/2" hole.



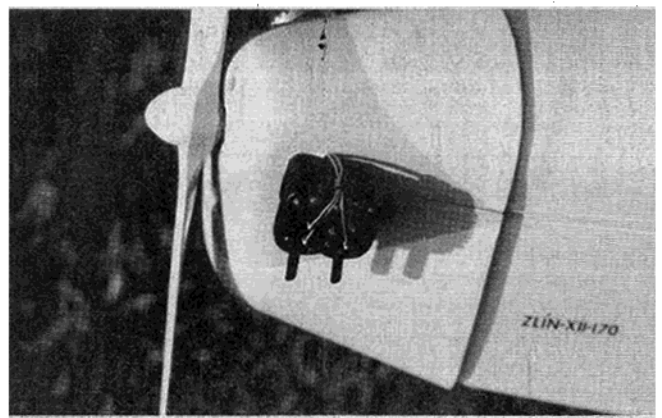
Author's wife, Vera, looks over the Zlin.



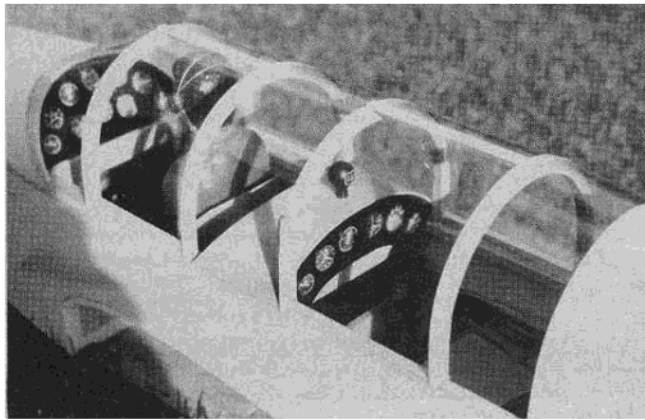
Dennis describes in text just how he made the custom silencer.



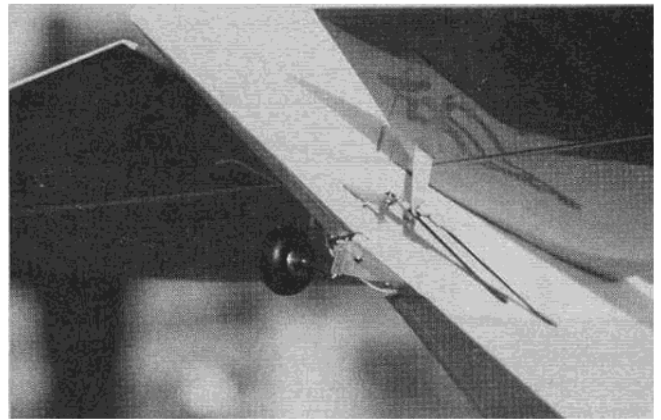
Front of Zlin with both cylinders protruding.



A close look at the dummy cylinder.



Cockpit complete with pilot in front.



View showing tail wheel and linkage hook-up for rudder and elevator.

and balsa knife. Butt the edges close together and cover the joint with cellophane tape (1/2" is okay) for the full length. Open the joint like a book, glue the exposed edges (make sure that the glue you use will sand easily — balsa cement is okay), close the joint, remove the excess glue, and then tape over that side. Continue in this way until your wing skins are the right size and shape. When they are dry remove the tape, lay the skin onto a flat smooth surface, and sand with a sanding block until it is smooth and you cannot feel the joints. If you try any other method, disaster could follow! By the way, the grain of the skin should lay parallel to the main spar. Great care is required to ensure that the correct washout is preserved in both wings, and that it is equal.

Don't forget the hardwood blocks and the paper tube for the servo leads. Mark the position of the ailerons on the skins so that you can cut them out later! It is better to cover the underside of the wings first, then place them back onto the drawing with the

5/8" shim piece in place; pin in position, then cover the top surface. It all sounds complicated, but washed-out tapered wings are just that. However, I'm sure you've done more difficult things before this! You will succeed if you are patient. **Make sure that you can slide the wing braces into place before you skin the wings! You can, of course, glue them into one half before skinning.**

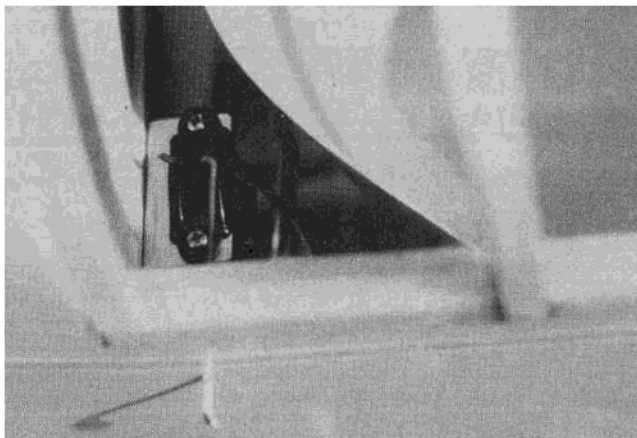
Fuselage:

This is a very straightforward box structure such as we have all built before. Make the two sides with the 1/4" sheet filling in the forward area. You will have to "crack" the longerons at the tail end and introduce the 1/4" sheet reinforcement between the longerons to strengthen them. The sides can now be covered with 1/64" ply. Cut the firewall from 3/8" ply, and you can now begin to get it all together.

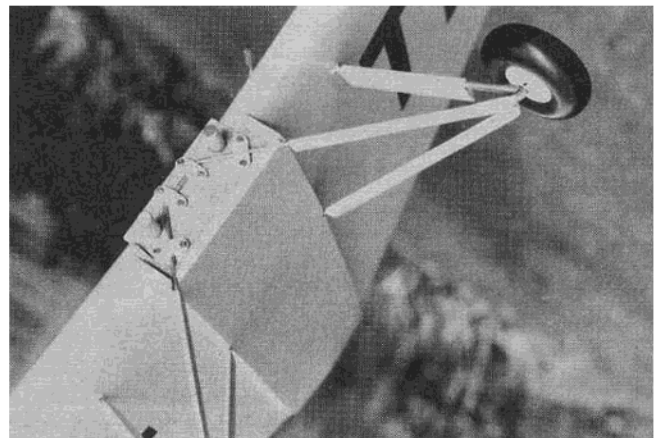
If you intend building the rear deck rather than using foam, cut out the formers you need, but do not notch them until the final stages; you can

then be sure that the stringers will be straight. Make sure that you leave the top forward deck off until you've put in the tank shelf, and given the entire inside area forward of former 3A, a good coat of resin to fuelproof it. Leave the rear bottom covering of 3/32" sheet off for access to pushrods, etc. I usually put a length of 1/8" o.d. nylon tube inside the fuselage for the rx antenna, exiting at the tail end near the tail wheel bracket. Fit the engine mount (I prefer alloy). Get one that is long enough to be trimmed to the right length. The ends can now be drilled and tapped to take the cowl retaining screws. Cut the cowl formers and assemble with the 1/4" x 1/4" and 1/8" x 1/4" hardwood, then add the 1/32" ply covering.

Cutouts, etc., will vary with the engine used. The silencer for the Merco was made from a 3" length of 2" dia. copper tubing. Ends were turned from 1/8" aluminum sheet to fit into the tube with a shoulder as shown. These ends are retained by #6 threaded rod right through the centre.

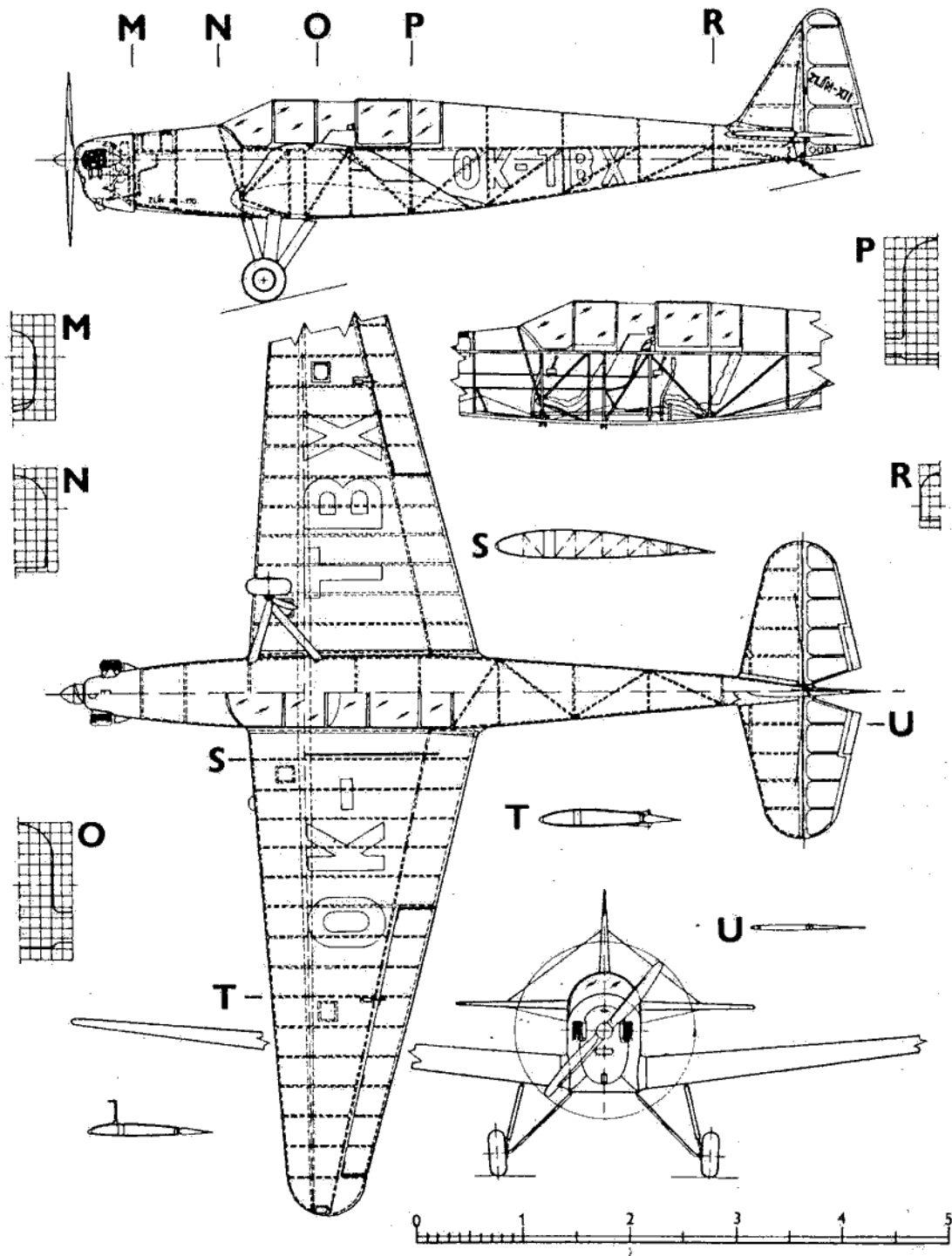


On-off receiver switch is located behind rear seat with push-pull wire.



View of completed landing gear.

Zlín Z-XII



The small copper elbow (approx. 1/2" o.d.), available from the local plumber, and the brass outlet pipe were silver soldered in place. The outlet must be drilled in one side only as shown. Do be sure that one hole is down at the very lowest position, otherwise oil can accumulate in the expansion box.

The manifold is made from a piece of 1/2" square section aluminum bar. Drill a blind hole down the centre, then open one side to match the engine

outlet. Drill two holes for retaining bolts; the manifold system will vary depending on the engine used. Two aluminum straps and a short piece of silicone tube complete the unit. Mine weighed around 5 oz., but, being fairly thick and heavy was quite efficient (I did need some weight in the nose anyway! It does pay to keep the tail end light). The dummy left hand engine cylinders are made with laminations of balsa and 1/32" ply as

shown. The cylinder head is from 1/2" balsa with saw cuts to simulate the fins. Cut out the areas of the fins where the nuts and spark plugs are glued in; use a sharpened piece of brass tube or something similar. Add the dummy exhaust pipe using 3/16" dowel. Paint the whole thing matt black, epoxy in the small nuts, add the dummy spark plug leads, and glue the complete unit to the top section of the cowl. It looks quite realistic.

Tail Unit:

This is quite conventional and requires little description. Sand the 1/16" balsa covering to about 1/20", or you could go to your local shop and find some that has been cut a bit thin. The thing to bear in mind is that this is a very long fuselage and **you must try to save weight** as much as you can in the tail area, so do select your wood carefully. Cut the two elevator horns and the rudder horn from 1/16" fiberglass P.C. board. Do not glue the tail unit in place until both it and the fuselage are covered.

Undercarriage: (To be fitted after the wing is complete)

Bend the 5/32" wire front and rear legs as shown. The best way to assemble the gear is by fixing the front legs to the wing with four nylon clamps as shown. (The wing at this stage should have the belly pan sides glued on.) Use two nylon clamps to retain the rear legs onto the wing blocks, make sure the fore and aft position of the main legs is correct, then bind and solder them together as shown. The main leg fixing plate should be epoxied into the wing block. Make the main legs as shown, and fit them temporarily. Check that the track is correct and the wheel axles are aligned.

Miscellaneous:

At this point I usually fit the servos, pushrods, etc. You should be in a position to temporarily assemble the entire model for this purpose now. Three servos fit side by side on two rails behind the cockpit area as shown, with room for the rx on top of the 1/4" ply wing bolt plate. I prefer to use 5/16" x 5/16" balsa pushrods or arrowshafts, with 1/16" welding wire ends for the elevator and rudder. It is best to "egg box" them in, every 9" or so, to eliminate harmonic vibration. The throttle pushrod is merely a length of 1/16" welding wire going all the way forward along the fuselage side to the engine bay through the tank area and firewall. The aileron servos are each mounted on a standard aileron bracket, usually available for the make of servo which you have, each using a long output arm to come above the wing lower surface for connecting to the aileron pushrods.

Note: Make quite sure that your radio gear will tolerate the extra long leads needed to extend to the aileron servos. My Fleet PCM and FM is perfectly capable of handling these extensions as are most modern sets, but do check

with the manufacturer or distributor of your set if in doubt. Some radios go berserk with long leads; better safe than sorry! My battery is up forward in front of F3A, but delay the positioning of it until the final balance is eminent. The switch is fitted on the former behind the rear seat, with a wire rod extension through the fuselage side, set to push for off.

Covering:

Note: The balsa sheeting over the stab is very fragile at this stage. I spot glued a block of balsa under it as a support while covering, removing it only when ready to glue the stab to the fuselage. In order to save weight I covered my model with heat shrink film in a "Zlin Yellow." This is the correct colour for OK-TBX according to the colour picture I have. The letters and trim are cut out of black and Tropic blue (S) "Solartrim" soon to be available, if not so already. The cowl trim is painted with matching Tropic Blue (S) Solarlac, as is the propeller. The Zlin Yellow can be matched by using one part Antique (J), two parts white (S), one part yellow (S) Solarlac. The cockpit interior should be painted grey. Unfortunately I have no information on the instrument panel, but at that particular time it would have been pretty basic. The canopy is all flat sheets and is put on in three pieces using double sided tape. I find this is a much cleaner and easier method, and you can't glue where it will spoil the effect.

Flying:

Set all tail surfaces neutral with the correct amount of movement. The ailerons should be set with their trailing edges up about 1/8" to help with differential and simulate extra washout. It is true to say that this model has no surprises, except perhaps for how fast it becomes airborne. Some right rudder is needed initially, but it soon becomes unnecessary. It does tend to float a bit when landing, but, apart from that it is a good, honest flying airplane, with excellent ground handling characteristics. Taxi out, take off, fly, land, and taxi back to the box. Lazy flying, but oh so nice!

Happy Landings.