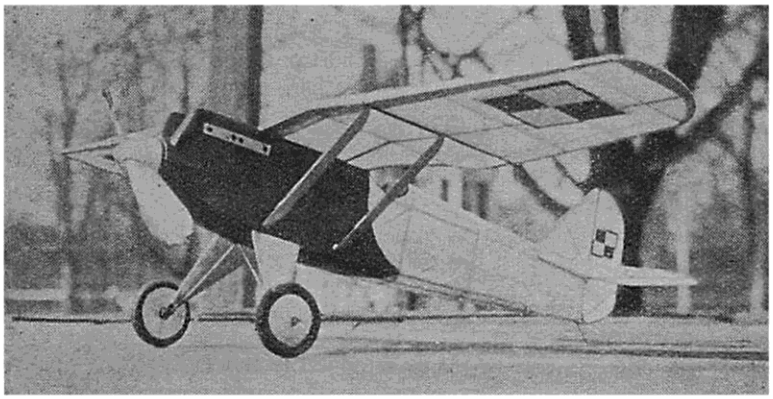
Build Your Own "Polish Fighter"

Make a Flying Model of This Zippy Craft at Small Cost and Little Trouble. Here's How!

By Howard G. McEntee

THIS month we shall construct a very unusual model, the PZL-1. This Polish pursuit ship is one of the outstanding European fighters. Its construction and design are in line with the growing tendency, especially on the Continent, towards monoplanes for pursuit purposes. The United States has not done so much in this line in pursuit ships, but will probably do so in the near future, as several monoplane types have been accepted, such as the Curtiss A.8. Attack and the new Boeing Bomber.



Polish Fighter PZL-1 built from these plans

The PZL-1 is a product of the Panstwowe Zaklady Lotnicze of Warsaw, from which it gets its name. Great interest was shown at the 1931 Cleveland Air Races in the PZL-6 ship which Captain Orlinski, of the international acrobatics team, flew. This is a version of the PZL-1, but with an air-cooled motor. The latter was chosen as a model subject because it is a bit more unusual in this country. Its span is about 35 feet.

Both ships are of all metal construction throughout, including all coverings, corrugated dural being used on the wing and tail surfaces and smooth dural on the fuselage.

THE performance of the PZL-1 is a little better than that of the PZL-6 because of higher power and less head resistance. The motor is a 600 H. P. Hispano Suiza, giving a high speed of 191 m.p.h., with a climb of 16,400 feet in 8 minutes. The engine is cooled by a retractable Lamblin radiator. This is not shown on the model as it would cut down the performance and add weight. It may be added if desired, however, and goes just in front of the landing gear.

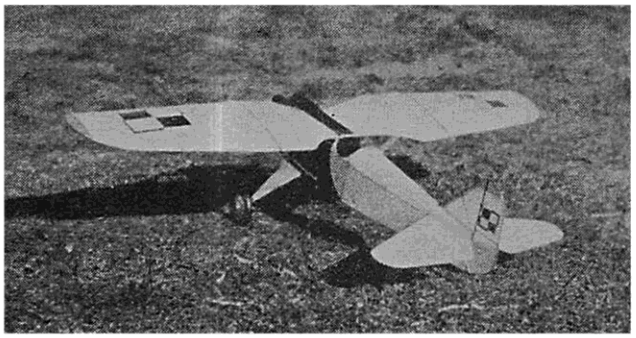
The foregoing history of the PZL-1 is short but will serve to acquaint the reader with the type of ship that is to be constructed. The builder will do well to keep in mind the necessity of reading over this article thoroughly at least once, and to study the drawings so that no mistakes will be made when construction is finally started.

Not a real "ship," just a model that performs like the real thing

Fuselage

The sides of the fuselage are made first as usual. The longerons, uprights and diagonals are all of 1/16" square balsa. After one side is laid out on the board and the glue is dry, outline along both sides of all pieces with a soft pencil. Then cut it off the board and lay out the other side. Since this fuselage does not have a flat bottom, a little different procedure is followed to assemble it. Therefore, when the glue is dry on the second side, do not remove it from the board. Instead, glue in place the formers, 1 (four of these), 4, 5 and 6 and a 1/16" square piece at the top of station No. 2. As the glue sets, straighten these pieces to a vertical position. When they are dry, put glue on the upper ends and put the remaining fuselage side in place, making sure all joints thus formed are well glued.

TAKE great pains to get the fuselage trued up correctly. Use a triangle or a carpenter's square for this and hold the assembly in position with small bottles, dope cans or other convenient means. Also two pieces, A and B, may be put in place between the lower longerons. They are both 1/16" square. When the work is well dried cut it off the board carefully with a razor blade. Formers 2, 3, 7, and 8 may now be put in place and glued, and the longerons glued together in the rear. Do not put in the rudder post, C, yet. The nose piece, D, with the hole cut and the motor stick clip in place is now assembled to the fuselage. The four longerons must be carefully cracked at station No. 2 so they will bend inward to meet D correctly. Place glue in the slots of D and also where the longerons were cracked, and use pins to hold the latter in place until the glue has set. Two bamboo pieces go from



This ship may be built to make a perfect take off.

each side of D back to the uprights at station No. 2. These are curved outward and serve to carry out the proper nose shape.

The stringers may now be glued in their slots on the formers. There are 3 the full length of the bottom and 5 from the rear of the cockpit back, on top. Cut the rear ends off approximately even with the ends of the longerons, but do not glue them yet.

THE motor blocks, E, are cut from fairly soft balsa. The best way is to start out with blanks, as we do with propellers. In this case, use two blanks 1" x 11/16" x 5/8". Cut them to the general outlines shown, then carefully cut to the correct cross section as shown. Be sure to make a right and a left. To the rear of the center the blocks are merely rounded off on both top edges. The bottoms are not rounded on either edge, nor are they hollowed out. They are glued on as shown in the drawings. The space left between the blocks is covered with a small piece of 1/32" balsa veneer, cutting it carefully to size and gluing in position. The finishing touches may be given after they are on, with sandpaper, to get them alike.

The cockpit outline of 1/16" reed finishes the work on the fuselage.

Landing Gear

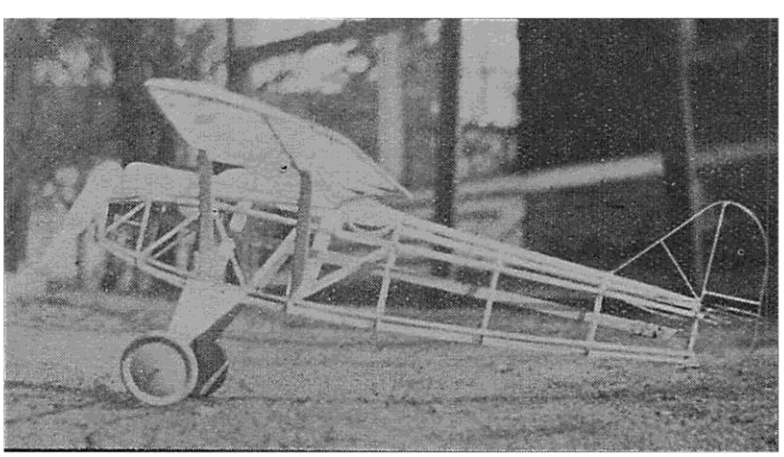
The four struts of the landing gear are of 1/32" x 3/32" bamboo. The front struts, F, are bent at the upper ends so they can continue along the uprights at station No. 3 for 1/2". The rear struts, G, are simply glued to the bottom longerons allowing 3/16" or so for the glue to make a good joint. The struts are bound and glued at the lower ends.

The axle is one continuous piece and also serves as a third member for each side of the landing gear. It is made of No. 12 music wire and is glued, in the center only, to the bottom former which is 1/8" thick. The ends are held to the landing gear Vees with small rubber bands. These should be tight enough to hold the axle from wobbling, but loose enough to give shock absorbing action. This axle, by the way, is placed to the rear of the Vees and not in the center, for in our models, most serious shocks are towards the rear, and not vertically as in the large ships.

The Vees are now covered with 1/32" balsa veneer on both sides. Do not cover all the way to the bottom; leave 1/2" uncovered so the shock absorbing rubber can be run through. Also leave 1/32" between the wood and the bottom longerons. This space is left to make the covering job a bit easier.

The tail skid, H, of No. 8 wire may be bent now, but cannot be put in place until the rudder post, C, is on.

The wheels are 1 9/16" in diameter and are turned out from balsa. Celluloid wheels may be used, but the exact size may not be available. In this case, use the nearest larger size.



The uncovered skeleton shows excellent construction.

Tail Surfaces

ALL TAIL surfaces are made of bamboo, the outlines being about 1/16" x 1/32". Make both sides of the horizontal tail in one piece and split it in two afterwards. When the outline is made, the elevators and stabilizer may be assembled over a piece of wax paper placed on the drawing. Put the whole on a board, with pins to hold the parts in place. Apply glue to all joints and set aside to dry.

The rudder parts can be made now, but the stabilizer should be put in place first. It is glued directly to the top of the upper longerons and the forward edge should be against former No. 8. Be sure it extends far enough below the lower longerons so the bottom stringers can be glued to it. The stringers are now cut, and glued in place.

The rudder outline can now be put on, with the forward end glued to the top stringer at former No. 8 and the lower end against the rudder post. A small triangular block, I, will strengthen this point. The tail skid, H, which is also the motor stick support, may now be glued on.

Put the two elevator braces, J, in place, and glue in the rudder cross pieces, K.

Motor Stick

The stick is of 1/8" x 1/4" spruce. A regular propeller hanger is bound and glued to one end, and the rear hook of No. 12 wire fastened to the other. A small hole in the rear end serves to hold it on H.

Propeller

The propeller is cut from a block of medium balsa, the size being shown on Fig. 5. The shaft is of No. 12 wire. The spinner is best made of balsa turned out with sandpaper on a fan motor. A slot of the proper size is cut in it to fit over the propeller and it is glued on. Any cracks left may be filled with a mixture of glue and very fine sawdust, which may be forced in with the tip of a knife blade.

A good going over with fine sandpaper will finish the propeller which should then be balanced. This is important for smooth running. The balancing is best done by sanding a little off the heavy blade, preferably near the tip, until balance is secured. Sometimes the spinner will throw it out too much to use this method. In such a case, tiny weights, such as pin ends stuck in the tip and secured with a drop of glue, will bring about balance.

Wings

The wings are the only parts apt to give trouble, especially to the inexperienced, but

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if the construction is carried out as outlined below, no trouble should be had.

The center section, or rather sections, will be made first. They are first assembled flat on a board and glued. Then they may be removed and the spars bent and glued. First make all four wing pins, L. These are of No. 12 wire, each 1¾″ long. Bend back ⅜″ on end of each, so they may be fastened securley in the spars.

Cut four spars of ⅛″ x ¼″ balsa, 4″ long. Make a slot in each one ½″ long as shown on Fig. 5 for the pins, L. Then starting 1¾″ from the slotted end, taper all four from ¼″ down to ⅛″ at the opposite end. Now on the under side, but not the tapered side, cut a very narrow Vee half way through each spar. This will enable you to break them very accurately later. Do not break them now, however. Set two of these prepared spars aside for use as rear spars, M. Round off one side of the other two to form the leading edges, N. Be sure not to make both alike, but make a right and a left. The tapered edge should be up and the V cut at the bottom. Put the wing pins in all four spars and bind with thread, covering with plenty of glue.

While the spars are drying, cut out all the ribs, including those for the wing tips. The No. 6 ribs are cut from blocks 2¼″ x ⅜″ x ¼″. They should be cut to shape roughly and finished after the wings are entirely assembled. Remember to make two end ribs No. 6 with curves opposite, two of No. 1, 3, 4, and 5 of 1/16″ balsa, and four of No. 2 of ⅛″ balsa. It will be found that the ribs shown on Fig. 6 are of exact size, except that the trailing ends are a little too long. These are left this way purposely because it is very easy, when building a tapered wing, to make ribs too short, making it necessary to cut new ribs. When the wings are laid out, the leading and trailing edges should be pinned down first, then the ribs may be cut off at the small end to the correct length. This applies to both wings and center sections. All of these should be made directly on top of the patterns, which are covered with wax paper, and with a board underneath.

The center sections may now be assembled as described above. Only one side is shown. The other may be traced on a separate sheet, using carbon paper. The tracing is then cut out and turned over so a left side may be made. The trailing edge piece, O, should be soaked in water and bent to the shape shown, with pins to hold it.

When dry, the spars, M, N, and O, should be carefully cracked, with the free ends down. Place the whole center section on a block or other convenient support 1/2″ high, so that the spars from No. 1 rib inward hang over the edge and touch the table top at inner ends. Thus the No. 1 and No. 2 ribs are 1/2″ higher than the inner ends. Put glue around the cracked part and set aside to dry. Do not put in the small top spar, P, until the wing is on the fuselage.

The wings themselves may now be made. The two rear spars, M′, taper from ¼″ to ⅛″ at the outer end as do the front spars N′. The latter are rounded off on one side so as to carry out the curve of the ribs. A small hole is drilled ¾″ into the large end of each spar with a No. 60 drill for the pins, L. Wrap over the holes with thread and coat with glue.

Assemble the same as with the center section, pinning down the outline first and then cutting the ribs to the correct size. Glue the ribs in as you go along and put in the spar, P′, last. The trailing edge, O′, is best made in two pieces, although a single piece could be bent if soaked in water first. When dry, finish off with fine sandpaper.

The center section is assembled to the fuselage by rounding off the ends of M and N and sticking them in holes made in the motor blocks. The ends are made long enough for this. Use plenty of glue, but before it has set, glue on the wing struts, Q. These are 1/16″ square bamboo with a trailing edge of balsa, rounded off front and rear. It is best to measure your own model before cutting the struts, as any small variations in construction would be apt to make the struts shown on Fig. 2 fail to fit.

Use great care in trueing up the center section, as the success of the model depends on it. The angle of incidence is zero degrees, and imaginary lines along the bottom outer ends of both M and N should be parallel with each other and the table top, when the tail is in flying position.

When the glue is entirely dry, slide on the wings and put in the motor sticks to be sure that they fit correctly before covering.

Covering and Decorating

Cover a little at a time, using pure banana oil as an adhesive. The author recommends covering the fuselage top and bottom with a separate piece between each former. Cover the sides next, then the tail surfaces, and the center sections last. Use a single piece on the bottom of the latter and two pieces on top of each. The wings may be covered with a single piece on top and the same on the bottom.

When finished, spray all covering lightly with water from an atomizer. Put little or no water on the tail surfaces or they will warp.

Since all wing surfaces of the large ship are covered with corrugated dural, the author drew lines ⅛″ apart with India ink on all paper used for the wings and tail, making it resemble the dural. Of course, this was done before covering. It is a tedious job, but looks very well on the finished ship.

All wooden parts, such as the propeller, wheels, motor blocks, struts, landing gear Vees and wing tips, should be coated thinly with white paste, rubbed in well. Then paint as follows:

Black: Tires; entire fuselage from cockpit forward, including motor block; wing tips.

Aluminum: Wheel centers; propeller and spinner; struts; landing gear; wing leading edge, ½″ wide at center, tapering to ⅛″ at tip; leading edge of fin and stabilizer, ¼″ wide; wing and tail tips, ½″ in from the tip.

Also, a rectangle of aluminum paint on each motor block, with four black dots for exhaust pipes. Outline the cockpit in black and install a rectangular celluloid windshield.

The insignia, as shown on Fig. 1, are painted on thin paper and glued in place.

This decoration scheme is as near the original as possible without adding excessive weight. The original model weighs 1¼ ounces unfinished, and 1½ ounces with all decorations.

Conclusion

The model should be flown with about six strands of ⅛″ flat rubber.

It will probably be necessary to bend the wing pins so that there is a dihedral of at least ½″ on each tip. That is just why the tips were designed to be detachable.

Keep at it and you will have a fine model, and one which, on the ground or in the air, is about as fine a looking one as it is possible to make.

Materials

Balsa (3 feet in length):
- ¼″ x ⅛″ (2)—wing spars M, N, M′, N′
- ⅛″ x 1/16″ (1)—trailing edge, O, O′
- 1/16″ square (6)—longerons, uprights and wing spar P, P′
- 1/16″ x 2″ (½)—ribs, formers
- ⅛″ x 2″ (⅓)—ribs
- 1/32″ x 2″ (⅓)—landing gear.

1 propeller block—7″ x 1⅛″ x ⅝″ balsa.
2 motor blocks—1″ x 11/16″ x ⅝″ balsa.
2 wing tip blocks—2¼″ x ¼″ x ⅜″ balsa.
1 spinner—1⅛″ diameter, balsa.
1 spruce motor stick—14″ x ¼″ x ⅛″.
Five 12″ lengths bamboo.
1 pair lightweight wheels 1¾″ diameter.
10 feet ⅛″ flat rubber.
2 feet No. 12 music wire.
6 inches No. 8 music wire.
2 sheets superfine paper.
Banana oil, glue, washers, pins, etc.