



ДОСААФ

POLIKARPOV PO-2

BY FRANZ MEIER



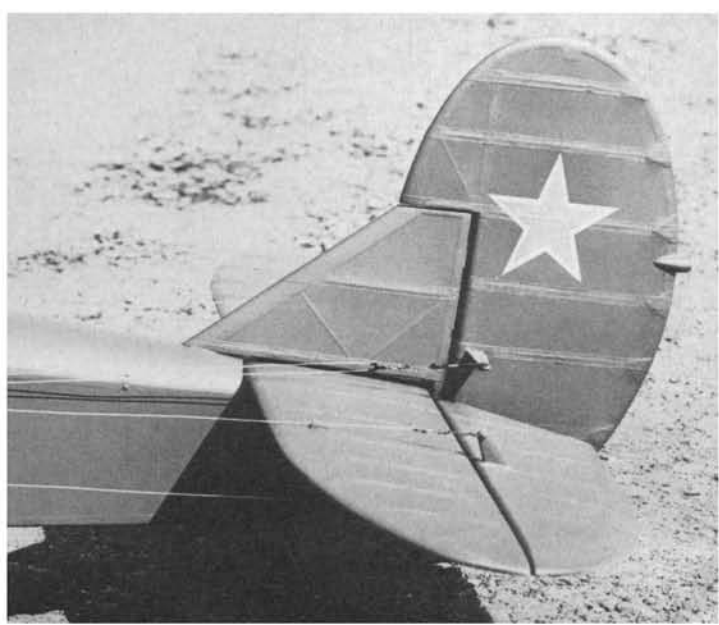
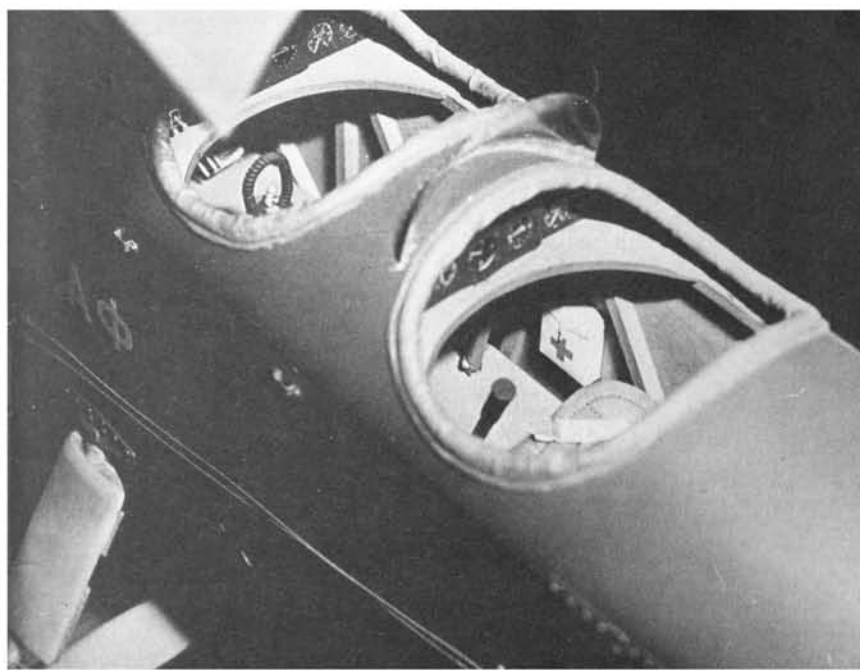
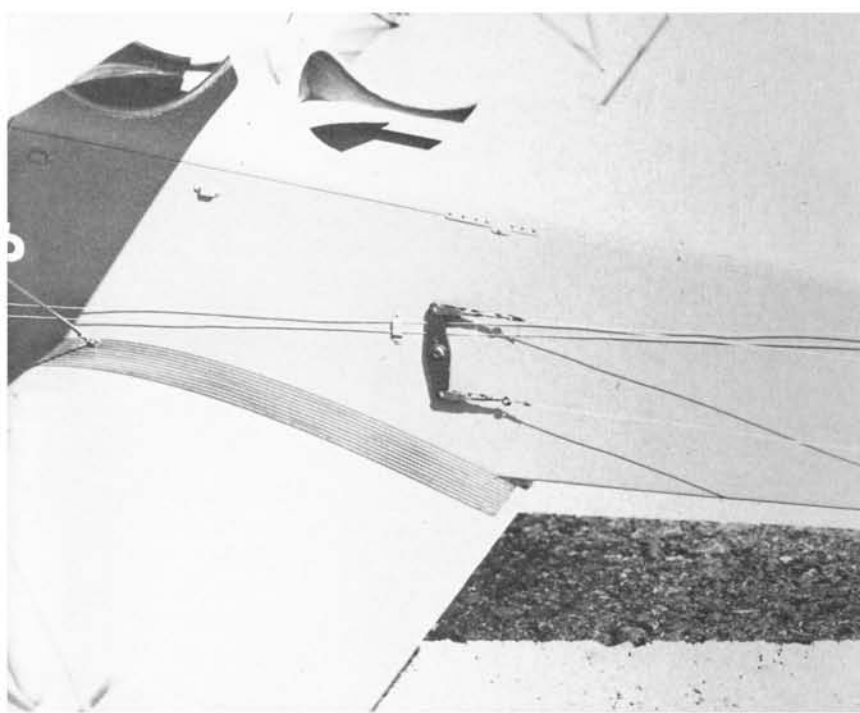
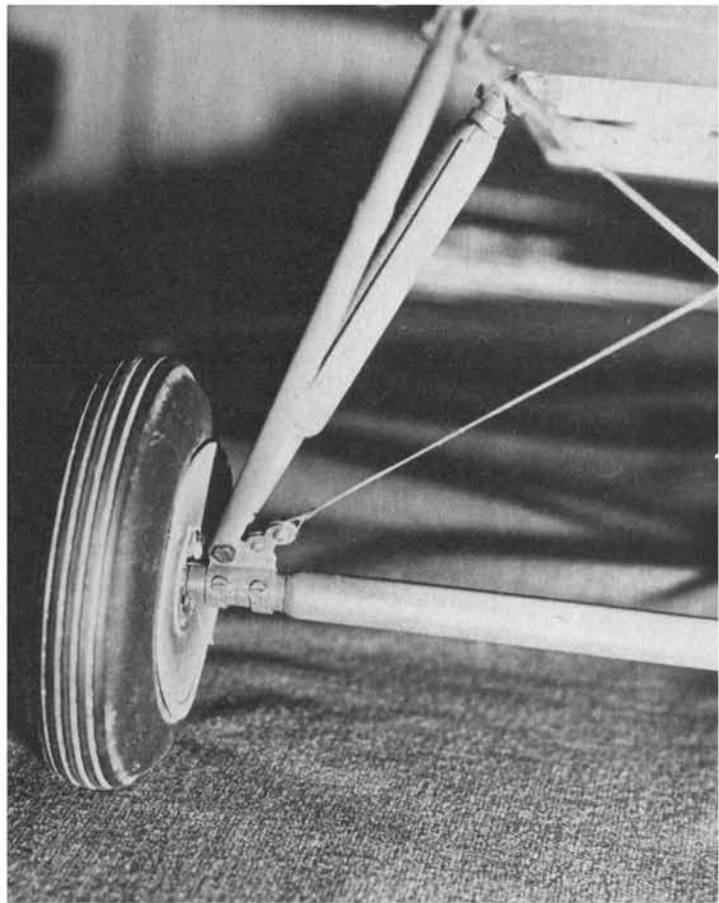
Translation by Bernard H. Huber

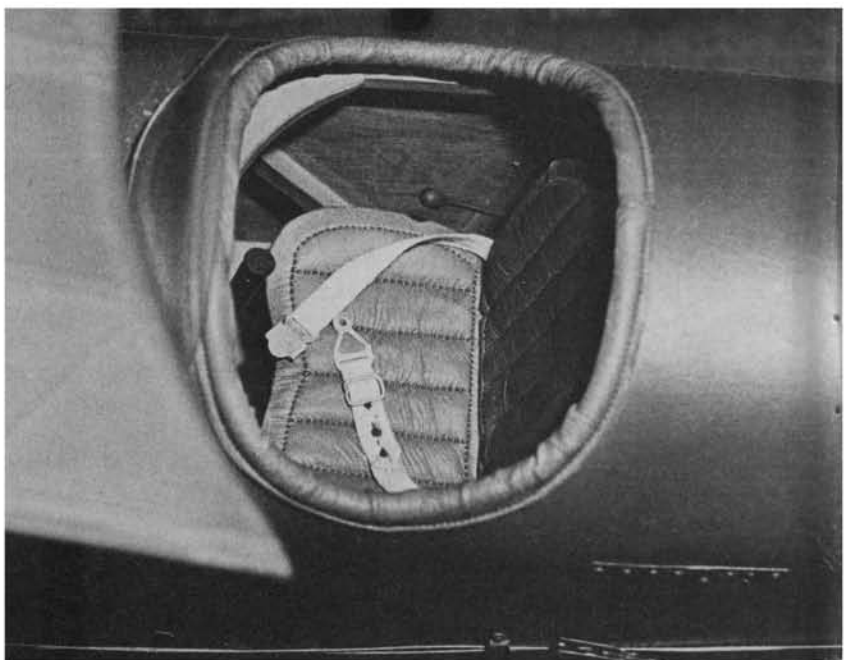
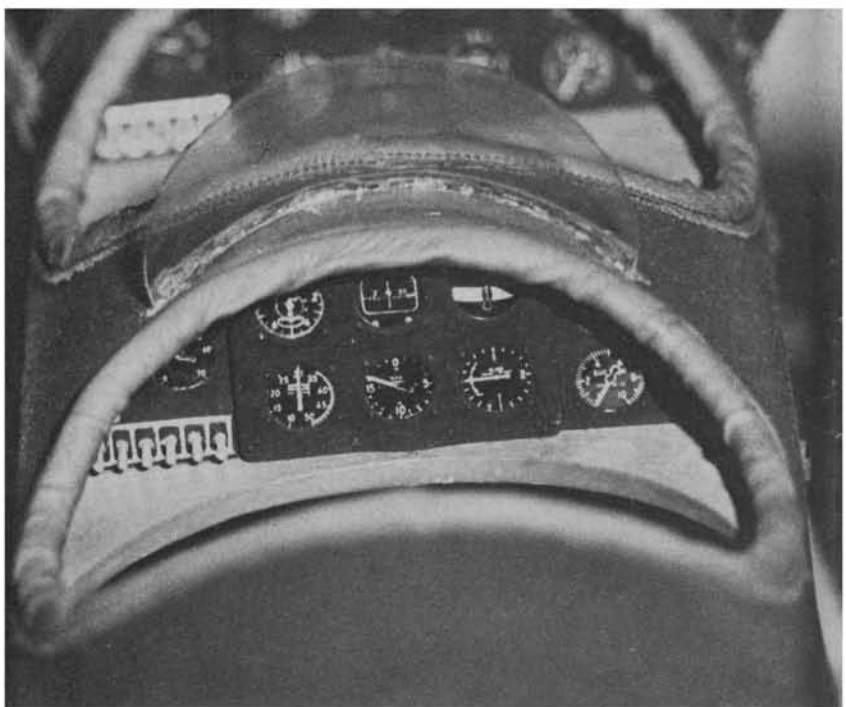
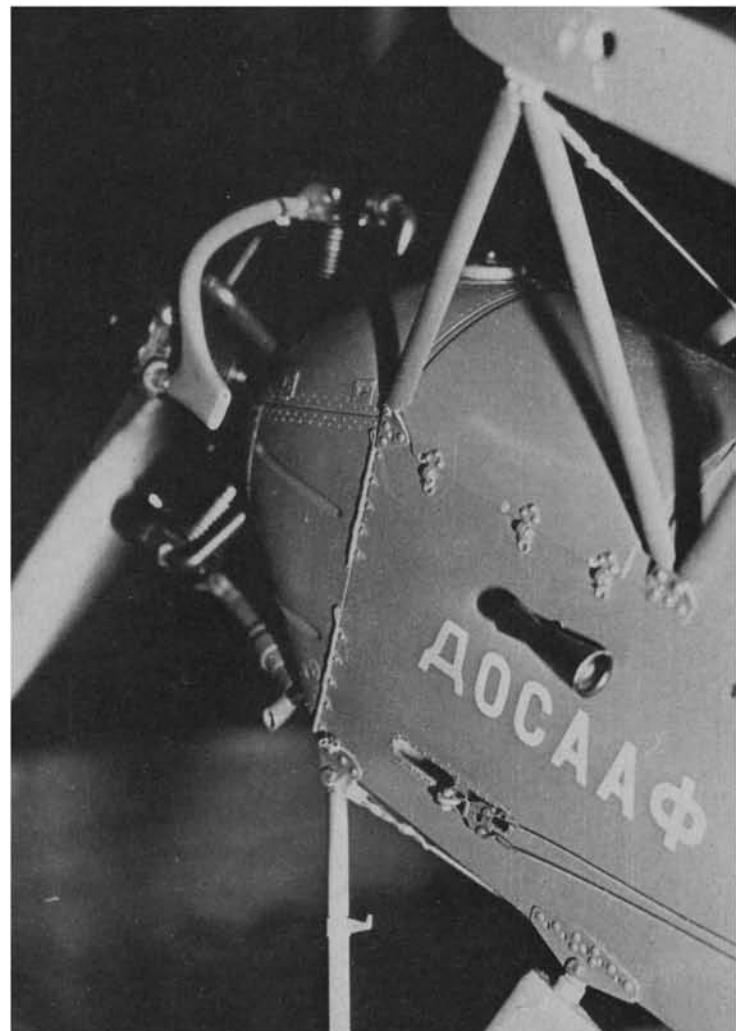
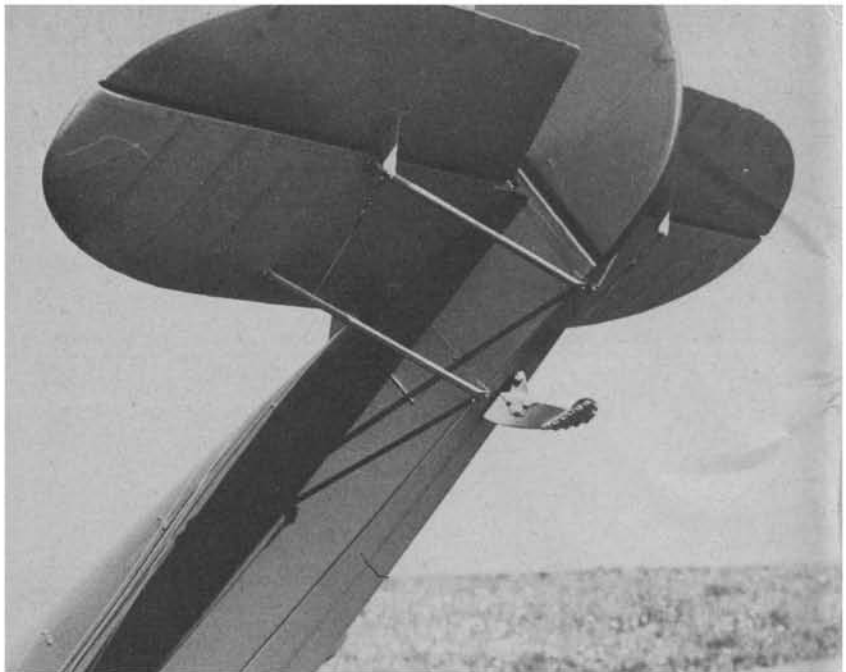
PREFACE

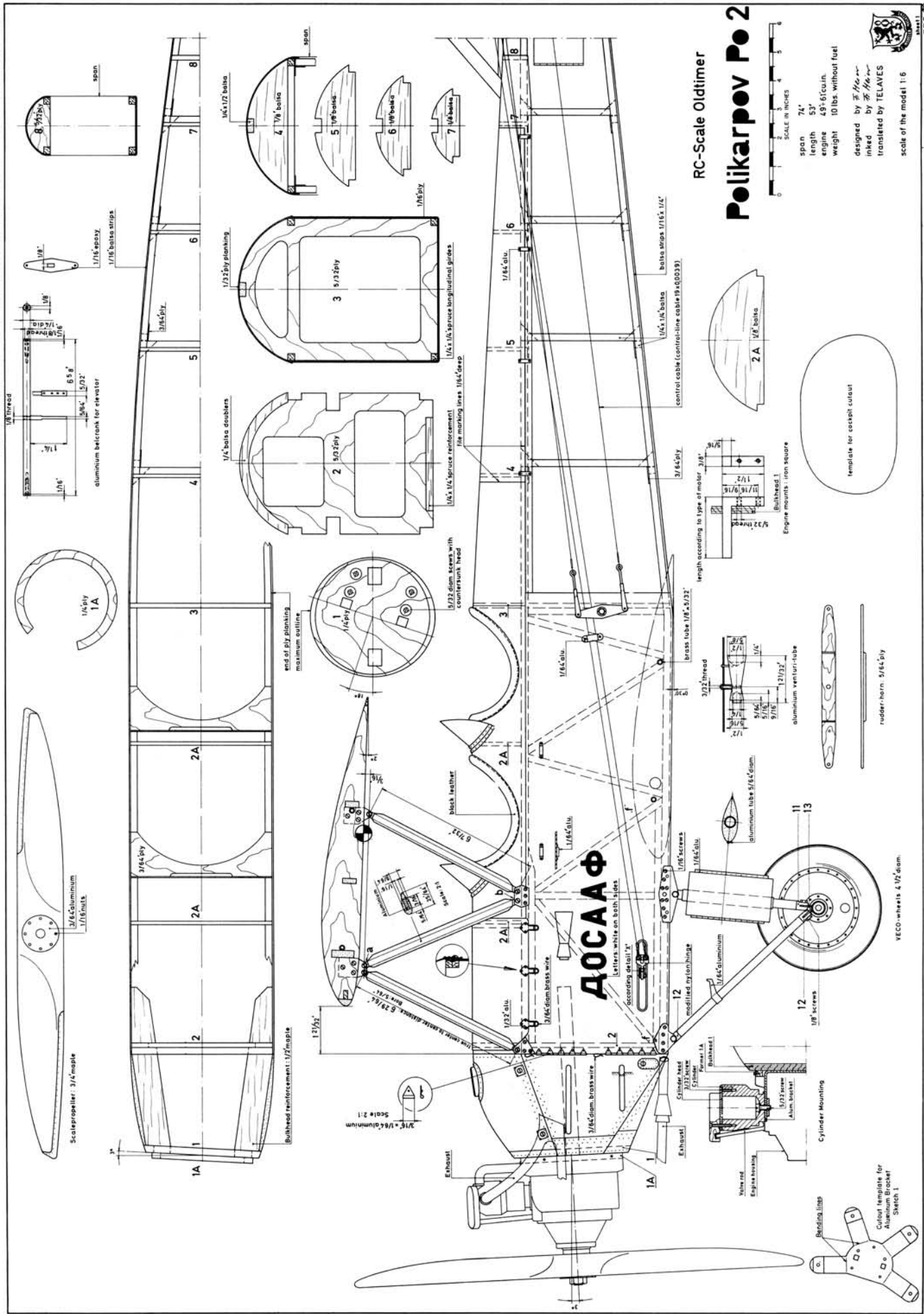
It would be possible to write a whole library about the original Po-2. There are only a few aircraft which have been in use for more than four decades and which could cover such a variety of operating modes. The Po-2 flew as a trainer, sailplane tow craft, parachute dropper, sport-plane, night bomber, scouting plane, sea-plane, agricultural aircraft, and test plane

and, today, it flies as reliably and economically as in its younger years.

Nikolai Nikolajewitsch Polikarpov designed and built the U-2 in 1926-27 and the first flight was made on January 7, 1928. In the same year the prototype was shown at the International Aeronautical Exhibition in Berlin. At that time, nobody would have thought that over 40,000 of these "ugly ducklings" would be built. In







RC-Scale Oldtimer

Polikarpov Po 2



span 74"
length 53"
engine 49"-61cuin.
weight 10 lbs without fuel

designed by *П. М. М. М.*
inked by *П. М. М. М.*
translated by TELAVES
scale of the model 1:6



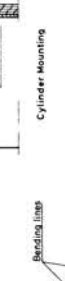
template for cockpit cutout



aluminum venturi-tube



rudder horn 5/16" ply



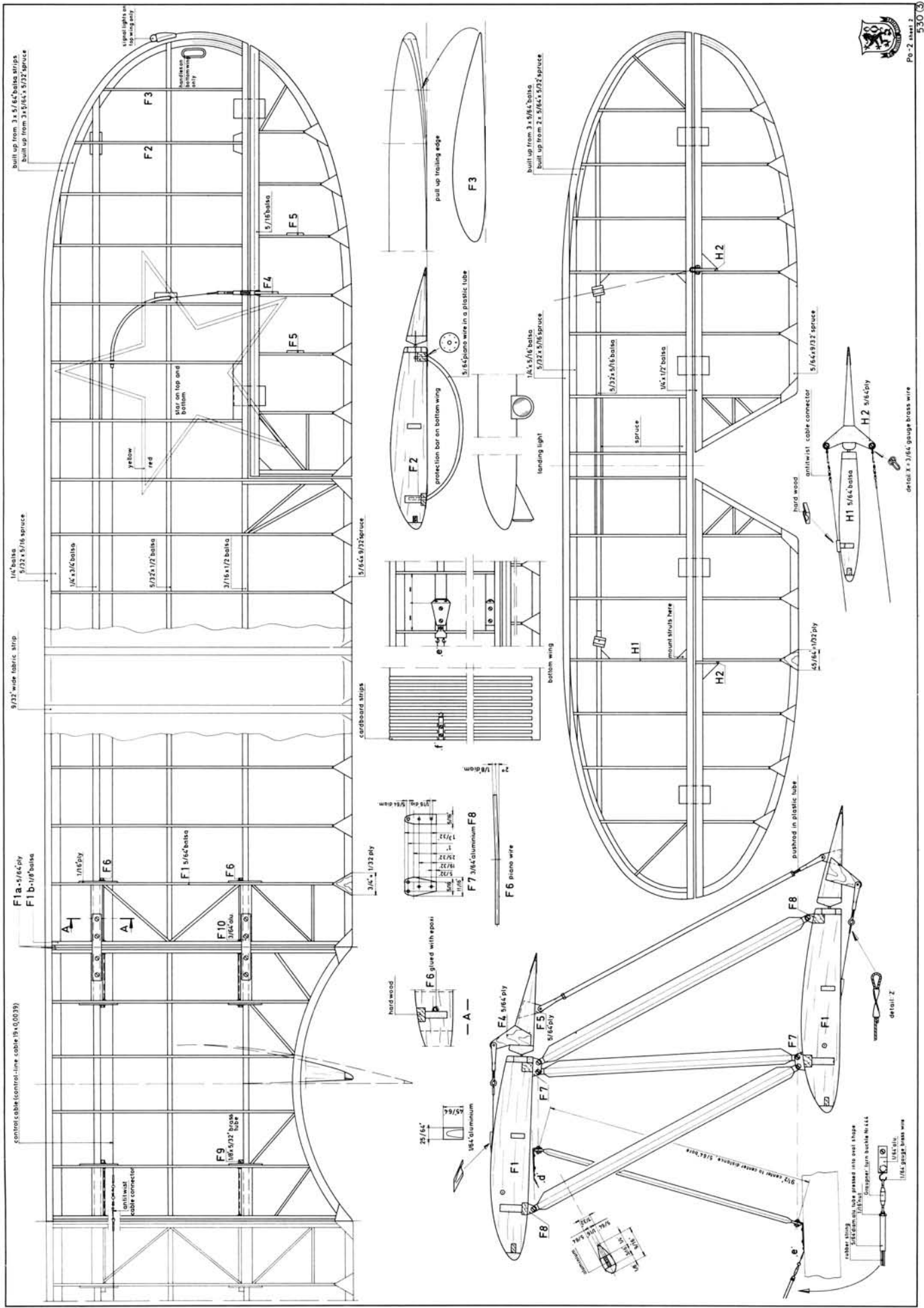
Cylinder Mounting

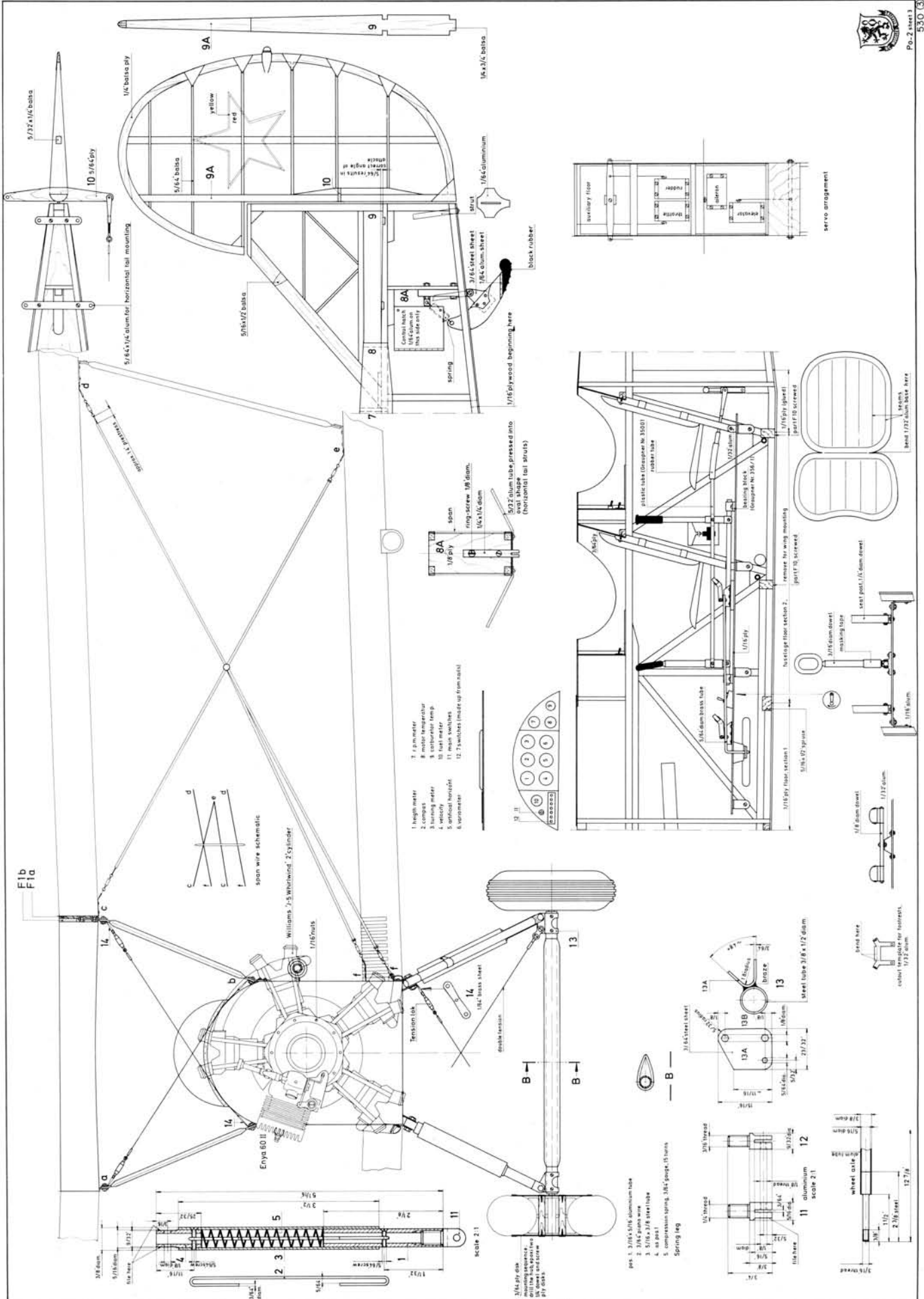


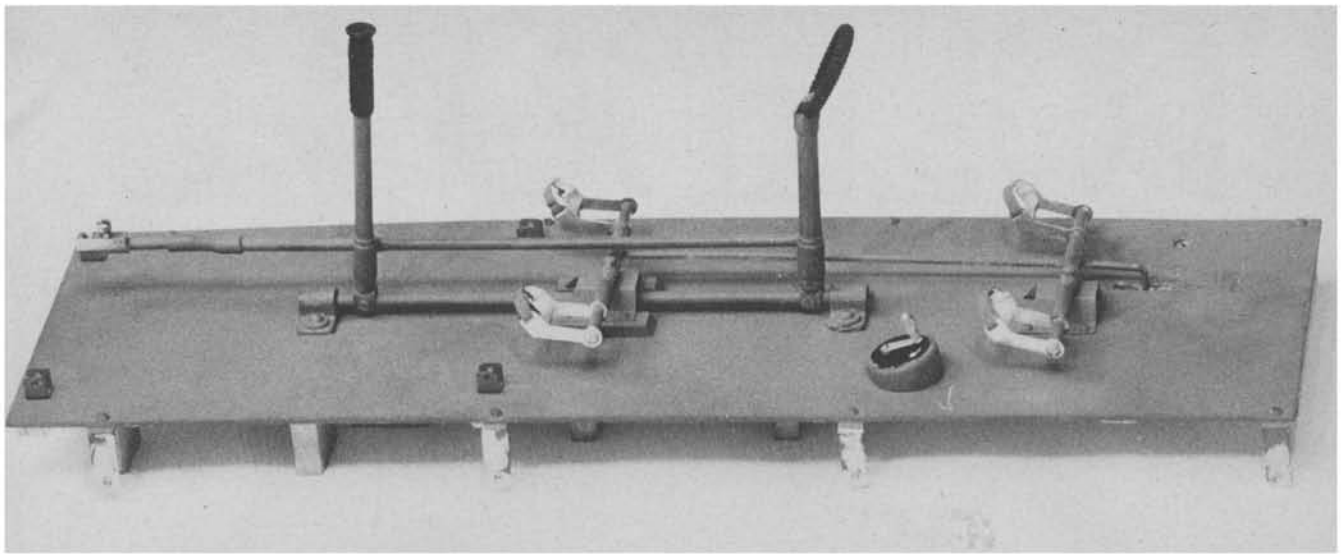
Bending Strip



Cutout template for Aluminum Bracket Sketch 1







Control sticks and pedals are coupled with the servos. Here, these units have been mounted on the base plate.

honor of the designer, who died in 1944, the U-2 was re-christened the Po-2.

The series production began in 1930 and the plane was used for more than 20 years for basic flight training in the U.S.S.R. As early as 1941 there were 13,600 Po-2's registered in various variations. Since the Po-2 was able to take off and land in almost any field, it was ideally suited for rescue purposes. This rescue configuration had two canopies over the lower wing on both sides of the fuselage to accommodate a stretcher. A later rescue configuration had a roofed cabin behind the pilots seat with a hatch enabling a stretcher to be boarded sideways. The wheels were replaced by skis for winter use.

The Po-2 was used for various tasks at the beginning of WW II, including use as a scouting plane, for connection purposes, as a rescue plane, and to supply the irregulars. For these purposes the plane was mostly flown by women. It soon proved that the Po-2 could also be used for direct combat operations. In so doing it sadly became famous as a light night bomber. Loaded with light bombs it crossed the lines with its throttled down engine and soon got the nickname "flying sewing machine," because of the characteristic sound of its motor. Nowadays the Po-2 is going through its second youth in the flying clubs of the Communist states. It is used as a basic trainer and by parachutists. Some hundred "sewing machines" are reported to be in use in Communist China.

The reason I chose to make a model of the Po-2 is because of its perfect

geometry. An airplane with such an ideal configuration should also be able to fly perfectly as a scale model. That I not only considered the good flying characteristics but also to come off well in a valuation of the model's construction can be realized from the photos and the plan. All the dimensions, cross sections of the spars, and so on are to scale --- even the angle for attaching the wings is exactly the same as its full size prototype. In addition to this, I took care to build the model with the same materials as far as possible. The design of the model was based on a three-quarter view in a British Model Magazine. As a three-quarter view is only valid for checking dimensions in scale competition, I had to look for more information, especially photos of the details. I remembered a friend in the German Democratic Republic who was able to take a lot of pictures of the Po-2 at an airfield in his neighborhood. After a long and difficult trip through a couple of Communist countries, I finally got the negatives.

The construction of the plane is quite conventional. In spite of its simple appearance the model has some individual characteristics to it, particularly in reference to the wing tips, the landing gear, and the dummy engine. But I think solving problems like these is what makes scale modeling so fascinating. The major sub-assembly of the model is undoubtedly the dummy engine. The material for the engine housing does not conform completely with the original, but the tooling for a metal housing would have been far too expensive. The actual configuration is a plastic molding. The cylinders are of

aluminum and, for the production of the cooling ribs, a special lathe tool had to be made. The cylinders were anodized to a mat black. The cylinder heads consist of a mixture of plastic, wood, and metal. The cooling ribs, spark plugs, and valve rods are taken from a "Williams" dummy engine, while the valve covers are of hardwood. The weight per cylinder is 1.83 oz., and the total weight of the complete dummy engine is 8.4 oz. Certainly many readers will now be interested as to how the cylinders are mounted. I made a bracket from 3/32" aluminum with a 72 degree sharing. The five parts of the bracket are bent about 90 degrees at the position of the housing. Small aluminum parts are riveted to the bent-up brackets, and then cut a thread into the aluminum. The mounting of the cylinders is made in the following sequence: First, bolt the aluminum bracket to the front bulkhead. The engine is then mounted to the engine mount, the housing is then slid over the engine and screwed to former 1A. The cylinders are then bolted to the bracket and the covers are bolted to the cylinder. The valve rods are fixed to the cylinder and are slid into a hole below the cover (see Sketch 1). To make it simpler for the less skilled model builders I designed the model so that the Williams' "Whirlwind 2" type cylinders will also fit on to it.

Another interesting detail on the Po-2 are the fabric strips which are glued over each rib as a reinforcement. The original Po-2 had a fabric span which was glued and stitched to the ribs. As an additional reinforcement

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there was a 1½" wide fabric strip with indented edges glued over the ribs. The notches have a depth of about 1/8" on the original, which gives us a little bit more than 1/64" on the model. As it is hardly possible to cut such small notches in fabric I decided to use the waving edge of the small fabric strip to get a similar effect. But, nevertheless, it takes a great deal of work and time to glue the 200 ft. of strips! I also improved the wing-spanning. Since the rubber span wire wouldn't receive any points in a competition, but rubber bands are still the best material for it, I used small oval-shaped aluminum tubes to hide the rubber bands (see page 2 of the plans).

After a relatively long building period of one year the first take-off was made in mid-May of 1972. The test pilot was, as for all of my models, the experienced Dr. Heini Steiner. After some taxiing we tried a take-off and realized a really perfect flight. At that moment I forgot the long evenings with the balsa dust. After solving some minor problems we made three other flights. Since then we have performed over 50 flights and participated in several competitions.

BUILDING INSTRUCTIONS FOR THE Po-2

The Po-2 is a model which will mainly enthrall the fans of the old-timer biplanes. The flying characteristics are outstanding and the behavior of the plane is indiscriminating, principally at low flying speeds. But like all scale models, the Po-2 requires an investment of a good deal of experience and building time. While the concept of construction has been kept as simple as possible, this is nevertheless not a model for beginners. For this reason, only the main details are given in the building instructions.

FUSELAGE:

Begin by building the fuselage. Cut the ply fuselage sides and glue the spruce longitudinal and transverse stiffeners. The connections are reinforced with ply triangles and the difference between the spruce members and ply side sheets are equalized with balsa strips. Make the formers fit and glue them in place, paying close attention to proper positioning of the formers. The top of the fuselage is covered with 1/32" ply, first from former 2A to 3, and then from 3 to 8. When necessary, moisten the plywood. The area between 2 and 2A is left free to be covered later by screwing a 1/32" ply cover in place. The fuselage bottom, consisting of two parts, is also to be screwed in place. After this, glue former 1 in position, fit the motor mounts in position, screw down, and secure them with epoxy. Then mount the 10 oz. rectangular fuel tank. After that, fill the space between former 1 and 2 with soft balsa blocks. Now glue the vertical fin in place and sand the completed fuselage.

INTERIOR:

Note that on this model the control sticks and pedals are coupled with the servos for complete movability. Construct all the parts as shown on the plans and mount them on the base-plate. Check for drag and friction free motion before final assembly. Spray both the control stick plate and the interior with a grey tone. I used the following color mixture: Mix together one ½ oz. can each of Humbrol mat Nr's. 27 and 34. The seats may be constructed now. The structural part of the seat is made from 1/64" sheet aluminum. The seats are bent into form and are attached with 1/16" screws to the struts, the bolts then being epoxied to the sheet aluminum. The sewing of the seat cushions seems a womanly job and could be made by your wife. Cut a 3/16" piece of foam rubber into the shape of the seats. The covering is made from thin dark brown plastic and cut to allow for a 5/16" overlap on all sides. Note that as opposed to the seat itself, the cushions are made in two parts, the seat and the back. When the sewing is completed, glue the cushions to the seat and bolt the seat to the struts.

WINGS:

The bottom and top wings are basically identical, the difference being in the attachment of the ailerons, the skids, and the planked section between rib 1 and 2 on the lower wing. The construction is simple with the built-up wing tips and reminds one of times past. It is important to lift the trailing edge as indicated on the plans. All the points where brackets are to be attached are doubled with pieces of maple. The top wing halves are fixed with the piano wires F6 to the middle piece, while the bottom halves are directly attached to the fuselage. The wings are secured with the aluminum pieces F10.

I don't have very much to say with regards to the horizontal tail. Please note that the middle spruce part must be carefully glued, since this is the location where the elevator is screwed to the fuselage.

We have now reached the point where the brackets and struts can be made. Begin with the brackets which are mounted on the fuselage and then build the struts for the middle piece of the wing. For the struts, start with the fully dimensioned ones, mount the wing, check it for proper alignment, and then take the measurement for the middle strut. For the wing struts, start with the middle strut and take the measurement of all other ones later. Only after everything is properly checked out may the struts be covered with balsa and the cross section worked out as indicated on the plan.

LANDING GEAR:

The fabrication of the landing gear, especially that of the "sprung legs," is relatively complicated, since it requires a certain degree of manual skill and specific equipment. If you don't have one or both of these try to get someone to make the parts for you. In any case, I advise against the use of an unsprung landing gear, because of the bad experience I had had with it myself.

Now make all the parts according to the drawing. Mount the limiting bow 2 to part 1 by screwing the 5/64" bolt in place. Twist the screw flush, so that part 1 can easily move in the guiding tube 3. Fix tube 3, mount part 1 and 2 together with the compression

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spring from one side, then part 4 is pressed in from the other side and bolted. Check if the limiting bow is properly engaged. Now the axle may be made. The aluminum tube is cut to size and the wheel bearings are pressed in place. Slide the previously brazed parts 13 on and drill and bolt them. Bolt brackets 11 and 12 and mount the landing gear to the fuselage. After checking the assembly apply the balsa linings and sand them to the proper cross section. Only after painting is the wiring mounted and the wheels fixed with self-securing nuts.

The skid is built up from three layers of ply, a 3/64" center and 3/32" cover sheets. The fixing bracket is fitted into the center layer and glued together. After sanding the skid, fit the aluminum cover and fasten it with small screws. For the rubber parts, a black bicycle tube could be used. The skid must be mounted before covering the model.

MOUNTING OF R/C SYSTEM:

I had a Kraft system in my prototype, but any other control system with comparably small servos can be used. The position of the servos is shown on the plans. The servos are mounted below the intermediate floor, with the battery and receiver right in front.

FINISH:

Rig the model completely and carefully check it over. Mount all the control cables and check for proper function. The fixing is performed according to detail "Z". Important: To connect the cables in the top wing, unlock the Kwik-Links on both ailerons. Then pull the cables with a wire through the middle piece (provide big enough holes), fix the right wing, attach the left wing slightly and connect the cable. Attach the wings rigidly and screw parts 10. Screw the lower servo arm according to detail



"Z". In order to do this we have to lift a part of the fuselage bottom.

Before covering the model we have to dismount all the brackets. Use a covering fabric with which you had good success. After the first dope coat on the ribs, apply the 1/4" wide fabric strips. Guard against air bubbles arising between the covering and strips. Then proceed as usual with the clear dope. Finally mount the brackets and prepare the model for painting. For my model I sprayed a nitro coat on, covered with a transparent semi-mat final coat. Apply the red stars and markings before the final coat. Color scheme: Top of the plane including fuselage sides and struts are dark green; bottom side and landing gear are light green; engine, propeller, venturi tube, steps, etc., are black. Because it is difficult to give a proper description of the color scheme I have made some color samples which can be sent on request when the necessary return postage is prepaid. (Franz Meier, Moosstrasse 31, 8630 Ruti, Switzerland)

When the paint is dry, install the windscreen and instrument boards. Next comes the mounting of the dummy engine. First, accommodate the engine housing to fit former 1a. Check if the cut-out for the dummy engine is big enough and if the throttle works properly. Cut out the openings for the Williams cylinders and glue them in with plastic glue. The exhausts are bent from 5/16" plastic tubes. The lower exhausts are screwed to the fuselage and loosely fitted on to the cylinder. The top exhaust is fixed to the second cylinder (seen clockwise) and sits loosely into the first cylinder. A rigid attachment would loosen exhausts and cylinders due to engine vibration.

FLYING:

Use a 12 x 5" wood propeller to fly the model. Check the C.G. without fuel. If necessary, screw some lead to the engine mounts. Accurately check all the control functions before the first flight. Apply speed gently to be able to compensate for the engine's torque. The Po-2 will lift its tail after a

short time, but keep the model on the ground to gain adequate speed. The normal setting is 3/4 throttle for take-off and half throttle for the flight.

Commence your turns with the rudder and fly it with the aileron. The Po-2 is no stunt model, but with the necessary experience we can also fly loops, turns, etc. Don't panic if the engine dies, since the gliding characteristics are good. For the landings flatten out before touch down and hold the elevator back in order to prevent the model from falling on its nose!

And now: Happy Landing!

