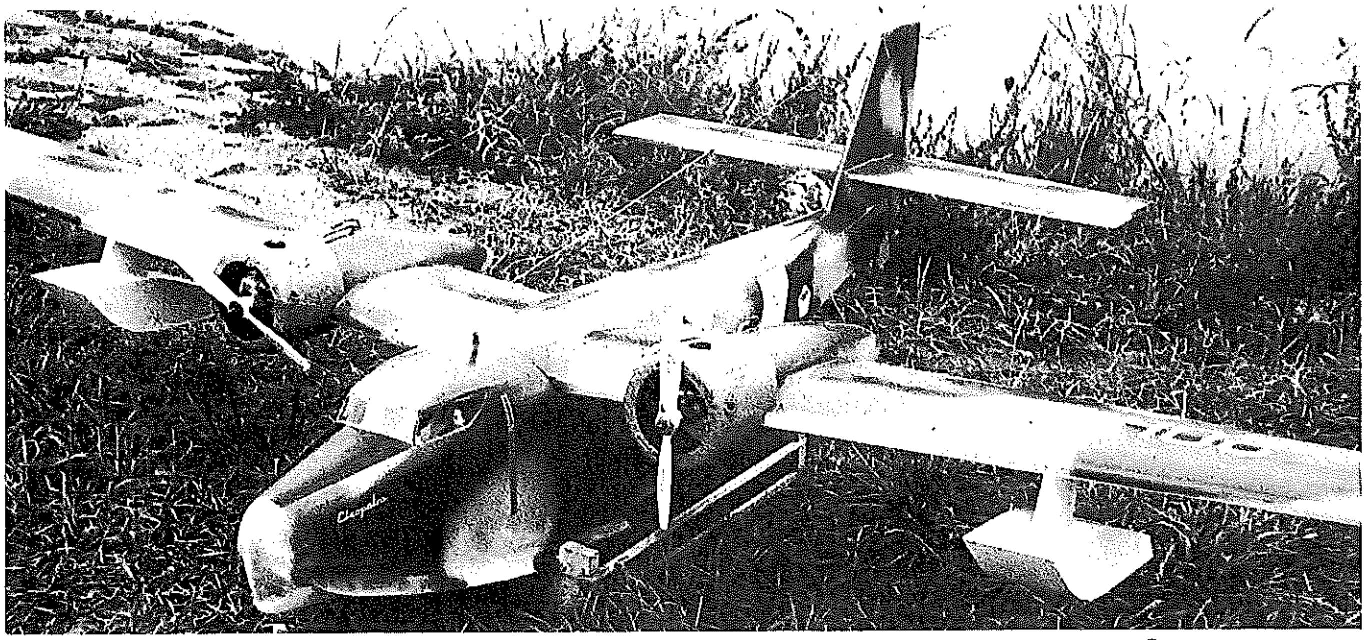


'CLEOPATRA'

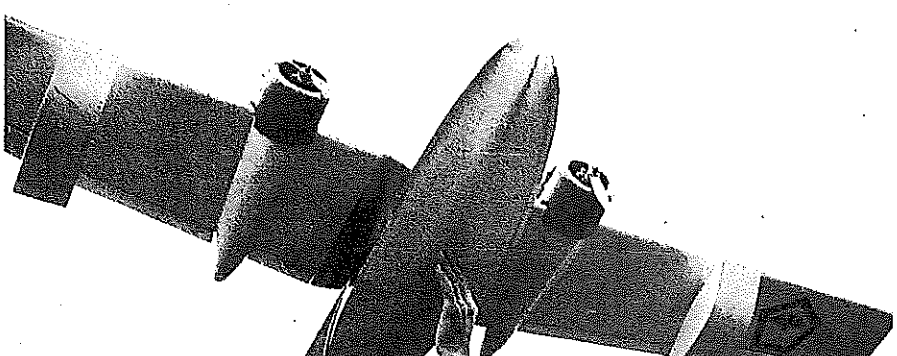
By PAVEL BOSAK . . . From one of our readers in far off Czechoslovakia comes an interesting R/C flying boat design. Very scale-like in appearance, it can also fly very scale-like distances!

Fortunately, for those of us who are not even that skilled in our own English language, Pavel Bosak, of Czechoslovakia, has been able to translate his own construction article for us. Relative to this, there is an old expression which, in effect, says that "something was lost in the translation." To prove that this is not always true, and that "something can be gained *(if you recognize it) in the translation", we have chosen to be very careful in editing Pavel's article so as not to affect the continental flavor. wcn*

• The sea is calm and clean as a mirror. A huge seaplane, Latecoere, at the pier, is being rocked by hardly-seen waves. As always, everything, is perfectly ready. Jean can absolutely rely on the ground mechanic gang. He signs the flight book and gets on. The crew is already inside. Waving hands, engines roar, and the plane is moving. A big ocean liner murmurs its greeting. Jean pulls the throttle up and down as usual when these two air and sea giants pass each other. The control tower radio operator wishes his happy journey, Latecoere politely thanks back, and glides on out to sea. The deep white liner under the plane gets narrower until it completely vanishes.

Thus is described a seaplane takeoff by the author, and it makes me believe that after reading it, every boy wants to hold the controls. And you grown-ups, be honest, would not you wish the same? Just a few people's dreams come true, but the rest of us can only dream. I have been attracted by a multi-engined seaplane ever since I took a piece of plywood and spruce into my hand for the first time. And it was the same with long cross-country flights, for both planes and models. That is how I realized my dreams and built a model which I called Cleopatra Clipper.

Naturally, to realize my boyish dream, I had to start with simple soaring gliders, Nordic A/2 planes, C/L models, and only then I began with R/C. Even here it was nothing but a step-by-step job. First Rudder-Only, then Intermediate, and finally pattern. Before I started to draw Cleopatra, I had gathered the necessary information, and after studying about 60 plans of seaplanes, I know enough. I did not want to build a scale plane, nor a purposely plain model, but a realistic looking airplane with cockpit and a crew. That is why searching for information went on. And Cleopatra was born. I put the stress on its stability, because during long flights, the control over a non-stable model would be too difficult. Next condition was its stability for long flights. I know that my usage of OS Max engines for this purpose was not the best, but in our republic I could not buy a better engine of category "40". That is why I have chosen this one so that the model could be big enough and could be well seen. There is much space in the fuselage, even for a one-gallon tank. But I did not try this one. I tried the first takeoff



Underside shot discloses the wide hull and spray rails which help prevent water spray from hitting the propellers during takeoff runs. Wide tip floats not as pretty, but very functional.

Cleopatra in full flight, with just the aft point of the forward step cutting a small track in the smooth water. A touch of up elevator and it will become completely airborne. Twin OS .40's give plenty of takeoff power for the 8 foot span flying boat.

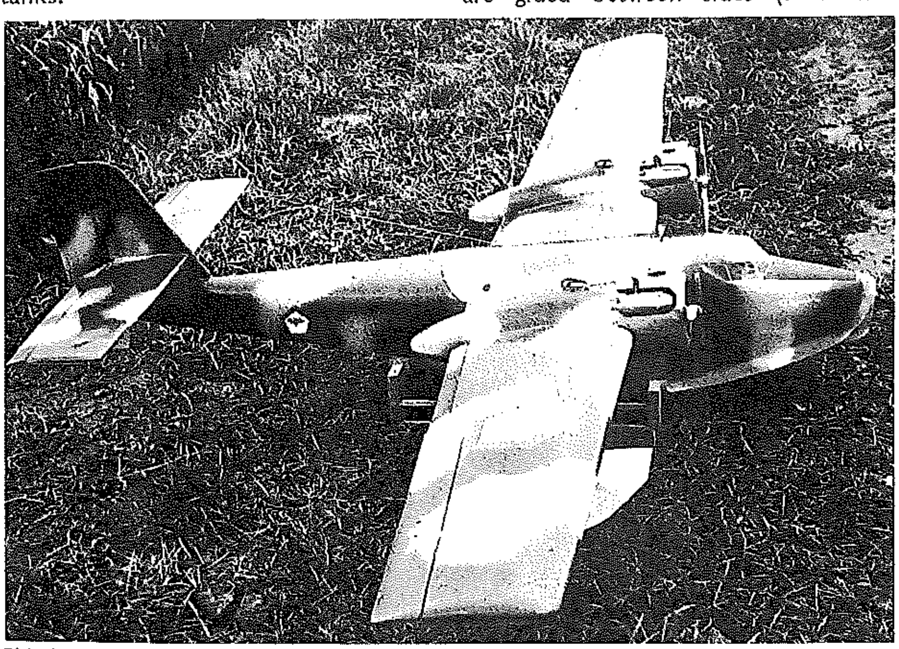
with a five pint tank. Such a tank, together with separate tanks for each engine (9 oz.) is enough for 2 hours of flight.

I have to stress that the engines do not take all the fuel, because I used an imperfect system of repumping with the help of pressure from silencers. This season I want to use Perry pumps. The OS Max 40 engines are efficient enough and are able to take off the model with a one-gallon tank. In case of my smaller tank, I used maximum engine output only while taking off. Once the model flies with a full tank, I give it half throttle and at the end, just one-third. The longest flight it has done so far was 50 miles, according to the guiding car. In fact, the flight was longer because I had to circle and wait for the car. Average speed in a straight flight was 43 miles-per-hour. The fuselage tank is used for cross-country flights only. For everyday fun flying, I use small wing tanks.

The model is equipped with wing flaps for the reason of difficulties at the takeoff. I didn't know if the engines would get the model off. Now they are useless because of the engine's output. But I use them for landing. The landing speed is lower, and the model does not glide on water surface so long. The length of landing is much shorter. If you do not use them, you might find yourself in a situation when the model would be darting into a pond dike and you would be unable to stop it. The flying itself is pleasant and simple. The control of the model is similar to category Intermediate. Thanks to slightly bent wings, it can be controlled by rudder . . . no ailerons.

CONSTRUCTION

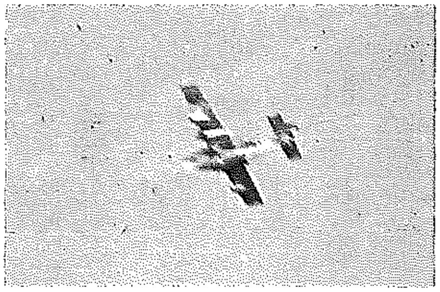
This was begun by fuselage, so that I could see the shape of my new model first. The base is two balsa sides which are strengthened by plywood where wings are fixed. Bulkhead F1 to F6 are glued between sides (I do not mention material sizes which is described in my plan). Before fuselage is glued together, get rudder frame ready. It consists of the main spar R5 and profiles R1 to R4, leading edge R6, and trailing edge R7. Beware of twisting the fuselage while you glue it together. Then cover its bottom front part as far as bow. What follows then is covering stern and finally jump behind bow. An experienced model builder is able to read my plan and that is why I do not describe single operations for beginners. To mention but one, I found useful while covering rear bottom fuselage part, to cut its shape from hard paper and only then cut it from balsa and glue to its place. Next operation is fixing the pushrods for rudder and elevator inside the fuselage. Now even rear top fuselage part can be covered.



Ship is realistic in appearance, but not really a scale model of any particular aircraft. Keen observers will recognize parts of various full-size designs.

Let us start the front fuselage part. Cover it as far as the bulkhead F2A, make cockpit floor and rear cockpit wall. There we can place figures of pilots, also of navigator or wireless operator. Here anything can be done according to your imagination. Cockpit windows are from celuloid or similar material. Do not forget to use a paper template first. The shape of windows must be exact. Each window is one piece. Frames are painted. Finally, cockpit cowling is covered as far as bulkhead F3.

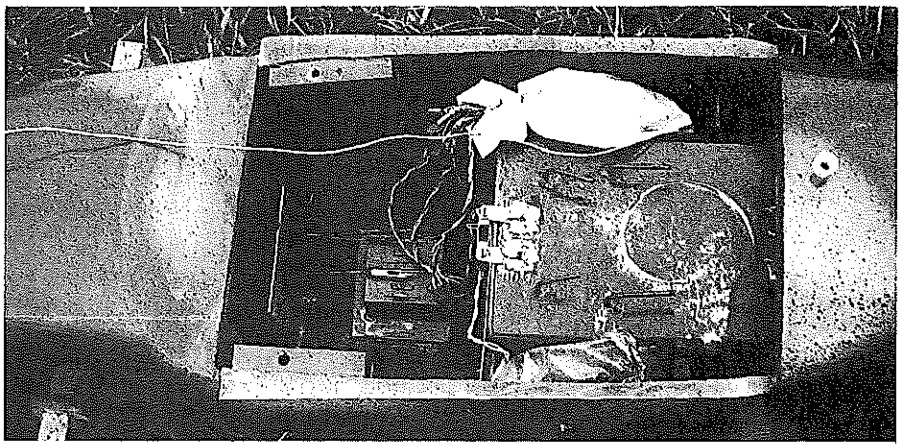
The most difficult thing is building the stab and elevator. The main stab spar E14 is glued on rudder spar R5. Then fix and glue stab airfoils (ribs). These are made from balsa rectangles by sanding between airfoil templates. Now glue trailing and leading edge E15 and E16. Stab balsa sheeting is done in such a way that as many sheeting parts as it is possible would be put through the fin. Sheet the stab first, and then the fin. Fin covering will end at stab. Then glue on the stab tips. Joint between fin and stab is filled with epoxy and balsa fillings. Glue on the fuselage nose block. Now sand the whole fuselage and glue on deflector bars F7.



Cleopatra has flown over 50 miles on a single flight, from pond to pond.

The author/designer, Pavel Bosak, holds Cleopatra aloft for a front view. Being a typical modeler, the engine cowlings are still unfinished, as explained in the text. Maybe tomorrow!

Pavel with his Tono 35 R/C powered Volks-plane design, which was published in Czeck model magazine "Modelar" in March 1975.



Endurance anyone? Though it will hold a gallon tank, this one is a mere 5 pint fuel cell, which supplies the individual 9 ounce nacelle tanks through engine pressure. Lots of radio room.

Joint between them and fuselage is again filled with epoxy and balsa filling.

Now study well detail AA. The whole front bottom fuselage part is laminated and also the top part of deflector. Thus we get a good cover against splashing water from the bow against the propellers. Now it is time to fill in joints, sand fuselage, and do modelspan sheeting. The same is done with elevator and rudder. Only then are they assembled in place with nylon hinges. Both halves of the elevator are joined by piano wire. The aluminum water rudder is inserted and glued into the air rudder.

WINGS

The wing is all-balsa construction. Ribs are made by rasp interpolation (stacking and sanding). Cut balsa rectangles according to the biggest rib. Make plywood templates of the root and tip rib, according to plan, and sandwich the required number of rib blanks between them. By sanding, which follows, we get all ribs at a time. It's useful to mark ribs with corresponding numerals. Now cut each rib to exact length over the plan. Cut notches as required. Keep the trailing ends of ribs W11-W16, as we shall need them for ailerons. W1, W4, W5, W10 ribs are strengthened with thin plywood. All wing details are put together on the main and the subsidiary spar (which reaches W6 rib at engine pod). Glue on the leading edge W29, and trailing edges W31 and W32, then both wing halves are glued together with plywood links W25, W26, W27, and W28. Then sheet bottom of wing and inside it, fix pushrods for ailerons, throttles, and flaps. Install also fuel tubes from main tank if you are going to put it in. Now glue part W24 with wing dowels W34 and plywood W33 for strengthening the center of wing under screws. Then glue part S1 for floats to rib W10. Cut a slot for this part in wing sheet. Before sheeting top part of wing, fill in between front spars with 3/16 balsa webbing, out to W6, and glue between W4 and W5 ribs the engine mount. Glue bulkheads M2, M2A, M1, M1A, M3, M3A. Install tanks and sheet-cover the pods. Tanks can be bought or make your own from

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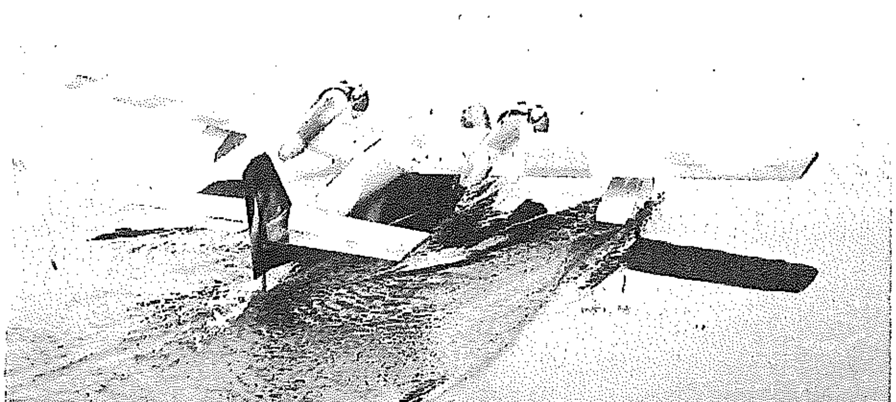

Under low power, the fuselage lays back on the rear step, putting the water rudder in a position to effectively steer for taxiing. Once on the step, the air rudder takes over.

Morgan Hill, California, make an ideal flying site. Though the grass was mowed both days of the contest, some of the (non-scale) small-wheeled, retract-gear fighters had some difficulties on take-off. But the grass sure helped save more than one hard landing.

The next Hill Country Flyers meet will be the Western Front, World War I Jamboree on September 24-25, 1977. World War I tail-draggers can look forward to flying off a thick carpet of grass in fine style. •

Cleopatra . . . *Continued from page 17*

thin brass sheet. Their size is chosen according to engines and flying time. Glue hollow balsa block to the end of engine pods. Now screw wing to fuselage. Bulkheads F3A and F5A are traced from the fuselage on plywood, glued in place, and sheet fairings added. Ailerons and flaps are fixed by nylon hinges. Flaps are made of solid balsa, and ailerons are built from the rib trailing pieces. Now glue on wing tips and sand the whole wing. Final operation is gluing floats. Put together bulkheads S2 and S3, glue to S1 according to plan, and glue on the float sides. After top and bottom balsa sheeting, glue balsa fairings to S1 and sand the whole piece into a smooth shape. See the plan. Now fill gaps and do thin modelspan sheeting.

ENGINE COWL

I laminated the cowls on a bottle with a 5 inch diameter. I used four ladies' silk stockings. Do it like this: Slide on 4 stockings on a bottle, tighten them and make a knot on both ends so they will not slacken. Then paint with laminate so the fabric is wet through and through. Do not forget to paint the bottle first with separater! Otherwise you will not take hoods off! Then cut off burrs and also make holes for needle valves, engine head, and silencer. I advise to sand cowl and fill gaps. I was in a hurry and that is why I did not do that. I put if off 'till tomorrow, but tomorrow has not come so far. Cowls are fixed with four wood screws on engine mount. One screw is also in a block on the top part of pod.

SURFACE FINISH

After sanding and filling gaps, the whole model is sheeted with thin modelspan and six times painted. Colour scheme is done by acetone colours, and final paint is against fuel effects. This is my own suggestion and anybody can realize his ideas.

TRIMMING AND FLYING

Because I planned my model for cross-country flying, I needed a high degree of stability. Wing incidence angle is plus 4° and stab incidence angle is minus 1°. That is why it is necessary to keep the exact center of gravity. It is possible to move it a little forward . . . not backward. Be careful about weight in rear part of fuselage while you do construction. If necessary, place some ballast lead up forward. My model has 10 oz. of lead. After radio and engines are installed, we can start flying.

At minimum speed, model stands on water surface with rudder above. With a little more throttle, rudder goes down and model can be controlled on water surface. It floats until we open full throttle. Then it begins to glide on the bow. Now try throttling back, but still it does not take off. Try this hydroplaning several times . . . especially beginners with hydroplanes. Each operation and transition into floating, and gliding must be mastered. You must get used to the model inertia and on the way it circles on water surface. Even at minimum throttle, model glides a long distance before it stops.

Now to taking off itself. Set elevator a little bit down by trim, and at full throttle, let it glide on surface. Takeoff distance is 80-100 meters. After setting elevator up, model should take off. Because model is high-winged and there is dihedral angle, ailerons are not so sensitive. That is my advice for pilots of the pattern category. But you can seek help with the rudder, which is efficient enough.

Before flying, engines must be set up so that they are brought into action simultaneously, and not one after the other. It could cause a disaster at takeoff. One engine would turn model into another direction. The landing could be even worse. Both engines are at minimum speed, landing track is suddenly too short, and every pilot gives full throttle, being in such a situation. If only one engine is brought into action, model will be up side down!

In case of one engine failure, it need not be a catastrophe. My model tried one-engine flight, but with just half throttle, and with ailerons and rudder in opposite positions. At idle run, no contra-position is required. When only one engine is in action, do turns *toward* that engine while model is airborne. Once model is airborne after its takeoff, control is easy. After several takeoffs, with some experience, we can try wing flaps and their effects on flying. Use them for landing and even for takeoff. At landing, my flaps are at 50°. I do not use them for takeoffs. Naturally, flap angle must be the same for both of them.

That is all I can write about Cleopatra. In case it seems to be too little, any questions can be addressed to me personally. I wish every Cleopatra builder many pleasant flying hours. And to those who will use my plans for a different model, lots of luck, and I hope that my experience will be useful for them the same way. I used other model plans.

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Choppers .... *Continued on page 21*

of model builders. What can be done by the average modeler, so that he ends up with the machine of his desires? Read on.

The key to the problem lies in the term "stability". Stability is defined as the response or reaction of a body (helicopter) to a disturbance. The disturbance can be a poor command by the pilot, or a gust of wind or other such force which causes the helicopter to go in an unwanted direction. The reaction of your helicopter *after* the unwanted force has been removed is the measure of its built-in stability. If it tends to return to its original position, then it has *positive* stability. If it fails to return to its original position, it is considered to be unstable. (Note: more detailed study of this subject will reveal other types of stability, such as, neutral, static, dynamic, uglocity, pendular, etc., however, these are not important for the present discussion).

To achieve a degree of stability, many things can be done . . . some are already built into your kit, such as stabilizer bar and paddles, vertical stabilizer (rudder/fin) and horizontal stabilizer. Proper location of the center of gravity also has a lot to do with it. Generally, the C.G. should be directly below the rotor hub or just slightly forward. A forward C.G. increases stability up to a point, whereas a rearward C.G. results in excessive instability, and should be avoided unless you want a "tricky" machine!

One of the greatest aids to helicopter stability is called *gyroscopic rigidity*. It is a fact that any rotating mass tends to resist any change in direction of movement with a very powerful force. The main rotor blades, tail rotor blades, and stabilizer bar/paddles are rotating masses and thus contribute greatly toward stability. Two things influence the amount of gyroscopic rigidity, (1) the higher the speed of the rotating mass, the higher the rigidity (stability), and (2) the heavier the weight of the rotating mass, the higher the rigidity. So, if you want high stability, make the rotor blades heavy, make the stabilizer paddles heavy, and increase the rotational speed of all three (caution: increased weight and speeds can exert tremendous forces on the attachments and could be very dangerous . . . this is where the kit designer earns his money in safe design techniques).

Reducing the throw of the servo controls will not increase stability, but