SHOESTRING 58 & 62
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CONSTRUCTION NOTES

This model is not intended to be a true scale model of the famous Shoestring racers of some years ago, but rather, is a Shoestring look-a-like that developed from a SIG Kommander that was built from a kit in 1974 in the days of glow engines. The Kommander was not a particularly appealing model in terms of appearance, and never quite looked right on wheels, but it was a really nice flying model with a .40 glow engine. I found that the layout of this model made it very easy to adapt to floats. With the shoulder wing, it was not as prone as a model with a high mounted wing to turn over in the water during that dreaded down wind turn.

I flew it ‘off and on’ for about ten years and it was always my favourite model on floats. But being powered with a glow engine, the fuselage became oil soaked and difficult to repair. I didn’t want to part with the model completely because the foam wing was in perfect condition and was obviously the reason that the model flew so well. So a new fuselage and tail was built, and an attempt was made to make it look more like the Shoestring Racer. The rebuilt model flew for another ten years until I sold it when changing over to electric models. That model was considered too heavy for converting to electric because at that time the nicad batteries in use were limited in power and the electric motors of the day were heavy and not very powerful.

Following this a new model was designed for electric power. It was smaller than the original glow powered model and had a span of 49 inches, flying on seven nicads with a S-600 size direct drive can motor. Performance was not exactly sparkling. The next step in the progression of electric power was discovering that better performance could be obtained by using a racing car motor on eight cells with a gear drive. Then in the quest for more speed, a smaller 44 inch model was built. At that stage, it seems that the Shoestring look-a-like was the only design I knew how to build. But they all flew so well! Why change? Eventually that 44 inch model flew on nine nicads and was quite the screamer. But the wing loading was high, and with my advancing years, slowing reflexes and limited eyesight, I started moving in the direction of larger, slower flying models. Hence the 62 inch model was born in 1997, pretty well the same size as the original Kommander conversion. It was a beautiful flyer, but would be classed more as an aileron trainer. When I was talked into selling it, life did not seem to be complete without a Shoestring. So the 58 inch model came along in 2001, and at the time of writing these notes in 2009, it is still my favourite model when I want something simple to do some relaxed flying, burning up the sky. The specs may mention it being powered with a Magnetic Mayhem, but this model has been used as a test bed for many motors. At present it has a 15 year old “gold plate” Kyosho Le Mans 240 BB sixteen turn racing car motor that refuses to wear out. On a 3S LiPo battery, using 6:1 reduction, it turns a 12x10 prop at 6,100 RPM and gives wonderful performance. If using a brushless motor, try to match the pitch speed of approx 60 mph, and 30 ounce static thrust that this combination gives.

FUSELAGE

The fuselage is traditional box-stick construction. The sides are built over the shaded longerons shown on the plan then attached to each other with cross pieces. CA glues are not strong for but joints. White carpenter glue has been found to be the best suited to construction of this kind. The front view of the fuselage shows that the fuselage is wider at the top of the fuselage side frames than at the bottom. This is optional, and is not shown in the top view of the fuselage. It adds a little character. In the days of larger battery packs it was a help to have the top of the fuselage a little wider to accommodate the battery. When the primary box structure has been built, the additional bulkheads, stringers and sheeting can be added to the top and bottom. If planning to fit the model with floats, plywood plates should be placed across the bottom of the fuselage where the front and rear float mounts will be located. In early models I used the forward main landing gear mounts for the front float struts, but these were a little too far back. For more strength it is better to have the forward float strut a little ahead of the forward landing get mount. 1/16" balsa sheeting can be used to cover the bottom of the fuselage from the nose back as far as the rear float mount.

With heavy nicads, it was necessary to have the battery pack near the C of G. The wing had to be removed to gain access to the battery. Now, with lighter li-po batteries, the battery pack is placed further forward, and it is possible to change it through the hatch that covers the motor.

TAIL SURFACES

Construction of the tail surfaces is traditional. They have a symmetrical airfoil section which results in a deeper spar that is stronger than it would be if a flat surface was built. It means that the tail surfaces can be built lighter, and the resulting tail section is less prone to warping. Make the spars first and hinge carefully to get good alignment before proceeding with building the tail surfaces in the usual manner. There is one thing to watch however. Because the spars and ribs are tapered, if the tail units are built with the lower surfaces pinned right down to the building board, they will end up with a warp in them. Check this during assembly because it may be necessary to slide some of the parts up the pins slightly so that there is no warp built into the surfaces. The parts that have to be slid up the pins slightly are the outer ends of the leading and trailing edges where they join the last rib.

A sub fin it used to help stability in the air when using floats. It compensates for the added lateral area of the front portion of the floats. The lower portion of the rudder attached to this sub fin also helps as a water rudder. It is not entirely in the water when taxiing, but with elevator up and tail down, it catches enough of the spray to respond quite well.

The sub fin also has an advantage when flying the model on wheels. A tail dragger is always easier to land at minimum speed if it has a long tail wheel arm that results in the tail wheel touching the ground at the same time that the main wheels make contact. This happens at minimum speed as the wing is stalling. Full scale airfoils stall at a much higher angle of attack then the small airfoils we use in our models. Although full size tail draggers were designed so that they touched down in the three point attitude when the wing reached its stalling angle, it is rarely possible to do this in a scale model (where the stalling angle of the wing is so much less) unless some modification is made. Different tricks can be used in models of tail draggers to reduce the angle of attack of the wing when the model is sitting on the ground. A very long tail wheel arm is the easiest way to achieve this, but usually looks out of place. The use of the sub fin in this model disguises the fact that, in reality, it has a very long outlandish looking tail skid. It does very nice three point landings.

WING

A full depth balsa spar runs the length of the wing, with ribs being cut, and glued to the front and back surfaces of the spar. The top and bottom surfaces are then sheeted from the leading edge back to the spar. This makes for a very strong, yet light, "D" box. Besides being strong, a wing built like this is very resistant to twisting. Start construction by cutting out the wing spar from balsa. Assemble the full length spar over the plan so that the correct dihedral angle is built in. Next attach the hardwood spars that run part way out the wing. These may be bass or spruce. To start assembly of the wing, pin one half of the spar to the building board with the other half propped up to the correct dihedral angle. Glue the rear part of each rib to the rear surface of the spar, and attach the trailing edge and aileron spar. The front parts of the ribs are next attached. Notice that the leading edge consists of two strips of balsa. At this stage, just glue the first (inner) strip to the nose of each rib.

When one wing has been assembled to this point, the opposite one can be built by propping up the completed section to the correct dihedral angle. Pin the spar of the second panel to the building board and complete the construction similar to the first one. When completed, the sheeting is applied to the lower surface of the wing from the leading edge to the main spar. Wing tips can now be completed.

Notice that the wing is still not torsionally strong, meaning that it can be twisted quite easily. Some people call this "Ivan's Spaghetti." Don't be fooled by this. It will become very rigid when the sheeting is applied to the upper surface. Hence it is very important to have the wing set in the correct position while applying the top sheeting.

A word of caution here is to check that each wing panel has the same angle of attack at the inboard end before sheeting the top surface. It is difficult to correct this later on. Sheeting is applied to the top of the wing from the main spar to the leading edge while the wing panel is weighted down on a perfectly flat surface. There is washout at the tip at the point indicated on the plans, but washout should only start at the aileron break. Hence the wing should be weighted down so there is no twist from the wing root to the point where the aileron starts. From there to the tip there is the slight twist that gives the correct washout.

With the wing firmly weighted down, glue the upper sheeting in place from the leading edge to the main spar. When this has been done, the remaining outer strip of the leading edge is added and shaped to the correct contour.

Many modelers wait until a wing is covered before they check for undesirable warps, or wrong washout. Then they heat the covering to twist the wing to correct the problem. This is very difficult to do with a wing built in this manner. It is just too strong and resistant to twisting. If the wing is not true at this point, dampen the sheet covering and weight it down and leave to dry overnight in the correct position.

Make sure that opposite panels match so that one wing does not have any more angle of attack than the other. Often an error creeps in at the centre section and the model will never fly right with this problem. When both panels match up, complete the sheeting of the centre section.

The ailerons are built next. One way to get an accurate fit is to hinge the aileron spar in place first, and then build the aileron in place with the wing weighted down over the plan. Attention to getting the ailerons to fit flush with the wing surfaces pays off in reducing drag.

When the wing is completed, it should be pinned in place on the fuselage while the section of the fuselage over the top of the wing cut-out is built in place on to the center section of the wing. The canopy is later attached to this section.

COVERING AND FINISHING

Regular film coverings have been used on the Shoestring models. Low temperature films are very easy to work with. But there is one disadvantage in the uses of film coverings in float planes. If water gets inside the covering, film does not breathe. The airframe takes a long time to dry out, and invariably the balsa gets very soft, and glue joins may suffer. The area where this shows up with extended use water is the tail of the model. It is difficult to keep water from getting inside the surfaces because of the spray that this area is exposed to.

Two things have been found to be helpful. One is to apply a coat of clear dope to the sub fin and inner section of the stab and elevator. The other is to use some other form of covering on the sub fin and lower surface of the stab and elevator. Lightspan has been found to be very suitable for this. It seems to breathe. And the airframe appears to dry out quicker if this is used instead of film covering.

Good luck with your Shoestring Look-A-Like.

Shoestring 58 (2001) 1/4.8 scale Span 58 ins. Wing area 500 sq ins.
Length 46 ins. Weight 56 oz with nine N-1900 SCR nicads. Wing loading: 16.1 oz/sq.ft. Eppler 374 airfoil. Magnetic Mayhem 22 turn motor with 3.0:1 ratio gearbox driving 12x10 APC-E prop at 5,000 RPM draws 28 amps static. Very fast and aerobatic, especially on a 3S Li-Po battery. The flying weight and wing loading will be considerably less with the use of a li-po battery and brushless motor.

Shoestring 62 (1997) Span 62 ins. Wing area 640 sq ins.
Length 49 ins. Weight 67 ozs with nine N-1900 SCR nicads. Wing loading: 15 oz/sq.ft. Eppler 374 airfoil. An Atomic Force 17T Motor with Great Planes GD-600 3.8:1 ratio gearbox turns an 11x7 APC–E airscrew at 7,500 RPM. Static thrust is 34 oz at 30 amps. This is a great aileron trainer and good for relaxing aerobatics.