

## 36" SPAD XIII

Designed by Peter Rake

The SPAD XIII was the culmination of French fighter design in WWI. The French started with war mainly with the Nieuports, 11, 17 and 28. SPAD entered the fray with the SPAD 7 followed by the XII and then the XIII. The SPAD XIII replaced the Nieuport 28's in most French and American squadrons. The SPAD was welcomed as a powerful and fast fighter which could hold it's own with any fighter of the time. The 200hp V8 Hispano Suiza engine was the weak link. The geared motor allowed higher engine revs with more power, but, the gearbox proved to be the weak link in the plane. Frequently a flight would start with 10 aircraft and only 2 or 3 would reach the battle area without retiring due to engine problems.

This model of the SPAD, designed as a sport scale model by Peter Rake, is a fast build for the intermediate builder. Construction is made easier through Peter's use of two piece fuselage construction. The front box section is built with slab sides and formers that help keep the sections square. The rear section is the familiar stick build with longerons and cross pieces built over the plans. When the front and rear are completed they are aligned and glued together. This method is simple and alleviates most problems associated with stick type fuselage construction.

The parts supplied are for Full house controls, using Aileron/Rudder/Elevator/Throttle for aircraft control. Four servos are required for this model, one in each top wing panel for the ailerons, two in the fuse for the rudder and elevator.

The recommended power for this plane is a geared sp400 and 8xNiMH cells. It has flown on a sp400 and it does fly well. The prototype was flown with a sp480 and 3sLiPo and flew with a surplus of power, with loops from level flight and short takeoff rolls. Other modelers have installed brushless motors with great success. The only real modification necessary for upgrades is in the motor mount.

Construction:

General: Use of CA or PVA for all construction with epoxy used for motor, landing gear, and wing mounts. I like med CA for stick type builds. Besides, it is so much fun to sand it off your fingers at the end of a day of building. When sheeting I change to thin CA. If you use CA I recommend having some acetone handy. That way when you stick your fingers together there is a chance to avoid an emergency room visit (acetone dissolves CA). Covering can be just about any type desired. We include Doculam as a courtesy and it does require painting (I use latex interior house paint). So-Lite (Coverite Microlite) works well. Airspan, Litespan, Solarfilm, tissue, silkspan, silk, and polyspan would also make good covering material. Monokote and it's competitive types are a bit heavy and will tend to warp

the structure when shrinking. Hinges can be any type suitable for park fliers, tape, CA type, mylar, dubro, etc. I used the dubro micro hinges on mine, but, they are much stronger than needed on this plane. Control is through the use of GoldenRod sleeve and wire control to the elevator and rudder. Pull-pull would also be a good choice on this one. Ailerons are controlled with servos in each wing with direct links from the servo arms to the aileron horns.

Before you begin:

Make sure you have all the parts listed on the inventory sheet. Then use the ID sheet to mark each lasercut piece and see where it goes on the plans. I recommend removing the pieces as you need them. That way you have a hope of identifying a loose piece halfway through your build. Pay special attention to the ribs as there are some subtle differences. If you have any discrepancies please email or call. Note that the plans include full size parts on them. That's so if you break a piece then you can use the outline on the plans to make a new one. Or, you can give the plans to a buddy so he can scratch build a twin to yours. Better yet, have him order a short kit from us and you can do airshows together!

Go over the plans and the instructions at least once to make sure you know where all the parts go and in what order you build them. If anything looks confusing go over it until it is clear, or, shoot me an email (or phone call). Some folks like to build wings first, or tails, but, I like to get the fuselage over with. Since I'm writing the instructions that's what comes first.

NOTE: To scale purists. This plane is not exact scale outline. We also do not include things like machine guns. I used dowels with a short piece of Al tube and balsa blocks to make the guns. The SPAD also had a distinctive grill with vanes. This can be simulated in several ways, the simplest being just a printed piece of paper glued to a sheet of balsa fitted in the cowl. Don't forget to drills some holes in the sheet for cooling.

Fuselage:

Begin by building the rear fuselage section over the plans. Cut the 1/8" sq sticks for the top and bottom longerons and pin in place. Fit the lasercut piece between them at the rear of the fuselage. These pieces are cut to clear pushrods for rudder and elevator. Then cut and fit the 1/8" square vertical joiners. When both sides are dry, remove from the board and pin them down over the top view of the fuse. Make sure the sides are square to the board. Fit the 1/8" liteply piece at the tail first, joining the tail of the fuse sides at the same time. Make sure everything stays straight and square as you do this. Then fit and glue the horizontal joiners as shown on the plans. There should be a horizontal joiner at the top and bottom where each vertical joiner is located. When finished you should have a completed rear fuselage!

The front fuselage is a box. First assemble the motor mount and F2A/F2B. Remember to

make sure you assemble it right side up. You should end up with the proper right and down thrust. Lay out the fuse sides. Glue the cabane struts to the fuse sides at this point. Now use F2 and F3 to join the fuselage sides together. Use squares and bracing to hold everything square until the glue sets.

Now install the servo mounts. Determine the desired location and install the servo mount rails. I like to use a 2"x4" sheet of 1/8" hard balsa for a servo mount plate. Cut to the fuse width, cut out sections for each servo, and glue in place. Install the U/C cross braces. Now break the forward fuse section where shown on the plans. The easiest way to do this is to deeply score the balsa on the outside edge until you can push it in against the motor mount plate and F1A/F1B. Glue everything together.

Next, join the front and rear fuselage sections together. It is easiest to do this over the plans, making sure everything is lined up straight and square. You may have to shim one side to make it line up correctly.

Install the fuselage formers. Then install the top and bottom fuselage stringers. Yes, there are a lot of them. Finally install the side stringers. The fuse forward section has some balsa sheet to be applied. Assemble the cowl pieces and tack to the front of the fuse.

You have a choice now. The fuselage needs to be filled in the front section. You can either use balsa block, pink foam (supplied) or use balsa planking. Carve everything to shape, blending with the stringers and balsa sheet.

Congratulations, the hard part is over!

#### Fin/Rudder and Stab/Elevator

While you have this section of the plans on your board go ahead and build up the tail feathers using the 1/8" thick stock and precut pieces. The outlines are made up of 1/8"x1/4" sticks and lasercut pieces as shown on the plans. Finish by fitting the 1/16"x1/8" ribs to the sections. Depending on which hinging method you use, bevel the LE of the rudder and elevator halves. Round off the LE of the fin and TE of the rudder.

The elevator halves need to be joined by the U shaped wire. This is complicated by the internal elevator controls. A brass strip needs to be shaped as shown on the plans and soldered to the elevator joiner wire. Then the elevator halves are joined together. Make sure they are flat with each other and the LE's are on line with each other.

#### Wings:

Change over to the other sheets of the plans. You can build all four wing sections at the

same time. Each wing panel is different with the ailerons in the top wing panels only.

Note: due to packaging limitations the top wing spars are not one piece. The preferred method to join them is to position the joints at different rib bays. Make a 45 deg angle on each and glue together. For further strength add a doubler of 1/32" ply to each spar. The only real complication in the top wings is the way the plans are laid out. To make wing assembly simpler you may want to cut and paste the plans for the top wing panels and center section together and build it in one piece.

Now cut the spars to length. Then notch the spars to fit the wingtip panels. Pin the wingtips and TE's in place. Then locate and pin each rib in place. Fit the LE in place with pins. Then fit the aileron pieces. Don't forget to fit the strut mount plates, servo mount plates, strut mount sockets and the aileron control horn plates in their proper positions. Once everything is in place then you can apply glue to the parts. If you like to use wood glue (yellow/white/PVA) then remove a piece, apply the glue, and refit to it's proper place.

Once the wings are all glued together you can apply the 1/16" sheet to the center sections and first rib bay of the lower wing sections.

Then shape the LE and TE as shown on the plans. Cut the ailerons free from the wing panels and bevel/round the LE of the ailerons.

Controls:

At this point fit all the radio gear, motor, and controls to the fuselage. If using sleeved wire for rudder/elevator, fit the sleeves to the fuse and select the exit location in the sheet at the rear of the fuse. For pushrods, test fit so the rods will clear the slots in the rear fuse sheet. For aileron control, attach the servos to the wings. I like to use silicon caulk to secure the servos. Another good alternative is to wrap the servo with a layer of tape and secure with hot glue.

The difficult part is the elevator horn connection inside the fuse. Make sure you fit the pushrod such that you can connect it after everything is covered. The easiest way is to make it so you can connect the pushrod as you assemble the stab/elevator to the fuse. Either a z connection, clevis, or other joiner of your choice. Make sure you have free travel with the controls setup. It is easier to fix this before covering.

When mounting the motor make sure it has the desired down/right thrust and the prop shaft exits at the center of the cowl. Cut away the necessary cowl area to clear your chosen motor/gearbox.

Covering:

This is the point at which I like to cover all the parts. Doculam is included in the kit for a covering material. It is frosted, but, when heated to shrink it turns clear. Since it is clear it is difficult to see the wrinkles before painting so examine closely when covering and heating. Other covering materials recommended are Airspan, Litespan, Solite (also known as Nelson Litefilm and Coverite Microlite) or Solarfilm (also known as Superkote from Hobby Lobby). Monokote and other heavier materials are not recommended. See section on painting below.

Assembling:

Rigging the wings is a lot simpler than it sounds. With the flat top wing it may be easier for you to assemble upside down. Put the wing on a flat surface and fit the fuselage to the wing. Jig the fuselage so that the wing is at the proper incidence. When it is adjusted correctly then glue in place. I like to use 30 min epoxy for assembling the wing since it allows time to adjust the wing before setting.

Once the top wing is fixed, then fit the lower wing. The struts should align the wing perfectly with the top wing and the fuselage. Once the fit is correct, then apply epoxy to the struts and root sections and fix in place. The critical alignments are the top wing incidence, wing LE's parallel to each other and perpendicular to the fuselage centerline. The bottom wing incidence is set by the top wing and the struts.

Assemble the ailerons to the top wing. Don't forget to install the control horns on the ailerons. Install the aileron linkage at this point.

Assemble the elevator to the stabilizer with hinges of your choice. Then glue the rudder to the fin using hinges. The rudder also has a control horn that needs to be installed.

Attach stabilizer to the fuselage. Remove the covering where it will be glued to the fuselage (same on the fuselage). Set the plane in a steady position and dry fit the stab first. Set it in position on the fuselage and align it with the wings. Measure from wingtip to stabilizer tip and adjust until both sides have the same measurement. Mark the position (dry erase markers work good for this). Step back and look at the stab in reference to the wing and make sure both are 'level'. If not then shim the stab on one side or the other. Once level and position is marked then remove stab from fuselage. Connect the pushrod to the elevator control horn, apply glue and put stab back in place, checking again to make sure it is level and aligned with wings. Check for free travel of elevator again.

Once the stab glue is set, then on to the fin/rudder. Do a dry fit of the fin to the stab. Make sure there is free movement of the elevator and rudder, even at full travel. Remove the covering where the fin will be glued to the stab. Align the fin over the stab and glue in place.

Use a square to make sure the fin is at 90 deg to the stab.

Assemble the wheels and glue on the tire (foam cord). Bend and attach the LG wires to the fuse crossmembers. Then bind the proper points with wire and solder. Place some rags under the LG so that any drips of solder won't harm your new covering. Fit the wheels to the LG with soldered washers or wheel collars. Then apply paper 'cones' to simulate the canvas covers used on the spoked wheels of old.

Connect the rudder to it's servo. Make sure the controls are all centered when the servos are centered. This makes the maiden flight go much smoother.

Painting/Trim:

Mask areas where you don't want paint, including control horns and control wires, wheels, prop/motor, etc.

Doculam requires painting. My recommendation is to use latex acrylic house paint (I use interior). The bad part is you have to buy it by the quart. The good news is that they (the local paint/hardware store) will perfectly match whatever color you want. Application is as follows. Rub down the plane with vinegar (any type). Vinegar is acetic acid, which lightly etches the doculam (alternative method: lightly rub it down with 0000 steel wool). Then clean it with alcohol (rubbing alcohol is fine, denatured is even better). Now paint. I like to use an airbrush, but, good quality paintbrushes work as well. Thin the paint about 50/50 with water or windshield washer fluid. The first coat should be fairly thin so it will dry quickly. Let it dry for at least 24 hours. Apply a second coat to get the coverage you want, then let this cure for at least 48 hours, 72 hours if you can. House paint cures from the outside, so, even though it feels dry, the part next to the film won't be fully cured for quite a while. Once fully cured the paint will stick to the doculam and will shrink with it. You can also patch over the paint without damage.

You can apply trim at this point. For masking I like to use low tack masking tape or vinyl trim tape. Do not use electrical tape, it will peel anything off, including the covering.

You are done!

Make sure all your controls are centered. Turn on the transmitter and connect the battery. Check all controls for proper direction and end point adjustment. Make sure the controls are all centered. Secure airplane. Check motor at partial and full throttle. Caution: keep body parts away from moving propellor!! Make sure propellor and moving motor parts are not rubbing against any airplane parts. Make sure battery is secure in the airplane.

Check the CG under the top wing of the airplane. If not within 1/16" of the recommended

position, add weight to the nose or tail until properly balanced.

You are ready to fly.

Have fun and send pictures.

charlie bice

manzano laser works

## Parts List:

### -Documents

Instructions	1
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### -Laser cut parts

1/16" sheets	5
1/8" sheets	4
3/32" sheets	2
1/4" sheet	1
1/32" ply sheet	1
1/16" ply sheet	1
Bag parts	1

### -Balsa sheet

1/16	2
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### -Balsa sticks

1/16x1/16	4
1/8x1/8	7
1/8x16	6
1/8x1/4	5
1/8x3/8	6
3/16x1/4	4
3/8x3/8	1

### -Bass sticks

1/8x3/8	2
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### -Dowels

1/8	2
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-Doculam	~10ft
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### -Wire

0.072" (14 ga)	3
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-Foam cord	1
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-Pink foam sheet	1
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