



Semi Scale Yak-54S, ARF 73"

ASSEMBLY MANUAL



Specifications

Wingspan:	73 in
Length Including Spinner:	69 in
Wing Area:	1,060 sq in
Weight (RTF):	11-12.5 lb
Radio:	4-6 Channel W/6 Servos
Recommended Engines:	
2-Stroke	1.4-1.6
4-Stroke	1.4-1.80
Gas	26-30cc

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Quique and I want to express our thanks to you for choosing our 73" Yak-54 S. We think that you will enjoy one of the best flying model aerobatic airplanes available. It is patterned after the 37% Yak-54 which took First Place honors at the 2003 Free Style Championships in Lakeland Florida, First Place at the Don Lowe Master competition 2003 & 2004, First Place Tucson Shoot Out 2004 Free Style, First Place XFC 2004, precision and free-style and Third Place at the Tournament of Championships in Las Vegas in 2002.

Quique and I have tried to prepare the best assembly manual possible along with best support on our line of Aircrafts. We are happy to announce that we have a support forum on www.Rcuniverse.com that is being led by Mr. Reza Gholamipour. Imagine, you are building your plane during weekend when we are close and you desperately need to get answer to your question so you can continue building, well we are happy to tell you that your question is most likely answered on Rcuniverse forum that we handle, if not, just post your question and have the answer in matter of hours.

Good flying to you!
Quique & Wayne

Covering Colors

Ultra-cote covering used on this 73" Yak-54 S can be purchased from Horizon Hobbies Website. The codes are as follows:

- Sky Blue Hanu875
- Smoke Purple Hanu868
- White Hanu870
- Bright Yellow Hanu872

Going Over the Covering

Before beginning the assembly of your Yak-54 S, remove each part from its bag for inspection. If you find any wrinkles in the covering, use a heat gun or covering iron to remove them. Use caution while working around areas where the colors overlap to prevent separating the colors. Make sure you go over the edges with your iron as well.

Hardware Supplied



Pull/Pull Rudder-4 hinges



Aileron-12 hinges



Elevator-6 hinges



Engine Mount



Wheels



Wing Anti-rotation pins



Engine Cowl & landing gear



Tail Wheel



Elevator & Wing connecting rods



Fuel Tank



Engine Box cowl mount blocks

Additional Required Tools and Adhesives

- Covering/Trim iron
- Xacto knife, #11 blade
- Pacer hinge glue (PT-55)
- 5, 15 and 30-minute epoxy
- Petroleum jelly/Lithium grease
- Acetone/Alcohol swabs
- Felt-tip marker
- Pencil and Marker
- Ruler
- Drill
- Drill bit #1, #3, #28, #51 and #52
- Wire cutter
- Course and fine sandpaper
- Thin, medium and thick C/A
- Full threaded servo mounting screws
- Sullivan inner nyrod
- Pliers
- Masking tape
- 1/16" balsa strips
- Ultra fine point sharpie
- Electrical tape
- Double-sided tape
- Small sheet metal screws
- Rat-tail file
- Pin vise
- White glue such as Elmer's Carpenter's wood glue
- Round toothpick
- 1/4"x3"x3-1/4" balsa wood
- Velcro

Extensions:

- (2) 9" servo extensions for Ailerons
- (2) 24" servo extension for Elevators
- (2) 3" servo extension from receiver to Ailerons

Servo Selection

The servos used for the control surfaces of this Yak-54 S must have a minimum of 130 ounce-inch of servo torque. In the prototype Yak-54 S, we used JR8411SA on all control surfaces and on throttle we used one standard JR servo. Best results can be obtained by using digital servos. Please do not risk your plane by using low torque servos. This Yak-54 S has large control surfaces and fully capable of any maneuvers that a pilot is able to perform, therefore using weak servos will increase chance of flutter and can cause you crash.

Using the Manual

This manual is divided into sections to help make assembly easier to understand and to provide breaks between each major section. Remember to take your time and follow the directions.

Warning

I am sure that for the most of you this is not your first venture into the World of flying radio controlled aircraft. For those of you that may be entering this exciting sport early on in your modeling experience and for you with vast experience, I think we all need to be reminded of the possible dangers that are associated with a high performance aircraft of this type. **This is not a toy.** This aircraft flying at a typical weight of ten pounds and up to one hundred miles per hour will inflict unbelievable damage to property, life and limb. This aircraft must be flown in a safe manner at all times. You should always do a preflight check including control surfaces hook-ups, radio operation, (please refer to your radio equipment instruction manual for range checks and other pertinent related information) and all other checks relating to the safe operation of this aircraft.

Warranty Information

Quique's Aircraft Company guarantees this kit to be free from defects in both material and workmanship at the date of purchase. This warranty does not cover any parts damaged by use or modification. In no case shall QQAC's liability exceed the original cost of the purchased kit.

Section 1-Preparing Fuselage

Required Tools and Adhesive

- Xacto knife, #11 Blade
- Trim Iron
- White Glue
- 1/16" balsa strips

Step 1

Use a Xacto knife with a # 11 blade and cut away the film covering on both sides of the fuselage for the wing openings, Figure 1.

Some modelers may want to overlap the film covering down inside the fuse in the opening for the wing. For example this type of an opening for the wing may be done as follows. Simply cut the film about 1/8 of an inch to the inside of the opening for the wing. You may then bend this extra 1/8 inch flap of film over ninety degrees to the inside of the fuse opening and iron it to the edge of the balsa sheeting over the foam. Use the trim iron for this application. Do not touch the foam, bead board, with your trim iron. Watch how much heat you use here as too much will melt the foam.



Figure 1

Step 2

Cut the film on the horizontal stab openings, both elevator servo openings and the slots for the rudder cables. Please note that the elevator servo opening on the right side of the fuse is forward of the elevator servo opening on the left side of the fuselage. There is a hole on the right side of the fuse just opposite of opening on the left side however it is a lightning hole and a little smaller than a hole required for a servo.

Note: You may want to add four pieces of 1/16 balsa strips approximately 1/2 inch wide inside the fuselage on the foam in the locations shown in Figure 2. They are best applied with white glue. We mentioned this small situation to our OEM and these areas should be covered with some small plywood pieces on your Somenzini Yak-54S.



Figure 2

Section 2-Horizontal Stab Installation

Required Tools and Adhesive

- Ultra fine point Sharpie
- Acetone
- Xacto knife, #11 Blade
- Felt tip marker
- Thin and thick C/A

Step 1

Center the H. Stab so that the left tip and right tip are equal distance from the fuselage sides. See Figure 3.



Figure 3

Step 2

Square up the H. Stab by measuring the diagonal distance from the turtle deck to the back corners (left and right) of the H. Stab. They must be the same distance. See Figure 4.



Figure 4

Step 3

Mark lines on both sides of the H. Stab top and bottom with a fine felt tip black marker, an Ultra Fine Point **Sharpie**® works well in this application. Later when you are ready to remove the black lines, acetone works best.

Step 4

Remove the H. Stab from the fuse. Mark a line, measured 1 mm on the inside of the two lines top and bottom that you marked along the right and left sides of the fuse.

Step 5

Use a new # 11 blade and gently cut through the ultra cote. See Figure 5. There are two layers, cut through the top layer first and remove it. You have probably cut through the second layer. If not you may cut through the second layer. Be very careful not to cut into the balsa sheeting as this will weaken the structure of the Horizontal Stab as the skin sheeting is important to its structural integrity.



Figure 5

Step 6

Use your iron to seal down the Ultra-cote where you removed the center section before you make the final attachment.

Step 7

Re-insert the H. Stab into the fuselage. IMPORTANT: Check the measurements again, see Figure 3 & Figure 4 to make sure the H. Stab is square. Before you make the final attachment of the H. stab to the fuse, you must check to see that the H. stab is parallel with the wing.

To do this, you may sight down the fuselage from the rear.

See Figure 6. Make sure you are looking straight down the middle of the fuse.

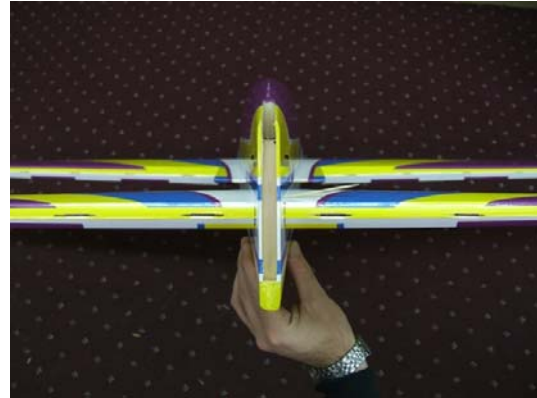


Figure 6

Step 8

Sight both sides of the H. stab and compare with both sides of the wing. If one side is lower and the other higher, you will need to shim so both the H. stab and the wing halves are parallel. Our prototype needed a little adjustment. We used a round toothpick to wedge the one side down a little. It was not enough so we used another round tooth pick on the other side of the fuse on the opposite side to bring the H. stab parallel with the wing. See Figure 7. It should not take much shimming to get it perfect. It is almost impossible for our OEM to assemble this fuse so that the H. stab and wing are always parallel. You can see that the little wedges with the round toothpicks can correct this small problem with very little adjustment. Now you are ready to glue in place.

Section 3-Vertical Fin Installation



Figure 7

Step 9

Place the fuse so the H. Stab is vertical so the thin C/A glue will flow into the fuse sides.

Apply the thin C/A glue along the H. Stab on both sides that do not have the toothpick wedges. Let the thin C/A set up and then apply some more thin C/A on the sides with the toothpick wedges. Be careful not to glue the toothpicks in place, as you will of course remove them as soon as the thin C/A sets up.

Step 10

Remove the toothpick wedges. Apply a fillet of medium C/A over all of the areas between the fuse sides and the H. stab. If there is a small gap, simply work more of the thick C/A into the small gaps.

Required Tools and Adhesive

- Acetone
- Xacto knife, #11 Blade
- Felt tip marker
- 30-minute epoxy
- Alcohol Swab/Alcohol and paper towel
- Round toothpick
- White glue

Step 1

Insert the Vertical Fin in the fuse. Mark a line along the V. Fin and fuse. See Figure 8.



Figure 8

Step 2

Mark another line about $\frac{1}{4}$ or an inch below the first line that you drew.

Step 3

Remove the film covering as shown. As with the Horizontal Stab there is more than one layer of film. By removing the film covering you will have a stronger bond between the Vertical Fin and the Fuse as shown. See Figure 9.

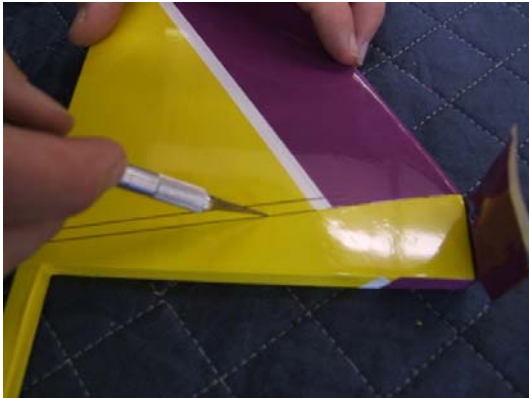


Figure 9

Step 4

Be careful to make a very shallow cut through the film on the V. Fin so you do not cut too deeply into the V. Fin sheeting. A very sharp # 11

blade is helpful. Remove the black ink line with acetone.

Step 5

Glue in place with 15 to 30 minute epoxy glue. Remove any excess epoxy with alcohol and a paper towel.

Step 6

After epoxy hardens, check to make sure the hinge slots between the rudderpost and fuselage did not fill up with epoxy. Before the epoxy hardens, you might be able to clean out most of the epoxy with a round toothpick or thin piece of 1/64 plywood. The bottom hinge slots are where the problem might occur. If the epoxy hardens before you clean out the hinge slots you will have a problem. White glue could also be used to attach the vertical fin and clean up with water and a piece of paper towel would be much easier.

Section 4-Preparation and Installation of Hinges

Required Tools and Adhesive

- Xacto knife, #11 Blade
- Lithium grease/Petroleum Jelly
- Toothpicks
- Pacer hinge glue (PT-55) or 30-minute epoxy

The hinge slots are already installed in the balsa hinge locations on both the fixed surfaces and the moveable surfaces. However they are covered up with the covering film so they may be a little difficult to see and locate. Look closely and you will find the hinge holes. I find them more easily by running my finger along the edge where the hinges are located. You should feel a little depression in the film at the opened slots under the film.

Step 1

Use a # 11 blade to open the flat hinge slot.

The hinge slots will have to have a larger opening cut out just on either side, top and bottom, of the pivot point on both surfaces. So you will need to open the area in the fixed and moveable surfaces of the ailerons, elevators and rudder.

Step 2

Use a #11 blade and make a wedge tapered opening to accept the pinned hinge area of the hinge. See Figure 10 & 11.

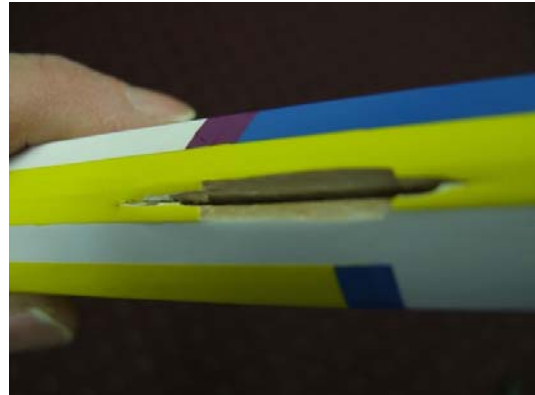


Figure 10

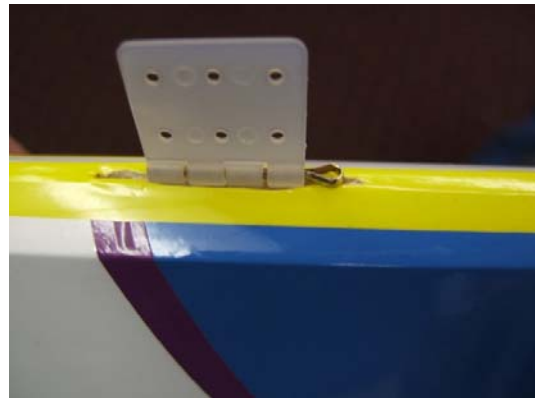


Figure 11

Step 3

Make a V- cut in the fixed and control surface area along the slot location of the flat hinge. This additional V- slot will insure that the hinge will insert far enough into the hinge slot so it is in the proper location and provide enough depth for the each hinge. The gap between the flying surface and the control surface needs to be at a minimum. However we have to have enough of a gap so full deflection is possible.

Step 4

Check the gap on each control surface. The gap should be somewhere between 2 and 3 mm. This procedure will take some time to do all of the hinges but take your time and do a nice job. As you do each hinge and check out the proper depth and shape of the V-slot necessary for each hinge, the time involved to do each subsequent hinge will lessen.

Before you glue the hinges in place:

Take some lithium grease or Vaseline and apply a very small amount on both sides of the hinge point on the flat hinges. Quique used a round toothpick. See Figure 12. This will help prevent any glue in the pivot point.

Be very careful not to get any grease etc. on the flat part of the hinges. Also remember that you always glue the hinges in to the fixed surfaces first, let the glue harden before you then glue in the control surfaces. Remember to check for the correct hinge gaps for rudder, elevators and ailerons. You must have the correct gap to insure the maximum control deflection necessary for the best 3-D aerobatics. For hinge attachment we like to use **Hinge Glue** by Pacer. You may use epoxy if you wish. If you use epoxy, use an epoxy with a curing time that will give you enough time to work the hinges in place before the epoxy hardens.



Figure 12

Step 5

Sealing the Control Surfaces

After you are done hinging the ailerons and elevators, make sure you seal the hinge line by using clear ultracote. Unsealed control surfaces may cause flutter like aileron flutter, which may cause your plane to crash, where sealed control surfaces will give you better and crisper response in flight.

For each aileron, cut $\frac{3}{4}$ "x32" of clear untracote and seal the hinge line from bottom using a straight edge and trim iron.

For each half elevator, cut $\frac{1}{2}$ "x10" of clear untracote and seal the hinge line from bottom same way as you did your ailerons.

Section 5-Elevator, Rudder and Aileron Control Horn Installation

Required Tools and Adhesive

- Course sandpaper
- Xacto knife, #11 Blade
- 30-minute epoxy
- Alcohol Swab/Alcohol and paper towel

Elevator Horn Installation

Step 1

Cut the slots in the bottom of the two elevators to accept the two PC Board elevator control horns. See Figure 13. Notice that the slot is located on the blue line. Again, rub your finger over the approximately location for the cut out to find it more easily.



Figure 13

Step 2

Rough up the surface of the P/C board control horn with coarse sandpaper only where it will be glued into the elevator.

Step 3

Then clean with alcohol or acetone and glue in place with epoxy. Be sure that the attachment point on the control horn is perpendicular to the hinge line. See Figure 14.

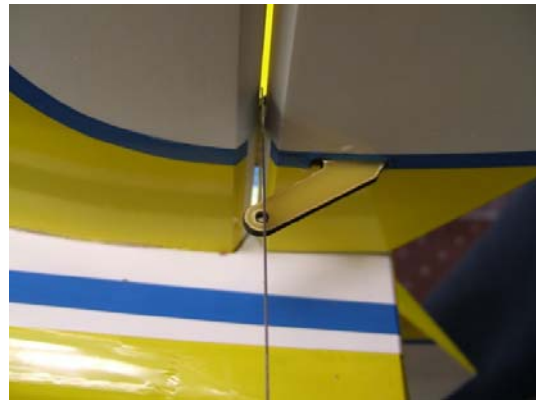


Figure 14

Rudder Control Horn Installation

Step 1

Find the location in the rudder where the P/C Board rudder control horn is to be inserted. Remove the film covering as shown in Figure 15.

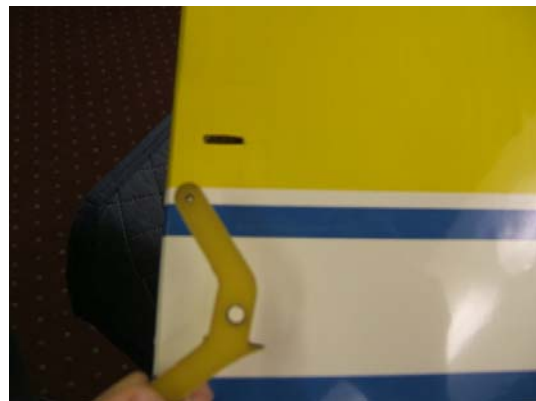


Figure 15

Step 2

Again rough up the surface on the P/C board control horn that will be glued into the rudder. Clean with alcohol or acetone and epoxy. Be sure that the rudder horn is square to the rudder. You should be able to eyeball this. See Figure 16.

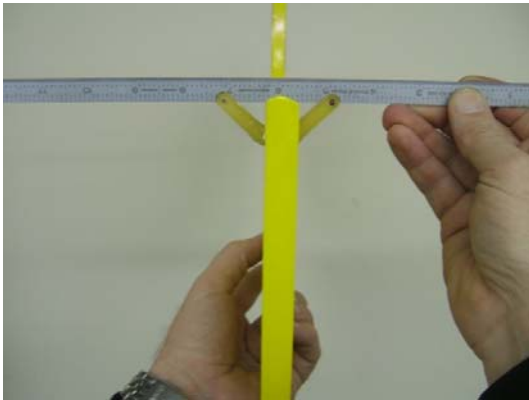


Figure 16

Aileron Horn Installation

Step 1

Find the location for the aileron servos in the bottom of each wing. Note that the openings are in the middle purple stripe. The location for the aileron servo is also located in the middle purple stripe. Note that there are two rectangle openings there. Use the smaller opening available that is closest to the fuselage. The other hole is one of many lightening holes to keep your Somenzini designed Yak-54 extra light. Every little bit helps.

Step 2

Cut out the film over the servo location hole.

Find the location on the ailerons for the P/C Board control horn and remove the film for both locations. See Figure 17.



Figure 17

Note that the connecting hole on the P/C board aileron control horn for the connecting rod attachment should be about 1/8 inch of an inch to the rear of a line that is perpendicular to a line drawn through the centerline chord of the wing. See Figure 18, which shows a straight edge with a projected perpendicular line.

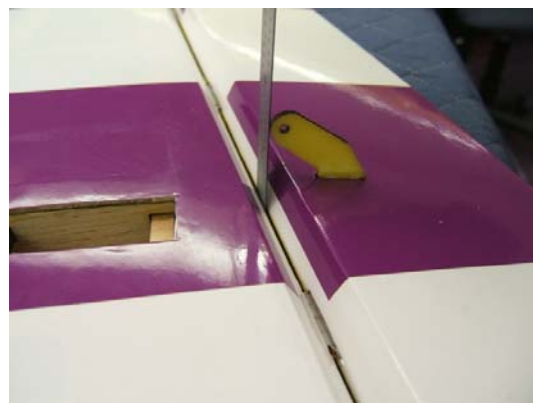


Figure 18

Step 3

Glue the control horns in place with 5 or 30-minute epoxy. If you work at a slow pace, perhaps you should choose the 30-minute.

Section 6-Rudder & Tail Wheel Installation

Required Tools and Adhesive

- Xacto knife, #11 Blade
- 30-minute epoxy
- Alcohol Swab/Alcohol and paper towel
- Wire cutter

You should have already prepared all flat hinge slots for all control surfaces. For flat hinge attachment method, please refer again to Section 4-Preparation and Installation of Hinges.

Step 1

First place the plastic tail wheel bracket on the tail wheel wire.

Step 2

Bend a 90-degree angle in the correct direction on the tail wheel wire that will be inserted into a hole, which you will soon drill into the rudder. See Figure 19 that shows a one inch distance from the 90-degree bend to the bottom of the plastic tail wheel-mounting bracket.

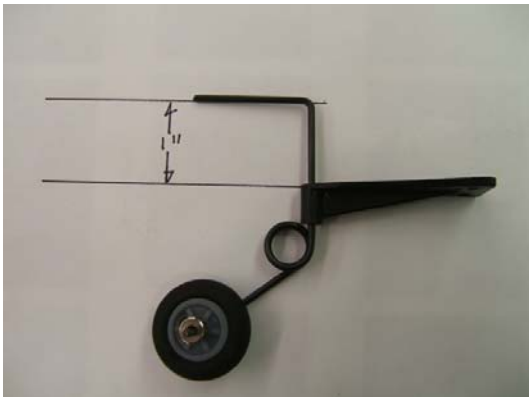


Figure 19

Step 3

Cut the wire that will go into the rudder to about one inch in length.

Step 4

Cut a V-slot in the bottom of the rudder to allow the space needed for the tail wheel wire.

Step 5

Drill a hole in the rudder for the tail wheel wire one inch from the bottom of the rudder. Again please check the v-slot in the bottom of the rudder to make sure it will allow the hinge to insert deep enough into the rudder. See Figure 20.



Figure 20

Notice the hole that will accept the tail wheel wire is just above the hinge and the point of the Xacto blade in this same picture.

Figure 21 shows the tail wheel assembly ready for placement into the rudder.

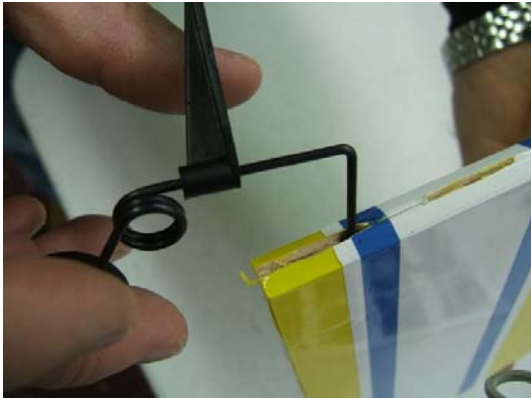


Figure 21

Step 6

Use the four screws provided and attach the tail wheel bracket assembly to the fuselage. See Figure 22.



Figure 22

Step 7

After you have checked to make sure all hinge slots are deep enough and also that the V-slots are properly cut and you have made a dry run attachment, you may glue the hinges into the vertical fin and fuse.

Step 8

Check the hinges for the proper depth and allow the epoxy glue to harden.

Step 9

Glue the rudder in place. Use 30- minute epoxy for the tail wheel wire attachment wire that is inserted into the rudder and also for the hinges that will be inserted into the rudder.

Step 10

After you have the epoxy applied, slip the rudder onto the hinges. Clean up any excess epoxy from all areas with alcohol to keep hinges from freezing up.

Section 7-Elevator Servo Installation

Required Tools and Adhesive

- 24" servo extension
- Sullivan inner nyrod
- Pin vise
- 2 full threaded servo mounting screws

Step 1

Attach 24-inch servo extension wires to the elevator servos. You may want to wrap the servo plug connections with a small piece of tape.

Step 2

To run the servo extension wires forward, use a piece of Sullivan inner Nyrod and place it through the oval holes in the bottom of the fuse formers starting from the canopy hatch area and exiting through the elevator servo mounting opening.

Step 3

Use a piece of tape and attach the Nyrod to the end of the elevator extension servo wire and gently pull the extension through the oval holes exiting into the canopy hatch area. See Figure 23.



Figure 23

Step 4

Mount both elevator servos. Drill the proper diameter holes with a pin vise into the hardwood servo mounting rails for the servo mounting screws. Mount the servos so the output shaft end of the servo is toward the front of the fuselage.

Step 5

Attach the two extended elevator control arms, provided, to the round servo control arms with some small screws. These screws are not provided. See Figure 24.



Figure 24

Step 6

To attach the elevator servo control arms to the elevator control horns, use the titanium elevator connecting rods, provided. The longer titanium control rod is for the *right* side of the fuse. Note that the ball links provided should be mounted as shown in Figure 25.



Figure 25

The ball links are mounted on the outside of the servo arms and on the inside of the elevator control horns. The titanium control rods have reverse threads for easy adjustment. The plastic ball link connectors do not have any threads so when you turn the titanium connecting rods in place you are in essence making the threads as you make your connections.

Section 8-Rudder Servo and Pull/Pull Installation

Required Tools and Adhesive

- Pliers
- Masking tape
- 2 full threaded servo mounting screws

Step 1

Install rudder servo as shown in Figure 26. Notice the servo wire is threaded through the oval holes in the bottom of the fuse formers and threaded forward to the radio receiver-mounting tray.



Figure 26

Step 2

Attach the black double rudder servo arm as shown in Figure 27 with two small screws (servo mounting type), not provided. You may also attach the ball links, provided, as shown in the previous picture. Note that the taper of the black rudder extended servo arm is mounted so that the tapered part of the arm is facing to the front of the fuse. Also note that the pull / pull control cables will be crossed. They are plastic coated to

avoid any metal-to-metal contact, which might cause R/F interference.

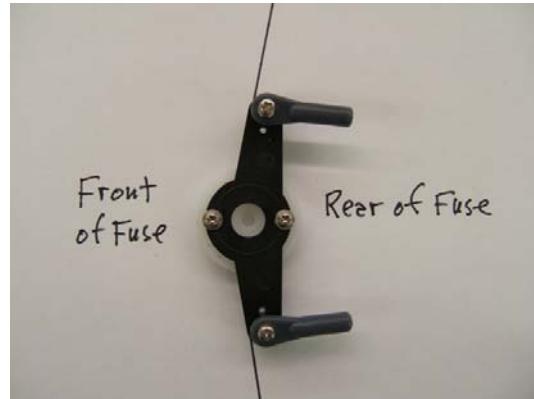


Figure 27

Step 3

On one end of each cable only, attach the pull/pull cable to the brass-threaded connection pieces using the brass tubes pieces, both provided, as shown in Figure 28.

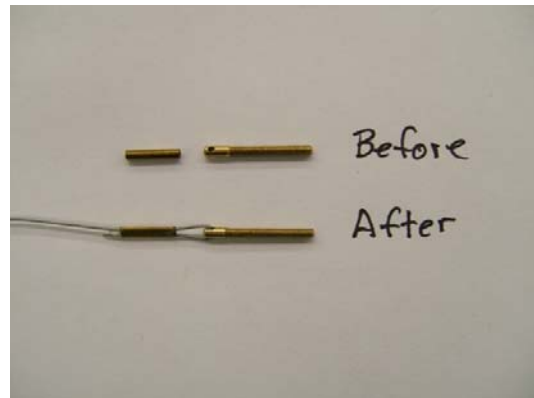


Figure 28

Step 4

Crimp the brass tubes pieces with pliers. Make a good firm crimp and then it's important to follow up with some thin C/A applied on both ends

of the crimped brass tube pieces and the cable.

Step 5

Screw the threaded brass connectors half way into the plastic ball link connection on the extended rudder servo arm as shown as shown in Figure 29.



Figure 29

Step 6

Install both pull/pull cables on the extended rudder servo control arm as shown in the same picture. To complete the pull/pull attachment to the rudder control horn, you will need to turn on your radio to hold the rudder servo arm firmly in neutral. Adjust the rudder servo arm with your trim functions on the transmitter so you have a good neutral.

Step 7

Cross the cables and exit them through the slots at the rear of the fuse.

Step 8

Tape the rudder to the front of the vertical fin so it will be held in a

neutral position also so you will be able to determine the final length of each pull/pull cable.

Step 9

Slip the brass sleeve over the end of the cable and then through the hole in the end of the threaded brass connector.

Step 10

Put the loose end of the cable through the brass tube. Make your final length adjustment on the pull/pull cables. See Figure 30.

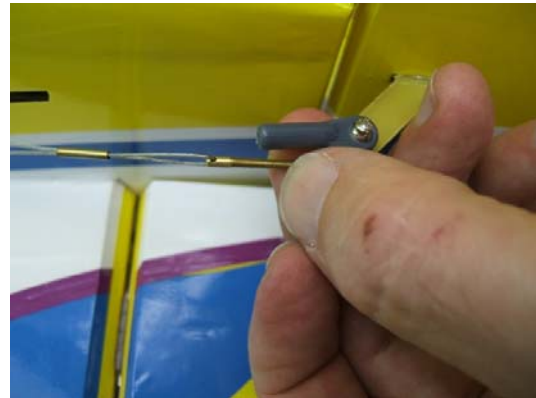


Figure 30

Step 11

Hold the threaded brass connection piece along the side of the plastic ball connector; you may tape it if you wish, where about half of the threads would be inserted into the plastic ball connecting piece.

Step 12

Bend the cable over and slip the loose end into the brass sleeve.
Important: Do not use the spacer when assembling the ball link to the rudder control horn. See Figure 31. This spacer is not needed in this application and think of all of the weight you will save.



Figure 31

Section 9-Engine Mounting and Throttle Control Installation

Required Tools and Adhesive

- Drill
- #3 (0.213") drill bit
- #1 (0.228) drill bit

Step 1

Mount your engine on the two engine mounts provided. Note that the prop hub of the engine must be exactly 5.5 inches in front of the back of the two engine mounts. This is shown in Figure 32.

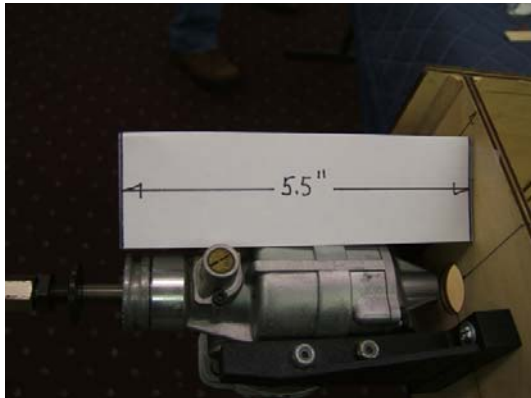


Figure 32

Step 2

Look at Figure 33, which is the front of the engine firewall. There is one horizontal and one vertical line drawn. They are centered on the centerline of the 22 mm diameter hole cut in the firewall, which represents the x and y for the location of the centerline of the crankshaft if it were to pass through the middle of this hole. Notice that the vertical line is 57 mm from the top of the engine firewall.

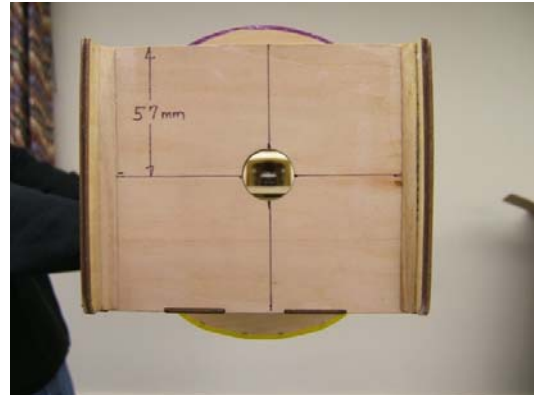


Figure 33

Step 3

Look at Figure 34, which shows the measurements from the outside of the engine box to accommodate the right thrust. This picture shows that the centerline of the engine crank shaft at the fire wall to be 78 mm from the right side of the engine box. This vertical line is not in the center of the engine box because the engine must be off set to accommodate the right thrust of the engine. We want the centerline of the crankshaft to exit the middle of the front of the engine cowling or as close as we can. The exact mounting holes for the mounting brackets will vary in width depending on which engine you choose.



Figure 34

Step 4

Determine the location of the holes on the firewall for installing the engine mount, mark them and drill the holes through the firewall using a #3 drill bit .213 of an inch in diameter to accept the blind nuts provided. A good tool for the centering of the holes for mounting the engine is available from Central Hobbies. See Figure 35. It has a small drill bit which you turn by hand to locate a starter hole and mark before drilling the final holes for mounting the engine.



Figure 35

The lengths of the blind nuts for mounting the engine are a little too long for the firewall. They will protrude through the front of the firewall. So you will need to counter sink a clearance hole in the back of the plastic engine mounts. Use a no. 1 drill bit, .228 inches in diameter and drill a clearance hole that is about 1/8 inch deep into the back of the plastic engine mounts which will accept the blind nut protrusion through the front of the firewall. Use a slow speed on your electric drill and also do not push too hard. Do this procedure very slowly, as would a brain surgeon. Don't need any slip-ups here. Your engine after

mounting should look something like this. Figure 36 and 37.



Figure 36

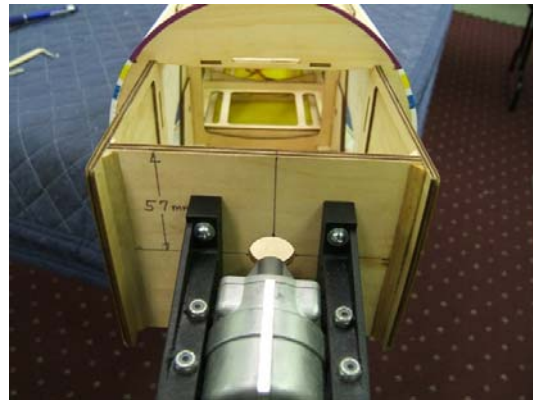


Figure 37

Step 5

After the engine is mounted, install the throttle control that is provided to the throttle servo. Depending on your choice of an engine, the throttle control rod may enter either the left side or right side of the fuselage passing by the fuel tank. In either case it is not a problem as the engine control servo is mounted to accommodate the control rod connection on either side. The engine box will be finished later. The top needs to stay open at this point so you can install the fuel lines more easily. The fuel lines from the engine to the fuel tank should enter through the round hole in the firewall.

Section 10-Landing Gear Installation

Required Tools and Adhesive

- Drill and #3 (0.213") drill bit

Step 1

Drill two holes in the landing gear to attach the gear to the fuselage. See Figure 38.

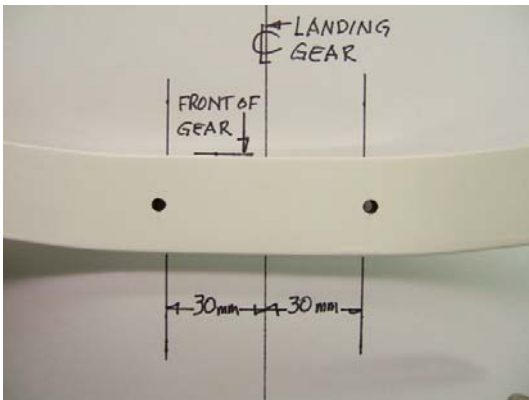


Figure 38

Step 2

Drill the holes in the landing gear legs for the axle and the wheel pant attachment screw. See Figure 39.

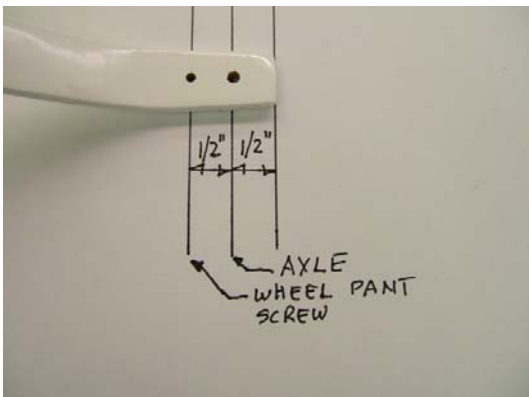


Figure 39

Mounting Landing Gear to Fuselage:

Step 3

Place the landing gear on the fuse in the correct position and mark the two mounting hole locations with felt tipped pen or similar marker through the two landing gear holes.

Step 4

Remove the gear and drill the holes in the fuselage landing gear plate with a # 3 drill bit.

Step 5

Insert the two blind nuts as provided on the inside of the fuselage on the landing gear mounting plate. See Figure 40. The blind nuts will protrude through the plywood landing gear mounting plate as they did on the engine firewall so you will have to drill a clearance hole in the gear to accept this protrusion. It will only be a very shallow clearance hole, maybe 1/16 inch so be very careful when drilling this clearance hole so that the drill bit does not grab the landing gear.



Figure 40

Step 6

Attach the wheel and wheel pant to the gear. Do not drill the hole in the wheel pant to accept the wheel pant screw just yet. Assemble as shown. Use 4mm x 50mm axle screw. Use 3 washers and two lock nuts that are provided as shown for each wheel.

Step 7

Put a washer on the gear axle and place the axle through from inside of the landing gear leg.

Step 8

Add a washer and one of the locking nuts with the plastic locking ring against the inside of the wheel. Quique used a battery-powered drill and held the lock nut in place with pliers to attach the lock nut. Do not tighten completely as the wheel is not ready to be installed.

Step 9

Add the other lock nut with the nylon-locking ring to the outside of the wheel. See Figure 41, 42 and 43.



Figure 41



Figure 42



Figure 43

Step 10

Measure the angle for the wheel pant. With the wheel pants attached to the landing gear but not yet fully tightened, place the fuselage on a table. Have a friend hold the tail of the airplane up to a flight line position. See Figure 44.



Figure 44

Section 11-Fuel Tank Installation and Engine Box Completion

Required Tools and Adhesive

- Medium C/A
- 15-30 minute epoxy
- Velcro
- 1/4"x3"x3-1/4" balsa wood
- Masking tape
- Sandpaper
- Double sided tape

Step 1

Assemble the fuel tank hardware as shown. See Figure 45. Be sure the vent tube with the short piece of fuel tubing is cut at an angle that is located at the top of the inside of the fuel tank when the tank is mounted in vertical position. The tank should be mounted in the fuselage so it is tall and less wide.



Figure 45

Step 2

Before you mount the fuel tank you need to make a floor for the fuel tank.

Glue a piece of balsa 1/4" x 3" x 3-1/4" with the grain of the balsa running the 3-1/4" direction. See Figure 46.



Figure 46

Step 3

Place a piece of double sided servo mounting tape 3 inches long by 1- 1/2 inch wide on top of the fuel tank floor.

Now install the fuel tank with Velcro and double sided tape between the tank and tank plate. See Figure 47.



Figure 47

Important: Make sure the tank is firmly secured. Keep in mind that with a full fuel tank, say 12 ounces, with an airplane pulling 10 G's creates a force of 120 ounces or 7.5 pounds. With this much force the full fuel tank might just like to take on a

mind of its own. Ten G's would not be uncommon in some violent 3-D maneuvers, which this Yak-54 is capable of doing certainly with the control surface throws that you have available.

Step 4

Install the fuel lines per the manufacturer's instructions for the engine of your choice shown in Figure 48 are the lines that Quique installed for his YS-140 Sport engine.



Figure 48

Step 5

After the fuel lines are installed, you may glue the lite-ply top piece onto the top of the engine box. But before you do that you should glue the three triangle stock reinforcing strips around the inside at the top of the box with medium C/A glue. See Figure 49.



Figure 49

Step 6

Lightly sand the burnt laser cut edges on top side of the fuse sides and firewall where the top lid of the engine box is to be secured.

Step 7

Attach the plywood piece to the top of the engine box with 15 minute or so epoxy. **Important:** do not apply any epoxy on the top piece or the vertical plywood former just in front of the canopy hatch where the slot is located to hold the canopy in place. Also do not apply epoxy on the engine box lid where the slot is located in the vertical half former just in front of the canopy hatch. Use masking tape as a clamp to hold the lid down while the epoxy is hardening. See Figure 50.

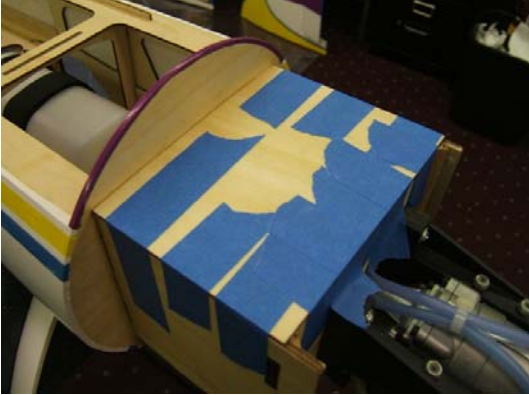


Figure 50

If you inadvertently get any epoxy in that slot area, make sure you clean it out. If any excess epoxy gets in that slot and hardens it won't be much fun to clean out and the canopy hatch will not slip into position.

Step 7

Install the muffler and get ready for next section to cut the cowl.

Section 12-Engine Cowling

Required Tools and Adhesive

- Course sandpaper
- 15-30 minute epoxy
- Pencil/Marker
- Drill & #51 drill bit
- Masking tape

Step 1

Rough up the areas of contact with some coarse sandpaper before you attach the four hardwood blocks to the round fuse former at the rear of the engine cowling and the engine box with epoxy. Make sure that the beveled part of the blocks is flush with the round fuse side, see Figure 51. This picture shows the two top block locations.



Figure 51

Figure 52 shows the location of the bottom blocks.



Figure 52

Very Important: Before you mark and make the final locations for the four cowl mounting screws, always have the canopy hatch in place. Other wise you will not be able to slip the canopy hatch under the engine cowling.

Follow below steps to mark the four cowling screw attachment location.

Step 2

Put some masking tape on the fuse behind the four hardwood blocks that you installed.

Step 3

Draw a line that matches up with the middle of the hardwood blocks and back onto the masking tape pieces you just placed on the fuse.

Step 4

Measure back one half inch from the front of the fuse former and make a vertical line. That is the distance of the overhang of the engine cowling over the fuselage. See Figure 53.

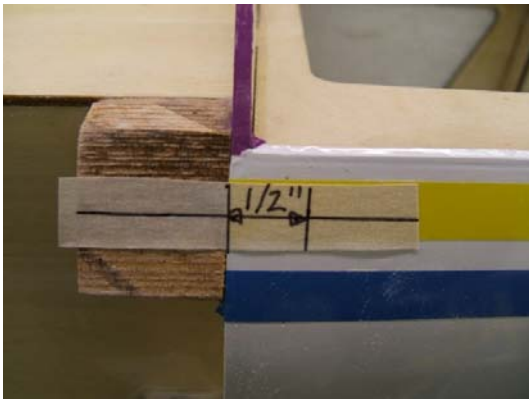


Figure 53

Step 5

Slip the engine cowling, on the fuselage, remember with the canopy hatch always in place, over the four pieces of masking tape you have affixed with the one half inch vertical lines with the back of the engine cowling on those vertical marks. Double check to make sure the engine prop hub is somewhere close to the center of the hole in the engine cowling. If not you may want to make some slight adjustments by shifting the engine cowling. However it is probably more important to check to see if the cowling overall looks straight on the fuselage. Like if

the top of the cowling is parallel to the canopy hatch behind it.

Step 6

Cut the holes needed in the engine cowling for the clearance of the engine head, muffler and any other protrusions that will ultimately be outside of the engine cowling. Please read the second paragraph from here for cutting out the holes in the engine cowling for some helpful hints. If you do this now before making the final attachment of the engine cowl, it will be easier to make sure that the crank case will be centered in the front of the engine cowling. See Figure 54 as an example of the holes to be cut in the engine cowling.



Figure 54

Step 7

Slip the engine cowling on the fuselage and put some masking tape just in front of horizontal lines that you put on the masking tape on the fuse. Extend the horizontal lines that you see in picture 53 on forward onto the engine cowling.

Step 8

Mark a vertical line one inch in front of the back of the engine cowling. These are the locations for the four holes to fasten the cowling to the fuselage. See Figure 55.



Figure 55

Step 9

Drill the four holes with a # 51 drill bit through the cowling and on into the wood blocks. Go ahead and insert each screw as you drill each hole. This will help to hold the cowling in place as you drill the other holes. Check to make sure the cowl hasn't shifted position after you attach each new screw.

Step 10

After all of the holes are drilled, remove the cowl and enlarge the holes in the cowl to accept the diameter of the cowl mounting screws. Now it is time for the fun part.

Step 11

Cut out the engine cowling and remove enough material to make room the part of the engine and

muffler that will protrude outside of the engine cowling.

Step 12

Cut a hole in the front of the engine cowling for the air to enter and cool the engine. You will also need to make sure you have enough area cut out in the engine cowling behind the incoming air hole to allow the incoming air to exit properly. A general rule of thumb is to have the exit area at least two to three times the area of the incoming air. Be careful and do not make the income air hole too large. It can be smaller than you may think. Specifically, it should not be any wider that the outside of the cooling fins on the engine. Figure 56 shows the cut outs used for the YS-140 Sport Engine used in Quique's proto-type test Yak-54.



Figure 56

Notice the hole cut out in the front of the engine cowling in the area that is painted black. This of course is for the incoming air that will pass through and around the cylinder to cool the engine. When you are ready to attach the engine cowling, we have found that it is very helpful to use a small O-Ring, 3/32" I.D., provided, between the two metal washers used to attach the cowl. See Figure 57.



Figure 57

When using a rubber O-Ring and the two metal washers, we have not had any problem with the cowl screws coming loose. Figure 58 shows the cowling with the YS-140 Sport engine installed and the entire engine cowling cutouts for incoming air and exiting air.



Figure 58

Section 13-Canopy Installation

Required Tools and Adhesive

- Xacto knife, #11 blade
- Drill and drill bit #28
- Thin/Medium C/A
- Rat-tail file

There are two holes in the fuse, one on each side, to accept the screws to hold the canopy in place.

Step 1

Find the locations for the two screw holes. They are 1-1/2 inches forward from the back of the canopy hatch and 5/16 inch below the canopy hatch line.

Step 2

Use your Xacto # 11 blade and remove the Ultra-Cote. See Figure 59.



Figure 59

Step 3

Now slip the canopy in place onto the fuselage and drill the holes in the canopy plywood tabs for the blind

nuts that you will install in the inside of the tabs.

Step 4

Insert the blind nuts on the inside of the canopy hold down tabs and tighten the 3mm screws with the Allen wrench provided to seat the blind nuts firmly into the plywood tab. See Figure 60.

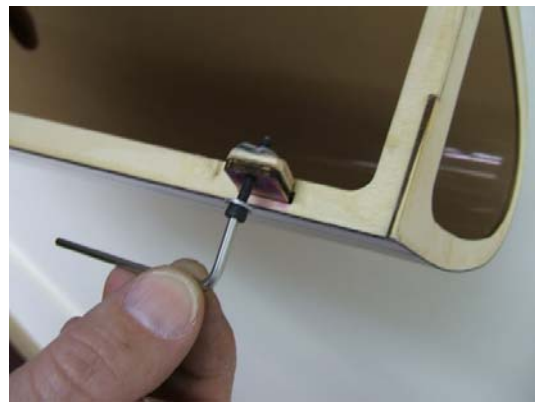


Figure 60

You should run a little thin or medium C/A around the blind nuts on the inside of the tabs to help them stay in place.

Step 5

If you have measured correctly, you should now be able to insert the two canopy hold down screws that are 3mm x 20mm into the blind nuts. Make sure the length of these screws is at least 20mm. If the screws do not line up with the blind nut hole in the canopy hold down tab, open up the hole in the fuse side a little with a small rat-tail file until the screws go in properly.

Step 6

At this point you should drop a little thin C/A glue around this hole in the fuselage side to make the lite-ply fuse side harder. The C/A will soak in and make the light ply more like regular aircraft plywood.

Step 7

Tighten the canopy screw down firmly it won't crush the harden lite-plywood. We want to do all we can to prevent the canopy from removing itself during flight. It is very important to use a 3/32" diameter O-Ring on the canopy hatch like on the engine cowling screws. Use flat steel-washers, O-Ring and another flat steel washer. If tightened properly, you should never loose a canopy in flight.

Section 14-Wing Preparation and Aileron Servo Installation

Required Tools and Adhesive

- Xacto knife, #11 blade
- Fine sandpaper
- Thin C/A
- 5-15 minute epoxy
- Alcohol swab/Acetone
- 9" servo extensions (2)
- Small sheet metal screws
- Ruler

Step 1

Cut out the film covering over the access holes for the aileron servo mounts. Please note that the aileron servo is located on the bottom of the wing, approximately in the middle of the middle purple stripe. There are two rectangle openings in the middle purple stripe. The aileron servo cut out is the rectangle opening closest to the fuselage. Remove the film covering here. The other hole is a lightning hole.

Step 2

Next, install the anti-rotation pins as follows: Lightly sand the aluminum anti-rotation (AR) pins on the end that inserts into the wing sockets with 400 or very fine sand paper. Of course the hole in the pin goes into the fuselage.

Step 3

Clean sanded pin with alcohol or acetone. Slip pins in the sockets.

Important: the measurement from the root chord rib to the center of the locking pinhole is 9mm. See Figure 61.

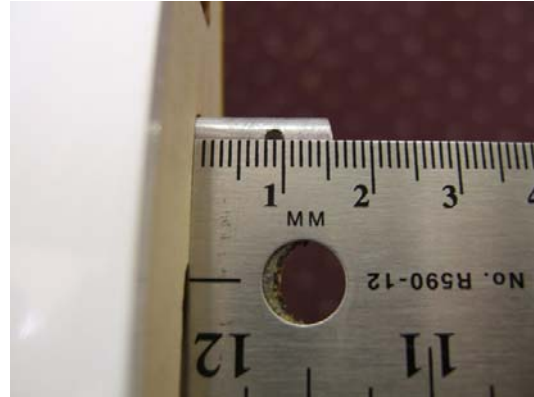


Figure 61

Also, equally important, the locking pinhole must be vertical. See Figure 62.



Figure 62

You will find that the two holes in each of the wing roots that accept the anti-rotation pins are a little oversized. This should not be a major problem. However you may have to adjust the size of the hole in the fuse sides into which the pins slip. You may do this with a small rat-tail file. Be very careful that you don't make the hole size too big.

Step 4

After you have checked all of these four holes for proper depth, use thin C/A glue and apply around the pins to affix them to the root rib of each wing.

Step 5

Use some epoxy and make a fillet of epoxy inside the wing around the anti-rotation pin and the second wing rib. See Figure 63.



Figure 63

Step 6

Install two (AR) pins per each wing half.

Step 7

Make up the four-donut cushion wing keepers that you will use when attaching the wing halves to the fuse.

Step 8

Glue the black O-ring to the metal washer with thin C/A. Four required. See Figure 64.



Figure 64

Step 9

Slip the wings onto the airplane and attach the donut and locking key it should look like Figure 65.



Figure 65

You should be able to install and remove the rear locking pins with only your hand. As the front locking pins are close to the fuel tank, you may want to use a pair of needle nose pliers to insert and remove.

Step 10

Now install the aileron servos.

Step 11

Attach a nine-inch servo extension cable to the servo. You do this by using the same system you used to install the elevator servo extension cables. To insert the aileron servo extension wires, use a music wire with a loop end and pull the extension through the servo lead hole in the wing root rib.

Step 12

Install the aileron servo.

Step 13

Attach the extended aileron servo arm, provided, to the round servo arm that came with your servo. Use small sheet metal screws, not provided. See Figure 66.



Figure 66

Use the two short titanium rods and ball links provided to make the connection between the extended aileron servo arm and the P/C board aileron control horn. Your final assembly should look like Figure 67.



Figure 67

Section 15-Battery Tray Installation

Required Tools and Adhesive

- Pencil/Marker
- Drill & drill bit #52
- 30-minute epoxy
- Double-sided tape
- Electrical tape
- Velcro
- Sandpaper (fine)

Align the battery tray to the engine mount. Take a pencil and mark. Then sand the area where the tray will be glued and then clean with alcohol. Drill 4 holes for the wooden screw provided with a distribution as it is shown in the picture. The most important are the two front screws. These two screws will be screw to the center of the firewall.

Once you drill the holes you are ready to apply 30 minutes epoxy. Apply the epoxy and precede to tight the screws while the epoxy is fresh so screws will hold the piece in place. Let it dry well. Then take the battery pack and wrapped with foam. I use electrical tape over the foam. Then use double side tape to put in between the battery pack and the tray this is to avoid the battery will be shifting under vibration (this is very important) then use Velcro to tight the battery down. Run the battery lead as it is shown in the picture.

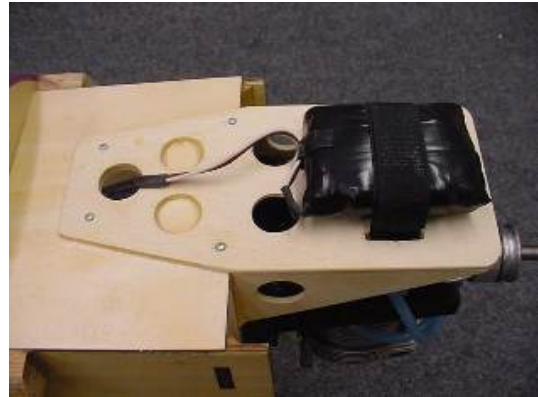


Figure 68

Note: This installation is required if you are using a glow engine weighing 32-34 oz, to help balance your model. For example a YS 1.40 weighs 33 oz or an OS 1.60 weighs 34 oz. Weights are without muffler.

If you are using a gas engine, your receiver battery can be installed next to receiver as is depicted in *Figure 69* because your ignition module and ignition up in front will help balancing your model.

Section 16-Radio Equipment

You are now in the final stages in completing the assembly of your Yak-54. Quique's method of mounting the radio receivers in his proto-type airplanes: Starting with the plywood mounting plate for the receiver, motor control servo and the radio switch:

1. Apply some beads of medium C/A.
2. Attach a piece of foam the size of the bottom of the receiver to the base.
3. Cover the bottom of the receiver completely with wide masking tape.
4. Apply more beads of medium C/A glue to the masking tape and place the receiver on the top of the foam.

This system has worked very well for him for many years. The receiver floats gently but is not fixed too firmly. If a receiver is fastened too tight in the airplane there could be problems with engine vibration transmitted to the receiver. See Figure 69 for an overall view of the fuel tank; throttle servo, receiver and switch.



Figure 69

Here are some better views (See Figure 70 & 71) of the switch mount inside and the push/pull rod outside the fuse. You may need to make your own music wire rod to connect the receiver switch to the outside of the fuse. You may also need to drill a hole in the switch button to accept the music wire. Perhaps your switch already has the parts necessary to make the connection outside the fuse.

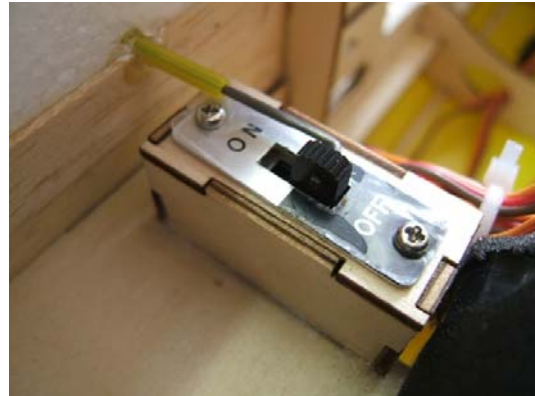


Figure 70



Figure 71

Custom Muffler

Central Hobbies has a custom muffler available for this Somenzini Yak-54 for the YS-140 Sport engine that Quique's uses in this airplane. You may contact them at their website, www.centralhobbies.com.

See Figure 72 & 73 for Quique's custom muffler installation. Between the muffler can and the plywood piece on the bottom of the engine box, you can see that he uses a piece of silicone tubing to separate the two and then he uses electrical tie wraps for attachment.

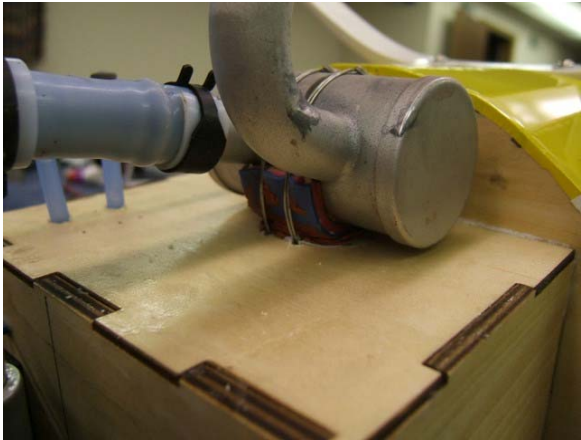


Figure 72



Figure 73

Balancing the Model

Perhaps one of the most important things that you need to check before you fly your plane is your model C.G. Correctly balancing an aerobatic model is critical to its performance and flight characteristics. An unbalanced model can be very hard to control. Please make sure that you carefully check the C.G of your plane before you attempt to fly it.

C.G Location

Measuring 174 mm from trailing edge forward to wingtip would give you best 3D and precision flying. However, the furthest you can go from trailing edge to wing tip is 184mm that means you would have a slightly nose heavy model and the aft limit from trailing edge to wing tip is 168mm. See Figure 74 & 75 for these three locations.

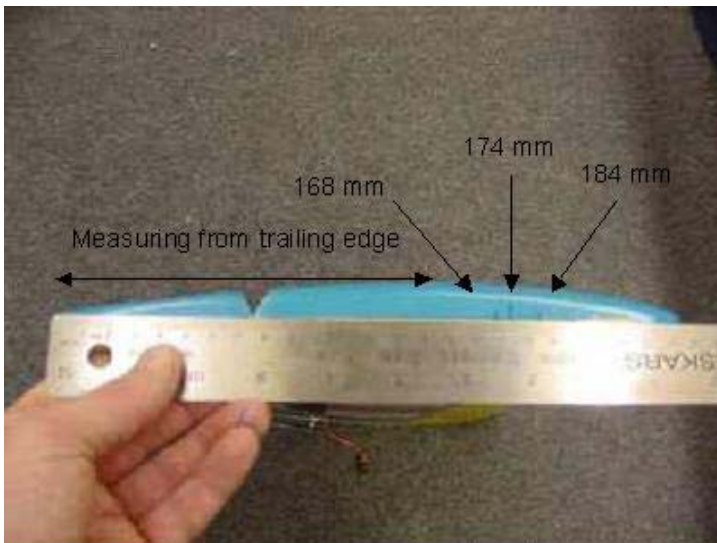


Figure 74

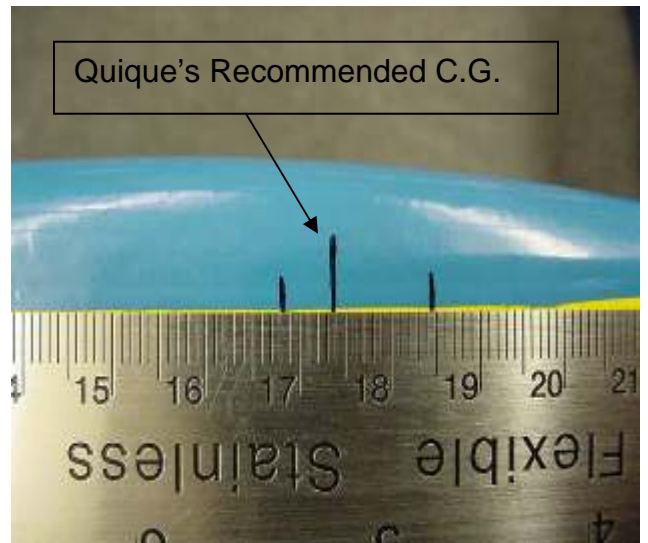


Figure 75

Control Throws

Aileron (As shown in Figure 76 & 77)

Low Rate

39 mm Up
39 mm Down

High Rate

59 mm Up
59 mm Down

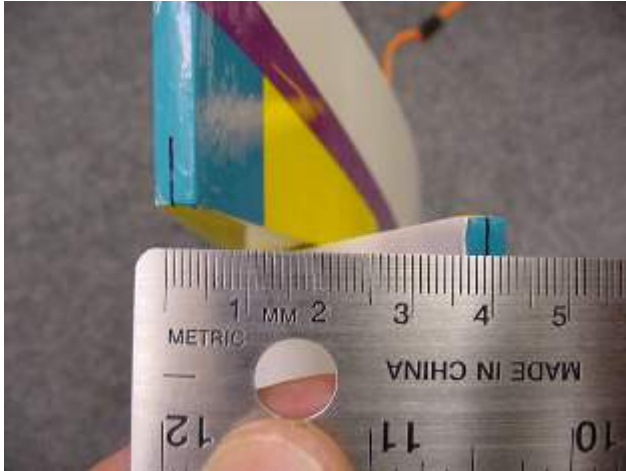


Figure 76



Figure 77

Elevator (As shown in Figure 78 & 79)

Low Rate

8 mm Up
8 mm Down

High Rate

61 mm Up
61 mm Down

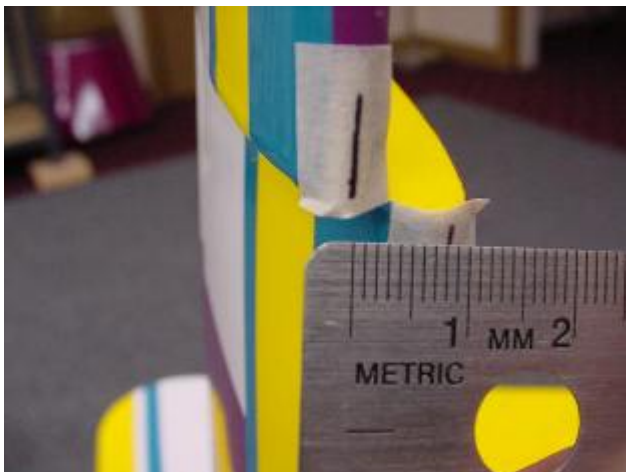


Figure 78

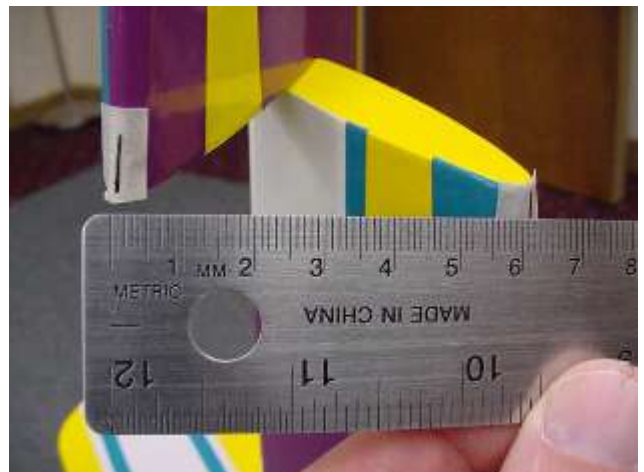


Figure 79

Rudder (As shown in Figure 80 & 81)

Low Rate

34 mm Right
34 mm Left

High Rate

70 mm Right
70 mm Left

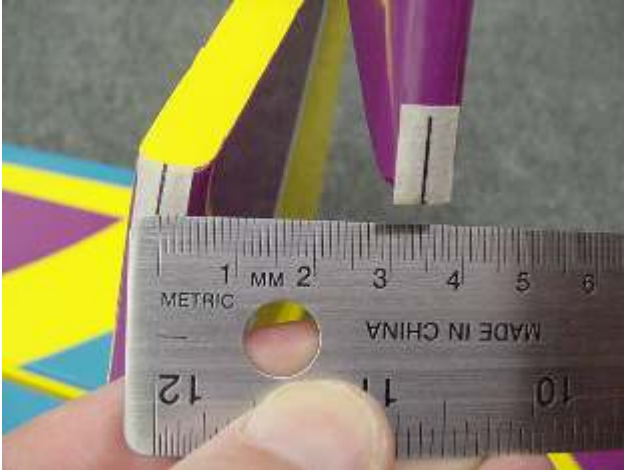


Figure 80

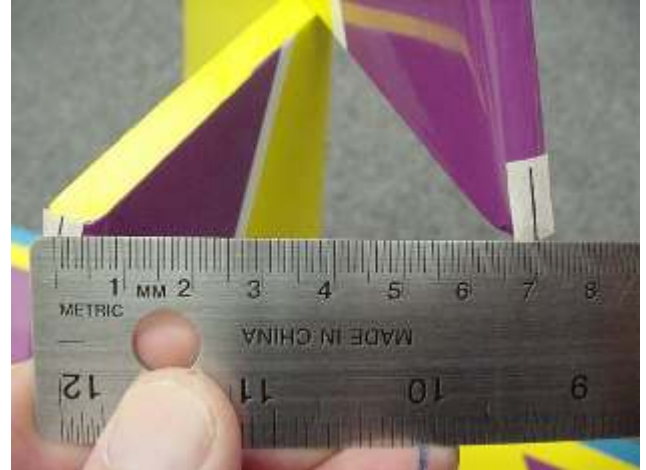


Figure 81

Preflight at the Field

Range Test Your Radio

Make sure you range check your radio before you attempt to fly your plane. Turn on your transmitter with antenna fully collapsed and walk away 100 ft. Move all your control surfaces and make sure everything is fine. If you are running a gas engine not only you need to range test your plane when it's not running but also when the engine is running. Make sure your model is secured and anchored. If you noticed any problems such as shorter range, servos jittering or PCM receiver locking out, you have problem. Do not fly your plane!

Ignition module on gas engines can cause RF interference with your receiver. Make sure your ignition module is at least 12" away from your receiver.

Check Your Batteries

Make sure your receiver, ignition and transmitter batteries are fully charged. Always double check before you fly.

Fasteners

Make sure all the bolts such as prop bolt, hatch and cowl are tight. After each flight check for possible loose bolts.