

Aviation Models

37.5% YAK 54 Assembly Manual



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Second edition rev. 5.12.28
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While this kit has been flight tested to exceed normal use, if the plane will be used for extremely high stress flying such as racing or extreme aerobatics the modeler is responsible for taking steps to reinforce the high stress points. If you do not feel confident to do this, seek advice from experienced modelers.

Read through this manual before starting construction. It contains important warnings and instructions concerning the assembly and use of this model.

Warning. This is not a toy. If not properly controlled it can cause injury or death and property damage.

Included Hardware: Aluminum spinner, fuel tank, aircraft grade aluminum wing-tube, aluminum main gear, rubber wheels, tail wheel bracket, aluminum servo arms, aluminum stab tube for removable stab, control horns, hinges, wheel pants, SAE bolts and nuts, much more.

Specifications:

Wingspan:	121in
Fuselage Length:	108.5 in
Wing Area:	2854 sq. in
Engine:	150cc
Flying Weight:	37.5 lbs

Thank you for buying a Aviation Models airplane. We are proud to produce one of the best designed, built and covered almost ready to fly (ARF) model airplanes available on today's market. If you have any questions about your new plane, assembly manual or hardware, feel free to call our Product Enquiry telephone number, or send an email to sales@toc1.com.

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37.5% Yak 54 Assembly Manual

Step 1. Open and inspect everything

This section should be fairly self explanatory.

In the large box you should have a fuselage with hatch., wing tube and dual stab tubes, the elevator/stab assemblies, the rudder, cowl, wheel pants, canopy, and a package with the landing gear, tail wheel bracket and miscellaneous nuts and bolts. Use some acetone on a rag to clean the glue off the tubes. Under all of this is a false floor, and under that you will find the wings with ailerons attached. The hinges are installed in the elevators and ailerons, **but they are not glued, you have to do that.** The hinges for the rudder are in the hardware pack. We have had good luck with Pro-bond Ultimate and Gorilla glue, both of which are glues that expand as they dry cure and fill the voids in the hinges and their sockets.

Check everything for shipping damage and/or manufacturing defects. **If there is a problem, report it to us NOW**, not after you start building the plane.

Read the quick start guide at the end of this manual first. It has helpful hints and any errata corrections that may be available.

Before proceeding to any assembly, now is a good time to go over the whole plane and fix any cosmetic flaws. Some cosmetic flaws are to be expected, this fact is reflected in the price.

Using This Manual

When you start a construction section, it is a good idea to first read that entire section before cutting or drilling or gluing. For example, if you are about to begin the section called “Mount the Hatch and Canopy”, then read that entire section before doing anything else. Toward the end of that section, there is an option to paint frame line on the inside of the canopy. If you’ve already glued it on, it will be impossible. Reading the entire section will give you a good feel of where you are headed and any options available.

Known issues and improvements

There are a few areas where, at this unassembled stage, you can improve the final results of your assembly project. There are many items that cannot be addressed on the assembly line due to cost and possibly because not every improvement would be welcomed by every builder. Here are a few items that have come up over time.

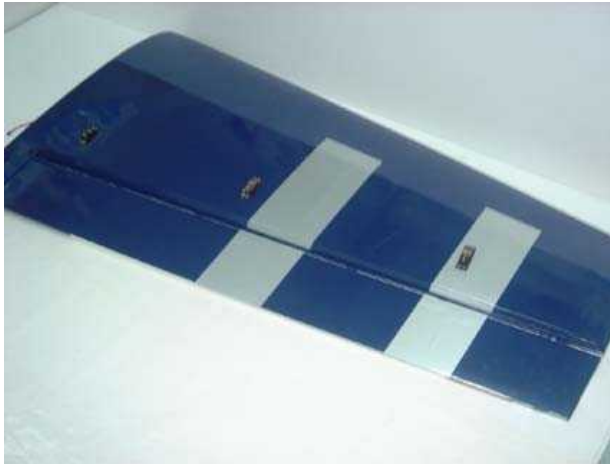
Go over the covering with a heat gun or iron. The covering tends to get loose over time and with changes in temperature and humidity. It may have come out of the box with wrinkles, I can assure you it did not go into the box that way.

Clean out the hinge holes. Without removing any wood, use a very sharp X-acto knife and remove any covering that may have been pushed into the hinge holes. It is very important that the glue sticks to the wood and not to the covering.

Lightweight landing gear and wing tube. In the 37.5% YAK we have tried to provide as much flexibility as possible with regard to engine choice. It is sometimes difficult to be all things to all people. In any case, we have provided very strong landing gear and wing tubes, which are suitable for any type of engine and flying but add some weight to the finished plane. Some pilots chose to order carbon fiber landing gear and/or wing tubes. This can save several ounces of weight.

Hardening holes. The fuselage sides on this plane are made of balsa which in certain areas is doubled by lite-ply. Using wood screws in balsa is difficult because balsa is very soft. It's a good idea whenever you drill a hole that must accept a wood screw to put a drop of thin CA into the hole and then if necessary re-drill the hole. The CA will wick into the wood and harden it, adding strength in that area.

Installing Servos in Wings and Hinging Ailerons



Locate the servo bay holes and cut the covering back. Use your covering iron and tack the covering around the edges.

Install the servo with four servo screws.



3. Locate the aluminum arm provided in your hardware package.



After installing your servo into the servo bays, apply power to the servo and make sure they are centered. Check that your trim and sub-trim in your Transmitter are centered. Install the aluminum servo arm so it is at 90-degree angle to the servo case.



Using a 2mm drill bit, drill four holes through the servo wheel. (You may also want to purchase some metal after-market servo wheels or arms for added strength. If after-market arms are used, they should be 1-1/2" long).



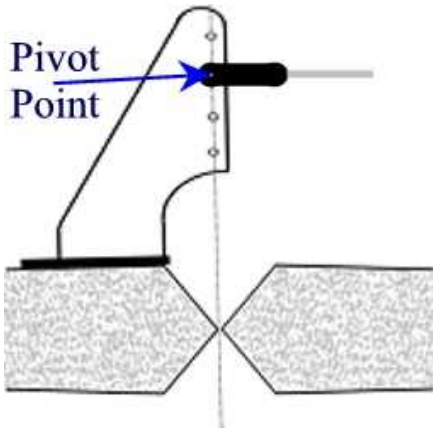
Once the four holes are drilled, install the metal arm to the wheel using four 2x10mm bolts.



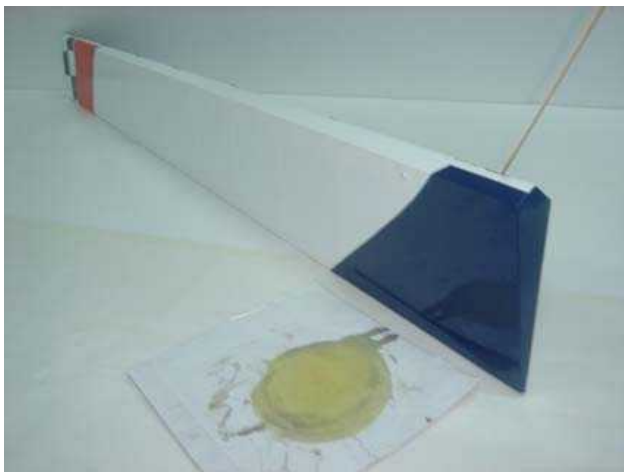
Use a clamp to help hold the control surface in a center position. Use something like a scrap piece of balsa or lite-ply to prevent the clap from damaging your finish.



With the servo and arm installed, you can now start to measure the length of your pushrods.



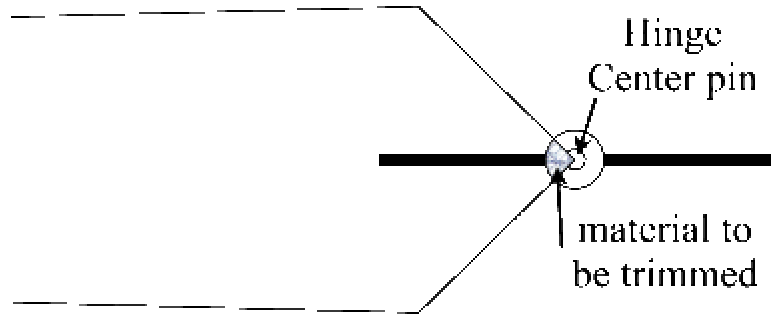
You can use whatever device you like for a control arm. You can drill through the moving surface and thread a bolt through, use a control horn, or a surface mount arm. But whatever you choose, try to keep the pivot point of the clevis over the hinge point.



Hinging is a very simple matter. We recommend that you hinge all the control surfaces in two steps allowing the glue to dry between steps.

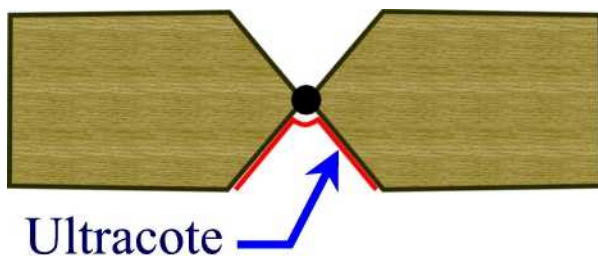
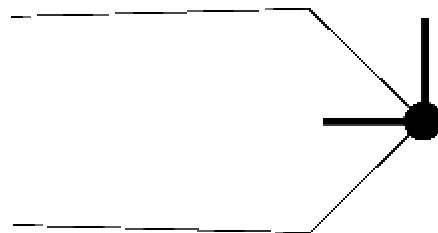
Before you start gluing anything, test fit each control surface - Aileron to wing, elevator to stabilizer, rudder to fin/fuse, with the hinges in place. Make sure the hinges go in the holes smoothly and that there is

ample room for the hinge “knuckle” so there is no large gap between surfaces. The hinge lines are beveled. The point of the bevel should be at the center of the hinge pin, this assures that the hinges are aligned and centered on the hinge line. (see below)



Once you are certain that they all go together smoothly, take one surface and remove the hinges. If you have a needle oiler, place 1 or 2 drops of oil into the hinge and work it back and forth. It's also a good idea to put some lite oil (like WD40) on a rag, and to wipe the edges of the hinging surfaces with this rag. The oily residue will keep spilled glue from sticking to the ultracote covering. Then wipe off any excess oil from the surface. Glue the hinges into the holes securely using the glue you prefer. I have had good success with Pro-bond polyurethane (not the pro-bond yellow furniture glue) because when drying it foams up slightly and fills the gaps between the hinge and the mounting hole. Pacer Hinge glue works great for the same reason.

Make sure the bent hinge is able to go perpendicular to the edge (see picture).



When the glue is dry, do the same thing with the mating surface, glue the hinge legs into the holes provided. Keep the surfaces as close together as possible to minimize gaps. When completed it's a good idea to seal the hinge gaps by ironing

a piece of Ultracote covering material into the groove between the surfaces.



Repeat this on both elevators and both ailerons. For the rudder you may wish to wait until later to do the final installation of the rudder, it makes it easier to handle the airplane.

To make the rudder removable, it is possible to remove the hinge pin from each hinge (grind off the recessed end and push the pivot out) and use one or two pieces of wire as the pivot on all the hinges. Use the largest wire that will fit through the hinge holes. Then to remove the rudder you just remove the wire, but be sure the wire can't fall out in flight.



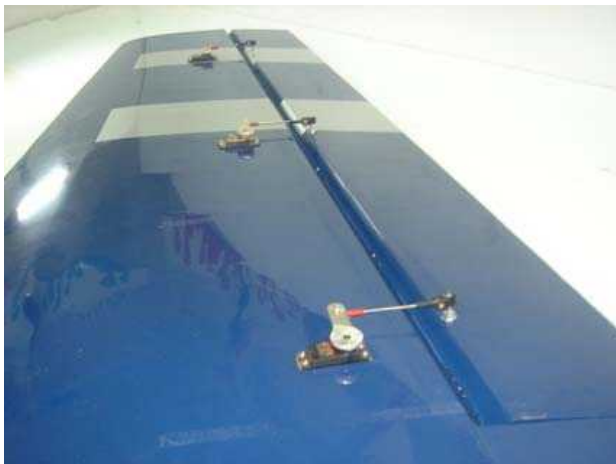
With control surface in center position and servo centered, measure the length of the pushrod and mark. Make sure you allow $\frac{1}{4}$ " of threads on each end to screw into the ball link and control horn.



You can now cut your pushrod to length and install.



Remove the servo arm from the servo and thread the ball link onto the pushrod.



Repeat this process for each of your servos – on each control surface.

Once you have all the servos mounted, it is a good idea to use a matchbox or other equalizing device, so that there is no binding in the servos. If such a device is not used, extreme care must be taken to mechanically match and adjust servo and linkage geometry to avoid binding, or servos fighting each other. If this step is overlooked or not performed with care, loss of control of model is very likely.

This goes for all control surfaces with multiple servos.

Installing the Landing Gear



Locate the landing gear provided with the plane.



Use the four 1/4x20 bolts provided to mount the gear to the gear plate. Back the bolt from the inside with the four lock nuts provided as well.



The bolts come through the canister tunnel. You will need a wrench to hold them in place while tightening the bolts.



Align the wheel pant and tape it into place. Then hold the wheel pant and drill the center hole through the landing gear.



Take a smaller drill bit and drill through the holes in the landing gear. Then place blind nuts on the inside of the wheel pant.



When the wheel pant is finished it should look like this.



Insert the axel through the wheel pant with the wheel inside the pant and tighten the nut on the inside of the wheel pant. Use the provided wheel collars to secure the wheel pant.



Use the provided bolts to secure the wheel pant into place. Tighten bolts into the previously inserted blind nuts for a secure fit.

Installing Servos in Horizontal Stabilizer



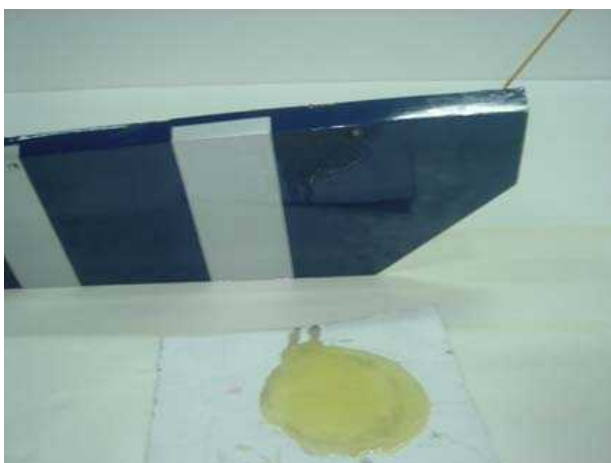
Mount the servo in the servo bay and install the arm onto the servo.

You can now start to measure the length of your pushrods.



Drilling holes for the control horns:

Follow the same procedure as for the ailerons to mount your Elevator control horns.



Hinging Elevators:

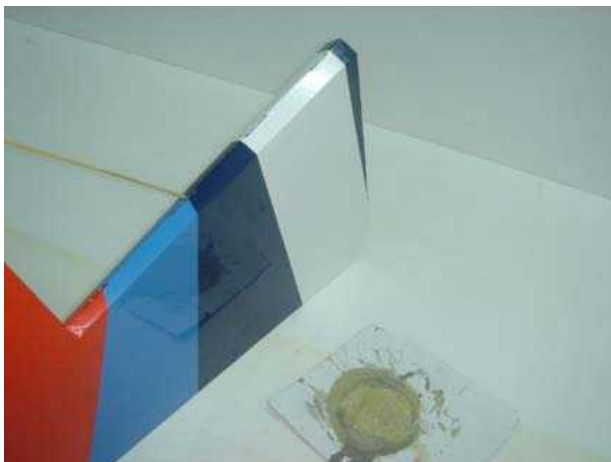
Follow the same procedure as for the Ailerons to hinge your Elevators.



After your control rod is properly installed into your control surface, connect the rod to both the ball link and the clevis. Make sure the arm is 90 degrees to the horn.

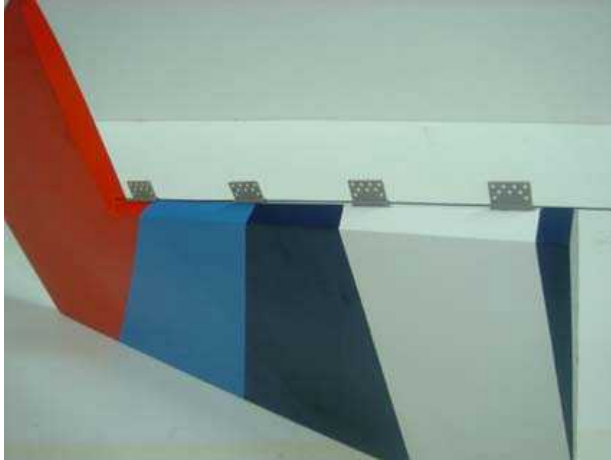


Stab servo, servo arm, and elevator control horn. The same steps apply to the elevator as with the ailerons. Make sure each servo is in center position with the control horn centered.



Hinging Rudder:

The rudder is removable, and hinges need to be glued to the rudder first, then to the vertical stab. Dry fit rudder to vertical stab. Mark on rudder and on stab where hinges are located. Remove rudder from stab, and remove hinges from rudder. Use preferred hinging glue and pour a line of glue over each pre-slotted hinging hole in the rudder, allowing the glue to penetrate deep into the groove.

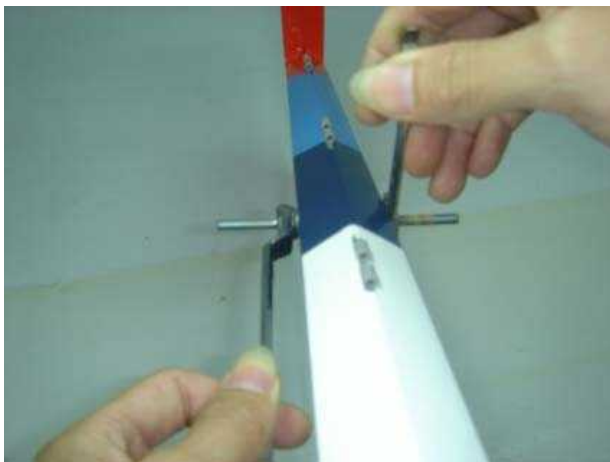


Place hinges into the groove and probe them in and out several times to ensure that the glue has thoroughly covered the hinge. Before glue dries, insert hinge rod through hole in top of rudder, and guide it through the hinges, attaching the non-glued hinge half, and lining the hinges up on a straight line. Repeat gluing process for the vertical stab. Then push the two surfaces together to complete the hinging.



Rudder control horn:

Drill through the hard point in the rudder and mount your control horn. Make sure that the control horn is low enough to clear your full down elevator travel.



Insert linkage onto control surface and make sure the linkage is evenly centered.



Tail Wheel Installation:
Install your preferred tail wheel to the hard wood at the rear section of the fuselage. Here is an example of our installation.



Here is another picture of the tail wheel installation.



Rudder Cable:
Take a straight edge and mark where the rudder cable will touch the fuse side. You are looking for a straight shot all the way up to your rudder servos. Make sure you have clearance between the cable and your elevator at full travel.



Mount your servos in the provided slots. Pre-drill the servo mounting screws and fasten servos.



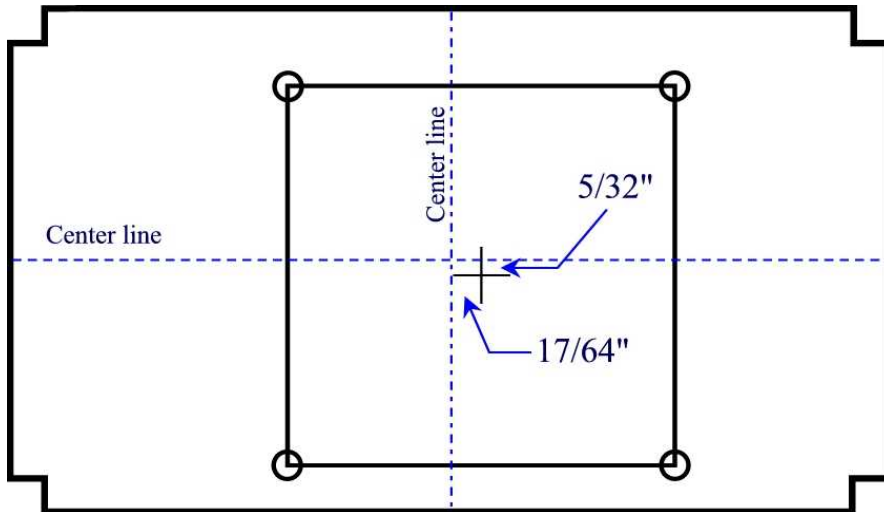
Rudder servo installation:

The torque of your servos and your flying style will be determining factors of how many servos you will need. If you decide to run more than two, simply extend the mount and run them inline, ganging them together. Make sure that the distance from each cable at the mounting point is the same distance as the rudder control horn. This will allow a slack free pull-pull system.



Mounting the Horizontal Stabilizers.

Insert the provided bolts into the fuse through the stab and secure the stabilizer in place.



The next step is to mark the center of the firewall. You will need to offset the engine to center the crank where it exits the cowl. Here is an example of what the firewall should look like when mounting a 3W

150 engine. The general measurements for mounting an engine, is that the engine should be offset $17/64$ " to the left and $5/32$ " down from the center of the firewall, when viewed from the rear of the plane. Because the engine is a very tight fit in the cowl, a good method of making sure the engine is centered in the cowl, is to after the firewall is secured, stand the fuse on its tail and secure it. Set engine with spark plug caps attached on firewall, then mount cowl. Now position engine so it clears both right and left side of cowl. Carefully remove cowl, and mark engine location on firewall.



Build motor Box and secure with the provided triangle bracing and wood screws. It has right thrust built in. Do not change the thrust angles.



Here is a picture of a 3w 150 mounted to the firewall.



Throttle servo mount:
Assemble the provided laser cut servo box and mount the servo to it. Position the servo mount on the motor box so that there is alignment for direct linkage to the carburetor. If using headers and cans, be sure that servo is a safe distance from either, and will not get damaged by heat. Epoxy it in place.



Tank Mounting:
Use Velcro straps or zip ties to secure your tank. Use foam underneath the tank so that vibration doesn't cause the fuel to foam up.



Cowl Installation:

Once the engine is mounted its time to start cutting out the cowl to clear the mufflers and also allow for cooling. Make sure you have plenty of room around the pipes so vibration will not cause any cracks in the cowl. You will need to cut out a generous amount from the cowl to provide cooling for your engine.



Wing attachment:

Slide the wings onto the tube and into the pockets in the fuselage. Now take the 1/4x20 nylon bolts provided and thread them into the wing root. Make sure you have two bolts per wing as well as making sure they are tight before each flight.

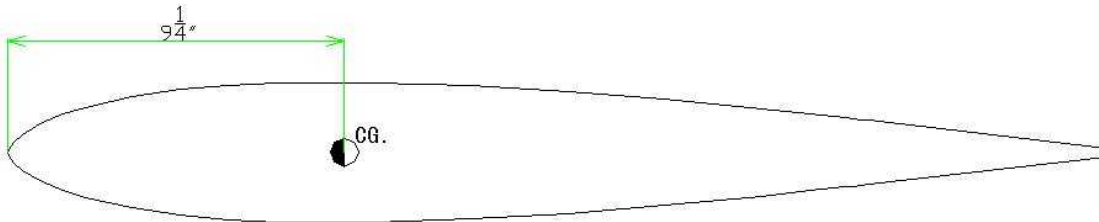


Canopy mounting:

Mount the canopy using your preferred glue and or screws. A tiny hole drilled into the pilot area in the back corner will prevent fogging and pressurization. Painting frame lines is optional. If you want to paint them on the inside of the canopy, do it before you glue it



Use the provided bolts to fasten the canopy to the plane. A small piece of silicone fuel tubing slid over the bolt will keep them from vibrating out.



Center of Gravity:

Assemble the entire plane as though you were about to fly. Set the balance point of your aircraft at 9.63" back from the leading edge of the wing. This point needs to be taken at the root of the wing where it meets the fuse. You may then adjust the CG further back or forward depending on your flying style. Be careful going to far back, the model can become unstable.

Control Throws

Here are some starting points for the control throws. **Do not use the 3d settings until you are thoroughly familiar with the plane on low rates. The 3D rates if pulled hard at moderately high speed will cause the plane to stall, tumble, and hunt for dirt.**

	High rate(3D)	Low rate
Ailerons	30+ deg	18 deg
Elevators	40+ deg.	18 deg.
Rudder	45 deg.	25 deg.

Fly the plane on low rates at first. The 3d rates are intended only for extreme aerobatics. If you are in doubt about your skills, ask a skilled aerobatic pilot to help you with a trainer cord.

Thanks for Purchasing our 37.5% Yak 54. We hope it provides you with many hours of enjoyment. Good luck!

Sammy