

Product Review

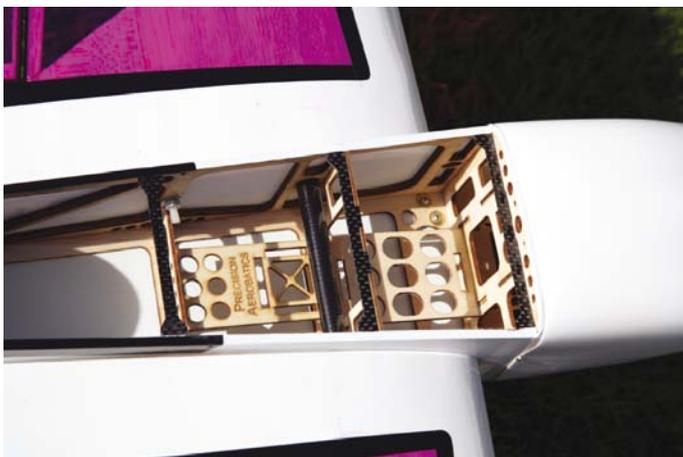
**Precision
Aerobatics
Katana Mini
electric ARF** by
James Armstrong.



The Katana Mini is one of Precision Aerobatics's newest offerings, available in 4 transparent colours -red, blue, purple and yellow. These colours look great with white and thin black trimming. The Katana Mini is a very complete, laser cut ARF (almost ready to fly). The special thing about the Katana mini is the use of carbon fibre throughout the structure and the quality hardware pack. The wing tube and sleeves in the fuse are carbon, carbon fibre stringers under the balsa sheeted turtle deck, carbon fibre reinforced fire-wall and bulkheads, carbon fibre landing gear, carbon fibre tube in the wing leading edge as well as carbon fibre control horns for the moving surfaces. Topping off the model, is the fiberglass cowl and wheel pants which come painted white.

SPECIFICATIONS

Wingspan: 1020mm (40.15 in) Length: 990mm (38.9 in) Wing area is 375.1 sq. in Recommended motor setup: 200-280w Recommended battery: 3s 2000mah radio: sub micro servo's and receiver The setup being used is a PA 4200kv motor, PA 11.1V 2000mAh LiPo, Blue Bird BMS-306BB servos, PA 25A ESC, Jeti Rx 5ch, 11x5.5E APC prop through a 5.33:1 gearbox. Power output: 21A-220w



C.N.C. cut parts and plenty of carbon fibre throughout.

The Katana Mini was well packaged and all pieces came covered in plastic and taped down so nothing moved. The control surfaces were temporarily taped to their correct surfaces and after carefully removing the plastic bags and all taped down items, I had the model laid out on the floor for an inspection. I noticed that the black trimming, in some places, had lifted. This was easily fixed with a warm modeling iron. Apart from a few loose corners, the covering looked perfect with no wrinkles and no warped surfaces. This is possible on an ARF so always have a look before you start building.

I searched the joints to see if the glue, Cyanoacrylate, used by the manufacturer had bridged and made a good bond. The most critical area was the front half of the fuselage, and I did wick some more medium cyano around the firewall, the carbon fuselage supports and also around the hatch area. It was a very stiff structure, and the extra cyano around the joints was just for a little extra security. Make sure to wear eye protection and a dust mask when working with carbon fibre or fibre glass.

The ARF was very complete. In a little bag were some foam wheels with plastic hubs, lots of nuts bolts and screws, nylon wing bolts, carbon fibre CNC machined control horns, carbon fibre push rods

which already had a wire Z-bend glued and secured with heat shrink on one end and some more assorted bits including small pieces of ply (get to those later) and some CA hinges.

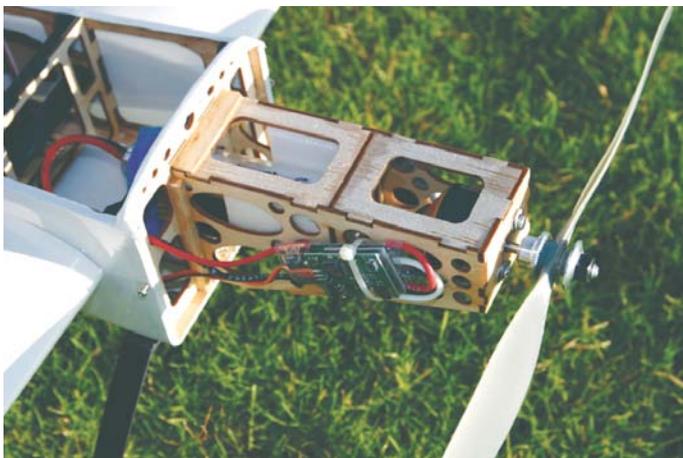
THE BUILD

The landing gear was installed first so that I could work on the fuselage without it rocking or tipping over. The landing gear, as mentioned before, was carbon fibre with no holes drilled so I drilled three holes as per the manual: one in the centre for the axle and two in the outer for the wheel pant bolts. The tail skid is pre-bent wire and is glued to the aft end of the fuselage using five minute epoxy. I used a hobby knife to cut the slot for the tail skid.

The servos are now fitted for the ailerons, elevator and rudder. As an upgrade from Precision Aerobatics, you can buy carbon fibre long servo arms to get the maximum throw for the surfaces. They are CNC machined cut and pre-drilled, and are screwed on top of the original servo arm using the supplied screws. The carbon fibre servo arms need to be installed on your servos before you put them in the wing.

You would need four sub micro servos for this model –one on each wing panel, one for the elevator and one for the rudder. The aileron servo mounts need to have the covering removed from above them. I used a soldering iron to melt away the covering. Inside the wing is a piece of string that you tie to the servo connector to pull the wing through (nice touch). In each wing panel is a little laser cut servo housing, pre-installed and made to fit a sub micro servo. The screws are supplied and a tip for a secure servo mount, after you have tapped a thread in the wood, remove the screws and wet the hole with cyano to harden it.

The elevator and rudder servos are positioned in mounts at the aft end of the fuselage and are secured exactly the same as the aileron servos. The review model used the Precision Aerobatics extension leads



Programmed for no brake, soft cut off, low timing advances and nine volt cut off. both the ESC and 2000 mAh 3S LiPo handle 220 watts from an 11x5 propeller with four servos. The fire-wall offers a choice of stick mount or a conventional motor box.

which can be purchased separately. They have to be soldered to the existing servo leads and you will then need to install the connector to the end of each lead. These leads are of very high quality, are made in Germany and are extremely flexible and light weight. Two little pieces of balsa are glued to the bottom fuselage structure to secure the servo extensions. There are multiple places to secure the servos as well, depending on their depth and your preference. This is possible as long as the push rod can run in a straight line in relation to the control arm on the surface. The reason for this is that you need to get as close to zero differential in the control throws as possible.

With both servos installed the wing is now ready for the wing bolt and alignment pins. Once again I used the soldering iron to remove the covering around the wing tube sleeve, alignment pins, wing bolts and where the servo extensions run from the wing into the fuselage.

I test fitted the wing tube into the fuselage sleeve, then slide the wing panels onto it to see how the fit was. Sometimes you might find that the tube is only slightly thicker than the sleeve and won't slide on smoothly. If it is a little too large, lightly sand the wing tube until it slides on nicely. If it doesn't fit first try, do not force it as it may damage the model. Remove the wing tube and continue to sand it. Included in the accessory bag are some 3mm thick carbon rod pieces. These are the wing alignment pins. They are glued into the aft end of the wing in the pre cut holes with cyano. The wing is held to the fuselage by one Teflon bolt on each side. I cut them to size with a hack saw and glued them in place on each wing panel. They hold very securely when properly glued with cyano.

The elevator is a single piece straight out of the box and there is no need for any elevator joiners. I melt away the area at the aft end of the fuselage where the horizontal and vertical stabilizers will be glued. I slide

the horizontal stabilizer into its slot in the fuselage and centre it by measuring from the trailing edge wing tips. With an equal distance each side the horizontal stabilizer is perfectly aligned with the wing. Once it is in place and aligned perfectly, I cut away the covering, slide it back in, and glue it in place. The vertical stabilizer is secured to the fuselage using the same method. With a sharp hobby knife, I cut slots in the elevator and rudder for the CA hinges as per the instructions.

Now that the hinges are installed in the stationary parts of the surfaces, I secured the rudder and elevator onto those hinges. I set the elevator up against the horizontal stabilizer and mark the spots for the cuts. I cut the slots with a knife and fit the hinges in. Before gluing the hinges though I deflected the surface to the desired amount of travel. I hold the gap and wick plenty of cyano on the hinge.

The rudder is constructed using the same method as the elevator. The ailerons also use the same method as the tail feathers. The only difference is that the hinge slots are already laser cut. All that was necessary was positioning the hinges and securing them with cyano.

When all surfaces were hinged, I use the supplied roll of covering to seal the undersides of the hinges. I deflected the control surface to "full throw" and iron the covering strips on.

The hatch is secured to the fuselage by two screws. On opposite sides of the fuselage are two laser drilled, pin sized holes. These are for the hatch screws. I test fitted the hatch before I drilled the holes for the screws, just to make sure it fitted nicely, and it did. The canopy is trimmed roughly with scissors on the mold lines. I placed the canopy on the hatch while it's on the fuselage then marked where I needed to trim so that it will fit perfectly.

When I had it fitting nicely, I used the supplied black tape to hide the canopy edge. When mounting your choice of mo-

tor, you have two options. You can either mount it to the fire wall on the motor box or mount it with a 10mm x10mm stick which is installed by cutting the motor cage short at the lines marked and then gluing the stick into place. The motor cage is all laser cut and is very easy to build. I glued it together as per instructions with cyano and epoxy.

The power system I used was based on a stick mount gear box which made the motor installation fairly easy. I cut the box in half on the marks and glued the stick in place. I then linked the ESC to the motor using 3.5mm bullet style connectors and ran the leads into fuselage. To secure the ESC I used two zip ties to hold it tight against the motor box.

For mounting to the firewall of the cage, I had to transfer the motor's bolt pattern to the wood and then drill and bolt the motor to the wall. I mounted the tiny Jeti 5ch RX behind the wing tube sleeve and hooked all the servo leads to their correct channels, reversing the servos where necessary and securing the receiver using double sided tape.

The carbon fibre control horns are extremely stiff. They are glued using cyano into the pre-cut slots in the surfaces. The carbon control rods have one end completed already. I found the correct position for the wire Z-bends and glued them to the rod with cyano. Once that dried I used the supplied heat shrink to secure and pretty it up. The cowl is secured using four small screws, two on each side and I taped it at its correct position then marked and drilled the holes. I next used my rotary tool to cut the necessary cooling cut outs.

The wheel pants are bolted to the landing gear using two supplied bolts and nuts. They are easily bolted to the holes in the landing gear legs.

I shifted the PA 3s 2000mAh pack around the battery bay until the centre of gravity was in the 75-80mm recommended range.



If you are into carbon fibre and want more try a set of carbon fibre servo arms. They provide increased throw and strength and PA also do as set of carbon wheel pants.

CONCLUSION OF BUILD

The build was very easy, apart from a few time consuming tasks like securing the landing gear successfully and cutting the fibre glass parts out. It was completed in only a few evenings. The instruction manual was detailed, full of photos and easy to follow. The accessory pack was of high quality and included everything needed to complete the model, apart from tools and glue. The plug in wings reduced construction time, with only a few pieces required to attach them to the fuselage. They also make transporting and storing the Katana Mini a lot easier.

Radio setup high rates low rates

Ailerons: 35 degrees	15 degrees
Rudder: 40 degrees	20-30 degrees
Elevator: 40 degrees	15-20 degrees

I used 50% exponential on all surfaces for high rates, and 30% on low rates.

FLYING

I taxied the Katana out to the run way, lined it into the slight wind that was blowing down the strip and then slowly increased the throttle to 3/4. It rolled down the run way and took off no problems at all. At 3/4 throttle it was climbing away nicely. With three clicks of right aileron trim and eight of down elevator the model flew very smooth and as if on rails. With the throttle cut, the Katana Mini glided well for a plane of its type. This made approaches for landings easier.

Be careful when playing with the rudder in the air. Too much rudder in certain attitudes of flight can result in a fairly violent stall. In level flight and no power, the stall is soft. Just be ready on the sticks to counter act as you can be taken by surprise sometimes.

After ten minutes of cruising around doing a mix of basic aerobatics, I brought the Katana in to land. Juggling the throttle to maintain a steady angle for approach, it touched down on the mains for a nice smooth landing. Make sure you get the



I use thirty percent expo on low rates and fifty percent on high rate.

landing reasonably smooth. Come in too hard and the landing gear may flex, bottom out and result in damage.

SMOOTH AEROBATICS

With the CG moved forward another eight mm by re-arranging the battery position, and with a freshly charged pack, the Katana really grooved through the air. I imagine this plane would be great for practising sequences. I was able to perform a large variety of pattern type maneuvers in the 3/4 to full throttle range. With the strong vertical performance available from the power system, snap rolls on the up lines and huge loops were very nice to watch and perform. Slow rolls across the length of the field, as well as knife edge passes were all part of the Katana capabilities. Knife edge required full rudder and a decent amount of power to perform. It wasn't hands off and did require some coupling of ailerons and elevator, though not a major amount was needed. Inverted required a small amount of down elevator for level flight. The roll rate is very quick. Snap rolls from inverted and upright were a blur. Be sure to adjust the exponential in your radio to suit you as you might be caught off guard by the responsiveness of the surfaces.

FREESTYLE/3D AEROBATICS

This is where the Katana mini excels. Fast, violent aerobatics, down low on the deck where every one can see. The most talked about 3D maneuver is the hover and torque roll. The Katana mini has no problems with holding a hover. At a few clicks over half throttle it will hold its weight. The hover is performed by coming in at a high angle off attack, raising the power and easing into a vertical stance. Be quick on the controls though. If it falls too much to one side you will have to back out and fly away.

Rolling circles and rolling harriers took some skill to perform. Rudder and elevator need to be used simultaneously with ailerons to hold them. When performed properly, the rolling circle looks great and really impresses spectators. The Katana mini loves hard flying. It has a really strong airframe, and is constructed extremely well. Violent maneuvers such as knife edge snaps, tumbles, blenders, knife edge spins and the spectacular lomcevak are easily achievable and the Katana copes well with the related stresses.

There is a variety of renditions for the lomcevak. The one I prefer involves flying level at a good speed, pointing the nose 45 degrees high and then tumbling end over end with power on. The resonance of the airframe sounds spectacular. It is quite exhilarating for pilot and spectators. Flying at a high angle of attack induces a small amount of wing rock, that is if, not entered properly. This is more evident in the Upright Harrier than in the inverted. The inverted has very little wing rock if any at all. Inverted harriers and elevators are one of the Katana's strengths.

Little to no wing rock meant that I was able to steer the plane around, just off the ground with confidence. Any maneuver I could devise, the Katana was able to perform with relative ease. With the Katana Mini using Dual aileron servo's, the ability to program is there if you are using a com-



After ten minutes of this the battery took 1100mAh, that's only just over half the capacity. The battery only gets warm after ten minutes of extreme aerobatics.



Hovering at just over half throttle so no matter the attitude there is plenty of power to pull it out of trouble.

puter radio. I opted not to use any mixes, and kept it simple.

The motor and battery combination at full throttle put out over 220w of power. On a model of this size and weight this is plenty of power. Enough power to pull through any maneuver, and also the security of knowing that you had adequate thrust to get out of trouble if needed.

I could fly the Katana Mini into any attitude of flight, and know the whole time that I was able to power out. The review was supposed to include PA's latest creation- a fully adjustable carbon fibre gear box. Unfortunately the test boxes weren't completed in time for the review. I had to use the run of the mill plastic housing gear box that is readily available.

With the power levels needed to bring this plane alive, I'd suggest staying clear of the cheap variety. The carbon fibre gear box has adjustable gear mesh and looks very impressive. The electronic speed

control used for the review is a new stick programmable 25A capable model. I programmed it for no brake, soft cut off, low timing advance and a 9V cut off, all of which was completed easily after a thorough reading of the instructions. The ESC worked very well, the BEC (Battery Eliminator Circuitry) handled 220W and 4 hard working servos with no problems at all.

The PA 2000mAh 3s pack can handle 20amps easily, and after a 10 minute flight, I was only putting 1100mAh back into the pack. That's just over half the capacity, which means flights into the high teens can be achieved easily. After a hard 10 minute flight of extreme aerobatics, the battery came out warm. Not nearly hot enough to damage the cells.

The choice of prop, an 11x5.5E APC, worked very well in all aspects of flight. I found it to be very efficient across the whole throttle range and in many different flight modes. I was able to cruise with

throttle below half, and scream across the strip with full. The design of this prop puts less load on the motor than the slow flight range props do, so fast throttling was very handy in those "down low on the deck maneuvers".

CONCLUSION

The Katana Mini, with its nice lines, great looks, and excellent flying abilities, is one model you will always want to have flight ready in your fleet. It is an easy build and the end result is very pleasing. The price is surprisingly low when considering the kit's quality and the abundance of CF components –just great value.

With power to perform the wildest maneuvers, it is definitely a plane for those who want to demonstrate their talent, but it would make a flyer of any level look good. The plug-in wings make transporting or storing the Katana mini easy. It can easily fit in the back seat of the car.

The fun thing about it is that you can fly the Katana Mini at almost any park or the nearest cricket pitch and virtually able to fly daily without the hassle of travelling to the flying field. Positives are plug in wings, excellent covering job and extended use of carbon fibre and high quality materials.

It has great flying characteristics and the only negatives I found were that little amount of wing rock in upright harrier and the landing gear is a little springy for my liking. There is a video of myself flying the Katana Mini on the Precision Aerobatics website.

The Katana Mini and its related items is sold directly to retail customers and distributed to hobby shops by Precision Aerobatics. 731 New Canterbury Rd. Hurlstone Park 2193 NSW Tel: 02-9558 0443 Fax: 02-9558 0453 www.precisionaerobatics.com.au