Review
KATANA

Specifications

Wingspan:	1020mm (40.15 in)
Length:	990mm (38.9 in)
Wing Area:	375.1 sq. in
Recommended Motor:	200-280w
Recommended Battery:	3s 2000mAh
Recommended Radio:	Sub micro servo's & receiver

Setup Used

Motor:	PA 4200kv Blue shark brushless
Battery:	PA 11.1V 2200mAh LiPo
Servos:	6.6g Blue Bird BMS-306BB
Speed Control:	PA 25A Brushless ESC
Receiver:	Jeti Rx 5ch
Prop:	12x3.8E APC
Gearbox:	PA Carbon Fiber 5.3:1
Power Output:	21A-220w

The first time I saw this plane I knew I wanted one. There is something about it that makes it appear delicate and sweet, but with the ability to become aggressive and agile.

After watching some of the videos on the Precision Aerobatics web site, I was then hooked. The full size Katana is an unlimited aerobatic aircraft that has many very successful models fashioned after it, and this one continues its legacy.

The Katana Mini from Precision Aerobatics is an electric powered 40" 3D plane with plug in wings and a bare air frame weight of only 370g. The all up flying weight is highly variable depending on your power train and battery pack but with those specs and 375.1sq inches, you are promised to end up with a highly agile and capable model. With the recommended package from PA, the review model weighed in at 570g and with the 2200mAh LiPo battery 730g ready to fly.

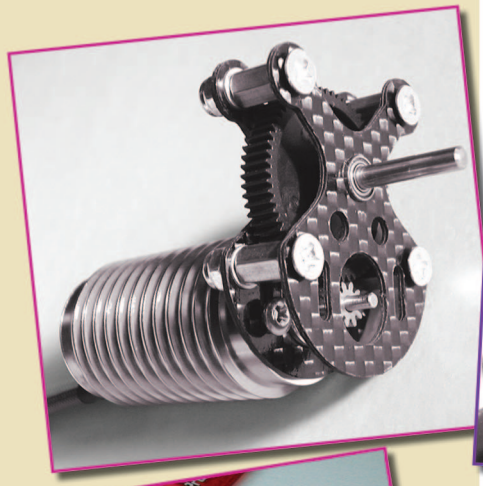
The Box

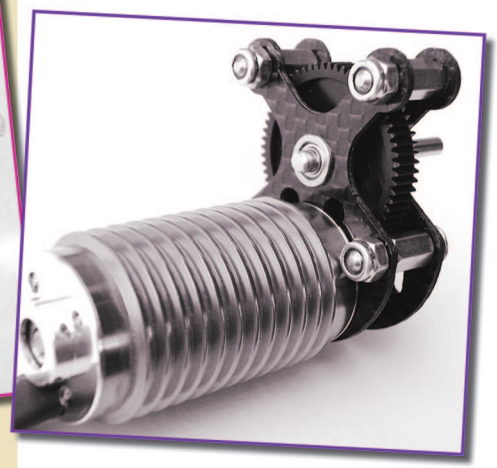
Nothing beats the excitement of opening the box on a high quality, well presented ARF. This was no exception. All components were individually packed in plastic and in perfect shape including the covering. Care had to be taken removing each component as they were taped individually to the inside of the box. This helps to prevent shipping damage, but does require a bit of extra care to take them out. The first thing I found remarkable was the extreme lightness of each piece. Wing panels are the lightest I have ever seen, and through the transparent covering seem to be well built. The laser cutting and fit up of each joint was flawless and the wing panels were dead straight and surprisingly stiff when subjected twisting forces. The fuselage was similar, and equally well built. Stabilizers and control surfaces were also in perfect condition with no warping or distortion present.

My first love for some time has been giant scale aerobatic, and the type of engineering displayed in this model is very similar to what you see in much larger planes. This should not be surprising as the Australian based company (Precision Aerobatics) who designed and build the Katana are leaders in giant scale aerobatics.

Mini ARF

by Jason Pickering





This is evidenced by the type of materials used and the amount of carbon fiber throughout the airframe. The wings have carbon fiber leading edges, carbon wing sleeve and wing tube and carbon anti rotation pins. The fuselage has carbon cross members, carbon longerons through the turtle deck, carbon undercarriage legs and even carbon wheel axles. The hardware also includes carbon fiber control horns. As optional extras, PA offer carbon fiber wheel pants and CNC machined carbon fiber servo arm extensions. I didn't personally go for the carbon wheel pants as the ones supplied are very light anyway, but they would be a nice touch. The carbon servo extensions though are good value for money and definitely worth getting.

The Package

There are many advantages to buying directly from the designer and manufacturer of any product. In this case the biggest advantage had to be the availability and easy fit of all the auxiliary equipment. The servos, motor, battery pack etc. were all from PA and they are not only matched by performance but also fit perfectly as the plane is designed with these specific items in mind.

I also like the idea that if a part is damaged I can easily get my hands on a replacement one. PA offers each and every component separately (cowling, canopy or even half wing).

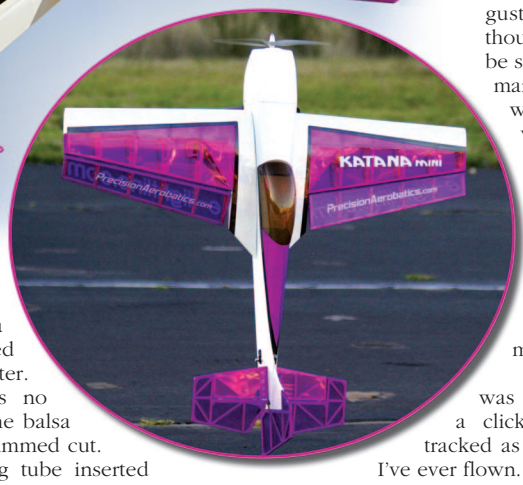
Building the Katana

The instructions are well written with clear photos and good methodology. They start with the assembly of the CF landing gear. This is without doubt the most delicate and tricky part of the build and as such it is a good job to get out of the way early on. I followed the steps as shown with the exception of connecting them to the fuselage. This is because I found the fuse sits well on its flat underside and provided it is on a relatively soft surface, won't suffer damage. My other departure from the order of tasks was to cut the vent holes in the cowl ready for installation. The reason for this was purely the fact that my dremel tool lives in a box and if I pull it out for one job, I like to do them all.

Next comes the aileron servo installation and set up. The servos used are BMS-306BB from the Blue Bird range. At just 5grams, they are the lightest around for their torque output. On this model I used a soldering iron to 'cut' out the penetrations for servos and tail surfaces in the covering. It is the first time I have used this method and was pleased with the results. The sub micro servos fit neatly into balsa boxes mounted onto the side of the rib. While they are certainly strong enough for the job, care must be taken not to apply excessive force while screwing the servo or servo arms in place. Before mounting permanently, the servo wires need to be extended. PA recommends using their light weight servo extension wire and solder them directly in line to save the weight of extra plugs. While it is a little fiddly to do it certainly does bear good results and is worth the effort.

The ailerons go on next, and again the instructions offered a slightly different method than is generally used. Each CA hinge was inserted halfway into the wing and glued before the aileron was fitted. Then after sliding the aileron on, a couple of extra drops of CA were added to secure it. This method seemed to work as well as any other with the benefit of not leaving a pin hole through the working part of the hinge. I have in the past had hinge failures on bigger models which I believe was largely due to the pin hole (used to centre the hinge) harbouring excessive CA glue, causing that part of the hinge to become brittle (of course added to the equation were the hundreds of flights, high deflection rates etc, etc). The carbon fibre machined control horns slip into the pre slotted holes and are glued in with cyanoacrylate, then the CF push rods are assembled and set to length. This is a simple system that takes only a few minutes, but it is necessary to centre the servos first by plugging them in. The last job remaining on the wings is the hinge gap seal, which again only took a few minutes but makes a huge difference to the performance of the wing.

The fuselage was next to tackle. I first took a look at all the glue joints through the opened hatch and decided to wick in some more CA. This only takes a few minutes, adds virtually no weight and while this may prove to be unnecessary, it gives good peace of mind when pulling those high G manoeuvres. The soldering iron was used again to expose stabilizer slots and wing tubes, and the tail servos were readied for installation. With that done, the tail feathers were prepared for gluing into place. Rather than use a scalpel to cut away the cov-



ering on the fin and stabilizer, I used a hot wire made from a paper clip and heated with a cigarette lighter. This method ensures no damage is made to the balsa and leaves a nicely trimmed cut. I then used the wing tube inserted through the fuselage to line the stabilizer up with for both directions and glued with PVA. The fin was glued on at the same time and left over night. Once set the elevator was attached using the same method as the ailerons along with the control horn. The last control surface to attach was the rudder.

The undercarriage was then attached along with the tail skid. After this part of the set up was complete the motor cage was assembled and the motor and ESC were installed. The motor is the "Blue Shark" also available directly from Precision Aerobatics. It is an in-runner weighing 65g designed for 200-250watts and when used on the supplied gear box puts out some efficient power. Its case incorporates a built in heat sink that wraps around the perimeter and full length of the motor. The gear box comprises the carbon front and back plates with the main gear between them. The motor mounts neatly on the back plate and the entire apparatus is mounted off the front plate directly to the motor cage. This provides good crash isolation for the motor as well as being straightforward to install. Being of carbon fibre, it is not only extremely light, but also very rigid which is important as any flex under load would affect the mesh. Assembly of the cage is very easy with all parts marked clearly and the fit up of the joints being very precise. The last job remaining was to mount the cowl and propeller. The Jeti mini 5 channel Rx was connected using channel 5 for the right aileron. This afforded the ability to mix flaps and spoilers at a later date. My initial set up was as follows and with a slightly aft CG.

Radio Set-Up

	High rates	Low rates
Ailerons:	35 degrees	15 degrees
Rudder:	40 degrees	20 degrees
Elevator:	40 degrees	15 degrees

I used 60% exponential on all surfaces for high rates, and 20% on low rates.

The Test Flight

As is often the case, the day of the test flight brought less than perfect conditions. It had been blowing hard all day so I waited till last light went the thermals dropped off and it had all settled a bit. There were still the odd gusts present, so I thought the flight might be somewhat limited. The mandatory range check was performed and with all systems go, the Katana was placed on the flight line. Pointed directly into the headwind, the power was added slowly and she was off the ground in less than 2 meters.

The only trim added was a touch of down and a click of right, and she tracked as straight as any plane I've ever flown. Despite windy conditions, she handled extremely well, showing good handling throughout. On maiden flights, I always do a trim first, usually in the space of a circuit, and then land to conduct a quick visual to make sure nothing is about to drop off. This has saved more than one plane in the past.

I lined the Katana up on final and adjusted the throttle to obtain a gentle descent. No trim change was needed to achieve this and the final approach looked good. I was very surprised at how easily this thing tracked, even on a windy day. The Katana continued its decent with my only input being to keep the wings level and it virtually landed itself.

A lot is learned about the behaviour of a plane in just one circuit, and so far this one was a delight. With the quick inspection out of the way, I was off for another couple of short flights. I actually found the first landing so easy I had to do it again several times to make sure it wasn't a fluke. I can truly say the Katana is one of the easiest planes to land that I have ever had, especially for something so small. But this plane isn't designed for just touch and goes so it was time to try some aerobatics.

This aircraft excelled at pattern aerobatics. Its directional stability made straight loops, slow rolls, hammerheads and snap rolls very easy and very clean. The large control surfaces gave plenty of response throughout the entire flight speed envelope. Slow flight was amazing and conversions into harriers were easy, with solid post stall characteristics.

Knife edges were held at half throttle, although a small amount of pitch and roll coupling will need to be mixed out.

The second flight was on a much better day with no wind and in the afterglow of a warm day. This is the best time to fly this sized model, and as conditions were perfect is was time to give it a work out. I'd made some changes to the CG in both axis, and this seemed to work very well. The battery pack was placed on a small foam block, so it could slip over the wing tube and move aft as desired. With this set up, the CG was 96mm from the leading edge in the forward/aft axis and centre of wing in the up/down axis. This made 3D manoeuvres much easier to perform with hovers and torque rolls being easier to enter and hold. In fact the torque rolls if entered properly took only a small amount of right rudder to maintain and virtually no other input was required. Again, even with the CG change it was ridiculously easy to land, and I actually enjoyed doing a few circuits and touch and goes. The rest of the flight was spent cruising up and down the runway exploring the slow flight capabilities which were some of the best I have experienced, giving good authority at all speeds. You could really be comfortable flying this in a park or small paddock as many do.

For those who have never flown electric, one delight is the lack of engine management needed, and reliability and precision of motor response. In many cases this can be a subtle difference but it indeed is noticeable. For that reason a plane like this can be very good for improving your aerobatic skills, particularly 3D, especially if you're not a simulator junky. In my case the Katana is far more capable than the pilot, so there is much I can learn through flying this plane.

Conclusion

Over the years I have had many ARFs go through my stable. Every once and a while though, one will come through that you just can't help but reaching for every time you go out for a fly. I can tell this is going to be one of those planes. The finish of the kit is very good with high quality hardware putting it in a class of its own for a plane this size. Its hassle free power plant and manageable size make it a perfect choice for that evening fly down at the park, and its flight characteristics and capabilities would suit a wide range of skill levels. I would highly recommend this package to anyone as a good small field practice plane, or even as a primary weekend flier. To see this plane in action, you can view numerous videos on at www.PrecisionAerobtics.com (recommended download is the latest by Kyle from e-flightline).

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PA Katana Mini and its related items are sold directly to public, and distributed to hobby shops, by **Precision Aerobatics**, Hurlstone Park NSW.