Vario's EC135

Inspired by a new County Air Ambulance!

words: Richard Morris, photos: Richard Morris and Jon Tanner

The machine that inspired the model.

For the uninitiated, 'Vario' have been around in the model helicopter world for more than two decades. They have staked their reputation on being able to produce high quality scale fuselages and mechanics sets, along with multi blade rotor head systems. Although primarily supplying models for the scale market they also produce many fine pod and boom sports machines.

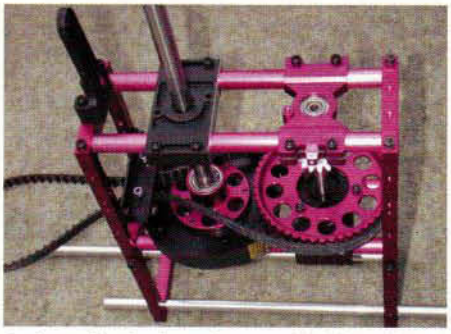
This review is going to look at the Vario EC135; this helicopter in its full size form first flew as far back as February 1994. It was the first German/French design in collaboration with 'Aèrospatiale' and 'Daimler Chrysler Aerospace' under the name of 'Eurocopter'. In general terms this machine is considered by many to be the machine for the new Millennium, as it is based on new technology. Couple with this its ultra-modern looks; it is aimed at filling all requirements especially in the field of rescue as it was developed in conjunction with doctors and rescue services. The anti-vibration system ensures minimum vibration and noise levels in flight while the two turbines ensure peace of mind for the occupants, as the machine will fly safely operate on one engine.

For the civil aviation market the EC135 provides space for up to seven passengers. In addition to fulfilling a role as an executive commuting tool, it is proving popular with police forces, because of its flexibility and capability as a platform for the latest technology.

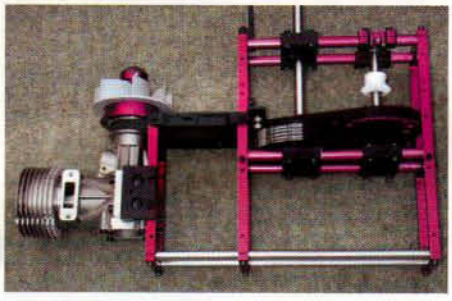
The Model

The model comprises of a superbly moulded twelve-part fuselage with separate doors, a full glazing set, all wooden die cut formers and an undercarriage. Included with the fuselage is the tail drive tube, along with all the necessary hardware, such as articulated joints etc. As well as being offered as a platform for turbine mechanics (as covered by Dave Hollins' article a couple of issues ago) the EC135 was initially designed for the ever-popular Vario X-Treme mechanics. These sets of mechanics have been with us for some time now. I personally looked at the X-Treme Economic pod and boom model back in May 2002.

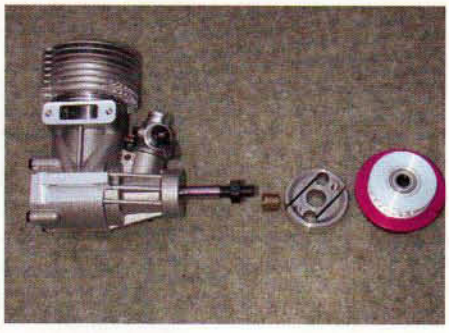
The mechanics set used in the EC135 is the 'Fenestron' version and comes supplied with the four blade rotor system and in our case is complimented by a Rossi 11.5 cc engine set. So that just about covers what I am going to look at in this review, so let's get started, firstly with the fuselage.



Basic mechanics in early stage of build - adjust second belt tension at this time.



Motor installed in mechanics - again check belt tension at this time.



Motor and clutch - note the use of the 8 mm crankshaft on the Rossi 65.

Fenestron hub is beautifully engineered and is factory assembled.

The Fuselage

The first time you come to appreciate the size of this model is when you try to fit the kit box into the car. The second time is when having arrived home you get the front of the shell and hold it together with the tail. It is only then that you fully appreciate just how big this model is going to be. The mouldings are superb and the front and rear of the fuselage are a perfect fit together. Now that you have got over the shock, it is time to start preparing the fuselage.

As with all Varios, you have to cut out the windows and doorways leaving a 5 mm border around the inside of the hole you cut out. I usually mark out the cut outs using 5 mm wide trim tape; make sure at this stage to remember to leave a 12 mm wide strip of material between the front and rear door cut outs. You will find that you also have to make a 20 mm hole at the rear of the fuselage for the aluminium tube to pass through, which carries the tail drive. The holes for the dummy turbine also need to be cut, along with the air intakes in the top moulding. The instruction diagrams also show the hole for the main shaft being cut at this stage. I decided, to leave this until the mechanics could be positioned in the fuselage; this would enable

'when you try to fit the kit box into the car, it is important that this is fitted the correct way up'

me to position the hole so that the main shaft would be in the middle of it.

With all the necessary holes cut in the fuselage, it is time to fit the top covers to the front half of the fuselage. These covers are secured in place using 2.5 mm screws and captive nuts mounted on small wooden blocks glued to the inside of the fuselage. With that done, attention can be turned to the wooden structure, which retains the undercarriage and acts as a plinth onto which the mechanics are mounted. As the X-Treme mechanics are not very tall, this structure, which comprises of 12 die cut pieces of plywood, has to be fitted onto the floor of the fuselage. On the outside of the fuselage the undercarriage is bolted to this structure with 3 mm cap head screws, which again are retained in captive nuts.

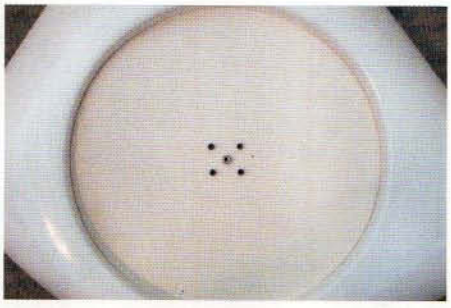
The undercarriage cross-members are located in recesses in the bottom of the fuselage, and the wooden structure mentioned above, has recesses in it, which locate on the reverse side of the recesses in the fuselage. That locates and positions the plinth, which will carry the mechanics longitudinally in the fuselage. This only then leaves the builder to position the structure in the centre of the fuselage with respect to width. The undercarriage itself is made up of four aluminium tubes. The cross members are secured to the skids by reinforced plastic joiners, glued and screwed in position. With the front half of the fuselage now sitting on the undercarriage as a single unit, it is as well to build the mechanics.

X-Treme Mechanics

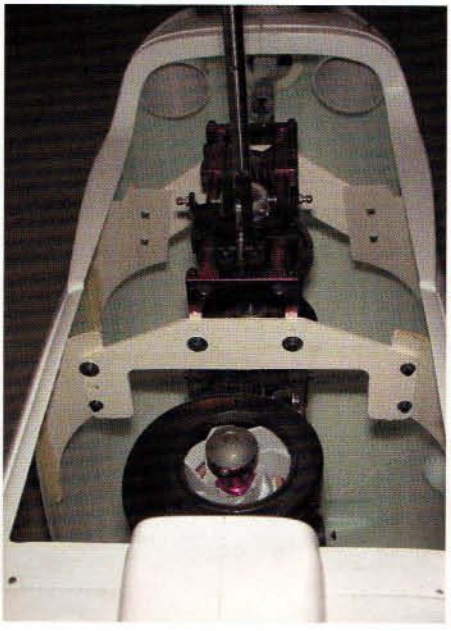
The X-Treme mechanics are somewhat unique in their construction, as they do not have conventional side frames, as we have come to recognise them. They are instead built into a space frame, making them light and very compact. Add to this the fact that they are belt driven and you will see that they are quite unique.

Construction starts with the rear pulley and lay shaft assembly, which carries one of the two bevel gears that transmit drive to the tail drive take off. All the pulleys in this set of mechanics are aluminium with the larger ones being anodised purple. The lay shaft assembly is mounted in the mechanics between two metal bearing blocks. The forward pulley assembly carries the auto-rotation unit, which runs on the main shaft, so there is no fully driven tail, which should come as no surprise since these mechanics drive a 'Fenestron' tail. Beneath the main pulley is situated a stepped spacer; it is important that this is fitted the correct way up.

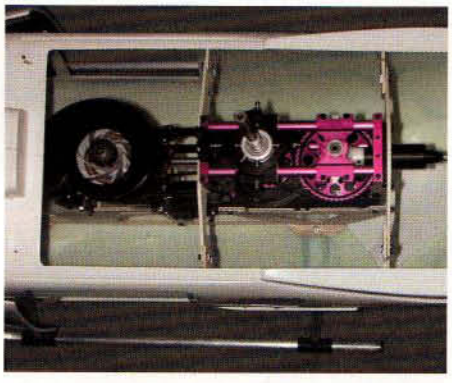
With these two assemblies built, it is time to start on the framework that holds everything together. On to the rear aluminium frame are attached four thin wall tubes. These are clamped into the former by four pinch bolts; on to these tubes four spacers are placed. These locate the rear lay shaft sub-assembly. Ensure that the two toothed drive



The ply disc is used to centre the tail gearbox.



Here you can see how the formers secure the upper mechanics.



Very narrow X-Treme mechanics. Note the tail drive shaft which is supported by a piece of boom in the fuselage moulding.

belts are in position around the lay shaft sub-assembly before locating in on the four tubes. This rear lay shaft sub-assembly is then clamped in place, with eight pinch bolts, which are screwed into the top and bottom bearing blocks. Now the rear sub-assembly is held in place, four more spacers are slid onto the thin walled tubes, followed by the main shaft sub-assembly. This time however, the smaller of the two belts has to be fitted around the main pulley, while the longer belt passes either side of the main shaft. The tension of the shorter of the two belts is set by adding special shims (supplied in the kit) between the front bearing blocks and the tube spacers already fitted; pay particular attention at this stage to get the belt tension correct, before tightening the pinch bolts in the bearing blocks.

Once again, four more spacers are positioned on the thin walled tubes and a further frame is then added. This frame carries an angle bracket, on to which are mounted two sets of two ballraces. These ballraces act as belt guides and their positioning in the pre-drilled holes in the angle bracket are critical. Once the angle bracket has been secured to the former, the pinch bolts in the former can be tightened to hold it in place. On to the top of this front former is attached the swashplate anti-rotation guide.

The formers, which we have used in this assembly so far, have six holes for tubes in them and so far only the top four have been used. The two lower holes carry longer tubes that run the entire length of the main mechanics; on to these is fitted a shorter former that carries the engine mounts. Now in this case we were supplied with the Rossi 65 motor set, as recommended. As with all Vario motor sets, this one came with everything required to install and run the engine, even down to the glow plug.

As the Rossi 65 is an ABC engine, it is critical that it is not turned over top dead centre before you are ready to run it. Before installing the engine, the clutch and fan assembly need to be fitted to it. The clutch bell is double ball-raced and is placed directly over the 8 mm crankshaft. Next to go on is a split location cone. As you push this down on to the clutch bell, pull the crankshaft forward, to ensure that any end float on the crankshaft is taken up. The clutch shoe then locates on to this cone, followed by the plastic fan. Be sure to locate the lugs on the bottom of the fan in to the holes in the clutch shoe. Next to be fitted on top of the fan is an aluminium spacer which holds the hex starter cap once the special crankshaft nut has been securely tightened. Now the motor, complete with the clutch assembly, is bolted to the engine mounting brackets, which in turn are bolted to the front former of the mechanics. This former can be slid into place on the main mechanics assembly. By pushing the engine as close to the mechanics as possible, you will find it fairly easy to feed the drive belt over the top of the fan and locate it on the pulley on the clutch bell. The rough tension of the drive belt is then set, by fitting the braces behind the front former. Final belt tension is achieved by placing the supplied shims between the motor and its mount as required.

Next to be fitted, is the ample cooling duct, followed by two lower side plates, one of which carries the throttle servo and two plates that fit into the bottom of the mechanics. These will make a floor, which can be used to carry the majority or the radio equipment. Behind the motor is fitted the fuel tank, while at the rear of the mechanics is

a bracket that carries the tail output drive shaft. It is at this stage in construction that the servos for the all-metal swashplate are fitted. You will require four identical servos, as this machine uses four servo eCCPM. These servos are fitted two each side of the mechanics, on the plastic plates supplied. Their output arms and the rods connect to the swashplate, must all be identical so as to ensure that the swashplate rises and falls while staying perfectly perpendicular to the main shaft. Time spent getting this right will pay dividends later in the build.

Fenestron Tail

The instruction diagrams of the mechanics now suggest that the rotor head is fitted to the mechanics. I elected not to do this, as without the head fitted the mechanics will be easier to handle while fitting them into the fuselage. Instead I turned my attention to the tail rotor gearbox. In this version of the mechanics you will find the all-metal gearbox supplied. Assembling this requires careful attention to detail. Firstly ensure that you get the bevel gears the right way round, as they are different sizes. This has been done to increase the output speed of the gearbox. Secondly, the mesh of these bevel gears will require adjusting using the shims provided. When assembled correctly, the gearbox should run as smooth as silk.

Next stage in the instruction diagrams for the mechanics, shows the building of the Fenestron rotor hub. Two ball races support each blade carrier; this means that there are no fewer than sixteen ball races as there are eight blade carriers. Luckily for the builder, Vario have seen fit to supply this hub factory assembled. All that is required from the builder is to attach the pitch change rod and all those blades. At this stage, I did not fit the hub to the tail gearbox.

Mechanics Assembly

With the majority of the mechanics now complete, I turned my attention back to the fuselage. With the wooden framework that carries the mechanics bolted into the fuselage, I set about attaching the mechanics to the top of it. With that done, the front formers were glued into the front of the moulding; as were the part wooden formers that fit at the side of the mechanics. From these formers, wooden braces are attached to the mechanics, thus making a rigid structure. The front of the helicopter was now ready to have the tail attached.

Before this could be done, it is necessary to fit the tube drive and position the tail gearbox correctly in the rear of the fuselage. The tube drive runs in a conventional tail boom, which is built into the tail section of the fuselage. The first stage was to ensure that the tail boom would fit where it was intended. Some sanding of the inside of the rear fuselage moulding was required, to ensure that the boom would sit right into the recess

Front formers to reinforce the fuselage - note the hinged front doors.

Finished Fenestron looks and works superbly.

'the really clever bit - the 4-blade rotorhead, this is a little gem'

that was intended for it. Now that the tail boom was in the correct position a hole could be marked and drilled in the fuselage so that the boom could protrude into the cavity, which would house the Fenestron.

With this done, the tail boom was removed and a wooden former glued at the rear of the tail section. Once the glue had dried, the tail boom was once again pushed into the rear of the fuselage. With the boom protruding into the Fenestron cavity, the socket onto which the tail gearbox is attached was glued in place. Once this glue had dried the tail gearbox was bolted in position and the tail boom adjusted, so that the output shaft of the tail gearbox was roughly in the centre of the Fenestron tunnel. Next comes the really clever bit! Supplied in the kit is a perfectly round piece of plywood drilled exactly in its centre, so as to fit onto the tail gearbox output shaft and bolt in place along with the gearbox casing. The outside diameter of this piece of plywood, is exactly the same diameter of the tunnel in which the Fenestron will run. So once this is located correctly in the tunnel and fitted to the tail gearbox, then the output shaft will be in the correct position in the centre of the tunnel. Once positioned correctly the whole tail boom can be glued in position and left to dry overnight.

Once dry, the round plywood former can substituted for the Fenestron rotor hub and the tail drive tube fitted ready for the joining of the two fuselage halves. Before the joining can finally be done, the drive tube needs to be measured and trimmed to length and the tail pitch push rod installed along with a former into the rear section. You are now ready to glue the two halves together and fit the final former approximately on the join line of the two halves of the fuselage. The two parts of the fuselage are an extremely good fit together and apart from supporting them while they dry, little else is required. Once the glue has dried, you are ready to fit the horizontal and vertical fins, along with the tail servo and exhaust system. That just about completes the mechanical part of the build; the rest will be attention to detail.

All the windows require cutting and trimming to fit the fuselage and the dummy exhausts also need to be fitted, as do all the doors. I hinged the two front doors holding them closed with magnets. The two rear doors are removable and also held in position with magnets. With the fuselage now complete, including the hole cut in the top covers, the time had come to remove all the mechanics and apply the final livery.

Paint and Final Fitting

Now anyone who knows me will be aware that when it comes to painting, there is only one person I trust with my models. So once I was satisfied that I had not forgotten any scale details, I set off for Manchester complete with fuselage, and as much scale detail as possible to see Mike Drinkhill, who has just started his own company 'Air Art' business. Now Mike had always said to me that he likes the challenge of painting scale models, so it was with this in mind, I rang his doorbell. To cut a long story short, this was several weeks before Christmas and after many telephone conversations several weeks after Christmas, an exhausted sounding Mike rang up and said "it's finished". So at the first opportunity I was in the car and once again on the way to Manchester. The result of Mike's labour, as I am quite sure you will all

agree, is quite stunning and I can only hope that the photographs do it justice.

Once I was back at home, the final fitting out of the model was completed, firstly starting with the avionics. The X-Treme mechanics are remarkably compact and allow you to fit all the avionics, apart from the airborne battery pack and tail servo, within their framework. The tail servo, which must be capable of a minimum of .65 Ncm torque, is mounted directly on the section of aluminium tail boom, which protrudes into the front section of the fuselage. I found tightening the tail servo mount clamps, almost impossible with the screws provided, so I substituted the original screws for cap screws, which I could reach easily with an Allen key. The Vario fuel filler was fitted along with the remote glow, which was included in the motor set. The gyro is mounted beneath the main shaft and is a non heading hold type as instructed by Vario.

The only thing left to do now, was to fit and set up the rotorhead. This is the Vario 4-blade head and it comes ready assembled. Before the head can be fitted, the swashplate driver must be put on to the main shaft, then you are ready for the head itself. The head is a very good fit on the main shaft and care must be taken lining it up, so that the single fixing bolt can be inserted and secured. Now that the rotor head is fitted, the job of setting up can be started in earnest. The 4 pushrods that go between the swashplate and the blade grips, need to have their rod ends fitted. These pushrods must be made identical in length, by doing this, you should be able to ensure that the blade tracking will be correct, apart from very minor adjustments. Now fit all the pushrods to their respective positions around the swashplate. The swashplate driver is then fitted to the spare position. Before the swashplate driver can be tightened in its final position, it must be set to give the correct phase angle for the blades.

This is done by fitting one blade into a blade grip and positioning it so that it points directly towards the rear of the model along the tail. Now operate the fore/aft cyclic control and turn the swashplate driver until the blade pointing to the rear of the model makes absolutely no change in pitch when the cyclic control is operated. Once you are satisfied that you have this correct, tighten up the swashplate driver. Now you have got to this stage, you can stand back and give yourself a pat on the back and admire your handy work, as the major part of the build is now finished and you have to see if this scale creation will fly.

First Flights

Now I had heard many stories about Rossi engines being particularly difficult to start and get running correctly. I decided that for the first starts I would run the engine on a pure Castor Oil based fuel with no Nitro. With the model filled with fuel and the glow plug connected the electric starter was applied. After a few seconds the engine started to fire then suddenly it burst into life. After some adjustments were made to the fuel mixture the model was allowed to run two tanks of fuel on the ground with the blades fitted just to bed everything in a little. Once this had been done the model was once again taken into the workshop and examined for any loose bolts and to make totally sure all was as it should be before the first flight.

I must admit that the first hovers were completed before Jon Tanner arrived with the camera for the all important photo session as I wanted to make sure that the rotor head was tracking properly. I need not have worried ➔

Excellent detail and lettering.

The Fueller works!

Very nice detail in the exhausts.

We Used

JR 3810 radio, 4 of DS811 digital servos for cyclic, 1 off DS8231 digital servo for tail, 1 off NES 517 standard servo for throttle, JR NEJ 900 piezo gyro.

Spec Check

Product: EC135 scale helicopter
Market Place: Serious scale model builder
Manufacturer: Vario Helicopter, Seewiese 7, D-97782 Grafendorf, Germany.
UK Importer: Vario UK Sales Units 4 & 5, Lynton Way, Windle, St Helens, Merseyside, WA10 6EQ.
Tel: +44 (0) 1744 602206
Fax: +44 (0) 1744 752204
Main Rotor Diametre: 1680 mm
Tail Rotor Diametre: 178 mm
Overall Length: 1,740 mm
All-Up Weight: 8.0 kg
Standard Main Gear Ratio: 10.2:1
Standard Tail Gear Ratio: 7:1
Control Requirements: 5 servo heli radio (4 servo eCCPM) and gyro
Power Requirement: .65 helicopter engine with 8 mm crankshaft
Current UK RRP:
EC135 fuselage kit #1330
£357.14
X-Treme Fenestron mech..#1002/8
£613.57
Rossi 65 Fuselage motor set #852
£285.00
4-blade set #404/41
£203.57
Main rotor shaft 235 mm #35/37
£19.00
Door fitting set #133/5
£30.64

Verdict

I can quite honestly say hand on heart that there is nothing about this model that I do not like. The build is both interesting and challenging. All the components are top quality and go together exactly as the manuals say that they should. The mechanics as I have mentioned earlier are both reliable and compact which is important when installing them into a fuselage. The rotor head looks the part and brings the model to life as well as inspiring confidence in the air and as for the Fenestron, it is the jewel in the crown.

as after only a minor adjustment all the four blades looked as one, so Jon was called and a time arranged for the photos. With all the photos taken and the editor satisfied, I could explore the models flying characteristics a little.

The rotor head seems very stable and predictable in the hover with the cyclic controls being well balanced. The rotor head speed is about 1200 rpm, this seems comfortable and gives good tail power from the Fenestron. Moving the model around is easy with the 4-blade head feeling safe and stable and tail control is positive in turns both to the right and left. As for aerobatics, forget it! I have spent many hours building this model and as the full size is never seen looping and rolling across the sky nor will the model be.

The flying time I have had with this machine so far has been very limited although I am looking forward to many an hour in the summer when I can fly it to my heart's content.

Conclusions

The building of the EC135 is quite straightforward for the experienced modeller although quite daunting for the first time scale builder. The co-ordination of the building diagrams with the component packages for both the fuselage and the mechanics does however leave the builder with the correct parts at hand at all times throughout the build. The Fenestron tail is an absolutely superb piece of engineering and should hold no fears for the builder as Vario have thought of everything with regard to its installation and operation. The rest of the mechanics are well tried and tested and although different to the norm are extremely reliable going by my past experience with them. As for the 4-blade rotorhead, this is a little gem and inspires great confidence the more you fly it.

The quality of the fuselage moulding Vario supply never ceases to amaze me, everything fits and what is more fits properly so there is no adjusting of parts to make thing look right. The amount of scale detail that can be added to this machine is up to the builder and with all the accessories you could ever desire available off the shelf the sky is the limit. With my particular machine there is still the internal detail to be fitted along with a couple external touches to be added, but this will be brought to you in the future. ■