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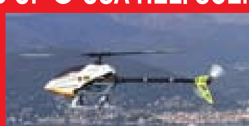

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IN THIS ISSUE REVIEWS ↘ EVENTS ↘ TECH

WORDS: **RICHARD MORRIS** PICTURES: **RICHARD MORRIS AND JON TANNER**

Schweizer 300C

VARIO'S GIANT GASSER HAS A 2.36 METRE ROTOR DISC

The 1:3.5 Scale Schweizer 300C looks great in the air

Full Size History

In 1955, the Hughes Tool Company's Aircraft Division (later Hughes Helicopters) carried out a market survey, which showed that there was a demand for a low-cost, lightweight two-seater helicopter. The division began building the Model 269 in September 1955. The prototype flew on 2nd October 1956, but it wasn't until 1960 that the decision was made to develop the helicopter for production.

On 9th April 1959, the 269 received certification from the Federal Aviation Administration (FAA) and Hughes continued to concentrate on civil production. With some design changes, deliveries of the Model 269A version began in 1961. By mid-1963 about 20 aircraft were being produced a month and by the spring of 1964, 314 had been built. Hughes had successfully captured a large portion of the civilian helicopter market with an aircraft that would prove itself popular in agriculture, police work and other duties.

In 1964, Hughes introduced the slightly larger three-seat Model 269B which it marketed as the Hughes 300. That same year, the Hughes 269 set an endurance record of 101 hours, to set the record, two pilots took turns piloting the aircraft and hovered in ground-effect for refuelling. To ensure no cheating, eggs were affixed to the bottom of the skid gear to register any record-ending landing.

The Hughes 300 was followed in 1969 by the improved Hughes 300C (sometimes known as the 269C), which first flew on 6th March 1969 and received FAA certification in May 1970. This new model introduced a more powerful 190 hp (140 kW) Lycoming HIO-360-D1A engine and increased diameter rotor, giving a payload increase of 45%, plus overall performance improvements. It was this model that Schweizer Aircraft began building under license from Hughes in 1983.

In 1986, Schweizer acquired all rights to the helicopter from McDonnell Douglas, which had purchased Hughes Helicopters in 1984. After Schweizer acquired the FAA Type Certificate, the helicopter was known for a short time as the Schweizer-Hughes 300C and then simply, the Schweizer 300C. The basic design remained unchanged over the years, despite Schweizer making over 250 minor improvements.

Between Hughes and Schweizer, and including foreign-licensed production civil and military training aircraft, nearly 3,000 units of the Model 269/300 have been built and flown over the last 50 years. Schweizer continued to develop the Model 300 by adding a turbine and redesigning the body to create the Schweizer 330. Further developing the dynamic components to take greater advantage of the power of the turbine engine led to the development of the Schweizer S-333.

Schweizer was purchased on 26th August 2004, by Sikorsky Aircraft. The Schweizer 300 models fill a gap in the Sikorsky helicopter line, which is known for its medium and heavy utility and cargo helicopters.

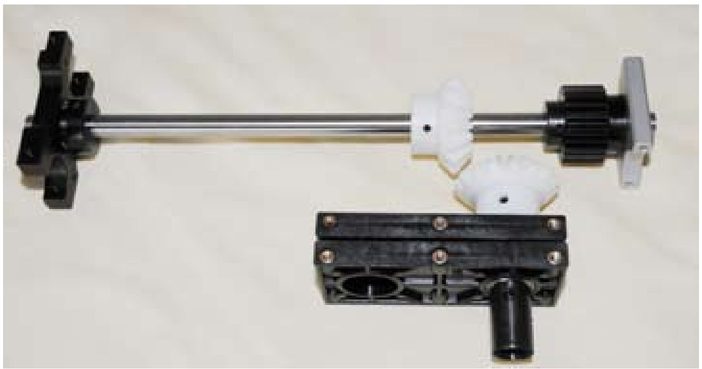
The Model Mechanics

Almost a decade ago I was fortunate enough to be able to review Vario's first Schweizer 300, which was powered by a 23 cc Zenoah and used a three-blade rotor head. That particular model served me very well being flown a fair amount over the years and was my first large-scale model. I was in Italy in 2011 when Dave Hollins announced that he had a new Vario in the car that might interest me! How right he was. My attention was well and truly grabbed when he emerged with the latest offering from Vario at that time, their new Schweizer 300. I ordered one on the spot and as soon as the first kits were available one arrived on my doorstep.

The Schweizer is almost the ideal introduction to scale models, as its design enables most of

ABOVE: As you would expect there is a packet for everything and everything is in its packet

The components that make up the tail output, the large bevel gear takes the drive from the layshaft



RIGHT`: Ready to be mounted on a main frame, the layshaft and the tail output shaft

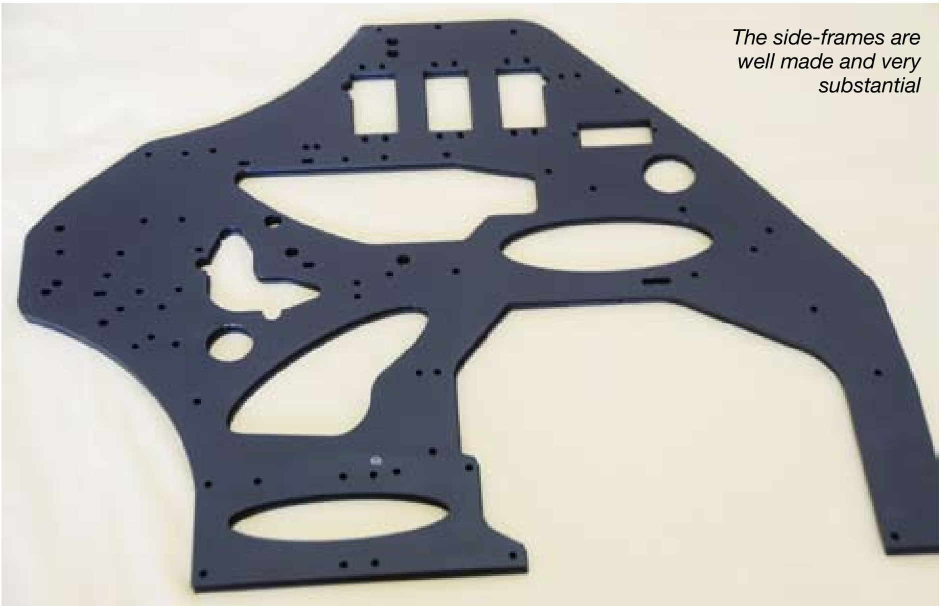
the mechanics to be accessed without any need for removing them from a fuselage. In fact as the scale detail is bolted to the mechanics, that makes it the ideal place to start with this review.

Based around the Zenoah 29 cc engine, the mechanics are a similar layout to those used in the Bell 47G, with the engine driving the mechanics through a toothed belt. The first stage of the assembly entails attaching the substantial auto-rotation unit to the Delrin main gear. This is in turn attached to the main shaft and located with grub screws that need to be locked in position on a ground flat on the main shaft. The main shaft runs in ball races either side of the main gear, held in metal bearing housings. The top of the main shaft also runs in a bearing with end loads being dealt with by a thrust race, but as these mechanics are used for several different models, I will come to this later on.

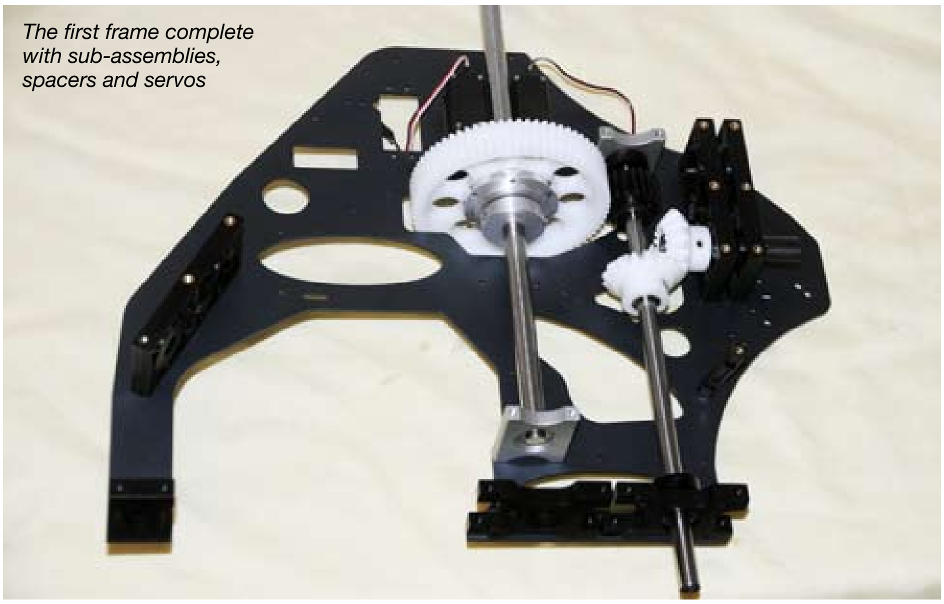
With the autorotation unit fitted to the main shaft, the other shafts can be assembled. There is a layshaft that carries a pinion, which drives the main gear on the main shaft then, beneath this, a Delrin bevel gear is located that will drive the tail drive output shaft. The layshaft is carried in two ball races, one at each end of the shaft and mounted in metal bearing blocks. The tail drive output shaft carries a second Delrin bevel gear and it too runs in two ball races, this time mounted in composite bearing holders. Drive is transmitted to the tail drive tube through a metal coupling. Once all the shaft sub-assemblies are complete, you can turn your attention to the mainframe side plates.

The first stage, is to fit the cyclic servos of your choice into the frames, two each side. I elected to use Futaba S9206 servos, as they are well suited for use with the four servo eCCPM mix that is used to control the swashplate. With the servos ready, you can now fit to one of the frames the shaft sub assemblies that you have already prepared, along with some additional frame spacers. The first sub-assembly to be fitted is the tail drive output shaft, followed by the layshaft. The main shaft sub-assembly is the last sub-assembly to be fitted along with the extended main shaft support unit, that gives the additional support required by the Schweizer's very tall main shaft. Now that a single side-frame has all the sub-assemblies attached, you can turn your attention to the mechanics base plate.

The base plate carries the engine, so the first job is to prepare the engine ready for installation. You may find it necessary to turn the pull starter to the correct orientation, so as to allow access once fitted into the model. In my case I had to turn it through 90º. This is simply done by



The side-frames are well made and very substantial



The first frame complete with sub-assemblies, spacers and servos removing the four screws that hold it in place and repositioning it. Next, the clutch was fitted to the crankshaft. The clutch bell runs on two ball races, on a brass spindle, that has a female taper that locates on the engine crankshaft, while a male taper, on the other end of the brass spindle, locates the clutch shoe. The complete cutch assembly is securely bolted to the crankshaft. The next stage is to remove the standard control lever from the carburettor and replace it with the lever supplied. Be absolutely sure to orientate and locate it correctly, before tightening the grub screw that holds it in place. Also be sure to use thread-lock, as it would be very difficult to get at this screw once the model is assembled.

Now fit the engine onto the base plate and locate it in the middle of the slots where it bolts. The throttle servo is then fitted to a right angle bracket and this is bolted to the base plate. The throttle link is fitted and the radio adjusted so that the carburettor opens and closes fully. It is most important that this stage is completed correctly as making any adjustment to the throttle linkage would be difficult once the model is built. When you are happy with the actuation of the carburettor, then you can attach the side-frame, with the sub-assemblies, to the base plate. You can now add the remainder of the cyclic servos to the second side frame and bolt this in place. Ensure all bolts are firmly tightened, with thread lock added. Next, the drive belt and the rear pulley are fitted and the belt tension adjusted. This does not need to be too tight, as the belt has teeth, so there should be no slippage.

Tail Gearbox

That concludes the assembly of the mainframe mechanics; next attention can be turned to the assembly of the tail gearbox. The tail gearbox is the, by now familiar, metal tail gearbox that is favoured by Vario for their large scale models. The gearbox can be built to operate in either direction and the instructions indicate the tail blades should be rotating in an anti-clockwise direction, with the pitch input on the trailing edge of the blade. The tail pitch control horn has a stiffener bolted to it, to avoid any flexing. Perhaps a metal horn might have been simpler? The tail rotor blades are held in composite blade grips, supported on two ball races, with end loads being coped with by a single thrust race. The tail pitch slider carries the pitch bridge on two ball races, with the afore-mentioned control horn pivoting on two ball races. The output shaft from the gearbox is carried on two ball races, as is the input shaft. It is worth taking care adjusting the gear mesh of the two bevel gears, with the shims provided, so a smooth running gearbox results.

The Model Schweizer

That basically completes the mechanics for the Schweizer, so it is now time to start on the model itself. The reason the Schweizer is a reasonably good choice for the first time scale modeller, is that it is in essence a pod and boom machine, with the mechanics at the front and a boom at the rear for the tail. Construction of the model starts with the undercarriage and the rectangular frame top frame, beneath which the undercarriage legs fit, while on top will be the cabin and framework that braces the tail boom. The rectangular frame is made up of two rectangular tubes for the sides and a number of square tubes, joined by means of a number of solid metal joiners with brackets machined into them. The four corner pieces are solid metal, with recesses machined to accept the tops of the dummy shock absorbers that support the undercarriage. The corner pieces and joiners are a tight press fit into the square and rectangular tubes but are also glued in position to ensure the frames integrity.

With the framework complete, the four undercarriage legs are bolted to the lower brackets of the framework. The dummy shock absorbers, with their rubber gators, are then bolted into place, between frame and undercarriage leg. Next to be glued and screwed in place are the undercarriage skids. Holes have to be drilled from the underside of the skids to allow a self-tapping screw to be screwed into the bottom of the undercarriage legs.

That concludes the bottom framework. The mechanics are bolted into place on the top with four spacers lifting them to the correct height. With the mechanics in place and standing on the undercarriage, you are now ready to start work on the tail boom and drive system.

There is a short intermediated tail shaft that has a ball joint on one end and a cruciform coupling on the other. This shaft runs in two ball races and is secured within the metal tail boom holder, which attaches at the rear of the mechanics between the side-frames.

On to the tail boom holder… The metal 25 mm diameter tail boom is secured with three

The mighty Zenoah 29 cc petrol engine should have more than enough power for the Schweizer

The component parts that go to make up the clutch assembly these will be familiar to anyone who has built a Vario Benzin

The tail gearbox will again be a familiar unit for any one who has built a large Vario machine

Standing on its own two feet so to speak, the mechanics are attached to the undercarriage frame

I always use 6 mm wide tape to mark where the windows need to be cut; this leaves a lip for the glass to sit on

With the windows and doors cut out you can mount the cabin onto the mechanics

cap screws. The metal tail torque tube runs through the tail boom, supported on three bearings equally spaced along its length. Both ends of the tail drive torque tube use cruciform couplings and it is important to ensure that the front cruciform is fully engaged in its mating part on the intermediate shaft.

Scale Treatment

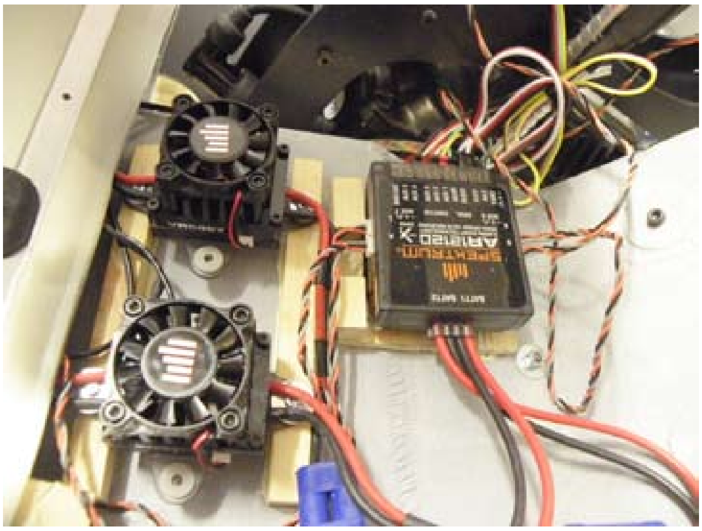
Once you have reached this stage in the build, the interesting bits start and the tail boom is the first part to get the scale treatment.

So as to achieve the correct scale appearance, an outer fibreglass tube has to be fitted over the metal tail boom. Onto this fibreglass tube is attached the vertical and angled tail fins. Within the tube there are two wooden rings that are glued in place, one at the rear and one half way along the length. At the front, a Delrin bush is fitted over the metal tail boom and inside the fibreglass tube. This Delrin bush has to be drilled and threads cut in it for screws to be added at a later stage. The positioning of the two wooden rings and the Delrin bush is important, as they have been drilled to accept the tail pitch pushrod, and so need to be lined up correctly to allow the push rod to run freely between the glass fibre tube and the metal tail boom.

At the rear of the mechanics, the tail pitch servo is fitted to a right-angled bracket, which operates the tail pitch push rod, through a second control horn fixed to the tail boom. Before gluing any rings to the tail boom and glass fibre tube, I fitted the complete assembly together, so as to get everything in the correct position, with the tail

The cabin is held in place by four cap screws in addition to the valance beneath the front

The rotor head has a metal centre block with composite grips; you can also see the frames that carry the fuel tanks attached to the back of the cabin



A Spektrum AR12120 Power Safe receiver takes care of communications and is powered by two VR6007 regulators

The exhaust pipe is securely held in place by this cleverly designed rubber mounted clamp

Within this tank is hidden the actual fuel tank

The very first few seconds in the air without any cockpit interior and a rather vague tail

pitch push rod in place. This allowed me to get everything lined up and the push rod operating smoothly. Now I knew where everything had to be stuck, I marked the positions and glued the parts in place.

The next stage is to fit the tail gearbox and cut the tail tube drive to the correct length. Make absolutely sure that the front cruciform joint is fully engaged, before cutting the drive tube one millimetre shorter than you measure. This ensures that there is half a millimetre free play in each coupling. The next job is to trim the tail pitch push rod to length and add the remainder of the scale detail, such as the tail support tubes and the rear tail blade guard. I also took this opportunity to add the swashplate and anti-rotation post, before turning my attention to the cockpit.

The main cockpit comprise of two parts, onto which the doors and fuel tanks are attached. The main cockpit component needs to have the windows cut out, as do the doors. A valance has to be glued under the front of the cockpit, which also attaches to the main frame of the helicopter to help support the front of the cockpit. Fitting this valance takes a good deal of trimming and measuring, so be prepared to take some time on this. I elected to fit the main body of the cockpit before finally positioning the valance. This allowed me to make sure the fit was good

and the valance met the mounting points on the main frame. Also be aware that the seam of the cockpit may not be the actual centre line, so measure things before starting to cut and trim.

The main body of the cockpit is held in place by four bolts, two into angle brackets at the top of the mechanics, while the others fit through some spacers and bolt through the mechanics base plate and into the main frame underneath. With the cockpit now mounted and securely bolted to the mechanics, some additional right-angle brackets are attached to the cockpit and are braced by another tube frame that also bolts to the main frame of the helicopter. With the cockpit now fitted, attention is turned to assembling the dummy fuel tanks that fit behind it.

Each of the tanks are a one piece moulding, to which two simple frames are glued, so you have four frames in total. The inner side of each inner frame is cut from fibreglass sheet, similar to that used for printed circuit board. The remaining components that go to make up these frames are wooden. The fibreglass frame sides fit inboard, closest to the engine. The fuel tanks, with the frames glued to them, are bolted to the rear of the cockpit with six M3 cap screws, screwing into captive nuts in each frame. Inside of the right dummy fuel tank is where the actual fuel tank is mounted. It is a very snug fit between the frames and is supported within the tank by a plastic beam.

With both fuel tanks bolted in place, the cockpit can be finished by adding the small wing that fits across the top and fitting the doors and windows. Inside the cockpit two wooden strips are glued in place, just under the front screen apertures. This is the support for the floor, which I chose to fit after the model had been painted. While the model was away being painted, I finished off setting up the cyclic servos to give the correct swashplate travel, bolting the rotor head in place and setting up the control rods, to give the correct amount of pitch.

Final Assembly

Once Andy Meakin, my paint man, had finished it was not too long before the finished component parts were sat back on the bench ready for final assembly. This is always the most nerve-racking time when you have to be so careful with all that fresh paint. Heaven forbid you scratch anything! After having carefully assembled the model, once more taking care to use thread-lock everywhere it was needed, I was ready to start installing the radio. With the cockpit being so large, you would have thought that installing the radio out of sight would have been a breeze. In fact there is only space beneath the floor and the seat to fit the radio and there is not really too much space in either location.

As is usual for me, I decided to use a Spektrum AR12120 Power Safe receiver, fed from two VR6007 regulators. In turn these are powered by two, 2-cell 5000 mAh OptiPOWER batteries – there should not be any issues with power! As ever, I managed to get the batteries as far forward as possible, which meant that I did not need to carry any weight to get the centre of gravity correct. With the batteries and regulator fitted beneath the plastic floor, I fitted the receiver under the bench seat. This allowed me to keep the servo wires as short as possible. With the electrics fitted and tested, I turned my attention to the exhaust, which by any standards is quite something. It is in fact a reasonable representation of the exhaust fitted to the full size and is mounted at the rear of the base frame in a rather clever rubber mounting. Now complete, apart from the cockpit detail, I elected to take the model out for a trial hover, just to be sure everything was as it should be and ensure that everything under the floor was working properly.

Test Hover

At the field, the model was filled with fuel and the radio checked and double-checked, ready for the first hop. The 29 cc Zenoah only took about half a dozen pulls to start and after a slight adjustment to the tick over, I was ready to see how the model would fly. Opening the throttle confirmed that the fuel mixture was weak, so an adjustment was made to both the high and low mixture needles on the carburettor. On opening the throttle for the second time, the engine picked up without hesitation and with the blades spinning, the tracking could be checked. Happy with the tracking, I increased the throttle a little more and the Schweizer lifted off. There was absolutely no drama! The model sat in the hover, while I started to get a feel for the controls. A small adjustment was made to the throttle curve and pitch curve as the rotor speed was a little on the fast side. As mentioned, this was only going to be a short test hover, so once I had flown for about five minutes, I decided to call it a day, happy in the knowledge that all was operating as it should.

Fine-Tuning

Back in the workshop, I set about fitting the bench seat and making up the instrument console. The plastic floor is held into the cockpit by some self-tapping screws. I made some small aluminium angle brackets to secure the seat and instruments in place, before assembling the pilot and the controls. The pilot is made from glass fibre and is totally non-flexible so quite some time was spent adjusting limbs, before final assembly. The controls have to be modified, as they are too small for the Schweizer, the joy sticks have to be extended which I did with some metal tube. As for fixing the pilot into the model I rely on the seat belts, which although time consuming to assemble do work well with the plastic catch actually working.

The next outing to the field was again just for a short test hover just to make sure I was happy with the model before giving Jon Tanner the thumbs up to come down and do the photographs. I did notice on this outing that the tail felt a little vague and the model was starting to pirouette making me feel slightly uneasy flying it so once again it was back to the workshop for some investigation. Having checked out the tail and tail drive I could find nothing wrong although I did notice that the tail rotor was running in an anti-clockwise direction with the pitch input levers at the trailing edge of the blades.

Checking my other models I noticed that they all ran clockwise and with the pitch input on the leading edge of the blade. As the tail rotor performance was so poor on the last outing I decided that I would re-assemble the tail rotor gearbox to give me the opposite rotation and I would also change the blade grips round to give pitch input at the leading edge of the blade. With this change done I set off for the field once more. After a tentative lift off the difference was evident straight away. The tail now had good authority and the model was much more settled with no tendency to wander. So now I was ready for that photo session.

Conclusions

The Vario Schweizer 300C is what can be termed a simple scale model ideal for anyone who requires a large impressive model that is easy to maintain and practical to operate. Using a Zenoah petrol engine means all that you require is unleaded petrol along with synthetic oil and you can go flying with the minimum of fuss. The model is not heavy so there are worries about requiring a CAA Exemption Certificate.

Building the mechanics for the model is straightforward although the instructions for the tail gearbox are somewhat misleading. Fitting the cockpit and the assembly of the scale detail to the tail boom is not difficult but it is fair to say that it is very time consuming.

As for flying what with the poor weather and other commitments I have not managed a great deal of flying. So far about one hour has been achieved and the characteristics are very good with excellent cyclic response and a tail that now works and feels as it should. As yet I have not fitted any stabilization to the rotor head and until I have flown the model some more I will make no decision to fit anything.

Verdict

Building the Schweizer is quite simple as far as large-scale models go and the result is very impressive. The Zenoah engine is a reliable power plant and so far has run smoothly without any issues, which is exactly what I would expect. The exhaust is large and to the un-initiated might seem to be rather large but is in fact a reasonable scale representation of the full size.

Vario seem once again to have managed to produce a model that is both impressive and practical for the everyday scale modeller who wants a large model that will turn heads. My previous Schweizer was with me for a long time and I have high hopes for this model being part of my fleet for equally long. ***MHW***

The pilot is very rigid but the working seat belt holds him in place

The consul is simple much like that of the full size

Just off the ground the finished model hovers for the camera

We Used

Spektrum DX18QQ transmitter, AR12120 receiver, four satellites two Spektrum VR6007 Voltage Regulators, Futaba S9206 servos, Futaba GY401 Tail Gyro, and two OptiPOWER 5000 mAh Lithium Polymer Batteries.

Spec

PRODUCT	Schweizer 300C
MARKETPLACE	Serious scale model builder
MANUFACTURER	Vario Helicopter, Seewiese 7, D-97782 Gräfendorf, Germany
UK IMPORTER	Vario Helicopter UK Sales, 6 Astbury Close, Lowton St Mary's, Cheshire WA3 1ED, Tel: 01924 273888, www.vario-helicopter.co.uk
SCALE	1:3.5
MAIN ROTOR DIAMETER	2360 mm
OVERALL LENGTH	2190 mm
WIDTH	650 mm
HEIGHT	835 mm
ALL UP WEIGHT	15 kg
CONTROL REQUIREMENTS	6 servo heli radio (4 servo CCPM) & gyro
POWER REQUIREMENT	ZENOAH 29 cc Petrol