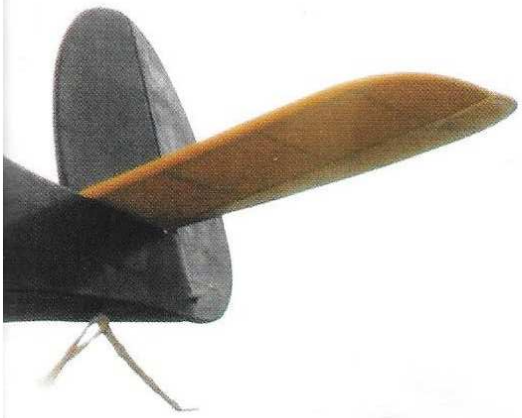
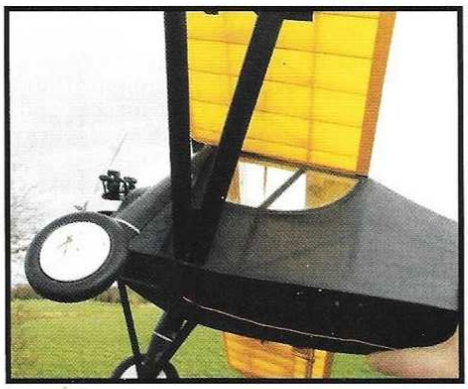
Construction feature

by Philip S. Kent

Velie Monocoupe

Phil goes electric with this conveniently sized 46.5" (1181mm) span sport-scaler that suits the popular 400-size brushless motor range





RIGHT: Some details showing the main undercarriage and wing strut arrangement, together with the dummy five-cylinder radial engine that is vital create the true image of the Velie Monocoupe.

This is a model that came about by accident. I was involved in disposing of the models of one of our late club members when I came across a scruffy part-built model that I identified as a Velie Monocoupe. The model needed a lot of work doing on it, but it looked as though it might fill my need for a small electric-powered scale model that would fit into my MG TF sports car.

Why I start on these projects I do not know, since they never seem to go as planned and I finish up having to do more work than when designing and building a new one. On closer inspection, the model was more or less what I expected and I found that a lot of work was required on all aspects of the original airframe.

After this discovery, I thought that I might see how accurate it was in scale outline by consulting my photocopy version of the old soft-back book, *Of Monocoupes and Men*. Well it didn't look too bad and as it was going to be a very stand-off scale fun model, I was happy. The wings were, however, a mess. Not only were they damaged, but they were heavy - not what you want for an electric-powered model. The fuselage needed a lot of sorting out too and I wondered again if I was wasting my time.

Out came the drawing board and a new drawing of the wing was produced. I now felt that I was moving in the right direction and modifications were started on the useable existing airframe parts. The fuselage was hacked about, but it did have one great redeeming feature, the windscreen portion was separate from the rest of the structure. This has proved to be an inspirational piece of design work by whoever did it, since, by removing the portion of the front fuselage, easy access is afforded to the battery, radio gear and motor.

I was quite smitten with the little machine now and building of the wings commenced. I had thought that I could use the existing tail unit, but after some more deliberations decided a new design using core construction would be much better.

A brief outline of the build follows and I feel that any modeller who has built a couple of models from a kit or plans will find the Monocoupe well within his capability. The fuselage is basically a box with some side stringers and a rounded decking in front of the windscreen. The wing is a built-up structure with the tail unit using the warp resistant core construction and a laminated outline. There is a small amount of metal work required for the undercarriage, but this is not difficult if the components are thoroughly cleaned and the joints bound with thin copper wire.

The model did not take a long time to build and it was not too heavy even though I decided to use some commercial 'vintage' wheels. I thought long and hard about the covering material and eventually decided to cover the model with tissue. The principal reason was that I do have a large stock of the old *Modelspan* tissue in several colours in light-weight and heavyweight grades and it does add a lot of rigidity to the structure. It is also good to rediscover techniques that have fallen out of

Rear three-quater view emphasises the short nose moment, so be sure to keep the tail-end light to avoid a balance-point problem.

favour in recent years.

The out-runner motor is a Tower-Pro BM2409-12T 220W 400 type and the speed controller a Hi-Model 25AS 1.1 brushless ESC were inexpensive units as was the Tornado 1100 1 1.1 V 3S 1P LiPo battery that was used on the original model.

The full-size Velie Monocoupe came about when the production of the Don Luscombe-designed Monocoupe became threatened due to the lack of suitable engines in 1928. Luscombe needed a dependable source of engines and since Velie Motors had factory space available due to a fall in demand for their autos, it prompted him to approach Willard S. Vilie in the hope that a new aircraft engine might be produced. As things turned out, this was an excellent move as not only did Willard S. Velie set in motion design work for an engine, but the Monocoupe builders became part of the Velie Automotive Corporation. The first engines that Velie produced were copies of the five-cylinder Rickenbacker Air-Cat motors and, because of this, they also inherited many of the faults of the Air-Cat. Eventually, aluminium heads were developed along with sodium valves and a new carburettor was designed and built by Stromberg. The new engine proved to be a success and over 350 Monocoupe Model 113s were built between 1928 and 1931.

Going back to the construction, I like to build the tail unit first as it goes together very rapidly and you can see some early results of your work.

Cut out the 1/32" sheet balsa cores remembering that they are about one 1/8 of an inch smaller than the outline shape where the laminated outline is. Pin the core to the building board after marking the positions of all the ribs and spars. Add the spars and the ribs and leave to dry.

Remove from the board, turn over, pin down and repeat the operation. The laminated outline is fitted next. I have found that this operation is very easy to do using pliable 1/32 inch strips of balsa attached with thin cyano. Three or four strips should give the required outline shape. Sand the components to the section shapes shown on the drawing.

The wings are built using two balsa spars, a balsa trailing edge and a square balsa leading edge. The ribs are first slid onto the two spars and then pinned in the correct place over the plan and sheet trailing edge. Thick cyano is then used to glue the parts together. Add the leading edges and the aileron spars again attaching with cyano or PVA adhesive.

Note that the wing is built flat on the board with no dihedral. The wing tips are from sheet balsa with a laminated outside formed around them. I used strips of soft 1/16" sheet balsa attached with fast-acting cyano adhesive just like the tail unit laminations, but this time they were wide enough to give the correct shape at the leading edge.

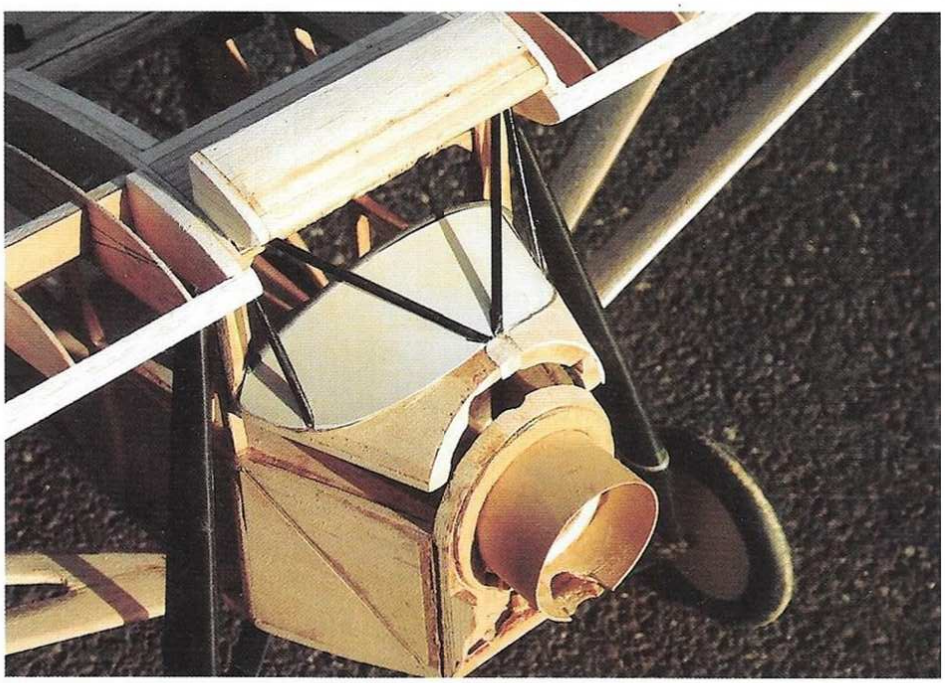
The ailerons are built directly over the drawing. On my own model I added some diagonal bracing between the two spars, but if the model is covered with tissue I don't think that these are necessary. Note that the centre section is cut back to allow for the removable windscreen hatch. Note also that this part is sheeted and has a ply cross-member to carry the wing mounting bolts.

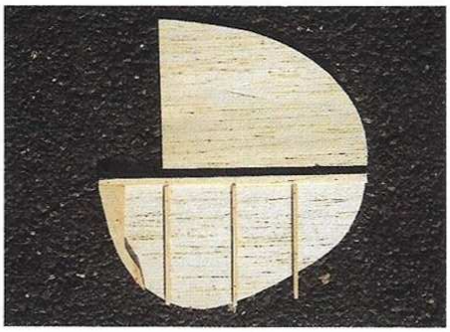
Don't forget the aluminium tube dowel that fits into the front of the centre section to complete the wing mounting. The struts that are shown on the drawing are to the actual length, but will need some adjustment for individual models.

Flattened brass tubes are epoxied to the struts giving an effective method of fixing them in place. A small bracket at each side of the fuselage fits inside the tubes and the struts are held in place with a 10 BA bolt. Small plywood pads should be attached to the wing locating ends of the struts and small self-tapping screws used to hold them in place. This must be done with the wing in position.

The fuselage is a simple box and I would suggest that it is built in three pieces, nose, mid-section where the wings fit, plus a rear section. It is possible to build the fuselage in one piece using two basic fuselage sides built directly over the side view joined with cross pieces. However I think modellers will find it easier to complete the three individual portions and, after assembly, butt join them together. The removable windscreen portion can be built in place after initial assembly of the fuselage.

On the prototype model this was a rea-

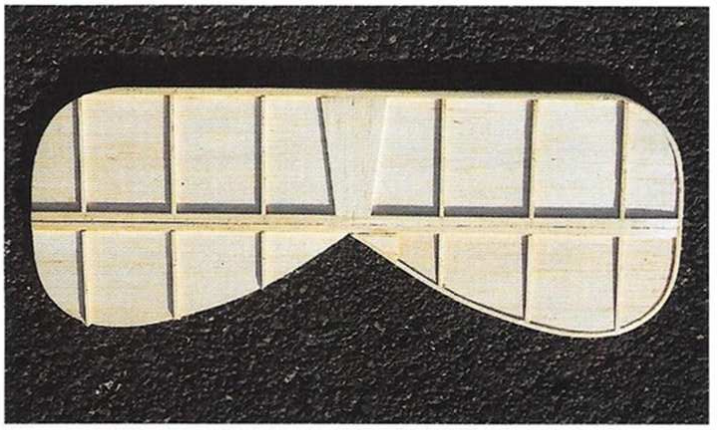


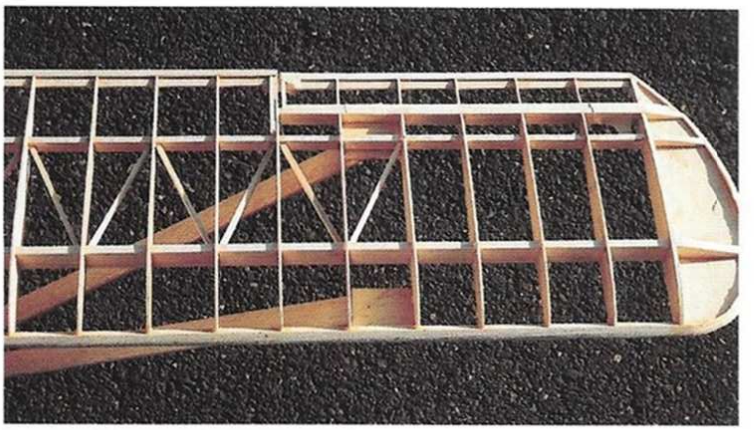


ABOVE LEFT: The nose section, showing circular motor mount at the firewall.

FAR LEFT: The removable cockpit hatch that provides good access to the internals.

LEFT: The basis of the fin and rudder, each build up on sheet balsa centre cores.





ABOVE LEFT: The completed, uncovered tailplane and elevator, built up over a sheet balsa core outline as per the fin and rudder. ABOVE RIGHT: The finished wing skeleton ready for covering. Phil used tissue to cover this model in preference to the commercially available heat-shrink coverings so widely used these days. RIGHT: Detail of the wing strut anchor points on the underside of the uncovered wing.

sonably tight fit and it does not move in flight. The best way to fix this item in place is to use a couple of the small magnets that are now available if you are worried about the fit. The stringers are fitted to each side of the fuselage where shown, but note that they are flush with the upright where they start aft of the wing and fit outside the uprights as they move to the tail end.

The tailskid is from wire, bound in place on a plywood mount. The motor mount is from plywood and this will vary depending on the type of motor used. The photographs give an idea of how the motor was mounted in the prototype model.

One of the features of the Velie Monocoupe is the open radial engine. The model will not look right without it and the cylinders should be made from balsa and plywood discs to give the effect of the fins. Balsa rocker boxes can be made with aluminium tube push-rods. The exhaust pipes and inlet pipes can be made from plastic tube. I did have a number of small *Williams Bros.* Wright Whirlwind cylinders and used these for my dummy engine.

I also used *Williams Bros.* commercial vintage style wheels for the model. These are quite heavy and it would be possible to use home-made wheels using balsa and plywood if you were having weight problems. The wire parts for the undercarriage are drawn out to the correct shape. They can be bent easily in a vice or with big pliers and should

RIGHT: The lower anchor point for the V-shaped wing structs showing the attachment to the fuselage lower side. BELOW LEFT: The finished, covered wing, respendent in yellow tissue, showing tghe wing strut attachment and the aileron servo link. BELOW RIGHT: Tailskid is a simple piano wire arrangement.

BELOW LEFT: The Cockpit windscreen access hatch - a very neat access arrangement. BELOW RIGHT: Servos, Li-Po battery and motor speed controller under the windscreen hatch.

ABOVE LEFT: Countersunk wing retainer bolts at the wing rear centre section. ABOVE RIGHT: Detail of the aileron, that is top surface hinged.

be attached to the fuselage with epoxy and thread binding.

At the present time there are quite a few lightweight covering materials on the market. I have never found them completely satisfactory and so, for this model, I have reverted back to tissue. As I mentioned earlier, I am in the fortunate position of having a good stock of very old *Modelspan* tissue and have used lightweight yellow for the wings and tailplane, with heavyweight black for the fuselage and fin. If you decide to take this covering route, other good quality tissues are still available.

To attach the tissue, use tissue paste (if you can find it) or thinned PVA white glue. It might also be worth considering a combination of film and tissue if you are worried about the durability of doped tissue. The tissue was applied damp and given three thinned coats of clear dope after it had shrunk and dried. One advantage of using tissue is that there is no need to add colouring, thus keeping the weight down.

The licence numbers were cut from black tissue and doped in place, while the Monocoupe logo was kindly done for me by Gary Protheroe using computer printed waterslide transfer material.

I fitted a small battery box in the front of the fuselage to carry the LiPo battery. The speed controller is out in fresh air where it keeps cool. I used a standard PPM receiver and small Hitec HS-81MG servos, but might change it to a 2.4 GHz system.

One servo, fitted at the centre of the wing using bellcranks and pushrods, can be used to drive the ailerons, but the prototype model has a servo in each wing, driving the ailerons via short pushrods.

The elevator uses a 16 swg wire joiner with an 18 swg brass horn silver soldered in place. The rudder is actuated by a closed-loop system to a GRP horn in the rudder; the drawing shows the shape of this and the aileron horns. If two servos are used for the ailerons, it is an easy task to programme them for differential movement, in this case more up movement than down. About three to one is ideal.

The model should balance where shown on the drawing; move the radio equipment about to achieve this.

In the air

The flying performance is very good. On the first flight, it was just a matter of opening up the throttle and watching for the torque effect. There were no problems when the model was in the air, with a touch of right trim getting the model to fly straight and level.

Flying was cut short on the first mission due to the motor coming loose. At first I thought it was my mounting, but after tightening the screws to no effect I had to call it a day. Back home I found that it was a small securing grub screw in the motor that had worked loose. With this tightened up, there have been no further problems.

The Monocoupe will do mild aerobatic manoeuvres; loops, stall turns etc. but is more limited when it comes to rolling manoeuvres. I might have to try altering the throws to improve things. The model is however great fun to fly and it will fit into the small car fully rigged.

The Monocoupe is easy to build and not expensive to construct or equip. If you want a small scale home-made scale model, this might be just the machine you are looking for, give it a try. ■

WELL WORTH THE EFFORT IN THE END! Phil had doubts about it all when he began the resurection of the basic airframe the he acquired - but it all worked out fine in the end!