Anderson Greenwood 14

A semi scale 51" model designed by Robin Fowler for direct drive 500 'Buggy' motor or a modified Mini Olympus gearbox and two 400 motors

The AG14 is an attractive little model... ... from any angle!

It's got potential!

I came across the Anderson Greenwood Model 14 in a book of Paul Matt drawings, lent to me by a fellow club member and it was one of three for which I had an instant liking. I was soon cutting another piece from my roll of tracing paper and pinning it to the drawing board. As I scaled off the dimensions and translated them onto paper at a suitable size I admired the lines of this small aircraft. The pusher configuration with the engine nestled into the space at the rear of the fuselage pod appealed, as did the twin boom and tricycle undercarriage. Here was a nice little package of model potential.

The original had a span of 34' 7", a length overall of 22' and a wing chord of only 42.5". This would have to be 'adjusted' in the interests of a viable model and the flaps, which took up the first 55.3" of the control surfaces outboard of the booms, which would be added in to the available aileron length, thus reducing the aileron throws required. These were the only deviations I proposed to make at the outset, but in the event, a mis-measurement of my own drawing resulted in my bending up the main undercarriage legs so that they were too long by about an inch, thus increasing ground clearance.

I decided this was no bad thing, apart from the slight added weight, as I was not sure what power I would be using. I had drawn the AG14 up to use a 500 buggy motor on six cells, but I had recently taken two 400s linked to a single Mini Olympus gearbox out of another model and this would fit into the airframe ideally. The downside of this installation however, would be that I may have to use a larger than scale prop, but now that I had the added ground clearance, this ought not to present an insurmountable obstacle.

One further modification from scale arose early on. The wing section, which should have been NACA 4418, would be translated into a flat-bottomed section of similar thickness for ease of building.

Structure

The main concern I had was for torsional rigidity for the wing root areas that would have to carry stresses from elevator control movements delivered to them by the booms. The booms themselves could be made very strong by using Cyparis for top and bottom with sixteenth ply sides. A little heavy perhaps, but the booms were of small cross sectional area and I doubted if even solid balsa (with grooves cut out to take elevator snake and aerial conduit), could stand up to the loads - especially in landing.

The wing roots would be fully skinned with medium hard balsa with Cyparis for top and bottom spars webbed on both sides with 32nd" ply. An early decision was to have the model basically of one piece, but to have wings outboard of the booms removable. This then required building in brass flat rods positioned vertically for rigidity in the outer ends of the root section locating into a tube in the corresponding ends of the outer wing sections.

The fuselage pod would be hung from the wing by liteply sides and a liteply floor provided to carry the battery pack, servos and receiver. I would clad this with ordinary builder's foam to sand to the shape required, which would be tricky to achieve by balsa sheet. Balsa sheeting is never a process I relish as my efforts normally land up showing every longitudinal joint. Maybe I should use more sandpaper and a different wood glue, but then why bother? The foam solution's only drawbacks lie in its ability to spread itself thinly over a wide area in the event of a sudden impact with something hard, and disappear altogether on contact with cellulose thinners. Since this model was going to be finished in silver Solarfilm I would just have to make sure I didn't apply too much heat with the iron or I would undo any good I managed to do with the sanding block.

Let's get building...

First to get attention was the fuselage pod and the four bits of liteply, which interlock to create the basis for further construction. These were soon glued together and setting while I bent up the undercarriage wire. Every time I set to with wire firmly in the vice and vigorous application of the iron persuader, the racket broadcasts the fact that I still haven't bought myself the wire bender I tell myself would really be a good idea for the next model. Such are promises!

The saddle clamps were quite easily made from some scraps of brass sheet cut to shape, then laid across the vice with a gap between the jaws about half as wide again as the wire to be clamped. A bit of said wire is then laid across and hammered down into the gap and in seconds the clamp is ready for drilling. Simple! I won't tell you how long it took me to come up

FREE PLAN

with that simple solution but the thought sprang to mind that the first monkey was probably mailing the first chapter of Hamlet to his agent about that time.... Er, where was I? Oh yes - not very far yet.

The wing roots were built on by sliding the lower spar, marked with wing rib positions, through the liteply sides followed by the top one. Once dry the ribs are added, then leading and trailing edges, all in the air, checking regularly for true. Control snake outers are installed at this stage. The booms go, in minus the outer sides so that the control snakes can be run down them and the spar thickeners installed to overlap the wing spars.

Once the outer sides are added the roots can be completed to the wing joins. The joining rod fixings have to be done before the spar webbing is completed for obvious reasons. I used a brass flat section and beat a couple of thicknesses of aluminium tube onto them for the outer section sleeves. A groove filed in the top allows an 18 SWG wire clip to locate them, so a wing doesn't come adrift in flight. This is pushed into the bottom spar of the outer wing section that has the tubes.

In my usual manner I allowed my box of scraps to direct my construction at various stages, so the wing tips used a bit of three quarter inch leading edge left over from one of my spitfires of ten years ago. Some scraps of quarter inch sheet also came in handy to the rear of this. Apart from these minor deviations from the drawing all was as drawn.

The shaping of the fuselage pod using sandpaper on builder's foam caused a need for lightweight filler as it pulled so many beads out, and this suggested to me that blue foam would have been better. I used a small piece for the nose and sanding was indeed much easier. Adding Solarfilm confirmed that this would have been easier to finish throughout, as the finish was far better even after the filler had been used on the rest. Blue foam is slightly heavier and stronger, leading me to wonder if much of the liteply could be omitted if it was used for all of the pod. The problem would then be in carrying the undercarriage, so it's probably as broad as it is long. With this experience to hand I therefore used another bit of blue foam for the front section of the cockpit hatch and was pleased with the result.

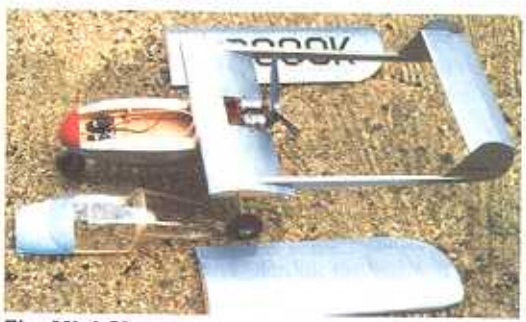
The large cockpit moulding was a couple of inches beyond the size which would allow my larger vacuum forming rig to be used, so in the absence of a 3-litre plastic bottle I settled for using two 2-litre ones. I cut a slit down the sticky side, so as to get the bottle over the girth of the mould and tacked the edges down to the back of the mould with my staple gun. Being careful not to play the hot air against the back, which I knew from experience would result in the staples heating up very quickly and melting their way through the plastic as it shrank. I surprised myself by getting a good moulding of all but the front screen.

This was easily formed from half of the other bottle and I then only needed to cut the two parts with a small overlap to have the whole cockpit sitting in my hand. I fitted the framework to it, adding the formed piece of blue foam once I had covered the section of it that came within the cockpit. In the course of covering the completed item in silver Solarfilm however, I lingered too long in places with the iron and distorted the moulding, thus ruining the sweeping lines. Oh well, as I often comfort myself by saying at times like these, if the model had been perfect (I should be so lucky!), I would not dare to fly it!

All I needed now was a wire clip to hold the canopy on and I could complete the electrical installation. A couple of inches of 18 gauge wire was cut off and bent up, then poked through a hole in the canopy former (suitably reinforced with balsa doublers), and the airframe was complete. On with the wings and let's have a look at her. Hmmm! Nice - apart from the dents in the canopy top - and very distinctive with twin booms and pusher engine position. The two holes in the nose for cabin fresh air added to the look even though I had enlarged them to about double their proper size so as to increase the airflow over the battery pack. This I had done with a soldering iron, the bit of which was about the right size. The engine air intakes under the wing roots were also satisfactory, for their practical cooling function as well as for their scale look. Out with the camera for a few on the ground shots. Now what about the final bits and pieces?

A close up of the wings center panel, note the use of Cyparis for the spars and the booms.

The traditionally built outer wing panels utilise brass joiners.

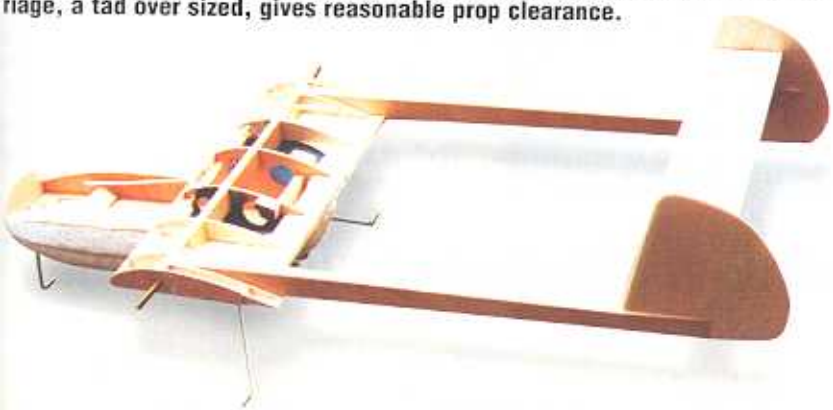


The Mini Olympus gearbox simply modified to take two 400 motors fits very nicely - almost ready to go.

Final installations

The speed controller would be closely coupled to the motors, although longer wires would be required for the battery connections so that they were accessible. The pack of six 2 amp-hour cells (Overlander ex camcorder pack, £5.95), fitted with light duty gold plugs and sockets from Mike Donkin (75p - not Mike, the pair of connectors!), was attached to the cockpit floor with Velcro. A modestly sized piece of high impact packing foam

The aerial tube and the elevator snake are routed though the boom. The undercarriage, a tad over sized, gives reasonable prop clearance.



was glued to the floor ahead of the batteries as a further safety measure.

Those wing root air intakes came in very handy for another purpose at this point. It took me a while to figure out that the only place where I could position the on/off switch, so that it was operable from outside without removing the canopy, was on the underside of one of the intakes. Since I am used to hand-launching my own models and am right handed, I have got into the habit of positioning the switches of all my models on the port side. This way I can give it a last visual check the moment before launch to check that I have not inadvertently brushed it to the off position. I did do that once many years ago with a thermal soarer and have been determined not to have to suffer the same feelings of frustrated helplessness, as I watched the uncommunicative glider listlessly climbing away on the bungee. I was praying that someone up there would take control, since I was now struck out of the equation. It seems that 'He' might have done just that, although these things by nature are incapable of any kind of proof!

My habit of launching with a little up elevator trim, which I would immediately centralise when the line dropped, meant that the glider was not trimmed to fly away into the distance but entered a series of sickening stalls and swoops. It was now only a question of what speed and angle of entry would pertain at the inevitable moment. In the event I found myself relieved to find so little damage. Presumable the relationship between height achieved off the top divided by the average height lost at each swoop had been favourable, although it was probably just another of life's unfathomable mysteries! Anyway, to return to the plot, the switch therefore was placed in the underside of the port intake close to the fuselage so that, should I have to try a hand launch at some stage, it was clearly visible.

Last to go in would be the GWS micro receiver. There was only one possible position for this. As the battery pack had been moved a little forward to get balance right, reducing the space available between it and the servos in the nose, the receiver would have to sit just above it. Here the most delicate and vital part of the system would be safe from the threat of the most dangerous bit becoming the heaviest, in the event of an emphatic arrival.

The blue foam decking is simple to produce.

Now that the model was ready for the air it was time to check out the numbers.

Despite the increased wing area the loading had risen to 21 ounces per square foot, which was more than I had hoped, but not necessarily such as to preclude the possibility of achieving pleasant flying.

Did I say the model was ready for the air? Well there were still some changes to be made. I had installed two old (and heavy) Sanwa mini servos which, confronted by the wing loading noted above, suddenly looked like a bit of an extravagance. Also, I realised that as I was using a GWS receiver (because of its lightness and cheapness), I would have to swap over the black and red wires in the servo plugs so as to connect to it. Now I had two good reasons to change the servos for modern lightweight ones, that would hopefully sneak the wing loading down a touch. So out came the old and in went the new.

Ground test

With all set to go once more I took the model out to the lawn (recently mown) and started her on a run down the longest stretch I had. The model sounded sweet but crept along with a carelessness that showed no intention of gaining airspeed. I shut down and went for my bag of props. Funny - the three blade job seemed good on the static test. A few prop changes later I had landed up with the same eleven by seven and three quarters Kavan prop I seem to use on half my designs.

The AG14 now had acceleration that looked much more lively. Promising even. During the course of this procedure I noticed that the sound had become more what I imagined the full size aircraft would have sounded like - but much quieter of course. I knew what had happened; the effect of the interplay between the blades and the trailing edge, unnoticeable with the three bladed prop was much more marked now that two larger blades were passing the trailing edge at the same moment. It gave the sound quite a beat.

In successive runs I found that the tracking of the wheels was not quite true. This would need a small tweak, but much worse was that the eccentric load on the aileron servo meant that it wobbled alarmingly from side to side, pivoting on its two screws. This gave most unreliable amounts of travel at the ailerons. Something would have to be done, and that something looked like involving one of the Sanwa servos I had just taken out! Oh well!

One Sanwa 321 servo was reinstalled and the ailerons were working properly. I reduced the throws some way from maximum because the ailerons on the model included the outer flap sections of the full size, so it should have loads of power in hand. The tight curves in the control cables introduced a lot of friction into all movements so that it soaked up servo power to start with. I tried to reduce this by feeding some 3 in 1 oil down them. Perhaps I should have used bell cranks? It might have been a little lighter too.

First Fright!

No! That was not a spelling mistake, nor a Chinaman's mis-pronunciation! It was only just long enough to call a flight, although there are flights and flights. The model did indeed sustain itself in the air, but I don't really reckon it's a flight unless it's of over five minutes duration!

Unable to achieve airspeed from a run along our grass strip (which has received far too much at the feet of a herd of cows after the rains of early spring), I hand-launched with due deference to the prop whirring inches from my right wrist. The model flew away happily enough without any apparent problem beyond a reluctance to climb until I decided that I had better turn or she'd be too far away. She responded to the command to turn to port eagerly, but then refused to do anything else. That aileron servo had jammed. The ten feet of altitude I had achieved vanished in the blink of an eye and suddenly it was all over. Outer wing sections fluttered into view above the weeds and disappeared again. All was silent. I went for a short walk wishing I had remembered to bring a plastic bag.

Arriving at the spot(s) I found that things were far from being as bad as I had at first supposed. The outer wing panels had only sustained the loss of the sixteenth inch ply horns from the ailerons and even the fuselage did not appear too badly bent. The blue foam nose had soaked up most of the shock left over from the nose leg's attempts at damage limitation. The hatch had flown clear as the batteries had released themselves from the clutches of the Velcro and unplugged themselves, and the only other damage was that the motors had come loose.

I had to cut out part of the upper wing to glue a bearer back in place, but repairs probably took only about an hour all told. The model was ready for the air weeks before either I or the weather was suitably prepared for.

'It would make a good aileron trainer'

'Here was a nice little package of model potential'

The 7 cell pack improved the AG14's flight performance.

Data file

Wing span:	51 inches
Wing chord:	6 inches (1" over scale)
Wing area (net):	271 square inches
All Up Weight:	2 pounds 9 ounces
Wing loading:	22 ounces per square foot
Width de-rigged:	15 inches (+ spar rods)
Length:	31 inches
Motors:	two 6 volt speed 400s (linked via adapted MFA Mini Olympus gearbox.)
Power cells:	seven cells, 2 amp-hour

First Flight!

Early one Sunday morning (well, before ten o'clock - what do you call 'early' on a Sunday?), I arrived at the field with the AG14 and called on the photographic skills of one of the other flyers. This was before most of the club flyers had arrived, which was a good time to make an exploratory flight (I don't like too much of an audience if I might make a fool of myself).

Pre flight checks done I flung it heartily. Full throttle was required for the whole flight and no great height was achieved. However, the model was admirably stable and only remained in a turn if held there. She just purred around happily. Dave clicked off a few shots while I stooged the model around at what I hoped was a photographable height, then I headed off to explore the flight envelope a little. Elevator authority was probably best described as 'adequate' but a loop of sorts was achieved on the second attempt from a good dive. There was no evidence of tip stalling, but I did not carry out a proper stall test, as I didn't expect to be able to gain enough height to do one safely in the time I expected to be left in the power pack. Neither did I expect there to be enough movement in the elevator to achieve one. I had of course forgotten to time the flight, but decided I had better land before I absolutely had to so as to get her down on the strip, arriving on terra firma with more than a minutes motor run left in the 'tanks'.

Now, after a sedate and pleasant flight I checked the trim positions. Ailerons were true, but the elevator was showing quite a lot of upward deflection that seemed to confirm that a little more power would be an advantage. It took the original aircraft half an hour to achieve its service ceiling of around 14,000 feet (if my memory serves me right), so maybe the model was not far off scale in that respect either.

Now we're cooking!

I took the six-cell power pack out and replaced it with a heavier seven-cell pack. This ought to give better performance. Next flight was made at the North London club's electric fly-in at Baldock, and the improvement in performance was very marked. The day was blustery and she rose from the ground without any problems. The model has no rudders (the full-size has only a rudder on the port fin, the starboard one being locked), but steering with ailerons was possible once a little speed had been gained. The climb-out was now good and I was soon throttling back. The wind proved to be no problem and a pleasing flight ensued. The landing showed that a little more up elevator movement would be an advantage as I was unable to flare out properly, but this didn't stop me making another flight without making the intended adjustment.

So?

The AG14 received a lot of attention at Baldock. Everybody seemed to be asking what it was. I like it anyway and reckon messrs. Anderson and Greenwood did a good job (I wonder what model numbers 1 to 13 look like?). It is a nice little model to fly and will gently return to level flight in roll axis if a touch of aileron is not held on. It would make a good aileron trainer.

Some interest was also shown in the linking of two speed 400 motors. The Mini Olympus gearbox is quite easy to adapt for this purpose. It is best to dismantle it first. A scoop has to be taken out of the faceplate and a single screw hole drilled by which to fix the second motor. A scoop also has to be taken out down the shaft length to allow the motor to sit tight to the shaft. A second output pinion has to be obtained (for a modest outlay), then the gearbox can be reassembled with two motors instead of the one for which it was designed.

Flight times are averaging just under ten minutes with this setup, but I have recently installed a seven cell pack of 800ARs, which give fourteen minutes in the air.

The plan has been left as designed however, and no mention is made of this power source as most people would probably prefer to use the single 500 direct-drive motor as designed. This does of course allow scale prop and undercarriage sizes to be used.

As usual, I would be happy to supply you with cockpit mouldings if you send a fiver in my direction. There's precious little else that could present the average modeller with problems. Worried about blue foam? Don't be. I just glue mine on with Copydex or even wood glue and sand it to make those lovely curves! Oops! My mind's wandering again! I'd better sign off!

Happy modelling.

RCMW

Robin Fowler

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