AIRTRONICS

SAGITTA 900

In-depth review by KEITH THOMAS

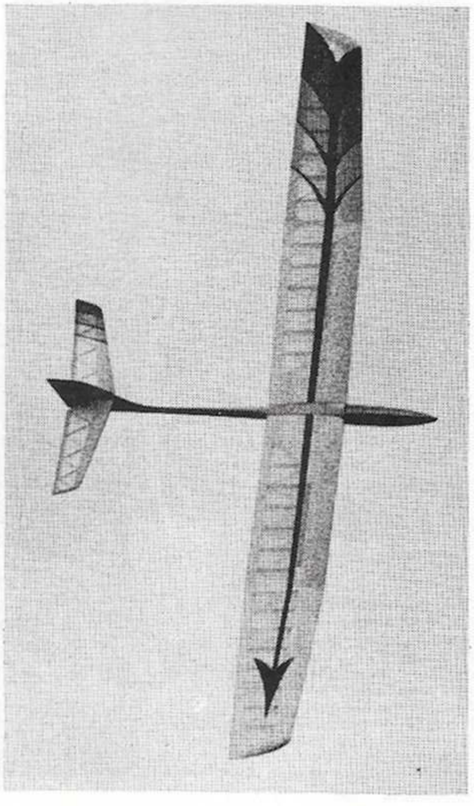
SAGITTA is an American glider of orthodox American appearance, with a polyhedral wing of low aspect ratio, slim fuselage, 'balanced' rudder and all-moving tailplane. Designed by the well-known Lee Renaud, the model is billed as a "standard class R/C sailplane for multiple task soaring competition ... for thermal or slope flying." It is 99in. span, has 900 square inches of wing area (which excludes it from British '100S' competition) and flies at a basic wing loading of around 7oz/square foot. Wing section is the fashionable Eppler 205, the bottom of which is flat aft of the maximum thickness point, and curves up towards the leading edge.

The rugged kit box is surprisingly small for a model of this size, but there can be no doubt that this is a very complete kit. All wood parts are supplied sawn to shape and sanded smooth — there are no die-cut components — and many of them are of hardwood or ply. A number of plastic bags stapled to the box side contain small wood parts and a generous supply of hardware, including self-adhesive lead weights for the spoilers, an Allen key for the tailplane retainer screws, and a length of dense, self-adhesive rubber strip for a landing skid, in addition to the customary rods, tubes, quicklinks etc. An unfortunate omission is the tailplane actuating link; unfortunate, as the item specified is not readily available here. More of this anon.

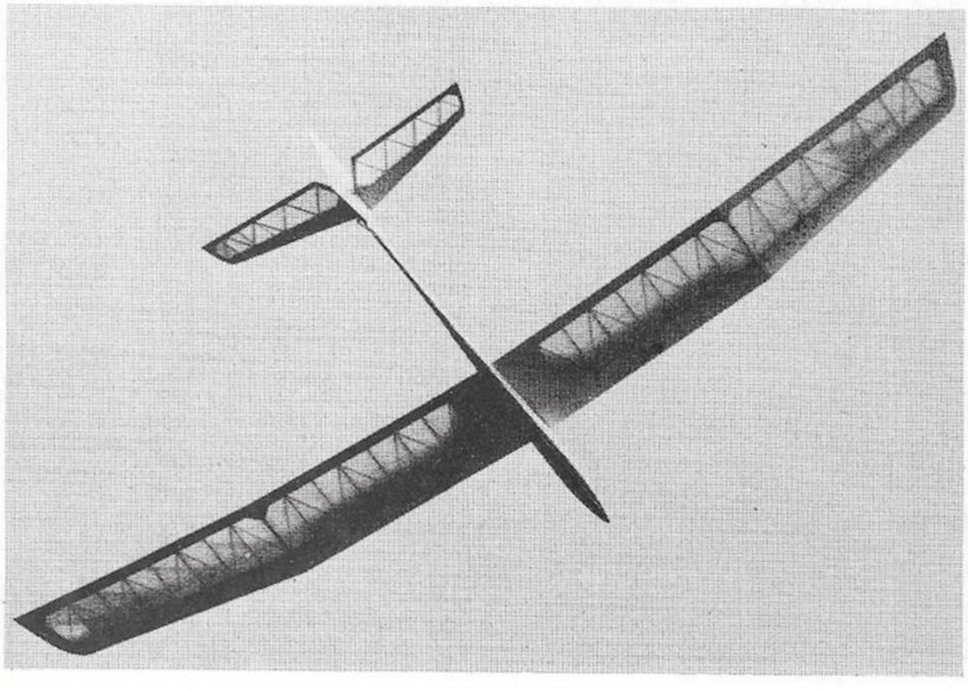
Initial study of the (rolled) plan makes it clear that the designer tolerated none of the compromises generally associated with kit production, and must be complimented for this. Examples of this philosophy are the spruce TE cap to all flying surfaces, which allows a sharp trailing edge to be achieved, and the intricacy of the tail surfaces; the rudder has no less than 18 components. Such attention to detail would be wasted if the quality of the wood supplied were not correspondingly high. I had few complaints in this respect. Although the wing ribs varied from soft to very hard, and it is worthwhile sorting them out with the heavier ones closer to the root. The important wing sheeting — eight pieces in all — were well matched in my kit. I would have picked lighter wood for the tip panels had I been scratch-building, but the wood supplied was by no means heavy enough to require replacement. My overall impression of the kit contents was highly encouraging.

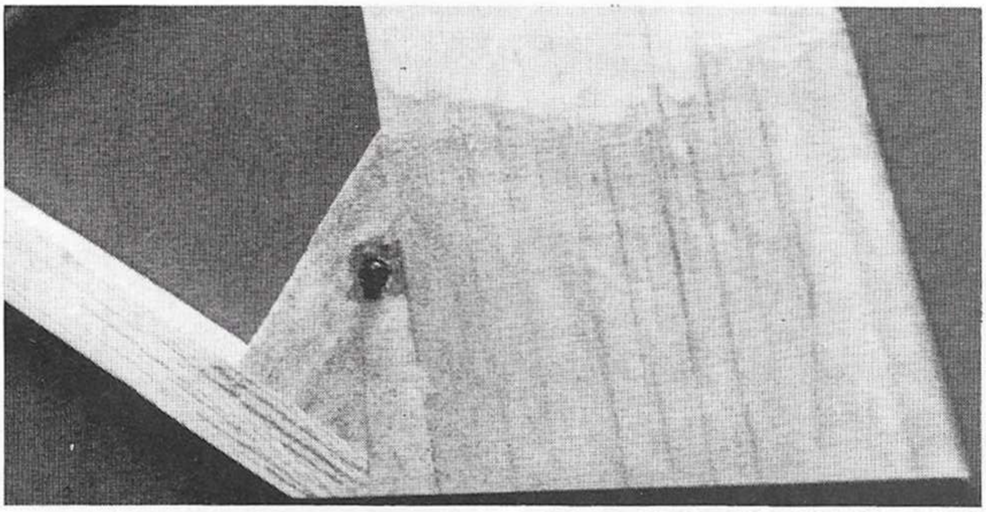
The arrow's notched

I made the tail surfaces (I rush these items if I leave them to last), and encountered no problems. The spruce TE cap strips do make sanding tricky, and it is as well to perfect your technique on the tail before tackling the wings. I joined the two strips and used a razor plane with a new blade on its finest setting, to reduce the spruce to the required taper before gluing the TE to the structure. This is contrary to the instructions, but I could imagine the diagonal braces flying in all directions otherwise. In either case, it is a good idea to hold the TE down on the edge of a flat board with scraps of double-sided sellotape for the planing and sanding operations. The tailplane is built in one piece, complete with joiner tubes, then divided later. Accurately pre-cut hardwood tube carriers make this stage of construction foolproof. A notable feature is the inclusion of a joiner wire clamping system. This takes the form of wheel collets with Allen-head grubscrews. Laudable though this feature is, I encountered two little problems with it. The thread of the collet has to be continued through the brass joiner tube, and the thread is the American 4-40 type. I found that a 6BA tap could be run through the collet and the tube, and the grubscrew supplied would still hold, although a simple clearance hole in the tube would probably be preferable. The second little problem is the Allen key supplied. It is made of very soft material. Do not overtighten those screws! The finished tail

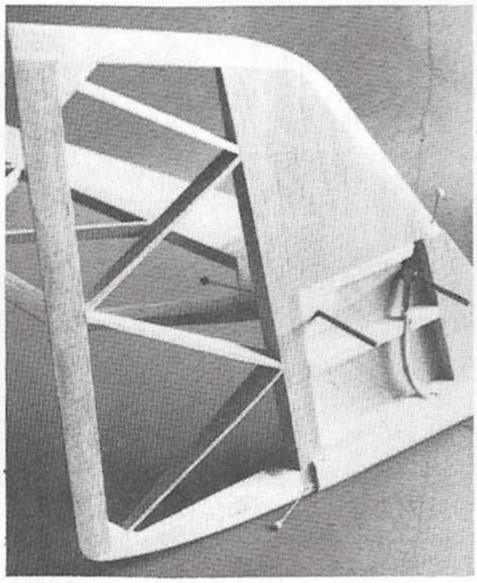


In flight! Built up wing structure with Warren-type diagonal bracing is clearly revealed by the light shining through the wings. (Natty motif, too).





Tailplane root (above) has glass reinforcement. Dark blob is tailplane retaining grubscrew. Actuating mechanism is shown right.



surfaces are light, have good anti-dent properties, and are amply rigid.

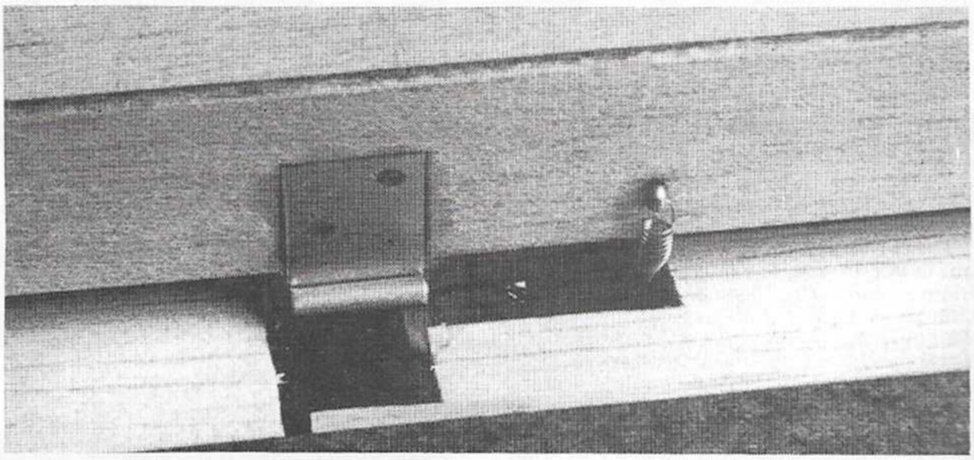
The fuselage is a remarkably rigid structure, consisting of full-length ply sides, ditto bottom, spruce longerons, ply formers and balsa triangular fillets at all junctions. The top decks are thick balsa to allow shaping. All parts fitted precisely, and the suggested procedures worked out well. Remember to fit the vertical former fillets — they are shown on the plan, but not mentioned in the instructions. I mention their omission because in nearly all other respects the highly detailed, logically arranged, well-illustrated instructions are exemplary. Stress is laid on the importance of anchoring the Bowden cable outers for the tailplane and rudder controls. Lost motion in the curved tailplane cable was just under 1mm, and for the straight rudder cable about half the amount. As mentioned earlier, the tailplane actuating link is not supplied. I made up a brass T-piece; an alternative is to drill out the brass ball of a ball-type clevis to take the wire. The extreme slimness of the fuselage rear end would not have permitted pushrods, but closed loop would be possible for the rudder. The front hatch (there are two) is supplied as a huge slab of balsa, which in my case was pretty hard wood. A small amount of nose ballast is required, however, so a little excess weight in the main hatch just reduces the nose ballast requirement. The hatch arrangement is very clever. The rear hatch hinges up from the rear to expose the spoiler servo, the rear ballast chamber and the wing retaining spring, and it is held closed by a dowel in the front hatch, which is removeable. I wish I'd thought of that! Fuselage construction took 11 hours.

An important point to note before starting on the wings is that the port wing must be built first. This is because the plan shows the internal construction of the starboard panel, and the top sheeting arrangement only of the port. Consequently you will cover up all constructional information if you build the starboard wing first. Three guesses how I found that out! When you have built the port wing, you can refer to the completed panel when building the second.

The wings have many unusual features. The bottom spruce spar is flush with the LE sheeting, while the top spar is below the sheeting as normal. The LE is a spruce strip machined to the correct section. It is usually difficult to sand a spruce/balsa junction, but in this case the difference in materials is a positive aid. The overlapping balsa sheeting is planed and sanded down until the spruce is reached. You are then ready for final sanding. The spruce TE cap has already been mentioned. The usual form of spar webbing (front and rear, forming a box spar) is replaced here by hefty, vertical grain balsa webs fitted between the spars, forming an 'I' spar. The webs step down from ⅜in. (root) to ⅛in. (just past the polyhedral break), and undoubtedly contribute to the immense rigidity of the wings. The wing joiner system is also unusual. One short, fat steel rod is employed, which leaves a scant 2¼in. inside each wing. The tubes for this substantial rod are housed in pre-shaped pine carrier blocks, grooved to set the correct dihedral. The blocks are wider than the main spars, which means that the ply webbing doublers only reinforce the block/spar web joint on one side, which is a pity. Nevertheless, the wing structure is strong and rigid, and certainly repays the considerable effort in building it (30 hours). I was surprised to see that the ⅜ × ⅛in. spruce main spars are continued right through to the tip. Some reduction in cross-section might be expected here, and the oversize spars and medium-weight balsa sheeting result in wing panels with a less than ideal weight distribution. I incorporated ⅛in. of washout in the tip panels; the instructions state "a small amount of washout is okay." The fit of the wing components was generally good; just the tip panel ribs needed trimming.

Spoilers were installed as suggested (all parts are supplied), and were hinged with the 'Slic-Tac' supplied. This is a self-adhesive tape of a very thin plastic material. The tape is pressed into place, and the action of the hinge checked. A cool iron is then passed briefly over the tape, and the adhesive becomes permanent (I hope). I must admit to fitting coil springs instead of lead weights to close the spoilers, as I had the intention of flying the model inverted. The wing section looks as if it will cope with such an indignity, although I have not tried it yet. The spoiler installation is simple, works reliably, and is the best I have encountered to date.

I glassed the fuselage as suggested, but substituted tissue for the Monokote recommended on the flying surfaces: heavy on the wings, light on the tail. Watch that the covering does not pull the thin trailing edges out of shape.



A spring was fitted to close the spoilers on the review model, as inverted flight is anticipated, instead of a small lead weight.

Shoehorn time

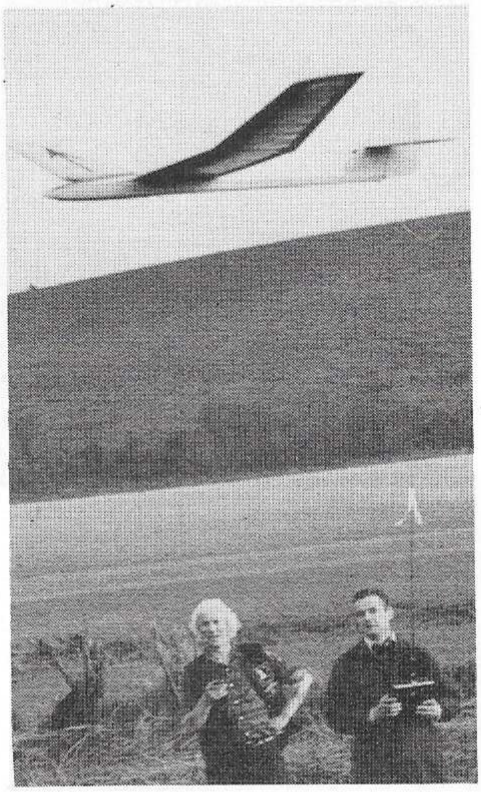
Fitting the radio presented a number of problems, all of them a result of the limited space available. The components all went in eventually, although not exactly where indicated on the plan. Owners of modern subminiature radios will find the job easier than I did. I was forced to use a large servo for spoiler actuation, and this effectively prevented me installing my intended releasable towhook where shown on the plan. The indicated position is almost directly below the C of G, which looks like an invitation to trouble. I fitted the servo-operated hook just in front of the next ply former, but in order to test the designer's claims, I also glued a hardwood block to the ply fuselage bottom to take a screw-in hook at the recommended position. Each spoiler cord was terminated in a crimped cable connector, the eye of which fits over a brass eyelet screwed to the servo output disc.

Three ounces of lead were added to the nose ballast compartment to bring the C of G to the point shown on the plan. This brought the all-up weight to 42oz which is the bottom end of the weight range stated on the kit box lid. The wing loading at this weight is 6.8oz/sq.ft.

Up to this point the model had swallowed up 60 hours of my time, 15 of which had been devoted to covering, finishing, and gear installation. I found construction to be enjoyable and rewarding; the comprehensive instructions, clearly drawn plan and good quality materials all contributed to a feeling that the final result would be worth the effort. If I could wish for one basic improvement, it would be for the parts to be numbered; finding a particular component from its description can be time-consuming.

Go for a gold

The building instructions include notes on flying specific to the *Sagitta,* and a separate



Going up . . . coming down. Viceless handling apparent in both situations.

booklet on general flying techniques — thermal and slope — is also included. From the abundance of information it is clear that the designer has actually spent a lot of time flying the *Sagitta;* not a feeling that I always get when reading kit notes.

First flights were made from the local slope in conditions more suited to courting than slope-soaring. Warm sun, almost nil wind, not a soaring bird in sight. Nevertheless a strong launch gained enough height for a wide circuit before landing, and on one circuit I was lucky enough to see a wingtip wobble encouragingly. The weakest of thermals took *Sagitta* up to a fair height, and I had ten minutes of pleasurable tip-toe flying before the lift evaporated and dumped the model back down again. Down at the bottom of the slope, I'm ashamed to say!

Further flights in slightly better conditions confirmed my initial impressions — this is a docile, easy-to-fly glider with no nasty habits. In 'light' conditions *Sagitta* can be floated around at very low speed, reacting nicely to little wisps of lift. At very low speed the rudder response is slow, as you would expect, but it is quite adequate for the gentle turns required to conserve height. The controls are well-balanced when set up as per plan, and the neutral pitch setting is also well within trim range. Coarse rudder inputs result in an ungainly oscillating yaw — don't blame the model, it's the pilot's fault. I found that continuous circling required quite a lot of rudder held in, but it proved fairly easy to hold the model 'on a wingtip' and fly tight turns without a spiral dive building up. With the washout incorporated as noted earlier, the model's stall was straight ahead and at low speed indeed. Repeated stalls with full up and full rudder thrown in eventually produced a lazy spiral dive with little speed build-up.

On a later occasion, a steady 10km breeze provided an opportunity to fling the model around a little. High speed runs were a lot of fun, and I pulled some high-speed turns to check the control response at the other end of the speed range. No problems, the model went where it was pointed at all times. My impressions of wing rigidity were confirmed by the fact that it was not possible to detect any wing deflection at all during this high-speed testing. The rudder response is adequate rather than rapid, and there is quite a marked tendency to stay in a given attitude. For example, once set up for a turn with around 10 or 15° of bank, the model will continue to turn through 180-270° with the rudder neutralised before straightening up of its own accord.

The spoilers were tested next. Pulling them out to 90° in one movement will give you a fright — don't do it. The nose-down pitch trim change is sudden and severe, and needs about half back stick to correct. If the spoilers are brought out gradually however, they become much more easy to handle. Surprisingly, the first 30° of movement have little effect; my *Sagitta* happily gained height in gentle slope lift with the spoilers at this setting. From about 45° upwards spoiler effectiveness rapidly increases, enabling height loss to be controlled quite accurately by opening and closing them slightly. Elevator has to be juggled at the same time, of course, to keep the fuselage level, but even with the spoilers fully deployed and lots of 'up' held in, there is no tendency to tip-stall, or indeed to stall at all. I enjoyed this phase of testing so much that I spent an entire afternoon trying to knock a handkerchief off a thistle on landing. I won't disclose my success rate, but nor will I blame the spoilers — they were great.

A word here about ballast. Two chambers are provided in the fuselage for lead, balanced fore and aft of the C of G position. Unfortunately my enforced re-siting of the towhook unit had used up one chamber, and I did not feel inclined to fit 20oz or so (recommended starting point) of lead behind the C of G. The designer states that he does not use ballast until the wind has passed the 15mph mark, and my experience would bear this out. Penetration is outstanding for such a lightly loaded glider.

I had no intention of checking the model's resistance to crash damage — that would be taking the reviewer's responsibility too far — but circumstances dictated otherwise. A colleague was flying the model at the slope while I was waving the camera about; I won't go into details, but all at once the *Sagitta* was heading straight for our kneecaps at high speed. Panic evasion measures (full up) resulted in a gigantic downwind stall, and my shiny new model dropped like a stone from about 15ft. Like any self-respecting arrow (*Sagitta* is Latin for that missile) the model stuck hard in the ground, but the only damage was slight compression to one wing root trailing edge where it had been pushed back against the fuselage. Not bad, eh?

A bungee session was held on a calm April evening to test the model's behaviour on tow. Using the rearward towing position shown on the plan, the model towed up perfectly straight, with no tendency whatever to tip-stalll or deviate to one side, in spite of provocation with up elevator. Several long flights were completed in the flat calm conditions, and the test pilots agreed that the model seemed to be more at home in this type of flying than at the slope, where its moderate rudder response is a slight handicap. Nevertheless in a club slope multi-task competition (loops, pylon racing, spot landing) *Sagitta* coped with a blustery 15-20km wind well enough to secure second place.

Summary

A no-compromise design offering high performance and ruggedness in a lightweight airframe. Good quality materials, thorough instructions, complete (almost) hardware set. Not a quick-build, but offers generous rewards for painstaking work. Good 'floating' performance, wide speed range, effective controls, alloyed with first-class handling. Highly recommended.

Distributor: Model Sailplanes, Cierra, Twinburn Crescent, Monkstown, Co.Antrim. Price: £47.95.

Very tight equipment bay, but with thought everything does eventually get in.