RAPIER

Pete Malone's "slim-line" multi—quick to build—and so economical.

WHEN I obtained my first proportional outfit, I was in something of a quandary as to what model to put it in to "convert" to propo flying, as no kits on the market at that time (something over two years ago), seemed to have the features I was looking for. Eventually, as I had by me a design of my own—originally intended for my old 10 channel reed outfit and a Merco .35 motor—I decided to build this. However, I no longer had the .35, so a Mk. II Merco .61 was bolted onto the front end instead! The model had a 56 x 11in. wing, with no dihedral, mounted on top of a box fuselage of ⅛in. sheet—and the finished article (for want of a better word) weighed in at around 5lb. Everyone said that I must be mad to attempt to learn to fly proportional on an unproven model, which looked positively lethal. As it turned out, on the first flight, after a ropey hand-launch, the good power-weight ratio paid off—and the thing just climbed out!

Ever since building that aircraft I have maintained that lightness is a prime factor, where performance and ease of flying is concerned.

One of my fairly recent designs has used a small—54 x 10in. wing but, after building and flying three of these models (and my friend one) we have "gone off" the idea of using small aircraft. It seems that tiny defects can have a magnified effect with smaller machines—for instance, the effect of a cylinder-head protruding from one side, with a "sidewinder" design (of which more anon). Motor torque also becomes less controllable, and a heavy glass fibre propeller can produce some strange gyroscopic precession. Actually, of course, small aircraft can be great fun for general sport and pleasure flying—let it not be thought that I am knocking them—but if you are concerned with contest pattern flying, they do have their limitations and one must arrive at a compromise when deciding upon the size of a projected model.

Design points

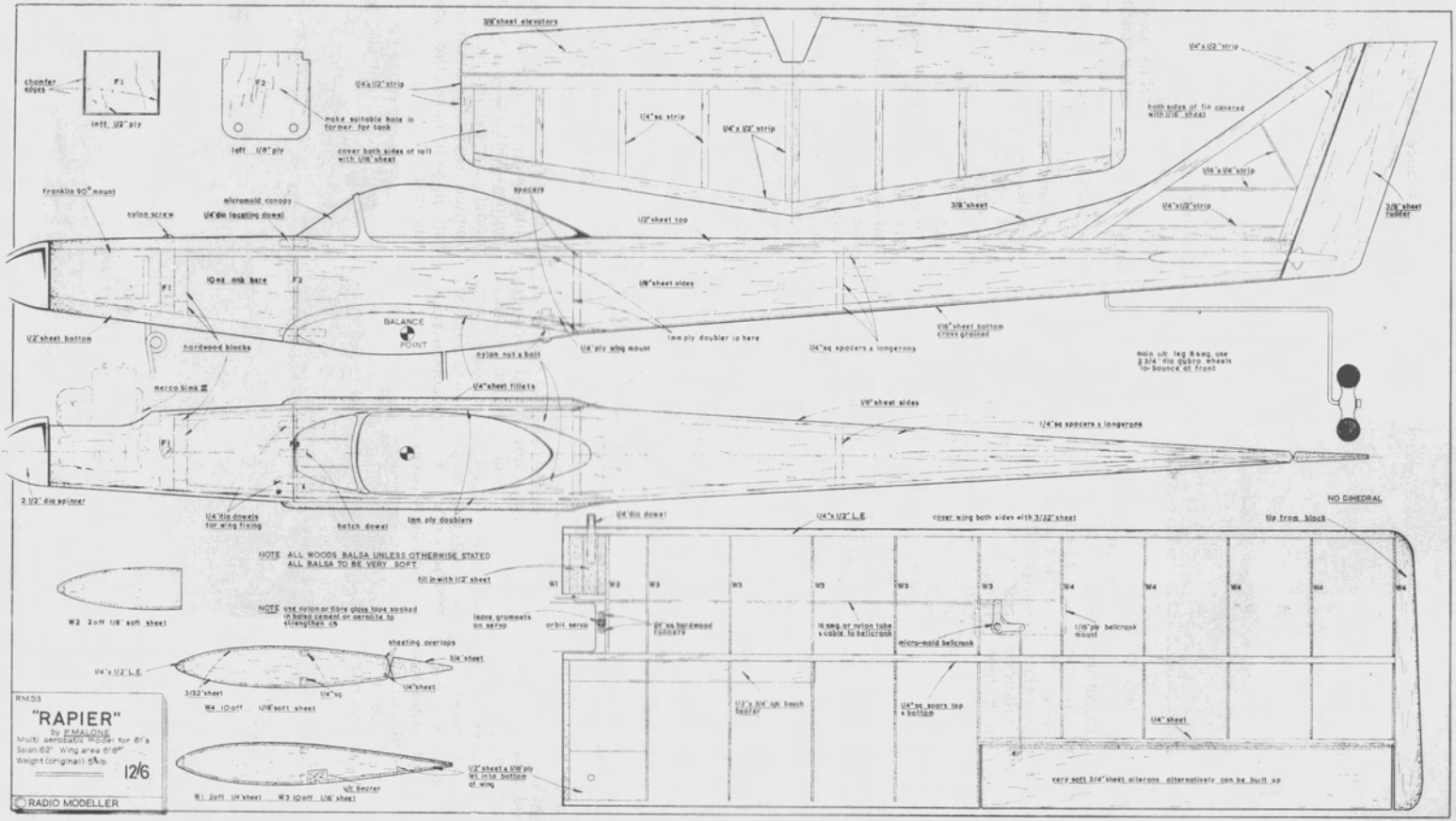
The *Rapier* was designed with the foregoing experience in mind, and the weight was kept to an absolute minimum. The original came out at 5¾lb., but no doubt some builders could shave several ounces off this. The fuselage was designed with the minimum practical cross-sectional dimensions; this suits my taste and, anyway, the less wood that's used, the cheaper and lighter the model will be. As a matter of interest, I actually attempted to bring the weight of the third model in the series up to over 6lb. to try out a pet theory, but I failed to do so and it came out at 5¾lb. again!

Weighty problem . . .

The theory was that a reasonably heavy model—say 6½ or 7lb. flies faster through the manoeuvres. It seems to me that momentum plays a larger part in most aerobatics than does the engine. That is, for the short time a model is in a climb during manoeuvres. This is borne out by the fact that when one applies rudder, despite the large amount of sidethrust, the motor has not enough effect to skid the model round in a turn unless it is flying very slowly and the motor is suddenly opened up. This is, of course, considering a model with no dihedral.

This brings me to an important point regarding trim, which I have only considered after reading Keith Jones's words concerning loops and outside loops. Although Keith's method cured the trouble, it did not, I feel, go right to the cause. The trouble usually is that both loops and outside loops finish up banked to the right. You correct the outside manoeuvres with aileron adjustment on the trim—and this makes the inside loops worse! What actually causes this trouble is unbalance. The wings might be balanced perfectly, but what about the 14oz. of motor sticking out of the starboard side? That is what actually causes things to go awry. Most models with balanced wings and a side-mounted motor balance somewhere along the starboard side of the fuselage. The G force acting through this during loops is considerable.

Now, I prefer a side-mounted motor in my machines, mainly because I feel it looks nicer than an upright one! It is also easier to get the tank position correct and makes the motor less liable to flooding when you're starting up, as the exhaust stack points



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downwards, and it's just as easy to start as an upright motor.

Bearing this in mind, therefore—balance not your wing, but the *whole model*—and ensure, by adding weight to the appropriate wingtip, that the model balances on its centre-line (i.e. on a line through spinner and rudder).

Cross hatchery . . .

Few people build hatches on the nose of their models these days, for access to the tank, for reasons of strength or—probably to a smaller extent—looks. What, then, happens if the clunk-weight falls off the tubing in the tank, or the fuel line splits, or ties itself in a knot or something silly like that? They have to remove the wing, take out the receiver, packing and Deacs, and remove the tank through the radio compartment to replace or repair the offending item.

The funniest bit (for the onlookers!) comes when the unfortunate flyer tries to get the wretched thing back in again and builds up his blood pressure something cruel trying to push the fuel line through the ever-shrinking hole in the front bulkhead. During this process, his eleven bob canopy has been squashed flat and he's lost the pin holding the aerial to the top of the fin—and, to top it all, he's put his hand in something that was lying there on the field. . .

Well, *you* can install the tank any way you like. I'll stick to a hatch.

General constructional features

The original *Rapier* had mushy soft $\frac{1}{8}$in. sheet sides, with cross-grained $\frac{1}{16}$in. balsa doublers. This was the first model I had built in this manner—without the usual ply doubler. As a result, it promptly fell apart—in the middle of a competition, of course. The ply doublers are now back, and appear on the plan.

The wing is simplicity itself and need only take two evenings to complete. It was designed with no dihedral because this adds nothing in the way of stability in upright flight, unless used in excessive amounts—and that makes inverted flying downright hairy. It can also produce an amusing sort of hesitation-roll, which can be seen quite clearly on some models of this type. The *Mustfire* is a good example. And it can also play havoc with the double-stall turn (now called a figure "M"—the same thing but done sideways). *Rapier's* wing has a rather thin section and, in view of this, I covered it with soft $\frac{3}{32}$in. sheet instead of the commonly used $\frac{1}{16}$in. By the way; *do not omit the glassfibre and nylon tape at the centre section!*

I am certain that the *Rapier* can be built faster than almost any other plan model of the same type (even *Kingpin*), although this feature may not necessarily interest you—unless you loathe building as much as I do, and begrudge the time not spent flying! Do *not* cover this model in nylon or silk; use heavyweight tissue, doped on, to keep the weight down. Or, of course, one of the commercial iron-on film coverings.

Performance characteristics

Rapier flies very smoothly, even in quite turbulent weather, and has also a very good low-speed performance. In fact, the stall is so slow that a true spin from the stall is nearly impossible using normal techniques. The way to spin it is to use ailerons as well as rudder—and then, I promise—it is a true, stalled spin. You simply approach the spin in the normal manner, then when the model is going really slowly, slam on full up-elevator and at the same time move rudder and aileron sticks in the *same* direction. The model will then drop into a spin immediately, as clean as a whistle.

If you put aileron on too soon, of course, the whistle will not be so clean—and the machine will then half-roll into the spin—so practise! The advantage of using this technique is that the entry and recovery are really most positive. Inverted spins (well, *sort* of inverted spins—since they are done on full power!) may also be performed, by putting on aileron *opposite* to rudder. This is because if you were to give left rudder when the model was inverted it would yaw the model to the right—this machine having no dihedral, of course.

Landing technique

The *Rapier* tends to land quite fast—it's not that it is dangerous to land it slowly, it's just that one runs out of up-elevator because of the airfoil's ability to fly at such a high angle of attack. This makes landings look really good when the model comes in with its nose pointed skywards. You are pretty duff if you bend the noseleg on this one!