

DOUBLE FEATURE AT TUR R E

First completely successful rudder-only twin engine design

In the constant search for something new and exciting in RC, several twin engine designs have appeared. There's a real thrill to the sound of two engines as the model zooms through the sky, but when one of the engines quits, unless the pilot is really on the ball, the results are usually disastrous. This is particularly true if the model is a single channel job with no motor control.

There are several ways to solve this problem, all of which will be discussed in a forthcoming article. For example, the simplest way is to design a model with tandem engines on the center line. This isn't quite as challenging or exciting, though, as the more common placement of engines on either side.

Then, too, you can always take the chance that your system—whether it involves a common fuel supply, or topping off both tanks just before launch — will make both engines quit at the same time. This will be true **most** of the time, but there will always be that one occasion when you goof on the needle valves, or a piece of dirt gets in one fuel line, and your luck subsequently runs out.

So, the thing to do is to make sure that if one engine quits for any reason, the airplane is still fully controllable. The easiest way to do this is to have the thrust of each engine directly through the center of gravity, or at least, nearly so. This is pretty hard to do with the engines mounted on the wing — although you can come fairly close by using small diameter props, mounting the engines close to the fuselage, and toeing the engines outward. This toe-out angle is large, however, and the overall appearance of the model suffers accordingly.

And that is why the Double Feature was designed. I took a leaf out of the Lockheed Jetstar design, mounted the engines aft of the wing, then cocked them in so the thrust line of each engine goes very nearly through the Center of Gravity. The angle is not so large as to be unsightly, yet single engine flight is very easy to control just by the simple escapement method — like most single channel sport fliers use. Obviously, if you were to use a proportional rig like the Septalette actuator and a C&S or Otation "double ended" receiver, your single engine control would be even simpler. And, a larger version with multi-channel equipment would be just about as easy to fly as any single engine design.

For you single channel enthusiasts, then, here is the Double Feature:

Fuselage

This is about as simple as you can get. 1/16" sheet sides with 1/4" square longerons and vertical bracing makes it a very rugged structure, yet by rounding the corners the result is a very pleasing fuselage line.

Up forward, where the fuselage line curves, two types of side reinforcement are possible. I used the old trick of softening the 1/4" square longerons by soaking them in water and then curving them to fit the fuselage line. Then you pin and glue them in place until dry. If you prefer, you can cut out 1/4" flat stock material to fit curve.

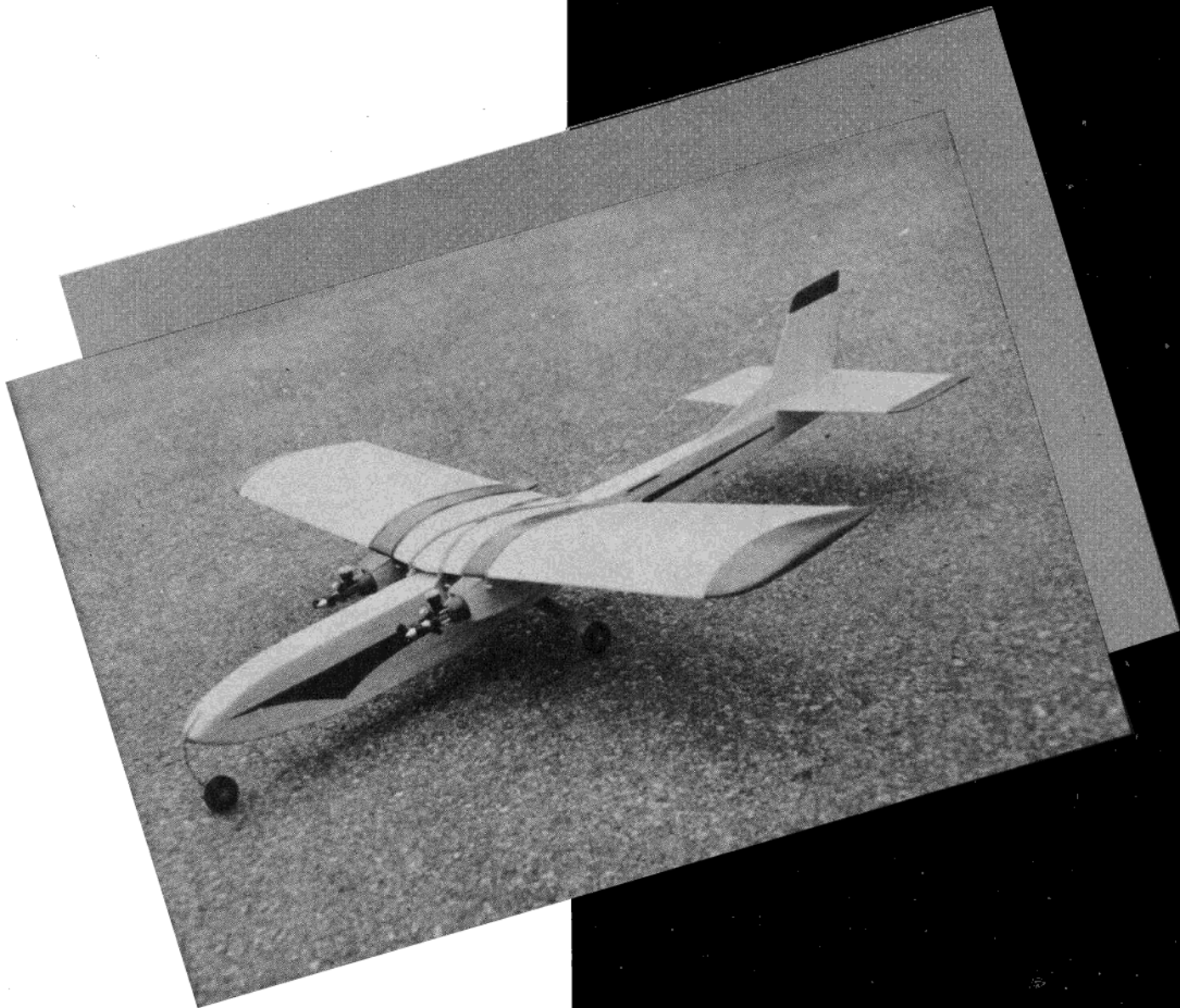
The other bracing of 1/4" material at the nose makes a strong backing for the noseblock.

Mounting the 1/8" plywood motor mount crosspiece involves a 1/8" notch in the longerons and the additional brace below it for strength.

If you prefer a tractor type installation, it can be done by installing the engine mount further to the rear.

Another method would be to make a removeable plate of 1/8" plywood on which you could install any one of several "power packs" as shown in the design variations. Then you could change the power system at will.

I think you'll find that the fuselage goes together very easily just by following the plans. Some of the detail in the mounting structure for the escapement will have to be modified if you use an escapement other than the Babcock, or if you install a proportional actuator. However, with the 1/16" plywood hatch arrangement, it's easy to set up any type of bracing required. I like the system of using a slotted crosspiece glued to the bottom, so the Babcock escapement backplate slides down into the slot, and the top is screwed to the basswood block at the top. This also makes it easier to install the torque rods, which are standard 3/16" square balsa with .040 wire ends bound and glued in place.



by

KEN WILLARD

Wing

The wing is a standard Top Flite Schoolmaster wing, with the dihedral increased to 7° in each panel. The big fin of the Double Feature makes it necessary to have more dihedral than the Schoolmaster. You can use less, particularly if you install proportional control, but the 7° gives excellent stability, and looks good as well.

Tail Surfaces

Use $\frac{1}{8}$ " medium stock, cut to shape. It is desirable to keep the tail surfaces fairly light for reasons of balance.

Landing Gear

Main gear is a standard deBolt aluminum gear, screwed on the hardwood mounting plate. You'll have to widen the tread by decreasing the angle of the bend.

The nose gear is the same as I used on the Virus model. It worked so well there that I've stayed with it. Use $\frac{3}{32}$ " wire since the Double Feature is a little heavier than the Virus. You'll have to open up the curve just a little when you're sliding the wire in place through the noseblock.

Radio Installation

Admittedly, things are a little tight up in the equipment department, but you have to keep the weights well forward to counter balance the weight of the rear-mounted engines. But, there's enough room for any of the small receivers and two E91 cells, or even four in series-parallel, if you need the weight. Potted nicads will also fit.

Finishing

This is a matter of choice, and since this is not a "beginner" type article, I won't go into finishing techniques. On my model I used Hobby Pox — two coats is all, with a sanding job in between. If you want a glassy finish, a coat of the filler between the two coats of Hobby Pox will do it.

Flying

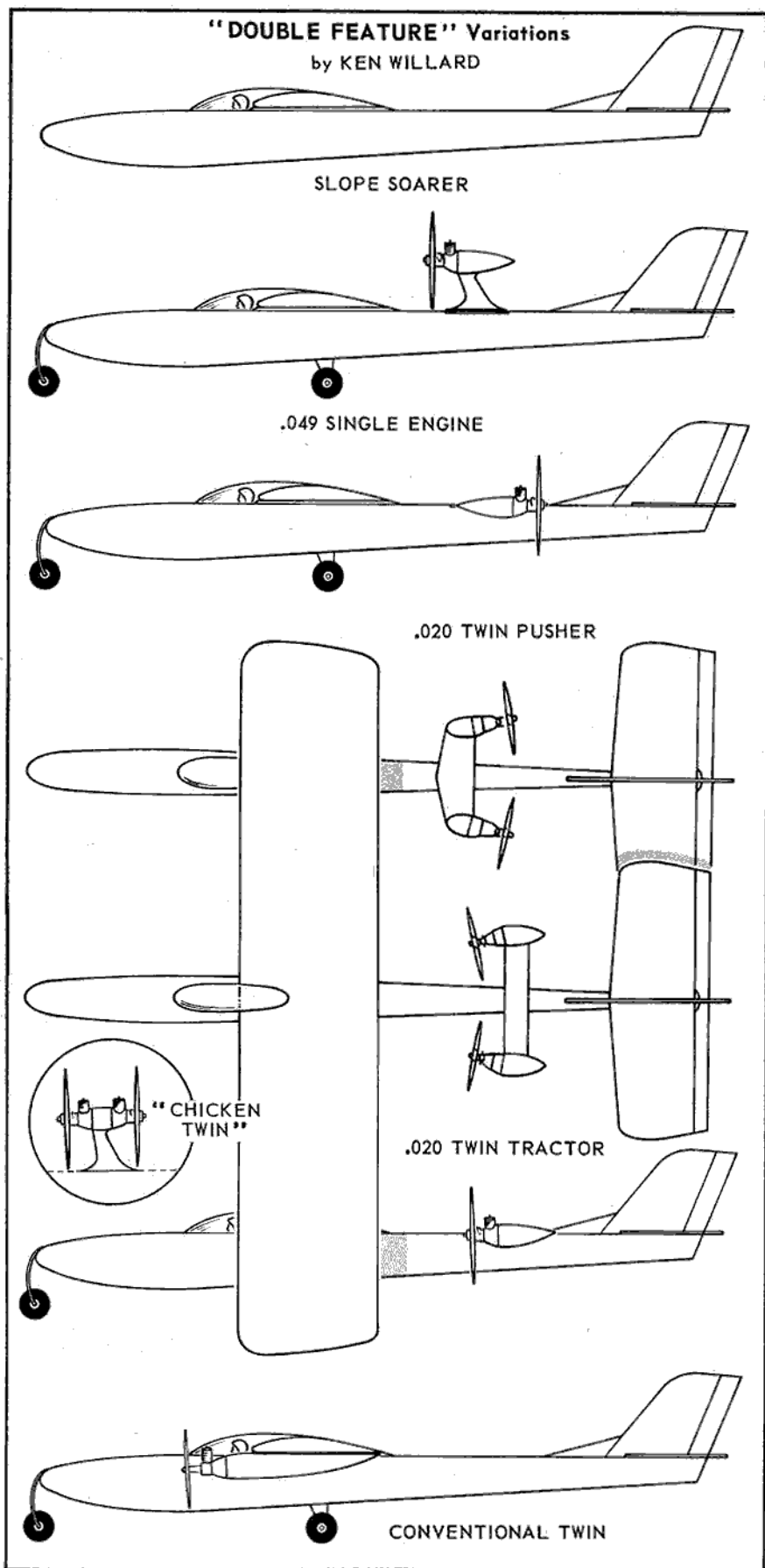
There are a couple of tricks worth copying here, so you can get acquainted with your Double Feature. I'm not going into the standard bit about test gliding and adjusting. You've read that before — these are what you might call "twin tricks."

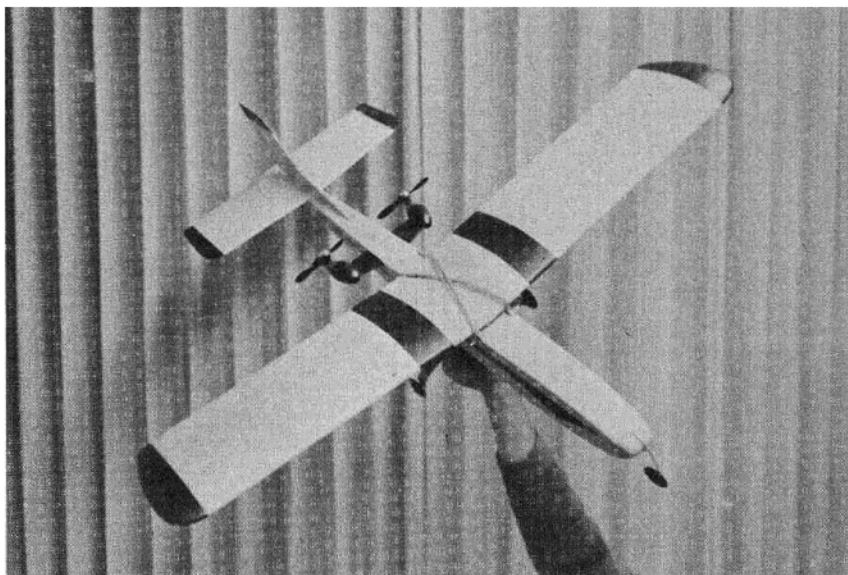
First, put the props on backward to reduce the thrust on the initial test flights. The props can be hand carved, or Grish $5\frac{1}{4}$ -3" pusher props with the tips cut to make them $4\frac{1}{2}$ " diameter, 3" pitch.

Next, put some washers behind the engine mounting screws at the inside points. This cocks the engines in a little more so that the thrust lines actually pass through the C.G. After a few flights, you can remove the washers one by one and observe the amount of turning which results in single engine flight. It's a matter of preference as to how much offset you want to have.

Third, top off both tanks before flying, and you'll only have a few seconds of single engine operation on the test flights — unless, as I mentioned earlier, you goof on the needle valve settings or get dirt in one engine. Later, when you get to know the handling characteristics, you can purposely top off one tank and get single engine operation at the end of the flight.

Finally, be sure that your model is trimmed slightly nose heavy at first. Because





The Double Feature — simple construction plus twin-engine performance.

of the long nose moment and the distribution of weight, the Double Feature is sensitive to elevator trim. The reason behind the nose down trim is obvious — if you have a stalling, swooping flight, and only one engine is running, then at the end of each swoop, the fin becomes less effective at the same time that the offset thrust of one engine becomes more pronounced, and your control is marginal until the speed builds up again.

Variations

For those of you who like to experiment, I've included some design variations in sketch form.

The slope soarer was suggested by my good friend, Walt Rady. I haven't tried slope soaring yet, but everyone who has is enthusiastic. Perhaps for this version, and in order to increase the glide ratio, an increase in the wing span to about four feet would be worth trying.

The single engine version is for all you modelers who have an .049 lying around and want to put it to work. Also, you could put two .020's up there in push-pull style. I call this the "chicken twin" — for those cautious modelers who do not trust side-mounted engines, but like the sound of two mills!

The tractor design (is it a tractor, or still a pusher, since the engines are behind the propeller?) with the engines behind the propeller,

allows you to use regular props with the TeeDee .020's. The power is greater here because the prop blast improves the scavenging at the exhaust. Also, with the engines ahead of the props, the exhaust gases occasionally get sucked into the venturi air intake and you get a power loss. However, it's not serious.

For those of you who prefer the old-fashioned type, wing-mounted twin, the design configuration is shown in the sketches. This version was flown quite successfully, although recovery time when one engine quits is substantially less (50%) than the twin version with the engines mounted aft. The torque problem, of course, is greater, as is the overall flight speed of the Double Feature, but can still be considered far more controllable than any of the conventional single channel twins available today. To prove this point, the conventional twin prototype was flown from launch to landing on one engine only, with completely controllable flights. The C&S Sep-talette would be excellent for this application.

At any rate, no matter which configuration you select, you'll be well pleased with your model. It has a very sleek appearance, is easy to build and fly, and when you start up both engines, watch out! The crowd will come running to watch the Double Feature Show.

A more conventional version — requires a little more experience on the button.

