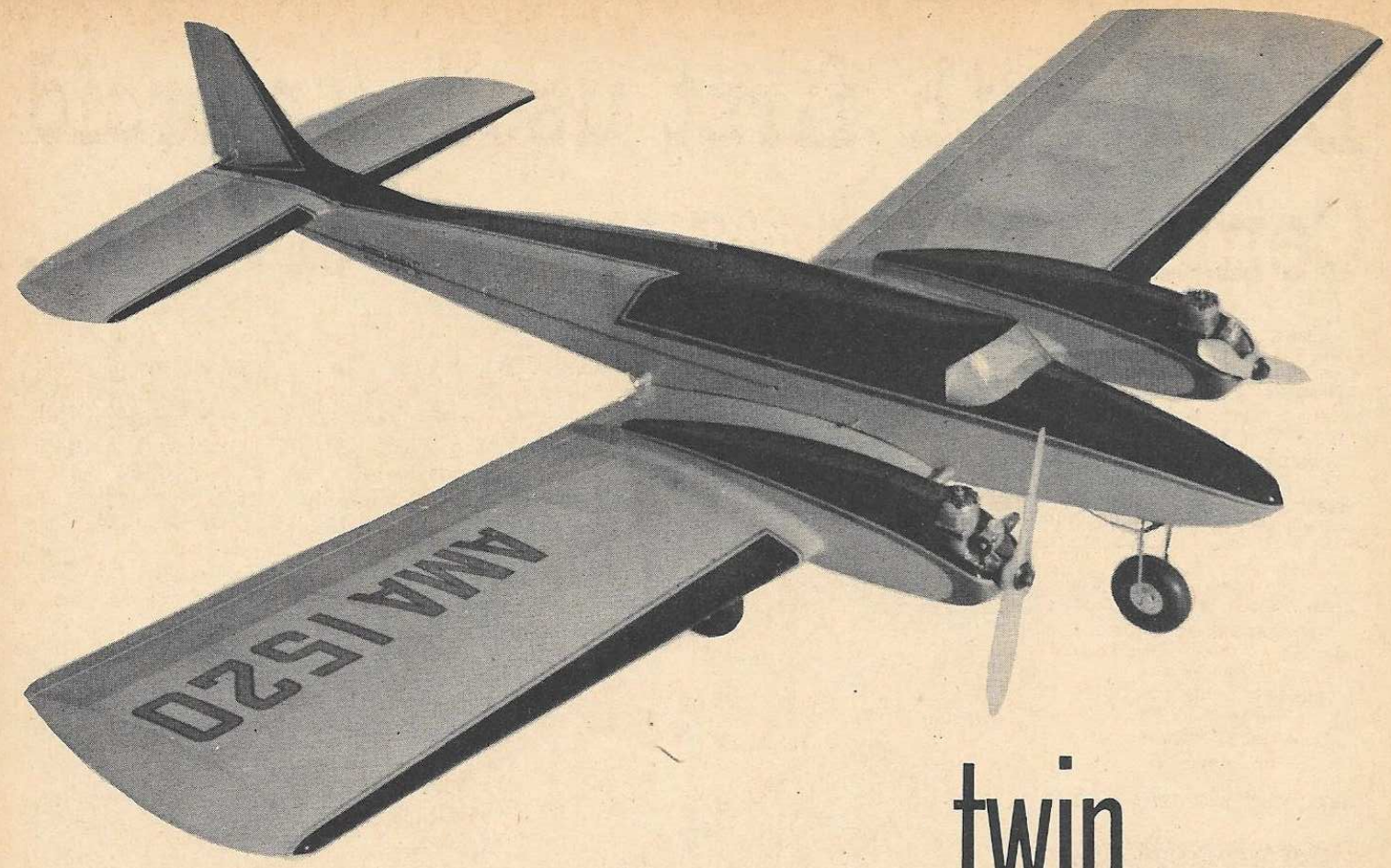

twin viscount

By HAROLD deBOLT . . . PIONEER R/C DESIGNER MET CHALLENGE OF THE BETTER MULTI PATTERN PLANE WITH THIS FINE PERFORMING MULTI ENGINE.

Familiar sight Pappy and his trademark the Corncob pipe—his Twin Viscount above is sleek and clean, best looking multi plane in a long time.

► Yes, there is a reason for it! Even if it is only the desire for more than one engine. For example, one of my flying buddies who had not been in R/C too long, announced that he would build his first model. Naturally, it was to be a twin-engined affair with a complete control system, full scale, fully proportional, of course. In addition, this dream boat would have a retractable landing gear. At the time, it was explained to him that all this was just a dream, even for the most advanced fliers of that day. Fortunately, he was persuaded to take on something just a bit less involved and he started with a 10-channel Bipe as this was as far down the ladder as he wished to go! Yet today, just a short time later, as you must be aware if you have been reading the magazine reports, his so-called dream boat has become a solid reality; as a matter of fact, it is most practical.

My reasons for trying to build a twin-engined plane also included some very sound aerodynamic ideas. First, I had recently read that Lockheed had spread the engines of the Electra all along the wing so that the slipstream from the props practically covered the whole wingspan. The reason behind the idea was that the slipstream would be present at whatever speed the aircraft was flying: hence there would be more available lift and control action at LOW SPEEDS than there would be if the engines were placed in the conventional manner. Since our models have a problem when flying at low speeds, as in landing approaches for example, it appeared that Lockheed's idea could be applied to our models. For this you need multi-engines, therefore the Twin.

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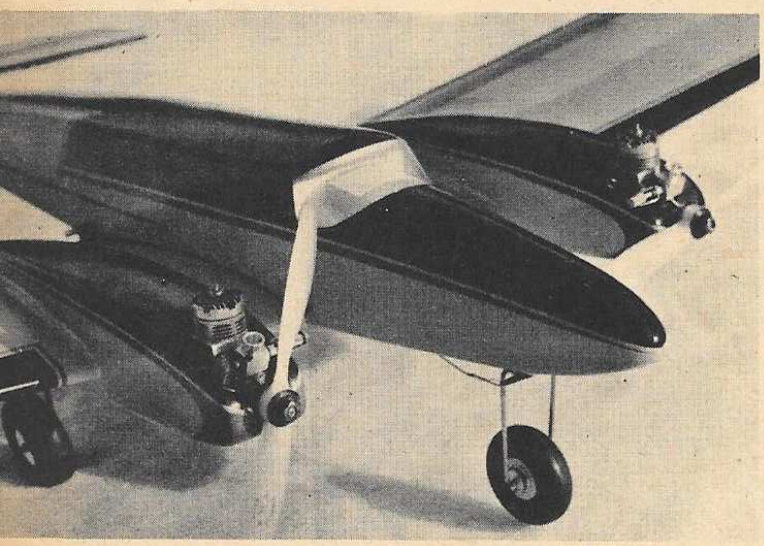

Close-up of cabin and engine/nacelles indicates plenty design forethought—read Pappy's article and you will agree he did think it through.

Twin Viscount Continued

In practice, what I found did not prove to be completely correct, but it did indicate that the idea would work. First of all, the model demonstrated increased lift at all times, even at high speeds where the slipstream would not be considered to be as effective. To evaluate these ideas, I had chosen my single engine Viscount design as a planform, as I am extremely familiar with this model and its single engine form and thus could easily note any difference in performance. Unfortunately, for this slipstream effect at low speeds, this was not the best design from which to form any conclusion, as even at low speeds the single engine Viscount is exceptionally stable and controllable. I did note that the landing approach had to be longer than usual, apparently as the sinking speed was lower due to the added lift, and the landing speed faster because of the slight additional weight. Speaking of weight, it is interesting to note that the addition of the second engine added less than a half-pound to the weight of the model. Total weight ready for flight was only 6 lbs.

Second effect of the slipstream was much more pronounced. I found the aileron action to be much more responsive and had to tone it down to keep from overcontrolling. This added action seems most useful during landings where immediate reaction is sometimes desired.

Another idea leading to the use of a Twin was gleaned from Charles Grant's good book, *Theory of Flight*. If you are familiar with Grant's bible, you will note that he devotes an entire chapter to propeller design and backs it up with what appear to be good hard facts. The main substance of the chapter is that the propeller should be designed to "fit the airplane" and not the engine, as we generally do. This makes sense because the propeller is intended to fly the airplane, not just the engine. Theoretically, we should design the propeller to fit the model and then choose an engine which would turn this propeller at the required rpm. Then we would be getting the most performance from our model.

I have reviewed the formulas several times toward developing a propeller to fit one of my models. It all seems to work out well except that for the average model, the propeller size comes to about 16″ in diameter. This shocks me each time and I have never been able to bring myself to use a .60 engine in a model that should normally use a .35, just so that I could swing a big prop at the correct rpm! A twin airplane can be the answer to this propeller efficiency problem, as there (*Continued on page* 30)

duke's mixture

I am happy to hear that there will be a rat race event at the Nationals, even though it is unofficial.

June (when this was written) brought a record number of visitors. One day we gave the tour to seven out-of-town model builders on vacation. Model builders are always welcome.

Visited two contests via Bonanza this month—Longview and K. C. Both went off smoothly, and congratulations to Maurice Teeter, Bud Tenney, Paul Runge and the rest who worked so hard.

Sorry to see the simple escapement R. C. model disappear from the R. C. contest scene. Class One has developed into a rather large servo operated bomb that can't by any imagination be called a beginner's model. Don't we need an event for single escapement models and flyers with no previous wins?

Bill Ledden and Joe Peters, of Crawford, N. J., stopped by and flew their Combat model a dozen or so flights. 35X powered model featured a baby pacifier tank. I must say this works better than any pen bladder or metal tank I have seen. Both are enrolling at Northrop's Aircraft Engineering School.

59 R. C. continuing to make new converts. Motor seems to wear forever. Only service problem occurs when vibration loosens throttle parts. So much leakage upsets adjustments. We can re-fit parts at modest cost.

How many of you would like an Encyclopedia of Model Motors (engines) showing pictures and basic data on all known motors? Such a book is in the making and I am wondering how many copies we should print. Price will be around six or seven dollars.

Happy to report a change in the seal material in our glow plugs has virtually eliminated the blowing out problem.

Sold one muffler the other day—first in months. Guess no one really wants quiet motors.

The improved MISSILE MIST has 4% more oil and a slight change in the other ingredients designed to make it a faster combat-rat race type fuel. Give it a try.

We get eight to ten motors a day for repairs, most suffering from age or "the concrete got in the way." Every now and then a jewel pops up. One fellow wanted us to repair the broken crankshaft on his Vivell. A mother sent us a new 35 saying her son was only three and could we exchange it for a more suitable toy. Then there was the fellow who wanted us to see why our .049 wasn't putting out enough to fly his Ringmaster.

Backward cylinder liners or pistons average about three a week. What do you do with a fellow who sends us his Dooling 29 and wants us to fit a Fox 35 piston so he can set a record?

Congratulations to contest winner James Fairchild, Dick and Roy Stubblefield, Billy Melton, John Otten, Roy Alberson, Bill Appleby, Gary Clark, Ivan Minglin, Zel Richie. Fox flyers—write us about your contest wins. (Adv.)

Twin Viscount

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are two propellers. Our engines require small diameter props to develop their potential horsepower; we need the power so big props cannot be used with success. However, two props are a horse of another color. Three governing factors of propeller design are diameter, blade area and pitch. It is easy to see that we can satisfy two of the three requirements simply by using more than one prop. When I tell of the performance attained with the Twin, I believe you will agree that there is some truth in this propeller design idea.

Then too, I had some ideas of my own that made the Twin look even better to me. Mostly they had to do with power loading: a good .35 engine will develop about .6 hp and about 50 in./oz. of static thrust. By comparison, a .19 engine will develop about .4 hp and nearly 40 in./oz. of thrust. If you double the .19, you come with .8 hp and 80 in./oz. of thrust. These figures are certainly more attractive than those of the .35 engine. It is also interesting to note that even the best .45 engines do not offer any substantial gain over the .35's. As a result, two .19's should easily out pull one .35 or even a .45. Everything else being equal this would be a very interesting advantage: what works most against the available power is the all-up weight. If we are to take advantage of the additional power we certainly cannot ask that it pull more than the weight of a model with a .45 in it. Let's examine this project to see how it all worked out. In the first place, an average .45 engine will weigh just about 10 oz. bare. Now, if you take an average .19 you will find that it will weigh approximately 5 oz. Thus two .19's do not weigh any more than one .45, yet they have more power. This is a good start! So, what additional weight would be gained by using twin engines? In the case of the Viscount, we already have a highly overstressed wing, therefore no additional structure is needed when two engines are used. This leaves only a set of engines mounts, a fuel tank and a few additional pieces of sheet balsa for the nacelles. Total weight not more than 3 or 4 oz. In the end, the weight actually increased by about 6 oz. over the single engine version, which, I thought to be quite remarkable.

Now, let's see what happened to the model's power loading and determine the advantage gained, if any. With the single engine version, we have 5 lbs. 10 oz. with about .6 hp and 50 in./oz. of thrust, and a power loading of 150 oz. per horsepower or a static thrust factor of 5/9; however, with the Twin and .19 engines we have a weight of 6 lbs. with .8 hp and 80 in./oz. of thrust. Result is a new set of figures much more favorable to our cause. The power loading now is 112 oz. per hp and the static thrust factor is only 8/9, which makes for a neat increase in performance potential.

I wish I could report to you in regard to the above combination, but unfortunately I cannot, because to date I have yet to fly the model with .19 engines. What happened was that the ailerons proved to be in perfect resonance with the .19 engines at about 4,000 rpm and they actually vibrated like a reed! The quick answer to the problem was to use a .35 engine and lower the noise of the engine another octave which cured the resonance. It also presented some startling new power loading figures: I now had 1.2 hp instead of .8 and about 120 oz. of static thrust. We now have more thrust than model's actual weight, which is a helicoper characteristic. We have now found the answer to the .19 engine resonance problem and we will be seeing whether the original conception was what it should have been. The answer to the resonance problem is simple: just change the aileron torque rods from 1/16" wire to 3/32", this stiffens the ailerons and at the same time lowers the vibration frequency.

To tell about the performance, a description of the first flight would be as good as any. Both .35 engines (Super Tigre) had been checked for maximum rpm, and were within 200 rpm of each other, which seemed tolerable. They also idled simultaneously at a respectable low speed. Hence no problem of synchronization was expected. Actually, it was a bitter cold day and we did have trouble getting both engines started and running together, but we managed before our fingers were completely frozen. With both engines checked and working the take-off was started on a smooth sheet of ice (not grass, as I am used to) and I did what I should not have done, which was to hold on a bit of "up" which is normally used to overcome the resistance of the grass. The Twin rolled about 10 feet and then literally leaped into the air at about a 45° angle. Surprised as I was, I could only stand there and gape as it climed out at the same angle picking up speed all the time. Guesses were that it was topping 60 mph in the climb out. I realized that in only a matter of seconds I would have to do something or it would be out of sight. The answer of course was to throttle back and turn around, which was exactly what I did. This was better on the nerves and at about 2/3 throttle I found that it had all the snap and vigor of a normal model. Some of the stunts were tried and it was difficult to realize that the model had twin engines. In fact it flew exactly like a single engined version! This was very pleasing and most of the rather short flight was made in this manner. Late in this flight one of the engines quit from being on the rich side, thus single engine performance was observed. I found that I could maintain control quite nicely by counteracting with the opposite control and about 2/3 throttle. However, with the .35 wide open I just did not have enough control action to overcome it. It was apparent that all single engine flying would have to be done at part throttle. I suspect that with the .19 engines this problem would probably not exist.

On a later flight with warmer weather, the potential of full power was investigated. I found that synchronization of the two engines was not really important; a couple of thousand rpm difference did not seem to affect the model in any noticeable way. With both engines at full tilt some really spectacular flying was observed. For instance, you could fly along level and pull straight up for great distances with very little loss in speed. Of course you could add a roll to this climb out, and successive vertical rolls proved to be nothing at all. We never actually measured the top speed, but a good guess would be that it was easily pushing 100 mph. Frankly, a bit too fast for comfortable flying. At top speed, three successive rolls could easily be accomplished within 4 plane lengths. With such speed and aileron action there was litle doubt about their being axial.

One of the more delightful aspects of this flying was the loops. With proportional control, loops could be opened up rather easily and it was tried. It was found

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Twin Viscount

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that the loops in the neighborhood of 200-300 ft. in diameter were real easy and pretty to watch. The model accomplishes these maneuvers without the usual loss of speed and the large diameter allows you to fly through them using controls as you would for level flight. I could go on describing other maneuvers but I'm sure you get the drift of it.

This will give you some idea as to what brute power can accomplish, but I doubt very much if we need it. Actually, I am most eager to get some time on the model with .19 engines as I feel that this may better suit our normal needs. If you are one of the people who have had the urge for a Twin, let me be quick to suggest that you give it a try. I know that it will be everything you expect, including the delightful sound of those two engines pulling away.

Like many of the new things today, I do not think this is a project for the newcomer to R/C to tackle. With the highly detailed plans, I expect that little need be said about construction of the model; I will leave a few hints to speed things along and let it go at that.

First, the fuselage is just a shell and light in weight. It should be kept light as you do not need the strength necessary for engine and fuel. Therefore the fuselage is the best place to save weight.

The wing and tail are quite normal in construction; nothing needs to be added or taken away here. Just be sure to use 3/32" torque rods for the ailerons so that you do not run into a resonance problem. Aileron action should be held to a minimum, about ¼" total movement should be ample. Elevator action should be about normal for the Viscount which is a total of 3/8".

The nacelles will be new to you. Note that they are simple box structures kept to a bare minimum of size, which keeps the weight down and reduces drag, both of which can be a detriment in an airplane of this sort. When installing nacelles be sure to watch alignment carefully. Remember that the wing must be set to the correct incidence angle to them as well as to the fuselage. You can use out-thrust for single engine control if desired. It was left out of the original deliberately and it does seem possible to fly without it, which can add considerably to the model's performance. Note that the nacelles were glued to the wing with no attempt to splice them. This was a doubtful point at first, but in practice, it worked very well. Note that the radio gear is mounted on rails, thus it can be moved fore or aft to balance out engine differences. Also note that the engine nacelles should be shortened for balance if you use engines which are much heavier than 5 oz.

That's it for the Twin. Believe me, it is a wonderful experience to fly one and if you have "had that dream" why not bring it to life?