RCM DIGITRIO: FINAL SYSTEM ALIGNMENT

RADIO CONTROL MODELER

MARCH / 1966 / 50¢

THE LEADING MAGAZINE FOR RADIO CONTROL

THE SECRET

CUNNINGHAM ON R/C

WALT AND WAGGER GO 1/4A MULTI

29c FLEX WINGS

BY BUCK FLEGEL

R/C FOR THE FORD MUSTANG GT

RCM PRODUCT REPORT

F & M DIGITAL-5

BEDE AIRCRAFT'S

BD-1

SCALE MULTI FOR PROPORTIONAL OR REEDS

BY NICK ZIROLI

RADIO CONTROL MODELER

MARCH 1966 VOL. 3 NO. 3

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The Cover

RCM's cover girl, "Abbie," poses as a boy for the Walt and Wagger article on the Tee Dee Bee. Black and white of BD-1 by Nick Ziroli. 35mm sequence shots are of Garry Lawrence, Deerfield, Illinois, launching a 2-wheel Lil-Tri-Squire.

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EDITOR'S MEMO

by Don Dewey

BEHIND every great man you'll find a great woman," which is what I told my wife just before Christmas when I asked her for a Playboy Club Key. I mean, like think of the reduction of work load on her part if she had help . . .

It must have been the wrong approach. I, personally, don't consider a one year subscription to R/C Modeler an adequate substitute . . .

●

The First Annual RCM Design Contest is over, and at the time this is being written, the judging is just being completed. This is certainly going to be an annual affair, since the entries were overwhelming. Unfortunately, some of the best creative design efforts lacked seriously in presentation, lacking either in plans, photographs, text, or a combination of all three. And since presentation also counted highly, a few well thought out designs lost out to more conventional designs that were well presented. Something to keep in mind for next year. In the months to come, and in fact, starting with this issue, you'll find some of these designs presented. Both the Bede and the Tee-Dee Bee were entries in the design contest. Coming up will be such projects as a scale Gruman Gulfhawk for proportional or reeds, full-house multi stunt models in the 48" span category, aerobatic bipes, etc. The wealth of material this contest will enable us to share with you made it worth the time and effort it took to conduce. We extend our deepest thanks to the many advertisers who sponsored the Design Contest. Without their help it would never have been possible.

●

As of January 1, 1966, an entire new concept for AMA chartered clubs went into effect — a concept more meaningful and beneficial for the club, the Academy, and for the overall development of model aviation. This, in the form of a new broad-based insurance program which provides more extensive liability and property damage insurance, designed to protect clubs as groups from liability claims resulting from model flying accidents and other accidents resulting from general club activities. The initial benefit for chartered clubs under the new concept will be broad insurance protection at a cost one-half that previously offered or available elsewhere.

The great importance of the new AMA insurance program, we feel, is that it commands recognition and respect by businesses and government, particularly by city fathers who have the property needed for flying and other club activities. It will also enhance many other services which the Academy is developing to be made available to chartered clubs once a greater national, or "grass roots" network is established. These will include assistance in planning and promoting model meets and demonstrations, assistance in finding and keeping flying sites in cooperation with local and Federal government agencies, and industry sponsors for educational activities and events.

In turn, the Academy will look to chartered clubs as the effective means of conducting local activities of national programs. The support of clubs has recently been quite helpful in demonstrating grassroots interest in radio control modeling to the Federal Communications Commission. It may be vital in the future to convince other agencies, such as the FAA, of the importance and value of modeling.

In short, model clubs across the country are the local organizations which keep modeling alive and growing. The Academy is the national organization which can tie the individual club efforts together in a unified program for the benefit of all. This is the prime reason why it is imperative that the Academy develop the chartered club concept and why the new club insurance progam is so vital. Protection accorded to the club is a total of $100,000 liability and property damage, the same amount as accorded under the individual AMA flier insurance which is provided automatically as a part of AMA membership benefits. Optional higher limits are also available. The major difference from individual coverage is that individual flier insurance covers only accidents resulting from flying models, whereas the club insurance protects the club during its non-flying activities as well.

Under the revised charter club con-

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EDITOR'S MEMO

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cept, all members of the club must be AMA members in order to qualify for the club insurance program. Every individual RC'er is urged to join the AMA NOW . . . each club is requested to apply to the AMA for a brochure giving full details of the insurance coverage along with applications for chartered club membership.

Your help in securing the future of model aviation . . . and R/C specifically . . . is needed. YOU CAN HELP.

You can help **NOW!** In so doing, you will be helping yourself to reap all of the benefits this hobby has to offer.

●

Here's a letter from Charles E. Brooks in Thailand I'd like to share with you:

Dear Don: –

Having been out of the U. S. for the past six years, I just became aware of your very fine magazine on a recent trip to Hong Kong. I was able to obtain several issues at a very dear price, approximately 95c per magazine, but well worth it.

I would like to inject a comment at this time for all model builders wherever they may be stateside that they may have their problems about noise (interference) and areas to fly in, but to a few of us in South East Asia, these sound like a joke. In Viet Nam the only place I've seen where one can fly is an area twice the size of a football field, and then you are right under the helicopters approach pattern. Anywhere else you may have unexpected company – Viet Cong wise!

Here in Thailand it is a little better except that there are no hobby shops to speak of and the one in Bangkok has what seems to be about 200% markup because of taxes. As for flying sites, there is all the room in the world and no one to bother with noise. The only drawback to the nice grass field is that it is about five feet deep and full of snakes and rice paddies.

So every place has its own problems, and like the Vietnamese people say, "be like the Bamboo tree and not the oak or evergreen" . . . bend with the wind.

Charles E. Brooks
Air America

●

According to an announcement made at the FAI headquarters during the annual meeting of the Committee for International Aero Modeling at Paris, France, the Soviet Union will attempt to hold a Model Aeronautic Olympiad in conjunction with the Aerobatic World Championships for full-scale aircraft. Scheduled dates are July 20 through August 10, 1966 in Moscow.

Invitations to compete in the event soon will be extended to individual national champion radio control and control line modelers through national aero clubs in their home countries. The NAA will soon forward the invitations through the AMA.

During the business meeting it was announced that the Radio Control World Championships in 1967 will be hosted by France on the island of Corsica in the Mediterranean.

●

The usual Sunday flying group was assembled at the field. On his first flight, one of the regulars broke his prop. Turning to the flier next to him, he asked, "Say, buddy, can I borrow a prop?"

"Sure," replies his friend, reaching in his tool box for a brand new nylon prop. Next flight, the same thing . . . "another one of those," our bad-luck pilot says.

"Look," replies his exasperated buddy, "those things cost me a dollar and a quarter each!"

"Hell!" replies the flier, "if you can't afford the hobby, you ought to give it up!"

And that from Bill Polvogt of El Paso, Texas.

●

Regards to the family.

Showcase '66

The 20th anniversary of **deBolt Model Engineering** was celebrated by the release of their newest R/C kit, the long-awaited dmeco "Acrobat" biplane. This new bipe has the traditional stability and ease of flight for which biplanes are noted, but when you add realistic acrobatics to the virtues you really have something new and interesting. One of the outstanding features is that the "Acrobat" does not have to fly as fast as the conventional low winger to be able to perform really clean maneuvers or to attain proper penetration, thus you have more time to think during the maneuvers themselves. Watch for the deBolt Acrobat, a really fine kit at $29.95. **Circle #1 on the Reader Service Index.**

The first product from **Darin Bros.** is one called the Aileronee. This is an aileron control horn that is fully adjustable simply by screwng the nylon connector up or down the threaded arms. There is nothing to loosen, untape, or bolt down in order to adjust strip aileron linkages. It could also be called 100% "failsafe" since the nylon connector self-threads on the horn and thus can't come off. Price per set is $1.25 plus 25c postage. Tested and recommended by RCM. **Circle #2 on the Reader Service Index.**

From **Model Trends** in Inglewood, California, one of the most magnificent multi ships we have had the pleasure of seeing — the Savage. The April issue of RCM will carry a complete story on this unusual airplane. The Savage is a sleek, smooth, light, strong, and flexible epoxy fuselage for $31.95. An excellent foam wing is also available for $7.95 and a matching stab for $2.95. We strongly suggest that you send for further information by **circling #3 on the Reader Service Index.**

America's Hobby Center has just completed the printing of a new 160 page catalog — one of the most complete ever produced in this industry. Virtually every item available to the modeler is contained in this book. Price is 50c from AHC. Mention RCM and it is available to you for 25c. Send to America's Hobby Center, Inc., 146 West 22nd Street, New York 11, N. Y.

Min-X Radio has announced the release of their Astromite III, a 3 proportional control system designed to fit the pocketbook of the modeler now flying 6 channel reeds or similar equipment. This is a single stick unit using Time Division Multiplex Digital techniques and designed to operate with three proportional feedback servos. Excellent servo resolution and reliability are assured by Min-X's use of a high velocity constant servo with proper damping ratio and properly rated components. Airborne weight is 14 ounces including receiver, three servos, and junction board, but less batteries. The linear push-pull servos have a thrust rating in excess of three pounds. Price is $299.95 which includes transmitter, receiver, three servos, and junction board with prewired connectors. For further information **Circle #4 on the Reader Service Index.**

New high-torque servos, delivering twice the power of previous models, are now standard equipment on all Orbit proportional systems. PS-2A analog servos are used for the entire Orbit 3+1 system and the full-house proportional throttle, aileron and elevator control functions. All Orbit 7-14 Digital proportional servos use the Orbit PS-2D digital servos as standard equipment. The new units utilize precision servo motors, silver alloy brushes and hard-surfaced carbon/ceramic pots. These features, combined with new circuitry, deliver full power servo output on minimum error signals for positive control. Built in rotary and/or linear output permits easy use of any system control linkage. 3 ounce weight. Both the PS-2A and PS-2D servos are priced at $40 each. **Circle #5 on the Reader Service Index.**

The newest addition to the **F&M** line is their Digital-3, a 3 channel proportional system designed for the Sunday or sport flier and Goodyear pilot. A complete review of this and the popular Digital-5 can be found in this issue of RCM. For further information on the F&M Proportional systems, **Circle #6 on the Reader Service Index.**

CUNNINGHAM ON R/C

FOR quite some time now there has been one particular question that has persisted in demanding an answer.

Now, after considerable thought, some trial and error experiments, conversation with other designers, and many long phone conservations with Fearless Leader, the answer finally worked itself out.

The problem, very simply stated, is this: **What makes one airplane fly while another will not?**

Or, to put it another way, why is one ship a great flyer, while another, which may look just like it (and quite likely is much prettier), won't fly worth a hoot? Scale ships are great examples of the problem. Almost every scale R/C ship is, at best, a marginal flyer, and usually a handful for the pilot. You're probably way ahead of me at this point and saying to yourself, "It's trim," or, "It's the pilot," or "The engine isn't any good," or "This blasted kit isn't worth the money to burn it," or . . . well, you name it, you've been through it and seen it a number of times. But all of the answers are just part of the real problem.

Why won't it fly?

First, let's eliminate some of the usual reasons for poor flying ships. Trim is the worst problem, but one that can be worked out provided the ship lasts long enough! The pilot is the next biggest snafu, but experience will solve most of these problems. And so on down the line, one at a time, the reasons why a ship will not fly can be worked out with all of the knowledge that we now have.

The reason that the big problem really bothered me was a design project that Don passed along in my direction. The project, as conceived, bombed out and the airplane wasn't any good. **Why** it wasn't has now been solved and the ship has since turned out to be a good aircraft. But, in the beginning, it was a terror to fly, and it shouldn't have been. The Problem raised its ugly head and almost shot down the entire project.

The secret is this: **The right combination of power, weight, and wing area will produce a good airplane. The wrong combination will, conversely, produce a bad ship, or a marginal one.**

Simple, you say? You knew it all along? Well, so did I, but how to find the right combination for any given ship – that is the real secret!

In scale work alone this answer should be worth at least a million man hours! It is a shame to see a beautiful scale ship vainly try to take the air, and never quite get off the ground. Or, if the pilot is unlucky enough to get into the air, he stays there just a short time. If you take the time to study the charts accompanying this article, you will be able to select the right combination and save yourself many hours of heartbreak. Designers of multi stunt ships can also profit from a study of these tables. Most stunt designs are very similar, and the general set-up is well established by now, but if you branch out in a new direction, you may gain a bit of headway by digging deeper into **The Secret.**

There is no hard and fast rule that will give you the answer mathematically, and a good bit of the reasoning behind The Secret is rule of thumb and trial and error. It is also based upon the engines that we have available today, and doesn't worry about the coming miniaturization of radio equipment, although the same basic reasoning will hold true for most given sets of conditions.

First, let us assume that all engines are created equal. It just ain't so, but we have to have a beginning, so put aside the arguments and, at least for a little while, stick with me and believe that this is so. The only consistent measurement of engine power that we have is the displacement of the engine in cubic inches. We will represent this by **D**. For all of you slide rule slippers and "writ by hand calculators," we will eliminate all decimal points. You math guys can go stark raving mad, but we're going to eliminate the decimals anyhow.

Second, we will measure our wing in square inches. We won't convert the area to square feet since we don't measure the chord or the span in feet or fractions of a foot. We'll simply leave the area in square inches, represented by **A**.

Third, the weight of the ship will be calculated in pounds and tenths of pounds, represented by **W**.

Fourth, a constant, which represents the **flyability** of the ship will be called **F**. Chart #1 gives the values of **F** and their normal ranges of performance. More about this later. Put all of these factors in one formula and we come up with **Flyability equals Displacement times Area divided by Weight,** or

$$F = \frac{DA}{W}$$

Now, for an example. Let us assume

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CUNNINGHAM ON R/C

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that we have a reasonably small aircraft, say 600 square inches of wing area, for which we planned to use a .19 engine. The anticipated weight is five pounds. The engine size is fixed, the wing area is fixed, but the weight is only "guesstimated." (And this is what keeps the formula from being a hard and fast rule.) Almost every modeler is weight conscious, but we can't pour a can of "fatgo" down the engine intake to lose weight, so we must develop certain rules covering our own building weights. At any rate, with the above specifications, we put them into our formula and we have: $F = \frac{.19 \times 600.}{5}$ Which all boils down to equal an F, or flyability factor, of 23. Consult Chart #1 and you will find that this is just barely in the flyable range, and is very marginal. A good .19 engine will turn the trick, but a poor one, or an underpowered one, will not cut the mustard. The heat of the day, or the grade of fuel that you are using will affect the power of your engine and so the lower powered mill simply won't pull a ship in this F range! Let's try another one.

Try a hot multi stunt ship with a wing area of 720 square inches, a .60 in the nose and a weight of 6.5 pounds. Some builders can get away with 5.5 pounds for this combination but let's try 65. Throw together, mix slightly, and the answer pops out at 79. A look at our chart and we find that this is in the super-duper range, and you already knew it! So what's the big deal?

Simply this: What size engine do we need to use for a ship to be scale-like in performance if we are going to have a craft carrying a wing of 800 square inches and our dope consumption makes it weigh in the neighborhood of 9 pounds? Far fetched? Not at all, most scale ships weigh at least that, and often more.

For scale flying range, let's pick out 40 for F. Our formula now looks like this: $40 = \frac{D \times 800}{9}$ and D then equals .45. Which, roughly translated, means that we have to have at least a .45 to haul our new ship around at a scale-like speed and with enough control to make it go! So what if we only have a .35 to put in the nose – what can we expect it to do? Answer: An F of 31 and just above the marginal class.

This brings us to another rule of thumb, which enters into this case. As a general rule, **do not load your engine down with more than double its displacement in pounds.** In other

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words, a .35 engine shouldn't be expected to haul around more than 7 pounds of airplane. A .60 shouldn't have to tote more than 12 pounds. Again, this sounds like a lot, and it is. In the case of the larger engines it's a lot to expect, whereas in the case of a .19, 3.8 pounds is usually lighter than you can build a multi ship. It's a rule of thumb, but it works!

You can see from the formula that without this rule of thumb, you only have to increase the wing area to make the formula come out right every time, and this can't be true. Another factor is the wing loading of the aircraft, and in a roundabout way, we have included this factor in our formula. A very simple way to quickly figure wing loading, working with factors that are known and not taking time to convert wing area to square feet and weight into ounces, is to multiply 23 times the weight in pounds, divided by the area in square inches, or: $WL = \frac{(\ \#\ ).}{\text{sq. in.}}$

Let's try another example to see if you have grasped the idea behind The Secret. Let us assume that we are going to want a ship that will fly in the good range, say at 50, and we are going to use a .45 engine, and the ship will have a wing area of 750 square inches. Pretty standard, isn't it? It is the usual case and why worry about the weight? Well, for one thing, if you know what weight you want to hit you can work toward this goal. In this case, the weight figures out to be 6.75 pounds. If you build it lighter, the F factor goes up accordingly.

One last example. Suppose that we are going to build a scale entry to be flown in the summer, in hotter areas where engine power can be sapped as much as 25%. This is to be a scale WWI fighter plane with power to be a .45 and wing area in the neighborhood of 1000 square inches. The weight, from our own building experience, will be around ten pounds. Taking the engine at its full rated displacement, we have an F factor of 45. Just about perfect – except for two things. First the weight is more than double the engine displacement, and we haven't taken into account the 25% loss of power possible in warmer weather. With the power reduction, we now have an F equal to 34. If we further examine the load carrying ability of our engine at this reduced power we find that under normally expected circumstances we would have wasted all of our building time and possibly a trip to the contest!

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If we still want to build the ship to the same size, then we have two avenues to take. First, enlarge the engine, and second, hold down the weight. Let's look at that ship again, and this time we are thinking of a .60 engine and nine pounds maximum weight. F, unchanged for hot weather becomes a 66, and influenced by a heat factor of 25%, becomes 50—the range that we wanted in the first place.

Now, to carry our experiment a little farther down the line, let's examine an NMPRA pylon racer in the light of this formula. The pylon racers are very shy on wing area, carry a pretty high weight, and are powered by fast engines. They can move! And, by the way, are sometimes hard to fly! With a racer of 450 square inches of wing area and a weight of 5.5 pounds, we have a wing loading of 28 ounces per square foot, just about the top level for flying. By top level, I mean that it is about the maximum wing loading that will fly acceptably. Optimum loading will be in the 18 to 21 ounce range. Our F factor for this pylon racer will be (assuming that we are going to use a .40 engine) in the scale range at 33. This doesn't mean that the ship will fly like a scale model duck, nor will it be scale speed to the full size pylon racer that it copies, but rather that its flying **characteristics** will be more on the scale-like side than the over-powered bombs that we fly in acrobatics. The pylon racer will be flying more nearly at its stalling point, and if slowed down somewhat for landing, may whip-stall into the ground. In fact, most pylon racers have a glide very much like a heavy brick once the engine quits, and you have to stand on the up-lever to keep them in the air.

This is not meant as a criticism of the pylon class, but as a clue as to why they are generally harder to fly than the average ship. The event, itself, is going to grow and become more popular as time passes. Just keep in mind that if you attempt one, you will be flying in the critical range.

The point of all this is that you **can** predict the way your ship will fly, all things being equal. Any little thing can change the equation—a hot .19 can out-perform a miserable .35 and a good pilot can make almost any ship look good. But for you who like to design your own, and especially for you scale fans, work your aircraft out in advance. Develop your own weight tables covering your own ships. You can do this easily by weighing all of your wings, bodies, tails, etc., and dividing the wing

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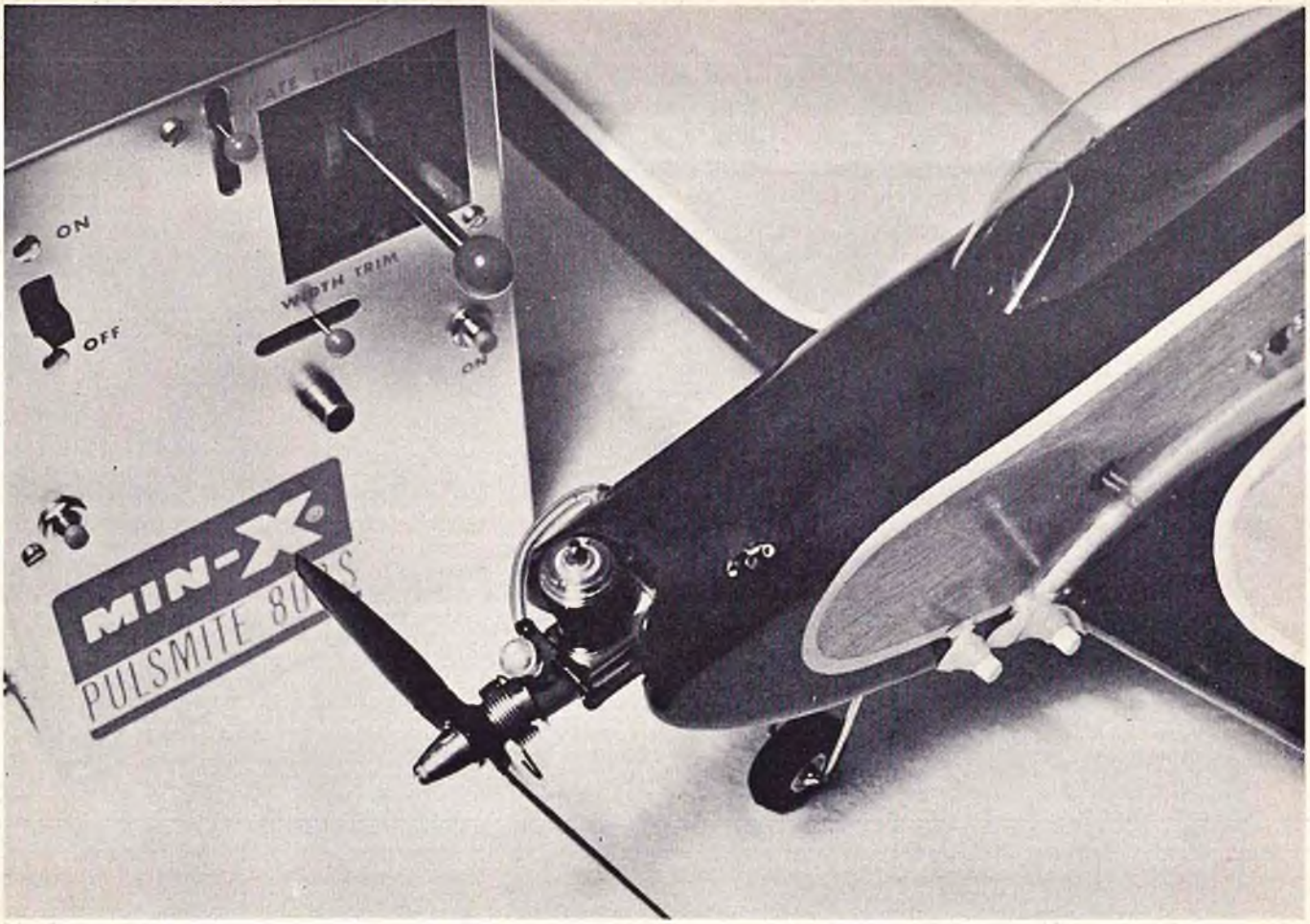
TEE DEE BEE

RCM design contest
RCM
award of merit

by LOREN DIETRICH



Min-X Pulsemite shows nicad charging jack installed under width trim lever. Full "off" button moved over to new hole drilled at far left of transmitter.

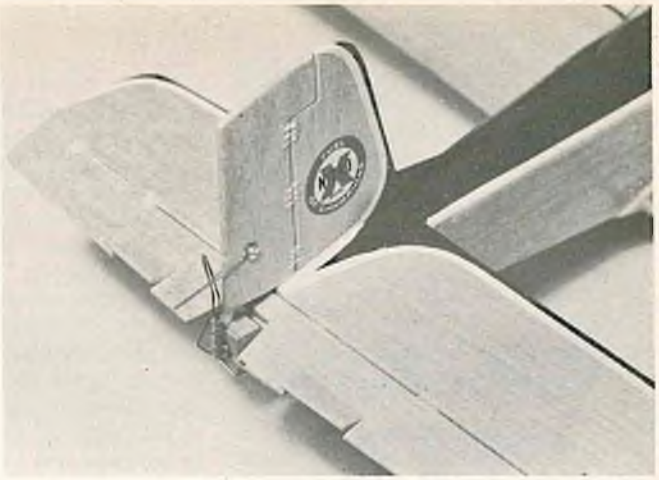
Walt and Wagger go ¼A multi with a 45 m.p.h. fully stuntable, 28" span, trike geared, semi-symmetrical airfoil low-wing design for proportional control—which proves it's a dog's life . . .

"COME on, Wagger! Move that doggy carcass of yours so I can drag this mess into the shop. Or maybe," added Walt, "I should just stand back and toss it through the keyhole. The largest part left is the fuel and repair bill on this airborne computer."

Perhaps this greeting of a tired businessman for his sad-eyed Bassett left something to be desired, but Walt had just returned from a Sunday at the flying field with his latest propo-multi dream child. Equipment had functioned faultlessly, but the pilot had not! The "Rhumba Child" had **almost** made it out of that maneuver before planting a fleeting kiss upon a protruding bush at 75 mph; the ensuing splintering balsa and ripping of transistors reminded Walt of small children smashing berry baskets! The 27 mile ride back home from the rolling countryside had left Walt with little love left for his particular representative of "man's best friend."

"Look, Walt, why not let that lumberwagon rest for a while and try something smaller?"

"You can put all of the principles of a multi-monster design to work astride a two foot wing. Just install a Tee Dee .020. . . ."



"Elevator tabs shown in photos and plans are not necessary and were used on test prototypes. They can be eliminated completely."

Wagger emitted a gusty sigh before sauntering to one side to allow the passage of man and machine, both broken in mind and body. To Walt's back he muttered something that sounded like "Rough!"

"Rough indeed, Wagger old buddy. I love controlled flight, but not at the price of one flight a week and a workbench of broken bones. Any suggestions, old horsehide?"

"Woof. Woof, woof," said Wagger. "Or to put it in the slang of your species, why not let that lumberwagon rest for a while and try something smaller? At least it won't take so long to repair if you goof-up while flying something light and small!"

Having given this opinion in his low, growling voice Wagger slumped contemptuously onto his blanket to one side of the bench. Walt, who often imagined that he had long conversations with this particular dog, did not look surprised but merely raised a skeptical eyebrow.

"Thanks, but no thanks, fleabite. I was flying escapements when you were cutting your puppy teeth on pawlaunched gliders. The thrill is gone in just guiding a missile. I want to fly my ships, not just aim them. So, my mutt, move that wagging tail of yours so I can get to work. And don't be so happy."

"Dear master," groaned Wagger, "Lassie-like, I am sending you a message. Have the decency to say something like 'What is it, girl?' or 'Look, she's trying to tell us something!' anyway. Observe the wagging tail, please."

"Oh, Piddle!" exclaimed Walt, ignoring the look of pain this brought to his housebroken pet. "I'm not trying any of that wiggle-waggle pulse-proportional tomfoolery! Rudder-only leaves me cold as a well-digger's watchfob, and Galloping Ghost requires just as much airplane and gadgetry as what I have now. Besides, you can't get all that junk into an .049 ship without having a flight pattern like a dropped hatchet, so give up already."

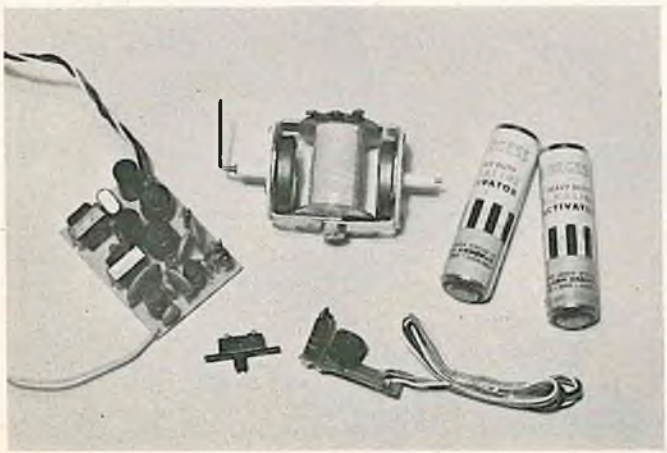
Wagger gave out a low moan and then mumbled patiently:

"Arf, arf. Or more specifically, crawl out of the dark ages, caveman. You can put all the principles of multi-monster design to work astride a two-foot wing. Just install a Tee-Dee .020 on the nose and a magnetic actuator inside, and presto! Multi-simultaneous proportional control of rudder and elevator, and in a cute little ship that flies fast and glides flat, flies a pattern and spins with the best. Woof, woof, and how about that jazz?"

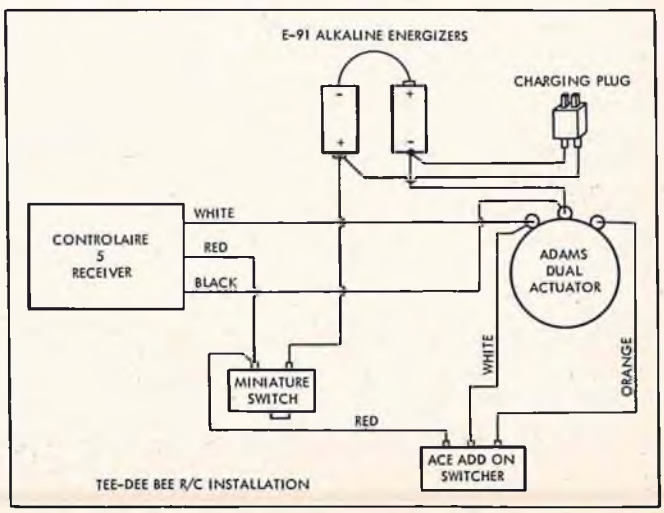
"My lovable laphound," whooped Walt, "you have flipped your dog biscuit. Were there such aircraft, I would have seen or read something about them by now; however, all that has been published has been a rather experimental attempt at driving a rudder which then drives a linkage to drive the elevator. I tried that, but gave up on the adjustment after using up sixteen feet of piano wire. Pray tell, dog, where did you find the solution to this doggy problem?"

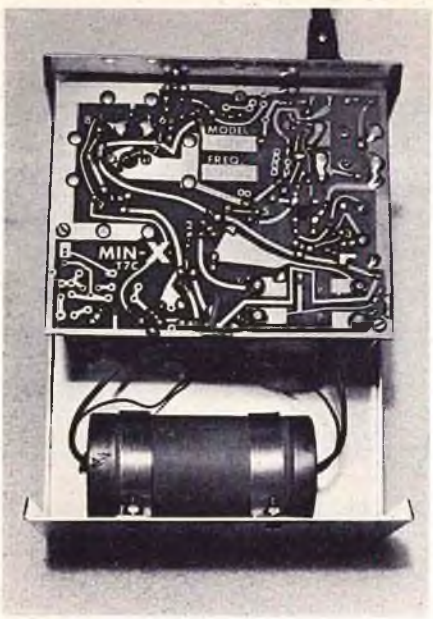
"I soluted it myself, if that's the word," Wagger said smugly. "Look, let's review the problem again with sketches. A magnetic actuator is just like an electric motor that can rotate only 45 degrees on each side of center,

"Here's all you need, O Master. A relayless receiver, Adams Dual actuator, miniature slide switch, Ace Add-On Switcher, and either 2 or 3 pencells."



"And here it is all hooked up and ready to go. Didn't know you could charge alkaline energizers, did you?"





"Converting the Min-X Pulsemite to nicad operation is a snap. Seven or eight button cells and two extra leads to a charging jack in the front panel."

right? Therefore, it can be coupled to a torque rod with plenty of throw to move a rudder from side to side, just like an escapement. The only catch is that full 'off' causes the actuator (and rudder to move to full **left**, and full 'on' moves the rudder to full **right**. Therefore, if we have a transmitter capable of varying its 'on' time to its 'off' time, we can vary the time that the rudder spends on one side of the aircraft and consequently we get the effect of proportional rudder control. Of course, this takes a transmitter such as the Min-X or Controlaire or the addition of a pulser to the normal single-channel transmitter."

"So a GG transmitter on the ground with a receiver, switcher, and magnetic actuator in the ship will give proportional rudder; big deal!" snorted Walt in Wagger's general direction. "With no control over up-and-down, you're in for a life of docile steering or mad zooms. Where will you get that doggoned multi you speak of?"

Wagger settled resignedly deeper into the blanket.

"Toss me another biscuit, and have one yourself while I continue," he grumped. "Remember that we have said we obtained proportional rudder by varying the **width** of the pulses; that is, the amount of 'on' time to the 'off' time. Don't forget that the transmitters we mentioned will also allow us to speed-up or slow down the whole cycle without changing that **width** relationship. In other words, we can change the **rate** we send these pulses; therefore, if we had an elevator sensitive to **rate** change we would be able to have rudder and elevator simultaneously. Right?"

"More electronics, such as decoders and PODs?" said Walt.

"Most emphatically not," replied the canny canine. "Such systems are workable but too heavy and complicated for us. What we are going to do will take place on the rudder torque rod, right back at the rudder itself. Notice that we have attached two arms at right angles to the arm which moves the rudder, thus making a thing like an upside-down tee. Notice also that those arms are directly under the trailing edge of each interconnected elevator, and that the elevator is lightly spring loaded into its 'down' position where it rests on these arms. Therefore, this system will act like the usual conventional Galloping Ghost system in that **even** pulsing will cause both rudder and elevators to spend equal amounts of time at their extreme positions. Varying pulse **width** will still give proportional rudder as before, but with a slight bit of up elevator to help hold the nose up in turns. Are you still with me?"

Walt nodded dubiously, but then pointed out:

"O.K., but there's a hole in your theory, my bone-biting friend. I can see that a slow pulse-**rate** will cause the elevator to spend more time in the **up** position because the rudder will spend more time on each side of the plane. Explain how you get good 'down' and you have a reservation at the head of the table for the next steak dinner!"

At this, Wagger lifted his dewlaps in a good imitation of a maniacal grin.

"That's just a short putt from here, mighty balsa-buster," he said. "What happens when you feed very high pulse rates to a magnetic actuator? It sits and 'dithers,' or takes up some position and just shudders slightly. In our case, the rubber band is pulling the elevator down against those two arms so **that** is the position in which it sits and shudders slightly: rudder neutral and elevator down! As a matter of fact, you can move this shudder slightly to one side or the other, thereby giving a small amount of rudder control even with full 'down' elevator. With something less than highest pulse rate, you have some amount of up or down elevator combined with your proportional rudder. Ergo! Propo rudder and elevator! Extra complication? Only 2 inches of piano wire and a rubber band. Get the picture?"

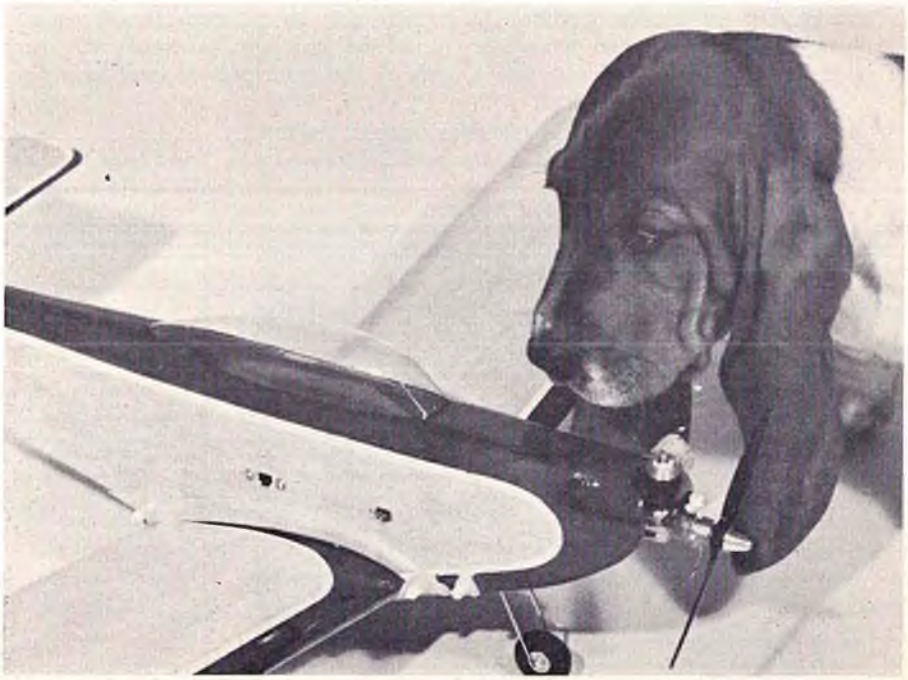
Walt eyed the jubilant Bassett Hound with grudging admiration. Suddenly his eyes narrowed, then he shouted:

"Hold it, you Gaines gobbler! This high airspeed of a propo ship will straighten that elevator out flat unless you make that rubber band as tight as a rat-racer's lead-ins! Magnetic actuators just won't have the power to operate against that much load; those things are notorius for their flea-power, you know."

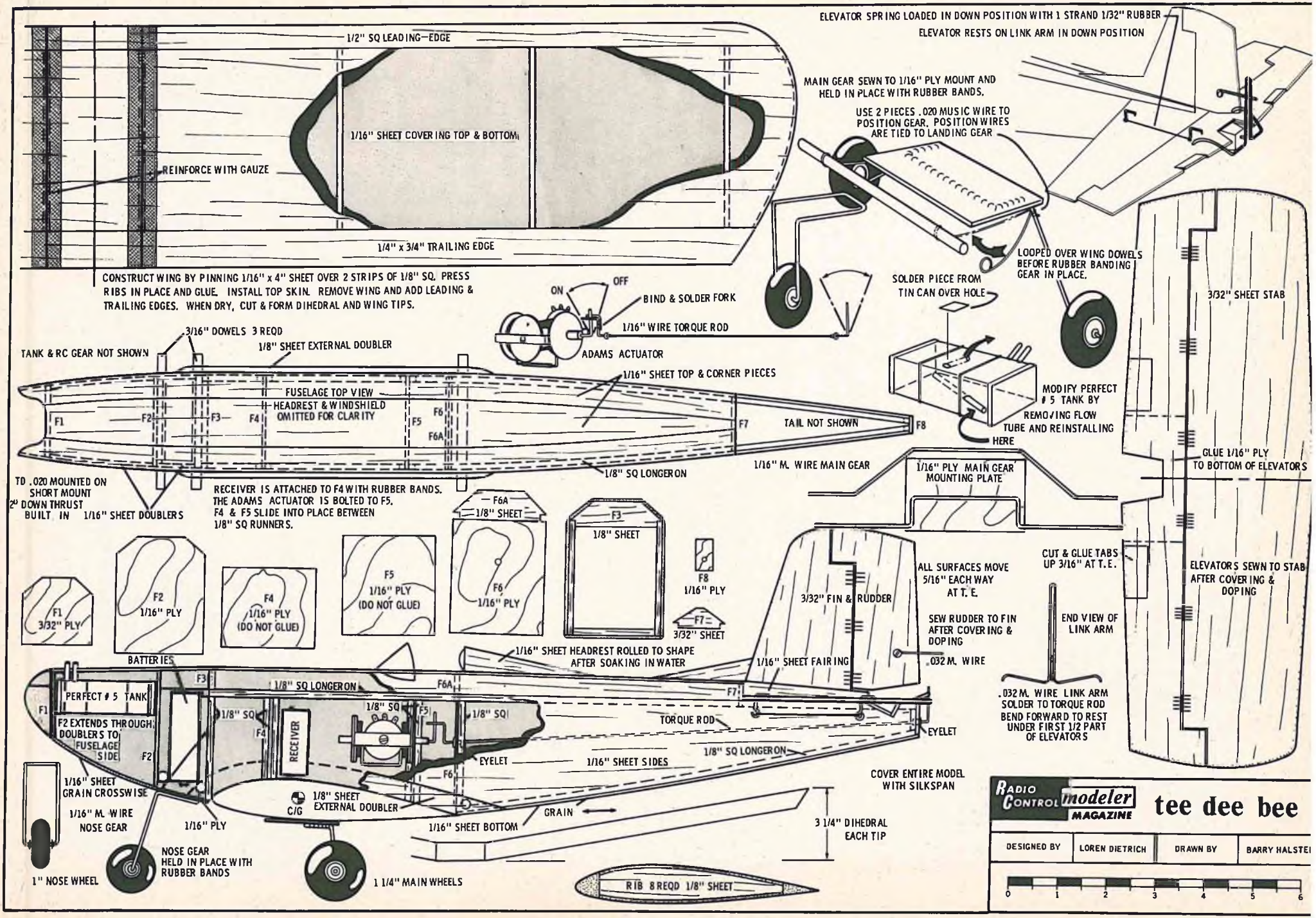
"Let's not get personal," said Wagger scratching gently. "But I'm not talking about just **any** actuator. The only actuator that I've found for the job is the **Dual**-Adams; a little heavy, but two 1½ volt alkaline pencells will power that receiver and actuator through a good number of 5 minute flights before re-

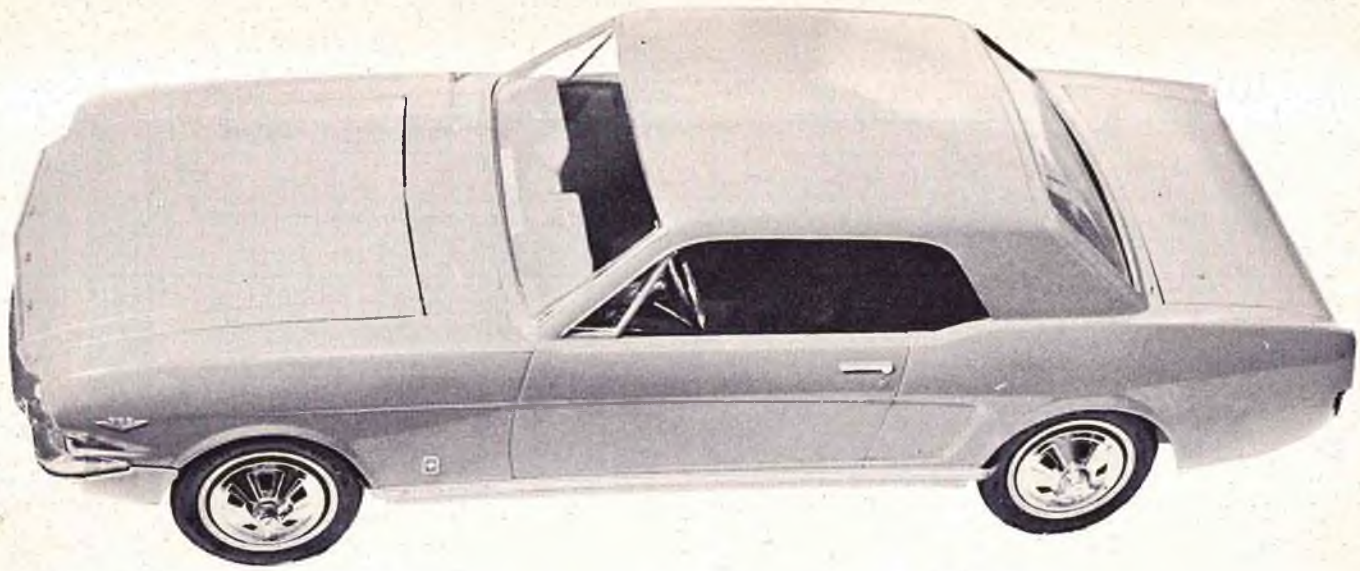
(Continued on Page 68)

"You don't have to put a dog yummy by the motor, Walt old boy, to get me to pose with my own plane. Besides, I prefer steak! Ah, well, it's a dog's life!"



SEE PAGE 44 FOR ADDITIONAL TEE DEE BEE PLAN NOTES





RADIO CONTROLLED FORD MUSTANG GT

BY CHUCK WAAS

A FEW weeks prior to the recent Holiday season, RCM obtained a 16" model of the 1966 Ford Mustang GT, manufactured by AMF Wen-Mac in cooperation with the Ford Motor Company, as part of the latter's sales promotion program for 1966. To date, over two million of these miniature Mustangs have been shipped to Ford agencies throughout the U. S. and possessions, due to the national press and television advertising given this phase of Ford's sales program.

The Wen-Mac Mustang GT is a 16" exact scale replica of the 1966 Mustang, complete even to the orange-red color and black upholstery. Fully assembled, it has a rugged plastic body hinged to a steel chassis, rendering it virtually immune to ordinary damage. As received, it has a powerful and efficient 3-6V electric motor coupled to a well-engineered gear train. The front axle is steerable and attached to a ratchet lock to enable the car to run straight or in circles. The headlights, taillights, and instrument lights all operate from a single 3-6V bulb source. Knock-off wheel hubs, opening hood, and simulated V-8 engine are also part of the Wen-Mac Mustang. An optional version with .049 glow engine and racing slicks is also available direct from AMF Wen-Mac.

This particular model appeared to be very easily converted to radio control operation. The challenge was to make the adaptation without disturbing the interior of the car so that the receiver, servos, and battery pack would not be visible from the exterior.

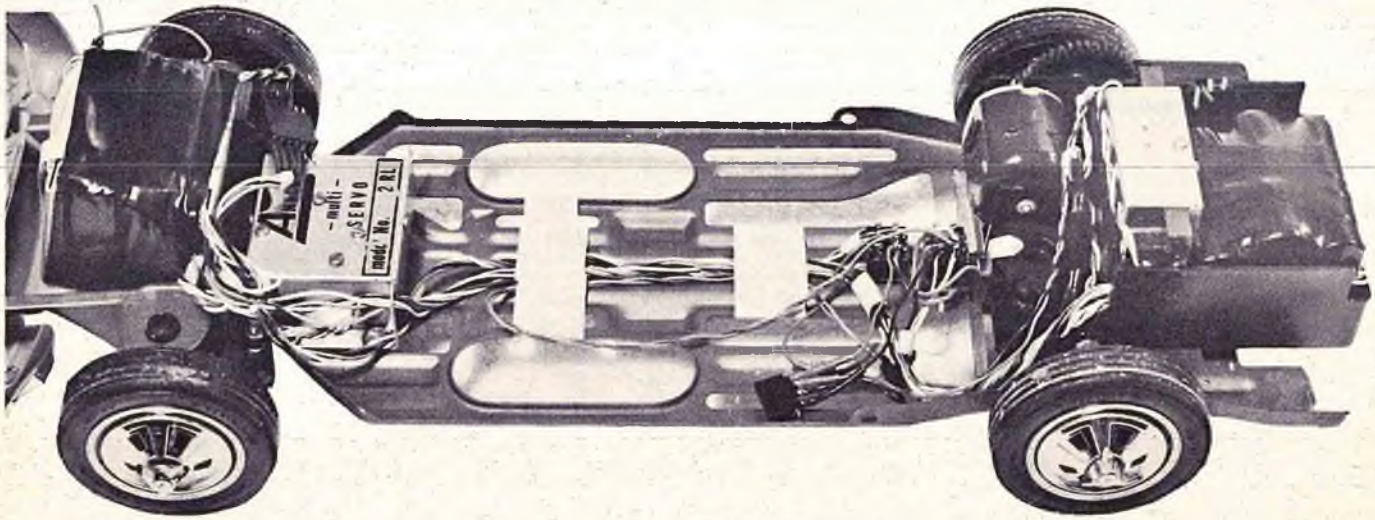
Modifications to Basic Car

The simulated V-8 engine must be removed. This simply snaps out from the engine compartment. The floor of the engine compartment must also be removed to allow clearance for the receiver. This can easily and quickly be accomplished by heating an X-Acto knife over an open flame and cutting the flat portion of the floor away. Be certain not to disturb the black plastic interior molding. In order to clear the steering servo, two holes must be cut in the forward part of the black plastic area in the region of the passenger foot and leg area. Again, carefully use the hot knife process and do not cut too much away. Note from the photos where the Annco servo is to be located, then make a trial fit to determine the amount of material to remove.

No other car body modifications are necessary.

R/C Installation

The steering servo is an Annco 2RL



self-neutralizing unit. This is located as shown in the photographs. Lay this servo in position, then separate the steering tie rod, using the heated X-Acto knife. Leave at least ½" of tie rod at the pivot point on each front steering assembly. The two stub ends of the tie rod then connect directly to the Annco servo using 2-56 x ¾" machine screws, as per the photograph. It will be necessary to drill out the Annco arm adjusters to accept the screws. The Annco servo is then bolted to the steel chassis.

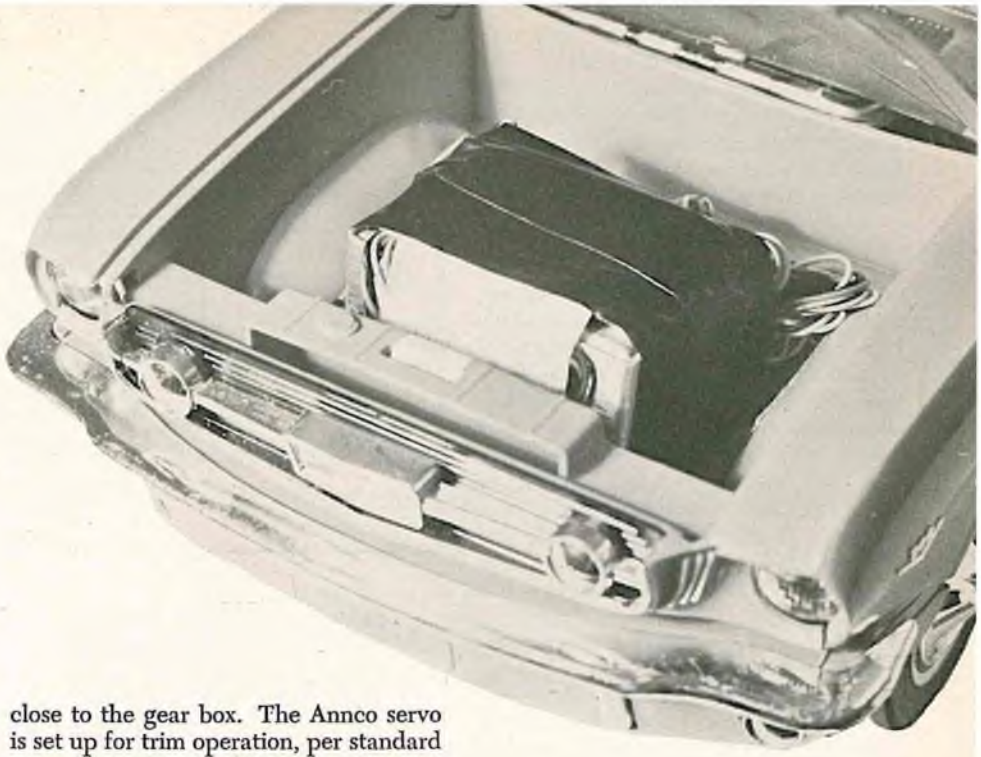
The receiver can be any type of relayless reed unit, in this case a Controlaire 10-channel superhet was used. The receiver, itself, rests between the two frame members in the engine compartment.

In order to eliminate connector plugs, we utilized an Accutronics Accu-Tie, cut to proper size and taped to the receiver. All wiring from the steering servo and receiver should be routed down the center of the metal chassis and secured in place with tape. (See photo.) The on-off switches should be mounted on the center line of the chassis immediately in front of the drive motor.

The drive motor and gear train furnished with the Ford Mustang is more than adequate for propulsion and requires no modifications with the exception of a capacitor (.01) across the motor terminals for noise suppression. Use any standard combination of noise suppression components to suit the equipment you are using. The electric motor can be snapped out of its mounting for this procedure.

Battery System and Reversing Servo

The battery compartment in the Mustang was designed to accommodate two 1½ volt flashlight batteries. These are removed and the remaining compartment used to hold a 5-pencell nickel cadmium battery supply and an Annco 2RL servo. The latter is used to stop, start, and reverse direction of the drive motor. Remove the existing battery terminals by snapping them out of the plastic casing. Cut all existing wires



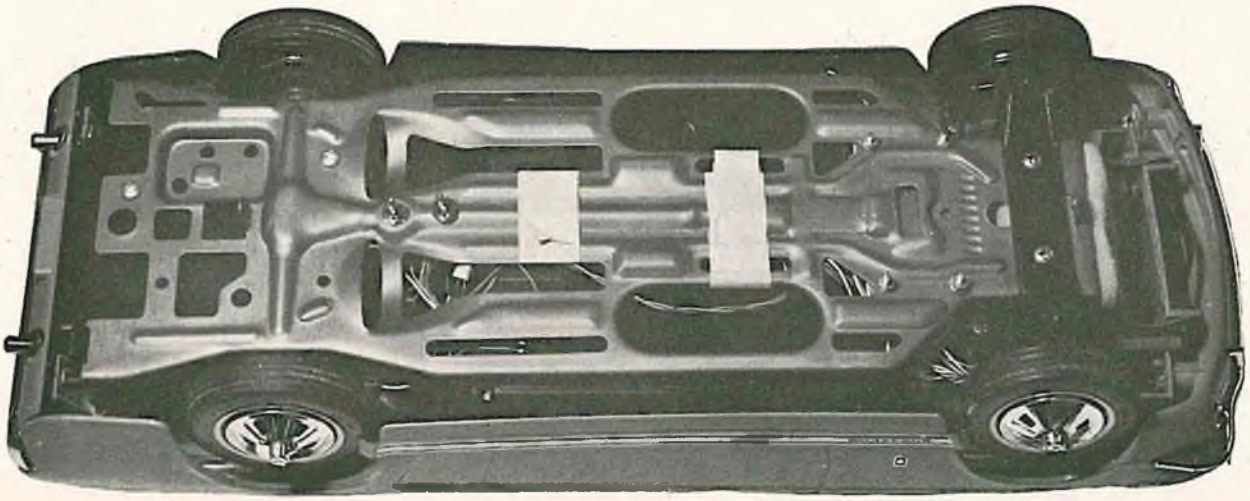
close to the gear box. The Annco servo is set up for trim operation, per standard Annco instructions, and must be further modified by the addition of two Micro switches #ISM 1-T, available direct from any Micro distributor or from local surplus stores. Ours were 39c surplus items obtained from C&H Sales in Pasadena, California.

Two small holes are drilled on each end of the servo case and two self-tapping screws used to hold the Micro switches in place. On ours, we used the screws from a Bonner control horn. They are the exact size and length. Use extreme caution when drilling the mounting holes so that they are in the right position and that internal servo amplifier components are not damaged. Position the switches so that when the servo arm is extended they are just closed, and will open as the arm travels its full distance. With a small file, radius slightly the lower side of the servo arm so that it will depress the Micro switch without jamming.

Wire the motor reversing Micro switches as shown in the schematic, thus eliminating the need for additional circuitry such as relays, etc. The servo and receiver wiring should be per instructions accompanying your receiver and servos. Voltage for the drive motor can be varied by tapping various combinations of cells in the battery pack. We found that 2.4V is sufficient for the average small living room, although a little slow for larger, unobstructed areas. In the case of the latter, simply hook up to 3.6V which is more than adequate for any operation. The total output of 6V was also tried, but requires a quick driver on the transmitter levers!

Antenna

Antenna mounting is accomplished by drilling a 3/32" hole in the normal car antenna position, positioning a length of 3/32" O.D. brass tubing in the hole, and mounting to the black interior casting with epoxy cement. A 10-12" length of .032 piano wire can then be slipped

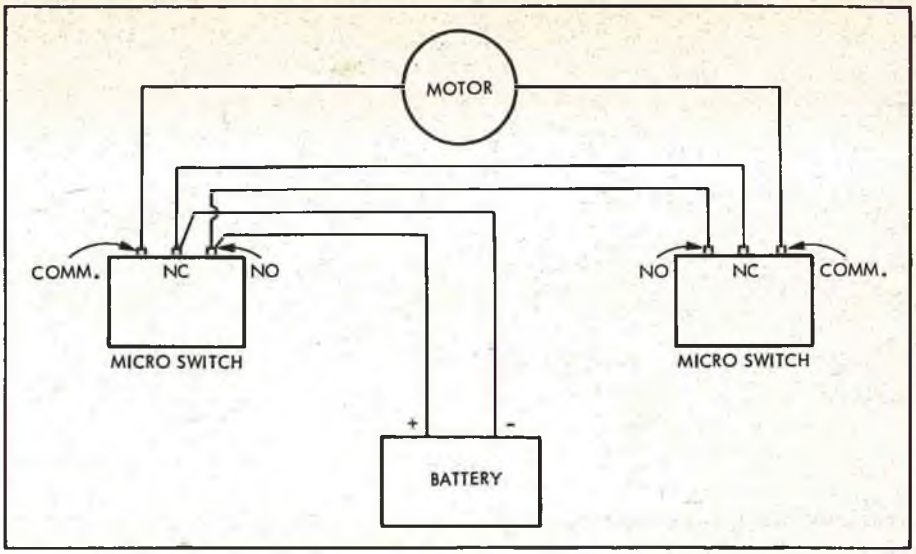


into this mount to make a more than adequate antenna system. Simply solder the receiver antenna stub lead-out to the brass tube. Crimp the .032 piano wire to fit snugly in the tubing and bend a loop at the top to prevent accidental maiming of your curious wife.

Conclusion

If you're too sophisticated to run a radio controlled car around the house, or if you're a dedicated, dyed-in-the-wool-airplane-type-who-wouldn't-be-caught-dead-with-a-car-and-who-will-probably-write-a-Letter-To-The-Editor-about-toy-cars-in-RCM, you're going to miss a lot of fun. We have a ball with ours, and have passed the word on to others such as Ted White of F&M, staff members Bill O'Brien, Dick Kidd, and Bernie Murphy—all of whom now have Mustang GT's running high, wide, and handsome.

For something a little different, see your local Ford dealer. The Wen-Mac Mustang GT sells for $4.95 and would be a bargain at twice the price. If he's temporarily out of stock, buy a new car, then wait patiently for the next shipment from Wen-Mac. Thanks to the outstanding efforts of Wen-Mac's sales department, headed by Pierre DeBaubt, back orders are nearly up-to-date, and by the time you read this, almost another million Mustang GT's will be available from local dealerships throughout the country.



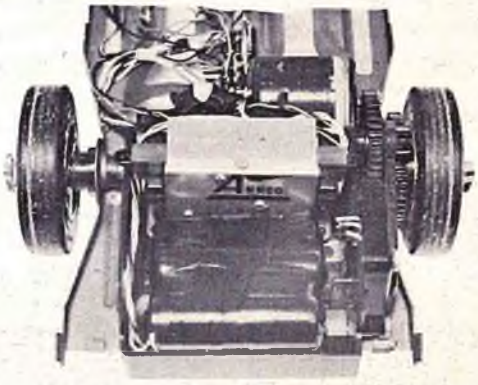
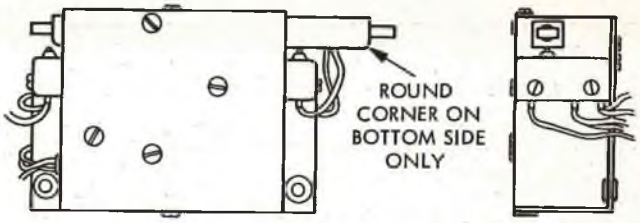
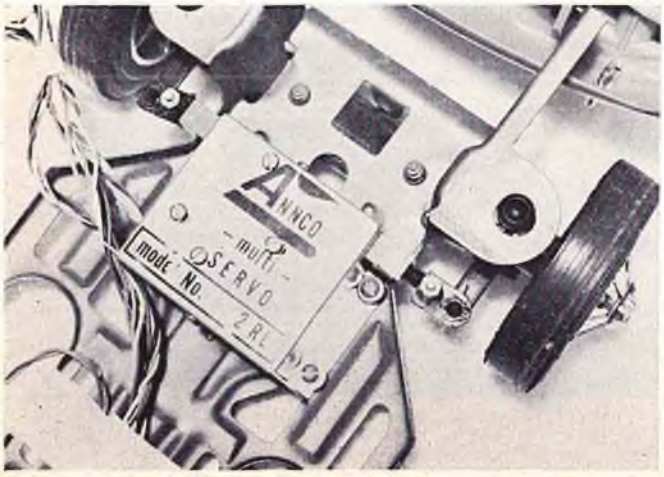
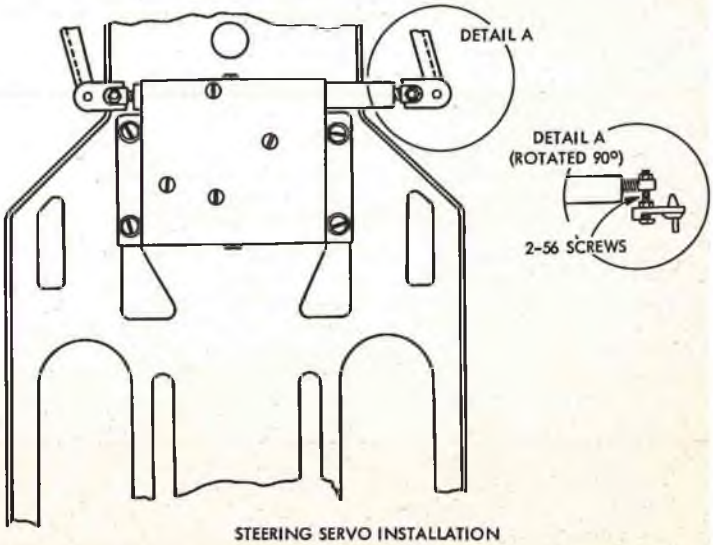


Photo and art series show complete installation data for RC'ing the Wen-Mac Mustang GT — available at your Ford dealer.

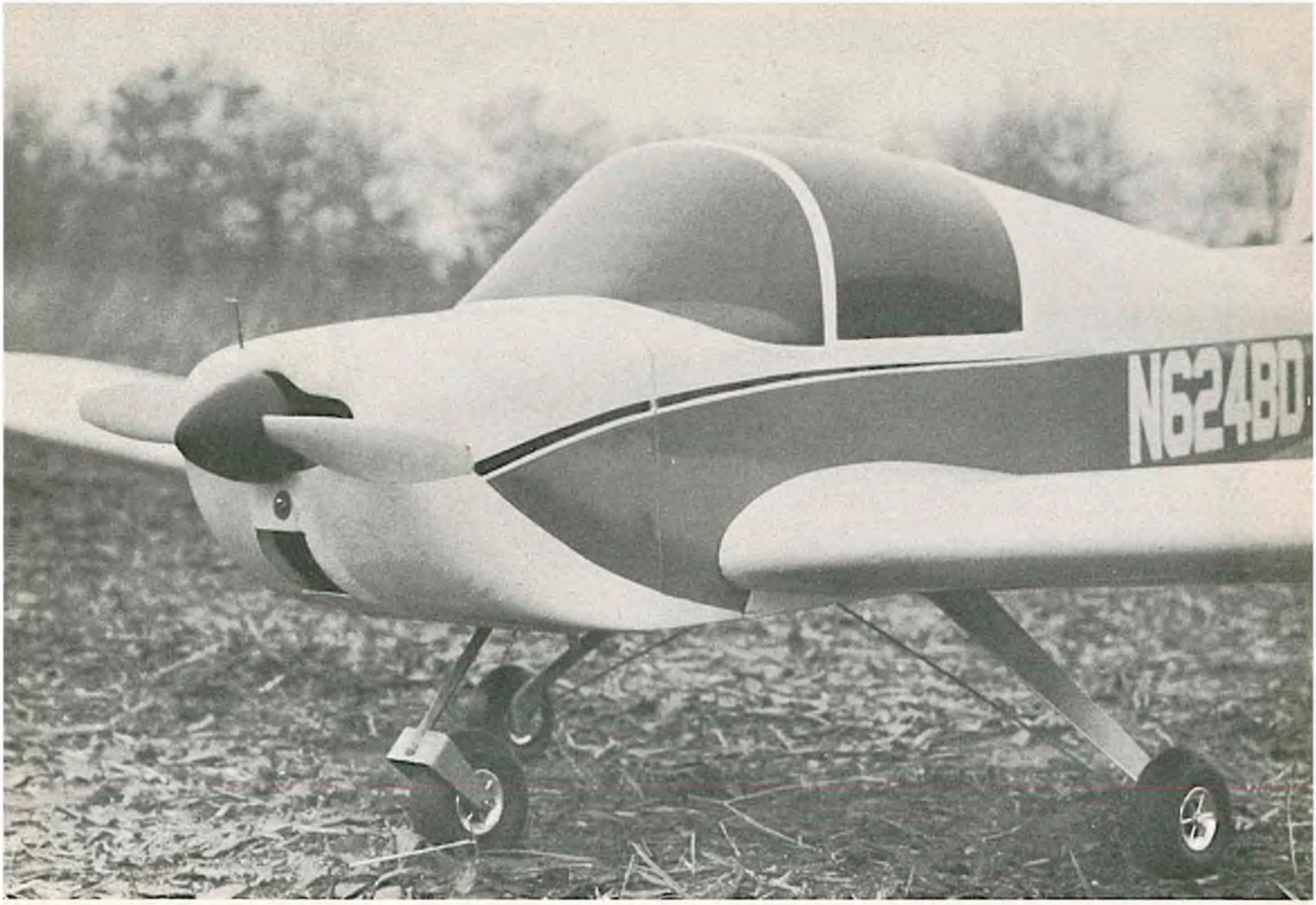


MOTOR SERVO INSTALLATION





STEERING SERVO INSTALLATION



BD-1

By Nick Ziroli

For proportional or reeds, a scale model of Bede Aircraft Corporation's phenomenal $2500 entry in the light aircraft field.

The pretty young lass is almost smaller than Nick's outstanding RC version of Bede Aircraft Corporations BD-1.

THE small plane boom that was predicted and expected after World War II, just never came to pass. Not that there weren't numerous attempts to get the public in the air. The Piper "Skycycle" and the Lockheed "Little Dipper" were two attempts that, for one reason or another, never quite made it.

Now, twenty years later, it appears that the "boom" is on its way to becoming a reality. This could be made possible by pilot designer, James Bede of Bede Aircraft, Inc., and his amazing BD-1. I say "amazing" because this is an all metal, low wing, two place fully aerobatic plane with a price tag of $2,500! This is with a re-manufactured 65 H.P. engine. The lowest price plane currently on the market has a price of more than twice this amount.

Price is not the only amazing feature of the BD-1. As stated before it is fully aerobatic, stressed to 9 G's, upright or inverted. The wings are removable. A single 6½" tubular steel wing spar plugs into stubs protruding from the fuselage sides in a fashion that has been used on models for years. Wing span is 23½ feet.

Construction is almost completely metal. A honey comb structure is used in a good portion of the fuselage. Very few fasteners are used in construction, with parts glued together with epoxy, instead.

Sound familiar? Parts that aren't metal, are constructed of fiberglass. This includes engine, cowling, wing tips and fairing, tail plane tips, and tail cone. One unique use of fiberglass is the landing gear. It offers light weight and better shock absorbing capabilities than conventionally constructed gear.

Possibly the biggest factor in making the low price possible, is the small quantity of parts required. There are 385 parts in a plane, most of which are interchangeable, adding up to only 175 different parts. For instance, horizontal and vertical tail surfaces are identical and interchangeable!

Many options are planned to be made available. Engines up to 108 hp. can be supplied giving a top speed of 155 mph. The price will go up according to options desired, but even with every option available you won't be able to spend over $5,500.

Only the future will tell whether or not the BD-1 will become a reality.

The good appearance and straight-forward lines are what inspired me to build the BD-1 as a model. It cannot be claimed that this is an exact scale model but rather semi-scale, or scale-like. The drawings were scaled up from an available three-view. Areas and moments were juggled a bit in the interest of flying ability. Stabilizer area was increased as the scale area is quite small. A thicker airfoil was also used to aid low speed characteristics. This proved to be of great value on the very first flight since I am used to long tail moment arm designs, such as the Taurus, and their rearward center of gravities. The BD-1 was set up this way. After a short take off run it was in the air, mushing along and hanging on its prop. Excessive elevator travel and insufficient trim travel made it impossible to keep it in a proper flight altitude. There was little tendency to fall off on either wing even in the extremely nose high attitude. The first flight ended in a rough cross wind landing followed by a cartwheel.

The center of gravity was then moved forward to the 25 per cent point. Further flights went off with no problems at all. The appearance in the air is very realistic.

It is assumed that anyone who plans to build the BD-1 has some building and flying background. Not that it is difficult to build, but it is not for a beginner. With this in mind, we will not use up precious space with detailed construction details. Instead, only a general outline of building steps will be covered.

A fiberglass cowl was used on the original model. Due to the tail heavy condition and the fact that the BD-1 nose is so squarish it was decided to show a built up block nose on the plan. The fiberglass cowl is very light, which is fine, but not when you need weight in the nose!

You may have noticed the extensive use of 1/8" plywood in the fuselage. The large size of the formers made this necessary for strength. I use a furniture grade of plywood for low stress areas such as formers, and doublers. This is available at kitchen cabinet manufacturers and some lumber yards. It is quite inexpensive. High stress areas such as fuselage sides, firewall, dihedral braces and landing gear mount, should be Sig or another quality grade of plywood.

The front section of the fuselage is built first. Take care that this assembly is square and not twisted. Cement the 1/4" square longerons and uprights to 1/8" sheet sides. Epoxy these to the front section and join at the tail. Reinforce the joint with light fiberglass and resin. Rear formers are added next.

Build the stabilizer and elevator from light balsa, except for the 1/4" x 3/8" spar which should be hard. Make sure no warps are built in as they will be practically impossible to remove when completed. Join the elevators with 3/32" dia. wire horn assembly. Use nylon hinges. Cement stabilizer in place and plank rear deck. This is best done with 1/8" sheet strips tapered from 3/4" to 1/4".

The fin and rudder are cut from medium soft 1/4" sheet. A 1/4" x 3/4" hard balsa strip is used as a leading edge and brace. This goes through a hole cut in the planking. Glued to the rear side of F-7 it gives the fin ample strength.

Build the wing over the plan. Pin lower wing main spar down, and block up trailing edges of ribs. Cement remaining spars and leading edge in place. When dry, remove from board and sheet bottom with 3/32" medium balsa. Join wing panels with 1/8" plywood joiners. Use 2 1/2" of dihedral under each tip. Epoxy 3/8" diameter wing hold down dowels and trailing edge reinforcement in place. Install aileron bellcranks and pushrods. Block the wing panels up so that leading and trailing edges are parallel and then sheet the top surface. Cement the wing tips in place and carve to shape.

Cut aileron bottom to shape and glue ribs on it. Add front and top sheeting. Epoxy fiber horns and end ribs in place. Tips are glued on, and carved to shape. Install hinges and pushrod links to aileron horns.

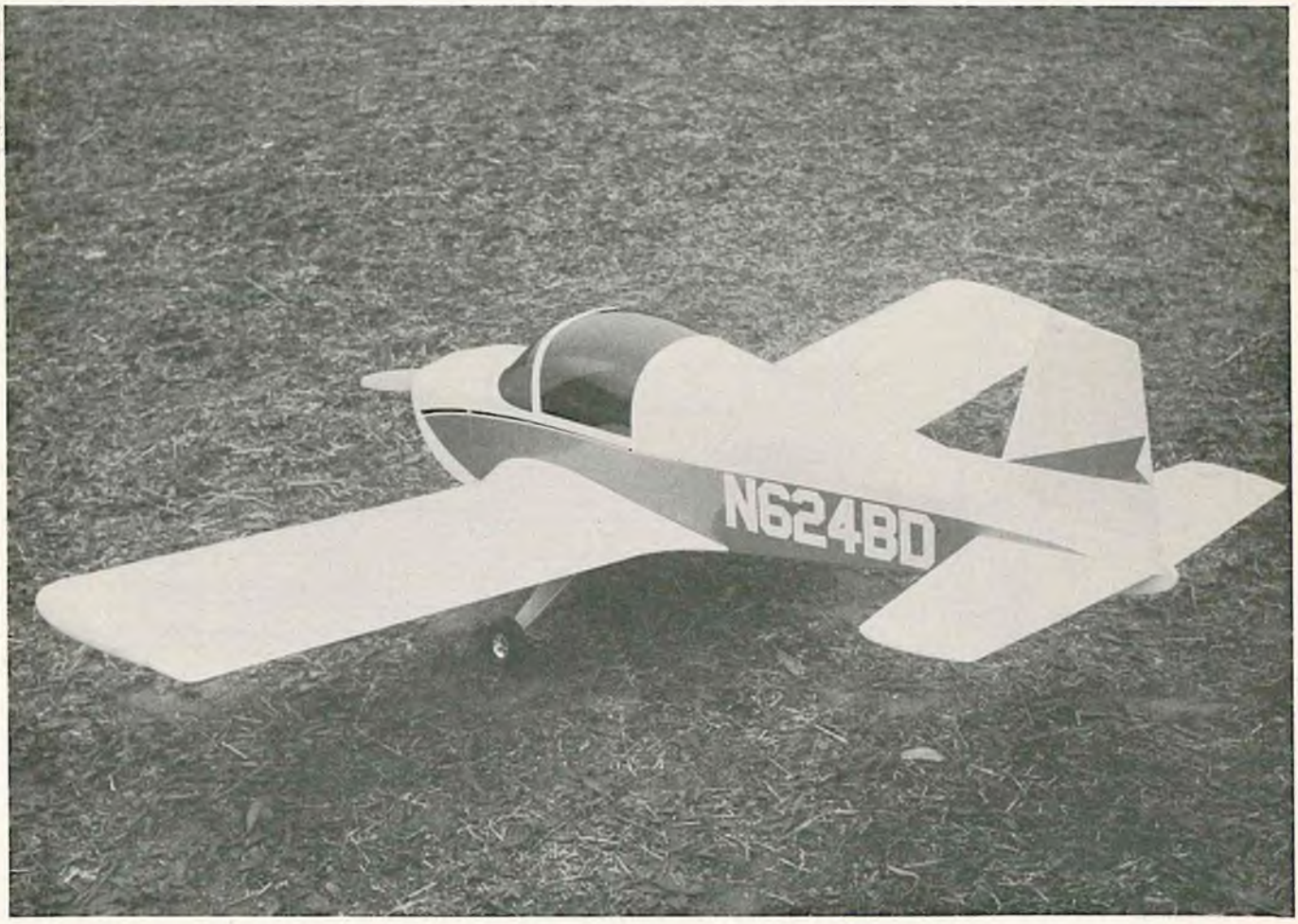
Cement the 1/8" plywood fuselage fairing sides to bottom of wing. The bottom of the wing center section will extend below the sides. Sand this off even with the sides with rough sandpaper on a large block. Mount the aluminum landing gear to its 1/8" plywood mount with 4-40 screws and "T" nuts. Remove gear and epoxy mount in place on bottom of wing. Cover remaining area with 1/8" hard sheet balsa.

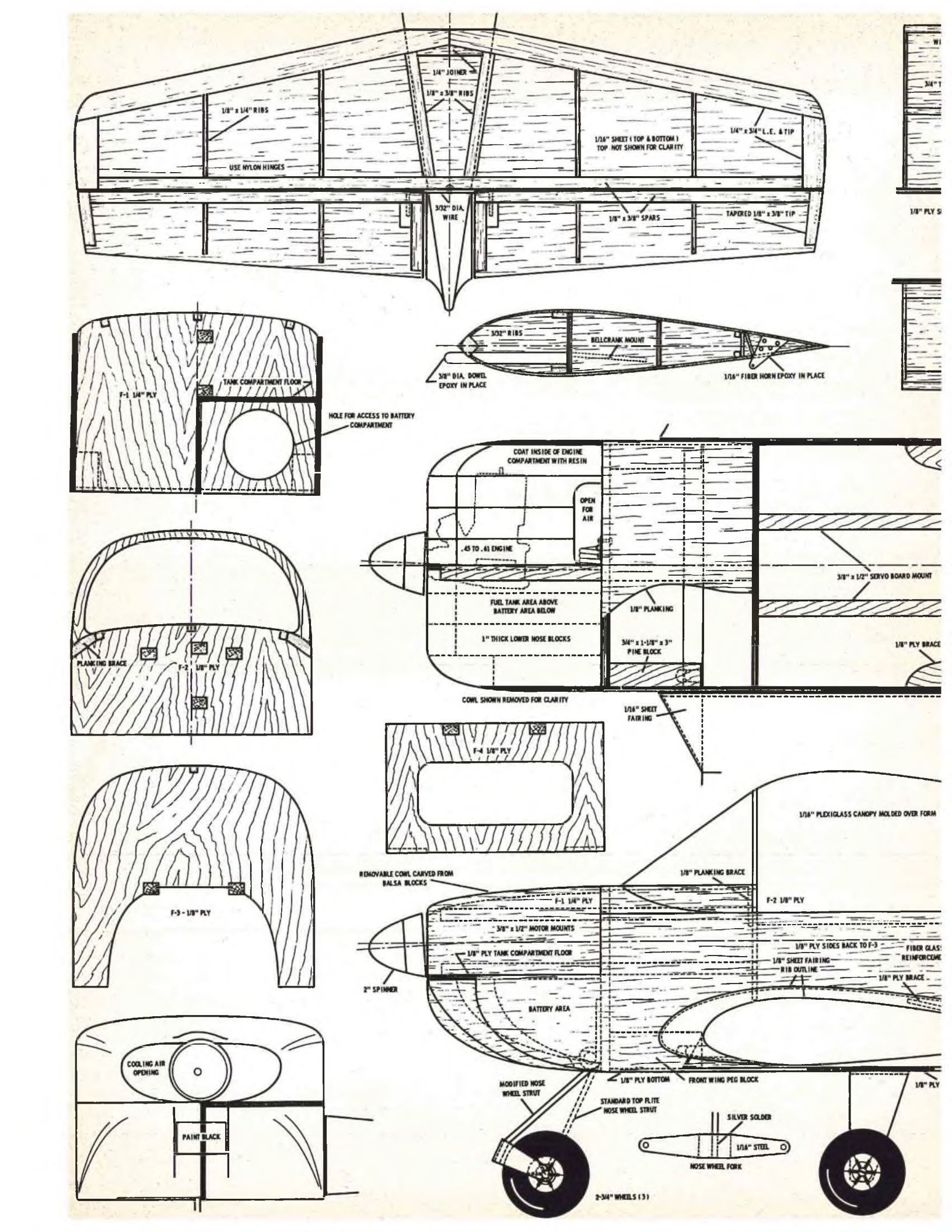
Due to the long springy landing gear legs, a 1/16" diameter wire brace was found necessary. This runs from one axle up to the center of the fuselage and down to the other axle.

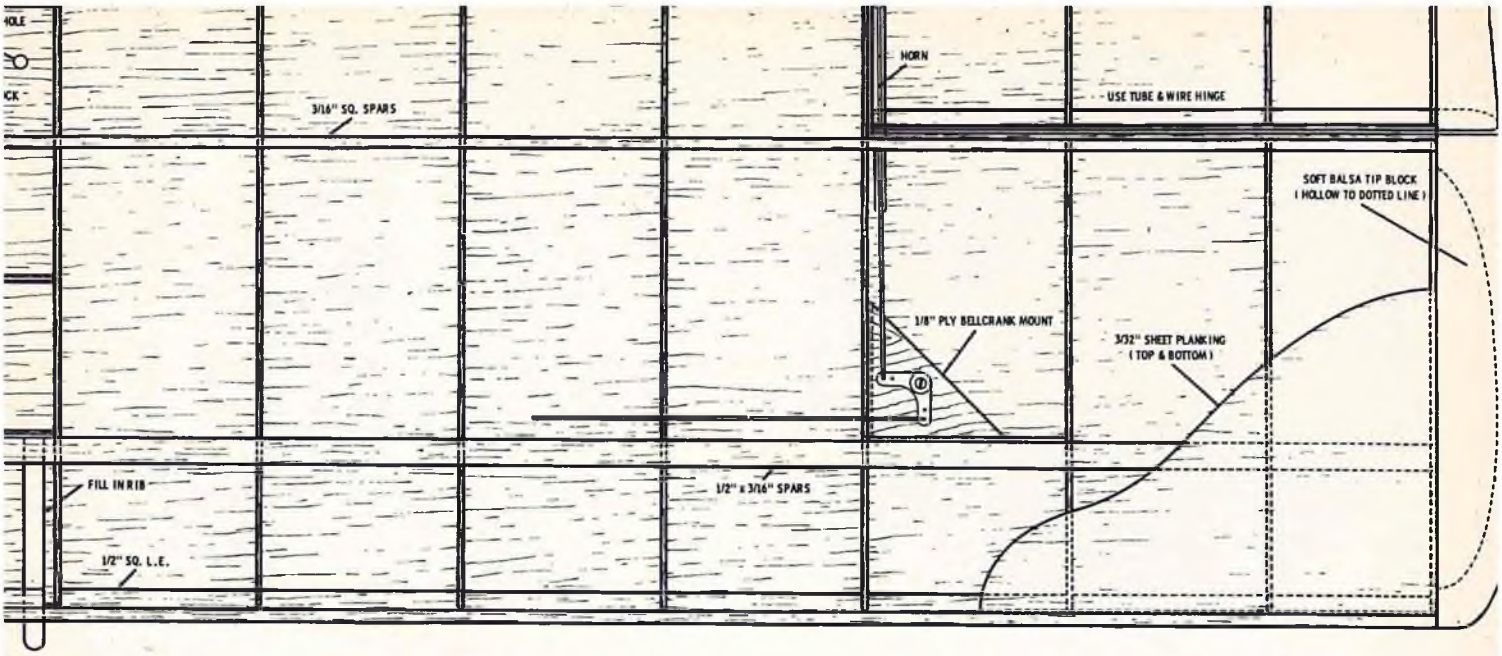
Mount wing to fuselage with 1/4-20 nylon screws and "T" nuts. With wing in place on fuselage cement 1/8" thick fairing rib to the wing. Leave a 1/32" space between the rib and fuselage.

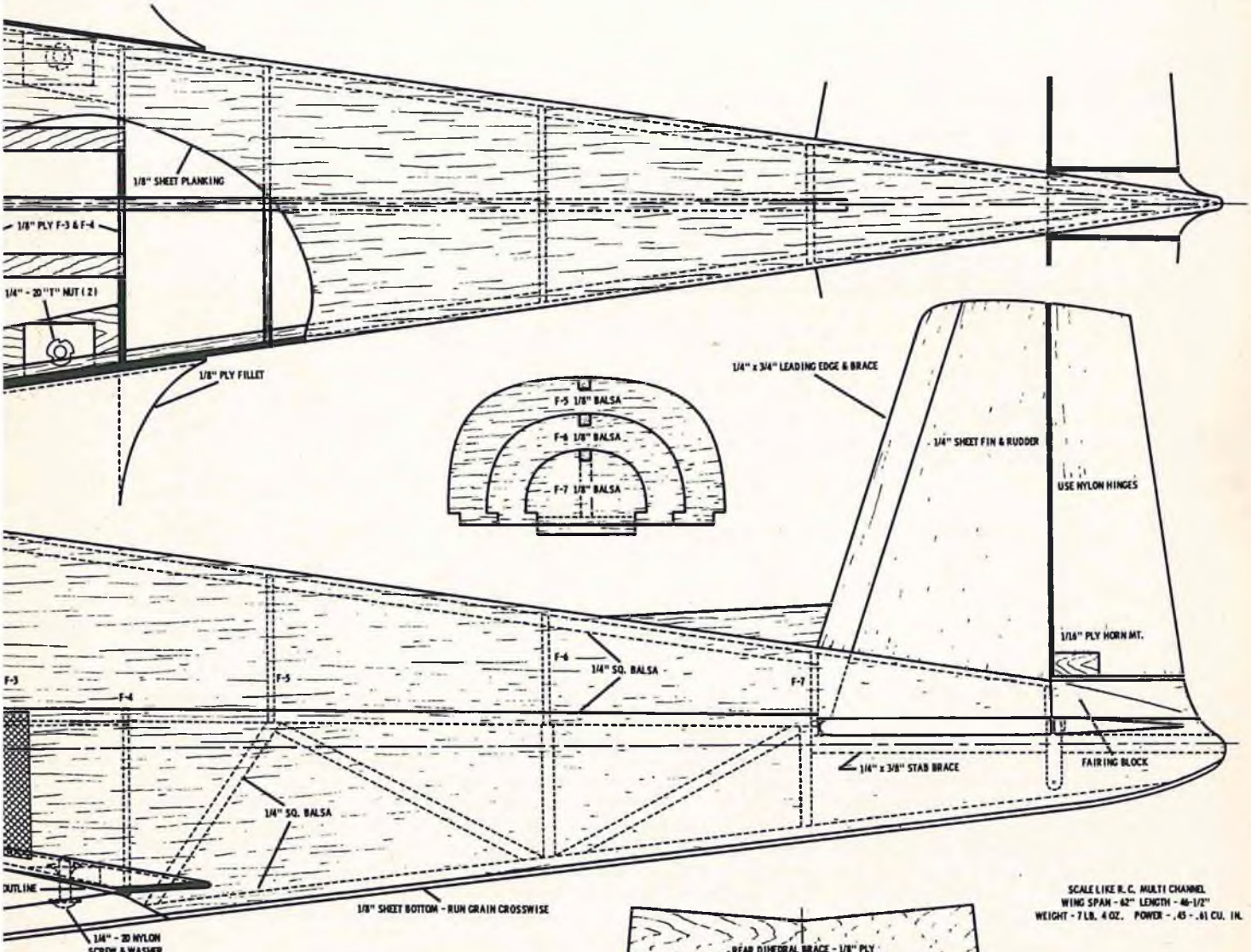
(Continued on Page 66)

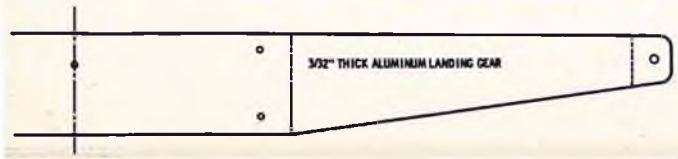
From any angle the red and white Bede is a popular favorite and sure to be a hit on your field. Canopy is blue molded plexiglass.

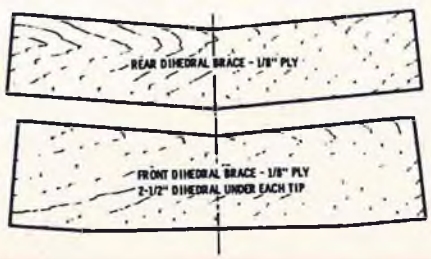



1/4" JOINER
1/8" x 3/8" RIBS
1/8" x 1/4" RIBS
USE NYLON HINGES
1/16" SHEET (TOP & BOTTOM) TOP NOT SHOWN FOR CLARITY
1/4" x 3/4" L.E. & TIP
3/32" DIA. WIRE
1/8" x 3/8" SPARS
TAPERED 1/8" x 3/8" TIP
3/32" RIBS
BELLCRANK MOUNT
3/8" DIA. DOWEL EPOXY IN PLACE
1/16" FIBER HORN EPOXY IN PLACE
F-1 1/4" PLY
TANK COMPARTMENT FLOOR
HOLE FOR ACCESS TO BATTERY COMPARTMENT
COAT INSIDE OF ENGINE COMPARTMENT WITH RESIN
OPEN FOR AIR
.45 TO .61 ENGINE
3/8" x 1/2" SERVO BOARD MOUNT
FUEL TANK AREA ABOVE BATTERY AREA BELOW
1/8" PLANKING
1" THICK LOWER NOSE BLOCKS
3/4" x 1-1/8" x 3" PINE BLOCK
1/8" PLY BRACE
PLANKING BRACE
F-2 1/8" PLY
COWL SHOWN REMOVED FOR CLARITY
1/16" SHEET FAIRING
F-4 1/8" PLY
1/16" PLEXIGLASS CANOPY MOLDED OVER FORM
REMOVABLE COWL CARVED FROM BALSA BLOCKS
1/8" PLANKING BRACE
F-1 1/4" PLY
F-2 1/8" PLY
F-3 - 1/8" PLY
3/8" x 1/2" MOTOR MOUNTS
1/8" PLY TANK COMPARTMENT FLOOR
1/8" PLY SIDES BACK TO F-3
1/8" SHEET FAIRING RIB OUTLINE
1/8" PLY BRACE
2" SPINNER
BATTERY AREA
COOLING AIR OPENING
PAINT BLACK
MODIFIED NOSE WHEEL STRUT
1/8" PLY BOTTOM
FRONT WING PEG BLOCK
STANDARD TOP FLITE NOSE WHEEL STRUT
SILVER SOLDER
1/16" STEEL
NOSE WHEEL FORK
2-3/4" WHEELS (3)









SCALE LIKE R.C. MULTI CHANNEL
WING SPAN - 62" LENGTH - 46-1/2"
WEIGHT - 7 LB. 4 OZ. POWER - .45 - .61 CU. IN.

Radio Control modeler MAGAZINE **BD-1**

DESIGNED & DRAWN BY	NICK ZIROLI	INKED BY	G.

0 1 2 3 4 5

Miami, Florida, Dec. 30th: Dave Holmes of Virginia takes 1st place in Class II Novice and 2nd place Open Pylon at King Orange Internats using RCM Digitrio. Modified C.G. Falcon used in Class II, Midwest Hustler Delta in Pylon Event.

RCM DIGITRIO: FINAL SYSTEM ALIGNMENT

PART VII BY ED THOMPSON

PREFACE

ANY radio system is only as good as the care taken to adjust and check it out. If you have not bothered to read the previous articles thoroughly, followed instructions, or substituted parts without complete understanding of their use in the circuits, now is the time to read the articles thoroughly, go over your equipment and install the proper parts. The staff at RCM has spent many, many hours trying to insure successful duplication of the Digitrio, but we cannot make up for mistakes or sloppy craftsmanship by individual readers. Your system will only work as good as the efforts you put into it! Since there are only a few completed Digitrios flying at the present time I am not able to pass on the experience of many modelers at this time. For the benefit of all the readers RCM welcomes your letters pertaining to your experiences with the Digitrio. We will compile this information and publish it for all to benefit. If you make any changes or improvements please state why you did so and the results.

The letters for a four-channel system have been increasing and I will start packaging the "Digiquad" as soon as possible. I have several circuits built and tested and all that remains is to log one hundred flights or so to prove their reliability. I have circuits using SCR's, trigistors and plain old transistors. The one I select will be based on reliability, reasonable cost and ease of duplication. At the present time the transistor circuit looks like the best bet because most of the parts in the decoder could be used over again. It consists of two flip-flops and a one shot. It also has provisions for adding a fifth channel. The biggest problem is the mechanical changes to the transmitter. The only change in the airborne part of the system will be exchanging the decoder board with the new one and adding a servo.

I have been flying the present system as three-plus-one for the last month and will present this modification in next month's issue. Fearless Leader has designed a trainer, and Dick Smith and I have designed a contest type airplane to take advantage of the Digitrio's small size, low weight and continuity of control. Both will be presented in a forthcoming issue of RCM.

I will cover each component part of the system giving alignment instructions, preventive maintenance and pass on to you some of my experiences with the different circuits.

TRANSMITTER

The transmitter should be tuned up according to instructions in the November issue. These instructions pertain to RF tuning. The coder was adjusted when the pots were placed in the center

Upper right: Dave Holmes with 'Super Falcon' and Digitrio — winning combination at recent King Orange Internat's. Left: Dick Smith's 'Digifli', small multi designed for the Digitrio.

of their travel. Here are some things I have found necessary to insure best results from the transmitter:

1. **Problem** – Unstable operation of the 200us one shot (Q10 & Q11). This can be caused by two things. If Q10 has an above normal base emitter resistance, D4, D5 and D6 in combination may divide the base current to ground. Also RF radiation from the antenna may cause spurious triggering of this one shot.
   Solution – Insert another diode in series with the bottom of D4, D5 and D6 and base of Q10. Install a .01 MFD capacitor from collector to emitter of Q10. See figure 1.
2. **Problem** – Oscillator tuning not pronounced enough. This can be caused by operating Q1 too high on its collector current curve. This will occur especially if Q1 is replaced by a "hotter" transistor than specified, like a 2N708.
   Solution – Increase the value of R3 until the peak is well pronounced – 330 ohms is about optimum for 2N708's or "hot" 2N706's. Also replace C3 (.1) with a .01 to retain proper pulse shaping.
3. **Problem** – Excessive collector current of Q2 and Q3. This can be caused by excessive drive, "hot" transistors in the final or combination of both.
   Solution – Lower the value of C4 and C5 and in extreme cases remove them entirely to obtain collector current of approximately 100 MA. Collector current can be measured by lifting the cold end of L6 and inserting an MA meter.
4. **Problem** – RF feedback, especially with antenna collapsed or removed. This is caused by direct RF radiation of L5. This situation is exaggerated by the use of "hot" transistors which increase power.
   Solution – Install the shield as described previously.
5. **Problem** – Z1 burning out. This is probably caused by incorrect installation or "shorting" wires together while checking the transmitter.
   Solution – Install Z1 as shown on the overlay (with the bar toward Q9). Tape the ends of the pot leads to prevent shorting. Make sure there are no metal objects under the transmitter board during checkout – such as clipped resistor leads, nuts and bolts, etc.
6. **Problem** – Meter pegs when antenna is inserted or removed. This is caused by accidental "shorting" of antenna and ground.
   Solution – Turn off the transmitter before installing or removing antenna.

Before using the transmitter make sure that the RF signal is perfectly clean. Listen to a monitor and a clean buzzing sound should be heard with no "fuzzyness." Place your hand near the loading coil deliberately detuning the antenna and note if the signal is still clean. Retract or remove the antenna and note if the signal is still clean. Run through the tuneup procedures once more, noting if the meter peaks cleanly. If it does not have a smooth peak you probably have a little feedback. If you have an oscilloscope the signal can be observed by placing a diode between the vertical input connectors and running a 36" piece of hookup wire from the "hot" input connector. This will give you a visual display of the output signal and any trouble can be easily observed. I would suggest the scope treatment before using the transmitter (there is bound to be someone in town who has one – try your ham friend, TV technician, etc.) In any case your transmitter must be checked by an FCC licensee prior to operation. Take the RCM articles with you to assist him in this certification check.

Here are two acid tests for the output of the Digitrio. These tests will not detect regeneration but will visually indicate the radiated power.

1. With the antenna removed place a G.E. #47 pilot lamp **with a .01 MFD capacitor,** in series, across the antenna connector to ground and observe its brilliance. This is RF voltage lighting the lamp. The lamp should glow at approximately one half brilliance.
2. With a full charge on the batteries it may be possible to light an NE-2 neon lamp with RF voltage on the antenna. To do so hold the lamp by one lead and touch the other lead above the loading coil. With your other hand tune the antenna by placing it near the loading coil. The NE-2 lamp should light. This again is RF voltage doing the work.

The front panel template shows the P.C. mounting posts too close together – increase the distance between them horizontally by ¼". The only preventive maintenance necessary for the transmitter is occasional adjustment of the stick springs and a drop of oil on the pot shafts.

RECEIVER

Tune the receiver as described in the September issue. If you have any problems the voltage checkpoints should reveal where they are located. Here are some problems and solutions I have encountered.

1. **Problem** – Meter reads negative instead of positive while tuning. This is caused by improper installation of diode D1.
   Solution–Install D1 properly (with the bar up). The picture of the receiver on page 18 of the December issue shows D1 apparently installed backwards. This is due to a shadow and the bar is not visible at the top of the diode.
2. **Problem** – Lack of sensitivity. This can be caused by many things. In one case I had reversed the black and white IF transformer. In another case I used a 10K for R3 and a 1K for R7.
   Solution – Double check installation of all components as per the overlay. Again I would recommend the scope treatment prior to using the receiver. Place the scope leads where the meter is used for tuneup. Check your signal for smoothness with a weak signal. If the receiver is carefully peaked with the meter as described it should correspond to the smoothest signal on the scope. Therefore once you have ascertained that the signal looks good a scope is of no further use for receiver tuning. I would recommend that the IF's be

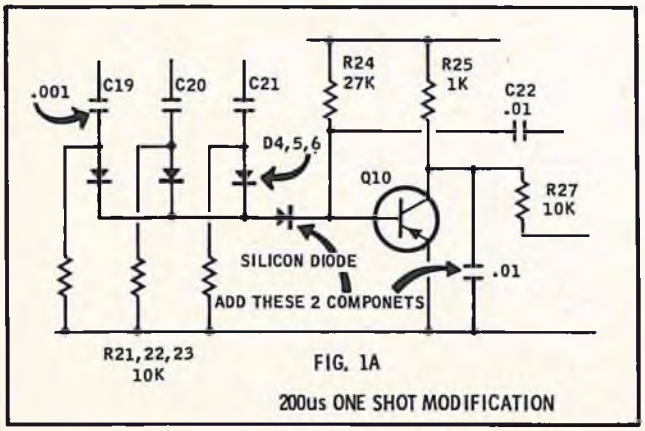


FIG. 1A
200us ONE SHOT MODIFICATION

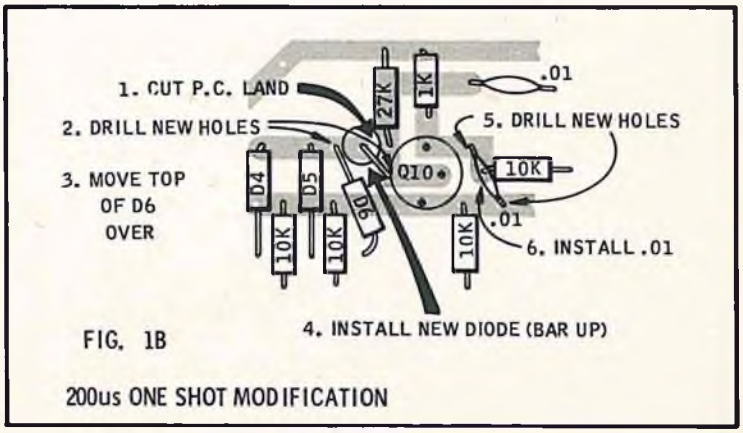


FIG. 1B
200us ONE SHOT MODIFICATION

retuned about twice a year as temperature changes go from one extreme to another.

DECODER

There is no tuning procedure for the decoder. All adjustments and circuit operating parameters are established by resistor capacitor combinations. The scope treatment here will reveal any discrepancies and is about the only way a qualitative check can be made. I have experienced no difficulty with the decoder so cannot pass on any problems or solutions at this time. I would recommend however that you double check the installation of all parts prior to using it—especially the shield installation and grounding strap. On the World Engines kit the grommet slots will have to be deeper to clear the case flange. A hole will have to be drilled for insertion of the grounding strap.

SERVOS

Close observance of the visual aids and instructions in the servo article should preclude any trouble here. I have run into a couple of problems which I'll describe.

1. **Problem** — Servo runs to one end when signal is applied. This is caused by incorrect installation of one or more diodes.
   Solution — Check the overlay carefully for improperly installed components.
2. **Problem** — Servo erratic during vibration check of aircraft. This was due to a "cold" solder joint at the collector lead of one of the motor driver transistors.
   Solution — Check all soldered joints carefully.
3. **Problem** — Motor servo chatters or buzzes with signal applied. This is due to the wide sampling period of the motor control one shot. In some cases it will not allow the extreme resolution the servo is capable of.
   Solution — Replace R14 and R15 (4.7K) with 10K's. This will broaden the resolution slightly and eliminate this condition.
4. **Problem** — Unable to secure full travel of servo output arm (adjustment will be covered later). This is caused again by the nature of the motor control one shot. Due to the demand on the one shot to recover so rapidly circuit components may make full travel impossible.
   Solution — Rather than "digging" into the decoder to replace critical parts simply replace R5 (27K) with a 33K. This will increase the reference generator one shot pulse and allow a longer recovery time for the motor control one shot in the decoder.

Although this has not been a problem, I would recommend that four small holes be drilled and resistor lead remnants soldered where the auxiliary board and main board are joined.

If other problems are encountered with the servo your best bet is to contact the local Einstein for assistance.

One source of trouble is the wearing of the wiper fingers on the output arm. This is not a new problem but it is aggravated by the coarse surface of the wirewound resistance element. My rec-

(Continued on Page 60)

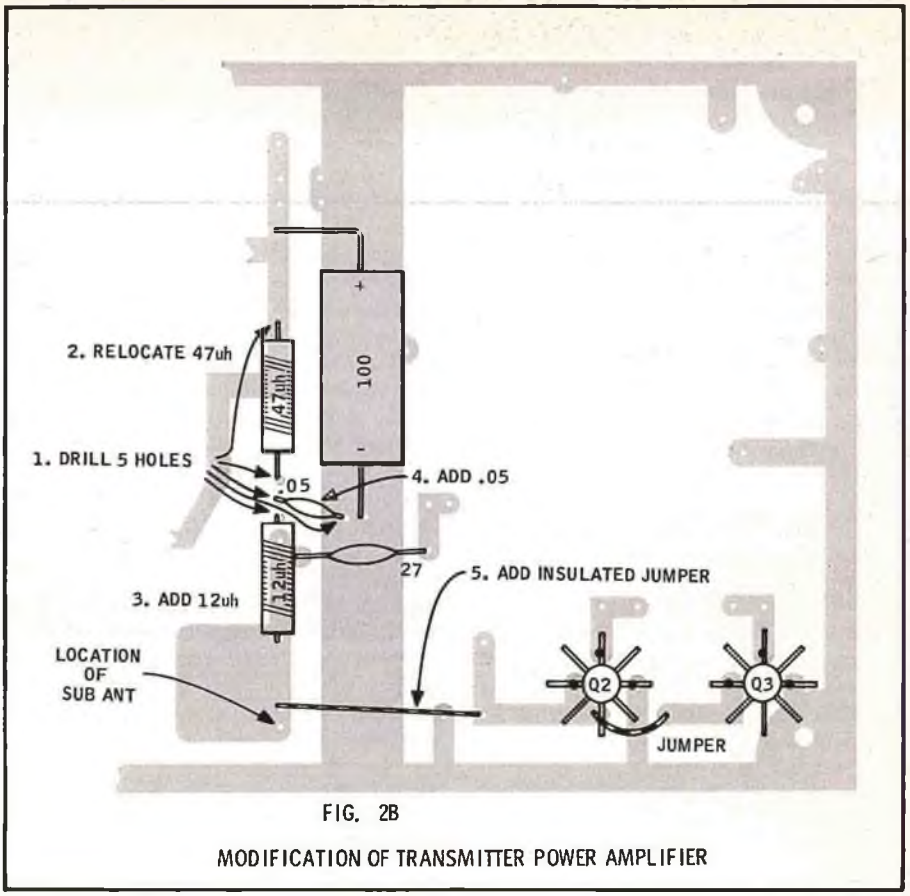


FIG. 2B

MODIFICATION OF TRANSMITTER POWER AMPLIFIER

Artwork illustrates simple modifications to transmitter power amplifier, described in article.

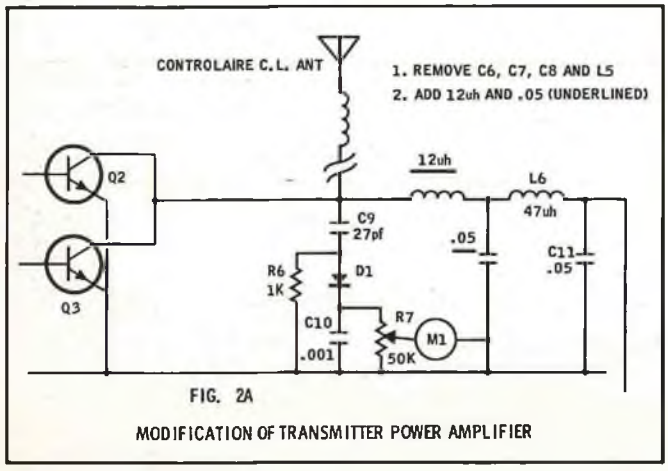


FIG. 2A

MODIFICATION OF TRANSMITTER POWER AMPLIFIER

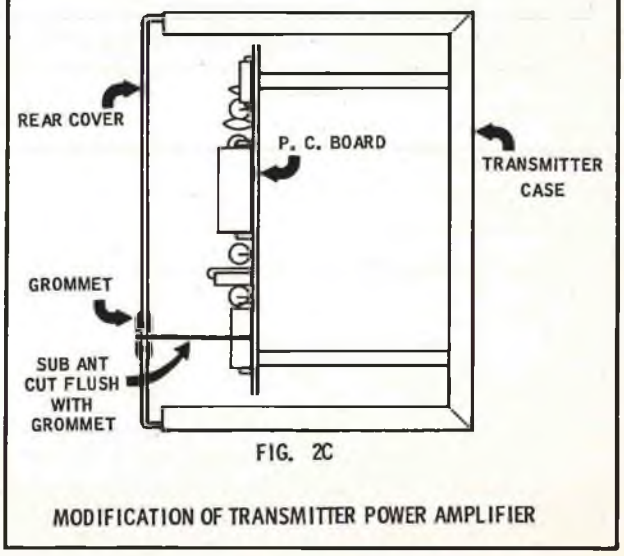


FIG. 2C

MODIFICATION OF TRANSMITTER POWER AMPLIFIER

Looking for something different? Try these . . .

29¢ FLEX-WINGS

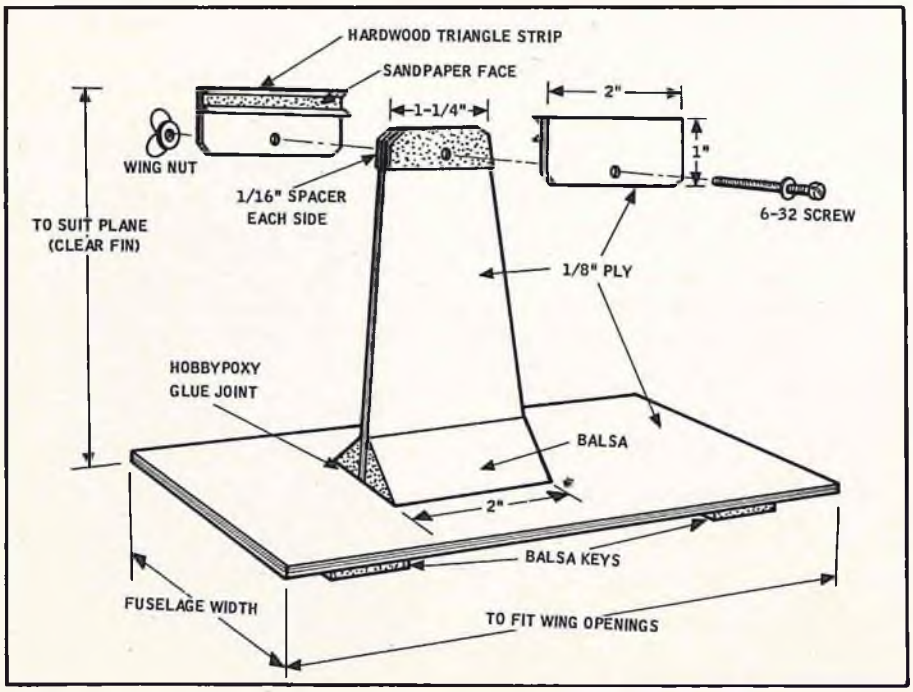
By Buck Flegel

IN the spring of this year, the North Pacific Products Co. of Bend, Oregon, brought out a different kind of kite called a "Glite." It's a paper kite employing three sticks and a clever tough plastic fitting that holds the sticks together.

The more I looked at a Glite the more it seemed that it could be used as a flex-wing for model aircraft, so I decided to give it a try.

Remembering an article in American Modeler on flex-wings, I searched for it and finally found it in the May '63 issue. From the information given, it looked like a 29c or 39c Glite would be right for ½A, and the 19c size for .020 (the 29c and 39c models are the same size, but the paper on the 39c one is impregnated with plastic).

Being too lazy to build a special fuselage for the experiment, I found a 4-year-old Keystone ½A Pacer body, much abused, with R.C. gear stripped out, but still with an engine mounted. This looked good for a try, so I started.



The pylon that holds the Glite is shown in the sketch. One-eighth plywood is used for the platform and upright. Hobbypoxy glue and ¾" triangular balsa make up the joint. Hard landings have shown this to be very satisfactory strength-wise. The adjustable bracket is held by a 6-32 screw and Ace R.C. wing-nut for quick adjustment. Since the Glite sticks are ¼" square with rounded edges, the clamp members are made with guide strips to fit and lined with sandpaper for grip. The 15° incidence angle called for in A.M. proved to be correct. Balance of the fuselage was no problem since shifting the Glite back or forward took care of it.

Test gliding was done in the conventional manner — use a good, flat throw since "wing loading" is high. Glide was fast but good.

Tuesday night being the regular flying session for the Stardusters R. C. Club, out we went for free flight tests. "Hooly" Graham, local glider nut, lurched forward as an assistant. The old engine was balky and this resulted in eight or ten prangs due to power failure just after hand launch, but there was no damage to plane or Glite. Finally we got a good run and the flight was fine; sweeping turns to the left and no problems at engine cut-off. It glided down nicely into the pucker brush.

(Continued on Page 59)

RCM PRODUCT REPORT:

F & M DIGITAL-5

PROPORTIONAL SYSTEM

By Bernie Murphy

THE F&M Digital 5 Proportional Control System is manufactured by F&M Electronics, Inc., 135 Vermont St., Albuquerque, New Mexico. F&M is a pioneer in the R/C field, with an enviable performance record. When it was announced that F&M was producing a digital proportional system, we waited patiently for the word that ultimately travels through the grapevine — good or bad. (Bad word travels much faster!) Gradually, the reports leaked through — mostly good, and to the effect that F&M had the first successful digital system on the market.

It wasn't until the 1964 Indiantown Gap Invitational that we had a chance to look at one of these rigs. Vern Krehbiel of VK Model Aircraft had one in his Cherokee prototype, and Leon Schulman had a new one in his Stormer. We watched closely the flights of both pilots, flying with at least five other frequencies operating simultaneously (these were the only digitals). No problems seemed to be encountered.

Late on Sunday afternoon, the inevitable happened — Schulman's throttle failed to operate. Lee asked if we would mind taking a look, as he was certain that the lock nut on the control stick had apparently loosened. Mind? This was the chance we had been waiting for. Sure enough, a loose nut was the only problem. (Ever have a loose nut on your field? We do!) It seemed somewhat ironical to have a mechanical failure when everyone was certain that this "digital stuff" was strictly "for the birds." Anyway, we had obtained a close look at the internal side of the transmitter and were impressed with the apparent quality of both materials and workmanship.

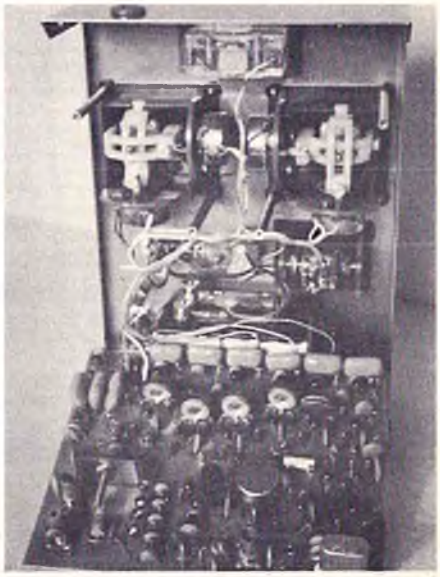
The good reports kept coming in, and in May we decided to do a product report on the Digital 5. The system was purchased through normal channels, arriving in about three weeks. The total system consisted of transmitter, receiver, four Digimite servos, nickel cadmium packs, chargers, and instructions, all well packed to withstand the rigors of shipment.

General Description

The F&M Digital 5 control system uses a digital technique known as Pulse Duration Modulation, commonly referred to as PDM. This technique is widely used in the transmission of information to and from missiles and satellites.

To understand how PDM actually works in the system, consider the control of one servo — say the aileron servo. Thirty times each second the transmitter sends out a pulse which is routed through the receiver to the aileron servo. When the aileron control stick is in the neutral position this pulse is 1.7 milliseconds long. Inside the servo, another pulse is generated whose length is dependent upon the position of the servo output arm. When the latter is centered, or neutral, the pulse generated in the servo is also 1.7 milliseconds long.

Assume now that both the transmitter stick and the servo are in the neutral position. When the pulse from the transmitter is received it is sent to the servo where it is compared to the length of the pulse generated in the servo. In this case, both pulses would be 1.7 milliseconds long and the servo would thus sense that it is in the correct position and would not move.



Two shots of F&M Digital-5 transmitter interior. PC board lowered to show Bonner stick assemblies.

Above: Digital-5 receiver-decoder. Right: F&M's new and larger plant facility.

Now the transmitter control stick is moved to the left position. The transmitter will now send an aileron pulse which is 1.1 milliseconds long. When the servo receives this pulse, it will compare it to its own 1.7 milliseconds pulse. Since the servo finds the incoming pulse to be shorter than its own, the servo will generate a signal, causing the motor to run in a direction which will move the servo arm to the left, shortening the servo pulse. Each pulse from the transmitter is compared, and the servo will continue to move until the pulse generated inside the servo matches the length of the pulse from the transmitter.

Eight sets of pulses are transmitted, followed by a brief "on time." Five of these pulses are used for control, the rest being used to assure proper cycling.

The Digital 5 is equipped with both "Lock-Out" and "Fail-Safe." Interference generally shows up as additional pulses, while loss of signal results in less than the normal eight pulses. Any time there are more than eight, or less than eight pulses, the receiver will automatically reject the erroneous carrier and go into "Lock-Out," in effect, locking all controls in their last position. If, after 1½ seconds of Lock-Out, the RF signal is still in error, the system will go into "Fail-Safe," returning all controls to neutral and running the engine to low throttle. Any time that the proper signal returns to the receiver, the pilot immediately regains control of the airplane.

Transmitter

The Digital 5 transmitter now employs the Bonner stick assemblies (no more loose nuts) in the most commonly used two-stick configuration. (Rudder and engine on left, aileron and elevator on the right.) An auxiliary control panel is located just under the left hand stick, allowing for easy control without releasing the primary control stick. One feature of the transmitter which could easily go unnoticed is the inclusion of engine trim. We have found this very useful, using low trim for engine cut-off, and high trim for idle. (The system is stable enough to allow this!)

A dual purpose meter is provided, reading either RF output or battery condition. The meter also indicates power supply charge rate while on charge. The transmitter has a relatively high output at .8 watts into a base loaded, 56", 6-section telescoping antenna. Selection and rating of electronic components is more than adequate. Silicon transistors are used throughout. The power supply is a 7.2V rechargeable nickel cadmium pack, with a 1.2 ampere hour rating. The current drain is 240 MaH. The overall level of workmanship is excellent, and typical of F&M's standards.

Receiver

The Digital 5 receiver is built on a two-deck configuration, the top deck containing the superhet receiver, while the lower deck contains the logic network or decoder. The physical size of the receiver is 2" x 1⅝" x 3" with a weight of 6 ounces. The receiver employs an all silicon superheterodyne with AGC, RF amplifier stage, and three IF stages. The digital circuitry is also all silicon, using fully saturating flip-flops with silicon diode decoding. Receiver sensitivity is better than 3 microvolts with an effective operating temperature range from 0 degrees F to 160 degrees F.

Servos

The system under evaluation was delivered with Digimite servos. These have been reviewed with other systems (RCM April 1965) and we shall not go into great detail concerning them. Two types of servos are supplied—Center Fail Safe for flying surfaces, and End Fail Safe for throttle. The servos feature a linear push-pull action, and are housed in a high-impact plastic case.

F&M recently announced that their Digital 5 was being shipped with a new servo manufactured by F&M. We have not as yet obtained one of these units, but feel certain that they will be found to be of comparable quality to that of the rest of the system.

(Continued on Page 58)

TOP OUT

BY JERRY KLEINBURG

Add Evens checks out Dian Kleinburg with details of his epic 8' bipe stunter. Sporting an original simul-firing twin, using McCoy 60 cylinders, plane performed full pattern in scale-like manner — met untimely end in mid-air prang.

"— 'bout the only way to explain it is to say it's the jawin' season 'n sometimes the talkin' gits ahead of the thinkin'!"

This is the way our friend the woodstove philosopher gathered together a bunch of conversational loose ends during an off-season rehash of R/C matters. He was listening to some building session palâver in which it was being stressed that there hadn't seemed to be enough progress during 1965. Now he'd heard enough of the theme and was about to re-arrange the tune. Balsa dust in the air, we listened —

"Progress is one of them funny things that comes in some sirprisin' ways and shapes. You fellas say yer unhappy 'cause the Contest Board 's been a mite slow on workin' out rules changes — 'cause nobody 's come out with a superduper no-trouble engine — 'cause plane designs ain't changed much — 'r mebbe 'cause those Goodyear racers haven't sprouted as fast as expected. . . . Well, mebbe all this is so, it still seems y'r overlookin' a purty big item that took a while ta come about and which ya sure should keep in mind.

"It don't seem so long ago," he continued, "that most considered themselves lucky if they got 10-20 flyin' hours put together in a whole year — an' luckier still if they ended up without losin' a plane 'r two flyin' off, ta boot," he added. "Nowadays what's the picture? Y'can fill it in fur y'rself . . . 100 ta 200 flyin' hours a year — 'r all ya got time ta do — 3, 4 up flyin' together, equipment works alla time — 'n that's considerin' these new per-porshun'ls, too — and the magazines fulla ready-made gimcracks ta make buildin' better 'n easier, makin' it possible ta put in more flyin'!

"Impatience," he concluded, "is nat'ral an' some re-arrangin' of the details'll come on in due time . . . but this ain't gettin' away from a mighty important fact. Remember now, all that air time y'r puttin' in is buildin' up experience, confidence, and all 'round knowhow that can't come about anyway else 'cept by flyin'. It all adds up ta somethin' ya don't lose once ya got it! The way I see it, **that's** real progress."

You know, the old man's got a point.

BLAME R/C

Saw an item in a local newspaper regarding a miniaturized Cardiac Resuscitator. This item has medical people pleased now that this diagnostic and treatment device is mobile and may save lives where speed in detecting heart attacks is important. The article sounded interesting so we talked to the doctor who participated in the research project and found out the idea stemmed from his hobby — R/C flying! Seems he figured present bulky medical equipment could be battery powered and transistorized along lines similar to our equipment. He and two others then obtained a research grant from the Medical Research Foundation of Texas which resulted in a 23 pound non-RF unit that may soon see widespread use by police and firemen in emergency cases of cardiac arrest, particularly in connection with fires or accidents where "heart failure" often occurs. The unit also includes a defibrillator to generate a controlled electric cardiac shock to restore heartbeat once the diagnosis, which takes thirty seconds, is completed. The newspaper article described the development as a remarkable breakthrough, to which we would like to add

A gaggle of Separators ranging from 36" to 60" attracts top rudder flyers (L to R) Hutchinson, Brammer, Dixon, Rhodes, Doiron, and Jackson at Port Arthur meet.

Port Arthur "Oily Birds" and friends, gather for Halloween RC Fly Fest. Meet attracted wide range of aircraft in late season meet.

our own appreciation to the MD who demonstrated R/C's broad reaching effect and influence.

AROUND THE COUNTRY

● From the Glue Dobbers' Al Solnok we hear Ralph Moore is hangared back in Tulsa after a California sojourn. Ralph's building a new one called "Savage" which sounds approriate in this age of tigers. Al also claims you can't afford to miss a flying session these days. With the TV people taking on footage like they are, you might miss a chance to be a star. Gary Vaughn at Box 263 Owasso, Okla., is the new Glue Dobbers Club pres. for 1966.

● Via Martha Beason and SHARKS SPARKS—John Moyle sends news from Goose Bay, Labrador, that R/C flying weather "is rather scarce." Other limitations, par for the frosty way off course, John relates, are a shortage of nuts and bolts – you know, all the nice hardware and gadgets we find at our corner hobby shop. John's house came with a real nice work bench – "only it's a bit high, like a bar," he whimseys. The 13 RCers at Goose, including 2 Canadians, cover the R/C spectrum in activities from single channel to Digimite – have a 500 by 5000 foot landing strip to try to land on.

Martha also assures us a "Bearus," such as Ron Beard flys is a combination of a Beachcomber fuselage and a Taurus wing, while a "Tarcomber" is a Taurus body and – yep, a Beachcomber wing! Now we've got it!

TECH TALK

Sometime back, Bob Angus, the best class-oner in the west, asked us to dig up some information on a method where Duramite servos could be used for single channel flying. Bob was referring to Owen Black's switcher circuit that's used with single channel relay receivers to operate the Bonner Duramites. The switcher-servo setup duplicates the action of a compound escapement – one pulse right, two for left, quick blip for motor. Important difference, however, the servo doesn't cycle through controls not wanted and has plenty of power for which Duramites are noted. Kits for the basic switcher (left and right functions) and additions for motor control (up to 5 positions) are available from Ace R/C or World Wide R/C. The kit builds to the size of an inch cube and should become an important contribution to the "art" of single channel flying.

. . . Keep hearing bits of news about a new R/C super-sized engine Duke Fox is preparing. Something on the order of a 70 which should interest the growing scale ranks and other RC'ers responding to the increased power trend. Wonder how much they'll cost?

World Wide Radio is marketing a new contact cement for beaded foam construction that should boost the growing technique as well as increase general use of this form of adhesive. Major advantages: positive grip, lighter, goes twice as far, doesn't get stringy or thick, and your brushes may be washed in water to clean them! The pint can, going for $2.50, covers two multi wings, plus, the Dearborn, Michigan-based firm promises.

WITH THE FLYERS

● Gremlins were possibly the only hobgoblin spirits who invaded the Hallowe'en R/C Fly Fest of the Port Arthur Oily Birds where RC'ers competed for prizes that were blithely advertised to include "all the fun you can

(Continued on Page 54)

Buddy Brammer and his Class I Genie. Merco 49 powered, ship was excellent performer, helped Bud collect many trophies. "Oily Birds" club trainer – also used to treat visitors to guest flights. Proved to be effective for public relations program of the Port Arthur RC Club.

BERNIE MURPHY

KITS AND PIECES

Lou Proctor's magnificent 'Antic' kit prior to covering. Ernie Boling's hand-crafted wire wheels add to scale-like realism of ship.

PERHAPS our masthead would be more appropriate if it read "Sticks and Pieces," for that was certainly our first impression of Lou Proctor's "Antic" kit when it arrived from our California office.

The "Antic" is a ¼ size semi-scale composite of the 1910 Nieuport and the 1913 Bleriot. The model spans seven feet with an undercambered, lifting airfoil, and an overall area of 980 square inches. Although designed for 6-10 channel gear, it is our opinion that the Antic would also do well with only rudder and engine controls.

If you are one of the many RC'ers who would rather fly than build, and would just as soon buy a "ready-to-fly," read no further! If, on the other hand, you enjoy building, are a vintage aircraft fan, a scale fan, or just like something different, here's your chance.

Construction of the Antic follows closely the construction used in early full-size aircraft – sticks and pieces! As a result, we were somewhat worried when the kit was first unpacked, realizing that our deadline was just two weeks away! Two bundles of spruce and balsa strips, pre-cut fuselage sheeting, formers, wing ribs, formed laminated wing tips, well made finished cabanes and landing gear parts comprise the major assemblies of the kit. In addition to these, countless small parts, four bags of hardware, bundles of bamboo strips, and formed bamboo leading and trailing edges for the fin, rudder, and elevators added to the appearance that we had just unpacked a gigantic jig saw puzzle. The kit also includes a thorough instruction book and two large sheets of unusually fine plans, rolled for ease of use—a small point, but much appreciated.

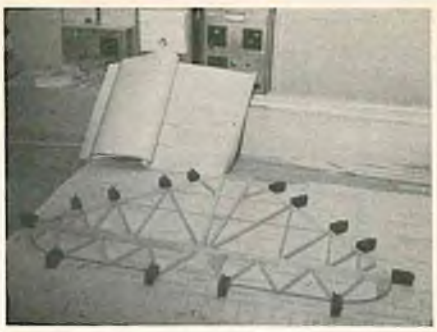
We decided to begin construction with the two wing panels (per the instructions – besides we wanted to get them out of the way!). Each wing rib must be cap stripped before beginning any actual structure. A small jig was made in order to simplify the capping process. The jig, consisting of an extra rib, short spar piece and pins, assures that the completed ribs will all be identical. Once the ribs have been completed, the wing structure can be assembled over the plans. Wing construction is really only slightly more difficult than the assembly of a Senior Falcon, or similar wing, the main difference being the built-in ailerons, and the addition of twenty false ribs at the leading edge. All spars, leading and trailing edges are spruce. After all the the ribs had been glued in place, the bamboo cross bracing was added, an assembly which progressed much faster than anticipated.

The stabilizer, elevator, fin, and rudder are of "built-up" construction. These are all designed so that they can be assembled on a flat building surface, and later carefully block sanded to cross section. The basic procedures are similar to those required to build a Taurus stab, only there is considerably more of it! The stabilizer and elevator can easily be completed in one evening. The same is true of the fin and rudder. The leading and trailing edges of the fin and rudder and trailing edge of the elevator are made from ⅛" square bamboo. These are pre-formed to approximate shape, but did require a little fitting. The bamboo parts can be easily formed simply by heating them over the flame of a candle (bamboo becomes quite flexible when hot and will hold its shape when cool).

The fuselage is built similar to the old 10c rubber models (remember them?) – two frame sides built over the plans. This takes a little longer than pulling two sheet sides from a box, however the simplicity of the rest of the structure helps to make up for the added effort here (there is no turtledeck or nose blocks to shape). The sides are framed from 3/16" square spruce and balsa and care should be taken to assure good, square fits (a razor saw is a must). We chose to deviate from the plans in the construction of the fuselage framework using all spruce and no balsa. The ease of finishing the spruce in the open areas more than makes up for the little added weight. Bamboo cross-bracing is added to the side frames before assembling the fuselage halves. The bamboo makes an excellent representation of the real wire bracing. A very neat cementing job can be done easily if you can manage to wrangle a hypodermic syringe from your doctor or dentist (so maybe you already have one?). The instructions recommend Duco cement for installing the cross-bracing since it shrinks on drying and tends to pull the bamboo tight. I don't know that Duco is any better than some of the other cements intended for modeling purposes, but we bought some anyway. Upon opening the tube it was like finding an old friend – never realized that cements had such individual odors. Here was the old, long-forgotten cement

Basing wing structure on Magna-Jig.

Block plane used to finish wing tip to cross section.

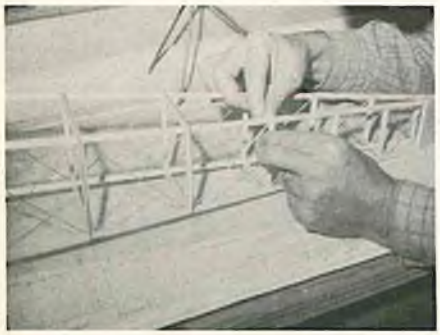


Stabilizer and elevator framework.

Fuselage side frame.

Small pin vise used to drill holes for "wire" rigging.

Hypo handy for applying cement in holes.



Assembling the sides. Rubber bands used for tension.

The completed "box."

Closeup of the tail assembly.

"Gee, dad — I can build this one."

Shades of 1914 . . . .

One for the dedicated builder.

that we had used years ago — before we became so experienced and sophisticated that we **had** to have special "model airplane" cement!

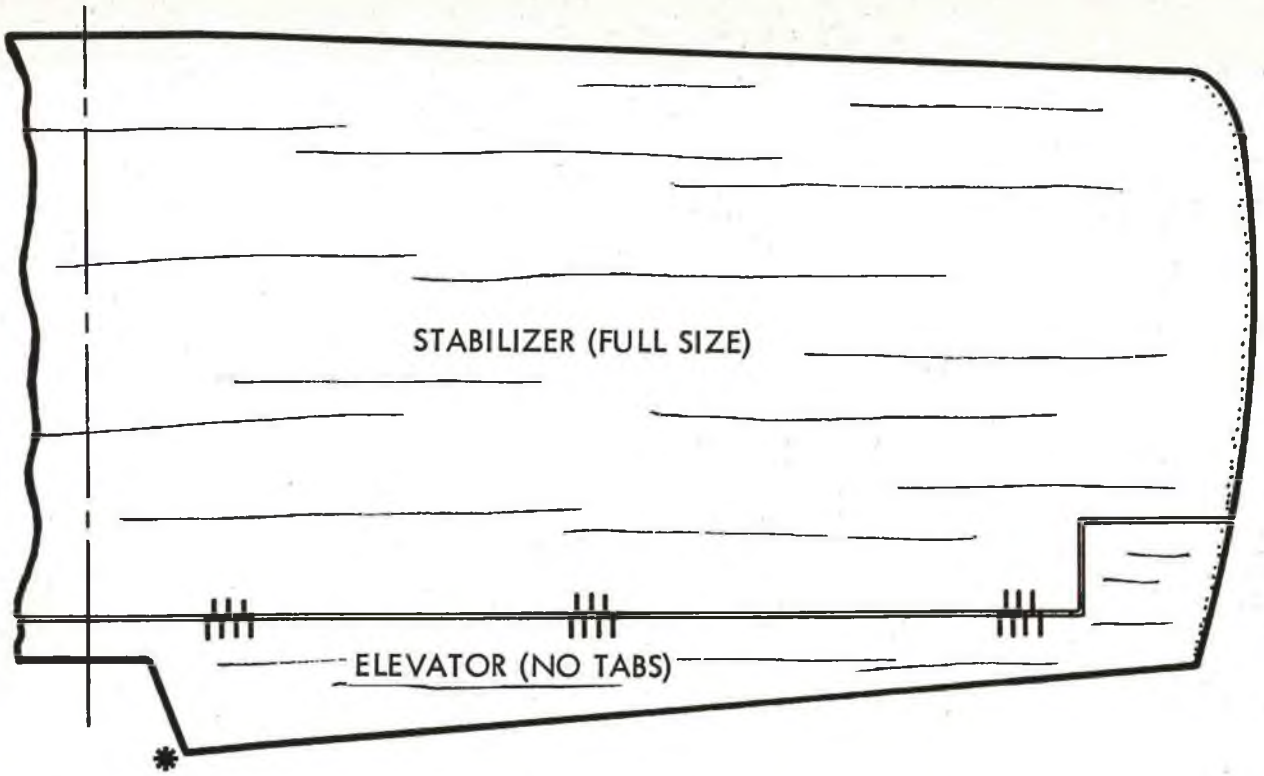
The fuselage assembly was completed with no difficulty. In fact, with surprising ease. The entire forward section is planked with 1/32" plywood, and what appears to be a flimsy looking fuselage is amazingly sturdy—as strong, or stronger, than many planked multi ships!

The motor mount assembly is built entirely of plywood with hardwood bearers, and bolts directly to the front of the fuselage. This mount carries both the engine and the tank, keeping the inside of the fuselage dry.

The tail assemblies are permanently attached to the fuselage, while the wings are fastened by means of wire rigging (that's right — **working rigging!**). The wings are located into the fuselage sides by guide pins and held in place by the flying wires to the upper and lower cabane structures. In addition to holding the wings in place, these lines also help support the seven foot span, and allow the wings to be trimmed by raising or lowering the trailing edge of either, or both, panels.

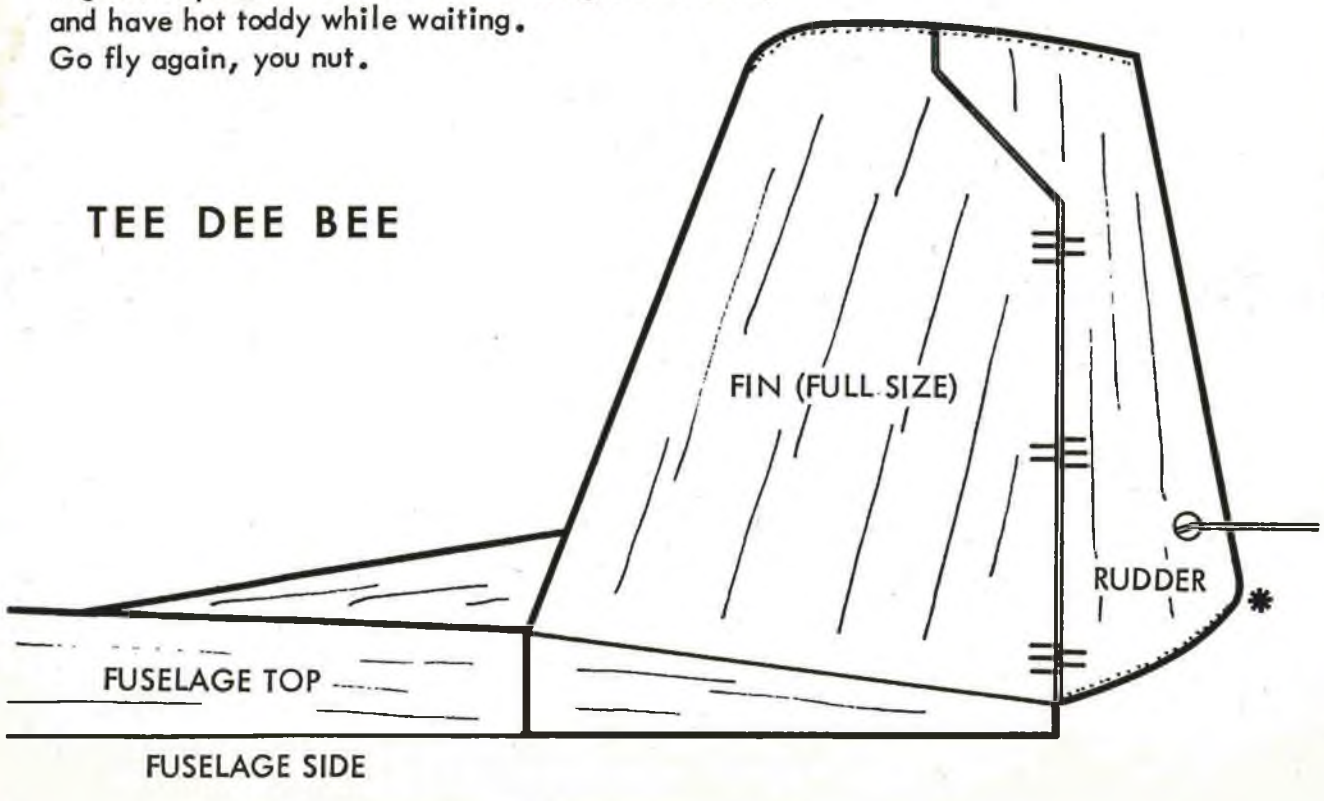
The landing gear was assembled from the pre-bent wires, and a pair of Ernie Boling's beautifully detailed spoked wheels were added. The entire gear is bolted into saddles in the fuselage. One rather interesting point in

(Continued on Page 53)



MODIFICATION TO TEE-DEE BEE FOR COLD WEATHER (65° OR LESS)

1. Use a total of 3 alkaline pencelis wired for overexcitation per Adams diagram and bring to a full charge of approximately 5 volts before each flying session.
2. Reduce size of elevator and rudder as shown on this plan.
3. Adjust elevator kickers to give 1/4" DOWN with rudder neutral. (Measure at *)
4. Turn on switch (with transmitter pulsing) and tension elastic until rudder throw is reduced to 3/8" each side of center. (Measure at *)
5. Cease flying when left rudder becomes weak in flight. This seems to be after 3 five minute flights. Rejuvenate batteries with charger to 5 volts, and have hot toddy while waiting. Go fly again, you nut.



SUNDAY FLIER

By KEN WILLARD

Escapements Versus Single Channel Servos . . . RCM's Chief Sunday Flier is Deluged by Reader Response to His Survey . . .

WELL, the results are in. The only thing is, I'm not quite sure what they prove, except that you modelers are still rugged individualists – or is it ragged?

I am referring, of course, to the poll we took concerning the current status of escapement operated single channel R/C models in comparison with the fast rising trend toward single channel servos.

You will recall that I made a guess, just to start things off, that there are about three escapement controlled single channel planes for every one that is servo operated. However, as far as I can tell from your letters, it's closer to being about "even Steven," or a one-to-one ratio. This, however, is far from definite, as the letters show such a wide variation. Some of them are pretty classic, too, and I want to share them with you. Let's start with this one from E. W. Lane of Windsor, Ontario, Canada:

Dear Ken:

I read your article in "Radio Control Modeler," December, 1965, and was amazed to find someone actually admitting he knew of, much less flew, an escapement aeroplane. Where I come from, this would be the equivalent of joining the K.K.K.

I have been flying a Tri-Squire for the past three years, using single channel equipment, and a Bonner escapement. This has been most successful, the three year old aeroplane still flying speaks for itself.

I, and others, are flying out of a very fine sod farm, well suited to all forms of R/C, however, I still prefer to hand launch. This no doubt stems from my previous experiences in a different field, in which we were operating under adverse conditions. The clover was grown for seed, and had grown so high that one had to develop a special launch procedure which went something like this:

Lean back as far as the clover would support, spring forward like a catapult, and between the arc let the aeroplane go. The problem was, however, to fly in a 45° inclined, face-down attitude while resting on the clover. Finally I trained my wife to yell, right rudder, left rudder, etc., until I was once again in a normal position. Later the farmer, watching these antics, cut a runway in the field, bless his heart, which helped considerably. A further gentleman, also noticing my struggles, invited me to fly off the present sod farm where we are now located. Unfortunately, I informed our club people, who are multi-types, of my good fortune, and the fun began. These people now share the field, and have used every possible means to drive me into multi operations. We were told:

1) Escapment operations are not positive, therefore dangerous, therefore should be eliminated.

2) Any child or simple clod can fly rudder only, single channel, only, the men fly multi.

3) Single channel is obsolete, give it up.

4) This is a multi field, these simple aeroplanes are cluttering up our air.

If I happen to carry out a nice piece of flying, say a good true slow roll, the remarks are – "conditions must be very stable today." If I, perchance, land very close to my chosen spot, the remarks are, "these gliding types are so easy to spot, no judgment required."

Now I am on the road for the Ford Motor Company five days a week, and during my absence the boys tried a new tack. They stated that due to my great experience – (HA), I was being held back due to my lack of multi equipment, which was a real shame. By the time I returned home, I found my wife ready to sell the house, car, and every damned thing, so that her poor husband could be released from frustration and fly multi, and be elevated into the proper status of society.

Now, it is true I am a renegade, but will always help a newcomer get over the bumps with a simple type aeroplane.

Seriously, the single channel, fun type aeroplane, is being sold short; there are, of course, limitations, but the range of possibilities is great enough to keep most people active for a couple of years. While I do appreciate a well flown multi-aeroplane, the pile of smashed low wing ships all over the place reminds me of my war days.

I have been a "fly boy" on real aeroplanes most of my life, commercial and military, and in general, the lack of real knowledge of what these control surfaces do, leaves a lot to be desired. If you wish to get the cold shoulder, just tell one of these multi masters that, "the elevator does not elevate," and that it is an attitude control only, the engine is doing the elevating.

Well, all the best, keep talking simple aeroplanes and give the young people a chance to become interested.

Yours very truly,
E. W. Lane

All I can say after reading Mr. Lane's letter is, "ain't it great to have a good sense of humor when somebody is sniping at your method of going things."

Now here's some excerpts from a contrasting letter sent in by Paul Fox, Jr., of Richardson, Texas. I've inserted my replies to some of his questions:

Dear Ken:–

Just finished reading your latest article in R/C Modeler. I'm a Sunday Fier and live in a suburb of Dallas, Texas. First, about the poll you are taking on escapements. Single channel flying was absolutely dead in and around Dallas two years ago. It was all multi. Then, one of the hobby shops started stocking the then new Controlaire Mule single channel transmitter and SH 100 superhet receiver – but, *most important of all, the new Royal single channel servo same out.*

I recently asked the hobby shop owner how many they have sold and they didn't know, but have sold many, many complete sets. We have twelve regulars with these mechanical servos and none with escapements.

Next, I would like to ask you some questions. Why do you use a superregen

(Continued on Page 49)

The Roostertail

The Official Publication of the International Model Power Boat Association
General Office:
2405 19th Avenue Broadview, Ill.

ON Oct. 9th and 10th, 1965, the Japan Model Power Boat Club held its 2nd annual long distance race at Lake Biwa. About 45 boats entered with contestants coming from all parts of Japan, with the majority from the Osaka, and Tokyo areas. The course was 5Km (3.1 mile) for boats up to .60 c.i. and 10 Km. (6.2 mi.) for boats over .60 c.i. Four (4) motorboats were hired as chase boats, and carried the contestant and an official observer, following the model along the entire course. Good weather prevailed, but gusty winds made the trip a little rough for some of the boats. Best speeds of the day:

Class 1 (up to 10 cc or .60 c.i.) 9 min. 22.7 sec. or 19.9 mph.

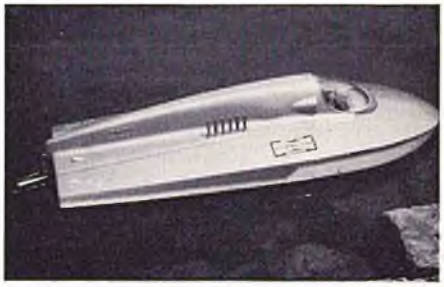
Class 2 (up to 37 cc or 2.3 c.i.) 18:45.8 or 19.9 mph.

Class 3 (up to 50 cc or 3.0: c.i.) 15:50.3 or 23 mph.

These are very respectable speeds for a long haul over open water. The whole event was run according to the IMPBA Port to Port rules, starting and stopping at the same place. This was an open water circuit of 5 and 10 Km. Anyone think he can beat that? Try it sometime!

●

We have all seen pictures of an assortment of White Heat V models, but this one by Hartwell T. Grenier of Chicago is a custom deluxe that deserves special mention. Check the cockpit, instruments, and a racing wheel yet! We wonder what it will look like after a season of multiple boat racing?



(Continued on Page 50)

INTERESTED IN POWER BOATING? MEMBERSHIP IN THE

IMPBA

MEANS THAT YOU CAN PARTICIPATE TO THE FULLEST EXTENT

JOIN NOW!

SUNDAY FLYER

(Continued from Page 46)

receiver. I'm sure it's not a question of economics.

Second, your articles always seem to indicate that you prefer a relayless receiver instead of a relay. Why?

Third, on your average small model, how much rubber do you use on the escapement? How many loops? How long are the loops in relation to the length of the fuselage? And, most important, how many turns do you put on the rubber for an average flight?

Fourth, do you "rework" or otherwise modify a new escapement?

Last, let me give you an actual situation and see what you recommend. I'm trying to get a new friend started in the hobby and here's the problem: We have a completed Schoolmaster with Cox .049, CitizenShip SE-2 escapement. The latter is powered by two loops of 3/16" flat rubber that are adjusted so as to have about 4" hanging out the rear of the fuselage when unwound. The receiver is a relay F&M receiver with an F&M Echo transmitter, both in excellent working order. Two hot E-91 alkaline energizer batteries are used. On the ground, in the den, in the garage — anywhere — it never fails to work. The escapement works correctly every time we push the button. Then the engine is fired up and, again, all works perfectly with never a missed signal. Following this is the range check. The range is so far we can hardly see each other — both with the engine still and running. We put 100 turns on the rubber and launch. The result? A flyaway every time. To be exact, ten times! The ship has never reacted to a command, whether it be 20 feet away or 1000.

The next course of action is to chase the ship on foot or in a car. Curse. Find ship, pick it up, and find the escapement still wound. Push the transmitter button and the rudder works perfectly every time. Batteries a full 3 volts.

What else can we do?

Paul Fox Jr.

First of all, Paul, in answer to your first question, I use a Superregen receiver so that I can experience the same problems with which you are encountered, and thus, perhaps, be able to come up with a few of the answers for you. Secondly, I use a relayless receiver since it is lighter, just as reliable, and has no points to clean or adjust.

With regards to the escapement rubber, I use one loop with a row and a half of knots when wound. The length of the unwound rubber is 10% longer than hook to hook distance. As for the escapement itself, I use units directly from the hobby shop with no modifications or alterations.

Insofar as your seemingly perplexing problem is concerned, it would appear that the escapement release may be marginal and depend on vibration, or even a slight "pressure" on the escapement bulkhead which is released when the model is airborne since the wing is holding up the fuselage in the air. It's just the opposite on the ground. You can simulate airborne conditions by putting a loop of quarter inch rubber around each wing, just inboard from each wingtip. Put a dowel through both loops and lift the airplane. Now, make a distance check with and without power. Adjust escapement clearance so

(Continued on Page 52)

ROOSTERTAIL

(Continued from Page 48)

World Records

(as recognized by the IMPBA as of Dec. 1, 1965)

R/C ¼ mile Oval Proto (Type 1)

A-1—.000-.100 None		
B-1—.101-.200		mph
J. Miller	1:26.7	10.4
C-1—.201-.300		
F. Toth	0:52.9	17.1
D-1—.301-.458		
F. Toth	0:59.7	15.1
E-1—.459-.670		
G. Preusse	0:49.8	18.1
F-1—.671-3.05		
G. Preusse	0.49.0	18.4
H-1—Steam None		
J-1—(Elec.) 0#-10#		
R. Paulikas	4:35.0	3.2
K-1—#10-#20		
R. Miller	2:16.9	6.5
L-1—20#-30#		
J. Conner	1:11.1	12.6
M-1—30#-50#		
J. Sitar	1:49.4	8.2

Hydro (Type 2)

A-2—None		
B-2—C. Borchert	0:54.97	16.37
C-2—L. Pender	0:44.6	20.01
D-2—R. Voelker	0:40.5	22.22
E-2—R. Buck	0:35.5	25.35
F-2—E. Mundt	0:33.8	26.6
H-J-K-L-M—None		

Unlimited (Type 3)

A-3—R. Foley	1:07.78	13.28
B-3—R. Foley	0:58.68	15.35
C-3—F. Toth	0:49.1	18.3
D-3—J. Whitlatch	0:45.46	19.8
E-3—G. Preusse	0:47.1	19.0
F-3—E. Mundt	1:04.5	13.9
H-3—None		
J.-3—F. Toth	2:09.0	6.98
K-3—E. Mundt	1:12.2	12.4
L-3—G. Preusse	1:07.3	13.3
M-3—E. Mundt	4:36.3	3.08

R/C Straight 1/16 mile Proto (Type 1)

A-1—None		
B-1—None		
C-1—F. Toth	0:12.33	18.3
D-1—M. Preusse	0:11.2	20.08
E-1—None		
F-1—S. Stevens	0:08.74	25.74
H-K-L-M—None		

Hydro (Type 2)

A-2—None		
B-2—J. Henry	0:08.01	28.09
C-2—L. Pender	0:09.6	23.5
D-2—M. Preusse	0:12.8	17.6
E-2—D. Park	0:06.39	35.21
F-2—D. Silva	0:06.10	36.89

Unlimited (Type 3)

A-3—R. Foley	0:10.05	22.39
B-3—G. Spickler	0:09.66	23.29
C-3—J. Henry	0:09.05	24.86
D-3—J. Henry	0:08.34	26.96
E-3—J. Barazoto	0:07.19	31.29
F-3—None		
H-3—None		
J-3—C. Borchert	1:12.99	3:08
K-3—W. McCallister	0:09.41	23.91
L-3—None		
M-3—None		

Tether Records

A—Steam—M. Succardo	58.44
A—Gas—H. Parohl	88.15
B—Ed Kalfus	101.46
C—J. Horvath	104.52
D—Modified—J. Horvath	102.73
D—Stock—J. Sampias	97.60
E—J. Sampias	71.82
F—F. Thornton	81.81
G—F. Thornton	70.37
H—Gas—B. Petre	49.45

Tether Proto

A—None	
B—T. DeMeskey	43.47
C—C. Baxman	42.65
D-M—T. DeMeskey	73.17
D-S—W. Paridee	70.38
E—T. DeMeskey	53.25
F—C. Baxman	64.74
G—T. Light	50.56
H—W. Marshall	20.73

Tether Outboard

A—None	
B—None	
C—None	
D—W. Paridee	22.44
E—R. Scott	16.70

Tether Proto Outboard

A-B-C—None	
D—C. Baxman	18.98
E—R. Scott	19.70

Tether Airscrew

A-B-C—None	
D-M—W. LeFeber	88.26
D-S—C. MacBride	88.23
E—W. LeFeber	87.80
F—C. Rector	85.71
G—W. LeFeber	78.26
H—C. Rector	52.32

Keep these records handy, as there is a brand new system of Multi Boat racing rules in the works which will incorporate the existing rules, as you see them printed here.

Earl Mundt's TAS powered Super Challenger making his record breaking run. The fastest ¼ mile Oval boat on record!

NATIONAL MINIATURE
PYLON RACING ASSOCIATION

P. O. Box 487 • Sierra Madre • Calif.

HERE we go again . . .

The Valley Flyers in Southern California, who, incidentally, provided the spark for the new Free Style Aerobatic event, have come up with another idea.

And it sounds like a good one.

We're referring to Frank Capan's recent notes about a Thompson Trophy Race class and a Bendix class. Here, we would have an almost unlimited number of planes to build. Several kits are already on the market for airplanes of this type. They could be limited to, say, 700 square inches of area and no maximum on power. Or, alternately, no limit could be placed on size. Size of the aircraft would almost automatically be limited by performance capabilities.

Frank suggests that the event could be set up similar to the Goodyear event. Picture, if you will, a plyon race with some of those old time Thompson Racers such as the Roscoe Turner racer, the Laird Solution, Gee Bee, and others. The pylon course could quite naturally be the same one as used for the Goodyear event.

Something to think about. And, incidentally, the NMPRA has been thinking about just that – Thompson and Bendix since the inception of the Goodyear event. We'd like to hear your views and comments. . . .

●

Hal deBolt's article has brought a substantial amount of mail concerning the current status of the Goodyear event and its prospects for a secure future. It would be safe to say that at least 95% of the mail received from NMPRA members, and non-members as well, agrees with Hal.

Pappy, by the way, dropped us a line with a few additional notes which we feel are well worth passing on to you:

"If you have a copy of Clymer's Air Race Sketch Book, the rules are in the back which cover full-scale Goodyear racers. These rules are what caused the racers to have pretty much the same appearance. If you go by them, the results have to be similar no matter how you try.

"My thought is that the handicap prototypes, as given, have kept many from trying their hand, and that it makes a simplified Goodyear a tough proposition. Yet you know that it is extremely hard to authenticate a scale job, and as a result of this and other factors, very few of the so-called racers we are flying are actually scale. If they are not true scale, why should they have the advantage of the handicap, and why should the whole event be held back by a scale rule which is not being followed as it was originally intended?

"A suggestion would be to form a set of basic rules along the lines which the NAA set up for full scale. Let's set up some design parameters and area limitations and weight plus engine restrictions similar to the NAA, only tailored towards simplicity for our models. Then the so-called 'scale' jobs would still qualify and yet you could eliminate all handicaps since even the prototypes would have to come out looking like we want them to. Something along these lines would open the event up and eventually lead to simpler models with the desired appearance."

●

From Great Britain, and the Bristol Radio Controlled Model Aircraft Club, we have learned that the provisional rules for the Bristol MAC Annual Rally Goodyear event were those laid down by the NMPRA and which are being accepted by the SMAE (British equivalent to AMA). For the purpose of the Bath Rally, certain modifications were adopted to the rules. These mods eliminate some of the advantage given to "scale" entries by stating that "all models shall qualify according to the Rules laid down, but will, after completion of the course, **then** be judged for their scale and concours appearance and **separate** prizes awarded on these aspects."

According to Ed Johnson, it is also proposed that "starting money" be given to **all** who complete an Official Race, with trophies to the winners. This may go a long way toward encouraging many modelers who are "frightened off" by "expert" participation in the Goodyear event.

●

There is substantial merit to all of these suggestions. We hope you, too, have some ideas on the subject.

Let's hear from **you!** It's **your** event.

SUNDAY FLIER

(Continued from Page 49)

it works under these conditions and it should work in the air.

If that doesn't work, try a servo!

I note from Paul's letter that single channel was nearly dead in his area until the new servos came out – but he's still using an escapement!

So now let's go right into the heart of sophisticated R/C users and manufacturers – Los Angeles. Here are two replies from that area–one from Leonard Malone and the other from a thirteen year old lad who forgot to sign his name. The letter was postmarked from Anaheim, California:

Dear Ken: –

I fly at Sepulveda Basin and the field in El Monte. I have one big field in La Puente where I work and it's excellent for flying. I started with escapements and found them all right. Then I tried a Royal servo and found it to be most reliable. At the Sepulveda, Los Angeles Model Airport, I see about two single channel servos to every one escapement. I feel that in about two years you'll see all single channel servos and no escapements at all. For one thing, servos are easy to install and linkage is quite simple. For a newcomer, this could be the way to start.

Leonard Malone

Dear Ken: –

There are six men, counting myself, that fly with escapements and only one that flies with single channel servos. The latter is my brother and he also does some escapement flying.

(Unsigned)

Isn't it interesting that escapements are still popular even in a great center of R/C advancement such as Los Angeles?

Well, there were many, many more letters like the ones I've shared with you. I wish there were room to publish them all, because even though they're pretty much like the ones I picked, they're all individually different.

In summary, though, they all seem to add up to about an equal distribution of escapements and servos in the single channel flying circuit. Where clubs predominate, the servo does too. With the individual flier, or loner, the escapement still seems to maintain its popularity.

So, let's close this month's column with an idea submitted by Bill Wright of South Hadley, Mass. It's an interesting use of the escapement principle, and one that you can have a lot of fun with:

Dear Ken: –

We escapement flyers aren't all gone. I am still to buy my first servo. Have

been flying several small planes this summer including a Pelican with an SH-100 and SN or Bonner compound escapement. Most flights, however, have been on a 1953 vintage Liberty Belle with Cox .049 and throttle. If all goes well I expect to have an RCM Digitrio operating by spring but intend to keep a single channel outfit for back-up.

A gadget with which I have had a lot of fun is a trigger used to drop a parachute when the first low motor signal is given. The simple trigger is formed from piano wire and is located in the fuselage side so that it engages the throttle pushrod after it passes through a bellcrank, such as used in the Schoolgirl. The throttle is in high motor position. When the first low motor signal is given, the trigger is released. It should swing down freely. A long rubber band or escapement type rubber can be attached to the trigger, pass under the fuselage, and be attached to the rear wing dowel. A small parachute or bomb can be held in place by the rubber and will be released on the first low motor signal. Hope you get the idea.

Willard F. Wright

KITS AND PIECES

(Continued from Page 43)

the gear design is the use of a coil spring for the axle, between the wheels, allowing the gear to flex, and also preventing tripping the ship should the axle strike something on the field.

There you have it — Lou Proctor's "Antic," ready for final sanding and covering. Time: something less than two weeks (a surprise to us). Weight: with wheels 3 pounds, 2 ounces (also a surprise). The "Antic" is a tough ship to evaluate from a construction standpoint. We cannot compare it to any other multi R/C kit without seemingly knocking the "Antic." At the same time, we cannot compare the finished product. The "Antic" is more work to build than some, but still it is far easier than others. Considering the construction which must be used for this type of aircraft, the kit is extremely well engineered to make assembly as simple as possible. All of the many pre-shaped parts fit perfectly, and no problems were encountered throughout the construction. Actually, the only points requiring any alteration whatsoever were the motor mounts which had to be blocked in to fit our Merco 61, and a minor modification to the servo tray which was pre-cut for Bonner Transmites and wouldn't fit the new Digimite servos. The hardware — turnbuckles, etc. — was unusually nice and complete. (Our only purchase was wheels!)

(Continued on Page 55)

TOP OUT

(Continued from Page 41)

stand — and whatever else we can dig up!" Knowing the brand of energy and human type spirit Oily Birds put into their shindigs, 33 flyers coming from Houston, San Antonio, Beaumont, as well as several points in Louisiana and around the "Oily" City of Port Arthur, responded to the appealing invitation of the 30 PARCC members. The gremlins, those mischief makers who cause unexplainable and unexpected aerial malfunctions, showed up mainly during the "most spins" contest and caused no less than 3 well trimmed and seasoned ships to flat spin all the way in — a real hair raiser. The mysterious epidemic did not slow up proceedings however, and at least 32 more spin flights were logged with Buddy Brammer topping the class I event with a 37 turner with his Texas Mambo. This was

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(Continued from Page 53)

Our overall building time was about 50% longer than that for the average multi ship, but the sense of pride and satisfaction to be found in the completed ship exceeds that of the average model by several hundred percent. During the coming month we will get our F&M proportional rig installed, and get the bird covered, doped, and in the air. Contrary to the instructions, which recommend painting the entire ship aluminum, we intend to cover with colored silk and clear dope (just can't see hiding all that framework under aluminum dope!) The "Antic" is certain to be a hit on any field, and everyone will be anxious to watch it fly.

The "Antic" will give any RC'er a sound and painless introduction to the art of "scale" modeling. Next step – that full-scale WWI bipe you've always dreamed about!

We highly recommend the "Antic" for the real RC'er – how about it – ready for a change of pace?

●

We have just received word from Lou Andrews of AAMCO that they are trying desperately to keep up with deliveries on their Aeromaster Bipe (we'll be doing this one in a month or so). If you can't find one, keep trying. Lou also advises that they are working on the Sportmaster, a low wing competition multi ship following the general profile of the Aeromaster. The Sportmaster will have a 67" span with an area of 770 square inches and a 17% airfoil. The wings will have high aspect ailerons (not strip) measuring approximately 17½" x 2" (same type as used on the bipe).

●

Seems as though we are in VK Models doghouse . . . they are blaming us for an avalanche of orders for their Cherokee which we reviewed. They are currently working around the clock trying to keep up! Sorry, Vern, we didn't do it – you did! Good kits do sell – and we think this one is first rate. Ours has over 300 flights and we are building another.

●

The winter months are traditionally the time for trade shows, conferences, symposiums and such. By the time this issue reaches you, the MATS show in California will be over, as will the Bisons Conference in Buffalo. There is still time, however, to make plans to attend the Weak Signals Toledo Conference to be held in Toledo on February 26-27. Contact Tom Dion.

●

The DCRC Symposium is scheduled for May 14-15 and will be held at the John Hopkins Applied Physics Laboratory located between Baltimore and Washington. For further information, contact John Strong, 12708 Goodhill Road, Wheaton, Maryland. These conferences are the highlight of the Winter season, and are well worth attending. Here is your chance to see the very latest in R/C, and talk with the people who make it. See **you** there!

●

Have you sent in your membership renewal to the Academy of Model Aeronautics? If not, why not do it **now?** The AMA **needs your support!**

●

The stacks of mail that come in almost daily are appreciated and enjoyed by yours truly. I must apologize, but I have found it impossible to answer each letter. (This would take two full-time secretaries.) I have tried to answer those that seemed most urgent, but still the pile accumulates. Keep 'em coming, anyway! Okay? Address them to me, c/o R/C Modeler Magazine, Linthicum, Maryland. If you don't remember that, just send them to the Home Office in care of old Fearless Leader in California who forwards everything and anything to the rest of the staff that contains more than words of two syllables. . . .

●

Till next month – see **you** at the . . . . . forget it, it's too damn cold!!

TOP OUT

(Continued from Page 54)

a form of justice since Buddy's pink Genie was an early victim to flat spinitus and nearly flattened club mate Bubba Doiron's 55 Chevy in the process! Bubba, almost routinely, good naturedly kicked the shape back into the car's roof – the crash caused a 2 foot dent – and went back to the flying after commiserating with Brammer on the shattered Genie!

Other events included Limbo (won by Jack Beauchamp at 3 feet), Pylon (also by Beauchamp in 1:38.5), class III spins (Yankee Carver with 47 turns), Spot Landing (Beauchamp, again, at 19.5 inches), and a Take-Off-Turn-Roll-and-Land maneuver (dubbed TO-Spin-Crash-and-Burn). This last event (won by Yankee Carver in 25.5 seconds) is a great exercise in nerve, coordination, and skill, especially if it's tried in under 30 seconds. The pylon event for class I saw a time of 2:37.2 set for a standard 5 lap AMA pylon run – lowest time since the event was started two years ago. Class I Pylon isn't an established AMA event so the record is strictly a local thing but the Port Arthur fliers invite anyone to take a crack at beating the time with a standard class I airplane. It's an exciting event with peculiarities of its own. Overall champ was Jack Beauchamp while Val Hutchinson topped single channel. Jack, you may have read, is a Houston RC'er who is active in FAI distance record attempts.

The meet will be remembered for a long while (in a rather dubious way) since it was the scene of the demise of Add Even's magnificent 8 foot biplane that attracted admiring attention for almost 9 years. The end to the beautifully performing Bipe came suddenly and dramatically on a mid-air collision that clipped off the tail of the red and white stunter followed by a prang that shredded the old performer completely. Although Add – who is an oustanding craftsman and electronics designer – will soon be airborne with another notable creation, the well-known Bipe will always be a fond memory.

The Port Arthur club, headed by Joe Peacock with Norm Rhodes as the chief activity pusher, recognizes its value as a local influence and maintains a trainer plane which is used to encourage modeling interest. Recently the club invited 30 boys from Boys' Haven Orphanage for a flyin' and feastin' day at their field. Hot dogs, goodies, and a chance for each one to fly the trainer was the order of the day for the boys who ranged in age from 10 to 18. Bob Moore, club secretary (916 S. 12th St., Nederland, Texas) relates the ole trainer came in on the last micron of battery power after the more than 30 flights the bird put in that day! By maintaining a display of planes in the downtown Groves Bank and holding building sessions in the high school the club sustains a public education effort that brings forth new talent and assures continual growth of the club and support for its efforts. Together with an aggressive flying program such as this last Hallowe'en Fun Fest, the club's inspiring influence continues to spread and bring credit to all RC'ers.

● The Shreveport Sharks club competition featured class I and a combined II and III in a hot spotlanding contest that saw Tom Barker beat H. J. Corder and Ron Alexander in R.O., as well as John Russel outscore Clarence Troegel and Keith McCoy and six others in multi class. "Le Mans" (getting the prop on and engine started) was taken by Russel in 24 seconds. The refreshment stand did a brisk business, we're told, with the ladies pushing **pickles** for some reason.

● New Orleans – and the Crescent City R/C Club – had its 4th annual contest which saw Mills Rogers and Ben Fernandez win in class I pattern; Syd Horn and Dudley Rabalais top class II; and in class III, Lou (Engine) Penrod won Novice while Ron Chidgey topped Joe Myles and Capt. Larry Beason in

Expert. AMA Pylon also went to Ron while Larry won the High Point trophy for all-around performance. The New Orleans meet is a favorite with the wives of the flyers since the ladies enjoy visiting the "old" scenic town and all are afforded an opportunity to a gala evening in a city known for an abundance of fine food and entertainment.

CONTEST TECHNIQUE

Class I contest technique continues with the next maneuver, the Barrel Roll, which follows right after the Wing Over. The latter maneuver (RCM, Feb. 1966) finishes up on a downwind leg that'll set you up nicely for the Barrel Roll.

First, a few basics. What will be wanted in the way of Rolls are three of them strung together to form one continuing maneuver, centering at an altitude of about 75 feet, and arranged so that the second roll is positioned in front of the flyer and judges. This will place the entire maneuver where it may be controlled accurately and judged best. With class I aircraft, rolls are of the 'barrel' variety because of aerodynamic limitations, with the diameter of the barrel highly variable depending upon aircraft characteristics, trim, speed, angle of entry, etc. Generally, best scores are achieved with a slow, smooth, even speed roll having a barrel of about 20 foot diameter, all of which allows a presentation that demonstrates deliberateness of control during the set of 3 rolls.

Positioning for the maneuver begins with a 180° turn since rolls are done into the wind to generate a good pitch rate into the maneuver. After establishing the 'line' of the rolls, maintain level flight for a few moments to 'set' this direction. Next, increase power to start an upward flex then chop the power to cause the ship to dip into the initial oscillation. As the ship reaches maximum nose low position add power to the desired amount (remember, rolls will be too tight with too much power — so don't overdo it, usually half to three-fourths throttle will be sufficient). Keeping the original course, allow the nose to come up to about 30° above horizontal and apply full right rudder and hold! (For the average contest trimmed ship right rolls are more 'open,' tend to rotate the plane slower, so we'll do ours that direction every time.) The plane will continue to roll as long as rudder is held, and will be in a nose down attitude as it passes through the three-quarters mark of the roll. At about 7/8ths point, release the hold on right which will stop the roll after momentum has brought the wings horizontal again. The nose, still down, will rapidly pitch up due to increased speed to the 30° point again so that the process may be repeated for the second and third rolls. As the first roll is completed note if the ship is off the original 'line,' or course, or at a different altitude. An off-course position results from holding the roll for an improper amount of time; if off to the left, the roll wasn't long enough — if to the right, for too long. Altitude increase indicates too much power while an altitude loss means more throttle is required. If the roll is started at a wrong nose-up angle, altitude will vary, with altitude being gained if the nose got too high or a loss from not waiting long enough. Altitude control is thus a fine balance between power setting and timing of the rudder controls which must be found during those practice periods mentioned previously. In any case, an ideally accomplished roll series will circumscribe the 'barrel' around a straight horizontal centerline.

Repeat the first roll and in the third roll, while the ship is inverted, cut the throttle to avoid excessive pitch up at the end of the last roll. With power off, the ship will still roll easily with your right hold, however the last eighth may be slower than on the previous two, so perhaps the right hold will be a speck longer on this third one. Stop the last roll with a definite motion which means avoiding any rock of the wings. Allow the nose to rise to a level position then call "maneuver complete" and follow this with a turn (while adding power) to keep the ship in close.

RCM PRODUCT REPORT

(Continued from Page 37)

Installation and Tuning

Installation of the Digital 5 system is quite simple. The receiver is packed in foam, as is the power supply. The servos may be mounted in any convenient position, and are quite easily side mounted directly to the airframe side walls. DuBro Kwik Links have been used in all installations with no noise problems experienced. The antenna was run to the tip of the horizontal stabilizer, and in cases where excess length remained, up to the vertical fin. No tuning of the receiver or transmitter is necessary, or permitted. We did notice that on our initial setup, the servos did not fail-safe exactly in the center. This was caused by having the servos in positions other than those where the set was adjusted at the factory. Switching the servos around quickly cured this factor.

Price and availability

The F&M Digital 5 system sells complete with transmitter, receiver, four servos, power supplies, chargers, and switch harness for $539.50. It is readily available through your local hobby dealer.

RCM Findings

As we mentioned earlier, the Digital 5 was purchased last May. Since that time it has undergone the most extensive on-the-field checkout of any system tested by RCM. The initial flight tests were made in a Senior Falcon during a 45-minute lull between two thunderstorms. (We had heard that digital systems were susceptible to noise!) Three flights were logged without any evidence of Lock-Out or Fail-Safe. Control appeared to be precise and immediate. The only difficulty encountered was a lack of two-stick experience on the part of our left-handed pilot. He insisted on cradling the transmitter and flying it ala single stick, a habit which was soon overcome.

On subsequent flights every effort was made to cause the system to Fail-Safe, or at least Lock-Out. After an entire season of flying the Digital 5, Fail-Safe has occurred only twice, and then only briefly. On the first occasion, the ship was at an altitude of approximately 500 feet and about 2000 feet out with the transmitter antenna deliberately collapsed! On the second occurrance, the transmitter was inadvertently switched off while lighting a cigarette!

The Digital 5 has been flown in no less than seven ships, run in a sailboat, logging a total "on-time" in excess of one hundred hours and some fifteen gallons of fuel! It has spent over fifty flights in a Tauri with a pilot that had never before flown multi! The exacting control and ease of handling of the Digital 5 is evidenced by the fact that each ship in which it has been flown is in perfect condition, having suffered neither from equipment failure or from pilot error. The system is comfortable, in that it affords the flier a relaxed sense of security in his equipment, allowing him to concentrate on flying alone.

This is the F&M Digital 5 — a five

channel digital proportional system. A system that is well engineered, well built, and thoroughly reliable. It is recommended by RCM and rated as one of the best.

Addendum

The newest offering from F&M Electronics is their Digital-3, a three channel proportional system which employs a pulse duration modulation scheme similar to the Digital-5. The entire system uses all silicon components and the transmitter, again, radiates better than .8 watts output. The transmitter size is 5½" x 6" x 2¾", and is intended to be cradled in the left forearm while flying. The single stick is used for elevator and rudder/aileron while the engine throttle is on the right hand side of the case, permitting operation by the left index finger. A coupling plug is provided to permit coupled ailerons and rudder.

The receiver size of the Digital-3 is 1⅝" x 1¾" x 2½". Contained within is an RF amplifier, three IF stages, dual level AGC with three microvolt sensitivity.

The servos are compatible with those used in the Digital-5. The fail-safe feature is identical to the five channel system. Price of the complete system is $350, and includes transmitter, receiver, three servos, switch harness, both battery packs and chargers.

29c FLEX-WING

(Continued from Page 35)

The landing on rough ground knocked off the previously weakened rudder and fin. We decided to try a flight without it. It flew fine, but with a slightly tighter turn. This landing finished off the old engine mount and firewall, ending the experiment.

Back at the shop, I installed a new firewall, Golden Bee engine, Controlaire 4 and escapement. The next Tuesday, it was back to the field. The wind was up to about 15 MPH; more than I like for test flying, but decided to go anyway. I slid the Glite back ½" as a wind trim.

Friend George Noreen hand-launched the ship. Climb was steep and it quickly moved to about 100'. However, it was unable to make headway and started drifting downwind. A series of rights and lefts dropped the nose, and it held its own against the wind. Response was beautiful and it forgave my over-controls with no problems. After three to four minutes of practically hanging in the air wiggling back and forth, the engine ran out. Transition was smooth and glide ratio seemed about one foot down and one-half foot forward in the wind. Control in the glide was adequate though not as responsive as under power. I brought it within about 15' of where we stood and yelled to fellow Starduster member, John DeCamp, "Catch it, John." He did so with grace. (He's caught for me before.) The snickers of the critics had turned into laughter. This was real low-pressure flying.

As to specifics: This fuselage is 23" long and I feel any high or shoulder wing ½A body — such as Jr. Falcon, 'Lil Esquire,' Mini Mambo, etc. — would work well. The rudder area was doubled and has a throw of ½" to each side. Make the pylon tall enough so that the Glite will clear the fin when installed at a 15° angle. This one is 6½" from top of platform to Glite stick on centerline of pylon. Down thrust of 5° and right thrust of 3° of the original ship were not changed. Two #64 Sig bands hold on the platform. One-eighth inch balsa keys on the bottom of the platform prevent shifting. Balance point is 11½" from front of Glite with fuselage parallel to ground. Centerline of pylon is approximately on balance point of conventional wing. Be sure all Glite sticks are pressed into plastic fitting tightly — it might be wise to cement them. All up weight is one pound.

This machine is a real pleasure to fly, and talk about spot landings — Wow! Don't take my word for it — gamble 29¢ and some scrap and see for yourself.

ommendation here would be to replace the output arm when wear becomes excessive. Each servo should be thoroughly checked and cleaned, the wipers retensioned and inspected every fifty flights or so. When you consider the price of an output arm against the cost of a complete aircraft it is easy to arrive at the benefits of output arm replacement. I use "Spra Kleen" produced by G.C. Electronics Co. #8666. It both cleans and lubricates. After wiping clean the gears, etc., spray the solution into the front compartment of the servo and blow away the excess. This will also quiet down a mechanically noisy servo. Each servo can be tailored for more or less resolution by changing R14 and R15. Increasing their values will widen the resolution and vice versa. The operation of the servo as is produces optimum results.

COMPLETE SYSTEM ALIGNMENT

After you are satisfied that all components are in proper operating condition hook the system up making sure the batteries are fully charged and that they are in good shape. Preliminary to final adjustment remove all gears from the servos and reinstall the output arms. Place the output arm in the approximate center of its travel on each servo. Temporarily disconnect the motor control servo, we'll do it last. Adjust the motor control trim pot (R13) inside transmitter to its highest resistance — clockwise looking down on the transmitter with the rear facing you. Turn on the transmitter and receiver — the rudder and elevator servo motors should run. Now move the output arm manually and find the point where each servo motor stops and reverses direction. Manually place the servo output arm between motor reversals until the motor is stopped. By movement of the control stick of the transmitter you should be able to control the direction of motor rotation. If your servos do not meet this condition recheck the centering of the transmitter control pots and try again. If it still does not operate properly you have system troubles and trouble shooting will be necessary to isolate the malfunctioning unit. If only one servo works properly your best bet is a defective servo. If neither works properly swap one with the extra servo and if it does not work either start with the decoder and work your way backwards until you find your trouble. If the servos work properly or you have corrected your trouble you can now disconnect the two servos and connect the motor control servo. With the motor control pot centered adjust the motor control trim pot R13 (inside transmitter) starting from the high resistance end.

Continue adjusting slowly until the motor stops and reverses. You should now be able by movement of the motor control stick to reverse the motor like the other two servos. Turn off the equipment and reinstall the gears and output arms. Turn on the system and note the position of the output arms. Move the stick and note the direction in which the servos travel. Now move the trim levers to see if the servos respond in the same direction as stick movement. If not reverse the yellow leads on the trim pot affected.

Chances are your output arms will not be exactly centered. To center the rudder and elevator servos loosen the trim pot collars and rotate the shafts until centering is accomplished. Place the trim pot levers to the center of their cutout and retighten. To center the motor servo slightly readjust R13.

You should have approximately ½" overall servo throw with 12% trim action on the rudder and elevator. The motor control servo should have slightly more throw. The servo throws can be altered for use with different types of control sticks by changing R9 and R11 (1.2K). Larger values will increase the throw and vice versa. The motor control servo throw can be altered by changing the value of R29 in the transmitter — lowering its value will cause more throw and vice versa. Servo resolution can be checked by slowly moving the trim pot to one end of the cutout. Listening very carefully move the trim pot stick in the opposite direction until the servo starts. You should have about 1/16" to ⅛" movement before the servo starts. Servo tailoring for more or less resolution is described previously under servo comments. If satisfactory motor control operation is not obtainable modify this servo as described previously in servo comments. To peak the antenna coil place the back on the transmitter and remove the antenna. Extend the receiver antenna and with your wife "pumping" the control stick have her back off until servo action is erratic. Peak the antenna core until solid operation is obtained. With your wife backing and you peaking adjust for maximum range. You should get from six to ten feet with solid control even though the servos will become noisy at about four feet. Make any last minute checks and if your conscience bothers you about any shortcuts you may have taken during construction, now is your last chance to repent. "Button up" your servos, check all screws for tightness, etc.

INSTALLATION

Installation of the system does not require more than average care or consideration for a digital system, just pack it in. Here are a few tips that should be followed for best results.

If you are using a shoulder wing aircraft run the antenna out the lead-

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RCM DIGITRIO

(Continued from Page 60)

ing edge of the wing, loop it over the wing dowel and run it back to the rudder. If you are using a low winger run the antenna out the top of the fuselage at the leading edge of the wing and run it back to the rudder. Possibly the best antenna you could use would be a 36" piece of music wire as a vertical antenna. A short length of brass tubing can be epoxied in the aircraft, the end of the wire crimped and forced into the tubing. The main point here is to keep the antenna away from the servos so it does not pick up servo noise. This can shorten range considerably. Do not worry if the controls bind a little. This does not mean that good craftsmanship practices should be ignored however, as a good mechanical linkage system will enhance the system's characteristics. I have used nylon tubing and flexible cable for all control surfaces including aileron and find it hard to beat for easy installation and trouble free operation. Avoid any metal to metal joints by using nylon clevices — especially on the motor control arm. Be sure your servos are shock mounted using the brass bushings supplied. If you mount the servos on a flat piece of plywood, countersink ¼" holes beneath the two servo cover screws to allow free movement. If it is desirable to reverse servo throw it can be accomplished easily at the transmitter. Reverse the outside leads on both the stick and trim pot affected.

PRE-FLIGHT CHECK AND ADJUSTMENT

Make a last minute check of antenna core tuning with the transmitter antenna removed. Adjust all your flight surfaces to neutral with the trim pots centered in their cutouts. Now make a ground range cheek of the system with the antenna installed and completely collapsed. Do not settle for less than 300 feet under these conditions. Make a vibration check with the antenna removed — the range should be approximately the same as when the motor is not running. Turn the transmitter off and install and extend the antenna. You should be able to place the transmitter and receiver antennae within 12" of each other before swamping occurs. If the system appears erratic in any way whatsoever find out why and correct the problem before you fly.

FLYING

If you are not used to flying a digital system you are in for a few surprises. The first one will probably be on take-off when you pull the stick back and the plane goes straight up into a stall due to over control. The next one will be when you give it up or down and get right or left simultaneously because as you push the stick you will inadvertently veer off to one side or the other, especially during rolling maneuvers. And finally when you flare the plane out for a landing it stalls again due to over control. If you get past your first flight successfully by judicious control stick movement rather than cramming the stick around, your next flight will be better and about your fifth flight you will be truly amazed by our own capability and your friends will soon get tired of your bragging and tell you to "shut your mouth!" Even your wife will get tired of hearing about your new experience. As your proficiency progresses and time and money permits you will go from one plane to another trying to find one to match the system's capabilities.

CONCLUSION

After you are satisfied with the system performance some of the components can be epoxied in place to prevent vibration problems later on. Here are some recommended areas.

Receiver — FL1, Q2, D1, both 40 MFD caps, Q6 and T4.
Decoder — Q10, both tantalums (.1 and .22) and D5.
Servo — .1 tantalum, Q11, Q12, and junction of auxiliary and main board.

In general look for items that appear top heavy, have a large mass or are fragile. The more epoxy you use the harder it will be to repair the equipment later on if necessary.

I have begun simplifying the Digitrio and have just recently completed a modification to the transmitter eliminating some parts and making tuneup much simpler. These changes are shown in the drawing and tuneup requires only peaking the core in L2 with the antenna extended. This also eliminates the troublesome RF radiation of L5.

The final amplifier collector current should be 45-60 MA. Install a sub-antenna ala Controlaire — you should get approximately two feet of range with the antenna removed. As ways to simplify the circuits are proven they will be published and in a short time with your help, by your letters, the Digritrio should become a commonplace item in the RC modeler's inventory. I am proud of the Digitrio and I think you'll see why when you get yours completed. The entire staff of RCM deserves the lion's share of the credit because the "Digritrio" would not have been possible without them. I have been so swamped with letters that it may seem that replies are slow (which they are). Now that the bulk of the work on Digitrio is completed I will try to be more prompt. Your letters, comments and questions are always welcome.

CUNNINGHAM ON R/C

(Continued from Page 16)

weight by the area, the body weight by its length and so on. In this manner you can arrive at a projected weight for your next ship and be reasonably close at the final weigh-in.

You can see the results of numerous calculations by looking at chart number four. It becomes evident that optimum performance is not always gained by added wing area, and only if the weight increase by the extra wing area is not too much.

As I said earlier, it is not a foolproof way of determining the answer to the problem, but it does give us something to go on and is a definite, working way to help you on your next project.

"F" Characteristics	
0-10	Won't Fly
10-20	Very Poor
20-30	Marginal
30-40	Scale Like
40-50	Good
50-60	Excellent
60-up	Super-Duper

Chart #1

Load Carrying Capacity
.19 = 3.8#
.29 = 5.8#
.35 = 7.0#
.40 = 8.0#
.45 = 9.0#
.49 = 9.8#
.60 = 12.0#

Chart #2

Formulas

Wing Loading	=	WL	=	ounces per square foot
Weight	=	W	=	pounds
Area	=	A	=	square inches
Flyability	=	F	=	numbers
Displacement	=	D	=	cubic inches

$WL = 23\left(\frac{W}{A}\right)$ $F = \frac{D \times A}{W}$

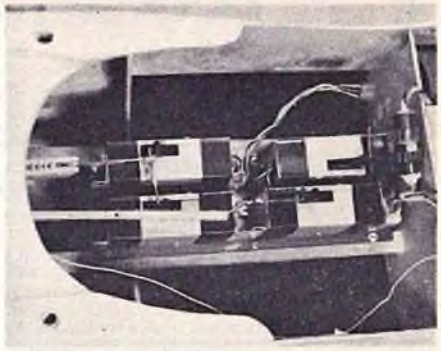
Chart #3

"F"	Eng.	Area	Weight (#)
17.5	.15	350	3.0
21.7	.19	400	3.5
21.4	.19	450	4.0
17.1	.19	450	5.0
19.0	.19	500	5.0
21.0	.19	550	5.0
22.8	.19	600	5.0
28.6	.35	450	5.5
35.0	.35	500	5.0
38.5	.35	550	5.0
38.1	.35	600	5.5
41.4	.35	650	5.5
40.8	.35	700	6.0
36.8	.45	450	5.5
49.0	.45	600	5.5
45.0	.45	600	6.0
48.75	.45	650	6.0
45.0	.45	650	6.5
52.5	.45	700	6.0
48.5	.45	700	6.5
51.9	.45	750	6.5
48.21	.45	750	7.0
57.1	.49	700	6.0
52.7	.49	700	6.5
52.5	.49	750	7.0
70.0	.60	700	6.0
64.6	.60	700	6.5
69.2	.60	750	6.5
64.28	.60	750	7.0
68.5	.60	800	7.0
68.0	.60	850	7.5
67.5	.60	900	8.0
57.0	.60	950	10.0

Chart 4#

BD-1

(Continued from Page 29)



Add the trailing edge fillet and cover fairing with 1/16" sheet.

Use your favorite procedure for applying the finish. The original was covered all over with silkspan to strenghten the wood and fill the grain. Sprayed on Hobbypoxy gave a smooth glossy finish with a minimum of work. The full size prototype BD-1 was white all over with red and black trim, and the model followed this color scheme.

The canopy was molded of blue 1/16" thick plexiglass. This was made in two pieces. A form must be made of laminated pine blocks and carved to shape. The plexiglass is heated in a 400° oven and pulled over the form. Epoxy the canopy pieces in place holding with masking tape until dry. Cover the joints with strips of white plastic tape.

Forming and fitting the canopy is one of the biggest jobs in building the BD-1. A simpler, but less shapely canopy can be made of heavy celluloid. One piece is wrapped over the top and one around the front for the windshield. This does not have the nice lines of the molded canopy, but would serve just as well.

Control pushrods and servos are now installed. I prefer a servo board mounted on rails. This is easily transferred from one plane to another. The servos could also be mounted directly to the plywood sides. Keep all equipment as far forward as possible, to concentrate weight in the nose where it is needed.

Since all my flying is done from grass fields I do not use a steerable nose wheel or brakes. I have found them unnecessary, and the steering hard on servos. They, however, may be installed as in any other multi plane.

Flying the BD-1 is no different than any other low wing multi, though no serious threat in class III competition, the attention it gets on the field makes the BD-1 a very rewarding project.

TEE DEE BEE

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charging. You did know that those alkaline cells rejuvenate nicely, didn't you?"

"News to me," said Walt. "How do you rejuvenate a battery?"

"Just use your nic-cad charger, and give them a charge of about 80 milliamps for several hours at the end of the day's flying," replied Wagger. "As a matter of fact, you can put a small charging jack right into the side of the aircraft and fly for weeks without even removing the wing. For $1.00 investment in batteries, that's cheaper than dog-biscuits. Have another and pass them on, by the way."

Walt passed the box of biscuits over absent-mindly, then said:

"I must admit it sounds good, practical and cheap. I assume that the equipment in the ship would consist of a dual-output super-regen receiver, or an 'Add-on switcher' such as Ace makes to drive the actuator, the Dual-Adams actuator, and two alkaline pencells, plus the torque rod and that little bit of linkage. It does sound like this could be installed in a ship weighing about 7 or 8 ounces. Is there a good, reliable engine to pull that little bucket?"

"Yay, verily, and woof arf," assented Wagger. "The Tee-Dee .020 is ideal; steady running with power to spare for all the maneuvers our ship can perform. Notice I **didn't** say Pee-Wee or .010. We will need the .020 Tee-Dee for this work. You might also give some thought to the fact that this ship will need a low-wing for controlling that power and speed, and while you're at it you might consider a semi-symmetrical airfoil too. Let's aim for real multi performance."

Walt bounded off the stool and barely missed stepping on Wagger's nose.

"You've convinced me! Football field multi-propo is for me! Let me at that drawing board," he said, heading for the closet.

Wagger settled down a little deeper into the blanket, and growled one last

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TEE DEE BEE

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rejoinder:

"Just don't step on my latest model in there. It's a multi-propo, ¼A, magnetic actuator, dual-simul, low-wing, semi-symmetrical airfoil, realistic, trike-geared, 5-minute duration, fully stuntable and spinnable little football-fielder called the 'Tee-Dee Bee'!"

Construction

Walt glanced up from his workbench and noticed that Wagger was sound asleep on his favorite basket. "Hey, Bonedoggler, front and center!"

"Grumpff," snorted the Bassett. "Does the Paul Bunyan of the balsa rack have problems?"

"Certainly not," rejoined Walt. "Though I am perfectly capable of duplicating this masterpiece of yours, I would like to pick up a few construction hints right from the dog's mouth. How about a short dissertation?"

"A reasonable request," agreed Wagger. "Although I don't say that the Bee is the last bark in airplanes, it **is** rather unconventional and success will depend upon following the original design rather closely. After you know her better, you can make changes and have a bell doing it."

Walt glanced up. "Have a BELL?" he questioned.

Wagger nodded. "Thanks. Don't mind if I do. Would you fetch it, please?"

As Walt sighed and crawled under the bench in search of Wagger's favorite toy, the Bassett described the construction of the Tee-Dee Bee as follows:

"The best dog-gone way I know of to build the wing is to make a simple wing jig out of ⅜" or ½" sheet. Take two pieces slightly longer than each wing panel and sand a dihedral bevel in the center. Make two legs of the appropriate length for the dihedral and glue to each end of the jig panel. Glue the two jig panels together at the center. When dry, add ⅛" square strips, parallel and 4" apart. This provides a jig for the wing, and makes it easy to duplicate your manly efforts.

"When the jig is ready for use, lay your 1/16" bottom sheet down. Glue the ribs in place by pressing down on the bottom sheeting—the sheeting will form the exact contour of the airfoil by being depressed between the ⅛" strips. When dry, glue on the top sheeting. After this is completed, remove from the jig, and add the leading and trailing edges. Next, add the angled 1/16" sheet tips. Sand completely, then reinforce the two center section dihedral breaks with gauze or fibreglass. Apply a couple of coats of (ugh!) dope, sand lightly and cover the entire wing with lightweight silkspan."

Wagger paused for a moment to scratch his left ear with his right hind-paw. (No small feat, mind you.) "You might even add your antenna inside the wing, gluing it behind the leading edge stock and bringing it out through the center section of the wing. This would give you use of the full antenna without it trailing out behind the rudder.

"The fuselage and tail surfaces are easy. Cut out the sides, add the doublers with contact cement, and add the formers. The tank is a modified ¾ ounce control-line tank that completely fills the area behind the firewall – gives you five minute flights, too! Be sure to epoxy the tank in place, allowing room for the blind mounting nuts for the TD .020 and the bolts that will protrude through the back of the firewall. While you've got the epoxy mixed, cement the receiver and actuator slide rails in place."

Wagger picked up the Tee-Dee Bee and looked it over from stem to stern. Walt was busily engaged (in the closet) cutting up sheets of balsa in defiance of the plans for the Tee-Dee Bee.

Wagger shook his head sadly. "The rest of the plane is self-explanatory. Just follow the plans to the letter, keep the weight to a minimum, and cover the entire plane with lightweight silkspan. Color dope should be limited to trim only."

Walt applied the last brush stroke to his newly-finished duplicate of Wagger's ¼A creation, then picked it up and headed for the door. "Cummon, watch-dog – quit watching and spring into action! Let's go fly this little wonder!"

Wagger stirred not a muscle except to growl. "Steady, caveman. Much as it pains me to admit it, the Tee-Dee Bee is a single channel system and has limitations. Set it up well and it will give you performance you have never had in a ¼A airplane. Rush into it and you'll add another pile of sticks to that impressive collection of multi-tinder on the bench. Let me list some check-points for you:

1. Make sure the actuator 'kicks' vigorously, with no binding.
2. Set the elevator kickers to give more 'up' travel than 'down' when viewed from the side.
3. Hook up the elastic. Stretch to give slight tension when the elevator is resting firmly on both elevator kickers. Insert the straight pin through the elastic and into the fuselage side, maintaining this tension.
4. Sight that the rudder is neutral. If not, bend one elevator kicker up and one down until rudder **is** neutral.
5. Turn on both receiver and transmitters, with transmitter trim knobs in neutral. Move stick in all

directions, noting that surfaces spend the most time in the appropriate positions. That is, right stick should give right rudder, and so on.

6. Move 'rate' trim to full down, and stick to full down. Check to see that elevator 'dithers' in down position.
7. Now start the engine, and operate all controls while viewing from the side. Their movement will be reduced due to the terrific slipstream from the Tee-Dee .020, but should still be moving vigorously. (This accounts for the fact that the 'Bee' is **more** responsive to control during the glide than during powered flight.)"

Wagger rose from his favorite flannel blanket with more enthusiasm than usual as he finished this checklist. Suddenly his eyes opened wide for the first time in months as he barked: "Walt! I could have bet a box of doggy biscuits that you were starting to test glide your Bee! Unless you've practiced throwing spears at sabre-tooth tigers lately, forget it! This little missile has a nice glide with proper elevator control, but has been estimated at 45 miles per hour in level flight!"

Wagger let his eyelids droop to their normal level and motioned Walt to the car. "Cummon," he said. "Let's go out in the country for test flights, so you can win your wings." Whereupon, and without further ado, Wagger got behind the wheel while Walt curled up on the seat beside him. In a few seconds, they were on their way down the street.

Mrs. Glitch looked out the window at the passing auto and exclaimed: "George! Did you see that dog driving that car?"

"Yeah," grunted her husband. "Lousy paw-signals, just like most dogs!"

Final Notes on the Bee

by me

"Kick-up galloping ghost" (or "Kick-in' Ghost") is not really new. Most everything in single channel "gimmick" systems has been around for ten years, needing only someone new to tighten his stomach muscles and launch into another application which will be the "perfect" control. The system in the Bee was developed as a result of two things:

a. flying pulse rudder in a Top Flite "Roaring 20"

b. reading a description of Woody Blanchard's "U-All-2" in Model Airplane News. Woody's system was tried in the '20,' but control was too limited. A new method of obtaining this same result was tried with the present kicker system and flown in the '20' with reasonable success. The "Roaring 20" was flown to a total of 146 flights in the local football field **before** installation of a Tee-Dee .020 in place of the original Cox Pee Wee. The new engine proved much too powerful for the flat bottom airfoil and shoulder-wing, whereupon it was retired and plans subsequently laid for the "Bee."

The "Bee" was designed to control the power of the Tee-Dee with a minimum of downthrust. Also incorporated was a multi-type airfoil which would, hopefully, allow the lift to be turned on and off by means of the limited elevator control this system provides. The large tail surfaces and short moment arms were intended to provide a means of obtaining "snap" maneuvers such as rolls and spins. To a great extent, the Bee has justified these efforts.

I would like to stress some notes of caution:

a. "Bee's" control system is not really new, but the "Bee" is. She has a total of thirty flights on this prototype – for a good ¼A airplane, this is infancy. The **revolution** of this airplane and system has been accomplished, but the **evolution** is just starting. You can make changes after you know the limitations of the present set-up, but until then, be cautious!

b. A loose elastic will give very little down, but a tight elastic will probably limit control throw severely. Elevator trim-tabs also give down load, so don't tighten that elastic much! Better to have more "up" than you need than to have more "down" than you can handle.

c. Adding a third battery, according to the Adams diagram should give increased control throw and make more violent maneuvers possible. However, I am now trying this for the first time and will not know the results for some time.

d. I have found that the pilot **must** learn to fly the "Bee." A ship capable of 45 miles per hour stalls, spins, and snap rolls must be controlled by a knowing hand. "Bee" is rugged, and will tolerate you while you learn – just give her a reasonable chance and soft dirt.

e. Caution!! You can use the full "on" and full "off" buttons in flight, but NEVER in the glide. She'll snap roll every time!

f. The "Bee" will consistently do the following maneuvers: Climbing turns from ROG; Procedure turns without appreciable zooming upon recovery; straight flight; mild dives; power dives after a one turn spiral; consecutive loops; vertical reverses; stalls; three-turn spins; snap rolls; passable Immelmanns; glide to landing, slow; flare for landing; land in short grass without appreciable tripping.

Well, that's all for the "Bee." She's young – I hope she finds some good homes.