# RIMFIRE:

(RIM'FIRE) *n.* A method of igniting the propellant charge in a cartridge for the launching of a small caliber projectile.

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Electronics technology continues to march forward with giant strides. Each step has provided us with some new improvement and simultaneously delivered something else into obsolescence. Yesterday's innovations are today's museum pieces just as today's spectacular equipment will be tomorrow's collector items. It doesn't take a grey-beard to recall the milestones of R/C industry. Gas tubes gave way to transistors just a handful of years ago and we all marveled at the presentation of a multi-channel reed system that could be contained in a cigar box. Not long after that, the first practical proportional system made its debut and we were greatly impressed with the fact that it was no bigger than a house brick! Improvements were made on that and the norm for the following few years was full house proportional that weighed in at a pound and one-half, plus or minus a few ounces. By this spring most manufacturers had implemented integrated circuitry and they are now producing radio equipment that generally tips the scales within an ounce or two of a pound. Don't think this is the end. This spring, Orbit Electronics previewed (at MATS and Toledo) an ultra-mini system that barely budges the scales at 9 ounces and will fit in a shirt pocket. From cigar box to cigarette pack is quite an accomplishment in reduction. It must be assumed that we (the consumer) will inspire or otherwise lead the way in the reduction of air frame dimensions.

While I was stationed in California a couple of years ago, Dick Riggs, of Orbit, was my frequent flying and building buddy. He drove a Sunbeam Tiger and I drove a Karman Ghia. My most frequent comment to him while loading 6 foot wings into such cramped space was, "Dammit, Dick, when are you people gonna' make some gear small enough for a 30-inch airplane?" His reply was always "someday". Well, in early March, Dick and Phil Garrard came to Hawaii for a week of ribaldry and to "show me something". Dick reached into his flight bag, brought forth and unwrapped a small package with such care I thought he had taken to smuggling dope or diamonds! What he revealed was the hand assembled prototype of the aforementioned ultra-mini gear. Receiver, four servos and battery pack made up a scarce hand full. My first thought was, "today must be 'someday'!"

Since he had accepted and hurled back the challenge to produce radio gear sized for a 30 inch airplane it was my obligation to then produce the airplane. The next day we, with gear in shirt pocket, went to the local hobby shop and started making a survey of suitable kits, if any. Just about any of the ½A or A control-line kits can be adapted but these, to me, were generally unspectacular. The Guillow 3/4" scale line was considered but seemed to be just about marginal in the wing area department. I was looking for something near 200 inches and the largest Guillow was the P-40 at just about 160 inches. The kit and a Fox .07 were purchased and taken home to the drawing board to see if things would fit, work and fly. Conclusions were that it would, even though the wing loading would be more than what was thought to be comfortable. With this size aircraft and the guessed at Reynolds numbers at which it would operate, the maximum acceptable wing loading seemed to be about one-tenth of an ounce per square inch. This would mean a 16 ounce airplane. The radio gear would weigh in at 9 ounces. This left another 7 ounces for the airframe and powerplant. It seemed that it could be done but then why fool with marginal and/or doubtful limits for this "first-time" effort? The original effort that went into producing this diminutive guidance system surely deserved a reciprocal originality in the aircraft that would carry it for the first time so the lid was placed on the P-40 and it was shelved for another day.

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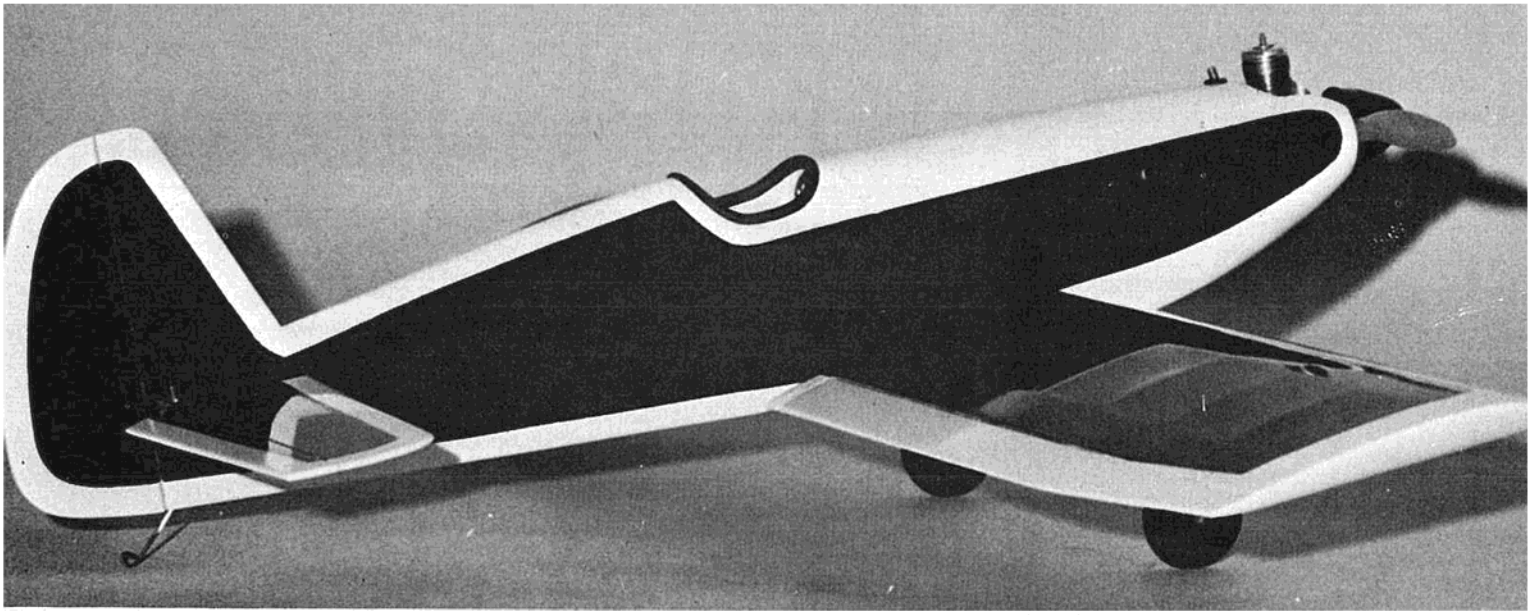
# RIMFIRE:

(RIM'FIRE) *n.* A 30" span Class C R/C aircraft designed to accomodate the ultra-small digital proportional rapid control systems that are currently being developed in the R/C industry.



**The Rimfire was the second place winner in RCM's recent Design Contest. The plane shown in the photographs was flown to California, equipped with a prototype of the new Orbit ultra-miniature proportional system, and test flown by Orbit and by R/C Modeler Magazine. The flight characteristics of this little ship have to be seen to be believed.**

Fresh paper was laid on the table and sketches were made around the gear. One hundred eighty square inches of wing was decided upon and the airplane evolved from there. A high wing or cabin type would have been a safe and appropriate configuration but this was multi gear and the airplane should be of multi variety. It was desirable to get as much lift and as little drag as possible out of the wing and I know of nothing better than the old reliable Clark Y for that. Agreed, the Clark Y is not optimum for negative G maneuvers but the intent of this first airplane is not to wipe out the Quik-Fli's, Thunderstormers, et al. (That will be the intent of the next one!) Trike gear didn't seem necessary because, at low idle, an airplane of this size and weight would still roll fast enough to make sensible steering and taxiing a fantasy. The thought was to forget the nose gear and let her be a tail-dragger. Take-offs could be accomplished a-la Goodyear and landings could be dead-stick or fly her on, then run after it. Fin and rudder area was made purposely large to lend directional stability on the ground. With that much vertical area it would at least try to keep its nose pointed into the wind and maybe refrain from ground-looping all over the runway.

So, sketches were smoothed out, a curve or two added here and there and the aircraft, as you see it depicted, emerged.

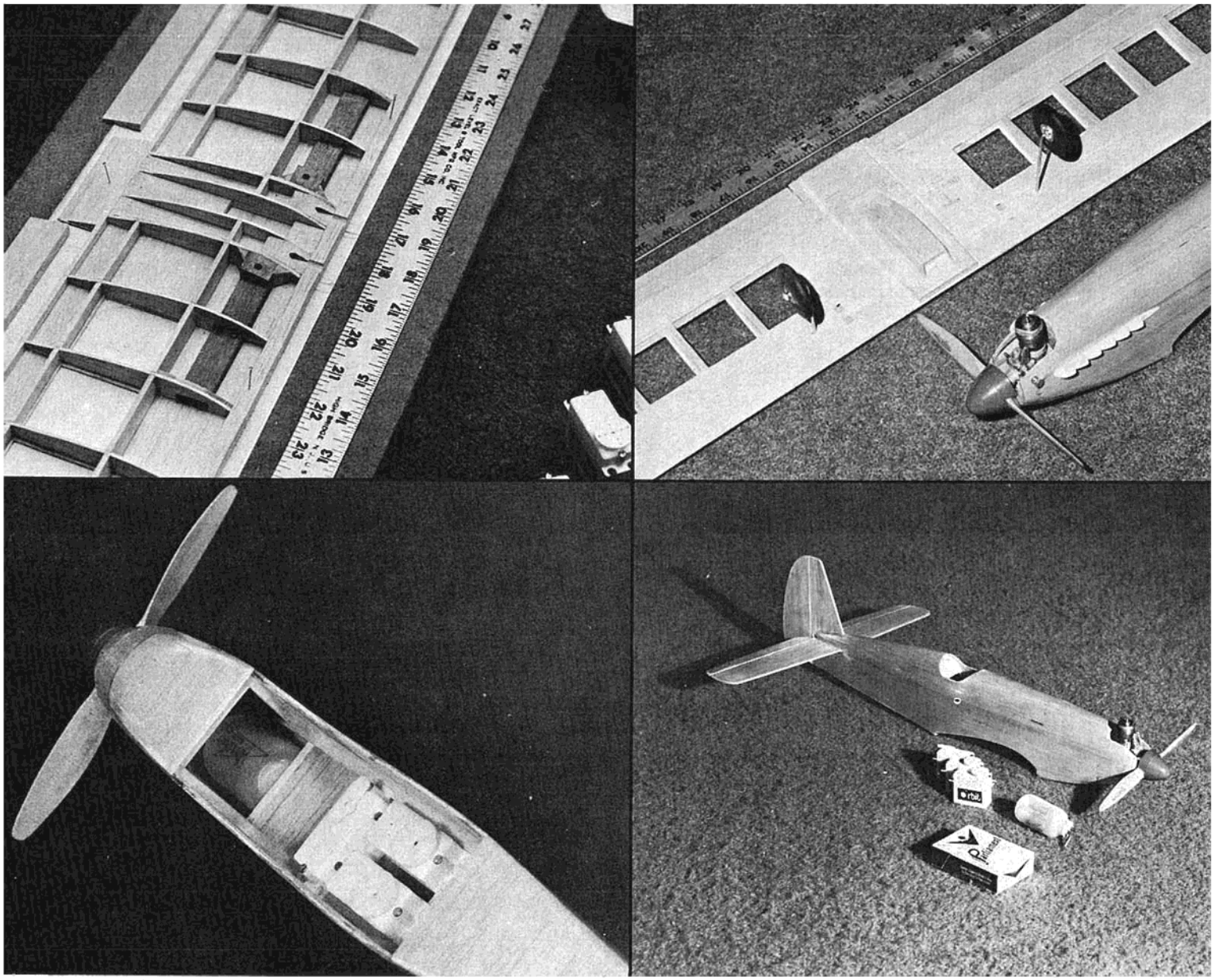
So what's unique about it? Nothing, really, if you consider only its appearance and general configuration. What IS significant and unique is the fact that here is an airplane that weighs scarcely over one pound, flies on 180 square inches of wing and is a full house digital proportional machine. No gallopers, kickers, pulsers, couplers, etc., to contend with. Just clean and reliable digital proportional which, at the time of this writing, is the ultimate in refinement and at the pinnacle of the current state of the R/C electronics art.

So what does that prove? It proves that to enjoy full house proportional flying it is not necessary to provide yourself with an airplane that takes considerable dollars to buy, considerable time to build and considerable space to construct, stow and fly. Also, flying areas are getting smaller as they get more scarce. The relatively low noise level of an .049 - .099 as compared to the roar of a big .60 might mean a step in the preservation of our more sensitive flying sites.

Will small airplanes make Quik-Fli sized airplanes obsolete for contest work? I don't think so. However, I do think that the big airplanes will become somewhat fewer. Of the X number of thousands of R/C flyers, only a small percentage are contest or competitively inclined. The majority are Sunday flyers and sport types who are in this hobby/sport strictly for the fun and relaxation that it provides. A small airplane is just as much fun to fly as a large airplane. Considering the mentioned advantages of a small airplane (time, money and space) it seems fairly certain that the number of big ships will begin to decrease in the fun and sport circles.

Another area for invasion by this small equipment is in the scale category. Just about everyone of us at one time or another came very close to building a scale airplane. Everyone of us has a favorite airplane and would build it if scale wasn't such a production. When you consider the weight of scale attachments (cowls, guns, turrets, scoops, etc.) plus the weight of the guidance system the whole idea becomes frightful. To come up with a decent wing loading, you end up with an airplane that is nearly too damned big to keep in the garage. A 2" or ½" scale is about the norm right now. Further discouragement to build scale is the absolute lack of scale accessories in this size range. Ever try to buy a 4" spinner; A 16" prop? A pair of 5" wheels (vintage excluded)? All these attachments have to be made and the construction total is enough to discourage all but the most ardent of scale addicts. So, the reduction in weight and dimension of the guidance system will make possible a reduction of weight and dimension in the airplane that carries it. This may result in a general increase in scale activity, especially if the rules ever get around to rewarding workmanship and fidelity instead of gadgetry and an insane flight pattern.

What else could a combination of small radio gear and small airplane lead to? I suspect that kit manufacturers may entertain a more than casual interest in these prospects. With balsa prices being what they are and with a more or less limited market, there is probably some deep thought and measurable re-



luctance gendered before tooling up for a $30.00 - $40.00 gargantua kit. Perhaps the advantages of lower production costs and a wider price market might herald a profusion of small kits in the less than $10.00 bracket.

Is that the end of it all? Not quite. Engine manufacturers will probably abandon further development of the .60 size mills and start to go the other way. Even now, the 16 ounce IC radio gear has prompted some flyers to come down to .40 - .49 range. This 8 ounce ultra-mini gear might bring us down to .049 - .099 but the happy medium will be somewhere in the .15 - .30 range. This is a safe middle of the road stance if the extremes are considered to be .049 and .49. Also, those folks who manufacture horns, cranks, landing gear and the myriad other accessories that we use will probably find it profitable to produce accessories in a size that is applicable to this type aircraft. So, there seems to be a plum in this pie for just about everybody. The fuel manufacturers aren't going to be too happy though. A gallon of fuel with this size engine is good for more than 100 flights as opposed to the 9 or 10 flights I used to get with the big Tigres.

In summation, this airplane represents an example of economy in time, space and money. It was built in four evenings on a desk-top at a total material cost of pennies less than $3.00.

The significance or value of all this is debatable and largely a matter of opinion. All we can do now is sit back and see if the art develops to the prophesied state.

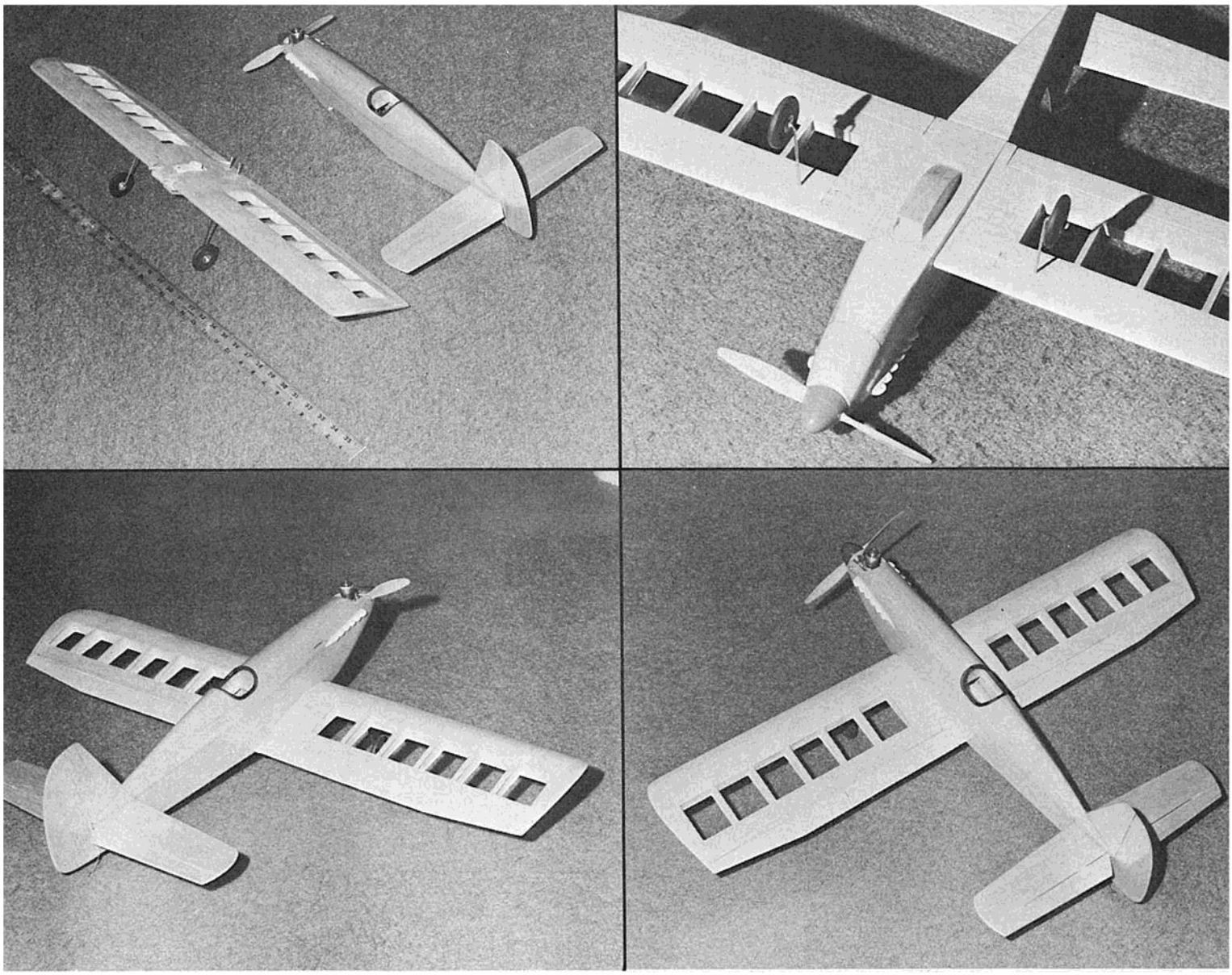
## FLYING THE RIMFIRE

The intent was to return to California with completed **Rimfire** for the first flight trials. There, we'd make the first flight with Dick's supervision. This seemed the prudent thing to do since the radio gear was, as yet, untried. Also, the dollar value of this hand assembled prototype was quite astronomical and most certainly Dick would have a great interest in its characteristics and disposition.

Things didn't work out as planned. On the same evening that I arrived in California, a recurrent Asian intestinal bug that I've hosted for years decided to manifest its presence again and down I went for a long count. Instead of improving with time I was getting worse and Dick sent me back to Hawaii for hospital treatment.

I waved a feeble goodbye to California, Dick and the **Rimfire** quite disappointed the tiny bird was yet untried. Dick promised he would see to a proper maiden flight. This he did and for a description of the airborne **Rimfire** I'll include, as he wrote it, Dick's letter to me.

"The Saturday after you left, I



charged out to the Square all primed and cocked to get some daylight under the little beast. I had cleaned and dried the nose section as best I could after the misfortune with the fuel line, and as you remember, purchased some of the tougher black line and installed same. Full of confidence and anticipation, I made a few brief checks on the gear, filled the bulb with fuel, hooked up to the feed line from the tank and promptly proceeded to AGAIN fill the fuselage, receiver, et al, with Thimble-Drome Racing fuel. This time the fuel line was not cut, but because it had to stretch so much over the larger tubing out of the tank, it merely split wide open. Once again, I swore mightily as I cleaned, dried, swabbed and replaced the foam packing. I slammed all back into the car and headed for home, vowing I was going to cure this problem once and for all. Off to the hobby shop for some small diameter tubing (brass) and then back home for a session with a hot soldering iron. I pretty much re-hashed the whole installation in the process, but now it works. Got back to the Square about 3:00 p.m. and found winds of just below hurricane velocity in progress. I ran the Fox anyway, and surprisingly, the idle seemed quite adequate, but max power puts it in the lower portion of the "Tiddler" range. A good .049 would eat the .07 alive while four-cycling. What with the winds and the indifferent performance of the Fox, I decided not to fly the ship. However I dawdled there until nearly 5:30 p.m. thinking maybe the winds would abate and I could re-evalute the engine situation. As things worked out, the winds did not diminish and anxiety and a mild case of frustration caused a re-evaluation of possible lack of performance, so with the Fox running its very best the intrepid pilot launced into the teeth of the howling gale. To make a long story short, even though yours truly was all set to get real salty on the sticks, (adrenalin flow at max) the little beast hiked her tail into the air, ran down the runway like on rails, and sailed into the air with all the aplomb of an airplane. Believe it or not, no changes were required on any of the trims as set on the transmitter before take-off. How's that for educated guesses? The high winds and associated turbulence made performance evaluation nearly impossible because the airplane lumped and bumped along pretty severely. However, all indications were that control sensitivity and general flight characteristics were decidedly docile. Landing was either a lot of luck or revelation. Everyone knows no skill was involved. I flew it twice with similar results each time and decided to hit the field bright and early the following morning. It was a repeat of gale force winds, much to my

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gust, but three more flights were logged with no difficulty. The most obvious results of trials thus far, pointed to the lack of power generated by the Fox .07. The airplane would do inside loops and cuban eights and rolls but some care had to be exercised at all times. The Fox simply ran out of breath too easily. It flies the airplane fine but lacks performance to be able to fly like a full class three ship. I left the field that day determined to hit the hobby shop and latch on to a decent .09 of some type or other. Possible choices I was thinking of were OS Pet .09, or Max .10. At present I just don't know of any other good .09's available, although I'm sure there must be others. Understand please, that what I'm saying, is that the Fox has sufficient power to fly the airplane quite nicely but yours truly has always been a power hog and I likes 'em to zip and zing. I decided, however, to try again in better conditions with .07 aboard.

Went to the field this afternoon and found conditions much improved. Only mild breezes and very few people around. Since I had a whole half-pint of fuel, I was determined to do some real flying. Well hell, only one ounce per flight and you can't believe how long the Fox will run on one ounce. Would you believe 9½ minutes? This was a good session and outside of proving the Fox doesn't have what I want for power, I had a real ball. I tried a few different props to see if any more performance was available but the final choice was 7/4 Rev-Up. 6/5, 6/6 and 6/4 were all tried and found less lively than the 7/4 and the 7/4 Rev-Up had a definitive edge over the 7/4 Power-Prop. Also, after the third flight, I decided to try the K&B 100 rather than the Cox Racing Fuel and discovered the engine performed better on the milder fuel. This session also bore out the conclusion regarding the surprising docility of such a small ship. It is in no way, shape, or form sensitive to controls. It also showed the RIMFIRE'S beautiful landing characteristics. It just greases on like a coat of paint for wheel landing and like a bird squattin' on a wire, on three points. All in all, so far, it must be termed a success."

## BUILDING THE RIMFIRE

Nothing exotic here. In the interests of time, simplicity and expense, no departure was made from precedented and proven construction methods. Also, an aircraft of this size cannot be complicated except on purpose. The only tools used were straight pins and razor blades.

### Fuselage and Tail Assembly:

Cut the fuselage sides from 1/16" sheet balsa. Cement on the 3/16" square longerons, uprights and the 1/32" plywood doublers. Cement on the 3/8" triangular stock which will butt the firewall and the 3/8" triangular stock that will fill and beef the lower nose section. When all is dry, bevel the rear of sides and cement together. Clamp with a spring-type clothespin. Cut the 1/16" plywood firewall. Cement to the 3/8" triangular braces taking care that the centerline alignment of fuselage is maintained. When the firewall and rear fuselage joint is dry, cut and cement the 3/16" square crosspieces at the stations as indicated on the fuselage top and bottom view. Cut the top formers and cement into positions over the crosspieces. Cut the stabilizer and elevator from 3/32" medium balsa sheet. Round off all edges to streamline and to allow free hinge movement. Reinforce the elevator center section by breeching with 1/16" music wire and epoxy in place. Hinge the elevator with mylar or nylon strip hinges. Cement the stabilizer and elevator assembly to the fuselage top. Cut the fin and rudder from 3/32" medium balsa. Round off the edges as you did on the stabilizer/elevator. Notch the fin and fuselage to allow elevator up-down clearance. Cement the fin to the top of the stabilizer and to the top of former #8, taking care to maintain centerline alignment.

Reinforce the fin trailing edge by cementing on a 3/32" x 1/8" spruce strip along the edge and onto the rear fuselage joint as depicted. When dry, hinge the rudder to the fin. Plank the fuselage top with 1/16" x 1/4" medium strips. The bottom of the fuselage is still open. Mix a batch of Hobby Poxy #2 glue and with an old brush, reach through the fuselage bottom and spread a liberal coat on the inside of the planks and on the back of the firewall. This will preclude having to silk the outside.

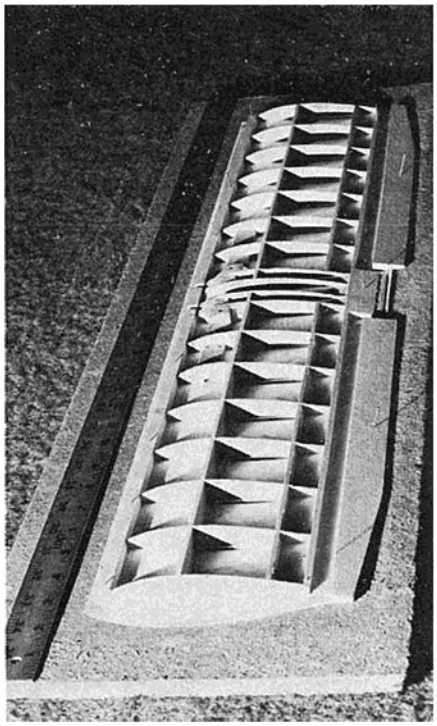
Sheet the rear fuselage bottom with 1/16" medium balsa. Sheet the forward fuselage bottom between firewall #1 and station #2 with a double lamination of 1/16" medium sheet. Bevel a soft block of balsa and cement inside the fuselage sides at the nose to serve as filler blocks. Make sure the inside surfaces are parallel and that the distance between them is identical to the distance across the beams of the engine that you select. I used 3/16" x 1/4" hardwood engine mounts epoxied directly to the fuselage side filler blocks. I would have preferred a Tatone radial/beam mount but couldn't find one here. I highly recommend that you use one and bolt directly to the firewall.

Now is the time to attach the engine. Choose the method you prefer. Cement a soft balsa filler block into the bottom of the nose/engine section. Let all blocks dry well and carve down to fit a 1⅜" Williams spinner. Remove the engine, sand the entire fuselage/tail assembly. Trim the cockpit cutout. Locate and drill the holes for 1/8" dowels for wing rubber bands. I used locking pegs and a 4-40 screwdown on the original, but generally find this to be more of a pain than a convenience. I only did it so the original would be pretty. I'm tired of a midwestern friend of mine calling my airplanes ugly!

Paint the inside of the engine compartment with a liberal coat of Hobby Poxy #2 glue. Let the entire fuselage/tail assembly dry and cure while you build the . . .

### Wing:

Lay out the plan and pin down and cement the 30" x 2" x 1/16" bottom leading edge sheet, the 30" x 1" x 1/16" bottom trailing edge sheet, the 3/16" x 1/16" bottom capstrips and the 1/16" bottom center sheet. Cement the 1/8" x 1/4" trailing edge to the bottom trailing edge sheet. Cement 1/4" square leading edge onto the bottom leading edge sheet. The original aircraft has the 1/4" x 3/4" hardwood gear blocks as shown on the plan. This was a gross over-build and the aircraft does not require that much beef. I recommend that you substitute 1/8" plywood instead and strap the landing gear directly to it with the Midwest all purpose brackets. Now is the time to cement the gear blocks onto the bottom leading edge sheet. Cement all wing ribs on, using the 3/32" hard (or two laminations of 1/16") ribs over each end of the gear blocks. Lay 1/4" sheet between the two centermost ribs making the cutout for the aileron servo. The servo will be screwed directly to this sheet. Cut and fit 3/32" sheet webs between each rib bay at the edges of the bottom sheeting. With a long sanding block, lightly dress the tops of the ribs, the web spars and the trailing edge spar. Cement small pieces of scrap block onto the trailing edge spar for some beef into which the aileron hinges will be inserted. Cement on all top sheeting and cap-strips. Cement onto the trailing edge spar at the center of



the wing, a 2¾" length of 1" trailing edge stock. This must be centered (1⅜" each side of wing centerline) and will complete the wing structure prior to removing it from the bench. Wait at least over-night before removing the wing structure. Since the wing is in one piece and contains no center splices, a good cure period will insure a perfectly true wing if the building board was true.

Remove the wing. Cement on and carve the tip blocks to suit. Rout channels and install the aileron horns. I bent my own, but many fine types can be purchased, so decide which brand you like. Install as depicted. Cut the 1" trailing edge stock to the length and plan form shown. Drill holes to accept the aileron horns and check fit to wing. Sand a V-shaped bevel into the aileron leading edge similar to that depicted on the typical wing section. Hinge and attach the ailerons to the wing, using strip hinges and making sure that you go into the wing where the scrap blocks were attached. Carve the leading edge to rough shape. Lock the ailerons in neutral with spring clothes pins and with a sanding block, sand the entire wing structure. Use 320 or finer paper and go easy because it doesn't take very long, or very much, to sand clear through the 1/16" sheet. Make the cut out in the top and bottom sheeting for the aileron servo. Mount the servo. Attach the wing to the fuselage. Build up the bottom center of the wing to conform to the fuselage contour. Build the air scoop to hide and protect the protruding aileron servo. The rudder and elevator servos fit side by side between the cross-pieces at former stations #3 and #4. The throttle servo fits across the fuselage directly forward of former station #3. To wood-screw the servos directly to the 3/16" square members seemed unwise, so a 1/32" plywood overlay was cemented to the members to give the screws something to thread through. This is entirely adequate. Pushrods consist of 1/32" wire running in nylon tubing but, here again, this is a matter of choice. Every hog to his own slop. All of us have our own preferred devices. If yours is easier or better than mine then by all means use it.

At this point we have a completed airframe that is begging for a finish. Volumes have been written about how to produce that "dazzling finish that looks an inch deep". Every instruction article that appears generally contains a lengthy discourse on the author's own "special" method. I won't punish your minds-eye with this subject. All I'll say is that a good finish depends 99% on careful and tender loving preparation of the surface and 99% of that depends on dedicated sandpapering. Sanding is work so if you are lazy, forget about ever having other than a mediocre finish.

I covered the wing with silkspan, gave the entire airplane four heavy brush coats of lacquer furniture sealer, sanding between each coat and finished it off with two light coats of acrylic auto lacquer from the 4 ounce touch-up spray cans. Works fine for me. If you have something quicker or easier, please write me and tell me all about it.

Wait a couple of days for everything to dry and cure and then polish with a fine grit polishing compound. Bend the landing-gear to the length shown on the plan side-view and to the configuration dictated by either the plug-in gear blocks or the bracket-on style ply sheet. Use 1/8" wire. Install the gear and wheels. Fuel up, turn on, and go fly. Within a few months after you read this, the ultra-miniature R/C system that is required will probably be on all the dealers shelves and available to any of us that can scratch up the money to buy it. What it will sell for is anyones guess, but I submit that the manufacturers will hold it to very near the current cost of the usual 4-8 digital system. So, get in line for yours, right behind me!

**Post Comment**

There was some apprehension about the choice of power for this craft. The Fox .07 was described to me as a real "klunker" by those who had knowledge of its output. I didn't have any choice because there was nothing else available to me. Dick's comments seem to bear out the opinions that the Fox is "adequate". (Sorry 'bout that, Duke) As he said, it's adequate. If you want something spectacular go to a bigger mill or one with better performance. Keep the C.G. at 25%. The Clark wing and horizontal area distribution of this little bird will get you into deep trouble if you tempt the tail-heavy gods. You might like to modify the Clark wing and go to a semi-symmetrical airfoil. Surely this will improve the outside maneuvers without severely affecting its low speed and landing characteristics. So, we have to start somewhere. The RIMFIRE is our first shot in the dark. You fellows take it from there and improve on the concept.