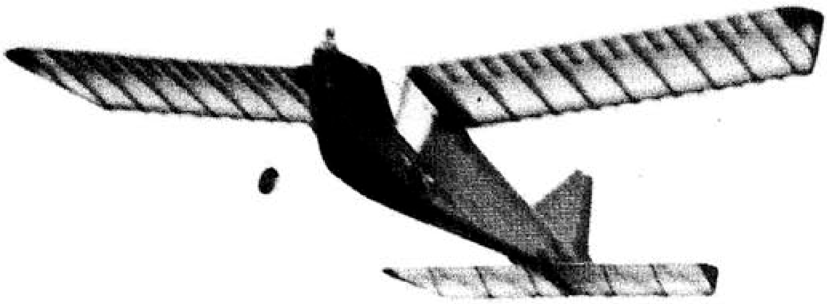


Designed by Bill Winter

Full Size "Timely" Plan Available

Scared off by the high powered multi types? Here's the place to start . . . out in the pasture with the rest of us . . .

Not a nervous bird, flies slow and easy, lets you get the feel of it, gain confidence, glue up your errors.

52" tip to tip, 45" overall, takes .10 power and an 8/4 club. Single Channel installations.

"AIRKNOCKER"

Looks like two fingers are glued together Bill, proves you built it. Light, plenty of area makes ship a one-man launch type. Good design for racking up flight time, sharpening up your panic senses. All the room you could ask for in cabin.

▶ Having built 66 radio-control models of all sizes, shapes, and types, we have long since learned that there comes a time when a fellow just wants to watch an airplane fly. Plane watching is an art.

Some people regard multi stunting as the ultimate but unless the pilot is expert enough to smooth out the maneuvers, to impart a certain majestic quality to his pattern, he is more apt to acquire a case of knocking knees than he is a feeling of serenity. To our mind, therefore, the most pleasant airplane to watch is a single-channel rudder job which climbs slowly, flies smoothly, turns as if a pilot in the cabin co-ordinated stick and rudder—no zooms, mad vibration, crazy stalls, death defying wind-downs, erratic tail wiggling, or shattering engine noises.

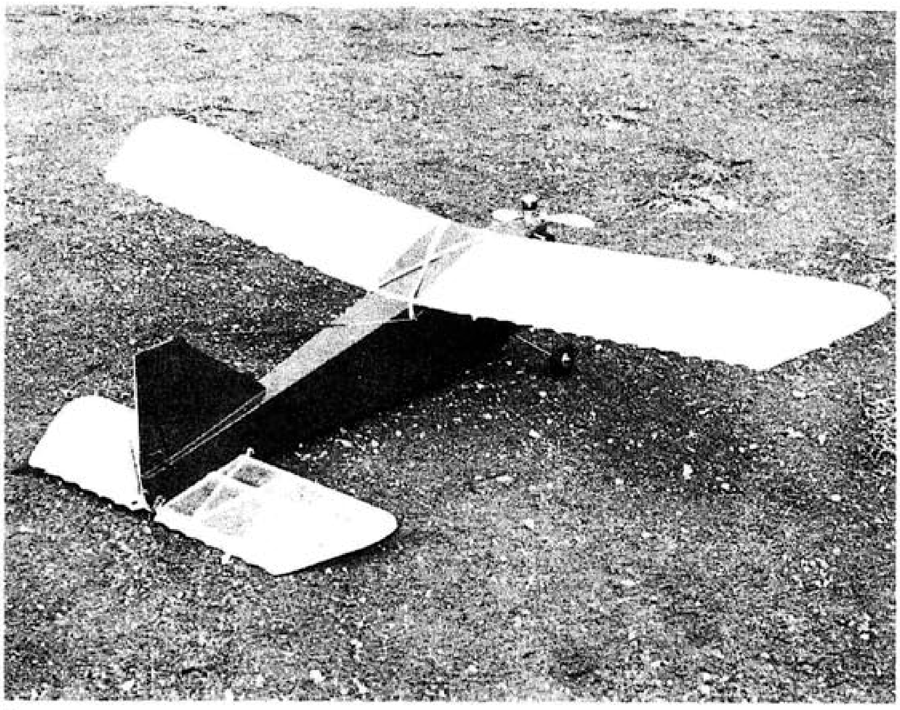
The trouble with most rudder jobs is that, if you have seen one, you have seen them all. The typical bomb spans 50 or so inches and is powered by anything from a .15 — this isn't enough they say!—to even a .29. The miracle is that anyone can fly them—though we all do. The genesis of this jumping bean school of design is the rules

. . . continued . . .

"AIRKNOCKER"

The old C-3 bathtub inspiration is obvious. Scalloped trailing edges are optional, typical sheeted fuselage.

A mystery: Who bit the trailing edges? Nice clear photo Schneider, all the rocks are in focus. Not a fast bomb, so you can fly it by the week, gain flying time, skill.



which dictate machines that stall and zoom, for you need that spectacular instability called "ballooning" to rack up points. It takes great skill to manage these jumpy aircraft.

Fast, high climbing—and all stunt—machines simply cannot be left alone long enough for the flier to sense the true feeling of flight. The ship that crosses the field in nothing flat has got to be turned abruptly, or looped, and constantly disturbed. When you explore the sky with a crate that allows you to relax and take note, every flight becomes an adventure, riding the cross wind dead stick, never seeming to come down, circling in thermals, playing the up and down areas over wood and field. When you fly high, wide and handsome things seem to happen. We have made many flights without touching a button until time to land. One flight landed at our feet without the button being punched. Swallows stream after the ship, occasionally a curious crow—once a circling hawk riding the same thermal took exception to our humming bird and swooped upon it. The blast from his wings tossed the ship into a full stall.

Though a curious bird, the "Airknocker" is no radical departure. (It looks like the old Aeronca C-3, hence the lightplaner's slang for Aeronca—Airknocker.) It is another 50-odd

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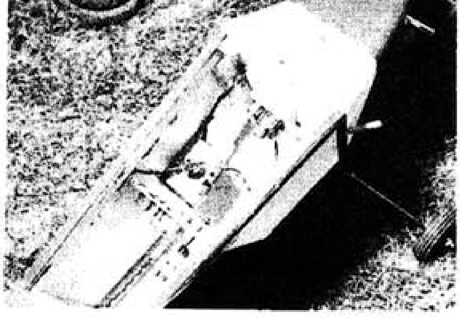

AIRKNOCKER

(*Continued from Page 10*)

incher but with just a Fox .10 for power, and a flivver plane motif to be different, and appropriate.

Something needs to be said about the effects on design of the new tiny, lightweight transistor receivers with their low battery drain. It ought to be noted that thousands of .010 ships of about 24-inch span are flying today, pointing up the fact that design should adapt itself to changing trends. With equipment weight and size way down, it stands to reason that a machine powered by, say, a .19, flies differently when equipped with modern radio than it did when fitted with a receiver weighing three times as much and a big lead lump called a battery pack. We have arrived at the day when designs should be specifically tailored for one type of radio, battery supply, and engine, for otherwise the performance variations can prove troublesome to the beginner, or even the Sunday sport flier.

While the writer has used many types and makes of equipment, this particular ship was specifically tailored for the Fox .10, a Kraft transistor relayless receiver (or similar), an 8/4 nylon prop (it gets wilder on a 7/4 allowed to wind up), and a 225 mah DEAC (C & S) nicad battery pack. The escapement is a Bonner Varicomp. When working with these new relayless receivers which have a single battery voltage requirement—which includes the actuator—a compatible system is essential. In general, stay away from dry pencells. Alkaline type batteries are a must and we feel that the rechargeable nicads are better and most reliable. Escapement resistances and other subtleties are involved so stick with the escapement that you know works with your receiver. Since escapement airplanes are not necessarily good pulse ships, or vice versa, the designer guarantees an exact kind of performance from this airplane only if equipped as described, if weighing approximately 28 to 32 ounces, balanced as designated and built accurately and free of warps.

We do not recommend a larger engine than the .10 unless the ship is built overweight—which would be a pity. More power, and a higher gross would make "Airknocker" just an-

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other crazy rudder job. In fact, because a .15 had been ruled out, some liberties—in the interest of a unique profile—could be taken without getting into trouble. On a contest-type layout one would never locate the fin and rudder so high above the imaginary center of lateral area, or so high above the rolling axis of the craft. Severe applications of rudder on a fast-moving contest ship would tend to roll the nose down, overbank, and spiral. In the sport ship with its relative low power and reasonable flying speed, this characteristic is not evident.

"Airknocker" was well tested with various fin sizes and rudder shapes and areas, in conjunction with more or less rudder throw. The exact amount of rudder throw for this type of flying depends on your ability to control the airplane in a slow glide in the wind. Under power, response naturally will be more emphatic. For test flights, the rudder throw—measured at the bottom of the rudder from the airplane center line should be 7/16 of an inch. For initial test flights more throw should be used, and this can be set temporarily by bending up the adjustable linkage arm on the rudder.

There is a major design problem these days—due to lightweight equipment and small batteries—in getting the CG on any rudder job far enough forward. The pulse people don't have it quite so tough because they favor relatively heavy battery supplies due to actuator drain; these batteries when placed forward, keep the CG near where it should be.

The "Airknocker", for instance, has its batteries located against the engine firewall. It uses two generous, hardwood motor bearers which come back to the front-of-cabin bulkhead. The firewall is 1/8" plywood. The belly is shaped from quite a few laminations of 1/4" sheet balsa—or from blocks if you prefer. The escapement is mounted slightly forward of the 50% of wing chord point. The tail, on the other hand, is built light and precautions should be taken to select light, though good grained, wood for stabilizer, fin and rudder—the latter two being soft wood.

As a matter of fact, the original model had a somewhat shorter nose with generous lead ballast. This was not a design error, but is in line with a practice the writer has followed for years in achieving good penetration and grooviness in sport designs. Since few people can be expected to go along with this approach, we reluctantly lengthened the nose on the plans to maintain desired balance with little or no ballast. You can check out this idea on any rudder job you have.

For instance, we flew a "Rebel" for two seasons on a Mills .08 Diesel. This ship had a heavy B battery just forward of the leading edge, and the stab shimmed negatively for more decalage. That ship would make beautiful hands-off 360's, perfectly banked, in a high wind. It could never balloon; even after a steep spiral it could not loop but would go out in a nice, moderate climb recovery from which a decent turn could be made in either direction. You cannot win a contest with such an adjustment—we might term it an all-weather adjustment—but the airplane sure does fly better.

To come back to the point, it is nearly impossible to keep the nose heavy enough without going to tail moment arms so short that longitudinal stability becomes marginal. On the average airplane a nose length of 75% of wing chord is inadequate—we have seen originals fly well with nose lengths of 100 and even 125% of chord (depending on aspect ratio). Since ships are growing so light with these little radios, why not shorten the nose and employ some of that weight saving in useful ballast? The other answer is to go to smaller aircraft—36 inch span for example. Again it is the contest requirements that militate against this—a 50-inch machine is none too large for competition.

A large amount of downthrust is designed into "Airknocker". The less the power, and the lighter the machine, the more downthrust required (not true of multi-type airfoils). A proof of this is that all the indoor R/C designs so far, notably Ken Willard's pace setters, have enormous downthrust. In slow flight, you have to stay away from the stall, and downthrust keeps that nose down. On low power, the machine stalls at a lower climb angle; the more powerful machine pulls through, but, of course, with more climb as the result. "Airknocker" is not ultra low powered, but power is modest enough to require a fair amount of downthrust.

CONSTRUCTION: There is no need to teach model building to any reader capable of tackling an R/C, so we will confine ourselves to the trickier points involved. No effort was made to achieve an ABC construction for "Airknocker." While performance is for the beginner and sport modeler, fuselage construction presumes some building experience, and therefore we've sought to make the fuselage interesting and different.

In profile it is realistically deep-bellied, as would be an old-fashioned flivver plane of the Aeronca C-3 variety. From the widest point at the front of the cabin, the fuselage is a straight-line taper both to nose and tail (top view). Cross-section tapers toward the bottom, and the forward belly is rounded off to prevent a feeling of too much mass in the landing gear area. The gear is short and fixed. By using a sheet-balsa floor as a jig, the fuselage is accurately aligned, and quite strong despite a quick impression that the sharp break in the fuse-

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lage sides would be weak.

The deep fuselage sides require butting together, side by side, two pieces of 3/32" sheet balsa. It will be found that if the upper piece is four inches wide—33 inches long roughly, the 3-inch wide lower piece can be about 19½ inches long. Working with 36-inch lengths, the extra wood will provide for the floor piece, all wing ribs, etc. It is important to use a light grade of wood, something between soft and medium hard. If the wood appears to have one end harder than the other, place the heavier end forward. The tail must be kept light, which is why the top and bottom fuselage sheeting is only 1/16" sheet. You can use 3/32" sheet for top and bottom if quite soft—it can be sanded down, too.

For accuracy, it is always advisable to line out with pencil—on the inside face of each fuselage side (and be sure one is left, and one right) the exact positions of vertical cross-pieces and bulkheads (formers). Note that the two cabin and bulkheads are laminated from two thicknesses of 1/8" sheet, at cross-grains to each other; and that the bulkhead at the stabilizer leading edge also is laminated, but from 3/32" sheet.

The sharp break in the sides does make for accurate alignment—for instance, when joining the sides at the rear, a straight piece of heavy strip can be pinned along the outside of each side to keep the material absolutely straight, and then be removed easily after all the rear cross-pieces have been cemented in place.

We achieved the sharp break by pressing down on the inside face of each side at the main cabin bulkhead position to crack, but not break off, the wood. The sides then can be bent further to the approximate desired shape, with the crack then being cemented on both sides. If you wish, various precautions can be taken. A strip of masking tape on the outside of the crack—put on before crease is made—will prevent the sides from separating along the crack before assembly can be begun. On a strip of pinking tape can be cemented permanently over the crease on the inside of each side (like a hinge). Even if the sides should separate—as could happen with mushy wood with little or no grain texture—they can be glued back together again. The floor and belly blocking provides many times the strength required.

The best procedure is to make the vertical crease by pressing down with a sharp edge—as on a draftsman's scale—then assemble the front and rear cabin bulkheads to the sides, with the fuselage inverted on the bench. Since the top of the fuselage is a straight line all the way to the tail, this is quite easy. The 1/8" sheet floor is then fitted into place, locking the basic assembly together, and holding the sides, toward the nose, in correct position. This floor piece absolutely prevents anything being cockeyed. If the fuselage is placed inverted over the top view on the plan, you can be sure that the tail post is exactly on the aircraft centerline and that one side is not pulled in more than the other—a common mistake which, effecting fin alignment, makes many an R/C a poor flier.

The 1/8" ply firewall should drop into place, having the correct angle for the downthrust (automatic). Nose doublers are 1/4" sheet; sand their ends to fit neatly to firewall and cabin bulkhead. Note that the 3/8" sq. hardwood motor mounts are angled for right thrust; butt the rear tips of the mounts against the cabin bulkhead and fill in with the 1/4" x 1/2" balsa cross-pieces which lock the mounts in place. The tank is installed before the 1/4" top nose sheeting goes on; and the mounting holes are drilled (install either 3/48 or 4/40 blind nuts) before the nose block shaping is completed.

Install the escapement, torque rod, etc., before completing the aft end of the fuselage; once in place, all cross-pieces can be dropped into place, and the top and bottom sheeting completed. (Wrap escapement in protective cover until body is completed.)

The easiest way to complete the rounded off fuselage belly is with soft balsa blocks. However, to save money, we've indicated a number of laminations of 1/4" soft sheet balsa, which could come from scraps. Rough fit one piece at a time, simultaneously locking the 1/8" ply landing gear former—gear installed—in position. We used three J-bolts to hold the 3/32" steel wire.

The remaining fuselage details are obvious enough.

The tail surfaces involve no problems and are assembled according to common practice. Some important specs should be observed. Use soft balsa for the fin, but a medium hard fin leading edge as shown; the rudder is soft. For the stabilizer use hard edges, soft tips, soft cross-pieces, and medium hard top and bottom spars. The dealer will "love" you for this but a good airplane is made at the time you select wood. We have not compromised an iota in the interest of giving you a ship that flies like the original—this means strength where needed, and lightness when strength is not required.

The fin pieces are assembled on wax paper as usual, but when you sand—use a sanding board or block and not a loose piece of paper!—do not remove much material, and turn the surface a few times so that pressure in sanding is evenly distributed. If overdone on one side, the wood may bow. The rear edge of the fin has radiused corners and the front edge of the rudder is rounded off. For hinging we used figure-8 stitching multi style (nylon hinge thread in packages at hobby shop).

The basic stabilizer frame consisting of both edges, tips and all cross-pieces is built flat on the bench over wax

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paper—like a built-up fuselage side would be. The top spar is now cemented on. When dry, the unit is lifted, then the bottom spar added. Finally the edges are shaped and sanded. The cross section will come automatically, if you use a wide enough sanding board, which rests upon the spar and one edge at the same time. The sanding motion will impart just the right slope to the spar and to the edge. Do not take off much material—see the cross-section.

The wings are exceedingly simple, consisting of a beefy spar, an anti-warp top spar, and hefty edges. Again, select wood with care. The 1/4" x 1/2" leading edge is medium hard (shaped after assembly); the spar is 1/4" x 5/8" or can be made from standard 1/4" x 1/2" with a 1/8" x 1/4" glued to it, and the trailing edge is hard 1 1/4" triangle stock. The spar and trailing edge must be hard and true. Sight along the wood for bows—crooked wood will give you warping problems. Select matching trailing edge pieces and avoid edge material which feels pliable. The 3/16" top spar also is hard.

The best sequence to follow is this: Pin down the trailing edges for each wing panel, then the bottom spar, sliding one rib along to check the spacing from root to tip. Having cut out the ribs—pin ribs together for sanding to identical shape and trimming—cement them in place, then install the leading edge, followed by the short false ribs. If the leading edge is placed upon 1/32" hard balsa—or ply—spacing pieces to support it at the proper height above the bench, it will align with all ribs. Assemble the wing tips, and install the top spar.

Shape the leading edge and the tips before joining the panels together at the prescribed dihedral angle. To achieve accurate joining for dihedral, block up each panel in turn, with its inner end exactly flush with the edge of your bench or working board (if a true straight edge). Then, using the bench edge for a jig, slide your sanding board back and forth along the edge of the bench, at the same time sanding to correct lengths and beveled angles all edge and spar ends.

To put in the dihedral, either block up both wing tips, on one wing tip at double the dihedral measurement (this is total dihedral now). Double cement the butt ends of spars and edges. A small 1/16" thick ply joiner reinforces the center joint of the leading edge. The main spar joiner is cut to shape from 1/4" sheet balsa. Its bottom edges are trimmed to match the bottom line of the main spar, but its top edge runs straight across the centerline—it will be about 3/4 inches deep at the centerline, and 1/2 inch deep at the first rib out from the center rib.

Work the center rib into position, then complete the top and bottom center section sheeting (1/16" thick). The 1/16" ply trailing edge brace goes on after covering; it prevents rubber bands damaging the edge.

Covering is silk, with the grain lengthwise on all surfaces, nose to tail on fuselage, tip to tip on wing and stabilizer. The fin and rudder are not silked.

After sanding the entire model, dope all wood that will come into contact with the silk, then sand lightly to remove the wood fuzz which is stiffened by the dope. Either wet or dry covering is OK, but we prefer wet as it is easier to get tight without wrinkles and insures against accidental looseness when finish doping. It is highly recommended that wing and tail not be color doped to save weight, since most of the area of these surfaces is behind the CG. Select an attractive colored silk instead. The fuselage can be color doped. Our fuselage was blue, the wings and tail natural gold-colored silk. If you do want to paint all surfaces, if possible use spray can dope for lightness.

At least four and probably five coats of clear dope will be required, with two of colored. The windows are white. The white should be applied before the color which can overlap. Use masking tape to outline windows when applying your color dope.

Plasticized clear dope is recommended first for the balsa fin and rudder to prevent warping. Mix about 10 drops of castor oil per two ounce of clear. Give about six coats of clear, sanding with wet-and-dry paper after each of the first four.

FLYING: No R/C model will fly well if there are warps present, if it is balanced improperly, if the surfaces are at other angles than those called for by plans, and if the wing and tail are not on straight when seen from front and top views.

Check all these points before attempting to fly. Any warps—or a twist in the fin—must be removed by holding the offending surface over a steam kettle while the warp is removed. Hold the surface in the steam until warm, twisting it the opposite way from the warp, then withdraw from the steam and after, say, one minute relax your grip. Check repeatedly until everything is true. Wing and stab warps can be sighted by holding the surface in front of the eye at arm's length, with the trailing edge toward you.

Check radio for operation at a dis-

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tance as manufacturer's directions require.

A small model like this can be hand glided—over grass preferably—until a fast glide without dips or swoops are in evidence. Aim at a spot about 50 feet away on the ground, run slowly and, as smoothly as possible, aim and launch the model. Do not throw it hard, as false stalls may result. The landing should be two-point, not three. If the nose rises prettily for a perfect landing—flareout—the glide is too slow and power flight will stall badly.

The first power flight is made with only enough fuel for one minute. Time a full tank run first, then hold the ship, engine running, until only a minute's fuel remains, then launch. The launch should be straight ahead as before. Don't aim the ship nose high. Run the engine somewhat rich—not peaked out.

Like bowling or golf no one really can tell you how to fly. We can tell you a few things to look out for. In general try to keep the ship upwind. It is many times more difficult to properly control the plane when it is downwind from you—any mistakes and you lose ground and the ship gradually can get away from you despite good radio control. Go far enough upwind so that turns can be made without drifting back as far as the transmitter.

At first make only gentle turns. If the ship is near adjustment at the very beginning, you will have no problem here and can take your time. Do not allow the plane to get far off to either side if you can help it, for a wrong way turn once you are off to the side may add greatly to pressure.

Things to avoid: If the ship is badly out of adjustment in the beginning and has a pronounced tendency to spiral in to one side, try not to allow that turn to develop. Every time the ship begins to tighten this unwanted turn, hold opposite rudder until the nose is well over on the opposite side—not just back to neutral. An S-shaped flight path will result but you will get down in one piece, and then make an adjustment. If the ship has a bad turn tendency at first—a slight warp will do this—never, if you can help it, make an intentional turn in the same direction. Even when acceptable flight is evident, but the ship still displays a tendency to stay in turns on one side, never put it into a spiral in the same direction. You may not get it out. Always spiral to the gentler side.

Bad stalls may be evident at first until you get trimmed out. Do not permit the ship to continue a series of stalls which build up in magnitude, because too-late attempts to recover will be handicapped by excessive speeds, crazy attitudes and really violent maneuvers. Rather, restrict all stalls by the use of rudder. For example, if the ship has completed a turn, then noses up, instantly hold rudder before even a slight zoom will result. This turns the craft away from the stall into normal flight.

Sometimes a flier will have trouble obtaining left rudder (two signals and a hold) with a compound escapement, when a fast flying ship gets into a steep right spiral. Most often, this is due to the speed of operation of the escapement not being synchronized by the pilot—he pulses too slow or too fast, thus ending up unknowingly on right rudder instead of left. If the turn is to the right, he then aggravates it. If you get into such a predicament, don't fight the rudder all the way into the ground. Left to itself the ship probably will get away with a cartwheel, but if wrong-signaled several times, it will hit at steep enough angle to crash. This is one reason why high-power and tricky stunt machines should be left to the expert—or not tackled until you are expert.

On a windy day add a match book cover shim at the stabilizer rear edge.

No free flight modeler will have trouble adjusting this R/C ship. All corrections for glide should be made by shimming the tail—front edge down to slow up, back edge down to speed up—and rudder, left or right, for turn correction. Power stall and turn tendencies require thrust line adjustments. "Airknocker" already has plenty of down and right thrust present. Keep in mind that glide corrections will affect power flight too, and require a touching up afterwards of thrust-line adjustments.

"Airknocker" has a mild climb, turns gently when rudder is held on, but can be spiraled in wide turns by holding rudder. If the CG is where it should be, it cannot be looped. Moving the CG back will permit such stunts but the ship will be much harder to fly and its penetration will be diminished, it should give many happy flying hours as it is set up. ●