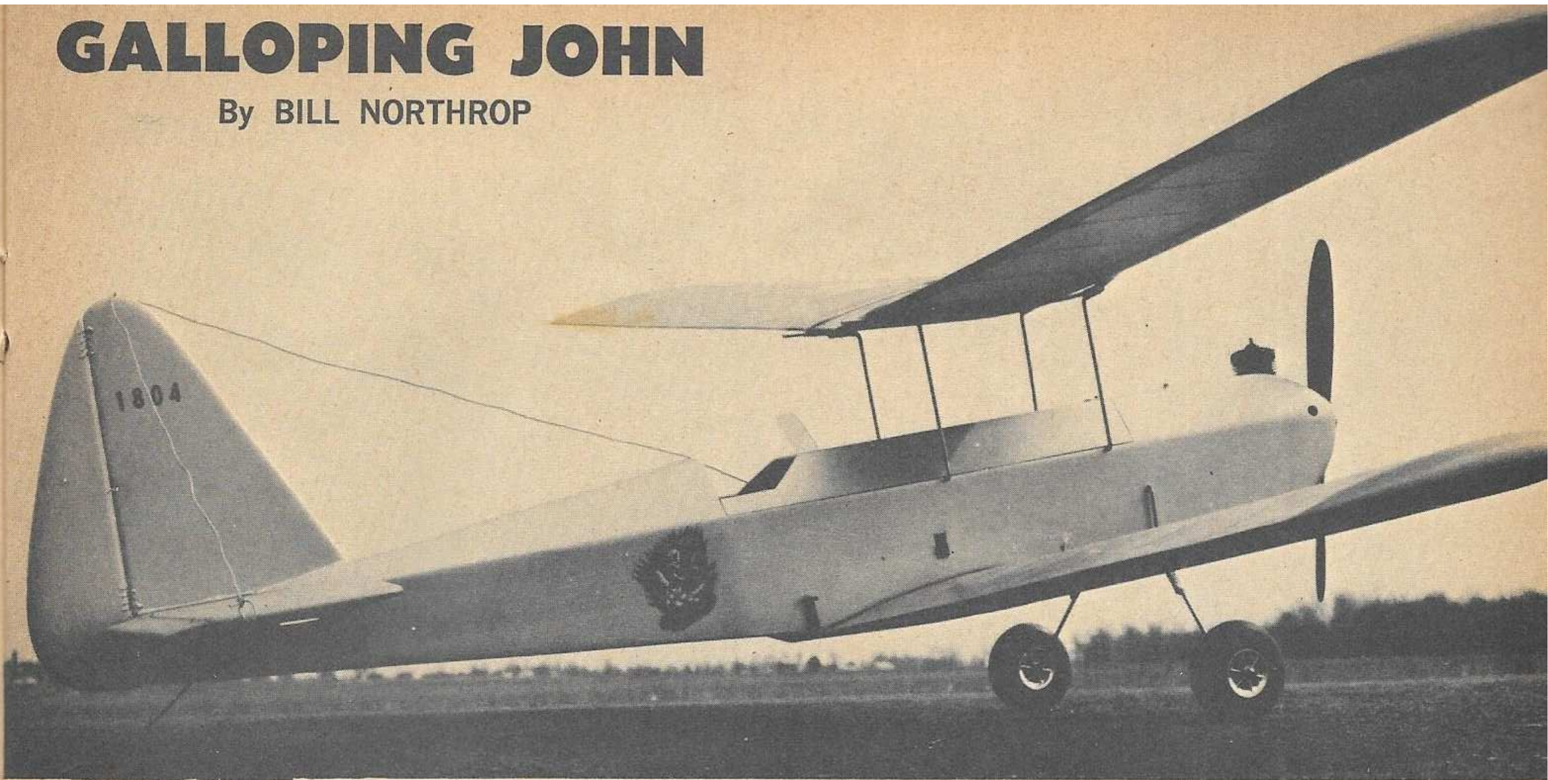
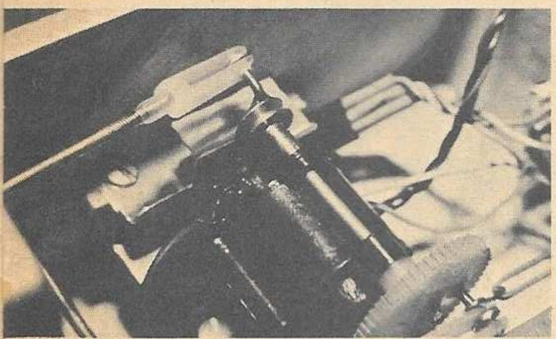
GALLOPING JOHN

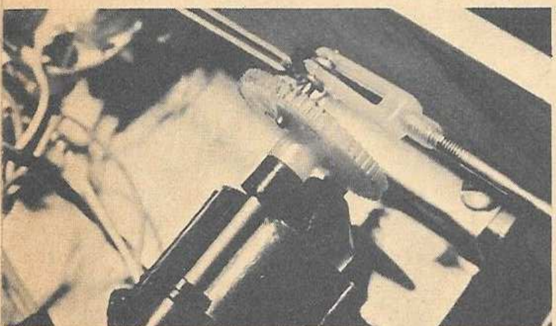
By BILL NORTHROP



Perhaps not the most esthetic lines, but our Galloping John certainly is functional and business like.



Above, rudder crank and rubber padded 250° stop. Below, elevator side of servo centering rubber hooks to bulkhead. Pin epoxied to gear.



ANOTHER IN OUR R/C EDITOR'S SERIES OF BIPLANES FOR THE MASSES. DESIGNED AS A TEST BED FOR THE FIELD AND BENCH SECTION, IT IS A "GALLOPING-GHOST" MODEL WITH A NEW AND DIFFERENT APPROACH TO CONTROL LINKAGE.

GALLOPING JOHN

► G. J. doesn't need a long introduction. It is a further reduction of two very successful multi biplanes, the original design 75" Big John, and the second and slightly smaller Duster (published in September 1964 M.A.N.).

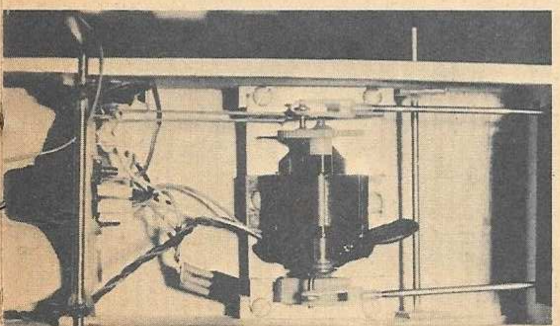
Having flown Galloping Ghost for several years before going into multi, it was only natural that we were curious about how the basic design would work out as a .15-powered single channel ship.

Right in the middle of this preliminary thinking we received a Min-X 1200 Pulsmite rig to evaluate. (See Field & Bench this issue). This really set the whole business in motion.

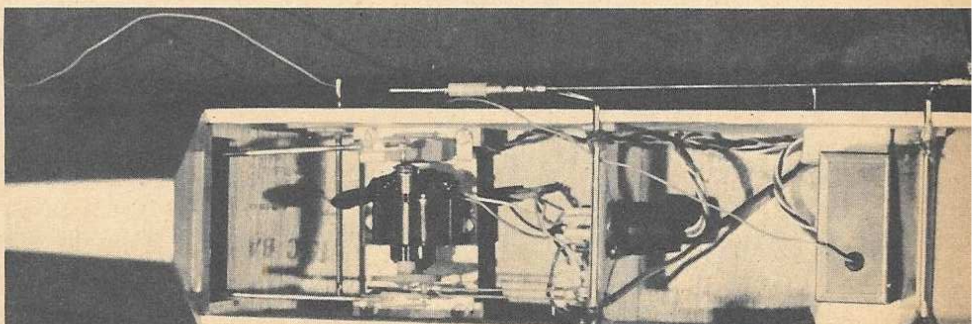
Two ships were built from the original drawing, ours for Galloping Ghost, with a K&B .15, and Bob Veasey's for pulse rudder with a throttle controlled Cox Medallion .15. By way of introduction, Bob is a Delaware R/C club member, former jet jockey, former AMA control line C speed record holder and now a charter member of the S.P.E.B.B. (Society for the Prevention of the Extinction of Barnstormin' Biplanes).

First flights on both ships were almost dull, they were so easy. Both had a slight *nose* heavy indication which was allowed to remain for the initial test. Anyone who's tried to handle a tail-heavy ship on its maiden flight knows why we did this.

The first test hop on Bob's ship produced a



Linkage system eliminates birdcage at tail. Note M.M. with Nylon case and Williams Bros. clevises.



Lots of room in the cabin and the installation permits easy access with all parts easily removed for checking. Receiver in front of cabin is bedded in foam rubber for shock resistance.

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powered landing, so the bottom wing was shimmed down 1/16" at the trailing edge. That was the only thing required for a perfect first flight. With an experimental pulse rudder actuator that permitted trim motor speed control with a go-around feature, Bob was making low speed passes moments after getting in the air. Further tests on both planes have proven that balancing at the indicated point, or slightly aft, is fine in mild winds.

Following Bob's test flight, the receiver was switched to our G. G. version (from whence the name) and again, the first flight indicated a nose-heavy condition. Of course, with elevator control, it was possible to move the elevator trim knob on the Min-X transmitter to compensate, however, the slower pulse rate produced a gallop when up elevator was applied. As with Bob's plane, a 1/16" shim between body and T.E. of the lower wing took care of this.

It is important to make a point right here about the gallop situation. Obviously, gallop is a result of having a slow pulse rate at the neutral, or level flight condition. When the stick is pulled back, the pulse rate is slowed down even more, to the point that the plane "sees" each elevator and rudder deflection. Trimming the plane to require a faster pulse rate for level flight is the very simple, and many times overlooked solution to this problem —a problem which gave the system its somewhat derogatory and misunderstood name in the first place. Our Square Hare, published in American Modeler in 1960, could pull three consecutive inside loops without a sign of gallop.

G. G. INSTALLATION

Setting up a Galloping Ghost system is the keystone of this article, and for that reason we'd like to detail the installation. If the inquiries we get are any indication, the mechanics of this system is the part that gives the most trouble. Refer to the Field & Bench story for the wiring arrangement.

Most G. G. installations use a torque-rod system, which, at the rear end looks not too unlike a wire-haired, over-activated, cookie pusher. About five years ago, we worked out an arrangement using push rods, with the unreplaceable Mighty Midget mounted crosswise in the fuselage. This succeeded in flying a Veco .19 powered, 5½ pound, 5½ foot spanned WAG (predecessor to Walt Good's Multi Bug). This ship had removable side panels to the radio compartment which we had covered with clear plastic. When making a low pass, you could see the Midget in there, flailing away at the pushrods, looking for all the world like a handcart on the Delaware Lackawanna trying to outrun the 10:15 to the next passing track.

Installation is very simple. The M. M. is doctored first. Incidentally, if you use the nylon case, manufactured by North American Hobbies, Petersburg, Michigan, the bearings will last a lot longer. First, solder a wire crank to the pulley end of the output shaft. Crank arm should be ¼" from centerline of shaft. Next, with this crank at its exact top position (12 o'clock high, if you'll excuse the expression), mark the nylon gear at the 3 o'clock position (looking from the nylon gear end of the motor). This mark should be ¼" from the shaft center line also. Drill gear and insert a 1/16" dia. pin about ½" long, allowing about a 1/16" to stick through the other side. Rough up the nylon and epoxy the pin in place.

What you should end up with is one crank straight above the shaft centerline for rudder, and another crank *90°* from, and *forward* of the first one, for elevator. With this arrangement, the rudder horn will be on the left, the elevator horn on the bottom. From this, it is pretty clear that the M. M. is mounted with the nylon gear on the right side of the fuselage. The motion and force drawings on the construction drawings show this quite clearly. Installation photos equally good.

Connections to the control surface horns on the original were by Williams nylon clevises and rods soldered end to end. No wood pushrods were employed. After bending to fit through the fuselage and openings, the rods were tightly bound with wire, put in place, adjusted for length, removed, and soldered. At the servo end, a 'V' is cut out of one side of each clevis. A washer is soldered about 3/32" from the end of each crank rod. The 'V' side of the clevis goes inside the washer and the uncut or hole side of the clevis fits over the pin. This linkage has been found very satisfactory, and eliminates any metal to metal contact in the entire crank system.

A stop is required to regulate total rotation of M.M. to around 250°. This stop should have a strip of 1/32" thick by ¼" wide (#64 band) rubber on it to absorb shock when the servo is pulsing slow enough to hit the stop (up elevator).

A centering rubber is attached by way of a small 'S' hook, to the elevator crank pin. The other end is fastened to the bulkhead forward of the servo. The following is *important*: Tension of the centering rubber must be such that it only "suggests" centering, it must *not* be strong enough to fully neutralize the servo when power is off. The exact tension is by trial and error. Too much creates needless drain on the pulsing batteries—too little will allow the servo to wander, demanding continual correction on the control stick in an effort to obtain straight and level flight. The author tries for tension that will pull the crank only about 5 to 10 degrees when released from either stop. Actually there isn't a Mighty Midget made that will turn in either direction with equal ease. In the prototype, the rubber tension pulls the crank about 10° from one stop and will hardly budge it from the other. With this tension, the plane shows no tendency to wander from straight and level flight.

CONSTRUCTION

Take any ten modelers who say they don't particularly care for biplanes. Under cross examination it will usually come out that about eight really like 'em, but don't relish having to build two wings.

The author feels the same way, but when you're hooked on biplanes you just have to put up with it. Laziness being the mother of invention, we've designed an easily built, yet rugged and warp-free wing structure.

Rib cutting is the first nuisance, and this can be overcome in several ways. With only 36 to do, it isn't really bad. We used an aluminum template with two holes punched out using a 1/16" dia. nail or brad. The flash from these holes, pressed into sheet balsa, will hold the pattern in place while the rib is cut out. The sliced bologna method, described in the Duster article may be used, but it's really more trouble than it's worth for this smaller project.

The rib section, though flat from the trailing edge to the bottom spar, is semi-symmetrical. The 'flat' was put there for one purpose, ease of construction. Each panel may be built on a flat board without the use of jigs.

Pin the trailing edge and the bottom leading edge sheeting in place, as well as the bottom center section sheeting. Glue and pin the bottom ⅛" x ¼" spar to the L.E. sheet, slanting the pins *forward* in order to clear the top spar and webbing that will be added before the wing is lifted from the plan.

Glue ribs in place. Avoid getting any glue between the rib and L. E. sheeting at this time. The trimmed center and next-to-center ribs can also be glued in place. Tilt the center rib to allow for dihedral. Don't worry about the dihedral braces at this time.

Next install the top spar, followed by the sub-leading edge. The latter should be trimmed and tapered to size before gluing in place. Now, and this is where a glue gun comes in handy, apply beads of glue to the bottom L.E. sheeting so that when pressed into place, it will be fastened to the ribs and sub-leading edge. Tilting the gun, and using the ribs and sub L.E. as a guide facilitate this procedure. Wedges and pins will hold the sheeting in place, it's not much of a bend.

Before removal from the board, the 1/32" webbing (none on the inner two panels) and T.E. gussets should be installed. Even at this time, when lifted from the plan, the structure will be quite rigid. The gussets prevent the ribs from getting shoved into the T.E. when the covering shrinks. Don't leave them out.

When you have a left and right panel at this stage of construction, they are ready for joining. Using a sanding block, dress the root ribs for a smooth, neat, butt joint, giving 2 inches dihedral in each panel. Double glue and pin the two panels together, being sure to align the leading and trailing edges carefully. The author prefers to do this "in the air" rather than pinning the thing down. It's easier to watch that all-important alignment. *Don't* use a lot of glue at this time, except on the actual contacting surfaces, i.e., no fillets around ribs, etc.

Using a thin, sharp blade, cut about an ⅛" of rib away from the spars at the dihedral brace locations, i.e., the center rib only for the L.E. and T.E. braces, and the center and next-to-center rib for the main brace. Install dihedral braces. The extra 1/32 inch or so of gap allows room to slip these 3/32" ply fittings into place without forcing out all the glue. Now you can beef up all the center section joints with extra applications of glue.

When the dihedral joint is dry, the wings may be completed by adding the top leading edge and center section sheeting, the ¼" x ½" L.E., and the tips. The last point of care to alignment is during the application of the top L.E. sheeting. Each panel should be pinned down for this step, because once this sheeting is in place and dry, the wing is literally locked in alignment, whatever it may be (and it better be *flat*).

TAIL SECTION

The original stab, elevator, fin, and rudder were cut from Sig "C" grain stock. Should you make the extra effort to use this wood, warp-free surfaces are just about guaranteed.

If you chose to strap on the tail, insert ⅛" sq. spruce where shown.

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FUSELAGE

Construction is pretty much straightforward (or backward, depending on where you start). Sides and doublers are cut from 3/32" sheet. If you laminate with white glue, be sure to wet the back surfaces to prevent curling while the glue dries. An exceptionally strong lamination may be obtained by using Hobbypoxy glue, Formula I or II, for this operation.

When marking the sides for bulkhead location, take care to maintain the thrust offsets built into bulkhead A, particularly if you plan to radial mount the engine. Every ship built so far required this offset, regardless of engine used. Drawing shows location of 3/8" sq. hardwood beams, if this method of motor mounting is preferred.

Assembly is started using bulkheads, A, B, and D. Alignment is obtained by installing the 1/8" balsa floor between A and B. Sides should be cut and carefully cracked at bulkhead D just before assembly begins. Pin the tail posts together and again watch alignment as the basic structure dries. Wire stitch the 3/32" I.D. landing gear tubing in place at this time. This plug-in L.G. arrangement, though a little different, has proved very rugged, and simplifies covering and finishing.

After installing the rear cross pieces and the tail skid, the entire fuselage bottom may be planked. Before planking over the rear deck, complete your control system installation.

The removable hatch is built right on the fuselage, using small pieces of Saran Wrap to prevent it from becoming a permanent part of the structure. The hatch latch works out nice and eliminates the messy and unsightly rubber bands.

Shaping the "Birdcage," or cabane struts, is probably second to the two wings in discouraging would-be biplane modelers. From long experience, we have found the best method is to start in the middle. Proceed as follows:

Estimate the length of wire needed, add a little, and start by making the two upright bends for both the front and rear struts. Just make sure that at least 3 inches of straight wire is left between the uprights. Now lay the U-shaped pieces over the plan and, using a corner of a fine file, mark each leg about 1/8 inch short of where the saddle wires should rest. Mark all four legs now, one set for the front, one set for the rear. When making the final bend, place this mark at the edge of the vise for each strut. By doing this, even if the overall length doesn't agree with the plan, the four should be in the correct relation to each other.

Stu Lovell, a Delaware R/C Club Member, came up with a clever idea for adjusting the birdcage strut lengths. Finding one strut too long when building a Duster, he cut it apart, removed a little excess, and soldered a short sleeve of brass tubing over the gap. Heating the joint allowed exact alignment of the wing saddle.

Following a coat of sanding sealer (dope and Sig balsa powder) and two coats of clear dope on all outside surfaces, the prototype was covered with Royal Products Silron. This included fuselage and sheet tail surfaces.

Six thin coats of dope, with sanding between the third fourth, and fifth, using worn out #400 paper, and a final sanding with worn out #600 before the sixth coat, completed the job on the red dyed Silron areas. Three coats of clear followed by three of silver, with light sanding between coats of silver, were used on the fuselage and rudder. All up weight, less fuel, was 36 oz., giving a lively wing loading of 11 oz. per sq. ft.

By the way, don't bother hand-launching unless your field is rougher than our grass one. Even the R.O. version of Galloping John takes off beautifully.