John Roth's

"CITATION"

Full Size "Timely" Plans Available

10 channels guide this super-simple multi . . . Designed to halve the building hours, slice cost of a stable full of contest-eager ships. A long list of wins, creative thought behind the design. Trike landing gear is steerable.

The "Citation" is an easy-to-fly, simple-to-build multi-control airplane. While one often hears such remarks about various multi's, "Citation" is a most practical airplane from every standpoint. It has won and placed at many contests, yet is an enjoyable ship to fly for sport. For it's performance and maneuverabiliy it is surprisingly simple to construct, to fly and to maintain.

During three seasons of competitive flying, we had used up nine kit low wings. For obvious reasons, building time had to be minimized. Attrition due to constant practice and competitive flying in all sorts of weather, crowd and field conditions implied frequent building of replacement airplanes. This problem was compounded, of course, by the maneuvering limitations and other qualities of the designs we were flying. For example, one of the low wings was notoriously tricky on the approach, which made hazardous touch-and-go and landing maneuvers under marginal conditions.

A detailed study was made of the ideal qualities that ought to be present in a practical top-notch multi. The "Citation" was the result. In three

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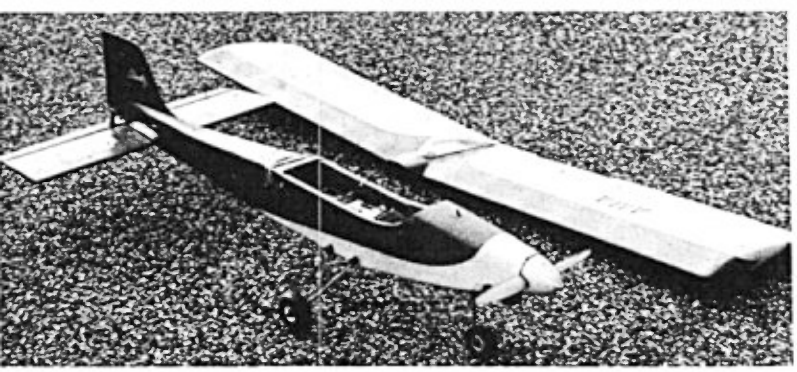
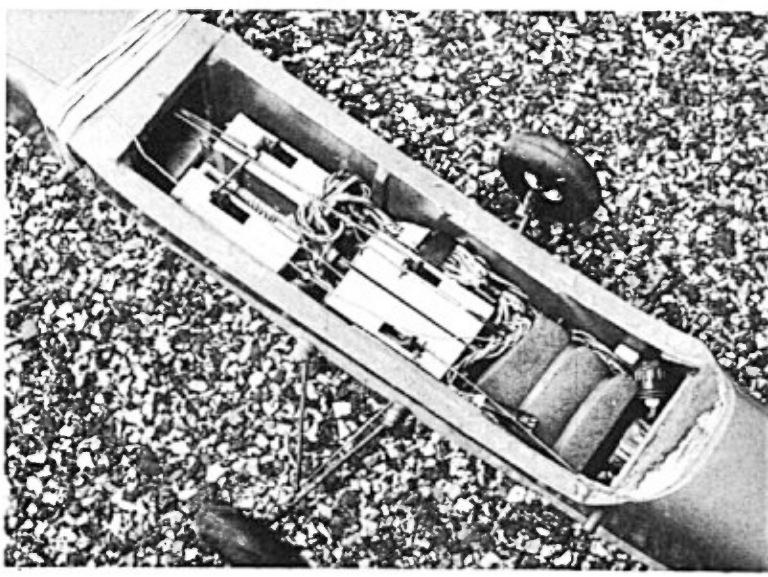
Servo & Spaghetti Hero. Compact, foam rubber protected. Siding is rugged enough to eliminate cross-bracing. Neat, orderly wiring essential.

Ideal exerciser for .35 to .45 mills. 62" tip to tip, 740 sq. inches of area.





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seasons we have now had to build only three machines and, if a replacement does need to be constructed, it requires not much more than half the time previously required.

In addition too simplicity and practicality, a good multi should possess certain other special attributes and chief among these is an almost automatic quality to its flight performance in order to minimize piloting corrections, both on the ground and in the air. Corrections can always be seen and can cost points. The necessity of making corrections, complicates piloting technique, making for inferior maneuvers.

The fewer the corrections necessary, the easier and quicker the maneuvers, and the more points scored. Even for the multi beginner or sport flier this is important because it permits the effective accomplishments of many stunts and maneuvers which normally are sloppy or actually unrecognizable. There should be a high order of stability throughout the approach and landing maneuvers.

"Citation" is a light-weight, tricycle-landing geared, shoulder wing having parallel edged wings and stabilizer.

Light weight is important in many maneuvers, notably the vertical eight where the entry is at the bottom of the eight, and the outside loop at the top of the eight—where a loggy machine is at a very great disadvantage. The lighter loading shows up on takeoffs and when an approach is slow. The heavier machine may look bad in climbing maneuvers and on outside loops, particularly when three consecutive outsides are performed. First-rate multi's today are coming in at 5½ and 5¾ but not more than 6 pounds. The "Citation" falls in this bracket.

The tricycle landing gear today is almost essential for ground maneuvering points. The three-wheel gear tracks far better on takeoff run in fairly deep grass and lifted off for a good climb out, so obviously its takeoffs are automatic, usually requiring no trim or elevator control movements until the ship has made its 360 and come back

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over the transmitter for straight flight, where a touch of down trim normally is required.

The nosewheel allows use of a one-wheel brake, whereas two-wheel gears require two brakes.

The shoulder-wing has many advantages, in our opinion—we say this after long experience with low wings. For the sport flier it is particularly important. If the beginner does bang into the ground, the wing can detach more readily whereas, on the low wing, it is trapped between fuselage and ground, and stopped by the nose gear, with the result that more wing damage is caused. This damage is increased by the presence of a landing gear assembly built integrally with the wing.

We found that no thrust offset was required for the design. Right thrust required on most low wings does compensate for a left turn tendency due to torque, but offset thrust is not equally effective at all speeds.

For the beginner, the wing tips, being higher on the shoulder wing, scrape the ground less often than those on a low wing—there is more leeway when a wing gets down close to the deck. And it is more convenient to fuss with inside details, even to strap on or remove a wing, with the shoulder wing, whereas the low wing may have to be turned over, resting on its fin tip.

The "Citation" grooves well inverted or right side up, in normal flight trim.

FUSELAGE CONSTRUCTION: Cut and assemble the 3/32" sheet balsa fuselage sides. Then locate the 1/16" sheet side doublers, allowing for formers and braces still to be added. Cement in place the 1/16" ply landing gear brace pieces.

The triangular longerons, if not available in that form, have to be cut from ½" sq. soft balsa.

Add these longeron pieces first on the cabin bottom, recessing them to fit over landing gear braces. Then add triangular longerons aft of wing. Locate all the ¼" sq. vertical cross-pieces on each fuselage side. Also the dowel support plywood and the 1/16" sheet rear doublers.

Cement in place the 3/16" sheet nose doublers leaving a ⅛" gap to fit the fuselage former F-17 in place. Drill holes in the ⅛" plywood firewall for the nose wheel mount, and for the tank feed line to the engine. Install the nose wheel mounting bracket.

Cement the ⅜"x⅝" hardwood engine mounts to the firewall former (F-16) and F-17. Check alignment of mounts and formers with a triangle—*they must be square.*

Assemble fuselage sides to engine mount unit; F-17 will fit into slots previously allowed, and the firewall will fit flush against the inner nose doubler. Also locate former F-18 at this time. Check alignment, top view, with a triangle; to check for twist, invert fuselage so that tops of F-17 and F-18 rest flat on bench.

Add remaining doublers and bottom sheeting to trailing edge of wing. Drill ⅛" dia. holes for the engine mounting and fit 4/40 blind nuts to the top of the mounts. The top front nose block is rough shaped and hollowed and then cemented to the top of the fuselage sides. Then cement 1/16" plywood formers F-15 and F-21 in place and blend in entire fuselage nose assembly.

Pull the sides together at the rear for joining at the tailpost. Accurate alignment is very important here, so please check carefully. Add remaining top and bottom fuselage planking. Wing fillets can be laminated from 3/16" sheet as shown and tapered as shown in several fuselage sections.

Locate the plywood landing gear and stop assembly and cement the ¼" sq. hardwood servo platform support rails, drill holes in the plywood servo platforms for the servos and for mounting screws which hold the platforms to the rails (platforms, with servos are removable).

Temporarily install servos to aid in making pushrods.

Make rudder and elevator pushrods from ¼" sq. balsa. The wire extensions are 1/16" music wire; the keepers, bound with light wire to the extensions, and soldered, are 1/32" dia. music wire. Before cementing the rear wire extensions to the pushrods, the tail

should be completed and trial fitted.

FIN AND RUDDER: Assemble the three 3/16" sheet fin and dorsal pieces. The insert piece helps prevent warping. Cut and sand the 3/16" rudder sheet to a tapered cross-section, about 3/32" thick at the trailing edge. Install the rudder control horn assembly, being certain not to shift the pushrod hole fore or aft of the hinge line (causes differential rudder movement).

Pin the fin temporarily in position to check alignment. It must line up perfectly with the rear of the stern post to avoid a stiff rudder action. Cement fin to fuselage and add the 3/16" thick tapered base fillet fin supports. Check vertical alignment before cement is allowed to set permanently.

RUDDER HINGING: The short lengths of .040 I.D. aluminum tubing are spot cemented to both fin, fuselage and rudder. Trial fit a length of .040" dia. music wire. When the fit permits easy rudder action, put more cement over the tubing, then secure each piece in place with cloth tape hinge material and cement well. Remove rudder.

STABILIZER AND ELEVATORS: Notch the stab leading and trailing edge for the ribs. Next cut and locate the stab ribs over the plan. The removeable tabs guarantee accurate lineup of both the leading and trailing edges which are identical. Use pins to hold ribs, and prop up leading and trailing edge with scrap balsa.

When dry, apply the 1/16" sheet top leading and trailing edge planking. Remove from board when dry and cut off rib tabs.

Now add leading and trailing edge planking to lower surface. Add centersection planking and rib capstripping throughout followed by soft tip blocks to stab and sand to streamlined shape.

Taper the one piece 3/16" soft balsa elevator similarly to the rudder. Follow the same procedure for installing the horn and metal tube hinging. It is essential that the elevator move freely, and it should drop of its own weight.

Fasten completed tail surface in place, temporarily adjusting fuselage cutout if necessary for tight seating. Next assemble stab leading edge fairing with stab temporarily in position.

WING ASSEMBLY: Begin by cutting or blanking out all the wing ribs, assembling dihedral joiners and cutting leading edges, trailing edge pieces and wing spars to required lengths. Basically, the wing is constructed in two halves, after which the wing panels are propped up, and the dihedral joiners and centersection ribs are added.

To start assembly, locate all the 3/32" ribs R-2 and R-3 over the plan, pinning them in position. The temporary rib tabs will accurately locate the leading edge. Cement the wing leading edge and top wing spars in position.

When dry, install the 4" wide 3/32" thick trailing edge piece on top of wing. Note that the sheet should overhang the ribs at least 3/16" to permit feathering the edge upon completion

of assembly. Remove panels from the bench and cement the 3/32" trailing edge spar against the backs of ribs R-3. Sand top edge of spar to match top trailing edge piece already in place. Cement the 1/8"x3/8" tapered trailing edge bracing in place. Cut out the aileron space.

Cement the bottom spars into their notches, when dry, trim off all rib tabs. Attach the bottom trailing edge pieces, first beveling the exposed edges of the sheeting to permit a desirable trailing edge seam.

The dihedral is incorporated before final sheet planking is applied. First, properly bevel the butt ends (at centerline) of all edges and spars so the panels mate at proper angle. Trial fit panels together with one panel flat on board and the other panel propped up to the desired angle. When satisfied, cement the panel ends together, cementing the balsa joiners between the top and bottom spars.

Cement all the 1/16" plywood spar joiners in place—small C-clamps are recommended for this. Locate center rib pieces R-IA and R-IC; cement pieces side by side on the centerline. The R-13 pieces are further outboard, one on each side of the servo compartment. When dry add 1/16" spar webbing, using vertical grain.

Install the aileron bellcrank mount assembly and drill the bellcrank bolt holes. Trial fit the 1/16" diam. music wire pushrods and nylon bellcranks. Fairleads to prevent pushrod buckling can be made in many ways, from bushings, 1/16" plywood discs, or small pieces of strip wood glued to border the hole in the rib. Screw adjustable pushrods are used between bellcrank and aileron—such as Du Bro Kwik-Links.

The Aileron servo rests upon plywood support pieces cemented to the inside of the top skin of the center-section. The supports adjacent to the skin are 1/8" plywood; to these, shorter supports of 1/16" plywood are cemented. The servo is held by 1/10 blind nuts under the supports and bolts, or by round head wood screws.

Cement the top 3/32" sheeting in place, by cementing first to top of spar then, when dry, to ribs and leading edge. Apply the lower leading edge sheeting in the same manner. Add the remaining planking tapering as shown in planform. Add the 3/32"x1/4" capstrips.

Rough shape the soft wing tip blocks and hollow out as indicated. Cement the tips in place, then smooth sand the entire wing assembly.

To assemble the wing center fairing, place the wing upon the fuselage. Position 1/16" plywood former F-22 against F-21 with wax paper between —then cement 1/16" sheet balsa piece F-23 and F-24 to the wing. Cover with pieces of 1/16" soft sheet balsa—moisten to facilitate bending.

AILERONS: Mark the rib positions on the inside face of the top 1/16" aileron sheeting, then pin wood to work bench with it's leading edge flush with the edge of the bench. Cement all ribs in place as well as the micarta control horn. (Be careful to make one left and one right aileron.)

Cement the top aileron sheeting in place; it's inside surface being flush with the front edge of the ribs A-I, permitting the outside edge to project and allow sanding to match the leading edge spar. Remove the aileron from the bench, then use your sanding board to smooth the front edge to mate with the leading edge spar. Before attaching the spar, run cement along the edges of the horn where the horn is cemented to the top and bottom sheeting, and allow to dry.

Next cement the leading edge spar in place. Add aileron tips which can be laminated as shown or shaped from one piece. Then cement the 1/16" plywood inboard rib in position. Aileron hinging is accomplished in the same manner as the rudder and elevator hinging. These hinges must be securely fastened because ailerons can pull loose more easily than any other control surface.

LANDING GEAR ASSEMBLY: The front and rear main landing gear struts are bent from 1/8" diam. piano wire and bound and soldered as indicated.

A 1/16" diam. wire spreader is also used, to minimize some of the bounce on hard landings. Standard wheel collars are used as retainers or you can solder washers on each side of the wheel axle. The gear is retained on the body by wrapping rubber bands tightly around the wire and landing gear dowels.

The Steerable nose wheel assembly on the model pictured was Top Flite, but if you like to make your own a full size layout is shown. Fuelproof the inside of the cowl also, before installing engine.

COVERING: Covering is silk with the grain running lengthwise on all surfaces. The fuselage is also silk covered. Either wet or dry covering methods can be used.

Coat all wood surfaces with dope, that will contact the covering. Remove balsa fuzz when dry.

The silk is given at least four coats of clear dope to fill the material, followed by two coats of colored dope.

When the model has been completely doped, add remaining details such as plastic canopy and decal trim.

PREFLIGHT CHECK: The radio installation follows manufacturer's directions. Mount the rudder, elevators, and ailerons, making any necessary adjustment for correct action, after putting the servos and pushrods in place.

Mount the engine and connect the throttle drive arm and fuel lines. Be-

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fore attempting to fly the airplane stand it on a level table top, with the tail supported so that the thrustline is precisely parallel to the table surface; then measure the leading and trailing edges of both wing and stabilizer to check if the angles of these flying surfaces are as indicated on the plans.

Check the balancing point to see if C.G. is located as required. Check for warps also. Any warps found must be removed.

Check whether all the control surfaces are resting in exact neutral. Make sure you can operate all controls by radio without evident binding or overloads on the servos.

Both airplane and equipment should be checked out before flying is attempted. Some people block up an airplane with some reference line parallel to the bench and then check by measurement the relative angular settings of wing and tail. Sometimes, obvious corrections are required, for the ship to agree with the plan. Since I use templates for the sheet parts in the original models I never have this problem and dispense with this check. But make this check as you desire.

By all means do check for any warps in both wing and tail—and this includes the fin. Check the alignment of the surfaces — that is, are the wing and tail on straight? Perhaps the stab is tilted high on one side, low on the other. Even a very slight warp will have effects in flight and might require a control surface adjustment; this is always bad because such compensation has varying effects with different flight speeds, again requiring undesirable piloting corrections.

Check the C.G. position. This should not vary more than an eighth inch either way from the location given on the plan. Some people will move a C.G. rearward trying to make a spin entry easier, and sometimes end up with a ship that won't recover from the spin. "Citation" has its center of gravity properly reliably located for proper control sensitivity and good all round performance still permits a consistant spin entry.

Check the thrustline. There should be no up or down, or side thrust. The first "Citation" did have slight downthrust but it was found as the throttle was retarded just before touchdown that the nose gradually came up toward an automatic flareout.

Most often it will be necessary to fly the ship onto the ground—there is a wind usually—so downthrust is not desirable.

The radio manufacturer has described the installation and handling of his equipment. Before you fly, however, try many dozens of fast impulses on all controls, holding simultaneous when desirable, to see that every control produces a response. If any signal is missed, repeat the test as often as necessary on the offending control, and remove the source of the trouble.

Always make a control check on the field before flying, to be sure that simultaneous is always available. Loss of simultaneous in a critical spot close to the ground can be serious—in a contest it may ruin a maneuver or an entire pattern. Before the first flight, make such a control check with the engine running and two helpers supporting the ship by its wing tips, to see if vibration is giving unwanted control action, or sluggish or intermittent action—usually due to a tight-packed receiver of the relay variety. Be sure the surfaces move freely so that servo action in not slowed down.

If you have never flown multi before, have an experienced flier make the first few takeoffs and introduce you to the controls after a safe altitude is obtained.

TAKEOFF: We make our takeoffs with a slight amount of up trim. Until you become so familiar with your ship you easily can tell what trim you have on it, it is best to check your elevator position before starting the engine, then to set the up trim. With a little up trim, the "Citation" should run straight ahead, requiring no rudder corrections and will lift off by itself. The beginner can try very slight up trim at first, chopping the throttle if the run is obviously too long. Anyone who has flown multi, however, would have no trouble lifting the ship with a touch of up elevator. Then the fun begins. It's an eager ship in the air . . . we think you'll find it inspiring.

BILL OF MATERIALS

(Balsa unless otherwise specified)

(2) 1/16" x 3" x 36" (Hard)—Stab ribs and doublers; (4) 1/16" x 3" x 36" (Soft)—Stab planking and Spar webbing; (4) 3/32" x 3" x 36" (Med)—Ribs, fuselage top and bottom; (4) 3/32" x 4" x 36" (Hard)—Wing ribs, fuselage sides; (7) 3/32" x 4" x 36" (Soft)—Wing planking; (1) 1/8" x 3" x 36" (Med)—Formers anl centersection fillers; (5) 3/16" x 3" x 36" (Med)—Fin, rudder, elevators, fuselage front pieces; (1) 1" x 2" x 21" (Soft)—Wing tip blocks; (6) 3/32" x 1/4" x 36" (Soft)—Rib Capstripping; (2) 3/8" x 3/8" x 36" (Hard)—Wing leading edge; (7) 1/4" x 1/4" x 36" (Hard)—Wing spars, bracing Torque rods; (4) 3/16" x 3/16" x 36" (Hard)—Rear wing spars; (1) 3/32" x 7/8" x 36" (Hard)—Wing trailing edge spar; (1) 1/8" x 3/8" x 36" (Hard)—Tapered trailing edge bracing; (1) 1/16" x 1" x 36" (Hard)—Aileron leading edge; (2) 3/16" x 3/8" x 24" (Hard)—Stab leading and trailing edges; (4) 1/2" x 1/2" x 36" (Soft)—Fuselage angle longerons; (1) 1/8" diam. 36" Length (Piano wire)—Landing gear struts; (1) 1/16" x 6" x 18" (Plywood)—Spar joiners, servo platforms; (1) 1/8" x 6" x 12" (Plywood)—Landing gear mount, formers and rails; (2) .040" diam. 36"length (Piano wire)—Hinge wire; (1) .040" I.D. alum. tubing (24" length)—Hinge sleeves; (3) 1/16" diam. 36" length (Piano Wire)—Pushrod, Control rods and landing gear spreader; (1) 1/16" I.D. Brass tubing (12" length)—Rod Sleeves; (1) 1/4" x 1/4" x 36" (Hardwood)— Servo rails; (1) 1/4" diam. dowel (18" length)—Hold downs; (1) 3/8" x 1/2" x 18" (Hardwood)— Engine mounts; Engine and servo mounting bolts; silk covering, .35 to .45 engine; Steerable nose wheel assembly; cloth tape hinging; Elevator and rudder control horns; Clevis; Aileron bellcranks; 7" to 8" plastic canopy; Soft top fuselage block; Micarta horn; fuel-proof clear and colored dopes; R/C ●