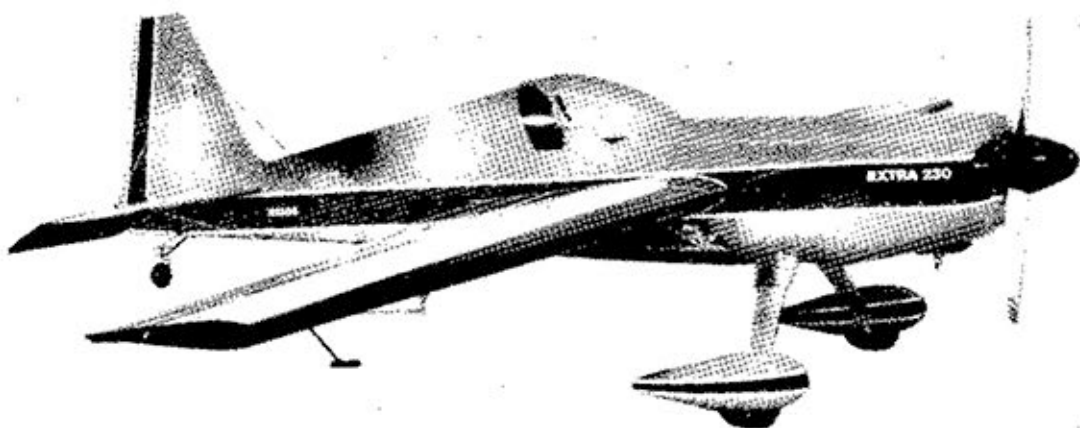


*Clint McHenry & Patty Wagstaff's  
Original Model of the*

# EXTRA "230"



*Now manufactured by:*

**ACE R/C, INC**

116 W 19 ST, POB 472  
Higginsville, MO, USA 64037-0472  
Business (816.584.7121)  
Technical Support (816.584.7121)

**50G5033**

**33%:** Wing Span - 96"      Wing Area - 1300 Sq In  
Weight - 18 Lbs and Up      Power - 2.6 Cu In - 3.2 Cu In

**ALL KITS INCLUDE:** Plans, cowl, canopy, landing gear, foam wing cores cut for spars, foam fuselage parts, balsa sheeting for wings and fuselage, plywood spars, doublers, fuselage formers and sides, wood for tail assembly, and other parts (no hardware, such as quick links, etc).

## I. INTRODUCTION

Thank you for purchasing our model of the **EXTRA 230** Standoff Scale. These instructions are written for the kit and plans. We have provided you with enough wood materials to assemble a framed up model. It will be necessary for you to purchase glues, engine, motor mount, gas tank, fuel line, covering material, hardware (pushrods, quick links, etc.), and any other items needed to finish the model. We cannot accept the responsibility for the way you assemble or fly this model airplane. The instructions are guidelines in the building and cannot cover every detail needed to complete this model.

This is not a beginner's model and building experience is required. We do not recommend this as your first radio controlled model. It is an acrobatic type airplane and flying experience is also required before attempting to fly this aircraft. Please cross reference instructions, parts list and plans while building. Some changes are included in the instructions as a direct feedback from previous builders. Any suggestions you may have will be evaluated and appreciated.

The exploded view enclosed with the model is for all three sizes of the **EXTRA 230** that we manufacture. All three aircraft build the same so we thought this would help you in your building. When cross referencing from the plans to the exploded view, bear in mind that the wood sizes are not the same for all three models. We highly recommend the safety rules of the following organizations be adhered to. **WRITE FOR INFORMATION TO:**

**IMAA:** International Miniature Aircraft Association, Inc.  
Don Vineyard  
205 Hilldale  
Salina, KS 67401

**AMA:** Academy of Model Aeronautics  
1810 Samuel Morse Drive  
Reston, VA 22090

**Scale** documentation for this aircraft has been difficult to obtain. The three views are metric and were obtained through a friend who got them from Walt Extra, the designer of the aircraft. We do now offer a photo pack of pictures taken of Clint McHenry's and Patty Wagstaff's Extra 230. The photos were taken in Sherman, Texas when they won the championships in 1987.

## II. WING

[ ] Build the **right wing panel first**. The top surface of the wing is flat from tip to tip, and spars are cut so this can be accomplished. The right wing panel is shown top view for clarity.

[ ] The main and rear spars are cut a little long for a reason. This enables you to fit the spars to the foam cores. Main spar and rear spar do not extend past the root of the foam core.

[ ] Before starting with the wings, refer to plans showing right wing panel. Glue 1/8" plywood spar doublers and triplers to the main and stub spars. **Right wing panel doublers and triplers glue to the front of the spars and left wing behind the spars.** When gluing the doublers and triplers, make sure they are flat on top.

[ ] Notch right foam panel to accept rear stub spar. When cutting foam for spar doublers and triplers, be very careful and **DO NOT** overcut the notch in the foam panel. If you do happen to have a gap between the spar and foam, **DO NOT** fill with latex fillers . . . there is very little strength in these products and vibrations will crack it away from the foam and spar. We use epoxy and micro-balloons to fill this gap.

[ ] We recommend **NOT** building the wings in the foam they are cut from. The machine does not recognize bowed foam and cuts the cores true. We build on a good flat surface. Epoxy right main spar in place. **NOTE:** When gluing stub spar to the main foam panel, ensure that it is **SQUARE** with the main spar. By ensuring the main and rear stub spars are **SQUARE** with each other, the wing mates in the fuselage with the former. When satisfied the spars are **SQUARE** to each other, epoxy rear stub spar in place. Glue remaining smaller foam portion to wing panel.

[ ] The wing sheeting (1/16" x 48" balsa) is furnished 3" wide. Use a straightedge to true up and glue ten sheets edge to edge.

[ ] Mark 20" up on the left side of the glued sheeting, then mark 20" down on the right side. Draw a line connecting these marks; cut along this line and you have 2 sheeting panels.

[ ] Sheet the wings with 1/16" balsa (Dave Brown Sorghum is recommended); add 1/2" x 1" leading edge and 1/2" x 3/4" trailing edge. Cut out root rib, but **DO NOT** glue it on. Measure and cut out the aileron (The plywood rear spar makes an excellent trailing edge and lets you true the leading edge of the aileron.) and glue 1/4" x 1" x 36" panel trailing edge on. Cut 1/2" from the front of the aileron and glue 1/4" x 3/4" balsa leading edge on. Cut and sand aileron as shown on the plans for movement. **NOTE:** This is the procedure we use for the ailerons . . . each builder may have his own way of doing this. Make sure the space between the wing and aileron is minimal. Large Robart Hinge Points work well; use six in each wing panel. A servo is used for each aileron. A 1/8" x 3" x 3" plywood plate is used to hold each servo in place. Cut a hole in the wing to accept this piece of plywood. Cut a hole in the plate for the servo. Attach servo to plywood with wood screws and trial fit mounted servo into wing. Some of the larger servos will not fit all the way down into the wing, but most coreless servos do. We recommend a servo that has at least 50 oz. in. torque. When cutting the hole for the servo mounting plate, we cut it the depth (about 1/2") so that the servo top is flush with the wing. Then cut out the hole for the servo to fit into the foam. (This gives more gluing surface for the mounting plate.) Cut and fit servo cover; it will be held in place with small sheet metal screws. To make a tunnel in the foam for the aileron extensions, heat a piece of 1/8" or larger music wire and slide it through the foam to the servo area. Reinstall the servo and make servo pushrod for the aileron. Use a 4-40 quick link or larger for this pushrod. The servo push rod is 90° to the hinge line. Cut root and tip rib from 1/8" lite ply blanks, fit to wing . . . but **DO NOT** glue on.

### III. FUSELAGE

There are steps in building the fuselage that need to be followed until you get the wings mounted. Then you can proceed to finish the airplane your own way. If you choose to build it in another sequence, read our method and then proceed with care.

**SPECIAL NOTE:** Parts F3A, F4, and F4A are supplied as lite ply, even though the plans depict balsa. Please keep this in mind as you proceed.

[ ] The fuselage sides are made by splicing the 1/8" x 2-13/16" x 48" to the 1/8" x 2-13/16" x 4-1/4" fuse side extension to form the fuse sides 52-1/4" long.

[ ] Mark the thrustline (center of wing) on the fuselage sides.

[ ] The top 1/4" hardwood stringers are made by splicing a 4-1/4" piece from the supplied 36" material to the 48" material to make them 52-1/4" long. Glue this stringer flush with the top of the fuselage side with the splice opposite the splice in the 2-13/16" fuse side.

[ ] Make the bottom 1/4" hardwood stringers by splicing the same way as you did the top stringers. Glue the bottom 1/4" hardwood stringers to the fuse sides so that 1/8" (or half) of the stringer extends below the fuselage side. By using a former for a guide, it gives you the correct spacing. This is done so that the planking has something to attach to.

[ ] Assemble fuselage upside down over top view of the plans. Stringer locations may be confusing as they are shown on the top view. We assemble the fuselage with masking tape to ensure proper fitting and alignment before gluing. **REMEMBER:** The bottom fuselage sides with the extended stringers are away from the building surface. Trial fit F-1 through F-7. Using a square when gluing the formers in place is recommended, as it is important in the wing attachment area. Check the distance between F-2 and F-3; it should be the same as the distance between the front and stub spar on the wings. Adjust F-3 accordingly and glue stringers in place. Rear center bottom stringers are made from 1/4" x 1" x 36" balsa.

[ ] Do not sheet fuselage bottom at this time. This makes it easier to mount the wings.

[ ] Remove fuselage from building surface and mark a 1/4" vertical slot in front of F-2 (2-3/16" high, with half of it above the thrust line and half below the center/thrust line). Do the same in front of F-3, only the slot should be 1-1/8". Do the same on the left side, only these slots should be behind F-2 and F-3. Cut these slots accurately as possible; it makes mounting the wings much easier. It is easier to enlarge them later.

[ ] Trial fit the wing panels. You may have to enlarge the slots, but do it with care. If you are satisfied with the fit, remove wings, make root ribs from 1/8" lite ply provided and slide them in place. **DO NOT** glue them on at this time.

[ ] To mount the wings, the fuselage needs to be secured by blocking it so that the thrust line and fuselage are level to the building surface (0 degrees). At least two "C" clamps are needed. . . slide the wing panels into the fuselage as tight as possible so that the root rib is snug against the fuselage sides. Clamp wing to F-2 and F-3 and recheck fuselage for level. (We use an incidence meter to check the wings.) If you do not own one, a method that will get you fairly close is to check that the center of the wing (leading and trailing edge) is on the thrust line. Because there is no dihedral in the wings, a level can be used to ensure this. When satisfied, drill holes in the spars for 8-32 socket bolts and blind nuts.

**NOTE:** Make sure spars and stub spars are not tapered from gluing them together. They have to be the same size because when you put the 1/4" stringer guides on, you may not be able to get the wings out because the spars are not square.

[ ] Remove wings. Cut 4 pieces of wax paper the width of the inside of the fuselage and 4" wide. Remove root ribs and coat foam wing panels with 30 minute epoxy. Slide root ribs on spars and slide wing panels back into the fuselage, putting the wax paper between the spars and formers. Bolt wings in place. If you have a gap between the root rib and wing panel, this can be filled later with scrap balsa and Model Magic Filler. Fold wax paper over top of the spars, making sure they are as tight as possible. Do the same on the bottom of the spars. Cut and glue 1/4" hardwood guides in place on top and bottom of spars. When dry, remove wing panels and sand spars, rounding the corners at the ends (they will slide in and out of the fuselage easier).

[ ] When building the engine box, refer to the top view of the fuselage. Two 1/4" plywood firewalls are provided in the kit to make a 1/2" firewall by epoxying them together. One fits inside the engine box and one on the outside. Engine box parts are cut with 0° thrust. Thrust is at the option of the builder; we find the aircraft performs better with the 2° as shown on the plans. You will have to cut the front, top, sides and bottom to accomplish this. Frame the engine box. Trial fit the firewall to the engine box and when satisfied, mark the thrust line on the engine box and firewall. Remove firewall, mark and drill for motor used. Triangle stock will have to be relieved around the motor mount bolts and blind nuts before being epoxyed in place behind the firewall. If blind nuts are used, vaseline in the threads will help keep the epoxy out. Epoxy firewall and triangle stock in place. Set engine box aside; it will be epoxyed in place after landing gear plates and supports are installed.

[ ] Turn fuselage upside down and install landing gear plate. Use a level to make sure this plate is level, otherwise your plane may lean to one side.

[ ] Epoxy the 3/8" x 3/4" x 7-7/8" hardwood landing gear supports between F-1 and F-2 as close to the fuselage side stringers as possible. Mount the landing gear by drilling and tapping the 1/4-20 nylon bolts.

[ ] Sheet fuselage bottom with 1/8" balsa to F-4. We usually dampen the outside of the sheeting and it bends easier.

[ ] Trial fit engine box. Check for alignment; if satisfied, epoxy in place.

[ ] Cap 1/4" stringers from F-4 to rear tail bracket. Also cap the 1/8" of the hardwood stringer that sticks below the fuselage side, otherwise the covering will suck in there.

[ ] Install 1/8" plywood tail wheel bracket. A CB 1/4 scale tail wheel assembly is used.

[ ] Cut 2-3/16" from the front of the foam front deck portion. Glue the two (2) 1/8" lite ply front hatch blanks to the front and rear of the 2-3/16" piece, just cut from the front deck portion. Trim and sand the hatch blanks to fit. Glue the third hatch blank to the front of the deck and trim to fit. Cut the foam to make the cockpit as needed. Taper the foam at the rear of the cockpit so that F-3A will meet F-4A at the top. Install F-3A. Glue one (1) F-4A to the rear of the front deck. Glue the 1/8" x 3/4" balsa to the bottom and sides of the front deck and the 2-3/16" foam front deck block.

[ ] Glue the 2-3/16" front deck block to the fuse top up against F-1. Sheet the front deck block and deck with the supplied 1/16" balsa above the 1/8" x 3/4" balsa side strips.

[ ] Construct the turtle deck in like manner, using the second F-4A and the 1/4" F-7A. Glue the 1/8" x 3/4" balsa to the turtle deck bottom and sides. Sheet the turtle deck with the supplied 1/16" balsa. Tack glue the hatch and turtle deck assemblies to the fuse and sand to shape from F-1 to F-7A.

[ ] Glue 1/4" x 3/4" x 3/4" plywood holdowns about 1/2" into the foam front deck so that they fit inside fuselage 1/4" side stringers. Front deck is held in place with 8-32 nylon bolts through fuselage sides and plywood holdowns. The holdowns will have to be drilled and tapped for the 8-32 nylon bolts.

#### IV. TAIL ASSEMBLY

[ ] Tail parts are made from 3/8" square balsa and 1/4" x 3/8" balsa. We use 1/8" plywood tail post and stab supports. If you do not use large hinge points for hinging, we recommend you cut the hinge slots prior to assembly of the tail pieces.

[ ] Cut tail fairing blocks from 1" x 2" x 8" provided. Install the 1/8" F-7A to the front of the tail fairing blocks. By tack gluing scrap 3/8" x 1" square to the center and 3/8" square to the front and rear bottom, you can shape and sand this difficult-to-shape quite easily. Tack glue this to fuselage and sand to shape.

[ ] Cut the horizontal stab and fuselage to accept plywood tail mounting brackets if you desire a removable tail assembly. If a removable tail assembly is not required, simply epoxy the assembly to the fuse at the appropriate time. If a removable tail assembly is required, proceed as follows: Attach 8-32 blind nut to top bracket and epoxy bracket to notch in horizontal stab. Be careful not to get epoxy in the blind nut. The fuselage bracket will be epoxied on later.

## V. ASSEMBLY

[ ] Install wings in fuselage and block fuselage so the thrustline and top edge of F-2 are level.

[ ] If you require a removable tail assembly, trial fit horizontal stab. If satisfied, remove and place a piece of wax paper between the 2-1/8" ply stab mounting plates and bolt in place. Place a piece of wax paper between the 1/4" F-7A and 1/8" F-7A. Epoxy the 1/8" plywood fuse stab mounting plate to fuse. After the epoxy sets, remove horizontal stab. Drill and install the 1/4" dowels in the 1/8" F-7A glued to the vertical fin. Tack glue the vertical fin assembly to the horizontal stab. Mark the position and drill the 1/4" F-7A to accept the 1/4" dowels of the vertical fin assembly, keeping everything aligned. If you require a non-removable tail assembly, trial fit the horizontal stab and vertical fin assembly. When you are satisfied with the complete assembly, epoxy the vertical fin in place and the horizontal stab, maintaining alignment.

[ ] Rear tail support wires are made from 12" quick links and solder links. These can be made and installed at this time. They are required as on the real airplane for support; without them, tail failure would probably occur. They will have to be removed for covering.

## VI. COWL

[ ] Wash cowl with soap and water before sanding. We leave the release agent on the epoxy; that way paper print does not penetrate the cowl. Cowl mounts are made from 3/8" x 3/8" hardwood around F-1. Remainder of area around F-1 is filled with scrap 3/8" balsa.

[ ] Install engine; engine cutouts on cowl are dictated by the engine used. Slide cowl onto fuselage, but **DO NOT** drill any holes yet. Using a straight edge, and with front deck in place, place straight edge on top of front decks and adjust cowl so that it conforms with the angle. (The hole for the propeller hub may not be exactly centered in the circle on the cowl; the spinner back plate will cover this discrepancy. Cowl is held in place with 8-32 nylon bolts.

## VII. FINISHING

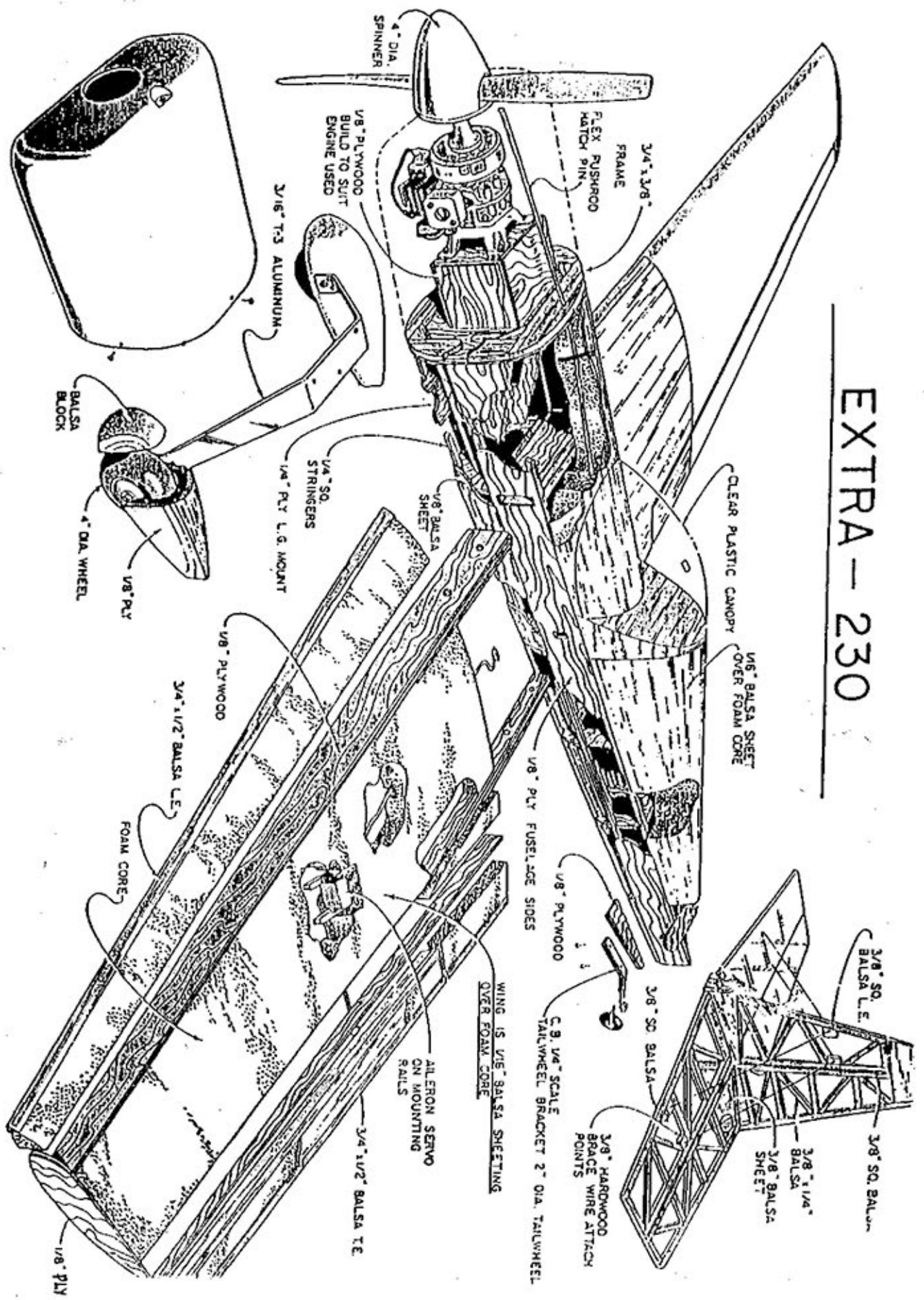
[ ] Covering and finishing is of your choice. Our models are covered with Monokote (Top Flite) and we use Perfect (Chevron) paint for epoxy parts. Painting this airplane will add one to two additional pounds.

[ ] Canopy is cut and fit. After covering, we glue the canopy on with a flexible white glue (like PIC Flex-White Aliphatic Glue) and tape edges with Ace/DJ's Striping Tape. Wheel pants are not included, but can be made from balsa and plywood as shown on the plans, or may be purchased separately from us.

[ ] We recommend one servo and one pushrod for each elevator with 4-40 size quick links (2-56 quick-links tend to break from vibration). Two golden rods are used on the rudder with a pull-pull hookup.

[ ] Balance the airplane 4-3/4" behind the leading edge at the fuselage. Nose heavy is better than tail heavy. Make sure you have airplane complete before balancing. The center of gravity is shown on the plans. Start with the front location and move it back or forward to your liking. Control surface movements are: Ailerons, 1/2" up and down; Elevators, 1" up and down; Rudder, as much as you can get . . . better knife edges! If you have dual rates, you can adjust surfaces to meet your needs. Completed airplane weight varies from 18 Lbs with a Q-35, to as high as 25 Lbs with the heavier engines. Q-50 with Monokote and smoke system will be right at 20 Lbs. Battery pack was behind F-4 in the rear foam deck and it balances between the two CG locations. Balance is important!

# EXTRA - 230



# EXTRA 230 33% KIT #50G5033 RUN #238

Note: When referring to a particular part, you must use the part number listed here.  
This list supercedes all other numbers or parts that may be printed elsewhere.

QTY	PART #	DESCRIPTION	QTY	PART #	DESCRIPTION
2	Z5033BWB58	3MM X 2-1/4 X 7-3/4 DIE CUT LITE PLY FIA BLANK	2	Z5033FMNA90	33% FOAM WING CORES (1 LFT & 1 RGT)
1	Z5033BWB61	1 X 2 X 8 BLOCK	1	Z5033FMNA91	FOAM FRONT DECK
1	Z5033BWB63	3/8 X 2 X 2 SMALL RUDDER FILL	1	Z5033FMNA92	FOAM REAR DECK
1	Z5033BWB62	3/8 X 2-1/2 X 3-1/8 BOTTOM RUDDER FILLER	1	13E5033CL	33% COWLING
1	Z5033BWB64	3/8 X 1-3/4 X 7-3/4 VERTICAL FIN FILL	1	13E5033CP	33% CANOPY
1	Z5033BWB65	3/8 X 1-15/16 X 6-1/8 RUDDER COUNTER BALANCE	1	25E5033LG	33% LANDING GEAR
2	Z5033BWB66	3/8 X 3-5/8 X 3-3/8 ELEVATOR FILLER	1	YBA5033B	KIT BOX, BOTTOM
1	Z5033BWB67	3/8 X 4 X 7 STAB CENTER	1	YBA5033T	KIT BOX, TOP
1	Z5033BPB20	1/4 X 2-3/8 X 2-1/4 REAR DECK FORMER	1	YIM5033	33% 230 INSTRUCTION MANUAL
1	Z5033BPB22	1/8 X 3 X 3 SERVO MOUNT PLATE	1	YLB5000	EXTRA 230 BOX LABEL
2	Z5033BPB23	1/16 X 3 X 3 SERVO COVERS	1	YPS50331	33% 230 PLAN SHEET #1
1	Z5033BPB28	1/8 X 1 X 2-7/8 BIRCH PLY F-8 FORMER	1	YPS50332	33% 230 PLAN SHEET #2
1	Z5033BPB26	3MM X 4 X 7-3/8 F-2A DIE CUT LITE PLY	2	Z5033HDPP64	3/8 X 3/4 X 7-7/8 L.G. SUPPORTS
1	Z5033PDBB34	3MM X 5-7/8 X 15 F-7A, F-4, F-5, F-6, F-7 DIE CUT LITE PLY	1	Z5033BPPP08	1/8 X 1-7/8 X 8 TAIL WHEEL BRACKET MT.
1	Z5033PDBB96	3MM X 6-1/4 X 17-1/2 LITE PLY FORMERS F4A, F3A	2	Z5033BPPP16	1/8 X 2-9/16 X 7-7/8 L.G. VERTICAL PLATES
1	Z5033BPB27	1/8 X 5-7/8 X 6-3/8 F-3 & TAIL PLATE DIE CUT BIRCH PLY	1	Z5033BPPP17	1/4 X 2-7/16 X 7 L.G. PLATE
1	Z5033BPB24	1/8 X 8-7/8 X 8-9/16 F-1 FORMER, SERVO MOUNT PLATE	2	Z5033BWS44	1/2 X 1 X 48 LEADING EDGE
1	Z5033BPB25	1/8 X 6-1/2 X 8 3 PLY BIRCH, F-2, TAIL PLATE	2	Z5033BWS45	1/2 X 3/4 X 48 TRAILING EDGE
6	Z5033BWS42	1/8 X 3/4 X 36 EDGE STRIPS	6	Z5033HDS59	1/4 X 1/4 X 48 STRINGERS
4	Z5033BWS39	1/8 X 1/4 X 36 STRINGER CAPS	2	Z5033BSS02	1/8 X 5/8 X 3/4 X 48 TAPERED REAR SPAR
1	Z5033BWS40	1/4 X 1 X 36 BOTTOM STRINGER	2	Z5033BPST03	1/8 X 1-15/16 X 2-1/4 X 18 FRONT SPAR DOUBLER
2	Z5033BWS46	1/4 X 1 X 36 WING PANEL EDGE	2	Z5033BPST04	1/8 X 2-3/32 X 2-1/4 X 12 FRONT SPAR TRIPLER
2	Z5033BWS47	1/4 X 3/4 X 36 ALERON HINGE STRIP	2	Z5033BPST05	1/8 X 3/4 X 1-1/8 X 14 STUB SPAR
1	Z5033BWS48	3/8 X 3/4 X 24 COWL MOUNT	2	Z5033BPST06	1/8 X 1 X 1-1/8 X 12 TAPERED STUB SPAR DOUBLER
4	Z5033BWS50	1/4 X 3/8 X 36 STICK	2	Z5033BPST07	1/8 X 1-1/16 X 1-1/8 X 9 TAPERED STUB SPAR TRIPLER
3	Z5033HDS90	1/4 X 1/4 X 36 STRINGERS	3	Z5033LPWT35	1/8 X 2-1/2 X 10-1/4 HATCH BLANKS
5	Z5033BWBW38	1/8 X 3 X 36 SHEETING	2	Z5033LPWT36	1/8 X 2-3/4 X 21 ROOT TIP BLANK
7	Z5033BWBW41	1/16 X 3 X 36 DECK SHEETING	2	Z5033LPWT37	1/8 X 1-1/2 X 9-1/2 TIP BLANK
20	Z5033BWBW43	1/16 X 3 X 48 WING SHEETING	6	Z5033HDHD63	3/8 X 3/4 X 3/4 TAIL BRACE STOCK
1	Z5033HDCM61	3/8 X 3/4 X 16 COWL MOUNT STOCK	6	Z5033BPHD29	1/4 X 1 X 1 HORN MOUNTS
1	Z5033HDCM62	1/2 X 1/2 X 16 TRIANGLE STOCK	4	Z5033BPNA21	1/4 X 3/4 X 3/4 DECK HOLD DOWNS
3	Z5033PCM19	1/8 X 3/8 X 16 STIFFNER	2	Z5033DLNA90	1/4 X 2" DOWEL
2	Z5033BPFS01	1/8 X 13/16 X 2-1/4 X 48 TAPERED FRONT SPAR	6	HW004C	8-32 LARGE BLIND NUTS
2	Z5033BPFS14	1/8 X 2-13/16 X 48 FUSE SIDES	4	HW018M	GALVENIZED 3/16" HOLE 1-1/4" DIA FENDER WASHERS
2	Z5033BPFS15	1/8 X 2-13/16 X 4-1/4 FUSE SIDE EXTENSION	9	HW103	8-32 X 1" NYLON BOLTS
2	Z5033BPHD09	1/8 X 4-1/4 X 11-3/4 MOTOR BOX SIDES	6	HW104A	8-32 X 1 SOCKET HEAD BOLT
1	Z5033BPHD10	1/8 X 4-1/2 X 11-3/4 MOTOR BOX BOTTOM	3	HW108	1/4-20 X 1 NYLON LANDING GEAR BOLT
1	Z5033BPHD11	1/8 X 4-1/2 X 4-1/4 MOTOR BOX TOP	1	MP	.062 X 1/2 X 2-1/4" ALUM TAIL BRACE ATTACHMENT
1	Z5033BPHD12	1/4 X 4-1/2 X 4-1/2 FIREWALL	1	MP	.062 X 1/2 X 3" ALUM TAIL WIRE ATTACHMENT
1	Z5033BPHD13	1/4 X 4-1/4 X 4-1/4 FIREWALL			