

INSTRUCTION MANUAL
FOR BUILDING THE
"CANARD STICK"

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INTRODUCTION

Back in 1982, when the Canard Stick concept was just a glimmer in the mind of the designer, it was pictured as being a far-out, futuristic design, having swept-back wings and tip fins. The tremendous success of the first prototype of that concept proved that canard airplanes are indeed well suited for R/C modelling! Soon after, the 1/5-scale "LONG-EZ" was born, with the 1/4-scale "QUICKIE" following close behind.

It has become apparent that many modelers, while being intrigued by the canard-configuration designs, are hesitant to step into this new realm due to the price and apparent complexity of the few canard kits currently available. The CANARD STICK was designed to meet that need, providing a low-cost, simple to build, and easy to fly canard-pusher airplane.

It is our hope that building and flying the CANARD STICK will be an enjoyable and satisfying experience, and that it will lead you to try our other canards in the near future.

Although we have taken many steps to insure that this kit builds and flies as intended, we are human and occasionally make mistakes; therefore, please take a few minutes to let us know if you experience any problems in building or flying your Canard Stick. We do not shun good constructive criticism, but use it to constantly improve our products. THANK YOU!

ADDITIONAL ITEMS NEEDED TO COMPLETE THE CANARD STICK

ADHESIVES

Cyanoacrylate, aliphatic resin,
and epoxy adhesives.

RADIO SYSTEM

Any 4-channel radio system
with 4 servos.

PARTS, CONNECTORS, LINKAGES

- 1/8 sq. yd. 2 oz. (medium) fiberglass cloth
- X 1/16 sq. yd. 3/4 oz. (light) fiberglass cloth
- 1 1/2 pkg. Sullivan #503 "Gold-n-Rods" pushrods,
or similar.
- X 2 pkg. Dubro #121 E-Z Connectors
- X 2 - Dubro #190 Ball Links
- X 1 1/2 pkg. Dubro #140 5/32" wheel collars
- 2 Dubro 2-3/4" treaded wheels
- 1 Dubro 2-1/4" treaded wheel
- a 3 Dubro #122 nylon clevises
- X 1 Dubro #123 nylon clevis w/ rod

FINISHING

Any covering material may be used. The prototype required 1 1/2 rolls of red Super Monokote, plus some scrap pieces of white and black Econokote for trim.

ENGINE / FUEL SYSTEM

- 1 - .35 to .45 cubic inch engine
- 1 - "Acorn"-type prop nut (aluminum)
- 1 - 10x6 2-blade, or 9x6 3-blade pusher propellor
- X 1 - 6 or 8 oz. fuel tank
- 2 ft. - Aerotrend medium silicone fuel tubing
- 1 - Engine mount to fit your engine
- Engine mounting hardware

PREPARATION FOR BUILDING

- ☐ 1. Check your inventory of spare parts, then purchase the materials needed for completion of the Canard Stick, referring to the previous list.
- ☐ 2. Remove all die-cut parts from their sheets. If some parts do not readily come out, complete the cuts with a sharp Xacto knife or razor blade.
- ☐ 3. Construction will progress much more smoothly and mistake-free if you take a few minutes right now to identify all of the parts by comparing them with the plans, and label each part accordingly. While you are doing this, study and become familiar with the plans.

FIN CONSTRUCTION

NOTE: The Canard Stick employs two fixed fins located out on the wings. No rudder is called for in this design. The "rudder" channel is used to control the nose wheel steering only. We have found that the Canard Stick has positive ground handling without the need for a rudder, even in mild crosswinds; therefore, for the sake of simplicity, a rudder is not included. If you feel uncomfortable with this configuration, don't panic! You may, if you choose, hinge the aft 2½-inches of one (or both) of the fins, and activate it with an extra servo mounted in the center of the wing, using a "Gold-n-Rod" for actuation. In this case, you will need to couple the rudder servo and the nose gear steering servo by means of a dual servo connector "Y-harness".

- ☐ 1. Find the 6 sheets of 1/4"x3"x8" balsa. Referring to the fin pattern on Plan sheet 2, edge glue these sheets together in groups of three.
- ☐ 2. Temporarily glue the fin pattern to one of these sheets using a little spray adhesive or rubber cement. Place both sheets together and cut along the indicated lines. This is best done on a jigsaw or band saw.
- ☐ 3. Working on a flat surface, use a sanding block to sand the fin sides smooth.

WING CONSTRUCTION

NOTE: The Canard Stick wing is built in two halves, then joined by gluing together. No spar braces are used; therefore, it is required that the center section be reinforced with a 6-inch wide strip of 2 oz. (or heavier) fiberglass cloth, top and bottom.

- ☐ 1. Tape the wing plan to your flat building surface and cover with waxed paper.
- | | | |
|-------------|--------------|---|
| Lt.
Side | Rt.
Side* | *NOTE THAT PLAN SHEET NO. 2 IS TRANSLUCENT, WHICH ALLOWS YOU TO BUILD THE RIGHT WING HALF ON THE BACKSIDE OF THE SHEET. |
|-------------|--------------|---|
- ☐ ☐ 2. Position one of the 3/8"x3/8"x28" balsa spars on the plan and pin in place.
 - ☐ ☐ 3. Note that the bottom of each die-cut wing rib has a straight edge between the spar and the trailing edge, while the tops of the ribs have a rounded shape. Using a few of the ribs for spacing, lay the tapered balsa trailing edge stock in place and pin down.
 - ☐ ☐ 4. Carefully lay each wing rib in place, using one of the Lite Ply webs as a template to align the ribs at 90° to the building surface, gluing them to the spar and trailing edge. When you come to the fin slot area, use the previously constructed fin, held temporarily in place, to achieve the proper spacing between these ribs. Do not glue the fin in place at this time.

Lt. Rt.
Side Side

- ☐ ☐ 5. Drop the top spar in place and glue to the ribs.
- ☐ ☐ 6. Glue the 1/4"x1/4"x28" balsa leading edge to the fronts of the ribs.
- ☐ ☐ 7. Glue the 1/8"x1-3/8"x1-1/2" lite ply web to the front of the spars in the center rib bay.
- ☐ ☐ 8. Sand the top of the tapered trailing edge, if necessary, to blend with the tops of the ribs.
- ☐ ☐ 9. Glue the 3/32"x1-1/2"x28" balsa top trailing edge sheet in place. The aft edge of this sheet is flush with the aft edge of the tapered trailing edge.
- ☐ ☐ 10. Sand the top of the 1/4"x1/4" leading edge slightly to blend with the ribs. Also sand the 1/8" lite ply web flush with the top of the ribs, if necessary.

NOTE: You will not be applying the center section sheeting until after joining the wing halves.

NOTE: Now find the six 3/32"x3"x28" balsa sheets. These are used for the leading edge sheeting, fin area sheeting and center section sheeting.

- ☐ ☐ 11. Glue the 3/32"x3"x28" balsa top leading edge sheeting in place. The aft edge of this sheet must extend halfway onto the top spar. After gluing the sheeting to the spar, wet the top of the sheeting to aid in bending the sheeting down over the ribs and leading edge.
- ☐ ☐ 12. From the 3/32"x1/4"x30" balsa strips, cut and glue capstrips to the tops of the ribs. Also, from one of the 3/32"x3"x28" sheets, cut sheeting for both sides of the fin slot area and glue in place, leaving an opening for the fin.
- ☐ ☐ 13. Unpin the wing from the building surface. Trim the excess leading edge sheeting flush with the 1/4"x1/4" leading edge.
- ☐ ☐ 14. With the wing upside down, sand the bottom spar and the 1/4"x1/4" leading edge to blend smoothly with the ribs.
- ☐ ☐ 15. Apply the 3/32"x1-1/2"x28" trailing edge sheeting, the 3/32"x3"x28" leading edge sheeting and the cap strips in the same manner as the top. For the bottom of the wing, you should completely sheet over the ribs in the fin slot area. Now trim off the excess leading edge sheeting.
- ☐ ☐ 16. Trim and sand everything flush with the end ribs.
- ☐ 17. Carefully glue the two wing halves together.
- ☐ 18. From the remainder of the 3/32"x3"x28" balsa, cut and apply the bottom center section sheeting.
- ☐ 19. Now, with the wing upright, cut and install the two filler blocks in the center rib bays where shown on the plan. These filler blocks are cut from the 3/4"x1-1/8"x3-1/8" balsa block provided. After installing, sand these blocks down to blend with the tops of the ribs.
- ☐ 20. Now add the top center section sheeting (cut from the remainder of the 3/32"x3"x30" balsa sheeting).
- ☐ 21. Taper the leading edge and round the trailing edge of the 1/4"x1"x28" balsa AILERONS, as shown in the side view on Plan sheet 1.

- ☐ 22. Cut the hinge slots and temporarily install the aileron hinges, checking for a good fit and free movement. Do not glue the hinges in place at this time.
- ☐ 23. Laminate the die-cut 1/8" balsa wing tip pieces in pairs of two, to make the two wing tips. Glue these wing tips to the tip ribs, and cut triangular braces from 1/8" balsa scrap to make braces as shown on the plan. Cut the 1/2"x1/2"x3" balsa block into four pieces, each having a length of approximately 3/4" which are the tip blocks. Now glue these tip blocks in place on the top and bottom of the front portion of the wing tips. Finally, glue strips of 1/8" balsa (from scrap) to the top and bottom of the wing tips near the trailing edge of the wing, as shown on the plan...these aid in blending in the wing with the tip, for ease of covering.
- ☐ 24. Use a sanding block to round the leading edge of the wing to the shape as shown in the fuselage side view. Also, round the wing tips and tip blocks to a smooth contour. Sand the entire wing smooth.
- ☐ 25. Reinforce the center section with a 6-inch wide strip of 2-oz. (or heavier) glass cloth, on the top and bottom. Secure this glass cloth to the center section sheeting using instant glue (cyanoacrylate), thinned epoxy, or resin.

CANARD (front wing) CONSTRUCTION

- ☐ 1. Locate the 1/4"x2"x20-3/4" balsa CANARD FRONT, and the 1/4"x1-3/4"x21-3/8" balsa CANARD REAR. Position these parts over the plan, glue them together, then trim the ends at the angle shown on the plan.
- ☐ 2. Cut the ELEVATORS from the two 1/4"x2-1/2"x9-1/4" balsa sheets. Scallop the elevator trailing edge, if you wish (this is optional, for appearance only).
- ☐ 3. Drill and carve out the leading edge of the elevators, as necessary, to install the steel elevator connector/horn. Also, taper the leading edge of the elevators as shown on the plan, to allow for up/down movement. When gluing the elevator connector to the elevators, do so with both elevators lying on a flat surface, to insure that both elevators are in the same plane.
- ☐ 4. Reinforce the area of the elevators where the connector/horn is attached, using 3/4 oz. (light) fiberglass cloth, top and bottom, as shown on the plan. Also, reinforce the center 5" of the canard, top and bottom, with 3/4 oz. fiberglass. NOTE: Because it is likely that you will have to add some nose weight to balance properly, you may, if you choose, fiberglass the entire canard. This will give your Canard Stick the needed nose weight, plus result in a very strong canard that will resist breaking if it comes in contact with long grass in the event of an overshoot landing.

FUSELAGE CONSTRUCTION

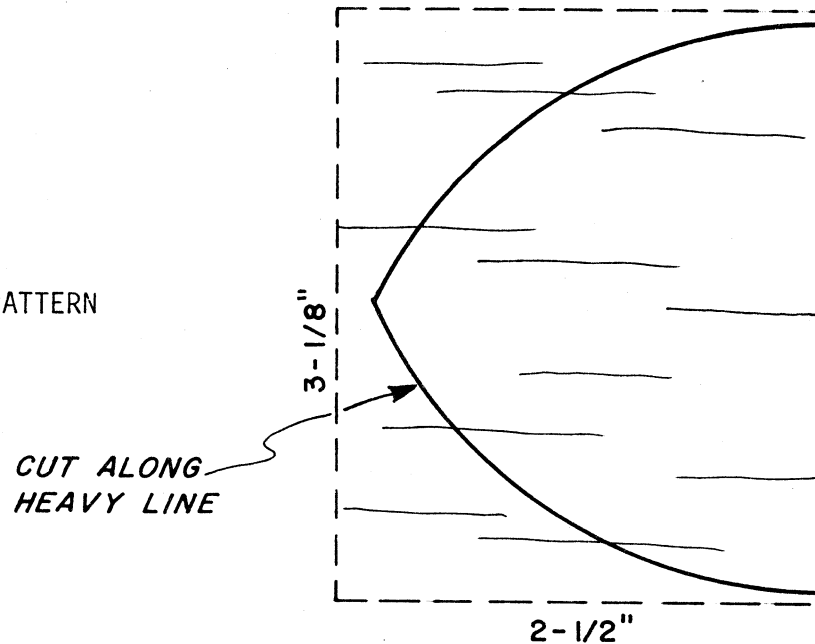
- ☐ 1. Before starting assembly, drill former F-1 and install the nylon nose gear mounting blocks. Use the blocks themselves to determine the actual hole locations. You may also drill the holes in F-4 for the engine mount, pushrods, and fuel lines. Hole locations and sizes may vary slightly from the plans, depending on your installation.
- ☐ 2. Position one of the precision cut 1/8"x3"x18" balsa front fuselage side sheets and the 1/8" die-cut balsa aft fuselage side in place over the fuselage side view on plan sheet 1. Butt glue these pieces together. Perform this step for both fuselage sides.

MAKE ONE LEFT AND ONE RIGHT FUSELAGE SIDE!!!!!!!!!!

- ☐ 3. Glue the die-cut 1/32" birch plywood aft fuselage doublers to the fuselage sides, making one left and one right fuselage side. Note that the aft edge of this 1/32" ply doubler is flush with the aft edge of the 1/8" balsa side.
- ☐ 4. Position the right fuselage side over the plan and mark the location of F-2 and F-3 on the inside of the fuselage side, using the "Former Locator Arrows" as a guide.
- ☐ 5. Glue the 1/8" die-cut balsa wing saddle triplers in place. NOTE: The aft edge of these triplers should be exactly 1/4" forward of the aft edge of the fuselage sides. Use former F-4 to achieve this spacing.
- ☐ 6. Glue the 1/4"x3/8"x18-3/4" balsa strips in place along the bottom edge of the fuselage sides. The aft end of these strips butt against the front of the 1/32" ply doubler, and the front end must be 1/4" aft of the front edge of the balsa fuselage side.
- ☐ 7. Glue the 1/4"x1/4"x14-3/8" spruce sticks in place along the top edge of the fuselage sides. The aft end of these sticks butts against the front of the 1/32" ply doubler.
- ☐ 8. Cut and glue pieces of 3/8" balsa triangle stock along the top edge of the fuselage sides, aft of the above 1/4"x1/4" spruce longerons. The aft end of these balsa triangles must end 1/4" forward of the aft end of the fuselage side.
- ☐ 9. Glue the 1/8" die-cut balsa CANARD SADDLE DOUBLERS in place 1/4" aft of the front edge of the fuselage sides. The bottom of these doublers rest on the top of the 1/4"x3/8" bottom corner strips. The top of these doublers are already cut off at the proper canard incidence angle; therefore, you may now trim the 1/8" fuselage side flush with the top of these canard saddle doublers. This automatically sets the proper canard incidence angle of +2°.
- ☐ 10. Cut and glue 3/8" balsa triangle stock along the top edge of the above canard saddle doublers (see Cross Section A-A) to provide ample gluing surface for the canard.
- ☐ 11. Laminate the two 1/8" die-cut lite ply F-3 formers, to make one former having a thickness of 1/4".
- ☐ 12. Glue formers F-1, F-2, F-3 and F-4 to the right fuselage side, USING EXTREME CARE TO INSURE THAT THEY ARE INSTALLED EXACTLY AT 90° (square) TO THE FUSELAGE SIDE.
NOTE: The top of F-3 is flush with the top of the fuselage sides, and the bottom of F-3 protrudes 1/8" below the bottom of the fuselage sides.
- ☐ 13. After the glue has firmly set, glue the left fuselage side to the formers.
- ☐ 14. Find the 1/4"x3/4"x3-1/4" birch ply wing bolt plate. Bevel one edge of this piece until it fits into the slot at the rear of the 1/8" balsa wing saddle tripler. Epoxy this plate securely in place. Now sand off the bottom of F-4 to blend with the wing bolt plate (see fuselage side view).
- ☐ 15. Cut and glue 3/8" balsa triangle stock in the aft fuselage corners at F-4.
- ☐ 16. With the fuselage inverted, lay the wing (inverted) in place in the saddle. Sand the saddle, if necessary, for a good fit. While holding the wing in place, centered and in proper alignment, drill 3/16" diameter holes for the wing dowels, drilling through the holes in F-3 as a guide. Remove the wing and continue drilling to a depth of at least 2-1/4" to make holes all the way through the 1/8" lite ply wing webs.

- ☐ 17. Find the 6" length of 3/16" diameter hardwood dowel. Cut off two pieces, each having a length of 2-3/4", and bevel the ends slightly. Now glue these dowels securely into the holes previously drilled in the wing, leaving 3/8" protruding out of the leading edge.
- ☐ 18. Epoxy the 3/8"x2"x3-1/4" birch ply landing gear mounting plate in place, adding 3/8" balsa triangle in the corners, as shown on the plan.
- ☐ 19. Mark the wing bolt locations on the bottom of the wing, 2-3/8" forward of the trailing edge, and 1" right and left of center. Now, place the wing back into the saddle, position accurately, and drill 5/32" holes through the wing and wing bolt plate (THE DRILL MUST BE POSITIONED AT 90° TO THE BOTTOM WING SURFACE). Remove the wing, and enlarge the holes in the wing (only) to 13/64". Cut threads into the ply wing bolt plate, using a 10-24 tap.
- ☐ 20. From the 6-1/4" length of 1/4"x1/4" spruce, cut and install two cross braces, one in front of F-2, and one at the front ends of the 1/4"x1/4" spruce longerons.
- ☐ 21. Now, while the fuselage is still wide open, is the best time to make the following installations:
 - 21a. Install your servo mounting tray and/or rails in the area between the canard and F-2 (the plans show a recommended installation).
 - 21b. Temporarily install the engine mount and engine.
 - 21c. Permanently (but not rigidly) install the fuel tank, using foam rubber between the tank and the fuselage sides.
 - 21d. Install fuel line tubing.
 - 21e. Permanently install the pushrods for the ailerons, elevator, throttle, and nose gear steering.
 - 21f. Temporarily mount the landing gear to the ply mounting plate, using the straps and screws provided.
 - 21g. After you have everything fitted and operating properly, remove the engine and landing gear.
- ☐ 22. From the two sheets of 1/8"x3"x30" balsa, sheet the bottom of the fuselage (cross grain) from the front of the landing gear mounting plate to the front of former F-1, notching as required for nose gear clearance.
- ☐ 23. Find the 1/8"x3-1/2"x7-3/16" lite ply sheet. This is the fuselage top hatch, and is not glued to the fuselage, but is held in place with eight #2 sheet metal screws, as shown on the plan. Position this hatch in place (the aft edge of the hatch is located at the front edge of F-2). Drill 1/16" holes at the eight screw locations, drilling down through the hatch and the 1/4"x1/4" spruce. Now remove the hatch and enlarge the holes in the hatch (only) to 3/32".
- ☐ 24. Sheet the top of the fuselage (cross grain) aft of the hatch, using the remainder of the 1/8"x3"x30" balsa.
- ☐ 25. Find the two pieces of 1/4"x3-1/8"x2-1/2" balsa. These are used for the nose side pieces, as follows: Using the nose side pattern (found on the next page), cut these two pieces of 1/4" balsa to shape. Glue these pieces to the front of F-4, then sheet the top and bottom of the nose section with two pieces of 1/8"x3-1/2"x3-1/2" balsa (cross grain). Wet the outside surface of the sheeting to facilitate bending.

NOSE SIDE CUTTING PATTERN



- ☐ 26. Use a sanding block to round the fuselage corners slightly (as shown in the cross sections), and sand the entire fuselage smooth.
- ☐ 27. OPTIONAL: Mount the wing to the fuselage, then carve and sand the $\frac{3}{8}$ "x $\frac{3}{4}$ "x $3\frac{1}{2}$ " balsa block to blend the bottom front of the wing to the fuselage, aft of F-3. Glue this block to the wing (only).
- ☐ 28. Center and squarely align the canard onto the fuselage, and tack glue in place temporarily. Glue the piece of $\frac{3}{16}$ "x $3\frac{1}{2}$ "x $3\frac{3}{4}$ " balsa to the top of the canard, and add a small piece of scrap $\frac{1}{8}$ " balsa to the top of F-1. Now, sand the $\frac{3}{16}$ " balsa filler piece to blend with the top of the fuselage. Finally, break the canard loose and remove from the fuselage.
- ☐ 29. Cut the hinge slots, and temporarily install the elevator hinges.
- ☐ 30. Cover the entire fuselage and canard with Super Monokote or whatever covering material you have chosen.
- ☐ 31. Glue the elevator hinges permanently in place; and drill down through the hinges and pin with round toothpicks, to prevent the hinges from pulling out.
- ☐ 32. Re-position the canard onto the fuselage, and mark the outside edge of the fuselage onto the bottom of the canard. Remove the canard, and cut away the covering material from the bottom of the canard, between the above lines. Finally, check to make sure that there is adequate clearance for the elevator connector to move freely without binding against the fuselage sides.
- ☐ 33. Securely glue the canard to the fuselage.

FINISHING

- ☐ 1. Insert the fins into the fin slots and mark a line on the fins corresponding to the top surface of the wing. Cover the wing and fins with Super Monokote (or any other covering), leaving bare wood exposed on that portion of the fins which will be glued into the wing.
NOTE: You may also permanently hinge the ailerons around this time, according to your preference.
- ☐ 2. Glue the fins into the fin slots in the wing.
- ☐ 3. Re-install the radio gear, fuel tank (if not already in), nose gear, main gear, wheels, engine, etc.
- ☐ 4. Seal the wing saddle area with foam tape or silicone bathtub sealer (use waxed paper on the wing if silicone sealer is used, as a release).

☐ BALANCE IMPORTANT!!!

With the fuselage level, engine installed, a full fuel tank, and everything else otherwise completed, lift the airplane at the center of the C.G. range (shown on the plan). Add weight to the nose, or move the battery pack aft, as necessary, to balance in the middle of the C.G. range.

CONTROL SURFACE THROWS

For best results, set up your linkages to provide the following movements...

- ☐ ELEVATOR: 1/2" to 9/16" Downward deflection (stick back)
1/2" to 9/16" Upward deflection (stick forward)
- ☐ AILERONS: 3/16" to 1/4" Downward deflection
3/16" to 1/4" Upward deflection
- ☐ NOSE WHEEL: Approximately 15 degrees left and right of center.

FLYING TIPS

If you are a beginner to the hobby of radio-controlled airplanes, you are strongly urged to join your local R/C club (if there is one), and/or to seek the assistance of a competent R/C pilot to provide you with the training you need.

Because the Canard Stick employs a PUSHER propellor, the engine does not receive quite as much cooling air blast as in a conventional tractor arrangement; therefore, it is recommended that you thoroughly break-in a new engine on the ground, using a TRACTOR propellor. After break-in, be sure to install the PUSHER propellor with the CURVED SIDE OF THE BLADE FACING THE FRONT OF THE AIRPLANE! Also, you will find that the engine on your Canard Stick will have a tendency to RICHEN during a climb (because the fuel tank is located in front of the engine). We have found that the power loss in a climb can be satisfactorily reduced by tuning the engine for NEARLY MAXIMUM RPM in the level position. Before takeoff, be sure to test for power loss by lifting the airplane and raising the nose to 45° above horizontal. A small power loss is normal and acceptable in most cases.

☐

CAUTION: Flying from sand or gravel surfaces is very dangerous with a pusher-configuration airplane, as the nose wheel kicks up small rocks which are then easily sucked into the propellor, causing prop damage and hurtling rocks laterally at high velocity.

Make your first test flights from smooth grass or asphalt, if possible, with a wind speed of less than 10 mph. For subsequent flights from rough fields or long grass, the use of a 9x6 3-blade pusher propellor is recommended for maximum prop/ground clearance.

Flying a canard airplane is quite similar to flying a conventional airplane, and does not require any special skills; therefore, you need not be apprehensive about your first flight. The most noticable difference will be the variation in elevator responsiveness as the airspeed changes. You will find that full up elevator (stick back) will be required for takeoff, and partial up elevator will be necessary during the climb-out and first turn, until the airplane reaches normal cruising speed. Extra elevator will also be required on the final approach and landing, to provide a slightly nose-high attitude at touchdown.

If your Canard Stick is properly balanced, you need not fear the possibility of stalling due to the application of too much elevator, even at low speeds, as the canard (front wing) will always stall (or "mush") before the main wing. When the canard stalls, the nose drops slightly, maintaining sufficient airspeed to keep the wing flying, so you maintain aileron control at all times! Extensive testing of our prototypes has shown the Canard Stick to be a very safe and predictable craft, with no bad habits.

CAUTION: Experience has shown that variations in building may result in an airplane that does not perform like the factory prototype! Excess weight, warped flying surfaces, misalignment, improper balance, and poor workmanship may combine to result in an airplane having poor or unsafe flying characteristics; therefore, you should always make the first test flights of a new airplane in an unpopulated area, where the risk of causing property damage or bodily injury is at a minimum.

The Canard Stick is capable of performing many interesting and exciting aerobatic maneuvers, and has full inverted capabilities; however, when performing a maneuver for the first time, maintain plenty of altitude, until you determine how your airplane will respond when doing the maneuver. The responsiveness may vary in different parts of the maneuver (depending on the airspeed), and there may be some altitude loss; therefore, save the low level aerobatics until you become thoroughly familiar with the flying characteristics of your airplane.

GOOD LUCK!

(Please clip and mail this form as soon as possible)

** REGISTRATION FORM - ST. CROIX MODELS "CANARD STICK" **

NAME: _____ DATE OF PURCHASE: _____
 ADDRESS: _____ WHERE PURCHASED: _____
 CITY: _____ STATE: _____ ZIP: _____

Send to: ST. CROIX MODELS, INC., P.O. BOX 279, PARK FALLS, WI 54552