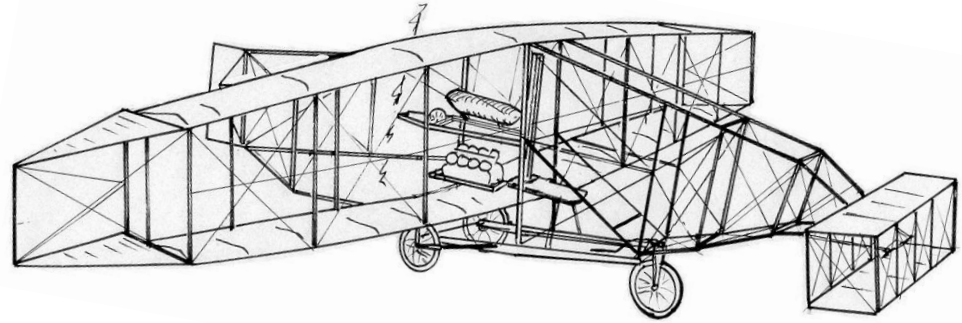


# Silver Dart

Instructions for Kit # D09

1:24 Scale Model  
Wing Span 24 1/2 inches,  
Fuselage Length 16 1/2 inches



## GENERAL NOTES:

- ◇ Read all instructions and study drawings before you start cutting wood!
- ◇ You will also need a sharp hobby knife, thread, a fine beading needle or small drill, and fine sand paper.
- ◇ Lay the plan out on your [MagnaBoard](#) and hold in place with the magnets.
- ◇ Place a piece of waxed paper or plastic wrap over the top of the plan. This prevents the parts sticking to the plan.
- ◇ Study building instructions, sketches, and plan before and during building process.
- ◇ Use glue sparingly, glue adds weight.
- ◇ Be sure all joints fit well and are secure. Always let the glue dry thoroughly.

More photos online!  
[www.easybuiltmodels.com](http://www.easybuiltmodels.com)

## Historic Background

On February 23, 1909 the Silver Dart piloted by Douglas McCurdy became the first successful powered flight in Canada. The Silver Dart was designed and built by the Aerial Experiment Association founded by Alexander Graham Bell on October 1, 1907. The design team included J. A. Douglas McCurdy, F. W. 'Casey' Baldwin, Lt. Thomas Selfridge, and American Glenn Curtiss. The team designed four aircraft designated Aerodromes Nos 1, 2, 3, and 4 and named respectively Red Wing, White Wing, June Bug, and Silver Dart.

The Silver Dart was powered by a new liquid cooled aero engine made by Curtiss, an important innovation which had come as a result of difficulties experience with engine cooling on earlier aerodromes. In at least one instance, these difficulties had lead to an engine seizure. Until the cooling difficulties were licked, it was impossible for an air cooled engine to provide sustained power.

Other innovations included ailerons for lateral control and the tricycle gear undercarriage with steerable nose wheel interconnected with the control wheel and rudder.

The pilot's controls comprised a control wheel, fore and aft movement of which controlled the elevators, as in modern practice, and right and left steering movement which controlled the rudder. The ailerons were operated by means of a neck or shoulder yoke which the pilot moved by leaning to the appropriate side. Although this system may seem primitive in modern eyes, it was extremely ingenious and its operation was practically instinctive.

The Silver Dart had a wing span of 49 feet and a chord at the center of 6 feet tapering to 4 feet at the tips. Each aileron comprised the whole wing tip with the pivot point apparently being at the leading edge so that they were not balanced. The interplane gap chord ratio was equal to 1:1 which explained the bowed appearance of the wings when seen head-on. Total wing area including ailerons was 420 sq. ft. All up weight including a 150 lb. Pilot was 860 lb. Giving a wing loading of 2.05 lb/sq ft.

The biplane elevators had a span of 12 ft., a chord of 26 in., and an interplane gap of 30 in. they were partially balanced by being hinged along an axis 5 in. behind their leading edge.

The upper surface of the wings were covered with rubberized silk laced to the ribs and spars, fitted into sockets in the center section. (The rubber compound used to dope the silk was silvery in color, hence the airplane's name.) The control surfaces were covered on both sides with the same material. The wing ribs fitted into pockets in the silk covering with the trailing edges being formed by wires strung through seams in the covering and tensioned by turnbuckles. The ribs at the interplane strut positions were fabricated of steel tubing while the struts themselves fitted into sockets and were held in place by the bracing wires. Extensive use was made of bamboo in the construction due to its strength. Aerodynamically the designers had already recognized the importance of reducing drag and accordingly all exposed members were carefully streamlined.

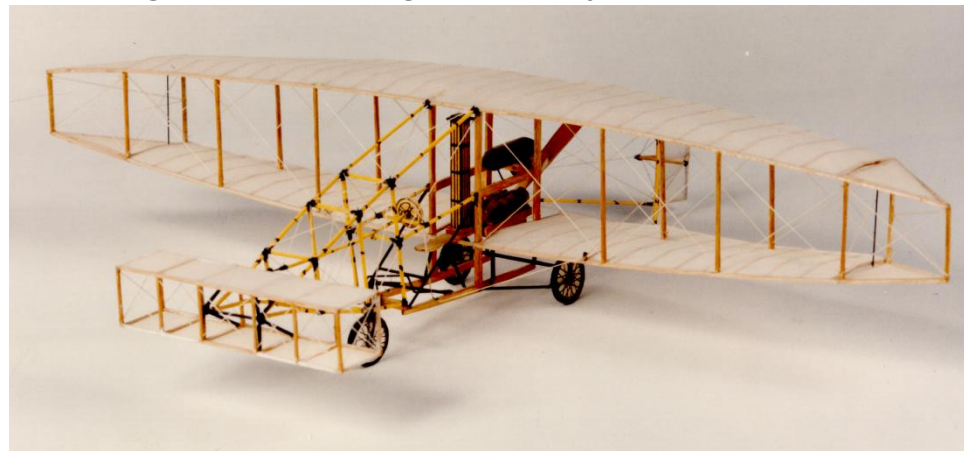
The Silver Dart could carry the pilot and one passenger in tandem. The pilot's seat was adjustable fore and aft to correct for trim changes when no passenger was onboard. The engine was a V-8 with the 2 banks of cylinders arranged at 90°. Bore was 3.75 in. and stroke 4 in. It was rated at 35 hp @ 1000 rpm and 50 hp @ 1600 rpm. Weight of the installed power plant was 250 lb. Given a power/weight ratio at peak power of 5 lb. Per hp. Dry weight was 165 lb.

The cylinders, which had copper jackets, were fitted to an aluminum alloy crankcase. Both cylinders and pistons were cast iron, while the connecting rods were steel forging. The crank shaft was made of specially treated vanadium steel, having a diameter of 1 3/8 in. and bored hollow for lightness. Crank shaft bearings were kept flooded with oil with a gear pump. The inlet and exhaust valves were concentric, and located at the cylinder head. Initially each cylinder had its own carburetor made of aluminum, but the number was later reduced to two, one for each bank of cylinders.

A variety of arrangements were apparently used for the propeller drive and by McCurdy's own account, at least 3 different propellers were tried. Originally the propeller drive consisted of a V-belt arrangement, different accounts mentioning 2 & 4 belts. The first flight was made by Douglas McCurdy using a chain & sprocket drive which was fitted on the morning of February 23.

The propeller shaft seems to have been square in cross section and was located about midway between the 2 wings facing aft since the Silver Dart was a pusher. The thrust line was inclined upwards from the datum line by about 3°.

The original Silver Dart was demolished at Petawawa, the engine was the only part undamaged. It eventually wound up in a fishing boat working in the Canadian Maritimes and later sank. The engine was salvaged and sent to an aeronautical museum at Uplands Airport, Ottawa where it was restored and put on display.



## Building Instructions for the Silver Dart

This is a 1:24 scale model of the original aircraft with 1/2" = 1 foot. The information gathered was taken from the replica on display at the National Aeronautical Collection in Ottawa, Ontario. Information and data was received from Ches Erb, Curator of the Canadian Aviation Historical Society.

### **Wings**

- Make 53 wing ribs as per plan, using 1/16" sq. balsa strip wood, use a piece of 1/8" sq. as the gauge for the break for the airfoil. Glue at break and let dry.
- Start wing by placing the two 1/16" sq. spars on the plan, splicing leading edge and spar as needed. Carefully set the wing ribs in place butting to the leading edge (L.E.). Note: the outer ribs have to be cut to match lengths shown on plan. Also ribs glue on top of rear spar. Make the tips from 1/16" sq. The ailerons can be made separately and installed later.
- Make two wings the same. Glue thread to the trailing edge (T.E.) and let dry. Cover wing tops only. Using plan and sketches, place covered wings on plan, L.E. to plan, bow top wing down, and bottom wing up. Pin in place.
- Cut struts as shown on wing front view, install and glue into position. It is necessary to slit the paper in the bottom wing to glue strut to rear spar. Let dry, do not put rigging on until model is completely assembled.

### **Fuselage**

- Make 2 body sides as per plan for front section. Glue together using the plan to determine the proper width, carefully maintain a straight and square unit.
- The wings have to be installed on the main body section before any detail can be added such as wheel assemblies, motor, etc. Slip wings over main body unit and position as shown on plan. Note the positions of the spars on the side view. When the wing is installed, the detail for the main body can now be completed except the rigging.
- Make the wheel and motor assemblies. Make the propeller drive shaft from 1/16" sq. Wheels are made by gluing wheel drawings (three) to 3/32" balsa, sanding to shape, and painting edges black to simulate tires.

### **Stabilizer**

- Make as per plan noting that both sides of stabilizer are covered before assembling with struts.
- Carefully install pivot unit as shown and with care it can be made to operate.

### **Rudder**

- Make rudder assembly as per plan noting that rudder is covered on both sides.
- At this time take the front section of the fuselage and glue into position to the main body unit.
- Take the rudder assembly and mount at points shown. Note the rudder assembly droops to the back and is not on a level plane with the center section. The rudder assembly is hard to keep square at this point, however, the rigging will pull it back into square.
- The front section and the rudder section supports can be made to look like bamboo by painting the wood yellow and the joints black. The main body is left natural with just a coat of model airplane dope or varnish.

## Rigging

- Using thread and a fine beading needle, sew in the rigging by passing the needle through the balsa at the points shown. One length of thread will do several sections. By pulling the thread, the various pieces can be square up. A drop of glue can be put at each joint and the thread will stay in place. Let dry.

## Finishing Touches

- Details can be added to suit the modeler's taste as per sketches.
- Using a small brush, paint the various parts with flat black to resemble the iron parts on the real aircraft.
- The gas tank is black, the motor is copper colored.
- The radiator is simulated using thin black marker lines to show the tubes.
- The propeller is balsa wood.

## Glue Methods For Attaching Tissue

*Always follow the manufacturer's use, safety and environmental instructions when using their products.*

### TRADITIONAL THINNED DOPE (50/50) OR THINNED WHITE/YELLOW GLUE (WITH WATER)

- Carefully apply a coating of thinned dope to the perimeter of the structure you are about to cover.
- Let dry well.
- Cut a piece of paper covering material as big as the area to be covered.
- Wet paper well allowing it to soak up the moisture and set aside.
- For dope only — in the meantime, lightly coat the perimeter of the structure again with thinned dope and proceed immediately to the next step.
- Carefully pick up the damp paper and place it against a starting edge. Rub your finger along the edge to make sure the paper is sticking. **Note:** More dope or thinned white glue can be applied to the outer surface and rubbed into the glue point to improve the adhesion. Pull out wrinkles as you proceed with the rubbing.
- Pin to a flat surface and allow to dry.

### GLUE STICK

- Cut a piece of paper covering material slightly larger than the structure to be covered.
- Wet the paper well allowing it to soak up the moisture and set aside.
- Carefully apply a coating of the glue to the perimeter of the structure you are about to cover. **Notes:** Glue sticks dry quickly, only coat a small section at a time applying the paper as you go. Keep blobs of glue to a minimum by using a toothpick to spread out evenly. Some builders report using rubbing alcohol to reactivate the applied glue by using a small brush to make small applications to the affected area.
- Carefully pick up the damp paper and place it against a starting edge. Rub a finger moistened with water along the edge making sure it adheres to the glue. Pull out wrinkles as you proceed. Pin flat and dry.

### Additional construction notes to help you with optional details

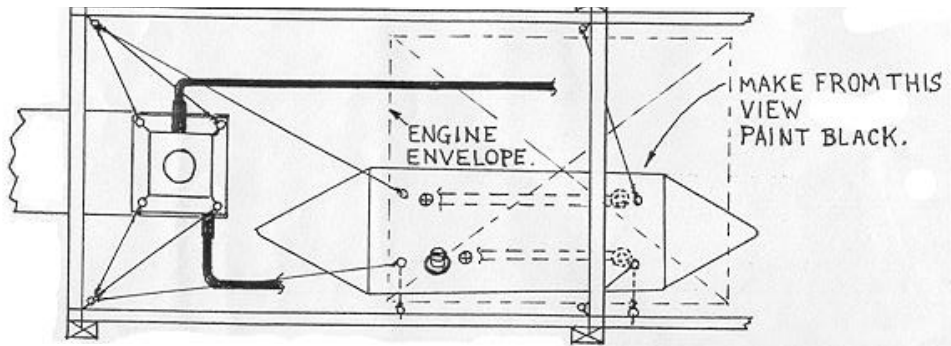
*written by Easy Built Models customer Al Yunker.*

**Wings** - The wings are covered on the tops only, with tension wires on the bottoms. A jig was made from Styrofoam to hold the curve of the wings while the struts and wings were glued together. Black craft/button thread was used for the rigging, tension wires, and trailing edges of the wings. Gray craft/button thread was used for the control lines of the rudder and ailerons. Small pulleys were made from cross cuts of very small dowel and grooves were placed on pulleys for lines to run around.

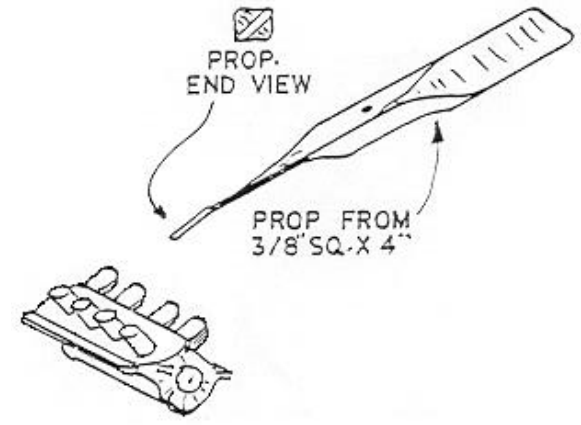
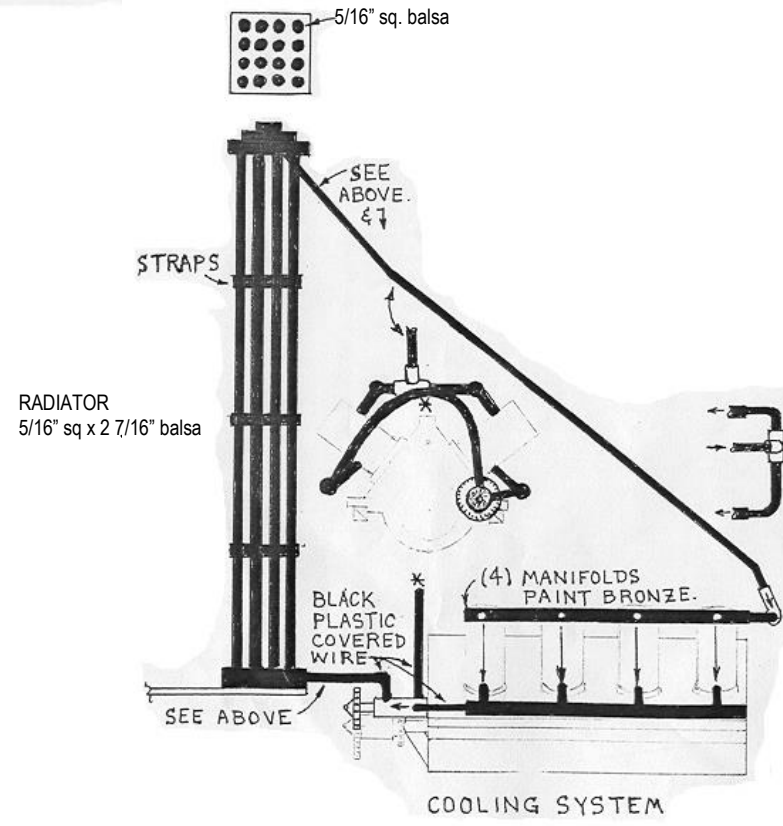
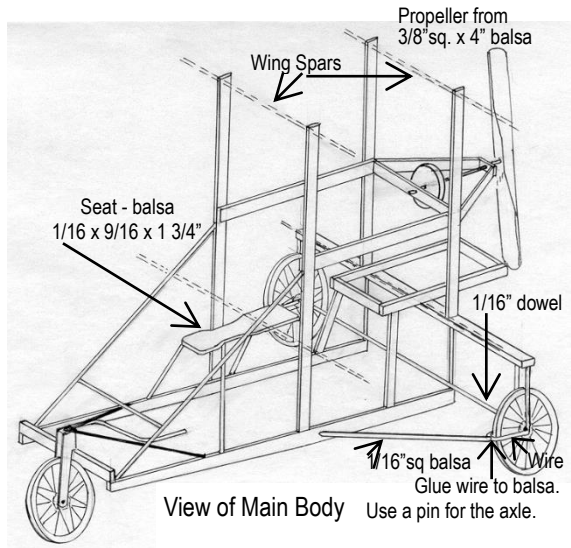
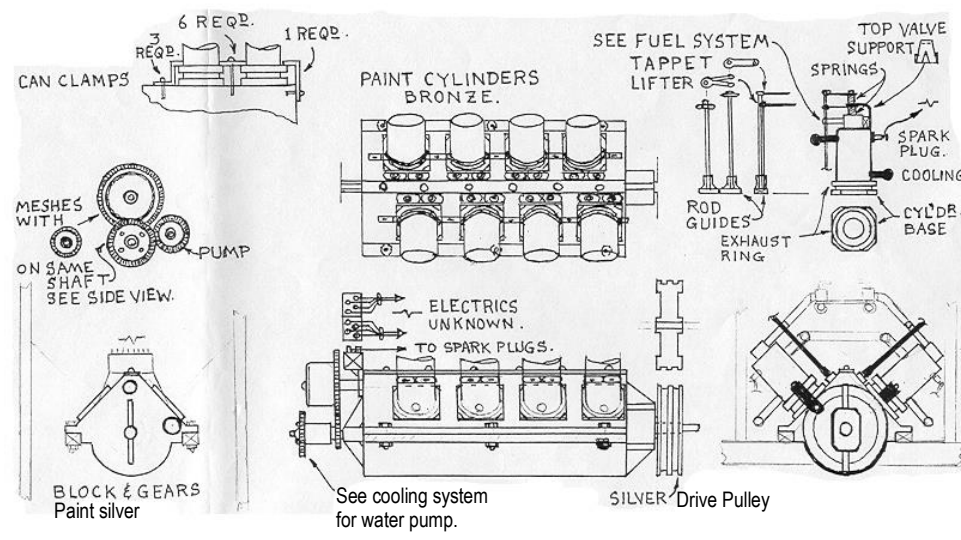
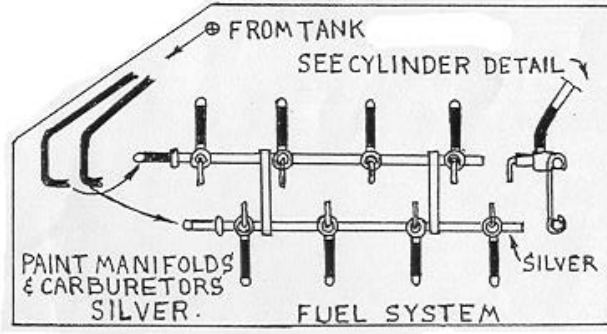
**Body** - The body was constructed as per the plans and materials provided. All balsa in the body that was not heavy stock was 1/16" sq balsa sanded to round the edges and marked with a pencil to simulate the bamboo that was used in the original plane. Again black craft/button thread was used for the rigging. The metal fittings where the bamboo joined was simulated with flat black paint. All balsa was stained to give the look of different types of wood.

**Engine** - The main body of the engine, the pistons, and the gas tank were made from various sizes of wood dowels. Balsa scraps, black craft/button thread and wire were used for the other detailing such as fuel lines, spark plug lines and belts. The radiator was constructed from music wire and balsa.

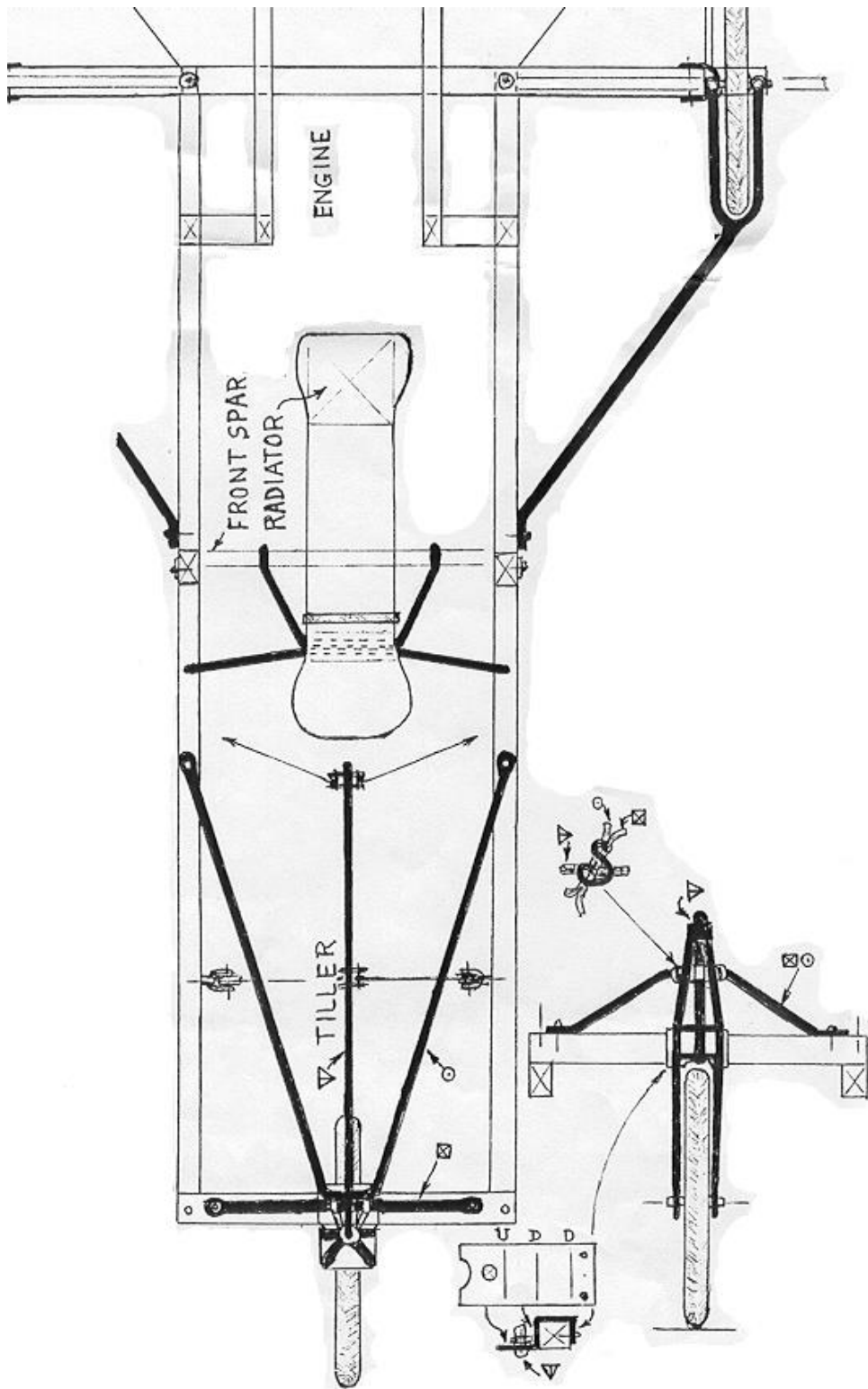
**Wheels** - The wheels and tires were made from balsa and black electrical wire. I cheated on the steering wheel. It came from a 1/25" scale model car.



**Not To Scale**

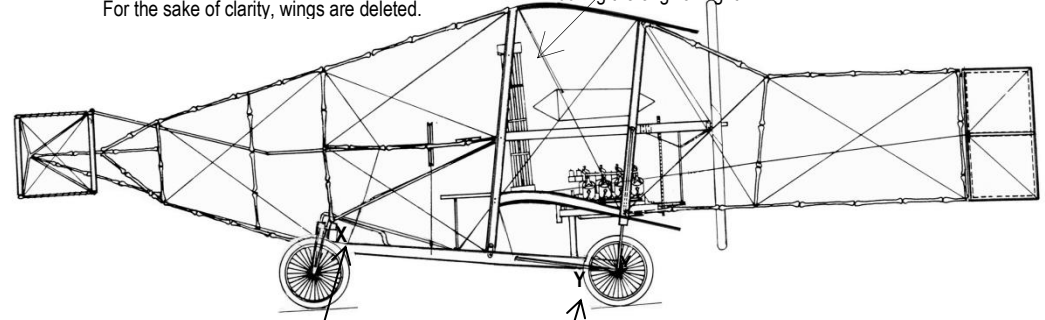


Motor Details are optional  
**Diagrams Not To Scale**

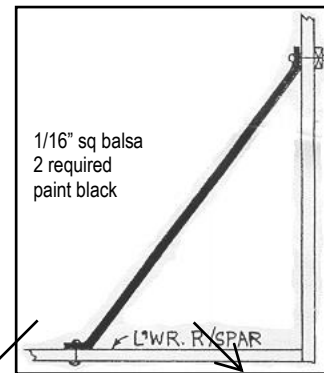


For the sake of clarity, wings are deleted.

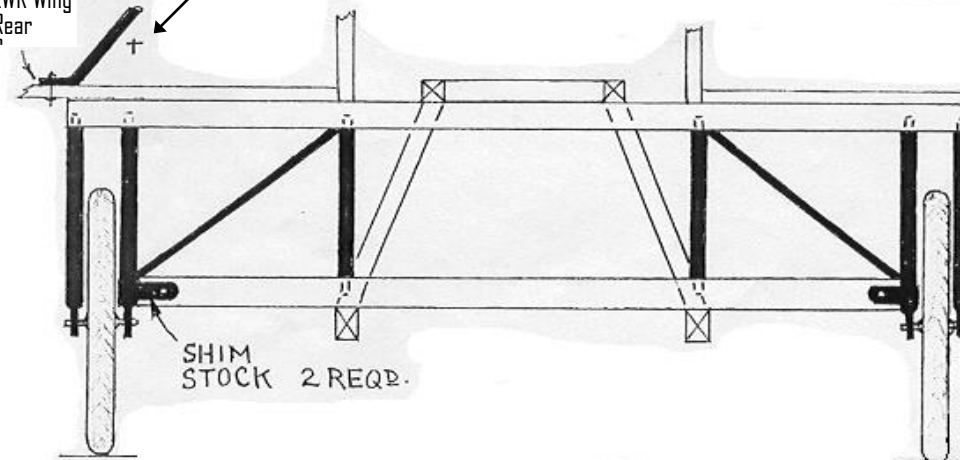
Radiator was located on aircraft center line during the original flight.



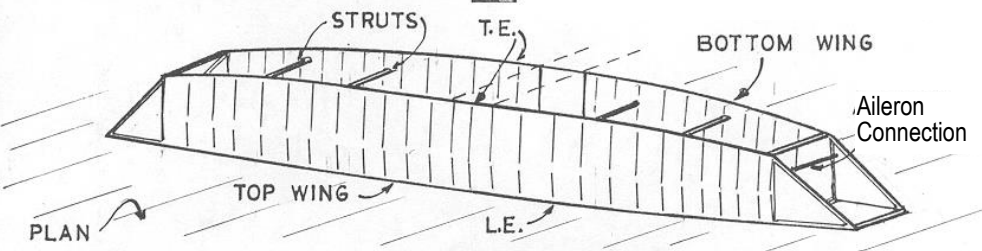
Block at 'X' and down-angled fork at 'Y' resulting in a decreased angle of incidence.



LWR Wing Rear



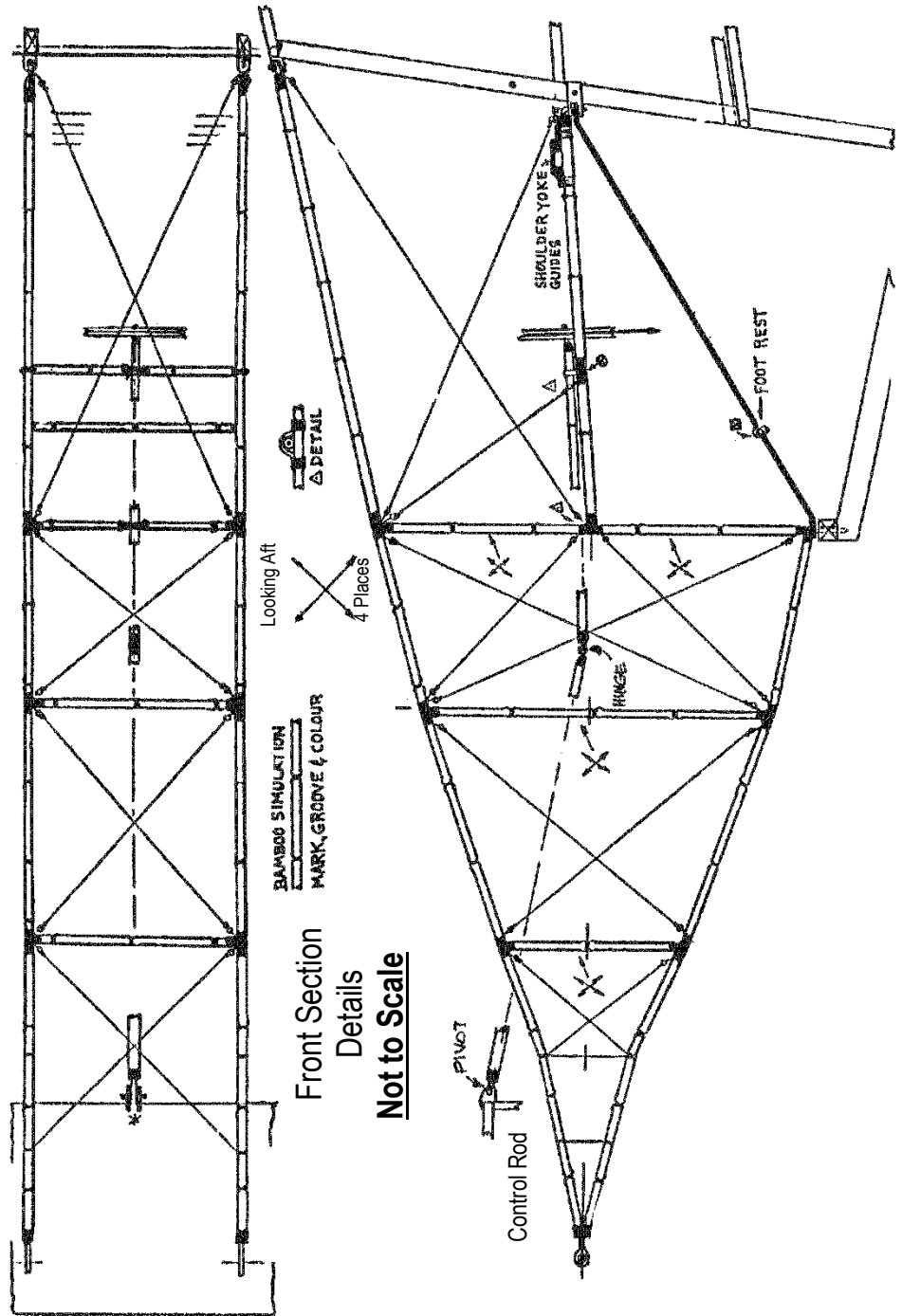
ASSEMBLE TWO WINGS ON PLAN - "AA" **Not to Scale**



Wheels and pilot are shown to scale.

J.A.D. M<sup>c</sup>GURDY  
 MAKE - BEST METHOD.  
 COLOUR - BEST GUESS.

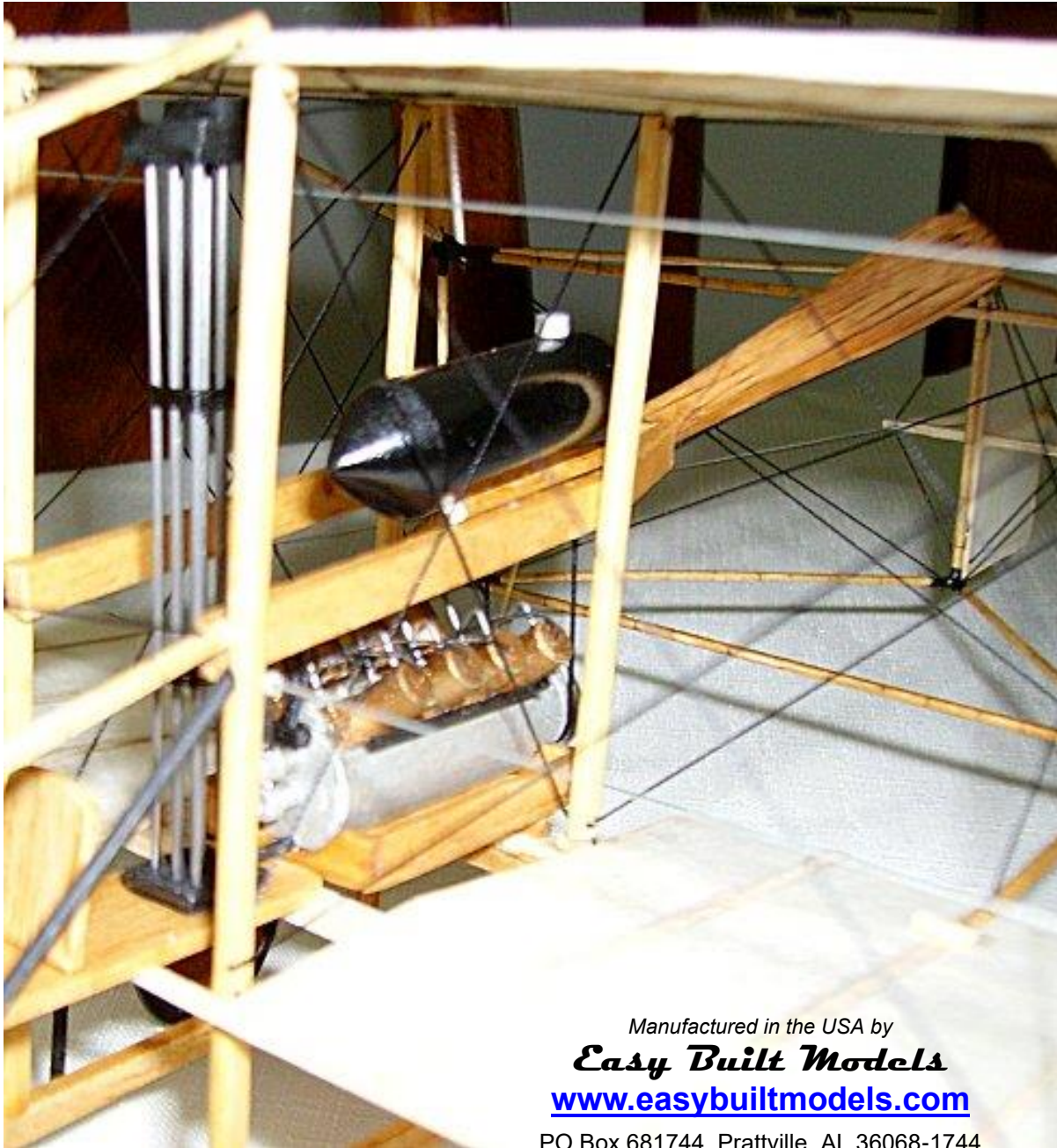
SEAT



**Kit# D9 - Silver Dart**

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Model as built by Al Yunkers



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