1911 Voisin Canard Build Description

The Voisin Canard was an aircraft developed by the Voisin brothers during 1910 and first flown early in 1911. It was named the Canard because of the resemblance of its forward fuselage to that of a duck's long neck while in flight. It was originally flown as a landplane, but with the addition of floats it became one of the first seaplanes used by the French Navy. The Canard was, even by the standards of 1910, a curiously regressive design, its layout reminiscent of Alberto Santos-Dumont's 14-bis of 1906.

As first flown at Issy-les-Moulineaux by Maurice Colliex, the aircraft had an uncovered fuselage of wire-braced wood construction with the 50 hp Rossel-Peugeot rotary engine at the rear and the front-mounted control surfaces consisting of an all-moving elevator divided into two halves, one either side of the fuselage, a rectangular balanced rudder mounted above the elevator, and a pair of short-span fixed horizontal surfaces with a high angle of attack mounted behind and below the elevators. Voisin's characteristic side-curtains were fitted to the outermost pair of interplane struts and roll control was achieved using trailing-edge ailerons on both upper and lower wings.

General characteristics:

Crew: 1

Capacity: 2

Length: 7.9 m (26 ft)

Wingspan: 12 m (40 ft)

Wing area: 43.9 m2 (473 sq ft)

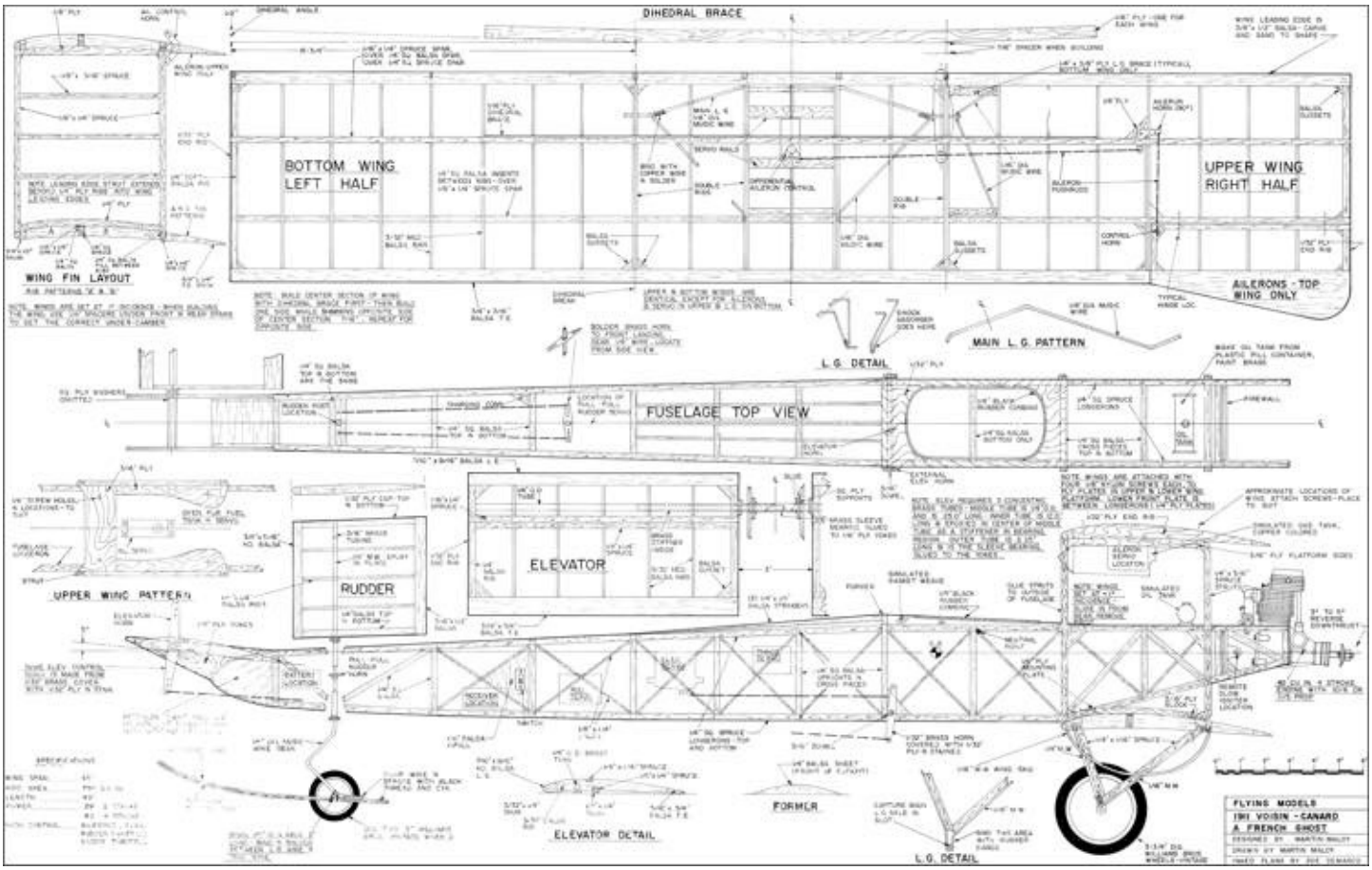
Gross weight: 549 kg (1,210 lbs)

Powerplant: 1 × Gnome 7-cylinder air-cooled radial, 70 hp

Performance:

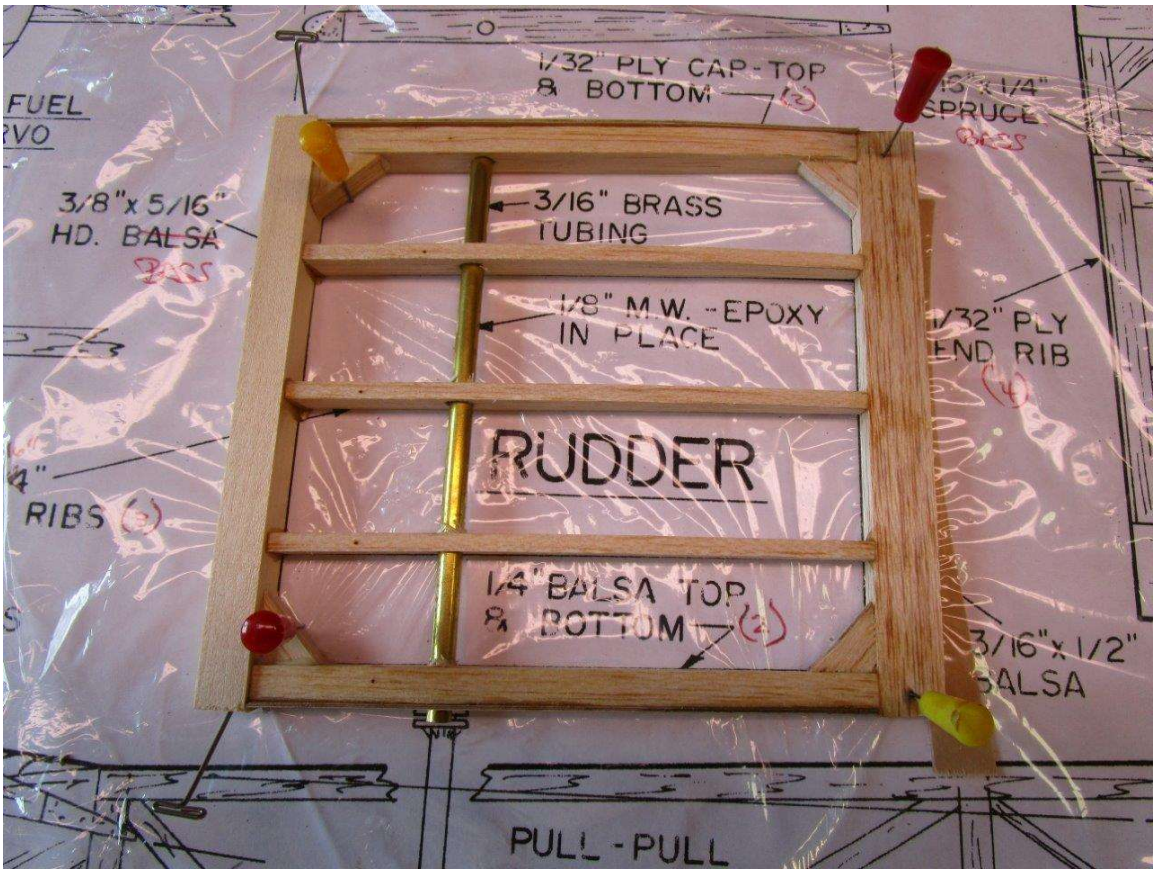
Maximum speed: 90 km/h (56 mph, 49 kn)

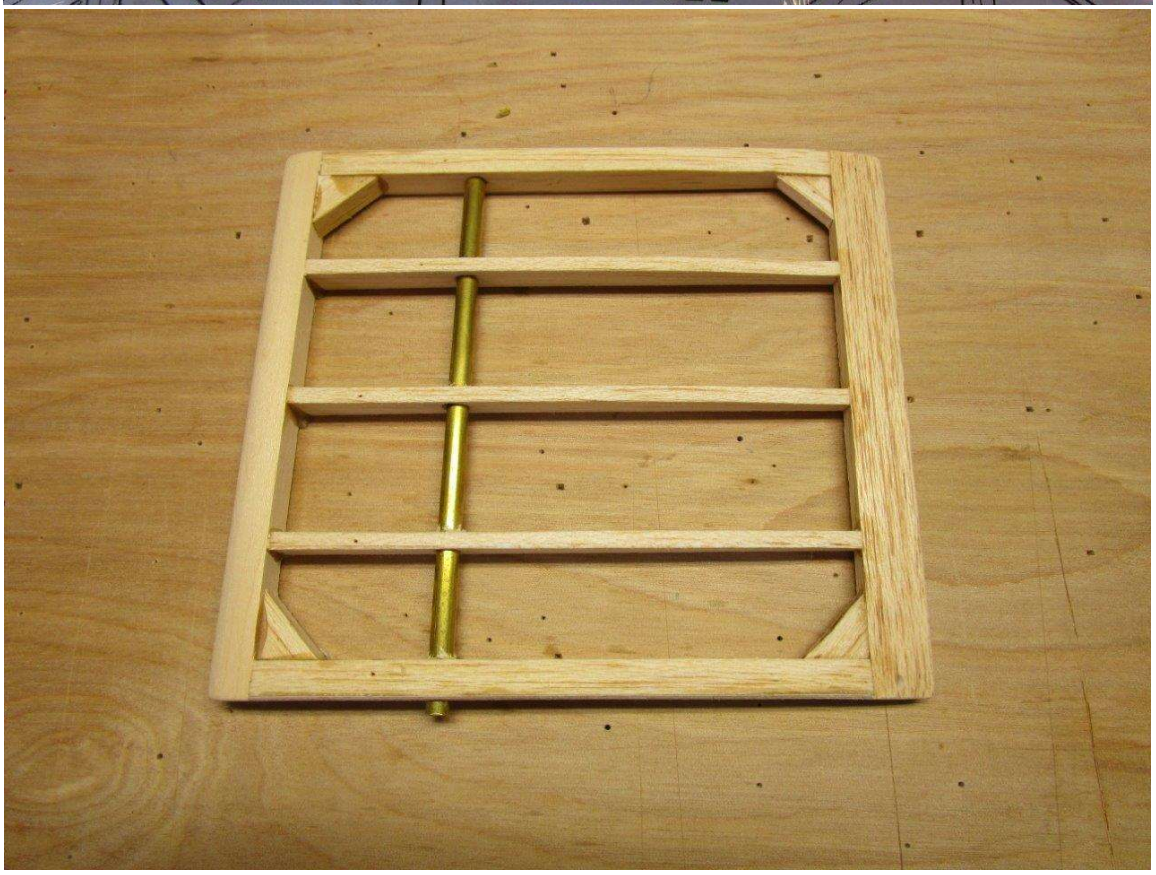
The plans for this scratch build were downloaded from AeroFred.com. Designed by Martin Maloy, the 1:10th sport scale model is designed for .40 CID glow engines installed in a pusher configuration at the rear of the aircraft; a .40 CID four stroke engine is shown on the plans and propeller-to-ground clearance should be carefully monitored to avoid a propeller "ground strike" on takeoff or landing. I used an old Thunder Tiger .54 4-cycle for this build. This one is for those who are up to a modeling challenge. I would not recommend you attempt this model until you have several builds under your belt.



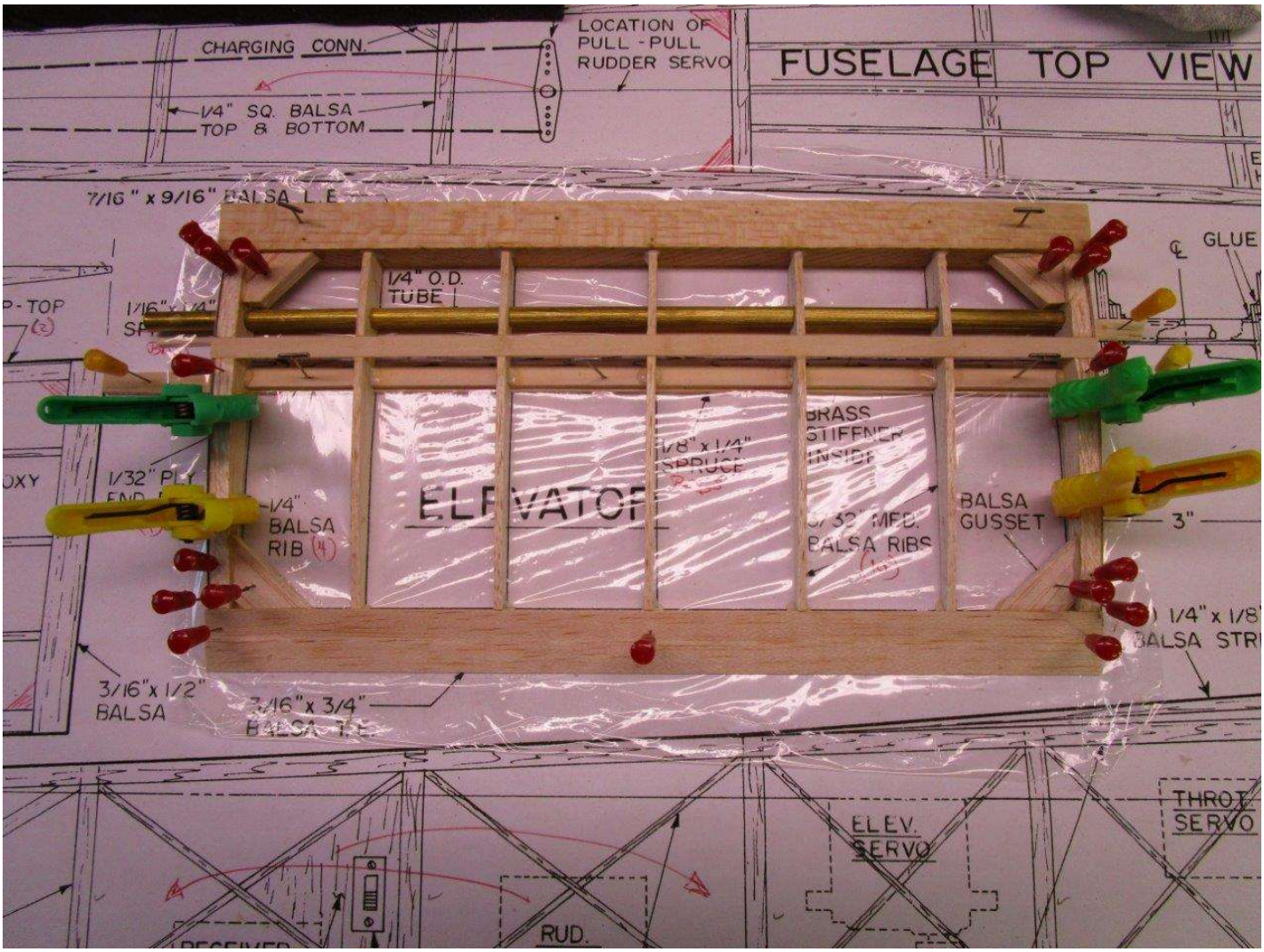
Having the full-size plan, I go through and determine all the materials I'll need to make the build. Once I had worked up a complete wood and material list, any balsa sticks and sheets, basswood, and plywood needed were ordered from Balsa USA. This scratch build will require several different sizes of brass tubing, and brass sheet. All these can be obtained at a good hardware store, or your local hobby shop. Wheels, servos, pull-pull cables and fittings, and other required hardware are easily located on the web or your local shop.

So, let's get started on this unique aircraft. The two pictures below are the rudder, first in-build over the plan, and then ready for covering. Being a canard aircraft, the rudder is at the front of the model, which will make the model look like a plane flying backwards. It is attached to the nose landing gear wire which is controlled by a small servo near the front of the fuselage (see plan photo) with a nose landing gear (NLG) NLG steering control arm. Sand the rudder to the shape shown in the first picture just above the rudder. The rudder, and the rest of the model, will be covered with flat tan Ultracoat.

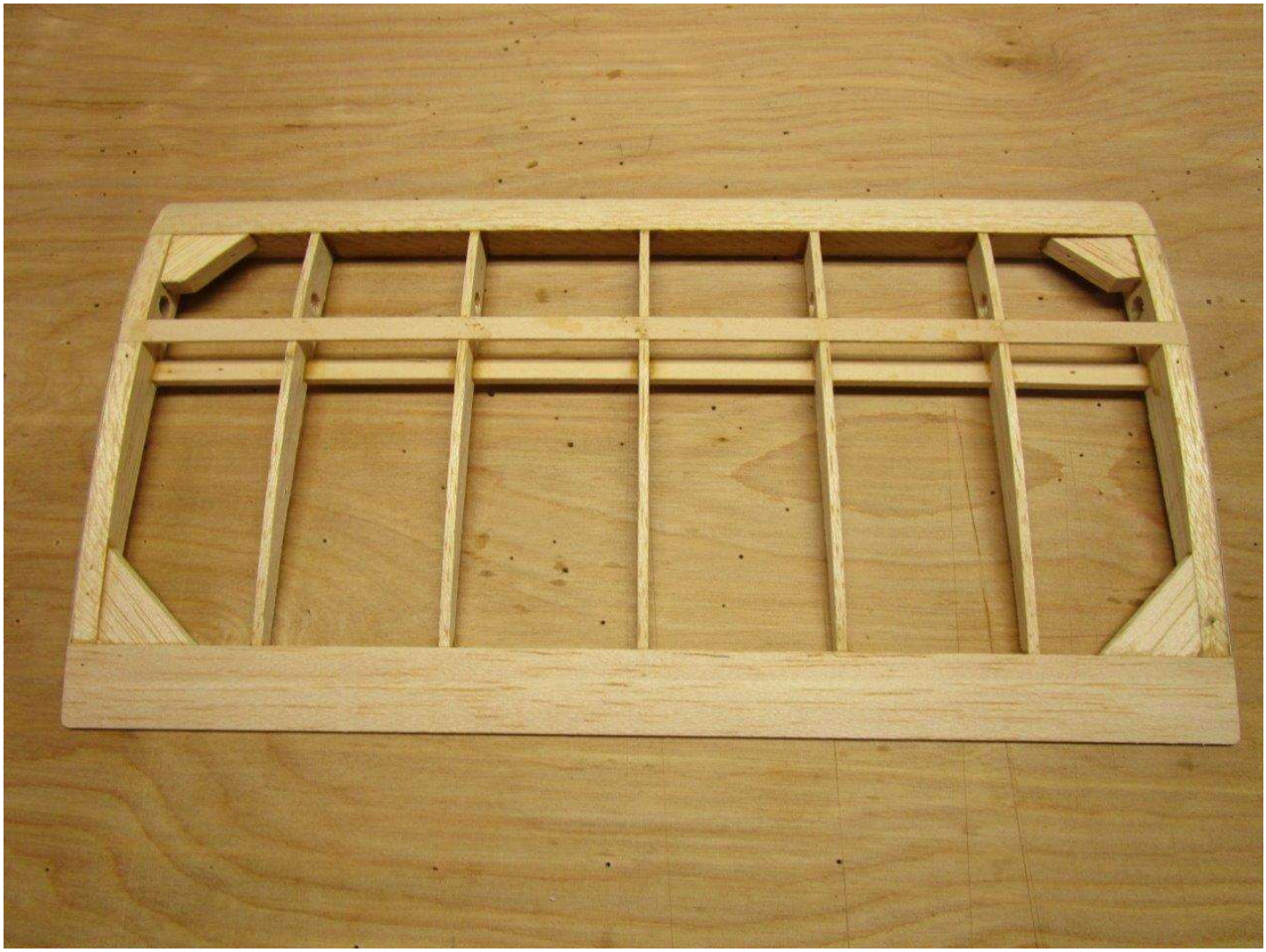

1/32" PLY CAP - TOP
& BOTTOM (2)
3/16" BRASS
TUBING
1/8" M.W. - EPOXY
IN PLACE
RUDDER
1/4" BALSA TOP
& BOTTOM (2)
3/8" x 5/16"
HD. BALSA
RIBS (6)
PULL - PULL



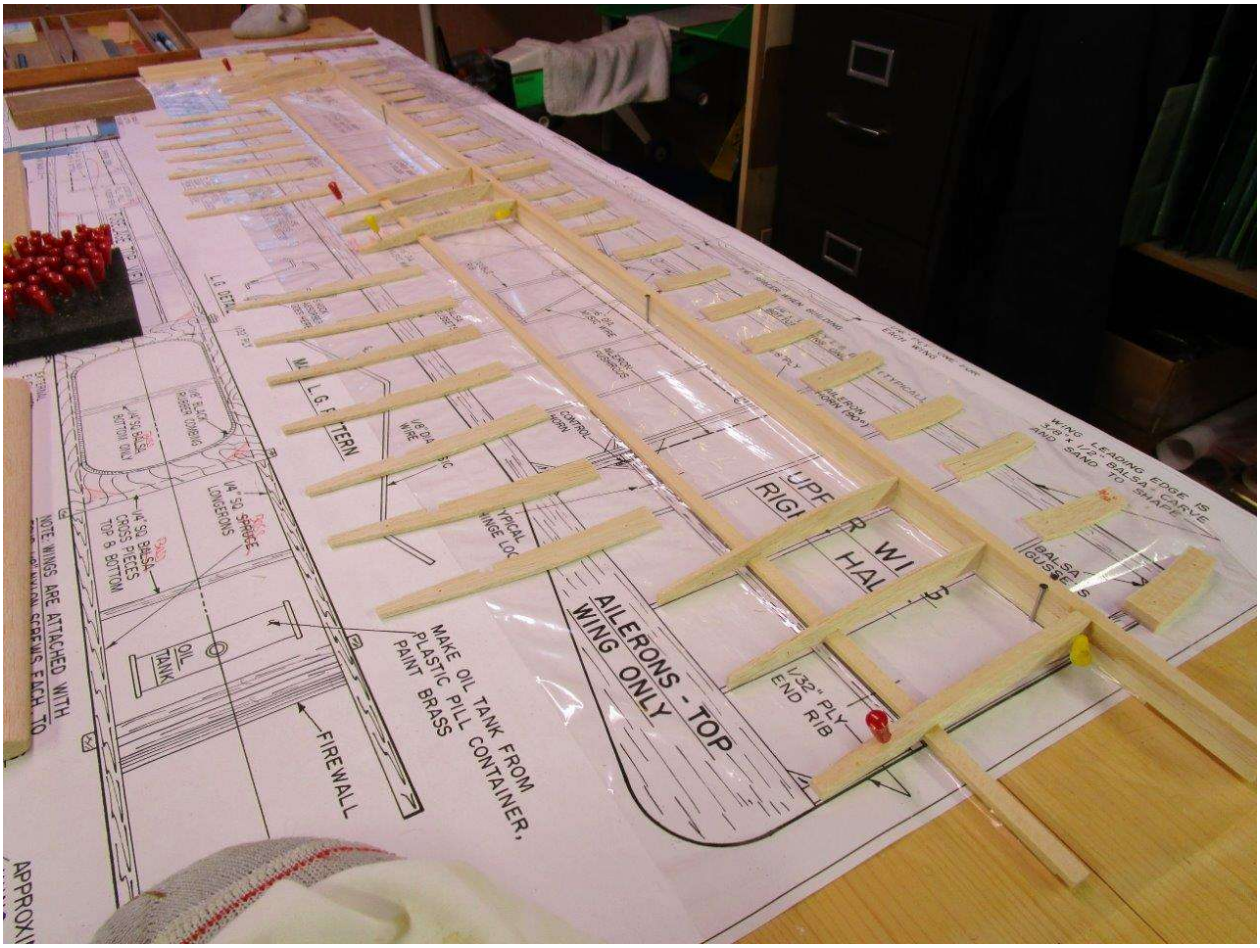
The next two pictures below are one of the two canards (or elevators), first in-build over on the plan, and then ready for the brass tub to be epoxied in place, and then covered. The canards are an under-camber airfoil, which makes for interesting build with shims. Both canards are attached at the very front of the fuselage, one on each side of the nose, using three different sizes of brass tubing for the pivot mechanism, and will be controlled using a servo that drives a pull-pull linkage from each side of the bottom of the fuselage up to the custom-made canard control horns (laminated brass sheet and very thin ply).



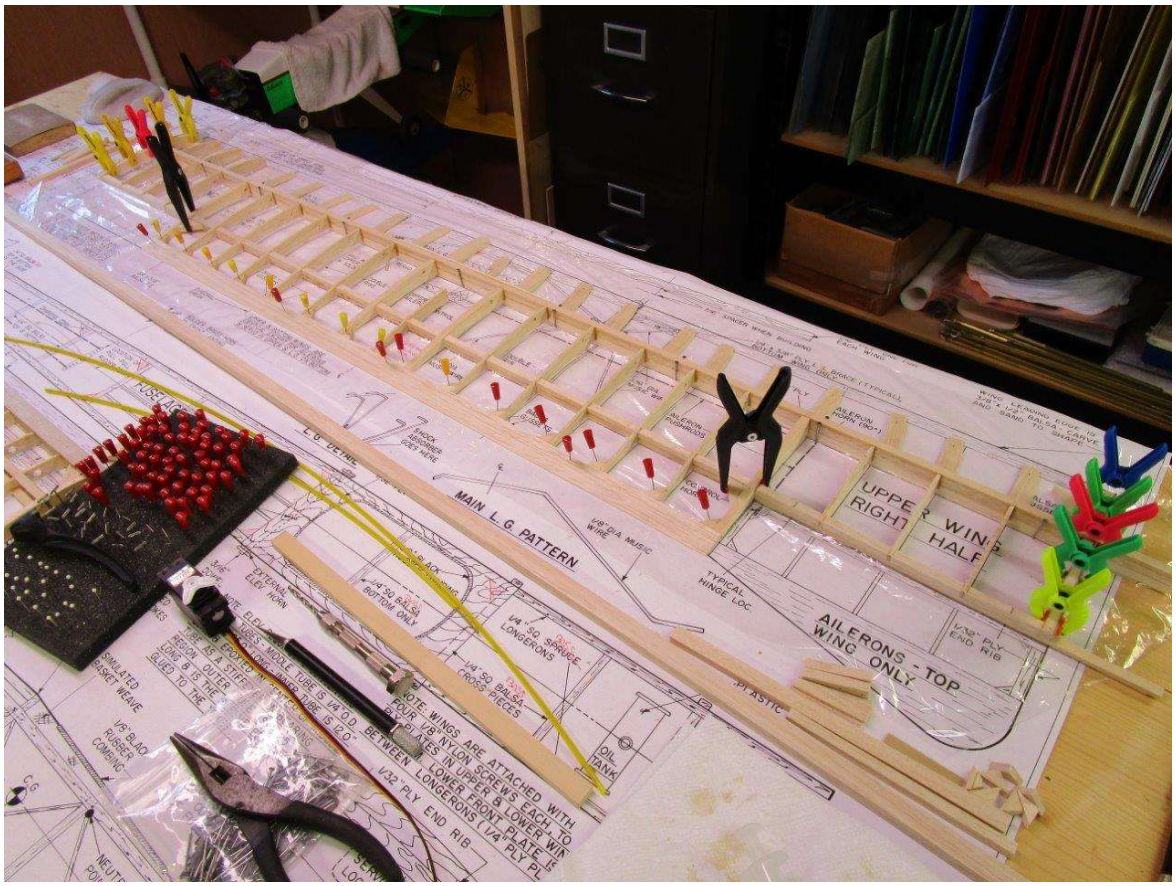
As can be seen above, I inserted the brass tube during the build to help align all the elevator ribs. As with the rudder, sanding must be done to shape the elevators to the final shape as shown on the plans. I used basswood for the elevator spars versus spruce as called out on the plans.

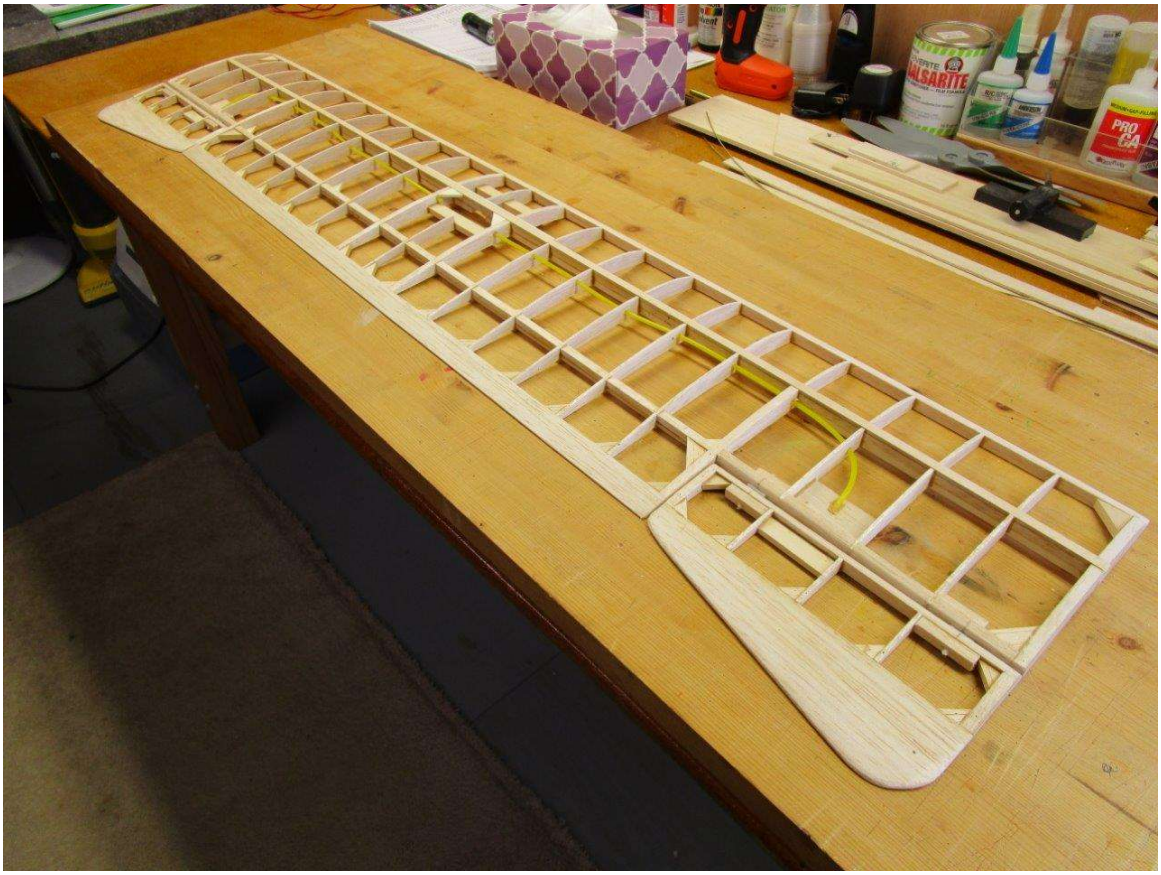


Now for the two wings (a biplane here). The two pictures below are the bottom wing, first at initial build over the plan, and then as finished except for the wing mounting blocks to be installed once the fuselage is built. Both wings are under-camber airfoils, which required shims under the front and aft spars during the build-up. Note the main spar, which is a build-up of two full length pieces of basswood with a piece of balsa sandwiched between them. This is the first model I've built using this design. The aft spar is one full length basswood piece, with balsa fillers between each rib. There are a total of **107 individual pieces** in this bottom wing. Yes, lots of time and effort in this build. The main landing gear mounting blocks can be seen between the various ribs. To better represent the original aircraft, I did not build the wings using an outer dihedral as shown on the plans. Each wing is 45 inches long.

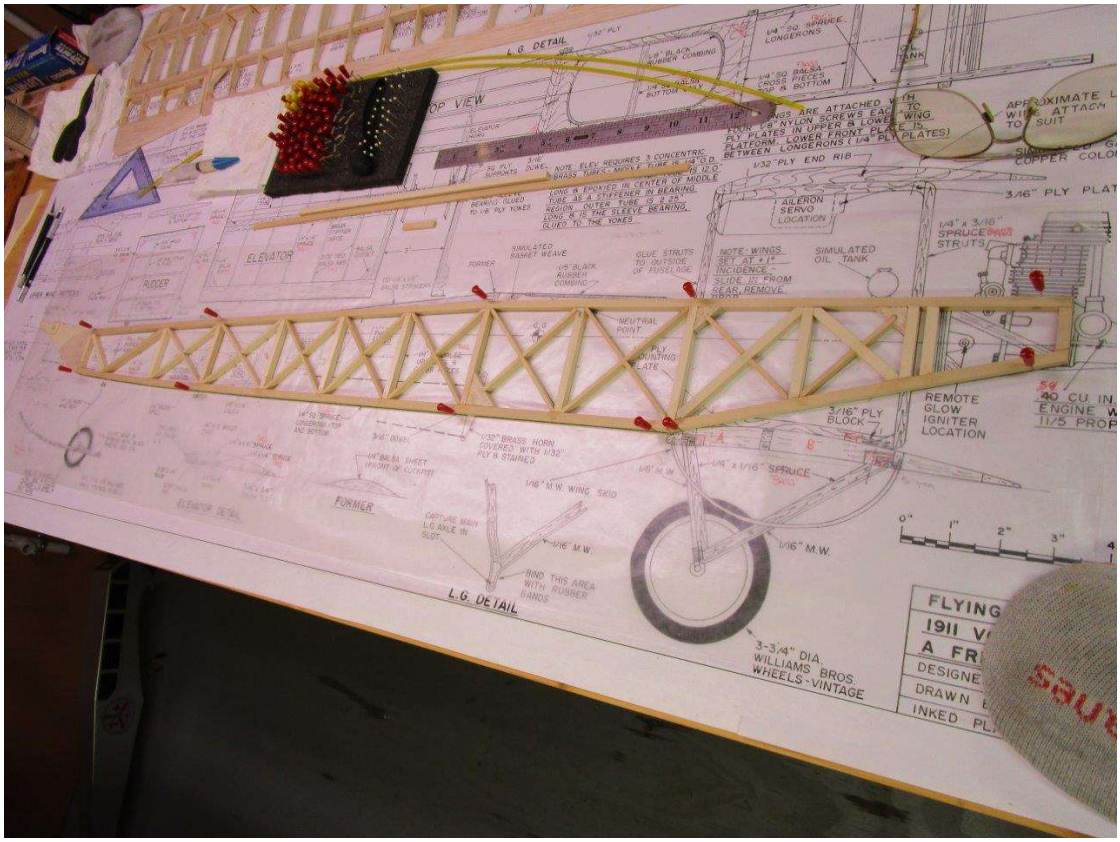

AILERONS - TOP
WING ONLY
MAKE OIL TANK FROM
PLASTIC PILL CONTAINER,
PAINT BRASS
FIREWALL
OIL TANK
1/32" PLY
END RIB
1/4" SQ SPRUCE
LONGERONS
1/4" SQ BALSA
CROSS PIECES
TOP & BOTTOM
NOTE: WINGS ARE ATTACHED WITH

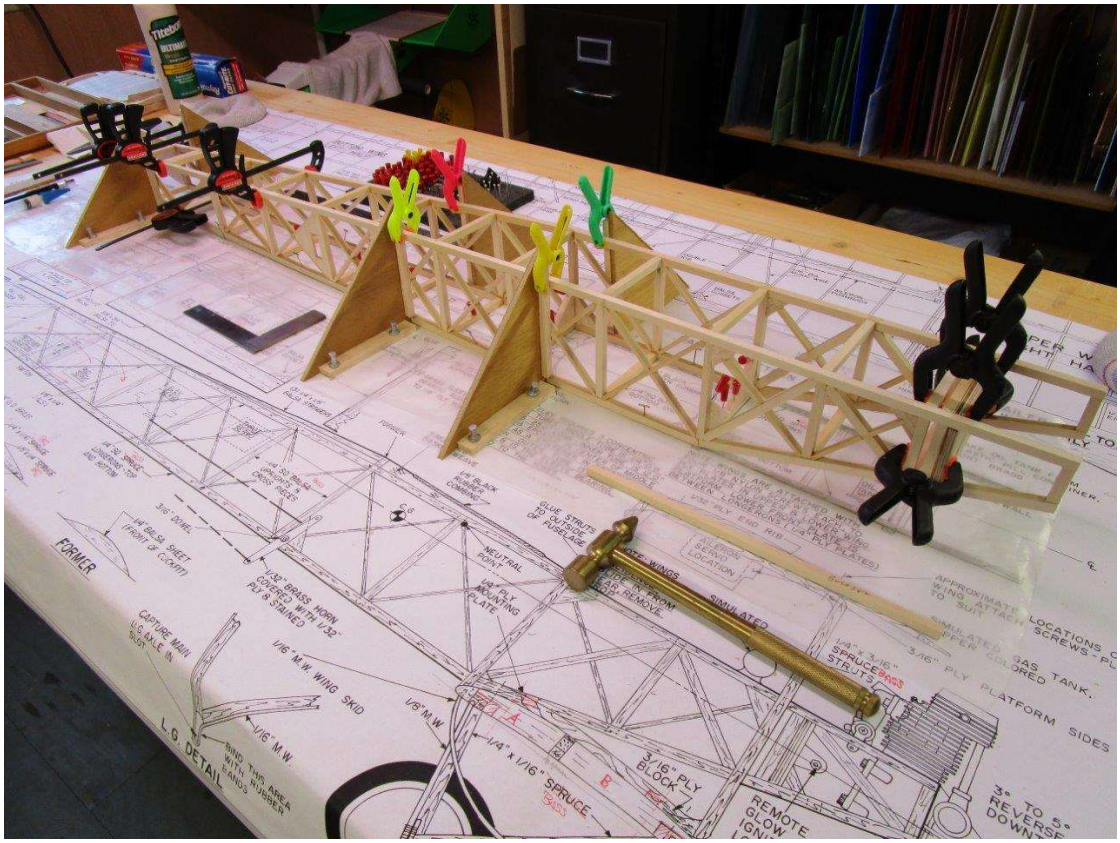
Below is the top wing in work over the plans. Similar under-camber airfoil and spar construction as the bottom wing except for the two ailerons, which will be controlled by a single center mounted servo using flexible Gold-N-Cables running inside the wing. The top wing has a total of **146 individual cut pieces**.





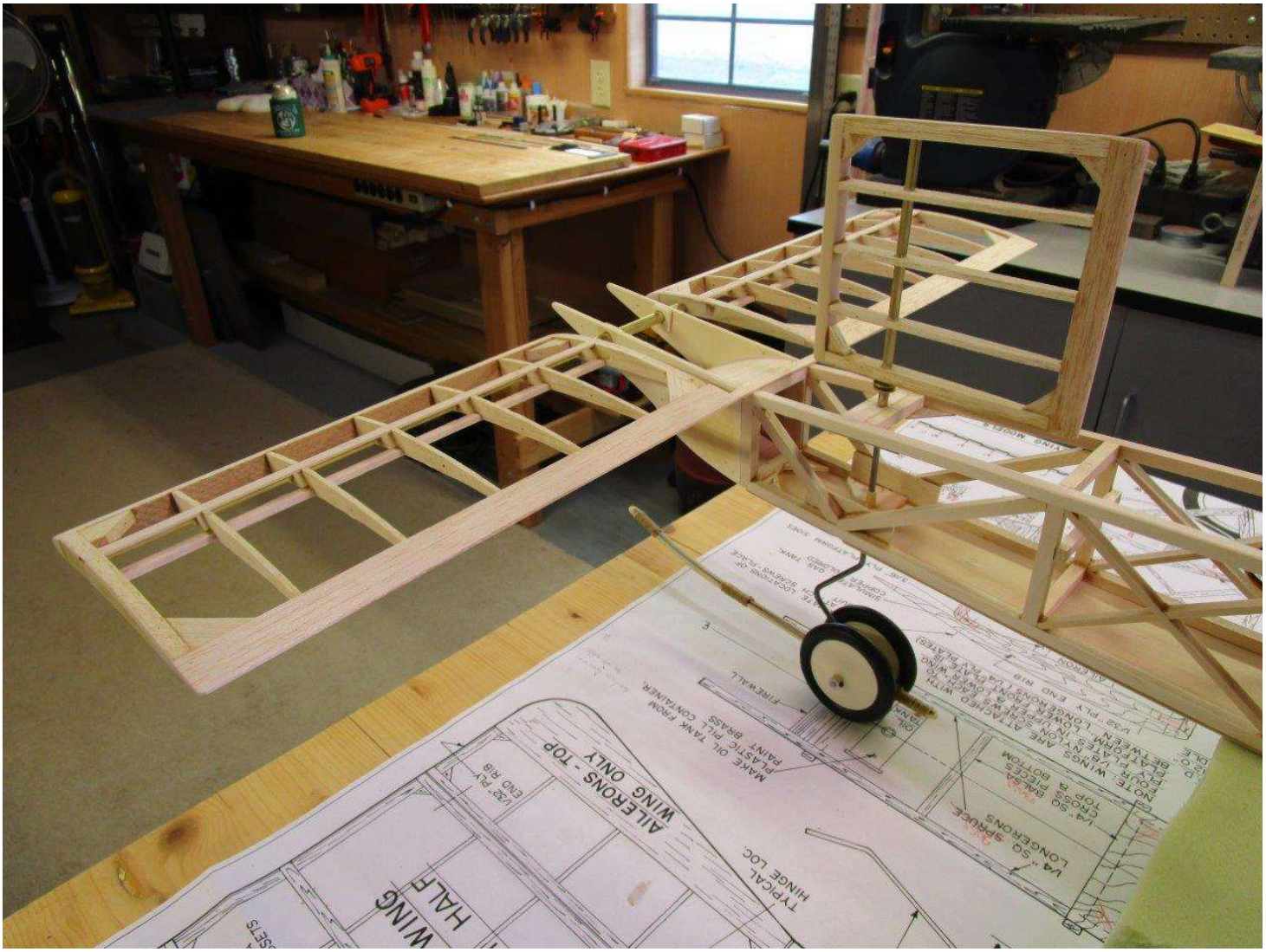
Ok, let's move on to the fuselage build. Shown below is the start of fuselage build over the plan. I used basswood throughout the structure, which increases the weight somewhat, but also will significantly increase the strength of this long stick fuselage. Fuselage sides where then aligned in a homemade jig to keep everything straight and square while the Ultimate Titebond III wood glue and epoxy joints all set up.



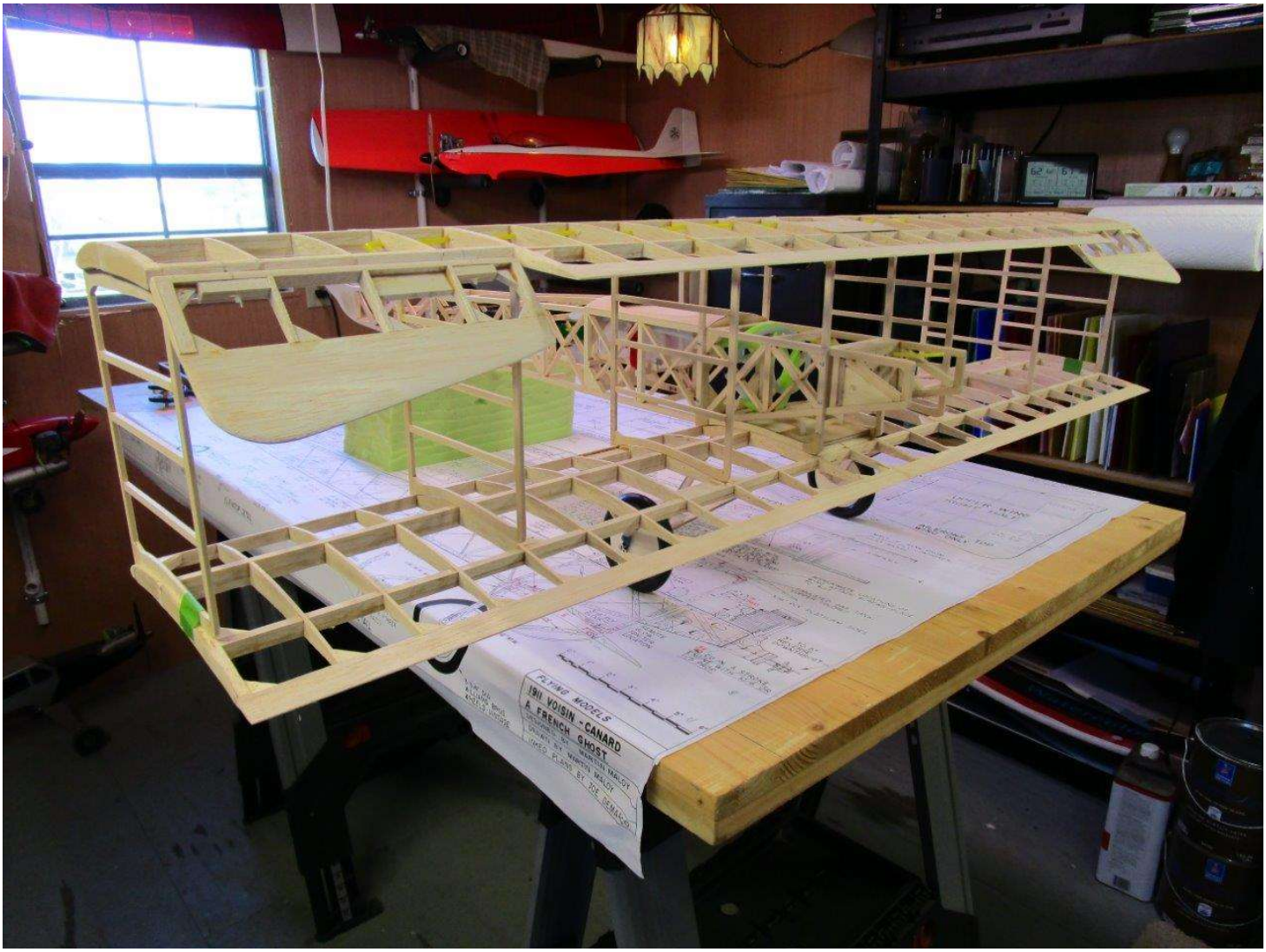


Pictured below you see the full fuselage prior to installation of fuel tank/lines; servo mounting plates for the three servos (canards, rudder/steering, throttle) that go inside the fuselage; and some additional buildup of an upper deck and cockpit. The two long horns sticking out the front will hold the canards center tube structure. The bottom of the entire fuselage will be covered with 1/32" ply (in four sections) that will allow easy access to everything inside and provide further fuselage twisting strength. I used blind nuts in the firewall (at the far right of this picture) for engine mount installation. These are epoxied in place, and all fuel line and control cable holes are drilled in the 1/4" ply firewall before this step of the assembly.

Below you can see the initial test fitting of the rudder, nose landing gear, and the two canards. Brass tube assemblies go through the entire length of the rudder and canard surfaces. The rudder is then glued to the nose landing gear 1/8" hard steel rod, which will be controlled using a standard NLG steering horn inside the fuselage. The two canards are mounted out on the front of the nose using an assembly of three different size brass tubes to allow pivoting of the entire canard surfaces. Lots of surface area out there, so it will be interesting to see just how sensitive the pitch control will be on this plane. Both canards are controlled using handmade control horns and a pull-pull cable system that comes through the fuselage sides back by the fuel tank near the CG. As I indicated earlier, this plane will look like it is flying backwards. Next comes building the four pull-pull control horns from 1/32" brass sheet covered with 1/32" ply, and final full-up fit checks and the critical CG balancing.



The next picture shows the initial test fitting of the two wings to the fuselage. Between the wings are six fins, and they will eventually be covered, which makes the wing assembly look like an old box kite. How many of you made a box kite when you were a kid? They fly great. While the plans do not call for them, I'm going to install small 90-degree brackets at the back of each wing fin to help hold them in place. The front of each fin fits into a notch cut into the leading edge of each wing. The main landing gear were bent from 1/8" and 1/16" hard wire, and then finished with basswood which is attached using cord wrapping.



With the major build complete, I then accomplish a full-up fit check of all aircraft assemblies to include engine; fuel tank and lines; aileron, throttle, and canard servos; and all the other hardware. This step also allows me to determine the position of the final servo (rudder/steering) and the battery pack to establish a proper CG. Unlike most RC planes, the CG for this model is 5 inches in front of the wing leading edge, which is just forward of the red strap you see around the fuel tank. Next step is disassembly and start all the painting and covering.

Once you have confirmed everything fits as needed, you are ready to start final prep and finish. Disassemble the major subassemblies and finish sand all wood surfaces with fine sandpaper (220 grit or finer). Use a painter's dust cloth (this can be found at the local Lowes or Home Depot) and wipe down all the sanded surfaces. With this plane having under-camber airfoil surfaces, to ensure the covering stays attached on the bottom of the wings and canards I apply Coverite Ultracoat (local hobby shop again) to all surfaces where the Ultracoat film covering touches the wood structure. Shown in the final two pictures below, I used flat tan to make the model look like it has real silk covering, and the three colors on the rudder are for the French flag.

Install all the control cables and pull-pull control horns and cable assemblies. In the first picture below, note the receiver on-off switch on the left side of the fuselage. Install the motor mount and engine, pusher prop, fuel tank, receiver and battery, and double check your CG once more. Turn on your transmitter and the model receiver and verify all control surfaces move in the correct directions with proper throws. Make sure you complete a "Range Check" before your maiden flight.

I hope this build description helped you in your build of a unique model. Enjoy the fruits of your labor.