MADE IN THE USA

Information package $10

Hummingbird

A Self Launching Sailplane.

USA Made premium Short Kit offering from

Jerry Nelson R/C Keller, Texas

A 30% scale R/C sailplane of the Nelson Hummingbird built by Ted Nelson Co. in the 1950's. The Hummingbird was the first high performance self launching sailplane. Six were produced and sold.

48 HP engine and propeller retract forward.

Photo of subject aircraft.

Photo of Ted Nelson's personal Hummingbird. Wingspan 54 feet. The two place all-aluminum aircraft has a glide angle of 27 to 1 which was very good at the time. A Nelson 4-cylinder 2-cycle 48 HP engine produces 350 ft/min climb at a gross weight of 1200 pounds. Takeoff distance is about 700 feet at a climb speed of 58 MPH. Six were manufactured.

Our 30% scale Hummingbird is designed by Jerry Nelson from original three view drawings drawn by Harry Pearl, the designer of the actual aircraft. State of the art, computer assisted CAD solid modeling software, is used to design our model.

The 16-foot wing features two wing panels with each panel consisting of two approximately 48" wing panels for ease of transport. The Fuselage is also in two sections for ease of transport. The front section is about 24" long and the rear section about 72" in length. Stabilizers are removable.

The model is powered with a Saito 60 or 90 4-cycle twin attached to a 4130 steel tubing motor mount assembly. The engine retracts completely into the fuselage. Actuator for the retract system is the power unit of a Sears electric screwdriver.

Featured are scale spoilers and dive brakes, nose gear steering, and a brake on the main gear. The plexiglass canopy assembly is hinged on the left side and fully opens in a scale manner. Two full-figure 1/3 scale pilots can be installed. Engine retract doors, nose and tail cone are fiberglass.

The fuselage is built from LightPLy bulkheads and spruce stringers. Rear part is covered with .010" G-10 Fiberglass. Front part is sheeted with 1/8"x 1/4" balsa strips covered with fiberglass cloth and resin. Wing features two 1/2" sq. spruce spars and 1/8" LightPly ribs. Sheeting is .007" G-10 Fiberglass.

Full size plans, detailed on-line PDF file instructions with illustrations, and laser cut LitePly ribs and bulkheads will be offered. Fiberglass parts will be available. Some machined parts will probably be available as well.

Cost of drawings and laser cut parts and availability of them is not known at the time of this printing.

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Brochure: Date Revised: 5/23/11

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Full-Scale Iaascs Fury II

HISTORY OF THE NELSON HUMMINGBIRD

by Jerry Nelson

June 20, 2011

Dear Modeler:

My father, Ted Nelson, produced two self launching sailplanes in the 1940's. The Bumblebee and its production aircraft, the Dragonfly. These two aircraft were manufactured for my dad by Hawley Bowles in Southern California during the 1940's. The Dragonfly was based on the Bowles Baby Albatross, all wood structure with an aluminum tube for the rear part of the fuselage. The engine as a pusher was located behind the fuselage pod underneath the tail boom. My dad designed and produced a light weight 2-cycle four cylinder 25 horsepower just for the project. The Dragonfly was certified by the FAA as an auxiliary powered sailplane. This was a new category created by the FAA just for the Dragonfly. Nine Dragonfly's were built before production was stopped because of 1940's economic problems in the USA. Many other aircraft companies went out of business during these times.

The Dragonfly was an airworthy aircraft and easy to fly, but it wasn't a very good sailplane and had a marginal rate of climb under power with two people. After the Dragonfly program was canceled, one of the engineers on the Dragonfly project, Harry Pearl, approached my dad with an idea of a true high performance sailplane with a retractable engine. More horsepower would be required for a reasonable amount of climb under power. My dad decided to have Harry come to work for him to design a high performance self launching sailplane with a retractable motor. The aircraft would be called the Hummingbird. While Harry was designing the Hummingbird, my dad started modifying the engine for more horsepower.

In the early 1950's construction of the prototype Hummingbird was started. Wings were aluminum and the fuselage and tail group were from wood. The engine was now producing about 40 horsepower. A two place side by side and later a two place tandem version were built and flown. The tandem version flew very well and had excellent soaring and aircraft performance. Six all aluminum Hummingbirds were put into production. After more than 50 years when the aircraft were built, there is still one of the Hummingbirds (my dad's) in flying condition. It has over 3000 hours of flying time on it. Four are now in museums, the Smithionan Aero Space, Soaring Society of America, Heller Aircraft, and Southwest Regional Soaring.

While I was in high school, by dad taught me how to fly in his Hummingbird, N68582. After getting my glider license, I put in many hours of flying time in the Hummingbird. Took a lot of friends for their first glider ride.

Being an avid modeler for all my life, I always thought I would like to build a R/C model of the Hummingbird. Never did so for many reasons. I am not getting any younger, so I decided to design and build my R/C Hummingbird. In the last couple of years I have learned to use solid modeling CAD computer assisted drawing software and this software greatly makes the engineering and creating complex drawings required for the Hummingbird project much easier.

The design work work on the Hummingbird was started in April 2011. At the time of this writing I am about 85% finished on the engineering drawings.

Sincerely,

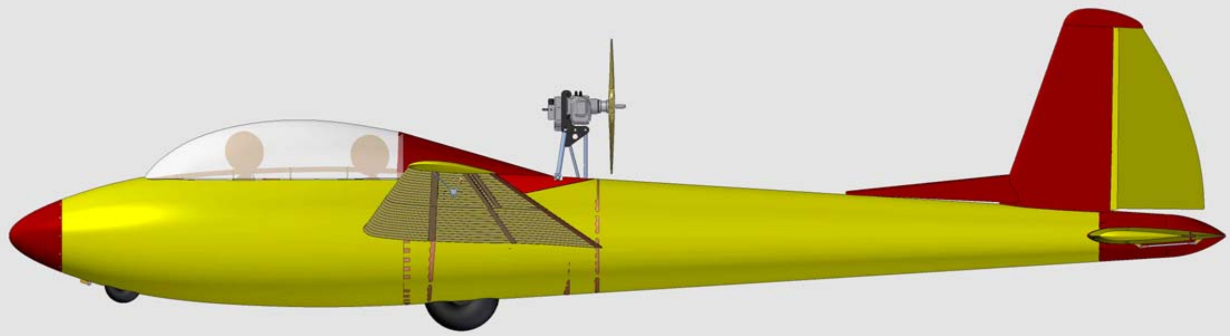
Jerry Nelson

Jerry Nelson R/C

Presenting our 30% scale model of the Nelson Hummingbird

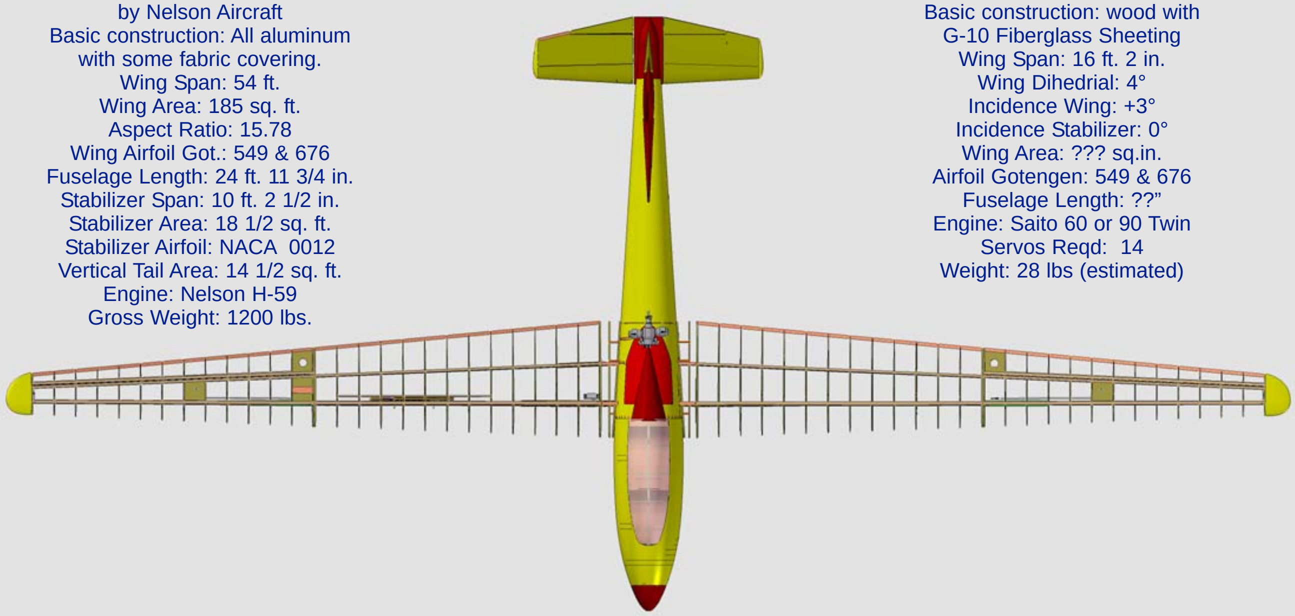
Subject Aircraft

Note: This information brochure is not complete. It will be constantly updated as we progress with the designing and construction of the prototype aircraft.



Nelson Hummingbird
Designed by Harry Pearl and built by Nelson Aircraft
Basic construction: All aluminum with some fabric covering.
Wing Span: 54 ft.
Wing Area: 185 sq. ft.
Aspect Ratio: 15.78
Wing Airfoil Got.: 549 & 676
Fuselage Length: 24 ft. 11 3/4 in.
Stabilizer Span: 10 ft. 2 1/2 in.
Stabilizer Area: 18 1/2 sq. ft.
Stabilizer Airfoil: NACA 0012
Vertical Tail Area: 14 1/2 sq. ft.
Engine: Nelson H-59
Gross Weight: 1200 lbs.

30% Scale Nelson Hummingbird
Designed by Jerry Nelson
Basic construction: wood with G-10 Fiberglass Sheeting
Wing Span: 16 ft. 2 in.
Wing Dihedrial: 4°
Incidence Wing: +3°
Incidence Stabilizer: 0°
Wing Area: ??? sq.in.
Airfoil Gotengen: 549 & 676
Fuselage Length: ??”
Engine: Saito 60 or 90 Twin
Servos Reqd: 14
Weight: 28 lbs (estimated)



This is a computer generated 3-view from our CAD drawing.

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Full-scale information:

The two place Nelson Hummingbird is the first high performance sailplane that could take off or land, without any assistance, at any airport. The nose wheel is steerable and a powerful brake on the main wheel allowed for controlled taxiing. Small outrigger wing tip skids with small wheels attached allowed for taxiing with one wing tip on the ground.

The Hummingbird was designed by Harry Pearl, a California engineer. The aircraft was engineered to meet all FAA regulations for a certified sailplane. Complete static testing of the airframe was done.

This is a photograph of Ted Nelson's personal Hummingbird. He flew this aircraft for almost 40 years and accumulated over 3,000 hours of accident free flying time in it. Engine on time was about 700 hours. Wingspan is 54 feet. Length 25 ft.. Gross weight is 1200 pounds.

The 48 HP Nelson engine has ample power to provide a rate of climb of 350 FPM with two people. Fuel capacity is 4 gallons. At full throttle, running time runs about 45 minutes. Engine also provides enough climb performance to reach an altitude over 12,000 ft. Maximum level flight speed is about 85 MPH.

It has an all aluminum structure designed for a load factor of 8 G's. The control surfaces are fabric covered as well as the area behind the rear wing spar. All riveting is flush with a few exceptions.


48 horsepower 2-cycle 4-cylinder engine weighs 50 pounds. It is a pusher configuration. Engine retracts forward using a hydraulic actuator. Doors automatically open and close during retract or extending operations.

The engine was designed and produced by Nelson Aircraft. It was especially designed for the Hummingbird. The engine is a four cylinder two cycle design. Crankcase is cast magnesium. Piston sleeves were not used. Instead the inside of the aluminum cylinders were treated with porous chrome. Rotary valves (2) were used for fuel induction. A special carburetor similar to a Fish automotive carburetor featured an automatic mixture control system while climbing. Engine weighed about 50 pounds. An electric starter was included as well as dual ignition. The engine was later certified by the FAA and the Military.

The engine retract system and engine opening doors are hydraulically actuated. The engine can be started by the pilot in the front seat by just pushing the start button. Of interest, a compression release system is used on the front two cylinders. By pushing a control button, compression is released on two of the cylinders during the engine start sequence. This allowed for a smaller, less weight, and lighter starter unit. Also took less power from the battery.

Performance of the Hummingbird is excellent. It was one of the best two place sailplanes before the fiberglass sailplanes became available.

Glide angle is 27 to 1. Stall speed is 48 MPH. Red-line airspeed is 120 MPH.

Spoilers and dive brakes are used for glide path control. The new at the time, full flying NACA one piece stabilizer featured large trim tabs for pitch control. The Hummingbird was the first civilian aircraft to use this new type of stabilizer. The Piper Cherokee aircraft later used a similar design.

Photo showing the engine doors open prior to retracting the engine. Doors are closed when the engine is extended or retracted

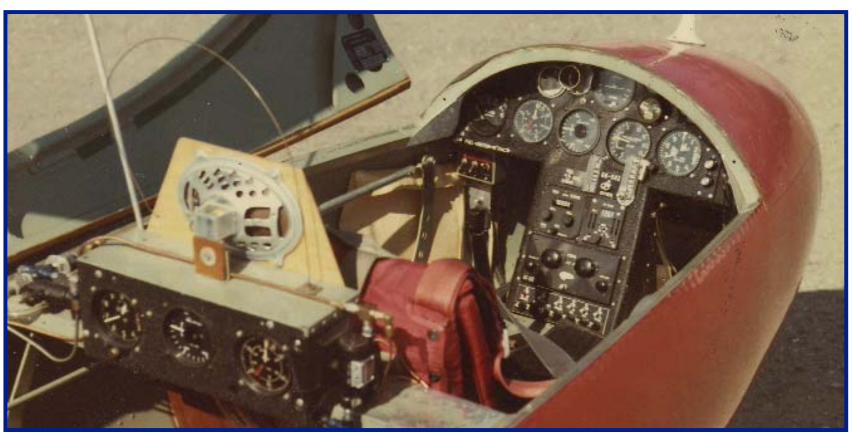
The wing leading edge was stiffened with Styrofoam placed between the ribs. The aluminum sheeting was then epoxied to the foam. This feature provided for a perfectly smooth airfoil contour during thermaling where the wing would be bent slightly due to the slight G-loads. Common with most aluminum aircraft of this type would be the minor deforming or wrinkling of the leading edge sheeting between the ribs when the wing is slightly bent.

Highest altitude flight in a Hummingbird was 33,000 feet. The longest soaring distance (power off) was about 325 miles.

Six of the all metal versions were built during 1953 and 1955. One is still in flyable condition at the South West Soaring Museum in New Mexico. One is in the Simithionan Aero Space Museum in Washington, DC. Another in the Soaring Society of America Museum in Elmira, NY, and the other one in the Hiller Aircraft Museum in Palo Alto, California.

Shown is Ted Nelson in his Hummingbird. He did most of his flying at his private glider port at his home in Livermore, California.

State of the art avionics and instrumentation is installed. The Hummingbird was the first sailplane to have an altitude reporting transponder installed. The FAA required a transponder when flying over 18,000 ft. in the mountain wave conditions in the mountain areas just east of the San Francisco air traffic control zone. Oxygen equipment provided supplemental oxygen for two people for wave flying flights over 12,500 feet.

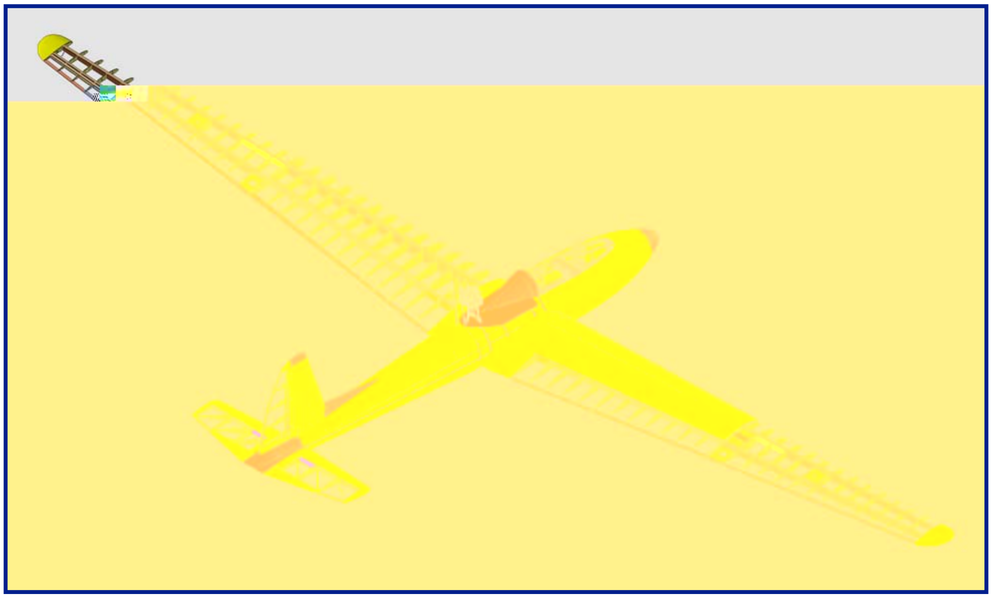


Aircraft has fully equipped instrumentation and avionics equipment. Also oxygen equipment for high altitude flying. Even has a altitude reporting transponder.

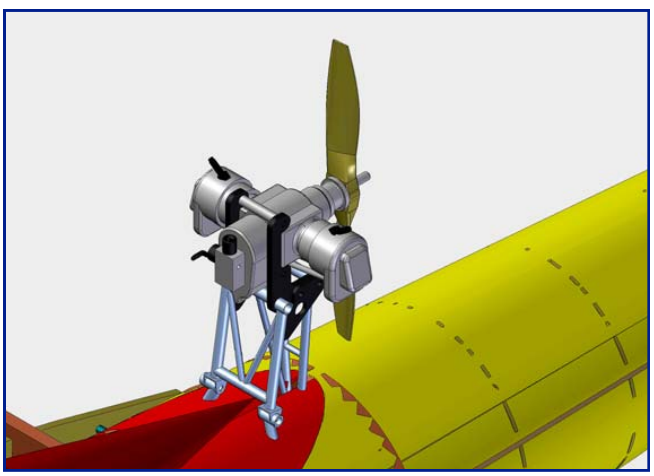
Design considerations for our 30% scale Hummingbird.

The concept of retracting a model R/C engine into a sailplane fuselage by remote control, is a major engineering challenge. When the engine is shut off in flight, the propeller must stop vertically so as to be able to go into the fuselage. The only practical way to do this is with a two cylinder engine. While in flight, the twin cylinder engine will usually stop in the same position as the pistons approach compression. The air stream will also cause the propeller to rotate to the piston's compression point.

There is only a limited selection of twin cylinder engines available. Most are much to big for a model powered sailplane. As compared to most scale and aerobatic models, very little power is required to obtain a takeoff and have a modest rate of climb.



This is a work in progress illustration, as of 6/20/11, of our 30% Hummingbird. The darker yellow color indicates G-10 fiberglass sheeting. Bright yellow (wing tips) are balsa wood covered with light weight fiberglass cloth. Tan color indicates spruce. A green color are the LightPly parts. Red color is fiberglass.



Close up representation of a Saito 60 4-cycle twin. Motor mount made from 4130 steel tubing silver soldered together.

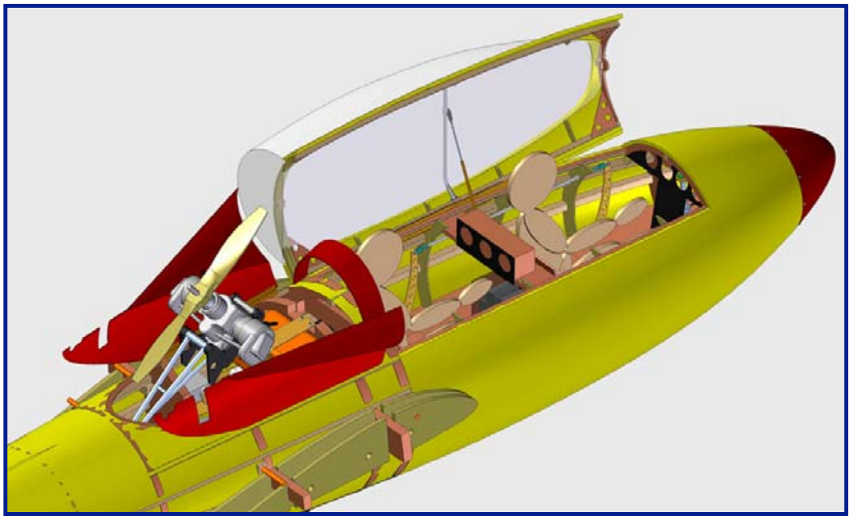
Sailplanes have a minimum amount of drag and have a very efficient high aspect ratio wing. The full-scale, 1200 pound 54 foot wing Hummingbird, only had a 48 HP engine so that it could take off in 700 feet and take two people to 12,000 ft in about 45 minutes. Fuel capacity is only 4 gallons. The main purpose of the engine in a self launching sailplane is to eliminate the need for a tow plane to get the sailplane into air to find lift created my mother nature. High rates of climb, cross country travel, and aerobatics are not to be designed for.

The Nelson 2-cycle engine ran at 4,000 RPM and used a small propeller. The fuselage shape around the engine retract area is designed just large enough to enclose the retracted engine and its propeller.

A 30% scale was selected for our model Hummingbird. This scale provides a large model, but one that can be disassembled for transport in a normal SUV or station wagon. Two piece fuselage is provided for with the rear part of the fuselage under 6 feet. The 16 foot wing is made with four plug in sections that are less than 4 feet in length.

Now back to the engine selection problem. Our 30% scale Hummingbird has room for a 11 inch propeller. The engine is a pusher which also requires a pusher type propeller. Fortunately Zinger Propellers have 11-7 and 11-10 wood pusher props. The only twin cylinder engines we could find to use these two props was the Saito 60 and 90 4-cycle twins. Although some what expensive, these are both excellent engines.

Another factor in the selection of the engine is the width of the fuselage opening where the engine will be placed when retracted. The Saito 60 and 90 twins will fit into the 30% scale opening for the engine.



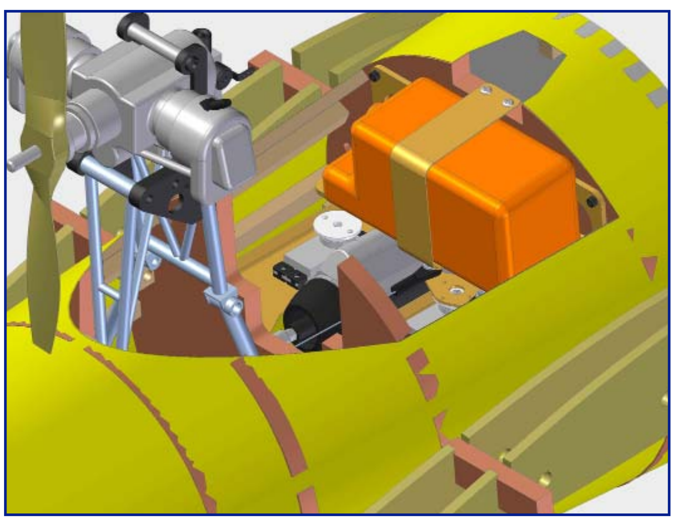
This illustration shows the engine retracted half way into the fuselage. Doors are fully opened. Individual servos operate the doors. Also shown is the scale canopy fully opened to show a detailed cockpit interior. Two 33% Simulated pilots shown.

There would not be room for silencers for the two cylinders. The Saito 4-cycle twins are very quiet and should not create any noise problems at most flying fields.

There should be sufficient power from the Saito 60 twin to allow take offs from hard surface runways and have a reasonable rate of climb. Will be using a Saito 60 (already have one) in our prototype aircraft. If there isn't sufficient power available, a Saito 90 twin will be installed.

Take offs from a grass runway could be a problem. To solve this problem, a bungee chord is attached to a fuselage tow hook. The stretched bungee chord will provide the initial acceleration to get the model out of the grass and airborne. The bungee cord tow hook will be located on the bottom of the fuselage. A R/C tow hook is located in the nose and is operated with a servo. This tow hook is for optional airplane towing. A fixed tow hook is used for bungee cord use. If the R/C hook were used for a bungee cord launch and if the release mechanism failed, the still attached bungee cord could cause the aircraft to crash. The bungee cord attached to a fixed hook will simply disegage when the bungee cord becomes slack.

Planed is a propeller location sensor to determine that the propeller is in the correct position prior to retracting into the fuselage. This is a Hall sensor attached to the engine and is activated with two magnets 180 degrees apart that are attached to the engine's prop driver. Some what like a Hall sensor used in spark ignition systems. If the prop is not at the vertical position after the engine is shut down, a relay will open shutting of the power to the retract power system and door servos.



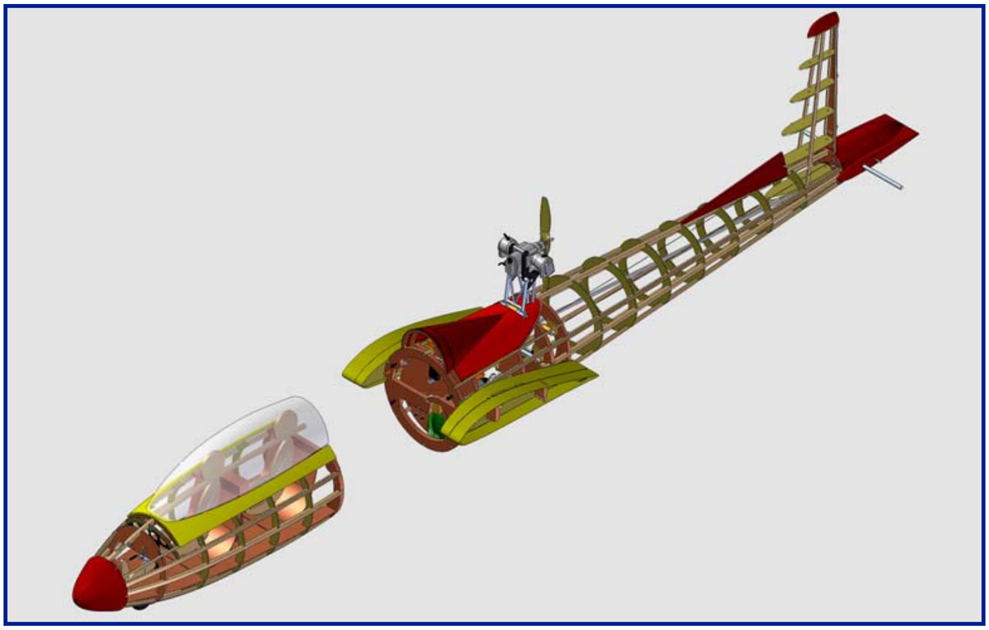
Opening of fuselage for the retracting of the engine. 12 ounce Dubro gas tank is mounted on an aluminum angle. Gas tank is removed when attaching wing panels.

Fuselage Details:

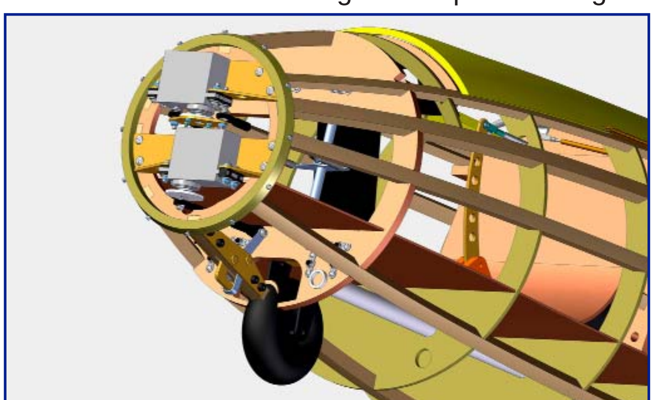
The fuselage is made in two pieces that are bolted together. The separation point is at the front bulkhead of the rear part of the fuselage. This is done to allow the fuselage to be transported some what easier. Rear portion of the fuselage is slightly less than 6 feet. Front portion is about 2 1/2 feet.

The front portion has two servos inside the fiberglass nose cone. One servo for the steerable nose gear. The other for the R/C tow hook. The batteries are also located in the front portion. Scale cockpit details are provided including the spoiler/brake control, control sticks, rear rudder petals, detailed instrument panels, and a simulated full-scale battery box that contains the retract motor batteries and back up batteries for the R/C equipment.

The front and rear fuselage has spruce stringers and LightPly and birch plywood bulkheads. The rear part is covered with .010” G-10 fiberglass. The front part is covered with 1/8” x 1/4” balsa strips that after being sanded to shape, are covered with 2 to 3 layers of fiberglass cloth and epoxy resin.



Fuselage is made in two sections that are bolted together at the front bulkhead of the rear portion of the fuselage. This is for ease of transport. Bulkheads are mostly 1/8” LightPly with the main bulkheads made from birch plywood. Rear part of the fuselage is sheeted with .010” G-10 fiberglass. Front part covered with 1/8” x 1/4” balsa wood strips sanded to shape and covered with fiberglass cloth and resin. Shown is the partially competed stabilizer and vertical fin and rudder assemblies.



Nose section of the fuselage has two servos attached to the front bulkhead. Upper servo is the nose gear steering servo. It operates a pull-pull cable with shock springs. Lower servo is the R/C tow hook servo. Nose gear attached to next bulkhead.

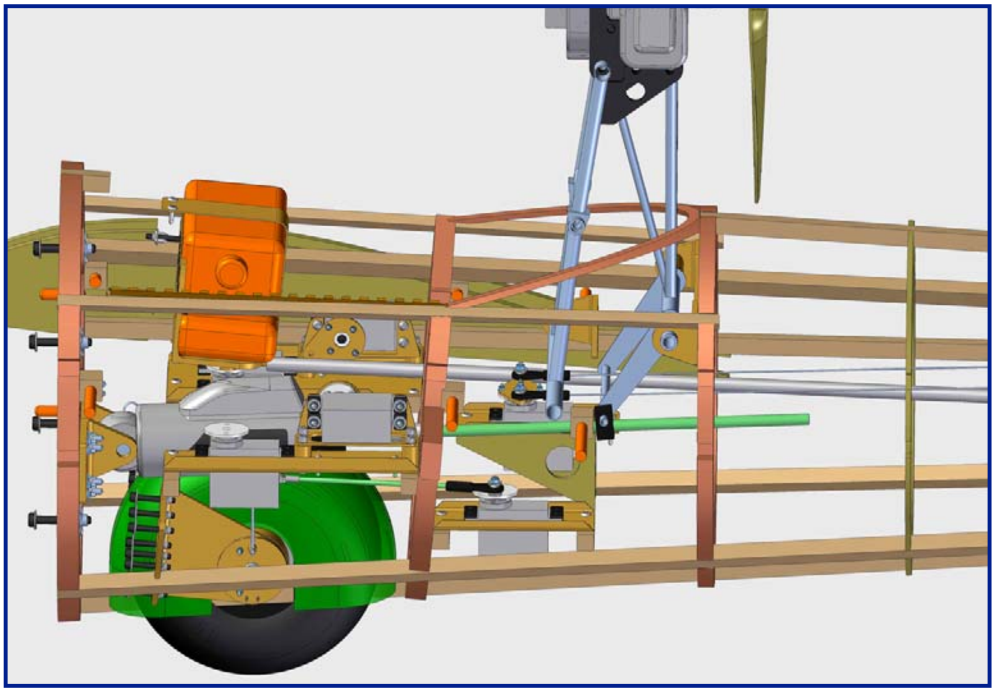
A simple fuselage jig is constructed to hold the bulkheads in place during assembly.

Canopy is 1/16” Plexiglass stretch formed over a pattern. It is hinged with a miniature piano hinge. It is held in position with a rotating lock mechanism on the right side of the canopy frame. Canopy is somewhat heavy, but the weight of it is needed for the proper center of gravity location.

The rear 3/16” birch plywood bulkhead is the attach point for the all-movable stabilizer and for the rear spar of the vertical fin.

The rear fuselage servos are mounted in five sperate servo trays. They are easy to make with normal shop tools. The servo trays are made from 1/32” aluminum. The use of servo trays allows easier removal of the servos during installation and removal for replacement if necessary.

In the rear section of the fuselage, there are seven servos all located in the same general area. This is the area that is exposed when the engine doors are opened. This is the only access to the servos. There isn't much extra room left over after the servos and their linkages have been installed. Also the engine and it's gas tank take up quite a bit of space as well.



Rear fuselage side view without the sheeting, shows the installation details of the various items placed into the fuselage. Note that the #2 bulkhead just behind the #1 front bulkhead is hidden from view. Some of the stringers are also hidden from view. A 12 oz. Dubro gas tank is placed above the 1/3 scale Dubro Cub wheel. A fiberglass cover is made for the wheel to keep dirt and water from going inside the fuselage. Bottom servo is the brake servo that operates our own design mechanical brake system. The servo above the brake servo and located in the center of the fuselage is the rudder servo that directly operates the pull-pull rudder cables. On each side of the fuselage and above the wheel are the two engine retract door servos. To the left center is the Sears electric screw driver drive mechanism that turns a 1/4" dia. threaded rod which inturn goes into a nylon block that drives the engine mount up and down. To the left of the drive unit is the throttle servo. Not shown clearly are the two elevator servos mounted to the right side of the retract actuator.

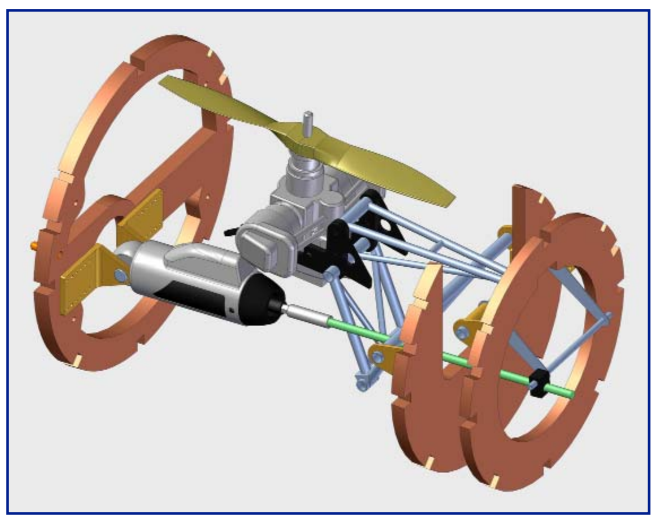
Locating all these items is somewhat simplified because the fuselage frame is completely assembled prior to installing all of the equipment.

After the frame assembly is completed, all of the servo trays with servos, linkage, brake assembly, the engine mount, and the engine retract system, can all be installed and checked for proper operation.

Also the inner wing assemblies, main wheel (a 1/3 scale Dubro Cub wheel). and the gas tank are fitted in place. With some difficulty, all of the items can be removed at a later date.

After everything is in place and functioning properly, then the G-10 fiberglass sheeting is attached.

The entire servo and mechanical systems appear to be very complex, however if one looks at each system individually, the various systems and components are simple make and install.



View of the engine retracted without the control linkage, wheel assembly, and gas tank. Note that the driving block attached to the retract control arm has moved rearward.The electric screw driver actuator is attach to the front birch ply. bulkhead.

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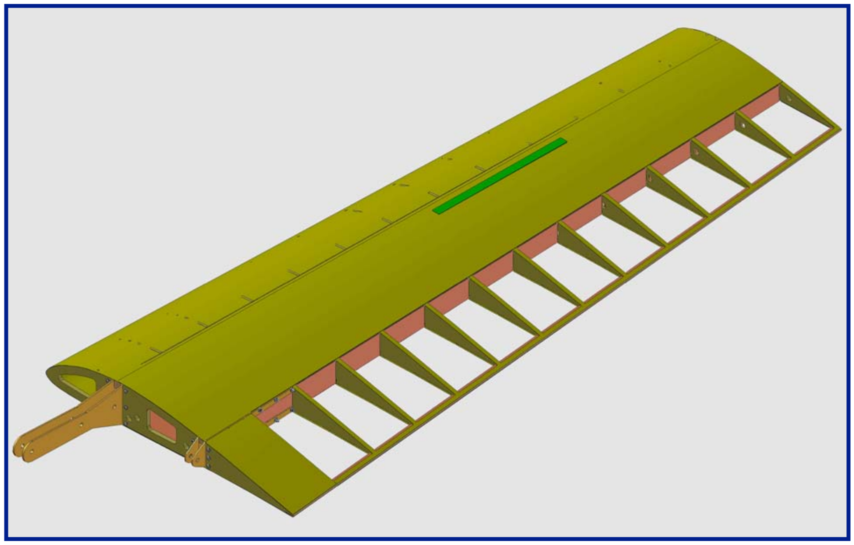
Wing Details:

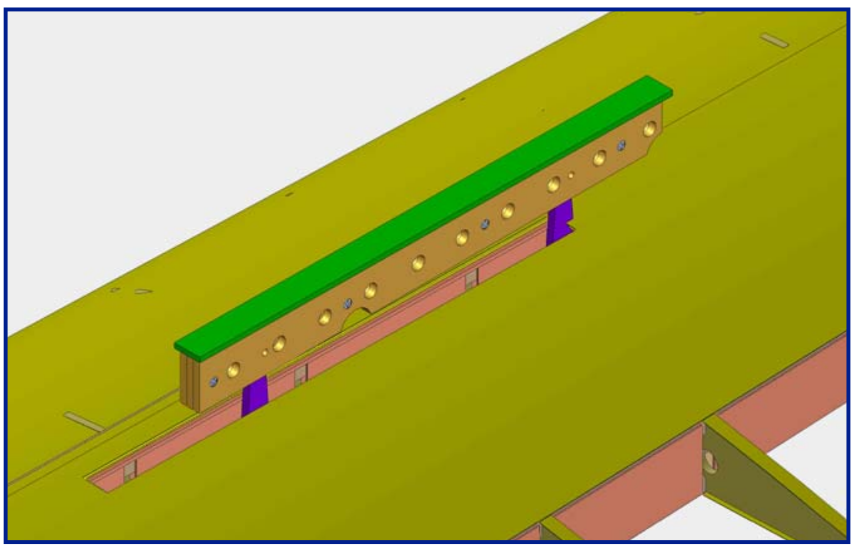
Each wing panel is made in two sections that are easily removable. The wing sections sperate at the inside edge of the ailerons.

The wing panels are joined together with a 3/4” dia. aluminum tube about 12 inches long. The tube goes into a pair of fiberglass tubes that are about 6 inches long. The tubes are flush with the end ribs of the inside wing panel and outer wing panel. A 1/4” hardwood dowel keeps the wing panel from rotating. 4-40 flat head screws secures the aluminum tube to the spars.



The inner wing panels are sheeted with .007” G-10 fiberglass sheet. Three sections are used, leading edge, center, and trailing edge with cap strips. Fabric covers the rear part of the wing panel. Top of the spoiler is from bass wood and is easily sanded to a perfect contour of the airfoil for a flush surface.

The inner wing panel has two 3/32” 7075T-6 aluminum main spar fittings bolted to the 1/2” sq. spruce spars with 4-40 screws and nuts to the main spars. The ends of the wing fittings attach to a 1/2” birch plywood fuselage bulkhead. The fittings go about 1/2 way across the bulkhead. Three attach points are used. The inner and outer (close to the root of the wing panel) attach points are 1/4” dia. aircraft bolts and nuts. The middle attach point is a 1/4” aircraft clevis pin. Clevis pin is used here since it is difficult to attach a bolt and nut due to space problems.



Spoiler in the extended position. It is made from two outer pieces of 1/8” aluminum and a center piece of 1/8” balsa. The bellcranks (2) are 1/8” Micarta.

The 1/16” aluminum rear spar fitting is attached to the rear 3/8” x 1/4” spruce spars with 2-56 screws and nuts. Only one 1/4” bolt and nut are used.

There is about a one inch gap between the root rib and the wing faring assembly that is attached to the fuselage. This gap gives access to the wing spar bolts and nuts. A .007” G-10 fiberglass gap cover goes over the gap.

Both spars have 1/32” plywood shear webs on each side of the spars.

The inner wing panel has spoilers and bottom dive brakes built into the structure. The spoilers and dive brakes are moved outward with a parallelogram type bellcrank linkage. A servo located at the root of the inner wing panel has an a 4-40 threaded rod connected to the inner spoiler/dive brake bellcrank

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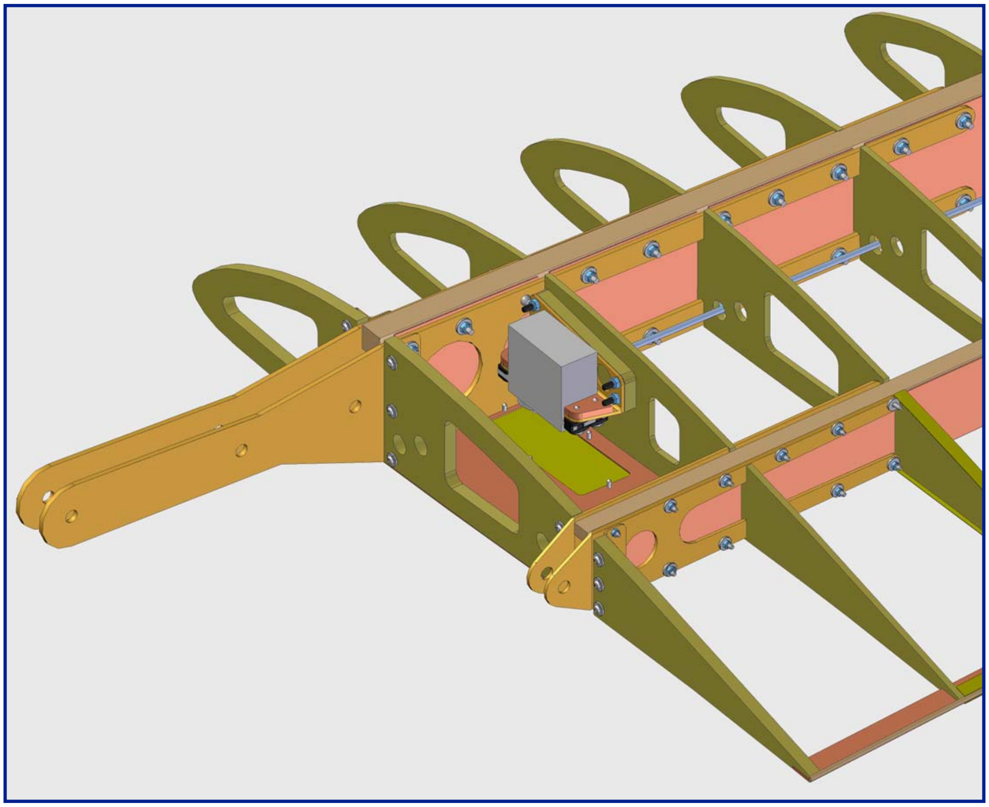
assembly.
The outer wing panel has scale top hinged ailerons. Five miniature piano hinges about one inch long are used. Ailerons are built in place while the wing panel is being built. They are cut out later.

A scale wing tip skid with a small nylon wheel is attached to the end of the outer wing panel main spar.

Both the inner and outer wing panels are built on two 3/8" dia aluminum tubing rods. The rods are attached to a particle board jig base. The wing panel with the rods in place, can be taken off the jig and rotated 180 degrees so as to allow work on the other side of the assembly.

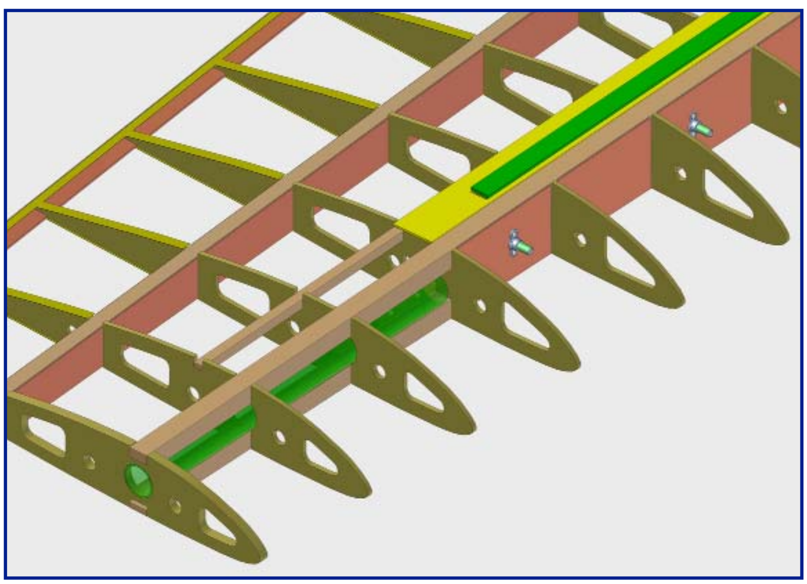


The main spar fittings are attached to the 1/2" sq. spruce main spars with 4-40 bolts and miniature elastic stop nuts. The rear spar fittings are attached to the 3/8" x 1/4" spruce rear spars with 2-56 bolts and miniature elastic stop nuts. 1/32" plywood shear webs on both sides of the main are rear spar. 1/8" LightPly ribs have lightening holes. Spoiler servo is mounted on a 1/32" aluminum servo tray attached the the side of the #2 rib. A flush hatch is located on the bottom of the sheeting for access to the servo .Note the three attach points for the main spar fittings.

The wing panels are sheeted with .007" G-10 fiberglass sheet. The rear section of the inner panel is fabric covered. The exposed ribs have 1/4" wide .007" G-10 cap strips strips

The ailerons are fabric covered.

The aileron linkage is completely hidden from view. Flush G-10 fiberglass hatches are provided to allow removal of the spoiler and aileron servos.



Outer wing tube (green color) is a fiberglass tube 3/4" inside diameter. It is epoxied between the two front spars. Yellow item is a sheet balsa wood fairing strip that is sanded to be flush with the rib contours to allow a perfect fit for the attachment of the G-10 fiberglass sheeting.

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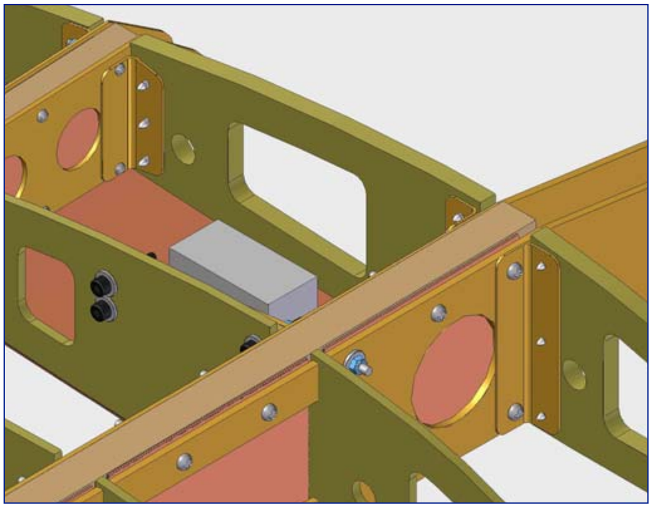
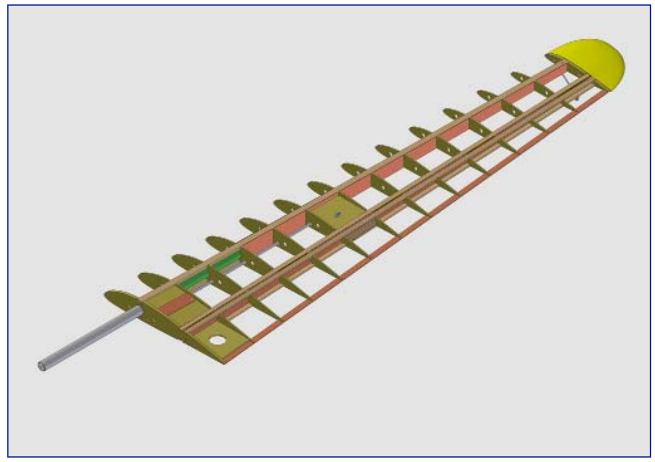
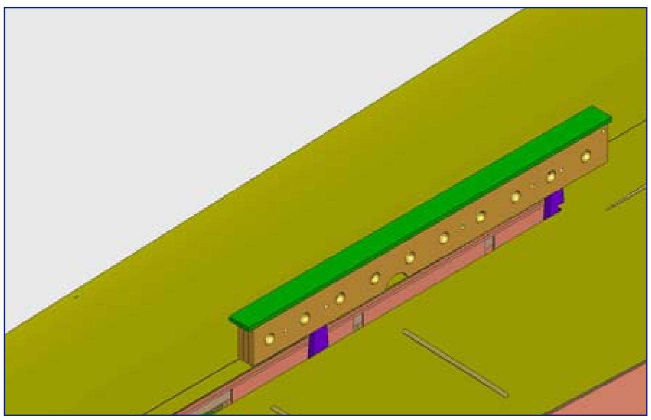


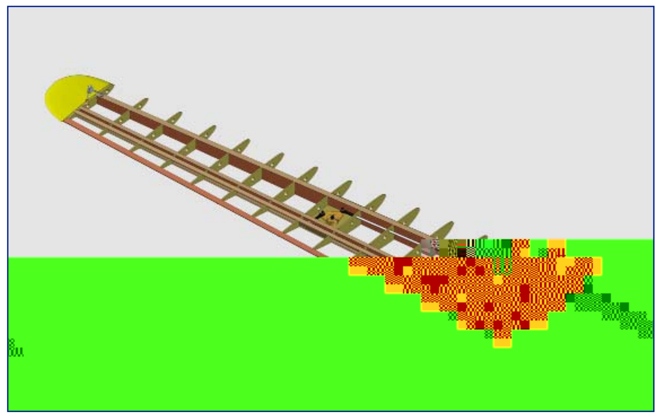
1/32” Aluminum angles are used to attach the root rib to the spar fittings. All other ribs are glued in place.



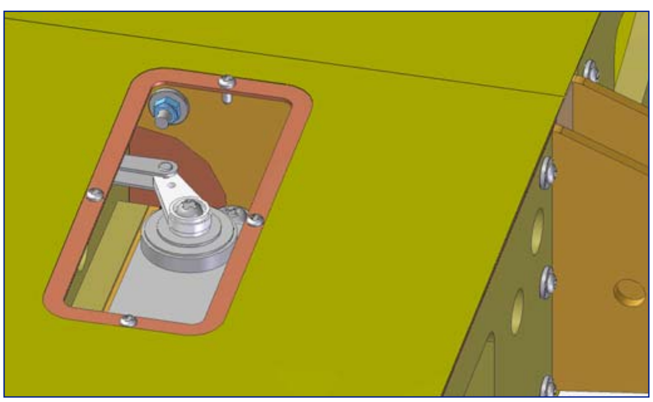
Top view of outer wing panel. Ailerons are hinged on the top surface with scale piano hinges. Note aluminum tube to join outer wing to the inner wing assembly.



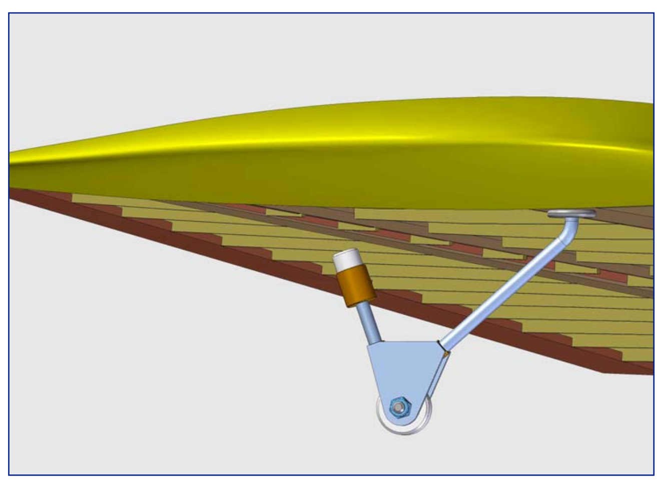
Bottom View of inner wing panel showing bottom dive brake extended to full position.



Bottom view of outer wing panel. Ailerons are built as part of the outer wing panel. They are cut out after the complete assembly is finished. Note 3/4” I.D. fiberglass joining tube (green color) for the aluminum tube.



Bottom view of the inner wing panel showing the spoiler servo mounted on an aluminum servo tray. Spoiler servo access hatch is shown removed. A 1/32” plywood sheet brace is attached flush with the inside bottom of the G-10 fiberglass sheeting to allow the attachment for the hold down screws. Hatch is held in place with four #0 or #1 sheet metal screws.



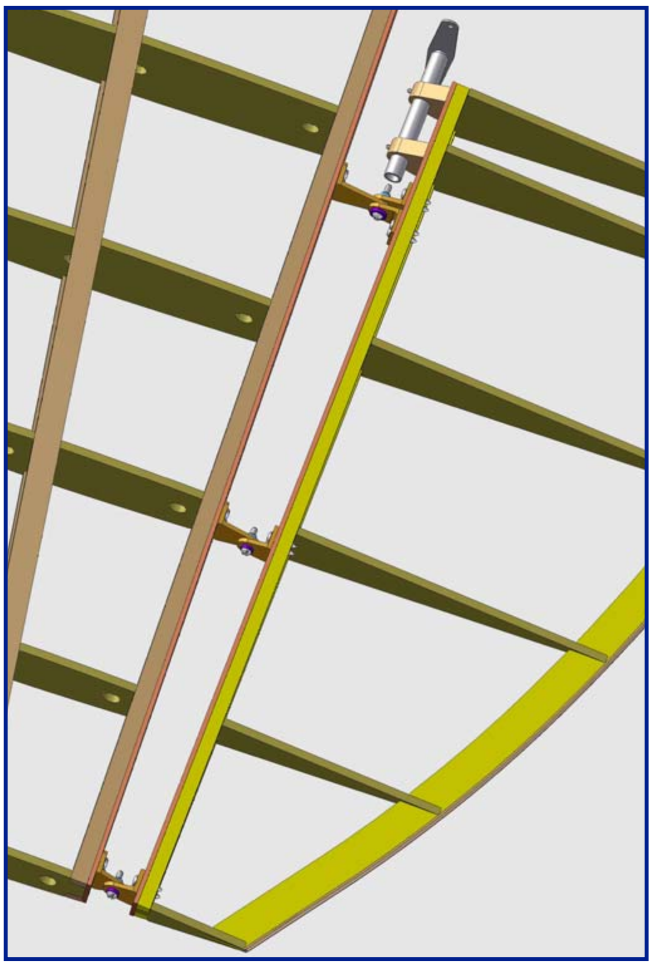
Wing tip skid assembly. Small replaceable nylon wheel allows use on hard surface runways. Eraser stop on end of skid.

Tail Group Details:

The rudder, vertical fin, and stabilizer are all built in a similar manner. 1/8" LightPly ribs, spruce spars, and are sheeted with .007" G-10 fiberglass. The tips are balsa wood covered with light weight fiberglass cloth.

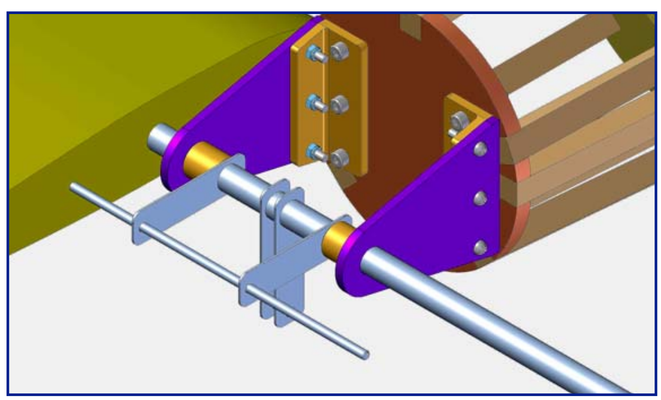
The rudder hinge design has a centerline hinge that is streamlined to the contours of the airfoil shape. Hinges are made from 1/16" aluminum angle and have nylon bushing bearings. Rudder can be removed after construction from the vertical fin. The rudder control horn is fully enclosed into the structure. A pull-pull cable system operates the rudder.

Ribs are 1/8" LightPly. Spars are 1/8" x 1/4" spruce. Vertical fin shear web is 1/16" birch plywood. Rudder control horn assembly is made from 4130 steel sheet and tubing silver soldered in place and held in to the mounting brackets with two 1/16" steel roll pins. Fin and rudder are sheeted with .005" G-10 fiberglass sheet.



Rudder hinges made from 1/16" aluminum angle with nylon bushings. Hinges attached with 2-56 screws and miniature elastic stop nuts. Rudder is removable after construction is finished. Trailing edge of rudder is 1/16" birch plywood.

The movable stabilizer is easily removed from the 5/16" diameter 4130 steel support tube. The support tube has 1/32" steel control horns silver soldered to the support tube. A 5/16" aluminum tube with full-scale aircraft 6-32 Rod Ends is attached to the control horn. A 1/8" diameter piano wire drive pin silver soldered to the control horn engages the root rib of the stabilizer that rotates the stabilizer.



The stabilizer support tube is 5/16" dia. 4130 steel tubing that is held in place with 1/8" aluminum brackets. Nylon bushings are installed into the bracket. Control horns are 1/32" 4130 steel. Drive pin is 1/8" dia. piano wire.

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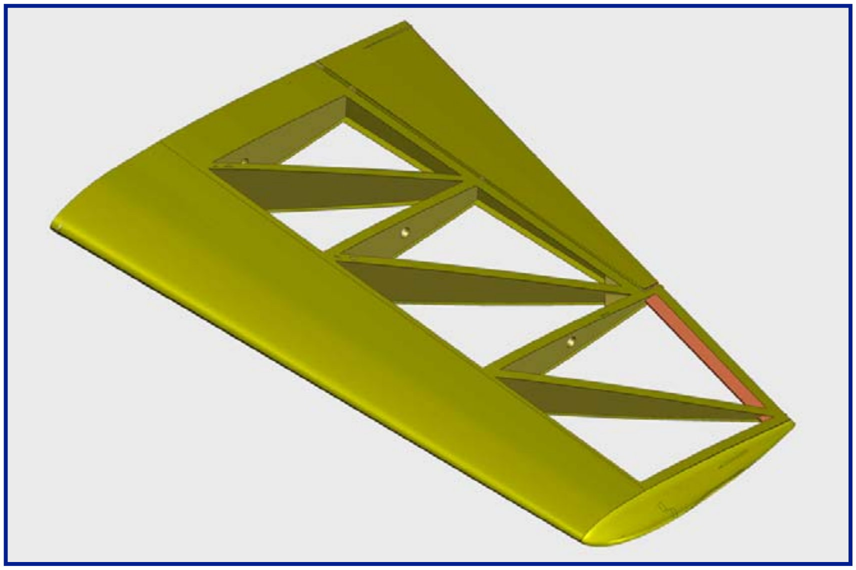
The stabilizer is sheeted with .005" G-10 fiberglass in front of the spar. Rear portion is fabric covered.

The right and left hand stabilizer ribs are symmetrical and are built the same except for the location of the piano hinge. The hinge is located in a scale manner on the top surface. The hinge is held in place with #1 flat head sheet metal screw.

The servo tab is not functional. The scale NACA full flying stabilizer used on the full-scale Hummingbird is not directly connected to the stabilizer. A pull-pull cable system in the cockpit move the servo tab. While in flight, the pilot will move the servo tab position to set the desired airspeed. The control stick will move to a hands off position for the airspeed that was set.

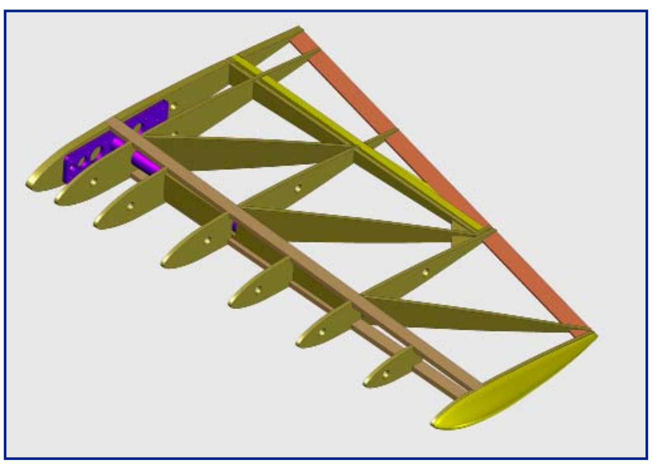


Stabilizer has a NACA 0012 symetrical airfoil which makes the right and left hand units the same. The servo tab hinge is on the top. This makes the servo tab assembly into a right and left hand unit.

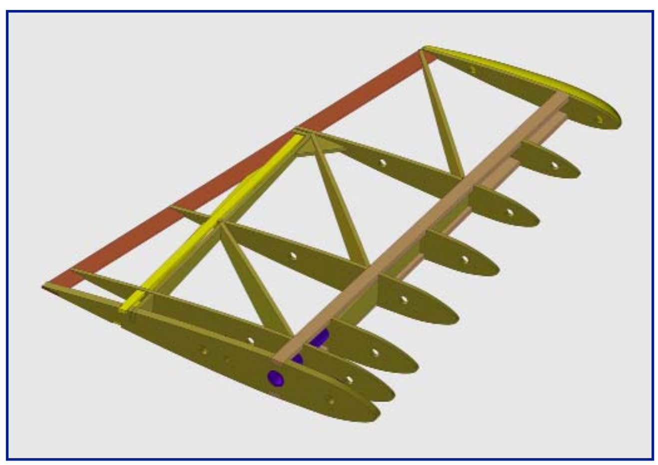
In our model Hummingbird the elevator servo system sets the position for the stabilizer for the desired incidence setting. For scale appearance reasons we have installed a somewhat scale linkage that looks realistic, but the actual servo tab is held in place at a fixed position at all times.Stabilizer ribs are 1/8" LightPly. Spars are 1/8" x 1/4" spruce. Trailing edge is 1/16" birch plywood. Tip is balsa wood.

Assembly is built on a partical board jig that supports two 1/4" dia. aluminum tubes that the ribs are inserted into. The scale diagonal ribs are installed after the assembly is removed from the jig.

Leading edge is sheeted with .005" G-10 fiberglass sheet. Cap strips and servo tab also employ the same G-10 sheeting.



Stabilizer ribs are 1/8" LightPly. Spars are 1/8" x 1/4" spruce. Trailing edge is 1/16" birch plywood. Tip is balsa wood. Assembly is built on a two 1/4" dia. rod jig.



Epoxied between the two spruce spars is a 5/16" I.D. fiberglass tube that the 5/16" steel support tube is inserted into. A 1/16" Micarta drive pin support attaches to the root rib.

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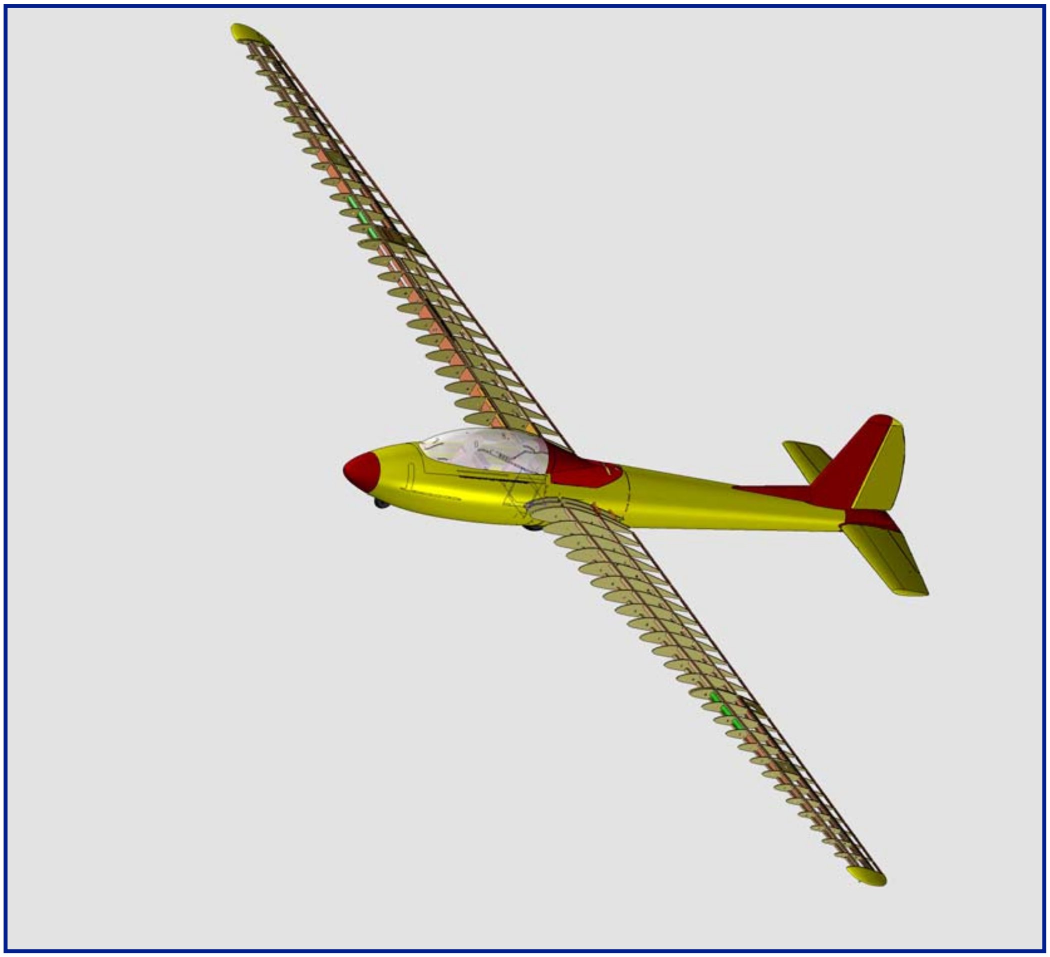

Our 30% scale Hummingbird is a great looking sailplane. One can find it hard to beleive that the graceful full-scale Hummingbird was designed and built in the early 1950's. With the engine retracted, it is even more beautiful.

Ordering and Priceing Information:

The following items will be offered for sale; Price and availability unknown at this time.
Full size drawings to construct major components.
Laser cut ribs and bulkheads.
1/16" Plexiglas Canopy.
Fiberglas nose cone.
Fiberglass tail cone.

Some mechanical items may be available depening on interest for these items. These items are aluminum servo trays, engine mount assembly, wing spar fittings, spoiler/dive brake assembly, main wheel brake assembly, and other items that are requested. Idealy I would like someone else to fabricate and sell these type of parts.

Available on-line at no charge, will be the detailed instructions and parts that would be suitable to be drawn on a 8 1/2" x 11" paper format.

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