

CLIPPED WING

Introduction

I met Duane Cole through our mutual friend, Mike Clark, while at the annual Confederate Air Force Airshow two years ago. As I watched Duane's flying I was impressed with his performance and with how easily his plane would adapt to R/C.

The full-size clipped wing Taylorcraft flown by Duane Cole is a 1938 model B-50. It was modified in 1950. The modifications include reducing the wingspan by reshaping the tips and "clipping" the inboard end of each wing panel. Duane chuckled as he told us he bought the plane for \$995.00 and has grossed over \$300,000 with it. He has flown it in all 48 contiguous states and 7 foreign countries including back of the Iron Curtain. With it he has won 2 National championships and was a member of the world acrobatic team.

For this project I obtained a set of 3-views and a brochure on

the current Taylorcraft from Taylorcraft Aviation Corp., 14600 Commerce Ave., N.E., Alliance, Ohio 44601. Then I made a table of dimensions to compare the stock model to the clipped wing version and to the Quarter Scale which I desired. From these comparisons I drew the outline shapes for the model.

Actual construction of the original prototype spanned only eight days from scratch to the model many of you saw at Toledo in 1979! The reason for this is that my wife helped immensely. She did both rough and fine sanding while I glued and carved.

We had originally intended to fly the plane after the Toledo show but we didn't because inclement weather prevented it until too close to time for the Southwest Modelers Show. Being basically lazy I just didn't want to chance it, so I didn't. After the Southwest Modelers Show was over I installed Kraft FM Radio in the plane and headed for the flying field to test hop my creation.

Test Flight Report:

The very first flight on my Quarter Scale clipped wing Taylorcraft was something to behold. I had run and adjusted the engine during the afternoon prior to test flight day. Now I had completely assembled the airplane at home and brought it to the field in my van. I unloaded the bird, fueled it, gave it a walk-around pre-flight and control check and finally pronounced it ready to go.

It was hot, windy, and no shade nearby when we began to "prop" it. Not much hand cranking on a 2.6 cu. in. engine with an 18" prop is necessary before you shut down and check out the problem spots. Since we had primed and choked the

engine our thought was ignition. Remove the spark plug, ground it to the engine, turn prop by hand, reveals no spark, hence no combustion, thus engine wasn't running.

There followed a shut down, tear down and inspection, minor maintenance to restore spark ignition followed by lengthy reassembly --- all in the mid-afternoon sun. The experience gave credence to Kipling's "mad dogs and Englishmen in the noonday sun" theory. The point of my telling you this is twofold: it sets the stage for what follows and it should be a lesson to you. Don't do the same thing I did. If extensive maintenance is required don't try to fly immediately after tiring yourself to the point of being less than **totally** cool and rational.

Now, the engine started quickly once the spark was restored and to say it roared to life is conservative. The jump from piped 60's to the 2.6 cu. in. Super Hustler was almost more than I could absorb. The thrust and vibration levels are immense. As the plane was positioned for take-off I mentally filed the flight plan in my mind to be sure I knew what I wanted to do. Just forward on throttle, right rudder to counteract torque, build speed, back pressure on elevator, climb to 150', turn left and enter a racetrack holding pattern.

What really happened was quite different. When I advanced the throttle the tail was

TAYLORCRAFT

immediately airborne. Back stick and more right were needed but the "don't snap roll" alarm in my head screamed "easy now, easy, easy . . ." Suddenly its airborne but not smooth — pick up the wing — aileron command shows up the first great problem. The ailerons are so incredibly sensitive that the plane immediately rolls 45° right — correction gets 45° left — Holy Cow, ease up on ailerons, I think, but at nearly the same time I ease up on elevator and discover that nose pitches over too quickly. Oh no, elevator too sensitive as well.

Here's the situation. A 20 pound plane is rapidly disappearing while performing non-symmetrical 3 dimensional oscillations and I'm the only guy who can control it. I wanted the take-off to be hands off like everyone else writes about.

I just looked at the untrimmed plane and thought how nice a fishing trip in the Rockies would be!

Back to reality — I swam the Taylorcraft up to 100 feet altitude and called for full up trim, full right aileron trim, then full right rudder trim in that order. Mike Clark was at my side and put in each trim for me. It's smoother that way. I then flew it around in large circles and figure eights until I was calm enough to plan the approach and landing.

As I throttled back and turned to final approach heading I had to fight a tendency to turn right. No time to wonder about that —

just hold heading, more left, heading, left, descend, left, whoops! What's hanging down between the wheels? Oh no! The 3/16" wire main strut has vibrated loose. Oh well. Continue the landing more left, looking good, 6', 3', 2', wouldja look at that drift, 1' — touchdown.

In the tall grass. Roll-out is real short. Grass hands and grass arms grabbing the landing gear. Nose heavy plane goes up, up, up, and over. Complete stop. On its back. The only damage was to the 18/10 prop. Now I could easily have left out this experience and said it flew hands off. Instead, let us learn together.

All that grief was caused by too much fidelity to scale. I had all the details but didn't need to be so accurate. Only minor changes were necessary, fortunately, and one at a time, here were the adjustments: change prop from 18/10 (scale diameter) to 20/8. Result was much less torque and/or P-factor — aileron trim back to neutral. Change aileron throw from scale movement of 23° each way to less than half that.

Thank goodness, my Kraft KP-7C has rate switches. This was simply a matter of turning a screwdriver. Same thing for the elevator. Moving the Center of Gravity back will cure the noseover. Slight rudder trim is necessary to compensate for the vertical fin being out of alignment.

It takes a while to get used to these big Quarter Scale planes. The rewards for more effort are scale-like speeds and sounds.

By the fourth flight of the model we had the trim just where it should be and the take-off was truly hands off — smooth and graceful. The plane is quick and crisp. It does nice point rolls. Spins like a top (even noseheavy) and for brute power I just pulled the nose up from level flight and when vertical commenced to snap roll. Got 3 complete before it fell over the top into a spin with easy recovery and nice landing. Build it. You will love it.

Preparation:

Before assembly it would be wise to fabricate all the many parts for two reasons. First, by so doing you will become more familiar with the plans and understand the assembly better. Secondly, you won't be held up in the assembly process while you make another part or two!

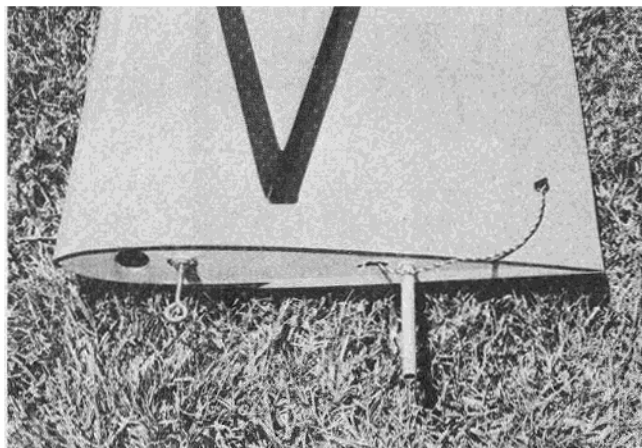
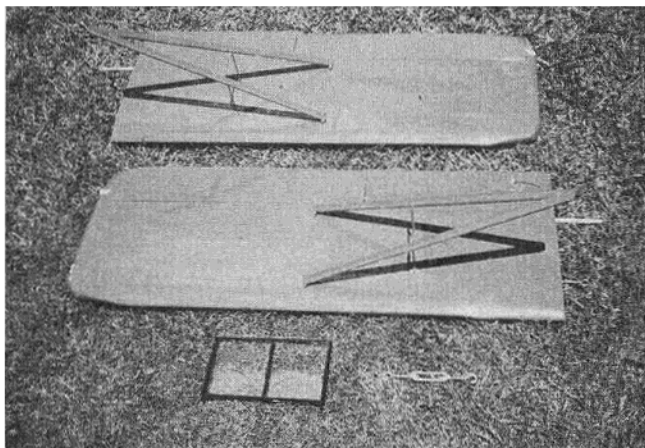
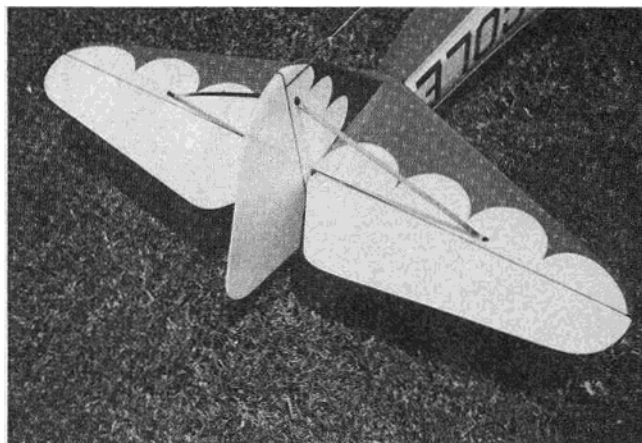
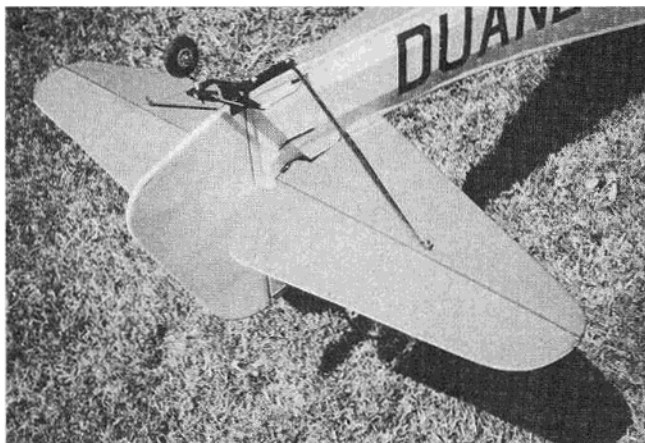
Beginning at the tail and working forward you can make the tailwheel assembly or buy it ready-made. C.B. Associates, Inc., 21658 Cloud Way, Hayward, Calif. 94545, manufactures such an item. It is Stock No. 5510 HD, called the Heavy Duty Tailwheel Assembly and lists for \$9.95 at this writing. If you choose to make your own, I can't be of much help because I used the C.B. version. In either case you must cut the mount from 3/16" ply, drill the mounting holes and install blind nuts on the top side.

The main landing gear is composed of 3/16" diameter music wire and 1/8" aluminum sheet grade 6061 T6, .125 thick which is 4 1/2" x 27 1/2". The center section is 10" wide and the four mount bolt holes are 1" inboard of the edges so they form the corners of a rectangle 2 1/2" x 8". The amount of taper is shown on the side view and is best cut on a band saw if you don't have access to a larger shear. Sand the edges and round the corners then drill the 3/16" diameter axle holes. Finally, drill the spade bolt hole 1/2" back from the leading edge on the centerline. Bending the gear to shape is best done on a sheet metal brake press. The proper angles are

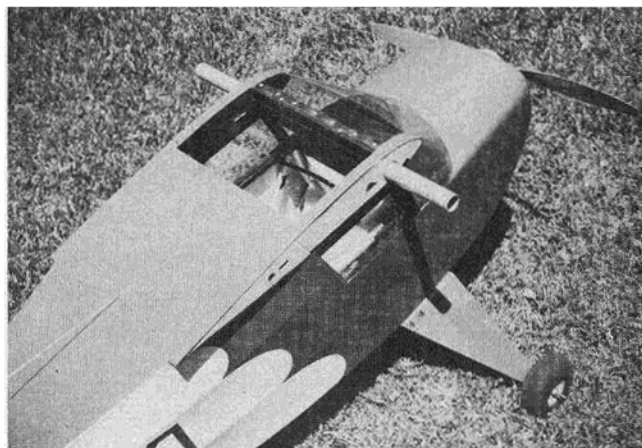
shown in the front view. The wheel pants are for looks only and can be made of either fiberglass or balsa plywood. We don't recommend flying with them on unless you have smooth paved runways. Otherwise, they get nicked or damaged in rough surfaces or they get clogged with grass, dirt, snow, etc. To make them with balsa and plywood, begin by cutting the core pieces of balsa thick enough to clear your tires. Note: we used the Du-Bro 4" tires which have to be pumped up. This makes them wider so be smart and pump up the tires first. If you have trouble finding 1 1/2" balsa it is okay to laminate whatever you have to reach the desired thickness. Next, cut the 1/8" plywood sides (they overlap the wheel openings by 1" front and back), epoxy in place and sand to shape. The top view of the finished pant should resemble a fish with blunt tail. This shape is dictated by the size of the wheel cut-out.

The cowl pieces are shown in the side and top views. Again, if those sizes of wood are unobtainable they can be pieced together. Cut 2 firewalls of 1/4" aircraft grade plywood. They

Designed in Quarter Scale, Duane Cole's famous clipped wing T-Craft makes a natural for the "Big Is Beautiful" crowd. Can be powered from a .91 to a 2.6 cu. in. By Jim Simpson.



TOP LEFT: Underside of tail showing C.B. tailwheel assembly. Goldberg long horns were used on each elevator. TOP RIGHT: Top view of tail assembly showing 3/64" x 5/16" steel straps for braces. ABOVE LEFT: Wing panels ready to attach to fuselage. ABOVE RIGHT: End view of wing panel. Rear aluminum tube plugs into center section. Front hole accepts tube built into center section. Note servo extension cable for servo in each wing panel. RIGHT: Large aluminum wing tube built into center section. Note spade bolts on landing gear for wing strut attachment. Smaller wheels shown on Taylorcraft are for use with wheel pants.



will be laminated to prevent warps. Cut the landing gear floor of 1/4" aircraft grade plywood. Cut the instrument panel of 1/8" sheet balsa. With the exception of the cabin center section the fabrication of the fuselage and tail is complete.

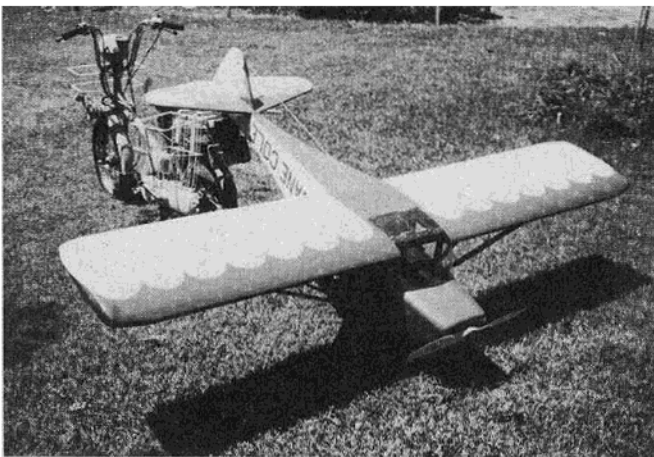
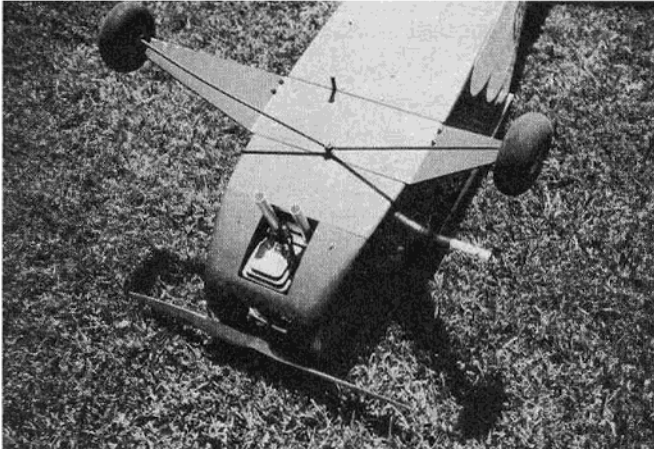
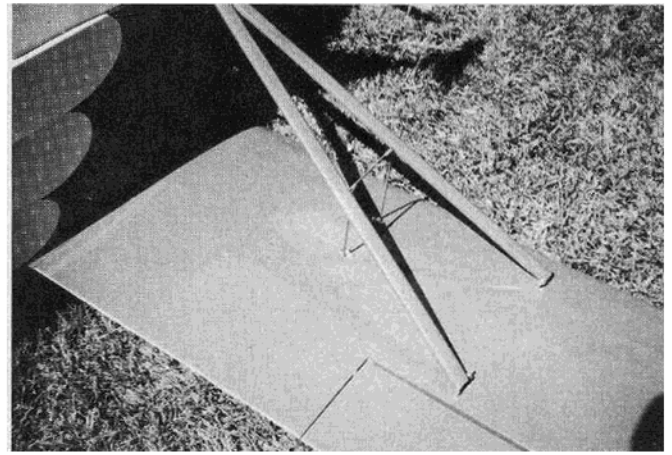
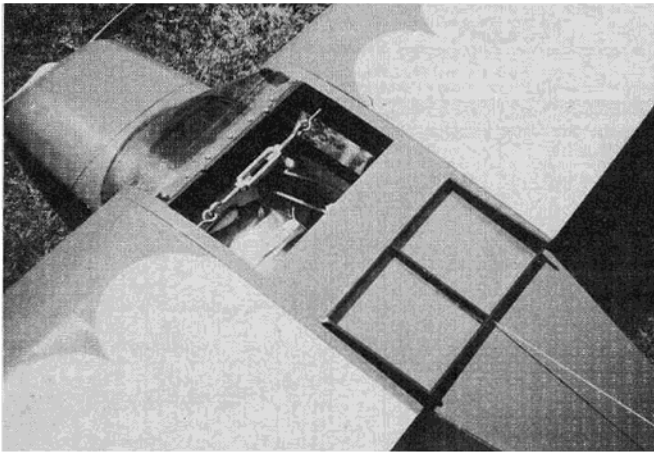
The cabin center section and the wing parts are fabricated simultaneously. The first step is to make an accurate template (from the fuselage side view) of the wing airfoil. Locate and drill the spar holes. Remember that the center section has a 1/2" tube secondary spar and the wings have 3/8" tube spar holes. If you do not have access to shop equipment you may want to consider cutting and shaping the ribs in 3 sections. That is Left Wing, Right Wing, Center Section. Notice that the wing root ribs are identical to the center section ribs **except** rear spar hole size. Therefore, you cut 4 ply and 2 3/8" balsa ribs and then drill, stack and sand them as one piece. It is wise to use the center section aluminum tube spars as guides. These spars are cut to length by the top view and sanded/deburred by hand.

Cut, sand and deburr the two sets of wing spars. Sanding

removes the oxide and makes a better bonding surface for white glue so use rough sandpaper. There are 13 balsa and 4 plywood ribs in each wing panel. You may wish to cut the blanks to a size of 2" x 1 1/4" drill them, and then stack them as one piece and bandsaw them to shape. Finish sand the ribs to final shape. Cut seven balsa ribs and one plywood rib to accommodate the aileron spar and aileron. Make four more aileron ribs of 1/8" balsa. Cut the 1/4" ply aileron sub spar to shape. Cut the plywood bellcrank and servo mounts and the strut mount pads from 1/8" aircraft grade plywood. That finishes the fabrication process.

Construction:

Before we glue or cut anything, let's pause to reflect on the finished product, or the desired outcome, if you will. If you have not been around Quarter Scale planes you are going to have a tough time comprehending what I am about to say. Nevertheless, believe me. These big engines shake the fool out of everything — so think about that as you make every joint and install every piece during the assembly. I assure you I



TOP LEFT: Wings attached using large turnbuckle. Cover hatch bolts in place which makes easy visual safety inspection. TOP RIGHT: Strut ends are bolted between two spade bolts. Be sure to use elastic stop nuts at these points. ABOVE LEFT: On its back showing off landing gear and engine opening in cowl. ABOVE RIGHT: Original started out with scale size prop (18 x 10) but had to be changed to a 20 x 8 for best results. LEFT: You meet the nicest people riding a "Honda."

have changed my thinking in order to develop this plane and from time to time I will share the changes with you.

If you have no experience with full size planes it will be difficult to make this next point, but I will try. This model should be treated like a full size plane. For example, use elastic self locking nuts or lockwashers and safety wire, on the bolts and nuts. Give the plane periodic and pre-flight inspection to be sure everything is secure. Remember this as you build each piece. Those of you who fly real airplanes will readily understand this point. Simply stated — "Build it right because you can't pull over to the roadside for repairs if something goes wrong during flight."

Let's begin with the tail, then do the fuselage and finish with the wings. Cut the 3/8" x 3/4" balsa pieces that outline the elevators and pin in place over the plan which has been covered with waxed paper. If you make accurate cuts (like in a mitre box) you may use either cyanoacrylate or aliphatic resin glue with good results. Carefully cut the 3/8" square cross pieces and glue them in place.

Notice that each elevator is separate and will **not** be interconnected. Each will be independently operated by its own servo and pushrod. The servos are electronically connected with a "Y" cord. This redundancy permits some degree of continued operation if one elevator servo fails. The elevators can be sanded to shape on a belt sander or with a large flat sanding board and the 3/16" music wire provided for the landing gear. Simply tape the wire to the edge of your workbench and with the trailing edge of each elevator next to it sand in the taper.

Build the horizontal stabilizer over the planform. Pin it in place over the plan covered with waxed paper. Make sure all joints are glued and secure.

Pin or tape elevators in place on stab after the glue is set and sand the assembly to shape. Make the edges perfectly round to simulate the real one which is made of aluminum tubing or steel rods.

The rudder is to be built exactly the same as the elevators were built and sanded likewise. Notice that the fin trailing edge

is laminated of two pieces of 3/8" square and that one extends down to the tailskid while the other ends even with the bottom of the horizontal stab. This will help to align the fin at final assembly. The small curved dorsal fairing is carved of scrap 3/8" balsa and fitted after the tail surfaces are joined to the fuselage. Other than that, the fin is assembled and sanded the same as the other surfaces.

Carefully mark the locations and glue in the 5/16" dowels which will receive the tail brace bolts. Drill holes in the center of each dowel to accept the brace bolts. Install RK-3 hinges at the locations shown by the Figure X. We recommend you remove the hinge pins and substitute the 1/32" piano wire if you prefer to have the surfaces removable.

The fuselage assembly begins with the construction of two identical fuselage sides built over the side-view plan which you have covered with waxed paper. First, cut the two basswood landing gear longerons to the shape shown. Then cut two wing saddles from 3/8" sheet balsa. Use large pins or small nails to secure one of each piece in place. Now cut the top longeron of 3/8" basswood and pin in place to follow the curve as shown. **Do not** glue it to the wing saddle piece. That will be glued **after** the cross pieces are installed. Cut the bottom longeron to shape and glue in place. Pin or nail it to conform with the bottom curve. It is not necessary to put the pins/nails through the wood. And last, cut and glue into place the two basswood uprights that connect the landing gear trunion to the wing saddle. Starting at either end add the remaining uprights and diagonals as shown. **Do not** glue the 3/8" balsa upright to the wing saddle. It will be glued after the crosspieces are installed. **Do not** glue the 3/16" square basswood stringers in place until the crosspieces are installed. When completely dry remove this side from the plan and build another side identical to this one. Upon removing the second side from the plans, carve and sand the taper at the aft end into each side. Be careful to make one right and one left side.

Build the wing center section over the plan's top view to be sure of alignment. Glue one 3/8" sheet balsa rib to one 1/4" ply rib. Do it again for the opposite side and make sure of a right hand and left hand assembly. Mark the location of the trailing edge and then glue the 1/8" sheet ribs to the 3/8" balsa. Now assemble the ribs and spars. Glue the spars in place with white glue. Rotate them to work the glue into the joint. Glue in the trailing edge and crosspieces. Be sure the shim between the main spar and the basswood crosspiece fits flush to both. Add the 1/8" sheet planking between balsa crosspieces and trailing edge at both top and bottom. When it is dry, sand it to shape and set it aside for the moment.

Epoxy the two 1/4" ply firewalls together, align with masking tape and stack books or bricks on them to insure that they remain flat. Next, lay out the plan top view on a flat, true surface and cover with waxed paper. Be sure the 1/4" ply landing gear mount plate is symmetrical then secure it in place over the plan. I used nails for this. Select a basswood scrap 10" long and place it in reach. Epoxy the firewall to the landing gear mount plate and nail the scrap in front to hold the firewall in place. Now epoxy the two sides in place and secure the curve with nails alongside the basswood trunion to hold curve

in place. Add a 3/8" sq. basswood crosspiece at the instrument panel position and glue the panel to it. Epoxy and clamp the triangular 1/8" plywood gussets in place inside the framework between firewall and landing gear plate. Epoxy the 3/8" x 3/4" basswood crosspiece between the sides at the aft end of the bottom hatch. Pause and check to be sure the sides are vertical and aligned. Set the crosspiece at the top aft end of the wing saddle in place but **do not** glue at this time. Notice the sides curve inward between trailing edge of the wing and leading edge of the stab. Use rubber bands or clamps to draw them inward. Glue the tail posts together using a right triangle or square to make sure the tailpost is truly perpendicular. Working from rear to front cut, fit and glue all crosspieces and diagonals in. Notice as you go along that the top corner longerons swing outward over the wing saddle. Now, fill and glue that joint and the crossmember together. Trim the longeron smooth and sand flush with the wing saddle. Cut and glue in place with four basswood uprights that connect the landing gear plate to the wing saddle. It is necessary to notch the forward uprights to clear the 1/8" ply triangular gussets.

Find the 7/8" aluminum tube and a 3/8" aluminum wing spar and center both in the tubes in the wing center section, then set the center section in place and use the tubes to insure that it is square and true. If necessary, trim the wing saddles to insure a flush fit. When satisfied, epoxy the center section in place, and remove the tubes when dry. Add the 1/8" sheet balsa planking between the firewall and instrument panel. Remove the fuselage from the board and turn it upside down.

Mark the location of the main landing gear holes, drill, and bolt gear in place. Glue the 1/8" sheet balsa in front of the gear. Trim the 1/8" plywood bottom hatch to size and install with sheet metal screws. Add the 1/8" balsa crosspiece aft of the hatch. Glue a 3/16" balsa stringer along the centerline from the balsa cross piece to the tailwheel mount plate which is installed at this time by notching the longerons and then epoxying the mount plate in place.

Turn the fuselage right side up and add the 3/16" square basswood stringer on top of the fuselage. You may notch the wing center section trailing edge to receive the stringer. Run it down flush with the stab fairing. Now add the 1/8" sheet balsa planking on each side of the fuselage forward end and around the side windows. Notice the window frame's outline is relieved to accept the Lexan glass (approx. 1/16") where it will fair in smoothly with the planking. Now, add the fuselage side stringers by notching them to be flush with the planking. Also, glue them in flush with the tailpost.

The cowling pieces can be glued in place and shaped as shown if you don't want it to be removable. An optional cowling installation would be to mount the engine directly on the firewall. Next, cut an inverted U-shaped 1/16" plywood former to fit flush with the firewall and which would clear the engine when pulled straight forward. Then build the cowl to fit on the plywood, and glue it in place. The 1/16" plywood can then be fastened to the firewall with six #2 sheet metal screws. A word of warning about closing in the front of the cowling, be sure the hole in the bottom is at least 30-50 percent larger than the

CLIPPED WING TAYLORCRAFT

Designed By : Jim Simpson

TYPE AIRCRAFT

1/4 Stand-Off Scale

WINGSPAN

88 Inches

WING CHORD

15 3/4 Inches

TOTAL WING AREA

1380 Square Inches

WING LOCATION

High Wing

AIRFOIL

NACA 23012

WING PLANFORM

Constant Chord

DIHEDRAL, EACH TIP

1 Inch

OVERALL FUSELAGE LENGTH

64 Inches

RADIO COMPARTMENT AREA

(L) 16" x (W) 10" x (H) 9"

STABILIZER SPAN

30 Inches

STABILIZER CHORD (incl. elev.)

8" Average

STABILIZER AREA

240 Square Inches

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

7 Inches

VERTICAL FIN WIDTH (incl. rud.)

8" Average

REC. ENGINE SIZE

.91-2.6 Cu. In.

FUEL TANK SIZE

33 Ounces

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

5

CONTROL FUNCTIONS

Rud., Elev., Throt., Ail., Choke

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage Balsa, Ply and Basswood

Wing Ply, Alum: Tubing & Balsa

Empennage Balsa

Wt. Ready-To-Fly 14-20 Pounds

Wing Loading 22-23 Oz./Sq. Ft.

intake holes on the front, and that baffles are installed to direct the airflow through and over the finned area of the engine cylinder.

Laminate the 1/8" balsa and 1/4" ply root ribs, then drill holes for servo cable and eyebolts. Install eyebolts and secure with locknuts. Epoxy nuts to rib.

The wing panels can both be built over the same wing plan. To do this you simply build one right side up and one upside down. The plan is an aid to rib location. Cover it with waxed paper. Lay out the ribs in the proper order (ply, balsa, balsa, ply, etc.) and cut as necessary to accommodate the wing spar. Trim the two outboard rib front ends to conform with the length shown on the plan.

Slide the ribs onto the spar in the proper order. Use scrap balsa to support spars such that rib barely touches work surface. Measure distance from spar end to work surface and make sure it is the same for both ends of each spar. Glue the ribs to the spar with **white glue only**. If you're quick you can rotate the spars to work glue into the joint. When dry, add the leading edge, trailing edge, sheeting and planking in that order to the side which is exposed. (**Do not** remove structure from board until this is complete.) Add the capstrips and then remove from board and add remaining sheet and capstrips. Glue the tip in place and sand to shape. Clean out the holes for the aileron hinge wire and install the brass tubing at each end of the wire, with the 3/32" wire in place. Epoxy a piece of 1/8" plywood 1" x 2 1/2" between the ribs, centered above the inboard piece of aileron hinge tubing and epoxy tube to the plywood. Be sure the aileron hinge wire extends all the way into it while you measure, then bend the L or J shape at the outboard end. This will be embedded in the tip block. Glue or bolt it in place when finished with the plane. Don't depend on Scotch tape to hold it in place because it won't.

Secure the wing to a flat building surface with the trailing edge flush. Build the aileron in place using scrap balsa as shim stock to determine placement of end ribs. Carve the leading edge to shape shown on the wing cross section. Glue in the leading edge, ribs, trailing edge and capstrips in that order after arranging on the aileron wire the hinge tubing. Glue the tubing to the ribs with white glue. When dry, sand to match wing contour and such that aileron moves freely up and down in the aileron well.

Tape the aileron to the wing at the trailing edge so that it is rigid and immovable. Study the control system carefully and then install it as follows: First, operate the aileron servos on the Y harness to insure proper direction of movement. Mount the servos in the wing root as shown. Your access hatch may be either top or bottom. (Top is easier.) Cut and bend the 3/32" music wire to shape and then install your favorite adjustable fastener at the servo end. **Caution** — remember the high level of vibration and increased strength required: Don't use a fastener that depends on a screw to hold it in place. Next, cut and bend the pushrod to proper length and assemble both pushrods to the bellcrank and then bolt the bellcrank into position on the 1/8" ply plate. Be sure there is no bind on the system before you glue it in place. The attachment of aileron to pushrod as shown on the plans is close to scale but is very difficult. If you prefer to use standard horns you may epoxy them in place but be sure to use heavy duty components. As shown on the plans, you sand the 2 plywood plates to shape, drill, and install counter-sunk screws. Drill for pushrod bearing at the joint. Cut a U-shaped slot to clear the ball joint, then remove the top piece and epoxy bottom piece in place. Add capstrips and be sure it is secure. Install the bearing, pushrod, and top lock block in that order. Now remove the wing tape and adjust the aileron throw to 1/2" up and 1/2" down as measured at the trailing edge.

Drill the 1/8" ply strut mount pads and install blind nuts and spade bolts. Epoxy in place and when dry drill a hole through pad into each spar and install a #2 sheet metal screw to insure a mechanical connection to the spar. Next, drill and install blind nuts in the jury strut mount pad; glue it in place. Now, do the other wing exactly the same way.

Covering And Final Assembly:

We recommend that you cover the components and then do the final assembly. If you prefer to do it vice versa skip to the later paragraphs but refer to this one. MonoKote is perfectly acceptable; it worked nicely on the original prototype. Because this craft is an open structure, I cannot recommend the other plastic films unless their tensile strength is equal to, or higher than, that of MonoKote. Of course, an iron-on such as Coverite will also do well and when painted would give a very realistic finish.

It is best to cover the larger pieces first and the smaller ones last. The real aircraft is an off-white, almost cream color, with dark red trim. I used white and red MonoKote. Cream and maroon might do as well. Cover the fuselage bottom in red, the sides up to the cabin windows in white and the top in red. Notice the paint outlines are on the plans so in order to cut scallops I placed two pieces of MonoKote face to face, or back to back, under the plans, pinned it all down and cut along the outline with my knife. Result is even scallops cut all at once. Be sure to poke millions of pinholes in the underneath MonoKote before adding the trim color layer. That will minimize trapped air bubbles. The bottom of wings and tail are red and top colors are shown on the plans.

When completely covered/painted the final assembly can begin with bolting the landing gear in place. Set the fuselage upright on the landing gear. Set the stab in place and mark the area that contacts the fuselage. Cut covering away from this area. Set fin in place on stab, mark contact area and remove covering from that also. Now, epoxy all of the tail group to the fuselage.

Insure alignment of the vertical fin by holding a straightedge on each side and comparing the marks at end of straightedge; on top of fuselage they should be centered. Insure stab alignment by measuring from each tip hinge line to a center point on the wing center section trailing edge. Next, measure, cut, and drill the steel strips which form tail bracing. Bolt them in place as shown on plans. Don't forget to use self-locking nuts.

We used a Kraft KP-7C radio and mounted the whole thing on two 3/8" x 3/4" basswood crosspieces which were epoxied onto the wing saddle bottom edge. We mounted the KPS-15 II servos between these rails in Kraft servo mounts. The three servos on the right side were connected to the tail surfaces with pushrods made of 3/32" wire and 3/8" square basswood. The two servos on the left side were connected to the throttle and choke with flex cable pushrods. **Do not** mount the ignition micro switch to the structure without less than 1/2" foam insulation. The solid state ignition is mounted on the cabin floor with plenty of foam insulation. The tank is mounted, centered below the Center of Gravity, inline with the carburetor. The filler tube can be made to come out the fuselage side and the overflow out the bottom.

Insert the 7/8" diameter spar carrythrough and slide wing panels in place. Mark root rib for eyebolt and servo cable holes and re-install panels. Install turnbuckle through top hatch into eyebolts and tighten by hand until panels are snug.

Place a folded towel on your work surface and, carefully turning fuselage over, set the wing center section on this towel. If you're lucky it will be 1" above the work surface. If not, adjust accordingly. Place weights on each wing tip and hold it on work surface. Re-check center section to be sure it's **one** inch above work surface.

Install the spade bolts in the landing gear. Set the brass tubing in place between each of the six pairs of spade bolts and push the 6/32" x 1 1/4" bolts through spade bolts and tubing. Cut and bend 3/32" music wire struts to shape. Place in position and secure the music wire to the brass tubing with uniform wraps of soft copper wire. Solder each joint with a big iron and good flowable solder. When cool, remove, clean, and re-install the struts. Locate the 3/8" x 3/4" basswood struts with a 3/32" groove in one side. Cut these to shape and glue in place with the 3/32" wire in the groove. This strut construction

assures both tension and compression resistance.

With struts in place drill a 3/32" hole in each basswood piece to receive the jury strut crosspiece. Set it in place. Bend the jury struts to shape and attach with the wire clips and bolts as shown on the plans. Solder the jury struts to the crosspieces. After they cool, clean and paint the struts.

Set the airplane upright and check the dihedral. It should be 1" under each tip. If so, drill holes for safety wire on the turnbuckle and remember always to safety wire it so it won't loosen in flight. Remove wings and set aircraft on workbench.

Cut windshield and side windows to patterns and glue in place. Secure with masking tape. When dry, cut narrow strips of MonoKote and cover edges of windshield and windows. Build the top window framework of 1/8" sheet balsa. Paint it all black, then trim top window to shape and glue it to the framework. The top window is held in place with #2 wood screws.

Finish assembly with as much detail work as you like, such as instruments on panel, seat, pilot, etc.

Flying:

Before flying be sure Center of Gravity is within range shown on plan sideview. Be sure tires are inflated, all servos move surfaces freely and in proper direction, and that movements do not exceed 1/2" plus or minus for ailerons measured at the trailing edge or 3/4" plus or minus for the elevator (less if C.G. is at aft limit). The rudder may swing 1" to 1 1/2" plus or minus.

Double check that all surfaces are true, and not warped. Make sure the strut bolts are secure with locknuts. Same with tail braces. Be sure all hinge pins are secure and won't vibrate loose.

Start the engine. Let it warm up in idle. While it is warming up check hinge pins and strut bolts. Advance throttle to high. Recheck hinge pins and bolts. Operate radio to be sure surfaces are smooth and free. When satisfied with the above, taxi to the runway and prepare to take-off. Check approaches and traffic pattern. When clear taxi into position.

Take-off by advancing the throttle smoothly and feeding rudder control to assure a straight take-off roll. Let it build speed and as end of runway approaches feed up elevator to achieve lift-off and smooth climb-out to 150' altitude. Remember that in order to turn one of these biggies you must use both aileron **and** rudder plus elevator as necessary. Fly a few racetrack patterns and as soon as practical land. Take the plane home or to a shady area to relax and check every last detail. Look for loose bolts on prop hub, engine mounting, servos, struts braces, landing gear and tail

braces. Repeat this inspection after each flight. Make the first flights short and gradually lengthen them until you're comfortable.

Let us hear your experiences and your suggestions for improvement. We will kit this aircraft in the near future through NAME, Inc., P.O. Box 1473, Hurst, TX 76053. We look forward to hearing from you. □

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