

## **... A 1/5 SCALE WACO YMF 3**

**“A PRACTICLE SIZE FOR THE 80’s”**

**The Golden Era of biplanes will come alive with this smooth Flying, easy building flying machine. It’s big enough to catch their Attention, yet small enough to use your everyday glow engine.**

**Originally developed and marketed by**



**PICA PRODUCTS  
(Now a part of Cox Models)  
Cox Customer Service  
1295 H Street  
Penrose, CO 81240  
1-719-372-9876**

**Revised by the WACO Brotherhood  
(a collaboration of dedicated modelers interested  
in keeping these planes and kits alive and flying)**

**The WACO Brotherhood was formed September 6, 2006**

**The original instructions are included as originally printed with the original artwork.**

**These instructions apply only to the original Pica kit and not to the Cox/Pica ARF. Some information in the original instructions is obsolete and is supplemented or replaced with recommendations from the WACO Brotherhood and are highlighted in bold. Some of the recommendations are for those modelers who are scratch building from the PICA plans available from the Academy of Aeronautics (AMA), plan # 35408.**

## RC-12 UPDATE SHEET

Fuse Wing Mount Block; plans read 1-3/4", should read 1-1/4"

Top Wing Mounting Blocks; plans read 1/2", should read 5/8"

Elevator Joiner now 3/8 x 5" dowel – see page 11 tail group

On page 4, step 7; do not glue top LE sheet or webbing until step 9 is complete

Plastic abs gas tank cover (supplied), should be centered and mounted to top of wing.

Cockpit kits are available for this kit. See enclosed order form price and ordering instructions.

### DIRECTIONS ----- PRESSURE SENSITIVE DECALS

1. Clean oil, dirt and any foreign matter from finish of entire plane or surface.
2. Cut out markings to be applied.
3. Peel backing from decal just enough to position. After getting position brush liquid dish soap over entire surface to be covered with decal. Now proceed to put on decal by peeling back balance of backing (paper) and putting decal on surface. Squeegee out decal from center toward edges, working out any air bubbles. Wipe entire area be sure to wipe entire area clean (balance of liquid).
4. DO NOT use any sharp instrument to rub decals.
5. These decals are made with a special adhesive, which does not cure for 24 hours. If any misplacement of decals, lift decal by using a sharp instrument to loosen an edge. Carefully peel off decal and replace.
6. If clear finished of Dope or Acrylics are desired, then they must be sprayed on only after decal adhesive is dry.
7. These decals are completely fuel-proof and fade resistant.
8. By brushing or spraying on a flat or Matte polyurethane varnish you will obtain a flat finish. If you wish to use a very fine sandpaper (400-600) you may lightly sand the surface and achieve the same effect.

## **THANK YOU!**

You have just purchased what we believe to be one of the best, most highly developed standoff scale kits in the world.

Usually, standoff scale models are designed to compromise between accurate appearance and safe flying characteristics. In the case of the WACO F-3, it was not necessary to change outline, and the result is 100% scale outline model with excellent and safe flying qualities.

With careful attention to the instructions, we are confident that this will be the best looking and flying R/C scale model you ever built.

## **INTRODUCTION**

The WACO F-3 models were first introduced in 1930, and it is felt by many that the 1934 F-3 version was one of the most attractive of all biplanes. This elegance combine with excellent handling and flying qualities made it a much sought after aircraft.

There has been some confusion about the difference between the F-3 and the F-5 models. Essentially the only difference was that the F-5 was a little more plush in its appointments. When the Continental engine was used the designation was UMF, with the Jacobs engine it became YMF.

All F-3 and F-5's were constructed with two cockpits and a cover was provided as standard equipment for the front cockpit. When used, this gave a single-cockpit appearance to the ship.

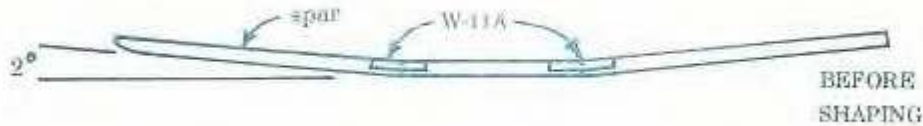
Since the real aircraft has all of the necessary areas and moment for an excellent flying model, the model portrayed here, has a 100% scale outline.

## **BEFORE YOU START - READ THIS**

Most problems which arise in building kit models are the result of inadequate instructions and/or lack of attention to the instructions. We have provided this booklet in order to have more space for written instructions and diagrams. It's a good idea to read the booklet through, referring to the plans, before actually cutting or gluing anything.

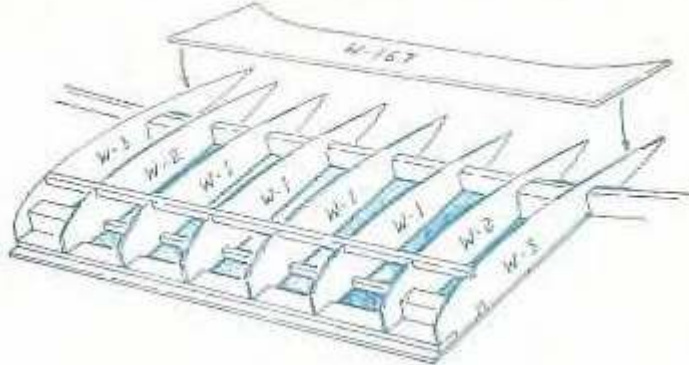
## TOP WING

1. The rear spar is made first. Take (1) 5/16" x 5/8" x 15" and (2) 5/16" x 5/8" x 30" strips, cut to the lengths shown and Join with ply braces W-11A. (**W-11A - make new ones from 1/8" ply, only make them go from the center of the wing, out at least 3 ribs into the wing. (you will need to cut the spar slots in these ribs to allow the longer wing joiners to fit.)** Make sure braces are flush with top edge of spar as shown. Check dihedral 2° at each end, Cut and shape into spar

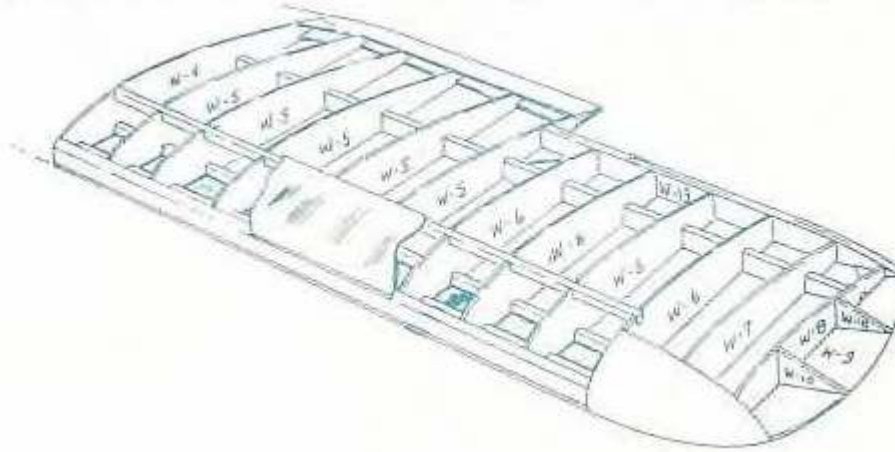


ends.

2. Pin assembled spar down over wing center panel plan. The ply braces face the rear. Glue and join the center sheeting using the bottom center sheet layout. Pin the sheeting in place on the front side of the spar. Now using a W-1 rib to insure perfect spacing, add the 5/16" x 5/8" x 15" L.E., the 5/16" sq. x 15" bottom spar, the 5/32" x 5/8" x 15" L.E. backup, and the W-11, W-11B plywood braces. (**make new ones from 1/8" ply, only make them go from the center of the wing, out at least 3 ribs into the wing. (you will need to cut the spar slots in these ribs to allow the longer wing joiners to fit.)**)



3. Glue ribs W-1, W-3 and 1/2" x 1-1/16" x 1/3/8" hardwood blocks in place then ribs W-2. Add riblets W-2A, W-2B, W-3A and W-3B, add top 5/16" sq. and W-16T.
4. Remove assembly from plan and bevel top of L.E. to flow rib contour. Pin assembly back to plan; join the other 3/32" sheeting using the top center sheet layout as a guide. Add 3/32" webbing at this time. Glue sheeting from W-16T forward over L.E. Trim to size when dry.
5. When whole unit is set, remove from plan and glue 3/32 x 2-1/4" x 15" with W-16B in place (dampening to make twists). Use small spring clamps to hold in place while glue sets.



6. Pin down rear spar over left panel plan. Pin down 3/32" x 2" x 24" L.E. sheet, glue 5/16" x 5/8" x 24" L.E. and 5/32" x 5/8" x 24" back-up piece to sheet. Glue all parts to center assembly. Glue lower 5/16" sq. x 24' spar to sheet and all ribs W-4 thru W-6.
7. Slide lower W-15 under rib and glue to W-5's only, not W-4. Glue W-13 in place. Make sure it is right side up. Glue upper W-15 and W-14 in place. Glue W-7 and W-8 in place, then tip block. Glue in upper 5/16" sq. spar, chamfer leading edge and add 3/32" top L.E. sheeting. Sand appropriate pieces even with outer edge of last W-6 rib. Glue 3/32" x 1-1/4" x 3" webbing in place.
8. Remove wing from board. Glue lower W-15 to W-4 rib and add lower W-14. Remove bottoms of W-7 and W-8. Glue W-9 and W-10 tip parts to wing. Carve tip block to shape. Sand whole wing smooth and add gussets W-12. (Cut gussets from 1/8" x 1-1/4" x 1-1/4").
9. Using wing section "E" as a guide, glue 1/8" x 1-1/4' x 2-1/4' plywood and W-6E and W-6F ply.
10. Repeat entire procedure for right wing panel.

## BOTTOM WING

**Scratch builders - When you cut the ribs for the bottom wing, use a forstner bit, and with the ribs stacked, and aligned from the rear main spar, drill a 1/2" hole in all the ribs to allow you to install a paper tube for the aileron wires to travel through.**

**For Dual Ailerons Servos in the wing – Omit the center section servo mounts, bellcrank, bellcrank mounts, and pushrods. Make the aileron hatch/door from 1/8 ply, hatch/door mounts from 5/16" hardwood, and install them outboard of the interplane strut mounts. Allow sufficient room (recess) for the hatches/doors to mount into place, and still be flush with the bottom of the ribs.**

1. The rear spar is made first. Take (1) 5/16" x 5/8" x 9" and (2) 5/16" x 5/8" x 30" strips, cut to the lengths shown and Join with ply braces W-11A. (**W-11A - make new ones from 1/8" ply, only make them go from the center of the wing, out at least 3 ribs into the wing. (you will need to cut the spar slots in these ribs to allow the longer wing joiners to fit.)**) Make sure braces are flush with top edge of spar as shown. Check dihedral 2° at each end, Cut and shape into spar ends.





8. Mount aileron servo on side-mount tray and screw tray into wing. Position so that servo and pushrod are correct distance apart for drive yoke to be installed. Install yoke and test movement using radio.
9. Carve and sand L.E.'s and smooth whole wing ready for covering.

## BOTTOM AILERONS

1. Pin down lower A-3 sheet to plan. Making sure A-4 is right side up, glue to sheeting only out as far as taper. Glue ribs W-1 in place then A-5 ply (and scrap ply) for aileron connection. Remove from plan. Glue remaining section of A-3 to tapered part of A-4. Glue in rib A-2. Sand top of L.E. to bevel to match ribs (shown on plan 2) then glue on upper A-3 sheeting. Make sure to make a L.H. & R.H. aileron.



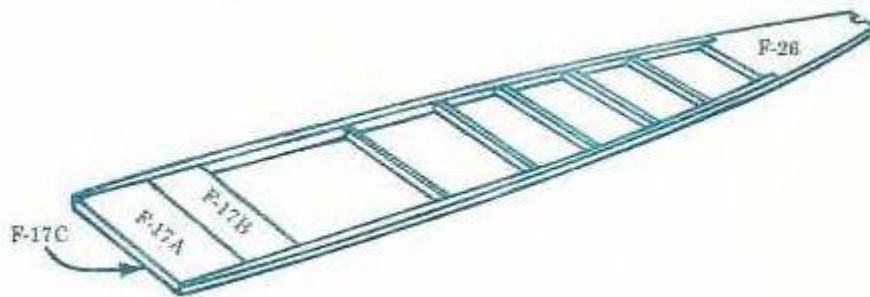
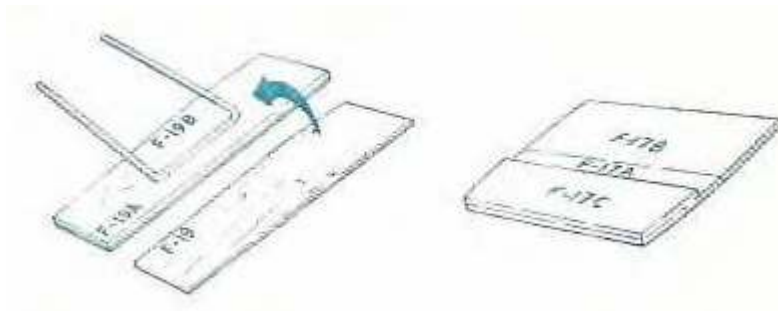
## TOP AILERONS

1. The top ailerons are constructed in the same manner except there are no A-5's.

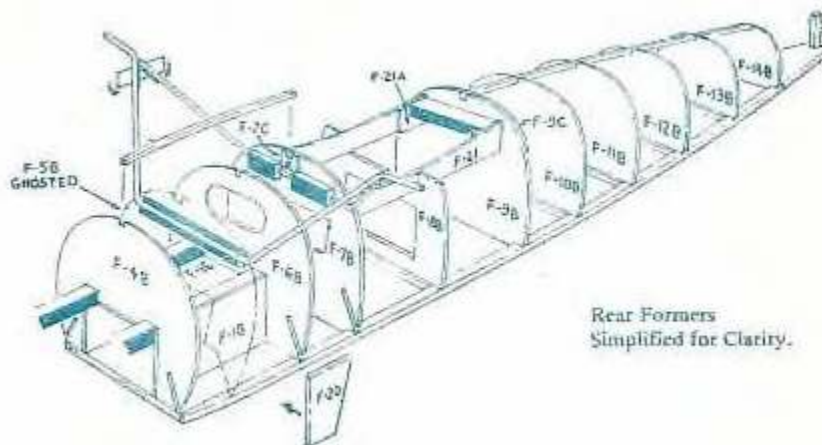
## FUSELAGE SUBASSEMBLIES:

### Parts to make new or modify.

1. **F-1 - Make from 1/4" ply. Needed for use with a radial engine mount instead of the maple motor mounts.**
2. **F-4B - Make from 1/4" or 5/16" ply, Do not cut tank access hole, and drill a hole large enough to get your fuel lines through.**
3. **Make F-16, the tank floor 1-1/4" wider; you will not be using the maple motor mounts.**
4. **Relieve former F-7B to enable installing the fuel tank (rear load, through bottom wing opening).**
5. **Replace the 5/16" sq. balsa stringers back to F-9B with 5/16" hardwood, splice in 5/16" sq. balsa (use the lap joint method) for the remainder of the fuselage stringers.**
6. **F-14B - Make from 1/4" ply. You will be mounting a 1/2A or e. p. nose gear mount to this former for the tail wheel in the scale location.**

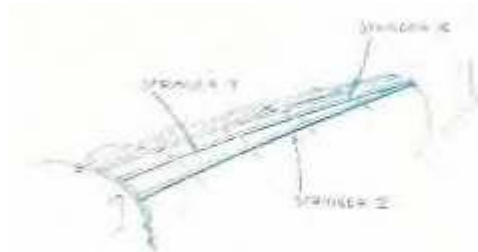


1. Glue F-19A to F-19, lay formed cabane struts in recess, and glue in F-19B, then second F-19 to trap wire. Make two. Glue two F-26's together to make 5/16" thick. Glue F-17A, B & C together; now glue the halves of the appropriate formers together.
2. Pin down 5/16" x 7/16" x 36" crutch strips over plans, and add 1/8" x 1/4" stiffeners. Glue F-26 assembly in place, then F-17 assembly resting on 5/32" scrap shim under rear end to make it flush to top of crutch. Using a triangle to keep them perpendicular to plan, add parts (**new 1/4" or 5/16" ply**) F-4B ply, F-6B ply and F-18's (5/32" x 3-3/16" x 6-1/4").

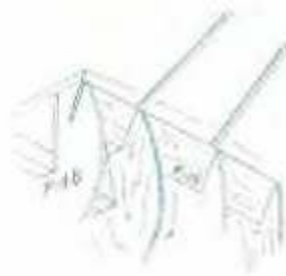


3. **Omit this step.** Slide 5/8" sq. maple motor mounts in place and *glue well*. Also glue F-16 (5/32 x 1-13/16" x 6-1/4") between mounts completing the fuel tank box.

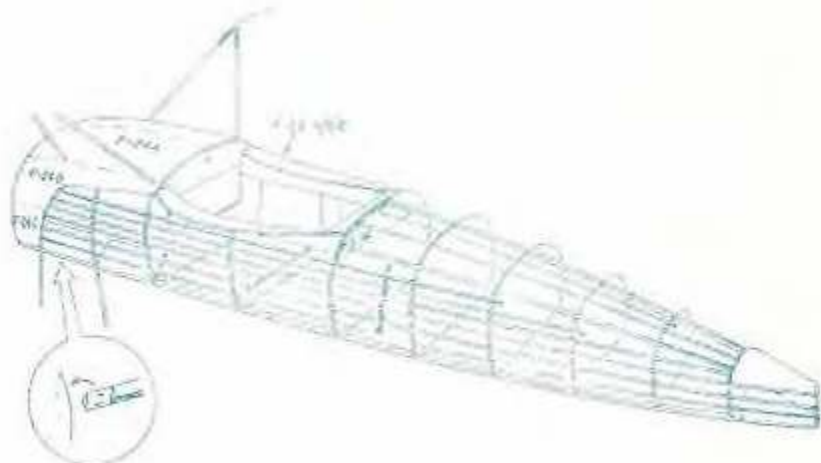
4. Glue F-7C ply in position on F-7B ply. Lay F-5B ply and F-7B ply down flat, position formed L.G. struts and glue grooved L.G. block to trap struts in position indicated by die marks. The short blocks fir the rear L.G. strut. Glue F-20 in position each side to hold F-5B ply at the correct angle, then F-5B ply and F-7B ply are added. Glue 5/16" sq. bottom stringer from F-4B ply to F-7C ply.



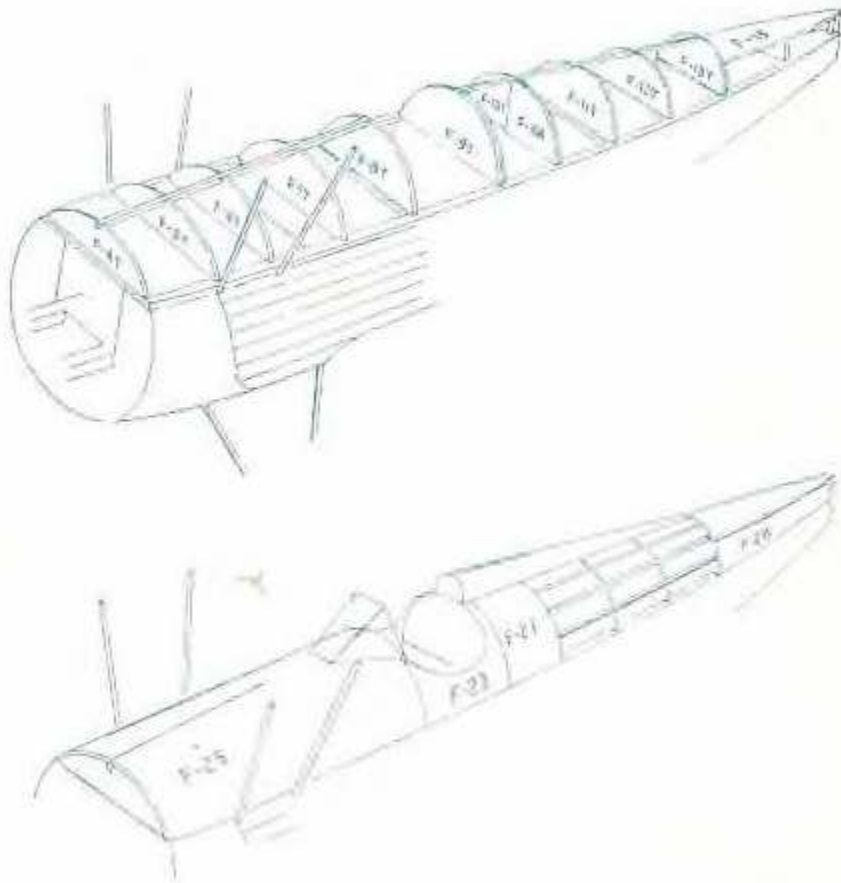
5. Glue in order, F-8B, F-21's, F-9B, F-21A (1/4' x 1" x 2" notch for wing mount block) wing mount block, F-9C, F-10B thru F-14B (**make a new F-14B from 1/4" ply. You will be mounting a 1/2A or e. p. nose gear mount to this former.**), then cut from a 5/16" sq. x 3" a sternpost (check carefully that this is perpendicular), 1/4" sq. bottom keel ending at F-14. Stringers X, Y and Z come next. Stringer X stops at F-13, X & Y stop at F-14. Note that stringer Y has no notch at F-14 due to cramped space. The stringer is butted against F-14 or lapped over it. Cut away and discard portion of F-8B between F-21's.



6. Lift structure from bench and slide the cabane strut assembly into slots in formers. Notice that the crutch must be trimmed a little to accomplish this. This assembly must be flush at the front and back of formers F-4B ply and F-7B ply respectively. When everything fits right, glue all parts firmly.

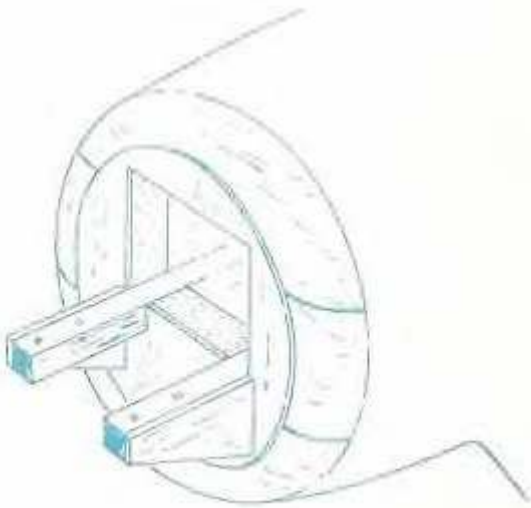


7. Using the templates on plan sheet 3 as a guide, cut out all fuse sheeting. Glue F-24A in place, wetting outside to aid in curving. Glue F-24B next to F-24A, then F-24C. Parts are all slightly oversize to allow trimming for a perfect fit.
8. The remaining stringers A thru F are now glued in place, (Stringers A, B and C are made from (6)  $\frac{1}{4}$ " sq. x 30" and (6)  $\frac{1}{4}$  x 12" spliced together to make (6)  $\frac{1}{4}$  sq. x 42"sq stringers) one to each side at a time. Notice a notch must be cut in the front of each one where it glues behind F-24's. Stringer D ends at F-14, E ends at F-12, F ends at F-11. Stringers A, B and C are pulled in and glued to  $\frac{5}{16}$ " sq. sternpost. Note that stringer D fits up to F-14 like stringer Y referred to earlier.
9. Join pieces F-22A, B & C and glue to F-21's. When set sand to follow fuselage outside shape. Now remove tape from L.G. assembly, bind and solder joints.
10. Pin lower wing in place, making sure that it is square to the fuselage from wing tip to tail post both sides. Drill thru wing T.E. and fuselage hardwood block with a #21 drill, one side only at this time. Remove wing. Tap out hole on block with the 10-32 tapping screw supplied. Drill out hole in wing to #8. Holding wing in place with the one nylon screw, repeat process for the other screw.



11. Glue F-4T thru F-8T and top  $\frac{5}{16}$ " sq. stringer. This section can now be sheeted with F-25 pieces. This is the time to cut the second cockpit if this is your choice. Wet outside of panels to aid in curving if wood is hard. Bevel outside edges to fit against crutch and glue this edge first. Finally glue to center stringer. Use the templates supplied to cut out access doors, etc. Use scrap sheeting for wing fillets, gluing to F-22 and stringer "F".

12. Glue F-9A on rear of F-9T, and F-10A on front of F-10T. Glue F-9T thru F-13T in position and glue center  $\frac{1}{4}$ " sq. stringer to support formers. Glue F-13A on rear of F-13T.
13. Glue F-8A on back of F-8T then F-23 on each side. Then F-27 left side only. Glue rest of top stringers in place butted to F-13T.
14. Glue F-14T and F-15 in place. Glue  $\frac{5}{16}$ " sq. on top of existing sternpost. Sand sides of F-15 to bevel following former outline, and glue on side sheet parts -28. Glue  $\frac{5}{16}$ " x  $\frac{3}{4}$ " x  $3\text{-}5/8$ " strip on rear end of fuselage. The tail block is now attached to stinger C and F-14, shaped, and relieved for the nylon tail wheel bracket assembly which is glued in place at this time. Bend a right angle (see plan) in the .080 tail wheel wire, slide wire thru tail wheel and bend remainder of strut to accept the tail wheel. Make tail wheel fairing at this time and glue in place.



15. The L.G. fairings are made from the  $\frac{3}{16}$ " x 3' x 15" sheet glued together at this time and installed in place. These should be covered with a fabric type material. In the nose block F-2 are two vertical saw cuts. Remove the wood between the cuts and glue the assembly in place. Use a piece of the excess  $\frac{7}{8}$ " sheet to fill in void between motor mounts. F-1 is now added and the blocks shaped when set. The  $\frac{1}{8}$ <sup>th</sup> ply motor mounts are now added.
16. Place the engine on the mounts, mark the location of the mounting holes and drill with a  $\frac{1}{8}$ " drill. Use the  $\frac{3}{4}$ " x #8 self tapping screws to secure the engine (or 6-32 bolts and blind nuts if you prefer).
17. The head rest is made from the tapered block supplied. Carve and sand to the cross section shown on plans. Attach after fuselage is covered.  

(If you are constructing the enclosed cockpit version skip to 20)
18. The windshield is cut from the clear butyrate using the pattern on the plans. Attach after the model is painted.
19. Cut former templates out of  $\frac{1}{8}$ " balsa and glue onto corresponding formers. Then glue  $\frac{3}{16}$ " sq. stringers in place.



## COWLING

1. First remove the center section and shape smooth with X-acto knife.
2. Cut scrap plastic into 1" x 2" strips and glue at 60° intervals around the cowl, forming a double thickness nylon bracket seat. Holding the brackets against the cowl, drill thru both simultaneously for the attaching screw. Screw all 6 brackets to the cowl using #2 x 3/8" screws.
3. The template strip on the plan gives the location of the blisters around the cowl. Cut out template, wrap around rear edge of cowl and tape together. Note the locating mark on the template give the position of the top dead center of the cowl.
4. Mark positions of blisters and glue in place with liquid plastic cement.

Allow glue overnight to dry completely before straining joints or painting cowl.



5. Drill holes thru rear face of mounting brackets for attaching screw. Holding cowl against model (center it carefully) mark positions of attach screws on plywood F-1. Stick pencil thru front holes in cowl to do this. Drill F-1 for screws. Remove nylon brackets from cowl and attach now to fuselage. The brackets stay with the fuselage when cowl is removed from here on. Screw cowl in place.
6. Cut any holes necessary for glow plug, needle valve, etc.

## TAIL GROUP

(Note: If you are constructing the enclosed cockpit version, then cut and shape all tail parts at this time.)

1. Glue parts S-1, S-2 and S-3 together to make core of stab. Pin over plan. Now pin and glue in order the T.E. strip, S-4 and the 5/32" sq. ribs. The elevator is made in the same manner, out of parts E-1 thru E-4. You must put a notch in E-2 for the 5/16" x 7/16" x 5" elevator joiner. This is glued in place first, then the L.E. piece along with E-4 and the 5/32" sq. ribs. When glue has set, turn units over, re-pin to plan and repeat procedure on opposite side.
2. The rudder is constructed using the same procedure.

## MOUNTING THE TOP WING

1. Mount the bottom wing first. Cut out and lightly tack glue the wing alignment jig to the fuselage, lining up at front of F-4. Make sure jog is vertical and centered accurately on fuse.
2. Referring to top wing plan, measure and mark positions of cabane screws on underside of wing. Drill each of four locations with a #30 drill.
3. Bend the four cabane terminals to approximate front view as shown, and screw to wing with four # 8 x 3/4" self tapping screws. Tighten screws just enough to prevent unwanted movement of the terminals but leave slack enough that you can swivel them by hand.
4. Now place the wing onto the struts, turning the terminals to slip down onto the cabane struts. Aim for the wing to lay exactly in the jig. Check front view for zero wing tilt. This should be done by measuring the bottom wing leading edge to top wing leading edge. This dimension must be the same on both sides. When satisfied, silver solder the terminals to struts. Recheck all alignment measurements. Discard jig.
5. Bend the strut brace as per diagram out of .080 soft wire, bind and solder in place. The cabane strut fairings are not essential but do help the appearance of the model. If you wish to use them, first cut 5/32" sq. to proper length and glue to front and back of each wire. Then glue a 3/32" x 7/16" capping strip to each side. When dry, sand to shape.

## RADIO INSTALLATION

1. Glue 1/4" x 3/8" hardwood servo rails in place according to plan. Note front servo rail can be adjusted to suit servos. Make up pushrods and install in fuselage, noting that the elevator rod exits the right side and the rudder the left side. Install throttle pushrod as shown. Install radio, mount servos. Install rudder and elevator horns exactly where shown. Hinge all surfaces. Temporarily pin and tape tail group to fuselage. Hook up pushrods and use the radio to check for freedom of movement.

## N – STRUTS

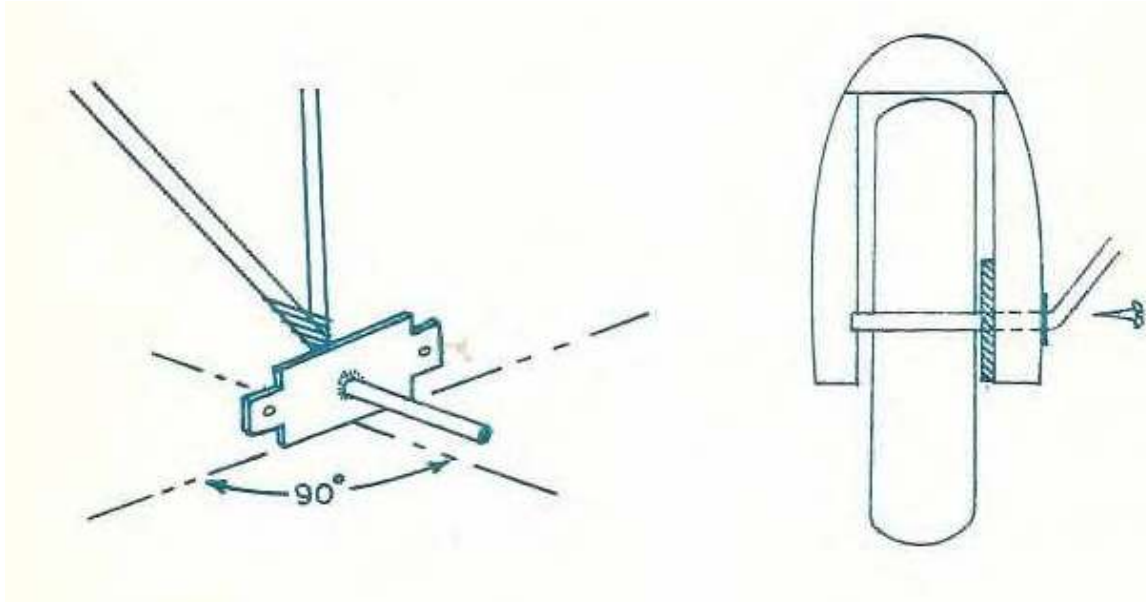
1. N-struts are constructed over the plan cut from (2) 5/16" x 9/16" x 36" basswood stock. When completed, sand N-strut to shape shown and bevel ends for wing attachment.

## COVERING

1. It is a good idea to cover the stab and headrest block before attaching to fuselage. Cut away fabric at the attach point on the stab to improve glue bond when attaching stab. If you use silk and dope a sticking problem might arise between the ribs of the tail group. To eliminate this, smear candle wax between the ribs leaving at least 1/8" x 3/16" tacking area around edge of surface.
2. Using the Styrene preformed aileron caps and tank cover will add a final touch to your model.

## WHEEL PANTS

1. Using the top and side views as a guide, cut and trim the required parts from 5/16" x 3" blocks and 5/8" x 3" blocks. Glue laminations 1, 2, and 3 together along with top block. Add 1/8" x 1-1/4" x 2-1/4" plywood. Trim and sand to shape.



2. Silver solder main landing gear (3/16"), to rear brace (5/32") (soft wire as shown on plans). Silver solder metal wheel pant mounting bracket in place. (Wheel pants are held in place with # 6 x 1/2" screws).

## FINAL ASSEMBLY

Cut 1/4" dowel supplied, to lengths shown on front views. Cut notches in bottom of fue at location shown. Slide the dowels in notches and glue where it attaches to the L.G. fairing only; leaving the other ends to move freely within the notches. Fairings between the pants and the L.G. struts may be made of micro-balloons. Remember the pants are removable, so tape saran wrap, wax paper or such on the pants to keep the micro-balloons fro adhering to them. You may leave the fairings off if you wish.

## WING AND TAIL FILLETS

These are optional; however, they do help the appearance of the model. These can be made of scrap balsa or micro-balloons. When using micro-balloons, an excellent accessory to have is the X-acto # 5 assortment of routers. Use these when the balloons are at the rubbery stage of going off and it will be like cutting butter. To make the fillets out of micro-balloons, proceed as follows: First temporarily cover the bottom wing center section out past the fillet line with Monokote or equivalent. Mount wing. Referring to the plan and 3-View, mask off shape of fillet, mix micro-balloons and fill in area. Using routers and eyeball, carve to shape. When set hard, pop the wing off and do final sanding. The tail group is faired in by eye.

## FLYING INSTRUCTIONS

This is an excellent, realistic, and safe flying model, when it is rigged right, warp less, and the C.G is in the design location. So before your first flight make sure that all of these things are correct. Since this airplane will stay airborne on very little power, a reliable low to medium idle is essential. The Waco has very good ground handling characteristics, needing very little if any right rudder on take-off provided your wheel alignment is correct and rotation is free.

*Rolls:* As with the real aircraft, this model does not roll like a pattern ship. To increase roll rate, set servos and control horn for maximum throw and use rudder with ailerons.

*Spins:* Do not use ailerons. Only full up and full rudder in that order. The model will recover almost immediately upon release of control levers.

*Flat-Spin:* This is a mind boggling maneuver but take heed: you must allow enough height for at least 3 full rotations *after* neutralizing controls.

To get into this maneuver the airplane must be slowed down and stalled in a level attitude. Throw in full left rudder, full up elevator and right aileron in that order.

If the nose drops at too steep an angle it will not rotate. Try again. Once the model starts spinning it will become progressively flatter until it appears to be "auto-rotating", losing height very slowly indeed. The effect is similar to the flight of a falling sycamore-tree seed. As mentioned before, leave plenty of height for recovery.

*Landing:* This model stall at a very slow speed, so you can float the model in for gentle landings without fear.

You will note the plans show rather powerful .90. This is not necessary; the model will fly beautifully on a .61 engine.

# PARTS IDENTIFICATION

