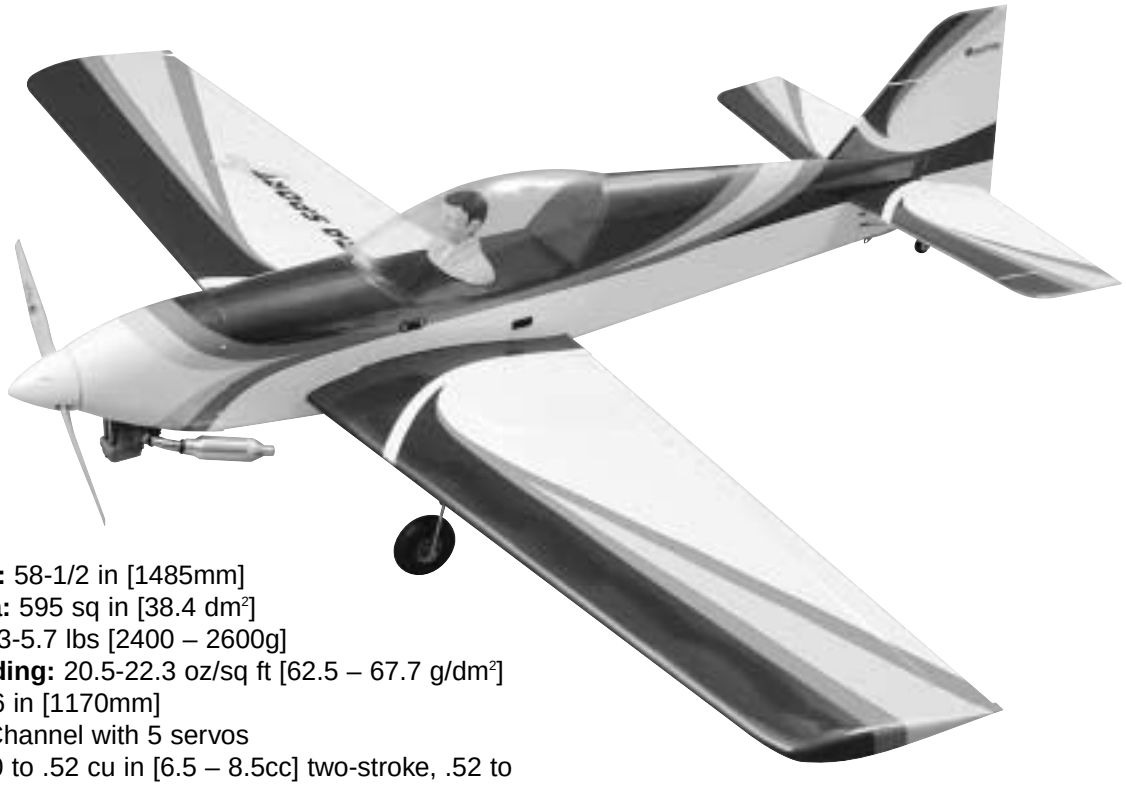
ULTRA SPORT+ 40

INSTRUCTION MANUAL



Wingspan: 58-1/2 in [1485mm]
Wing Area: 595 sq in [38.4 dm^2]
Weight: 5.3-5.7 lbs [2400 – 2600g]
Wing Loading: 20.5-22.3 oz/sq ft [62.5 – 67.7 g/dm^2]
Length: 46 in [1170mm]
Radio: 4-Channel with 5 servos
Engine: .40 to .52 cu in [6.5 – 8.5cc] two-stroke, .52 to .70 cu in [8.5 – 11.5cc] four-stroke

WARRANTY

Great Planes® Model Manufacturing Co. guarantees this kit to be free from defects in both material and workmanship at the date of purchase. This warranty does not cover any component parts damaged by use or modification. **In no case shall Great Planes' liability exceed the original cost of the purchased kit.** Further, Great Planes reserves the right to change or modify this warranty without notice.

In that Great Planes has no control over the final assembly or material used for final assembly, no liability shall be assumed nor accepted for any damage resulting from the use by the user of the final user-assembled product. By the act of using the user-assembled product, the user accepts all resulting liability.

If the buyer is not prepared to accept the liability associated with the use of this product, the buyer is advised to return this kit immediately in new and unused condition to the place of purchase.

READ THROUGH THIS MANUAL BEFORE STARTING CONSTRUCTION. IT CONTAINS IMPORTANT INSTRUCTIONS AND WARNINGS CONCERNING THE ASSEMBLY AND USE OF THIS MODEL.

GREAT PLANES® MODEL MANUFACTURING COMPANY
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INTRODUCTION

The Great Planes Ultra Sport 40 Plus™ is a kit designed to appeal to a wide range of modelers. The starting point for the design of this new airplane was the original Ultra Sport kit which was legendary. The new Great Planes Ultra Sport 40 Plus can be flown low and fast or it can be used for wild aerobatics, including 3D type flying. The Great Planes Ultra Sport 40 Plus tracks straight no matter what flying attitude the pilot tries to hold. This is a fly-where-you-point airplane. The Great Planes Ultra Sport 40 Plus has an extremely wide CG range to allow for fast and easy flying with a forward CG or wild aerobatics with an aft CG. The new airplane has also been designed to have no roll or pitch coupling at an aft CG. An engine within the higher end of the recommended engine range will provide unlimited vertical while the 3D throws will make hovering maneuvers easy. The Great Planes Ultra Sport 40 Plus is a great sport airplane that will do anything the pilot asks.

For the latest technical updates or manual corrections to the Great Planes Ultra Sport 40 Plus visit the web site listed below and select the Great Planes Ultra Sport 40 Plus. If there is new technical information or changes to this kit a "tech notice" box will appear in the upper left corner of the page.

http://www.greatplanes.com/airplanes/index.html

PROTECT YOUR MODEL, YOURSELF & OTHERS...FOLLOW THESE IMPORTANT SAFETY PRECAUTIONS

1. Your Great Planes Ultra Sport 40 Plus should not be considered a toy, but rather a sophisticated, working model that functions very much like a full-size airplane. Because of its performance capabilities, the Great Planes Ultra Sport 40 Plus, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage to property.

2. You must assemble the model **according to the instructions**. Do not alter or modify the model, as doing so may result in an unsafe or unflyable model. In a few cases the instructions may differ slightly from the photos. In those instances the written instructions should be considered as correct.

3. You must take time to **build straight, true** and **strong**.

4. You must use an R/C radio system that is in first-class condition, and a correctly sized engine and components (fuel tank, wheels, etc.) throughout the building process.

5. You must correctly install all R/C and other components so that the model operates correctly on the ground and in the air.

6. You must check the operation of the model before **every** flight to insure that all equipment is operating and that the model has remained structurally sound. Be sure to check clevises or other connectors often and replace them if they show any signs of wear or fatigue.

7. If you are not already an experienced R/C pilot, you should fly the model only with the help of a competent, experienced R/C pilot.

8. While this kit has been flight tested to exceed normal use, if the plane will be used for extremely high stress flying, such as racing, the modeler is responsible for taking steps to reinforce the high stress points.

We, as the kit manufacturer, provide you with a top quality kit and instructions, but ultimately the quality and flyability of your finished model depends on how you build it; therefore, we cannot in any way guarantee the performance of your completed model, and no representations are expressed or implied as to the performance or safety of your completed model.

Remember: Take your time and follow the instructions to end up with a well-built model that is straight and true.

Before starting to build, compare the parts in this kit with the Parts List, and note any missing parts. Also inspect all parts to make sure they are of acceptable quality. If any parts are missing, broken or defective, or if you have any questions about building or flying this airplane, please call us at (217) 398-8970, or e-mail us at *productsupport@greatplanes.com*. If you are contacting us for replacement parts, please be sure to provide the full kit name (Great Planes Ultra Sport 40 Plus) and the part numbers as listed in the Parts List.

You can also check our web site at *www.greatplanes.com* for the latest Great Planes Ultra Sport 40 Plus updates.

If you have not flown this type of model before, we recommend that you get the assistance of an experienced pilot in your R/C club for your first flights. If you're not a member of a club, your local hobby shop has information about clubs in your area whose membership includes experienced pilots.

In addition to joining an R/C club, we strongly recommend you join the AMA (Academy of Model Aeronautics). AMA membership is required to fly at AMA sanctioned clubs. There are over 2,500 AMA chartered clubs across the country. Among other benefits, the AMA provides insurance to its members who fly at sanctioned sites and events. Additionally, training programs and instructors are available at AMA club sites to help you get started the right way. Contact the AMA at the address or toll-free phone number below:

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302
Tele: (800) 435-9262
Fax (765) 741-0057
Or via the Internet at:
http://www.modelaircraft.org

DECISIONS YOU MUST MAKE

Radio Equipment

The Great Planes Ultra Sport 40 Plus can use either a 4 channel radio with 5 servos (and Y harness for the ailerons) or a computer radio. While the 4 channel non-computer radio will provide more than enough performance to fly the airplane, a computer radio will help the pilot to extract all possible performance out of the airplane, and that is why it is recommended. Five standard servos are all that is necessary to fly the Great Planes Ultra Sport 40 Plus.

Engine Recommendations

The recommended engine size range for the Great Planes Ultra Sport 40 Plus is a .40 to .52 cu in [6.5 – 8.5cc] two-stroke, or .52 to .70 cu in [8.5 – 11.5cc] four-stroke. If an engine in the upper end of the size range is used, throttle management must be practiced. While all engines in the recommended range provide good performance, a 2-stroke engine is more suitable for high speed flying and a 4-stroke engine is better for constant speed aerobatics. Make sure you pick an engine adequate to your flying style.

Landing Gear Configurations

The Ultra Sport 40 Plus has been designed around three different landing gear configurations. Your must choose which one you want to use before you begin construction of the kit. These are the three options:

Fixed Tricycle: Probably the configuration that makes ground handling easier. It is also the least aerodynamic.

Fixed Mains and Tail Wheel: This is the simplest and lightest possible landing gear configuration. It is also more aerodynamic than the Fixed Tricycle. Ground handling is not as easy as with the Fixed Tricycle, especially on take off

where the engine torque tends to steer the airplane to the left.

Retractable Mains/Fixed Tail Wheel: This is the heaviest and most complex of the three configurations. It is also the most aerodynamic and the "coolest" by far.

Throughout the manual there are steps named as above which pertain only to that landing gear configuration. Decide which landing configuration you want to use and cross out all steps that are for other landing gear configurations.

ADDITIONAL ITEMS REQUIRED

Hardware & Accessories

Following is the list of hardware and accessories required to finish the Great Planes Ultra Sport 40 Plus. Order numbers are provided in parentheses.

- ❑ Spinner – 2-1/4" (GPMQ4515)
- ❑ Propellers – see engine manufacturer's recommendation
- ❑ Fuel line – 3' [914mm] silicone (GPMQ4131)
- ❑ 10 oz. Fuel tank (GPMA4104)

If you are using a computer radio you will also need:
- ❑ (2) 6" Servo extensions (HCAM2700)

If you are using a non-computer radio you will also need:
- ❑ (1) "Y" harness (HCAM2751)
- ❑ (1) 6" Servo extension (HCAM2700)

If you are building a Fixed Mains and Tail Wheel Landing Gear Configuration you will also need:
- ❑ (2) 2-1/2" Main wheels (GPMQ4223)
- ❑ (1) 1" Tail wheel (GPMQ4241)
- ❑ (4) 5/32" Wheel collars (GPMQ4306)
- ❑ (1) 3/32" Wheel collars (GPMQ4302)

If you are building a Fixed Tricycle Landing Gear Configuration you will also need:
- ❑ (2) 2-1/2" Main wheels (GPMQ4223)
- ❑ (1) 2-1/4" Nose wheel (GPMQ4222)
- ❑ (5) 5/32" Wheel collars (GPMQ4306)

If you are building a Retractable Mains/Fixed Tail Wheel Landing Gear Configuration you will also need:
- ❑ (2) 2-1/2" Main wheels (GPMQ4223)
- ❑ (1) 1" Tail wheel (GPMQ4241)
- ❑ (2) Great Planes .40-size retractable landing gear (GPMQ2905)
- ❑ (4) 5/32" Wheel collars (GPMQ4306)
- ❑ (1) 3/32" Wheel collar (GPMQ4302)
- ❑ (4) Screw-Lock pushrod connectors (GPMQ3870)

Adhesives & Building Supplies

In addition to common household tools (screw drivers, drill, etc.), this is the "short list" of the most important items required to build the Great Planes Ultra Sport 40 Plus. *We recommend **Great Planes Pro**™ CA and Epoxy glue.*

- ❑ 1/2 oz. Thin Pro CA (GPMR6001)
- ❑ 1 oz. Medium Pro CA+ (GPMR6008)
- ❑ 6-Minute epoxy (GPMR6045)
- ❑ Latex foam rubber (HCAQ1000)
- ❑ 30-Minute epoxy (GPMR6047)
- ❑ Hobby knife (HCAR0105)
- ❑ R/C-56 canopy glue (JOZR5007)
- ❑ Microballoons (TOPR1090)
- ❑ #11 Blades (HCAR0211)
- ❑ Single-edge razor blades (HCAR0212)
- ❑ Denatured alcohol (for epoxy clean up)
- ❑ Small T-pins (HCAR5100)
- ❑ Builder's triangle (HCAR0480)
- ❑ Electric drill and 1/16" [1.6mm] [1.6mm], 5/64" [2mm], 3/32" [2.4mm] [2.4mm], 1/8" [3.2mm] [3mm], 9/64" [3.6mm], 5/32" [4mm],17/64" [6.7mm] and 1/4" [6mm] drill bits
- ❑ Small Phillips and flat blade screwdrivers (HCAR1040)
- ❑ Pliers with wire cutter (HCAR0630)
- ❑ Great Planes Plan Protector™ (GPMR6167) or waxed paper
- ❑ Sanding tools and sandpaper assortment (see ***"Expert Tip-Easy-Touch™ Bar Sander"*** on page 5)
- ❑ Great Planes tap and drill set (GPMR8108)
- ❑ Great Planes 1/4-20 tap and drill set (GPMR8105)
- ❑ Great Planes Pro Threadlocker™ (GPMR6060)

Optional Supplies & Tools

Here is a list of optional tools mentioned in the manual that will help you build the Great Planes Ultra Sport 40 Plus.

- ❑ Great Planes CG Machine™ (GPMR2400)
- ❑ Top Flite® Precision Magnetic Prop Balancer™ (TOPQ5700)
- ❑ Top Flite Hot Sock™ iron cover (TOPR2175)
- ❑ Straightedge with scale (HCAR0475)
- ❑ Cutting mat (HCAR0456)
- ❑ Masking tape (TOPR8018)
- ❑ CA debonder (GPMR6039)
- ❑ CA applicator tips (GPMR6033)
- ❑ CA accelerator (GPMR6034)
- ❑ Milled Fiberglass (GPMR6165)
- ❑ Epoxy Brushes (GPMR8060)
- ❑ Mixing Sticks (GPMR8055)
- ❑ Builder's Triangle Set (for fin alignment, HCAR0480)
- ❑ Felt-Tip marker (TOPQ2510)
- ❑ Small metal file
- ❑ Rotary tool such as Dremel® Moto-Tool®
- ❑ Rotary tool reinforced cut-off wheel (GPMR8020)
- ❑ Sealing iron (TOPR2100)

- ❏ Great Planes Slot Machine™ (GPMR4010)
- ❏ Great Planes Hinge Marking Tool™ (GPMR4005)
- ❏ Covering sock (TOPR2175)
- ❏ Curved-Tip canopy scissors for trimming plastic parts (HCAR0667)
- ❏ Hook and loop material (GPMQ4480)
- ❏ Dead Center™ engine mount hole locator (GPMR8130)
- ❏ Great Planes Accu-Throw™ Deflection Gauge (for measuring control throws, GPMR2405)
- ❏ Great Planes Groove Tube™ (GPMR8140)
- ❏ Great Planes Pro Wood Glue (GPMR6160)

EXPERT TIP

EASY-TOUCH BAR SANDER

A flat, durable, easy to handle sanding tool is a necessity for building a well finished model. Great Planes makes a complete range of Easy-Touch Bar Sanders and replaceable Easy-Touch Adhesive-backed Sandpaper. While building the Great Planes Ultra Sport 40 Plus, two 5-1/2" [140mm] Bar Sanders and two 11" [280mm] Bar Sanders equipped with 80-grit and 150-grit Adhesive-backed Sandpaper were used.

Here's the complete list of Easy-Touch Bar Sanders and Adhesive Backed Sandpaper:

5-1/2" [140mm] Bar Sander (GPMR6169)
11" [280mm] Bar Sander (GPMR6170)
22" [560mm] Bar Sander (GPMR6172)
33" [840mm] Bar Sander (GPMR6174)
44" [1120mm] Bar Sander (GPMR6176)
11" [280mm] Contour Multi-Sander (GPMR6190)

12' [3.66m] roll of Adhesive-backed 80-grit sandpaper (GPMR6180)
150-grit (GPMR6183)
180-grit (GPMR6184)
220-grit (GPMR6185)
Assortment pack of 5-1/2" [140mm] strips (GPMR6189)

We also use Top Flite 320-grit (TOPR8030, 4 sheets) and 400-grit (TOPR8032, 4 sheets) wet-or-dry sandpaper for finish sanding.

IMPORTANT BUILDING NOTES

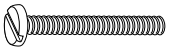
- There are two types of screws used in this kit:

Sheet metal screws are designated by a number and a length.

For example #6 x 3/4"

This is a number six screw that is 3/4" long.

Machine screws are designated by a number, **threads per inch**, and a length. **SHCS** is just an abbreviation for "socket head cap screw" and that is a machine screw with a socket head.



For example 4-40 x 3/4".

This is a number four screw that is 3/4" long with forty threads per inch.

- When you see the term ***test fit*** in the instructions, it means that you should first position the part on the assembly **without using any glue**, then slightly modify or *custom fit* the part as necessary for the best fit.

- Whenever the term ***glue*** is written you should rely upon your experience to decide what type of glue to use. When a specific type of adhesive works best for that step, the instructions will make a recommendation.

- Whenever just ***epoxy*** is specified you may use ***either*** 30-minute (or 45-minute) epoxy ***or*** 6-minute epoxy. When 30-minute epoxy is specified it is **highly** recommended that you use only 30-minute (or 45-minute) epoxy, because you will need the working time and/or the additional strength.

- **Photos** and **sketches** are placed **before** the step they refer to. Frequently you can study photos in following steps to get another view of the same parts.

There are many places in this manual where we tell you to reinforce holes made into wood with thin CA. It is important to do this properly to ensure the strongest possible grip of the screw into the wood. The proper procedure is to drill the specified pilot hole first, then run the screw in, remove it, wick thin CA into the hole, allow the CA to cure and reinstall the screw.

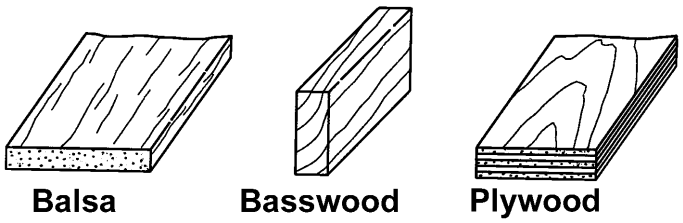
- Not all die-cut parts have a number, or their complete name stamped on them, so refer to the die patterns on pages 7 and 8 for identification. When it's time to remove

the parts from their die sheets, if they are difficult to remove, do not force them out. Instead, use a sharp #11 blade to carefully cut the part from the sheet, then lightly sand the edges to remove any slivers or irregularities. Save some of the larger scraps of wood.

COMMON ABBREVIATIONS

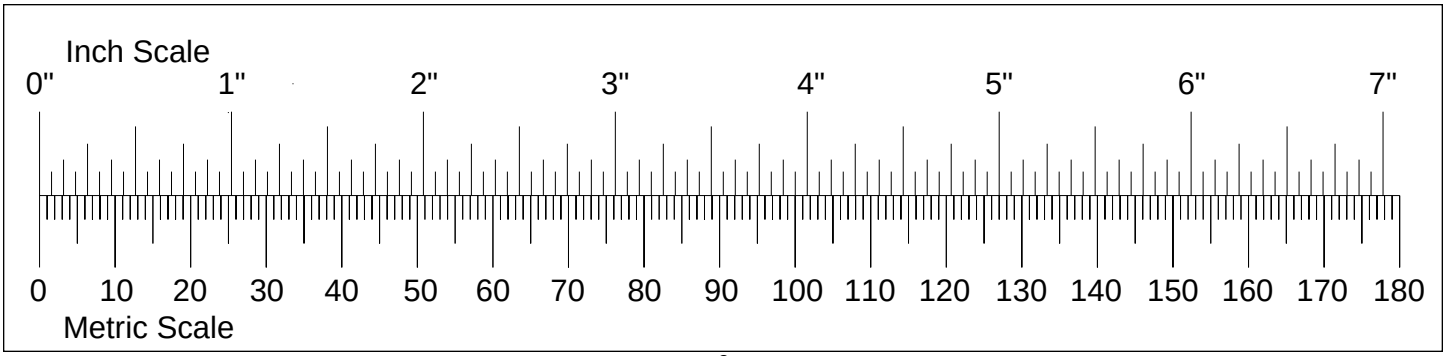
Fuse = Fuselage
Stab = Horizontal Stabilizer
Fin = Vertical Fin
LE = Leading Edge
TE = Trailing Edge
LG = Landing Gear
Ply = Plywood
" = Inches
mm = Millimeters
SHCS = Socket Head Cap Screw

TYPES OF WOOD



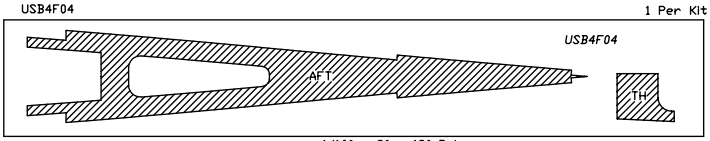
METRIC CONVERSIONS

1/64"	**=**	**.4 mm**	**3/8"**	**=**	**9.5 mm**	**12"**	**=**	**304.8 mm**
1/32"	**=**	**.8 mm**	**1/2"**	**=**	**12.7 mm**	**18"**	**=**	**457.2 mm**
1/16"	**=**	**1.6 mm**	**5/8"**	**=**	**15.9 mm**	**21"**	**=**	**533.4 mm**
3/32"	**=**	**2.4 mm**	**3/4"**	**=**	**19.0 mm**	**24"**	**=**	**609.6 mm**
1/8"	**=**	**3.2 mm**	**1"**	**=**	**25.4 mm**	**30"**	**=**	**762.0 mm**
5/32"	**=**	**4.0 mm**	**2"**	**=**	**50.8 mm**	**36"**	**=**	**914.4 mm**
3/16"	**=**	**4.8 mm**	**3"**	**=**	**76.2 mm**			
1/4"	**=**	**6.4 mm**	**6"**	**=**	**152.4 mm**			



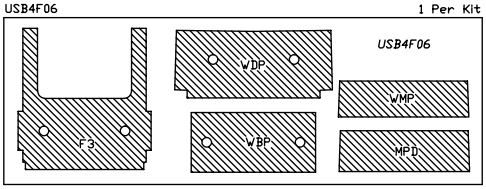
DIE PATTERNS

USB4F04 — 1 Per Kit



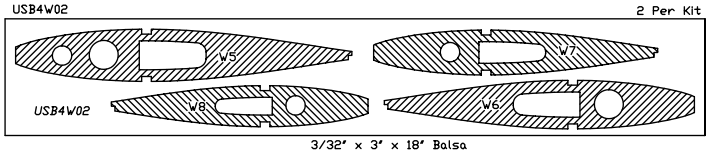
1/16" x 3" x 18" Balsa

USB4F06 — 1 Per Kit



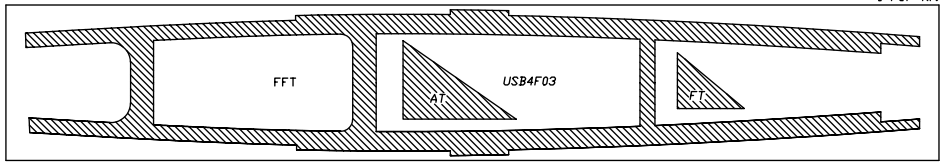
1/8" x 4-7/8" x 11-3/4" Lite Ply

USB4W02 — 2 Per Kit



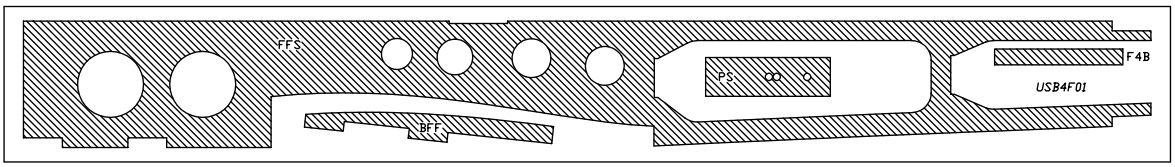
3/32" x 3" x 18" Balsa

USB4F03 — 1 Per Kit



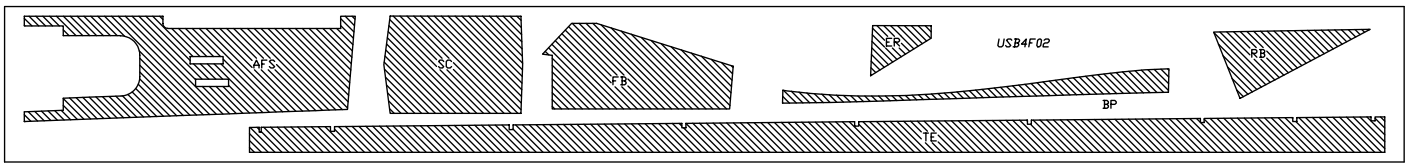
1/16" x 4" x 24" Balsa

USB4F01 — 2 Per Kit



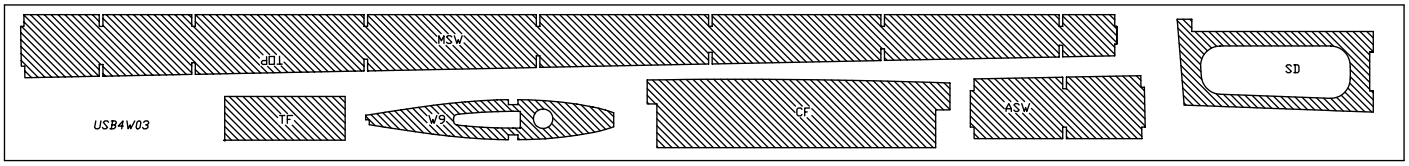
1/8" x 4" x 30" Balsa

USB4F02 — 2 Per Kit



1/8" x 4" x 36" Balsa

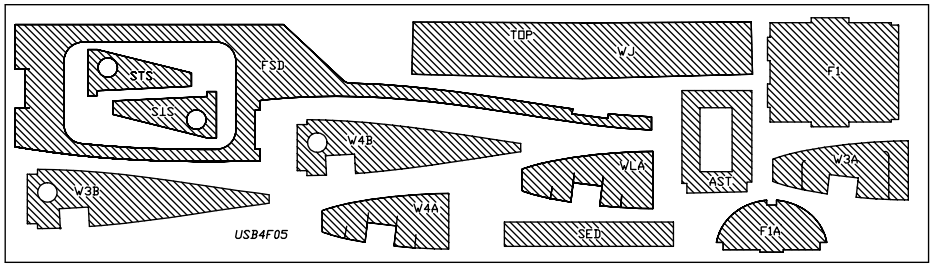
USB4W03 — 2 Per Kit



1/16" x 4" x 36" Balsa

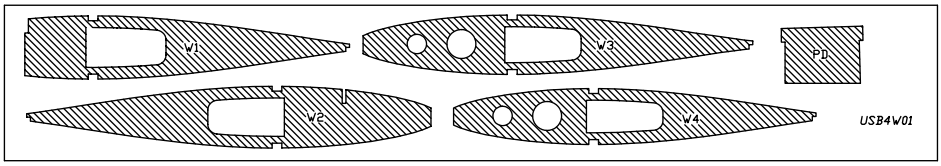
DIE PATTERNS

USB4F05 — 2 Per Kit



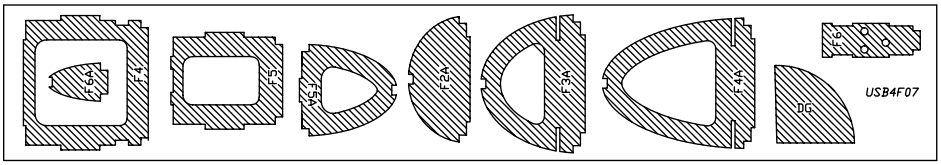
1/8" x 5-1/8" x 23-3/4" Lite Ply

USB4W01 — 2 Per Kit



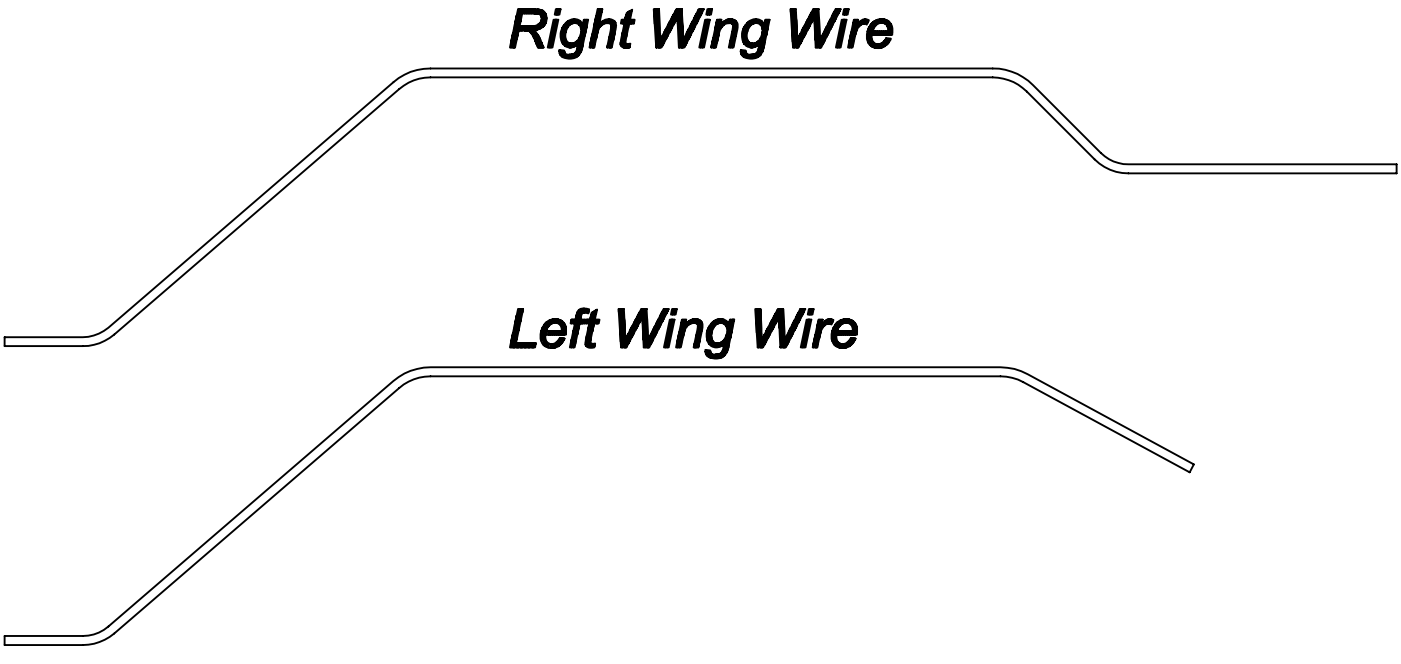
3/32" x 4" x 24" Balsa

USB4F07 — 1 Per Kit



3/32" x 4" x 24" Balsa

RETRACT WIRE TEMPLATE



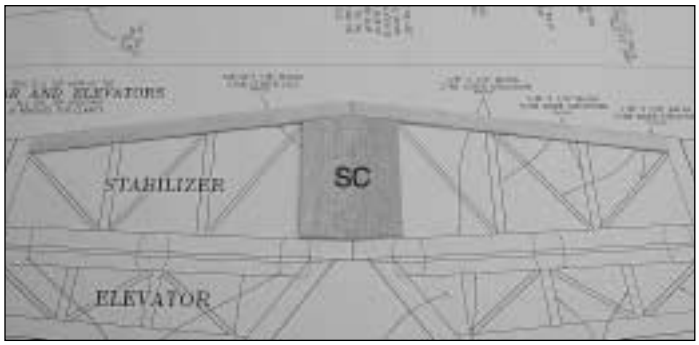
BUILDING INSTRUCTIONS

BUILD THE TAIL SURFACES

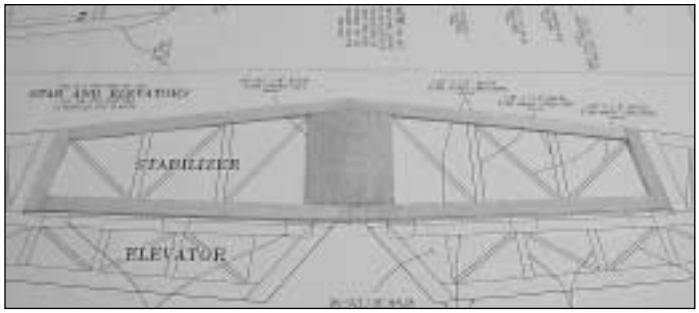
Build the Stab & Elevator

❏ 1. Unroll the plan sheets. Roll them inside out so they will lie flat.

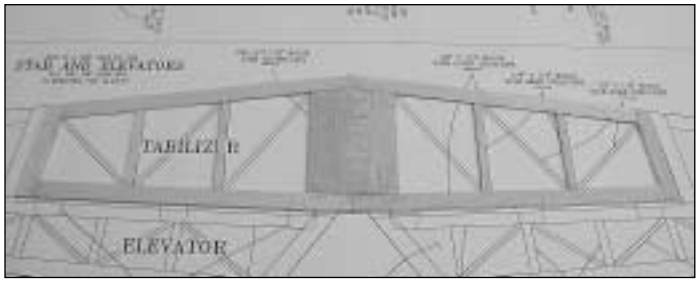
❏ 2. Position the wing so that the stab and elevator plan is over your flat building board. Cover the plan with Great Planes Plan Protector or waxed paper so glue will not adhere.



❏ 3. Locate the die-cut 1/8" [3.2mm] **stab center (SC)**. Pin the stab center in its position over the plans. Locate one 1/8" x 1/2" x 30" [3.2mm x 13mm x 760mm] balsa stick. Cut it to size as shown on the plan to form the leading edge of the stab. Glue it in place with medium CA.

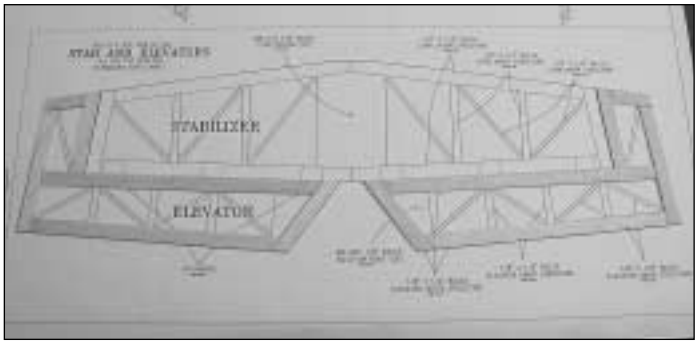


❏ 4. Cut 1/8" x 1/2" x 30" [3.2mm x 13mm x 760mm] balsa sticks to size as needed to form the stab outer structure. Glue them in place with medium CA.

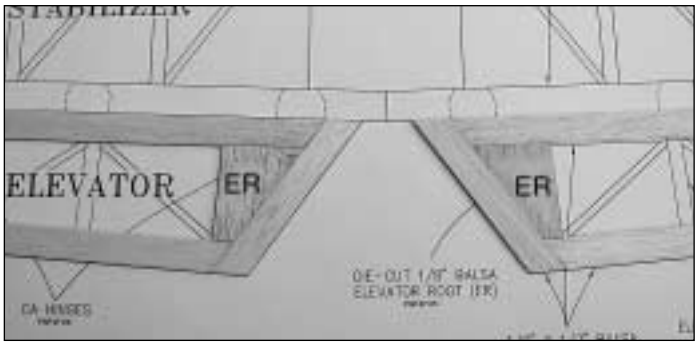


❏ 5. Locate the 1/8" x 1/4" x 30" [3.2mm x 6.4mm x 760mm] balsa sticks. Cut them to size as shown on the plan. Then glue them in place with medium CA to form the stab inner structure.

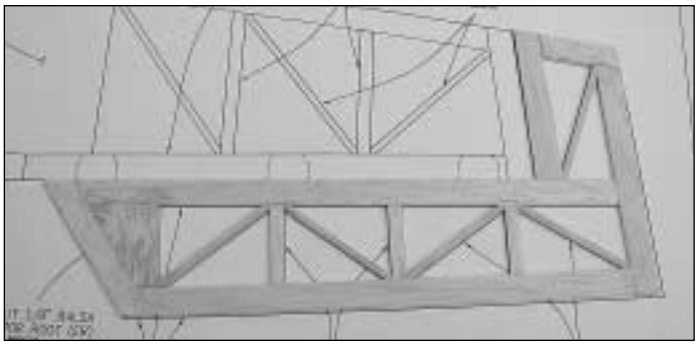
❏ 6. Locate the 1/8" x 1/8" x 30" [3.2mm x 3.2mm x 760mm] balsa sticks. Cut them to size as shown on the plans to complete the stab's inner structure. Glue them in place with thin CA. Remove the stab from the plans and lightly sand the top and bottom surfaces of the stab smooth.



❏ 7. Cut 1/8" x 1/2" x 30" [3.2mm x 13mm x 760mm] balsa sticks to size to form the elevator outer structure. Use medium CA to glue the sticks in place.

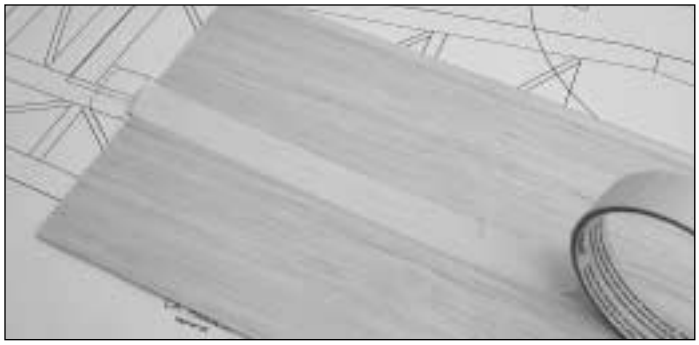


❏ 8. Locate the two die-cut **elevator roots (ER)**. Glue one in place in each elevator half as shown on the plan.



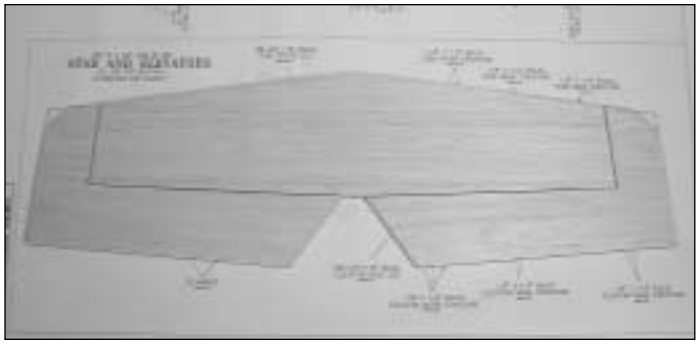
❏ 9. Cut the 1/8" x 1/4" x 30" [3.2mm x 6.4mm x 760mm] balsa stick to size to form the elevator inner structure. Also, cut the 1/8" x 1/8" x 30" [3.2mm x 3.2mm x 760mm] balsa stick to size to complete the elevator inner structure. Use thin CA to glue the sticks in place.

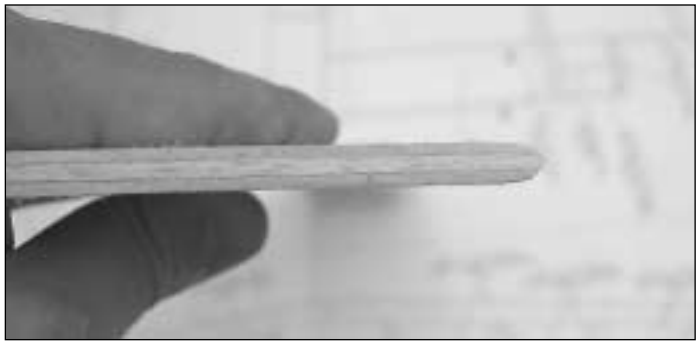
❏ 10. Remove the control surfaces from the plan and sand them smooth. Locate four 1/16" x 3" x 36" [1.6mm x 76mm x 914mm] balsa sheets. Mark and cut each sheet 19" [480mm] from one end.



❏ 11. Join two 19" [480mm] sheets together. Tape them together with masking tape, then flip the sheets over and glue the other side with thin CA. Let dry, remove the masking tape and lightly sand the joint. Do this twice so that you have one sheet for each side of the stab.

❏ 12. Sheet the top and bottom of the stab by applying slow-curing glue such as 30-minute epoxy or wood glue to the top and bottom of the stab structure and then placing the structure between the 1/16" [1.6mm] sheets you just joined. Use weights to apply pressure on the sandwich. Make sure the stab is placed on a flat surface while the glue cures. Sheet the top and bottom of the elevators following the same procedure using the leftover 1/16" [1.6mm] sheets. Again, make sure the elevators are placed on a flat surface while the glue cures. If you wish to do so, you can round the tip of the elevators.

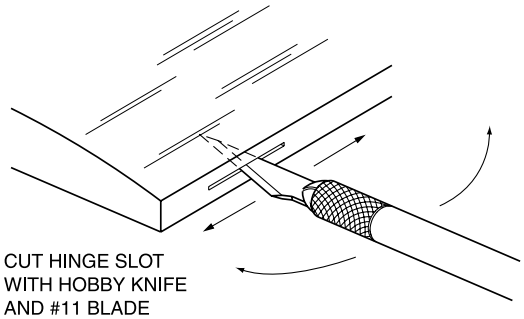




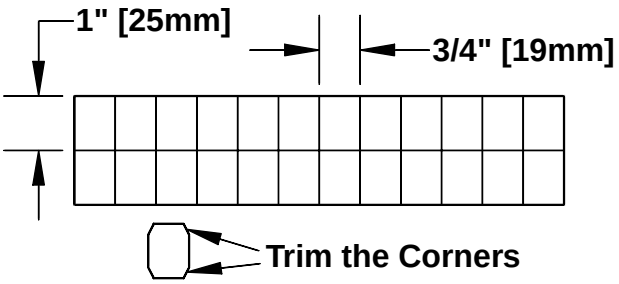
❏ 13. Sand the edges of the stab and the elevators square using a bar sander. Mate the stabilizer and elevators to check the fit. Shape the leading edge of the stab and the leading edge of the elevator counter balance to obtain the shape shown in the plan's cross section. Do not shape the leading edge of the elevators yet.

❏ 14. Locate the center of the trailing edge of the stab. Place a T-pin on the center at each end of the stab. Lay a straight edge against the pins and draw a centerline on the trailing edge of the stab. Repeat this procedure for the leading edge of the two elevators. A great tool for marking the center of the trailing edge is the Great Planes Precision Hinge Marking Tool (GPMR4005).

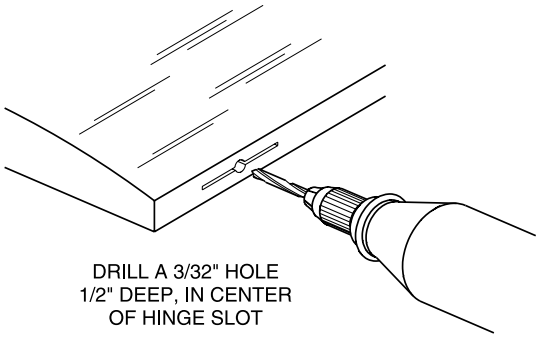
❏ 15. Using the plans as your reference, mark the location for the hinges on the T.E. of the stab and the L.E. of the two elevator halves.



❏ 16. Cut the hinge slots in the stab and elevators using a #11 blade inserted in your hobby knife. Begin by carefully cutting a very shallow slit at the hinge location to accurately establish the hinge slot. Make three of four more cuts, going a little deeper each time. As you cut, slide the knife from side to side until the slot has reached the proper depth and width for the hinge.



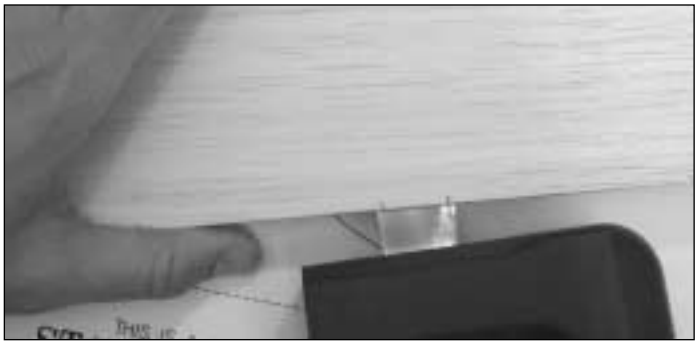
❏ 17. Cut six 3/4" x 1" [19mm x 25mm] hinges from the CA hinge strip. Snip off the corners so they go in easier.



❏ 18. Drill a 3/32" [2.4mm] hole 1/2" [13mm] deep in the center of the hinge slot. This will help the glue to better saturate the hinge and the wood when the hinges are installed.

EXPERT TIP

We have simplified the task of cutting hinge slots with the introduction of the Great Planes Slot Machine™. This simple electric tool cuts a perfect width slot for use with CA hinges.



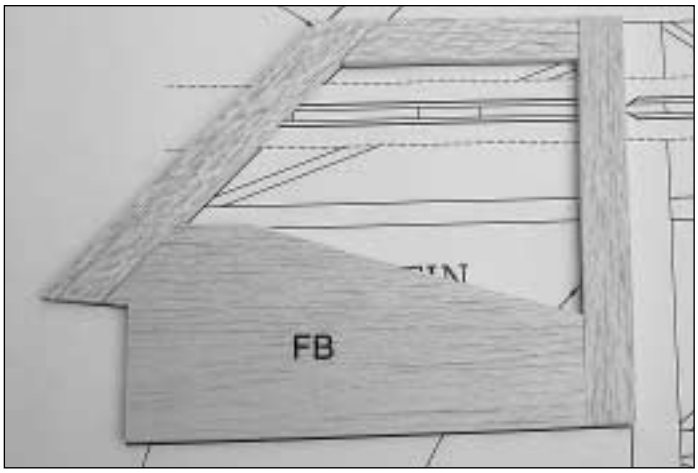
To cut the hinge slot, place the blades onto the wood where you want the slot. Lightly press the teeth into the wood. When you are satisfied with the location, press the button on the handle and the blades will cut easily into the balsa wood.

❏ 19. Bevel the L.E. of the elevator halves as shown on the plan cross section.

❏ 20. Test fit the stab, hinges and elevator halves together. **IMPORTANT: Do not glue the hinges in place. This will be done after the model has been covered.**

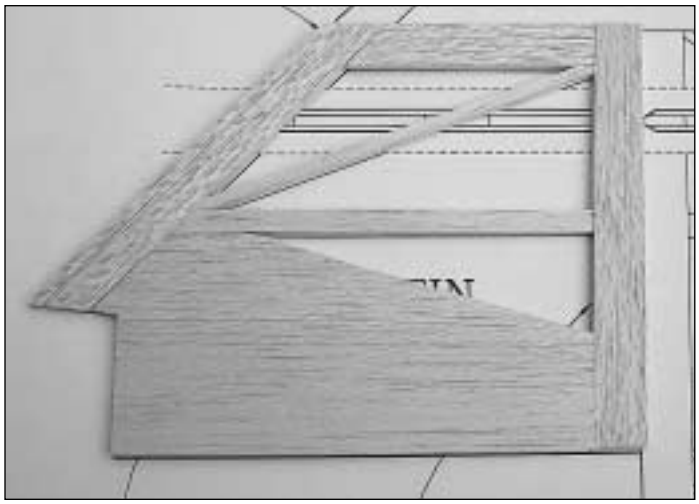
❏ 21. Drill 1/16" [1.6mm] the holes for the control horns on both elevators as indicated on the elevators plan. Wick some thin CA into the holes.

Build the Fin & Rudder

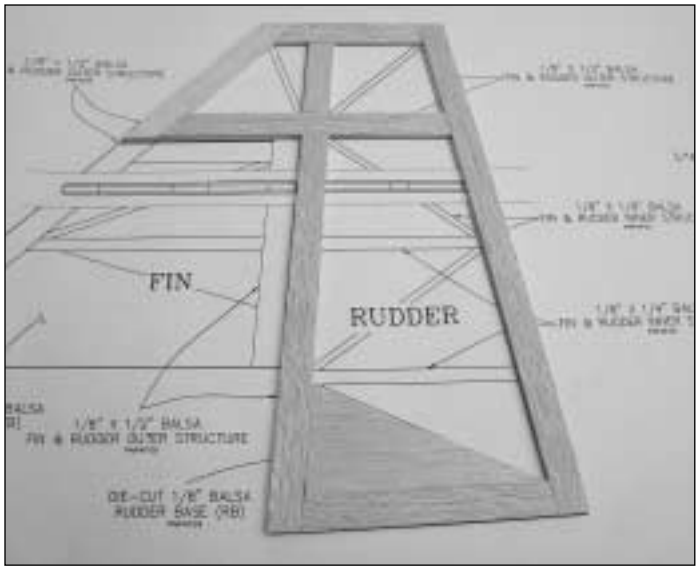


❏ 1. Unroll the wing plan. Pin the die-cut 1/8" [3.2mm] balsa **fin base (FB)** onto the plan and build the fin outer structure

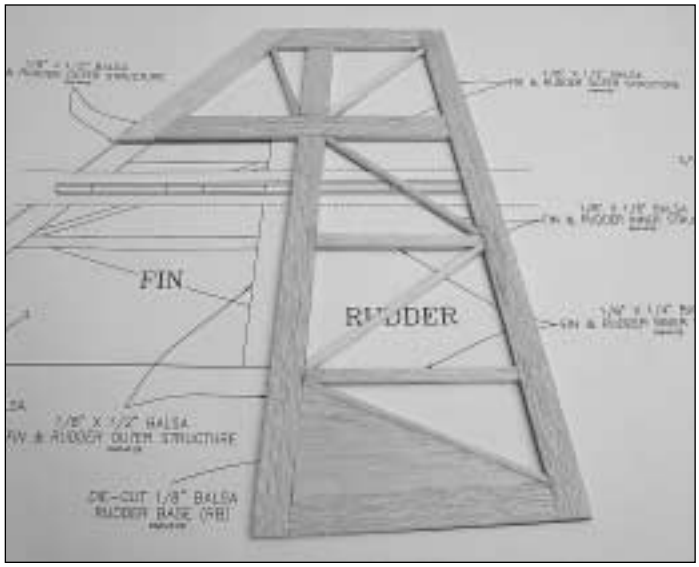
around it using the 1/8" x 1/2" x 30" [3.2mm x 13mm x 760mm] balsa sticks. Cut them to size as shown on the plan.



❑ 2. Finish the inner structure of the fin using the 1/8" x 1/4" x 30" [3.2mm x 6.4mm x 760mm] balsa sticks and the 1/8" x 1/8" x 30" [3.2mm x 3.2mm x 760mm] balsa sticks.

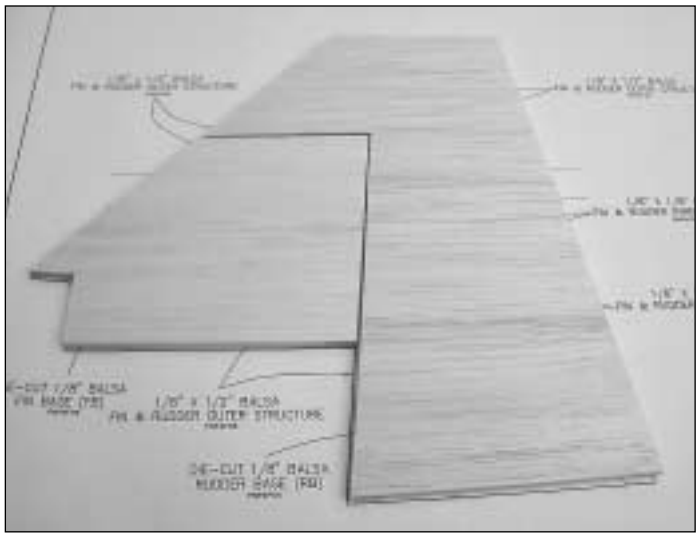


❑ 3. Locate the die-cut 1/8" [3.2mm] **rudder base (RB)** and pin it onto the plan. Construct the rudder outer structure using the 1/8" x 1/2" x 30" [3.2mm x 13mm x760mm] balsa stick. Cut them to size as shown on the plan. Then glue them in place.



❑ 4. Cut the 1/8" x 1/4" x 30" [3.2mm x 6.4mm x 760mm] and the 1/8" x 1/8" x 30" [3.2mm x 3.2mm x 760mm] balsa sticks to size to form the rudder inner structure. Glue them in place with thin CA.

❑ 5. Remove the fin and rudder from the plan and sand them smooth. Locate two 1/16" x 3" x 36" [1.6mm x 76mm x 914mm] balsa sheets. Sheet both sides of the fin and the rudder using the same procedure you used for the stab and elevator.

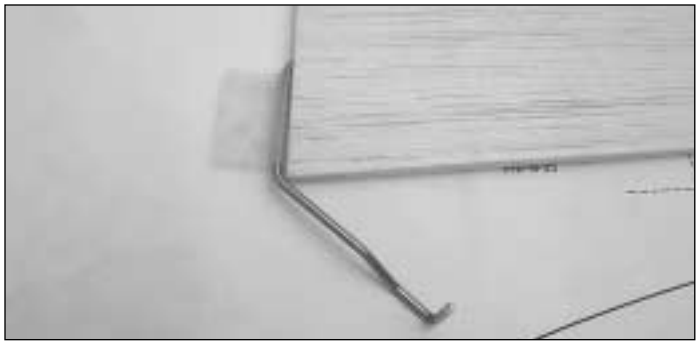


❑ 6. Sand the edges of the fin and rudder square using a bar sander. Mate the fin and the rudder to check the fit. Shape the fin and the rudder to obtain the shape shown in the plan's cross section. Do not shape the leading edge of the rudder yet. If you wish to do so, you can round the top of the rudder as shown on the plan.

❑ 7. Locate the center of the leading edge of the rudder and the center of the trailing edge of the fin using the same procedure that was used on the elevator and stab.

❑ 8. Using the plan as a reference, mark the location of the CA hinges on the fin and rudder.

❏ 9. Cut the hinge slots on the trailing edge of the fin and the leading edge of the rudder following the same procedure used on the stab and elevators.



❏ 10. **Fixed Mains and Tailwheel and Retractable Mains/Fixed Tailwheel.** Drill a 7/64" [2.8mm] hole 1" [25mm] deep in the rudder for the tail wheel assembly as shown on the plan. Make sure it is oriented 90 degrees to the leading edge of the rudder. Wick thin CA in the hole. Cut a groove 1/8" [3.2mm] wide from the bottom of the rudder up to the hole. **Hint:** A perfect tool for this is the Great Planes Groove Tube™ (GPMR8140).

❏ 11. Bevel the leading edge of the rudder as shown on the plans cross section.

❏ 12. Test fit the CA hinges but do not glue them in place. This will be done after the model is covered.

❏ 13. Drill 1/16" [1.6mm] holes for the control horn on the rudder as indicated on the rudder plan. Wick some thin CA into the holes.

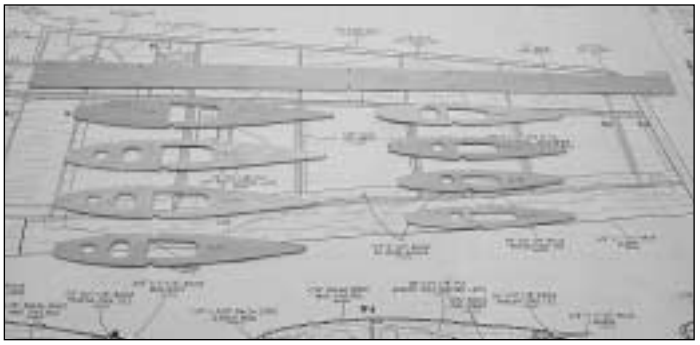
BUILD THE WING

Build the Wing Panels

❏ 1. Unroll the plan sheet. Roll it inside out so they will lie flat.

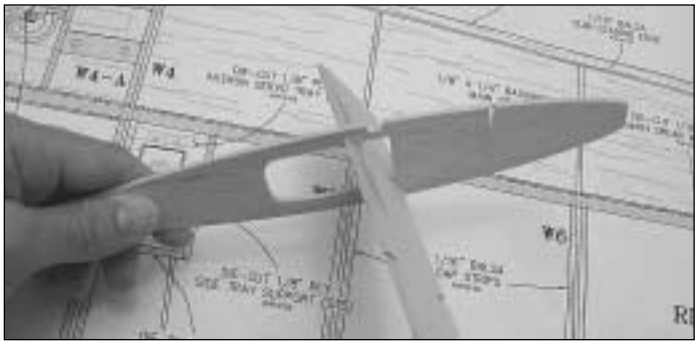
❏ 2. Locate the right wing panel of the plan. You may find it helpful to cut the plan in half, making them a more manageable size to pin to your building board.

❏ 3. Position the right wing panel plan flat on the building board. Cover the plan with Great Planes Plan Protector or waxed paper so glue will not adhere to it.

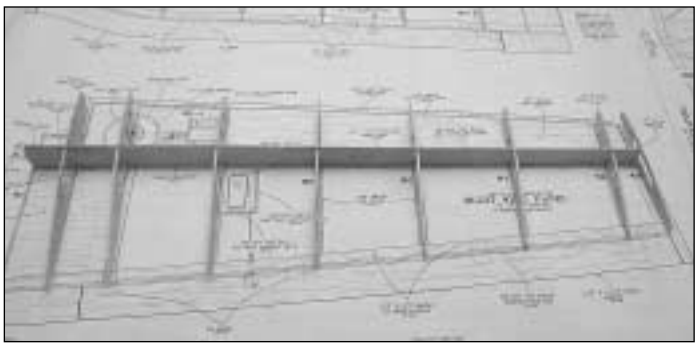


❏ ❏ 4. Locate the die-cut 1/16" [1.6mm] balsa **main shear web (MSW)**, the die-cut 3/32" [2.4mm] balsa **wing ribs W2** through **W8** and the die-cut 1/16" [1.6mm] balsa **wing rib W9**.

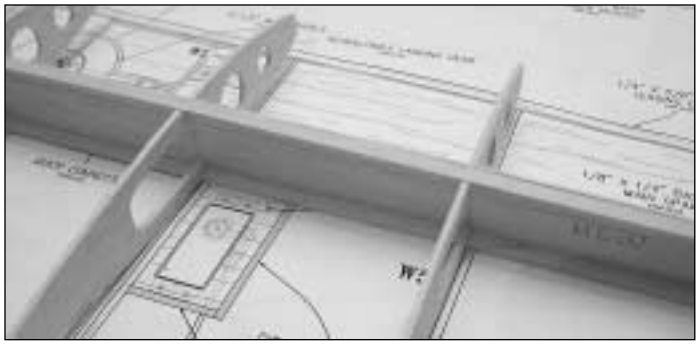
Note: In the following steps it is important to pay careful attention and assemble the parts exactly as instructed. Failure to do so will result in a wing that is not straight.



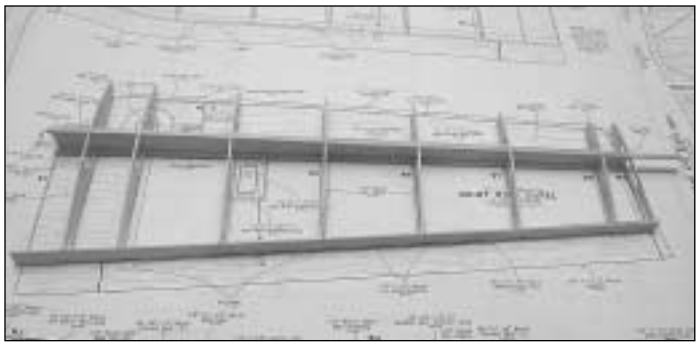
❏ ❏ 5. Insert the wider end of MSW into W2. Position the rib over the second set of notches and then twist it into the notch. The top of MSW is marked. Push MSW forward until it sits against W2. Do not glue them to each other at this time.



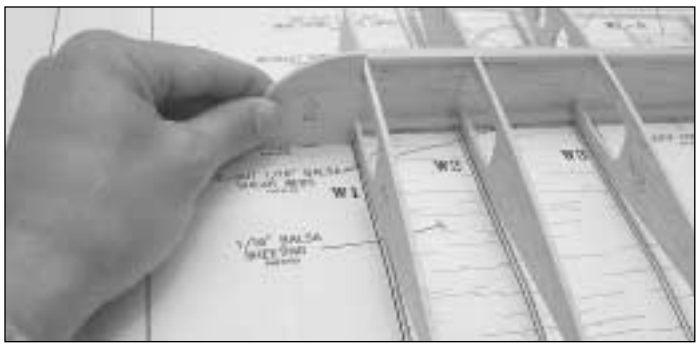
❏ ❏ 6. Insert all other ribs in order (W3, W4, W5, ...W9) and twist them into their notches. Because W9 is installed at a different angle against MSW, you may need to slightly sand MSW to be able to position W9 as shown on the plans. Again, all letters in the ribs should be right-side-up. Do not glue any of the ribs in place yet.



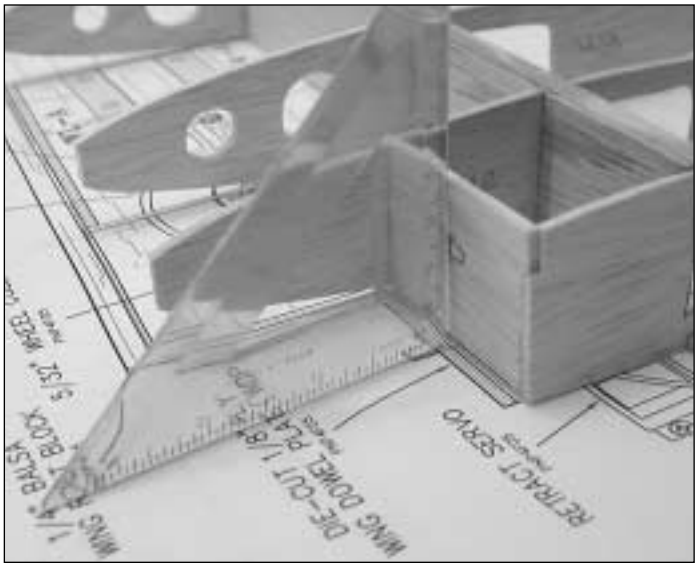
❑ ❑ 7. Locate two 1/8" x 1/4" x 30" [3.2mm x 6.4mm x 760mm] hardwood wing spars. Insert them in place in the ribs as shown. You should now have the top and bottom wing spars inserted on the wing ribs as shown. Do not glue the spars in place yet.



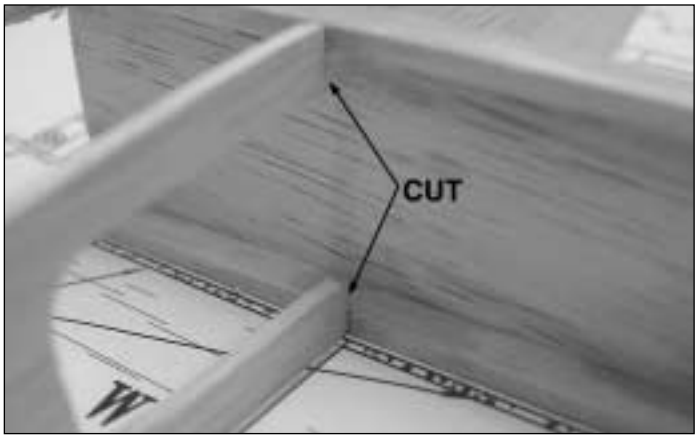
❑ ❑ 8. Locate the die-cut 1/8" [3.2mm] **wing trailing edge (TE)**. Insert it into the notches at the trailing edge of each of the ribs. Be sure that the tall end of TE is at the root of the wing. Line up the ribs and webs with the plans. Place weights on top of the structure to make sure it sits flat against the building surface. Use thin CA to glue all the parts together.



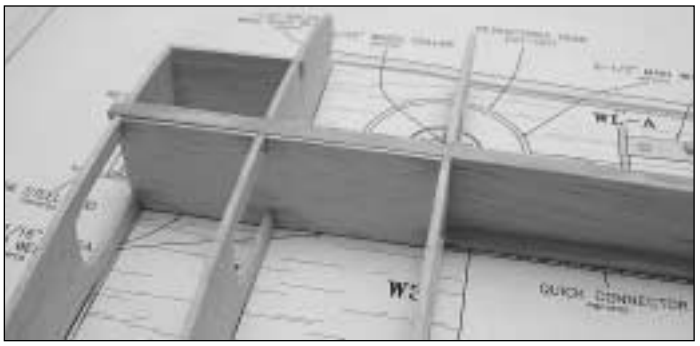
❑ ❑ 9. Locate the die-cut 3/32" [2.4mm] **wing rib W1**. Place the rib in the notches in MSW at the root of the wing. Use the die-cut **dihedral gauge (DG)** to set the correct amount of dihedral for the root rib W1. Insert the trailing edge notch on the rib in its slot in TE. Glue W1 in place with medium CA.



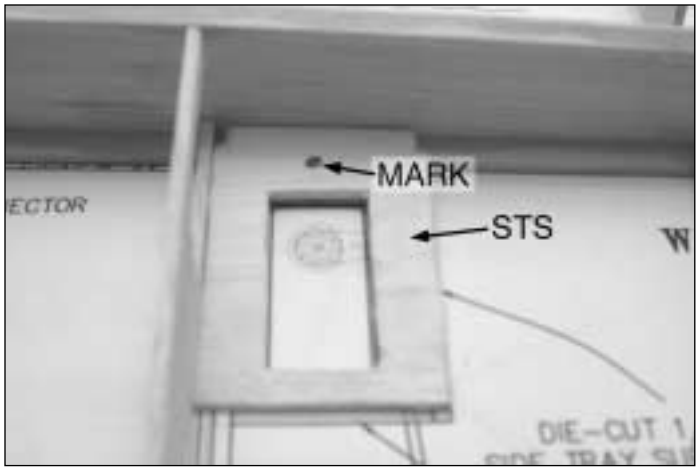
❑ ❑ 10. Locate the die-cut 3/32" [2.4mm] **dowel plate doubler (DP)**. Insert it as shown in the slot in W2 and the leading edge of W1. Make sure it is inserted at 90 degrees from the building surface. Glue it in place with medium CA.



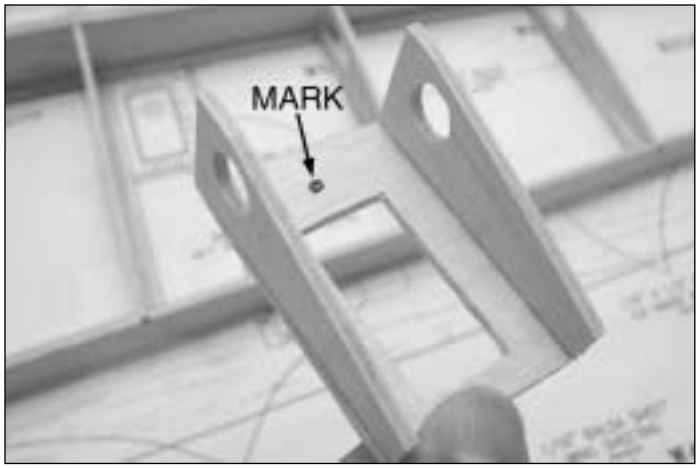
❑ ❑ 11. Carefully cut the portion of the rib W2 that is between the wing spars. This is done to allow the wing joiner to later be inserted between the wing spars.



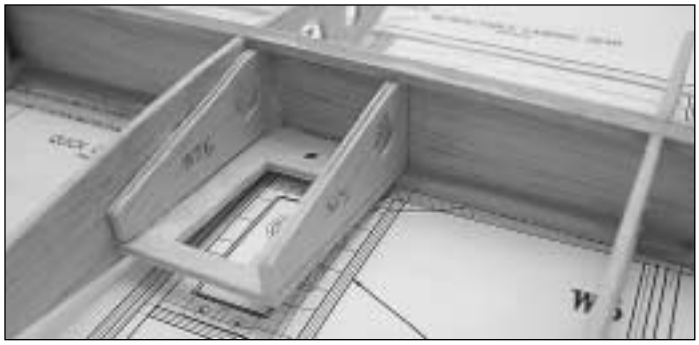
❑ ❑ 12. Locate the die-cut 1/16" [1.6mm] **aft shear web (ASW)**. Insert it between ribs W1, W2 and W3, twist it and push it against the wing spars. Glue ASW in place with thin CA.



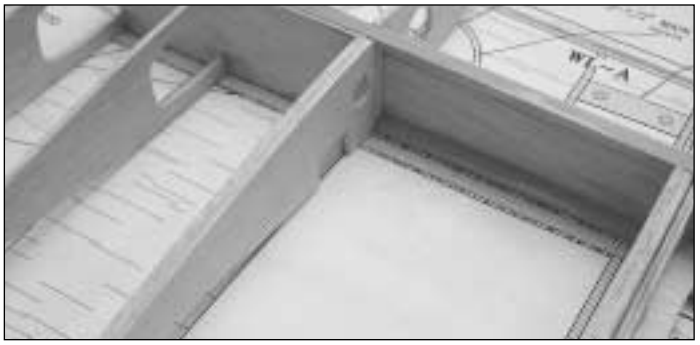
❑ ❑ 13. Locate one die-cut 1/8" [3.2mm] lite-ply **aileron servo tray (AST)**.The tray is not symmetrical because of the sweep of the main wing spar. Place the aileron servo tray against the wing main shear web (MSW) and the wing rib W4. The servo tray will only fit one way, so flip it if you need to. Once you are satisfied with the fit, mark the top side of the tray as shown.

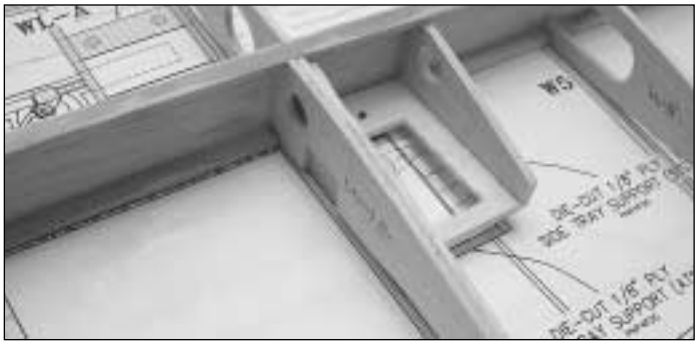


❑ ❑ 14. Locate two die-cut 1/8" [3.2mm] **servo tray supports (STS)**. Glue them to ATS as shown in the above image.

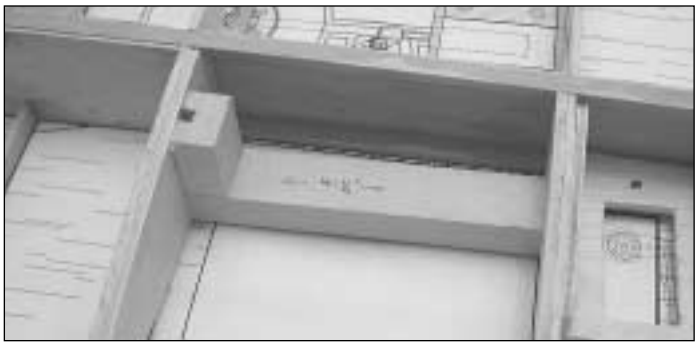


❑ ❑ 15. Fit the servo tray assembly to the main shear web (MSW) and W4 as shown. You will need to slightly sand one of the servo tray supports (STS) to make it fit as shown in the above image. Once you are satisfied with the fit, glue the assembly in place with medium CA.

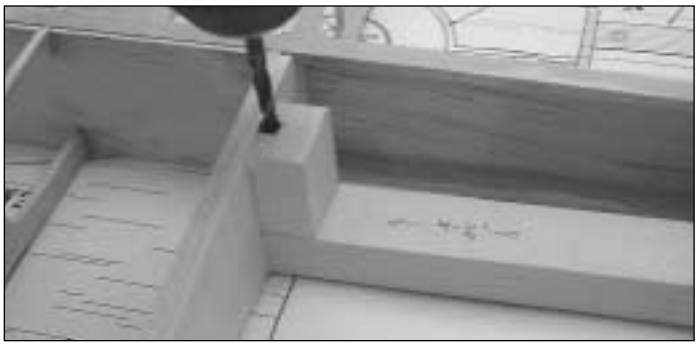




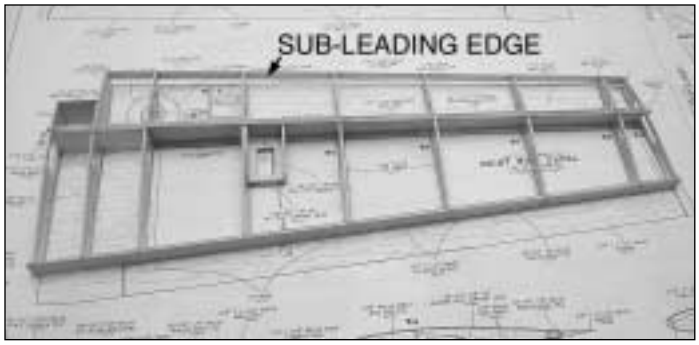
❑ ❑ 16. **Fixed Tricycle.** Locate the die-cut 1/8" [3.2mm] lite-ply **ribs W3-B** and **W4-B**. Glue them to the inner side of the 3rd bay with epoxy as shown in the plans. Use plenty of epoxy on this and the following steps.



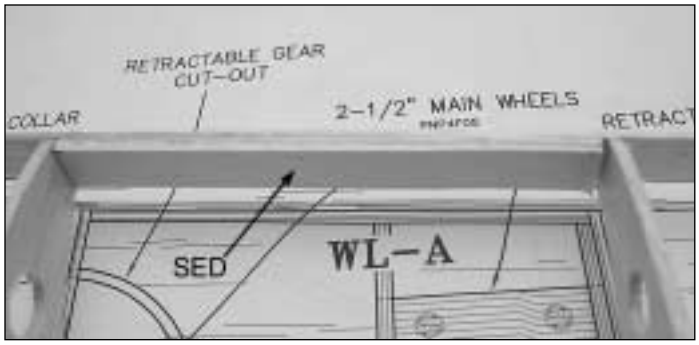
❑ ❑ 17. **Fixed Tricycle.** Locate one of the 1/2" x 3/4" x 5-1/2" [13mm x 19mm x 140mm] hardwood landing gear rails. Cut the rail into two pieces, one 4-1/4" [108mm] long and another 7/8" [22mm] long. Glue them in place as shown using epoxy.



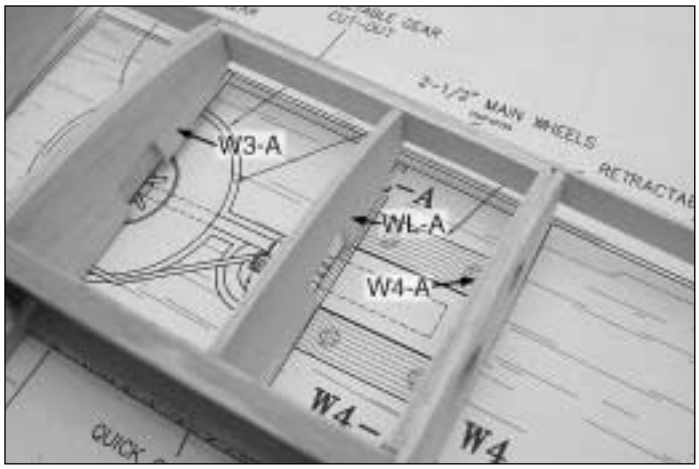
❑ ❑ 18. **Fixed Tricycle.** Drill a 5/32" [4mm] hole through the slot on the vertical piece of the landing gear rail into the horizontal portion of the rail. This is for the landing gear wire.



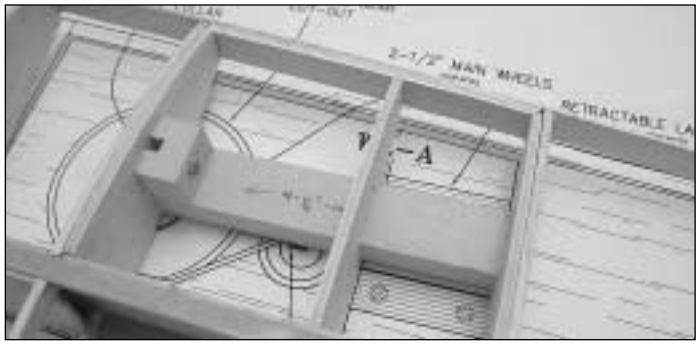
❑ ❑ 19. Locate one 1/16" x 1/2" x 30" [1.6mm x 13mm x 760mm] balsa sub-leading edge. Glue it in place in front of all ribs with medium CA. After gluing it in place, lightly sand the top and bottom of the sub-leading edge with a sanding bar, making sure it matches the shape of the ribs. Sand the ends to fit the ribs.



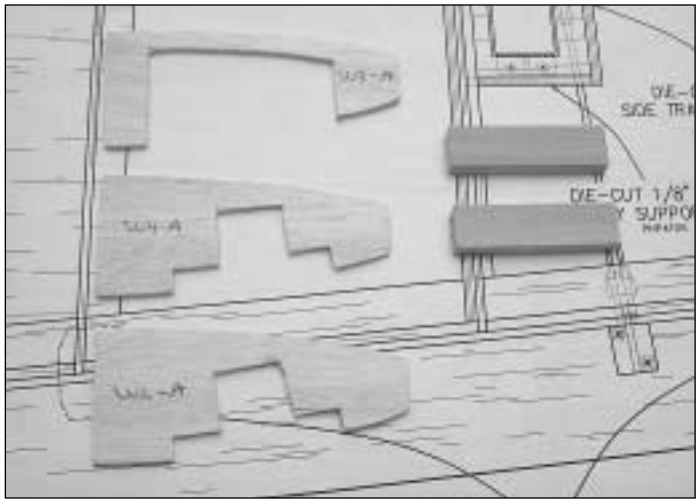
❑ ❑ 20. **Fixed and Retractable Mains/Fixed Tailwheel.** Locate the die-cut 1/8" [3.2mm] lite-ply **sub-leading edge doubler (SED)** and glue it with epoxy to the sub-leading edge between ribs W3 and W4. After the glue has cured, lightly sand SED until it matches the shape of the ribs.



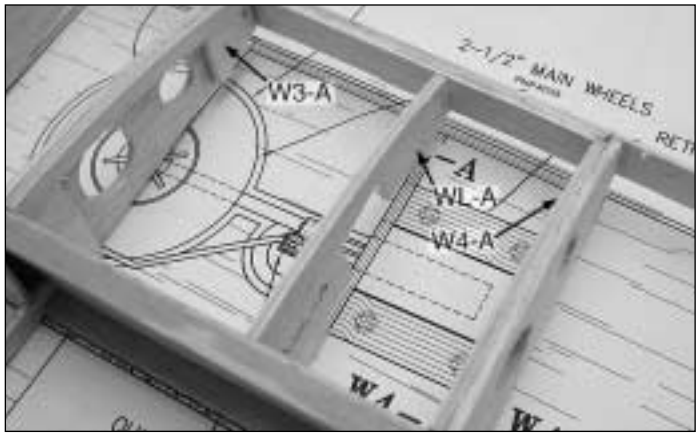
❑ ❑ 21. **Fixed Mains and Tailwheel.** Locate the die-cut 1/8" [3.2mm] lite-ply ribs **W3-A**, **WL-A,** and **W4-A**. Use epoxy to glue them in place as shown on the wing plan. Also, use epoxy on the cuts on the ribs. After the epoxy has cured, sand the ribs smooth with the top and bottom surfaces of the wing.



❑ ❑ 22. **Fixed Mains and Tailwheel.** Locate one of the 1/2" x 3/4" x 5-1/2" [13mm x 19mm x 140mm] hardwood landing gear rails. Cut the rail into two pieces, one 4-1/4" [108mm] long and another 5/8" [16mm] long. Glue them in place as shown using epoxy. Drill a 5/32" [4mm] hole through the slot in the vertical rail into the horizontal rail. This is for the landing gear wire.

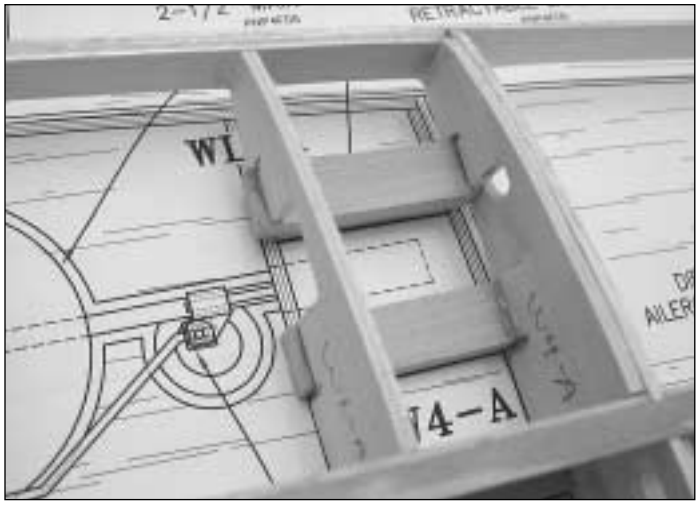


❑ ❑ 23. **Retractable Mains/Fixed Tailwheel.** Locate the die-cut 1/8" [3.2mm] lite-ply ribs **W3-A, WL-A,** and **W4-A**. Make straight lines between the top of the pre-cut edges and cut the material out as shown in the above image. Locate the 1/4" x 1/2" x 8" [6.4mm x 13mm x 203mm] hardwood stick and cut it in four pieces 1-7/8" [48mm] long. You will use two pieces on each retractable landing gear mount on each wing.

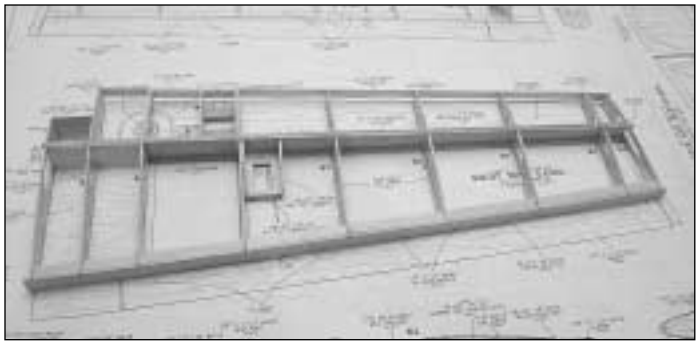


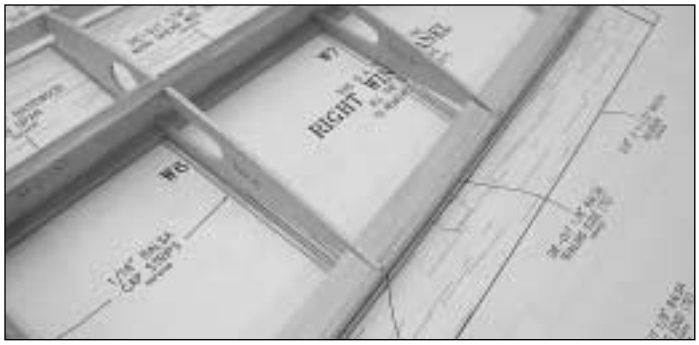
❑ ❑ 24. **Retractable Mains/Fixed Tailwheel.** Glue W3-A, WL-A and W4-A as shown in the above image using epoxy.

The strength of your landing gear depends on how well you glue these parts in place. Make sure W3-A, WL-A and W4-A are also glued well to the wing's main shear web (MSW) and to the sub-leading edge doubler (SED).

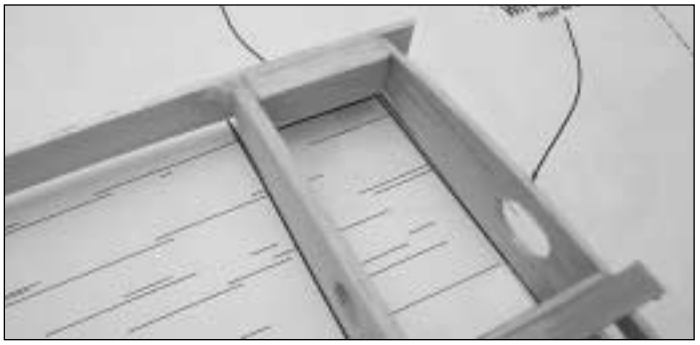


❏ ❏ 25. **Retractable Mains/Fixed Tailwheel.** Glue the two 1/4" x 1/2" x 1-7/8" [6.4mm x 13mm x 48mm] hardwood retractable gear mounts between W4-A and WL-A as shown with epoxy. Add small pieces of scrap hardwood sticks glued with epoxy between the landing gear mounts and the lite ply ribs to reinforce the area.

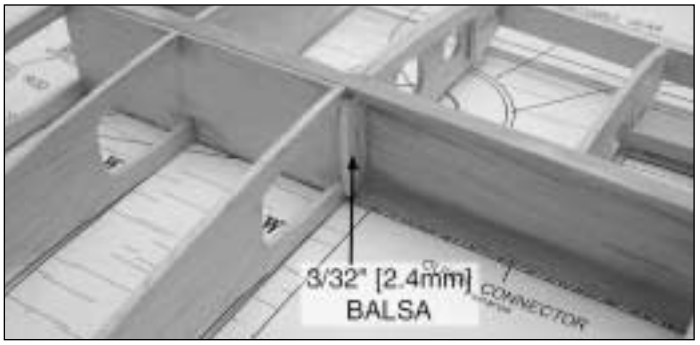




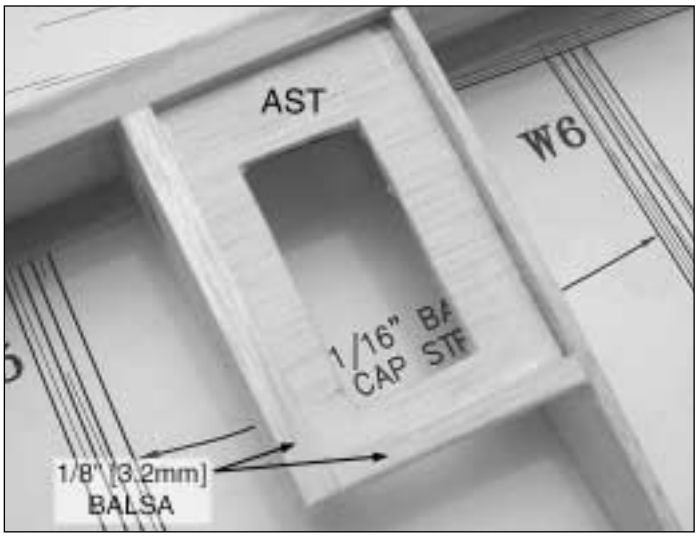
❏ ❏ 26. Locate two 1/4" x 1/2" x 30" [6.4mm x 13mm x 760mm] balsa sticks and cut them in five pieces 4-1/2" [114.5] long, two pieces 2-1/4" [57mm] long and one piece 1-7/8" [48mm] long. Sand the edges at an angle so that they fit between the ribs at the trailing edge of the wing and glue them in place with medium CA.



❏ ❏ 27. Cut another piece from the leftover 1/4" x 1/2" x 30" [6.4mm x 13mm x 760mm] sticks in the above steps and fit it between W8 and W9 at the leading edge as shown on the plan. Glue it in place with medium CA. After the glue has cured, lightly sand the block until it matches the shape of the ribs.

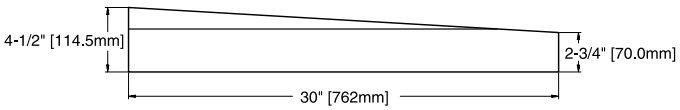


❏ ❏ 28. **Fixed and Retractable Mains/Fixed Tailwheel.** Cut a 3/32" [2.4mm] piece of scrap balsa to fit between the main spars at the W3 rib. This piece of balsa seals the inner end of the wing joiner pocket to prevent the epoxy from spilling into the wing while gluing the wing joiner in place in a future step.

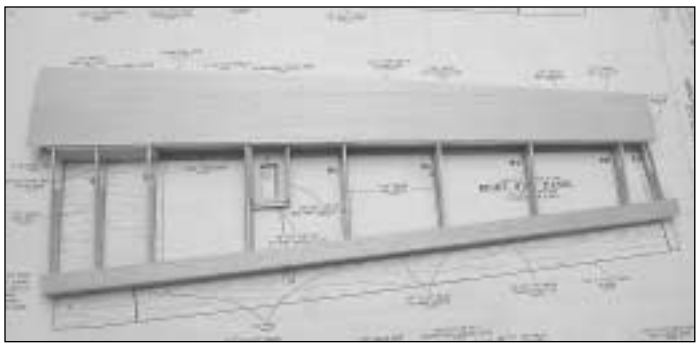


❏ ❏ 29. Flip the wing over so that you can see the bottom side and glue a small piece of scrap 1/8" [3.2mm] balsa to the edges of the aileron servo tray. Once the glue has cured, sand the balsa to match the shape of the ribs.

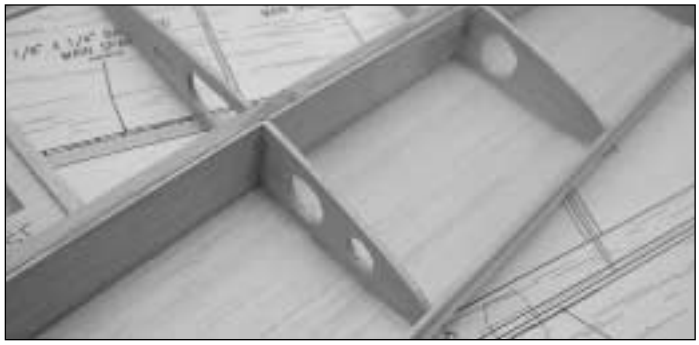
❏ ❏ 30. Flip the wing over again to work on the top side. Locate a 1/16" x 3/4" x 30" [1.6mm x 19mm x 760mm] balsa stick. Glue the stick flush with the wing trailing edge (TE) with medium CA. Cut the ends of the stick that extend past the wing tip and wing root.



❏ ❏ 31. Glue together two pieces of 1/16" x 3" x 30" [1.6mm x 76mm x 760mm] soft balsa used to sheet the tail surfaces in a previous step. Sand the joint smooth. Mark one end of the sheet 2-3/4" [70mm] away from the long edge. Mark the other end of the sheet 4-1/2" [114.5mm] away from the long edge. Make a straight line through these two marks and use a straight edge to cut along the line. One of the cut parts of this sheet will be used to sheet the leading edge of the wing. The other part will be used to sheet part of the center-section of the wing and for cap stripping the wing.

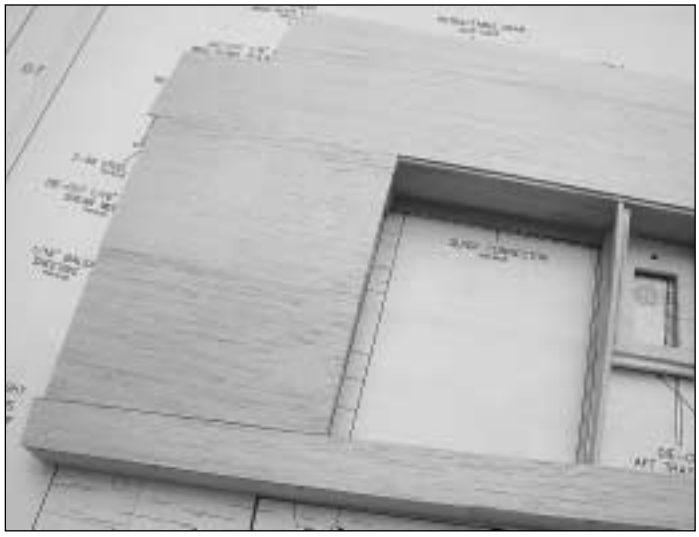


❏ ❏ 32. Sand the top of the wing smooth with a long sanding bar. Glue the sheeting to the main wing spar and to the ribs and sub-leading edge as shown with medium CA. Note that the sheeting starts centered on the main wing spar. If you prefer to use a slower curing glue, place weights on the sheeting to keep it attached to the wing ribs as the glue cures.

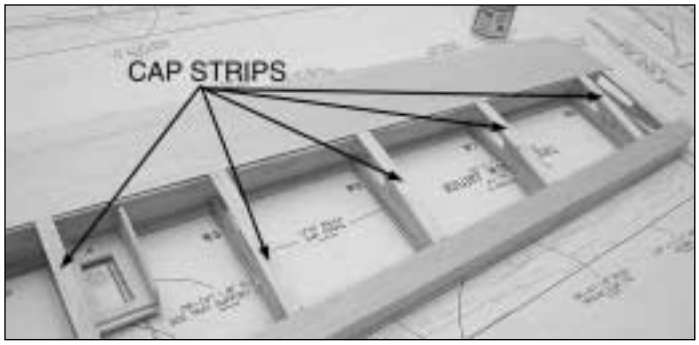


❏ ❏ 33. Once the glue has cured, flip the wing over and add more glue if necessary to attach the sheeting to the ribs or sub-leading edge.

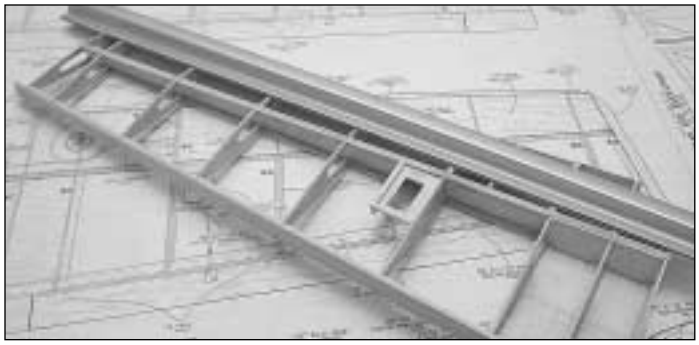
❏ ❏ 34. Cut the portion of the sheet that extends past the root and the tip.

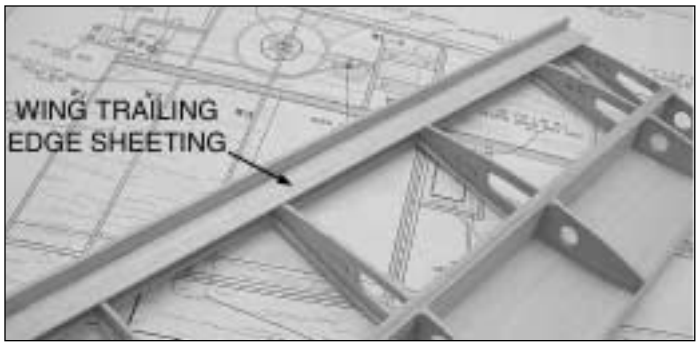


❏ ❏ 35. Locate a 1/16" x 3" x 30" [1.6mm x 76mm x 760mm] balsa sheet and cut four pieces 4-3/4" [121mm] long from it. Glue one of the parts to the wing center-section. Use some of the leftover sheeting cut in step 31 to complete the center-section sheeting.



❏ ❏ 36. Cut the leftover sheeting from step 31 with the grain into 3/8" [9.5mm] wide balsa strips. Use these strips to make your cap strips. Cut the cap strips to fit between the forward sheeting and the trailing edge sheeting. Use the plans as a guide to identify the ribs that should be cap stripped.

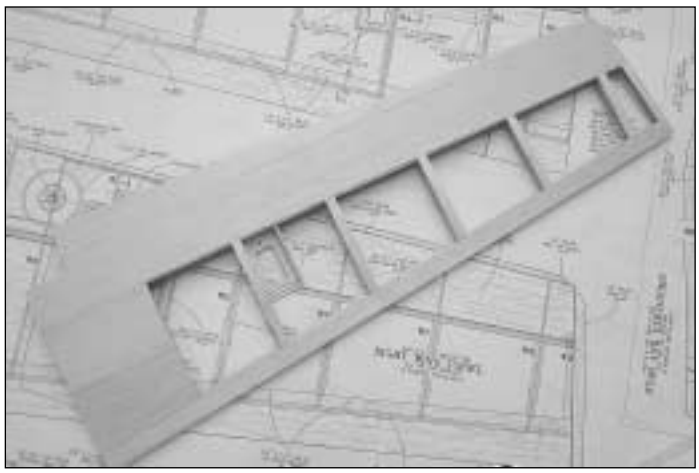




❏ ❏ 37. Flip the wing over and sand the bottom of the wing smooth. Locate a 1/16" [1.6mm] x 3/4" x 30" balsa stick. Glue the stick flush with the wing trailing edge (TE) using medium CA. Cut the ends of the stick that extend past the wing tip and wing root.

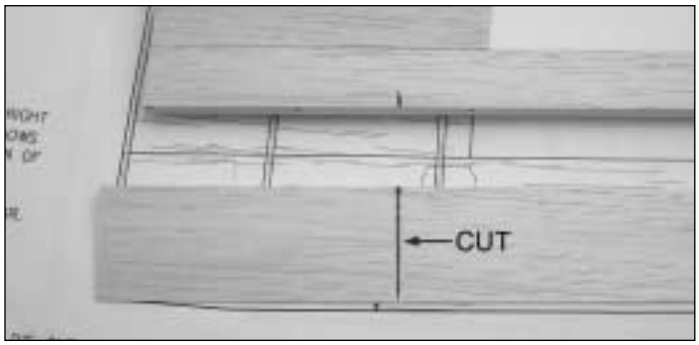
❏ ❏ 38. Use the sketch in step 31 to prepare the sheeting for the bottom wing surface. Glue the sheeting in place using the same procedure as was used for the top sheeting. Cut the ends of the sheeting that extend out from the wing root and tip.

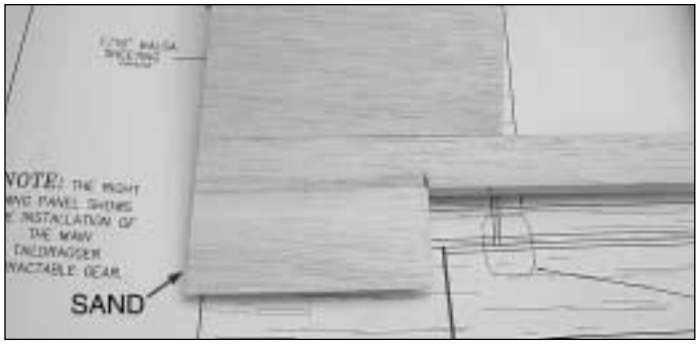
❏ ❏ 39. Glue one of the 1/16" x 3" x 4-3/4" [1.6mm x 76mm x 121mm] balsa sheets cut in step 35 to the wing center-section. Use some of the leftover sheeting cut in step 31 to complete the center-section sheeting. Also, cut that same leftover balsa sheet into 3/8" [9.5mm] strips and use them to cap strip the ribs on the bottom surface of the wing. Remember to cap strip the aileron servo tray. This is the same procedure as used for the top wing sheeting and cap strips.



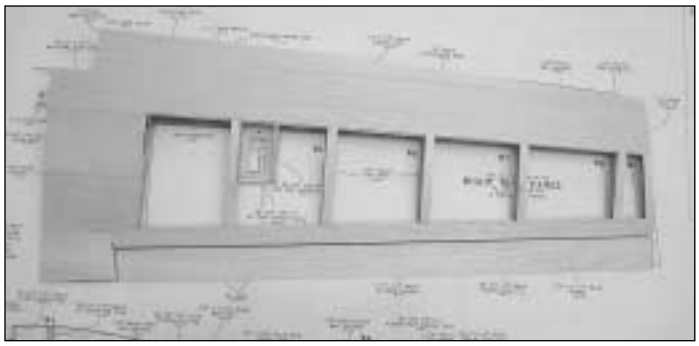
❏ ❏ 40. Sand the tip and root of the wing smooth. Sand the leading edge sheeting flush with the sub-leading edge. Also

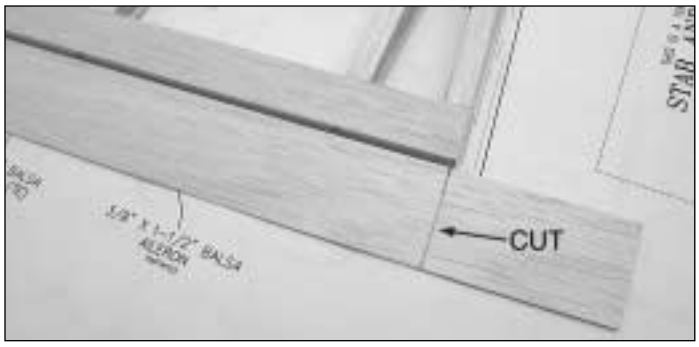
sand the trailing edge sheeting flush with the wing trailing edge (TE). Sand the top and bottom of the wing smooth.



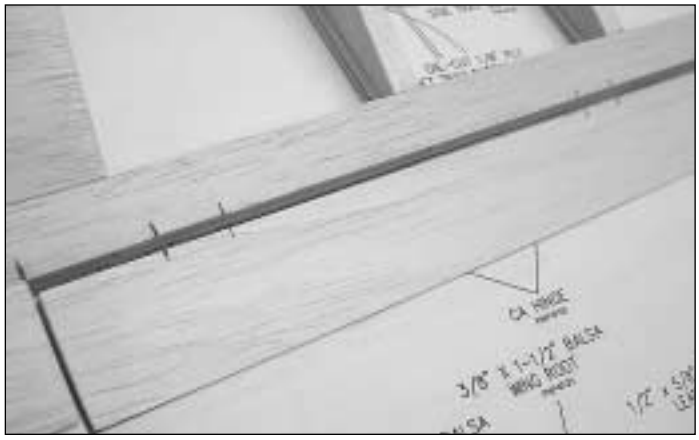


❏ ❏ 41. Mark the trailing edge of the wing where the aileron ends between W2 and W3. Mark one piece of aileron stock 1/2" longer than that distance. Cut the aileron stock at that mark and glue it to the trailing edge of the wing as shown above. Also, sand the stock flush that extends past the root rib.

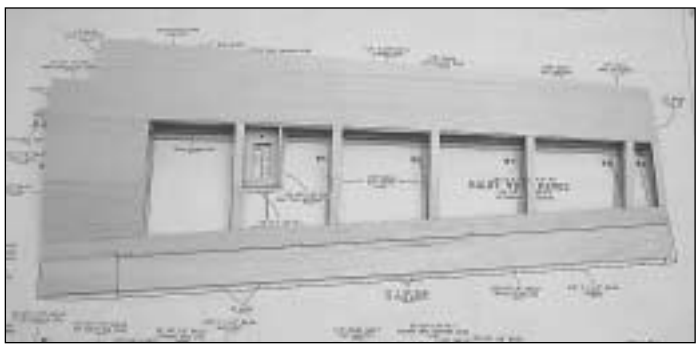




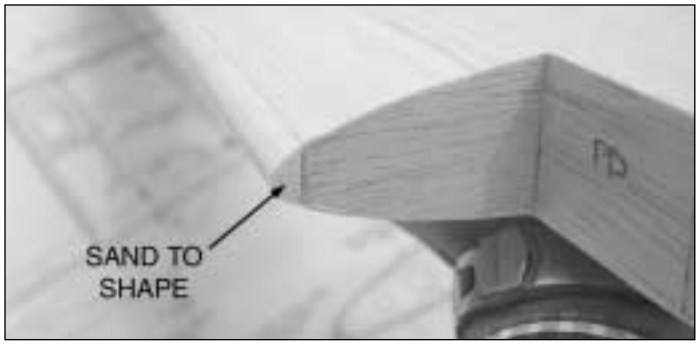
❏ ❏ 42. Place the aileron at the trailing edge of the wing against the piece you just glued. Draw a line at the tip rib on the aileron. Cut the aileron stock to length.



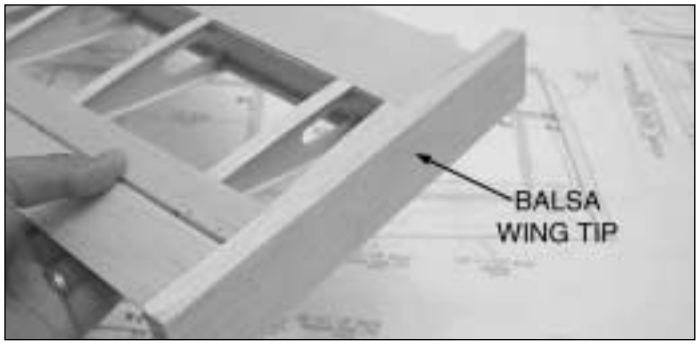
❏ ❏ 43. Use the same method described on step 14, page 10 to draw a centerline on the wing trailing edge and aileron leading edge. Mark the location of the CA hinges on the aileron and wing trailing edge as shown on the plans. Cut the hinge slots using the same method you used for the elevators.

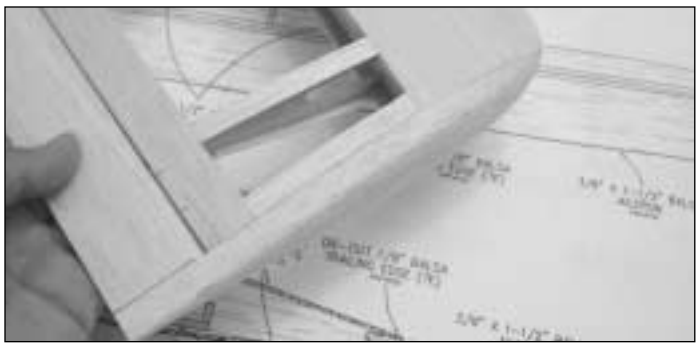


❏ ❏ 44. Bevel the aileron as shown. Test fit the aileron to the wing trailing edge with the CA hinges. Sand the sides and the top or bottom of the aileron as needed to account for the wing taper.

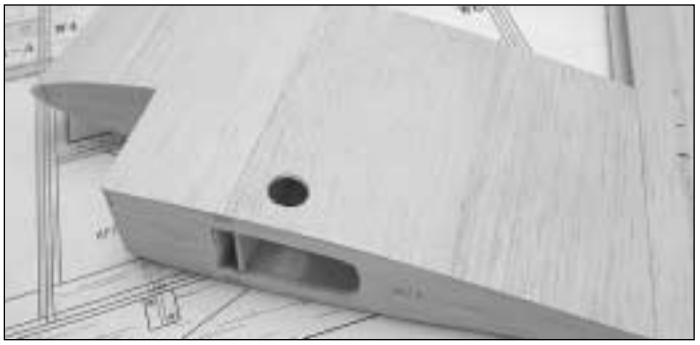


❑ ❑ 45. Locate the 1/4" x 5/8" x 30" [6.4mm x 16mm x 760mm] balsa leading edge and glue it to the sub-leading edge of the wing. Cut the portion of the leading edge that extends past the tip rib and W2. Sand the leading edge to shape as shown on the plans cross section.

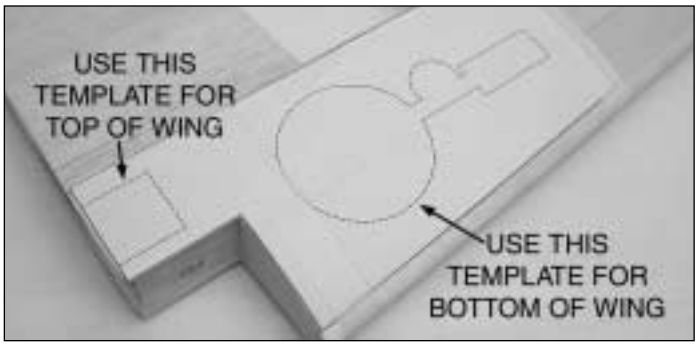


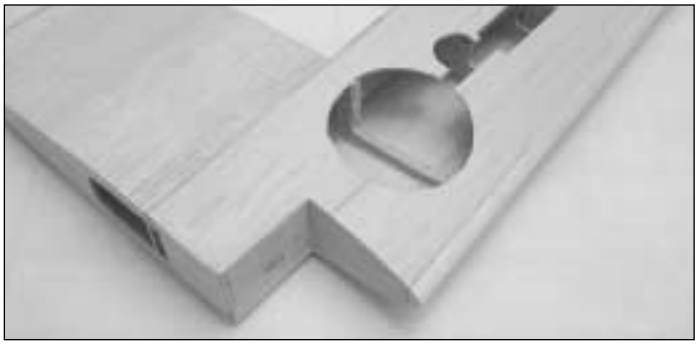


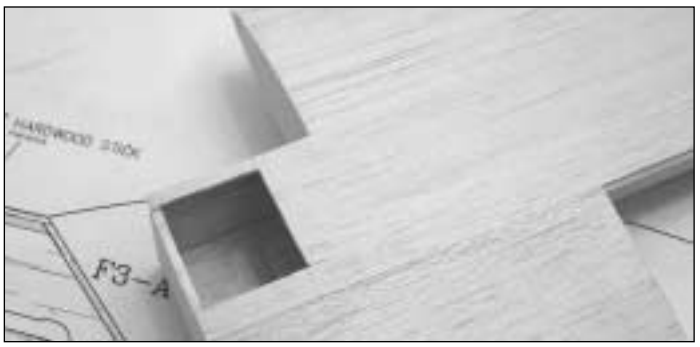
❑ ❑ 46. Locate the 1/2" x 1-1/2" x 9" [13mm x 38mm x 229mm] balsa **wing tip block** and glue it to the wing tip. Make sure the block covers the wing leading edge and the aileron. Use a clothespin between the aileron and the wing trailing edge at the root to hold the aileron in a neutral position. Sand the block to shape as shown on the plans.



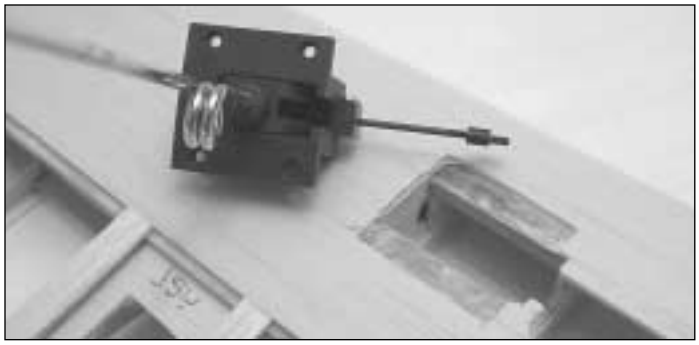
❑ ❑ 47. Use a high speed rotary tool to drill a 1/2" [13mm] hole in the top sheeting of the center-section as shown above. The exact location of the hole is not important as long as it is behind the main wing spar.

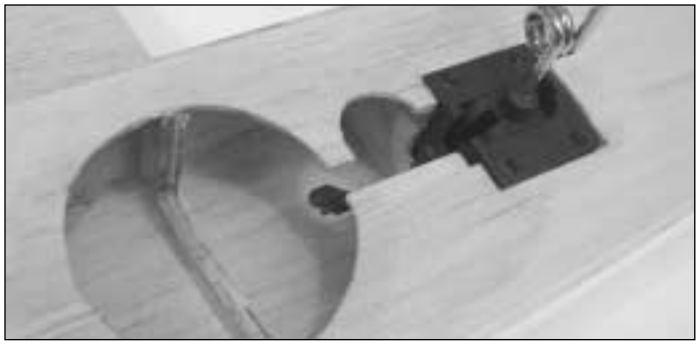




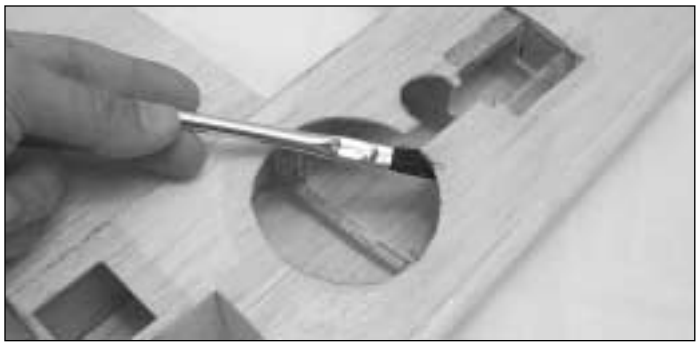


❑ ❑ 48. **Retractable Mains/Fixed Tailwheel.** Locate the Retractable Mains/Fixed Tailwheel landing gear cut-out template and place it as shown on the sheeting on the bottom of the wing. Cut the opening for the wheel and retract in the bottom sheeting. Then remove the template, and place it on the sheeting on top of the wing. Cut the opening for the retract servo in the top sheeting.





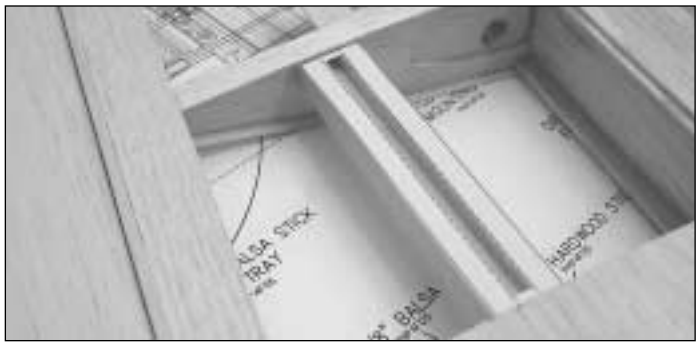
❏❏ 49. **Retractable Mains/Fixed Tailwheel.** Fit your retractable landing gear to the opening. Cut the sheeting as needed so that the gear is flush with the sheeting. Once you are satisfied with the fit, mark the holes for the landing gear onto the mounting blocks.



❏❏ 50. **Retractable Mains/Fixed Tailwheel.** Mix some epoxy thinned with alcohol and brush it on the inside of the landing gear compartment and on the edges of the sheeting to reinforce it.

❏❏ 51. **Retractable Mains/Fixed Tailwheel.** Drill a 1/4" [6.4mm] hole through W1 and W2 as shown at the die-cut mark.

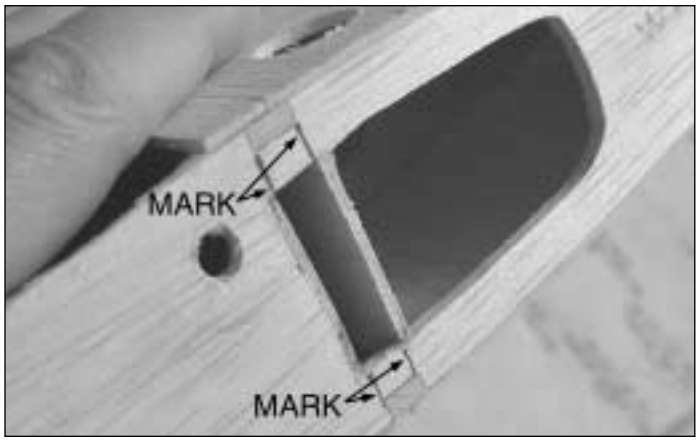
❏❏ 52. **Fixed Mains and Tailwheel.** Locate the Fixed Mains and Tailwheel landing gear cut-out template. Place it as shown on the bottom sheeting. Cut the sheeting as indicated by the template.

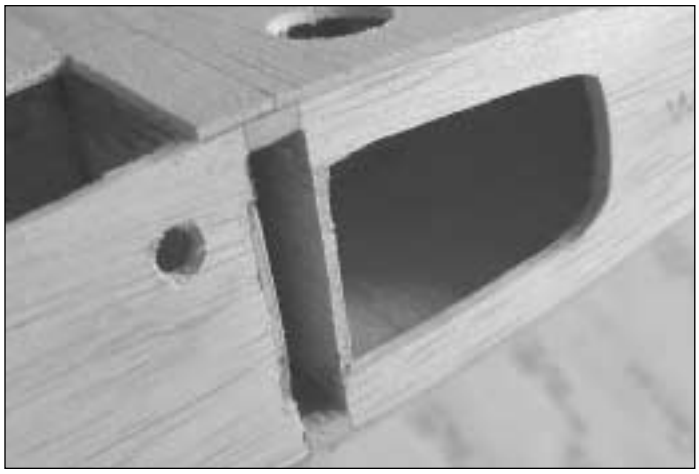


❏❏ 53. **Fixed Tricycle.** Locate the Fixed Tricycle landing gear cut-out. Place it on the landing gear rail as shown above. Cut the sheeting as indicated by the template.

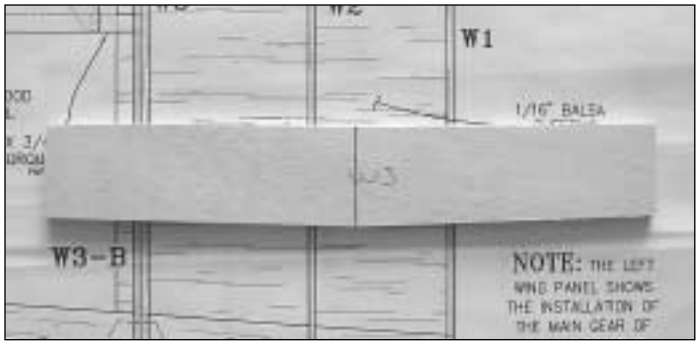
❏ 54. If you have not done so, go back to step 4 and build the left wing panel.

Join the Wings

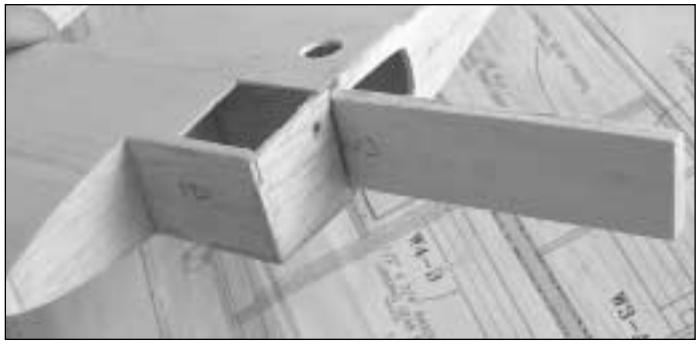




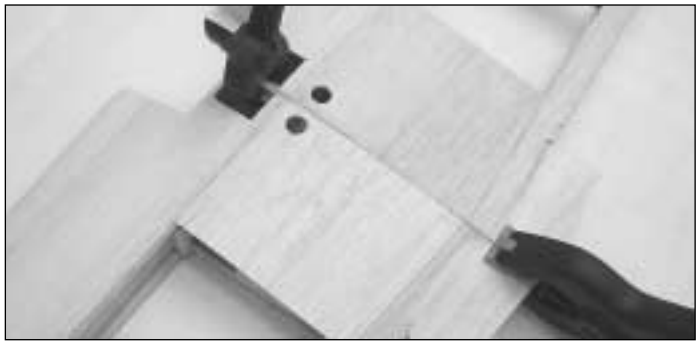
❑ 1. Make a line joining the edges of the top and bottom main spars on both wing roots as shown above. Cut out the wood between the lines.



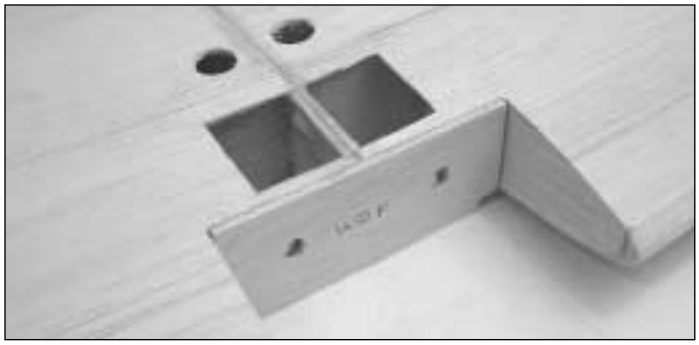
❑ 2. Locate the two die-cut lite-ply **wing joiners (WJ)**. Mix some 30-minute epoxy and glue them together. Clean up the excess glue and sand the edges smooth. Also, make a line at the center of the wing joiner.



❑ 3. Test fit the wing joiner into the wing joiner pocket between the main wing spars and shear webs. **Note:** The top of the wing joiner is marked with a "TOP." You will need to sand the joiner for it to fit properly in the pocket. The fit should be snug but not tight. The center-section of the wing is not as strong as it will be until after the wing joiner is glued in so do not force the joiner into the pocket. Do this for both wing panels. Lightly sand the wing root ribs to achieve the 1-5/8" [41mm] dihedral. Note that you will need to bend the joiner back slightly to make the wing root ribs meet because of the taper of the main wing spars.

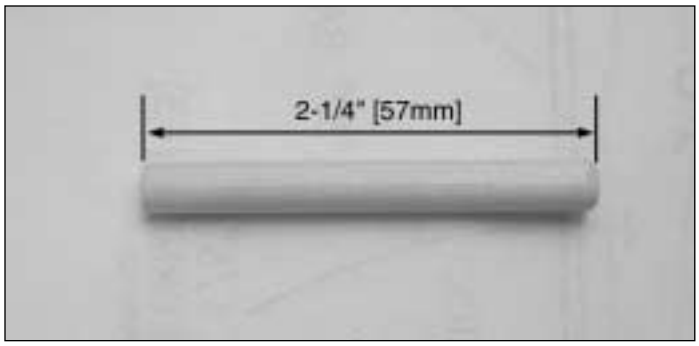


❑ 4. Mix 1 oz of 30-minute epoxy. Coat the wing joiner and both wing roots with epoxy. Also, drop some epoxy into both wing joiner pockets. Insert the wing joiner into the wing joiner pocket of the right panel, making sure the top of the joiner is facing the top of the wing. Slide the left wing panel's pocket onto the wing joiner until the root ribs meet. Bend the wing joiner until the root ribs meet. Use clamps or tape to hold the wing roots together until the glue has cured. Check again that the dihedral is 1-5/8" [41mm]. Clean up any excess epoxy. **Note:** You need to follow the above procedure to glue the wing joiner in place to make sure the bending stress on the wing joiner is distributed evenly.



❏ 5. Locate the die-cut **wing dowel plate (WDP)** and center it between ribs W2 as shown above. Once satisfied with the fit, glue it in place with epoxy. The die letters on the part should be right side up.

❏ 6. Drill a 1/4" [6.4mm] hole through DP where the holes on WDP are as shown above. Drill into the wing joiner 3/32" [2.4mm]. To do so, apply some masking tape to the 1/4" [6.4mm] drill bit 1-13/16" [46mm] away from the end and drill until the tape reaches the wing dowel plate.



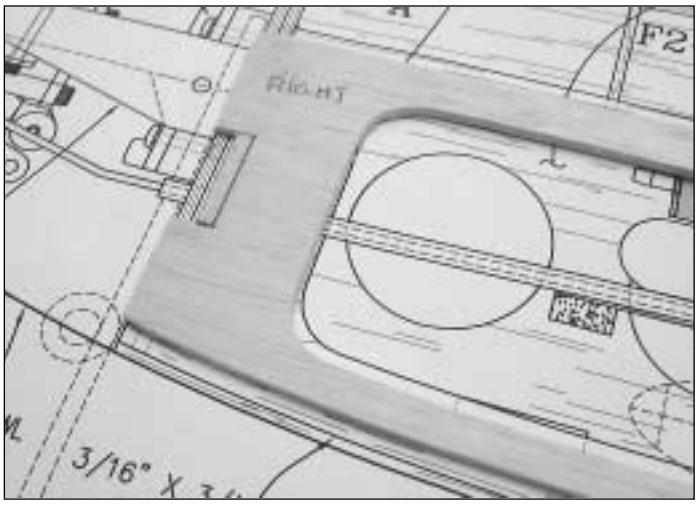
❏ 7. Locate the 1/4" x 5" [6.4mm x 127mm] wing dowel. Cut it in two 2-1/4" [57mm] long dowels. Round the edges of the dowels.

❏ 8. Mix a small amount of epoxy and glue the dowels in place as shown above. It is important that these dowels are properly glued. Make sure that there is enough epoxy in all the holes. After the dowels are installed, use a brush to apply some more epoxy around the holes and the dowels inside the wing.

BUILD THE FUSELAGE

❏ ❏ 1. Unroll the plan sheet. Roll it inside out so they will lie flat.

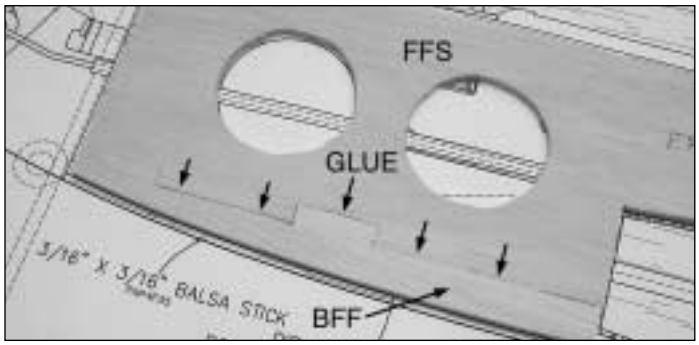
❏ ❏ 2.Position the fuselage plan flat on the building board. Cover the plan with Great Planes Plan Protector or waxed paper so glue will not adhere to it.

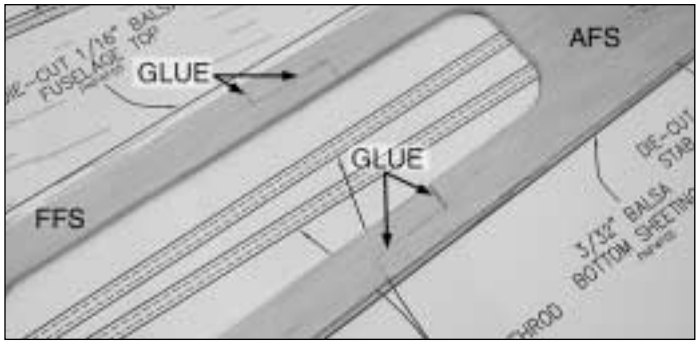


❏ ❏ 3. Locate the two die-cut 1/8" [3.2mm] lite-ply **fuselage side doublers (FSD)**. At the front of each FSD there is a notch with two additional slits. On one FSD only, draw a line from the end of each slit. Cut on the line using a hobby knife and mark this FSD as “Right.” Mark the other FSD as “Left.”

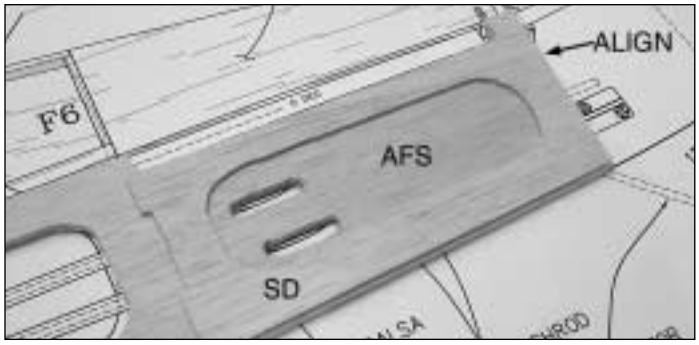
Note: You will begin building the right side fuselage. Make sure you do not build two right sides. The **forward fuselage side (FFS)** with the deeper notch is the right side of the fuselage. This is important. The deeper notch on the right

side is what builds the engine right thrust so it is important to install the left and right side correctly.

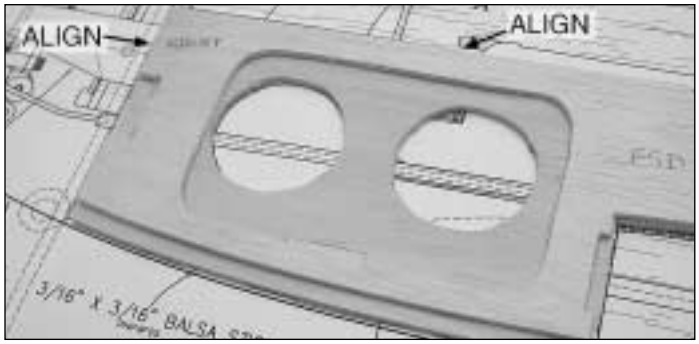


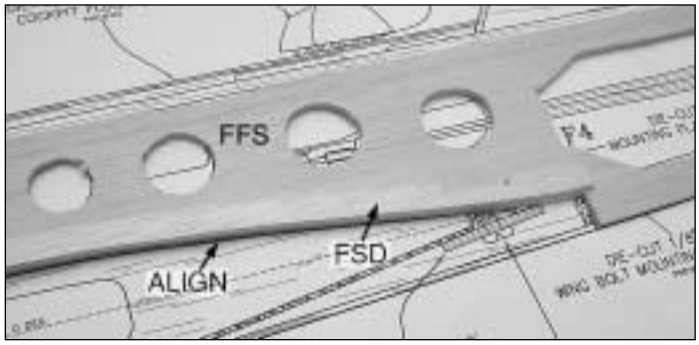


❏ ❏ 4. Locate the “right” die-cut 1/8" [3.2mm] balsa forward fuselage side (FFS), bottom forward fuse (BFF) and **aft fuselage side (AFS)**. Align them over the plans and glue them together with epoxy. After the epoxy has cured, sand the glue joint smooth.

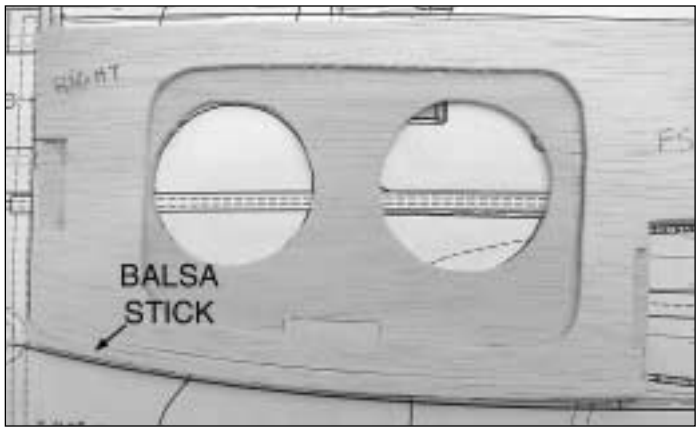


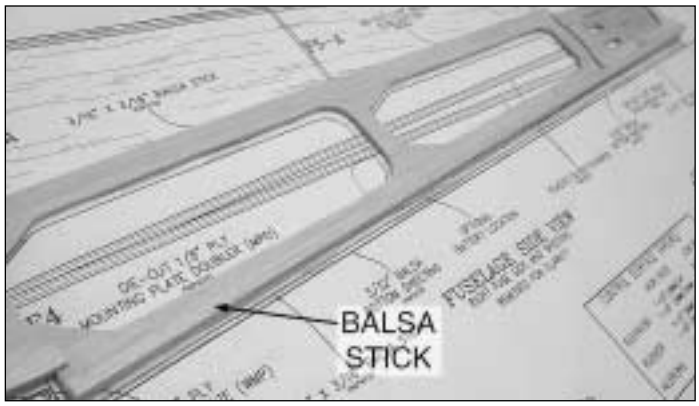
❏ ❏ 5. Locate the die-cut 1/16" [1.6mm] balsa **stab doubler (SD)** and glue it as shown in the above image. The aft edge of SD should be aligned with the aft edge of the aft fuselage side AFS.



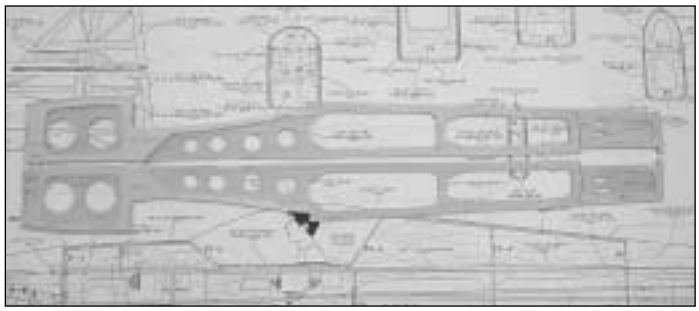


❏ ❏ 6. Glue the right FSD on the assembled right forward fuselage side as shown with epoxy. The top and forward edge of the two parts must be aligned when glued.

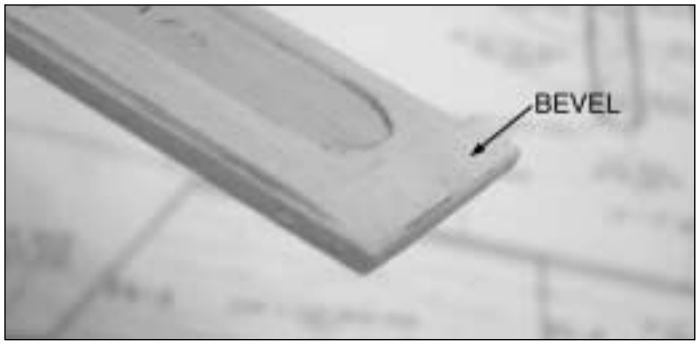




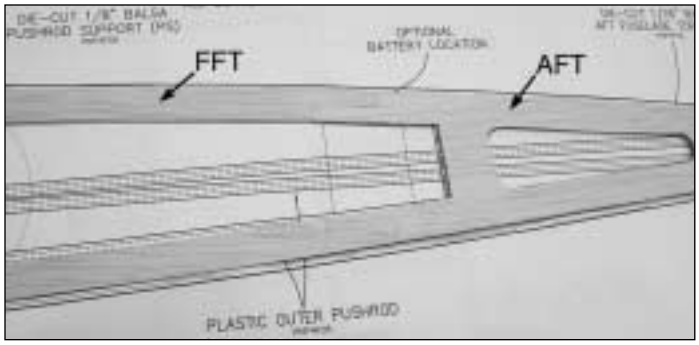
❏ ❏ 7. Locate one 3/16" x 3/16" x 30" [4.8mm x 4.8mm x 760mm] balsa stick and glue it to the bottom aft edge of the fuselage side as shown above. Cut the protruding stick and glue it to the bottom forward fuselage side.

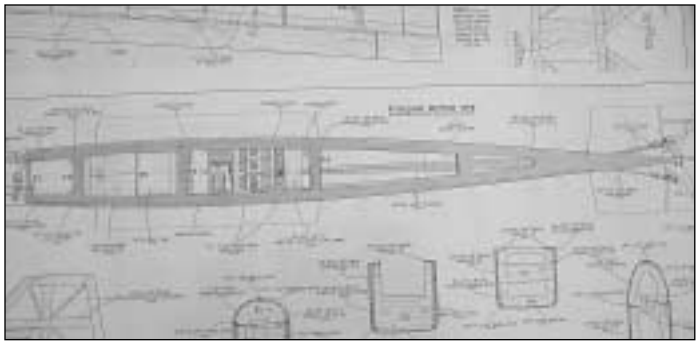


❏ 8. Repeat steps 3 to 5 for the left fuselage side. Remember, the left side mirrors the right side of the fuselage. **Do not build two right fuselage sides!**

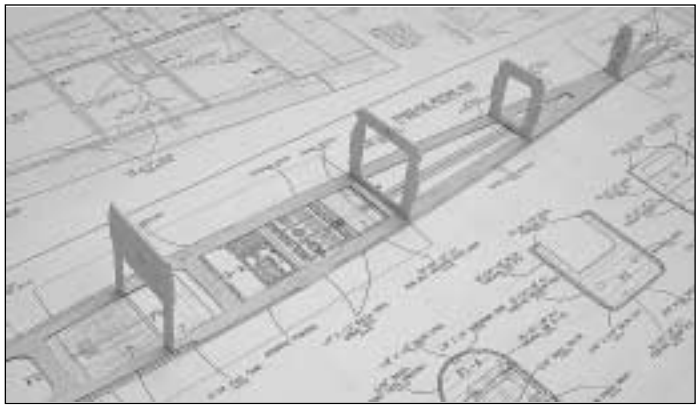


❑ 9. Now that both fuselage sides are completed, align them and clamp them together. Lightly sand the fuselage edges until they are identical. Also, sand the end of the fuselage side (where the stab doubler (SD) is) at a slight bevel as shown.

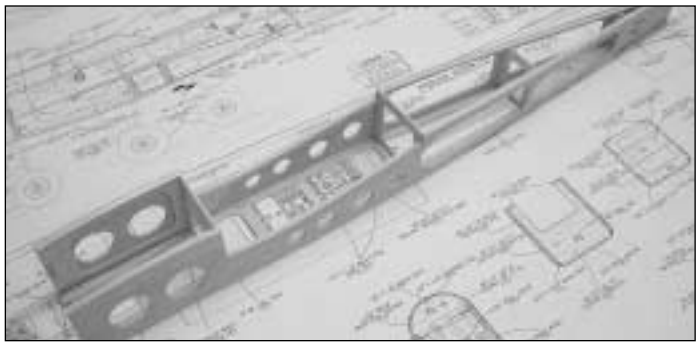




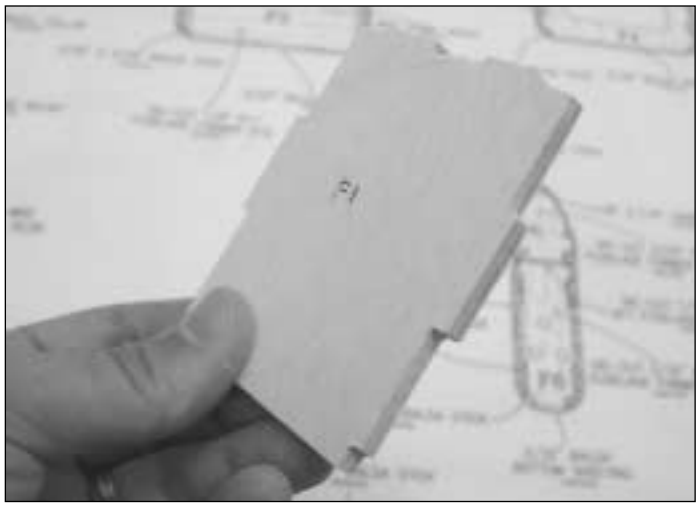
❑ 10. Locate the die-cut 1/16" [1.6mm] balsa **forward fuselage top (FFT)** and **aft fuselage top (AFT)**. Align them over the plans and glue them as shown. After the glue has cured, sand the joint smooth. Pin the assembled top fuselage on the plans.



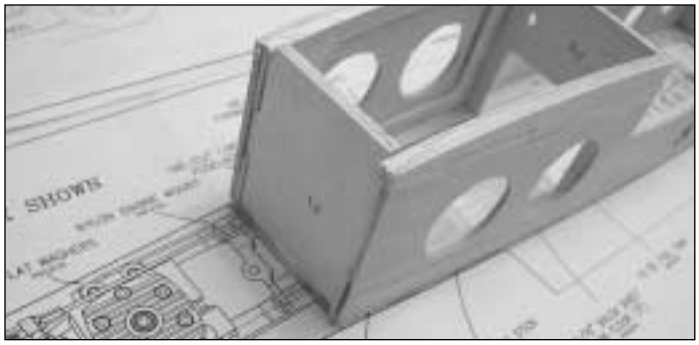
❑ 11. Locate the die-cut 1/8" [3.2mm] lite-ply **fuselage former F3** and the die-cut 3/32" [2.4mm] balsa fuselage **formers F4, F5** and **F6**. Glue them in position on the fuselage top as indicated on the plans. Make sure that all formers are glued 90 degrees to the building board.



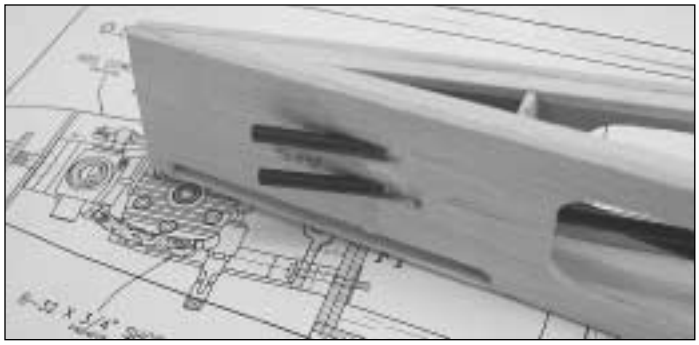
❑ 12. Glue the right side of the fuselage to the fuselage top. When completed, glue the left side in place.



❑ 13. Locate the two die-cut 1/8" [3.2mm] lite-ply **fuselage formers F1**. Glue them together with epoxy. Wipe excess epoxy with a paper towel dampened with alcohol. Sand the edges so they match after the glue has cured.



❏ 14. Using 30-minute epoxy, glue the firewall (F1) in place to the fuselage sides and the fuselage top. When gluing, push the firewall (F1) against the fuselage sides and top. Make sure the firewall (F1) is glued in with 3 degrees of right thrust (check the plans) and 0.5 degrees of down thrust. Hold in place with clamps until the glue has cured. **Note:** Because the fuselage is being built upside down, the built-in right thrust will appear to be left thrust and the down thrust will appear to be up thrust.



❏ 15. Locate three 36" [914mm] plastic **flexible outer pushrod tubes**. Using the plans as your guide, install the outer pushrods into the holes in the fuselage formers, exiting the slots in the rear of the fuselage. Note that there are two elevator pushrod tubes and only one rudder pushrod tube.

❏ 16. Make a mark on the tubes where they contact the fuselage formers and sides. Remove the tubes. Then roughen the tubes with sandpaper at the marks you have made. Reinstall the outer pushrod tubes back into the fuselage and glue them in place with thin CA. The tubes should extend about 2" [52mm] into the radio compartment.

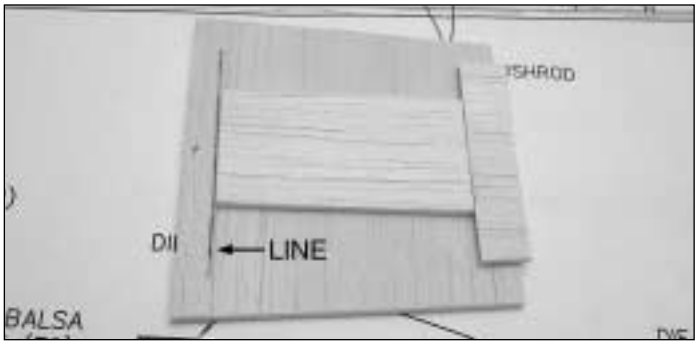
❏ 17. Cut the tubes at an angle about 1/4" [6.4mm] away from where they exit the fuselage. Fill the slots where the tubes exit the fuselage with a 50/50 mix of 6-minute epoxy and microballoons. The addition of the microballoons thickens the epoxy, preventing it from running and making it sand easier. Be careful not to get epoxy in the tubes. Do this for both the right and left side of the fuselage. After the epoxy is fully cured, use a sanding bar to sand the pushrod exits flush with the fuselage on both sides of the fuselage.

❏ 18. Make a mark on the bottom fuselage 3" [76mm] in front of former F5. Make another mark 3" [76mm] in front of the first one. Locate the 3/32" x 4" x 30" [2.4mm x 102mm x 760mm] balsa sheeting and sheet the bottom of the aft fuselage, leaving the portion between the marks unsheeted. Sand the sheeting flush with the fuselage sides. Note that the sheeting is done across the fuse for strength.

❏ 19. Cut a piece of the leftover 3/32" [2.4mm] sheeting to a width of 3" [76mm] to be used as a hatch cover. Glue a small piece of balsa on the bottom with the grain crossed to act as a cover lip. Also, the lip should protrude about 1/8" [3.2mm] past the edge of the hatch. Sand the edges of the lip until it fits under the sheeting. Glue a leftover piece of lite-ply on the fuselage, under the sheeting to act as a support for the hatch screw.

❏ 20. Install the hatch in place with a #2 x 1/2" [12mm] screw and a #2 washer. Sand the edges of the hatch flush with the fuselage sides.

❏ 21. Flip the fuselage over and mark the location of the screw hatch support. Remove the screw and the hatch cover. Wick some thin CA into the hatch's hole and the hatch support hole.

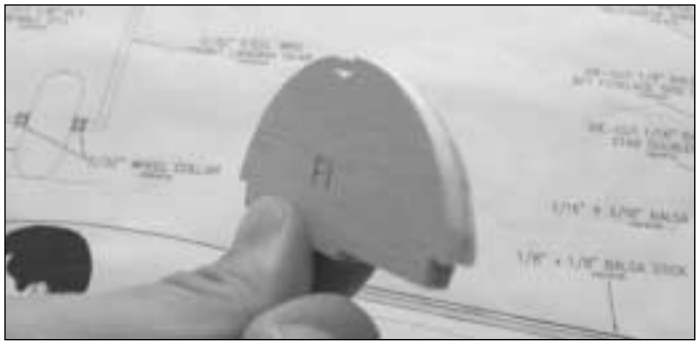


❏ 22. Cut another piece of leftover balsa as shown in the above photo and glue it to the inside of the hatch cover to stiffen it up. This piece of balsa should extend from the line you just marked to the edge of the cover lip. Glue this in with CA.

❏ 23. After the glue has cured, reinstall the hatch and round the edges of the aft fuselage bottom.

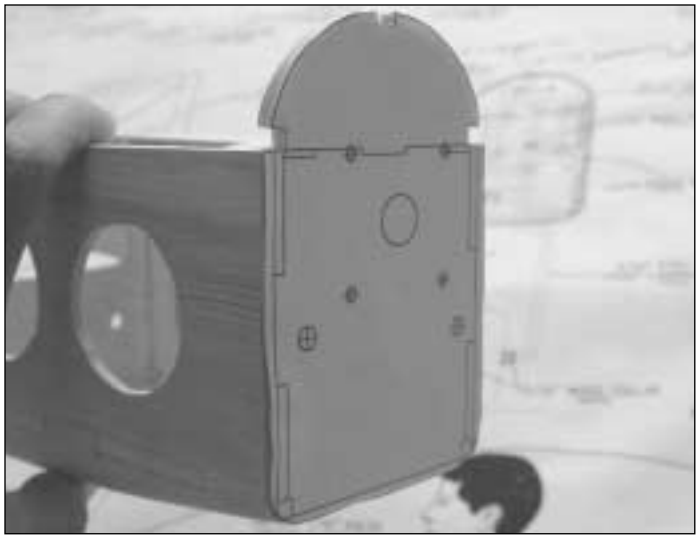
❏ 24. Still using the same 3/32" [2.4mm] balsa sheet, sheet and then sand the bottom forward fuselage. Round the edges. See cross sections on the plans.

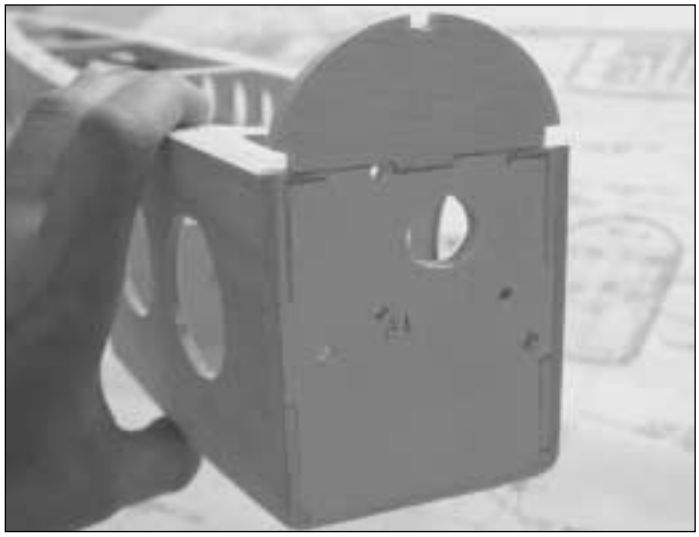
❏ 25. Flip the fuselage over and sand the top of the fuselage smooth.



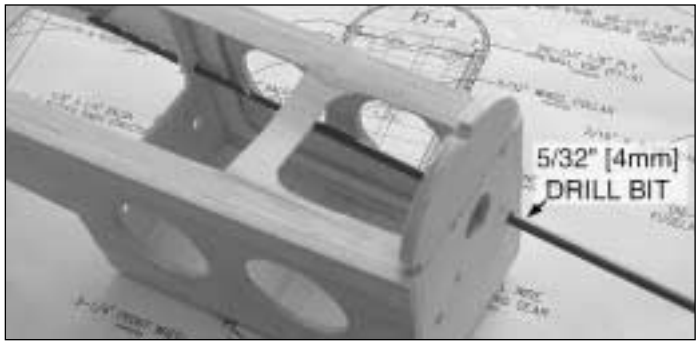
❑ 26. Locate the two die-cut 1/8" [3.2mm] lite-ply **formers F1-A**. Glue them together with epoxy. Wipe away the excess epoxy with a paper towel dampened with alcohol. Sand the edges smooth after the glue has cured.

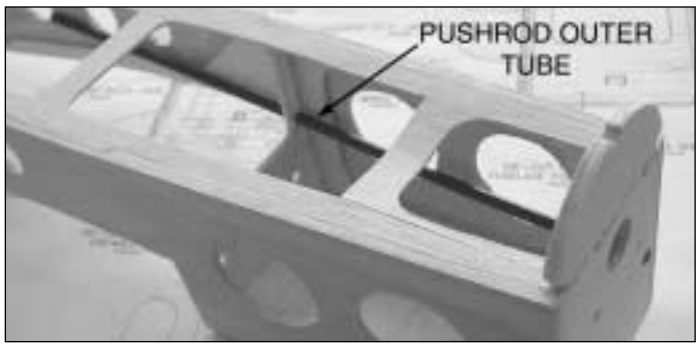
❑ 27. Glue F1-A at the top front of the fuselage into the slots in F1. Use 6-minute epoxy. Make sure that F1-A is flush with the firewall (F1). After the glue has cured, sand the face of the firewall (F1) smooth.





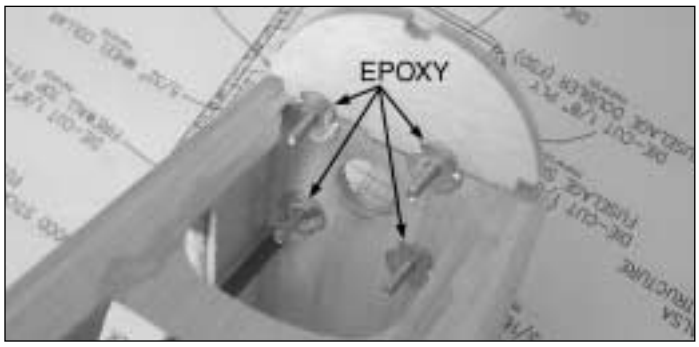
❑ 28. Locate and cut out the engine mount template on page 57 of this manual. Use spray adhesive on the back of the template to glue it to the firewall (F1). Use a 5/32" [4mm] drill bit to drill the engine mount bolt holes in the firewall (F1). Use a 3/16" [4.8mm] drill bit for the outer pushrods. Note that one of the pushrods is for the throttle and the other one is for the steering if you are using a tricycle gear setup. Also, use a high speed rotary tool to drill the large hole for the fuel tubing. **Note:** Depending on the type and brand of engine you use, you may have to relocate the throttle pushrod. To do so, fit your engine to the engine mount. Once the engine mount is installed, determine where the throttle pushrod should be.





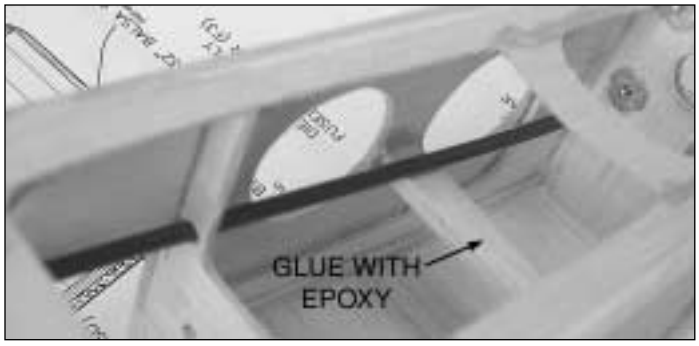
❑ 29. Insert a long 3/16" [4.8mm] drill bit into the throttle pushrod hole in the firewall (F1). Using the plans as a guide, align the drill bit to make a hole in former F2 so that the throttle pushrod has a straight path to the throttle servo arm. Insert a leftover piece of plastic outer pushrod into the holes as shown. Mark and sand where the outer pushrod meets with the fuselage formers. Glue the outer pushrod in place

with thin CA. **Note:** If you will be installing a tricycle gear with nose steering, you will need to repeat this procedure for the steering pushrod on the other side of the fuselage.



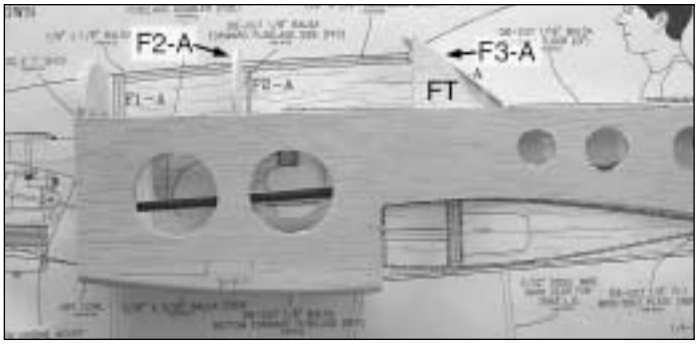
❏ 30. Locate four 6-32 blind nuts, four #6 washers and four 6-32 X 1" [25mm] SHCS. Insert a washer onto each SHCS, then install a SHCS in each hole with a blind nut as shown above. Tighten the bolts until the blind nuts are drawn tight into the wood on the back of the firewall (F1). Apply a small dab of epoxy to the nuts so that they do not come loose, being careful not to get any in the threads.

❏ 31. Locate the two die-cut 1/16" [1.6mm] balsa **tank floor parts (TF)**. Glue them side by side using CA as shown above.

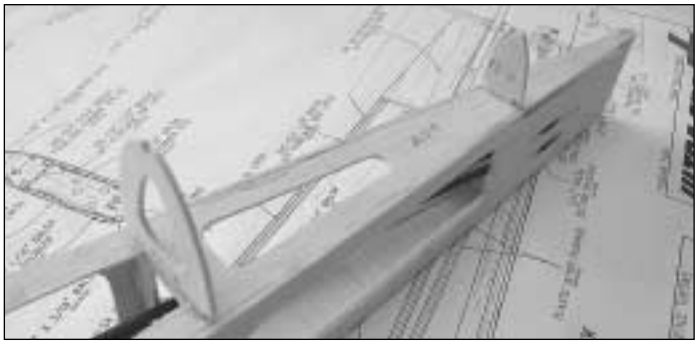


❏ 32. Cut a 1/4" x 1/2" [6.4mm x 12mm] piece of balsa stick to length to fit in the forward fuselage as shown in the plan just under the throttle pushrod as shown above. Use epoxy to glue it in place.

❏ 33. Glue the tank floor on top of F3 and the stick you just glued. Use CA to glue it in place.

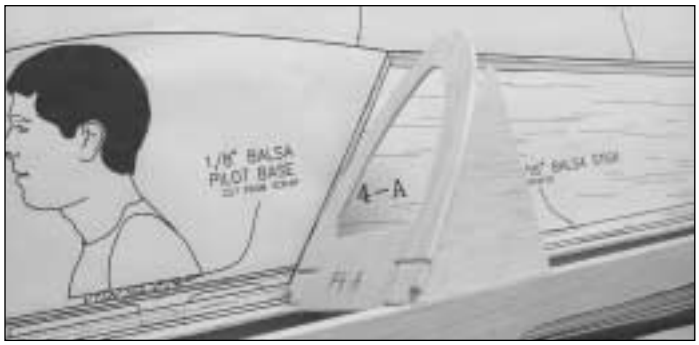


❏ 34. Glue the die-cut 3/32" [2.4mm] balsa **former F2-A** as indicated on the plans with CA. Use the die-cut 1/16" [1.6mm] balsa **forward template (FT)** to glue the **former F3-A** at the needed angle with CA.

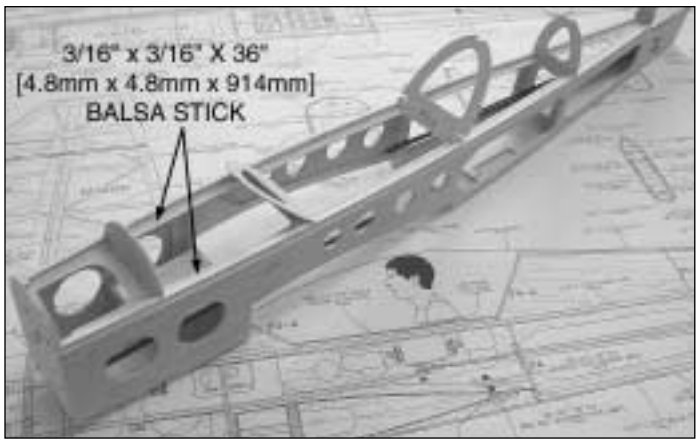


❏ 35. Draw a line across the top of the fuselage at the front edge of the stab saddle as shown. Glue **F6-A** in front of this

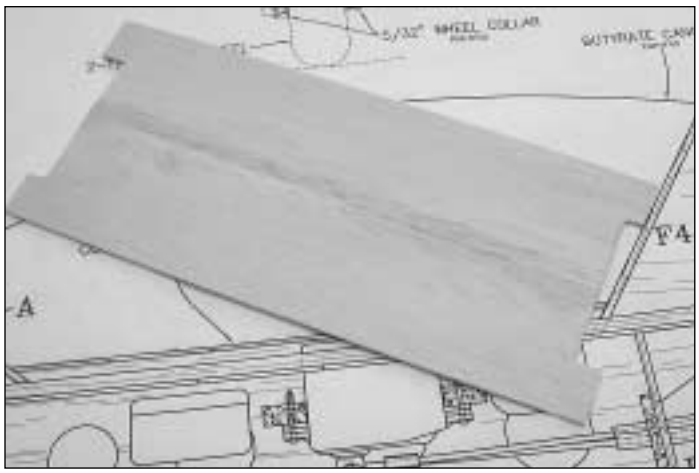
mark with CA. Also, glue **F5-A** in place. Both formers should be 90 degrees with the top of the fuselage.



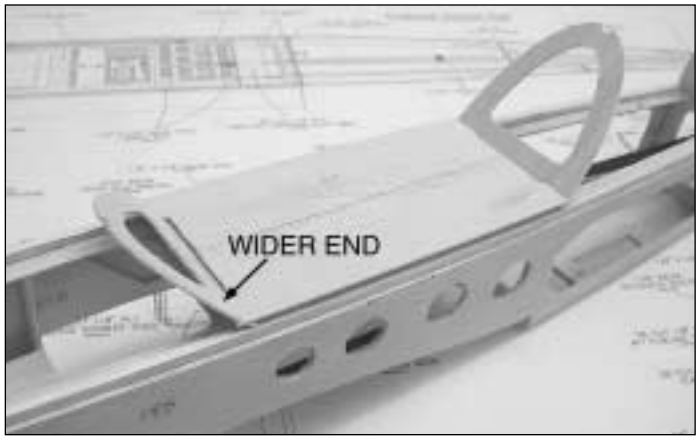
❑ 36. Use the die-cut 1/16" [1.6mm] balsa **aft template (AT)** to glue the die-cut 3/32" [2.4mm] balsa **former F4-A** at the required angle with CA.



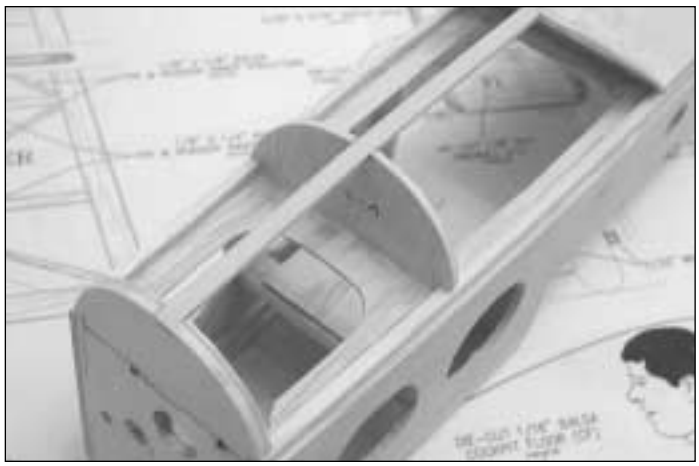
❑ 37. Locate the two 3/16" x 3/16" x 36" [4.8mm x 4.8mm x 914mm] balsa sticks and glue them in place with CA. Check the fuselage plan and formers section view for the exact position of these.

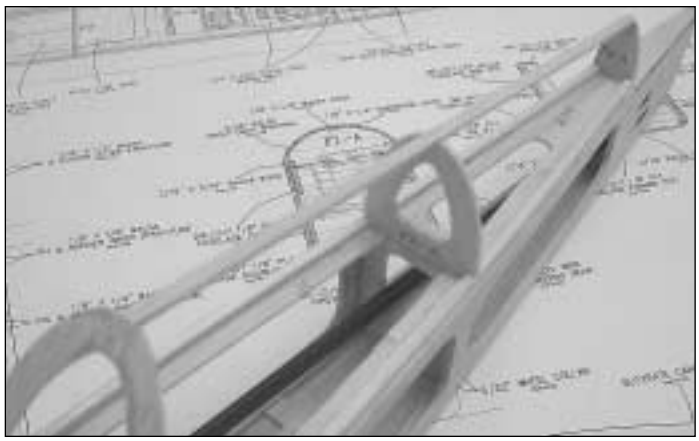


❑ 38. Locate the two die-cut 1/16" [1.6mm] balsa **cockpit floor (CF)** pieces and glue them together as shown. Note that one end of each of the die-cut pieces is wider than the other end. The wider ends must be on the same end.

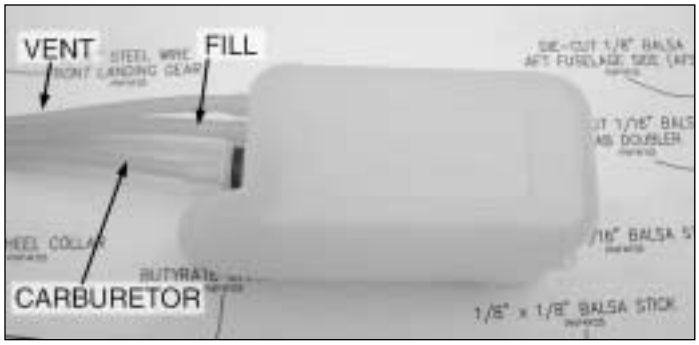


❑ 39. Insert the cockpit floor in the space between F3-A and F4-A. The wider end of the cockpit floor must be towards the front of the fuselage. Because of the angle of the canopy formers, you may have to slightly sand the cockpit floor and/or formers F3-A and F4-A to get a good fit. Also, there will be a gap between the center of the cockpit floor and the canopy formers F3-A and F4-A. This gap will be later filled with filler. Once you are satisfied with the fit, glue CF in place with CA.





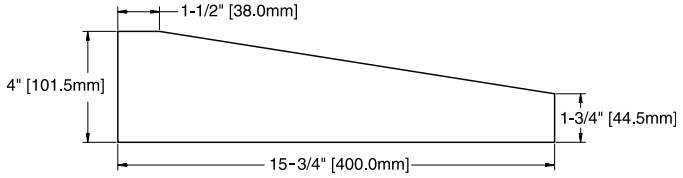
❑ 40. Locate the 1/8" x 1/4" x 30" [3.2mm x 6.4mm x 750mm] hardwood spar. Cut it to fit and then glue in the top notches in the top of the aft (turtle deck) and forward (front deck) formers as shown above. Use CA to glue it in place.



❏ 41. Assemble the fuel tank following the instructions that came with your tank. Cut the 3' [760mm] fuel tubing in three 1' [255mm] sections. Connect each one of the fuel tubes to the fuel tank and label them “vent,” “carburetor” and “fill.” Note that if you plan to use a Great Planes Easy Fueler Valve (GPMQ4160), you only need two lines, the carburetor and the vent line.

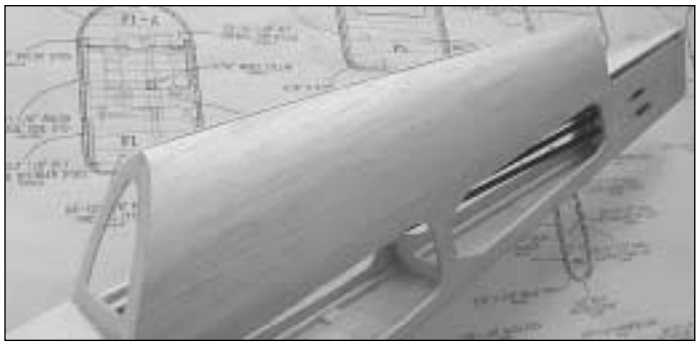
❏ 42. Slide the fuel tank into the fuselage through the opening in the wing saddle. Pull the fuel tubes through the large hole in the firewall (F1). Locate the two die-cut 1/16" [1.6mm] balsa **fuel tank holders (TH)** and glue them as shown to hold the fuel tank in place. Once both tank holders are glued in place with CA you may either leave the tank installed inside the fuselage or you may remove it and reinstall it later.

❏ 43. Locate the 1/8" x 1/8" x 30" [3.2mm x 3.2mm x 760mm] balsa stick, cut it the proper length and glue it as shown along the center of the hardwood spar in step 40 on top of the turtle deck and the front deck formers. Use thin CA for this step.

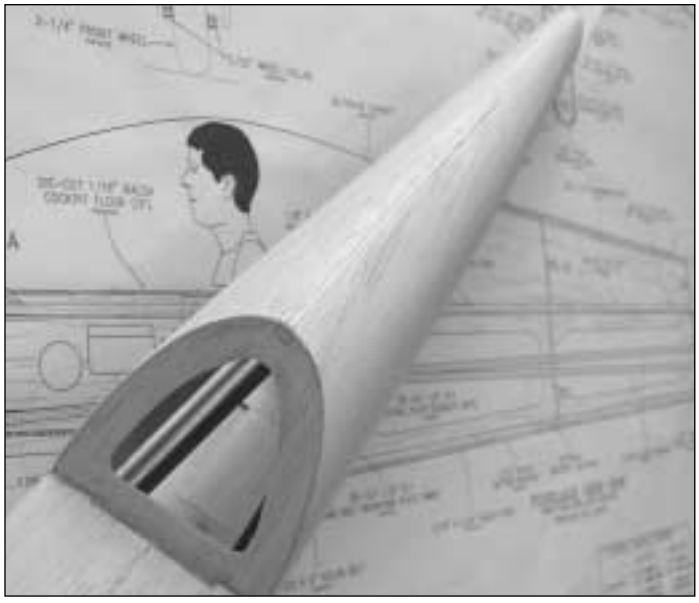


❏ 44. Locate a 1/16" x 4" x 30" [1.6mm x 101mm x 760mm] balsa sheet and cut it as shown in the above sketch. Glue

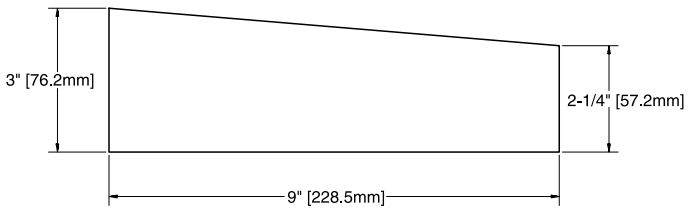
the bottom edge to the top of the fuselage side and the 3/16" [4.8mm] balsa stick. Tape the sheet in place while the glue cures.



❏ 45. Wet the outer side of the sheet with warm water and ammonia. This will help you to bend the sheet to the aft turtle deck shape. Once the sheet has conformed to shape, apply CA to the edges of formers F4-A to F6-A and to the top fuselage spar. Hold the sheeting in place with tape or rubber bands until the glue has cured. When the sheeting has dried, sand the ends flush with the formers.



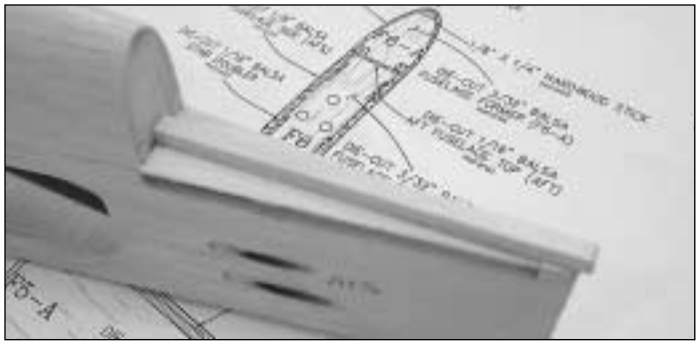
❏ 46. Follow the same procedure to glue the sheeting on the other side of the aft turtle deck.



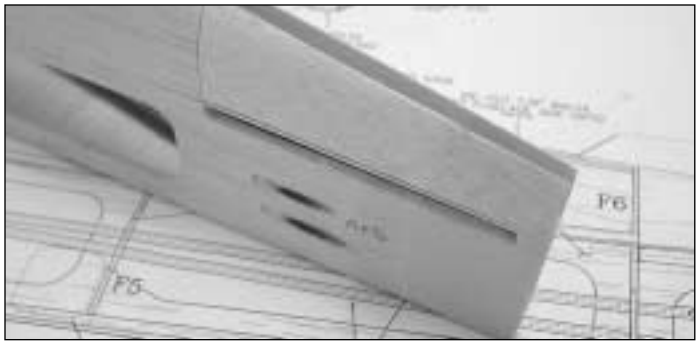
❏ 47. Locate a 1/16" x 3" x 18" [1.6mm x 76mm x 457mm] balsa sheet. Use the preceding sketch to cut the sheeting for the forward sheeting. Use the same procedure as described in the previous step to glue both sides of the forward turtle deck sheeting. Once the sheeting is glued in place and dry, sand the ends flush with the formers.

❏ 48. Cut a piece of leftover 1/16" [1.6mm] sheeting to fit at the canopy base between F3-A and F4-A. Glue it in place with CA and sand it flush with the sides.

❏ 49. Mark the center of the fuselage top at F6-A. Make two more marks on each side 1/8" [3.2mm] away.

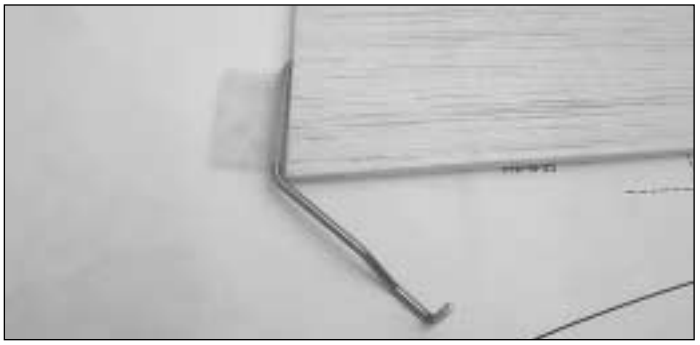


❏ 50. Glue two pieces of 1/8" x 1/4" [3.2mm x 6.4mm] balsa stick on top of each other at the center of the top fuselage as shown.



❏ 51. Cut the 1/2" x 1-3/4" x 11" [13mm x 44mm x 280mm] balsa fin block into two 5-1/2" [140mm] long pieces. Glue one block on each side of the balsa stick you glued in the previous step and to former F6-A. Use epoxy for this step. Once the glue has cured, sand the blocks to shape as shown above.

❏ 52. Insert the fin (but do not glue) between the blocks. Sand where necessary to make the fin fit properly.



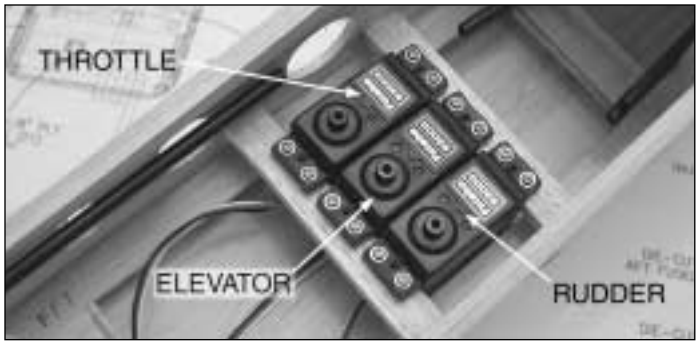
❏ 53. **Fixed Mains and Tailwheel and Retractable Mains/Fixed Tailwheel.** Temporarily install the tail wheel assembly into the rudder and fit the rudder to the fin and fuse. Mark where the slot for the tail wheel assembly nylon bushing needs to be cut out in the aft fuselage. Cut the needed slot in the fuselage.

❏ 54. If you decided to not take the fuel tank out in step 42, you will now need to insert some 1/4" [6.4mm] latex foam rubber (HCAQ1000) through the hole in former F3-A to hold the fuel tank in place. If you took the fuel tank out, you will need to do this when you reinstall it.

RADIO & ENGINE INSTALLATION

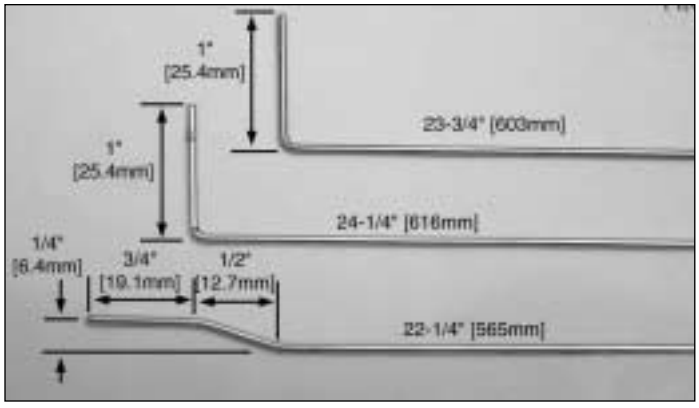
Radio Installation

❏ 1. Locate the 1/4" x 1/2" x 30" [6.4mm x 13mm x 760mm] balsa stick that was used to make the fuel tank support. Cut two pieces the length of the fuselage servo rails and glue them in place as shown on the plans with epoxy.

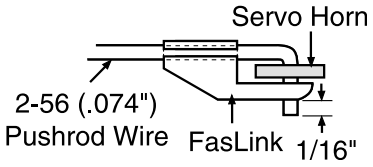


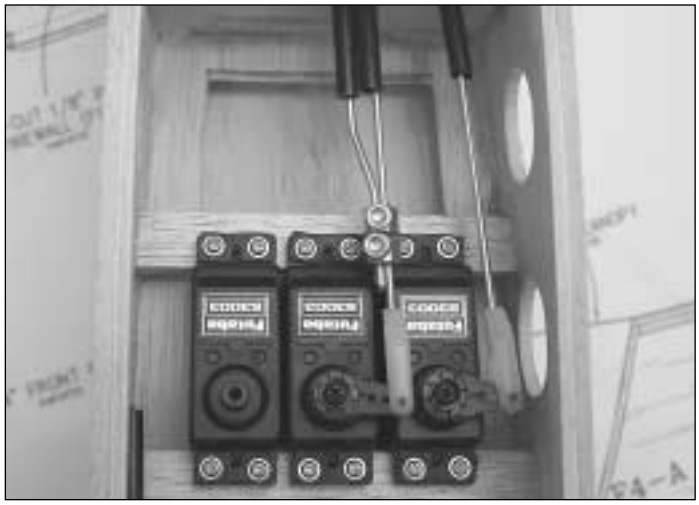
❑ 2. Install the elevator, rudder and throttle servos as indicated on the plans with the hardware supplied by the manufacturer. Make sure you use thin CA in the servo screw holes in the balsa rails.

❑ 3. Locate the die-cut 1/8" [3.2mm] balsa **pushrod support (PS)**. Insert the elevators and rudder plastic outer pushrod into the holes in the balsa pushrod support as indicated above. Push PS against former F4 and move it up or down until the plastic outer pushrods are at the same height as the servo arms. Glue the pushrod support in place with CA.

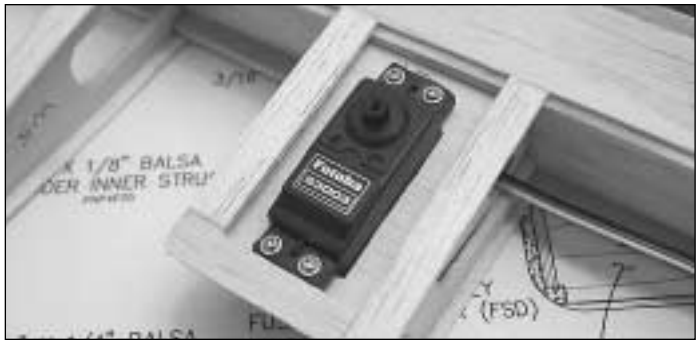


❑ 4. Locate three 2-56 x 36" [914mm] threaded one end pushrods. Cut one of them 24-1/4" [616mm] from the threaded end, another at 22-1/4" [565mm] from the threaded end and the last one at 23-3/4" [603mm] from the threaded end. Bend the wires as indicated in the above image.

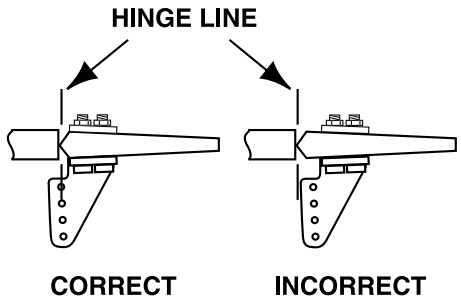


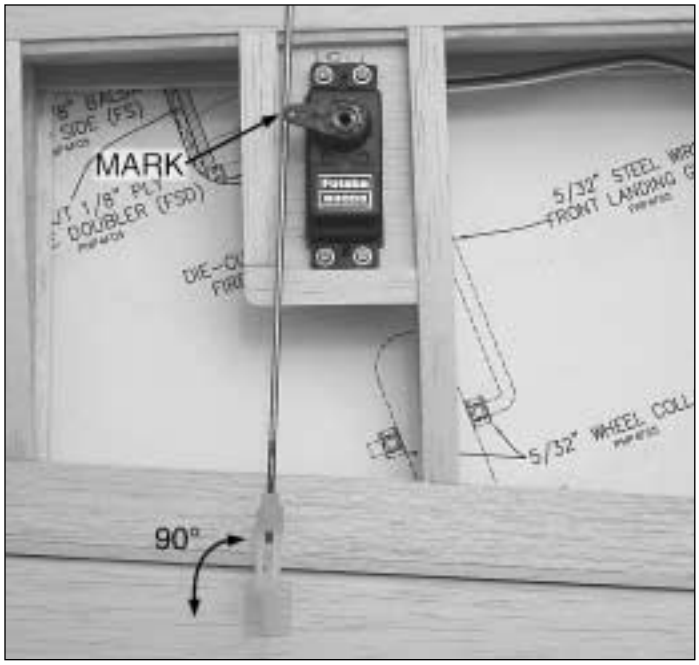


❑ 5. Center the servos and position the servo arms as shown in the photo. Insert the 24-1/4" [616mm] wire into the plastic outer pushrod in the center (elevator). Insert the 23-3/4" [603mm] pushrod wire into the right plastic outer pushrod (rudder). Insert the last pushrod wire (22-1/4" [565mm]) in the left plastic outer pushrod (other elevator). Locate two 5/32" [4mm] wheel collars and two 6-32 x 1/4" [6.4mm] SHCS and attach the elevator pushrods as shown above. Locate two nylon FasLinks and install them on the elevator and rudder pushrods and servo arms.

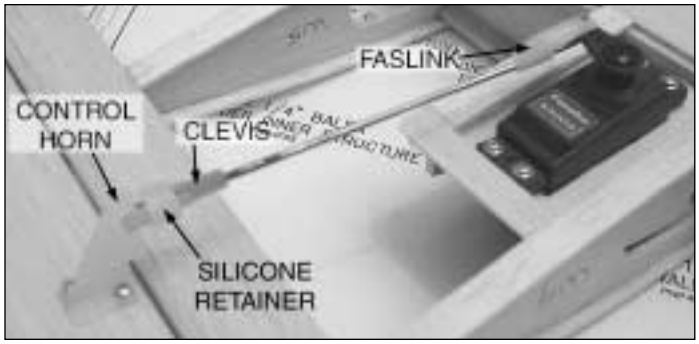


❑ 6. Install the two aileron servos as shown on the plans using the hardware supplied by the manufacturer. Apply thin CA to the screw holes in the servo tray.





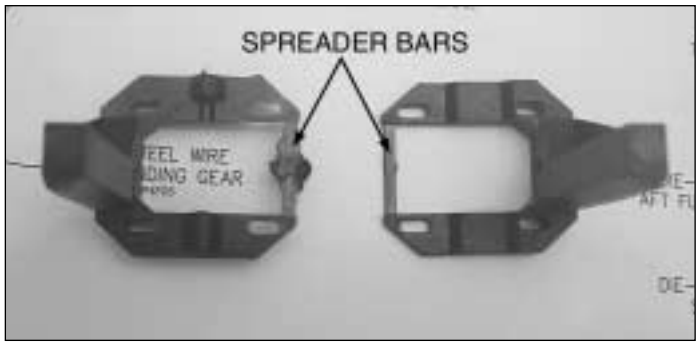
❏ 7. Thread a clevis 15 full turns onto a 2-56 x 12" [152mm] threaded one end pushrod. Install a clevis retainer onto the clevis. Connect a control horn to the clevis. Place the control horn on the aileron as shown above. The pushrod should be at 90 degrees from the trailing edge of the wing. Mark the holes for the control horn and also where the pushrod meets the servo arm.



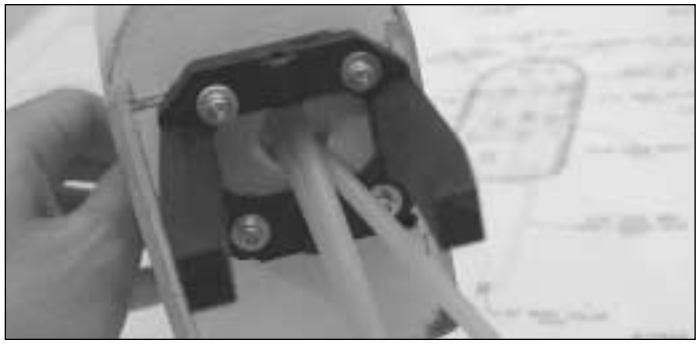
❏ 8. Drill 1/16" [1.6mm] holes where the control horn screws need to be. Wick some thin CA into the holes and install the control horn in place with two #2 x 1/2" [13mm] screws and a backplate. Also, bend the wire 90 degrees where the wire pushrod meets the servo arm and install a FasLink. Cut the excess wire 1/16" [1.6mm] away from the FasLink.

Engine Installation

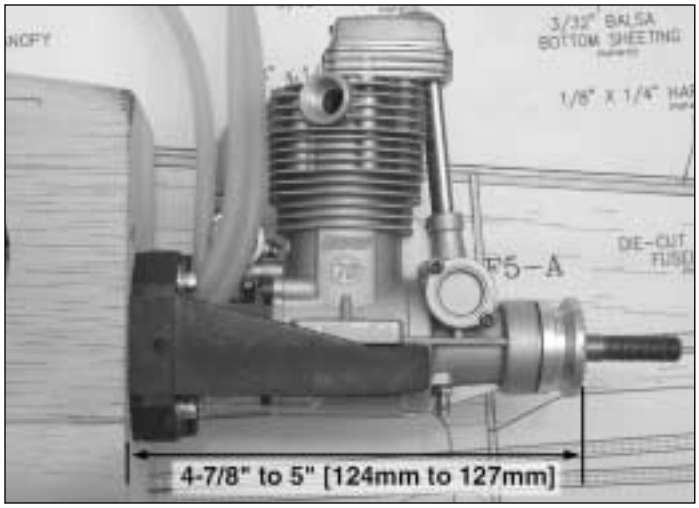
Note: In the installation shown, the engine installed is an O.S.® .70 4-Stroke. A 2-stroke engine can be installed the same way as the instruction model engine. The recommended position to install the engine is inverted, although if you wish, you may install it in a different position.

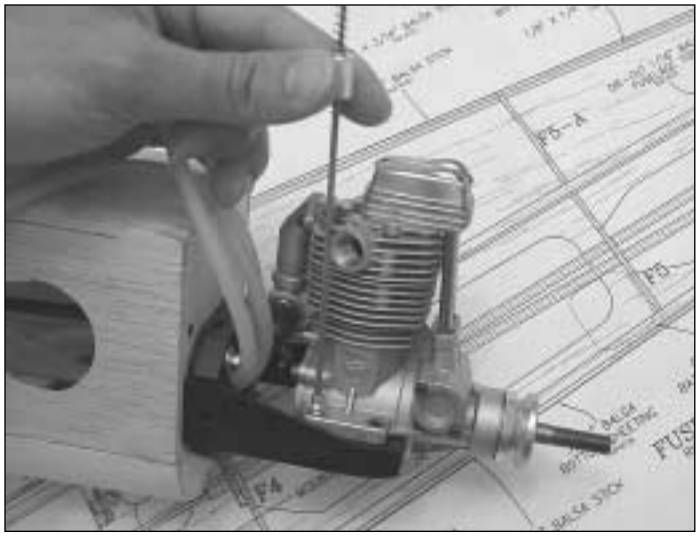


❏ 1. Locate the left and right halves of the engine mount and cut out the spreader bars.



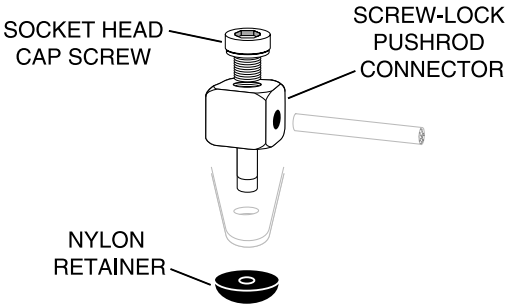
❏ 2. Install the engine mount to the firewall (F1) with four 6-32 x 1" [25mm] SHCS, four #6 Washers and four #6 lock washers. Before you tighten the SHCS, make sure that the mount is the width you need for your engine and that it is centered with the fuel line hole on the firewall (F1). Use some Great Planes Pro Threadlocker on the engine mount bolts and tighten the SHCS.





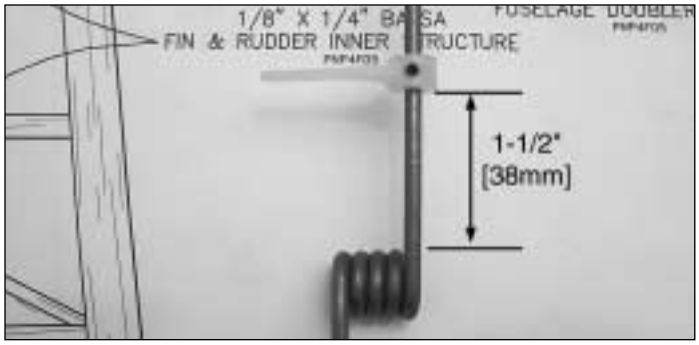
❏ 3. Position the engine on the mount so that the face of the drive washer is 4-7/8" to 5" [124mm to 127mm] in front of the firewall (F1). Mark the position of the engine mounting holes onto the mount. A Great Planes Dead Center Hole Locator (GPMR8130) works great for this. Remove the engine from the mount.

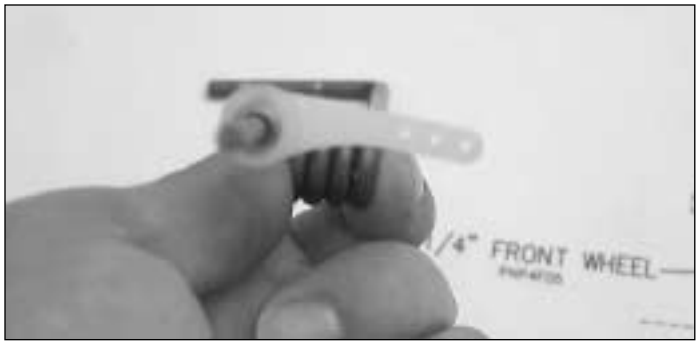
❏ 4. Drill the engine mount at the marks with a 7/64" [2.8mm] drill and then tap the holes with a 6-32 tap. Mount the engine onto the mount using four 6-32 x 3/4" [19mm] SHCS and four #6 lock washers. Use Great Planes Pro Threadlocker on the SHCS and tighten them.



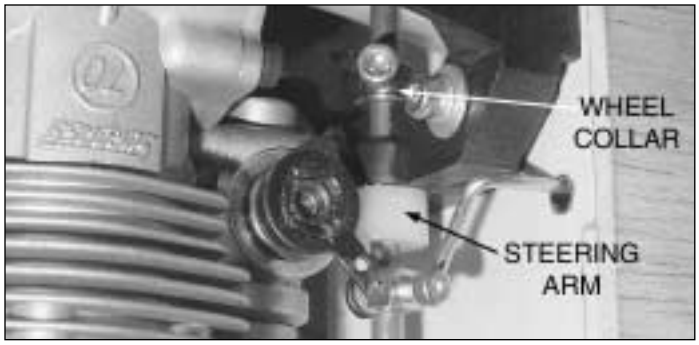
❏ 5. Locate a 1/16 x 36" [914mm] music wire and cut it in half. Insert the 18" [457mm] music wire into the throttle plastic outer pushrod. Bend the wire as necessary so that it reaches your carburetor. Connect the music wire to the carburetor arm using a screw-lock pushrod connector. Use Great Planes Pro Threadlocker on the screw-lock SHCS and tighten it.

❏ 6. Connect the throttle music wire to the throttle servo arm with a screw-lock pushrod connector as shown above. Use Great Planes Pro Threadlocker on the screw-lock SHCS and tighten it.

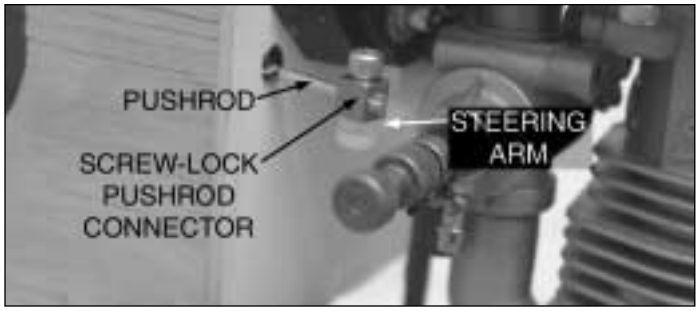




❏ 7. **Fixed Tricycle.** These images are for your reference. The steering arm should be installed 1-1/2" [38mm] above the coil of the nose gear. Also, it should be installed at a slight angle as shown above. To ensure that it will not come loose, a flat spot should be filed where the steering arm's SHCS will be installed. Remember, the steering arm is at a slight angle and so the flat spot will be, too. Use Great Planes Pro Threadlocker on the steering arm's SHCS.



❏ 8. **Fixed Tricycle.** Install the nose gear in place through the holes at the bottom of the engine mount. The gear coil should be 3/32" [2.4mm] away from the bottom of the fuselage. Use Great Planes Pro Threadlocker on the SHCS and tighten it.



❏ 9. **Fixed Tricycle.** Locate the leftover piece of music wire used in step 5. Insert the music wire into the steering plastic outer pushrod. Connect the music wire to the steering arm using a screw-lock pushrod connector. Use Great Planes Pro Threadlocker on the screw-lock SHCS and tighten it.

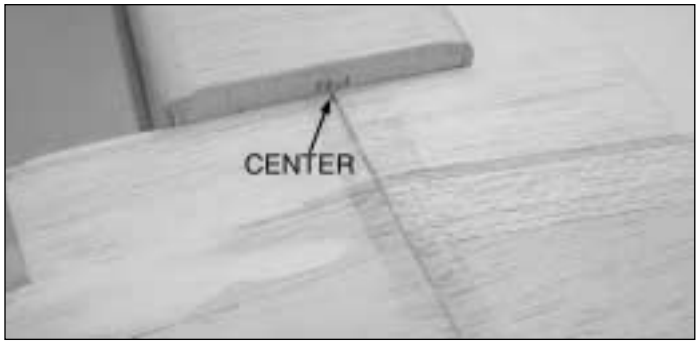
❏ 10. **Fixed Tricycle.** Connect the steering music wire to the rudder servo arm with a screw-lock pushrod connector as shown above. Use Great Planes Pro Threadlocker on the screw-lock SHCS and tighten it.

❏ 11. Install the radio switch on the side of the fuselage. If you wish to do so, now is the time to install an external charge jack.

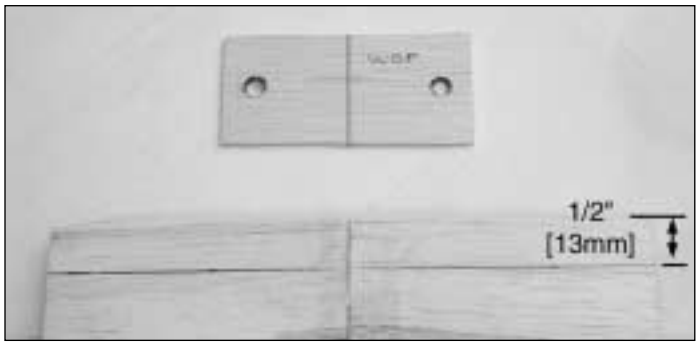
MOUNT THE WING TO THE FUSELAGE

❏ 1. Locate the die-cut 1/8" [3.2mm] lite-ply **wing mounting plate (WMP)** and the die-cut 1/8" [3.2mm] lite-ply **wing**

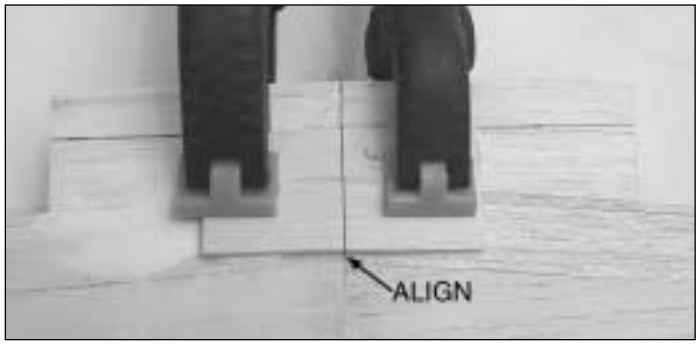
mounting plate doubler (MPD). Glue the two parts together with 30-minute epoxy as shown on the plans. Then glue the assembly in position as shown in the image on the previous page.



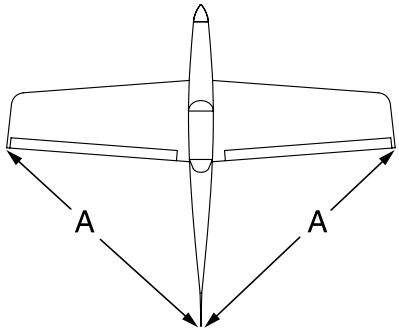
❑ 2. Mark the center of the fuselage at the wing trailing edge (former F4). Insert the wing dowels into the wing dowel holes in former F3. Push the wing down until the wing trailing edge hits the bottom of the fuselage. Sand the trailing edge of the wing flat as shown on the plan until the wing fits in the fuselage saddle. Make sure it remains centered.

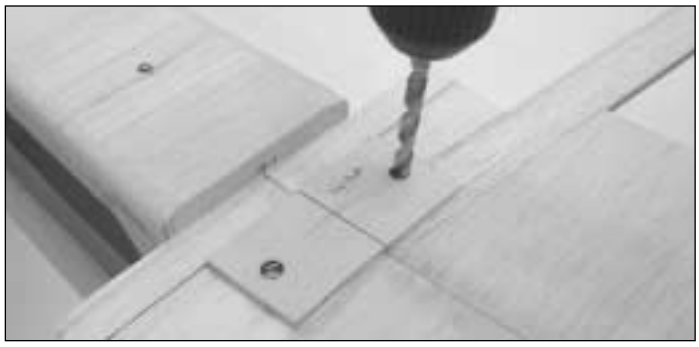


❑ 3. Draw a straight line 1/2" [13mm] away from the wing trailing edge at the bottom of the wing. Also, draw a line at the center of the die-cut 1/8" [3.2mm] lite-ply wing bolt plate (WBP).



❑ 4. Align the aft edge of the **wing bolt plate (WBP)** with the line on the wing (remember, you are working on the bottom of the wing). Also align the centerline on WBP with the wing's centerline. Glue the wing bolt plate in place with epoxy. Use clamps to hold the wing bolt plate in place while the glue cures.

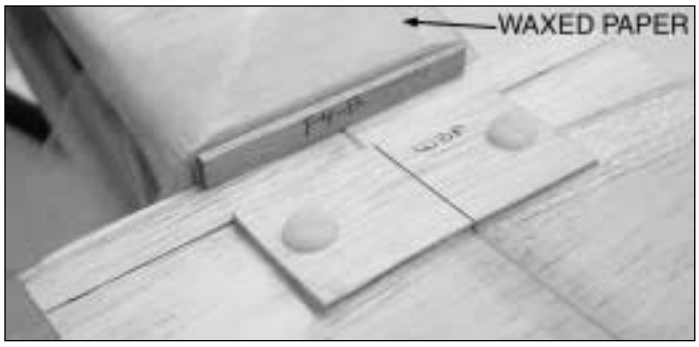




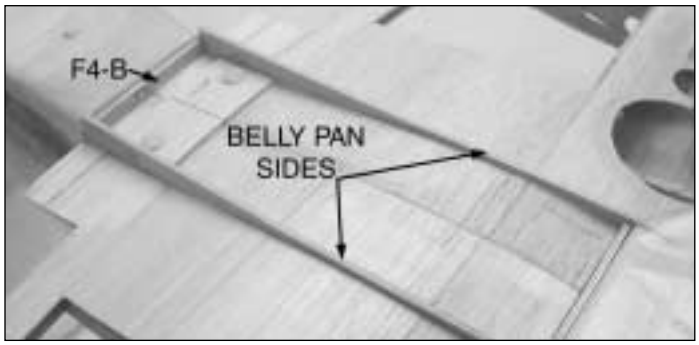
❑ 5. Align the wing to the fuselage using the above sketch. Use a 13/64" [5.15mm] or #25 drill bit to drill into the wing and through the wing mounting plate in the fuselage. Make sure the hole is perpendicular to the wing bolt plate. Remove the wing.

❑ 6. Use a 1/4-20 tap to thread the holes in the wing mounting plate (WMP) in the fuselage. Use thin CA to strengthen the threads and re-tap the holes with the same

1/4-20 tap. Enlarge the holes in the wing with a 1/4" [6.4mm] drill bit. Reinforce the area with thin CA.



❏ 7. Place a piece of waxed paper or Great Planes Plan Protector between the wing and the fuselage. Install the wing in place and tighten the wing bolts. Glue former F4-B to the wing trailing edge as shown with CA.

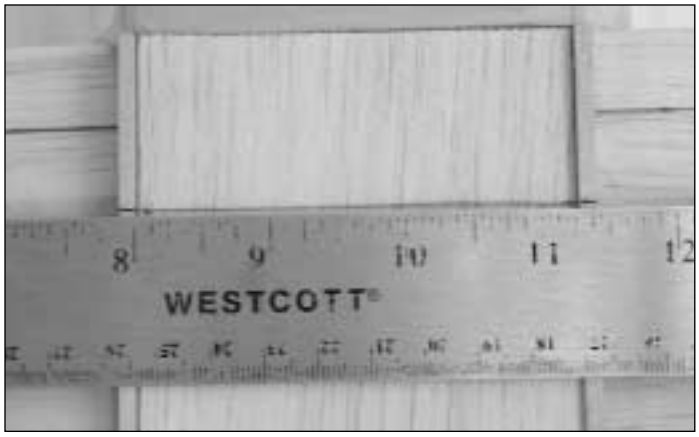


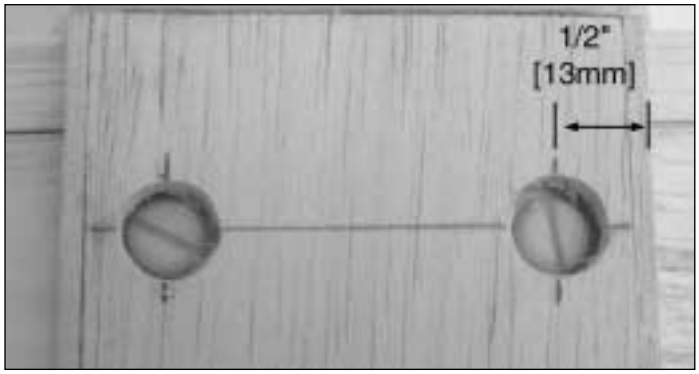
❏ 8. Glue the two die-cut 3/32" [2.4mm] balsa **belly pan (BP)** sides to the bottom center-section of the wing between formers F4-B and the wing dowel plate.

❏ 9. Make a mark on the edges of the belly pan sides where the wing bolts are located.

❏ 10. Locate a 3/32" [2.4mm] left over piece of sheeting. Cut it 10" [254mm] long. Fit it on top of F4-B and the wing dowel plate. Mark the inner edges of the belly pan sides on the sheeting. Draw straight lines between the marks and cut the sheeting at those lines.

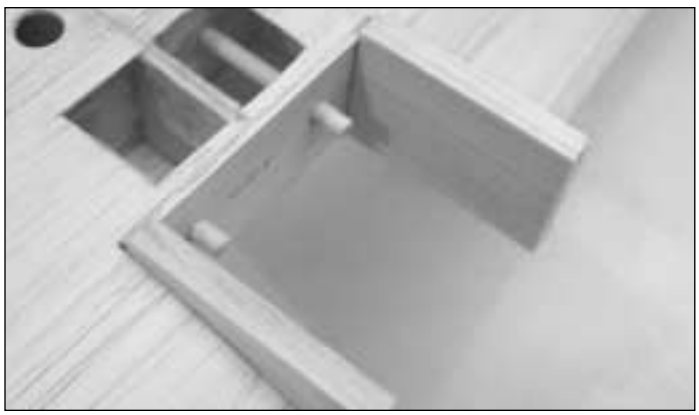
❏ 11. Glue the belly pan sheeting to the belly pan sides and formers F4-B and the wing dowel plate.



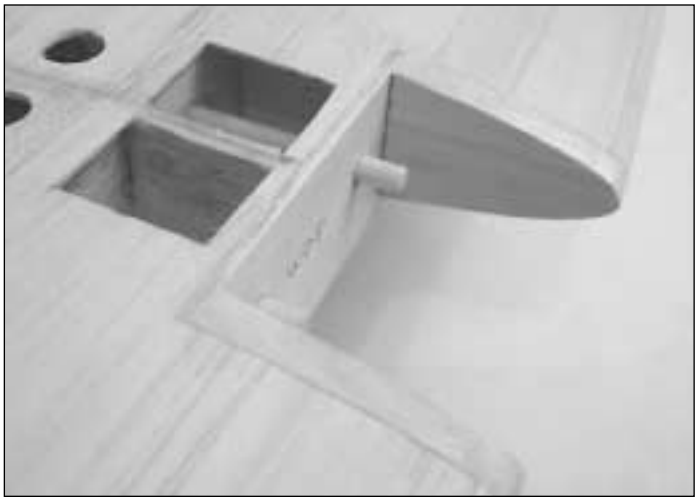


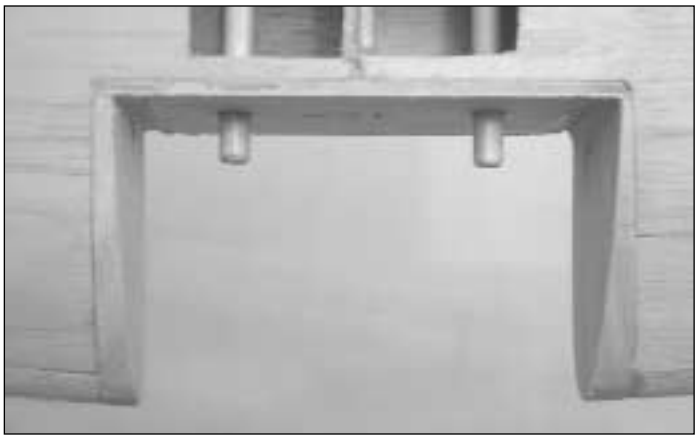
❏ 12. Draw a line between the marks you made in step 9. Draw another mark 1/2" [13mm] away from the belly pan edges at the line. Use a high speed rotary tool to open up holes at the marks for the wing bolts.

❏ 13. Sand the belly pan corners round.



❏ 14. Locate the 3/8" x 2" x 6" [9.5mm x 51mm x 152mm] balsa block and cut it in two 3" [76mm] pieces. Glue a block to each side of rib W2 as shown above.

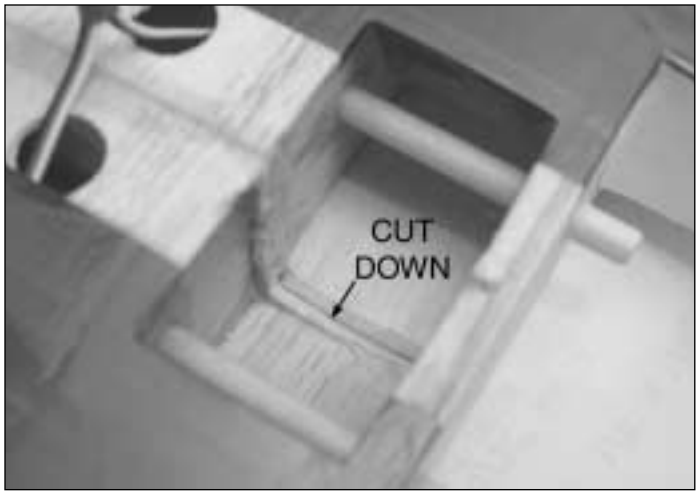




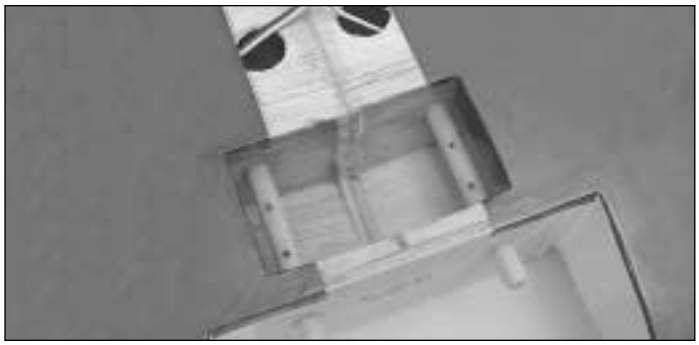
❏ 15. Sand the blocks flush with the wing skins. Also, test fit the wing onto the fuselage, sanding the blocks if necessary until it fits well.

INSTALL THE LANDING GEAR

Note: These final landing gear installation steps can be done before or after the covering has been applied to the airframe.

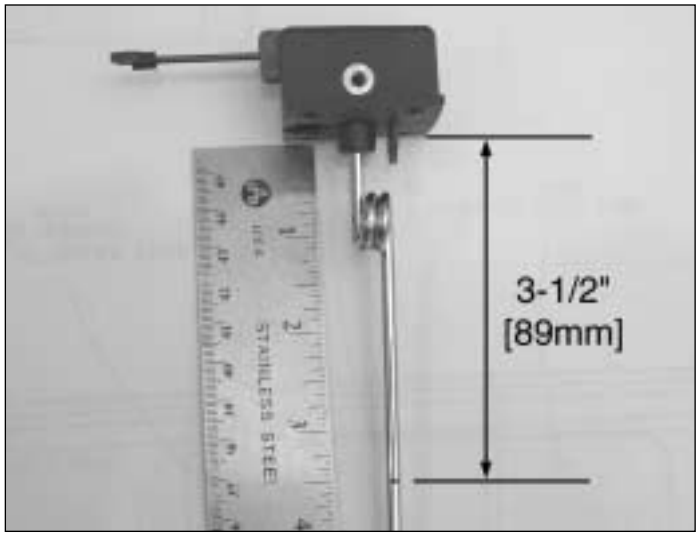


❑ 1. **Retractable Mains/Fixed Tailwheel.** Cut out the root rib so that the retract servo fits between the wing dowels. Place the servo between the dowels as shown above. Both a Hobbico CS-63 retract servo (HCAM0160) and a Futaba compact retract servo (FUTM0670) fit well in this location.

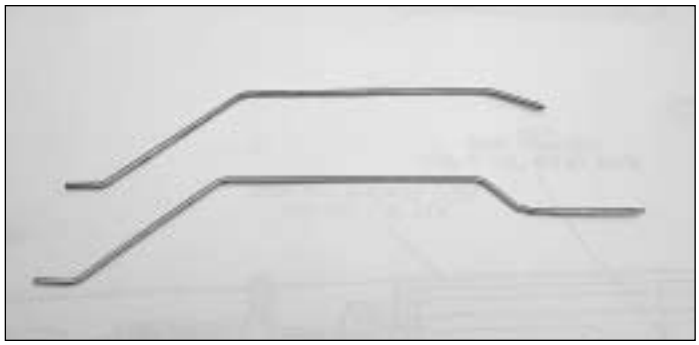


❑ 2. **Retractable Mains/Fixed Tailwheel.** With the servo in place, drill a 1/16" [1.6mm] hole through the servo mounting holes into the dowels. Remove the servo and wick some thin CA into the holes.

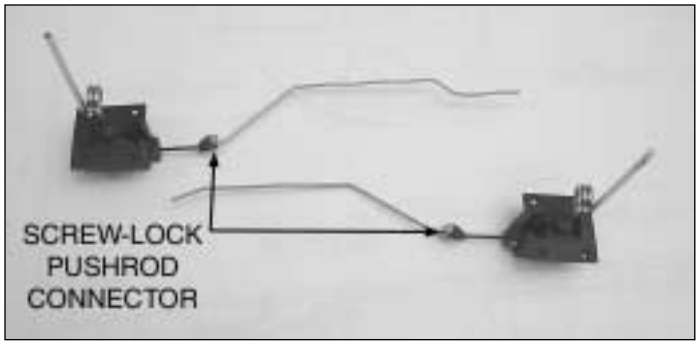
❑ 3. **Retractable Mains/Fixed Tailwheel.** Install the retract servo in place with the hardware supplied by the manufacturer. Remove the servo's output shaft.



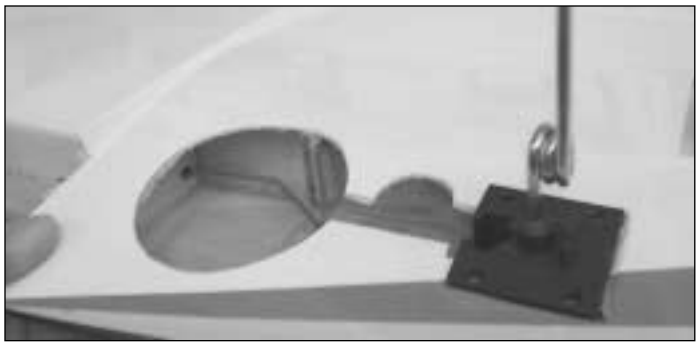
❑ 4. **Retractable Mains/Fixed Tailwheel.** The retract leg should have a total length of 3-1/2" [89mm]. Mark the leg of your retracts at that distance when the retract is fully extended and cut it with a high speed rotary tool such as a Dremel Moto-Tool.



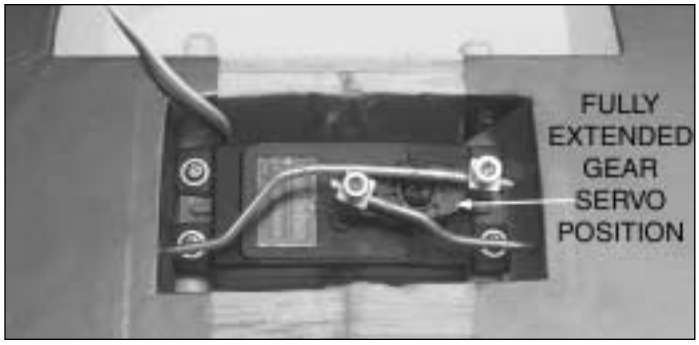
❑ 5. **Retractable Mains/Fixed Tailwheel.** Locate the leftover 2-56" rods from the pushrods. Cut and bend the wire as indicated in the retract wire template on page 8. The template on the top is for the right retract and the template at the bottom is for the left retract.



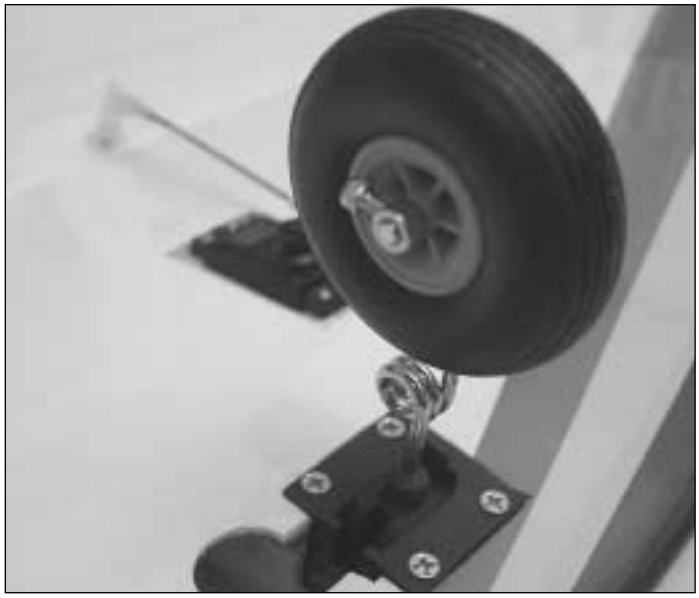
❏ 6. **Retractable Mains/Fixed Tailwheel.** Install a screw-lock pushrod connector on each retract control arm. Use a nylon retainer to secure the connector to the control arm. Locate two 4-40 x 1/8" [3.2mm] SHCS and use them to hold the wire in place as shown. Apply some Great Planes Pro Threadlocker on the SHCS. Use the above images for reference.

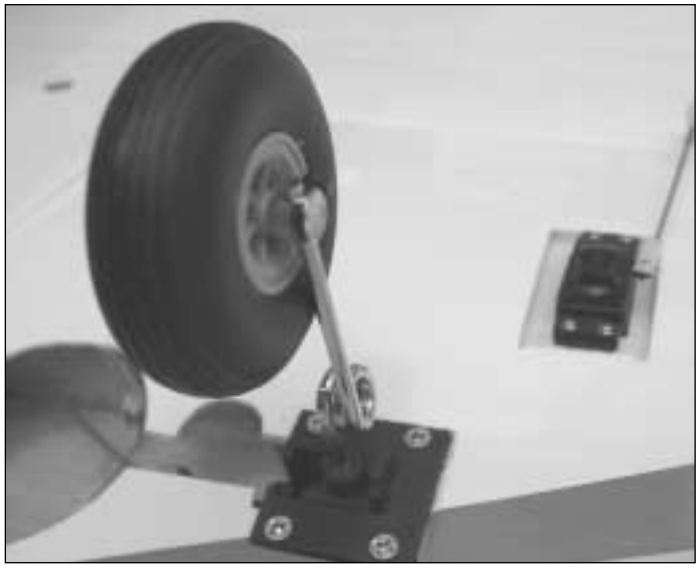


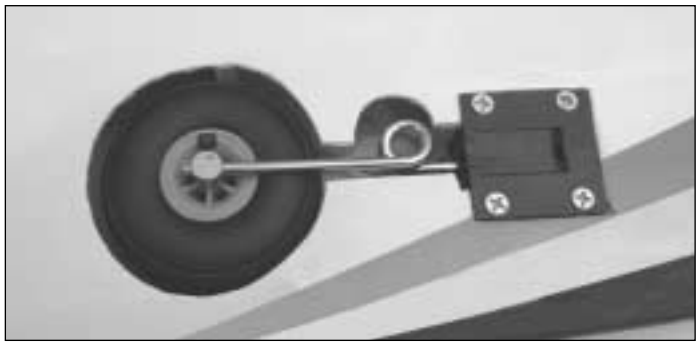
❏ 7. **Retractable Mains/Fixed Tailwheel.** Install the right and the left retracts in place on the retract mounts using the hardware supplied by the manufacturer. Use the retract manufacturer's instructions to drill properly sized holes, harden them with thin CA and install the retracts. The control pushrod should slide into the hole previously drilled in W2.



❏ 8. **Retractable Mains/Fixed Tailwheel.** Cut up a servo arm as shown in the above image and install two screw-lock pushrod connectors on it. Install the servo arm on the servo and secure it with the servo screw. Install the retract control wires to the screw-lock pushrod connectors. Apply Great Planes Pro Threadlocker on the SHCS of the screw-lock pushrod connectors. You will need to adjust the assembly after the radio is installed.







❏ 9. **Retractable Mains/Fixed Tailwheel.** Install the retract axles included with the retracts on the retract legs. Install the wheels on the axles and hold them in place with 5/32" [4mm] wheel collars and 6-32" x 1/4" [6.4mm] SHCS. Make sure the wheel is aligned with the centerline of the wing and

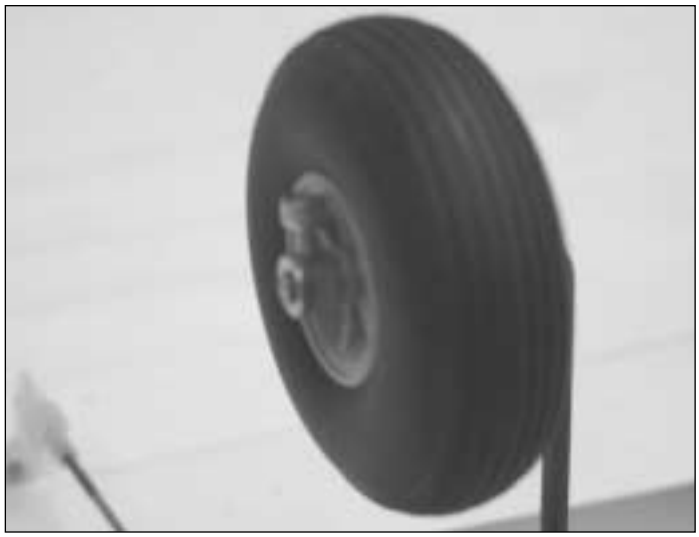
that they fit in the wheel pocket in the wing. Once you have determined the configuration, file flat spots on the retract legs and the wheel axles for the wheel collars and wheel axle. Apply Great Planes Pro Threadlocker on the SHCS and tighten them.

Note: The installation of the main fixed gear for both the Fixed Mains and Tailwheel and the Fixed Tricycle is identical except for the location. The mounting blocks for either of the two fixed gear were installed during the wing construction and the openings in the wing sheeting for either of the gear were cut out on page 22, steps 52 and 53 of the wing construction. Use the following instructions for the installation of both main fixed gear.

❑ 10. **Fixed Mains and Tailwheel & Fixed Tricycle.** Use a small file to bevel the hole in the landing gear mounting blocks. Locate the left main gear wire and slide it in place in the landing gear mounting block. Do the same for the right landing gear wire.

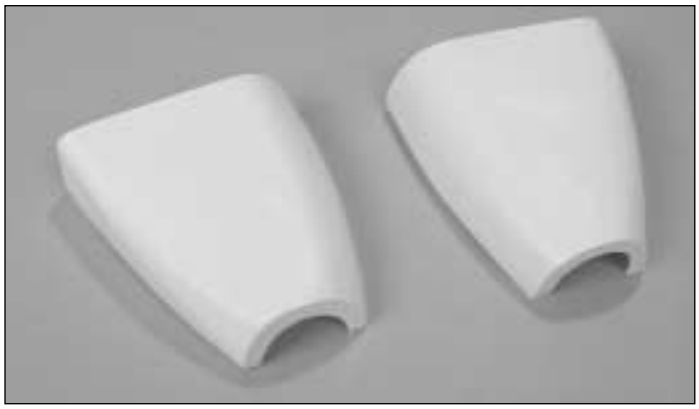
❑ 11. **Fixed Mains and Tailwheel & Fixed Tricycle.** Place two nylon landing gear straps on the landing gear mounting blocks as indicated on the plans. Drill 1/16" [1.6mm] pilot holes for the landing gear straps mounting holes. Wick thin CA into the holes. Repeat this step for the other wing.

❑ 12. **Fixed Mains and Tailwheel & Fixed Tricycle.** Install all four landing gear straps in place with eight #2 x 1/2" [13mm] screws.



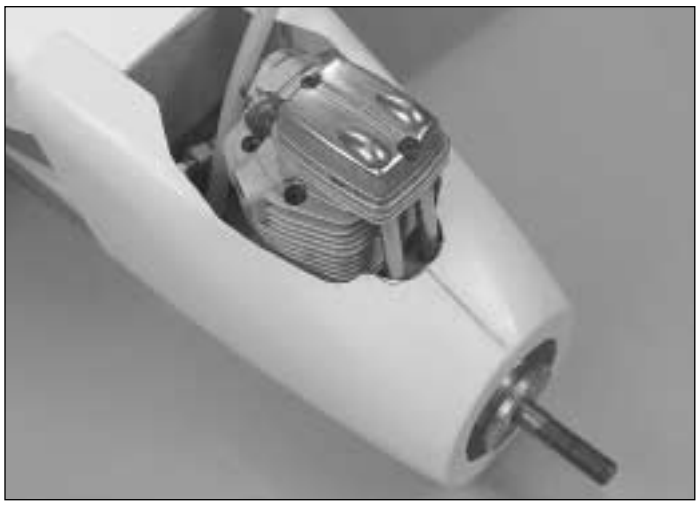
❑ 13. **Fixed Mains and Tailwheel & Fixed Tricycle.** Install the main wheels in place using four 5/32" [4mm] wheel collars and four 6-32 x 1/4 [6.4mm] SHCS for both wheels. File flat spots for the wheel collars. Use Great Planes Pro Threadlocker on the SHCS and tighten them.

ASSEMBLE THE COWL

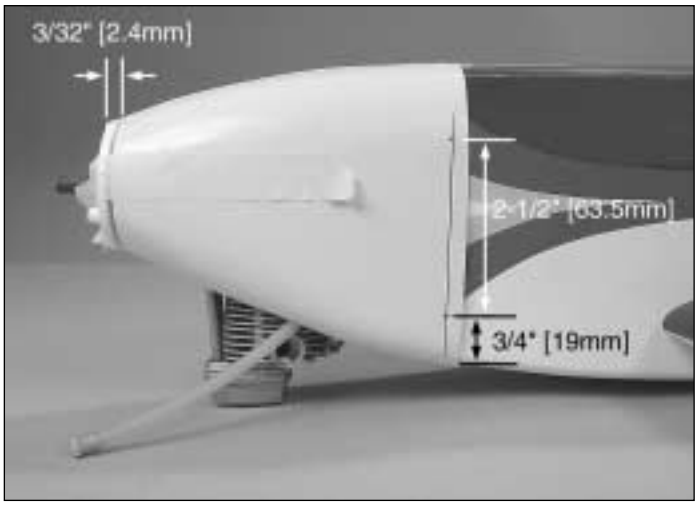


❏ 1. Locate the two **cowl halves**. Cut the two cowl halves at the cut marks with Hobbico's Curved-Tip Canopy scissors (HCAR0667).

❏ 2. Glue the two halves together with medium CA. Work on one side first, applying glue to a small section at a time, working your way around the cowl. Do not use CA accelerator as it will make the ABS brittle and susceptible to cracks.



❏ 3. Fit the cowl to the fuselage and to the engine you are going to use. Make the clearance opening you need for the engine cylinder. **Note:** This clearance opening needs to be as small as possible. Its exact shape and size can be adjusted later, when the cowl position has been fixed with the cowl screws.



❏ 4. Position the spinner backplate against the engine's drive washer. Position the cowl so that it is 3/32" [2.4mm] behind the spinner backplate. Draw a line parallel to the cowl edge 1/4" [6.4mm] away from it. Make a mark 3/4" [19mm] up from the bottom of the cowl up on this line. Make another mark 2-1/2" [63.5mm] higher than the first one. Do this on both sides of the cowl.

❏ 5. Hold the cowl in place with tape. Make sure it does not move. Drill a 1/16" [1.6mm] hole at the marks into the fuselage sides. Remove the cowl and wick thin CA into the holes in the fuse.

❏ 6. Remember that you need clearance holes for the carburetor needle valve and glow plug. To do that, mark the location of the holes you need to drill with paper strips attached to the airplane and then install the cowl in place and mark the holes on the cowl. Use a high speed rotary tool to drill the holes.

❑ 7. Apply a plastic filler such as Bondo® to fill the seam where the cowl halves are joined. After the filler has cured, sand the seam until the two cowl halves blend smoothly together.

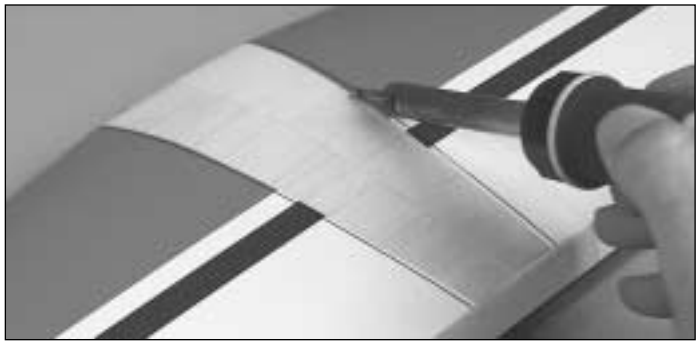
❑ 8. Wet sand the entire cowl with 400 grit wet or dry sandpaper. The cowl is now ready to be primed and painted. Once you are ready to install the cowl onto the fuselage, you will use four #2 x 1/2" [13mm] screws with four #2 washers.

COVER THE MODEL WITH MONOKOTE®

It is assumed that you have already covered a couple of models in the past, so we won't go into many details on covering techniques, but here are some tips you should consider.

❑ 1. **NEVER CUT THE COVERING DIRECTLY ON THE SHEETING.** The Ultra Sport 40 Plus depends on the sheeting for some of its strength. Modelers who cut through the covering tend to cut the sheeting and this will weaken the structure.

EXPERT TIP



HOW TO CUT COVERING FROM BALSA

Use a soldering iron to cut the covering from the wing. The tip of the soldering iron doesn't have to be sharp, but a fine tip does work best. Allow the iron to heat fully. Use a straightedge to guide the soldering iron at a rate that will just melt the covering and not burn into the wood. The hotter the soldering iron, the faster it must travel to melt a fine cut. Peel off the covering.

❑ 2. Use a Top Flite® Hot Sock™ to minimize dents in the wood from your covering iron.

❑ 3. When you cover large sheeted surfaces such as the wing, bond the covering in the middle and work outward, pushing out air as you proceed. Do not move the iron in a circular motion, but move it span-wise with the grain of the wood.

❑ 4. When you cover smaller parts with square edges such as the elevators and ailerons, cover the edges first with separate pieces of covering. Then, all you have to do is wrap the covering around the top and bottom and iron it down.

❑ 5. When you cover sharp junctions like where the stab meets the fuse, cut narrow strips of covering and apply them in the corners before you cover the major surfaces. The larger pieces of covering will overlap the smaller pieces. This technique also eliminates the need to cut the covering after it has been applied.

❏ 6. If you want to duplicate the trim scheme pictured on the box you will need the following rolls of Top Flite MonoKote:

1 Roll of Metallic Plum – TOPQ0403
1 Roll of Red – TOPQ0201
1 Roll of Yellow – TOPQ0203
2 Rolls of White – TOPQ0204

Covering Sequence

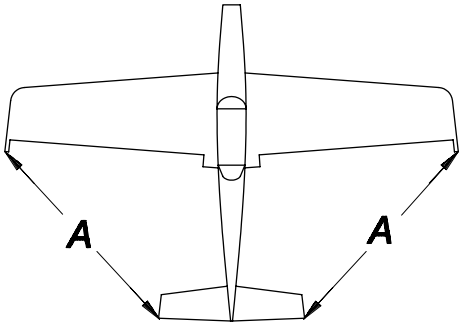
Fuselage
❏ 1. Tail *junctions strips* as described previously
❏ 2. Stab tops, then bottoms
❏ 3. Fin right, then left side
❏ 4. Fuse bottom aft, then front
❏ 5. Fuse sides
❏ 6. Turtle deck (may be done in one or two pieces)
❏ 7. Front deck (aft of cowl)

Wing
❏ 1. Hidden areas and corners such as the trailing edge on the flap and aileron area
❏ 2. Belly pan sides and belly pan
❏ 3. Bottom of one, then the other half of the wing
❏ 4. Top of one, then the other half of the wing

Control Surfaces and Details
❏ 1. Ends, bottoms, then tops of elevators, ailerons and flaps
❏ 2. One, then the other side of the rudder

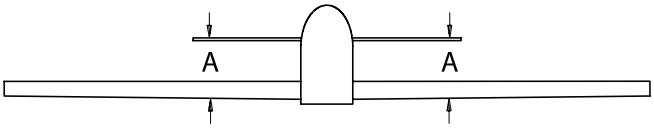
INSTALL THE STAB & FIN

Once you have the stab, fin and fuselage covered you can permanently install the stab and fin to the fuselage.



❏ 1. Mount the wing to the fuselage. Then, insert the stab into the slots in the fuselage. Measure the distance from the tip of the stab to the tip of the wing on the right side of the fuselage. Measure the same point on the left side of the fuselage. Adjust the stab until both sides measure the same.

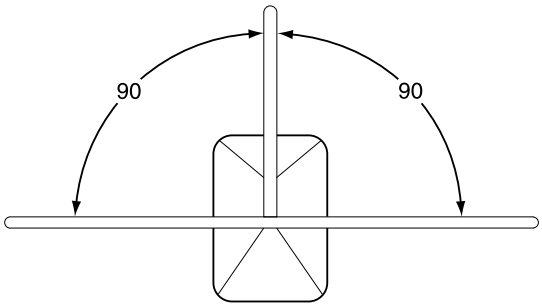
❏ 2. If you covered the center-section of the stab, draw the outline of the fuselage on the stab with a felt-tip marker. Then, cut away the covering in the center-section so that you can achieve a good glue joint between the balsa stab center-section and the stab base on the fuselage. When cutting the covering away **be careful** not to cut the balsa wood. Cutting the balsa wood can weaken the structure! Use the **Expert Tip** on page 46 for cutting the MonoKote.



❏ 3. Stand five to ten feet behind the model and view the stab and wing. If the stab and wing align with each other, proceed to the next step. If the stab and wing do not align, place a weight on the "high" side of the stab to bring it into alignment. If too much weight is required, remove the stab and sand the "high" side of the slot in the fuse where the stab fits until the stab aligns with the wing.

❏ 4. Glue the stab to the fuselage with 6-minute epoxy, checking the distance from the stab to the wing before the glue cures.

❏ 5. After the glue has cured on the stab, insert the fin into the slots in the fuselage. Mark the outline of the fuselage onto both sides of the fin. Remove the fin and cut the covering, being careful not to cut into the balsa wood structure.



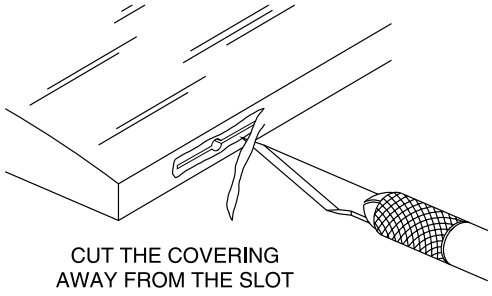
❏ 6. Be sure the fin is 90 degrees to the stab. Then, glue the fin to the fuselage with 6-minute epoxy.

PAINTING

At this stage all of your plastic pieces should have the seams filled with Bondo or putty. If you haven't already done so, wet sand the plastic parts with 400-grit wet-or-dry sandpaper so the paint will adhere. Spray the cowling with at least one coat of Top Flite LustreKote® primer. Wet sand the plastic parts between coats with 400-grit sandpaper. Use Great Planes 1/8" [3.2mm] EZ-Mask Flexible Masking Tape (GPMR1000) for masking sharp lines. A Top Flite Tack Cloth (TOPR2185) is useful to remove dust before you paint. Top Flite LustreKote paint gives a matching finish to your MonoKote finish.

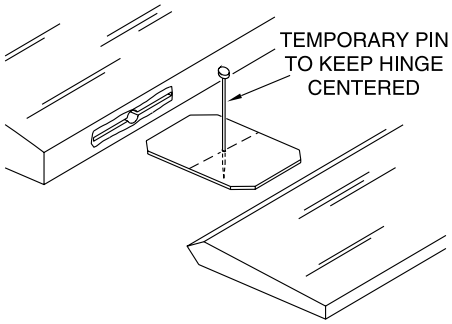
JOIN THE CONTROL SURFACES

Now that the control surfaces are covered, you can permanently install the hinges into the control surfaces.



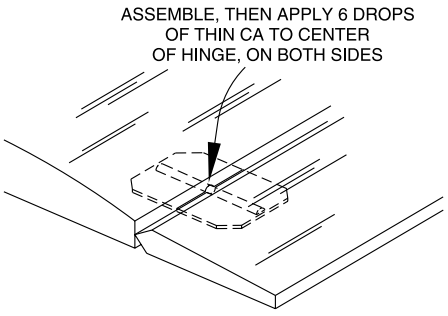
❑ 1. Start with the stab and elevators. Remove a small strip of covering from the hinge slots.

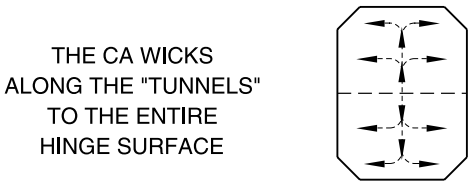
❑ 2. Fit the hinges in the stab and elevator (without glue).



❑ 3. Join the elevators to the stab with the hinges. If the hinges do not remain centered as you join the elevators to the stab, remove the stab and insert a pin in the center of the hinge to keep them centered. Make sure there is approximately a 1/64" [.5mm] gap between the elevators and the stab so you do not glue them together.

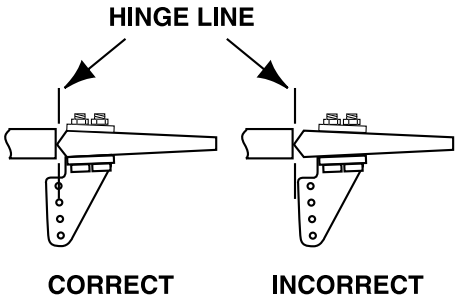
Do not use CA accelerator on any of the hinges and do not glue the hinges with anything but thin CA. Do not attempt to glue one half of the hinge at a time. The hinges will not be properly secured and could come out while the model is in flight.





❑ 4. Add six drops of thin CA to the center of the hinges on both the top and bottom. The holes you drilled in the hinge slot will wick the CA into the entire hinge surface. Use a paper towel to absorb excess CA from the hinge gap before it cures.

❑ 5. Use the same hinging method to join the rudder to the fin and the ailerons to the wing.



❑ 6. Reinstall the pushrods you disconnected before covering and mount the control horns to the ailerons, elevator and rudder. Reinstall any hardware and other components you may not already have in place such as the fuel valve, fuel lines, servos, on/off switch, etc. Make sure you install silicone clevis retainers on all nylon clevises.

FINISHING THE MODEL

Apply the Decals

1. Use scissors or a sharp hobby knife to cut the decals from the sheet.

2. Be certain the model is clean and free from oily fingerprints and dust. Prepare a dishpan or small bucket with a mixture of liquid dish soap and warm water-about one teaspoon of soap per gallon of water. Submerse the decal in the soap and water and peel off the paper backing. **Note:** Even though the decals have a “sticky-back” and are not the water transfer type, submersing them in soap & water allows accurate positioning and reduces air bubbles underneath.

3. Position decal on the model where desired. Holding the decal down, use a paper towel to wipe most of the water away.

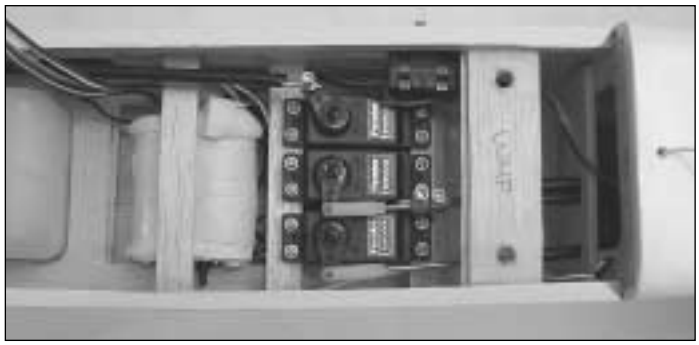
4. Use a piece of soft balsa or something similar to squeegee remaining water from under the decal. Apply the rest of the decals the same way.

Finish the Cockpit

❏ 1. Cut the canopy on the cut line. If you chose to install a pilot, use double-sided tape or glue it with CA to attach it in place. The instrument panel decal should also be in place by now. Position the canopy in place on top of the fuselage. Once satisfied with the fit, apply a small bead of Z-56 canopy glue to the bottom of the canopy where it comes in contact with the fuselage. Hold the canopy in place with masking tape until the glue is fully cured (overnight).

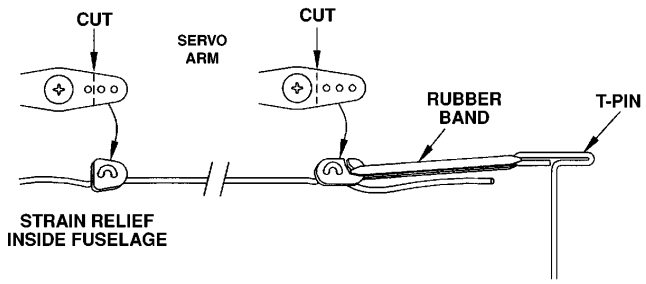
Finish the Radio Installation

❏ 1. Wrap the battery in 1/4" [6.4mm] R/C foam. The battery can be installed in two different places. If you use a light weight engine or you do not want to explore the aft range of the CG of this airplane, you can install it directly behind the servos and secure it in place with a piece of scrap 1/4" x 1/2" [6.4mm x 13mm] balsa stick. If you used a heavy engine or you plan to explore the aft range of the CG of this airplane, install the battery in the bottom fuse behind the hatch in the aft end of the fuselage. Use double-sided tape and several drops of CA on the tape to secure the battery in place. Another method to hold the battery in place is to use hook and loop material with one of its sides glued to the fuselage's bottom balsa sheeting and the other wrapping the battery to secure it in place. In any case, you should always use some kind of rubber padding to protect the battery from vibration.



❏ 2. Wrap the receiver in 1/4" [6.4mm] R/C foam and install it in place as shown on the plans. Use a piece of scrap 1/4" x 1/2" [6.4mm x 13mm] balsa stick glued to the sides of the fuselage to secure it in place.

❏ 3. Connect all servos, servo extensions and battery wires to the receiver and switch. Secure critical connections with heat shrink tubing or tape.



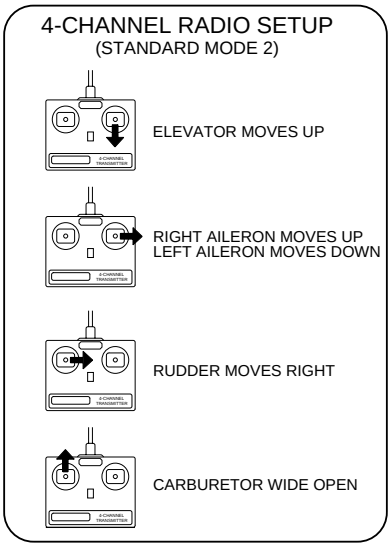
❏ 4. Make a small hole at the bottom fuselage sheeting. Install a strain relief on the antenna wire and route it to the aft part of the airplane. Use another strain relief and a small rubber band to attach the battery to a pin in the aft area of the fuselage or to the tail wheel.

GET THE MODEL READY TO FLY

Check the Control Directions

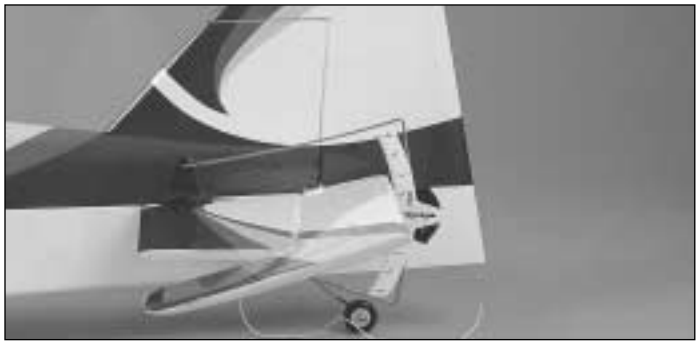
❏ 1. Turn on the transmitter and receiver and center the trims. If necessary, remove the servo arms from the servos and reposition them so they are centered. Reinstall the screws that hold on the servo arms.

❏ 2. With the transmitter and receiver still on, check all the control surfaces to see if they are centered. If necessary, adjust the clevises on the pushrods to center the control surfaces.



❑ 3. Make certain that the control surfaces and the carburetor respond in the correct direction as shown in the diagram. If any of the controls respond in the wrong direction, use the servo reversing in the transmitter to reverse the servos connected to those controls. Be certain the control surfaces have remained centered. Adjust if necessary.

Set the Control Throws



Use a Great Planes Accu-Throw (or a ruler) to accurately measure and set the control throw of each control surface as indicated in the chart that follows. If your radio does not have dual rates, we recommend setting the throws at the low rate setting. After you get used to the airplane, you may change the throws to the "high rates" settings.

Note: The throws are measured at the **widest part** of the elevators, rudder and ailerons.

These are the recommended control surface throws:

ELEVATOR:

Low Rate	High Rate	3D Rate
3/8" [10mm] up	9/16" [15mm] up	1-1/2" [38mm] up
3/8" [10mm] down	9/16" [15mm] down	1-1/2" [38mm] down

RUDDER:

Low Rate	High Rate	3D Rate
1-3/4" [45mm] right	3-3/8" [85mm] right	4-3/4" [121mm] right
1-3/4" [45mm] left	3-3/8" [85mm] left	4-3/4" 121mm] left

AILERONS:

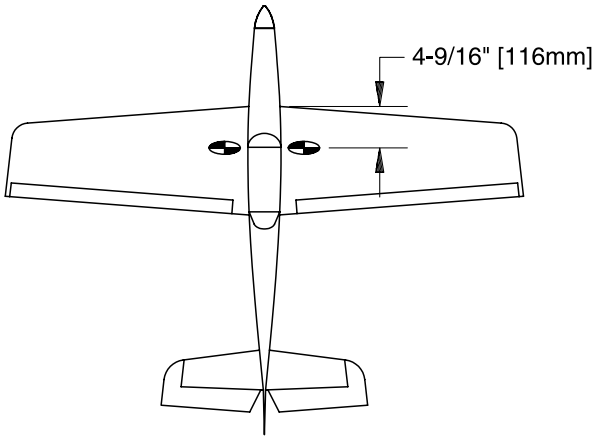
Low Rate	High Rate	3D Rate
5/16" [8.5mm] up	7/16" [11.5mm] up	3/4" [19mm] up
5/16" [8.5mm] down	7/16" [11.5mm] down	3/4" [19mm] down

IMPORTANT: The Great Planes Ultra Sport 40 Plus has been **extensively** flown and tested to arrive at the throws at which it flies best. Flying your model at these throws will provide you with the greatest chance for successful first flights. If, after you have become accustomed to the way the Great Planes Ultra Sport 40 Plus flies, you would like to change the throws to suit your taste, that is fine. However, too much control throw could make the model difficult to control, so remember, *"more is not always better."*

Balance the Model (C.G.)

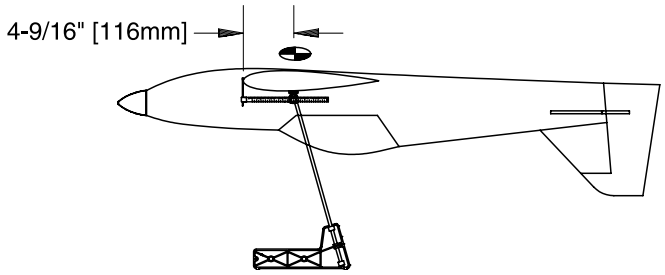
More than any other factor, the **C.G**. (balance point) can have the **greatest** effect on how a model flies, and may determine whether or not your first flight will be successful. If you value this model and wish to enjoy it for many flights, **DO NOT OVERLOOK THIS IMPORTANT PROCEDURE.** A model that is not properly balanced will be unstable and possibly unflyable.

At this stage the model should be in ready-to-fly condition with all of the systems in place including the engine, landing gear, covering and paint, and the radio system.



❏ 1. Use a felt-tip pen or 1/8"-wide tape to accurately mark the C.G. on the top of the wing on both sides of the fuselage. The C.G. is located 4-9/16" [116mm] back from the leading edge of the wing.

This is where your model should balance for the first flights. Later, you may wish to experiment by shifting the C.G. up to 9/16" [14mm] forward or 9/16" [14mm] back to change the flying characteristics. Moving the C.G. forward may improve the smoothness and stability, but the model may then require more speed for takeoff and make it more difficult to slow for landing. Moving the C.G. aft makes the model more maneuverable, but could also cause it to become too difficult to control. In any case, **start at the recommended balance point** and do not at any time balance the model outside the specified range.



❏ 2. With the wing attached to the fuselage, all parts of the model installed (ready to fly), fully extended retracts and an empty fuel tank, place the model upside-down on a Great Planes CG Machine, or lift it upside-down at the balance point you marked.

❏ 3. If the tail drops, the model is "tail heavy" and the battery pack and/or receiver must be shifted forward or weight must be added to the nose to balance. If the nose drops, the model is "nose heavy" and the battery pack and/or receiver must be shifted aft or weight must be added to the tail to balance. If possible, relocate the battery pack and receiver to minimize or eliminate any additional ballast required. If additional weight is required, nose weight may be easily added by using a "spinner weight" (GPMQ4645 for the 1 oz. weight, or GPMQ4646 for the 2 oz. weight). If spinner weight is not practical or is not enough, use Great Planes (GPMQ4485) "stick-on" lead. A good place to add stick-on nose weight is to the firewall (F1) (don't attach weight to the cowl–it is not intended to support weight). Begin by placing incrementally increasing amounts of weight on the bottom of the fuse over the firewall (F1) until the model balances. Once you have determined the amount of weight required, it can be permanently attached. If required, tail weight may be added by cutting open the bottom of the fuse and gluing it permanently inside.

Note: Do not rely upon the adhesive on the back of the lead weight to permanently hold it in place. Over time, fuel and exhaust residue may soften the adhesive and cause the weight to fall off. Use #2 sheet metal screws, RTV silicone or epoxy to permanently hold the weight in place.

❏ 4. **IMPORTANT:** If you found it necessary to add any weight, recheck the C.G. after the weight has been installed.

Balance the Model Laterally

❏ 1. With the wing level, have an assistant help you lift the model by the engine propeller shaft and the bottom of the fuse under the TE of the fin. Do this several times.

❏ 2. If one wing always drops when you lift the model, it means that side is heavy. Balance the airplane by adding weight to the other wing tip. **An airplane that has been laterally balanced will track better in loops and other maneuvers.**

PREFLIGHT

Identify Your Model

No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on page 55 and place it on or inside your model.

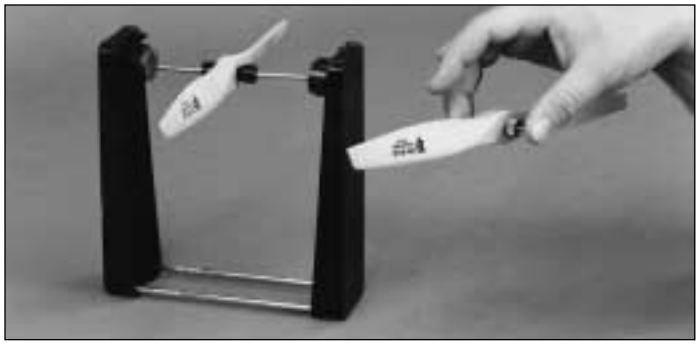
Charge the Batteries

Follow the battery charging instructions that came with your radio control system to charge the batteries. You should always charge your transmitter and receiver batteries the night before you go flying, and at other times as recommended by the radio manufacturer.

Note: Checking the condition of your receiver battery pack is **highly recommended**. All battery packs, whether it's a

trusty pack you've just taken out of another model, or a new battery pack you just purchased, should be cycled, noting the discharge capacity. Oftentimes, a weak battery pack can be identified (and a valuable model saved!) by comparing its actual capacity to its rated capacity. Refer to the instructions and recommendations that come with your cycler. If you don't own a battery cycler, perhaps you can have a friend cycle your pack and note the capacity for you.

Balance the Propellers



Carefully balance your propeller and spare propellers before you fly. An unbalanced prop can be the single most significant cause of vibration that can damage your model. Not only will engine mounting screws and bolts loosen, possibly with disastrous effect, but vibration may also damage your radio receiver and battery. Vibration can also cause your fuel to foam, which will, in turn, cause your engine to run hot or quit.

We use a Top Flite Precision Magnetic Prop Balancer™ (TOPQ5700) in the workshop and keep a Great Planes Fingertip Prop Balancer (GPMQ5000) in our flight box.

Ground Check

If the engine is new, follow the engine manufacturer's instructions to break-in the engine. After break-in, confirm that the engine idles reliably, transitions smoothly and rapidly to full power and maintains full power-indefinitely. After you run the engine on the model, inspect the model closely to make sure all screws remained tight, the hinges are secure, the prop is secure and all pushrods and connectors are secure.

Range Check

Ground check the operational range of your radio before the first flight of the day. With the transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet away from the model and still have control. Have an assistant stand by your model and, while you work the controls, tell you what the control surfaces are doing. Repeat this test **with the engine running** at various speeds with an assistant holding the model, using hand signals to show you what is happening. If the control surfaces do not respond correctly, **do not fly!** Locate and correct the problem first. Look for loose servo connections or broken wires, corroded wires on old servo connectors, poor solder joints in your battery pack or a defective cell, or a damaged receiver crystal from a previous crash.

ENGINE SAFETY PRECAUTIONS

Failure to follow these safety precautions may result in severe injury to yourself and others.

Keep all engine fuel in a safe place, away from high heat, sparks or flames, as fuel is very flammable. Do not smoke near the engine or fuel; and remember that engine exhaust gives off a great deal of deadly carbon monoxide. Therefore, **do not run the engine in a closed room or garage**.

Get help from an experienced pilot when learning to operate engines.

Use safety glasses when starting or running engines.

Do not run the engine in an area of loose gravel or sand; the propeller may throw such material in your face or eyes.

Keep your face and body as well as all spectators away from the plane of rotation of the propeller as you start and run the engine.

Keep these items away from the prop: loose clothing, shirt sleeves, ties, scarves, long hair or loose objects such as pencils or screwdrivers that may fall out of shirt or jacket pockets into the prop.

Use a "chicken stick" or electric starter to start the engine. Do not use your fingers to flip the propeller. Make certain the glow plug clip or connector is secure so that it will not pop off or otherwise get into the running propeller.

Make all engine adjustments from behind the rotating propeller.

The engine gets hot! Do not touch it during or right after operation. Make sure fuel lines are in good condition so fuel will not leak onto a hot engine, causing a fire.

To stop a glow engine, cut off the fuel supply by closing off the fuel line or following the engine manufacturer's recommendations. Do not use hands, fingers or any other body part to try to stop the engine. To stop a gasoline powered engine an on/off switch should be connected to the engine coil. Do not throw anything into the propeller of a running engine.

AMA SAFETY CODE (excerpt)

Read and abide by the following Academy of Model Aeronautics Official Safety Code:

GENERAL

1. I will not fly my model aircraft in sanctioned events, air shows, or model flying demonstrations until it has been proven to be airworthy by having been previously successfully flight tested.

2. I will not fly my model aircraft higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right of way to, and avoid flying in the proximity of full-scale aircraft. Where necessary an observer shall be used to supervise flying to avoid having models fly in the proximity of full-scale aircraft.

3. Where established, I will abide by the safety rules for the flying site I use, and I will not willfully and deliberately fly my models in a careless, reckless and/or dangerous manner.

7. I will not fly my model unless it is identified with my name and address or AMA number, on or in the model.

9. I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind).

RADIO CONTROL

1. I will have completed a successful radio equipment ground check before the first flight of a new or repaired model.

2. I will not fly my model aircraft in the presence of spectators until I become a qualified flier, unless assisted by an experienced helper.

3. I will perform my initial turn after takeoff away from the pit or spectator areas, and I will not thereafter fly over pit or spectator areas, unless beyond my control.

4. I will operate my model using only radio control frequencies currently allowed by the Federal Communications Commission.

CHECK LIST

During the last few moments of preparation your mind may be elsewhere anticipating the excitement of the first flight. Because of this, you may be more likely to overlook certain checks and procedures that should be performed before the model is flown. To help avoid this, a check list is provided to make sure these important areas are not overlooked. Many are covered in the instruction manual, so where appropriate, refer to the manual for complete instructions. Be sure to check the items off as they are completed (that's why it's called a *check list!*).

- ❏ 1 Fuelproof all areas exposed to fuel or exhaust residue such as the firewall (F1), wing saddle area, etc.
- ❏ 2. Check the C.G. according to the measurements provided in the manual.
- ❏ 3. Be certain the battery and receiver are securely mounted in the fuse. Simply stuffing them into place with foam rubber is not sufficient.
- ❏ 4. Extend your receiver antenna and make sure it has a strain relief inside the fuselage to keep tension off the solder joint inside the receiver.
- ❏ 5. Balance your model *laterally* as explained in the instructions.
- ❏ 6. Use thread locking compound to secure critical fasteners such as the set screws that hold the wheel axles to the struts, screws that hold the carburetor arm (if applicable), screw-lock pushrod connectors, etc.
- ❏ 7. Add a drop of oil to the axles so the wheels will turn freely.
- ❏ 8. Make sure all hinges are **securely** glued in place.
- ❏ 9. Reinforce holes for wood screws with thin CA where appropriate (servo mounting screws, cowl mounting screws, etc.).
- ❏ 10. Confirm that all controls operate in the correct direction and the throws are set up according to the manual.
- ❏ 11. Make sure there are silicone retainers on all the clevises and that all servo arms are secured to the servos with the screws included with your radio.
- ❏ 12. Secure connections between servo wires and Y-connectors or servo extensions, and the connection between your battery pack and the on/off switch with vinyl tape, heat shrink tubing or special clips suitable for that purpose.
- ❏ 13. Make sure any servo extension cords you may have used do not interfere with other systems (servo arms, pushrods, etc.).
- ❏ 14. Secure the pressure tap (if used) to the muffler with high temp RTV silicone, thread locking compound or J.B. Weld.
- ❏ 15. Make sure the fuel lines are connected and are not kinked.
- ❏ 16. Use an incidence meter to check the wing for twists and attempt to correct before flying.
- ❏ 17. Balance your propeller (and spare propellers).
- ❏ 18. Tighten the propeller nut and spinner.
- ❏ 19. Place your name, address, AMA number and telephone number on or inside your model.
- ❏ 20. Cycle your receiver battery pack (if necessary) and make sure it is fully charged.
- ❏ 21. If you wish to photograph your model, do so before your first flight.
- ❏ 22. Range check your radio when you get to the flying field.

FLYING

The Great Planes Ultra Sport 40 Plus is a great-flying model that flies smoothly and predictably. The Great Planes Ultra

Sport 40 Plus does not, however, possess the self-recovery characteristics of a primary R/C trainer and should be flown only by experienced R/C pilots.

Fuel Mixture Adjustments

A fully cowled engine may run at a higher temperature than an un-cowled engine. For this reason, the fuel mixture should be richened so the engine runs at about 200 rpm below peak speed. By running the engine slightly rich, you will help prevent dead-stick landings caused by overheating.

CAUTION (THIS APPLIES TO ALL R/C AIRPLANES): If, while flying, you notice any unusual sounds, such as a low-pitched "buzz," this may indicate control surface *flutter*. Because flutter can quickly destroy components of your airplane, any time you detect flutter you must **immediately** cut the throttle and land the airplane! Check all servo grommets for deterioration (this may indicate which surface fluttered), and make sure all pushrod linkages are secure and free of play. If the control surface fluttered once, it probably will flutter again under similar circumstances unless you can eliminate the free-play or flexing in the linkages. Here are some things which can cause flutter: Excessive hinge gap; Not mounting control horns solidly; Poor fit of clevis pin in horn; Side-play of pushrod in guide tube caused by tight bends; Poor fit of Z-bend in servo arm; Insufficient glue used when gluing in the elevator joiner wire; Excessive *play* or *backlash* in servo gears; and Insecure servo mounting.

Takeoff

Before you get ready to takeoff, see how the model handles on the ground by doing a few practice runs at **low speeds** on the runway. Hold "up" elevator to keep the tail wheel on the ground. If necessary, adjust the tail wheel so the model will roll straight down the runway. If you need to calm your nerves before the maiden flight, shut the engine down and bring the model back into the pits. Top off the fuel, then check all fasteners and control linkages for peace of mind.

Remember to takeoff into the wind. When you're ready, point the model straight down the runway, hold a bit of up elevator to keep the tail on the ground to maintain tail wheel steering, then gradually advance the throttle. As the model gains speed decrease up elevator, allowing the tail to come off the ground. One of the most important things to remember with a tail dragger is to always be ready to apply **right** rudder to counteract engine torque. If you are flying the tricycle configuration, ground handling will be easier and the torque reactions will not be as severe as they are on a tail dragger. Gain as much speed as your runway and flying site will practically allow before gently applying up elevator, lifting the model into the air. At this moment it is likely that you will need to apply more right rudder to counteract engine torque. Be smooth on the elevator stick, allowing the model to establish a **gentle** climb to a safe altitude before turning into the traffic pattern. If you are using the retract configuration, now it is time to retract the wheels.

Flight

For reassurance and to keep an eye on other traffic, it is a good idea to have an assistant on the flight line with you. Tell him to remind you to throttle back once the plane gets to a comfortable altitude. While full throttle is usually desirable for takeoff, most models fly more smoothly at reduced speeds.

Take it easy with the Great Planes Ultra Sport 40 Plus for the first few flights, gradually getting acquainted with it as you gain confidence. Adjust the trims to maintain straight and level flight. After flying around for a while, and while still at a safe altitude with plenty of fuel, practice slow flight and execute practice landing approaches by reducing the throttle to see how the model handles at slower speeds. Add power to see how she climbs as well. Continue to fly around, executing various maneuvers and making mental notes (or having your assistant write them down) of what trim or C.G. changes may be required to fine tune the model so it flies the way you like. Mind your fuel level, but use this first flight to become familiar with your model before landing.

Landing

To initiate a landing approach, lower the throttle while on the downwind leg. If you are using the retract configuration, lower the retracts. Allow the nose of the model to pitch downward to gradually bleed off altitude. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. Make your final turn toward the runway (into the wind) keeping the nose down to maintain airspeed and control. Level the attitude when the model reaches the runway threshold, modulating the throttle as necessary to maintain your glide path and airspeed. If you are going to overshoot, smoothly advance the throttle (always ready on the right rudder to counteract torque) and climb out to make another attempt. When you're ready to make your landing flare and the model is a foot or so off the deck, smoothly increase up elevator until it gently touches down. Once the model is on the runway and has lost flying speed, hold up elevator to place the tail on the ground, regaining tail wheel control.

One final note about flying your model. Have a goal or flight plan in mind for **every** flight. This can be learning a new maneuver(s), improving a maneuver(s) you already know, or learning how the model behaves in certain conditions (such as on high or low rates). This is not necessarily to improve your skills *(though it is never a bad idea!)*, but more importantly so you do not surprise yourself by impulsively attempting a maneuver and suddenly finding that you've run out of time, altitude or airspeed. Every maneuver should be deliberate, not impulsive. For example, if you're going to do

a loop, check your altitude, mind the wind direction (anticipating rudder corrections that will be required to maintain heading), remember to throttle back at the top, and make certain you are on the desired rates (high/low rates). A flight plan greatly reduces the chances of crashing your model just because of poor planning and impulsive moves. **Remember to think.**

Have a ball! But always stay in control and fly in a safe manner.

GOOD LUCK AND GREAT FLYING!

Make a copy of the identification tag shown below and place it on or inside the model.

This model belongs to:

Name

Address

City, State, Zip

Phone number

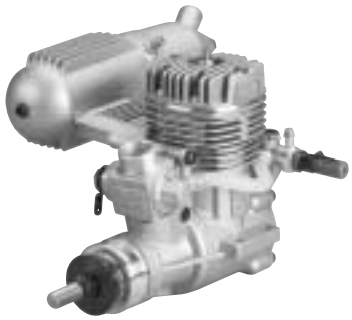
AMA number

OTHER ITEMS AVAILABLE FROM GREAT PLANES

Great Planes RV-4
A natural for Sunday sport flying with a .40, the 54.65" span RV-4 can also be an agile aerobat with a .46. Either way, it's a fast "build" – and a good fit – for intermediates. Precision-formed ABS parts add detail with minimum work. Under the butyrate canopy, the cockpit includes rollover bar and instrument panels. Performance is realistic, too, with easy low-speed handling and dual aileron servos. Flaps can be added, and the nylon mount adjusts to fit a wide engine range. Requires a 2-stroke .40-.52 or 4-stroke .48-.70 engine, Pitts-style muffler, 4 or 5-channel radio w/5-7 servos (5-channel radio w/7 servos for optional flaps). **GPMA0180**

Great Planes Extra 300S .40
Ideal for MiniMAC, Great Planes' sport-scale Extra 300S kit requires no more experience, expense or assembly work than the average mid-size sport model. It minimizes building challenges with CAD-engineered, perfectly interlocking parts, a photo-illustrated instruction manual and accurate, full-size plans. The fully symmetrical wing comes with preshaped and notched leading and trailing edges, and D-tube construction to maximize strength. Economize by using the engine from your .40-size sport trainer...or use a "hot" .40 engine to fly unlimited vertical! **GPMA0235**

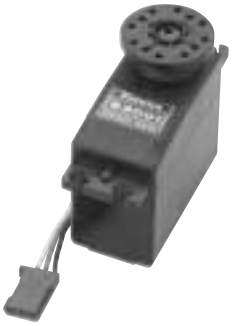
Great Planes Giles G-202 .46
Depending on your engine choice, the 59.3" span G-202 can be a docile second plane or a dynamite aerobat! Either way, you'll enjoy the way the G 202's self-aligning, slot and tab design builds up fast, straight and strong. Other features include dual aileron servos, room for (optional) twin elevator servos AND longitudinal ply rails in the fuselage that absorb touchdown stress from the included, heavy-duty aluminum landing gear. Requires a 4-channel radio or higher w/5-6 servos, 2-stroke .46-.61 or 4-stroke .70-.91 engine and 3 rolls of MonoKote. **GPMA0238**



O.S.® .50 SX
There's nothing wrong with wanting more out of aerobatics, and the .50 SX Ring delivers it. It punches out 10% more

power than a .46, yet fits in the same space as a .40. It's a clear gain in performance AND options, for sport flying and aerobatics, and here's why. The 1-piece remote needle valve can be repositioned for standard upright or side mounting and the fuel inlet rotates, for ease either way you go. Also included: dual bearings, an #873 muffler and 2-year warranty. **OSMG0550**

O.S. FS-70 Surpass™ II
Improve your fuel economy and increase your power with the FS-70 Surpass II. It puts out an impressive 1.1 horsepower at 11,000 rpm – with all the power you need to execute big maneuvers. Its Type 60R carb provides more precise fuel flow control and smoother throttle control than the original FS-70 Surpass. The FS-70 Surpass II also features easier installation, adjustment and maintenance. Muffler and glow plug included. Two-year warranty. **OSMG0872**

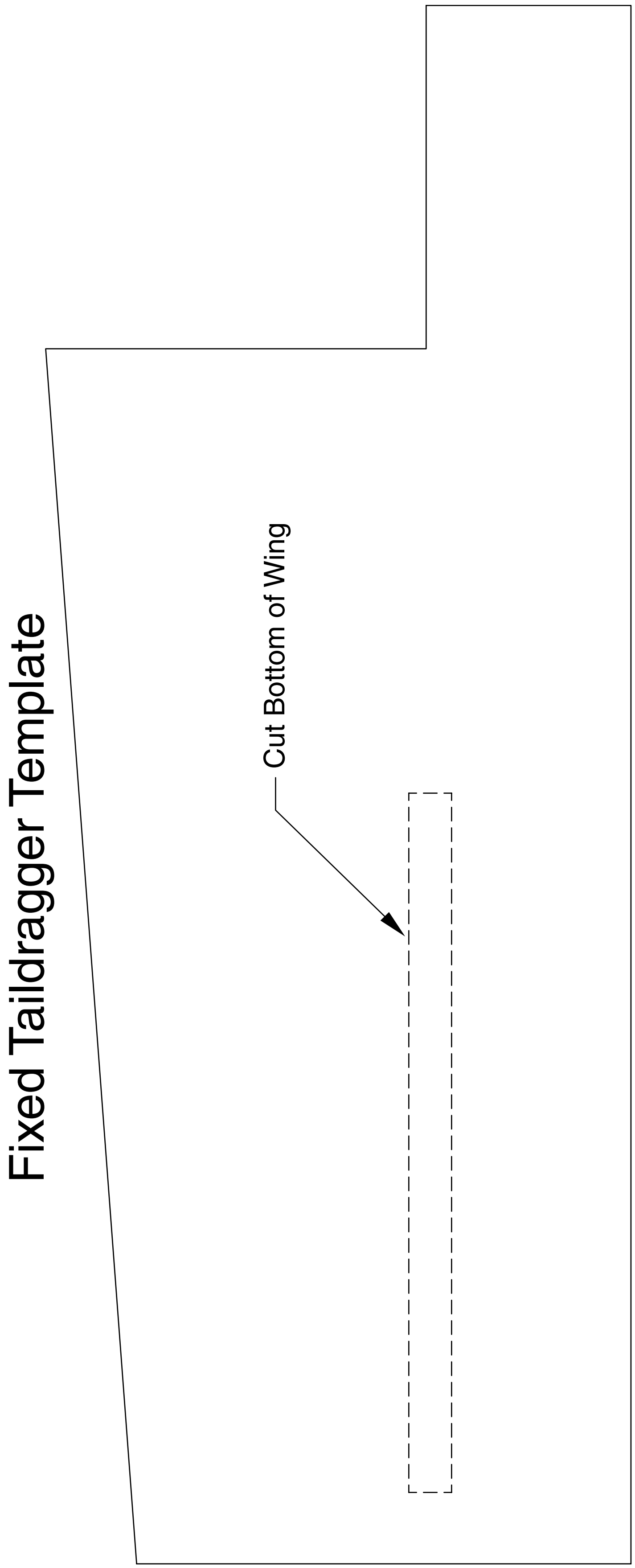


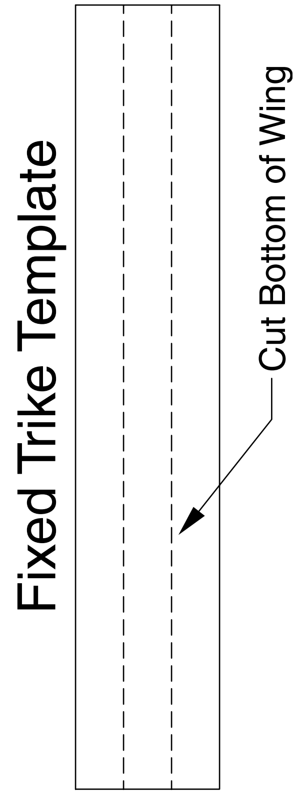
Futaba® S3001 Standard Ball Bearing Servo
Futaba's S3001 is a standard servo with nylon gears, "J" connector and ball bearing on the output shaft. Length: 1.59 in. Width: 0.78 in. Height: 1.42 in. Weight: 1.6 oz. Torque: 33.3 oz-in (4.8V); 41.7 oz-in (6V). Transit time: 0.28 sec./60° (4.8V); 0.22 sec./60° (6V). One year warranty. **FUTM0029**

Futaba S9001 Aircraft Coreless Ball Bearing Servo
Ideal for airplanes, sailplanes, helis, even nitro or electric boats, the S9001 features a coreless motor for smooth, fast response and a final gear with dual ball bearings for fast transit time. It comes with "J" connector, one attached servo horn, three extra horns and mounting hardware. Length: 1.59 in. Width: 0.78 in. Height: 1.42 in. Weight: 1.69 oz. Torque: 54.1 oz-in (4.8V); 72.2 oz-in (6V). Transit time: 0.22 sec./60° (4.8V); 0.18 sec./60° (6V). One year warranty. **FUTM0075**

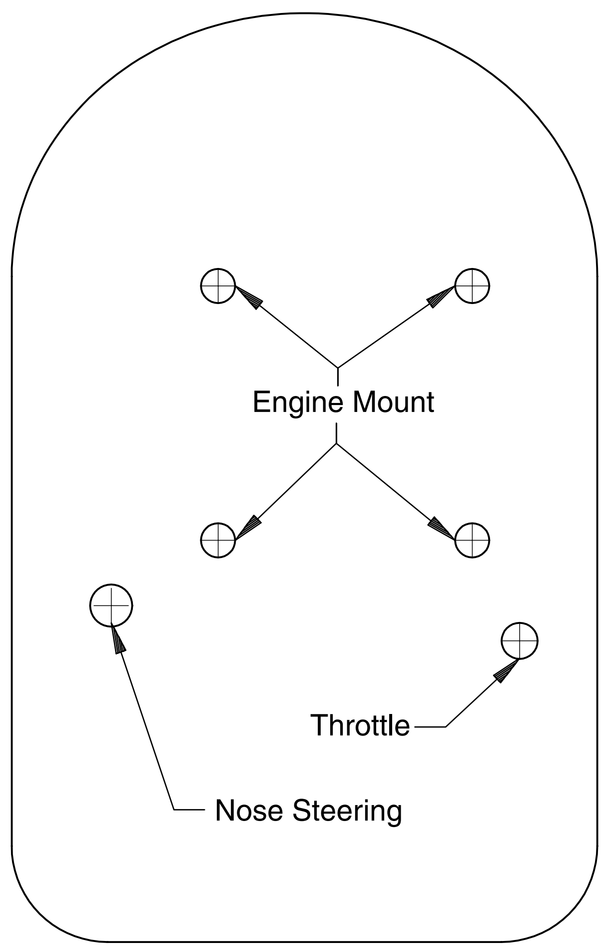
Great Planes .40-Size Mechanical Retracts
Simple, sensibly priced, low-profile Great Planes retracts offer a proven design and unique features. Mounting flanges on the nylon-reinforced composite housing conform to airfoil shapes, ensuring a neat, smooth appearance. A deployment angle of 88° ensures virtually perfect support for wings with 0-2" dihedral. Include adjustable axles for no-bend installation ease. Require wheel and retract servo. Weight/retract: 5 oz. **GPMQ2905**

GREAT PLANES®
MODEL MANUFACTURING COMPANY





ENGINE MOUNT TEMPLATE



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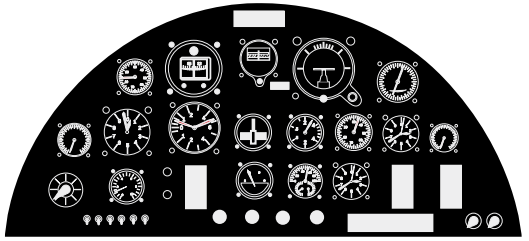
ULTRA SPORT+ 40

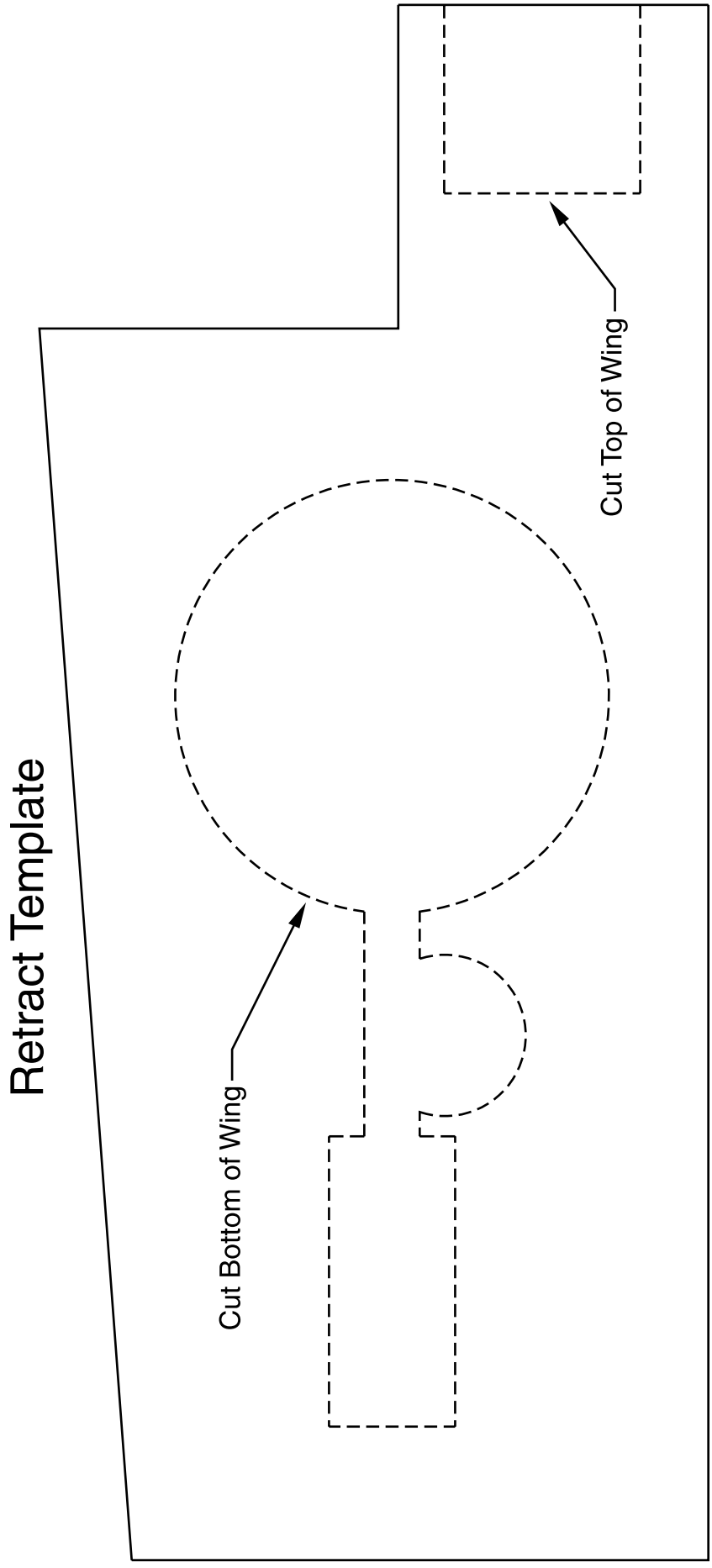
ULTRA SPORT+ 40

ULTRA SPORT+ 40



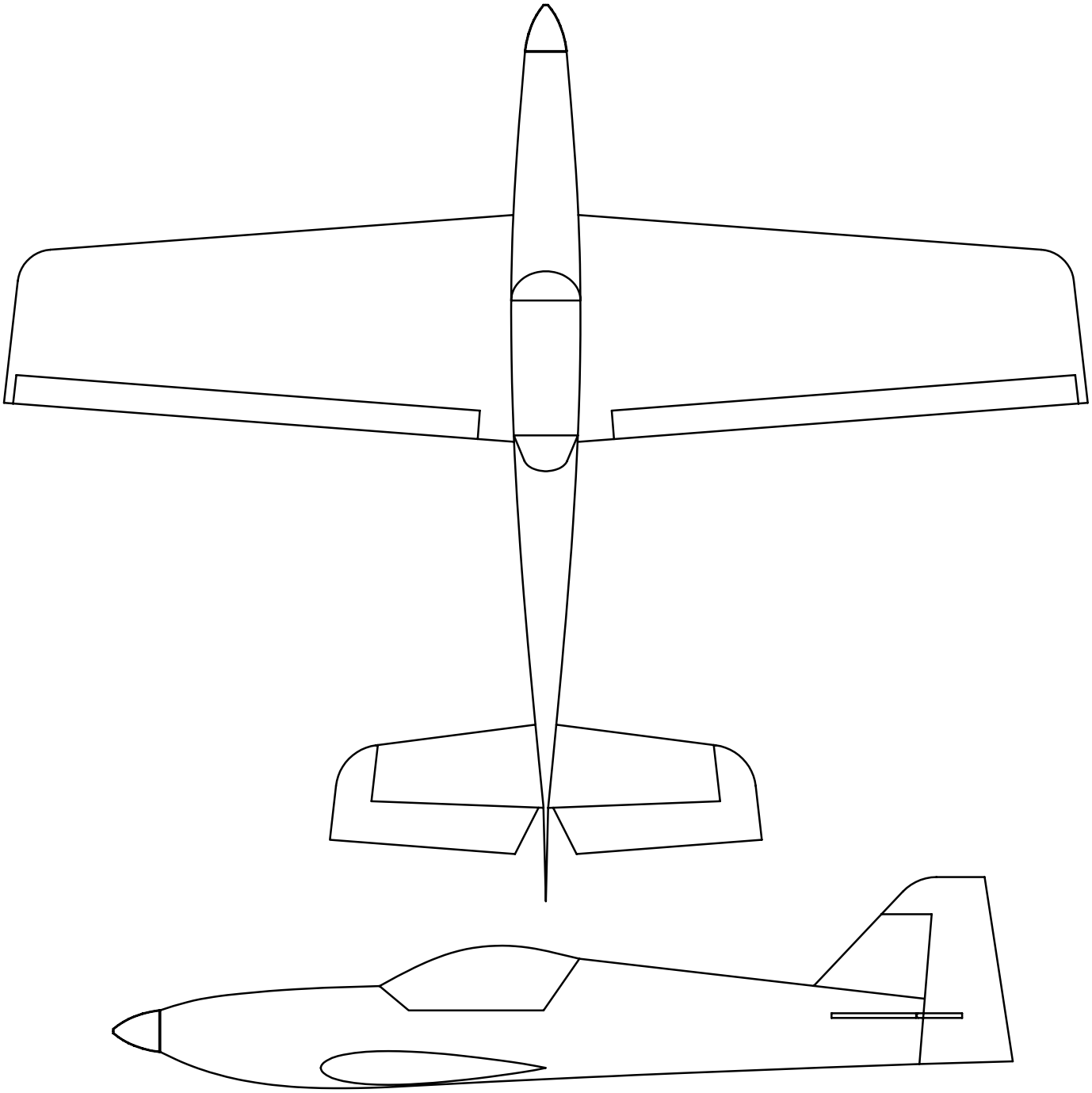
USB4D01

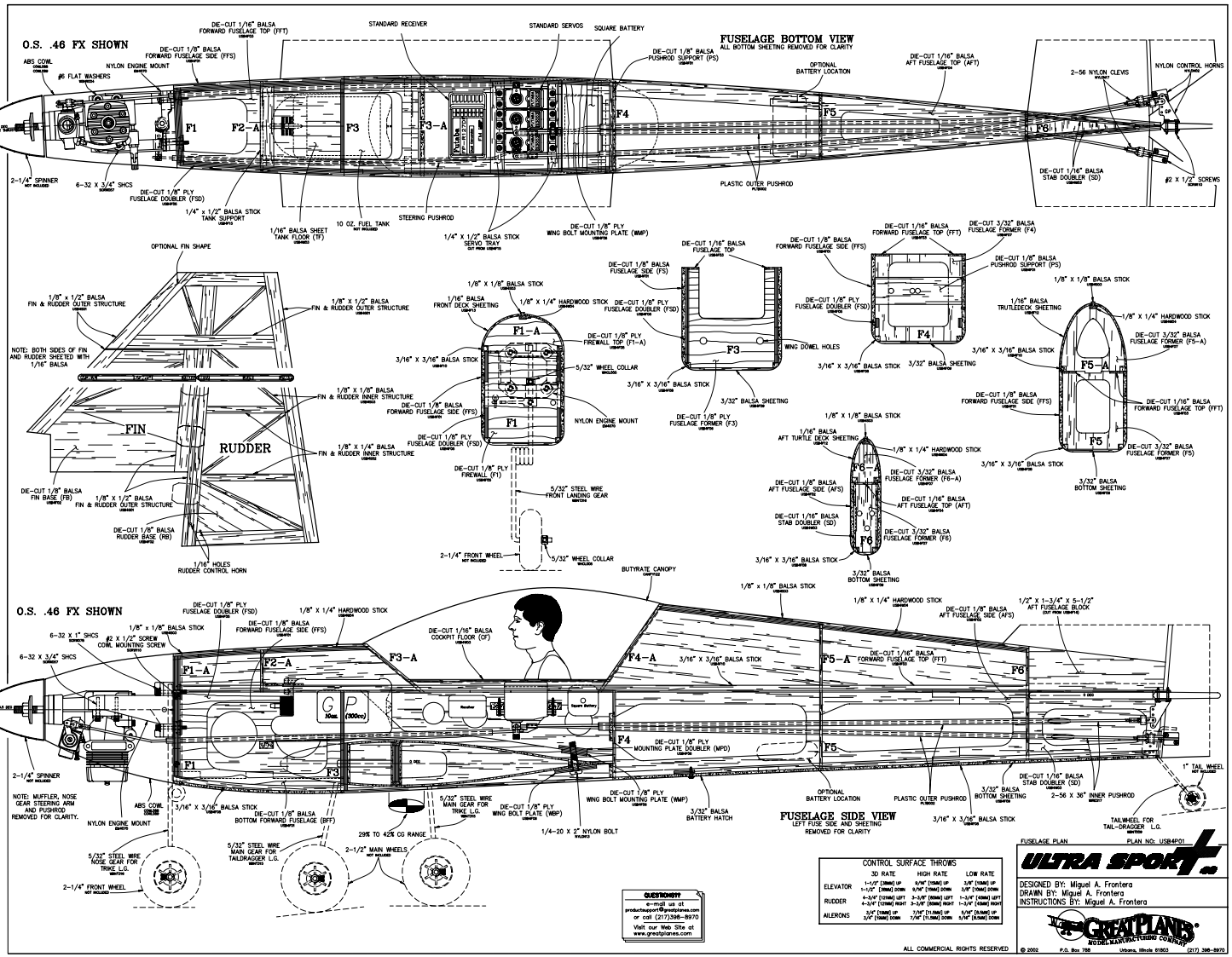
Note: Make a copy of the Two View Drawing that appears on the back cover page before cutting out this template.



TWO VIEW DRAWING

Use copies of this page to plan your trim scheme




O.S. .46 FX SHOWN
FUSELAGE BOTTOM VIEW
ALL BOTTOM SHEETING REMOVED FOR CLARITY
STANDARD RECEIVER
STANDARD SERVOS
SQUARE BATTERY
DIE-CUT 1/16" BALSA FORWARD FUSELAGE TOP (FFT)
DIE-CUT 1/8" BALSA FORWARD FUSELAGE SIDE (FFS)
DIE-CUT 1/8" BALSA PUSHROD SUPPORT (PS)
OPTIONAL BATTERY LOCATION
DIE-CUT 1/16" BALSA AFT FUSELAGE TOP (AFT)
ABS COWL
#6 FLAT WASHERS
NYLON ENGINE MOUNT
2-56 NYLON CLEVIS
NYLON CONTROL HORNS
F1
F2-A
F3
F3-A
F4
F5
F6
2-1/4" SPINNER
6-32 X 3/4" SHCS
DIE-CUT 1/8" PLY FUSELAGE DOUBLER (FSD)
1/4" X 1/2" BALSA STICK TANK SUPPORT
1/16" BALSA SHEET TANK FLOOR (TF)
10 OZ. FUEL TANK
STEERING PUSHROD
1/4" X 1/2" BALSA STICK SERVO TRAY
DIE-CUT 1/8" PLY WING BOLT MOUNTING PLATE (WMP)
PLASTIC OUTER PUSHROD
DIE-CUT 1/16" BALSA STAB DOUBLER (SD)
#2 X 1/2" SCREWS
OPTIONAL FIN SHAPE
1/8" x 1/2" BALSA FIN & RUDDER OUTER STRUCTURE
NOTE: BOTH SIDES OF FIN AND RUDDER SHEETED WITH 1/16" BALSA
FIN
RUDDER
1/8" X 1/8" BALSA FIN & RUDDER INNER STRUCTURE
DIE-CUT 1/8" BALSA FIN BASE (FB)
DIE-CUT 1/8" BALSA RUDDER BASE (RB)
1/16" HOLES RUDDER CONTROL HORN
1/8" X 1/8" BALSA STICK
1/16" BALSA FRONT DECK SHEETING
1/8" X 1/4" HARDWOOD STICK
DIE-CUT 1/8" PLY FUSELAGE DOUBLER (FSD)
DIE-CUT 1/8" PLY FIREWALL TOP (F1-A)
3/16" X 3/16" BALSA STICK
5/32" WHEEL COLLAR
DIE-CUT 1/8" BALSA FORWARD FUSELAGE SIDE (FFS)
DIE-CUT 1/8" PLY FUSELAGE DOUBLER (FSD)
DIE-CUT 1/8" PLY FIREWALL (F1)
NYLON ENGINE MOUNT
5/32" STEEL WIRE FRONT LANDING GEAR
2-1/4" FRONT WHEEL
DIE-CUT 1/16" BALSA FUSELAGE TOP
DIE-CUT 1/8" BALSA FUSELAGE SIDE (FFS)
DIE-CUT 1/8" PLY FUSELAGE DOUBLER (FSD)
WING DOWEL HOLES
3/16" X 3/16" BALSA STICK
3/32" BALSA SHEETING
DIE-CUT 1/8" PLY FUSELAGE FORMER (F3)
DIE-CUT 1/16" BALSA FORWARD FUSELAGE TOP (FFT)
DIE-CUT 3/32" BALSA FUSELAGE FORMER (F4)
DIE-CUT 1/8" BALSA FORWARD FUSELAGE SIDE (FFS)
DIE-CUT 1/8" BALSA PUSHROD SUPPORT (PS)
DIE-CUT 1/8" PLY FUSELAGE DOUBLER (FSD)
3/16" X 3/16" BALSA STICK
3/32" BALSA SHEETING
1/8" X 1/8" BALSA STICK
1/16" BALSA TRUTLEDECK SHEETING
1/8" X 1/4" HARDWOOD STICK
DIE-CUT 3/32" BALSA FUSELAGE FORMER (F5-A)
3/16" X 3/16" BALSA STICK
DIE-CUT 1/8" BALSA FORWARD FUSELAGE SIDE (FFS)
DIE-CUT 1/16" BALSA FORWARD FUSELAGE TOP (FFT)
DIE-CUT 3/32" BALSA FUSELAGE FORMER (F5)
3/16" X 3/16" BALSA STICK
3/32" BALSA BOTTOM SHEETING
1/8" X 1/8" BALSA STICK
1/16" BALSA AFT TURTLE DECK SHEETING
1/8" X 1/4" HARDWOOD STICK
DIE-CUT 3/32" BALSA FUSELAGE FORMER (F6-A)
DIE-CUT 1/8" BALSA AFT FUSELAGE SIDE (AFS)
DIE-CUT 1/16" BALSA AFT FUSELAGE TOP (AFT)
DIE-CUT 1/16" BALSA STAB DOUBLER (SD)
DIE-CUT 3/32" BALSA FUSELAGE FORMER (F6)
3/16" X 3/16" BALSA STICK
3/32" BALSA BOTTOM SHEETING
BUTYRATE CANOPY
O.S. .46 FX SHOWN
1/8" X 1/8" BALSA STICK
1/8" X 1/4" HARDWOOD STICK
1/2" X 1-3/4" X 5-1/2" AFT FUSELAGE BLOCK
DIE-CUT 1/8" BALSA AFT FUSELAGE SIDE (AFS)
DIE-CUT 1/16" BALSA FORWARD FUSELAGE TOP (FFT)
DIE-CUT 1/8" PLY FUSELAGE DOUBLER (FSD)
DIE-CUT 1/8" BALSA FORWARD FUSELAGE SIDE (FFS)
1/8" X 1/4" HARDWOOD STICK
6-32 X 1" SHCS
#2 X 1/2" SCREW COMP. MOUNTING SCREW
6-32 X 3/4" SHCS
DIE-CUT 1/16" BALSA COCKPIT FLOOR (CF)
3/16" X 3/16" BALSA STICK
DIE-CUT 1/8" PLY MOUNTING PLATE DOUBLER (MPD)
DIE-CUT 1/16" BALSA STAB DOUBLER (SD)
2-56 X 36" INNER PUSHROD
1" TAIL WHEEL
NOTE: MUFFLER, NOSE GEAR STEERING ARM AND PUSHROD REMOVED FOR CLARITY.
ABS COWL
NYLON ENGINE MOUNT
DIE-CUT 1/8" BALSA BOTTOM FORWARD FUSELAGE (BFF)
5/32" STEEL WIRE MAIN GEAR FOR TRIKE L.G.
5/32" STEEL WIRE NOSE GEAR FOR TRIKE L.G.
2-1/4" FRONT WHEEL
29% TO 42% CG RANGE
2-1/2" MAIN WHEELS
DIE-CUT 1/8" PLY WING BOLT MOUNTING PLATE (WMP)
DIE-CUT 1/8" PLY WING BOLT PLATE (WBP)
1/4-20 X 2" NYLON BOLT
3/32" BALSA BATTERY HATCH
OPTIONAL BATTERY LOCATION
PLASTIC OUTER PUSHROD
3/32" BALSA BOTTOM SHEETING
3/16" X 3/16" BALSA STICK
TAILWHEEL FOR TAIL-DRAGGER L.G.
FUSELAGE SIDE VIEW
LEFT FUSE SIDE AND SHEETING REMOVED FOR CLARITY
CONTROL SURFACE THROWS
3D RATE
HIGH RATE
LOW RATE
ELEVATOR
1-1/2" [38mm] UP
1-1/2" [38mm] DOWN
9/16" [15mm] UP
9/16" [15mm] DOWN
3/8" [10mm] UP
3/8" [10mm] DOWN
RUDDER
4-3/4" [121mm] LEFT
4-3/4" [121mm] RIGHT
3-3/8" [86mm] LEFT
3-3/8" [86mm] RIGHT
1-3/4" [45mm] LEFT
1-3/4" [45mm] RIGHT
AILERONS
3/4" [19mm] UP
3/4" [19mm] DOWN
7/16" [11.0mm] UP
7/16" [11.0mm] DOWN
5/16" [8.0mm] UP
5/16" [8.0mm] DOWN
QUESTIONS?
e-mail us at productsupport@greatplanes.com
or call (217)398-8970
Visit our Web Site at www.greatplanes.com
FUSELAGE PLAN
PLAN No: USB4P01
ULTRA SPORT 46
DESIGNED BY: Miguel A. Frontera
DRAWN BY: Miguel A. Frontera
INSTRUCTIONS BY: Miguel A. Frontera
GREAT PLANES MODEL MANUFACTURING COMPANY
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Urbana, Illinois 61803
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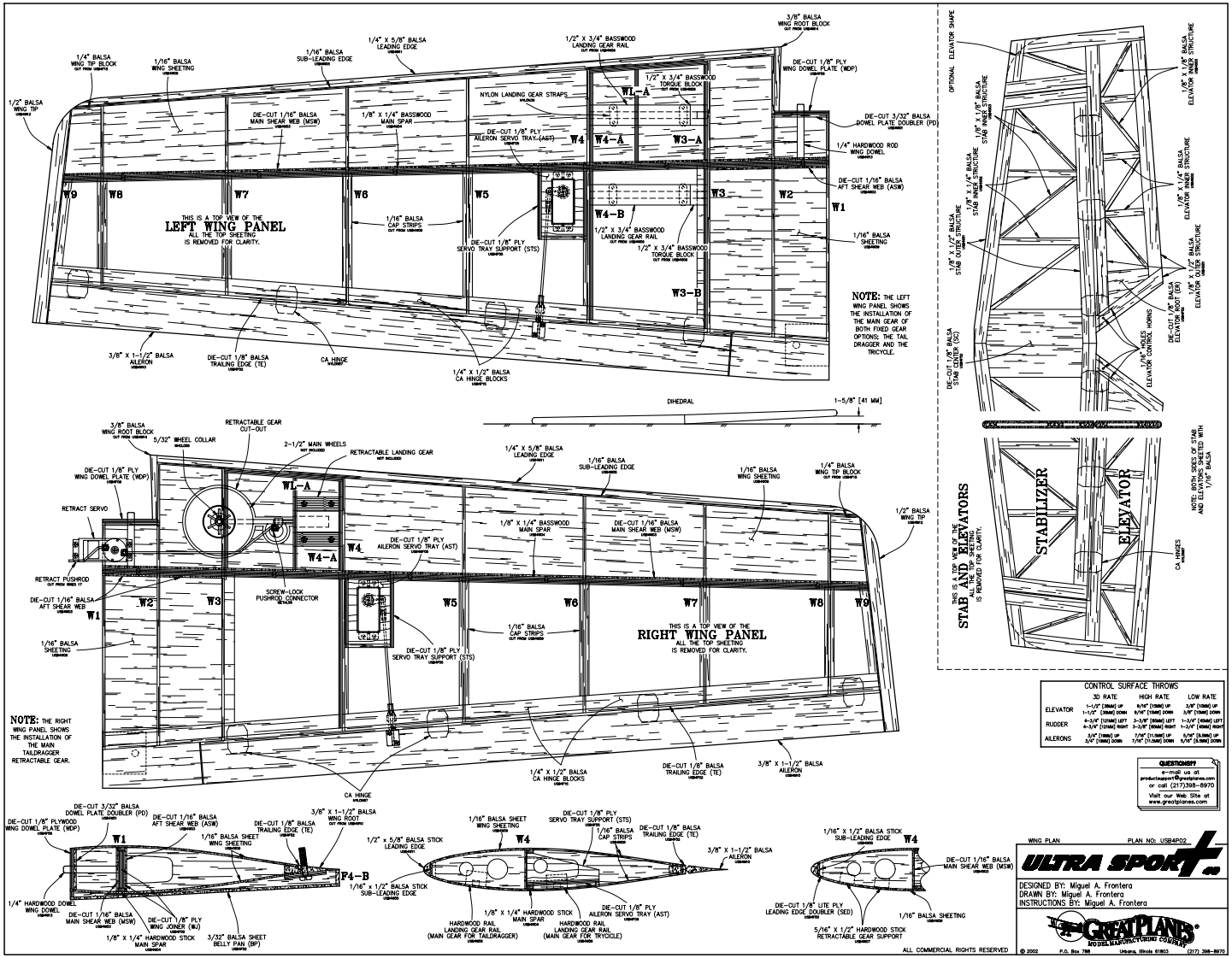
THIS IS A TOP VIEW OF THE
LEFT WING PANEL
ALL THE TOP SHEETING
IS REMOVED FOR CLARITY.
THIS IS A TOP VIEW OF THE
RIGHT WING PANEL
ALL THE TOP SHEETING
IS REMOVED FOR CLARITY.
NOTE: THE LEFT WING PANEL SHOWS THE INSTALLATION OF THE MAIN GEAR OF BOTH FIXED GEAR OPTIONS; THE TAIL DRAGGER AND THE TRICYCLE.
NOTE: THE RIGHT WING PANEL SHOWS THE INSTALLATION OF THE MAIN TAILDRAGGER RETRACTABLE GEAR.
DIHEDRAL
1-5/8" [41 MM]
STABILIZER
ELEVATOR
THIS IS A TOP VIEW OF THE STAB AND ELEVATORS ALL THE TOP SHEETING IS REMOVED FOR CLARITY.
NOTE: BOTH SIDES OF STAB AND ELEVATORS SHEETED WITH 1/16" BALSA
CONTROL SURFACE THROWS
3D RATE
HIGH RATE
LOW RATE
ELEVATOR
1-1/2" [38MM] UP
1-1/2" [38MM] DOWN
9/16" [15MM] UP
9/16" [15MM] DOWN
3/8" [10MM] UP
3/8" [10MM] DOWN
RUDDER
4-3/4" [121MM] LEFT
4-3/4" [121MM] RIGHT
3-3/8" [86MM] LEFT
3-3/8" [86MM] RIGHT
1-3/4" [45MM] LEFT
1-3/4" [45MM] RIGHT
AILERONS
3/4" [19MM] UP
3/4" [19MM] DOWN
7/16" [11.5MM] UP
7/16" [11.5MM] DOWN
5/8" [15.5MM] UP
5/8" [15.5MM] DOWN
QUESTIONS?
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or call (217)398-8970
Visit our Web Site at www.greatplanes.com
WING PLAN
PLAN NO: USB4P02
ULTRA SPORT 40
DESIGNED BY: Miguel A. Frontera
DRAWN BY: Miguel A. Frontera
INSTRUCTIONS BY: Miguel A. Frontera
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