Dynaflite™

S.E.5a

1/5 Scale

• QUICK BUILDING – IDEAL FOR FUN-SCALE COMPETITION
• 64" WINGSPAN (IMAA Legal)
• SMOOTH-FLYING BIPE – CAPABLE OF SCALE AEROBATICS

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

Wingspan: 64 in [1625mm]
Wing Area: 1440 sq in [93dm²]
Weight: 12.0 - 13.5 lb [5440 - 6120g]
Wing Loading: 19.2 - 21.3 oz/sq ft [59 - 65g/dm²]
Fuselage Length: 53 in [1345mm]
Engine: .61 - 1.20 cu in [10.0 - 19.5cc] two-stroke, .91 - 1.20 cu in [15.0 - 19.5cc] four-stroke
Radio: 4-channel, 7 or 8 servos (single or dual elevator servos)

Instruction Manual

WARRANTY

Dynaflite™ 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 Dynaflite's liability exceed the original cost of the purchased kit.** Further, Dynaflite reserves the right to change or modify this warranty without notice. In that Dynaflite 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.**

MADE IN USA

SE5AP03 for DYFA3045 Printed in USA V1.1

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INTRODUCTION

Thank you for purchasing the Dynaflite S.E.5a. This kit is intended for modelers who desire the nostalgic appearance and gentle flight characteristics of a WWI biplane, but don't wish to spend hours in the shop working on minute scale details. Simply by following the instructions you'll end up with a model that very much represents an S.E.5a featuring the most important characteristics including exhaust pipes, wing struts, pilot head rest, wooden tail gear and simulated radiators. Of course, if you like to fiddle and spend extra time there's no end to the amount of detail you could add on your own.

For the latest technical updates or manual corrections to this model visit the web site listed below and select the Dynaflite S.E.5a. 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.dynaflite.com

IMAA

The Dynaflite S.E.5a is an excellent sport-scale model. Because it's a biplane with a wingspan over 60", it is eligible to fly in IMAA events. The IMAA (International Miniature Aircraft Association) is an organization that promotes non-competitive flying of giant-scale models. If you plan to attend an IMAA event, contact the IMAA for a copy of the **IMAA Safety Code** at the address or telephone number below.

IMAA
205 S. Hilldale Road
Salina, KS 67401
(913) 823-5569

SCALE COMPETITION

Though the Dynaflite S.E.5a may not have the same level of detail as an "all-out" scratch-built competition model, it is a scale model nonetheless and is therefore eligible to compete in the *Fun Scale* class in AMA competition. This is the perfect place for beginning scale modelers to "get their feet wet." To receive the five points for scale documentation, the only proof required that a full size aircraft of this type in your paint/markings scheme did exist is a single sheet such as a kit box cover from a plastic model, a photo, or a profile painting, etc. If the photo is in black and white other written documentation of color must be provided. Contact the AMA for a rule book with full details.

Note: The full-size S.E.5a has a wingspan of 26'-4" [slightly over 8m]. This model has a wingspan of 64" [1625mm], so the scale is 20.25%, or slightly larger than 1/5 scale. The model featured on the kit box cover and in this instruction manual was finished similar to the one on the cover of the Squadron Publication's *S.E.5a in Action* book (No. 1069). This book contains many photographs, different trim schemes and documentation that would be useful for finishing your model and getting to know more about the full-size S.E.5a.

Another source of photographs, three-view drawings and scale documentation is:

Bob's Aircraft Documentation
3114 Yukon Ave
Costa Mesa, CA 92626

Telephone: (714) 979-8058
Fax: (714) 979-7279
e-mail: *www.bobsairdoc.com*

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

1. Your S.E.5a 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 S.E.5a, 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 aggressive aerobatics, 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 (Dynaflite S.E.5a) and the part numbers as listed in the Parts List.

You can also check our web site at www.dynaflite.com for the latest S.E.5a 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:

AMA
SINCE 1936

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 Dynaflite S.E.5a may be operated with either seven or eight servos. The elevators are connected to separate pushrods, but the pushrods may be linked together and connected

to one servo, or connected to separate servos. If powering the S.E.5a with an engine in the upper end of the recommended range, and/or if you plan of flying lots of aerobatics with your S.E.5a, two elevator servos are recommended. If two servos are used for the elevators, a radio capable of electronic mixing (so one of the servos can be "reversed") must be used, or an electronic device to make one of the servos move in the opposite direction will be required. The Futaba® SR-10 Synchronized Servo Reverser (FUTM4150) may be used to reverse one of the servos and is compatible with most popular radio systems.

As for the type of servos, servos with a minimum of 50 oz.-in. of torque are recommended for the elevator(s) and rudder, while standard servos may be used on the ailerons and throttle.

Three (3) Hobbico® Pro Series™ "Y" Harnesses (HCAM2751 for Futaba J connectors) are also required for the ailerons (one "Y" Harness in each wing and one inside the fuselage).

A receiver battery with a minimum capacity of 1,000 mAh is also recommended.

ENGINE RECOMMENDATIONS

Keep in mind that this is a scale model of a WWI biplane that is intended to fly in a scale-like manner-planes of that day weren't capable of some of the high-stress aerobatic maneuvers flown today. The Dynaflite S.E.5a flies most scale-like with engines nearer the bottom of the recommended size range. Even with the O.S.® MAX .91 four-stroke, the model was flown at reduced throttle settings much of the time. If the S.E.5a is powered by an engine in the upper end of the recommended size range prudent throttle management must be used.

COVERING & PAINT

The S.E.5a on the kit box cover was covered primarily with flat olive drab and flat cream Top Flite® MonoKote® film. The white band around the fuselage was made from white MonoKote and the rudder was covered with dark red, sky blue and white MonoKote (scuffed with 600-grit sandpaper to remove the shine). The plastic parts (cowl, headrest, etc.) were painted with olive drab Top Flite LustreKote® (TOPR7210). The wing struts and tail gear mount were stained with Minwax Special Walnut 224 stain, then clear-coated with crystal clear LustreKote (TOPR7200). Below are the order numbers for full 6' rolls of covering to finish the model like the one on the kit box cover (only approximately one foot of dark red, white and sky blue are required).

Flat Olive Drab (two rolls) – TOPQ0510
Flat Cream (one roll) – TOPQ0512
White – TOPQ0204
Sky Blue – TOPQ0206
Dark Red – TOPQ0218

ADDITIONAL ITEMS REQUIRED

HARDWARE & ACCESSORIES

This is the list of hardware and accessories used to finish the S.E.5a. Order numbers are provided in parentheses.

- ❑ (3) Y-harnesses for ailerons (HCAM2751 for Futaba)
- ❑ R/C foam rubber (1/4" [6mm] - HCAQ1000, or 1/2" [13mm] - HCAQ1050)
- ❑ 10 oz. [300cc] fuel tank (GPMQ4104)
- ❑ Propeller and spare propellers
- ❑ 3' [900mm] standard silicone fuel tubing (GPMQ4131)
- ❑ Fuel filler valve for glow fuel (GPMQ4160)

❏ William's Brothers #13300 5" [127mm] Vintage Wheels (WBRQ1133)
❏ 1/2" [13mm] double-sided foam mounting tape (GPMQ4440)
❏ Velcro hook and loop material (for mounting battery pack, GPMQ4480)
❏ Great Planes long-handle 3/32" hex driver ball wrench (for wing strut screws, GPMR8002)

ADHESIVES & BUILDING SUPPLIES

❏ 2 oz. [60g] Thin Pro CA (GPMR6003)
❏ 2 oz. [60g] Medium Pro CA+ (GPMR6009)
❏ Pro™ 30-minute epoxy (GPMR6047)
❏ Milled fiberglass (GPMR6165) -or-
❏ Microballoons (TOPR1090)
❏ HobbyLite™ balsa-colored balsa filler (HCAR3401)
❏ Plan protector (GPMR6167) or wax paper
❏ Threadlocker thread locking cement (GPMR6060)
❏ Drill bits: 1/16" [1.6mm], 3/32" [2.4mm], 1/8" [3.2mm], 9/64" [3.6mm] (or 1/8" [3.2mm]), 5/32" [4mm], 3/16" [4.8mm], 13/64" [5.2mm], 1/4" [6.4mm], 17/64" [6.7mm] (or 1/4" [6.4mm]), #34 (or 17/64" [6.7mm])
❏ 6-32 tap and #36 (or 17/64" 6.7mm]) drill or Great Planes 6-32 tap and drill set (GPMR8102)
❏ 1/4-20 tap and #7 (or 13/64" [5.2mm]) drill or Great Planes 1/4-20 tap and drill set (GPMR8105)
❏ Tap handle (GPMR8120)
❏ Silver solder w/flux (GPMR8070)
❏ Stick-on segmented lead weights (GPMQ4485)
❏ #1 Hobby knife (HCAR0105)
❏ #11 blades (5-pack, HCAR0211)
❏ #11 blades (100-pack, HCAR0311)
❏ T-pins (small – HCAR5100, medium – HCAR5150, large – large HCAR5200)
❏ 3/16" [4.8mm] K&S brass tube
❏ X-Acto® #240 razor saw (XACR1440)
❏ Sanding tools and sandpaper assortment *(see* "Easy-Touch™ Bar Sander" *section)*

COVERING TOOLS

❏ 21st Century® sealing iron (COVR2700)
❏ 21st Century iron cover (COVR2702)
❏ 21st Century trim seal iron (COVR2750)

OPTIONAL SUPPLIES & TOOLS

Here is a list of optional tools and accessories mentioned in the manual that will help you build the S.E.5a.

❏ 16" x 36" [410 x 910mm] building board (GPMR6948)
❏ Robart Super Stand II (ROBP1402)
❏ William's Brother's #625 1/4-scale standard pilot (WBRQ2625)
❏ Acrylic paint and paint brushes for painting pilot (found at hobby and craft stores)
❏ William's Brother's #161 2" 1/6-scale Lewis Aircraft machine gun (WBRQ3561)
❏ Fourmost Products #FOR 114 regular cockpit coaming (FORQ2014)
❏ Masking tape (TOPR8018)
❏ CA activator (2 oz. [57g] spray – GPMR6035, or 4 oz. [113g] aerosol – GPMR634)
❏ CA applicator tips (HCAR3780)
❏ CA debonder (GPMR6039)
❏ Denatured alcohol (for epoxy clean up)
❏ Epoxy brushes (6, GPMR8060)
❏ Mixing sticks (50, GPMR8055)
❏ Mixing cups (GPMR8056)
❏ Slot Machine™ hinge slotting tool (110V, GPMR4010)
❏ Builder's Triangle Set (HCAR0480)
❏ Curved-tip canopy scissors for trimming plastic parts (HCAR0667)

- ❏ D.G. Products Perma-Grit tungsten carbide flat sanding bar
- ❏ Heat shrink tubing (for securing servo wire connections inside wings, GPMM1058)
- ❏ K & S #801 Kevlar thread (for stab alignment, K+SR4575)
- ❏ Switch & Charge Jack Mounting Set (GPMM1000)
- ❏ Remote glow plug hookup (Sullivan #M 021 Remote Headlock, MODP1221
- ❏ Panel Line Pen (TOPQ2510)
- ❏ Rotary tool such as Dremel® Moto-Tool®
- ❏ Rotary tool reinforced cut-off wheel (GPMR8020)
- ❏ Servo horn drill (HCAR0698)
- ❏ Hobby Heat™ micro torch (HCAR0750)
- ❏ Dead Center™ engine mount hole locator (GPMR8130)
- ❏ AccuThrow™ deflection gauge (GPMR2405)
- ❏ Laser incidence meter (GPMR4020)
- ❏ Precision Magnetic Prop Balancer™ (TOPQ5700)

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 S.E.5a, 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] rolls of Adhesive-backed sandpaper:
80-grit (GPMR6180)
150-grit (GPMR6183)
180-grit (GPMR6184)
220-grit (GPMR6185)

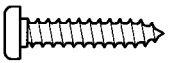
Assortment pack of 5-1/2" [140mm] strips (GPMR6189)

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:

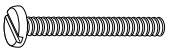
Sheet metal screws are designated by a number and a length.



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.



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.

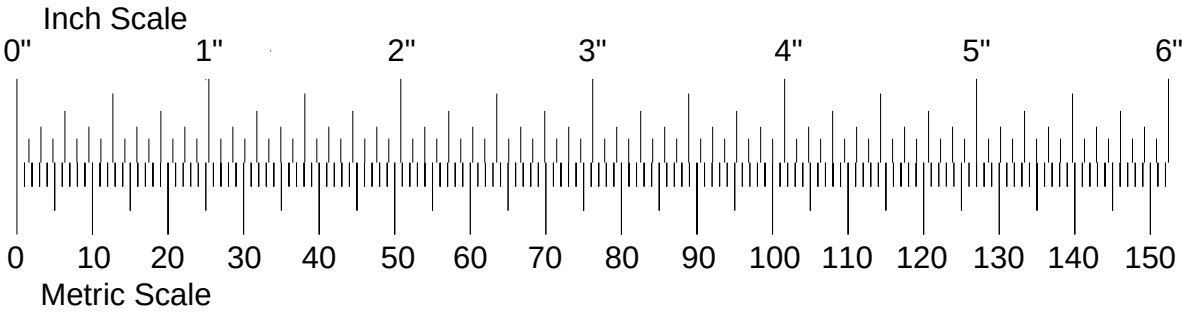
• **Photos** and **sketches** are placed **before** the step they refer to. Frequently you can study photos in following steps to get another view of the same parts.

• Not all die-cut parts have a name, or their complete name stamped on them, so refer to the die drawings on pages 9 and 10 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.

• The easiest way to cut balsa sticks is with a single-edge razor blade or razor saw. Position the stick over the plan, mark its size, then cut the part on a piece of scrap wood. A modeling miter box works well for cutting square corners and 45° gussets.

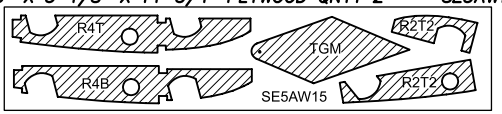
METRIC CONVERSIONS

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

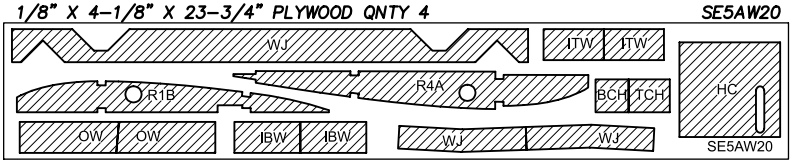


Die Drawing

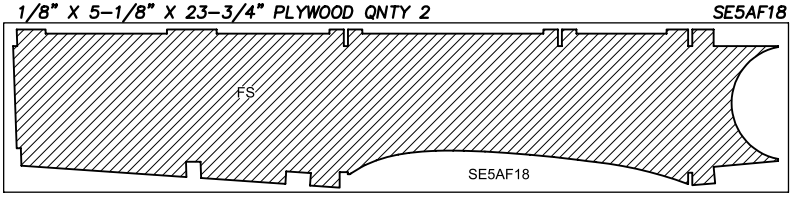
1/16" X 3-1/8" X 14-3/4" PLYWOOD QNTY 2 *SE5AW15*



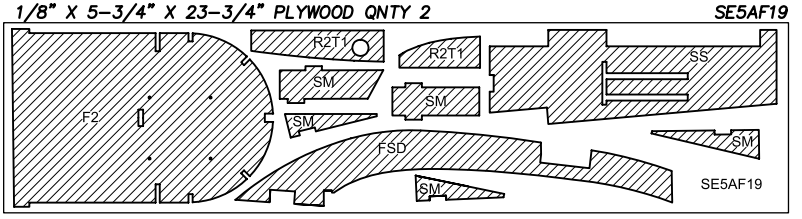
1/8" X 4-1/8" X 23-3/4" PLYWOOD QNTY 4 *SE5AW20*



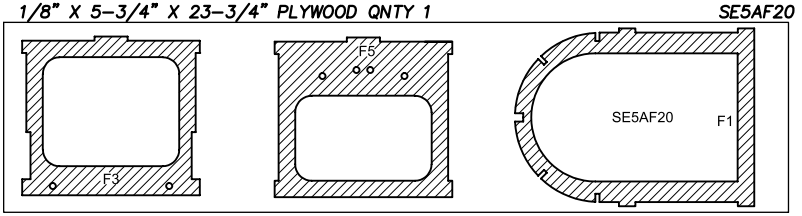
1/8" X 5-1/8" X 23-3/4" PLYWOOD QNTY 2 *SE5AF18*



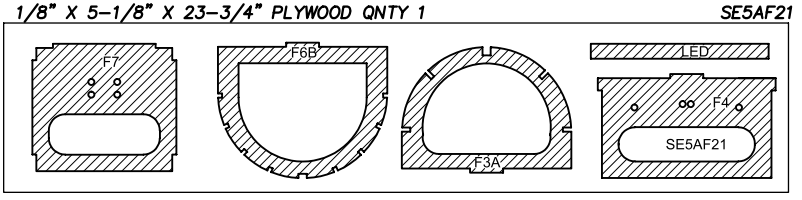
1/8" X 5-3/4" X 23-3/4" PLYWOOD QNTY 2 *SE5AF19*



1/8" X 5-3/4" X 23-3/4" PLYWOOD QNTY 1 *SE5AF20*

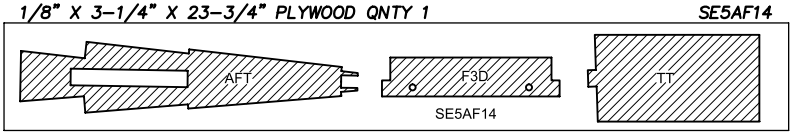


1/8" X 5-1/8" X 23-3/4" PLYWOOD QNTY 1 *SE5AF21*

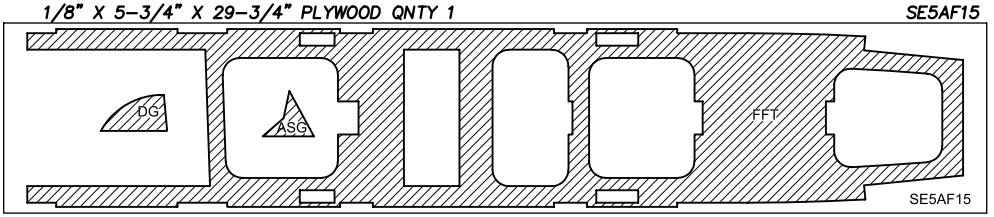


Die Drawing

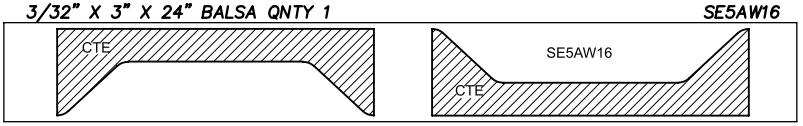
1/8" X 3-1/4" X 23-3/4" PLYWOOD QNTY 1 SE5AF14



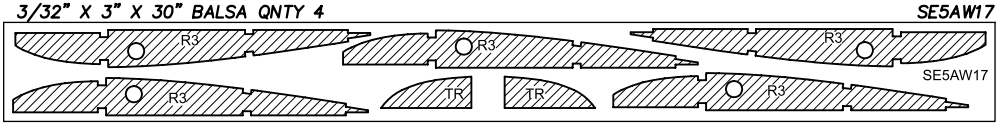
1/8" X 5-3/4" X 29-3/4" PLYWOOD QNTY 1 SE5AF15



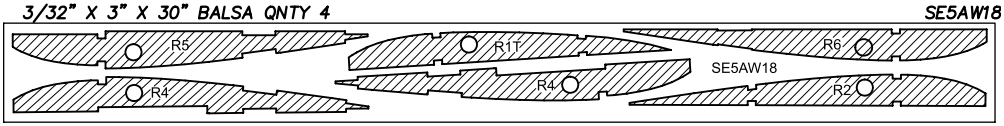
3/32" X 3" X 24" BALSA QNTY 1 SE5AW16



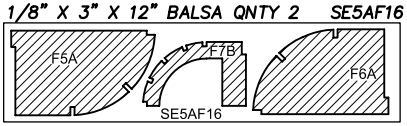
3/32" X 3" X 30" BALSA QNTY 4 SE5AW17



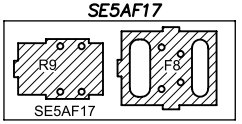
3/32" X 3" X 30" BALSA QNTY 4 SE5AW18



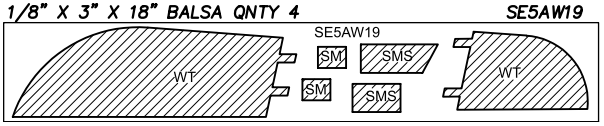
1/8" X 3" X 12" BALSA QNTY 2 SE5AF16



1/8" X 3" X 7" BALSA QNTY 1 SE5AF17



1/8" X 3" X 18" BALSA QNTY 4 SE5AW19



LASER-CUT 1/8 BALSA QNTY 1 SE5AF8B

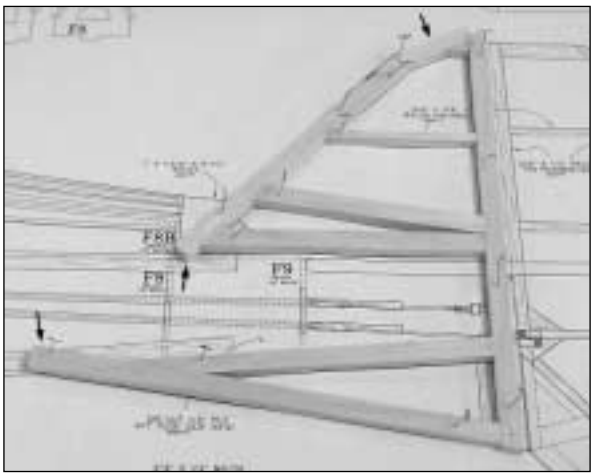
LABEL THE PARTS

❑ Use the ***die drawings*** on pages 9 and 10 to identify and mark the die-cut parts with a ballpoint pen **before** removing them from their die sheets (some, but not all of the parts already have numbers or names stamped on them). While building, if a part is difficult to remove from its die sheet, don't force it out. Instead, cut around the part with a hobby knife and a #11 blade. Where necessary, lightly sand the edges of the part to remove slivers or die-cutting irregularities. As you proceed, it's not necessary to save every scrap of wood, but some of the larger pieces of wood should be saved.

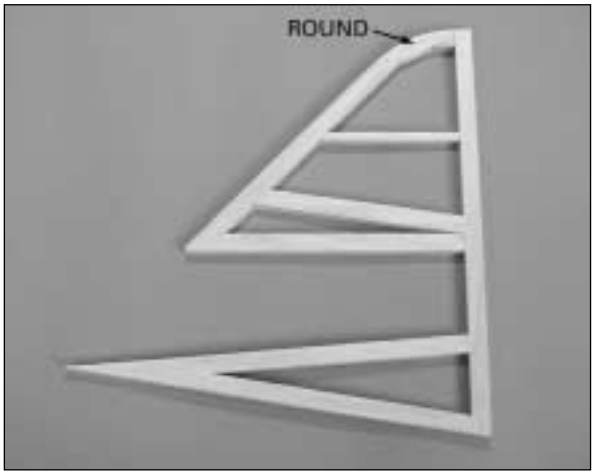
BUILD THE TAIL SURFACES

❑ 1. Unroll the fuselage plan. Roll it inside out so it will lie flat.

❑ 2. Position the plan so the **fin** is over your flat building board. Cover the plan with Great Planes Plan Protector or wax paper so glue will not adhere to the plan.



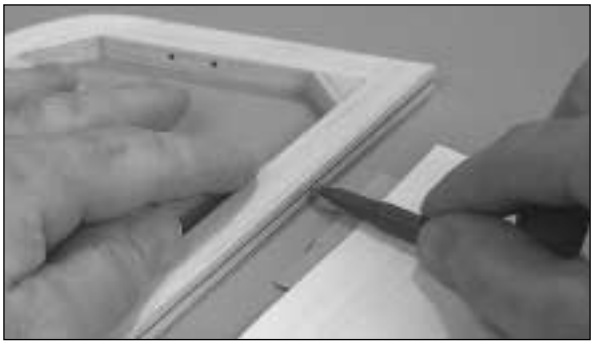
❑ 3. Use medium CA to build the fin from three 3/8" x 1/2" x 30" [9.5 x 13 x 760mm] balsa sticks and one 1/4" x 3/8" x 18" [6.4 x 9.5 x 460mm] balsa stick. Use T-pins to hold the sticks down as you proceed. Note the angles on the ends of some of the sticks (indicated by the arrows in the photo) are not cut until the next step. Also note the 3/32" [2.4mm] **vent holes** (shown on the plan) that have been pre drilled through the sticks to allow air to escape during covering. It's easiest to drill these holes before the sticks are glued into position.



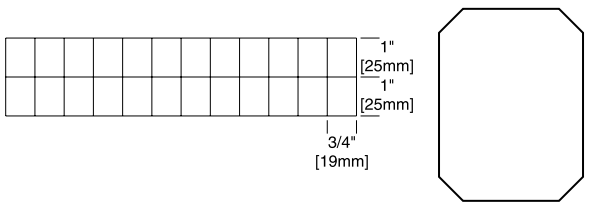
❑ 4. Remove the fin from the plan. Cut the rest of the angles on the sticks that weren't cut earlier. Sand both sides of the fin flat and smooth and round the tip.

❑ 5. Build the rudder using the sticks left over from the fin plus an additional 3/8" x 1/2" x 30" [9.5 x 13 x 760mm] balsa stick.

❑ 6. Reposition the plan so the stab is over the building board. Don't forget to cover it with Plan Protector or wax paper. Use the sticks left over from the fin and rudder plus four more 3/8" x 1/2" x 30" [9.5 x 13 x 760mm] balsa sticks and three more 1/4" x 3/8" x 18" [6.4 x 9.5 x 460mm] balsa sticks to build the **stab** and **elevators**.



❑ 7. Use a ballpoint pen to mark centerlines on the trailing edge of the fin and stab and on the leading edges of the rudder and elevators. **Hint:** Rest the pen on a thin stack of plywood or cardstock. Adjust the thickness of the stack until the pen is on-center.



❑ 8. Cut twelve 3/4" x 1" [19 x 25mm] hinges from the 2" x 9" [51 x 230mm] **CA hinge strip** supplied with this kit. Snip the corners off so they go in easier.

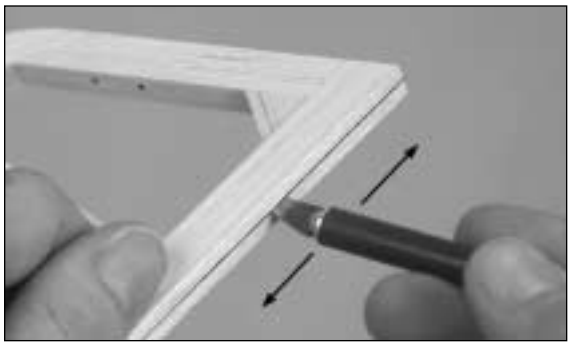
❑ 9. Use a Great Planes Slot Machine to cut the hinge slots on the centerlines in the stab and elevators and in the fin and rudder where shown on the plan. If you do not have a Slot Machine, follow the procedure that follows to cut the hinge slots with a hobby knife and a #11 blade *(or run to the hobby shop and buy a Slot Machine!).*

NOTES ABOUT CA HINGES

This kit is supplied with CA hinge material consisting of a 3-layer lamination of Mylar and polyester specially made for hinging model airplanes. When properly installed, this type of CA hinge provides the best combination of strength, durability and easy installation. We use these hinges on all our models, but it is **essential** to install them **correctly**. Follow the hinging instructions in this manual for the best result. The techniques shown have been developed to ensure thorough and secure gluing.

How to cut hinge slots with a hobby knife

When using a hobby knife to cut hinge slots, one of the most common mistakes made by modelers is making the slots too tight. This restricts the flow of CA to the back of the hinges. Another mistake made when installing hinges is not using enough glue to fully secure the hinge over its entire surface area. This results in hinges that are only *tack glued*. Follow these steps to cut hinge slots with a hobby knife:



A. Using the centerline as a guide, cut one of the hinge slots where shown on the plan with a #11 blade. Begin by cutting a shallow slit. Make three or four cuts along the same line, going slightly deeper each time. As you proceed, be certain to go **straight** into the wood and move the knife from side to side until the slot is wide enough to accommodate a hinge.

B. Test fit a hinge into the slot. If the hinge does not slide into the slot easily, remove the hinge and reinsert the knife, working the blade back and forth a few times to provide more clearance (it's the back edge of the blade that does the widening).

C. Cut the rest of the hinge slots the same way.

❏ 10. Temporarily join the rudder to the fin and the elevators to the stab with the hinges. Make adjustments to the hinge slots where necessary. With the control surfaces temporarily joined, sand the outer edges of all the parts round (except for where they are hinged).

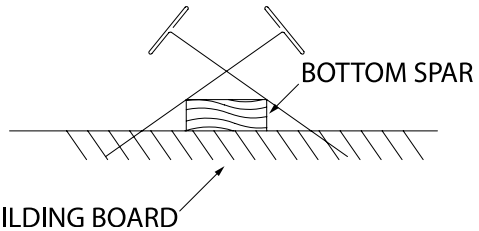
❏ 11. Remove all the hinges. Use a razor plane followed by a bar sander to shape the leading edge of the rudder and elevators to a "V" as shown on the plan.

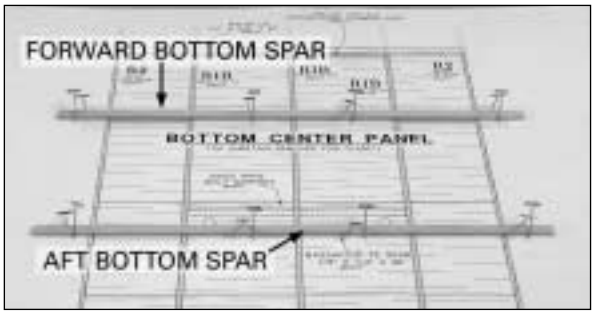
Set the tail parts aside and proceed to the wing.

BUILD THE WING

BUILD THE BOTTOM CENTER PANEL

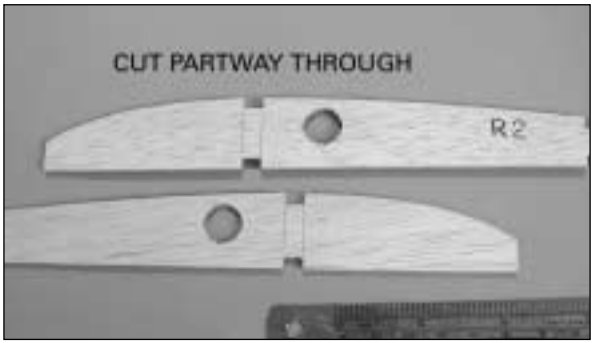
❏ 1. Roll the wing plan inside out so it will lay flat. Position the plan so the **bottom center panel** is over your flat building board (or cut it from the wing plan). Cover the plan with Plan Protector or wax paper so glue will not adhere to it.





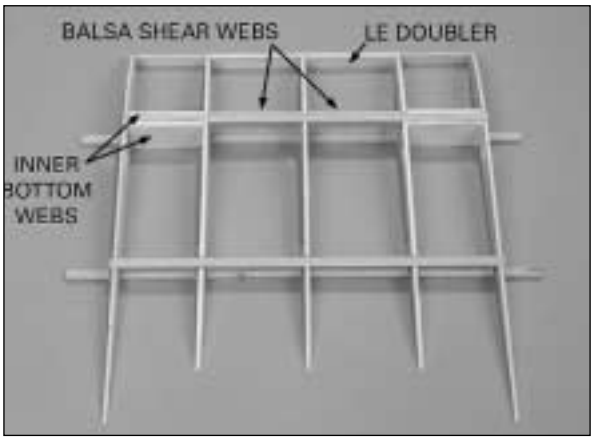
❏ 2. Cut a 1/8" x 1/4" x 24" [3.2 x 6.4 x 610mm] basswood stick into two 12" [305mm] pieces.

Use the "crossed-pin" technique to pin the spars to the plan over the location for the **forward** and **aft bottom spars**.



❑ 3. Use a hobby knife and a straightedge to cut partway through **opposite** sides of both die-cut 3/32" [2.4mm] balsa wing ribs **R2** between the forward spar notches.

Refer to this photo for the following six steps.



❑ 4. With the cuts made in the previous step facing outward, glue both R2 ribs and the three die-cut 1/8" [3.2mm] plywood **R1B** ribs to the spars over their location on the plan. Use a small builder's triangle to hold the ribs vertical as you glue. It is **especially** important that the outer R2 ribs are vertical.

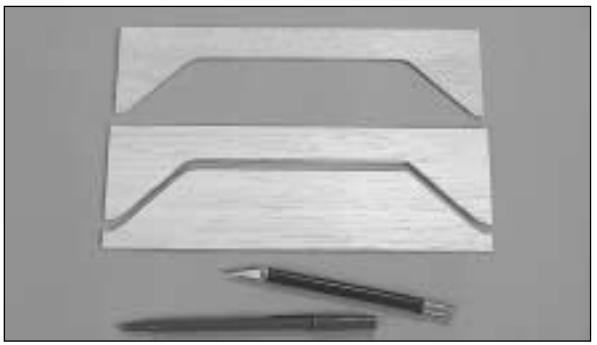
❑ 5. Cut another 1/8" x 1/4" x 24" [3.2 x 6.4 x 610mm] basswood stick into two 9-5/8" [245mm] pieces. Glue them into the notches in the top of the ribs for the **forward** and **aft top spars**. The same as when gluing the ribs to the bottom spars, use a small builder's triangle to hold the ribs–especially the outer ribs–vertical as you glue.

❑ 6. Glue the four die-cut 1/8" [3.2mm] plywood **inner bottom webs** (labeled **"IBW"** on the part) to the spars and ribs where shown. Glue the die-cut 1/8" [3.2mm] plywood **leading edge doubler** (labeled **"LED"** on the part) to the R1B ribs, then cut the **sub-leading edge** from a 1/16" x 3/8" x 24" [1.6 x 9.5 x 610mm] balsa stick and glue it into position. Save the remainder of the stick for the top center panel.

❑ 7. Cut 4" from each of three 3/32" x 3" x 24" [2.4 x 76 x 610mm] balsa sheets. After doing so, you will have three 3/32" x 3" x 4" [2.4 x 76 x 102mm] balsa sheets. These are to be used for **shear webs**. You will also have three 3/32" x 3" x 20" [2.4 x 76 x 510mm] balsa sheets to be used for sheeting the center panel.

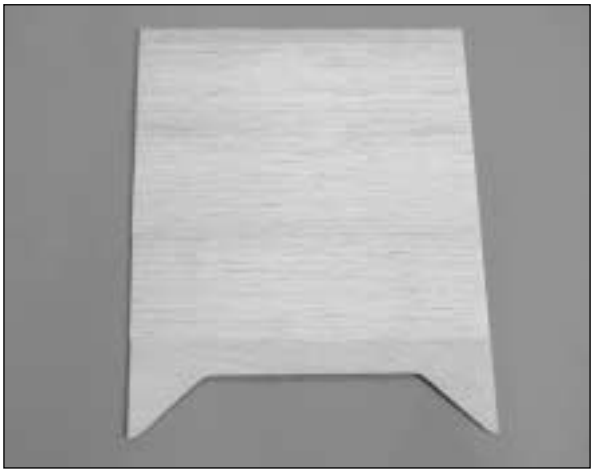
❑ 8. From one of the 3/32" x 3" x 4" [2.4 x 76 x 102mm] balsa sheets, cut two **shear webs** for the front of the forward spars. Note that the grain is vertical. Glue the shear webs into position.

❑ 9. Remove the bottom inner panel from the plan. Use a bar sander to sand off any glue bumps or uneven surfaces from the bottom of the panel.

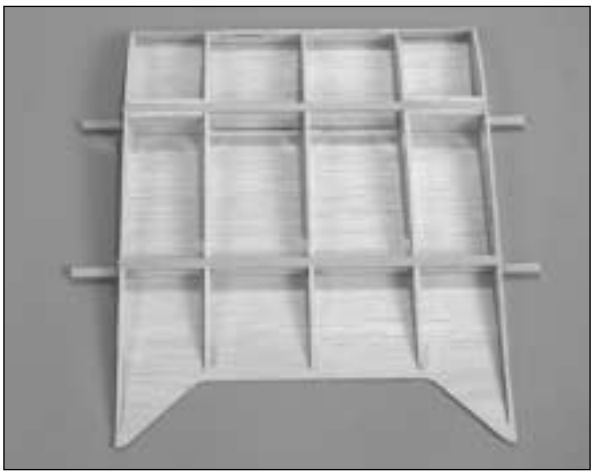


❑ 10. Using one of the die-cut 3/32" [2.4mm] balsa **center panel trailing edges** (labeled

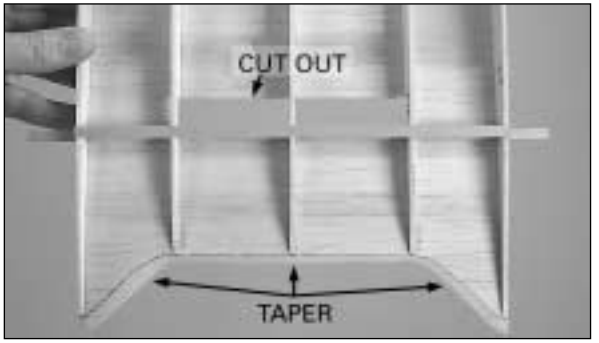
"CTE") as a pattern, make an additional center panel trailing edge from a 3/32" x 3" x 24" [2.4 x 76 x 610mm] balsa sheet. Save the remainder of the sheet for the top center panel.



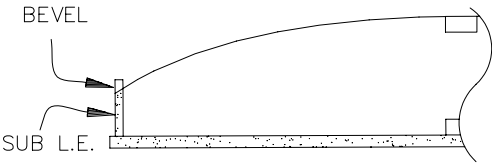
❑ 11. Make the **top** and **bottom** skins for sheeting the center panel from the three 3/32" x 3" x 20" [2.4 x 76 x 510mm] balsa sheets you cut earlier and the center panel trailing edges. Make the sheets slightly oversize to allow for trimming later.



❑ 12. Working over a flat surface, glue the center panel structure to the skin that has the harder, die-cut center panel trailing edge.



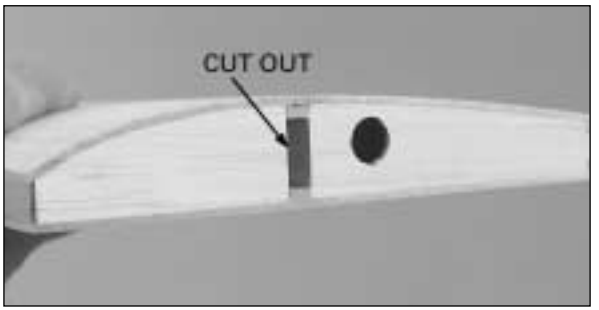
❑ 13. Cut out the bottom sheeting to accommodate the grooved 1/2" x 3/4" x 5-3/8" [12.7 x 19.1 x 137mm] basswood **aft landing gear block**. Note the difference between the aft and the forward landing gear blocks; the groove in the **forward** landing gear block is **centered**, while the groove in the **aft** landing gear block is not centered. Use a bar sander to taper the trailing edge of the sheeting using the ribs as a guide.



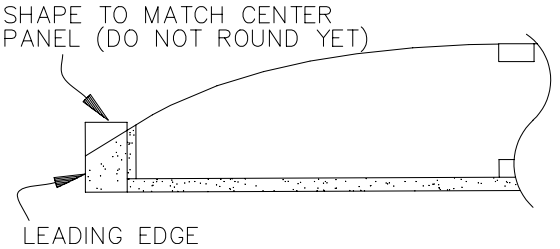
❑ 14. Use a bar sander to lightly sand the top of the center panel so all the ribs and spars are even. Also be certain to bevel the top of the sub leading edge to match the angle of the ribs.

❑ 15. Sheet the top of the center panel with the other skin. After the glue dries, sand the spars

and sheeting even with the ends. Sand the front of the sheeting even with the sub leading edge.



❑ 16. Cut the rest of the way through the lines in the ribs on both ends of the center panel and remove the balsa between the spars. Set the bottom center panel aside.



❑ 17. Cut the **center panel leading edge** slightly longer than required from a 1/4" x 5/8" x 24" [6.4 x 15.9 x 610mm] balsa stick (save the remainder of the stick for the top center panel). Glue the leading edge to the front of the center panel. Sand the ends and top of the leading edge even with the center panel, but do not round the leading edge until instructed to do so.

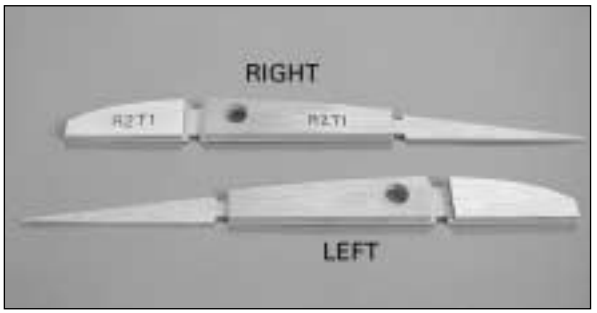
That's it for the bottom center panel. Set it aside and work on the top center panel.

BUILD THE TOP CENTER PANEL

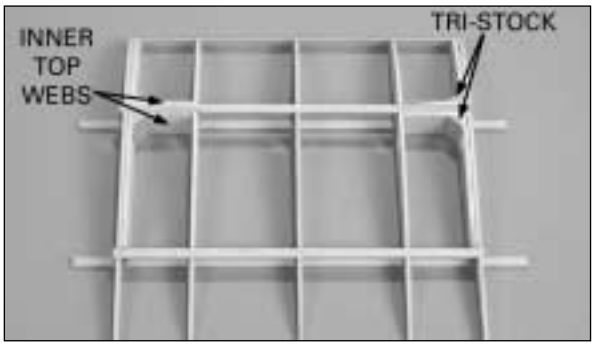
❑ 1. Position the plan so the **top center panel** is over your flat building board (or cut it from the wing plan) and cover it with Plan Protector or wax paper.

❑ 2. The same as was done for the ribs on the ends of the bottom center panel, cut partway through opposite sides of both die-cut 3/32" [2.4mm] balsa wing ribs **R2** for the ends of the top center panel between the **forward** spar notches.

Be certain to refer to the wing plan while performing step 3.



❑ 3. Make the rib **assemblies** for both ends of the **top center panel** as shown on the plan by gluing together the die-cut 3/32" [2.4mm] balsa ribs **R2**, the die-cut 1/16" plywood ribs **R2B** and the die-cut 1/8" [3.2mm] plywood ribs **R2T1**. Be certain to make a **right** and a **left**.



❑ 4. Build the **top center panel** the same as the bottom center panel. After gluing in the die-cut 1/8" [3.2mm] plywood **inner top webs (ITW)** add the triangle stock reinforcements cut from the 3/8" x 17-7/8" [9.5 x 455mm] balsa tri-stock. Make another **center panel trailing**

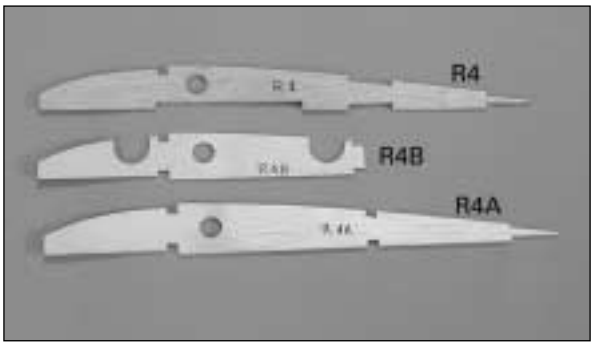
edge using the 3/32" x 3" [2.4 x 75mm] balsa sheet left over from making the first center panel trailing edge for the bottom center panel. Make the skins and save the leftover pieces for shear webs. Glue the top center panel to the bottom skin, add the balsa shear webs, then glue the top skin to the panel. Sand the ends of the sheeting even with the ribs and sub leading edge, then cut out the ribs on the ends of the panel between the spars. Add the leading edge cut from the 1/4" x 5/8" [6.4 x 15.9mm] balsa stick left over from the leading edge on the bottom center panel, then sand to match the shape of the ribs. Set the top center panel aside.

BUILD THE OUTER PANELS

Note: All four outer panels are nearly identical. The only differences are that, obviously, there are two rights and two lefts. The only difference between the top and bottom panels is the 1/16" [1.6mm] plywood rib assemblies at R4 where the wing struts connect.

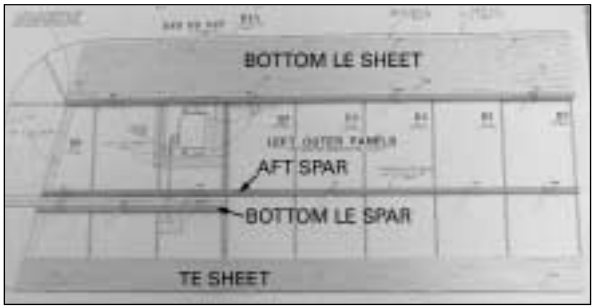
Start with the **left, bottom** outer panel first**.**

❑ ❑ ❑ ❑ 1. Position the left outer wing panel plan over your flat building board and cover it with wax paper or Plan Protector.



❑ ❑ ❑ ❑ 2. Referring to the illustrations near the leading edge of the left panel on the wing plan, use medium CA to glue together the die-cut 1/8" [3.2mm] plywood rib **R4A**, the die-cut 1/16" plywood rib **R4B** and the die-cut 3/32" [2.4mm] balsa rib **R4**. **Be certain** you are looking at the correct illustration for the wing panel you are working on (top or bottom).

Refer to this photo for the following six steps.



❑ ❑ ❑ ❑ 3. Cut the **forward spar** 1/8" [3mm] longer than shown on the plan from a 1/8" x 1/4" x 24" [3.2 x 6.4 x 610mm] basswood stick. Cut the **aft spar** 1/8" [3mm] longer than shown on the plan from a 1/8" x 1/4" x 30" [3.2 x 6.4 x 760mm] basswood stick.

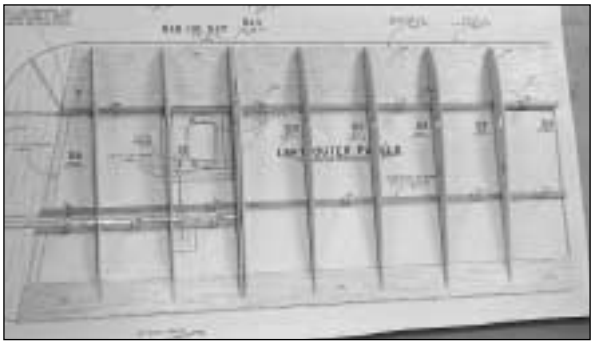
❑ ❑ ❑ ❑ 4. Cut the **bottom leading edge** sheet 1/8" [3mm] longer than shown on the plan from a 3/32" x 3" x 24" [2.4 x 76mm x 610mm] balsa sheet.

❑ ❑ ❑ ❑ 5. Glue the forward spar to the top of the leading edge sheet along the aft edge. Pin the spar and sheeting to the plan.

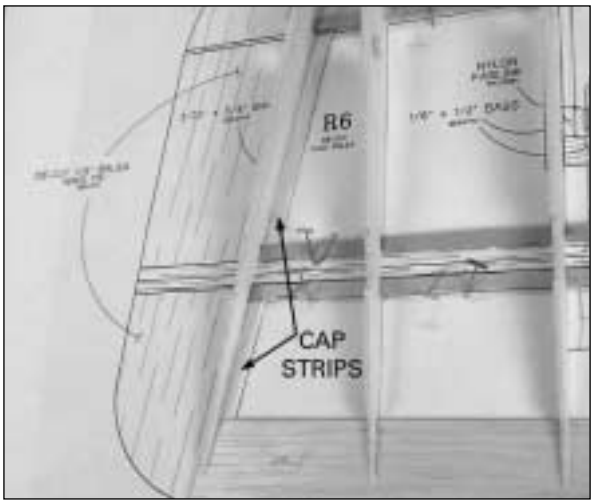
❑ ❑ ❑ ❑ 6. Cut 4-1/2" [115mm] from a 3/32" x 4" x 30" [2.4 x 100 x 760mm] balsa sheet. Add the 4-1/2" [115mm] sheet to the stack of sheets you've been saving for shear webs.

❑ ❑ ❑ ❑ 7. Cut the 25-1/2" [650mm] sheet from the previous step into two 1-1/2" [38mm] wide strips to make the **trailing edge sheets**. The same as was done for the leading edge sheet, cut the trailing edge sheet 1/8" [3mm] longer than shown and pin to the plan. Save the other 1-1/2" [38mm] wide strip for the top.

❑ ❑ ❑ ❑ 8. Cut the **bottom aileron spar** from a 1/8" x 1/4" x 24" [3.2 x 6.4 x 610mm] basswood stick as shown on the plan, then pin it over its location. Save the remainder of the stick for the top.



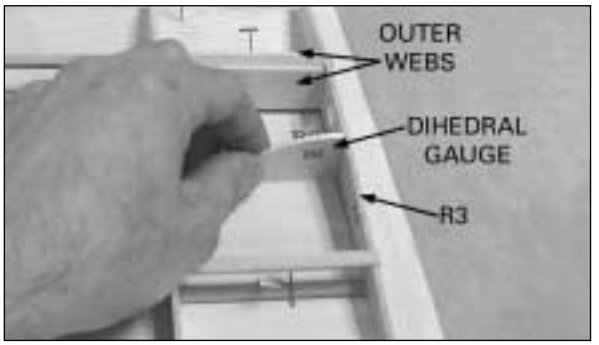
❑ ❑ ❑ ❑ 9. Glue all the ribs **except for rib R3 at the root of the panel** and **rib R6 at the tip of the panel** to the spars and sheeting.



❑ ❑ ❑ ❑ 10. Cut the **cap strips** that go under rib R6 from a 3/32" x 3/8" x 24" [2.4 x 9.5 x 610mm] balsa stick, then glue them into position. Glue rib R6 to the assembly.

❑ ❑ ❑ ❑ 11. The same as was done for the ribs on the ends of the center panels, use a hobby knife and a straightedge to cut partway through the outside of the remaining rib R3 that goes on the end of the outer panel you are working on.

Refer to this photo for the following two steps.



❑ ❑ ❑ ❑ 12. Without using any glue, add the following parts to the assembly:

- Rib R3 that goes on the root end of the panel.
- The top, **forward** spar cut from a 1/8" x 1/4" x 24" [3.2 x 6.4 x 610mm] basswood stick.
- The top, **aft** spar cut from a 1/8" x 1/4" x 30" [3.2 x 6.4 x 760mm] basswood stick.
- The die-cut 1/8" [3.2mm] plywood **outer webs (OW)** that go on the forward spars.

❑ ❑ ❑ ❑ 13. Using the die-cut 1/8" [3.2mm] plywood **dihedral gauge (DG)** and the outer webs to set rib R3 at the correct angle, glue rib R3 to the bottom spars and sheeting only.

❑ ❑ ❑ ❑ 14. Glue the top spars to all the ribs. Glue the outer webs to the spars and ribs. Note that the top of the outer web on the back of the spars is even with the top spar.

Refer to this photo for the following three steps.

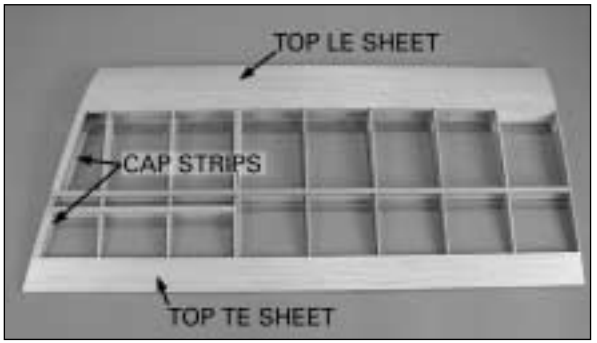
❑❑❑❑ 15. Cut the **top aileron spar** from the remainder of the 1/8" x 1/4" x 24" [3.2 x 6.4 x 610mm] basswood stick used for the bottom aileron spar, then glue it into position.

❑❑❑❑ 16. Cut the **sub-leading edge** from a 1/16" x 3/8" x 24" [1.6 x 6.5 x 610mm] balsa stick, then glue it into position.

❑❑❑❑ 17. Since the plan you are working over is covered by the structure, refer to the other outer panel plan you are not working over to view the **shear webs**. Cut the shear webs from two of the 3/32" x 3" x 4" [2.4 x 76 x 100mm] balsa sheets leftover from making the center panel skins. Remove any T-pins that are in the way, then glue the shear webs to the front of the forward spars. Note that the grain on the shear webs is vertical.

❑❑❑❑ 18. Use a bar sander to sand the sub leading edge to match the angle on the top of the ribs.

Refer to this photo for the following four steps.



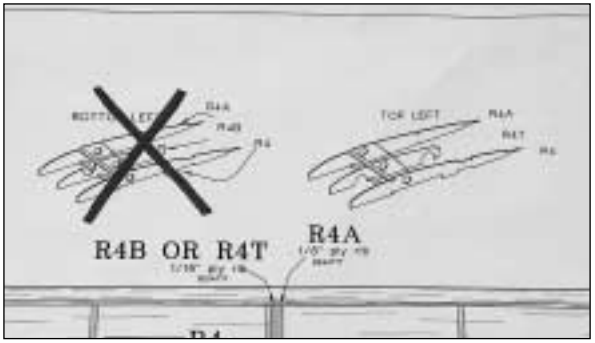
❑❑❑❑ 19. Cut the **top leading edge sheet** from a 3/32" x 3" x 24" [2.4 x 76 x 610mm] balsa sheet. Glue the sheet into position.

❑❑❑❑ 20. Remove the outer panel from the building board. The same as was done on the center panel trailing edges, taper the outer panel trailing edge to accommodate the top trailing edge sheet. Glue the top trailing edge sheet into position.

❑❑❑❑ 21. Cut the **cap strips** that go over rib R6 at the wing tip from the remainder of 3/32" x 3/8" balsa stick used for the cap strips on the bottom of the wing. Glue the cap strips into position.

❑❑❑❑ 22. Use a bar sander to sand the sheeting, spars and cap strips even with the ribs on both ends of the outer panel.

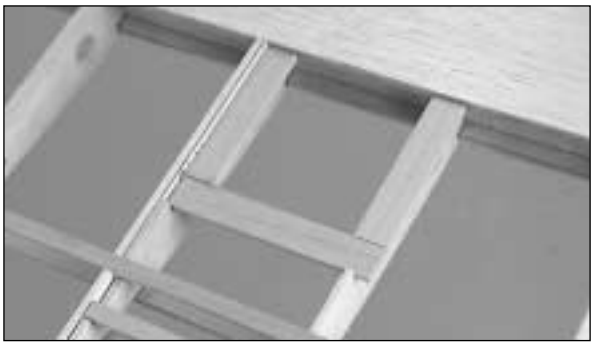
❑❑❑❑ 23. Cut the **leading edge** from a 1/4" x 5/8" x 24" [6.4 x 16 x 610mm] balsa stick, then glue it into position. Sand the leading edge to match the shape of the outer panel, but do not round until instructed to do so.



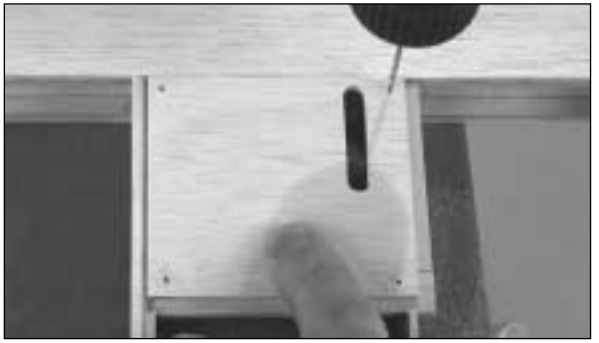
❑❑❑❑ 24. Repeat the same steps to build the **left top panel**, then switch to the other plan and build both right panels. **Be certain to refer to the illustrations depicting which R4 assemblies to use for the panel you are working on. Hint:** Use a thick magic marker to put a bold **"X"** through the illustration of the R4 rib assembly already completed, so you do not inadvertently build the same one.

MOUNT THE AILERON SERVOS

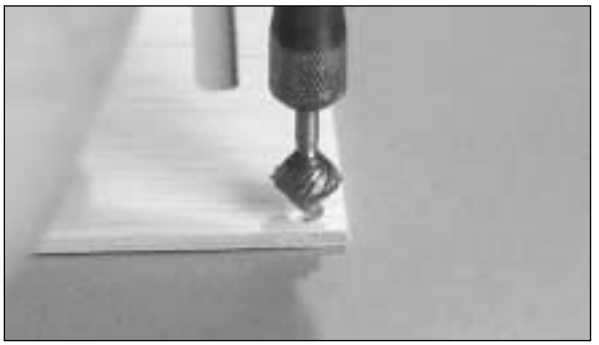
The same as we've been doing all along, start with the left, bottom outer panel.



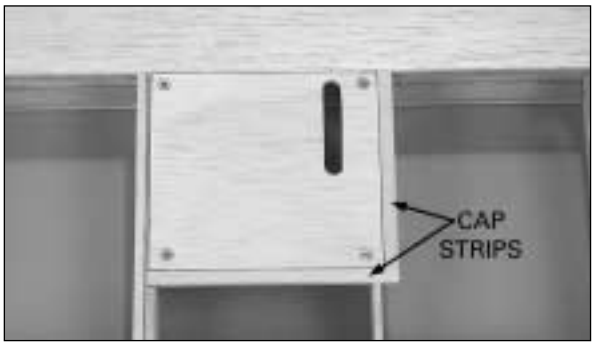
❑ ❑ ❑ ❑ 1. Cut the **servo hatch rails** as shown on the plan from the 1/8" x 1/2" x 18" [3.2 x 12.7 x 460mm] basswood stick, then glue them into position. Save the remainder of the stick for the servo hatch rails for the top panel.



❑❑❑❑ 2. Place a die-cut 1/8" [3.2mm] plywood **servo hatch (HC)** over the rails as shown on the plan. Drill 1/16" [1.6mm] holes through the hatch and the rails.



❑ ❑ ❑ ❑ 3. Enlarge the holes **in the hatch only** with a 3/32" [2.4mm] drill. Use a small countersink bit or Dremel #178 cutting bit to countersink the holes in the hatch for the #2 x 3/8" [9.5mm] flat-head screws.

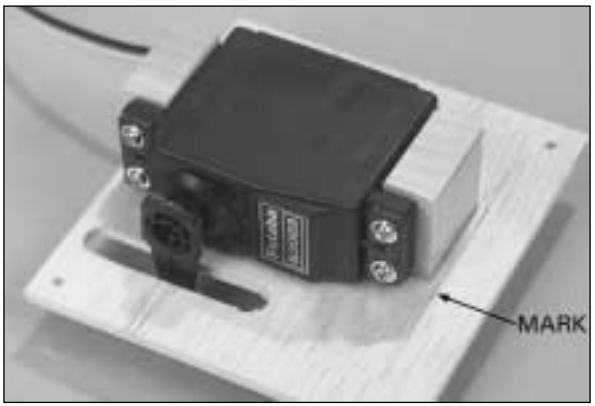


❑❑❑❑ 4. Mount the hatch with four #2 x 3/8" [9.5mm] flat-head screws. Cut the **cap strips** for the edges of the hatch from a 3/32" x 3/16" x

30" [2.4 x 4.8 x 760mm] balsa stick. Glue the cap strips to the rails next to the hatch.

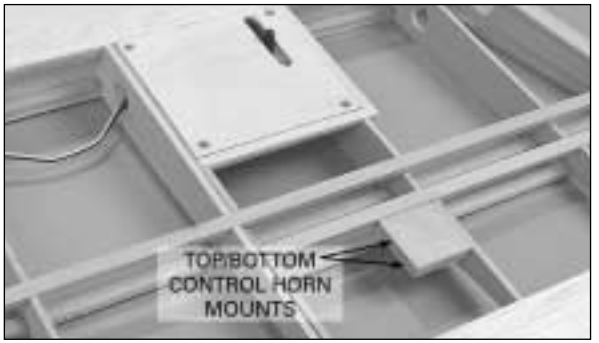
❑ ❑ ❑ ❑ 5. Mount the aileron servo to two 3/8" x 3/4" x 3/4" [9.5 x 19 x 19mm] basswood **servo mount blocks** by drilling 1/16" [1.6mm] holes into the blocks. Run the servo screws (that came with the servo) in and out of the holes in the blocks a few times to form some "threads." Remove the screws, add a few drops of thin CA to the holes and allow to **fully** harden. Mount the servo to the blocks with the screws.

❑ ❑ ❑ ❑ 6. Make a one-arm servo arm by cutting off three of the arms. Install the arm on the servo.



❑ ❑ ❑ ❑ 7. Use a ballpoint pen to mark the forward edge of the aft servo hatch rail onto the inside of the hatch. Remove the hatch cover from the wing. Use 30-minute epoxy to securely glue the servo mount blocks to the hatch with the servo arm centered in the slot. Be certain the aft servo block is not over the line depicting the aft servo hatch rail.

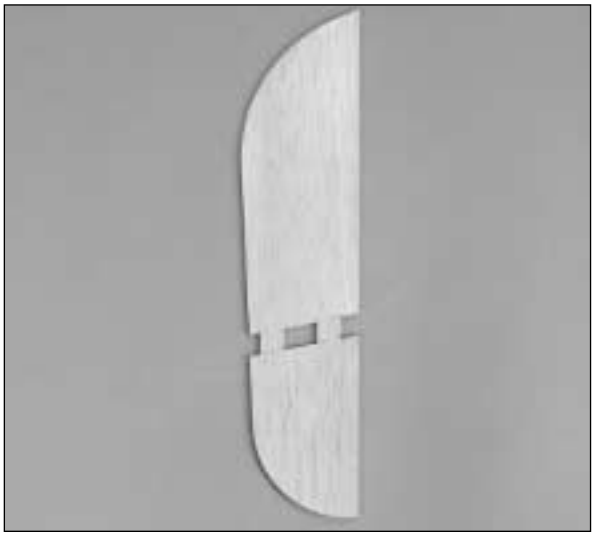
❑ ❑ ❑ ❑ 8. While the epoxy is hardening and the hatch is out of the wing panel, add a few drops of thin CA to the screw holes in the hatch rails.



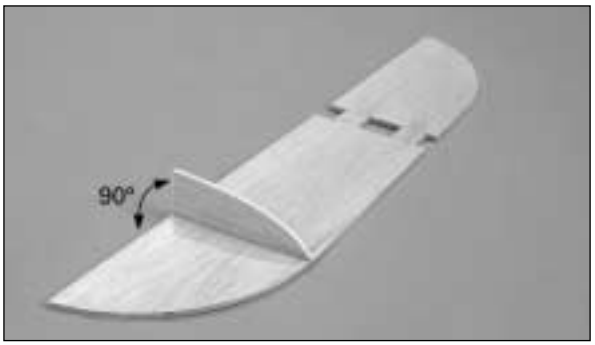
❑ ❑ ❑ ❑ 9. After the epoxy hardens, mount the hatch with the servo to the wing. Glue the die-cut 1/8" [3.2mm] plywood **top** and **bottom control horn mounts (TCH, BCH)** into position.

You may return to the beginning of this section and mount the servos in the remaining three outer panels now, or continue with the first panel and proceed to the wing tip.

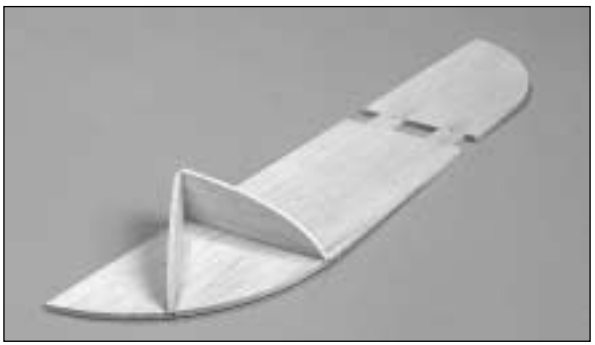
BUILD THE WING TIPS



❑ ❑ ❑ ❑ 1. Working over the plan, glue both parts of the die-cut 1/8" [3.2mm] balsa **wing tips (WT)** together.

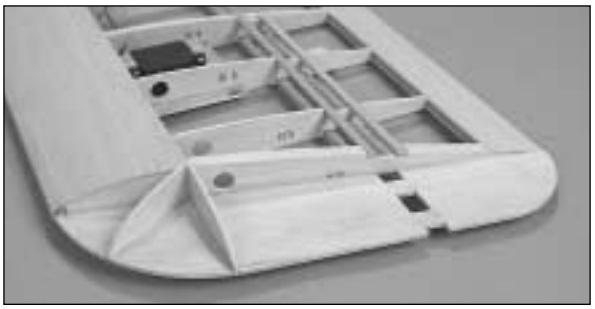


❑❑❑❑ 2. Place the wing tip over the plan and mark the location of the tip ribs. Glue one of the die-cut 3/32" [2.4mm] balsa **tip ribs (TR)** to the wing tip. The outer edge of the tip rib should align with the outer edge of the wing tip. Maintaining a 90° angle as shown, sand the inner edge of the tip rib even with the tip.

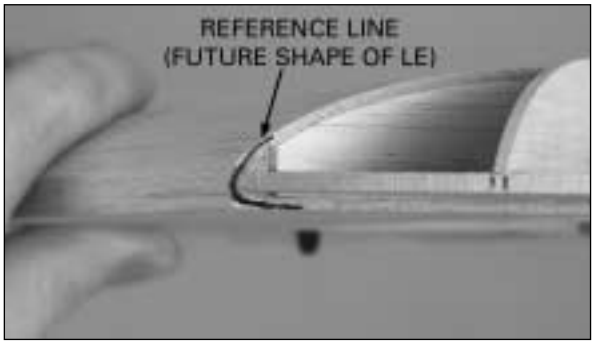


❑❑❑❑ 3. Glue the other tip rib into position and sand the end as well.

Do not use any glue in the following two steps.



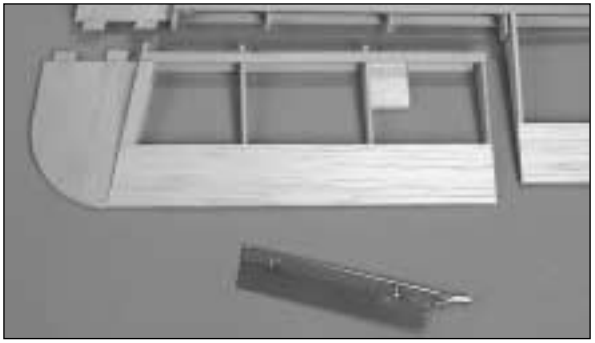
❑❑❑❑ 4. Position the wing tip on the end of the wing. Center the gap between the forward and aft parts of the tip between the aileron spars and the aft spars.



❑❑❑❑ 5. Center the trailing edge of the wing tip on the trailing edge of the wing. Center the leading edge of the wing tip on the leading edge of the wing. For clarity in the photo, a reference line has been drawn on the end of the wing noting where the center of the leading edge ***will be*** when the panel is finally rounded to shape.

❑❑❑❑ 6. Securely glue the tip and tip ribs to the end of the wing in this position.

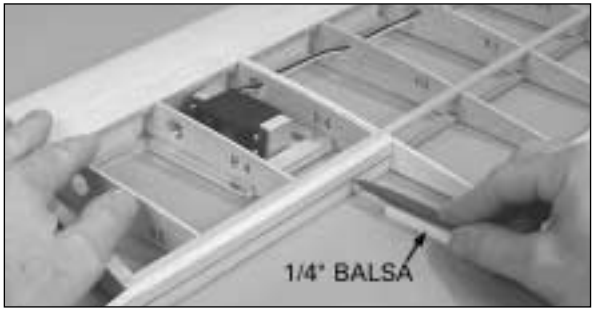
❑❑❑❑ 7. Make the tip ribs for the bottom of the wing tip from leftover 3/32" [2.4mm] balsa and glue them into position. Sand the top and bottom tip ribs even with the top and bottom of the wing and the wing tip.



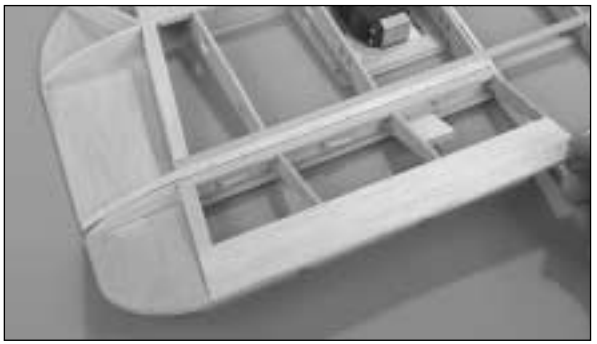
❑ ❑ ❑ ❑ 8. Use a razor saw to cut the aileron from the outer panel.

❑ ❑ ❑ ❑ 9. Trim the leftover portions of the ribs and wing tip even with the outer panel and the aileron spars. Cut the **outer trailing edge** and the **aileron leading edge** from a 1/4" x 7/8" x 24" [6.4 x 22.2 x 610mm] balsa stick, then glue them into position.

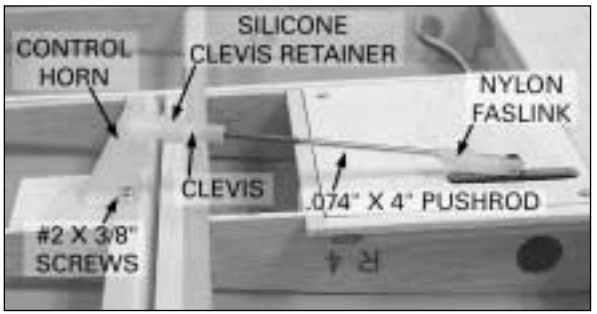
❑ ❑ ❑ ❑ 10. Sand the aileron leading edge even with the aileron and sand the outer trailing edge even with the wing. Place the wing and the aileron flat on the workbench. Holding them down, sand the wing trailing edge and the aileron leading edge even with each other.



❑ ❑ ❑ ❑ 11. The same as was done on the tail surfaces, mark a centerline on the outer trailing edge. On the model shown, a ballpoint pen supported by a piece of 1/4" [6.4mm] balsa was used to mark the lines (the lines don't have to be **exactly** on center–it's more important that the lines accurately align with each other). Mark a centerline on the aileron leading edge the same way.



❑ ❑ ❑ ❑ 12. Cut the hinge slots, then bevel the leading edge of the aileron to allow for control throw movement. Test fit the aileron to the wing with the hinges. Make adjustments where necessary.



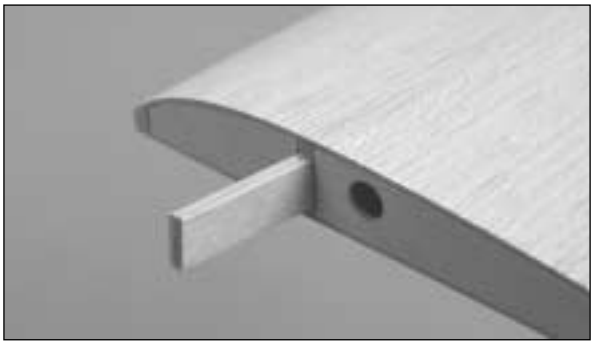
❑ ❑ ❑ ❑ 13. Make the **aileron pushrod** from the hardware shown in the photo and on the

plan. Drill 1/16" [1.6mm] holes for the control horn screws. Run the #2 x 3/8" [9.5mm] screws in and out of the control horn mount, remove the screws, then add a few drops of thin CA to the holes and allow to fully harden. Mount the control horn and hook up the aileron. Make adjustments where necessary.

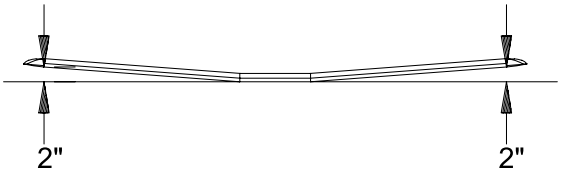
Other than final-sanding (which will be done after the outer panels are joined to the center panel), the outer panels are now completed. You know the routine…return to the beginning and mount the servos and finish the wing tips on the remaining three outer panels the same way.

JOIN THE WING PANELS

❑ 1. Make one 1/4" [6.4mm]-thick **wing joiner** by gluing together two die-cut 1/8" [3.2mm] plywood **wing joiners (WJ)**. Make three more wing joiners the same way.



❑ ❑ 2. Test fit two joiners in the panels of the bottom wing. It may be necessary to sand the edges of the joiners to get them to fit. Be **certain** the panels you are test fitting are matched up correctly (bottom center panel to bottom outer panels)!



❑ ❑ 3. Lay the bottom center panel on your flat workbench. Place weights on top of the center panel to hold it down. Use balsa blocks or something similar to raise both ends of the wing under rib R6 **two inches**. Check the fit of the outer panels to the center panel and be certain the leading and trailing edges align.

Note: Join only **one** outer panel to the center panel at time. Do not attempt to join both outer panels to the center panel simultaneously. Mix a new batch of epoxy for joining each wing panel. Otherwise, the epoxy may begin to harden while you are working.

Read through the following steps before beginning and gather all the items used so you'll have everything on-hand before you begin (you're doing that with every step anyway–right?)

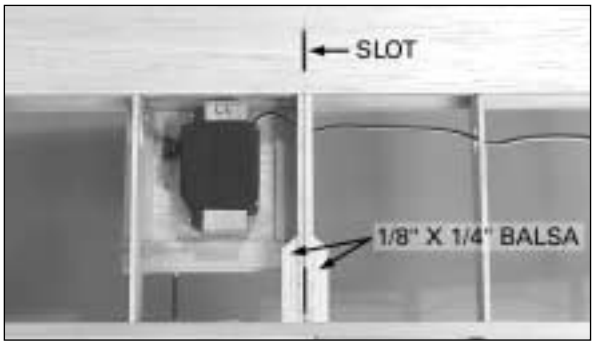
❑ ❑ 4. Cut a few paper towels into approximately 2" [50mm] squares for epoxy clean up. Mix up 1/2 oz. [15cc] of 30-minute epoxy in a mixing

cup. Use an epoxy brush to apply a film of epoxy to the joining ribs on the end of the **bottom left panel** and the **bottom center panel**. Set the panels on-end so the epoxy will not run. Coat the joiner with epoxy as well. Add milled glass fibers or microballoons to the remainder of the epoxy mixture. Use a piece of wire to apply the epoxy and microballoons mixture inside both panels between the spars where the joiner fits. Insert the joiner in one of the panels. Use the wire to wipe away excess epoxy that squeezes out, then join the center panel again, wiping away excess epoxy. Immediately proceed to the next step.

❑ ❑ 5. Lay the joined panels on top of your building board covered with wax paper. Place weights on top of the center panel to hold it down (small plastic bags containing lead shot work well for this). Use a balsa block or something similar to prop up the end of the wing under rib R6 2" [51mm]. Use large balsa sticks T-pinned to the building board (indicated by arrows in the top photo) to **tightly** squeeze the panels together. Use a few paper towel squares dampened with alcohol to wipe away any more epoxy that squeezes out of the joint. Make certain the leading and trailing edges of the joining panels align. Do not disturb the wing until the epoxy has fully hardened.

❑ ❑ 6. Proceed and join the top left panel to the top center panel. After the epoxy joining the left panels has hardened, join the right panels.

One last thing before moving onto the fuselage...



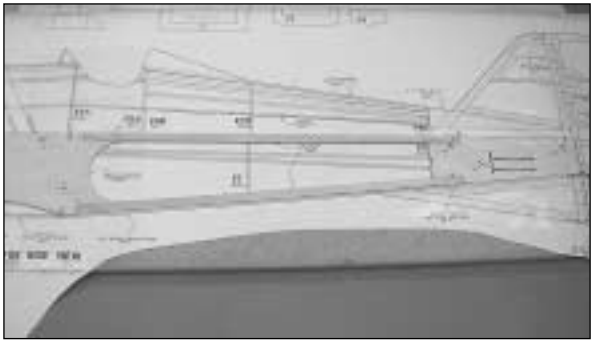
❑ ❑ 7. In the bottom wing, cut slots in the top of the sheeting over the openings for the **forward strut retainers**. Glue pieces of leftover 1/8" x 1/4" [3.2 x 6.4mm] balsa to both sides of the ribs to support the covering around the **aft strut retainers**. Repeat the same procedure on the bottom of the top wing. Cut the slots for the strut retainers in the center panel of the top wing.

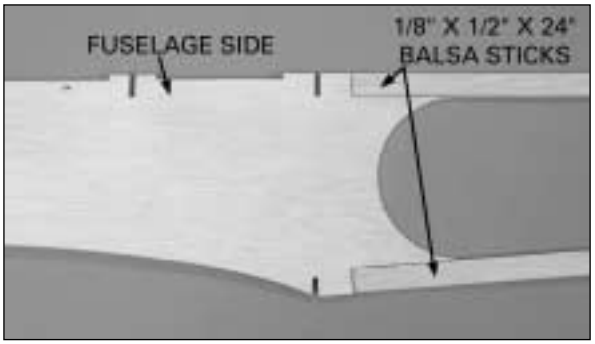
Now that the wings are framed-up and joined we'll get started on the fuse. The wings will be completed and finish-sanded later.

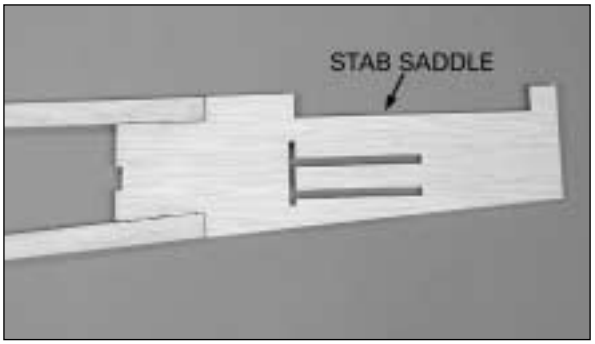
BUILD THE FUSELAGE

BUILD THE FUSELAGE SIDES

❑ 1. Place the side view of the fuselage plan over your flat building board and cover it with Plan Protector or wax paper.

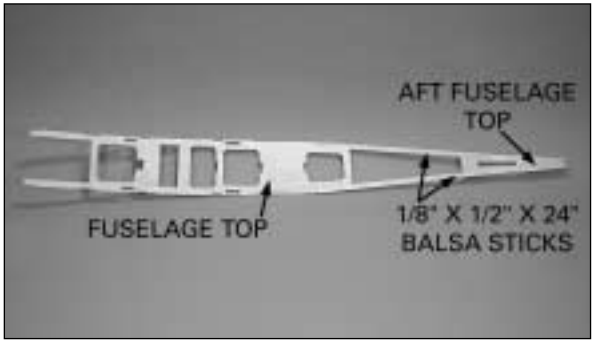




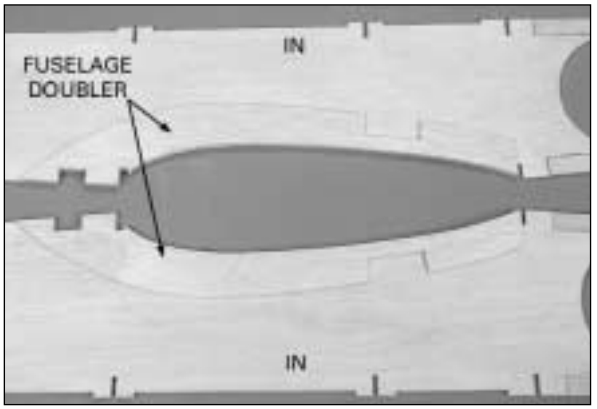


❑ 2. Make a fuselage side by gluing together a die-cut 1/8" [3.2mm] plywood **fuselage side (FS)**, two 1/8" x 1/2" x 24" [3.2 x 12.7 x 610mm] balsa sticks and the die-cut 1/8" [3.2mm] plywood **stab saddle (SS)**. Use T-pins to hold the parts over their location on the plan as you proceed.

❑ 3. After the glue from the previous step has hardened, remove the fuselage side from the plan. Make another fuselage side the same way. After the glue dries, sand both assemblies flat and even.



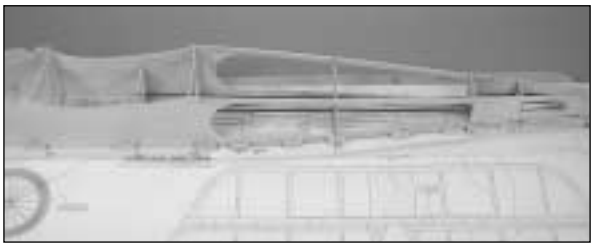
❑ 4. Switching to the fuselage **bottom view**, build the **fuselage top** over the plan from the die-cut 1/8" [3.2mm] plywood **forward** and **aft fuselage tops (FFT, AFT)** and two 1/8" x 1/2" x 24" [3.2 x 12.7 x 610mm] balsa sticks. Remove the fuselage top from the plan, then sand flat and even.



❑ 5. Arrange both fuselage sides as shown in the photo. Use a ballpoint pen to write "IN" on the outward facing sides. Glue a die-cut 1/8" [3.2mm] plywood **fuselage side doubler (FSD)** to the **inside** of each fuse side.

❑ 6. Glue the die-cut 1/8" [3.2mm] plywood **former F3D** to the front of die-cut 1/8" [3.2mm] plywood **former F3**.

Refer to these photos for the following four steps.



❏ 7. Pin the fuse top back to the plan with Plan Protector underneath. Without using any glue, join both fuselage sides to the fuse top. Use balsa sticks T-pinned to the plan to hold the fuse sides tightly to the fuse top.

❏ 8. Add die-cut 1/8" [3.2mm] plywood **formers F3** through **F9** to the assembly.

Note: Though there are **two** elevator pushrods and **one** rudder pushrod, **four** pushrod tubes are installed in the fuselage–the unused pushrod tube is for the receiver antenna. The rudder servo will be mounted to the side of the fuselage opposite the throttle servo.

❏ 9. Cut the four 3/16" x 36" [4.8 x 915mm] pushrod tubes to a length of 30-1/2" [775mm]. Save one of the remaining 5-1/2" [140mm] pieces for the throttle pushrod tube. Roughen the outside of the tubes with coarse sandpaper so glue will adhere, then slide them through the holes in the formers as shown on the plan. (Some of the following photos may only show three tubes.)

❏ 10. Making certain all the parts fit correctly and that the fuse top is **fully contacting the plan**, use medium CA to carefully glue all the formers to the fuse sides and fuse top. Glue the fuselage sides to the fuse top from F3 aft. **Do not** glue the fuselage sides to the fuselage top from F3 forward until instructed to do so. When gluing the fuse sides to the fuse top aft of former F9, use a builder's square to hold the fuselage sides vertical.

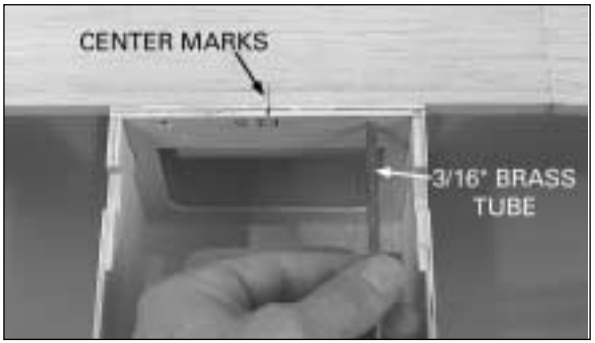
❏ 11. Use medium CA to glue the pushrod tubes to the formers. Glue the aft end of the pushrods to the stab saddles and fill the slot with 30-minute epoxy mixed with microballoons.

❏ 12. Sheet the bottom of the fuselage from F5 aft using the 1/8" x 3" x 36" [3.2 x 75 x 915mm] balsa sheet.

❏ 13. Remove the fuselage from the building board. Sand the bottom sheeting and the pushrod tubes even with the fuselage sides.

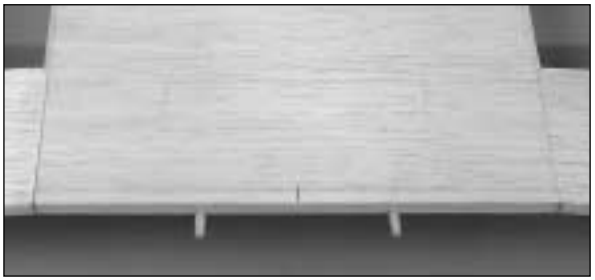
❏ 14. Place the bottom wing in the wing saddle. Taking accurate measurements, mark the center

of the bottom wing panel on the leading edge and the center of the fuselage at former F3. Center the wing in the fuselage, aligning the marks.



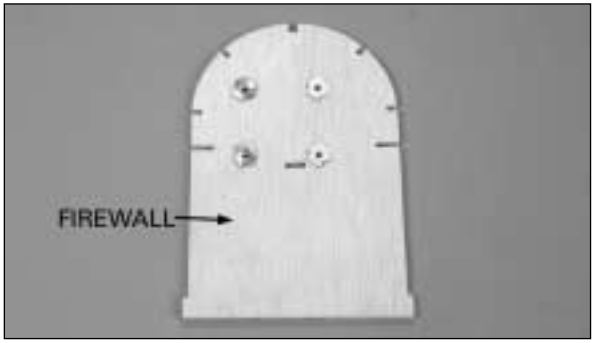
❑ 15. Using the holes in F3 as a guide, use a 3/16" [4.8mm] brass tube sharpened on the end to cut holes through the balsa leading edge of the wing for the wing dowels. (To sharpen the end of a brass tube, use a rotary tool with a cutoff wheel or a file to bevel the outside of the tube, and use a #11 hobby knife to bevel the inside of the tube.)

❑ 16. Remove the wing from the fuselage. Use the brass tube or a 3/16" [4.8mm] drill to drill holes the rest of the way through the wing and into the shear webs inside.



❑ 17. Round one end of both 3/16" [4.8mm] wing dowels. Without using any glue, fit the dowels into the wing, then test fit the wing to the fuse. **Do not** glue the dowels into the wing until instructed to do so.

❑ 18. Glue both die-cut 1/8" [3.2mm] plywood **formers F2** together. From now on this assembly will be referred to as the **firewall**.

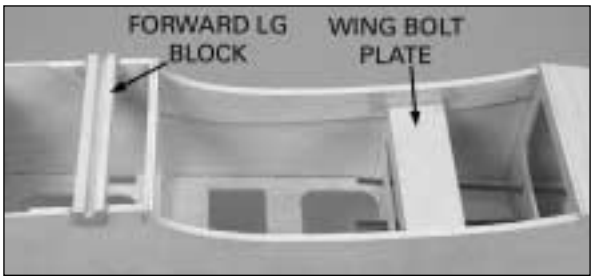


❑ 19. Drill 13/64" [5.2mm] holes through the four punchmarks in the front of the firewall. Insert four 8-32 blind nuts into the holes in the back of the firewall and lightly tap them in with a hammer. Carefully add a few drops of thin CA around the nuts to permanently hold them in.

❑ 20. Glue the die-cut 1/8" [3.2mm] plywood **former F1** to the front of the fuselage.

❑ 21. Fit the firewall into position. Note the angle on the front of the fuse top where it contacts the firewall to provide the correct amount of right thrust. Glue the firewall into the fuselage with 30-minute epoxy using clamps where necessary to securely hold it into position.

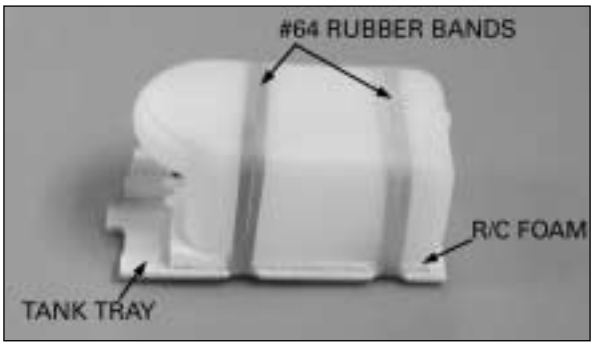
❑ 22. Sand the bottom of former F3 and the firewall even with the bottom of the fuse sides. Glue the fuselage top to the fuselage sides from F3 forward.

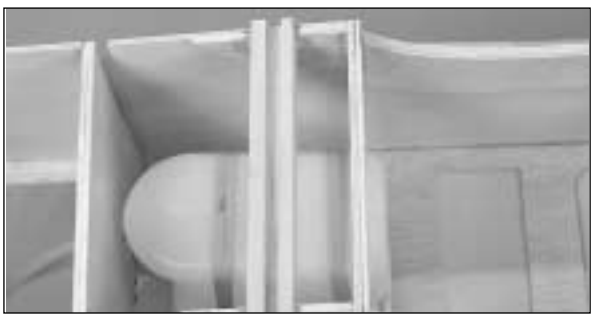


❑ 23. Test fit, then use 30-minute epoxy to glue the 1/4" x 1-1/2" x 5-1/8" [6.4 x 38 x 130mm] **wing bolt plate** and the 1/2" x 3/4" x 5-3/8" basswood **forward landing gear block** into position.

MOUNT THE FUEL TANK

Refer to these photos for the following five steps.





❑ 1. Test fit the die-cut 1/8" [3.2mm] plywood **tank tray (TT)** in the fuselage. Cut notches in the front of the tray to accommodate the blind nuts in the back of the firewall.

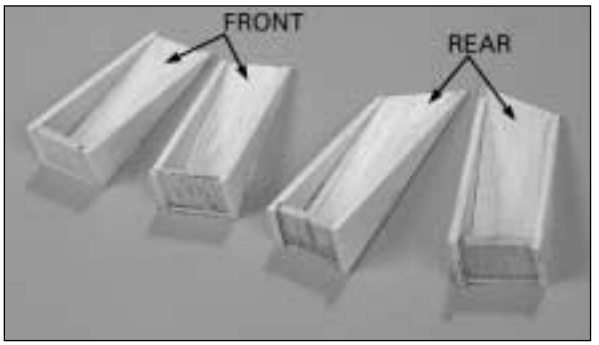
❑ 2. Glue together two pieces of leftover 1/8" x 1/4" [3.2 x 6.4mm] basswood from the wing spars to make a 1/4" x 1/4" [6.4 x 6.4mm] **mounting rail** for the tank tray. Cut the rail to a length of 3" [75mm]. Glue the rail to the back of former 3 as shown on the plan.

❑ 3. Drill 1/16" [1.6mm] holes through the aft end of the tank tray and the rail. Remove the tray. Enlarge the holes in the tray only with a 3/32" [2.4mm] drill.

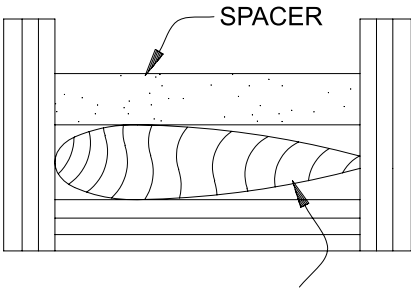
❑ 4. Use a couple of #64 rubber bands to mount the fuel tank to the tray with a piece of 1/4" 6.4mm] R/C foam rubber in between. Mount the tray in the fuselage with two #2 x 3/8" [9.5mm] screws and #2 washers.

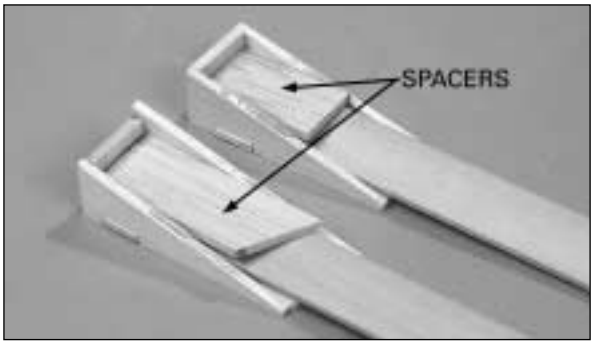
❑ 5. Drill 1/4" [6.4mm] holes through the firewall for the fuel lines. Temporarily connect the fuel lines to the fuel tank.

INSTALL THE STRUT MOUNTS

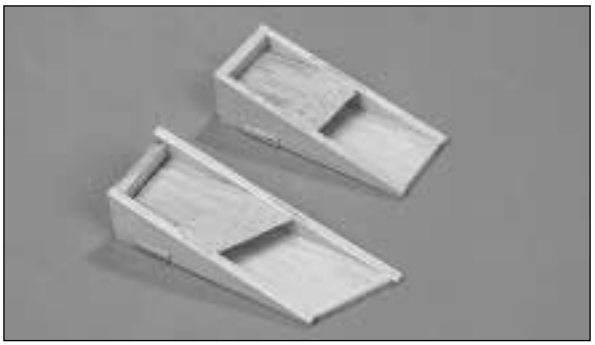


❑ 1. Make four **strut mounts** from the die-cut 1/8" [3.2mm] plywood and balsa parts shown (all labeled **"SM"**). Note that both **front** mounts are the same, but there is a **right** and **left rear** mount.

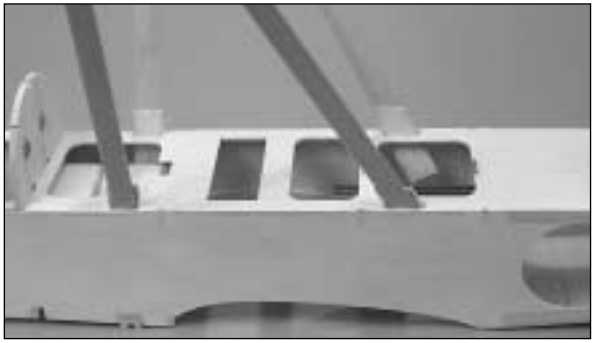


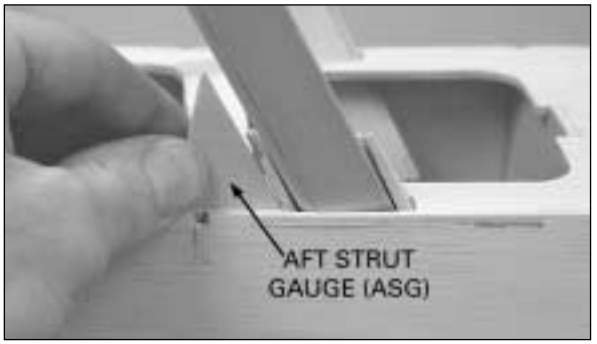


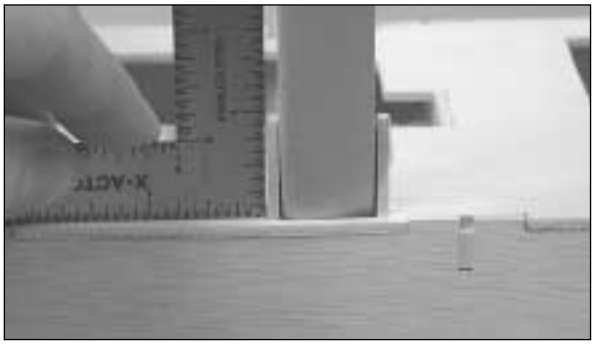
❑ 2. Using the 18" [460mm] basswood **wing struts** to set the correct spacing, carefully glue the die-cut 1/8" [3.2mm] balsa **spacers (SM)** into all four strut mounts without inadvertently gluing in the wing struts (two of the strut mounts are shown in the photo).



❑ 3. Sand the spacers even with the strut mounts.



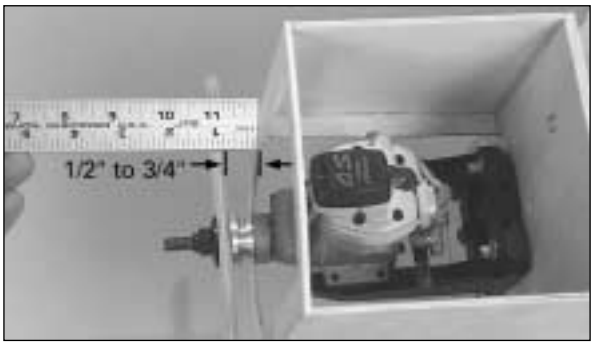




❑ 4. Test fit the strut mounts and four wing struts into the fuselage. Slide the strut mounts as far upward into the slots in the fuselage top as they will go. Use the die-cut 1/8" [3.2mm] plywood **aft strut gauge (ASG)** to set the aft strut mounts at the correct angle. Use a 90° triangle or a builder's square to set the front strut mounts. Make any adjustments required to get the struts and strut mounts to fit correctly.

❑ 5. Securely glue the strut mounts into position.

MOUNT THE ENGINE



❑ 1. Mount the engine mount to the firewall with four 8-32 x 1" [25mm] SHCS, #8 lock washers and #8 flat washers and adjust it to fit your engine. Position the engine on the mount so the propeller (or a flat piece of wood with a hole drilled in it) will be 1/2" to 3/4" [13 to 19mm] from the front of the fuselage.

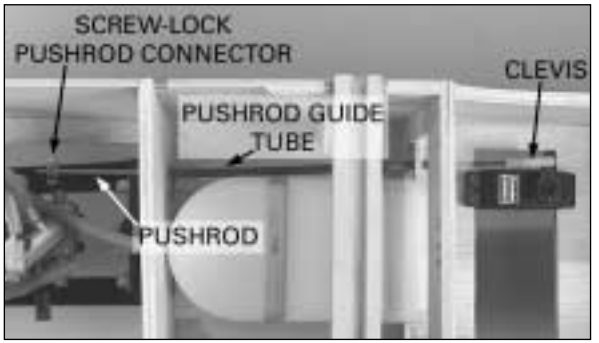
❑ 2. Use a Great Planes Dead Center™ Hole Locator (GPMR8130-shown in the photo) or your own preferred method to mark the locations of the holes for mounting the engine.

❑ 3. Remove the engine and the engine mount from the firewall. Drill #36 (or 7/64" [2.8mm]) holes through the mount at the marks, then tap 6-32 threads into the holes. Mount the engine mount to the fuse, but center the mount on the screws (the mount may have some side-to-side play) before fully tightening them. Mount the engine to the mount with 6-32 x 1" [25mm] screws and #6 lock washers and flat washers.

Now that the engine is mounted, go ahead and hook up the throttle and do the rest of the hookups while the engine compartment is open and easily accessible.

❑ 4. Refer to the side view of the fuselage plan and glue pieces of 1/8" x 1/2" balsa (left over from making the fuselage sides) to the top of both sides of the opening in the fuselage top for the servo screws.

Refer to these photos while hooking up the throttle.



❑ 5. Plan the throttle hookup. The throttle servo may be mounted on either side of the fuselage–whichever aligns best with the carburetor arm on the engine. Use a 3/16" [4.8mm] brass tube sharpened on the end or an extended 3/16" [4.8mm] drill to drill a hole through the firewall for the throttle pushrod tube.

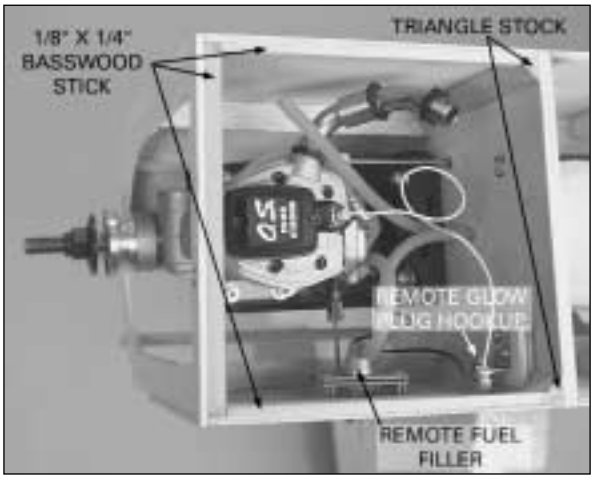
❑ 6. Use one of the leftover 5-1/2" [140mm] pushrod tubes for the throttle. Slide the tube into place. Hook up the throttle using a 2-56 x

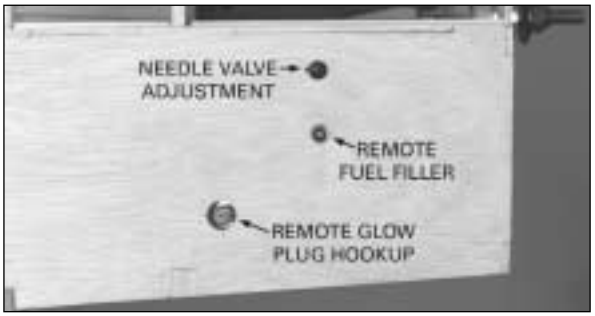
18" [460mm] pushrod connected to the throttle servo with a nylon clevis and connected to the carburetor with a screw-lock pushrod connector.

❑ 7. Make a ***brace*** for the aft end of the throttle tube by drilling a 3/16" [4.8mm] hole through a piece of leftover plywood and gluing it to F3 as shown.

❑ 8. Drill 1/16" [1.6mm] holes through the fuse top for the throttle servo screws. Run the servo mounting screws in and out of the holes a few times, remove the screws, then add a few drops of thin CA to the holes and allow to fully harden. Mount the servo in the fuselage with the screws.

Refer to these photos while finishing the engine compartment.





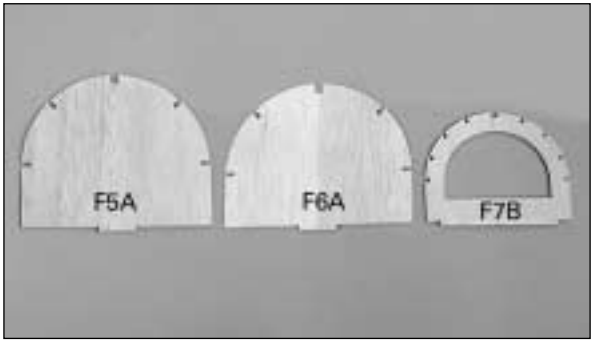
❑ 9. Should you decide to use a remote fuel filler and a remote glow plug hookup, mount them and cut access holes for them where necessary. A mount for the fuel filler like the one in the photo could be made from leftover 1/8" [3.2mm] plywood, or the fuel filler could be mounted directly to the fuselage side. Cut a hole for the needle valve as well.

❑ 10. Temporarily mount the muffler to see how it fits in the fuselage. An O.S. MAX "in" type exhaust header pipe (OSMG2624) was used on this model to aim the exhaust downward without having to cut holes in the fuselage sides.

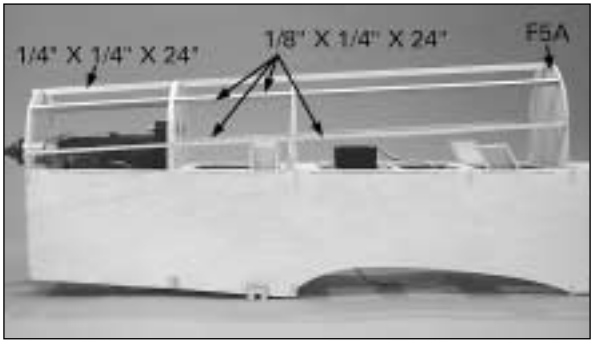
❑ 11. Cut the approximately 14" [360mm] piece of triangle stock leftover from the top, center wing panel into two pieces and glue them to both sides of the front of the firewall and the fuse sides.

❑ 12. The same as was done for the tank tray, glue together two pieces of 1/8" x 1/4" [3.2 x 6.4mm] basswood left over from the wing spars. Cut the stick to the correct length and glue it to the bottom of F1 along the aft edge between the fuselage sides. Glue two more 1/8" x 1/4" [3.2 x 6.4mm] basswood sticks along the inside bottom edge of both fuselage sides between the firewall and F1.

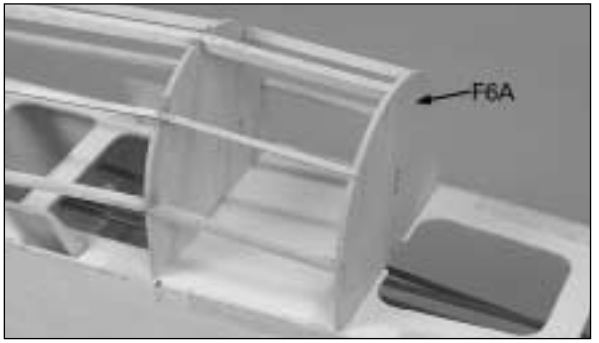
BUILD THE TOP OF THE FUSELAGE



❑ 1. Glue together both halves of the die-cut 1/8" [3.2mm] balsa **formers F5A**, **F6A** and **F7B**.



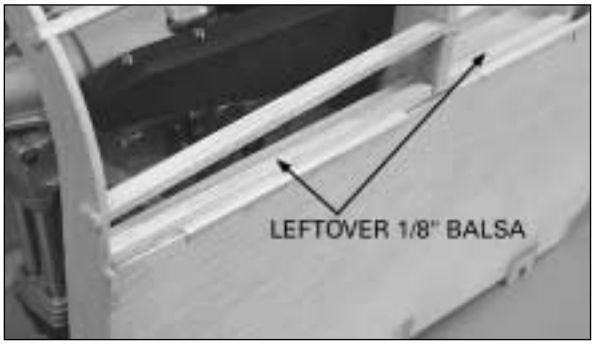
❑ 2. Glue formers F3A, F5A and F6A to the fuse top as shown. Cut one 1/4" x 1/4" x 24" [6.4 x 6.4 x 610mm] balsa stick and four 1/8" x 1/4" x 24" [3.2 x 6.4 x 610mm] balsa sticks to the correct length, then glue them into the notches in formers F1 through F5A. Note that the aft end of all the sticks "ends" in the middle of F5A. As you proceed, use a builders' square to remove warps and hold the stringers vertical. Glue the stringers into the formers.



❑ 3. Cut 4-1/2" [115mm] from each of four more 1/8" x 1/4" x 24" [3.2 x 6.4 x 610mm] balsa sticks and 4-1/2" [115mm] from one 1/4" x 1/4" x 24" [6.4 x 6.4 x 610mm] balsa stick. Save the longer sticks for the aft end of the fuselage. Glue the 4-1/2" [115mm] sticks into the notches of formers F5A and F6A. Cut, then sand the sticks even with the back of F6A.

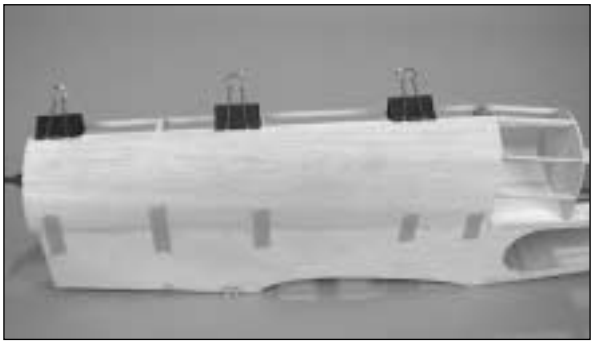
❑ 4. The same as you made the skins for sheeting the center panels, glue together two 1/8" x 3" x 30" [3.2 x 75 x 760mm] balsa sheets to make a skin for one side of the front of the fuselage. Glue together two more sheets for the other side.

❑ 5. Sand both skins flat and even, then cut them to a length of 21" [535mm]. Save the remainder of the sheets for sheeting over the cockpit between formers F5A and F6A.

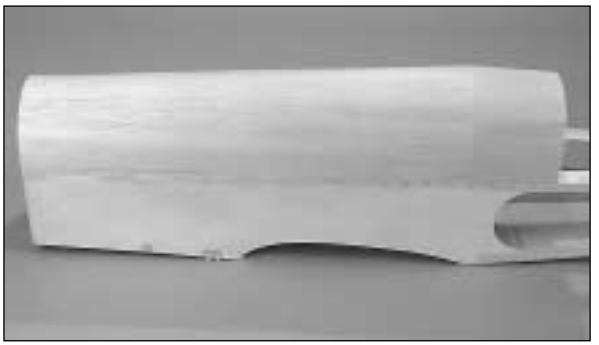


❑ 6. Use a ballpoint pen to mark the location of the struts on the fuselage sides. This will aid in cutting the sheeting for the struts later. As shown in the photo, glue strips of leftover 1/8"

[3.2mm] balsa to the fuse top 3/32" [2.4mm] from the edge between formers F1 and the firewall and between the firewall and the front strut mounts. Also glue 1/8" [3.2mm] strips of balsa to the fuselage top between F3A and the aft strut mount. These strips will support the bottom of the sheeting when gluing it into position.

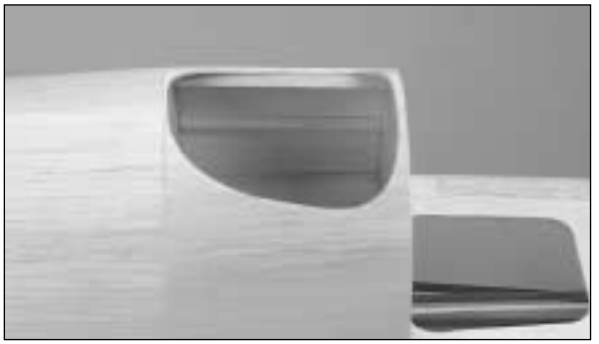


❑ 7. Sheet the left side first. Wet the outside of one of the skins with a few squirts of window cleaner or water, then position it on the fuse. Bend the skin into position, then use a ballpoint pen to mark the top of the skin where it is to be cut over the center of the 1/4" x 1/4" [6.4 x 6.4mm] stringer on the top of the formers. Cut the skin at the marks, then test fit and continue to cut as necessary to get it to fit well. Glue the skin into position with medium CA. Use tape and clamps to hold it down until the glue hardens.

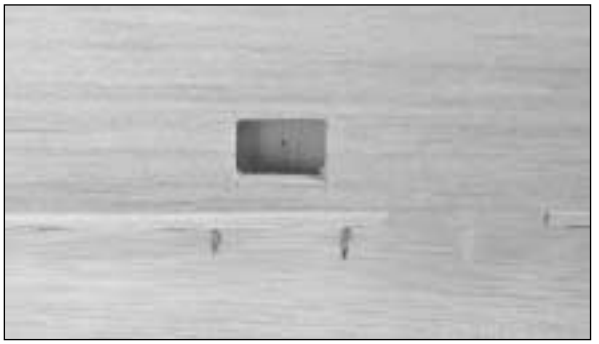


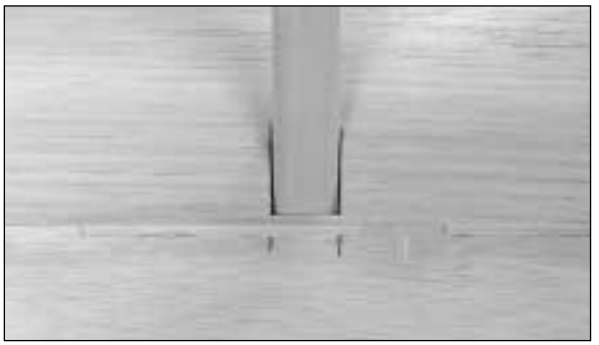
❑ 8. Glue the right skin into position the same way. Sheet the cockpit area with the remaining balsa sheeting left over from step 5.

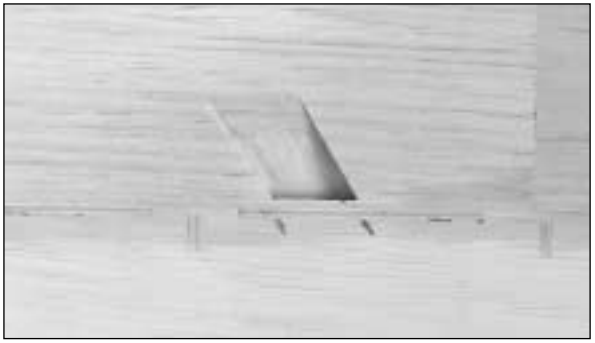
❑ 9. Before doing any sanding, use balsa filler where required to fill any gaps in the sheeting. Allow the filler to dry, then sand the sheeting smooth and even.



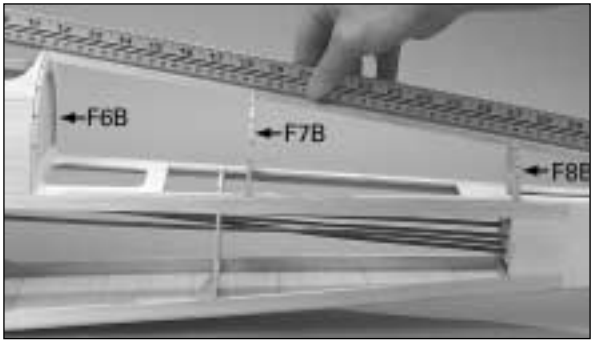
❑ 10. Use the **cockpit opening pattern** provided on the plan to trace the outline of the cockpit opening onto the fuse sheeting. Cut out the opening.







❑ 11. Using the marks made earlier on the fuselage sides, cut the sheeting to accommodate the wing struts. Start by making the openings small, then carefully enlarge the holes until the struts will fit.



❑ 12. Glue the die-cut 1/8" [3.2mm] plywood **former F6B** into position on the back of F6A. Glue the laser-cut 1/8" [3.2mm] balsa **former F8B** into position. Position, but **do not glue** the die-cut 1/8" [3.2mm] balsa former F7B on top of the fuselage. Insert the 1/4" x 1/4" [6.4 x 6.4mm] balsa stick left over from step 3 into the notches of the three formers. Using a straightedge, adjust the position of F7B until the stringer is straight. Glue F7B into that position. Glue the stringer into the notches of the formers.

❑ 13. Use the four remaining 1/8" x 1/4" [3.2 x 6.4mm] balsa sticks left over from step 3 and four more 1/8" x 1/4" x 24" [3.2 x 6.4 x 610mm] balsa sticks to make the stringers that run from F6B to F8B and glue them into position.

FINAL CONSTRUCTION

MOUNT THE BOTTOM WING

❑ 1. Sand the bottom of the bottom center wing panel flat, smooth and even. Use 30-minute epoxy to glue the **aft landing gear block** into the bottom of the bottom center panel.

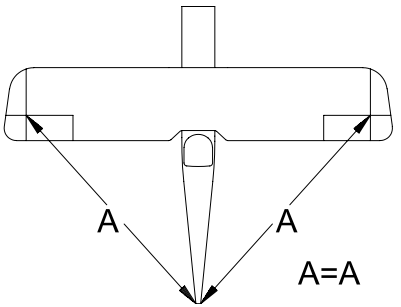
❑ 2. Starting with a razor plane, followed by sanding, shape the leading edge of the bottom wing as shown on the plan.

❑ 3. Install the 3/16" x 4" [20.6 x 100mm] **wing dowels** in the bottom wing. You may permanently glue them in now with 30-minute epoxy, or wait until after the wing is covered (which is the way it was done with the model shown in this manual). Fit the bottom wing into the fuse. Place weights on the wing to hold it down.

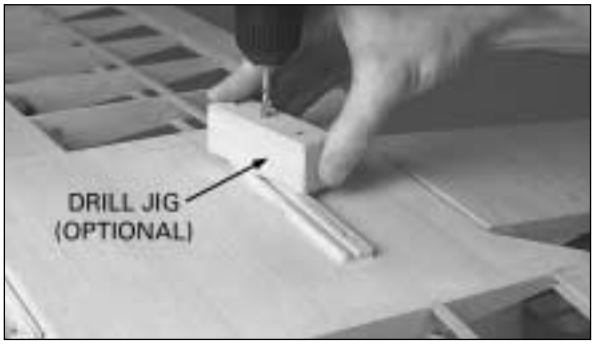
❑ 4. Taking accurate measurements, mark the aft landing gear block where the holes for the

wing bolts are to be drilled (the holes are 4" [100mm] apart–2" [50mm] both sides of center).

❑ 5. Stick a T-pin into the center of the bottom sheeting near the aft end of the fuselage. Tie a small loop in one end of an approximately 50" [1.3m] piece of non-elastic string such as K & S #801 Kevlar thread (K+SR4575). Slip the loop in the string over the T-pin.



❑ 6. Fold a piece of masking tape over the other end of the string and draw an arrow on it. Slide the tape along the string and align the arrow with one end of the wing as shown in the photo. Swing the string over to the same position on the other end of the wing. Adjust the wing and slide the tape along the string until the wing is centered (as shown in A = A in the sketch) and the arrow aligns with both sides of the wing.



❑ 7. With the wing in alignment, drill #7 (or 13/64") holes through the aft landing gear block and the wing bolt plate inside the fuse at the marks made in step 4. **Hint:** Make a ***drill jig*** by using a drill press to drill the hole through a hardwood block. Setup the drill press so the hole will be perpendicular. This will ensure that the holes you drill through the wing go straight through.

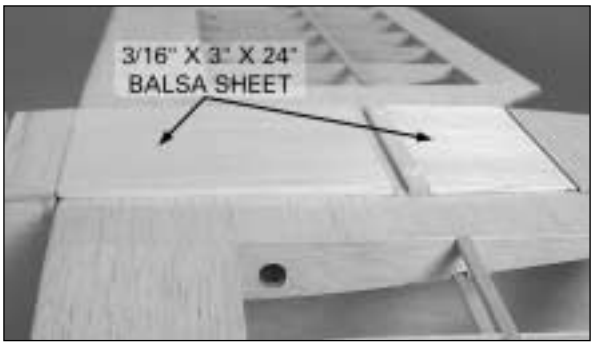
❑ 8. Remove the wing from the fuse. Use a 1/4-20 tap to tap threads into the wing bolt plate. Enlarge the holes **in the wing only** with a 17/64" (or 1/4" [6.4mm]) drill.

❑ 9. Harden the threads in the wing bolt plate by adding a few drops of thin CA or epoxy and allowing to fully harden. Re-tap the threads.

❑ 10. Test mount the wing to the fuse with the 1/4-20 x 2" [50mm] nylon wing bolts. **Note:** When mounting the wing at the flying field, don't forget to use a 1/4" washer under each bolt to help secure the main landing gear.

While we've got the plane upside-down, let's go ahead and finish the bottom of the fuse...

❑ 11. Glue a leftover 1/8" x 1/4" [3.2 x 6.4mm] balsa stick to both sides of the forward landing gear block (as shown on the side view of the fuselage plan) to support the bottom sheeting. Now would be a good time to fuelproof the fuel tank compartment. Use epoxy or fuelproof paint to do so. Sheet the bottom of the fuselage from the forward landing gear block to F3 and from the forward landing gear block to the firewall with the 1/8" x 3" x 11-7/8" [3.2 x 75 x 300mm] balsa sheet. Before gluing the sheets down, fuelproof the inside of the sheets as well.

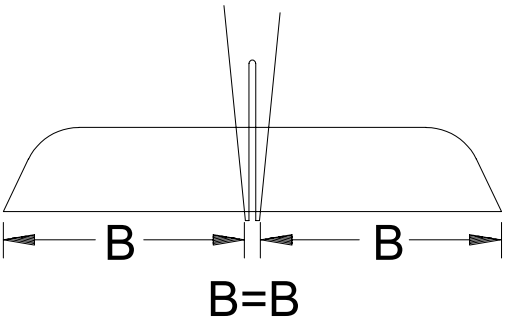


❑ 12. Bolt the bottom wing back onto the fuselage. Sheet the bottom of the wing to match the fuselage between F3 and F5 using the 3/16" x 3" x 24" [4.8 x 75 x 610mm] balsa sheet. Sand the sheeting even with the bottom of the fuselage and the aft landing gear rail.

FIT THE STAB & FIN

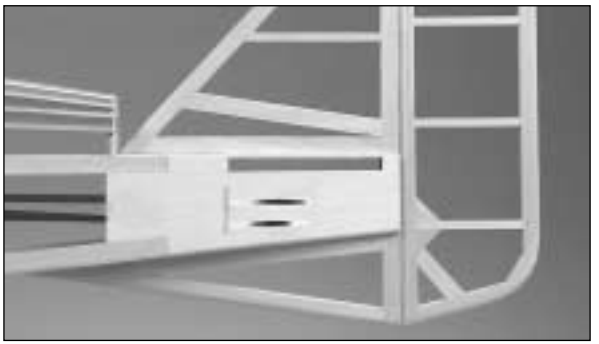
Note: These instructions show how to temporarily fit the stab and fin to the fuselage. After final sanding, the stab, fin and fuselage will be covered. Then, the stab and fin will be **permanently** glued in. Modelers who prefer to glue the stab and fin to the fuselage before covering may do so after final sanding.

❑ 1. Bolt the bottom wing to the fuselage and slide the stabilizer into position. As best as you can, for now just visually center the stab in the fuse. Stand a few feet behind the model and view the alignment between the stab and the bottom wing. If the stab does not align with the wing, there may be enough free-play to tilt the stab one way or the other to align it. If you cannot get the stab to align with the wing, remove the stab from the fuselage. Sand one side of the stab saddle as necessary until the stab is able to align with the bottom wing.



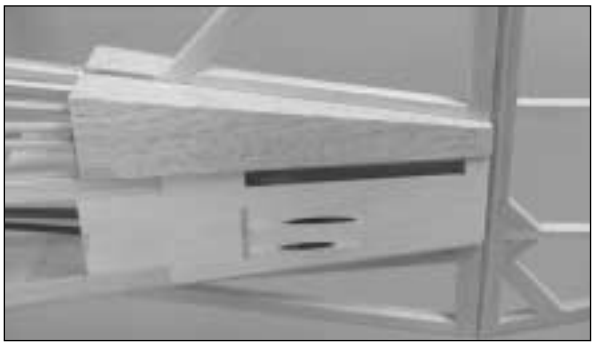
❑ 2. Taking accurate measurements, center the trailing edge of the stab in the fuselage by

making sure B=B as shown in the sketch. The same way you aligned the bottom wing, use the "pin and string" technique to align the stab (insert the pin into the top stringer in the front of the fuselage). Use a ballpoint pen to lightly mark the top and bottom of the fuselage sides onto the stab. Later, the stab will be covered to the lines, leaving an area of exposed balsa for gluing the stab into position.



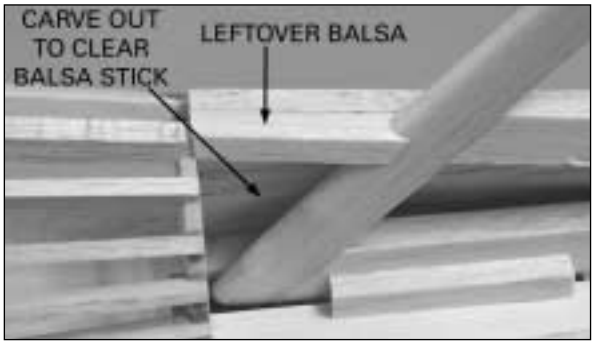
❑ 3. Cut a notch in the aft end of the bottom fuselage sheeting to accommodate the trailing edge of the fin. Test fit the fin onto the fuselage.

❑ 4. Taking accurate measurements from side-to-side, center the fin in the fuselage, then glue pieces of leftover balsa to the top of the fuse holding the fin centered. Be careful not to get any glue on the fin.

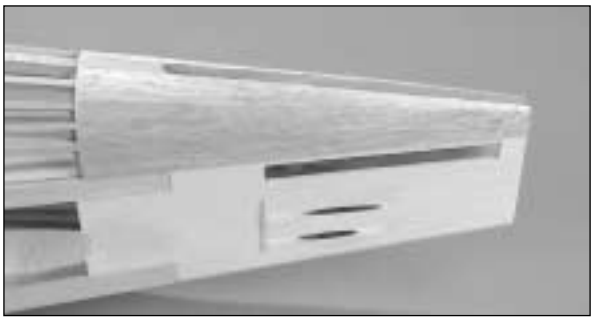


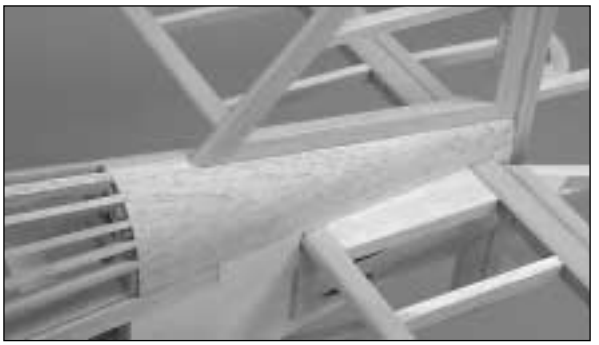
❑ 5. Position both 1-1/8" x 1-7/8" x 8-1/2" [28.6 x 82.4 x 216mm] balsa blocks on the fuse on both sides of the fin (the blocks will have to be carved-out to accommodate the balsa sticks).

❑ 6. Mark the outline of former F8 on the front of the blocks. Remove the blocks, then roughly carve them to the approximate shape.



❑ 7. Using care not to get any glue on the fin, glue one of the blocks to the top of the fuselage. Fill the space between the leading edge of the fin and F8 with a piece of leftover balsa.

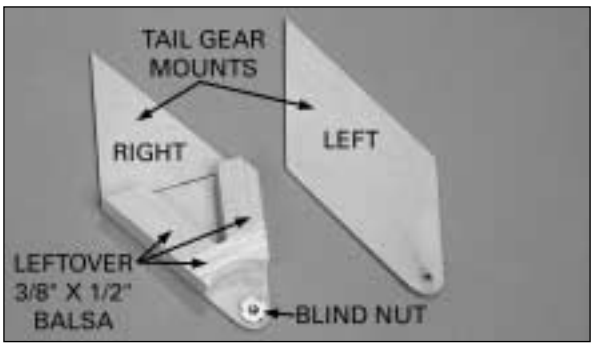




❑ 8. Again, using care not to get any glue on the fin, glue the other tail block to the fuselage. Remove the fin. Use a razor plane to roughly shape the tail blocks to match the fuselage, then use sandpaper to finish the job. Just for fun, reinstall the fin and stab to see how it all looks!

MAKE THE TAIL GEAR MOUNT

Refer to this photo for the following four steps.

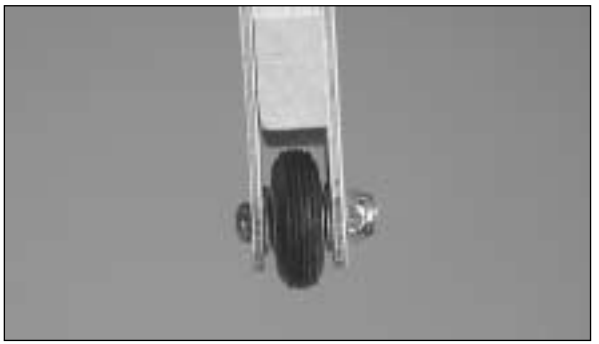


❑ 1. Drill 9/64" (or 1/8" [3.2mm]) holes through the punchmarks in both die-cut 1/16" [1.6mm] plywood **tail gear mounts (TGM)**. Fit a 4-40 blind nut in the inside of both mounts, then use a hammer to securely tap the blind nuts all the way into the wood (do this over a piece of wood so the blind nut can go all the way through). Use a few drops of thin CA to secure the blind nuts.

❑ 2. File the protruding portions of the blind nuts even with the outside of the tail gear mounts.

❑ 3. Position the **right** mount over its location on the plan. Mark the bottom of the rudder on the tail gear mount.

❑ 4. Cut pieces of leftover 3/8" x 1/2" [9.5 x 12.7mm] balsa as shown and glue them into position.

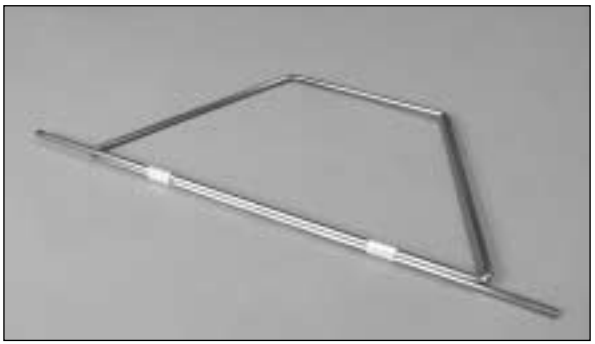


❑ 5. Enlarge the hole in the 3/4" [19mm] tail wheel with a #34 (or 7/64" [2.8mm]) drill. Put the assembly together with the wheel and a 4-40 x 5/8" [16mm] Phillips-head screw and a 4-40 lock nut, but **do not** glue it together.

❑ 6. Test fit the tail wheel assembly to the rudder. If necessary, sand the balsa framework of the tail wheel assembly to match the thickness of the sanded rudder. After a good fit has been achieved, permanently glue the left tail gear mount to the assembly (leave the wheel attached so the left and right mounts remain in alignment). Set aside until it's time to finish the model.

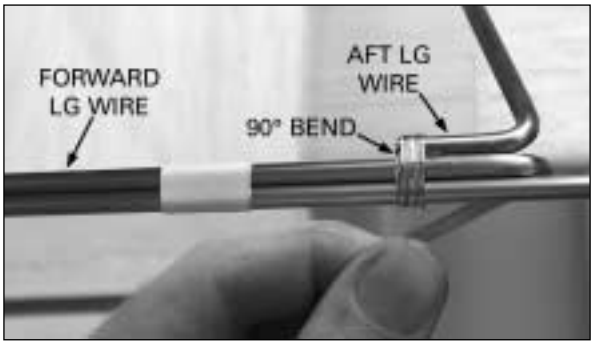
MOUNT THE MAIN LANDING GEAR

❑ 1. Prepare the prebent 3/16" [4.8mm] **forward** and **aft main landing gear wires** for soldering and painting by cleaning them with denatured alcohol or other suitable solvent. **Thoroughly** sand the wires with medium-grit sandpaper, followed once again by wiping with denatured alcohol. Use a file or a rotary tool with a cutoff wheel to remove any burrs from the ends of all the wires.



❑ 2. Tightly tape the horizontal wires of the **forward landing gear wire** together as shown.

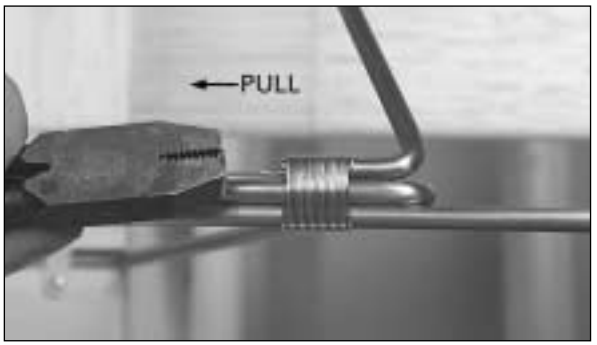
Refer to this photo for the following three steps.



❑ 3. Drill 1/16" [1.6mm] holes in the forward landing gear block for the screws that hold the nylon landing gear straps. Bolt the bottom wing onto the fuselage, then place both landing gear wires on the model. With the forward landing gear wire in the groove, mount the landing gear straps to the forward landing gear block with four #2 x 1/2" [12.7mm] screws.

❑ 4. Tape one side of the aft wire to the forward wire. Use a few drops of thin CA and accelerator if necessary to tack-glue the other side of the aft wire to the forward wire.

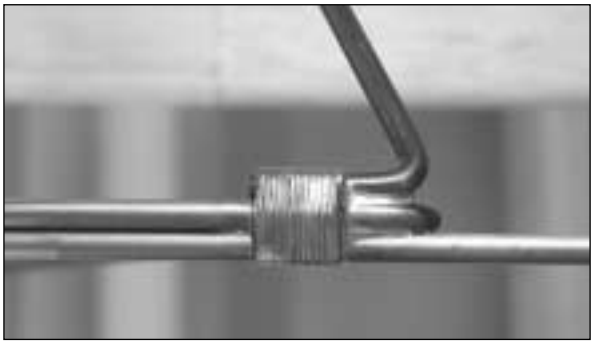
❑ 5. Make a 90° bend about 1/4" [6.4mm] from one of the 36" [915mm] pieces of the thin reinforcement wire included with this kit. Tuck the bent end of the wire between two of the landing gear wires (indicated by the arrow in the photo), then tightly wrap the rest of the wire around the landing gear.



❑ 6. Continue to **neatly** and **tightly** wrap the wire around the landing gear until there are just a few inches left. Insert the end of the wire back through the wire wrapped around the gear, then pull tight with a pair of pliers. Cut off the excess wire.

❑ 7. Flip the model right-side-up. Add several drops of soldering flux that comes with silver solder to the area to be soldered. Heat the area with a torch and add silver solder. Make certain to use **silver solder**, not regular electrical solder. While the joint is still hot, carefully turn the model back over and inspect the bottom. If necessary, add more flux and solder while heating the joint. Do not add excess solder until it drips from the joint. Allow the joint to cool. After the solder has hardened, but while it is

still hot, carefully use a paper towel or a cloth to wipe away as much of the residual "caramelized" soldering flux as possible.



❑ 8. Carefully examine the joint from all angles. If necessary, reheat and add or remove solder as needed. This photo shows what the soldered joint should look like.

❑ 9. Solder the other side of the gear the same way. After the solder has cooled, remove the landing gear and **thoroughly** clean the wire to remove all residual soldering flux. If necessary, re-sand with fine sandpaper.

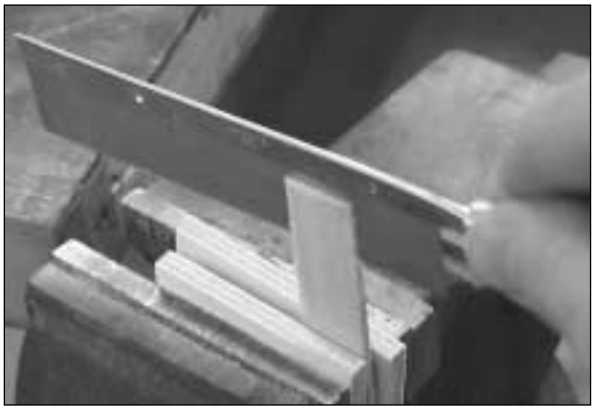
❑ 10. Test fit the wheels on the landing gear with a 3/16" [4.8mm] wheel collar on both sides of each wheel. File a flat spot on the wire for the set screw in the outer wheel collar that holds on the wheels. Cut off the excess wire that protrudes from the wheel collars. If you choose to do so, the landing gear wire may be painted at any time.

PREPARE THE WING STRUTS

The wing struts will be cut to approximate length and prepared for mounting now, but will be finished and mounted after the model has been covered.

❑ 1. Using the patterns provided on the plan, cut all eight **wing struts** from the 18" [460mm] airfoil-shaped basswood sticks. **Note:** The patterns for the wing struts on the plan are approximately 1/8" [3mm] longer than the required finished length, so there is no need to cut them longer than the pattern.

Note: The procedure of cutting the slots in the ends of the struts for the aluminum strut retainers may appear to be laborious, but if you approach it methodically, take your time and work accurately, it's really not that difficult. In the end you'll have a job well done with twelve (gulp) neatly cut slots in the ends of the struts. To start, you could practice by cutting slots in the short pieces left over from the previous step.



❑ 2. Proceeding with care, use an X-Acto #240 razor saw (XACR1440) or similar coarse-tooth hobby saw to cut a 3/4" [20mm] deep slot in the end of one of the struts for the aluminum **strut retainers**. As shown in the photos, a vice mounted to a workbench is indispensable for this. Use pieces of scrap wood to protect the strut.

❑ 3. Widen the slot with a piece of medium-grit sandpaper folded in half.

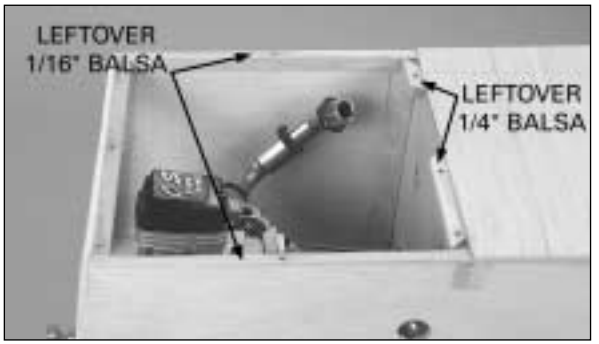
❑ 4. Finish widening the slot to the correct thickness with a piece of coarse-grit sandpaper folded in half. If you happen to have one, a D.G. Products Perma-Grit tungsten carbide flat sanding bar works best. When completed, a strut retainer should slide into the slot with little resistance.

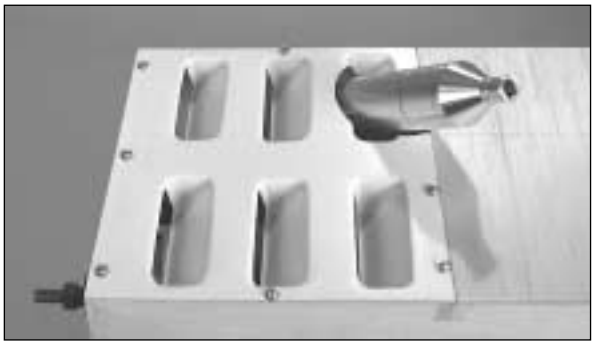
❑ 5. Cut the rest of the slots in the ends of the struts. Don't forget–the **inner struts** require slots in only the **TOP** (no sense in cutting any unnecessary slots!).

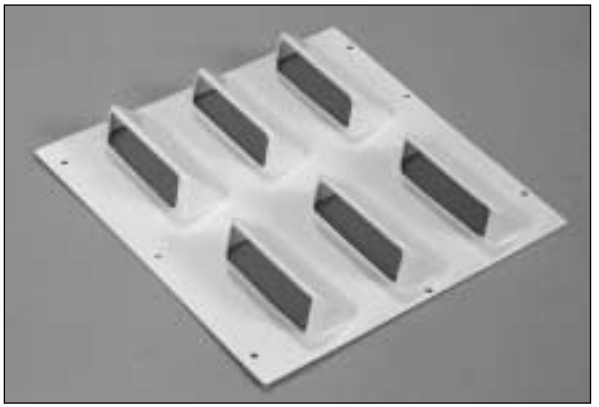
This is as far as we will go with the wing struts until after the model has been covered.

MOUNT THE ENGINE COWLS

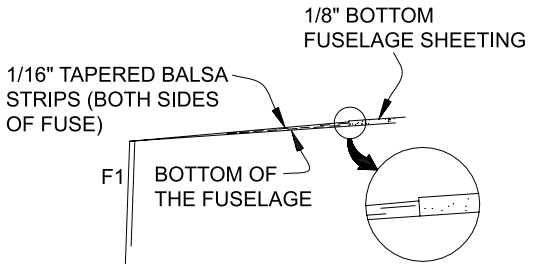
Refer to the following two photos while fitting the bottom engine cowl.







❑ 1. Cut out the molded plastic **bottom engine cowl** slightly larger than the molded-in cutlines around the edges. A rotary tool with a high-speed cutter bit is recommended for cutting the openings in the louvers.

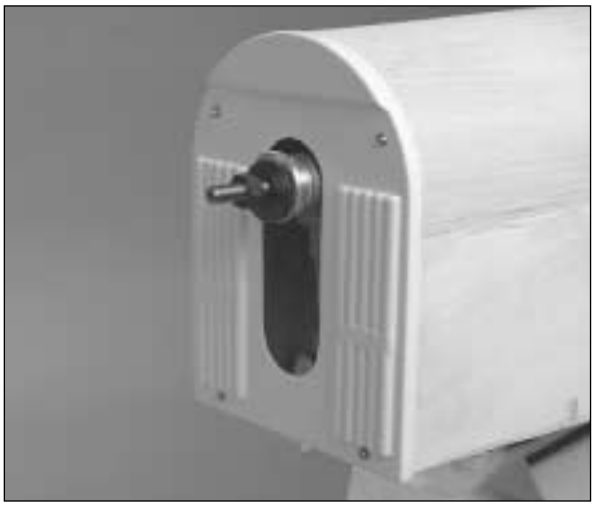


2. Glue tapered strips of leftover 1/16" [1.6mm] balsa to the bottom of the fuselage sides so that when in position, the aft edge of the bottom cowl will be even with the bottom fuselage sheeting.

3. Glue leftover 1/4" [6.4mm] balsa sticks to the firewall for the screws that secure the aft edge of the bottom cowl. Fit the bottom cowl to the fuse, sanding the edges of the cowl where necessary for a good fit (this step will be easier without the engine muffler in the way).

4. Drill 1/16" [1.6mm] holes through the bottom cowl into the bottom of the fuselage. Remove the cowl. Enlarge the holes **in the cowl** only with a 3/32" [2.4mm] drill. Run the #2 x 3/8" [9.5mm] screws in and out of the holes a few times to "cut" threads, then remove the screws and add a few drops of thin CA to the holes and allow to fully harden. Mount the bottom cowl to the fuse with the screws and #2 washers.

5. Cut out the bottom cowl to accommodate the muffler.



❑ 6. Cut out and test fit the molded plastic **front engine cowl** to the fuselage. Drill four 1/16" [1.6mm] holes through the cowl into F1. The bottom two holes should be centered in the basswood stick on the back of F1. After drilling the top two holes, glue pieces of leftover 1/8" x 1/4" [3.2 x 6.4mm] basswood to the back of F1 centered over the holes. Drill 1/16" [1.6mm] holes through the basswood pieces, "cut" the threads with another #2 x 3/8" [9.5mm] screw, and harden with CA. Enlarge the holes in the cowl only with a 3/32" drill, then mount the front cowl with four #2 x 3/8" [9.5mm] screws and #2 washers.

COVER THE MODEL

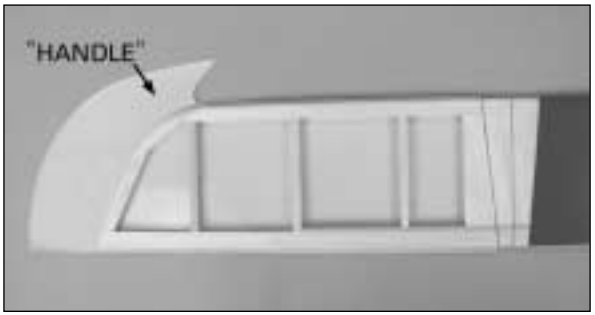
In addition to covering, there are still a few things that need to be done to finish the model such as the rest of the radio installation and a few scale details like the pilot, dummy exhaust pipes and finishing the wing struts. But it's easiest to do these things after the model has been covered.

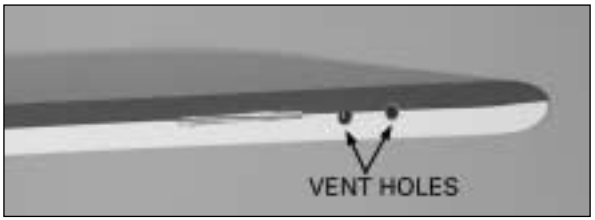
IMPORTANT: The following instructions illustrate how the S.E.5a on the kit box top was covered. It was finished to resemble the S.E.5a on the cover of the Squadron/Signal Publications *"S.E.5a In Action"* book. You may

follow these instructions exactly, or simply use them as a guideline while applying your own covering techniques. However you decide to finish your S.E.5a, **do not forget to install the "Y" connectors in the wings before covering them.**

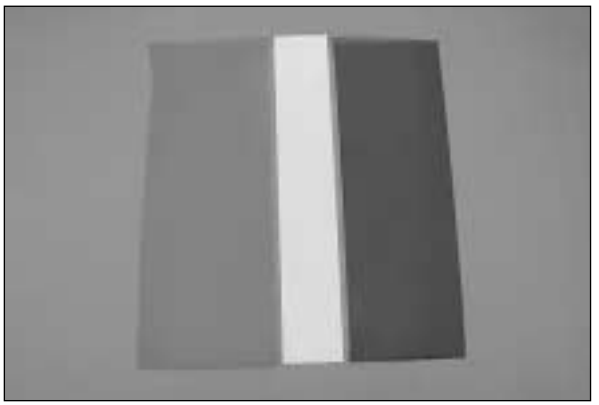
❑ 1. Remove the engine and any hardware in the model that would interfere with sanding and covering.

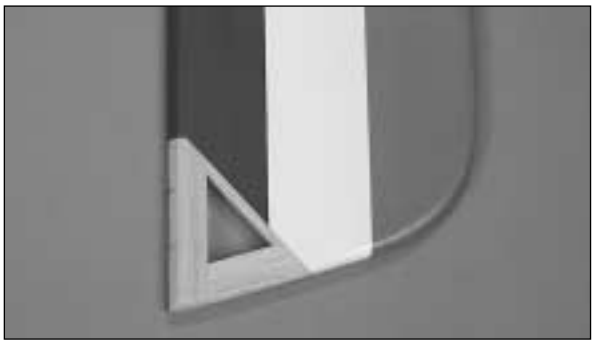
❑ 2. Apply balsa filler where needed, allow to dry, then final-sand all parts of the model using progressively finer grits of sandpaper finishing with 400-grit.





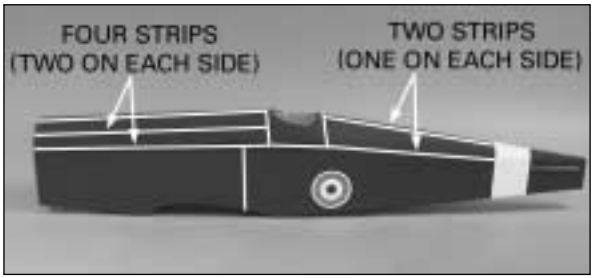
❑ 3. Cover the stab up to the lines marked earlier indicating the sides of the fuselage. First apply the cream to the bottom, followed by the olive drab on top. Cover the top and bottom of the elevators the same way. Don't forget to cut the covering from the small vent holes to allow air to escape while tightening the covering. **Hint:** Pre-cut the leading and trailing edges of the covering on the workbench before ironing it down. Leave excess material around the tip that can be used as a "handle" to pull the covering tight around the tips. After the covering has been ironed around the tips, trim off the excess "handle."





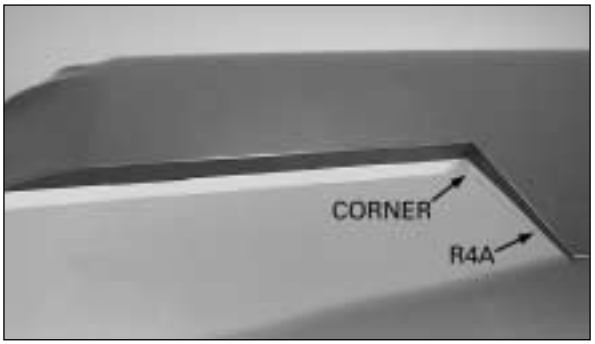
❑ 4. Cover the fin, then the rudder. For the rudder, pieces of dark red, white and sky blue MonoKote were first scuffed with 600-grit sandpaper to give it a matt appearance. Then, the pieces were cut into strips and ironed together off the model over a piece of glass. A

1/2" [15mm] overlap is suggested. Lastly, the red, white and blue were applied to the rudder as though it were one piece of covering. Use care not to heat the overlapping seams while heating the rest of the covering. Otherwise, the adhesive on the covering will soften, and the seam may pull apart as the covering tightens. Don't forget to leave part of the rudder exposed for gluing on the tail wheel mount.

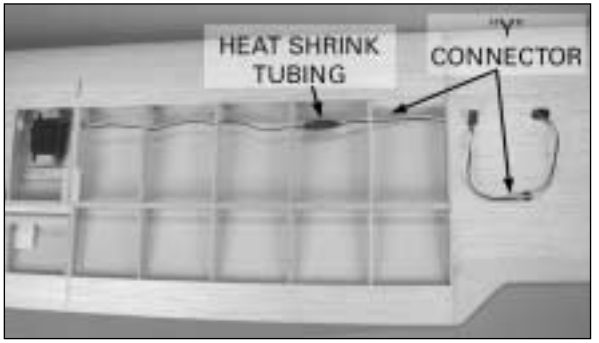


❑ 5. The fuselage is a little trickier to cover than it may appear. However, it can be simplified by covering it in several sections rather than attempting to do each side in just one or two pieces. Start with the white band (scuffed with 600-grit sandpaper first), then cover the fuse aft of the stripe. Cover the rest of the fuselage in small sections as shown in the photo.

❑ 6. Cover the aileron servo hatches.



❑ 7. Cover the "corners" and the side of rib R4A in the wings where the ailerons fit.

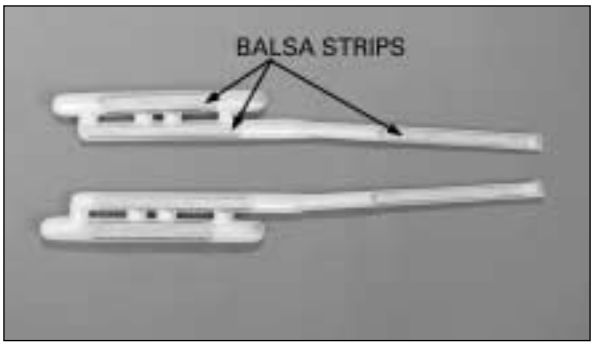


❑ 8. Cover the bottom of the wings, but **do not** yet cover the top of the wings. Before covering the tops, route a "Y" connector through the holes in the ribs in both wings. Connect the "Y" connectors to the aileron servo wires, then mount the servo hatches to the wing. Secure the connections between the "Y" connector and the servo wires with heat shrink tubing, tape or clips intended for that purpose. Also cut a hole through the sheeting in the top of the bottom wing for the Y-connector to exit (the hole in the top wing for the "Y" connector will be cut later). Now you may cover the tops of the wings and proceed to the ailerons.

PAINTING

❑ 1. Now that the model has been covered, use epoxy or fuelproof paint to fuelproof areas of unprotected wood that will be exposed to fuel or exhaust residue such as the inside of the engine compartment and partway down into the radio compartment inside the fuselage (including the fuselage sides, the back of former F3 and the front of former F5). Also fuelproof the grooves in the landing gear blocks if they are not already sealed by the covering.

❑ 2. Cut out the molded plastic **head rest** leaving about a 3/16" [5mm] "flange" around the bottom. Cut out the molded plastic **right** and **left exhaust pipes**. Use coarse sandpaper to sand the exhaust pipes so they will lie flat.



❑ 3. Glue strips of leftover balsa inside the exhaust pipes as shown. Sand the balsa strips even with the bottom edges of the exhaust pipes so they will lie flat again.

❑ 4. Sand all of the plastic parts (head rest, exhaust pipes, top and bottom cowl) with 400-grit sandpaper. Paint the parts as required. On the model featured on the kit box cover and in this manual, only one coat of Top Flite LustreKote olive drab was required for the front and bottom cowl and the headrest, and one coat of flat black was required for the exhaust pipes.

❑ 5. After the paint on the exhaust pipes has fully dried, strip the covering from the fuselage where necessary so the balsa strips inside the exhaust pipes will contact bare balsa. (The wing struts are installed in the photo, but should not yet be installed on your model.)

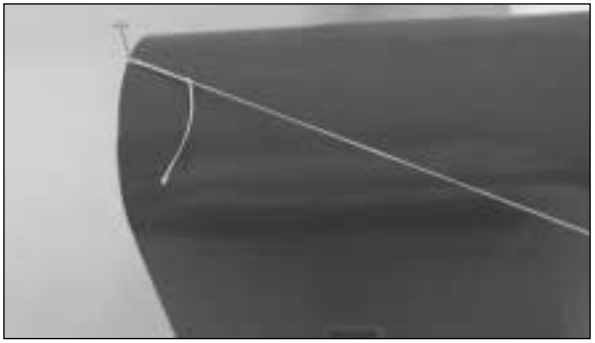
❑ 6. Glue the exhaust pipes into position. The head rest will be glued on after finishing the cockpit later.

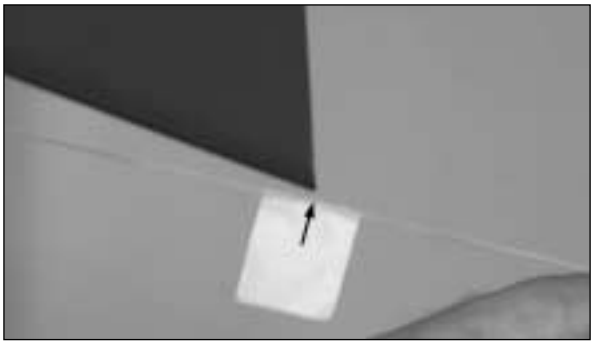
❑ 7. While geared-up for painting, sand the tail wheel mount and apply a light coat of wood stain. Minwax Special Walnut 224 stain was used on this model. Allow to dry, then spray on two coats of clear LustreKote, allowing it to dry and sanding between coats.

FINAL ASSEMBLY

GLUE IN THE STAB & FIN

❑ 1. Cut the covering from the hinge slots in the tail surfaces and from the pushrod exits in the rear of the fuselage. Also cut the covering from the slots in the fuselage for the stab and fin.

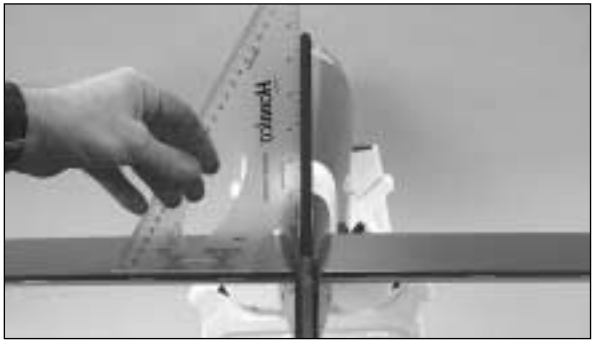




❑ 2. Prepare to glue the stab into the fuse by double-checking the stab alignment using the pin and string technique the same as was done before the model was covered.

❑ 3. Remove the stab from the fuselage. Bolt the bottom wing to the fuselage. **Liberally** coat the exposed balsa on both sides of the stab and the inside of the fuselage slot where the stab goes in. Slide the stab into position. Working quickly, use small paper towel squares or tissues dampened with denatured alcohol to wipe off epoxy that has been deposited on the stab. Use the pin and string to align the stab with the fuselage and visually align the stab with the bottom wing. Do not disturb the model until the epoxy has fully hardened.

❑ 4. If you haven't yet done so, cut a strip of covering from the bottom of the fuselage where the bottom of the fin comes into contact.

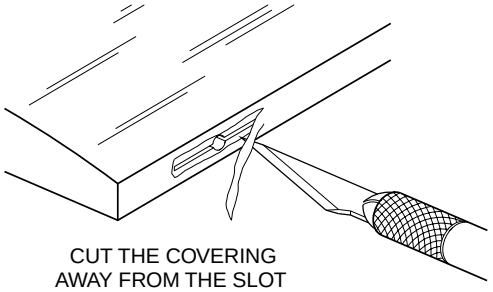


❑ 5. Test fit the fin into the fuselage. Use a Hobbico Builder's Triangle or another triangle to be certain the fin is perpendicular to the stab. If necessary, when gluing the fin into position in the next step, use masking tape to pull the stab to one side or the other to get it vertical.

❑ 6. Glue the fin into position on the top and bottom of the fuselage with 30-minute epoxy. Use T-pins where necessary to hold the bottom of the fin to the bottom of the fuselage.

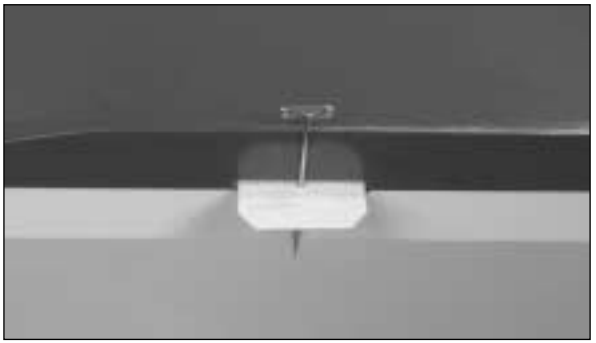
❑ 7. Mount the tail wheel to the tail gear mount. Use 30-minute epoxy to glue the tail gear mount to the rudder.

HINGE THE CONTROL SURFACES



CUT THE COVERING
AWAY FROM THE SLOT

❑ 1. If you haven't yet done so, cut a thin strip of covering from all of the hinge slots in the wings and ailerons, stab and elevators and fin and rudder.



❑ 2. Join one of the ailerons to the corresponding wing with the hinges. If the hinges don't remain centered, stick a pin through the center of them, then join the aileron.

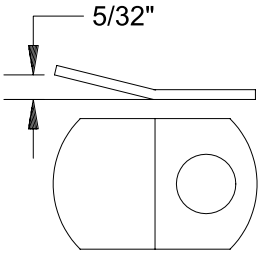
3. Remove the pins if used. Adjust the aileron so there is a small gap between the leading edge of the aileron and the trailing edge of the wing–just enough to slip a piece of paper through or to see light through.

❑ 4. Add six drops of thin CA to both sides of the hinges. Keep a tissue nearby to absorb excess CA in case any seeps into the hinge gap or onto the wing.

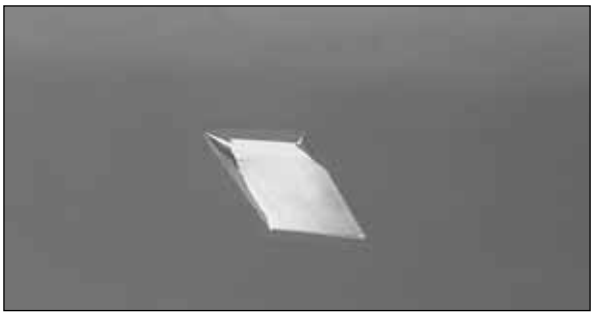
❑ 5. Join the rest of the control surfaces the same way.

FINISH THE WING STRUTS

❑ 1. Cut the covering from the slots for the strut retainers in the top and bottom wings.



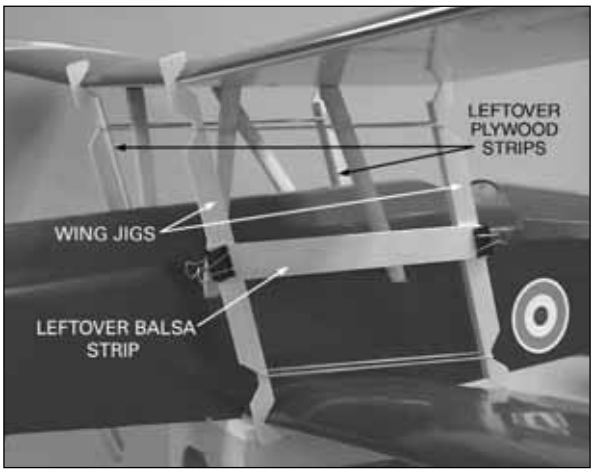
❑ 2. Bend **four** of the aluminum strut retainers as shown in the sketch. Use 30-minute epoxy to permanently glue **only the bent strut retainers** into the slots in the center panel in the top wing. Be certain the holes in the retainers are in the wing and that the retainers are installed so the bends are facing **inward**. While the epoxy is out, glue the wing dowels into the bottom wing if you have not done so already.



❑ 3. Cut the covering from the fuselage 1/8" [3mm] inside the openings for the wing struts. Use a trim iron to iron the edges of the covering down.

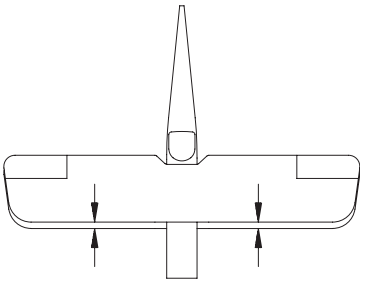
❑ 4. Bolt the bottom wing to the fuselage. Temporarily install the inner wing struts into the fuselage.

❑ 5. Join the top wing to the inner struts by fitting the strut retainers into the tops of the struts.



❑ 6. Use the included #33 (1/8"x7" [3.2x180mm]) rubber bands to hold the die-cut 1/8" [3.2mm] plywood **alignment jigs (AJ)** to the wings. The jigs are to be positioned where the outer panels join the center panels. Make certain all the jigs are in the same location on the wings. Stabilize the jigs by clamping the fronts to the rears with leftover balsa strips. Also note the 1/8"x1/4" [3x6mm] strips cut from leftover plywood that have been glued to the sides of the alignment jigs. This will increase the rigidity of the jigs while they are holding onto the wings.

❑ 7. Raise or lower the struts as necessary until they are contacting the bottom of the top wing and the leading and trailing edges of the wing are **centered** in the jigs. As the struts were cut slightly longer than required to allow for adjustment, it may be necessary to remove some or all of the struts and trim them to achieve the adjustment required.



TOP AND BOTTOM WINGS PARALLEL

❑ 8. View the model from the top. If necessary, adjust the top wing so it is parallel with the bottom wing.

❑ 9. Double and triple-check the wing alignment as described in the previous three steps. After confirming that the struts are the correct length and that the wings align with each other and the jigs, use a ballpoint pen to mark the **inside** of each of the four struts near the top noting its location (i.e. RF, RR, LF, LR). Make the marks small, but **deep** so they can't get sanded off and can be seen after the struts have been painted.

❑ 10. Rejoin the top wing to the fuselage with the struts and position the wing jigs. Drill a 1/8" [3.2mm] hole through one of the struts and the

strut retainer. Temporarily install a 4-40 x 1/2" [13mm] screw into the strut and strut retainer.

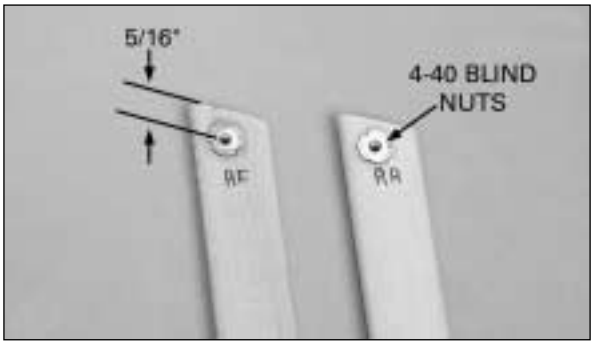
Hint: When threading in the 4-40 x 1/2" screws, a Great Planes long-handle 3/32" hex driver ball wrench (GPMR8002) is indispensable.

❑ 11. Confirm that the wing alignment has not shifted. Adjust if necessary. One at a time drill a hole through the remaining three struts and strut retainers, inserting a screw and checking the wing alignment between each.

❑ 12. Mark the struts near the bottom where they go into the fuselage. When it's time to paint the struts, paint them only 1/8" [3mm] below the line so the epoxy will adhere.

❑ 13. Reposition the wing jigs farther out on the wings–1" [25mm] inboard from the ends of the ailerons. Without using any glue, insert the remaining eight strut retainers into the slots in the wings. Test fit, trim as necessary, then test fit again and trim the outer struts until they fit the wing. As you proceed, be certain the wings remain centered in the wing jigs and that the leading edges of the wings remain parallel with each other.

Refer to this photo for the following four steps.



❑ 14. Once all of the outer struts have been trimmed to the correct length, one at a time, remove the outer struts and use a ballpoint pen to mark them the same way you did the inner struts (i.e. RF, RR, LF, LR). Remove the top wing and take all the struts off.

❑ 15. Drill a 1/8" [3.2mm] hole 5/16" [8mm] from both ends of the outer struts. Enlarge **only the inner hole** of all the struts with a 5/32" [4mm] drill. **Hint:** Slip a strut retainer into the slot in the strut to stop the drill from going all the way through and enlarging the hole in the other side.

❑ 16. Sand all the struts smooth with progressively finer grits of sandpaper.

❑ 17. Insert a 4-40 blind nut into one of the struts. Slip a piece of thin plywood into the slot in the strut, then use a hammer to lightly tap the blind nut all the way into the strut. Add medium CA all the way around the flange of the blind nut to permanently hold it in. Insert blind nuts into the holes in the rest of the struts the same way.

❑ 18. Apply wood stain to the struts. Allow to dry, then apply a clear coat of fuelproof paint.

❑ 19. After the paint on the struts has dried, mix up a batch of 30-minute epoxy and glue the inner struts into the fuselage. Working quickly before the epoxy hardens, join the top wing to the struts and bolt them on with the 4-40 x 1/2" [13mm] bolts. Reattach the wing jigs to the inner locations to the wings. Align the wings. Check the wing alignment frequently as the epoxy hardens.

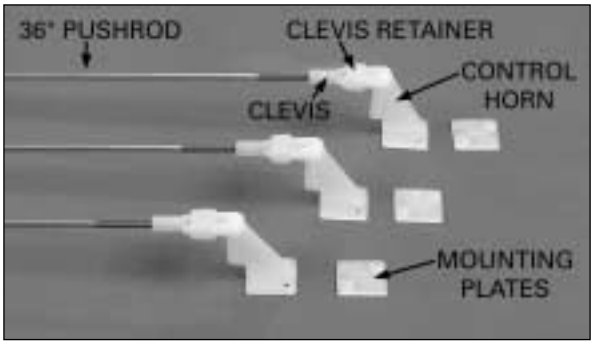
❑ 20. The same as you did before, install the strut retainers in the wings and fit the outer struts. Move the wing jigs out on the wings and check the alignment. Mark the **bottom** hole in all the outer struts onto the bottom strut retainers.

❑ 21. Remove struts. Remove the bottom strut retainers, marking each one so they may be reinstalled in the same slot they came from exactly the same way they came out.

❑ 22. Drill 1/8" [3.2mm] holes through the bottom strut retainers at the marks you made. Fill the strut retainer slots in the bottom wing with 30-minute epoxy, then working quickly, insert the strut retainers, wipe away excess epoxy and mount the struts to the top and bottom strut retainers with the screws. Still working quickly before the 30-minute epoxy hardens, position the wing jigs, align the wings as necessary and do not disturb the plane until the epoxy has fully hardened.

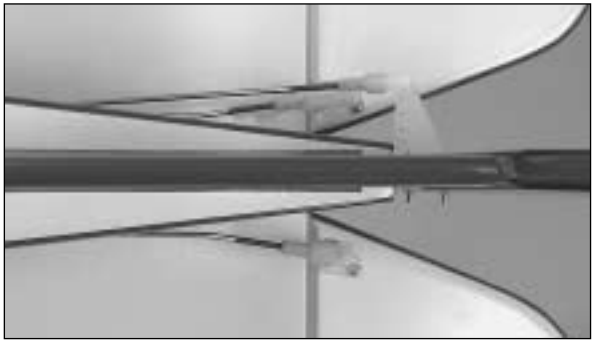
❑ 23. Place the model upside-down on your workbench. Mark, drill and glue the strut retainers into the top wing the same as you did the bottom wing. Leave the model upside-down while the epoxy hardens so it does not run down into the struts.

FINISH THE RADIO INSTALLATION



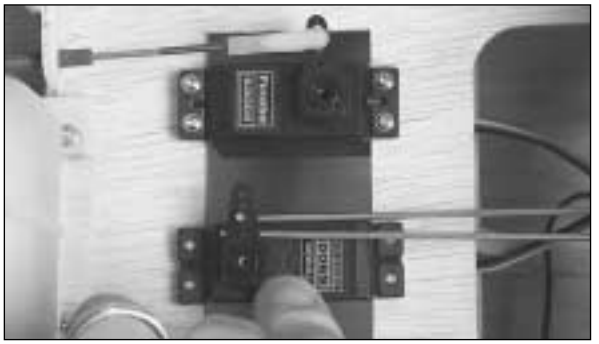
❑ 1. Thread a nylon clevis about twenty full turns onto a 36" [915mm] wire pushrod, then slip a silicone retainer over the clevis. Connect the clevis to the outer hole of a nylon control horn. Prepare two more pushrods the same way.

❑ 2. Slide the pushrods into the guide tubes from the rear of the fuselage. The elevator pushrods go in the **top** guide tubes (nearest the elevator) and the rudder pushrod goes in the guide tube **opposite** the previously installed throttle servo.



❑ 3. Drill 3/32" [2.4mm] holes through the elevators and rudder for mounting the control horns. Mount the control horns with 2-56 x 5/8" [16mm] screws and the nylon mounting plates (it may be necessary to make a slight bend in the elevator pushrods to get them to rest on the elevators where required).

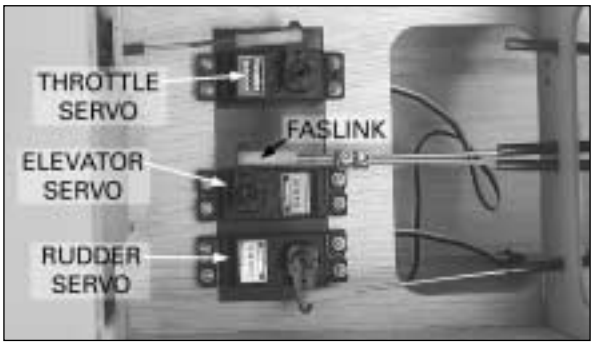
❑ 4. Fit the elevator and rudder servos into the servo tray, but do not drill holes and screw them in yet. **Note:** As shown on the plan and in this manual, both elevator pushrods are connected to one elevator servo. However, as explained near the beginning of the manual, two servos could be used for the elevators.



❑ 5. Make a 90° bend in one of the elevator pushrods to connect it to the elevator servo arm. **Hint:** Disconnect the pushrod from the elevator and rotate the pushrod 90-degrees. Make the bend to the side, then rotate the pushrod back into position so the bend is downward (toward the bottom of the fuselage). Connect the pushrod to the servo arm and the elevator. Adjust the clevis on the end of the

pushrod so the elevator is centered when the servo arm is centered.

Refer to this photo for the following three steps.

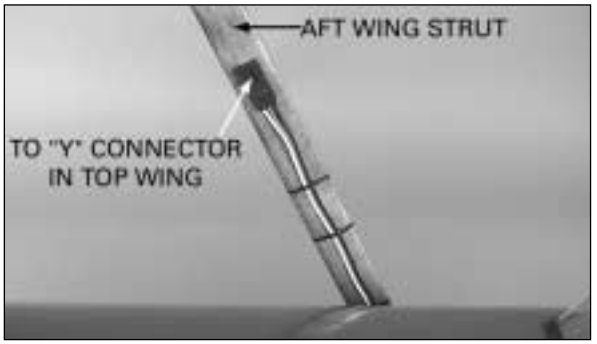


❏ 6. Cut the other elevator pushrod about 1" short of the servo arm. Slip two 5/32" [4mm] wheel collars with two 6-32 x 1/4" [6.4mm] screws over the pushrods. Connect the pushrod already bent to the servo arm with a FasLink. Drill 1/16" [1.6mm] holes into the servo tray for the servo mounting screws, run the screws in and out a few times and add a few drops of thin CA to the holes. Allow the CA to fully harden, then mount the elevator servo with the screws.

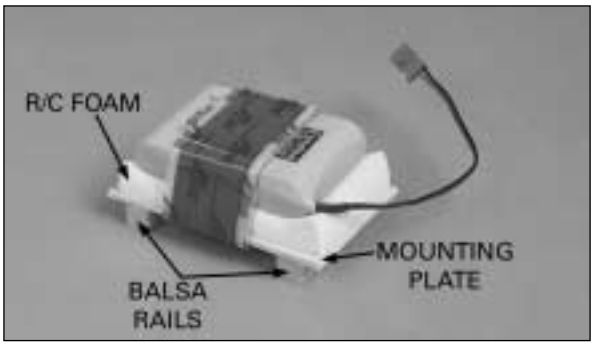
❏ 7. With the servo arm and the elevator that is connected to the servo arm centered, center the other elevator, then tighten the screw on one of the wheel collars to lock the pushrods together. Remove the screw from the other wheel collar, add a drop of threadlocker to the threads, then insert the screw into the wheel collar and tighten. Remove the other screw, add threadlocker, reinsert and tighten.

❏ 8. Connect the rudder pushrod to the rudder servo by making a 90° bend in the pushrod and fastening it to the servo arm with a FasLink. Mount the rudder servo to the servo tray the same as was done for the elevator servo.

❏ 9. Cut a small hole in the bottom of the top wing near one of the **aft** strut retainers. Use a small piece of wire with a hook bent on the end to "fish out" the end of the "Y" connector previously installed in the wing.

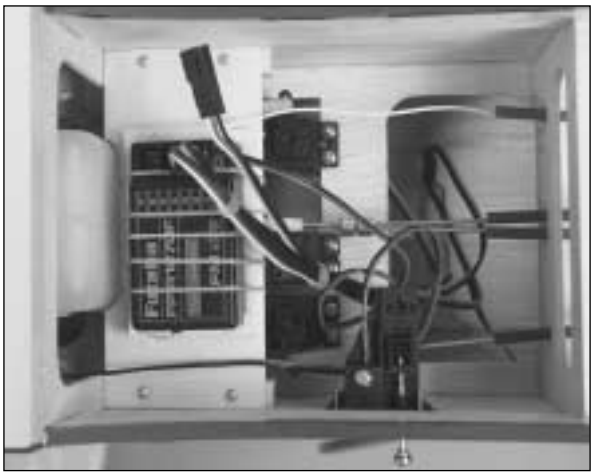


❏ 10. Cut a small hole through the fuselage near the bottom of the aft wing strut that is on the same side as the hole just cut in the wing. Route the end of a "Y" connector that connects to a servo out of the hole for connecting to the servo wire coming from the wing. **Suggestion:** Roughen one side of the plug so glue will adhere, then use epoxy to glue the plug to the inside of the strut. Secure the servo wire to the strut with tape. This will make it easy to connect the servo wire coming out of the wing.



❑ 11. Mount the battery pack. It is suggested that the battery pack be mounted as far forward as practically possible to reduce or eliminate the amount of lead ballast that may be required in the nose. With the battery mounted where shown, our prototype required approximately 8 oz. of weight in the nose. Make a mounting plate from leftover plywood and balsa. Secure the battery to the plate (with R/C foam rubber in between) with Velcro, then securely glue the balsa rails on the bottom of the plate to the bottom of the fuselage behind the firewall (the fuel tank must be removed to do this).

Refer to this photo for the following three steps.



❑ 12. Mount the receiver. For this model a removable mounting plate was made from leftover plywood and screwed to leftover hard balsa rails glued to the fuselage sides. The receiver was mounted to the plywood plate (with R/C foam in between) with rubber bands.

❑ 13. Connect the servo wires and on/off switch to the receiver and connect the battery to the on/off switch. Connect the end of the "Y" connector for the ailerons to the aileron plug in the receiver (the remaining end of the "Y" connector will be connected to the other "Y" connector coming from the ailerons in the bottom wing). Mount the on/off switch to the side of the fuselage. For easy battery monitoring and quick-charging, a Great Planes Switch & Charge Jack Mounting Set (GPMM1000) was used on this model.

❑ 14. Route the antenna through the open guide tube that doesn't have any pushrods.

FINISH THE COCKPIT

❑ 1. Assemble and test fit the pilot. A William's Brother's 1/4-Scale WWI Pilot (WBRQ2625) was used in this model. Even though this S.E.5a is closer to 1/5-scale, upon studying and test fitting various sizes of pilots, it was decided that the 1/4-scale pilot fits best and appears to be most scale-like. Placing the pilot on a 2" x 2" [50 x 50mm] balsa block (not included) positions him perfectly at the correct height.

❑ 2. Paint the pilot and cockpit. **Optional:** The cockpit can be "dressed-up" with Fourmost Products #FOR 114 Regular Cockpit Coaming (FORQ2014). Cut it to the length required, fit it over the edges of the opening and glue it into position with thin CA.

❑ 3. Securely glue the pilot (and balsa block if used) into position.

❑ 4. Mount the headrest to the top of the fuselage behind the pilot. A simple and secure method is to use double-sided tape, but the headrest could also be glued into position

similar to the way the exhaust pipes were glued into position with balsa sticks.

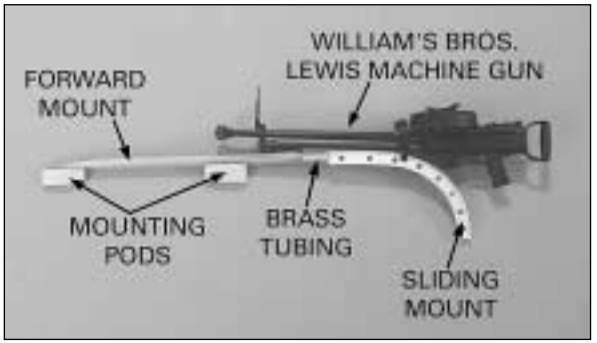
❑ 5. Cut out the molded clear plastic windscreen. Paint the base black. Position the windscreen on the fuselage, then mark its outline directly onto the fuselage with a ballpoint pen. Cut a 1/16" [1.6mm] strip of covering from the fuselage along the line.

❑ 6. Position the windscreen on the fuselage so it conceals the removed strip of covering. Glue the windscreen into place with thin or medium CA. Use the CA sparingly so as not to fog the plastic.

MOUNT THE MACHINE GUN

A wing-mounted machine gun is not supplied with this kit, but the following instructions show how to make one from a William's Brother's #16100 2" (1/6-scale) Lewis Aircraft Machine Gun kit (WBRQ3561) and a few other various hobby materials.

Refer to this photo while making the machine gun and mount.



❑ 1. Assemble the machine gun per the instructions that came with it.

❑ 2. Make the **sliding mount** from a sheet of plastic or thin plywood (the cross-section is the shape of an "I" beam). The **forward mount** was made from a 3/16" wood dowel (though further study of the photos shows that the forward mount should actually be square).

❑ 3. Notch the aft end of the forward mount and connect it to the sliding mount with a piece of brass tubing. Carve the **mounting pods** from balsa or basswood and glue them to the forward mount.

❑ 4. Paint the machine gun and mount, then mount to the top of the wing.

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

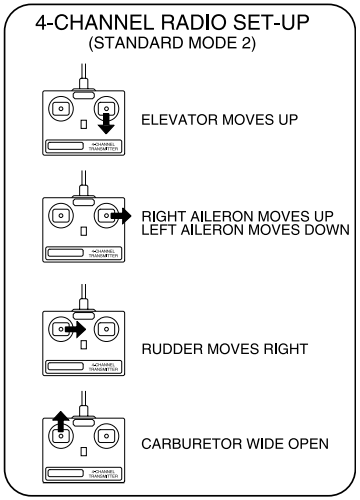
4. Use a piece of soft balsa or something similar to squeegee remaining water from under the decal. Apply the rest of the decals the same way.

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 AccuThrow™ (or a ruler) to accurately measure and set the control throw of each control surface as indicated in the chart that follows.

These are the recommended control surface throws:

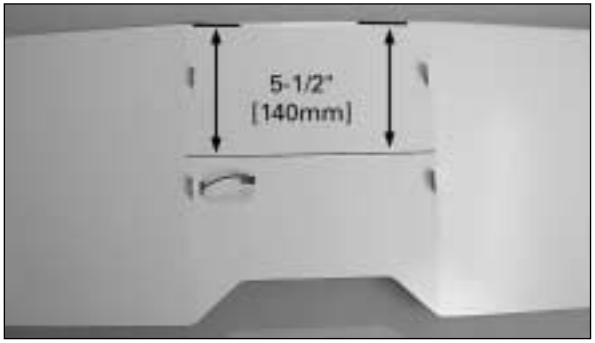
	High Rate	Low Rate
ELEVATOR:	1-1/2" [38mm] up	3/4" [19mm] up
	1-1/2" [38mm] down	3/4" [19mm] down
RUDDER:	1-1/2" [38mm] right	1" [25mm] right
	1-1/2" [38mm] left	1" [25mm] left
AILERONS:	1-1/2" [38mm] up	1" [25mm] up
	1-1/2" [38mm] down	1" [25mm] down

IMPORTANT: The S.E.5a 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 S.E.5a 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.)

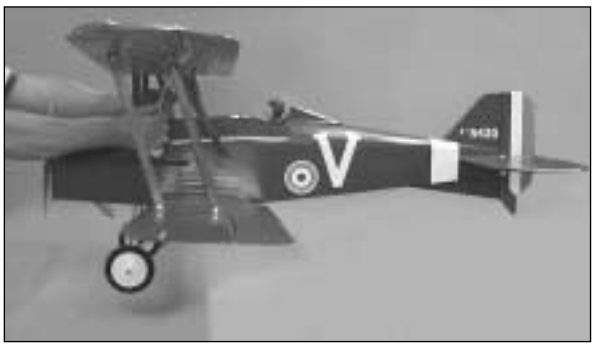
More than any other factor, the **C.G**. (balance point) can have the **greatest** effect on how a model flies, and may determine whether or not your first flight will be successful. If you value this model and wish to enjoy it for many flights, **DO NOT OVERLOOK THIS IMPORTANT PROCEDURE.** A model that 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" [3mm]-wide tape to accurately mark the C.G. across the center panel on the **bottom** of the **top wing** 5-1/2" [140mm] back from the leading edge.

This is where your model should balance for the first flights. Later, you may wish to experiment by shifting the C.G. up to 1/4" [6mm] forward or 1/4" [6mm] 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) and an

empty fuel tank, have an assistant lift the model at the balance point you marked on the bottom of the top wing. **Hint:** Instead lifting the model with his finger tips, have your assistant use the eraser end of a pencil held in each hand to lift the model (be certain the erasers are positioned on the line **near the ends** of the center panel under the ribs inside). This will improve the accuracy of the C.G. procedure.

❏ 3. While your assistant is holding the model at the balance point, view the model from the side. (If viewing the model from the front as you would be if doing this procedure by yourself, detecting whether or not the fuselage is level would be difficult. Viewing the model from the side provides a much better perspective.) If the fuselage is not level as shown in the photo, the C.G. must be corrected. If the tail is low, 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 is low, 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 adding additional weight, nose weight may be easily added by using a "spinner weight" (GPMQ4645 for the 1 oz. [28g] weight, or GPMQ4646 for the 2 oz. [57g] 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 or fuselage sides (don't attach weight to the cowl–it is not intended to support weight). Begin by placing incrementally increasing amounts of weight on the top of the fuse over the firewall 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 wings 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 the decal sheet and place it on or inside your model.

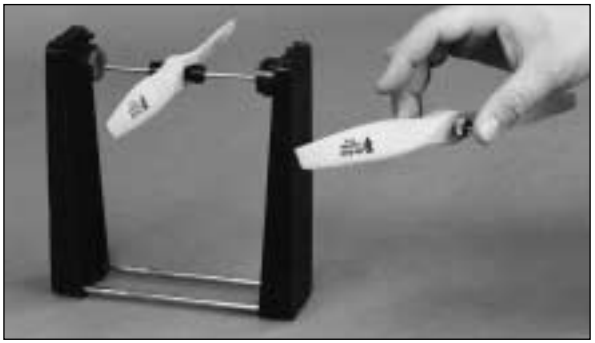
CHARGE THE BATTERIES

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 PROPELLER



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 [30m] 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!** Find 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, scarfs, 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.

IMAA SAFETY CODE (excerpt)

Since the S.E.5a qualifies as a "giant scale" model and is therefore eligible to fly in IMAA events, we've printed excerpts from the IMAA Safety Code which follows:

Definition

For the purpose of the following IMAA Safety Code, the term "Giant Scale" shall refer to radio controlled model aircraft, either scale or non-scale, which have a wingspan of 80 inches or more for monoplanes and 60 inches or more for multi-winged model aircraft and have a ramp weight (fueled and ready to fly) of 55 lbs. or less.

Section 1.0: SAFETY STANDARD

1.1 Adherence to Code: This safety code is to be strictly followed

1.2 The most current AMA Safety Code in effect is to be observed. However, the competition sections of the code may be disregarded.

Section 3.0: Safety Check

3.4 Flight Testing: All Giant Scale R/C aircraft are to have been flight tested and flight trimmed with a minimum of six flights before the model is allowed to fly at an IMAA Sanctioned event.

3.5 Proof of Flight: The completing and signing of the Declaration section of the Safety Inspection form by the pilot (or owner) shall document as fact that each aircraft has been successfully flight-tested and proven airworthy prior to an IMAA event.

Section 6.0: Radio Requirements

6.1 All transmitters must be FCC type certified.

6.2 FCC Technician or higher-class license required for 6 meter band operation only.

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 checklist 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 engine compartment, radio compartment inside the fuselage and the fuel tank compartment.

❑ 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 the 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 the model *laterally* as explained in the instructions.
❑ 6. Use thread locking compound to secure critical fasteners such as the set screws in the wheel collars, 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 the receiver battery pack (if necessary) and make sure it is fully charged.
❑ 21. If you wish to photograph the model, do so before the first flight.
❑ 22. Range check your radio when you get to the flying field.

FLYING

The Dynaflite S.E.5a is a great-flying model that flies smoothly and predictably. The S.E.5a 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 an alarming or unusual sound such as a low-pitched "buzz," this may indicate control surface *flutter*. Flutter occurs when a control surface (such as an aileron or elevator) or a flying surface (such as a wing or stab) rapidly vibrates up and down (thus causing the noise). In extreme cases, if not detected **immediately**, flutter can actually cause the control surface to detach or the flying surface to fail, thus causing loss of control followed by an impending crash. The best thing to do when flutter is detected is to slow the model immediately by reducing power, then land as soon and safely as possible. Identify which surface fluttered (so the problem may be resolved) by checking all the servo grommets for deterioration or signs of vibration. Make certain all pushrod linkages are secure and free of play. If it fluttered once, under similar circumstances it will probably flutter again unless the problem is fixed. Some things which can cause flutter are; Excessive hinge gap; Not mounting control horns solidly; Poor fit of clevis pin in horn; Side-play of wire pushrods caused by large bends; Excessive free play in servo gears; Insecure servo mounting; and one of the most prevalent causes of flutter; Flying an over-powered model at excessive speeds.

FIELD ASSEMBLY

Mount the bottom wing to the fuselage with the 1/4-20 x 2" [50mm] nylon wing bolts and 1/4" [6mm] washers to hold the aft landing gear wire to the wing. Be certain the #2 x 1/2" [13mm] screws that hold the landing gear straps over the forward landing gear wire are tight. Mount the top wing with the struts and screws. A small drop of non-permanent threadlocker on the threads of the screws for the wing struts is recommended.

TAKEOFF

The Dynaflite S.E.5a handles well on the ground–similar to most tail draggers such as a Mustang and even easier than some tail draggers such as a Cub. The S.E.5a does, however, weathervane easily in crosswinds so be sure to use the high-rate for the rudder. Before taking off, 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 rudder so the model will roll straight down the runway. If you need to gather your thoughts 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 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. 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 possible that additional right rudder will be required 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 established at your field.

FLIGHT

In its time, the British Royal Aircraft Factory S.E.5a was a groundbreaking aircraft with exceptional climb rates and dog-fighting abilities. Powered with the recommended

engines, the Dynaflite S.E.5a is similarly nimble with a good climb rate and the ability to perform many classic dog-fighting maneuvers including loops, rolls, spins, stall turns, Immelman turns, etc.

When you're ready to fly, it would be a good idea to have an assistant on the flight line with you for reassurance and to keep an eye on other air traffic. 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 S.E.5a 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

Unless experienced and confident in your ability to control a model in crosswinds, it is strongly recommend that your first flights with the S.E.5a are in calm conditions or when the winds are parallel with the runway. Without crosswinds, the S.E.5a lands beautifully–just the same as any other model. However, in a crosswind the model must be "cross-controlled" so that its heading and trajectory are parallel with the runway. For example, if there were a crosswind coming from the left, right rudder and left aileron would have to be applied to counter the crosswind and keep the model heading straight down the runway. If the wheels are not going straight when the model touches down it may ground loop. If you're not comfortable doing these "slip" landings, practice in non-windy conditions or have an experienced pilot assist you.

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

BUILDING NOTES

Kit Purchased Date: _____

Where Purchased: _____

Date Construction Started: _____

Date Construction Finished: _____

Finished Weight: _____

Date of First Flight: _____

FLIGHT LOG