Piper
ARROW II

Top Flite Gold Edition Piper Arrow II Assembly Instructions

Wingspan: 81 in [2060mm]
Wing Area: 1089 sq in [70.2 dm^2]
Weight: 12–14 lb [5440–6350 g]
Wing Loading: 25–30 oz/sq ft [76–92 g/dm^2]
Fuselage Length: 61.5 in [1560mm]
Radio: 6-channel, 1 high-torque servo, 5-7 standard servos, 1 micro servo (optional)
Engine: .61–.91 cu in [10.0–15.0cc] two-stroke, .91 cu in [15.0cc] four-stroke

WARRANTY: Top Flite Models 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 Top Flite's liability exceed the original cost of the purchased kit. Further, Top Flite reserves the right to change or modify this warranty without notice. In that Top Flite 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.** To make a warranty claim send the defective part or item to Hobby Services at the address below.

Hobby Services
3002 N. Apollo Dr. Suite 1
Champaign IL 61822
USA

Include a letter stating your name, return shipping address, as much contact information as possible (daytime telephone number, fax number, e-mail address), a detailed description of the problem and a photocopy of the purchase receipt. Upon receipt of the package the problem will be evaluated as quickly as possible.

Top Flite Models • Champaign, Illinois • Telephone (217) 398-8970 ext. 5 • Fax (217) 398-7721 • productsupport@top-flite.com

READ THROUGH THIS INSTRUCTION BOOK FIRST. IT CONTAINS IMPORTANT INSTRUCTIONS AND WARNINGS CONCERNING THE ASSEMBLY AND USE OF THIS MODEL.

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INTRODUCTION

Congratulations and thank you for purchasing the Top Flite® *Gold Edition* Piper Arrow II. One of the unique features of this Top Flite *Gold* kit is the scale corrugations on the vertical and horizontal stab and on all of the control surfaces. The corrugations are optional, but add much to the scale effect of this model. While this kit can be assembled by intermediate builders, note that the corrugations take additional time, skill and patience. Read through the manual to see how the corrugations are made and how they are covered before making a decision. Should you decide not to build your Arrow with corrugated control surfaces simply replace the die-cut, corrugated skins with regular sheeting (not included).

Another option is to build the plane with fixed or retractable landing gear. This kit was designed to fit Robart retracts, so should you decide to install another brand any modifications required would be up to you.

Flaps are another option. The manual is primarily "geared" toward building the Arrow with flaps, but instructions are also provided for building the model without flaps.

Lastly, the cabin top is vacuum-formed from a clear, PETG plastic sheet. The window outlines are molded in. Finishing the cabin top requires masking, sanding and painting around the windows. Since the cabin top is molded from PETG, it may be painted with Top Flite LustreKote®.

The level of scale detail you wish to achieve is up to you. Simply by following the instructions you'll end up with a model that very much represents a Piper Arrow II. But you could also "go all-out" by adding even more scale details to make a model that would be a contender in any level of scale competition.

For the latest technical updates or manual corrections to the Piper Arrow visit the Top Flite web site at www.top-flite.com. Open the "Airplanes" link, then select the Piper Arrow. If there is new technical information or changes to this model a "tech notice" box will appear in the upper left corner of the page.

AMA

We urge you to join the AMA (Academy of Model Aeronautics) and a local R/C club. The AMA is the governing body of model aviation and membership is required to fly at AMA clubs. Though joining the AMA provides many benefits, one of the primary reasons to join is liability protection. Coverage is not limited to flying at contests or on the club field. It even applies to flying at public demonstrations and air shows. Failure to comply with the Safety Code (excerpts printed in the back of the manual) may endanger insurance coverage. Additionally, training programs and instructors are available at AMA club sites to help you get started the right way. There are over 2,500 AMA chartered clubs across the country. Contact the AMA at the address or toll-free phone number below:

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302-9252
Tele. (800) 435-9262
Fax (765) 741-0057
Or via the Internet at: http://www.modelaircraft.org

IMPORTANT!!!

Two of the most important things you can do to preserve the radio controlled aircraft hobby are to avoid flying near full-scale aircraft and avoid flying near or over groups of people.

IMAA

The Top Flite Piper Arrow II is an excellent scale model and 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, obtain a copy of the **IMAA Safety Code** by contacting the IMAA at the address or telephone number below, or by logging on to their web site at:

www.fly-imaa.org/imaa/sanction.html

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

Scale Competition

The outline of this Top Flite Gold Edition Piper Arrow II was derived from three-view drawings and photos. The scale is 1:4.6 which was calculated from averaging the scale wingspan and the scale length. Though the Top Flite Piper Arrow II may not have the same level of detail as an "all-out" scratch-built competition model, it is still a relatively detailed scale model and is therefore ideal for competing in R/C Sport Scale (Sportsman and Expert), R/C *Fun Scale* (Division 1 or Division 2), or even the Team Scale classes in AMA competition (we receive many favorable reports of Top Flite models in scale competition!). In Fun Scale, to receive the five points for scale documentation, the only proof required that a full size aircraft of this type did exist in your paint/markings scheme 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 propeller on the model on the kit box cover is oversize for the engine, but provides a scale appearance. It is a Master Airscrew 13 x 8 three-blade (MASQ1938). The model could actually be flown with a three-blade prop, but it must be the correct size to match your engine.

If you would like photos of the full-size Piper Arrow for scale documentation, or if you would like to study the photos to add more scale details, photo packs are available from:

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 Piper Arrow 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 Piper Arrow, 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 an experienced pilot or 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.

8. While this kit has been flight tested to exceed normal use, if the plane will be used for extremely high stress flying, such as racing, or if an engine larger than one in the recommended range is used, the modeler is responsible for taking steps to reinforce the high stress points and/or substituting hardware more suitable for the increased stress.

NOTE: We, as the kit manufacturer, provide you with a top quality kit and great 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 die drawings 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 contact Top Flite at the address or telephone number below. If requesting replacement parts, please provide the full kit name (Top Flite Gold Edition Piper Arrow) and the part numbers as listed in the Parts List.

Top Flite Product Support
3002 N Apollo Drive Suite 1
Champaign, IL 61822
Telephone: (217) 398-8970
Fax: (217) 398-7721
E-mail: productsupport@top-flite.com.

DECISIONS YOU MUST MAKE

This is a partial list of items required to finish the Piper Arrow that may require planning or decision making before starting to build. Order numbers are provided in parentheses.

RADIO EQUIPMENT
Even though the Piper Arrow is giant-scale, it's basically a ".60-size" model. Therefore, the Arrow doesn't require any specialized, heavy-duty radio gear. It may be flown safely with standard servos on all of the flying surfaces **except** for the full-flying stabilizer. The stabilizer should be controlled by a ball bearing servo with at least 50 oz.-in. of torque. Servo extensions and Y-harnesses will also be required. Following is a list of servos and other gear used to build the Piper Arrow as shown in this manual. If you set up your model differently, other radio gear may be required. **Note:** All of the part numbers provided for R/C gear are for **Futaba**.®

- ❏ (1) Stabilizer servo with at least 50 oz.-in. of torque (Futaba S9001 or similar—FUTM0075)
- ❏ (5) Standard servos (1-nose wheel steering, 1-throttle, 2-ailerons, 1-rudder)
- ❏ (2) Hobbico 24"[610mm] servo extensions (for ailerons—HCAM2721)
- ❏ (3) Hobbico 12"[305mm] servo extensions (for stabilizer and rudder servos and coming from receiver to hook up ailerons —HCAM2711)
- ❏ (1) Futaba dual extension cord (for ailerons—FUTM4130)

A Great Planes Switch & Charge Jack Mounting Set was also used (GPMM1000)

The following items will also be required if building optional flaps:
- ❏ (2) Standard servos
- ❏ (1) Hobbico Y-harness (HCAM2751)
- ❏ (1) 12"[305mm] servo extension (from receiver to flap Y-harness—HCAM2711)

If installing retractable landing gear this additional radio equipment will also be required.

- ❏ (1) Micro servo
- ❏ (1) 6"[150mm] servo extension (HCAM2701)

A receiver battery pack with a **minimum** of 1,000mAh is also required. (Futaba HR4RB, FUTM1380)

ENGINE RECOMMENDATIONS
The engine size recommendations for the Piper Arrow are straightforward. See the recommendations on the cover of this manual. Keep in mind that this is a scale model of a four-seat, general aviation aircraft, not an aerobatic air show plane. It is intended to fly "on the wing" and will do so **easily** with a .61 two-stroke or a .91 four-stroke. Do not overpower this aircraft. If using an O.S.® Max SF or SX engine the Top Flite in-cowl muffler may be used:

- ❏ TOPQ7920 Top Flite header for in-cowl muffler (For O.S. Max engines)
- ❏ TOPQ7917 Top Flite In-cowl muffler

LANDING GEAR OPTIONS
The Piper Arrow requires two 3"[75mm] main wheels and one 2-1/2"[64mm] nose wheel. If building the Arrow with fixed landing gear, any brand of the appropriate-size wheels is suitable. With retracts, Robart wheels are recommended as they are narrow and fit better into the wing. Note that a Robart 2-1/4"[57mm] nose wheel is recommended as it will fit on the nose strut better than a 2-1/2"[64mm] wheel (the Robart 2-1/4"[57mm] wheel is actually closer to 2-3/8"[60mm], so it is only 1/8"[3mm] smaller than recommended). Following are the part numbers for the recommended wheels:

- ❏ Great Planes 3"[75mm] main wheels (GPMQ4225)
- ❏ Great Planes 2-1/2"[64mm] nose wheel (GPMQ4223)

-or-

- ❏ Robart 3"[75mm] main wheels (ROBQ1514)
- ❏ Robart 2-1/4"[57mm] nose wheel (ROBQ1511)

The following items were also used to assemble the Piper Arrow with retractable landing gear:

- ❏ Robart #530ARW pneumatic retractable landing gear kit for Piper Arrow (ROBQ1621)
- ❏ Robart #188VR variable rate air control kit (ROBQ2302, includes air tank, variable rate valve, lines, fittings)
- ❏ (1 pkg.) Robart #190 Air Line Quick Disconnects (ROBQ2395)
- ❏ Robart hand pump with gauge (or suitable replacement) (ROBQ2363)
- ❏ Micro servo and 6"[150mm] servo extension (previously listed under "Radio Equipment")
- ❏ (2 pkgs.) Great Planes 0-80 (1/16") threaded ball link ball (GPMQ3842)
- ❏ Optional: 3/4 oz. [20g] glass cloth to reinforce wing sheeting inside wheel wells (HCAR5000)

COCKPIT AND PILOTS

A scale cockpit kit is also available for this model (TOPQ8414). It includes the floor, sides and back, instrument panel, dashboard and four seats. Even though the cockpit kit can't be seen in great detail unless you are up close or have the cabin top removed, it adds MUCH to the overall scale effect and really "finishes" the model. Installation instructions are also included with the cockpit kit.

Two Williams Brother's #62600 Sportsman 3"[75mm] (1/4-scale) pilots (WBRQ2626) were used. Since the pilots are not full-body, a platform was made from 3/32"[2.4mm] hard balsa to support them. Acrylic paint found at craft stores and hobby shops was used for painting the pilots. Acrylic paint is favored because it is easy to use and washes with water.

TRIM SCHEME/FINISHING SUPPLIES

The trim scheme on the model on the kit box cover was inspired by a full-size Piper Arrow. All of the wood surfaces were covered with Top Flite MonoKote®. The cabin top, cowl and tail cone were painted with Top Flite LustreKote®. Modelers who are experienced in the application of iron-on coverings will find this trim scheme of medium difficulty. If a simpler or different trim scheme is desired this one could be used as a reference, or just follow the trim scheme of another full-size subject. Following are the part numbers of the MonoKote, LustreKote and covering tools used.

COVERING

- ❏ (2) 6' [1.8m] rolls White MonoKote (TOPQ0204)
- ❏ (1) 6' [1.8m] roll Metallic red MonoKote (TOPQ0405)
- ❏ (1) 6' [1.8m] roll Metallic gold MonoKote (TOPQ0404)

PAINT

- ❏ (2) White primer LustreKote (TOPR7801)
- ❏ (1) Jet White LustreKote (TOPR7204)
- ❏ (1) Metallic red LustreKote (TOPR7405)
- ❏ (1) Crystal clear-gloss LustreKote (TOPR7200)

- ❏ 1 roll of 1/4"[6.4mm] Metallic gold striping tape was also used on the cowl and tail cone (GPMQ1530)

COVERING TOOLS

- ❏ Top Flite MonoKote trim seal iron (TOPR2200)
- ❏ 21st Century sealing iron (COVR2700)
- ❏ 21st Century iron cover (COVR2702)

ADDITIONAL ITEMS REQUIRED

HARDWARE AND ACCESSORIES

In addition to the items listed in the **"Decisions You Must Make"** section, following is the list of hardware and accessories required to finish the Piper Arrow. Order numbers are provided in parentheses.

- ❏ Propeller and spare propellers suitable for your engine
- ❏ 14 oz. [420cc] fuel tank (GPMQ4106)
- ❏ Fuel line (3' [910mm], GPMQ4131)
- ❏ 2-1/2"[65mm] spinner (white-GPMQ4520, black-GPMQ4521, red-GPMQ4522)

  -or-
- ❏ Three-blade aluminum True Turn spinner (TRUQ2514)
- ❏ Acrylic paint and paint brushes for painting pilot (found at craft stores)
- ❏ Auto body filler (Bondo or similar)
- ❏ R/C foam padding (1/4"[6mm] HCAQ1000, 1/2"[13mm] HCAQ1050)
- ❏ Sullivan #521 Kevlar pull-pull control cable set (for nose wheel steering, SULQ3121)
- ❏ If building flaps: (1 pkg. of 6) Robart Super Hinge Points (ROBQ2509)

ADHESIVES AND BUILDING SUPPLIES

In addition to common modeling tools (screw drivers, hobby knives, drill, etc.), this is the "short list" of the most important items required to build the Piper Arrow. *We recommend **Great Planes Pro**™ CA and Epoxy glue.*

- ❏ 2 oz. [60g] Thin Pro CA (GPMR6003)
- ❏ 2 oz. [60g] Medium Pro CA+ (GPMR6009)
- ❏ 1/2 oz. [15g] Thick Pro CA- (GPMR6013)
- ❏ Pro 30-minute epoxy (GPMR6047)
- ❏ Pro 6-minute epoxy (GPMR6045)
- ❏ Pro Aliphatic resin (2 oz. [60g], GPMR6160)
- ❏ NHP balsa filler (NHPR2211)
- ❏ Plan protector (GPMR6167) or wax paper
- ❏ Drill bits: 1/16"[1.6mm], 5/64"[2mm], 3/32"[2.4mm], 7/64"[2.8mm], 1/8"[3.2mm], 9/64"[3.6mm], 5/32"[4mm], 11/64"[4.4mm], 3/16"[4.8mm], 13/64"[5.2mm], 7/32"[5.6mm], 15/64 [6mm], 1/4"[6.4mm], 17/64"[6.7mm], 9/32"[7.1mm]
- ❏ 8-32 tap and drill set (GPMR8103)
- ❏ 1/4-20 tap and drill set (GPMR8105)
- ❏ Tap handle (GPMR8120)
- ❏ Small metal file
- ❏ Stick-on segmented lead weights (GPMQ4485)
- ❏ Silver solder w/flux (GPMR8070)
- ❏ #1 Hobby knife (HCAR0105)
- ❏ #11 blades (100-pack, HCAR0311)

❑ Single-edge razor blades (100-pack, HCAR0312)
❑ Small T-pins (100, HCAR5100)
❑ Medium T-pins (100, HCAR5150)
❑ Large T-pins (100, HCAR5200)
❑ Sanding tools and sandpaper assortment (*see* Easy-Touch Bar Sander section)
❑ 16"x 48"[410 x 1220mm] Great Planes Pro Building Board (GPMR6950)
❑ Curved-tip canopy scissors for trimming plastic parts (HCAR0667)

OPTIONAL SUPPLIES AND TOOLS

Here is a list of optional tools mentioned in the manual that will help you build the Piper Arrow.

❑ 2 oz. [57g] spray CA activator (GPMR6035)
❑ 4 oz. [113g] aerosol CA activator (GPMR634)
❑ CA applicator tips (HCAR3780)
❑ CA debonder (GPMR6039)
❑ 3M 75 repositionable spray adhesive (MMMR1900)
❑ Kyosho® masking film (KYOR1040)
❑ Epoxy brushes (6, GPMR8060)
❑ Mixing sticks (50, GPMR8055)
❑ Mixing cups (GPMR8056)
❑ Builder's Triangle Set (HCAR0480)
❑ Metal Template Set (30/60/90 and 45 degree triangles, HCAR0500)
❑ 36"metal ruler (HCAR0475)
❑ Robart Super Stand II (ROBP1402)
❑ 24"x 36"[460 x 910mm] Builder's Cutting Mat (HCAR0456)
❑ 16"x 48"[410 x 1220mm] building board (GPMR6950)
❑ Fuel filler valve for glow fuel (GPMQ4160)
❑ Hobbico Duster™ can of compressed air (HCAR5500)
❑ Masking tape (TOPR8018)
❑ Milled fiberglass (GPMR6165)
❑ Microballoons (TOPR1090)
❑ Threadlocker thread locking cement (GPMR6060)
❑ Denatured alcohol (for epoxy clean up)
❑ K & S #801 Kevlar thread (for stab alignment)
❑ Panel Line Pen (TOPQ2510)
❑ Rotary tool such as Dremel
❑ Rotary tool reinforced cut-off wheel (GPMR8200)
❑ Servo horn drill (HCAR0698)
❑ Hobby Heat™ Micro Torch II (HCAR0755)
❑ Dead Center™ Engine Mount Hole Locator (GPMR8130)
❑ AccuThrow™ Deflection Gauge (GPMR2405)
❑ Precision Hinge Marking Tool (GPMR4005)
❑ Slot Machine™ hinge slotting tool (110V, GPMR4010)
❑ CG Machine™ (GPMR2400)
❑ Laser incidence meter (GPMR4020)
❑ Precision Magnetic Prop Balancer™ (TOPQ5700)

EASY-TOUCH™ BAR SANDER

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

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

5-1/2"[140mm] Bar Sander (GPMR6169)
11"[280mm] Bar Sander (GPMR6170)
22"[560mm] Bar Sander (GPMR6172)
33"[840mm] Bar Sander (GPMR6174)
44"[1120mm] Bar Sander (GPMR6176)
11"[280mm] Contour Multi-Sander (GPMR6190)
12' [3.66m] roll of Adhesive-backed 80-grit sandpaper (GPMR6180)
150-grit (GPMR6183)
180-grit (GPMR6184)
220-grit (GPMR6185)
Assortment pack of 5-1/2"[140mm] strips (GPMR6189)

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

IMPORTANT BUILDING NOTES

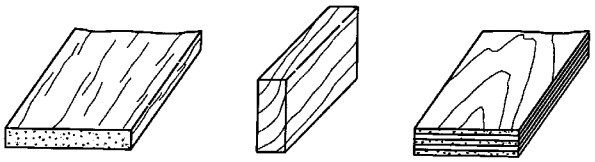
- Whenever just ***epoxy*** is specified you may use ***either*** 30-minute (or 45-minute) epoxy ***or*** 6-minute epoxy. When 30-minute epoxy is specified it is **highly** recommended that you use only 30-minute (or 45-minute) epoxy, because you will need the working time and/or the additional strength.
- **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 8 & 9 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.

METRIC CONVERSION

1" = 25.4mm (conversion factor)

1/64" = .4mm	1" = 25.4mm
1/32" = .8mm	2" = 50.8mm
1/16" = 1.6mm	3" = 76.2mm
3/32" = 2.4mm	6" = 152.4mm
1/8" = 3.2mm	12" = 304.8mm
5/32" = 4mm	15" = 381mm
3/16" = 4.8mm	18" = 457.2mm
1/4" = 6.4mm	21" = 533.4mm
3/8" = 9.5mm	24" = 609.6mm
1/2" = 12.7mm	30" = 762mm
5/8" = 15.9mm	36" = 914.4mm
3/4" = 19mm	

TYPES OF WOOD



BALSA **BASSWOOD** **PLYWOOD**

COMMON ABBREVIATIONS

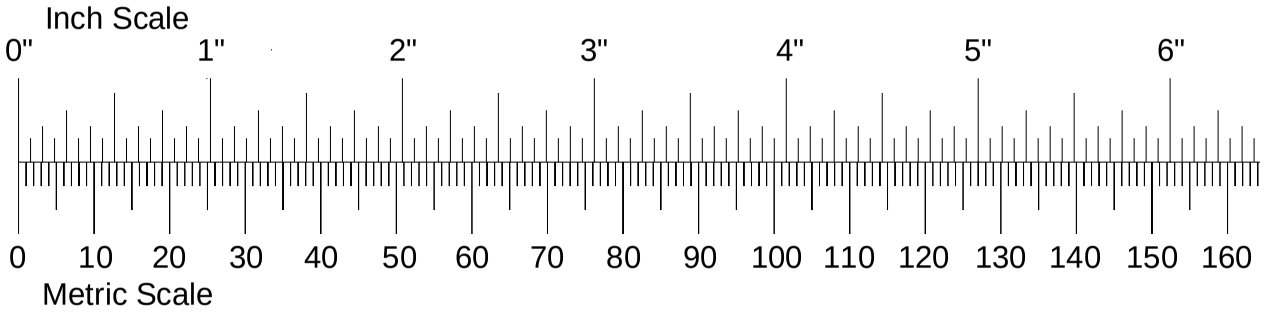
Fuse = Fuselage
Stab = Horizontal Stabilizer
Fin = Vertical Fin
LE = Leading Edge
TE = Trailing Edge
LG = Landing Gear
" = Inches
mm = millimeters

HOT TIP

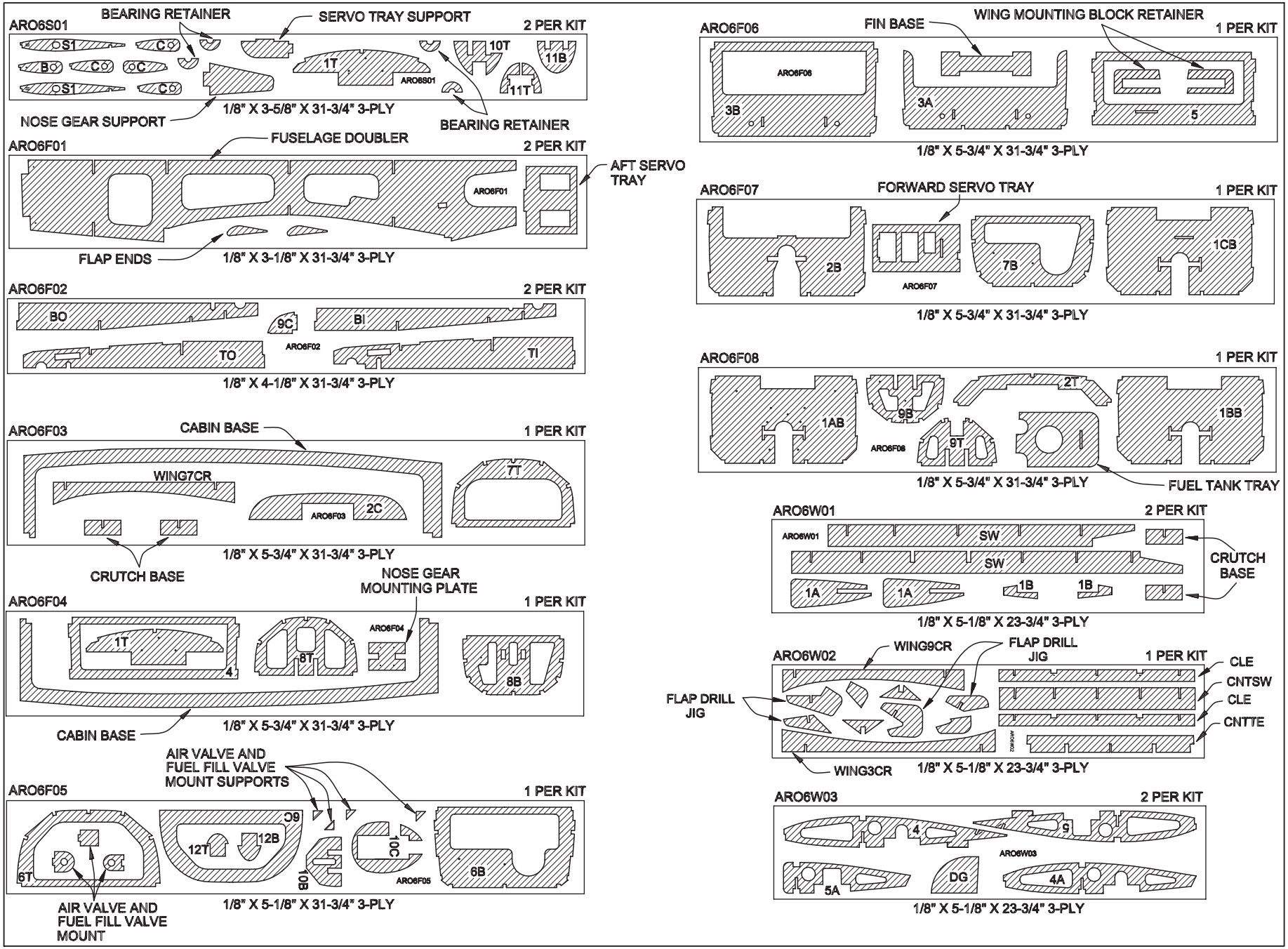
Plastic bags filled with lead shot are recommended for building weights. They assume the shape of curved surfaces and apply uniform pressure. Shot can be purchased at sporting goods stores where hunting supplies are sold. #6 shot is recommended. One 25 lb. [11kg] bag costs about twenty dollars. Small, sealable food storage bags can be used to hold the shot. Tape the bags shut for security. Each bag holds about two to three pounds. Twelve to fifteen bags is adequate for this project.

HOT TIP

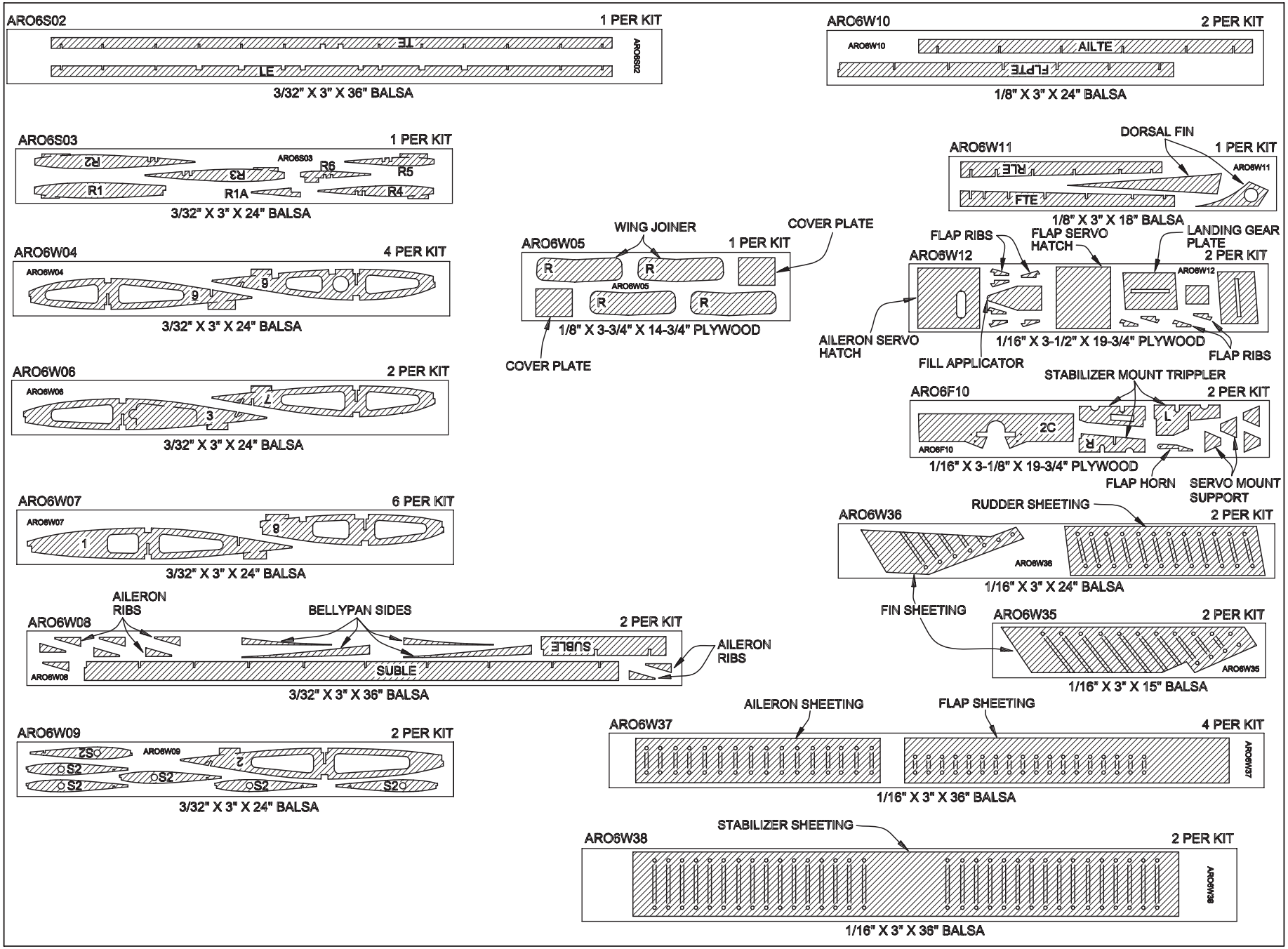
During construction there will be several occasions where epoxy cleanup will be necessary. Instead of wasting whole paper towels, stack three or four paper towels on top of each other and cut them into small squares. This will conserve paper towels and the little squares are easier to use. For epoxy clean up dampen the squares with denatured alcohol.



DIE-CUT DRAWINGS



DIE-CUT DRAWINGS



PREPARE TO BUILD

1. If you've already purchased the retractable landing gear, or as soon as you do, take the air lines out of the package. Unravel the lines and hang them somewhere in your shop. When it's time to install the lines they'll be nice and straight and they'll be easier to work with.

2. Remove all the parts from the box. Use a ballpoint pen (not a felt-tip pen) to lightly write the **name** or **size** on each piece so it can be identified later. Use the ***die-cut patterns*** on pages 8 & 9 to identify and mark the die-cut parts **before** removing them from their die sheets. Many of the parts already have numbers stamped on them, but in some cases the numbers are located beside the part or only on the die drawings in the manual. 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. After removing the parts from their die sheets, lightly sand the edges 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.

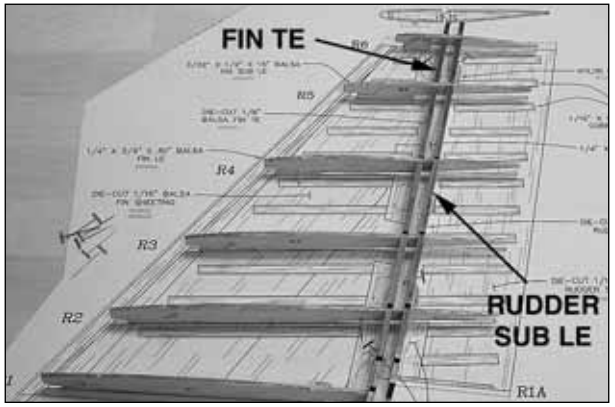
3. Separate the parts into groups such as **stab, fin, wing,** and **fuse.** Store smaller parts in zipper-top food storage bags.

BUILD THE TAIL SURFACES

BUILD THE VERTICAL STABILIZER (FIN)

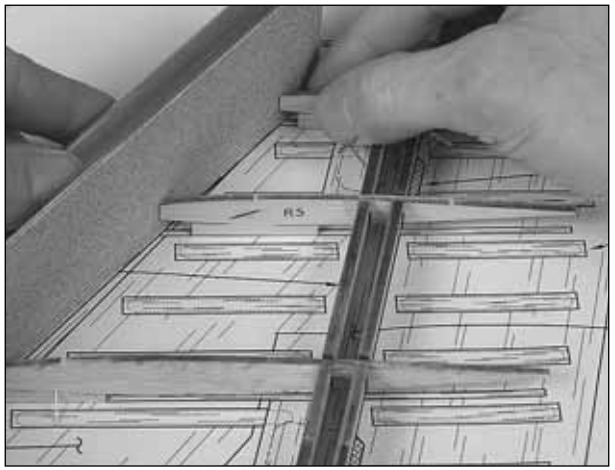
❑ 1. Unroll the fuselage plan, then re-roll it inside out so it will lay flat. Cut out the fin plan, then position it over your flat building board and cover it with Great Planes Plan Protector or wax paper so glue will not adhere.

Note: *If you plan to build your Arrow with any kind of a scale lighting system, now is the time to drill or cut any holes in the ribs necessary to accommodate the wiring.*

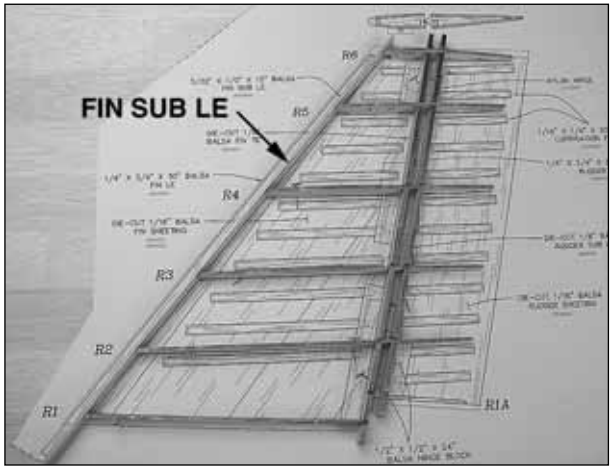


❑ 2. Fit the die-cut 3/32"[2.4mm] balsa **fin ribs R1** through **R6** into the notches of the die-cut 1/8"[3.2mm] balsa **fin trailing edge** and the die-cut 1/8"[3.2mm] balsa **rudder sub leading edge**. Note that all of the notches are slightly oversize so the parts can fit at an angle. Also note that a portion of the fin trailing edge and rudder sub LE protrude below the assembly, but will be trimmed off later. Make certain the parts are **accurately** positioned over the plan and hold them to the building board with T-pins.

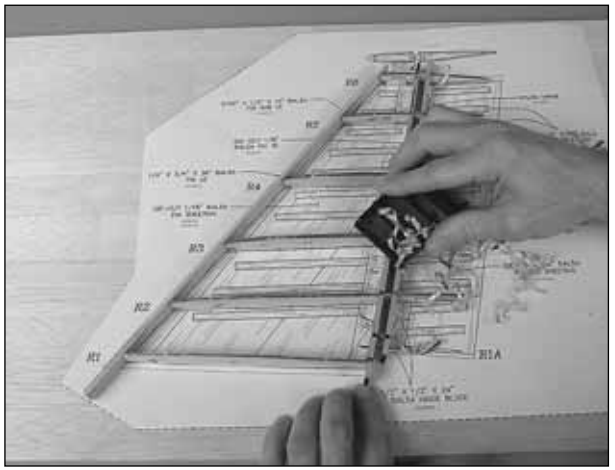
❑ 3. Make sure all the jig tabs are **fully** contacting the building board, then glue the assembly together.



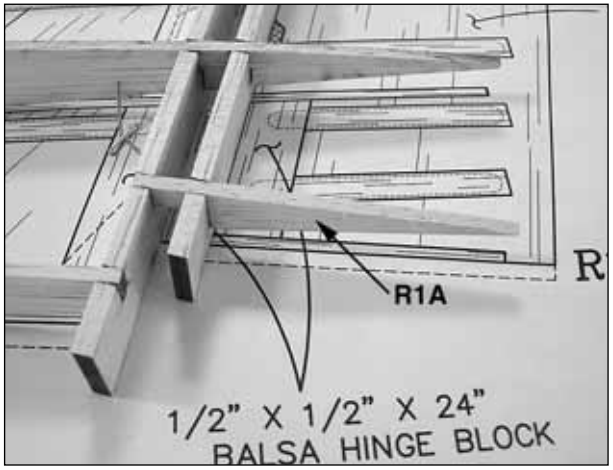
❑ 4. Use a bar sander with 80-grit sandpaper to sand a bevel on the leading edge of all the ribs. Do one rib at a time starting with rib R6 at the top. Hold the rib with your fingers and draw the bar sander down past, resting it against the other ribs to get the correct angle.



❑ 5. Center the 3/32"x 1/2"x 15"[2.4 x 12.7 x 380mm] balsa **fin sub leading edge** vertically on the front of the ribs, then glue it into position.



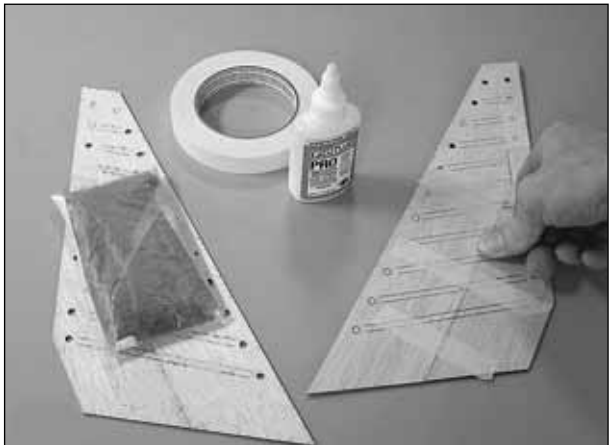
❑ 6. Use a razor plane and/or a bar sander to shape the top (left side) of the sub leading edges and the trailing edge so they are even with the ribs. **Note:** Make sure none of the T-pins protrude above any of the parts so they won't catch.



❑ 7. Glue the die-cut 3/32" [2.4mm] balsa **rudder rib R1A** into position. If necessary, sand R1A to blend with the rest of the structure.

Now it's time to make the balsa skins for sheeting the fin and rudder.

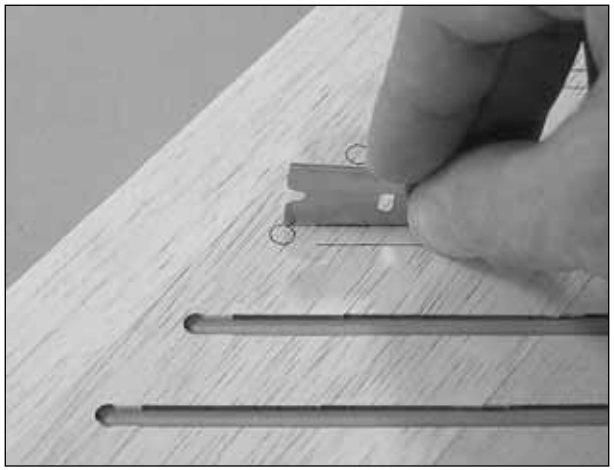
Note: Should you decide to build your Arrow without the corrugations, replace the die-cut skins supplied with this kit with soft to medium density 1/16"[1.6mm] balsa sheeting (not supplied).



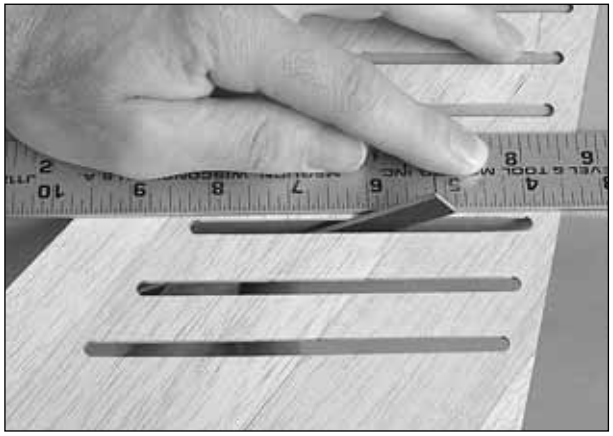
❑ 8. Glue together both sets of die-cut 1/16"[1.6mm] balsa parts that make up the **fin skins**. CA could be used, but aliphatic resin (white glue) is preferred as it allows time for positioning and is easier to sand. Use masking tape and weights to hold the parts together while the glue dries and press down along the glue joint to make sure the seams are flat.

❑ 9. Cut the two corner pieces and the leading edge pieces as shown on the plan from a 1/16"x 3"x 30"[1.6 x 75 x 760mm] balsa sheet to complete the skins and glue them into position.

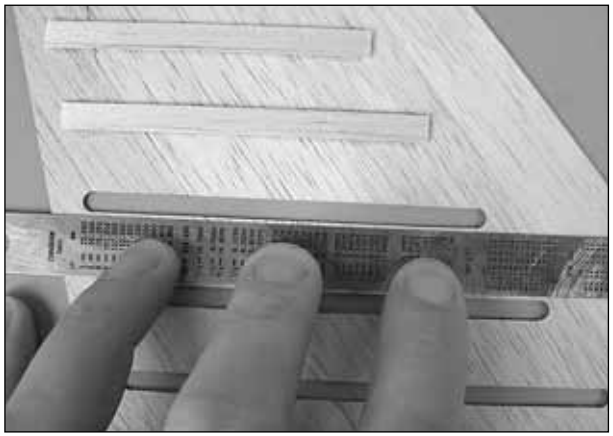
❑ 10. After the glue dries examine both skins to see which side will be the right and which side will be the left. Arrange the skins so the best sides will be on the outside. Use 180-grit sandpaper to **carefully** sand both sides of the skins flat. **Note:** The insides don't have to be as "flat" as the outsides—use care not to over thin the skins by sanding too much.



❑ 11. **Carefully** cut out the corrugations. A single-edge razor blade works well until you get to the smaller ones near the top of the skin where a #11 blade will have to be used.



❑ 12. Make a thin sanding tool by using spray adhesive to bond a piece of medium-grit sandpaper to a strip of leftover 1/16"[1.6mm] plywood. Use the sanding tool to true the edges of the corrugations. Hold the skin down near the edges of the corrugations with a ruler or something similar so you do not damage the skin while sanding.

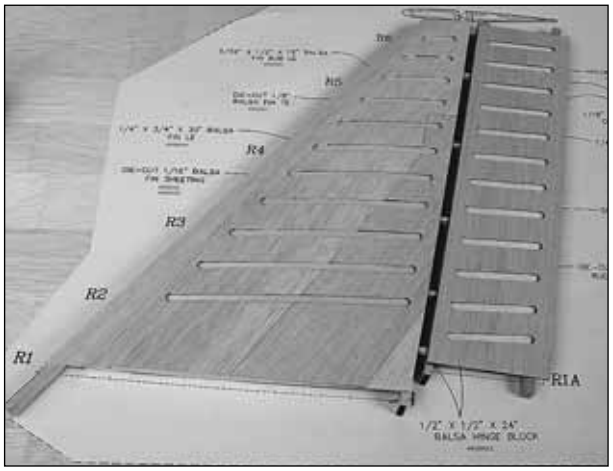


❑ 13. Cut the **corrugation filler strips** from 1/16"x 1/4"x 30"[1.6 x 6.4 x 760mm] balsa sticks and glue them to the **inside** of the fin skins. The best way to align the strips is with a straightedge—start at the top and work your way down. Once a filler strip has been positioned, use medium CA to glue it into position. Using thin CA is not recommended because it may not create a strong enough bond to hold the filler strips to the skin when bending it to the ribs.

❑ 14. Prepare the die-cut 1/16" [1.6mm] balsa **rudder skins** by cutting out the corrugations and gluing on the corrugation fillers the same as the fin skins.

❑ 15. Remove most of the T-pins holding the fin framework to the building board, but leave a few of them in R1 and R6 to hold the structure down. Make sure none of the pins will be concealed under the skin after it has been glued into position.

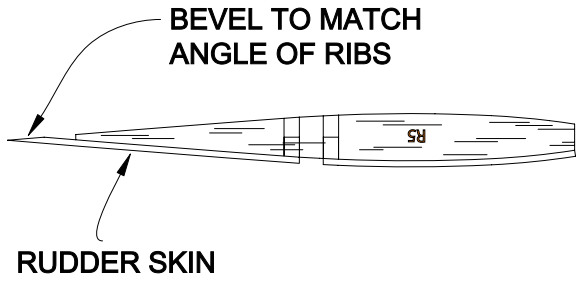
Refer to this photo for the following two steps.



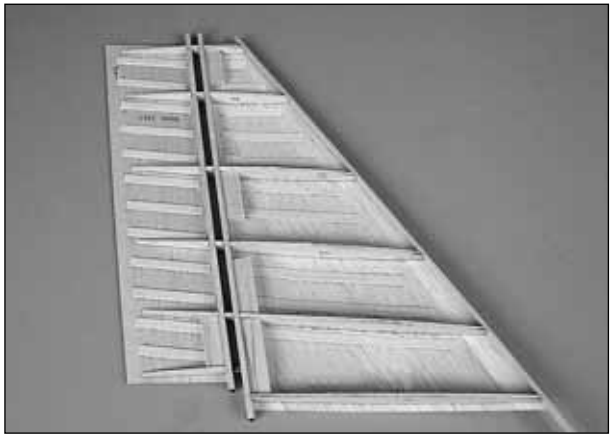
❑ 16. Test fit the left fin skin to the framework and see how it lines up. The bottom of the skin should align with the dashed line indicating the bottom of the skin on the plan. After you see how the skin fits, glue it into position with medium or thick CA.

❑ 17. Glue the left rudder skin into position the same way.

❑ 18. Take out any remaining T-pins and remove the fin/rudder assembly from the building board.

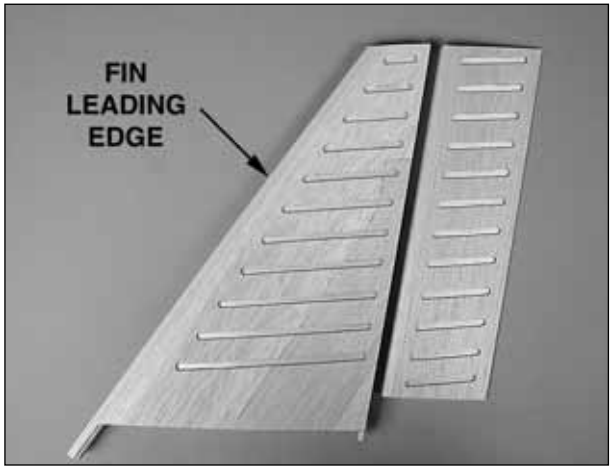


❑ 19. Trim off the jig tabs with a hobby knife, then use a razor plane followed by a bar sander with 80-grit sandpaper to trim the leading and trailing edges even with the ribs. Using the ribs in the rudder as a guide, bevel the trailing edge of the left skin to accommodate the right skin as shown in the sketch and on the cross section of the fin drawing on the plan.



❑ 20. Referring to the plan, cut the **hinge blocks** from a 1/2"x 1/2"x 24"[12.7 x 12.7 x 610mm] balsa stick. Trim the blocks so that when in position, they will be 1/16"[1.6mm] below the surface of the ribs to accommodate the 1/16"[1.6mm] balsa corrugation filler strips on the right side of the fin and rudder skins. Glue the hinge blocks into position.

Refer to this photo for steps 22 through 26.



❑ 21. Test fit, then glue the rudder and fin skin into position on the right side. Align them the same as was done for the skins on the left side of the assembly.

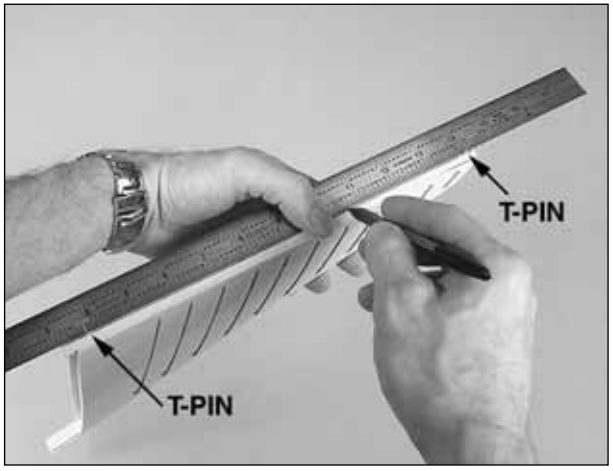
❑ 22. Sand the leading edge of the skins even with the sub leading edge. Trim the bottom of the skins and the spars even with rib R1 and R1A.

❏ 23. Cut the **fin leading edge** from the 1/4"x 3/4"x 30"[6.4 x 19 x 760mm] balsa stick, then glue it into position. Save the remainder of the stick for the rudder leading edge. Sand the top of the fin leading edge even with R6 and sand the sides of the leading edge even with both sides of the fin.

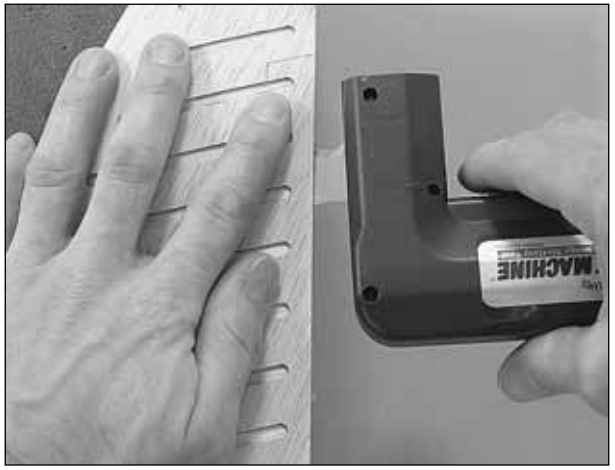
❏ 24. Use a small razor saw to separate the rudder from the fin. Sand the fin sheeting and rib stubs even with the fin trailing edge and sand the rudder sheeting and the rib stubs even with the rudder sub leading edge.

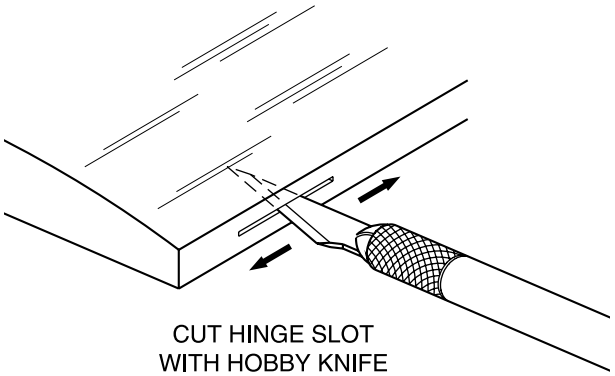
❏ 25. Cut the **rudder leading edge** from remainder of the 1/4"x 3/4"[6.4 x 19mm] balsa stick used for the fin leading edge, then glue it into position. Sand the top, bottom and sides of the rudder leading edge even with the rudder, but do not sand the "V" on the leading edge until instructed to do so.

FINISH THE FIN AND RUDDER



❏ 1. Taking accurate measurements, stick T-pins into the middle of the fin trailing edge near both ends. Place a straightedge against the pins and use a fine-point ballpoint pen to mark a centerline all the way down.

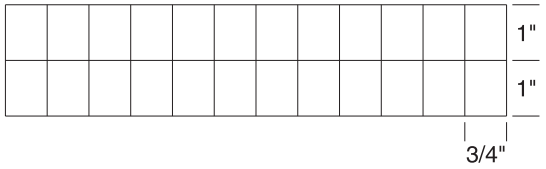


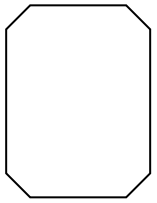


CUT HINGE SLOT
WITH HOBBY KNIFE
AND #11 BLADE

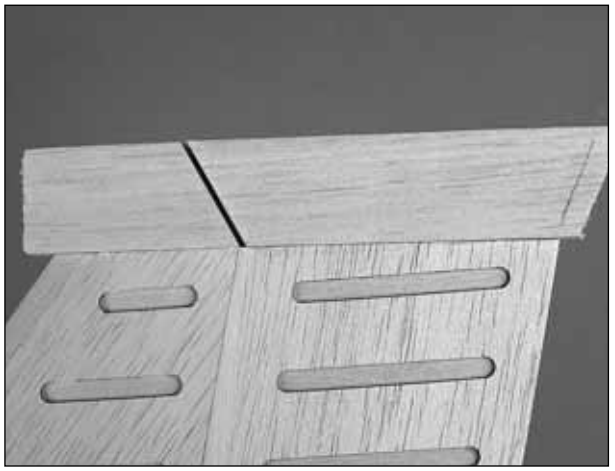
❏ 2. If you have a Great Planes Slot Machine, use it to cut the hinge slots where shown on the plan on the centerline you marked. If you do not have a Slot Machine, use a #11 hobby blade to cut the hinge slots. Start by making a small slit. Then, working in small increments, go a little deeper moving the blade back and forth. Note that it's the back of the blade that does the work.

❏ 3. Use the same procedure to mark the centerline and cut the hinge slots in the rudder.



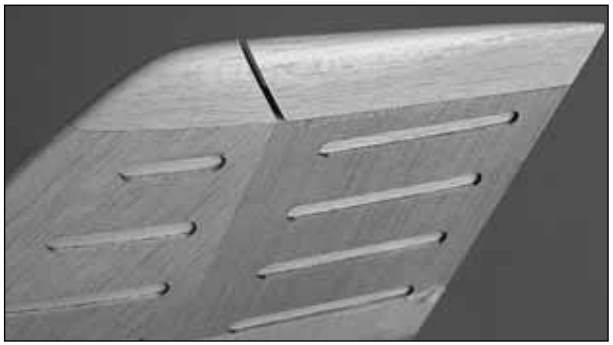


❏ 4. Cut three 3/4"x 1"[19 x 25mm] hinges from the CA hinge strip. Snip off the corners so they go in easier. **Temporarily** join the rudder to the fin with the hinges. Use masking tape to securely hold the rudder to the fin so it will not move.

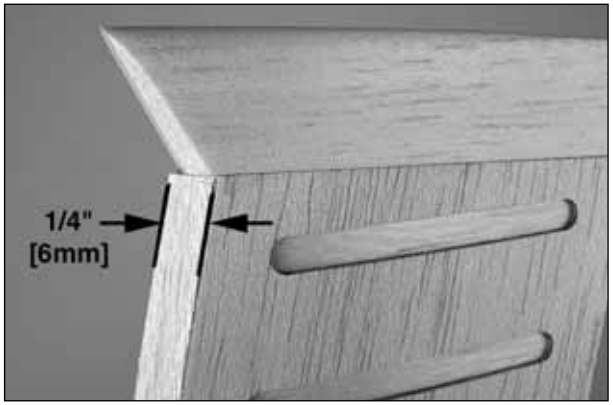


❏ 5. Cut the **fin** and **rudder tip** from a 1/2"x 1"x 24"[13 x 25 x 610mm] balsa stick, then glue them to the top of the fin and rudder. Be certain to leave an approximately 3/32"[2.4mm] gap between the fin and rudder tips.

❑ 6. Use a razor plane and/or a hobby knife followed by a bar sander to shape the fin and rudder tip to match the fin and rudder, but do not round the top until the next step.

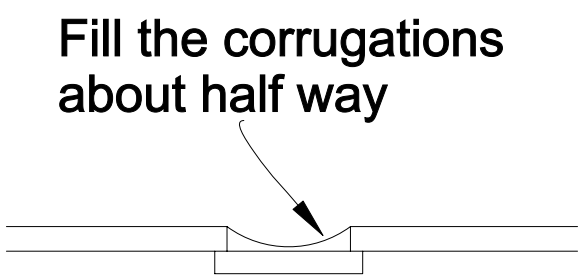


❑ 7. Now go ahead and round the tips of the fin and rudder by sanding.

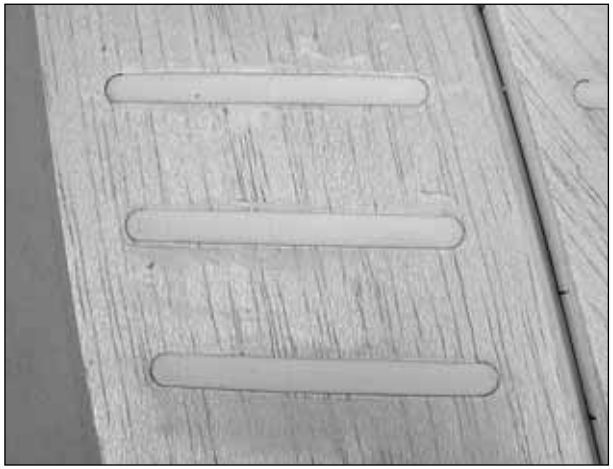


❑ 8. Remove the tape and separate the fin from the rudder. Use a straightedge and a ballpoint pen to mark lines on both sides of the rudder 1/4"[6mm] back from the leading edge. Using the lines and the centerline as a guide, shape the leading edge of the rudder to a "V" shape to allow for control throw. Also shape the front of the rudder tip as shown.

❑ 9. Test fit the rudder to the fin with the hinges. Move the rudder back and forth to make sure it moves freely. Make any adjustments necessary.



❑ 10. Use a putty knife or the included 1/16"[1.6mm] die-cut plywood applicator to apply lightweight balsa filler to partially fill the corrugations. Try to be consistent and fill the corrugations about half-way as shown in the sketch.

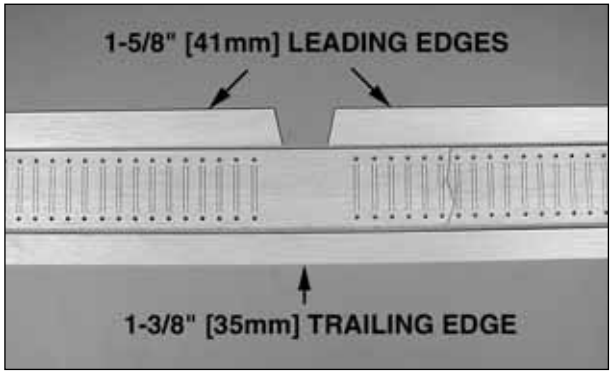


❑ 11. After the filler has dried, sand the surface of the skins and down into the corrugations.

Set the fin and rudder aside while you build the stab.

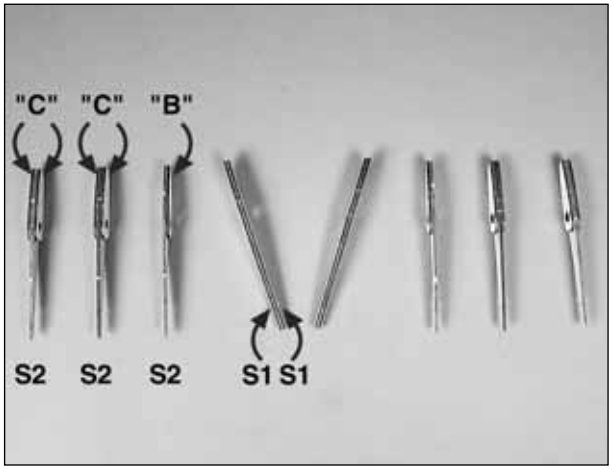
BUILD THE HORIZONTAL STABILIZER (STAB)

Don't forget, this is a one-piece, "flying" stabilizer and has no elevators. Let's start by making the top and bottom stab skins...



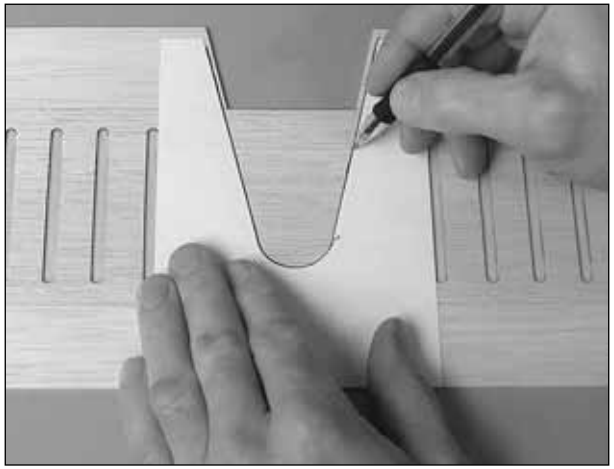
❑ 1. Cut a 1-3/8"[35mm] strip from a 1/16"x 3"x 30"[1.6 x 75 x 760mm] balsa sheet to be used as the **trailing edge** portion of one of the die-cut 1/16"[1.6mm] balsa **stab skins**. Use the remaining 1-5/8"[41mm] sheet to make the right and left **leading edge** portions.

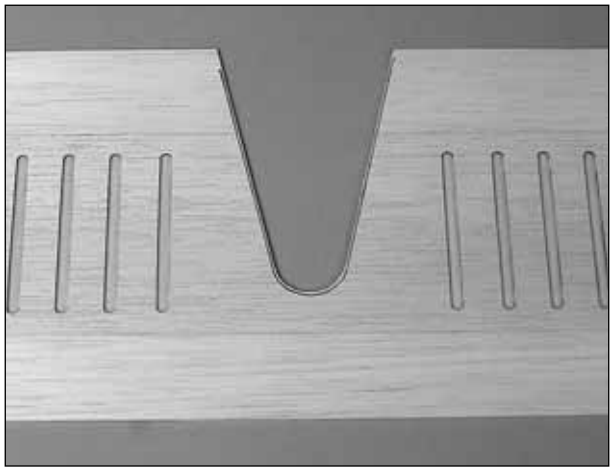
❑ 2. Repeat the previous step to make the leading and trailing edge portions of the other stab skin. Glue the sheets you just cut to the front and back of the **stab skins**. **Reminder:** Aliphatic resin is recommended over CA because it will allow time to position the sheets and will be easier to sand after it dries.



❑ 3. While the glue on the stab skins is drying, make up the ribs for the stab assembly by gluing a die-cut 1/8"[3.2mm] plywood **rib doubler "S2C"** to both sides of four die-cut 3/32"[2.4mm] balsa **stab ribs S2**. Glue one die-cut 1/8"[3.2mm] plywood **rib doubler "S2B"** to one side of another stab rib S2 (make two of these, and be sure to make a **right** and a **left**). Lastly, make two sets of root stab ribs by gluing together two die-cut 1/8"[3.2mm] plywood **stab ribs S1**. **Note:** If you forget which of the doublers "B" are, they are the ones with the larger hole for the brass tubing.

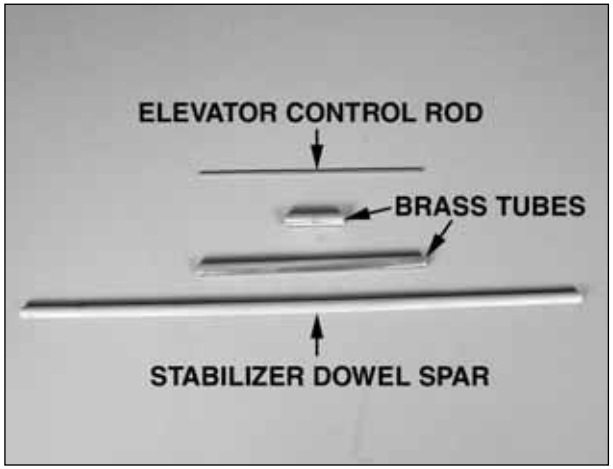
...Back to the stab skins...



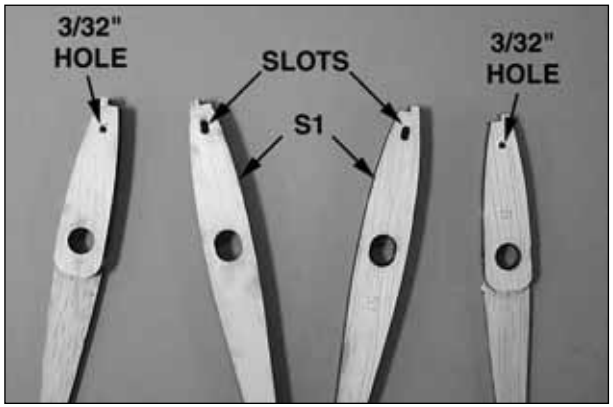


❑ 4. After the glue on the stab skins has dried remove the masking tape and sand both sides flat and even. Cut the **Stab Center Cutout Template** from the plan and use it to mark the cutout in the stab skins with a ballpoint pen. Cut and remove the section of sheeting, but do not cut directly on the line—leave some additional material to allow for positioning.

❑ 5. Cut out the corrugations and true the edges with your sanding tool. Cut the corrugation fillers from more 1/16"x 1/4"x 30"[1.6 x 6 x 760mm] balsa sticks and glue them to the insides of the stab skins the same as you did for the fin and rudder skins.



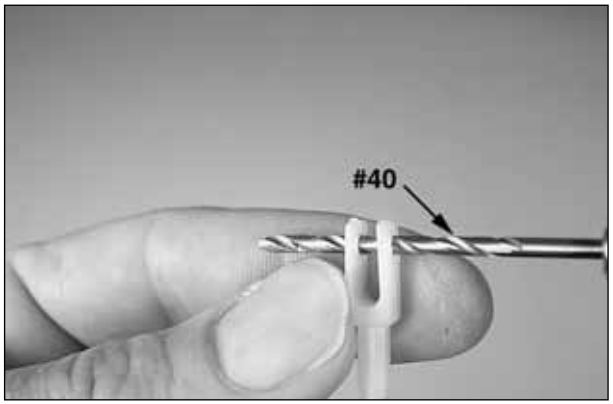
❑ 6. Cut the **stabilizer control rod** to a length of 6"[150mm] from a 4-40 x 12"[300mm] pushrod by cutting off the threaded end. Discard the threaded end (or keep it for your spare parts bin). Cut the **dowel spar** to a length of 15-3/4"[400mm] from the 5/16"x 16"[8 x 405mm] hardwood dowel. Use a piece of a paper towel or a tissue dampened with denatured alcohol to clean any residual oil from the control rod. Clean the inside and outside of the 11/32"x 6"[8.7 x 150mm] brass tube and the 3/8"x 1-1/2"[9.5 x 38mm] brass tube as well.



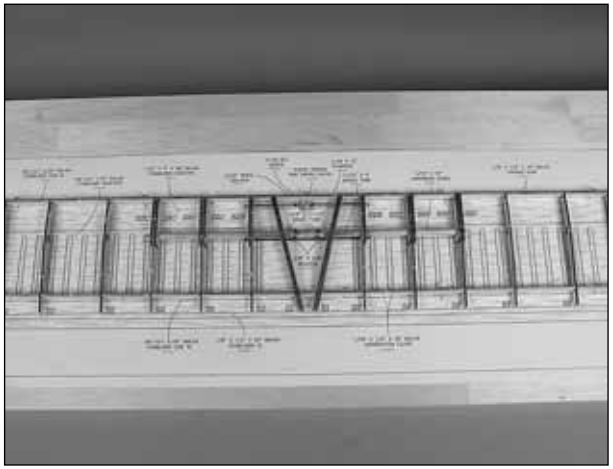
❑ 7. Drill 3/32"[2.4mm] holes between the ends of the die-cut slots in the plywood S1 Ribs to make slots that will accommodate the stabilizer control rod. Also drill 3/32"[2.4mm] holes through the punchmarks through the ribs at the punchmarks in the B doublers.

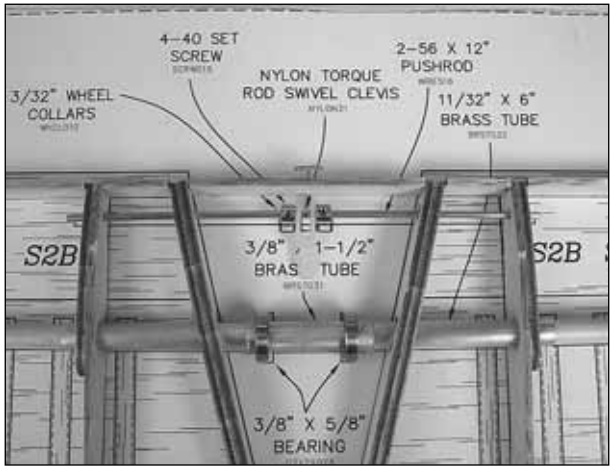
❏ 8. Use 320-grit or 400-grit sandpaper to roughen the **outside** of the 11/32"x 6"[8.7 x 150mm] brass tube and the **inside** and **outside** of the 3/8"x 1-1/2"[9.5 x 38mm] brass tube so glue will adhere.

❏ 9. Use 30-minute epoxy to glue the dowel spar and tubes together—both tubes should be centered on the dowel. From now on this assembly will be referred to as the **stab spar**.
Note: It may be necessary to sand down the dowel to get it to fit into the 11/32" [8.7mm] brass tub.



❏ 10. Enlarge the holes in the nylon swivel clevis with a #40 drill.



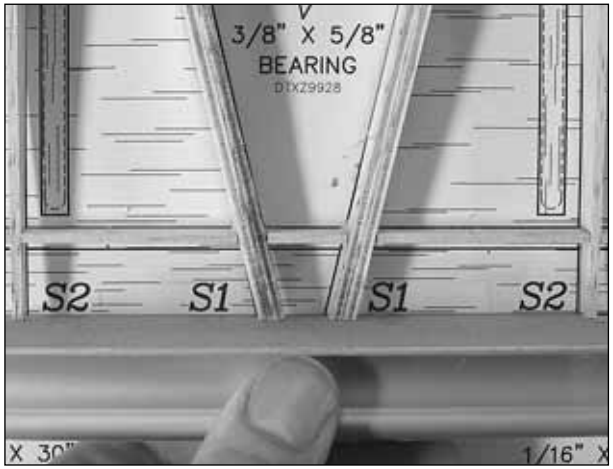


❏ 11. Slide the swivel clevis and two 3/32"[2.4mm] wheel collars onto the 4-40 control rod. (The set screws will be installed and tightened when finalizing the radio setup after the model has been completed.) Slide the bearings over the stab spar. Fit the ribs on the pushrod and the stab spar. Working over the stab plan, fit the assembly to the die-cut 3/32"[2.4mm] balsa **sub leading edge** and the die-cut 3/32"[2.4mm] balsa **sub trailing edge**. Join the rest of the ribs to the assembly.

❏ 12. Hold the stab assembly to the building board with T-pins. Glue the ribs to the sub leading edge and to the sub trailing edge.

❏ 13. Securely glue the stab spar and the stabilizer control rod to the ribs.

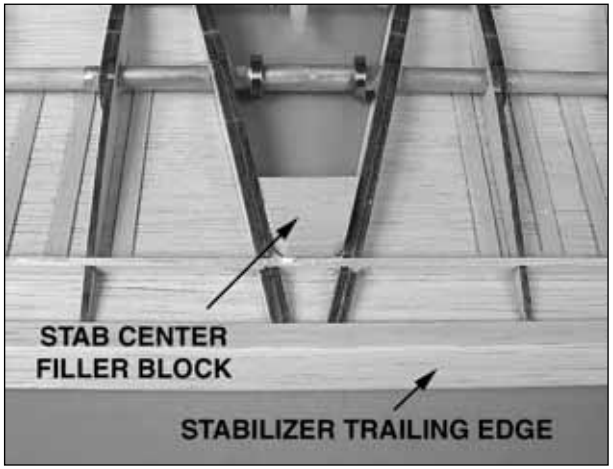
❏ 14. Use a razor plane followed by a bar sander to shape the top of the sub leading and trailing edges even with the tops of the ribs to accommodate the sheeting. Make sure none of the T-pins are in the way.



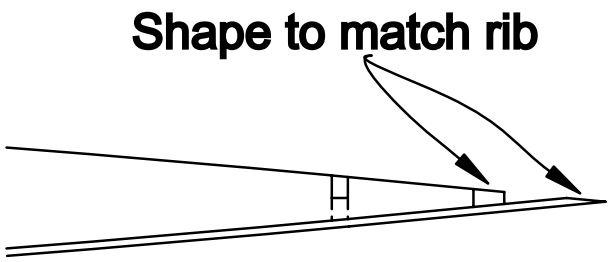
❏ 15. Sand the trailing edge of the plywood S1 ribs to accommodate the balsa stab trailing edge.

❏ 16. Remove any T-pins from the stabilizer assembly that will be concealed under the stab skin when you glue it into position. Glue one of the stab skins to the top of the stab. Thick or medium CA could be used, but aliphatic resin is recommended because it will allow more working time for positioning the skin. Use T-pins and weights to securely hold the skin down until the glue dries.

❏ 17. Remove the stab from the building board. The same as you did with the vertical stabilizer, trim the bottom of the sub trailing edge and the bottom of the sub leading edge even with the ribs to accommodate the bottom sheeting.

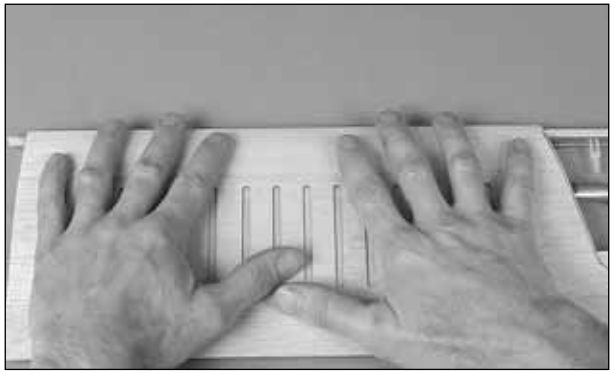


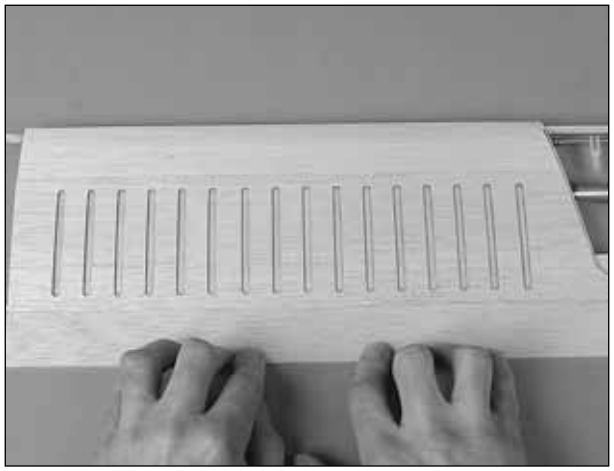
❏ 18. Glue the 1/8"x 1/4"x 30"[3.2 x 6.4 x 760mm] balsa **stabilizer trailing edge** into position. Cut the **stab center filler block** from the 1/2"x 1"x 24"[12.7 x 25 x 610mm] balsa stick (first used for the fin and rudder tips). Shape the block to fit between the S1 ribs, but don't worry about rounding the inside edge at this time. Glue the block into position.



❏ 19. Shape the stabilizer trailing edge, the stab center filler block and the top sheeting to match the shape of the ribs.

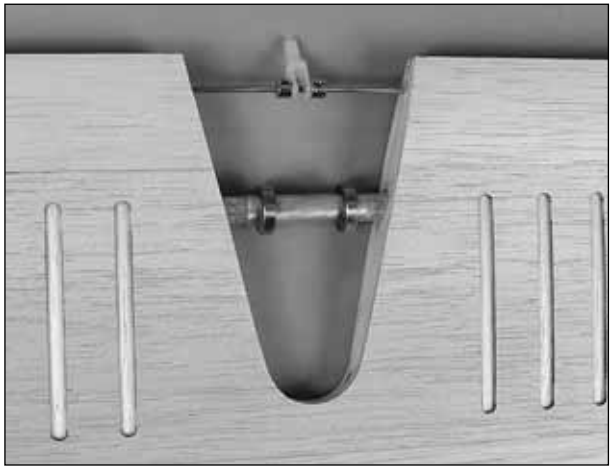
❏ 20. Prepare to glue on the bottom stab skin. Test fit the skin and check the alignment. Make any adjustments where necessary for a good fit. The skin will be glued on with medium or thick CA, so you'll want to get it positioned correctly and work quickly.





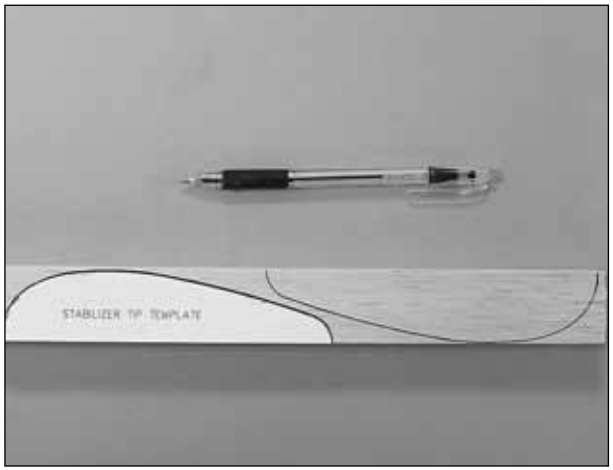
❏ 21. Apply thick or medium CA to the ribs and spars and to the trailing edge of the top skin where it contacts the bottom skin. Working quickly, position the bottom skin. Carefully press the skin into position without introducing any twist. Apply pressure to the trailing edge over your flat work surface. This will ensure a straight and true trailing edge. Handle both halves of the stab as though they were two separate pieces—work on pressing down both halves of the skin separately.

❏ 22. After the CA has hardened, trim the leading edge and the tips of the skins even with the sub leading edge and the ribs.

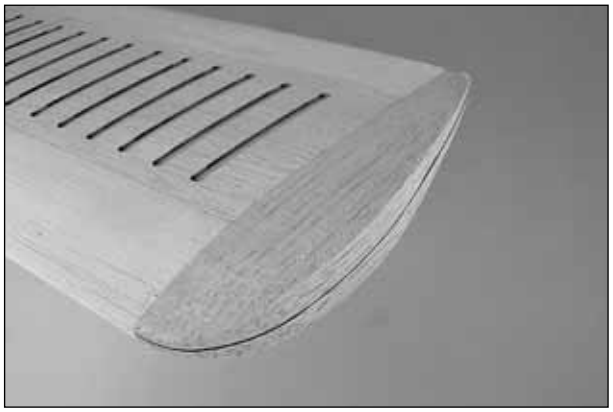


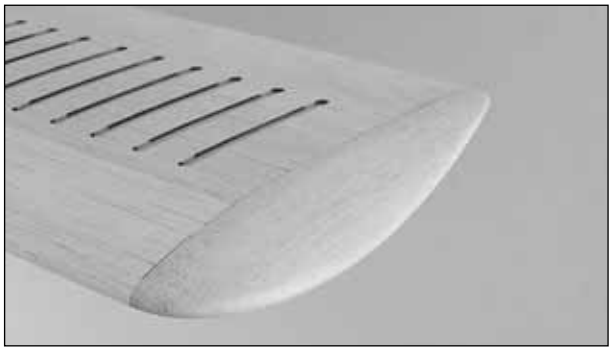
❏ 23. Round the stab center filler block and trim the sheeting even with the S1 ribs.

❏ 24. Cut the stabilizer **leading edge** from a 1/4"x 1/2"x 30"[6.4 x 25 x 760mm] balsa stick, then glue it into position. Shape the leading edge to match the plan and sand it even with the tip ribs and the S1 ribs.



❏ 25. Cut the **Stabilizer Tip Template** from the plan and use it to cut out two **stabilizer tips** from the 1"x 1-1/2"x 15"[25 x 38 x 380mm] balsa stick.





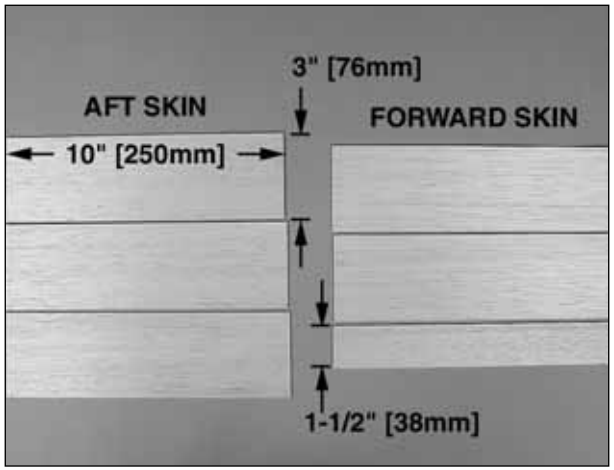
❑ 26. Mark a centerline around the tips, then glue them into position. Using the centerlines as guides, carve and sand the tips to match the stab, then round to a finished shape.

❑ 27. The same as was done on the fin and rudder corrugations, get out your putty knife and wood filler and partially fill all of the corrugations on both sides of the stab. Allow to dry, then sand.

BUILD THE WING

MAKE THE WING SKINS

❑ 1. Cut the **wing center panel** plan from the wing plan. Cover the plan with Plan Protector or wax paper and place it over your flat building board.

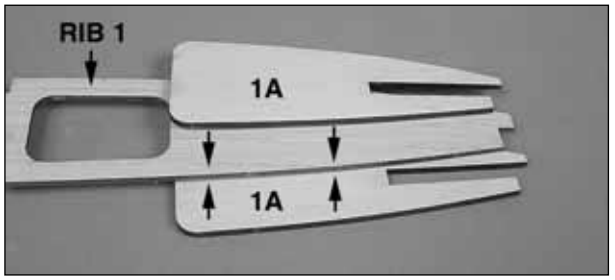


❑ 2. Cut four 1/16"x 3"x 30"[1.6 x 75 x 760mm] balsa sheets into twelve 3"x 10"[75 x 250mm] balsa sheets. Set one of the 3"x 10"[75 x 250mm] sheets in your scrap pile and cut another one of the 3"x 10"[75 x 250mm] sheets into two 1-1/2"x 10"[38 x 250mm] sheets.

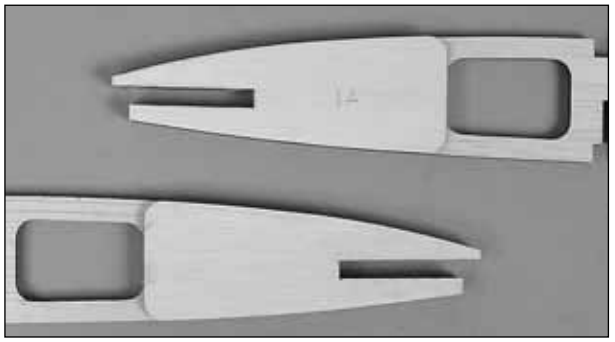
❑ 3. Glue the sheets together as shown in the previous photo to make a **forward** and **aft center panel skin**. Make two of each.

❑ 4. Sand the skins flat and even.

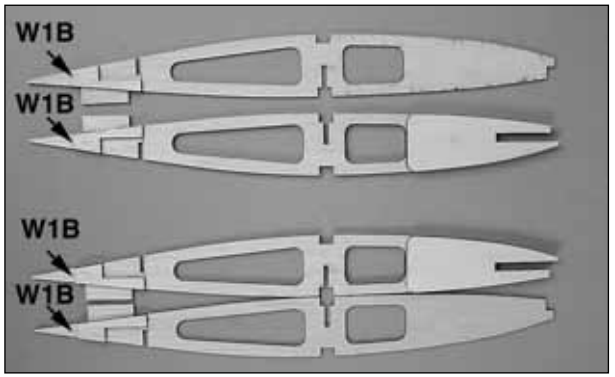
BUILD THE CENTER PANEL



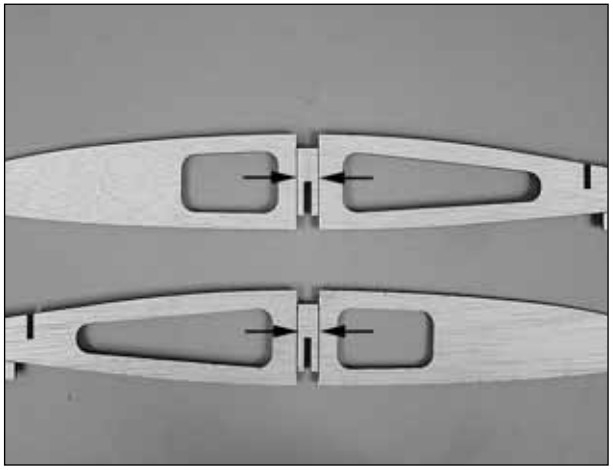
❑ 1. Glue a die-cut 1/8"[3.2mm] plywood **rib doubler 1A** to both sides of a die-cut 3/32"[2.4mm] **balsa rib W1**. Make another assembly the same way.



❑ 2. Cut the balsa from between the dowel notches in both rib assemblies.



❑ 3. Referring to the plan, glue the four die-cut 1/8"[3.2mm] plywood doublers **W1B** to the opposing sides of the outer two ribs that will go on both ends of the center panel.

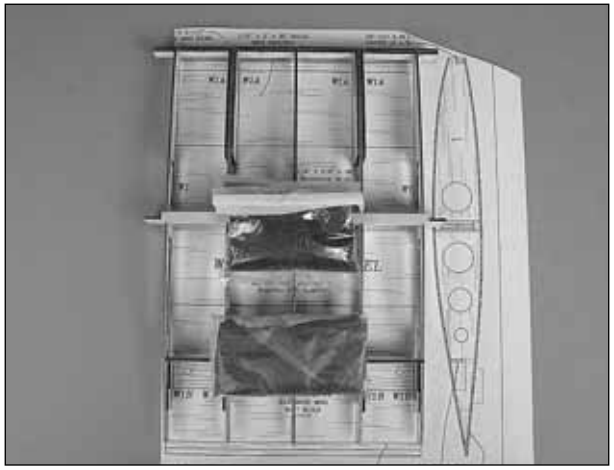


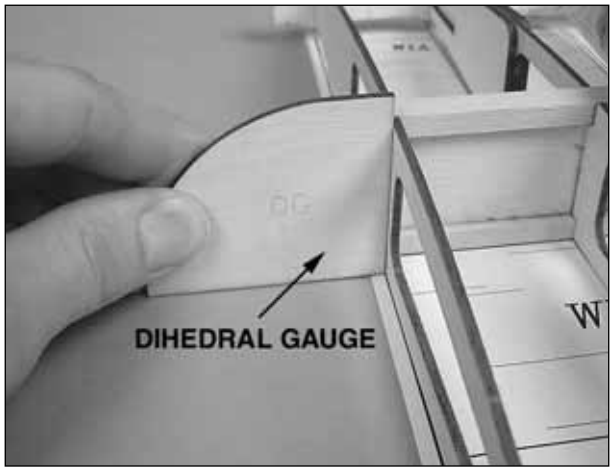
❑ 4. Use a #11 blade to cut **part way** through both sides of the ribs that go on the outer ends of the center panel between the spar notches.

❑ 5. Glue together both die-cut 1/8"[3.2mm] plywood **center leading edges (CLE)**.

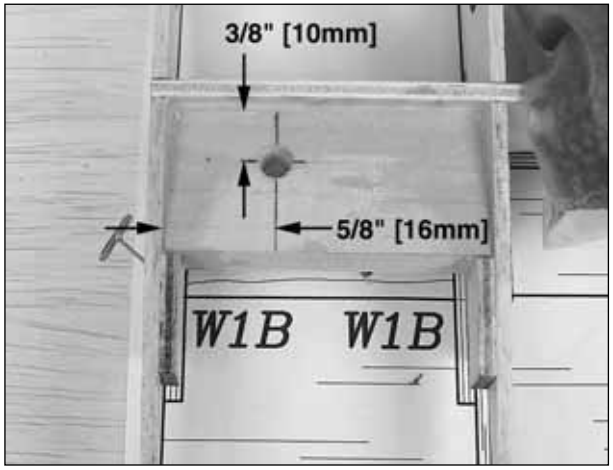
❑ 6. Cut the **top** and **bottom spars** for the center panel to a length of 9-3/8"[240mm] from a 1/4"x 3/8"x 36"[6.4 x 9.5 x 910mm] basswood stick.

❑ 7. Join the ribs to the center leading edge, the die-cut 1/8"[3.2mm] plywood **center trailing edge**, the die-cut 1/8"[3.2mm] plywood **center spar web** and the top and bottom main spars.

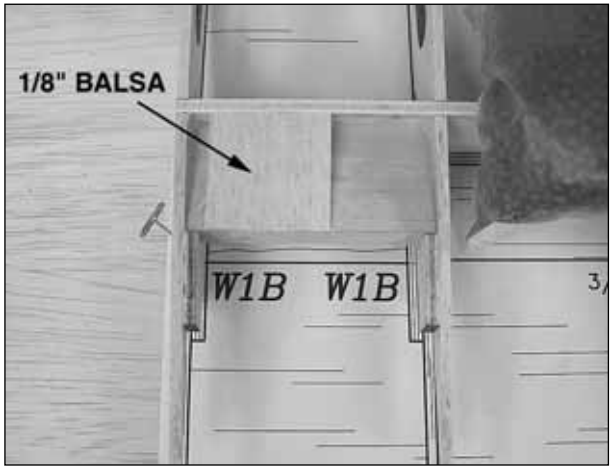




❑ 8. Position the assembly over the plan and hold it down with weights and a few T-pins stuck into the jig tabs and into the bottom of the ribs where they contact the plan, just aft of the bottom spar. Use thin and medium CA to glue all the parts together. When gluing the outer ribs, use the die-cut 1/8"[3.2mm] plywood **dihedral gauge** to make certain they are set at the correct angle.



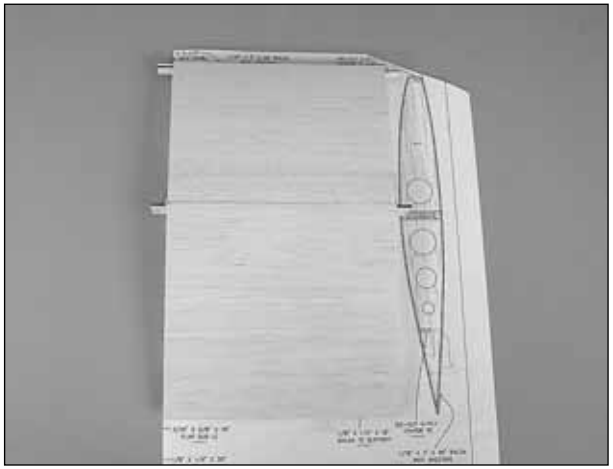
❑ 9. Mark the center of the hole to be drilled in one of the 3/8"x 1"x 2-1/16"[9.5 x 25 x 52mm] basswood **wing bolt blocks** 5/8"[16mm] from the end and 3/8"[10mm] from the front edge. Drill a #7 hole through the block at the mark. Mark and drill the other wing bolt block the same way. Use 30-minute epoxy to glue the wing bolt blocks into position.

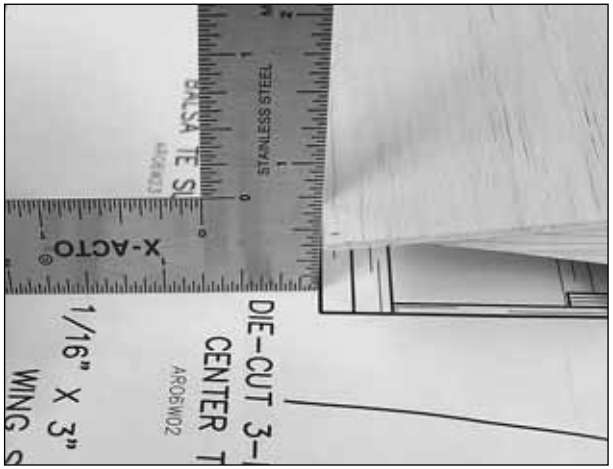


❑ 10. After the epoxy hardens, glue leftover 1/8"[3.2mm] balsa over the blocks to support the sheeting around the holes that will be drilled later.

❑ 11. Remove the weights and carefully sand the **tops** of the center leading edges and the center trailing edge even with the tops of the ribs.

Refer to this photo for the following two steps.



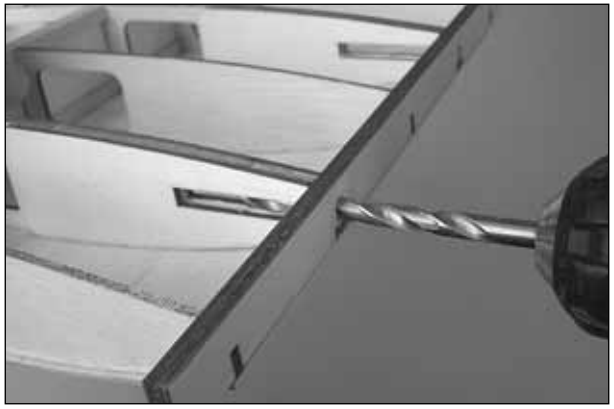


❏ 12. Both sides of the center panel will be sheeted in two sections—with the seam centered over the main spars. With the assembly accurately aligned over the plan, start by sheeting the aft section with one of the skins you prepared earlier. The skin should be trimmed so that the aft edge aligns with the trailing edge depicted on the plan and the front edge aligns with the middle of the top spar. Glue the skin into position—aliphatic resin is preferred as it will allow time for alignment. Thick or medium CA could be used, but you'll have to work quickly.

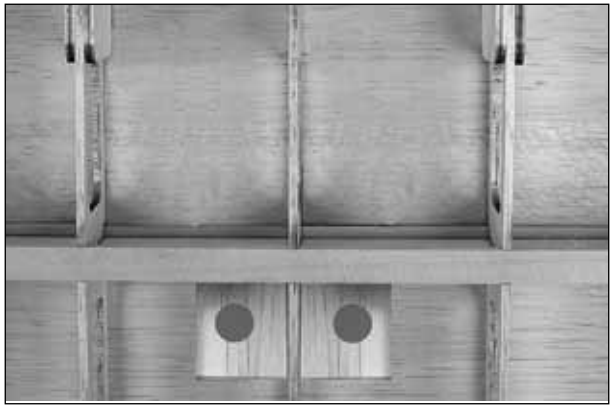
❏ 13. Glue the forward sheet into position.

❏ 14. After the glue has dried, remove the center panel plan from the building board. Carefully cut the jig tabs from the bottom of the ribs. Sand all the parts even with the ribs and bevel the underside of the trailing edge of the top sheeting to the same angle as the ribs to accommodate the bottom sheeting.

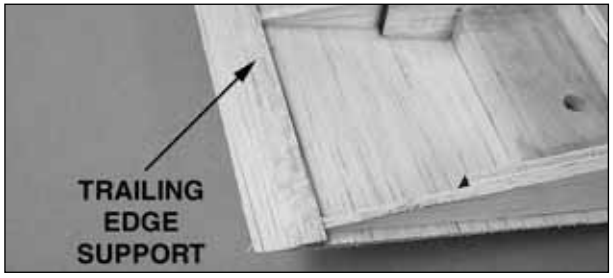
❏ 15. Using the holes in the wing bolt blocks as a guide, drill a #7 hole through the top sheeting.



❏ 16. Drill 1/16"[1.6mm] pilot holes through both punchmarks in the center leading edge. Enlarge the holes for the wing dowels with a 1/4"[6.4mm] drill.



❏ 17. Glue pieces of leftover 3/32"[2.4mm] balsa inside the wing where shown. Cut or drill 1/2"[13mm] holes for the servo wires and air lines.

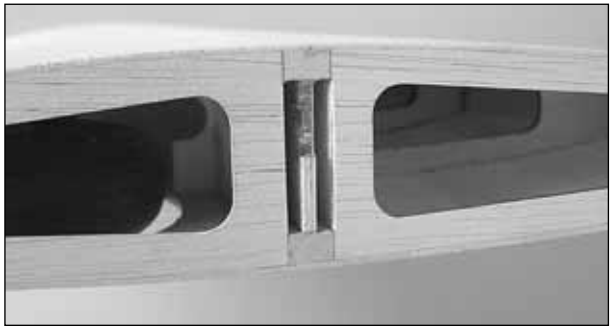


❏ 18. Cut the **trailing edge support** from a 1/8"x 1/4"x 30"[3.2 x 6.4 x 760mm] balsa stick and glue it into position. Bevel the support to match the shape of the bottom of the wing.

❏ 19. Select the hardest of the remaining 1/16"x 3"x 30"[1.6 x 75 x 760mm] balsa sheets. From this sheet, cut the **shear webs** as shown on the plan for the front and back of the spars on both ends of the panel. Glue the webs into position.

❏ 20. Sheet the bottom of the center panel in two sections the same way you sheeted the top.

❏ 21. Trim the sheeting and spars even with the ribs on both ends of the center panel. Sand the sheeting flat and even.



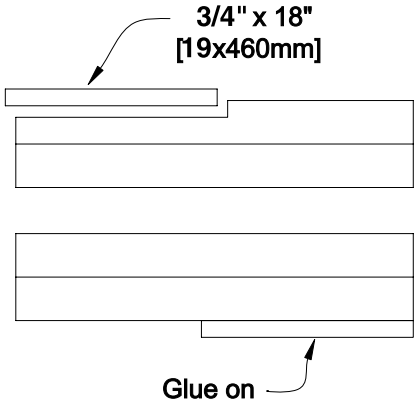
❏ 22. Remember when you were instructed to cut part way through the ribs on the ends of the panel? Now is the time to cut the rest of the way through the ribs along the lines and remove the material between the spars.

Now the center panel is complete and may be set aside while building the outer panels.

BUILD THE OUTER PANELS

We'll start by making the wing skins. It's a bit of an undertaking to do them all at once, but then you won't have to make any more. Or you could just make the skins as needed…

❏ 1. Glue together two 1/16"x 3"x 36"[1.6 x 75 x 910mm] balsa sheets to make one 6"x 36"[150 x 910mm] balsa **outer wing skin**. Make seven more 6"x 36"[150 x 910mm] outer skins the same way.



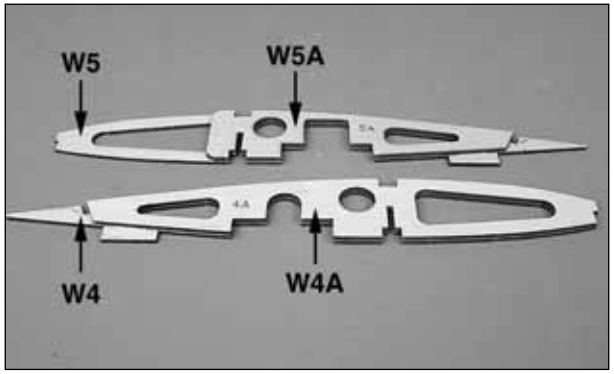
❏ 2. After the glue has dried, cut a 3/4" x 18"[19 x 460mm] strip from four of the skins. These will be the skins used for sheeting the front of the wings. Glue the cut off strips to each of the remaining four other skins. These will be the skins used for sheeting the rear of the wings.

❏ 3. After the glue has dried, sand the skins flat. Remember, the insides of the skins don't have to be perfect—do not over thin the skins by sanding too much.

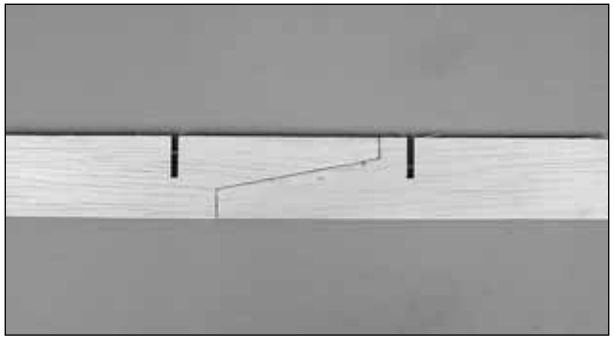
Start building the left panel so your progress matches the photos the first time through.

❏ ❏ 4. Cut the left wing panel plan from the wing plan and place it over your flat building board and cover with Plan Protector so glue will not adhere.

❏ ❏ 5. The same as was done for the ribs on the ends of the center panel, cut partway through both sides of rib W2 between the spar notches.

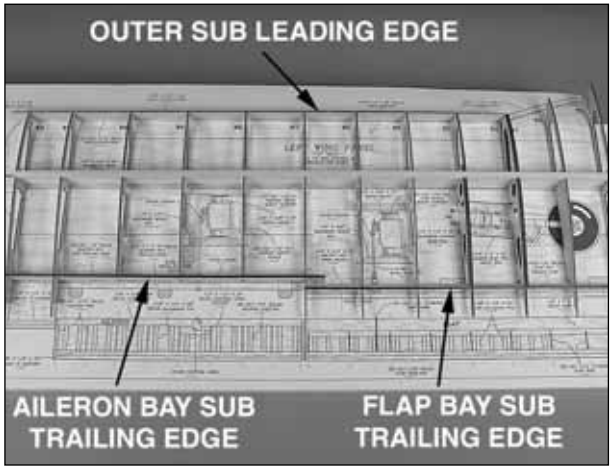


❏ ❏ 6. Glue a die-cut 1/8"[3.2mm] plywood wing rib **W5A** to **W5** and glue a **W4A** to **W4**. **Make sure you glue the "A" ribs to the correct side for the wing panel you are working on.**

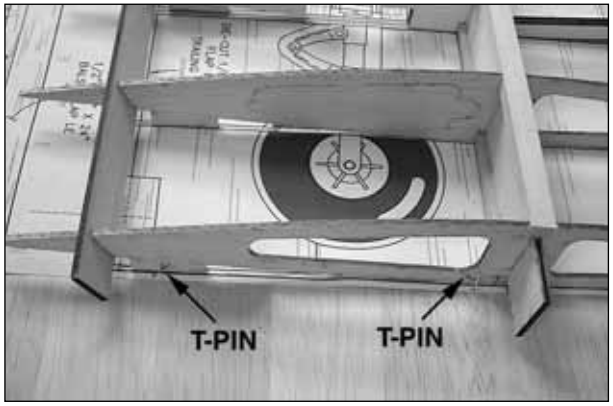


❏ ❏ 7. Glue together the two parts of the die-cut 1/8"[3.2mm] plywood **spar webs**.

❏ ❏ 8. Cut two 1/4"x 3/8"x 36"[6.4 x 9.5 x 910mm] basswood sticks to the length shown on the plan for the **top** and **bottom spars**.



❏ ❏ 9. Fit but do not glue all the wing ribs (W2 through W9) to the spar web. Fit but do not glue the top and bottom spars, the die-cut 1/8"[2.4mm] balsa **aileron bay sub trailing edge**, **flap bay trailing edge** and the die-cut 3/32"[2.4mm] balsa **outer sub leading edge**.



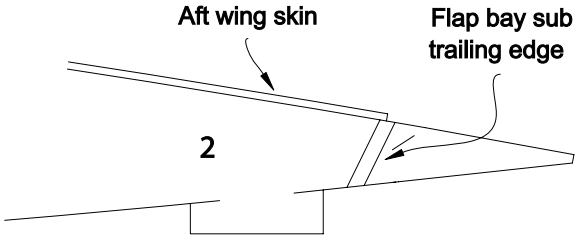
❏ ❏ 10. Pin five or six of the wing ribs down to the building board through the low points just aft of the bottom spar and through the jig tabs.

❏ ❏ 11. Use thin or medium CA to glue all contacting parts together except for the top spar—do not get any glue on the top spar. Use the dihedral gauge to make sure rib W2 is set at the correct angle. (The rib should lean slightly toward the wing tip to accommodate the dihedral.)

❏ ❏ 12. Remove the top spar from the assembly. Apply a bead of medium or thick CA along the top edge of the spar web, then reposition the top spar. Make sure W2 is still at the correct angle using the dihedral gauge.

❏ ❏ 13. Glue the die-cut 1/8" [3.2mm] balsa **inner sub leading edge** into position.

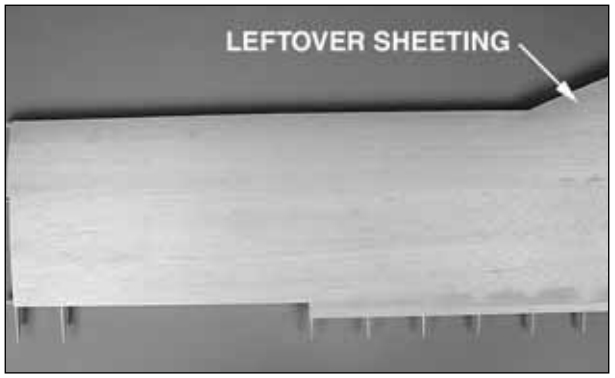
❏ ❏ 14. Prepare the top of the wing for sheeting by trimming and sanding the sub leading edges, the aileron bay sub trailing edge, the flap bay trailing edge and the top spar even with the tops of the ribs.



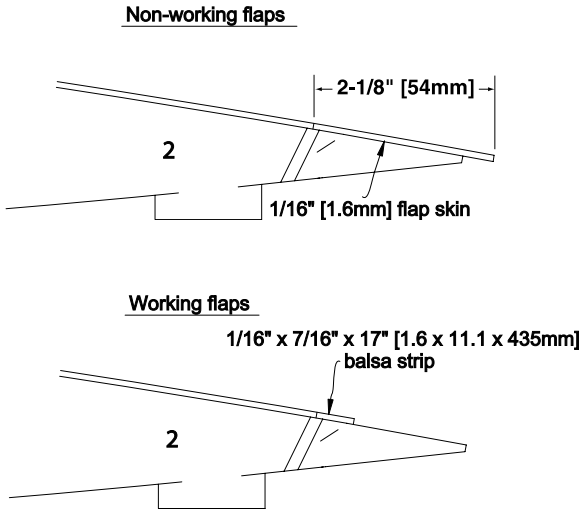
❏ ❏ 15. Trim one of the aft skins to fit the wing so that the front edge aligns with the **middle** of the top spar and the aft edge aligns with the middle of the flap bay sub trailing edge. The skin should extend 1/16" [1.6mm] or so past the aileron bay sub trailing edge to allow for trimming later.

❏ ❏ 16. Glue the aft skin into position. Aliphatic resin is recommended as it will allow time for positioning. Use weights and T-pins to hold the skin in position while the glue dries. The rest of the trailing edge between the W9 ribs at the wing tip will be sheeted later.

Refer to this photo for the following two steps.



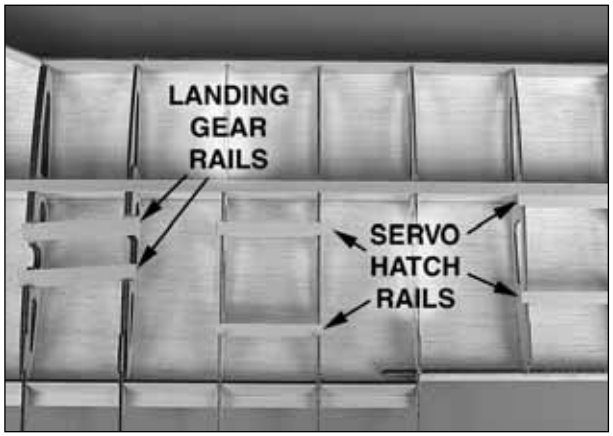
❏ ❏ 17. Cut and trim one of the forward skins to fit the wing, then glue it into position. Use a piece of leftover sheeting for the small corner at the leading edge where the front sheet won't reach. Use weights and/or T-pins to hold the sheeting down while the glue dries.



❏ ❏ 18. If **not** building flaps, test fit one of the die-cut 1/16" [1.6mm] balsa **flap skins** to the wing. The trailing edge of the skin should extend 2-1/8" [54mm] aft of the top wing skin. Cut out the slots for the corrugations and trim the flap skin as necessary for a good fit, then glue the skin into position. If you **are** building working flaps, trim a 7/16" x 17-3/4" [11 x 435mm] strip from a piece of leftover 1/16" [1.6mm] hard balsa. Glue the strip over the flap bay trailing edge.

❏ ❏ 19. After the glue on all of the wing sheeting has dried, remove the wing from the building board.

Refer to this photo for the following two steps.



❏ ❏ 20. Flip the wing over and lay it on your workbench. Cut two 3-3/4" [95mm] long **landing gear rails** from the 1/4" x 1/2" x 16" [6.4 x 13 x 410mm] basswood stick. Use 30-minute epoxy to glue the rails into position. For additional strength, milled glass fibers could be added to the mixture. This will allow you to build up small fillets without the glue dripping away from the joints.

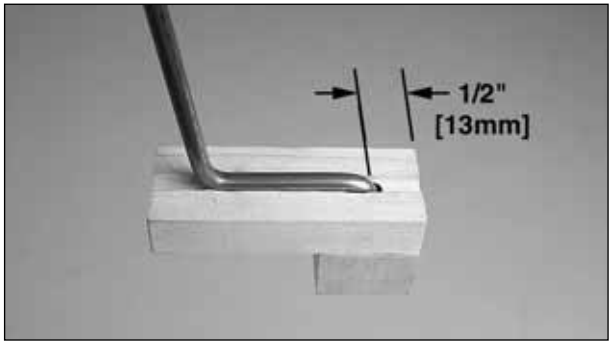
❏ ❏ 21. While the epoxy on the landing gear rails is hardening, make the **servo hatch rails** from a 1/4" x 3/8" x 36" [6.4 x 9.5 x 910mm] basswood stick and glue them into position. Be certain to glue the aileron hatch rails in the two inboard W8 ribs as shown on the plan. **Note:** If not building working flaps, there is no need to cut and glue in the servo rails for the flaps.

❏ 22. Return to step 4 and build the right wing panel. Don't forget to build over the **right** wing plan.

FIT THE FIXED LANDING GEAR

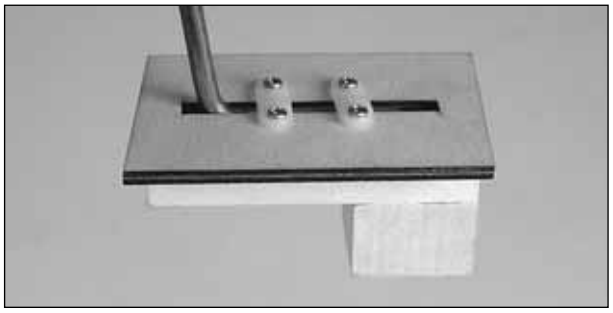
Skip this section if installing retracts.

Note: Even though the landing gear assembly for the **left** wing is shown in the photographs, both landing gear assemblies could be installed simultaneously.



❏ 1. Use 30-minute epoxy to glue a 3/4" x 1" x 1" [19 x 25 x 25mm] basswood **main landing gear torque block** to one end of a 1/2" x 1" x 2-11/16" [12.7 x 25 x 68mm] grooved basswood **main landing gear rail**. After the epoxy has hardened drill a #11 (or 3/16" [4.8mm]) hole in the middle of the groove through the rail and the block 1/2" [13mm] from the end. Bevel the opening of the hole to accommodate the bend in the wire, then test fit the **left** landing gear wire.

Refer to this photo for the following two steps.



❏ 2. Glue together two die-cut 1/16" [1.6mm] plywood **fixed landing gear plates**. Note that the grain direction of each plate runs in the opposite direction. Use 30-minute epoxy to glue the plates to the rail, but use care not to inadvertently glue in the wire gear.

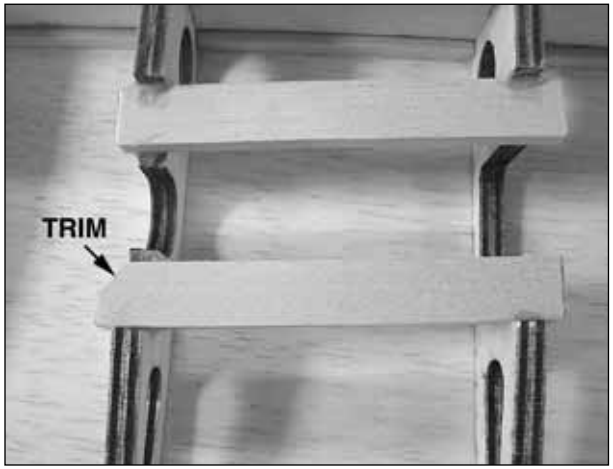
❏ 3. Secure the gear with two nylon landing gear straps and four #2 x 1/2" [13mm] screws. Drill 1/16" [1.6mm] holes for the screws. Don't forget to harden the threads with a few drops of thin CA.

❏ 4. Install the assembly in the wing between the landing gear rails, then drill six 7/64" [2.8mm] holes through the landing gear plates and the rails in the wing for the mounting screws. Remove the landing gear from the wing and enlarge the holes in the landing gear plate with a 9/64" [3.6mm] or 5/32" [4mm] drill. Mount the landing gear assembly to the wing with six #6 x 1/2" [13mm] screws.

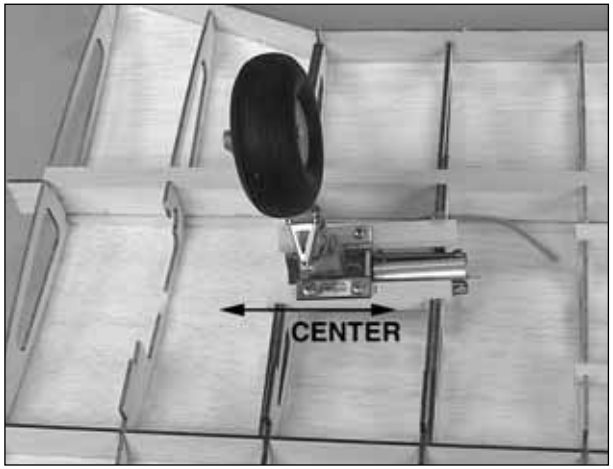
FIT THE RETRACTABLE LANDING GEAR

Skip this section if installing fixed landing gear.

❏ 1. Remove the partial cutout in rib 3 to accommodate the wheel.



❏ 2. Test fit the landing gear into the rail. If the fitting for the air line on the side of the air cylinder prevents fitting the retract, the cylinder may be rotated so the fitting is facing at a downward angle. Then the retract unit should fit between the rails. A small corner of the aft rail will have to be trimmed to accommodate the oleo strut.



❏ 3. Center the landing gear in the rails from side-to-side. Mark the center of the four mounting holes on the rail. Drill 7/64" [6.7mm] holes through the rails at the marks for the mounting screws. Mount the retract to the rail with the #6 x 1/2" [13mm] screws that came with the retract.

❏ 4. Fit a piece of 3/16" [4.8mm] brass tubing into the strut where the axle goes. Place a straightedge on the wing parallel with the spar. Adjust the strut so the tubing is parallel with the straightedge and tighten the strut.

❏ 5. Cut the axle to the correct length and mount a 3" [75mm] wheel to the strut.

❏ 6. Retract the gear into the wing. Trim rib R3 as necessary so the wheel will fully retract.

❏ 7. Remove the retract unit from the wing. Add several drops of thin CA to the screw holes to harden the threads.

FINISH FITTING THE LANDING GEAR

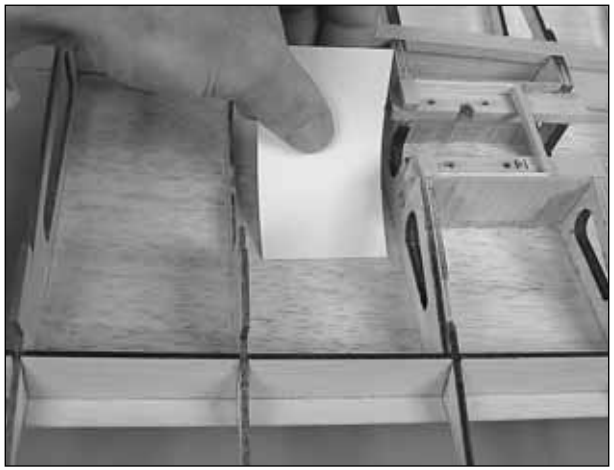
Even though retractable landing gear are shown in the photos, this section applies both to fixed and retractable landing gear.

❏ 1. Cut the **landing gear rail shear webs** from the remainder of the 1/16" x 3" x 30" [1.6 x 75 x 760mm] balsa sheet used for the shear webs for the center panel. Glue the shear webs into position.

❏ 2. Determine how close you can position a piece of leftover 1/8" [3.2mm] balsa across the rails to the retract unit while still allowing the unit to be removed from the wing. This piece of balsa will support the sheeting. Glue the support into position.

❏ 3. Build a ***box*** around the retract mount with leftover balsa strips. Sand the edges of the box even with the contour of the ribs. After the bottom of the wing has been sheeted and the opening has been cut for the retract, the opening will be nice and neat and the sheeting will be supported.

If you will be “glassing” and painting the inside of the wheel wells, get the other wing panel to this same stage of completion. That way both wheel wells can be treated at the same time.



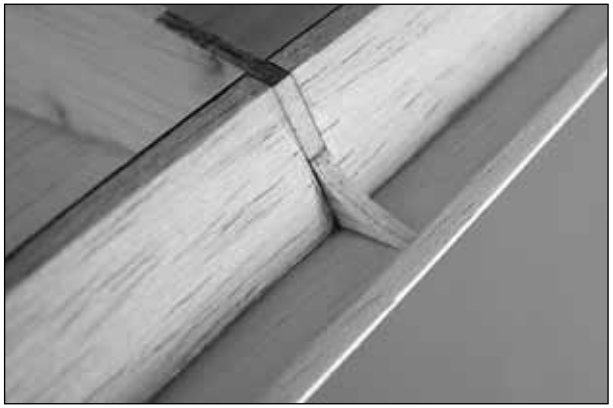
❏ 4. **Optional:** For a durable, finished appearance, the top sheeting inside the wing over the wheel openings can be coated with lightweight (3/4 oz.) fiberglass cloth and resin. When sanded and painted, this will make the inside of the wheel wells fuel and weather proof and look great. First, cut four strips of cloth (two for each wing) to fit between the ribs, then lay into place. Use a soft brush to coat the cloth with finishing resin or 30-minute epoxy. Before it thickens, use a business card to lightly squeegee excess resin from the cloth. This will remove wrinkles and bubbles making the cloth lay flat. After the epoxy has fully hardened, lightly sand with 400-grit sandpaper. Now the wheel wells may be painted. An airbrush will provide the most even coverage and allow you to get paint into all of the little corners without over spraying the rest. See page 61 on how to spray LustreKote® through an airbrush. **Note:** Should you decide to add the cloth later, be certain to do so **BEFORE** covering the model. Otherwise, epoxy and paint will soak into the sheeting and show through the covering.

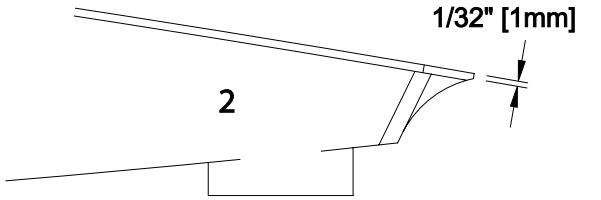
SHEET THE BOTTOM OF THE WING

❏ 1. Trim the jig tabs from the ribs on the bottom of the wing. Sand the flap bay trailing edge, the aileron bay sub trailing edge and the sub leading edges even with the bottoms of the ribs.

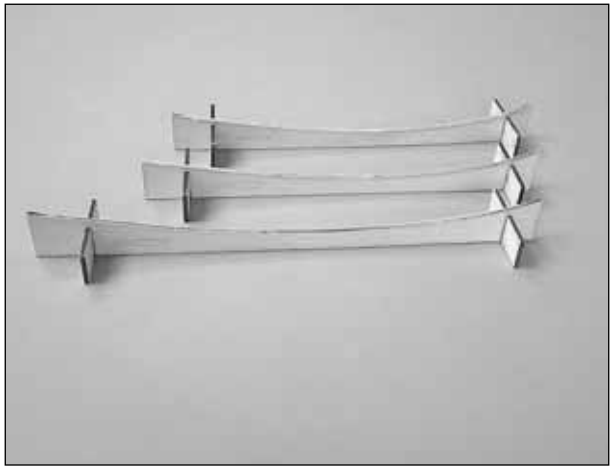
❏ 2. If **not** building working flaps, cut out the corrugations from a die-cut 1/16" [1.6mm] balsa **flap skin**. Glue the flap skin to the wing, then glue on the 1/8" x 1/4" x 30" [3.2 x 6.4 x 760mm] balsa TE support and the corrugation filler strips. Use the ribs on the bottom of the wing as a guide to sand the TE support and the top flap skin to accommodate the bottom flap skin.

❏ 3. If building working flaps, cut three 1-1/2" [40mm] **flap hinge blocks** from the 3/4" x 3/4" x 12" [19 x 19 x 300mm] balsa stick. Shape the hinge blocks to fit the flap bay trailing edge, then glue them into position where shown on the plan. Sand the hinge blocks even with the bottom of the wing.

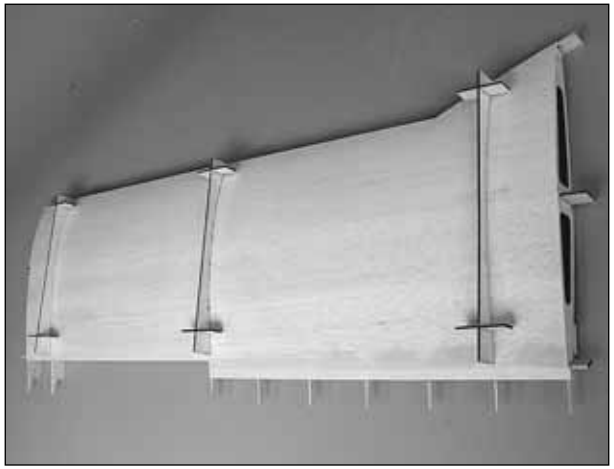




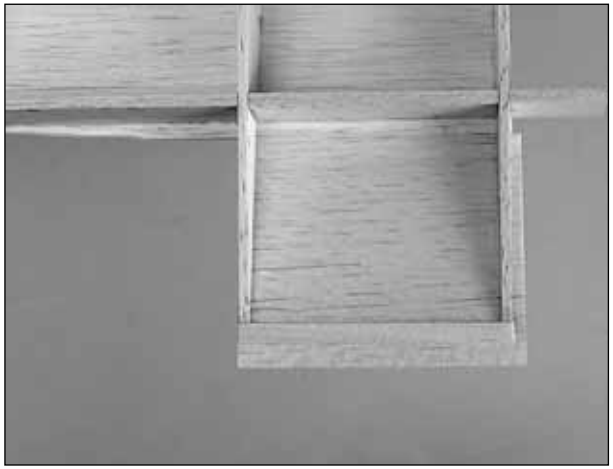
❏ 4. If building working flaps, trim the ribs and top sheeting aft of the flap bay trailing edge as shown.



❏ 5. Assemble the three die-cut 1/8" [3.2mm] plywood **wing cradles** by gluing the “feet” onto the supports.



❏ 6. Use thick or medium CA to tack glue the cradles to the top wing sheeting directly over the respective ribs—just a drop of CA in a few areas is all that is required.



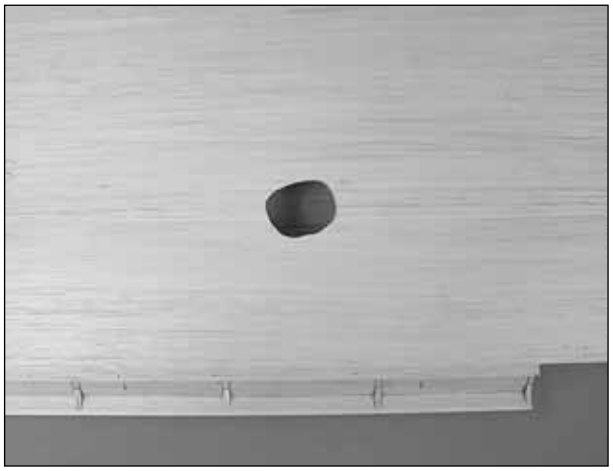
❏ 7. Use leftover 1/16" [1.6mm] sheeting and a leftover 1/8" x 1/4" [3.2 x 6.4mm] balsa stick to sheet the **top** of the wing and the TE support over the R9 ribs at the wing tip. Sand the sheeting and TE support even with the bottom of the ribs.

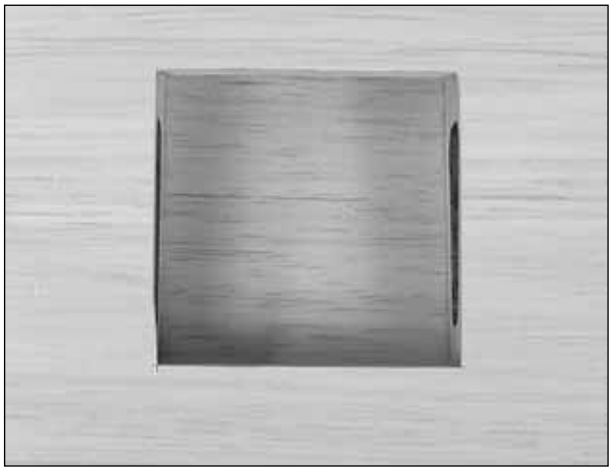
❏ 8. Trim one of the aft wing skins to fit the bottom of the wing. If building flaps, the skin should extend slightly beyond the flap bay trailing edge for trimming later. If building fixed flaps the skin should extend only to the **middle** of the flap bay trailing edge. In both cases, the front of the skin should align with the middle of the bottom spar. Glue the skin into position, but do not glue the skin to the flap or aileron hatch rails or to the ribs between the rails. This will facilitate the cutting of the sheeting for the hatch covers later. Glue another piece of leftover 1/16" [1.6mm] sheeting to the bottom of the wing over the R9 ribs.

❏ 9. If building fixed flaps glue the corrugations to the inside of another flap skin, test fit, then glue the skin into position.

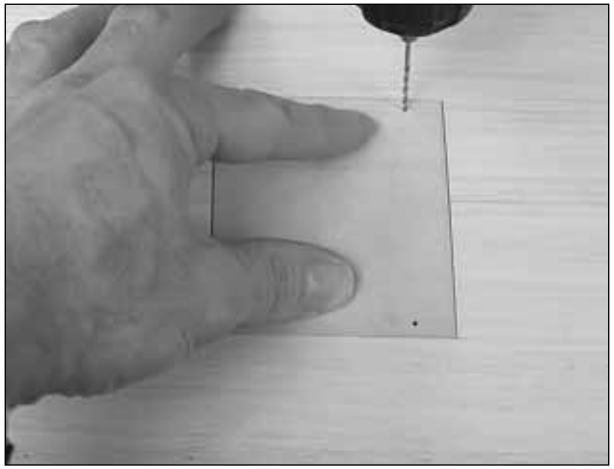
❏ 10. Fit, then glue the forward wing skin into position.

MOUNT THE HATCHES AND LANDING GEAR

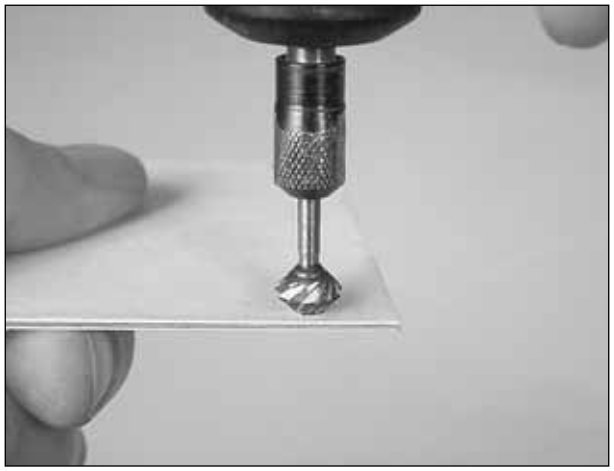




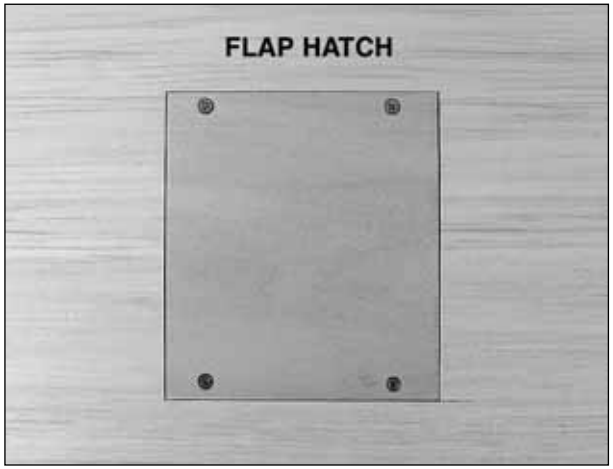
❏ 1. Cut the openings for the aileron and flap (if used) hatches. Start by cutting a small hole, then enlarging the hole until you get to the ribs and the servo rails. Use the die-cut 1/16" [1.6mm] plywood hatches as templates to enlarge the openings until the hatches fit perfectly (with an approximately 1/64" [.5mm] gap all the way around). Note that the ribs support **both** the sheeting **and** the hatch, so you'll have to work with precision.



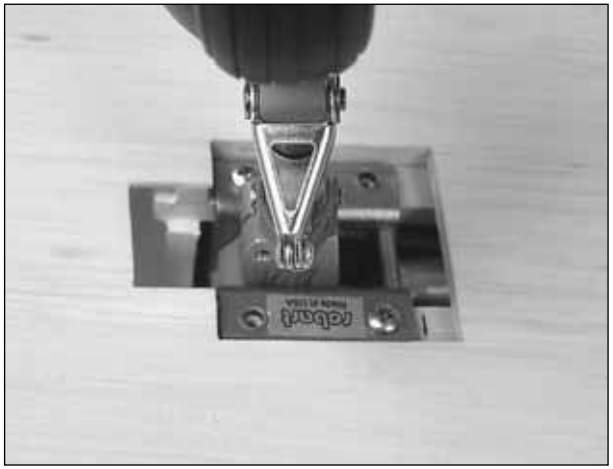
❏ 2. Center the hatch in the opening. Hold the hatch down so it will not move, then drill 1/16" [1.6mm] holes through the hatch and the mounting rails.

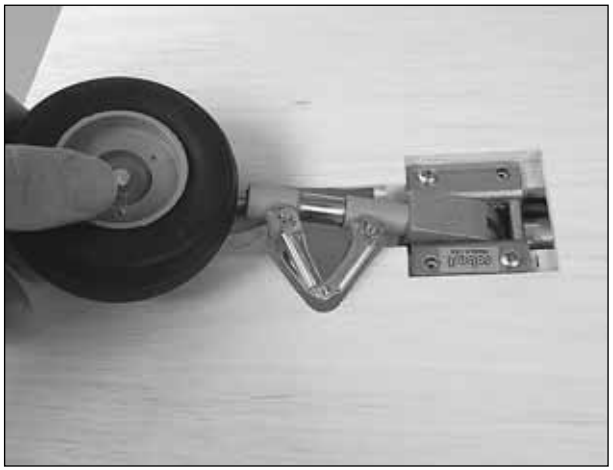


❏ 3. Remove the hatch. Enlarge the holes **in the hatch only** with a 3/32" [2.4mm] drill. Countersink the holes in the hatch with a small countersink, a hobby knife or a Dremel #178 cutting bit (shown in the photo).

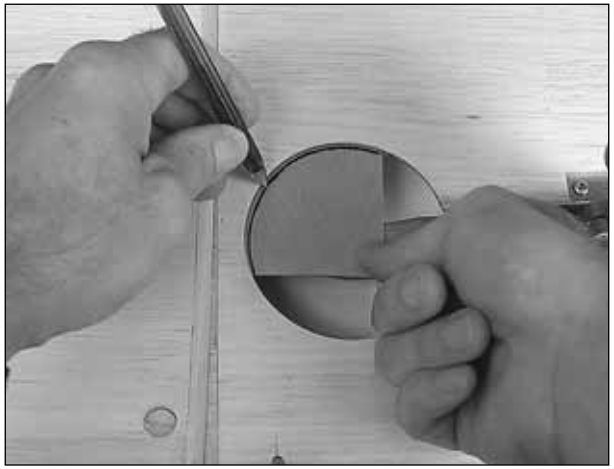


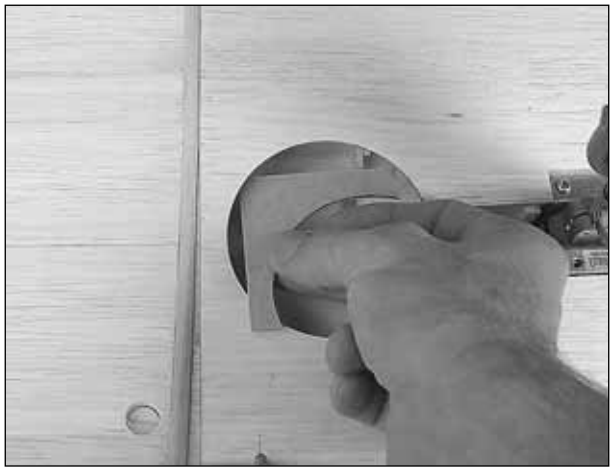
❏ 4. Mount the hatch to the wing with four #2 x 3/8" [9.5mm] screws. If necessary, perfect the gap all the way around the hatch by trimming the hatch or the opening. Remove the hatch, then use medium CA to glue the sheeting to the ribs and rails where it wasn't glued before.





❏ 5. Cut the sheeting for the landing gear and the wheels (if installing retracts). Do it the same way you did for the servo hatches—start by cutting small holes, then enlarging the holes until you can get the gear and the wheel to fit. If installing retracts, mount the gear first, then cut the hole for the wheel as you retract the gear and fit the wheel into the wing.



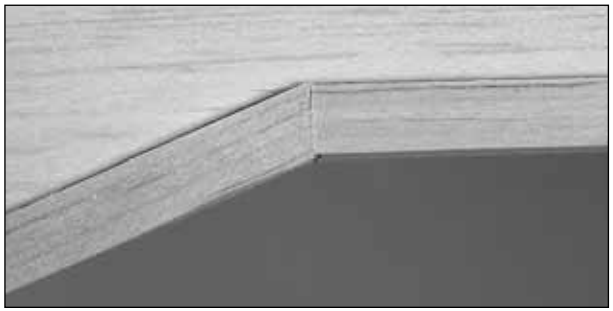


❏ 6. If you mounted retracts, reinforce the bottom sheeting around the wheel cutouts with 1/32" [.8mm] plywood (not included) or 1/16" [1.6mm] balsa. Do so first by cutting a sheet to fit between the ribs, then by marking the cutout. Cut out the unneeded portion, then use medium CA to glue the sheet into position. Do this in sections until the opening is completely lined. True the edges to match the shape of the original cutout.

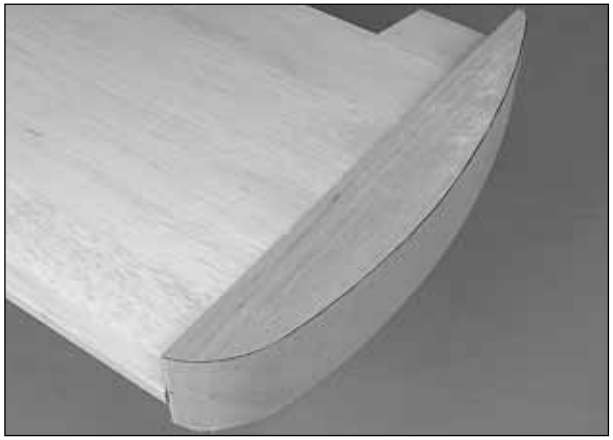
❏ 7. True all the edges of sheeting and spars even with both ends of the wing, the sub leading edges, the aileron bay sub trailing edge and the flap bay trailing edge.

❏ 8. Cut the **aileron bay trailing edge** from a 3/8" x 1" x 18" [9.5 x 25 x 460mm] balsa stick, then glue it into position. Carve and sand to match the wing.

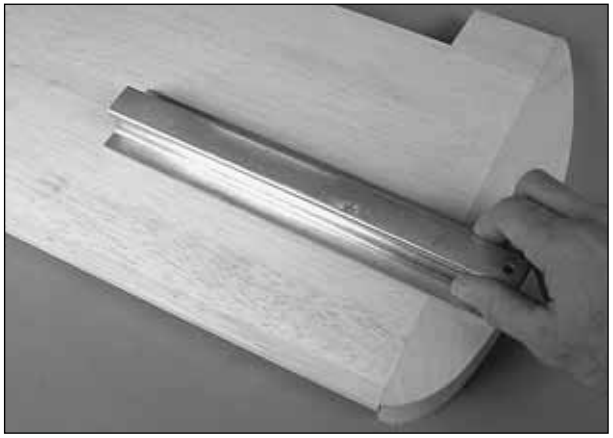
❏ 9. The same as was done for the ribs on the ends of the center panel, cut the rest of the way through the rib on the end of the outer panel so the spar joiner will fit in the wing.



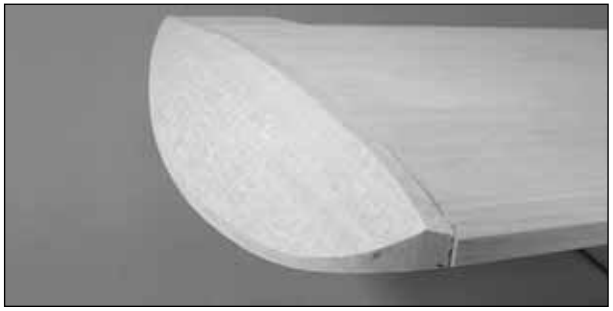
❏ 10. Cut the **outer leading edge** from a 3/8" x 7/8" x 30" [9.5 x 22.2 x 760mm] balsa stick, then glue it to the front of the wing. Cut the **inner leading edge** from another 3/8" x 7/8" x 30" 9.5 x 22.2 x 760mm] balsa stick and bevel the end to meet the outer LE. Glue the inner LE into position. Shape the leading edges to match the wing, but don't round and final-shape them yet.



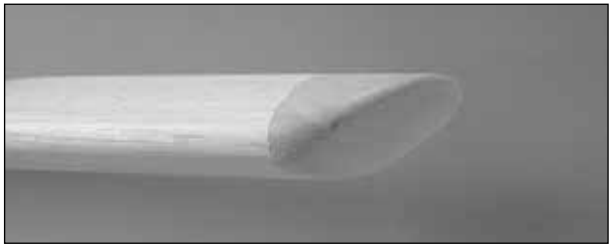
❏ 11. Use the **wing tip template** on the plan to shape one of the 2" x 2" x 13" [50 x 50 x 330mm] balsa blocks. Glue the block to the end of the wing.



❏ 12. Use a carving knife or a razor plane to shape the top of the block to match the shape of the wing. Follow with a bar sander and 80-grit sandpaper. **Note:** When sanding, hold the bar sander on the end over the tip and apply pressure there only. This way, you won't be sanding the sheeting.



❏ 13. Shape the bottom of the tip to a 45-degree angle as shown on the cross-section on the plan.

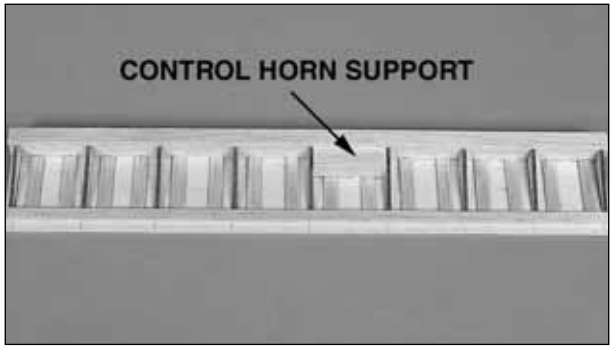


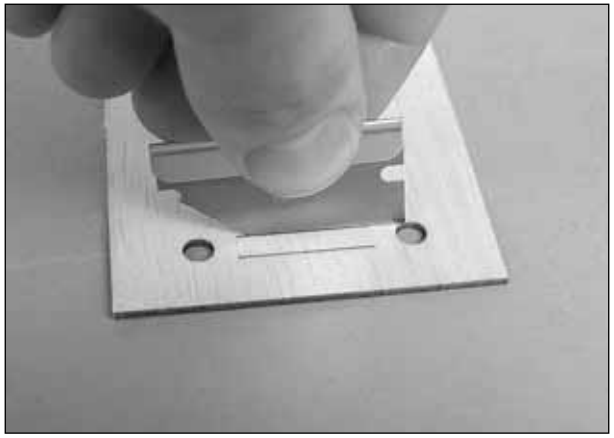
❏ 14. Use progressively finer grades of sandpaper to final-shape the wing tip and the leading edge of the wing.

BUILD THE AILERONS

Do the left aileron first.

Refer to this photo for the following eight steps.





❏ ❏ 1. Cut out the corrugations from one of the die-cut 1/16" [1.6mm] balsa **aileron skins**. This will be the **bottom**, **left** aileron skin. **Hint:** A single-edge razor blade works best for cutting, but is too long. Use a cut-off wheel to shorten a razor blade so it will fit in the slots.

❏ ❏ 2. Position the aileron skin over the left aileron plan. Note that the skin is a little wider (from the front to the back) than it needs to be. Mark the leading and trailing edge where the skin is to be trimmed. Trim the skin as needed so it fits the plan. **Note:** The skin is also a little longer than it needs to be, but it won't be trimmed until later.

❏ ❏ 3. Reposition the skin over the plan. Mark the locations of the aileron ribs that will be glued on later.

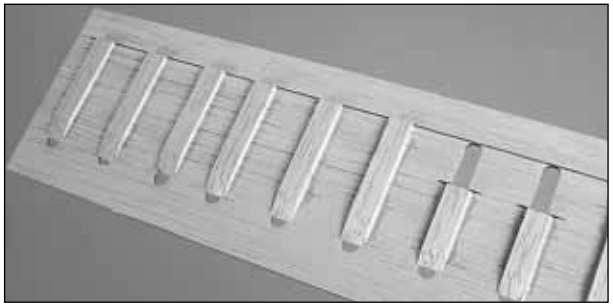
❏ ❏ 4. Cut a 3/8" x 5/8" x 18" [9.5 x 16 x 460mm] balsa stick to the correct length for the **aileron leading edge**. Glue the leading edge to the skin.

❏ ❏ 5. Cut the **control horn support** from a leftover piece of 1/2" x 1/2" x 24" [13 x 13 x 610mm] balsa stick (there should be a piece left from the fin leading edge). Glue the horn support into position.

❏ ❏ 6. Cut sixteen corrugation fillers to the length shown on the plan from a 1/16" x 1/4" x 30" [1.6 x 6.4 x 760mm] balsa stick, then glue them into position.

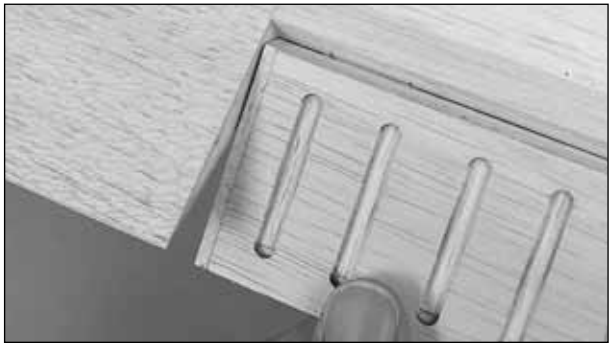
❏ ❏ 7. Glue the nine die-cut 3/32" [2.4mm] balsa **aileron ribs** into position.

❏ ❏ 8. Glue the 1/8" x 1/4" x 30" [3.2 x 6.4 x 760mm] trailing edge support into position. Bevel the leading edge, the trailing edge support and the trailing edge of the aileron skin to match the angle of the aileron ribs.



❏ ❏ 9. Prepare the **top** aileron skin by cutting out the corrugations. Cut the corrugation fillers. Note that the fillers extend from the front of the cutouts to approximately 1/8" [3mm] from rear of the cutouts. Cut a bevel on the aft edge of the fillers to accommodate the fillers on the top skin, then glue the fillers into position. Also note the two shorter corrugation fillers to accommodate the control horn support. Test fit, then glue the skin to the rest of the assembly. Trim aileron to the length shown on the plan.

❏ ❏ 10. Mark a centerline along the aileron leading edge and along the trailing edge of the wing where the aileron goes. Cut hinge slots in the wing and aileron where shown on the plan.



❏ ❏ 11. Bevel the leading edge of the aileron, then test fit it to the wing with the hinges.

❏ ❏ 12. Glue pieces of leftover 1/8" [3.2mm] die-cut balsa to ends of the aileron and shape to fit.

❏ 13. Return to step one and make the **right** aileron the same way.

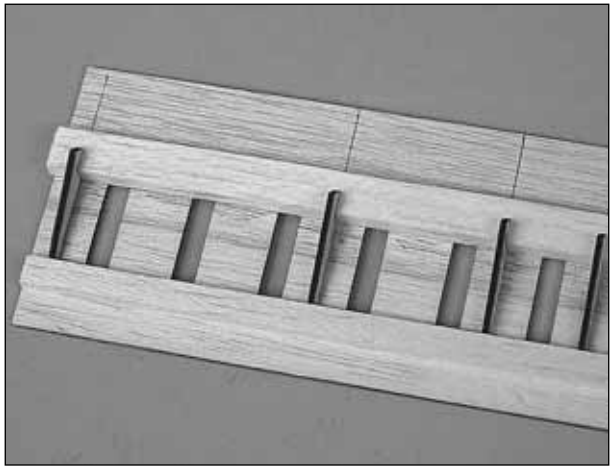
BUILD THE WORKING FLAPS

Build the left flap first.

❏ ❏ 1. The same as you have been doing all along, cut out the corrugations from one of the die-cut 1/16" [1.6mm] balsa **flap skins**.

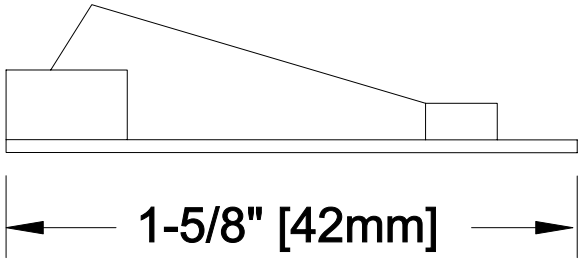
❏ ❏ 2. Place the flap skin over the plan aligning the corrugations. Use a ballpoint pen and a straightedge to mark the location of the trailing edge support all the way across.

❏ ❏ 3. Mark the locations of the flap ribs, then cut the trailing edge support from a 1/8" x 1/4" x 30" [3.2 x 6.4 x 760mm] balsa stick. **Note:** Since the right wing plan shows the fixed flap version, the locations of the right flap ribs are indicated by the small dashed lines. Glue the trailing edge support to the skin along the line marked in the previous step.

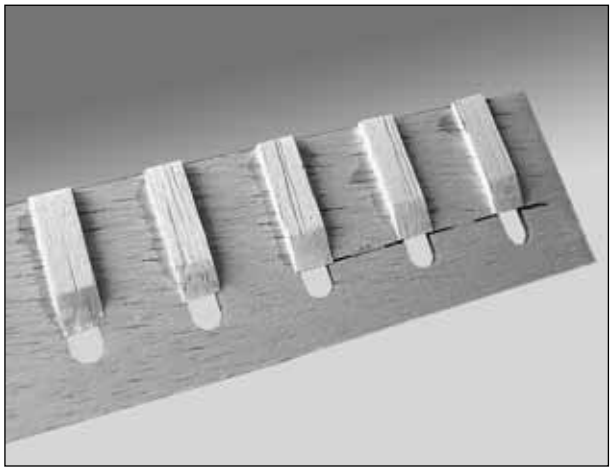


❏ ❏ 4. Glue on the die-cut 1/16" [1.6mm] plywood **flap ribs**. Cut the **flap sub leading edge** from a 3/16" x 3/8" x 18" [4.8 x 9.5 x 460mm] balsa stick, then slip it under the notches in the flap ribs and glue it into position with thin CA.

❏ ❏ 5. Cut off the flap skin along the front of the flap sub leading edge. Cut the corrugation filler strips, then glue them into position.



❏ ❏ 6. Trim the trailing edge of the flap skin as necessary until the total width of the flap is 1-5/8" [42mm], then bevel the trailing edge of the skin to match the angle of the ribs.

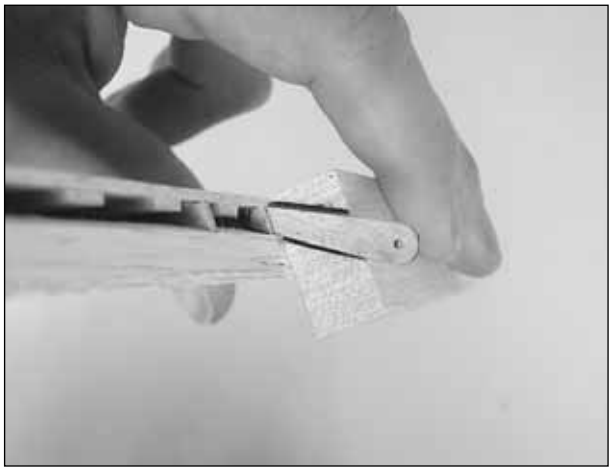


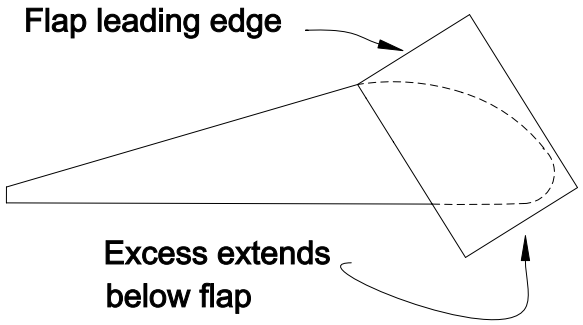
❏ ❏ 7. Trim 3/4" [19mm] from the front and 3/16" [4.8mm] from the rear of another flap skin. Cut eighteen 1-1/8" [3.2mm] long corrugation fillers and glue them to the inside of the skin so the front is even with the front of the skin.

❏ ❏ 8. The same as was done with the corrugation filler strips for the top aileron skin, bevel the aft end of the corrugation filler strips on the top flap skin. Test fit the skin to the flap assembly. Make adjustments where necessary, then glue the top flap skin into position.

❑ ❑ 9. Bevel the front of the flap to match the angle of the plywood flap ribs.

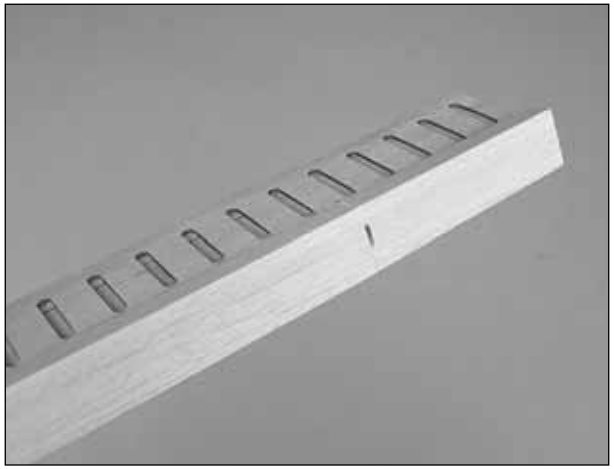
❑ ❑ 10. Drill a 1/16" [1.6mm] hole through the punchmark in the die-cut 1/16" [1.6mm] plywood **flap control horn.** Fit but **do not glue** the horn into the flap next to the flap rib where shown on the plan for the flap you are working on. Mark, then cut the 1/2" x 1" x 24" [13 x 25 x 610mm] balsa **flap leading edge** into two pieces at the horn.





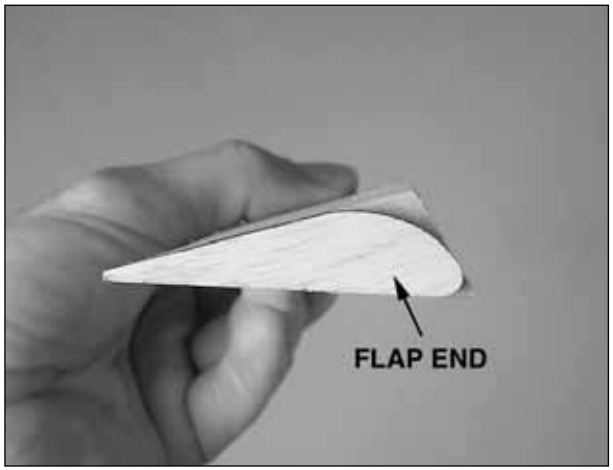
❑ ❑ 11. Position the shorter piece of flap leading edge on the flap next to the horn. Note how the flap leading edge is positioned so that the top aligns with the top of the flap and the excess extends below the bottom of the flap. Use a ballpoint pen to mark the outline of the horn onto the end of the leading edge.

❑ ❑ 12. Cut a 1/16" [1.6mm] deep groove in the leading edge piece between the lines marked noting the horn.

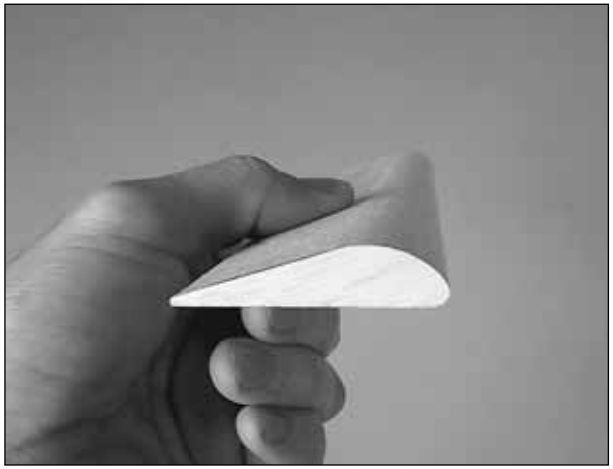


❑ ❑ 13. With the flap horn still in position, permanently glue the **longer** section of flap leading edge to the flap, but do not get any glue on the horn as it will need to be removed. Remove the flap horn, then use a couple drops of thick or medium CA to tack glue the shorter section of leading edge to the flap.

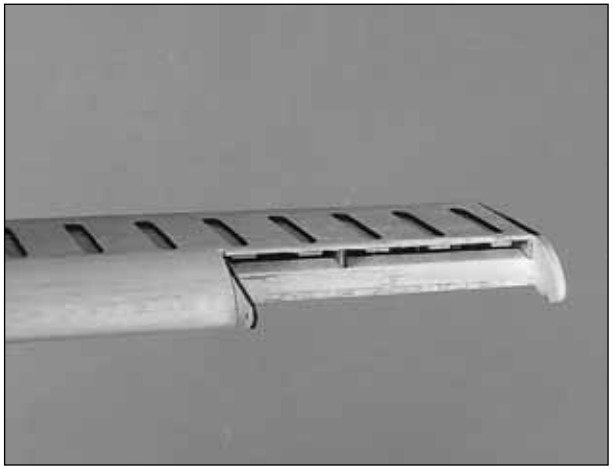
❑ ❑ 14. Shape the top and bottom of the flap leading edge to match the flap, but do not round the leading edge until instructed to do so.

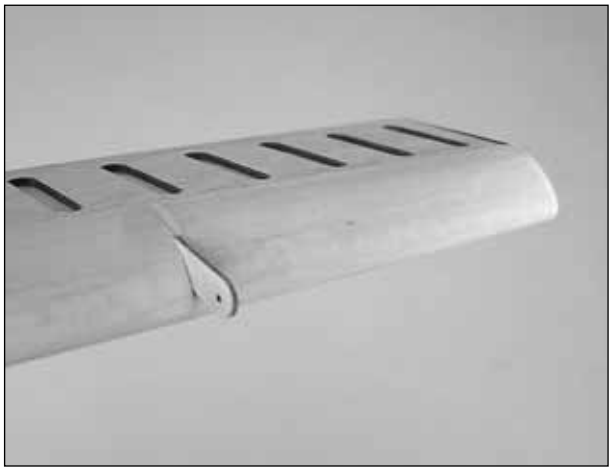


❑ ❑ 15. Sand the ends of the flap leading edge even with the flap ribs on both ends of the flap. Glue one of the die-cut 1/8" [3.2mm] plywood **flap ends** to the end of the flap and the longer, permanent section of flap leading edge. Glue another flap end to the other end of the flap, but not to the short section of flap leading edge that is tack glued to the flap.



❑ ❑ 16. Shape the flap leading edge to match the flap ends.

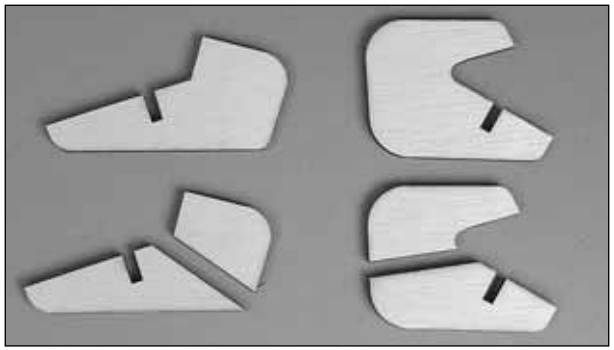


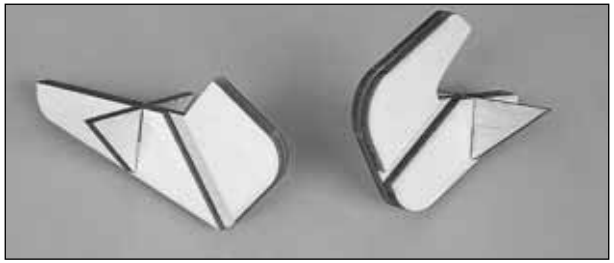


❏ ❏ 17. Carefully break away the short piece of flap leading edge that was tack glued to the flap. Glue the flap horn into the flap, then glue the flap leading edge back on. Use thick CA or aliphatic resin so you will have time to accurately reposition the leading edge.

❏ 18. Return to step 1 and build the right flap the same way. Use the small hash marks on the right wing plan to mark the flap hinge locations.

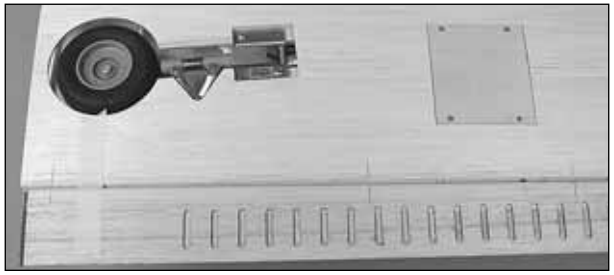
HINGE THE FLAPS





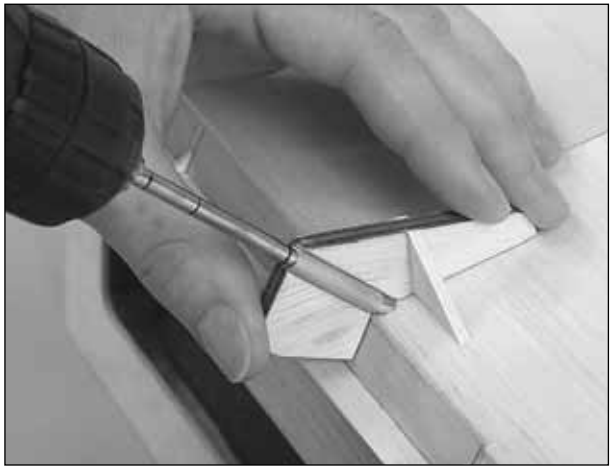
❏ 1. Glue together the die-cut 1/8" [3.2mm] plywood pieces that make up the **wing** and **flap hinge drill guides**.

❏ 2. **Optional:** The drill guides may be used *as is* to guide a 3/16" [4.8mm] drill while drilling the holes for the flap hinges. However, for ultimate precision, 7/32" [5.6mm] brass tubes could be glued between the grooves of the guides to support your drill even better. The grooves in the drill guides will have to be beveled slightly to accommodate the tubes. (The tubes can be seen in following photos).

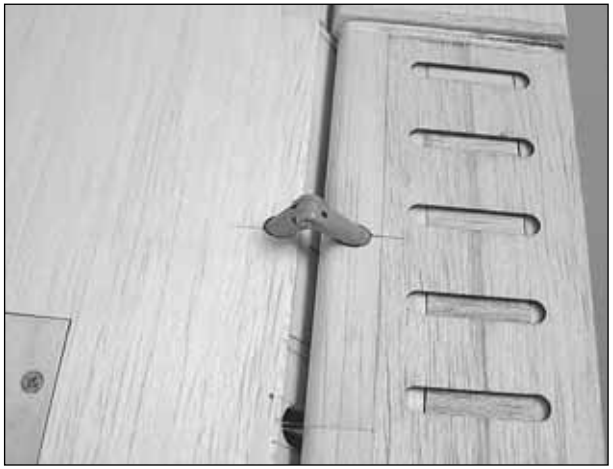


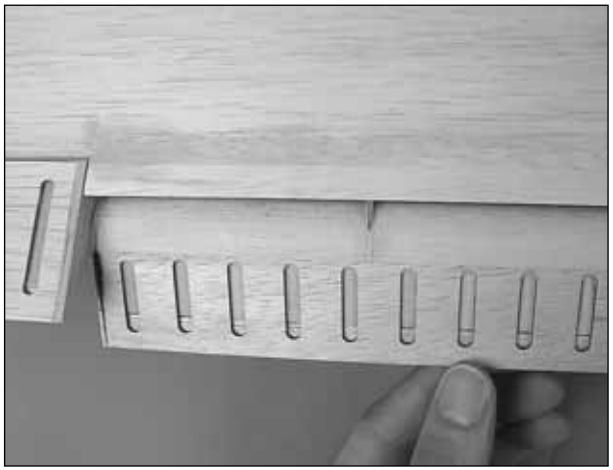
❏ 3. Cut the hole in the flap bay trailing edge to accommodate the flap horn. Position the flap on the wing and use masking tape to temporarily hold it in position. Referring to the wing plan, use a straightedge and a ballpoint pen to lightly mark the hinge locations on the flap and wing.

❏ 4. Remove the flap from the wing. Using the appropriate drill guide, drill 3/16" [4.8mm] holes 5/8" [16mm] deep into the flap. **Hint:** "Cleaner" holes can be drilled with a 3/16" [4.8mm] brass tube sharpened on the end. Note the marks on the brass tube indicating the depth of the hole.



❏ 5. Drill the hinge holes in the wing the same way. Stop drilling after you feel the drill (or tube) go through the hinge block so you don't go through the top wing sheeting.

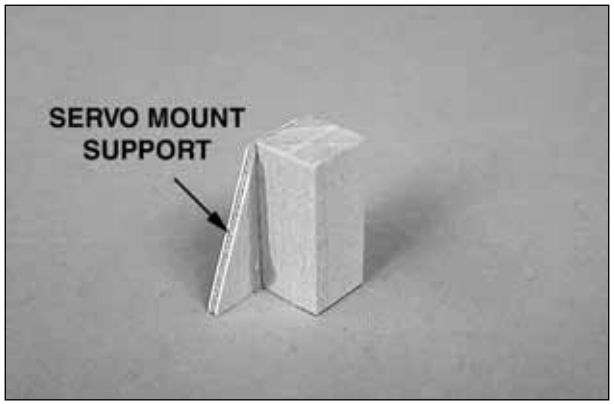




❏ 6. Trim one end of three large Robart Hinge Points so they will fit into the flap. Test fit the flap to the wing with the hinges. Move the flap up and down to align the hinges and see how the flap fits. Make any adjustments needed for smooth operation.

❏ 7. Hinge the other flap the same way.

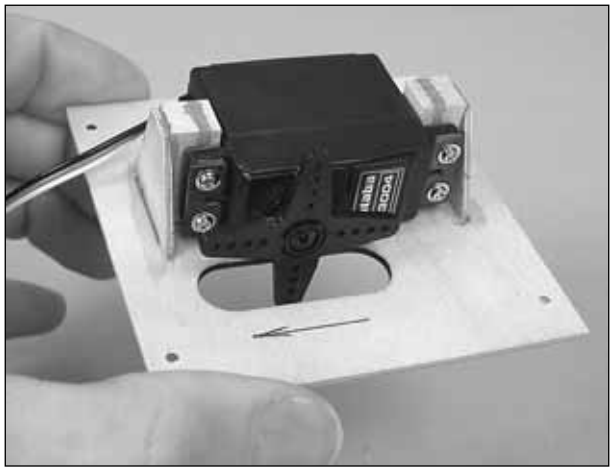
MOUNT THE FLAP AND AILERON SERVOS



❏ 1. Cut four (or eight if building working flaps) 7/8" [22.2mm] **servo mounts** from the 3/8" x 3/8" x 24" [9.5 x 9.5 x 610mm] basswood stick. (Save the remainder of the stick for mounting the fuselage.) Glue one servo mount to each of the die-cut 1/16" [1.6mm] plywood **servo mount supports**.

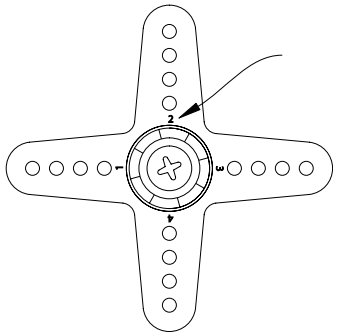
Mount the aileron servos first...

Refer to this photo to mount the servos to the hatches.



❏ 2. Mount the aileron servos to the servo mounts by drilling 1/16" [1.6mm] holes into the servo mounts and using the servo screws that came with the servos. Make sure the second servo is mounted in a “mirror image” of the other for the opposite side of the wing.

❏ 3. Temporarily remove the screws, add a few drops of thin CA to the holes, allow to harden, then remount the servos.



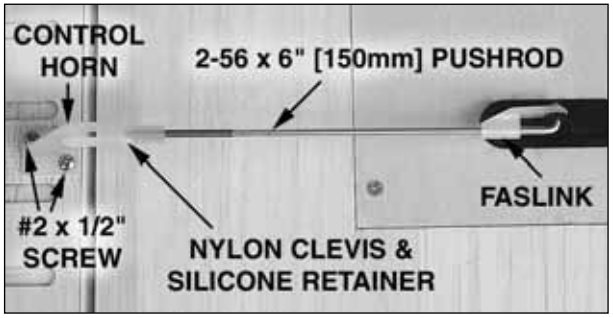
Futaba servo arms

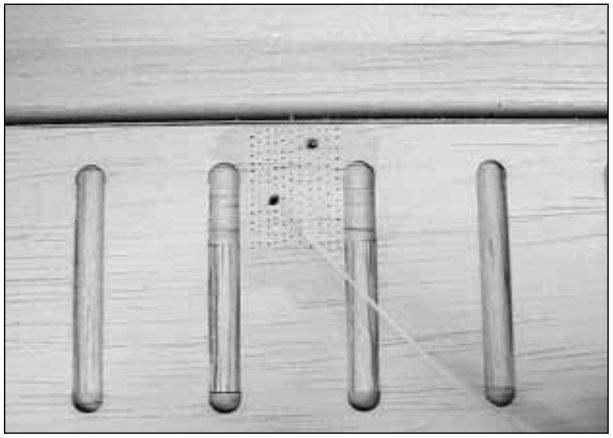
Have you ever noticed the small, molded-in numbers on the Futaba servo arms? Each number represents the number of degrees that the arm is offset from 90-degrees. Due to mass-production variances, not all servos are exactly the same. Before cutting off the unused servo arms, determine which arm is the correct one to keep for that servo. To do this, connect the servo to the desired channel in the receiver. Turn on the transmitter and receiver, then center the trim lever. Position the arm on the servo until you find one that is 90-degrees, then cut off the others. Now your servo arm will be centered when your trim is centered—of course, this procedure could be done when actually setting up the radio after the model has been finished.

❏ 4. Cut off the unused servo arms. Use 30-minute epoxy to securely glue the servo mounts to the hatches. Make sure the servo arms are centered in the openings.

❑ 5. If building working flaps, mount the flap servos to two more sets of mounting blocks. Note that while the aileron servos are mounted to the hatches in a "mirrored" image, the flap servos are **not** mirrored (so that the flaps will work together (instead of in opposition as do the ailerons).

It will be easier to hook up the ailerons before joining the wing halves, so go ahead and do so as instructed below. But it will be better to hook up the flaps after the model has been covered and the flaps have been permanently joined to the wing with the hinges.



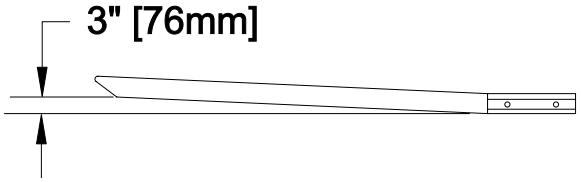


❑ 6. Enlarge the holes in the aileron servo arms with a Hobbico Servo Horn Drill (HCAR0698) or a 5/64" [2mm] drill. Connect the ailerons to the servos using the hardware shown in the photo. Drill 1/16" [1.6mm] holes into the ailerons for the screws that mount the horns. Poke several pinholes into the ailerons and wet the area with a few drops of thin CA to harden the balsa.

JOIN THE WINGS

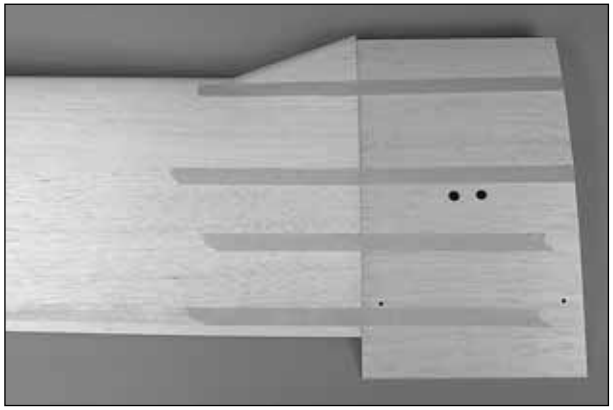
❑ 1. Remove the flaps and ailerons from both wing panels.

❑ 2. Test fit the die-cut 1/8" [3.2mm] plywood **wing joiners** into each of the three wing panels. Note that the ends of the joiners marked "R" are the ends that go into the center panel. Make adjustments as necessary to get the joiners to fit into the wing panels, then test fit the wing panels together with the joiners.



❑ 3. Tightly tape the outer panels to the center panel. There should be no gaps. Check the dihedral by laying the center panel flat and measuring the distance between the workbench and the bottom of the tips under the spar. The distance should be 3" [76mm], but a variance of plus or minus 3/8" [10mm] is acceptable **as long as both panels are the same**.

❑ 4. Prepare for gluing the panels together—this should be done one panel at a time. Gather all the items necessary including 30-minute (or longer) epoxy, mixing utensils, wax paper, masking tape, paper towel squares and denatured alcohol for cleanup.



❑ 5. Make sure any parts-fit problems in joining the wings have been resolved—there won't be time to correct problems once you start gluing. Mix a batch of 30-minute epoxy—1/2 oz. [15cc] should be more than enough to do the job. Apply epoxy to the rib on the end of the outer panel and to the inside of the outer panel where the joiners go. Apply epoxy to the joiners and insert them into the outer panel. Coat the inside and outside of the outer panel the same way, then slide the two together. Wipe away excess epoxy as it oozes out. Use plenty of masking tape on the top and bottom of the wing to **tightly** hold the panels together. Continue to wipe away excess epoxy as you make sure the panels are accurately aligned. Do not disturb the wing until the epoxy has fully hardened. **Hint:** It will be much easier to wipe excess epoxy from the wing before it has hardened than it will be to try sanding if off after it has hardened.

❑ 6. After the epoxy from the previous step has hardened remove the masking tape and join the other panel to the assembly.

❑ 7. If you haven't yet done so, fill the corrugations with lightweight balsa filler, allow to dry, then lightly sand smooth.

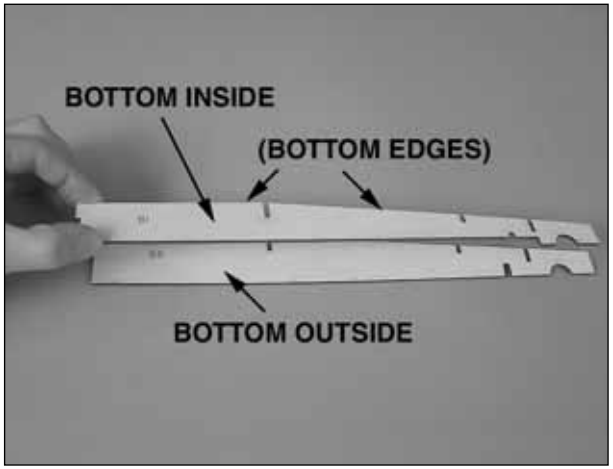
Set the wing in a safe place while you are working on the fuselage.

BUILD THE FUSELAGE

FRAME THE BOTTOM OF THE FUSELAGE

❏ 1. The fuselage plan consists of two pieces. Cut one of the pieces at the lines, then tape it to the other plan aligning the lines.

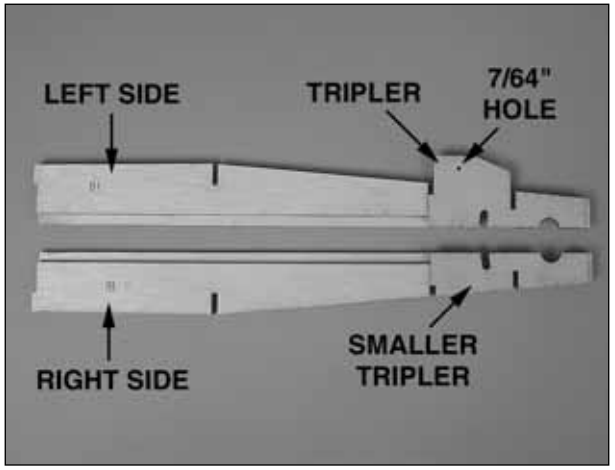
❏ 2. Cut the bottom view of the fuselage plan from the rest of the plan (or leave the plan together and position the bottom view over your flat building board). Cover the plan with Great Planes Plan Protector or wax paper so glue will not adhere.



❏ 3. Glue a die-cut 1/8" [3.2mm] plywood **bottom inside stabilizer mount (BI)** over a die-cut 1/8" [3.2mm] plywood **bottom outside stabilizer mount (BO)**. Note that the bottom, angled edges of the parts should align (remember the fuselage is being built upside-down so for now, the bottom is the upward facing edge). **Note:** Unless otherwise specified, all of the fuselage formers are 1/8" [3.2mm] plywood.

❏ 4. Make another assembly the same way, except **make them a mirror image** for the other side.

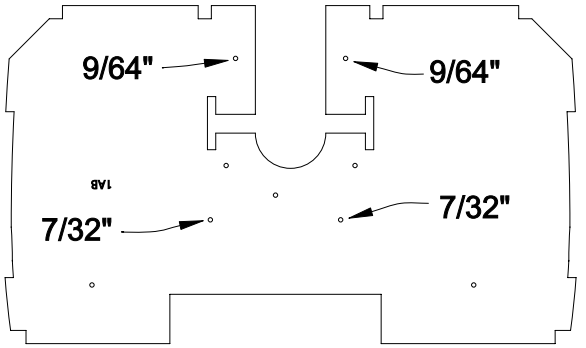
Refer to this photo for the following two steps.

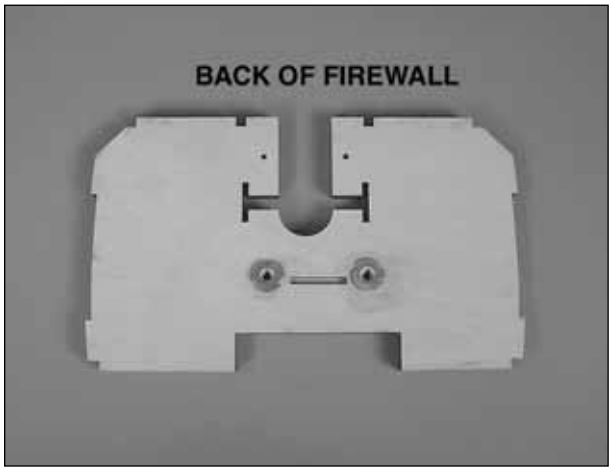


❏ 5. Drill a 7/64" [2.8mm] or 1/8" [3.2mm] hole through one of the die-cut 1/16" [1.6mm] plywood **bottom stabilizer mount triplers**. Note that two of these parts are included, but only the one is used. Glue the tripler to the inside of the **left** stabilizer mount as shown in the photo. Glue the other, smaller tripler to the inside of the **right** stabilizer mount.

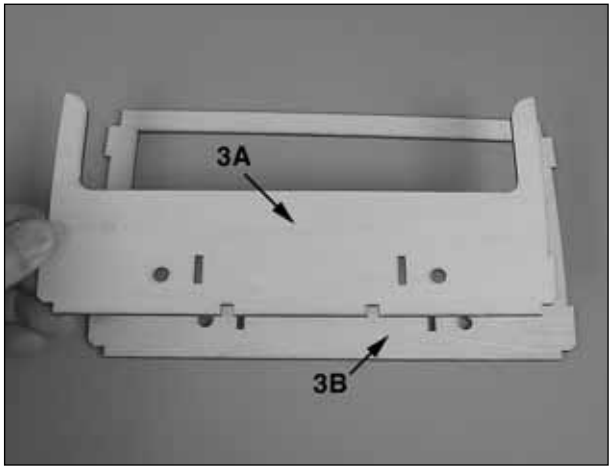
❏ 6. Glue together the three die-cut 1/8" [3.2mm] plywood parts of the **firewall bottom 1AB**, **1BB** and **1CB**. Make sure you glue them together in that order and that the stamped names of the parts all face upward (forward).

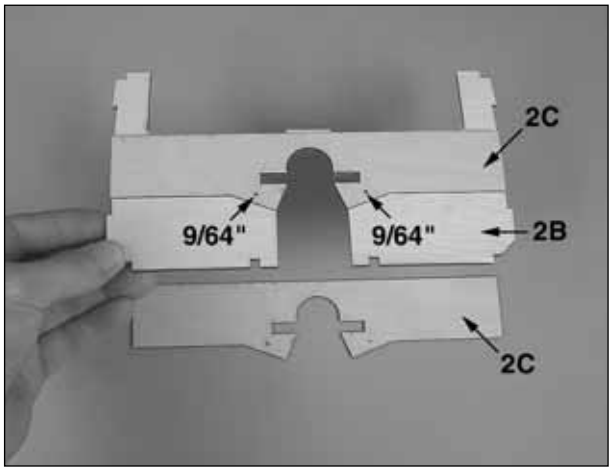
FRONT VIEW



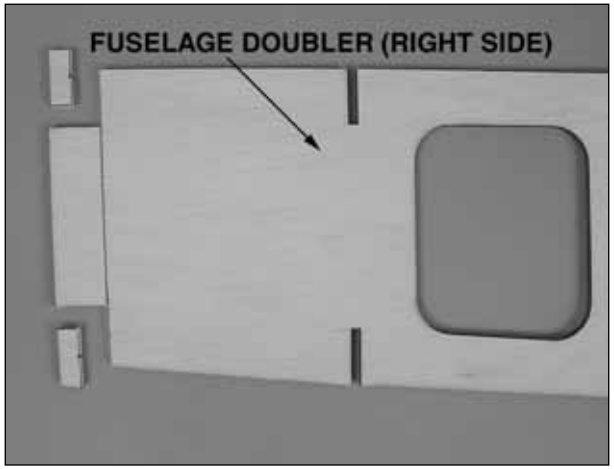


❏ 7. Drill 7/32" [5.6mm] holes through the two punchmarks in the firewall where indicated by the arrows in the sketch for the bottom engine mount blind nuts. Tap two 8-32 blind nuts into the holes in the **back** of the firewall. Use thin CA to permanently secure the blind nuts. If you will be installing retractable landing gear, drill 9/64" [3.6mm] holes through the two other punchmarks for the nose steering guide tubes.

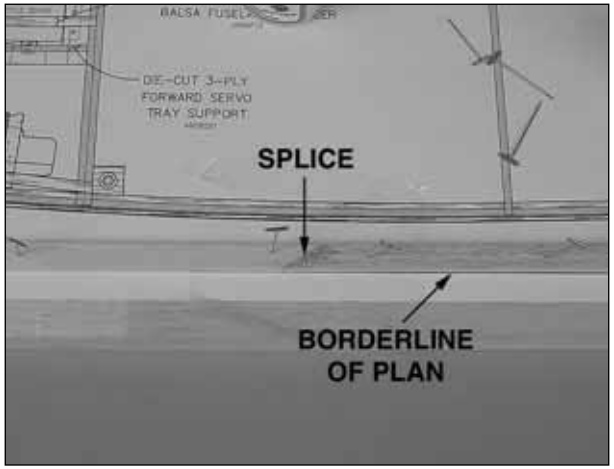




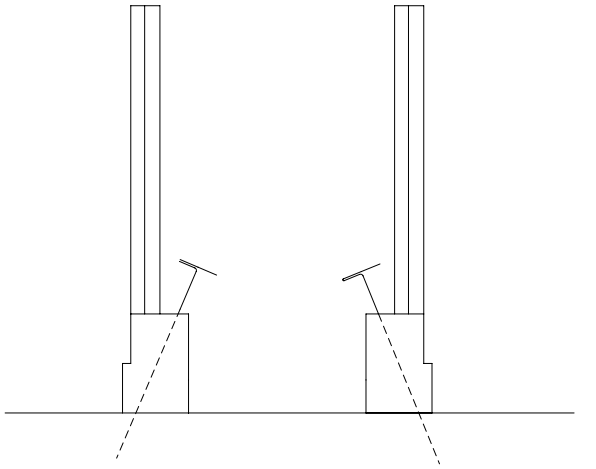
❏ 8. Glue former **3A** to the front of **3B**. Glue the die-cut 1/16" [1.6mm] plywood doublers **2C** to both sides of former **2B**. If you will be installing retractable landing gear, drill 9/64" [3.6mm] holes through the two other punchmarks for the nose steering guide tubes.

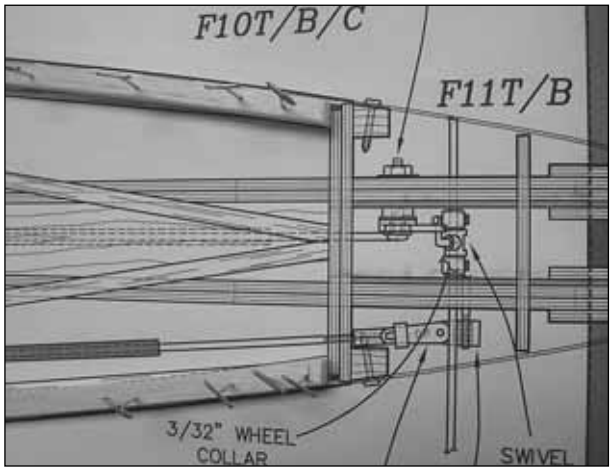


❏ 9. Use a straightedge and a fine-point ballpoint pen to draw a line across the punchmarks in one of the die-cut 1/8" [3.2mm] plywood **fuselage doublers**. Enlarge the notches in the doubler back to the line by cutting away the unused material. This will now be the **right fuselage doubler**.



❏ 10. Cut one of the shaped 1/4" x 3/8" x 36" [6.4 x 9.5 x 910mm] balsa **fuselage main spars** in half. Splice one of the halves onto another fuselage main spar. **Hint:** Pin the spars to the building board along the borderline of the plan to make sure they are straight. Make another assembly the same way.



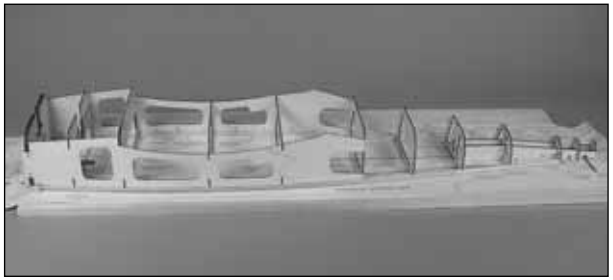


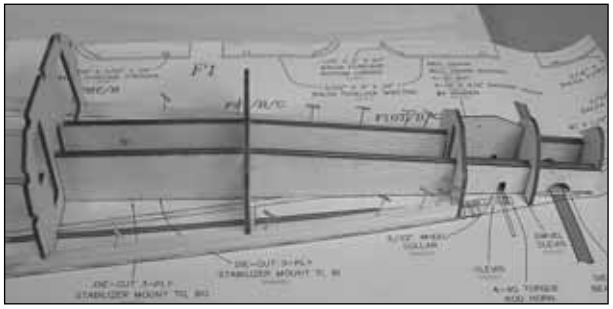
❏ 11. Pin the fuselage main spars to the building board over the plan as shown in the sketch. Note that the aft ends of the spars align with the front edge of F10B. The front of the spars should extend slightly past the front of the firewall (for trimming later). Also note that the T-pins should go in at an angle so as not to interfere with the fuselage doublers when they are added later.

❏ 12. Drill 3/16" [4.8mm] holes through the punchmarks in formers 9B, 8B, 7B and 6B. Drill 1/8" [3.2mm] holes through the bottom two punchmarks on both sides of former 2B.

Finally, it's time to start gluing on formers. We'll start with the back and work our way forward.

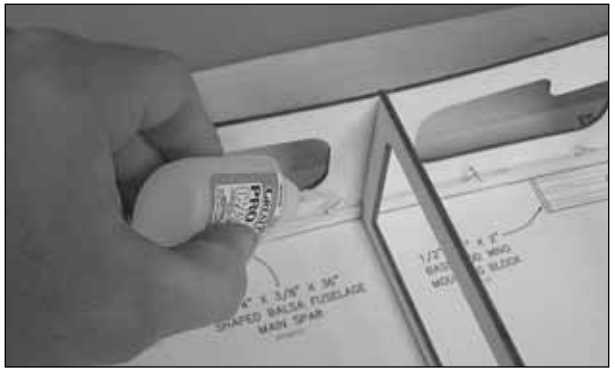
Here's a photo of what the bottom of the fuselage looks like when it's partially framed-up. You can use this photo as a reference as you perform the following several steps.





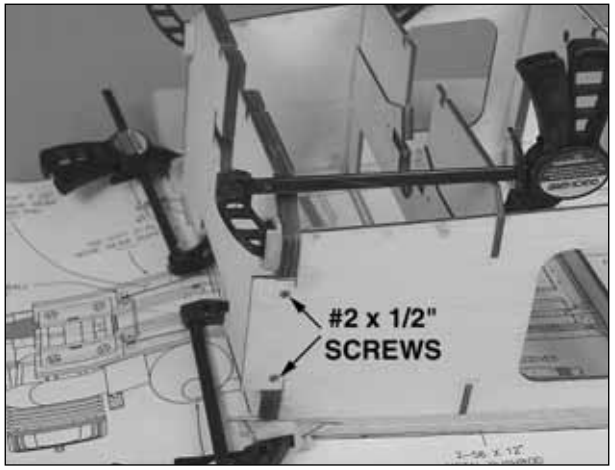
❏ 13. Test fit, then glue formers **7B** through **12B** and the bottom stabilizer mounts into position. Be certain all of the formers are vertical and accurately align with their position on the plan. **Note:** Twisted formers will simply be straightened when the stringers are added later. **Note**: Be certain the pushrod holes in the formers align with the pushrod holes shown on the plan.

❏ 14. Starting from the aft end, fit, but do not glue formers 6B through 2B and both fuselage doublers to the assembly. Be certain that the fuselage doubler you cut earlier will be on the **right** side of the fuselage—remember, the fuselage is being built upside-down, so the right side is the side nearest us in the photos. **Note**: Be certain that 3A faces forward as shown on the plan.



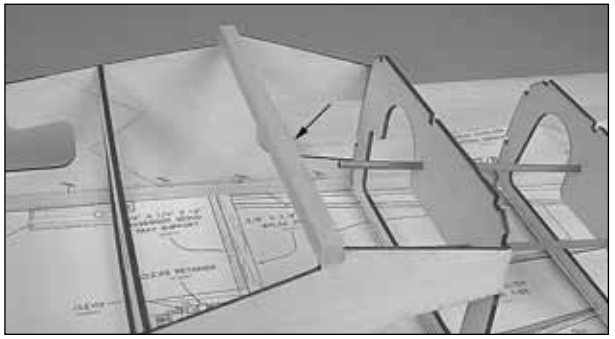
❏ 15. Glue former 4B and the fuselage doublers—only in the area of 4B—to the fuselage spars.

❏ 16. Proceed by gluing the remaining formers (except the firewall) and the fuselage doublers into position. As you proceed, bow the fuselage doublers outward between the formers so they align with the fuselage main spars and glue as you go.

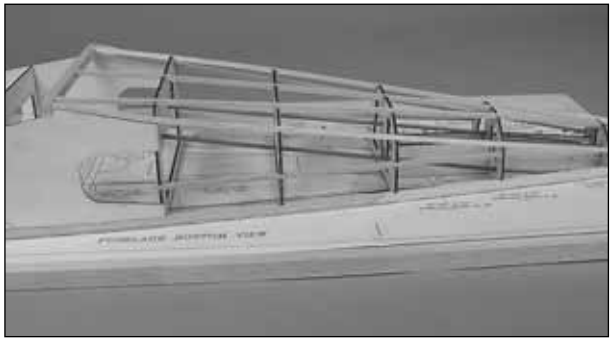


❏ 17. Glue the firewall into position with 30-minute epoxy. Use clamps, large T-pins or whatever means necessary to hold the parts together and keep the firewall in alignment until the epoxy hardens. #2 x 1/2" [13mm] screws may also be used to help hold the fuselage sides to the firewall. Tighten the screws securely so the heads sink partway into the doublers—the screws will be permanent.

❏ 18. Cut both 3/16" x 24" [4.8 x 610mm] gray pushrod guide tubes to the length shown on the plan for the stabilizer and rudder. Roughen the outside of the tubes with coarse sandpaper, then slide them into position, but **do not glue**.

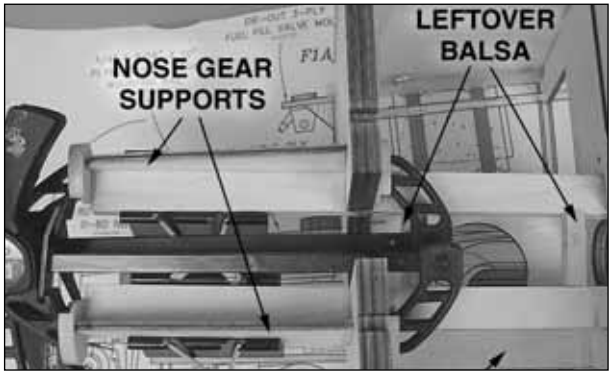


❏ 19. Use the remainder of the 3/8" x 3/8" x [9.5 x 9.5mm] basswood stick leftover from the aileron servo mount for the bottom of the fuselage across the doublers. Glue the stick into position and sand the ends even with the doublers.



❏ 20. Cut and glue seven 3/16" x 3/16" x 24" [4.8 x 4.8 x 610mm] balsa stringers into the notches in the formers in the aft end of the fuselage. Any formers that are twisted can be drawn into position as the stringers are glued to them. Now glue the previously-installed guide tubes to the formers.

❏ 21. Glue in the die-cut 1/8" [3.2mm] plywood **fuel tank tray**. (The tray can be seen in following photos.)

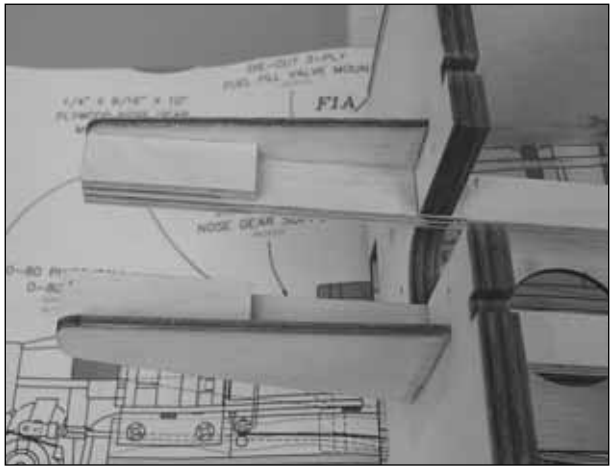


❏ 22. Test fit the die-cut 1/8" [3.2mm] plywood **nose gear supports** and the 1/4" x 9/16" x 10" [6.4 x 14.3 x 250mm] plywood **nose gear mounting rails**. Cut the rails to the correct length and save the cut off pieces. Glue the parts into position with 30-minute epoxy. Use clamps to hold the supports to the firewall and to the rails. Wedge leftover balsa sticks between the rails to press them into the notches in the firewall and former 2.

❏ 23. Test fit your servos in the die-cut 1/8" [3.2mm] plywood **forward servo tray**. If necessary, enlarge the openings for the servos.

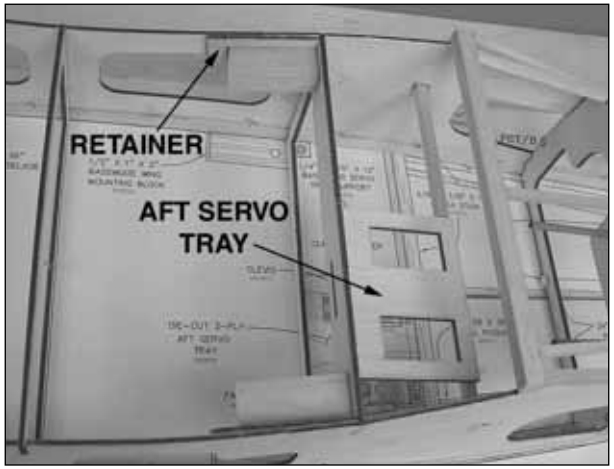
❏ 24. Glue the die-cut 1/8" [3.2mm] plywood **servo tray supports** to the tray, then glue strips of leftover 1/8" [3.2mm] plywood across the bottom of the tray for the servo screws. Glue the forward servo tray into position.

Skip step 25 if installing fixed landing gear.



❏ 25. If installing retracts, cut the remaining two pieces of 1/4" x 9/16" [6.4 x 14.3mm] plywood leftover from step 22 and glue them to the bottom of the front of the rails.

Refer to this photo for the following two steps.

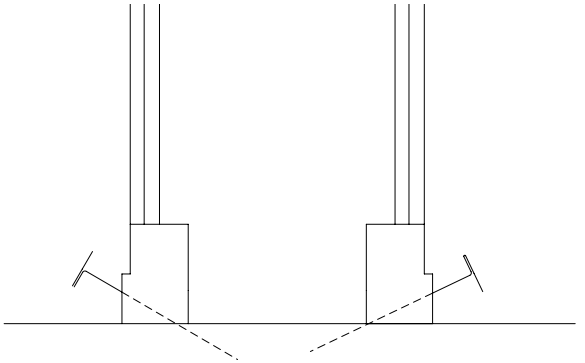


❏ 26. Glue both die-cut 1/8" [3.2mm] plywood **wing mounting block retainers** into position. Sand an angle on one end of both 1/2" x 1" x 2" [13 x 25 x 50mm] basswood **wing mounting blocks** to match former F5. Glue the mounting blocks into position with 30-minute epoxy. Use clamps to hold the blocks in position until the epoxy hardens.

❏ 27. Glue another strip of leftover 1/8" [3.2mm] plywood across the front of the servo openings in the die-cut 1/8" [3.2mm] plywood **aft servo tray**. Simultaneously fit the aft servo tray and the 1/4" x 1/4" x 12" [6.4 x 6.4 x 305mm] basswood stick into position. Cut the stick to the correct length between the fuselage sides, then glue the parts into place.

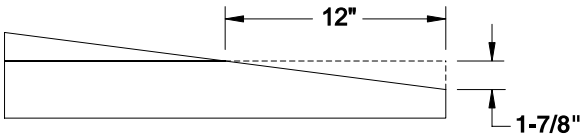
❏ 28. Use two more 3/16" x 3/16" x 24" [4.8 x 4.8 x 610mm] balsa sticks for the four stringers between the firewall and former F3 and glue them into position.

SHEET THE BOTTOM OF THE FUSELAGE

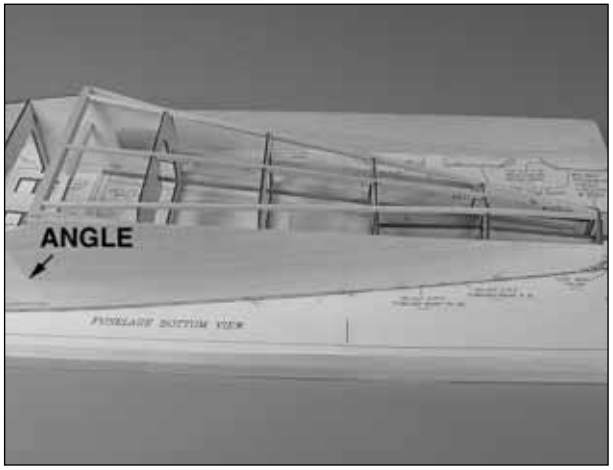


❏ 1. One at a time, remove, then replace the T-pins in the fuselage main spars as shown.

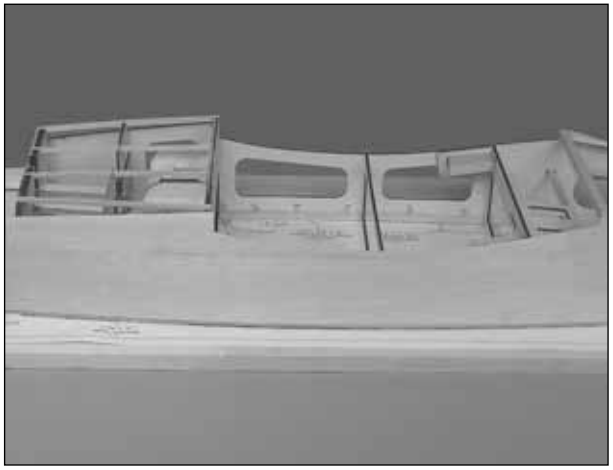
❏ 2. Sand all of the fuselage stringers even with formers to accommodate the sheeting.



❏ 3. Cut a 12" x 1-7/8" [305 x 47.6mm] piece from a 3/32" x 3" x 24" [2.4 x 75 x 610mm] balsa sheet. Glue the piece back on as shown in the sketch.

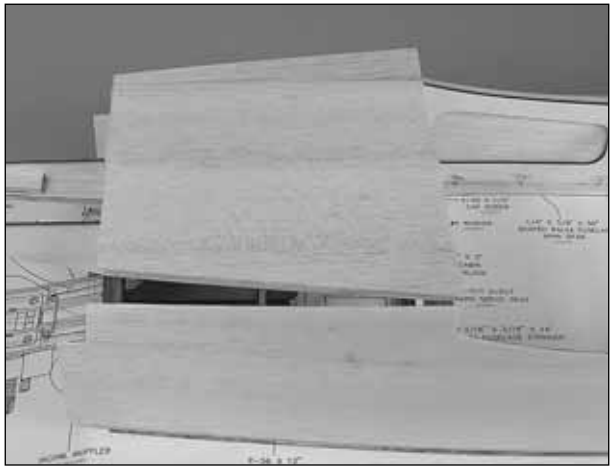


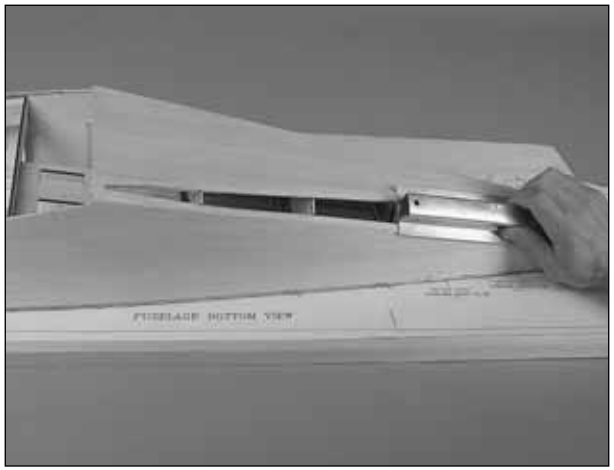
❏ 4. Test fit the sheet to the aft fuselage bottom. Cut an angle at the front, then glue the sheet into position—the exact angle isn't critical because the second sheet will be custom fit to the first.



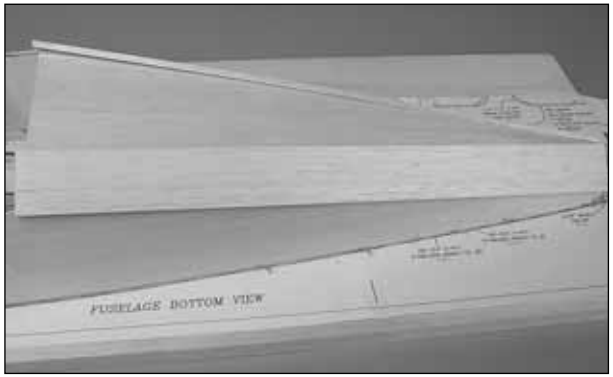
❏ 5. Sheet the front of the fuselage bottom using two more 3/32" x 3" x 24" [2.4 x 75 x 610mm] balsa sheets. The aft end of the sheet will have to be cut at an angle to match the sheet already on the fuselage in the previous step.

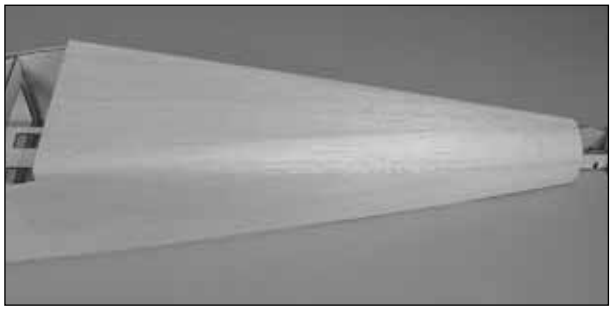
❏ 6. Sheet the other side of the fuselage the same way.

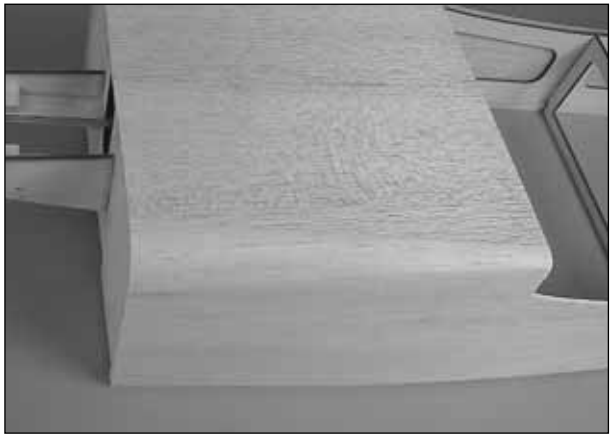




❏ 7. Use one more 3/32" x 3" x 24" [2.4 x 75 x 610mm] balsa sheet and leftover 3/32" [2.4mm] balsa to sheet the forward and aft bottom of the fuselage. Sand the bottom and side sheeting and the stringers to match the angle of the formers.



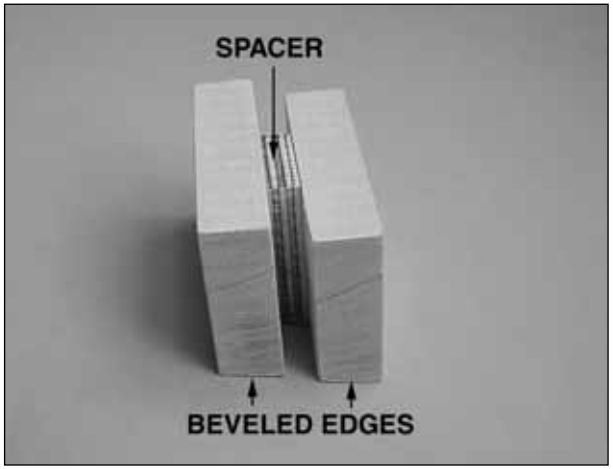




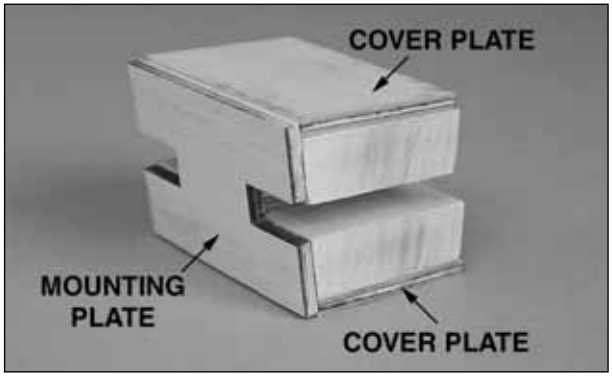
❏ 8. Use three 1/4" x 2" x 24" [6.4 x 50 x 610mm] balsa sheets to cover the corners on the bottom of the fuselage—two for both sides of the rear and the third cut in half for the front. Remove the fuselage bottom from the plan. Use a razor plane and bar sanders to round the corners, but don't remove too much material so there will be enough to match the fuselage to the tail cone in the rear and to the cowl in the front.

MOUNT THE FIXED NOSE GEAR

Skip this section if installing retracts.

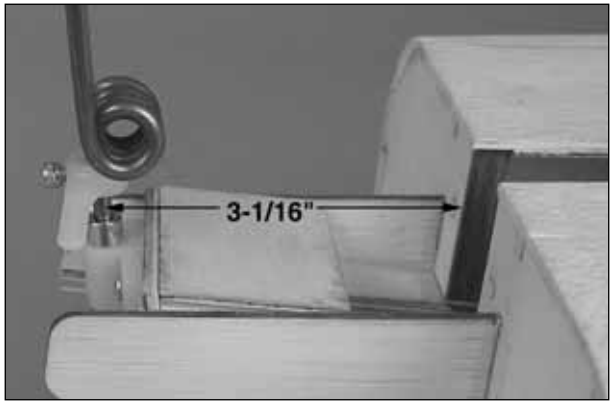


❏ 1. Glue the 1/4" x 3/4" x 1-3/8" [6.4 x 19 x 35mm] plywood **spacer**, centered, between the 1/2" x 1-9/16" x 2" [13 x 39.7 x 50mm] basswood **fixed nose gear blocks**. When doing so, lay the parts on a flat surface with the beveled edges down so they align.



❏ 2. Glue the die-cut 1/8" [3.2mm] plywood **mounting plate**, centered, to the front, beveled end of the basswood blocks. **Hint:** Temporarily slide the assembly over the mounting rails on the fuselage to center the mounting plate on the blocks. Glue the die-cut 1/8" [3.2mm] plywood **cover plates** to the top and bottom of the assembly. **Note:** The assembly is photographed upside-down because we are still working on the fuselage while it is upside-down.

Refer to this photo for the following two steps.



❏ 3. Drill 3/32" [2.4mm] holes through the punchmarks in the mounting plate. Fit the nose gear wire with the steering arm and collars to the nose gear bearing. Mount the assembly to the mounting plate assembly with four #4 x 5/8" [16mm] screws. (You can see all of the parts in the following photo).

❏ 4. Slide the assembly onto the mounting rails on the fuselage until the center of the nose gear wire is 3-1/16" [1.6mm] from the firewall.

❏ 5. Drill 5/32" [4mm] holes all the way through the nose gear mounting assembly. Temporarily mount the assembly to the rails with four 6-32 x 2" [50mm] bolts, #6 flat washers and lock washers and 6-32 blind nuts as shown on the plan.
The nose steering and throttle will be hooked up after the engine has been mounted.

MOUNT THE RETRACTABLE NOSE GEAR

Skip this section if not building retracts.

❏ 1. Mount two 0-80 ball link balls (not included) to the steering arm on the nose gear.

❏ 2. Remove the strut from the assembly. Place the nose gear mount on the rails. Retract the gear and make sure the steering arm will clear the ends of the plywood standoff pieces previously glued to the bottom of the rails.

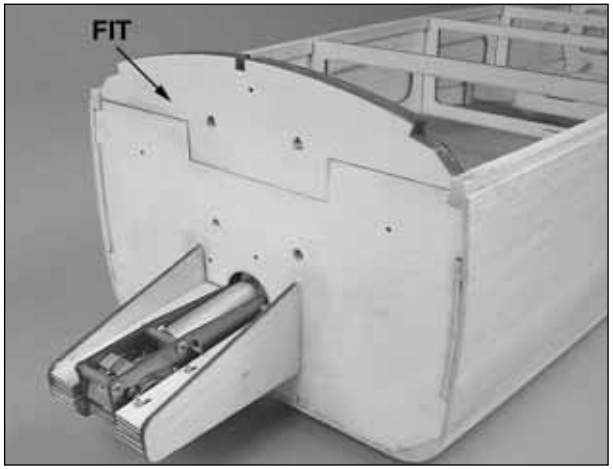
❏ 3. Drill 7/64" [2.8mm] holes through the rails for mounting the nose gear. Mount the nose gear with four #6 x 1/2" [13mm] screws.

❏ 4. Mount the strut on the nose gear assembly and mount the axle and a nose wheel (not supplied) to the nose gear. **Reminder:** A 2-1/2" [64mm] wheel is specified, but if using Robart wheels a 2-1/4" [57mm] wheel is used as their wheels are slightly oversize. Use a cutoff wheel to file a flat spot on the axle and cut it to the correct length.

❏ 5. The same as was done for the main landing gear, reinforce the inside of the bottom sheeting with 3/32" plywood (not supplied) or leftover balsa. Cut an opening in the bottom of the fuselage to accommodate the nose gear. Proceed slowly to get a nice-looking cutout, but make sure you leave enough room all the way around so the gear will never "hang up."

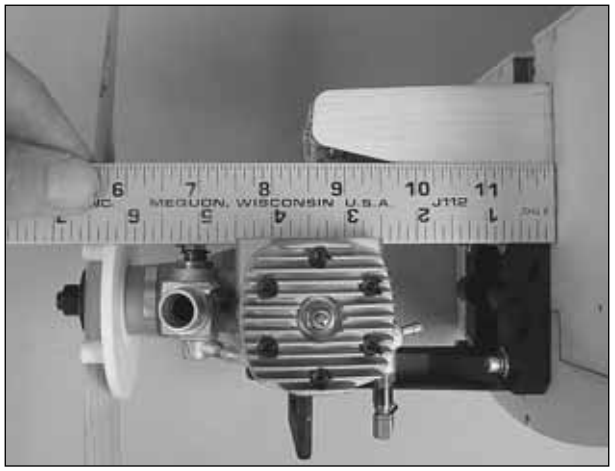
MOUNT THE ENGINE

❏ 1. Glue together the three die-cut 1/8" [3.2mm] plywood formers **F1T**. After the glue dries drill 7/32" [5.6mm] holes through the two punchmarks for the top engine mount blind nuts. Install the blind nuts, then permanently glue them in with thin or medium CA.



❏ 2. Test fit, then glue in F1T into position.

❏ 3. Temporarily bolt the engine mount to the firewall with four 8-32 x 1-1/4" [32mm] socket head cap screws, #8 lock washers and flat washers, but don't tighten the bolts all the way. Adjust the engine mount to fit your engine, then tighten the bolts.



❏ 4. Use small C-clamps to hold the engine on the mount so the backplate of the spinner will be 6-1/8" [155mm] from the firewall.

❏ 5. Use a Great Planes Dead Center™ Engine Mount Hole Locator (GPMR8130) or another method to mark the engine mounting hole locations on the engine mount.

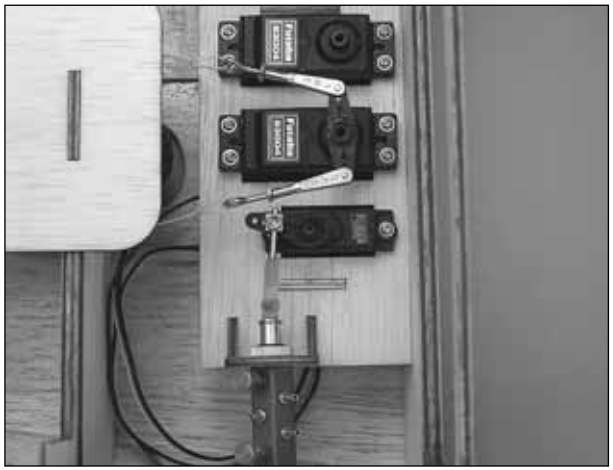
❏ 6. Remove the engine and drill #29 holes at the marks. Use an 8-32 tap to cut threads into the holes. Bolt the mount to the firewall, but don't tighten the bolts yet. Mount the engine to the mount with four 8-32 x 1" [25mm] socket head cap screws and #8 lock washers. **Suggestion:** Use a drill press to drill the holes in the engine mount if you have access to one.

❏ 7. Center the engine mount vertically on the engine mount bolts, then tighten the bolts the rest of the way.

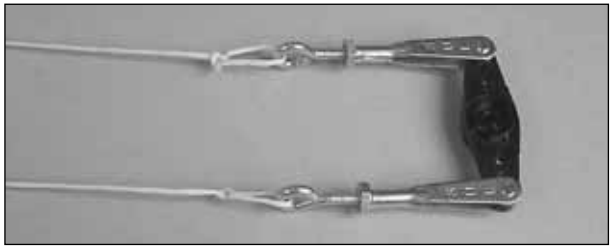
CONNECT THE NOSE STEERING AND THROTTLE

❏ 1. If installing retracts, cut two 4-1/2" [115mm] pieces from the 12" [300mm] white, plastic **guide tube**. Roughen the outside of the tubes with coarse sandpaper so glue will adhere, then glue them into the holes previously drilled in the firewall and former F2.

Refer to this photo for the following three steps.

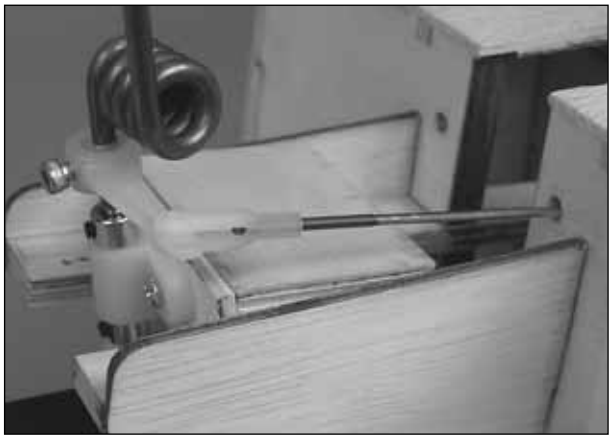


❏ 2. Mount the throttle and nose wheel steering servo as shown. If installing retracts, also mount the air valve servo and the air control valve with the 1/8" [3.2mm] plywood **air control valve mount**.

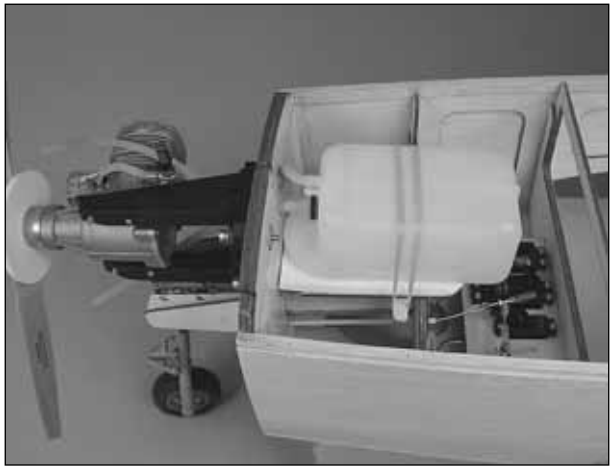


❏ 3. If installing retracts, connect the nose wheel steering cables/lines to the servo arm as shown. A Sullivan #521 Kevlar Pull-pull control cable set (SULQ3121) was selected because the Kevlar lines are strong, easy to work with and the swivel connectors are preferred. Rather than using the crimp tubes, knots were tied in the lines and secured with a small drop of thin CA.

❏ 4. Temporarily install the pull/pull lines and connect the air valve to the air valve servo using the hardware shown. Note that the air valve servo can only move so far before it will interfere with the nose wheel steering lines. The air valve should be fully open (or closed) when the servo is in this position. This can be adjusted using the AFR or ATV function in your transmitter.



❏ 5. If installing fixed landing gear, connect the nose wheel steering servo to the steering arm with the hardware shown in the photos. The pushrod goes through the hole in the bottom of the firewall and the cutout for the retractable nose wheel in former F2. Bend the pushrod as necessary and cut it to the correct length.



❏ 6. Test fit the fuel tank and route the lines through 1/4" [6.4mm] holes drilled through the firewall. Secure the tank as shown in the manual with a #64 rubber band connected to a leftover 1/8" [3.2mm] plywood stick glued across the bottom of the tray. Don't forget to use R/C foam rubber underneath. The lines will be connected later.

❏ 7. Use an extended 3/16" [4.8mm] drill or a 3/16" [4.8mm] brass tube sharpened on the end to drill holes through the firewall and F2 for the throttle pushrod guide tube. Use a piece of guide tube leftover from the stabilizer and rudder guide tubes and glue it into position. Connect the carburetor arm to the throttle servo with the pushrod and hardware shown on the plan.

COVER THE HORIZONTAL STABILIZER

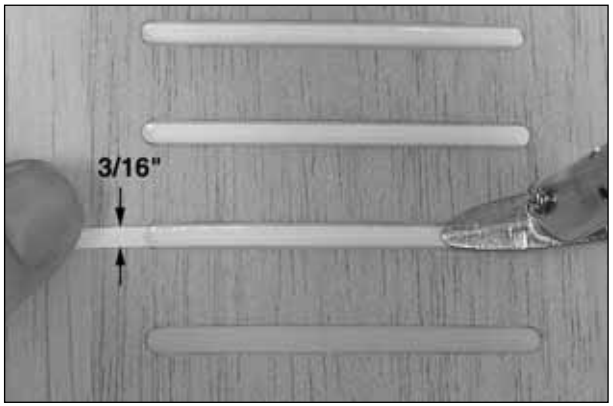
It's time to get started on the top of the fuselage, but the horizontal stabilizer will be permanently installed during the process. It will be much easier to cover the stab ***before*** *attaching it to the fuselage, so follow the instructions to cover the stab. We've experimented with several different methods for covering the corrugations and found that the method described works best.*

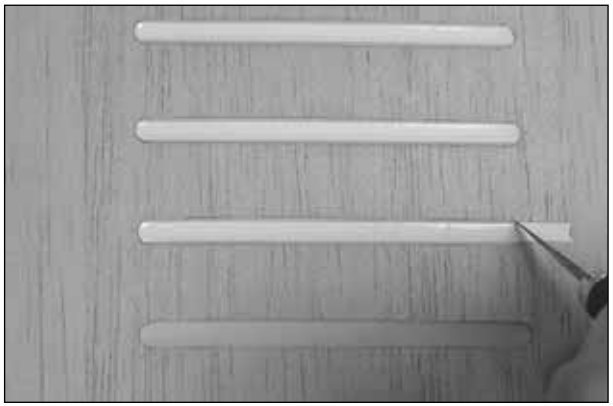
❏ 1. If you haven't yet done so, final-sand the stab to prepare it for covering. Remove all balsa dust using a shop-vac with a brush attachment or compressed air.

❏ 2. Start by covering the inside edges of the stab. First cut a strip of covering, then use a 3/8" [9.5mm] brass tube sharpened on the end to cut a hole in the strip. Cut a slit from the hole to the front of the strip, then slip the strip over one of the brass tubes. Iron the strip into position.

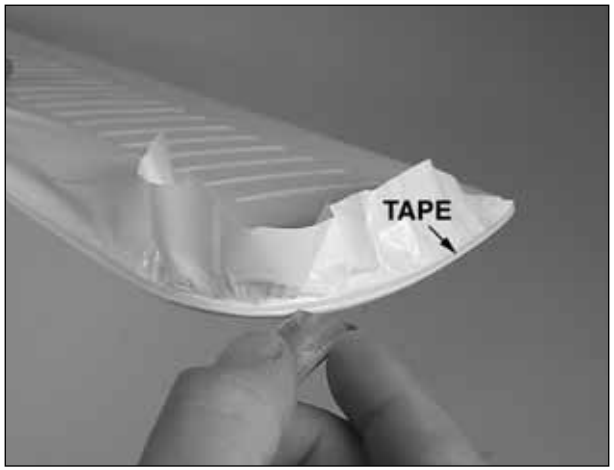
❏ 3. Cover the rest of the way around the inside edge of the stab, then cut the covering approximately 1/16" [1.6mm] from the outer surfaces. Iron the covering down.

Now for the fun part...



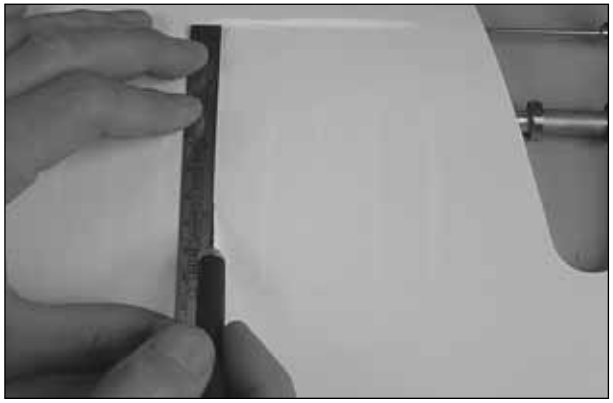


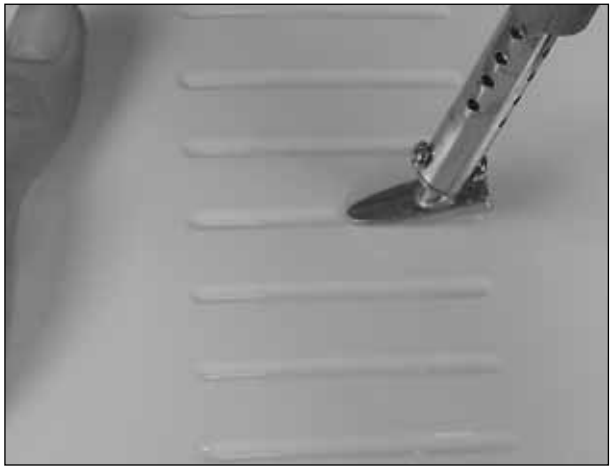
❏ 4. Use a trim seal tool to iron 3/16" [4.8mm] strips of covering down into the corrugations. Carefully cut the ends of the strips at the ends. **Hint:** Use a metal file and wet/dry sandpaper to round the tip of your trim seal tool to match the radius of the corrugations.



❏ 5. After all of the corrugations have been covered, cover the bottom of the stab going right over the corrugations as though they weren't even there. The bottom can be covered in one piece. After ironing the covering down around the tips, use thin tape as a guide to cut the covering. Peel off the tape and the unneeded covering.

❏ 6. Cover the top of the stab the same way—the tape trick still works. This will provide an even, straight, nearly invisible seam.

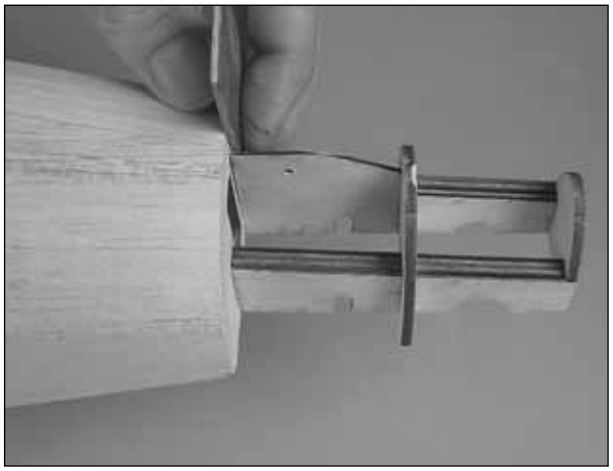




❏ 7. Now to finish the corrugations—use a straightedge and a **sharp** hobby knife to slit the covering down the middle of all the corrugations—don't worry, this really works (you could try it on the bottom first). Use the trim seal tool to iron the covering down into the corrugations over the previously ironed-down strips. **Note:** Should your covering job ever require a little touch-up to remove any wrinkles that may appear in the future, don't use a heat gun. This will pull the covering from the corrugations. Always use a covering iron with a covering sock to remove wrinkles.

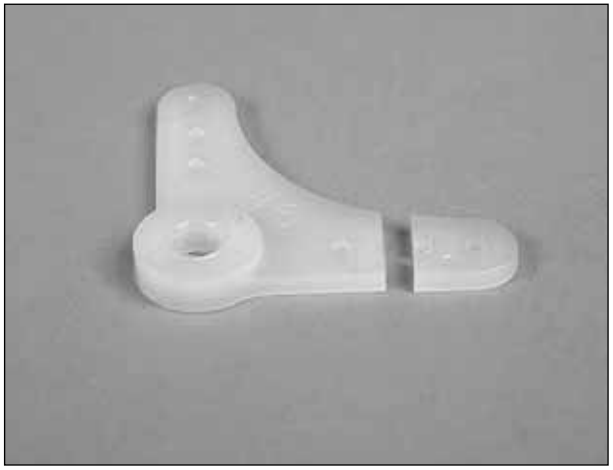
Now that the stabilizer has been covered, you may proceed with construction.

MOUNT THE HORIZONTAL STABILIZER



❏ 1. Sand the sheeting around the bottom and sides of the fuselage even with former F10.

❏ 2. Mount the stabilizer servo in the rear servo tray. Cut the unthreaded end from a 36" [910mm] pushrod so the pushrod will be 25" [635mm] long. Thread a nylon clevis 20 full turns onto the pushrod. Guide the pushrod through stabilizer pushrod tube, then connect the clevis to the servo arm on the stabilizer servo.

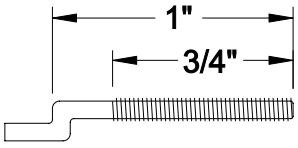


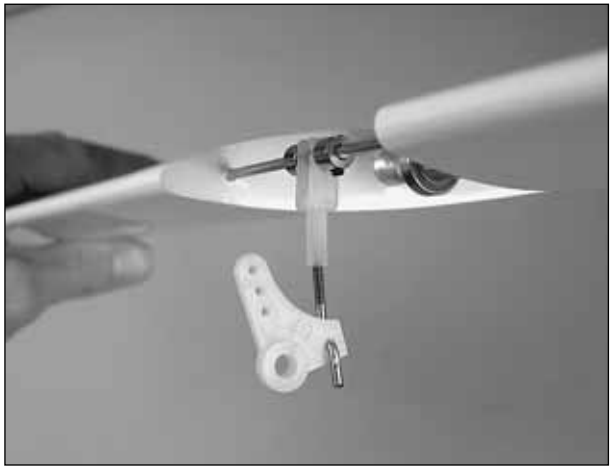
❏ 3. Trim the nylon bellcrank as shown. Enlarge the remaining holes with a Hobbico servo horn drill or a 5/64" [2mm] drill.

❏ 4. Temporarily mount the bellcrank with the brass bushing, a 4-40 x 3/4" [19mm] screw, a #4 washer and a 4-40 nut. Mark the stabilizer pushrod where it crosses the holes in the bellcrank.

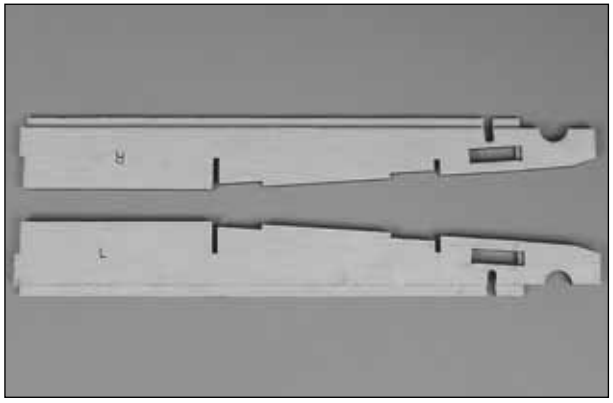
❏ 5. Disconnect the pushrod from the servo, slide the pushrod out past former F11B and make a Z-bend in the pushrod at the mark. Cut off the excess wire. Remove the bellcrank.

Short stabilizer pushrod





❏ 6. Make the **short stabilizer pushrod** as shown in the sketch from a 6" [150mm] pushrod. Note that a portion of the threaded end also has to be cut off. Thread the pushrod into the swivel clevis on the stabilizer control rod. Connect the bellcrank to the pushrod.

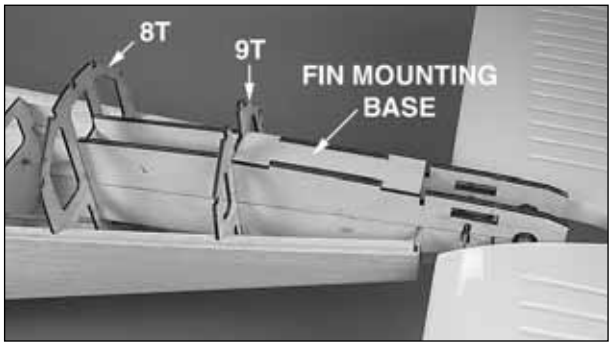


❏ 7. Glue together both sets of die-cut 1/8" [3.2mm] plywood **top outer** and **top inner stabilizer mounts**. Be certain to make a right and a left side. Note that the parts align along the top edges.

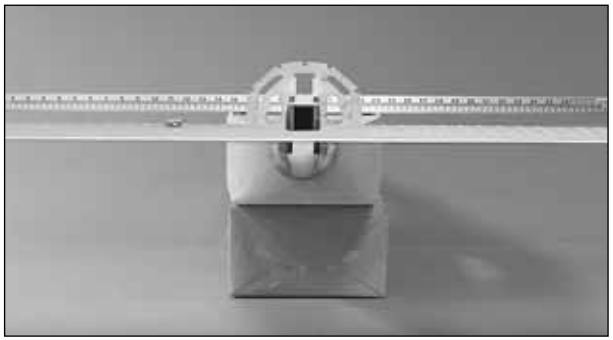
❏ 8. Now is your final opportunity to make any fixes/improvements/adjustments to the covering on the horizontal stabilizer, because soon, it will be permanently mounted to the fuselage. Do anything now that will be difficult to do when the stab is on

the fuselage.

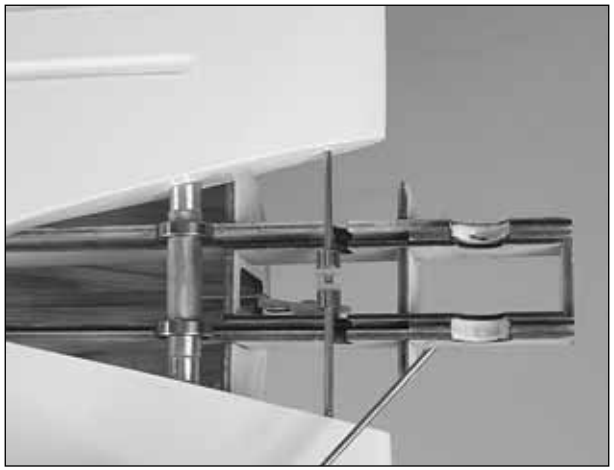
❏ 9. Connect the stabilizer pushrod to the bellcrank and place the stabilizer bearings (that are already on the stabilizer) in the stab mounts. Mount the bellcrank. *(You can see more pictures of the bellcrank hookup, starting on page 51 under "Fit the Tail Cone.")*



❏ 10. **Without using any glue**, place the top stabilizer mounts on the fuselage over the stabilizer bearings. Again without glue, join die-cut 1/8" [3.2mm] plywood formers **8T** and **9T** and the die-cut 1/8" [3.2mm] plywood **fin mounting base** to the assembly.

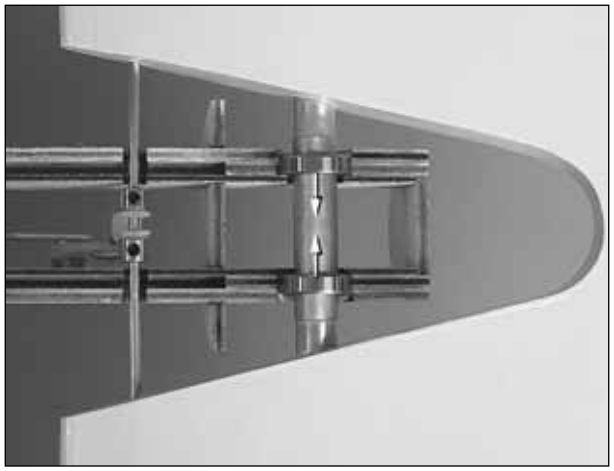


❏ 11. Place a straightedge across the top of the fuselage. Stand about ten feet behind the model and view the alignment of the stabilizer and the straightedge. If the stabilizer is not parallel with the straightedge, try placing an ounce or two of weight on the "high side" of the stab. If weight is not enough to align the stab, remove the stab from the fuselage and look for glue blobs or any other imperfections where the bearings fit in the stab mounts. Make any modifications necessary and remount the stab, then recheck the alignment.



❏ 12. Remove 8T, 9T, the fin mounting base and the top stabilizer mounts. Leave the stab connected to the bellcrank and pushrods, but swing the trailing edge of the stab forward and upward so the stab will be resting upside-down on the fuselage. Apply a thin coating of 30-minute epoxy and microballoons in the bearing seats in the bottom stab mounts.

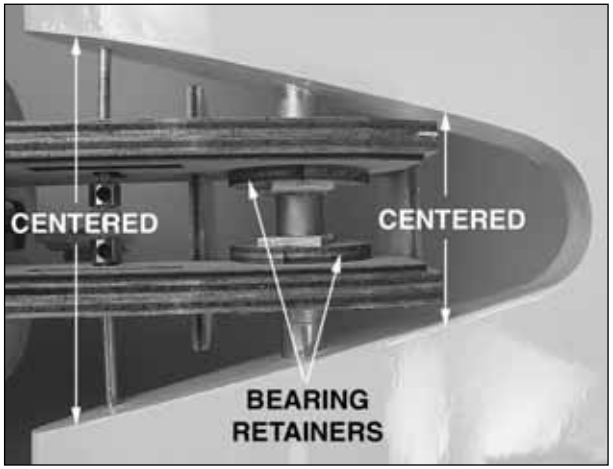
IMPORTANT: Use care not to get any epoxy in the bearings. They must rotate freely after the epoxy has cured.

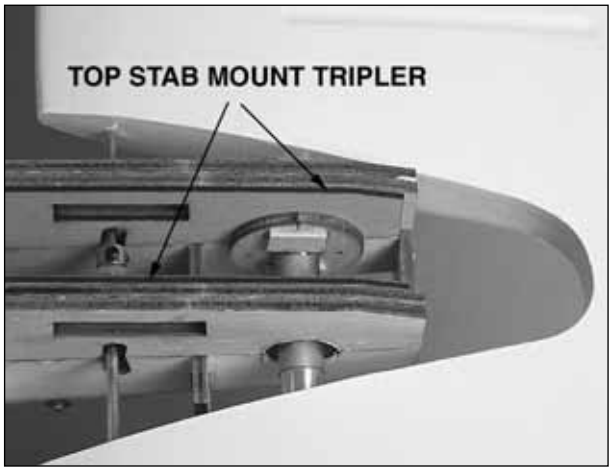


❏ 13. Reposition the stab. Make certain the bearings are all the way inward up against the 1/16" [1.6mm] triplers and that the stab is centered from side-to-side. Proceed immediately to the next step.

❏ 14. Apply another coating of 30-minute epoxy and microballoons to the bearing seats in the top stab mounts, then use medium CA or 30-minute epoxy to permanently glue the top stab mounts into position. Also glue 8T, 9T and the fin mounting base into position.

❏ 15. **IMPORTANT!** Take **accurate** measurements to make certain the stab is centered from side-to-side. There will be plenty of clearance between the stabilizer and the tail cone, but if the stab isn't perfectly centered you will be able to see an uneven gap between the two sides.



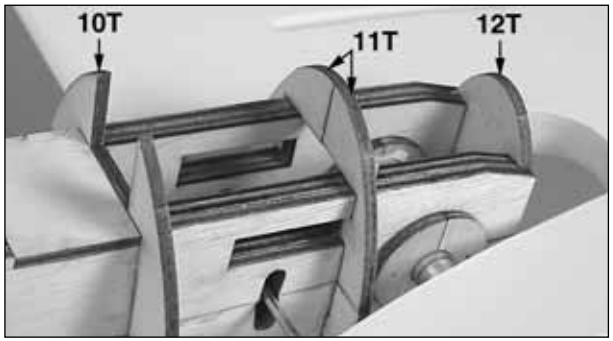


❏ 16. Glue both die-cut 1/16" [1.6mm] plywood **top stab mount triplers** to the inside of the stab mounts above the bottom stab mount triplers. Glue two sets of die-cut 1/8" [3.2mm] plywood **bearing retainers** to the outer brass tube and to each other, but **do not glue the retainers to the stab mount**. Make certain the retainers are pressed tightly against the stab mount triplers, but do not glue them to the triplers. This will keep the stab from shifting in the bearings. Glue strips of leftover balsa across the halves to strengthen the glue joint between the two halves.

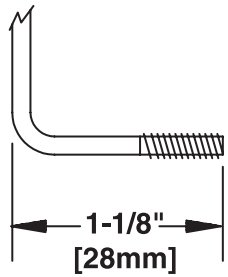
❏ 17. Glue two more sets of bearing retainers to the outside of the stab mounts, but **do not glue them to the brass tubes**. These will ensure that the bearings remain in place.

❏ 18. Disconnect the stab pushrod from the servo. Move the pushrod back and fourth to make the stab move up and down. The stab should move freely. If necessary, make adjustments to get the stab to move without any binding. Reconnect the pushrod to the servo.

MOUNT THE VERTICAL STABILIZER (FIN)

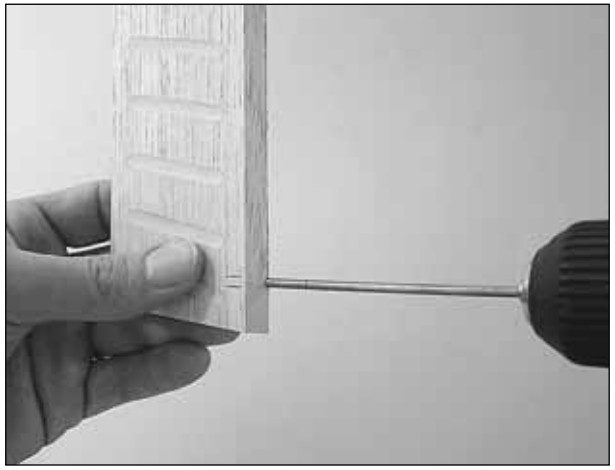


❏ 1. Glue die-cut 1/8" [3.2mm] plywood formers **12T**, both halves of **11T**, and **10T** into position. Also glue **7T** and **6T** into position.

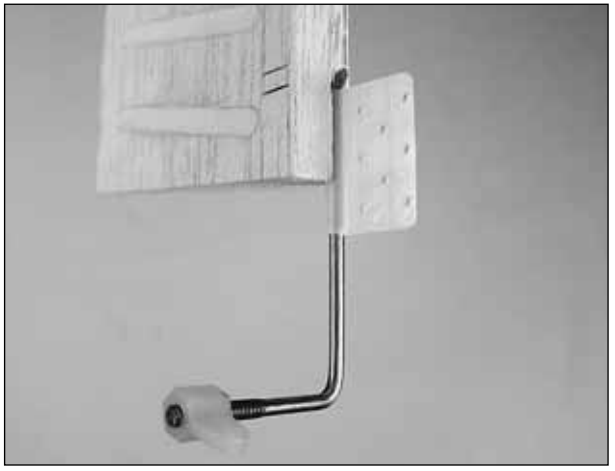


❏ 2. Cut the threaded end of the rudder torque rod to a total length of 1-1/8" [28mm] as shown in the sketch.

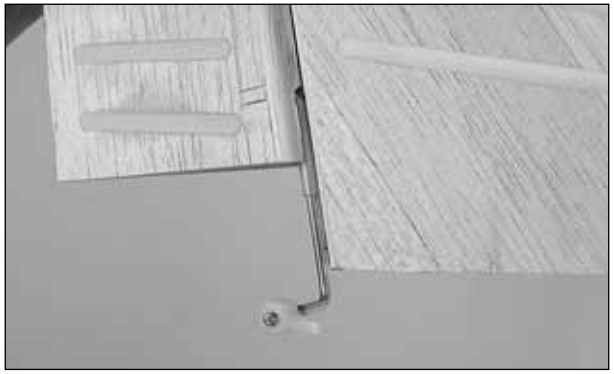
❏ 3. Temporarily set the fin and rudder into position. Thread the 4-40 nylon torque rod horn onto the rudder torque rod. Hold the torque rod up to the rudder so the threaded arm portion will be centered in the slot in the top stabilizer mount. Mark the location of the other end of the torque rod onto the rudder



❑ 4. Use a 1/8 [3.2mm] drill bit or a brass tube sharpened on the end to drill a hole into the rudder for the torque rod.

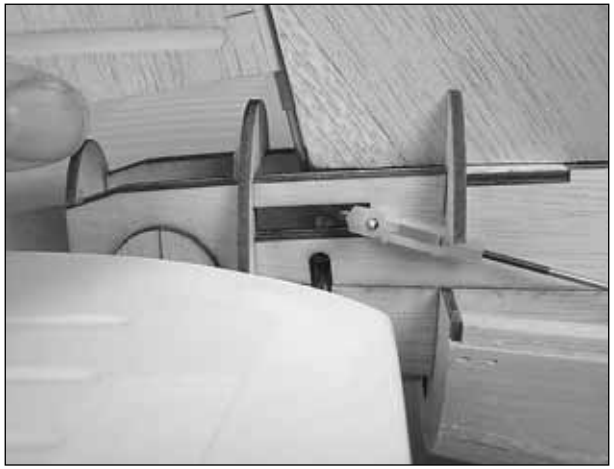


❑ 5. Use a 5/32" [4mm] brass tube sharpened on the end or a hobby knife to cut a groove for the torque rod and the nylon bearing. Test fit the torque rod and the bearing to the rudder.

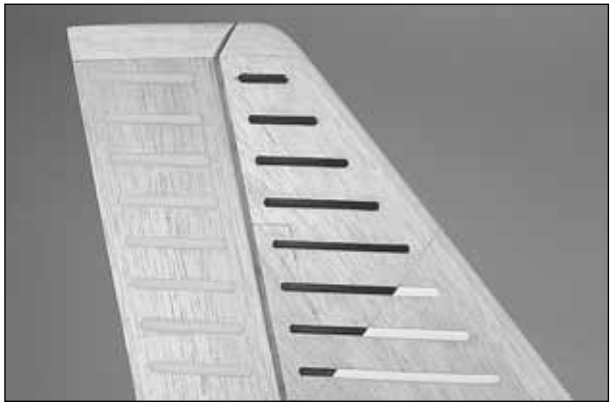


❑ 6. Cut a hinge slot in the fin for the bearing, then test fit the rudder and the bearing to the fin. Make adjustments where necessary for a good fit and smooth operation. Separate the rudder from the fin and take out the torque rod.

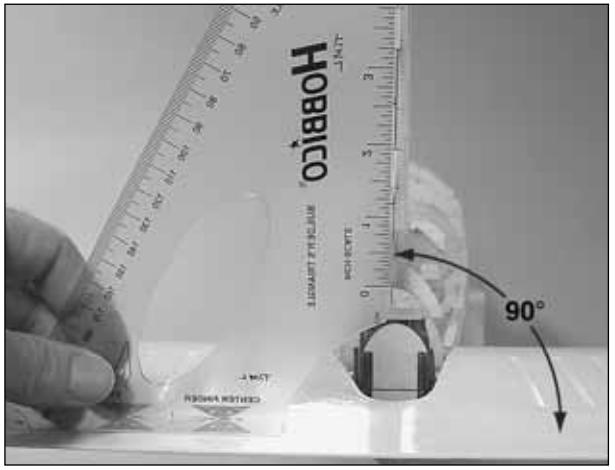
❑ 7. Mount the rudder servo the same way you mounted the stabilizer servo. Cut another pushrod to a length of 27" [685mm], then thread on a nylon clevis. Inset the pushrod through the rudder guide tube from the back of the fuselage.



❑ 8. Insert the torque rod into the fuselage, then set the fin into position and insert the bearing into the fin. Join the rudder. Connect the clevis on the rudder pushrod to the torque rod horn. Move the pushrod back and forth to check the operation. Make adjustments where necessary.

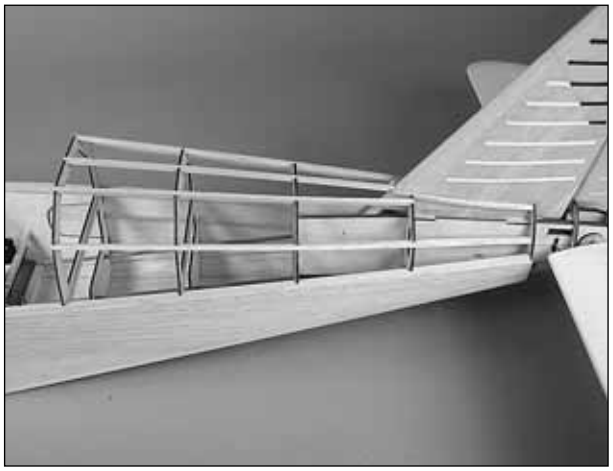


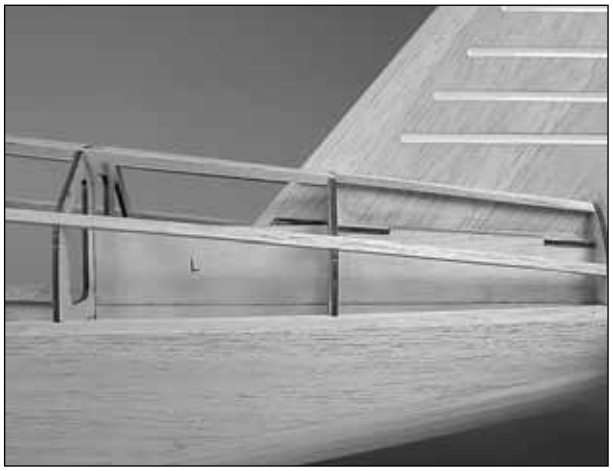
❑ 9. The fin *could* be glued into position at this time, but similar to the stabilizer, it will be easier to apply the covering strips down in the corrugations first. Apply the corrugation strips at this time. If duplicating the trim scheme on the kit box cover, apply the white strips first with overlapping metallic red strips as shown. Note the covering guidelines lightly penciled directly onto the fin.



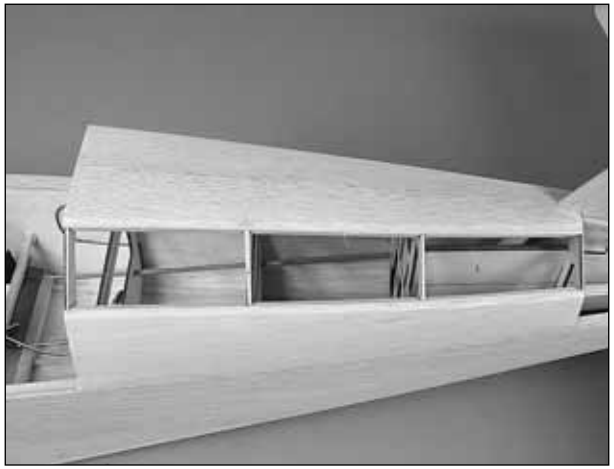
❑ 10. Glue the fin into position using 30-minute epoxy mixed with milled glass fibers or microballoons to thicken the mix to keep it from running. Simultaneously glue the rudder torque rod bearing into the fin. Use a builder's square to make certain the fin is perpendicular to the stabilizer before the epoxy hardens. Use the line drawn on the trailing edge of the fin as an alignment cue.

SHEET THE AFT END OF THE FUSELAGE

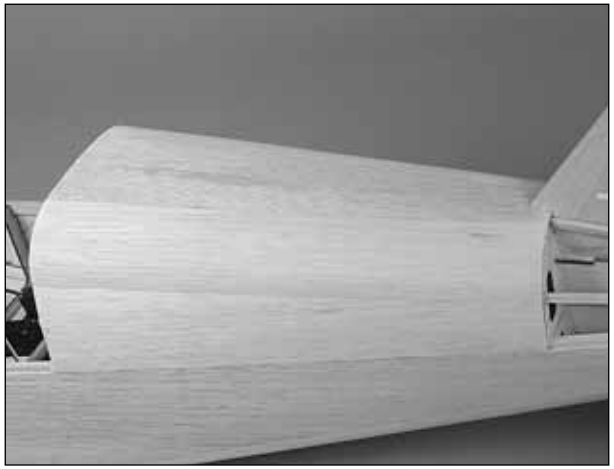




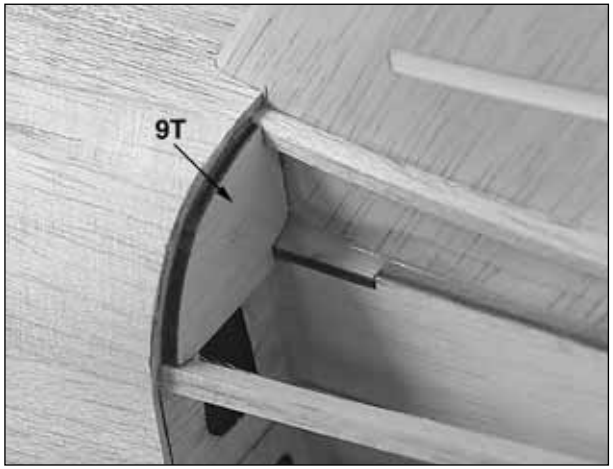
❏ 1. Glue the 3/16" x 3/16" x 24" [4.8 x 4.8 x 610mm] balsa stringers into the notches in the formers as shown. As you proceed, make certain the formers are vertical (especially F6) as you glue in the stringers. Glue two shorter stringers along both sides of the fin. Make certain they follow the same contour as the top of the fuselage.



❏ 2. Use four 3/32" x 3" x 24" [2.4 x 75 x 610mm] balsa sheets to sheet the sides and top of the aft end of the fuselage as shown. The same as was done on the bottom, sand the sheeting even with the stringers to accommodate the thicker balsa corners.

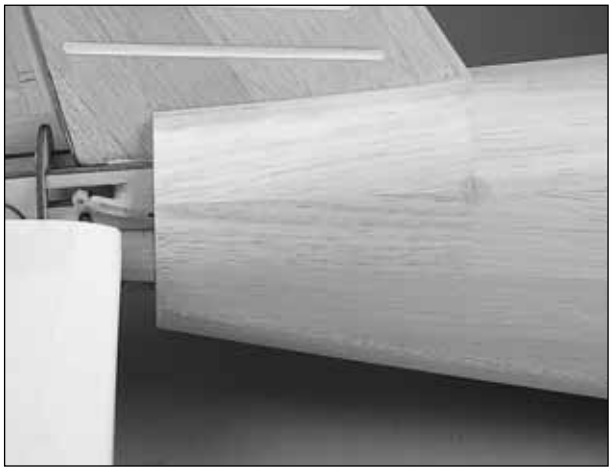


❏ 3. Cut both 3/8" x 3" x 24" [9.5 x 75 x 610mm] balsa sheets to the correct length, then glue them into position for the corners. After the glue hardens use a razor plane to do the initial, rough shaping.



❏ 4. Glue both die-cut 1/8" [3.2mm] plywood formers pieces **9T** into position on both sides of the fin.

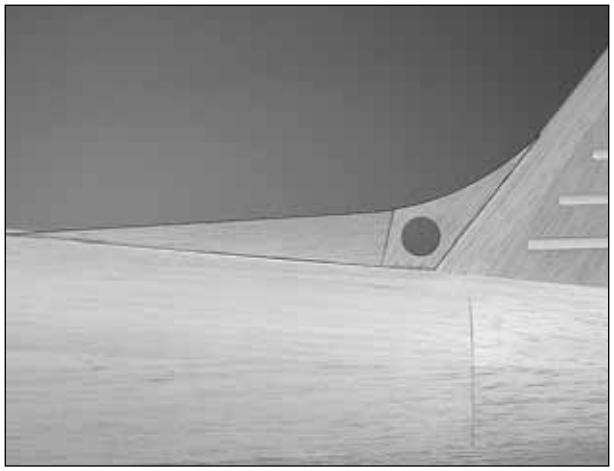
❏ 5. Shape a piece of leftover 1/8" [3.2mm] balsa to fit between the top and bottom of former 10 as shown. Make sure there is adequate clearance for the pushrod.



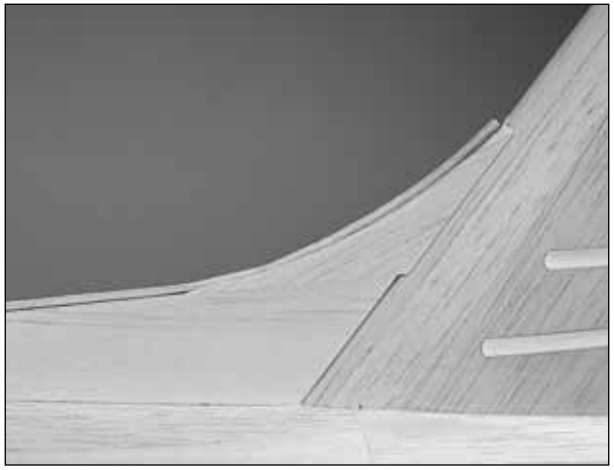
❏ 6. Use leftover 3/32" [2.4mm] balsa sheets to sheet the remaining open section of the fuselage in two pieces. Do the upper portion first, then the lower portion.

❏ 7. Apply lightweight balsa filler where needed, then sand to blend with the rest of the sheeting.

BUILD THE DORSAL FIN



❏ 1. Glue together the two parts of the die-cut 1/8" [3.2mm] balsa **dorsal fin**. Glue the dorsal fin, centered, to the fuselage.

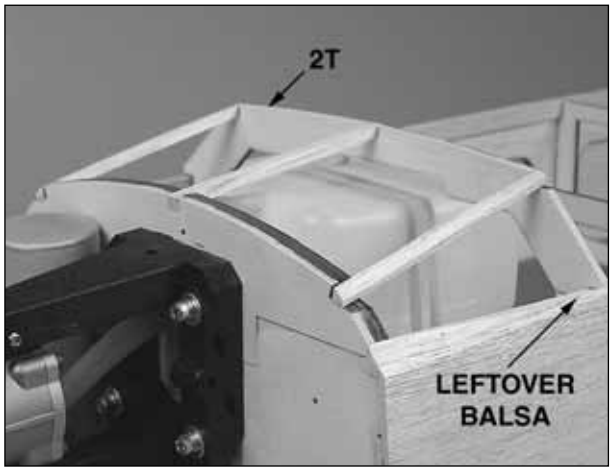


❏ 2. Glue pieces of leftover 1/16" [1.6mm] balsa to both sides of the dorsal fin. Note the grain direction.

❏ 3. Use lightweight balsa filler to blend the dorsal fin to the fin. This is best done in multiple layers, sanding between each application after the filler dries.

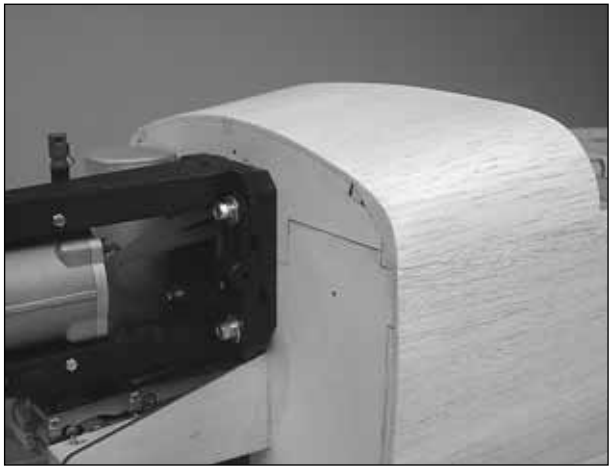
FINISH THE TOP OF THE FUSELAGE

Refer to this photo for the following two steps.



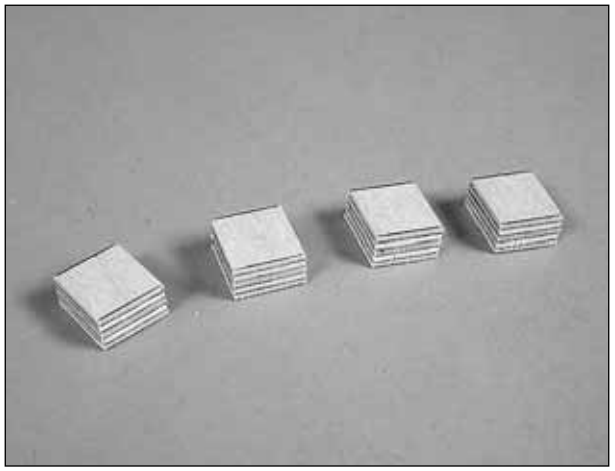
❏ 1. Glue the die-cut 1/8" [3.2mm] plywood **fuselage former top 2T** into position. Glue leftover 3/8" x 3/8" [9.5 x 9.5mm] stringers into the notches as shown.

❏ 2. Glue a piece of leftover 3/32" [2.4mm] balsa to the side stringer to fill the gap between the fuselage sheeting and 2T. The same as was done on the bottom of the fuselage, sand the sheeting and formers even with the angle on the firewall and 2T.

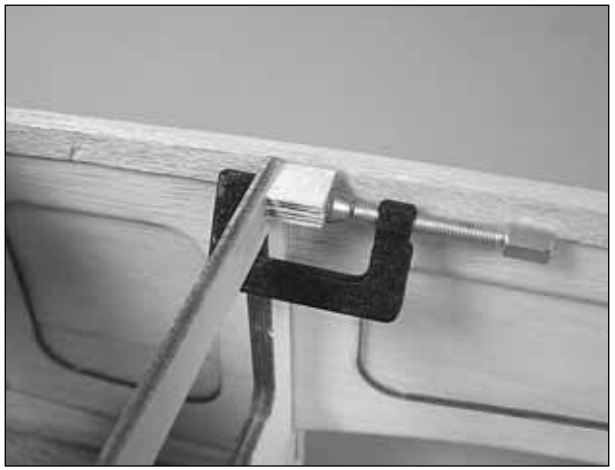


❏ 3. Sheet the top of the fuselage over the firewall and 2T with leftover 3/32" [2.4mm] balsa sheeting. Bevel the edges of the sheeting even with the stringers, then finish the top of the fuselage by gluing on leftover 3/8" x 3" [9.5 x 75mm] balsa sheets for the fuselage corners. Use a razor plane or a hobby knife followed by a bar sander to round and shape the corners even with the side and top sheeting, but remove as little material as possible as final shaping will be done when fitting the cowl and cabin top. Also sand the sheeting and corner blocks even with the firewall and 2T.

MOUNT THE CABIN TOP

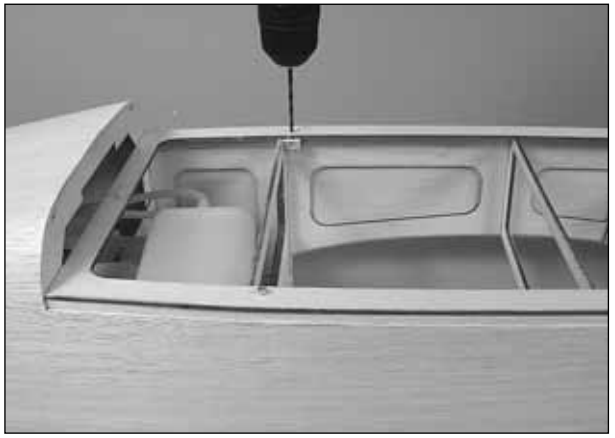


❏ 1. Cut four 1/2" [13mm] **cabin mounting blocks** from the 1/4" x 1/2" x 3" [6.4 x 13 x 75mm] plywood stick.



❏ 2. Test fit, then use 30-minute epoxy to glue the blocks into position where shown on the plan.

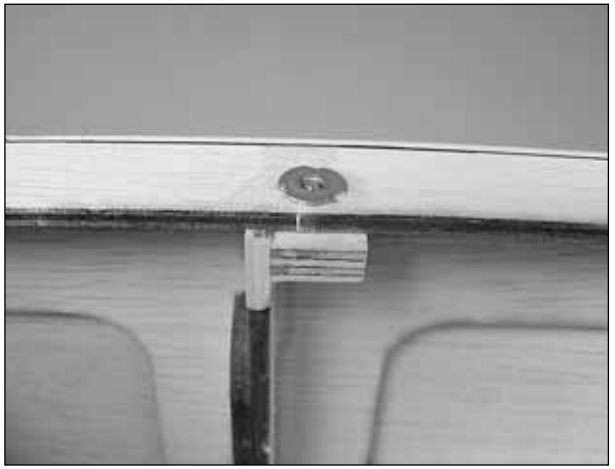
❏ 3. Glue together both halves of the die-cut 1/8" [3.2mm] plywood **cabin frame**. Temporarily slide the fuel tank out of the way or remove it altogether, then position the cabin frame on the side stringers in the fuselage. Accurately center the cabin frame from side-to-side. Use small clamps or masking tape to hold the cabin frame in place.



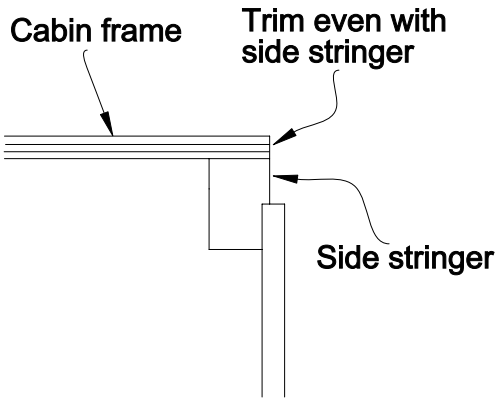
❏ 4. Drill 1/8" [3.2mm] holes through the cabin frame and the cabin mounting blocks. After you drill each hole temporarily insert a 4-40 x 1/2" [13mm] socket head cap screw.

❏ 5. Enlarge the holes in the cabin frame **only**, with a 9/64" [3.6mm] drill bit. Insert 4-40 blind nuts into each hole on the top of the frame (*see* the photo at step 7). Permanently secure the blind nuts with a few drops of thin CA. Allow to fully harden.

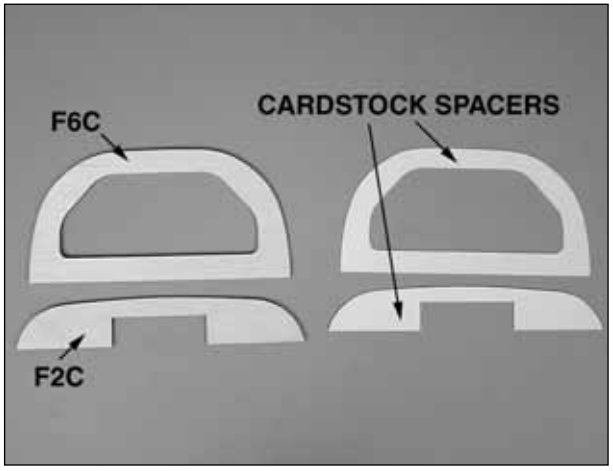
❏ 6. If installing the scale cockpit interior, cut the *cross brace* from the top of formers F3, F4 and F5.



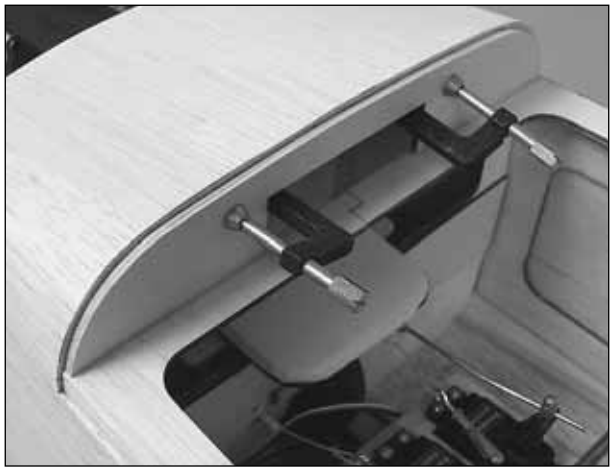
❏ 7. Mount the cabin frame to the fuselage with the socket head cap screws and #4 washers.



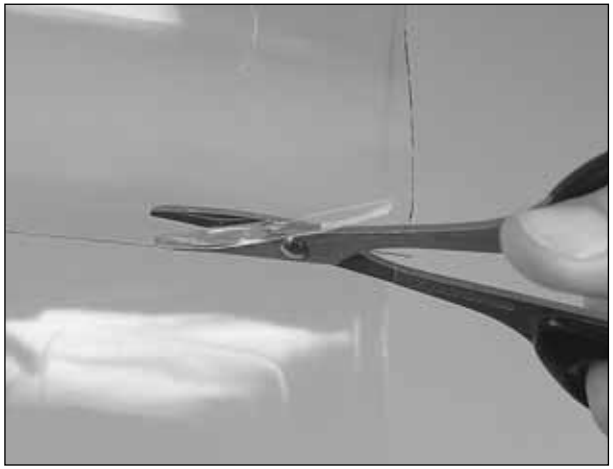
❏ 8. Use a ballpoint pen to mark the edges of the cabin frame anywhere it needs to be trimmed to align with the fuselage side stringer. Remove the cabin frame, trim the edges, refit and mark and trim again as necessary until the sides of the cabin frame are even with the side stringer all the way down both sides.



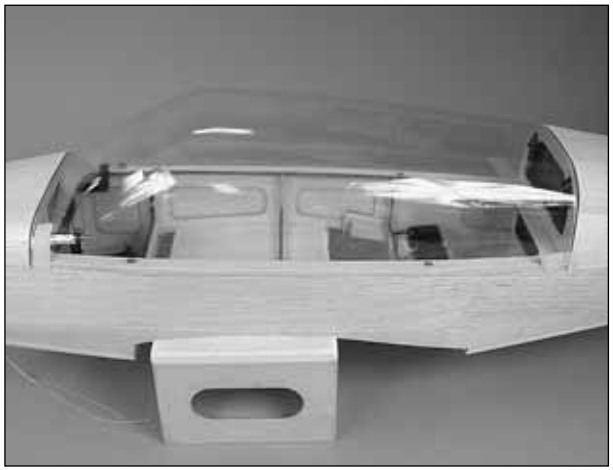
❏ 9. Make ***spacers*** for the die-cut 1/8" [3.2mm] plywood **cabin top formers F2C** and **F6C** from thin cardstock or double layers of a manila folder—approximately .020" [.5mm] is the desired thickness.



❏ 10. Use 3M 75 Repositionable spray adhesive or something similar to adhere the spacers to the back of F6C and to the front of F2C. Test fit, then clamp the formers to the fuselage as shown. Use medium CA to glue the cabin top formers to the cabin top only.



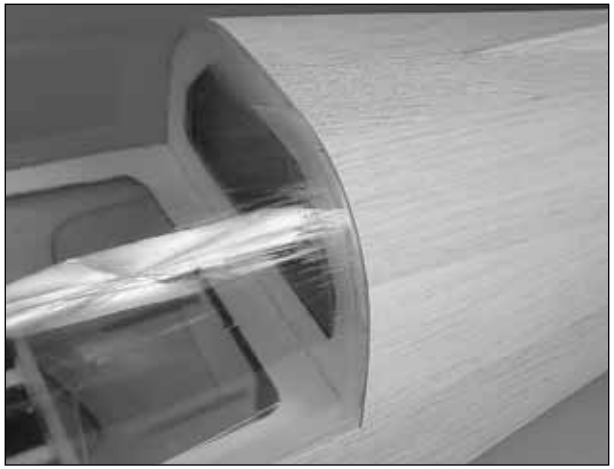
❏ 11. Use curved-tip plastic-cutting scissors to trim the cabin top along the molded in cutlines. Start first by rough-cutting the cabin top approximately 3/16" [4.8mm] from the cutlines. Then cut on the outside edge of the cutlines to leave enough material for fine-tuning by sanding. **Note:** Whenever cutting plastic parts, always cut them slightly oversize. Then they can be custom-fit by sanding with a bar sander.



❏ 12. Test fit the cabin top to the fuselage over the cabin frame. Use a bar sander with 80-grit sandpaper to sand the edges of the cabin top wherever necessary to get a good fit all the way around. Proceed **slowly** and **carefully** to get a nice fit.

❏ 13. Once satisfied with the fit of the cabin top to the fuselage, roughen the inside of the cabin top with medium-grit sandpaper where it contacts the cabin frame. Reposition the cabin top on the fuselage. Use masking tape to hold it in position wherever necessary so it will not move.

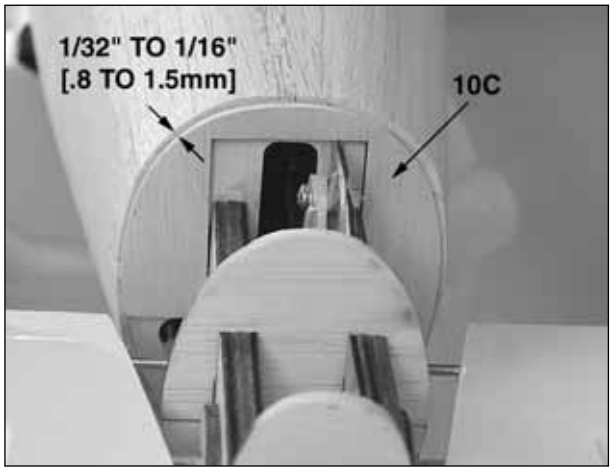
❏ 14. Glue the cabin top to the cabin frame. As can be seen in the photo, thick CA is recommended as it will not wick down past the cabin frame, inadvertently gluing it to the fuselage. Medium CA could also be used. If uncertain, you could use thin, plastic sandwich wrap between the cabin frame and the fuselage stringer. When ready to glue, work along the base, gluing just a few inches at a time. Use a balsa stick to hold the cabin to the frame as you go. CA accelerator may be used as necessary.



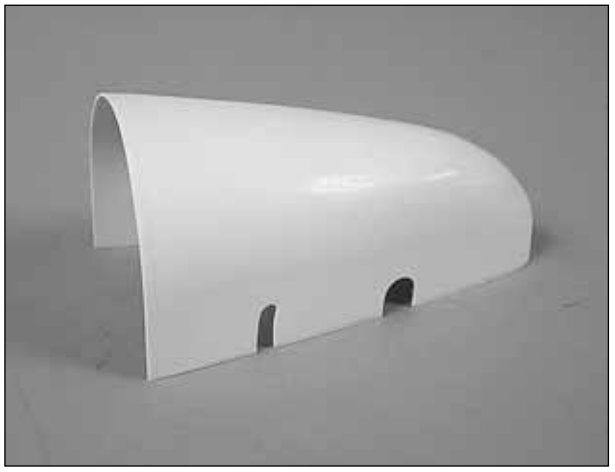
❏ 15. Once the cabin top has been securely glued to the cabin frame, loosen the mounting bolts and remove the cabin top. Make any more adjustments that may be needed for a good fit, then sand the fuselage to match the aft end of the cabin top—don't trim the front end until the cowl has been fitted and be careful not to scratch the windows. Other than the windows, it'll be okay if you scuff up the cabin top a little bit because the outside gets painted anyway and you can sand out the scratches—but do use a little care not to make too much work for yourself by deeply scratching the cabin top.

❏ 16. Reinstall the fuel tank. Cut away the section of the cabin frame below the front cabin top former to accommodate the fuel tank.

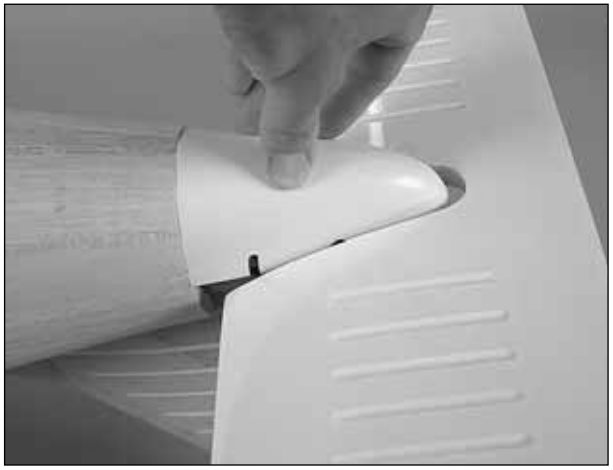
FIT THE TAIL CONE



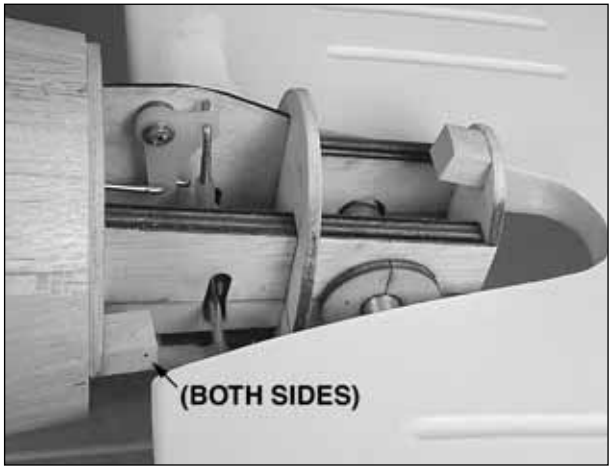
❏ 1. Test fit, but do not glue the larger part of the die-cut 1/8" [3.2mm] plywood former **10C** into position. Trim the former so there will be a 1/32" to 1/16" [.8 to 1.5mm] difference between the former and the sides of the fuselage. After the proper fit has been achieved, glue the former into position.



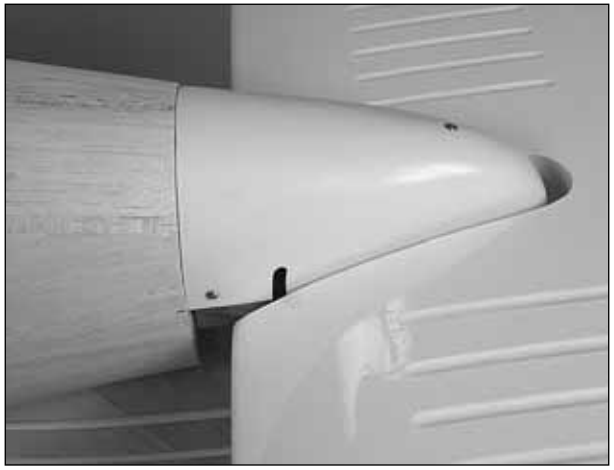
❏ 2. Use curved-tip plastic-cutting scissors to cut out the molded plastic **tail cone bottom**. Use a rotary tool with cutting bits or a hobby knife to cut out the rounded notches for the pushrod and the stabilizer tube. Remember to cut slightly outside of the cutlines to allow for trimming and positioning.



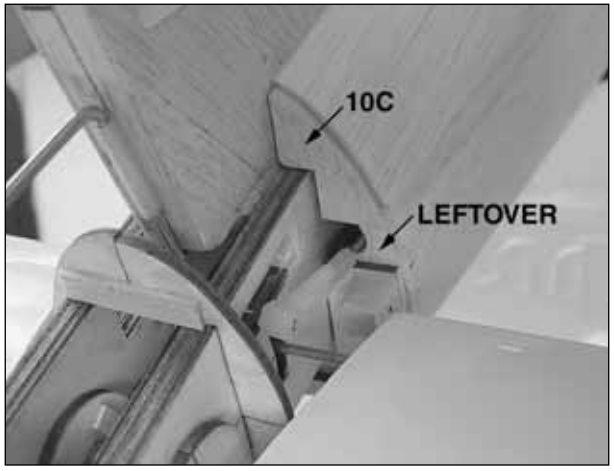
❏ 3. Test fit the tail cone bottom to the fuselage. Little by little, sand the front edge of the cone where necessary to get a good fit. **Hint:** Scuff the outside of the cone with 320-grit sandpaper, then use a lead pencil to mark the cone where necessary for trimming.



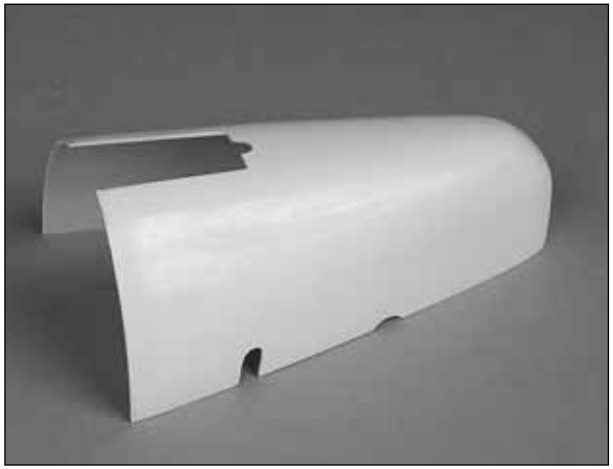
❏ 4. Cut the remainder of the 3/8" x 3/8" [9.5 x 9.5mm] basswood stick used for mounting the flap and aileron servos into six 3/8" [9.5mm] square **tail cone mounting blocks**. Sand an angle on one end of three of the blocks so that when glued into position as shown, they will match the angle of the tail cone. Glue the blocks into position where shown in the photo and on the plan.

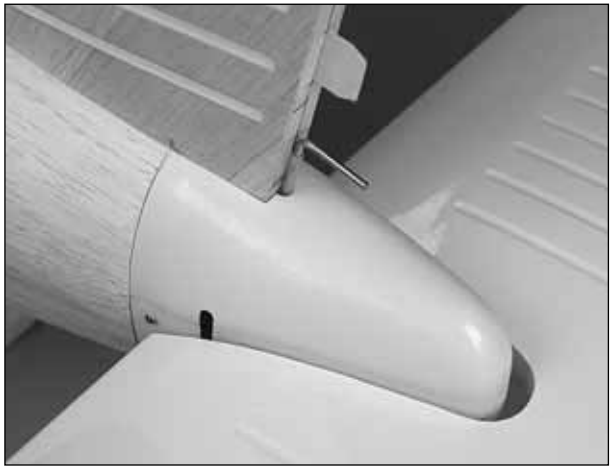


❏ 5. Reposition the bottom tail cone. Drill 1/16" [1.6mm] holes through the cone and the mounting blocks. Use a 3/32" [2.4mm] drill to enlarge the holes in the cone only, then temporarily mount the bottom cone with three #2 x 3/8" [9.5mm] button head screws.

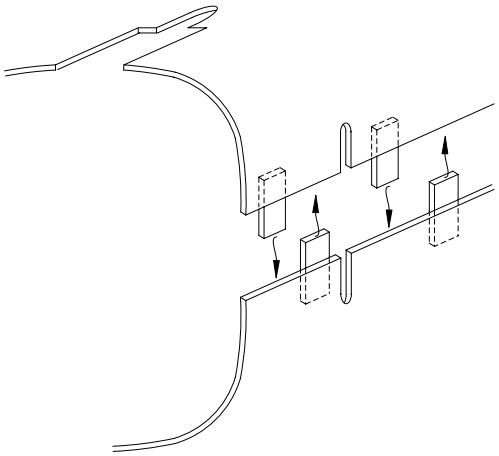


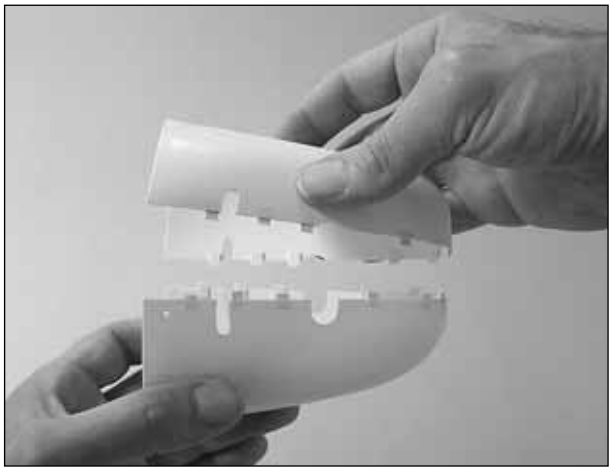
❏ 6. Glue on the other part of die-cut 1/8" [3.2mm] plywood former **10C**. Glue a piece of leftover 1/8" [3.2mm] balsa around the pushrod. Trim the piece to match the curvature of 10C.





❏ 7. Cut out the **top tail cone**. Position, fit and trim the cone as necessary for a good fit. **Note:** These instructions illustrate permanently gluing on the top tail cone. With the rudder in position the top tail cone cannot be removed. However, should you prefer to make the top tail cone removable, this could be done by mounting the cone with the remaining three mounting blocks and making the rudder removable by using removable Robart hinge pockets.





❏ 8. Cut twenty-four 3/16" x 1/4" [4.8 x 6.4mm] plastic strips from leftover ABS plastic. Glue the pieces in alternating locations on both halves of the tail cone. Be sure to position the strips where they will not interfere with the mounting blocks or any structure inside the cone. These pieces will align the seam. Test fit the top and bottom cone halves. Make adjustments where necessary.

❏ 9. Connect the rudder pushrod to the rudder servo by making an “L” bend in the pushrod and using a nylon Faslink. Make sure the rudder is centered when the servo is centered. If necessary, adjust the clevis on the rudder. Install a silicone retainer on the clevis.

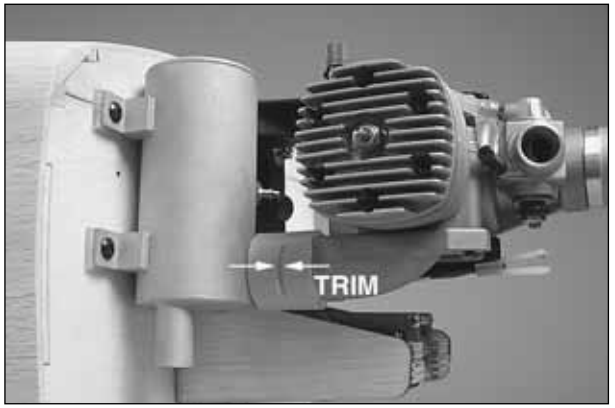
Decide whether to glue on the tail cone top now (before painting), or after it has been painted and the model has been covered. Gluing on the tail cone top now will provide a seamless transition between the fuselage and the tail cone top because the joint can be hidden with filler. If done this way, the tail cone top will have to be painted while it is on the model, requiring an airbrush and good painting skills. (A method for painting LustreKote with an airbrush is described in the "Finishing" section of this manual.) Gluing on the tail cone top after it has been painted will make it easier to paint, but it will be more difficult to achieve a perfect transition between the cone top and the fuselage. However, this is where a natural seam exists on the full-size plane anyway, so if done well, good results can also be achieved with this method.

❏ 10. If gluing on the cone before painting and covering, mount the tail cone bottom to the fuselage, then **carefully** glue on the tail cone top using thick or medium CA. Use **great care** not to inadvertently glue the top cone to the bottom cone or to glue the bottom cone to the fuselage. Use filler where necessary and sand to blend the tail cone top and bottom to the fuselage.

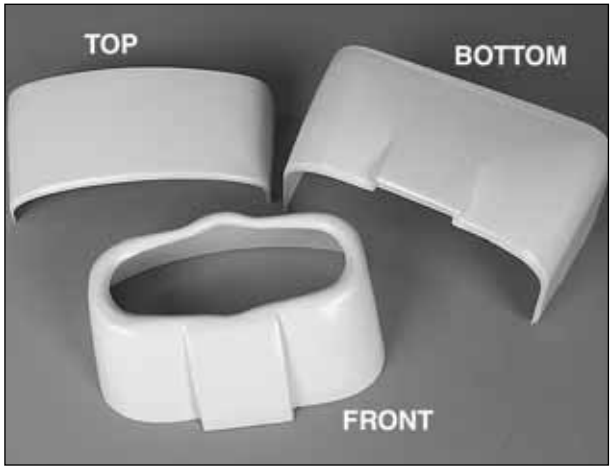
❏ 11. If not gluing on the tail cone at this time, tape one side of the tail cone to the fuselage, then blend the other side of the fuselage to match the shape of the tail cone. Shape the other side the same way.

FINAL CONSTRUCTION

MOUNT THE COWL

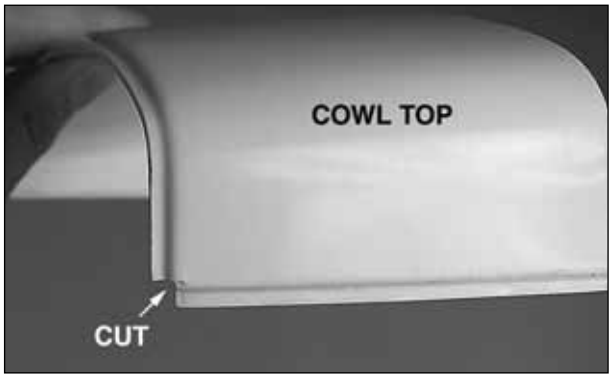


❏ 1. Mount the muffler. If using the Top Flite muffler, both the header and the tube coming from the muffler that connects to the header will have to be trimmed in order to fit in the space provided.

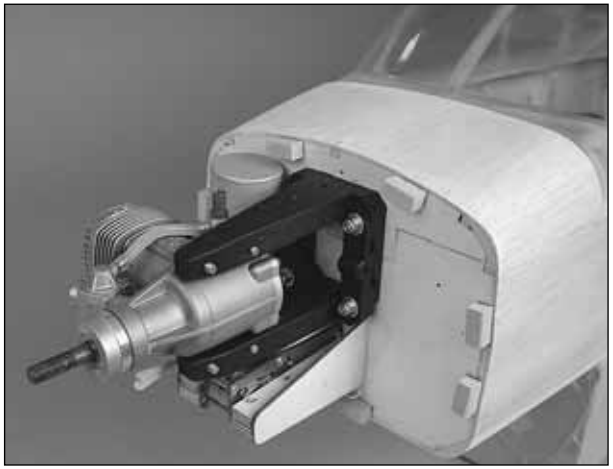


❏ 2. Note that the cowl is made of three parts—the **top**, **bottom** and **front**—that will eventually be glued together. The same as when cutting out the cabin top, use curved-tip, plastic-cutting scissors to cut out the cowl **top** and **bottom** along the molded-in cutlines, **except** along the **aft edges** where they meet the fuselage. Cut the cowl top and bottom 1/8" [3mm] outside the cutlines along the aft edges. This

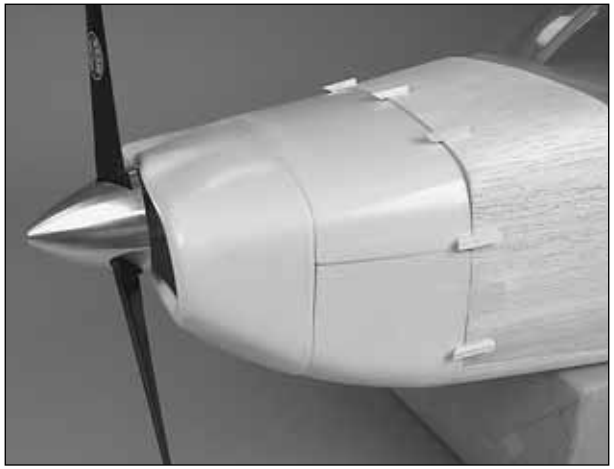
will leave material for adjusting the fit of the cowl to the fuselage. Cut the cowl **front** 1/8" [3mm] outside the molded-in cutline as well.



❏ 3. Cut out a small corner from the molded-in lip on the left side of the front of the cowl top and from the right side of the front of the cowl bottom. Use a bar sander with coarse sandpaper to true the edges of all three cowl parts. Securely tape the three pieces of the cowl together with masking tape.



❏ 4. Cut eight 3/4" [19mm] **cowl mounting blocks** from the 3/8" x 3/8" [9.5 x 9.5mm] basswood stick leftover from the tail cone mounting blocks and the servo mounts in the wing. Securely glue the cowl mounting blocks to the front of the fuselage 1/16" [1.6mm] from the outer edge to allow for the thickness of the cowl.



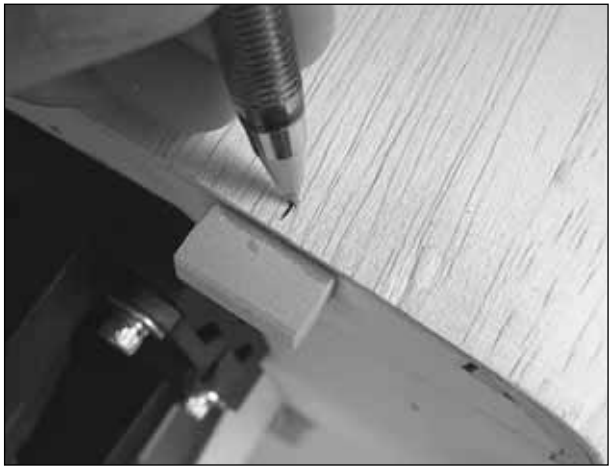
❏ 5. Position the cowl and slip the spinner over the crankshaft. Note the small balsa sticks that have been tack glued to the front of the fuselage to align the cowl. See how the cowl fits the fuselage and spinner. There are three things to look for: 1) whether or not the spinner is centered in the front of the cowl; 2) the spacing between the spinner backplate and the cowl; 3) the fit of the cowl to the fuselage. The fit should already be "pretty close," but now you have to trim and fit the cowl as necessary until you get a finished fit. Start by noting where the aft edge of the cowl needs to be trimmed so the spinner will be centered. If the spinner is off to the right side of the cowl, the cowl will need to be shifted over more toward the right. To achieve this, trim the right side of the aft edge of the cowl. Remove the cowl and trim as necessary—if much material has to be removed use curved-tip scissors, but when you start "zeroing in" on the fit use a bar sander with 80-grit sandpaper.

❏ 6. Once the front of the cowl has been centered on the spinner, it is time to trim the aft edge of the cowl front to get an even gap between the back plate of the spinner and the cowl. Use a bar sander to trim the cowl front as necessary to achieve the desired fit. Note that trimming the back of the cowl top and bottom (as done in step 4) will "steer" the cowl in the correct direction so the spinner is centered, but trimming the back of the cowl front will change the spinner gap (between the back plate of the spinner and the front of the cowl). Take your time and proceed slowly to get a good fit.

❏ 7. Once cowl alignment has been achieved, remove the cowl and separate the three pieces. Use coarse sandpaper to **thoroughly** sand the inside and outside of the cowl around the seams so glue and filler will adhere. Tape the cowl back together. Use thin and medium CA to permanently glue the parts together.

❏ 8. Remove the masking tape and refit the cowl to the fuselage. Make any final trim adjustments necessary for a good fit between the cowl and the fuselage and between the cowl and the spinner.

❏ 9. Use coarse sandpaper to thoroughly roughen the inside of the cowl along the seams between the three pieces. Use an epoxy brush to apply 30-minute epoxy all the around the seams, then lay strips of 3/4" [20mm] fiberglass cloth along the seams. Brush the epoxy through the glass cloth while brushing the glass cloth down to the plastic. Allow the epoxy to harden.

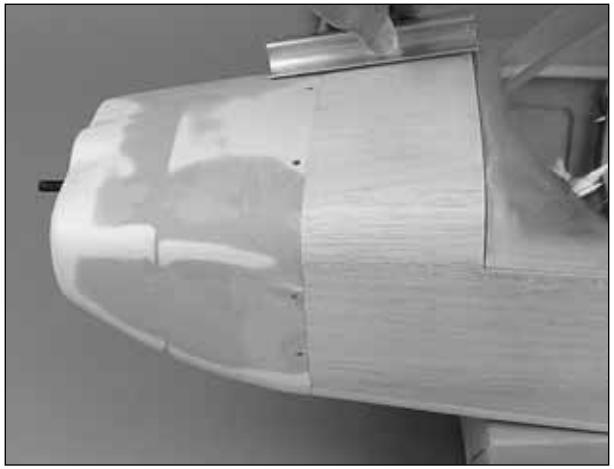


❏ 10. Mark the center of the cowl mounting blocks onto the fuselage.

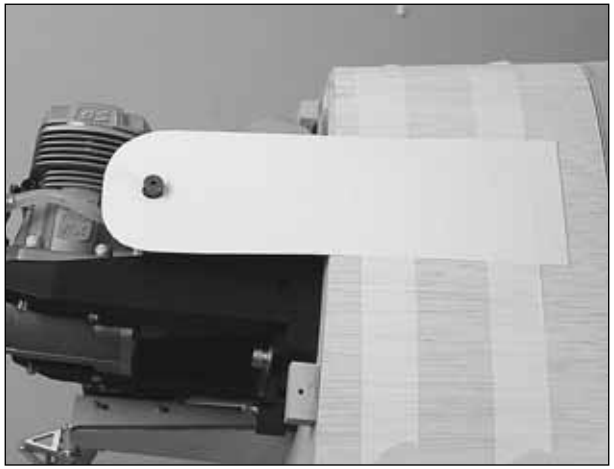
❏ 11. Tape the cowl to the fuselage. Drill 1/16" [1.6mm] holes through the cowl and into the cowl mounting blocks 1/4" [6mm] from the front edge of the fuselage.

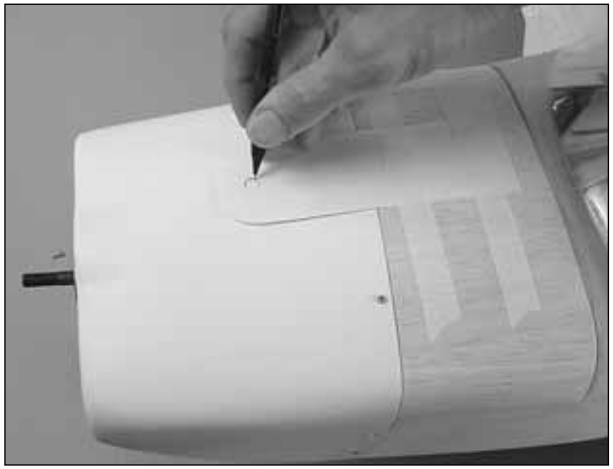
❏ 12. Remove the cowl. Enlarge the holes in the cowl only with a 3/32" [2.4mm] drill. Mount the cowl with eight #2 x 1/2" [13mm] screws. Optional: The same as was done for the aileron and flap hatches on the wing, bevel the opening of the cowl mounting screw holes and mount the cowl with #2 x 3/8" [9.5mm] flat head screws (not supplied). This makes for a neater appearance, but requires a little more skill to countersink the holes without over-enlarging them.

❏ 13. Now that the seams on the inside of the cowl have been “glassed” and the cowl has been mounted to the fuselage, it is time to smooth the outside with filler. Automotive filler such as two-part polyester Bondo is highly recommended, but don’t build up too much at once or it will take a long time and be difficult to sand. Use an expired credit card or something similar to apply filler where needed, allow to harden, wet sand, and apply more filler as needed for a smooth appearance.

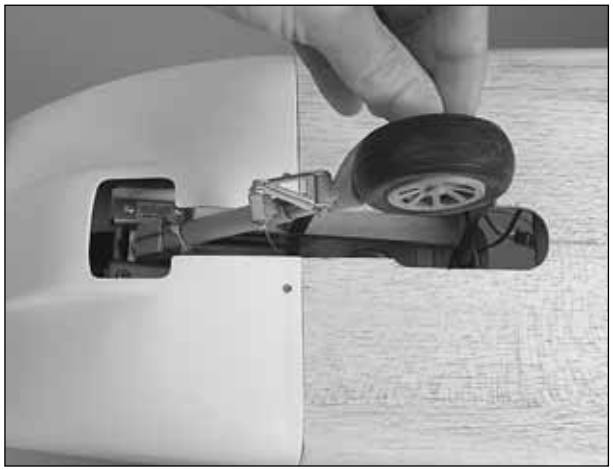


❏ 14. Mount the cowl to the fuselage and blend the two together by sanding where necessary.



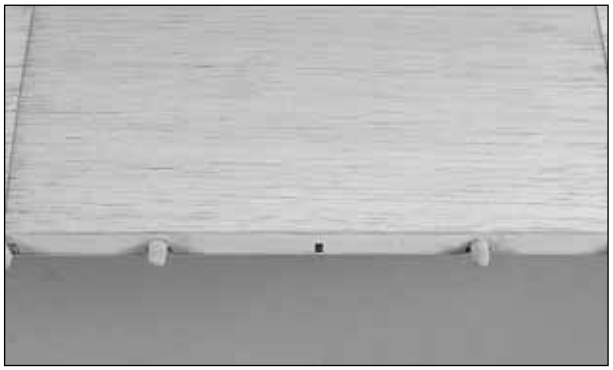


❏ 15. Apply a coat of primer to the cowl and allow to dry. Reinstall the cowl and cut all openings necessary for the glow plug, needle valve, engine exhaust, etc. One method for locating holes is to make a template from a piece of cardstock. Tape the cardstock to the fuselage, then mount the cowl. Mark the hole in the cardstock onto the cowl, then remove the cowl and cut the hole.

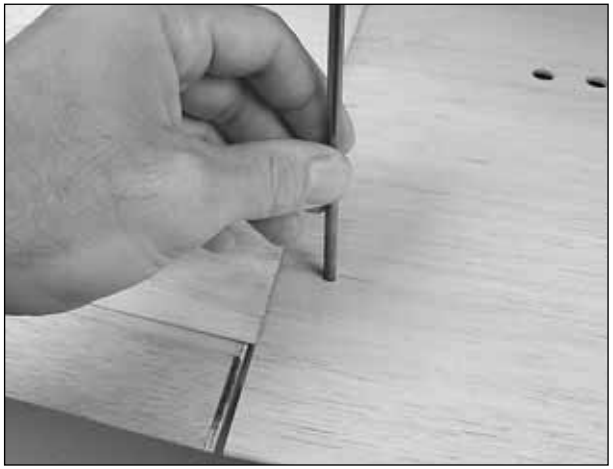


❏ 16. Cut the opening in the bottom of the cowl for the nose gear. If you’ve installed retracts, be certain there is adequate clearance to allow for right and left steering.

MOUNT THE WING

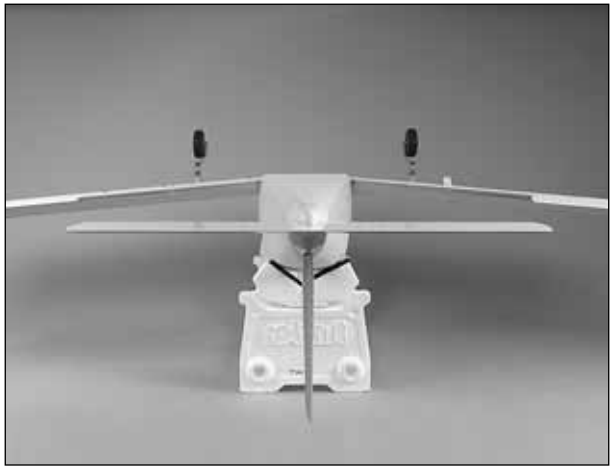


❏ 1. Round one end of both 1/4" x 2-1/4" [6.4 x 57mm] hardwood **wing dowels**. Use 30-minute epoxy to glue the dowels into the wing. Allow the epoxy to harden before fitting the wing to the fuselage.

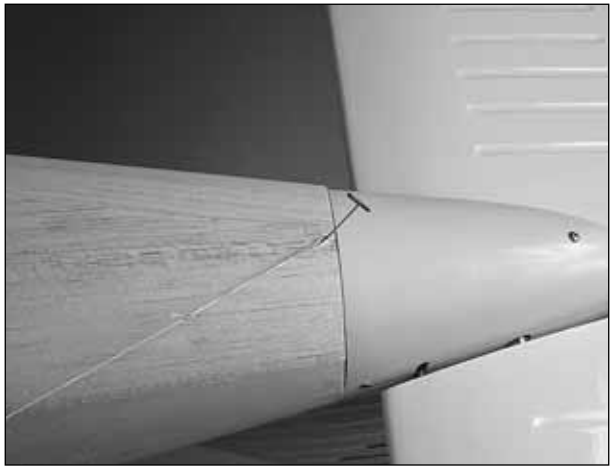


❏ 2. Using the wing bolt holes that are already in the top of the wing as a guide, use a 3/16" [4.8mm] brass tube sharpened on the end or a 3/16" [4.8mm] drill bit to the holes through the bottom sheeting.

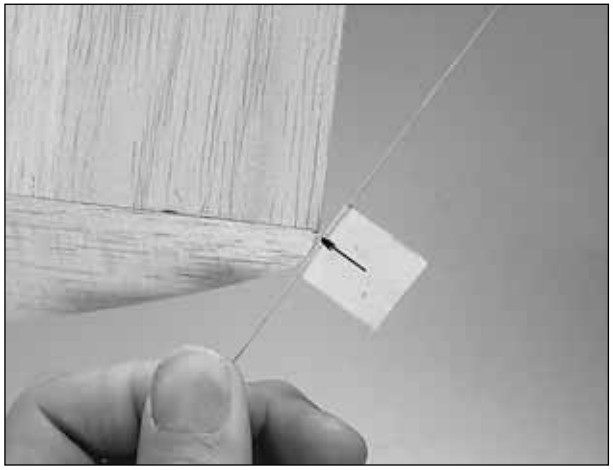
❏ 3. If you haven't done so already, use a bar sander with 80-grit or 150-grit sandpaper to sand the balsa fuselage sheeting even with the plywood fuselage doublers and former F3 to accommodate the wing. Test fit the wing in the fuselage and make any adjustments necessary for a nice fit.



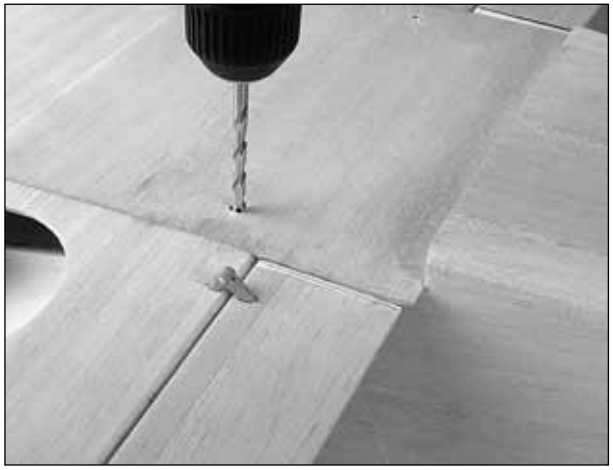
❏ 4. With the wing in the fuselage, stand six to ten feet behind the model. View the alignment between the wing and the stabilizer. If the two are in alignment proceed to the next step. If the wing and stab do not align, remove the wing and carefully sand the "high side" of the wing saddle in the fuselage to bring the wing into alignment with the stabilizer.



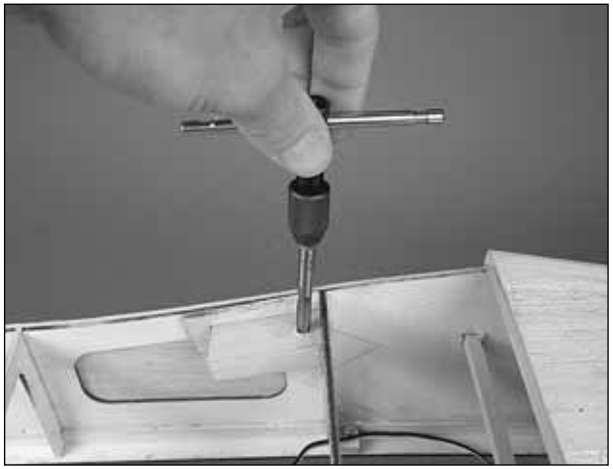
❏ 5. Stick a T-pin into the bottom of the fuselage centered over the bottom stringer at the rear. Tie a loop in one end of a 60" [1.5m] piece of non-elastic line such as monofilament or Kevlar line. K & S #801 Kevlar thread works perfectly for this. Slip the loop in the string over the T-pin.



❏ 6. Fold a piece of masking tape over the string near the other end 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 other end of the wing and hold it in the same position. Rotate the wing as necessary and slide the tape along the string until both ends are equalized. Now the wing is centered.



❏ 7. Being careful not to disturb the wing alignment, drill #7 holes through the wing and the wing bolt blocks in the fuselage.



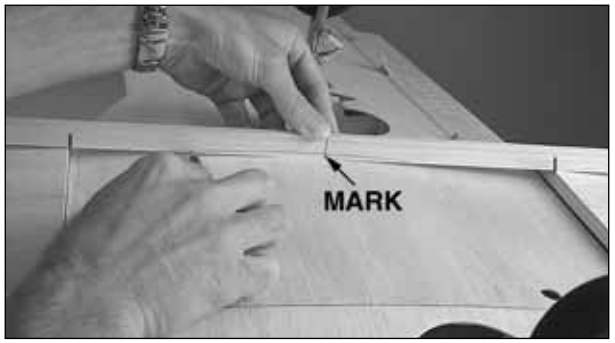
❏ 8. Remove the wing. Tap 1/4-20 holes into the holes drilled in the wing bolt blocks. Add a few drops of thin CA to the threads, allow to fully harden, then retap the threads.

❏ 9. Enlarge the bolt holes in the wing with a 17/64" [6.7mm] drill, then bolt the wing to the fuselage with two 1/4-20 x 2" [50mm] nylon wing bolts. Cut holes in the bottom sheeting to accommodate the heads of the bolts.

❏ 10. Test fit the wing to the fuselage and bolt it down with two 1/4-20 x 2" [50mm] nylon bolts. See how it looks and make any adjustments where necessary.

BUILD THE BELLY PAN

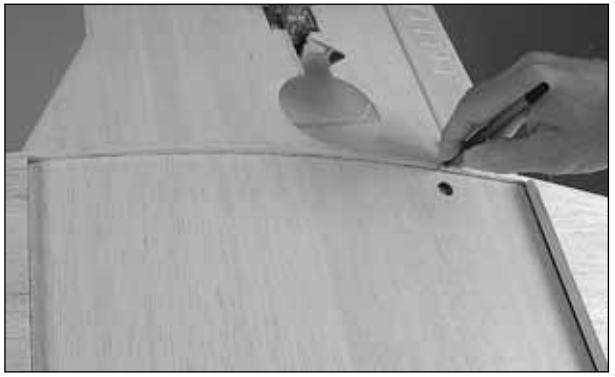
❏ 1. Cut a 20" [510mm] **belly pan side** from a 1/4" x 3/4" x 30" [6.4 x 19 x 760mm] balsa stick. Make another belly pan side the same way. Save both 10" pieces for the front and back.



❏ 2. Mark the middle of one of the belly pan sides. Place it on the bottom of the fuselage aligning the line with the glue joint in the middle of the bottom sheeting. Lay a ballpoint pen on the bottom of the wing and mark the curvature of the wing onto the belly pan side. Also mark the stick at the front and back of the wing saddle in the fuselage.

❏ 3. Cut the belly pan side at the marks on both ends, then cut it on the curvature line you marked. Reposition the belly pan side and mark another curvature line, then cut again. Once more, mark, then cut. Now the belly pan side should fit the wing well. Trim where necessary for a good fit.

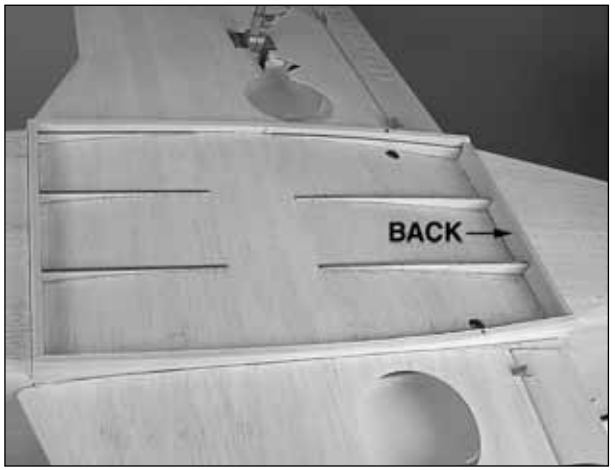
❏ 4. Make the other belly pan side the same way.



❏ 5. Pin a leftover 3/16" x 3/16" [4.8 x 4.8mm] balsa stick along one side of the fuselage under the wing. This will reveal the location of the belly pan side making a smooth transition between the front and the back of the wing saddle. Use a ballpoint pen to draw the location of the belly pan side along the balsa stick. Mark the other side of the bottom of the wing the same way.

❏ 6. Glue the belly pan sides to the bottom of the wing along the lines.

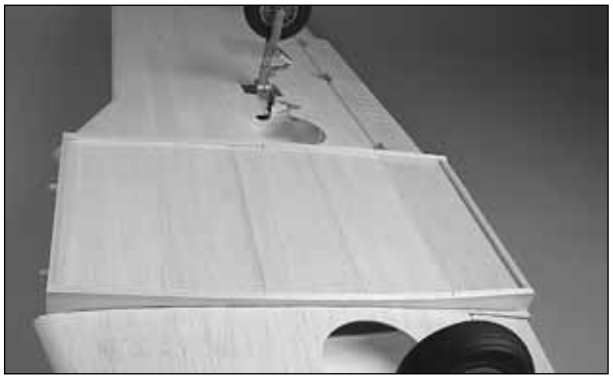
Refer to this photo for the following three steps.



❏ 7. Use the remaining two 1/4" x 3/4" x 10" [6.4 x 19 x 250mm] balsa sticks to make the front and back of the belly pan. Glue the sticks into position.
Hint: Use thin cardstock to shim the front and back of the belly pan away from the fuselage.

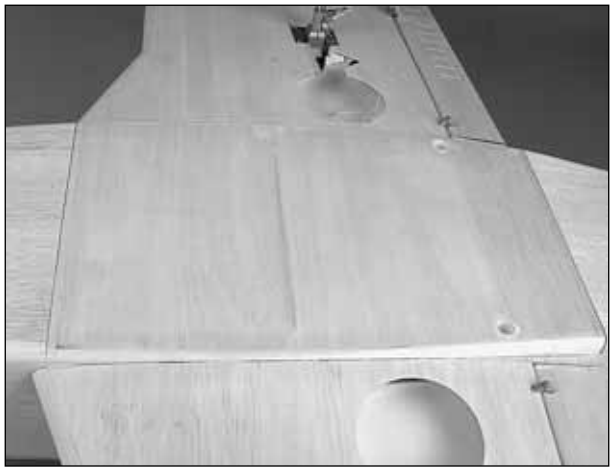
❏ 8. Glue the eight die-cut 3/32" [2.4mm] balsa belly pan ribs into position as shown. The outer ribs fit against the belly pan sides.

❏ 9. Mark the location of the wing bolts on the belly pan sides. Remove the wing from the fuselage.



❏ 10. Sheet the belly pan between the belly pan sides using three 3/32"x 3"x 24"[2.4 x 75 x 610mm] balsa sheets.

❏ 11. Using the marks you made on the belly pan sides as an alignment cue, cut holes in the sheeting for the cardboard **wing bolt tubes**. Cut two 1"[25mm] **wing bolt tubes** from the 9/16"[14mm] cardboard tube. With the wing bolts in position, use epoxy mixed with microballoons to glue the tubes into the wing. While the epoxy is hardening twist the wing bolts occasionally so any epoxy that may have gotten onto the heads of the bolts will not take a set and glue them in.



❏ 12. After the epoxy has hardened, trim, then sand the belly pan sides, front and rear and the wing bolt tubes even with the belly pan sheeting. Bolt the wing to the fuselage, then round the corners of the belly pan to match the fuselage.

FINISH THE MODEL

At this time all of the woodwork, plastic fitting and most of the systems installation should be complete, so now it's time to prepare the model for covering and painting. Some modelers have their own preferences as to covering/finishing materials and the order in which it is all done. The model on the kit box cover was finished using the following methods. Follow these techniques or use your own proven methods to finish your Piper Arrow.

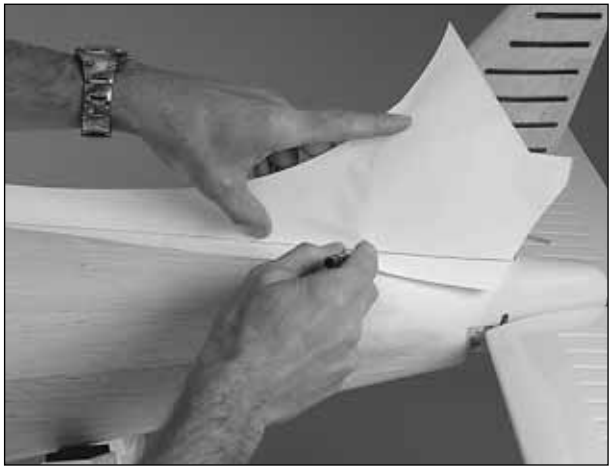
COVERING

❏ 1. Fill low spots, cracks or nicks with balsa filler. Many small dents in balsa can be repaired without filler. Use a small dab of water to wet the area and allow to dry before sanding. Often this is enough to make the balsa expand thus removing the dent.

❏ 2. Remove any hardware that will interfere with final sanding, painting or covering such as the landing gear, engine, etc. Use progressively finer grades of sandpaper to finish-sand the model. Ending with 400-grit should be adequate. Use a bar sander or sanding blocks where necessary to make you don't over-sand soft balsa around hard glue joints.

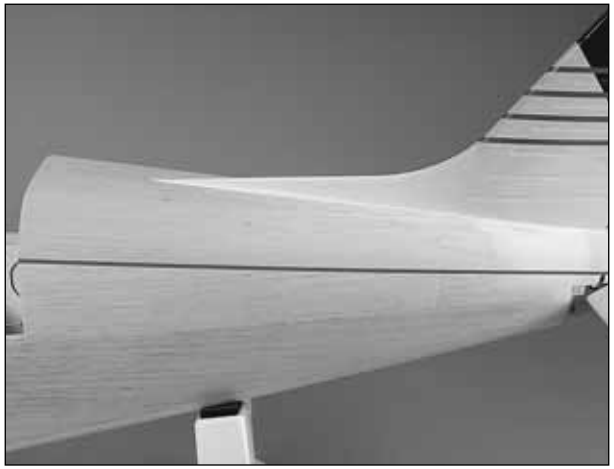
❏ 3. After final-sanding, use a shop-vac with a brush attachment, a large paint brush, compressed air or a tack cloth to remove all the balsa dust.

Covering can be quite an undertaking, but following are some techniques that may assist you.

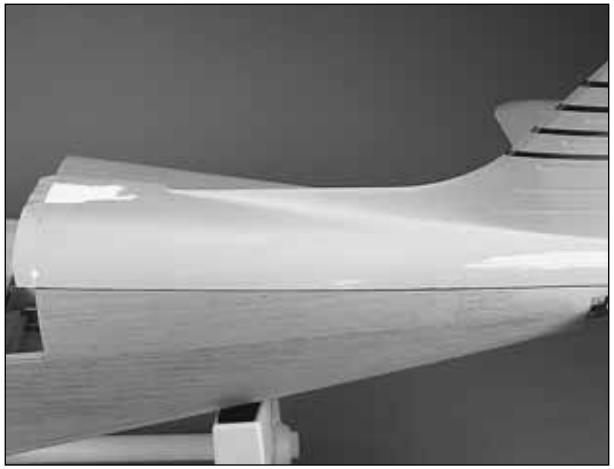


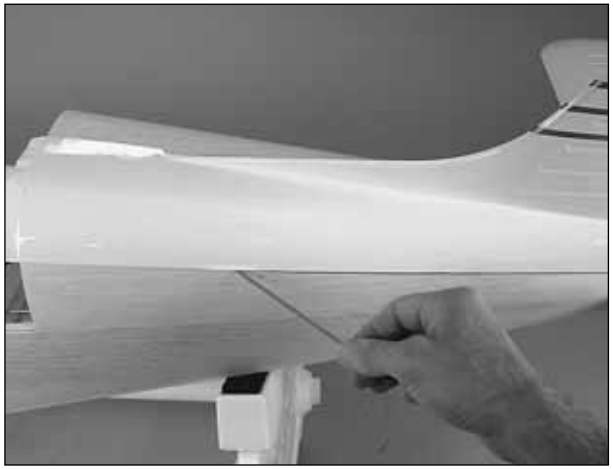
❏ 4. Begin with the fin. Cut a piece of covering to the approximate shape, but make sure it is at least two or three inches oversize all the way around (except at the top, where it should align with your trim line (if you are duplicating the trim scheme on the kit box cover). Holding the piece of covering to the fin, use a ballpoint pen to mark the covering where the fin meets the fuselage.

❏ 5. Cut the covering 3/32"[2.4mm] outside the line. Wipe off the ink with a paper towel square dampened with denatured alcohol. Reposition the covering on the fin, and iron into position. Notice how approximately 1/8"[3.2mm] of the bottom of the covering is ironed onto the fuselage.

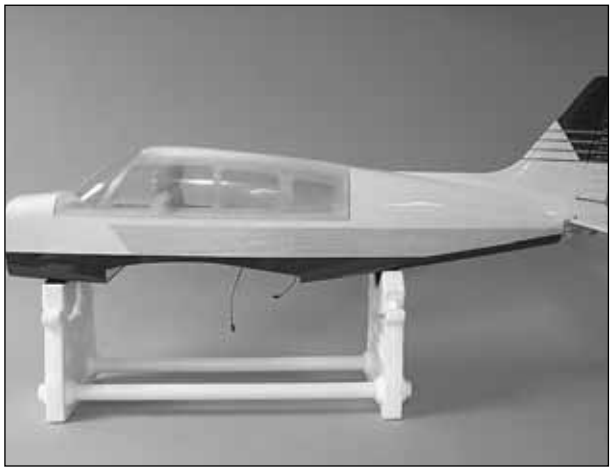


❏ 6. When ready to cover the fuselage, note that seams are preferred over wrinkles. In other words, do not attempt to cover the whole side of the fuselage in one piece. Instead, study the model, consider your skills and limitations and figure out how many pieces it will take you to cover any particular part without getting any wrinkles. In the case of this fuselage and the trim scheme chosen, it was decided to cover the fuselage as shown. One method for making straight seams is to apply a strip of 1/8"[3mm] paint masking tape where you want a seam to be.





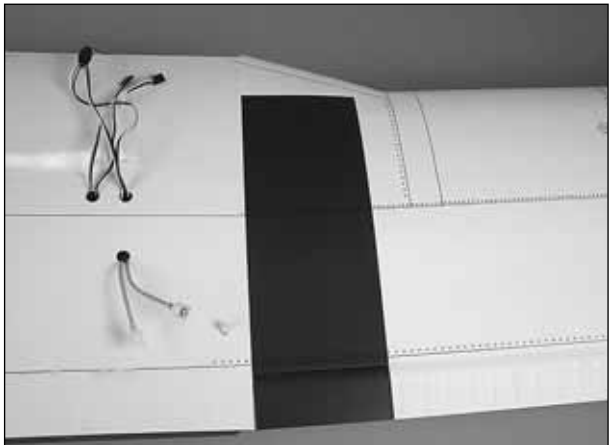
❏ 7. Apply the covering over the tape, then cut the covering on top of it. You'll be able to see the tape underneath the covering. Peel off the tape and covering remnant, then iron the covering the rest of the way down.



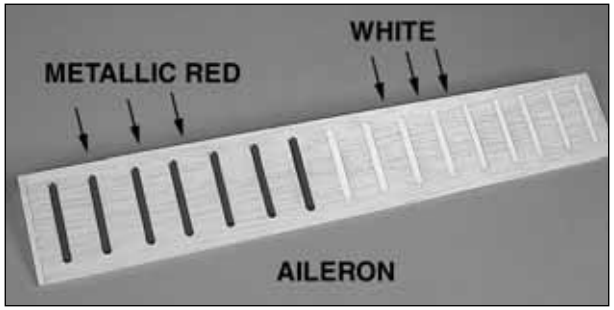
❏ 8. Lay another strip of tape over the edge of the covering already ironed down. Iron down the the next piece of covering, cut, then peel off the tape. Now you'll have a straight seam.

❏ 9. Finish covering the rest of the fuselage.

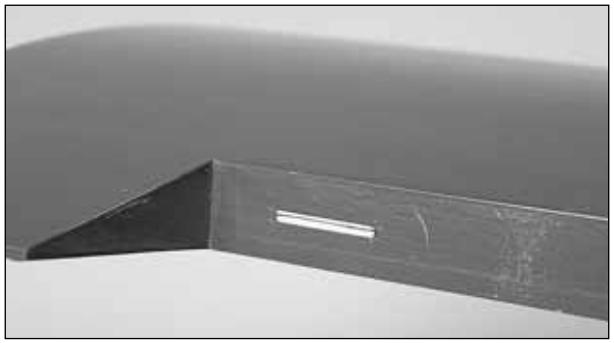
❏ 10. When covering the wings, start with the wing tips, then cover belly pan. First cover the front and back of the belly pan, then apply a 1/4"[6mm] strip of covering as shown. Now cover the bottom of the wing, the belly pan and then the top of the wing to match the trim scheme you have selected.



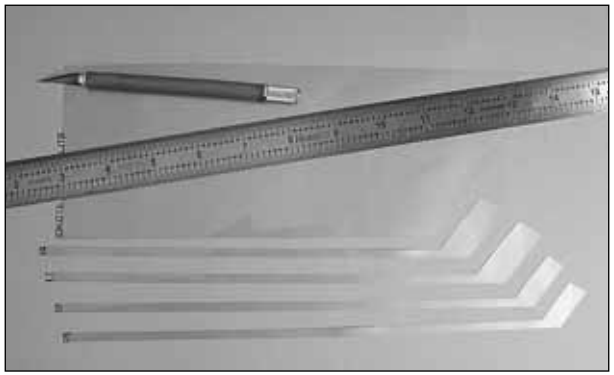
❏ 11. Flat black MonoKote may be used to simulate the walkway on the right wing and flap.



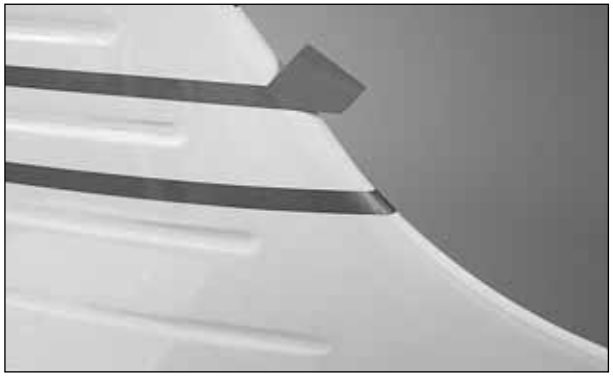
❏ 12. When covering the ailerons, flaps and rudder, don't forget to cover the corrugations to match your trim scheme.



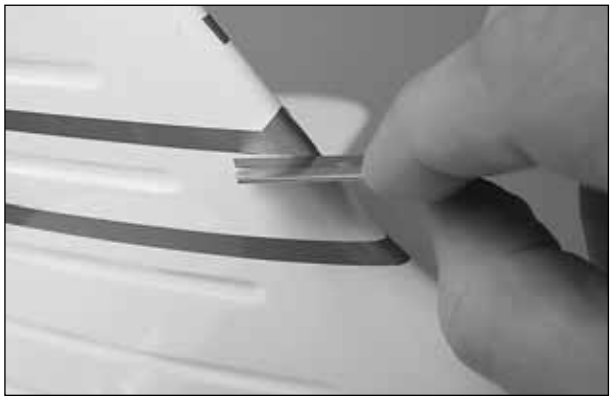
❏ 13. Cut a narrow strip of covering from all of the CA hinge slots in the wing and ailerons and in the fin and rudder. Without using any glue, temporarily join the ailerons to the wing, then add the gold striping.



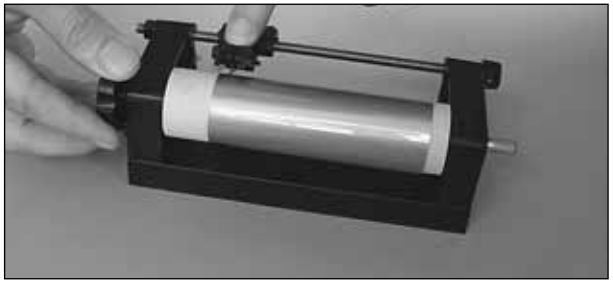
❏ 14. If applying the gold stripes to the fin like the model on the kit box, first cut the stripes as shown. Cut them over a cutting mat if you have one.



❏ 15. Apply the stripes to the fin so the excess material wraps around the leading edge.



❏ 16. Use a sharp, single-edge razor blade to cut the covering around the leading edge.



❏ 17. Determine how the gold stripes on the fuselage will be done. The recommended way is to use a Top Flite SmartStripe stripe cutting tool to cut 1/4"[6.4mm] stripes from gold MonoKote and iron them into position. It may be helpful to have the "N-numbers" already in position before applying the gold stripes. Refer to "Apply the Decals" on page 67 for suggestions on how to apply them. When it's time to add the stripes to the cowl use Great Planes 1/4"[6.4mm] gold striping tape.

PAINTING

Now that the model has been covered, it's time to paint the cowl, cabin top and tail cone to match.

HOT TIP

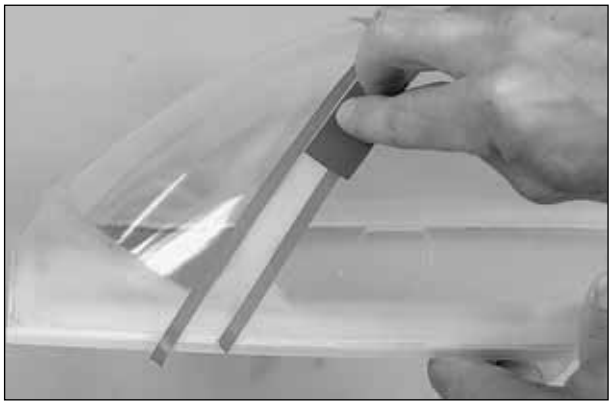
HOW TO PAINT LUSTREKOTE WITH AN AIRBRUSH

MonoKote-matching Top Flite LustreKote paint is recommended for painting the plastic parts. However, when painting smaller parts (such as the tail cone), better results can be achieved by applying LustreKote with an airbrush. An airbrush atomizes the paint better for finer coverage. However, LustreKote is available only in a spray can. To prepare LustreKote for airbrush application, spray the desired color through a tube into a cup. Spraying through a tube will contain the overspray thus allowing the paint to drip into a cup. Allow LustreKote to stabilize for approximately a half-hour stirring a few times in between. Now the LustreKote may be poured into your airbrush container. If thinning is desired, we have had great success using Midwest Aero Gloss fuelproof dope thinner. This is also a suitable solvent for cleaning up your airbrush when finished.

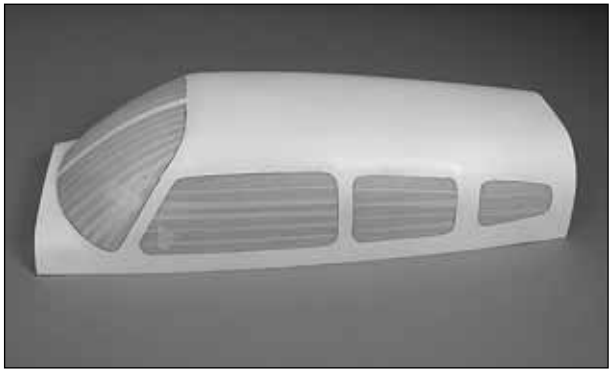
❏ 1. Paint the tail cone—a coat of primer is recommended. Using an airbrush here will provide the best results. Mask off the rest of the model with Kyosho (or similar) masking film (KYOR1040). Kyosho masking film has a "low-tack" tape already attached to the film and greatly simplifies the masking procedure.

❏ 2. If necessary, wet-sand the tail cone and apply a second coat of paint.

❏ 3. Paint the cowl. If necessary apply additional coats of primer, wet sanding between coats. First paint the white, then the metallic red. Do not sand the final coat of metallic red. Apply the gold striping to match the fuselage, then spray on a clear coat to "melt" it all together.



❏ 4. Thoroughly scuff the cabin top with 400-grit sandpaper to remove any deep scratches leftover from sanding the fuselage and to provide a surface to which the paint will adhere. Apply strips of tape where necessary to protect the windows.



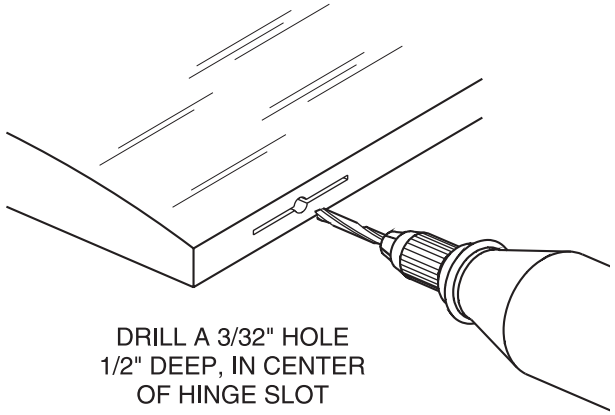
❏ 5. After sanding the cabin top, apply strips of masking tape over the windows. Using the molded-in window frames as a guide, use a soft, lead pencil to mark the window outlines onto the tape. Use a sharp #11 blade to cut on the lines, then peel away the excess tape leaving the windows masked off. Apply a coat of primer. Remove the masking tape, wet sand the primer, then re mask the windows. Now apply the color coat. With a little luck and skill all that will be required will be two coats—one primer coat and one color coat. **IMPORTANT:** You can learn from our mistake! Even though you are painting the outside of the cabin top, **BE CERTAIN** to mask off the inside as well. Any overspray that gets on the inside of the windows will have to be removed. We haven't discovered a solvent that will remove LustreKote without affecting the plastic as well.

❏ 6. If you want to go all-out, you can do the same as we did on the model on the kit box cover and paint the landing gear too. Disassemble the gear, then use denatured alcohol to wipe away any grease or oil. Lightly sand the parts as best you can with 400-grit sandpaper. Any extra mold flashing will have to be trimmed off the wheel covers on Robart wheels. Use an airbrush to spray the landing gear parts. Allow to dry thoroughly before reassembling.

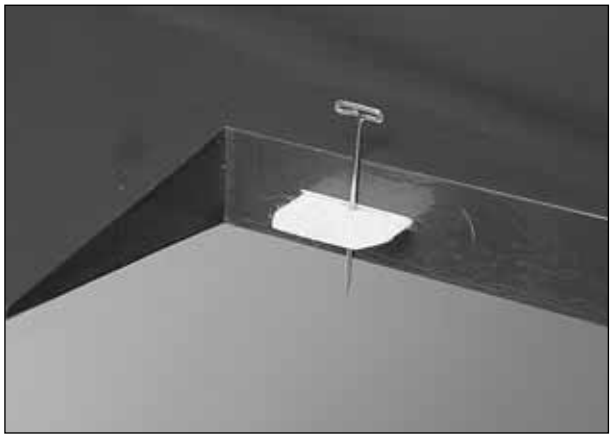
❏ 7. If you haven't yet done so, coat the firewall and the nose gear structure with 30-minute epoxy thinned with alcohol or fuelproof paint. Also coat the underside of the top wing sheeting in the flap area (if you've built working flaps).

FINAL ASSEMBLY AND SYSTEMS HOOKUP

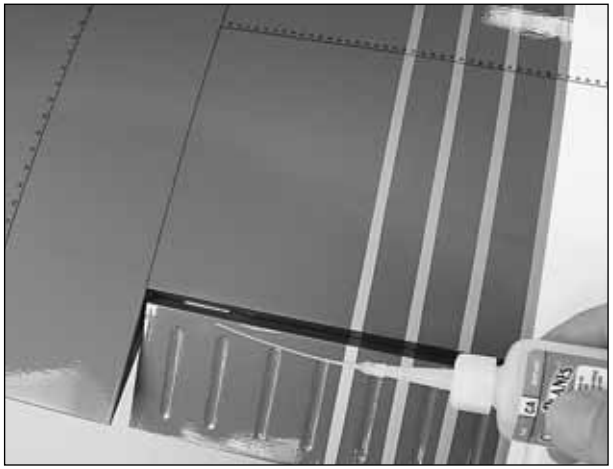
We're finally getting down to the "home stretch" and pretty soon your Arrow will be ready to take to the air!



❏ 1. If you didn't use a Great Planes Slot Machine to cut the hinge slots, drill 3/32"[2.4mm] holes, 1/2"[13mm] deep, through the middle of all the hinge slots to allow the CA to wick all the way to the back of the hinge. Drilling holes is not necessary if the hinge slots were cut with a Slot Machine.



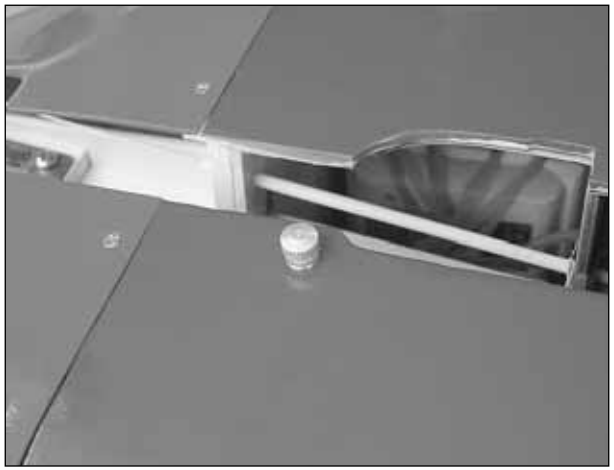
❏ 2. Fit the ailerons to the wing with the CA hinges. If any of the hinges don't remain centered, stick a T-pin through the middle of the hinges, then join the ailerons and remove the T-pins.



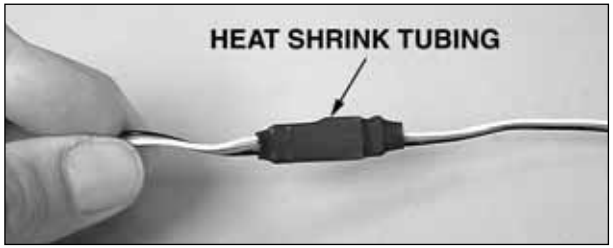
❏ 3. Adjust the ailerons so there is a small gap between the leading edge of the ailerons and the wing—just enough to see light through or to slip a piece of paper through. Apply six drops of thin CA to both sides of all the hinges. Wait a few seconds before each drop to make sure it soaks in and does not run into the hinge gap. Any CA that does spill into the gap should quickly be absorbed with a small paper towel square. Hardened CA can be picked away with a #11 blade or removed with CA debonder.

❏ 4. Join the rudder to the fin the same way, but first coat the "arm" portion of the rudder torque rod and fill the hole in the rudder with 30-minute epoxy. Join the rudder to the fin and the torque rod with the hinges, wipe away excess epoxy, then permanently glue in the hinges.

❏ 5. Use 30-minute epoxy to securely glue the flap hinges in the wing and flaps. Make sure the trailing edges of the flaps are aligned with the ailerons and the wing at the center section. Use tape to hold the flaps in position until the epoxy hardens.



❏ 6. Reinstall the engine and muffler. If you have not done so already, connect the fuel lines from the fuel tank to the engine. Rather than using a fuel filler valve, a third filling line was connected to the tank. The line was guided through a 1/4"[6.4mm] O.D. brass tube glued through the bottom of the fuselage and closed off with a Great Planes fuel line plug (GPMQ4166). With the fuel line plug inserted, the line will stay in place when pushed up into the brass tube.

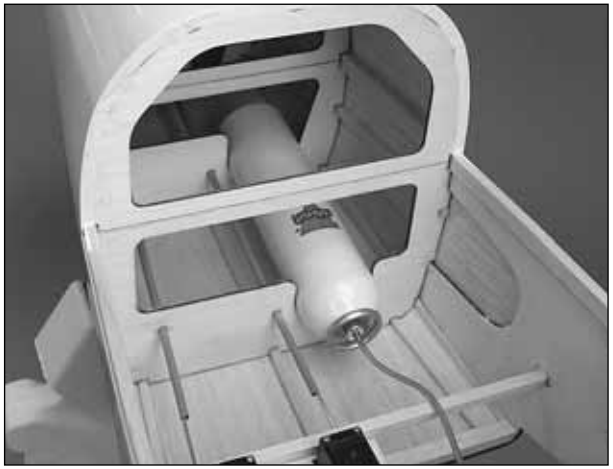


❏ 7. The easiest way to operate the aileron servos is to connect both servos to the same socket in the receiver using a Y-connector. To do it this way, connect each aileron servo to a Hobbico 24"[610mm] extension wire. Secure the connections with heat shrink tubing, tape or clips suitable for that purpose. Guide the wires through the wing and out the hole in the top of the center section. Now connect both aileron servo wires to a Futaba dual servo extension cord. Mount the aileron hatches to the wing and hook up the ailerons with the pushrods you made earlier during construction.

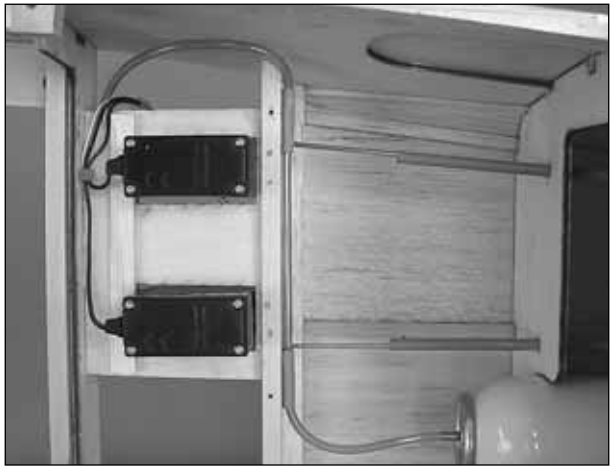
❏ 8. The flaps may be connected using a Y-harness, or, if you have a computer radio capable of doing so, the flaps may be mixed electronically (but this shouldn't be necessary). To mix the flaps with a Y-harness, it's easiest to get one flap set up first, then get the other one to match. This will require connecting the flap servos to the receiver so they can be operated by the transmitter. First position the servo arm on the servo, then make the pushrod and cut it to the correct length. Now adjust the endpoints so the correct flap throw can be achieved. Set up the other flap to match the first.

❏ 9. Now that the servos have been installed in the wing, guide the air lines for the retracts through the wing, then connect the lines to the retracts. Whichever way you connect the colored lines, hook them up the same on both landing gears. Mount the landing gear in the wing.

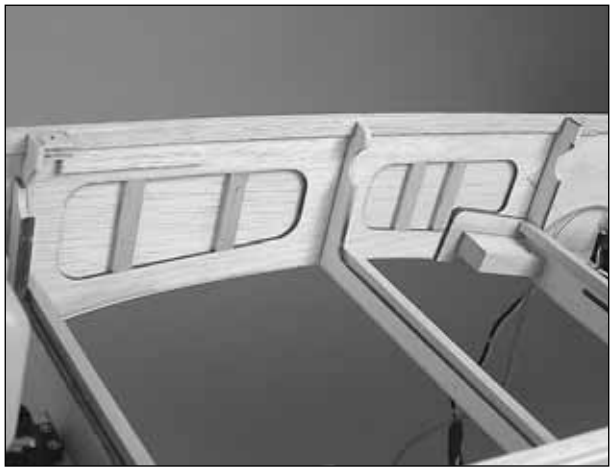
❏ 10. Glue strips of plastic or balsa across the openings in the wing to retain the air lines and the servo wires so they will not interfere with the landing gear.



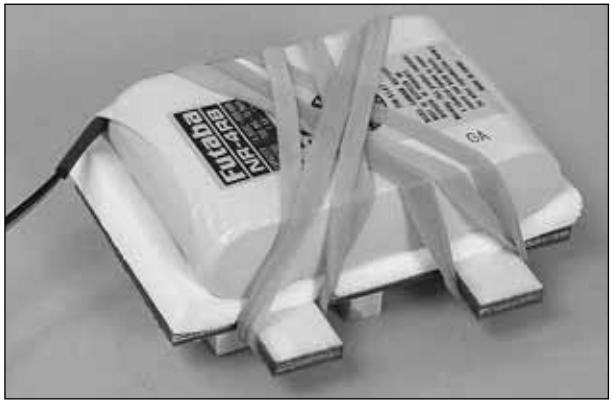
❏ 11. Mount the air tank in the fuselage. Use RTV silicone or epoxy to glue it in place.

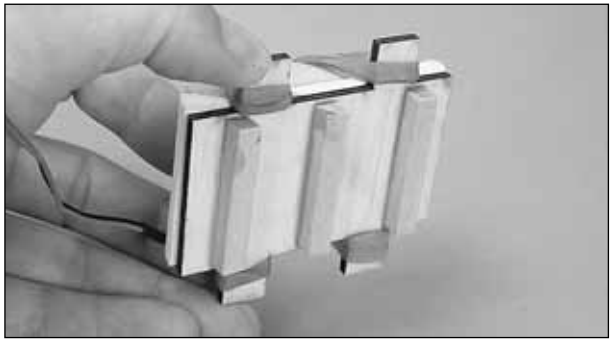


❏ 12. Glue pieces of leftover pushrod guide tubing to the back of the servo rail, then guide the air line coming from the air tank through the tubes.

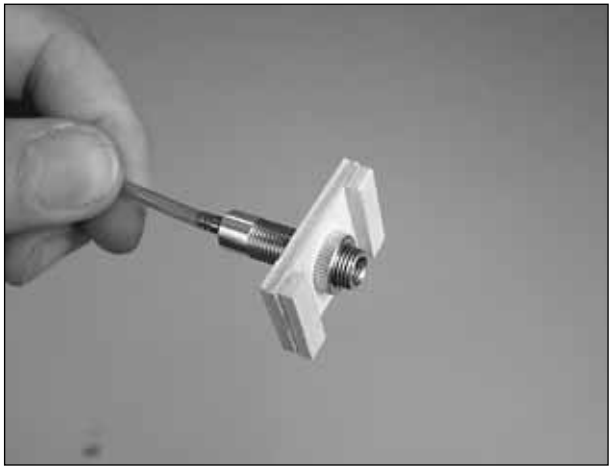


❏ 13. Cut rounded notches near the top of the formers as shown. These will accommodate the air line from the tank and the rudder and stabilizer servo wires when the cockpit kit has been installed.

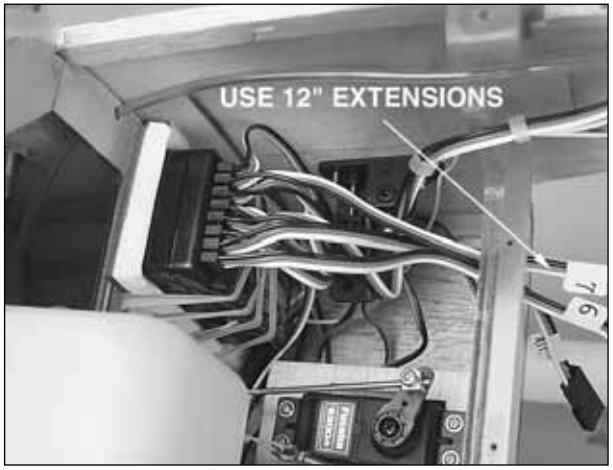




❏ 14. Make a battery mounting plate from leftover plywood, then glue hardwood sticks across the bottom. Mount the receiver battery to the plate using rubber bands with R/C foam rubber in between. Securely glue the battery inside the fuselage where shown on the plan, or in another strategic location.

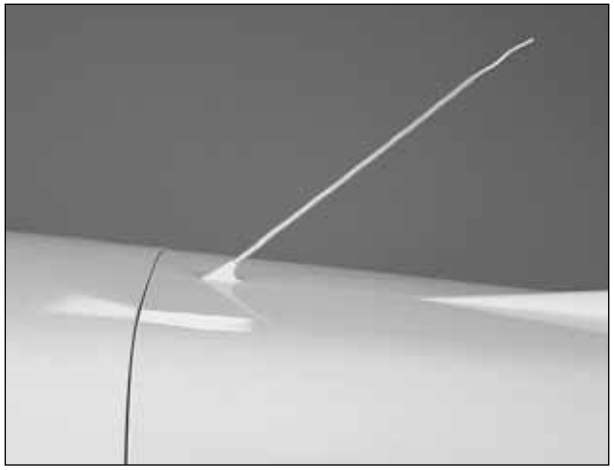


❏ 15. Make a mount for the air fill receptacle. Use a 5/16"[8mm] brass tube to cut a hole through the fuselage for the valve, then glue the mount to the inside of the fuselage with the fill receptacle in the hole.



❏ 16. The same as was done for the battery, make a mounting plate for the receiver. Mount the receiver, then glue the mount into position.

Note: The three 6"[150mm] servo extensions coming from the receiver protruding through former F3 should actually be 12"[300mm] servo extensions. Label strips of masking tape wrapped around the servo extensions for identification.



❏ 17. The receiver antenna may be routed down through the fuselage through small holes drilled in the formers, or mounted externally. The way we mounted ours was via an Ernst #153 Antenna Exit Guide. Rather than using the hook included with the antenna, the hole in the mount was enlarged to accommodate a small piece of tubing (taken from a compressed air spray can). The antenna was guided up through the tubing. This also presents a somewhat scale appearance.

❏ 18. Connect the air lines to the nose gear, then mount the gear.

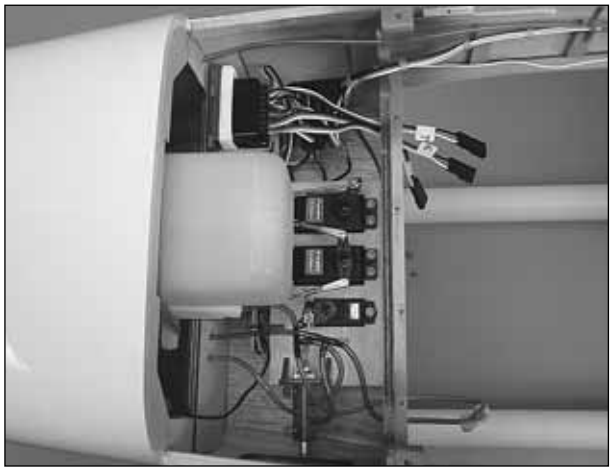
❏ 19. Use a 1/8"[3.2mm] drill or a 1/8"[3.2mm] brass tube sharpened on one end to cut holes where necessary to guide all of the air lines to the control valve. The two “up” lines in the wing are joined to a Robart T-fitting. The remaining, open fitting on the “T” is connected to a few inches of line with a Robart quick-disconnect on the end. The “down” lines in the wing are treated the same way. In the fuselage, the up line coming from the nose gear is connected to another T-fitting. One of the open ends of the T-fitting is connected to another segment of line with another quick-disconnect which, when joining the wing to the fuselage at the flying field, will be connected to the quick-disconnect coming from the up line in the wing. The remaining end of the T-fitting is connected to the control valve via another piece of air line. Connect the other nose gear down line to another quick-disconnect and the control valve via another T-fitting the same way.

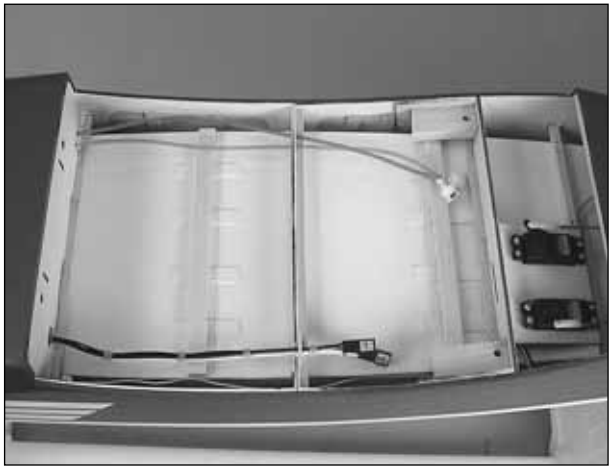
❏ 20. Connect the fill receptacle to the line coming from the air tank and to the air valve via one more T-fitting. Be certain all of the lines are securely connected and that none of the air lines will interfere with any of the other systems.

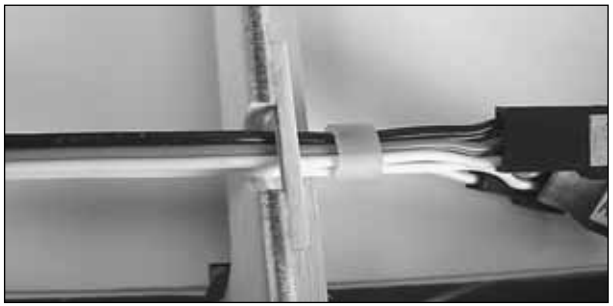
❏ 21. Connect the rudder and stabilizer servos to 12"[305mm] servo extensions. Secure the connections with heat shrink tubing, tape or special clips suitable for that purpose. Connect the servos to the receiver.

❏ 22. Hook up the nose steering servo, the throttle servo and the air control valve servo using the hardware shown.

Here is an overall shot of the radio installation and servo hookup in this area.

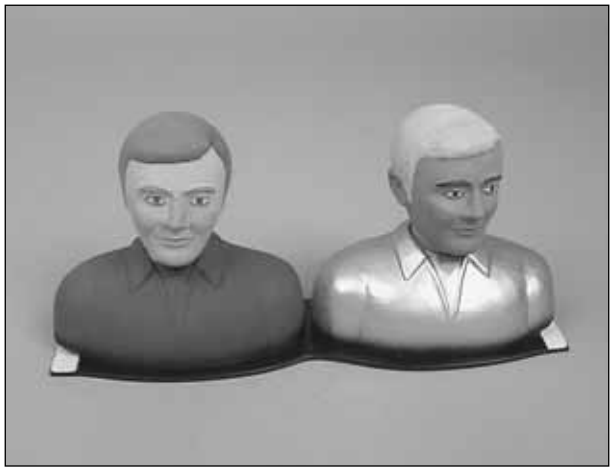




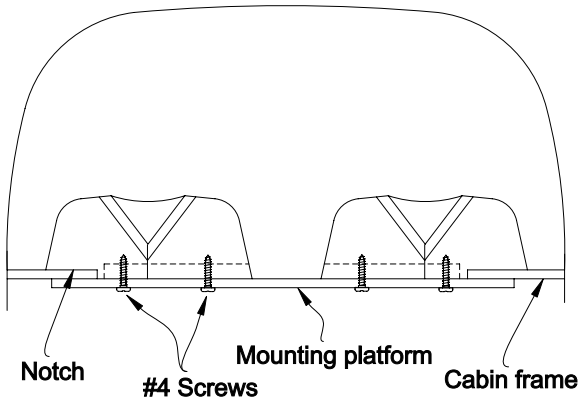


❏ 23. If you have not done so already, assemble, paint and install the cockpit kit according to the instructions included with it. Guide and secure the aileron and flap servo extensions under the cockpit floor.

MOUNT THE PILOTS



Two Williams Brother's #62600 Sportsman 3"(1/4-scale) pilots (WBRQ2626) were mounted in this model. Even though the model is slightly smaller than quarter-scale, these pilots look best.



❏ 1. Make a mounting platform from leftover 3/32"hard balsa. The platform fits between the fuselage side stringers and will be glued to the bottom of the cabin frame. Paint the platform flat black. Note that the sides have been masked from the paint to expose the wood for a better glue joint to the bottom of the cabin frame.

❏ 2. Cut a notch in the outer shoulder of both pilots to accommodate the cabin frame.

❏ 3. Shape, then glue sheets of leftover 1/8"[3.2mm] plywood inside the base of both pilots.

❏ 4. Glue the mounting platform to the bottom of the cabin frame. Be certain the platform will fit between the fuselage side stringers when the cabin top is on the fuselage.

❏ 5. Place one of the pilots on the platform. Drill two 3/32"[2.4mm] holes through the platform and the bottom of the pilot. Enlarge the holes in the platform, then mount the pilot to the platform with two #4 x 1/2"[13mm] screws and washers (not included).

❏ 6. Mount the other pilot the same way.

GLUE ON THE EXTERNAL STRINGERS

The Piper Arrow has four external stringers running partway down the bottom of the fuselage. The same as a few of the other scale details on this model, the stringers are optional.

❏ 1. Cut the stringers to the correct length. They run from the aft edge of the cowl to about the leading edge of the flaps.

❏ 2. Paint the stringers to match the trim scheme.

❏ 3. Carefully glue the stringers into position using thin CA. **Hint:** Before gluing the stringers into position, poke several pinholes through the covering to permanently bond the covering to the wood underneath. This will also help the stringers remain secure.

APPLY THE DECALS

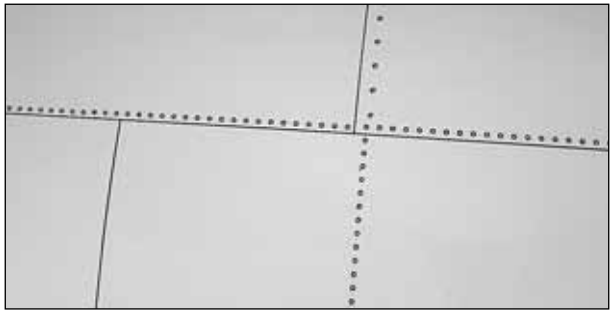
1. Use scissors or a sharp hobby knife to cut the decals from the sheet.

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 one of the decals 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.

ADD PANEL LINES



❏ Panel lines and rivets are supplied on the decal sheet. They can also be added with a Top Flite Panel Line Pen (TOPQ2510) or by cutting thin lines from MonoKote and ironing them on. The panel lines in the photo were inked on. Ironed-on lines will be more permanent and will not "smudge" as will the inked-on lines over time. Use a Top Flite Scale Template (TOPR2187) for making rivets and other details with the Panel Line Pen.

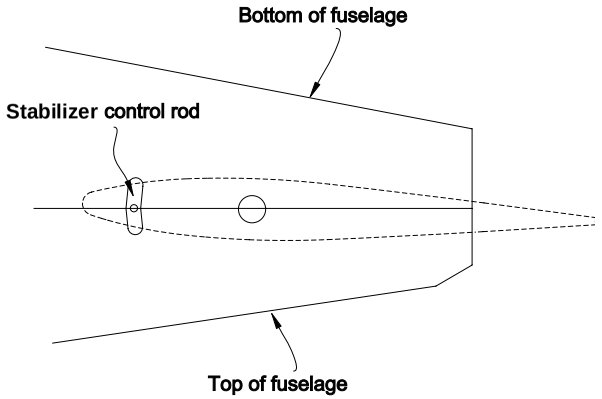
GET THE MODEL READY TO FLY

CENTER THE CONTROLS & CHECK THE DIRECTIONS

❏ 1. Turn on the transmitter and receiver and center the trims. If necessary, reposition any servo arms that aren't centered. Don't forget to reinstall the screws that hold on the servo arms.

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

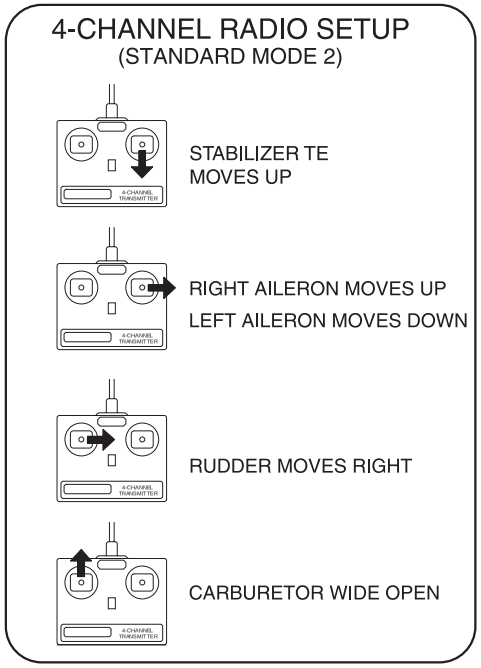
NOW it's time to setup the stabilizer...



❏ 3. Remove the bottom tail cone. With the radio on and the stabilizer trim centered, adjust the clevis on

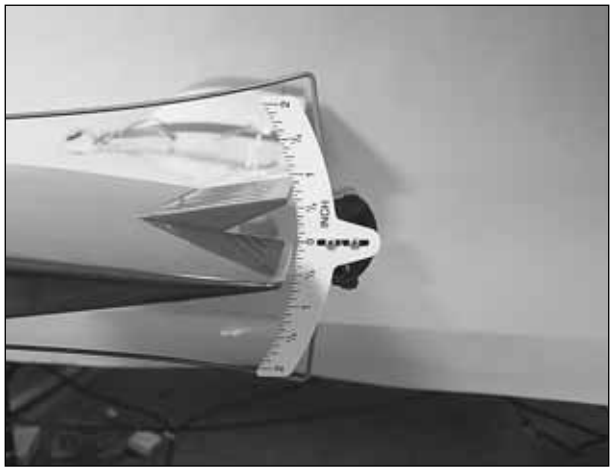
the servo end of the stabilizer pushrod until the **top** of the stabilizer control rod is even with the seam between the top and bottom stabilizer mounts. A piece of wire with an L-bend on the end can be used as a "gauge." With the gauge under the control rod, adjust the elevator until the top of the gauge is even with the seam. **Note:** The plane in the sketch is upside-down because the model will be upside-down during this procedure.

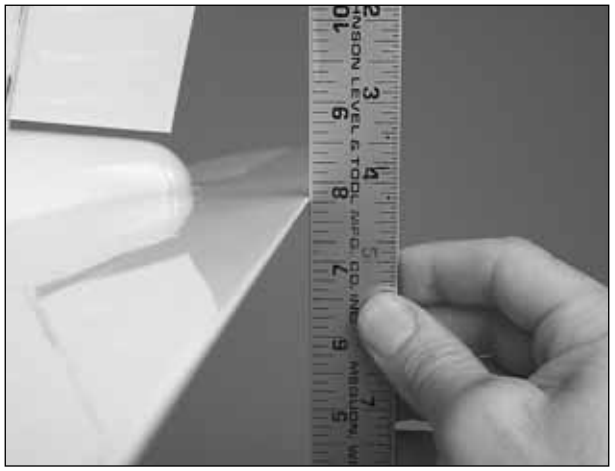
❏ 4. Now that the stabilizer has been set up, secure the nut on the bellcrank with threadlocker. Also lock the wheel collars that are on both sides of the swivel clevis onto the stabilizer control rod. Use a small drop of threadlocker on both set screws in the collars.



❏ 5. 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. A ruler will have to be used on the stabilizer.

RECOMMENDED CONTROL SURFACE THROWS

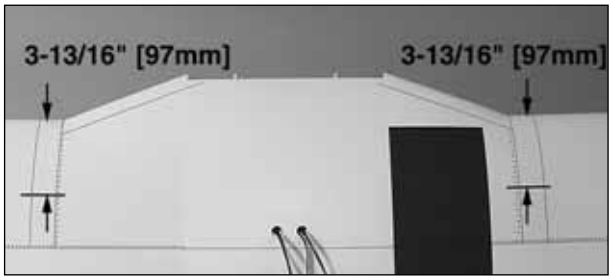
	HIGH RATE	LOW RATE
AILERONS	7/8"[22mm] up 7/8"[22mm] down	1/2"[13mm] up 1/2"[13mm] down
STABILIZER	1/2"[13mm] up 1/2"[13mm] down	1/4"[6mm] up 1/4"[6mm] down
RUDDER	1"[25mm] right 1"[25mm] left	3/4"[19mm] right 3/4"[19mm] left
FLAPS	1-1/2"[38mm] full down	

IMPORTANT: The Piper Arrow 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 Arrow 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.)

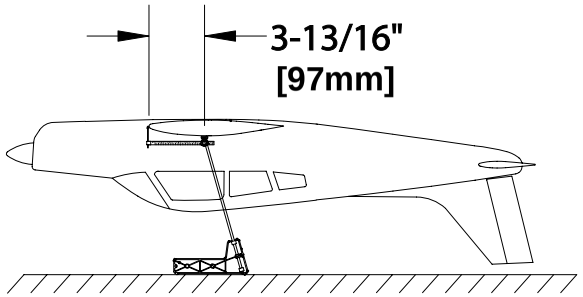
More than any other factor, the **C.G.** (balance point) can have the **greatest** effect on how a model flies, and may determine whether or not your first flight will be successful. If you value this model and wish to enjoy it for many flights, **DO NOT OVERLOOK THIS IMPORTANT PROCEDURE.** A model that 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, propeller and spinner, landing gear, covering and paint, and the radio system. The fuel tank should be empty.



❏ 1. Use a felt-tip pen or 1/8"[3mm]-wide tape to accurately mark the C.G. on the top of the wing at the joint between the center section and outer panels on both sides of the fuselage. The C.G. is located 3-13/16"[97mm] back from the leading edge of the wing.

This is where your model should balance for the first flights. Later, you may wish to experiment by shifting the C.G. up to 3/8"[10mm] forward or 3/8"[10mm] 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, place the model upside-down on a Great Planes CG Machine, or lift it upside-down at the balance point you marked.

❏ 3. If the tail drops, the model is "tail heavy" and the battery pack and/or receiver must be shifted forward or weight must be added to the nose to balance. If the nose drops, the model is "nose heavy" and the battery pack and/or receiver must be shifted aft or weight must be added to the tail to balance. If additional weight is required, 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 (don't attach weight to the cowl—it is not intended to support weight). Begin by placing incrementally increasing amounts of weight on the bottom of the fuse over the firewall until the model balances. Once you have determined the amount of weight required, it can be permanently attached. If required, tail weight may be added by cutting open the bottom of the fuse and gluing it permanently inside.
Note: Do not rely upon the adhesive on the back of the lead weight to permanently hold it in place. Over time, fuel and exhaust residue may soften the adhesive and cause the weight to fall off. Use #2 sheet metal screws, RTV silicone or epoxy to permanently hold the weight in place.

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

BALANCE THE MODEL LATERALLY

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

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

PREFLIGHT

IDENTIFY YOUR MODEL

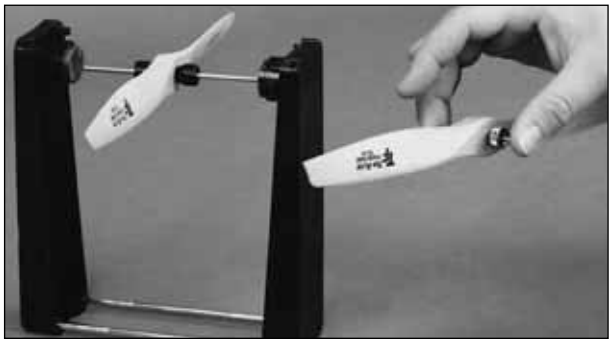
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on page 73 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

CAUTION: Unless the instructions that came with your radio system state differently, the **initial** charge on **new** transmitter and receiver batteries should be done for 15 hours **using the slow-charger that came with the radio system**. This will "condition" the batteries so that the next charge may be done using the fast-charger of your choice. If the initial charge is done with a fast-charger the batteries may not reach their full capacity and you may be flying with batteries that are only partially charged.

BALANCE PROPELLERS



Carefully balance your propeller and spare propellers before you fly. An unbalanced prop can be the single most significant cause of vibration that can damage your model. Not only will engine mounting screws and bolts loosen, possibly with disastrous effect, but vibration may also damage your radio receiver and battery. Vibration can also cause your fuel to foam, which will, in turn, cause your engine to run hot or quit. We use a Top Flite Precision Magnetic Prop Balancer™ (TOPQ5700) in the workshop and keep a Great Planes Fingertip Prop Balancer (GPMQ5000) in our flight box.

GROUND CHECK

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

RANGE CHECK

Ground check the operational range of your radio before the first flight of the day. With the transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet away from the model and still have control. Have an assistant stand by your model and, while you work the controls, tell you what the control surfaces are doing. Repeat this test **with the engine running** at various speeds with an assistant holding the model, using hand signals to show you what is happening. If the control surfaces do not respond correctly, **do not fly!** 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 (EXCERPTS)

Read and abide by the following excerpts from the Academy of Model Aeronautics Safety Code. For the complete Safety Code refer to *Model Aviation* magazine, the AMA web site or the Code that came with your AMA license.

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 and avoid flying in the proximity of full-scale aircraft. Where necessary, an observer shall be utilized 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.

5) I will not fly my model unless it is identified with my name and address or AMA number, on or in the model. Note: This does not apply to models while being flown indoors.

7) 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) At all flying sites a straight or curved line(s) must be established in front of which all flying takes place with the other side for spectators. Only personnel involved with flying the aircraft are allowed at or in the front of the flight line. Intentional flying behind the flight line is prohibited.

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

5) **I will not knowingly operate my model within three miles of any pre-existing flying site except in accordance with the frequency sharing agreement listed** [in the complete AMA Safety Code].

9) Under no circumstances may a pilot or other person touch a powered model in flight; **nor should any part of the model other than the landing gear, intentionally touch the ground, except while landing.**

IMAA CODE

IMAA SAFETY CODE (excerpts)

Since the Piper Arrow qualifies as a "giant-scale" model and is therefore eligible to fly in IMAA events, we've printed excerpts from the IMAA Safety Code that may apply to this model.

What is Giant-Scale?

The concept of large or giant-scale is generally considered to apply to radio controlled model aircraft with minimum wingspans of 80 inches for monoplanes and 60 inches for multi-wing aircraft. Quarter-scale or larger replicas of person-carrying aircraft with proper documentation (minimum 3-view drawing) which do not fit the size requirements will also be permitted.

SECTION 1.0: SAFETY STANDARD

1.1 Adherence to Code: The purpose of this Safety Code is to provide a structure whereby all participants, including spectators, will be aware of the inherent dangers in the operation of radio controlled aircraft. This code is meant to serve as a minimum guideline to all participants. It is understood that the ultimate responsibility for the safety of any aircraft lies with the owner(s), pilot(s) and spectator(s) involved in any event. It is the responsibility of all participants to exercise caution when operating, or observing the operation of all radio controlled aircraft. The pilot/owner of an aircraft will not be dissuaded from taking whatever steps they deem necessary, in addition to this code, to insure that their aircraft is safe.

The most current AMA Safety Code in effect is to be observed.

SECTION 3.0: SAFETY REVIEW

3.4 Flight Testing: All aircraft are to have been flight tested and flight trimmed with a minimum of six (6) 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 Review form (see Section 3.2) by the pilot (or owner) shall document, as fact, that the noted aircraft has been successfully flight-tested and proven airworthy prior to the IMAA event.

Section 4.0: SPOTTER/HELPER

4.1 Spotter/Helper Definition: An assistant to aid the pilot during start-up, and taxing onto the runway. The spotter/helper will assist the pilot in completing a safe flight.

4.2 Each pilot is required to have a spotter/helper at all IMAA sanctioned events. The event Safety Committee should be prepared to assist those pilots who do not have a spotter/helper to make sure that every registered pilot has the opportunity to fly at a sanctioned event.

SECTION 5.0: EMERGENCY ENGINE SHUT OFF (Kill Switch)

5.3 There must also be a means to stop the engine from the transmitter. The most common method is to completely close the carburetor throat using throttle trim, however other methods are acceptable. This requirement applies to all glow/gas ignition engines regardless of size.

SECTION 6.0: RADIO REQUIREMENTS
All transmitters must be FCC type certified.

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

The following recommendations are included in the Safety Code not to police such items, but rather to offer basic suggestions for enhanced safety. It is expected that IMAA members will avail themselves of technological advances as such become available, to promote the safety of all aircraft and participants.

Servos need to be of a rating capable to handle the loads that the control surfaces impose upon the servos. Standard servos are not recommended for control surfaces. Servos should be rated heavy-duty ounces of torque. For flight-critical control functions a minimum of 45 inch/ounces of torque should be considered. This should be considered a minimum for smaller aircraft and higher torque servos are strongly encouraged for larger aircraft. The use of one servo for each aileron and one for each stabilizer half is strongly recommended. Use of dual servos is also recommended on larger aircraft.
On-board batteries should be, at a minimum, 1000 mAh up to 20 lbs., 1200 mAh to 30 lbs., 1800 mAh to 40 lbs., and 2000 mAh over 40 lbs. flying weight. The number and size of servos, size and loads on control surfaces, and added features should be considered as an increase to these minimums. Batteries should be able to sustain power to the onboard radio components for a minimum of one hour total flying time before recharging.

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.

❏ 1. Fuelproof all areas exposed to fuel or exhaust residue such as the firewall and engine area, the wing saddle area, the cardboard wing bolt tubes, wheel wells, etc.

❏ 2. Check the C.G. according to the measurements provided in the manual.

❏ 3. Be certain the battery and receiver are securely mounted. Simply stuffing them into place with foam rubber is not sufficient.

❏ 4. Extend your receiver antenna and make sure it has a strain relief inside the fuselage to keep tension off the solder joint inside the receiver.

❏ 5. Balance your model *laterally* as explained in the instructions.

❏ 6. Use threadlocking compound to secure critical fasteners such as the set screws that hold the wheel axles to the struts, screws that hold the carburetor arm (if applicable), screw-lock pushrod connectors, etc.

❏ 7. Add a drop of oil to the axles so the wheels will turn freely.

❏ 8. Make sure all hinges are **securely** glued in place.

❏ 9. Reinforce holes for wood screws with thin CA where appropriate (servo mounting screws, cowl mounting screws, etc.).

❏ 10. Confirm that all controls operate in the correct direction and the throws are set up according to the manual.

❏ 11. Make sure there are silicone retainers on all the clevises and that all servo arms are secured to the servos with the screws included with your radio.

❏ 12. Secure connections between servo wires and Y-connectors or servo extensions, and the connection between your battery pack and the on/off switch with vinyl tape, heat shrink tubing or special clips suitable for that purpose.

❏ 13. Make sure any servo extension cords you may have used do not interfere with other systems (servo arms, pushrods, landing gear, etc.).

❏ 14. Secure the pressure tap (if used) to the muffler with high temp RTV silicone, thread locking compound or J.B. Weld.

❏ 15. Make sure the fuel lines are connected and are not kinked.

❏ 16. Use an incidence meter to check the wing for twists and attempt to correct before flying.

❏ 17. Balance your propeller (and spare propellers).

❏ 18. Tighten the propeller nut and spinner.

❏ 19. Place your name, address, AMA number and telephone number on or inside your model.

❏ 20. Cycle your receiver battery pack (if necessary) and make sure it is fully charged.

❏ 21. If you wish to photograph your model, do so before your first flight.

❏ 22. Range check your radio when you get to the flying field.

FLYING

The Arrow is a great-flying model that flies smoothly and predictably. The Arrow 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 as safely 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.

This model belongs to:

Name

Address

City, State Zip

Phone number

AMA number

Fill in and place in your model.

TAKEOFF

Before you get ready to takeoff, see how the model handles on the ground by doing a few practice runs at **low speeds** on the runway. Make sure the model rolls straight down the runway and make any trim adjustments necessary to get it to go straight. If you need to take a break before the maiden flight, shut off the engine 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, then gradually advance the throttle. Gain as much speed as your runway and flying site will practically allow before gently applying up elevator and lifting the model into the air. A small amount of right rudder may be required to correct engine torque to keep the wings level. Be smooth on the elevator stick, allowing the model to establish a **gentle** climb to a safe altitude before turning into the traffic pattern.

FLIGHT

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

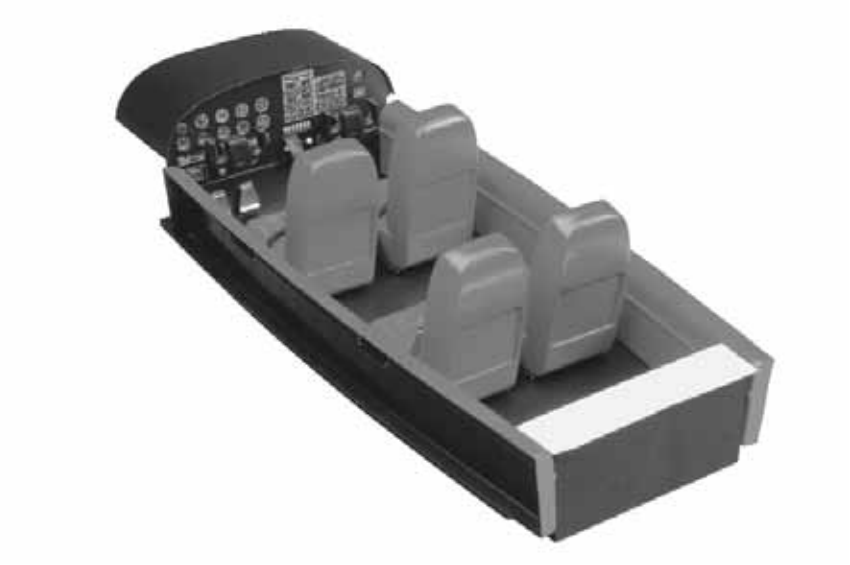
Take it easy for the first few flights, gradually getting acquainted with the model as you gain confidence. Adjust the trims to maintain straight-and-level flight. After flying around for a while, and while still at a safe altitude with plenty of fuel, practice slow flight and extend the flaps to see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

LANDING

To initiate a landing approach, lower the throttle while on the downwind leg, allow the model to slow, then extend the flaps. Allow the nose of the model to pitch downward to gradually bleed off altitude. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. Make your final turn toward the runway (into the wind) keeping the nose down to maintain airspeed and control. When landing with flaps, keep a few additional "clicks" of throttle to maintain airspeed. Level the attitude when the model reaches the runway threshold, modulating the throttle as necessary to maintain your glide path and airspeed. If you are going to overshoot, smoothly advance the throttle, allow the model to gain speed, retract the flaps and climb out to make another attempt. When you're ready to make your landing flare and the model is a foot or so off the deck, smoothly increase up elevator until it the wheels gently touch down. Once the model is on the runway and has lost flying speed, relax the elevator and taxi the model back. Examine the model and make any mechanical adjustments necessary so the trims can be returned to center.

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.



Top Flite® Piper Arrow II Cockpit Kit (TOPQ8414)

Add a detailed cockpit to your Piper Arrow II, and you'll win raves on the ground and in the air. Lightweight styrene plastic parts assemble with CA and finish with enamel paints. Completion takes just a few short hours, but leaves the impression that your plane just arrived fresh from the factory. Features include floor, sides, seats and seatbelt material, cockpit deck -- even instrument panel. Any time is the right one to add a cockpit kit. You can install it while you're building or retrofit after your masterpiece is already complete.

Top Wingspan: 71.5 in (1815mm)
Bottom Wingspan: 69 in (1755mm)
Total Wing Area: 1466 sq in (94.6dm2)
Weight: 14-15 lb (6.35-6.8kg)
Wing Loading: 22-23.5 oz/sq ft (67-72g/dm2)
Length: 56.75 in (1441mm)
Requires: 2-stroke or 4-stroke .91-1.20 cu in (15-19.5cc) engine, 4-channel radio w/5-7 servos

Great Planes® Super Stearman 1.20 ARF (GPMA1350)

Long considered the "classic" biplane, the Super Stearman still thrills onlookers with its aerobatics. This 71.5" span, IMAA-legal scale model has extraordinary attention to detail. All main sections feature built-up balsa and ply construction, covered in MonoKote film, and accented by a painted fiberglass cowl, wheel pants and landing gear fairings. Other scale touches include a dummy radial engine, polished aluminum spinner and a pair of painted scale pilot figures. A plywood ring glued inside the cowl strengthens the nose assembly and eliminates visible screw heads. Four ailerons help give this Stearman "super" agility, especially when each is powered by its own servo. A steerable tailwheel aids in ground handling.

Wingspan: 84.5 in (2140mm)
Wing Area: 1245 sq in (80.3dm2)
Weight: 17.5-19 lb (7.9-8.6kg)
Wing Loading: 32-35 oz/sq ft (98-107 g/dm2)
Length: 73.5 in (1865mm)
Requires: 5-7 Channel radio with 9-11 servos; 2.1-2.8 cu in (34.5-46cc)
2-stroke glow engine or 2.5-4.3 cu in (41-70cc) spark ignition gasoline engine

Top Flite® Gold Edition™ Giant P-51D Mustang ARF (TOPA0700)

The P-51D Mustang has a well-earned reputation as America's favorite fighter -- and Top Flite captures every aspect of the warbird's profile and performance in a large 1/4 scale ARF replica that can be flying sorties in as little as 25-30 hours! The prebuilt, fully sheeted main sections are MonoKote-covered, while the cowl and wing fillets are prepainted fiberglass. Fixed wire landing gear is supplied, but you can substitute optional Robart retracts with functional landing gear doors. The large dimensions increase flight visibility and make for effortless installation of on-board radio gear. When powered by a 41cc gasoline engine, the Giant P-51D ARF executes dogfight maneuvers with realistic WWII drama!

Wingspan: 81 in (2060mm)
Wing Area: 1000 sq in (64.5dm2)
Weight: 13-14 lb (5.9-6.35kg)
Wing Loading: 29-32 oz/sq ft (89-95g/dm2)
Length: 62.5 in (1590mm)
Requires: 2-stroke .91-1.08 cu in (15-17.5cc) or **4-stroke** 1.20 cu in (19.5cc) engine, **5-channel radio w/7 standard servos**

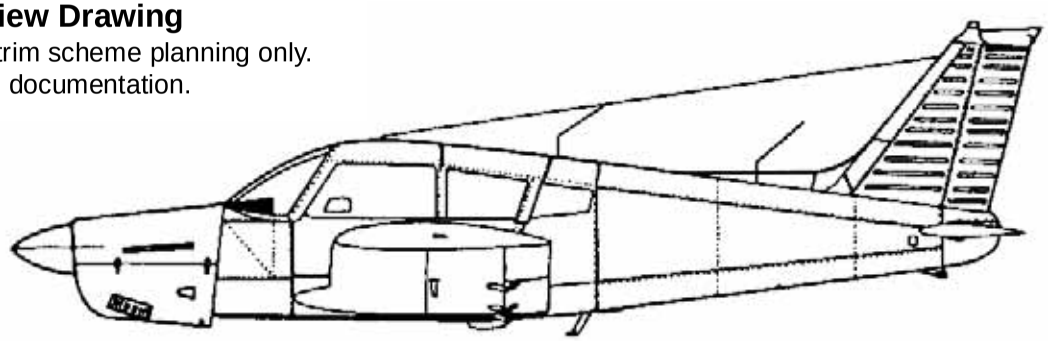
Great Planes® Giant Super Chipmunk 1.20 ARF (GPMA1303)

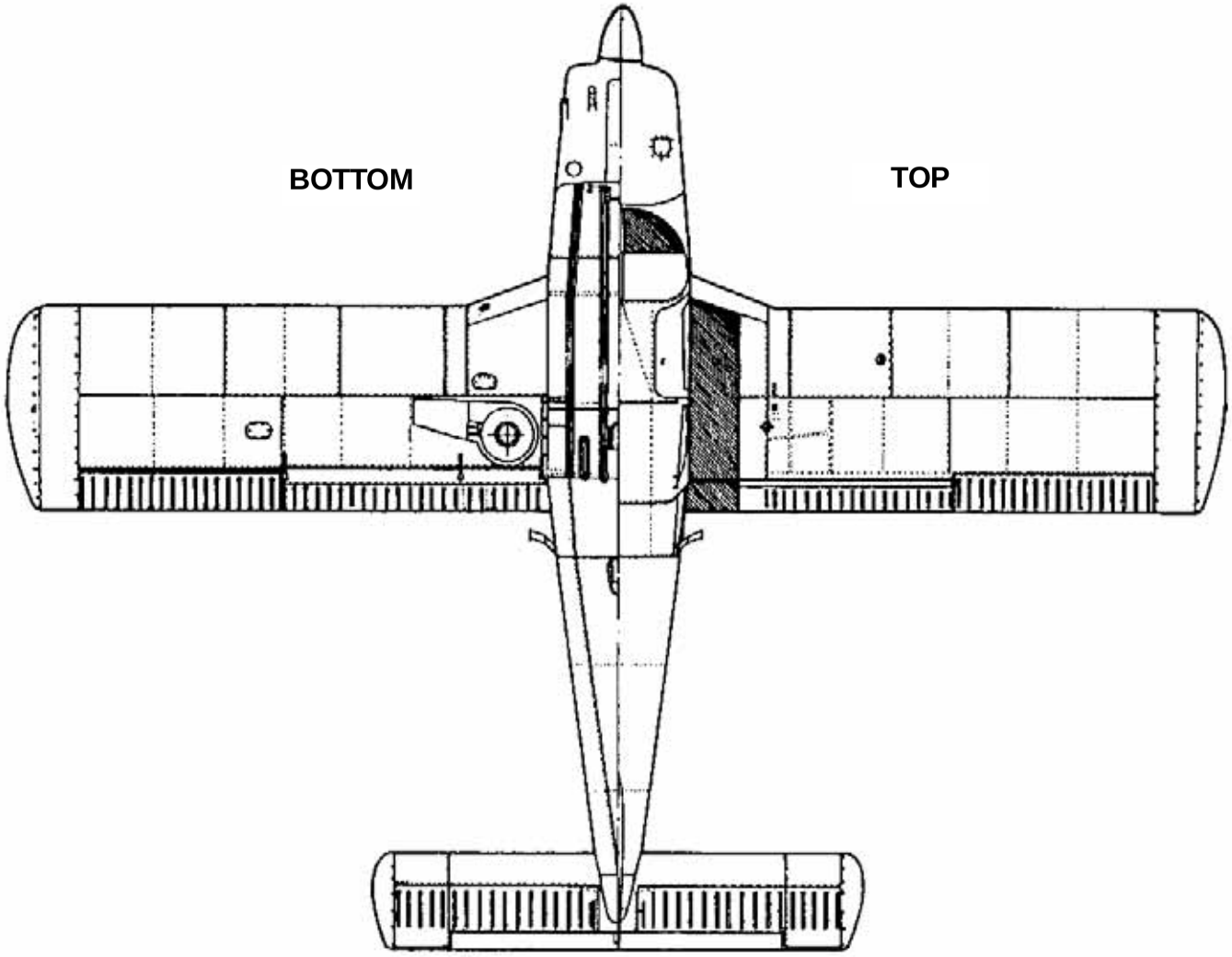
Art Scholl performed airshow magic with his Super Chipmunk for over 25 years. And with the help of Great Planes' magic, you can have this scale replica ready to perform in just 12-15 hours. The trim scheme is authentic, provided by MonoKote on the built-up wings and stab and paint on the fiberglass fuselage, cowl, wheel pants and landing gear fairings. Instrument panel decals and a pilot figure provide extra "eye candy" without extra work. Routing tubes for pushrods, a 3-piece wing and a steerable tailwheel offer added ease on the ground. Dual servos on each flap, aileron and elevator half put the power to dazzle a crowd at your fingertips.

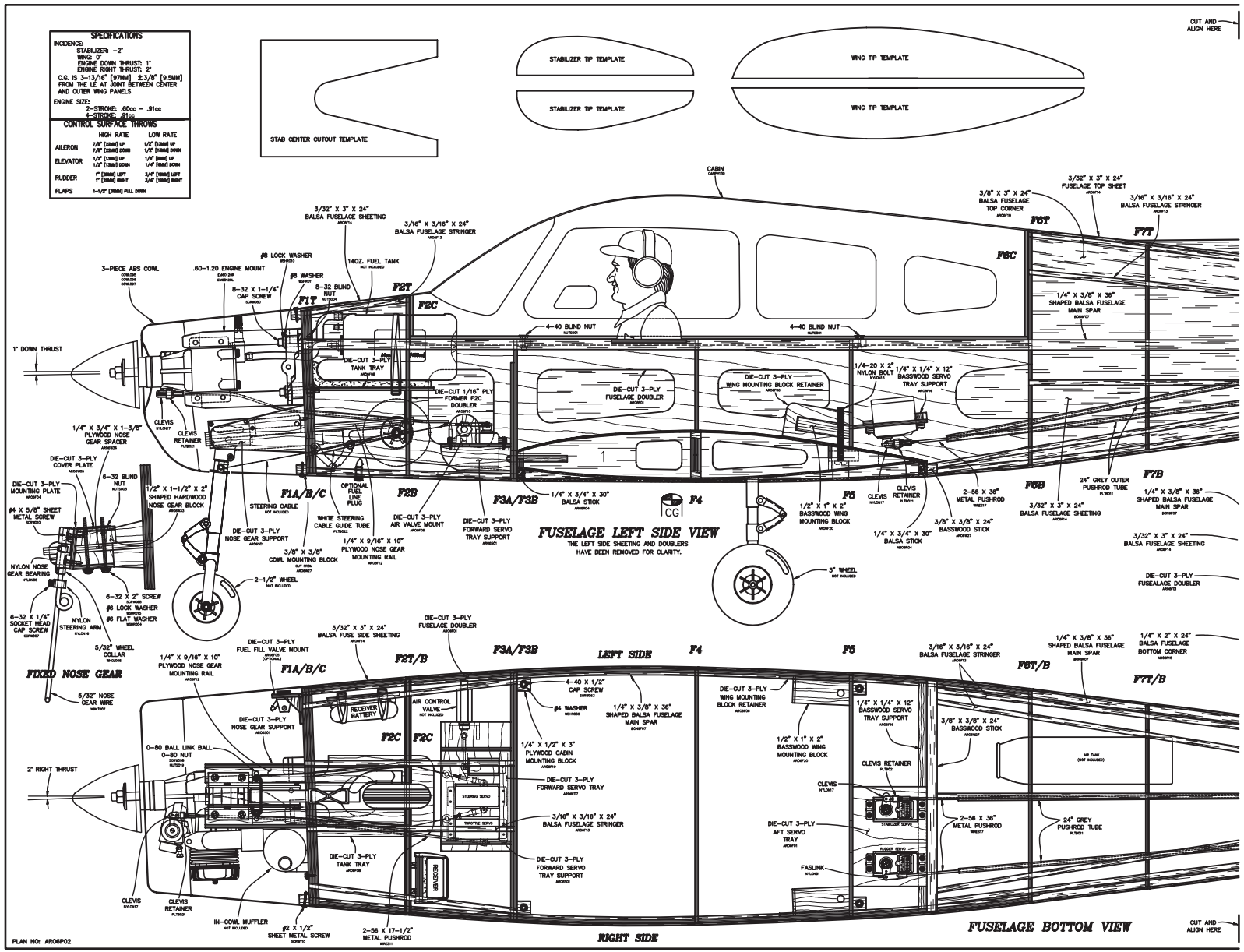
Manufactured under license by Pennzoil-Quaker State Company, 2004.
Hobbico, Inc. 2904 Research Rd, Champaign, IL 61826.

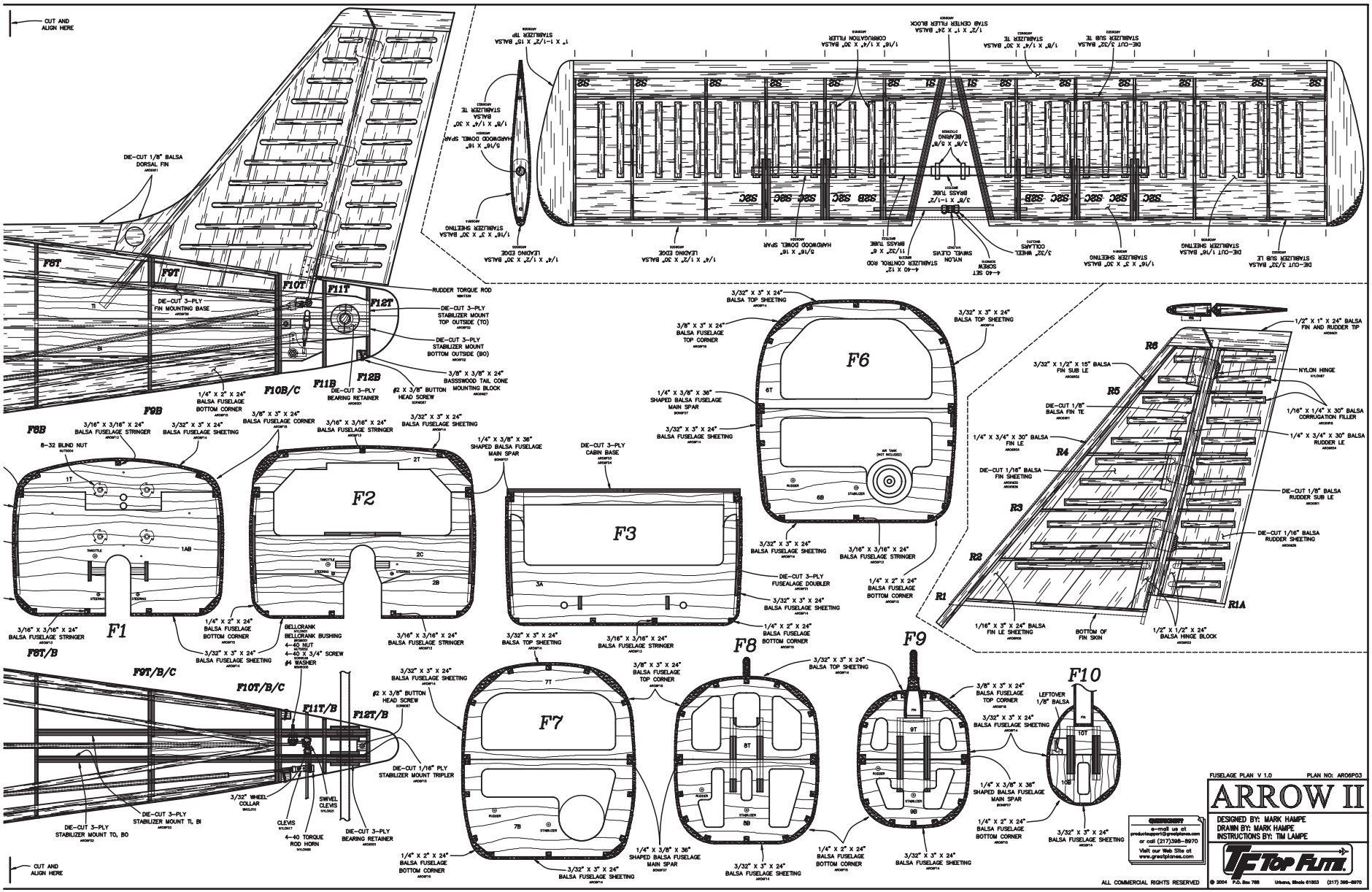
2 - View Drawing

Use this drawing for trim scheme planning only.
Not suitable for scale documentation.






SPECIFICATIONS
INCIDENCE:
STABILIZER: -2°
WING: 0°
ENGINE DOWN THRUST: 1°
ENGINE RIGHT THRUST: 2°
C.G. IS 3-13/16" [97MM] ±3/8" [9.5MM] FROM THE LE AT JOINT BETWEEN CENTER AND OUTER WING PANELS
ENGINE SIZE:
2-STROKE: .60cc - .91cc
4-STROKE: .91cc
CONTROL SURFACE THROWS
HIGH RATE
LOW RATE
AILERON
ELEVATOR
RUDDER
FLAPS
STAB CENTER CUTOUT TEMPLATE
STABILIZER TIP TEMPLATE
STABILIZER TIP TEMPLATE
WING TIP TEMPLATE
WING TIP TEMPLATE
CUT AND ALIGN HERE
CABIN
3-PIECE ABS COWL
.60-1.20 ENGINE MOUNT
#6 LOCK WASHER
#6 WASHER
8-32 X 1-1/4" CAP SCREW
8-32 BLIND NUT
140Z. FUEL TANK
NOT INCLUDED
3/32" X 3" X 24" BALSA FUSELAGE SHEETING
3/16" X 3/16" X 24" BALSA FUSELAGE STRINGER
F1T
F2T
F2C
F6C
F6T
F7T
3/8" X 3" X 24" BALSA FUSELAGE TOP CORNER
3/32" X 3" X 24" FUSELAGE TOP SHEET
3/16" X 3/16" X 24" BALSA FUSELAGE STRINGER
1/4" X 3/8" X 36" SHAPED BALSA FUSELAGE MAIN SPAR
4-40 BLIND NUT
1" DOWN THRUST
DIE-CUT 3-PLY TANK TRAY
DIE-CUT 1/16" PLY FORMER F2C DOUBLER
DIE-CUT 3-PLY FUSELAGE DOUBLER
DIE-CUT 3-PLY WING MOUNTING BLOCK RETAINER
1/4-20 X 2" NYLON BOLT
1/4" X 1/4" X 12" BASSWOOD SERVO TRAY SUPPORT
CLEVIS
CLEVIS RETAINER
1/4" X 3/4" X 1-3/8" PLYWOOD NOSE GEAR SPACER
DIE-CUT 3-PLY COVER PLATE
6-32 BLIND NUT
DIE-CUT 3-PLY MOUNTING PLATE
#4 X 5/8" SHEET METAL SCREW
1/2" X 1-1/2" X 2" SHAPED HARDWOOD NOSE GEAR BLOCK
F1A/B/C
STEERING CABLE
OPTIONAL FUEL LINE PLUG
F2B
F3A/F3B
1/4" X 3/4" X 30" BALSA STICK
F4
F5
1/2" X 1" X 2" BASSWOOD WING MOUNTING BLOCK
2-56 X 36" METAL PUSHROD
3/8" X 3/8" X 24" BASSWOOD STICK
F6B
F7B
24" GREY OUTER PUSHROD TUBE
3/32" X 3" X 24" BALSA FUSELAGE SHEETING
1/4" X 3/8" X 36" SHAPED BALSA FUSELAGE MAIN SPAR
DIE-CUT 3-PLY NOSE GEAR SUPPORT
WHITE STEERING CABLE GUIDE TUBE
DIE-CUT 3-PLY AIR VALVE MOUNT
DIE-CUT 3-PLY FORWARD SERVO TRAY SUPPORT
1/4" X 9/16" X 10" PLYWOOD NOSE GEAR MOUNTING RAIL
3/8" X 3/8" COWL MOUNTING BLOCK
2-1/2" WHEEL
NOT INCLUDED
3" WHEEL
NOT INCLUDED
FUSELAGE LEFT SIDE VIEW
THE LEFT SIDE SHEETING AND DOUBLERS HAVE BEEN REMOVED FOR CLARITY.
NYLON NOSE GEAR BEARING
6-32 X 2" SCREW
#6 LOCK WASHER
#6 FLAT WASHER
6-32 X 1/4" SOCKET HEAD CAP SCREW
NYLON STEERING ARM
5/32" WHEEL COLLAR
FIXED NOSE GEAR
5/32" NOSE GEAR WIRE
DIE-CUT 3-PLY FUEL FILL VALVE MOUNT
(OPTIONAL)
F2T/B
F3A/F3B
LEFT SIDE
F4
F5
F6T/B
F7T/B
4-40 X 1/2" CAP SCREW
#4 WASHER
1/4" X 3/8" X 36" SHAPED BALSA FUSELAGE MAIN SPAR
DIE-CUT 3-PLY WING MOUNTING BLOCK RETAINER
3/16" X 3/16" X 24" BALSA FUSELAGE STRINGER
1/4" X 2" X 24" BALSA FUSELAGE BOTTOM CORNER
RECEIVER BATTERY
AIR CONTROL VALVE
NOT INCLUDED
DIE-CUT 3-PLY NOSE GEAR SUPPORT
F2C
0-80 BALL LINK BALL
0-80 NUT
2° RIGHT THRUST
1/4" X 1/2" X 3" PLYWOOD CABIN MOUNTING BLOCK
DIE-CUT 3-PLY FORWARD SERVO TRAY
3/16" X 3/16" X 24" BALSA FUSELAGE STRINGER
DIE-CUT 3-PLY FORWARD SERVO TRAY SUPPORT
DIE-CUT 3-PLY TANK TRAY
RUDDER
CLEVIS
CLEVIS RETAINER
IN-CAWL MUFFLER
NOT INCLUDED
#2 X 1/2" SHEET METAL SCREW
2-56 X 17-1/2" METAL PUSHROD
RIGHT SIDE
1/4" X 1/4" X 12" BASSWOOD SERVO TRAY SUPPORT
3/8" X 3/8" X 24" BASSWOOD STICK
1/2" X 1" X 2" BASSWOOD WING MOUNTING BLOCK
CLEVIS RETAINER
CLEVIS
DIE-CUT 3-PLY AFT SERVO TRAY
FASLINK
2-56 X 36" METAL PUSHROD
24" GREY PUSHROD TUBE
FUSELAGE BOTTOM VIEW
PLAN NO: AR06P02
CUT AND ALIGN HERE


CUT AND ALIGN HERE
DIE-CUT 1/8" BALSA DORSAL FIN
F6T
F9T
F10T
F11T
F12T
RUDDER TORQUE ROD
DIE-CUT 3-PLY FIN MOUNTING BASE
DIE-CUT 3-PLY STABILIZER MOUNT TOP OUTSIDE (TO)
DIE-CUT 3-PLY STABILIZER MOUNT BOTTOM OUTSIDE (BO)
3/8" X 3/8" X 24" BASSWOOD TAIL CONE MOUNTING BLOCK
1/4" X 2" X 24" BALSA FUSELAGE BOTTOM CORNER
F10B/C
F11B
F12B
DIE-CUT 3-PLY BEARING RETAINER
#2 X 3/8" BUTTON HEAD SCREW
F9B
F8B
3/16" X 3/16" X 24" BALSA FUSELAGE STRINGER
3/32" X 3" X 24" BALSA FUSELAGE SHEETING
3/8" X 3" X 24" BALSA FUSELAGE CORNER
8-32 BLIND NUT
F1
F2
F3
F6
F7
F8
F9
F10
1T
1AB
2T
2C
2B
3A
6T
6B
7T
7B
8T
8B
9T
9B
10T
10B
1/4" X 3/8" X 36" SHAPED BALSA FUSELAGE MAIN SPAR
DIE-CUT 3-PLY CABIN BASE
3/32" X 3" X 24" BALSA TOP SHEETING
3/8" X 3" X 24" BALSA FUSELAGE TOP CORNER
3/16" X 3/16" X 24" BALSA FUSELAGE STRINGER
DIE-CUT 3-PLY FUSEALAGE DOUBLER
1/4" X 2" X 24" BALSA FUSELAGE BOTTOM CORNER
BELLCRANK
BELLCRANK BUSHING
4-40 NUT
4-40 X 3/4" SCREW
#4 WASHER
F6T/B
F9T/B/C
F10T/B/C
F11T/B
F12T/B
DIE-CUT 1/16" PLY STABILIZER MOUNT TRIPLER
3/32" WHEEL COLLAR
CLEVIS
SWIVEL CLEVIS
4-40 TORQUE ROD HORN
DIE-CUT 3-PLY STABILIZER MOUNT TO, BI
DIE-CUT 3-PLY STABILIZER MOUNT TI, BI
DIE-CUT 3-PLY BEARING RETAINER
LEFTOVER 1/8" BALSA
1/2" X 1" X 24" BALSA FIN AND RUDDER TIP
3/32" X 1/2" X 15" BALSA FIN SUB LE
NYLON HINGE
DIE-CUT 1/8" BALSA FIN TE
1/16" X 1/4" X 30" BALSA CORRUGATION FILLER
1/4" X 3/4" X 30" BALSA RUDDER LE
1/4" X 3/4" X 30" BALSA FIN LE
DIE-CUT 1/16" BALSA FIN SHEETING
DIE-CUT 1/8" BALSA RUDDER SUB LE
DIE-CUT 1/16" BALSA RUDDER SHEETING
R6
R5
R4
R3
R2
R1
R1A
1/16" X 3" X 24" BALSA FIN LE
BOTTOM OF FIN SKIN
1/2" X 1/2" X 24" BALSA HINGE BLOCK
1/16" X 1/4" X 30" BALSA
1/16" X 1/4" X 30" BALSA STAB/ELZR TE
1/2" X 1/4" X 24" BALSA CENTER FILLER BLOCK
1/8" X 1/4" X 30" BALSA STABILIZER SUB TE
DIE-CUT 1/32" BALSA STABILIZER SUB LE
1/16" X 3" X 30" BALSA STABILIZER SHEETING
DIE-CUT 1/16" BALSA STABILIZER SHEETING
DIE-CUT 3/32" BALSA STABILIZER LE
1/4" X 1/2" X 30" BALSA LEADING EDGE
5/16" X 16" HARDWOOD DOWEL SPAR
1/16" X 3" X 30" BALSA STABILIZER SHEETING
1" X 1-1/2" X 12" BALSA STABILIZER TIP
1/8" X 1/4" X 30" BALSA STABILIZER TE
4-40 SET SCREW
NYLON SWIVEL CLEVIS
STABILIZER CONTROL ROD
3/32" WHEEL COLLARS
3/8" X 1-1/2" BRASS TUBE
3/8" X 5/8" BEARING
11/32" X 6" BRASS TUBE
CUT AND ALIGN HERE
FUSELAGE PLAN V 1.0
PLAN NO: AR06P03
ARROW II
DESIGNED BY: MARK HAMPE
DRAWN BY: MARK HAMPE
INSTRUCTIONS BY: TIM LAMPE
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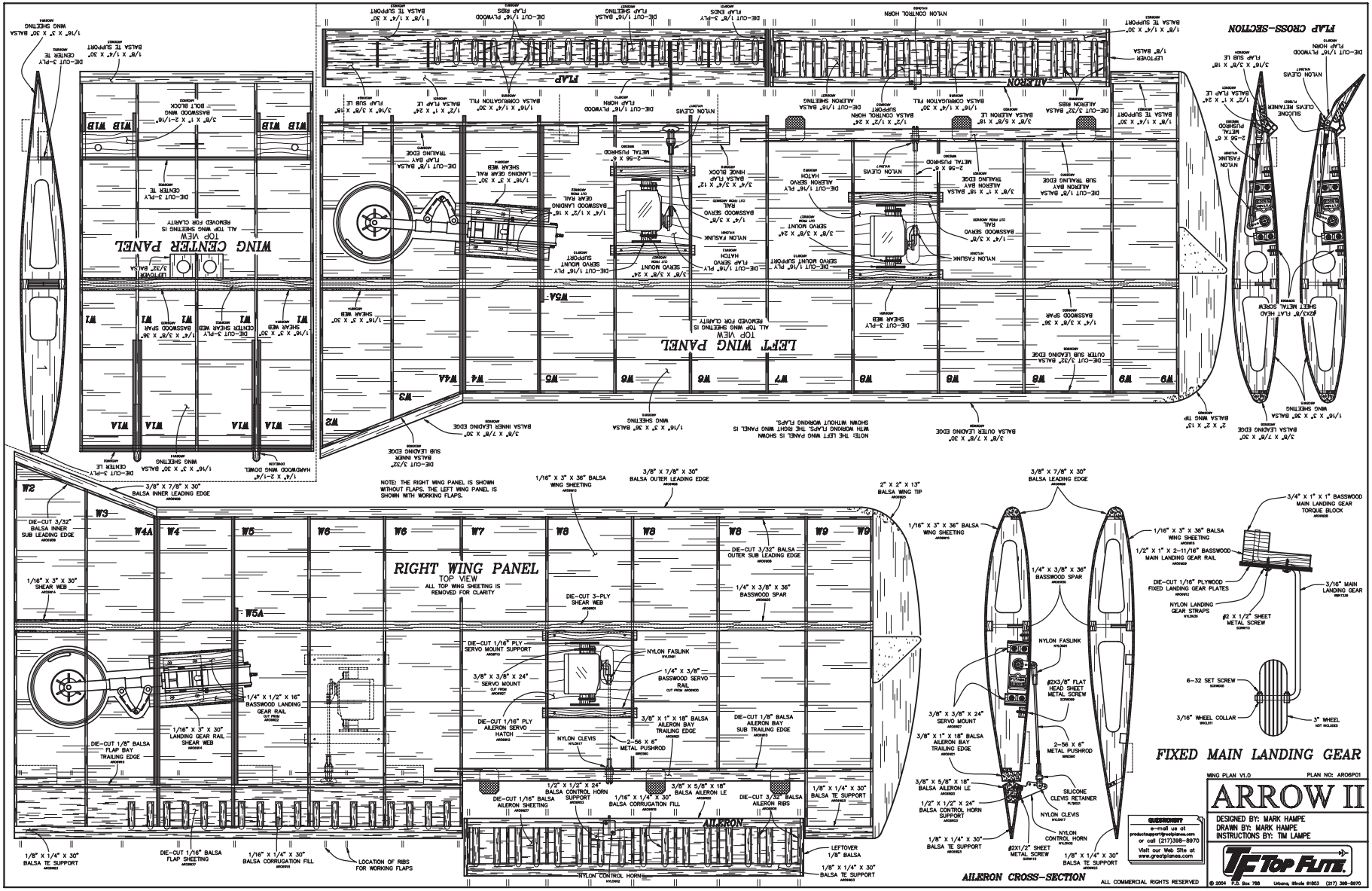
RIGHT WING PANEL
TOP VIEW
ALL TOP WING SHEETING IS REMOVED FOR CLARITY
NOTE: THE RIGHT WING PANEL IS SHOWN WITHOUT FLAPS. THE LEFT WING PANEL IS SHOWN WITH WORKING FLAPS.
LEFT WING PANEL
TOP VIEW
ALL TOP WING SHEETING IS REMOVED FOR CLARITY
NOTE: THE LEFT WING PANEL IS SHOWN WITH WORKING FLAPS. THE RIGHT WING PANEL IS SHOWN WITHOUT WORKING FLAPS.
WING CENTER PANEL
TOP VIEW
ALL TOP WING SHEETING IS REMOVED FOR CLARITY
FLAP CROSS-SECTION
AILERON CROSS-SECTION
FIXED MAIN LANDING GEAR
AILERON
FLAP
LEFTOVER 1/8" BALSA
NYLON CONTROL HORN
1/16" X 3" X 36" BALSA WING SHEETING
3/8" X 7/8" X 30" BALSA OUTER LEADING EDGE
3/8" X 7/8" X 30" BALSA INNER LEADING EDGE
2" X 2" X 13" BALSA WING TIP
3/8" X 7/8" X 30" BALSA LEADING EDGE
1/8" X 1/4" X 30" BALSA TE SUPPORT
1/16" X 3" X 30" SHEAR WEB
1/4" X 3/8" X 36" BASSWOOD SPAR
1/4" X 1/2" X 16" BASSWOOD LANDING GEAR RAIL
1/16" X 3" X 30" LANDING GEAR RAIL SHEAR WEB
DIE-CUT 1/8" BALSA FLAP BAY TRAILING EDGE
DIE-CUT 1/16" BALSA FLAP SHEETING
1/16" X 1/4" X 30" BALSA CORRUGATION FILL
LOCATION OF RIBS FOR WORKING FLAPS
DIE-CUT 3/32" BALSA OUTER SUB LEADING EDGE
DIE-CUT 3-PLY SHEAR WEB
DIE-CUT 1/16" PLY SERVO MOUNT SUPPORT
3/8" X 3/8" X 24" SERVO MOUNT
DIE-CUT 1/16" PLY AILERON SERVO HATCH
NYLON FASLINK
1/4" X 3/8" BASSWOOD SERVO RAIL
3/8" X 1" X 18" BALSA AILERON BAY TRAILING EDGE
2-56 X 6" METAL PUSHROD
NYLON CLEVIS
DIE-CUT 1/8" BALSA AILERON BAY SUB TRAILING EDGE
DIE-CUT 1/16" BALSA AILERON SHEETING
1/2" X 1/2" X 24" BALSA CONTROL HORN SUPPORT
3/8" X 5/8" X 18" BALSA AILERON LE
DIE-CUT 3/32" BALSA AILERON RIBS
1/8" X 1/4" X 30" BALSA TE SUPPORT
1/16" X 1/4" X 30" BALSA CORRUGATION FILL
1/8" X 1/4" X 30" BALSA TE SUPPORT
NYLON CONTROL HORN
3/8" X 7/8" X 30" BALSA LEADING EDGE
1/16" X 3" X 36" BALSA WING SHEETING
1/2" X 1" X 2-11/16" BASSWOOD MAIN LANDING GEAR RAIL
3/4" X 1" X 1" BASSWOOD MAIN LANDING GEAR TORQUE BLOCK
DIE-CUT 1/16" PLYWOOD FIXED LANDING GEAR PLATES
3/16" MAIN LANDING GEAR
NYLON LANDING GEAR STRAPS
#2 X 1/2" SHEET METAL SCREW
6-32 SET SCREW
3/16" WHEEL COLLAR
3" WHEEL
NOT INCLUDED
#2X3/8" FLAT HEAD SHEET METAL SCREW
3/8" X 3/8" X 24" SERVO MOUNT
3/8" X 1" X 18" BALSA AILERON BAY TRAILING EDGE
2-56 X 6" METAL PUSHROD
3/8" X 5/8" X 18" BALSA AILERON LE
SILICONE CLEVIS RETAINER
1/2" X 1/2" X 24" BALSA CONTROL HORN SUPPORT
NYLON CLEVIS
NYLON CONTROL HORN
#2X1/2" SHEET METAL SCREW
1/8" X 1/4" X 30" BALSA TE SUPPORT
1/8" X 1/4" X 30" BALSA TE SUPPORT
WING PLAN V1.0
PLAN NO: AR06P01
ARROW II
DESIGNED BY: MARK HAMPE
DRAWN BY: MARK HAMPE
INSTRUCTIONS BY: TIM LAMPE
QUESTIONS?
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