# STINSON RELIANT

GIANT SCALE


**Wingspan:** 100.5" [2553mm]
**Wing Area:** 1487 sq. in. [95.9 sq. dm]
**Weight:** 16 - 25 Lbs. [7258 - 11340g]
**Wing Loading:** 24.8 - 38.7 oz./sq. ft. [75.7 - 118.1 g/sq. dm]
**Fuselage Length:** 67.8 in. [1722mm]

MADE IN USA

**WARRANTY.....**Top Flite Models guarantees this kit to be free of 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 immediately return this kit in new and unused condition to the place of purchase.**

**Top Flite Models P.O. Box 788 Urbana, Il 61803** **Technical Assistance Call (217)398-8970 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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**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.

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

Your Stinson is not a toy, but a sophisticated working model that functions very much like an actual airplane. Because of its realistic performance, if you do not assemble and operate your Stinson correctly, you could possibly injure yourself or spectators and damage property.

**To make your R/C modeling experience totally enjoyable, get assistance with assembly and your first flights from an experienced, knowledgeable modeler.** You'll learn faster and avoid risking your model before you're truly ready to solo. Your local hobby shop has information about flying clubs in your area whose membership includes qualified instructors.

You can also contact the Academy of Model Aeronautics (AMA), which has more than 2,500 chartered clubs across the country. We recommend you join the AMA which will insure you at AMA club sites and events. AMA Membership is required at chartered club fields where qualified flight instructors are available.

Contact the AMA at the address or toll-free phone number below.

**Academy of Model Aeronautics**
**5151 East Memorial Drive**
**Muncie, IN 47302**
**(800) 435-9262**
**Fax (765) 741-0057**

or via the Internet at: http://www.modelaircraft.org

1. You must build the plane **according to the plan and instructions.** Do not alter or modify the model, as doing so may result in an unsafe or unflyable model. **In a few cases the plan and instructions may differ slightly from the photos. In those instances the plan and written instructions are correct.**

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

3. You must use a proper R/C **radio** that is in first class condition, the correct sized **engine** and correct **components** (fuel tank, wheels, etc.) throughout your building process.

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

5. You must **test** the operation of the model before every flight to insure that all equipment is operating and you must make certain that the model has remained structurally sound.

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

**Please inspect all parts carefully before you start to build! If any parts are missing, broken or defective, or if you have any questions about building or flying this model, please call us at:**

**(217) 398-8970 or e-mail us at productsupport@top-flite.com**

**We'll be glad to help. If you are calling for replacement parts, please look up the part numbers and the kit identification number (stamped on the end of the carton) and have them ready when you call.**

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

# INTRODUCTION

Congratulations and thank you for purchasing the **Top Flite *Gold Edition* Stinson SR-9**. Due to the large quantity of details and accessories on the full size subject (cowl blisters, windows & doors, step ladder, landing gear covers, etc.), the Stinson makes an ideal project for experienced scale modelers. However, due to the familiar building techniques and all wood construction, this ***Gold Edition*** kit is also an ideal project for moderately experienced builders who have not yet ventured into the realm of scale craftsmanship. Those who wish to go all out can even cover their "Reliant" with a fabric and paint system and add rib stitching. That's the beauty of this Gold Edition kit—since we've done all the engineering you'll end up with an impressively detailed scale model. Another benefit of choosing the Stinson as a scale subject is its relaxing flight characteristics. The Stinson's large, high wing and long tail moment yield an "honest" craft that instills confidence. Working flaps are the icing on the cake! This is one bird among your squadron that is sure to make many appearances at your local flying field.

Though the Stinson requires a little more skill to build than some of the other models in the Gold Edition lineup, complete instructions (right down to the airfoiled landing gear covers and opening doors) leave little or nothing up to the imagination. Highly experienced scale builders may venture off in areas of scale detail and apply their own techniques, but should refrain from making modifications to the main structure. Less experienced modelers need only to follow the instructions while building such details.

One last note before you continue: We highly recommend that you get photos or a book about the Stinson Reliant, or send for a documentation package as soon as possible (see Scale Documentation on page 4). This way, you can study the drawings and photos while you're building to get a feel for how your SR-9 should look when you're done. This will also help you figure out what scale details to add and decide on a trim scheme (you can also dream about how cool your SR-9 is going to look when it's done!).

# DECISIONS YOU MUST MAKE

## ENGINE

**Recommended engine size:**
1.08 to 1.99 cu. in. [17.7 to 32.6cc] **2-stroke**
1.2 to 1.6 cu. in. [19.7 to 26.2cc] **4-stroke**
25 to 35cc **ignition**

The Top Flite Gold Edition Stinson will perform well with any of the engines within the recommended range, but you must base your engine selection upon how much your finished model will weigh. This is greatly determined by the level of scale detail you plan to achieve and the method of covering. Refer to the ***Designer's Notes*** section for further details on engine selection.

We highly recommend the O.S.® FT-160 Twin Cylinder glow engine featured in the instructions. It has ample power for even a 22 lb. model with scale appearance and sound!

## FLAPS (Optional)

Your SR-9 is designed to incorporate working flaps; however, flaps are optional and not required for an excellent flying experience. Without flaps, the takeoff roll is a bit longer and the landing speed is a bit faster. If you do not wish to build working flaps, simply glue them into position. You can wait until you are well into wing construction until deciding whether or not to build working flaps. For flaps, you will need these additional items:

Hinges of your choice
Two servos
Y-connector
Servo extension cords (if the Y-connector is not long enough)

## HINGES & PULL-PULL SYSTEM

Due to the variety of hinges available, and the preferences some modelers have for certain types, this kit does not include hinges. Our preference is Robart® #310 Super Hinge Points (24 required, ROBQ2510), but other hinges may be used as long as they are suitable for giant-scale use.

Similarly, a pull-pull cable system for rudder control is not supplied with the kit. We used the Sullivan No. 520 Pull-Pull Cable Kit, but other systems will work, provided they are suitable for use in giant models.

## COCKPIT

Since the Top Flite Stinson features scale opening doors, a complete scale cockpit interior is virtually a "must." While you could just "black out" the cabin with fuel proof paint, a highly detailed scale interior is easy to achieve with Top Flite's Stinson Reliant Scale Interior Kit (TOPQ8409). The kit features front and rear seats, a laser-cut wood instrument panel and other accessories. The interior may be installed at any time, but will be easier to fit during fuse construction.

## COVERING

Of the many different types of model airplane coverings available, a "fabric" type of covering is most preferable due to its scale appearance. The prototype on the box was covered with 21st Century Super Coverite, then primed and painted with Stits paint. If you prefer not to use a covering which requires painting, you could use 21st Century® Fabric which is available in a wide variety of colors and closely simulates painted cloth.

## COMPETITION-MINDED MODELERS

The Top Flite Gold Edition Stinson SR-9 was designed from scale three-view drawings supplied by Scale Model Research (address follows) and photos of various full-size Stinsons. The scale of this kit is 1:5, or one-fifth scale.

If you plan to enter your SR-9 in scale competition (it's lots of fun, and the runways are usually paved!), this kit qualifies for Fun Scale, Sportsman Scale and Expert Scale. All the scale classes have the same flight requirements in which you must perform ten maneuvers, five of which are mandatory. The other five are up to you—easy stuff like a slow, low "inspection pass" with flaps extended, or maybe a touch-and-go. If you have never competed in a scale contest, you could start out in Fun Scale. In Fun Scale, the only documentation you need for static judging is any proof that a full-size aircraft of this type, in the paint/markings scheme on your model, did exist. A single photo, a kit box cover from a plastic model, or even a painting is sufficient proof! If you're interested, contact the AMA for a rule book that will tell you everything you need to know. Look in the back of the AMA magazine (Model Aviation) for a schedule of events.

The trim scheme we selected for the prototype featured on the kit box cover is a variation of a trim scheme taken from an SR-9 produced in 1937, NC-17154—which was still flying when this was written. If you are not concerned with a 100% accurate trim scheme you can make a variation of the one on the box, or design your own. If you plan to compete in scale competition, use the photos in your documentation package as a guide.

One last note for those interested in scale competition: Strive to build your model to reflect your documentation. Whatever lines and features appear on the full-size plane should also appear on your model. There seems to be much variation of the Stinson restorations in existence, so refer to the photos and documentation of the Stinson you are using for your model.

Your Top Flite Gold Edition Stinson Reliant is intended for scale and general sport flying including mild aerobatics such as chandelles and stall turns. Its structure is designed to withstand such stresses. If you intend to use your Stinson for more rigorous types of flying such as aggressive aerobatics or flying from rough fields, it is your responsibility to reinforce areas of the model that will be subjected to the resulting unusually high stresses.

## SCALE DOCUMENTATION

Three-view drawings and photo packs of full size SR-9's are available from:

Scale Model Research
3114 Yukon Ave, Costa Mesa, CA 92626
(714) 979-8058
Fax: (714) 979-7279

## *DESIGNER'S NOTES*

*For several years I've been hearing modelers say, "It's time for something different."*

*Well, this is it - The Top Flite Stinson Reliant, Gold Edition, for the scale craftsman. We have tried hard to design a 'traditional' stick model with Gold Edition engineering. This model is a departure from what we normally do, so if you like it, please let us know.*

*The Top Flite Stinson Reliant is a LARGE model that requires strong craftsmanship and modeling skills. Be prepared for a richly rewarding project that requires dedication to a sometimes challenging project. Do not be intimidated by the Gull Wing of the Reliant. The wing is relatively easy to build on a flat building board with the included die-cut jigs. DO be mildly intimidated by the traditional mostly stick-built fuselage.*

*The Top Flite Stinson Reliant is a sport scale model of the model SR-9 Reliant, manufactured by Stinson in the late 1930's. With some modifications, it can also be built as a*

*model SR-10. The most recognizable features of the aircraft are the gull wing and the 18 blisters on the engine cowl for the engine valve assemblies.*

*The gull wing at first looks difficult to build, but, it is actually comparatively easy to build using the die-cut trailing edge jigs. The most difficult part of the wing construction is the extensive cap stripping needed to duplicate the fabric covered appearance of the full-size aircraft. There are 132 feet of cap stripping material included in this kit, but you won't need all if it. You should end up with at least two feet of scrap!*

*With its eighteen blisters, the cowl looks, and is, intimidating! We like to call it our easy-to-build 20-piece cowl. It sure does look nice on the model though. If you aren't up to it, leave the blisters off and tell everyone your model is the SR-10-2. The plans show where to modify the top fuselage formers to the outline of the SR-10.*

*Speaking of the fuselage, it's pretty much your typical stick-built structure. We have worked hard to engineer a structure that is easier to build than most stick type structures and to assure a straight, square structure. We have even die-cut some of the sticks where precision is required (die-cut sticks; now that's unique). As the full-scale aircraft is very big, so is this 1/5 scale model. Its very size makes it easier to incorporate some impressive scale details. To gain access to the wing hold-in bolts you must build at least one functional door. Once you build one, the second won't take nearly as long.*

*Just keep one thing in mind as you build this model: "You never finish a scale model; you eventually come to a point where you stop working on it and fly." While this is a moderately difficult project, it is also richly rewarding.*

## SCALE ACCURACY

*The Top Flite Stinson Reliant SR-9 is a faithful reproduction of the full-size aircraft, with a few exceptions:*

1. *The horizontal stab/elevator area has been increased by 9% to improve pitch stability. To make the stab closer to scale, move the stab leading edge 1/2" aft. Then re-contour the ribs and stab tip.*
2. *The wing strut attaches directly to the side of the fuselage to simplify construction. This is close to the location of the SR-10 but is noticeably different than the SR-9. If desired, you could move the mounting location to the scale location.*
3. *The windscreen shown is for the SR-9. With some balsa blocks you could make one that looks like the SR-10. This is one area where your craftsmanship will allow you to make the windscreen as scale-like as you desire.*

*This is one model that can be made very true to scale.*

## POWER

*DO NOT overpower this model. The power plant needed for your model will largely depend on how you finish it and whether you use a gas or glow engine. If you cover the model with fabric and then paint it, you could easily add four or more pounds to the finished weight of the model. A gas engine will also add a pound or two. This model can easily handle the weight, however, as it has a large wing area and high-lift airfoil.*

*The weight of the model does affect the power required to fly it, however. If you are careful to build the model as light as possible and cover if with film instead of fabric, the flying weight will be closer to 16 lbs. At this weight a strong 1.20-size four-stroke engine will be ample power. But if you build heavy and cover the model with fabric and paint, the model will weigh closer to 25 lbs., requiring a more powerful engine.*

*Our prototype model was covered with Super Coverite Fabric and then painted with the Stits paint system. It was detailed with pinking tape, rib stitching and other detailing. It had a flying weight of 23 lbs. and was powered by an O.S. FT-160 twin-cylinder engine. This proved to be a near perfect combination. The engine produced a static thrust of 13 lbs., 8 oz. with a Zinger 18 x 6-10 prop. A strong 1.20-size engine, such as the O.S. FS-120 III or the YS-120 NC, will produce a static thrust of 13 lbs. on a 16 x 6-10 prop. This would be ample thrust for a model that weighs less than 20 lbs.*

*You should also bare in mind that this is a high-drag aircraft. Weight is not the only factor you need to consider when selecting an engine. Normally, a 1.20-size engine would be adequate power for a 16 lb. model - and is for the Stinson as well. But, due to the higher drag of the Stinson, a tired 1.20 size engine will not give the performance you would expect during slow speed maneuvers, such as a go-around during a landing. That is why we recommend only powerful 1.20 engines.*

*It is important that you do not overpower this model as well. This is a fabric-covered aircraft which means the tail surfaces and wings will not have the rigidity you are used to with other models. Too much power will result in higher airspeeds, which could cause flutter. While a 35cc gas engine is within the recommended power range, a high performance, powerful 3W type of engine should not be used. Our 23 lb prototype model flew in a convincing, scale like manner on an OS FT-160 engine producing 13 lbs., 8 oz of thrust.*

*If you do install an engine at the upper end of the power range, you should sheet the tail surfaces with 1/16" balsa to increase their rigidity.*

*If you cover the model with fabric and paint, be careful not to allow excess weight to accumulate by applying too much filler and paint. This is a large model and paint can quickly increase its weight if not properly applied.*

## WHAT'S INCLUDED IN THE KIT

*This is a very complete kit for a model of its size and type. However, there are a few items that are not included. We have not included an engine mount and mounting hardware because of the wide variety and type of engines that could be used on this model. We do not feel it fair to increase the cost of the kit by including a mount that most modelers won't use anyway. Similarly, we have not included control surface hinges or the rudder pull-pull linkage system. It has been our experience that many modelers building this type of kit are likely to have strong preferences for these components. (If you have no preference, we recommend Robart #310 Super Hinge Points (24 total) (2-ROBQ2510) and the Sullivan No. 520 steel Pull-Pull Cable Kit.)*

### *FLIGHT CHARACTERISTICS*

*Our prototype model had no bad habits or other areas to be concerned about. Its ground handling was excellent for a tail dragger and it was easy to takeoff and land from a grass field. It showed little tendency to ground loop, even on a smooth hard surface runway. It has a thick airfoil, and its fuselage cross section is large, so the model has a great deal of drag. This limits the top speed of the model and allows it to slow quickly for landing. With full flaps, steep approaches can be accomplished, just as in the full-scale aircraft. Because of the high drag, be prepared to carry more power for landing than you are accustomed to with other models.*

## OTHER ITEMS REQUIRED

These are additional items you will need to complete your Stinson that are not included with your kit. Order numbers are in parentheses (GPMQ4130). Our exclusive brand is listed where possible: TOP is the Top Flite® brand, GPM is the Great Planes® brand, and HCA is the Hobbico® brand.

- ❏ 4 to 5 Channel radio with 5 high-torque servos for ailerons, elevator and rudder, and standard servos for flaps (2) and throttle (1)
- ❏ Y-connectors for aileron, elevator and flap servos
- ❏ (2) 24" Servo extensions for aileron servos
- ❏ (4) 24" Servo extensions for battery, rudder, elevator servos (for gasolineengine installation, in which these components are installed in the tail)
- ❏ Pull-Pull cable kit for rudder steering (SULQ3120)
- ❏ (2) 5" Main Wheels (DUBQ0800)
- ❏ 2" Tail wheel (DUBQ0755)
- ❏ 16 oz. Fuel tank (GPMQ4107) (for glow engines)
- ❏ Silicone fuel tubing (GPMQ4131) (for glow engines)
- ❏ 24 oz. Fuel tank (GPMQ4112) (for gas engines)
- ❏ Gasoline fuel tubing (for gas engines)
- ❏ Fuel filler valve (GPMQ4160) (for glow engine)
- ❏ 1/2" (HCAQ1050) or 1/4" (HCAQ1000) R/C Foam rubber padding
- ❏ 1/5 Scale replica radial engine (TOPQ7903)
- ❏ Covering
- ❏ Paint
- ❏ Large capacity Rx battery pack suitable for giant scale models

## BUILDING SUPPLIES

Here's a list of supplies you should have on hand while you're building. Some of these are optional. Use your own experience to decide what you need. We recommend Great Planes Pro™ CA and Epoxy.

### ADHESIVES

- ❏ 4 oz. Thin CA (GPMR6004)
- ❏ 4 oz. Medium CA+ (GPMR6010)
- ❏ 2 oz. Thick CA- (GPMR6015)
- ❏ CA Accelerator (GPMR6035)
- ❏ CA Debonder (GMPR6039)
- ❏ CA Applicator Tips (HCAR3780)
- ❏ 30-minute Epoxy (GPMR6047)
  or
  45-minute Epoxy (GPMR6048)
- ❏ 6-minute Epoxy (GPMR6045)
- ❏ Pro Wood Glue (GPMR6161)
- ❏ Microballoons (TOPR1090)
- ❏ Milled Fiberglass (GPMR6165)
- ❏ Lightweight Hobby Filler (Balsa Color, HCAR3401)
- ❏ Auto body filler (Bondo® or similar)
- ❏ Isopropyl Alcohol (to clean up excess epoxy)

### TOOLS

- ❏ #11 Blades (HCAR0311, 100 qty.)
- ❏ Single-Edge Razor Blades (HCAR0312, 100 qty.)
- ❏ Razor Plane (MASR1510)
- ❏ Hobbico Builder's Triangle (HCAR0480)
- ❏ T-Pins (HCAR5100 (S), HCAR5150 (M), HCAR5200 (L)
- ❏ Drill Bits: 1/16", #48 (or 5/64"), 3/32", #36 (or 7/64") and 6-32 tap, 1/8", 9/64" (or 5/32"), 5/32", 7/32", 1/4"
- ❏ Curved-Tip Scissors (HCAR0667)
- ❏ Long handle 7/64" ball end hex wrench (GPMR8003)
- ❏ Silver Solder w/flux (GPMR8070)
- ❏ Great Planes Plan Protector (GPMR6167) or wax paper
- ❏ Masking Tape
- ❏ Easy–Touch™ Bar Sanders
- ❏ Dremel® #178 cutting bit (for countersinking screws in the servo hatch covers)

**Note:** In several instances the manual suggests using brass tubing sharpened on one end to cut accurate, clean holes in balsa. Use a rotary tool with a cut-off wheel to sharpen the outside edge of the tube, and a hobby knife to sharpen the inside edge of the tube. The sizes of tubing used are 3/16", 7/32" and 3/8".

## RECOMMENDED COVERING TOOLS AND ACCESSORIES

- ❏ Top Flite Heat Gun (TOPR2000)
- ❏ Top Flite Trim Seal Tool (TOPR2200)
  -and-
- ❏ Top Flite Sealing Iron (TOPR2100)
- ❏ Top Flite Hot Sock (TOPR2175)
  -or-
- ❏ 21st Century Sealing Iron (COVR2700)
- ❏ 21st Century Cover Sock (COVR2702)

## 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 patented **Easy-Touch Bar Sanders** and replaceable **Easy-Touch Adhesive-backed Sandpaper**. While building the Stinson we used two 5-1/2" Bar Sanders and two 11" Bar Sanders equipped with 80-grit and 150-grit Adhesive-backed Sandpaper.

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

5-1/2" Bar Sander (GPMR6169)
11" Bar Sander (GPMR6170)
22" Bar Sander (GPMR6172)
33" Bar Sander (GPMR6174)
44" Bar Sander (GPMR6176)
11" Contour Multi-Sander (GPMR6190)

12' roll of Adhesive-backed sandpaper

80-grit (GPMR6180)
150-grit (GPMR6183)
180-grit (GPMR6184)
220-grit (GPMR6185)

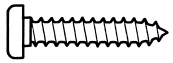
Assortment pack of 5-1/2" strips (GPMR6189)

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

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

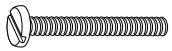
**Sheet metal screws** are designated by a number and a length.

For example #6 x 3/4" [1.91mm]



**Machine screws** are designated by a number, threads per inch, and a length.

For example 4-40 x 3/4" [1.91mm]



## IMPORTANT BUILDING NOTES

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

- Whenever the term ***glue*** is used you should rely upon your experience to decide what type of glue to use. When a specific type of adhesive works best for that step we will tell you what type of glue to use.

- Whenever just ***epoxy*** is specified you may use ***either*** 30-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.
- Occasionally we refer to the *top* or *bottom* of the model or *up* or *down*. To avoid confusion, the *top* or *bottom* of the model is as it would be when the airplane is right side up and will be referred to as the top even if the model is upside-down during that step, *i.e.* the top main spar is always the top main spar even if the wing is upside-down when you are working on it. Similarly, *move the former up* means move the former toward the top of the fuselage even if the fuselage is upside-down when you are working on it.

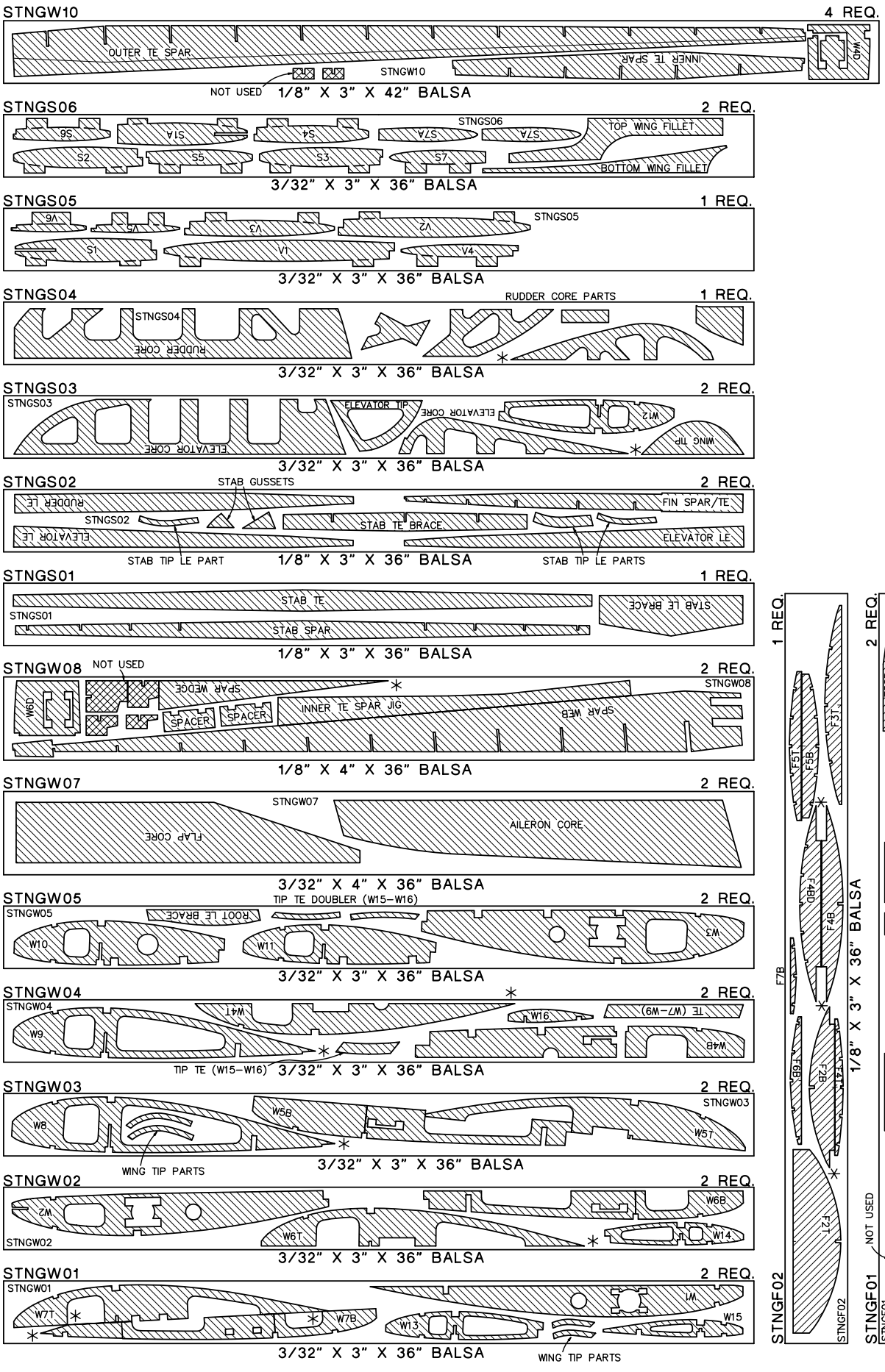
- When you get to each step, read that step **completely through to the end** before you begin. Frequently there is important information or a note at the end of the step that you need to know before you start.

- **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.

- Note that there are four plan sheets. Two of them must be cut along the dashed lines and joined with tape. The other two plans are used separately.

(Continued on page 10)

# DIE-CUT PATTERNS

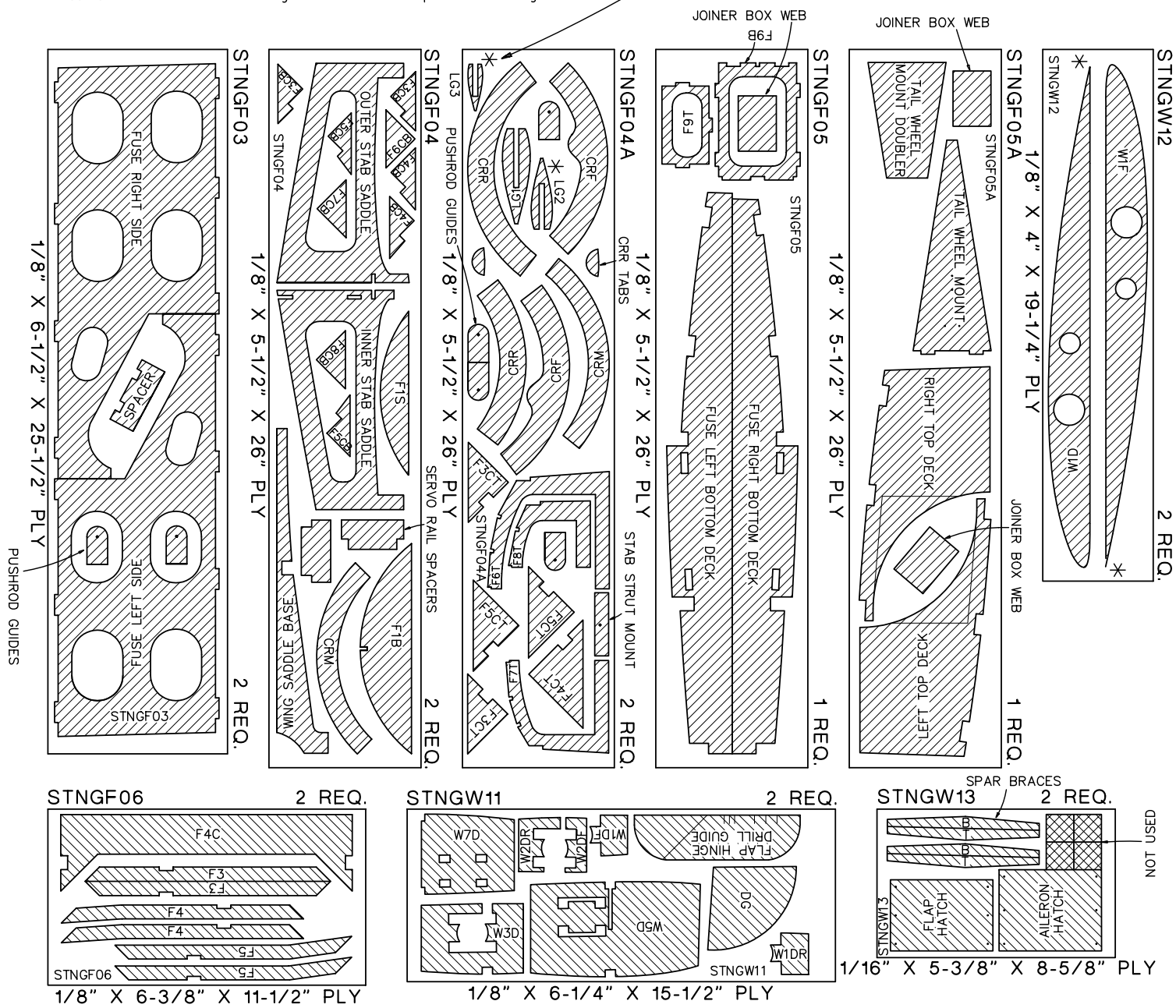



NOTE: ✳
An asterisk (*) on these die drawings indicates areas where you will have to finish cutting around some parts in order to remove them from their die sheets. In some instances the die-cutting blades cannot be placed close together.

# DIE-CUT PATTERNS

NOTE: ✳
An asterisk (*) on these die drawings indicates areas where you will have to finish cutting around some parts in order to remove them from their die sheets. In some instances the die–cutting blades cannot be placed close together.

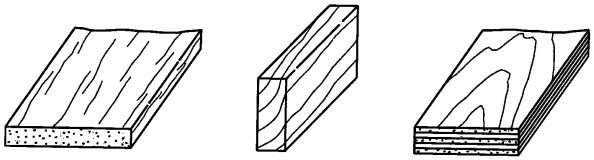
NOTE:
Refer to page 42, step 2 of the manual before removing LG2 and LG3 from the die sheet.



## COMMON ABBREVIATIONS

| | |
|---|---|
| Deg = degrees | Elev = elevator |
| Fuse = fuselage | " = inches |
| LE = leading edge | Ply = plywood |
| Stab = stabilizer | TE = trailing edge |
| LG = landing gear | mm = millimeters |

## TYPES OF WOOD



**BALSA** **BASSWOOD** **PLYWOOD**

## METRIC CONVERSION

1" = 25.4mm (conversion factor)

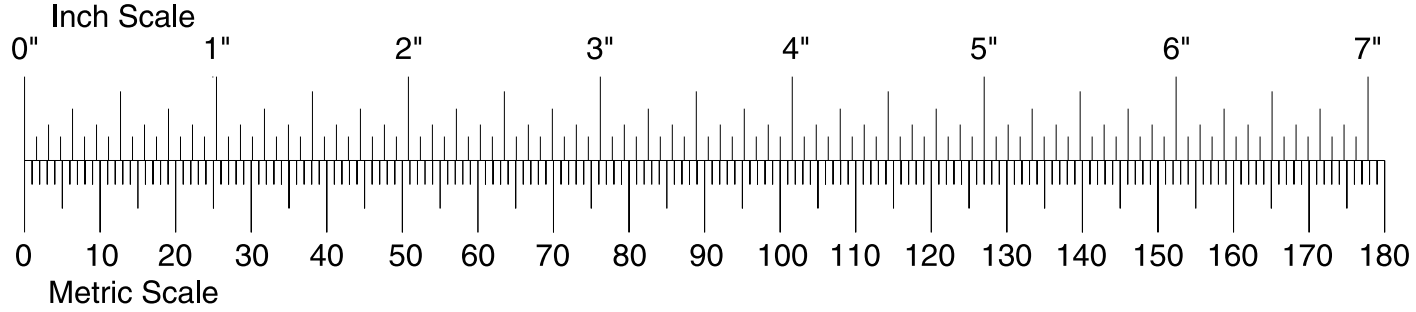
| | |
|---|---|
| 1/64" = .4mm | 1" = 25.4mm |
| 1/32" = .8mm | 2" = 50.8mm |
| 1/16" = 1.6mm | 3" = 76.2mm |
| 3/32" = 2.4mm | 6" = 152.4mm |
| 1/8" = 3.2mm | 12" = 304.8mm |
| 5/32" = 4mm | 15" = 381mm |
| 3/16" = 4.8mm | 18" = 457.2mm |
| 1/4" = 6.4mm | 21" = 533.4mm |
| 3/8" = 9.5mm | 24" = 609.6mm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

## GET READY TO BUILD

1. Unroll the plan sheets. Roll them inside out so they lie flat. Cut the two fuselage plan sheets where indicated along the dashed lines and join them with tape.

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 you can identify it later. Use the ***die-cut patterns*** on page 8 & 9 to identify and mark the die-cut parts **before** you remove them from their die sheets. Many of the parts already have numbers stamped on them, but in some cases the numbers are located alongside the parts or only on the die drawings in the manual. You may remove all the die-cut parts from their die sheets now or wait until you need them. If a part is difficult to remove, don't force it out but cut around it with a hobby knife and a #11 blade. After you remove the parts from their die sheets, lightly sand the edges to remove slivers or die-cutting irregularities. Save some of the larger scraps of wood.

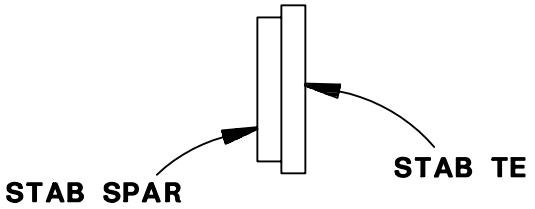
3. Separate the parts into groups such as **stab, fin, wing,** and **fuse.** Store smaller parts in zipper-top food storage bags.



# BUILD THE TAIL SURFACES

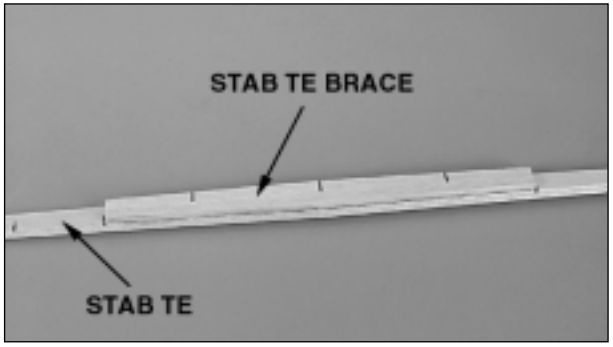
## Build the stabilizer

❏ 1. Place the stab plan over your building board (you may cut it from the fuse plan) and cover it with Great Planes Plan Protector or waxed paper.




❏ 2. Without using any glue, position the die-cut 1/8" balsa **stab spar** on the die-cut 1/8" balsa **stab TE**. Note that the stab spar is centered height-wise on the stab TE to accommodate the cap strips and is centered lengthwise to accommodate rib S7 at both tips. Glue the stab spar to the stab TE as described. From now on, this assembly will be referred to as the **stab TE**.

❏ 3. Make the 1/4" **stab TE brace** by gluing together both die-cut 1/8" balsa **stab TE braces** so the notches align.



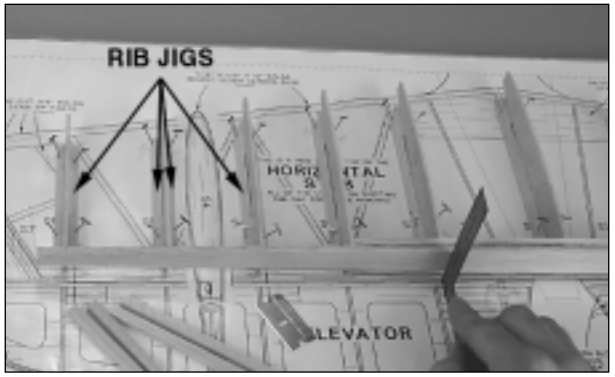

❏ 4. Glue the stab TE brace to the stab TE. Note that the notches in the stab TE brace are **opposite** the notches in the stab TE.

*Now that the preliminary stuff is done, let's start framing this baby up!*

### HOT TIP

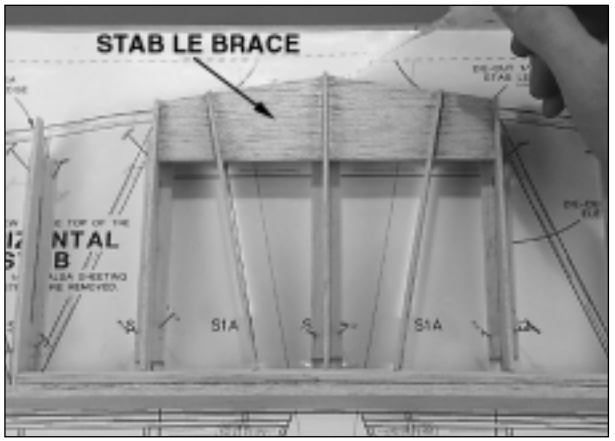
Some modelers prefer to vent the air that gets trapped inside the control surfaces (stab, elevators, fin, rudder, ailerons, flaps) while covering. Trapped air expands and prevents the covering from fully shrinking. To avoid this, drill or cut holes in the ribs before you begin building. Later, drill a hole in an inconspicuous spot near the tip of the leading edge of the control surfaces and in the trailing edge of the stab and fin. This is most important on smaller parts like the elevators and rudder *(though they're not so small on this model!)*.

❏ 5. Without using any glue, insert the die-cut 3/32" balsa **stab ribs** S1 - S6 into the notches of the stab TE. Position the assembly over the plan. Do not install S1A at this time.

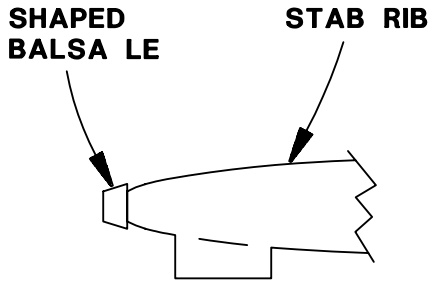


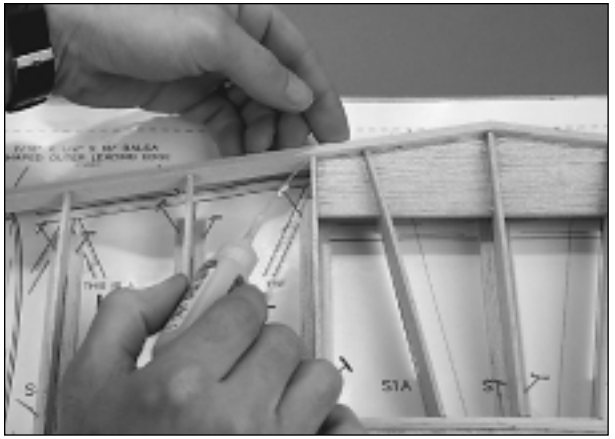

❏ 6. Cut **rib jigs** from four 1/4" x 1/4" x 36" balsa sticks. The rib jigs extend from the forward jig tabs to the aft jig tabs on all the ribs. Use the rib jigs and T-pins to hold the ribs over their location on the plan. After all the ribs are in position, use a small square to align the TE over the plan.

❏ 7. Use thin CA to glue the ribs to the TE. As you proceed, **be certain** the jig tabs of all the ribs are contacting the plan.



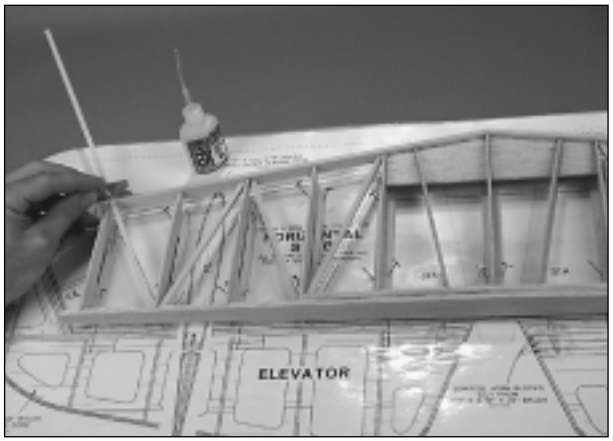

❏ 8. Test fit both die-cut 3/32" balsa **ribs S1A** and the die-cut 1/8" balsa **stab LE brace** to the assembly. Make adjustments where required for a good fit, then glue the pieces into position.




❏ 9. Use a hobby knife or a bar sander to bevel the leading edge of the ribs to match the aft sweeping

angle of the LE. Cut two shaped 15" balsa **stab LE's** to match the plan, then glue them centered, as shown in the sketch, to the fronts of the ribs and the LE brace.

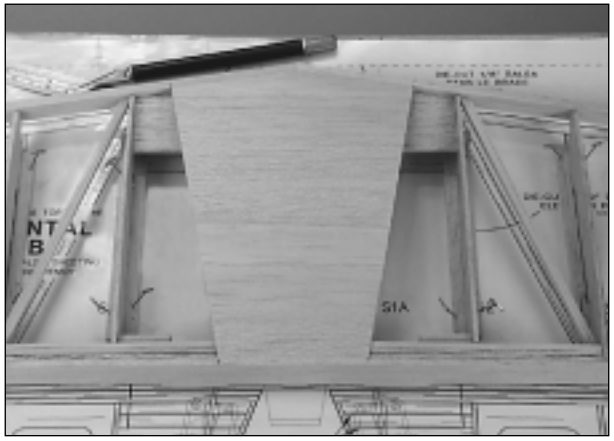



❏ 10. Cut the stab **cross-bracing** as shown on the plan from two 3/16" x 3/16" x 36" balsa sticks. Glue the bracing into position (you may have to reposition some of your T-pins if they interfere with the cross-bracing).

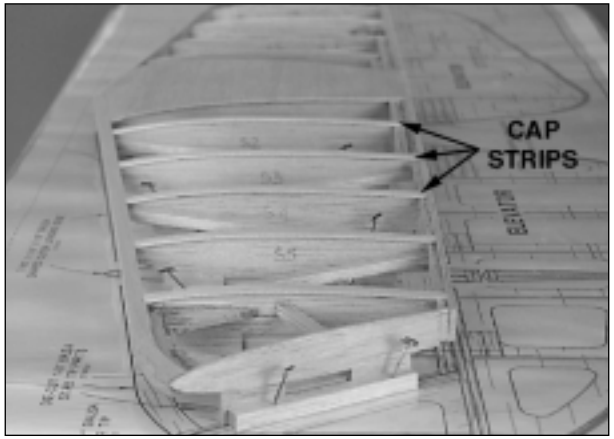

❏ 11. Glue together the three die-cut 1/8" balsa stab tip LE's to make a **stab tip LE**. The larger piece is "sandwiched" between the two smaller pieces. Build the left stab tip using the stab tip LE you just made, the die-cut 1/8" balsa **stab tip gussets**, the die-cut 3/32" balsa stab rib **S7** and an additional 3/16" x 3/16" cross-brace. Trim the TE even with tip rib S7.

❏ 12. Build the right stab tip the same way.

❏ 13. Cut ten 1" long **stab hinge blocks** from a 1/4" x 7/16" x 24" balsa stick, then glue them to the stab TE where shown on the plan. The hinge blocks should be vertically **centered** on the TE.



❏ 14. Sheet the top of the center section across ribs S1A with a 1/16" x 3" x 24" balsa sheet.
**Important:** If you are using a large engine, sheet the entire stab with 1/16" balsa (not included).

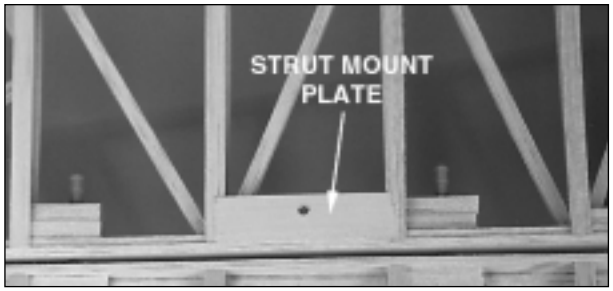



❏ 15. Of the 1/16" x 1/4" x 36" balsa sticks supplied with this kit, select four of the harder sticks. Use two of the sticks you selected to make the **cap strips** extending from the LE to the TE on ribs S2 to S6 on both sides of the stab. Glue the cap strips to the top of the ribs. Carefully and lightly sand the LE and TE, blending them to the cap strips, but do not round the LE until instructed to do so.

❏ 16. Remove the stab from your building board. Save the rib jigs for use on the fin.

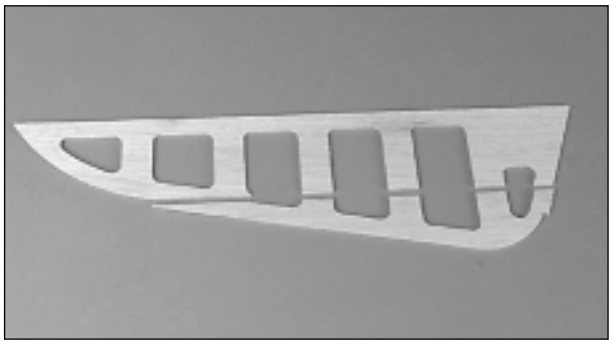
❏ 17. Use a hobby knife to carefully trim the jig tabs from the bottom of the stab ribs. Follow up with a bar sander to make a smooth transition as though the jig tabs never were there.
**Note**: If you are sheeting the entire stab, perform step 19 **before** step 18.

❏ 18. Sheet the bottom of the center section using the remainder of the 1/16" sheeting you used for the top (*aren't you glad you've already cut them?*). Make the cap strips for the bottom of the ribs using the two remaining harder 1/16" x 1/4" x 36" balsa sticks you set aside earlier and glue them into position. Sand the bottom of the stab to blend the LE and TE to the cap strips and the sheeting.

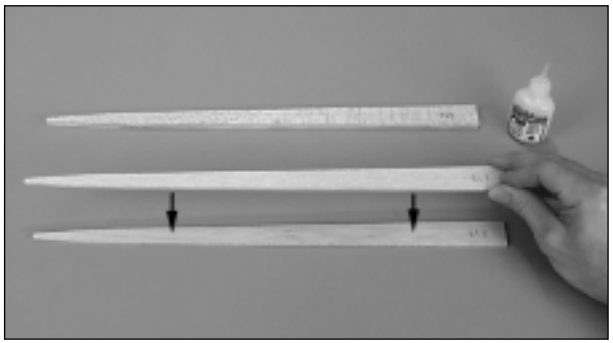



❏ 19. Drill a 9/64" (or 5/32") hole through both die-cut 1/8" plywood **strut mount plates.** Glue a 4-40 blind nut in both plates. Trim the cap strips between ribs S4 and S5 to accommodate the plates, then glue them to the bottom of the stab between the ribs as shown. Fill the space between the aft edge of the mount plate and the TE with leftover balsa.

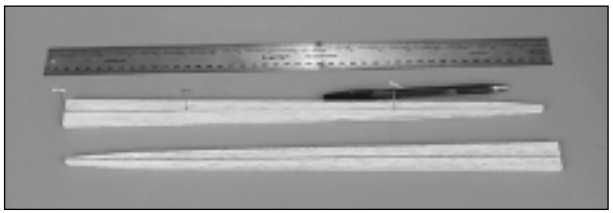
## Build the elevators



❏ 1. Make both **elevator cores** by gluing together the two die-cut 3/32" balsa pieces as shown in the photo and on the plan.

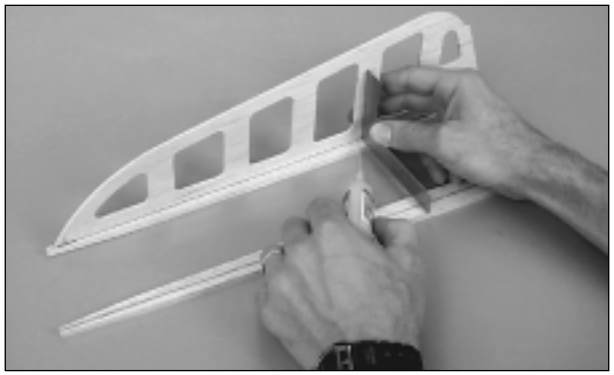


❏ 2. Make two 1/4" **elevator leading edges** by gluing together two sets of die-cut 1/8" balsa **elevator leading edges (ELE)**. Lightly sand the edges to align them and to remove excess glue.

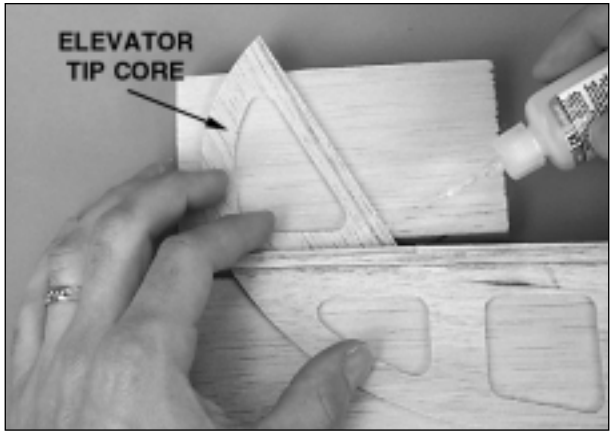


❏ 3. Use a ballpoint pen and a straightedge to mark a centerline on both elevator LE's. Use T-pins to hold the straightedge on center while you mark the line. Using the centerline as a guide, mark an additional guideline close to the centerline (3/64" from the centerline to be exact) to make certain the elevator core will remain true and on center when it's time to glue it to the elevator LE.

***Build the left elevator first.***



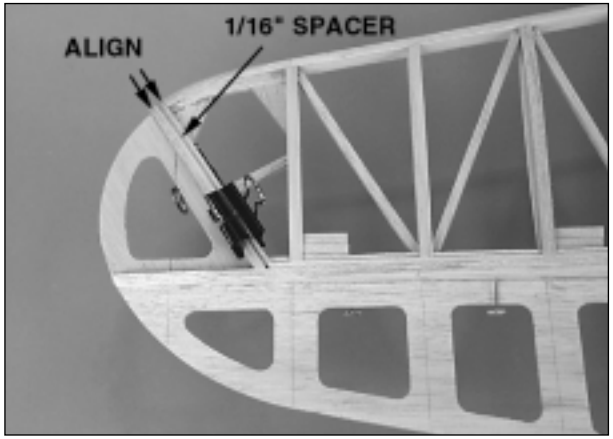
❏ ❏ 4. Glue one of the elevator cores to one of the elevator LE's using the guidelines you drew to keep the core on center and straight. Use a small square to hold the core perpendicular to the LE as you proceed. Note that the LE extends beyond the root end of the core by 1/8".




❏ ❏ 5. Glue the die-cut 3/32" balsa **elevator tip core** to the elevator LE. **Hint:** Place both cores on pieces of 1/2" balsa or something similar to assure correct alignment. Trim the tip of the elevator LE even with the tip core and elevator core.

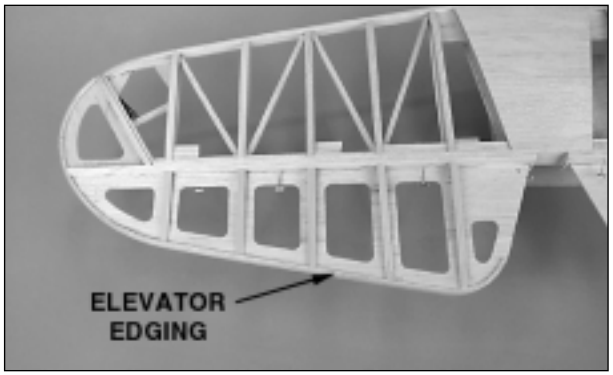
❏ ❏ 6. Glue two die-cut 3/32" balsa elevator S7A ribs together. Refer to the following photo, then clamp the glued-together ribs to S7 on the end of the stab with a 1/16" spacer in between. Use your bar sander to sand the end of the ribs even with the trailing edge. Leave the ribs temporarily clamped to the stab until instructed to remove the clamps.

**Note:** The following steps are intended to assure accurate alignment of the elevator, the elevator tip and the stab. When the elevator is neutral or centered, the elevator tip must also be centered to align with the stab—especially at the leading edge where even a slight misalignment will be easily seen. Keep this in mind while you proceed.

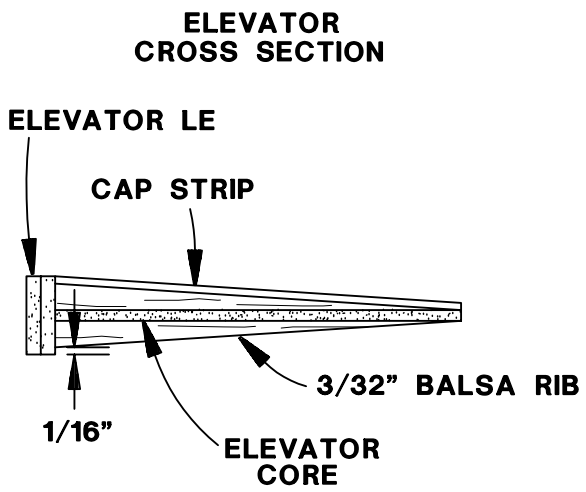



❏ ❏ 7. Temporarily, but securely pin the elevator LE to the stab TE and S7 ribs to the stab. Be certain the elevator core and elevator tip core are centered and neutral, then glue the elevator tip core to the S7A tip ribs.

❏ ❏ 8. Remove the clamps. Use a bar sander to carefully sand the elevator LE and elevator tip ribs to match the stab.




**Use this photo and the sketch below for the following four steps.**

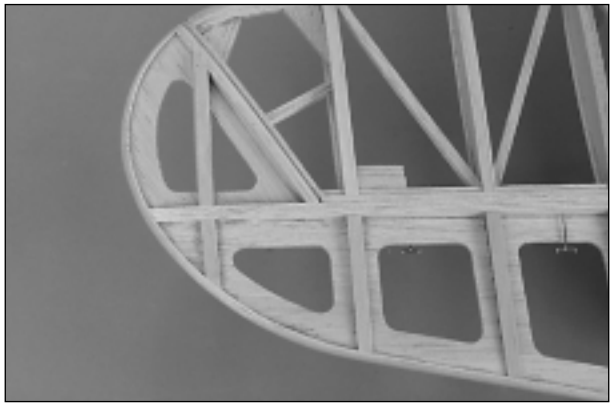



❏ ❏ 9. Use 3/32" x 5/8" x 24" balsa sticks to make the **elevator ribs** that align with stab ribs 2, 3, 4, 5 and 6 for both sides of the elevator. Notice that the ribs should be 1/16" below the elevator LE and taper to a point at the TE to accommodate the cap strips. Glue the ribs to the elevator.

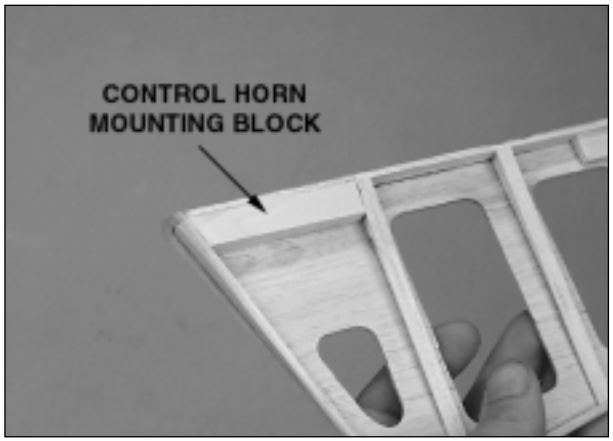
❏ ❏ 10. Cut the cap strips for both sides of the elevator ribs from a 1/16" x 1/4" x 36" balsa stick and glue them in place. Sand the ends of the cap strips even with the elevator core.

❏ ❏ 11. Of the remaining 1/16" x 1/4" x 36" sticks supplied, select four of the softest sticks for the **elevator edging**. Glue one of the sticks to the edge of the elevator as shown on the plan. This is easily done if you begin at the tip (at ribs S7A), use thin CA to glue just a couple of inches at a time and keep the edging centered as you proceed toward the root. When you near the curve at the root, use a fine razor saw to lightly cut part way through the inside of the edging to assist in bending around the curve. Trim the edging to the correct length, bend it around the curve and glue it in place.

❏ ❏ 12. Bend an additional 1/16" x 1/4" x 36" stick around the first layer of edging and glue it in place with medium CA.



❏ ❏ 13. Make the last rib for the end of the elevator from one of the 1/4" x 1/4" rib jigs you used when framing the stab. Sand the rib to blend with the rest of the structure, then carefully sand the elevator edging and the elevator cap strips, blending them as well. Round the leading edge of the stab as shown in the cross section of the plan and finish sanding the elevator and stab, carefully blending all surfaces together.




❏ ❏ 14. Remove the elevator from the stab. Make the **elevator control horn mounting block** for the **bottom** of the elevator from the 5/8" x 5/8" x 22" basswood stick and glue it to the **bottom** of the elevator. Make the elevator ribs for the end of the elevator from leftover 1/8" balsa and glue them in position, then blend the ribs, elevator LE and control horn block by sanding.

*Set the first elevator aside, take a break, clean off your workbench and return to step four and build the right elevator. We'll see you when you get back to here!*

## Hinge the elevators

❏ 1. Make the **elevator hinge blocks** from leftover 3/16" balsa and 1/4" x 7/16" balsa. Glue them in place on both sides of the elevator. Notice that the hinge blocks should slide **under** the cap strips and next to the elevator ribs so they will rest **below** the covering when it is applied.

❏ 2. See the **Hot Tip** that follows, then drill holes or cut slots for your hinges (not supplied) in both elevators and the stab.

HOT TIP

**How to accurately mark the centerlines of the control surfaces for hinging.**

**A**. Insert T-pins through the **center** of the elevator LE near both ends. Position a straightedge along the T-pins and mark a centerline with a fine-point ballpoint pen.

**B**. Do the same for the other elevator and the TE of the stab.

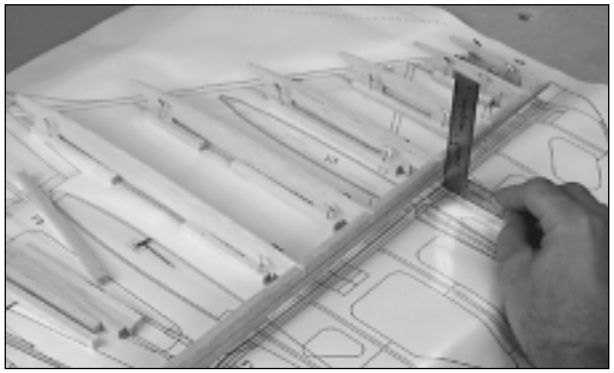
❏ 3. Bevel the LE of both elevators for control throw. Make certain you can achieve 1" of up and down control throw as measured at the widest part of the elevators.

## Build the Fin

❏ 1. Place the fin plan over your building board (you may cut it from the fuse plan) and cover it with Great Planes Plan Protector or waxed paper.

❏ 2. Glue both die-cut 1/8" balsa **fin TE's** together so the notches align. Use a straightedge and a ballpoint pen to draw a centerline on the back of the fin TE.

❏ 3. **Without using any glue**, join the die-cut 3/32" balsa **fin ribs** to the fin TE and place the assembly over the fin plan. Use leftover 1/4" x 1/4" rib jigs from the stab to hold the fin ribs to the plan.



❏ 4. Use a small builder's square to align the fin TE with the plan and to make sure it is perpendicular to your building board. Measure the distance between the centerline you drew and your building board to make sure the fin TE is true and level. Glue the TE to the ribs.

❏ 5. Bevel the front of the fin ribs to the same angle as the LE. Cut a shaped 15" balsa **fin LE** to the length shown on the plan, then glue it into position. The LE is centered on the fin ribs the same as it was on the stab ribs.

❏ 6. Use the 3/16" x 3/16" sticks leftover from the stab bracing to make the fin bracing between the ribs where shown on the plan. Glue the fin bracing into position.

**NOTE:** In the following two photos, disregard the sheeting on the right side of the fin and the fact that the fin is no longer on the building board. Your fin should still be pinned to your building board at this stage.

❏ 7. Use a 1/16" x 3" x 24" balsa sheet to sheet the LE of the fin as shown in the photo and on the plan.

❏ 8. Using the **bottom fin sheeting pattern** on the plan, make the **bottom fin sheeting** from the remainder of the 1/16" x 3" x 24" balsa sheet you used in the previous step. **Note:** When using the patterns provided, always cut the pieces larger than the pattern to allow for positioning, trimming and variances between individual models. Glue the bottom fin sheeting to the fin.

❏ 9. Remove the fin from your building board. Turn it over and cut off the jig tabs.

❏ 10. Make the three **fin hinge blocks** from a 1/4" x 7/16" balsa stick and glue them to the fin TE where shown on the plan.

❏ 11. Sheet the right side of the fin with an additional 1/16" x 3" x 24" balsa sheet the same way you sheeted the left side.

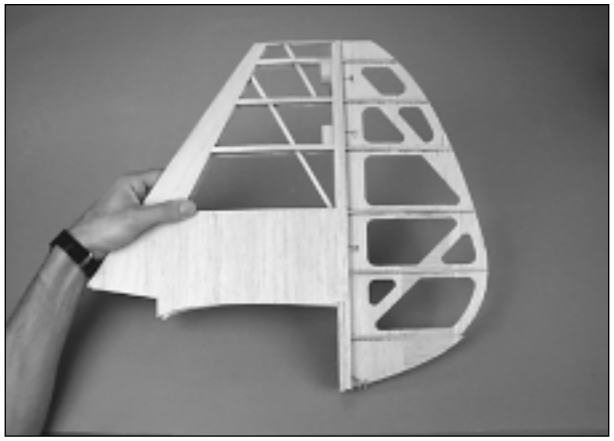
❏ 12. Use two 1/16" x 1/4" x 36" balsa sticks to make the cap strips for the TE and ribs V3, 4 and 5. Sand the fin, blending the sheeting, cap strips and LE together. Set the fin aside for now.

## Build the Rudder

❏ 1. Working over the rudder plan, glue the six die-cut 3/32" balsa rudder core pieces together to make the **rudder core**. *(It's kind of like a puzzle; can you figure it out?)* Sand both sides of the rudder core flat and even.

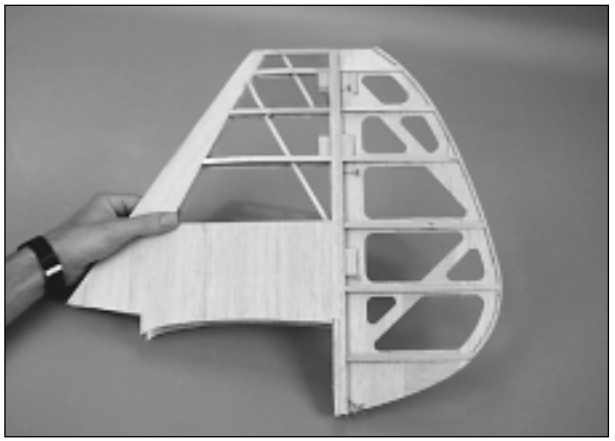
❏ 2. Glue both die-cut 1/8" balsa **rudder LE's** together. Glue the rudder core, on center, to the rudder LE the same way you did the stab cores.

❏ 3. The same way you did the elevators, securely but temporarily T-pin the rudder LE, accurately aligned and on center, to the fin. **Note:** The top of the rudder core and the rudder LE should extend above the top of the fin by 1/16". Carefully sand the sides of the rudder LE to match the fin TE.



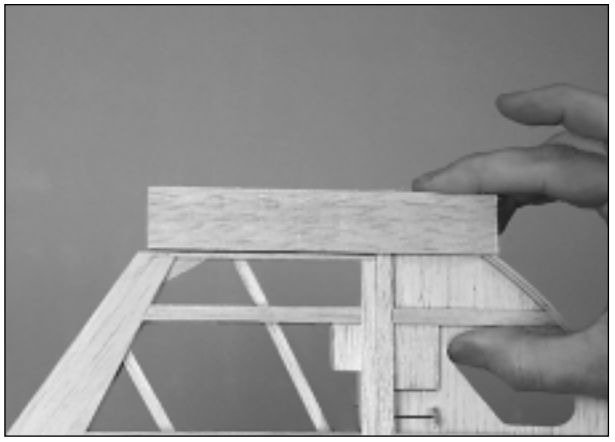
❏ 4. The same as you did for the elevator ribs, cut the **rudder ribs** from 3/32" x 5/8" x 24" balsa sticks and glue them to the rudder core where shown on the plan. Note that the rudder ribs should be 1/16" **below** the rudder LE to accommodate the cap strips (just the same as the elevators were).

❏ 5. Use leftover 3/32" and 1/4" balsa to make the **rudder hinge blocks** and glue them to both sides of the rudder core where shown on the plan.

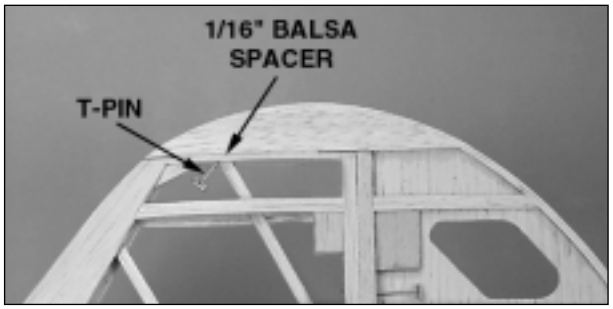


❏ 6. The same way you did for the elevators, make the rudder cap strips from 1/16" x 1/4" x 36" balsa sticks and glue them to the rudder ribs. Sand the ends of the cap strips flush with the rudder core and glue the rudder edging around the TE.

❏ 7. Using leftover 3/32" balsa, make the small **gusset** as shown on the plan for the top of the fin. Glue the gusset to the LE and rib V6.

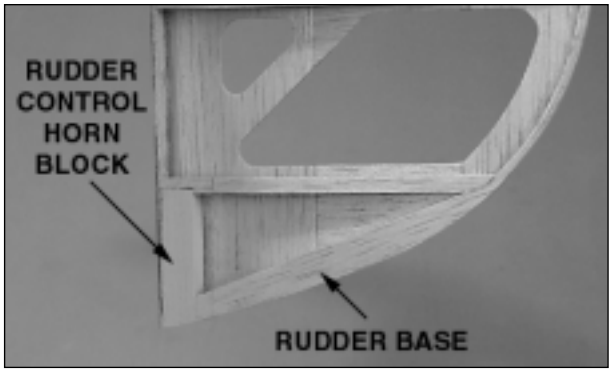


❏ 8. Test fit the 3/8" x 1" x 5-5/8" balsa **rudder tip** to the top of the rudder. Carefully align the rudder tip with the fin, then glue it to the rudder.




❏ 9. Insert a 1/16" balsa **spacer** between the rudder tip and fin rib V6. Hold the rudder tip to the fin with a T-pin. Shape the rudder tip as shown on the plan to match the rudder and fin.

*Now you may separate the rudder from the fin.*




❏ 10. Make the **rudder control horn blocks** for both sides of the rudder from the remainder of the 5/8" x 5/8" basswood stick. Make the **rudder base** for both sides of the rudder from the 3/8" x 1/2" x 12" balsa stick. Trim the bottom cap strip and the rudder edging to accommodate the rudder base, then glue the rudder bases to the rudder. Trim, then sand the rudder control horn blocks and the rudder bases to blend with the rudder, but do not round or final shape until instructed to do so (when it's time to match the rudder to the bottom of the fuse).

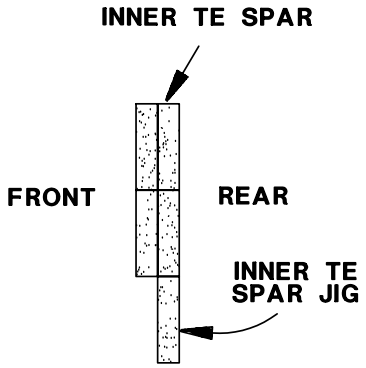
❏ 11. Hinge the rudder and fin the same as you did the stab and elevators. Bevel the leading edge of the rudder to allow for control throw. Be certain you can achieve 2" control throw in both directions.

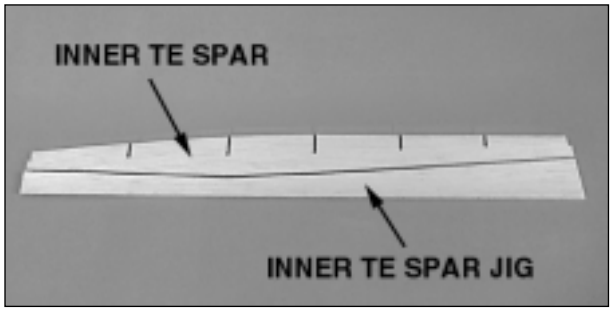
# BUILD THE WING

## Preliminary assembly

❏ ❏ 1. When removing ribs from die-cut sheets, save the 1-1/8" round **plug** from both rib 10's.

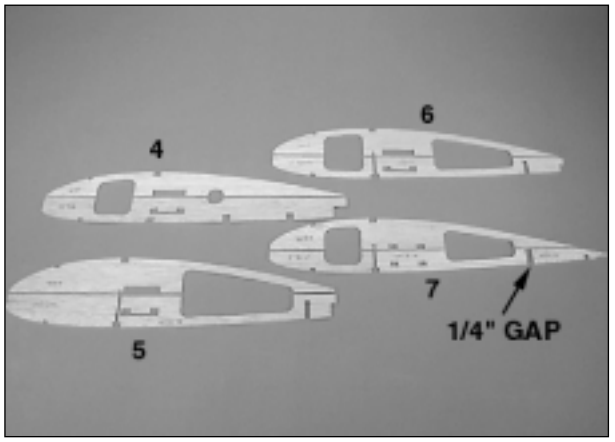
*Build the left wing panel first so yours matches the photos.*



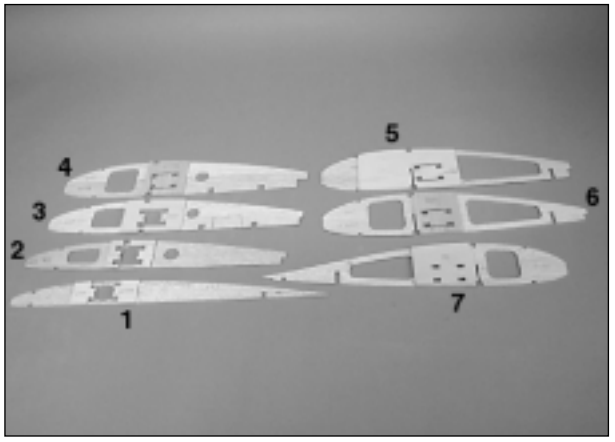




❏ ❏ 2. Glue together two die-cut 1/8" balsa **inner TE spars** with the notches in alignment. Securely, but temporarily, **tack-glue** the die-cut 1/8" balsa **inner TE spar jig** to the bottom of the inner TE spar along the aft edge. The jig will support the inner TE during construction, but will be removed after the wing panel is removed from the building board.

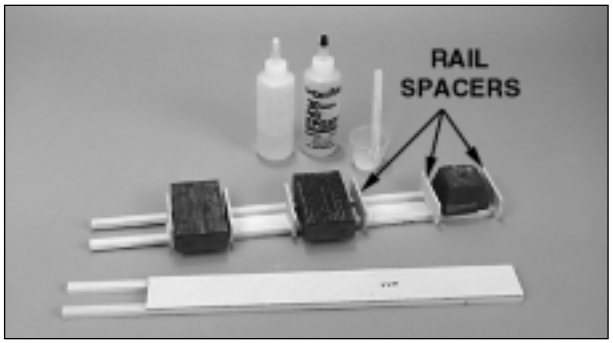
❏ ❏ 3. Cut along the partially die-cut line of one die-cut 1/8" balsa **outer TE spars** and remove the jig**.** Glue that outer TE spar to the **front** of another outer TE spar that has the jig still attached.




❏ ❏ 4. Working over Great Planes Plan Protector, glue together the die-cut 3/32" balsa pieces that make up **ribs W4, 5, 6** and **7**. **Note:** Be certain to leave a 1/4" gap between W7B M and W7B R.



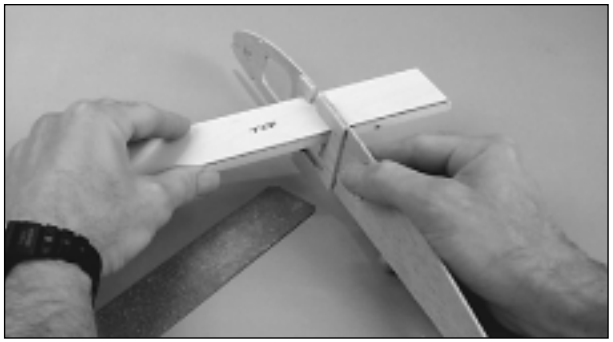

❏ ❏ 5. Glue the die-cut 1/8" balsa **rib doublers** to ribs 4 and 6 and the die-cut 1/8" plywood **rib doublers** to ribs 1, 2, 3, 5 and 7. Refer to the plan to see which side of the ribs the respective doublers are glued to (the doublers go on the outside of all ribs **except** rib 7).




❏ ❏ 6. Cut four 17" **joiner box rails** from two 1/4" x 3/8" x 36" basswood sticks. Refer to the note at the end of this step *(you're reading the steps all the way through before proceeding, aren't you?)*, then use epoxy to glue two of the rails to the 1/8" x 1-11/16" x 14" ply **joiner box top.** Use the die-cut 1/8" balsa and ply **rail spacers** to maintain the correct spacing of the rails. Use C-clamps or weights to hold the rails to the joiner top until the epoxy is fully cured. From now on this assembly will be referred to as the **joiner box top**. **Note:** The root end of the rails extend beyond the 1/8" ply joiner box top by 3/32".

❏ ❏ 7. After the epoxy has fully cured, remove the spacers and sand the edges of the rails and ply box top even. Use a ballpoint pen to write "top" somewhere on the joiner box top.

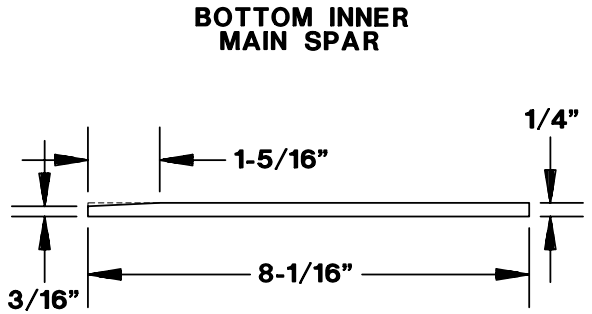
❏ ❏ 8. Make an identical assembly the same way. Mark it as the "bottom."



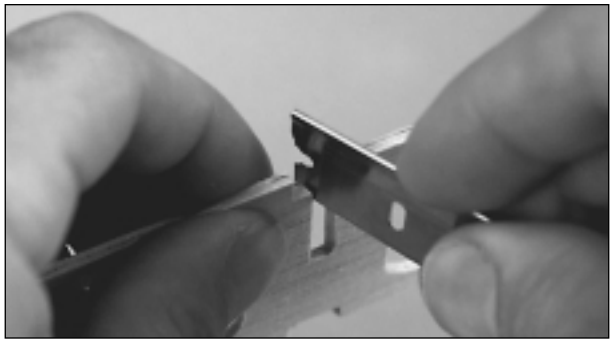
❏ ❏ 9. One rib at a time, test fit the joiner box top through the slot in the top of ribs 2 thru 7. Make adjustments to the slots in the ribs as necessary so the joiner box top can slide all the way through. **Hint:** The joiner box top passes through the ribs at an angle. A thin sanding tool such as a Perma-Grit (F-102) makes sanding the angle in the slots easy.

❏ ❏ 10. Test fit the joiner box bottom through the slot in the bottom of ribs 2 thru 7 the same way.

❏ ❏ 11. Cut the **bottom outer main spar** from a 1/4" x 3/8" x 36" basswood stick to the length shown on the plan (between ribs 15 and 5).

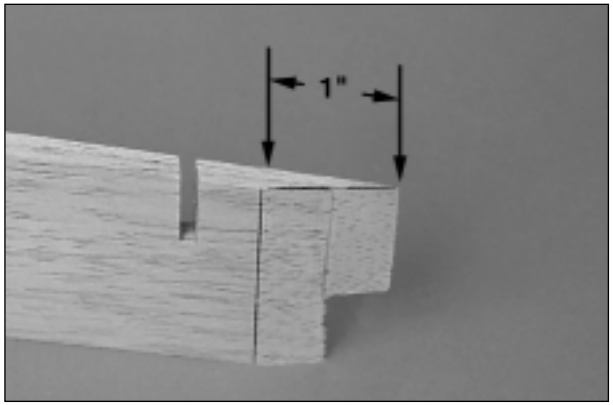



❏ ❏ 12. Following the dimensions in the sketch, cut the **bottom inner main spar** that fits between rib 5 and rib 2 from a 1/4" x 3/8" x 36" basswood stick (or use the remainder of the same stick you used for this step if you are building the second (right) wing panel).



❏ ❏ 13. As you can see by observing the wing plan, the spar web, outer TE spar, top main spar and bottom main spar join the ribs at an angle. However, the notches in the ribs for the spars can only be die-cut straight through. Therefore, you must bevel the notches in ribs 4 thru 15 to allow the spars to pass at the required angle. Use a single-edge razor blade, a sharp hobby knife or a Perma-Grit sander to bevel the notches in the ribs. Study the ribs and the spars for the wing panel you are building to be certain you are cutting the bevel in the correct direction.

❏ ❏ 14. Bevel the notches of the die-cut 1/8" balsa **spar web** and the outer TE spar the same way.




❏ ❏ 15. Bevel the aft edge of the outer TE spar to the angle at which it will meet the inner TE spar 1" from the end.

*Clean all the balsa dust and wood chips off your workbench and put away the CA. We still have more work to do before it's time to start gluing (but at least we're finally going to start fitting parts together!).*

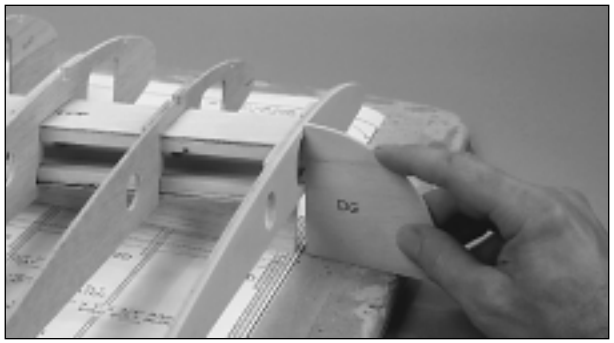
## Frame the panel

❏ ❏ 1. Without using any glue until instructed to do so, fit ribs W5 through W15 on the spar web, then add the bottom outer main spar and the outer TE spar. Cut the **top outer main spar** from a 1/4" x 3/8" x 36" basswood stick and add it to the assembly.

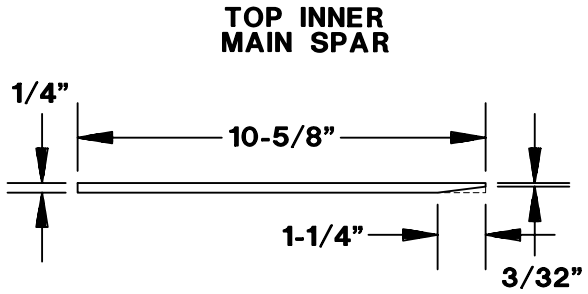

❏ ❏ 2. Position the assembly over the wing plan covered with Great Planes Plan Protector. Use 1/4" x 1/4" balsa jig sticks leftover from building the stab and fin to securely hold the bottom outer main spar and the outer TE spar over their positions on the plan.


❏ ❏ 3. Still without using any glue, add the inner TE spar and ribs 2, 3 and 4 to the assembly. Tack glue the die-cut 1/8" balsa **spar wedge** to the bottom inner main spar and slip the assembly into position under ribs 2 thru 5. Use additional leftover 1/4" x 1/4" balsa rib jigs to hold the inner TE spar in position.

❏ ❏ 4. Slide the joiner box bottom through ribs 2 thru 7, then fit the joiner box top the same way.



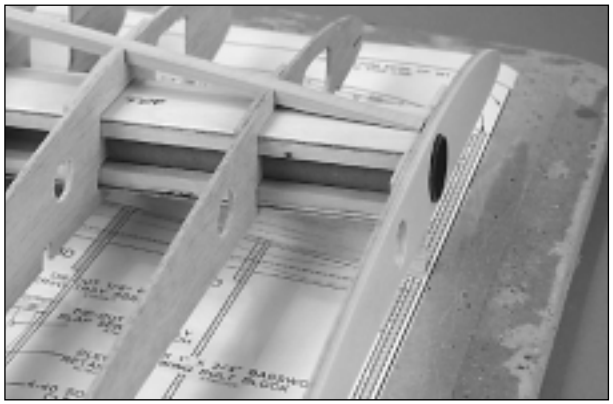
❏ ❏ 5. Glue the die-cut 1/8" plywood **root rib W1D** to W1. From now on these ribs will be referred to as W1. Add W1 to the wing panel making certain the end of the joiner box rails key into W1. Align the die-cut 1/8" plywood **dihedral gauge** with the line indicated on the plan. Position the joiner box top and bottom so that W1 is fully contacting the dihedral gauge.




❏ ❏ 6. Cut the **top inner main spar** to the dimensions shown in the sketch from the remainder of the basswood stick you used for the bottom inner main spar (or use an additional 1/4" x 3/8" x 36" basswood stick if this is your second (right) wing panel). Still without using any glue, join the top inner spar to the wing (you can take a peek at how the spar fits the assembly in the following photo).

❏ ❏ 7. Cut a 6-5/8" piece from the cardboard **wing joiner tube**. True the ends of the 6-5/8" tube with a bar sander. Apply a **small amount** of thin CA to one end of the tube, allow to cure, then sand smooth. Trim the 1-1/8" diameter 3/32" **plug** you saved from rib 10, to fit in the other end of the tube. Glue it in place.

❏ ❏ 8. Use a metal file or sandpaper to remove any burrs you find on both ends of the aluminum **wing joiner** tube. Test fit the aluminum joiner tube into the cardboard tube you just prepared to make sure it fits. If necessary, remove glue bumps from the end of the cardboard tube so the aluminum joiner slides through without resistance.



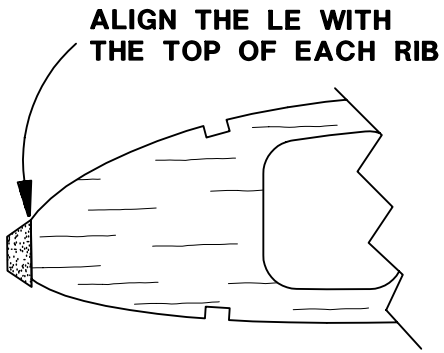
❏ ❏ 9. Test fit the cardboard wing joiner tube through ribs 1, 2 and 3.

*Time to get out the CA. Make sure it's fresh and you have plenty of spare tips because it's finally time to start gluing!* As you proceed, be certain the bottom outer main spar and the jig tabs of the TE spars are fully contacting your building board and be certain all the ribs are fully seated into the notches of the spar web and TE spars.

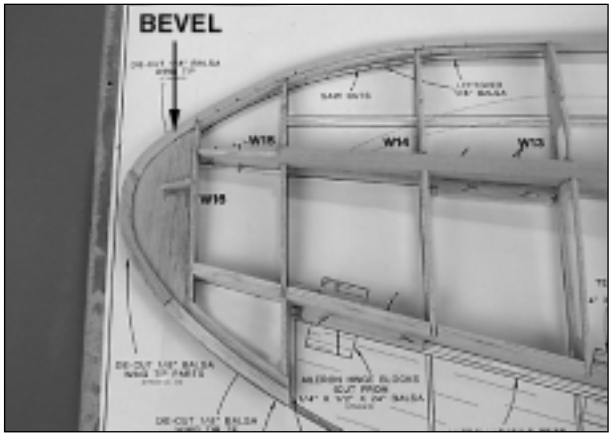
❏ ❏ 10. Glue the spar web to the bottom spar, then to ribs 4 through 15. Glue all ribs except rib 1 to the TE spars and glue the outer TE spar to the inner TE spar. Glue the outer and inner top main spars to each other with epoxy and to all the ribs and the spar web with CA. **Do not** glue the inner top spar to the joiner box top until instructed to do so.

❏ ❏ 11. Glue rib W16 in place.

❑ ❑ 12. Glue the die-cut 3/32" balsa **LE brace** to ribs 1, 2 and 3. Glue rib 1 to the inner TE spar only, while using the dihedral gauge to hold rib 1 at the correct angle over the plan.

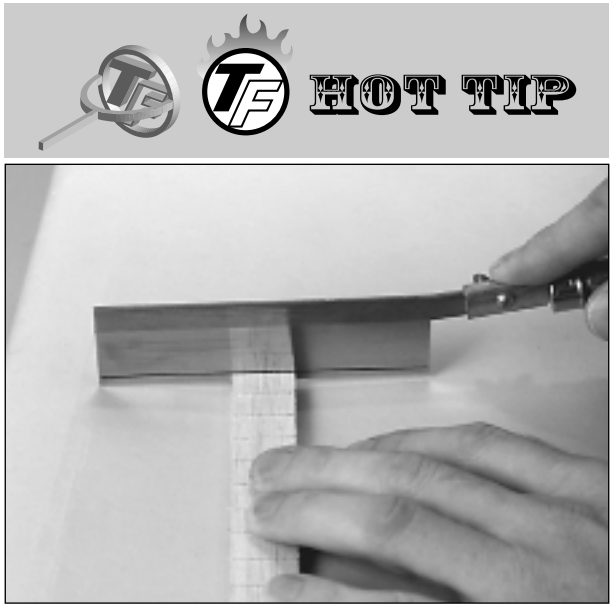



❑ ❑ 13. From the **larger** of the two shaped 24" balsa **LE sticks**, cut the **inner LE** section (that goes from rib 5 to rib 9) to the length shown on the plan. Glue it to the front of the ribs with the upper edge aligned with the front of the ribs.




**Refer to this photo for the following four steps.**

❑ ❑ 14. Refer to the Hot Tip that follows, then cut the **outer LE** from the smaller shaped 24" balsa LE stick and make the saw cuts at the end of the LE as shown on the plan. Trim the bottom of the LE near the end so you can lower it to the fronts of the ribs. Wet the front of the outer LE near the end and carefully bend it into position. When you can achieve the bend, trim the outer LE to the correct length, then glue it to the front of the ribs.

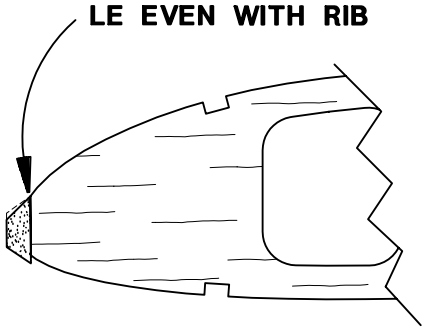



Use a felt tip pen to mark a line 5/32" above the saw teeth on your razor saw. Use the line as a guide so all your cuts will be the same depth for uniform and controlled bending.

❑ ❑ 15. Cut 3/16" wide strips of leftover 1/8" balsa and glue them to aft edge of the outer LE as shown.

❑ ❑ 16. Glue together the eight die-cut 3/32" and 1/8" balsa pieces that make up the **wing tip**. Bevel the front pieces to accommodate the wing tip sheeting that will be added later on, then glue the wing tip to the wing. Add the **top gusset** cut from leftover 3/32" balsa.

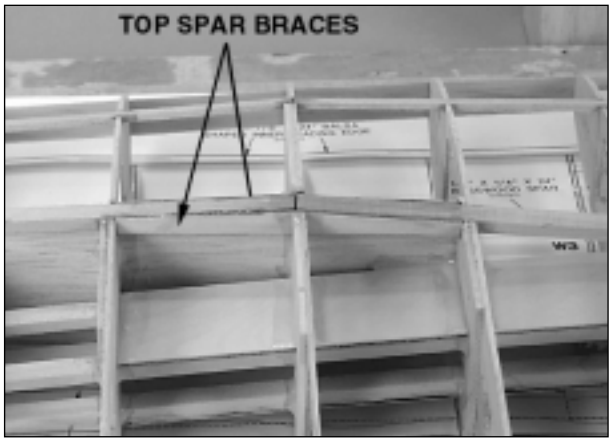
❑ ❑ 17. Trim the remainder of the larger balsa inner LE stick, make the saw cuts, wet the end and glue it to ribs 1 thru 5 and the LE brace.




❑ ❑ 18. Use a razor plane followed with a bar sander and 80-grit sandpaper to trim the LE even with the ribs.

*Now that the wing is stabilized, we can securely glue the joiner box into position.*

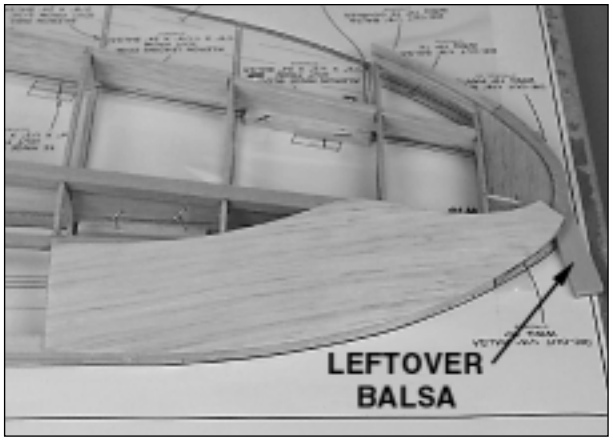
❑ ❑ 19. Mix up about 1/4 oz. of 30 or 45-minute epoxy. Add milled fiberglass for additional strength. Reposition the dihedral gauge on rib W1 and align it with the plan the same way you did before. Use the gauge to make certain the top and bottom joiner boxes are in the correct position and that W1 is at the correct angle. Glue the top and bottom joiner boxes to the ribs everywhere you can reach and glue the cardboard joiner tube in position. Glue W1 to the ends of the joiner box and glue the top inner spar to the ribs and the joiner box top. Keep this operation nice and neat and refrain from using gobs of epoxy, yet be thorough and glue all the joints you can reach. Don't worry about areas you can't reach because we will remind you to apply glue to the rest of the joints after removing the wing panel from the building board. Before the epoxy cures, confirm the joiner box positioning and the alignment of W1 with the dihedral gauge. Allow the epoxy to fully harden before proceeding.




❑ ❑ 20. Cut notches in rib 5 on both sides of the top main spar to accommodate the die-cut 1/16" plywood **top spar braces**. Glue the braces in position with epoxy.

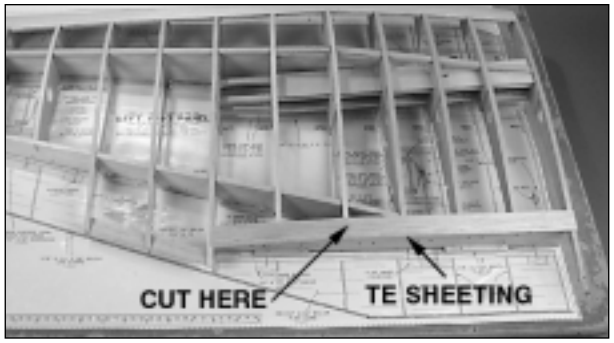
❑ ❑ 21. Use a 1/8" x 1/4" x 31" basswood stick for the top LE spar that goes from rib 15 to rib 5 and a 1/8" x 1/4" x 24" basswood stick from rib 5 to rib 1. Save the remainder of the 24" stick for the bottom of the wing. Glue the spars in position.

❑ ❑ 22. Use a bar sander with 80-grit sandpaper to sand the top of the wing, blending all the spars to the ribs.

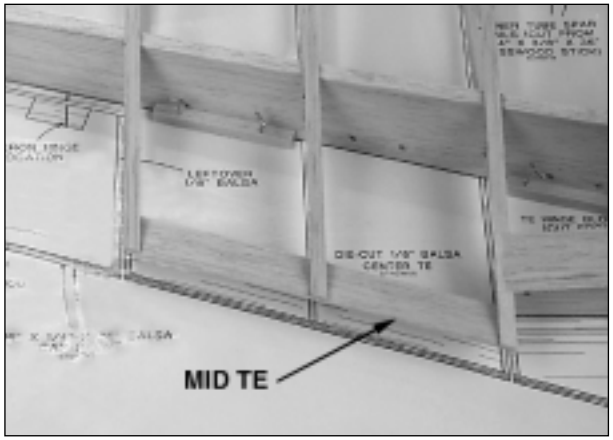



❑ ❑ 23. Use the **wing tip sheeting template** provided on the plan to make the wing tip sheeting from a 3/32" x 3" x 36" balsa sheet. Test fit the sheeting to the wing and trim as required for the correct fit. The sheet ends in the middle of rib 13. If necessary, wet the top of the sheeting with water or window cleaner to facilitate bending. Place a shim from leftover balsa, under the wing tip so you don't misalign it as you are pressing the sheeting down. Then, glue the tip sheeting to the wing.


❑ ❑ 24. Use a 3/32" x 3" x 36" balsa sheet to make the **top wing sheeting** that runs from the tip sheeting at rib 13 to rib 1. You'll have to trim a piece of the sheeting from the tip and glue it near the other end so the sheet will be wide enough to reach from the LE spar to the LE at rib 5. After you've trimmed the sheet to the correct size, glue it only to the LE spar. Wet the sheet and bend it to the LE and glue it to the ribs and LE. **Hint:** Place weights over the trailing edge of the wing to hold it to your building board while you apply pressure to the LE as you bend the sheeting down.

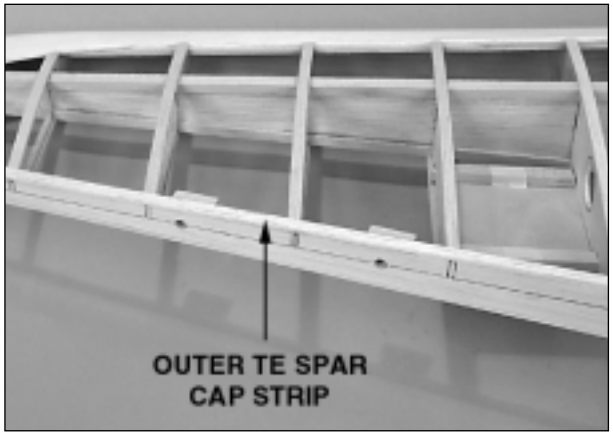



❑ ❑ 25. Make the 3/32" balsa/ply **wing TE sheeting** for the flap area by laminating a 1/32" x 1" x 18" plywood strip to a leftover 1/16" balsa strip. Cut the strip into two pieces as shown and glue them, ply side down, to the wing with 3/8" **extending aft of the inner TE** (this can be seen in the sketch at step 5 on page 24).




❑ ❑ 26. Glue the die-cut 3/32" balsa **mid TE** to the notches in the bottom of ribs 7, 8 and 9. Bevel the aft edge of the mid TE to match the tapering angle of the ribs.

*Now for the fun part!*




**Refer to this photo for the following two steps.**

❑ ❑ 27. Cut the **cap strip** for the outer TE spar that fits between ribs 9 and 15 from a 3/32" x 1/4" x 36" balsa stick and glue it into position.

❏ ❏ 28. Cut the cap strips for the top of all the ribs from five more 3/32" x 1/4" x 36" balsa sticks and glue them into position. The cap strips are most easily and accurately cut with a sharp, single-edged razor blade. Start with the longest cap strips first. If you cut one too short, it may still be used for the next rib down the line. Note that the cap strips on ribs 9 and 15 are offset for the aileron and the cap strip on rib 7 is offset for the flap.

❏ ❏ 29. Take the wing off the building board. Remove the spar wedge you tack glued to the bottom inner main spar. Use 30-minute epoxy to glue the bottom inner main spar and the die-cut 1/16" plywood **bottom spar braces** into position. While you have your epoxy out, glue the joints around the joiner box that you couldn't reach earlier *(I told you we'd remind you!)*.

❏ ❏ 30. Carefully trim the jig tabs off the outer and inner TE spars. Sand the spars even with the ribs. Use a razor plane followed by a bar sander and 80-grit sandpaper to trim the bottom of the LE even with the ribs.

❏ ❏ 31. Cut the bottom **outer** LE spar from a 1/8" x 1/4" x 36" basswood stick and the bottom **inner** LE spar from the remainder of the 1/8" x 1/4" x 24" stick that was used for top inner LE spar.

❏ ❏ 32. Sheet the bottom of the wing over the leading edge the same way you did the top, using a 3/32" x 3" x 36" balsa sheet and the remainder of the 3/32" x 3" x 36" sheet that was used for the top tip sheeting. If you're building the second (right) wing panel, use an additional 3/32" x 3" x 36" balsa sheet for the last tip sheeting piece.

❏ ❏ 33. Use a razor plane and a bar sander with 80-grit sandpaper to clean up the leading edge of the wing by removing excess glue and trimming the top and bottom sheeting even with the LE. *Just roughly shape the LE for now. Do not final sand until instructed to do so.*

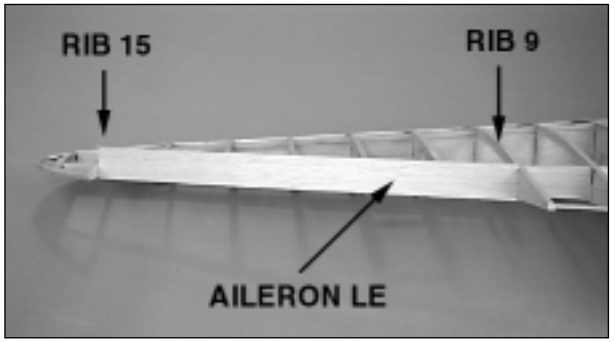
❏ ❏ 34. Use six more 3/32" x 1/4" x 36" balsa sticks for the cap strips over the ribs and outer and inner TE spars of the wing panel. Cut but **do not glue** the cap strips for ribs 3, 4, 10 & 11.

❏ ❏ 35. Cut the **flap** and **aileron servo hatch rails** from leftover 1/4" x 3/8" basswood and glue them into the slots of ribs 3 & 4 and 10 & 11. Glue the cap strips cut in the previous step to the ribs. Note that the cap strips are offset to accommodate the hatch covers.

*At any time from this point forward you may set aside the first wing panel and begin construction on the second, or you may continue with this panel until completion.*

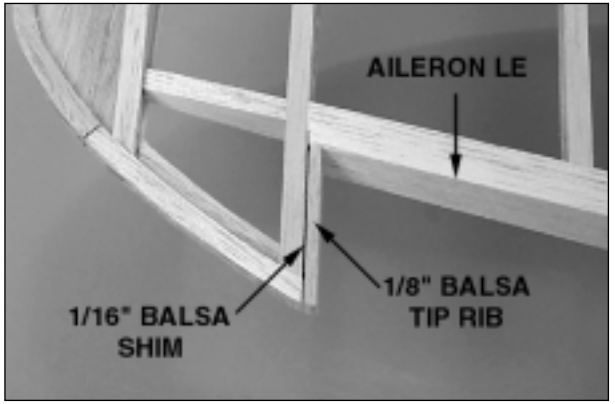
## Build the aileron

*The aileron is built directly onto the wing, then removed after completion. This insures accurate alignment which may otherwise be difficult to achieve due to the built-in washout of the wing.*



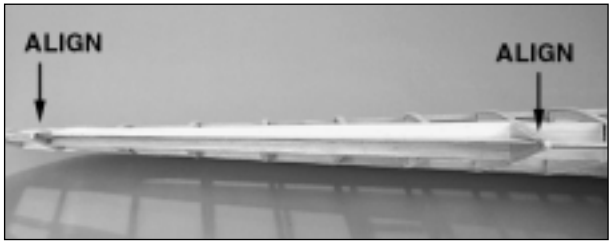

❏ ❏ 1. Cut the **aileron LE** from a 1/4" x 1-1/2" x 24" balsa stick to fit between ribs 15 and 9. Temporarily tack glue the aileron LE to the outer TE spar by applying about three or four drops of thick or medium CA evenly spaced along the outer TE, then pressing the aileron LE into position.

❏ ❏ 2. Use a razor plane followed with a bar sander and 80-grit sandpaper to shape the aileron LE to match the wing.




❏ ❏ 3. Make the **aileron tip rib** from leftover 1/8" balsa, then tack glue it to rib 15 with a 1/16" balsa shim in between. Make the **aileron root rib** the same way.

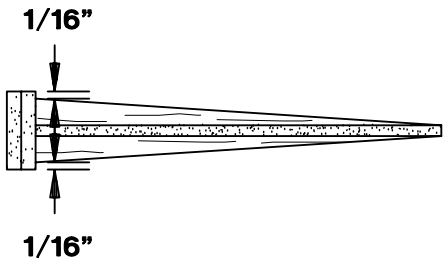
❏ ❏ 4. Test fit the die-cut 3/32" balsa **aileron core** to the wing and trim as necessary for a good fit between the aileron tip ribs. Mark the rib locations on both sides of the aileron core where shown on the plan.




❏ ❏ 5. Position the aileron core on the aileron LE. Align the core so that both ends of the trailing edge align with the wing (at ribs 9 and 15). Because of this alignment, the leading edge of the core may not be **exactly** centered on the LE, but it should be close. This is to account for the washout in the wing. If you are not accurate here, the ends of the aileron may not align with the wing when it's finished.

❏ ❏ 6. After you have aligned the aileron core, glue it to the aileron LE and the tip ribs.

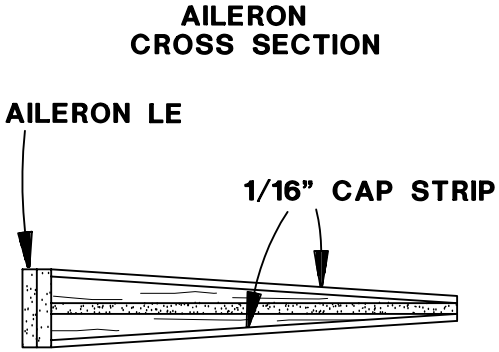
**Refer to this photo for the following five steps.**




❏ ❏ 7. Cut the top and bottom **aileron ribs** from a 3/32" x 5/8" x 24" balsa stick and glue them to the aileron. Be certain to cut the ribs 1/16" below the aileron LE to accommodate 1/16" cap strips which will be added later. **Note:** Don't forget to cut small vent holes through the aileron ribs the same as we suggested for the elevators and rudder. As you may recall, this is to allow expanded air to escape during the covering procedure so the covering will fully tighten.

❏ ❏ 8. Cut the **aileron control horn block** from the 5/8" x 5/8" basswood stick used for the elevators and rudder. Glue the horn block to the **bottom** of the aileron as shown on the plan.

❏ ❏ 9. Cut sixteen 1" long **TE hinge blocks** from a 1/4" x 1/2" x 24" balsa stick. Glue the hinge blocks to both sides of the aileron core and to the outer TE spar where shown on the plan. Trim the hinge blocks on the aileron where necessary so they will not contact the covering.




❏ ❏ 10. Cut the aileron cap strips from a 1/16" x 1/4" x 36" balsa stick and glue them to the aileron ribs.

❏ ❏ 11. Use a bar sander and 80-grit sandpaper to gradually taper the 3/32" cap strips on ribs 7, 8 and 9 to 1/16" at the ends (to blend them to the 1/16" cap strips on the aileron).

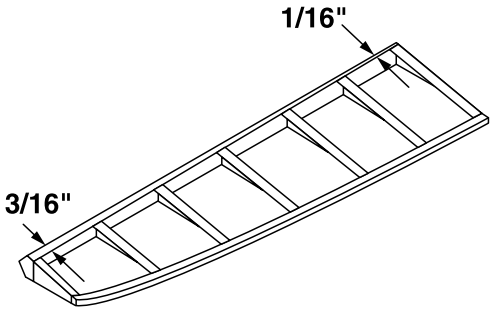
❏ ❏ 12. Use two 1/16" x 1/4" x 36" balsa sticks for the aileron edging. Glue the edging to the aileron and the mid TE. Sand the edging even with the cap strips.

❏ ❏ 13. Cut the edging between the end of the aileron and the mid TE. Carefully "break" the aileron free from the wing. True the ends of the aileron with a bar sander and 80-grit sandpaper.

❏ ❏ 14. Use a straightedge and T-pins to mark the hinge line across the front of the aileron LE. **Note:** The hinge line should be directly in line with the aileron core which may not be **exactly** centered on the LE. (As described in step 5.)

❏ ❏ 15. Mark the hinge line on the outer TE spar to match up with the hinge line of the aileron. Mark the hinge locations where shown on the plan and drill the holes in the aileron and the wing for the hinges.

❏ ❏ 16. Test fit the aileron to the wing with the hinges. Make adjustments where necessary.




❏ ❏ 17. Bevel the LE of the aileron as shown in the sketch. The dimensions shown should provide the correct control throw, but measure the throw of your aileron to be certain you can achieve 1" of up and 7/8" of down throw. Increase the angle of the bevel if necessary to permit the correct throw.

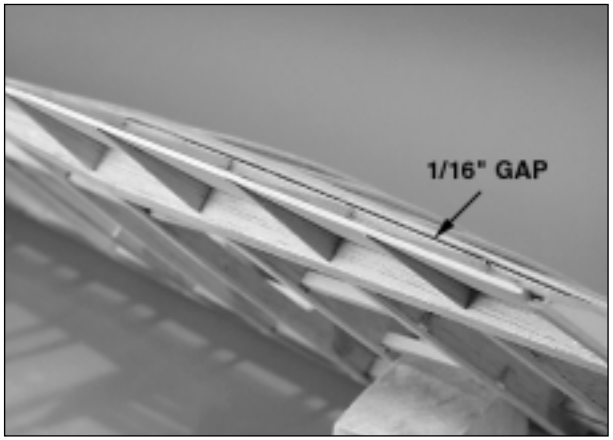
## Build the flap

*The flap is built much the same as the aileron—attached to the wing for accurate alignment and a perfect fit.*

❑ ❑ 1. Cut a 1/4" x 1-1/2" x 36" balsa stick into two 18"-long pieces and glue them together to make the **flap LE**.

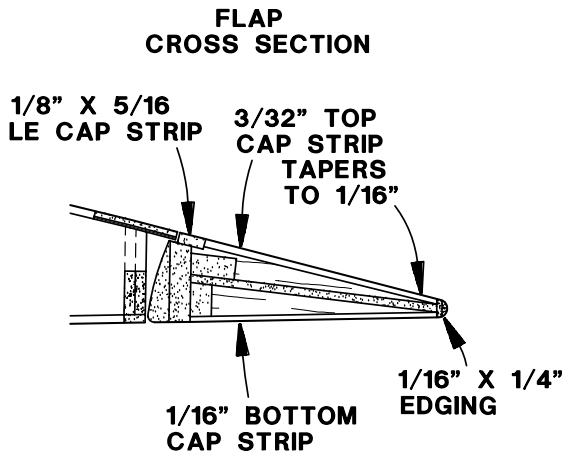
❑ ❑ 2. Trim the ends of the flap LE to fit between ribs 1 and 7. Trim the top of the flap LE to fit the TE sheeting that extends past the inner TE in flap area.

❑ ❑ 3. As you did the aileron LE, tack glue the flap LE to the wing. There must be a 1/16" gap between the top of the flap LE and the TE sheeting (you can see the gap in the following photo). Trim the bottom of the flap LE to match the wing.




**Refer to this photo for the following three steps.**

❑ ❑ 4. As you did with the aileron core, glue the die-cut 3/32" balsa **flap core** to the flap LE. The ends of the flap core should align with ribs 7 and 1.




❑ ❑ 5. Study the sketch to understand how the flap is constructed and what it should look like when completed. Make the **bottom flap ribs** from a 3/32" x 5/8" x 24" balsa stick and glue them into position. Note that there should be a 1/16" gap between the bottom of the flap ribs and the bottom of the flap LE to accommodate 1/16" cap strips which will be added later.

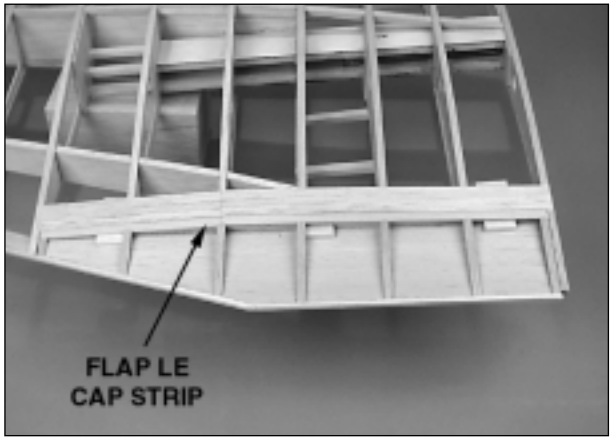
❑ ❑ 6. Make the **top flap ribs** from the remainder of the 3/32" x 5/8" balsa stick you used for the bottom flap ribs and glue them into position. Note that the top flap ribs should align with the top of the flap LE.


**Refer to this photo for the following four steps.**

❑ ❑ 7. Use the 5/8" x 5/8" basswood stick to make the **flap control horn block** that fits on the **bottom** of the flap between flap ribs 3 & 4. Glue the horn block into position.

❑ ❑ 8. Make the **flap hinge blocks** for the top and bottom of the flap from the remainder of the 1/4" x 1/2" balsa stick used for the aileron hinge blocks and glue them into position. Note that there are only two hinge blocks on the bottom of the flap and they lie on the 1/4" side. The hinge blocks on the top of the flap lie on the 1/2" side.

❑ ❑ 9. Cut three 1"-long flap hinge blocks for the wing from the 3/4" x 1" x 7" balsa stick and glue them to the inner wing TE where shown on the plan. Glue a piece of leftover balsa over the outer TE spar aft of the middle hinge block (this can be seen in the photo at step 13 on page 25).

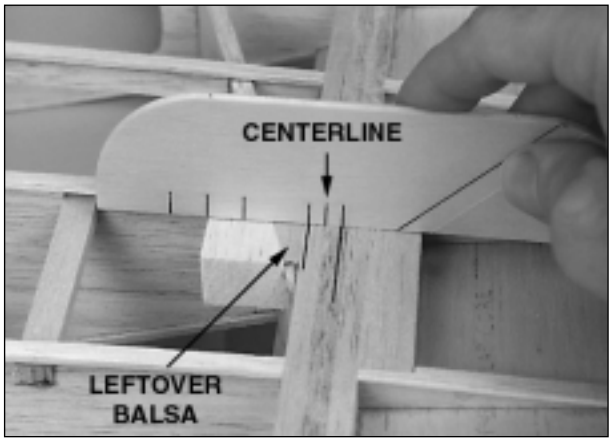



**Refer to this photo for the following three steps**

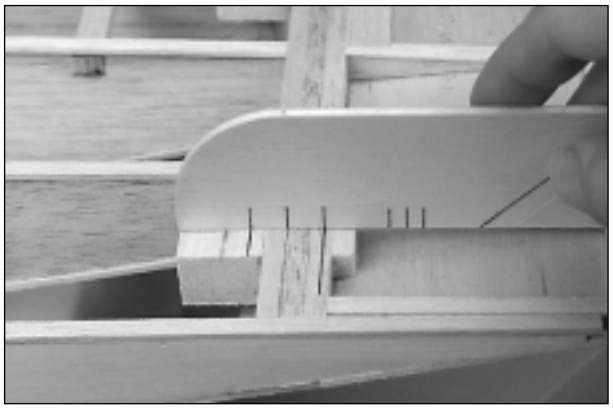
❑ ❑ 10. Cut the **flap LE cap strip** from a 1/8" x 5/16" x 36" balsa stick (if this is your second wing panel, use the remainder of the stick you used for the first wing panel). Glue the strip to the top of the flap LE allowing a 1/32" gap between the strip and the wing TE sheeting. Sand the cap strip even with wing TE sheeting.

❑ ❑ 11. Cut the cap strips for the **top** of the flap from a 3/32" x 1/4" x 36" balsa stick and cut the cap strips for the **bottom** of the flap from a 1/16" x 1/4" x 36" stick and glue them into position. Cut notches in the cap strips where necessary to accommodate the hinge blocks on the bottom of the wing.

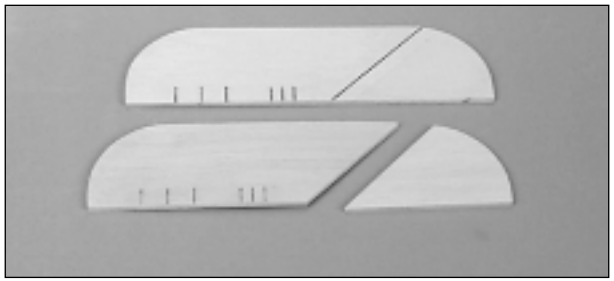
❏ ❏ 12. As you did for the cap strips over ribs 7, 8 and 9, taper the 3/32" cap strips on the top of the flap down to 1/16" at the TE of the flap. Use a 1/16" x 1/4" x 36" balsa stick for the **flap edging** and glue it to the TE of the flap. Sand the edging even with cap strips and the edging on the center TE. Sand all surfaces so the flap blends to the wing.




❏ ❏ 13. Locate both of the die-cut 1/8" plywood **flap hinge drill guides**. Use one of the guides to mark the location of the **center** flap hinge using the *closer together* set of embossed lines on the drill guide. Note that the center line on the guide is positioned where the flap LE meets the inner TE.

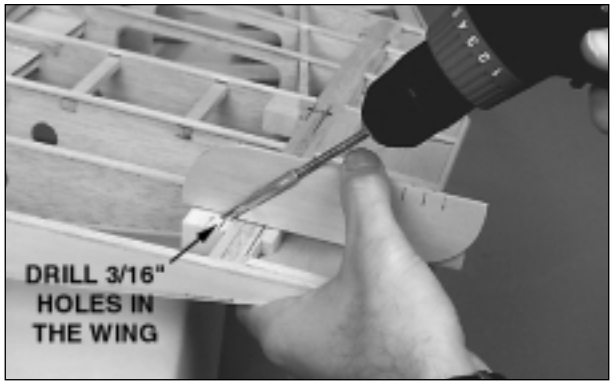


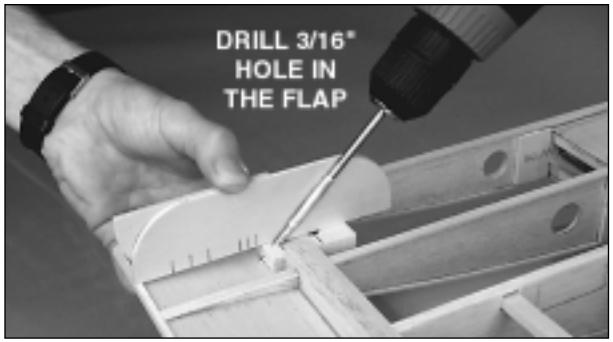
❏ ❏ 14. Mark the location of both **outer** flap hinges the same way, only this time using the *farther apart* set of embossed lines on the flap hinge drill guide.



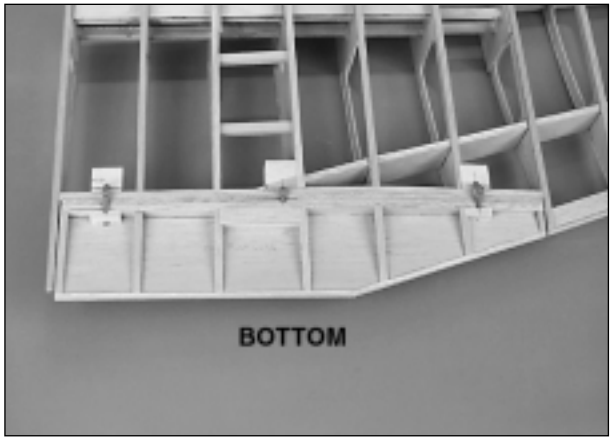
❏ ❏ 15. On **one** drill guide, use a hobby knife to cut the rest of the way through the partially die-cut line.

❏ ❏ 16. Glue the two separated pieces to the other drill guide as shown in the following photos. You can see how the drill guide will be used to align your drill for the flap hinges. For additional guidance and accuracy, glue 7/32" O.D. (3/16" I.D.) brass tubes to the guide.




❏ ❏ 17. Using the drill guide, drill 3/16" holes in the wing and in the flap at the marks you made earlier. You can use a 3/16" drill bit, but a 3/16" O.D. brass tube sharpened at the end cuts much cleaner holes.





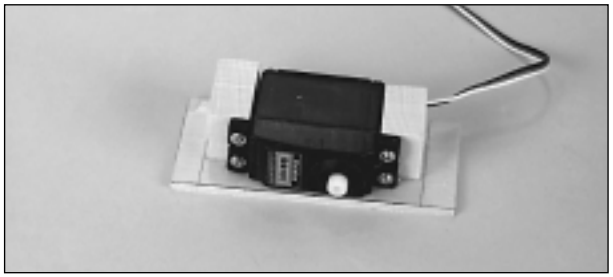
❏ ❏ 18. Carefully remove the flap from the wing. True the ends of the flap with a bar sander and 80-grit sandpaper for a good fit to the wing. Test fit the flap to the wing with your hinges.

❏ ❏ 19. Shape the LE of the flap as shown in the cross section on the plan and in the sketch at step 5 on page 24.

## Mount the wing servos

*Let's start with the flap...*

❏ ❏ 1. Check the orientation of the flap servo in the wing panel you are building. Mount your flap servo to the 1/2" x 1" x 3/4" basswood **servo mounting blocks** using the screws that came with your servo. If necessary, trim the blocks to accommodate your servo.



❏ ❏ 2. Use 30-minute epoxy and two #2 x 3/8" flat-head screws to **securely** and **permanently** mount the blocks to the 1/8" x 1-1/2" x 3-11/16" plywood **flap servo plate.** Be certain the flap servo is in the correct orientation for the wing panel you are building. A Dremel® #178 cutting bit works great for countersinking the screws in the bottom of the servo plate.


❏ ❏ 3. Place the servo plate with the flap servo on the rails. Cut spacers from leftover 1/8" plywood and glue them to the rail.

❏ ❏ 4. Place the die-cut 1/16" plywood **flap hatch cover** on the servo plate. Drill 1/16" holes through the punchmarks in the hatch cover and into the rails. Enlarge the holes **in the hatch cover only** with a 3/32" drill bit, then countersink the holes for the flat-head screws the same way you did for the bottom of the servo plate. Mount the hatch cover with #2 x 3/8" flat-head screws.


❏ ❏ 5. Glue leftover 1/4" x 1/4" balsa sticks between the ribs on both ends of the hatch cover. Cut the slot in the hatch cover for your servo arm.

❏ ❏ 6. Mount the aileron servo and hatch cover the same way noting the orientation of the servo for the wing panel you are building. The plywood aileron servo plate is 1/8" x 1-3/4" x 3-11/16"

## Hook up the controls

**Refer to this photo to hook up the flap and aileron.**

❏ ❏ 1. Drill a #36 or 7/64" hole in the flap control horn block that is in alignment with your flap servo arm. Tap 6-32 threads in the control horn block. Add a few drops of thin CA in the hole, allow to fully cure, then retap the threads.

❏ ❏ 2. Thread a large nylon torque rod horn onto one end of a 6-32 x 1-1/2" threaded rod. Temporarily thread the control rod 1/2" into the hole you tapped in the control horn block. The control rod won't be glued in place until after the model is covered.

❏ ❏ 3. Make the flap pushrod from a 4-40 solder clevis, a .095" x 4-1/2" threaded one-end pushrod and a 4-40 threaded clevis. Silver solder should be used on the solder clevis. After soldering, remove residual soldering flux, then coat the clevis and the rod with a film of oil to prevent corrosion.

❏ ❏ 4. Connect the flap to the servo with the control rod. Notice that the servo arm is 90 degrees (straight down) when the flap is up.

❏ ❏ 5. After you've set up the flap linkage, install silicone retainers on the clevises and a 4-40 nut behind the threaded clevis.

❏ ❏ 6. Make the aileron linkage the same way.

❏ ❏ 7. While you have both servos in the wing, determine how you are going to route your servo cords and determine what type of servo extension cords you will use. You could make paper guide tubes and glue them in place, or just route the servo cords through the holes in the ribs.

❏ ❏ 8. Reinforce any glue joints you missed earlier or those that don't look strong.

*If you haven't yet began the second wing panel, return to step 1 on page 17 and start building it. Otherwise, pick up where you left off and finish building the right panel.*

## BUILD THE FUSELAGE

The bottom half of the fuselage is framed upside-down over the plan. This ensures that you have a straight, true structure from which to build. After the bottom half is constructed, it is removed from the plan, then the tops of the formers and remaining stringers are added to it. But, before you can begin constructing the bottom half of the fuse, you must build the formers. The formers are constructed over the plan just the same as the wing and tail surfaces. The “trueness” and “straightness” of the fuse greatly depends upon how accurately you build the formers. Therefore, it is important to work carefully. As mentioned earlier in the manual, refrain from using excessive CA that will interfere with parts that will be added later. You can reinforce glue joints that don’t look strong after the fuse is completed.

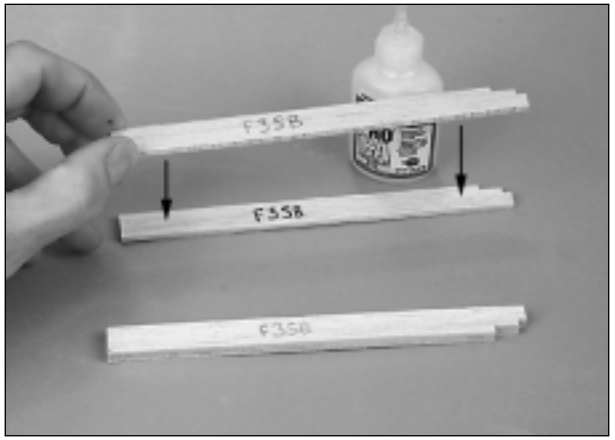
### Build the formers

All the formers are constructed basically the same way. Detailed instructions are provided for building the first one, with notes where necessary to build the others. The bottom and top of the formers are built **separately**.

*Start with former 3...*

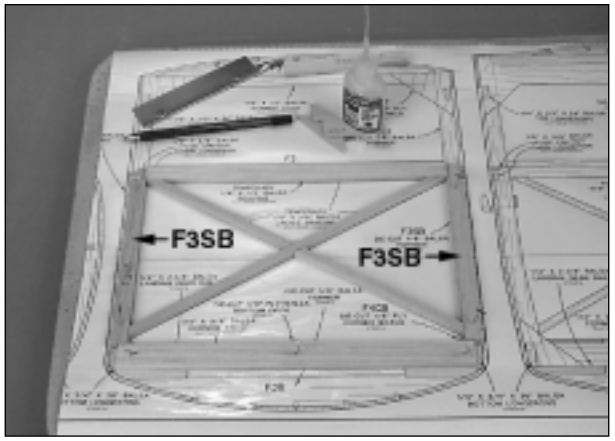
❏ 1. Cover the former drawings on the plan with Great Planes Plan Protector or wax paper.

❏ 2. Using the plan and the die-drawings on pages 8 & 9, identify all the die-cut 1/8” balsa and ply parts used to construct **former 3**. Remove the parts from their die sheets. While you’re at it, you could gather the parts required for the rest of the formers and set them aside, or remove the parts from their die sheets as you need them.

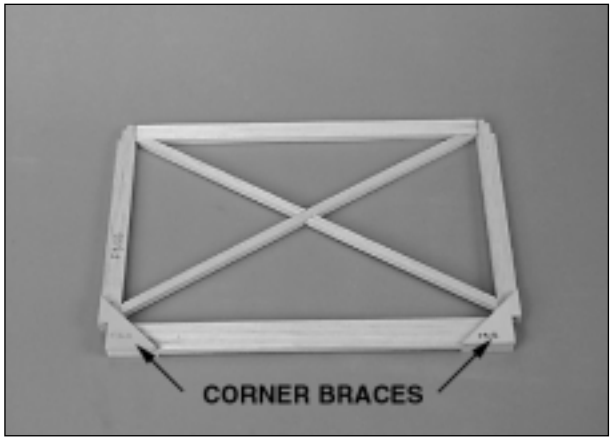



❏ 3. Make a 1/4" **bottom former side** by gluing together two die-cut 1/8" balsa **F3SB former sides**.

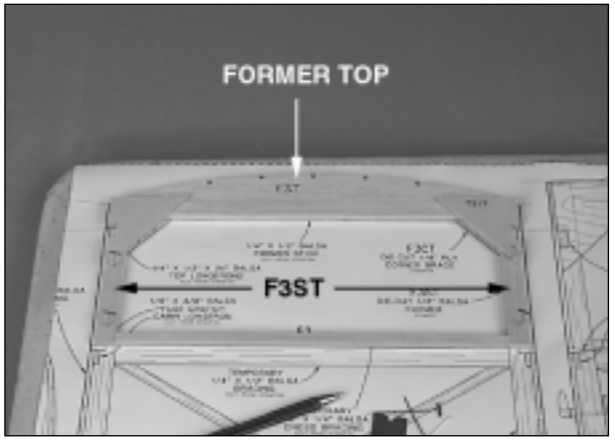
❏ 4. Make the other bottom former side and two **top former sides (F3ST)** the same way.




❏ 5. Position the laminated bottom former sides F3SB over the plan and hold them in position with T-pins. Build the framework around the bottom half of F3 from a 1/4" x 3/4" x 36" balsa stick, a 1/4" x 1/2" x 24" balsa stick, and a 1/4" x 1/4" x 36" balsa stick. Note that some of the bracing is temporary and will be removed from the structure after the fuselage is fully framed. This ensures that the formers remain square during fuselage construction.

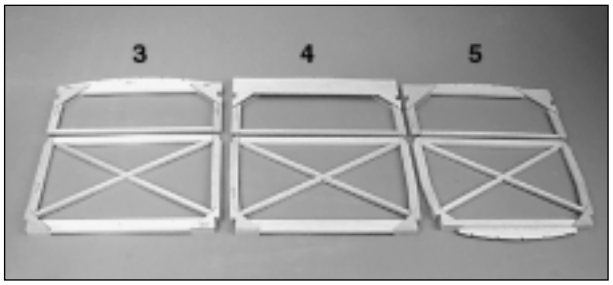


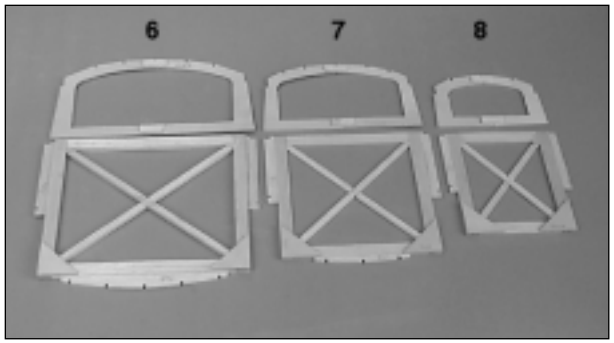

❏ 6. Glue two die-cut 1/8" plywood **bottom corner braces F3CB** to the bottom of F3 where shown. Remove the former from the plan, then glue two more corner braces to the other side.




❏ 7. Build the **top** of former F3 over the plan the same way. Glue the die-cut 1/8" balsa **former top F3T** to the assembly. Add the die-cut 1/8" plywood **top corner braces F3CT** while the former is still pinned to your building board. Remove the assembly from the plan and glue the corner braces to the other side.

❏ 8. Refer to the following photos and notes to build formers 4 through 8 from the die-cut parts and balsa sticks specified on the plan.




**Notes for building former 4**

A. Add the laser-cut 1/8" plywood **former top F4C** to the **upward** facing side of the former top (this will be the front) while it is pinned to the plan.

B. After you remove the top of the former from your building board, add the die-cut 1/8" plywood **top corner braces F4CT** to the back.

**Notes for building former 5**

A. From former 5 onward, all of the cross bracing is permanent.

B. Glue the die-cut 1/8" balsa **former bottom F5B** to the bottom of the former while it's still pinned to the plan, and glue the **former top F5T** to the top of the former.

**Notes for building former 6**

A. For formers 6, 7 and 8, there are die-cut 1/8" plywood **corner braces** for only **one side** (the front) of the former.

B. Add the die-cut 1/8" balsa **former sides F6S** and **bottom F6B** to the assembly while it is pinned to your building board.


C. The former tops on formers 6, 7 and 8, consist of two die-cut 1/8" plywood halves. After joining the halves over the plan, reinforce the joint with leftover 3/32" balsa. **Note:** Do not be alarmed if the die-cut ply formers will not rest flat on your building board. You will be able to remove any twists when the stringers are added later on.

**Notes for building formers 7 & 8**

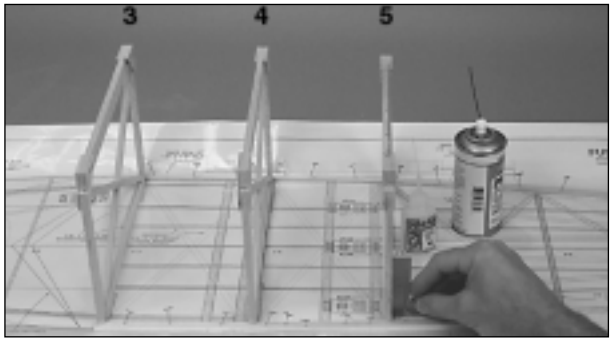
Use two 1/8" x 1/2" x 24" balsa sticks and two 1/8" x 1/4" x 24" balsa sticks for the framework of formers 7 and 8.

*That was a good evening's work wasn't it! Clean up your building board and neatly stack up all your beautifully constructed formers. You can knock off for the evening, or forge ahead and start framing the fuse bottom.*

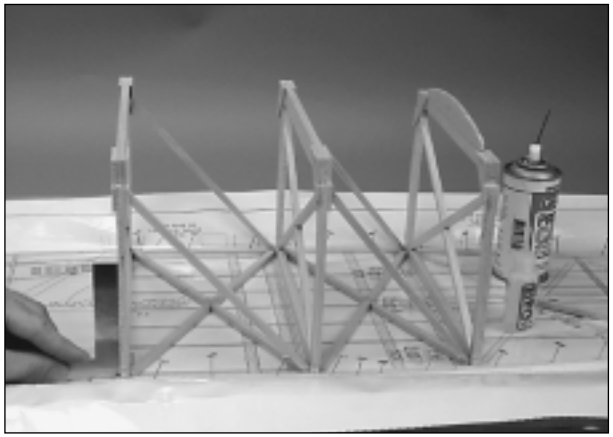
## Build the bottom of the fuse

❏ 1. **Accurately** tape the fuse plans together along the dotted lines. Place the top view over your building board and cover it with Great Planes Plan Protector. **Note:** Your building board needs to extend only from former 3 to former 9.

❏ 2. Securely pin both 1/8" x 3/8" x 42" balsa **main stringers** to the plan. Cut the aft end of the stringers at the aft edge of former 9.

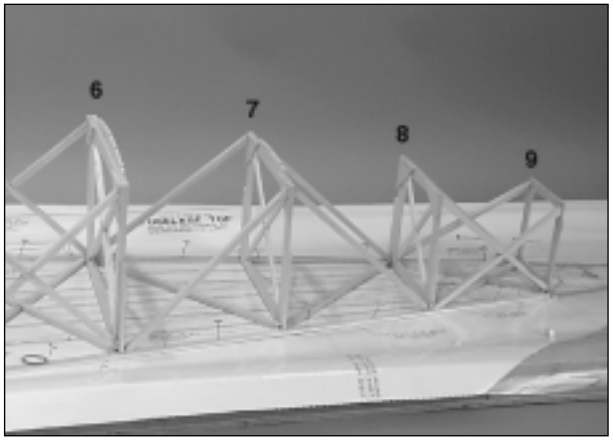



❏ 3. Glue the bottom portions of formers 3, 4 and 5 to the stringers over their locations on the plan. As you proceed, use a small builder's square to be certain the formers are vertical.

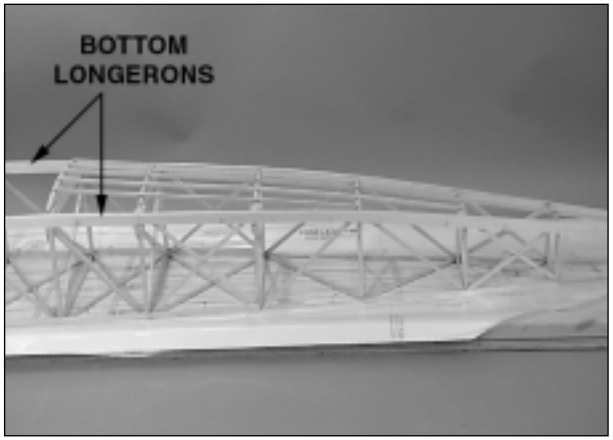


❏ 4. Use 1/4" x 1/4" balsa sticks you have left over from building the formers, and additional 1/4" x 1/4" x 36" balsa sticks to make the temporary cross

bracing between formers 3, 4 and 5. Use a builder's square to hold each former vertical as you glue the bracing into position.




❑ 5. Glue the bottom portions of formers 6 through 9 and the rest of the cross bracing into position as shown in the photo and on the plan.
**IMPORTANT!** Be certain former 9 is perpendicular to your building board when you glue it into position, and be certain it remains perpendicular when you glue the 1/4" x 1/4" bracing into position. The positioning of former 9 has a great effect upon the stab incidence because the stab saddles attach to former 9.




**Refer to this photo for the following 6 steps.**

❑ 6. Place a straightedge along both sides of formers 9 through 5 where the bottom longerons will be fitted. Observe any high spots that will prevent the longerons from making a straight line from former 9 to 5. Bring the formers into alignment by sanding down any high spots or by adding shims as needed.

❑ 7. Cut the **bottom longerons** from three 1/4" x 3/4" x 36" balsa sticks. Make the saw cuts to aid in bending where shown on the plan, then glue the longerons into position. Notice that the splice is at former 5 and the longerons extend past former 9 to the end of the fuse.

❑ 8. Glue together the die-cut 1/8" balsa **former bottoms F4B** and **F4BD**. Glue the assembly, centered, to the bottom of F4 with F4B (the one without the notches) facing forward.

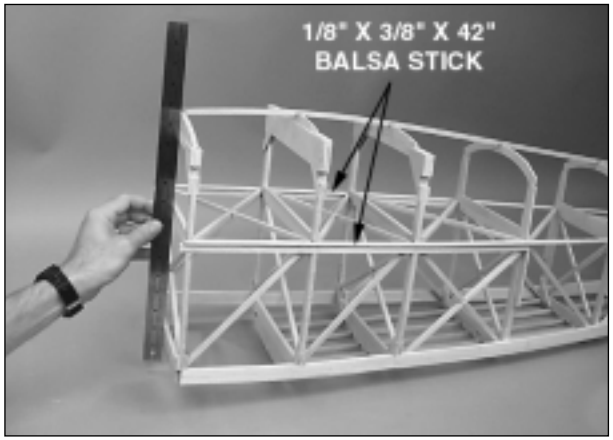
❑ 9. Cut the cabin longerons to the correct length from a 1/8" x 3/8" x 42" balsa stick. The cabin longerons extend from the front of former 6 to the front of former 3 and fit below the main stringer on both sides of the fuse. Glue the cabin longerons into position (this can be best seen in the next photo).

❑ 10. Cut and test fit the **stringers** for the bottom of the fuselage from five 1/8" x 1/4" x 36" basswood sticks. All the stringers begin at former 4. The middle stringer extends to former 9. The stringers on both sides of the middle stringer extend to former 8. The outer two stringers extend to former 7. View the fuselage from the front or the rear. If necessary, adjust the notches in the formers to keep the stringers straight, then permanently glue the stringers into position.

❑ 11. Remove the bottom half of the fuse from your building board.

## Add the tops of the formers

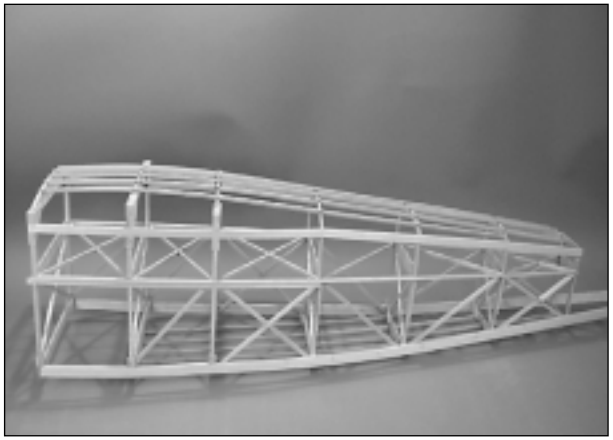
❑ 1. Glue the tops of the formers into position. As you proceed, use a straightedge to hold the tops of the formers in vertical alignment with the bottoms of the formers.




❑ 2. Fit one 1/8" x 1/4" x 36" basswood stringer into the center notch in the top of formers 3 through 8. Starting at former 3, use a straightedge to hold the top of the formers in alignment with the bottom of the formers. The same as you did with the bottom stringers, view the stringer from the front or the rear of the fuselage. If necessary, adjust the notch in any of the formers to keep the stringer straight. When the stringer and top of the formers are in alignment, glue the stringer into position.

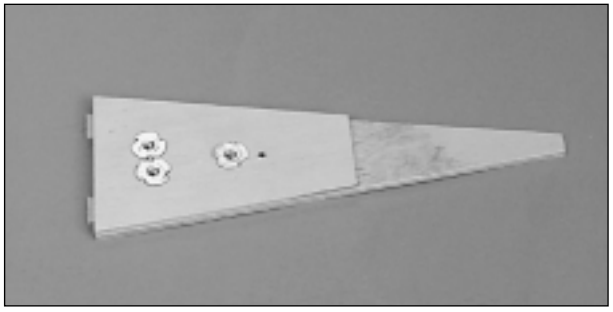
*If you're a messy builder, now's the time to start putting away tools you don't need and keeping your workbench cleared as much as possible. This thing's beginning to take up considerable room and it's not going to get any smaller!*

❑ 3. Glue the rest of the 1/8" x 1/4" x 36" basswood top stringers in place the same way **being certain to pull any twisted former tops into alignment as you proceed**. Refer to the photo in step 12 on page 34 to see where the stringers end.

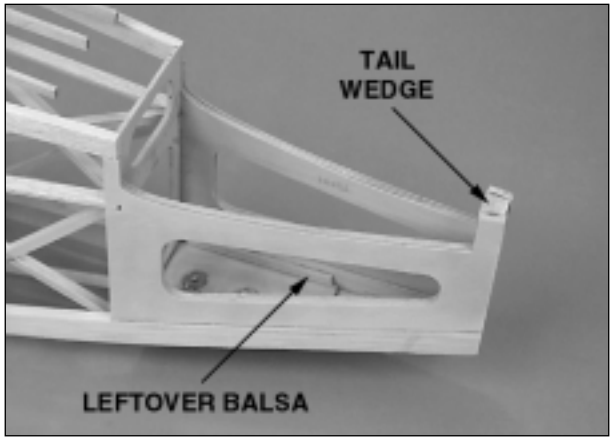


❑ 4. Use four 1/4" x 1/2" x 24" balsa sticks for the **top longerons** on both sides of the fuselage and glue them into position. Note the splice at former 6.
**Note:** When observing the fuselage from the rear, you may note a concave bend in the top longerons at former 6. Do not be alarmed as this is the intended design and will be worked out when more parts are added to the fuselage later on.

## Add the stab saddles



❑ 1. Glue the die-cut 1/8" plywood **tail gear mounting plate** to the die-cut 1/8" plywood **tail gear plate doubler**. Drill 11/64" (or 5/32") holes through the three forward punch marks and a 1/8" hole through the aft punch mark. Insert three 6-32 blind nuts into the holes in the tail gear plate doubler, use a hammer to lightly tap them all the way in, and permanently secure them with a few drops of thin CA. Glue the assembly to former 9 and the bottom longerons.




**Refer to this photo (and the fuse plan) for the following four steps.**

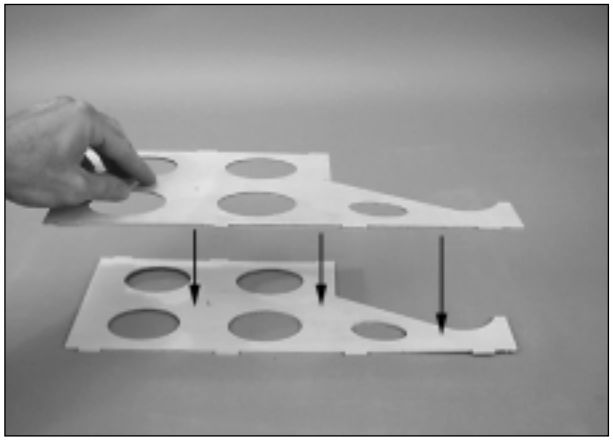
❑ 2. Glue both die-cut 1/8" plywood **inner stab saddles** to former 9 and to the bottom longerons. Note that the inside edge of the saddle aligns with the inner edge of the bottom longeron, thus providing a ledge on the outside for the outer stab saddle.

❑ 3. Glue both die-cut 1/8" plywood **outer stab saddles** to the inner stab saddles and to the bottom longerons.

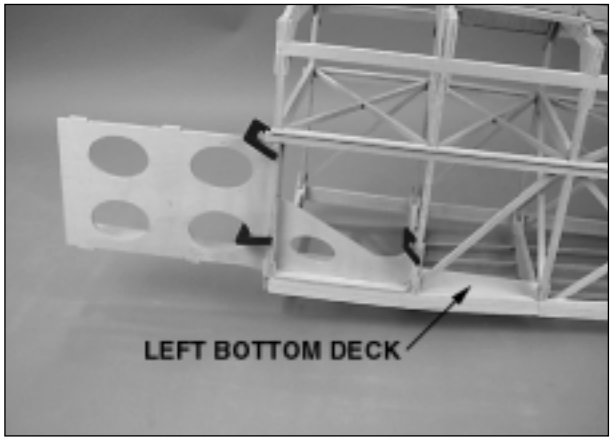
❑ 4. Glue two pieces of leftover 1/4" x 3/4" balsa together to make the **tail wedge** that will be inserted between the end of the stab saddles. Bevel the sides of the tail wedge to match the angle of the stab saddles, then glue it into position, flush with the aft edge of the stab saddles. Sand the ends of the longerons even with the stab saddles.

❑ 5. Glue strips of leftover 1/8" x 1/4" balsa to the longerons to support the tail gear mounting plate.

## Build the front of the fuse

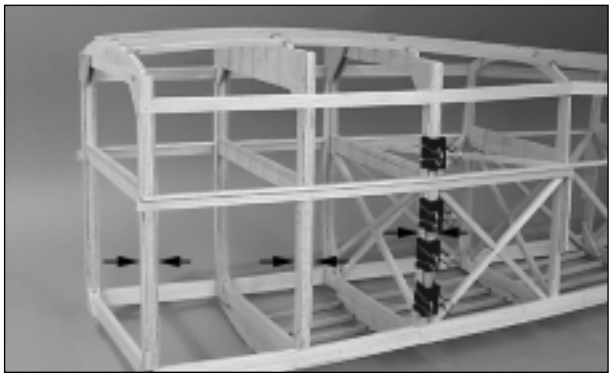


❑ 1. Glue both sets of die-cut 1/8" plywood **right** and **left forward fuse sides** together to make two 1/4" forward fuse sides. **Note:** The left side is longer than the right side.



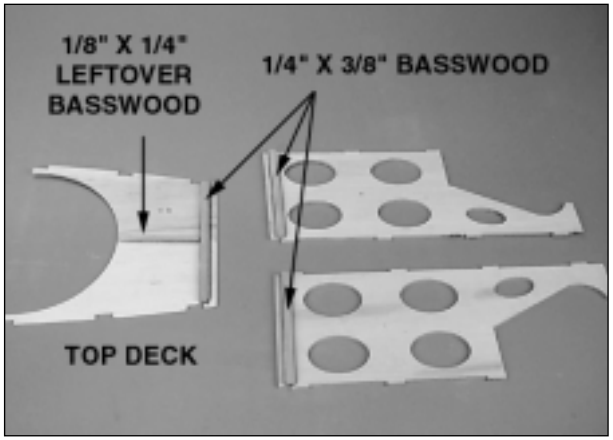

❑ 2. Remove the bottom temporary cross bracing from formers 3 and 4. Test fit the die-cut 1/8" plywood **left bottom deck** and the left forward fuse side to the fuse. Note that the forward fuse side must be notched to accommodate the bottom corner braces of former 3 and 4.

❑ 3. Test fit the right forward fuse side and the right bottom deck to the fuse the same way. Remove both assemblies from the fuselage.



❑ 4. Removing additional cross bracing as you proceed, use epoxy to glue the laser-cut 1/8" plywood **vertical former bracing** to both sides of formers 3, 4 and 5. Where necessary, cut notches in the 1/8" x 3/8" balsa main stringers to accommodate the bracing.

❑ 5. Use 30-minute epoxy to glue the second laser-cut 1/8" plywood former brace F4C to the front of F4C on the top of former 4.

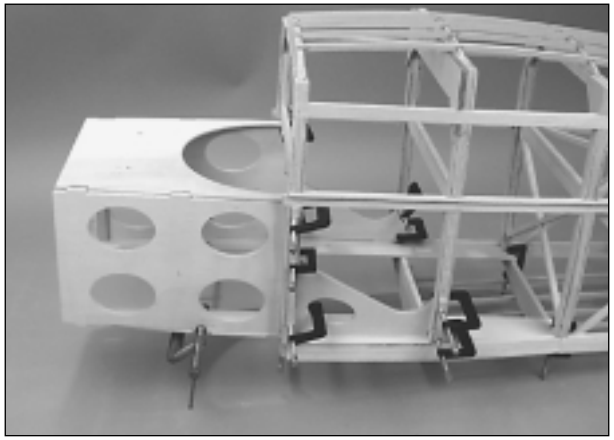



❑ 6. Glue together the die-cut 1/8" plywood **left** and **right top deck**. Sand both pieces flat and even, then glue a piece of leftover 1/8" x 1/4" basswood to the bottom of the assembly across the glue joint, 1/2" aft of the front edge. Use a ballpoint pen to mark the partially die-cut lines on the bottom of the right top deck on the top, so you will know where to cut for the instrument panel when instructed to do so. Test fit the assembly to the forward fuse sides.

❑ 7. Mark a line on the inside of both forward fuse sides 1/4" from the front edge. Mark a line on the inside of the top deck that aligns with the lines you marked on the forward fuse sides (the parts must be fitted together to see where to mark the lines on the top deck).

❑ 8. Cut three **firewall reinforcement sticks** from a 1/4" x 3/8" x 36" basswood stick and use 30-minute epoxy to glue them to the forward fuse sides and the top deck along the lines you marked.

❑ 9. Once more, test fit the left and right bottom deck and the left and right forward fuse sides to the fuse and hold in position with C-clamps. Add the top deck. Make certain you understand how the parts fit together and join to the fuse. Make adjustments where required for good fitting joints.

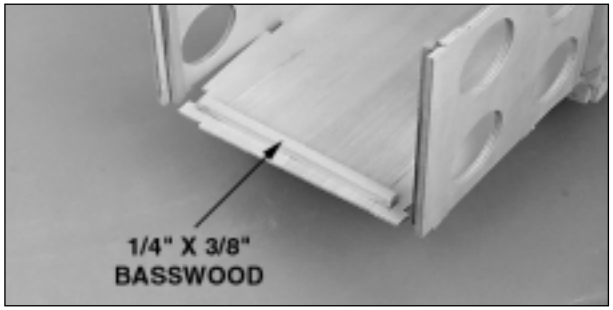


**Refer to this photo for the following two steps.**

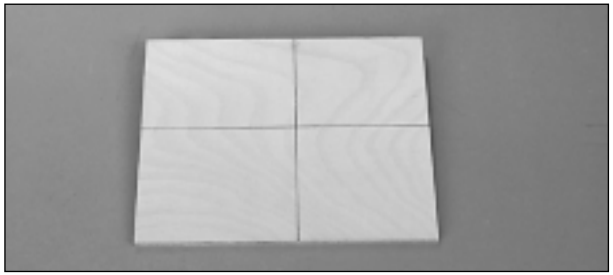
❑ 10. Remove the parts from the fuse. Use 30-minute epoxy to glue the left fuse side and the left bottom deck to each other and to the fuse. **Do not** apply glue to the left fuse side or to the left bottom deck forward of former 3. This will be done later when it's time to join the firewall. Proceed to the next step before the epoxy fully cures.

❑ 11. Mix up a new batch of 30-minute epoxy and glue the right fuse side and the right bottom deck in position the same way. Add the top deck to the assembly to help with alignment, but do not apply any glue. Though there is no glue forward of F3, note the C-clamps holding the fuse sides to the bottom decks. This is to help establish the correct curvature in the fuse sides. Do not remove the C-clamps until the epoxy is fully cured.

❑ 12. Make the **center bottom deck** by gluing together two 1/8" x 3" x 24" balsa sheets to make a 1/8" x 6" x 24" balsa sheet. Trim the center bottom deck to fit between the left and right bottom deck.

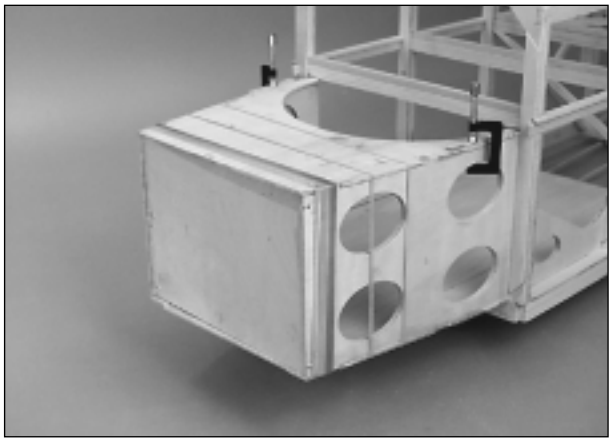



❑ 13. Test fit the center bottom deck in the fuse. Make certain that when the center bottom deck is glued to the right and left bottom decks, the distance between the insides of the forward fuse sides will be 7-3/32" (the same width as the firewall). Glue the center bottom deck into position. Glue a 1/4" x 3/8" basswood stick across the bottom deck in alignment with the sticks on the forward fuse sides.



❑ 14. Position the 1/4" x 5-11/16" x 7-3/32" **firewall** over the firewall drawing on the plan. Use a ballpoint

pen to transfer the engine mount centerlines on the plan to the firewall. For future reference, this is where the centerline of your engine should meet the firewall so the crank shaft will be centered in the front of the cowl.



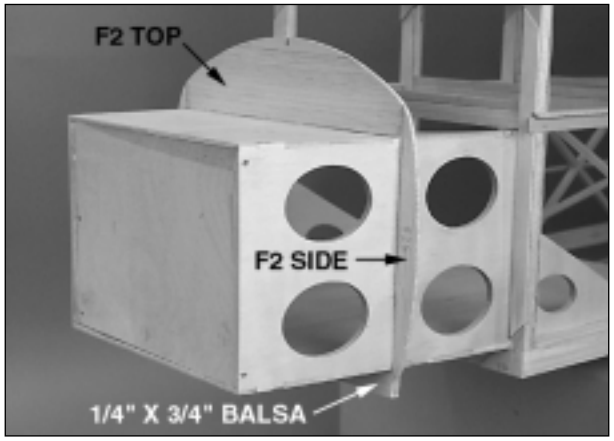
❏ 15. Use 30-minute epoxy to glue the forward fuse sides, the top deck, the bottom deck and the firewall together. #64 Rubber bands are perfect for holding everything tight until the epoxy hardens. **Hint:** Where necessary, #2 wood screws may be used to pull the sides to the firewall.

❏ 16. After the epoxy from the previous step has fully cured, “pin” the edges of the firewall to the fuse sides and top and bottom deck with round toothpicks and epoxy. A 3/32" drill bit should work for most round toothpicks.

❏ 17. From two 1/8" x 1/4" x 36" basswood sticks, cut the **side stringers** that run from former 5 to the front of the stab saddles. Note that the front of the side stringers protrude 1/8" outside of former 5 to accommodate the 1/8" fuse sheeting that will be added later. Glue the side stringers into position.

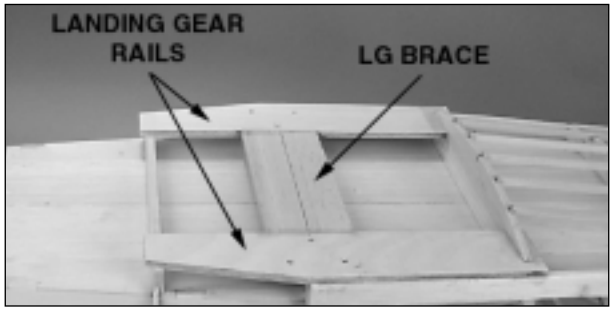
❏ 18. Glue leftover 1/4" x 3/8" basswood sticks across both sides of the bottom of former 3, between the corner braces as shown on the plan.

## Mount the landing gear




❏ 1. Glue the die-cut 1/8" balsa **former sides** and **top** of **F2** to the fuse where shown on the plan. Glue a leftover 1/4" x 3/4" balsa stick across the bottom deck aligning with the sides of F2.

❏ 2. Use the **landing gear rail template** on the plan to make two **landing gear rails** from the 1/4" x 2-1/8" x 11" plywood sheets. Position the landing gear over the templates and confirm that the holes in the gear align with the holes in the template. Make adjustments if necessary. Drill 11/64" (or 5/32") holes through the rails where shown on the templates, then insert three 6-32 blind nuts into the holes of both landing gear rails, making a right and a left rail.




❏ 3. Use 30-minute epoxy to glue both landing gear rails and the 1/4" x 2-1/2" x 6-1/16" balsa **landing gear brace** to the fuse. Be certain the rails and the brace are centered on the fuse.

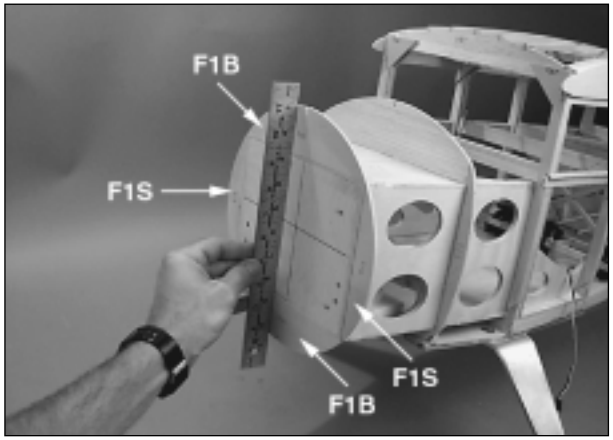
❏ 4. After the epoxy from the previous step has fully cured, temporarily mount the landing gear to the rails with six 6-32 x 5/8" socket head cap screws and washers.

# FINAL CONSTRUCTION

## Mount the engine

If you haven’t yet decided on which engine you are going to use, or if you haven’t purchased it yet, or if it’s just your preference to mount the tail surfaces before the engine, you may skip ahead to **Mount the Stab and Fin** on page 33. Return to this page when you’re ready.

❏ 1. Use a bar sander and 80-grit sandpaper to sand the fuse sides, bottom deck and top deck even with the firewall. Redraw the engine mount alignment lines you marked earlier if you’ve sanded them off.




❏ 2. Glue the die-cut 1/8" plywood **formers F1B** and **F1S** to the fuse sides and top and bottom deck. Use a straightedge to make certain all the formers are in alignment with the firewall.

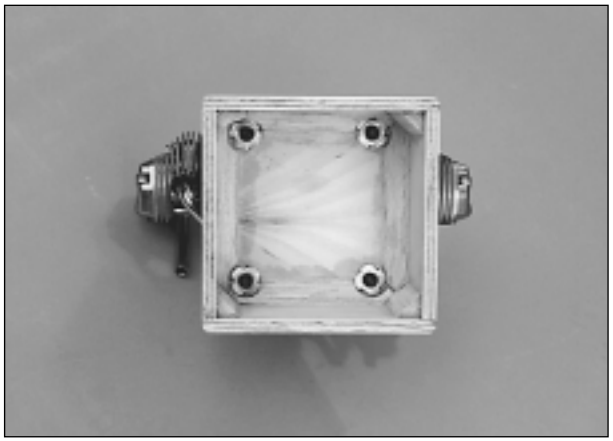
**Note:** Whatever engine and mounting method you decide to use, the distance from the firewall to the back plate of the spinner (or the front of the drive

washer) should be 7-7/16". Most glow engines will require an “extension box” made from 1/4" Plywood (not included). For ignition engines and large glow engines some modelers prefer to mount the box (if required) to a vibration isolation mount such as the Great Planes Vibration Isolation Plate (GPMG2000, not included).

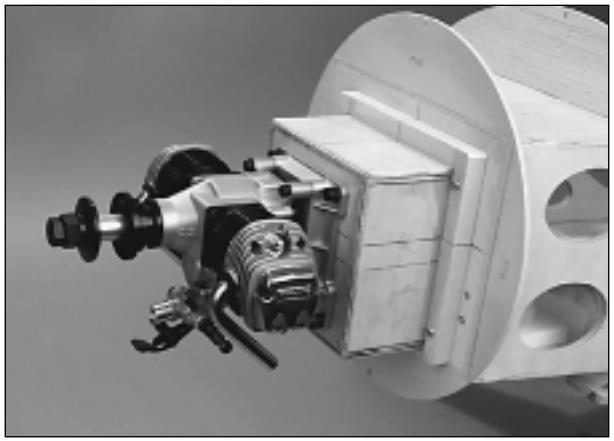
Skip the following two steps if you are **not** building an extension box.

**Materials required for extension box:** sheet of 1/4" 5-ply birch plywood, 1/2" balsa triangle stock, and 1/2" x 1/2" basswood.

❏ 3. To determine the length to make the extension box, measure the distance from the back of the mount to the front of the drive washer. Subtract that distance from 7-7/16". That’s how long the extension box must be. In the case of the O.S. Gemini 160 shown here, the box must be 2-3/4" long.



❏ 4. Build the **extension box** from 1/4" birch plywood (not included) using 30-minute epoxy. Reinforce the inside corners of the box with triangle stock (not included). If using a Great Planes Isolation Mount, be certain the box will fit on the mount and will not interfere with the grommets.



**Refer to this photo for the following three steps.**

❏ 5. Mount your engine to the box using the appropriately sized screws and blind nuts (not included). Make the back of the box from 1/4" plywood and glue it inside the back of the box, flush with the back edge of the box sides. Mark reference lines on all four sides of the box that align with the crankshaft on the engine. Some engines have “tick marks” that indicate the centerline.

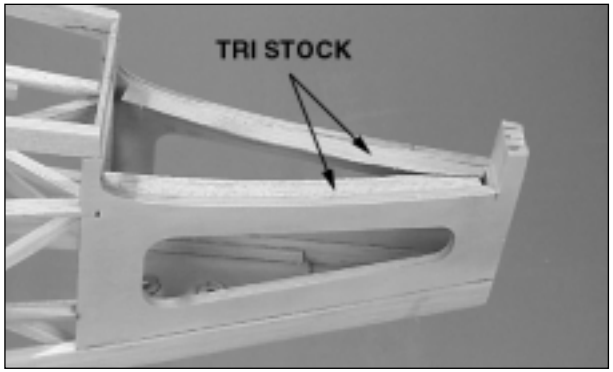
❏ 6. Make **reinforcement rails** from 1/2" x 1/2" basswood (not included) and glue them around the base of the box. Position the box on the firewall in alignment with the tic marks, then **temporarily** secure the box to the firewall with #6 x 1" screws (not included). The box will be permanently glued to the firewall after the fuse is sheeted.

*Let’s temporarily mount the fuel tank before sheeting the front of the fuse.*

**Note:** Before continuing, plan the routing of your throttle pushrod, as this may have an effect on fuel tank location.

❏ 7. Determine the height of the fuel tank in relation to the carb on your engine. The fuel tank should be positioned, so that when half full, the fuel level is even with your carburetor. If necessary, build a **fuel tank mount** from the 1/8" x 4-3/8" x 5-3/4" plywood **fuel tank floor** and leftover 1/4" x 3/8" basswood as shown on the plan. Use screw eyes (not included) or something similar to secure the tank, then glue the assembly into position. In the case of the model shown in the manual (using the O.S. Gemini 160), no fuel tank floor was required due to the low positioning of the carburetor. Removable balsa rails were used to secure the tank. Position your fuel tank and drill holes for routing the fuel lines. Later, the vent line will be connected to the pressure tap (or connected to a drain tube in the case of the Gemini as no tank pressure is required) and the fuel line will be connected to a Great Planes Easy Fueler Fuel Filler Valve (GPMG4160, not included). **Note:** Do not **permanently** mount the tank until after you have hooked up the throttle.

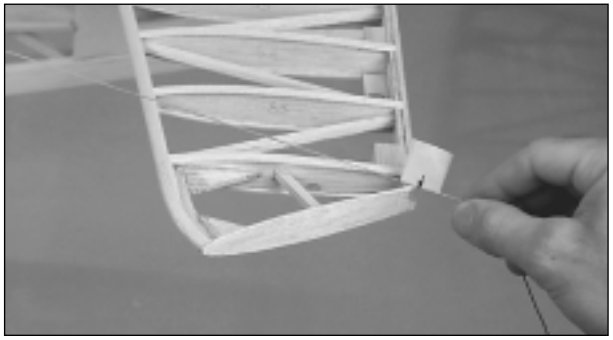
## Mount the stab and fin




❏ 1. Cut two 7-1/4" long pieces from the 1/2" x 24" balsa tri stock. Use a fine razor saw to make saw cuts in the tri stock so you can bend it to the stab saddle, then securely glue both pieces to the saddles. Where necessary, carefully trim the tri stock even with the stab saddles.

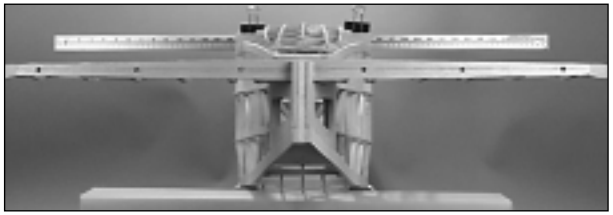
❏ 2. Place the stab in the stab saddle. Take measurements and make marks with a ballpoint pen to center the TE of the stab in the saddle. Place a weight on top of the stab to hold it down and keep it from shifting.

❏ 3. Stick a T-pin into the center fuse stringer above former 3. Tie a small loop in one end of a 50" piece of string and slip it over the T-pin.



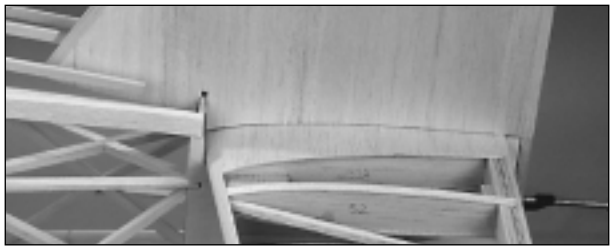
❏ 4. Fold a piece of masking tape over the other end of the string and draw an arrow on it. Slide the tape along the string and align the arrow with one tip of the stab. Swing the string over to the other tip of the stab and check the alignment. Shift the stab and slide the tape along the string until the arrow reads the same on both sides of the stab. Now your stab is aligned.

❏ 5. Place a straightedge across the top longerons in front of former 4 and hold it in place with C-clamps or clothes pins.

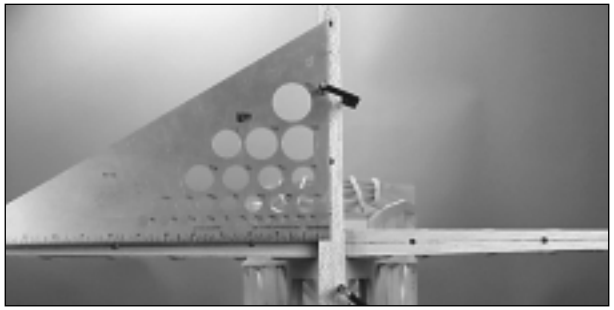


❏ 6. Observe the fuselage from the rear and check the alignment of the stab with the straightedge. If necessary, remove the stab and adjust the height of one of the stab saddles until the stab is parallel with the straightedge.

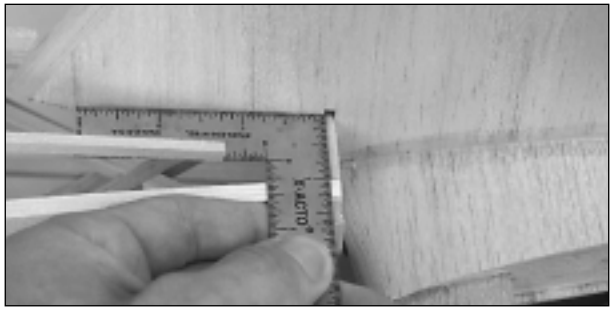
❏ 7. Once the stab is level with the straightedge, glue the stab into position with 30-minute epoxy. Place a weight on top of the stab to hold it down. Use the pin and string to recheck the stab alignment. Wipe away excess epoxy before it hardens.



❏ 8. Test fit the fin to the fuse and the top of the stab. Trim the sheeting on the bottom of the fin as necessary for a good fit to the stab. The fin TE should rest tightly against the aft end of the saddles and the tail wedge.

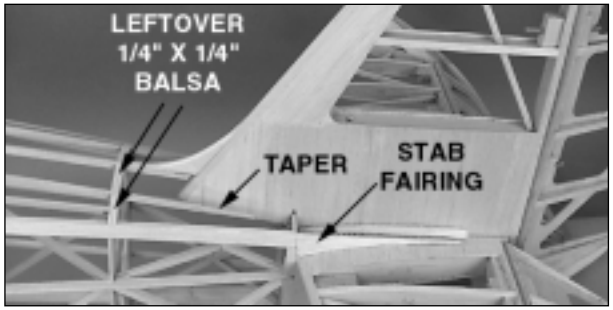


❏ 9. Use a C-clamp to hold the bottom of the fin TE to the stab saddle. Align one edge of a large draftsman's triangle with the centerline on the TE of the fin. Use a small C-clamp to hold the triangle in position. Check the alignment of the bottom of the triangle with the centerline on the stab TE. Trim the bottom of the fin sheeting where it rests on the stab until you can get the fin vertical.



❏ 10. Adjust the front of the fin laterally by measuring the distance between both sides of the fin and the sides of former 9. **Note:** It is important that the fin be accurately aligned with the fuse centerline.

❏ 11. Glue the fin to the stab and fuse with 30-minute epoxy. Before the epoxy hardens, confirm the vertical and lateral fin alignment as described previously. **Note:** Be certain the fin sheeting is securely glued to the stab sheeting, but do not build up a large fillet. This joint will be reinforced with tri stock in the next step.




**Refer to this photo for the following five steps.**

❏ 12. Cut two pieces from the 1/4" x 18" balsa tri stock and glue them to the fin and stab with 30-minute epoxy. Note that the tri stock should end 1-1/2 forward of the fin TE.

❏ 13. Gradually taper the 1/8" x 1/4" basswood stringers on both sides of the center stringer on top of the fuse. The ends of these stringers just "float" in the structure and will gradually and smoothly disappear underneath the covering.

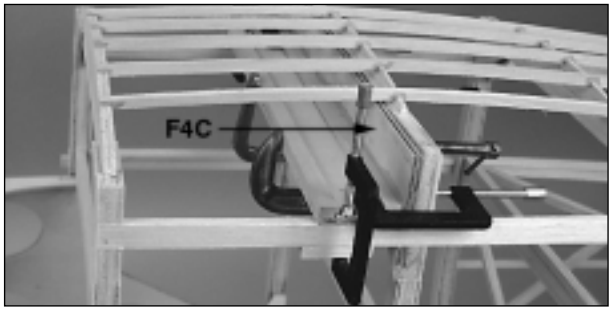
❏ 14. Use the **stab fairing pattern** on the plan to make two **stab fairings** from leftover 1/4" balsa and glue them into position on both sides of the fuse.

❏ 15. Glue the ends of the 1/8" x 1/4" basswood outer stringers on the top of the fuse to former 8. Glue leftover 1/4" x 1/4" balsa sticks between the top stringers.

❏ 16. Make the **fin fillet** as shown on the plan from leftover 1/4" balsa and glue it into position. Round the fin LE and the fin fillet smoothly blending the two together.

## Mount the wing

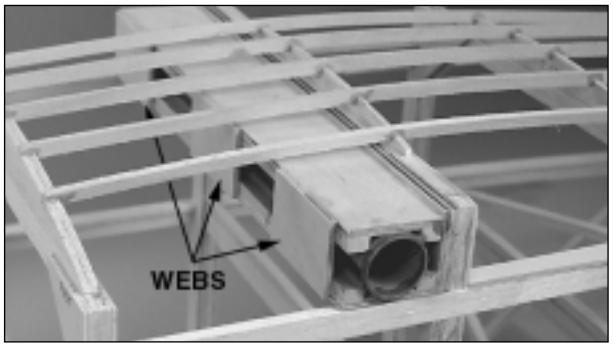
❏ 1. As you did for the wing, (shown on page 18 in steps 6, 7 & 8), build the **joiner box top** and **bottom** for the fuse from two 1/8" x 1-11/16" x 10-9/16" ply sheets and two 1/4" x 3/8" x 36" basswood sticks.



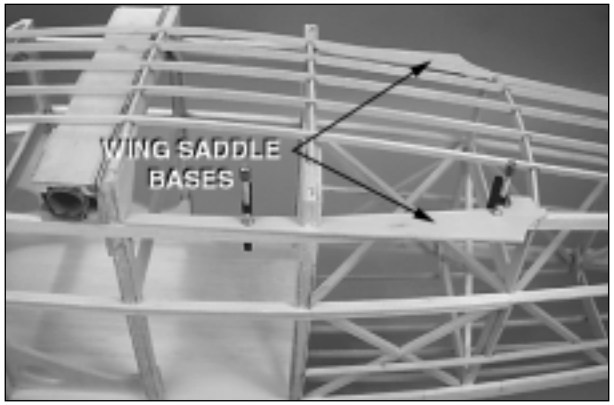

❏ 2. Trim the ends of the joiner box bottom and top so they are exactly the same width as the fuselage on the 1/4" x 1/2" longerons at former 4. Use 30-minute epoxy to glue one of the joiner box assemblies to the longerons and the front of F4C. **Note:** F4C is **two** layers of laser-cut 1/8" ply, previously installed.

❏ 3. Use your bar sander with 80-grit sandpaper to true the edges of formers 3 & 4 and the joiner box bottom.

❏ 4. Cut the remainder of the cardboard tube to a length of 10-7/8" and harden the ends with thin CA just the same as you did for the wing tubes.



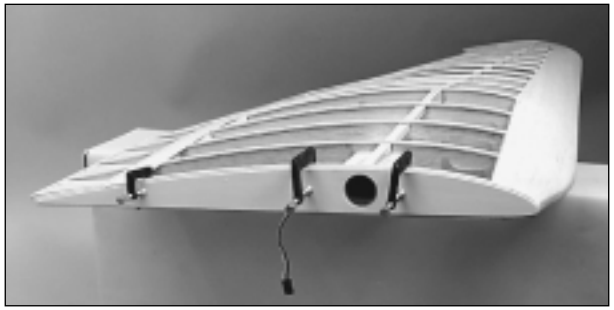

❏ 5. Test clamp the joiner box top and the cardboard joiner tube to the fuse with the three die-cut 1/8" plywood **joiner box webs**. Once you are sure all the parts fit well, glue the assembly into position with 30-minute epoxy. Be certain the cardboard tube is **centered** in the fuse. **Hint:** Fit the aluminum joiner tube into the cardboard tube so it cannot be inadvertently deformed during clamping.




❏ 6. Test fit both die-cut 1/8" plywood **wing saddle bases** to the fuse sides between formers 4, 5 and 6 over the top longerons, and hold them in position with clamps or T-pins.

*Now for the moment of truth. Hopefully you have a large workbench!*

❏ 7. Place the die-cut 1/8" plywood **fuselage root ribs W1F** on both sides of the fuse over the ends of the cardboard tube, then slide the wing panels into position with the aluminum joiner tube.



❏ 8. Align the fuselage root ribs with the root ribs of the wing panels, then use C-clamps to hold the fuse root ribs to the wing. The photo illustrates the root ribs clamped to the wing (but the wing and root ribs should be on the fuse).

❏ 9. Glue two 1/2" x 1" x 3/4" basswood wing bolt blocks, centered vertically, to the inside of rib 1 on both wing panels where shown on the plan.


❏ 10. With the fuse root ribs clamped to the wing, remove the wing panels from the fuse. Drill 5/32" holes through the fuse root ribs and the wing bolt blocks in both wing panels. Insert 6-32 blind nuts into the wing bolt blocks of both wing panels. Fasten both fuse root ribs to both wing panels with 6-32 x 1" socket head cap screws and #6 washers—now your wing is **guaranteed** to align with the fuse root rib. You may remove the C-clamps.

*Now we have to glue the fuse root rib to the fuse...*


❏ 11. With both fuselage root ribs bolted to the wing panels, place the panels on the fuse with the joiner

tube. Adjust the wing saddle bases so they are contacting the fuselage root ribs, then glue **only the saddle bases** to the fuselage.

❏ 12. Align the bottom of the fuse root rib on both wings with the **bottom** of the wing saddle bases at the rear (pivoting the wings about the joiner tube). Clamp both wing panels to the saddle bases near the aft wing bolt block.

❏ 13. Place an incidence meter on one wing panel at rib 8 and read the incidence. Check the incidence of the other wing panel at rib 8. Adjust both wing panels until the incidences are the same, keeping in mind that the rear of both root ribs should align with the bottom of both wing saddle bases.

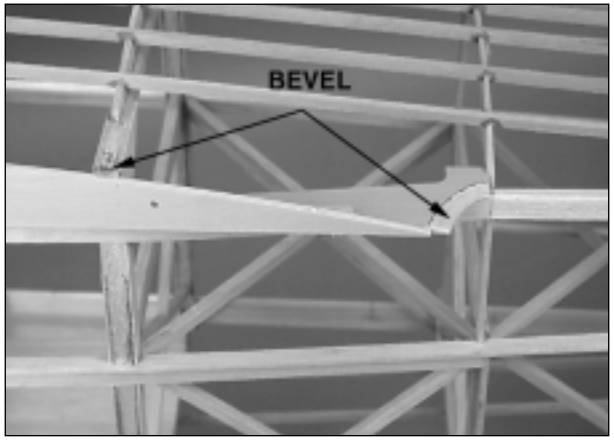
❏ 14. Now that you have confirmed that both wings are at the same incidence, remove the panels, apply epoxy to the ends of the joiner box on both sides of the fuse, reposition both wing panels and clamp them into position. Recheck the incidence of both panels, make adjustments if required, and do not disturb the model until the epoxy cures.

❏ 15. Remove the clamps and finish gluing both fuse root ribs to the fuse.

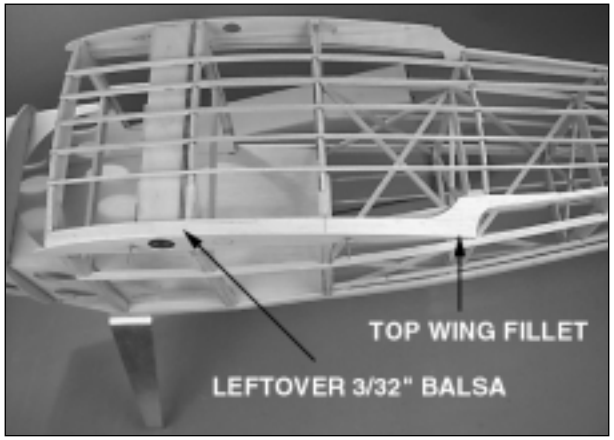
*Now, the only way to get the wing off the fuse is to use your 7/64" ball driver!*


*For clarity, we took the wing off the fuse in this photo (plus, this thing won't fit in our photo studio with the wings on!).*

❏ 16. With both wing panels still bolted to the fuse, glue leftover 1/4" x 1/4" balsa sticks along the bottom of both fuse root ribs permanently joining them to the top longeron and the saddle bases. **Important**: If you plan to do aggressive aerobatics, use leftover basswood sticks as reinforcement.

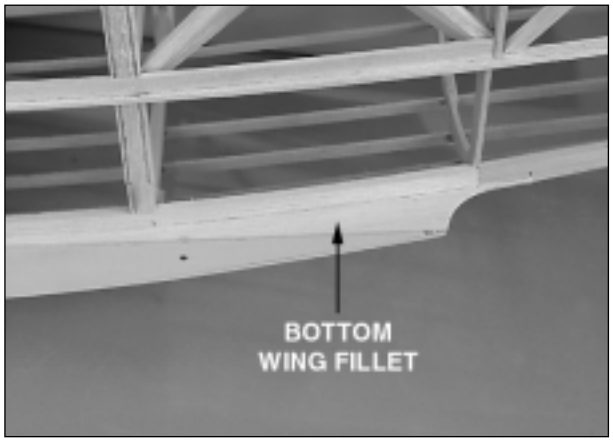



❏ 17. Remove the wing panels. Bevel the aft, curved edge of the wing saddle base. Trim the top of formers 3, 4 and 5 so they are even with the top of the fuse root rib to accommodate the top wing fillet.




❏ ❏ 18. Test fit, then glue the die-cut 3/32" balsa **top wing fillet** to the fuse root rib, saddle base and the top longeron. Glue an additional leftover 3/32" balsa strip on top of the fuse root rib continuing the fillet to the top of former 3.

❏ ❏ 19. Sand the edge of the top fillet even with the root rib. Bolt the wing to the fuse and check the fit. Build the top fillet for the other side of the fuse the same way.




❏ ❏ 20. Glue the die-cut 3/32" balsa **bottom wing fillet** to the bottom of the ply wing saddle base. Glue an additional leftover 3/32" balsa strip on the bottom of the fuse root rib continuing the fillet to former 3.

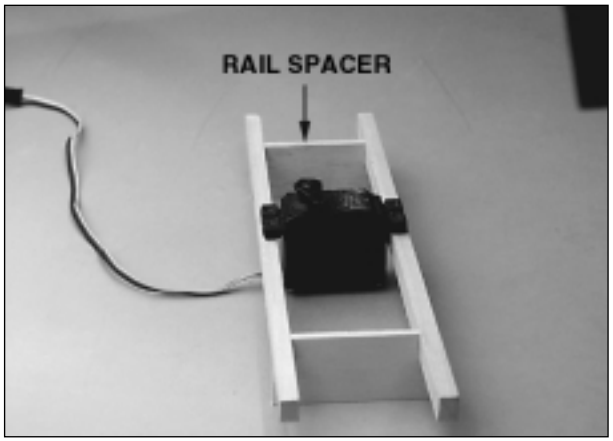
❏ ❏ 21. Sand the bottom fillet even with the root rib, then sand the end even with the top fillet, neatly blending it to the fuse.

❏ 22. Build the other bottom fillet the same way, then bolt the wings to the fuse and blend the fillets neatly to the wing and fuse.

## Mount the servos

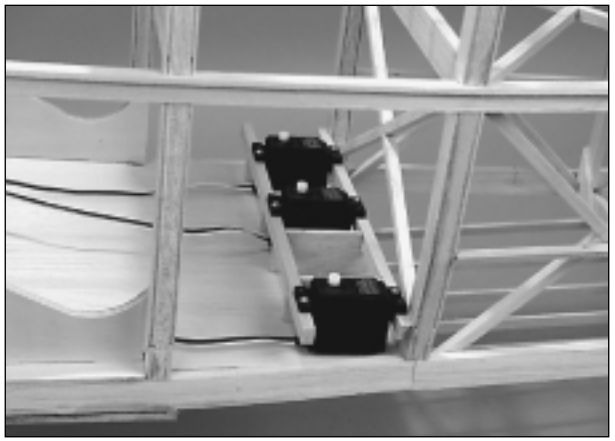
**Note:** The following instructions show how to mount the servos in the forward of two optional mounting locations. For illustration in this manual, the forward location is chosen due to the size and weight of the engine used in the prototype. If you are using a heavier ignition engine, your model may come out nose heavy, so you may choose to mount your servos in the aft location.

As you proceed, keep in mind that, after the model is completed, components in the cabin (radio system, fuel tank, cockpit interior, wing bolts, etc.) will be accessed through the side doors. Although some modelers prefer to leave radio installation and other interior details until after the model is covered and/or painted, it will be easier to do as much of this work as possible while the cabin is open.



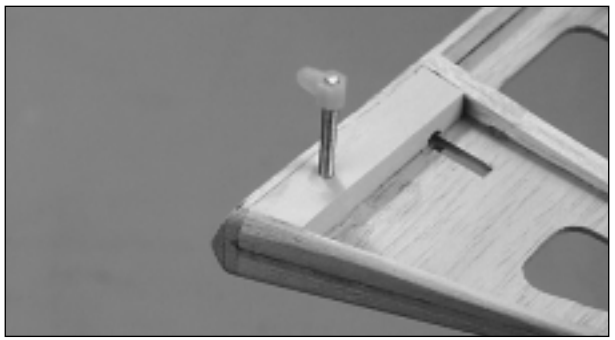

❏ 1. The servos will be mounted to 1/4" x 3/8" basswood rails, spaced apart and held in position by the die-cut 1/8" plywood **servo rail spacers**. Be certain the rail spacers are the correct size for your servos by test fitting one of your servos on rails held in position on your workbench by the rail spacers. If necessary, modify the rail spacers, or make new ones from leftover 1/8" plywood to accommodate your servos.

❏ 2. Simulate the 1/8" balsa fuse sheeting that will be added later by temporarily clamping pieces of leftover balsa across both sides of formers 4 and 5 in the area of the servo rails. Cut the **servo rails** to fit between the sheeting from a 1/4" x 3/8" x 36" basswood stick.



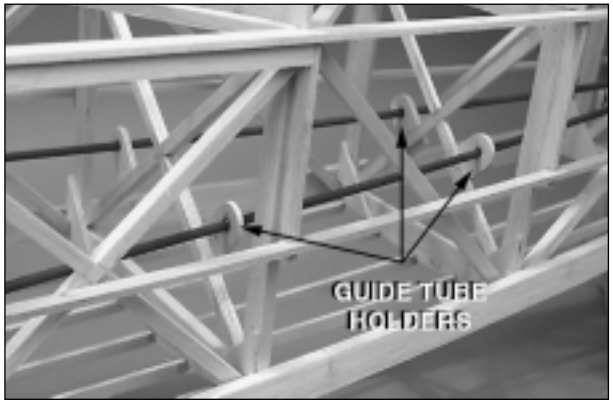
❏ 3. Refer to the top view of the plan. Notice that the elevator servos and rail spacer are offset, so both elevator pushrods will be at the same angle and have the same geometry. Glue the rails and rail spacers into position.

❏ 4. Drill a #36 or 7/64" hole in both elevator control horn blocks where shown on the plan. Tap 6-32 threads in the control horn blocks, then add a few drops of thin CA in the holes, allow the CA to fully harden, then re-tap the threads.



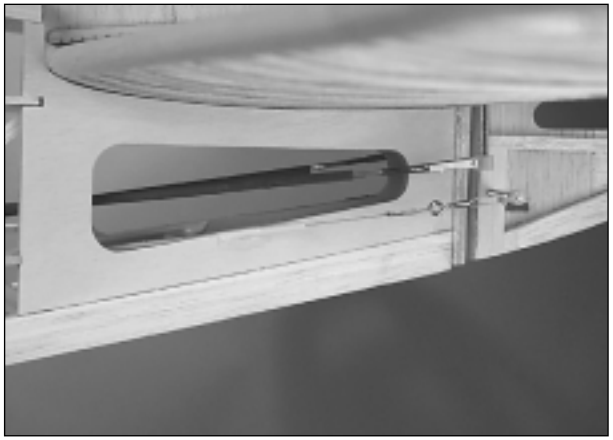
❏ 5. Thread a large nylon torque rod horn onto one end of a 6-32 x 1-1/2" threaded rod. Temporarily screw the thread control rod 1/2" into the hole you tapped in the control horn block. The threaded rod won't be glued in place until after the model is covered.

❏ 6. Join both elevators to the stab. Make both elevator pushrods as shown on the plan from two 4-40 solder clevises, two .095" x 36" threaded one-end pushrods and two 4-40 threaded clevises. Silver solder should be used on the solder clevis. After soldering, remove residual soldering flux, then coat the clevis and the rod with a film of oil to prevent corrosion.



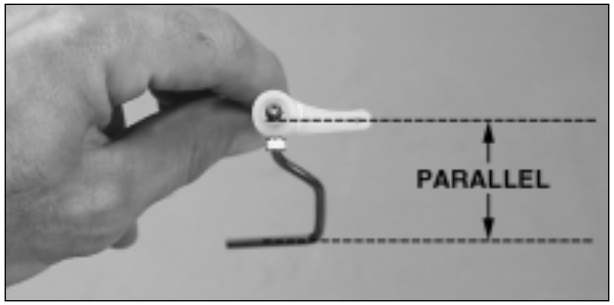

❏ 7. Cut two 3/16" **pushrod guide tubes** (Gray) so that there is approximately 1-1/2" between the ends of the tube and the clevises at both ends. Slide the guide tubes over the elevator pushrods in the fuse. Drill a 13/64" (or 7/32") hole in eight die-cut 1/8" plywood **guide tube holders** and slide four holders over each guide tube. Connect the pushrods to the elevators and servos, and glue the guide tube holders to the cross braces. Glue the guide tubes to the guide tube holders.

❏ 8. The same way you did the elevators, temporarily insert the 6-32 x 1-1/2" threaded rods into both sides of the rudder as shown on the plan.



❏ 9. Install your rudder control linkage. We used a Sullivan No. 520 Pull-Pull Cable Kit (not included) and connected one end of the cable to the rudder, but did not connect the other end to the servo at this time. This way, the cables can be removed for finishing and covering, then reinstalled and connected after the model is completed. To ensure that the cables do not contact any of the balsa formers or cross braces, route the pull-pull cable through two 36" inner pushrod tubes (White) included with this kit. Cut notches in the stab saddles to accommodate the cable guide tubes and glue them to formers 7 and 8 and the saddles with epoxy.

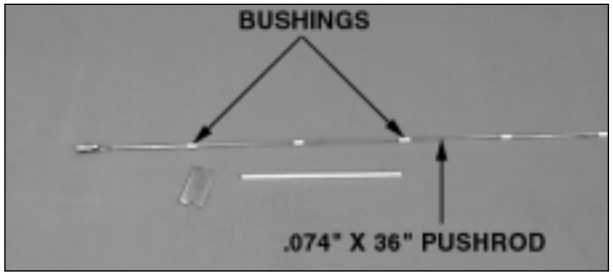
❏ 10. Route the throttle pushrod through the firewall and connect it to the engine, but do not mount the throttle servo until you have tested the fit of your cockpit interior. An 11-3/4" inner pushrod tube, 36" outer pushrod guide tube, .074" x 4" one-end threaded rod, 2-56 x 1" threaded rod, screw-lock connector and ball link are supplied for hooking up the throttle (see the detail on the fuse plan). On our prototype, we routed the throttle pushrod under the fuel tank. If you are going for an all-out, fully detailed cockpit interior, you may mount your throttle servo on its side under one of the front seats. Use two 1/2" x 1" x 3/4" basswood blocks just the same as you did the aileron and flap servos. If you are not installing a cockpit interior, mount your throttle servo wherever most convenient.




❏ 11. Insert a 5/32" wheel collar into the nylon steering arm. Trim the arm as shown on the top view of the fuse plan. File a flat spot on the back of the 1/8" pre bent **tail gear wire**, so that the steering arm will be parallel with the “axle” portion of the wire. Temporarily mount the steering arm to the tail gear with a 6-32 x 1/4" socket head cap screw to be certain it is parallel. If necessary, adjust the position or angle of the flat spot *(the better the job done here, the less trouble you will have at the flying field)*.

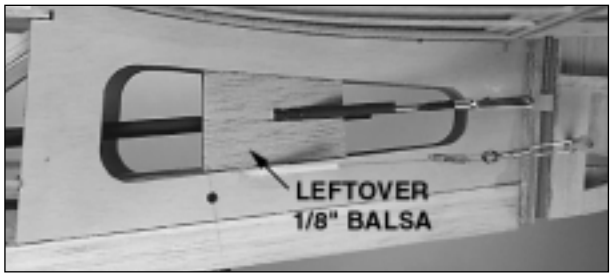
❏ 12. Temporarily mount the tail gear assembly to the fuselage with three 6-32 x 1/2" Phillips head screws. Secure the steering arm to the tail gear wire. It will be necessary to drill an 1/8" hole through the side of the fuse to access the screw on the steering arm with your hex wrench. Be certain the steering arm is locked onto the flat spot.

❏ 13. Use denatured alcohol or other solvent to clean the .074" x 36" threaded one-end pushrod. Cut the pushrod to the correct length for the **tail gear steering pushrod** that connects the rudder servo to the steering arm on the tail gear.




❏ 14. Cut eight 3/8" long **bushings** from the leftover guide tubes you used to guide the pull-pull cable for the rudder. Slide the bushings evenly spaced, onto the pushrod. If the bushings fit loosely, secure them with a small drop of thin CA.

❏ 15. Hook up the tail wheel steering the same way you did the elevators with the pushrod you just made, a 3/16" guide tube and four 1/8" plywood guide tube holders. If you prefer to remove the tail gear assembly when it’s time for covering, proceed to the next step. Otherwise, remove the screw in the steering arm and the two set screws on the collars, apply a small drop of thread lock to the screws, then reinstall and securely tighten. Be certain the screw in the steering arm is securely fitted in the flat spot on the tail gear wire.

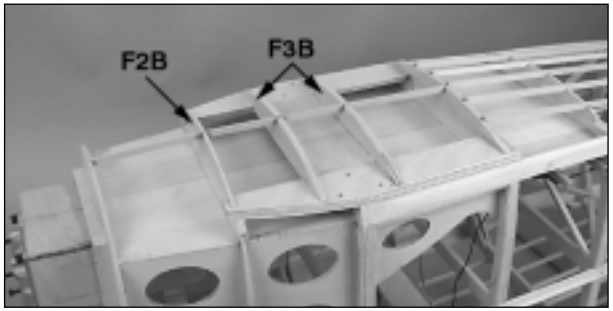



❏ 16. Secure the aft end of both elevator pushrod guide tubes with leftover 1/8" balsa. Cut a slot in the balsa to accommodate the tubes, then glue the balsa pieces to the inside of the stab saddles. This area will be concealed later with pushrod exit covers.

❏ 17. If you intend to install the Top Flite Full Cockpit interior (not included with this kit), glue leftover 1/4" balsa supports to the servo rails to raise the back seat above the servos (as shown in the instructions included with the cockpit kit). If you haven't done so already, remove the temporary cross bracing between formers 3 and 4. Test fit the cockpit kit referring to the instructions included with the kit.

## Sheet the bottom of the fuselage

Before you begin, remove the engine, elevators and rudder to make the fuselage easier to maneuver around on your workbench.

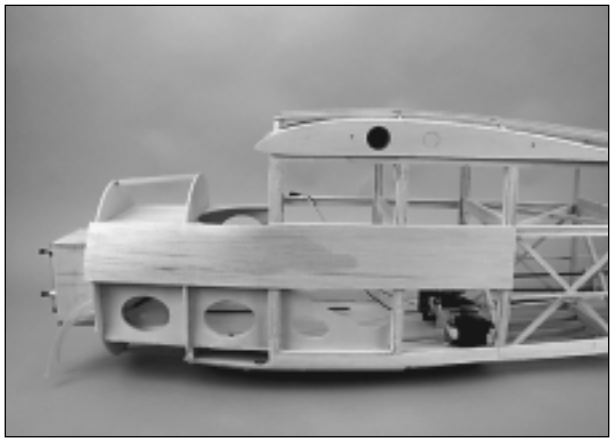



**Refer to this photo for the following two steps.**

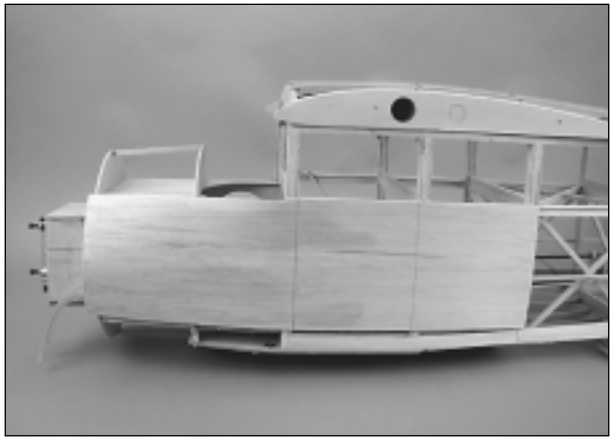
❏ 1. With the landing gear in place, glue formers F2B and F3B into position. Glue a leftover 1/8" x 1/4" basswood stick into the notch in the bottom formers. Glue an additional leftover 1/8" x 1/4" basswood stick into the notch in the **top** of formers 1 & 2.

❏ 2. Remove the landing gear. Round the corners of the landing gear plates to match the contour of the side and bottom formers.

❏ 3. Of the eight 1/8" x 3" x 24" balsa sheets, select the two softest sheets and set them aside for use later in step 7.

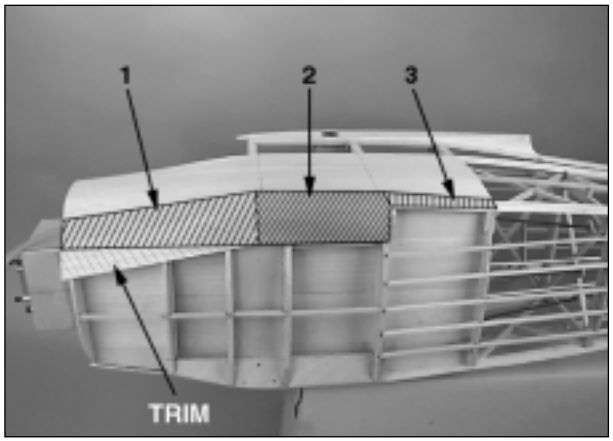


❏ 4. Glue one of the remaining 1/8" x 3" x 24" balsa sheets to the fuse side as shown in the photo. The top edge is flush against the main stringer. If necessary, wet the sheet with water so it will be easier to bend around the front of the fuse.



❏ 5. Glue a second 1/8" x 3" x 24" sheet to the fuse as shown. Before continuing with the sheeting, use a straightedge and a ballpoint pen to lightly mark the edges of formers 3 & 4. This will help later when it's time to cut out the doors.

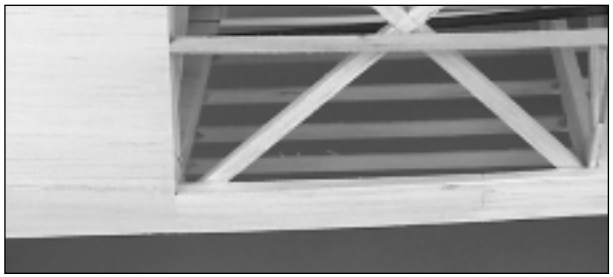
❏ 6. Glue two additional 1/8" x 3" x 24" balsa sheets to the other side of the fuse the same way.




❏ 7. Use one of the two softest sheets you set aside earlier to sheet the corner of the fuse, wrapping the sides around to the bottom. This should be done in three sections as shown in the photo. Wet the sheeting if necessary—this bend may appear to be extreme, but with soft balsa you should encounter no problems. After gluing the sheeting down, trim the front sheet parallel with the inner edge of the 1/4" ply landing gear plate as shown.

❏ 8. Glue the other side of the sheeting into position the same way.

❏ 9. Sheet the bottom of the fuse using two 1/8" x 3" x 30" balsa sheets. Save leftover 1/8" balsa for sheeting the top of the fuse.

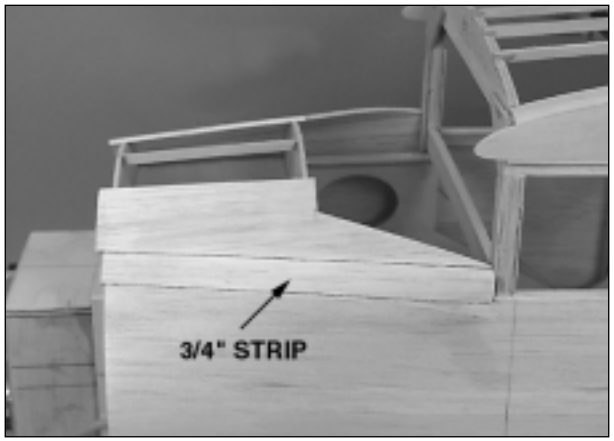


❏ 10. Blend the aft edge of the sheeting to the longerons by gluing pieces of leftover 1/8" x 3/4" balsa to both bottom longerons. Taper the balsa pieces by sanding them to make a seamless transition from the sheeting to the longerons.

❏ 11. Sand the sheeting you've completed thus far smooth and even. Cut slots in the sheeting for the landing gear and drill a hole for the innermost landing gear screw. Mount the landing gear.

## Sheet the top of the fuselage

❏ 1. If installing the full cockpit kit, cut the top deck along the die-cut lines and test fit the instrument panel (included with the cockpit kit). If you're going for an all-out scale cockpit, refer to your documentation photos in case any modifications need to be made at this time.




❏ 2. Using 1/8" balsa left from sheeting the sides and bottom, cut a 3/4" wide strip and glue it into position as shown on the photo. Cut a second piece of 1/8" balsa as shown and glue it to the 3/4" strip.

❏ 3. Sheet the other side of the top of the fuse the same way. Cover the space between both sides to finish the job. Sand the sheeting smooth and even.

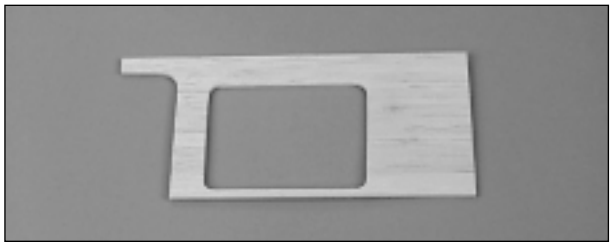
❏ 4. Now that the fuselage is nearly completed, examine all glue joints and look for those that don't appear to be strong. Apply glue where necessary.

## Make the windows and doors

**Note:** In order to access components inside the fuselage (radio system, fuel tank, scale interior, etc.) and to facilitate bolting and unbolting the wing at the flying field, frequent and easy access to the cabin is necessary. Therefore, this model was designed to withstand the stresses of scale flight even with one or two opening scale doors. On many full-size Stinsons, the right door was standard, while the left door was optional. On this model, only one door is necessary to access the cabin and to bolt the wings on, but you should refer to your documentation package to see if you need to make both doors. Making opening doors may be done several different ways. The method illustrated in this manual is rather straightforward and reproducible by the average modeler. If you have much experience in this area, you may use your own method for constructing and attaching opening doors. As in other detailed areas of construction with this model, neatness and minimal glue will yield the best results.

The photos in this section show the left door. If you're only building one door, make the right.

*Let's start with the rear window.*



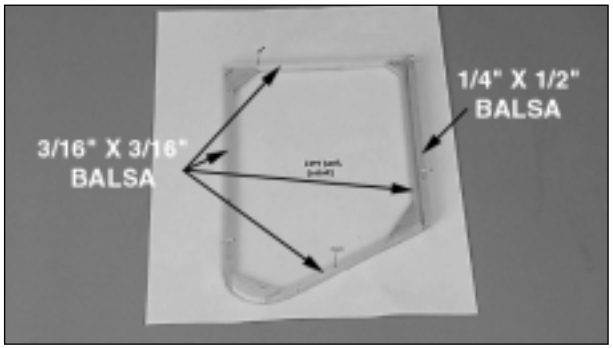
❏ ❏ 1. Make the **aft window frame** from a 1/8" x 3" x 24" balsa sheet. Cut the corners in the window opening using a 3/8" brass tube sharpened at the end. Be certain to position the window opening in the frame so the sides are 1/8" from former 4, the top longeron and the main stringer (as shown on the plan). If you wish to add any scale details to the window frame (such as interior trim or edging) it may be easiest to do this now.


❏ ❏ 2. Glue the aft window frame in position. Use additional 1/8" balsa to blend the aft window frame to the top longeron and former 3. Note that the 1/8" sheeting aft of the window frame is 1/8" thick at the front (at the window frame) and then tapers to zero thickness at the aft end where it blends to the longeron.

❑ ❑ 3. From inside the fuselage, use the bottom of the 1/4" ply fuse sides as a guide to mark the outline of the bottom of the door on the 1/8" balsa fuse sides with a ballpoint pen. Cut the opening in the fuse for the door. Be certain to cut at least an 1/8" away from formers 3 & 4 and from the bottom of the door outline you marked earlier to allow for accurate trimming.


❑ ❑ 4. Cut a 7/8" x 6-3/8" strip of plastic from one of the molded ABS landing gear fairings. Test fit, then glue the strip to the bottom of the door opening joining the 1/8" fuse sheeting to the 1/4" ply fuse sides. Trim the inner edge even with the ply fuse sides. Trim the edges of the door opening even with the formers, the top longeron and the plastic sheet.

❑ ❑ 5. Hold a piece of paper backed up by a magazine or cardboard to the door opening. From inside the fuse, use a ballpoint pen to trace the edges of the door outline onto the sheet of paper. This is your “plan” for building the door frame.

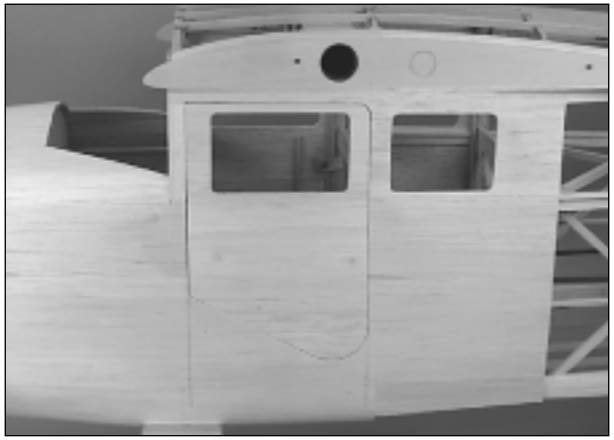



**Refer to this photo for the following two steps.**

❑ ❑ 6. Build the door frame over the plan using a 3/16" x 3/16" x 36" balsa stick and a 1/4" x 1/2" x 24" balsa stick. Make the gussets from the 3/16" x 3/16" stick.

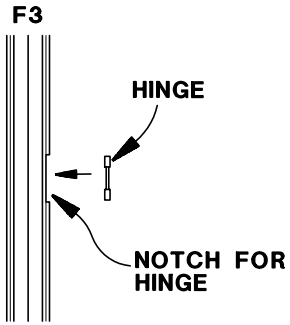
❑ ❑ 7. Trim the door frame to match the curve on the plan at the bottom corner.

❑ ❑ 8. Build the window frame for the door just the same way you did for the fuse (aft of the door). Sheet the rest of the door with 1/8" x 3" x 24" balsa.

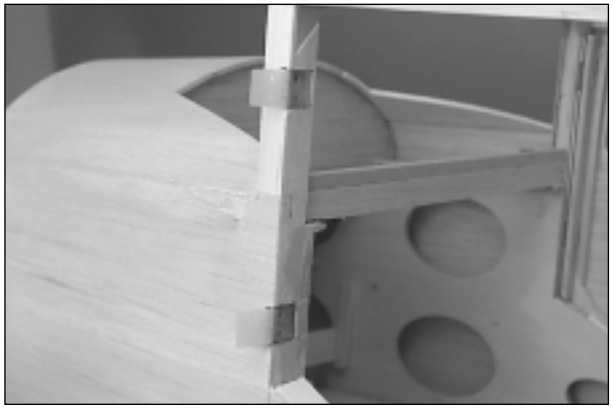


❑ ❑ 9. Test fit the door in the fuse. Trim where necessary for a good fit.

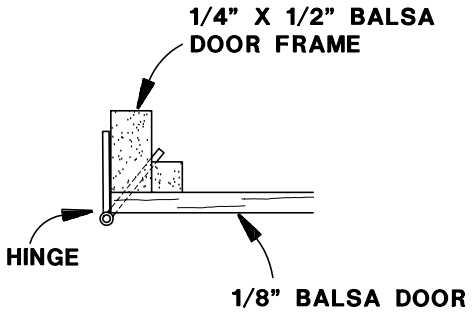
**Note:** For hinging your doors, you may use the Great Planes hinges included with the kit, or hinges of your own choice. Hinges with removable pins are recommended, so the doors may be removed during finishing and covering and after the model is completed. If you use the Great Planes hinges, make removable hinge pins from large T-pins or similar size piano wire. Make an “L” bend on the end of the hinge pin so it can be removed.




❑ ❑ 10. Cut two notches in the aft edge of former 3 to accommodate the door hinges so they will be flush with the aft edge of the former.



❑ ❑ 11. Confirm that the door fits well in the fuse. Make any final adjustments necessary, then glue one half of both hinges into the notches you cut in former 3.




❑ ❑ 12. Mark the hinge locations on the door. Cut the hinge slots in the door to position the hinges as

shown in the sketch. Without using glue, fit the other half of the hinges in the door, then test fit the door to the fuse. If necessary, sand the fuse or door sheeting so the fuse and door blend together (it is most likely that you will have to sand the bottom of the door to match the fuse were it begins to curve slightly toward the bottom).

❏ ❏ 13. Make a **stop** for the aft edge of the door so it can't be pushed inward, and glue it to former 4.

*Now let's make the door latching mechanism...*

**Note:** As explained earlier, this is one of those areas where experienced scale modelers may have their own preferences on how to make mechanisms such as the door latch. If you decide to develop a method other than the one shown here, it is a good idea to make the door latch removable so final sanding and covering will be easier.

Refer to the **door latch detail** in the bottom, right-hand corner of the fuse plan while you make the door latch.

❏ ❏ 14. Make the **guide block** from leftover basswood. Drill a 5/64" (or #48) hole through the block for the torque rod which will be made from a threaded pushrod. Glue the guide block to the inside of the door, then drill the hole through the door.

❏ ❏ 15. Make the **torque rod** and the **door handle** from a .074" x 4" threaded one end rod. Solder the handle to the torque rod. After the model is finished, the handle can be shaped with automotive filler or epoxy to match the full size aircraft.

❏ ❏ 16. Thread the torque rod through the basswood block. The torque rod will fit tightly into the block, making threads as it goes through. This is what holds it in and pulls the door to the fuselage.

❏ ❏ 17. Make the **latch** from leftover 1/16" plywood. Drill a 1/8" hole through the latch and insert a 2-56 blind nut. Thread the latch onto the torque rod until it will catch the inside of former 4 and pull the door closed. Lock the latch to the torque rod with a 2-56 nut.

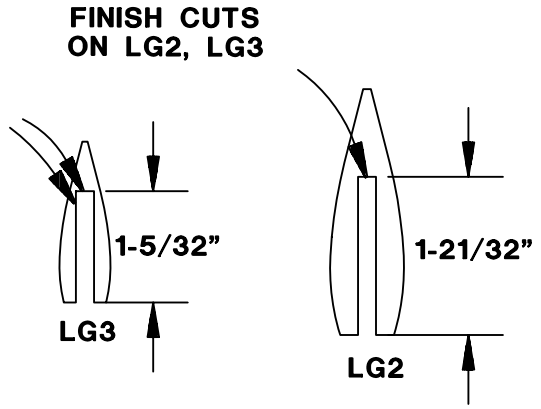
❏ ❏ 18. Make final adjustments to the fit and sizing of the door to accommodate the thickness of added covering and paint.

❏ ❏ 19. If you wish to go that extra mile for scale realism, add door trim made from sheet plastic or plywood (not included). For illustration, the photo shows the trim in position, but it may be better to add the trim after you paint or cover your model.

❏ 20. Return to step one and build the other window frame and door. If you're only building one door, just make the front and rear window frames instead of the opening door.

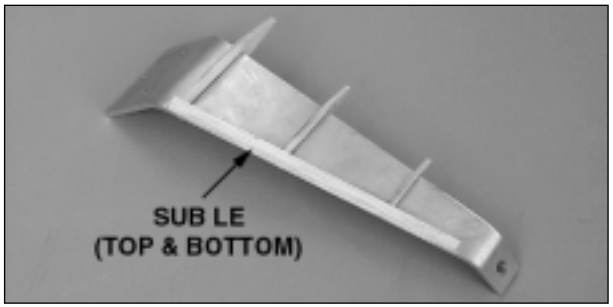
## Build the landing gear

❏ 1. Use denatured alcohol or other solvent to clean both prebent aluminum landing gears. Roughen the landing gear with coarse sandpaper so glue will adhere.

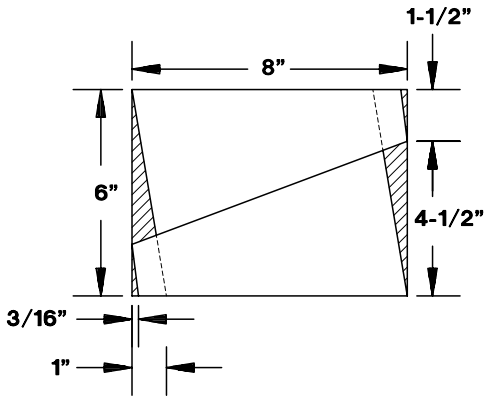


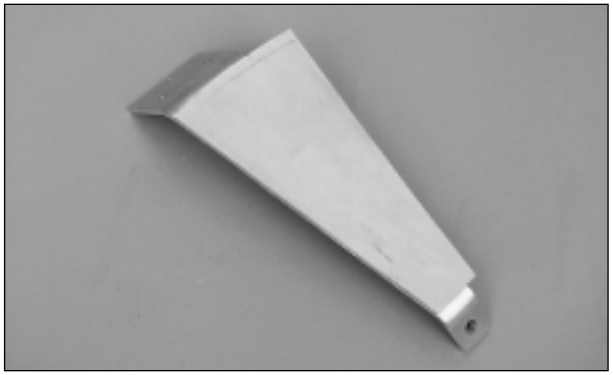

❏ ❏ 2. Cut two 7-3/8" **landing gear sub LE's** from a 1/4" x 1/4" x 36" balsa stick. Test fit the die-cut 1/8" plywood **landing gear ribs** to the gear using one of the sub LE's to determine the exact location of the ribs on the gear. **Note**: You will have to finish the die-cuts where indicated by the arrows in the sketch to remove the landing gear ribs from their die sheets.

❏ ❏ 3. Glue both sub LE's and the ribs to the gear with epoxy (CA does not adhere well to aluminum). If you're working on the second gear, don't forget to make a right and a left!



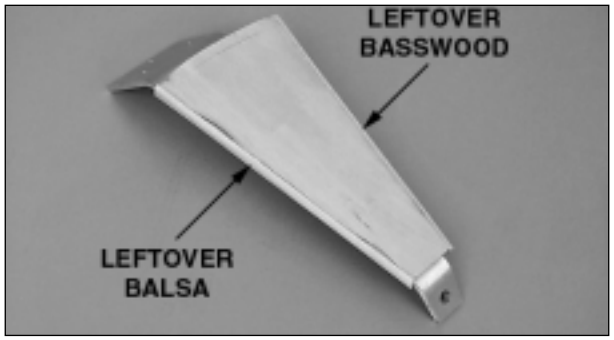

❏ ❏ 4. Shape the sub LE's to match the downward curving angle of the ribs.



❏ ❏ 5. Cut two **landing gear skins** from the 1/32" x 6" x 8" plywood sheet using the dimensions shown in the sketch. Glue one of the skins to the top of the landing gear and the other to the bottom.

❏ ❏ 6. Sand the sheeting even with the front of the aluminum gear and the end of the ribs.



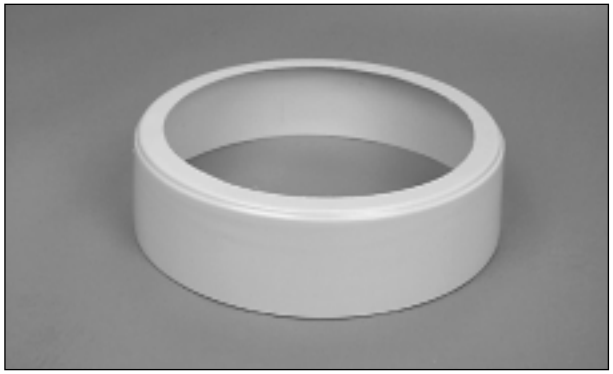

❏ ❏ 7. Glue leftover 1/8" balsa to the LE and leftover 1/8" x 1/4" basswood to the TE of the gear. Blend the LE and TE to the sheeting. The landing gear may now be covered with iron-on covering, but for the best durability and appearance, it is recommended that the landing gear be covered with glass cloth and resin, then primed and painted.

❏ 8. Build the other landing gear the same way. Be certain to make a right and a left, as both aluminum landing gears are the same.

## Mount the Cowl

❏ 1. Trim the bottom flange around the molded ABS **forward cowl** so that approximately only 1/8" remains. Use 250-grit sandpaper to thoroughly scuff the outside of the cowl so you can make marks with a pencil. Place the forward cowl and a pencil on a flat surface. Hold the pencil to the base of the cowl and turn the cowl around the pencil marking a trim line all the way around.

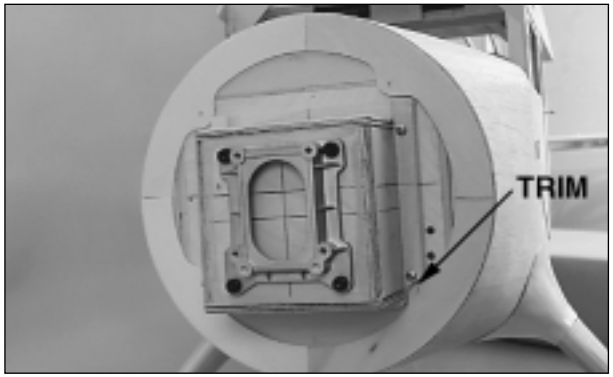
❏ 2. Use a builder's square as a guide to mark lines extending from the molded-in "dots" near the bottom of the cowl to the front of the cowl. These will be used later for aligning the cowl blisters. Trim the forward cowl along the line you marked around the base.



❏ 3. Mark and trim the bottom of the molded ABS **aft cowl** the same way. Cut a hole in the middle of the aft cowl leaving a 1/2" ring all the way around. Save the leftover circular sheet of plastic for the pushrod exit covers to be made later.

❏ 4. **Thoroughly** sand the inside of the forward and aft cowl, and the groove where the forward cowl will join the aft cowl with coarse sandpaper so glue and glass cloth will adhere.

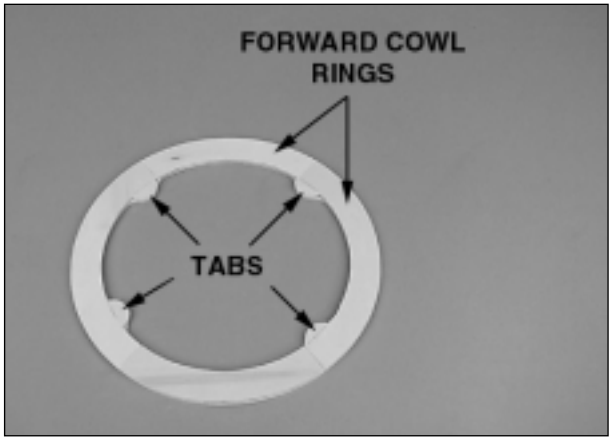
❏ 5. Center the forward cowl on the aft cowl and glue them together with CA. Refrain from using CA accelerator because it may soften the plastic.




❏ 6. Determine where to fit the four die-cut 1/8" plywood **aft cowl ring sections** on the firewall. The

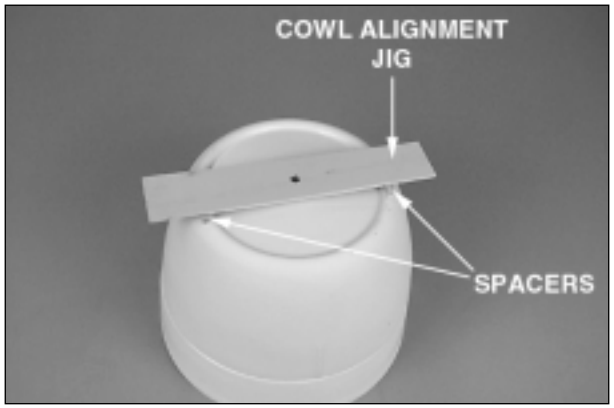
"tabs" on the cowl ring sections are where the cowl mounting screws will be located, so position the tabs where you will be able to access the mounting screws, taking into consideration the positioning of the engine, exhaust, and whatever other systems you plan to install inside the cowl. If necessary, trim the extension box to accommodate the cowl ring sections (as we have done to our prototype seen in the photo). Position the tabs over the 1/4" firewall if possible. **Note:** It may be necessary to trim the ends of the cowl ring sections so they will all fit together on the firewall. From now on the joined assembly of the four aft cowl ring sections will be referred to as the **aft cowl ring**.

❏ 7. Temporarily hold the aft cowl ring to the firewall with a few drops of CA or 3M® 77 or 75 spray adhesive.



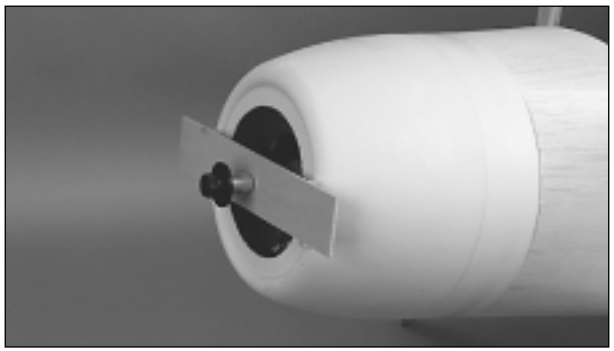

❏ 8. With the aft cowl ring temporarily held to the fuse, glue the four die-cut 1/8" plywood **forward cowl ring sections** and the four die-cut 1/8" plywood ***tabs*** to the aft cowl ring. Note that the joints in the forward cowl ring sections **do not** align with the joints in the aft cowl ring. From now on this assembly will be referred to as the **cowl ring**. *For illustration the cowl ring shown in the photo is off the firewall, but yours should be on the firewall.*

❏ 9. Temporarily secure the cowl ring to the firewall with four #2 x 3/8" screws. Be certain a small "ledge" exists where the 1/8" fuse sheeting steps down to the cowl ring for the thickness of the cowl. If necessary, trim the cowl ring.

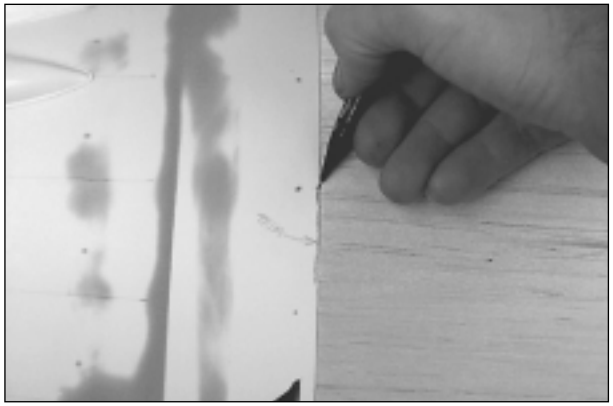



❏ 10. Drill a 1/4" hole in the exact center of the cowl. Make a **cowl alignment jig** by drilling a hole to fit the crankshaft of your engine in a piece of leftover 1/8" plywood or balsa. Align the hole in the jig with the hole you drilled in the center of the cowl, then temporarily glue the jig to the cowl with spacers in between to set the desired prop clearance (1/4" is recommended).

❏ 11. The jig will center the front of the cowl on the engine, so now cut the opening in the front of the cowl as shown in the following photo.



❏ 12. Fit the cowl to the fuse with the cowl alignment jig on the engine. Be certain the molded-in *dimples* that indicate the location of the cowl blisters straddle the centerline on the top and bottom of the fuse.



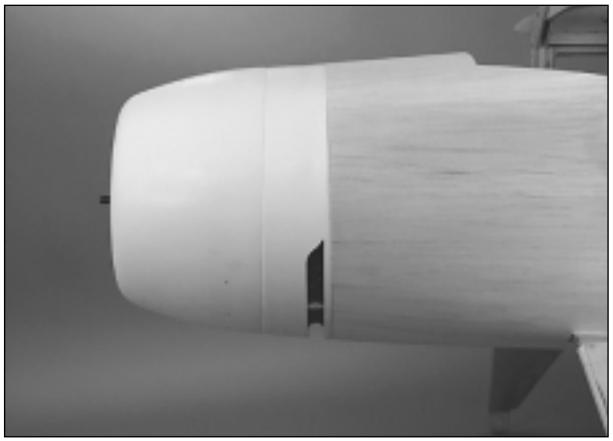
❏ 13. Little by little, trim the aft edge of the cowl for a good fit to the fuse. **Hint:** Scuff the outside of the cowl so you can use a pencil to make marks. As you "zero in" on the fit of the cowl to the fuse, mark the high spots that interfere with a good fit to the fuse, then remove the cowl and sand where you marked. Test fit, mark and trim as necessary.

❏ 14. After you are satisfied with the fit of the cowl to the fuse, remove the cowl and the cowl ring. Use a 1/4" drill to enlarge the holes in the firewall left by the #2 screws. Use epoxy to glue four **6-32 threaded inserts** into the holes.

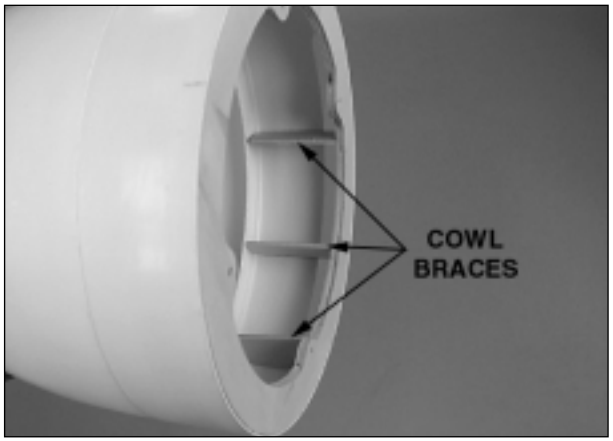
❏ 15. Enlarge the holes in the cowl ring with a 5/32" drill bit, then test fit the cowl ring to the fuse with four 6-32 x 5/8" socket head cap screws, #6 lock washers and #6 flat washers.

❏ 16. Remove the cowl ring. Cover the entire firewall with a piece of waxed paper, then remount the cowl ring. Position the cowl on the fuse, confirm alignment, then glue the cowl to the cowl ring with a mixture of epoxy and microballoons to keep it from flowing.

❏ 17. Blend the fuse to the cowl by sanding where necessary. Remove the cowl and take off the cowl alignment jig.

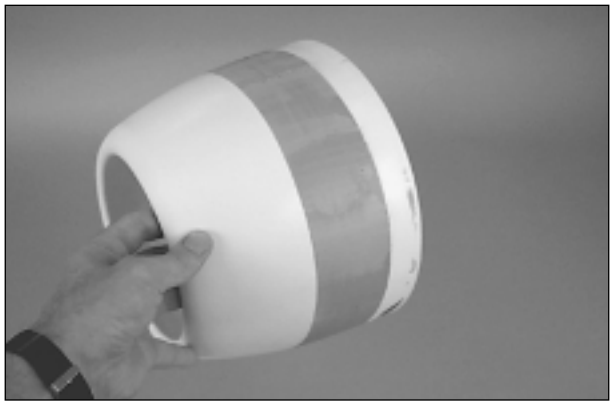


❏ 18. Cut the air exit slot around the bottom of the cowl. On our prototype, we made this slot about 5/8" wide and extended it about 1/2-way around the cowl. Refer to your own documentation for the exact sizing and location of the slot on your model.




❏ 19. Use the die-cut 1/8" plywood **cowl brace** as a pattern to make two more cowl braces from leftover 1/8" plywood. Trim each cowl brace to fit inside the bottom of the cowl, bridging the gap between the cowl ring and the bottom of the cowl. Glue the braces into position.

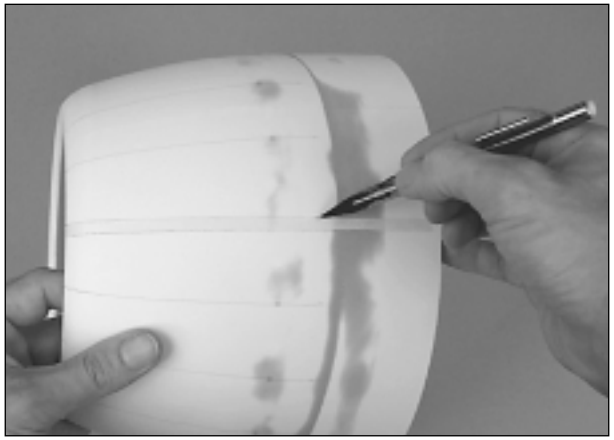
**NOTE**: There are four additional cowl ring pieces labeled CRM. If desired, they can be used to reinforce the joint between the forward and aft cowl.



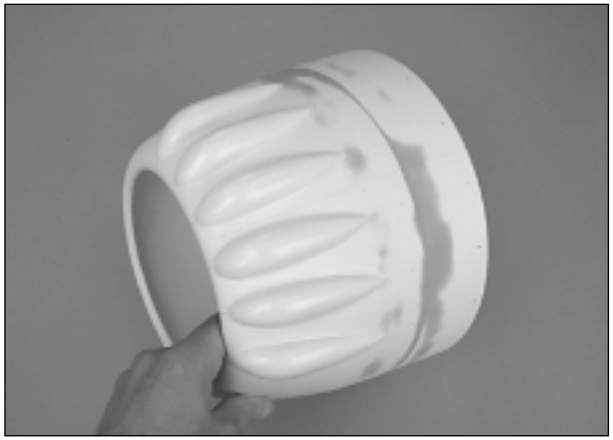
❏ 20. **Thoroughly** sand the outside of the cowl so filler will adhere. Use filler such as automotive Bondo® or something similar to blend the aft cowl to the forward cowl. **Hint:** Wrap the cowl with masking tape about 1-1/2" on both sides of seam. Apply only as much filler as is required, then remove the tape. This will greatly reduce the amount of sanding required.

❏ 21. Sand the filler smooth, blending the aft cowl to the forward cowl.

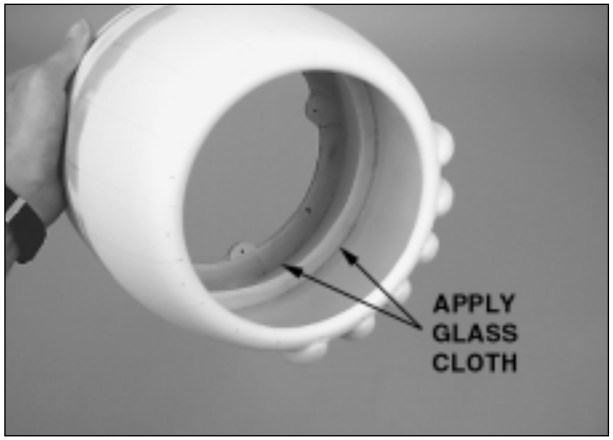
❏ 22. Trim the eighteen molded ABS **cowl blisters** so only about a 1/16" lip remains around the edge. **Thoroughly** sand the cowl blisters so adhesive, filler and paint will adhere.



❏ 23. Refresh the pencil lines that you drew earlier in step 2. Notice that the two blisters on the top and the two blisters on the bottom of the cowl straddle the centerline of the fuse.



❏ 24. Align the cowl blisters over the lines you marked on the cowl and glue them into position with thin CA. Drill 1/16" vent holes through the cowl under the blisters so they won't pop off in hot conditions.




❏ 25. Cut the 50" strip of 1" wide glass cloth into three-inch strips. Use 30-minute epoxy to glue the strips around the inside of the cowl to reinforce the joint between the forward and aft cowl and between the aft cowl and the cowl ring. Be certain the cowl is **thoroughly** sanded in these areas so the epoxy will adhere.

❏ 26. If you haven't done so already, hook up your exhaust system. Since there are many different engine configurations available for this model, it is up to you to select a suitable exhaust system. On one of our prototype Stinsons with the O.S. 160 Gemini, we made exhaust tubes from K&S 11/32" brass tubing and connected them to the exhaust headers with high temp (1,100 degree minimum) silver solder. Other suitable exhaust systems for the O.S. Gemini (and other four stroke engines) are Aerotrend tubing (AERG2205), O.S. flex tubing (OSMG2672) or C.B. Associates tubing (CBAG3136). We recommend you place the highest priority on making a reliable exhaust system rather than making a scale exhaust system with difficult bends that may cause overheating or other problems.

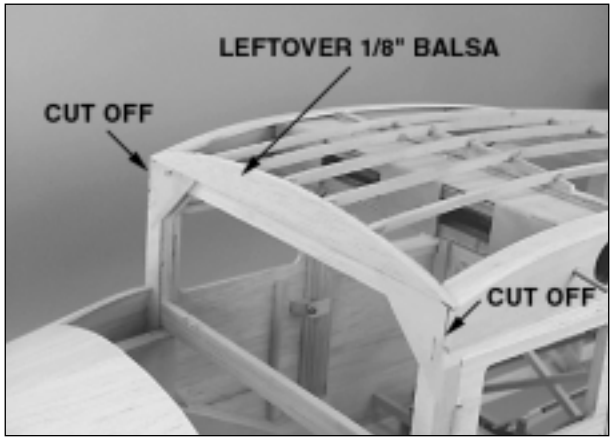
❏ 27. Mount your fueling system, remote glow plug hookups and any other accessories you plan to use, then cut holes in the cowl to accommodate or access those items as well as your needle valve and choke (if one is used on your engine).

❏ 28. If you've decided to use one, fit a dummy radial engine inside the cowl. We adapted the 1/5-scale Top Flite Corsair radial engine to fit inside the cowl of the Stinson. To do this, the overall diameter of the dummy cylinders has to be trimmed by cutting off a portion of the valve covers. The diameter when trimmed should be approximately 8-1/4". Note that the valve covers have been trimmed at an angle to match the shape of the cowl.

❏ 29. Test fit the dummy engine inside the cowl and trim as necessary for a good fit. Glue the dummy engine to a piece of 1/8" lite-ply (not supplied). Trim where necessary to allow air passage over the head(s) of your engine and to accommodate the carburetor and wrench for access to the cowl screws. After the model is finished and the cowl and engine are painted, glue the dummy engine inside the cowl with RTV silicone adhesive.

## Finish the front cabin

Before proceeding, be certain you have finalized any details that will be difficult to reach once the cabin top and windshield are in place. Such details (should you decide to add them) would be the instrument panel, scale interior lining, painting in the cabin area, additional instrumentation, etc.

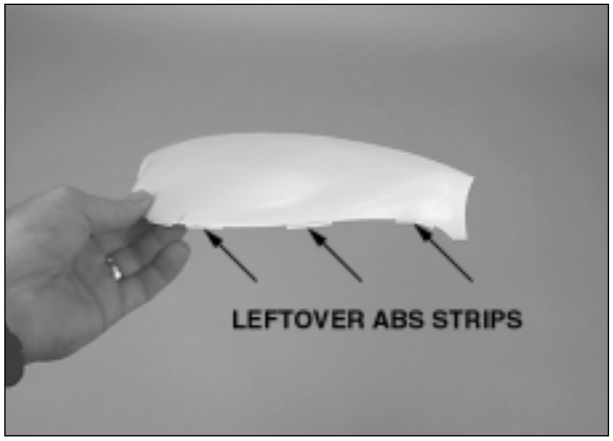



**Refer to this photo for the following two steps.**

❏ 1. Cut off both ply fuse root ribs flush with the front of former F3.

❏ 2. Glue a piece of leftover 1/8" balsa across the top of former 3 above the corner braces. Shape the balsa to match the top of the fuse and the stringers.

❏ 3. Join the wing to the fuse. Replace the fronts of the fuse root ribs you cut off with leftover 1/8" balsa and glue to the fuse as shown. Shape the 1/8" balsa pieces to match the wing, leaving approximately 3/16" extending below the bottom of the wing.

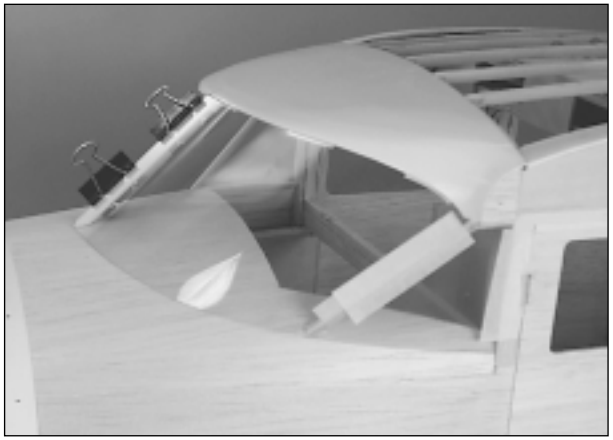



❏ 4. Cut the front of the molded ABS **cabin top** along the cutlines. Cut the rest of the cabin top along the aft edges as shown. Glue 3/16" wide strips of leftover ABS inside the top edge to support the clear windshield that will be added later.

❏ 5. Glue the cabin top to the fuse, then trim the ends even with fuse root ribs.

❑ 6. Cut three 1/4" x 5-3/4" wood dowels to the correct length as shown in the photo, then bevel the ends to match the fuse. Glue the dowels to the fuse and cabin top with epoxy.

❑ 7. Use the **side** and **front windshield patterns** on the plan to cut the **windshields** from the 10" x 20" clear plastic sheet. **IMPORTANT:** The fit of the windshields may vary from model to model depending upon dowel placement and the final shape of the cabin top. For this reason, be sure to cut your windshields larger than the patterns to allow for accurate trimming and positioning.



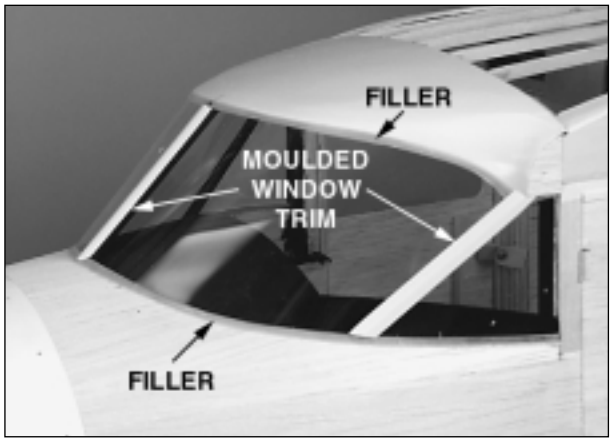
❑ 8. Test fit the side and front windshields to the cabin top and fuse. Trim where necessary.

❑ 9. At this stage the instrument panel and dashboard area should be nearly completed, because we're getting ready to install the front windshield which will make these areas virtually inaccessible. The way the prototype in this manual was finished was to mark the outline of the side and front windshields on the fuse, then remove the windshields and paint the front of the cabin black. Some modelers may prefer to finish the cabin and install the windshields after the model is covered, but this may be easier to do now because of the windshield trim that will be added soon.

**NOTE**: The window material may be covered with a clear plastic protective layer on both sides.

*If you prefer to glue the windows in place and add the trim after the model is covered, skip ahead to the next section, then return when you're ready.*

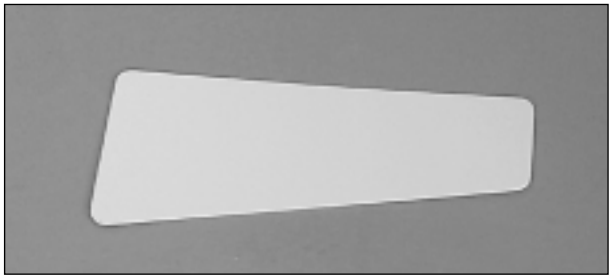
❑ 10. Wash the side and front windshields with a mild soap and water solution, then glue them into position. If you're careful, you may use CA. If you've had bad luck gluing windows in with CA, use canopy glue such as RC-56. The edges of the windows will be concealed with filler to simulate window trim, so you don't have to do a *perfect* gluing job, but use care not to get glue or any other unremovable "guck" anywhere else on the windows.



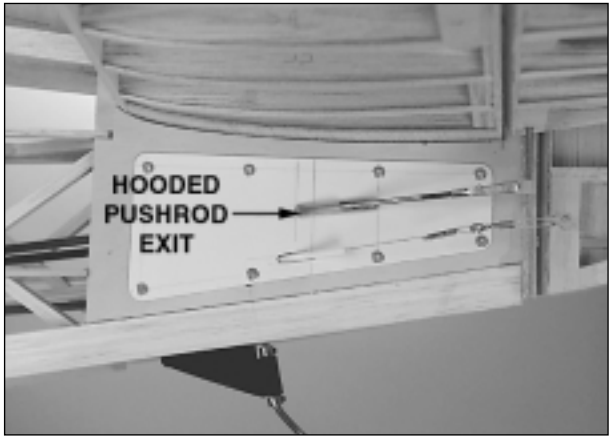

❑ 11. Use filler or epoxy mixed with microballoons to make a fillet that simulates window trim joining the windows to each other and to the fuse and the cabin top. Allow the filler to harden, then cover the windows with masking tape to avoid scratches and carefully sand the filler to remove any rough edges.
**Note:** In case you wish to modify your windows if you are building another version of the Stinson, molded ABS **window trim** is supplied with this kit. The triangular parts of the molded window trim may be used for the vertical posts over the 1/4" dowels on this model.

❑ 12. While you're at it, use the remaining clear plastic sheet to make the side windows for the aft cabin and doors. You can cut them slightly oversize and simply glue them to the inside of the cabin (after you've covered the model), or inset them into the window openings and add trim made from plastic sheeting (not supplied) just the same as was shown for the opening doors.

## Make the Pushrod Exit Covers



❏ ❏ 1. Use the **pushrod exit cover pattern** on the plan to make a **pushrod exit cover** from the circular sheet of plastic you cut from the aft cowl.




**Refer to this photo for the following three steps.**

❏ ❏ 2. Cut slots in the pushrod exit cover so the elevator pushrod and rudder cable can pass through. Test fit the cover over the fuse to make sure the slots are in the correct location. Make adjustments if necessary.

❏ ❏ 3. Glue a **hooded pushrod exit** in the upper slot for the elevator pushrod. Trim the flange on the base of the hooded pushrod exit flush with the inside surface of the pushrod exit cover. Cut the remaining portion of the elevator pushrod guide tube that protrudes from the fuselage.

❏ ❏ 4. Fit the pushrod exit cover over the fuse. Drill 1/16" holes in the fuse and 3/32" holes in the cover, then secure the cover to the fuse with #2 x 3/8" screws.

❏ ❏ 5. If you prefer, glue an additional hooded pushrod exit to the pushrod exit cover over the rudder cable guide tube, or leave the guide tube extending from the fuse as shown in the photo.

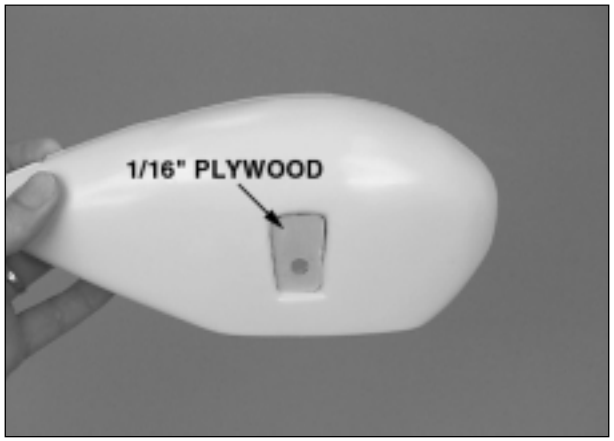
❏ 6. Make the pushrod exit cover for the other side of the fuse the same way.

## Assemble the Wheel Pants

❏ ❏ 1. Cut one set of wheel pant halves along the molded-in cutlines. Thoroughly roughen the insides of both wheel pant halves so glue will adhere.

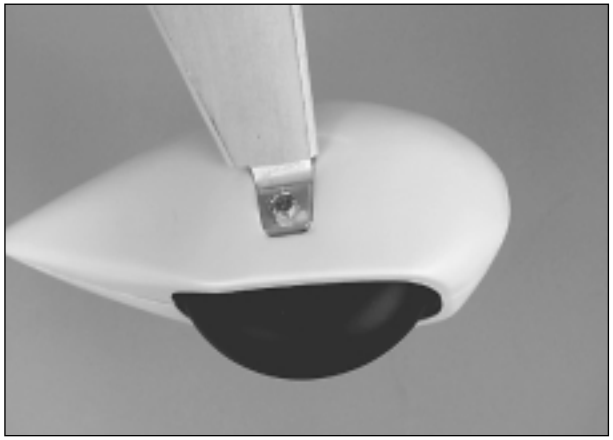
❏ ❏ 2. Cut a piece of leftover 1/16" plywood to fit in the recess in the inner wheel pant half and glue it into position (you can see the ply piece in the following photo).

❏ ❏ 3. Test fit the inner wheel pant to the corresponding landing gear. If necessary, round the edges of the gear so it will fully contact the ply plate.




❏ ❏ 4. Temporarily fit the inside wheel pant to the matching landing gear. Mark the location of the hole on the pant, then drill or cut a 5/16" hole for the axle.

❏ ❏ 5. Glue the inner wheel pant half to the outer wheel pant half with CA. Refrain from using accelerator because it may soften the plastic. Be certain the two halves are securely glued together by reinforcing the seam from the inside with CA.



❏ ❏ 6. Slip a 3/16" wheel collar, a 5" wheel followed by another 3/16" wheel collar onto the axle. Fit the assembly into the wheel pant, then mount the pant and the axle to the landing gear with a nut. **Note:** If necessary, use a #11 drill to enlarge the hole in your wheel to fit the axle.

❏ ❏ 7. Center the wheel in the wheel pant. Be certain the opening for the wheel provides at least 3/16" clearance all the way around. Enlarge the opening if necessary.

❏ ❏ 8. Tighten and loosen the set screws a few times to mark where they contact the axle. Remove the wheel and wheel pant and file flat spots on the axle where the set screws left their marks. **Do not** omit the outer flat spot on the axle, otherwise the wheel collar may shift or fall off. *(One wheel landings are not particularly difficult, but can be embarrassing.)*

❏ 9. *You know the drill.* Return to the first step and assemble the other wheel pant the same way.

❏ 10. The same as you did for the cowl, fill seams between the wheel pant halves with filler such as automotive Bondo® or similar.

You may remount the wheels and pants to the model at this time, or wait until after they are painted. When you mount the wheels on the axles during final assembly, lubricate the wheels on the axles to be certain they roll freely.

## Mount the Stab Struts


**Refer to this photo while you mount the stab struts.**

❏ ❏ 1. Cut a *pocket* in the bottom longeron to accommodate a 3/4" x 1-1/4" **fuselage strut mount** made from leftover 1/8" plywood. Glue the strut mount into position.

❏ ❏ 2. Cut the 21" basswood stab strut in half. Cut one of the **stab struts** to the correct length and bevel the ends to fit the stab and the fuse.

❏ ❏ 3. Drill a 1/8" hole through the top of the strut in alignment with the hole in the strut mount on the stab. Secure the strut to the stab with a 4-40 x 1/2" socket head cap screw.

❏ ❏ 4. Drill a 3/32" hole through the other end of the strut and the fuselage strut mount. Enlarge the hole in the strut only with a 1/8" drill.

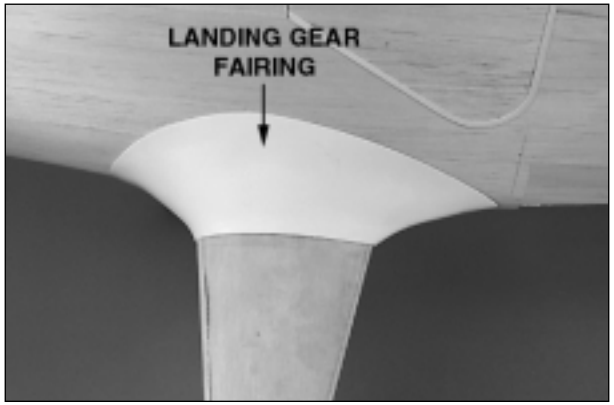
❏ ❏ 5. Add a few drops of thin CA to the hole in the fuse strut mount, allow to harden, then secure the strut to the fuse with a #4 x 5/8" screw.

❏ 6. Mount the strut to the other side of the stab the same way. When it's time for finishing, you may cover the stab struts with iron-on covering, or cover them with lightweight glass cloth and resin, then prime and paint.

## Mount the Landing Gear Fairings and Wing Struts

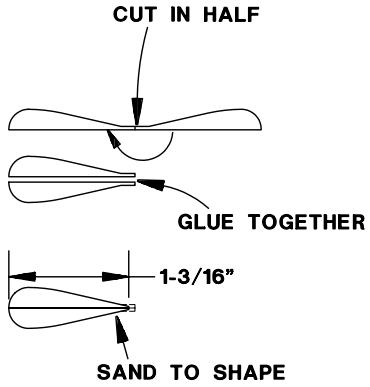
**Note:** The wing struts are for scale appearance only and do not add structural support to the wing. Due to the design of the wing and its own internal bracing, the additional support of functional struts is not required when the Stinson is **flown in a scale-like manner**.

*Make the left side first so yours will match the photos.*

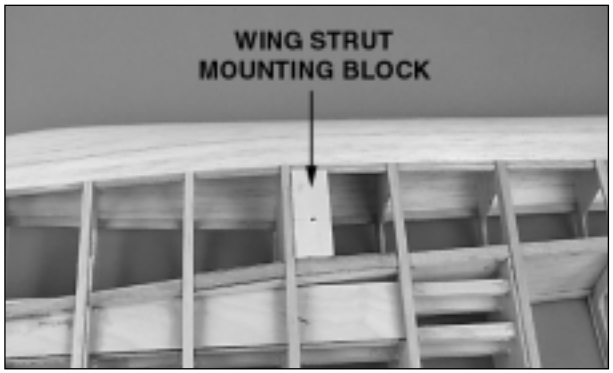



❏ ❏ 1. Cut the left molded ABS **landing gear fairing** along the cutlines, then trim the opening for the landing gear. Test fit the fairing and trim the opening until it fits the fuse and the landing gear. **NOTE**: The smaller of the two fairings is the left one.

❏ ❏ 2. Temporarily attach the landing gear fairing to the fuse with masking tape.

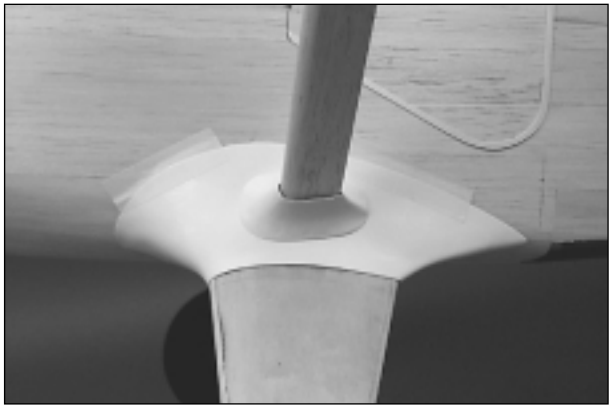



❏ ❏ 3. Separate two shaped 18" basswood **wing strut halves** as shown in the sketch. Glue the two halves together, then sand smooth and even.

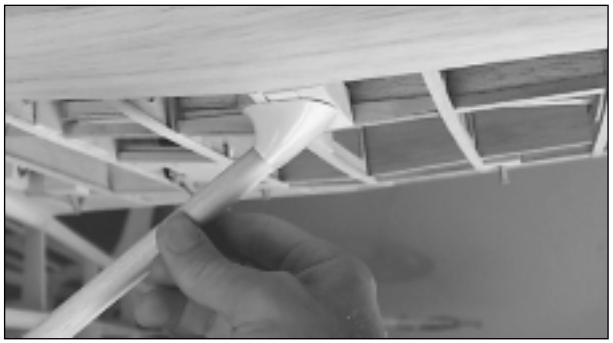



❏ ❏ 4. Drill a 5/32" hole through the 3/4" x 1" x 3-1/2" **wing strut mounting block** where shown on the plan. Trim the block to fit in the wing, then glue it in place to rib doubler 5D flush with the bottom wing sheeting and cap strips as shown. Do not install the 6-32 blind nut until instructed to do so.

❏ ❏ 5. Mount the wing to the fuse. Cut the wing strut to the correct length, then bevel one end to match the angle at which it meets the wing. The bottom of the strut simply rests against the landing gear fairing. **Note:** You'll find that the wing strut interferes with the door and does not allow it to open all the way (in fact, the door can only open about halfway). This is "scale" and is the same on the full-size Stinson.



❏ ❏ 6. Cut out the molded ABS **lower strut fairing** along the cutlines. With the strut in position, trim the lower strut fairing to fit the landing gear fairing and the wing strut. After you've achieved a good fit, glue the lower strut fairing to the landing gear fairing. **Note:** You don't have to get a perfect fit between the lower strut fairing and the landing gear fairing—filler will be added later, blending the two for a seamless transition.
**IMPORTANT**: If you plan to do aggressive aerobatics, you should make the wing strut load bearing. Make an aluminum bracket that is attached to the bottom of the strut and mounts to one of the landing gear screws.



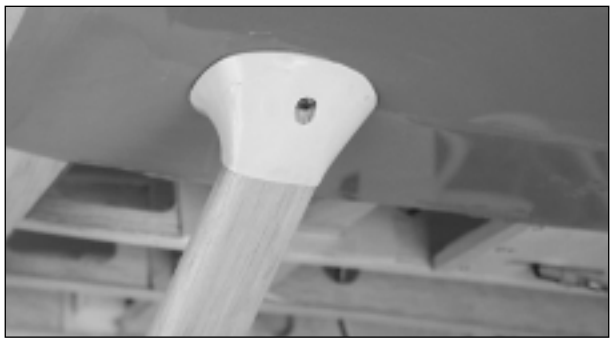
❏ ❏ 7. Test fit the molded ABS **upper strut fairing** to the top of the wing strut and the wing the same way you did the lower strut fairing.

❏ ❏ 8. After you are satisfied with the fit of the upper strut fairing to the wing and the strut, position the assembly on the wing, then glue the fairing to the strut, (don't glue them to the wing).

❏ ❏ 9. Temporarily cover the bottom of the wing with iron-on covering where the top of the strut comes into contact. Cover that part of the wing with wax paper, Saran wrap, or spray on a light coat of mold release agent. Fill the top strut fairing with filler such as automotive Bondo or something similar, then fit the strut to the wing and allow the filler to harden.

❏ ❏ 10. Remove the strut from the wing, then sand the filler, blending it to the top strut fairing.

❏ ❏ 11. Position the strut on the bottom of the wing, centering it under the hole in the strut mounting block. From the top of the wing, use the hole you already drilled in the strut mounting block as a guide to drill a 5/32" hole through the strut *(now the holes are guaranteed to line up)*.

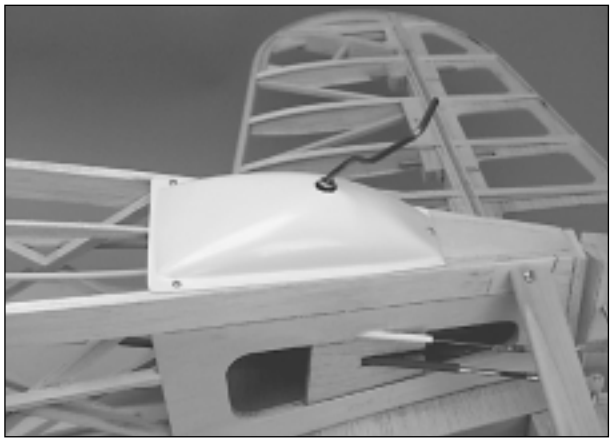


❏ ❏ 12. Enlarge the opening of the hole in the upper strut fairing to countersink the head of a 6-32 x 1-1/4" socket head cap screw. Install a 6-32 blind nut into the top of the wing strut mounting block. Test mount the strut to the wing with the screw.

❏ ❏ 13. Mount the landing gear fairing. There are two ways to do this. The first way is to permanently glue it to the landing gear. Drill holes in the bottom of the fairing for the landing gear screws. The second way is to use eight #2 screws, evenly spaced around the edges, to hold the fairing to the fuse sheeting. If you use this method add a few drops of thin CA to the holes in the balsa to get a secure grip on the screws.

❏ 14. Use filler to blend the lower strut fairing to the landing gear fairing. When the filler hardens, sand it to shape.

❏ 15. Return to step 1 and build the other wing strut the same way.



❏ 16. While the model is upside-down, cut out the molded ABS **tail gear cover** and test fit it to the bottom of the fuse over the tail gear. You can use #2 screws to hold it in position, or glue it in place with RTV silicone after the fuse is covered and the cover is painted.

## Prepare the Model for Covering

With a scale model such as this, there may be several “loose ends” to be completed before or after the model is covered. Use your own expertise and preference as a guide, but some of the following items may be easier to tackle now, before the model is covered.

❏ 1. Determine where to route the servo extension cords and make provisions for internal connectors. Connections between servo cords and extension cords should be secured with vinyl tape, heat shrink tubing, or special clips intended for this purpose. Conceal connectors and extension cords inside the cabin where they won’t be seen (if you are installing a scale cockpit kit).

❏ 2. Mount your on/off switch and external charge jack. Since this model has opening doors, you may mount the switches inside the cabin.

❏ 3. Determine what scale details you will be adding and make provisions for them now. Accessories such as the step ladder, storage compartments, lighting and various antennas may be easier to fashion and figure out how to attach now, rather than after the model is covered. If possible, make these delicate scale accessories removable so they will not get damaged during transportation.

❏ 4. If you prefer an internal receiver antenna, mount an antenna guide tube inside the fuselage.

❏ 5. If you haven’t already done so, determine where to mount the receiver and battery pack. You don’t have to actually mount them now, but you should at least make provisions for where they are to be located. At this preliminary stage, your battery pack location should just be tentative. If it becomes necessary to adjust the C.G., it may help to relocate the battery pack rather than adding additional ballast. Full information on balancing the model is on page 53.

❏ 6. Inspect all surfaces for uneven glue joints and seams that require filler. Apply filler where needed. Many small dents or scratches in balsa can be repaired by applying a few drops of water or moistening the area with a wet tissue. This will swell the wood so you can sand it when it dries.

❏ 7. Final sand the entire model with progressively finer grits of sandpaper, finishing with 320 or 400-grit. Round the outer square edges of the top and bottom longerons on the fuselage to simulate metal tubing.

*This is as close as your model will get to being finished before the covering is added. Now is the time to balance the model laterally.*

## Balance the Airplane Laterally

❏ 1. Mount the wings to the fuse.

❏ 2. With the wing level, carefully lift the model by the crankshaft and the aft end of the fuselage under the stab (this will require two people). Do this several times.

❏ 3. If one wing always drops when you lift the model, that side is heavy. Balance the airplane by gluing weight inside the other wing tip. Do this by carving a cavity in the bottom of the balsa wing tip and filling it with the amount of weight required to balance the model laterally. Glue the weight in place with epoxy and cover the rest of the cavity with balsa filler. An airplane that has been laterally balanced will track better in certain maneuvers.

# FINISHING

## Painting

❏ 1. Determine whether to paint the cabin top and window trim before or after the model is covered. This depends upon the covering system and finishing method you have chosen. If you are going to use a covering that requires painting, cover the model first, then paint the cabin top and window trim when you paint the rest of the model. If the covering you are going to use does not require painting (such as 21st Century fabric), you could paint the cabin top and window trim first, then apply the covering.

❏ 2. Prime and paint parts that will not be covered with iron-on covering. These include the wheel pants, landing gear, wing and tail struts, pushrod exit covers, landing gear fairings and cowl. Wood parts such as the landing gear and struts should be covered with glass cloth and resin before painting.

❏ 3. Paint the cockpit interior (or if you prefer, wait until after the rest of the model is finished).

## Covering

NEVER CUT THE COVERING DIRECTLY ON THE MODEL. Modelers who cut through the covering tend to cut into the sheeting or leading edges, weakening the structure.

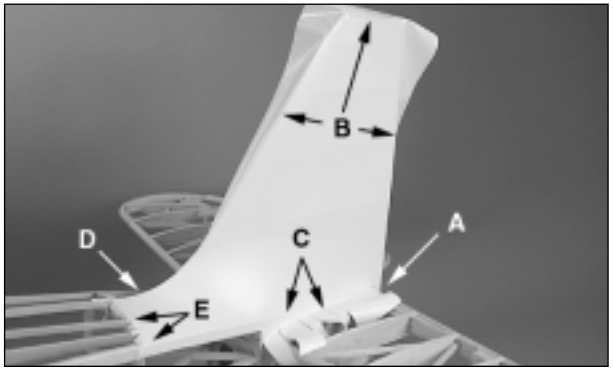
Most of the covering on this model is straightforward. The only area where you may encounter difficulty is around the base of the fin. Following are instructions on how to cover this area.

❏ 1. Before you begin covering, use a dust brush, compressed air or a Top Flite Tack Cloth to remove balsa dust from the model.

❏ 2. Cut the covering to fit the fin. It is said that some coverings have a “grain.” For sake of this illustration, we will establish that the grain direction of a covering is the direction in which it shrinks the most. If you are using 21st Century fabric, the grain runs the length of the roll. Cut the covering to fit the fin so the grain runs vertically. For 21st Century Fabric, the edges of the roll of covering should run vertically, or parallel with the trailing edge of the fin.

❏ 3. Using a trim iron set on low heat, seal the covering to the model in the order shown in the photo and described below.

**Note:** When 21st Century Fabric is heated, the adhesive softens and the covering shrinks. For this reason, 21st Century Fabric **cannot** be applied using an iron on high heat. It must be thoroughly bonded to the wood with low heat (wrapping the covering around corners such as trailing edges and the sides of ribs helps), then tightened with high heat. While shrinking the covering, never apply heat where it is attached to the airframe. Otherwise, the adhesive will soften and the covering will pull away. Where the fabric is under much tension (such as around wing tips and other curved surfaces near open structure), use a generous amount of "overlap" to make certain the edges are securely bonded to the structure. As much as 1/2" or 5/8" overlap is desirable in these areas.




**A**. Iron the covering to the corner of the bottom of the fin and the stab TE.
**B**. Iron the covering to the TE, tip and LE of the fin.
**C**. Iron the covering to the stab fairing and the top of the stab.
**D**. Iron the covering to the fin fillet.
**E**. Pull the covering tight, then iron it to the top longeron and the top of former 8.
**F**. Be certain all edges of the covering are **securely** bonded to the airframe, then use a heat gun or an iron to tighten it.
**G**. Trim the excess covering with a sharp razor blade or a hobby knife.

❏ 4. Cover the rest of the model using the tips mentioned previously.

❏ 5. After you cover the wings, mount them to the fuselage. Check the incidence at the tip of both panels at rib 15. There should be 1 degree of washout* at the tips. If necessary, correct by twisting the wing panel in the correct direction and applying heat to tighten the covering. Recheck the incidence at the tips to be certain you have achieved the correct washout.

**Washout is a "twist" intensionally built into the wing where the tip is at a lower angle of attack than the root. During stall situations this allows the tips to provide lift longer than the rest of the wing and helps the wing remain level so the model will not enter a spin.*

## Final Assembly

❏ 1. Gather all the control surfaces and the 6-32 x 1-1/2" threaded rods. Use 30-minute epoxy to permanently glue the threaded rods into the holes you previously tapped in the basswood blocks.

❏ 2. Permanently attach the control surfaces with your hinges using the adhesive recommended by the manufacturer of the hinges—most require 30-minute epoxy. **Hint:** Apply a small amount of petroleum jelly to hinge pins to keep epoxy from locking up the hinge.

❏ 3. Assemble the wheel pants and wheels, then join the landing gear and the landing gear fairings to the fuse. Don't forget to file flat spots on the axles for the set screws and to apply a drop of oil to the axles. A small drop of thread locking cement on the set screws is also **highly** recommended.

❏ 4. Mount the tail gear fairing and install a 2" tail wheel with two 1/8" wheel collars—don't forget the flat spot for the set screw on the wheel collar that holds the wheel on and a drop of oil on the axle.

❏ 5. Mount the engine, install the fuel tank, (if it's not installed already), and hook up all the connections including the throttle pushrod, fuel lines, fuel filler, exhaust system, etc.

❏ 6. Mount the pushrod exit covers on the aft end of the fuse.

❏ 7. If you haven't done so already, mount the servos in the wing and fuse.

❏ 8. Install the pull/pull cables for the rudder. The connections should already be made for the elevator, but now is the time to connect the other end of the cables to the rudder servo. Follow the instructions included with the pull/pull cable.

❏ 9. Hook up the rest of the controls. Secure all clevises with a silicone retainer and use a 4-40 jam nut on all threaded steel clevises.

❏ 10. Mount your battery pack and receiver. As mentioned previously, upon checking the CG, be prepared to relocate the battery pack.

❏ 11. Install the cockpit interior, followed by the side windows. We suggest using special "canopy glue" such as RC/56 (JOZR5007) to glue in the side windows.

❏ 12. Glue the door hinges to the door. Mount the doors with the removable hinge pins and the door latch mechanism.

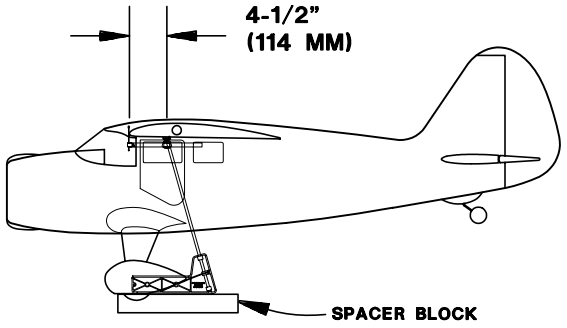
❏ 13. Study the photos on the box to decide where to place the decals. Trim the decals close to the edges and carefully apply them to your model. You can *float* them into position by dipping them into a solution of dish soap and water (just a few drops to a quart of water), then squeegeeing out the solution with a piece of soft balsa or a credit card wrapped with a tissue. Let the decals set for at least 12 hours before running the engine.

# GET YOUR MODEL READY TO FLY

## Balance your Model

**NOTE: This section is VERY important and must NOT be omitted! A model that is not properly balanced will be unstable and possibly unflyable.**

❏ 1. Since this model is mostly an "open" structure that is fabric covered, the wing has no structural "hard points" at which to support the model while checking the C.G. Place leftover pieces of balsa or plywood across the ribs on the bottom of the wing where you wish to lift the model for checking the C.G.




❏ 2. Accurately mark the balance point on the bottom of the wing on both sides of the fuselage. The balance point is shown on the plan (CG) and is located 4-1/2" [114mm] aft of the leading edge of the wing at the root ribs where they contact the fuse. This is the balance point at which the model should be balanced for the first flights. Later, you may experiment by shifting the balance up to 1/2" [13mm] forward or back to change the flying characteristics. If you move the balance point forward it may improve the smoothness and tracking, but the Stinson may then require more speed for takeoff and become more difficult to slow for landing. If you move the balance aft it may make the Stinson more agile with a lighter feel and allow you to slow the model more for landing. In any case, please start at the location we recommend and do not at any time balance your model outside the recommended range. Our model flew best in the forward half of the CG range.

❏ 3. The model must be in a ready-to-fly condition with all components installed and an empty fuel tank. Place blocks or something similar under the tail so the fuselage is level on your workbench.

❏ 4. With the wing attached to the fuselage, lift the model at the balance point or place it on a CG stand. If you're using a C.G. Machine, use longer wires (not included) to spread the base further apart and blocks to raise it off your bench. If the tail drops, the model is tail heavy and you must shift your battery pack or other components forward or add weight to the nose. If the nose drops, it is nose heavy and you must shift your battery pack or other components aft or add weight to the tail. In order to save weight, relocate the battery pack and/or receiver or other components before adding additional weight to arrive at the correct CG. You may install nose or tail weight by gluing lead weights inside the fuselage where necessary. If nose weight is required, position it as far forward as possible. Securing nose weight to the engine box is preferable.

## Final Hookups and Checks

❏ 1. Take the servo arms off your servos, turn on your transmitter and center all the trims. Reinstall all the servo arms and secure them with the screws.

❏ 2. Double-check all the servos and make sure the servo arms and mounting screws are secure and all the clevises have a silicone retainer.

❏ 3. Make sure the control surfaces move in the correct direction.

❏ 4. Adjust your pushrod hookups and set up your radio to provide the control surface movements as follows. Use a ruler or a Great Planes AccuThrow™ Control Surface Deflection Meter (GPMR2405) to measure the throws.

## Control Surface Throws

**Recommend control surface throws:**

| | High Rate | Low Rate |
|---|---|---|
| **ELEVATOR:** | 1" up<br>1" down | 9/16" up<br>9/16" down |
| **AILERONS:** | 1" up<br>7/8" down | 3/4" up<br>5/8" down |
| **RUDDER:** | 2" right<br>2" left | |
| **FLAPS:** | 1-1/2" down | |

**Note:** Throws are measured at the **widest part** of the control surface.

**TRIM MIXING:** If your transmitter has flap-to-elevator mixing, we recommend mixing 5% (1/16", or 1/20" to be exact) down elevator when the flaps are fully extended. This will allow the model to maintain a level attitude when the flaps are extended.

**The balance point and control surface throws listed in this manual are the ones at which the Stinson flies best. Set up your aircraft to those specifications. If, after a few flights, you would like to adjust the throws or CG to suit your tastes, that is fine. Too much control surface throw can make your model difficult to control or force it into a stall, so remember...More is not better.**

# PREFLIGHT

## Identify your Model

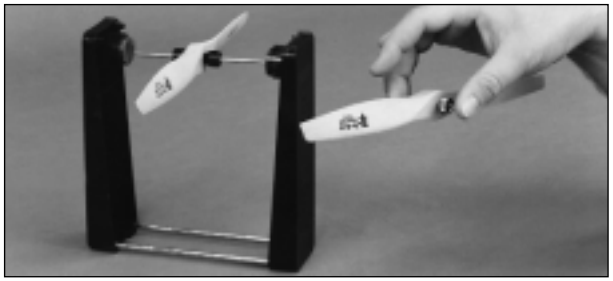
Whether you fly at an AMA sanctioned R/C club site or somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is required at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification sticker included with this kit and place it on or inside your model.

## Charge your Batteries

Follow the battery charging procedures in your radio instruction manual. 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.

## Balance your Propellers

Carefully balance your propellers before you fly. An unbalanced prop is 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(tm) (TOPQ5700) in the workshop and keep a Great Planes Fingertip Prop Balancer (GPMQ5000) in our flight box.

## Find a Safe Place to Fly

The best place to fly your model is an AMA chartered R/C club flying field. Contact the AMA (their address is on page 2) or your hobby shop dealer for the club in your area and join it. Club fields are intended for R/C flying, making your outing safer and more enjoyable. The AMA also provides insurance in case of a flying accident. If an R/C flying field is not available, find a large, grassy area at least six miles from buildings, streets and other R/C activities. A schoolyard is usually not an acceptable area because of people, power lines and possible radio interference.

## Ground Check your Model

If you are not thoroughly familiar with the operation of R/C models, ask an experienced modeler to inspect your radio installation and control surface setup. Follow the engine manufacturer's instructions to break-in your engine. After you run the engine on the model, perform a close inspection to make sure all screws remain tight and your pushrods and connectors are secure.

## Range Check your Radio

Ground check the 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 the 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 in your battery pack, or a damaged receiver crystal from a previous crash.

## CHECK LIST

During the last few moments of preparation your mind may be elsewhere, anticipating the excitement of your first flight. Because of this, you may be more likely to overlook certain checks and procedures you should perform after your model is built. To help you avoid this, we've provided a checklist to make sure you don't overlook these important areas. 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 you complete them (that's why we call it a *check list!*).

❏ 1. Fuelproof all areas exposed to fuel or exhaust residue, such as the firewall/engine compartment and the fuel tank compartment.

❏ 2. Check the CG according to the measurements provided in the manual.

❏ 3. Secure the battery and receiver with a strip of balsa or plywood or other secure mounting method. 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. Secure critical fasteners with thread-locking compound (the screws that hold the carburetor arm, set screws on wheel collars, 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 plates, servo 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 jam nuts on thread-on clevises.

❏ 12. Fasten all servo arms to the servos with the screws included with your radio.

❏ 13. 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 or heat shrink tubing.

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

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

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

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

❏ 18. Securely tighten the propeller nut and jam nut (if used).

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

❏ 20. Cycle your transmitter and receiver battery pack and make sure they are **fully** charged.

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

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

## ENGINE SAFETY PRECAUTIONS

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

Store model fuel in a safe place away from high heat, sparks or flames. Do not smoke near the engine or fuel as it is very flammable. Engine exhaust gives off a great deal of deadly carbon monoxide **so do not run the engine in a closed room or garage.**

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

Use safety glasses when you operate model engines.

Do not run the engine near loose gravel or sand; the propeller may throw loose material in your eyes.

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

Always be **aware** and very **conscious** of hand movements and be **deliberate** in your reach for the needle valve, glow plug clip, or other items near a spinning propeller.

Keep loose clothing, shirt sleeves, ties, scarfs, long hair or loose objects away from the prop. Be conscious of pencils, screw drivers or other objects that may fall out of your shirt or jacket pockets.

Use a chicken stick or electric starter and follow the instructions to start your engine.

Make certain the glow plug clip or connector is secure so that it will not pop off or get into the running propeller.

Ask an assistant to hold the model from the rear while you start the engine and operate the controls.

Make all engine adjustments from behind the rotating propeller.

The engine gets hot! Do not touch the engine during or immediately after you operate it. Make sure fuel lines are in good condition so fuel will not leak onto a hot engine and cause a fire.

To stop the engine, close the carburetor barrel (rotor) or pinch the fuel line to discontinue the fuel flow. Do not use your hands, fingers or any body part to stop the engine. Never throw anything into the prop of a running engine.

## AMA SAFETY CODE (excerpts)

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

### GENERAL

1. I will not fly my model aircraft in sanctioned events, air shows, or model flying demonstrations until it has been proven to be airworthy by having been previously successfully flight tested.
2. I will not fly my model aircraft higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right of way to and avoid flying in the proximity of full scale aircraft. Where necessary an observer shall be used to supervise flying to avoid having models fly in the proximity of full scale aircraft.
3. Where established, I will abide by the safety rules for the flying site I use and I will not willfully and deliberately fly my models in a careless, reckless and/or dangerous manner.
7. I will not fly my model unless it is identified with my name and address or AMA number, on or in the model.
9. I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind).

### RADIO CONTROL

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

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

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

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

# FLYING

## Takeoff

To aid in ground handling during taxiing and your initial takeoff roll, hold up elevator to keep the tail wheel in contact with the ground. Up elevator should be gradually relaxed as you gain speed to keep the model from lifting into the air before you are ready.

As with most tail draggers, engine torque will cause the nose to turn to the left as you accelerate and roll down the runway during takeoff—especially on pavement. Though this tendency is minimal with the Stinson, it is something you should expect and be prepared for. To minimize this, always be ready to apply a bit of right rudder. Additionally, hold a bit of up elevator during initial rollout (as mentioned previously) and advance the throttle **smoothly** and **gradually,** using rudder to keep the model on the centerline of the runway. As you near full throttle and the model's speed increases, decrease up elevator and allow the tail to lift off the runway—always at the ready with right rudder. Do not allow the model to leave the ground yet. Allow the Stinson to build up as much speed as your runway or flying site will safely provide (this may take a little longer due to the relatively thick airfoil and large fuselage cross section), then apply up elevator and gently lift her into the air. Once the model "breaks ground," be ready to apply right rudder to counteract torque. Establish a gentle climb. After you have reached a safe altitude, begin your turn away from the runway and get into the traffic pattern.

## Flight

In the flying section of most of our other instruction manuals, we recommend that modelers take it easy with their new model for the first few flights, gradually getting acquainted as they gain confidence in the engine and flight characteristics. However, with the Stinson we recommend you **always** take it easy! Keep in mind that this is a large, docile, scale model of a civilian small transport aircraft. Therefore, the Stinson is not intended for aerobatic maneuvers other than those such as chandelles and stall turns. Barrel rolls and gentle loops—with proper throttle management—can also be accomplished, but are not prototypical. The Stinson should be flown in a scale-like manner prototypical of the full size aircraft (surely, all advanced scale pilots know this already!).

After you have reached a safe altitude after takeoff, adjust the trims so the Stinson will fly straight and level at cruise speed. Though rudder is not absolutely necessary, we found that the Stinson turns best, and most scale-like, by using a small amount of rudder to initiate the turn before adding ailerons. You can even electronically mix in a small amount (start with about 5%) of rudder to ailerons. Try different throttle settings to see how the model reacts and what kind of trim changes may be required. Still at altitude, execute practice landing approaches to see how the Stinson handles at lower speeds. Do the same with the flaps extended so you know what to expect when you're in an actual landing approach. Add power and see how she climbs with flaps as well. Do this exercise a few times and decide whether or not you will be using flaps for your first landing. Fly around and execute various maneuvers making mental notes (or having a friend standing by with a note pad) on how she behaves. Note what might be required to fine tune your Stinson so it handles just the way you like. Use this time and altitude to become as familiar as possible with the Stinson before your first landing.

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

## Landing

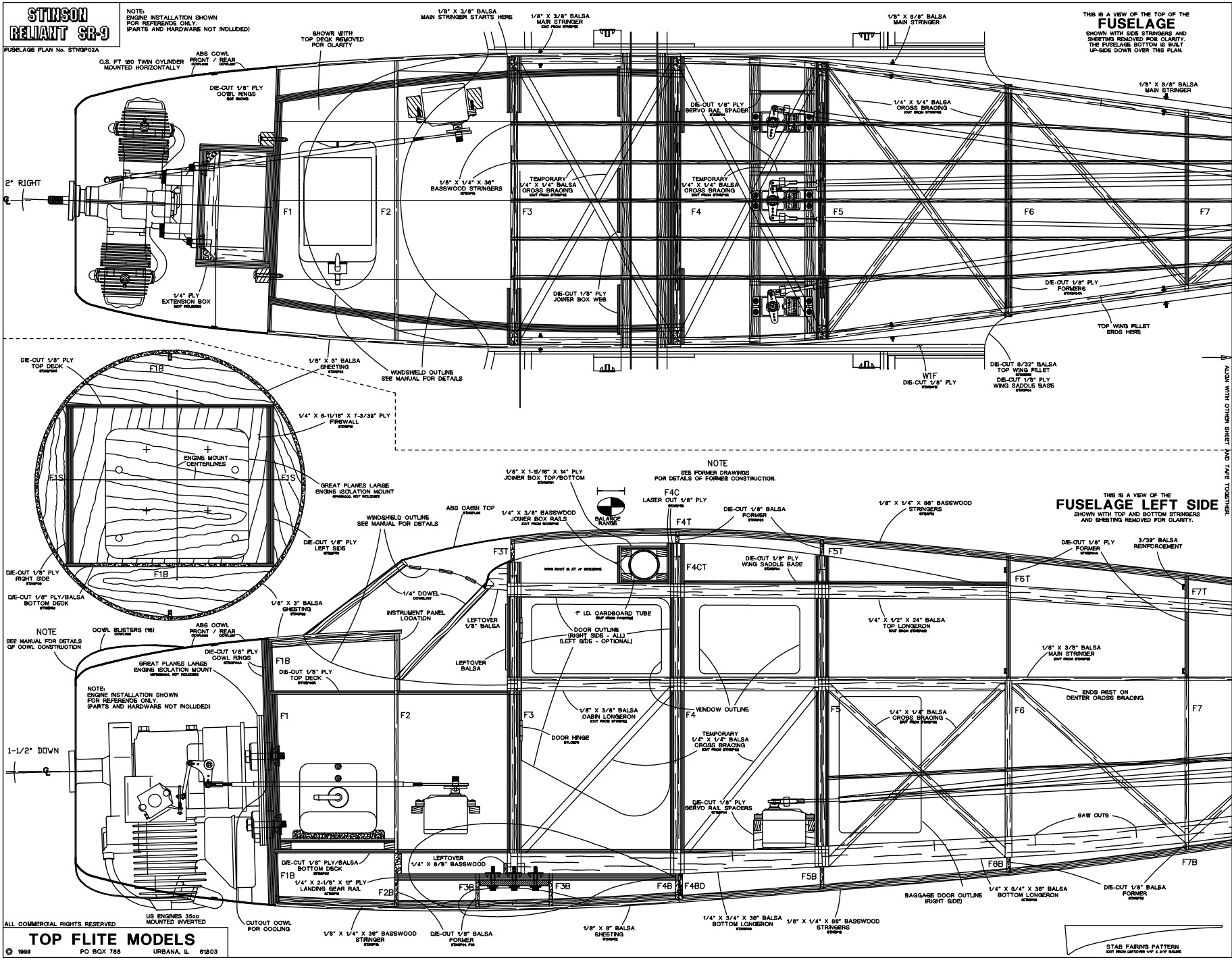
The Stinson lands much the same as any other high wing model, except it bleeds off air speed a little faster due to the higher drag of the airframe. Just carry a little extra power to stretch the glide path. Landings may be performed with or without flaps. With flaps she comes in slower yet, though at a steeper glide angle. If you choose to use flaps, maintain an engine R.P.M. that is slightly higher than normal to overcome the additional drag. Flaps should be extended after the throttle is reduced on the downwind leg. If you extend the flaps at too high an airspeed, the nose may pitch up strongly. To initiate a landing approach, make your final turn toward the runway (always into the wind) keeping the nose down to maintain airspeed and control. Level the attitude when the Stinson reaches the runway threshold, modulating the throttle as necessary to maintain your glide path and airspeed. When it's over the runway and just a foot or so off the deck, smoothly increase up elevator to execute the landing flare. Mind your fuel so you can make as many attempts as required before you're ready to touch down. Refrain from using flaps during dead-stick landings unless you're near the runway and lined up. Otherwise, flaps will reduce the model's range causing it to land much shorter than you might normally expect.

**Have a ball! But always stay in control and fly in a safe manner. GOOD LUCK AND GREAT FLYING!**

# STINSON RELIANT SR-9

FUSELAGE PLAN No. STNGP02A

NOTE:
ENGINE INSTALLATION SHOWN FOR REFERENCE ONLY. (PARTS AND HARDWARE NOT INCLUDED)






**TOP FLITE MODELS**
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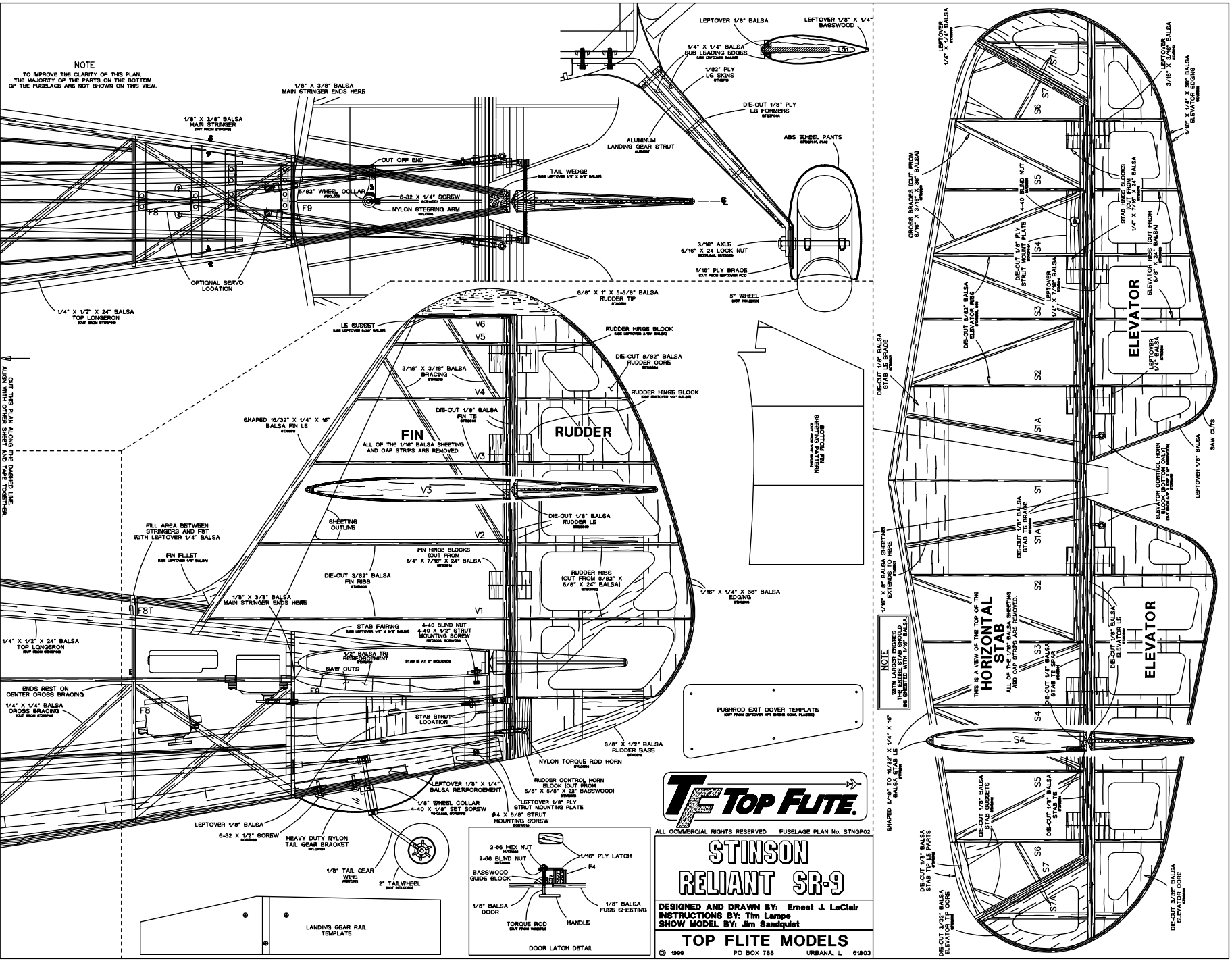
NOTE
TO IMPROVE THE CLARITY OF THIS PLAN, THE MAJORITY OF THE PARTS ON THE BOTTOM OF THE FUSELAGE ARE NOT SHOWN ON THIS VIEW.
1/8" X 3/8" BALSA MAIN STRINGER ENDS HERE
1/8" X 3/8" BALSA MAIN STRINGER
OUT OPP END
TAIL WEDGE
5/32" WHEEL COLLAR
6-32 X 1/4" SCREW
NYLON STEERING ARM
OPTIONAL SERVO LOCATION
1/4" X 1/2" X 24" BALSA TOP LONGERON
LEFTOVER 1/8" BALSA
LEFTOVER 1/8" X 1/4" BASSWOOD
1/4" X 1/4" BALSA SUB LEADING EDGES
1/32" PLY LG SKINS
DIE-OUT 1/8" PLY LG FORMERS
ALUMINUM LANDING GEAR STRUT
ABS WHEEL PANTS
3/16" AXLE
5/16" X 24 LOCK NUT
1/16" PLY BRACE
5" WHEEL
1/4" X 1/2" X 24" BALSA TOP LONGERON
8/8" X 1" X 5-5/8" BALSA RUDDER TIP
LE GUSSET
RUDDER HINGE BLOCK
DIE-CUT 8/32" BALSA RUDDER CORE
3/16" X 3/16" BALSA BRACING
RUDDER HINGE BLOCK
DIE-CUT 1/8" BALSA FIN TE
SHAPED 16/32" X 1/4" X 16" BALSA FIN LE
FIN
ALL OF THE 1/16" BALSA SHEETING AND CAP STRIPS ARE REMOVED.
RUDDER
SHEETING OUTLINE
DIE-CUT 1/8" BALSA RUDDER LE
FILL AREA BETWEEN STRINGERS AND FBT WITH LEFTOVER 1/4" BALSA
FIN FILLET
FIN HINGE BLOCKS (CUT FROM 1/4" X 7/16" X 24" BALSA
DIE-OUT 3/32" BALSA FIN RIBS
RUDDER RIBS (CUT FROM 6/32" X 6/8" X 24" BALSA)
1/16" X 1/4" X 96" BALSA EDGING
1/8" X 3/8" BALSA MAIN STRINGER ENDS HERE
STAB FAIRING
4-40 BLIND NUT
4-40 X 1/2" STRUT MOUNTING SCREW
1/2" BALSA TRI REINFORCEMENT
SAW CUTS
ENDS REST ON CENTER CROSS BRACING
1/4" X 1/4" BALSA CROSS BRACING
STAB STRUT LOCATION
6/8" X 1/2" BALSA RUDDER BASE
NYLON TORQUE ROD HORN
RUDDER CONTROL HORN BLOCK (CUT FROM 6/8" X 5/8" X 24" BASSWOOD)
LEFTOVER 1/8" X 1/4" BALSA REINFORCEMENT
LEFTOVER 1/8" PLY STRUT MOUNTING PLATE
1/8" WHEEL COLLAR
4-40 X 1/8" SET SCREW
Ø4 X 5/8" STRUT MOUNTING SCREW
LEFTOVER 1/8" BALSA
6-32 X 1/2" SCREW
HEAVY DUTY NYLON TAIL GEAR BRACKET
1/8" TAIL GEAR WIRE
2" TAILWHEEL
CUT THIS PLAN ALONG THE DASHED LINE ALIGN WITH OTHER SHEET AND TAPE TOGETHER.
BOTTOM FIN SHEETING PATTERN
PUSHROD EXIT COVER TEMPLATE
LANDING GEAR RAIL TEMPLATE
2-56 HEX NUT
2-56 BLIND NUT
BASSWOOD GUIDE BLOCK
1/16" PLY LATCH
F4
1/8" BALSA DOOR
1/8" BALSA FUSS SHEETING
TORQUE ROD
HANDLE
DOOR LATCH DETAIL
LEFTOVER 1/4" X 1/4" BALSA
LEFTOVER 3/16" X 3/16" BALSA
1/16" X 1/4" X 36" BALSA ELEVATOR EDGING
CROSS BRACES (CUT FROM 6/16" X 3/16" BALSA)
STAB WIRE BLOCKS (CUT FROM 1/4" X 7/16" X 24" BALSA
ELEVATOR RIBS (CUT FROM 6/8" X 24" BALSA)
4-40 BLIND NUT
DIE-CUT 1/8" PLY STRUT MOUNT PLATE
LEFTOVER 1/4" X 7/8" BALSA
DIE-CUT 1/16" BALSA ELEVATOR RIBS
ELEVATOR
LEFTOVER 1/4" BALSA
DIE-CUT 1/4" BALSA STAB LE BRACE
LEFTOVER 1/4" BALSA
SAW CUTS
ELEVATOR CONTROL HORN
1/16" X 1/4" X 96" BALSA EDGING
1/16" X 8" BALSA SHEETING EXTENDED HERE
DIE-CUT 1/8" BALSA STAB TE BRACE
THIS IS A VIEW OF THE TOP OF THE HORIZONTAL STAB
ALL OF THE 1/16" BALSA SHEETING AND CAP STRIPS ARE REMOVED.
NOTE
WITH LARGER ENGINES THE INNER RIB MAY NEED TO BE REMOVED WITH A SHARP KNIFE
DIE-CUT 1/8" BALSA ELEVATOR LE
DIE-CUT 1/8" BALSA STAB TE SPAR
ELEVATOR
SHAPED 6/16" TO 16/32" X 1/4" X 16" BALSA STAB LE
DIE-CUT 1/8" BALSA STAB GUSSETS
DIE-CUT 1/8" BALSA STAB TE
DIE-CUT 1/8" BALSA STAB TIP
DIE-CUT 3/32" BALSA ELEVATOR TIP CORE
DIE-CUT 3/32" BALSA ELEVATOR CORE
TOP FLITE.
ALL COMMERCIAL RIGHTS RESERVED FUSELAGE PLAN No. STNGP02
STINSON RELIANT SR-9
DESIGNED AND DRAWN BY: Ernest J. LeClair
INSTRUCTIONS BY: Tim Lampe
SHOW MODEL BY: Jim Sandquist
TOP FLITE MODELS
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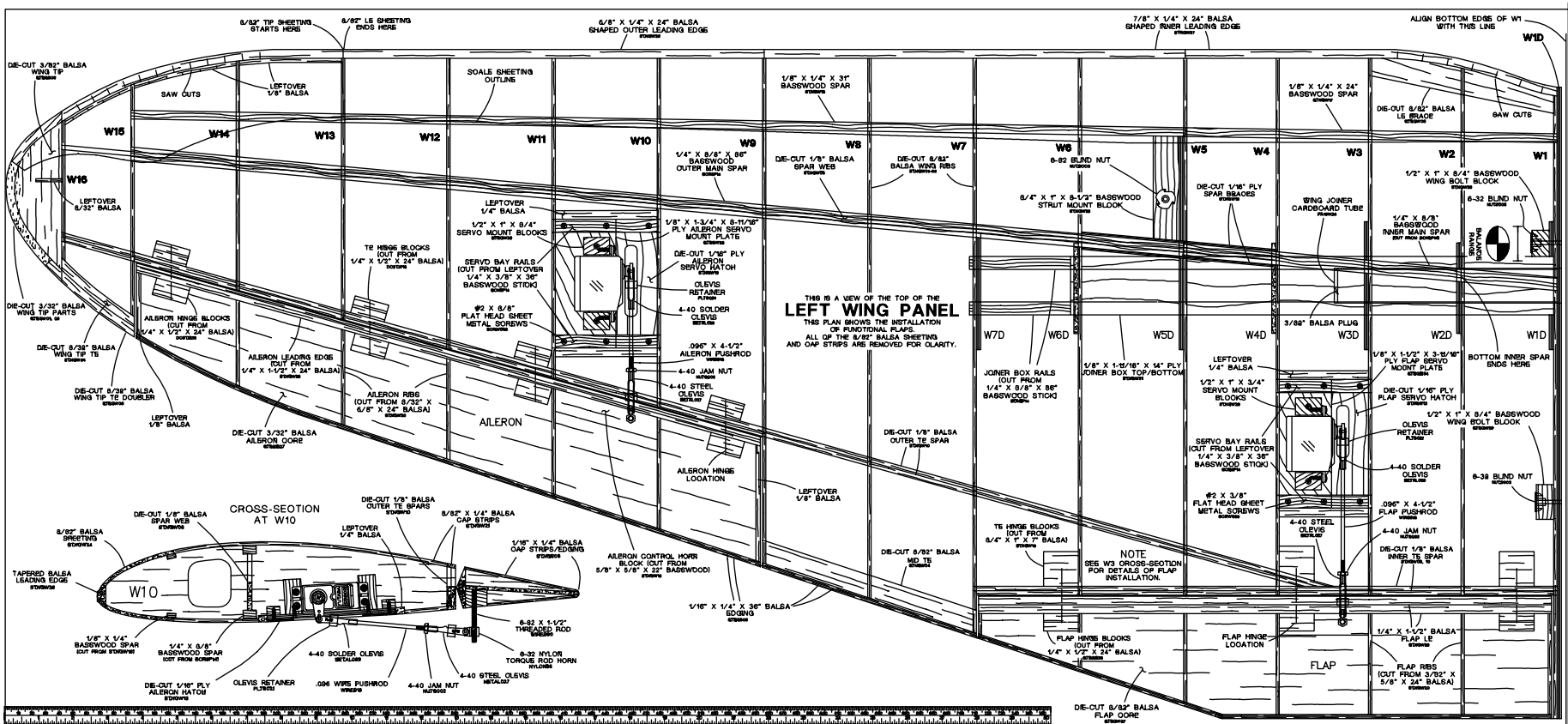




WING PLAN No. STNGP01A

# STINSON RELIANT SR-9

## TOP FLITE MODELS



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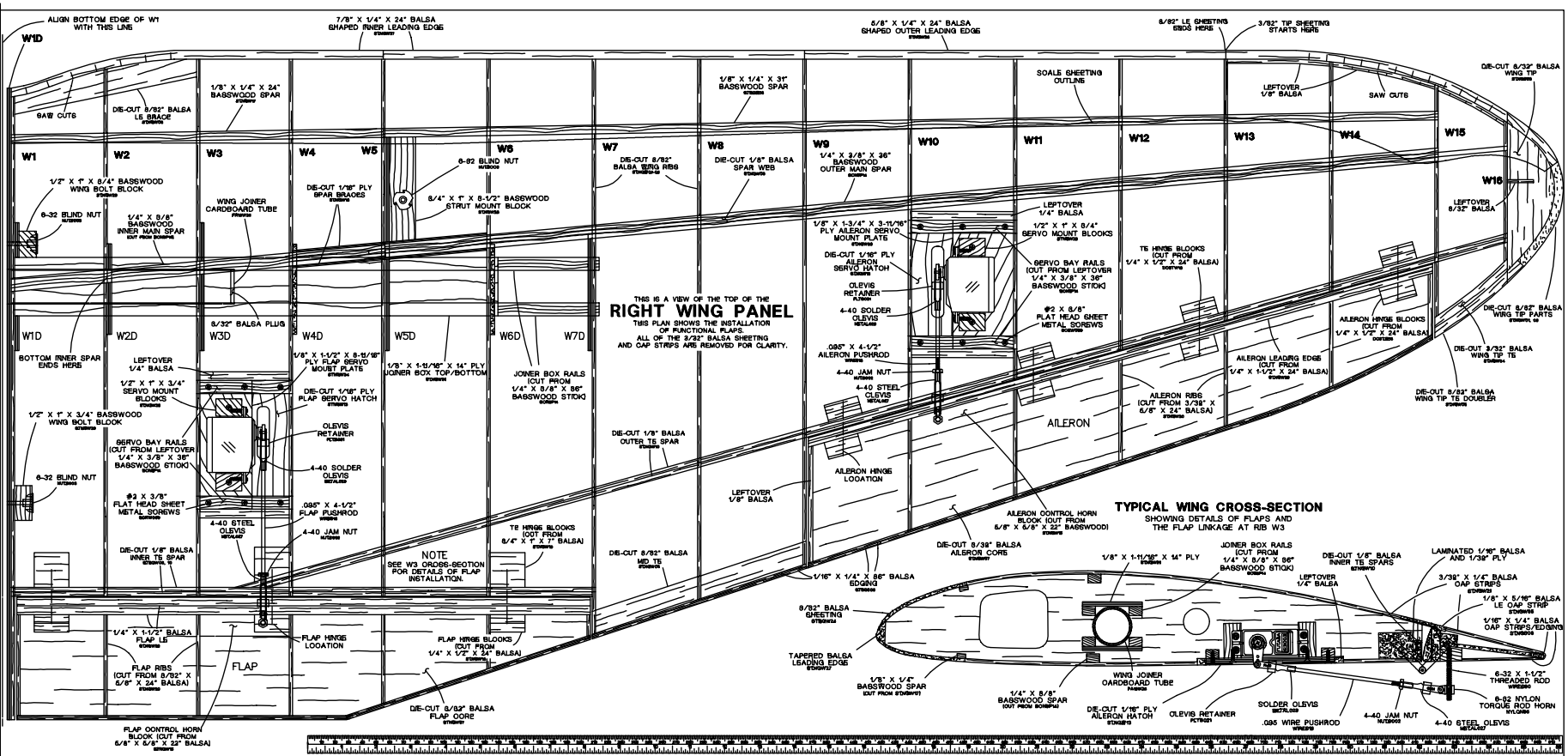


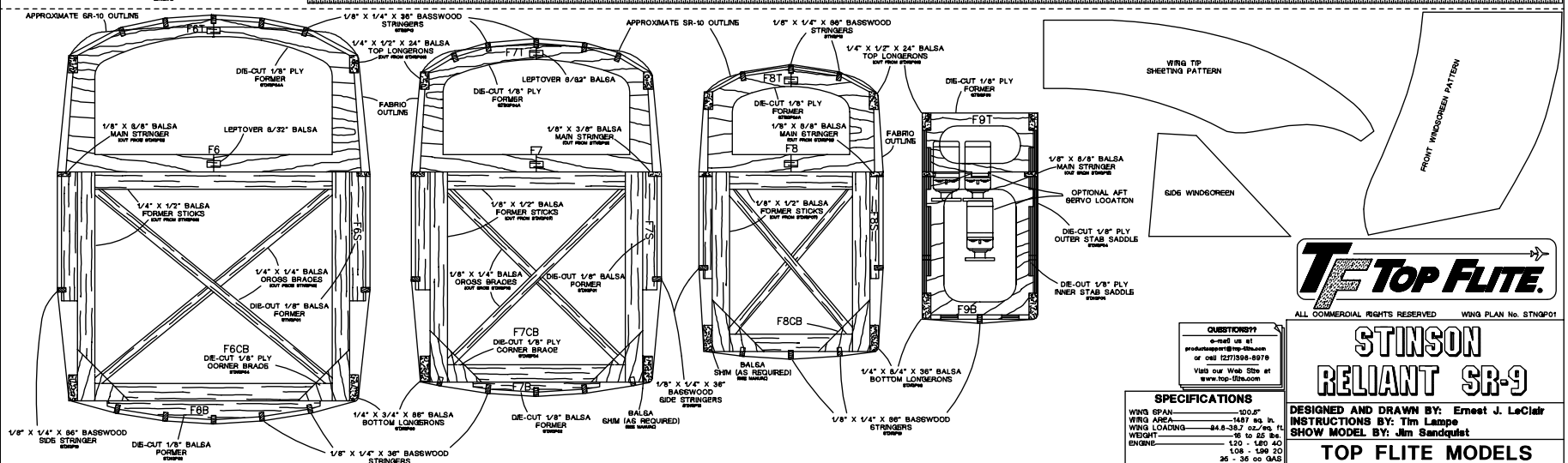




WING PLAN No. STNGP01

QUESTIONS??
e-mail us at productsupport@top-flite.com or call (217)398-8970
Visit our Web Site at www.top-flite.com

## SPECIFICATIONS

| | |
|---|---|
| WING SPAN | 100.5" |
| WING AREA | 1487 sq. in. |
| WING LOADING | 24.8-38.7 oz./sq. ft. |
| WEIGHT | 36 to 58 oz. |
| ENGINE | 1.20 - 1.60 4C<br>1.08 - 1.99 2C<br>.36 - .36 cc GAS |
| RADIO | 4-5 CHANNELS |

# STINSON RELIANT SR-9

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