FANCAIR ES

.61-.91 SIZE SPORT SCALE ARF PLANE

INSTRUCTION MANUAL

Wingspan: 79-3/4 in [2030mm]
Wing Area: 690 sq in [44.5 dm²]
Weight: 8.5 – 9 lb [3850 – 4080g]
Wing Loading: 28 – 30 oz/sq ft [85 – 92g/dm²]
Length: 52 in [1320mm]
Radio: 5-channel with 7 servos
Engine: .61 – .75 cu in [10 – 12cc] 2-stroke,
.91 cu in [15cc] 4-stroke

WARRANTY

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

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

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

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

GREAT PLANES® MODEL MANUFACTURING COMPANY
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(217) 398-8970, Ext. 2
airsupport@greatplanes.com

GPMZ0243 for GPMA1347 V1.0

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INTRODUCTION

Of the many airplanes flying today, the Lancair (Lance-air) is considered by many to be a “Modern Classic.” With its sleek, clean lines, it has a very graceful appearance both on the ground and in the air. Great Planes is proud to bring you this wonderful classic in an easy to fly model that will impress you by the way it flies and its good looks in the air. We are sure you will get years of enjoyment from your Lancair.

For the latest technical updates or manual corrections to the Lancair, visit the web site listed below and select the Great Planes Lancair ARF. If there is new technical information or changes to this model, a “tech notice” box will appear in the upper left corner of the page.

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

For information on the full-size Lancair visit this web site:

http://www.lancair.com

IMAA

The Great Planes Lancair is an excellent sport-scale model and is eligible to fly in IMAA events. The IMAA (International Miniature Aircraft Association) is an organization that promotes non-competitive flying of giant-scale models. If you plan to attend an IMAA event, contact the IMAA for a copy of the **IMAA Safety Code** at the address or telephone number below.

IMAA
205 S. Hilldale Road
Salina, KS 67401
(913) 823-5569
www.fly-imaa.org/imaa/sanction.html

Scale Competition
Though the Great Planes Lancair is an ARF and may not have the same level of detail as an “all-out” scratch-built competition model, it is a scale model nonetheless and is therefore eligible to compete in the *Fun Scale* class in AMA competition (we receive many favorable reports of Great Planes ARFs in scale competition!) In Fun Scale, the “builder of the model” rule does not apply. To receive the five points for scale documentation, the only proof required that a full-size aircraft of this type in this paint/markings scheme did exist is a single sheet such as a kit box cover from a plastic model, a photo, or a profile painting, etc. If the photo is in black and white, other written documentation of color must be provided. Contact the AMA for a rule book with full details.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

AMA
SINCE 1936

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

DECISIONS YOU MUST MAKE

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

Radio Equipment

The Lancair requires a minimum of a 5-channel radio and receiver, plus: seven servos producing a minimum of 41oz.-in of torque, two Y-harness connectors, two 24" [610mm] and two 12" [305mm] servo extensions.

Engine Recommendations

The recommended engine size range for the Lancair is .61 – .75 cu in [10 – 12cc] two-stroke, .91 cu in [15cc] four-stroke. We flew our prototype with the O.S.® .61 FX (OSMG0561). We found this to be more than adequate power. This coupled with the Top Flite® In-Cowl muffler (TOPQ7917), exhaust header (TOPQ7920), and exhaust deflector (HCAP2180) not only provided the correct power combination but also makes for a very nice scale engine installation. If an engine in the upper end of the size range is used, remember that this is a scale model that is intended to fly at scale-like speeds, so throttle management should be practiced.

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

ADDITIONAL ITEMS REQUIRED

Hardware & Accessories

- ❑ Engine and suitable propellers
- ❑ Exhaust deflector (HCAP2180)
- ❑ (2) 12" [300mm] Servo extension (HCAM2711 for Futaba®)
- ❑ (2) 24" [610mm] Servo extension (HCAM2721 for Futaba)
- ❑ (2) Y-harness (HCAM2751 for Futaba)
- ❑ R/C foam rubber (1/4" [6mm] – HCAQ1000, or 1/2" [13mm] – HCAQ1050)
- ❑ #64 Rubber bands (1/4 lb [113g] box, HCAQ2020)

Adhesives & Building Supplies

In addition to common household tools and hobby tools, this is the "short list" of the most important items required to build the Lancair. ***Great Planes Pro™*** *CA and Epoxy glue are recommended.*

- ❑ 1/2 oz. [15g] Thin Pro CA (GPMR6001)
- ❑ 1 oz. [30g] Medium Pro CA+ (GPMR6008)
- ❑ Pro 30-minute epoxy (GPMR6047)
- ❑ Pro 6-minute epoxy (GPMR6045)
- ❑ Microballoon filler (TOPR1090)

Optional Supplies & Tools

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

- ❑ Drill bits: 1/16" [1.6mm], 5/64" [2mm], 3/32" [2.4mm], 1/8" [3.2mm], 5/32" [4mm], 3/16" [4.8mm], 7/32" [5.6mm], 1/4" [6.4mm]
- ❑ #11 Blades (5-pack, HCAR0211)
- ❑ 3 Standard silicone tubing (GPMQ4131)
- ❑ 2 oz. [57g] Spray CA activator (GPMR6035)
- ❑ CA applicator tips (HCAR3780)
- ❑ CA debonder (GPMR6039)
- ❑ Epoxy brushes (6, GPMR8060)
- ❑ Mixing sticks (50, GPMR8055)
- ❑ Mixing cups (GPMR8056)
- ❑ 36" metal ruler (HCAR0475)
- ❑ Robart Super Stand II (ROBP1402)
- ❑ Hobbico® Duster™ can of compressed air (HCAR5500)
- ❑ Masking tape (TOPR8018)
- ❑ Threadlocker thread locking cement (GPMR6060)
- ❑ Rubbing alcohol (for epoxy clean up)
- ❑ Switch & Charge Jack Mounting Set (GPMM1000)
- ❑ Rotary tool such as Dremel® Moto-Tool®
- ❑ Rotary tool reinforced cut-off wheel (GPMR8200)
- ❑ Servo horn drill (HCAR0698)
- ❑ Dead Center™ Engine Mount Hole Locator (GPMR8130)
- ❑ Accu-Throw™ Deflection Gauge (GPMR2405)
- ❑ CG Machine™ (GPMR2400)
- ❑ Precision Magnetic Prop Balancer™ (TOPQ5700)
- ❑ Sealing Iron (TOPR2100)
- ❑ Sandpaper–100, and 220-grit
- ❑ 6-32 Tap

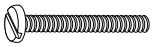
IMPORTANT BUILDING NOTES

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

Sheet metal screws are designated by a number and a length. For example #6 x 3/4".

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

Machine screws are designated by a number, **threads per inch**, and a length. **SHCS** is just an abbreviation for "socket head cap screw" and that is a machine screw with a socket head. For example 4-40 x 3/4".



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

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

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

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

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

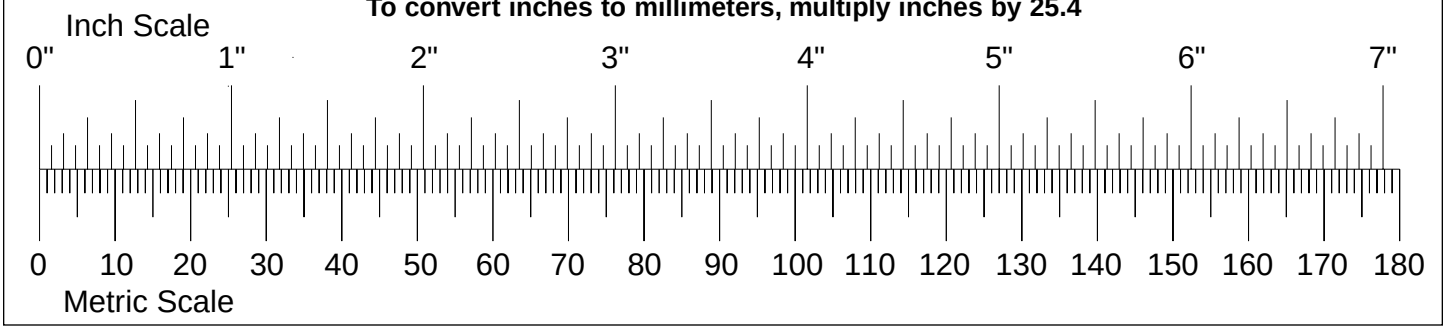
• The Lancair is factory-covered with Top Flite MonoKote® film. Should repairs ever be required, MonoKote can be patched with additional MonoKote purchased separately. MonoKote is packaged in six-foot rolls, but some hobby shops also sell it by the foot. If only a small piece of MonoKote is needed for a minor patch, perhaps a fellow modeler would give you some. MonoKote is applied with a model airplane covering iron, but in an emergency a regular iron could be used. A roll of MonoKote includes full instructions for application. Following are the colors used on this model and order numbers for six foot rolls.

White–TOPQ0204, Black–TOPQ0208
Sapphire Blue–TOPQ0226, Metallic Gold–TOPQ0404

COMMON ABBREVIATIONS

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

To convert inches to millimeters, multiply inches by 25.4



ORDERING REPLACEMENT PARTS

To order replacement parts for the Great Planes Lancair ARF, use the order numbers in the **Replacement Parts List** that follows. Replacement parts are available only as listed. Not all parts are available separately (an aileron cannot be purchased separately, but is only available with the wing kit). Replacement parts are not available from Product Support, but can be purchased from hobby shops or mail order/Internet order firms. Hardware items (screws, nuts, bolts) are also available from these outlets. If you need assistance locating a dealer to purchase parts, visit **www.greatplanes.com** and click on "Where to Buy." If this kit is missing parts, contact **Great Planes Product Support**.

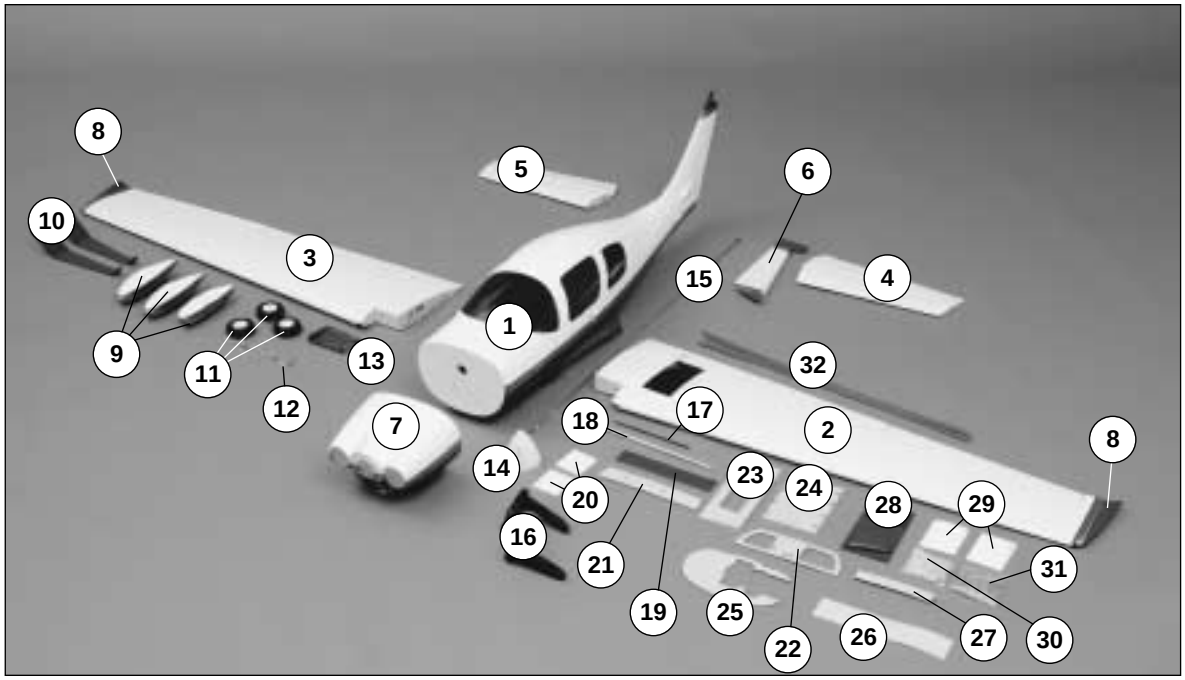
Replacement Parts List

Order Number	Description	How to Purchase
	Missing pieces	Contact Product Support
	Instruction manual	Contact Product Support
	Full-size plans	Not available
GPMA2320	Wing Kit	Contact Your Hobby Supplier to Purchase These Items
GPMA2321	Fuse Kit	
GPMA2322	Tail Set	
GPMA2323	Cowl	
GPMA2327	Canopy	
GPMA2324	Landing Gear	
GPMA2325	Wheel Pants	
GPMA2326	Tail Joiner Tube End Rod	

KIT CONTENTS

Before starting to build, use the **Kit Contents** list to take an inventory of this kit to make sure it is complete, and inspect the parts to make sure they are of acceptable quality. If any parts are missing or are not of acceptable quality, or if you need assistance with assembly, contact **Great Planes Product Support**. When reporting defective or missing parts, use the part names exactly as they are written in the Kit Contents list on this page.

Great Planes Product Support:
Telephone: (217) 398-8970
Fax: (217) 398-7721
E-mail: airsupport@greatplanes.com



Kit Contents (Photographed)

1. Fiberglass Fuselage
2 Left Wing/Aileron and Flap
3. Right Wing/Aileron and Flap
4. Left Stabilizer
5. Right Stabilizer
6. Rudder
7. Cowl
8. Fiberglass Wing Tips
9. Fiberglass Wheel Pants
10. Main Landing Gear
11. Wheels
12. Nose Gear Wire
13. Fiberglass Exhaust Air Panel
14. Spinner
15. Pushrod Wires
16. Engine Mount
17. Carbon Fiber Anti-Rotation Pin
18. Aluminum Tube
19. Wing Bolt Plate
20. Flap Covers
21. Forward Former
22. Rear Former
23. Servo Tray (2)
24. Receiver/Battery Tray (2)
25. Engine Baffle
26. CA Hinge Strip Material
27. Wing Joiner (2)
28. Nose Wire Fairing
29. Aileron Covers
30. Nylon Hardware Bag
31. Metal Hardware Bag
32. Outer Pushrod Tubes

Kit Contents (Not Photographed)

(4) 5/16" x 3/4" 7/8" Servo Mount Blocks
(2) 5/32" x 2" Axle
(1) Brass Screw-Lock Pushrod Connector
(2) 4-40 Blind Nuts
(4) 8-32 Blind Nuts
(2) 5/16-24 Lock Nut
(2) 1/4-20 Blind Nuts
(3) Large Nylon Control Horn
(4) Small Nylon Control Horn
(1) Nose Gear Bearing
(2) 1/4-20 Nylon Wing Bolt
(1) Nylon Steering Control Arm
(8) Nylon Clevis
(1) Nylon Landing Gear Strap
(1) Nylon Retainer For Screw-Lock Pushrod Connector
(1) 2" x 9" CA Hinge Material
(8) Nylon FasLinks
(8) Silicone Clevis Retainer
(1) 4-40 x 1/8" Socket Head Cap Screws
(4) 2-56 x 5/8" Machine Screw
(8) #4 x 1/2" Sheet Metal Screw
(5) 6-32 X 1/8" Set Screw
(3) 6-32 x 1/4" Socket Head Cap Screws
(2) #4 x 5/8" Sheet Metal Screw
(2) 4-40 x 5/8" Phillips Pan Head Screws
(40) #2 x 3/8" Sheet Metal Screw
(4) 2-56 x 3/4" Socket Head Cap Screws
(4) 6-32 x 1" Socket Head Cap Screws
(4) 8-32 x 1" Socket Head Cap Screws
(4) #2 x 1/2" Sheet Metal Screw
(8) 5/32" Wheel Collar
(4) .074 x 36" Wire Threaded One End
(4) .074 x 6" Pushrod Wire
(5) #6 Flat Washers
(22) #2 Flat Washers
(4) #8 Lock Washers
(4) #8 Flat Washers
(4) #6 Lock Washers

IMPORTANT INFORMATION ABOUT WORKING WITH FIBERGLASS

If you have never worked with fiberglass there are a few basic things you should be aware of:

- When you are cutting into fiberglass, be sure you are cutting the correct place. Unlike wood, you are not able to go back and easily fix a mistake.
- Whenever you are gluing a part to the inside of fiberglass it is important to roughen the inside surface of the fiberglass with 220-grit sandpaper and then wipe the area with alcohol. The molding process leaves a waxy residue that can prevent a good bond between the glue and the parts being glued.
- If you do not have a high-speed rotary tool such as a Dremel® tool you should consider purchasing one or borrowing one from a fellow modeler. This combined with a fiberglass cut-off wheel is going to be extremely helpful in the assembly process.

WARNING: The cowl, wheel pants and fuselage included in this kit are made of fiberglass, the fibers of which may cause eye, skin and respiratory tract irritation. Never blow into a part to remove fiberglass dust, as the dust will blow back into your eyes. Always wear safety goggles, a particle mask and rubber gloves when grinding, drilling and sanding fiberglass parts. Vacuum the parts and the work area thoroughly after working with fiberglass parts.

PREPARATIONS

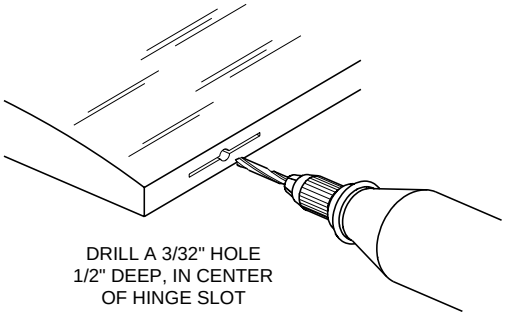
❏ 1. If you have not done so already, remove the major parts of the kit from the box and inspect for damage. If any parts are damaged or missing, contact Product Support at the address or telephone number listed in the **"Kit Contents"** section on page 6.

❏ 2. Remove the tape and separate the ailerons and flaps from the wing and the elevators from the stab. Use a covering iron with a covering sock on high heat to tighten the covering if necessary. Apply pressure over sheeted areas to **thoroughly** bond the covering to the wood.

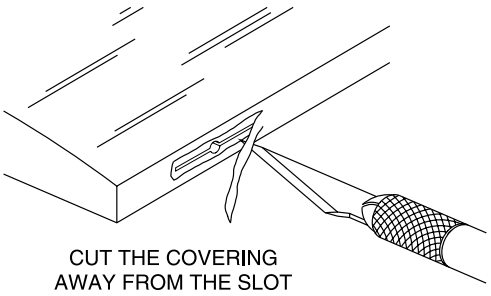
BUILD THE WING

Install the Flaps & Ailerons

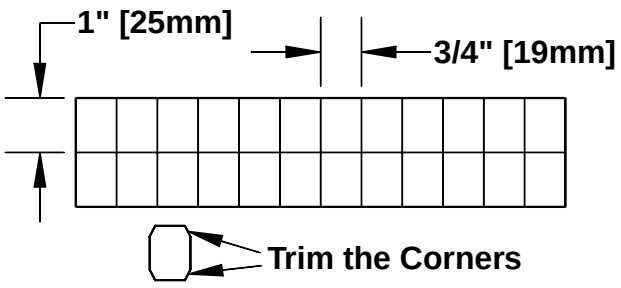
Do the right wing first so your work matches the photos the first time through. You can do one wing at a time, or work on them together.



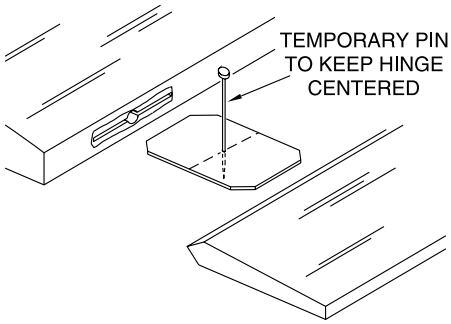
❏ ❏ 1. Drill a 3/32" [2.4mm] hole, 1/2" [12.7mm] deep in the center of each hinge slot to allow the CA to "wick" in. Follow-up with a #11 blade to clean out the slots. **Hint:** If you have one, use a high-speed rotary tool to drill the holes.



❏ ❏ 2. Use a sharp #11 blade to cut a strip of covering from the hinge slots in the wing and aileron.

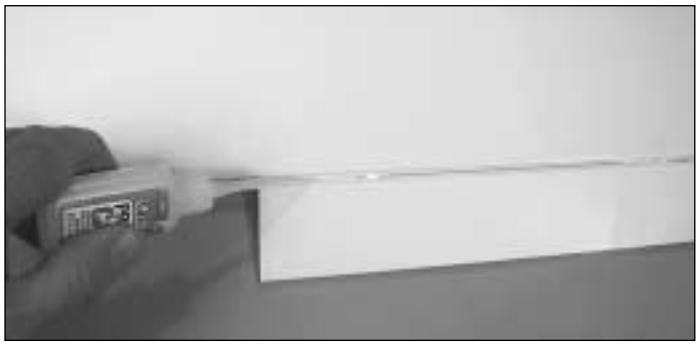


❏ ❏ 3. Cut seven 3/4" x 1" [19 x 25mm] **hinges** from the **CA hinge strip**. Snip off the corners so they go in easier.



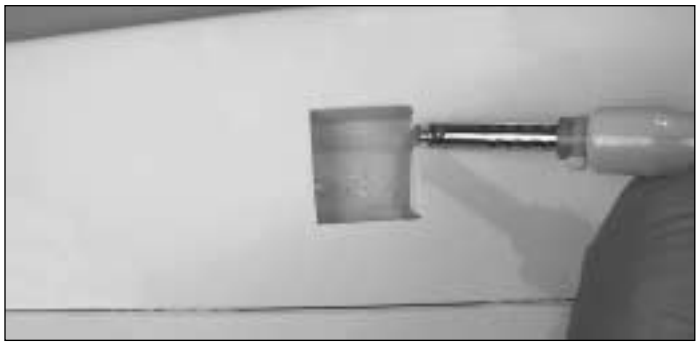
❏ ❏ 4. Test fit the ailerons to the wing with the hinges. If the hinges don't remain centered, stick a pin through the middle of the hinge to hold it in position.

❏ ❏ 5. Remove any pins you may have inserted into the hinges. Adjust the aileron so there is a small gap between the LE of the aileron and the wing. The gap should be small, just enough to see light through or to slip a piece of paper through.

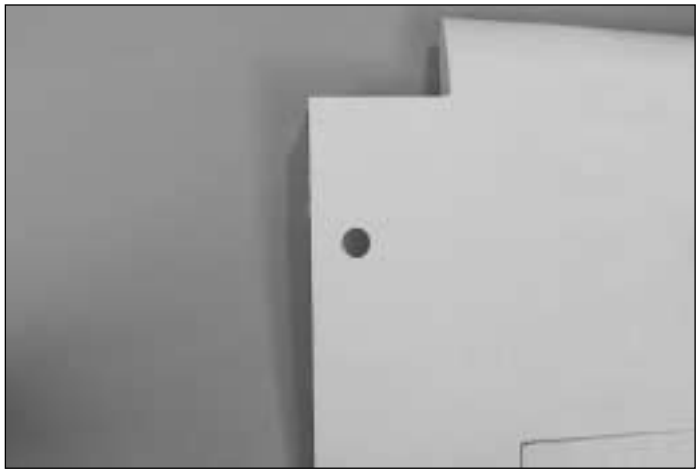


❏ ❏ 6. Apply six drops of thin CA to the top and bottom of each hinge. Do not use CA accelerator. After the CA has fully hardened, test the hinges by pulling on the aileron.

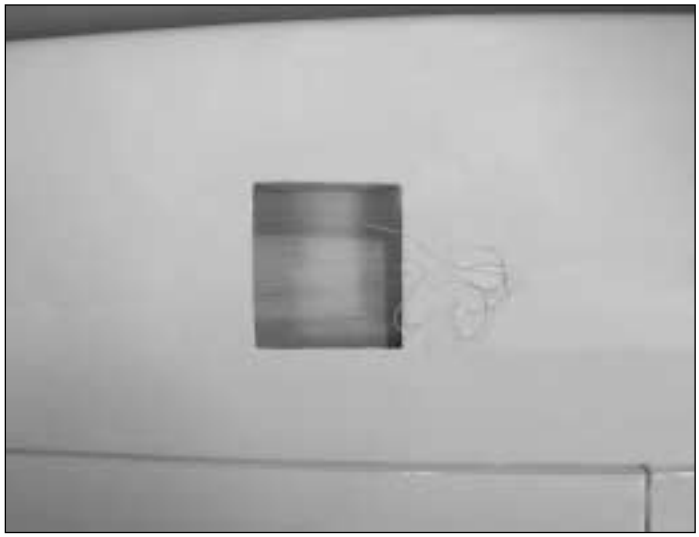
❏ ❏ 7. Repeat this procedure for installing the flap using four CA hinges. Note that the hinge slots on the flap are not centered as the ailerons are.



❏ ❏ 8. Find the hole for the aileron servo by feeling the covering on the bottom of the wing. Cut the covering 1/8" [3mm] inside the opening in the wing for the aileron servo. Use a trim iron to seal the covering to the inner edges of the opening. Repeat this same procedure in the opening for the flap servo.



❏ ❏ 9. On the top of the wing, cut the covering away from the hole at the wing center-section. This hole is for the aileron and flap servo wires to come through, into the fuselage.



❏ ❏ 10. Locate the string from inside of the aileron servo bay and tape it to the wing. Do not pull the string out of the wing! Do the same with the string in the flap servo bay.

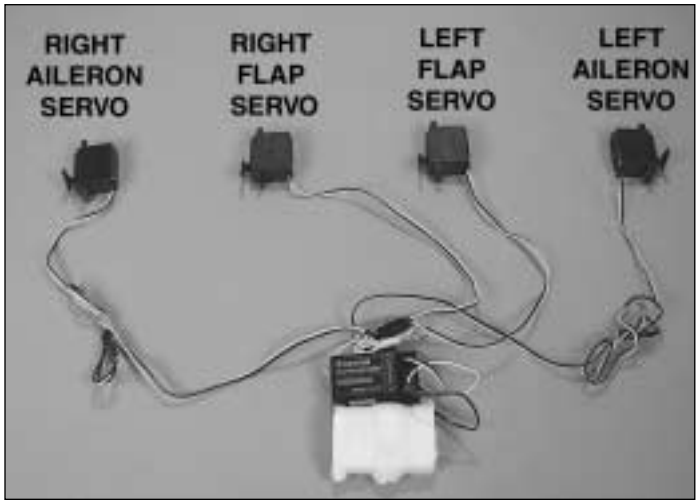
❏ 11. Repeat steps 1-10 for the left wing panel.

Install the Flaps & Aileron Servo

The following steps for installing the servos may be somewhat different from other servo installations you are familiar with. You may find it helpful to read through the servo installation instructions to familiarize yourself with the process before beginning the installation. ***Important!*** *Following these instructions will assure a safe and solid servo installation.*

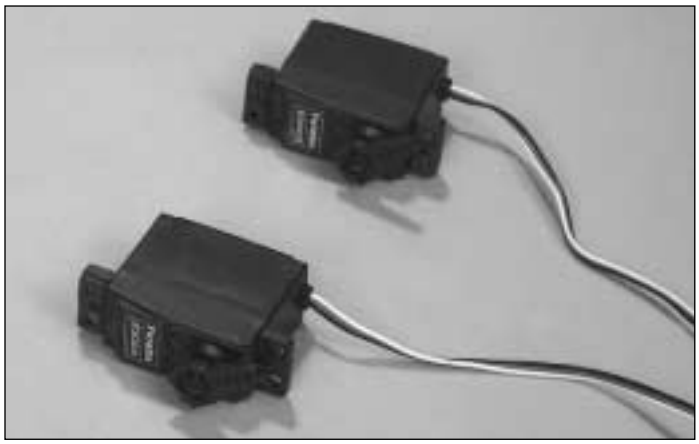
❏ ❏ 1. Installing the servos in the wing will require the use of one 24" [610mm] servo extension for the aileron. Depending on your brand of servos you may find it necessary to use one 6" [152mm] servo extension for each of the flaps. Two Y-harness connectors are required and are used to allow the aileron servos to plug into one slot in your

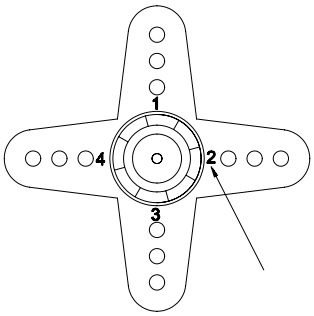
receiver and for the flaps to be plugged into another slot in your receiver. You may have a computer radio that allows you to plug the servos into separate slots and then mix them together through the radio transmitter. If you choose to mix them with the radio rather than Y-harnesses, refer to the instructions for your particular brand of radio.



❏ ❏ 2. Attach the servo extensions to the aileron and flap servos. Secure the connectors together using a large piece of heat shrink tubing, tape or other suitable method. Lay the servos, receiver and battery on your work bench, placing the servos just as they will be when installed in the wing. Remember that you are laying the servos on your bench just as they will be placed into the bottom of the wing. (**Note:** You will not need to install the rubber grommets and eyelets on the servos for the aileron and flap installation). The servo arms on the flap servos need to move the same direction. The aileron servo arms must move opposite one another. (Note the orientation in the above photograph; **remember you are looking at the bottom of the wing**).

❏ ❏ 3. Turn your radio system on, allowing the servos to center. Be sure that all of the radio trims are centered on the transmitter.





❏ ❏ 4. Using the switch or rotary knob that you will be using to activate the flaps, set the switch to the position that will bring the flaps into the "up" position (normal flying mode). Install the servo arms onto the servo with the arm forward. This will allow the servo to push against the flap control horn to keep the flap retracted. When the flap switch is in the "flaps down" position (landing mode) the arm will rotate in the opposite direction, pulling the flaps down. Operate the servo using the flap switch to be sure they are moving the correct way. ***Hint:*** *On many brands of servo arms you will find that each arm has a small number on it. Each arm has a slightly different position on the servo spline once it is installed. You will find it helpful for setting up the flaps if you use two arms with the same number on it (see above sketch).*

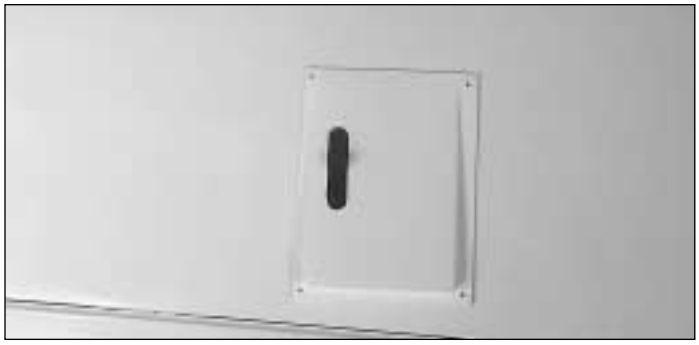
❏ ❏ 5. Install the servo arms on the aileron servos, making sure the arms are positioned as shown in the photograph in step 2. Using your transmitter, operate the aileron servos making sure that the arms are moving in directions opposite of one another. When you are satisfied everything is working properly, turn off the radio system. Unplug the aileron and flap servos from the receiver.

❏ ❏ 6. Locate the ABS **aileron servo cover** for the right wing. Cut out the opening in the cover for the aileron servo arm. The cut lines for the opening are on the inside of the cover. Drill a 1/16" hole [1.6mm] in each corner of the aileron cover.

❏ ❏ 7. The side of the aileron servo case that will rest against the top of the wing inside of the servo bays needs to be cleaned with rubbing alcohol. **Do Not Omit This Step!** This surface must be free of any fuel or oil residue in order

to assure a good bond between the servo and the servo tape that will be used for holding the servo to the wing.

❏ ❏ 8. Tie the string inside the aileron servo bay to the aileron servo wire. Pull the servo wire out towards the wing root with the string. Feed the end of the wire through the hole in the top of the wing center-section. Remove the string from the servo lead and tape the servo lead to the top of the wing to prevent it from falling back into the wing.



❏ ❏ 9. Place the aileron servo into the servo bay. Temporarily place the aileron cover over the servo to help locate the final position for the servo. Remove the cover and make a couple of reference marks inside the servo bay for the servo location. This will help you relocate the servo when it is installed in the next step.

❏ ❏ 10. Using 6-minute epoxy, permanently glue the servo in place inside the servo bay, gluing it to the wing skin. ***Note:*** *We understand that some modelers may resist gluing a servo permanently to the wing. Because of the very thin airfoil it becomes difficult to make a removable servo mounting assembly. Fortunately the servo required for the aileron are the standard, inexpensive type and permanently installing them should not be cost prohibitive.* The **Expert Tip** that follows presents an alternative method of gluing in the servos.

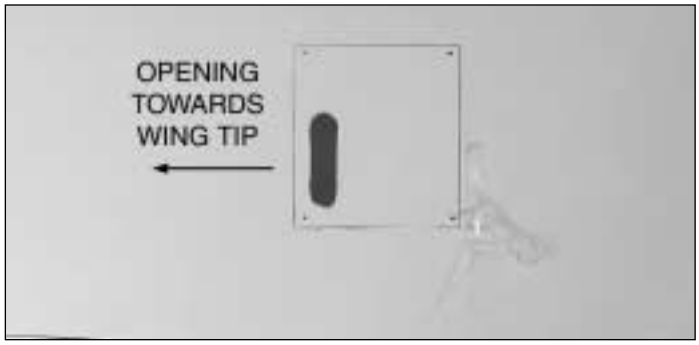
EXPERT TIP

One method for gluing the servo in place while still having the option to remove it is to wrap 2-1/2" [64mm] heat shrink tubing around the servo (PARC1625). This heat shrink is commonly used for making battery packs. After the servo is tightly encapsulated with the heat shrink tubing, glue the servo in place in the wing.

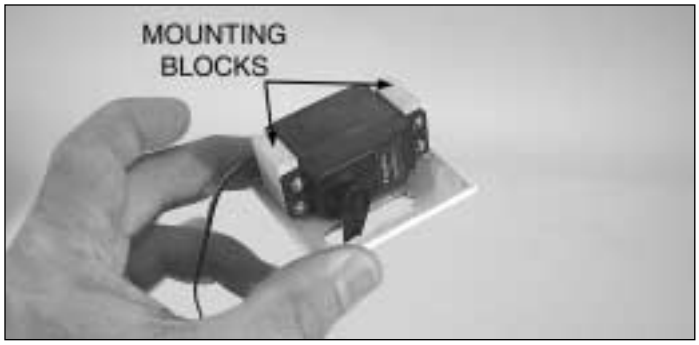
Should you ever need to remove the servo simply cut the heat shrink tubing and remove the servo. If you do not have heat shrink tubing readily available, you can achieve similar results by wrapping the servo with electrical tape and then gluing it in position.

❏ ❏ 11. Place the aileron servo cover over the servo, making sure the servo arm is centered in the cut out. Using the cover as a guide, drill a 1/16" [1.6mm] hole into the wing skin through each of the holes in the cover. Remove the cover.

❏ ❏ 12. Thread a #2 x 3/8" [9.5mm] sheet metal screw into each of the four holes. Remove the screw, then saturate the holes with thin CA. Enlarge the holes in the **cover** only with a 3/32" [2.4mm] drill. Allow the CA to cure and then install the cover into place over the servo.



❏ ❏ 13. Locate the wood flap servo cover for the right wing. Cut the covering from the opening for the servo in the cover. Temporarily place the cover into position with the slot towards the wing tip. **Note:** On the left wing, the slot in the cover is towards the wing root. Drill a 1/16" hole [1.6mm] through each corner of the aileron cover and through the hardwood tabs in the wing. Remove the cover. Drill a 3/32" [2.4mm] clearance hole through each of the holes in the servo cover only!



❏ ❏ 14. Drill 1/16" [1.6mm] holes in two 5/16" x 3/4" x 7/8" [7.9 x 19.1 x 22.2mm] servo mount blocks and mount the aileron servo to the blocks using the screws that came with the servo. Glue the servo mount blocks to the inside of the flap servo cover with 6-minute epoxy.

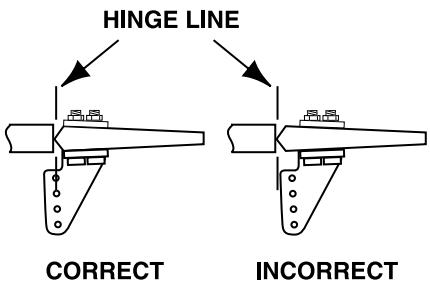
❏ ❏ 15. After the epoxy has hardened, remove the screws that mount the servos to the blocks. Apply a few drops of thin CA to the holes and allow to harden. Remount the servo to the blocks.

❏ ❏ 16. Tie the string inside the flap servo bay to the flap servo wire. Pull the servo wire out the root of the wing with the string. Feed the end of the wire through the hole in the top of the wing center-section. Remove the string from the servo wire and tape it to the top of the wing to prevent the servo wire from falling back into the wing.

❏ ❏ 17. Use four #2 x 3/8" [9.5mm] sheet metal screws and four #2 flat washers to attach the cover to the wing.

❏ 18. Repeat steps 1-17 for the left wing panel.

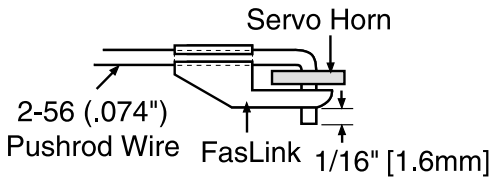
Install the Flap & Aileron Hardware & Pushrods

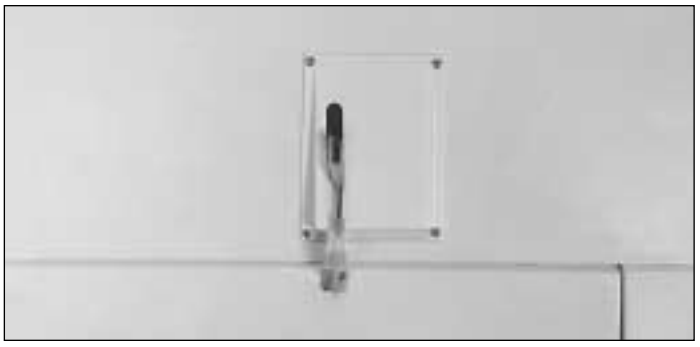


❏ ❏ 1. Position a small nylon **control horn** on the aileron, positioning it as shown in the sketch and aligning it with the servo. Mark the location for the screw holes. Drill through the marks you made with a 3/32" [2.4mm] drill bit. Mount the nylon control horn to the aileron by inserting two 2-56 x 5/8" [2-56 x 16mm] machine screws through the control horn and into the nylon mounting plate on the top of the aileron.

❏ ❏ 2. Locate a .074" x 6" [1.9 x 152mm] **pushrod wire** threaded on one end. Thread a nylon clevis onto the threaded end of the wire 20 turns. Install a silicone clevis retainer onto the clevis. Then, install the clevis on the aileron control horn.

❏ ❏ 3. Be sure the aileron servo is centered (plug the servo into the receiver and turn the radio on to re-center it properly if you are unsure). Enlarge the hole in the servo arm with a Hobbico Servo Horn Drill (or a #48 or 5/64" [2mm] drill bit). Center the aileron and align the wire pushrod with the hole in the end of the servo arm. Using a marker, mark the location where the wire aligns with the hole in the servo arm. On that mark make a 90° bend. From the bend measure an additional 3/8" [9.5mm] and then cut off the excess pushrod wire.





❏ ❏ 4. Install the wire into the hole in the servo arm using a nylon **FasLink** as shown in the sketch.

❏ ❏ 5. Position a small nylon **control horn** on the flap, positioning it in the same manner as you did the aileron. Mark

the location for the screw holes. Drill through the marks you made with a 1/16" [1.6mm] drill bit, drilling through the plywood plate in the bottom of the flap. Do not drill all the way through the flap. Install the screw, then remove it. Harden the holes with thin CA. Mount the nylon control horn to the flap with two #2 x 3/8" [#2 x 9.5mm] sheet metal screws.

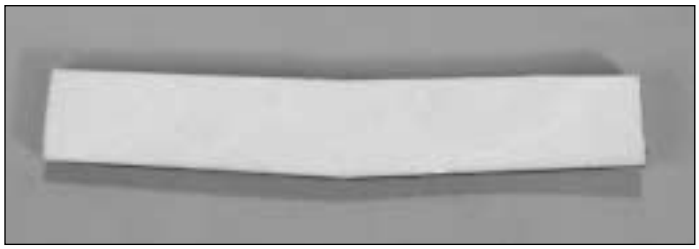
❏ ❏ 6. Locate a .074" x 6" [1.9 x 152mm] **pushrod wire** threaded on one end. Thread a nylon clevis onto the threaded end of the wire 20 turns. Install a silicone clevis retainer onto the clevis. Then, install the clevis to the flap control horn.

❏ ❏ 7. Be sure the flap servo arm is forward, in the position that will pull the flap into the retracted position. (Plug the servo into the receiver and turn the radio on to re-position it properly if you are unsure). Enlarge the hole in the servo arm with a Hobbico Servo Horn Drill (or a #48 or 5/64" [2mm] drill bit). Position the flap to the retracted (neutral) position and align the wire pushrod with the hole in the end of the servo arm. Using a marker, mark the location where the wire aligns with the hole in the servo arm. On that mark make a 90° bend. From the bend measure an additional 3/8" [9.5mm] and then cut off the excess pushrod wire.

❏ ❏ 8. Install the wire into the hole in the servo arm using a nylon **FasLink**.

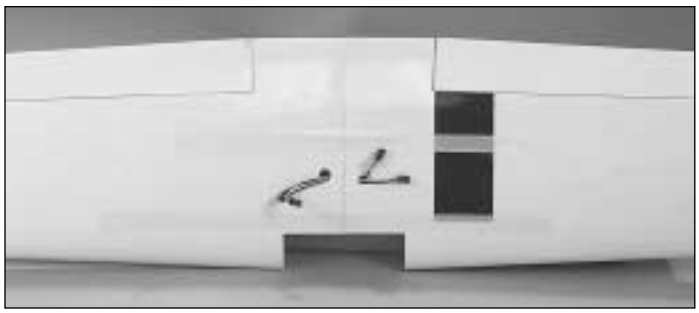
❏ 9. Repeat steps 1-8 for the left wing panel.

Join the Wings



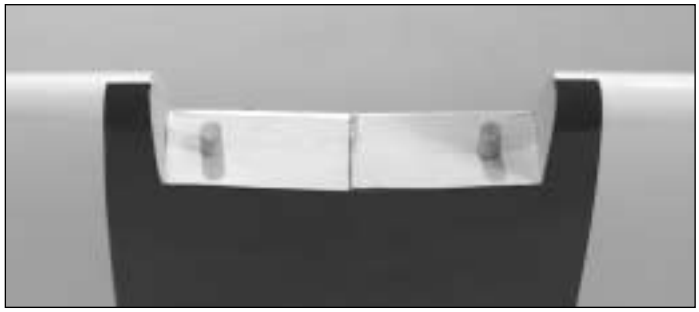
❏ 1. Locate the two 1/8" [3mm] plywood **wing joiners**. Using 6-minute epoxy, glue them together, forming one 1/4" [6mm] wing joiner.

❏ 2. Test fit the wing joiner into each wing panel, making sure that it is not too tight. Sand the joiner as needed to get a good fit.



❏ 3. Apply 30-minute epoxy to both sides of the wing joiner, the joiner pocket in both wing panels and to the root rib of each wing panel. Push the wing panels together and hold them in place with masking tape. Before the glue cures, set the wing flat on your bench and measure the dihedral. The distance from the top of the bench to the bottom of the wing should be approximately 4-1/8" [105mm]. Block the wing tip up while the glue cures. ***Note:*** *Due to production techniques there may be some variance in the actual dihedral of each model. Our prototypes flew well with the dihedral anywhere between 3-7/8" and 4-1/4" [98mm and 108mm].* Minor differences will not affect the flight characteristics.

❏ 4. Set the wing aside allowing the glue to cure.



❏ 5. Locate two 3/8" x 1-3/4" [9.5mm x45mm] wood **dowels**. Apply 6-minute epoxy to the portion of the dowel that will be inserted into the holes in the leading edge at the center-section of the wing. Apply epoxy into the holes in the center-section of the wing. Then, insert the dowels into the holes until they stop. Wipe away excess glue from the dowels and set the wing aside to dry.

❏ 6. Locate the 1/4" [6mm] holes under the covering at the trailing edge of the wing center-section. Cut the covering away on both the top and bottom of the wing.

❏ 7. Lay the wing on your bench with the bottom of the wing facing you. Locate the hardwood **wing hold down plate**. Place the hold down plate in position at the wing trailing edge with the tapered edge of the plate facing the front of

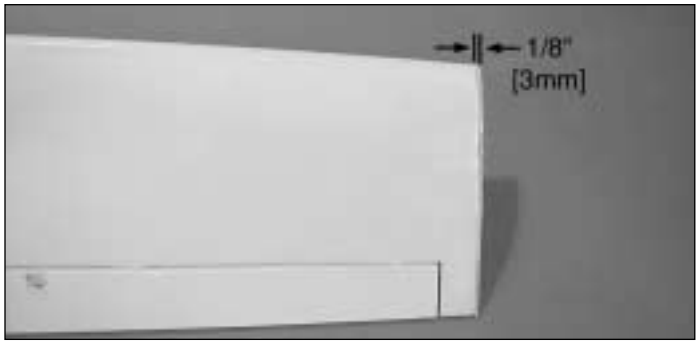
the wing. Trace the plate onto the wing with a felt-tip pen. Cut the covering away in the area where the plate will be (see **Expert Tip** that follows). *Be careful not to cut into the wood. This will weaken the structure.* Glue the wing hold down plate to the wing with 6-minute epoxy.

EXPERT TIP

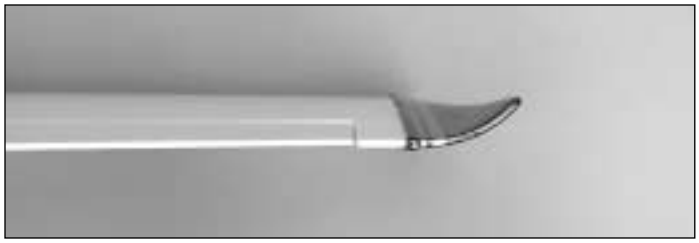
HOW TO CUT COVERING FROM BALSA

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

❏ 8. Once the glue has cured, drill a 1/4" [6mm] hole through the holes in the top of the wing, drilling through the wing hold down plate.



❏ 9. On the top and bottom of the wing, cut the covering away 1/8" [3mm] from the end of the wing tip, being careful not to cut through the balsa wing skin.



❏ 10. Locate the right wing tip. (When installed on the wing the curve on the wing tip will be turned up). With 220-grit sandpaper, roughen the inside of the tip where it will make contact with the wing and then wipe the area with rubbing alcohol.

❏ ❏ 11. Glue the tip to the wing with 6-minute epoxy. Repeat this step for the left wing tip.

Set the wing aside and begin the fuselage. You will come back to the wing and install the landing gear later in the instructions.

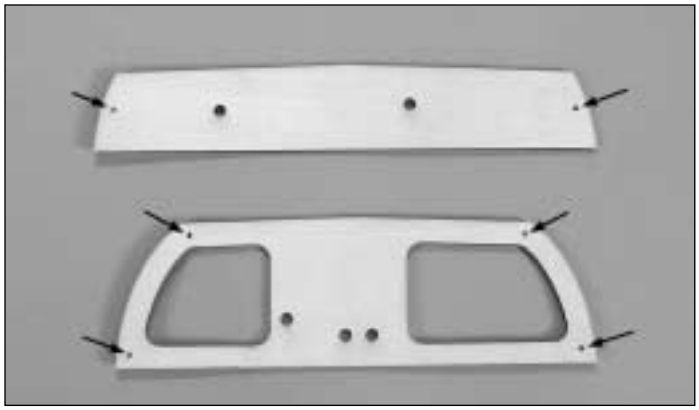
ASSEMBLE THE FUSELAGE

Install the Pushrod Tubes & Fuselage Formers

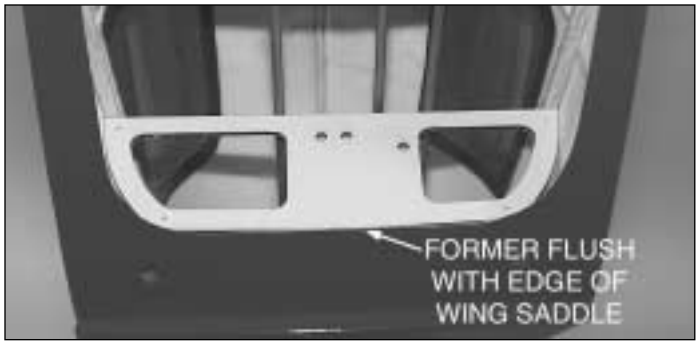
❏ 1. Examine the fiberglass **fuselage**. At the rear of the fuselage there are three molded pushrod exits. A 3/16" [4.8mm] hole needs to be drilled through each of them. **You must follow this procedure!** If you try to drill a single 3/16" [4.8mm] hole the drill *will* tear the fiberglass. Start by drilling a 1/8" [3mm] hole followed by a 5/32" [4mm] hole and then a 3/16" [4.8mm] hole. Another method that works very well is to make the hole with a high-speed rotary tool and a small grinding bit. This would be the preferred method because there is almost no likelihood of splitting the fiberglass.

❏ 2. Locate three 24" [610mm] gray outer plastic **pushrod guide tubes**. Cut the tubes to a length of 18" [457mm]. Roughen both ends of each tube with 220-grit sandpaper. Insert the tubes into the holes you drilled, feeding them through the holes in the rear bulkhead inside of the fuselage.

❏ 3. Glue each of the tubes into the holes using 6-minute epoxy. Be sure you have roughened the tubes before gluing them into position.

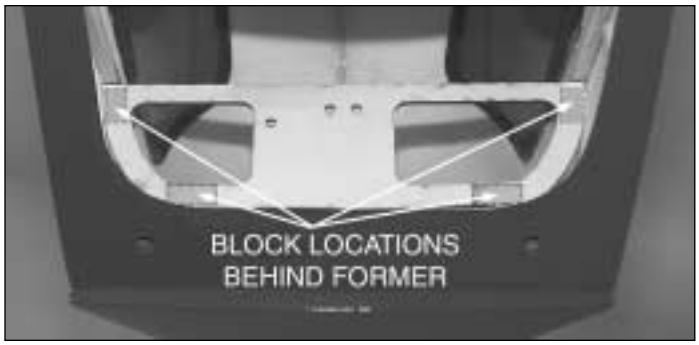


❏ 4. Locate the 1/8" [3mm] plywood **front** and **rear pushrod support formers**. Drill a 3/32" [2.4mm] hole in each corner of the rear former and a 3/32" [2.4mm] hole centered at each end of the front former.



❏ 5. Place the rear former in position in the rear of the fuselage opening as shown. The former needs to be placed flush to the edge of the rear of the wing saddle.

❏ 6. With the former positioned properly, use a felt-tip pen and mark on the fuselage where the back of the former rests. Remove the former.



❏ 7. Locate four 1/4" x 3/8" x 3/4" [6mm x 9.5mm x 19mm] hardwood **blocks**. These are to be mounted behind the former. The former will be attached to each of these blocks. Two blocks need to be glued to the fuselage side. The other two blocks are glued on top of the wooden block that the wing bolt blind nuts are mounted to. Sand the inside of the fiberglass fuselage and clean the area with alcohol where the blocks are glued to the fuselage. Once the fiberglass has been prepared, glue the blocks in place with medium CA glue.

❏ 8. Put the former back into the fuselage, resting it against the four hardwood blocks. Drill a 1/6" [1.6mm] hole into each of the blocks drilling through the holes you previously drilled in the former. **Note:** You are most likely not going to be able to use a power drill due to the small area you are working in. We used a Hobbico® Servo Horn Drill (HCAR0698) but you can also use a small finger drill, pin vise or in a pinch you can put a small wheel collar on the end of the drill bit as a knob to hold and rotate the bit.

❏ 9. Install the pushrod tubes through the former (the two pushrod tubes that are used for the elevator should be fed through the two holes that are side-by-side). Do not glue the tubes to the former. Install the former to the blocks with four #2 x 3/8" [#2 x 9.5mm] screws and #2 flat washers.

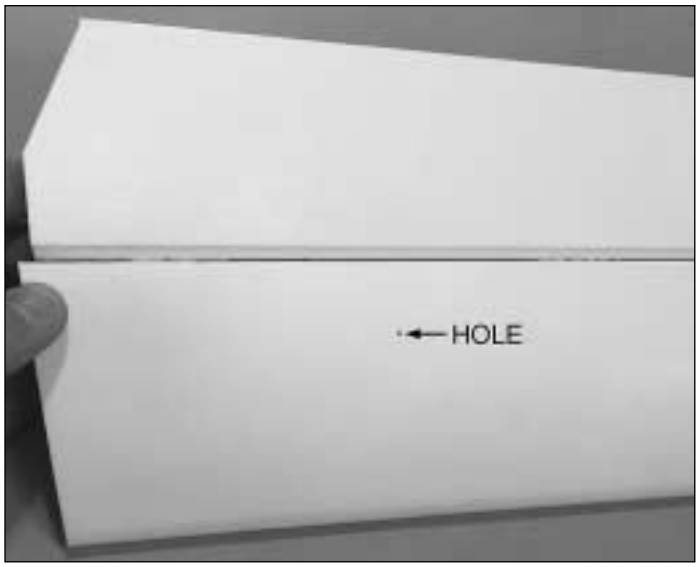
❏ 10. Following the same procedure, install the forward former. The forward former only requires the use of two wood blocks, one on each side of the former. Hold the former in place using two #2 x 3/8" [#2 x 9.5mm] screws and #2 flat washers.

❏ 11. Once the formers are properly installed, remove the formers and set them aside. They will be re-installed permanently when you get to the radio installation.

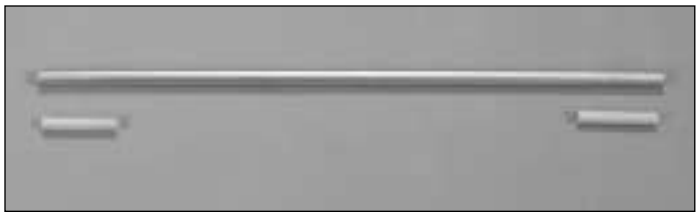
Install the Horizontal Stab, Elevators, Rudder & Pushrods

IMPORTANT! Steps 1-11 provide instruction for installing a stab that is removable. Many of you will find this to be a helpful feature when packing your plane into your car to head out to the field. You may not have a need for the removable stab, in which case you can follow the installation instructions and never take your stab off. If you choose to, you can skip steps 2-11 and permanently glue your stab to the joiners and the fuselage with epoxy. It is suggested you read through steps 1-11 before making a final decision.

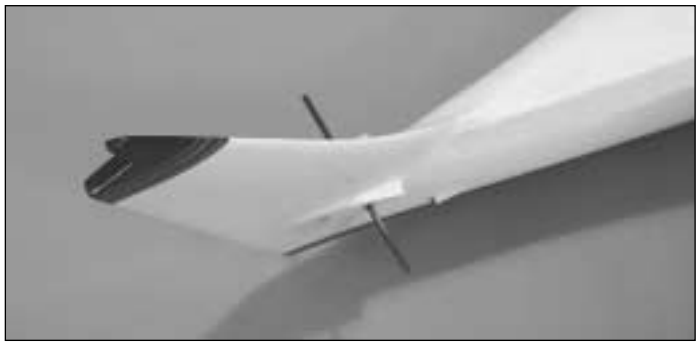
❑ ❑ 1. Install the elevators to the stab with three hinges per elevator, using the same installation method used on the ailerons on page 7, steps 1-8.



❑ ❑ 2. Look closely at the horizontal stab. On one side you will find a small pin hole. This is the bottom of the stab. Place a mark on both stab halves indicating the left side/right side.



❑ 3. Locate the 1/4" x 12" [6mm x 305mm] aluminum **stab tube** and two 1/4" x 1-1/2" [6mm x 38mm] wood **dowels**. Using 6-minute epoxy, glue a dowel into each end of the stab tube. Set it aside until cured.



❑ 4. Locate the 5/32" x 6-1/2" [4mm x 165mm] black carbon fiber **anti-rotation pin**. Insert it into the front hole in the back of the fuselage. Center the pin in the fuselage. Then, glue it in place with a couple of drops of thin CA.

❑ 5. Insert the stab tube into the fuselage, centering the tube left/right. Once it is centered, mark the tube with a marker where it meets the fuselage on both sides.

❑ 6. Slide the right side stab onto the tube and the anti-rotation pin, making sure the root rib of the stab is tight against the side of the fuselage. Using the reference mark on the tube on the left side, make sure the tube is still centered in the fuselage. Drill a 1/16" [1.6mm] hole into the aluminum tube and into the wood dowel inside of the tube. *Do not drill through the opposite side of the tube!*

❑ 7. Remove the stab assembly from the fuselage. Remove the aluminum tube from the fuse. Thread a #2 x 3/8" [#2 x 9.5mm] sheet metal screw into the hole in the tube. Remove the screw and apply a drop of thin CA into the hole. Allow

the CA to cure. Then, re-insert the screw and again remove the screw. Run your finger over the hole. You will probably notice a small burr or bump on the metal. Remove the burr using 220-grit sandpaper.

❏ 8. Insert the tube back into the right side stab, aligning the hole in the stab with the hole in the stab tube. ***Hint:*** *A T-pin will be helpful in aligning the holes.* Attach the stab to the tube by installing the #2 x 3/8" [#2 x 9.5mm] sheet metal screw through the hole in the bottom of the stab and into the tube. Be sure to tighten the screw until it is firmly resting against the plywood that is underneath the balsa skin of the stab.

❏ 9. Insert the tube back into the fuselage with the right side stab attached to the tube. Slide the left side stab onto the tube, making sure the root rib of the stab is tight against the side of the fuselage. When properly installed on the tube, drill a 1/16" [1.6mm] hole into the aluminum tube and into the wood dowel inside of the tube.

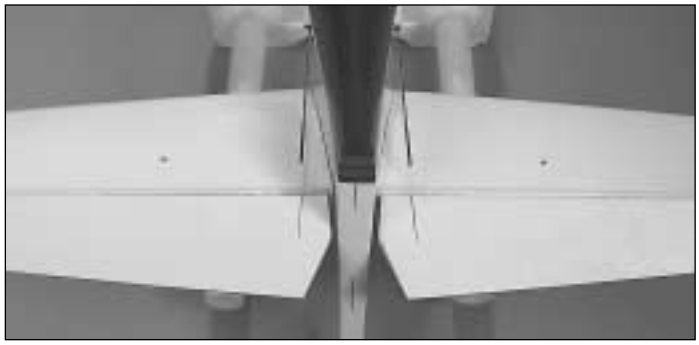
❏ 10. Remove the left side stab from the tube. Install a #2 x 3/8" [#2 x 9.5mm] sheet metal screw into the hole in the tube. Remove the screw and apply a drop of thin CA into the hole. Allow the CA to cure, then re-insert and again remove the screw. Run your finger over the hole, feeling for a burr. Remove any burr from the tube.

❏ 11. Re-install the stab to the tube by inserting the #2 x 3/8" [#2 x 9.5mm] sheet metal screw through the hole in the bottom of the stab and into the tube. Be sure to tighten the screw until it is firmly resting against the plywood that is underneath the balsa skin of the stab.

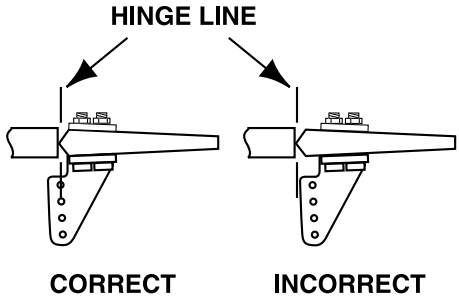
REMOVING THE STAB FOR TRANSPORTATION AND STORAGE

When you find the need to remove your stab from the fuselage, you will find that it is much simpler to re-install the stab if you only remove the stab from one side of the tube and leave the remaining stab attached to the tube. By doing this you will not have any difficulty aligning the hole in the stab with the hole in the tube when reinstalling the stab half. If you are consistent in removing the same side each time, you will minimize wear to the holes in the tube. If you plan to remove the tube completely from both stab halves, it is a good idea to mark the right and left side of the aluminum tube to be sure everything aligns properly when put back together.

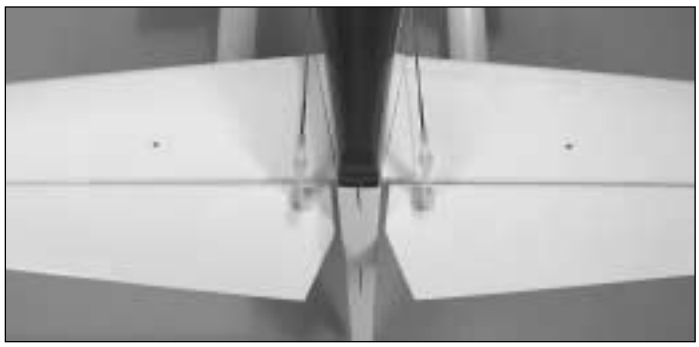
If at any time you find that a screw is getting loose in the hole, add a small drop of thin CA to the hole to add more material into the hole. Our prototype did not experience any loosening of the screw from normal flying but you should check the screws every few flights to be sure they are tight.



❏ 12. Locate two 36" [914mm] wire **pushrods** threaded on one end and cut them to a length of 27" [685mm], making sure you cut the wire off at the unthreaded end of the pushrod wire. Insert them into the pushrod tubes that are used for the elevator control. (These are the tubes in the white molded blisters on the fuselage.) The threaded end of the pushrod should be towards the elevator.



❏ 13. Position a large nylon **control horn** on the right elevator, positioning it as shown in the sketch and aligning it with the pushrod. Mark the location for the screw holes. Drill through the marks you made with a 3/32" [2.4mm] drill bit. Mount the nylon control horn to the elevator by inserting two 2-56 x 3/4" [2-56 x 19mm] socket head cap screws through the control horn and into the nylon mounting plate on the top of the elevator.



❏ 14. Thread a nylon clevis onto the threaded end of the wire 20 turns. Install a silicone clevis retainer onto the clevis. Then, install the clevis on the elevator control horn.

❏ 15. Repeat the process for installing the control horn on the left elevator.

❏ 16. Install the rudder with three CA hinge strips following the same technique used for the other control surfaces.

❏ 17. Position a large nylon **control horn** on the left side of the rudder, over the plywood plate located under the covering, aligning it with the pushrod. Use a T-pin to locate exactly where the plywood plate is on the left side of the rudder. Mark the location for the screw holes. Drill through the marks you made with a 1/16" [1.6mm] drill bit, drilling only through the plywood plate on the left side of the rudder. **Do not drill all the way through the rudder!** Thread two #2 x 3/8" [#2 x 9.5mm] sheet metal screws into the holes you drilled. Remove the screws and apply a couple of drops of thin CA into the holes to harden them. Mount the nylon control horn to the rudder with two #2 x 3/8" [#2 x 9.5mm] sheet metal screws.

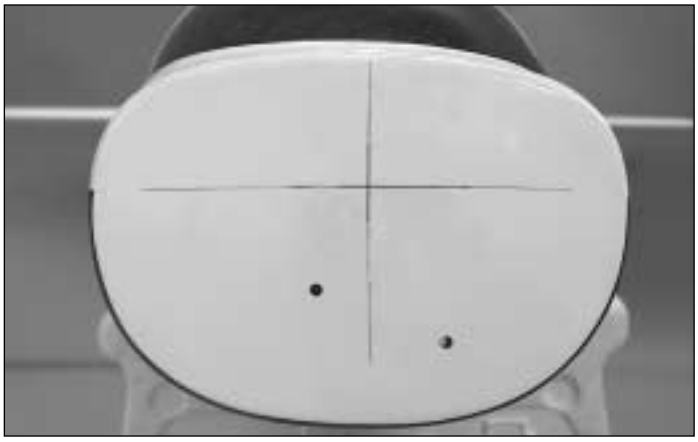
❏ 18. Cut another 36" [914mm] wire pushrod threaded on one end to a length of 28" [711mm], making sure you cut the wire off at the un-threaded end of the pushrod wire. Insert it into the pushrod tube for the rudder. The threaded end of the pushrod should be towards the rudder. Thread a nylon clevis onto the threaded end of the wire 20 turns. Install a silicone clevis retainer onto the clevis and then install the clevis on the rudder control horn.

INSTALL THE ENGINE & MUFFLER

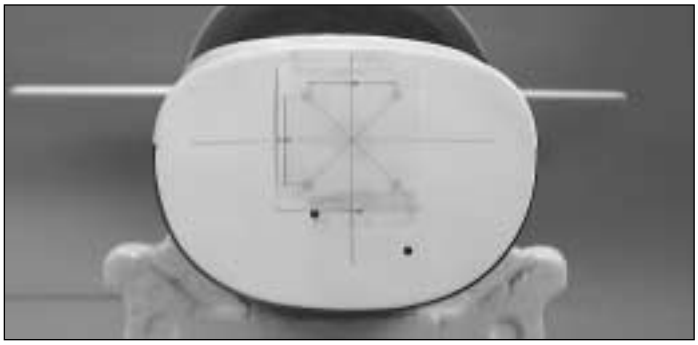
Install the Engine

The following instructions are for installing an O.S.® .61 engine (OSMG05610) with the Top Flite in cowl muffler (TOPQ7917) and Top Flite muffler header (TOPQ7920). This combination of engine and muffler allowed us to completely enclose the engine in the cowl. Because of this enclosed engine installation, some engine baffling is necessary and is explained once you proceed to installing the cowl. The engine mount and installation instructions for the engine mount will work for most .61-.75 two-stroke and .91 four-stroke engines. If you choose to install your engine with a standard muffler system you will need to make different cut outs in the cowl than we will be showing in this manual. Now is the time to determine the exact engine and muffler you will be using.

❏ 1. Locate the engine mount template located on page 39 of this manual. Cut the template from the manual.

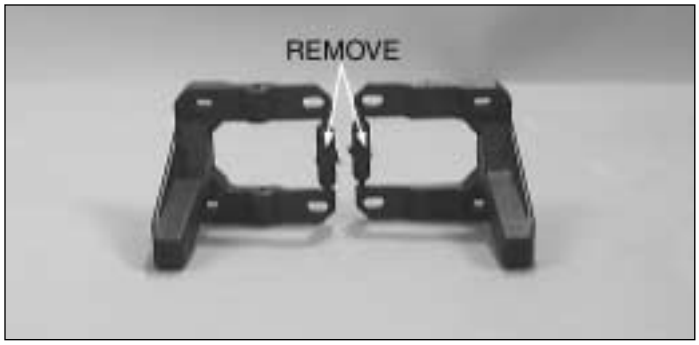


❏ 2. Molded into the firewall are lines that are for referencing the location of the engine mount template. Using a felt-tip pen, draw through the lines extending them further out to each side of the firewall.

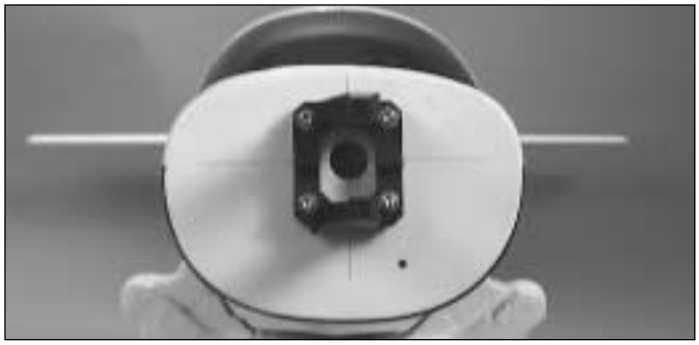


❏ 3. Tape the engine mount pattern to the firewall, aligning the pattern on the lines you have drawn on the firewall. Drill a 3/32 [2.4mm] pilot hole through each of the marks in the corners of the pattern. Then drill through the pilot holes with a 7/32" [5.6mm] drill bit.

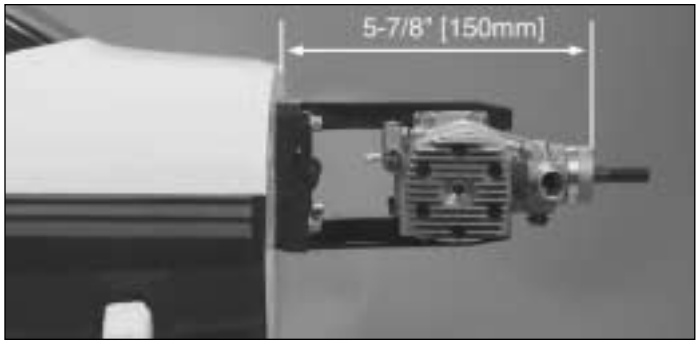
❏ 4. Remove the template and install four 8-32 blind nuts on the backside of the firewall. This is easily done if you insert an 8-32 bolt into a #8 washer. Insert the bolt and washer through the hole. Reach into the fuselage with the blind nut, inserting it on the bolt. Tighten the bolt against the firewall, pulling the blind nut into place. You should have little trouble reaching into the fuselage to insert the blind nut. If you should have difficulty you may find it easier if you remove the forward former you installed earlier. Remember to re-install it after the blind nuts are in place.



❏ 5. Locate the left and right halves of the engine mount. Remove the tabs.



❏ 6. Mount the engine mount to the fuselage. We will be installing the engine in a side-mounted configuration. Install the mount with four 8-32 x1" [8-32 x 25mm] socket head cap screws, four #8 lock washers and four #8 flat washers. Leave the bolts slightly loose.



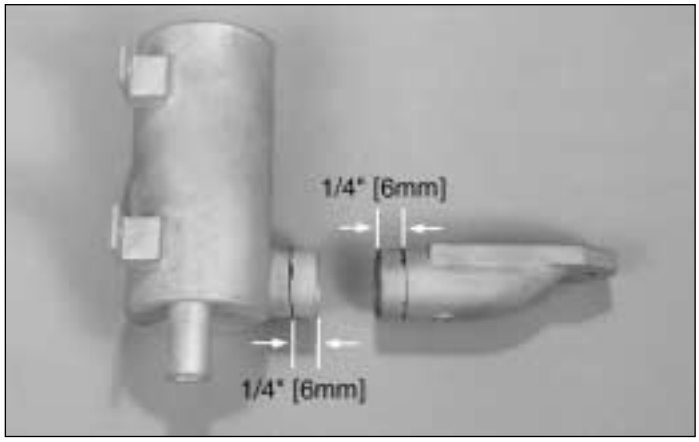
❏ 7. Position your engine onto the engine mount. With the engine resting on the engine mount rails, center the engine and engine mount. Then, tighten the engine mounting bolts. With your engine still resting on the rails, position the engine so that the distance from the firewall to the front of the engine thrust washer is 5-7/8" [150mm]. With the engine properly positioned, resting on the engine mount, slide the cowl onto the fuselage to be sure the engine is extending out of the cowl far enough. If you plan to use a spinner other than the one supplied with the kit, make sure you have adequate clearance for your spinner.

❏ 8. Using the engine as a guide, mark the four holes for the engine bolts on the engine mount. This is easily accomplished with a Great Planes Dead Center™ Tool (GPMR8130). Install the engine onto the engine mount. Drill four #36 (7/64") [2.8mm] holes in the mount. Then, use a 6-32 tap to thread the holes.

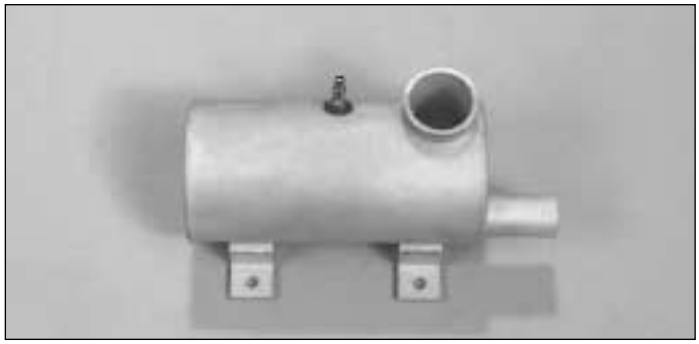
❏ 9. Use four 6-32 x 1" [6-32 x 25mm] socket head cap screws, four #6 lock washers and four #6 flat washers to install the engine onto the mount.

Join the Muffler

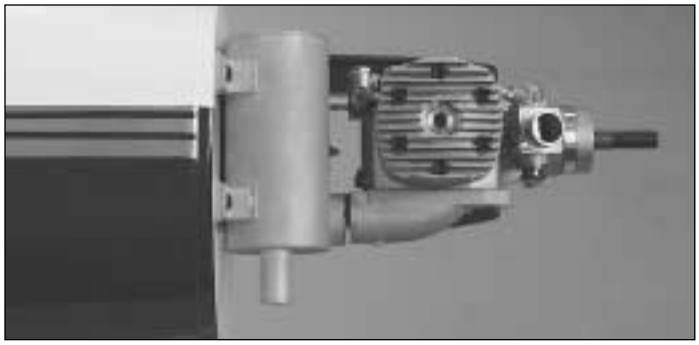
As previously stated, the O.S. .61 and the Top Flite in cowl muffler (TOPQ7917) and Top Flite muffler header (TOPQ7920) work well to give a completely cowled installation of the engine and muffler. For everything to fit you will need to make the following modifications to the muffler and header.



❏ 1. Remove 1/4" [6mm] from the end of the muffler header and the muffler inlet. This can be done with a hacksaw, rotary cutting wheel or grinder.

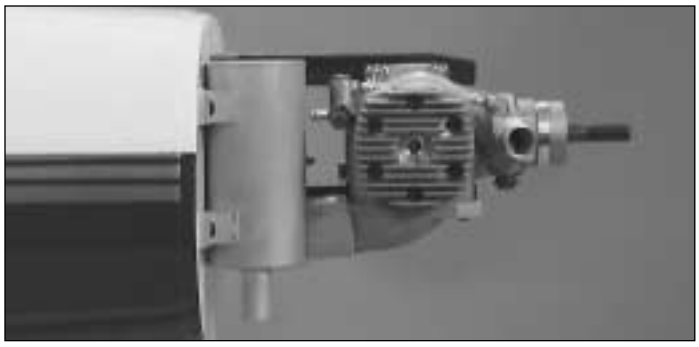


❏ 2. Install the washer and pressure tap into the muffler. Use thread locking compound on the pressure tap before threading it into the muffler.



❏ 3. Install the header onto the engine. Align the muffler inlet with the exhaust outlet on the header. This is the proper placement for the muffler. Mark the firewall where the muffler mounting bolts will be installed to the firewall. **Note:** You want to have a gap between the header and the muffler. You do not want any metal to metal contact that could vibrate and cause noise that may interfere with your radio system.

❏ 4. Drill a 5/64" [2mm] hole through the marks you made on the firewall. Install the screws, then remove them. Harden the holes with thin CA. Using the screws and rubber pads included with the muffler, insert a rubber pad behind each mounting foot of the muffler (the rubber foot insulates the muffler from the firewall). Then, install the muffler to the firewall.

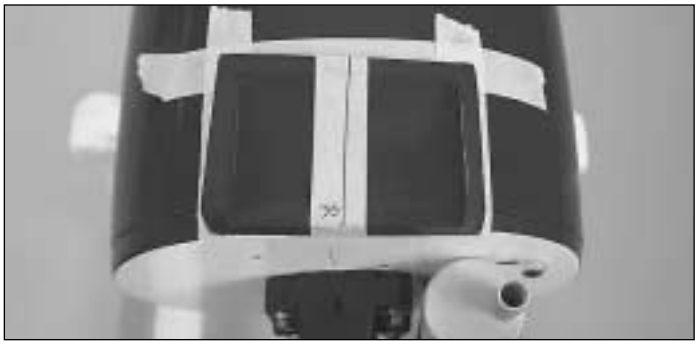


❏ 5. Cut the rubber coupler to fit tightly between the header and the muffler. Remove the header and install the coupler over the muffler. Insert the header into the coupler and re-attach the header to the engine using a small amount of thread locking compound.

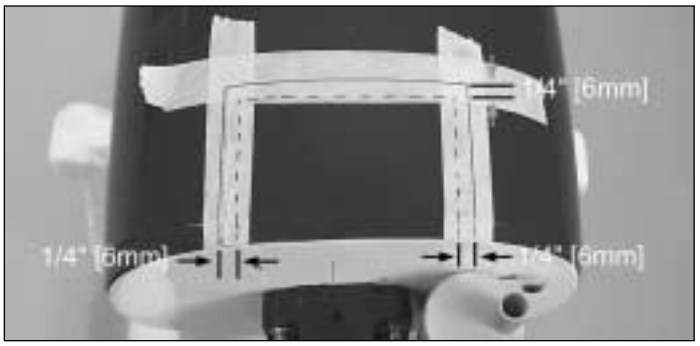
Install the Nose Wheel

The following steps cover installation of the nose wheel as well as an air outlet. The air outlet is required for proper cooling with the Top Flite muffler. If you are installing a standard muffler and have large cut outs in the cowl for the muffler you probably can skip installation of the air outlet. However, the extra air outlet cannot hurt for any engine installation.

❏ 1. Locate the fiberglass **exhaust air panel**. Place a piece of masking tape down the center of the panel. Measure and locate the exact center of the panel and draw a centerline on the tape.

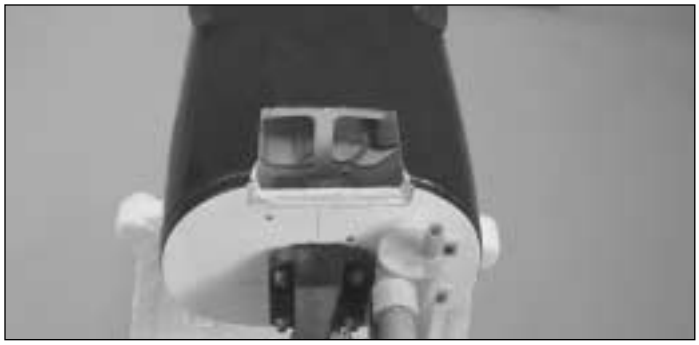


❏ 2. Align the center of the panel with the center of the fuselage. Place masking tape on the fuselage under the edges of the panel. Re-center the panel if necessary. Then, trace the shape of the panel onto the fuselage.



❏ 3. Measure inside the outline 1/4" [6mm] from the sides of the panel and 1/4" [6mm] from the rear edge of the panel. Draw this onto the tape with a marker.

Note: The next step is done fairly easily using a high speed rotary tool such as a Dremel tool. This combined with a reinforced fiberglass cut-off wheel will make the next step pretty easy. Without one it is going to be a pretty laborious job. If you do not own a high-speed rotary tool we suggest you purchase one or borrow one from another modeler. Most modelers probably have at least one of these in their tool collection.



❏ 4. On the inside lines that you have drawn, cut that portion of the fuselage and firewall away. After you have removed it, test fit the exhaust air panel into the opening. Because the exhaust air panel is a fiberglass lay up, there may be some slight variations in manufacturing. Trim the opening to fit your exhaust air panel.

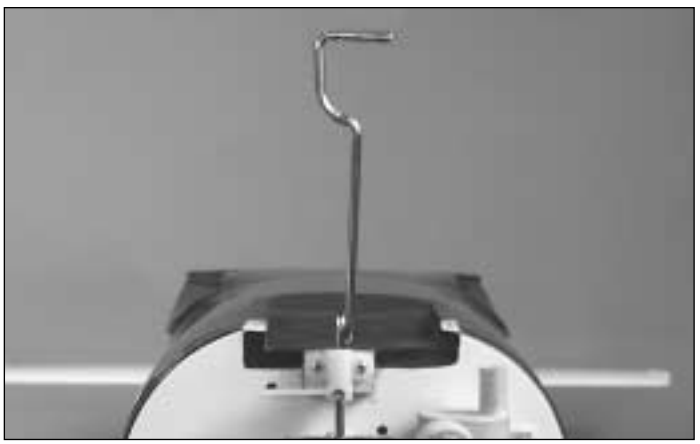
❏ 5. When you are satisfied with the fit, lightly sand the backside of the exhaust air panel where it will contact the fuselage and firewall. Lightly sand the part of the fuselage where the panel will contact the fuselage. Wipe the areas you have sanded with rubbing alcohol. *Failure to properly prepare these parts will create a poor bond between the panel and the fuselage.* Using 6-minute epoxy, glue the exhaust air panel into place on the fuselage, holding it in place with masking tape while the epoxy is curing. Clean any excess epoxy with a rag dampened with alcohol.

❏ 6. After the glue is completely cured, remove the tape. With the panel in place you will see that it will conflict with the cowl installation. Sand the corners of the panel so they match the step in the fuselage that the cowl rests against. This is easily done with the high speed rotary tool and the reinforced fiberglass cut off wheel.

❏ 7. Using a 5/32" [4mm] drill bit, drill through the hole located in the engine mount.

❏ 8. Locate the 3/16" x 3/4" x 1-1/4" [4.8mm x 19mm x 32mm] plywood **nose gear mounting block**. Temporarily locate it on the fuselage, centered above the hole in the engine mount. The bottom of the wood block should be even with the edge of the air exhaust panel. Mark the location on the firewall. Using 220-grit sandpaper, roughen the area on the fuselage where it will be attached. Then, glue it to the firewall with 6-minute epoxy.

❏ 9. Locate the nylon **nose gear bearing**. Position it on the wood block so the bottom of the nylon nose gear bearing is flush with the bottom of the wood block. Mark the location of the mounting holes. Then, drill two 5/64" [2mm] holes on the marks in the wood block. Slide the nose gear wire into the nose gear bearing and into the hole in the engine mount. Harden the holes with thin CA. Mount the nose gear bearing to the wood block with two #4 x 5/8" [#4 x 15.9mm] sheet metal screws.

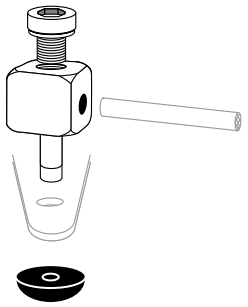


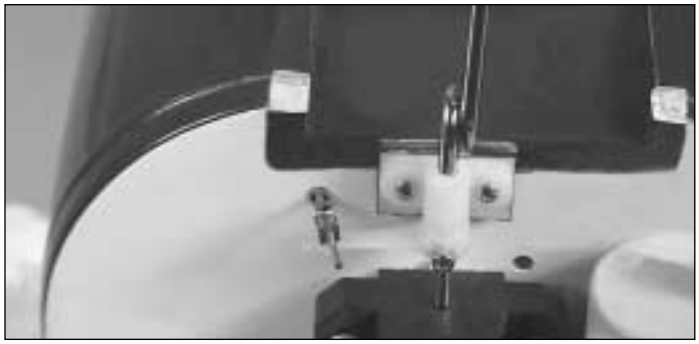
❏ 10. Insert a 5/32" [4mm] wheel collar into the nylon **nose gear steering arm** and a 6-32 x 1/4" [6-32 x 6mm] socket

head cap screw into the arm and wheel collar. Slide the metal **nose gear wire** into the nylon nose gear bearing, nose gear steering arm and engine mount. The coil of the nose gear wire should rest on the nylon nose gear bearing. Tighten the set screw against the flat spot in the nose gear wire.

❏ 11. Cut one of the 24" [610mm] gray outer pushrod tubes in half, making two 12" [305mm] tubes. Roughen one end of the outer pushrod tube with sandpaper. Insert the end you did not roughen into the hole in the firewall adjacent to the nose gear steering arm (see the photo at step 13). Apply glue to the roughened end of the outer pushrod tube and insert it into the firewall, allowing the end of the tube to extend approximately 1/4" [6mm] beyond the firewall. Do the same with the second tube, inserting it into the hole in the firewall for the throttle pushrod and through the hole in the former, behind the firewall.

❏ 12. Locate a .074 x 36" [1.9 x 450mm] pushrod wire. From the unthreaded end of the wire, cut a 15" [381mm] long, unthreaded pushrod wire. Insert the pushrod into the outer pushrod tube for the nose gear steering.

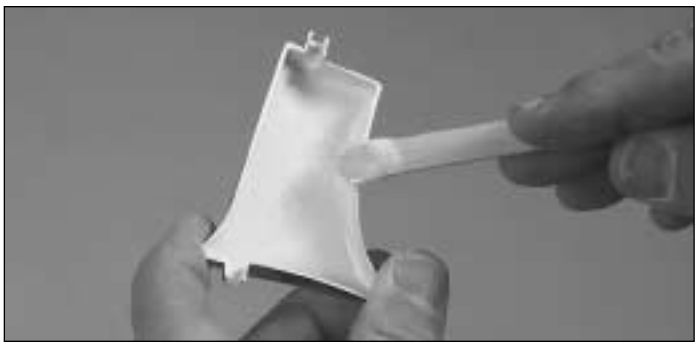




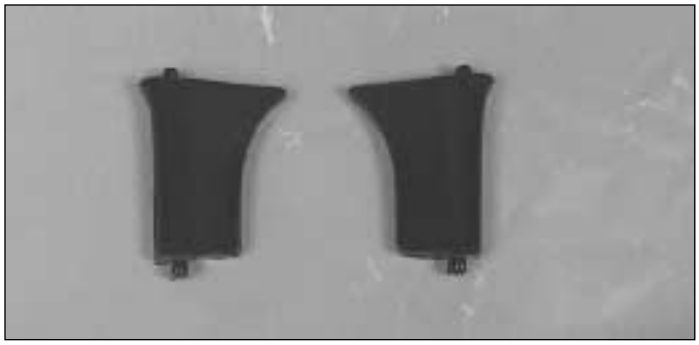
❏ 13. Locate the brass **screw-lock pushrod connector**, 4-40 x 1/8" [4-40 x 3mm] socket head cap screw and nylon retainer. Install it on the steering arm as shown in the sketch, tightening the set screw to the wire pushrod. Be sure to leave approximately 3/8" [9.5mm] of wire extending through the screw-lock pushrod connector to allow for adjustment to the steering.

❏ 14. From the remainder of the 36" wire you cut, thread a nylon clevis onto the threaded end of the wire 20 turns. Install a silicone clevis retainer onto the clevis. Then, install the pushrod into the outer pushrod tube for the throttle. Install the clevis on the carburetor arm. Depending on the exact location of your carburetor, you may need to make a small bend in the wire to get free movement of the throttle and pushrod.

❏ 15. Carefully cut out the left and right halves of the ABS **nose gear fairing**.



❏ 16. The next two steps are going to require you to work rather quickly so be sure you have 6-minute epoxy, microballoon filler and a small piece of waxed paper ready. Mix 1/2 ounce of 6-minute epoxy. Add some microballoon filler. Spread a small amount along the inside edges of both the left and right fairing. Move quickly and don't worry if it is not too uniform. We are not filling up the fairing; only building up the edges as shown in the photo at step 18.

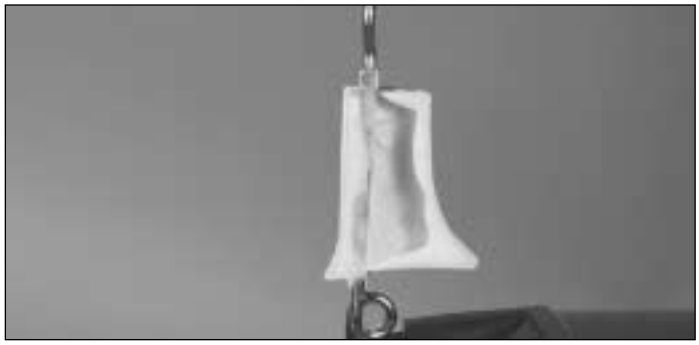


❑ 17. Turn the fairings over, placing them on a piece of waxed paper. Allow the glue to cure.

❑ 18. Once the glue cures, remove the fairings from the waxed paper. The glue will have formed a nice edge all around the fairings. This is going to provide a surface for gluing the two halves together.

❑ 19. Use a coarse 100-grit sandpaper to roughen up the plating on the landing gear wire where the fairings are to fit. Wipe the wire with alcohol.

❑ 20. Position the nose gear wire as if you are taxiing the airplane straight on the runway. Position one of the fairings onto the wire so that it is also aligned straight ahead. Tack glue the fairing to the wire with a small amount of CA.

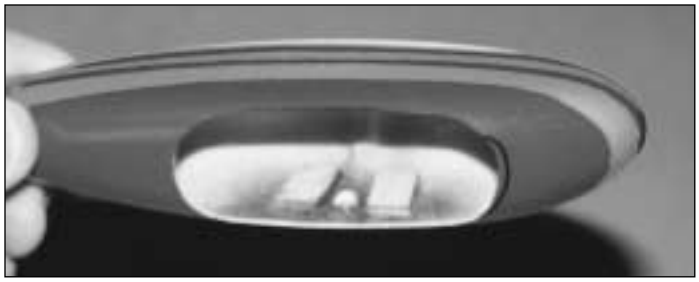


❑ 21. Mix another small amount of 6-minute epoxy and microballoon filler. Coat the area around the fairing that is in close contact with the wire so that the fairing is securely glued to the wire. Allow the glue to cure. Before the glue dries you can clean any excess glue from the outside of the fairings with rubbing alcohol.

❑ 22. Glue the two halves of the fairing together. This can be done with either CA or 6-minute epoxy.

❑ 23. Locate the nose wheel pant (the nose wheel pant has a small groove molded into one side) and two 1/8" x 3/8" x 3/4" [3mm x 9.5mm x 19mm] plywood plates.

❑ 24. Drill a 5/32" [4mm] hole at the bottom of the molded groove in the wheel pant for the axle to pass through.



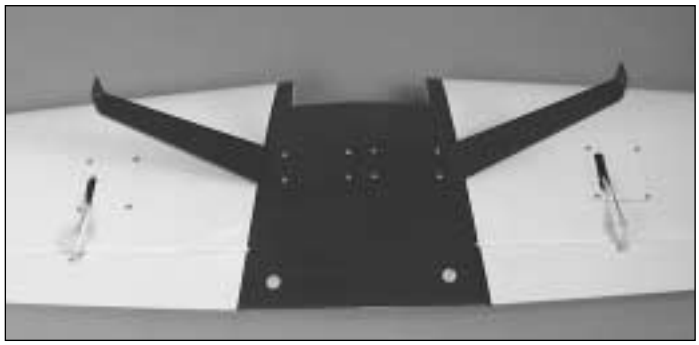
❏ 25. Roughen the area in the wheel pant where the plywood blocks are to be mounted. Wipe the area with rubbing alcohol. After the alcohol has dried, glue the blocks into the wheel pants along side the groove for the nose gear wire.

❏ 26. Lay the wheel pant on your workbench with the grooved side facing you. Locate the nylon **landing gear strap** and position it on the wheel pant, making sure it lays over the groove in the pant and that the holes for mounting it are aligned over the blocks inside the pant. When you are sure it is properly positioned, mark the mounting hole locations on the wheel pant. Drill a 1/16" [1.6mm] hole through each of these marks.

❏ 27. File a flat spot on the bottom of the end of the nose gear wire. Partially slide the wheel pant onto the landing gear wire. Slide a #6 flat washer over the landing gear wire followed by the wheel. Insert a 6-32 set screw into a 5/32" [4mm] wheel collar (use a bit of thread locking compound for this). Then, install the wheel collar onto the end of the nose gear wire to hold the wheel to the nose gear wire. Use two #2 x 3/8" [#2 x 9.5mm] sheet metal screws to attach the landing gear strap to the wheel pant and nose gear wire.

Install the Main Landing Gear

❏ 1. At the wing center-section on the bottom of the wing locate the cut outs for the landing gear. Cut the covering away, revealing the plywood mounting plates. Seal the edges of the covering with your covering iron. Apply thin CA to the wood and allow it to cure. This will fuelproof the wood.



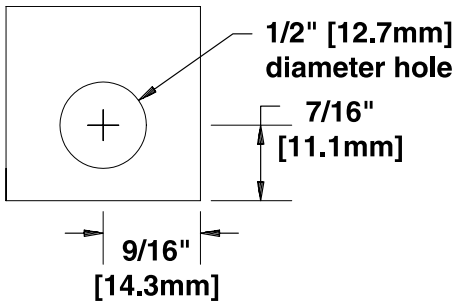
❏ 2. Place both landing gears in place on the plywood plates. Drill a 5/64" [2mm] hole through each of the mounting holes in the landing gear. Thread a screw into each hole, and then remove the screws. Harden the holes with thin CA. Then, mount the gear to the plate with four #4 x 1/2" [#4 x 13mm] sheet metal screws.

❏ 3. Locate two bolt-on **landing gear axles**. The axles need to be shortened. Cut each axle to a length of 1-1/4" [32mm].

❏ 4. Bolt an axle to each landing gear with a 5/16"-24 [8mm-24] axle nut.

❏ ❏ 5. Place a piece of masking tape centered on the left side of a **wheel pant**. This pant will be mounted to the right landing gear. *(**Note:** When doing this for the wheel pant on the left landing gear, the hole will be made on the right side of the wheel pant).* Measure the opening in the wheel pant to find the exact center. Draw a line on the masking tape indicating the center of the wheel pant. Measure up from the bottom of the wheel pant 1/2" [13mm] and mark another line. Drill a 5/32" [4mm] hole at the intersection of the lines through the side of the pant. Do not drill through the outside of the pant.

❏ ❏ 6. Draw a 1/2" [13mm] circle onto the wheel pant centered on the hole you have drilled. Use a high-speed rotary tool and a small grinding wheel to open the hole to 1/2" [13mm]. If you have to use a drill, drill a series of progressively larger holes until you get up to 1/2" [13mm]. If you try to drill a 1/2" [13mm] hole without getting progressively larger the bit *will* tear the fiberglass.



❏ ❏ 7. Locate one of the 1-1/8" x 1-1/8" x 1/8" [28mm x 28mm x 3mm] plywood **landing gear mounting plates**. Mark the plate as shown in the sketch. Drill a 1/2" [13mm] hole in the plywood plate.

❏ ❏ 8. Roughen the inside of the wheel pant with 220-grit sandpaper around the hole you have made. Clean the area with rubbing alcohol. Glue the plywood plate to the inside of the wheel pant, aligning the 1/2" [13mm] holes over each other.

❏ ❏ 9. This step will probably require the help of another person. Temporarily install the wing onto the fuselage. Put a wheel on the left landing gear axle. Put the wheel and wheel pant on the right landing gear axle. Align the pant with the nose gear wheel pant. (This is where the other person can help). When they are aligned with each other, press a T-pin through one of the mounting holes in the landing gear, making a mark on the wheel pant. Remove the wheel pant from the axle. Drill a 1/16" [1.6mm] hole through the mark the pin left on the wheel pant. Put the wheel and the wheel pant back onto the axle. Insert a #2 x 3/8" [#2 x 9.5mm] sheet metal screw through the mounting hole in the landing gear and insert it into the wheel pant. Stand back and look at the wheel pant again. If you are satisfied with the alignment, drill another 1/16" [1.6mm] hole through the other mounting hole in the landing gear and wheel pant. Remove the screws and harden the holes with thin CA. Insert #2 x 3/8" [#2 x 9.5mm] sheet metal screws through the mounting holes in the landing gear, installing them into the wheel pant.

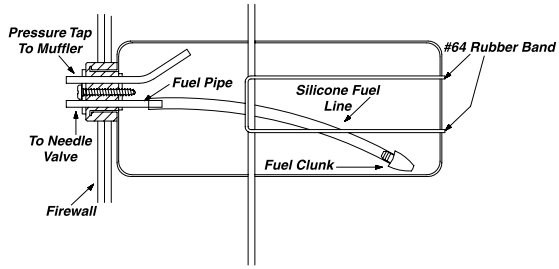
❏ ❏ 10. Remove the wheel and the wheel pant from the axle. Locate two 5/32" [4mm] wheel collars and two 6-32 set screws. Apply a small amount of thread locking compound to the set screws. Insert the set screws into the wheel collars. Slide the wheel pant partially onto the axle followed by a wheel collar, the wheel and another wheel collar. Attach the wheel pant onto the landing gear. Then, center the wheel using the wheel collars. Once centered, tighten the set screws in the wheel collar to keep the wheel centered in the wheel pant.

❏ 11. Repeat steps 5-10 for the remaining wheel pant. **Important!** *When repeating step 5, make sure you drill the hole on the opposite side of the wheel pant than you did for the previous wheel pant.*

Install the Fuel Tank

❑ 1. Remove the forward and rear former that you installed into place during the fuselage construction.

Fuel Tank

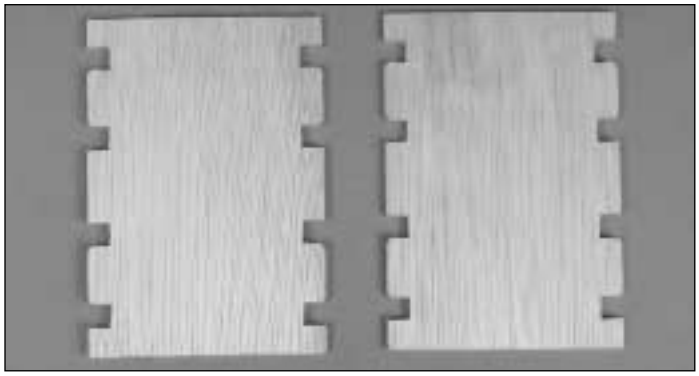


❑ 2. Assemble the fuel tank as shown in the sketch. When tightening the center screw be sure not to overtighten it. You just want it snug enough to pull the rubber stopper tight against the tank.

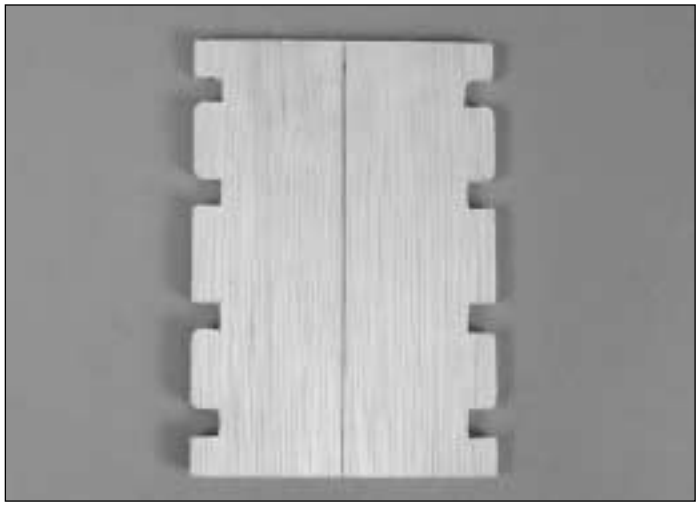
❑ 3. Install silicone fuel tubing (not included in the kit) onto the aluminum tubes from the fuel tank. The line with the fuel clunk will feed to the fuel inlet at the needle valve and the other will attach to the pressure tap on the muffler. For our installation we chose to use an external fill valve. If you choose to do this as well, follow the instructions with the fuel valve. Should you choose not to install a fuel filler valve, you can fill the fuel tank by removing the fuel line to the carburetor and filling through it. However, depending how you cut out the cowling to accommodate the engine, the cowling may make it difficult to access the carburetor. You can also install a third line to the tank and use it for filling the tank. The method you use is your choice but make your decision before moving onto the installation of the fuel tank.

❑ 4. Hold the tank in place inside the fuselage by wrapping two #64 rubber bands around the tank, attaching the bands to the tabs in the plywood former that supports the tank.

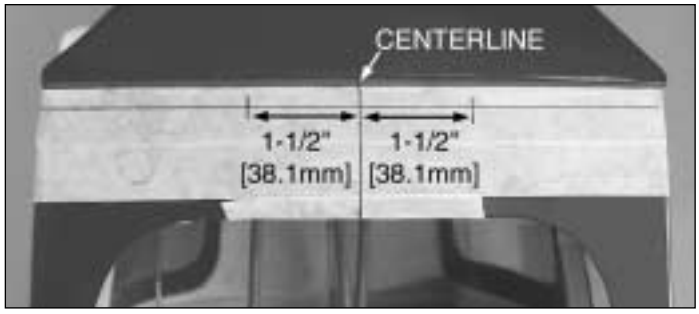
INSTALL THE RADIO SYSTEM



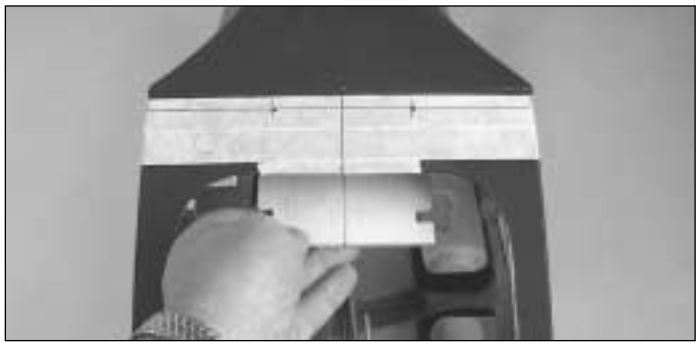
❑ 1. Locate the two die-cut 1/8" [3mm] plywood **receiver/battery trays**. Glue them together forming one 1/4" [6mm] tray.

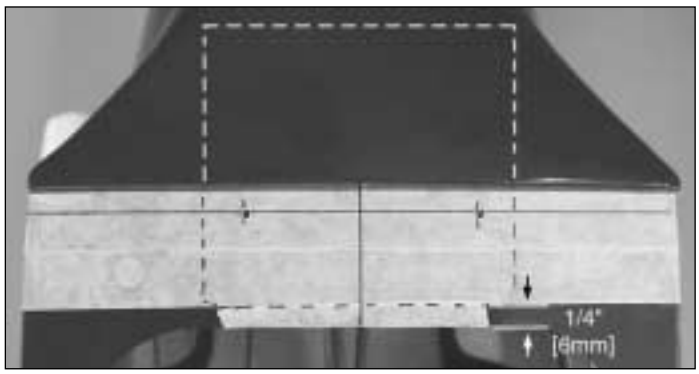


❑ 2. Draw a line down the center of the tray.



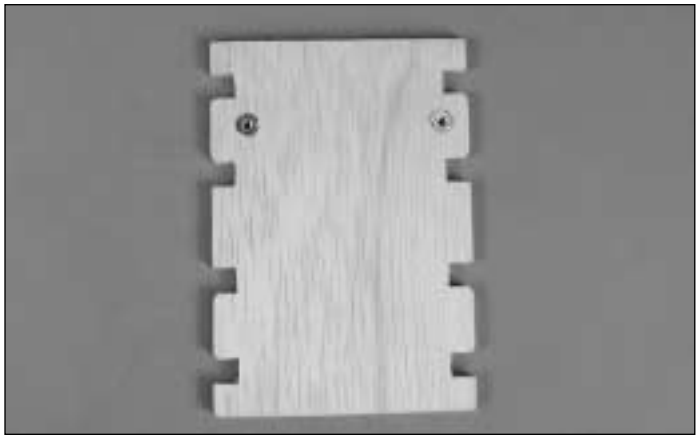
❑ 3. Place masking tape on the rear portion of the wing saddle where the wing bolt holes are located. Draw reference marks as shown in the photograph. Drill a 1/8" [3mm] hole through the marks you made on both sides of the centerline. Be sure that you keep the drill perpendicular to the surface you drill through.





❑ 4. Insert the receiver/battery tray into the fuselage, aligning the centerline of the tray with the centerline of the

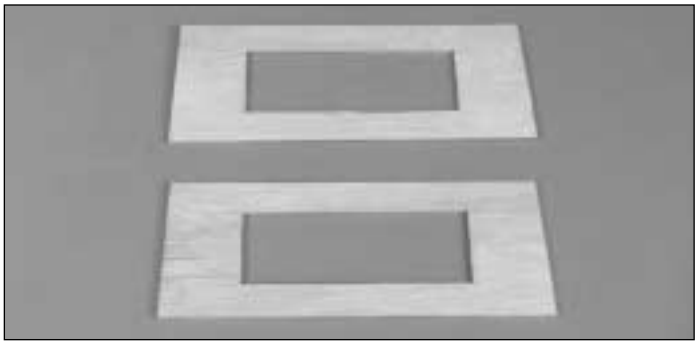
fuselage. The tray will rest between the wing bolt mounting blocks and on the hardwood rail between the blocks. Place the tray so that it is positioned 1/4" [6mm] behind the wing saddle as shown in the photograph. (It is necessary to position it here so there is room to re-install the rear former). Once it is properly positioned, drill a 1/8" [3mm] hole through the two holes you previously drilled in the wing saddle and through the tray. ***Important:*** *When drilling the holes through the tray, be sure the tray is being held firmly against the hardwood rail in the fuselage and that the drill remains perpendicular to the drilling surface.*



❑ 5. Remove the tray and insert a 4-40 blind nut into each of the holes in the tray. Apply a small amount of CA to the blind nut to help secure it to the wood. Be careful not to get any glue into the threads!

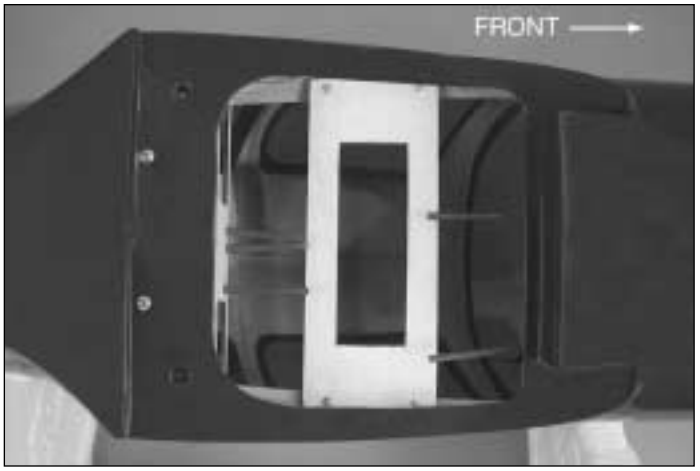
❑ 6. Locate two 4-40 x 5/8" [4-40 x 16mm] phillips pan head screws. Using a small grinding bit and a high-speed rotary tool, grind away enough of the fiberglass around the holes you drilled in the wing saddle to allow the head of the screws to sit down flush with the top of the saddle. Countersinking the heads of the screws allows the wing to be put in place in the wing saddle without the heads of the screws protruding into the wing.

❑ 7. Set the receiver/battery tray aside for now. You will install it later.

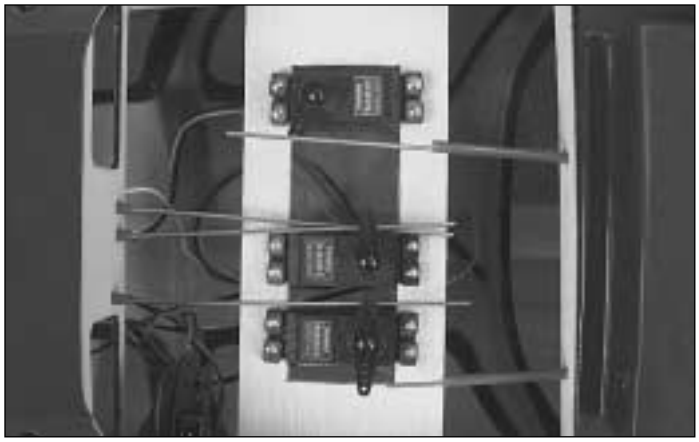


❑ 8. Locate the two plywood **servo trays**. Glue them together forming one 1/4" [6mm] servo tray. Drill a 1/8" [3mm] hole through each corner of the tray.

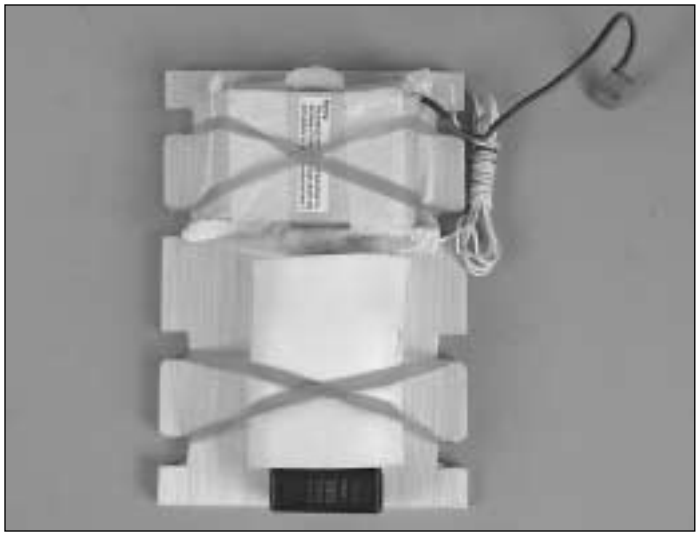
❑ 9. If you did not remove the front and rear formers as you were instructed earlier in this manual, remove them now.



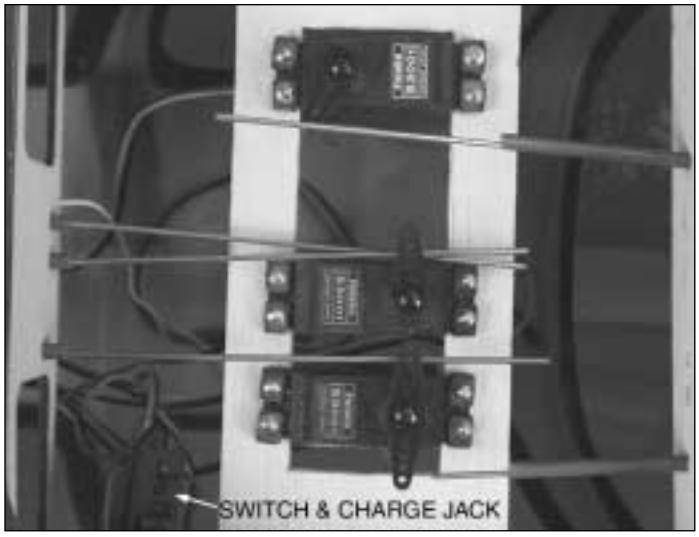
❑ 10. Insert the tray into the fuselage. The tray needs to rest on the hardwood rails inside of the fuselage. Getting the tray on top of the rails is a bit tricky. Insert the tray into the fuselage, sliding it forward into the front of the fuselage, almost up to the fuel tank. Raise the tray high enough to sit on top of the rails. Then, slide the tray towards the back of the fuselage, resting the tray on top of the hardwood rail. Position the tray in the fuselage as shown in the photograph. Through the holes previously drilled in the tray, drill a 1/16" [1.6mm] hole into the hardwood rails. Thread a #2 x 1/2" [13mm] screw into the holes in the rail, remove the screw and put a drop of thin CA into the hole to harden it. Once the glue has cured, install the tray to the rails using four #2 x 1/2" [13mm] sheet metal screws and four #2 washers. Re-install the front and rear formers into position, inserting the pushrod tubes into the holes in the formers.



❏ 11. Using the hardware included with your servos, mount the throttle, elevator and rudder servos onto the tray, positioning them as shown.

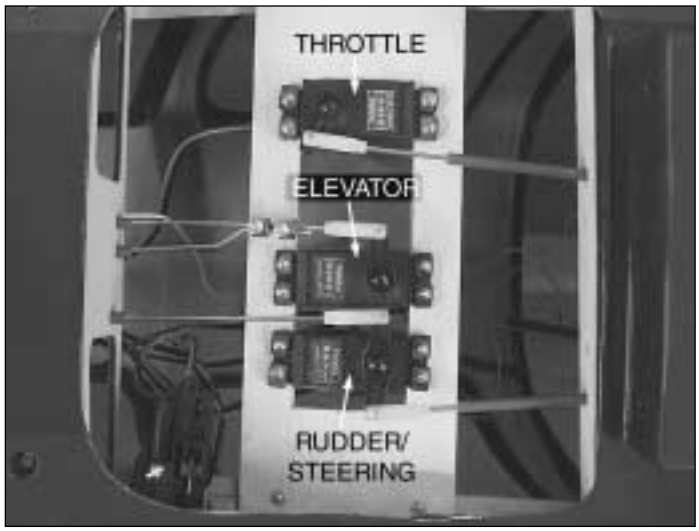


❏ 12. Wrap the battery and receiver in 1/4" [6mm] foam (not included). Install your battery and receiver onto the receiver/battery tray as shown (the battery should be at the aft end of the tray). Use two #64 rubber bands on both the battery and the receiver to hold them securely to the tray.



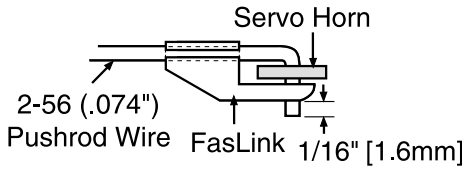
❏ 13. Install your radio switch and charge jack to the fuselage. We used the Great Planes Switch and Charging Jack Mounting Set (GPMM1000). We mounted it on the left side of the fuselage behind the servo tray.

❏ 14. Temporarily set the receiver/battery tray onto the fuselage. Plug the switch into the battery and receiver. Plug the servos into the receiver. Turn the transmitter and receiver on, centering the servos. Place the servo arms onto the servos as shown in the photograph at step 13. Once the servos are centered, you can unplug everything and set the receiver/battery tray to the side or you can leave things plugged in and do the following steps. If you leave things connected you may wish to use masking tape to hold the receiver/battery tray to the fuselage while you are working.



Refer to this photo when connecting the pushrods in the following steps.

❏ 15. Pull the throttle pushrod wire as far aft as it will go. Align the throttle pushrod wire with the hole in the end of the throttle servo arm. Using a marker, mark the location where the wire aligns with the outside hole in the servo arm. On that mark make a 90° bend. From the bend measure up 3/8" [9.5mm] then cut off the excess pushrod wire.

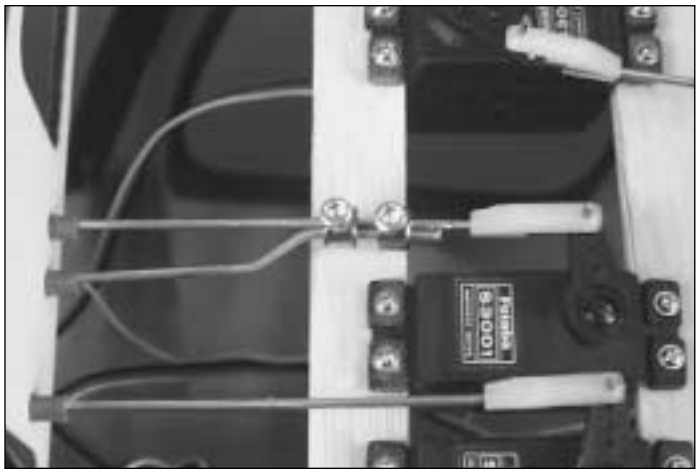


❏ 16. Install the wire into the hole in the servo arm using a nylon **FasLink** as shown in the sketch.

❏ 17. Center the rudder and the nose gear. Install the pushrod wires to a double servo arm using the same procedure you used on the throttle. Use the outside hole for the rudder and the second hole in from the end for the nose wheel.

❏ 18. Center the elevators, then align one of the elevator pushrods with the hole you are using in the elevator servo arm. Mark the wire where it meets the hole in the servo arm.

Slip two 5/32" [4mm] wheel collars onto the pushrod. Bend the pushrod 90 degrees up at the mark. From the bend measure up 3/8" [9.5mm]. Then, cut off the excess pushrod wire. Install the wire into the hole in the servo arm using a nylon FasLink.



❏ 19. Re-center the other elevator. Bend the pushrod as shown above to mate it with the first pushrod. Place the two wheel collars as shown; put a drop of Great Planes Pro Threadlocker™ in the wheel collar screw hole and tighten the wheel collar to the wires with a 6-32 x 1/4" [6-32 x 6mm] socket head cap screw in each wheel collar.

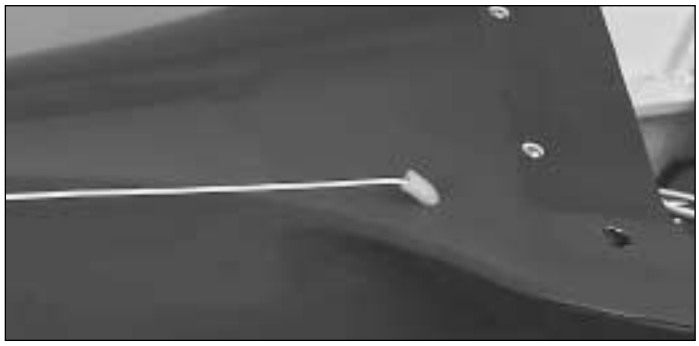
Install the Receiver & Battery

You should now have all of the servo installation complete. This leaves only the installation of the receiver/battery tray into the fuselage. With all of the room in the fuselage you are probably wondering why we don't have the battery and receiver mounted on a tray with the servos. The battery and receiver need to be mounted where we have them in order to achieve the proper balance without having to add weight to the tail. This airplane has very clean lines and there is no place we could have easily added tail weight without having to stick lead to the tail or the fuselage. Though it is a bit inconvenient, this installation utilizing a removable rear former allows you to balance the plane without added weight. Also, the removable front former allows access for servicing the fuel tank.

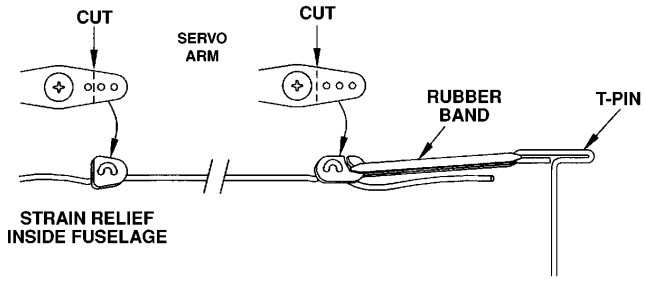
❏ 1. If the servos are not still connected to the receiver, reconnect them. Plug the battery into the switch. Slide a piece of heat shrink tubing over the connection or tape the connections together to prevent them from coming loose in flight. In addition to your servo connections, plug two 12" extensions into the proper channels on your receiver for the aileron and flaps. Mark the end of each extension for easy identification of the flap and aileron.

❏ 2. Install the receiver/battery tray using the two 4-40 x 5/8" [4-40 x 16mm] phillips pan head screws. In order to do this you will probably need to disconnect the pushrods and possibly remove the screws from the rear former. It really depends on how large your hands are. Again, we understand this is a bit inconvenient but once installed, you should not have to remove the tray very often.

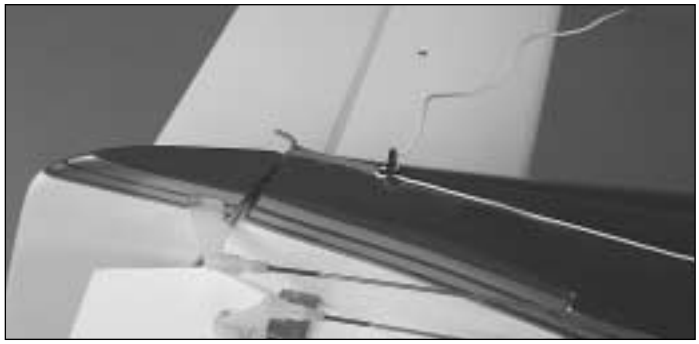
Receiver Antenna Routing



❏ 1. Here is a suggested method for installing the receiver antenna. Other methods may also be acceptable. Drill a 5/32" [4mm] hole in the bottom of the fuselage. Be sure that this hole does not interfere with the location of the receiver tray. Insert a 3/4" length of fuel tubing into the hole. This will protect the wire from being cut by the edge of the fiberglass.



❏ 2. With a leftover servo arm, make a strain relief for the antenna as shown. Install one arm onto the antenna wire, sliding it onto the wire to within a few inches of the receiver. Insert the antenna through the hole / fuel tubing in the fuselage. Guiding the wire to the aft of the fuselage, install the other arm onto the end of the wire as shown.

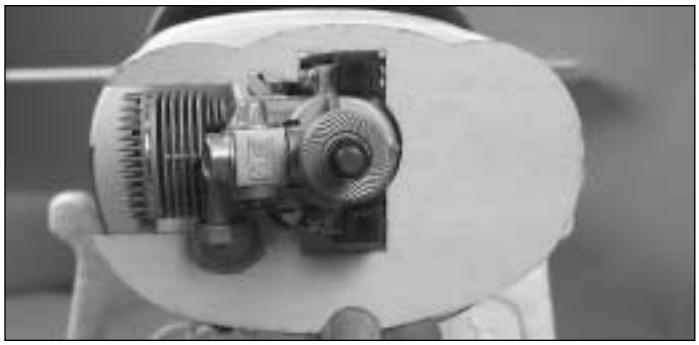


❏ 3. The rubber band needs to be placed over an attachment point at the end of the fuselage. We drilled a 5/64" [2mm] hole at the rear of the fuselage, tapped the hole with a 2-56 tap and made a hook from a small length of 2-56 threaded rod. You might also consider installing a T-pin in the bottom of the rudder or you can tape the rubber band to the bottom of the fuselage.

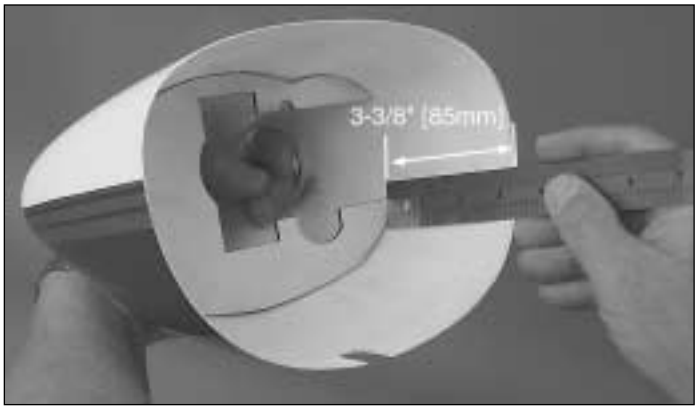
INSTALL THE COWL

❏ 1. Test fit the cowl onto the fuselage. You will see that a cut out needs to be made in the cowl to accommodate the nose gear. Mark the location for the clearance slot. Then, cut an opening in the cowl approximately 1/2" x 1" [13mm x 25mm].

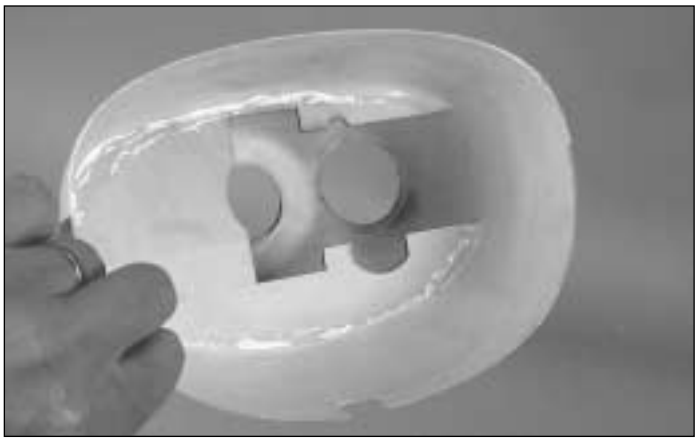
❏ 2. Locate the 1/8" [3mm] plywood **baffle**. This baffle has been made to fit the O.S. .61 two-stroke engine. As stated during the engine installation, this baffle is only required if you are using the in-cowl muffler system from Top Flite. Because of the tight engine and muffler installation it is important that proper air flow is achieved over the head of the engine. If you are using a different engine and adapting it to the Top Flite in cowl muffler, you may have to change the inside shape of the baffle. If you have chosen to use a standard muffler or are installing a four-stroke engine, you will have to make cut outs in the cowl to allow the head of the engine to clear the cowl or for muffler clearance. In this case there is no need for the baffle. If you are not using the in-cowl muffler system, skip ahead to step 6.



❏ 3. The photograph shows the position of the baffle over the engine when it is installed inside of the cowl. If you have any part of your engine or throttle linkage that conflicts with the baffle, make those adjustments now.



❏ 4. Place the baffle into the cowl. The baffle should be approximately 3-3/8" [85mm] from the trailing edge of the cowl. Roughen the inside of the cowl with 220-grit sandpaper where the baffle makes contact with the cowl. Clean the area with alcohol. Re-position the baffle. Use a couple of small drops of CA to temporarily hold it in place. Slide the cowl onto the fuselage. Looking through the openings in the front of the cowl, check to be sure that the baffle is placed properly over the engine. Turn the radio system on and operate the throttle to be sure that it is clearing the baffle properly. If there is any adjustment that needs to be made to the baffle, do it now.



❏ 5. Once you are satisfied with the placement of the baffle, mix 1/2 ounce of 6-minute epoxy and microballoons. Make a filet of glue where the baffle and the fuselage sides come together. Set the cowl aside, allowing the glue to cure.

❏ 6. Place the cowl in position on the fuselage, making sure the engine is centered in the opening in the front of the cowl.

❏ 7. Mix 1/2 ounce of 6-minute epoxy. Apply a thin layer over the front and rear of the baffle with an epoxy brush. This will fuelproof the baffle.

❏ 8. When you are satisfied with the placement of the cowl, drill two 1/16" [1.6mm] holes in each side of the cowl, drilling into the step area of the fuselage. Remove the cowl and drill through the holes in the cowl with a 3/32" [2.4mm] drill bit. Install one of the #2 x 3/8" [#2 x 9.5mm] sheet metal screws into the four holes in the fuselage. Then, remove the screws. Put a small drop of thin CA into the four holes. After the glue has cured, install the cowl with four #2 x 3/8" [#2 x 9.5mm] sheet metal screws and four #2 flat washers.

❏ 9. Cut holes in the cowl for the glow plug access, needle valve and the exhaust outlet. For an exhaust extension to get the exhaust out of the cowl, we used the top portion of a Hobbico exhaust extension (HCAZ2180). Simply cut it to a length just long enough to clear the cowl. Because the extension is flexible, you will still be able to slide the cowl off and on without interference from the extension.

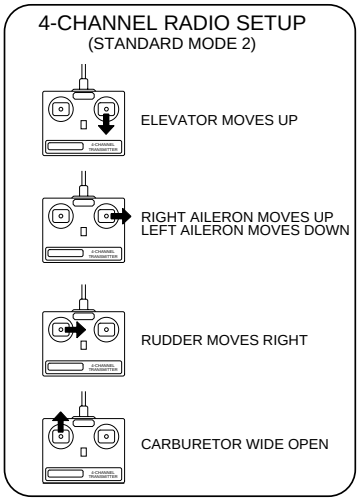
❏ 10. Install the appropriate propeller for your engine and the spinner. That's about it. Take some time to go through the next few steps and the model is ready to fly!

GET THE MODEL READY TO FLY

Check the Control Directions

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

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



❏ 3. Make certain that the control surfaces and the carburetor respond in the correct direction as shown in the diagram. If any of the controls respond in the wrong direction, use the servo reversing in the transmitter to reverse the servos connected to those controls. Be certain the control surfaces have remained centered. Be sure that the flaps move from neutral to the down position when activated by the switch on the radio. Adjust if necessary.

Set the Control Throws

Use a Great Planes Accu-Throw™ (or a ruler) to accurately measure and set the control throw of each control surface as indicated in the chart that follows. If your radio does not

have dual rates, we recommend setting the throws at the low rate setting.

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

These are the recommended control surface throws:

	High Rate	Low Rate
ELEVATOR:	1/2" [13mm] up	3/8" [10mm] up
	1/2" [13mm] down	3/8" [10mm] down
RUDDER:	1-3/8" [35mm] right	1" [25mm] right
	1-3/8" [35mm] left	1" [25mm] left
AILERONS:	5/8" [16mm] up	3/8" [10mm] up
	5/8" [16mm] down	3/8" [10mm] down
FLAPS:	1-1/2" [38mm] down	1" [25mm] down

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

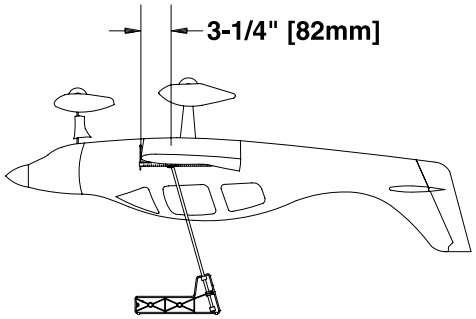
Balance the Model (C.G.)

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

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

❏ 1. Use a felt-tip pen or 1/8"-wide tape to accurately mark the C.G. on the top of the wing on both sides of the fuselage. The C.G. is located 3-1/4" [82mm] back from the leading edge of the wing as measured at the fuselage.

This is where your model should balance for the first flights. Later, you may wish to experiment by shifting the C.G. up to 3/8" [10mm] forward or 3/8" [10mm] back to change the flying characteristics. Moving the C.G. forward may improve the smoothness and stability, but the model may then require more speed for takeoff and make it more difficult to slow for landing. Moving the C.G. aft makes the model more maneuverable, but could also cause it to become too difficult to control. In any case, **start at the recommended balance point** and do not at any time balance the model outside the specified range.



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

❏ 3. If the tail drops, the model is "tail heavy" and weight must be added to the nose to balance. If the nose drops, the model is "nose heavy" and weight must be added to the tail to balance. At the location the receiver/battery tray are mounted our model balanced perfectly. However, due to the manufacturing process involved with laying up fiberglass, it is not unusual to have some differences in the thickness of the fiberglass, which can account for some differences in weight required at the nose or tail. If additional weight is required, nose weight may be easily added by using a "spinner weight" (GPMQ4645 for the 1 oz. weight, or GPMQ4646 for the 2 oz. weight). If spinner weight is not practical or is not enough, use Great Planes (GPMQ4485) "stick-on" lead. A good place to add stick-on nose weight is to the firewall (don't attach weight to the cowl–it is not intended to support weight). Begin by placing incrementally increasing amounts of weight on the bottom of the fuse over the firewall until the model balances. Once you have determined the amount of weight required, it can be permanently attached. If required, tail weight may be added by reaching into the fuse and gluing it permanently inside.

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

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

Balance the Model Laterally

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

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

PREFLIGHT

Identify Your Model

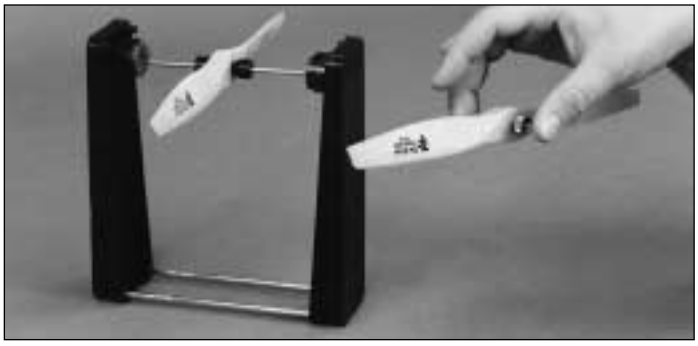
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on page 36 and place it on or inside your model.

Charge the Batteries

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

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

Balance the Propellers



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

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

Ground Check

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

Range Check

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

ENGINE SAFETY PRECAUTIONS

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

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

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

Use safety glasses when starting or running engines.

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

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

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

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

Make all engine adjustments from behind the rotating propeller.

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

To stop a glow engine, cut off the fuel supply by closing off the fuel line or following the engine manufacturer’s recommendations. Do not use hands, fingers or any other body part to try to stop the engine. Do not throw anything into the propeller of a running engine.

AMA SAFETY CODE (excerpt)

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

GENERAL

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

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

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

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

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

RADIO CONTROL

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

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

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

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

IMAA SAFETY CODE (excerpt)

Since the Lancair qualifies as a “giant-scale” model and is therefore eligible to fly in IMAA events, we’ve printed excerpts from the IMAA Safety Code which follows:

Definition:

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

Section 1.0: SAFETY STANDARD

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

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

Section 3.0: SAFETY CHECK

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

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

Section 5.0: EMERGENCY ENGINE SHUT OFF (kill switch)

5.1 All magneto spark ignition engines must have a coil grounding switch on the aircraft to stop the engine. This will also prevent accidental starting of the engine. This switch shall be readily available to both pilot and helper. This switch is to be operated manually and without the use of the radio system.

5.2 Engines with battery power ignition systems must have a switch to turn off the power from the battery pack to disable the engine from firing. This will also prevent accidental starting of the engine. This switch shall be readily available to both pilot and helper. This switch shall be operated manually and without the use of the Radio System.

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

Section 6.0: RADIO REQUIREMENTS

6.1 All transmitters must be FCC type certified.

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

Additional IMAA General Recommendations

The following recommendations are included in the Safety Code not to police such items, but rather to offer basic suggestions for enhanced safety.

Servos need to be of a rating capable to handle the loads that the control surfaces impose upon the servos. Standard servos are not recommended for control surfaces. Servos should be rated heavy-duty. For flight-critical control functions a minimum of 45 inch/ounces of torque should be considered. This should be considered a minimum for smaller aircraft and higher torque servos are strongly encouraged for larger aircraft. The use of one servo for each aileron and one for each elevator half is strongly recommended. Use of dual servos is also recommended for larger aircraft.

On-board batteries shall be 1000 mAh up to 20 lbs., 1200 mAh to 30 lbs., 1800 mAh to 40 lbs. and 2000 mAh over 40 lbs. flying weight. The number and size of servos, size and loads on control surfaces, and added features should be considered as an increase to these minimums. Batteries should be able to sustain power to the on-board radio components for a minimum of one hour total flying time before recharging.

Redundant and fail-safe battery systems are recommended.

The use of anti-glitch devices for long leads are recommended.

There is no maximum engine displacement limit, as it is the position of this body that an underpowered aircraft presents a greater danger than an overpowered aircraft. However, the selection of engine size relative to airframe strength and power loading mandates good discretionary judgment by the designer and builder. Current AMA maximums for engine displacement are 6.0 cu in for two-stroke and 9.6 cu in for four-stroke engines. These maximums apply only to AMA Sanctions concerning competition events (such as 511, 512, 515 and 520) and, as such, the maximums apply. All IMAA (non competition) events should be sanctioned as Class “C” events, in which these engine size maximums do not apply.

Generally, it is recommended that no attempt should be made to fly a radio controlled model aircraft with a gasoline engine in which the model aircraft weight would exceed twelve (12) pounds (underpowered) per cubic inch of engine displacement, or be less than five (5) pounds (overpowered) per cubic inch of engine displacement. **Example:** Using a 3 cu in engine, a model would likely be underpowered at an aircraft weight greater than 36 pounds. With the same engine, an aircraft weighing less than 15 pounds would likely be overpowered.

Servo arms and wheels should be rated heavy duty. Glass-filled servo arms and control horns are highly recommended.

Control surfaces linkages are listed in order of preference:

1. Cable system (pull-pull). A tiller bar is highly recommended along with necessary bracing.

2. Arrow Shaft, fiberglass or aluminum, 1/4" or 5/16" O.D. bracing every six (6) to ten (10) inches is highly recommended.

3. Tube-in-tube (nyrod). Bracing every few inches is highly recommended. Inner tube should be totally enclosed in outer tube.

4. Hardwood dowel, 3/8" O.D. bracing every six (6) to ten (10) inches is highly recommended.

Hinges should be rated heavy duty and manufactured for giant-scale use primarily. Homemade and original design

hinges are acceptable if determined to be adequate for the intended use.

Clevis (steel, excluding heavy-duty ball links) and attachment hardware should be heavy duty 4-40 threaded rod type. 2-56 threaded size rod is acceptable for some applications (e.g. throttle). Clevis is to have lock nuts and sleeve or spring keepers.

Propeller tips should be painted or colored in a visible and contrasting manner so as to increase the visibility of the propeller tip arc.

CHECK LIST

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

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

FLYING

The Lancair is a great-flying model that flies smoothly and predictably. The Lancair does not, however, possess the self-recovery characteristics of a primary R/C trainer and should be flown only by experienced R/C pilots.

Fuel Mixture Adjustments

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

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

Takeoff

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

Remember to takeoff into the wind. When you're ready, point the model straight down the runway. Gradually advance the throttle. Gain as much speed as your runway and flying site will practically allow before gently applying up elevator, lifting the model into the air. Be smooth on the elevator stick, allowing the model to establish a **gentle** climb to a safe altitude before turning into the traffic pattern.

Flight

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

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

Landing

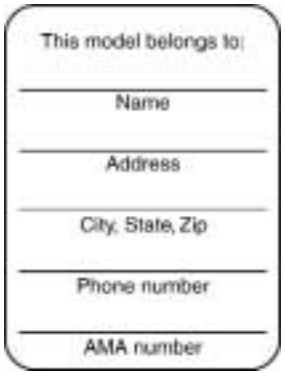
The Lancair is capable of being landed with and without flaps. Landing the Lancair without extending the flaps will be faster than if you use the flaps. To initiate a landing approach without using the flaps, lower the throttle while on the downwind leg. Allow the nose of the model to pitch downward to gradually bleed off altitude. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. Make your final turn toward the runway (into the wind) keeping the nose down to maintain airspeed and control. Level the airplane when the model reaches the runway threshold, modulating the throttle as necessary to maintain your glide path and airspeed. When you're ready to make your landing flare and the model is a foot or so off the deck, smoothly increase up elevator until it gently touches down. Using the flaps for your landing will slow the plane nicely. If you have not used flaps it is a good idea to practice flying the plane at slow speeds with the flaps down. Flaps should only be used when you reduce power to 1/3rd throttle or less. With the flaps extended in slow flight you will find that the plane flies well but in a slightly nose high attitude. ***Note:*** *If you have too much airspeed when you extend the flaps the plane will pitch up slightly. This "pitch up" will tend to go away as the plane continues to slow. Until the airspeed dissipates, you may need to apply a slight amount of down elevator. With a computer radio you could mix a small amount of down elevator to the flaps.* To initiate a flaps-down landing, extend the flaps on the base leg of your landing approach, gradually bleeding off some airspeed. Continue to fly a standard landing approach. The only real difference you will notice is that you have to fly the plane to the runway with power on until you are about a foot off of the ground. Do not hesitate to keep additional power on when you are landing with flaps. The flaps do add additional drag that must be overcome by the use of a higher throttle setting.

One final note about flying your model. Have a goal or flight plan in mind for **every** flight. This can be learning a new maneuver(s), improving a maneuver(s) you already know, or learning how the model behaves in certain conditions (such as on high or low rates). This is not necessarily to improve your skills *(though it is never a bad idea!)*, but more importantly so you do not surprise yourself by impulsively attempting a maneuver and suddenly finding that you've run out of time, altitude or airspeed. Every maneuver should be deliberate, not impulsive. For example, if you're going to do a loop, check your altitude, mind the wind direction (anticipating rudder corrections that will be required to maintain heading), remember to throttle back at the top, and make certain you are on the desired rates (high/low rates). A flight plan greatly reduces the chances of crashing your model just because of poor planning and impulsive moves. **Remember to think.**

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

GOOD LUCK AND GREAT FLYING!

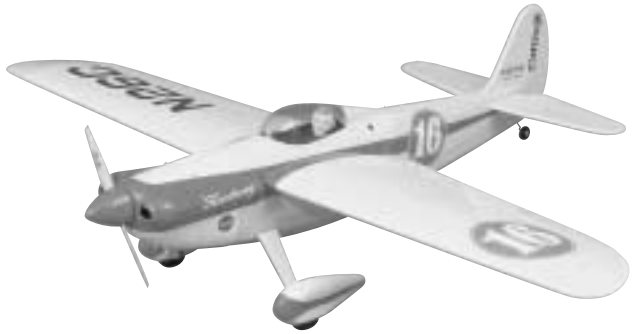
Make a copy of the identification tag shown below and place it on or inside the model.



OTHER ITEMS AVAILABLE FROM GREAT PLANES

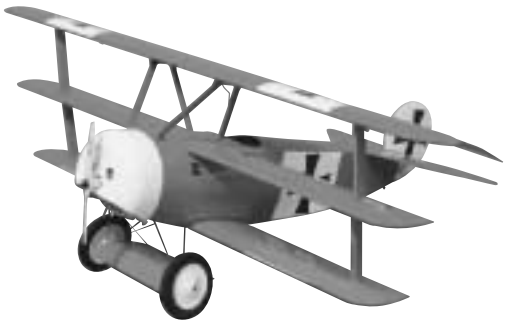
Great Planes Cessna® 182 Skylane™ ARF
If you're beyond an ARF trainer – and want to build basic aerobatic skills instead of a kit – make this 65.5" span model your next plane! The strong, lightweight structures are prebuilt and precovered in MonoKote. Fiberglass details speed assembly even more. Dual aileron servos simplify linkages and strengthen response. Airfoil-shaped struts and supplied fairings enhance the profile. And it can all be flight-ready in just 15-20 hours! Requires a 2-stroke .40-.51 or 4-stroke .52-.80 engine and 4 or 5-channel radio w/5 servos. **GPMA1228**

Great Planes Extra 300S .40 ARF
It's the aerobat that's engineered for ease, and precovered in Top Flite MonoKote film, the choice of fliers worldwide! Rounded aluminum gear add scale looks, along with prepainted ABS wheel pants and a 1-piece cowl that conceals most engines. In the air, dual aileron servos and independently adjustable elevator yokes increase control precision and authority. **Note:** Pilot figure not included. **GPMA1240**



Great Planes 1/4-Scale Shoestring ARF
It's a great first scale model – it's an aerobatic blast to fly – the 61.5" span Shoestring is both, with kit quality and easy ARF assembly as added bonuses. All-wood parts makes it light and lively; dual aileron servos and a symmetrical wing supply the speed and might for exciting stunts and new moves. Factory-applied MonoKote and factory-painted fiberglass parts add vibrant color and durability. Requires a 2-stroke .61 or 4-stroke .91 engine and 4-channel radio w/5 servos. Pilot figure not included. **GPMA1325**

Great Planes Ryan STA 1.20 ARF
Golden Era Ryan aircraft were renown for high quality and exceptional performance – the same characteristics you'll find in this 82" span ARF, from the superior woods used in construction to the ducting and blister marks on the strong fiberglass cowl. Dual aileron servos boost control surface precision and authority. Enjoy it after as little as 12-15 hours of final assembly! Requires a 2-stroke .61-.91 or 4-stroke .91-1.20 engine and 4 or 5-channel radio w/6 servos. Pilot figure not included. **GPMA1345**



Great Planes Fokker Dr.1 ARF
Show up at the field with this 60" span Fokker Dr.1 ARF and everyone will want a look – and a chance to take it up! Flight

is suitable for anyone who's mastered low wings. Lift from three flat bottom airfoils increases stability and allows realistic, slow landing speeds. Two aileron servos – one in each top wing half – provide strong, fast response. Assembly takes as little as 15 hours! The lightweight, all-wood airframe comes covered in a historically accurate MonoKote trim scheme, with engine-concealing fiberglass cowl painted to match. Requires a 2-stroke .46-.75 or 4-stroke .52-.80 engine and 4 or 5-channel radio w/5 standard servos. **GPMA1380**

Great Planes Master Caddy Prebuilt Field Box
Built to last, the sturdy ply, 90% assembled Master Caddy Prebuilt has a place for all of your important field accessories and tools. Within its 25" x 15.75" x 8.25" dimensions are three open top compartments, two roomy drawers with dividers and a shelf for a gallon can or jug of fuel. Cushioned cradles adjust to hold your model safely during maintenance or repair. In the detachable APS (Auxiliary Power Station), carry your standard power panel, 12V battery, starter, glow plug clip and tools – whatever you need for the flight line. **GPMP1001**

Great Planes C.G. Precision Aircraft Balancer™
Accurate balancing makes trainers more stable, low-wings more agile, and pylon planes move at maximum speed. The innovative C.G. Machine helps you achieve optimum balance easily, without measuring or marking–and without the errors that fingertip balancing can cause. You'll quickly pinpoint your plane's exact center of gravity. Then you'll know at a glance whether weight should be added, removed or relocated. The C.G. Machine works with kits and ARF models of any size and wingspan. Its slanted wire balancing posts support models weighing up to 40 pounds. **GPMR2400**

Great Planes Accu-Throw™
Control Surface Deflection Meter
One leading cause of crashes is flying an airplane with its control throws set differently from those recommended in the instructions. The Great Planes Accu-Throw lets you quickly and easily measure actual throws first, so you can make necessary corrections before you fly. Large, no-slip rubber feet provide a firm grip on covered surfaces without denting or marring the finish. Spring tension holds Accu-Throw's plastic ruler steady by each control surface. Curved to match control motions, the ruler provides exact readings in both standard or metric measurements. **GPMR2405.**

Great Planes Pro™ Adhesives
"Best if used by" dates on the label provide visible proof of freshness on all Pro CAs. Available in formulas that range from thin, quick-bonding CA to Gel – a formula so thick that it won't run even on nearly vertical surfaces. Pro Epoxies are available in money-saving 4-ounce sizes. Also available: CA debonder; CA activator; Glue-B-Gone™ adhesive remover; Pro Wood Glues; Pro Threadlocker; and Milled Fiberglass Reinforcer. **GPMR6001 thru GPMR6049**

BUILDING NOTES	
Kit Purchased Date: _____	Date Construction Finished: _____
Where Purchased:_____	Finished Weight: _____
Date Construction Started: _____	Date of First Flight: _____

FLIGHT LOG	

ENGINE MOUNT TEMPLATE