

Top Flite Models Champaign, IL

Ph: (217) 398-8970, Ext. 5

Fax: (217) 398-7721

airsupport@top-flite.com

P-40 WARHAWK

WARRANTY

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

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

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

To make a warranty claim send the defective part or item to Hobby Services at this address:

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

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

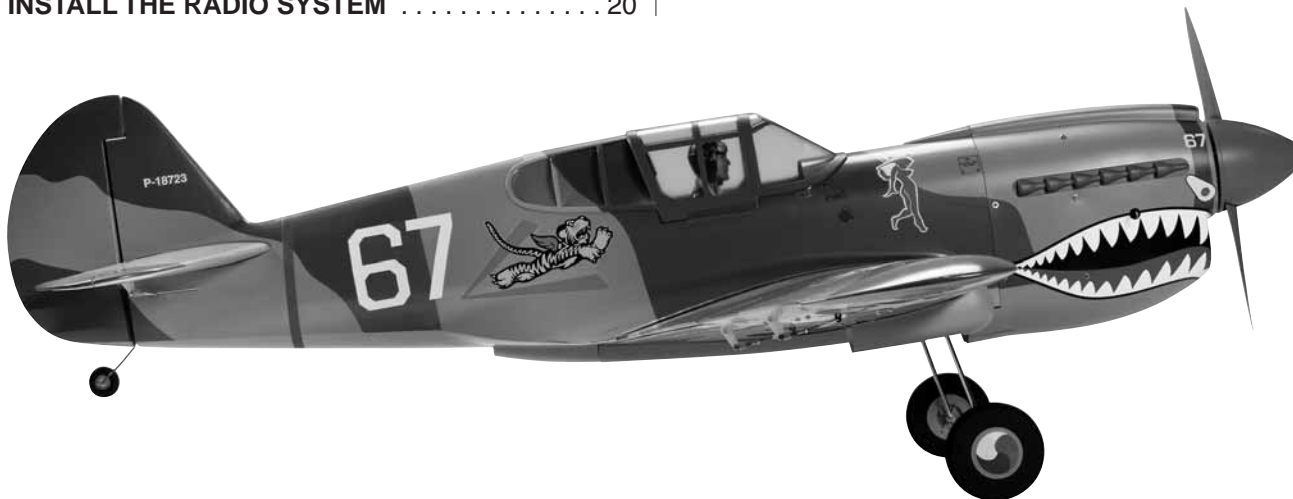
SPECIFICATIONS

Wingspan:	64.5 in [1640mm]
Wing Area:	722 sq in [46.6 dm ²]
Weight:	9.75– 10 lb [4420– 4530 g]
Wing Loading:	31–32 oz/sq ft [95–98 g/dm ²]
Length:	55 in [1395mm]
Radio:	5-6 channel with 7-8 servos
Engine:	.60–.91 cu in [10–15cc] two-stroke, .90–1.20 cu in [15–20cc] four-stroke

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

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INTRODUCTION

TopFlite is well known for the quality and scale detail provided with our kits. Now you can have that same quality and detail in an ARF that can be completed in as little as 15-20 hours! Beautifully covered in TopFlite MonoKote® with expertly painted fiberglass parts, the P-40 Warhawk will surely be the focus of attention at the flying field. In addition, the P-40 includes economical fixed landing gear, but is designed so that the optional pneumatic retract set made specifically for TopFlite warbirds is a drop in installation.

For the latest technical updates or manual corrections to the P-40 Warhawk ARF visit the Top Flite web site at www.top-flite.com. Open the "Airplanes" link, then select the P-40 Warhawk 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.

AMA

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

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302-9252



Ph. (800) 435-9262
Fax (765) 741-0057

Or via the Internet at:
<http://www.modelaircraft.org>

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

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

1. Your P-40 Warhawk ARF 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 P-40, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage to property.

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

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

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

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

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

7. If you are not an experienced pilot or have not flown this type of model before, we recommend that you get the assistance of an experienced pilot in your

R/C club for your first flights. If you're not a member of a club, your local hobby shop has information about clubs in your area whose membership includes experienced pilots.

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

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

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

Before starting to build, compare the parts in this model with the Parts List and note any missing parts. Also inspect all parts to make sure they are of acceptable quality. If any parts are missing, broken or defective, or if you have any questions about building or flying this airplane, please contact Top Flite at the address or telephone number below. If requesting replacement parts, please provide the full model name (P-40 Warhawk ARF) and the part numbers as listed in the Parts List.

Top Flite Product Support

3002 N Apollo Drive, Suite 1
Champaign, IL 61822

Ph: (217) 398-8970

Fax: (217) 398-7721

E-mail: productsupport@top-flite.com

DECISIONS YOU MUST MAKE

This is a partial list of items required to finish the P-40 Warhawk ARF that may require planning or decision making before starting to build. Order numbers are provided in parentheses.

BUILDING STAND



A building stand or cradle comes in very handy during the build. We use the Robart Super Stand II (ROBP1402) for most of our projects in R&D, and it can be seen in pictures throughout this manual.

RADIO EQUIPMENT

A minimum 5-channel radio system with a standard receiver and seven standard size servos with a minimum torque of 50 oz-in [3.6 kg-cm] are required for the control surfaces of the P-40 Warhawk ARF. If installing optional pneumatic retracts, a standard torque servo such as a Futaba S3003 will also be required. One standard torque servo is required for the throttle. A receiver battery pack with a minimum capacity of 1000mAh is recommended. Order numbers are provided below:

- Futaba® S9001 Servo Aircraft Coreless BB (FUTM0075)
- Futaba S3003 Servo Standard (FUTM0031)

- Futaba NR4RB Receiver NiCd 4.8V 1000mAh J (FUTM1380)

OR

- Hobbico® HydriMax™ 4-Cell 4.8V 2000mAh NiMH Flat AA Rx U (HCAM6321)

If you have a radio system with enough available channels to mix the flap and aileron servos together, then you will need two 16" [406mm] servo extensions to connect the aileron servos directly to the receiver and you will need two 12" [305mm] servo extensions to connect the flap servos directly to the receiver:

- Futaba Servo Extension 16" J (FUTM3955)
- Hobbico Extension 12" Futaba J (HCAM2100)

If you plan to connect the aileron and flap servos together using Y-harnesses then you will need two 12" [305mm] servo extensions for the ailerons and two 6" [152mm] servo extensions for the flap servos. You will also need two Y-harnesses:

- Hobbico Extension 12" Futaba J (HCAM2100)
- Hobbico Extension 6" Futaba J (HCAM2000)
- Futaba 6" Dual Servo Extension J (FUTM4130)

ENGINE RECOMMENDATIONS

A .60-.91 cu in [10-15cc] two-stroke or .90-1.20 [15-20cc] four-stroke engine is required. An O.S. FS-91 Surpass™ II four-stroke engine installation is shown in this manual.

- O.S.® FS-91 II Surpass (OSMG0896)

An optional 90° header for the O.S. FS-91 engine is shown in the engine installation section:

- O.S. Exhaust Manifold Inside FS-70/FS-91 (OSMG2624)

LANDING GEAR OPTIONS

The P-40 Warhawk ARF includes fixed wire landing gear. Optional pneumatic retracts can also be

installed. The part number for the pneumatic retract set is provided below:

- 90° Retract Landing Gear Set (TOPQ7955)

Optional Robart parts:

- 615 100 Degree Rotating Mains (2) (ROBQ1815)
- 188VR Standard Air Control Kit (ROBQ2302)
- 190 Air Line Quick Disconnects (ROBQ2395)
- Great Planes Wire Axle 2x3/16" (2) (GPMQ4282)
- Optional: 650 Straight RoboStrut (ROBQ1700)

SCALE COMPETITION

Though the Top Flite P-40 Warhawk ARF 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 Top Flite models in scale competition!). To receive the five points for scale documentation, the only proof required that a full size aircraft of this type in your paint/markings scheme did exist is a single sheet such as a kit box cover from a plastic model, a photo, or a profile painting, etc. If the photo is in black and white other written documentation of color must be provided. Contact the AMA for a rule book with full details.

If you would like photos of the full-size P-40 Warhawk 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

Ph: (714) 979-8058
Fax: (714) 979-7279

Or via the Internet at:
www.bobsairdoc.com

ADDITIONAL ITEMS REQUIRED HARDWARE AND ACCESSORIES

In addition to the items listed in the "Decisions You Must Make" section, following is the list of hardware and accessories required to finish the P-40 Warhawk ARF. Order numbers are provided in parentheses.

- R/C foam rubber (1/4" [6mm] - HCAQ1000, or 1/2" [13mm] - HCAQ1050)
- 3' [900mm] standard silicone fuel tubing (GPMQ4131)
- Great Planes Velcro® Hook & Loop (GPMQ4480)

ADHESIVES AND BUILDING SUPPLIES

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

- 1/2 oz. [15g] Thin Pro CA (GPMR6001)
- Pro 30-minute epoxy (GPMR6047)
- Drill bits: 1/16" [1.6mm], 5/64" [2mm], 3/32" [2.4mm]
- 8-32 tap and drill set (GPMR8103)
- Great Planes Pro Threadlocker (GPMR6060)
- #1 Light Duty Aluminum Handle Knife w/Blade (RMXR6901)
- #11 Light Duty Blades (5) (RMXR6930)
- Medium T-pins (100, HCAR5150)
- Masking tape
- Denatured alcohol (for epoxy clean up)
- Panel Line Pen (TOPQ2510)
- J&Z R/C-56 Glue 4 oz (JOZR5007)
- 220-grit sandpaper
- Petroleum jelly or oil

OPTIONAL SUPPLIES AND TOOLS

Here is a list of optional tools mentioned in the manual that will help you build the P-40 Warhawk ARF.

- 21st Century® sealing iron (COVR2700)
- 21st Century iron cover (COVR2702)
- 21st Century trim seal iron (COVR2750)
- 1/2 oz. [15g] Medium Pro CA+ (GPMR6007)
- 1/2 oz. [15g] Thick Pro CA- (GPMR6013)
- Pro 6-minute epoxy (GPMR6045)
- Stick-on segmented lead weights (GPMQ4485)

- 2 oz. [57g] spray CA activator (GPMR6035)
- 4 oz. [113g] aerosol CA activator (GPMR6034)
- CA applicator tips (HCAR3780)
- CA debonder (GPMR6039)
- Epoxy brushes 6, (GPMR8060)
- Mixing sticks (GPMR8055)
- Mixing cups (GPMR8056)
- Pliers with wire cutter (HCAR0630)
- Compressed Air 10 oz (TAEC1060)
- Microballoons (TOPR1090)
- Switch & Charge Jack Mounting Set (GPM1000)
- Ernst Charge Receptacle Futaba J (ERNM3001)
- Rotary tool such as Dremel®
- Rotary tool reinforced cut-off wheel (GPMR8020)
- Servo horn drill (HCAR0698)
- Hobby Heat™ micro torch (HCAR0750)
- Dead Center™ Engine Mount Hole Locator (GPMR8130)
- AccuThrow™ Deflection Gauge (GPMR2405)
- CG Machine™ (GPMR2400)
- Great Planes Heat Shrink Tubing 3/8x3" (3) (GPM1060)
- Ernst Security Clips Universal (2) (ERNM3035)
- Precision Magnetic Prop Balancer (TOPQ5700)
- Hobbico Flexible 18" Ruler Stainless Steel (HCAR0460)
- Hobbico Pin Vise 1/16 Collet w/6 Bits (HCAR0696)
- Hobbico 8-Piece Ball Tip Hex L Wrench SAE (HCAR0520)
- Hobbico 7-Piece Ball Tip Hex L Wrench Metric (HCAR0521)
- Great Planes Precision Prop Reamer Standard (GPMQ5006)
- Great Planes Precision Prop Reamer Metric (GPMQ5007)
- Great Planes Clevis Installation Tool (GPMR8030)

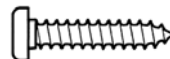
- X-Acto® Extra Hands Double Clip (XACR4214)
- Woodland Scenics Low Temp Foam Glue Gun (WOOU1445)

IMPORTANT BUILDING NOTES

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

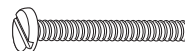
Sheet Metal Screws are designated by a number and a length. For example #6 x 3/4" [19mm].

This is a number six screw that is 3/4" [19mm] long.



Machine Screws are designated by a number, **threads per inch**, and a length. For example 4-40 x 3/4" [19mm].

This is a number four screw that is 3/4" [19mm] 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.

KIT INSPECTION

Before starting to build, 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 **Product Support**. When reporting defective or missing parts, use the part names exactly as they are written in the Kit Contents list.

Top Flite Product Support

3002 N Apollo Drive, Suite 1
Champaign, IL 61822

Ph: (217) 398-8970, ext. 5

Fax: (217) 398-7721

E-mail: airsupport@top-flite.com

ORDERING REPLACEMENT PARTS

Replacement parts for the Top Flite P-40 Warhawk ARF are available using the order numbers in the **Replacement Parts List** that follows. The fastest, most economical service can be provided by your hobby dealer or mail-order company. Not all parts are available separately. 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.

To locate a hobby dealer, visit www.top-flite.com and click on "Where to Buy". Follow the instructions provided on the page to locate a U.S., Canadian or International dealer.

Parts may also be ordered directly from Hobby Services by calling (217) 398-0007, or via facsimile at (217) 398-7721, but full retail prices and shipping and handling charges will apply. Illinois and Nevada residents will also be charged sales tax. If ordering via fax, include a Visa® or MasterCard® number and expiration date for payment.

Mail parts orders	Hobby Services
and payments by	3002 N Apollo Drive, Suite 1
personal check to:	Champaign IL 61822

Be certain to specify the order number exactly as listed in the **Replacement Parts List**. Payment by credit card or personal check only; no C.O.D.

If additional assistance is required for any reason contact Product Support by e-mail at productsupport@top-flite.com, or by telephone at (217) 398-8970.

REPLACEMENT PARTS LIST

Order Number	Description
TOPA1770	Fuselage
TOPA1771	Wing
TOPA1772	Tail Set
TOPA1773	Cowl
TOPA1774	Cockpit Kit
TOPA1775	Decals
TOPA1776	Canopy
TOPA1777	Spinner
TOPA1778	Dummy Exhaust Set
TOPA1779	Landing Gear Wires
TOPA1780	Retract Covers
TOPQ7955	90 Degree Retract Landing Gear

COMMON ABBREVIATIONS

Stab = Horizontal Stabilizer

Fin = Vertical Stabilizer

LE = Leading Edge

TE = Trailing Edge

" = Inches

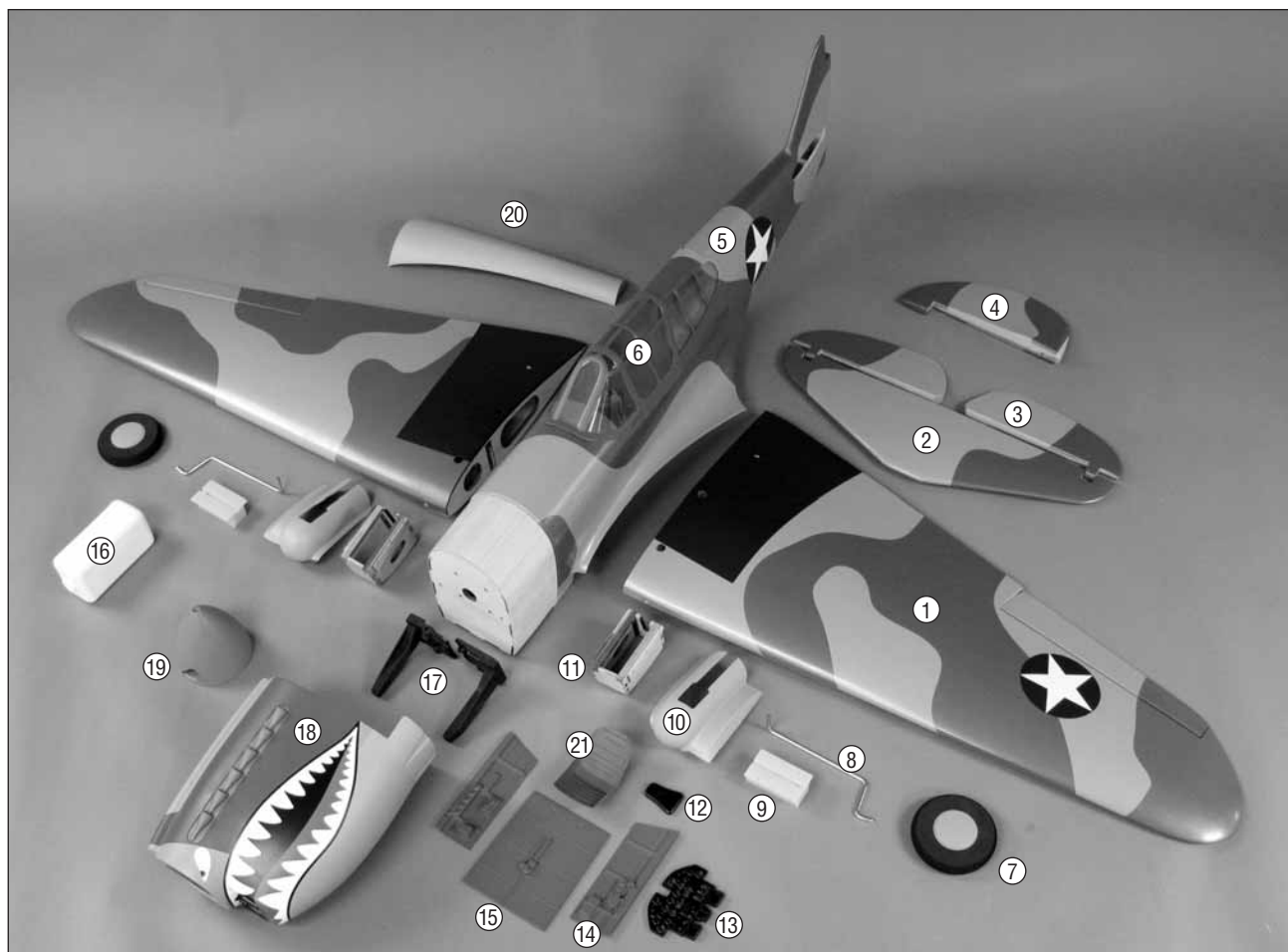
mm = Millimeters

SHCS = Socket Head Cap Screw

mAh = Milliamp Hours (refers to the usable capacity of a battery)

To convert inches to millimeters, multiply inches by 25.4 (25.4mm = 1")

KIT CONTENTS



- | | |
|----------------------------------------|-----------------------------|
| 1. L/R Wing Panels w/ Ailerons & Flaps | 12. Headrest |
| 2. Horizontal Stabilizer | 13. Instrument Panel |
| 3. L/R Elevator Halves | 14. L/R Cockpit Side Panels |
| 4. Rudder | 15. Cockpit Floor |
| 5. Fuselage | 16. Fuel Tank |
| 6. Canopy | 17. Engine Mount |
| 7. Main Wheels | 18. Cowl |
| 8. L/R Fixed Landing Gear | 19. Spinner |
| 9. Fixed Landing Gear Blocks | 20. Belly Pan |
| 10. L/R Retract Covers | 21. Pilot Seat |
| 11. L/R Landing Gear Mounting Boxes | |

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 Inspection" section on page 5.

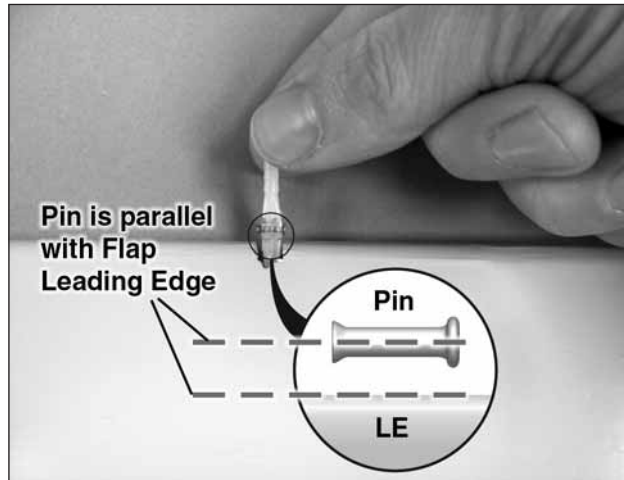


- ❑ 2. Carefully remove the tape and separate all the control surfaces. Use a covering iron with a covering sock on medium/high heat to tighten the covering if necessary. Apply pressure over sheeted areas to **thoroughly** bond the covering to the wood.

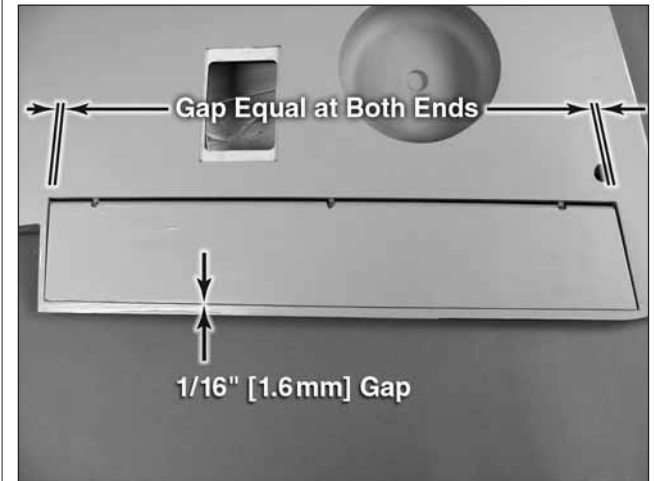
ASSEMBLE THE WING

HINGE THE AILERONS & FLAPS

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



- ❑ ❑ 1. Test fit the included hinge points into the pre-drilled pockets in the **flap**. Press the hinge points into the pockets with the pins in the hinge points aligned parallel with the hinge line on the flap. Push the hinge points as far deep as they can fit into the pockets in the flap. Work the hinge up and down in the pocket. Be sure that the hinges move freely inside the pocket. If there is any interference, use a hobby knife to slightly enlarge the pocket as necessary.

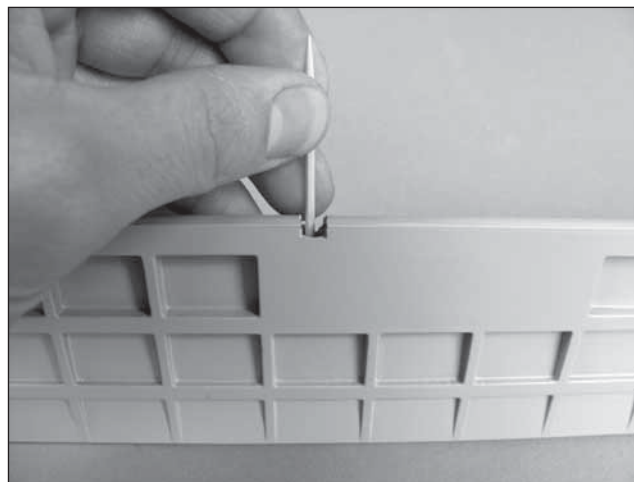


- ❑ ❑ 2. Fit the flap to the wing panel by inserting the other ends of the hinge points into the pockets in the wing trailing edge. Position the flap so that there is a 1/16" [1.6mm] gap between the flap trailing edge and the edge of the recessed area in the wing as shown. Work the flap up and down to ensure smooth movement.

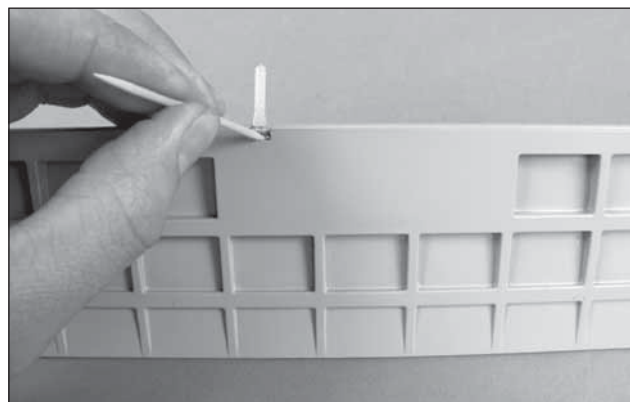
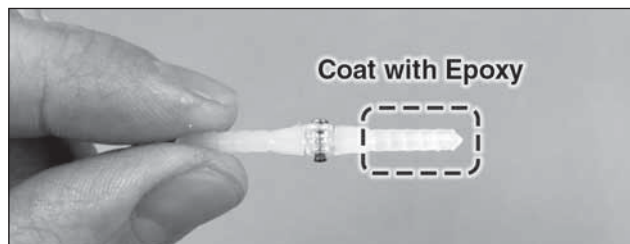


❑❑ 3. Remove the flap from the wing panel and pull the hinge points from the pockets. Coat the center of each hinge point with petroleum jelly or oil. This will prevent epoxy from sticking to the pivoting portion of the hinges.

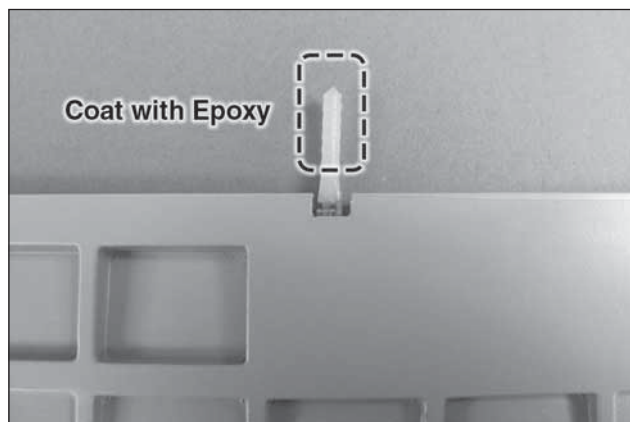
Before performing steps 4 and 5, have denatured alcohol and some paper towel pieces ready for epoxy cleanup.



❑❑ 4. Mix up a batch of 30-minute epoxy. Use a toothpick or something similar to coat the insides of the hinge point pockets in the flap and the wing panel. Wipe away any excess epoxy from around the pockets using a paper towel dampened with alcohol.

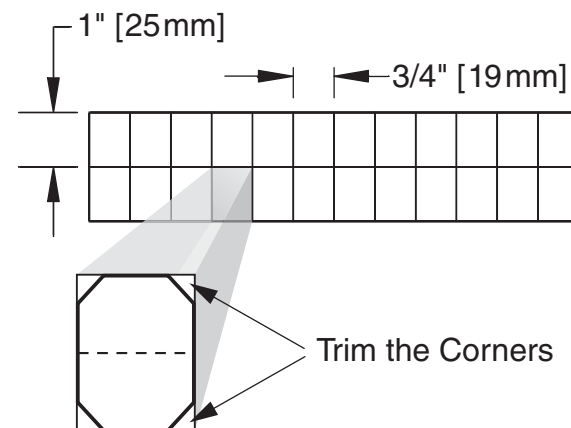


❑❑ 5. Coat one end of each hinge point with epoxy. Insert the hinges into the pockets in the flap. Use a clean toothpick to scrape out any excess epoxy that may have squeezed out the pocket.

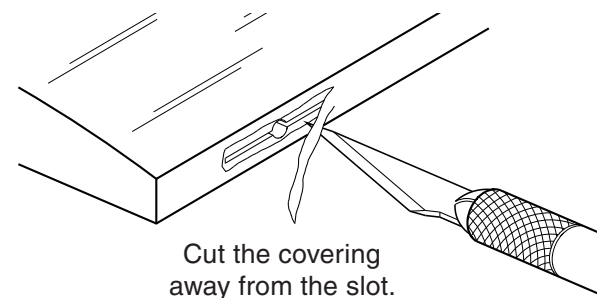
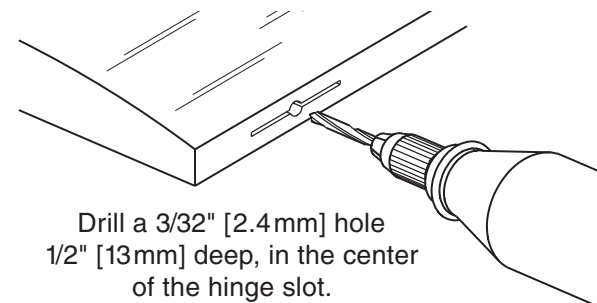


❑❑ 6. Coat the other end of each hinge point with epoxy. Slowly join the flap to the wing while wiping away any excess epoxy that squeezes out of the pockets. When the hinge points are all the way inserted into the wing, deflect the flap downward and check the leading

edge for excess epoxy. Position the flap in the recess as was done in step #2. When satisfied, set the wing aside and allow the epoxy to cure undisturbed.

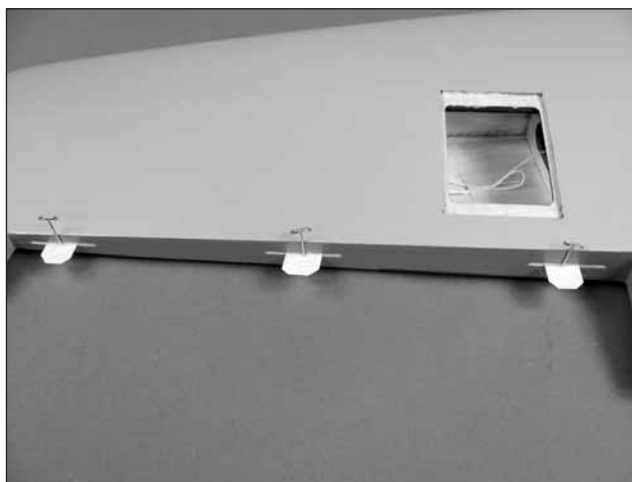
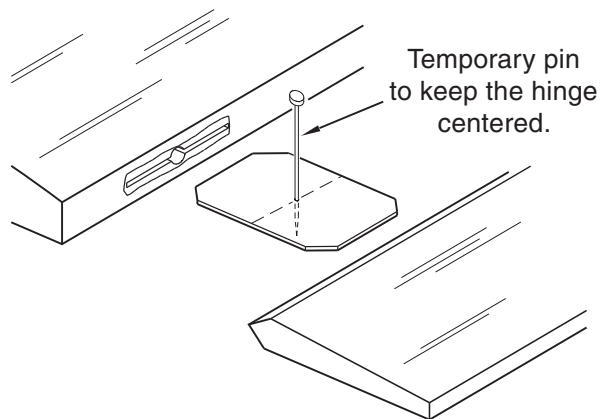


❑❑ 7. Cut the included 2" x 9" [51mm x 229mm] piece of CA hinge material into 3/4" x 1" [19mm x 25mm] individual hinges. Use a hobby knife or scissors to trim the corners from each hinge to make them easier to insert into the hinge slots.

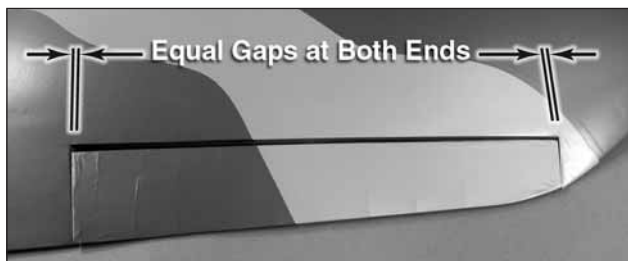


❑❑ 8. Drill a 3/32" [2.4mm] hole 1/2" [13mm] deep in the center of each hinge slot in the wing panel and

aileron. Use a sharp hobby knife to carefully cut away the covering just around each hinge slot.



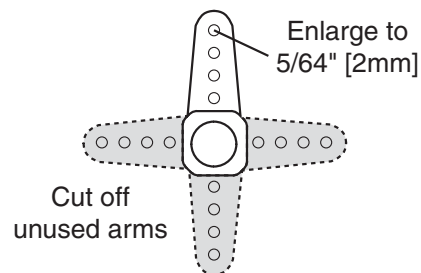
❑❑ 9. Fit a CA hinge into each hinge slot in the wing panel. If the hinges are difficult to install, use a hobby knife to slightly enlarge the slots. Push a pin (T-pins work well for this) through the middle of each hinge to keep them centered.



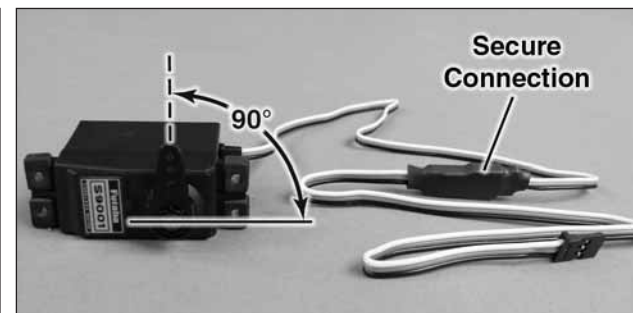
❑❑ 10. Fit the aileron to the hinges and center it in the opening. Remove the pins from the hinges and position the aileron against the TE of the wing panel. The hinge gap between the aileron and wing should only be wide enough to allow a small line of light through. When satisfied, apply 6 drops of thin CA glue to the center of each hinge on both sides. When the CA has dried, gently pull on the aileron to confirm that it is securely glued in place.

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

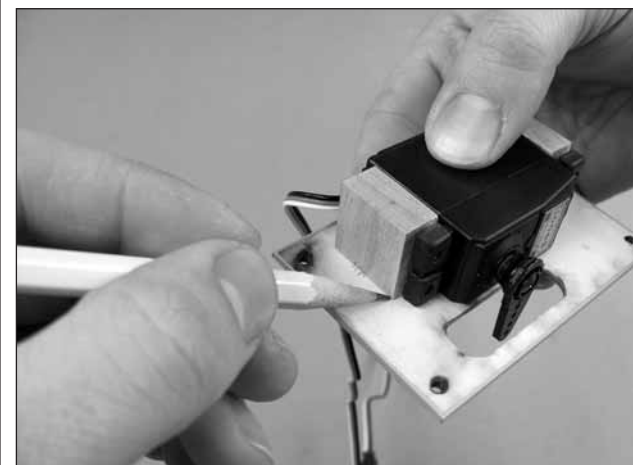
MOUNT THE SERVOS



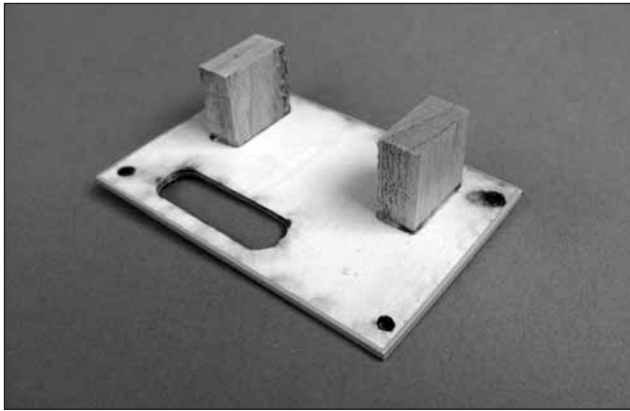
❑❑ 1. Cut three arms from a four-armed servo arm included with the aileron servo. Enlarge the outer hole of the remaining arm with a 5/64" [2mm] drill bit.



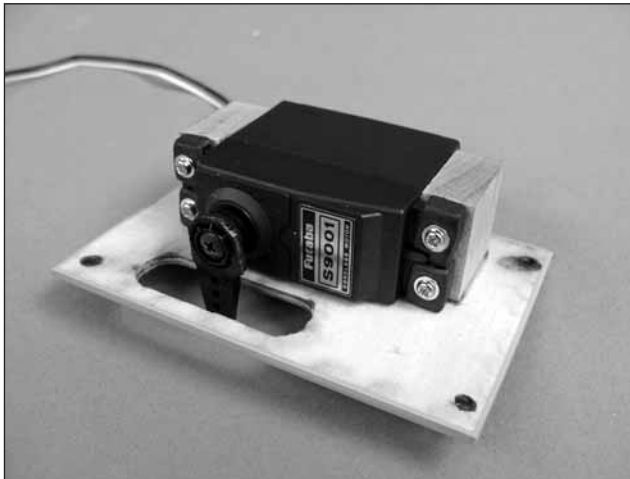
❑❑ 2. Attach a 12" [305mm] servo extension to the aileron servo and secure the connector using tape, heat shrink tubing (not included), or clips specifically made for that purpose (Note: If you plan to connect the aileron extensions directly to the receiver without using a Y-harness, you will need servo extensions at least 16" [406mm] in length). Center the servo with your radio system and install the servo arm to the servo perpendicular to the servo case as shown. Be sure to reinstall the servo arm screw into the servo. Install the grommets and eyelets that came packaged with the servo.



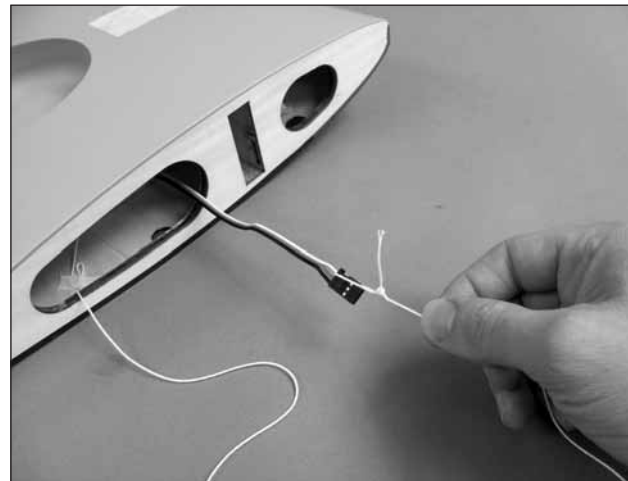
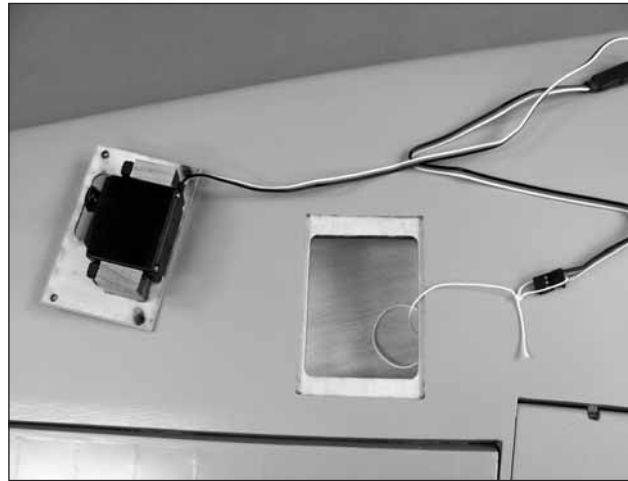
❑❑ 3. Center the aileron servo onto the underside of the aileron servo hatch cover. The servo arm should be centered in the opening. Place a 3/4" x 3/4" x 5/16" [19mm x 19mm x 8mm] hardwood servo mounting blocks on each side of the servo against the servo mounting tabs. Use a pencil to mark the positions of the blocks onto the cover.



❑❑ 4. Remove the servo from the hatch cover and use epoxy to glue the blocks to the hatch cover.



❑❑ 5. When the epoxy is fully cured, position the servo against the underside of the aileron servo hatch cover between the mounting blocks. Place a piece of paper folded several times between the servo and the hatch cover to space the servo away from the hatch cover. Drill 1/16" [1.6mm] holes through the mounting tabs on the servo case into the blocks. Thread a servo mounting screw (included with the servo) into each hole and back it out. Remove the piece of paper and apply a drop of thin CA to each hole to harden the wood. When the CA has dried, install the servo onto the hatch cover using the hardware supplied with the servo.



❑❑ 6. Use the strings taped inside the aileron servo hatches to pull the servo leads through the wing ribs.



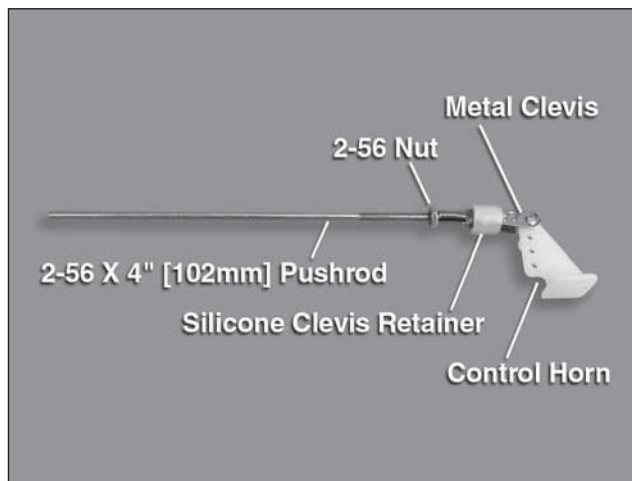
❑❑ 7. Drill a hole into the wing through each hole in the hatch cover using a 1/16" [1.6mm] drill bit. Thread a #2 x 3/8" [9.5mm] self-tapping screw into each hatch mounting hole and back it out. Apply a drop of thin CA to each hole to harden the wood. Install the aileron hatch cover to the wing as shown using four #2 x 3/8" [9.5mm] self-tapping screws and four #2 flat washers.



❑❑ 8. Mount the flap servo and hatch cover in the same way. If using a Y-harness, the flap servo requires a 6" [152mm] servo extension. If you plan to connect the flap servo directly to the receiver, install a 12" [305mm] extension.

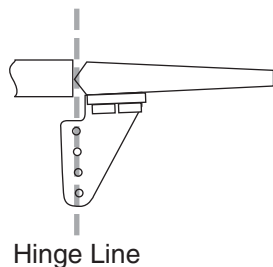
9. Repeat steps 1-8 for the left wing panel. Make note that the flap servo arm will be mounted pointing toward the wing tip side of the left wing panel so that when the flap servos are joined together using a Y-harness, they will both move in the same direction.

INSTALL THE AILERON AND FLAP PUSHRODS

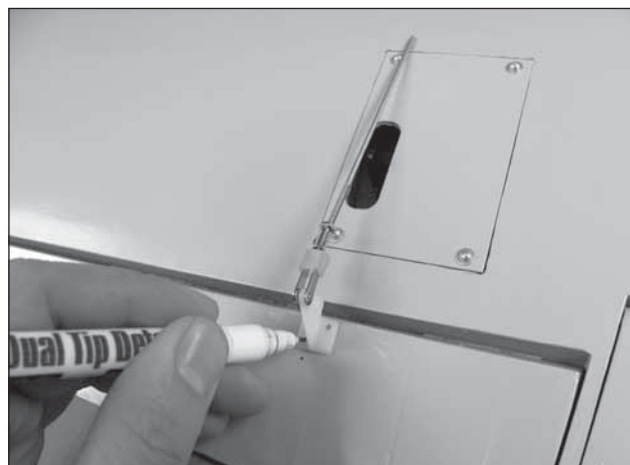
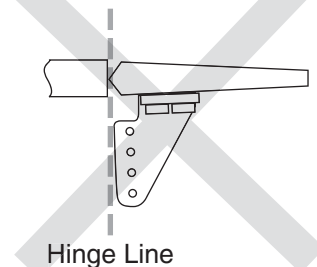


1. Thread a 2-56 nut and a metal clevis 15 complete turns onto a 4" [102mm] pushrod. Slide a silicone clevis retainer onto the clevis and connect the clevis to the outer hole of a nylon control horn.

CORRECT



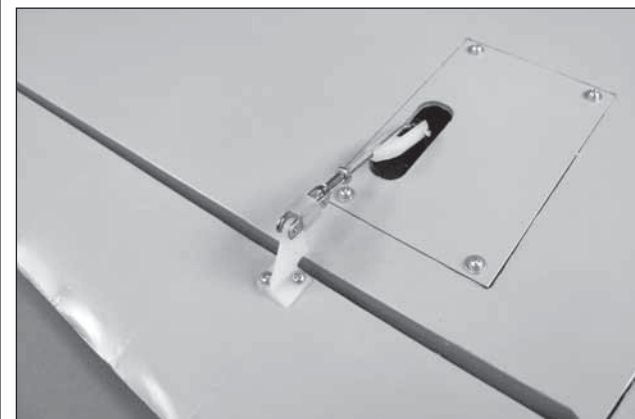
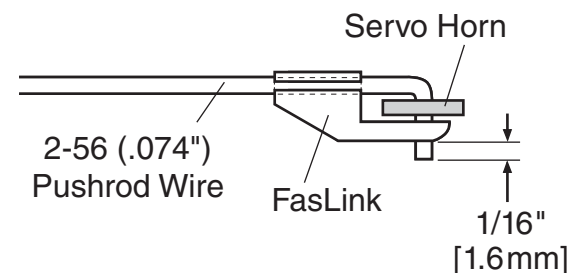
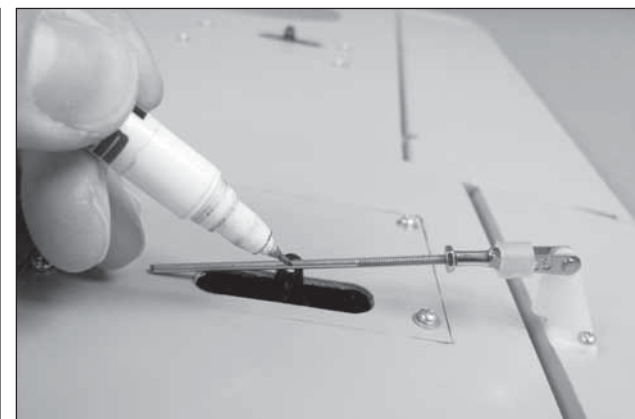
INCORRECT



2. Position the control horn over the plywood plate in the aileron (if you cannot see it, hold the aileron at a shallow angle in good lighting or use a small pin to puncture the covering) using the position of the servo arm as a guide. Align the holes in the control horn directly over the aileron hinge line and mark the location of the control horn mounting holes.

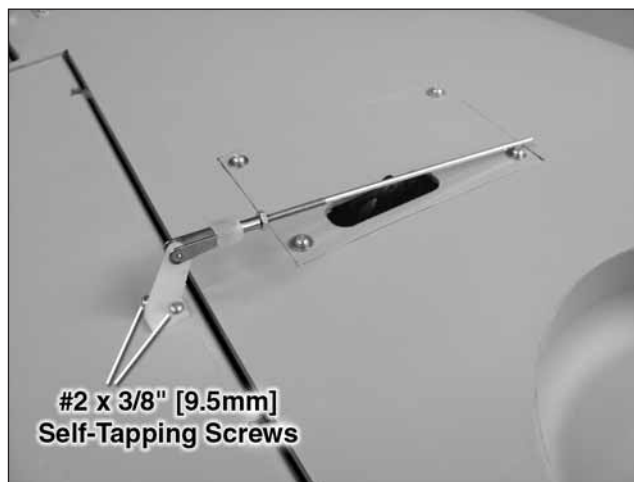
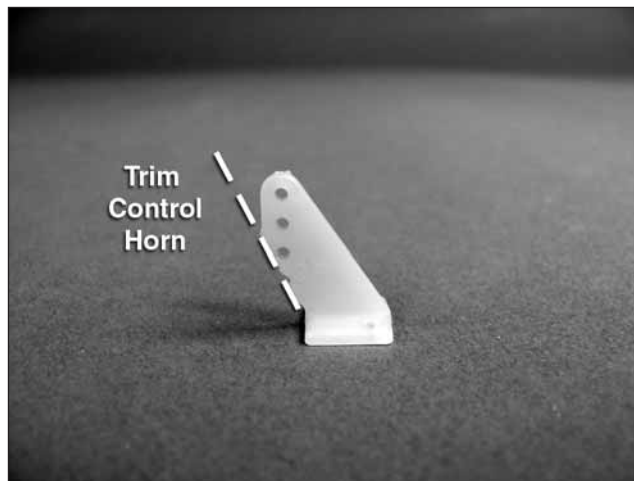


3. Drill 1/16" [1.6mm] holes at the marks you made through the plywood plate. **Do not drill all the way through the aileron!** Thread a #2 x 3/8" [9.5mm] self-tapping screw through each hole and back it out. Apply a couple drops of thin CA glue to each hole to harden the wood. When the glue has dried, install the control horn onto the aileron using two #2 x 3/8" [9.5mm] self-tapping screws.

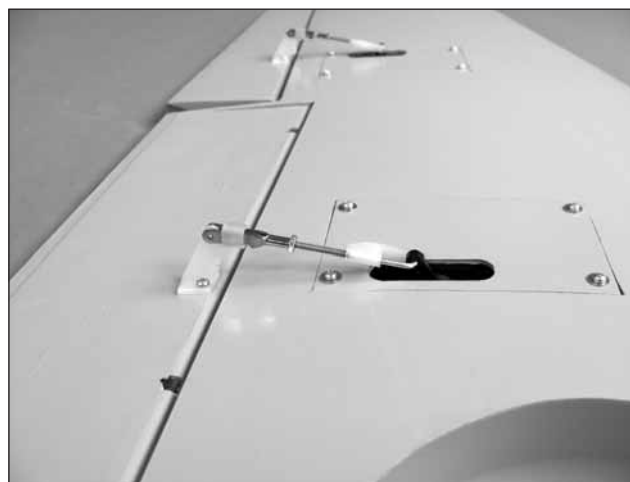
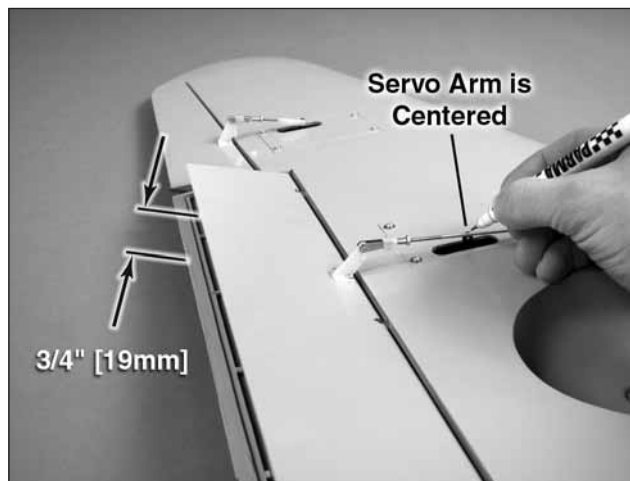


4. Use tape or a small clamp to hold the aileron in the neutral position. Make a mark on the pushrod where it crosses the outer hole in the servo arm. Make a 90° bend at the mark on the pushrod and cut off the excess pushrod 1/4" [6mm] beyond the bend. Attach the pushrod to the servo arm using a nylon FasLink™. Thread the clevis up or down on the pushrod as necessary to center the aileron with the servo arm centered. When satisfied, apply a drop

of threadlocking compound onto the threads behind the clevis and tighten the 2-56 nut against it. Slide the silicone clevis retainer to the end of the clevis to secure it.



□ □ 5. Trim a control horn as shown for installation onto the flap. Install the control horn inline with the flap servo arm onto the flap using two #2 x 3/8" [9.5mm] self-tapping screws. Be sure that the holes in the control horn are centered over the hinge point pins and you are installing the horn onto the hardwood mounting point on the flap (look at the underside of the flap to locate the mounting point).



□ □ 6. Lower the flap 3/4" [19mm] and with the flap servo arm still centered, mark the pushrod where it crosses the outer hole in the servo arm. As you did with the aileron, install the pushrod onto the servo arm using a FasLink. Be sure to slide the silicone clevis retainer to the end of the clevis and tighten the nut against the clevis with a drop of threadlocking compound.

□ 7. Repeat steps 1-6 for the other wing panel.

FINISH THE WING



□ 1. **Thoroughly** coat the inside of both landing gear pockets in the wings with 30 minute epoxy. Fit the plywood landing gear mounting boxes into the pockets (there is a left and a right box) and allow the epoxy to cure undisturbed.

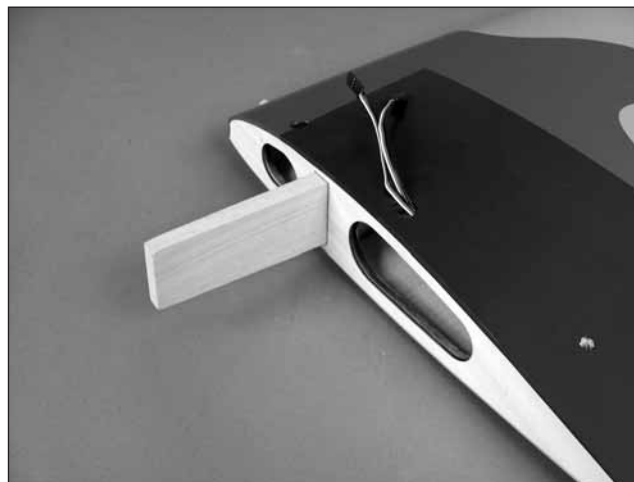


□ 2. If you are planning on installing optional pneumatic retracts, now would be a good time to route

your air lines through the wing panels and into the boxes. Approximately 14" [356mm] of air line should be installed into each panel. Also, route the servo extensions through the holes in the sheeting.

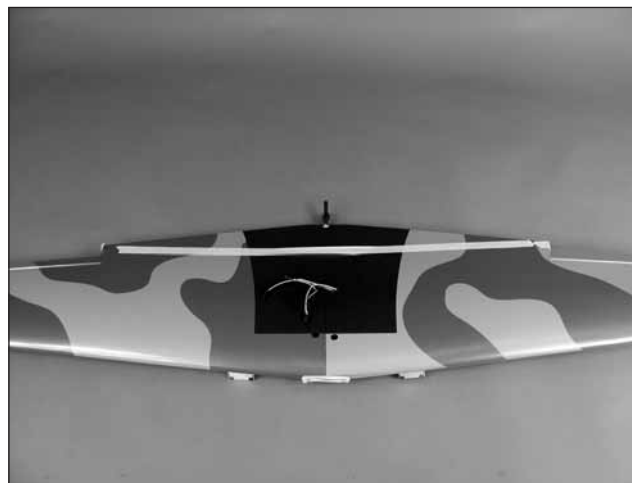


❑ 3. Use epoxy to glue the nylon **wing dowels** into the holes in the wing leading edge (be sure the smooth ends of the pins face outward). Wipe away excess epoxy with a paper towel dampened with denatured alcohol.



❑ 4. Test fit the **wing joiner** into the joiner pocket of each wing panel with the "V" shaped side pointing to the bottom of the wing. The joiner should be able to

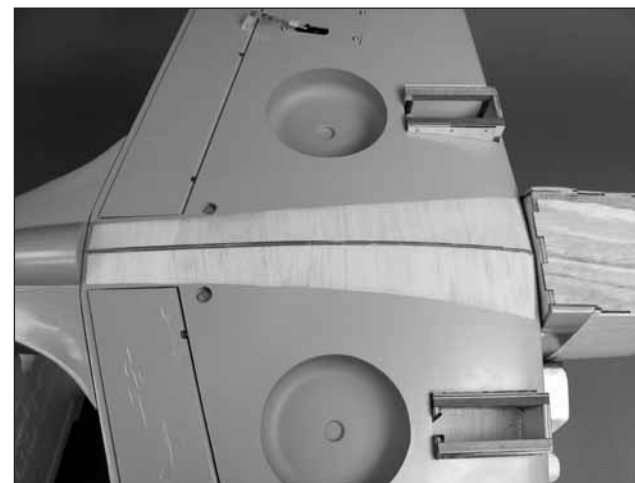
fit halfway into each pocket and be slightly loose to allow room for epoxy. There is a front and back side to the wing joiner. It will only fit in the wings in the correct orientation. Sand the joiner as necessary for the proper fit. Dry fit the wing panels together using the joiner. The root ribs of the panels should sit flat against each other with no gaps. Lightly sand the face of the root ribs if necessary to eliminate any gaps between the wing panels.



❑ 5. When satisfied with the fit of the wing panels, mix up a batch of 30-minute epoxy and coat the inside of the wing joiner pockets in each wing panel. Coat one half of the wing joiner and slide it into one wing panel. Coat the root ribs of both wing panels as well as the exposed end of the joiner. Join the two wing panels together and use paper towels dampened with denatured alcohol to wipe away any excess epoxy from the joint between the panels. Use masking tape to hold the panels together tightly. A rubber band around the wing dowels works well to hold the LE of the wing panels together and a clamp at the TE helps keep them aligned. Set the wing aside and let the epoxy cure undisturbed.



❑ 6. Fit the wing to the **fuselage** and use two 1/4-20 nylon wing bolts to secure the wing in place. Align the **belly pan** in place onto the underside of the wing. Use a felt-tip pen to trace around the belly pan onto the wing.



❑ 7. Carefully cut the covering 1/16" [1.6mm] inside the lines you drew and remove the covering. Use a sharp hobby knife and take care to only cut through the covering and not into the wood beneath. Use denatured alcohol to wipe away the lines you drew (or use CA debonder). See the following **Expert Tip** for an alternative method for removing covering.



HOW TO CUT COVERING FROM Balsa

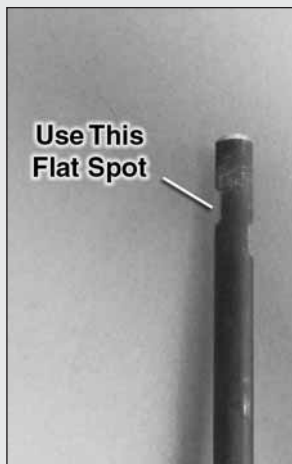
Use a soldering iron to cut the covering from the area beneath the belly pan. The tip of the soldering iron doesn't have to be sharp, but a fine tip does work best. Allow the iron to heat fully.



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.

OPTIONAL PNEUMATIC RETRACT INSTALLATION

If you plan to install pneumatic retracts, skip to step 11 after you have completed this installation.

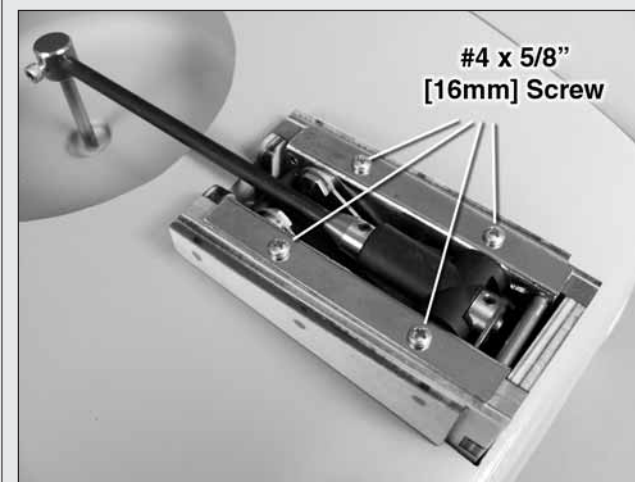


1. Two sets of bolt-on axles are included with the optional pneumatic retract set. If you plan to use the wheels included with the P-40, you will install the 5mm diameter axles. If you plan to use wheels from another manufacturer such as Robart, install the 3/16" [4.8mm] axles. Flat spots are provided on both sides of each landing gear strut. The flat spots that are closest to the end of the struts should be used. Install the axles onto the struts using the included 3mm SHCS and threadlocking compound. Do not completely tighten the screws yet.

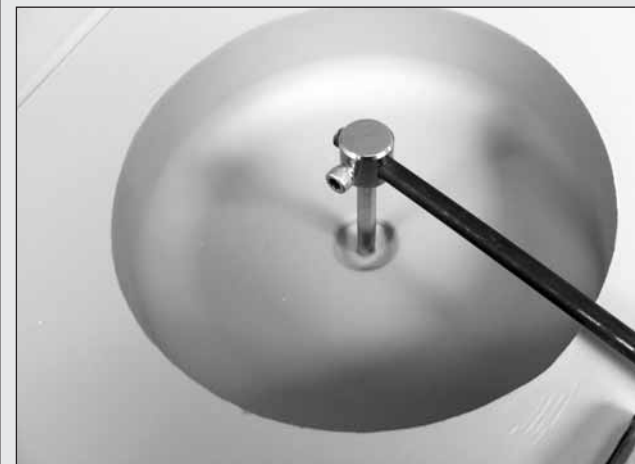


2. Connect the airlines to the retract. Insert the retract into the plywood mounting box and slide the

retract as far forward (toward the LE of the wing) as it will go. Mark the locations of the four mounting holes onto the box. Drill 5/64" [2mm] holes at your marks.



3. Thread a #4 x 5/8" [16mm] self-tapping screw into each hole and back it out. Apply a couple drops of thin CA to each hole. When the CA has dried, install the retract with four #4 x 5/8" [16mm] self-tapping screws.



4. If the end of the axle does not align with the center of the wheel well when the gear is in the up position, adjust the position of the axle on the strut until it does and then thoroughly tighten the screw in the axle.

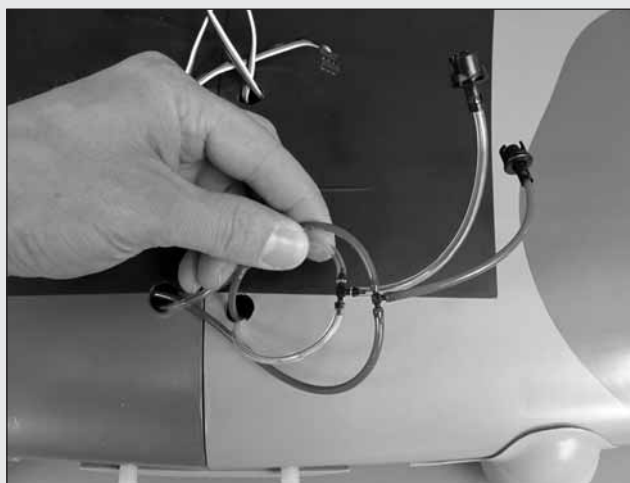


❑ 5. Slide a 5mm wheel collar onto the axle followed by a wheel and another 5mm wheel collar. Mark the location of each wheel collar onto the axle. Use a metal file or rotary tool to grind flat spots onto the axle at your marks.



❑ 6. Thread a 6-32 set screw into each of the 5mm wheel collars and tighten one wheel collar onto the inner flat spot on the axle. Apply a drop of oil to the axle and install the wheel. Tighten another 5mm wheel collar on the outside of the wheel. Be sure that the wheel rotates freely. Press the plastic wheel cover onto the wheel and apply the wheel cover decal.

❑ 7. Repeat steps 1-6 for the other retract.

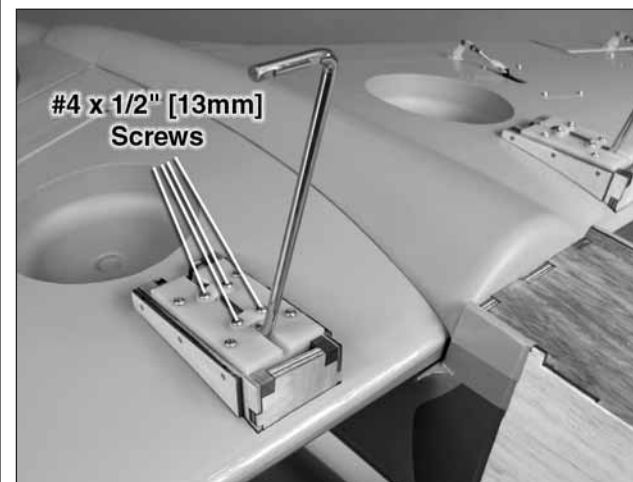


❑ 8. Install quick disconnects onto the air lines.

(Continued from page 13)



❑ 8. Mark the locations for the fixed landing gear block mounting holes onto the plywood landing gear mounting blocks. Drill 5/64" [2mm] holes at your marks. Install the blocks using eight #4 x 5/8" [16mm] self-tapping screws. Be sure to install the blocks so that the landing gear wire holes are toward the TE of the wing.



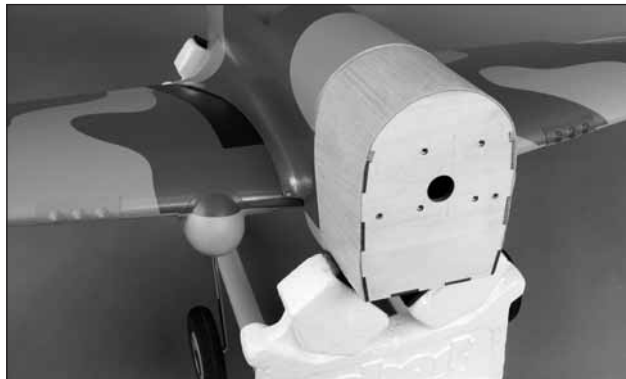
❑ 9. Install the fixed landing gear wires into the blocks using eight #4 x 1/2" [13mm] self-tapping screws and four nylon landing gear straps.



❑ 10. Thread a 6-32 set screw into two 5mm wheel collars and tighten the wheel collars onto the inner flat spots on the landing gear wires. Apply a drop of oil to each wire and install the main wheels. Tighten another 5mm wheel collar on the outside of each wheel. Be sure that the wheels rotate freely. Press the plastic wheel covers onto the wheels and apply the wheel cover decals.

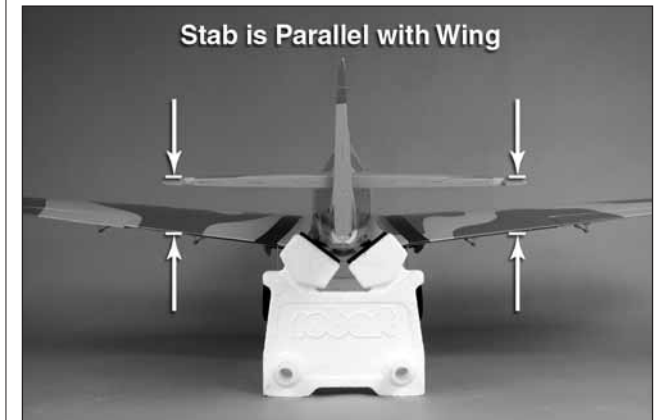
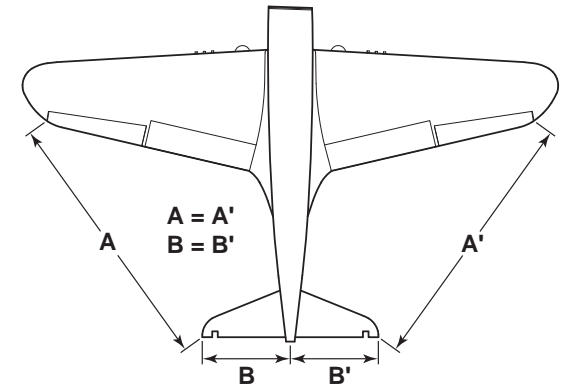


❑ 11. Fit the fiberglass retract covers into position over the landing gear boxes. Drill four holes evenly spaced at the edges of each cover with a 1/16" [1.6mm] drill bit. Remove the retract covers and thread a #2 x 3/8" [9.5mm] self-tapping screw into each hole and back it out. Apply a drop of thin CA to each hole to harden the surrounding wood. When the CA is dry, apply a small bead of canopy glue to the retract covers and install them onto the wings using eight #2 x 3/8" [9.5mm] self-tapping screws. The screws will hold the retract covers in place while the glue dries. If you have installed pneumatic retracts, test the operation of the gear with the retract covers now in place. Sand the inside edges of the retract covers if necessary to provide clearance of the gear struts. If the retract covers need to be removed in the future, remove the screws and carefully peel the retract covers away from the wing covering.



❑ 12. Glue the ABS machine guns onto the LE of the wing. For added realism, paint the gun barrels black.

ASSEMBLE THE TAIL SECTION



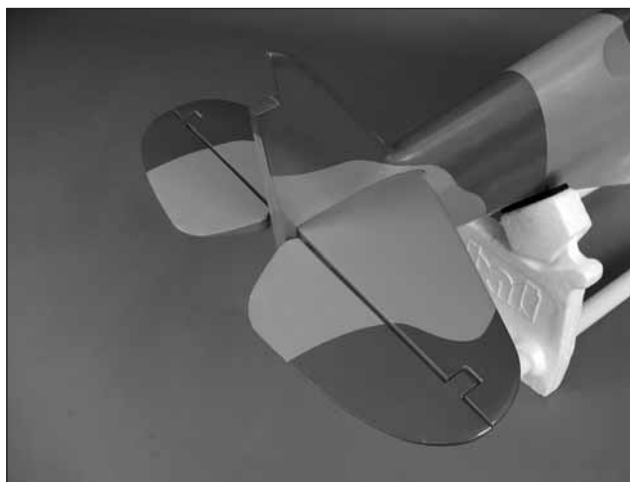
❑ 1. Insert the horizontal stabilizer into the stab pocket and center the stab left and right in the fuselage. Stand back 15-20ft [5-6m] and check to be sure the stab is

parallel to the wing. If necessary, adjust the stab saddle as needed by lightly sanding it until the stab and wing are parallel. Measure the distance from the tip of each wing to the tip of the stab. Adjust the stab until the distance from the tip of the stab to the tip of the wing is equal on both sides. When satisfied with the position of the stab, use a felt tip marker to mark the outline of the fuselage onto the top and bottom of it.

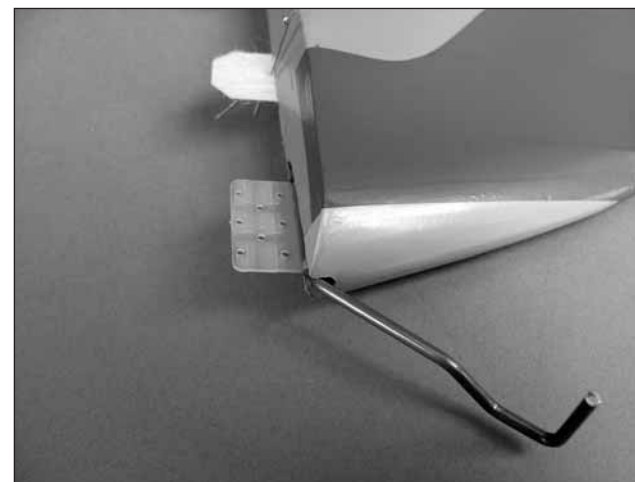


❑ 2. Carefully remove the covering 1/16" [1.6mm] inside the lines you drew. Wipe away the lines with alcohol or debonder. Coat the exposed wood of the stabilizer with 30-minute epoxy. For a stronger joint, we recommend also coating the stab pocket with epoxy. Set the stab in position in the stab pocket and confirm that it is centered and parallel with the wing. When satisfied, clean up any excess epoxy from the stab and fuse with paper towels dampened with denatured alcohol. Be thorough when cleaning to prevent a haze left behind on the covering after the epoxy cures. Allow the epoxy to cure undisturbed.

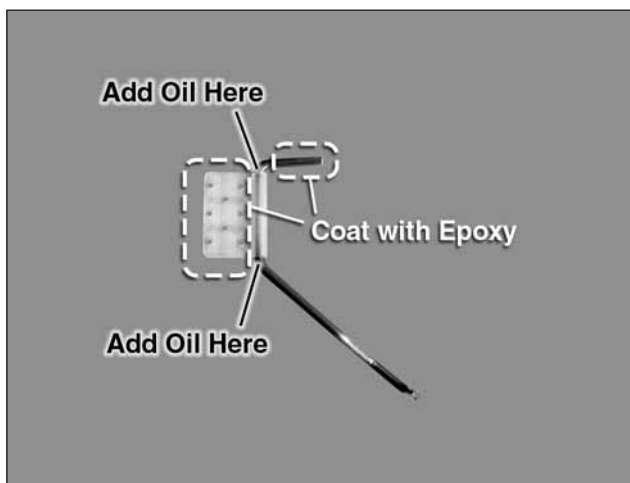
❑ 3. The wing can now be removed from the fuselage.

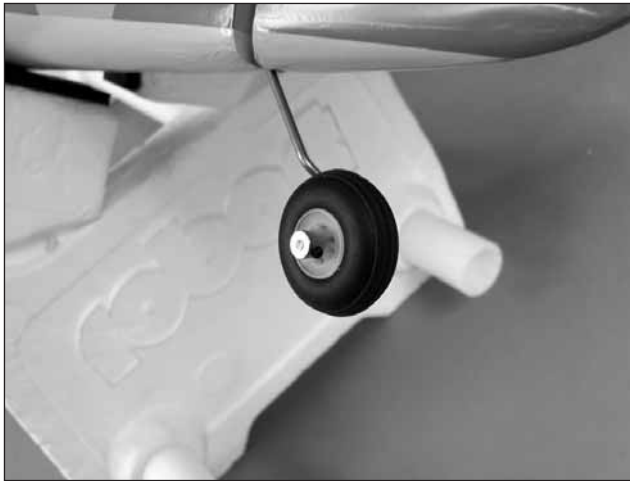


❑ 4. As you did with the ailerons, install the elevators onto the stabilizer using CA hinges. Before applying the CA to the hinges, be sure the elevators move up and down freely.

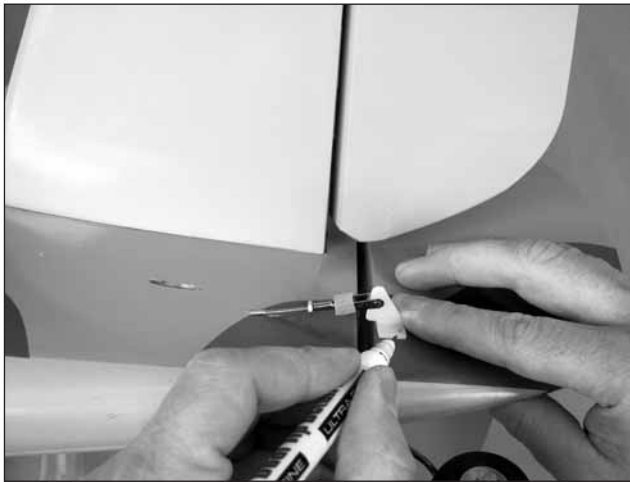


❑ 5. A few drops of oil at the ends of the tail wheel tab hinge will prevent epoxy from sticking to it. Coat the wire end and nylon tab with epoxy and fit the wire end into the pre-drilled hole in the rudder. Insert CA hinges into the rudder and fit the rudder in place onto the fuselage. The CA hinges will hold the rudder secure while the epoxy cures. Wipe away any excess epoxy with denatured alcohol.





❑ 6. Oil the tail wheel axle and install the tail wheel. Secure it with a 3/32" [2.4mm] wheel collar and a 4-40 set screw. Be sure that the tail wheel rotates freely.



❑ 7. Cut one of the 36" [914mm] pushrods to 24" [610mm] to make it easier to work with. Thread a 2-56 nut and clevis onto the pushrod. Slide a silicone clevis retainer onto the clevis. Install the clevis onto the third outer hole of a control horn. Insert the pushrod into the rudder outer pushrod tube. Align the holes in the control horn over the rudder hinge line and mark the mounting holes onto the rudder. Be sure you are installing the control horn onto the plywood mounting plate.



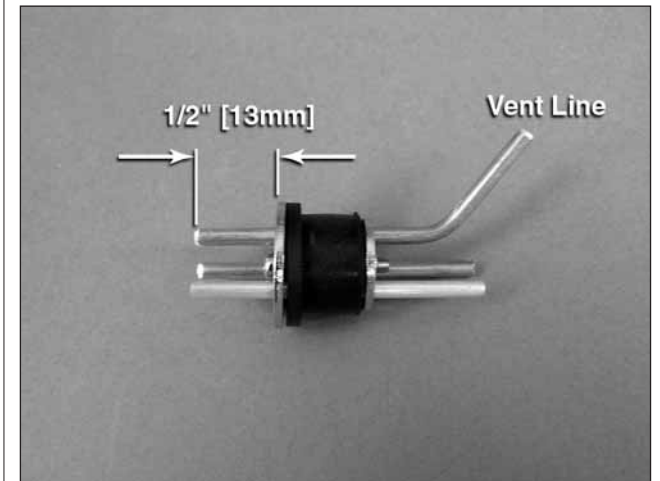
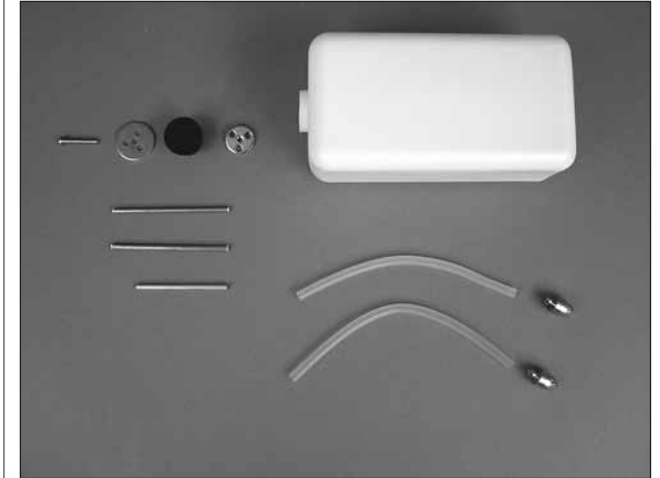
❑ 8. Drill 1/16" [1.6mm] at your marks. Do not drill all the way through the rudder. Thread a #2 x 3/8" [9.5mm] self-tapping screw into each hole and back it out. Apply a drop of thin CA to each hole. When the CA has hardened, install the control horn using two #2 x 3/8" [9.5mm] self-tapping screws. Slide the silicone clevis retainer to the end of the clevis and tighten the 2-56 nut against the clevis with threadlocking compound.



❑ 9. Install a pushrod and control horn onto each elevator as was done with the rudder. The clevises should be installed in the outer holes of the control horns.

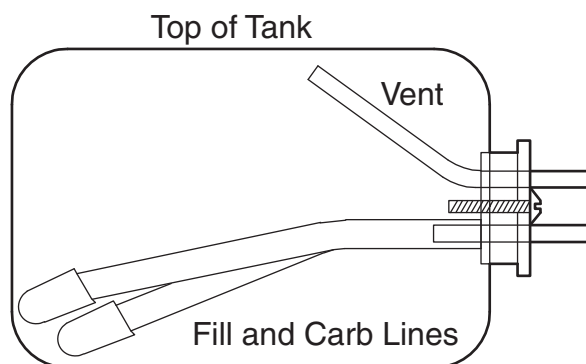
INSTALL THE ENGINE AND FUEL TANK

The engine shown in this section is an O.S. FS-91 Surpass II 4-stroke engine. The installation of a 2-stroke engine is the same procedure.



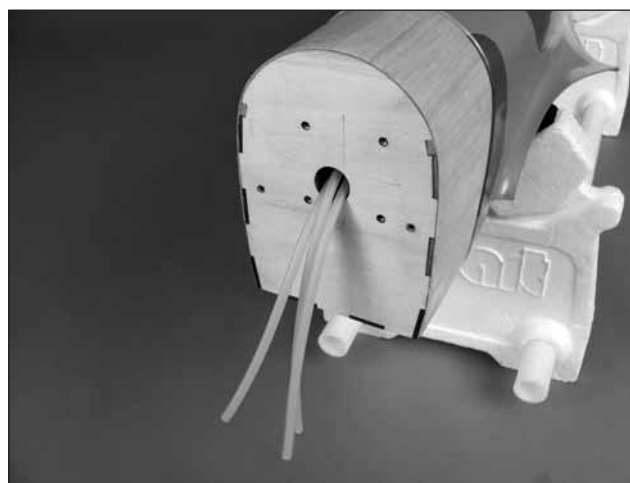
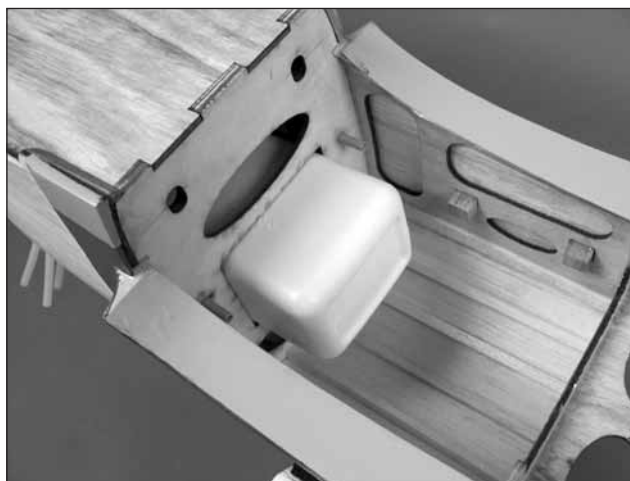
❑ 1. The fuel tank can be assembled as a two line system consisting of a vent (pressure) line to the muffler and a carb line. Filling and emptying of the tank would need to be done through the carb line, or an optional fuel fill valve (not included). The tank can also be assembled as a three line system having a vent line, carb line, and fill line. If installing a fill line,

puncture the top of the stopper above the sealed off fuel tube hole. The fill and carb lines should extend out 1/2" [13mm] beyond the stopper and the vent line should be bent upwards and left uncut. With the tubes installed in the stopper, fit the stopper plates loosely in place with the 3 x 25mm phillips screw to hold the assembly together.

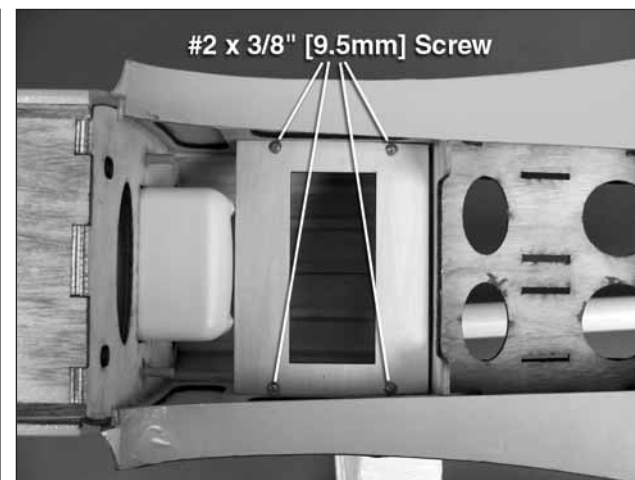


❑ 2. Fit the stopper assembly into the tank with the vent line pointing toward the top of the tank, but not touching. The fuel tubing and clunks (fuel pickup) on the carb and fill lines should almost reach the back of the tank but not touch. The clunks must be able to move freely inside the tank when assembled. Adjust the length of the fuel tubing accordingly. When satisfied, tighten the 3 x 25mm screw in the stopper to secure it

in place (do not over tighten). Mark the side of the tank that must face up when installed in the plane, and we also suggest marking the tubes in the stopper.



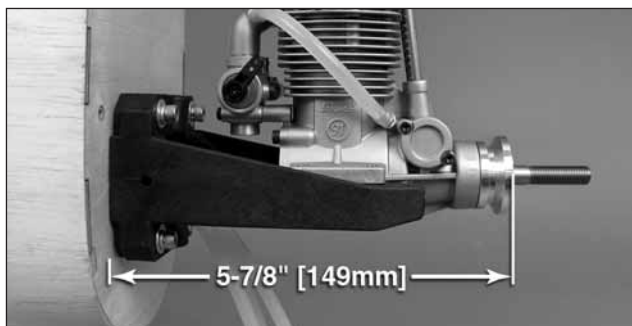
❑ 3. Attach a 6"-7" [152mm-178mm] piece of fuel tubing onto each line coming from the tank. Insert the tank into the fuselage with the correct side facing up. The neck of the tank should fit into the former behind the firewall. We recommend marking the fuel lines so they can be easily identified when connecting them to the engine.



❑ 4. Install the plywood throttle servo tray behind the fuel tank using four #2 x 3/8" [9.5mm] self-tapping screws and four #2 flat washers. The tray should be pressed up against the back of the fuel tank to prevent it from moving in flight.



❑ 5. Using four 8-32 x 1" [25mm] SHCS, four #8 flat washers, four #8 lock washers, and threadlocking compound, attach the engine mount inverted to the firewall. Leave the screws slightly loose. Test fit your engine between the mount halves. Slide the mount halves against the sides of the engine and finish tightening the mount screws.



❑ 6. Position the front of the engine drive washer 5-7/8" [149mm] from the firewall. Mark the location of the engine mount holes onto the mount rails using a Dead Center hole locator. Remove the engine from the mount and use an 8-32 tap and drill set to create threads in the four mounting holes. Attach the engine to the mount using four 8-32 x 3/4" [19mm] SHCS, four #8 flat washers, and four #8 lock washers.



❑ 7. Install your muffler onto the engine. We used an optional 90° header (OSMG2624) to route the muffler pipe entirely within the cowl. If you choose to only use the header included with the engine, the muffler will exit on the side of the plane and some of the cowl will need to be cut away. If you have installed a 2-stroke engine, we recommend using an optional in-cowl muffler. The stock muffler can also be used; however, the muffler will exit on the side of the plane. Cut the vent line and carb line to the correct length and connect them to the engine. Leave the fill line uncut.

INSTALL THE RADIO SYSTEM

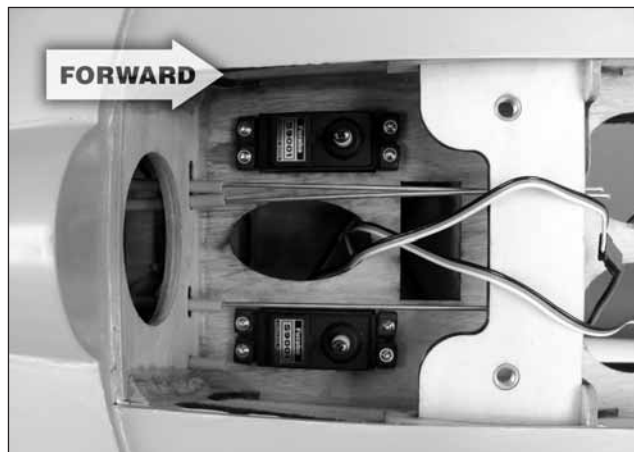


❑ 1. Install your throttle servo in the throttle servo tray on the same side of the fuselage as the throttle arm on the carburetor.



❑ 2. Cut three arms from a four-armed servo arm. Install a brass screw-lock connector into the third hole from the center of the remaining arm using a nylon retainer. Loosely thread a 4-40 x 1/8" [3mm] SHCS into the screw-lock connector. Use your radio system to center the servo and attach the arm perpendicular to the servo case pointing away from the center of the fuselage. Be sure to install the servo arm screw. Install a screw-lock connector with a 4-40 x 1/8" [3mm] SHCS into the throttle arm on the carb. Cut the threads off of the 17-1/2" [445mm] 2-56 pushrod. Slide the pushrod through the outer pushrod tube as shown. Make any necessary bends in the pushrod to connect it to the throttle arm. With the throttle servo centered and the carb at 1/2 throttle, insert the pushrod ends into the

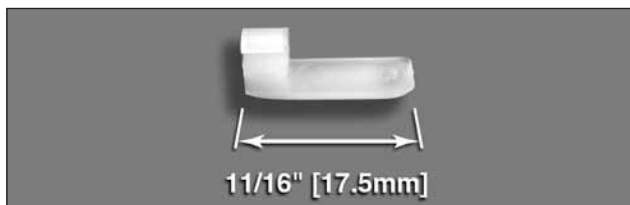
screw-lock connectors and tighten the screws. Test the operation of the throttle with your radio system confirming that the servo properly opens and closes the carb. Make any adjustments necessary.



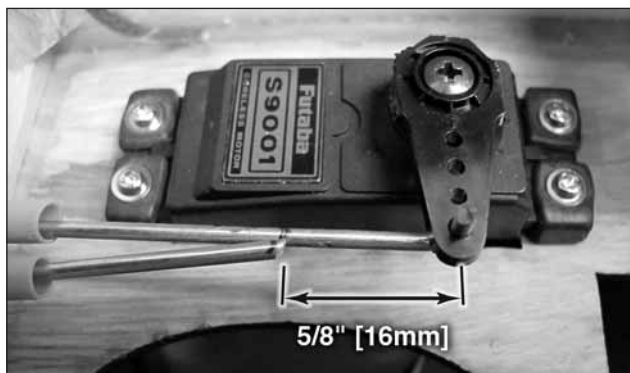
- ❑ 3. Install the rudder and elevator servos into the servo bays with the servo splines facing forward.



- ❑ 4. Install a servo arm onto the rudder servo and enlarge the outer hole of the arm with a 5/64" [2mm] drill bit. With the rudder servo and rudder centered, mark the rudder pushrod where it crosses the outer hole of the servo arm. Make a 90° bend at the mark, cut off the excess pushrod 1/4" [6mm] beyond the bend and connect the pushrod to the servo arm and secure it with a nylon FasLink.



- ❑ 5. Cut a FasLink to 11/16" [17.5mm] long.

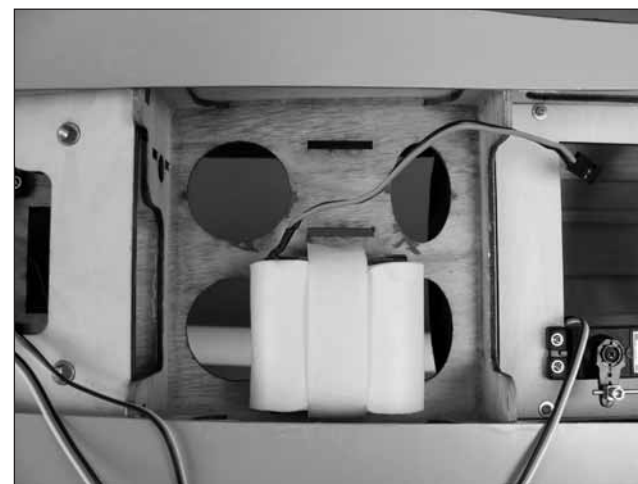
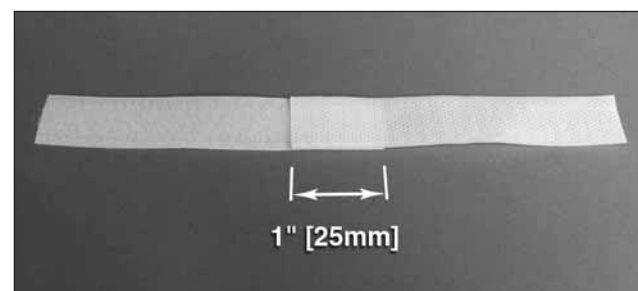


- ❑ 6. Install a servo arm onto the elevator servo. As you did with the rudder pushrod, center the right elevator and make a bend in the pushrod where it crosses the outer hole of the elevator servo arm. Center the left elevator and make a mark on the pushrod 5/8" [16mm] aft of the outer hole of the servo arm. Cut off the excess pushrod at your mark.

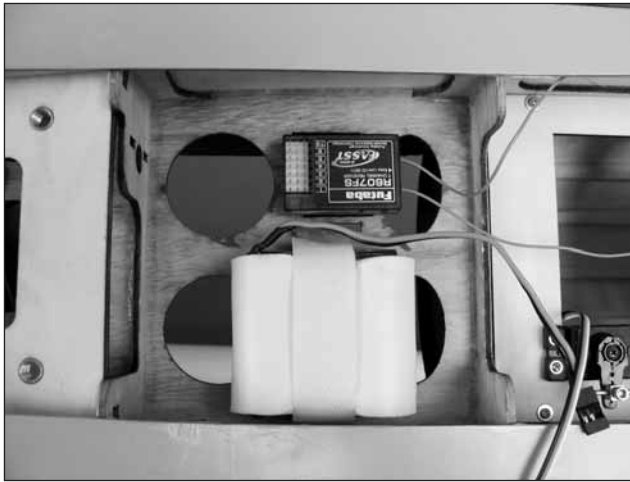


- ❑ 7. Loosely thread a 6-32 x 1/4" [6mm] SHCS into two 5/32" [4mm] wheel collars with threadlocking compound. Fit the wheel collars over both pushrod

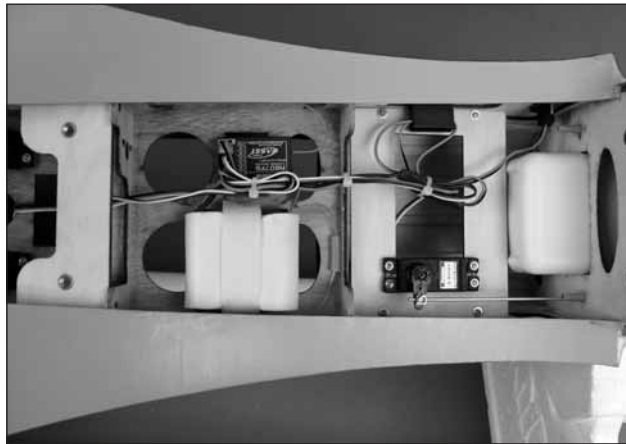
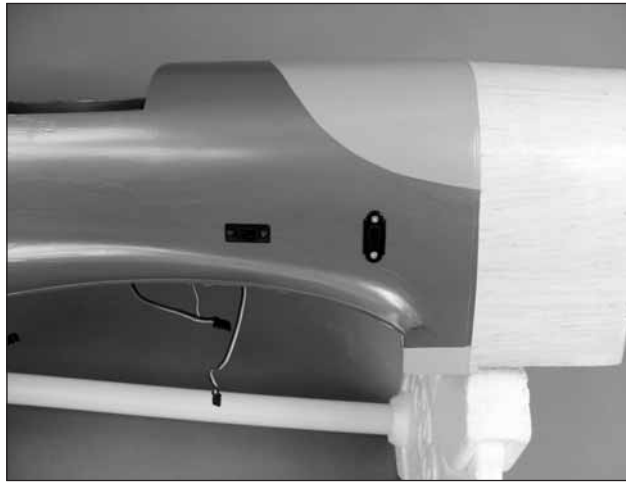
ends. Connect the left elevator pushrod to the servo arm and secure it with the shortened FasLink. Slide both wheel collars just behind the FasLink, view the plane from behind and confirm that both elevator halves are parallel, and **thoroughly** tighten the screws in the wheel collars. Test the operation of the elevator servo with your radio. Make any fine adjustments with the clevises to bring the elevator halves perfectly parallel with each other.



- ❑ 8. Make a hook and loop strap by cutting the included material to a length that will wrap around your receiver pack and then overlap the mating ends by approximately 1" [25mm]. Cut a piece of foam rubber (not included) to match your pack. Secure the pack to the receiver tray with the strap.



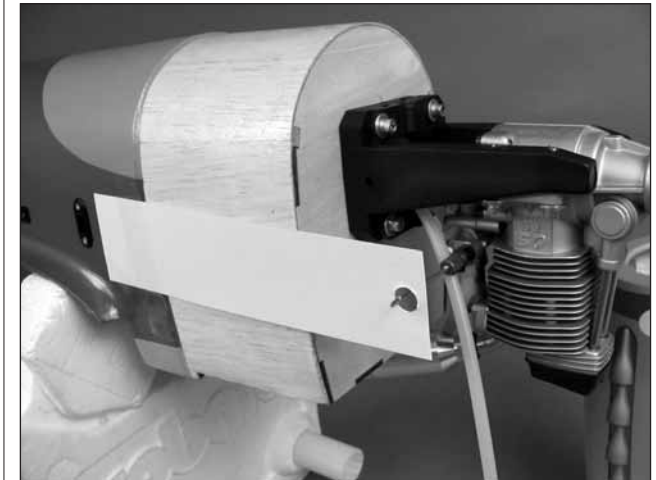
❑ 9. Apply a thin coat of epoxy where the receiver will be installed and allow it to cure fully. When cured, use a piece of self-adhesive hook and loop material (not included) to secure the receiver in place. The epoxy will provide a smooth surface to apply the hook and loop material. (It is recommended to wrap the receiver in foam rubber to protect it against vibration.) Note: If you are installing a larger receiver, make another strap and install the receiver in the same manner as you did the battery. Be sure to leave space for the retract valve mount if you are also installing the optional pneumatic retracts.



❑ 10. Install your receiver switch and charge jack onto the side of the fuselage opposite the throttle servo. Connect your servos and switch to the receiver and connect the receiver battery to the switch. Be sure to use tape or heat shrink tubing to secure the connection between the switch and the battery. Neatly bundle the wires together out of the way of the servos. We used small tie straps. Also, small pieces of fuel tubing glued inside the fuselage can support 2.4GHz receiver antennas in the suggested orientation described in your radio manual. If you are using an FM or PCM radio system, an antenna tube is provided adjacent to the rudder outer pushrod tube. The antenna tube exits the underside aft end of the fuselage. Locate the exit slot and carefully trim away the covering.

FINISH THE MODEL

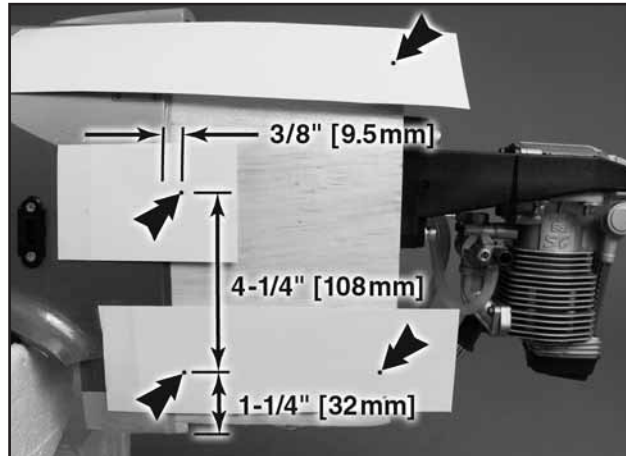
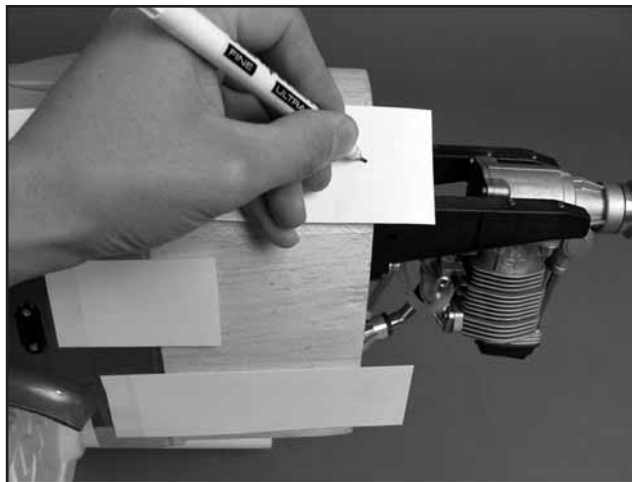
INSTALL THE COWL AND SPINNER



❑ 1. Make templates for the locations of cutouts you will need to make in the cowl. We made a needle valve extension from leftover 2-56 pushrod used to assemble this plane as seen in the photo (needle valve extensions are also available for purchase such as OSMG7290). Remove the needle and temporarily install the cowl. Mark the locations for the cutouts onto the cowl using the templates as a guide. Other cutouts you may need to make include glow plug access and an opening for the exhaust.

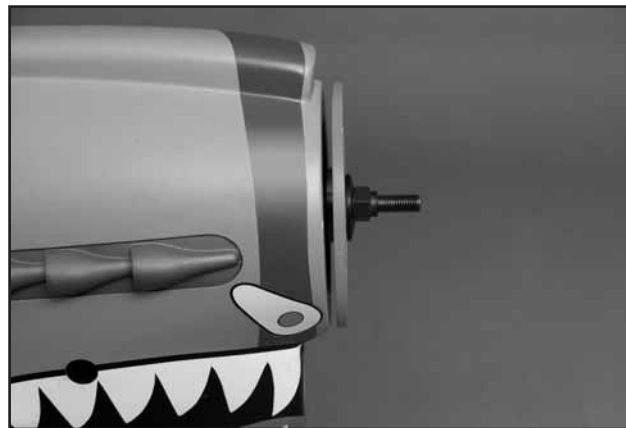


❑ 2. We also made a hole in the cowl for the fuel fill line. Start with a small hole (we chose to make the hole in the black paint on the cowl because the included fill line plug is black; be sure that the hole will clear the firewall) and enlarge the hole until the fill line with the plug inserted fits snugly when pushed into the hole. When satisfied, coat the inside of the cowl around the hole with CA to harden the surrounding fiberglass.



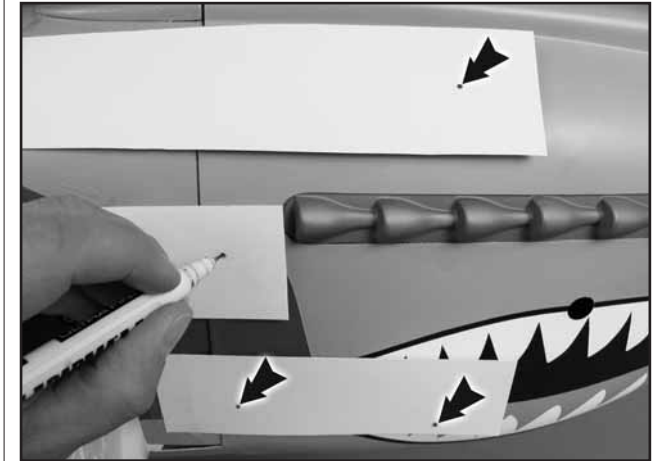
❑ 3. Remove the cowl from the fuselage and prepare additional paper templates for marking and drilling the cowl mounting holes. The cowl will be held on by eight screws, four per side. The forward cowl mounting holes need to be drilled into the firewall in the approximate locations shown. The aft holes need to be carefully measured using the dimensions provided to accurately drill the holes into the plywood plates pre-installed in the fuselage.

❑ 4. Drill 1/16" [1.6mm] holes into the fuselage at the marks you made. Thread a #2 x 3/8" [9.5mm] self-tapping screw into each hole and back it out. Apply a drop of thin CA into each hole.



❑ 5. Fit the cowl onto the fuselage. Temporarily install the spinner backplate onto the engine (a 5/16"

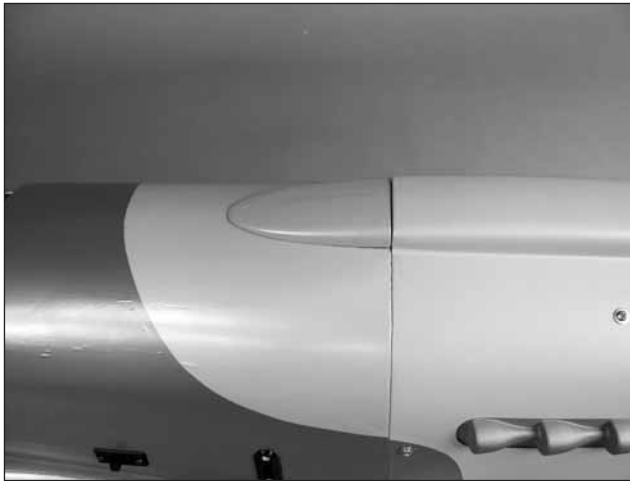
[7.9mm] brass insert is provided for 5/16" crankshafts). Use the prop washer and nut to hold the backplate tight against the drive washer. Align the paint on the cowl with the covering on the fuselage and also the front of the cowl with the backplate. When satisfied, tape the cowl in place (an assistant for this step is not necessary, but is helpful).



❑ 6. Transfer your marks from the paper template onto the cowl. Remove the cowl and drill 3/32" [2.4mm] holes into the cowl at your marks.



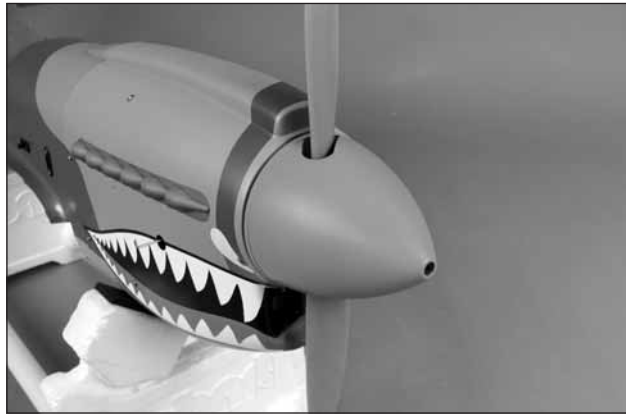
❑ 7. Feed the fill line through the hole you made in the cowl and install the cowl on the fuse using eight #2 x 3/8" [9.5mm] screws and eight #2 flat washers. Install your needle valve and any other connections necessary.



- ❑ 8. Hold the carburetor intake piece in place on the fuse and trace around it with a felt-tip pen. Remove the covering inside the lines and glue it in place.

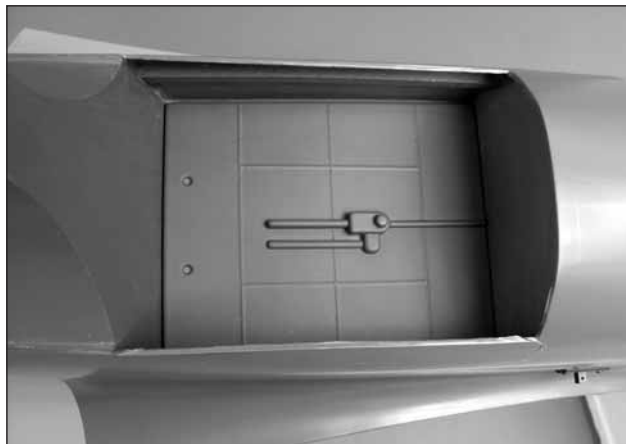


- ❑ 9. Install the spinner backplate, propeller and prop washer onto the crankshaft. Two spinner nuts are included in the spinner hardware bag. The silver nut is intended for 2-stroke engines. The black nut is intended for 4-stroke engines and matches the jam nut size of O.S. 4-stroke engines. If you are installing a 4-stroke engine, be sure to first tighten the large nut included with the engine, then install the 4-stroke spinner nut.



- ❑ 10. Fit the spinner cone onto the backplate and center the prop blades in the cutouts. Two spinner bolts are included in the hardware bag. If you have installed an O.S. 4-stroke engine, install the shorter of the two bolts into the spinner cone and thoroughly tighten it. The longer bolt is intended for engines with shorter crankshafts.

INSTALL THE COCKPIT KIT AND CANOPY



- ❑ 1. Begin by gluing the cockpit floor in position. Be sure that the floor is centered in the cockpit to allow room for the cockpit side panels. We used hot glue because it hardens quickly and it can be applied in thick beads. If you choose to use epoxy or CA, you will need to make some balsa spacers to fill the gap between the cockpit floor and the fuselage.



- ❑ 2. Install the cockpit side panels in the same manner.



- ❑ 3. Glue the instrument panel and headrest in position.

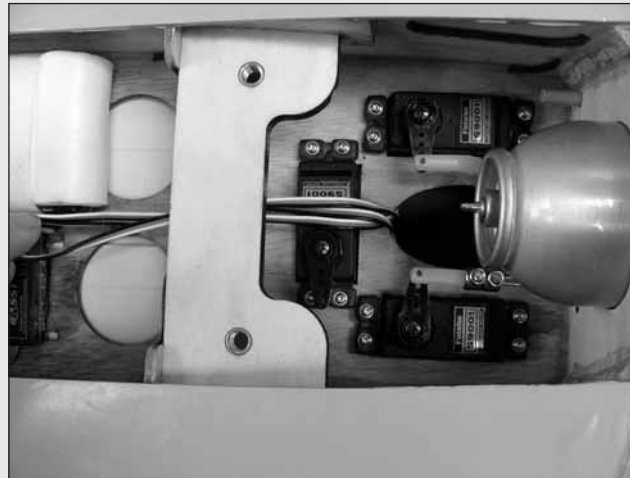


❑ 4. A pilot seat is included. If you choose to install it, you will need to make a spacer block from scrap balsa so it has a flat surface to glue to. Another option is to omit the seat and install a pilot bust. We used pilot figure GPMQ9115.

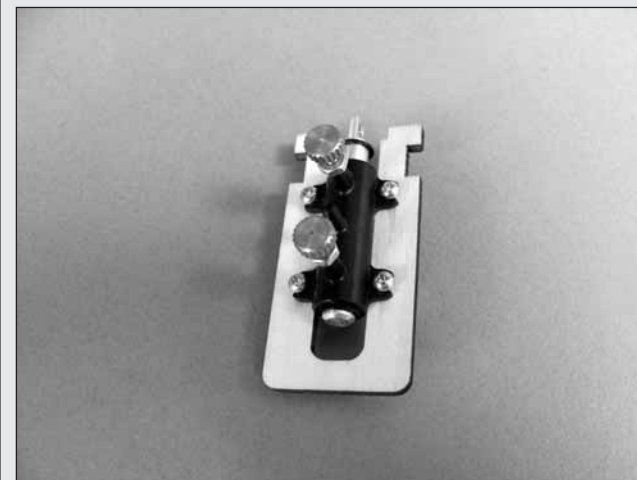
OPTIONAL PNEUMATIC RETRACT HARDWARE INSTALLATION



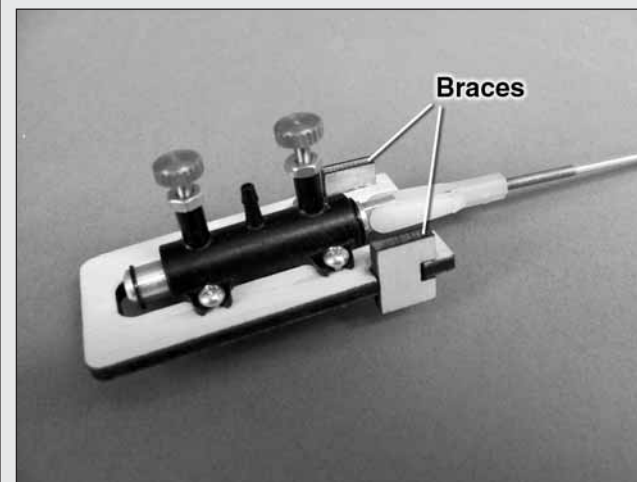
❑ 1. Install the air tank into the fuselage as shown. Use silicone to glue the tank to the fuselage former.



❑ 2. Install the retract servo into the servo bay. Cut three arms from a four-armed servo arm and enlarge the outer hole with a 5/64" [2mm] drill bit. Center the servo and install the arm onto the servo as shown.



❑ 3. Mount the retract valve to the plywood valve mount using four #2 x 3/8" [9.5mm] self-tapping screws.



❑ 4. Thread a nylon clevis onto a 4" [102mm] pushrod and connect it to the retract valve. Glue the two plywood valve mount braces to the mount as shown.



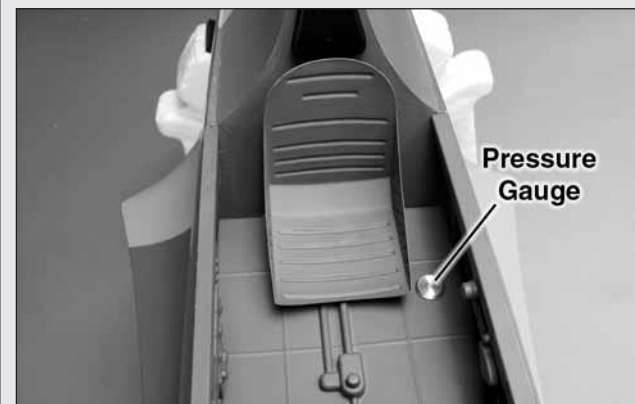
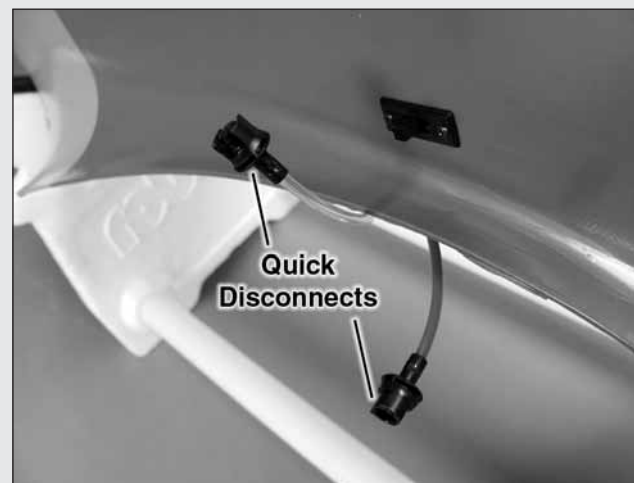
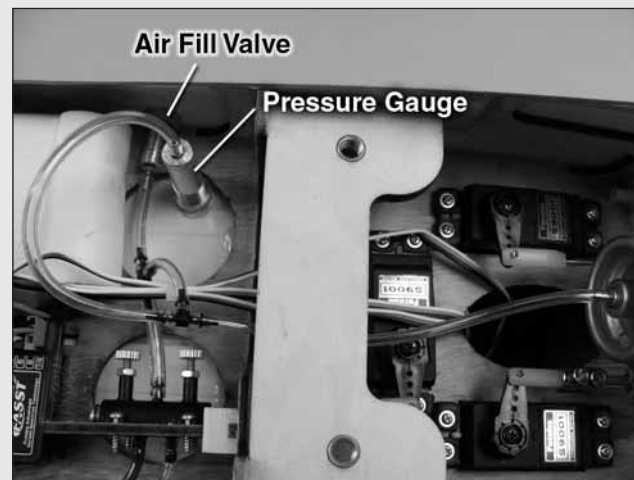
1/4" [6mm] beyond the bend. Reinstall the mount into the fuse and glue it into the slots. Connect the pushrod to the servo arm and secure it with a FasLink.



❑ 5. Temporarily fit the valve mount into the slots in the fuselage former as shown. Mark the pushrod where it crosses the outer hole of the servo arm.



❑ 6. Remove the mount from the fuselage and make a 90° bend at your mark. Cut off the excess pushrod



❑ 7. Reference the photos for installing the air lines and T-fittings. Drill a hole for the air fill valve on the side of the fuselage. Be sure to use threadlocking compound on the thumb nuts. The pressure gauge should be mounted to the cockpit floor so it can be seen through the canopy. Install quick disconnects onto the air lines that connect to the retracts.

❑ 8. Adjust the ATV on your radio so that the retract servo only travels the short distance needed to open and close the retract valve.

❑ 9. Temporarily connect the retracts to the retract valve by joining the quick disconnects. Fill the air tank by connecting a pump to the fill valve and fill the tank to 100 psi.

❑ 10. Test the operation of the retracts using your radio system. The adjustment screws on the valve control how quickly the retracts raise and lower.

(Continued from page 25)



- ❑ 5. Glue the canopy to the fuselage using canopy glue such as J&Z R/C 56 Canopy Glue (JOZR5007).



- ❑ 6. This completes the assembly process!

APPLY THE DECALS

Use the following instructions to apply the decals.

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

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

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

Refer to the pictures on the box to determine the location for the decals.

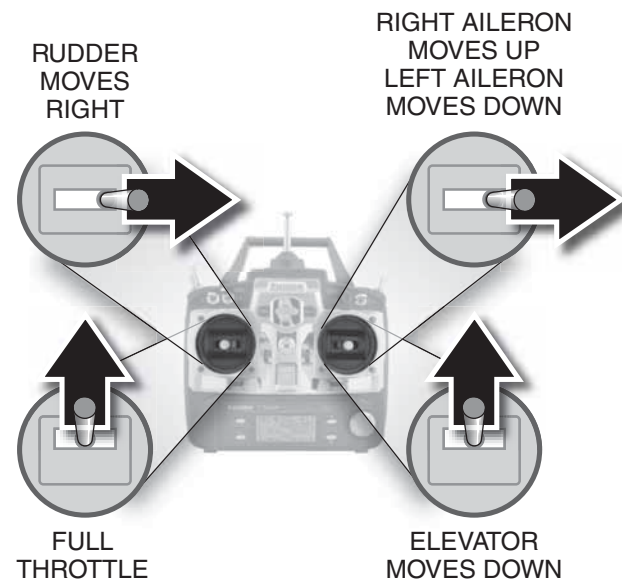
GET THE MODEL READY TO FLY

CHECK THE CONTROL DIRECTIONS

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

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

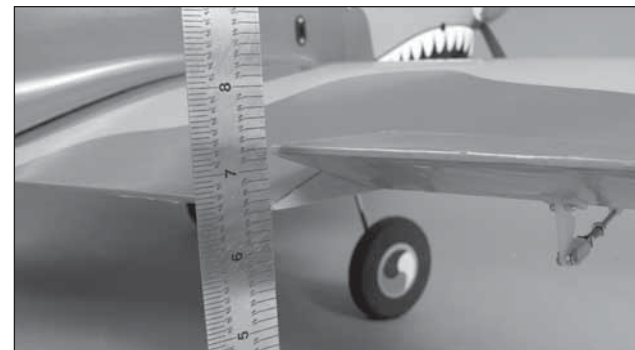
4-CHANNEL RADIO SETUP (STANDARD MODE 2)



- ❑ 3. Make certain that the control surfaces and the carburetor respond in the correct direction as shown in the diagram. If any of the controls respond in the wrong

direction, use the servo reversing in the transmitter to reverse the servos connected to those controls. Be certain the control surfaces have remained centered. Adjust if necessary.

SET THE CONTROL THROWS



Use a Great Planes AccuThrow (or a ruler) to accurately measure and set the control throw of each control surface as indicated in the chart that follows. 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	Up	Down	Up	Down
	5/8" [16mm] 11°	5/8" [16mm] 11°	7/16" [11mm] 7°	7/16" [11mm] 7°
RUDDER	Right	Left	Right	Left
	1-1/2" [38mm] 18°	1-1/2" [38mm] 18°	1" [25mm] 12°	1" [25mm] 12°
AILERONS	Up	Down	Up	Down
	5/8" [16mm] 14°	5/8" [16mm] 14°	1/2" [13mm] 12°	1/2" [13mm] 12°
FLAPS	Full Rate	1-1/2" [38mm] 32°	1/2 Rate	3/4" [19mm] 15°

IMPORTANT: The P-40 Warhawk ARF 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 P-40 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.”

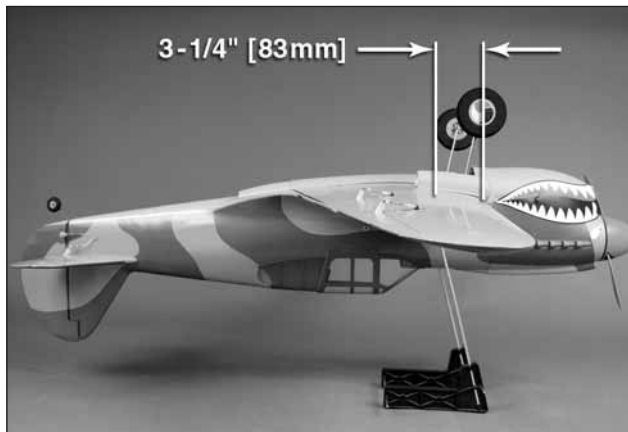
BALANCE THE MODEL (C.G.)

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, and the radio system.

❑ 1. Use a felt-tip pen or 1/8" [3mm]-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" [83mm] back from the leading edge of the wing where it meets the fuse.

This is where your model should balance for the first flights. Later, you may wish to experiment by shifting the C.G. up to 1/4" [6mm] forward or 1/4" [6mm] back to change the flying characteristics. Moving the C.G. forward may improve the smoothness and stability, but the model may then require more speed for takeoff and make it more difficult to slow for landing. Moving the C.G. aft makes the model more maneuverable, but could also cause it to become too difficult to control. In any case, **start at the recommended balance point** and do not at any time balance the model outside the specified range.



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

❑ 3. If the tail drops, the model is “tail heavy” and the battery pack and/or receiver must be shifted forward or weight must be added to the nose to balance. If the nose drops, the model is “nose heavy” and the battery pack and/or receiver must be shifted aft or weight must be added to the tail to balance. If possible, relocate the battery pack and receiver to minimize or eliminate any additional ballast required. If additional weight is required, nose weight may be easily added by using a “spinner weight” (GPMQ4645 for the 1 oz. [28g] weight, or GPMQ4646 for the 2 oz. [57g] weight). If spinner weight is not practical or is not enough, use Great Planes (GPMQ4485) “stick-on” lead. A good place to add stick-on nose weight is to the firewall (don’t attach weight to the cowl—it is not intended to support weight). Begin by placing incrementally increasing amounts of weight on the bottom of the fuse over the firewall until the model balances. Once you have determined the amount of weight required, it can be permanently attached. If required, tail weight may be added by cutting open the bottom of the fuse and gluing it permanently inside.

Note: Do not rely upon the adhesive on the back of the lead weight to permanently hold it in place. Over time, fuel and exhaust residue may soften the adhesive and

cause the weight to fall off. Use #2 sheet metal screws, RTV silicone or epoxy to permanently hold the weight in place.

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

BALANCE THE MODEL Laterally

❑ 1. With the wing level, have an assistant help you lift the model by the engine propeller shaft and the bottom of the fuse under the 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

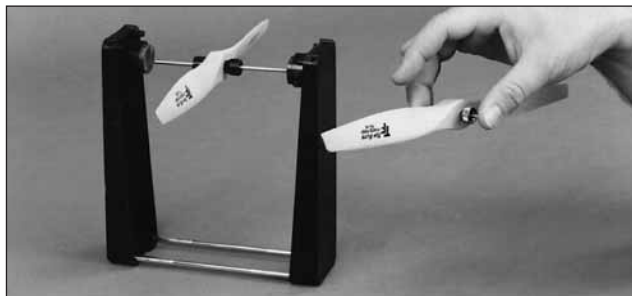
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on page 31 and place it on or inside your model.

CHARGE THE BATTERIES

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

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

BALANCE PROPELLERS



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

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

GROUND CHECK

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

are secure, the prop is secure and all pushrods and connectors are secure.

RANGE CHECK

Ground check the operational range of your radio before the first flight of the day. With the transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet away from the model and still have control (if you are using a 2.4GHz radio system, follow the range check procedure described in your radio manual). Have an assistant stand by your model and, while you work the controls, tell you what the control surfaces are doing. Repeat this test **with the engine running** at various speeds with an assistant holding the model, using hand signals to show you what is happening. If the control surfaces do not respond correctly, **do not fly!** Find and correct the problem first. Look for loose servo connections or broken wires, corroded wires on old servo connectors, poor solder joints in your battery pack or a defective cell, or a damaged receiver crystal from a previous crash.

ENGINE SAFETY PRECAUTIONS

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

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

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

Use safety glasses when starting or running engines.

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

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

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

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

Make all engine adjustments from behind the rotating propeller.

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

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

AMA SAFETY CODE (excerpts)

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

GENERAL

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

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

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

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

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

RADIO CONTROL

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

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

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

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

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

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

CHECK LIST

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

☐ 1. Fuelproof all areas exposed to fuel or exhaust residue such as the cowl mounting blocks, wing saddle area, etc.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

☐ 18. Tighten the propeller nut and spinner.

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

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

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

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

FLYING

The P-40 Warhawk ARF is a great-flying model that flies smoothly and predictably. The P-40 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 cowed engine may run at a higher temperature than an un-cowed engine. For this reason, the fuel mixture should be richened so the engine runs at about 200 rpm below peak speed. By running the

engine slightly rich, you will help prevent dead-stick landings caused by overheating.

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

TAKEOFF

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

Remember to takeoff into the wind. When you’re ready, point the model straight down the runway, hold a bit of up elevator to keep the tail on the ground to

maintain tail wheel steering, then gradually advance the throttle. As the model gains speed decrease up elevator allowing the tail to come off the ground. One of the most important things to remember with a tail dragger is to always be ready to apply **right** rudder to counteract engine torque. Gain as much speed as your runway and flying site will practically allow before gently applying up elevator, lifting the model into the air. At this moment it is likely that you will need to apply more right rudder to counteract engine torque. Be smooth on the elevator stick, allowing the model to establish a **gentle** climb to a safe altitude before turning into the traffic pattern.

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

LANDING

To initiate a landing approach, lower the throttle while on the downwind leg. Allow the nose of the model to pitch downward to gradually bleed off altitude. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. Make your final turn toward the runway (into the wind) keeping the nose down to maintain airspeed and control. Level the attitude when the model reaches the runway threshold,

modulating the throttle as necessary to maintain your glide path and airspeed. If you are going to overshoot, smoothly advance the throttle (always ready on the right rudder to counteract torque) and climb out to make another attempt. When you’re ready to make your landing flare and the model is a foot or so off the deck, smoothly increase up elevator until it gently touches down. Once the model is on the runway and has lost flying speed, hold up elevator to place the tail on the ground, regaining tail wheel control.

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

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

GOOD LUCK AND GREAT FLYING!

This model belongs to:					
	Name	Address	City, State, Zip	Phone Number	AMA Number

