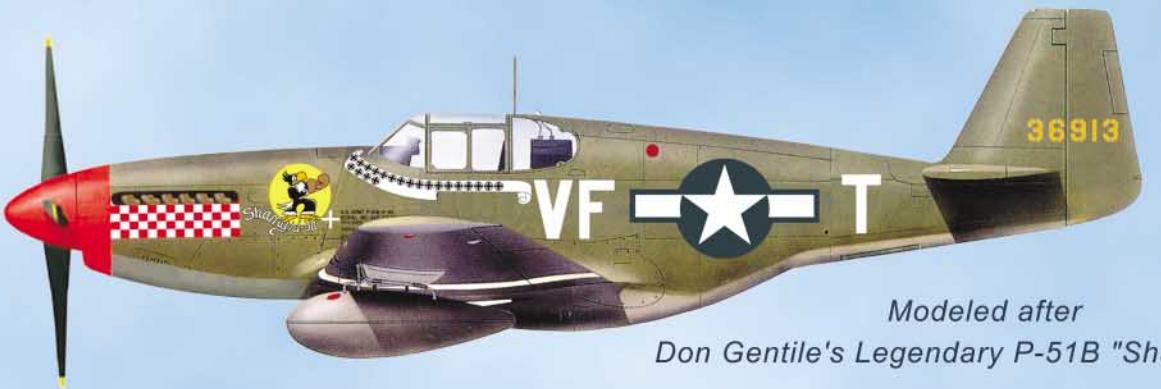
P-51B MUSTANG

ALMOST READY TO FLY

SIG

KIT NO.
SIGRC103ARF

ASSEMBLY MANUAL



Modeled after
Don Gentile's Legendary P-51B "Shangri-La"

SIG MANUFACTURING COMPANY, INC.

P-51B MUSTANG

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INTRODUCTION

Congratulations and thank you for your purchase of the SIG P-51B Mustang ARF. The unique scale appearance of this seldom seen R/C warbird will really stand out at the flying field and we predict that it will quickly become one of your favorite R/C airplanes. Smooth and effective flight controls, along with standard features like retractable landing gear and operating flaps, give this Mustang breathtaking realism in flight. It “grooves” through aerobatic maneuvers like the best sport-pattern model you've ever flown.

The SIG P-51B Mustang ARF has been engineered to get you into the air as quickly as possible with an R/C model that compares to the best scratch-built airplanes. The airframe has been expertly constructed of the finest balsa and plywood available, then professionally covered with tough SIG AEROKOTE® polyester film.

This assembly manual has been sequenced to put your Mustang together in the correct order. We urge you to read through the manual carefully before starting assembly, to familiarize yourself with the various parts and assembly sequences. We also urge you to carefully check your kit contents against the parts listing in this manual. The successful assembly and flying of this airplane is ultimately your responsibility. If you deviate from these instructions, you may wind-up with problems later on.

Last, the SIG P-51B Mustang is NOT recommended for beginning R/C pilots. If this is your first R/C model aircraft, we strongly urge you to seek the expertise and assistance of an experienced R/C modeler to help you properly assemble and fly this airplane.

Specifications	**Standard**	**Metric**
Wingspan:	66.9 in.	1700 mm
Length, inc. spinner:	55.9 in.	1420 mm
Wing Area:	770 sq. in.	49.67 dm^2
Flying Weight*:	8.0 - 8.5 lbs.	3.63 - 3.86 kg
Wing Loading:	23.9 - 25.4 oz./sq. ft.	73.1 - 77.6 g/dm^2
Scale of Model:	approx. 1 : 6.6	
SIG Kit Number:	SIGRC103ARF	

** Flying weight can vary with use of different engines, battery pack, servos, and other equipment.*

ITEMS REQUIRED TO COMPLETE THIS KIT:

- 6-channel Radio System with eight (8) servos (see **RADIO EQUIPMENT** section just ahead)
- Appropriate servo extensions and Y-harnesses (see **RADIO EQUIPMENT** section just ahead)
- 1100 mAh Receiver Battery Pack (see **RADIO EQUIPMENT** section just ahead)
- Engine (see **ENGINE SELECTION** section just ahead)
- Propeller to suit engine of choice
- Mounting Bolts, Nuts, Washers to fit your engine
  - (8-32 size in most cases)
  - 4 - Steel Socket-Head Bolts, 1-1/4” long
  - 4 - Lock Nuts
  - 4 - Flat Washers
- Fuel Tubing
- Optional Fuel Filling Valve - DuBro® #334 shown in manual
- SIG 1/4" thick Foam Rubber for receiver and battery pack
- Thread Locking Compound - such as Locktite® #242 (blue)
- SIG 30-Minute Epoxy Glue
- SIG 5-Minute Kwik-Set Epoxy Glue
- Thin, Medium, and Thick SIG CA Glue, plus CA Accelerator and Debonder
- Silicone Sealer, white or clear
- 1/6-Scale WWII Pilot - Hanger 9® #HAN8297 shown in manual
- Common Modeling Tools, including:
  - Screwdrivers
  - Pliers - Needle Nose & Flat Nose
  - Diagonal Wire Cutters
  - Small Allen Wrenches
  - Hobby Knife With Sharp #11 Blades
  - Scissors
  - Covering Iron and Trim Seal Tool
  - Masking Tape
  - Fine CA Applicator Tips
  - Paper Towels
  - Power Drill With Selection of Bits
  - Pin Vise for Small Drill Bits
  - Dremel® Tool and Bits

RADIO EQUIPMENT

We highly recommend the use of a modern programmable computer radio. Such radio systems allow you to easily set and adjust every channel and additionally program various flight functions to suit your individual style of flying.

The P-51B Mustang, with retracts and flaps, requires a 6-channel radio system to control the Ailerons, Elevators, Rudder, Throttle, Flaps, and Retracts. You will need a total of eight (8) servos - seven (7) standard servos and one (1) special retract servo.

SERVO REQUIREMENTS

Ailerons - two (2) standard servos* with 42+ in/oz of torque
Elevator - one (1) standard servos with 42+ in/oz of torque
Flaps - two (2) standard servos with 42+ in/oz of torque
Rudder - one (1) standard servos with 42+ in/oz of torque
Throttle - one (1) standard servos with 42+ in/oz of torque
Retracts - one (1) retract servo** with 90+ in/oz of torque

** We used Hi-Tec® HS-311, 322, 325, 422, & 425 standard servos in our prototype P-51Bs.*

*** We used a Hi-Tec® HS75BB Retract Servo in our prototype P-51Bs.*

SERVO CHORDS NEEDED

Ailerons - one (1) standard Y-harness chord (plugged into the rx)
two (2) 12" long servo ext.chords (located in the wing)
Elevator - one (1) 24" long servo ext.chord
Flaps - one (1) reversing Y-harness* (plugged into the rx)
Rudder - no extra chords needed
Throttle - no extra chords needed
Retracts - one (1) 12" long servo ext.chord (plugged into the rx)

** We used a Maxx Products® "Miracle-Y"*

Note: Both our reversing Y-harness and regular Y-harness were 24" long, simply because that's all we could find. If your radio manufacturer makes them 12" long, that is long enough and will make a neater installation.

RADIO Rx BATTERY PACK

Most radio systems, typically, come with a 500-600 mAh nicad receiver battery pack, which runs the receiver and the normal 4 servos. Because the P-51B carries extra servos, plus a high torque retract servo, we strongly recommend that you upgrade to a larger 1100-1200 mAh airborne battery pack in order to safe. All radio manufacturers have the larger capacity packs available for their systems.

ENGINE SELECTION

There are many R/C engines on the market suitable for the P-51B Mustang. This Mustang will perform well with any

.90 - 1.00 cu.in. (15 - 16.4 cc)
2-Stroke or 4-Stroke Glow Engine

We prefer the use of 4-stroke engines in this model simply because they fit well inside the cowling, have smaller exhaust systems (mufflers), sound great, and allow the use of larger propellers, which is beneficial in light of the P-51s large spinner. For reference, we have flown all of our prototype P-51B Mustangs with Saito .91 and Saito 1.00 4-stroke engines, mounted in the inverted position. These engines have proven to be ideal for the P-51B, both in weight and power. Even the smaller of the range, the Saito .91 provides the P-51B with excellent power and aerobatic performance. Our propeller of choice for either engine has been the APC 14-6. Other brands of 4-stroke engines (like the OS 91 4C, Magnum 91 4C) should work equally well. Engines larger than 1.00 cu.in. (even a 1.10 or 1.20 size) tend to be quite a bit heavier than a .91 or 1.00 and might cause balance problems. Engines weighing 24 oz. or less, including muffler, work best.

KIT CONTENTS INVENTORY

The following is a complete list of all parts contained in this kit. Before beginning assembly, we suggest that you take the time to inventory the parts in your kit, using the check-off boxes ❑. Note that the hinges for all the control surfaces are in place in each of these parts but are not yet glued in place. Also, note that the nuts and bolts required to mount your engine to the motor mounts are not included in this kit and must be purchased separately.

1 Bag ❑ (1) Left Wing Panel - covered with AeroKote®
(1) Left Aileron - covered with AeroKote®
(4) CA Hinges - installed in aileron but not glued
(1) Left Flap - covered with AeroKote®
(4) Point Hinges - installed in flaps but not glued
(1) Aileron Servo Hatch - installed with (4) T2.6 x 8 mm PWA Screws
(1) Flap Servo Hatch - installed with (4) T2.6 x 8 mm PWA Screws

1 Bag ❑ (1) Right Wing Panel - covered with AeroKote®
(1) Right Aileron - covered with AeroKote®
(4) CA Hinges - installed in aileron but not glued
(1) Right Flap - covered with AeroKote®
(4) Point Hinges - installed in flaps but not glued
(1) Aileron Servo Hatch - installed with (4) T2.6 x 8 mm PWA Screws
(1) Flap Servo Hatch - installed with (4) T2.6 x 8 mm PWA Screws

1 Bag ❑ (1) Vertical Fin - covered with AeroKote®
(1) Rudder - covered with AeroKote®
(4) CA Hinges - installed but not glued

1 Bag ❑ (1) Horizontal Stabilizer - covered with AeroKote®
(2) Elevators - covered with AeroKote®
(6) CA Hinges - installed but not glued
(1) Elevator Joiner Wire - installed but not glued

1 Bag ❑ (1) Fuselage - covered with AeroKote®
(1) Canopy - painted & installed with (6) T2.6 x 8 mm PWA Screws
(1) Tailwheel Hatch - covered & installed with (4) T2.6 x 8 mm PWA Screws
(1) Elevator Servo Hatch - covered & installed with (4) T2.6 x 8 mm PWA Screws
(2) 1/4-20 Blind Mounting Nuts - installed for wing bolts

1 Bag ❑ (1) Fiberglass Cowling - factory painted
(4) T2.6 x 8 mm PWA Screws

1 Bag ❑ (2) 70 mm dia. (2-3/4") Main Wheels

1 Bag ❑ Complete Tailwheel Assembly - includes:
(1) 25 mm dia. Tailwheel
(2) 2.1 mm ID Wheel Collars
(1) Steering Arm
(1) Tailwheel Wire, 2.5 mm dia.
(1) Plastic Tailwheel Bracket
(2) T3 x 10 mm P/H Screws

1 Bag ❑ (1) Complete Balsa Rudder Pushrod Assembly w/ RC Clevis & Z-bend (long)
(1) Complete Balsa Tailwheel Pushrod Assembly w/ RC Clevis & Z-bend (short)
(1) Complete Nylon Tubing Throttle Pushrod Assembly w/ (2) RC Clevis
(1) Complete Elevator Pushrod Wire Assembly w/ RC Clevis & Z-bend
(2) Complete Aileron Pushrod Wire Assembly w/ RC Clevis & Solder Clevis (long)
(2) Complete Flap Pushrod Wire Assembly w/ RC Clevis & Solder Clevis (short)
(2) Complete Retract Pushrod Wire Assembly w/ RC Clevis & Pushrod Connector

1 Bag ❑ (6) Nylon Control Horns - ail(2), flaps(2), elev(1), rud(1)
(12) T2.6 x 12 mm PWA Screws - for control horns

1 Bag ❑ (1) Molded Plastic Right Wing Fairing, painted
(1) Molded Plastic Left Wing Fairing, painted

1 Bag ❑ (2) Molded Plastic Main Wheel Cups, painted

1 Bag ❑ (1) Molded Plastic Wing Leading Edge Fairing, painted
(1) Fiberglass Air Scoop, painted

1 Bag ❑ (2) 15 mm x 54 mm fiberglass Wing Bolt Guide Tubes
(2) 1/4-20 x 1-1/2" nylon Wing Bolts
(1) Main Wing Joiner, laser-cut plywood
(1) Retract Servo Tray, laser-cut plywood
(2) Retract Servo Tray Supports, laser-cut plywood
(2) Wing Bolt Reinforcement Discs, laser-cut plywood
(1) 8 x 20 x 120 mm Balsa Stick, for fuel tank retainer

1 Bag ❑ (1) Molded Plastic Tail Fairing - painted

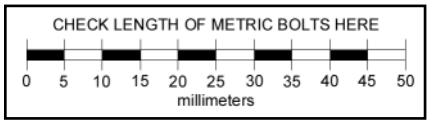
1 Bag ❑ Fuel Tank Assembly - includes:
(1) Tank, 450 cc (15.2 oz.)
(1) Fuel Pick-Up Clunk Weight
(1) Fuel Line Tubing
(1) Rubber Stopper
(3) Aluminum Tubes (40 mm, 50 mm, 60 mm long)
(1) Front Clamp
(1) Rear Clamp, threaded
(1) M3 x 20 mm Clamp Compression Bolt

1 Bag ❑ (1) Right Engine Mount
(1) Left Engine Mount
(4) 8-32 x 1-1/4" S/H Bolts
(4) 8-32 Blind Nuts
(4) 8-32 Flat Washers
(4) 8-32 Split-Ring Lock Washers

1 Bag ❑ (1) Right Landing Gear Door
(1) Left Landing Gear Door
(4) Metal LG Straps
(8) M2 Hex Nuts
(8) M2 x 5 mm F/H Bolts

1 Bag ❑ (8) Hardwood Servo Mounting Blocks
(8) T2.6 x 10 mm PWA Screws
1 Bag ❑ 4" dia. Spinner Assembly - includes:
(1) Aluminum Back Plate
(1) Plastic Spinner Cone, Red
(1) M4 x 60 mm S/H Bolt
(1) M7(1.0) Adapter Nut
(1) M8(1.25) Adapter Nut
(1) 5/16" Adapter Nut
(1) 3/8" Adapter Nut
(3) Prop Washers
1 Bag ❑ (8) T3 x 14 mm P/H Sheet Metal Screws, for retracts
❑ (1) Set Retractable Main Landing Gear
❑ (1) P-51B Decal Sheet #SIGDKM103A
❑ (1) P-51B Decal Sheet #SIGDKM103B
❑ (1) P-51B Printed Cockpit Details, Cardstock

Hardware Notes
- This kit contains both standard and metric hardware.
- Metric Screws typically have a "T" designation - i.e. *T2.6 x 20 mm PWA Screw* is a screw having a diameter of 2.6 mm and a length of 20 mm with a Phillips Washer Head.
- Metric Bolts typically have a "M" designation - i.e. *M4 x 60 mm S/H Bolt* is a bolt having a diameter of 4 mm and a length of 60 mm with a Socket-Head. The nuts and washers that go with the bolts also have a corresponding "M" designation.
- Abbreviations for head styles of bolts and screws
  PWA = Phillips Washer Head
  P/H = Phillips-Head
  S/H = Socket-Head
  S/H = Slotted-Head
  F/H = Flat-Head



COVERING MATERIAL

Your SIG P-51B Mustang ARF model has been professionally covered with SIG Aerokote® iron-on plastic covering. This high quality polyester film covering has been expertly applied, using a scale color scheme based on the legendary *"Shangri-La"* flown by WWII ace Don Gentile.

For reference, the SIG P-51B Mustang is covered with the following Aerokote® colors and part numbers:

Olive Drab #SIGSTL340
Slate Grey #SIGSTL202

Wrinkles! Some wrinkles may develop in the covering of your P-51B after you've removed the parts from their original plastic bags. If that is the case, there is no need to be alarmed. This is perfectly normal and does not mean that your model has a defect. The SIG P-51B ARF kits are built and covered in a part of the world (China), that is typically very humid. When the covered parts are removed from their plastic bags some wrinkling may occur, especially if you live in a climate drier than where it was applied. Such wrinkles are a result of the wood itself losing moisture and dimensionally shrinking slightly in the process. This is the nature of wood, especially soft wood like balsa. The airframe doesn't have to shrink much (you can't measure it with a ruler) for the covering to show a wrinkle. With over 40 years of experience with iron-on plastic covering materials, we know that any covering material - regardless of brand - that has been hand applied over wood is subject to the possibility of wrinkling.

Any wrinkles that appear in the covering are easy to remove by using normal hobby-type covering tools, such as a heat iron, a trim seal tool, and a heat gun. We suggest covering the heat iron with a thin soft cotton cloth, such as an old T-shirt, to prevent scratching the film. The iron should be set to about 250° F (121° C).

First, use the hot iron to go over all the seams and color joints in the covering, making sure they are all sealed down and well adhered. Then, use the heated iron to lightly shrink the wrinkled material - do not press on the covering - hold the iron right over the surface. After the covering is tight, you can lightly iron the material down to the wood.

You can also use a hobby-type heat gun to re-shrink the covering material, but you must be extra careful around the seams. This is because a heat gun generates a great deal of broadcast type heat that in turn can loosen the seams, often causing the seams to "creep". If you must use a heat gun around or near seams, we suggest that you protect the seams from the heat by soaking a few paper towels in cool tap water and arrange the wet towels directly onto and over the seams. You can then use your heat gun to carefully shrink the neighboring areas. The wet strips cool the seam while the covering immediately next to it shrinks.

Note that the temperatures required to shrink and seal Aerokote® (about 250° F) are high enough to melt and/or distort plastic parts. Exercise common sense when working with heat around the plastic parts on your P-51B.

Also, to avoid unnecessary dents, dings, or scuffing of your airplane parts, we suggest that you cover your workbench with a soft household blanket or foam sheet while working on your model.

HINGING THE AILERONS AND FLAPS

❑ 1) As received in the kit, both wing panels have the ailerons and flaps temporarily hinged in place. Be aware that the hinges are NOT GLUED in place! You will permanently hinge the ailerons and flaps to the wing shortly. For now, remove the ailerons and flaps from the wing panels, pulling out all of the hinges and setting them aside until called for.

❑ 2) Make sure all the edges of the Aerokote® covering are sealed down tight to the model structure. Then, re-tighten the covering if needed. See previous section on **COVERING MATERIAL**.

❑ 3) Fuel proof the leading edge dowels and the inside of the wing bolt holes by soaking them with a coat of Thin CA. Avoid getting a visible large build-up of glue - use only enough CA to soak into the wood and disappear.

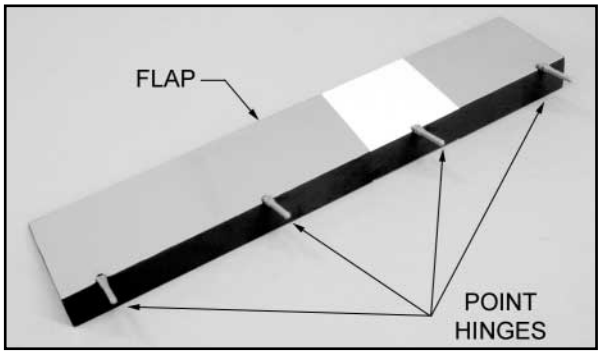
❑ 4) Hinge the flaps first. We recommend using epoxy glue for this job - either the 30-minute or 5-minute variety - it's your choice. Just remember when using 5-minute epoxy to keep the job size small enough to allow you to get done before the glue dries. We've had no problem using 5-minute epoxy for this step, but if you don't want to feel rushed, you should use the slower drying variety.

a) Use a toothpick or sharpened dowel to apply a small amount of Vasoline® to the center pivot point of each point hinge - do not get Vasoline® on the outer arms of the hinges. The Vasoline® protects the hinge pivot point from the epoxy glue.

b) Working on one flap at a time, mix up a small batch of epoxy and use a toothpick, wire, or sharpened dowel to apply a thin coat of glue inside each of the four pre-drilled holes in the flap. Also, apply a thin coat of glue to the outer arms of the four hinges - one half only. Quickly push the hinges in place in the holes. Make sure the pivot pin of each hinge is in line with the leading edge of the flap. Wipe off any excess glue that oozes out of the hole, using

a rag soaked in rubbing alcohol. Monitor the position of the hinges as the glue dries, making sure they stay properly aligned.

c) Repeat the process to glue four hinges in the other flap.



NOTE: Keep in mind that it's not necessary to use a lot of glue when installing point type hinges. The outer arms of the hinges have many grooves and ledges that do a wonderful job of capturing the glue and securing the hinges in place. Only a thin coat of glue inside the holes and a thin coat on the hinge arms (just fill the grooves) is all that is needed. Too much glue will make a big mess as it oozes out of the hole and gets into the hinge's pivot joint.

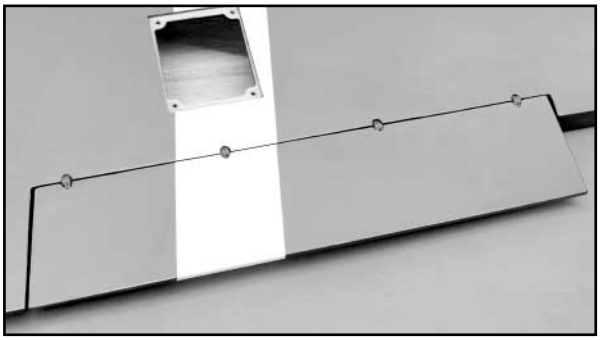
❑ 5) The flaps are now hinged to their appropriate wing panels.

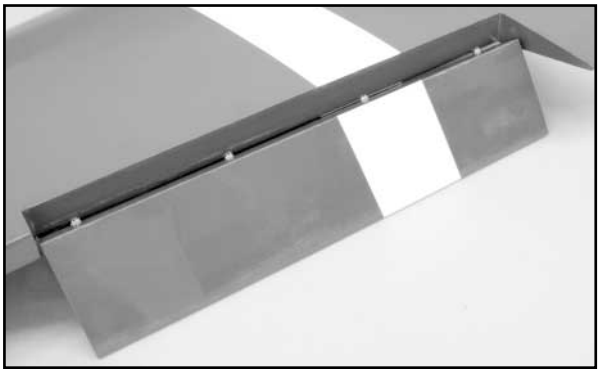
a) First, trial fit the flap in position to make sure that it lines up with the top and bottom surfaces of the wing panel. Make adjustments in the mounting holes in the wing as needed to achieve a good fit.

b) Again, mix a small batch of epoxy glue and apply a thin coat inside the holes and to the hinge arms. Insert the four hinge arms into the holes in the wing panel and slide the flap into position. Check to see if any excess glue has oozed out of the hole on either side of the hinge. If so, wipe off any excess glue with a rag soaked in rubbing alcohol. Use pieces of tape to hold the flap in correct position while the glue dries.

c) Repeat this procedure to attach the remaining flap to the opposite wing panel.

d) After the epoxy dries, flex each flap repeatedly to free up their movement.

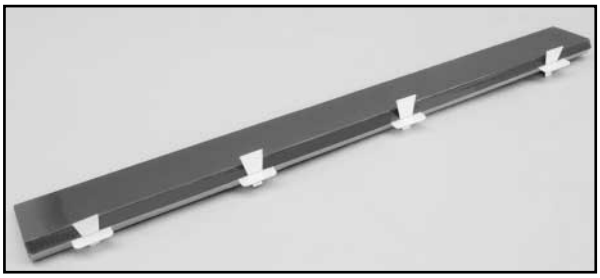




❑ 6) The ailerons are now hinged in place to each wing panel. The supplied hinges for the ailerons are the CA type and should only be glued with Thin CA. Note that the installation proceedure for these CA hinges is the same for the CA hinges in the elevators and rudder. Consequently the following step-by-step instructions for gluing CA hinges will not be repeated later in the book when those surfaces are hinged. You can refer back to this section at that time.

a) The CA hinges supplied have a die-cut center slot that can be used to accurately place and center the hinges equally into both the wing panel and the aileron. To do this, use a business card and pair of scissors to cut four "wedges". These should be cut wide enough at the top so as to not pass through the slot in the center of the hinge.

b) Working on one aileron at a time, insert four CA hinges into the pre-cut slots in the leading edge of the aileron. Push the hinges in halfway, up to the die-cut center slot. Place a card "wedge" into each of the hinge slots.



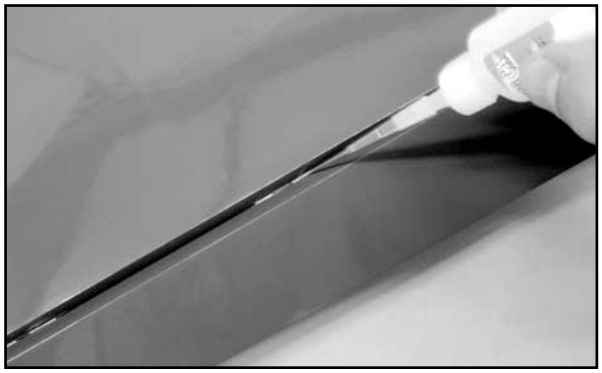
❑ 7) Carefully push the exposed side of the four CA hinges into the slots in the back of the wing, right up to the card wedges. Make sure that the aileron is in its correct position, with a reasonable clearance between the aileron and the flap, and between the aileron and the wingtip. If everything checks out, proceed with gluing the hinges permanently in place.

a) Begin the gluing by flexing the aileron downward, exposing the hinges between the wing panel and the aileron. Then, remove the card wedge from the first hinge and apply 3 or 4 small drops of glue directly onto the exposed sections of the hinge. You will notice that the glue is quickly wicked into the slot as it penetrates both the wood and the hinge.

Note: For CA hinges, we always recommend using a fine-tip applicator on your CA glue bottle, to better control the flow. Also, if you get some glue smears on the plastic covering, don't worry about them right now. Once the glue has had a chance to dry, you can clean the glue smears off the covering with CA Debonder.

b) Remove the card wedge from the next hinge and again, apply 3 or 4 small drops of glue to the exposed portion of the hinge. Repeat this process to glue the remaining hinges.

c) Turn the wing panel over and flex the aileron in the opposite direction. Repeat the gluing process on all four hinges. Return the aileron to its centered position and let dry.



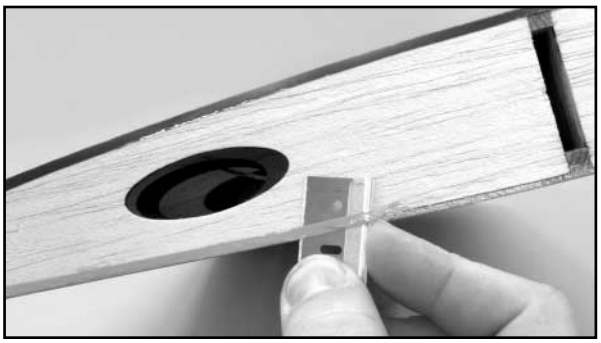
d) Wait at least 15 minutes for the glue to fully "wick" its way through the hinge surface and the surrounding wood, before flexing the aileron. After sufficient time has passed, flex the aileron up and down several times. At first, you might notice a little stiffness in the joint. This will go away after the hinges have been flexed back and forth a few times. Also, pull on the aileron at each hinge location to make sure all the hinges are securely in place. Repeat this process to attach the other aileron to the other wing.

WARNING: The CA hinges provided in this kit are made of a special absorbant material that can only be glued with Thin CA adhesive. Thin CA (any brand) is the only type of glue that can be used on these hinges - do not use epoxy or any other type of glue! Also, never use CA Accelerator on CA hinges!

It's critical that you only make one application of glue to each side of a CA hinge! If you apply additional glue after the first application of glue is dry, the second application of glue will merely puddle in the hinge gap and make the hinge too stiff to operate. The excess glue could also weaken the hinge! When properly glued, the part of the hinge that you can see in the hinge gap should have a dry appearance, not wet. A dry appearance indicates that almost all of the glue has properly soaked into the hinge slot. A wet appearance indicates that excess glue is puddled in the hinge gap. Three to four drops of Thin CA is the right amount.

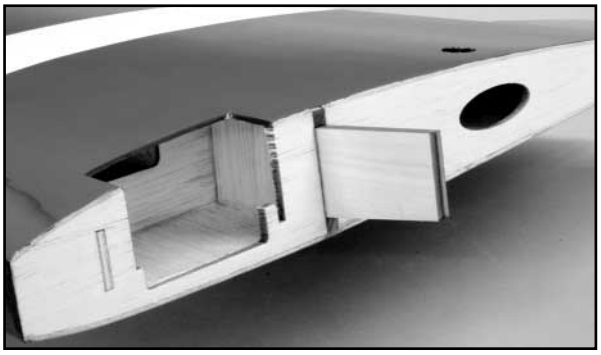
JOINING THE WING PANELS

❑ 1) Start by trimming and/or sanding the overlapped edges of the Aerokote® covering material off of the center rib of both wing panels. This will allow a maximum bond between the wing panels.



❑ 2) Next, trial fit both wing panels onto the Plywood Wing Joiner. Check to see that the wing panels fit together in proper alignment and that both root ribs come into firm contact with each other. If the Hardwood Wing Joiner requires a little trimming to achieve this fit, do so now. When satisfied with the fit, take back apart and proceed to the next step.

❑ 3) Use 5-minute epoxy to glue the wing joiner into one wing panel. Be sure to use plenty of glue! Wipe off any excess glue that oozes out of the joint with an alcohol soaked rag or paper towel. Let dry.



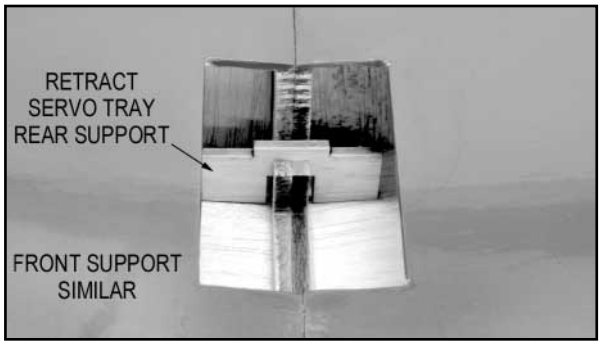
❑ 4) For gluing the two wing panels together, we recommend that you use slow drying epoxy glue so you will have plenty of time to get them properly aligned and cleaned up.

Mix a batch of epoxy large enough to cover both center ribs and the exposed wing joiner. Apply the glue generously to both center ribs, work some glue into the open joiner slot, and coat the exposed end of the joiner itself. Then, carefully slide the wing panels together, inserting the wing joiner into the slot. Push the panels tightly together. Wipe away any excess epoxy that oozes from the joint with a rag or paper towel dampened with rubbing alcohol. Carefully line up the center ribs, making sure that the leading and trailing edges of the two wing panels are perfectly aligned. Make sure the center joint stays tightly together until the glue dries. Use tape and pins to hold end ribs securely in alignment during the drying period.

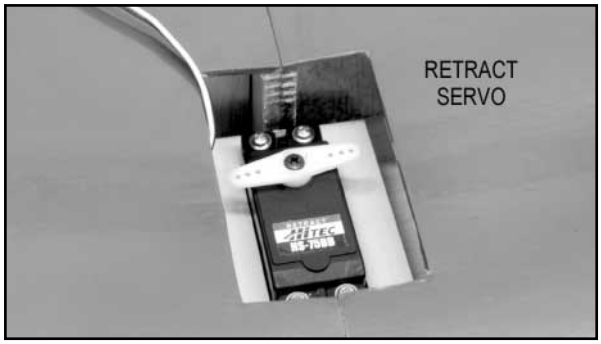
NOTE: It's very important to use plenty of epoxy when gluing the wing panels together. The strength of your wing joint depends on it! Don't worry if the excess glue oozes out and gets on the covering material. With slow-drying epoxy, you will have plenty of time to clean up all the glue smears with a rag soaked in rubbing alcohol. Also, if possible get someone to help you with this procedure. An extra set of hands makes the job much easier! While one person is holding the wing panels tightly together, the other person can wipe off the excess glue.

MOUNTING SERVOS IN THE WING

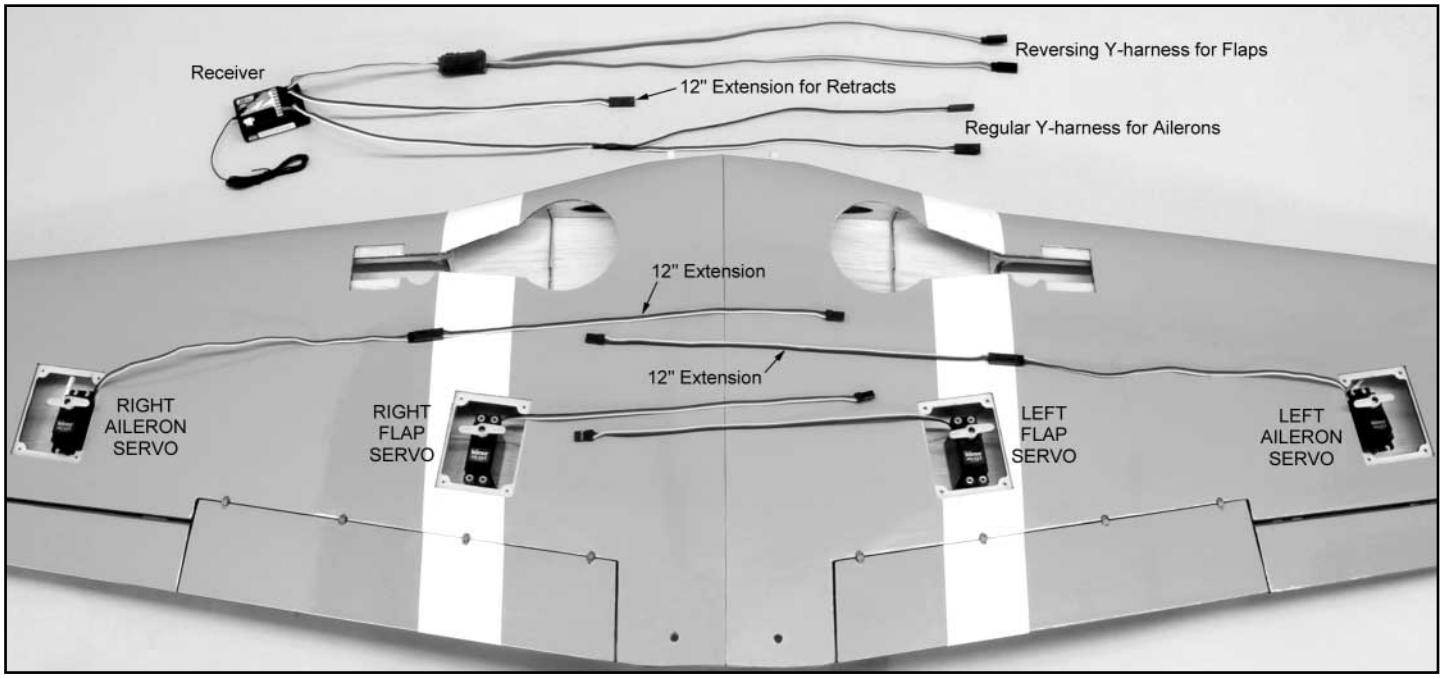
❑ 1) Locate the laser-cut plywood Retract Servo Tray and two Retract Servo Tray Supports. Glue one of the supports in place at the front of the retract servo opening and one at the rear, as shown in the picture.



When dry, glue the plywood servo tray in place on top of the supports. Let that dry. Then, you can install your retract servo in the tray using the screws provided with the servo.



❑ 2) In preparation for installing the aileron and flap servos, gather all four servos and the required chords. Lay them out on the wing to make sure you have all the necessary parts and understand how they connect together. The large picture on the next page shows the combination that worked in our prototypes.



AILERON, FLAP, AND RETRACT RADIO EQUIPMENT

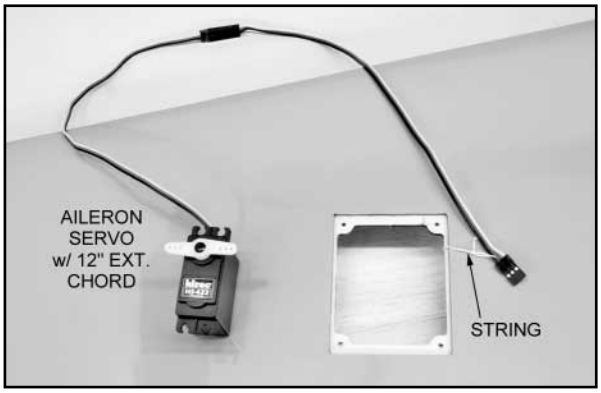
AILERONS: Both aileron servos need a 12" extension chord in order to exit at the top center of the wing. A regular Y-harness stays plugged into the receiver for the ailerons. When the wing is put on the airplane, the extension chords are plugged into the Y-harness.

FLAPS: The wires on your two flap servos will usually be long enough to exit the top of the wing at the center section - no additional chords should be needed in the wing for the flaps. A reversing Y-harness stays plugged into the receiver for the flaps.

RETRACTS: For the retract servo all that is needed is a 12" servo extension chord that stays plugged into the receiver.

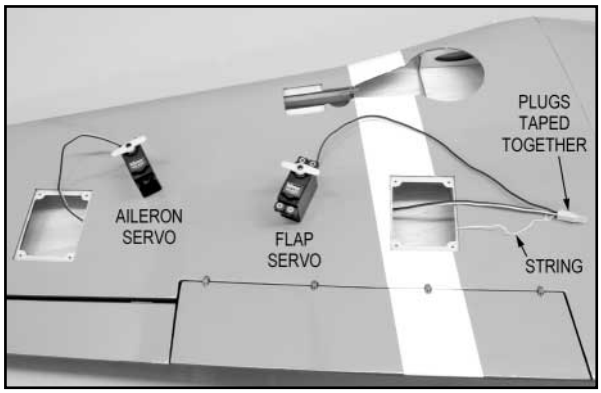
❑ 3) Attach a 12" long servo extension chord onto the end of each aileron servo wire. Wrap the connection with a piece of plastic tape to insure that it won't come unplugged in flight. Install mounting grommets and eyelets in the servos, according to your servo manufacturer's instructions.

❑ 4) Inside the aileron servo bay opening, you will find a short length of wood with a string tied to it. The string will be used to pull the aileron servo wire through the wing panel to the center of the wing. Gently break the wood piece loose from the wing structure. Pull it and the string a few inches out of the servo bay opening. Remove the wood from the string and discard it. Tie the end of the string securely to the end of the servo wire, as shown.



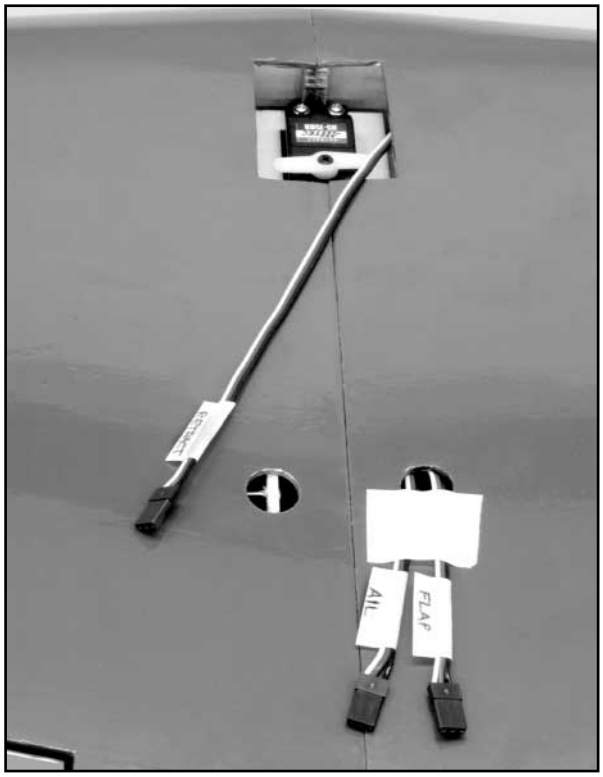
On the top of each wing panel, just inboard of the center rib, you will find a round hole in the wing sheeting. This is the exit hole for the aileron and flap servo wires. Inside this opening, you will see another small piece of wood with a string tied to it. This is the other end of the string that you tied to the aileron servo wire. Break the wood piece loose and begin carefully pulling the string and aileron chord through the wing towards the center.

When the aileron servo plug appears in the open flap servo bay, stop and tape the flap servo plug flat against the aileron servo plug. Then, resume gently pulling both plugs towards the center of the wing.



You may occasionally feel like the wire has become stuck inside the wing. This is simply the plug on the end of the servo wire hitting the side of the holes in the wing ribs. Gently work the string back and forth from both ends until the plug fits through the hole. Sometimes the servo plug comes through all the ribs the first time without getting hung up, and other times it seems like it gets hung up on every rib. Be patient and don't try to force it. The holes in the ribs are large enough to get any common servo plug through.

When the servo plugs become visible in the round hole, reach in with a narrow needle nose pliers or a hemostat and grasp the plugs and pull them through the hole to the outside of the wing. Temporarily tape the plugs to the wing surface so they can't fall back inside the wing. Then, untape the plugs and cut away the string. Put identification tags on each plug -- FLAP or AILERON -- so you can tell them apart.

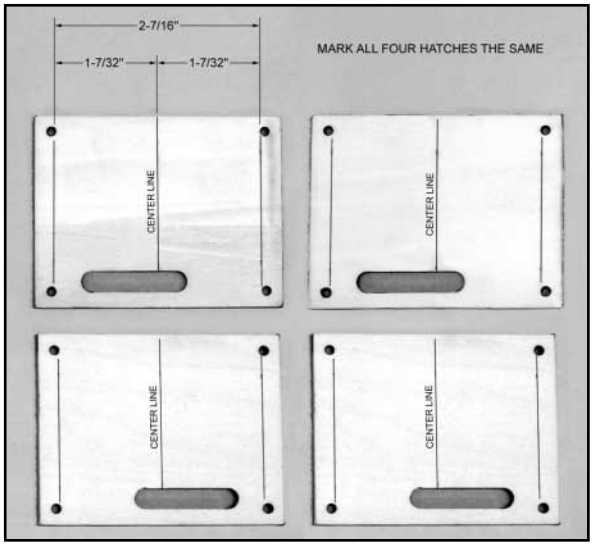


Repeat this step to pass the aileron and flap servo wires through the opposite wing panel.

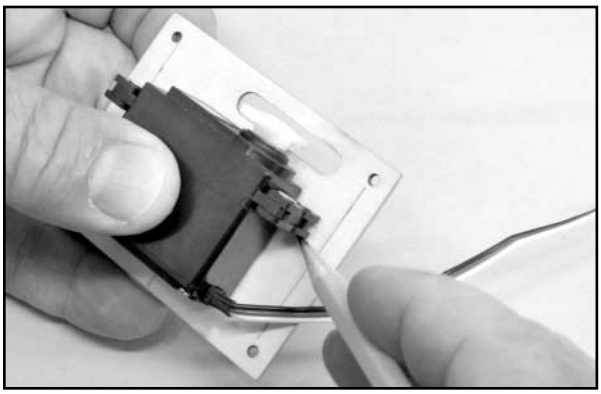
❑ 5) The aileron and flap servos will be mounted to the back uncovered sides of their respective servo hatches. Notice that all four hatches are the same outer dimensions, and thus, share these common steps.

a) To prepare the two Aileron Hatches and two Flap Hatches for servo mounting, first, use a ruler and sharp pencil to find the center of each hatch. Draw a center line all the way across each hatch, as shown.

b) Then, draw two parallel lines, one on each side of the center line, exactly 1-7/32" away from the center line. The total distance between the two outer parallel lines should be 2-7/16". These lines represent the outer location limits for the two Hardwood Servo Mounting Blocks, which will be mounted onto each hatch.

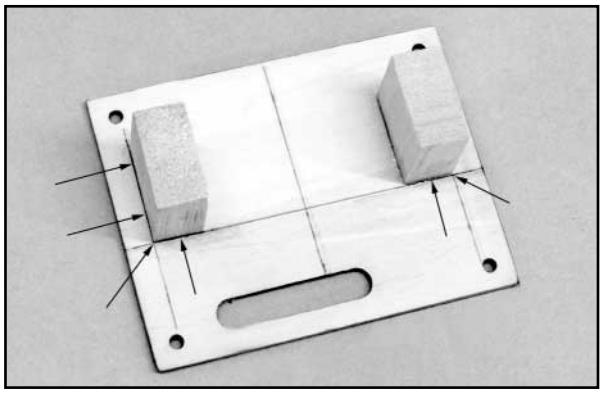


c) To determine exactly where to mount the blocks in the other dimension, hold one of your servos up against the back side of the hatch, with the servo arm centered in the pre-cut slot in the hatch. Mark the bottom of the servo gromments onto the hatch. Then, draw a pencil line across the hatch at this distance, perpendicular to the other drawn lines.

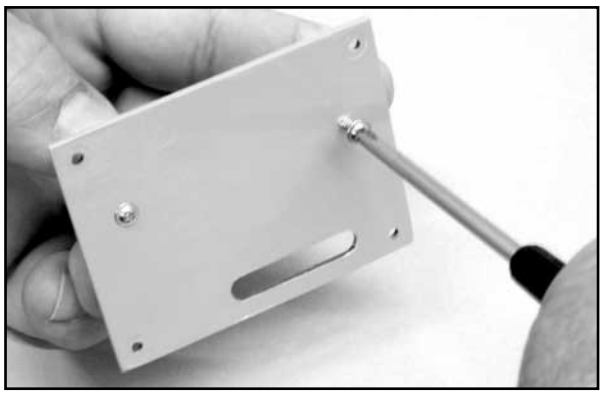


Note: Since your aileron and flap servos are already in the wing, use one of your other servos (elevator, rudder, or throttle) of the same size for this step.

d) Use Medium CA or epoxy to glue two Hardwood Servo Mounting Blocks in position on the hatch, right up against the lines you drew on the hatch, as shown. Let dry.



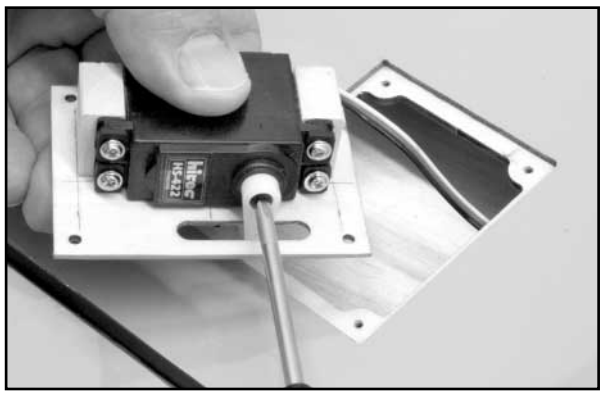
e) In the same bag that contained the Hardwood Servo Mounting Blocks, there are eight T2.6 x 10 mm PWA Screws. These screws are to be used to reinforce the mounting of the blocks to the hatch. Use a ruler to find the center of each block and mark it on the covered side of the hatch. Drill a 1/16" dia. pilot hole at the mark - about 1/4" deep - through the hatch and into the mounting block. Install a T2.6 x 10 mm PWA Screw in the hole. Repeat for the other mounting block on the hatch.



f) Now, you can mount your servo to the hatch. Be sure to drill pilot holes in the mounting blocks before screwing the servo in place, using the screws that came with the servo.

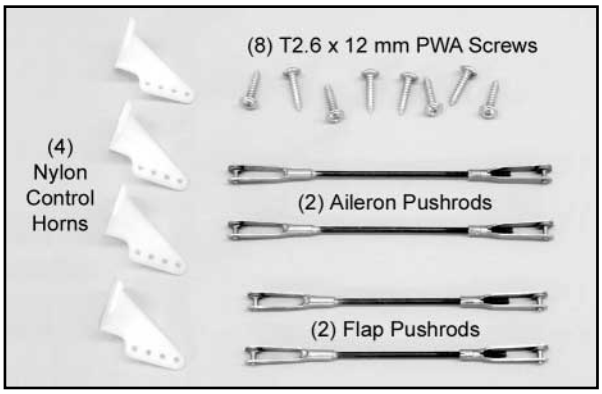
g) Use your radio system to center the servo and check servo travel. Install the servo arm. Check to see that the arm does not bind on the slot in the hatch at extremes of travel.

Note: If you have a double-sided servo arm, cut off the side of the arm that you won't be using so that it cannot bind on the top wing sheeting when the hatch/servo are installed in the wing.



h) Repeat steps a) through g) to mount the other aileron and flap servos to their hatches.

❑ 6) From the kit contents, locate (4) Nylon Control Horns, (8) T2.6 x 12 mm PWA Screws for mounting the control horns, (2) Complete Aileron Pushrods, and (2) Complete Flap Pushrods.



❑ 7) **AILERON HOOKUP**: For this step you need to plug the two aileron servo leads into the dual leads of a standard Y-harness. Install the single end of the Y-harness into the aileron slot in the receiver. Turn on the radio system and center the aileron trim lever on the transmitter. Check to see if the aileron servo arms are both perfectly centered on each servo -- the arms need to be perpendicular to the servo body when the servo is at neutral. If necessary, take the servo arm off the servo and reposition to make it perpendicular. Next, move the aileron transmitter stick to test for correct direction of travel and full motion of the servos. Note that the aileron servos should be moving in opposite directions to each other.

a) Notice that Aileron Pushrods have an adjustable clevis on one end and a non-adjustable clevis on the other. Connect the non-adjustable end of the Aileron Pushrod into the outermost hole of the aileron servo arm. (Note: If the clevis pin is hard to snap into the hole in the servo arm, open up the hole with a 1/16" drill bit.)

b) Install a Nylon Control Horn on the adjustable clevis end of the pushrod, using the top or outermost hole in the horn.

c) Hold the control horn in place at the leading edge of the aileron hinge line. Thread the adjustable clevis in or out to allow the base of the control horn to rest flat on the surface of the aileron with its front edge right at the hinge line. Move the control horn right or left as needed to position it in line with the servo arm. Hold the horn in this position and use a pencil or sharp awl to mark the mounting hole locations for the control horn onto the flap surface.

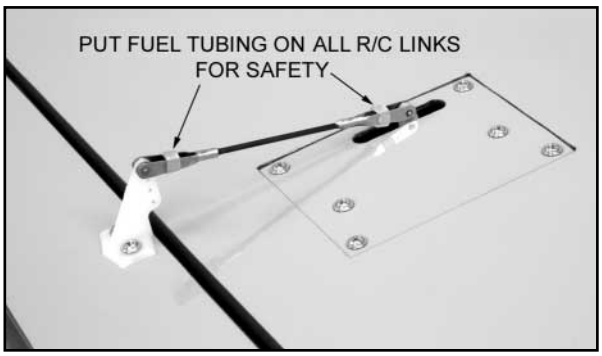
d) Drill a 3/64" dia. (or #56) pilot hole into the aileron at both marked locations. Be careful not to drill completely through the aileron! Mount the control horn in place using two T2.6 x 12 mm PWA Screws.

e) Repeat this process for the second aileron.

IMPORTANT: After mounting the control horns for the first time, take them back off and put a few drops of Thin CA into each of the screw holes in the aileron. The Thin CA will soak into the threads in the wood, and when it dries, the holding power of the threads will be much stronger. Use Thin CA only, not medium or thick CA. Let the Thin CA dry completely before remounting the control horns onto the ailerons.

❑ 8) Turn on your radio system and double check the movement of the ailerons. If there is any binding, find the cause and correct it now. Then, refer ahead in this manual to the section titled **CONTROL MOVEMENTS** to read the recommended travel amount for the ailerons. Use the EPA (End Point Adjustment) feature of your transmitter to yield the recommended amount of aileron travel.

SAFETY ISSUE: After centering the servos and setting the control throws, "safety" each R/C clevis by slipping a short length of fuel tubing (not supplied) over the clevis, as shown in many of the photos. This will prevent the clevis from opening up and becoming disconnected from either the control horns or the servo arms.



❑ 9) **FLAP HOOKUP**: Unlike the ailerons, the flap servos both need to travel in the same direction. The easiest and most convenient method to achieve mirror image movement of the flap servos is by using a Reversing Y-harness. Many radio manufacturers make them for their systems. If your radio manufacturer does not make a reversing Y-harness, the option is to purchase an aftermarket Reversing Y-harness like the Maxx Products® "Miracle Y".

a) Plug the two flap servo leads into the dual leads of the Reversing Y-harness, and then plug the single end of the Y-harness into the receiver channel you are using for the flaps.*

**Note: Which channel to use for flaps? Some transmitters have toggle switches to activate the flap channel. These are typically two or three position switches that give one or two pre-set flap angles upon activation. While this works fine in many cases, we much prefer a rheostat type knob that allows us to roll in as much or as little flap input as needed for the wind conditions during any given flight. Check your radio manual to figure out the best way to operate the flaps on your P-51B Mustang.*

b) Make sure your transmitter's flap control (knob or switch) is set to the "flap up" position, and then, turn on the radio system. The correct position for both flap servo arms when in the flap up

position is for the arms to be angled back towards the wing trailing edge approximately 45°. Reposition your flap servo arms, as necessary, to get them in this position. Now, when the transmitter is set to the "down flap" position, the servo arms should both pull towards the wing leading edge. If your down flap motion moves the servo arms towards the flaps instead of towards the wing leading edge, then, you need to reverse the direction of the flap channel in your transmitter. Activate the transmitter flap control several times to make sure the flap servo arms are in the correct position and the flap servos are both traveling together in the right direction. If all is correct, put the flaps servos in the full up position (servo arms 45° towards the trailing edge) and turn the radio off.

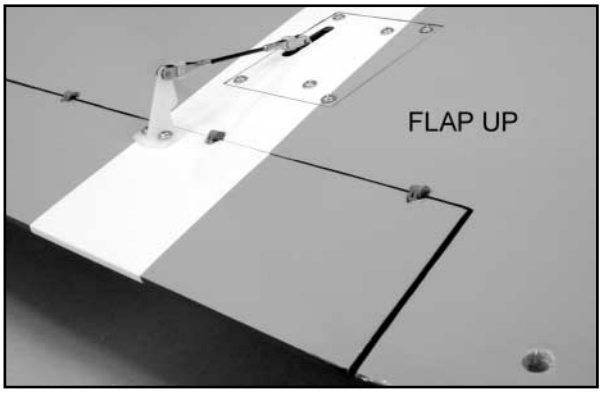
c) Locate the two Flap Pushrods. Connect the non-adjustable clevis of the pushrod into the outermost hole of the flap servo arm.

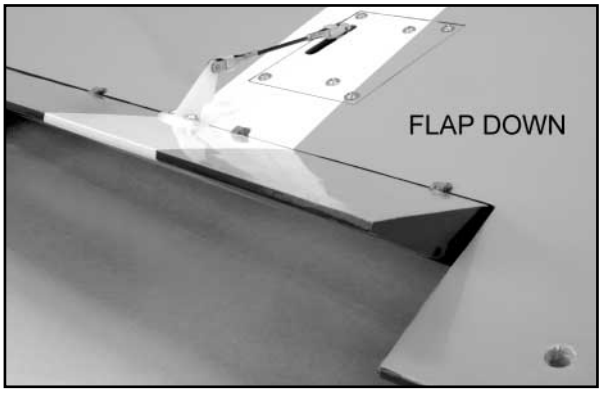
d) Install a Nylon Control Horn on the adjustable clevis end of the pushrod, using the top or outermost hole in the horn.

e) Hold the control horn in place at the leading edge of the flap hinge line. Thread the adjustable clevis in or out to allow the base of the control horn to rest flat on the surface of the flap with its front edge right at the hinge line. Move the control horn right or left as needed to position it in line with the servo arm. Hold the horn in this position and use a pencil or sharp awl to mark the mounting hole locations for the control horn onto the flap surface.

f) Drill 3/64" dia. (or #56) pilot holes in the flap at both marked locations. Be careful not to drill completely through the flap! Mount the control horn in place with two T2.6 x 12 mm PWA Screws.

g) Repeat this process for the second flap.





❑ 10) Turn on your radio system and double check the movement of the flaps. If there is any binding, find the cause and correct it now. Then, refer ahead in this manual to the section titled **CONTROL MOVEMENTS** to read the recommended travel amount for the flaps. Use the EPA (End Point Adjustment) feature of your transmitter to yield the recommended amount of flap travel.

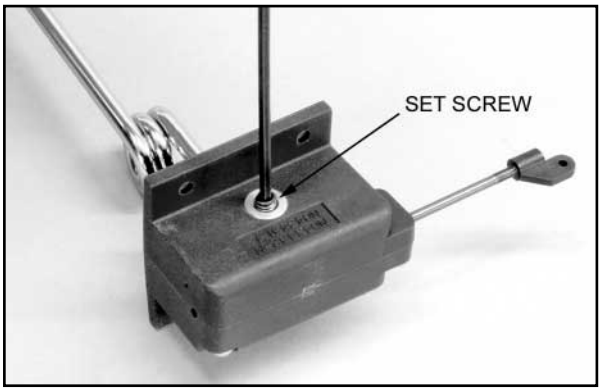
INSTALLING RETRACT LANDING GEAR

As mentioned in the opening paragraphs of this manual, you will need a high torque retract servo to actuate the retractable landing gear units, included in this kit. Most radio manufacturers make retract servos for their radio systems. Make sure the servo you select has 90 or more in/oz of torque*.

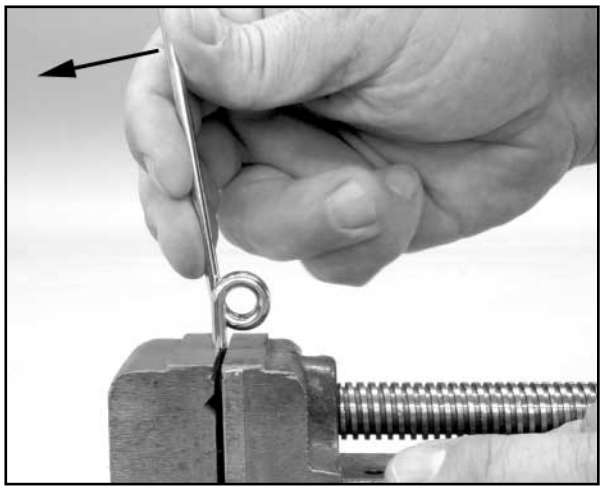
** We used a Hi-Tec® HS75BB Retract Servo in our prototype Mustangs, as shown in this manual.*

❑ 1) The EZ Retract units furnished in this kit come with a universal style wire landing gear leg, that must be adapted to fit each specific airplane. Work on one retract unit at a time to avoid getting the right and left gear legs mixed up.

a) First, remove the landing gear leg from the left retract unit. Note that the wire leg is held into the unit with a socket-head set screw. Use a 2 mm hex driver or allen wrench to loosen the set screw and back it almost all the way out. Then, pull the wire out of the retract unit.



b) Put the short end of the wire landing gear in a vice and then, bend the long leg forward (away from the coil) slightly until it matches the full-size pattern shown on page 26.

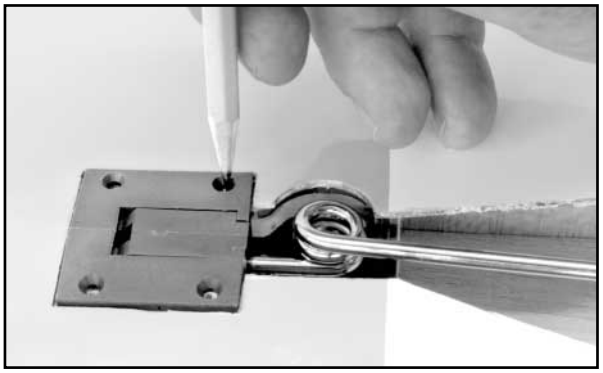


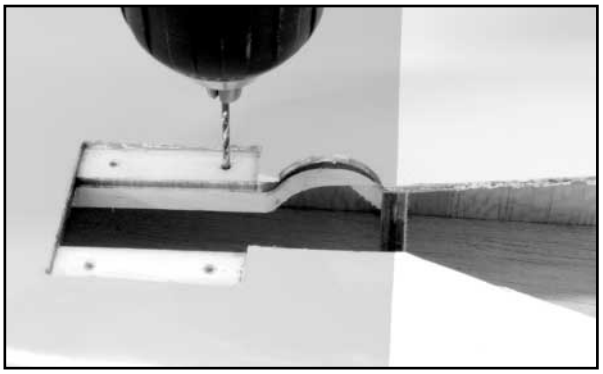
c) While you have the wire on the full-size pattern, use a felt-tip pen to mark the wire for shortening of the long leg, as indicated on the drawing. Then, cut the wire off at the mark. Clean up the cut end of the wire, removing any burrs.

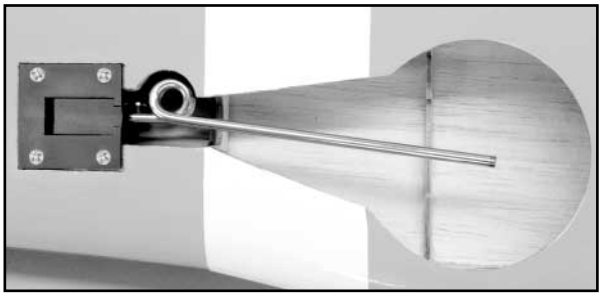
d) Re-insert the altered wire leg back into the retract unit. Note that the wire has a flat spot where the set screw engages it. Be sure to rotate the flat spot to the set screw side. Before re-installing the set screw, put one drop of Locktite® thread locker into the set screw hole, and then, re-install the set screw. Tighten securely.

e) Set the retract unit in place in the wing. Mark the four

mounting hole locations onto the plywood mount. Set the retract unit aside and drill 1/16" dia. pilot holes at the four locations. Screw the retract unit in place with four T3 x 14 mm P/H Sheet Metal Screws.





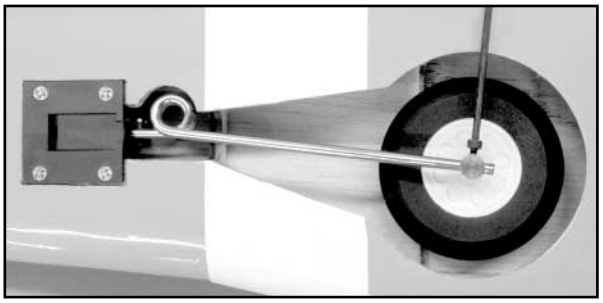


f) Repeat steps a) through e) for the right retract unit.

❑ 2) Back to the left retract unit:

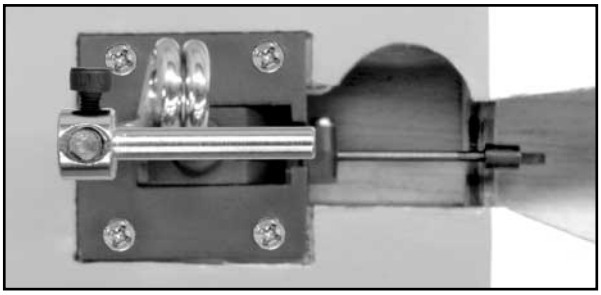
a) Locate the axle and install the socket-head set screw part way in.

b) Set one of the main wheels in the wheel well. Install the axle onto the wire gear leg and into the wheel at the same time. Center the wheel in the wheel well, and then, tighten the set screw with a 2.5 mm hex driver or allen wrench -- don't overtighten the set screw at this point -- just snug enough to hold the axle from coming off.



Note: If the wheel is too tight on the axle to rotate freely, drill out the hole in the wheel with a 4 mm or #20 drill bit.

c) Open the retract unit to fully extend the landing gear leg. Look straight down the gear leg to see if the axle is oriented perfectly square with the base of retract unit. It should be very close. If it is off a little bit, grab hold of the axle and twist it into alignment.



d) Temporarily remove the entire retract unit from the wing. Use a felt-tip pen to mark the location of the axle boss on the landing gear wire. Also, mark the side of the leg where the set screw is engaging the wire -- this mark will be used as a guide for grinding a flat spot on the wire in the next step.

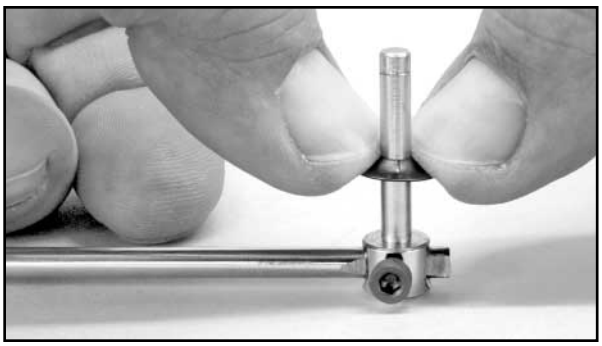
e) Temporarily remove the axle from the landing gear leg. Carefully grind a flat spot on the gear leg where the set screw engages. Put the axle back on the gear leg and double check to see that the axle stays in correct alignment with the retract unit when the set screw is tightened. If not, regrind the flat spot slightly to correct the angle.

f) Once the flat spot is satisfactory, permanently re-install the axle onto the gear leg, using Locktite® thread locker in the joint and on the set screw to keep them secure in flight.

g) Repeat steps a) through f) for the right retract unit.

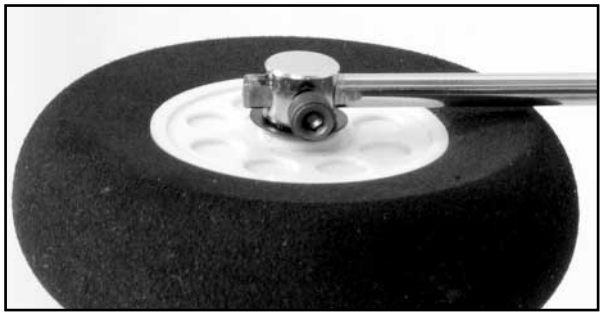
❑ 3) Four stamped metal retainer washers are provided for mounting the main wheels on the axles. (They may not look like your favorite wheel collars, but they really do work. Once installed, they won't come off!)

a) Lay one of the retracts on a sturdy bench with the axle boss resting flat on the bench and the axle itself pointing straight up in the air. Push one of the wheel retainer washers onto the axle, with the domed side oriented as shown. It takes a hard push to get the washer started onto the axle. We do it by pushing firmly down on the washer using a thumb on each side. Push it all the way down against the axle boss -- this washer acts as a spacer to keep the wheel from rubbing against the gear leg.

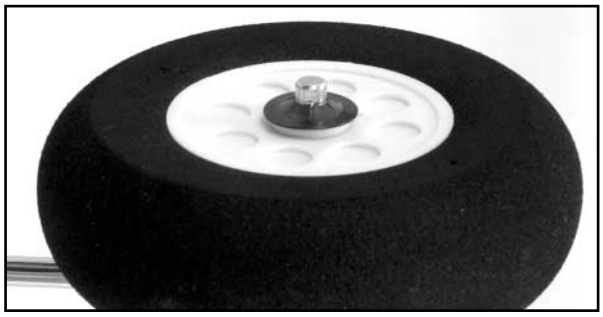


Note: If you have a problem pushing the washer on the axle by hand with your thumbs, find a scrap piece of 1/4" thick plywood or other hardwood and drill a 3/8" dia. hole completely through it. Center the hole over the washer as it rests on the end of the axle. Then, have an assistant give the wood a tap with a hammer to get the washer started. Enlist a helper -- an extra set of hands makes the job a lot easier.

b) After you have the first washer in place up against the axle boss, slide the wheel onto the axle.



c) Then, put a final retainer washer on to hold the wheel in place. Be careful not to push this last retainer washer on too far, which could cause the wheel to bind and not rotate freely.



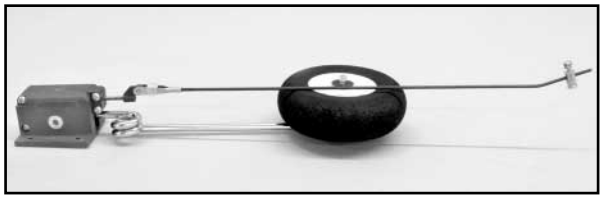
Note: A good way to insure that the wheel will turn freely when you are done is to put a piece of thin cardboard or plywood between the wheel and the top washer while you push the washer in place. After it is in place, remove the cardboard.

❑ 4) Locate the two complete retract pushrods. They have an adjustable clevis on one end and a pushrod connector on the other end.

a) Loosen the set screws of both pushrod connectors and slide the connectors off the wires. Set them aside for now.

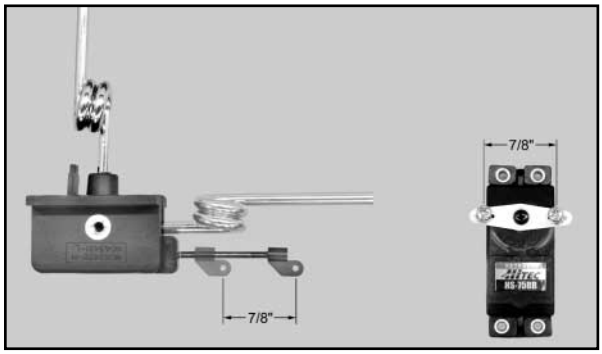
b) Measure 7-3/4" from the threaded tip of the pushrod and make a mark with a felt-tip pen. Use a pliers to bend the wire at that mark to a 30° angle -- see full-size drawing of Retract Pushrod on page 26. Do this to both pushrods.

c) Attach a pushrod to each retract unit by snapping the adjustable clevis into the unit's actuating arm. *Note: Be sure to "safety" the clevis with a short length of fuel tubing, as previously mentioned for the aileron and flap pushrods.*



d) Mount the retract units back in the wing, at the same time feeding the pushrod wires through the wing towards the retract servo.

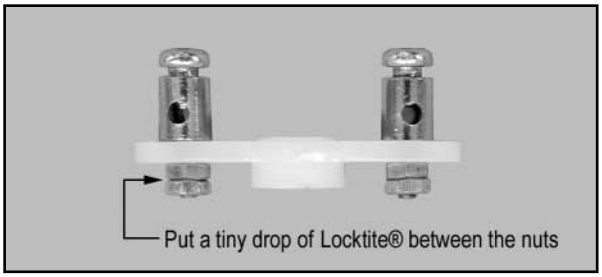
❑ 5) As a GENERAL RULE, when installing mechanical retracts that are driven by a 180° Retract Servo, you need to match the distance between the holes on the servo arm with the distance the retract unit's actuator arm travels -- see photo.



The retract units included in this kit have a travel of 7/8". Select a servo arm from those that came with your servo that has a pair of holes (equally spaced from the center) that are approximately 7/8" apart. If not right at 7/8", choose a pair of holes that are just slightly wider than 7/8" (1/32" or so larger won't hurt anything).

❑ 6) The pushrod connectors included in this kit for the retract servo arm have an oversize pin for additional strength. They will not fit in the holes of a stock servo arm. Drill out the holes in the arm with a 5/64" dia. bit so that the pin goes in freely.

Install the pushrod connectors in the holes of the retract servo arm. Notice that each pushrod connector comes with two hex nuts and one flat washer. Discard the flat washers - they are not needed. Screw the first hex nut onto the pushrod connector - threaded it near but not tight against the servo arm - the connector must rotate freely. Then, add a tiny drop of Locktite® thread locker (apply with a toothpick) and screw on the second hex nut. Tight it securely against the first nut.



❑ 7) Our prototype P-51s have the transmitter retract switch and servo response set up as follows. These instructions assume you will use the same mode of operation.

Moving the transmitter retract switch <u>towards</u> the pilot <u>raises</u> the landing gear.

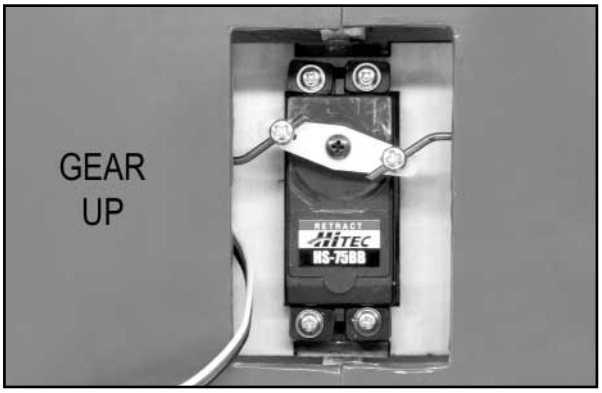
Moving the transmitter retract switch <u>away</u> from the pilot <u>lowers</u> the landing gear.

The servo moves <u>clockwise</u> (viewed from above) to <u>raise</u> the landing gear.

The servo moves <u>counter-clockwise</u> (viewed from above) to <u>lower</u> the landing gear.

a) Turn on your radio system and use the transmitter's "servo reversing" feature to setup your retract system as described above. When you finish the setup, put the retract switch and servo in the GEAR UP position, and then turn off the radio. Mechanically put the landing gear legs in the GEAR UP position.

b) Install the servo arm on the retract servo, inserting both pushrod wires into the pushrod connectors in the process. Orient the servo arm and wires as shown. Push each pushrod wire towards its retract unit, firmly against the stop, as you tighten the set screw on the pushrod connector



c) Turn your radio on and actuate the retracts to the GEAR DOWN position. Observe the operating cycle carefully, watching for any binding in the linkage. If they operate smoothly, cycle the gear several times UP and DOWN. Check to see that the retracts reach the end of their stroke and fully lock in the UP and DOWN positions.

If your retract installation isn't working smoothly, study the movement carefully to figure out what is wrong and make adjustments.

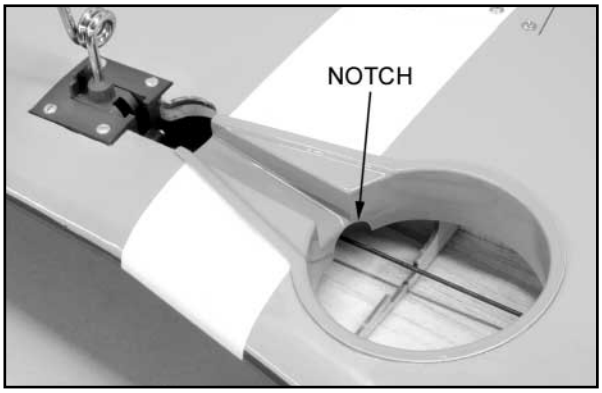
If the gear won't fully lock up or down you can make fine adjustments to the pushrod length by using the adjustable clevises at the retract end of the pushrods.

If the servo is giving too much movement, try canting the servo arm just a little more. Setting the arm at an angle to the servo will slightly reduce the total pushrod movement. Likewise, setting the arm more perpendicular on the servo will give you slightly less pushrod movement. Keep in mind that this is a very fine adjustment. If you need more drastic change to the total pushrod travel distance, you will have to use a different hole spacing on your servo arm.

If you are using close to 7/8" spacing on your servo arm, you shouldn't have any major problems getting the retracts to function properly.

❑ 8) When satisfied that the retracts are working properly, loosen the pushrod connector set screws long enough to put a small drop of Locktite® thread locker on them, then re-tighten permanently.

❑ 9) Trial fit the molded plastic Main Wheel Cups in the wing. Notch the lip of the cup as needed to clear the retract pushrod. Then, glue the cups permanently in place.



❑ 10) Bolt the Landing Gear Doors in place on the wire gear legs using the Metal LG Straps, M2 x 5 mm Flat-Head Bolts, and M2 Hex Nuts provided. Use Locktite® on each nut to keep them from coming loose. Also put some Locktite® underneath the Metal LG Straps, where they contact the gear leg. Make sure the Gear Doors are straight and square with the wheels. Let dry.

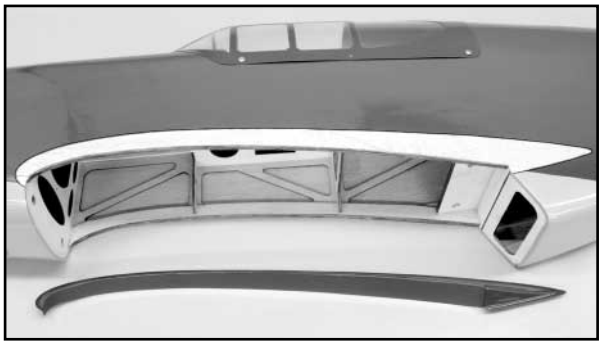
ATTACHING WING FAIRINGS

❑ 1) First, test fit the wing onto the fuselage using the two 1/4-20 x 1-1/2" nylon bolts provided. The nylon wing bolts should pass freely thru the holes near the trailing edge of the wing and thread into the blind nuts that are pre-installed in the fuselage. It will probably fit perfectly, but if you need to make any slight alterations, do it now before proceeding.

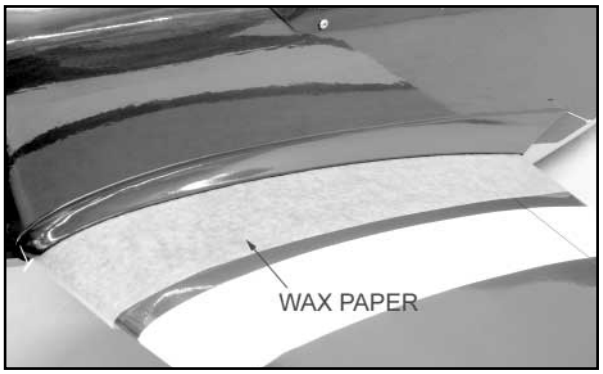
❑ 2) There are as many ways to glue on the Molded Plastic Wing Fairings as there are types of glue on the market. Some of your options are; epoxy or CA glue (if you first peel off the fuselage covering where the fairing attaches); or silicone based construction adhesive; or Gorilla® type glue; or RC56® type canopy glue. Typically, the silicone and gorilla glues, that do the best job of

sticking plastic-to-plastic, are also the hardest to clean up for a good looking result. Canopy glues are easy to clean up with water and will hold well for a long time, but with the constant flexing of taking the wing on and off they make work loose eventually. For that reason mainly, we prefer to glue the plastic fairings directly to wood using slow-drying epoxy, after first peeling the covering off the fuselage where the fairing sits.

Epoxy Method: Hold the Molded Plastic Left Wing Fairing in place on the fuselage. Use a fine-point felt-tip pen to mark the location of the fairing onto the fuselage side. Then, set the fairing aside and use a sharp #11 hobby knife to cut through the covering material about 1/16" inside the marked line. Be very careful to cut the covering material only - do not cut deeply into the balsa wood structure underneath! Peel the covering away in the fairing area. Then, take off the pen lines with a rag soaked in rubbing alcohol. Prepare the other side of the fuselage in the same manner.



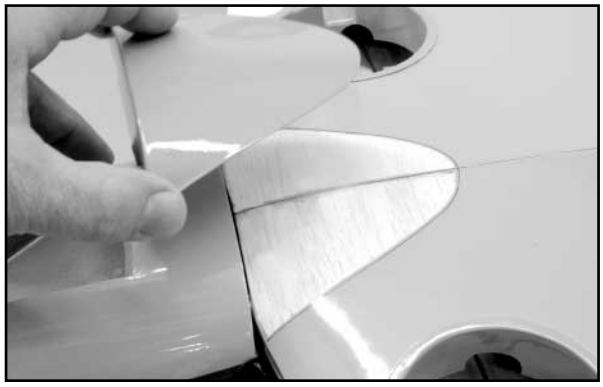
Glue both plastic wing fairings in place with slow-drying epoxy glue. Clean up any major oozing of glue with a rag or paper towel soaked in rubbing alcohol. After you get both fairings glued and sitting in place, then, bolt the wing onto the fuselage which will clamp the fairings in position (protect the top surface of the wing with wax paper or plastic wrap to keep any oozing epoxy from sticking to the wing.). Double check to make sure the fairings are sitting in perfect position before tightening the wing bolts. Use a couple small pins, if necessary, to keep the fairing tight against the fuselage. Once again, clean up any glue smears with an alcohol soaked rag and then let it dry.



❑ 3) Use the same basic procedure to glue the molded plastic Wing Leading Edge Fairing in place on the bottom of the wing.

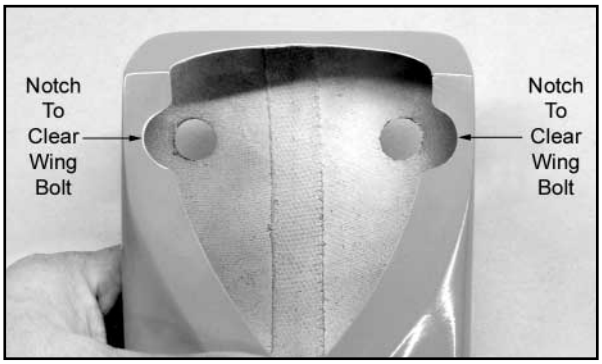
a) Set the leading edge fairing in place on the bottom of the wing. Align it with the fuselage. Use a fine-point felt-tip pen to mark the location of the fairing on the wing surface. Then, remove the fairing and wing from the fuselage. Remove the covering material from the bottom of the wing approximately 1/16" inside of the marked lines.

b) Now, permanently glue the leading edge fairing in place on the wing with epoxy glue. Let dry.

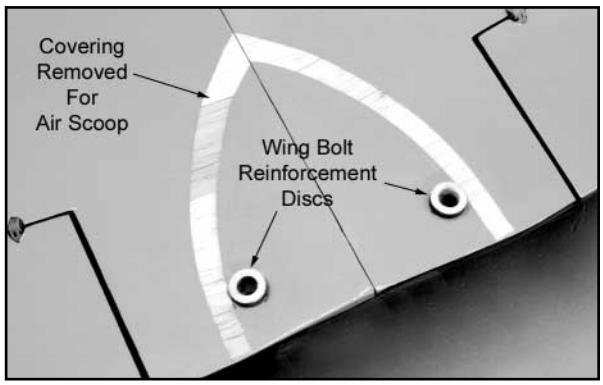


❑ 4) Glue the laser-cut plywood Wing Bolt Reinforcement Discs in place on the bottom of the wing, carefully aligning the 1/4" holes in the discs with the holes in the wing before the glue dries. Make sure there is no excess glue inside the holes. If necessary, run a 1/4" dia. drill bit through the holes after the glue is completely dry.

❑ 5) Trial fit the Fiberglass Air Scoop on the bottom of the wing. Notch the flange of the air scoop slightly to clear the plywood Wing Bolt Reinforcement Discs.



Glue the Fiberglass Air Scoop in place using the same methods you did for the other fairings.



Note: If you are using epoxy glue for this step, like we did, you will want to remove the covering material from the bottom of the wing where the air scoop sits. To make that easier, there is a full-size pattern on page 26 of the area of covering that needs to be removed. Cut out the pattern and use it to mark out the area of covering that needs to be removed.

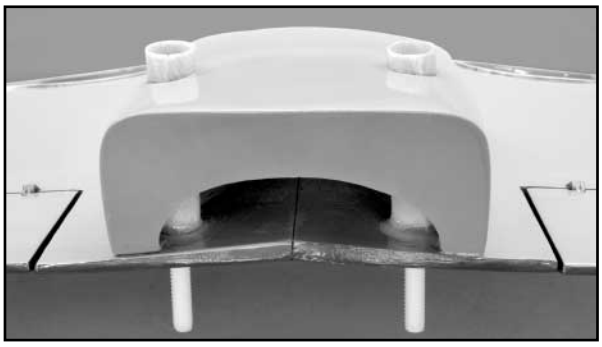
❑ 6) Remove the wing from the fuselage and locate the two fiberglass Wing Bolt Guide Tubes.

a) Fit the fiberglass guide tubes into the wing bolt holes in the air scoop. The guides should slip into the holes and go all the way down against the surface of the wing and around the head of the plywood wing bolt reinforcement discs. If the holes in the bottom

fairing are too tight, enlarge them slightly until the guides slide in - but not too much, you want a snug fit!

b) Once you have the wing bolt guides fitted in place, use Thin CA, sparingly, to glue them to the air scoop. Let dry.

c) Working through the opening in the back of the air scoop, apply a small fillet of thick glue around the ends of the fiberglass tubes where they contact the wing. Let dry.



d) Use a sharp hobby knife to trim the excess fiberglass guide tube off flush with the bottom of the air scoop. Don't try to take it all off with one deep cut - cut off small pieces at a time. By working slowly and carefully, you can get it trimmed off without gouging or cutting into the air scoop.

RUDDER SERVO, TAILWHEEL, AND PUSHRODS

❑ 1) Install your rudder servo in the center opening of the servo tray in the fuselage, using the hardware that came with the servo. Be sure to drill appropriate size pilot holes in the plywood before putting in the screws.

❑ 2) Locate the complete balsa Rudder Pushrod Assembly - it is the longer of the two balsa pushrods in this kit.

a) The Z-bend wire is the servo end of the pushrod, and it has a diameter of .070". To accomodate that size wire, drill out the holes in your rudder servo arm with a #49 or 5/64" dia. drill bit.

b) Unscrew the RC Clevis from the rudder end of the pushrod and set aside it. Feed the threaded wire end of the pushrod into the fuselage, starting through the fuel tank hole in the firewall, and then back towards the exit slot in the left rear of the fuselage. Guide the pushrod past the servo and all the fuselage formers. When the threaded tip of the pushrod wire reaches the exit slot, use a small screwdriver to lift and guide the tip up through the slot, to the outside.

c) Screw the RC Clevis back onto the threaded end of the pushrod. Put the Z-bend end of the pushrod in the outermost hole of the rudder servo arm.

❑ 3) Locate the complete Tailwheel Assembly and its mounting screws.

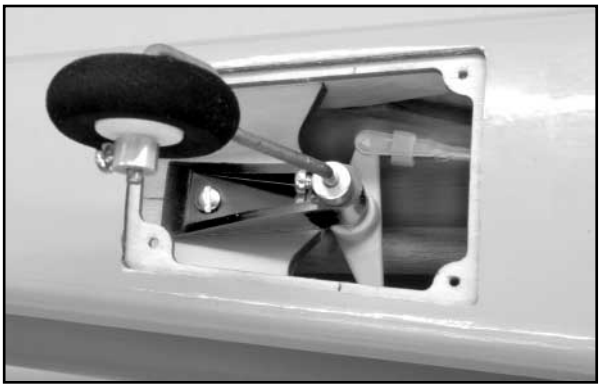
a) Double check to make sure that tailwheel wire moves freely in the bracket. Also make sure that the steering arm set screw is tight -- to keep it from coming loose in flight, take the set screw out and put a small drop of Locktite® on the threads, and then, tighten it back up.

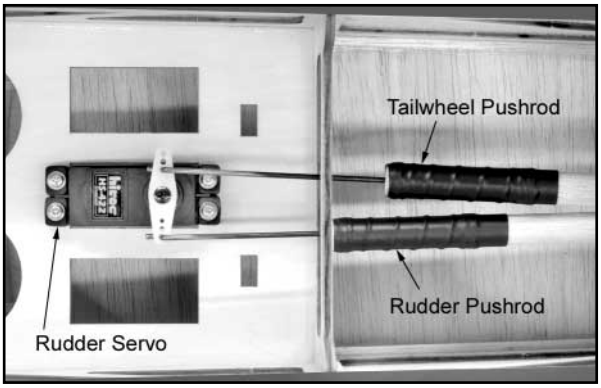
b) Drill out the holes in the steering arm with a 1/16" dia. drill bit.

c) Remove the hatch in the bottom rear of the fuselage that covers the tailwheel mount. Screw the tailwheel assembly to the plywood mount inside the fuselage, as shown. Make sure that the tailwheel wire exits the fuselage 15/16" behind the front of the hatch opening, in order for the hatch to fit properly.

d) Feed the balsa Tailwheel Pushrod Assembly into the fuselage, adjustable clevis end first. When the clevis reaches the tailwheel, hook it up to the right side of the tailwheel steering arm (the side opposite the rudder pushrod exit). Put the Z-bend end of the pushrod in the innermost hole of the rudder servo arm, on the side of the arm opposite the rudder pushrod.

e) Temporarily remove the wheel collar that holds the tailwheel onto the wire. Take off the wheel just long enough to put the hatch back in place. Then, re-install the tailwheel and wheel collar.





ATTACH THE TAIL SURFACES

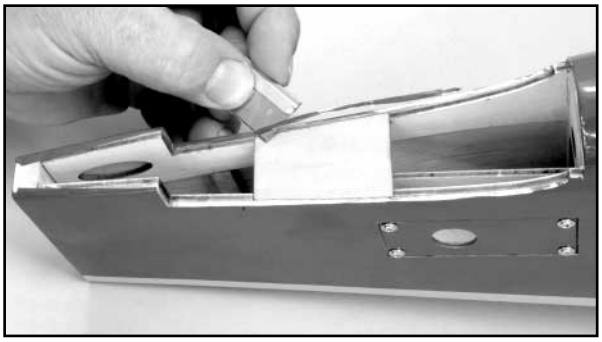
❑ 1) As received in the kit, the stabilizer and elevators are temporarily hinged together with 6 CA hinges. Be aware that the CA hinges are NOT GLUED in place! You will permanently hinge the elevators to the stabilizer very shortly, but for now separate the stab and elevators by pulling them apart. Remove all of the CA hinges and set them aside until called for.

❑ 2) The two elevators are joined by an Elevator Joiner Wire. Like the hinges, the elevator joiner wire is not yet glued into the front of the elevators.

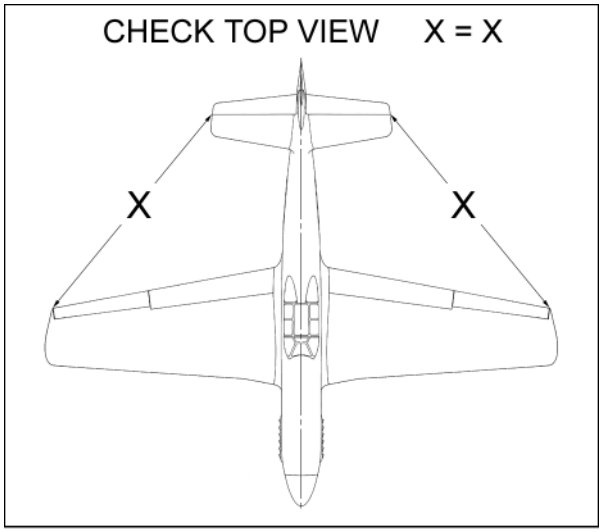
Pull the elevator joiner wire out of the elevators. Mix up some epoxy glue and use a toothpick or wire to coat the inside of the holes that the joiner wire came out of with the epoxy. Also, coat the notch in the leading edge of the elevators that the joiner wire sits in. Re-insert the joiner wire into the elevators. Clean off any excess epoxy that oozes out of the assembly with an alcohol soaked rag or paper towel. Let dry.

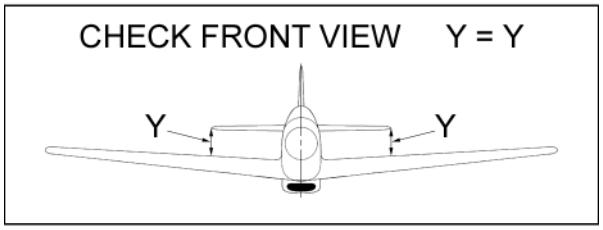
❑ 3) Permanently hinge the elevators to the back of the stabilizer with the 6 CA hinges. Use the same procedures you used for gluing the aileron hinges on page 4. Let dry 15 minutes before flexing the hinges.

❑ 4) Prepare the fuselage to receive the stab and elevators by removing the covering material on the fuselage sides where the stabilizer will sit. Use a good sharp blade and avoid cutting away any wood.

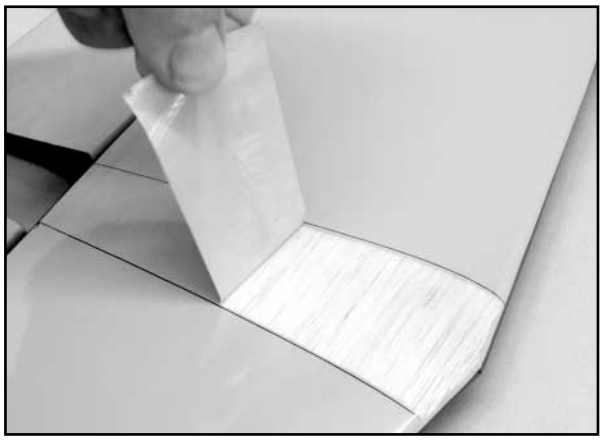


❑ 5) Mount the wing to the fuselage. Then, trial fit the stabilizer/elevator assembly in place. Check the alignment of the stabilizer with the rest of the airplane. View the airplane from the top, front and rear, making sure the stabilizer is not tilted or skewed (see drawing below). Measure the distance from the wing tip trailing edge back to the stab hinge line, and note the distance. Then make the same measurement on the opposite side of the airplane. The two measurements must be the same. Adjust the stabilizer as needed.

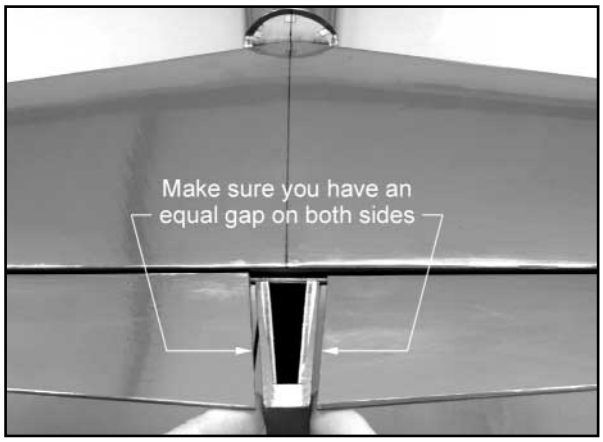




❑ 6) Once you have the stabilizer properly aligned, use a felt-tip pen to mark the location of the fuselage sides on the bottom of the stab. Take the stabilizer back off the airplane and carefully remove the covering material between the lines, so there will be a good wood-to-wood joint between the stab and the fuselage. Be very careful not to cut into the balsa wood when removing the covering.



❑ 7) Slow-drying epoxy glue is recommended for gluing the stabilizer on the fuselage, to allow you plenty of time to get the stab in proper alignment before the glue dries. Wipe any epoxy glue smears off the covering with an alcohol soaked rag. Let dry.



❑ 8) As received in the kit, the fin and rudder are temporarily hinged together with 4 CA hinges. Be aware that the CA hinges are NOT GLUED in place! You will permanently hinge the rudder to the fin shortly, but for now, separate the fin and rudder by pulling them apart. Remove all of the CA hinges and set them aside.

❑ 9) Trial fit the fin alone in place on the fuselage. Note that the bottom rear of the fin has a thick tab that fits down between the fuselage sides, while the front of the fin rests on top of the stabilizer. Set the fin into place and line it up with the center line of the stab. Use a felt-tip pen to mark the location of the fin onto the top of the stab. Remove the fin and carefully remove the covering material between the marked lines. Be very careful not to cut into the balsa wood.

❑ 10) Glue the fin permanently on the fuselage. Epoxy glue is recommended for this step for maximum strength. Wipe any excess epoxy glue smears off the covering material with a rag soaked in rubbing alcohol. Double check the alignment before the glue dries, making sure that the fin is perpendicular to the stab; also, that it is pointed straight ahead along the fuselage/stab center line; and that the rear of the fin is lined up with the rear of the fuselage. Let dry.

❑ 11) Locate the molded plastic Tail Fairing. Trial fit the fairing in place onto the fuselage. Trim as needed to fit. Once satisfied with the fit, mark the edges of the fairing onto the fuselage, stabilizer, and fin with a fine-point felt-tip pen. Remove the fairing. Cut away the covering just inside of the lines, exposing the wood. Apply a coat of glue to the inside of the fairing edges where it will contact these areas. Install the fairing, pressing it firmly in place. Use pins or tape to hold it firmly in place until the glue dries. Clean up any excess glue with an alcohol soaked rag. Let dry.

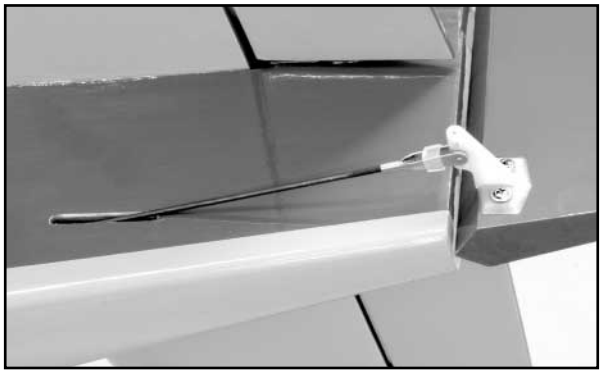
❑ 12) Permanently hinge the rudder onto the back of the fin and fuselage with the 4 CA hinges, using the same techniques you used for the other control surfaces in previous steps. Let dry for 15 minutes before flexing the hinges.

❑ 13) Install a Nylon Control Horn on the rudder, inline with the rudder pushrod.

a) Hold the control horn in place on the rudder with its front edge right at the hinge line. Move the control horn right or left as needed to position it in line with the pushrod. Hold the horn in this position and use a pencil or sharp awl to mark the mounting hole locations for the control horn onto the rudder.

b) Drill a 3/64" dia. (or #56) pilot hole into the rudder at both marked locations. Be careful not to drill completely through the rudder! Mount the control horn in place using two T2.6 x 12 mm PWA Screws.

c) Adjust the pushrod length with the clevis to get the rudder in neutral position when the rudder servo and tailwheel are neutral. Note: Don't forget to "safety" the clevis with a short length of fuel tubing (not supplied) to prevent the clevis from opening up and becoming disconnected.



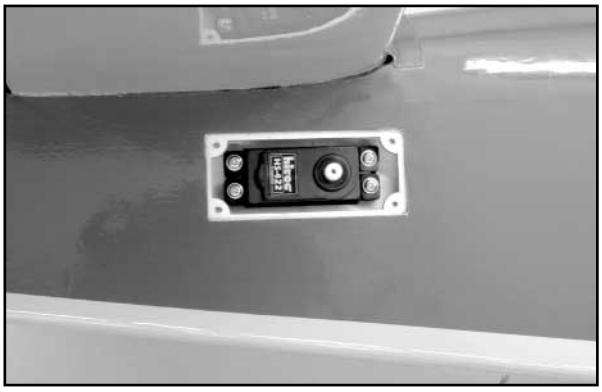
❑ 14) Remove the hatch in the right fuselage side under the stab. This is where the elevator servo will be mounted.

a) Attach a 24" long servo extension chord to your elevator servo. Put tape around the connection so it can't come loose.

b) Hold the fuselage vertical, nose down, and feed the extension chord into the fuselage through the servo opening. Keep feeding the chord forward towards the front of the fuselage. When it's all the way in, set the elevator servo in place and mark the mounting holes on the plywood servo mount.

c) Drill pilot holes in the plywood servo mount at the marks. Then, screw the elevator servo in place using the screws that came with the servo.

d) Re-install the hatch over the elevator servo.



❑ 15) Locate the Elevator Pushrod - it has an adjustable clevis on one end and a Z-bend on the other.

a) The elevator pushrod wire has a diameter of .070". Drill out all the holes in your elevator servo arm with a #49 or 5/64" dia. drill bit to accomodate the wire.

b) Install the servo arm and pushrod on the elevator servo.

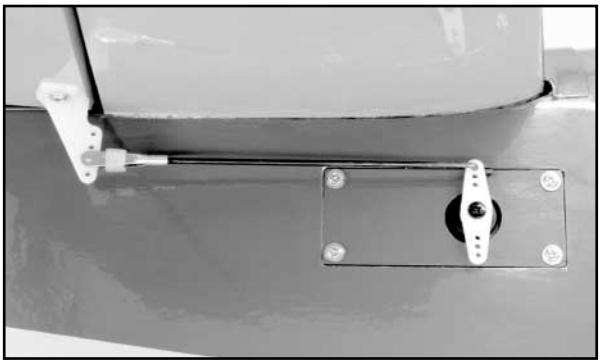
❑ 16) Install a Nylon Control Horn on the bottom of the right elevator.

a) Hold the control horn in place with its base flush with the end of the elevator and right at the edge of the hinge line. Hold the horn in this position and use a pencil or sharp awl to mark the mounting hole locations for the control horn onto the elevator.

b) Drill a 3/64" dia. (or #56) pilot hole into the elevator at both marked locations. Be careful not to drill completely through the elevator! Mount the control horn in place using two T2.6 x 12 mm PWA Screws.

c) Adjust the pushrod length with the clevis to get the elevator in neutral position when the servo is neutral.

Note: Don't forget to "safety" the clevis with a short length of fuel tubing (not supplied) to prevent the clevis from opening up and becoming disconnected.



ENGINE INSTALLATION

Locate the bag containing the Engine Mounts and 8-32 mounting hardware. These bolts, blind nuts, and washers are for bolting the engine mounts onto the firewall. In addition, you will also need to purchase appropriate bolts, lock nuts, and flat washers to mount your engine to the mounts. The size of that mounting hardware can vary from engine to engine. In the case of the Saito 1.00, shown in the following steps, we used 8-32 x 1-1/4" Socket-Head Bolts, 8-32 Nylon-Insert Lock Nuts, and #8 Flat Metal Washers. Some engines may require 6-32 size mounting hardware.

SAFETY NOTE -- Size Limit on Glass-Filled Engine Mounts!

The glass-filled engine mounts provided in this kit are intended for glow engines up to 1.20 cu. in., either 2-stroke or 4-stroke. Using

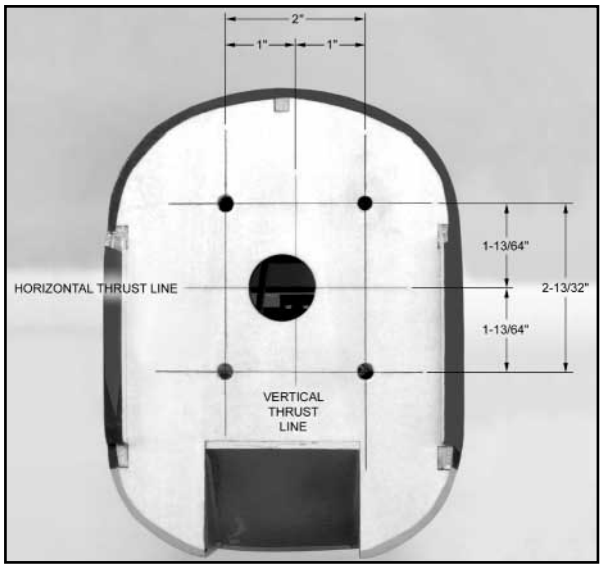
these mounts with larger engines is not recommended. Larger engines should use an aluminum engine mount (not furnished).

❑ 1) Note that the horizontal and vertical thrust lines are scribed into the front of the firewall. Also, notice that the vertical thrust line is slightly off center. This is to compensate for the right thrust that is already built into the fuselage.

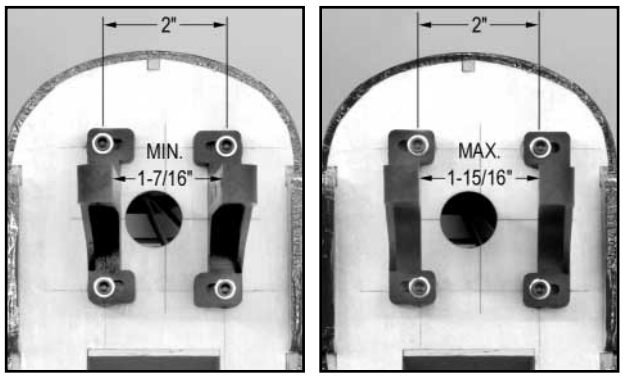
a) Draw two parallel vertical lines exactly 1" on each side of the vertical thrust line.

b) Draw two parallel horizontal lines exactly 1-13/64" above and below the horizontal thrust line (1-13/64" is just a thin pencil line bigger than 1-3/16").

c) The intersections of these four lines indicate where the Blind Nuts need to be installed for the Engine Mounts. Use a 1/4" dia. bit to drill four holes in the firewall for the 8-32 Blind Nuts.



NOTE: The 2" total vertical spacing between the blind nuts, along with the slotted holes in the engine mounts, should allow the engine mounts to accommodate any engine that has a crankcase width between 1-7/16" to 1-15/16". That should cover most engines that will be used in the Mustang. If the width of your engine's crankcase is less than 1-7/16", or more than 1-15/16", you will have to plan accordingly and adjust the dimension in step 1a) above.



❑ 2) Bolt the engine mounts in place on the front of the firewall using the 8-32 8-32 x 1-1/4" S/H Bolts, Blind Nuts, and Washers provided. The blind nuts go on the back of the firewall, inside the fuselage (see *Building Tip* in next column). As you tighten the bolts the first time, the prongs of the blind nuts will sink into the back of the firewall, holding the blind nuts in place. After all the blind nuts are installed, apply a little glue on the flanges of the blind nuts inside the fuselage, to keep the blind nuts from ever coming loose. Be careful not to get any glue in the threads of the blind nuts.

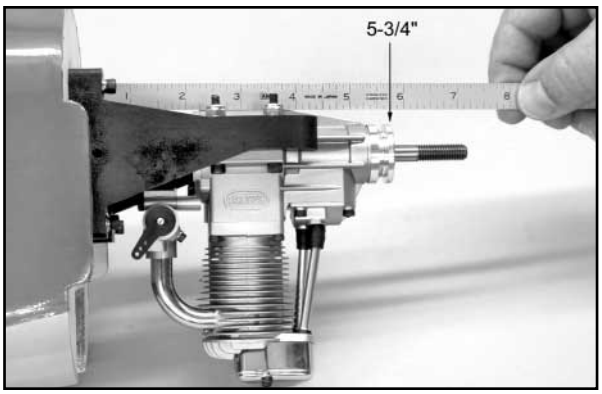
Building Tip: *Inserting the blind nuts into the holes in the back of the firewall, working through the belly of the fuselage, can be a difficult job if you have big hands. A short stick and a little piece of masking tape can make the job a lot easier. Simply double back the tape and use it to hold the blind nut on the end of the stick as shown (a 1/4"sq. balsa stick is being use in these pictures). This "handle" makes it easy to insert and hold the blind nut in the hole while you thread the mounting bolt in from the front.*

❑ 1) a) Set your engine on the engine mounts and move it forward or backward until you measure exactly 5-3/4" from the front of the firewall to the front face of the prop drive washer. This is the distance your engine needs to be from the firewall for proper cowl alignment and prop clearance purposes. Accurately mark the engine's mounting bolt hole locations onto the engine mounts. Then, set the engine aside.

b) Drill the four engine mounting holes completely through the mounts. Be very careful to drill the holes perpendicular to the mount -- use a drill press if available. These four holes should be clearance holes for your mounting bolts (see Safety Note below). For example, for the Saito 1.00 engine shown here, we used 8-32 x 1-1/4" socket-head bolts. To drill a clearance hole for the 8-32 bolts, which have a diameter of .162", we used a 11/64" dia. (.172") drill bit. A #18 drill bit (.169") would also work OK.

c) Mount your engine in place on the engine mounts.

Note: This kit DOES NOT contain bolts for mounting your engine to the engine mounts. That's because not all .90-1.00 size engines use the same size. Most engines will need 8-32 size bolts, while others may need 10-32. You will need to go to the hobby shop to obtain the correct size mounting bolts and nuts for your engine. The bolts need to be at least 1-1/4" long.



IMPORTANT SAFETY ISSUE!

DO NOT DRILL AND TAP THE GLASS-FILLED ENGINE MOUNTS FOR BOLTS, OR USE SELF-TAPPING SCREWS OR WOOD SCREWS. THOSE METHODS WILL WEAKEN THE ENGINE MOUNTS AND CAN LEAD TO ENGINE MOUNT FAILURE!

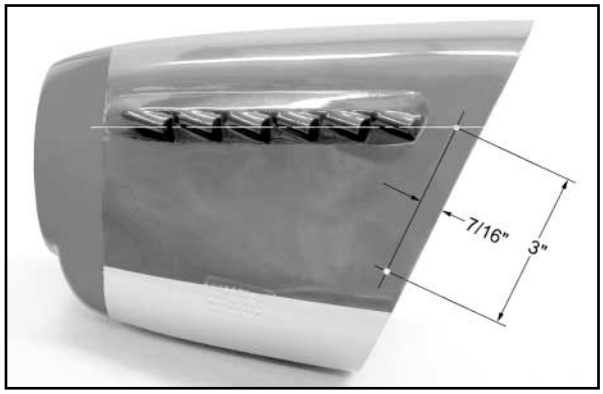
1) Use only **Socket-Head Bolts** with **Aircraft Lock Nuts** and **Flat Metal Washers** to fasten your engine to the glass-filled engine mounts, as shown in these instructions.

2) The holes you drill through the mounts must be big enough for the engine mounting bolts to pass freely through. The bolts should not go in tight. In the case of 8-32 mounting bolts, a 11/64" dia. drill bit will provide proper clearance holes. For 10-32 bolts use a 13/64" drill bit.

MOUNTING THE COWLING AND SPINNER

❑ 1) Drill two 1/8" dia. holes in each side of the cowling at the locations shown here. The dimensions are based from the center of the last exhaust pipe that is molded into the side of the cowling. Using a felt-tip pen, draw a horizontal line straight back from the center of the last exhaust pipe. Draw another line parrallel to the back edge of the cowling, exactly 7/16" away from the edge. Where the parrallel line and the exhaust center line intersect, that is the location for the top screw hole. The bottom screw hole is located exactly 3" below the top hole, measured along the parrallel line.

Once you have the holes marked on both sides of the cowling, drill them with a 1/8" dia. bit, using a backing block of scrap wood to support the cowl as it is being drilled. Clean up the drilled holes by sanding the inside of the cowling lightly with fine sandpaper.

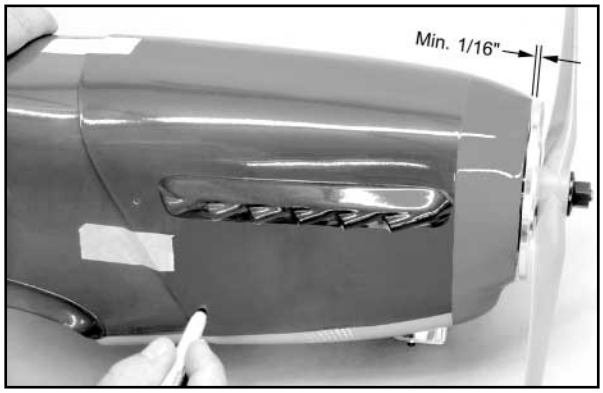


❑ 2) Try fitting the cowling over your engine and back onto the fuselage. If you have a typical engine installation (a single-cylinder engine mounted inverted), you will probably find that you need to make an opening in the bottom of the cowling for the engine cylinder to stick through. Looking through the spinner opening, watch carefully to see where the head of the engine first hits the inside of the cowling and mark that spot with a pencil or felt tip marker. Remove the cowl, and use a Dremel® Tool to make a small opening in the cowl at the point of contact. Refit the cowl, checking the hole location and size, adjust as needed and again use the Dremel® Tool to make the opening bigger. Keep refitting, remarking, and readjusting the hole until the cowling can be slipped over the engine into correct position on the fuselage. As a general rule, you should end up with at least 3/16" clearance between the cowling and any engine part.

Note: On page 26, we've provided a full-size pattern of the opening we put in our cowl for the Saito 1.00 4-stroke engine shown in the pictures. If you are using the same engine, or one very similar, the pattern will provide a good starting point for your cutout.

SAFETY ISSUE: Whenever working with fiberglass, always use a facemask and safety glasses!

❑ 3) Once you can get the cowling in proper position on the fuselage without any part of the engine contacting the cowl, mount your spinner backplate and propeller on the engine prop shaft. Tighten the prop assembly sufficiently to bring the spinner backplate firmly in contact against the engine's prop mounting flange. Now, check to see that you have at least a 1/16" gap between the back of the spinner backplate and the front of the cowling (1/16" to 1/8" is OK). Adjust the final location of the cowling, making sure that the spinner backplate is centered at the front and that the back edges of the cowl are tight against the fuselage. Use masking tape to hold the cowling securely in position on the fuselage.

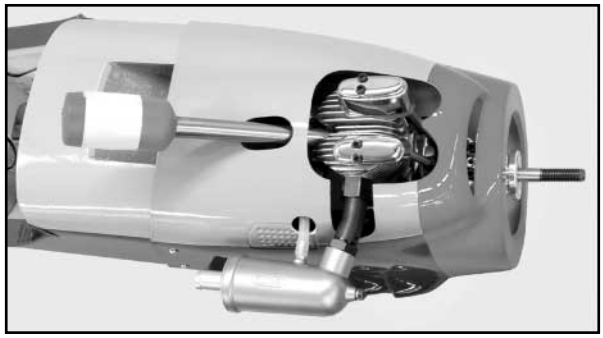


With the cowling taped in place, mark the cowl mounting screw positions onto the fuselage through the pre-drilled holes in the cowl. Remove the cowl and use a 3/64" (or #56) dia. bit to drill pilot holes in the fuselage at the marks just made. After drilling the holes, screw in the four T2.6 x 8 mm PWA Screws provided for mounting the cowl. Run the screws in and back out a couple times to create good threads in the wood. Then, take the screws back out and place a small drop of Thin CA glue in each hole. Let dry and then, run the mounting screws in and out again. This hardens the threads in the wood, making them tough and durable enough to hold up to dozens of cowl removals and installations.

❑ 4) Figure out what size and shape opening you will need in the cowling to accommodate your engine's muffler, and cut it out now.

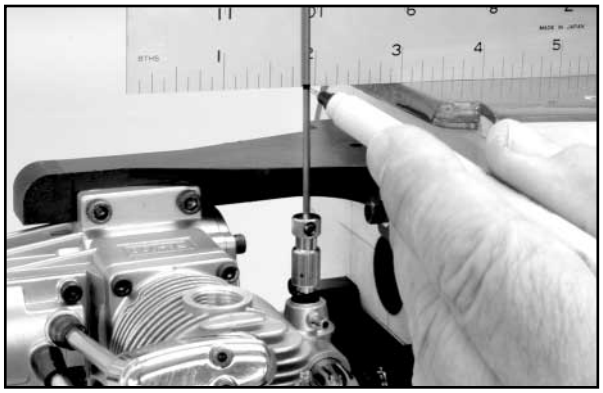
❑ 5) Figure out how you are going to light your glow plug and whether that will require an opening in your cowling.

Note: One option, that requires no cowling changes, would be to use a "remote" glow plug wiring harness (not supplied). Another option, as shown here with our Saito 1.00 installation, was to use an extended glow plug battery igniter (not supplied), and make another small slotted hole in the bottom of the cowling, just behind the engine head cutout. Position the hole to allow the glow igniter to line up perfectly with the glow plug.



❑ 6) Make sure you can get to your engine's main needle valve for on-field adjustments. In most cases this will probably require making an extension to get the needle valve to exit the cowling. The main needle valve of most modern engines will have a hole in the end and a set screw to accept a homemade music wire needle valve extension. Our Saito 1.00 needle valve has this feature, with a center hole just large enough to accept a 5/64" dia. (.078") music wire needle valve extension. Here"s the step-by-step method we used to make a simple neat needle valve extension for our Saito 1.00, and to figure out where it will exit the cowling.

First, remove the cowl. Cut a 2" long piece of 5/64" dia. music wire and deburr the ends. Insert one end of the wire fully into the hole in the end of the needle valve and tighten the set screw. Screw the needle valve all the way into the carburetor. Lay a straight edge against the side of the fuselage at the nose, intersection the piece of wire. Mark this point on the wire with a marker pen. Remove the needle valve from the engine and remove the wire extension from the needle valve. Cut the wire to length at the mark just made. Sharpen the end of the wire to a sharp, tapered point using a bench grinder or a Dremel® Tool.



Reinstall the wire back in the needle valve, with the blunt end in the needle valve and the sharpened end exposed. Screw the needle valve fully back into the carburetor. Mount the cowling on the fuselage. From the front of the cowling, use a pair of hemostats to begin turning the needle valve out of the caburetor. As the needle valve is turned, the sharpened end of the wire will come into contact with the inside surface of the cowl. Continue turning the needle valve until it is firmly pressed against the cowl. Place a pad of paper over the cowl at the location of the sharpened wire point and lightly tap the paper pad with a small hammer or block of hardwood. Removing the pad, you should see a small dimple on the outside of the cowl.

Remove the cowl and use a 3/32" dia. (.093") bit to drill a hole through the cowl at the dimple mark. Remove the needle valve from the engine, and then remove and disgard the sharpened piece of wire. Cut a new 3" long piece of 5/64" dia. music wire and deburr the ends. Grind a small flat spot, about 3/32" long, on one end of the music wire. Install the new wire in the needle valve, tightening the set screw against the flat spot.

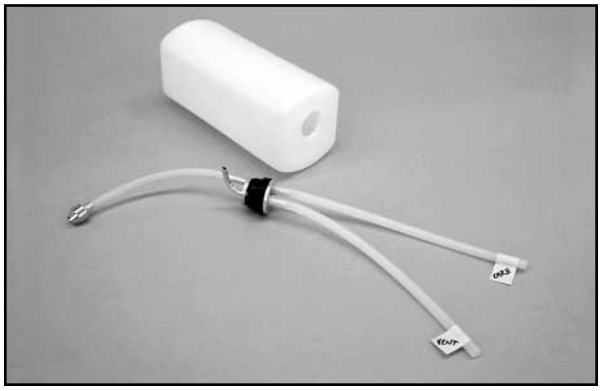
Remount the cowling on the fuselage. Use a hemostats or long needle nose pliers to insert the needle valve inside the cowling through the front opening. Guide the wire extension through the 3/32" hole in the cowl. Line up the needle valve with the carburetor and then screw it full back in. At the outside of the cowling, use a fine-tip pen to mark the wire about 1/8" or so away from the cowl. Once again, take the needle valve out of the cowl. Use a heavy pliers to bend the wire 90° at the mark. Cut off the bent end of the wire to a length of 1/2" or so, and deburr the end. Reinstall the needle valve for the final time.

FUEL TANK INSTALLATION

❑ 1) Assemble the fuel tank as shown. We recommend that you plumb the tank with a simple two-line fuel delivery setup. One fuel line is connected from the fuel tank's pick-up or "clunk" line to the engine's carburetor. The second line is the overflow or vent line. After filling the tank, this same fuel line is then connected to the engine's muffler pressure nipple, providing some manifold pressure to the tank. Note that the rubber stopper for the tank has two holes that go all the way through it. Use these two holes for the two aluminum fuel lines. Also, note that the correct orientation of the fuel tank body in the tank compartment is with its neck "up", in the front view.

Use the shortest of the three supplied aluminum tubes for the fuel feed tube. Use the longest of the aluminum tubes for the vent tube. Gently bend the vent tube upwards to 90°, so it will be near the top of the tank. The fuel pick-up aluminum tubing requires no bending. Adjust the length of the internal silicone fuel tubing to allow free movement of the metal clunk pick-up inside the tank. Install the stopper assembly into the neck of the tank and secure by tightening the clamp bolt. Tighten this bolt firmly, causing the rubber stopper to compress and expand in the tank's hole, creating a secure seal around the neck of the tank.

Cut two 8" or so lengths of silicone fuel tubing (not included), and slide them over the two exposed aluminum fuel lines. Correctly identify each of them as "vent" and "carb" and label them with small pieces of tape. Doing this now avoids any confusion later.



❑ 2) Trial fit the tank in place into the front of the fuselage to familiarize yourself with how it mounts. The front of the tank should fit through the hole in the firewall. The main body of the tank is supported by the contoured hole in the fuselage former. Take the tank back out of the fuselage.

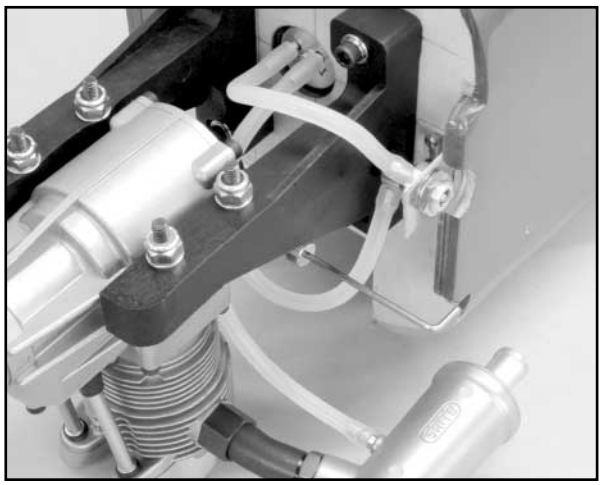
❑ 3) Apply a generous bead of silicone sealer around the neck of the tank (regular household bathroom type silicone sealer, available at most hardware stores, is recommended). Slide the tank in place in the fuselage, feeding the two silicone fuel lines and the neck of the tank through the hole in the firewall. Push the tank firmly up against the back side of the firewall, compressing the silicone sealer to make a good seal.

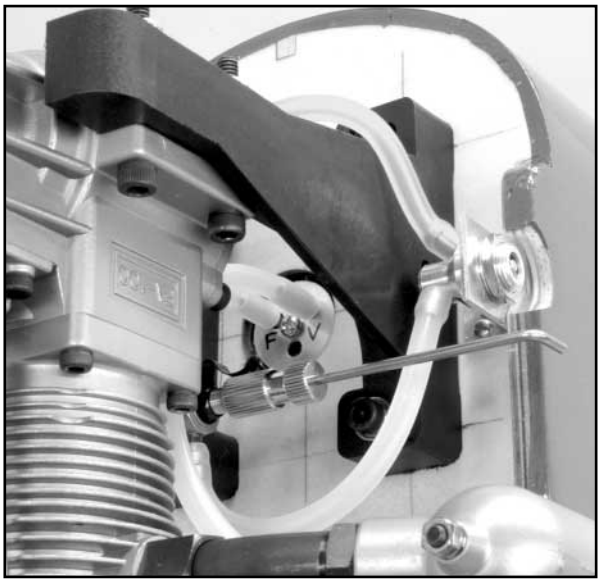
Note: If your engine mounting bolts are protruding behind the firewall, it's a good idea to take them out and cut them off so they don't protrude. If they contact the tank, they might dig into the tank and cause a leak in the future. Cut them off or use shorter bolts.

❑ 4) A 8 mm x 20 mm x 120 mm Balsa Stick (approx. 5/16" x 3/4" x 4-3/4") is provided to keep the fuel tank in place. Install the balsa stick across the back of the tank, gluing it to the front of the fuselage former. This will keep the tank from sliding backwards in flight. If the tank ever has to be removed for service, you can break the balsa stick loose and get the tank out.

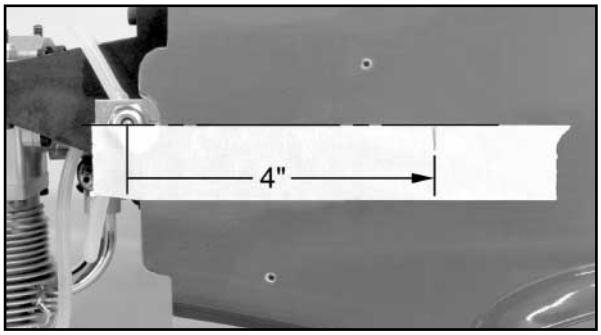
❑ 5) Next, figure out how you are going to fuel and de-fuel your airplane, and whether that will require another opening in your cowling. We used and can highly recommend the Du-Bro Kwik-Fill Fueling Valve #334 and a SIG Fueling Valve Mounting Bracket #SIGSH759. With the simple two-line fuel system shown in this manual, these two aftermarket parts create a very neat and efficient fueling system.

a) Decide on the best place to locate the fueling valve. We highly recommend that you mount it to the firewall - NOT to the cowling. If you mount it directly to the fiberglass cowl, the repeated insertion of the fueling probe will ultimately cause flex cracks in the cowl. We mounted the fueling valve bracket alongside the left engine mount. Note that we ground a recess in the fuselage side protrusion to clear the fueling valve. We also had to shorten the base leg of the fueling valve bracket to fit in the tight space between the engine mount and the fuselage side protrusion. Use a heavy metal snips to cut the base leg to length to fit in that space. Drill two new 3/32" dia. holes in the base leg for the mounting screws. Mount the fueling valve and bracket. Plumb the tank lines as shown, according to the instructions with the fueling valve.

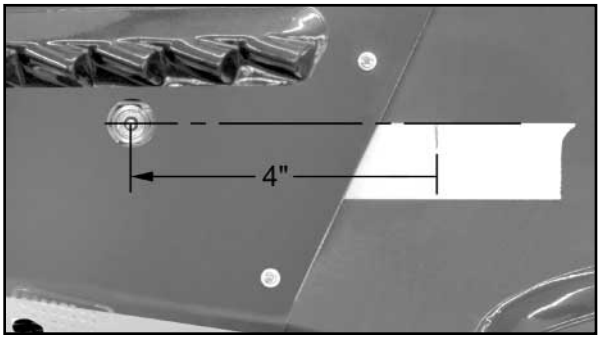




b) Now you need to make a hole in the cowling directly over the fueling valve, to allow the fueling probe to be inserted into the valve. Lay the edge of a piece of masking tape over the exact center of the fueling valve, and then in a straight line back along the fuselage for a distance of about 6" or so. This tape will assist in locating the required hole in the cowling. Make a mark on the masking tape exactly 4" back from the center of the fueling valve.



Install the cowling back onto the fuselage. Now, measure forward exactly 4" from the rear mark along the top edge of the masking tape. Mark this location on the cowl. Remove the cowl and drill a 3/32" dia. hole through the cowl at the mark just made. Remove



the masking tape, peeling it back against itself to avoid lifting the covering material. Remount the cowling on the fuselage.

You should now be able to see the center of the fueling valve through the small hole just drilled in the cowl. It might be a little off center but this is easily corrected, in a moment. The Du-Bro fueling probe that comes with the valve itself, requires a 1/4" hole diameter to fit fully into the valve. Use a pencil and a circle guide to draw a 1/4" dia. hole directly onto the cowl - corrected as needed to adjust for any off center issues. Use a Dremel® Tool with a tapered sanding bit to open up the hole in the cowl to the 1/4" outline just drawn. Mount the cowl and check your work. The fueling opening in the cowl should be directly over the center of the fueling valve and the fuel probe should fit into and out of it easily.

THROTTLE SERVO & PUSHROD

The following instructions describe installation of the throttle pushrod materials that are included in this kit. This pushrod system should work with most 4-stroke single cylinder glow engines, like the Saito 1.00 shown in the photos. There may be some engines that require different pushrod materials (not supplied).

❑ 1) Mount your throttle servo in the plywood servo tray in the fuselage, using the rubber grommets and mounting screws that came with the servo. If your engine's throttle arm is on the right side of the airplane, like the Saito 1.00 shown, then you should mount the throttle servo to the right of the rudder servo. If your throttle arm is on the left, mount the servo on the left.

❑ 2) Drill a 1/4" dia. hole through the firewall, aligned with the engine's carburetor throttle arm. From the front, insert the Throttle Pushrod Assembly through the hole in the firewall and into the fuselage, back to the throttle servo. Notice that there are oval shaped holes in the sides of the fuselage former at the wing leading edge to pass the throttle pushrod through and keep it away from the fuel tank. There is also a smaller hole in the fuselage former at the front of the servo tray. If that hole doesn't line up smoothly with your throttle servo arm, you may need to slot the hole slightly, like we did (see photos).

❑ 3) Determine how long the pushrod outer sleeve needs to be to fit your installation, (we purposely provided the entire throttle pushord extra long so it would cover many situations). In most cases you will need to shorten the entire pushrod. As a general rule, the servo end of the pushrod outer sleeve should be about 1-1/2" away from the servo arm, and the engine end of the pushrod outer sleeve should protrude just outside the front of the firewall (1/8" or so). Mark the outer pushrod sleeve to length, remove it from the rest of the pushrod, and then, use a sharp razor blade to cut it to length. Then, reinstall it back onto the pushrod.

❑ 4) At the firewall, attach the clevis to the engine throttle control arm. Then, reach inside the fuselage and operate the throttle pushrod inner tube from the servo end. Make sure the pushrod can fully open and close the carburetor without binding.

❑ 5) At the servo end, unscrew the clevis and threaded stud from the end of the pushrod tube. *Note: You can grip the threaded stud with a needle nose pliers held at the end of the plastic tube to minimize thread damage.* Then, install the clevis and stud in the outermost hole of the throttle servo arm.

Turn your radio on and make sure the throttle servo is operating in the correct direction for high and low throttle. Put the throttle servo in high throttle position and turn off the radio. Put the carburetor, with pushrod attached, in high throttle position. Hold the pushrod tube up against the threaded stud on the servo and mark the tube for cutting to length. Be sure to allow for the 1/8" that the threaded stud will be screwed inside the end of the pushrod tube. Cut off the excess pushrod tube with a sharp blade.

Remove the clevis and threaded stud from the servo and thread the stud back into the end of the plastic tube, at least 1/8". Adjust the clevis on the stud, changing the overall pushrod length, until you can attach the clevis back onto the throttle servo arm.

Turn your radio back on and check the operation of the throttle pushrod. Adjust the overall length of the pushrod by screwing both clevises in or out, as needed, to achieve full throttle control. You may also need to use your transmitter's EPA (End Point Adjustment) feature to fine tune the throttle pushrod operation. When finished, secure one of the clevises to it's threaded stud with a drop of CA or epoxy glue, so that the pushrod tube cannot rotate in flight and change the adjustment.

RADIO INSTALLATION

With all the servos now installed, all that remains is the installation of the receiver, battery pack, and switch.

RX BATTERY PACK: The single heaviest unit of the radio system is the battery pack. This means that you can, if needed, locate the battery pack wherever it is needed in the airplane to help achieve the correct balance point. Be sure to wrap the battery pack in foam rubber and use rubber bands or zip-ties to secure it to the model structure so that it can't move around in flight.

ON/OFF SWITCH: The radio on/off switch should be mounted on the fuselage side opposite the engine exhaust. Cut a small rectangular opening in the fuselage side for the switch toggle to poke through, and drill two small holes for the switch mounting bolts.

RECEIVER: Wrap the receiver in foam and use rubber bands, zip-ties, and/or more foam to secure it in the fuselage.

ANTENNA: The receiver antenna can be mounted in a number of ways - internally or externally - the choice is yours.

METHOD i - EXTERNAL: You can route the antenna along the inside of the fuselage to a point just behind the canopy. Drill a 3/32" dia. hole through the top of the fuselage at that point and poke the antenna through the hole. Anchor the antenna to the top of the fin with a rubber band hooked over a T-pin that is glued securely into the fin.

METHOD iI - INTERNAL: Purchase a length of nylon pushrod tubing to use as an antenna holder. Slide the antenna inside the tube, stringing it out as straight as possible. Then, mount the tube in the aft portion of the fuselage, sticking it through the holes in the formers. Glue the tube securely to the fuselage structure.

DECAL APPLICATION

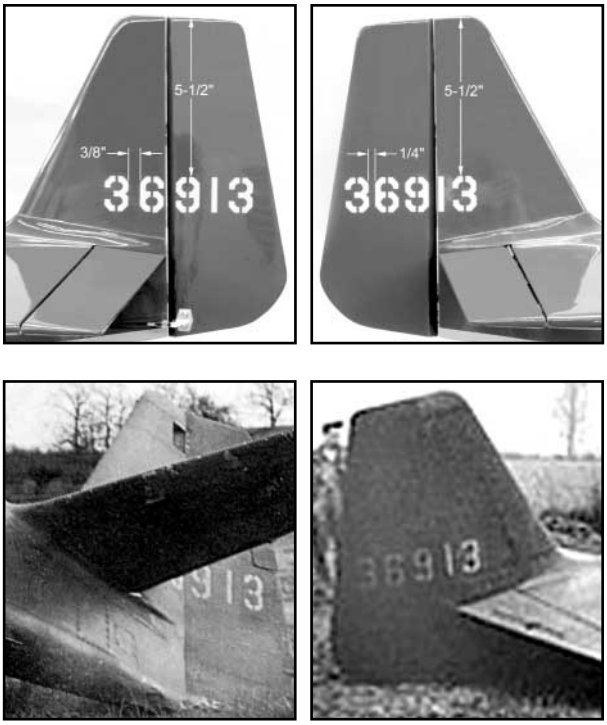
The decals supplied with your P-51B Mustang are sticky-back Mylar® with a very aggressive adhesive. They are NOT water-activated transfers. These decals are not die-cut and need to be cut from their sheets with a sharp hobby knife or scissors. A straight edge makes this easier when straight lines are involved. Trim as close to the image as possible. Use the box art and other photos of the full-scale "Shangri-La" to learn the correct placement of all the decals.

Putting sticky-back decals on a model can be tricky, especially medium to large size ones like some of those in this kit. If you don't do it right you will end up with unsightly air bubbles trapped underneath the decal. The best method is to put large decals on "wet". This technique involves using a "soapy water" mixture to float the decal on the surface of the model until you get it in correct position, and then use a squeegee to press the decal permanently in place.

The soapy water mixture can simply be water mixed with a very small amount of dish soap, or SIG Pure Magic Model Airplane Cleaner, or Fantastic®, or Windex®, or 409® type household cleaners - they all work great. For a squeegee, we recommend the SIG 4" Spreader #SIGSH678, or simply use some scraps of sheet balsa. You will also want to have some soft paper towels or clean soft cloths (old tee shirts are great) handy. We, also, suggest that you have some narrow (1/8" width or less) trim tape handy for making temporary guidelines to help in aligning the decals.

First, spray the surface of the model where the decal is to be placed with a soapy water mixture. Then, carefully peel the decal completely off the backing sheet, being careful not to let the sticky side double over and adhere to itself. Then, spray the adhesive side of the decal as well. Lightly position the decal in place on the wet surface of the model. Do not push down! The liquid allows you to slide the decal into the desired final position, as long as you don't press down on it. Once you have it in position, gently squeegee the excess liquid out from under the decal, starting from the middle and working out towards the edges. Mop up the liquid with a dry cloth. Squeegee repeatedly to get as much of the water out from under the decal as possible. Allow the decals to set overnight to finish drying. Once dry, they will be solidly adhered to the model.

Rudder Number Placement: The spacing between the individual rudder numbers is different on the left and right sides of the airplane. This is the way it was on Don Gentile's original "Shangri-La", due to the USAAC marking specs and how they related to the rudder hinge line. On the model, you need to space the numbers approximately 3/8" apart on the left side of the rudder, and approximately 1/4" apart on the right side, as shown here.



Hard-to-find pictures of both sides of the rudder of the original "Shangri-La", taken after Don Gentile's unfortunate crash on April 13, 1944.

COCKPIT DETAILS (Optional)

Nothing dresses up a scale model more than some cockpit details. For a "sport scale" model like this P-51B MUSTANG, you don't need museum-class scale details, but some simple "eye candy" to fill the space under the canopy. This kit includes a sheet of easy-to-use cockpit details printed on heavy card stock. There's an instrument panel, a pilot seat back, and a radio box. While these paper items may seem too simple and unimportant at first glance, they really do add a lot to the looks of the finished airplane, (see photos), yet are very simple to make and install.

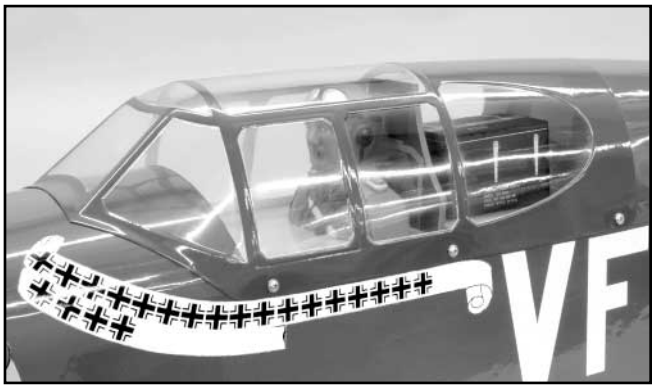
Instrument Panel: Carefully cut out with a sharp hobby knife or scissors, cutting precisely on the edge lines. Glue in place in the airplane with spray-on craft glue, epoxy, or ordinary white glue.

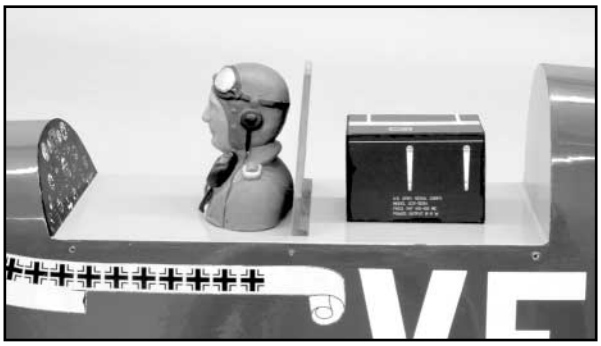
Pilot Seat Back: Carefully cut out with a sharp hobby knife or scissors, cutting precisely on the edge lines. Glue the seat back print to a piece of scrap balsa or plywood (1/16"-1/8" thick). Trim the wood to match the outline of the seat back. Paint the wood chromium green or primer gray. Glue in place, with another piece of 1/8" sq. scrap balsa for support.

Radio: Carefully cut out with a sharp hobby knife or scissors, cutting precisely around the perimeter lines. DON'T cut off the white 45° assembly tabs - cut right on the lines. After you have it

cut out, fold it carefully into a box shape, gluing together the corners with the assembly tabs. Go slowly and make the folds precisely on the lines, you will end up with a good looking result. Touch up any white lines showing at the corner joints with matching colored pens. Glue in the finished radio in place behind the seat back.

Pilot: We used a Hangar 9 1/6-scale U.S. WWII Pilot #HAN8297 (not supplied) in our prototype MUSTANGS. Other brand pilots of the same scale will also work.





BALANCE THE MODEL

This is probably the single most important step in preparing your P-51B Mustang for flight. The final placement of the longitudinal Center of Gravity, or Balance Point, is extremely important and should be approached with patience and care.

Completely assemble the model, including propeller, spinner, etc. Do not leave anything off the airplane that will be on it in flight. DO NOT fill the fuel tank for balancing purposes. Some people prefer to balance their airplanes by lifting the model up by one finger at each wingtip to find the spot where the model will sit perfectly level. This has been done for years and is an acceptable way to balance a model. However, with an airplane as large as the MUSTANG, it is virtually impossible to balance it by the wingtips by yourself. We prefer balance to the Mustang in the upside down position, with the measurements taken at the wing root right alongside each fuselage side.

IMPORTANT NOTE: Balanced means the airplane sets perfectly level when supported at the desired balance point - NOT slightly nose down or nose up - PERFECTLY LEVEL!

BALANCE POINTS REFERENCE CHART

* Percentage of Mean Aerodynamic Chord

% of MAC*	distance aft of wing leading edge measured along the fuselage side
27%	5.068"
28%	5.182"
29%	5.295"
30%	5.409"
31%	5.523"
32%	5.636"
33%	5.750"

For initial test flying we suggest a starting balance point of 5-3/8" (5.375") behind the leading edge of the wing, with is approximately of 30% MAC, measured along the fuselage side.

As your experience with the P-51B Mustang increases, you can adjust the balance point to suit yourself. In general, as the balance point is moved aft the airplane will become more responsive and less stable in all axis. Some pilots like their models extremely reactive, while others like to fly with more smoothness. In the end, the final balance point and control throws you use will depend somewhat on how you like to fly.

The best means of shifting the CG fore or aft is by shifting the location of the battery pack. It is the heaviest movable component in the airplane. Wherever you put the battery pack, make sure it cannot move around in flight. Our P-51B MUSTANG prototypes, using either the Saito 91 and 100 4-strokes, required no additional nose or tail weight to achieve different balance points. We shifted the balance point by shifting the battery pack.

If moving your battery pack does not achieve the balance point you want, and more weight is needed, consider using a larger (and therefore heavier) battery pack. Try to avoid adding useless weight. If your model is nose heavy and battery shifting does not work, you can try adding lead stick-on weights in the rear of the fuselage. After you've determined how much tail weight you need, the weights can be mounted inside the fuselage by simply removing the elevator servo and gluing the weights securely inside the fuselage. With the elevator servo back in place, the weights willbe hidden.

INCIDENCE & THRUST ANGLES

For best results do not change the incidence or thrust angles of this model - leave it alone! Your P-51B MUSTANG was factory built in a jig to the following specifications. We are confident that it is built within tolerance and will fly well. These specs are given for reference only, in case the airplane ever needs to be rebuilt. We do not recommend that you alter the incidence and thrust angles of your MUSTANG before test flying as built by the factory.

Wing Incidence:	+ .8°
Stab Incidence:	+1.5°
Engine - Down Thrust	- .5° down
Engine - Side Thrust	2° right

PRE-FLIGHT SAFETY CHECK
Turn the radio system on and check the function of all the controls. Make sure they are moving in the right direction! Thousands of R/C airplanes have crashed over the years because the servos were moving the wrong way! Also, make sure all the servos are centered and working perfectly, without any binding. Double check to make sure that you have secured the servo arms to the servos with the retaining screws. Correct all such problems now.

CONTROL MOVEMENTS
Following control surface movements for the P-51B Mustang are based on our experience flying our prototype models. These measurements have provided us with a very smooth flying model. We urge you to use these measurements for your initial test flight set up. Later, after test flying, you can change them incrementally if you feel you want faster or slower control response. Because all pilots have differing opinions about what they like or dislike in control authority, these numbers can certainly be changed to suit your own flying style.

Ailerons:	7/16" Up - 7/16" Down
Elevators:	11/16" Up - 11/16" Down
Rudder:	1-3/8" Left - 1-3/8" Right
Flaps:	1-1/2" Down (maximum)
Expo:	20% on Ailerons and Elevator

Note that these measurements are taken from the widest (inboard) end of the tapered ailerons and flaps, and at the widest trailing edge point of the elevators and rudder.

RANGE CHECK
Be sure to range check your radio installation on the ground, before you attempt to fly your MUSTANG for the first time. With the transmitter antenna collapsed, and the receiver and transmitter turned on, you should be able to walk at least 100 ft. away from the model and still have solid control. Have an assistant stand by the airplane to watch the action of the control surfaces, while you walk slowly away from the model, constantly working the controls as you go. Your assistant should signal to you if the control surfaces become erratic. If all is well out to 100 ft. or further, repeat the test with the engine running, with the assistant holding the airplane. 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, poor solder joints in your battery pack, or a defective cell in the battery pack, or a damaged receiver crystal from a previous crash. If you can't find and fix the problem, send the radio in to an approved service center.

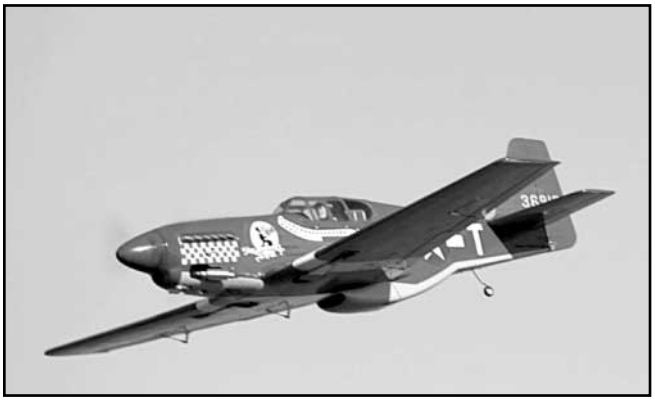
NEVER FLY WITH A RADIO SYSTEM THAT ISN'T WORKING 100% CORRECTLY. THE PROBLEM WON'T GET BETTER IN THE AIR, IT WILL GET WORSE!

FLYING
If you have carefully followed this assembly manual, test flying your P-51B Mustang should be a lot of fun with no surprises. Planning and preparation are the keys to success in flying R/C!

Try to choose a calm day with little or no wind for the first flight. Good conditions allow you to better evaluate and more accurately adjust the trim requirements for your airplane.

A good running reliable engine is a must for the success of this or any airplane. Take the time to solve any engine related problems before trying to fly your model.

Always check each control linkage to be sure they are secure and that nothing is loose. Always make it part of your pre-flight routine to check each control on the airplane, making sure the surfaces are moving in the correct directions. Also, be sure to range check your radio system per the radio manufacturer's instructions.



TAKE-OFF: When you're satisfied that the airplane is ready for flight, start the engine and allow it to warm up to operating temperature. While the engine is warming up, make one last check that all controls are functioning in the right direction. Make sure the flaps are up - we do not recommend using them on takeoff under normal conditions. Taxi the P-51B our to the take-off position on the flying field. Hold full up elevator during the taxi to keep the tailwheel firmly to the ground. Line up with the center of the runway with the nose pointed directly into the wind. When ready to go, hold a little up elevator and smoothly advance the throttle - do not slam the throttle full open all at once. The airplane should roll forward smoothly, tailwheel on the ground. As speed builds, back off of the up elevator input and use the rudder as needed to maintain a straight takeoff run. The tail will come up as flying speed is reached and a little up elevator will lift the Mustang off the ground. Keep the wings level with the ailerons and climb out at a shallow angle until a safe maneuvering altitude is reached. Make your control inputs smooth and avoid jerking the sticks. Retract the landing gear during the climb out. Once you achieve a safe altitude, throttle back slightly to a nice "cruising" speed. Use your transmitter trim levers to make any necessary trim adjustments to achieve straight and level, hands-off flight.

With the airplane now trimmed and flying straight and level, you can begin to explore the P-51's flying characteristics. You should find it to be a very comfortable flying airplane, with smooth neutral-stability characteristics. If you've flown "pattern-style" aerobatic airplanes, the Mustang should feel very familiar. It will perform all the basic aerobatic maneuvers with ease and grace - loops, rolls, inverted flight, snap rolls, spins, Immelman turns, split S, etc., are all well within the P-51's flight envelope. Take it easy with the Mustang on the first flight, gradually getting acquainted with it as you gain confidence.

STALL TEST: Sometime during the first flight you should take the Mustang to altitude and see how it stalls. Fly the airplane directly into the wind and get the wings perfectly level. Begin throttling back the engine while steadily increasing up elevator input as the airplane starts into a descending glide. This will give you a good idea of the airplane's glide characteristics. While still at idle, steadily increase up elevator until the airplane stops flying and enters a stall. If the wings are level, the stalls tend to be clean and straight ahead, with the nose simply dropping forward and controlled flight resuming quickly. This is great information to have when set up for your first landing.

GETTING INTO LANDING CONFIGURATION: In preparation for your first Mustang landing, it's a good idea to take the Mustang to a safe altitude and experiment with getting the airplane into landing configuration - that means putting the gear and flaps down and getting the aircraft in a gradual descent at an appropriate "approach" speed.

Throttle Back To Slow Down: First throttle the engine back to slow the airplane down. Don't throttle back all the way to full idle, but back to approximately 1/4-1/3 throttle. As the speed bleeds off, let the airplane settle into a comfortable landing "approach" speed with the nose slightly down. You will probably have to hold a slight amount of up elevator to achieve this approach speed and flight attitude.

Drop Landing Gear: When ready, flip the retract switch to put the landing gear down. You'll find that the airplane's attitude in flight won't change much as the gear comes down.

Drop Flaps: Next, deploy the flaps - remember that the flaps are a low speed control surface and should never be extended down while flying at high speed. Use no more than 1/2 flaps the first time. As the flaps come down the airplane may want to climb a little due to the increased lift, especially if you haven't slowed down enough yet. It won't be a drastic climb or a dangerous situation. How much it climbs depends on how fast the model is going when you put the flaps down. If you haven't slowed down sufficiently, it will balloon more. Simply relaxing any up elevator you may have been holding and/or putting in a bit of down elevator can correct the situation - until the airplane slows down to the right speed for the flap/throttle/airspeed combination you have set. As the flaps slow the airplane, the nose will settle back down. Readjust the throttle slightly and the amount of up elevator you are holding to achieve a steady gradual descent rate with the flaps deployed. Sounds tricky, but it's really not. The main thing is - SLOW DOWN BEFORE DEPLOYING THE FLAPS! That will make the transition much smoother. How much throttle to carry with the flaps deployed is a matter of trial and error and learning.

LANDING: Once you are set up on final with the gear and flaps down and a gradual descent rate, the actual landing shouldn't present any problems. When the airplane is 3-4 feet off the ground, close the throttle completely in preparation for touchdown. Gradually add more up elevator as the airplane slows down and settles towards the ground. Flair the airplane, as the ground approaches, for a smooth 3-point landing and rollout. Hard landings are not necessary - sound piloting skills are. After landing, always remember to hold up elevator when taxiing to keep the tailwheel firmly to the ground.

Before flying your Mustang a second time, double check the airplane carefully for anything that may have come loose, become disconnected, etc. during the first flight. Each flight will be even more fun as you get more familiar and comfortable with your Mustang.

Please operate your airplane in a safe, responsible manner with constant regard to other flyers, spectators, and property.

GOOD LUCK AND GOOD FLYING!

WARNING! THIS IS NOT A TOY!

Flying machines of any form, either model-size or full-size, are not toys! Because of the speeds that airplanes must achieve in order to fly, they are capable of causing serious bodily harm and property damage if they crash. **IT IS YOUR RESPONSIBILITY AND YOURS ALONE** to assemble this model airplane correctly according to the plans and instructions, to ground test the finished model before each flight to make sure it is completely airworthy, and to always fly your model in a safe location and in a safe manner. The first test flights should only be made by an experienced R/C flyer, familiar with high performance R/C aircraft.

JOIN AMA

The governing body for radio-control model airplanes in the United States is the **ACADEMY OF MODEL AERONAUTICS,** commonly called the **AMA**. The **AMA SAFETY CODE** provides guidelines for the safe operation of R/C model airplanes. While AMA membership is not necessarily mandatory, it is required by most R/C flying clubs in the U.S. and provides you with important liability insurance in case your R/C model should ever cause serious property damage or personal injury to someone else. For more information:

ACADEMY OF MODEL AERONAUTICS
5161 East Memorial Drive
Muncie, IN 47302
Telephone: (765) 287-1256
Web Site: www.modelaircraft.org

SIG CUSTOMER SERVICE

SIG MANUFACTURING COMPANY, INC. is committed to your success in both assembling and flying the P-51B MUSTANG ARF kit. Should you encounter any problem building this kit, or discover any missing or damaged parts, please feel free to contact us by mail or telephone.

SIG MANUFACTURING COMPANY, INC.
P.O. Box 520
401-7 South Front Street
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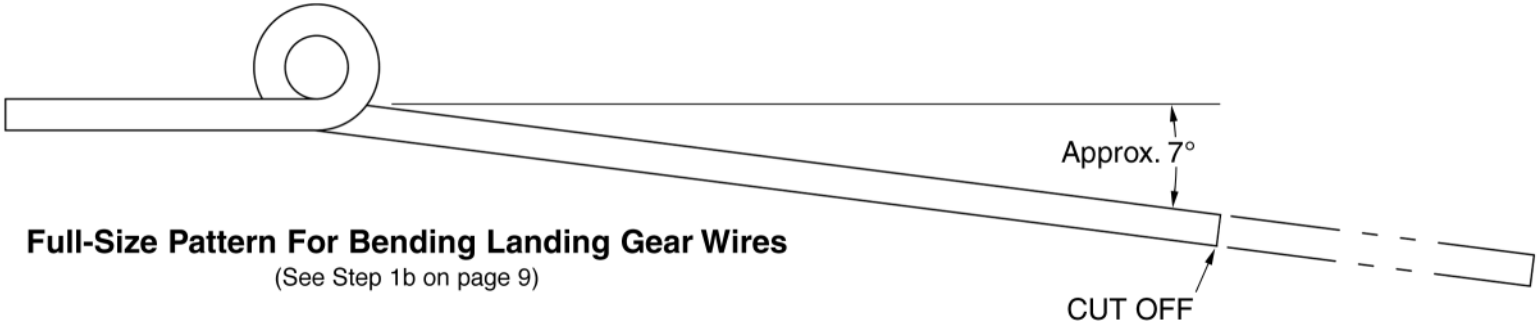
SIG WEB SITE: www.sigmfg.com
SIG E-MAIL: mail@sigmfg.com

LIMIT OF LIABILITY

The craftsmanship, attention to detail and actions of the builder/flyer of this model airplane kit will ultimately determine the airworthiness, flight performance, and safety of the finished model. SIG MFG. CO.'s obligation shall be to replace those parts of the kit proven to be defective or missing. The user shall determine the suitability of the product for his or her intended use and shall assume all risk and liability in connection therewith.

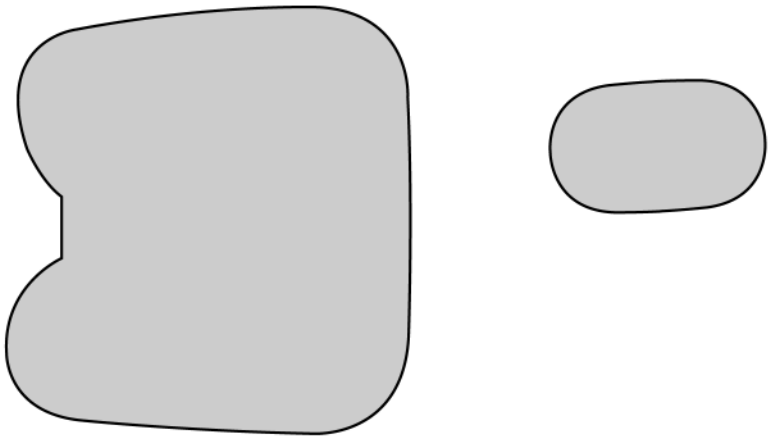


Full-Size Pattern For Bending Landing Gear Wires

(See Step 1b on page 9)

Full-Size Pattern For Bending Retract Pushrods

(See Step 4b on page 11)

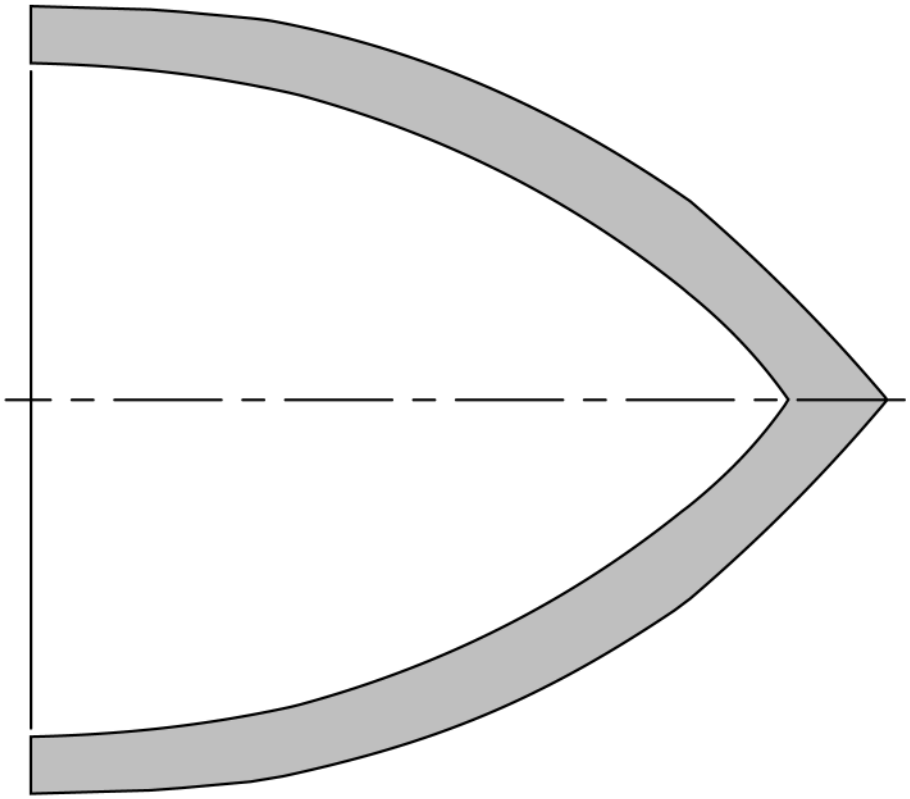


Full-Size Pattern For Saito 1.00 Cowling Cutouts

(See Step 2 on page 18)

Full-Size Pattern For Air Scoop Covering Removal

(see Step 5 on page 13)



The Legacy of the P-51B Mustang

The early "B" version of the P-51 Mustang has been mostly overshadowed by its more numerous sibling, the P-51D. Nonetheless, the P-51B was a great looking and superior flying aircraft in it's own right, and it played a very crucial role in the outcome of World War II in the air - perhaps an even more important role than that of it's more famous sibling. As the old saying goes, *"Timing is everything"*.

Air War 1943

In 1943 the American daylight bombing campaign against Germany was not going well. Frontline U.S. fighters, primarily early P-47s, didn't have enough range to escort the B-17 and B-24 bombers all the way to the target and back. Starting out from their home bases in England, the P-47s could only stay with the bombers for a few hundred miles. Day after day the bomber crews watched despondently as their fighter escort turned back to base, leaving the bombers to go on alone, just as they were approaching the enemy's den. Packs of Luftwaffe fighters simply waited until the P-47s turned back, and then, pounced on the unprotected bomber formations. Eighth Bomb Group losses were so heavy during this period that 75% of its crewmembers never completed their 25 missions. The US Air Force was on the brink of cancellation of daylight raids -- until the P-51B Mustang came along!

Birth of the Mustang

In 1940 the embattled British were buying P-40s as fast as Curtiss could build them. Needing more fighters, they approached North American Aviation to ask if they would build P-40s for them under license from Curtiss. The president of North American, "Dutch" Kindelberger, didn't like that idea. He said his company could produce a combat plane that was better than the P-40 using the same engine, that being the Allison 1,200 hp V-12. The British accepted NAA's counterproposal, with the condition that the first prototype be ready to fly in 120 days. That's the time it would have taken to tool up for building the P-40 at NAA. True to their word, NAA rolled out the prototype P-51 just 102 days later, minus its Allison engine, which was late arriving. North American waited on Allison's doorstep until the engine was ready. Once they got it, the first flight took place on October 26, 1940. The new airplane combined advanced aerodynamic features with exceptionally clean lines and its performance was truly outstanding. It flew 25 mph faster than the Curtiss P-40, using the same engine. Deliveries of the airplane to England as the Mustang Mk I began in October 1941.

Advanced Aerodynamics
The P-51 Mustang design featured two groundbreaking features -- a laminar-flow airfoil and a radiator cooling system that actually increased the airplane's thrust.

Laminar-Flow Wing: This was a concept that had originated at the NACA laboratory but had yet to be incorporated into a production airplane. Essentially a laminar-flow airfoil features a relatively thin leading edge with the section's thickest point placed as far back as possible. In theory, this would insure that the boundary layer airflow adhered, or stayed "laminated", to the wing further aft of the leading edge than with any other airfoil section. This would be especially beneficial in high speed maneuvering situations, where airflow over conventional airfoils would break up much earlier on the wing surface, causing drag inducing turbulence. The catch was that a laminar flow airfoil required a perfectly smooth highly finished surface, which was difficult to achieve in mass production. Seeking ultimate performance in a wartime situation, North American went all out, devising a method of filling and sanding the front part of the P-51 wing to ensure laminar flow.

Thrust Producing Cooling System: Prior to the P-51, high-speed liquid-cooled fighter aircraft like the P-40, Spitfire, and Me-109, were loosing 10% or more of their power to cooling system drag. In an ingeniously designed new cooling system arrangement, the P-51 actually created thrust as the hot air was trapped and supercharged, and then, exited at a greater velocity than it entered. The net gain was to offset almost all of the drag that the cooling system created. The faster the airplane flew, the more pronounced the benefit became. At high speed, the Mustang's power loss to cooling system drag dropped to a mere 3%. This gave it a 20 - 30 mph speed advantage over other fighters with similar horsepower. North American executive Lee Atwood offered this explanation; *"The full-power propeller thrust was about 1,000 lb. and the gross radiator drag was about 400 lb., but the momentum recovery (of the new system) was some 350 lb. of compensating thrust - for a net cooling drag of only some three percent of the thrust of the propeller".*

A Merlin Engine For The P-51B
While the first Allison-powered Mustang was better than the P-40, the switch to the more powerful Merlin engine (the Spitfire engine), which was rated 420 hp more than the Allison, made it truly outstanding. Now, the P-51 could reach a speed of 440 mph at 30,000 feet, and a climb to 20,000 feet required only five minutes and 54 seconds. The P-51B was approximately 30 mph faster than the Spitfire, with the same engine, and faster at high altitude than any other fighter airplane of the time. This was a remarkable advance in flight performance!

The addition of a new 85-gallon fuselage tank gave the P-51B a huge internal gasoline tank capacity (around 425 gallons). This meant its range was 1,080 miles, and it could be extended to 2,600 miles when extra drop-tanks were attached to the wings -- far more than any other allied or German fighters of the time.

The first P-51Bs began arriving at U.S. 8th Air Force units in England in December 1943. The German Luftwaffe fighters were about to get a rude awakening!

Turning The Tide
For the bomber crews, the P-51B was a Godsend. The new Mustang gave the Allies a new hope, as it quickly began to change the outlook of the air war. Now, when the P-47s turned back low on fuel, the Mustangs pulled up to take over escort, all the way to Berlin! The Luftwaffe could no longer attack unprotected bombers. As one general said about the slightly less limber P-51; *"The Mustang won't do what a Spitfire does, but it does it over Berlin."*

The first P-51 ace was Major James H. Howard of the 354th Fighter Group, flying his P-51B named "Ding Hoa". On January 11, 1944, he shot down five German fighters to become an "ace-in-a-day". He was awarded the Medal of Honor for this feat. During that same air battle, 49 new P-51B's shot down 15 enemy planes without suffering a single loss.

By April 1944, the P-51B Mustangs had decisively taken control of the skies over Europe. Its superior capabilities shortened the war immensely. They turned what had been a brutal stalemate into victory for the Allies. Without the P-51B Mustang, the bombing of Germany would have had to been halted. With the Mustang, the tragic losses suffered by bomber crews was greatly lessened.

Don Gentile and Saga of "Shangri-La"
One of the most famous P-51B aircraft is *"Shangri La"*, flown by the 4th Fighter Group ace Don Gentile. Gentile totaled 30 kills during the war, breaking Eddie Rickenbacker's WWI record of 26. Incredibly, he scored two-thirds of his kills in a short 6-week period in March and early April of 1944 -- right after he started flying his new P-51B.

Don Gentile was a seasoned veteran by the time the P-51B arrived on the scene. He had originally enlisted in the Royal Canadian AF before the U.S. entered the war. He was posted to England in 1941, flying the Supermarine Spitfire with the famed "Eagle Squadron". He claimed 2 kills in his time with the squadron. In September 1942, the Eagle Squadron was

transferred to the USAAF, becoming the 4th Fighter Group. Having been Spitfire pilots, Gentile and many other pilots of the 4th were skeptical of the heavy P-47 Thunderbolt they were now given to fly. After a year of flying the P-47, they were eager to get the new Merlin powered P-51 Mustangs they'd heard about. Finally, in February 1944 they got their wish, as brand new P-51B Mustangs began to arrive at their air base in Debden, England.

The 4th Fighter Group's *"Debden Ponies"* quickly launched into a new phase of the air war. General Hap Arnold, commander of the USAAF, unleashed his new long range fighters with these instructions; *"My personal message to you - and this is a MUST - is to destroy the enemy airforce wherever you find them, in the air, on the ground, and in the factories."* Defending the bombers wasn't the only objective any more -- it was now a mission of seek and destroy!

Don Gentile's Amazing 6-Week Record With His New P-51B "Shangri-La"

March 2, 1944 - Logs his first flight in *"Shangri-La"*.

March 8, 1944 - Scores 4 Me-109s (kills #10, #11, #12, #13)
It's a big day for the new P-51Bs on the outskirts of Berlin! Gentile teams up for the first time with a new wingman, John Godfrey, who also shoots down two ME-109s this day. They go on to become the greatest fighter duo in history! Some of their tactics are still being taught to today's jet fighter pilots. Gentile's 4 kills on this day brings his total to 13, and puts him in a tie with veteran Duane Beeson for the title of "Top Ace" in the USAAF. This starts a very public "Ace Race" between Gentile and Beeson to see who will be first to break Eddie Rickenbacker's record. The eager press follow every mission. Both men forego leaves they were due to continue their battle. A series of photos are taken of Gentile and Beeson and sent to the states to publicize the competition between the two.

March 18, 1944 - Scores 1 Fw-190 (kill #14)
Beeson gets 1 Me-109 - they're still tied at 14 kills each!

March 23, 1944 - Scores 2 Me-109s (kills #15 and #16)
Beeson also gets 2 Me-109s *- tied at 16 kills each!*

March 27, 1944 - Scores 2 Me-110s (kills #17 and #18)
Beeson gets 2-1/2 kills *and goes slightly ahead for now!*

March 29, 1944 - Scores 2 Fw-290s & 1 Me-109 (kills #19, #20, and #21)
A big day for Don Gentile and "Shangri-La", giving him the lead in the "Ace Race".

April 1, 1944 - Scores 1 Me-109 (kill #22)
Beeson also scores an Me-109, but gains no ground on Gentile.

April 5, 1944 - Scores 5 kills ground strafing
The USAAF considers ground kills as important as air kills in the war effort. Today pushes Gentile's total to 27, breaking the record of 26 set by Captain Eddie Rickenbacker during World War I. On this same day, Duane Beeson is brought down by German ground fire while strafing. He is captured, thus ending the "Ace Race". Beeson would spend the rest of the war as a POW. He scored 22 victories.

April 8, 1944 - Scores 3 Fw-190s (kills #28, #29, and #30)
These three kills fill out the final total of 30 crosses applied to "Shangri-La". Don Gentile is the top scoring ace in the 8th AF, and the press cannot get enough of him and the colorful "Shangri-La".

April 11, 1944 - General Eisenhower comes to Debden Airfield to award Don Gentile the Distinguished Flying Cross. He remarks to Don; ***"You are a one man air force!".***

April 13, 1944 - Returning from a mission to Schweinfurt, which was to be his last mission before a stateside publicity tour, Gentile crashes *"Shangri-La"* while making an extra low level pass for the assembled press reporters and movie cameras. The airplane is a total loss. His commander, Col. Blakeslee, immediately grounds Gentile as a result. By the end of April he was back in the U.S. selling War Bonds.

One of the ground crew gave this account of the accident; *"The press was there - this was to be his last mission before a short break back to the States, and everybody was out in full force to watch him come back. He gave the dispersal a real rattling on his first pass, but after spotting the rather large crowd, he decided to make his next one something nobody would forget. Circling around ... Don lined up, put his nose down and leveled off just feet off the ground. ... Don was so low at the beginning of his run that he disappeared from view ... he reappeared just before he crossed the southern part of the runway. He crossed the runway right on the deck, and the plane seemed to settle and Shangri-La's prop struck the grassy area about 100 yards in front of the dispersal area. They, later, found numerous chop marks where the prop had dug into the ground. After he felt those first unmistakable jolts, Don immediately pulled the kite up, and sailed right over the heads of the assembled crowd and the squadron's dispersal shacks, nearly hitting them.... His prop was slowly wind milling, and horribly bent as he flew/glided west-southwesterly for almost a mile, gently arcing slightly right as he spotted and aimed for ... a good flat set of open fields.... He manage to squeak his glide just barely over ... a large stand of trees, then hit hard and slid to a stop. ... Shangri-La broke her back when she "landed", and was a total write-off. ... 'Well', he said, 'I think I flubbed up!'. This stunt forever ended Don's combat days - Blakeslee almost literally kicked him out of the 4th Fighter Group, and he never again saw combat - ever."*

After his War Bond tour, Don Gentile was assigned to Wright Field in Dayton as a test pilot. He tried, but was never able to get reassigned to combat duty before the war ended. After surviving all the Germans could muster, Don Gentile was killed in the crash of a T-33 jet trainer on January 28, 1951 at the age of 30.

Served The Entire War

In addition to Don Gentile and Duane Beeson, many other pilots were becoming aces in their new P-51Bs in early 1944. The USAAF asked North American to expand production as fast as possible. North American's huge Inglewood, California factory was greatly expanded and dedicated solely to Mustang production. A new plant was also built in Dallas to produce more P-51s, as well as the company's AT-6 trainers. Inglewood-built Mustangs were designated P-51B, while Dallas-built Mustangs were designated P-51C. These aircraft were almost identical, and can generally be distinguished only by serial number. In total, Inglewood built 1,988 P-51Bs and Dallas built 1,750 P-51Cs. Many veteran pilots regarded the P-51B/C as the best Mustang of the entire series. They felt it was lighter, faster, and had crisper handling than the later bubble-topped P-51D. P-51B/C fighters remained predominant until the middle of 1944, when large numbers of P-51Ds began to arrive. Even as late as the last month of the war, 1000 out of the 2500 Mustangs serving in the ETO were of the P-51B/C variety. The last P-51B passed out of service in 1949.

Great publicity shot of Don Gentile relaxing on the wing of his legendary P-51B "Shangri-La" at their home base in Debden, England in March 1944.

Duane Beeson gives his crew chief a thumbs up from the cockpit of his P-51B Mustang named "BEE". His logo was an angry bee brandishing two six guns.

The ground crew watches intently as Gentile warms up "Shangri-La" for another mission. The 21 kill marks gave Gentile the lead over Beeson in the "Ace Race".

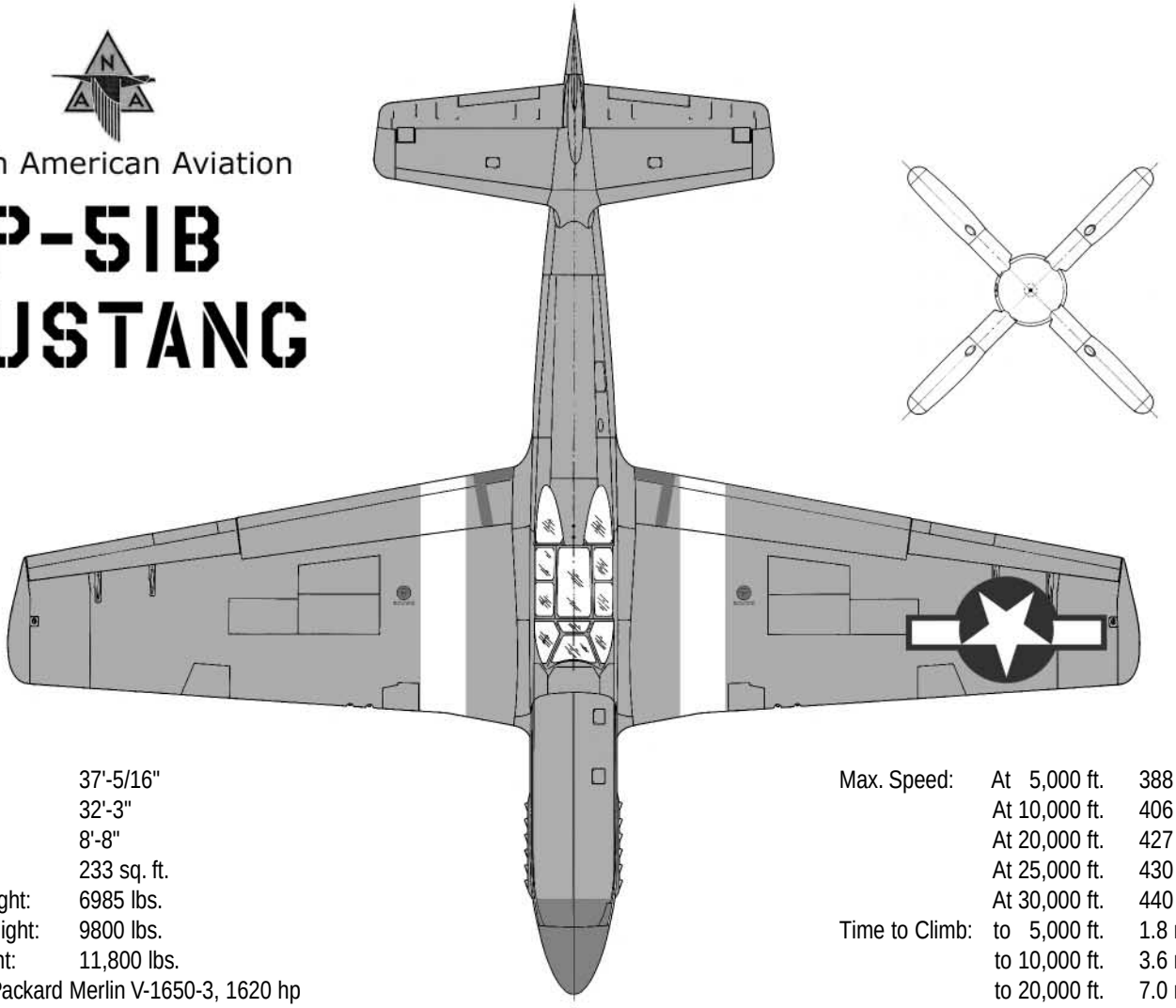
April 4, 1944 Don Gentile makes a low pass over Debden Airfield for the benefit of the press corps. A similar low pass 9 days later would destroy "Shangri-La".

On April 13, 1944 the press gathered at Debden to welcome Gentile home from his last mission. He gave them an extra low level buzz job that wiped out "Shangri-La". He was sent home to sell war bonds, never returning to combat.

A dejected crew member surveys the damage. Both Gentile and his wingman John Godfrey had red and white checkerboard painted on the noses of their airplanes so they could find each other quickly in a dog fight.

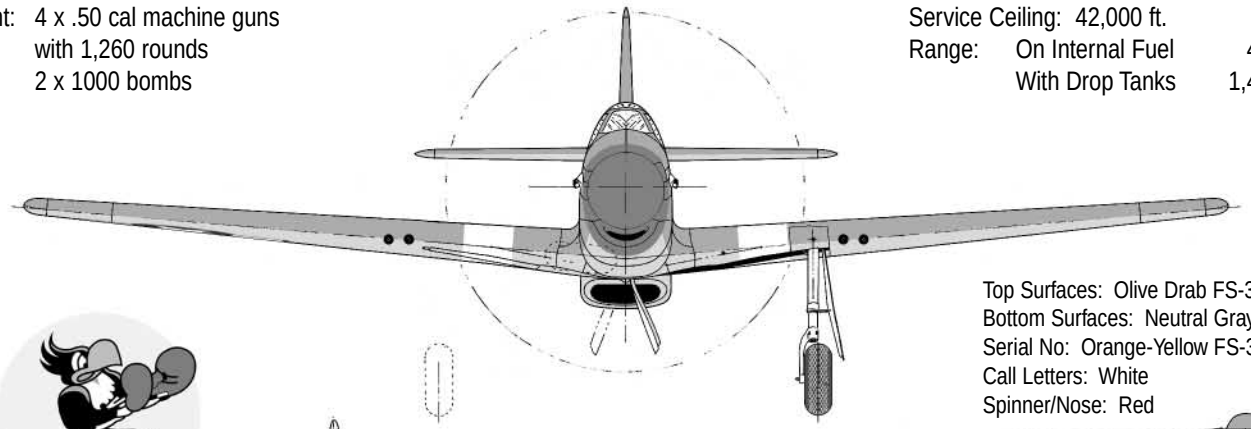
North American Aviation

P-51B MUSTANG

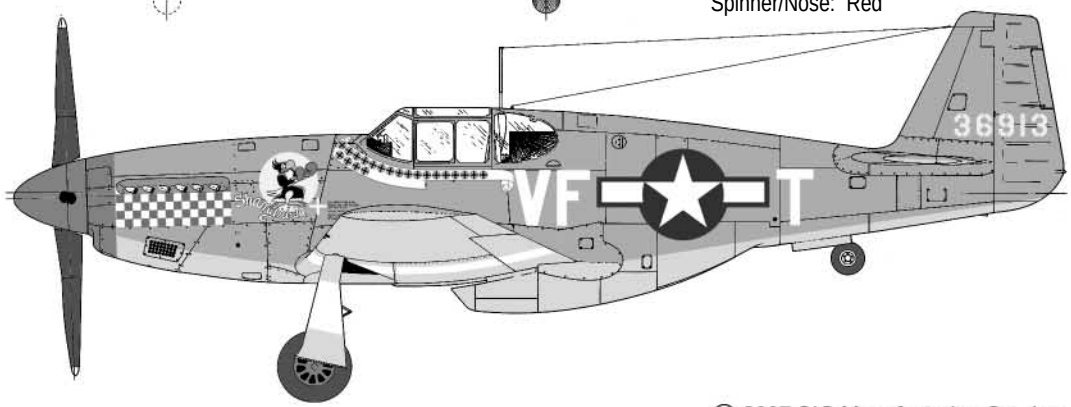


Wingspan:	37'-5/16"
Length:	32'-3"
Height:	8'-8"
Wing Area:	233 sq. ft.
Empty Weight:	6985 lbs.
Normal Weight:	9800 lbs.
Max. Weight:	11,800 lbs.
Engine:	Packard Merlin V-1650-3, 1620 hp
Armament:	4 x .50 cal machine guns with 1,260 rounds 2 x 1000 bombs

Max. Speed:	At 5,000 ft.	388 MPH
	At 10,000 ft.	406 MPH
	At 20,000 ft.	427 MPH
	At 25,000 ft.	430 MPH
	At 30,000 ft.	440 MPH
Time to Climb:	to 5,000 ft.	1.8 minutes
	to 10,000 ft.	3.6 minutes
	to 20,000 ft.	7.0 minutes
Service Ceiling:	42,000 ft.	
Range:	On Internal Fuel	410 Miles
	With Drop Tanks	1,450 Miles



Top Surfaces: Olive Drab FS-34087
Bottom Surfaces: Neutral Gray FS-36173
Serial No: Orange-Yellow FS-33538
Call Letters: White
Spinner/Nose: Red



Aircraft: P-51B-7-NA
Serial No: 43-6913
Call Letters: VF-T

Pilot: Major Don Gentile
336th Fighter Squadron
4th Fighter Group, USAAF

Enemy Aircraft Destroyed: 27.8