

P51 MUSTANG



ASSEMBLY & OPERATIONS MANUAL

Please review this manual thoroughly before assembling or operating this model.

Proceeding with assembly and use of this product indicates Agreement With & Acceptance of the following Liability Disclaimer.

Model airplanes, model engines, model engine fuel, propellers and related accessories, tools and equipment can be hazardous if improperly used. Be cautious and follow all safety recommendations when using your VMAR model airplane. Keep hands, tools, clothing and all foreign objects well clear of engines when they are operating. Take particular care to safeguard and protect your eyes and fingers and the eyes and fingers of other persons who may be nearby. Use only a good quality propeller that has no cracks or flaws. Stay clear of the propeller and stay clear of the plane of rotation defined by the propeller. The Manufacturer, Distributor, Retailer and/or other

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CAUTION

A Remote Control Model Aircraft is not a toy. It is a flying model that functions much like a full size airplane. If you do not assemble and operate this product properly you can cause injury to yourself and others and damage property. **DO NOT FLY** this model if you are not qualified. You are entirely responsible for the mechanical,

aeronautical and electrical integrity of this model and its structure, control surfaces, hinges, linkages, covering, engine, radio, wiring, battery and all other components. Check all components before and after each flight.

Don't fly until it's right!



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The Graphics and Detailing are inside the POLYCOTE ECS!

STAGE 1

WING ASSEMBLY-JOINING THE WING HALVES

Parts needed

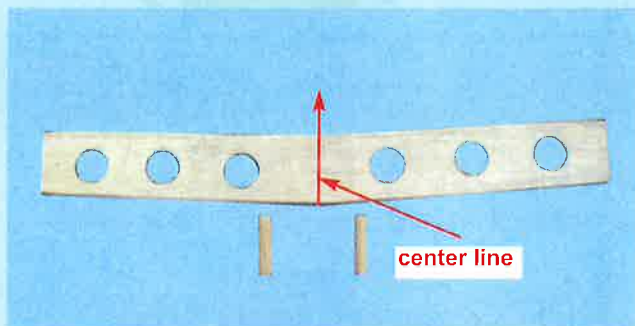
- right and left wing panels
- Roll of wing joiner tape
- Wing joiner (also called dihedral brace)
- Two short dowel guides

Tools and adhesives needed

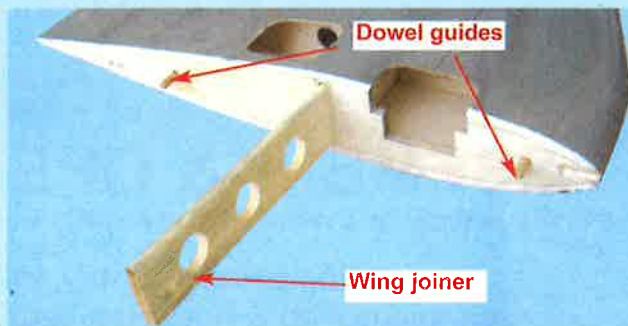
- 30 minute epoxy
- Epoxy brush or stir sticks
- Disposable mixing dish for the epoxy
- Sandpaper (coarse 240 grit recommended)
- Low tack masking tape
- Pencil
- Knife
- Ruler
- Paper towels

STEP 1.1 Locate the wing joiner (also called dihedral brace). Using the ruler, determine the center of the wing joiner and mark it with the a pencil as illustrated in 1A. Also mark a center line on each of the dowel guides

Step 1.2 Trial fit the wing joiner into the wing panels. It should insert smoothly up to the center line as illustrated in 1B. Now slide the other wing panel onto the wing joiner until the wing panels meet. If the fit is overly tight, sand the wing joiner slightly and try again. Mark the joiner to indicate with way is **UP** as illustrated in 1A



1A - preparation of wing joiner and dowel guides



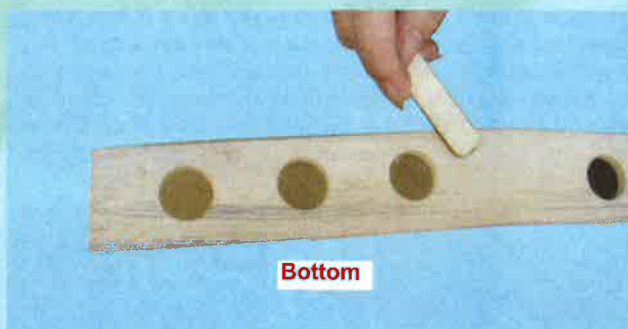
1B - Trial fit the wing joiner and dowel guides

Step 1.3 Insert the dowel guides into one of the wing panels all the way to the center line. Apply CA glue to secure the dowels into their places as illustrated 1B and 1C. **Do not apply CA glue to the wing joiner**

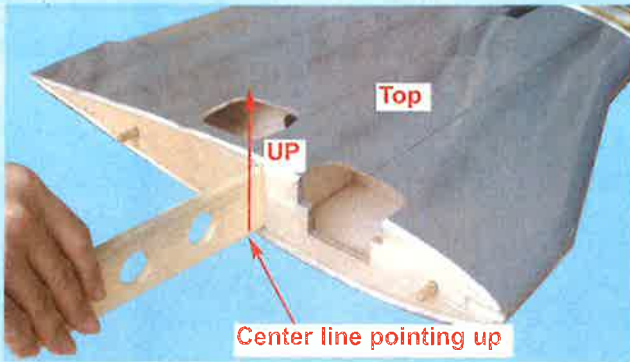
Step 1.4 Apply plenty of 30 minute epoxy to one end of the wing joiner. Using a stir stick or epoxy brush. Carefully insert the joiner into the first wing panel as illustrated in 1D,1E and 1F, then wipe off the excess epoxy that squeezes out of the joint with a cloth or tissue. Repeat this process several times to ensure that the wing joiner and cavity are well coated in epoxy. when the wing joiner and cavity are well coated with 30 minute epoxy, insert the joiner to the center line, wipe away any excess epoxy and let dry. (**Note. Do not use 5 minute epoxy or CA to join the wings**)



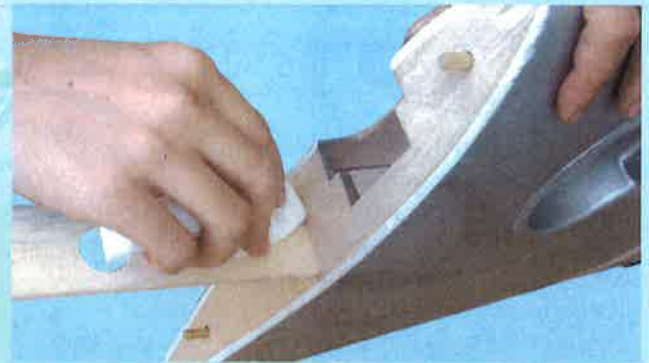
1C - Apply CA glue to secure dowels into their places



1D - Apply plenty of 30 minute epoxy to the wing joiner



1E- Carefully insert the joiner all the way to the center line



1F- wipe off the excess epoxy then allow to cure

STAGE 2

WING ASSEMBLY - JOINING THE WING HALVES (Cont.)

Step 2.1 When the epoxy has cured in stage 1, trial fit the second wing panel onto the wing joiner first to ensure that the two panels fit without an excessive gap

Step 2.2 Now apply plenty of epoxy to the wing joiner and wing root ribs of both wing panels. Use only 30 minute epoxy to ensure a strong bond and give yourself plenty of working time

As described in the step 1.4, repeatedly apply epoxy and insert into the wing joiner cavity, the epoxy should ooze from the joint and the excess should be cleaned off with a rag or tissue before it cures

Step 2.3 Use low tack masking tape to hold the two wing panels together until the epoxy cures. See 2C



2A- Apply plenty of 30 minute epoxy glue to all surface



2B- Align the two wing panels and slowly close the gap until the wing root end are firmly in contact with each other



2C- Use low tack masking tape to hold tightly together

STAGE 3

WING ASSEMBLY - JOINING THE WING HALVES (Cont.)

Step 3.1 One epoxy has cured completely (allow several hours at least), the tape can be carefully removed from the wing panels. Peel the tape back on itself... do not pull upright away from the wing. To seal and finish the joint in the wings, a roll of wing joiner tape has been supplied. Starting on the bottom side of the wing, stick the tape centrally over the joint ensuring that it is pressed down firmly as you work around the wing. Wrap the tape all the way around the wing joint in one piece, starting and finishing at the wiring harness cavities at the top of the wing



3A- Apply tape over the joint starting here on the bottom wing



3B- Keep continue around the wing



3C- Continue over the top of the wing and trim off the excess tape

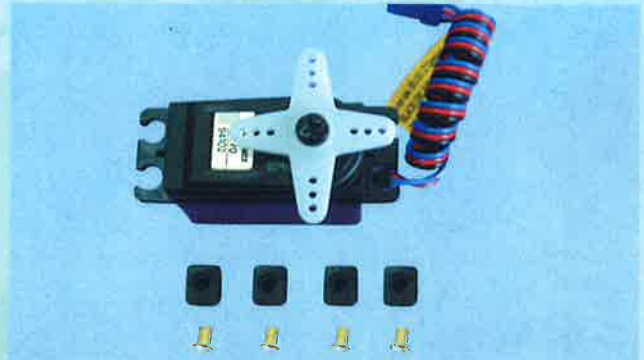
STAGE 4 INSTALLING THE AILERON & FLAP SERVO INTO THE WING

To install the aileron and flap servos into the wing you will need the following items

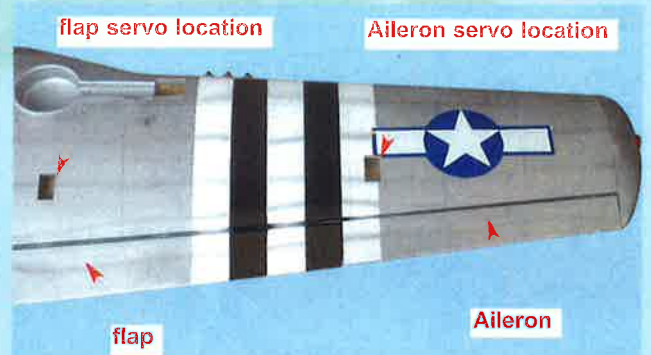
- Servo
- Servo mounting screws and grommets as supply with the servo
- Servo control arms as supplied with the radio
- Two aileron control rod assemblies supplied with the kit.. The assemblies consist of a metal rod with a clevis screwed onto each end.
- Two flap control rod assemblies supplied with the kit.. The assemblies consist of a metal rod with a clevis screwed onto each end.
- Low tack masking tape
- 2 aileron control horn assemblies
- 2 flap tack control horn assemblies

Step 4.1 Trial fit the aileron servo into the servo mounting cavity. Yo may have to modify the cavity slightly to fit the servo

Step 4.2 Screw the servo into place with the screws and grommets and screw correctly. See the manual that came with your radio for instrution about your particular servo grommets



4A- Prepare the servo by fitting the rubber grommets & ferrules supplied with your radio



4B- Aileron and aileron servo location. Also flap and flap location

STAGE 5 INSTALLING THE AILERON CONTROL SYSTEM

Step 5.1 Consul your radio instruction manual and center the aileron servo by plugging it into the aileron channel in the receiver. Turn on the transmitter then the receiver. Center the aileron trim lever on the transmitter. Remove the servo arm mounting screw and the servo arm

Step 5.2 Mount the servo arm back on the servo. Position the arm is parallel with the back edge of the wing. Screw the arm into place with the servo arm mounting screw supplied with the servo. Locate the two aileron control rod in the hardware bag.. Ensure the clesises are screwed well onto the threaded portion of the rod. Rotate and tug aggressively on the clevises and ensure that they are not loose on the rods. Tape the aileron into they neutral position so that they are even with the tralling edge of the wing and not pointing up or down

Step 5.3 Ensure that the aileron control horns are screwed onto the threaded aileron control horn bolts and that both control horns are in approximately the same on their respective bolts

Step 5.4 Connect the aileron servo rods to the aileron control horns. Connect the control rod to the servo output arm using a clevis.



5A- Aileron control rod assembly



5B- Aileron control horn and servo



5C- Aileron control rod installed

Step 5.5 Connect the other end of the control rod to the control horn using the second clevis

Step 5.6 Remove the masking tape holding the aileron..

Step 5.7 In the case of computer radios couple the servos together electronically by connecting them to the appropriate receiver channels. In the case of analog radios couple the servos together using a Y harness.

Step 5.8 Turn on your radio and activate the ailerons, using the aileron stick and ensure a smooth full motion can be achieved.

Step 5.9 With the wing top side up and viewed from the back, ensure that moving the transmitter aileron stick to the left raise the left aileron and lowers the right aileron. Movement of the stick to the left will roll the aircraft to the left. (Counterclockwise roll of the wing when viewed from the back).

Step 5.8 With the wing top side up and viewed from the back, ensure that moving the transmitter aileron stick to the right raises the right aileron and lowers the left aileron. Movement the stick to the right will roll the aircraft to the right.

STAGE 6 FITTING THE HORIZONTAL AND VERTICAL STABILIZERS

To install the stabilizer into the fuselage you will need:

- Fuselage
- Vertical stabilizer with pre-installed rudder
- Right and left horizontal stabilizers with pre-installed elevators
- Two elevator joiners



6A- The fuselage slots for the vertical & horizontal stabilizer



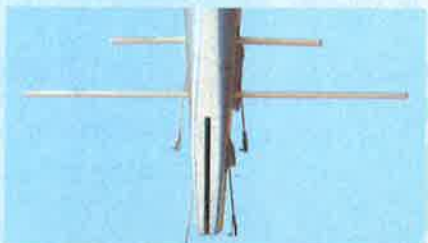
6B- Vertical stabilizer with pre- installed rudder



6C- Horizontal stabilizer with pre- installed elevator and 2 elevator joiner

STAGE 7 INSTALL THE HORIZONTAL STABILIZER

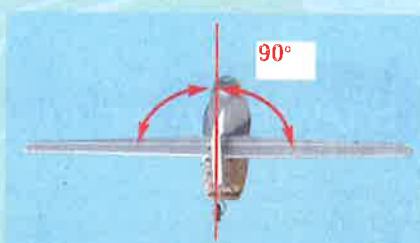
Install the wing to the fuselage first. Trial fit the vertical stabilizer into the fuselage slot



7A Trial fit the 2 horizontal stabilizer joiner into the fuselage



7B- Use CA glue to secure the horizontal joiner into the fuselage



7C- Trial fit the right and left horizontal stabilizer into the fuselage with straight and 90 degree to the fuselage



7D Apply sufficient 30 minute epoxy to the expose wood on both horizontal stabilizers



7E Apply sufficient 30 minute epoxy to the expose wood on the fuselage



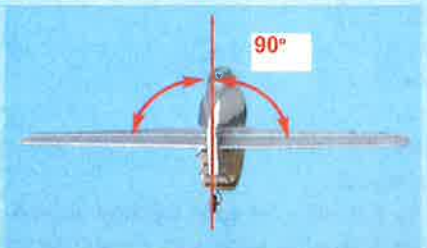
7F slowly press both horizontal stabilizers to the fuselage



7G- Press both horizontal stabilizers until it hit the fuselage



7H- Wipe off the excess epoxy



7I- The horizontal stabilizer straight and square with the fuselage

STAGE 8

INSTALLING THE VERTICAL STABILIZER



8A- Trial fit the vertical stabilizer into the fuselage



8B- Apply sufficient epoxy to the exposed wood area



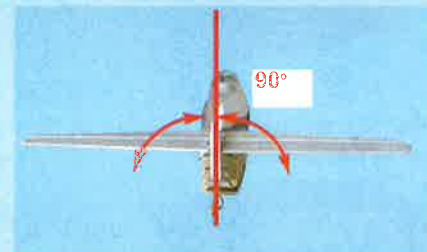
8C- Apply sufficient epoxy to the exposed wood area in the fuselage



8D- Install the vertical stabilizer to the fuselage



8E- Wipe off the excess epoxy



8F- Vertical stabilizer straight with the fuselage and square with the horizontal stabilizer

STAGE 9

INSTALL THE LANDING GEAR

The P51D Mustang has a tail dragger (tail wheel) configuration using a tail wheel and main landing gear

Identify the main landing gear components show below

- 2 Pre-bent main landing gear sets pre-assembled with mounting block
- 8 sheet metal screws (3 x 15 mm)

Step 9.1 Turn over the wing to locate the pre-drilled main landing gear mounting cavities. See 9B

Step 9.2 Insert one of the Pre-assembled main landing gear into place. Use 4 sheet metal screws to attach the landing gear to the wing. See 9C

Step 9.3 Repeat step 9.2 to attach the second main landing gear to the wing



9A- Components of one main landing gear



9B- Main landing gear location



9C- Both main landing gear mounted to the wing

STAGE 10

INSTALL THE TAIL WHEEL

The tail wheel on the P51D Mustang has Pre-installed by the factory and the steering rod also pre-installed



10A- Pre-installed tail wheel assembly with steering push rod



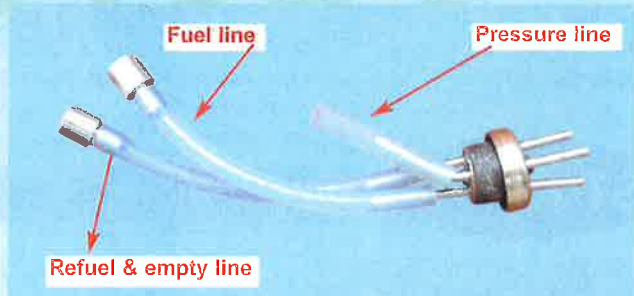
10B- Pre-installed tail wheel assembly with steering rod connected to the rudder

STAGE 11

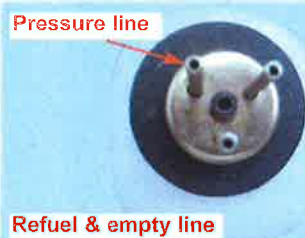
FITTING THE FUEL TANK

To assemble the fuel tank you will need the following items

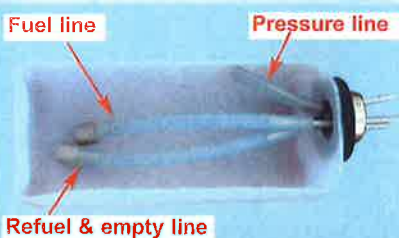
- The fuel tank assembly (supplied)
- 2 clunks (supplied)
- About 12 in (30 cm) of medium ID silicone fuel line (DUB-197 or DUB-222 or similar)



11A- Use 2 in. (50mm) for the pressure line and 4 in. (100 mm) for fuel and refuel lines



11B- Fuel tank and stopper assembly (front view)



11C- Illustration of fuel line positioning inside cutaway of the tank



11D- Fuel tank installed into the fuselage after adding external fuel lines from tank forward to engine area

STAGE 12

INSTALLING THE FUEL TANK INTO THE FUSELAGE

Step 12.1 Identified the fuel tank and fuel tank holder

Step 12.2 Putting the fuel tank into the fuel tank holder

Step 12.3 Install the fuel tank holder into it position. Use two 2 x 10mm screws (supplied) to secure the fuel tank holder in the fuselage



12A Fuel tank and fuel tank holder



12B- Fuel tank location



12C- Fuel tank assembly in position

STAGE 13 INSTALLING THE ENGINE

The VMAR P 51D 2 meter is designed for 90 to 120 size two stroke engines, or 120 to 160 four stroke engines

Step 13.1 Trial fit your engine to the engine mount. Check engine compartment clearances and modify using Dremel tool to allow your engine to sit properly on the mounts. Ensure the spinner back plate clears the front of the fuselage by $1/16 - 3/32$ in, 1.5 - 2.5mm. See 13A

Step 13.2 Once you have positioned the engine on the mounting beam, mark the location of the engine mounting holes. See 13B

Step 13.3 Center punch the hole locations on the beams. Drill $3/32$ in. (2.5mm) pilot holes at right angles through the beams. Put a drop of oil in each hole. Use four 4 x 25mm sheet metal screws to mount the engine. See 13C



13A- Allow for gap between the spinner back plate and the fuselage



13B- Mark the location of the engine mounting holes



13C- Drill $3/32$ in. (2.5mm) pilot holes at right angles through the beams



13D- Use four 4 x 25mm sheet metal screws to mount the engine.

STAGE 14 CONNECTING THE THROTTLE CONTROL ROD TO THE ENGINE

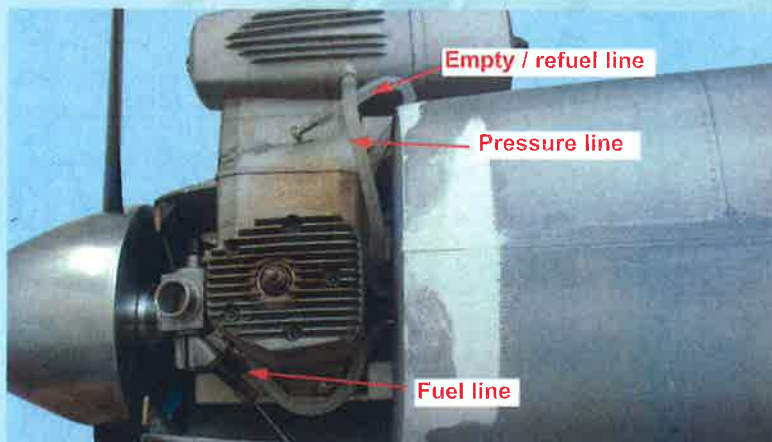


14A- Connect the clevis to the engine throttle arm



14B- Connect the servo arm to the engine throttle arm using the throttle control rod

STAGE 15 CONNECTING THE FUEL LINE



Typical fuel line, pressure line and empty/refuel line connection

Step 15.1 Install the muffler. Connect the fuel tank pressure line to the the muffler pressure nipple

Step 15.2 Connect the fuel tank fuel line to the carburetor fuel inlet nipple

Step 15.3 Double check that you have connected the metal fuel line from the tank to the carburetor and that you have connected the metal pressure line from the tank to the muffler

Step 15.4 The fuel tank refueling line is use only when filling the tank. Keep the line plugged after fueling is completed

STAGE 16

INSTALL THE PROPELLER AND THE SPINNER

Step 16.1 Consult your engine manual and select a suitable propeller

Step 16.2 Install the thrust washer, the spinner backing plate, the propeller, the prop washer and the prop nut supplied with the spinner. Ensure that they are all firmly attached. See 16B, 16C

Step 16.3 Trial fit the spinner cone and spinner cone retaining hex bolt. If necessary enlarge the cut out in the spinner cone to allow adequate clearance for the propeller. See 15D

Step 16.4 Double check that the spinner cone retaining hex bolt are firmly attached



16A- Aluminum spinner complete with all hardware (supplied)



16B- Install the spinner backing plate



16C- Install the propeller, the prop washer and the prop nut

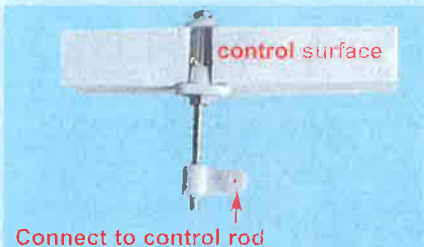


16D- Install the spinner cone using the retaining hex bolt. Ensure the retaining hex bolt is tight and secure

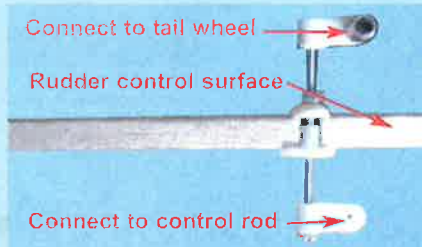
STAGE 17

FITTING ELEVATOR AND RUDDER CONTROL HORNS

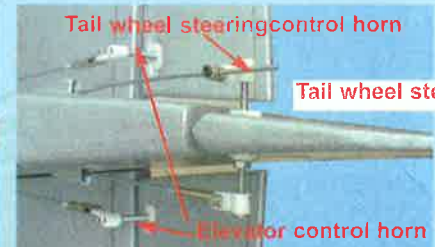
Step 17.1 The elevator and rudder control horns are installed through the elevators and protrude from the bottom of the elevators pierce the covering over the pre-drilled holes and install the control horns as shown



17A Typical control horn mounted to the aileron, flap and elevator surface



17B- Typical control horn mounted to the rudder

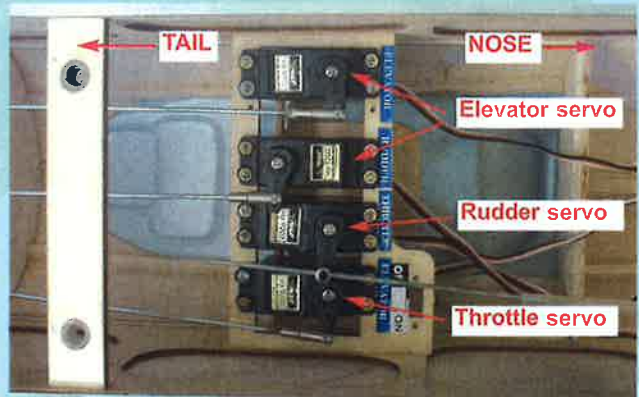


17C- Elevator servo mount to the fuselage and connect to the elevator control horn

STAGE 18

INSTALLING THE SERVOS

Install the rubber servo grommets and brass ferrules supplied with your radio equipment. The 4 servos that control the 2 elevator surfaces, rudder and throttle are to be installed in the servo cavities located in the fuselage (high torque servo recommended)



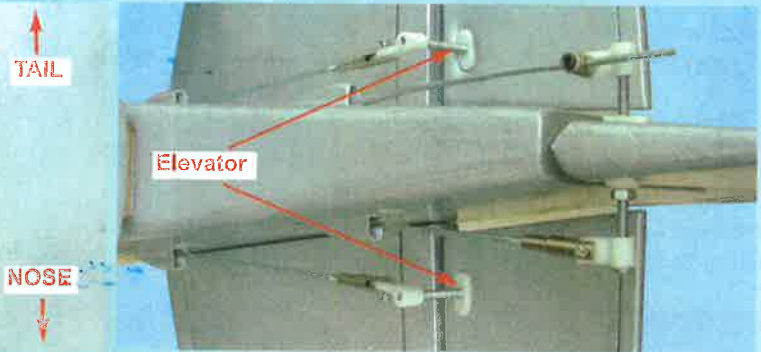
STAGE 19

CONNECTING THE PUSHRODS TO THE ELEVATOR SERVO

The P51 D Mustang has two separate elevators and two separate elevator control rods each running to an independent servo



19A- Connecting the elevator control rod to the servos



19B- Connecting the elevator control rod to the elevator

STAGE 20

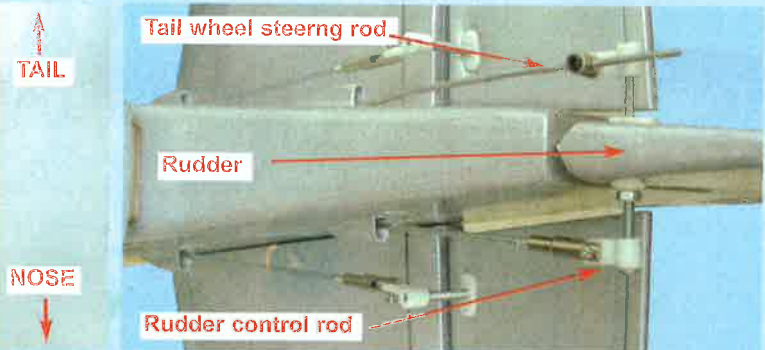
CONNECTING THE PUSHRODS TO THE RUDDER SERVO

Step 20.1 The control rod connected to the rudder exit inside fuselage. Connect the control rod to the servo. See 20A

Step 20.2 Connect the rudder control rod to the rudder. Connect other side of rudder control horn to the tail wheel steering



20A- Connecting the rudder control rod to the servo



20B- Connecting the rudder control rod to the rudder

STAGE 21

ADJUST CONTROL SURFACE THROW LIMITS

Adjust the deflection of the control surfaces to match the specifications on page 12. You can reduce the amount of throw by doing either or both of the following:

- From the servo end, move the clevis to a hole in the servo arm that is closer to the servo output shaft.

- From the control horn end, move the control rod/clevis further out on the horn (away from the control surface). Always confirm that the clevis is firmly attached after making any adjustment.

STAGE 22

FINAL RC SET-UP

Before starting the final set-up of the model, switch on the radio and ensure that all trims are in their neutral positions. Check that the ailerons, elevator and rudder are centered. If any adjustments are needed, do these by uncoupling the relevant clevis and turning it clockwise to shorten the linkage or counter-clockwise to lengthen it. Only when each control surface has been centered mechanically in this way should you begin adjusting the surface movement (or throw)

Now confirm that the control surfaces are moving in the correct direction. Use the servo reversing switches on your transmitter to reverse the direction of a servo if necessary. The most popular transmitter mode (with the throttle on the left, with ailerons and elevator on the right) is shown here.

STAGE 23

INSTALLING THE RECEIVER BATTERY

Step 23.1 Consult your radio manual for instructions about hooking up your receiver, battery, receiver and switch harness

Step 23.2 Wrap the battery pack securely in foam suitable for RC equipment and wrap the foam insulated pack in a plastic bag or cling wrap.

Step 23.3 Thread the battery pack connector forward in preparation for connecting to your switch harness

Step 23.4 Connect the battery pack connector to your switch harness according to your radio manual

STAGE 24

INSTALLING THE RECEIVER

Step 16.1 Consult your radio manual for instructions about hooking up your receiver.

Step 16.2 Plan where you are going to put the receiver with consideration for routing the antenna safely.

Step 16.3 Wrap the receiver securely in foam suitable for RC equipment and wrap the foam insulated receiver in a

plastic bag or cling wrap.

Step 16.4 Generally in the absence of specific instructions from the radio manufacturer, it is recommended that the receiver should be placed where it is least likely to have impact during a crash. Keep the battery pack and other heavy loose items ahead of the receiver.

STAGE 25

CONFIRM RADIO OPERATION

Step 25.1 Consult your radio manual for instructions about testing and operating your radio system.

Step 25.2 Pay particular attention to charging your batteries and range testing your system before and after each

flight.

Step 25.3 Check that all controls are working correctly before and after each flight.

STAGE 26

BALANCING THE AIRCRAFT

Step 26.1 The CG for your P51D Mustang is located at 6" to 7" (150mm - 170mm) back from the leading edge of the wing when the wing has been attached to the fuselage as per illustration 24A.

Step 26.2 For the initial flight, the CG should be located at 6" (150mm) back from the leading edge of the wing when the wing has been attached to the fuselage.

Step 26.3 The CG is measured with the engine, radio gear and all other components installed but WITH NO FUEL IN THE FUEL TANK

Step 26.4 Set up the CG as it will be when you fly it.

Step 26.5 It is very important to have the CG correct. Flying your model with the CG too far back will likely lead to loss

of control and a crash. If you discover that after you have assembled your model and installed your radio, motor and battery that the CG of your model is incorrect you must bring the CG to the correct location by doing the following BEFORE FLYING :

- Move the battery pack fore or aft
- Move other components fore or aft
- Change engine to a lighter or heavier model
- Add weight to the nose or tail. If adding it to the nose, try to make it useful by going to a heavier duty engine or adding a spinner with a heavy metal backing plate. As a last resort, add stick on "dead" weight where appropriate

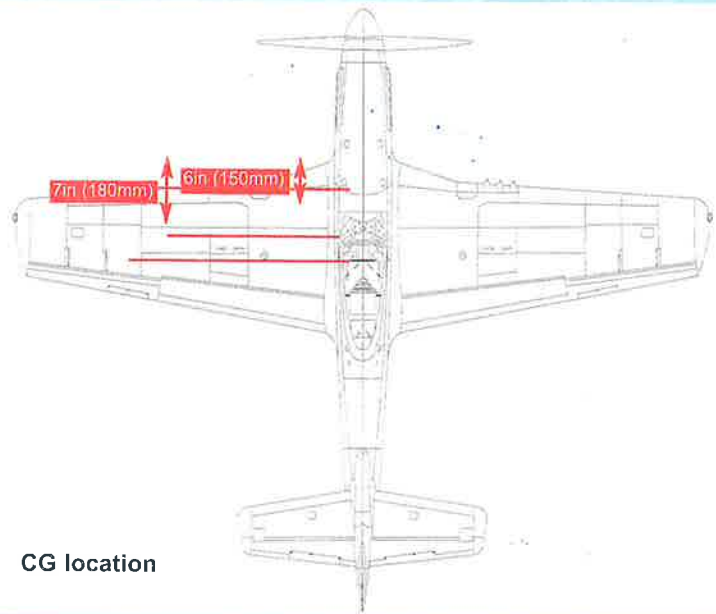
STAGE 27

CONFIRM MECHANICAL INTEGRITY

Step 27.1 Once you have confirmed that the CG is correct, you should do a thorough review of the entire model before your first flight. Check everything twice! Every hook up, every coupling, everything! Do it twice!!

Step 27.2 Before your first flight, have an experienced flyer review your work. Do not fly your model until it has been checked out by a third party who knows how to fly and how to set up a model aircraft. Do not fly alone. Seek experienced help.

Step 27.3 Once you have completed your first flight, get in the habit of checking your model over before and after each flight! Don't fly if you find something that is not right!



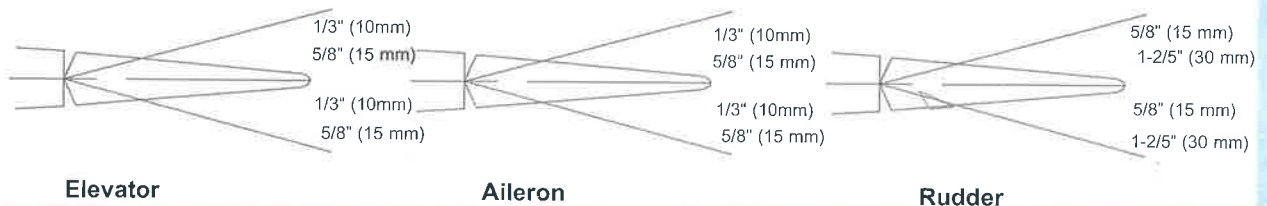
CG location

CONTROL SURFACE THROW SPECIFICATIONS:

The throws are measured at the widest part of the control surface. Adjust the position of the pushrods at the control and/or servo horns to control the amount of throw. You may

also use ATV's if your radio has them but the mechanical linkages should still be set so that the ATV's are near 100% for best servo resolution.

	Low rate	High rate
ELEVATOR	1/3" (10mm) up	5/8" (15 mm) up
	1/3" (10mm) down	5/8" (15 mm) down
AILERON	1/3" (10 mm) up	3/4" (18 mm) up
	1/3" (10 mm) down	3/4" (18 mm) down
RUDDER	5/8" (15 mm) right	1-2/5" (30 mm) right
	5/8" (15 mm) left	1-2/5" (30 mm) left



STAGE 28

INSTALL THE FLAPS

The P51D Mustang comes with flaps. If you do not plan on using the flaps, secure them in neutral position. To activate the flaps, install the control linkages & servos as show in 28A, 28B & 28C



28A- Flaps and flap servo cavity locations



28B- Install the flap servos and flap control horns



28C- Install the flap control rods between the servo and the horn

STAGE 29

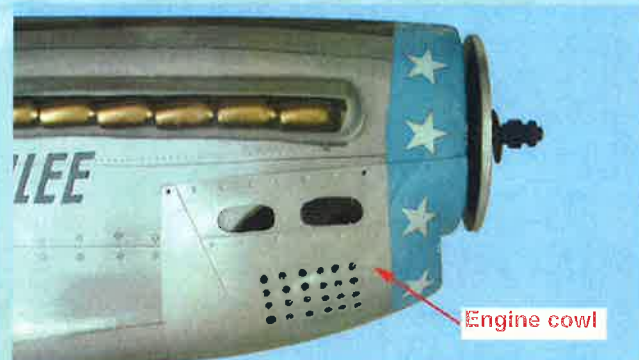
INSTALL THE ENGINE COWL

Stage 29.1 Cut the exit for the engine muffler, needle valve, and engine glow plug. See 29A

Stage 29.2 Install the cowl to the fuselage. See 29B



29A- Engine cowl



29B- Engine cowl installed to the fuselage

STAGE 30

INSTALL THE AIR SCOOP

The air scoop can be mounted to the wing. Using the following procedure

Stage 30.1 Install the wing to the fuselage

Stage 30.2 Using the pencil to mark the air scoop location

Stage 30.3 Install the air scoop to the wing by using two 3 x 20mm bolts and nuts. See 30B



30A- Fiber glass air scoop



30B- Air scoop installed to the wing

STAGE 31

INSTALL FRONT WING COVER

The front wing cover can be mounted to the wing. Using the following procedure

Stage 31.1 Install the wing to the fuselage

Stage 31.2 Locate the front wing cover

Stage 31.3 Use thick CA glue to secure the front wing cover to the wing



31A- Front wing cover



31B- Front wing cover installed to the wing

STAGE 32 INSTALL THE DUMMY FUEL TANKS

The dummy fuel tank can be mounted to the wing by following the procedure

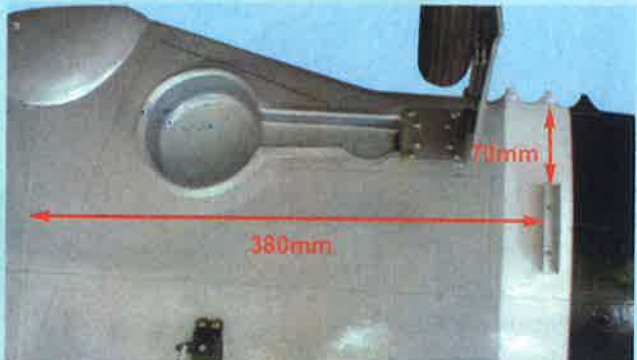
Stage 32.1 Using two 2 x 10mm screws to install the mounting rail to the left wing. See 32B

Stage 32.2 Mount the dummy fuel tank to the rail. See 32C

Stage 32.3 Repeat step 32.1 and 32.2 for the right dummy tank



32A- Dummy fuel tank with mounting hardware



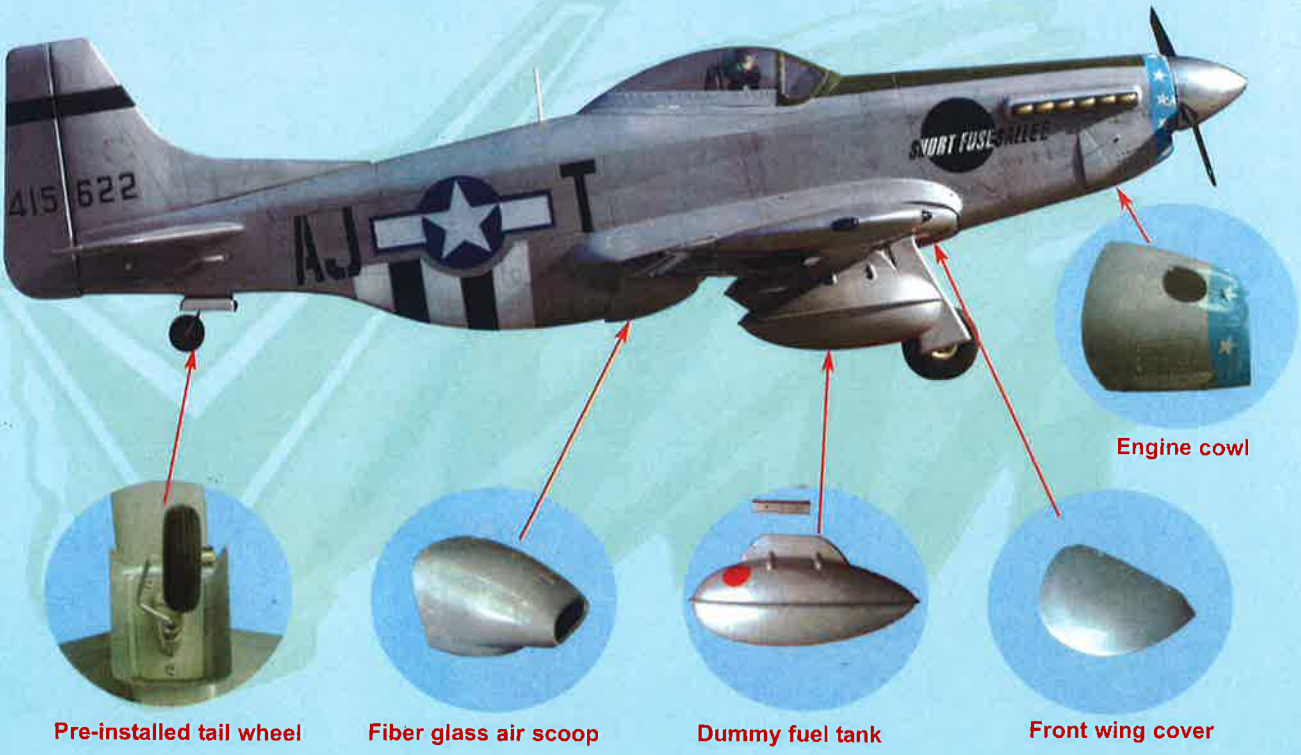
32B- Mounting the rail to the wing



32C- Mount the dummy fuel tank to the rail



32C- 2 dummy fuel tanks mounted to the plane



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