

Note

**MCDONNELL  
DOUGLAS**

**A4<sup>45-52</sup> Semi Scale ARF**  
**SKYHAWK**



## 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

suppliers of this product expressly disclaim any warranties or representations, either expressed or implied, including but not limited to implied warranties of fitness for the purposes of achieving and sustaining remotely controlled flight. In no event will the Manufacturer, Distributor, Retailer and/or other suppliers of this product have any obligation arising from contract or tort, or for loss of revenue or profit, or for indirect, special, incidental, consequential or other damages arising from the use of this product. In purchasing and/or using this product, the user accepts all responsibility for its use and accepts all liability associated with such use.

### 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 it's structure, control surfaces, hinges, linkages, covering, engine, radio, wiring, battery and all other components. Check all components before and after each flight.

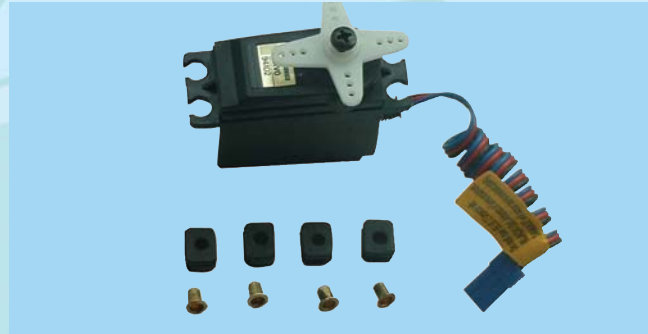
**Don't fly until it's right!**



## STAGE 1 INSTALLING THE AILERON SERVOS INTO THE WING

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

- Servos
- Servo mounting screws and grommets as supplied with servos
- Servo control arms as supplied with servos
- Two aileron control rod assemblies supplied with the kit  
The assemblies consist of a metal rod with a clevis on each end
- Low tack masking tape
- 2 aileron control horn assemblies



1A - Prepare the servos by fitting the rubber grommets & ferrules supplied with your servos



1B - Aileron servo locations



1C - Mount the aileron servos into the wing

**Step 1.1** Turn the wing upside down and locate the aileron servo cavities. See 1B

**Step 1.2** Trial fit the aileron servos into their servo mounting cavities. You may have to modify the cavity slightly to provide clearance for the servo and servo wires. Use a hobby knife to modify the cavity as required. Most servos have their output shaft closer to one end than the other. We recommend locating the servo so that the output shaft is as close to the rear of the wing as possible.

**Step 1.3** Screw the servos into place with the screws and grommets supplied. It is important to install the grommets and screws correctly. See the manual that came with your radio for instructions about your particular servo grommets. See 1C

**Step 1.4** Fasten the screws down according to the servo manufacturers recommended tightness.

**Step 1.5** Repeat this procedure for both wing servos.

## STAGE 2 INSTALLING THE AILERON CONTROL SYSTEM

**Step 2.1** Consult your radio instruction manual and center each aileron servo by plugging it into the aileron channel in the receiver. Turn on the transmitter and then the receiver. Center the aileron trim lever on the transmitter. Remove the servo arm mounting screw and the servo arm.

**Step 2.2** Mount the servo arm back on the servo. Position the arm to be 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 rods in the hardware bag. Ensure the clevises 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 ailerons into their neutral position so that they are even with the trailing edge of the wing and not pointing either up or down.

**Step 2.3** 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 place on their respective bolts.

**Step 2.4** Connect the aileron servo rods to the aileron control horns. Connect the control rod to the servo output arm using a clevis.

**Step 2.5** Connect the other end of the control rod to the control horn using the second clevis.

**Step 2.6** Remove the masking tape holding the aileron.

**Step 2.7** 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.

Note

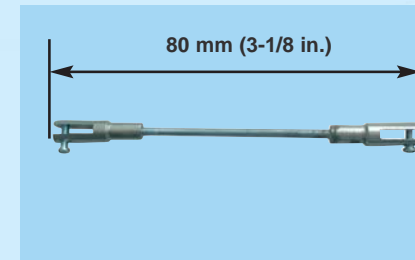


Note

**Step 2.8** Turn on your radio and activate the ailerons, using the aileron stick and ensure a smooth full motion can be achieved.

**Step 2.9** With the wing top side up and viewed from the back, ensure that moving the transmitter aileron stick to the left raises 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 2.10** 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 of the stick to the right will roll the aircraft to the right



2A - Aileron control rod assembly



2B - Aileron control horn installed

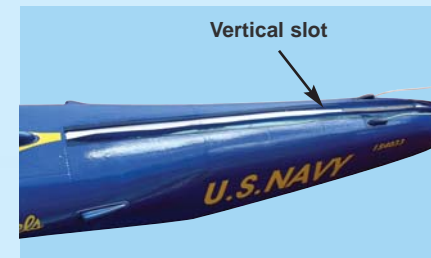


2C - Aileron control rod installed

### STAGE 3 FITTING THE VERTICAL AND HORIZONTAL STABILIZERS

To install the stabilizers into the fuselage you will need:

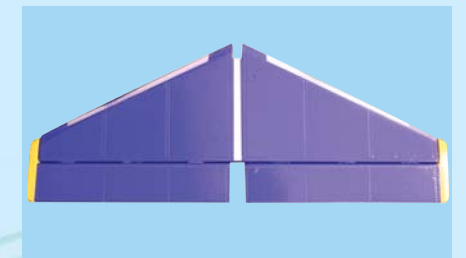
- Fuselage
- Vertical stabilizer
- Rudder with pre-installed torque rod
- Horizontal stabilizer with pre-installed elevators



3A - The fuselage slot for the vertical stabilizer



3B - Vertical stabilizer with pre-cut horizontal stabilizer slot



3C - Horizontal stabilizer with pre-installed elevators

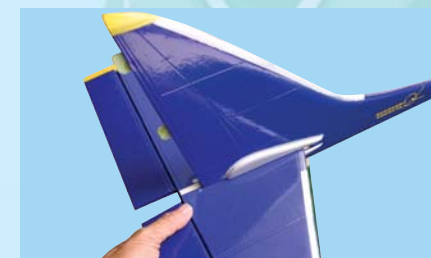
### STAGE 4 INSTALL THE HORIZONTAL STABILIZER TO THE VERTICAL STABILIZER

**Step 4.1** Check fit of the horizontal stabilizer in its slot located in the vertical stabilizer. See 4A

**Step 4.2** Remove the horizontal stabilizer from the vertical stabilizer.

**Step 4.3** Apply sufficient 30 minute epoxy to the exposed wood area on the horizontal stabilizer. See 4B

**Step 4.4** Apply sufficient 30 minute epoxy into the horizontal slot located in the vertical stabilizer. See 4C



4A - Check fit the horizontal stabilizer in its slot located in the vertical stabilizer



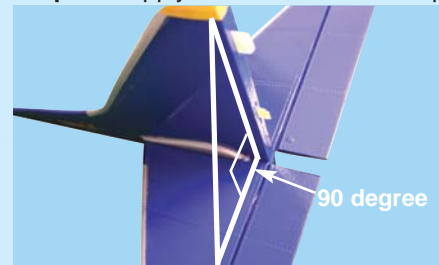
4B - Apply 30 minute epoxy to the exposed wood area on the horizontal stabilizer



4C - Apply 30 minute epoxy to the horizontal slot located in the vertical stabilizer



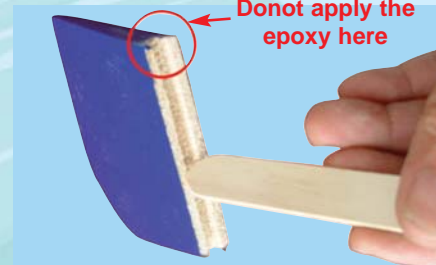
- Step 4.5** Slide the horizontal stabilizer into its slot located in the vertical stabilizer & make sure it is square. See 4D  
**Step 4.6** Wipe off the excess epoxy and wait until the epoxy cures.  
**Step 4.7** Attach the rudder to the vertical stabilizer (use CA thin to secure the hinges to the rudder). See 4E. Check freedom of movement & then pin the hinges.  
**Step 4.8** Apply sufficient 30 minute epoxy to the lower rudder tongue. See 4F



4D - Slide the horizontal stabilizer into its slot located in the vertical stabilizer

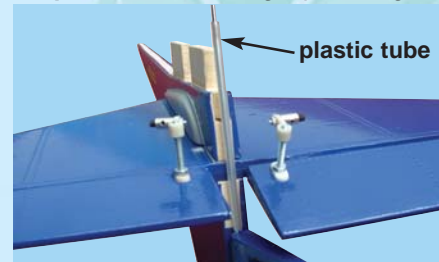


4E - Attach the rudder to the vertical stabilizer



4F - Apply sufficient 30 minute epoxy to the lower rudder tongue

- Step 4.9** Install the plastic tube over the metal rudder torque rod. See 4G  
**Step 4.10** Attach the lower rudder to the vertical stabilizer by carefully positioning the lower rudder over the torque tube. See 4H  
**Step 4.11** Use masking tape to align and hold the lower rudder in place until the epoxy cures. See 4I



4G - Install the plastic tube over the metal rudder torque rod



4H - Attach the lower rudder to the vertical stabilizer



4I - Use the marking tape to align and hold the lower rudder in place

## STAGE 5

## INSTALL THE VERTICAL AND HORIZONTAL STABILIZER TO THE FUSELAGE

- Step 5.1** Trial fit the vertical and horizontal stabilizer to the fuselage then remove it. See 5A and 5F  
**Step 5.2** Apply sufficient 30 minute epoxy to the exposed wood area in the fuselage. See 5B  
**Step 5.3** Apply sufficient 30 minute epoxy to the exposed wood area in the vertical stabilizer. See 5C



5A - Trial fit the vertical and horizontal stabilizer to the fuselage



5B - Apply sufficient 30 minute epoxy to the exposed wood area in the fuselage



5C - Apply sufficient 30 minute epoxy to the exposed wood area in the vertical stabilizer

- Step 5.4** Insert the vertical and horizontal stabilizer into the vertical slot located in the fuselage. See 5D  
**Step 5.5** Press the vertical and horizontal stabilizer carefully into the fuselage slot. See 5E  
**Step 5.6** Confirm that the horizontal stabilizer is level with respect to the wing. See 5F



5D - Insert the vertical and horizontal stabilizer into the vertical slot



5E - Carefully press the vertical and horizontal stabilizer into the fuselage slot



5F - Confirm that the horizontal stabilizer is level with respect to the wing

Note



## STAGE 26

### WING TIP FLASHING LIGHTS



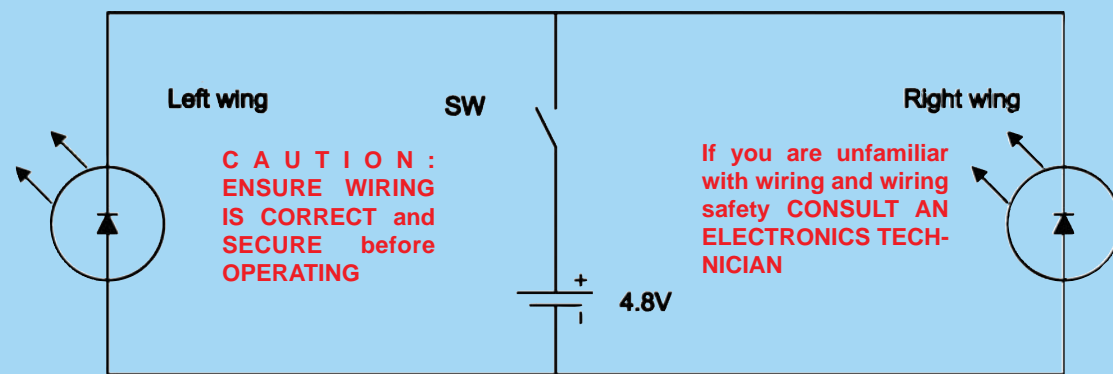
The VMAR A4 Skyhawk comes with wing tip LED flashing lights pre-installed and pre-wired. These lights operate on 4.8V. A second airborne battery pack will operate the lights for many hours.

**Do NOT use your receiver battery pack to power the lights. You MUST use a SECOND BATTERY PACK for the lights.** We have pre-installed the wiring. If you wish to hook up the lights please consult the wiring schematic diagram below. Be attentive when doing any wiring. **Make sure your connections are correct and secure.**

You will need a connector to match your battery pack, and a set of crimp connectors or solder and heat shrink. A switch to turn the power on and off is a useful addition or you can simply unplug the battery pack.

The LED lights have a long life when using a 4.8V battery pack. **Higher voltages will burn the LED lights out.** If you need to replace the LED lights remove the clear tape securing the wing tip covers.

Contact our Parts and Support web address for spare LED bulbs.



Electronic Schematic diagram for wiring the LED flashing wing tip lights

For parts and support related to this product please visit us at [www.richmondrc.com/support.htm](http://www.richmondrc.com/support.htm)  
For more VMAR products please visit us at [www.richmondrc.com](http://www.richmondrc.com)

**HAPPY FLYING!**

Note



## STAGE 6

### INSTALL THE LANDING GEAR

The Skyhawk A4 has a tricycle gear configuration (trike gear) using a steerable nose wheel and main landing gear.



## STAGE 7

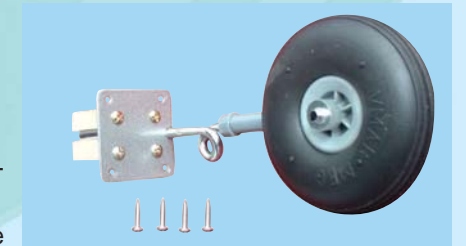
### INSTALLING THE MAIN LANDING GEAR

Identify the main landing gear components shown below:

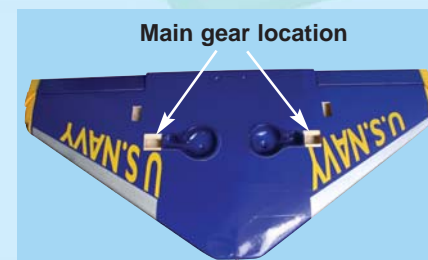
- 2 pre-bent main landing gear sets pre-assembled with struts, wheels and mounting plates.
- 8 sheet metal screws (3x15 mm)

**Step 7.1** Turn over the wing to locate the pre-drilled main landing gear mounting cavities. See 7B

**Step 7.2** Insert the pre-assembled main landing gear into place. Use 4 of the sheet metal screws to mount each of the main landing gear assemblies to the wing. See 7C and 7D



7A - Pre-assembled main landing gear and the sheet metal mounting screws



7B - Main landing gear location



7C - Mounting the main landing gear to the wing



7D - Main landing gear mounted to both wings

## STAGE 8

### INSTALLING THE NOSE GEAR

- Identify the nose gear components per illustration 8A
- 1 completed nose gear assembly with strut and wheel
  - 1 steering arm with pre-installed EZ-connector

**Step 8.1** Remove the steering arm from the nose gear assembly. Insert the nose gear push rod through the EZ-connector. Do not tighten yet. See 8B

**Step 8.2** Slide the nose gear wire through the nose gear bearing in the fuselage, passing the wire through the steering arm. Secure the steering arm to the nose gear wire by tightening the set screw. See 8C

**Step 8.3** Secure the EZ-connector to the nose gear push rod by tightening the set screw. See 8D



8A - Nose gear assembly



8B - Insert the nose gear push rod through the steering arm EZ-connector. Do not tighten yet



8C - Secure the steering arm to the nose gear wire by tightening the set screw



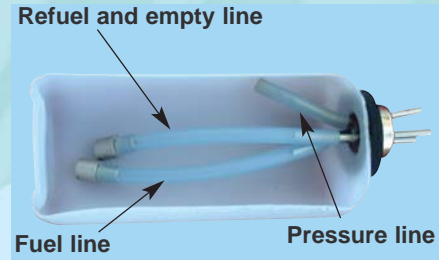
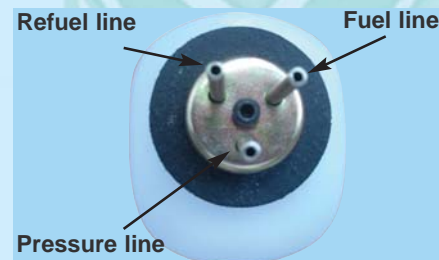
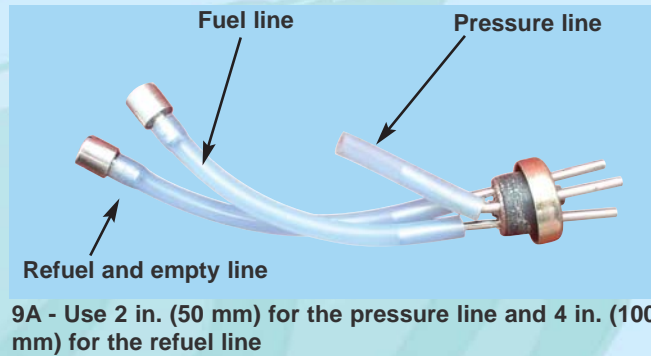
8D - Secure the EZ-connector to the nose gear push rod by tightening the set screw

## STAGE 9

### FITTING THE FUEL TANK

To assemble the fuel tank you will need the following items:

- The fuel tank and fuel stopper assembly (supplied)
- 2 clunks (supplied)
- About 10 in. (25.4 cm) of medium ID silicone fuel line (DUB-197 or DUB-222 or similar)

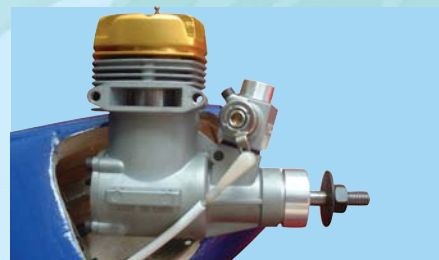
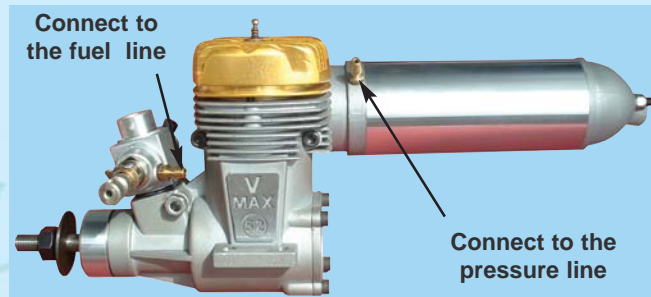


## STAGE 10

### INSTALLING THE ENGINE

The A4 Skyhawk is designed for .46 to .52 2 stroke glow engines; 4 stroke and gas engine are not recommended.

- Step 10.1** Remove the engine mount clamps. See 10B
- Step 10.2** Trial fit the engine. Use a Dremel or other tool to modify the engine compartment if required to accommodate your engine. Install and center the spinner back plate so there is a gap between the spinner and the fuselage of 1/16 to 3/32 in. (1.5-2.5 mm). See 10C
- Step 10.3** Remove the spinner backing plate then remove engine, connect the throttle control rod to the engine throttle arm.
- Step 10.4** Insert the muffler bolts into your engine in advance and then re-install your engine using the engine clamps. Ensure the clamp bolts are tight but do NOT OVER TIGHTEN.



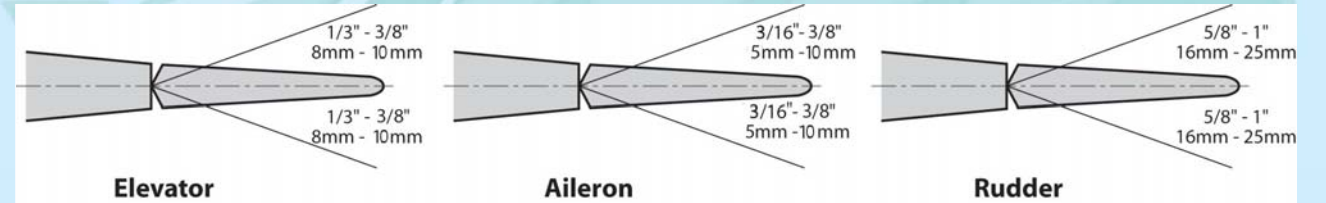
### CONTROL SURFACE THROW SPECIFICATIONS:

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" (8mm) up		3/8" (10 mm) up
	1/3" (8mm) down		3/8" (10 mm) down
AILERON	3/16" (5 mm) up		3/8" (10 mm) up
	3/16" (5 mm) down		3/8" (10 mm) down
RUDDER	5/8" (16 mm) right		1" (25 mm) right
	5/8" (16 mm) left		1" (25 mm) left



## STAGE 24

### INSTALL LANDING GEAR CAVITY COVERS

The VMAR A4 Skyhawk is retract ready. The fixed gear can be replaced with retracts. We have tested with ROBART #ROB-RB610 nose gear and #ROB-608HD main gear. Please follow instructions that come with the retracts.

If you are NOT installing retracts please do the following:

- Step 24.1** Cut out the cavity covers using sharp scissors. See 24A
- Step 24.2** Glue the cavity covers into place using CA glue. Use the glue sparingly and do not drip any CA onto the surface. Avoid fingerprints. See 24B and 24C

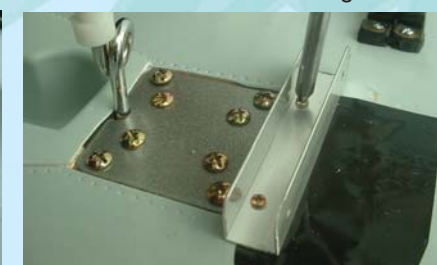
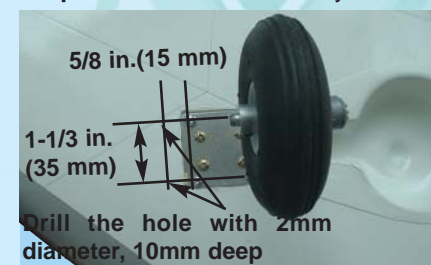
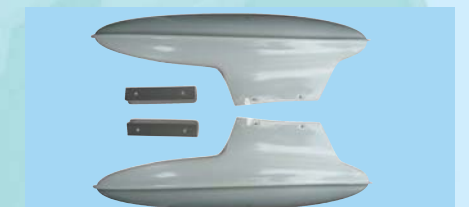


## STAGE 25

### INSTALL THE DUMMY FUEL TANK

The dummy fuel tanks can be mounted to the wings using the following procedure:

- Step 25.1** Review 25B & 25C and mark the location of the mounting holes for the aluminum rack outboard of the main landing gear plates. Drill 5/64 in. (2mm) holes about 3/8 in. (10mm) deep.
- Step 25.2** Use sheet metal screws to mount the aluminum rack to the wing. See 29C
- Step 25.3** Mount the dummy tanks to the aluminum rails on both wings



## STAGE 21 CONFIRM RADIO OPERATION

**Step 21.1** Consult your radio manual for instructions about testing and operating your radio system.

**Step 21.2** Pay particular attention to charging your radio system batteries and range testing the system before and after each flight.

**Step 21.3** Check that all controls are working correctly before and after each flight.

## STAGE 22 BALANCING THE AIRCRAFT

The CG for your A4 SKYHAWK is located at 8-1/4 in. to 8-7/8 in. (210 - 225 mm) back from the leading edge of the wing when the wing has been attached to the fuselage.

For the initial flight, the CG should be located at 8-1/4 in. (210mm) back from the leading edge of the wing when the wing has been attached to the fuselage.

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

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 and engine 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 weight 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 23 CONFIRM MECHANICAL INTEGRITY

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!!

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.

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!

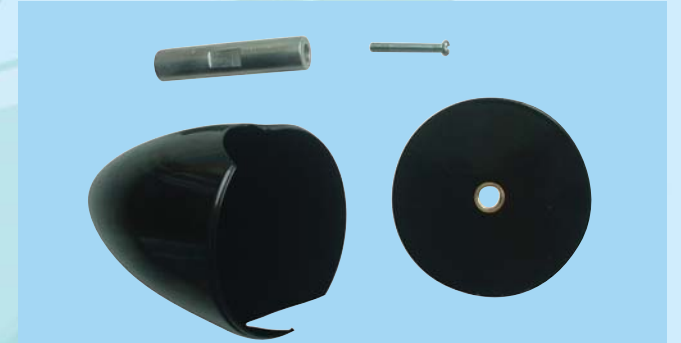
## STAGE 11 INSTALL THE PROPELLER AND THE SPINNER

**Step 11.1** Consult your engine manual and select a suitable propeller.

**Step 11.2** Install the thrust washer, the spinner backing plate, the propeller, the prop washer, and the prop nut. Ensure that they are all firmly attached. See 11B, 11C

**Step 11.3** Trial fit the spinner cone and spinner cone retaining screw. If necessary enlarge the cutouts in the spinner cone to allow adequate clearance for the propeller. See 11D

**Step 11.4** Double check that the prop nut and spinner cone retaining screw are firmly attached.



11A - Aluminum spinner complete with all hardware (supplied)



11B - Install the spinner backing plate



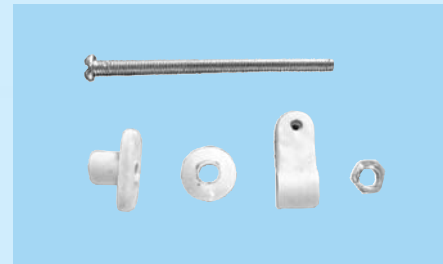
11C - Install the propeller, the prop washer and the prop nut



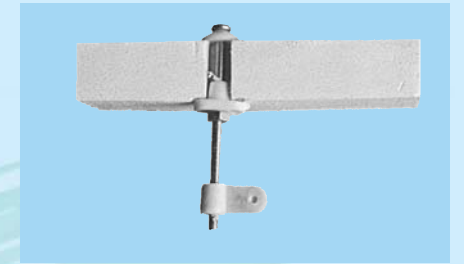
11D - Install the spinner cone using the retaining screw. Ensure the retaining screw is tight and secure

## STAGE 12 FITTING ELEVATOR AND RUDDER CONTROL HORN

The elevator 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. See 12B. The rudder control rod runs through the plastic rudder tube and exits into a cavity in the bottom of the fuselage beneath the rudder. Install the supplied rudder control horn assembly. Loosely tighten the set screw only at this point. See 12D



12A - Control horn assembly



12B - Typical control horn mounted to the control surface



12C - Elevator control horns installed



12D - Rudder control horn installed

## STAGE 13 INSTALLING THE SERVOS

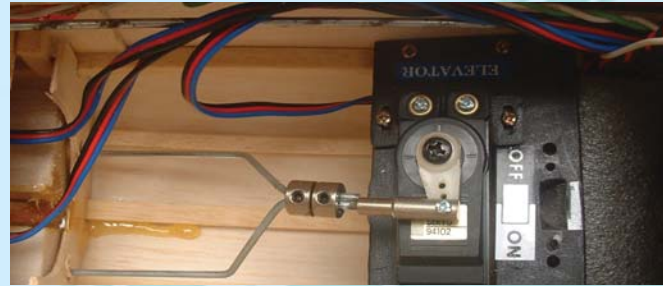
Install the rubber servo grommets and brass ferrules supplied with your radio equipment. The 4 servos that control the 2 elevator surfaces, rudder and throttle are to be installed in the servo cavities located towards the back of the fuselage. See 13A



13A - Location of elevator, rudder and throttle servos

## STAGE 14 CONNECTING THE PUSHRODS TO THE ELEVATOR

The A4 Skyhawk has two separate elevators. The control rods from the elevators are coupled together in the fuselage and then connected to a single elevator servo. See 14A



14A - Joining & connecting the elevator control rods to the servo



14B - Connecting the elevator control rods to the elevator

## STAGE 15 CONNECTING THE PUSHROD TO THE RUDDER

**Step 15.1** See 15B. Align the rudder straight with the fuselage and the rudder control horn as shown.

**Step 15.2** With the rudder aligned straight with the fuselage connect the rudder servo to the receiver and turn on your transmitter. Ensure the rudder servo is centered at neutral.

**Step 15.3** Connect the rudder control rod between the rudder servo arm and the rudder control horn. Tighten the control horn set screw firmly and ensure it is secure. See 15D



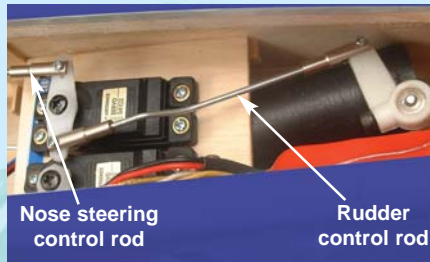
15A - Rudder control horn assembly



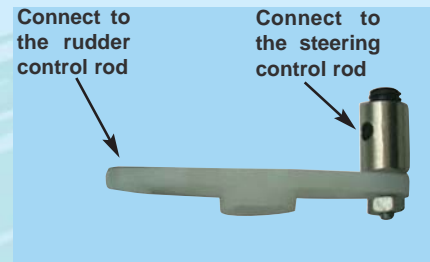
15B - Install the rudder control horn to the rudder control rod



15C - Connect clevis to the control horn then tighten the control horn



15D - Connect the rudder control rod to the rudder servo arm. Connect the nose gear steering rod to the opposite side of the rudder servo arm. See 19E



15E - Connect the rudder control rod to the servo arm

## STAGE 16 CONNECTING THE THROTTLE CONTROL

With the throttle control arm clevis connected to the engine throttle arm, move the throttle arm to roughly half throttle. Look into the throat of the engine carburetor as you rotate

the throttle arm and select a position where the throttle opening is about half what it is when fully open.



16A - Throttle control rod connected to the engine throttle arm



16B - The throttle servo controls the engine throttle using the throttle control rod

## STAGE 17 ADJUST CONTROL SURFACE THROW LIMITS

Adjust the deflection of the control surfaces to match the specifications on page 11. You can reduce the amount of throw by doing either or both of the following:

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

- From the control horn end, move the horn out further on the threaded bolt's. Always confirm that the horn is still thoroughly engaged with the threaded bolt after you have adjusted it.

## STAGE 18 FINAL RC SET-UP

**Step 18.1** 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 aileron, 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).

**Step 18.2** 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.

## STAGE 19 INSTALLING THE RECEIVER BATTERY

**Step 19.1** Consult your radio manual for instructions about hooking up your receiver battery, receiver and switch harness.

**Step 19.2** Wrap the battery pack securely in foam suitable for RC equipment and wrap the foam insulated pack in a plastic bag or cling wrap. Position the battery pack as shown in 20B.

**Step 19.3** Thread the battery pack connector forward in preparation for connecting to your switch harness.

**Step 19.4** Connect the battery pack connector to your switch harness according to your radio manual.

## STAGE 20 INSTALLING THE RECEIVER

**Step 20.1** Consult your radio manual for instructions about hooking up your receiver.

**Step 20.2** Plan where you are going to put the receiver with consideration for routing the antenna safely.

**Step 20.3** Wrap the receiver securely in foam suitable for RC equipment and wrap the foam insulated receiver in a plastic bag or cling wrap.

**Step 20.4** Install your receiver near the aft end of the fuselage as shown in 20B.



20A - Receiver location



20B - Receiver battery and receiver location