# AirVista

Two Tools Are All You Need!

# Innovative Prebuilt R/C Trainer Aircraft

## Assembly Instructions

- ***The video "Getting to the Flying Field" makes mastering Radio Control even easier – watch it before getting started***
- ***Builds with 2 tools in 1 evening***
- ***We guarantee your success***


AIRVISTA

# *SUCCESS GUARANTEE INFORMATION*

We are so confident that the Hobbico AirVista is the best almost-ready-to-fly trainer available that we make this guarantee: You will successfully learn how to fly with the Hobbico AirVista or we will replace it with your choice of another Hobbico trainer of up to equal value. All we ask is that you learn under the supervision of a qualified, club-designated instructor, follow normal safety precautions, fly at an AMA-chartered club and construct the kit as outlined in the included instruction manual.

If for some reason, you find the design and/or workmanship of the AirVista is not conducive to learning to fly under the conditions outlined above, contact Hobby Services, Monday through Friday, 9AM to 5PM central time to request a AirVista replacement verification form. This form will verify that all terms and conditions of the flight guarantee have been followed and signatures from you and your AMA-club qualified instructor have been obtained.

This guarantee is effective for 60 days after you receive the kit and does not cover incidental items (engines, radio equipment and hardware, etc.). The kit, along with the replacement verification form and original purchase receipt must be returned to Hobby Services for inspection no later than 60 days after receipt of the kit. Hobbico reserves the right to verify all information provided. The AirVista Success Guarantee is only good for kits purchased and flown in the United States. Replacement trainer kit options are limited to flat-bottom wing trainer models available from Hobbico and only one replacement kit per customer.

Contact Hobby Services at:

Hobby Services
Attn: Service Department
1610 Interstate Drive
Champaign, IL 61821-1067
(217) 398-8970

## *INTRODUCTION*

Thank you for purchasing the prebuilt AirVista Trainer. You have taken the first step into the exciting hobby of Radio control. You are about to build in just one evening what took aviation pioneers years – a powered machine that flies. The AirVista was created especially for first time radio control modelers. This easy to build, easy to fly model will help you develop skills to take you anywhere you want to go in this exciting hobby.

Please take some time to watch the video and read through this assembly manual to familiarize yourself with the AirVista kit and assembly methods.


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

Your AirVista is not a toy, but rather a sophisticated, working model that functions very much like an actual airplane. Because of its realistic performance, the AirVista, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage property.

**To make your R/C modeling experience totally enjoyable, we recommend that you get help from an experienced, knowledgeable modeler for your first flights.** You will learn faster and avoid risking your model before you're truly ready to solo. Your local hobby shop has information about flying clubs in you area whose membership includes qualified instructors.

You can also contact the national Academy of Model Aeronautics (AMA), which has more than 2500 chartered clubs across the country. Through any one of them, instructor training programs and insured newcomer training are available.

Contact the AMA at:

AMA SINCE 1936

***Academy of Model Aeronautics***
5151 East Memorial Drive
Muncie, IN 47302
Office: (765) 287-1256
Toll Free: (800) 435-9262
Fax: (765) 741-0057
Web Site: http://www.modelaircraft.org

## *REQUIRED TOOLS*

You only need two tools to build the AirVista:

- ❑ (1) Medium Phillips Screwdriver (#1)
- ❑ (1) Pliers

## *OPTIONAL TOOLS*

For convenience, these additional tools will make the job a little easier:

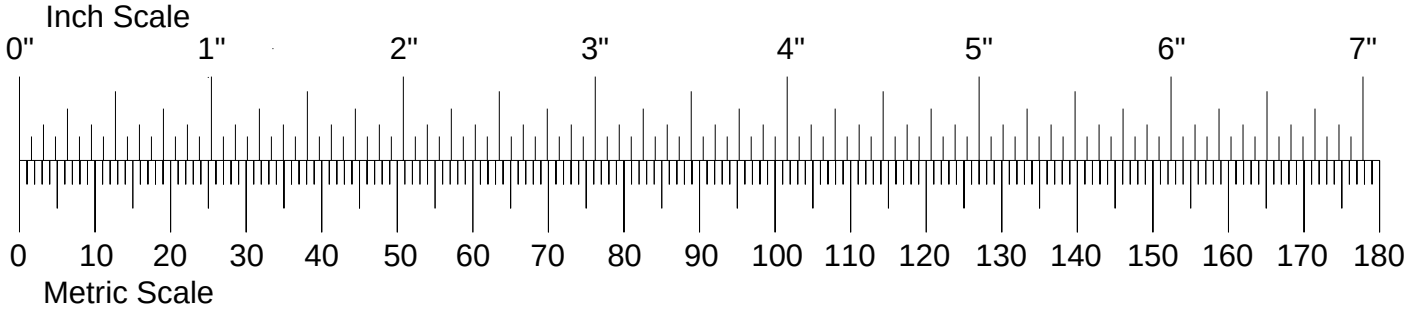
- ❑ (1) Hobby knife with #11 blade
- ❑ (1) Adjustable wrench
- ❑ (1) Large Phillips Screwdriver (#2)
- ❑ (1) Scissors
- ❑ (1) Diagonal Cutter

## *ACCESSORIES REQUIRED TO FINISH YOUR AIRVISTA*

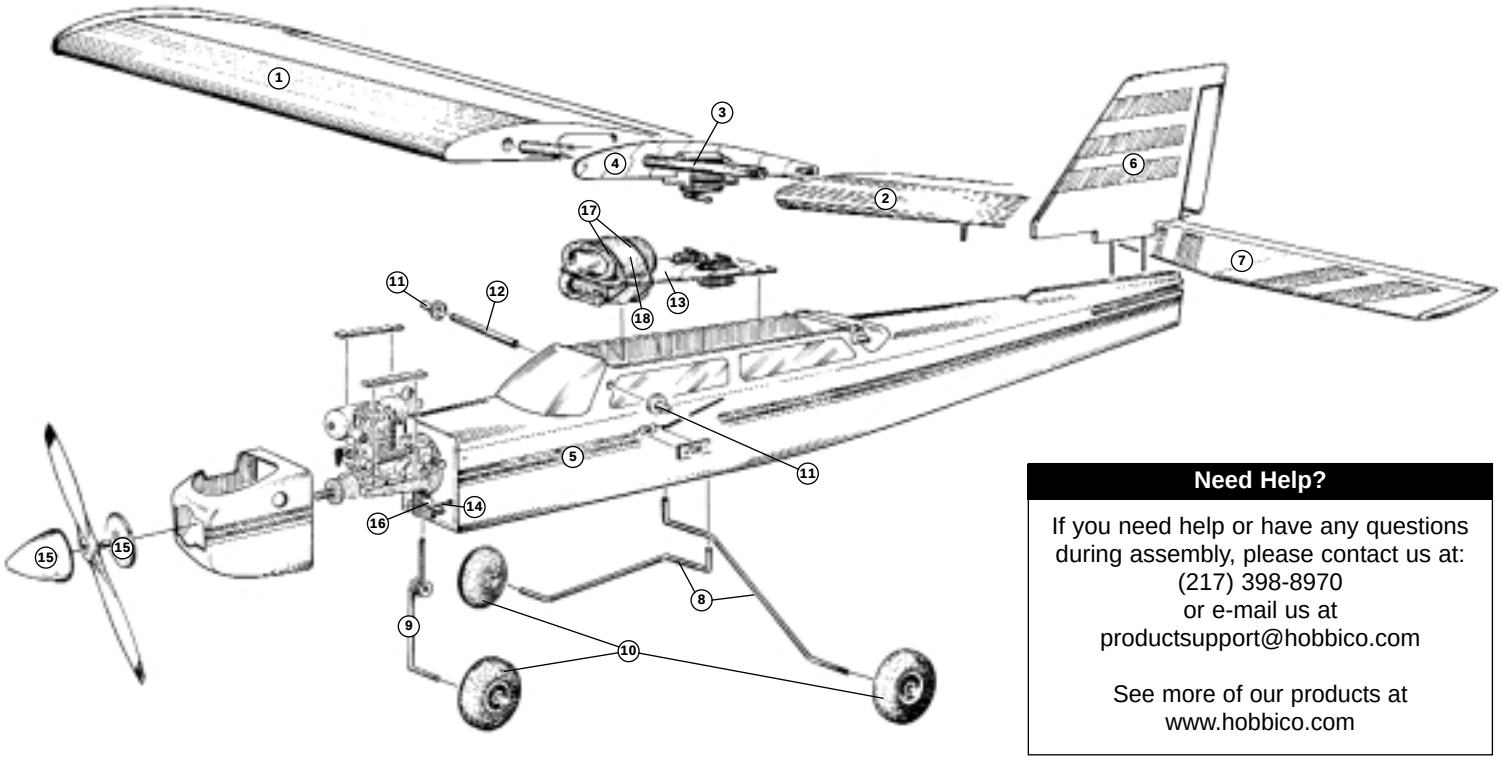
- ❑ 4-channel radio system with 4 servos
- ❑ We recommend the Top Flite® Power Point® brand of props (see the engine manufacturer's recommendations)
- ❑ .40-size two-stroke engine

**O.S.® .40 LA**
**OSMG0040**

***NO GLUE REQUIRED!***



# AirVista Parts List




**Need Help?**

If you need help or have any questions during assembly, please contact us at:
(217) 398-8970
or e-mail us at
productsupport@hobbico.com

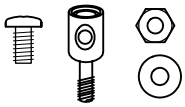
See more of our products at
www.hobbico.com

Take a moment to familiarize yourself with the parts of the AirVista.

1 (1) Right Wing Panel
2 (1) Left Wing Panel
3 (1) Steel Wing Joiner Rod
4 (1) Plywood Center Rib Assembly
5 (1) Fuselage
6 (1) Fin/Rudder Assembly
7 (1) Stab/Elevator Assembly
8 (2) 4mm Landing Gear Wire
9 (1) 4mm Nose Gear Strut
10 (3) Wheels
11 (4) Plastic Dowel Caps
12 (2) Wing Dowels (Wood)
13 (1) Plywood Servo Tray
14 (1) 1.5mm Wire for Nose Gear Steering
15 (1) Spinner Assembly
16 (1) Steering Arm
17 (14) #64 Rubber Bands
18 (1) Foam Sheet

***Hardware included with the kit:***
(7) 3 x 5mm Screws
(1) 3 x 8mm Screw
(4) Nylon Torque Rod Horns
(4) Nylon Servo Connectors
(5) Nylon Clevis
(1) Fuel Tubing
(5) Clevis Retainer
(2) Brass Pushrod Connector
(2) Nylon Retainers For Brass Pushrod Connectors
(2) 2-56 Wire Pushrod for Elevator/Rudder
(2) 2-56 Wire Pushrod for Aileron
(1) 2-56 Wire Pushrod for Throttle
(1) Plywood Control Throw Gauge
(7) Metal Wheel Collars
(1) White Decal Strip
(1) Window Decal Sheet
(12) 2.5 x 10mm Sheet Metal Screws
(4) #4 x 5/8" Sheet Metal Screws
(2) 4-40 Lock Nuts
(1) #48 Drill Bit
(2) 4-40 x 1/8" Phillips Head Screw
(6) #4 Washers
(1) Fuel Tank Assembly
(2) Flat Landing Gear Straps
(4) 4 x 20mm Screws
(4) 4mm Washers
(4) 4mm Lock Washers
(4) 4mm Nuts
(1) Metal “T” Pin
(1) Video “Getting To The Flying Field”
(1) Small Rubber Band
(2) Metal Landing Gear Straps

These items will not be used in this kit:



***Replacement Parts:***
In the event that you need replacement parts, contact your hobby dealer and ask for the following:

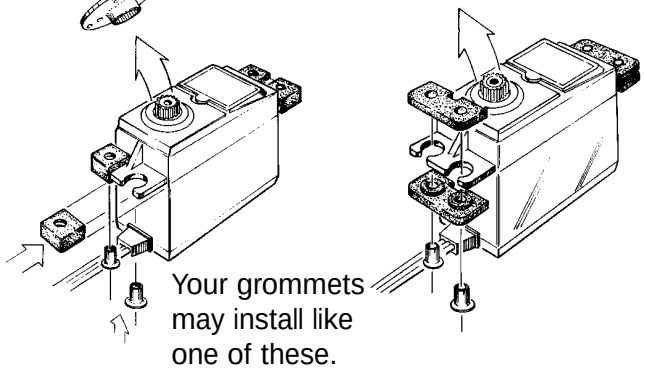
Right Wing Panel (HCAA3546)
Left Wing Panel (HCAA3548)
Aileron Servo Tray and Wing Joiner Rod (HCAA3550)
Fuse and Servo Tray (HCAA3552)
Tail Assembly (HCAA3554)
Landing Gear with Strap and Wheels (HCAA3556)
Cowl (HCAA3558)
Turtle Deck (HCAA3560)

# SECTION 1
# Radio System Preparation

## STEP 1: Unpack your Radio System

Charge your radio system following the manufacturer's instructions. This is usually an overnight process.

Remove the wheels.



Your grommets may install like one of these.

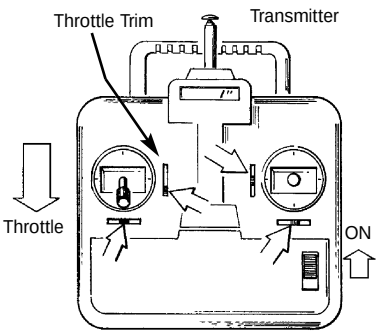
Install the rubber grommets with brass inserts to each of the four servos.

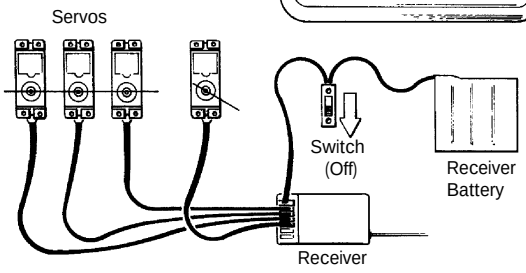
**Note:** Your system may look slightly different. Consult your radio instructions.

## STEP 2: Connect your Radio System

**A.** Connect your radio system and turn it on.

**B.** Position the "trim levers" and sticks as shown.

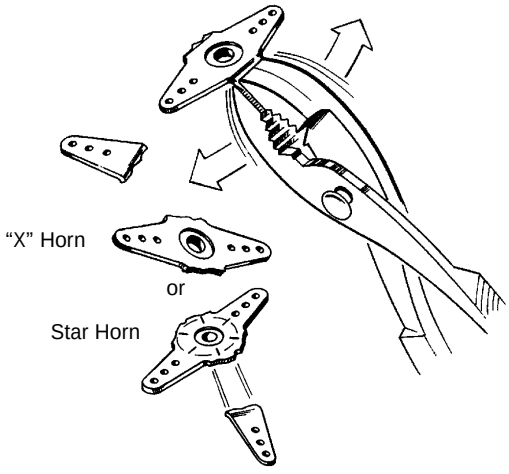


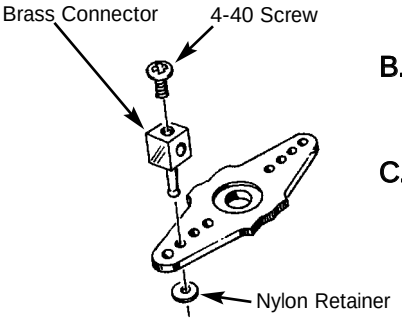

**C.** Turn off your receiver switch followed by the transmitter. Your servos are now properly centered.

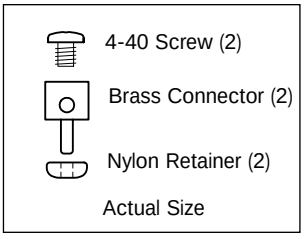
**Note:** If you bump or move your servos during assembly, simply repeat this step.

## STEP 3: Choose the Control Arms




**A.** From your radio system, select four arms that look like an "X" or Star and snap off the sides with your pliers. (A diagonal cutter works well also).

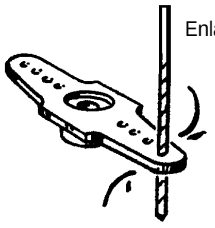


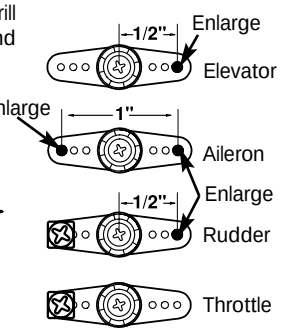




**B.** Install the Brass Pushrod Connectors onto ***TWO*** of the arms.

**C.** Squeeze the nylon retainers in place using your pliers.

Tip! Hold the drill bit with a pliers and turn the arm.





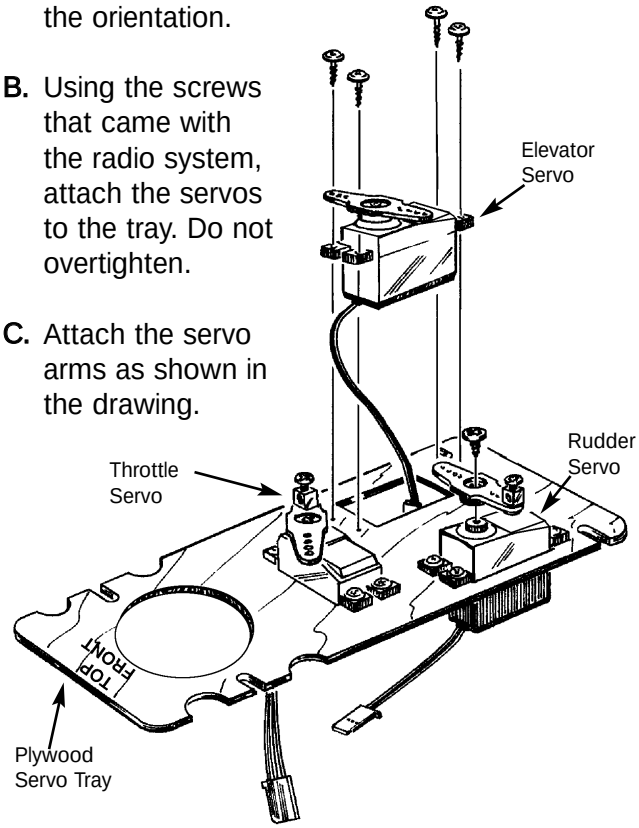

**D.** Enlarge the selected holes in the servo arms using the drill bit provided.

## STEP 4: Install the Servos

**A.** Position the servos where shown. Note the orientation.

**B.** Using the screws that came with the radio system, attach the servos to the tray. Do not overtighten.

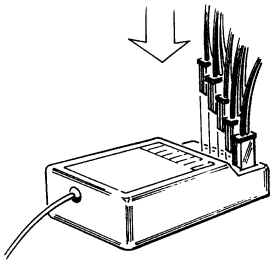
**C.** Attach the servo arms as shown in the drawing.



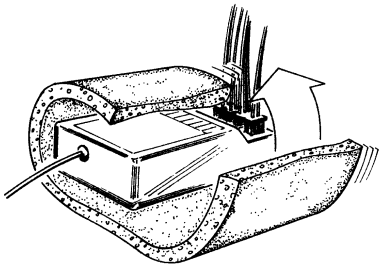

## STEP 5: Connect the Servos to the Receiver

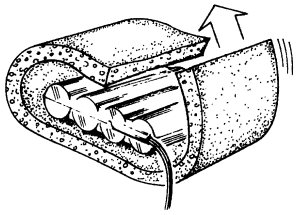
**A.** Connect the three servos to the receiver according to the manufacturer's instructions.

**B.** Connect the battery to the receiver switch harness and the switch to the "battery" socket on the receiver (the extra wire on the switch is for charging your system).



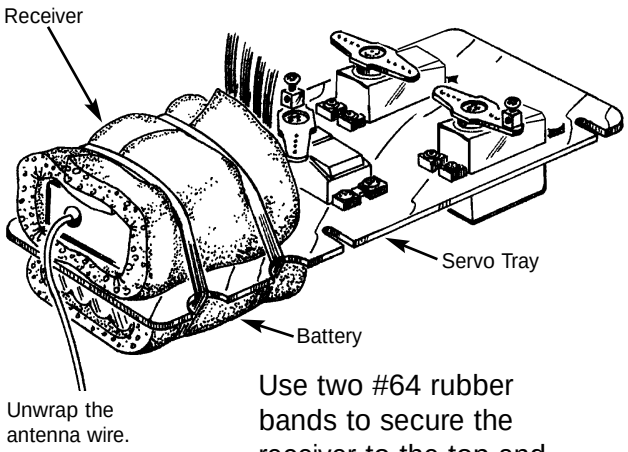
**C.** Connect the extension wire to the aileron socket.





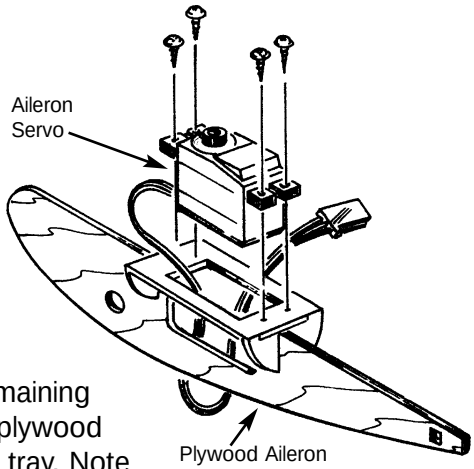
**D.** Tear or cut the foam sheet in half and wrap the receiver and the receiver battery.

## STEP 6: Install the Receiver and Battery




Use two #64 rubber bands to secure the receiver to the top and the battery to the bottom of the servo tray.

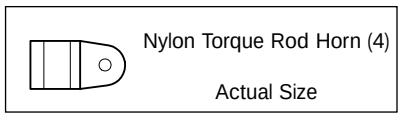
## STEP 7: Install the Aileron Servo

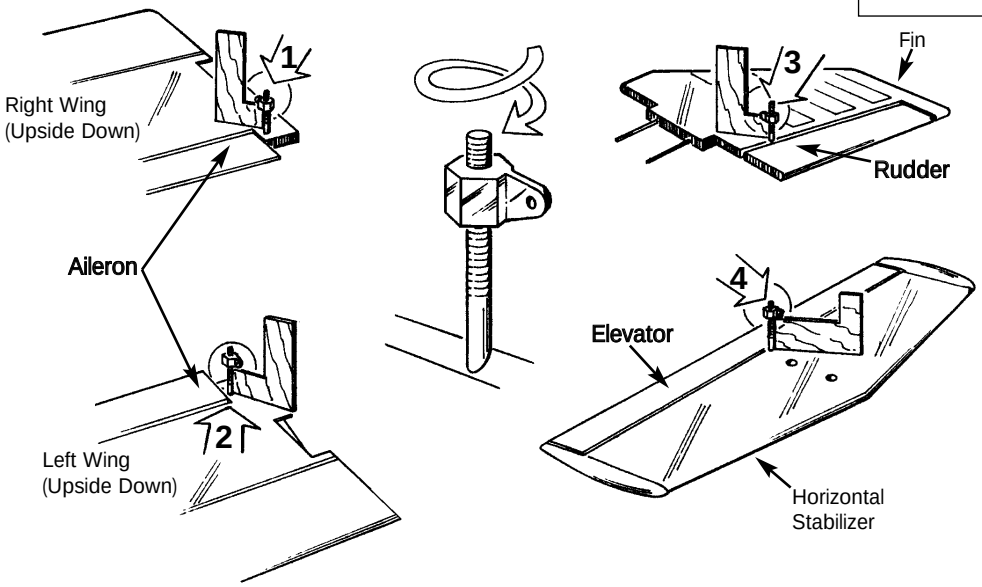



Install the remaining servo in the plywood aileron servo tray. Note the orientation and routing of the servo wire.

# SECTION 2
# Wing Assembly

## STEP 1: Install the FOUR Torque Rod Horns

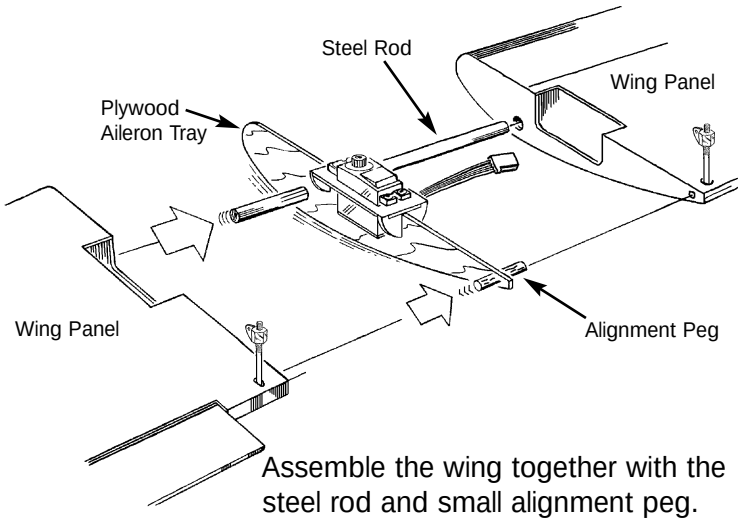



Install the nylon torque rod horns to the Ailerons, Rudder and Elevator.

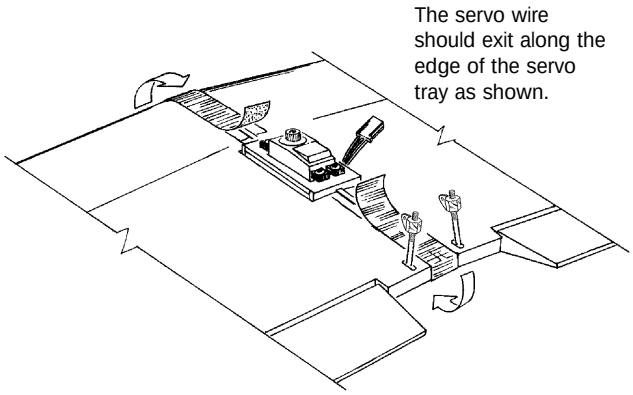
Use the “L” shaped plywood gauge to set the height of the horns, on each torque rod.

## STEP 2: Assemble the Wing




Assemble the wing together with the steel rod and small alignment peg.

## STEP 3: Apply the Tape




Apply the white tape around the center of the wing to hold the assembly together.

Note: Replace page 8 in the Instruction Manual with this page.

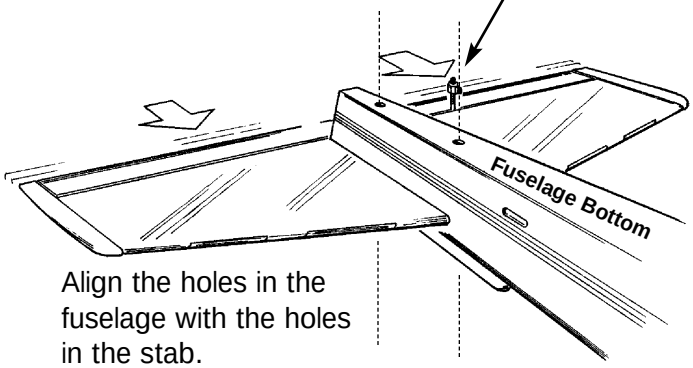
# SECTION 3
# Fuselage Assembly

## Part
## Tail and Wing Dowel Installation

### STEP 1: Install the Horizontal Stabilizer

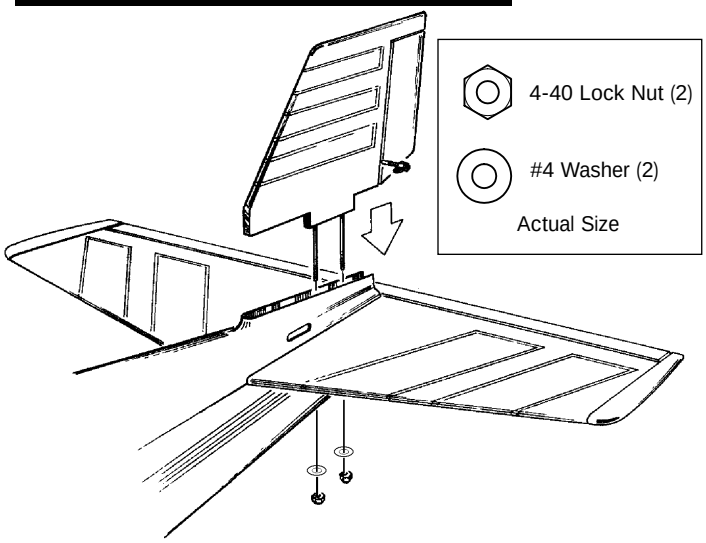
Insert the Stabilizer into the Fuselage.

The nylon horn should be towards the fuselage bottom.




Align the holes in the fuselage with the holes in the stab.

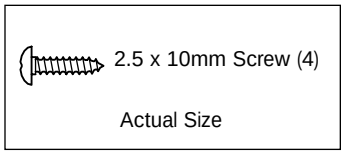
### STEP 2: Install the Fin




Insert the Fin into the fuselage. Use the two 4-40 lock nuts along with washers to hold the tail in place.

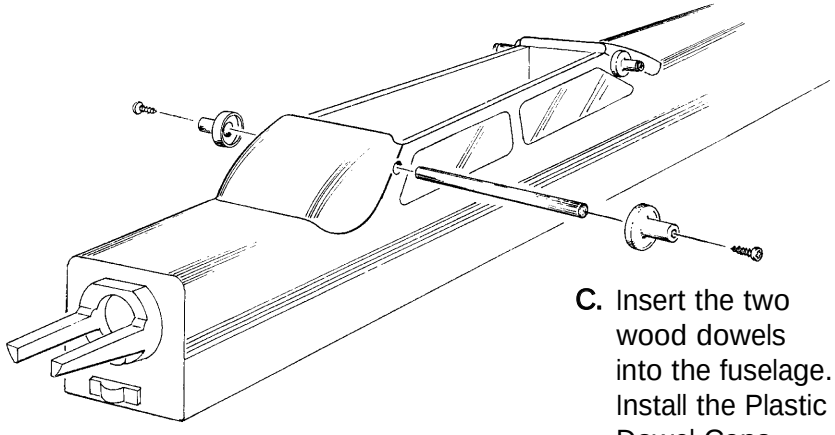
### STEP 3: Install the Wing Dowels

You may need to hold one screw with a pliers while installing the other side.




**A.** Install the window decals.

B. Use the screwdriver to open the dowel holes.

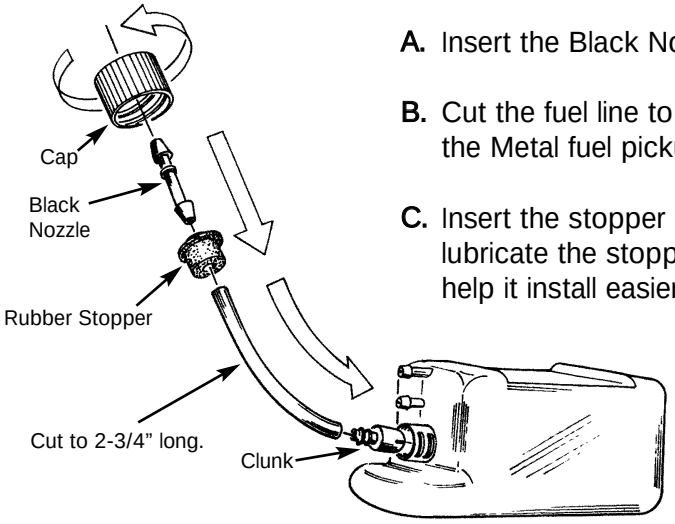


**C.** Insert the two wood dowels into the fuselage. Install the Plastic Dowel Caps.

Part Two

# Fuel Tank and Radio Tray Installation

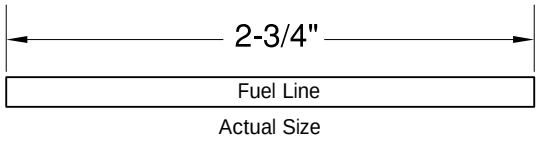
## STEP 1: Assemble the Fuel Tank




**A.** Insert the Black Nozzle into the Rubber "Stopper."

**B.** Cut the fuel line to 2-3/4" (70mm) and install it onto the black nozzle and to the Metal fuel pickup (commonly referred to as the "clunk").

**C.** Insert the stopper into the tank and tighten the cap. You may need to lubricate the stopper with skin oil (best found on the sides of your nose) to help it install easier.

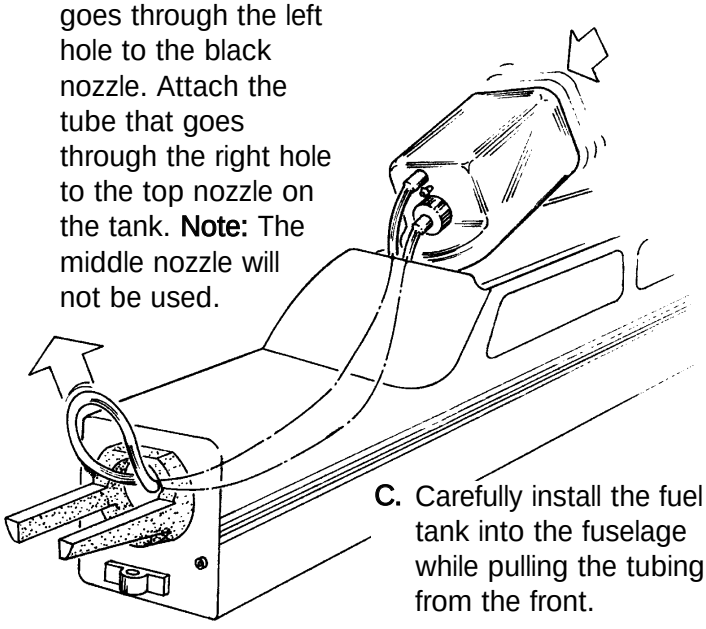



## STEP 2: Install the Fuel Tank

**A.** Insert the fuel tubing into the holes located on the firewall.

**Note:** "Left" and "Right" are as viewed from the rear of the airplane.

**B.** Attach the tube that goes through the left hole to the black nozzle. Attach the tube that goes through the right hole to the top nozzle on the tank. **Note:** The middle nozzle will not be used.



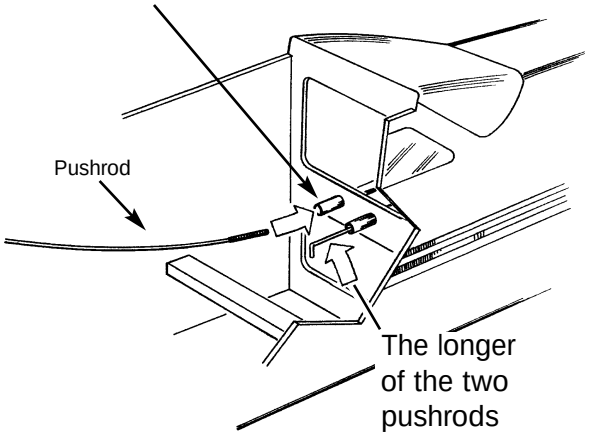
**C.** Carefully install the fuel tank into the fuselage while pulling the tubing from the front.

**D.** Slide the fuel tank in place. Make sure the fuel line is not pinched during installation. This will cut off the fuel supply to the engine.

## STEP 3: Insert the Pushrods

Insert the two longest Pushrods into the tubes from inside the fuselage.

If the pushrod guides are not pre-installed, cut the pushrod guides approximately 1/2" ahead of the bulkhead.

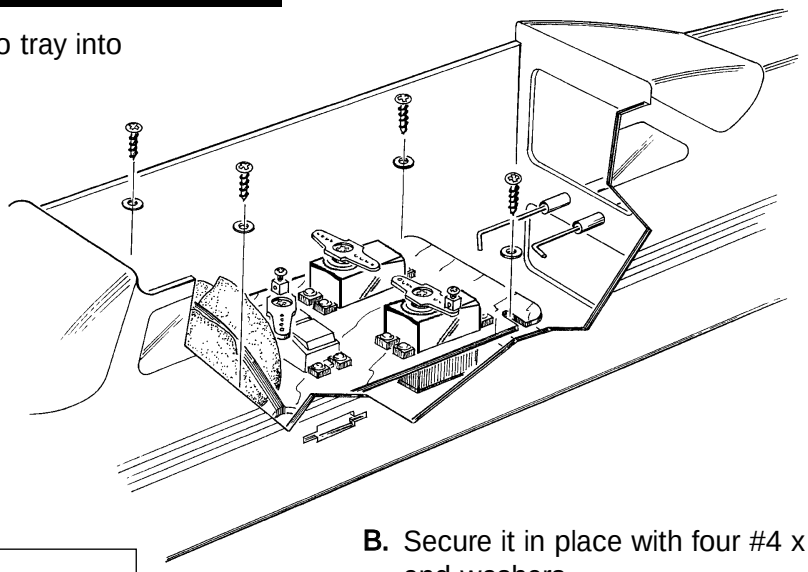


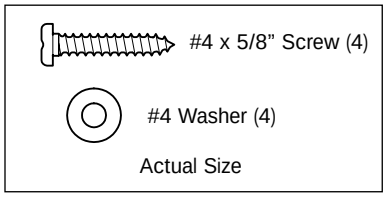
## STEP 4: Install the Radio Tray

**A.** Install the radio tray into the fuselage.

Make sure the servo wires do not get pinched.

Cut the white tubes if they are in the way.

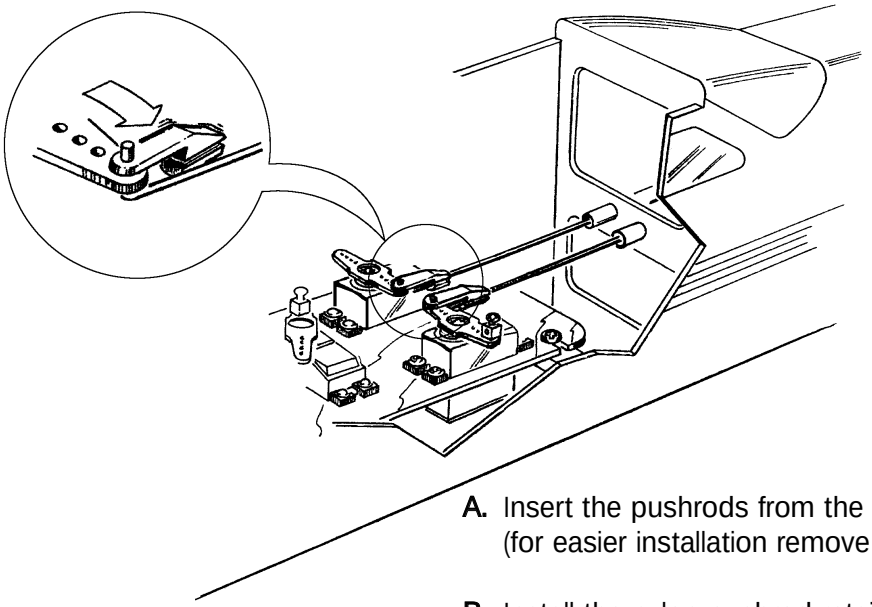





**B.** Secure it in place with four #4 x 5/8" screws and washers.

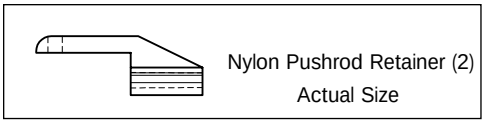
**C.** **Note:** If you bump the servo arms, re-center them as shown in section 1.

## STEP 5: Hook Up the Servos

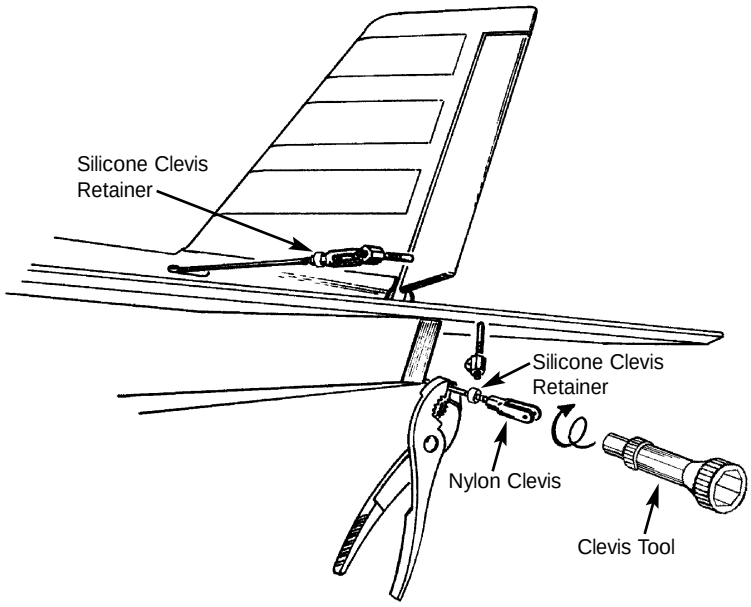


**A.** Insert the pushrods from the bottom of the servo arms (for easier installation remove the arms from the servos).

**B.** Install the nylon pushrod retainers.



## STEP 6: Attach the Clevises to the Control Surfaces

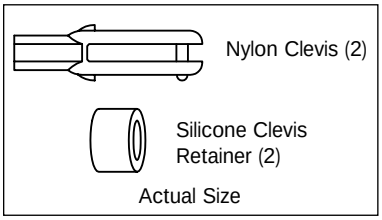


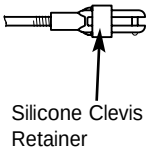

**A.** Slide a silicone clevis retainer onto each wire pushrod. Attach the clevises onto the threads using the tool provided.

**B.** Make sure the servos do not move.

**C.** Screw the clevises on so that the control surfaces are centered. Attach the clevises to the horns.

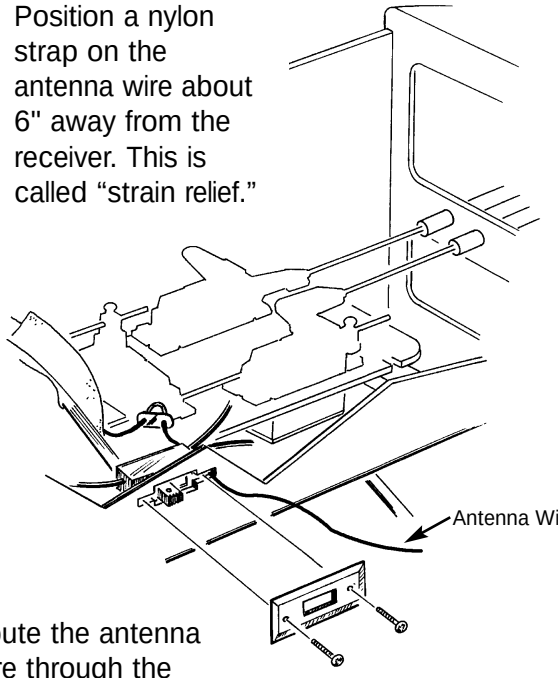
**D.** Slide the retainers over the clevises.



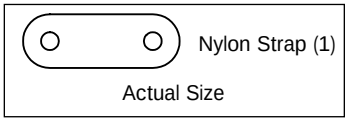




## STEP 7: Attach the Switch

**A.** Position a nylon strap on the antenna wire about 6" away from the receiver. This is called “strain relief.”

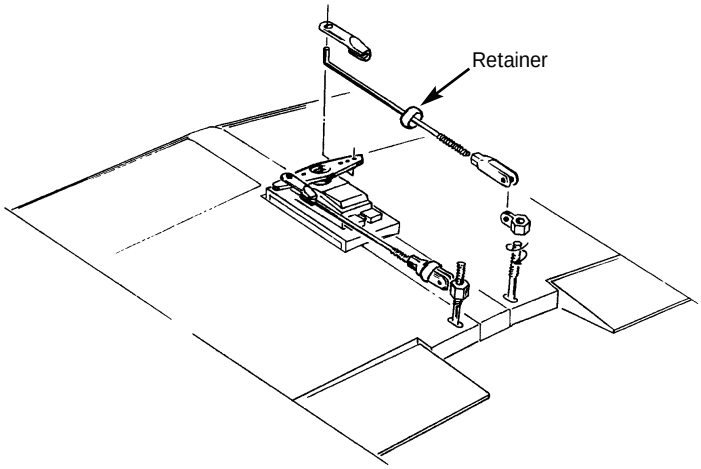



**B.** Route the antenna wire through the longer slot where you installed the switch.




**C.** Attach the switch to the left side of the fuselage.

## STEP 8: Install the Aileron Pushrods




**A.** Install the two remaining clevises with retainers onto the short pushrod wires.

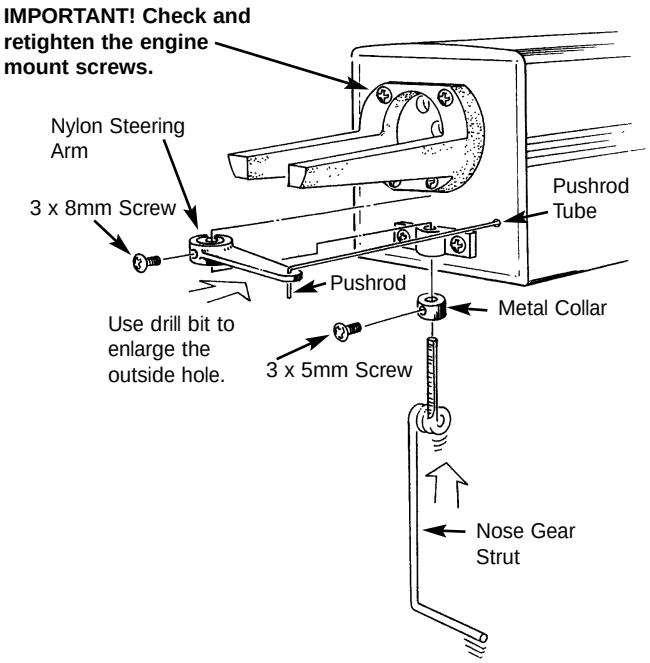
**B.** Connect the rods using the nylon retainers.

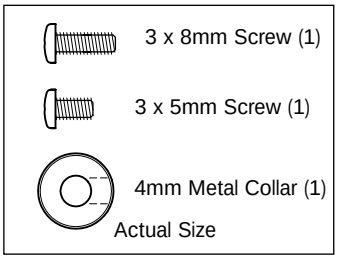
**C.** Adjust the clevises so the ailerons are centered when the servo is centered.

Part

# Landing Gear Installation

## STEP 1: Install the Steering Hardware



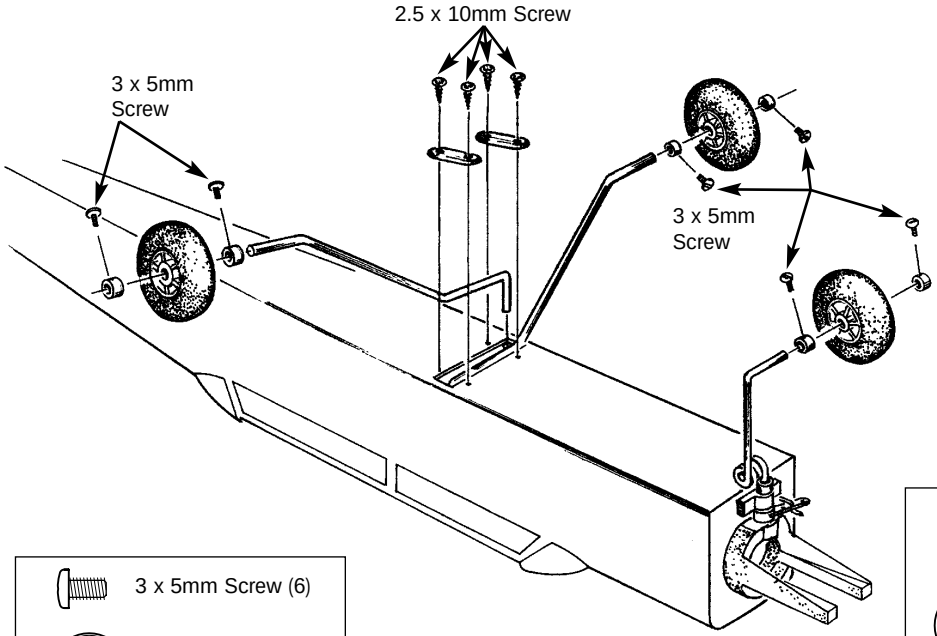

**A.** Insert the steering pushrod wire through the outer hole in the nylon steering arm. Slide the wire into the tube so that it will extend through the brass connector on the rudder servo.

**B.** Place a 4mm metal collar over the nose gear strut. Slide the strut in place capturing the steering arm between the bottom bracket and engine mount.

**C.** Tighten the steering arm screw so the end of the steering arm is positioned about 3/8" (10mm) from the firewall while the nose gear is straight.

**D.** From the inside fuselage, tighten the screw to secure the pushrod to the brass connector.

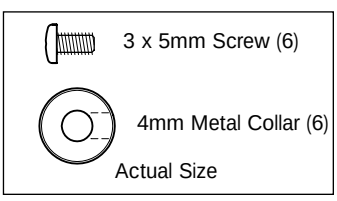
## STEP 2: Install the Main Landing Gear and Wheels

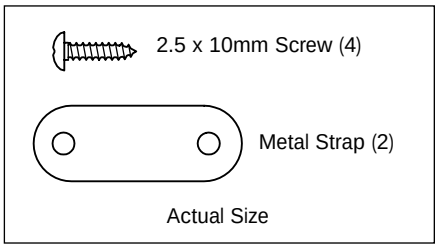



**A.** Insert the two main landing gear wires into the slots on the bottom of the fuselage.

**B.** Secure the landing gear using two metal straps and four 2.5 x 10mm screws.

**C.** Attach the wheels using the 4mm metal collars with the 3 x 5mm screws.

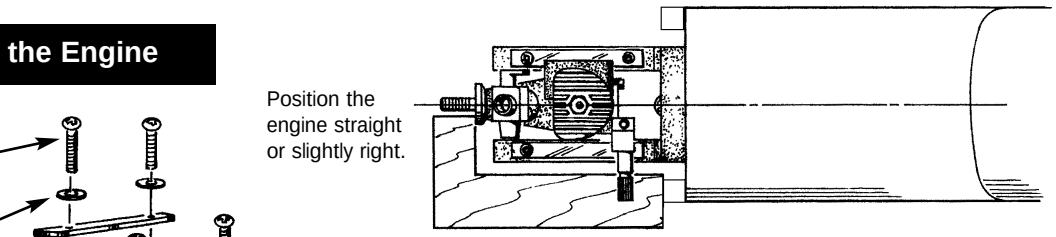


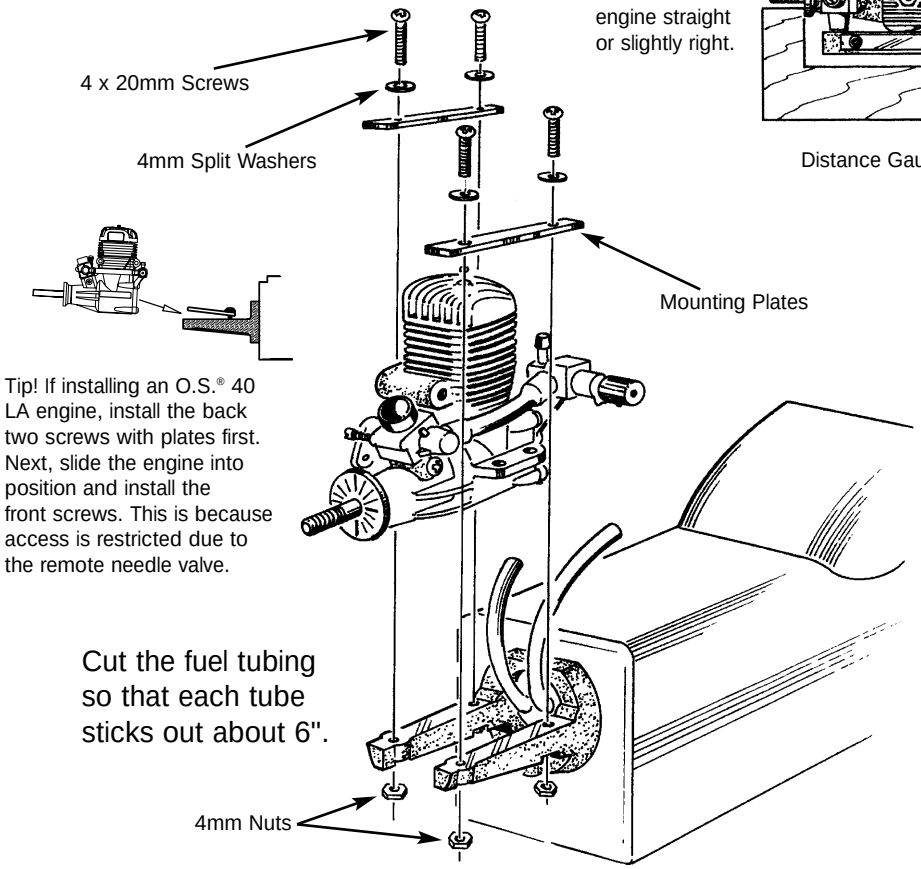



# Part Four

## Engine Installation

### STEP 1: Install the Engine

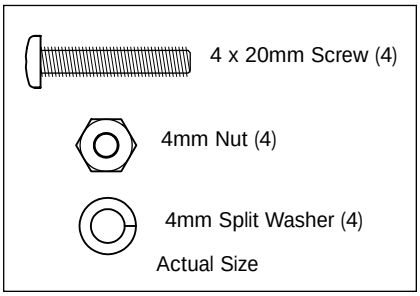



Tip! If installing an O.S.® 40 LA engine, install the back two screws with plates first. Next, slide the engine into position and install the front screws. This is because access is restricted due to the remote needle valve.

Place the engine onto the engine mount. Use the plywood gauge to set the distance from the firewall. The engine should be positioned straight or slightly to the right (NEVER LEFT).

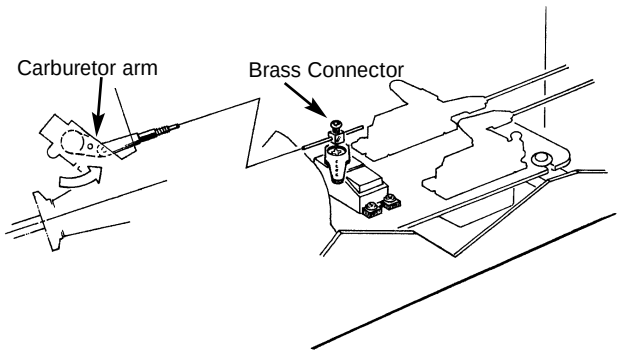
Cut the fuel tubing so that each tube sticks out about 6".



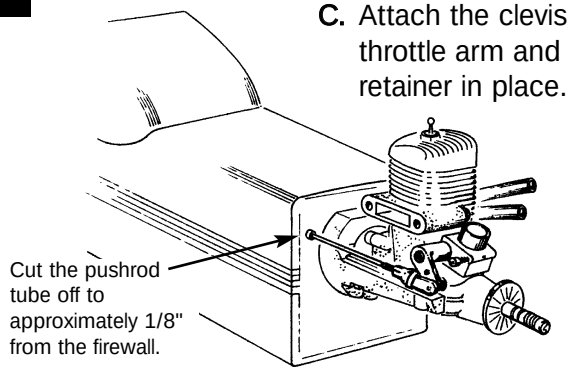

### STEP 2: Install the Throttle Control Linkage

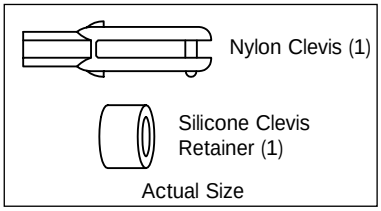
**A.** Attach a clevis with retainer onto the remaining pushrod wire.

**B.** Insert the wire into the fuselage so that it passes through the brass connector on the throttle servo.



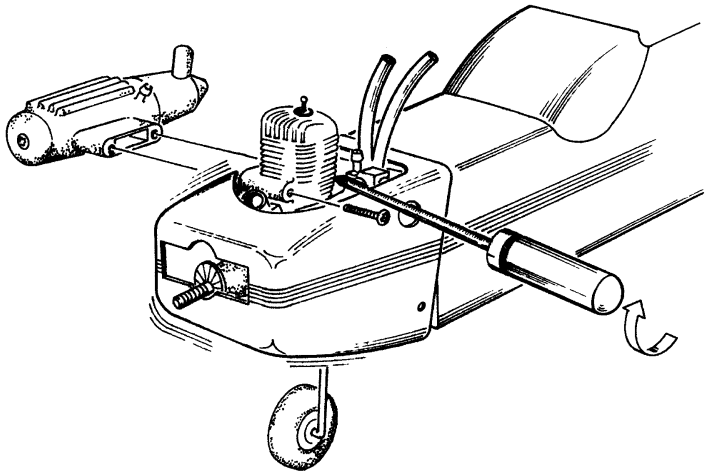

**C.** Attach the clevis to the throttle arm and slide the retainer in place.



## STEP 3: Position the Cowl, Install the Muffler

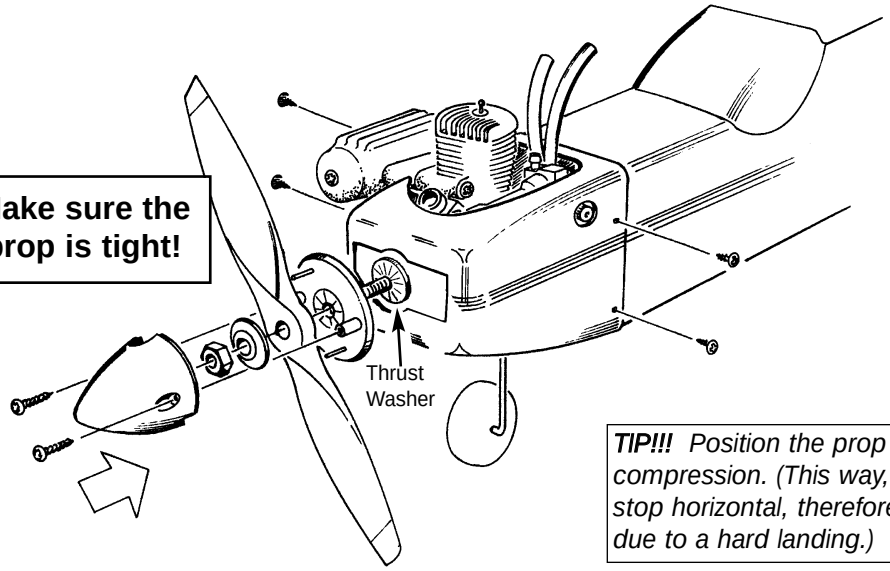
Work the cowl around the engine. Install the muffler.



Note: For some engines, you may need to trim the cowl to provide access to the needle valve.

## STEP 4: Attach the Cowl and Install the Spinner

**Make sure the prop is tight!**




**A.** Position the cowl so the thrust washer on the engine sticks out 1/8" (3mm). Make sure the spinner does not contact the cowl at any point.

**B.** At the holes in the cowl, use the four 2.5 x 10mm screws to attach the cowl in place.

2.5 x 10mm Screw (4)

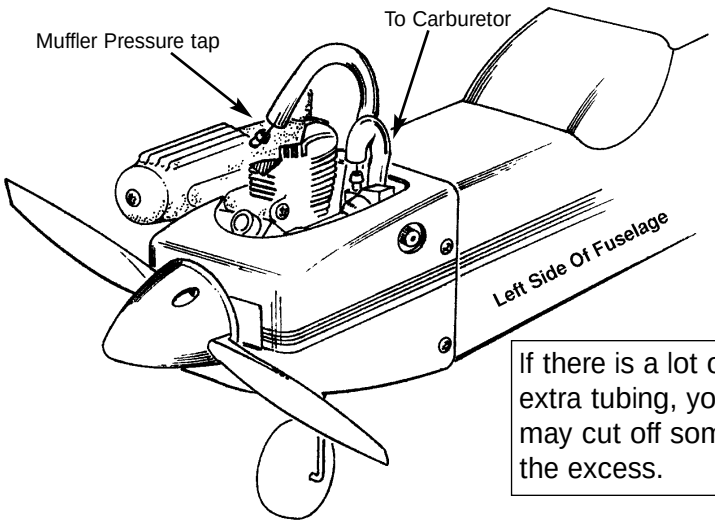
Actual Size

***TIP!!!*** *Position the prop so it is horizontal when you can feel compression. (This way, if your engine quits in flight, the prop will stop horizontal, therefore reducing the chance of prop breakage due to a hard landing.)*

## STEP 5: Attach the Fuel Lines

Attach the fuel tube that comes out of the "left" hole in the firewall, to the nozzle <u>on</u> the carburetor.

Attach the remaining fuel tubing to the muffler. This is called the "vent line" or "muffler pressure line."



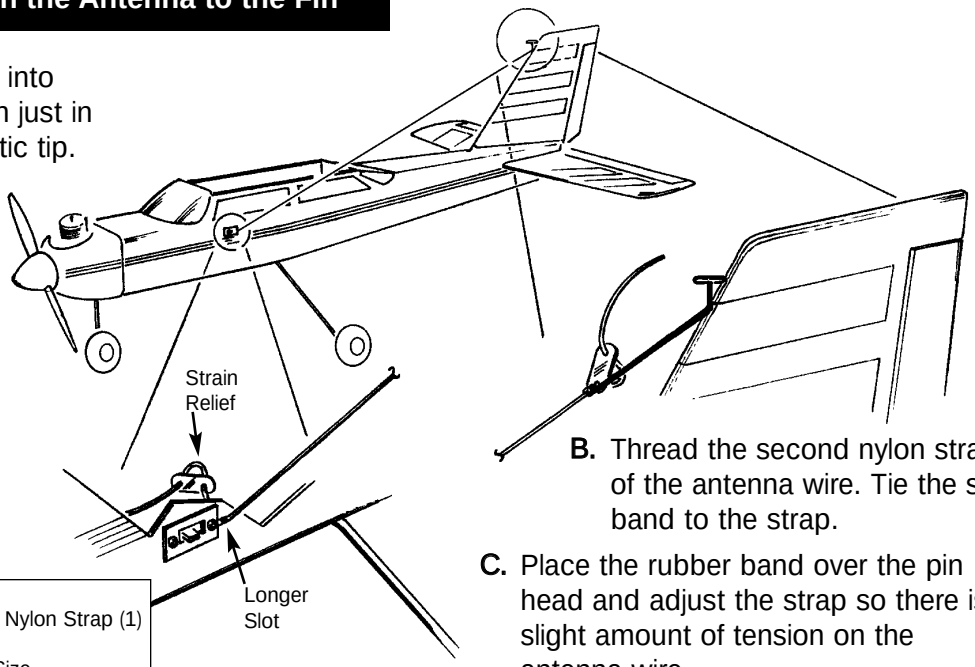

If there is a lot of extra tubing, you may cut off some of the excess.

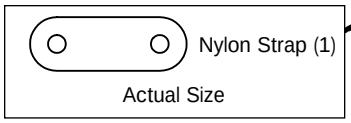
## Part Five

# Final Assembly

### STEP 1: Attach the Antenna to the Fin

**A.** Insert the T- Pin into the top of the fin just in front of the plastic tip.



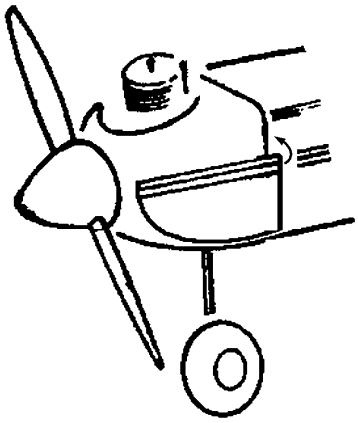




**B.** Thread the second nylon strap near the end of the antenna wire. Tie the small rubber band to the strap.

**C.** Place the rubber band over the pin head and adjust the strap so there is a slight amount of tension on the antenna wire.

### STEP 2: Apply the Decals

Temporarily remove the bottom cowl screws.



Apply the stripes to the cowl sides.

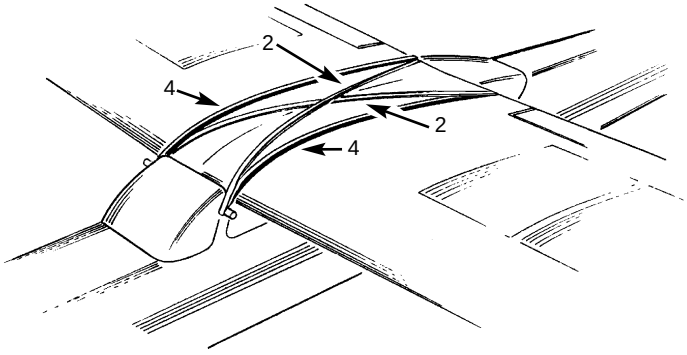
Wrap the excess inside the back part of the cowl.

Reinstall the screws.

### STEP 3: Attach the Wing

**Important!** Plug the aileron servo wire into the receiver.

Attach the wing to the Fuselage using twelve #64 rubber bands. Attach four on each side and criss-cross the remaining four.



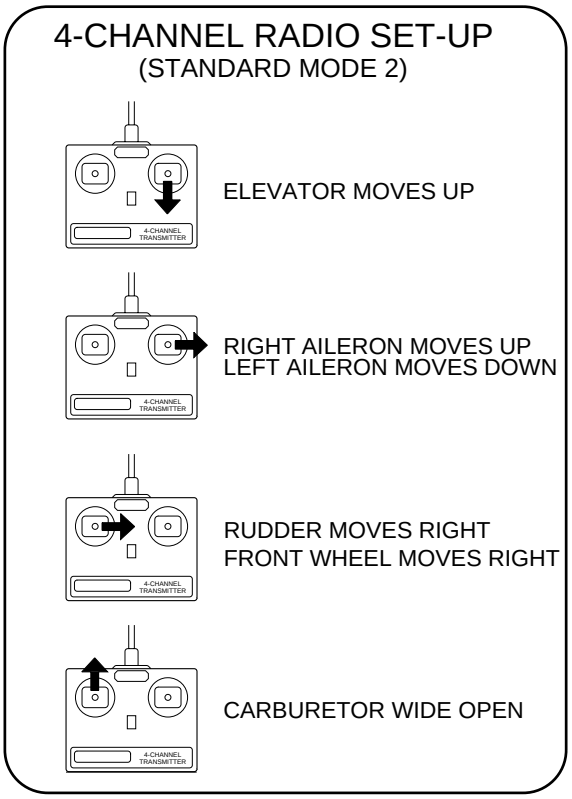
# SECTION 4
# Preparing For Flight

## *RADIO SYSTEM SET-UP*

**Note:** We recommend that you have your instructor help you with the set up of your radio system.

***CHECK THE CONTROL DIRECTIONS***

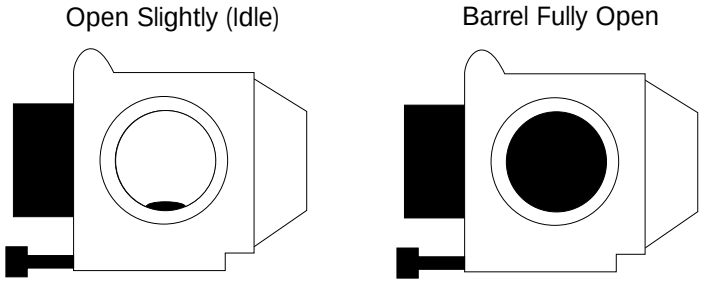
1. Turn on the transmitter and then the receiver. Standing behind the plane, make the following movements with the transmitter and observe the control surfaces:




If any of the servo movements are wrong, reverse the servo direction with the **servo reversing switches** on the transmitter.

***ADJUST THE THROTTLE***

2. For added **safety** and **convenience**, the throttle should be set up so that the engine can be stopped using the throttle trim. To do this, loosen the pushrod connector screw and move the throttle pushrod so that the carburetor is completely **closed** with the throttle stick and trim lever on the transmitter fully **back**. (**Note:** If the carburetor does not fully close, adjust the idle **stop screw** on the carburetor until it will.) Next, tighten the screw on the pushrod connector. Test the trim lever by advancing it to full. This will be a **fast idle position** with the carburetor barrel open slightly (about 1/32" or .8mm).




Now move the throttle stick forward to full. Make sure that the carburetor barrel opens **all the way**. (See sketch.) If it doesn't open far enough or opens too far (bending the rod) move the pushrod connector in or out on the servo arm and/or the carburetor arm to gain or reduce movement. The throw will be correct when the carburetor barrel will stop fully open at the same time the throttle stick reaches full. With the throttle set up properly, you should be able to run the engine with the trim lever set midway to the full position (adjusted for a smooth but slow idle). Then when it is time to stop the engine, simply pull back on the trim to close the carburetor and the engine will stop running.

***ADJUST THE NOSE WHEEL***

3. With the radio system on, adjust the steering pushrod at the rudder servo, so that the nose wheel is straight. Tighten the screw on the brass connector.

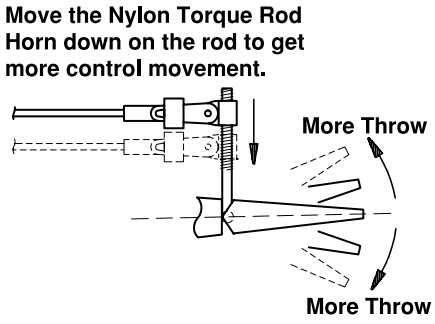
***ADJUST THE CONTROL THROWS***

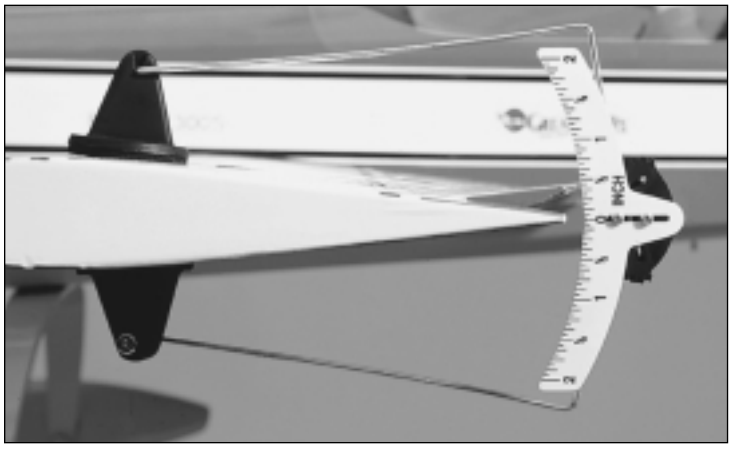
4. Check the movement of the control surfaces. Use a ruler to match our measurements listed below. If your radio features dual rates, set up both the high and low rates following the radio system's instructions. If your radio does not have dual rates, set up the plane using low rates first and increase the throws as you get familiar with the plane.

| | **Low Rate** | **High Rate** |
|---|---|---|
| **Aileron** | 1/2" (13mm) up<br>1/2" (13mm) down | 5/8" (16mm) up<br>5/8" (16mm) down |
| **Elevator** | 3/8" (10mm) up<br>3/8" (10mm) down | 1/2" (13mm) up<br>1/2" (13mm) down |
| **Rudder** | 1" (25mm) left<br>1" (25mm) right | Same as low rate<br>Same as low rate |

These are the suggested deflections from center.

If you need more control movement, you can move the nylon horn closer to the control surface or you can move the rod at the servo away from the center of the servo horn. If you have too much movement, reverse the process.



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

## *BALANCE YOUR MODEL*

### *CHECK THE LATERAL BALANCE*

Now that you have the model completed, this is a good time to balance the airplane laterally (side-to-side). Here is how to do it:

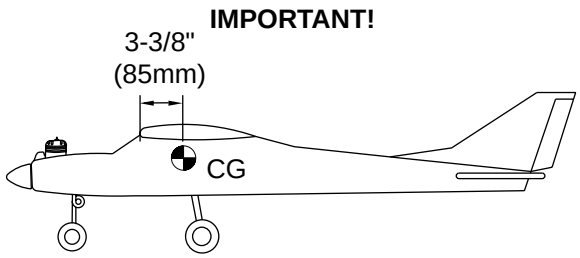
❏ 1. Attach the wing to the fuselage.

❏ 2. With the airplane sitting level, lift the model by the engine propeller shaft and the bottom of the fuselage at the tail (this may require two people). Do this several times.

❏ 3. If one wing always drops when you lift the model, it means that side is heavy. Balance the airplane by attaching weight to the lighter wing tip. **Note:** An airplane that has been laterally balanced will track better in loops and other maneuvers. Balancing weight is available from your local hobby dealer.

### *CHECK THE FORE-AFT BALANCE (CENTER OF GRAVITY)*

**Note:** This section is **VERY** important and must **NOT** be omitted! A model that is not properly balanced will be unstable and possibly unflyable.




❏ 1. Accurately mark the balance point on the bottom of the wing on both sides of the fuselage. The balance point is located 3-3/8" (85mm) back from the leading edge. This is the balance point at which your model should balance for your first flights. Later, you may wish to experiment by shifting the balance up to 1/4" (6mm) forward or back to change the flying characteristics. Moving the balance forward may improve the smoothness and arrow-like tracking, but it may then require more speed for takeoff and make it more difficult to slow down for landing. Moving the balance aft makes the model more agile with a lighter and snappier "feel". In any case, please start at the location we recommend and do not at any time balance your model outside the recommended range.

❏ 2. With the wing attached to the fuselage, all parts of the model installed (ready to fly), and an **empty** fuel tank, position your fingertips at the marked balance point.

❏ 3. Lift the model. If the tail drops when you lift, the model is "tail heavy" and you must add weight* to the nose. If the nose drops, it is "nose heavy" and you must add weight* to the tail to balance.

**Note:** Nose weight may be easily installed by using a Heavy Spinner Hub or gluing lead weights to the firewall. Tail weight may be added by using Great Planes (GPMQ4485) "stick-on" lead weights.

*If possible, first attempt to balance the model by changing the position of the receiver battery and receiver. If you are unable to obtain good balance by doing so, then it will be necessary to add lead weights to the nose or tail to achieve the proper balance point.

Improve the flight of your AirVista with the Great Planes C.G. Machine's exact balancing. The C.G. Machine's stable, "hands-off" operation eliminates the potential for error. It works with all airplanes weighing up to 40 pounds–regardless of size or wingspan. **GPMR2400**.

## *PREPARING TO FLY YOUR AIRVISTA*

If you are a novice, there is one thing that you will need to fly your AirVista safely that is not furnished with the kit: You will need a **qualified** instructor to teach you how to fly. No model ever made will let you teach yourself to fly safely. It can be done, but you would be seriously risking more than just the airplane. To find an instructor, you should join an R/C flying club. If there is not a club nearby, then you should find an experienced model pilot who is willing to help you. The chosen instructor should fly well enough to allow you to concentrate on your own flying. If you are worried about your instructor crashing your model, you will not be able to concentrate on learning to fly. After you have found an instructor, you should spend some time just **talking** about what you will be trying to learn. They should inspect the model to be certain that it is ready to fly. Listen to them and learn from their experience.

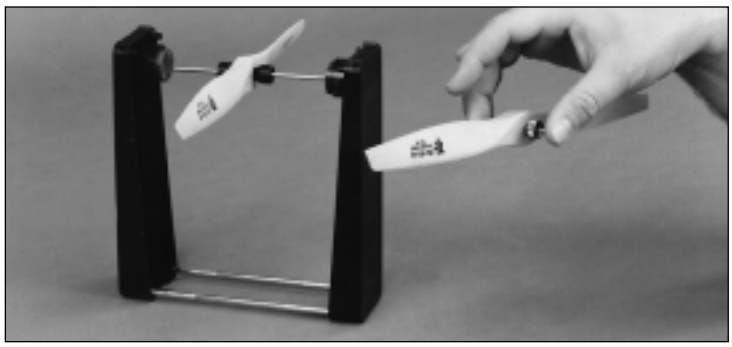
Now that you have a good model and an instructor that you can trust, you can go out and start learning to fly. You can expect to be very nervous at first, and will make some mistakes. There will be several instances where the instructor will prevent you from crashing. This will be unsettling, but the thing to do is jump right back into flying the model (after your knees stop shaking, of course). This is one of the most important things about learning to fly model airplanes...**you have to fly!** Fly as often as you can. Be sure to make several flights each time you go to the flying field, but give yourself time after each flight to calm down and discuss the flight with your instructor. Spending some time after each flight talking about what happened and what you need to work on to improve your skills will pay off with greater confidence in your own growing abilities.

### *CHARGE THE BATTERIES*

Follow the battery charging procedures in your radio instruction manual. You should always charge your transmitter and receiver batteries the night before you go flying, and at other times as recommended by the radio manufacturer.

### *BALANCE THE PROPELLER*

Balance your propellers carefully before flying. An unbalanced prop is the single most significant cause of damaging vibration. Not only will engine mounting screws and bolts vibrate out, possibly with disastrous effect, but vibration will also damage your radio receiver and battery. Vibration may cause your fuel to foam, which will, in turn, cause your engine to run rough or quit.



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

### *FIND A SAFE PLACE TO FLY*

The best place to fly your R/C model is an AMA (Academy of Model Aeronautics) chartered club field. Ask your hobby shop dealer if there is such a club in your area and join. Club fields are set up for R/C flying and that makes your outing safer and more enjoyable. The AMA also can tell you the name of a club in your area. We recommend that you join the AMA and a local club so you can have a safe place to fly and have insurance to cover you in case of a flying accident. (The AMA address is listed on page 3 of this instruction book).

If a club and its flying site are not available, you need to find a large, grassy area at least 6 miles away from any other R/C radio operation like R/C boats and R/C cars and away from houses, buildings and streets. A schoolyard may look inviting but it is too close to people, power lines and possible radio interference.

### *GROUND CHECK THE MODEL*

If you are not thoroughly familiar with the operation of R/C models, ask an experienced modeler to check to see that you have the radio installed correctly and that all the control surfaces do what they are supposed to. The engine operation also must be checked and the engine "broken-in" on the ground by running the engine for at least two tanks of fuel. Follow the engine manufacturer's recommendations for break-in. Check to make sure all screws remain tight, that the hinges are secure and that the prop is on tight.

***RANGE CHECK YOUR RADIO***

Check the operation of the radio before each time you fly. First, make sure no one else is on your frequency (channel). With the transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet away from the model and still have control. Have someone help you. Have them stand by your model and, while you work the controls, tell you what the models various control surfaces are doing.

Repeat this test with the engine running at various speeds with an assistant holding the model. If the control surfaces are not always acting correctly, do not fly! Find and correct the problem first.

***ENGINE SAFETY PRECAUTIONS***

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

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

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

Check the engine bolts occasionally and retighten.

Use safety glasses when starting or running engines.

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

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

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

Use a “safety stick” device or electric starter; follow instructions supplied with the starter or stick. Make certain the glow plug clip or connector is secure so that it will not pop off or otherwise get into the running propeller.

Make all engine adjustments from **behind** the rotating propeller. **IMPORTANT: Never reach around a rotating propeller.**

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

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

## *AMA SAFETY CODE (excerpt)*

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

***GENERAL***

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

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

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

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

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

***RADIO CONTROL***

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

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

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

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

## *FLYING YOUR AIRVISTA*

The moment of truth has finally arrived. You’ve put a lot of effort into building your model and it looks great! Protect your investment by following a few simple tips:

1. If possible, have an experienced modeler look over your work before you head out to your flying field. It’s easier to fix problems in the workshop instead of the flight line.

2. Become familiar with starting your engine, and break it in before going for your first flight. Be sure the engine will stop when the trim lever is pulled all the way back.

3. Assemble a simple flight kit (a shoe box is fine to start with) which should include a starting battery and glo-plug clip (or ni-starter), “chicken stick” for flipping the prop, fuel and a means of filling the tank, a couple of small screwdrivers, #64 rubber bands, spare prop and glo-plug, 6” adjustable wrench, and a pair of needle nose pliers. In addition to tools, you should also take along some paper towels and spray window cleaner to remove fuel residue after each flight.

4. When you load up to go to the flying field be sure that the batteries have charged for at least 14 hours, and that you have your fuselage, wing, transmitter, and flight box. And, most important, you have your AMA license.

5. Range check the radio! See page 19.

***USING RUBBER BANDS***

The rule of thumb is to use two #64 rubber bands per pound of model weight. If your model weighs in at 6 pounds, you need 12 rubber bands. It doesn’t matter too much how many you run straight across the wing or how many are criss-crossed, so long as the last two are criss-crossed. This trick stops the other bands from popping off. Do not use oily rubber bands for more than a few flying sessions. Check each rubber band before using it; discard any that have cracks. Rubber bands can be conditioned by storing the oily ones in a zip-top storage bag partially filled with talcum powder or corn starch. Both products will absorb the oil.

***TAXIING***

Start the engine and set the throttle trim for a slow, steady idle. Have your instructor or a helper hold the plane while you work the controls. Upon release, advance the throttle slightly to start rolling, then back-off the power to prevent going too fast and possibly taking off. Stand behind the plane as it taxies away from you and note the direction it turns as you move the rudder control. One thing to keep in mind with R/C models (whether it be cars, boats, or planes) is that the steering controls may seem to “reverse” when the model is moving toward you. For example, if you are flying toward yourself, and you give a right control input (ailerons or rudder), the model will move off to your left. The fact of the matter is of course, that the controls are not reversed and the aircraft did actually enter a right turn. The plane does move off to your left from your vantage point, but if you imagined yourself in the cockpit you would realize the plane turned to the right as commanded. All it takes is a little practice to maintain proper orientation of your aircraft, but that’s why we recommend finding an instructor.

When you feel comfortable, advance the throttle a little while standing behind the plane to get the feel of a takeoff roll, but pull back on the power before the model lifts off. Try this several times, adding a little more power each time. If the plane starts to veer off, immediately cut the power to prevent a mishap.

Although many R/C pilots have taught themselves to fly, we strongly recommend that you find an instructor to help get you started. Although trainer airplanes offer the greatest opportunity of success for the self-taught, there is a high probability that you will crash your airplane on the first flight. Protect your investment of time and money—obtain the assistance of an experienced R/C pilot.

**TAKEOFF**

Your first flights should be made in little or no wind. If you have dual rates on your transmitter, set the switches to “low rate” for takeoff. Taxi into position, pointing directly into the wind. Although this model has good low speed characteristics, you should always build up as much speed as your runway will permit before lifting off, as this will give you a safety margin in case of a “flame-out.” Advance the throttle smoothly to the wide-open setting. When the plane has sufficient flying speed (you won’t know until you try), lift off by smoothly applying a little up elevator (don’t force it off into a steep climb!), and climb out **gradually**, trying to keep it straight and the wings level. Climb to about 100 feet before starting a VERY gentle turn by moving the aileron stick. Apply a little more back pressure on the elevator stick as the model turns. Stop the turn by moving the aileron stick in the opposite direction until the wings are level, then return the stick to the neutral position. Pull the power back to 1/2 throttle.

***FLYING***

We recommend that you take it easy with your model for the first several flights and gradually “get acquainted” with the plane as your engine becomes fully broken-in. Trainers are designed to fly level with neutral elevator trim at approximately 1/3 - 1/2 throttle — this is the best speed for learning to fly. On later flights, if you want your model to maintain level flight at full throttle, you will need to give it a little down trim.

Your first flights should consist of mostly straight and level flight with gentle turns to keep the model over the field. These flights will give you practice at coordinating your control inputs and maintaining the proper orientation of the airplane. As mentioned earlier, turns are accomplished by banking the aircraft with the ailerons (rudder will accomplish this on a 3-channel airplane) then gently adding some back stick (up elevator). Enough back stick should be held in to keep the aircraft at a constant altitude. To stop turning, apply opposite aileron (or rudder) to level the wings, then release the sticks. There is a memory aid that may help keep you out of trouble when the plane is flying toward you — “put the stick under the low wing.” In other words, move the stick in the direction of the low wing to raise that wing. When you are comfortable flying the aircraft, you can practice using the rudder along with the ailerons to “coordinate” the turns — usually, a small amount of rudder applied in the direction of the turn will keep the tail following in the exact same track as the nose.

The most common mistake when learning to fly is “over control.” Think of *pressure* instead of large movements of the control sticks. Remember, most trainers will recover from almost any over control situation (given enough altitude) if you simply let go of the sticks.

Add and practice one maneuver at a time, learning how your model behaves in each one. For ultra-smooth flying and normal maneuvers, we recommend using the “low rate” settings as listed on page 16. High rate control throws will give your model enough control for loops, barrel rolls, and many other basic aerobatic maneuvers.

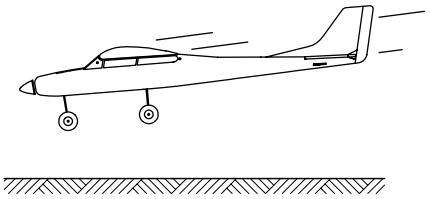
After you have several flights on your model, it’s time to reward yourself with your first aerobatic maneuver — a loop. Climb to a safe altitude and turn into the wind. Apply full throttle, level the wings, then slowly pull back on the elevator stick to about 1/2 to 3/4 up elevator (depending on your throws), and hold this control input. After you go over the top and start down the back side of the loop, pull the throttle back to about half. This will keep the stresses on the airplane low and the airspeed relatively constant. Keep holding “up” elevator until the plane is level, then slowly release the sticks. You’re done! It’s really that easy!

***CAUTION (THIS APPLIES TO ALL R/C AIRPLANES):*** If, while flying, you notice any unusual sounds, such as a low-pitched “buzz,” this may be an indication of control surface “flutter.” Because flutter can quickly destroy components of your airplane, any time you detect flutter you must immediately cut the throttle and land the airplane! Check all servo grommets for deterioration (this will indicate which surface fluttered), and make sure all pushrod linkages are slop-free. If it fluttered once, it will probably flutter again under similar circumstances unless you can eliminate the slop or flexing in the linkages. Here are some things which can result in flutter: excessive hinge gap; not mounting control horns solidly; sloppy fit of clevis pin in horn; elasticity present in flexible plastic pushrods; side-play of pushrod in guide tube caused by tight bends; sloppy fit of Z-bend in servo arm; insufficient glue used when gluing in the elevator joiner wire or aileron torque rod; excessive flexing of aileron, caused by using too soft balsa aileron; excessive “play” or “backlash” in servo gears; and insecure servo mounting.

***LANDING***

When it’s time to land, fly a normal landing pattern and approach as follows: Reduce the power to about 1/4 and fly a downwind leg far enough out from the runway to allow you to make a gentle 180 degree turn. As you make the turn into the wind for your final approach, pull the throttle back to idle. Most trainer planes have a lot of lift, so you will need a slow, reliable idle in order to achieve a nice, slow landing. Allow the plane to keep descending on a gradual glide slope until you are about 3 feet off the runway. Gradually apply a little up elevator to flare for landing. You should apply just enough up elevator to hold the plane just off the runway while the excess speed bleeds off. The model should settle onto the runway for a slow, slightly nose-high landing. If your approach looks short, add in a little power to extend the glide. If you are too high, add throttle slowly and go around for another try. Do not try to “force” the airplane to land.

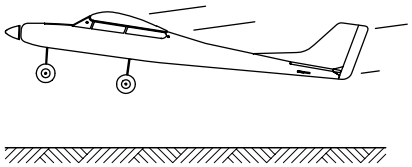
**APPROACH TOO STEEP**



**Apply Up Elevator**

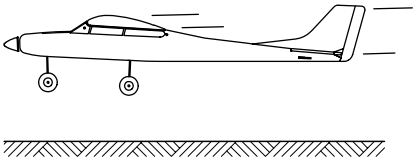
**TOO MUCH FLARE**

**Danger Of Stalling!**



**Release A Little Elevator.**

**GOOD LANDING FLARE**



**Hold This Angle Until Touchdown.**

***Good luck and have fun flying your model, but always stay in control and fly in a safe manner.***

## *SOME MODELING TERMS & TRIVIA*

**Adverse Yaw** - The tendency of an airplane to yaw in the opposite direction of the roll. For instance, when right aileron is applied, the airplane yaws to the left, thus opposing the turn. Adverse yaw is common in trainer type airplanes having flat bottom wings. It is most noticeable at slow speeds and high angles of attack, such as during takeoffs and when stretching a landing approach. Caused by the unequal drag of the upward and downward deflection of the ailerons, this undesirable trait can be minimized by setting up the ailerons with Differential Throw or by coordinating the turns, using the aileron and rudder controls simultaneously. (See Differential Throw.)

**Ailerons** - Hinged control surfaces located on the trailing edge of the wing, one on each side, which provide control of the

airplane about the roll axis. The control direction is often confusing to first time modelers. For a right roll or turn, the right hand aileron is moved upward and the left hand aileron downward, and vice versa for a left roll or turn.

**Angle of Attack** - The angle that the wing penetrates the air. As the angle of attack increases so does lift and drag, up to a point.

**ARF** - A prefabricated model - Almost Ready to Fly.

**Buddy Box** - Two similar transmitters that are wired together with a "trainer cord." This is most useful when learning to fly — it's the same as having dual controls. The instructor can take control by using the "trainer switch" on his transmitter.

**Boring Holes in the Sky** - Having fun flying an R/C airplane, without any pre-determined flight pattern.

**CA** (Abbreviation for "Cyanoacrylate") - An instant type glue that is available in various viscosities (Thin, Medium, Thick, and Gel). These glues are ideal for the assembly of wood airplanes and other materials. **Note:** Most CA glues will attack Styrofoam.

**Carburetor** - The part of the engine which controls the speed or throttle setting and lean/rich mixture via setting of the needle valve.

**CG** ("Center of Gravity") - For modeling purposes, this is usually considered — the point at which the airplane balances fore to aft. This point is critical in regards to how the airplane reacts in the air. A tail-heavy plane will be very snappy but generally very unstable and susceptible to more frequent stalls. If the airplane is nose heavy, it will tend to track better and be less sensitive to control inputs, but, will generally drop its nose when the throttle is reduced to idle. This makes the plane more difficult to land since it takes more effort to hold the nose up. A nose heavy airplane will have to come in faster to land safely.

**Charge Jack** - The plug receptacle of the switch harness into which the charger is plugged to charge the airborne battery. An expanded scale voltmeter (ESV) can also be plugged into it to check battery voltage between flights. It is advisable to mount the charge jack in an accessible area of the fuselage so an ESV can be used without removing the wing.

**Charger** - Device used to recharge batteries and usually supplied with the radio if NiCd batteries are included.

**Chicken Stick** - A hand-held stick used to "flip start" a model airplane engine.

**Clunk** - A weighted fuel pick-up used in a fuel tank to assure the intake line is always in fuel.

**Dead Stick** - A term used to describe unpowered flight (glide) when the engine quits running.

**Differential Throw** - Ailerons that are set up to deflect more in the upward direction than downward are said to have Differential Throw. The purpose is to counteract Adverse Yaw.

**Dihedral** - The V-shaped bend in the wing. Typically, more dihedral causes more aerodynamic stability in an airplane, and causes the rudder to control both the roll and yaw axis. This is why some trainers and sailplanes require only 3 channels of radio control—i.e., having no ailerons.

**Ding** - Minor dent or damage to the structure. Also, a nick in a prop. Dinged props must be replaced.

**Down Thrust** - Downward angle of the engine relative to the centerline of the airplane. Down thrust helps overcome the normal climbing tendency of flat bottom wings.

**Electric Starter** - A hand-held electric motor used for starting a model airplane engine. Usually powered by a 12-volt battery.

**Elevator** - Hinged control surface located at the trailing edge of the horizontal stabilizer, which provides control of the airplane about the pitch axis and causes the airplane to climb or dive. The correct direction of control is to pull the transmitter elevator control stick back, toward the bottom of the transmitter, to move the elevator upward, which causes the airplane to climb, and vice versa to dive.

**Epoxy** - A two-part resin/hardener glue that is extremely strong. It is generally available in 6 and 30-minute formulas. Used for critical points in the aircraft where high strength is necessary.

**Expanded Scale Voltmeter** (ESV) - Device used to read the battery voltage of the on-board battery pack or transmitter battery pack.

**Field Charger** - A fast battery charger designed to work from a 12-volt power source, such as a car battery.

**Flaps** - Hinged control surface located at the trailing edge of the wing inboard of the ailerons. The flaps are lowered to produce more aerodynamic lift from the wing, allowing a slower takeoff and landing speed. Flaps are often found on scale models, but usually not on basic trainers.

**Flare** - The point during the landing approach in which the pilot gives an increased amount of up elevator to smooth the touchdown of the airplane.

**Flight Box** - A special box used to hold and transport all equipment used at the flying field.

**Flight Pack** (or Airborne pack) - All of the radio equipment installed in the airplane, i.e., Receiver, Servos, Battery, Switch Harness.

**Flutter** - A phenomenon whereby the elevator or aileron control surface begins to oscillate violently in flight. This can

sometimes cause the surface to break away from the aircraft and cause a crash. There are many reasons for this, but the most common are excessive hinge gap or excessive “slop” in the pushrod connections and control horns. If you ever hear a low-pitched buzzing sound, reduce throttle and land immediately.

**Frequency Control** - The FCC has allowed the 72MHz band to be used for R/C aircraft operations. This band is divided up into many different channels in which you can choose a radio system. You should be aware that certain areas have frequencies in which there is pager interference. This is why it is always a wise move to check with your local hobby shop to find out any channels that may be troublesome in the area you wish to fly.

**Fuel Overflow Line** (Vent) - The fuel line is either open to atmospheric pressure or attaches to the muffler pressure nipple to pressurize the fuel tank for better fuel flow to the engine. This is the line through which the fuel will overflow when the tank is full.

**Fuel Pick Up-Line** - The fuel line in the fuel tank through which fuel travels to the carburetor. Typically a flexible tube with a weight or “Clunk” on the end which allows it to follow the fuel with changes in aircraft attitude. This is the line through which the tank is filled.

**Fuselage** - The body of an airplane.

**Glitch** - Momentary radio problem that never happens unless you are over trees or a swamp.

**Glow Plug** - The heat source for igniting the fuel/air mixture in the engine. When starting the engine a battery is used to heat the filament. After the engine is running, the battery can be removed. The wire filament inside the plug is kept hot by the “explosions” in the engine’s cylinder. (See next heading and “Idle Bar” Plug.)

**Glow Plug Clip/Battery** - A 1.2-volt battery, which is connected to the glow plug on a model airplane engine for starting. The battery is removed once the engine is running steadily.

**Grease-In** - A very smooth, gentle landing without a hint of a bounce.

**Hit** (or to be hit) - Sudden radio interference which causes your model to fly in an erratic manner. Most often caused by someone turning on a radio that is on your frequency, but can be caused by other radio sources miles away.

**Horizontal Stabilizer** - The horizontal tail surface at the back of the fuselage which provides aerodynamic pitch stability to the airplane.

**Idle Bar Plug** - This type of glow plug has a “bar” across the tip to help prevent raw fuel from being splashed onto the glow element. Too much raw fuel will cool the plug and prevent it from igniting the fuel/air mixture. An idle bar is a help in obtaining a low idle speed.

**Lateral Balance** - The left-right or side-to-side balance of an airplane. An airplane that is laterally balanced will track better through loops and other maneuvers.

**Leading Edge** (LE) - The very front edge of the wing or stabilizer. This is the edge that hits the air first.

**Muffler** - A device attached to the exhaust stack of the engine to reduce noise and increase back pressure which helps low speed performance. **Note:** Most R/C Clubs require the use of mufflers.

**Muffler Baffle** - A restrictor plate inside the muffler which reduces engine noise. This plate can be removed to increase power, but only if there are no noise restrictions where you fly.

**Needle Valve** - Adjustment on a carburetor used to set proper fuel/air mixture. Some carburetors have separate needle adjustments for low and high throttle. Typically, turning the needle clockwise (screwing in) leans the mixture (less fuel), and vice versa. However, there are a few exceptions—refer to the engine manufacturer’s instructions.

**NiCd** - Nickel Cadmium battery. Rechargeable batteries which are typically used as power for radio transmitters and receivers.

**Nitro** - Nitromethane, a fuel additive which increases a model engine’s ability to idle low and improves high speed performance. Ideal nitro content varies from engine to engine. Refer to the engine manufacturer’s instructions for best results. Nitro content in fuel is indicated by the percent of the fuel.

**Ni-Starter** - A self-contained battery and glow plug clip, used when starting the engine. (See Glow Plug Clip.)

**One-Point Landing** (or a figure 9) - Synonymous with “stuffing it in.” Something we hope you never do.

**Pitch Axis** - The airplane axis controlled by the elevator. Pitch is illustrated by holding the airplane at each wingtip. Raising or lowering the nose is the pitch movement. This is how the climb or dive is controlled.

**Power Panel** - 12-volt distribution panel that provides correct voltage for accessories like glow-plug clips, fuel pumps and electric starters. Usually mounted on a field box and connected to a 12-volt battery.

**Prop Pitch** - Props are designated by these two numbers, for instance 10 - 6. The first number is the prop’s length, 10". The second number is the pitch or angle of the blades. The 6 represents the distance the propeller will move forward in one revolution, in this case 6".

**Re-Kitting Your Airplane** - Changing your finished model back into a kit, as a result of “stuffing it in.”

**Receiver** (Rx) - The radio unit in the airplane which receives the transmitter signal and relays the control to the servos. This is somewhat similar to the radio you may have in your family automobile, except the radio in the airplane perceives commands from the transmitter, while the radio in your car perceives music from the radio station.

**Roll Axis** - The airplane axis controlled by the ailerons. Roll is illustrated by holding the airplane by the nose and tail. Dropping either wingtip is the roll movement. This is used to bank or turn the airplane. Many aircraft are not equipped with ailerons and the Roll and Yaw motions are controlled by the rudder. This is one reason why most trainer aircraft have a larger amount of dihedral.

**Rudder** - Hinged control surface located at the trailing edge of the vertical stabilizer, which provides control of the airplane about the Yaw axis and causes the airplane to Yaw left or right. Left rudder movement causes the airplane to Yaw left, and right rudder movement causes it to Yaw right.

**Servo** - The electro-mechanical device which moves the control surfaces or throttle of the airplane according to commands from the receiver. The radio device which does the physical work inside the airplane.

**Servo Output Arm** - The removable arm or wheel which bolts to the output shaft of a servo and connects to the pushrod.

**Shot Down** - A “hit” that results in a crash landing. Sometimes caused by radios miles away.

**Slop** - Unwanted, excessive free movement in a control system. Often caused by a hole in a servo arm or control horn that is too big for the pushrod wire or clevis pin. This condition allows the control surface to move without transmitter stick movement. (See Flutter.)

**Solo** - Your first totally unassisted flight that results in a controlled landing.

**Spinner** - The nose cone which covers the hub of the propeller.

**Sport Airplane** - A model which possesses some attributes of many of the specialty airplanes and are best for general flying as they are the most versatile and durable.

**Stall** - What happens when the angle of attack is too great to generate lift regardless of airspeed. (Every airfoil has an angle of attack at which it generates maximum lift — the airfoil will stall beyond this angle).

**Tachometer** - An optical sensor designed specifically to count light impulses through a turning propeller and read out the engine RPM.

**Tip Stall** - The outboard end of one wing (the tip) stops developing lift, causing the plane to roll suddenly in the direction of the stalled wing. This situation is not fun when you are only a few feet off the runway trying to land.

**Trainer Airplane** - A model designed to be inherently stable and fly at low speeds, to give first-time modelers time to think and react as they learn to fly.

**Trailing Edge** (TE) - The rearmost edge of the wing or stabilizer.

**Transmitter** (Tx) - The hand-held radio controller. This is the unit that sends out the commands that you input.

**Touch-And-Go** - Landing and taking off without a pause. Often confused with a good bounce.

**Vertical Fin** - The non-moving surface that is perpendicular to the horizontal stabilizer and provides yaw stability. This is the surface to which the rudder attaches.

**Washout** - An intentional twist in the wing, causing the wing tips to have a lower angle of attack than the wing root. In other words, the trailing edge is higher than the leading edge at the wing tips. Washout helps prevent tip stalls.

**Wheel Collar** - A small, round retaining device used to keep wheels from sliding off an axle.

**Wing** - The main lifting surface of an airplane.

**Wing Loading** - This is the amount of weight per square foot that has to be overcome to provide lift. It is normally expressed in ounces per square foot. This specification can be easily calculated as follows: If you know the square inches of the wing, simply divide by 144 to obtain square feet. Divide the total weight (in ounces) of the airplane by the wing area (in square feet). This information is valuable when deciding on which airplane to build next. Planes with high wing loading numbers must fly faster to stay in the air. These are generally “performance” airplanes. Conversely, planes with lower numbers do not need as much air flowing around the wing to keep it flying. Gliders and trainer airplanes fall into this category because slow, efficient flight is desirable.

**Wing Root** - The centerline of the wing, where the left and right wing panels are joined.

**Yaw Axis** - The airplane axis controlled by the rudder. Yaw is illustrated by hanging the airplane level by a wire located at the center of gravity. Left or right movement of the nose is the Yaw movement.

**Z-Bend** - A simple Z-shaped bend in the wire end of a pushrod, which is used to attach the pushrod to a servo output arm.

**Z-Bend Pliers** - An inexpensive plier type tool used for easily making perfect Z-bends.

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