

HANGAR 9®

Alpha 650™

ASSEMBLY MANUAL



Ready-To-Fly

Featuring the Unique Evolution Trainer Power System

	<p><i>The Evolution Trainer Power System. Engineered for ease... first flight, every flight.</i></p>
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Specifications

- | | | | |
|------------------|---------------------------|----------------|-------------------------|
| Wingspan: | 71.5 in (1816mm) | Engines: | .6l 2-stroke (included) |
| Length: | 54 in (1371mm) | Radio:..... | 4-channel w/4 servos |
| Wing Area: | 965.2 sq in (62.27 sq dm) | | (included) |
| Weight:..... | 7-8 lb (3.2-3.6 kg) | | |

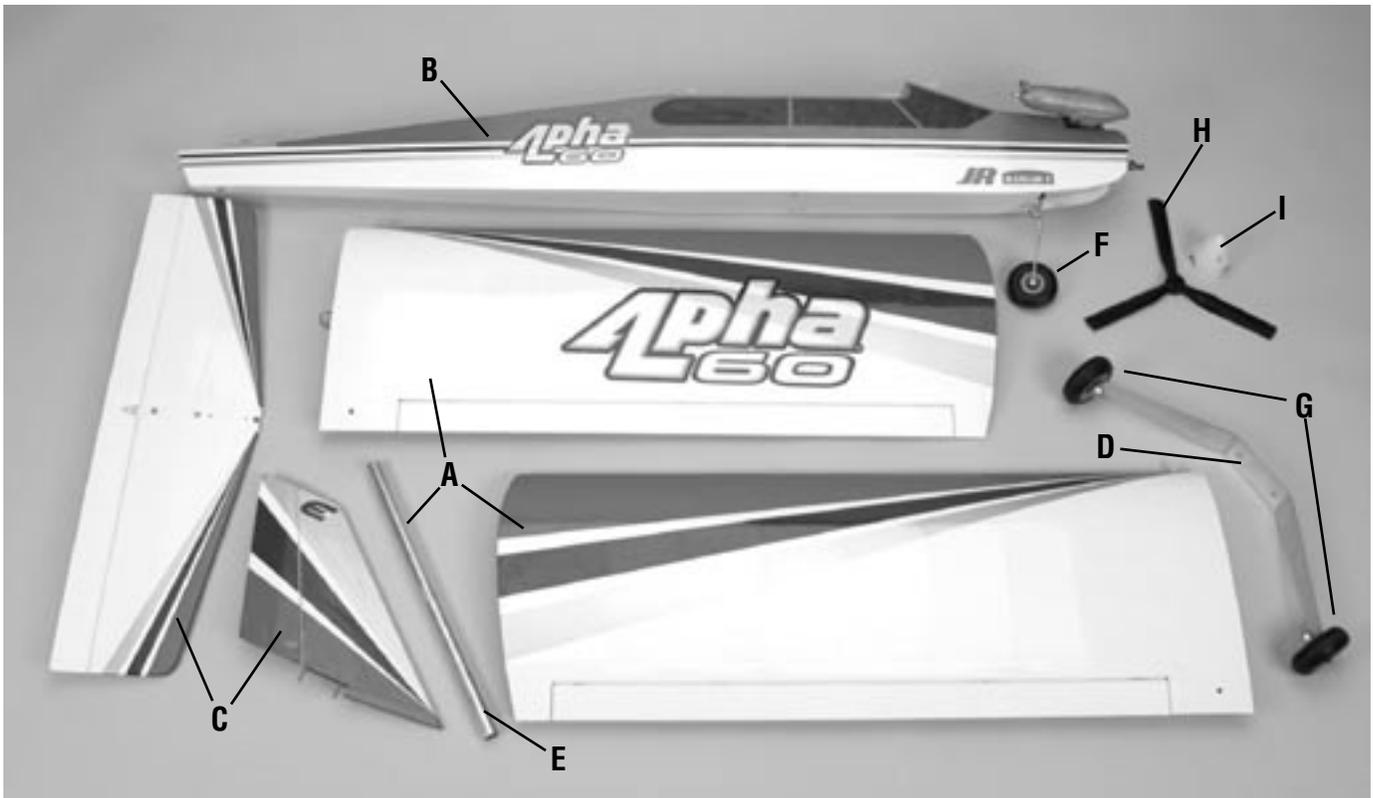
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Covering Colors

- | | | | |
|-------------|---------|----------|---------|
| • True Red | HANU866 | • White | HANU870 |
| • Deep Blue | HANU873 | • Silver | HANU881 |

Contents of Kit



Replacement parts:

A. Wing Set w/Alum. Tube	HAN2601
B. Fuselage	HAN2602
C. Tail Set	HAN2603
D. Landing Gear Set	HAN2604
E. Wing Tube	HAN2605
F. 2 ³ / ₄ " Wheels	HAN305
G. 3" Wheels	HAN306
H. Propeller	EVO0610P
I. Spinner	EVO0610S

Items Not Shown:

Engine Mount	HAN90M
Pushrod Set	HAN2607
Fuel Tank (assembled)	HAN2606

Repair Information

In the misfortune of a crash or broken part, see your local hobby dealer for replacement parts. Use the part

numbers listed to aid in the selection of the correct replacement parts.

Field Equipment Required

- Fuel
- Glow Plug Wrench (HAN2510)
- Glow Plug Igniter with Charger (HAN7101)
- Glow Plug (HAN3001/3006)
- Manual Fuel Pump (HAN118)
- #64 Rubber Bands (ARC64)
- Skypack Pilot Support Package (HAN001)

Optional Field Equipment

- 4-Way Wrench (DUB701)
- Field Box (HAN130/131/117)
- Cleaner & towels
- Extra Glow Plugs (HAN3001/3006)
- Blue Block After Run Oil (EVOX1000)
- Power Panel (HAN106)
- 12V 7Ah Sealed Battery (HAN102)
- PowerPro 12V Starter (HAN161)
- Start-Up Field Pack (HANSTART)

Additional Required Tools and Adhesives

Tools

- Adjustable wrench
- Drill
- Drill bit: 5/64", 3/32"
- Hobby Knife (XAC3126)
- Phillips screwdriver (small)
- Flat screwdriver

Adhesives (Optional)

- 30-Minute Epoxy (HAN8002)
- Thick CA (cyanoacrylate) Glue (PAAPT02)
- CA Remover/Debonder (PAAPT16)
- Masking Tape (MMM20901)

Other Required Items (Optional)

- Epoxy Brushes (DUB345)
- Felt-Tipped Pen (PAR10400)
- File
- Measuring device (e.g. ruler, tape measure)
- Mixing Sticks for Epoxy (DUB346)
- Paper towels
- Rubbing alcohol
- Wax paper

Warning

An RC aircraft is not a toy! If misused, it can cause serious bodily harm and damage to property. Fly only in open areas, preferably at AMA (Academy of Model Aeronautics) approved flying sites, following all instructions included with your radio and engine.

Before Starting Assembly

Before beginning the assembly of the Arrow, remove each part from its bag for inspection. Closely inspect the fuselage, wing panels, rudder, and stabilizer for damage. If you find any damaged or missing parts, contact the place of purchase.

If you find any wrinkles in the covering, use a heat gun or covering iron to remove them. Use caution while working around areas where the colors overlap to prevent separating the colors.



HAN100 – Heat Gun



HAN101 – Covering Iron

Using the Manual

This manual is divided into sections to help make assembly easier to understand and to provide breaks between each major section. In addition, check boxes have been placed next to each step to keep track of each step completed. Steps with two boxes indicate that the step will require repeating, such as for a right or left wing panel, two servos, etc. Remember to take your time and follow the directions.

Warranty Information

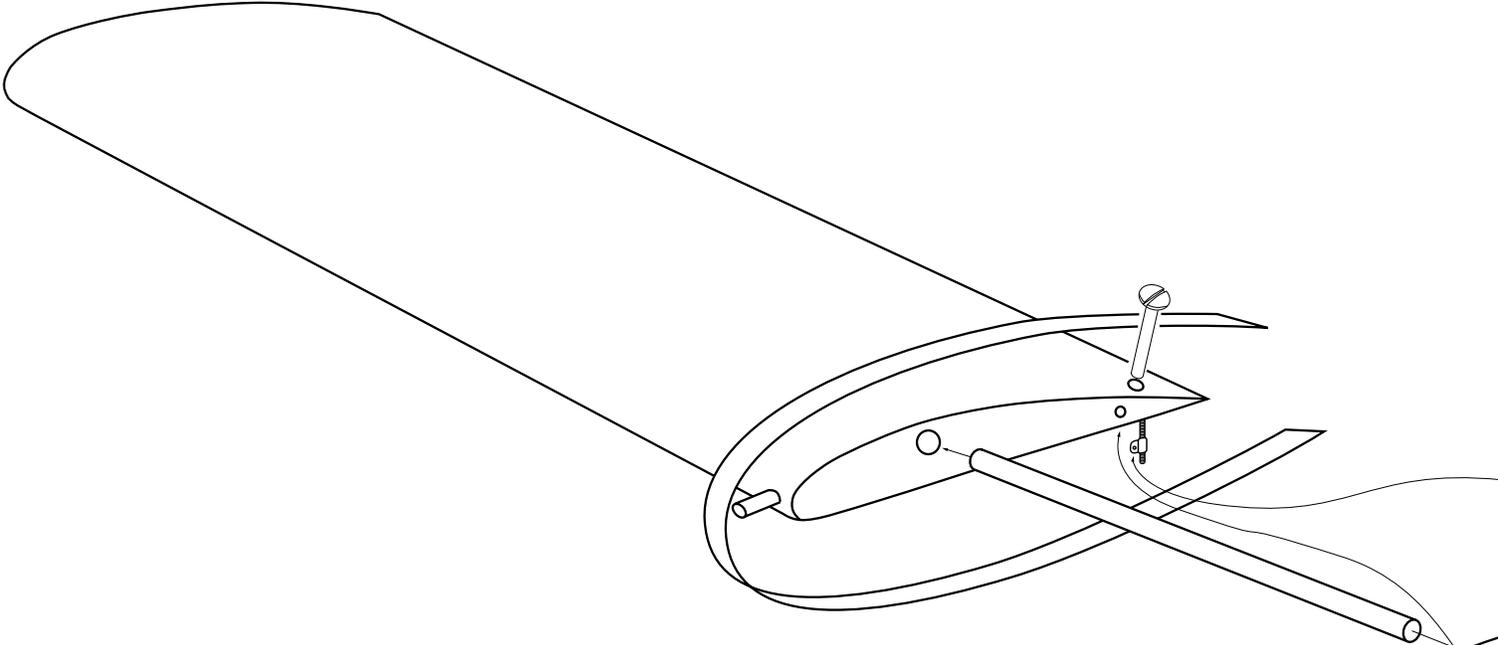
Horizon Hobby, Inc. guarantees this kit to be free from defects in both material and workmanship at the date of purchase. This warranty does not cover any parts damage by use or modification. In no case shall Horizon Hobby's liability exceed the original cost of the purchased kit. Further, Horizon Hobby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

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

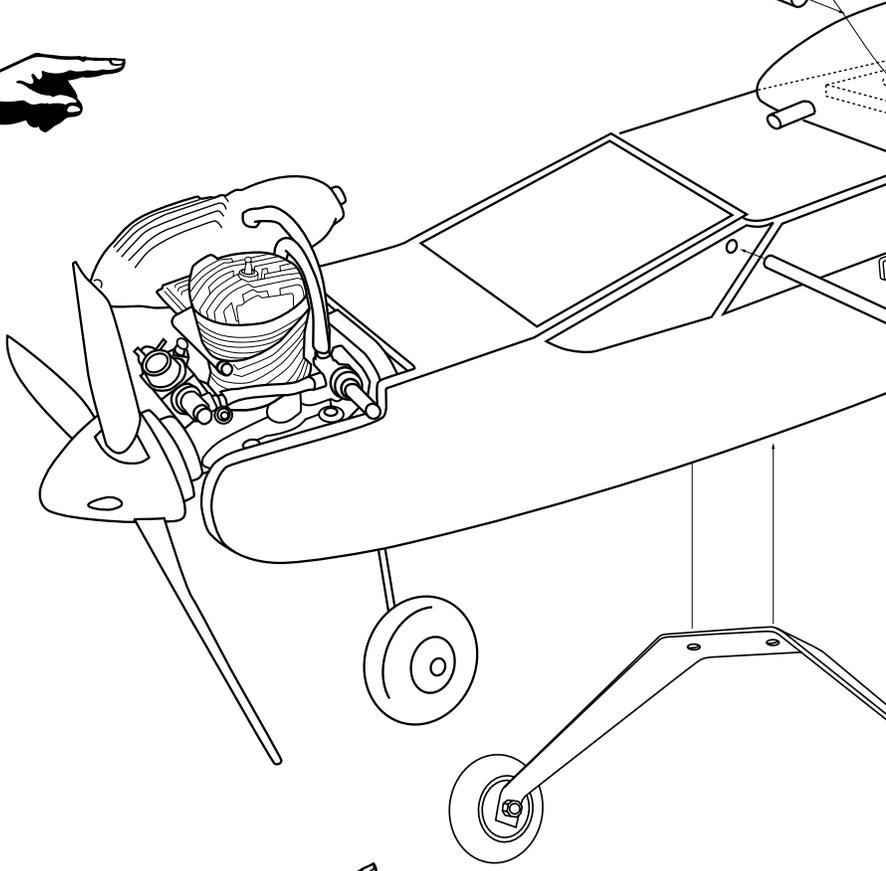
Once assembly of the model has been started, you must contact Horizon Hobby, Inc. directly regarding any warranty question that you have. Please do not contact your local hobby shop regarding warranty issues, even if that is where you purchased it. This will enable Horizon to better answer your questions and service you in the event that you may need any assistance.

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

Horizon Hobby
4105 Fieldstone Road
Champaign, Illinois 61822
(877) 504-0233
www.horizonhobby.com



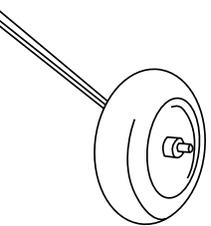
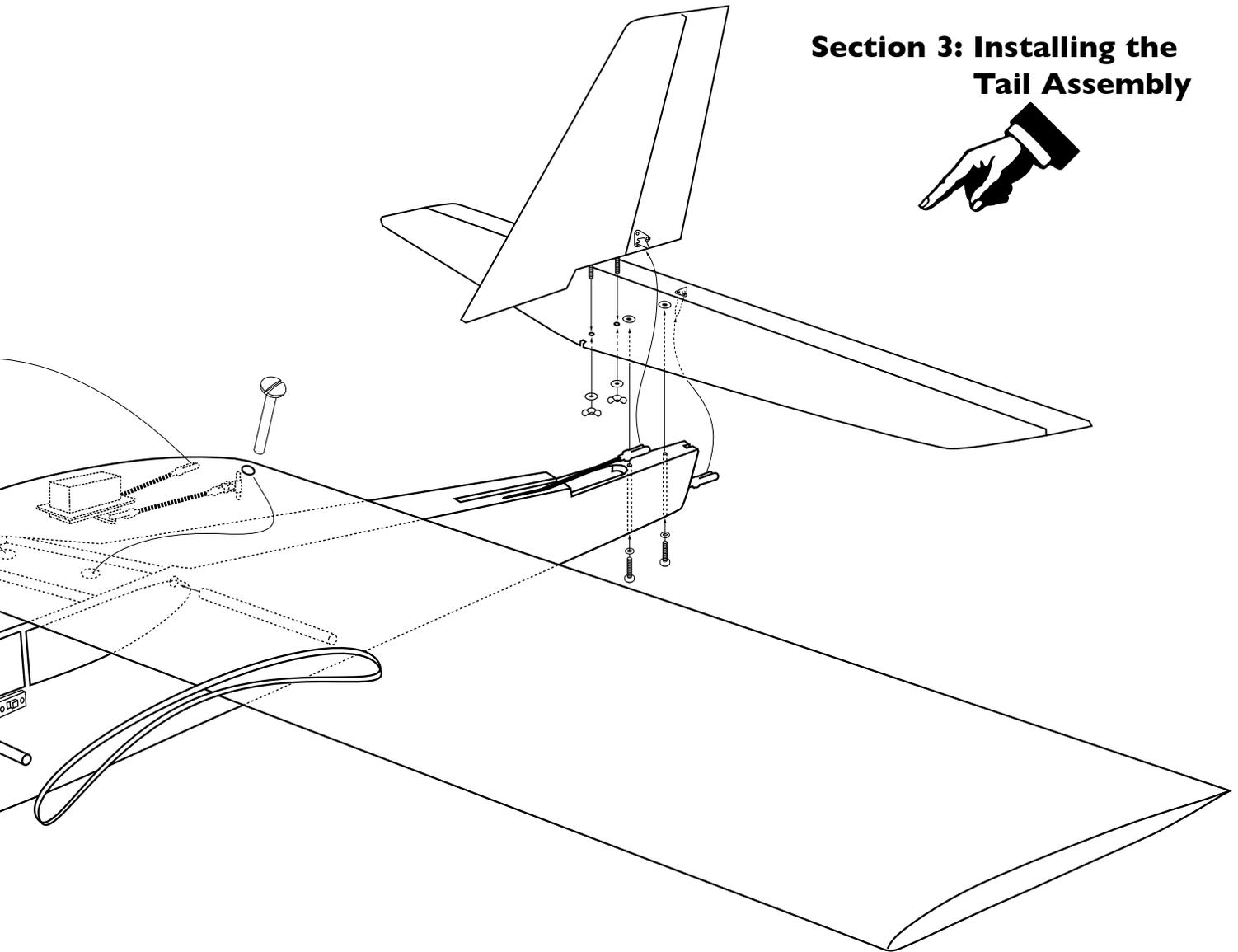
Section 1: Assembly of the Wing



Section 2: Installation of the Main Landing Gear



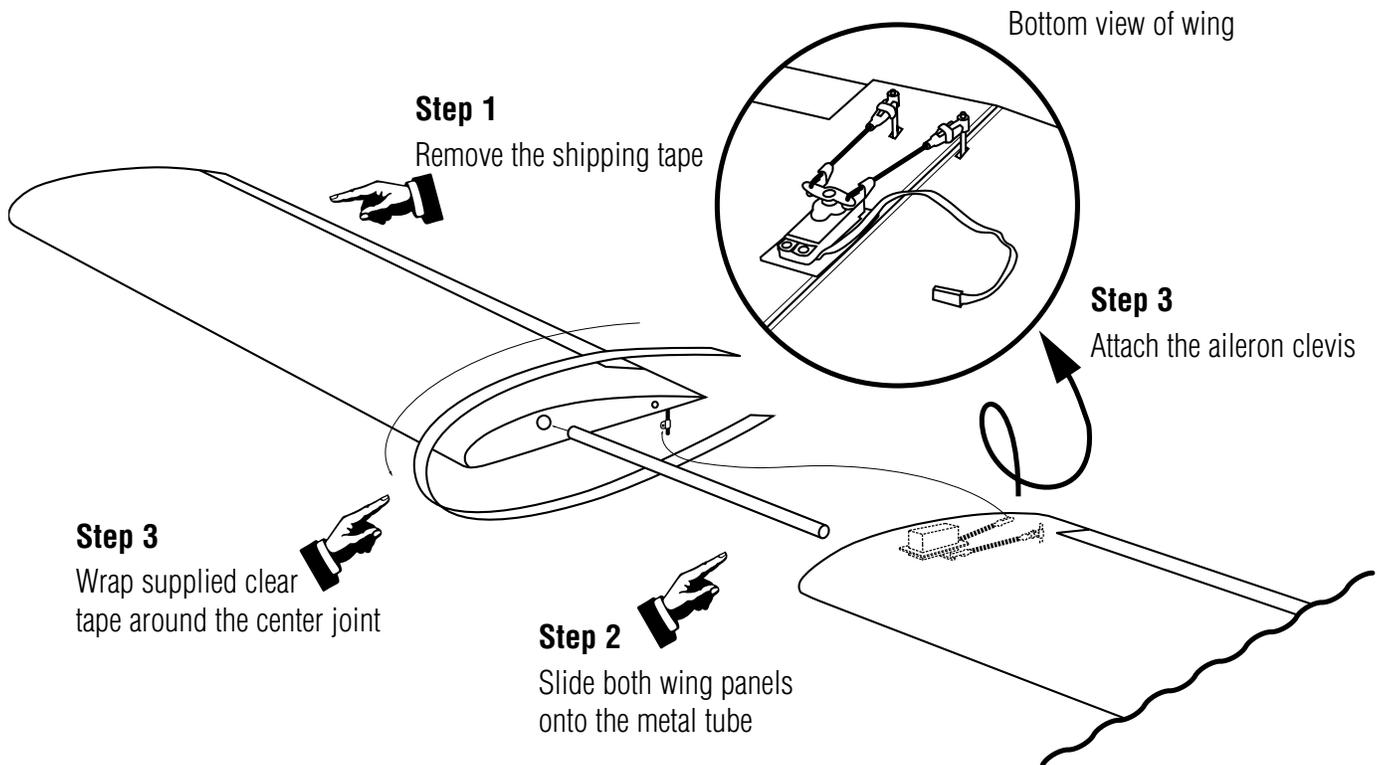
Section 3: Installing the Tail Assembly



Assembly Diagram

Please carefully read through the entire instruction manual before beginning assembly of the Alpha .60 Trainer Ready-To-Fly (RTF) kit.

Section 1: Assembly of the Wing



Carefully remove the contents of your Alpha Trainer Ready-To-Fly kit. It is recommended that you charge the transmitter and receiver batteries for 24 hours prior to flying your model.

Step 1

Remove each wing panel from its protective plastic bag. Remove the pieces of tape that hold the ailerons in place for shipping. The hinges in the Alpha Trainer have already been glued in place during manufacturing. Check to make sure hinges are secure by gently pulling on the wing and aileron, trying to separate the ailerons from the wing. Be careful not to damage the wing structure.

Step 2

Locate the aluminum wing tube and carefully slide it into the opening in one wing panel. Use a twisting motion while inserting the tube. A short metal pin is located near the trailing edge of one wing panel. This pin keys into the opposite wing panel and keep the wing from rotating around the wing tube. Carefully slide the other wing panel onto the wing tube. Align the metal pin in one panel into the hole of the opposite panel and press the two panels tightly together.

Step 3

Locate the clear wing joiner tape and apply it to the top and bottom of the wing along the joint. Start at the top of the trailing edge and wrap it around the front of the wing and to the bottom trailing edge.

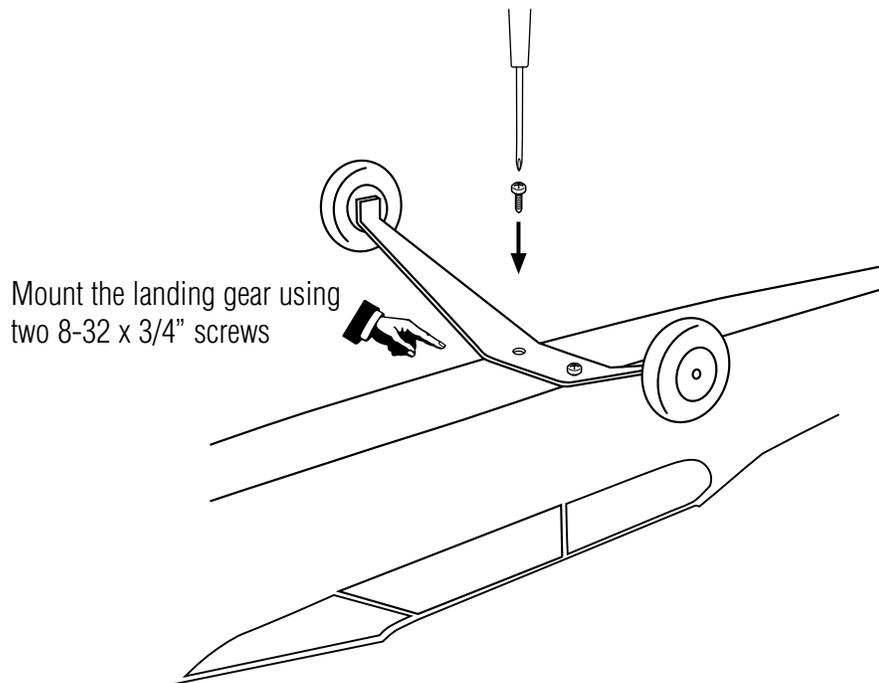
Step 4

The aileron servo lead has been wrapped around the linkage for shipment. Untie the servo lead to free up the aileron linkage.

Note: The aileron servo lead has been labeled with a piece of tape; do not remove this tape.

One of the aileron linkages has already been connected to the aileron and secured with a small piece of tubing (clevis keeper). This is done to prevent the clevis from opening during flight. Connect the other aileron linkage to the aileron and snap the clevis in place. Slide the clevis keeper over the clevis to secure the linkage to the aileron. You have successfully assembled the wing of your Alpha™ Trainer.

Section 2: Installation of the Main Landing Gear



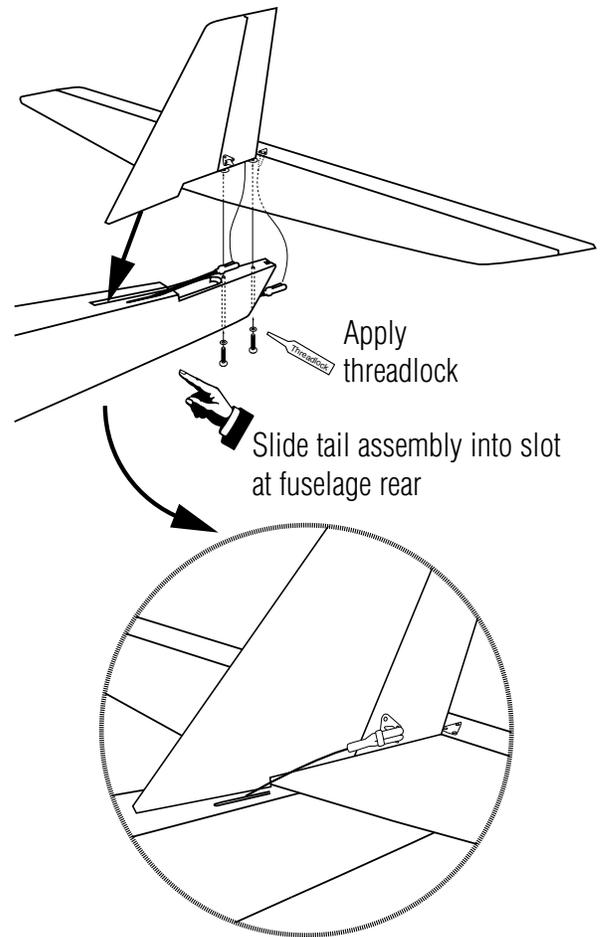
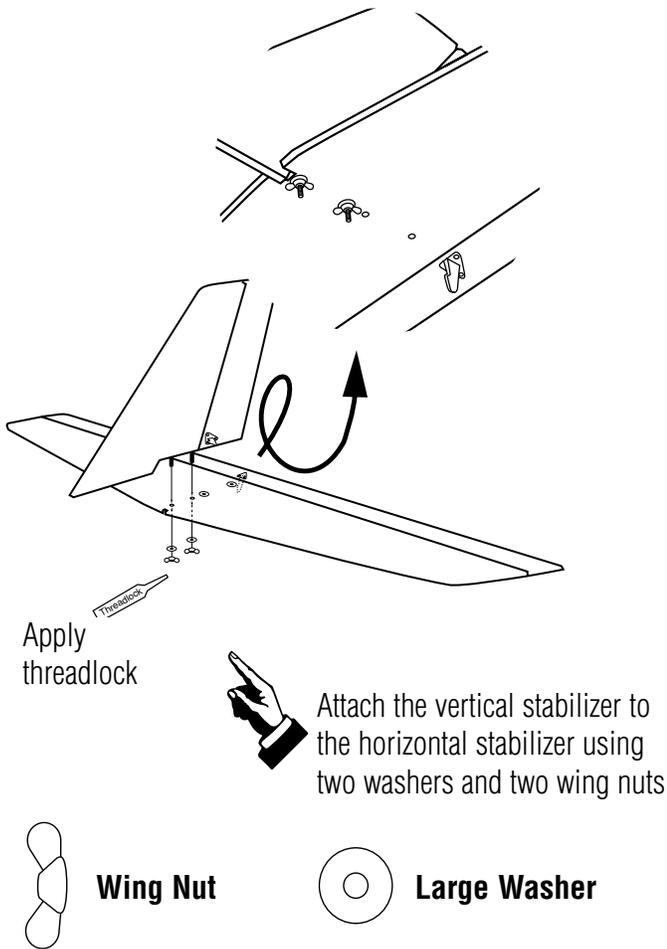
Step 1

Locate the aluminum landing gear and two 8-32 x 3/4" screws. The wheels have already been installed for you. On the bottom of the fuselage you will find a two holes and blind nuts to accept the screws. The landing gear will be positioned over these holes and the screws used to secure the landing gear to the fuselage.

Step 2

Position the landing gear over the holes. Slide one 8-32 x 3/4" screw through the corresponding hole in the landing gear and into the blind nut. Repeat the procedure for the remaining screw. Use a Phillips screwdriver to tighten both of the screws.

Section 3: Installing the Tail Assembly



Locate the horizontal stabilizer and vertical stabilizer assemblies. The rudder and elevator have been pre-hinged at the factory and the control horns are also attached.

Remove the shipping tape holding the rudder and elevator in place. Check both the rudder and elevator for freedom of movement. Also check to make sure the hinges have been glued securely.

□ Step 1

The vertical stabilizer has threaded rods in the bottom that secure it to the horizontal stabilizer. Insert the threaded rods through the predrilled holes in the horizontal stabilizer. Secure them together using two large washers and wing nuts. Place a drop of threadlock on the threaded rods before tightening the wing nuts.

□ Step 2

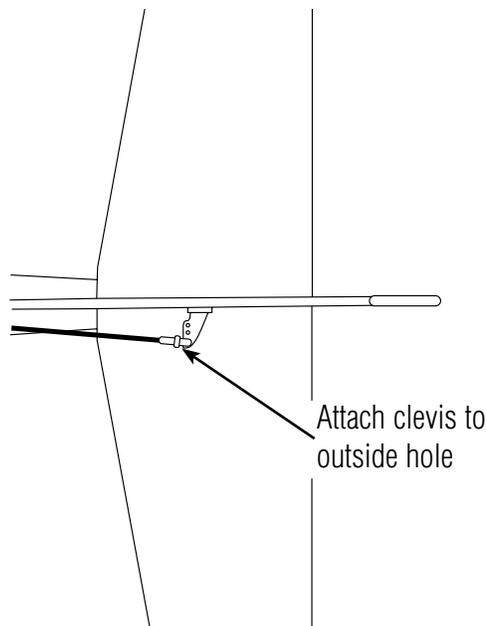
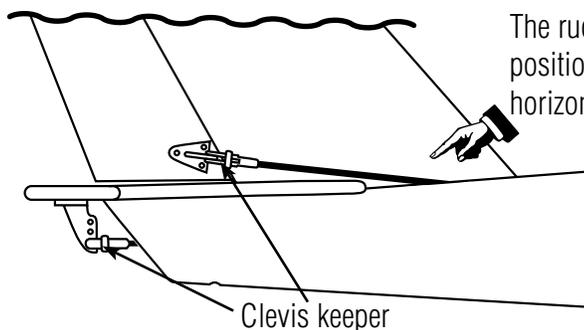
Slide the tail assembly into the slot in the rear of the fuselage; making sure the rudder pushrod is on top of the horizontal stabilizer. Use the two long screws and two small washers to secure the tail assembly to the fuselage. There is a hole in the bottom of the fuselage to access the forward screw location. Place a drop of threadlock on the screws before installing the screws.

Hint: Use a magnetic screwdriver when installing the screws.

Section 3: Installing the Tail Assembly

Step 3

Connect the rudder and elevator pushrod clevises to the preinstalled control horns. Install the clevises into the hole furthest away from the control surface (see illustration). Secure each clevis to the control horn by snapping the clevis pin into the hole. Slide the clevis keeper up onto the clevis to prevent the clevises from accidentally opening in flight.

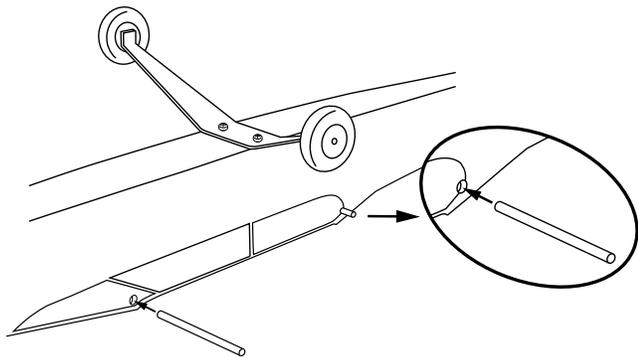


Section 4A: Installing the Wing (Rubber Band)

Note: The wing can be attached to the fuselage using either bolts or rubber bands. Section 4B covers the installation using wing bolts.

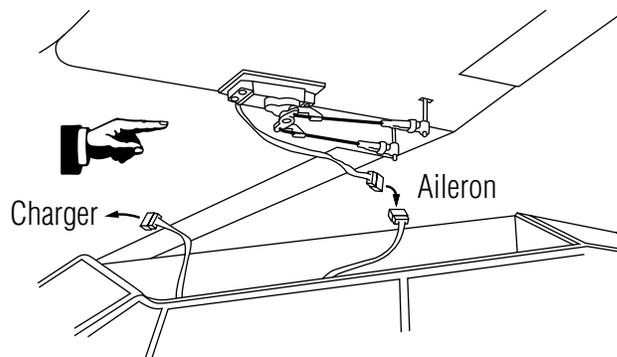
Step 1

Remove the covering from the holes in the fuselage for the wing hold-down dowels using a sharp hobby knife. Locate the two wing hold-down dowels and using a twisting motion, carefully insert one into each of the two holes located in the fuselage. The dowels should be positioned so an equal amount sticks out each side of the fuselage.



Step 2

Plug the aileron servo connector into the connector marked "aileron" located in the fuselage. This will connect the aileron servo in the wing to the aileron channel of your receiver.



Step 3

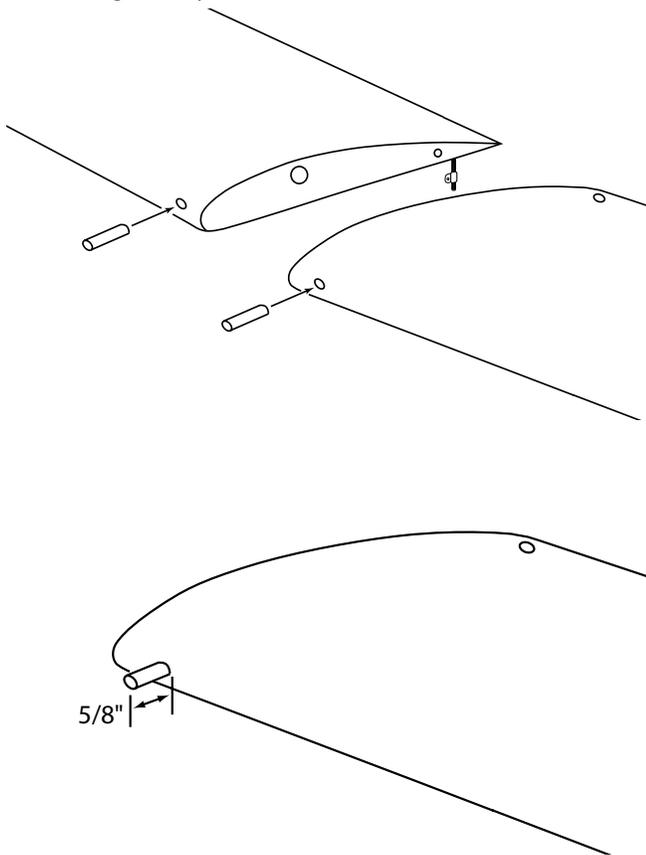
Temporarily attach the wing to the fuselage by stretching a rubber band from wing hold-down dowels starting at the leading edge of the wing back to the trailing edge of the wing. For now, use two rubber bands to mount the wing in position.

Section 4B: Installing the Wing (Bolt-On)

Note: The wing can be attached to the fuselage using either bolts or rubber bands. Section 4A covers the attachment of the wing using rubber bands.

□ Step 1

Use a sharp hobby knife to remove the covering in the wing for the wing dowels. Mix 1/2 ounce of 30-minute epoxy and apply a small amount to both the hole and dowel. Press the dowel into the hole so 5/8" extends from the front edge of the wing. Use a paper towel to clean up any excess epoxy. Allow the epoxy to fully cure before continuing to Step 2.

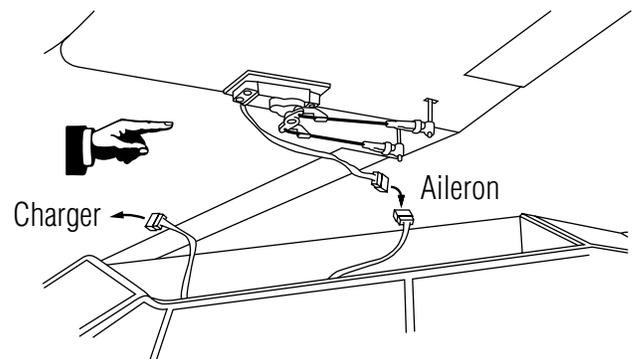


□ Step 2

Remove the covering from the wing at the rear using a hobby knife to access the holes for the wing bolts. Use two 1/4-20 x 2" nylon bolts to secure the wing to the fuselage as shown.

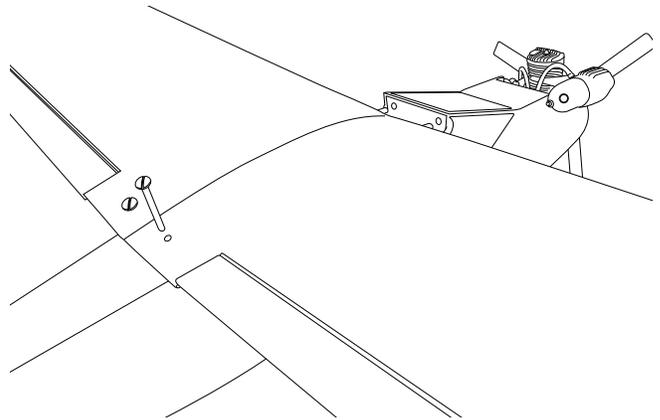
□ Step 3

Plug the aileron servo connector into the connector marked "aileron" located in the fuselage. This will connect the aileron servo in the wing to the aileron channel of your receiver.



□ Step 4

Position the wing onto the fuselage. Slide the wing forward so the dowels in the wing slide into the adjacent holes in the fuselage.



Section 5: Installing the Propeller and Spinner

Note: Due to the unique design of the Evolution Trainer Power System and 3-bladed propeller, it was necessary to remove the propeller for shipping. Carefully follow these instructions for installation of the propeller and spinner.

Step 1

Remove the prop nut and washer from the Evolution engine, noting the position of the washer and flywheel.



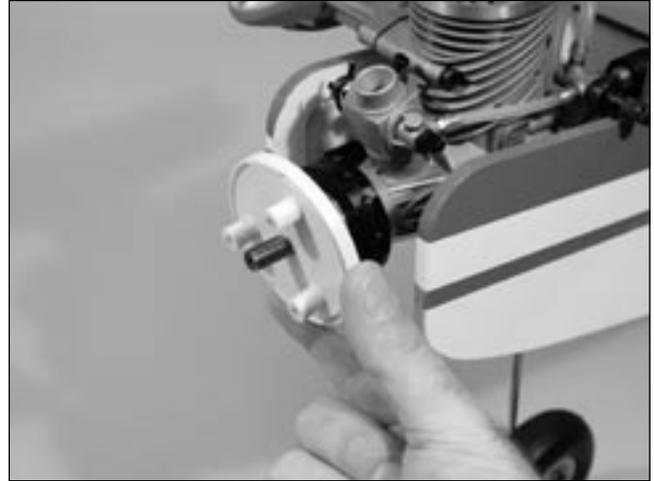
Step 2

Locate the spinner included with the Alpha™ Trainer and remove the self-tapping screws (3) and back plate.



Step 3

With the flywheel in place, install the spinner back plate onto the engine as shown.



Note: The flywheel is keyed into place onto the engine's crankshaft and should be tight against the front engine bearing.

Step 4

Slide the propeller onto the engine with the "E" molded on the propeller blades facing forward as shown.



Section 5: Installing the Propeller and Spinner

□ Step 5

Install the prop washer and prop nut removed in Step 1. Make sure to position the beveled edge of the washer forward.



□ Step 6

Use an adjustable wrench to tighten the prop nut while holding the propeller in place.

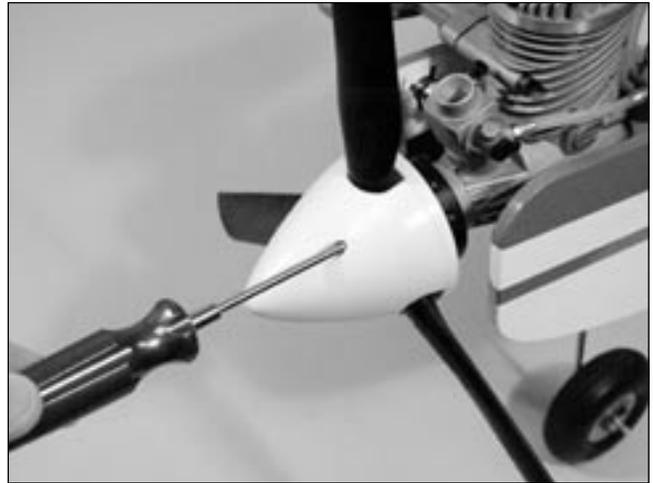


Warning: The propeller must be securely tightened before attempting to run the Evolution engine. Be sure to check the propeller before each flying session.

Note: The propeller must be positioned to allow the spinner cone to fit into the slots in the back plate. Test fit the spinner cone before attempting to install the self-tapping screws of the spinner.

□ Step 7

Using a Phillips screwdriver, secure the spinner cone in place with the self-tapping screws (3) provided.



Note on rubber bands: A good general rule is using at least two rubber bands per pound of airplane. An 8-pound plane will use 16 rubber bands. Using more than the recommended amount is fine, just don't go overboard.

When removing the rubber bands, place them in a container with a small amount of talcum powder. This will soak up some of the fuel from the rubber bands, making them last longer.

Section 6: Center of Gravity

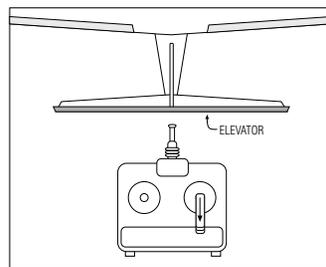
The Alpha™ Trainer has been balanced at the factory. If changes are made in battery location or a different engine is installed, you will need to make sure the balance of the aircraft is correct before attempting

to fly it. The balance point (center of gravity) of the Alpha is $4\frac{1}{4}$ " from the leading edge of the wing. If you have to add weight to the nose or tail, use the stick-on variety available at your local hobby shop.

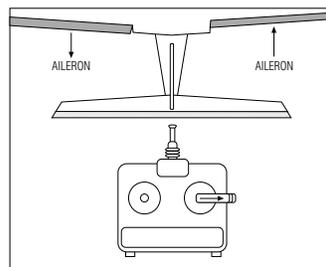
Section 7: Control Checks

The correct servo directions are preadjusted, but it's a good idea to confirm the correct direction. After charging the transmitter and receiver batteries per the instruction included with the radio, turn on the transmitter and airplane and check that the controls are moving in the correct direction, as per the illustrations below.

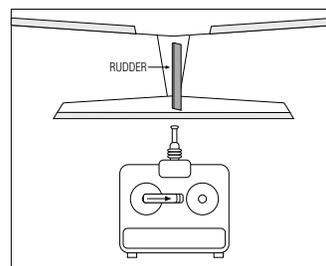
Elevator: Moving the right stick down should cause the elevator to move upward. Pushing the right stick up will cause the elevator to move down.



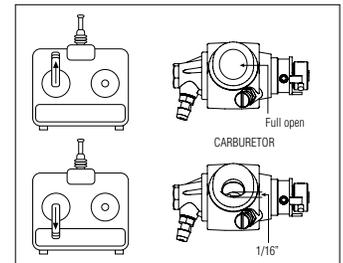
Aileron: Moving the right stick to the right should move the right aileron up and the left aileron down. Moving the stick in the opposite direction will give the opposite result.



Rudder: Moving the left stick to the right should move the rudder to the right. Moving the stick to the left moves the rudder to the left.

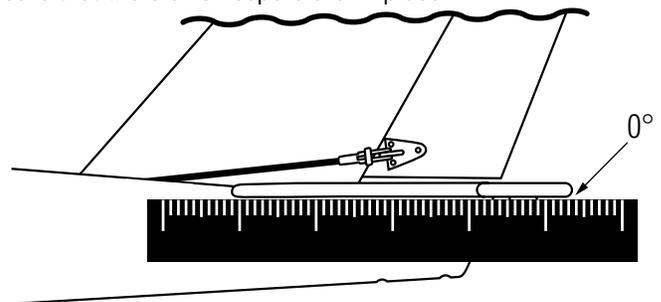


Throttle: Look into the carburetor. With the throttle (left stick) in the up position, the carburetor should be fully open. With the throttle in the lower position and trim lever at the mid point, the carburetor should be $1/16$ " open.



It is very important that you make sure the control surfaces (rudder, elevator and ailerons) are at 0 degrees when the transmitter control sticks and trim levers are centered. Turn on your transmitter and receiver. Make sure the rudder, elevator and aileron sticks are centered and the trim levers are centered. Place a ruler against the control surfaces to see if there is any deflection from the center (0 degrees). Adjustments to the control surfaces can be made by temporarily disconnecting the clevis from the horn and threading the clevis in or out on the control rod. Threading in causes the surface to move toward the rod. Threading out causes the surface to move away from the rod. Set the control surfaces, ailerons, elevator and rudder to 0 degrees.

Reconnect the clevises to the outer hole of the control horn of the rudder and elevator control horns. Make sure that the clevis keepers are in place.



Section 8: Preflight Checks at the Field

Important: Be sure to change both the transmitter and receiver batteries following the procedures described in the radio instruction manual.

Before each flight, check the screws and nuts that secure the metal plate holding the engine in place on the engine mount. Also check the clevises of each control surface for security and presence of a clevis keeper.

Check the screws that hold the tail assembly in place, as they can loosen during flight.

Perform a ground range check before each day's flying as follows:

- Do not extend the transmitter antenna. Turn the transmitter on.
- Turn the model on.
- Slowly walk away from the model while moving the control surfaces. The aircraft should function properly at a distance of 75–100 feet.
- Make sure all trim levers on the transmitter are in the proper position.
- Make sure all servos and switch harness plugs are secure.

Section 9: Starting the Evolution Engine

Field Equipment needed

The following are included in the Hangar 9® Start-Up Field Accessory Pack (HANSTART)

- Sturdy cardboard construction tote box
- Manual fuel pump
- Hangar 9 glow plugs (2)
- 4-way wrench
- Rechargeable glow driver with charger
- Start stick

Other Items Needed (not included in Start-Up Field Accessory Pack)

- Fuel, 10 to 15% nitro content (Cool Power or Powermaster recommended)
- Electric starter (optional)

Step 1

Fill the fuel tank with the proper fuel. We recommend 10% or 15% Nitro content such as Cool Power or Powermaster fuel. Fill the tank by connecting the fuel pump to the line connected to the remote needle valve assembly. Disconnect the fuel line attached to the pressure fitting of the muffler; your tank is full when fuel begins to run out of the pressure line. Reconnect the fuel lines to the needle valve assembly and muffler.

Note: It is very important to reconnect the lines to the correct place. The engine will not run properly if they are improperly connected.



Section 9: Starting the Evolution Engine

□ Step 2

To prime your engine, first turn on your transmitter and then your receiver. Move the throttle to full open and place your finger over the carburetor opening. Turn the propeller over by hand until you can see fuel entering the fuel line. Move the throttle stick full down to idle.



Caution: Always have a helper hold your plane when starting the engine.

□ Step 3

Move the throttle to the low position and the throttle trim lever to the middle position. Place the glow driver on the glow plug and, using a start stick, turn the propeller counterclockwise through the compression stroke. You should feel a “bump” against the start stick. When you feel the “bump,” flip the propeller counter clockwise to start the engine. Repeat the process if the engine does not start.



Section 10: Flying the Alpha Trainer

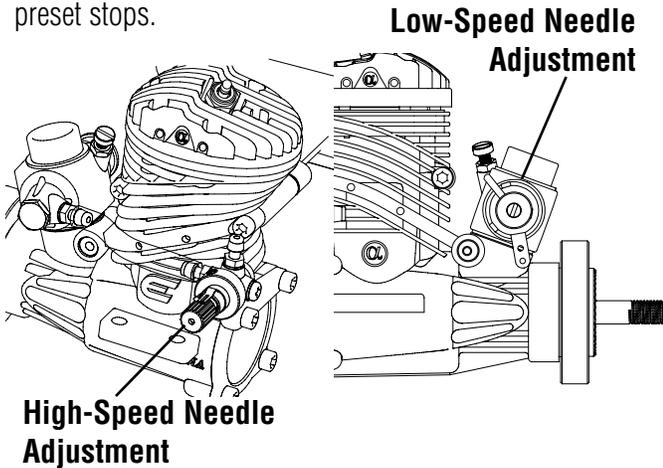
For first-time pilots, the thought of flying the Alpha™ Trainer through loops, rolls and perfect three-point landings can be thrilling. Learning to fly, however, takes time, patience, and most importantly, a good instructor. If you're a first time pilot, don't try to fly your model without an instructor. Seek an experienced pilot for your first flight. Your local hobby shop can put you in touch with an someone in your area who can test fly your Alpha Trainer, and then give you your first chance on the “sticks” with very little risk of damage to the airplane. We cannot overemphasize the importance of having a qualified instructor to help you through your first flights.

The JR® Quattro radio system has a built-in trainer system or “buddy box” option. The transmitter can be used with any JR transmitter and a trainer cord (JRPA130). Use of the “buddy box” for the first few flights is highly recommended.

More experienced pilots will find the Alpha Trainer to be a confidence-inspiring airplane. Its super stable and slow-flight characteristics make pinpoint landings easy. At full throttle, the Alpha Trainer is more than capable of most sport aerobatics maneuvers. The self-righting stability of the model also makes it one of the easiest airplanes you'll ever fly.

Section 11: Engine Adjustments

Model engines run on a mixture of fuel and air. The high-speed and low-speed needle valves control the ratio of fuel to air that the engine receives. If you find that small adjustments are needed, have an experienced modeler help you to fine-tune your engine. Do not attempt to move the needles past the preset stops.



Warning: Make all adjustments to the Evolution engine's low-speed needle valve with the engine stopped.

Our technicians have preset the needle valves of the Evolution engine. Your engine should run properly at these preset needle settings. On occasion, depending on your location, you may find it necessary to adjust the high-speed and low-speed needle valves to optimize the performance of your engine. The needle valves have limiters to allow small adjustments to the engine.

The low-speed needle valve limiter allows 1/4 turn of the needle valve, turning clockwise (in) will lean the mixture while turning counterclockwise (out) will richen the mixture to the low-speed or idle setting of the engine. The high-speed needle valve limiter allows one full turn of the needle valve. As with the low-speed adjustment, turning the high-speed needle valve clockwise (in) will lean the mixture, while turning counterclockwise (out) will richen the mixture of the high-speed setting of the engine.

• Fine-Tuning the High-Speed Needle

Start your engine and advance the throttle to full, then pinch the red fuel line going to the engine. If the engine dies immediately without an increase in rpm, the setting is too lean. Adjust the high-speed needle valve counterclockwise (out) 1/2 turn and repeat the test. When the high-speed needle is adjusted correctly, the engine should increase rpm slightly and then quit. If the engine rpm increases more than 200–300 rpm and continues to run, the needle valve setting is too rich. Adjust the needle valve clockwise (in) 1/8th of a turn and repeat the test until the engine responds correctly to the pinch test.

• Fine-Tuning the Low-Speed Needle

After fine-tuning the high-speed needle, you can begin to test the low-speed needle. Start your engine and go to full throttle for approximately 5–10 seconds then return to idle. Pinch the red fuel line going to the engine. If the engine dies immediately without an increase in rpm, the setting is too lean. Adjust the needle valve counterclockwise (out) 1/8th of a turn and repeat the test. When the low-speed needle is adjusted correctly, the engine should increase rpm slightly and then quit. If the engine rpm increases more than 200–300 rpm and continues to run, the needle valve setting is too rich. Adjust the needle valve clockwise (in) 1/16th of a turn and repeat the test until the engine responds correctly to the pinch test.

Section 12: Evolution Trainer Power System

The Evolution Trainer Power System has been specifically designed with the first time pilot in mind. The engine and special 3-blade propeller have been designed to give your Alpha Trainer the optimum performance for training new RC pilots. The engine is designed for easy starting and reliable idle to give you confidence in your equipment, allowing you to concentrate on developing your piloting skills.

Benefits of the Evolution Trainer Power System

- Lower noise level than standard 10 x 6 prop; baffle in muffler lowers noise even more
- Smaller speed envelope—the 3-bladed prop design has a lower top speed, so overspeeding the model is less likely; this gives the beginner more reaction time while still providing lots of power to climb out of bad situations
- Pre-set needle settings—ready-to-run out of the box
- Needle valve limiters make it impossible for beginners to adjust the needle valves incorrectly to the point that the engine will not run
- User friendly—easy to start from first the try with super reliable idle and no break-in needed

Warning: Before operating your engine, read and follow all safety points. A rotating propeller can cause serious personal injury.

Follow these instructions carefully! If this is the first time you have run a model airplane engine, we recommend that you seek the help of an experienced modeler. Your local hobby shop can put you in contact with the flying club in your area.

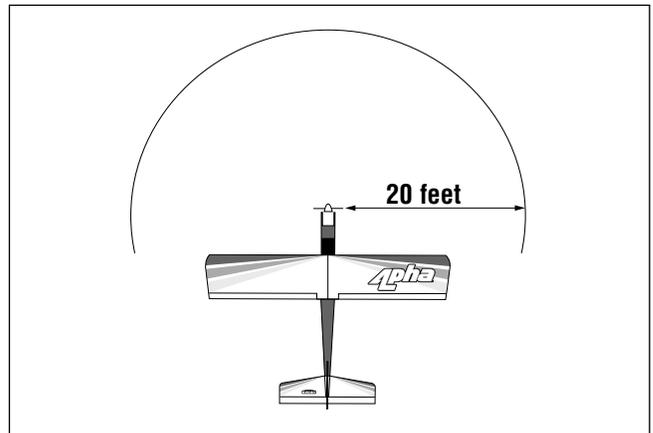
- Only use a "Start Stick" or electric starter to start the engine.



- Only make adjustments to the carburetor from behind the engine.



- Keep spectators at least 20 feet away and out of the path of a rotating propeller.



- Wear safety glasses and hand protection when operating model engines. Do not permit any objects to touch a turning propeller. Remain clear of the propeller plane of rotation.
- To stop the engine, cut off the fuel and air supply by moving the throttle stick and trim lever down to close the carburetor. Do not stop the propeller with your hand or other object.
- Inspect the propeller after each flight; discard any propeller that has nicks, scratches or any other visible defect. Do not repair, alter or in any way modify a propeller. Replacement propellers are available through your local hobby retailer.

Glossary of Terms

- **Ailerons:** Each side of this airplane has a hinged control surface (aileron), located on the trailing edge of the wing. Move the aileron stick on the transmitter left, the left aileron moves up and the right aileron moves down. Moving the left aileron up causes more drag and less lift, causing the left wing to drop down. When the right aileron moves down, more lift is created, causing the right wing to rise. This interaction causes the airplane to turn or roll to the left. Perform the opposite actions, and the airplane will roll to the right.
- **Carburetor:** By adjusting the needle valve in the carburetor, you control the engine's lean/rich fuel mixture and set the engine for correct operation.
- **Charger:** This is the device used to charge/recharge batteries. If Ni-Cd batteries are provided with the radio, a charger is usually provided as well.
- **Clevis:** The clevis connects the wire end of the pushrod to the control horn of the control surface.
- **Clunk:** Located inside the fuel tank, a clunk is weighted and ensures that the intake line has a steady supply of fuel regardless of the attitude of the airplane.
- **Control Horn:** This arm connects the control surface to the clevis and pushrod.
- **Control Surfaces:** The moveable parts of the wing and tail that cause the aircraft to roll (aileron), pitch (elevator) or yaw (rudder).
- **Dead Stick:** When the airplane is in flight gliding without the engine running, it is called "dead stick."
- **Dihedral:** The degree of angle (V-shaped bend) at which the wings intersect the fuselage is called dihedral. More dihedral gives an airplane more aerodynamic stability. Some sailplanes and trainer planes with large dihedral dispense with ailerons and use only the rudder to control the roll and yaw.
- **Electric Starter:** This is the small motor commonly used to start the airplane's engine.
- **Elevator:** The hinged control surface on the back of the stabilizer that moves to control the airplane's pitch axis. Pulling the transmitter's control stick toward the bottom of the transmitter moves the elevator upward, and the airplane begins to climb. Push the control stick forward, and the airplane begins to dive.
- **Expanded Scale Voltmeter (ESV):** This device is used to check the voltage of the battery pack.
- **Flight Box:** The box in which you store and transport your flying equipment.
- **Flight Pack or Airborne Pack:** These interchangeable terms describe the radio equipment that is installed on the airplane.
- **Fuel Overflow Line (Vent):** This line connects to the muffler and pressures the fuel tank when the engine is running. It also functions as an overflow line when the fuel tank is full.
- **Fuel Pickup Line:** This line connects the fuel tank to the carburetor.
- **Fuselage:** The main body of an airplane.
- **Glow Plug Clip/Battery:** A 1.2-volt battery with a clip that is connected to your engine's glow plug and is used to start the engine. You remove it once the engine is running smoothly.
- **High Wing:** The term describes an airplane that has its wing mounted on the top of the fuselage.
- **Hinge:** Flexible pieces used to connect the control surface to the flying surface. All hinges must be glued properly and securely to prevent the airplane from crashing. (This has already been done for you on the Alpha™ Trainer.)
- **Horizontal Stabilizer:** The horizontal flying surface of the tail gives the airplane stability while in flight.
- **Leading Edge:** The front of a flying surface.
- **Main Landing Gear:** The wheel and gear assembly the airplane uses to land, is attached to the bottom of the fuselage.

Glossary of Terms

- **Muffler:** This device muffles engine noise and increases the back pressure from the engine's exhaust stack, which can improve the engine's performance at low speeds. RC clubs usually require mufflers.
- **Needle Valve:** This mechanism within the carburetor adjusts the fuel mixture. Refer to your instructions for directions on how to adjust the needle valve.
- **Ni-Cd:** This abbreviation stands for Nickel Cadmium, the chemical compound used in rechargeable batteries.
- **Nitro:** Short for nitromethane, a fuel additive that improves an engine's performance. 10% to 15% nitro content is recommended for the Evolution engine.
- **Nose Gear:** The part of the landing gear that is attached to the nose of the fuselage. The nose gear is usually connected to the rudder servo to help you steer the airplane on the ground.
- **Pitch Axis:** The horizontal plane on which the airplane's nose is raised or lowered. By moving the elevator, you can raise the airplane's nose above the pitch axis (climb) or lower it below the pitch axis (dive).
- **Pushrod:** The rigid mechanism that transfers movement from the servo to the control surface.
- **Receiver:** The receiver unit in an airplane receives signals from the ground transmitter and passes the instructions along to the airplane's servos.
- **Roll Axis:** The horizontal plane on which the airplane's wings are raised or lowered. By adjusting the ailerons, you can drop a wing tip below the roll axis and cause the airplane to bank or roll.
- **Rudder:** The hinged control surface on the vertical stabilizer that controls the airplane's yaw. Moving the rudder to the left causes the airplane to yaw left; moving the rudder to the right causes it to yaw right.
- **Servo:** The servo transforms your ground commands into physical adjustments of the airplane while it's in the air.
- **Servo Output Arm:** A removable arm or wheel that connects the servo to the pushrod (also called servo horn).
- **Spinner:** Term describing the nose cone that covers the propeller hub.
- **Switch Harness:** This switch is commonly located on the fuselage and governs the On/Off mechanism for the flight pack.
- **Tachometer:** A device that measures the engine's rpm (rotations per minute) by counting light impulses that pass through the spinning propeller.
- **Threadlock:** A liquid that solidifies; used to prevent screws from loosening due to vibration.
- **Torque Rods:** Inserted into the ailerons, these rigid wire rods run along the wing's trailing edge, then bend downward and connect to the pushrod.
- **Trainer Airplane:** Designed to fly with high stability at low speeds, a trainer model airplane allows new pilots some extra reaction time as they learn to control an airplane.
- **Transmitter:** The device used on the ground to transmit instructions to the airplane.
- **Vertical Stabilizer:** The vertical flying surface of the tail gives an airplane stability while in flight.
- **Wheel Collar:** The round retaining piece that anchors wheels in place on the wheel axle.
- **Wing:** The lifting surface of an airplane.
- **Yaw Axis:** The vertical plane through which the airplane's nose rotates as it yaws to the left or to the right. The rudder controls the yaw axis.
- **Z-Bend:** The wire ends of pushrods have Z-shaped bends that attach to the servo.

2003 Official AMA National Model Aircraft Safety Code

Effective January 1, 2003

Model Flying MUST be in accordance with this Code in order for AMA Liability Protection to apply.

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 higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right-of-way and avoid flying in the proximity of full-scale aircraft. Where necessary, an observer shall be utilized to supervise flying to avoid having models fly in the proximity of full-scale aircraft.

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

4) The maximum takeoff weight of a model is 55 pounds, except models flown under Experimental Aircraft rules.

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

6) I will not operate models with metal-bladed propellers or with gaseous boosts, in which gases other than air enter their internal combustion engine(s); nor will I operate models with extremely hazardous fuels such as those containing tetranitromethane or hydrazine.

7) I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind) including, but not limited to, rockets, explosive bombs dropped from models, smoke bombs, all explosive gases (such as hydrogen-filled balloons), ground mounted devices launching a projectile. The only exceptions permitted are rockets flown in accordance with the National Model Rocketry Safety Code or those permanently attached (as per JATO use); also those items authorized for Air Show Team use as defined by AST Advisory Committee (document available from AMA HQ). In any case, models using rocket motors as a primary means of propulsion are limited to a maximum weight of 3.3 pounds and a G series motor. (A model aircraft is defined as an aircraft with or without engine, not able to carry a human being.)

8) I will not consume alcoholic beverages prior to, nor during, participation in any model operations.

9) Children under 6 years old are only allowed on the flight line as a pilot or while under flight instruction.

RADIO CONTROL

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

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

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

4) I will operate my model using only radio control frequencies currently allowed by the Federal Communications Commission. (Only properly licensed Amateurs are authorized to operate equipment on Amateur Band frequencies.)

2003 Official AMA

National Model Aircraft Safety Code

- 5) Flying sites separated by three miles or more are considered safe from site-to site interference, even when both sites use the same frequencies. Any circumstances under three miles separation require a frequency management arrangement, which may be either an allocation of specific frequencies for each site or testing to determine that freedom from interference exists. Allocation plans or interference test reports shall be signed by the parties involved and provided to AMA Headquarters. Documents of agreement and reports may exist between (1) two or more AMA Chartered Clubs, (2) AMA clubs and individual AMA members not associated with AMA Clubs, or (3) two or more individual AMA members.
- 6) For Combat, distance between combat engagement line and spectator line will be 500 feet per cubic inch of engine displacement. (Example: .40 engine = 200 feet.); electric motors will be based on equivalent combustion engine size. Additional safety requirements will be per the RC Combat section of the current Competition Regulations.
- 7) At air shows or model flying demonstrations, a single straight line must be established, one side of which is for flying, with the other side for spectators.
- 8) With the exception of events flown under AMA Competition rules, after launch, except for pilots or helpers being used, no powered model may be flown closer than 25 feet to any person.
- 9) Under no circumstances may a pilot or other person touch a powered model in flight.

Organized RC Racing Event

- 10) An RC racing event, whether or not an AMA Rule Book event, is one in which model aircraft compete in flight over a prescribed course with the objective of finishing the course faster to determine the winner.
- A. In every organized racing event in which contestants, callers and officials are on the course:
1. All officials, callers and contestants must properly wear helmets, which are OSHA, DOT, ANSI, SNELL or NOCSAE approved or comparable standard while on the racecourse.
 2. All officials will be off the course except for the starter and their assistant.
 3. "On the course" is defined to mean any area beyond the pilot/staging area where actual flying takes place.
- B. I will not fly my model aircraft in any organized racing event which does not comply with paragraph A above or which allows models over 20 pounds unless that competition event is AMA sanctioned.
- C. Distance from the pylon to the nearest spectator (line) will be in accordance with the current Competition Regulations under the RC Pylon Racing section for the specific event pending two or three pylon course layout.
- 11) RC night flying is limited to low-performance models (less than 100 mph). The models must be equipped with a lighting system that clearly defines the aircraft's attitude at all times.



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4105 Fieldstone Road
Champaign, Illinois 61822
(877) 504-0233
www.horizonhobby.com