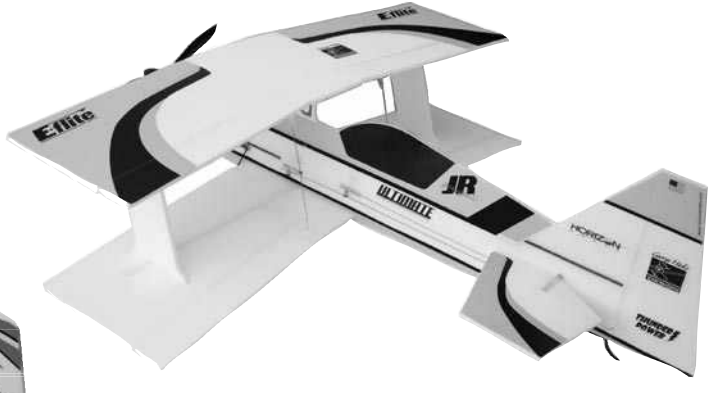
Ultimate EP 3D Profile and Tribute EP 3D Profile

Instruction Manual



Available from www.modelflight.com.au

Table of Contents

Specifications

Tribute:

Wingspan: 37 in (940 mm)

Length: 37.5 in (952.5 mm)

Wing Area: 374.62 sq in (24.2 sq dm)

Weight w/o Battery: 9 oz (225.1g)

Ultimate:

Wingspan: 28 in (711 mm)

Length: 29.5 in (749 mm)

Wing Area: 384.7 sq in (24.8 sq dm)

Weight w/o Battery: 9 oz (225.1g)

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.

Additional Required Equipment

Recommended JR® Systems

Servos: JR 241 Sub-micro servo (4)
Receiver: JR R610M 6-channel micro FM Rx

Battery and Speed Control Requirements

Li-Po Battery: 7.4V 860–2100 2-Cell (stock motor)
11.1V 860–2100 3-Cell (brushless motor)
Speed Control: 20 Amp (EFLA105)

Additional Tools and Adhesives

Tools

Square
Hobby knife
Ruler
1/16" drill bit
Sewing needle
Pliers
Small Phillips screwdriver

Motor/Gearbox

370 size with 6.6:1 gearbox (included)
Propeller: (included)
20mm diameter w/gearbox brushless (optional)

Adhesives

Foam-safe CA
6-minute epoxy
Silicon glue

Other

Clear tape
T-pins

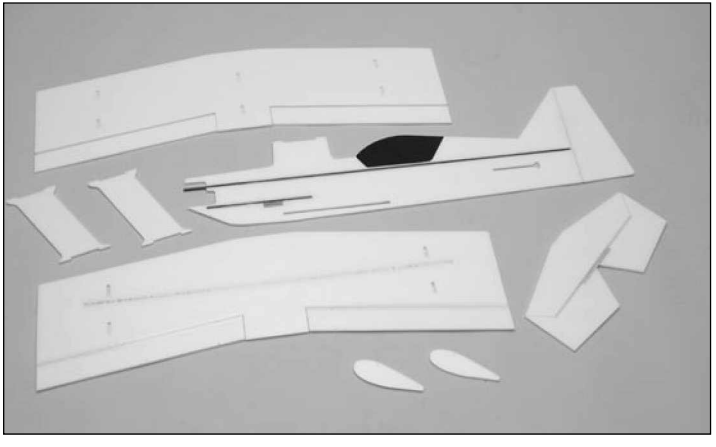
Contents of Kit/Parts Layout

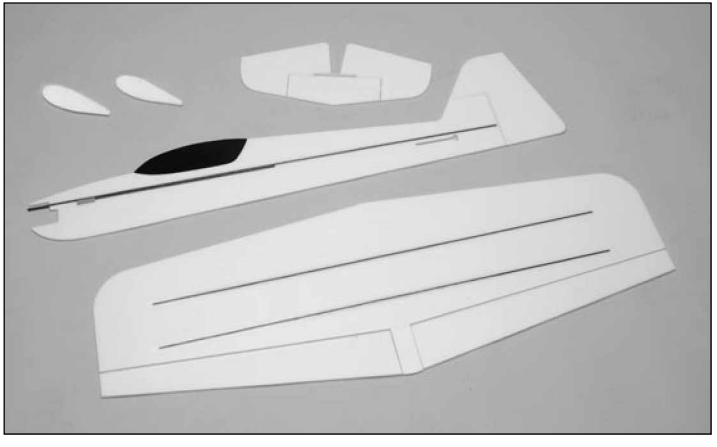
Ultimate Replacement Parts:

Fuselage w/Rudder	EFL2027
Wing Set w/Struts	EFL2026
Horizontal Tail Assembly	EFL2028
Wheel Pants	EFL2029
Decals (Ultimate)	EFL2031

Tribute Replacement Parts:

Wing	EFL2001
Fuselage w/rudder	EFL2002
Horizontal Tail Assembly	EFL2003
Wood Mount & Screw	EFL2006
Wheel Pants	EFL2029
Decals (Tribute)	EFL2008





Complete parts listing

Ultimate Replacement Parts:

Fuselage w/Rudder	EFL2027
Wing Set w/Struts	EFL2026
Horizontal Tail Assembly	EFL2028
Wheel Pants	EFL2029

Tribute Replacement Parts:

Wing	EFL2001
Fuselage w/rudder	EFL2002
Horizontal Tail Assembly	EFL2003
Wood Mount & Screw	EFL2006
Wheel Pants	EFL2029

Items not shown:

Landing Gear w/String (Tribute)	EFL2030
Landing Gear w/String (Ultimate)	EFL2005
Radio Mounting and Hinge tape	EFL2007
Pushrods w/Guides	EFL2004
Micro Control Horns	EFLA200
Micro Pushrod Keepers	EFLA201
Tailskid	EFLA202
Micro Control Connectors	EFLA203
Micro Rubber Spinner	EFL204
Micro Park Wheels	EFL205
370 Motor w/gearbox	EFLM205
Decals (Tribute)	EFL2008
Decals (Ultimate)	EFL2031

Optional Parts:

Park 370 Brushless Motor, 4100Kv	EFLM1000
10x4.7 Slow Flyer Propeller (2)	EFLP1047
10x7 Slow Flyer Propeller (2)	EFLP1070
11x4.7 Slow Flyer Propeller (2)	EFLP1147
11x7 Slow Flyer Propeller (2)	EFLP1170
12x3.8 Slow Flyer Propeller (2)	EFLP1238
12x6 Slow Flyer Propeller (2)	EFLP1260
Celectra 1-2 cell LiPo Charger	EFLC3000
Celectra 1-3 cell LiPo Charger	EFLC3005
1320 2-cell 7.4V LiPo Battery	THP13202SJ
1320 3-cell 11.1V LiPo Battery	THP13203SJ
Foam CA & Activator Pack	EFLA208

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 component 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 resulting from the use of the final assembled product. By the act of using the assembled product, the user accepts all resulting liability.

Please note that once assembly of the model has been started, you must contact Horizon Hobby, Inc. directly regarding any warranty question. 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, Inc.
4105 Fieldstone Road
Champaign, Illinois 61822
(877) 504-0233

Introduction

The Tribute and Ultimate encompass the latest developments in small 3D Aerobatic Electric design. These designs are meant to serve as both an advanced trainer for those interested in learning 3D-aerobatics, while also being a tool to keep the proficient pilot sharp during the off-season by allowing 3D-style aerobatics to be flown in a controlled indoor or low wind outdoor environment. Special consideration was given to insure flight speeds that could be comfortably flown in a standard size gymnasium. Once the pilot becomes proficient at hovering-flight, it is possible to fly the model in very confined spaces such as a garage or living room.

The included 370 motor is designed for 2-cell use. For extreme 3D aerobatics and extended hovering it is recommended to upgrade to a brushless motor.

Before Starting Assembly

Before beginning the Assembly of your Ultimate or Tribute, 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.

Using the Manual

This manual is divided into sections to help make assembly easier to understand, and to provide breaks between each major section.

Remember to take your time and follow the directions.

Brushed vs. Brushless Motors

The included 370 motor is designed for use with 2-cell Lithium Polymer (LiPo) batteries. For extreme aerobatics and extended hovering, we strongly suggest upgrading to our E-Flite park 370 motor (4100KV) (EFLM1000), which is designed to fit into the existing supplied gearbox and for use with 3-cell LiPo batteries.

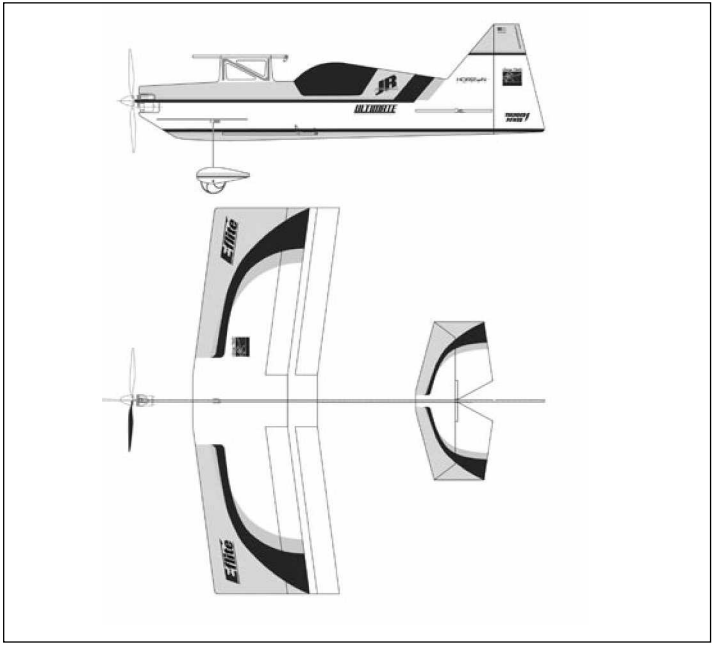
To get the best lifespan from the supplied motor, it should not be operated with a 3-cell LiPo battery. In addition, there are a couple more tricks that will also extend the life of the motor. First, it is suggested to break-in the motor properly. Place a drop of oil on both the front and rear bushing of the motor, then run the motor for a few minutes on a lower voltage source, such as 4.8 volts. This will seat the brushes to the commutator, giving the best performance. Another option, but is slightly more difficult, is to water-dip the motor while it is running. Although it takes only a short amount of time (a few seconds vs. a few minutes as stated earlier), there is a higher risk of damage to the motor. To perform a water break-in, simply fill a cup with warm water. remove the motor from the gearbox, get the motor running, then dip the motor into the water. Let the motor run under water for about 10-20 seconds, then remove. the water will be ever so slightly cloudy because of the material removed from the brushes. Let the motor run for another 30-seconds, then remove the battery and dry the motor. As with both break-in procedures, apply a drop of oil after break-in. Also apply a drop of oil after every 5-6 flights for good measure.

Another good way to get good performance is to use a high-quality speed control to operate the motor. This will provide the best transition of the motor speed. In addition, the amount of voltage to the motor will be slightly higher due to lower internal resistance of the speed control. Finally, a higher frequency speed control will get the best performance of the motor.

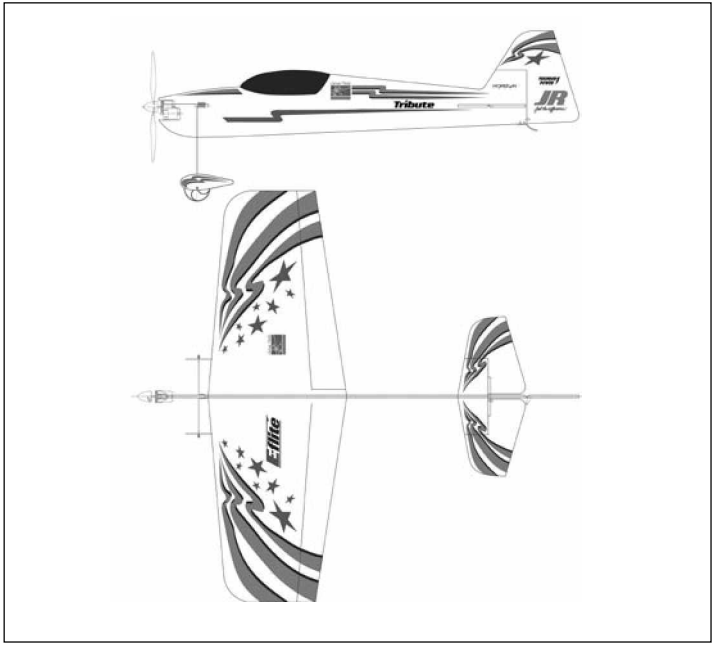
Decal Installation

Required Parts

Fuselage	Wing
Elevator/stabilizer	Decals



❍ 1. Apply the decals as shown in the illustration and on the box. It may be helpful to spray a mixture of water mixed with 1–2 drops of detergent onto the airframe so the decals will



Stabilizer Installation

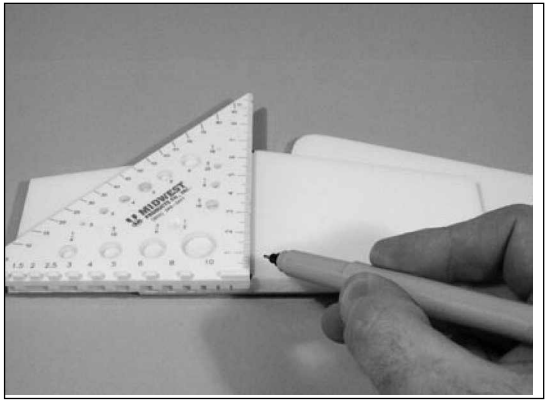
Required Parts

Stabilizer
Fuselage
Clear tape

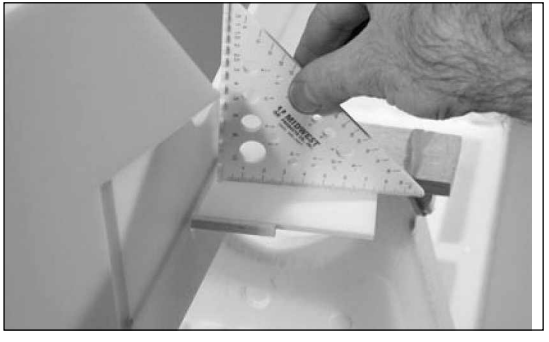
Required Tools and Adhesives

Square
Foam-safe CA

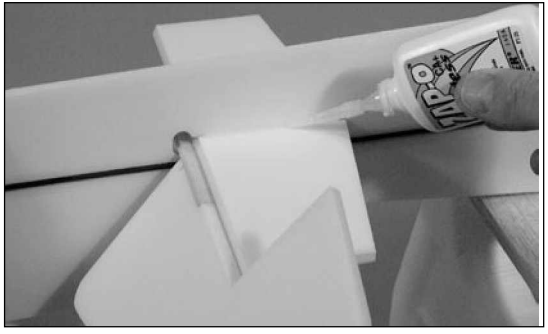
❍ 1. Locate the stabilizer and remove the elevator that is not hinged to the stabilizer. Measure and draw a centerline on the



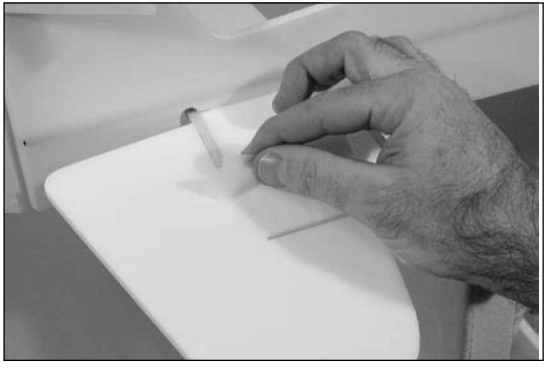
❍ 2. Slide the stabilizer into the slot in the fuselage. Use a square to check the alignment of the stabilizer as



❍ 3. Use foam-safe CA to glue the stabilizer into the fuselage.



❍ 4. Use foam-safe CA to glue the elevator to the balsa elevator joiner. Use the included clear tape on the top and bottom of the hinge line to complete the elevator



Landing Gear Installation

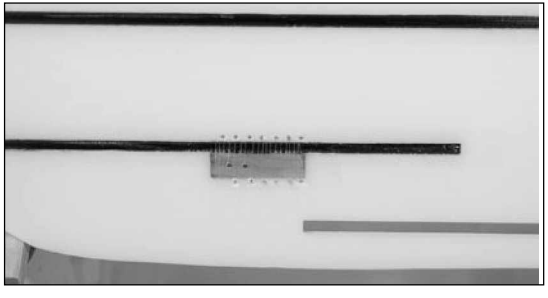
Required Parts

Fuselage	Tail skid
Micro wheel (2)	Main wheel retainer
Gear retaining thread	Wheel pants
Landing gear wire (right and left)	

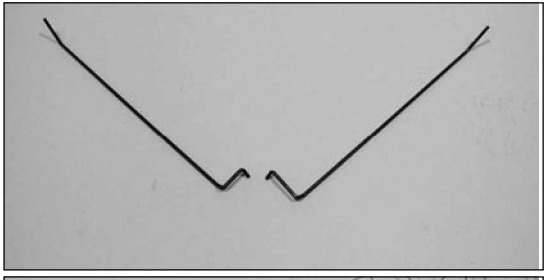
Required Tools and Adhesives

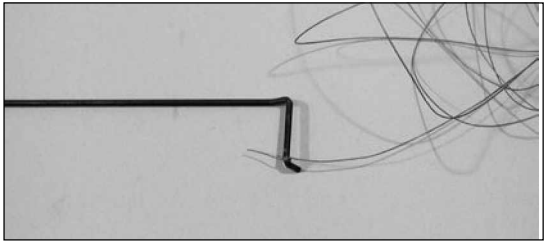
Foam-safe CA	1/16" Drill bit
Sewing needle	Silicon glue

❍ 1. Make 5–6 1/16" (1.5mm) holes above the fuselage brace, above and below the landing gear block.



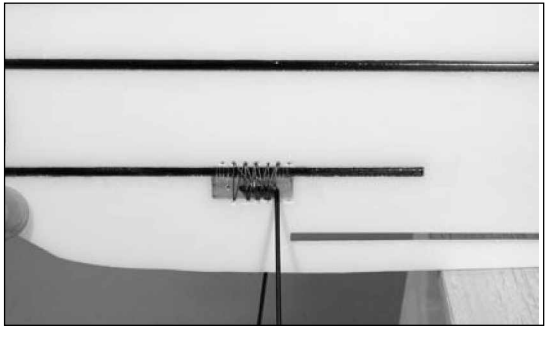
❍ 2. Locate the two landing gear wires. Tie one end of the landing gear wrapping thread to the gear with the longer mount.





❍ 3. Wrap the gear retaining thread around the landing gear and landing gear block. Use as much of the thread as possible, as this is the only thing keeping the gear from flying off on a hard landing. Apply a generous amount of foam-safe CA to the string on both sides of the fuselage

Note: It is helpful to use a needle to thread the retaining thread through the holes.



❍ 4. Slide the wheels onto the landing gear. Slide the wheel pants onto the landing gear and glue them, using foam-safe CA or silicon glue. Secure the pants and wheel using the wheel retainers.

Note: Do not get glue on the axle and wheel or the wheels will not be able to roll.

Hint: A drop of CA on the retainers will help keep them from falling off in flight.

❍ 5. Press the tail skid into position on the bottom of the fuselage. Remove the skid and apply
2–3 drops of foam-safe CA onto the skid and

Rudder and Elevator Linkages

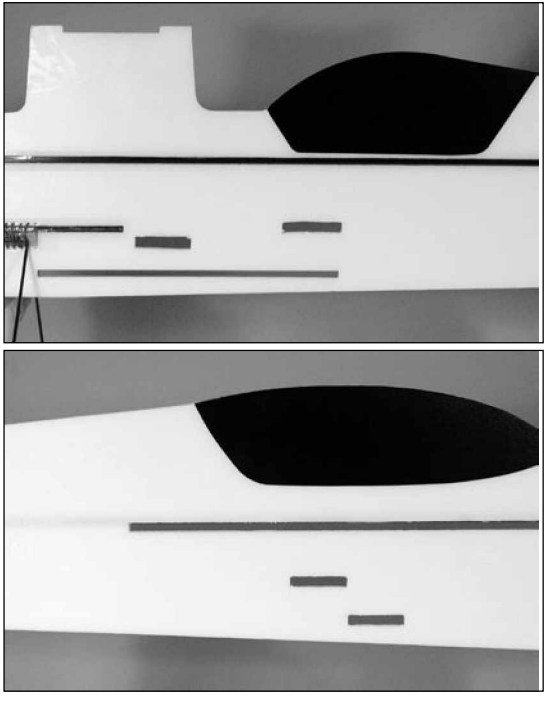
Required Parts

- Fuselage
- Pushrod guide (12)
- Control horn backplate (2)
- Micro pushrod keepers (2)
- Micro control connectors (2)
- Control horn (2)
- Pushrod wire (2)
- Double-sided tape (2)

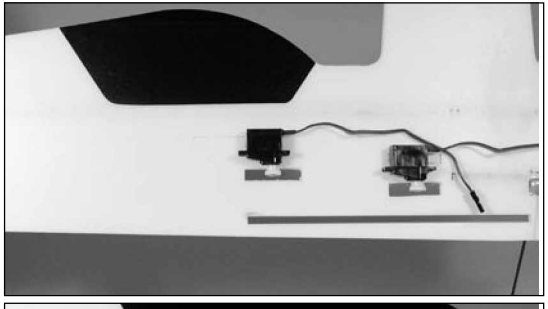
Required Tools and Adhesives

- Square
- Ruler
- Pliers
- Hobby knife
- Foam safe CA
- Servo (2)

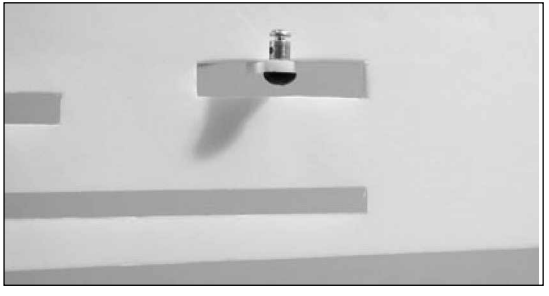
❍ 1. Cut slots in the fuselage for the rudder and elevator servo arms to pass through.



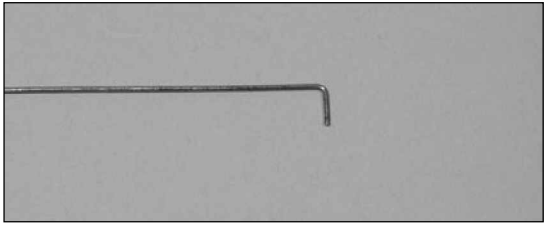
❍ 2. Use your radio system to electronically center two servos for use on the rudder and elevator. It is highly suggested to install long servo arms at this time. Center the output of the servo in the slots and use double-sided tape to attach the servos to the fuselage.



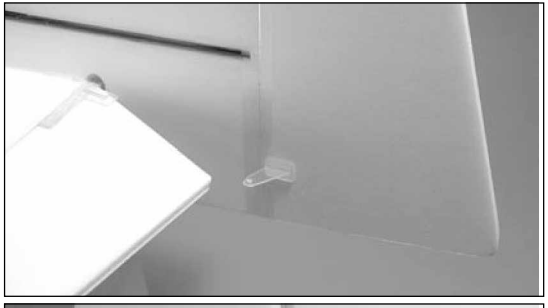
❍ 3. Install the micro control connectors onto the rudder servo arm. The screw will face away from the wing for later adjustments.



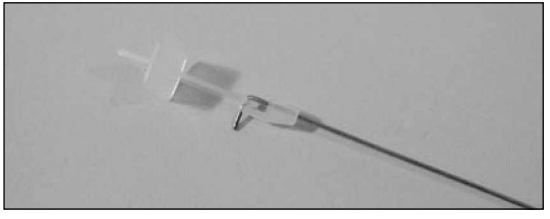
❍ 4. Make an L-bend in one of the pushrod wires using pliers.



❍ 5. Attach a control horn onto the rudder using a control horn backplate. Add a few drops of foam safe CA to the horn to secure it in place.

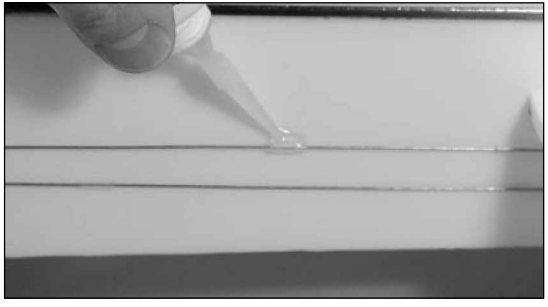


❍ 6. Attach the L-bend to the control horn using a micro pushrod keeper. (The control horn is not on control surface for more detail.)

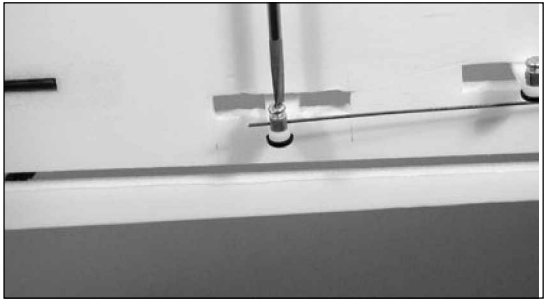


❍ 7. Roughen 4–6 pushrod guides, using medium grit sandpaper. Slide the pushrod guides onto the pushrod wire. Pass the wire through the micro control connectors.

❍ 8. Space the pushrod guides evenly between the rudder and servo. Use foam-safe CA to glue the guides to the fuselage.



❍ 9. Center the rudder and tighten the screw in the connector to secure the pushrod. Trim off any excess wire.



❍ 10. Repeat Steps 3 through 9 for the elevator pushrod.

Wing Installation

Required Parts

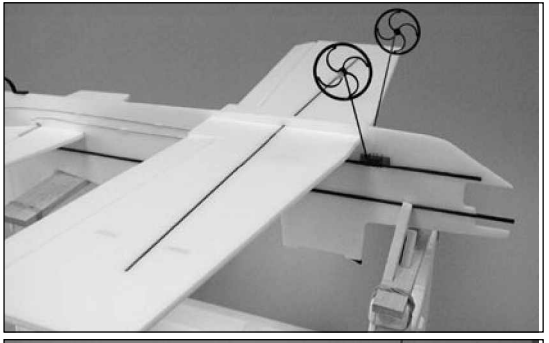
Wing Fuselage

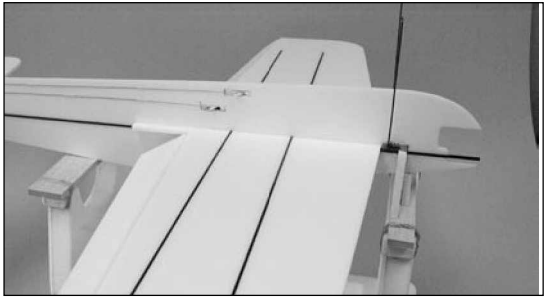
Required Tools and Adhesives

Square Foam-safe CA

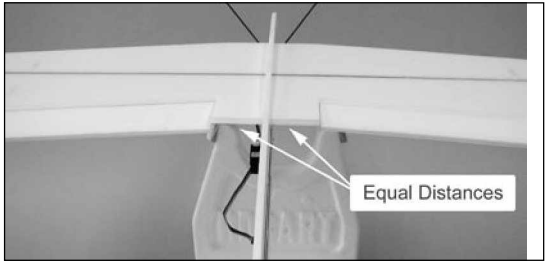
Note: The installation of the wing for the Tribute and the bottom wing for the Ultimate follow the exact same procedure. Installation of the top wing for the Ultimate is covered in Top Wing Installation (Ultimate). If you are building the Tribute, you can skip to Aileron Servo Installation once the wing has been installed.

❍ 1. Locate the wing and slide it into position into the fuselage. Use the wing with the carbon spar for the Ultimate.



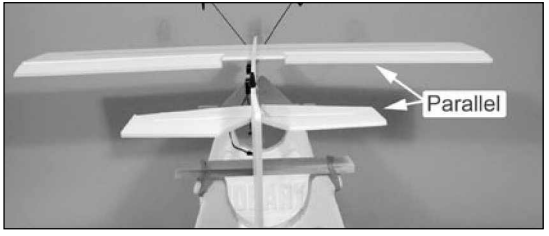


❍ 2. Center the rear of the wing by measuring the distance from the fuselage to each side of the wing center between the ailerons.



❍ 3. Use a square to align the main spar in the wing to the fuselage.

❍ 4. Check and adjust the wing so it is parallel to the stabilizer.



❍ 5. Double-check the alignment of the wing made in Steps 2 through 4. Use foam- safe CA to glue the wing to the fuselage. Use CA on both the top and bottom of the wing.

Top Wing Installation (Ultimate)

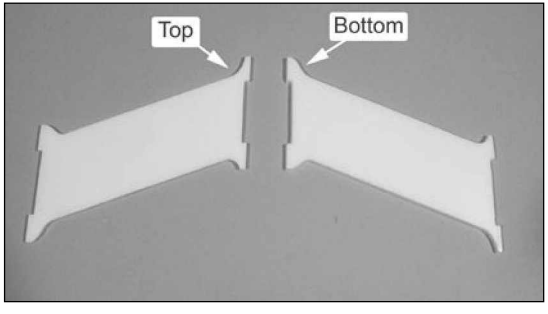
Required Parts

Top wing
Wing strut (2)
Fuselage

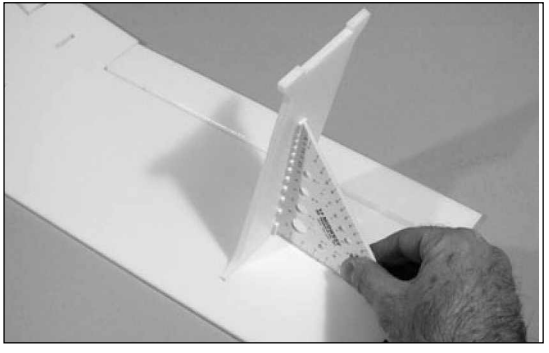
Required Tools and Adhesives

Square
Foam-safe CA

❍ 1. Locate the two wing struts. Note the top and bottom of each strut as shown.



❍ 2. Check the fit of one of the struts to the top wing. The strut will angle back toward the trailing edge. Use a square and foam-safe CA to glue the strut to the wing. Repeat for both struts.



❍ 3. Check the fit of the top wing assembly to the fuselage. Use foam-safe CA to glue the top wing assembly to the fuselage, and the struts to the bottom wing, once satisfied with the fit.

Aileron Servo Installation

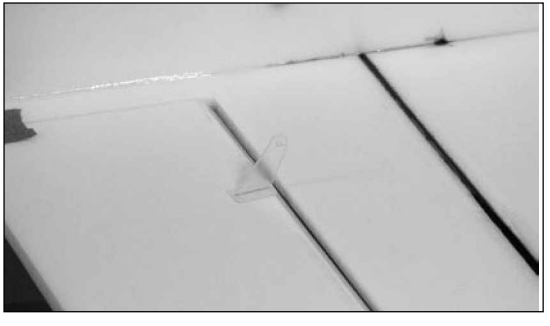
Required Parts

Airplane assembly
Micro control connector (2)
Control horn backplate (2)
Micro pushrod keepers (2)
Pushrod wire
Control horn (2)
Servo tape (2)

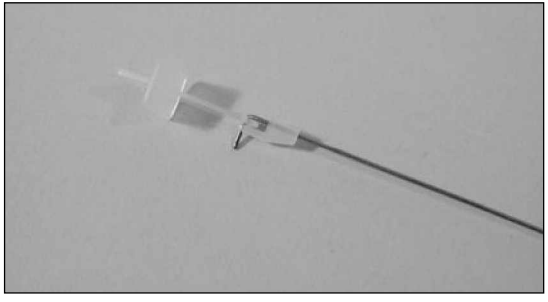
Required Tools and Adhesives

Pliers

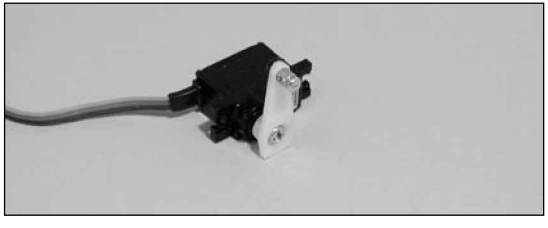
❍ 1. Locate a control horn and control horn backplate. Install the horn into the aileron. Use foam safe CA to secure the horn.



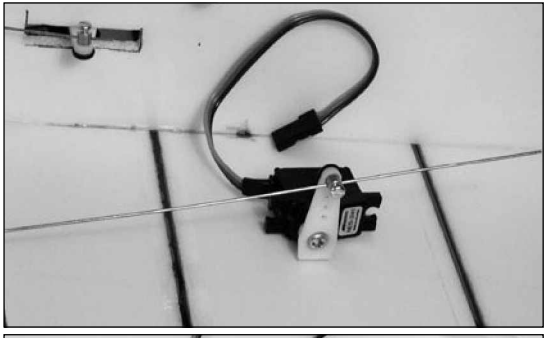
❍ 2. Make an L-bend in one end of the remaining pushrod wire. Attach the wire to the control horn using a micro pushrod

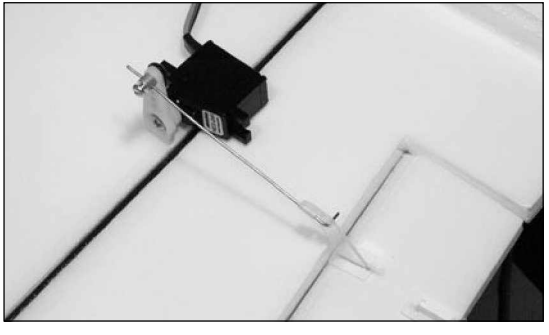


❍ 3. Center one aileron servo and install a long arm onto the servo. Attach a pushrod connector to the outer hole of the servo arm.



❍ 4. Use servo tape to secure the servo to the wing. Locate the Tribute servo in between the wing spars. The Ultimate servo is centered on the wing spar.





❍ 5. Center the aileron servo and aileron. Tighten the screw on the connector to secure the pushrod wire.

❍ 6. Repeat Steps 1 through 5 for the remaining aileron servo.

Ultimate Aileron Connection Linkage

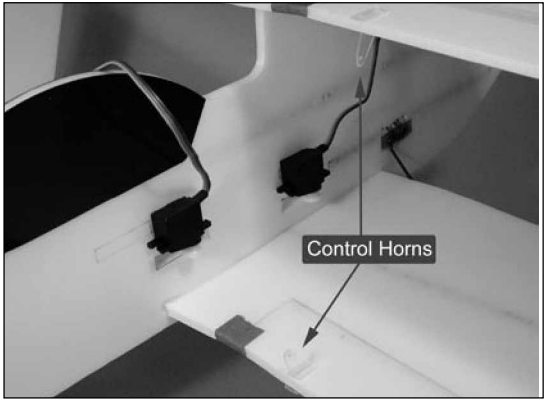
Required Parts

Airframe
Control horn back plate (4)
Micro pushrod keeper (4)
Control horn (4)
Aileron wire

Required Tools and Adhesives

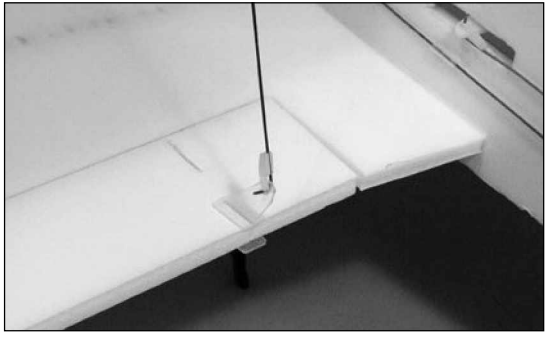
Pliers

❍ 1. Locate two control horns and two control horn back plates. Install one control horn in the top aileron, the other in the bottom aileron. The horns will face each other when

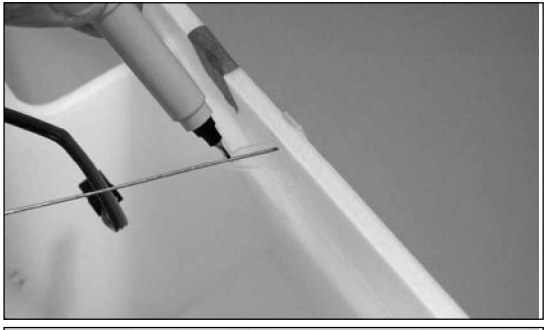


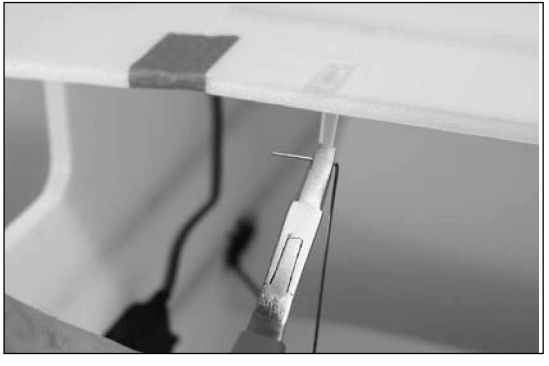
Hint: Use tape to hold the ailerons at neutral while installing the linkages.

❍ 2. Make an L-bend in one end of a pushrod wire. Attach the wire to the bottom control horn using a micro pushrod keeper.

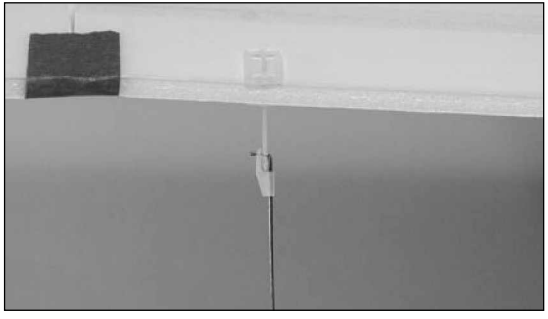


❍ 3. Mark the pushrod where it crosses the hole in the upper control horn. Make a 90-degree bend at the mark.





❍ 4. Secure the pushrod to the control horn using a micro pushrod keeper. Trim the excess wire.



❍ 5. Repeat Steps 1 through 4 for the opposite ailerons.

Gearbox Installation

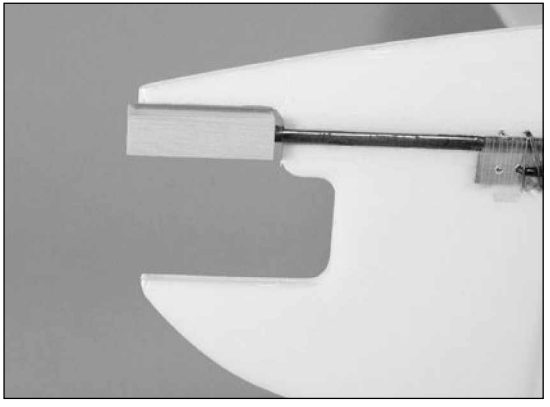
Required Parts

Aircraft	Gearbox assembly
Gearbox mounting block	2mm x 6mm screw
Propeller	Motor

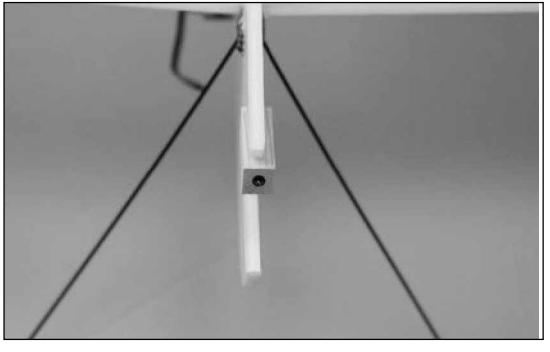
Required Tools and Adhesives

6-minute epoxy	Hobby knife
Small Phillips screwdriver	

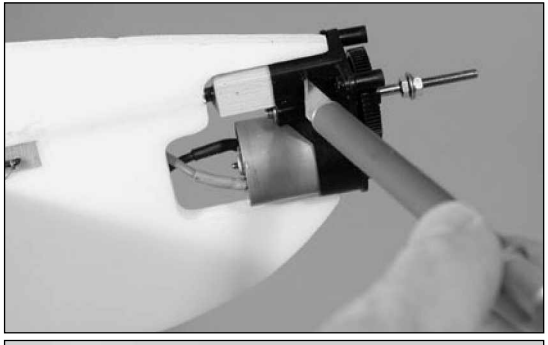
❍ 1. Test fit the gearbox mounting block onto the fuselage stiffener. Slide the block onto the stiffener so the front edge of the block is even with the front edge of the stiffener. Roughen the stiffener, using medium grit sandpaper. Use 6-minute epoxy to glue the block to the stiffener once satisfied with the fit.

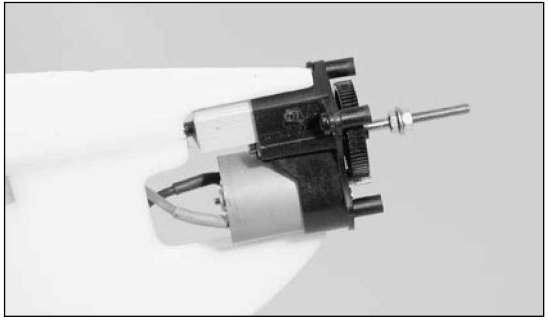


Note: Position the block square to the fuselage.



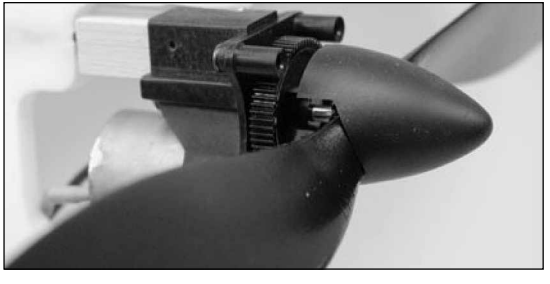
❍ 2. Slide the gearbox assembly onto the gearbox mounting block. Use a hobby knife to make a pilot hole for the 2mm x 6mm screw. Secure the gearbox using the screw.





❍ 3. Attach the propeller and spinner to the motor gearbox output shaft. The washer is placed on the front between the propeller

❍ 4. Press the spinner onto the propeller



Final Assembly

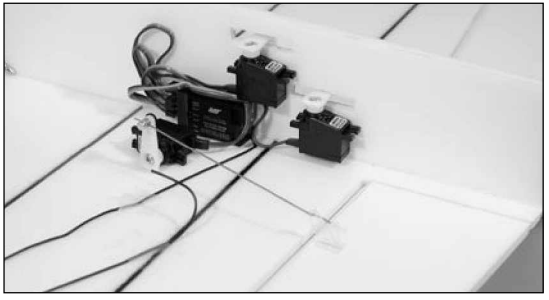
Required Parts

Airframe
Servo tape
Hook and loop

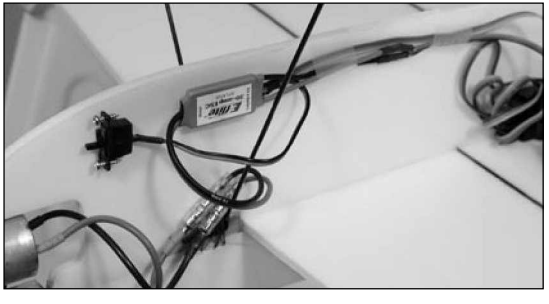
Required Tools and Adhesives

Hobby knife
Receiver
20 Amp speed control
Foam-safe CA
Motor battery

❍ 1. Cut a small hole in the fuselage to pass the aileron servo lead through. Plug the servos into the receiver. Cut a piece of hook and loop material in half. Attach the receiver to the fuselage using the cut piece of hook and loop material. Route the antenna either down the fuselage or under the wing.



❍ 2. Attach the speed control to the fuselage using the other half of the hook and loop material. Set up the speed control using the instructions provided with the speed control.



Note: You may need to change the connectors on the speed control to match those of the motor or battery. Also be careful of the spinning propeller.

❍ 3. Use the full piece of hook and loop material to attach the battery to the fuselage. Read through the section on Center of Gravity to choose the correct location for the

For best flight performance of the Ultimate, a high center of gravity is important. To achieve this, we recommend locating the battery on the cabane strut even with the front edge.

Control Throws

Tribute:

	Low Rate	High Rate
Aileron:	1" (25mm) Up 1" (25mm) Down	1 1/4" (32mm) Up 1 1/4" (32mm) Down
Elevator:	1 1/4" (32mm) Up 1 1/4" (32mm) Down	2 1/2" (63mm) Up 2 1/2" (63mm) Down
Rudder:	3 1/8" (79mm) Right 3 1/8" (79mm) Right	4 1/4" (108mm) Left 4 1/4" (108mm) Left

Ultimate:

Aileron:	1/2" (13mm) Up 1/2" (13mm) Down	7/8" (22mm) Up 7/8" (22mm) Down
Elevator:	1 1/4" (32mm) Up 1 1/4" (32mm) Down	2 1/4" (57mm) Up 2 1/4" (57mm) Down
Rudder:	2 1/8" (54mm) Right 2 1/8" (54mm) Left	3 1/8" (79mm) Right 3 1/8" (79mm) Left

Center of Gravity

An important part of preparing the aircraft for flight is properly balancing the model.

Caution: Do not inadvertently skip this step!

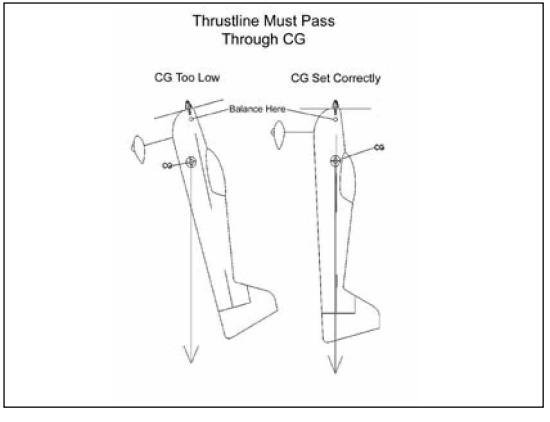
The recommended Center of Gravity (CG) location for the Tribute™ is 4 1/4" (108mm) behind the leading edge of the wing against the fuselage. If necessary, move the battery pack towards the nose or the tail until the correct balance is achieved.

The Center of Gravity (CG) location for the Ultimate is 3 3/4" (95mm) behind the leading edge of the top wing against the fuselage. Again, move the battery pack to obtain the correct CG.

Note: For best flight performance of the Ultimate, a high center of gravity is important. To achieve this, we recommend locating the battery on the cabane strut even with the front edge.

Longitude Balance

Having a high thrust line and low vertical CG position will cause the airplane to be less statically stable during inverted flight, possibly requiring one to hold up elevator to trim during inverted flight. With this in mind, it is very important to balance the model in a vertical sense. Do this by creating a small hole directly behind the motor that passes through the propeller thrust line. Insert a T-pin or small piece of music wire through the hole and suspend the model. Be sure that the model hangs perfectly vertical as shown below.



Setting up for 3D flight

People often spend a tremendous amount of time constructing a perfectly straight airplane only to neglect the radio installation. The control system is arguably of equal importance to actual construction and must be given adequate attention to ensure that the potential of the airplane is realized.

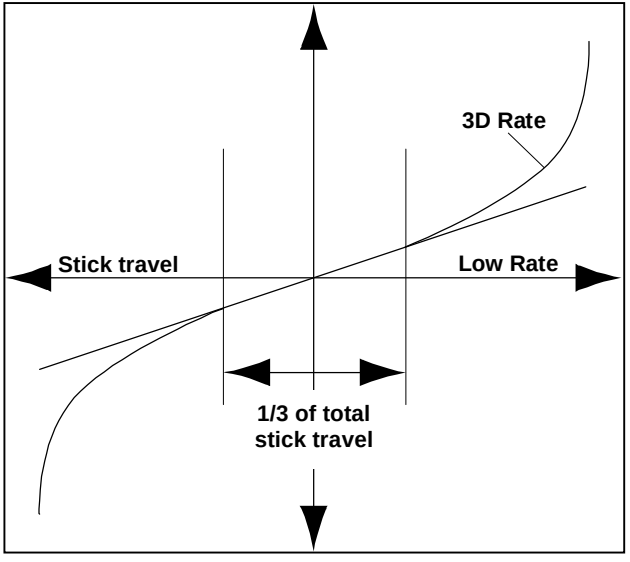
Since the purpose of the Tribute and Ultimate is 3D flying, take a moment to think about what is actually necessary for successful 3D flight. The first obvious answer is thrust. In order to hover, the minimum amount of thrust necessary is equal to the total weight of the airplane. In reality we need to have some excess thrust to maneuver and accelerate. For gas/glow-powered models this typically is not a problem, but many electric models are borderline in the static thrust department. This is the primary reason that the total weight of the airplane must be kept to a minimum. The Tribute and Ultimate are designed to have a flying weight under 12 ozs. The best way to test to make sure you have adequate thrust for hovering flight is to hold the airplane vertically and advance the throttle to full power. The thrust should be enough to make the airplane accelerate vertically from a standstill.

Many people also consider the proverbial "aft" center of gravity (CG) to be crucial to hovering success. Through much experimentation on many types of models, we have found that neither a very forward or very aft CG is beneficial to hovering flight. In fact, given sufficient control surface movement, softened correctly with exponential throws, one can hover controllably over a large range of CG positions.

This brings us to the most important aspect of 3D setup—control surface deflection. Do you need large amounts of deflection to hover? The truth is you do not. During the perfect hover or torque roll you barely move the surfaces off their neutral position. It is not until you get the airplane in an attitude far enough from vertical that you need to delve into your large reserves of control surface throw and excess power. You will find that having 45–55 degrees of throw is very beneficial to your success in 3D flight. Typically, the most throw you can mechanically achieve is what you should use. Set up the airplane such that maximum throw is obtained by placing the pushrod the farthest hole out on the servo and the hole closest to the control surface on the control horn.

While this is not standard or recommended practice on a larger airplane because of the potential of flutter, this type of setup works quite well on the aerobatic indoor electric models.

Large amounts of throw tend to make the airplane feel very sensitive around neutral. Because of this, it is highly recommended that you use a radio with dual rates that is capable of exponential throws. A good way to correctly set the amount of exponential for the 3D-rate is to find a low-rate setting that feels comfortable in normal flight. Once you've done this for the aileron, elevator, and rudder, dial in enough exponential to make the low-rate setting and 3D-rate setting feel the same for the first 1/3 of the stick travel. If you have a computer radio that displays the graph of stick position vs. servo output, you can easily set the correct amount of exponential by making the slopes of these graphs identical for the first 1/3 of stick movement.



Slope of the line is the same for the first 1/3 of the stick travel

Flying

Now that the airplane is set up correctly, it is time to fine-tune the setup in the air. Start by flying the airplane on low rates. If you have triple rates, set the mid-rate in between the high and low rates. Once you get comfortable with the airplane and tune the exponential setting, you will be able to fly it all the time on the 3D rates.

One will find the propeller effects (such as torque, spiral slipstream, P-factor, gyroscopic procession and prop normal force) often dominate the stability and control of the smaller indoor airplanes. Consequently, the use of smaller diameter/lower-pitch propellers tends to reduce the adverse effects on the airplane's longitudinal and directional stability. The smaller diameter will reduce static thrust, however lower pitch increases static thrust. With this in mind, we quickly see there is a compromise between the precision and 3D propeller selection. As with most airplanes, if you use the rudder to generate large yaw rate you'll have to counter the adverse rolling moment with some opposite aileron. With a little practice, this will become very natural and you can use the rudder literally like the steering wheel of a car.

Rolling maneuvers are done with relative ease from normal aileron rolls to slow rolls, point rolls, rolling circles and rolling loops. Knife-edge flight is also possible. The Tribute and Ultimate are especially good at the 3D type maneuvers such as Torque Rolls, Elevators / Harriers, and High-Alpha Rolls. While the airplanes are quite capable of all these maneuvers, the ultimate goal is to make the pilot capable of performing them as well. We do not know of any airplane design that will Torque Roll / Hover without constant help from the pilot. If such an airplane existed, the mystique of the maneuver would disappear simply because the pilot skill required to perform the maneuver would have been taken away…in other words the difficulty actually makes it worth learning.

How does one go about learning how to torque roll? The best way is to practice on a simulator until you can literally do the maneuver without needing to think about the inputs. The skill involved is nothing more than a muscle memory response to what you see the airplane doing.

Is the simulator realistic? Probably not, but regardless of its accuracy it will get your eyes and hands accustomed to the proper movements required to perform the maneuver. The simulator will help you get over the “mechanics” of the maneuver so you will not have to think about which direction to move the sticks when faced with the real thing.

How much should you have to practice? If you are serious about learning how to hover or toque roll, work on the simulator 30 minutes to an hour each night for a month. Evaluate your progress after this amount of time. Chances are you will have become bored with the simulator and are ready to really tackle the real airplane with confidence, but do not be surprised or discouraged if it takes three months of dedicated practice. Remember that there is nothing super-human about hovering. Anyone who is willing to put in the practice time can learn to do this maneuver. Of course you can be a purest and learn to hover solely with the real airplane, but it will take longer because you physically can not get the practice time with a model that you can on the simulator. Keep in mind that your simulator practice must be supplemented with actual flying because you need to learn how to react when the consequence of a mistake is a crash. The good thing about the Tribute and Ultimate is you can typically pick them up after a mishap and fly again immediately. Nerves can play a big part in hovering success, but you will find the better you get at the simulator the more confidence you will have with the real airplane and the nerves will eventually subside, thus freeing your mind to concentrate on flying the model. It often helps to have someone show you that your airplane can hover. For some reason this is a huge psychological boost that makes you realize it is not the airplane limiting you. One common mistake people make is hovering too far away from them. The closer you are to the airplane, the better you will be able to control it because you can see it so much better. This is of course a double-edged sword because you will also be closer to the ground. Once again the Tribute and Ultimate can handle the abuse thus making it better for training. Eventually you will find that the closer the airplane is to the ground, the less chance it has of getting damaged in a crash because it has less potential energy. This is especially useful if for some reason you have a battery die or the BEC cuts off.

Another common misnomer is that the ailerons do not work while hovering. This could not be further from the truth. If you do not use the ailerons during hovering, you will be at the mercy of the motor's torque and the airplane will continually roll to the left. Two very effective techniques to employ to reduce or stop this rotation is first to counter the left rolling moment with right aileron and also to lean the airplane 5–10 degrees either slightly to the gear or away from it. Leaning the airplane makes it more difficult for the torque of the motor to roll the airplane because the weight and thrust vectors are misaligned. You can also use this mode of flight to move the airplane closer or further away from you. When you start doing this, you will quickly realize that you are starting to perform a very high angle of attack harrier.

With this in mind lets tackle the "Elevator" and "Harrier," which is the second most popular 3D maneuver. A common misconception is that you always fly around with the elevator fully deflected. What you will find is you must continually modulate the elevator to maintain the same angle of attack. This is done by watching the flight path and body angle of the airplane and adjusting the elevator and throttle accordingly. Also you must work to keep the wings level with the ailerons. Many times we hear people say that certain airplanes do not lock into the harrier well. While this may be true, what you will find is most every airplane has a magic angle of attack that minimizes wing-rock, and the pilots whose airplanes appear to be locked into these maneuvers know how to keep their airplane in this sweet spot.

2004 Official AMA National Model Aircraft 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 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.

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.)

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.