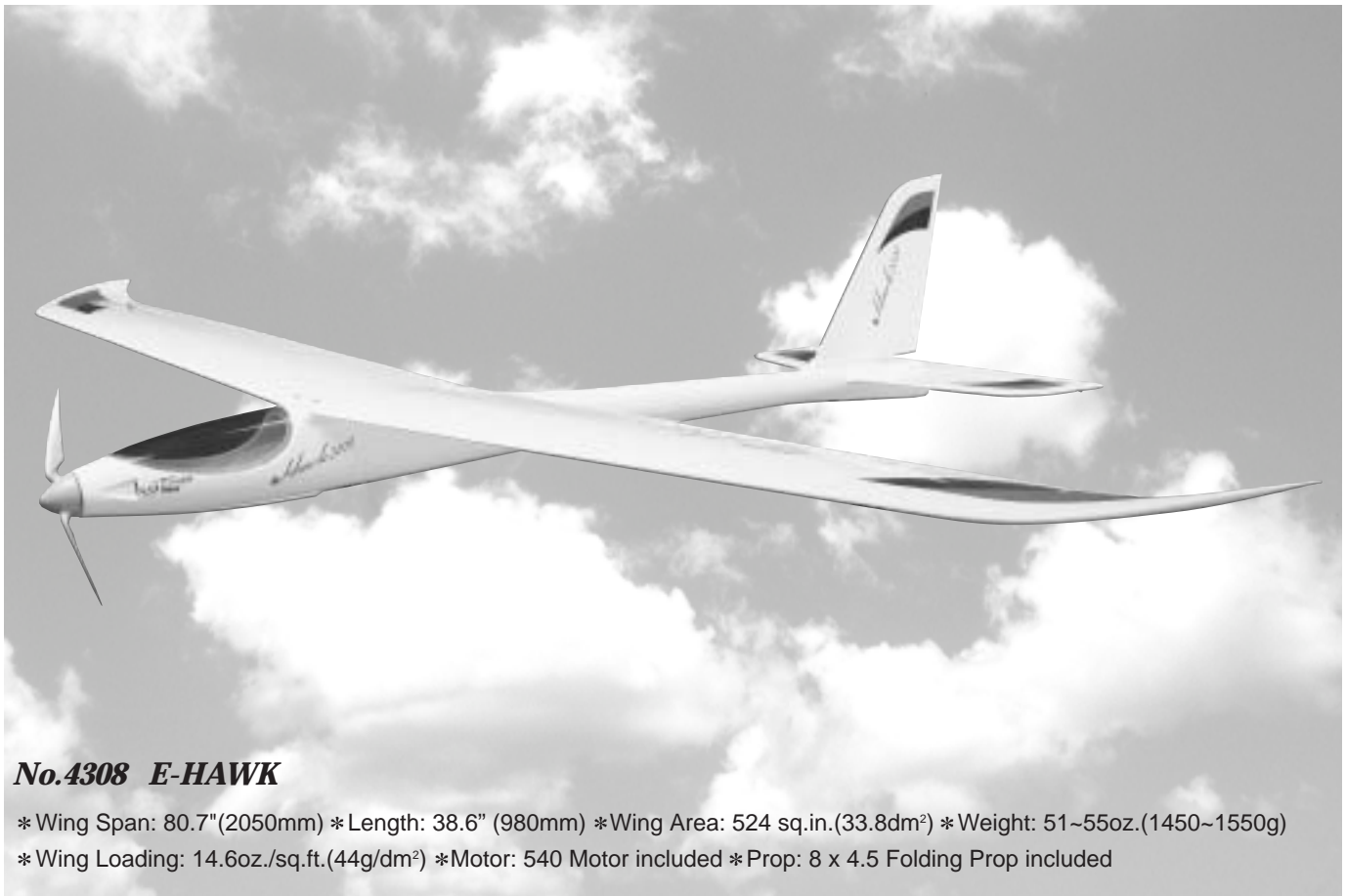


# *e Hawk 2000*

## Almost Ready To Fly 2M Electric Powered R/C Sailplane



### **No.4308 E-HAWK**

\* Wing Span: 80.7" (2050mm) \* Length: 38.6" (980mm) \* Wing Area: 524 sq.in. (33.8dm<sup>2</sup>) \* Weight: 51~55oz. (1450~1550g)  
\* Wing Loading: 14.6oz./sq.ft. (44g/dm<sup>2</sup>) \* Motor: 540 Motor included \* Prop: 8 x 4.5 Folding Prop included

**Warranty:** This kit is guaranteed to be free from defects in material and workmanship at the date of purchase. It does not cover any damage caused by use or modification. The warranty does not extend beyond the product itself and is limited only to the original cost of the kit. By the act of building this user-assembled kit, the user accepts all resulting liability for damage caused by the final product. If the buyer is not prepared to accept this liability, it can be returned new and unused to the place of purchase for a refund.

**Notice: Adult Supervision Required:** This is not a toy. Assembly and flying of this product requires adult supervision. Read through this book completely and become familiar with the assembly and flight of this airplane. Inspect all parts for completeness and damage. Customers in North America please call 1-949-833-7498 for help if you encounter any problems.

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## **INTRODUCTION**

All of us at Thunder Tiger want to thank you for choosing the E-Hawk. This Kit has been engineered to go together quickly and easily while still providing you with great looks and exceptional flying performance. The world of electric powered sailplanes can be an extremely challenging and rewarding experience. Your skill along with the design capabilities of your model will combine to defy the laws of gravity and produce flights of unbelievable distance or duration. Under proper conditions your E-Hawk can stay aloft for hours from a single battery charge! As you gain experience with your model you will be able to “feel” the wing and lift conditions that affect it enabling you to greatly extend your flight times.

The E-Hawk is an electric powered 2-meter sailplane which is intended for use in light to medium wind and lift conditions. Its airfoil, motor package and design planform are intended to maximize performance under those flying conditions and will provide great results for pilots of all skill levels.

We suggest that before beginning to assemble this kit you thoroughly read this assembly instruction manual to familiarize yourself with the complete assembly procedure. This will insure that your assembly process will be as smooth and uneventful as possible.

We are confident that you will enjoy flying your E-Hawk and that it will provide many hours of challenging and rewarding flight.

## PRE-ASSEMBLY NOTES

1. If you are not an experienced R/C pilot plan to have a fully competent pilot help you to learn to fly your E-Hawk. This will help you to be successful much faster and also avoid potential damage to your model.

2. Please assemble your model exactly according to these instructions. Do not attempt to modify or change the E-Hawk in any way as doing so may adversely change its flying characteristics.

3. Before you begin please check the entire contents of this kit against the parts list and part drawings to be sure that no parts are missing or damaged. This will also help you to become familiar with each component of your E-Hawk. If you find that any of the parts are either missing or damaged please contact your dealer immediately for replacement. Note: Your dealer cannot accept kits for return if construction has begun.

For customers in the US and Canada please call or write to ACE Hobby Distributors, Inc for replacement of missing or damaged parts.

### ACE Hobby Distributors, Inc.

2055 Main Street, Irvine, CA 92614

Tel: 949.833.0088

Fax: 949.833.0003

E-Mail: [service@acehobby.com](mailto:service@acehobby.com)

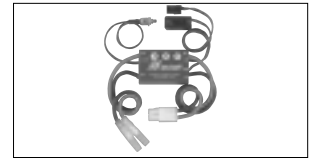
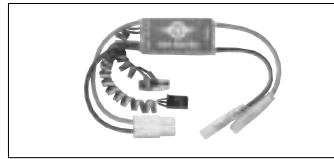
**Remember.** We have worked very hard to make this model as easy to assemble as possible while still maintaining our high standards of quality. Your assembly of this model is very important and will determine the final flight capabilities of your E-Hawk, so use extra care and follow the assembly procedure exactly.

## OTHER ITEMS REQUIRED

**Radio:** You will need at least a 3 channel radio control system with 3 mini servos on an aircraft frequency for use in your E-Hawk. However, if you are really looking for every bit of extra performance then you should consider using one of the miniature radio systems available which would lower the weight and increase the performance of your E-Hawk.



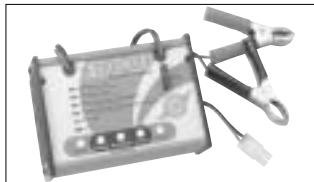
**Electronic motor controller:** We recommend the ACE8007



controlling the power of your E-Hawk as well as eliminating the need for a separate radio battery. The BEC (Battery Eliminator Circuitry) in this controller will automatically turn off the power to the motor when the battery reaches a factory present discharge level leaving about 20-25 minutes of flight time for the radio system. Note: Some radio manufacturers offer a lightweight radio system with a built-in motor controller with BEC especially for this type of model.

**Flight Battery:** We recommend the use of a 6~7 cell 7.2~8.4V 2000 mAh battery pack for maximum performance.

**Charger:** You will need a quick charger to charge your power battery. We recommend our ACE2529 EDC-01 simple charge or TTR2685 7.2V DC Quick Charger for 6-cell battery pack or TTR2686 8.4V DC Quick Charger for 7-cell battery pack. Note: When charging your flight battery be sure to very carefully follow the instructions provided with the charger.



**Extension Wire:** 2 servo extensions plus Y harness are required. If you are going to use Flaperon then it will require 2 servo extensions which are 15" in length minimum.

## TOOLS AND SUPPLIES NEEDED

1. 5 Minute Epoxy
2. Thin CA Glue
3. Thick CA Glue
4. 1/2" Masking Tape
5. Mixing Stick for Epoxy
6. Medium Grit Sandpaper
7. Rubbing Alcohol
8. Paper Towels
9. Hobby Knife
10. 1/16" Drill
11. 5/64" Drill
12. 1/8" Drill
13. 3/16" Drill
14. Ruler
15. "Z" Bend Pliers
16. Pen, Pencil or Marker
17. Small Screw Drivers
18. Curved scissors

### AS6187 Main Wing Set

Wing Protector (1) Two-Sided Tape (2) Aileron Servo Tray (2) Hatch Cover (L/1, R/1) Wing Bolt (L/2, S/2) Wing Joiner (L/1, S/1) Wood Screw (8)

Left Wing (1) Right Wing (1)

### AS6195 Fuselage Set

Motor Mount (1) Fuselage (1)

Foam Tape (2) Servo Tray (1) Wing Mount (2) Triangle Wood (4) Blind Nut (4) Vecro (2) Zip Tie (1)

### AS6188 Canopy

Wood Screw (3)

Canopy (1)

### AS6194 Tails Set

Horizontal Tail (1)

Vertical Tail (1)

### AS6193 Decal

Hawk 2000

### AS6190 Pushrod Set

Elev. Pushrod (1)

Rudd. Pushrod (1)

Aileron Pushrod (2) Clevis (4)

### PE0565 Folding Prop Set

Spinner (1) Blade (2)

Drive Shaft (1) Backplate (1)

2 x 12mm Screw (2)

2 x 8mm Sink Screw (1) Washer (1)

5mm Nut (1) Drive Nut (1)

### PE0009 Hardware Set

2mm Nut (2) Allen Wrench (1)

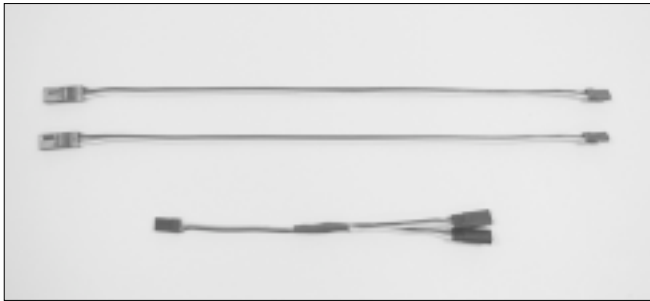
EZ Connector(2) Set Screw (2)

### AS6191 Control Horn

2 x 12mm Screw (8)

Backplate (4) Control Horn(4)

## Wing Assembly 主翼的安裝步驟：



1. Before you install the aileron servo you have to decide if your e-Hawk will have Flaperons (FLPN) or not.

If Flaperon function is applied, then it will require 2 Servo Extensions which are 15" long minimum. (We recommend to set up the e-Hawk with Flaperon if you have a computer radio with mix function )

If Aileron function only is applied, then it requires 2 Servo Extensions plus a Y harness.

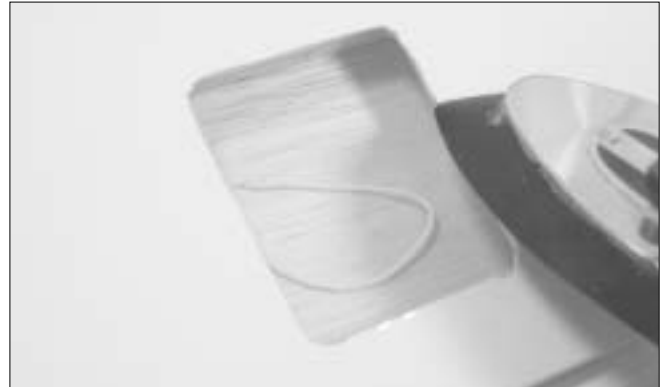
在安裝副翼伺服機前、請先確認遙控器是否有支援 FLPN (副翼、襟翼混控功能)，若有請準備兩條15英寸 (40cm以上) 以上的伺服機延長線、分別控制單一邊的副翼、並以遙控器執行混控副翼操作以及襟副翼的功能。

若您使用簡單的2-3動遙控器、您另外必須準備一條Y型的延長線，以將兩個伺服機作連結控制。



2. Cut away the covering at servo hatch and the hole near the wing root where extension wire passes through.

將覆蓋在伺服機座及翼根處圓孔上面的包覆紙小心割除，伺服機座中的細繩必須保留、以牽引伺服機電線穿過。



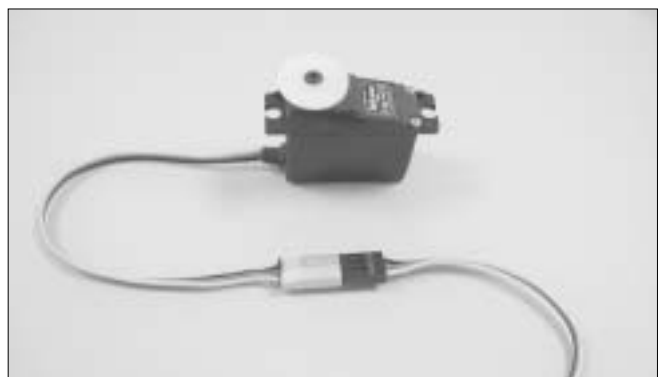
3. Use heat iron to tack down the covering at the opening.

伺服機座的周圍使用包覆紙專用的電熨斗、將周圍的包覆紙均勻的燙平。



4. Glue the aileron servo tray ( square plastic piece) on the wing sheeting with instant glue.

使用瞬間膠水將副翼伺服機座固定於木板上。



5. Connect the extension wire. You can tape it together to prevent from disconnecting during flight.

將伺服機延長線與伺服機電線連接，建議使用膠帶確實包捆、預防脫落。



6. Make a knot on the servo extension wire and the leading string.

將細繩與伺服機延長線頭打結。



7. As the holes in the ribs are very small, it will be easier to pull the string if you tape the extension cord end to the leading string in a tapered fashion as shown.

由於翼肋上的電線孔很小、建議使用膠帶將細繩與延長線綑綁（建議使用膠帶將伺服機線頭與細繩連接處捆成一個錐形），以方便延長線穿過。



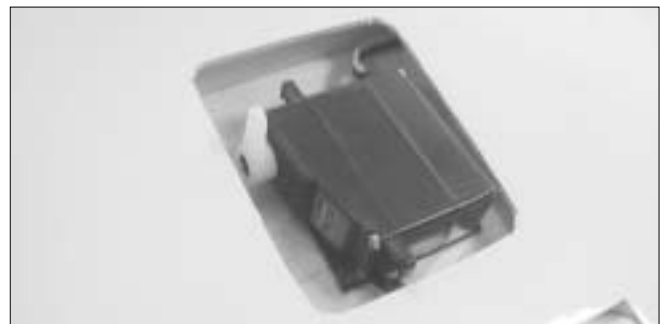
8. Pull the string out from the hole slowly, using needle-nose pliers or tweezers.

利用尖嘴鉗或鑷子小心地將細繩及延長線拉出。



9. Cut the servo horn as shown. Before you install the control horn and secure the aileron servo in place, you will have to connect the servo to your receiver and set up in your radio to make sure the direction and centering of the servo arm is correct.

將伺服機擺臂切修至適當長度，確認伺服機與接收機之連接方式以及伺服機動作方向正確之後再將控制擺臂與伺服機確實的安裝至固定位置。



10. Attach the servo horn in place when servo is at neutral position. Before using two-sided tape to secure the servo in place, use the hatch cover as a guide to position the servo. Make sure the servo horn does not contact the fairing when attached.

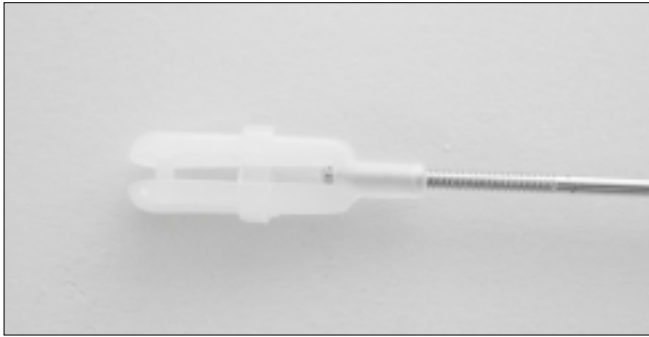
安裝完畢後將伺服機歸位置中立點、以確認安裝位置無誤，先利用伺服機整流罩作為伺服機裝置位置的參考點、再使用雙面膠帶將伺服機固定，需注意確實固定後轉動伺服機控制臂不能與整流罩干涉。



11. Install the control horn and secure it with the 2x8mm machine screw.

安裝舵角控制器、並以M2x8mm的圓頭十字螺絲固定。





12. Locate the clevis and the pushrod. Thread the clevis onto the pushrod at least 1/4" (6mm).

Snap the clevis onto the control horn. Make a Z bend at the place where pushrod connect to servo horn.

先將連桿頭與連接桿相互鎖合、必須至少保留1/4" (6mm) 以上長度的螺牙將連桿頭裝置到舵角控制器中、再將連接桿與伺服機控制臂的一端、以Z型鉗彎曲為一個標準的Z字型。



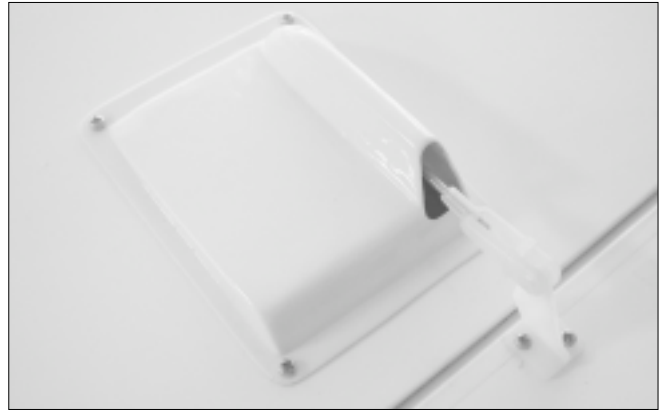
13. Remove the clevis from control horn and insert the Z bend end to the servo horn then snap the clevis onto the control horn. Adjust the clevis for neutral aileron as necessary. Cut small piece of silicone tube and slide it onto the clevis.

將連桿頭自舵角控制器取出、再將Z型的一端穿入伺服機控制片，整個連接桿的長度必須先做完調整、然後截取一段油管（約3mm）、穿入連接桿中以防止連桿頭於動作中脫開。



14. Locate the Hatch Cover. Cut a hole as an exit for pushrod and drill holes at each corner with 1/16" (1.6mm) drill bit, before securing the Hatch Cover, thread the pushrod rod through the exit hole.

先將整流罩的四端使用1/16" (約1.6mm) 鑽頭鑽孔並將連接桿出口處切除。讓連桿穿過整流罩後固定整流罩。



15. Secure the Hatch Cover with furnished 2x5mm wood screws. Now do the same for the other wing.

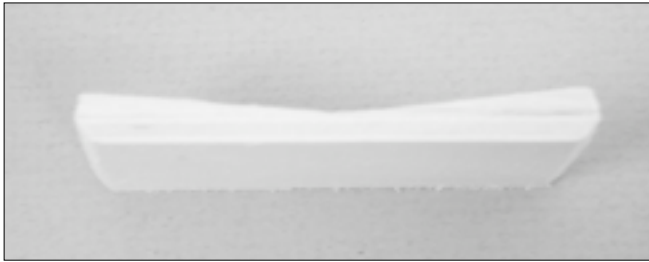
利用零件包中所提供的2x5mm自攻螺絲固定伺服機整流罩。連桿穿過整流罩的U型端重新裝入舵角控制器後、必須確實的壓緊定位，再將油管推入連桿頭中。

## Fuselage 機身的組裝步驟



16. Locate the 4 triangle wood blocks and two square plywood pieces. Glue the two triangle wood blocks on the plywood as shown. This will be the wing mount.

首先安裝4片三角型木塊與兩片三夾板、將2片三角型木塊固定（使用瞬間膠或環氧樹脂）在三夾板上（如圖示），就完成了主翼固定座。



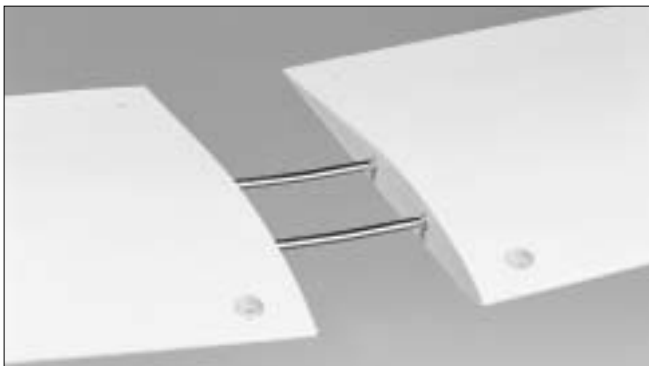
17. Trial fit the wing mount in the fuselage, sand to fit if necessary.

用砂紙砂磨邊緣並試將主翼固定座安裝固定在機身上。



18. Before gluing the mount in the place, sand the area in fuselage that will contact the plate with 200 grit sandpaper. This will provide a better glue bond. Glue the plate in place either by thick instant glue or epoxy.

機身接合處可用砂紙將此處拋光以增加接著力。如有隙縫可用木削及瞬間膠水填補空隙。粘合時可依您的習慣使用瞬間膠或是環氧樹脂粘合。



19. Locate the two wires and join the wing by inserting the wires to the wing halves.

Hint: The wires have 2 degreed dihedral prebent into them, make sure the two wires are up right before join the wing halves.

安裝金屬翼樑、將鐵絲插入機翼中的孔位，需注意這兩支鐵絲有兩度上反角度、在安裝時必須一致以利安裝。



20. Place the main wing on the fuselage with the wing halves jointed CLOSELY.

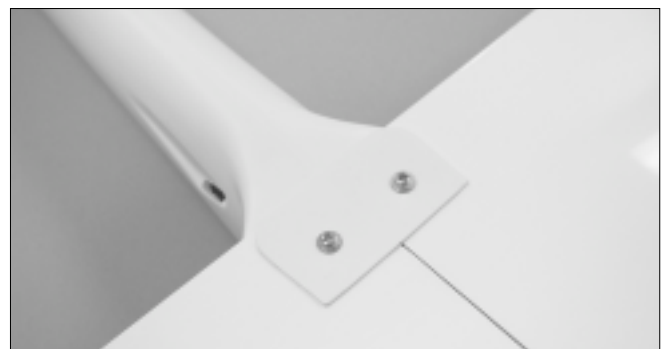
Use masking tape to tape to hold together. Use the holes on the wing as the guide to make drill marks. Drill 5mm(3/16") holes where you marked.

將主翼安裝在機體上必須緊密接合，建議使用紙膠帶確保更緊密的接合；以主翼固定孔為導引在機身做記號、並在記號處鑽5mm (3/16") 的孔。



21. Remove the wing and screw the 6/32 wing bolt all the way in so the blind nut is fixed in the wing mount.

移開主翼後從機身內側主翼固定座孔內壓入盲孔螺帽，使用尖嘴鉗或用機翼固定螺絲鎖入，將盲孔腳螺帽深入固定在機翼固定座內側。





22. Locate the wing protector, place the wing protector where is even with the trailing edge. With it centered then make drill marks on the wing protector. Drill 3mm(1/8") holes at the marks.

Trail secure the wing and protector in place make sure the two wing halves are secured closely and firmly on the fuselage.

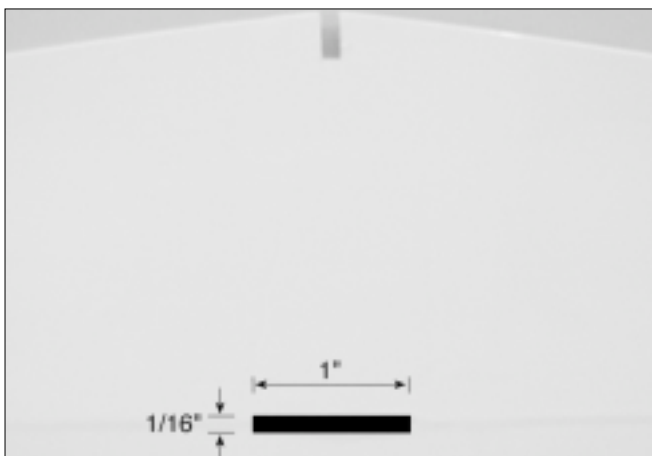
將主翼後緣補強片裝置在主翼後緣中心位置，以主翼固定孔來定位在補強片上作記號並在記號處鑽 3mm (1/8") 的孔洞，將主翼連同補強片鎖起來並確認主翼緊密而牢靠的固定在機體上。



23. Locate the plywood servo tray. Insert the tray from the wing saddle opening and trial fit into the fuselage as shown. Trim the radio tray if necessary to obtain a proper fit in the fuselage. Slightly sand the inside of fuse with 200 grit sandpaper then glue the servo tray in place with epoxy or thick instant glue.

將伺服機座從翼鞍處開口處置入，伺服機座與機身接合處稍做砂磨以加強接合、可使用環氧樹脂或是瞬間膠水固定。

## Tail Installation 尾翼的安裝步驟



24. Cut away the covering both at the center leading and trailing edge as shown.

將水平尾翼前緣中間鏤空部分及後緣中間如圖所示之包覆紙割除。



25. Cut the rear fuselage as shown so the stab can be inserted.

將機體尾部割開以使尾翼能插入安裝。



26. Spread the rear fuselage and insert the stab in the place. Make sure the tail fairing is a perfect match with the stab.

撥開機尾將尾翼裝入、並確認能緊密的結合。



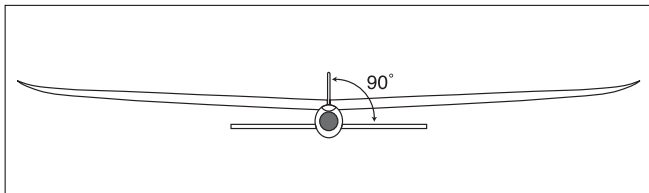
27. Trial fit the vertical tail in place. When satisfied, use pencil or marker to draw lines against the edges of fuselage.

在尾翼與機體接合處使用鉛筆、或是細簽字筆沿著機體邊緣做記號。



28. Remove the tail. Cut the covering away about 1/8" inside the line. Clean the line with rubbing alcohol after you cut away the covering.

將尾翼取下並沿著線內約1/8" (約2-3mm) 割除包覆紙、必須小心仔細的不能傷害到木質結構，然後使用酒精或是橡皮擦將線清潔乾淨。



29. With main wing installed, make sure the stab and fin are parallel and perpendicular to the wing. When satisfied with the fit and alignment, glue in place.

將主翼安裝到機身上、確認水平尾翼與主翼平行，垂直尾翼也必須與主翼成垂直的狀態，若有偏差必須調整至正確的角度再進行粘合（建議使用瞬間膠水）。如果您想安裝方向舵則必須粘合前執行步驟 33 再進行粘合。



30. Cut control horn as shown.

將舵角控制器裁減至適當長度如圖所示。



31. Enlarge the exit hole at the rear of fuselage, make sure that clevis and control horn will pass through freely.

將機身尾端的預留孔加大至連桿頭可以順暢通過的尺寸。



32. Install the control horn on the elevator, the same as you did on the aileron. The control horn is right after the pushrod exit hole of fuselage.

按照安裝副翼舵角控制器相同程序安裝升降舵之舵角控制器，並安裝在機尾預留孔的正後方。



33. Thread the clevis on the pushrod ( Long) then cut a small piece of silicone tube and slide it on the clevis. Insert the pushrod through the fuselage and snap the clevis on the control horn.

將連桿頭裝置在長推桿上並相同的截取一小段油管裝置在上面，再將推桿穿過機身並將連桿頭裝置在舵角控制器上。



34. The kit comes with the rudder pushrod. You may choose to have rudder control by cutting the vertical fin. Trim the rudder then tape it at both side. Install the control horn and connect the furnished pushrod (short). You will have to drill a hole at rudder pushrod exit fairing for rudder pushrod pass through.

套件中附有方向舵推桿您可以依照您的需求選擇安裝此舵面控制，當您需要裝置方向舵時將方向舵依照需求裁修出並以膠帶貼覆兩側做成可活動的關節。方向舵推桿（短）與舵角控制器同側的機身推桿出口必須穿洞。

## Servo Installation

### 伺服機的安裝步驟



35. Install the EZ connector on the servo horn as shown. Install the elevator servo on the servo tray.

將簡易推桿固定座裝置在伺服機控制擺臂上（如圖示），將升降舵伺服機裝置在伺服機座上。



36. Insert the pushrod through the EZ connector then secure the horn on the servo when elevator in neutral position. Secure the pushrod with the 3mm set screw.

If you have Rudder Control Surface then install the rudder servo as the same procedure on the elevator servo.

將升降舵推桿裝置到簡易推桿連結器上、確認升降舵是在中立點上，再將伺服機控制搖臂固定在伺服機上、以3mm無頭內六角螺絲將推桿固定；若使用方向舵控制機構，需將方向舵伺服機依此要領安裝。

## Motor / Prop Installation

### 馬達以及螺旋槳的安裝步驟



37. Locate the motor mount, drill the 3mm(1/8") holes at the pre-punched mark.

安裝馬達固定座、在預留記號上鑽出3mm(1/8") 孔洞。



38. Trial fit the motor. When satisfied, secure the motor to the fuselage with furnished 3x5mm countersunk screw.

使用套件所提供的M3x5圓頭十字螺絲將馬達固定在機身上。



39. Locate the prop, spinner and screws as shown. Assemble the folding prop first. Make sure the two blades move freely. Insert the drive nut to the backplate then the drive shaft. The hole of drive nut is tapered to accommodate the drive shaft. Secure the whole set onto motor shaft with the nut. Do not over-tighten the nut as it might break the aluminum drive shaft but make sure it will not spin out when it is in high rotation.

先組合可摺疊螺旋槳、需確認螺旋槳可以順暢運作，驅動螺帽因驅動軸的關係、因而設計為漸縮孔，將馬達輸出軸經由驅動螺帽與驅動軸連結、將螺帽鎖至適當緊度即可（高速不能打滑、否則會傷及鋁製傳動軸）。

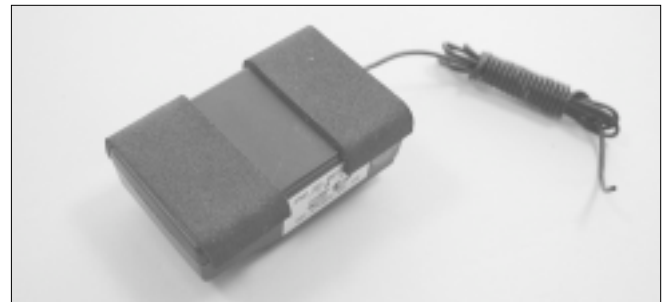


40. Make sure there is about 2mm (5/64") gap between spinner backplate and fuselage.

確認螺旋槳座與機身間需保留2mm的間隙。

## Receiver & other device Installation 接收機及其它安裝步驟

41. Locate the foam tapes. Tape at the bottom side of receiver to reduce the vibration from motor.



將發泡海綿貼在接收機底部、以減少因馬達運作所發生的震動。



42. Use furnished zip-tie to fix the receiver in place.

利用零件包提供的束帶將接收機固定。



43. Locate the Velcro, tape one side on the battery pack.

將魔鬼氈的一面固定在電池上。

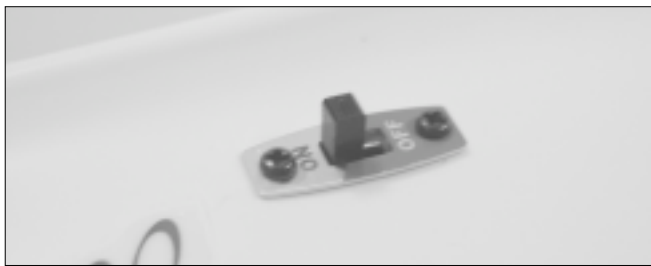


44. Tape the other side of Velcro in the fuselage so it will keep the battery in place.

Note: We use 6-cell Sanyo Battery Pack and the initial setting is 4 1/4"(108mm)away from the motor.

魔鬼氈的另一面貼在機身上以固定電池。

※注意事項：圖示的電池是以2號充電式電池、6個連結之7.2V電池組，正確的裝置位置約距離馬達4 1/4" (約108mm)。



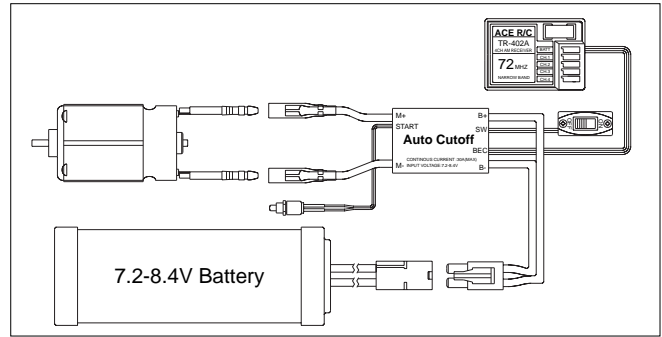
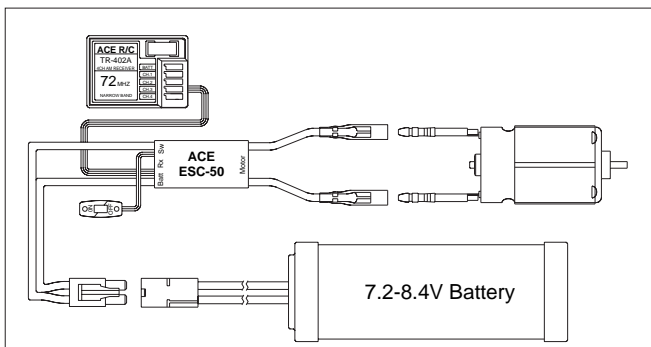
45. Use switch plate as a template, drill holes then install the switch as shown.

以電源開關面板作為開孔的模板，開洞並固定之。



46. Refer to the manual of Electronic Speed Control Unit (ESC-50 Shown P/N : ACE8014), link to motor, battery and receiver.

將速控器 (或是自動斷電開關) 連結馬達、電池、與接收器。



47. The attached two pictures are the examples for using ESC-50 and auto-cutoff.

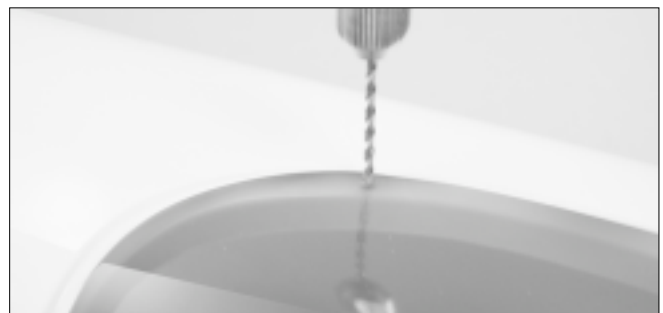
這兩張圖例是使用速控器及自動斷電開關連接的示範。

## Canopy Installation 座艙罩的安裝步驟



48. Locate the canopy. Cut 1.5mm(1/16") outside the molded line with curved scissors. Trial fit and trim it until it fits on the fuselage.

利用曲線剪刀沿著裁修線保留1.5mm(1/16") 距離將座艙罩剪下，然後再將它罩至機身上並慢慢的修剪至可合適的安裝在機身上為止。

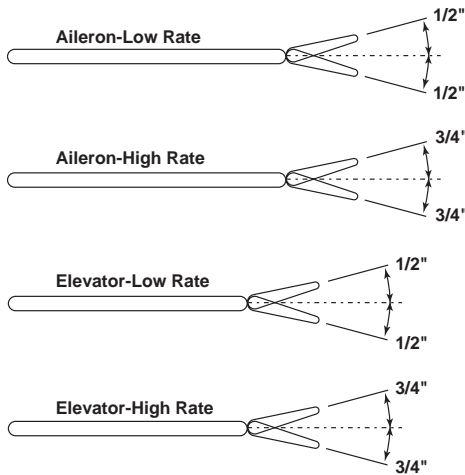


49. With the canopy in place on the fuselage, drill three holes with (1.5mm)1/16" bit. One in the front of canopy, two at both rear sides of the canopy.

在座艙罩前端與兩側各鑽1.5mm(1/16") 的孔洞以固定座艙罩。

## Control Throws

These control throws are merely a starting point for your radio setup and can be tailored to fit your flying style.



## Balance 平衡步驟



50. Balancing your model is very important and must not be overlooked. The center of gravity (CG) is 2 3/4" behind the leading edge of the wing near the wing root, parallel with the fuselage. You can adjust the battery pack forward or backward to reach the right CG.

機體的重心平衡是非常重要的事，本產品的重心位置自翼根處沿著機身距主翼前緣約2 3/4" (約70mm) 的位置，您可以藉著調整電池位置來找出正確的重心。

### FIRST FLIGHTS

## Checks You Should Make

Before you attempt to fly your model you should perform some final checks:

1. Fully charge your radio and flight batteries following

2. Check the direction of travel of your control surfaces and the operation of the motor controller per the manufacturers instructions.

3. Range check your radio system per the manufacturers instructions.

4. Double check that you have installed the screws in the servo control arms and that the clevis are snapped tightly on the control horns.

We strongly recommend that you get help from an experienced R/C pilot to learn to fly if you are just beginning. You should be able to find help at your local dealer or club field.

## Flying Your E-Hawk

First of all, if you are flying with other flyers, check to make sure they are not operating on the same frequency as you. If they are, do not turn on your radio until they have safely landed and have turned their radios off.

Secondly, even though the E-Hawk is very easy to fly, if you are a novice modeler/pilot, we highly recommend that you seek the help of an experienced modeler for your first few flights. He can save you a lot time and possible disappointment by helping you get your model in the air safely and getting it trimmed out for you.

Important: The radio control system is set up to operate the control surfaces just like a real airplanes as if the pilot (you) are sitting in cockpit controlling the airplane. When you want the plane to dive, you push the elevator stick forward (up), to climb you pull the stick back (down), to turn right, you move the aileron stick to right with elevator up and visa versa. When you want to turn the motor on you push the throttle stick forward and when you want to turn the motor off you pull the stick back. It is the turning that causes the most problems with novice pilots because when the plane is flying towards you a right turn command on the transmitter cause the plane to turn to your left (which is the planes right). Get the picture? Fortunately the up and down commands do not change. The easiest way to conquer this problem is to try and always face your body near the direction the planes is flying. This means that you will have to look over your shoulder at times, but many modelers find this an easy way to learn.



## THE FIRST FLIGHTS

You should always use the first few flights to get accustomed to your new airplane and its flying characteristics. Keep the model upwind and climb to a good comfortable altitude to cut off the motor and trim your E-Hawk for a glide. At altitude cut the motor and start your glide. Have an experienced modeler adjust the trims of the transmitter for you until the plane will glide straight and level without any other control input. Once the trims are set practice making smooth turns in both directions while losing as little altitude as possible. When the E-Hawk starts to get too low for comfort turn the motor back on and climb back up to altitude. Practice this climbing and gliding until you are comfortable with the airplane.

Depending on the battery you use the E-Hawk will make 2 to 3 good climbs up to a nice thermal searching altitude from single battery charge. Once the Auto Cut-off Device or ESC shuts off the power to the motor you will need to set up for your landing. Continue to make smooth gently turns while lining up the E-Hawk with your landing strip. Once you are set up to land keep the wings level and let the model settle in for an nice gentle landing while adding up elevator to keep the nose up slightly as the plane slows down. Make several flights like this to really familiarize yourself with the characteristics of your model and to learn the glide and distance covering abilities of the E-Hawk. Once you have mastered a good "comfort level" you are ready to start searching for thermals which will really increase your flight times.

## THERMALS

Thermal soaring is one of the most interesting and challenging types of flying there is. Believe it or not, your E-Hawk is capable of flights thousands of feet high, lasting for several hours, and covering dozens of miles. The following paragraphs will help explain how to take advantage of nature's energy sources called thermals.

"Thermal" is the term applied to columns of rising air. This air is rising because it is warmer than the surrounding air. A dust devil is simply a thermal which has picked up some dust. Even a tornado is very similar to a thermal, but of course much stronger.

Thermals occur when the sun, or other heat source, heats the air in one location faster and/or warmer than the surrounding air. Darker surfaces (plowed fields,

asphalt parking lots, etc.) absorb the sun's energy faster than lighter colored and are generally good thermal generators. This warmer air is lighter (less dense) than the cooler air and thus rises. The rising air naturally starts to rotate, much like water going down a drain, and forms an inverted funnel shaped column that usually gets larger with altitude. This warmer air often contains water vapor which condenses as it reaches the cooler air high above the earth forming big puffy Cumulus clouds that experienced sailplane flyers will watch to determine where the thermals are forming. Thermals vary in strength, but often contain air that is rising at speeds over 1200 feet per minute. Some thermals are so strong they can even rip a sailplane apart, especially if the plane is flying fast when it passes through the thermal.

## THERMAL SOARING

It takes lots of practice and concentration to thermal soar like the Hawks and Eagles. Since the pilot is not sitting inside an model sailplane, he cannot feel the thermal, he can only see his sailplane's reaction to the thermal. Therefore, the majority of the time, unless the pilot is paying careful attention to the plane, he may not even realize that plane is near a thermal. Since most thermals are relatively small, less than a hundred feet in diameter near the ground, the sailplane will rarely fly directly into the thermal and start rising. More likely, it will fly near a thermal and the wing closest to the thermal will rise turning the plane away from the thermal. So as you can see, an inexperienced pilot may bounce around between the thermals with never knowing that he is encountering rising air.

In order to take advantage of thermals, you need to fly smoothly with as few control inputs as possible. Watch the sailplane carefully and it will tell you what the air around it is doing.

When a sailplane does fly directly into a thermal it will either start rising or stop sinking at its normal rate. Either case is reason enough to explore further. Continue flying straight ahead until you have obviously passed through the area of strongest lift. Now start circling in fairly tight, but smooth circles. Because of the thermals inverted funnel shape, the lower the plane's altitude, the tighter the circles need to be. As the plane gains altitude, the diameter of the circles can be increased. If you see the plane falling

the stronger lift. Thermals are swept along by the wind so allow your circle to drift downwind with the thermal. Be careful when following a thermal downwind though as you still have to be able to make it back to the field!

If the sailplane is flying along and all of a sudden turns by itself, it has probably flown near a thermal. Keep in mind that thermal will have tendency to turn the plane away, so make a 180 degree turn and fly back towards the thermal. If you don't quickly encounter lift start searching around that area. If you find the thermal, follow the procedure outlined above to take advantage of it.

Thermals can be generated at any time of the day, but the strangest thermals are usually produced when the sun is directly overhead 10:00am to 2:00pm seems to be the best time to find the strongest thermals.

If you find yourself getting too high or you're having trouble getting out of a strong thermal. DO NOT dive the plane to lose altitude. This will very quickly over-stress the airframe and blow the wings off the plane. The easiest and safest way to quickly lose altitude is to apply full rudder (either right or left) and full up elevator. This will put the plane into a tight spin that will normally not over-stress the airframe. This is especially useful if the sailplane gets sucked into a cloud or gets too high to see. The spinning action will give the sun a better chance of reflecting off of the wing and catching your attention.

As you might expect, with all this rising air, there must also be some sinking air. This sinking air is the sailplane pilots enemy and one of the factors that really make soaring challenging. "Sink" as it is referred to, is usually not as strong as the nearby thermals, but it can quickly put a sailplane on the ground. Sink in one of the reasons, you have to be very careful when chasing a thermal downwind. If you encounter sink, immediately turn and fly 90 degrees to the direction of the wind. Apply a little down elevator to pick up some speed and get out of the bad air as quickly as possible.

## Safety Precautions

You as the pilot of this radio controlled model are responsible for any accidents that may occur during its use. We recommend that you fly your model at a model club field which is specially set up for model flying. Please do not fly your model in the middle

in a safe and careful manner and observe the

### Following Suggestions:

1. Do not fly your model close to buildings, power lines, roads, or other obstacles.
2. Do not fly in congested areas such as parks or occupied playing fields. Select wide, flat and open area to fly with no obstructions and plenty of room for learning to fly.
3. Do not fly without help from an experienced model pilot until you have learned how to fly. Your local model club or hobby shop can recommend an instructor if you do not already know one.
4. Always check for other modelers in the area and be sure that your frequency is not in use by someone else which might cause you model to crash. Always observe frequency control systems at flying fields and wait your turn to fly.
5. Never fly your model directly toward spectators, autos, other modelers or their models.
6. Always abide by the rules for model flying provided by your club and the governing agency for model aircraft in your country.

## Congratulations



Now that you have completed the assembly of your E-Hawk model we feel that have a very capable and good looking 2-meter electric sailplane. We hope that you will enjoy this model and get many hours of flying pleasure from its use. Thank you for purchasing this E-Hawk from Thunder Tiger and we look forward to providing you with other great R/C products in the future.