

EP F-20 Tigershark

EDF ARF



ElectriFly[™]
by Great Planes

INSTRUCTION MANUAL

SPECIFICATIONS

Wingspan:	22.5 in [565mm]	Weight:	26.8 oz [760 g]
Wing Area:	162 in ² [10.4 dm ²]	Wing Loading:	23.8 oz/ft ² [73 g/dm ²]

Length:	37 in [940mm]
Radio:	3-Channel minimum with two mini servos & mini Rx
Motor, ESC	24-45-3790kV Ammo [™] , 45A ESC
Battery:	2200mAh 14.8V 25C LiPo

WARRANTY

Great Planes[®] Model Manufacturing Co. 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 damaged by use or modification. **In no case shall Great Planes' liability exceed the original cost of the purchased kit.** Further, Great Planes reserves the right to change or modify this warranty without notice.

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

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.

To make a warranty claim send the defective part or item to Hobby Services at the address below:

Hobby Services
3002 N. Apollo Dr. Suite 1
Champaign IL 61822 USA

Include a letter stating your name, return shipping address, as much contact information as possible (daytime telephone number, fax number, e-mail address), a detailed description of the problem and a photocopy of the purchase receipt. Upon receipt of the package the problem will be evaluated as quickly as possible.

READ THROUGH THIS MANUAL BEFORE STARTING CONSTRUCTION. IT CONTAINS IMPORTANT INSTRUCTIONS AND WARNINGS CONCERNING THE ASSEMBLY AND USE OF THIS MODEL.



Champaign, Illinois
(217) 398-8970, Ext 5
airsupport@greatplanes.com

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The Northrop F-20 Tigershark was a development of the F-5 twin-engine light fighter jet aircraft. The project was initiated by a demand for exportable fighter jets to supply U.S. allies. Switching over to a single engine boosted the performance by 60%, but due to stiff competition and limited interest the project was cancelled after only 3 prototypes were made.

Great Planes brings you this unique aircraft now in EDF form. AeroCell™ foam construction provides a lightweight and durable structure that will handle everyday use. Two AIM-9 Sidewinder missiles and a display stand are included that will allow your F-20 EDF ARF to look as great sitting on the shelf as it does in the air. The recommended brushless motor will allow your F-20 EDF ARF to reach speeds up to 85 mph!

For the latest technical updates or manual corrections to the F-20 EDF ARF visit the Great Planes web site at www.greatplanes.com. Open the "Airplanes" link, then select the F-20 EDF ARF. If there is new technical information or changes to this model a "tech notice" box will appear in the upper left corner of the page.

AMA

If you are not already a member of the AMA, please join! The AMA is the governing body of model aviation and membership provides liability insurance coverage, protects modelers' rights and interests and is required to fly at most R/C sites.



Academy of Model Aeronautics

5151 East Memorial Drive
Muncie, IN 47302-9252
Tele. (800) 435-9262
Fax (765) 741-0057
Or via the Internet at:
<http://www.modelaircraft.org>

IMPORTANT!!! Two of the most important things you can do to preserve the radio controlled aircraft hobby are to avoid flying near full-scale aircraft and avoid flying near or over groups of people.

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

1. Your F-20 EDF ARF should not be considered a toy, but rather a sophisticated, working model that functions very much like a full-size airplane. Because of its performance capabilities, the F-20 EDF ARF, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage to property.
2. You must assemble the model **according to the instructions**. Do not alter or modify the model, as doing so may result in an unsafe or unflyable model. In a few cases the instructions may differ slightly from the photos. In those instances the written instructions should be considered as correct.
3. You must take time to **build straight, true and strong**.
4. You must use an R/C radio system that is in good condition, and other components as specified in this instruction manual. All components must be correctly installed so that the model operates correctly on the ground and in the air. You must check the operation of the model and all components before **every** flight.
5. If you are not an experienced pilot or have not flown this type of model before, we recommend that you get the assistance of an experienced pilot in your R/C club for your first flights. If you're not a member of a club, your local hobby shop has information about clubs in your area whose membership includes experienced pilots.

We, as the kit manufacturer, provide you with a top quality, thoroughly tested kit and instructions, but ultimately the quality and flyability of your finished model depends on how you build it; therefore, we cannot in any way guarantee the performance of your completed model, and no representations are expressed or implied as to the performance or safety of your completed model.

Remember: Take your time and follow the instructions to end up with a well-built model that is straight and true.

DECISIONS YOU MUST MAKE

This is a partial list of items required to finish the F-20 EDF ARF that may require planning or decision making before starting to build. Order numbers are provided in parentheses.

Radio Equipment Recommendations

The F-20 EDF ARF requires a minimum 3-channel radio system with three micro servos. Ailerons, elevator, and throttle are used (there is no rudder). A typical 4-channel basic radio system is adequate for this model. Complete radio systems that include micro servos and a receiver are available from your local hobby dealer. In any case, for this airplane you will need:

- Futaba® R617FS 2.4GHz Receiver (FUTL7627)
– OR –
- Futaba R114F 4-Channel FM Micro Receiver w/o Crystal (Low Band: FUTL0442; High Band: FUTL0443)
- Futaba FM Single conversion receiver crystal for R114F (Low Band: FUTL62**; High Band: FUTL63**)
- (3) Futaba S3114 Micro HT Servos (FUTM0414)

Battery, ESC & Motor Recommendations

The following motor and electronic speed control (ESC) have been tested extensively and are recommended. With this set up you can expect to draw 38A of current. If you're interested in checking your current, order the optional RC Electronics Watt's Up meter listed in the "Optional Supplies & Tools".

- Great Planes ElectriFly™ Silver Series SS-45, 45A brushless ESC (GPMM1840)
- Great Planes ElectriFly Power Series 2200mAh 14.8V 25C LiPo battery (GPMP0521)
- FlightPower EON-X Lite™ 2100mAh 14.8V 25C LiPo (FPWP4197)

In order to charge your LiPo flight packs, you'll need a LiPo charger and cell balancer. We recommend the following ones.

- PolyCharge4™ LiPo battery charger (GPMM3015)
- Equinox™ 1 to 5 cell LiPo cell balancer (GPMM3160)
- Equinox 4S FlightPower adapters (GPMM3182)
- 12 Volt DC power supply (HCAP0250)

ADDITIONAL ITEMS REQUIRED

Adhesives & Building Supplies

This is the list of Adhesives and Building Supplies that are required to finish the F-20 EDF ARF

- Hobby knife (EXLR9018)
- #11 Blades (HCAR0311)
- Pro™ 30-minute epoxy (GPMR6047)
- 1 oz. [30g] Medium Pro CA+ (GPMR6008)
- 1 oz. [30g] Medium Foam-Safe CA (GPMR6069)

- 1 oz. [30g] Thick Pro CA- (GPMR6014)
- Pro Threadlocker thread locking cement (GPMR6060)
- Numbered drill bits: #55, #57
- Denatured alcohol

Optional Supplies & Tools

Here is a list of optional tools that will help you build the F-20 EDF ARF.

- R/C-56 Glue 4oz (JOZR5007)
- Pro 6-minute epoxy (GPMR6045)
- Epoxy brushes (6, GPMR8060)
- Mixing sticks (50, GPMR8055)
- Mixing cups (GPMR8056)
- Panel line pen (TOPQ2510)
- 2 oz. [57g] Spray CA activator (GPMR6035)
- CA debonder (GPMR6039)
- 18" [457mm] Flexible steel rule (HCAR0460)
- Hobbico® Builder's Protractor (HCAR0490)
- AccuThrow™ Deflection Gauge (GPMR2405)
- Hobby Heat™ micro torch (HCAR0755)
- RC Electronics Watt's Up Watt Meter (RELP0100)
- C.G. Machine™ (GPMR2400)
- Segmented lead weights 6 oz (GPMQ4485)
- 1/4" [6.4mm] Heat shrink tubing 9" [228mm] (DUBM2188)
- 3/8" [9.5mm] Heat shrink tubing 9" [228mm] (DUBM2180)
- Red striping tape, 1/8" [3mm] (GPMQ1320)

IMPORTANT BUILDING NOTES

- When you see the term **test fit** in the instructions, it means that you should first position the part on the assembly without using any glue, then slightly modify or *custom fit* the part as necessary for the best fit.
- Whenever the term **glue** is written you should rely upon your experience to decide what type of glue to use. When a specific type of adhesive works best for that step, the instructions will make a recommendation.
- Whenever just **epoxy** is specified you may use **either** 30-minute (or 45-minute) epoxy **or** 6-minute epoxy. When 30-minute epoxy is specified it is **highly** recommended that you use only 30-minute (or 45-minute) epoxy, because you will need the working time and/or the additional strength.
- **Photos** and **sketches** are placed **before** the step they refer to. Frequently you can study photos in following steps to get another view of the same parts.

LITHIUM BATTERY HANDLING & USAGE

WARNING!! Read the entire instruction sheet included with the battery. Failure to follow all instructions could cause permanent damage to the battery and its surroundings, and cause bodily harm!

- ONLY use a LiPo approved charger. NEVER use a NiCd/ NiMH peak charger!
- NEVER charge in excess of 4.20V per cell.
- ONLY charge through the "charge" lead. NEVER charge through the "discharge" lead.
- NEVER charge at currents greater than 1C.
- ALWAYS set charger's output volts to match battery volts.
- ALWAYS charge in a fireproof location.
- NEVER trickle charge.
- NEVER allow battery temperature to exceed 150° F [65° C].
- NEVER disassemble or modify pack wiring in any way or puncture cells.
- NEVER discharge below 3.0V per cell.
- NEVER place on combustible materials or leave unattended during charge or discharge.
- ALWAYS KEEP OUT OF REACH OF CHILDREN.

ORDERING REPLACEMENT PARTS

Replacement parts for the Great Planes F-20 EDF are available using the order numbers in the Replacement Parts List that follows. The fastest, most economical service can be provided by your hobby dealer or mail-order company.

To locate a hobby dealer, visit the Great Planes web site at www.greatplanes.com. Choose "Where to Buy" at the bottom of the menu on the left side of the page. Follow the instructions provided on the page to locate a U.S., Canadian or International dealer.

Parts may also be ordered directly from Hobby Services by calling (217) 398-0007, or via facsimile at (217) 398-7721, but full retail prices and shipping and handling charges will apply. Illinois and Nevada residents will also be charged sales tax. If ordering via fax, include a Visa® or MasterCard® number and expiration date for payment.

Mail parts orders and payments by personal check to:

Hobby Services
3002 N. Apollo Drive, Suite 1
Champaign, IL 61822

Be certain to specify the order number exactly as listed in the Replacement Parts List. Payment by credit card or personal check only; no C.O.D.

If additional assistance is required for any reason contact Product Support at productsupport@greatplanes.com, or by telephone at (217) 398-8970.

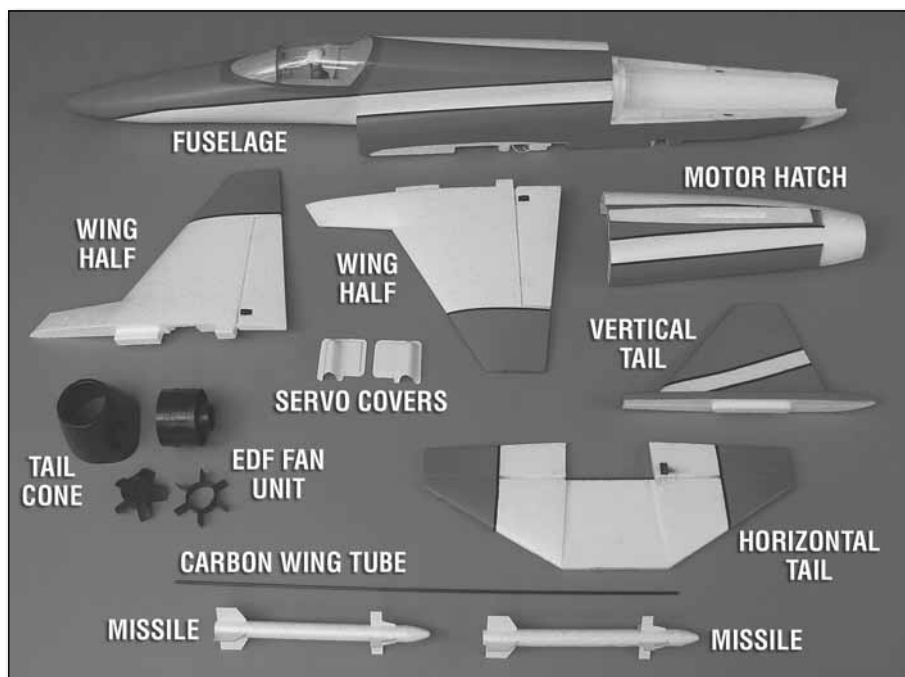
REPLACEMENT PARTS LIST

Order No.	Description
GPMA3230	Fuselage Set
GPMA3231	Wing Set
GPMA3232	Tail Surfaces
GPMA3233	Canopy/Hatch
GPMA3234	Rocket Set
GPMA3235	Tail Cone
GPMA3236	Decal Sheet
GPMA3237	Servo Covers
GPMA3238	Display Stand
GPMA3239	Fan Hatch/Fin
GPMG3910	EDF Fan Unit
GPMG5185	Ammo 24-45-3790 Brushless Motor
NOTE ▶	Full-size plans are not available. You can download a copy of this manual at www.greatplanes.com .

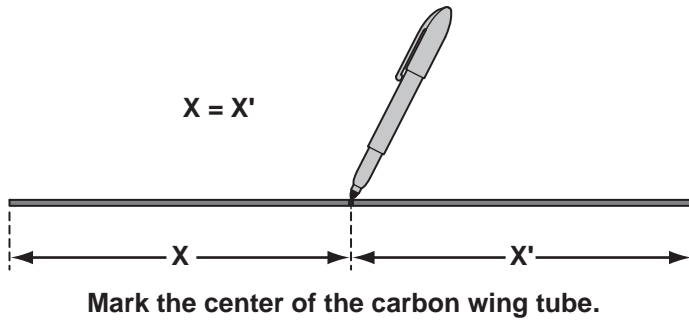
KIT INSPECTION

Before starting to build, take an inventory of this kit to make sure it is complete and inspect the parts to make sure they are of acceptable quality. If any parts are missing or are not of acceptable quality, or if you need assistance with assembly, contact **Product Support**. When reporting defective or missing parts, use the part names exactly as they are written in the Kit Contents list.

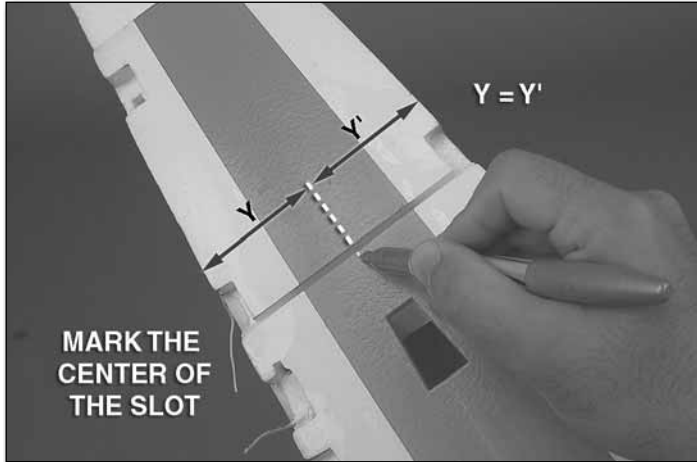
Great Planes Product Support:
3002 N Apollo Drive, Suite 1
Champaign, IL 61822
Telephone: (217) 398-8970, ext. 5
Fax: (217) 398-7721
E-mail: airsupport@greatplanes.com



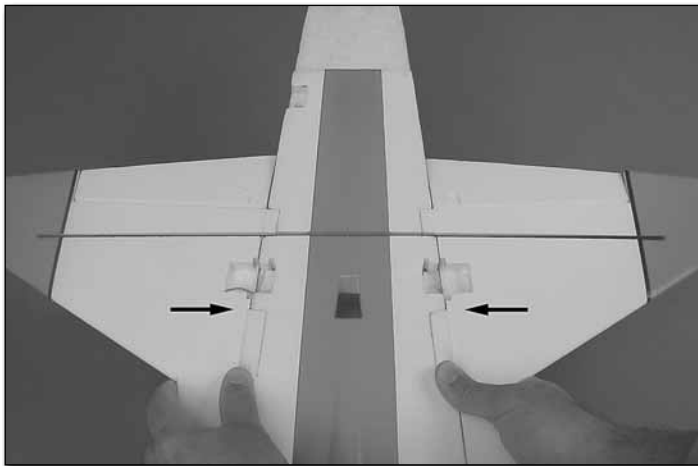
WING INSTALLATION



- ❑ 1. Locate the 3 x 460mm carbon wing tube. Make a mark in the center of the tube by measuring from side to side and dividing that figure by two. Where distance X equals distance X', make a small mark on the tube using a felt-tip pen or a piece of trim tape.



- ❑ 2. Turn the fuselage over and mark the center of the wing tube slot. Where distance Y equals distance Y', mark the fuselage.



- ❑ 3. Test fit the carbon wing tube into the corresponding slot in the fuselage and test fit each of the wings. Make sure that your centering marks are correct and correspond with each other before gluing the wing tube and wings. Make adjustments as necessary.

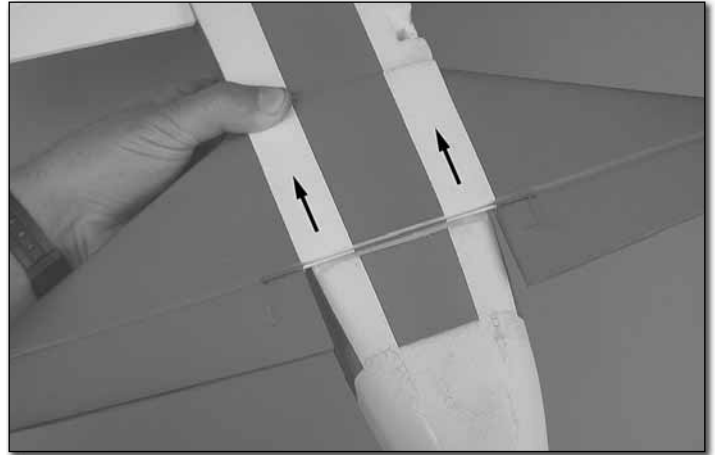


- ❑ 4. Clean all gluing surfaces with denatured alcohol. Using thick regular CA, apply a continuous bead of glue into the spar slot in the bottom of the fuselage. Center the carbon wing spar using the marks that you made and press it up into the slot completely. Set the fuselage on a flat table and make sure that the wing spar is parallel with the table top. This will ensure that you have inserted the spar correctly. Use a cotton swab or a paper towel to clean up the excess CA from the slot. Set the fuselage aside and allow the CA to cure or spray some CA accelerator on to speed up the cure. **Note:** For the remaining steps in this section, please do not use CA accelerator to cure the CA adhesive until after step 7.



- ❑ 5. Apply thick CA to the wing tabs and the wing root of each wing where the wing will join with the fuselage. **Note:** Wipe the glue across all mating surfaces. Remove excess glue so that the CA does not run when the wings are joined.

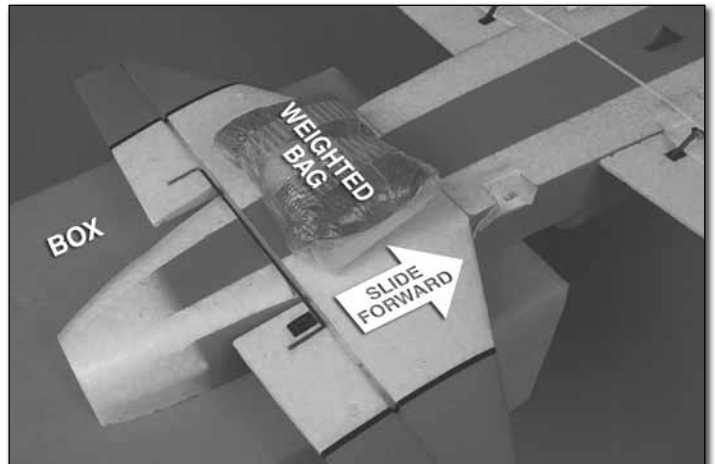
HORIZONTAL TAIL INSTALLATION



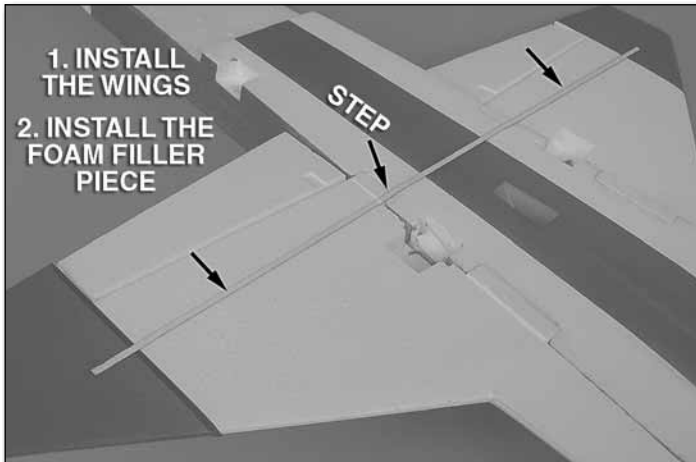
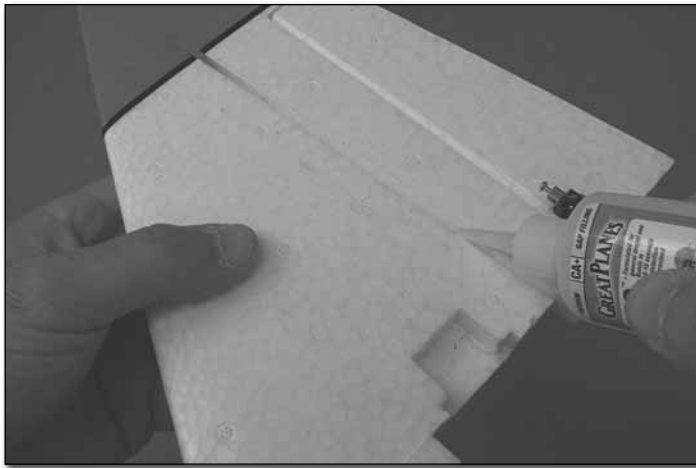
❑ 1. Test fit the horizontal tail to the bottom of the fuselage. Slide the stab all the way forward. **Note:** The elevator joiner wire must clear the slot in the fuse.



❑ 2. Apply thick or medium CA to the center section of the horizontal tail where it contacts the fuselage.



❑ 3. Fit the horizontal tail to the fuselage, making sure to slide it all the way forward. Check for proper operation of the elevator. Spray some CA accelerator into the joint to cure the CA or turn the fuse over and place a box under the fan channel to support it as you place weight on the stab center section. Allow the CA to fully cure.



❑ 6. Turn the wings over and apply a bead of CA into the spar slot in the bottom of each wing. Push the wing tube into the slot in each wing as you slide the wing firmly up against the fuselage joint. Fit the wing tabs tightly into the corresponding fuse pockets.

❑ 7. Insert the 460mm foam filler piece into the wing slot, being careful to orient the foam so that the stepped portion faces down and matches the step in the bottom of the fuselage. Push the foam piece into the slot completely so that the filler piece lies flush with the bottom surface of the wing. Clean up any excess CA with a paper towel. Set the model aside to let the CA cure or spray CA accelerator into the joint.

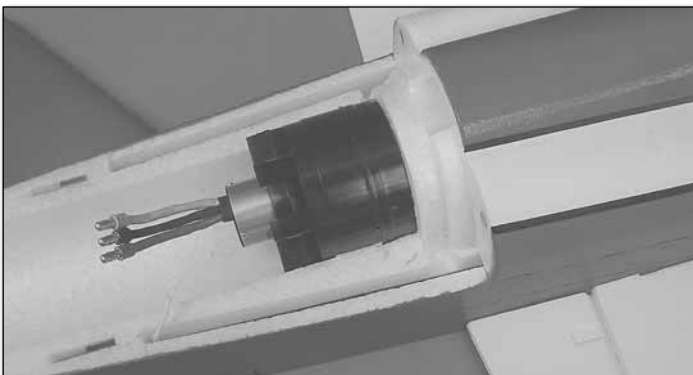
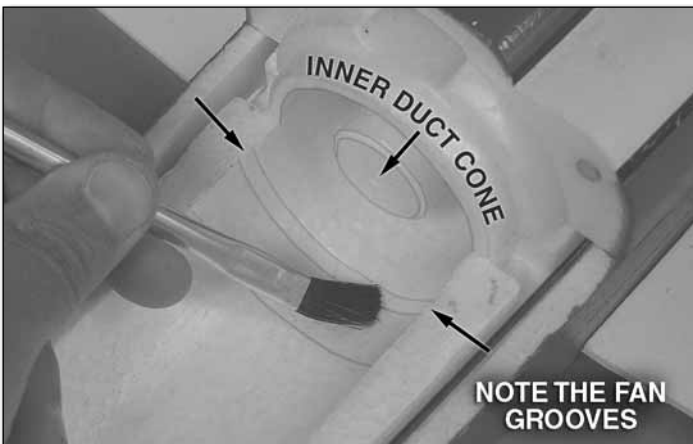
EDF FAN PREPARATION & INSTALLATION

This model uses the Great Planes ElectrIFly Ammo 24-45-3790 brushless in-runner motor (GPMG5185, included) and the Silver Series SS-45 brushless ESC (GPMM1840, not included)

NOTE: DO NOT INSTALL THE FAN'S SPINNER CONE

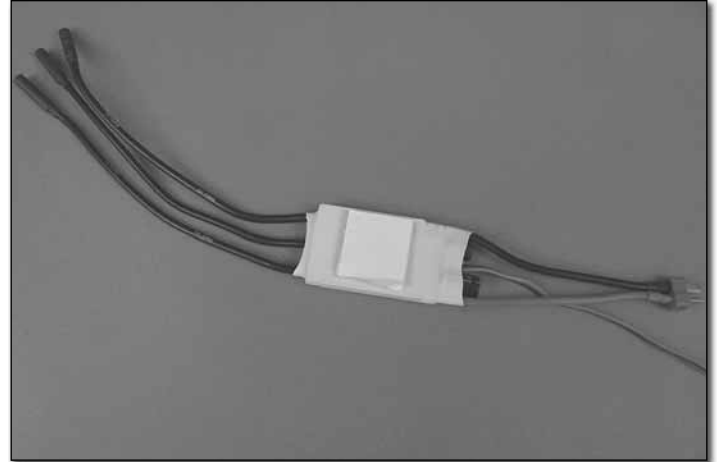


❑ 1. Use the included EDF fan instruction manual to assemble and break-in the EDF fan unit. Do not install the rotor cone. Use threadlocking compound on all screws. Before you glue the EDF unit into your airplane, we recommend that you check the fan and motor for proper operation. If there is a problem it is much easier to take care of before the fan is glued into the airframe. If you prefer, you can use double-sided tape to hold your fan in place, but you will need to recess the EDF channel in the fuse to accommodate the thickness of the foam tape.

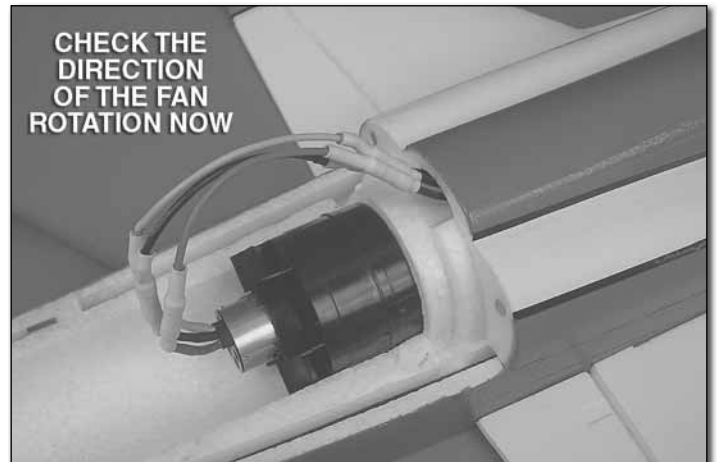


❑ 2. Apply 30-minute epoxy or CA to the fan duct in the recessed area where the EDF fan unit mounts. Mount the

fan in the model so that the ridges on the fan case drop into the corresponding grooves in the fan duct. Mount the motor so that the wires exit the motor and face the top of the model. Allow the glue to fully cure. **Note:** During installation, you may notice that the fan rotor's flange makes contact with the inner duct cone. This is normal and helps improve fan efficiency. When you first run the motor on the plane, the fan will seat itself in the foam. If you feel that the fan is too tight against the inner duct cone, you may trim the duct cone using a hobby knife before installation. Trim a little at a time and check the fit.



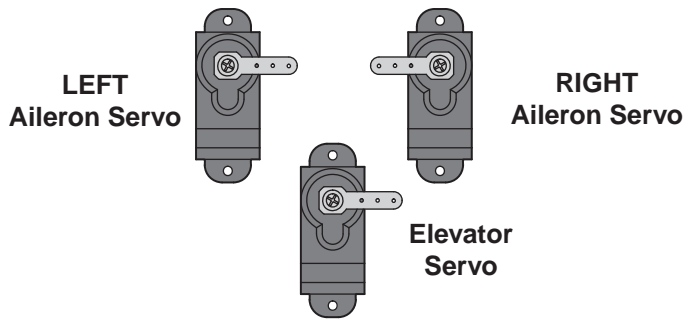
❑ 3. Cut the 2" [51mm] piece of hook and loop fastener in half so that you have equal amounts of material to fasten your ESC and receiver in place. Stick one piece on the back side of your ESC. Turn the model over and route the ESC motor leads through the upper channel inside the fuse and out into the motor bay.



❑ 4. Connect the supplied motor lead extensions to the motor wires. Refer to the instructions that came with your ESC to correctly arm and operate the motor. Check the direction of motor operation and that air is blowing out of the back side of the EDF unit. If the fan is rotating backwards, swap the position of any two motor leads and test the fan rotation again. Use 1/4" [6.4mm] diameter heat shrink tubing (not supplied) to secure each connection. If heat shrink tubing is not available, you may wrap the connectors with electrical tape.

INSTALL THE RADIO GEAR

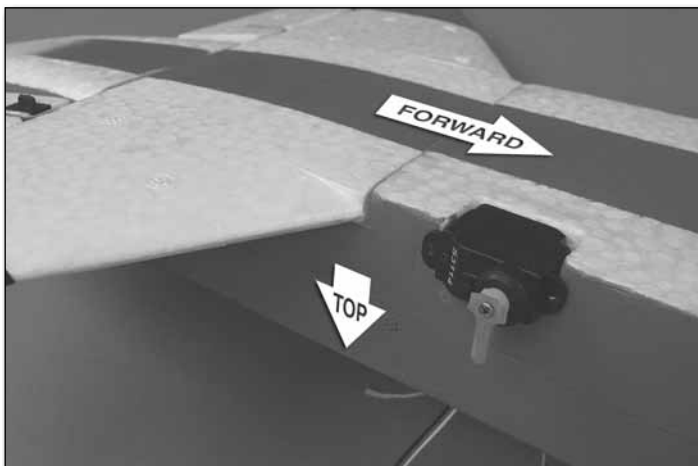
With servos centered, position each arm 90° to the servo case.



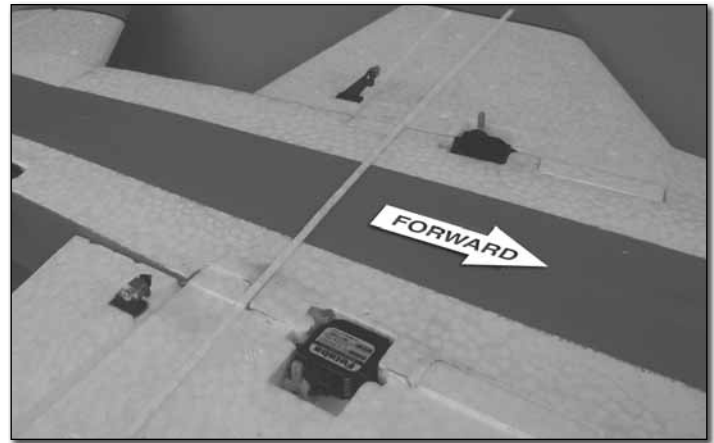
- ❑ 1. Use your radio to center each of your servos. Remove the servo arms and reposition each one so that the servo arm is 90° to the servo case. Prepare two aileron servos and one elevator servo as shown in the sketch. Clip off the unused servo arms. Reinstall the servo arm screw on each servo.



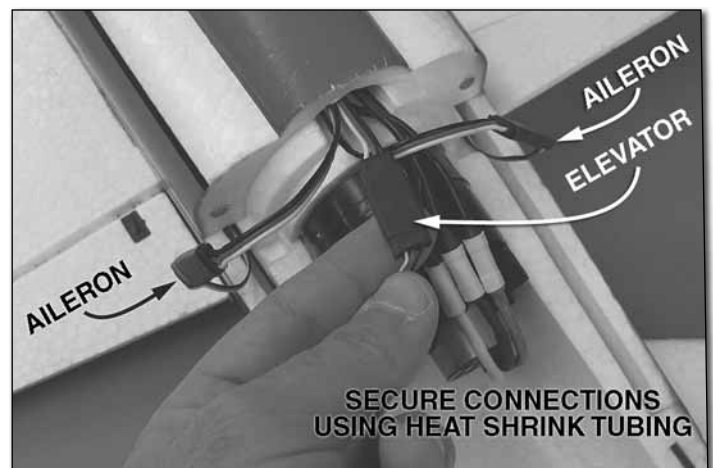
- ❑ 2. Using a #57 [1.09mm] drill bit, enlarge the hole that is 5/16" [7.9mm] from the output shaft on each servo arm. If you don't have a #57 drill bit, carefully use a hobby knife to enlarge the hole until you can fit the 1mm Z-bend pushrods.



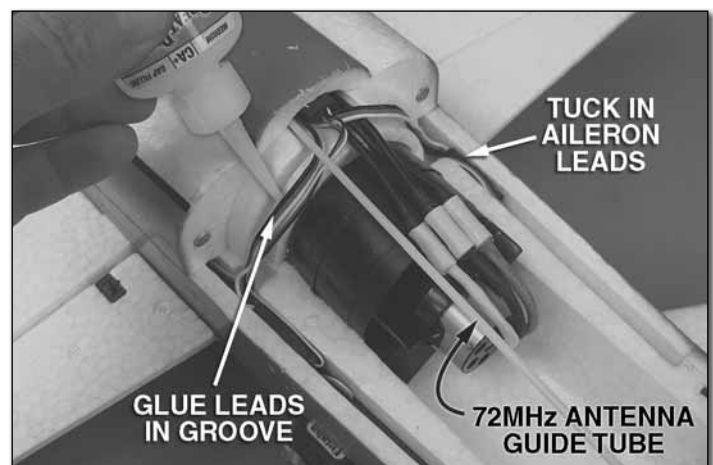
- ❑ 3. Route the elevator servo lead through the slot in the bottom of the fuselage. Make sure that the servo's output shaft faces forward and the servo arm faces up toward the top of the model. Clean the servo with denatured alcohol, then glue into position as shown using thick or medium CA.



- ❑ 4. Identify the left and right aileron servos and tie each servo lead guide string to its corresponding servo lead. Pull each servo lead through the fuselage and glue each servo in position.

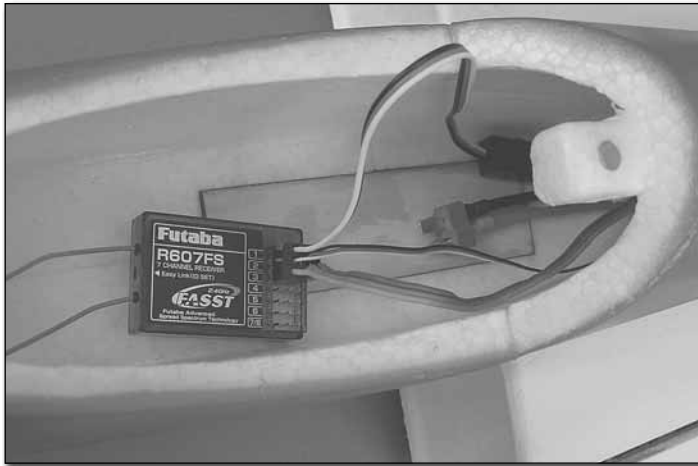


- ❑ 5. Remove the guide strings from the aileron servo wires. Attach the supplied Y-harness to the two aileron servo leads and the 14" [365mm] extension to the elevator servo lead using electrical tape or 3/8" [9.5mm] diameter heat shrink tubing to secure the connections. Tie the guide string to the aileron Y-harness and the elevator extension lead and route the wires into the radio compartment. **Note:** You should be careful to match the polarity of the servo leads with the lead extensions.

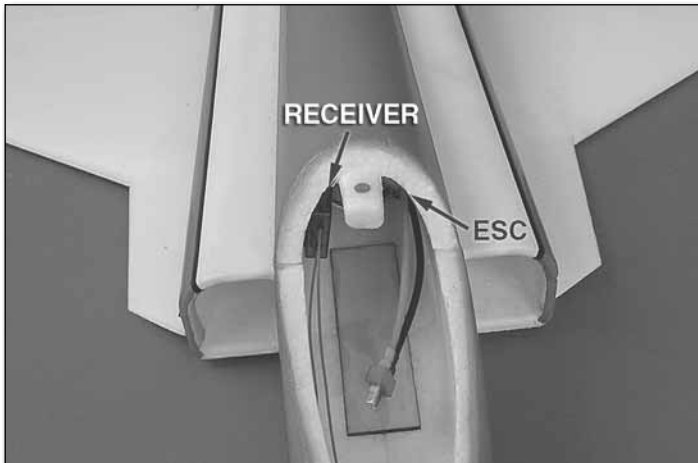


- ❑ 6. Pull the servo leads through the upper channel so that they are positioned as shown. Route the elevator lead so that

the connector tucks into the upper channel. Tuck the aileron connectors into the side channels and route the leads up along the notched groove. Place a small drop of CA onto the wires to hold them to the notched groove. Note: If you are using a 72MHz radio system, route the included antenna tube through the upper channel at this time.

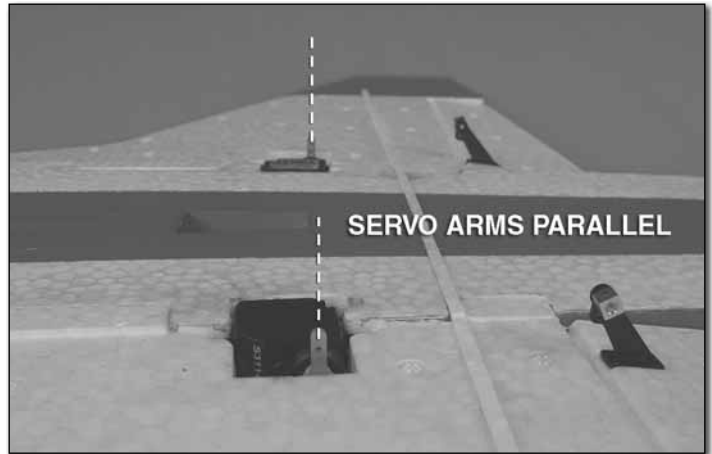


7. Stick a 1" [25mm] piece of hook and loop fastener material to the back side of your receiver. Plug the servo leads and the ESC signal lead into their respective channel in the receiver.



8. Peel the backing paper off of the hook and loop material and stick your ESC and receiver inside the fuselage in the locations shown. You can stick the ESC to the left or the right side depending on the location of your battery's wires.

LINK THE CONTROLS



1. Use your radio system to verify that the servos are centered. The aileron servos should be parallel with each other. Use your radio's sub-trim function to correct this. Caution: Do not arm the motor by moving the throttle. Debris can be ingested and thrown causing damage or injury. If you do accidentally arm the motor, unplug the battery, set the throttle to cutoff, and re-apply power to reset the ESC.



2. Remove the locking screw from the screw lock pushrod connectors on the elevator and both ailerons.

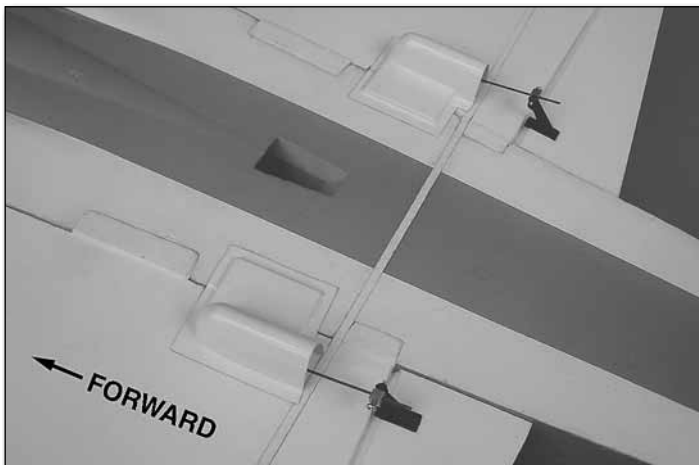


3. Install the 1 x 130mm wire pushrod onto the elevator servo so that the Z-bend is in the hole you drilled on the servo

arm. Deflect the elevator down and fit the pushrod into the screw-lock pushrod connector. *Apply a drop of thread locking compound to the screw threads* and install the locking screw. With the elevator at neutral and the elevator servo centered, tighten the locking screw. **Note:** If you have a difficult time trying to insert the pushrod while deflecting the controls, trim off 1/8" [3.2mm] of the pushrod end and try again.

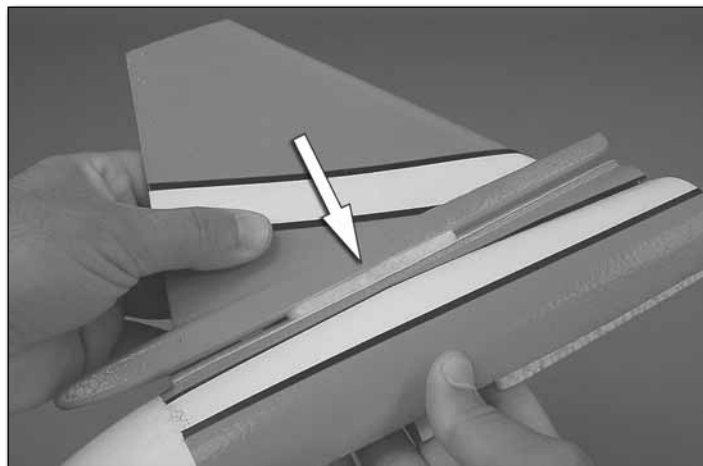


❑ 4. Install the 1 x 60mm wire pushrods onto each aileron servo so that the Z-bend is in the hole you drilled on the servo arm. Deflect each aileron up and fit the pushrod into the screw-lock pushrod connector. *Apply a drop of thread locking compound to the screw threads* and install the locking screw. Set each aileron at neutral throw and tighten the locking screw.

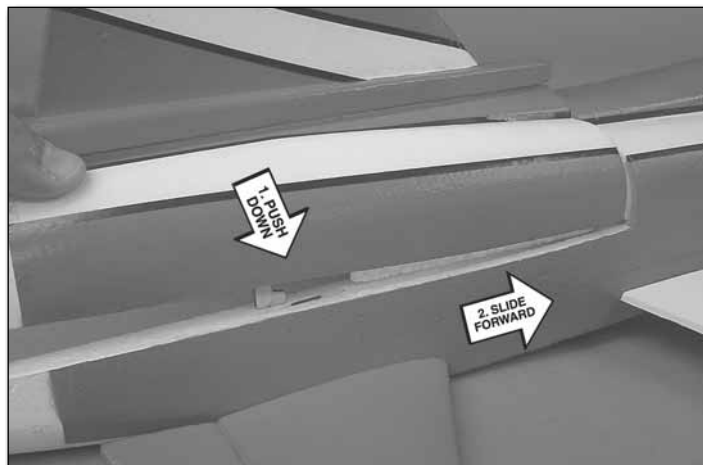


❑ 5. Peel the backing paper from the double-sided tape applied to the left and right aileron servo covers. Install the servo covers as shown.

HATCH & VERTICAL TAIL INSTALLATION

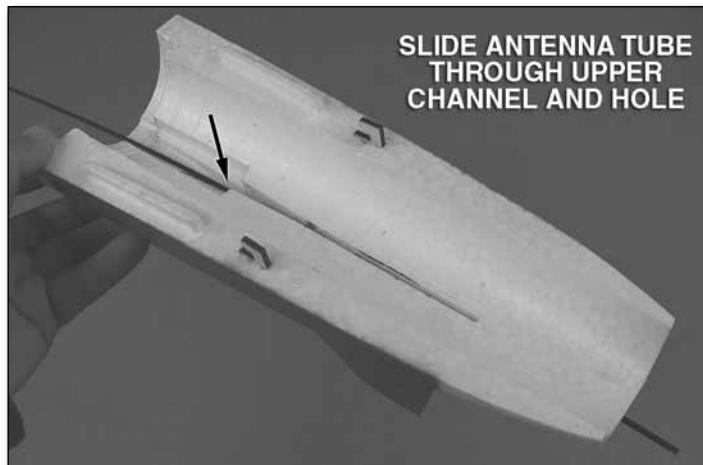


❑ 1. Apply a bead of medium regular CA adhesive to the motor hatch at the base of where the vertical fin will mount. Fit the fin to the motor hatch.

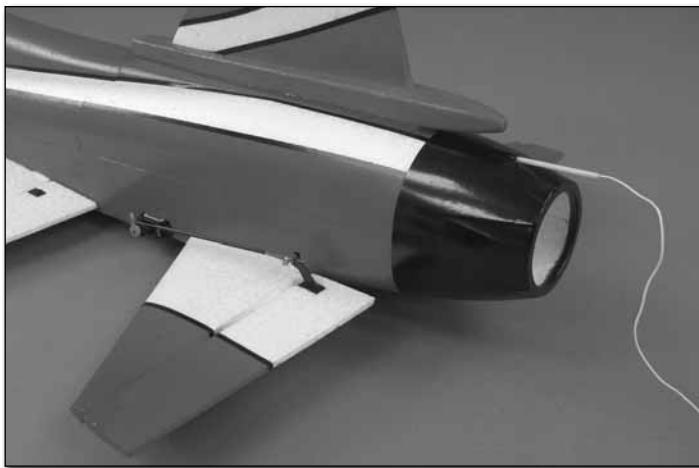


❑ 2. Test fit the motor hatch to the fuselage. Once the tabs are in the slots, push the hatch down and slide it forward until the magnets engage.

If you are installing a 2.4GHz radio system, please install the hatch and skip to step 4.

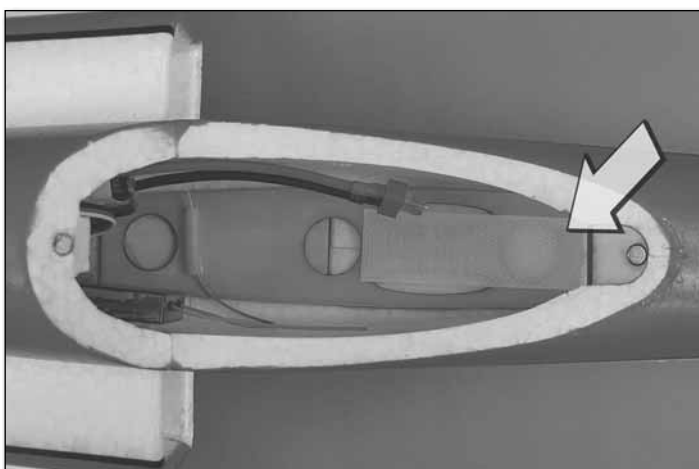


❑ 3. If you are using a 72MHz radio system, slide the antenna and antenna tube into the upper channel in the hatch as you install the hatch.

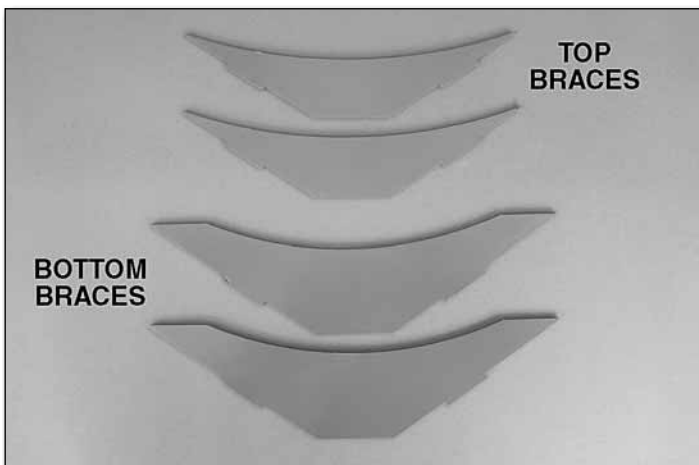


- ❑ 4. Install the tail cone. Use cellophane tape (household tape) to secure it to the hatch and the fuselage. If you choose to use glue, R/C-56 Glue (JOZR5007) will allow easy removal of the hatch in the future. Medium CA is also acceptable, but only if two small drops are used 180° apart from each other.

GET THE MODEL READY TO FLY

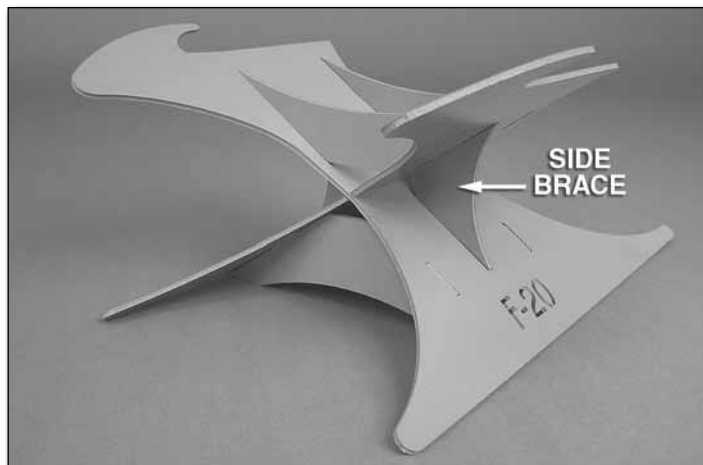


- ❑ 1. Stick the hook side of the 4" [102mm] piece of hook and loop material to the battery tray in the location shown.



- ❑ 2. Locate the parts to assemble the foam display stand. There should be two side braces, two top braces (small), two bottom braces (large), and two interlocking supports. **Note:** The foam

display stand is not made of AeroCell™ foam. Only foam-safe CA adhesive can be used. Regular CA will melt the foam.



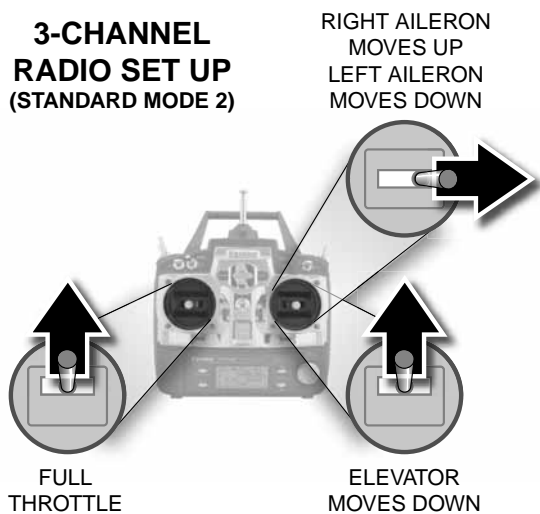
- ❑ 3. Assemble the stand by first interlocking the supports and then adding the two vertical side braces. Add the top and bottom lateral braces next. The top braces are smaller to allow the aileron servos and linkages to clear.

- ❑ 4. Apply the pre-cut decals, using the box photos as a guide for placement

Check the Control Directions

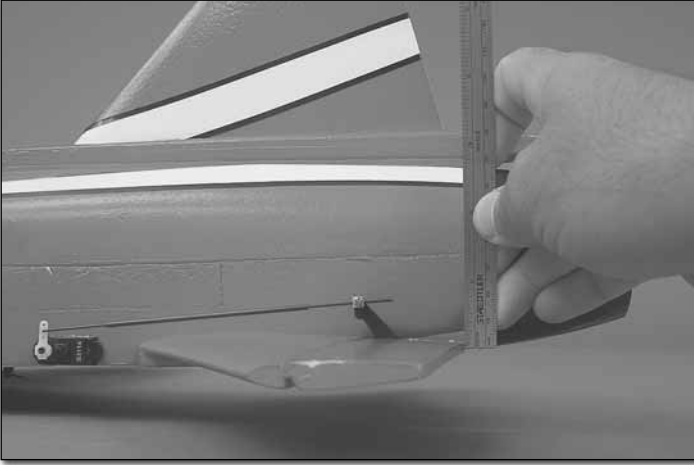
- ❑ 1. Turn on the transmitter and receiver and center the trims. If necessary, remove the servo arms from the servos and reposition them so they are centered. Reinstall the screws that hold on the servo arms.

- ❑ 2. With the transmitter and receiver still on, check all the control surfaces to see if they are centered. If necessary, adjust the screw-lock pushrod connectors to center the control surfaces.



- ❑ 3. Make certain that the control surfaces and the ESC respond in the correct direction as shown in the diagram. If any of the controls respond in the wrong direction, use the servo reversing in the transmitter to reverse the servos connected to those controls. Be certain the control surfaces have remained centered. Adjust if necessary.

Set the Control Throws



- ❑ 1. Use a ruler, protractor, Great Planes AccuThrow™, or inclinometer to accurately measure and set the control throw of each control surface as indicated in the chart that follows. If your radio does not have dual rates, we recommend setting the throws at the **low rate** setting.

Note: The throws are measured at the **widest part** (root) of the elevators and ailerons.

- ❑ 2. Depending on your radio, you may have to adjust the mechanical position of the pushrod linkages in order to achieve the proper throw. This is preferred to adjusting AFR, ATV, or servo end-points in the transmitter because it preserves the control resolution of the servo and allows for better control of the model.

- ❑ 3. Tighten all screw-lock pushrod connectors and install all servo arm mounting screws.

These are the recommended control surface throws:

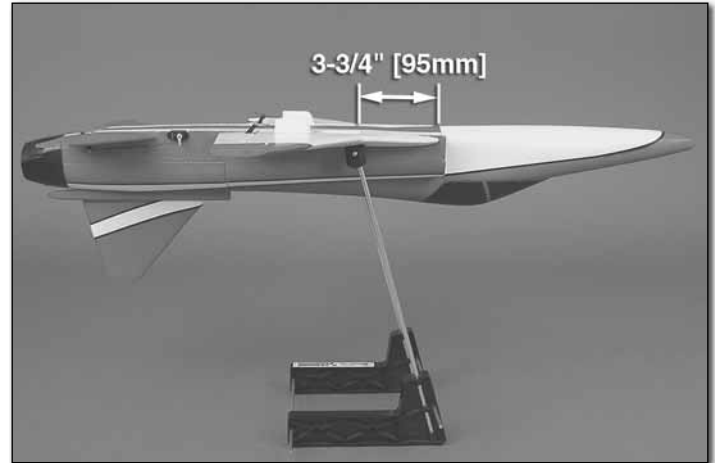
	HIGH RATE		LOW RATE	
	Up	Down	Up	Down
ELEVATOR	3/8"	3/8"	1/4"	1/4"
	[10mm]	[10mm]	[7mm]	[7mm]
	14°	14°	10°	10°
AILERONS	3/8"	3/8"	1/4"	1/4"
	[10mm]	[10mm]	[7mm]	[7mm]
	11°	11°	7.5°	7.5°

Note: Use high rate elevator for takeoffs and landings.

Balance the Model (C.G.)

At this stage the model should be in ready-to-fly condition. Place the battery in the battery tray but do not connect it.

- ❑ 1. The **C.G. is located 3-3/4" [95mm] back from the LE of the wing at the fuselage** (the seam where the wing panels have been joined to the fuselage). Make a small mark at this location on the top side of the wing using a felt-tipped pen or a piece of trim tape. Please fly the model at this C.G. for the first few flights. After this, you may move the C.G. forward up to 1/8" [3.2mm] or aft up to 1/16" [1.6mm].



- ❑ 2. With all parts of the model installed (ready to fly), place the model upside-down on a Great Planes C.G. Machine, or lift it upside-down at the balance point you marked.

- ❑ 3. If the tail drops, the model is "tail heavy" and the battery pack must be shifted forward to balance. If the nose drops, the model is "nose heavy" and the battery pack must be shifted back to balance. If you still cannot achieve the recommended C.G., you may add segmented lead weight to the nose or tail (GPMQ4485). The C.G. range of this airplane is from 3-5/8" [92mm] to 3-13/16" [97mm] as measured from the LE of the wing at the root.

LITHIUM BATTERY HANDLING & USAGE

WARNING!! Read the entire instruction sheet included with your battery. Failure to follow all instructions could cause permanent damage to the battery and its surroundings, and cause bodily harm!

- **ONLY** use a LiPo approved charger. **NEVER** use a NiCd/NiMH peak charger.
- **NEVER** charge in excess of 4.20V per cell.
- **ONLY** charge through the “charge” lead. **NEVER** charge through the “discharge” lead.
- **NEVER** charge at currents greater than 1C.
- **ALWAYS** set the charger’s output volts to match the battery volts.
- **ALWAYS** charge in a fireproof location.
- **NEVER** trickle charge.
- **NEVER** allow the battery temperature to exceed 150° F (65° C).
- **NEVER** disassemble or modify the pack wiring in any way or puncture the cells.
- **NEVER** discharge below 2.5V per cell.
- **NEVER** place the battery or charger on combustible materials or leave it unattended during charge or discharge.
- **ALWAYS** KEEP OUT OF THE REACH OF CHILDREN.
- **NEVER** charge the battery in the plane.
- **ALWAYS** remove the battery from the plane after a crash. Set it aside in a safe location for at least 20 minutes. If the battery is damaged in the crash it could catch fire.

If the battery starts to swell, quickly move the battery to a safe location, preferably outside: Place it in a bucket, covering the battery with sand.

PREFLIGHT

Identify Your Model

No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on the back cover of this manual and place it on or inside your model.

Charge the Batteries

Follow the battery charging instructions that came with your radio control system to charge the transmitter battery. You should always charge your transmitter battery the night before you go flying, and at other times as recommended by the radio manufacturer. Charge your airplane’s LiPo battery according to the battery manufacturer’s recommendations and always charge it before you fly.

CAUTION: Unless the instructions that came with your radio system state differently, the **initial** charge on **new** transmitter batteries should be done for **15 hours using the slow-charger that came with the radio system**. This will “condition” the battery so that the next charge may be done using the fast-charger of your choice. If the initial charge is done with a fast-charger the batteries may not reach their full capacity and you may be flying with batteries that are only partially charged.

Range Check

Ground check the operational range of your radio before the first flight of the day. With the transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet [30m] away from the model and still have control. Have an assistant stand by your model and, while you work the controls, tell you what the control surfaces are doing. Repeat this test **with the motor running** at various speeds with an assistant holding the model, using hand signals to show you what is happening. If the control surfaces do not respond correctly, **do not fly!** Find and correct the problem first. Look for loose servo connections or broken wires, corroded wires on old servo connectors, poor solder joints in your battery pack or a defective cell, or a damaged receiver crystal from a previous crash.

AMA SAFETY CODE (EXCERPTS)

Read and abide by the following excerpts from the Academy of Model Aeronautics Safety Code. For the complete Safety Code refer to *Model Aviation* magazine, the AMA web site or the Code that came with your AMA license.

General

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

2) I will not fly my model aircraft higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right-of-way 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.

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

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

Radio Control

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

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

3) 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.

5) **I will not knowingly operate my model within three miles of any pre-existing flying site except in accordance with the frequency sharing agreement listed** (in the complete AMA Safety Code).

9) Under no circumstances may a pilot or other person touch a powered model in flight; **nor should any part of the model other than the landing gear intentionally touch the ground, except while landing.**

CHECK LIST

During the last few moments of preparation your mind may be elsewhere anticipating the excitement of the first flight. Because of this, you may be more likely to overlook certain checks and procedures that should be performed before the model is flown. To help avoid this, a check list is provided to make sure these important areas are not overlooked. Many are covered in the instruction manual, so where appropriate refer to the manual for complete instructions. Be sure to check the items off as they are completed.

- 1. Check the C.G. according to the measurements provided in the manual.
- 2. Be certain the battery and receiver are securely mounted in the fuselage.
- 3. Confirm that all controls operate in the correct direction and the throws are set up according to the manual.
- 4. Inspect the ducted fan unit for obvious damage and tighten the fan screw.
- 5. Check the operation of the ducted fan unit prior to each flight.
- 6. Make sure that all servo arms are secured to the servos with the screws included with your radio.
- 7. Place your name, address, AMA number and telephone number on or inside your model.
- 8. If you wish to photograph your model, do so before your first flight.
- 9. Range check your radio when you get to the flying field.

FLYING

IMPORTANT: If you are an inexperienced modeler we strongly urge you to seek the assistance of a competent, experienced R/C pilot to check your model for airworthiness AND to teach you how to fly. Attempting to learn to fly on your own is dangerous and may result in destruction of your model or even injury to yourself and others. You should fly under the careful watch of an instructor until you have acquired the skills necessary for safe and fully controlled operation of your model.

Launching

Less-experienced flyers should fly the F-20 EDF ARF only in calm (less than five miles per hour) conditions. Frequently, winds are calm in the early morning and early evening. Often these are the most enjoyable times to fly anyway!

We suggest always using a skilled assistant to help you launch the airplane. Use HIGH rates for takeoff and let the model build up speed before attempting to climb out.

Turn on the transmitter and plug the battery into the ESC. Turn on the receiver by following the instructions that came with your ESC. Secure the canopy hatch in place.

IMPORTANT: Confirm that the transmitter operates the controls properly by moving the sticks and watching the surfaces respond.

When you're ready to launch, have your assistant hold the F-20 EDF ARF behind the C.G above the wing for an underhanded toss or behind the TE of the wing for an overhanded toss. Practice the throwing motion and choose the method that best suits the person launching the model. Line up the model so that the nose is pointed directly into the wind. Advance the power to full and have your assistant toss the model into the air with a slightly nose-up attitude. Be ready on the controls to make the corrections necessary to build up speed while maintaining a wings-level attitude.

When the model has gained adequate flying speed under its own power, gently pull the elevator stick back until the airplane starts a gradual climb. If you notice the model losing speed, release the elevator stick and allow the model to gain airspeed before climbing out. Continue a gradual climb and establish a gentle turn (away from yourself and others) until the airplane reaches an altitude of 20 to 30 meters [75 to 100 feet].

Flight

The main purpose of the first few flights is to learn how the model behaves and to adjust the trims for level flight. After the model has climbed to a safe altitude, reduce the throttle slightly to slow the model, yet maintain altitude. The F-20 EDF ARF should fly well at about 1/2 throttle.

Adjust the elevator trim so the model flies level at the throttle setting you are using. Adjust the aileron trim to level the wings. It may take a few minutes to get the trims adjusted, but this should be your first priority once at a comfortable altitude. Continue to fly around, executing turns and making mental notes (or having your assistant take notes for you) of what additional adjustments or C.G. changes may be required to fine tune the model so it flies the way you like. Try some slow flight and standard stalls to familiarize yourself with the airplane's slow-speed handling characteristics. When you are comfortable, try making a few practice approaches.

Landing

To minimize wear and the possibility of damage, choose a grass runway that is flat and free of deep ruts. Bring the power back to about 1/2 stick of throttle and turn downwind (keeping your current traffic pattern in mind). Maintain your speed and altitude during your downwind leg and turn to base. Start a descent and throttle back a few clicks. Keep power in when you turn to final. When you're about 6 meters [20 feet] from the end of the runway, cut the power and drop the nose slightly to maintain speed. Flare gently for landing.

Until you are able to accurately judge how far the F-20 EDF ARF can glide, it may be helpful to reserve some battery power to run the motor so the plane can be flown back to the runway.

GOOD LUCK AND GREAT FLYING!

This model belongs to:

Name _____

Address _____

City _____

State ***ZIP*** _____

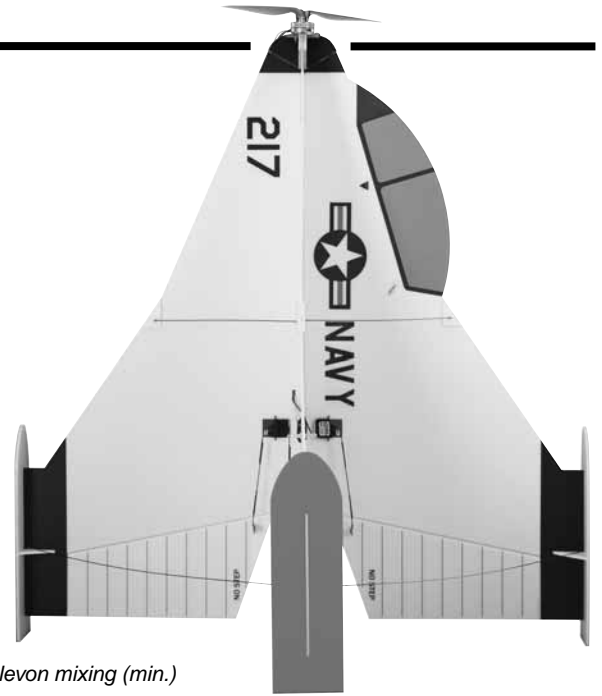
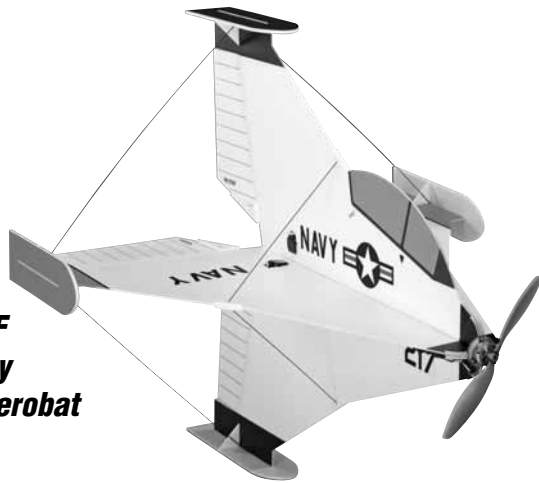
Phone # _____

AMA # _____

Make a copy of this identification tag and put it on or inside your model.

ALSO AVAILABLE FROM GREAT PLANES

ElectriFly™ VFO ARF **Almost Ready-to-Fly** **Electric Sport/3D Aerobat** **GPMA1135**



Part plane, part helicopter — all fun!

Wingspan: 26.5 in (675 mm)
Wing Area: 382 in² (24.6 dm²)
Weight: 9-10 oz (255-285 g)
Wing Loading: 3.4-3.8 oz/ft² (10-12 g/dm²)
Length: 29.5 in (750 mm)

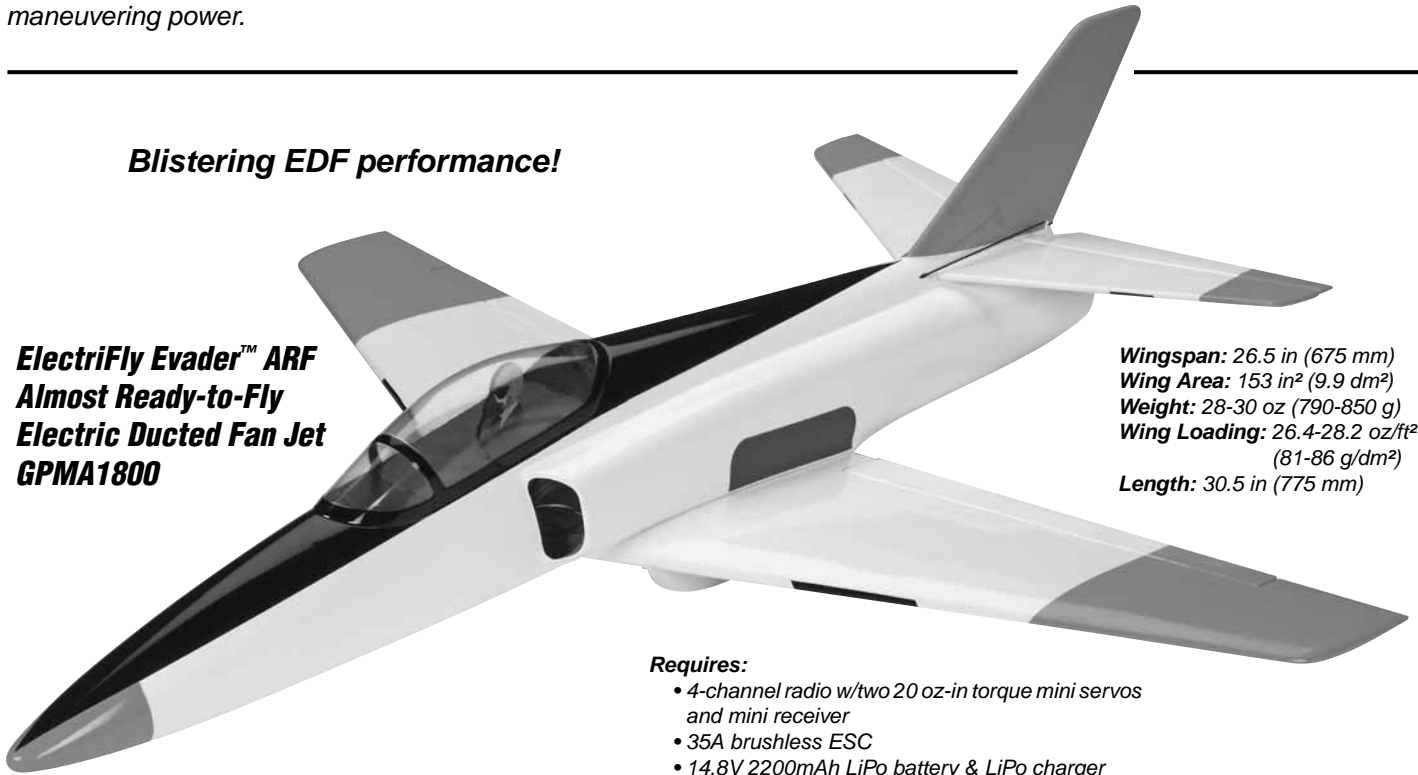
Requires:

- 6-channel radio w/4 micro servos & elevon mixing (min.)
- 300-size outrunner brushless motor
- 12A brushless ESC (min.)
- 11.1V 300mAh LiPo battery & LiPo charger

The VFO (Vertical Flying Object) takes off like a rocket, hovers like a heli and flies like a plane — and does it all with economical on-board components. It performs Harriers, high-alpha and prop hangs with ease, and transitions from a Wall directly into a tumbling back flip. Lightweight, finished foam parts with servo cut-outs and easy-to-use pushrods make assembly quick and easy. Carbon-fiber bracing offers lightweight support...and oversized control surfaces deliver massive maneuvering power.

Blistering EDF performance!

ElectriFly Evader™ ARF **Almost Ready-to-Fly** **Electric Ducted Fan Jet** **GPMA1800**



Wingspan: 26.5 in (675 mm)
Wing Area: 153 in² (9.9 dm²)
Weight: 28-30 oz (790-850 g)
Wing Loading: 26.4-28.2 oz/ft²
(81-86 g/dm²)
Length: 30.5 in (775 mm)

Requires:

- 4-channel radio w/two 20 oz-in torque mini servos and mini receiver
- 35A brushless ESC
- 14.8V 2200mAh LiPo battery & LiPo charger

Satisfy the urge for jet looks and speed — economically, in a convenient size, and with “goes where you point it” stability plus the potential for thrilling sport aerobatics. Constructed of a fiberglass fuselage and MonoKote® film-covered, built-up wing and tail surfaces, the lightweight Evader reaches straight-and-level flight speeds of 100+ mph*. Its impressive thrust comes from an included HyperFlow™ ducted fan unit with Ammo™ 24-45-3790 motor. ElectriFly also includes a 15-foot bungee for easy launching and decals for military and sport trim schemes.

* At sea level with recommended electronics.