FV-31 CYPHER

BEFORE CONTINUING WITH THIS INSTRUCTION MANUAL OR ASSEMBLY OF YOUR AIRCRAFT, PLEASE VISIT OUR WIKI SUPPORT SITE FOR THE LATEST PRODUCT UPDATES, FEATURE CHANGES, MANUAL ADDENDUMS AND FIRMWARE CHANGES FOR BOTH YOUR AIRCRAFT AND THE INSTALLED FLEXF3 STABILIZATION SYSTEM.

wiki.flexinnovations.com/wiki/Cypher

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INTRODUCTION

Unparalleled Flight Performance

The Flex Innovations Plug-and-Play FV-31 Cypher VTOL EDF is the most advanced and versatile vertical take off and landing (VTOL) and short take off and landing (STOL) model aircraft of its type. Two fixed EDF units are mounted toward the leading edge of the wing, while two larger EDF units are mounted to a rotating pod at the rear of the aircraft. This advanced EDF configuration provides the greatest in total performance versatility, while remaining simple to use and easy to fly.

Thanks to the Flex Innovations developed, FLEXF3 stabilization board, you get a total of six unique ways you can fly, while being able to choose between any of them, at any time during the flight. These flight modes work seamlessly together to offer the most stable and predictable flight experience possible. Pilots will always retain total control, even during tansitions between modes.

For the latest updates, features, addendums and more, before assembly, please visit:

wiki.flexinnovations.com/wiki/Cypher

- Factory-installed and custom-tuned FLEXF3 Flight Control System

- 4 EDF units for great power, control and improved safety

- Bluetooth module and Micro-USB cable included

- Assemble and set up in less than one hour

- (4) 40A, 32-bit brushless ESC unit with switching BEC

- (3) Potenza DS-15 digital servos for controls

- (1) S0090 Standard-size, metal gear servo for fan tilt

- Light Weight EPO foam that is durable and easy to repair

SPECIFICATIONS

35.0 in. (890mm)

3lb 10oz (1.68 kg)
RTF with 3S 3500mAh battery installed

38.2 in. (970mm)
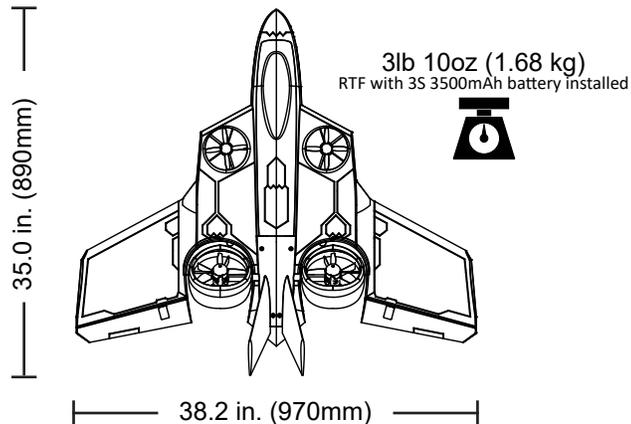
REPLACEMENT PARTS

FPM387001A	Fuselage, no hatches or fins (White)
FPM387001B	Fuselage, no hatches or fins (Grey)
FPM387002A	Wing Panels (White)
FPM387002B	Wing Panels (Grey)
FPM387003A	Fin Set, Upper and Lower (White)
FPM387003B	Fin Set, Upper and Lower (Grey)
FPM387004A	Canopy/Hatch Set (White)
FPM387004B	Canopy/Hatch Set (Grey)
FPM387005	Landing Gear Set (No Wheels)
FPM387006	Wheel and Collar Set (3)
FPM387007	Wing Tubes
FPM387008	Pushrod Set
FPM387009A	Air Force White Decal Set
FPM387009B	Marines Grey Decal Set
FPM387010	Gauge Set
FPM387011A	Rear Nacelle Set (White)
FPM387011B	Rear Nacelle Set (Grey)
FPM387012	Rear Left and Right Fan Blades
FPM387013	Front Left and Right Fan Blades
FPM387014	Rear, Left and Right Motor/Fan Adapters
FPM387015	Tray and Hardware Set
FPZA1030	FLEXF3 RX Cable Set (3-3 & 3-4)
FPZA1031	Servo Extension Lead (480mm)
FPZFLEXF3	FLEXF3 with Hardware (no cables)
FPZCYPESC	4 x 40A ESC w/BEC
FPZCYPBT	Bluetooth Module for FLEXF3
FPZS0090	Standard Servo, Metal Gear w/Arm
FPZDS15	DS-15 Sub-Micro Servo (370mm lead)
FPZMCYPR	Cypher Rear Motor - Right
FPZMCYPL	Cypher Rear Motor - Left
FPZMCYPFR	Cypher Front Motor - Right
FPZMCYPFL	Cypher Front Motor - Left

OPTIONAL ACCESSORIES

FPZB26003S45	Potenza 3S 2600mAh 45C Li-Po	
FPZB35003S75	Potenza 3S 3500mAh 75C Li-Po	
SPM4649T	Spektrum Serial Telemetry Receiver	(Recomended SPM Receiver)
SPMAR8010T	Spektrum AR8010T DSMX Receiver	
FUTR2001SB	R2001SB S.BUS S-FHSS Receiver	(Recomended FUT Receiver)
FUTR7003SB	R7003SB S.BUS FASSTest Receiver	
FPM387016	Keychain Camera Mount (Cypher)	
FPZA1010	Potenza Digital Battery Analyzer	
ISDTD2	ISDT 2-Port 200W AC Charger	
ISDTT8	ISDT 1000W DC Charger	

COMPLETION ITEMS

INSTALLED!		(2) Potenza Front & (2) Potenza Rear Brushless Outrunner Motors (FPZMCYPR, FPZMCYPL, FPZMCYPFR & FPZMCYPFL)
INSTALLED!		(4) 40A 32-Bit ESC with BEC (FPZCYPESC)
INSTALLED!		Potenza DS-15 & S0090 Servos (FPZDS15 & FPZS0090)
INSTALLED!		FLEXF3 Flight Control System (FPZFLEXF3)
INCLUDED!		4 EDF Units (FPM387012 & FPM387013)
NEEDED TO COMPLETE		2200-5200mAh 3S 11.1V 40C+ Li-Po (FPZB35003S75)
NEEDED TO COMPLETE		6+ Channel Computer Transmitter
NEEDED TO COMPLETE	Receiver	Spektrum SRXL Receiver Futaba S.Bus Receiver FrSky S.Bus Receiver Hitec S.Bus Receiver Graupner SumD Receiver JR XBus Mode B Receiver Jeti EX-Bus Receiver PPM 6+ Channel Receiver (Any Brand)

BATTERY CHARGING GUIDELINES

⚠ WARNING

FOLLOW ALL INSTRUCTIONS PROVIDED BY YOUR BATTERY AND CHARGER MANUFACTURER. FAILURE TO COMPLY CAN RESULT IN FIRE.

The assembly of the FV-31 Cypher can be accomplished in less than one hour. Prior to assembling the aircraft, it is advisable to charge your battery so that you are ready to begin setup upon completion of the assembly of your model.

We recommend the use of an advanced Li-Po balancing charger for your batteries to get the maximum performance and lifespan.

Our aircraft are designed around our Potenza Li-Po batteries, and we recommend the Potenza 3S 3500mAh 75C Li-Po based on our extensive testing and development. These batteries feature an EC3 connector, so no soldering is required for use in your Cypher.

All are available at flexinnovations.com

IMPORTANT INFORMATION REGARDING WARRANTY

Please read our Warranty and Liability Limitations section before building this product. If you as the Purchaser or user are not prepared to accept the liability associated with the use of this Product, you are advised to return this product immediately in new and unused condition to the place of purchase.

SAFETY WARNINGS AND PRECAUTIONS

Protect yourself and others by following these basic safety guidelines.

1. This manual contains instructions for safety, operation and maintenance. It is essential to read and follow all the instructions and warnings in the manual, prior to assembly, setup or use, in order to operate correctly and avoid damage or serious injury.

2. This model is not a toy, rather it is a sophisticated hobby product and must be operated with caution and common sense. This product requires some basic mechanical ability. Failure to operate this product in a safe and responsible manner could result in injury or damage to the product or other property.

3. This model must be assembled according to these instructions. Do not alter or modify the model outside of these instructions provided by Flex Innovations LLC as doing so may render it unsafe and/or unflyable. It is your responsibility to ensure the airworthiness of the model.

4. Inspect and check operation of the model and all its components before every flight.

5. If you are not an experienced pilot or have not flown a high-performance model before, it is recommended that you seek assistance from an experienced pilot in your R/C club for your first flights. If you're not a member of a club, the Academy of Model Aeronautics (AMA) has information about clubs in your area whose membership includes experienced pilots.

6. Keep the fan area clear from such items as loose clothing, jewelry, long hair, or tools as they can become entangled. Keep your hands and body parts away from the propeller as injury can occur.

7. Never fly in visible moisture, or submerge the airplane or any of its electronic components in water. Permanent damage to electronic components may occur, or corrosion of components may lead to intermittent failures.

FLEXF3 CONTROL SYSTEM

The FLEXF3 Control System installed in your aircraft is specifically tuned and configured for the FV-31 Cypher. Compatible with virtually every serial-based receiver on the market, the FLEXF3 features special configuration for serial data connections using Spektrum SRXL, Futaba, Hitec and FrSky S.Bus, Graupner HOTT (Sum D of 8), JR XBus (Mode B), and Jeti EX-Bus (standard) systems, as well as PPM connections.

The FLEXF3 Control System installed in your aircraft has been pre-tuned for ease of use, eliminating many hours of tedious setup. For the latest features, programs, transmitter downloads, and instructions, please visit:

wiki.flexinnovations.com/wiki/Cypher

The FLEXF3 is programmable through any Windows or Mac OS based PC or tablet utilizing the Betaflight Configurator or through any Android or iOS device using the SpeedyBee application. All dual rate, expo, travel and assignable mode programs are adjusted inside the FLEXF3 System through the PC or mobile application.

- Works conveniently with all major radio systems

- Accepts signals from Spektrum SRXL, Futaba, Hitec or FrSky S.Bus, Graupner Hott (Sum D of 8), JR XBus (Mode B), Jeti EX-Bus (standard), or PPM Stream.

- Expertly tuned and ready to use

- USB port allows, user programming, and firmware updates (bluetooth module included)

- 3 Flight Configurations and 2 Control Profiles allow assistive or aggressive settings to be selected in flight

- 3-axis and 6-axis gyro utilized in aircraft programming

Visit wiki.flexinnovations.com/wiki/Cypher for the latest product information and tips for your particular radio brand.

Description of Pre-Configured Control Modes and Flight Configurations

The FV-31 Cypher comes pre-configured with two Control Profiles (Beginner or Advanced) that are controlled by your transmitter's channel 5 and three Flight Configurations (Hover Configuration, 45° "Magic" Configuration and Conventional Configuration) that are controlled by transmitter channel 6. The pilot can select between any of these at any time during the flight. Reference the charts below for further information.

Beginner Profile (6-axis)	In this profile, the aicraft will return to upright level flight when the transmitter sticks are returned to neutral. Also, bank and pitch angles are limited to approximately 68 degrees and the aircraft will not fly inverted.
Advanced Profile (3-axis)	In this profile, the aicraft has no pitch or bank limits and will not try to return to level flight when the transmitter sticks are centered. The aircraft is fully aerobatic in this profile, including loops, rolls, flips and more.

Channel 5

Hover Configuration	In this configuration, the rear fans are tilted near parallel to the wings. The aircraft will hover and flies primarily like a helicopter or multirotor in this configuration. Takeoffs and landings can be done in this flight configuration.
45° "Magic" Configuration	In this configuration, the rear fans are tilted to a 45 degree angle. The aircraft will fly forward at approximately 12 mph (19kph) and flies like a hybrid between a helicopter (or multirotor) and an airplane. Short takeoffs and landings can be done in this flight configuration.
Conventional Configuration	In this configuration, the rear fans are tilted perpendicular to the wings. The aircraft will fly like a traditional airplane in this configuration, using differential thrust from the rear fans for yaw control. Traditional airplane takeoffs and landings can be done in this flight configuration.

Channel 6

Hover Configuration

45° "Magic" Configuration

Conventional Configuration

TRANSMITTER SETUP

The FLEXF3 system is designed to work with all major transmitter and receiver brands. The FV-31 Cypher requires a minimum 6-channel programmable transmitter for proper function. When programming your transmitter, start with a freshly reset new model memory in your transmitter. **Make ONLY the changes shown in the Transmitter Configuration Guide unless otherwise noted.**

The FLEXF3 in your aircraft defaults to three flight configurations that are switched via CH6 in your transmitter. In your transmitter, you may need to reassign CH6 to a three-position switch.

The FLEXF3 in your aircraft also defaults to two flight profiles that are switched via CH5 in your transmitter. In your transmitter, you may need to reassign CH5 to a two-position switch.

Consult your transmitter manual if you have questions on how to change the switch or channel assignments.

The FLEXF3 comes pre-programmed with rates and expos specifically designed for your aircraft and its flight configurations. For changes in expo or dual rates, it is highly recommended to tune through the Betaflight Configurator or Speedy Bee mobile app.

The Betaflight Configurator is free to download, and can be used on any Windows or MacOS based PC or tablet.

Download at:

https://github.com/betaflight/betaflight-configurator/releases

The SpeedyBee mobile application is free to download and can be used on both android and iOS devices. Simply search "SpeedyBee"in your device's application store.

NOTICE

The following pages provide specific information for transmitter setup and receiver selection for some of the most common transmitter and receiver brands. Please follow the instructions closely.

For transmitter and receiver brands not covered in this instruction manual, please visit our wiki page for this aircraft at the web address below:

wiki.flexinnovations.com/wiki/Cypher

You can skip ahead to the section in this instruction manual that pertains to your particular transmitter and receiver type. Use the info below for specific page information.

SPEKTRUM TRANSMITTER AND RECEIVER SETUP

Transmiter Setup

Follow the chart below for setup of your Spektrum transmitter. **Be sure to start with a blank and freshly reset model memory before starting setup.**

TRANSMITTER CONFIGURATION GUIDE				
	Spektrum			
Frame Rate	11ms Preferred (22ms OK)			
Wing/Tail Type	1 Aileron, 1 Elevator, 1 Rudder			
End Points (Travel Adjust or ATV)	Thro/Ail/Ele/Rud **148%**			
	CH5/CH6 **100%** (CH6 set to 100% initially, fine tuned later in this manual)			
Reversing	Throttle - Normal	**Aileron - Reversed**	Elevator - Normal	**Rudder - Reversed**
Sub Trim	**Verify at zero, NOT ALLOWED**			
Trim Levers	**Verify at zero**			
CH. 5 (Gear)	**Assigned to a 2-position switch (selects FLEXF3 Control Profiles)**			
CH. 6 (Aux 1)	**Assigned to a 3-position switch (selects FLEXF3 Flight Configurations)**			
Timer[4]	**Start with: 2:20 (3S 2200mAh), 3:00 (3S 2600mAh), 3:40 (3S 3500mAh)**			

Channel Assignment

Your transmitter's instruction manual is the best place to find information on how to assign channels in your transmitter. For *most* Spektrum transmitters, you can follow the instructions below.

1. Navigate to your transitter's "System Setup" menu. This is typically done by holding the scroll wheel down while powering on your transmitter.

2. Locate the "Channel Assign" menu and enter it by selecting with a press of the scroll wheel.

3. Once in the Channel Assign menu, navigate to the page titled "Channel Input Configuration."

4. Locate Channel 5 (Gear) and select the two-position switch you want to control the Flex F3 Profiles (Beginner/Advanced Profiles). You can reverse Channel 5 to reverse the switch direction if desired.

5. Locate Channel 6 (Aux 1) and select the three-position switch you want to control the Flight Configurations (Hover/45° Magic/Conventional Configurations). We set this on a switch so that the up or forward switch position is the Conventional Flight Configuration (forward flight = forward switch). You can reverse Channel 6 to reverse the switch direction if desired.

6. Use the back button to navigate back the home flying screen.

7. Click the scroll wheel and navigate to your transmitter's "Monitor." Verify Channel 5 (Gear) and Channel 6 (Aux 1) move accordingly when you move the switches assigned in steps 4 and 5.

SPEKTRUM TRANSMITTER AND RECEIVER SETUP (CONTINUED)

Receiver Selection

For Spektrum users, you must use an SRXL capable receiver. We've listed a few options below for FLEXF3 compatible receivers:

Spektrum Quad Race Serial Receiver with Telemetry (SPM4649T) - **Highest Recommended**
Spektrum AR8010T (SPMAR8010T)
Spektrum AR9030T (SPMAR9030T)
Spektrum AR7700 (SPMAR7700) - no telemetry

Spektrum remote receivers are not supported with this product.

Receiver Installation

Install your Spektrum receiver and antennas according to your receiver's instruction manual.

There are two recommended methods to connect your Spektrum receiver to the FLEXF3. **CHOOSE ONE METHOD.**

Connection A
Connect to the FLEXF3 board in this manner to simplify setup, **as it does not require the use of a PC or mobile application for receiver setup.** PC or mobile application setup still required for Beginner profile calibration. This works with ALL Spektrum SRXL capable receivers.

Connection B
Connect to the FLEXF3 board in this manner to gain the use of Betaflight telemetry. This does require the use of the Betaflight PC application or SpeedyBee mobile application to configure. **This also requires the use of a telemetry capable receiver.** Telemetry setup in your transmitter is required for the transmitter to receive telemetry data. See the Cypher wiki page for further details.

wiki.flexinnovations.com/wiki/Cypher

Connection A (without Betaflight Telemetry)
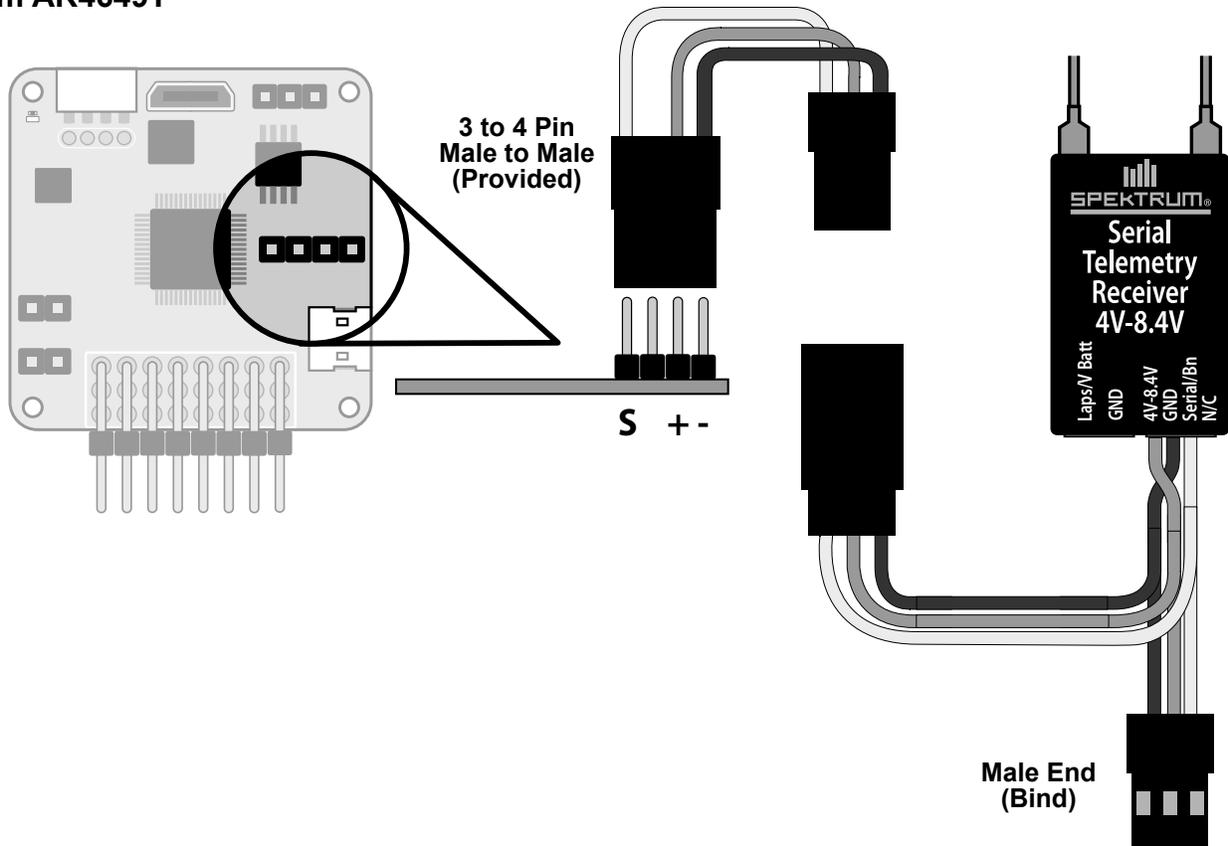
Spektrum AR4649T

3 to 4 Pin
Male to Male
(Provided)

S + -

SPEKTRUM®
Serial
Telemetry
Receiver
4V-8.4V

Laps/V Batt
GND
4V-8.4V
GND
Serial/Bn
N/C

Male End
(Bind)

SPEKTRUM TRANSMITTER AND RECEIVER SETUP (CONTINUED)

Connection A (without Betaflight Telemetry) (Continued)

Spektrum AR8010T with SRXL

3 to 4 Pin Male to Male (Provided)

S + -

AR8010T

To SRXL Port

Connection B (with Betaflight Telemetry)

Spektrum AR4649T

Male End

Female End (Bind)

Betaflight (PC) or SpeedyBee (mobile) application setup required for Connection B.

SPEKTRUM TRANSMITTER AND RECEIVER SETUP (CONTINUED)

Connection B (with Betaflight Telemetry) (Continued)

Spektrum AR8010T with SRXL

3 to 4 Pin Male to Male (Provided)

S + -

To SRXL Port

Betaflight (PC) or SpeedyBee (mobile) application setup required for Connection B.

SPEKTRUM TRANSMITTER AND RECEIVER SETUP (CONTINUED)

Connection B (with Betaflight Telemetry) Application Setup

If you have chosen to utilize a Betaflight Telemetry connection (Connection B), please follow the steps below to activate Telemetry on the Betaflight PC application or SpeedyBee mobile application. If you have chosen Connection A (without Betaflight Telemetry, please proceed to the section on page 14 titled "Binding".

1. Download the Betaflight Configurator for your computer or the SpeedyBee Application for your mobile device. You can search for these applications online (or in your mobile device's app store) or visit the web addresses shown below.

Betaflight Configurator   https://github.com/betaflight/betaflight-configurator/releases/

SpeedyBee Mobile App for iOS
SpeedyBee Mobile App for Android   Search for "SpeedyBee" in your device's application store

2. **Computer**
   Connect the FLEXF3 controller to the computer via the provided USB cable. You do not need to power the aircraft with your flight battery.

   Mobile Device
   Connect the provided bluetooth module to the FLEXF3 controller. You will then need to power the aircraft in order to provide power to the bluetooth module. You do not need to pair the device in your mobile device settings menu.

3. Open the application. Click "Connect" in the upper right hand corner to connect to the FLEXF3 controller.

Connection B (with Betaflight Telemetry) Application Setup (Continued)

If you have chosen Connection A (without Betaflight Telemetry, please proceed to the section on Page 13 titled "Binding".

4. Click the Configuration tab on the left side of the application.

5. Scroll down until you see the switch tab for Telemetry. Slide this tab into the on (yellow) position. Click Save and Reboot in the lower right hand corner to save the settings to the F3 controller. Click disconnect to complete the process. Remove the USB cable from the FLEXF3 controller.

SPEKTRUM TRANSMITTER AND RECEIVER SETUP (CONTINUED)

Binding

Reference your transmitter and receiver's instruction manual for specifics on the bind process.

1. With the aircraft and transmitter powered off, insert a bind plug into your receiver's bind port (or press and hold the bind button on your receiver if available).

    Note: If you are using the AR4649T Serial Telemetry receiver, this may be the male or female lead depending on your connection type. Reference the receiver connection drawings in the previous pages for details.

2. Power on the aircraft with the flight battery. Confirm the receiver has entered bind mode by looking for a rapidly flashing LED on the Spektrum receiver.

    Follow your transmitter's instructions on placing the transmitter into bind mode. Once bound, the LED on the receiver will be solid orange.

NOTICE

You will not gain control after the bind process until you remove the bind plug from the receiver. Remove the bind plug, wait two seconds, and then check for control function.

FUTABA TRANSMITTER AND RECEIVER SETUP

Transmiter Setup

Follow the chart below for setup of your Futaba transmitter. **Be sure to start with a blank and freshly reset model memory before starting setup.**

TRANSMITTER CONFIGURATION GUIDE			
	Futaba		
Wing/Tail Type	1 Aileron, 1 Elevator, 1 Rudder		
End Points (Travel Adjust or ATV)	Thro/Ail/Ele/Rud **120%**		
	CH5/CH6 **100%** (CH6 set to 100% initially, fine tuned later in this manual)		
Reversing	**Thro - Set Per Page 19**	Aileron - Normal	**Elevator - Reversed**	Rudder - Normal
Sub Trim	**Use the Betaflight or SpeedyBee application and adjust to achieve "1500" center on the receiver tab of the app. Covered on P19 of this instruction manual.**		
Trim Levers	**Verify at zero**		
CH. 5 (Gear)	**Assigned to a 2-position switch (selects FLEXF3 Control Profiles)**		
CH. 6 (Aux 1)	**Assigned to a 3-position switch (selects FLEXF3 Flight Configurations)**		
Timer	**Start with: 2:20 (3S 2200mAh), 3:00 (3S 2600mAh), 3:40 (3S 3500mAh)**		

Channel Assignment

Your transmitter's instruction manual is the best place to find information on how to assign channels in your transmitter.

FUTABA TRANSMITTER AND RECEIVER SETUP (CONTINUED)

Receiver Selection

For Futaba users, you must use an S.Bus capable receiver. We've listed a few options below for FLEXF3 compatible receivers:

Futaba R2001SB S.Bus S-FHSS Receiver (FUTR2001SB) - **Highest Recommended**
Futaba R6303SB S.Bus FASST Receiver (FUTR6303SB)
Futaba R7003SB S.Bus FASSTest Receiver (FUTR7003SB)

Receiver Installation

Install your Futaba receiver and antennas according to your receiver's instruction manual.

Follow the diagram below for connection to the FLEXF3 from your Futaba S.Bus receiver.

Futaba S.BUS Connection

**3 to 4 Pin
Male to Male
(Provided)**

3/B   S.BUS

Futaba
R2001SB
1ch.+ S.BUS receiver

2.4GHz
S-FHSS

LED   S.BUS
LINK
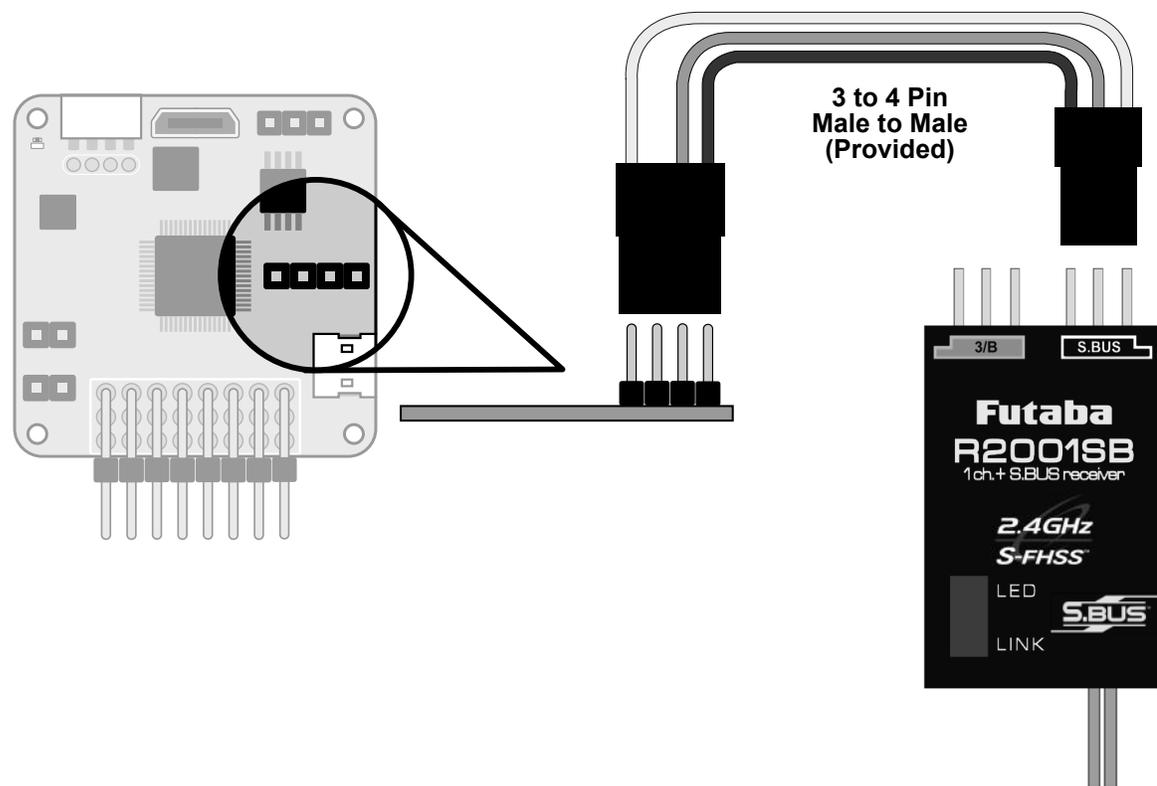
Note: Futaba does not interface with Betaflight telemetry, however, some T-FHSS and FASSTest receivers are capable of sending flight pack voltage back to the transmitter. Reference the Cypher Wiki page for more information:

wiki.flexinnovations.com/wiki/Cypher

FUTABA TRANSMITTER AND RECEIVER SETUP (CONTINUED)

Application Setup

If you you are using a Futaba S.BUS connection, please follow the steps below to complete setup on the Betaflight PC application or SpeedyBee mobile application.

1. Download the Betaflight Configurator for your computer or the SpeedyBee Application for your mobile device. You can search for these applications online (or in your mobile device's app store) or visit the web addresses shown below.

   Betaflight Configurator   https://github.com/betaflight/betaflight-configurator/releases/

   Speedy Bee Mobile App for iOS
   Speedy Bee Mobile App for Android   Search for "SpeedyBee" in your mobile device's application store.

2. **Computer**
   Connect the FLEXF3 controller to the computer via the provided USB cable. You do not need to power the aircraft with your flight battery.

   Mobile Device
   Connect the provided bluetooth module to the FLEXF3 controller. You will then need to power the aircraft in order to provide power to the bluetooth module. You do not need to pair the device in your mobile device settings menu.

3. Open the application. Click "Connect" in the upper right hand corner to connect to the FLEXF3 controller.

FUTABA TRANSMITTER AND RECEIVER SETUP (CONTINUED)

4. Click the Configuration tab on the left side of the application.

5. Scroll down until you see the section titled "Receiver". Verify that the first drop-down menu (Receiver Mode) has "Serial-based receiver (SPEKSAT, SBUS, SUMD) selected. Once verified, click the second drop down menu (Serial Receiver Provider), and choose SBUS. Click "Save and Reboot" to save the changes.
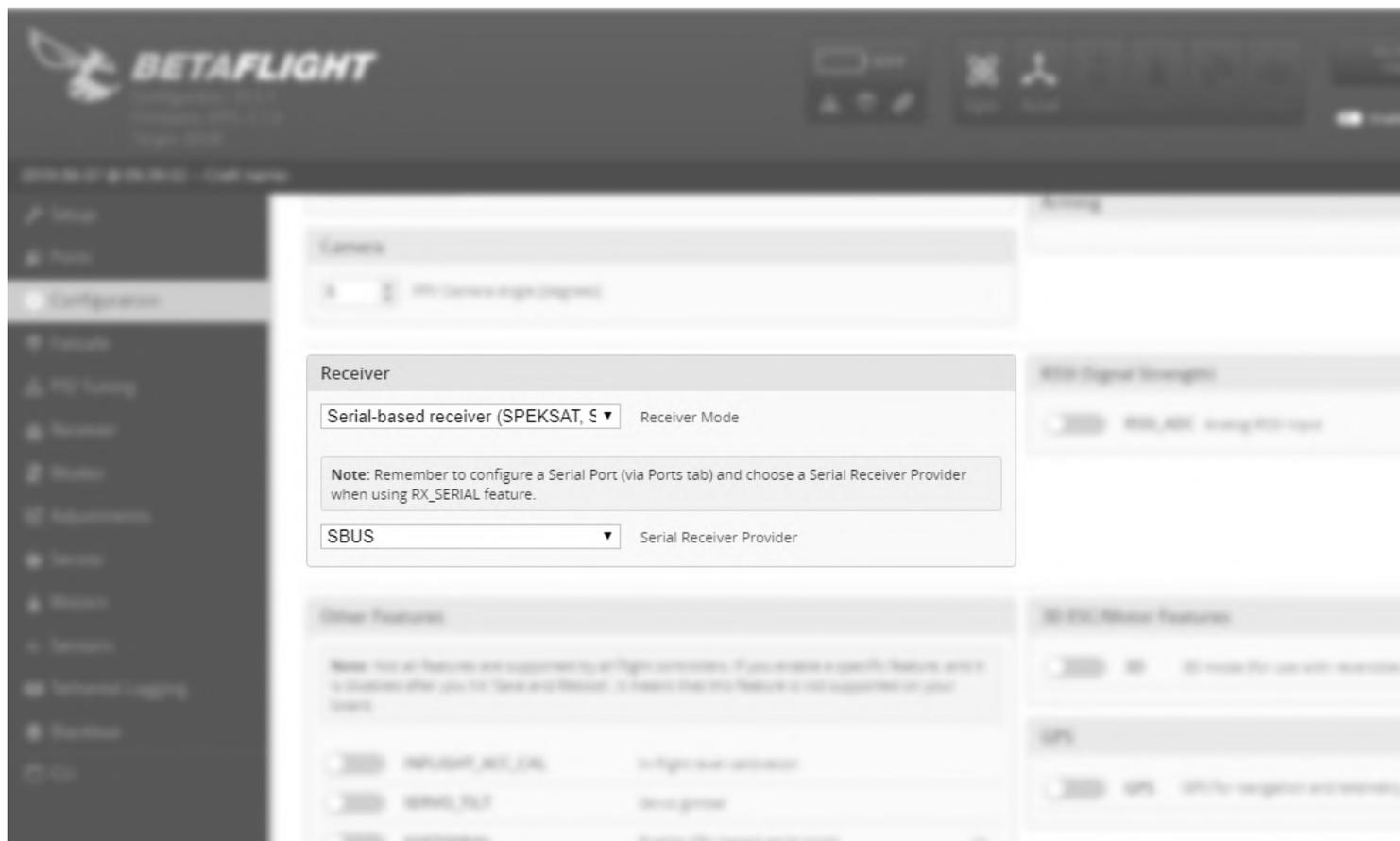
FUTABA TRANSMITTER AND RECEIVER SETUP (CONTINUED)

5. Re-connect to the FLEXF3. Navigate to the Receiver tab on the left hand side of the page.

6. On the right-hand side you will see Channel Map (Channel Order). By default, it is set to TAER1234. Click the drop down menu and select the proper channel order for Futaba: AETR1234. Click save in the lower right hand corner to save the settings. Click disconnect and remove the FLEXF3 from your programming device..

FUTABA TRANSMITTER AND RECEIVER SETUP (CONTINUED)
Binding

Some Futaba S.Bus receivers will need to be configured and set up to output the proper S.Bus signal and order. Consult your receiver manual for information on this process. If you have questions on binding your particular receiver and transmitter, consult your transmitter and receiver's instruction manual.

End Point Sub-Trim and Throttle Reversing Setup

Futaba transmitters will need to have their sub-trims and travels adjusted to a range that the FLEXF3 is expecting. Throttle direction may vary depending on your particular transmitter. Follow the instructions below for proper adjustment of these settings.

1. Open the Betaflight Configurator or the SpeedyBee mobile application. Connect the USB to your FLEXF3 and your PC or connect via bluetooth with your mobile device. Click "Connect" in the top right corner of the application.

2. Navigate to the "Receiver" page.

3. Once connected, you will see the values in the chart change when you move the sticks on the transmitter. Take note of the Roll, Pitch, Throttle, Yaw and CH6 values.

    A. With the Flight Configuration switch set to 45 Degree "Magic" Configuration (CH6 - middle switch position), adjust the subtrim in the transmitter until Roll, Pitch, Yaw and channel 6 (CH6 is Betaflight AUX 2) show "1500" at center stick in the Betaflight or SpeedyBee monitor.

    B. High throttle should read as a higher value (2000), whereas low throttle should read as a lower value (1000). Reverse the throttle direction in the transmitter if necessary to achive this.

    C. Deflect each stick fully in both directions (including throttle). Adjust the travels (ATV) in your transmitter until you reach 1000 at one end of stick movement and 2000 at the other end of stick movement when looking at the Betaflight monitor.
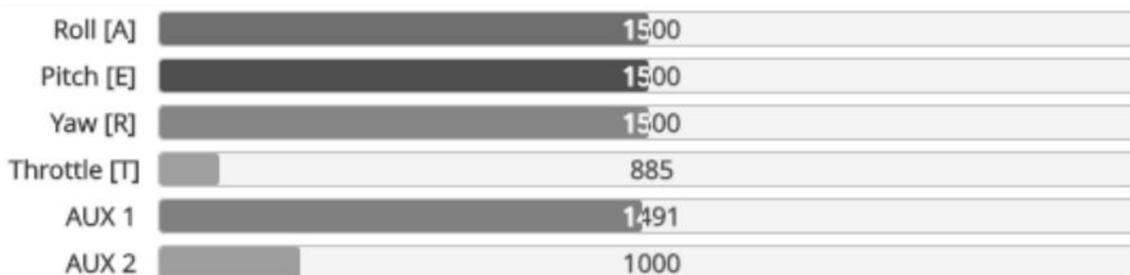
4. Once complete, click "Disconnect" and remove the USB cable or bluetooth module from the FLEXF3.

CONNECTING A BATTERY/ARMING THE ESC

Observe the following procedures to safely power up your model after it has been bound. **Ensure propellers are removed unless this sequence is followed to power up before flight.**

1. Lower the throttle stick it's lowest setting and turn on the transmitter. Wait for your transmitter to indicate the radio signal is being broadcast before proceeding.

2. Ensure the aileron, elevator and rudder gimbals are centered.

3. With the aircraft on a solid surface, connect the battery to the ESC and wait. The ESC will make the motor emit a series of audible tones during its intialization process.

4. **Once the aircraft has powered up and control is established, use full right rudder while at low throttle (idle) to arm the motors.**

5. **Use full left rudder while at low throttle to disarm the motors.**

⚠ WARNING

When making adjustments to linkages, transmitter settings or the flight control system, remove the fans to guard against accidental spool up.

⚠ CAUTION

Always connect the battery when the throttle stick idle/cut-off position.

⚠ WARNING

Hold the aircraft securely when connecting the battery before flight. Always ensure the fans are clear of any and all objects as they may become entangled.

ARM MOTORS

THROTTLE

RUDDER

DISARM MOTORS

THROTTLE

RUDDER
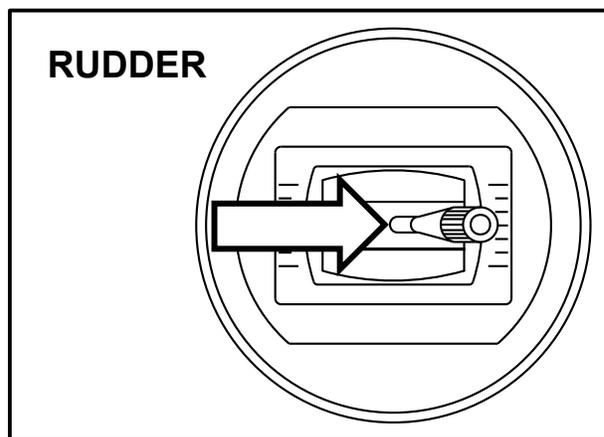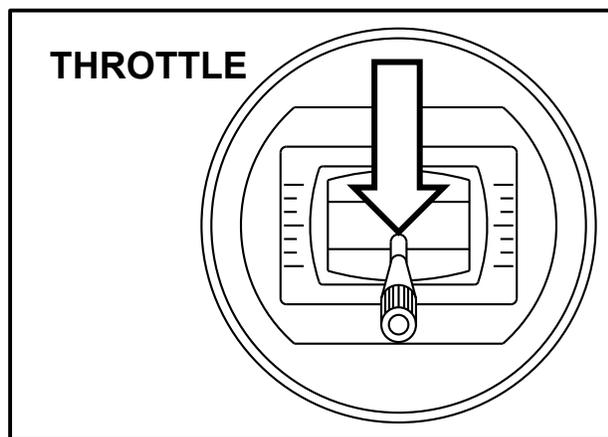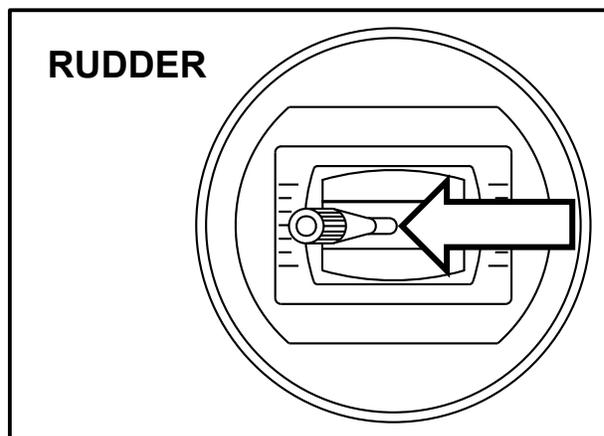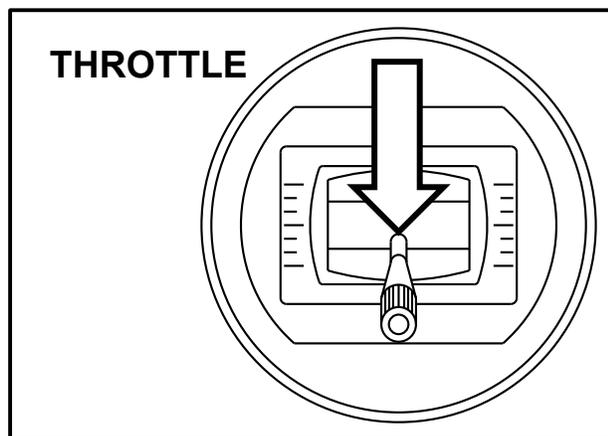
LOW VOLTAGE CUTOFF

Li-Po batteries have a nominal (rated) voltage of 3.7V per cell, and fully charged, reach 4.2V per cell. Batteries are designed to be discharged below the nominal voltage, however, if they are discharged below 3.0V per cell, damage will occur and the pack will lose capacity. **For best long-term battery life and safe return of the aircraft, set a timer and land after a time that leaves approximately 15-20% of the battery's capacity remaining.**

Low voltage cutoff is a feature that is built into the included ESC that is designed to protect the connected battery from being discharged too far and causing permanent damage to the cells. The ESC will automatically detect when the input voltage from the battery pack reaches below 3.15V per cell (average) and will remove power to the motors, but still deliver power to the servos. If the motor begins to lose power rapidly during flight, the LVC has sensed that the total voltage of the pack has dropped below 3.15V per cell average, and you have flown the aircraft too long. **DO NOT FLY TO LVC!**

REAR FAN ANGLE ADJUSTMENT

The following steps will guide you through the adjustment and setup of the rear fans. You must have your receiver bound and control surfaces working before completing these steps. You will also need to have the aircraft on a stand where the rear fans can tilt and move freely.

NOTICE

Be sure to follow these steps closely as these steps are critical in making the aircraft perform as intended. Failure to do so may result in an aircraft that is unflyable.

1. Verify that the tilt servo arm, linkage and tilt control horn are properly aligned with one another, and that all hardware is tight. With your channel 6 switch set to the middle position (45 'Magic' Configuration), the servo arm should be perpendicular (or near-perpendicular) to the servo body. The tilt control horn should be parallel (or near parallel) to the servo arm.

2. Move your Flight Configuration switch (channel 6) to the 45 degree "Magic Mode" position. Align the provided 45 degree gauge with the panel line on the top surface of the wing and the center of a rear fan. Adjust the tilt angle by shortening or lengthening the linkage. Set the angle of the rear fans so that they match the provided gauge.

REAR FAN ANGLE ADJUSTMENT (CONTINUED)

3.   Move your Flight Configuration switch (channel 6) to the 90 degree "Conventional Configuration" position. Align the provided 90 degree gauge with the panel line on the top surface of the wing and the center of a rear fan. Adjust your transmitter's channel 6 end point (travel adjust or ATV) to set the angle of the rear fans so that they match the provided gauge. Move the switch back and forth a few times and triple check this angle. **This is the most critical of the three angles. Take extra care when adjusting to be certain it is correct.**

2.   Move your Flight Configuration switch (channel 6) to the "Hover Configuration" position. Use a ruler on the top surface of the wing and adjust your transmitter's channel 6 travel/end point/ATV to set the angle of the rear fans. Make this adjustment so that the front edge of the fan just touches the ruler edge. This is the least important of the three angles. If flying in higher winds, you can decrease travel slightly to provide more forward thrust. If flying in dead-calm conditions, you can increase the travel slightly to stop forward motion. A slight forward bias is preferred overall, as it also helps yaw authority while in Hover Configuration.

LANDING GEAR INSTALLATION

Required Tools and Fasteners:

#1 Phillips Screwdriver
(4) M3x8 Phillips Head Self-Tapping Screw

(QTY 4)

1. Locate the main landing gear, four M3x8 self-tapping screws and two plastic main gear retaining plates. Insert the main landing gear into the fuselage slots.

2. Place the retaining plates over the landing gear wire in the slot in the fuselage, noting that their orientation matches the landing gear wire shape. Secure them in place with two M3x8 self-tapping screws. Do not over tighten.
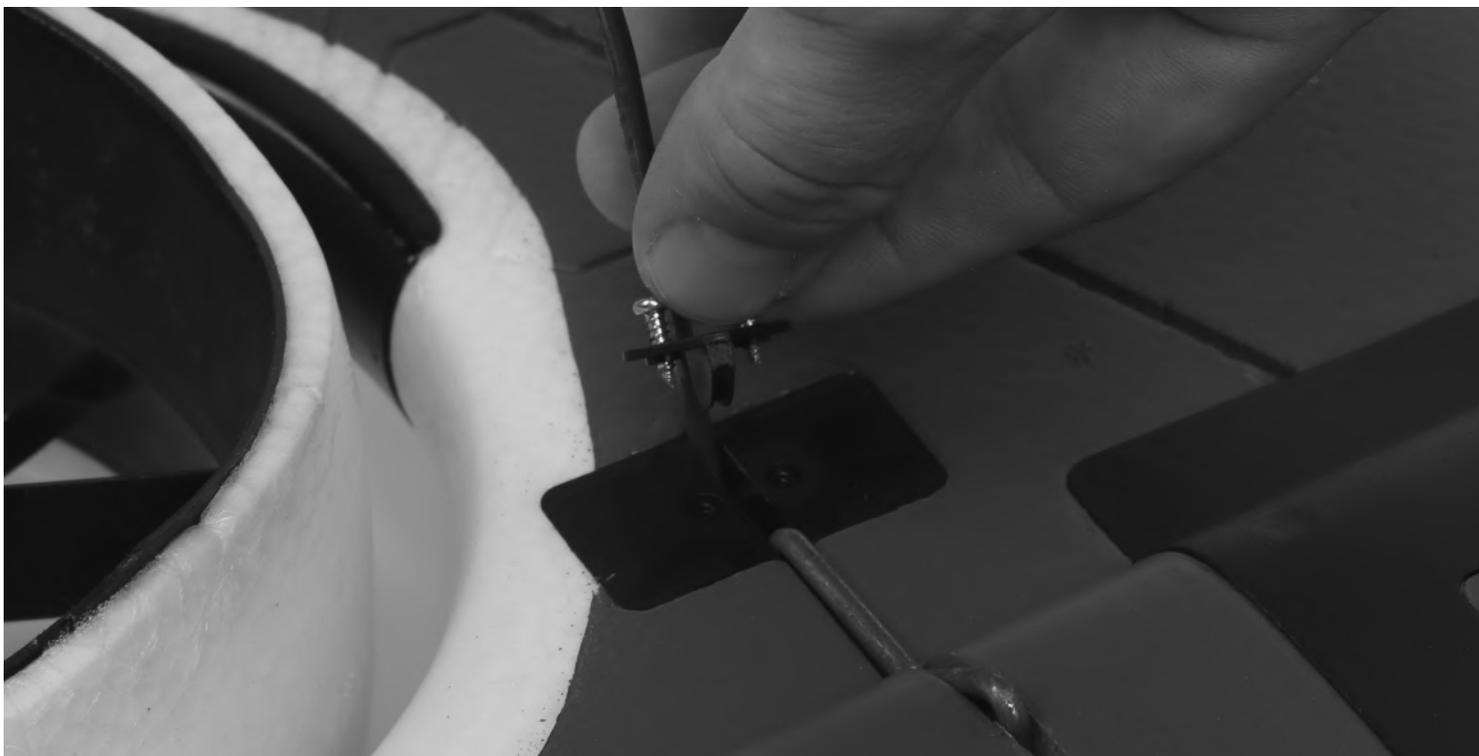
LANDING GEAR INSTALLATION (CONTINUED)

Required Tools and Fasteners:

1.5mm Hex Driver

1. Locate the nose gear strut assembly. Insert the strut into the mount in the bottom of the fuselage and through the nose gear steering arm. Be sure to orient the coil on the strut towards the rear of the aircraft. Insert the strut until it is flush with the top of the mount inside the fuselage (under the battery hatch).
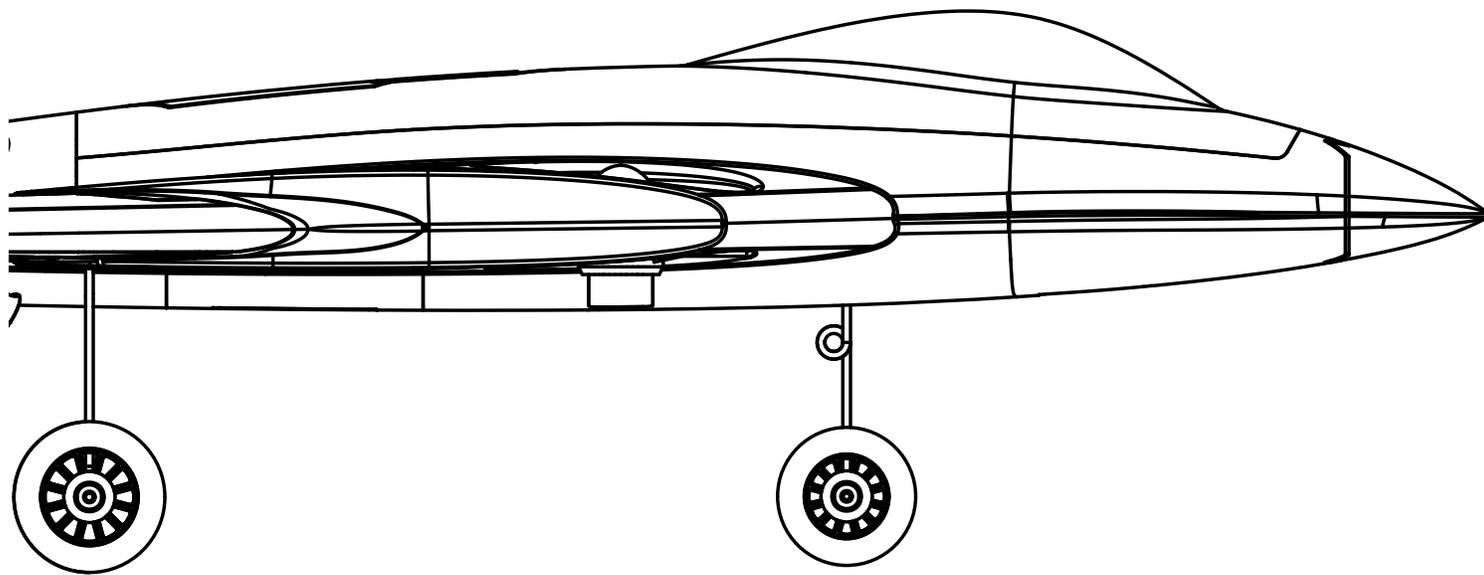
2. Use a 1.5mm hex driver to tighten the two set screws in the front and rear of the strut mount (inside the hatch). Do not overtighten, as the set screws thread into the plastic and it is possible to strip the threads.

VENTRAL FIN INSTALLATION

Required Tools and Fasteners:

Medium CA

1. Locate the ventral fin. Test fit the fin in place, noting that the more angled edge fits towards the nose of the aircraft. Use medium CA to secure the ventral fin in place.
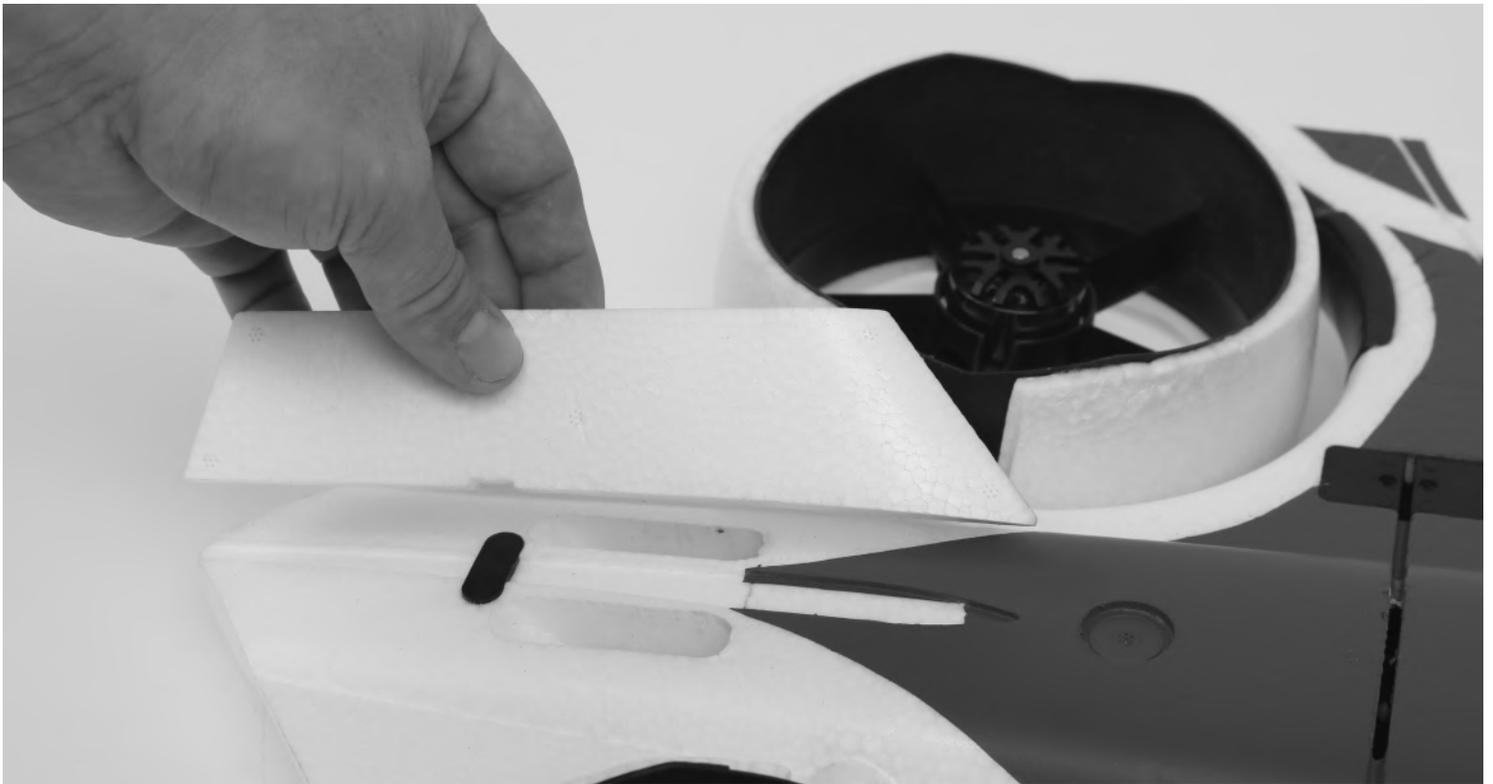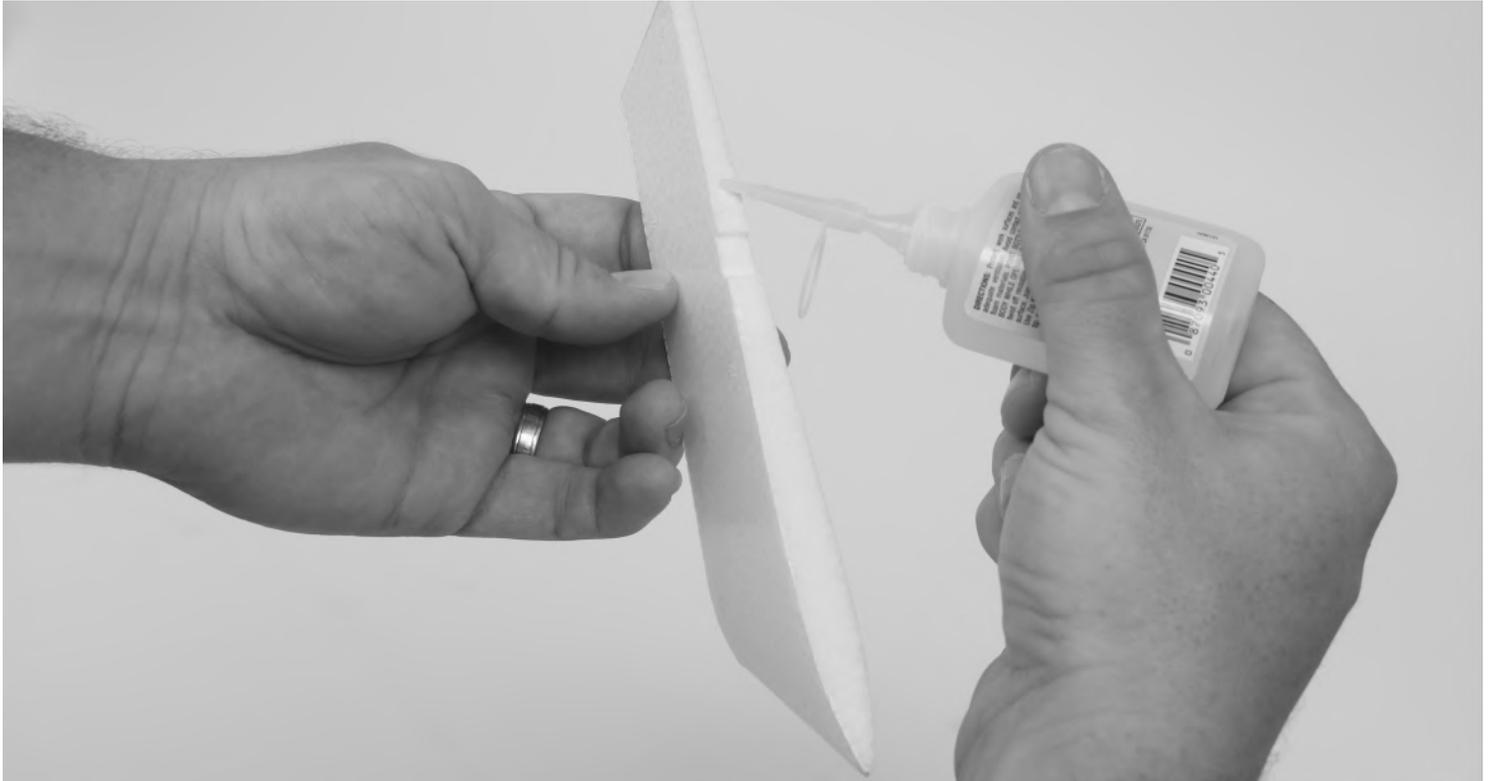
VERTICAL FIN INSTALLATION

Required Tools and Fasteners:

Medium CA   Medium Grit Sandpaper
#1 Phillips Screwdriver

1. Locate the two vertical fins as well as the rear hatch removed when setting the rear fan tilt. Test fit the vertical fins into the rear hatch, noting that they only fit in one direction and on a particular side (the FV-31 Cypher logos should face out). If your Cypher has painted mating surfaces, scuff them with a medium grit sandpaper to remove paint and promote adhesion. Use medium CA to secure the fins in place.

2. Once the vertical fins have dried, use a #1 Phillips screwdriver and the screws removed in the tilt setup section to secure the rear hatch assembly onto the fuselage. Note that the two shorter screws are used for the rear mount locations, and the longer screws are used for the front mount locations.

*fins shown removed for clarity

MAIN WING INSTALLATION

Required Tools and Fasteners:

M2x8 Self-Tapping Screws   Clear Tape
#1 Phillips Screwdriver

1. Remove the canopy hatch and locate the two wing tubes. Test fit each of the wing tubes into the wings and then into the fuselage. Slide the wing tubes into the fuselage, being sure they engage fully with the battery tray. Use a #1 Phillips screwdriver and 4 M2x8 self-tapping screws to secure the wing tube clamps in place over the wing tubes.
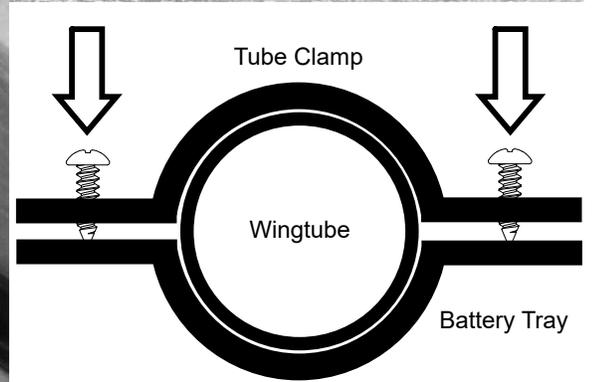
2. Partially slide one wing onto the appropriate wing tube, leaving room for you to connect the elevon servo lead to the servo extension in the fuselage. Connect the servo lead to the extension, noting proper polarity.

MAIN WING INSTALLATION (CONTINUED)

3. Slide the wing into the fuselage while guiding the servo wire into the slot in the bottom of the wing. Note that there is a slightly larger recess in the wing that will fit the servo lead connection point.
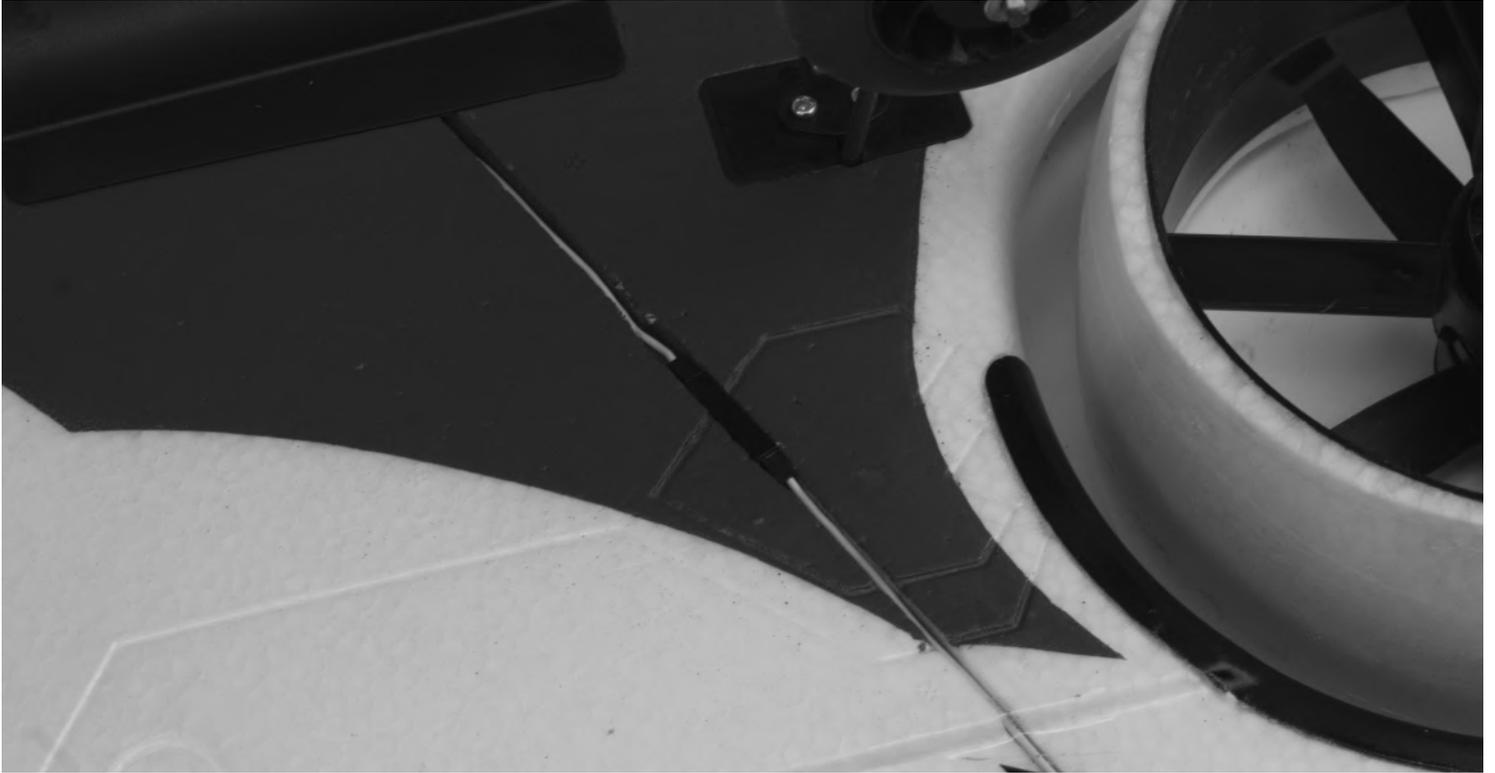
4. Apply clear tape at the trailing and leading edge of the wing, both top and bottom, to secure it in place. You can also tape over the servo lead connection for extra security.
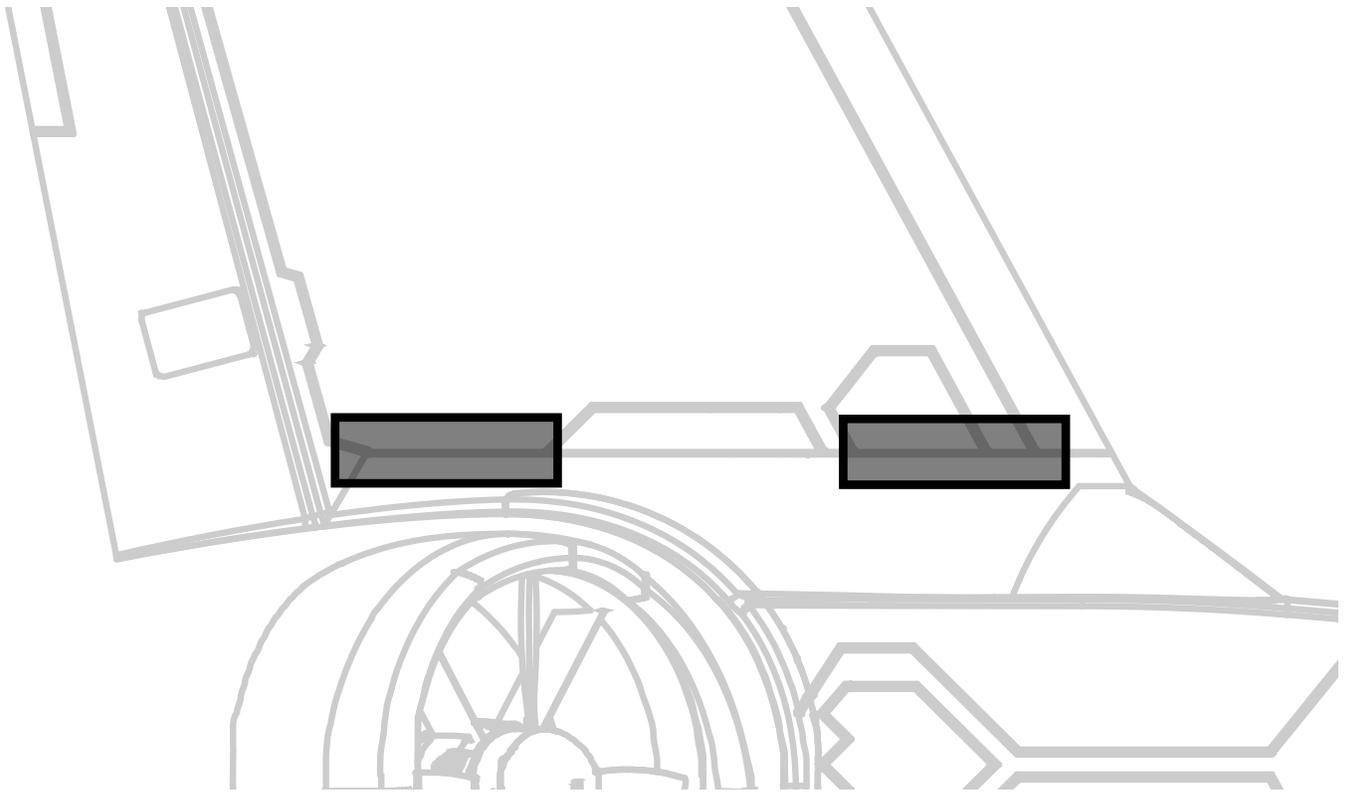
ELEVON SETUP

Required Tools and Fasteners:

Elevon Centering Gauge
Flat Blade Screwdriver

1. Power on your transmitter and the Cypher being sure you have control. Place your FLEXF3 Profile switch (Channel 5) into the Advanced Profile position. You can confirm that it is in the correct position by rotating the aircraft to a specific angle away from level. If the aircraft only attemps to correct while it is in motion, you are in the correct profile. If it attempts to correct the angle even after motion has stopped, you are in the incorrect profile.

2. Place the elevon gauge over the top surface of the wing, parallel to the wing root. Slide the silicone keeper on the clevis away from the control horn, then use a flat bladed screwdriver to open the clevis and remove it from the control horn. Turn the clevis in or out as needed to align the elevon with the elevon gauge. Snap the clevis closed over the control horn and return the silicone keeper to the end of the clevis near the control horn. Note that the elevon may appear to be slightly angled up relative to the wing when properly centered.
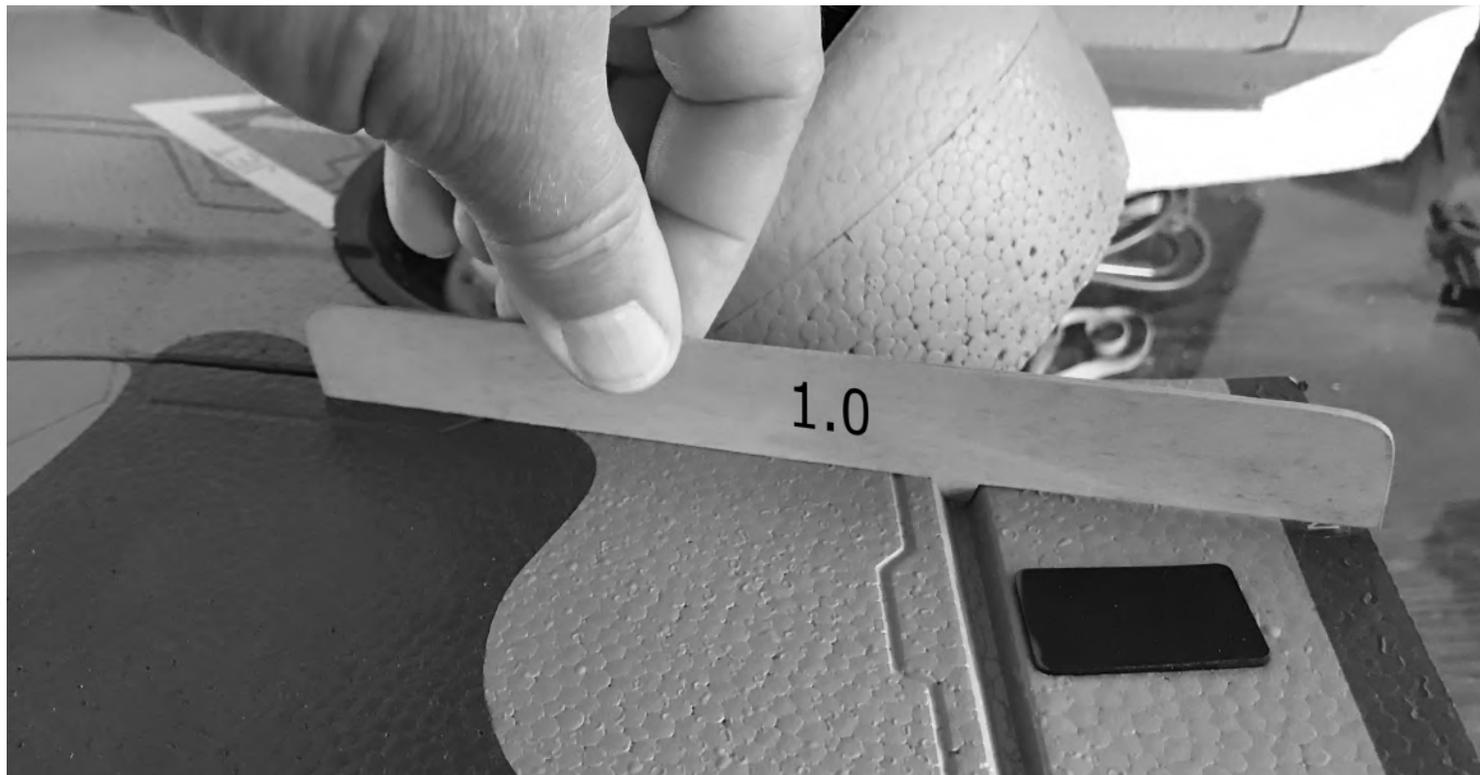
BEGINNER PROFILE CALIBRATION

In order to ensure the Beginner Profile works properly, you must calibrate the FLEXF3 sensor. If you do not plan to fly in the Beginner Profile, it is still highly recommended that you calibrate the sensor.

If you have a crash or replace parts, it is always a good idea to repeat this process to ensure proper flight performance.

1. Connect the FLEXF3 to the Betaflight PC or SpeedyBee mobile applications with the provided USB cable or bluetooth module. Reference the receiver setup pages for more information on how to do this.

2. Place the aircraft with its landing gear installed on a level surface like a workbench or table top. If required, place shims under each main wheel to get the aircraft as close to level as you can by sight. Shim the nose gear so that it is approximately 3mm (1/8") higher than the main gear. This should apply approximately a two to three degree nose up attitude.

   Please note, this calibration does not have to be absolute perfection. Flex has found the methods above to work adequately for the desired flight performance.
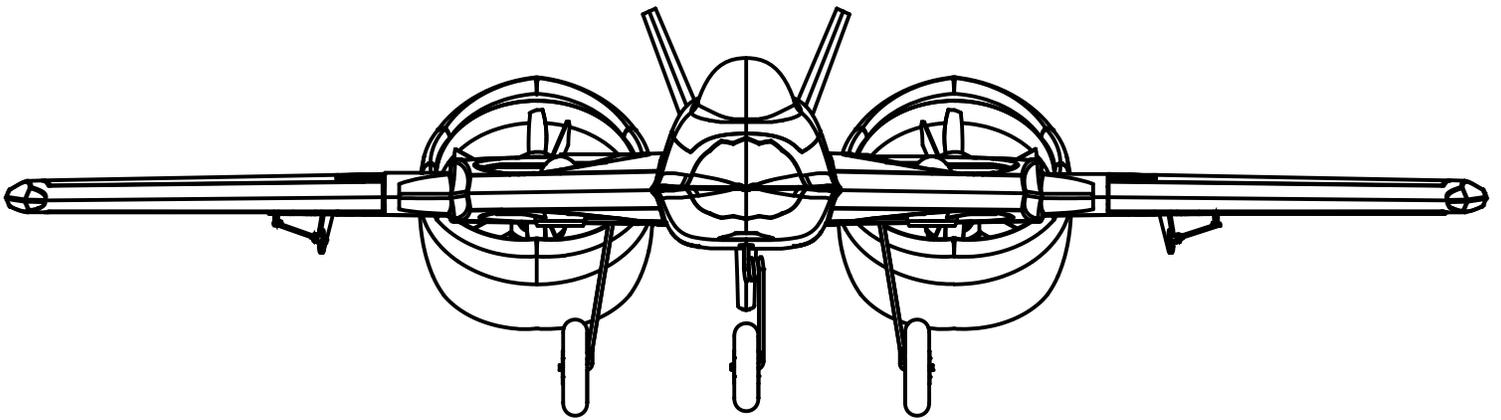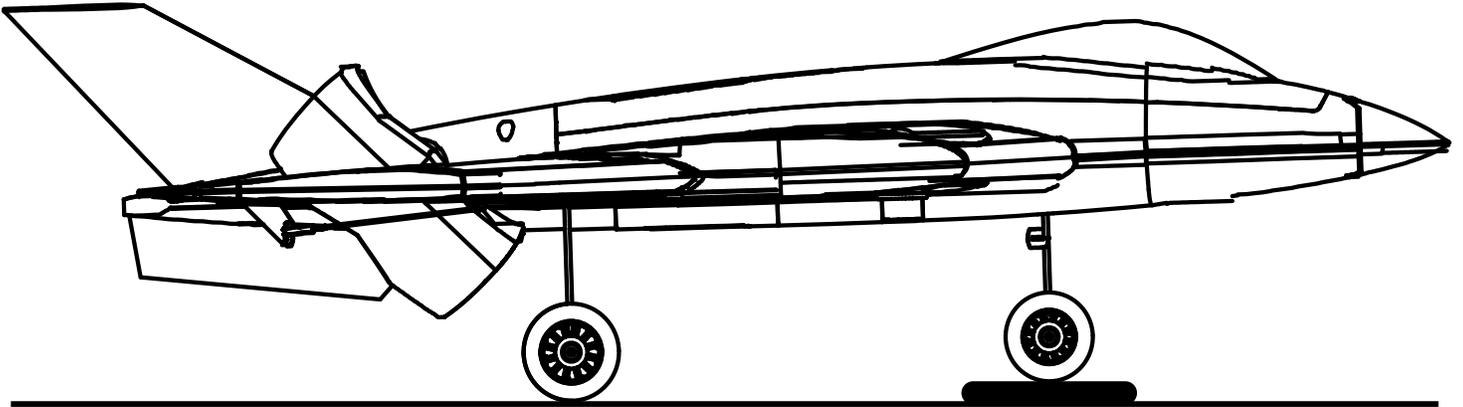
BEGINNER PROFILE CALIBRATION (CONTINUED)

3. In the Betaflight or Speedy Bee application, navigate to the Setup tab on the left hand side of the screen.

4. Once the aircraft is in a stable, proper position (reference step 2) as well as motionless, click Calibrate Accelerometer in the application. Wait until the calibration has been completed, then click disconnect and remove the USB or blueooth module from the FLEXF3.

TRANSMITTER CONTROL DIRECTION TEST

Refer to the chart below to determine the proper control surface directions.

If controls are reversed, DO NOT REVERSE CONTROLS IN THE TRANSMITTER OR THE APPLICATIONS. Email us at support@flexinnovations.com for corrective action. Note that BOTH the Transmitter Control Direction Test AND the Flight Controller Sensor Direction Test MUST BOTH BE PASSED! IF ONE DOES NOT PASS, DO NOT FLY!

Note: The rudder stick movement controls both the motors and nose gear steering for yaw control. The motors will not spin with rudder movement unless the aircraft is armed and in Conventional Configuration.

	Stick Movement	Proper Control Surface Deflection
AILERON	**Stick Left**	
	Stick Right	
ELEVATOR	**Stick Aft**	
	Stick Forward	
RUDDER	**Stick Left**	Nose Gear
	Stick Right	Nose Gear
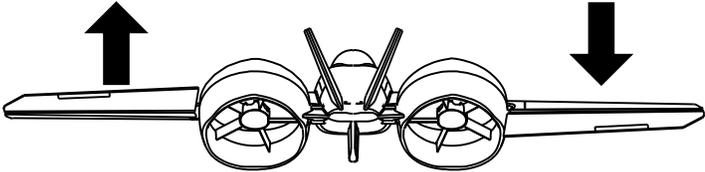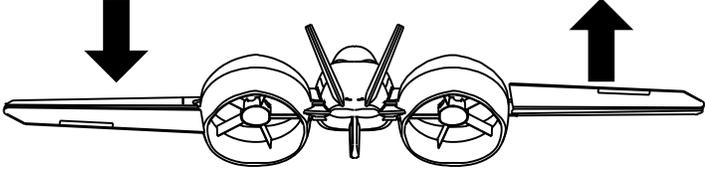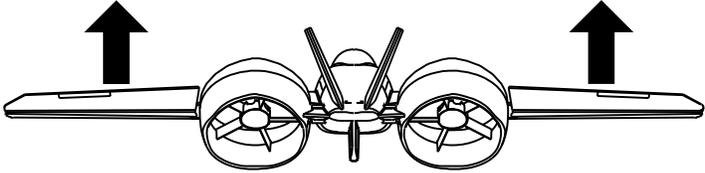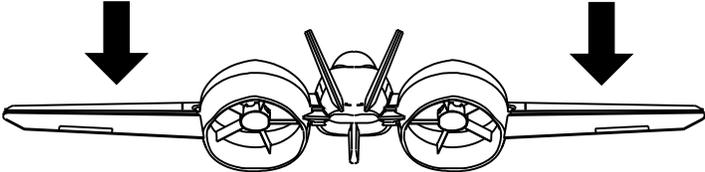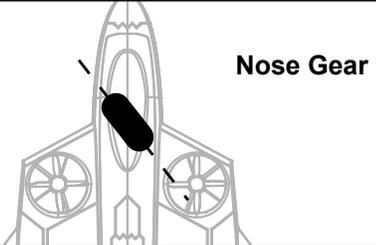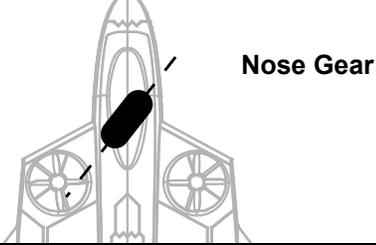
FLIGHT CONTROL SENSING DIRECTION TEST

Perform a test of the gyro system to verify the corrections made for a given movement are correct. If any of the tests do not result in the correct reaction for the airplane's gyro system, **DO NOT FLY THE AIRCRAFT**, and contact us via email at support@flexinnovations.com.

The flight control system activates with RF broadcast. Perform these tests in the Beginner Profile (6-axis) for better visibility, and then again in the Advanced Profile. Please note that the control surfaces will **ALWAYS** try to correct the aircraft to level in the Beginner Profile but will **ONLY** correct while the aircraft is **ROTATING** in the Advanced Profile.

Yaw correction is done with the motors and will only be active when the aircraft is armed. Either two or four motors may activate depending on the Flight Configuration selected and throttle position.

	Aircraft Movement	Proper Control Surface Deflection
AILERON		
AILERON		
ELEVATOR		
ELEVATOR		
RUDDER		Nose Gear
RUDDER		Nose Gear
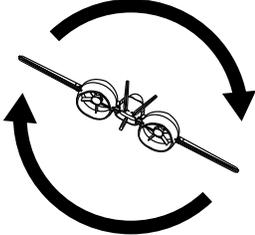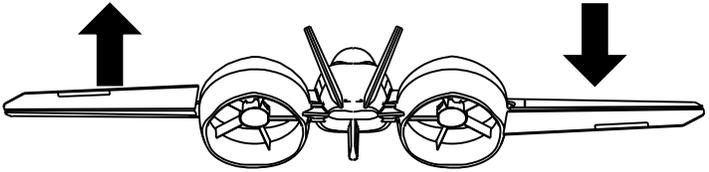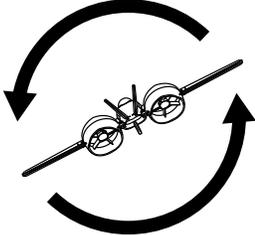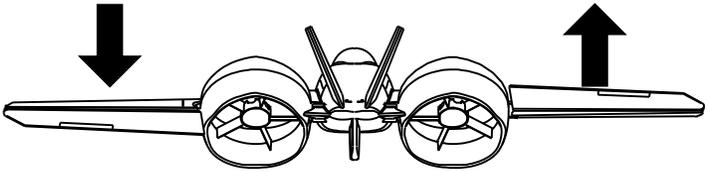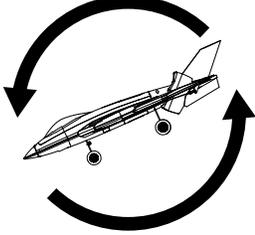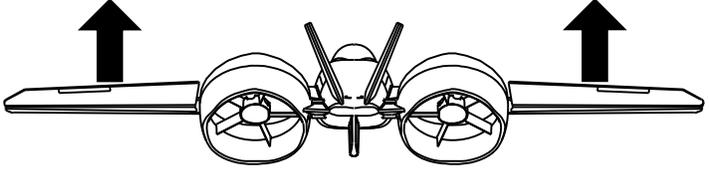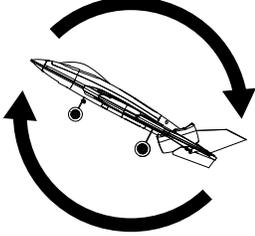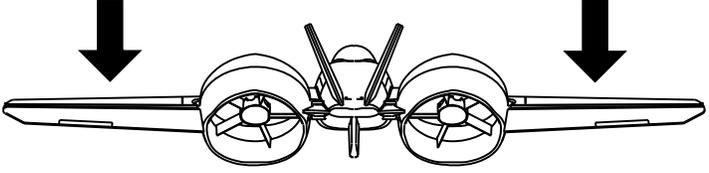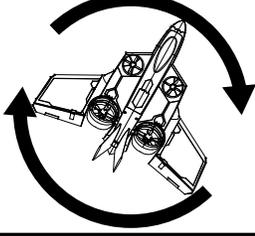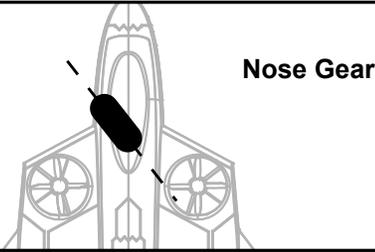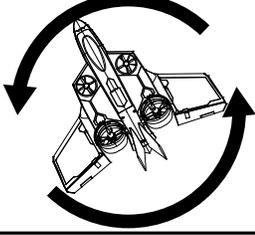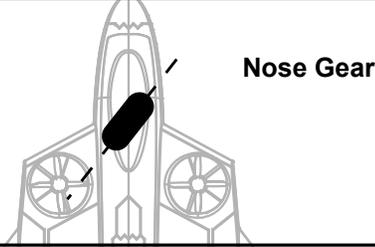
FAN INSTALLATION

⚠ WARNING

When making adjustments to the model, transmitter or FLEXF3 with the model powered, remove all fans to guard against accidental spool up.

Please note, the right rear and front left motors have reverse direction (left hand) fan and fan adapter threads. You will need to tighten their corresponding nuts by turning them counter-clockwise.

1. The fans on the FV-31 Cypher spin in different directions for stability and performance. Power the model and verify the motors spin in the proper direction as shown in the diagram below. Once confirmed, remove power from the model.

   The motor numbers in this diagram correspond to the numbers used for each motor in the Betaflight or SpeedyBee Configurators.

   You can also use this diagram in conjuction with the FLEXF3 diagram at the back of this manual for maintenance purposes, should you need to unplug one of the motors from the FLEXF3.

Motor & Fan Direction

FRONT

3   **2**

LEFT   **RIGHT**

4   **1**
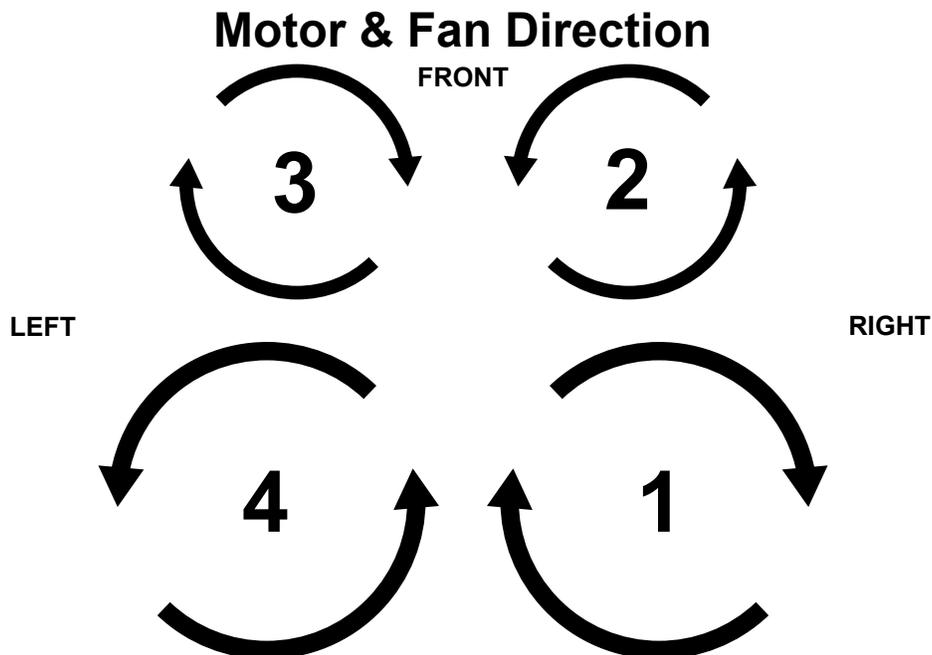
2. The front fans thread directly onto the motor shaft. In order to tighten the fans adequately, the front motors must be removed. Use a #1 Phillips screwdriver to remove the four M3 screws that secure the motor in place.
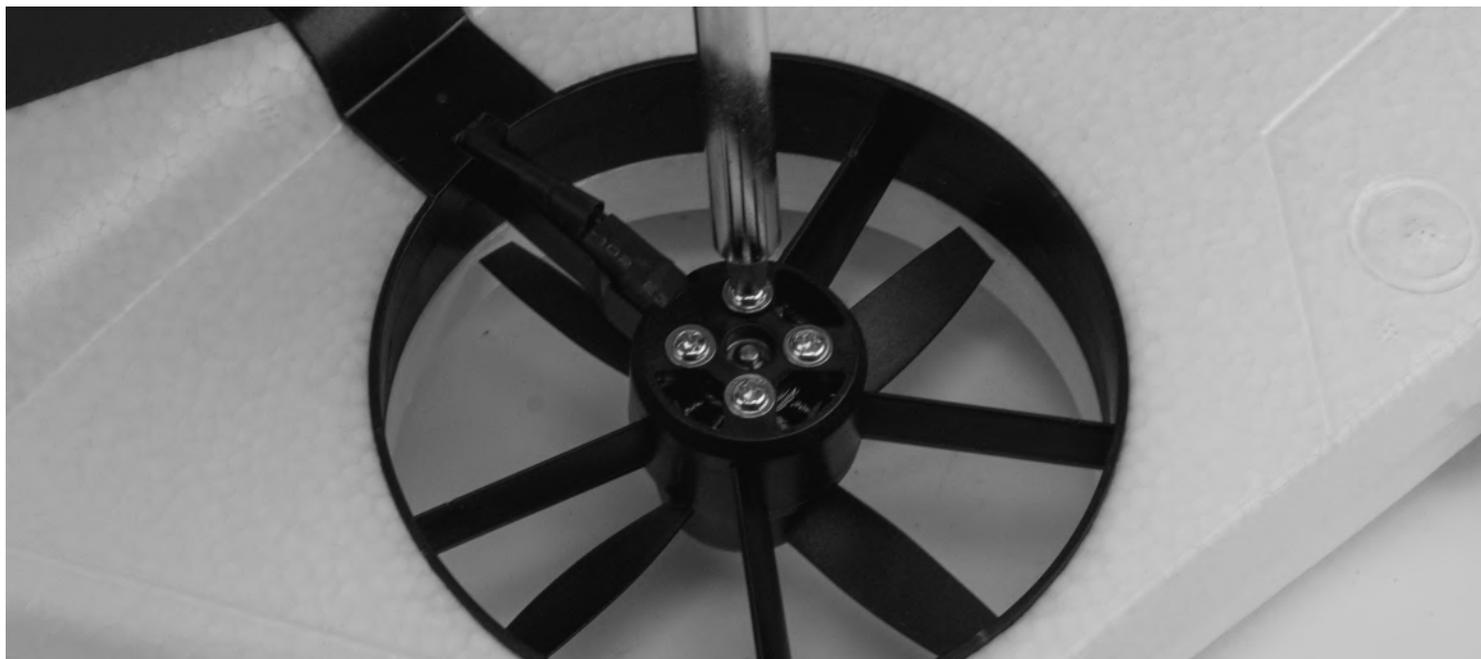
FAN INSTALLATION (CONTINUED)

3. Turn the fans onto the motor shafts. Use a #1 Phillips screwdriver and the screws removed in step one to reattach the motors to the airframe.

4. The rear motors use a traditional fan nut and spinner but do have different thread directions as with the front motors. Place the propeller over the appropriate motor, paying close attention to the direction (reference the diagram on the previous page). Place a fan washer over the fan on the motor shaft, followed by the fan nut. Tighten the nuts completely with an adjustable wrench.

FAN INSTALLATION (CONTINUED)

5. Place the spinner over the fan while noting the orientation of the fan blades and spinner cutouts. Use a Phillips screwdriver and a M3x5 machine screw to secure the spinner to the fan adapter. Repeat for the other side.

CENTER OF GRAVITY VERIFICATION

The center of gravity (CG) location for your aircraft is located at the location shown to the right as well as listed below.

The recommended starting CG is located 21mm (13/16 inch) FORWARD of the aft edge of the plastic belly pan. The total acceptable CG range for this aircraft is 18-24mm (23/32-15/16-inch) FORWARD of the aft edge of the plastic belly pan.

This CG is measured by lifting the completed aircraft upright, with all components installed. This location was determined from many test flights by designer and multi-time Top Gun champion, David Ribbe. Lift the airplane from the underside of the wing to check CG.

Setting the center of gravity is one of the most important steps for success, particularly with a new aircraft. The FV-31 Cypher is a unique flying aircraft that couples multirotor and airplane flight characteristics together. This VTOL type of aircraft makes it a very enjoyable aircraft to fly, but if the CG is not within an acceptable range, it will make the aircraft difficult, if not impossible to control.

NOTICE

The CG measurement should be made with the completed airframe with all components (batteries, servos, receiver, linkages, hardware, etc.) installed. Failure to do so will result in an inaccurate measurement.

13/16 in. (21mm)
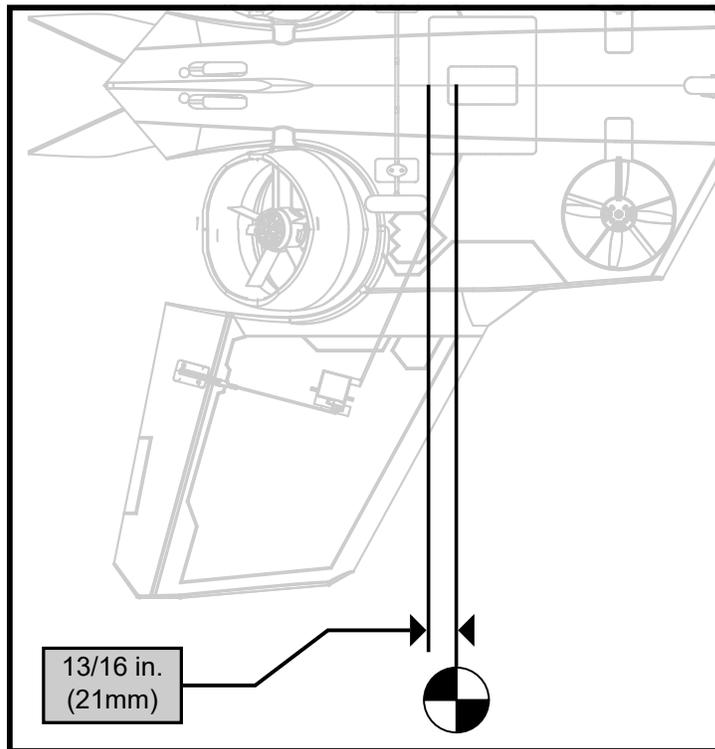
PRE-FLIGHT CHECKS

To help ensure a successful first flight, as well as many flights after, perform a few simple pre-flight checks to ensure the aircraft is ready for flight.

1. **Check and re-check all of the rear fan tilt angles with the provided gauges. It is always a good idea to keep the gauges with you at all times to re-check in case of a crash, hard landing or even accidentally bumping the fans during transport.**

2. **Check and re-check the elevon centers with the provided gauge. It is always a good idea to keep the gauges with you at all times to re-check in case of a crash, hard landing or even accidentally bumping the elevons during transport.**

3. Verify transmitter stick inputs result in the proper control surface movements (reference page 32), and that all FLEXF3 Flight Configurations and Profiles work properly.

4. Verify aircraft movement results in proper FLEXF3 sensor corrections (reference page 33).

5. Verify control surfaces are properly hinged and in good working order. Pinch a control surface between your thumb and fore finger, and stabilize the wing with your other hand. Give the control surface a firm pull away from the wing. The control surface should not come unhinged from the wing. Be sure to avoid over-stressing the part, as an aggressive pull may cause the surface to come unhinged even though it is hinged properly. If hinging is loose, do not fly. Apply thin CA to the loose side(s) of the hinge(s) to resecure.

6. Verify that all hardware and all other aircraft parts are properly secured, including those connections that require blue thread lock. This includes hardware and parts installed by the factory.

7. Verify your battery is fully charged and in good condition. Avoid using batteries with swollen cells, or batteries that do not charge back to their full capacity.

8. Verify the CG is in the proper location, and the battery is well-secured in place.

9. Ensure the FLEXF3 is on and functioning properly. Power on your transmitter, followed by the aircraft. Ensure the FLEXF3 is calibrated properly and receiving a valid radio source.

10. Verify the motor and ESC function properly. Point the aircraft in a safe direction, and away from any objects or limbs that could become entangled in the fans. Hold the aircraft firmly so that you are away from the fans. Smoothly advance the throttle to full and back to idle. Listen and watch for any od or unusual behavior from the motor and ESC.

FLYING TIPS - CONTROLS & FLIGHT PROFILES

Controls

The FV-31 Cypher is a totally unique aircraft and has several different types of controls depending on your selected Flight Configuration and Flight Profile. Check out the information below and on the following pages for details on controls and flying tips for each Flight Configuration and Profile.

Beginner Profile (6-axis)

This Profile prevents the pilot from commanding the aircraft into an unwanted attitude (like inverted) by limiting the roll and pitch angles to approximately 65 degrees. When the pilot centers his sticks, the aircraft will also automatically return itself to level, upright flight.

ROLL   PITCH
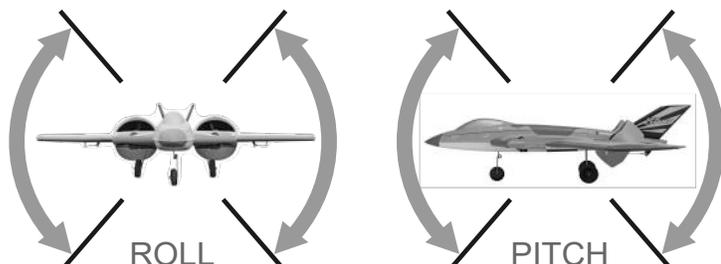
The transmitter roll and pitch sticks command a specified bank or pitch angle, ranging from 0-65 degrees depending on the specific movement of the transmitter stick. Full travel on the stick will command the aircraft to a full bank angle (approximately 65 degrees). Half travel on the stick will command the aircraft to half that angle (approximately 33 degrees). The yaw stick will command certain motor speeds through the FLEXF3 flight controller than result in yaw rotatio, but the strength of these movements will vary depending on the selected Flight Configuration and airspeed.

Roll

If you apply a stick right command with the transmitter, the right wing (if viewed as the pilot) will drop, and the left wing will rise to the commanded angle. A stick left command works in the opposite manner.

Pitch

If you apply a stick forward (toward the transmitter antenna) command with the transmitter, the nose will lower to the commanded angle. If you apply a stick rear command (toward the person holding the transmitter) with the transmitter, the nose will rise to the commanded angle.

Yaw

If you apply a stick right command with the transmitter, the nose of the aircraft will rotate to the right (if viewed as the pilot) until you release the stick. If you apply a stick left command, the nose of the aircraft will rotate to the left until you release the stick.

Advanced Profile (3-axis)

This Profile allows total freedom of flight. The aircraft is fully capable of aerobatics (like loops, rolls, flips and more) in this profile. There is no bank or pitch angle limits and the aircraft will not return to upright flight when you center the sticks.

ROLL   PITCH
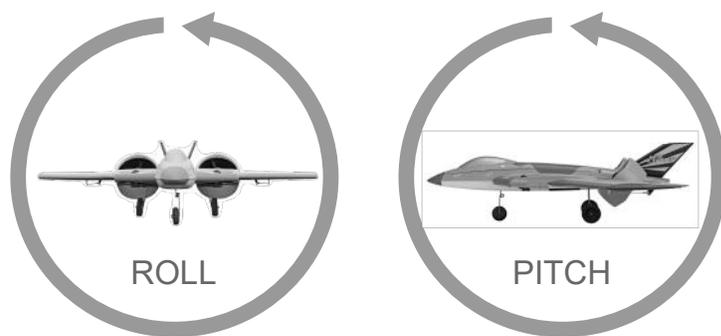
The transmitter roll and pitch sticks command a certain deflection on the control surface. The further you move the stick, the further the control surfaces deflect. The yaw stick will command certain motor speeds through the FLEXF3 flight controller that results in yaw rotation, but the strength of these movements will vary depending on the selected Flight Configuration and airspeed.

Roll

If you apply a small, right stick command, the aircraft will continue to roll right (right wing down, left wing up) at a slow rate until you move the stick back to center. Once the stick has returned to center, the aircraft will stop its motion until the next command is received. Other forces or variations (like wind, airspeed changes etc.) may alter the specific attitude after the rotation was stopped.

If you apply a large, right stick command, the aircraft will continue to roll right but at a faster rate than the small stick command, until you return the stick to center.

Pitch

Like roll, if you apply a small, forward stick command, the aircraft will continue to pitch nose down at a slow rate until you move the stick back to center. Once the stick has returned to center, the aircraft will stop its rotation until the next command is received. Outside forces may alter the specific attitude after the rotation was stopped.

If you apply a large, forward stick command, the aircraft will continue to pitch nose down at a slow rate until you move the stick back to center.

Yaw

Like roll and pitch, a small amount of right stick command will result in a slow nose-right rotation rate until you center the stick. Once the stick has returned to center, the aircraft will stop its motion until the next command is received. Other forces or variations (like wind, airspeed changes etc.) may alter the specific attitude after the rotation was stopped. A larger right stick command will result in a faster nose-right rotation rate.

FLYING TIPS - FLIGHT CONFIGURATIONS & FIRST FLIGHTS

Hover Configuration

This configuration allows for vertical take-offs and landings (VTOL) as well as general low-speed (-6 to +6mph, -10 to +10kmh) flight. This Flight Configuration uses all 4 motors in unison for flight. The aircraft is most susceptible to wind in this configuration as it will not penetrate the wind as easily as other Flight Configurations. Yaw authority is near its greatest, with all four motors working in unison for yaw control. The aircraft will not have a traditional airplane stall in this Configuration but can require higher throttle settings to maintain stability. Roll and pitch controls will vary depending on which Flight Profile you are flying in (Beginner or Advanced).

45° Magic Configuration

This configuration allows for short take-offs and landings (STOL) or even vertical take-offs and landings provided there is enough wind or angle of attack. This Flight Configuration is better for low-medium wind speeds and has better wind penetration than the Hover Configuration. General airspeed in this configuration is around -2 to +14mph (-3 to +23kmh). The aircraft has good yaw authority and it will not have a traditional airplane-like stall in this configuration. Roll and pitch controls will vary depending on which Flight Profile you are flying in (Beginner or Advanced).

Conventional Configuration

This configuration allows for traditional airplane-style take-offs and landings and flies like a conventional flying wing. This Flight Configuration is better for medium-high wind speeds and has the greatest wind penetration.The aircraft has good yaw authority at high throttle and low airspeeds but can be limited at high airspeed and lower throttle. The aircraft is flying off of its wing and will have a traditional airplane stall in this configuration. Roll and pitch controls will vary depending on which Flight Profile you are flying in (Beginner or Advanced).

Selecting a Flying Site

Selecting a flying site is critical to a successful flight. An aircraft like the Cypher can quickly take up air space, therefore, a neighborhood or parking lot is not recommended. A local AMA field is the best location for flying your aircraft. If no AMA field is available in your area, a large open field with short grass and generous overfly area is the best candidate. Know your overfly area. Ensure that there are no houses, playgrounds, people or other buildings that may be damaged if the aircraft were to crash.

Tips for your First Flights

Depending on your previous experience, you may want to start flying the aircraft in the Flight Configuration and Profile you are most comfortable with. If you have previously flown four (or more) channel airplanes but have limited experience with helicopters or multirotors, you may choose to make your first flight in Conventional Configuration. Conversly, if you are more familiar with helicopters or multirotors, you may choose to make your first flight in Hover Configuration.

Takeoff

Conventional Takeoff

Set your Flight Configuration switch (CH6) to the Conventional Configuration position. This is when the rear fans are perpendicular to the wing. Set your Flight Profile switch (CH5) to the position you are most comfortable with. For traditional airplane controls, this would be the advanced profile. Arm the aircraft and taxi to the end of your takeoff space. Point the nose into the wind. Smoothly advance the throttle to full and steer using the rudder stick. As the aircraft picks up speed, smoothly feed in an adequate amount of up elevator and the aircraft will leave the runway. Climb to a safe altitude to learn how the aircraft is trimmed. Follow our trimming tips for more details.

Vertical Takeoff

Ensure that wind speeds are low. In Hover Configuration, the aircraft will fly backward if there is more than a light wind. Set your Flight Configuration switch (CH6) to the Hover Configuration position. This is when the rear fans are near-parallel to the wing. Set your Flight Profile switch (CH5) to the position you are most comfortable with. For traditional helicopter or 'acro' multirotor controls, this would be the Advanced Profile. For self-leveling, 'angle' controls, this would be the Beginner profile. Place the aircraft in its takeoff location with the nose pointed into the wind. Stand a safe distance behind the aircraft so that the controls are simple: forward on the pitch stick is forward (away from you), right is to your right etc. Arm the aircraft, and slowly advance the throttle until the aircraft is about 6-inches (15cm) off the ground. Full throttle is not required. If at any point you feel that a crash is imminent, quickly lower the throttle to return the aircraft safely to the ground. As you get more comfortable with the aircraft, you can bring it higher and begin to maneuver around. Note that when near the ground, fan wash and ground effect can become a factor. As the aircraft nears the ground, the fans force air below the aircraft but the air cannot move as freely as it can at altitude. This causes the air to return upward toward the aircraft, creating a buoyancy effect. While the aircraft may be descending at a good, consistent rate for landing, you may find that you need to lower the throttle further as you near the ground (typically this can start to occur around 3 feet (1m).

Landing

There are various ways to land the FV-31 Cypher. For your first flight, you may choose not to make any transitions. If that is the case, you will be landing in the same Flight Configuration that you took off in.

Conventional Landing

Reserve enough battery on your first flights for several missed approaches. Slow the aircraft to a comfortable airspeed around 35% throttle. Fly downwind far enough to give yourself adequate time to make final adjustments on your final upwind approach. Be sure not to fly too far downwind. If there is a significant amount of wind, it will take longer on your final approach upwind. As you make your turn upwind, reduce the throttle to appoximately 15-20% and slowly begin descending. Don't point the nose significantly down, as this will cause the aircraft to pick up airspeed and only make the final flare more difficult and the airspeed higher than it needs to be. Instead, keep the nose level and use throttle to manage the rate of descent. As you approach the threshold of the runway, continue to manage your descent with throttle until you are ready to flare.

FLYING TIPS - FIRST FLIGHTS, TRANSITIONS AND TRIMMING

Conventional Landing (Continued)

Once ready to flare, slowly reduce the throttle to idle and smoothly feed in up elevator to bring the aircraft down gently on its main wheels. Avoid hitting nose gear first, as this will cause the aircraft to bounce quickly back into the air, stall and then repeat. Remember, you can always go around, so don't force yourself to land if you are not completely ready.

Vertical Landing

Ensure there is not excessive wind when landing in this configuration. If there is significant wind, we recommend landing in the 45° 'Magic' Configuration or Conventional Configuration rather than Hover Configuration. Be sure to reserve plenty of battery as Hover Configuration can consume battery capacity quickly. Point the aircraft into the wind and try to minimize its motion with small commands. Focus mainly on left to right movement as this can cause the aircraft to tip in the roll direction if the main landing gear hits the ground while in side-to-side motion. Slow fore or aft movement is okay and will not likely result in any problems since the aircraft is designed to roll on the ground in those directions. Once the aircraft is stable in a hover, slowly reduce the throttle to bring it to rest on the ground. Once the aircraft touches the ground, immediately lower the throttle to idle.

Transitions

While there are 3 possible Flight Configurations (Hover, 45°, Conventional), transitions occur when changing from one flying state to another. Flex Innovations defines two flying states when talking about transitions; **flying on the wing** or **flying on fan thrust**.

Conventional Configuration is flying on the wing.
Hover and 45° Configuration are both flying on fan thrust.

Transitions occur when the aircraft changes:

1. From Conventional Configuration **TO** 45° Configuration OR Hover Configuration

OR

2. From Hover OR 45° Configuration **TO** Conventional Configuration

Transition to Conventional Configuration (to the wing)

For your first transition to Conventional Configuration, switch your aircraft to the 45° Configuration. The 45° Configuration flies very similar to Hover Configuration, just with a bit more forward speed. Climb to a safe altitude. For some people this may be 100ft (30m), for others, it may be higher or lower. Decide for yourself; you don't want to be so high you can't see the model, but you also don't want to be so close to the ground that if something happens, you can't recover. For the first transition, we recommend selecting the Beginner Profile, as this is the easiest and simplest for most users.

With the aircraft level and pointed into the wind, increase the throttle to 100% and switch into the Conventional Configuration. No pilot input should be needed before or during the transition. Within a few seconds the aircraft will be flying conventionally on the wing and you can reduce power as needed.

Transition from Conventional Configuration (to fan thrust)

For your first transition from Conventional Configuration, you will transition to the 45° Configuration. Perform a normal traffic pattern at a reduced but safe speed. Descend (or climb) into the wind to a safe altitude (as described previously). Place the throttle between 35 and 60% and switch to the 45° Configuration. The aircraft will automatically transition over the next several seconds. Continue maneuvering in the 45° Configuration as needed. Point the nose where you want to go (in example, point down to go down). You may continue to land in the 45° Configuration, or switch to Hover Configuration.

As you gain experience, transitions can be accomplished directly to and from the Hover Configuration (straight through 45° Configuration) as well.

Minimal pilot input is needed for transitions, even if flying in the Advanced Profile! There is no need to lower the nose to increase airspeed before transitioning to Conventional Configuration. The Cypher will manage it for you. Should you need to add an input, keep the inputs small. **If for some reason the aircraft pitches abruptly during the transition, this is typically caused by an improper fan angle and/or improper elevon centering. Follow the directions in this manual for setting these angles.** The CG can also play a part in pitching during transitions but is far less significant than the fan and elevon angles.

Trimming

The first several flights in Conventional Configuration should be dedicated to trimming and setup. Switch to the Advanced Profile while in Conventional Configuration and fly the aircraft at approxiately 65% power. Trim with the transmitter trims for level flight. Land and take note of where the elevons are. Return the transmitter trim to zero and adjust the elevon linkages to the position noted before. Repeat until the aircraft flies hands-off, straight and level.

If you notice the aircraft pitches abruptly during transitions, this may be caused by improper fan angle adjustment or improper elevon centering. Use the provided gauges and follow the instructions for fan and elevon angle setup.

AIRCRAFT TROUBLESHOOTING GUIDE

Should you encounter any abnormal situations with your aircraft, refer to the matrix below to determine a probable cause and a recommended solution for the action.

If the required solution does not rectify the problem, please contact product support for further assistance.

⚠ NOTICE

Unless specifically required, ALWAYS trouble shoot with fan blades removed, motors unplugged from the ESC or with the aircraft securely restrained and clear of people and loose objects.

DISCREPANCY	PROBABLE CAUSE	RECOMMENDED SOLUTION
Motors will not Arm/Run - no initialization tones	Dead battery	Use a charged battery
	Bad ESC Module	Replace ESC Module
Motors will not Arm/Run - with initialization tones, Red LED BLINKING on FLEXF3	Model not level	Level the model (the model must be within 25 degrees of level to arm)
	Throttle command not low enough to Arm	Lower throttle stick. Lower throttle trim. Note: In forward flight configuration, throttle must be advanced to run motors
	No valid signal from the receiver	Check that transmitter and receiver are on and bound. Check receiver connections per this instruction manual. Check that the correct settings are made in the FLEXF3
	Connected to Configurator via USB or Bluetooth	Disconnect/Unplug. Cycle FLEXF3 power.
	Throttle channel reversed	Check transmitter setup. Reverse throttle channel as needed.
	Arming fault not found	See Cypher wiki for further ARMING information
Do not have control	Receiver not bound	Bind receiver. Consult radio manual for proper binding instructions.
	Receiver port not configured in the FLEXF3.	Configure the FLEXF3 receiver port as described in this manual of on the Flex Wiki page.
	Wrong FLEXF3 receiver input settings.	Select the appropriate receiver choices as described in this manual or on the Flex Wiki page.
	Incorrect connection of receiver to the FLEXF3	Connect the receiver to the FLEXF3 as described in this manual or on the Flex Wiki page.
Have control, but a control surface is not responding correctly	Transmitter model bound incorrectly, incorrect active model memory, incorrect data output configuration, incorrect transmitter settings.	Consult radio manual for proper binding and model selection instructions.
	Airframe or control linkage(s) damaged	Replace damaged control system components. DO NOT ATTEMPT REPAIR.
	Battery voltage too low	Use volt meter to check battery. Replace or recharge as necessary.
	Battery intermittently connected to ESC	Verify that battery is connected, EC3 plugs are fully seated and that all wires and cables are properly/well connected.
	Battery Eliminator Circuit (BEC) damaged	Replace ESC. DO NOT ATTEMPT REPAIR.
	Damaged servo	Replace servo. DO NOT ATTEMPT REPAIR.
Have control, but transmitter sticks are NOT moving the correct controls	Wrong Channel Map in Betaflight Settings	Use your Configurator's receiver page to set the Channel Map (Channel Order) as specified for your radio in this manual.
	Wrong Transmitter Settings	Set your transmitter's Wing Type, Tail Type, switches, etc. as specified for your radio in this manual or on the Flex Wiki page.
Failed control direction test	Incorrect transmitter or FLEXF3 controller setting	DO NOT FLY! - Reference transmitter and receiver sections of this manual
Model does not have control in hover	Battery not fully charged	Replace with fully charged battery
	Bad Motor	Check motor performance. Replace damaged motors.
	Motor turning wrong direction	Verify: if direction wrong, reverse any two wires of that motor at ESC
	Wrong fan blades installed in location	Check fan pitch. Fans should generate thrust out bottom of model while turning correct direction. Replace with correct fan blades for location.
Short or reduced flight time or aircraft under powered	Battery not fully charged	Replace with fully charged battery
	Flight battery weak or damaged	Remove battery from service and replace with different battery
	Battery capacity too small for intended use	Replace battery with one of proper capacity and discharge capability (C rating)
	Battery's discharge (C) rating too low	Replace battery with one of a higher discharge (C) rating
	Ambient temperature is too cold	Ensure battery packs are adequately warm (70°F/21°C) before flight.
Excessive fan blade noise and/or vibration	Damaged fan blades, fan adapter or motor	Replace damaged components. DO NOT ATTEMPT REPAIR.
	Fan blades not balanced	Balance or replace the fan blades
	Fan or fan nut is loose	Tighten with proper tools as needed
Control surface oscillation	Fan/Motor not balanced	Balance or replace Fan/Motor
	Loose FLEXF3 Mounting	Realign and secure the FLEXF3 PCB to the aircraft
Model not trimmed in forward flight	Fan angle not properly set	Use gauges to adjust angle per this manual
	Control surfaces need adjustment	Use clevises to adjust surfaces as described in this manual
	Wrong Center of Gravity	Adjust CG to location specified as described in this manual

AIRCRAFT TROUBLESHOOTING GUIDE

Should you encounter any abnormal situations with your aircraft, refer to the matrix below to determine a probable cause and a recommended solution for the action.

If the required solution does not rectify the problem, please contact product support for further assistance.

⚠ NOTICE

Unless specifically required, ALWAYS trouble shoot with fan blades removed, motors unplugged from the ESC
or with the aircraft securely restrained and clear of people and loose objects.

DISCREPANCY	PROBABLE CAUSE	RECOMMENDED SOLUTION
Model climbs or dives excessively during transition but is trimmed in forward flight	**Fans not set at correct angles (particularly in 45 Degree and Conventional Configurations)**	**Adjust fan angles with supplied gauges as described in this manual**
	Inappropiate power setting	Do initial transitions to forward flight at 85 to 100% throttle. Do initial transitions from forward flight at 35 to 55% throttle at 'pattern speed'.
	Wrong attitude	Make transitions to forward flight within few degrees of level not in a climb.
	Wrong Center of Gravity	Set CG per this manual
	Pilot Oscillation/Overcontrol	Pilot inputs are allowed during transition, but generally are not needed. Any pilot input during transition should be smooth and small.

MICRO USB
(uses UART1)

UART2
BLUETOOTH
(19200 BAUD)

GND
5V
TX2
RX2

PPM

S
4.3V
GND

BLUE LED
(POWER)

RED LED
(STATUS)

UART 3
(RX INPUT)

RX3   TX3

GND 4.3V

BOOT

BUZZER/LED

4.3V
GND

GND
VBATT

FLIGHT PACK
VOLTAGE INPUT

A
1 — MTR 3 (ORANGE)
2 — MTR 4 (YELLOW)
3 — MTR 2 (VIOLET)

B
1 — MTR 1 (GREEN)
2 — 5V (BEC INPUT)
3 — GND (BLACK)

C
1 — R ELEVON
2 — 5V
3 — GND

D
1 — L ELEVON
2 — 5V
3 — GND

1
2
3

A B C D E F G H

E
1 — FAN TILT
2 — 5V
3 — GND

F
1 — NOSEWHEEL
2 — 5V
3 — GND

G
1 — CH9
2 — 5V
3 — GND

H
1 — CH8
2 — 5V
3 — GND

FLEXF3
REFERENCE
DIAGRAM

43

Academy of Model Aeronautics National Model Aircraft Safety Code
Effective January 1, 2015

A. **GENERAL:** A model aircraft is a non-human-carrying aircraft capable of sustained fight in the atmosphere. It may not exceed limitations of this code and is intended exclusively for sport, recreation, education and/or competition. All model fights must be conducted in accordance with this safety code and any additional rules specific to the flying site.

1. Model aircraft will not be flown:
   (a) In a careless or reckless manner.
   (b) At a location where model aircraft activities are prohibited.
2. Model aircraft pilots will:
   (a) Yield the right of way to all human-carrying aircraft.
   (b) See and avoid all aircraft and a spotter must be used when appropriate. (AMA Document #540-D.)
   (c) Not fly higher than approximately 400 feet above ground level within three (3) miles of an airport without notifying the airport operator.
   (d) Not interfere with operations and traffic patterns at any airport, heliport or seaplane base except where there is a mixed use agreement.
   (e) Not exceed a takeoff weight, including fuel, of 55 pounds unless in compliance with the AMA Large Model Airplane program. (AMA Document 520-A.)
   (f) Ensure the aircraft is identified with the name and address or AMA number of the owner on the inside of affixed to the outside of the model aircraft. (This does not apply to model aircraft flown indoors.)
   (g) Not operate aircraft with metal-blade propellers or with gaseous boosts except for helicopters operated under the provisions of AMA Document #555.
   (h) Not operate model aircraft while under the influence of alcohol or while using any drug that could adversely affect the pilot's ability to safely control the model.
   (i) Not operate model aircraft carrying pyrotechnic devices that explode or burn, or any device which propels a projectile or drops any object that creates hazard to persons or property.

   Exceptions:
   - Free Flight fuses or devices that burn producing smoke and are securely attached to the model aircraft during flight.
   - Rocket motors (using solid propellant) up to a G-series size may be used provided they remain attached to the model during flight. Model rockets may be flown in accordance with the National Model Rocketry Safety Code but may not be launched from model aircraft.
   (j) Officially designated AMA Air Show Teams (AST) are authorized to use devices and practices as defined within the Team AMA Program Document. (AMA Document #718.)
   (a) Not operate a turbine-powered aircraft, unless in compliance with the AMA turbine regulations. (AMA Document #510-A.)
3. Model aircraft will not be flown in AMA sanctioned events, air shows or model demonstrations unless:
   (b) The aircraft, control system and pilot skills have successfully demonstrated all maneuvers intended or anticipated prior to the specific event.
   An inexperienced pilot is assisted by an experienced pilot.
4. When and where required by rule, helmets must be properly worn and fastened. They must be OSHA, DOT, ANSI, SNELL or NOCSAE approved or comply with comparable standards.

B. RADIO CONTROL (RC)
1. All pilots shall avoid flying directly over unprotected people, vessels, vehicles or structures and shall avoid endangerment of life and property of others.
2. A successful radio equipment ground-range check in accordance with manufacturer's recommendations will be completed before the first flight of a new or repaired model aircraft.
   At all flying sites a safety line(s) must be established in front of which all flying takes place. (AMA Document #706.)
   (a) Only personnel associated with flying the model aircraft are allowed at or in front of the safety line.
   (b) At air shows or demonstrations, a straight safety line must be established.
   (c) An area away from the safety line must be maintained for spectators.
   (d) Intentional flying behind the safety line is prohibited.

4. RC model aircraft must use the radio-control frequencies currently allowed by the Federal Communications Commission (FCC). Only individuals properly licensed by the FCC are authorized to operate equipment on Amateur Band frequencies.
5. RC model aircraft will not knowingly operate within three (3) miles of any pre-existing flying site without a frequency-management agreement. (AMA Documents #922 and #923)
6. With the exception of events flown under official AMA Competition Regulations, excluding takeoff and landing, no powered model may be flown outdoors closer than 25 feet to any individual, except for the pilot and the pilot's helper(s) located at the flightline.
7. Under no circumstances may a pilot or other person touch an outdoor model aircraft in flight while it is still under power, except to divert it from striking an individual.
8. RC night flying requires a lighting system providing the pilot with a clear view of the model's attitude and orientation at all times. Hand-held illumination systems are inadequate for night flying operations.
9. The pilot of an RC model aircraft shall:
   (a) Maintain control during the entire flight, maintaining visual contact without enhancement other than by corrective lenses prescribed for the pilot.
   (b) Fly using the assistance of a camera or First-Person-View (FPV) only in accordance with the procedures outlined in AMA Document #550.
   (c) Fly using the assistance of autopilot or stabilization system only in accordance with the procedures outlined in AMA Document #560

C. FREE FLIGHT
1. Must be at least 100 feet downwind of spectators and automobile parking when the model aircraft is launched.
2. Launch area must be clear of all individuals except mechanics, officials, and other fliers.
3. An effective device will be used to extinguish any fuse on the model aircraft after the fuse has completed its function.

D. CONTROL LINE
1. The complete control system (including the safety thong where applicable) must have an inspection and pull test prior to flying.
2. The pull test will be in accordance with the current Competition Regulations for the applicable model aircraft category.
3. Model aircraft not fitting a specific category shall use those pull-test requirements as indicated for Control Line Precision Aerobatics.
4. The flying area must be clear of all utility wires or poles and a model aircraft will not be flown closer than 50 feet to any above-ground electric utility lines.
5. The flying area must be clear of all nonessential participants and spectators before the engine is started.

LIMITED WARRANTY

Warranty Coverage

Flex Innovations, LLC and its authorized resellers ("Flex") warrant to the original purchaser that the product purchased (the "Product") it will be free from defects in materials and workmanship at the date of purchase.

Outside of Coverage

This warranty is not transferable and does not cover:

    (a) Products with more than 45 days after purchased date.
    (b) Damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or due to improper use, installation, operation or maintenance
    (c) Modification of or to any part of the Product.
    (d) Product not compliant with applicable technical regulations.
    (e) Shipping damage
    (f) Cosmetic damage
    (g) Products that have been partially, or fully assembled

OTHER THAN THE EXPRESS WARRANTY ABOVE, FLEX MAKES NO OTHER WARRANTY OR REPRESENTATION, AND HERBY DISCLAIMS ANY AND ALL IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF NONINFRINGEMENT, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE PURCHASER ACKNOWLEDGES THAT THEY ALONE HAVE DETERMINED THAT THE PRODUCT WILL SUITABLY MEET THE REQUIREMENTS OF THE PURCHASER'S INTENDED USE.

Purchaser's Solution

Flex's sole obligation and purchaser's sole and exclusive remedy shall be that Flex will, at its option, either (i) service, or (ii) replace, any Product determined by Flex to be defective. Flex reserves the right to inspect any and all Product(s) involved in a warranty claim. Service or replacement decisions are at the sole discretion of Flex. Proof of purchase is required for all warranty claims. **SERVICE OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE PURCHASER'S SOLE AND EXCLUSIVE REMEDY.**

Limitation of Liability

FLEX SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY, REGARDLESS OF WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY OR ANY OTHER THEORY OF LIABILITY, EVEN IF FLEX HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Further, in no event shall the liability of Flex exceed the individual price of the Product on which liability is asserted. As Flex has no control over use, setup, assembly, modification or misuse, no liability shall be assumed nor accepted for any resulting damage or injury. By the act of use, setup or assembly, the user accepts all resulting liability. If you as the purchaser or user are not prepared to accept the liability associated with the use of the Product, purchaser is advised to return the Product immediately in new and unused condition to the place of purchase.

Law

these terms are governed by Florida law (without regard to conflict of law principals). This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. **FLEX RESERVES THE RIGHT TO MODIFY THIS WARRANTY AT ANY TIME WITHOUT PRIOR NOTICE.**

Questions & Assistance

Visit **www.flexinnovations.com/articles.asp?ID=269** to find customer support in your region.

Inspection or Services

If this Product needs to be inspected or serviced and is compliant in the region you live and use the Product in, please contact your regional Flex authorized reseller. Pack the Product securely using a shipping carton. Please note that original boxes need to be included, but are not designed to withstand the regors of shipping without additional protection. Ship via a carrier that provides tracking and insurance for lost or damaged parcels, as Flex is not responsible for merchandise until it arrives and is accepted at our facility.

Warranty Requirements

For Warranty consideration, you must include your original sales receipt verifying the proof of purchase date, original packaging materials, including the shipping carton. Provided warranty conditions have been met, your Product will be replaced free of charge. Shipping charges are as follows: shipping to Flex paid by customer, shipping to customer paid by Flex. Service or replacement decisions are at the sole discretion of Flex.

COMPLIANCE INFORMATION FOR THE EUROPEAN UNION

Declaration of Conformity (In accordance with ISO/IEC 17050-1)

Product(s):   FV-31 Cypher Super PNP - White
                      FV-31 Cypher Super PNP - Gray

Item Number(s):   FPM3870A
                      FPM3870B

The object of declaration described above is in conformity with the requirements of the specifications listed below, following the provisions of the EMC Directive 2004/108/EC.

EN 55022: 2010+AC:2011
EN 55024: 2010
**EN 61000-3-2: 2006+A2:2009**
EN 61000-3-3: 2013

EN 61000-6-3: 2007/A1:2011
EN 61000-6-1: 2007

Instructions for disposal of WEEE by users in the European Union

This product must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of their waste equipment by handing it over to a designated collections point for the recycling of waste and electronic equipment. The seperate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where to drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or where you purchased this product.

POTENZA™

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INNOVATIONS
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