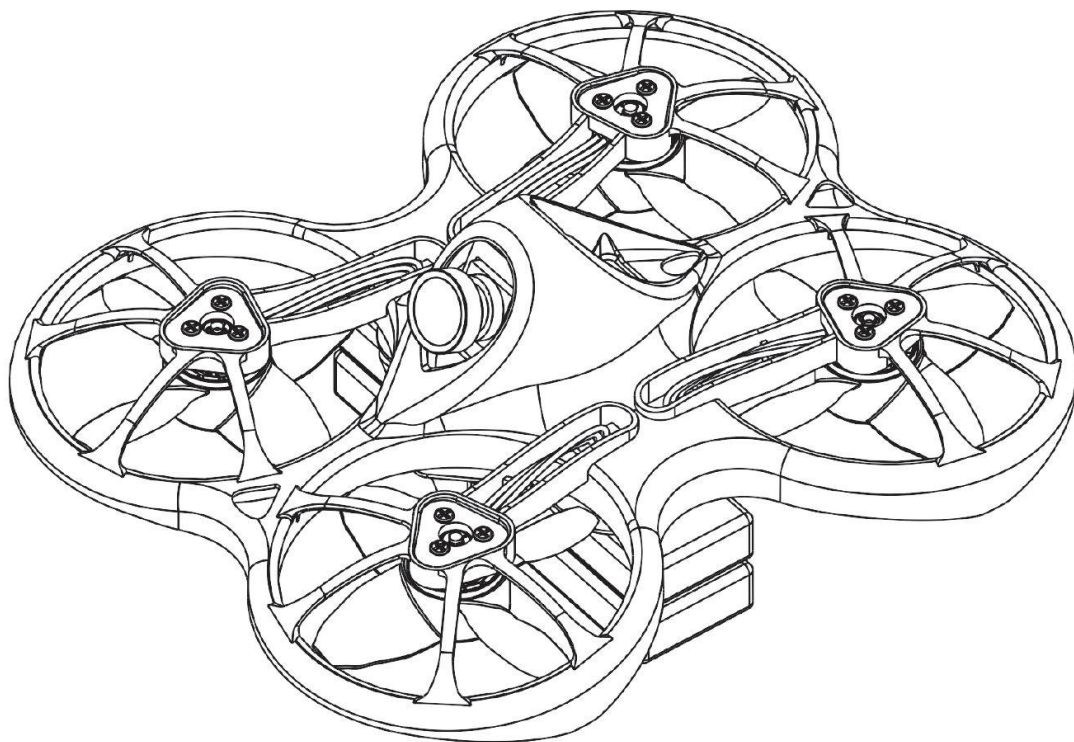Thanks for purchasing the Tinyhawk S. Designed in California, assembled in China.

Disclaimer

Please read the disclaimer carefully before using this product. By using this product, you hereby agree to this disclaimer and signify that you have read them carefully and completely. This product is not suitable for people under the age of 18. Adult supervision is highly recommended for kids under the age of 18.

Our Tinyhawk S features open-source flight controller and Electronic Speed Controllers to meet the FPV enthusiasts' need to upgrade their quad.

Please read the instruction manual and warnings carefully. Before every flight, make sure the battery is fully charged and power connections are secure. DO NOT fly around crowds, children, animals or objects. EMAX ACCEPTS NO LIABILITY FOR DAMAGE(S) OR INJURIES INCURRED DIRECTLY OR INDIRECTLY FROM THE USE OF THIS PRODUCT.

Precautions

Please follow the instructions to assemble and to operate this product in a proper way.

Pilots do not use this product if you have physical or mental illness, dizziness, fatigued, or use while under the influence of alcohol or drugs.

Please fly in a safe area away from people

Do not modify or use other parts and accessories not approved for the use of EMAX.

Do not use this product in harsh environments (such as winds, rain, lightning, snow, etc.).

 Do not use this product in a strong electromagnetic environment.

Support

Please visit **emax-usa.com** or **emaxmodel.com** for any updates or support needs.

Table of Contents

Product specification

Tinyhawk S	Parameter
Diagonal wheelbase (without paddles)	75mm
Maximum size of the aircraft (without antenna, cable tie)	125mm
Aircraft weight (without battery)	30g
Motor	TH0802 15500KV
Propeller	Avan TH Turtlemode Propeller
Main Flight Controller	F4（MATEKF411 firmware） 4 in one 5A ESC EMAX Tiny receiver（Compatible with Frsky remote control D8/D16 mode）
Camera	600TVL CMOS camera
Transmitter	25mW Adjustable frequency 37CH
Battery	1 Cell 450 mAh HV lipo battery

Product list
1. Tinyhawk S × 1
2. Instruction manual × 1
3. Emax 1s HV 450 mAh × 1
4. Emax 2s HV 300 mAh × 1
5. Charger × 1
6. Extra Propeller Set (2x CW, 2x CCW)
7. Screwdriver x 1

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Tinyhawk S Structure

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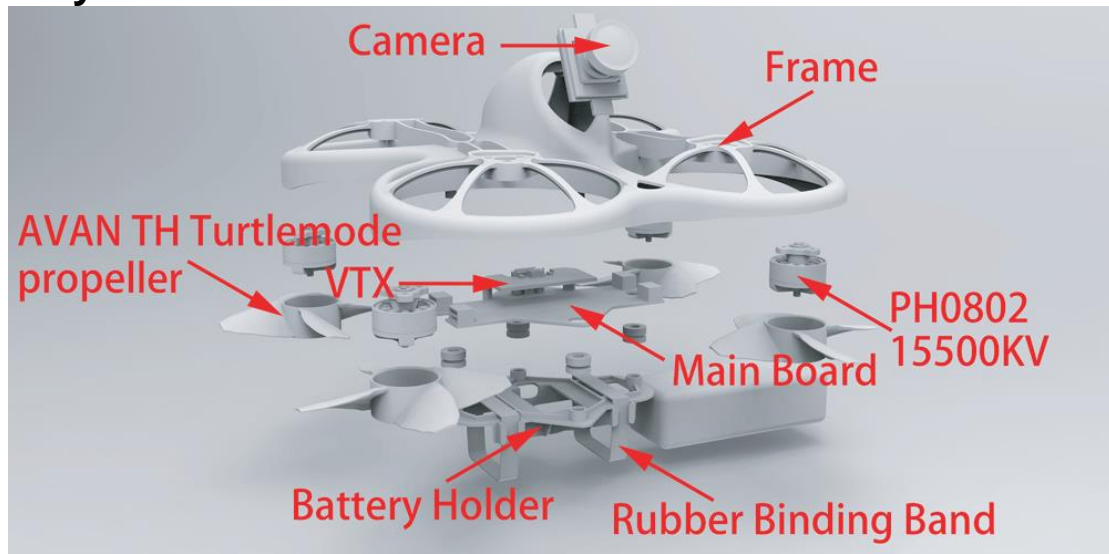
Tinyhawk S

Propeller Direction and Mounting

There are 2 spinning directions for Tinyhawk S propellers, Clockwise (CW) and Counter-Clockwise (CCW). When Buying a set of propellers, 2 CW and 2 CCW will be given. The blunt leading edge indicates the direction the propeller is suppose to rotate as compared to the sharp trailing edge. When mounting propellers please make sure the correct orientation shown in the diagram below.
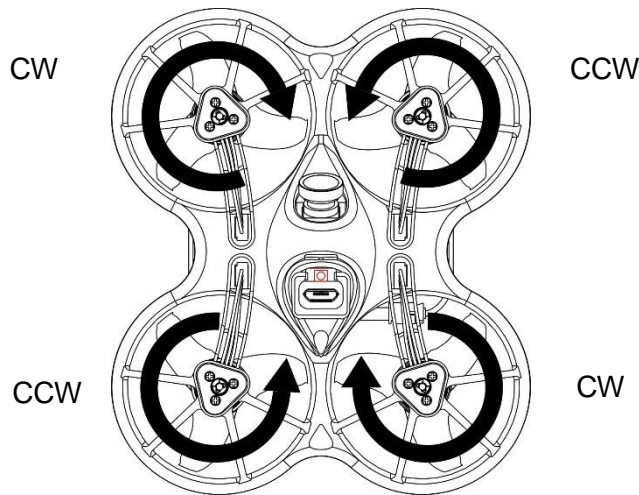
Caution: Failure to mount the propellers in the correct orientation will cause Tinyhawk S to not fly correctly and with no control. Please double check for the correct orientation.

1. Line up the 3 struts of the propeller with the 3 struts on the motor bell.
2. Press on the propeller while supporting the backside of the motor with our fingers.
3. Press on until the motor shaft is flush with the propeller.

Caution: Failure to support the motor sufficiently can cause the frame to break. Use caution when pressing the propellers on.

Propeller Dismount

Use caution when dismounting the propellers. Only do so if completely necessary to change to a new propeller.

1. Use a small tool (such as a 1.5mm hex wrench or the small screwdriver provided) to press on the metal on the bottom of the motor and Tinyhawk S.
2. Press on the blades of the propeller with your fingers until the propellers pop off the motor.

Caution: Failure to support the motor sufficiently can cause the frame to break. Use caution when pressing the propellers off.
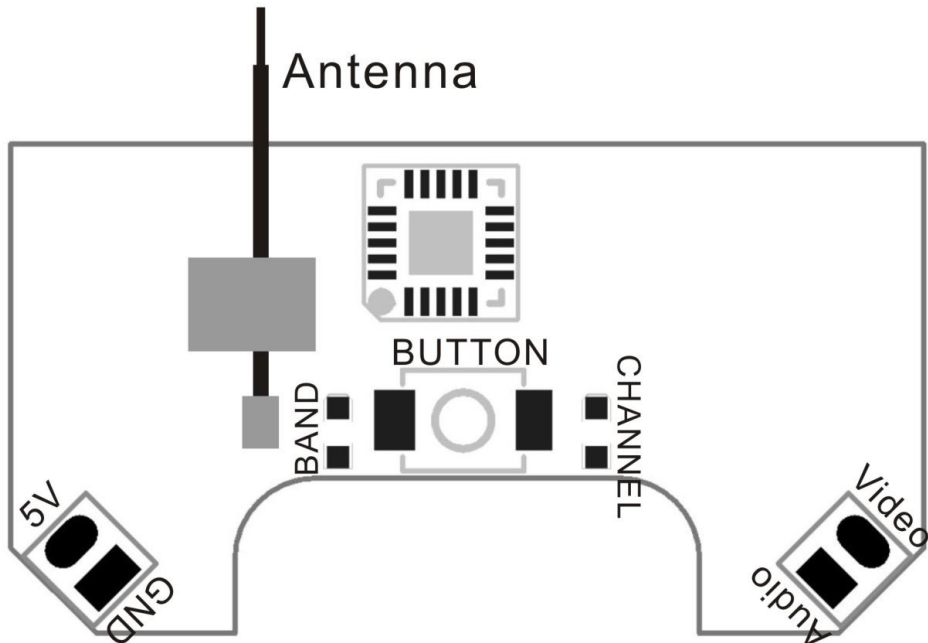
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Tinyhawk S VTX Settings

Vtx Schematic and Button Diagram

VTX Channel Settings with the Button

1. Normal display

All LEDs on the VTX are normally off until the button is pressed. To check band and channel status click the button once quickly, and LED starts to indicate frequency band and frequency channel. First indicate the frequency band and then indicate the frequency channel. After all 2 rounds of LED display cycles, all LED will be off.

2. Menu Entry / Exit

(1)Press the button and hold for 5s to enter the menu. After entering the menu, BAND LED lights up.

(2)Press the button and hold for 5s again to save parameters and exit the menu. After saving and exiting the menu, all LED goes out.

3. Band and Channel parameter change

After entering menu, short click button to switch frequency group band(b)/frequency channel (C),and the LED of the corresponding menu is lit.

4.Enter/Exit Parameters

(1) After choosing menu, press the button and hold for 2s to enter parameter option. And the corresponding LED flash.

Notice: If you change to an illegal channel using SmartAudio, there will be no image transmitting from Tinyhawk S. To switch back to a legal channel, press the button on the vtx and follow the vtx menu guide shown below.

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Button Menu Diagram

Button Menu Diagram
5s press

Hold the button and power the VTX

HAM LIC.UNLOCK

U unlock

All indicator lights are on.

CE FCC LOCK

L lock

All indicator lights go out.
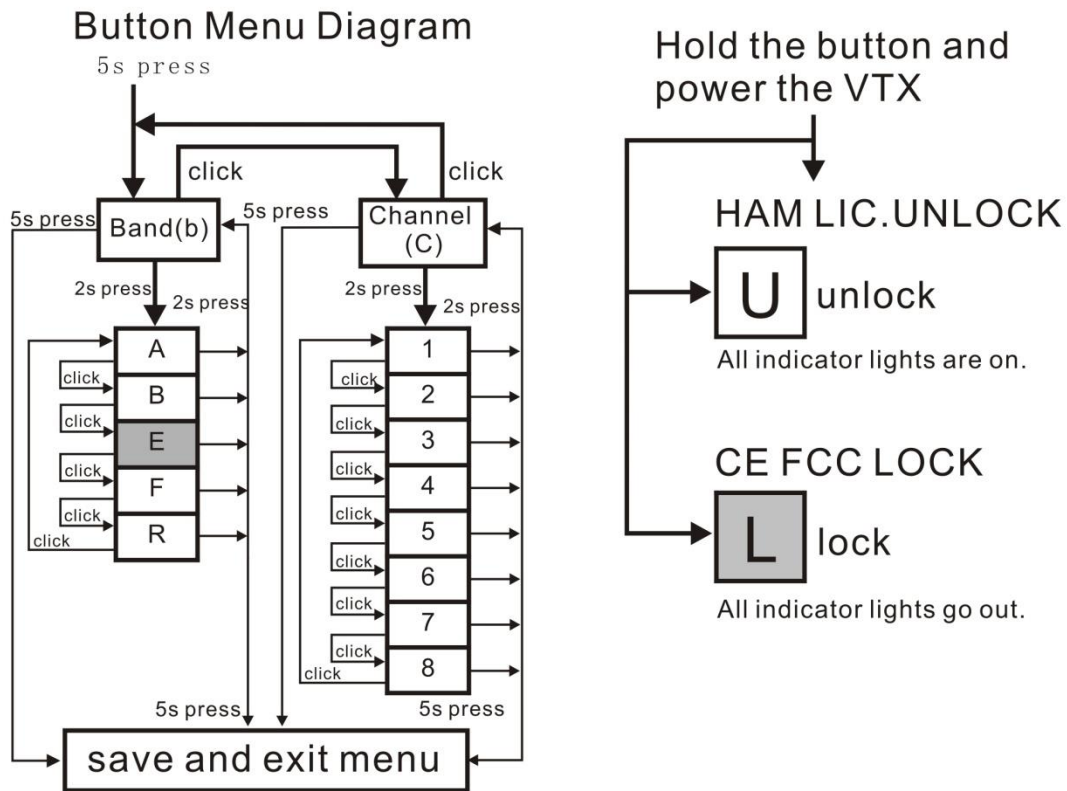
CE and FCC unlicensed user chart

FR\CH	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	
A	5865	5845	5825	5805	5785	5765	5745	—	MHz
B	5733	5752	5771	5790	5809	5828	5847	5866	MHz
E	—	—	—	—	—	—	—	—	MHZ
F	5740	5760	5780	5800	5820	5840	5860	—	MHz
R	—	—	—	5769	5806	5843	—	—	MHz

Unlocked FCC HAM licensed user chart

FR\CH	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	
A	5865	5845	5825	5805	5785	5765	5745	5725	MHz
B	5733	5752	5771	5790	5809	5828	5847	5866	MHz
E	5705	5685	5665	—	5885	5905	—	—	MHz
F	5740	5760	5780	5800	5820	5840	5860	5880	MHz
R	5658	5695	5732	5769	5806	5843	5880	5917	MHz

* From the factory this video transmitter is designed to operate within CE and FCC unlicensed users specifications. To use the unlocked features of this VTX the user is required to have a HAM radio license or prior consent from the FCC.By purchasing this equipment, the user is agreeing that they understand these responsibilities and will operate the equipment legally. Emax cannot be held responsible for your actions if you purchase and/or use this product in violation of your government's regulations.

Changing VTX setting via Betaflight OSD

Tinyhawk S is equipped with SmartAudio and is already configured with stock settings. The SmartAudio line is operated on UART 2 TX.

1. Power on Tinyhawk S, goggles, and Controller.

2. Follow the tips on screen to enter the main settings menu: THROTTLE MID+ YAW LEFT+ PITCH UP to enter OSD parameter adjustment menu. as shown in Figure 2.

3. In the menu interface, switching PITCH up/down to choose menu option. Move the cursor to "FEATURES" and stir Roll stick right to enter next menu. Using PITCH stick to move cursor to "VTX SA", as shown in Figure 3.Then pull ROLL stick right to enter VTX configuration menu, as shown in Figure 4.
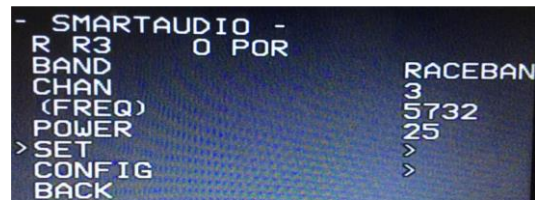

Figure 1

Figure 1

Figure 3

Figure 5

4. In the menu of VTX SA, we can configure the BAND, CHAN and POWER. Pulling the PITCH stick to move cursor up and down to choose VTX options that need setting. While pulling ROLL stick left and right to change the corresponding parameters.Once the parameters is set, moving the cursor to "SET", then turn ROLL stick right to enter "SET" and choose "YES" and turn ROLL stick right to save setting parameters, as shown in Figure 5.
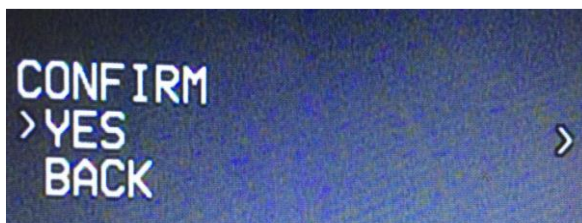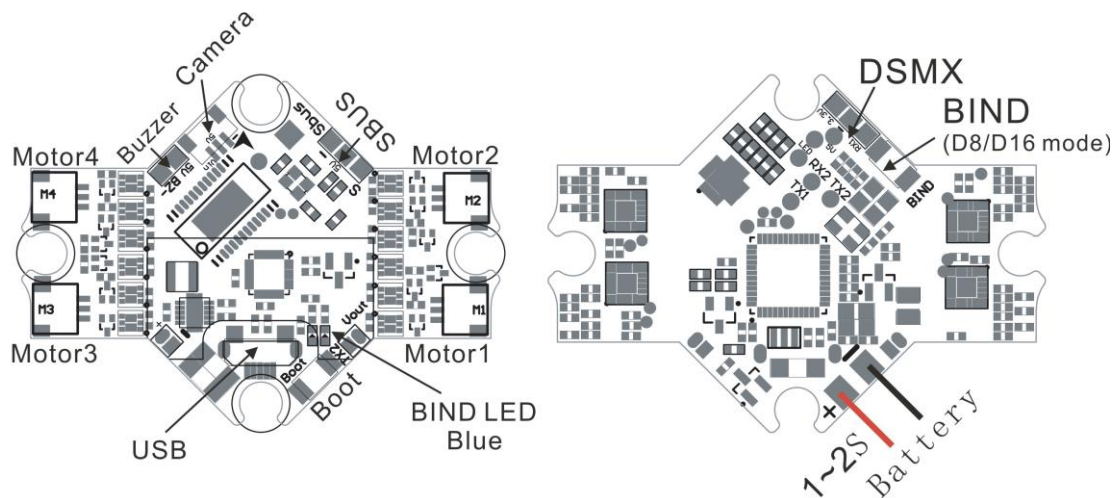

Figure 6

6

Tinyhawk S All-in-One Flight Controller

Tinyhawk S's main electronic board is shown above. This board contains a F4 flight controller with all 4 esc's and an 8CH receiver.

Emax On-Board Receiver

Number of Channels: Up to 8CH using SBUS

Compatibility: FrSky D8 mode

The receiver is programmed into the main flight controller MCU via betaflight. The bind procedure is similar and different settings can be changed in betaflight if desired.

Binding Procedure

Binding is the process of uniquely associating a receiver to a transmitter module. A transmitter module can be bound to multiple receivers (not to be used simultaneously). A receiver can only be bound to one transmitter module.

1.Hold the bind button for 2 seconds while the flight controller is already on. When the RED LED is flashing, it means the receiver is in BIND MODE

2.Turn on the transmitter, make sure it is set to D8 mode, and then set it into bind mode. When the BLUE LED on the flight controller starts flashing, it means bind successful.

3.Power cycle the flight controller and take your radio out of bind mode.

Emax Tinyhawk S Flight Controller (FC)

This flight controller has a F4 MCU with a MPU6000 gyro. Tinyhawk S flight controller comes pre-programmed and properly tuned for optimal flight. The flight controller is programmed with Betaflight 4.0.0. For a full tune and configuration setting file (CLI dump file) please visit https://emax-usa.com/ for the CLI dump file.

Stock Flight Controller Settings

Tinyhawk S is configured to take a channel map of the TAER1234 convention. That is the channel map is in the respective order: throttle, aileron, elevator, rudder, AUX 1, AUX 2, AUX 3, and AUX 4. The arm switch on Tinyhawk S is set on AUX 1 and armed with the highest value. AUX 2 is configured for a 3 stage switch to select flight modes: Acro, Horizon, and Angle activating in an increasing order. AUX 3 is

configured for the beeper. In a high state the motors will beep. AUX 4 is set to Flip Over After Crash mode (often referred to as turtle mode). Turtle mode is set when AUX 4 is in a high state. Please configure your radio as described above or change these settings in Betaflight Configurator.

PID profiles:

PID profile 1 is tuned and optimized for Tinyhawk S with the provided Emax 1s HV 450 mAh battery for ultimate control of flight indoors and outdoors.

PID profile 2 is tuned and optimized for Tinyhawk S with the provided Emax 2s HV 300 mAh battery for ultimate control of flight indoors and outdoors.

Please do not change these values.

Rate Profiles:

Profile 1 is designed for optimal indoor flight control with the Emax 1s HV 450 mAh Battery.

Profile 2 is similar to profile 1 but with a different throttle curve for use with 2s batteries.

Profile 3 is a more sensitive rate profile tuned for people who like to fly "pincher" style. These profiles can easily be switched in Betaflight OSD menu.

Adjusting Software Settings (Betaflight Configurator)
Betaflight Configurator can be used to changed programmed settings on Tinyhawk S and to flash new firmware if desired. Betaflight Configurator and flight controller firmware can be downloaded at https://github.com/betaflight/. The hardware target for Tinyhawk S Flight Controller is MatekF411RX.

DISCLAIMER: We do not suggest changing any PID settings on Tinyhawk S or upgrading the firmware to new versions. Tinyhawk S comes stock with an optimal tune for superior flight performance. Changing this can affect flight time, overall speed, control of the aircraft, and excessive heat within the motors.

Reprogramming Tinyhawk S Flight Controller
1. Put the Flight Controller in DFU mode by pressing the BOOT button while plugging in the micro USB cable to a computer.
2. Select MATEKF411RX as the target and then select the firmware (4.0.0) or download the hex file from https://emax-usa.com/ . Select Manual Baud Rate with 256000 in the drop down menu
3. Select Load Firmware(Online) to download the firmware or Load Firmware (Local) if already downloaded the hex file.
4. Select Flash Firmware to program the flight controller
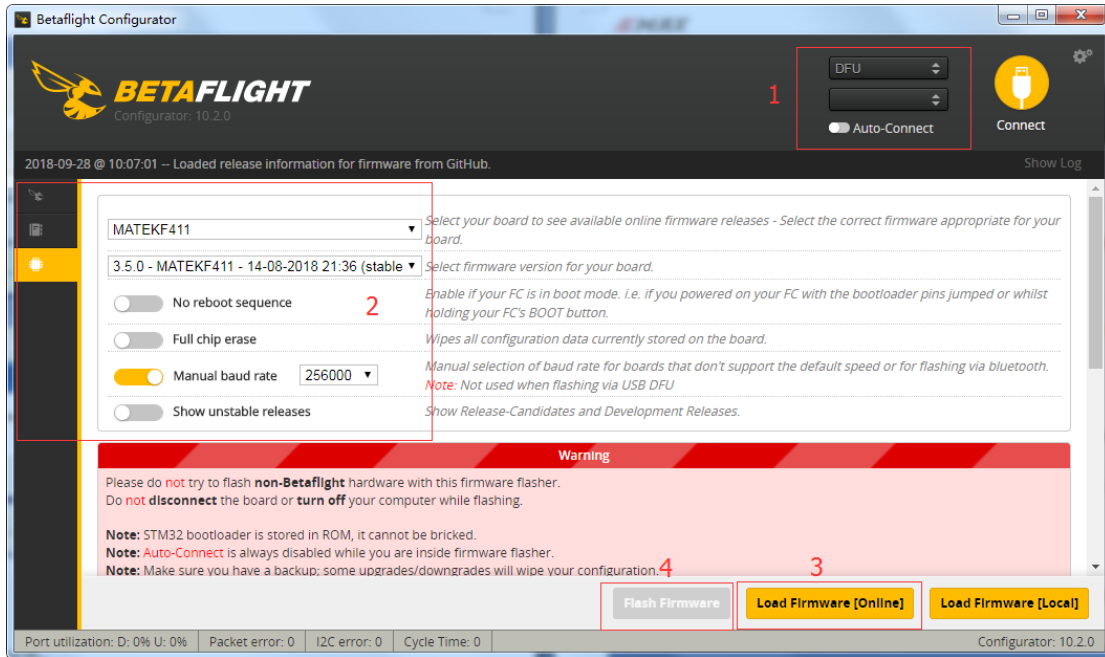
Set the Correct Settings
1. Download the latest CLI Dump File from https://emax-usa.com/
2. Connect Tinyhawk S to Betaflight configurator and select the CLI tab
3. Open the CLI Dump File in a text editor and copy all the text.
4. Paste the settings into the command bar and press enter
5. Tinyhawk S will reconnect to Betaflight when completed
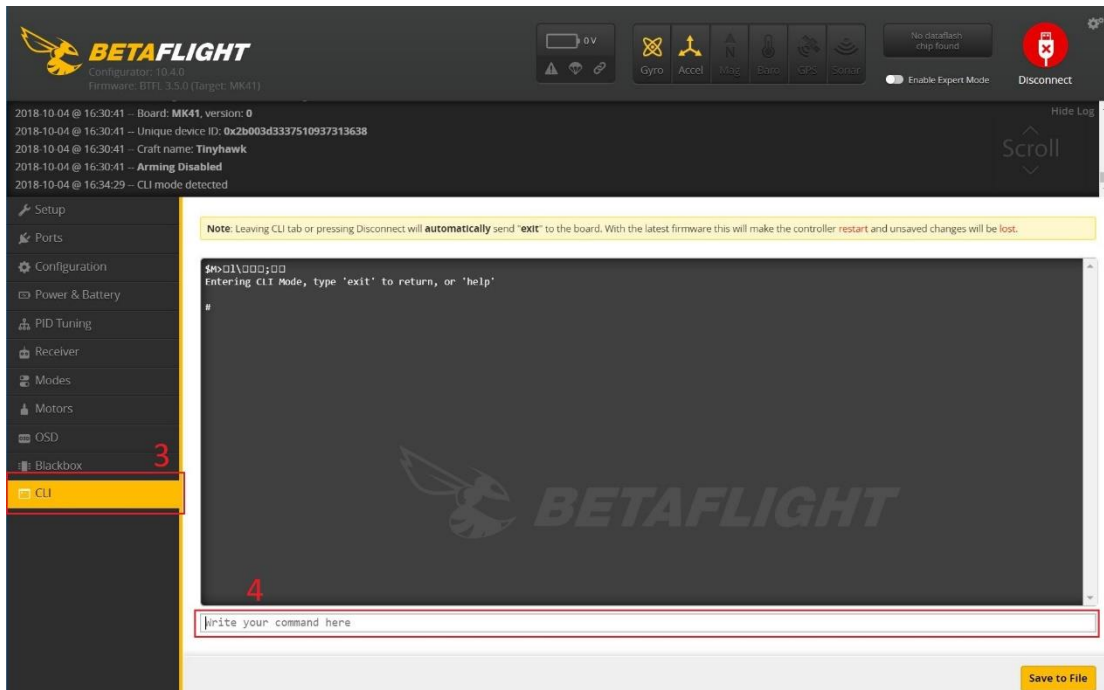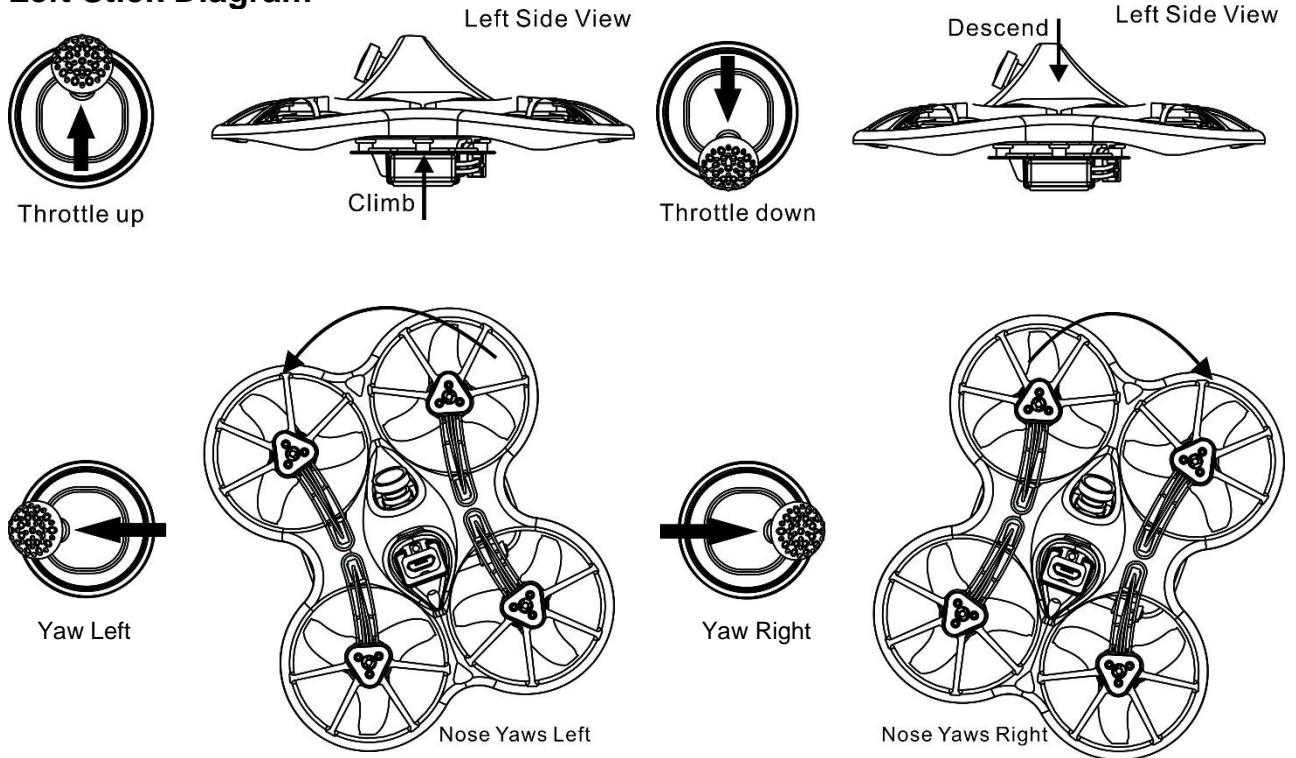
Flight

Always use caution when flying and operate in an open and controllable area. Please learn the flight controls first before powering on the aircraft to fly.
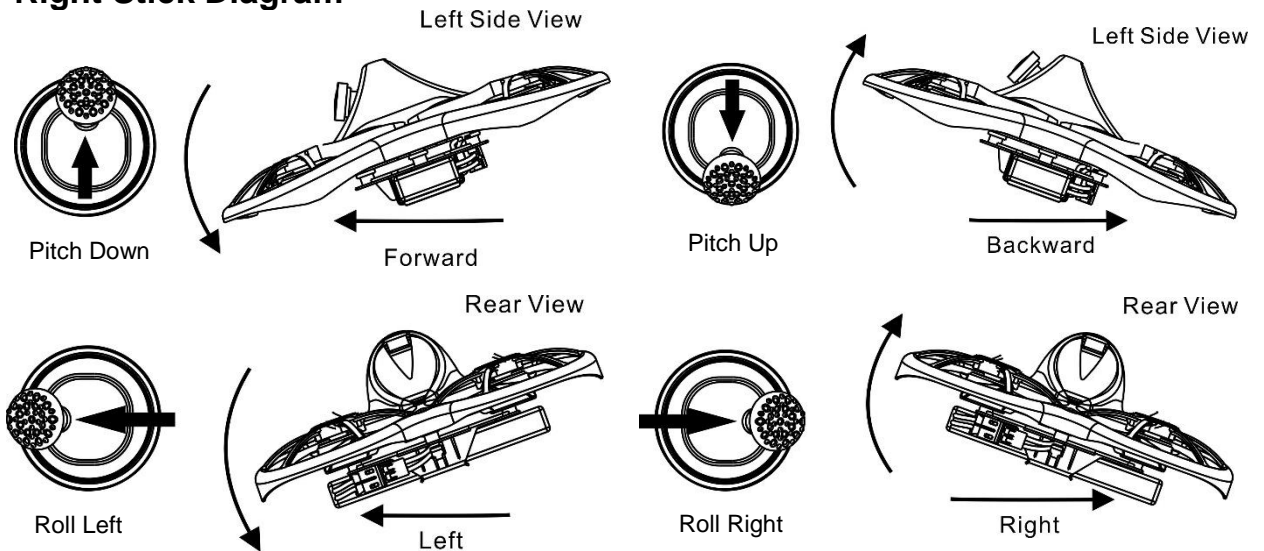
Radio Stick Controls

The left stick controls throttle and yaw direction of Tinyhawk S. The right stick controls pitch and roll of the aircraft.
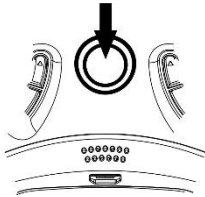
Left Stick Diagram

Left Side View

Throttle up   Climb   Throttle down

Descend   Left Side View

Yaw Left   Nose Yaws Left   Yaw Right   Nose Yaws Right

Right Stick Diagram

Left Side View

Pitch Down   Forward   Pitch Up   Backward   Left Side View

Rear View

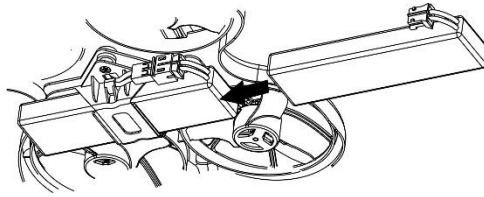Roll Left   Left   Roll Right   Right   Rear View

10

Fly Tinyhawk S

Start by powering on your Radio and Goggles. Tinyhawk S comes already bound to your radio and on the right video channel matched with your goggles. Power on Tinyhawk S by sliding the battery into the battery tray and plugging it in. Once the battery is plugged in, set Tinyhawk S on a stable surface so it can calibrate. Calibration takes a few seconds then Tinyhawk S is ready to fly. Tinyhawk S can fly for 4 minutes on a fully charged battery. Land Tinyhawk S when the battery reaches 3.2v; flying any longer can severely damage your battery and is not recommended.
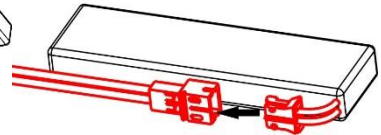
| 1. Turn on Transmitter | 2. Install Battery | 3. Connect Battery |

Arming

Arming refers to setting Tinyhawk S to a fly ready state. When Tinyhawk S is powered on first it will not spin up the propellers until it is armed. Arm the aircraft by first moving throttle to the bottom position. Then move the left switch of the radio to its 3rd position upwards. You will see the propellers spinning when Tinyhawk S is

1. Throttle down

2. Switch to Arm Position
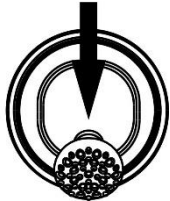
successfully armed.
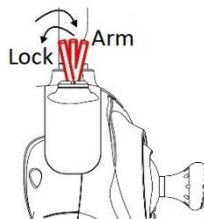
In the event of a crash always disarm immediately. Failure to disarm in a timely manner can damage Tinyhawk S.

Always disarm Tinyhawk S before handling it.

Flying Modes

Tinyhawk S comes stock set in rate mode. This is an advance mode where control sets the angular rate of the aircraft. The AUX 2 switch is set to change this mode on a 3 stage switch. When AUX 2 is in a high state, Tinyhawk S will be in angle mode where control sets the attitude of the aircraft. When the switch is in the middle state, Tinyhawk S will be in Horizon mode.

Line of Sight Flying

To learn how to fly Tinyhawk S start by flying it line of sight (no goggles yet). Power on Tinyhawk S and set it down in a cleared room. Arm Tinyhawk S then throttle up using the left stick to a hover position. Work on maintaining a constant altitude. Pitch and roll Tinyhawk S with the right thumb stick and yaw Tinyhawk S with the left thumb stick.

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First Person View (FPV) Flying

Make sure Tinyhawk S and the goggles are on the same vtx channel and that you have a clear area to fly around in. Apply the same principals learned when flying Tinyhawk S line of sight except now work on flying in a forward direction while maintaining a controlled constant altitude. It is easier to learn flying FPV by always moving in a forward direction so always apply a slight amount of pitch using your right thumb stick. You can steer Tinyhawk S like a car using yaw on the left thumb stick.

There is an on screen display (OSD) overlaying the video feed from the camera of Tinyhawk S. The OSD displays important information such as flight time and battery voltage. Pay attention to these numbers during flight to know how much battery life is left. Tinyhawk S can fly for a maximum of 4 minutes. When the battery reaches 3.2v, land Tinyhawk S. Drawing the battery below 3.2v is not suggested and can damage the battery.

Tips: Work on maintaining a controlled altitude flight to begin while driving Tinyhawk S with pitch and yaw. Do not let the battery go lower than 3.2v. The arm switch activates a beeper when set in the 2nd position (middle); this is useful when looking for Tinyhawk S.

Thank you for purchasing our product! Enjoy Flying Tinyhawk S.

 Warning：

Please pay attention to your surroundings. Not

Recommended for persons under 18 years of age.