



# Cetus X HD

FPV Drone

User Manual

Version No.1 2023-09-22



# 1. Product List

1 x Cetus X HD Brushless Quadcopter (Betaflight Firmware)

## Box Contents:

1 x BT3.0 450mAh 2S LiHV Battery

1 x 2S Battery Charger and Voltage Tester| BT3.0

4 x 2020 4-Blades Prop (Spare Set)

1 x Propeller Removal Tool

1 x Special Screw Package (Spare Set)

1 x Phillips screwdriver

1 x 4Pin Adapter Cable

1 x Avatar HD Mini Camera Manual

1 x USB Type-C Adapter Board (Used with 4Pin Adapter Cable to adjust parameters on Betaflight Configurator )

1 x JST Type-C Adapter Board (Used with the exposed JST0.8 cable on the drone to export recorded camera videos)

## 2. Pre-flight Checks

1. Check all parts are included according to product check-list. Ensure all parts are intact and the frame is undamaged.
2. Ensure that propellers and motors are installed correctly and stably.
3. Ensure the motors can spin smoothly. If there are any obstructions, such as propeller friction or foreign objects entangled, please deal with them first.
4. Ensure batteries (of transmitter, quadcopter, and FPV goggles) are fully charged.
5. This quadcopter uses BT3.0 2S LiHV battery. When connecting the battery, please ensure that the positive and negative poles of the battery match with the poles of the quadcopter power cable.
6. The BT3.0 450mAh 2S LiHV battery should be installed with the BETA FPV logo facing outward for proper connection to the quadcopter's power supply line.
7. Familiarize yourself with the functions of each joystick before flying. For detailed information on the transmitter joystick functions, please kindly refer to the manual.
8. During the test flight, keep a safe distance in all directions around the quadcopter (at least one meter). Operate the quadcopter carefully in an open space.

### 3. Binding the Quadcopter and Goggles

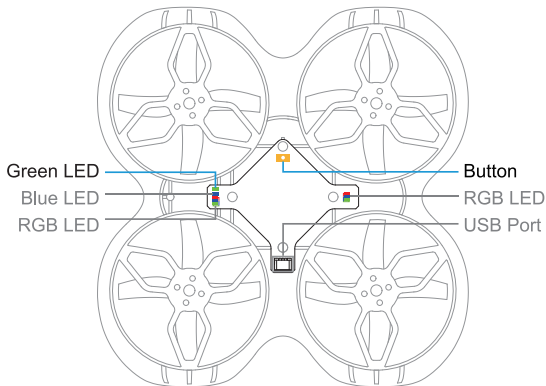
The Cetus X HD quadcopter integrated SPI ELRS 2.4G receiver with the default ExpressLRS 3.0 protocol.

Ensure that your transmitter is on the same protocol as Cetus X HD quadcopter, which has all the channels preset beforehand(default channel map is AETR1234).

The following demonstrations are based on LiteRadio 3 transmitter (mode3 Left Stick Throttle). as an example to explain the binding process.

The binding steps are as follows:

- Ensure that the current protocol on the transmitter is ExpressLRS 2.4G 3.0 protocol;
- Power on the quadcopter and wait for the initialization to complete.
- Press the BIND button on the bottom of the quadcopter with a screwdriver for 1 second, and the green LED on the quadcopter will change from slow flashing to rapid flashing.
- Power on the transmitter and wait for the initialization to complete.
- Gently press the BIND button on the bottom of the transmitter with a screwdriver for 1 second, and the red LED on the transmitter will flash rapidly.
- If the green LED on the quadcopter changes from rapid flashing to steady on, then the binding is successful.



*Note:*

- 1. The SPI ELRS 2.4G receiver integrated in Cetus X HD supports the default ExpressLRS 3.0 protocol. It is not compatible with ExpressLRS 1.X or ExpressLRS 2.X protocols for frequency connection.*
- 2. The SPI ELRS 2.4G receiver integrated in Cetus X HD can change the ExpressLRS version by flashing the relevant firmware on Betaflight Configurator, but it is not recommended to change it to a version other than ExpressLRS 3.0;*
- 3. After one successful binding, restarting the quadcopter or transmitter will automatically establish the connection. Re-bind is not needed.*
- 4. The re-binding of the remote control radio transmitter and the quadcopter may not be successful after pressing the BIND button of the remote control radio transmitter once. In this situation, pilot needs to press the BIND button a second time to complete the binding.*

## 4. Avatar HD Mini camera and Goggles Binding

The Cetus X HD quadcopter (Betaflight version) utilizes the Walksnail Avatar HD Mini camera and requires binding with the Walksnail HD goggles.

To obtain more information about the Walksnail Avatar HD Mini camera, please kindly refer to the Avatar HD Mini camera manual or log into the following website for consultation: <https://caddxfpv.com/products/walksnail-avatar-hd-mini-1s-kit>

To Bind the Avatar HD Mini camera with the Walksnail HD goggles, the steps are as follows:

- First, ensure that your Walksnail HD goggles are compatible with the Walksnail Avatar HD Mini camera.
- Power on the quadcopter and wait for the initialization process to complete.
- Gently press the digital bind button on the side of the quadcopter with a screwdriver for one second, and the LED light on the digital VTX board to flash red.
- Power on the Walksnail HD goggles and wait for it to complete initialization.
- Press the digital bind button on the Walksnail HD goggles with a pointed object for one second, resulting in a "beep" sound.
- If the LED light on the digital VTX board turns solid green and the Walksnail HD goggles receive the camera's video image, it means the binding is successful.

## 5. Avatar HD VTX Power Switching

The power of Walksnail Avatar HD VTX is divided into 25mW, 200mW and 500mW. The power can be switched through Walksnail HD goggles by the following steps:

- First, ensure that the Walksnail Avatar HD Mini camera is connected to Walksnail HD goggles.
- Use the 5D button on Walksnail HD goggles to enter the goggles settings interface.
- In the settings interface, navigate to Settings -> Transmit Power, then press the 5D button to confirm.
- Use the 5D button to select the desired power, and press the 5D button again to confirm.
- After the settings are completed, press the return button on Walksnail HD goggles to exit the settings interface, then the power switching is successfully completed.

## 6. Setting up OSD Display on the Quadcopter

The OSD may not be centered when connecting Walksnail HD goggles for the first time. If that happens, please kindly adjust it to the center through the settings of Walksnail HD goggles. The steps are as follows:

- First, ensure that the Walksnail Avatar HD Mini camera is connected to the Walksnail HD goggles.
- Press the 5D button on the Walksnail HD goggles to access the goggle settings interface.
- In the settings interface, navigate to: Settings -> Display -> OSD Position, then press the 5D button to confirm.
- Use the 5D button to move the OSD position up/down/left/right until it is centered on the goggle screen, then press the 5D button to confirm again.
- After the setting is completed, exit the setting interface through the return button of the Walksnail HD goggles to complete the OSD setting.

*Note: If your Walksnail HD goggle does not have the option to adjust the OSD settings, it may be that the goggle firmware is not updated to the latest version.*

# 7. Betaflight Configuration

Parameters of Cetus X HD quadcopter (Betaflight version) are calibrated before delivery which means customers need not repeat this procedure. The only preparation before a flight is to bind the transmitter and quadcopter.

It is recommended to master the basics of Betaflight Configurator and Betaflight firmware before configuring the quadcopter.

*Note: If you have no prior knowledge or experience with Betaflight flight controllers, it is recommended to read and study the following video: <https://www.bilibili.com/video/av803250559>*

The FC assembled in Cetus X HD quadcopter(Betaflight version) is F4 2S 15A AIO (with SPI ELRS 2.4G receiver).

The configuration of the SPI ELRS 2.4G receiver is shown below:

Receiver

SPI Rx (e.g. built-in Rx) Receiver Mode

Note: The SPI RX provider will only work if the required hardware is on connected to an SPI bus.

EXPRESSLRS SPI Bus Receiver Provider

Set receiver's channel as AETR1234, with throttle's lowest value being 1050. (If the minimum value of the throttle stick on the transmitter is set above 1050, arming will be invalid.) Exact setting is shown below:

Channel Map

AETR1234

'Stick Low' Threshold	Stick Center
1050 ?	1500 ?

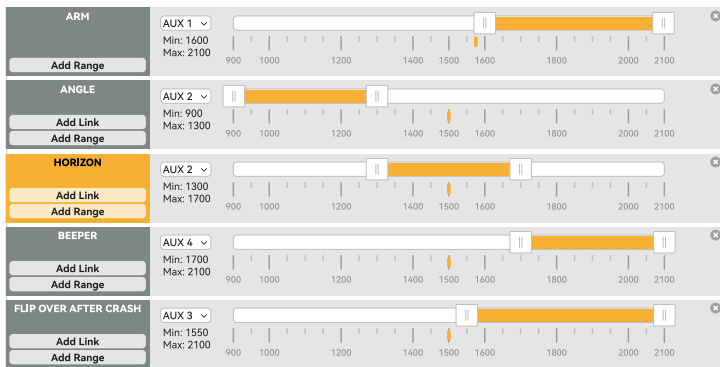
The default setting for flight mode is shown below.

AUX1: Arm/Disarm Quadcopter

AUX2: Flight Modes of Quadcopter configured with Horizon Mode, Angle Mode and Air Mode

AUX3: Turtle mode





The default firmware and configuration for the Cetus X HD quadcopter(Betaflight version)are shown below, facilitating customers to restore the default settings. If necessary, please visit our official website for more information and consultation. (Kindly select the corresponding firmware and configuration based on the quadcopter information)

<https://support.betafpv.com/hc/en-us/sections/9435794300441-Cetus-Series>

# 1. 产品清单

1 \* “飞鲸” Cetus X HD无刷整机（Betaflight固件）

下面为配件类清单：

1 \* BT3.0 450mAh 2S HV锂电池

1 \* 2S电显充电器|BT3.0

4 \* 2020四叶桨（备用）

1 \* 取桨器

1 \* 专用螺丝包（备用）

1 \* 十字螺丝刀

1 \* 4Pin转接线

1 \* Avatar HD Mini摄像头说明书

1 \* USB Type-C转接板（与4Pin转接线配合用于飞控连接上位机调参）

1 \* JST Type-C转接板（与飞机外露的JST0.8线配合用于导出摄像头录制的视频）

## 2. 飞行前注意事项

1. 取出所有设备，对照产品清单，确定配件齐全无损，确定飞机机架无变形。
2. 检查桨叶和电机是否安装正确和稳固。
3. 检查电机是否能够正常旋转，如果出现桨叶摩擦机架，或者异物缠绕等阻碍电机旋转情况，请先处理。
4. 确保遥控器电池、飞机电池以及FPV眼镜电池电量充足。
5. 本飞机使用BT3.0 2S锂电池，与飞机连接时需确认电池与飞机电源线的正负极相匹配。
6. BT3.0 450mAh 2S HV锂电池印有BETA FPV一面朝外安装，才能很好地连接飞机电源线。
7. 请确保熟知每个摇杆的功能后再进行飞行，遥控器摇杆功能详情见遥控器操作。
8. 进行试飞的时候，人与飞机保持一米以上距离，小心操作，选择空旷环境。

### 3. 遥控器和飞机对频

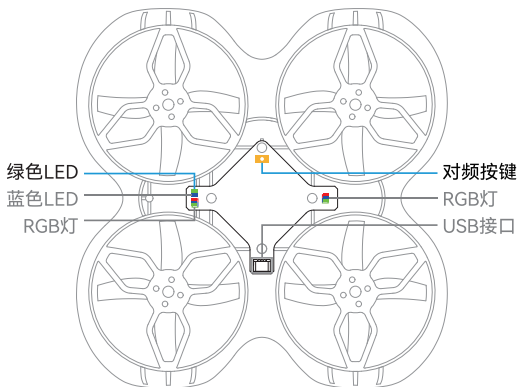
Cetus X HD整机集成SPI ELRS 2.4G接收机，出厂默认ExpressLRS 3.0协议。

使用遥控器与飞机对频，首先请确保您的遥控器使用的协议和Cetus X HD整机的协议是一致的，并且已经配置正确了遥控器通道（通道配置为AETR1234）。

下面以遥控器LiteRadio 3，美国手版本（左手油门）为例进行说明。

对频步骤如下所示：

- 首先请确保遥控器当前协议为ExpressLRS 2.4G协议第3版，即ELRS 3.0版本；
- 飞机上电，等待飞机初始化完成；
- 用螺丝刀轻按飞机底部的对频按键1秒，飞机上的绿色LED由慢闪变为快速闪烁；
- 遥控器开机，等待遥控器初始化完成；
- 用螺丝刀轻按遥控器底部的对频按键1秒，遥控器LED红色快速闪烁；
- 若飞机上绿色LED由快速闪烁变为常亮，则对频连接成功。



- 注意：
1. Cetus X HD集成的SPI ELRS 2.4G接收机出厂默认支持ExpressLRS 3.0协议；使用ExpressLRS 1.X或者ExpressLRS 2.X协议无法对频连接；
  2. Cetus X HD集成的SPI ELRS 2.4G接收机可以通过Betaflight上位机刷写相关固件更改ExpressLRS 2.X版本，但不建议修改为ExpressLRS 3.0以外版本；

3. 对频成功之后，重启飞机或者遥控器，将会自动完成连接，无需每次上电重新对频。
4. 遥控器与飞机重新对频时，可能按压一次遥控器BIND键后无法完成对频操作，此时需要按压第二次遥控器对频键才能完成对频。

## 4. 数传摄像头和眼镜对频

Cetus X HD整机（Betaflight飞控版本）使用的是Walksnail Avatar HD Mini数传摄像头。需要以Walksnail HD眼镜与之配对使用。

想要了解更多关于Walksnail Avatar HD Mini数传摄像头的信息，除了查阅本产品配置的Avatar HD摄像头说明书，还可以登录以下网址了解咨询：

<https://caddxfpv.com/products/walksnail-avatar-hd-mini-1s-kit>

数传摄像头与Walksnail HD眼镜对频，步骤如下：

- 首先请确保您的Walksnail HD眼镜支持与Walksnail Avatar HD Mini数传摄像头配对；
- 飞机上电，等待飞机初始化完成；
- 用螺丝刀轻按飞机侧面的数传对频按键1秒，数传板的LED灯为红色闪烁；
- Walksnail HD眼镜开机，等待眼镜初始化完成；
- 用针状物体轻按Walksnail HD眼镜的数传对频按键1秒，眼镜发出“滴滴”响声；
- 若数传板的LED灯变为绿色常亮，Walksnail HD眼镜接收到摄像头画面，则对频连接成功。

## 5. 数传摄像头功率切换

Walksnail Avatar HD Mini数传摄像头的使用功率分为：25mW、200mW、500mW，可以通过Walksnail HD眼镜设置切换功率，步骤如下：

- 首先请确保Walksnail Avatar HD Mini数传摄像头与Walksnail HD眼镜正在连接；
- 通过Walksnail HD眼镜的5D按键进入到眼镜设置界面；
- 在设置界面上操作：设置->发射功率，点击5D按键确定键；
- 通过5D按键选择不同功率，选定功率后再点击5D按键确定键；
- 设置完成后，通过Walksnail HD眼镜的返回按键退出设置界面，即可完成功率的切换。

## 6. 飞机OSD画布显示设置

首次连接Walksnail HD眼镜时可能存在飞机OSD不居中的现象，出现该现象需通过Walksnail HD眼镜设置调整到居中，步骤如下：

- 首先请确保Walksnail Avatar HD Mini数传摄像头与Walksnail HD眼镜正在连接；
- 通过Walksnail HD眼镜的5D按键进入到眼镜设置界面；
- 在设置界面上操作：设置->显示->OSD位置，点击5D按键确定键；
- 通过5D按键拨动上/下/左/右移动OSD画布，使之在眼镜画面上居中，再点击5D按键确定键；
- 设置完成后，通过Walksnail HD眼镜的返回按键退出设置界面，即可完成OSD设置。

注意：如果您的Walksnail HD眼镜没有OSD设置的选项，可能是眼镜固件没有更新到最新版本。

## 7. Betaflight配置

Cetus X HD整机（Betaflight飞控版本）在出厂的时候，是配置好所有的参数的，所以一般无需客户自行配置，只需要完成和遥控器的对频就可以飞行。

建议掌握基本的Betaflight上位机（又叫Betaflight Configurator）的使用和Betaflight飞控固件基本配置，再对飞机参数进行修改。

注意：如果以往完全没有了解和接触过Betaflight飞控，建议先阅读和学习：<https://www.bilibili.com/video/av803250559>

Cetus X HD整机（Betaflight飞控）使用的是我司F4 2S 15A AIO飞控。该飞控接收机是一个SPI ELRS 2.4G接收机。

飞控集成SPI ELRS 2.4G接收机，配置如下：

### 接收机

SPI Rx (例如内置 RX)    接收机模式

注意：SPI 接收机只有通过 PSI 总线连接到飞控或者板载了相应硬件时才能工作。

EXPRESSLRS    SPI 总线接口接收机协议

接收机通道的配置为AETR1234。油门摇杆最低位阈值为1050（如果遥控器的油门摇杆最低值设置大于1050，则无法解锁）。配置如下：

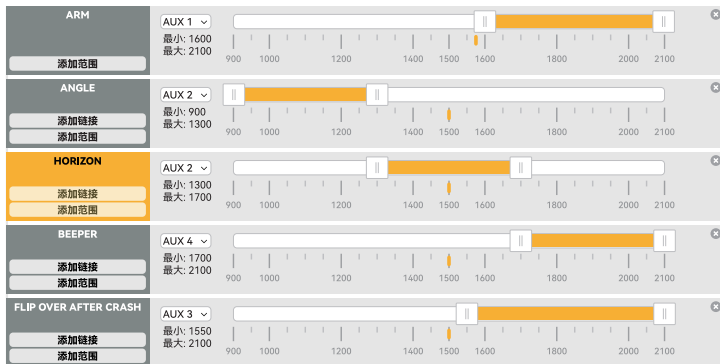
通道映射	
AETR1234	
‘摇杆低位’阈值	摇杆中点
1050	1500

飞行模式的默认出厂配置如下所示。

AUX1: 控制飞机的解锁、上锁；

AUX2: 控制飞机的飞行模式，已经配置了Horizon Mode、Angle Mode和Air Mode；

AUX3: 反乌龟模式；



官网提供Cetus X HD整机（Betaflight版本）出厂的默认固件和配置，方便客户恢复出厂设置，如有需要，请进入我司官方网站了解咨询：（需根据整机信息选择对应固件和配置）

<https://support.betafpv.com/hc/en-us/sections/9435794300441-Cetus-Series>



[betafpv.com](http://betafpv.com)