

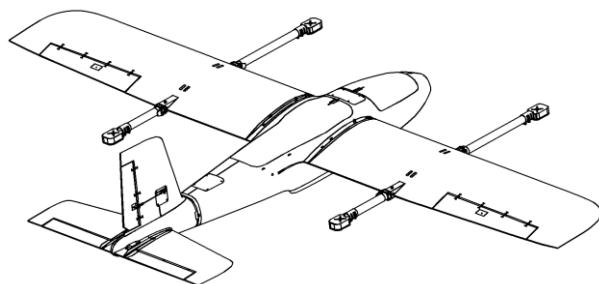
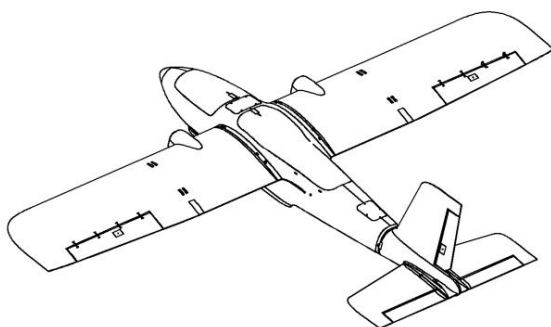
# 奋斗者

# FIGHTER

用户手册 v1.0

User Manual V1.0

2020.04



**mfe**  
makeflyeasy

# 产品概述

## 简介 Introduction

奋斗者是一款 10kg 级固定翼飞行平台(手抛伞降/垂直起降),具有携带易用,操作友好,稳定耐用等特点。奋斗者定位为一款大载重、长航时固定翼,多维度降低航测难度,进一步解放生产力、提高航测效率。

模块化设计理念让飞机组装工作简单快捷,可快拆机翼、可折叠机臂,可快拆尾翼、使飞机具有实用的便携性和友好的用户体验。开放式飞控舱兼容 Pixhawk 飞控,支持挂载 Sony A7R2 4200W 像素全画幅相机 /1.5kg 级轻量级激光雷达,最大支持 12S@22000mah 锂聚合物电池,可以实现超长续航和高质量的拍摄效果。

配合适量控制点成图结果满足 1:1000 和 1:2000 航测标准,可应用于地形测绘、实景三维、农林牧防护、电力巡线、环保、水利等方面。

The fighter is a 10kg fixed-wing flight platform (hand parachute/VTOL), which is easy to carry,friendly to operate,stable and durable.The fighter is positioned as a heavy-duty,long-endurance fixed wing,which greatly reduces the difficulty of aerial survey,further liberates productivity and improves the efficiency of aerial survey.

The modular design concept makes the aircraft easy and fast to assemble.The wings,folding arms and tail fins can be easily dismantled,making the aircraft practical and portable and user-friendly.The open flight control cabin is compatible with Pixhawk flight control and supports mounting of Sony A7R2 4200W pixel full-frame camera /1.5kg lightweight lidar. The maximum support is 12s@22000mah lithium polymer battery,which can achieve ultra-long range and high-quality shooting effect.

Using proper control point cooperatively,the final mapping would satisfy 1:1000 and 1:2000 aerial survey standard,which realized a wide-ranging application such as geography surveys,farmland,forestry land and grassland protection,power line inspection,environment protection,water conservancy and etc.

## 产品规格

材质：EPO、EVA、碳纤维、PC、工程塑料等

翼展：2430mm

机身高：180mm

机身长：1450mm

翼面积：72.5dm<sup>2</sup>

推荐飞行速度：17~20m/s

失速速度：10m/s

推荐有效载荷：<2500g

载荷舱尺寸：280\*160\*110mm

最大航程：>150km(600g 负载)

最大起飞重量：11.5kg

实用升限：4000m

抗风能力：5 级

起降方式：垂直起降/手抛

拆装方式：无工具拆装

运输箱寸：1.26m×0.35m×0.495m

## Products specifications:

Material: EPO,EVA,carbon fiber,PC,engineering plastics and etc.

Wing Span: 2430mm

Fuselage height: 180mm

Fuselage length: 1450mm

Wing area: 72.5dm<sup>2</sup>

Suggested flight speed: 17~20m/s

Stalling speed: 10m/s

Suggested payload: <2500g

Payload bay size: 280\*160\*110mm

Longest flight range: >150km (600g load)

Max take-off weight: 11.5kg

Practical ceiling height: 4000m

Wind resistance: 5

Take-off and landing approach: VTOL/ Hand

Dismounting way: tool-free

Transport case seize: 1.26m×0.35m×0.495m

# 产品使用注意事项 Usage Attentions

## 安装注意 Installation Attentions

1. 在焊接大电流连接器时，一定要注意焊接线序要相互对应，以免烧毁电调、舵机。

1. Pay attention to the welding wires sequence which should be corresponding to each other during the welding of large current connector. Or maybe ESC and servo suffered burning-out.

2. 副翼和尾翼推荐使用银燕 **ES3054** 数字舵机，或者其他相同尺寸的舵机，便于舵机安装和尾翼快拆装置的安装。

2. We recommend the EMAX ES3054 metal digital servo, or other same size servo for the easy installing of servo and tail wings quick release devices.

3. 在安装电机座时注意调至水平。

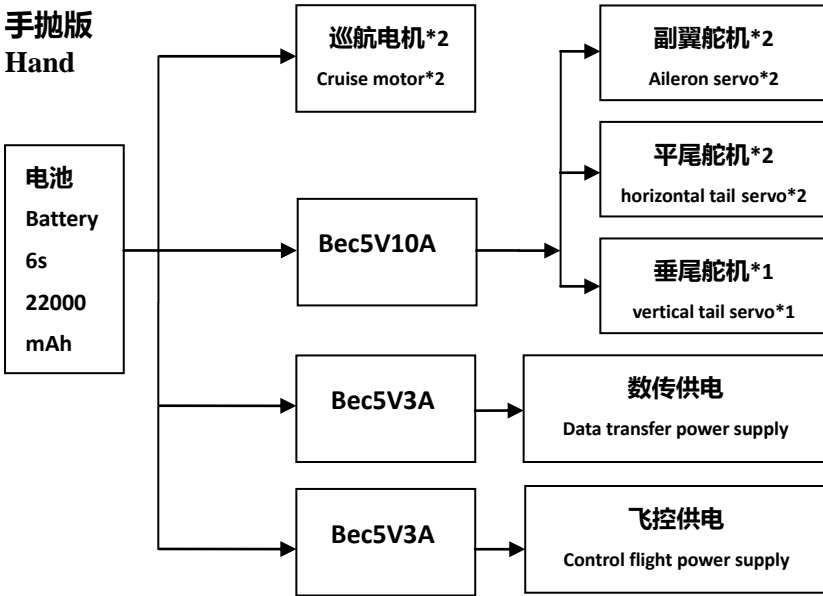
3. Please adjust the front and rear motor frame to the level during installation.

4. 奋斗者电源供电方案请参考下图。

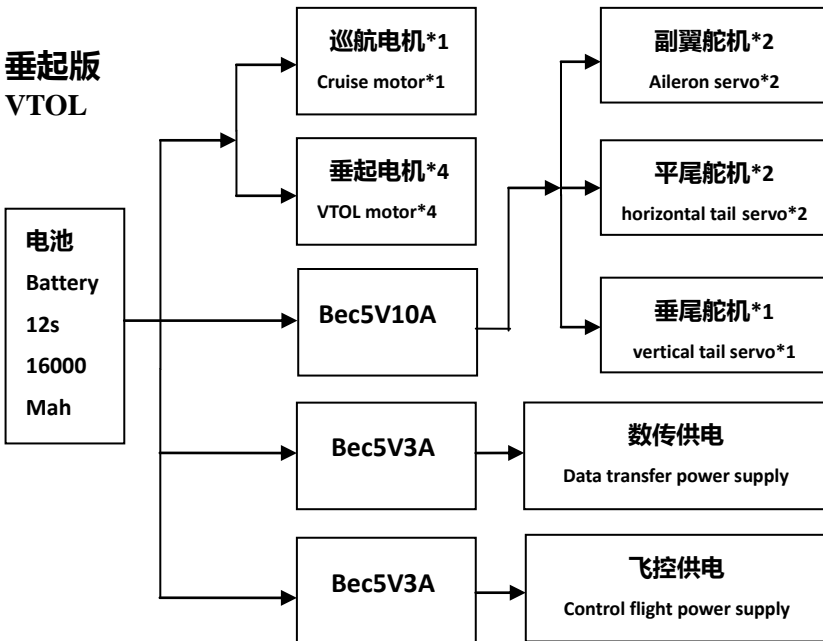
4. Please refer to below the Fighter power supply conceptual drawing when you were confused by the Installing sequence.

# 奋斗者供电方案图 Fighter power supply conceptual drawing

## 手抛版 Hand

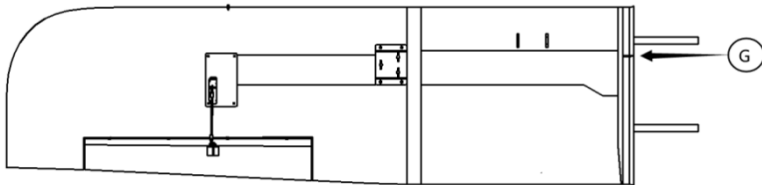


## 垂起版 VTOL



## 飞行注意 Flying Attentions

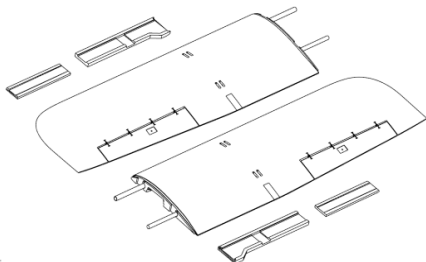
1. 请避免在 10m/s 以下的速度飞行转弯，以免飞机失速。  
1. Don't cornering when the aircraft flying speed was less than 10m/s, or the aircraft maybe stalling.
2. 飞行前请务必检查电机、螺旋桨安装正确稳固，电调信号线和电源线插头连接紧固可靠。  
2. Ensure the motor and propeller were installed correctly and toughly before flying, inspecting the ESC signal wires and power wires plug, ensure they were connected toughly.
3. 飞行时请远离不安全因数，如障碍物、人群、儿童、建筑物、高压线等等。  
3. Away from the unsafe factors such as barrier, crowd, children, buildings, high-voltage wires and etc while flying.
4. 务必在安全起飞重量下飞行，切勿在机场净空区范围飞行。  
4. Takeoff under the safety weight and never flying in the area of airfield clearance zone.
5. 请按标识重心位置配重（位于机翼翼根塑料件下凸起处）。  
5. Conduct the counterweight at the marked center of gravity position. (Located under the plastic part of the wing root)



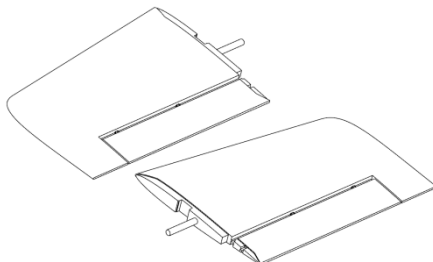
# 盒内物品清单 Contents in the box

## EPO 部件 EPO Parts

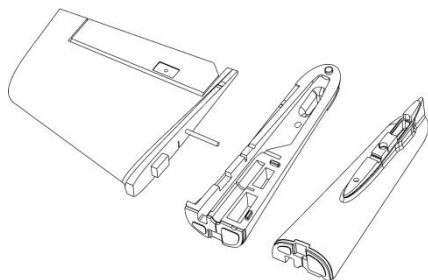
1 左右机翼 1 left & right wing



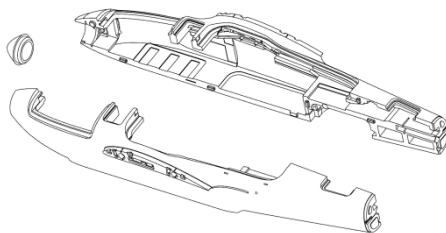
2 水平尾翼 2 horizontal tails



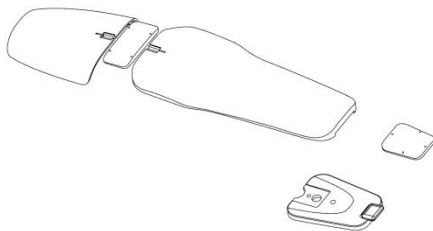
3 垂直尾翼 3 vertical tail



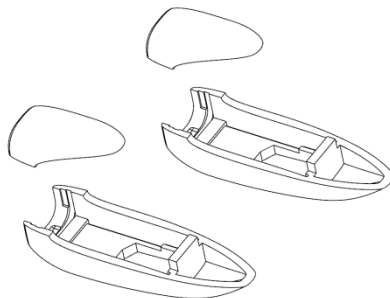
4 左右机身 4 left & right fuselage



5 机舱盖 5 Cabin cover



6 双发电机座 6 Motor mount on wing



## 碳管部件 Carbon tube parts

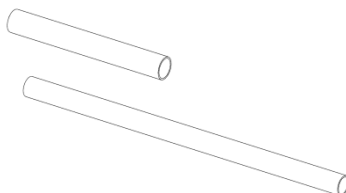
### 1 机身支撑碳管

- 1 Fuselage supporting carbon tube  
16\*14\*260mm  
14\*12\*260mm



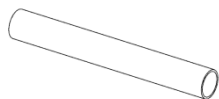
### 2 机身尾翼连接碳管

- 2 Fuselage & tail-fin carbon tube  
16\*14\*120mm  
14\*12\*250mm



### 3 平尾对插碳管

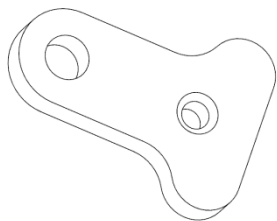
- 3 horizontal tails carbon tube  
10\*8\*97.4mm



## 金属部件 Metal parts

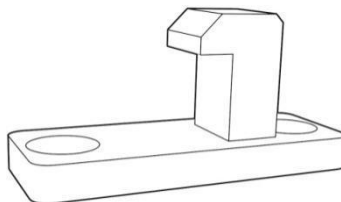
### 1 挂伞金属件\*4

- 1 Parachute mount \*4



### 2 金属锁钩\*8

- 2 Mental latching hook\*8

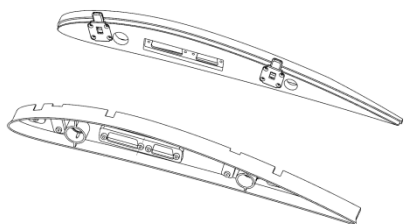




## 塑料部件 Plastic parts

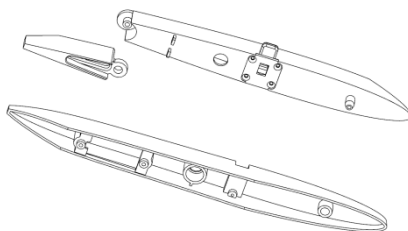
### 1 机翼连接件\*2

1 Wings connecting parts\*2



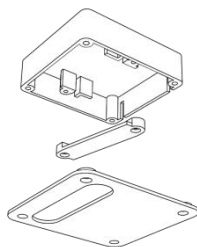
### 2 尾翼连接件\*2

2 tails connecting parts\*2



### 3 舵机固定件\*3

3 Servo fixing parts\*3



舵机安装座

servo installing base

舵机压片

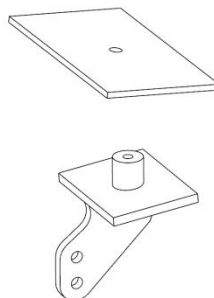
servo presser

舵机盖板

servo covering plate

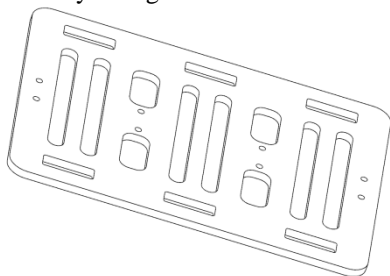
### 4 舵角\*3

4 Helm angle \*3



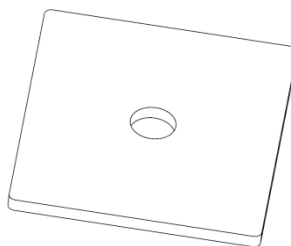
### 5 电池固定板

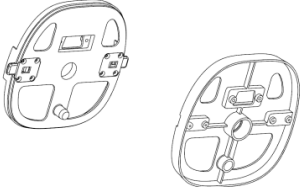
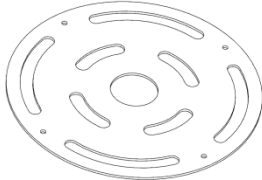
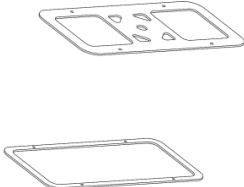
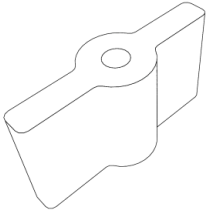
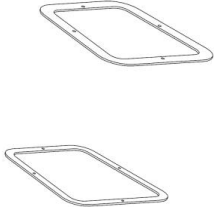
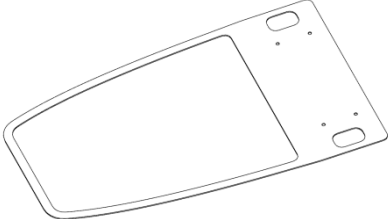
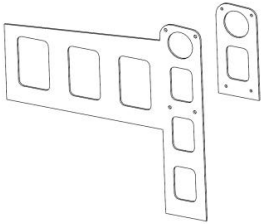
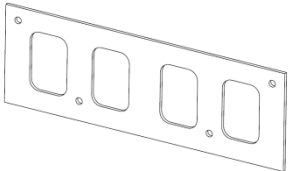
5 Battery fixing board

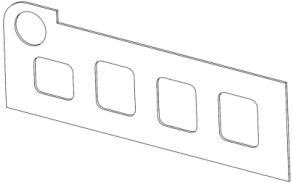
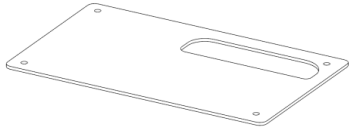
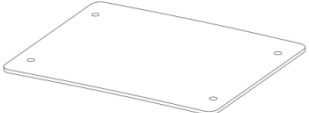
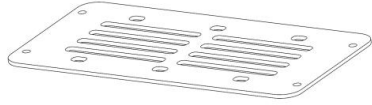
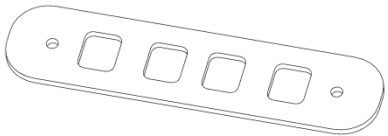
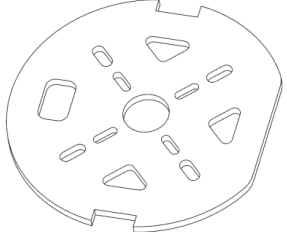


### 6 天线固定板\*2

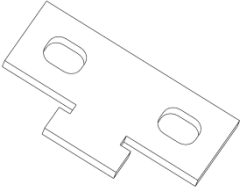
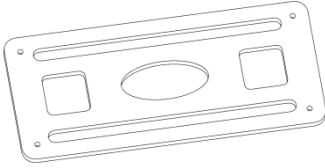
6 Antenna fixing board\*2

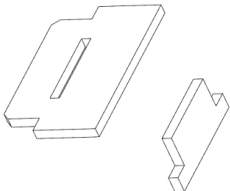
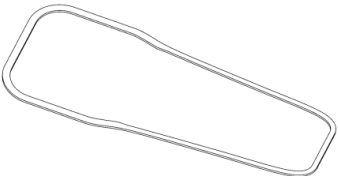
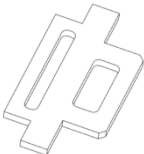
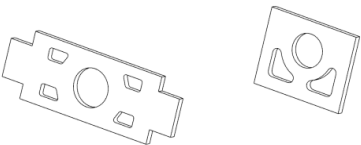
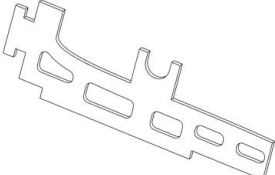
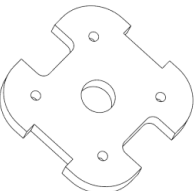
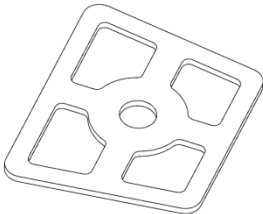
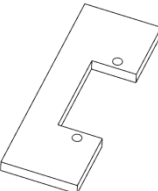


<p>7 机身连接件 7 Fuselage connecting parts</p> 	<p>8 GPS 固定板 8 GPS fixing board</p> 
<p>9 舱盖 (分电舱) 固定板 9 Cabin cover fixing board (Distribution room)</p> 	<p>10 螺丝柱*14 10 Stud*14</p> 
<p>11 舱盖 (GPS 舱) 固定板 11 Cabin cover fixing board (GPS cabin)</p> 	<p>12 电池舱口加强件 12 Battery hatch stiffener</p> 
<p>13 机身主碳管加强件*2 13 Fuselage main carbon tube stiffener*2</p> 	<p>14 机身线材固定板*2 14 Fuselage wire plate *2</p> 

<p>15 机身副碳管加强件*2 15 Fuselage carbon tube stiffener*2</p> 	<p>16 机翼舵机盖板*2 16 Wing servo cover</p> 
<p>17 机翼接线舱盖板*2 17 Wing wiring hatch cover*2</p> 	<p>18 双发电调舱盖板*2 18 Wing ESC hatch cover*2</p> 
<p>19 机头电调固定安装板*2 19 Head ESC fixed mounting plate*2</p> 	<p>20 巡航电机安装座 20 Head motor mounting mount</p> 

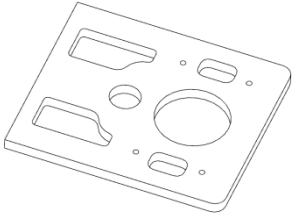
## 木板部件 Wooden parts

<p>1 巡航电机安装座加强板*2 1 Head motor mounting seat stiffener *2</p> 	<p>2 机头电调固定板 2 Cruise motor ESC mounting plate</p> 
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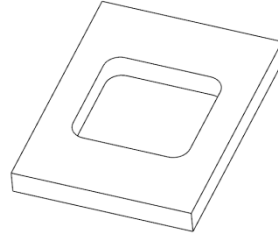
<p>3 电池舱盖固定板 3 Battery hatch cover mounting plate</p> 	<p>4 载荷舱口加强板 4 Payload hatch stiffeners</p> 
<p>5 载荷舱盖固定板 5 Payload bay cover mounting plate</p> 	<p>6 机身尾翼连接加强层板 6 Fuselage tail joint stiffener</p> 
<p>7 双发电机座加强件*4 7 Wing motor mounting seat stiffener*4</p> 	<p>8 双发电机安装座*2*2 8 Wing motor mounting mount*2*2</p> 
<p>9GPS 放置板 9 GPS locating board</p> 	<p>10 伞舱舵机座 11 Basement of parachute servo</p> 

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11 伞舱盖木板  
11 Wooden plate of parachute hatch cover



12 伞舱盖加强板  
12 Stiffer of parachute hatch cover

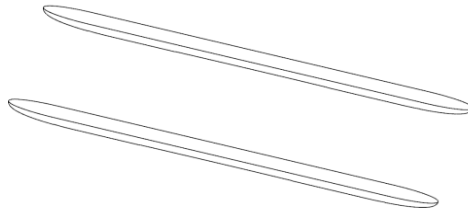


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## EVA 部件 EVA parts

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1 电池区缓冲垫 1 Fuselage cushion



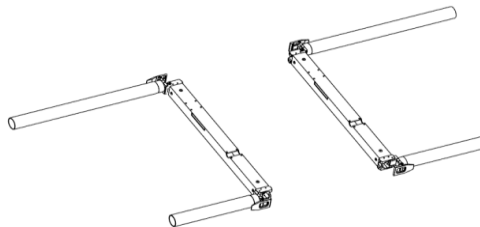
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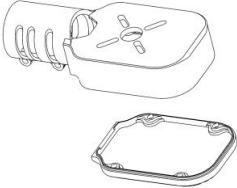
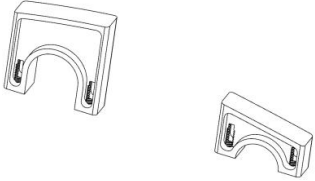
## 垂起配件 VTOL parts

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1 左右可拆式折叠机臂

1 Detachable folding machine arm



<p>2 电机座*4</p> <p>2 Motor frame*4</p> 	<p>3 机臂固定件*4</p> <p>3 Machine arm fastener*4</p> 
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### 其他配件 Other fittings

编号 NO.	名称及型号 Name & Model	数量 Qty	备注 Notes
1	割尾圆头螺丝 M2*4 Round head flat tail screw M2*4	22	
2	割尾圆头螺丝 M2*8 Round head flat tail screw M2*8	70	
3	割尾圆头螺丝 M2*10 Round head flat tail screw M2*10	8	
4	带垫螺丝 M2.6*6 Gasket screw M2.6*6	35	
5	内六角螺钉 M3*10 Soket head cap screw M3*10	10	
6	金属挂钩 Metal hanger	6	挂降落伞和提重心 Mounted parachute & Measuring the center of gravity
7	一字螺柱 Plastic stud	16	
	尼龙螺柱 Hexagon nylon stud	28	

9	平尾传动螺柱 4.2-M2*8 Horizontal tail drive stud 4.2-M2*8		2	平尾部分 The part of the horizontal tail
	圆头螺钉 Button head screw M2*10		3	
	平尾传动舵角 The transmission leg of the horizontal tail		2	
10	热缩管	5mm	12	
	heat shrink tubing	2mm	80	
11	球头 Ball head		6	球头连杆 Ball link rod
	连杆 Link rod		3	
	圆头螺钉 Button head screw M2*10		7	
	自锁螺母 Block nut M2		7	
13	舱盖锁扣 Plastic latch		2	
14	铰链 Hinge		17	
15	大电流连接器 7W2 Large electronic current connector 7W2		2	
	D-SUB 连接器 DB9P D-SUB connector DB9P		3	
18	魔术扎带 Magic tie straps		2	与电池固定板搭配使用 Matching the battery fixing board
19	硅胶线 Silicone wire	14 AWG 红色 1.5 米 14 AWG Silicone wire (red) 1.5M	1	
		14 AWG 黑色 1.5 米 14 AWG Silicone wire (black) 1.5M	1	

20	舵机线材 The servo wire	舵机延长线 10cm Servo extending wire 10cm	2	机翼部分 wing section
		单端公头线 35cm Single head servo wire(male) 35cm	3	尾翼部分 Tails section
		单端公头线 45cm Single head servo wire(male) 45cm	4	机翼部分 wing section
		单端母头线 45cm Single head servo wire(Female)45cm	7	机身部分 fuselage section

### 辅助安装工具和材料 (自备) Auxiliary installation tools and materials (Self-contained)

工具 Tools	用途 Usage
3.0mm 十字螺丝刀 3.0mm cross screwdriver	安装螺丝 Installing the screws
1.5mm-3mm 内六角 1.5mm-3mm Hexagon socket head cap screw	电机座安装 Installing the motor frame
电烙铁、焊锡丝 Electric iron,solder wire	焊接电源、舵机线 Welding the power line and servo wire
打火机 Lighter	固定热缩管 Fixed heat shrink tube
小刀 Knife	剥线 Wire stripping tool
纸胶、透明胶、纤维胶带(Transparent) adhesive tape,fabric adhesive tape	飞机粘合辅助定位、飞机局部加强 Aircraft bonding and auxiliary positioning,local reinforce



# 测试配置与性能 Test configuration & performance

## 垂起 4+1 VTOL 4+1

种类 Types	型号 Model	数量 Qty
巡航电机 Cruise motor	5015 kv200	1 个 1PCS
垂起电机 VTOL motor	5015 kv170	4 个 4PCS
巡航电调 Cruise ESC	12S 高压 60A 12S HV 60A	1 个 1PCS
垂起电调 VTOL ESC	12S 高压 40A 12S HV 40A	4 个 4PCS
副翼/尾翼舵机 Aileron/tails servo	银燕 ES3054 EMAX ES3054	5 个 5PCS
巡航电机桨 Cruise motor rotor	APC2013 正桨 APC2013 propeller	1 把 1PCS
多旋翼电机桨 VTOL motor rotor	2070 碳纤维正反桨 2070 Carbon fiber propeller of positive and negative	2 对 2pair
UBEC	5V@3A	1 个 1 PCS
	5V@10A	1 个 1 PCS
飞控 Flight control	Pixhawk	1 套 1group
动力电池 Power battery	12S@22000mah 锂聚合物 12S@22000mah lithium polymer	1 组 1group

负载重量 Payload weight	SONY A7R (约 600g)	1 台 1set
起飞重量 Take-off weight	约 11kg (含负载 600g) Approximate 10kg (including 600g load)	
续航 Endurance	150km 左右 Approximate 150km	
测试条件 Test condition	海拔 500 米, 温度 15 摄氏度, 3 级风 Altitude:500m, Temperature:15°C, Wind behavior:3	

### 手抛双发 Hand toss twin-shot aircraft

种类 Types	型号 Model	数量 Qty
巡航电机 Cruise motor	4014 kv480 /3520 kv500	2 个 2PCS
巡航电调 Cruise ESC	6S 60A	2 个 2PCS
副翼/尾翼舵机 Aileron/tails servo	银燕 ES3054	5 个
	EMAX ES3054	5PCS
巡航电机桨 Cruise motor rotor	APC1510 正反桨 APC1510 propeller of positive and negative	1 对 1 pair
UBEC	5V@3A	1 个 1 PCS
	5V@10A	1 个 1 PCS
飞控 Flight control	Pixhawk	1 套 1group
动力电池 Power battery	6S@22000mah 锂聚合物	1 组 1group

	6S@22000mah lithium polymer	
负载重量 Payload weight	SONY A7R (约 600g)	1 台 1set
起飞重量 Take-off weight	约 7kg (含负载 600g) Approximate 7kg (including 600g load)	
续航 Endurance	120km 左右 Approximate 120km	
测试条件 Test condition	海拔 500 米, 温度 15 摄氏度, 3 级风 Altitude:500m, Temperature:15°C, Wind behavior:3	

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SWUST, Fucheng District, Mianyang City, Sichuan, China Province,  
China. National University Science Park