#### T1 Ranger VTOL – PNP Instruction Manual

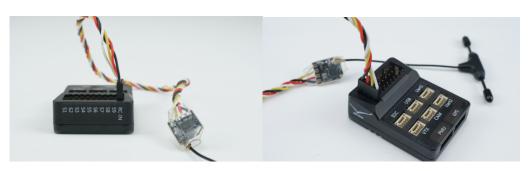
Package Content



Remove the content out of the box including the provided USB wires for the Flight Controller. Also, prepare your radio, receiver and battery.



Connect your preferred receiver to the RC-In port of the FX-405 Flight Controller. \*Note the Ground, 5V & Signal line.



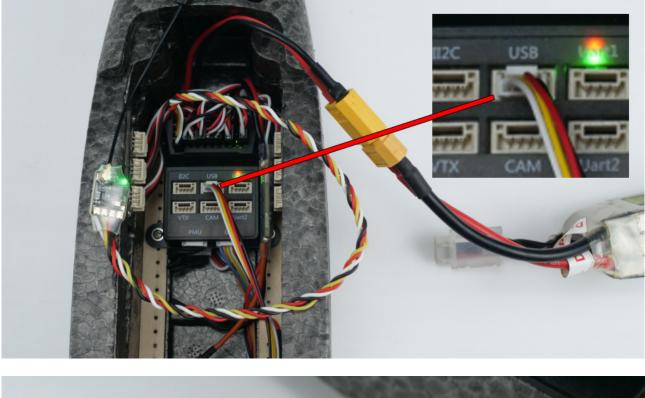


For SBUS



Turn on your radio and hook up battery to your T1 Ranger.

Then connect the USB cable provided to the flight controller's USB port and the other end to your PC.





Open the Mission Planner software on your pc. If you do not have one yet, visit our website for the download link here > <u>https://www.heewing.com/pages/fx-405-vtol-flight-controller</u>



On the top right of the window, select the correct COM port. \*every PC has different COM number, it will be different COM number on your PC.



#### Then click connect

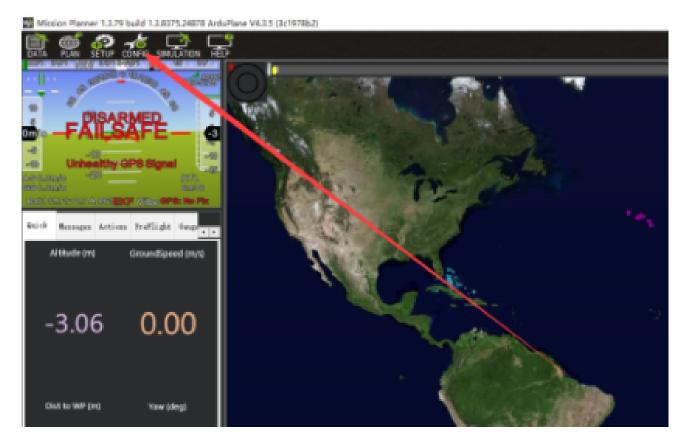


After successfully connecting to the flight controller, please ignore any errors and proceed to next step.

Note : Ardupilot automatically recognizes SBUS input, you do not need to perform receiver setup if you are using SBUS receiver. For Crossfire or ELRS receiver, please follow steps below.



# <u>1. Setting up of the receiver</u>Click CONFIG on the top left of the screen



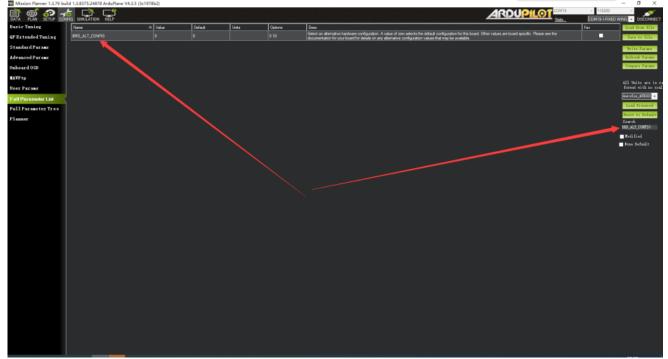
#### Click Full Parameter List on the left menu

Mission Planner 1.3.79 build 1.3.8375.24878 ArduPlane V4.3.5 (3c1978b2) **1** 2 1 DATE **Basic Tuning** erro Ter ÷ 0.050 ÷ -QP Extended Tuning 0.308 • 1 300 \* Tataged. Standard Parane + 0.000 3 ÷ Dependent -Advanced Paraze 1 1002 0.000 -15 -100\_300  $\mathrm{INT}_{\mathrm{c}}\mathrm{INT}$ Interpreter Res -U Central - Tura <u>Central</u>-Period ||7 Onboard 050 ÷. IN STREET, Imping 0.16 Upor Parame Elieb Res (s/s) ÷ 6.0 Full Parameter List tipà Min (n/s) . 0 ÷ Other Mis's Theoretics 0-1004 ÷ . Full Parameter Tree intel (  $\frac{1}{2}$ Ernise Sinc . . 0 \* 0.600 -Litch Despendent - 11 ÷ Builder Mi Fluxer Rea 6.0 ÷ Slashate -Sarigativ Isak Ka Mangaed a/a-1210 Fitch Re-The size ..... 승 ÷ Pitch R 1.9838 Batil ter Der

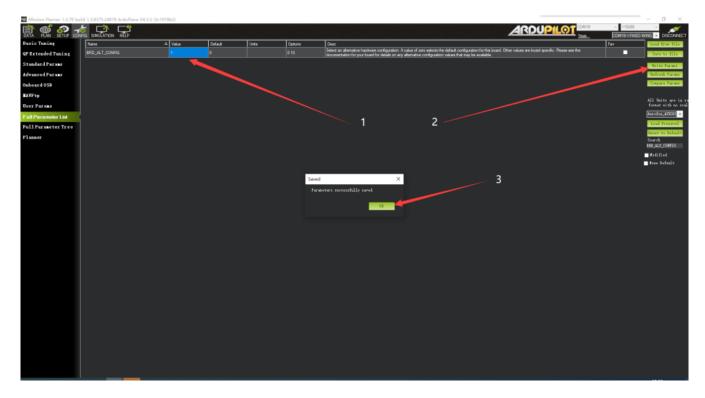
## On the Search box on the right side, type BRD\_ALT\_CONFIG

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							- 115200 COM15-1/100	D HTHE + DISCONNECT
Baric Tuning	Hane	A Value	Defect	Unta	Options	Desc	fav	· Load from file
QP Extended Tuning	SERVOS_REVERSED				ENunal 1 Reversed	Revense servis operation. Set to 0 for nomal operation. Set to 1 to revene this subjut channel.		free to file.
	ACRO_LOCKING				COubled 1 Erabled	Enable attlude locking when sticks are released. If set to 2 then-quaternion based locking is used if the yaw rate controller is enabled. Quaternion based locking will hold any attluable	•	
Standard Parana	ACRO_PITCH_RATE					The maximum pilot-rate at M table deflection in ACRO mode		Write Parast
Advanced Parane	ACRO_ROLL_RATE	180	180	deg/s	10 500	The maximum nal rate at hall atok deflection in ACRO mode		Refresh Parans
Onboard OSD	ACRO_YAW_RATE			deg/s		The maximum yave rate at full stick deflection in ACHD mode. If this is zero then subler is directly controlled by subler stick input. This option is only available if you also net YANT_RATE_DUADLE to 1.		Corpore Parans
LATP to	AFS_ENABLE	0	0			This enables the advanced failuate system. Ethic is not to zero (disable) then all the other ATS options have no effect		
	AHRS_COMP_BETA					This controls the time constant for the cross-over frequency used to fuse. AHPS jampeed and heading) and GPS data to extinate gound velocity. Time constant is It fasts. A larger time constant will use GPS data less and a small time constant will use at data less.	•	All Units are in re
Esex Parans	AHRS_ENF_TYPE	3	3		0 Oradiled 2 Enable DKF2 3:Enable DKF3 11 External ArrPS	This controls which Nex/EXF Falman filter version is used for attitude and position estimation	•	format with no and Recolor_ATENT -
Full Parameter Tree	AHRS GPS GAN				6010	This controls how much to use the GPS to correct the attlude. This should rever be set to zero for a plane as It would result in the plane losing control in turns. For a		Load Presared
	AHRS OPS WINEATS				010	plane please use the default value of 1.0 Minimum number of satellites value to use GPS for velocity based corrections atitude correction. This defaults to 5, which is about the point at which the velocity		Benet be Befugte
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	AHRS_GPS_USE				CPS for DCH position 21.4e GPS for DCM protein and height DNone 1 Yaw-65	The controls whether to use developmentary or OFTS have for exception. If set to Stree the OPT work has anot for exception, and only development development of the control of the CON-Barred Area (Area (Area)) and a control of the CON-Barred Area (Area) and a control of the CON-Barred A	•	Relified
	ands, original or	•	•		2.7 mail 1 fam 30 million 2.7 mail 1 fam 30 million 2.7 mail 1 fam 30 million 2.7 mail 10 million 3.7 mail 10			
	ARSJPJ					This controls how fast the acceleraneous connect the attude		
	AHRS_TRIM_X	4.01164775	0	red		Compensates for the roll angle difference between the control board and the frame. Positive values make the vehicle roll right.		
	AHRS_TRM_Y			red .	-0.1745 -0.1745	Compensates for the pitch angle difference between the control board and the frame. Positive values make the vehicle pitch-up-back.		
	AHRS_TRM_Z	•	<u> </u>	net	-0.17450.1745	Net Und Note that the second second second second State to the term of the first second second second second second second		
	AHRS_WIND_MAK					This sets the maximum allowable differences between ground speed and aimpeed. This allows the plane to cope with a failing aimpeed senser. A value of zero means to use the aingreed as is. See ARSPO_OPTIONS and ARSPO_MAR_WIND to double aingreed sensors.	-	
	AHRS_YAW_P					This controls the weight the compass or GPS has on the heading. A higher value means the heading will task the year source GPS or compass) more repidly.	-	~

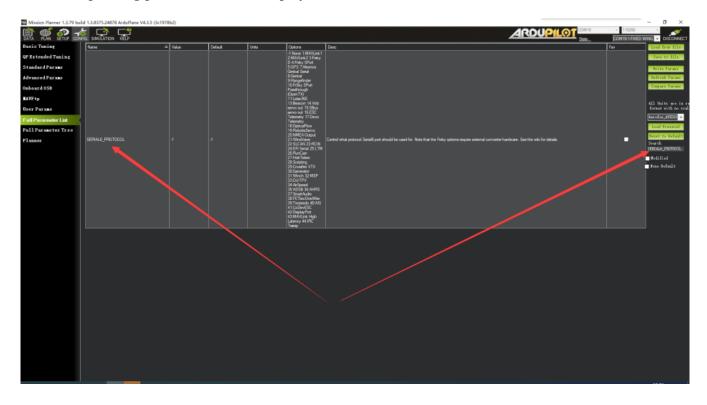
# The corresponding parameter will be displayed



Change the "Value" from "0" to "1", then click "Write Params" to write the changes to the flight controller. Click "Ok" to confirm.

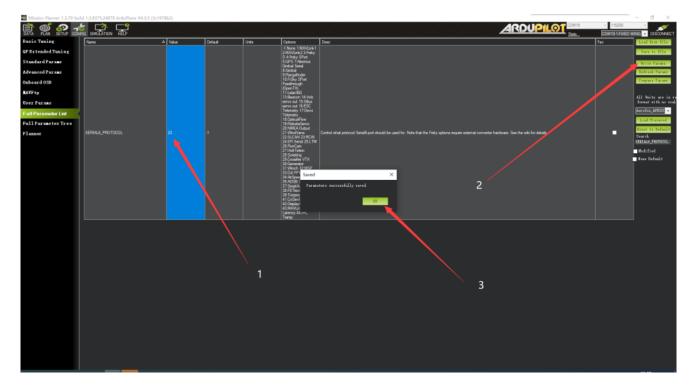


Again, on the Search box, type SERIAL6\_PROTOCOL The corresponding parameter will be displayed



Change the "Value" from "0" to "23". Click "Write Params", then click "Ok".

Congratulation! You are done!

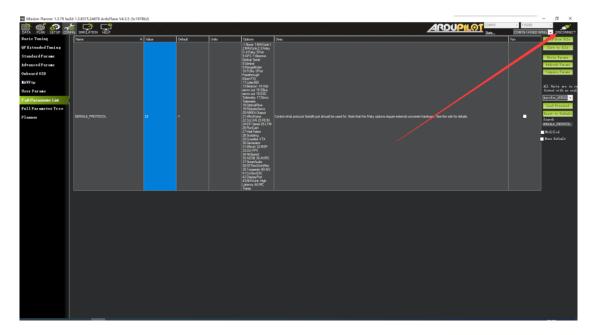


Below are the relevant parameters for your reference. Please make sure it's correct.

SBUS receiver setup	: BRD_ALT_CONFIG = 0 ; SERIAL6_PROTOCOL = -1
CRSF/ELRS receiver setup	: BRD_ALT_CONFIG = 1 ; SERIAL6_PROTOCOL = 23

**IMPORTANT**, after the above is completed, before we proceed to next step, click "Disconnect" on the top right of the screen > disconnect the USB cable from the Flight controller and the PC > disconnect the battery.

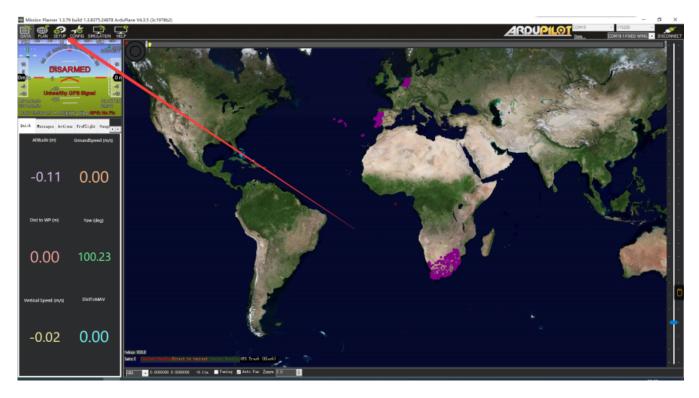
When you connect the battery again, CRSF/ELRS should be working now.



#### 2. Radio Calibration

Turn on the radio, connect battery to your T1 Ranger, connect USB to the flight controller and your PC.

Then open Mission Planner and click Setup.

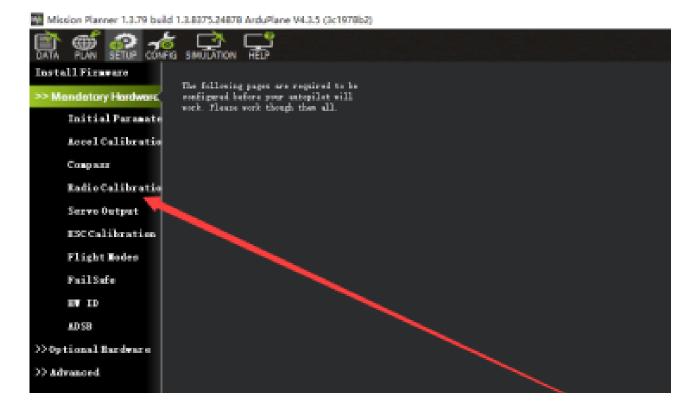


Click "Mandatory Hardward" on the top left.

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#### Click "Radio Calibration"



Click "Radio Calibration" as shown in the picture below



Follow the instruction as shown on the screen. Click OK.

Radio 9 999	Radio 14 880	
Radio 15 2001 Reverse	Radio 16 2011	
Cal	librate Radio	
Elevons CH2 Rev Bind DSM2 Bind I	conv plul nous	×
	Ensure your transmitter is on and receiver is powered and connec Ensure your motor does not have power/no props!!!	ted
		ОК
	ر	

Click OK and perform the instruction as shown. Move all your control sticks and flight modes switches to their max.

.e (rc3) 988	Reverse		Radio 13 880 Radio 14 880			
15 CHI Rev	Reverse	Cl:	Radio 16 2011 ok when Done DSMX Bi <mark>-1 news</mark>			
				icks and switches to bars hit the limits.	X their OK	

Click OK. Now observe Mission Planner recognizing your new inputs/stick values of your own radio.



When you are done, click "Click when Done"





Follow the instruction shown and click OK

Radio 1519201 20 Radio 16 2011 20 11 Reverse Completed 247 Slevons CH2 Rev Ensure all your sticks are centered and throttle is down, and click ok to continue	
iev Elevans CH2 Rev Bind DSM2 Bind DSM3 Bind DSM3	
Ensure all your sticks are centered and throttle is down, and click ok to continue	
ок ок Самариала се	

Mission Planner now display the MIN and MAX of your PWM values of your Radio. Click OK again

C Keverse		
Keverse 2 Radio 8 999 201 60% 6	3 880	
8 Radio 9 999 201 882adio 3	4 880	
Radio 1519201 20 Radio 1		
011 Reverse	Radio X	
	NOTE Channels not connected are displayed as 1500 +-2 Normal values are around 1100   1900	
Rev Elevonz CH2 Rev Bind DSM2 Bind DSMX B	Channel:Min   Max	
	CHI 968   2011 CH2 968   2011 CH3 968   2011 CH4 968   2011 CH5 999   2000 CH6 999   2000 CH7 999   2000 CH8 999   2000 CH9 999   2000 CH15 1920   2011	

It will then display "Completed"

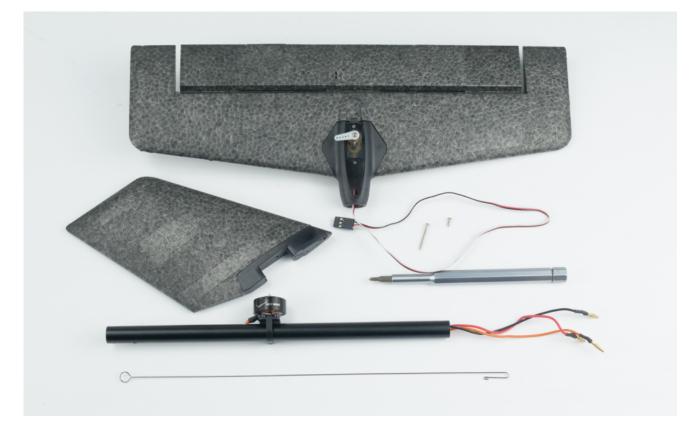


Mission Planner 1.3.79 build 1.3.8375.24878 ArduPlane V4.3.5 (3c1978b2)

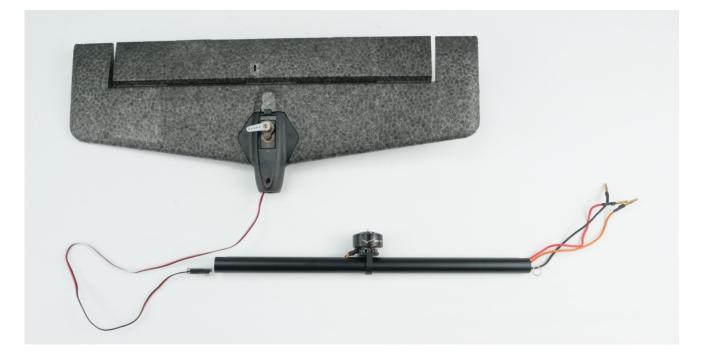
You have completed the Ardupilot/Mission Planner setup.

#### 3. Assembly of the plane

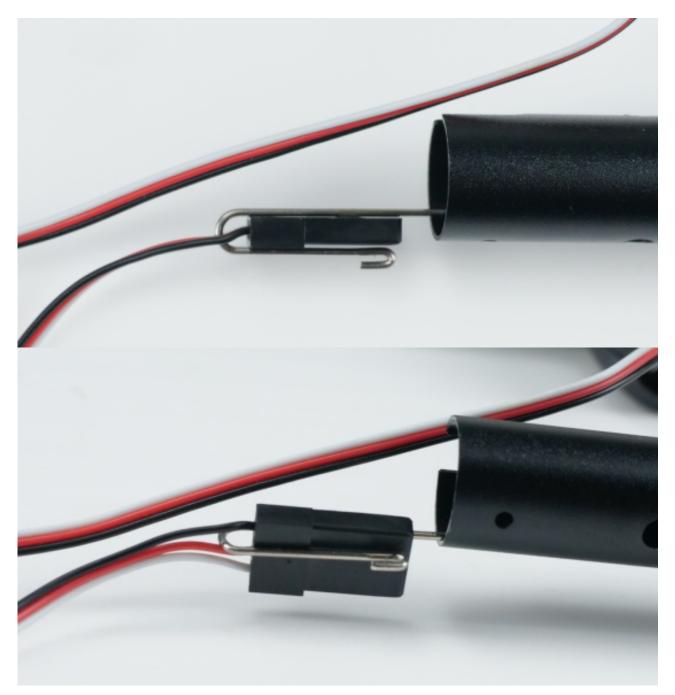
a. Prepare the tail boom, horizontal stabilizer, vertical stabilizer, guide wire, 2x20 screw, 2x6 screw and a Philips screwdriver.



b. Using the provided guide wire, pull the servo connector through from one end of the tail boom to the other end of the tail boom



Tips : using the U shape of the wire and clip it onto the servo connector



Gently pull the servo connector through the tail boom to the other end as shown



c. Observe the U Shape cut on the tail boom and align it to the stop inside the horizontal stabilizer mount.



d. After inserting the tail boom, ensure the U shape cut is centered and is not pushing onto any wires. If installed correctly, the hole is clearly see through and the servo wire is visible as well.



e. Align the vertical stabilizer onto the clip of the horizontal stabilizer as shown below and install it.





f. Rotate to the other side and install the corresponding screws according to the marking on the mount.

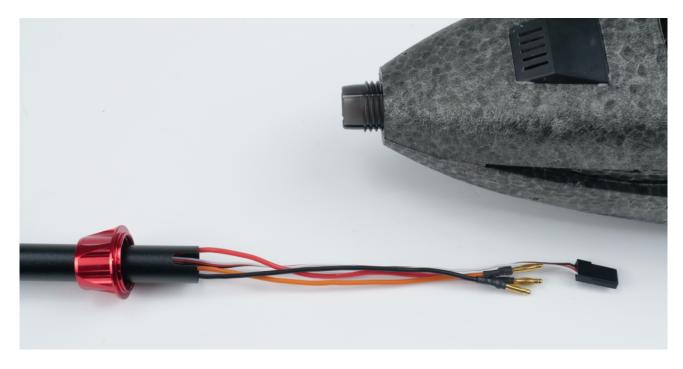




g. Now let's assemble our completed tail onto the main fuselage. This is to be secured with the provided nut.



h. Slot the red color nut onto the tail boom first, observe the direction as shown below



I. Slot in the wires into the fuselage together with the tail boom and secure it with the nut. Do not need to over tighten the nut as long as it's not loose.



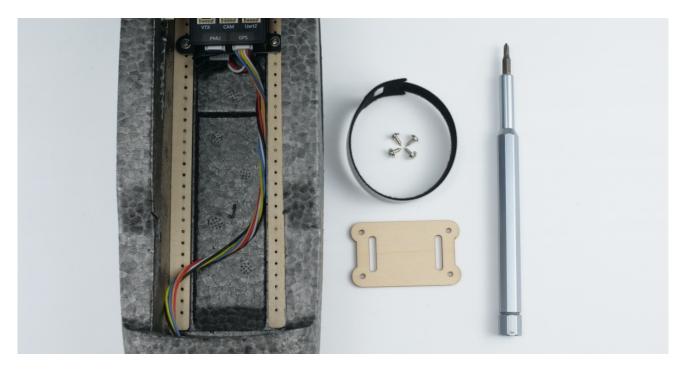
j. Connect the elevator servo into S2 port on the flight controller. Observe the Ground, 5V & Signal orientation.



k. Now connect the 3 motor wires together. Just follow the wires color ie black to black, red to red and orange to orange.

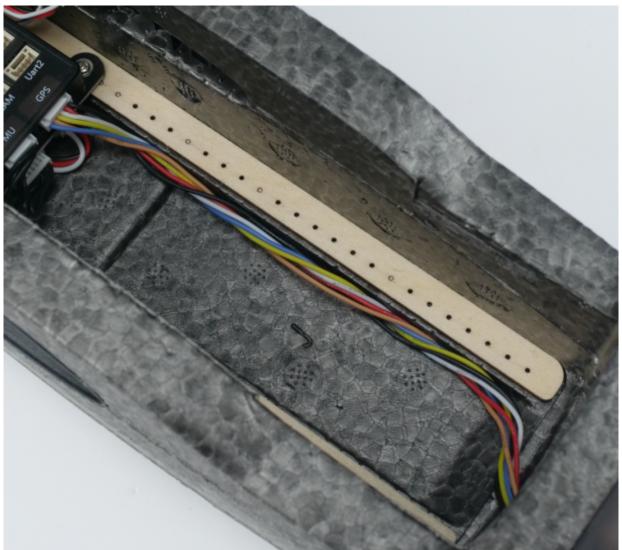


l. Now we are gonna install the battery mount. Prepare the battery mount, fuselage, battery strap, 2x6 screw and the screwdriver



m. Slot the battery strap through the battery mount, organize the wires to one side to prevent the wires getting squashed





n. Place the battery mount onto the wooden rail, align the screw holes and secure it with 4pcs of 2x6 screw.



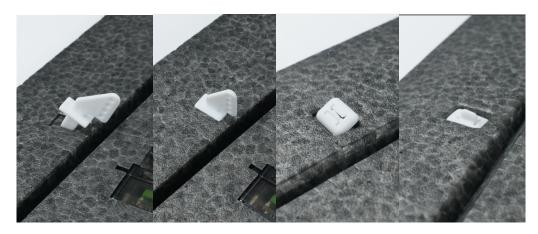
o. Now let's install the Control Horns



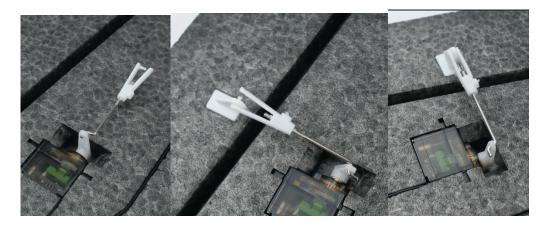
p. After installing the steel linkage into the latch, place it in the opening of a vernier caliper, the end to end length should be 46mm. If you do not have a vernier caliper, you may use a ruler. Repeat the same thing for the other 2 linkages.



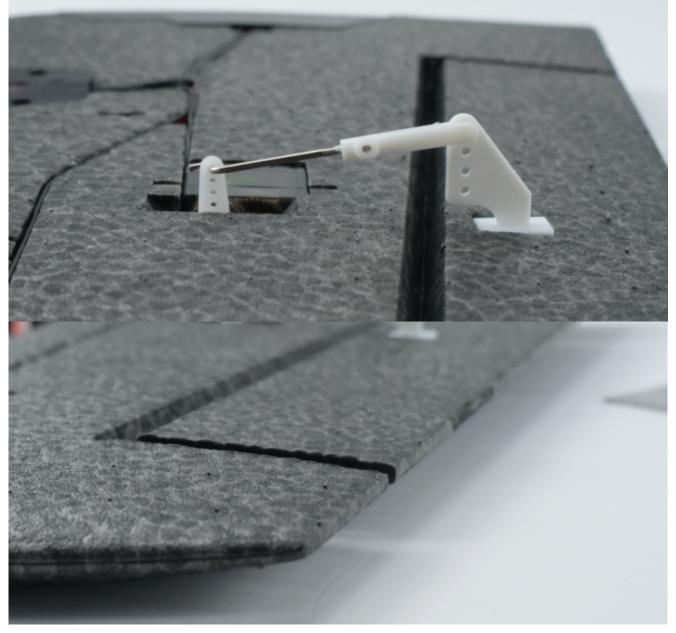
q. On the main wing, install the control horn through the slit of the control surface and secure it with the latch.



r. Slot the steel linkage into the hole on the servo horn that is furthest away from the center, then secure the other end onto the control horn.



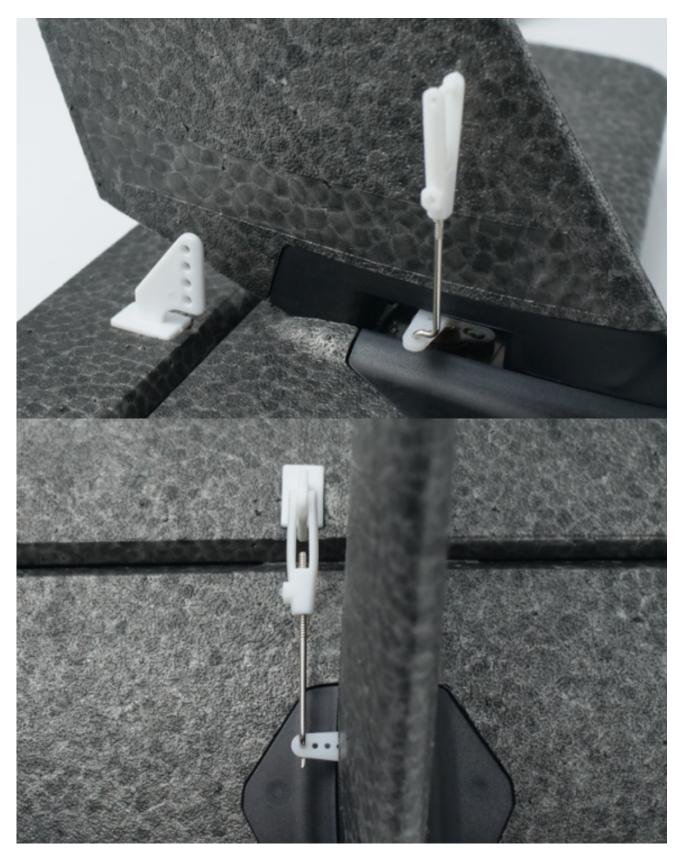
s. The servo horn angle should be parallel to the wing surface. With the servo centered(best when it's powered), you may adjust the linkage length accordingly to ensure that the control surface is align with the wing surface as shown on the 2<sup>nd</sup> photo



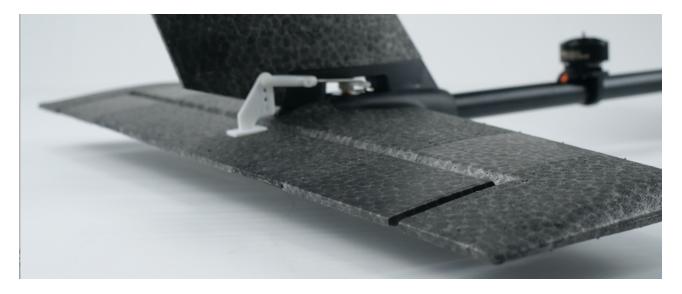
t. Install control horn onto the elevator and secure it with the latch



u. Install the linkage the same way as on the main wing previously



v. Ensure that the elevator is parallel to the horizontal stabilizer by adjusting the linkage length



x. Installing wings onto the main body/fuselage



y. Slot the carbon rod into the main wing  $\$ 



z. Carefully atach the main wing onto the fuselage and ensure that it's properly clipped onto. \*Do not attach or detach the main wing while it's powered as this can damage the electronics



#### ab. Installing latch of the canopy



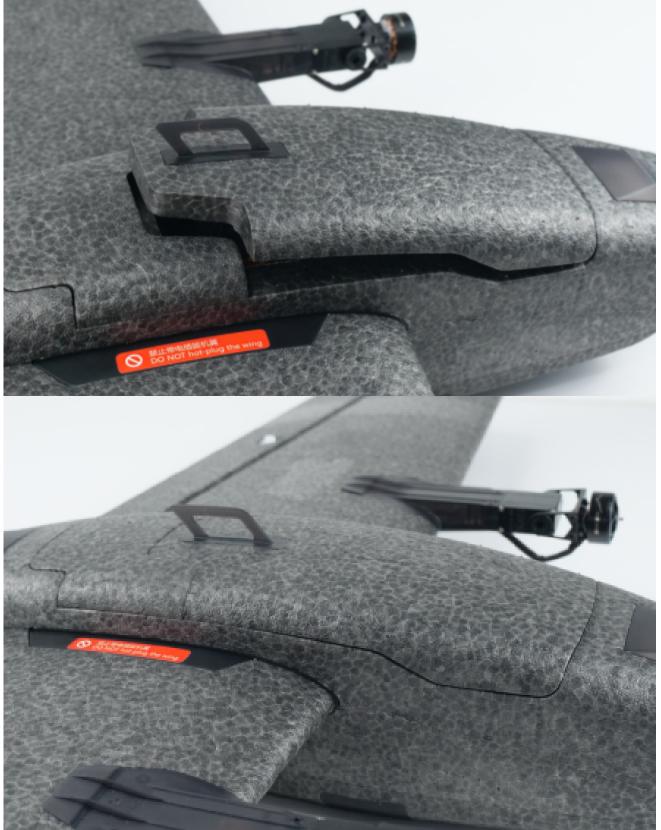
ac. Slot the latch through the canopy and secure it with the clip. The flat side of the clip facing outside.



ad. Slide the smaller rear canopy towards the rear of the fuselage and ensure no wire between the canopy and the carbon rod.



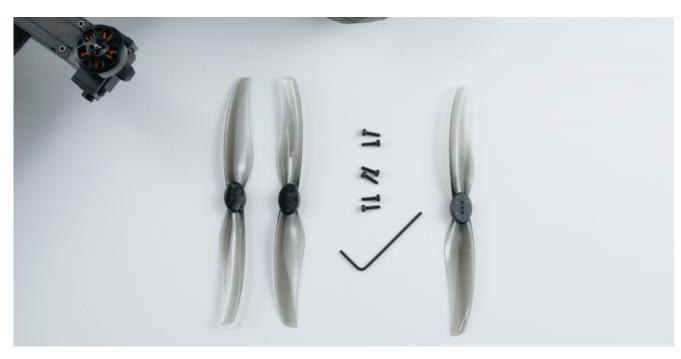
ae. Now slide the canopy with the hatch towards the front, gently press the latch onto the carbon rod to secure it onto the fuselage.



## af. Installing the propellers



ag. Prepare your propellers, 2x8 screws and an allen key



ah. Secure the propeller onto the motor with the screws. Observe orientation of the propeller.



ai. Rotation of left and right side of the propeller



aj. The build is completed! You may install the decal or the landing gear according to your personal preference.

