Self-Landing Rocket Instructional Manual

Raise the Ratio!

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Order List

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Electronics Order List

Component Number	Component	Quantity	Vendor	Price
1	Tattu R-Line 1050mAh 95C 4S1P Lipo Battery Pack	1	Tattu	$20.59
2	Universal Proto-board PCBs 4cm x 6cm	1	Adafruit	$2.50
3	Electric Speed Controller	2	Amazon	$39.99
4	Buck Converter	1	Amazon	$7.99
5	Wire spool	1	Amazon	$12.99
6	Corona DS-843MG	2	Hobby King	$12.95
7	iFlight XING2 2207 4-6S Brushless Motor	2	Amazon	$32.10
8	Adafruit 9-DOF Absolute Orientation IMU Fusion Breakout - BNO055	1	Adafruit	$29.95
9	Adafruit BMP390 - Precision Barometric Pressure and Altimeter	1	Adafruit	$10.95
10	MicroSD card breakout board+	1	Adafruit	$7.50
11	PJRC Teensy 4.0 USB Development Board	1	Adafruit	$23.80

** Example Reference: E2 = Universal Proto-Board

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Hardware Order List

Component Number	Component	Quantity	Vendor	Price
1	56 mm X 10" Clear Tube	1	Apogee Rockets	$7.56
2	Propellers	2	GetFPV	$3.99
3	Carbon Fiber Sheet 300x400x3MM	1	Amazon	$69.99
4	Large Diameter Carbon Fiber Rod	1	McMaster	$24.97
5	Small Diameter Carbon Fiber Rod	1	McMaster	$15.88
6	Solid Carbon Rod	1	McMaster	$17.47
7	M2 x 10mm	20	-	-
8	M3 x 10mm	26	-	-
9	M3 x 16mm	4	-	-
10	M3 heat set inserts	8	-	-
11	Vibration Dampeners	4	Amazon	$6.59
12	Zip Ties	15	-	-

** Example Reference: H2 = Propellers

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Required Equipment

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Hand Tools

Equipment #	Equipment	Specifications
1	Dremel	Carbide Dremel Blade
2	Screwdriver	M1 M2
3	Allen Key	2.5 mm 1.5 mm
4	Drill	3 mm Drill Bit
5	Soldering Iron	
6	Calipers / Ruler	
7	Epoxy	
8	Super Glue	
9	Exacto Knife	

** Example Reference: HT4 = Drill

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Specialty Tools		
Equipment #	**Equipment**	**Specifications**
1	FDM Printer	Ender 3 was used with .4mm nozzle
2	Resin Printer	Used Formlabs Form 3, black or clear resin, Adaptive layer height
3	CNC Router	Shapeoko 4 was used. 400 mm/s feed rate, 150mm/s plunge rate, 1/16" 4 flute burr endmill

1

** Example Reference: ST2 = Resin Printer

2

3

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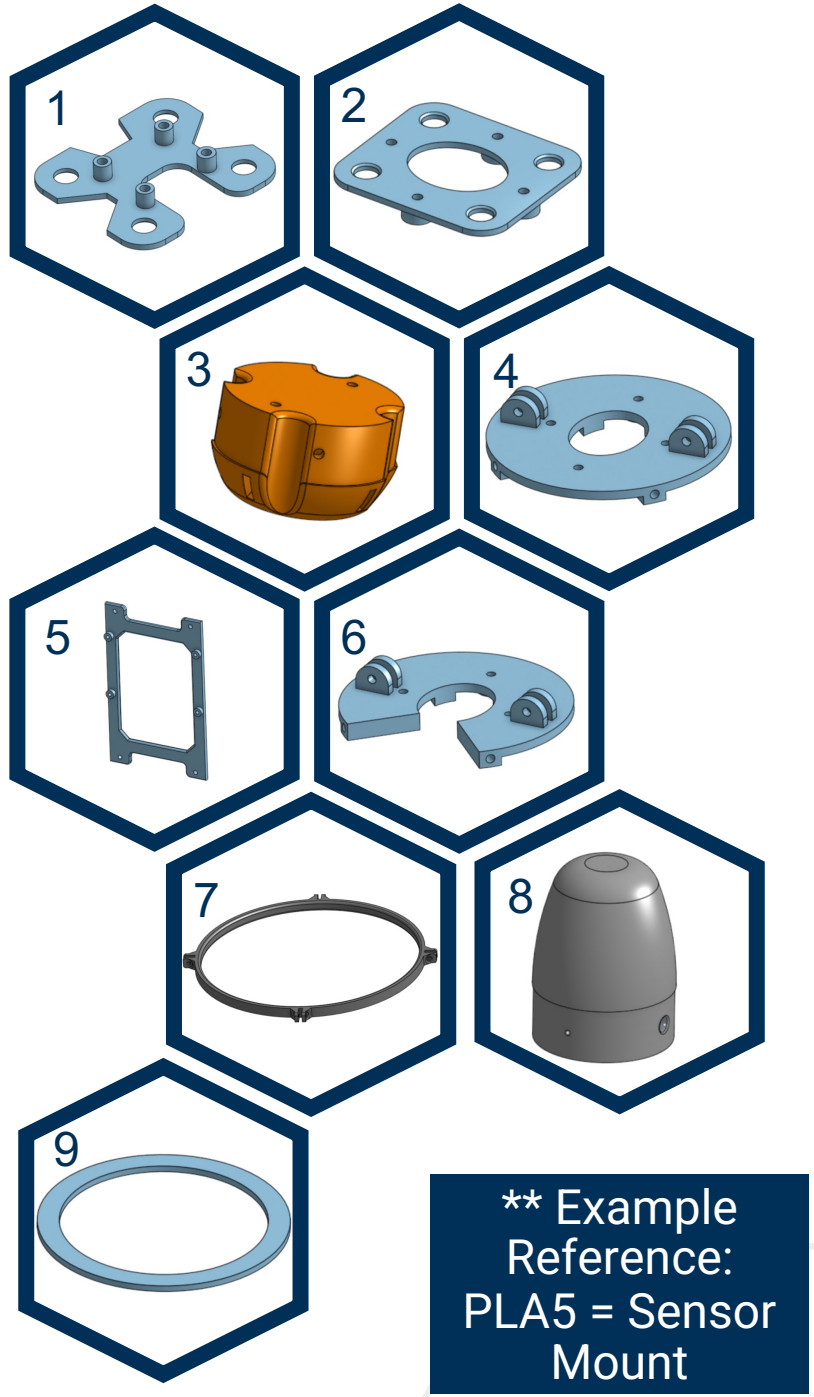
3D Prints

Lightweight PLA Printed Parts (Using ST1)

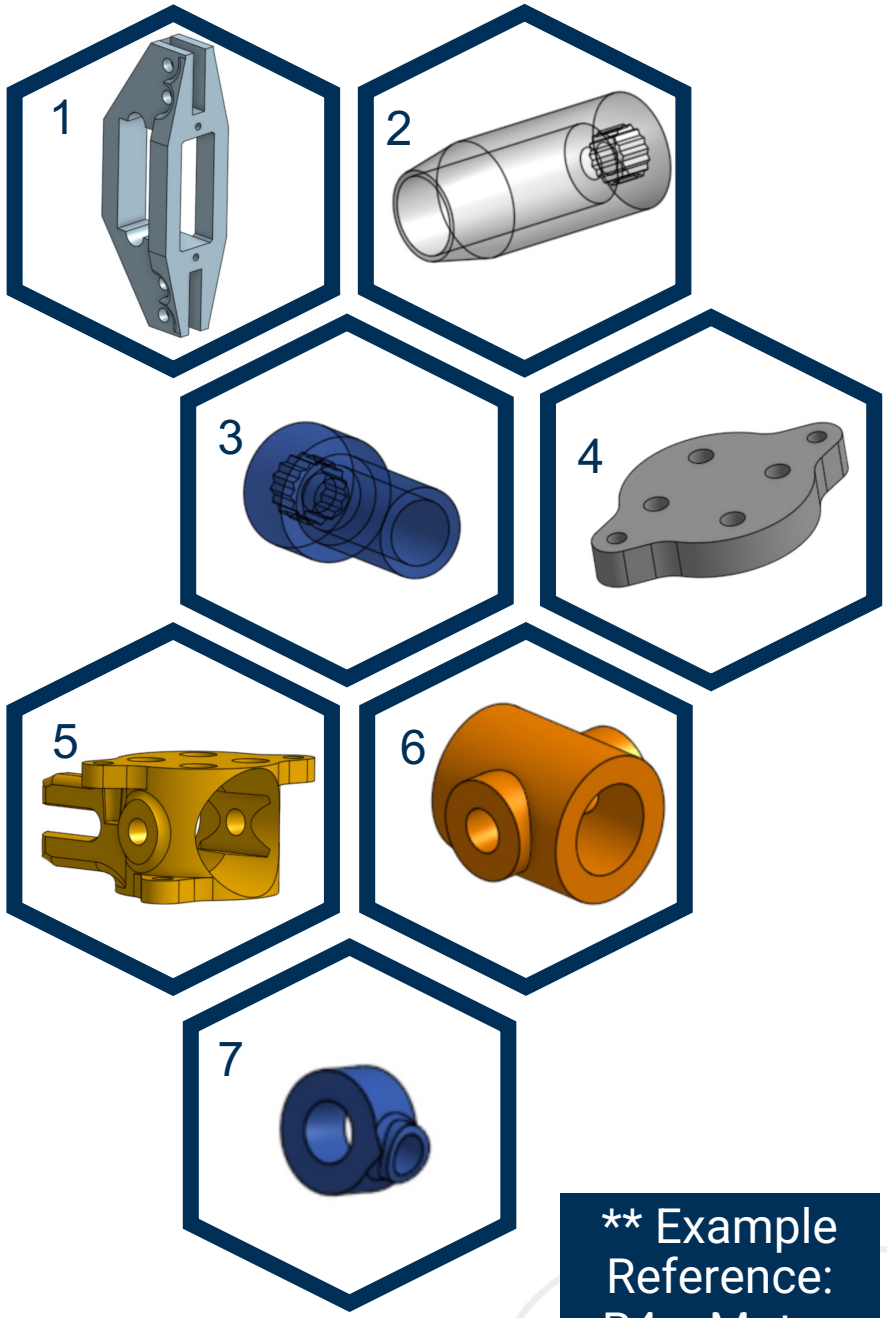
Component #	Component	Quantity	Settings
1	IMU Mount Upper	1	15% infill, Supports needed on parts 4 and 6, .15mm layer height
2	IMU Mount Lower	1	
3	Rocket Fuselage Mount	1	
4	Top sensor mount holder	1	
5	Sensor Mount	1	
6	Bottom sensor mount holder	1	
7	Ring Stiffener	1	
8	Nose Cone	1	
9	Tube Cutting Guide	1	



** Example Reference: PLA5 = Sensor Mount

Resin Printed Parts (Using ST2)

Component #	Component	Quantity	Settings
1	Servo Leg Mount	2	Printed on Formlabs Form 3, black or clear resin, Adaptive layer height
2	Smaller Servo Coupler	1	
3	Larger Servo Coupler	1	
4	Motor Plate	2	
5	Motor Pivot	1	
6	Large diameter carbon tube pivot	1	
7	Small diameter carbon tube pivot	1	



** Example Reference: R4 = Motor Plate

CNC Cuts

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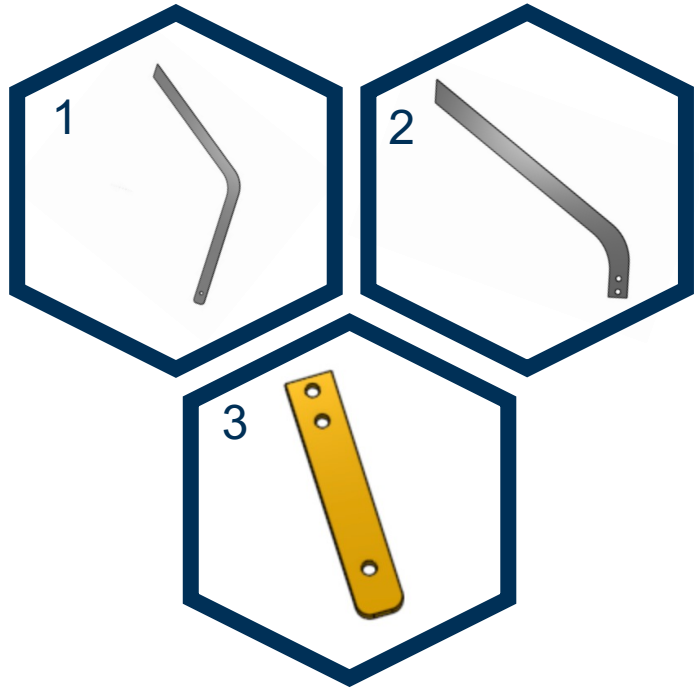
CNC Machnied Parts (Using ST3 and H3)			
Component #	**Component**	**Quantity**	**Settings**
1	Large Carbon leg	2	Cut on Shapeoko 4. The feed rate was set to approximately 400mm/s and the plunge rate was set to 150mm/s with a 1/16" 4 flute burr endmill
2	Small Carbon leg	2	
3	Leg extender	2	



** Example Reference: C1 = Large Carbon leg

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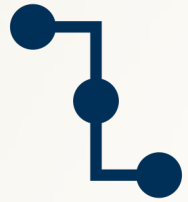
Electronics



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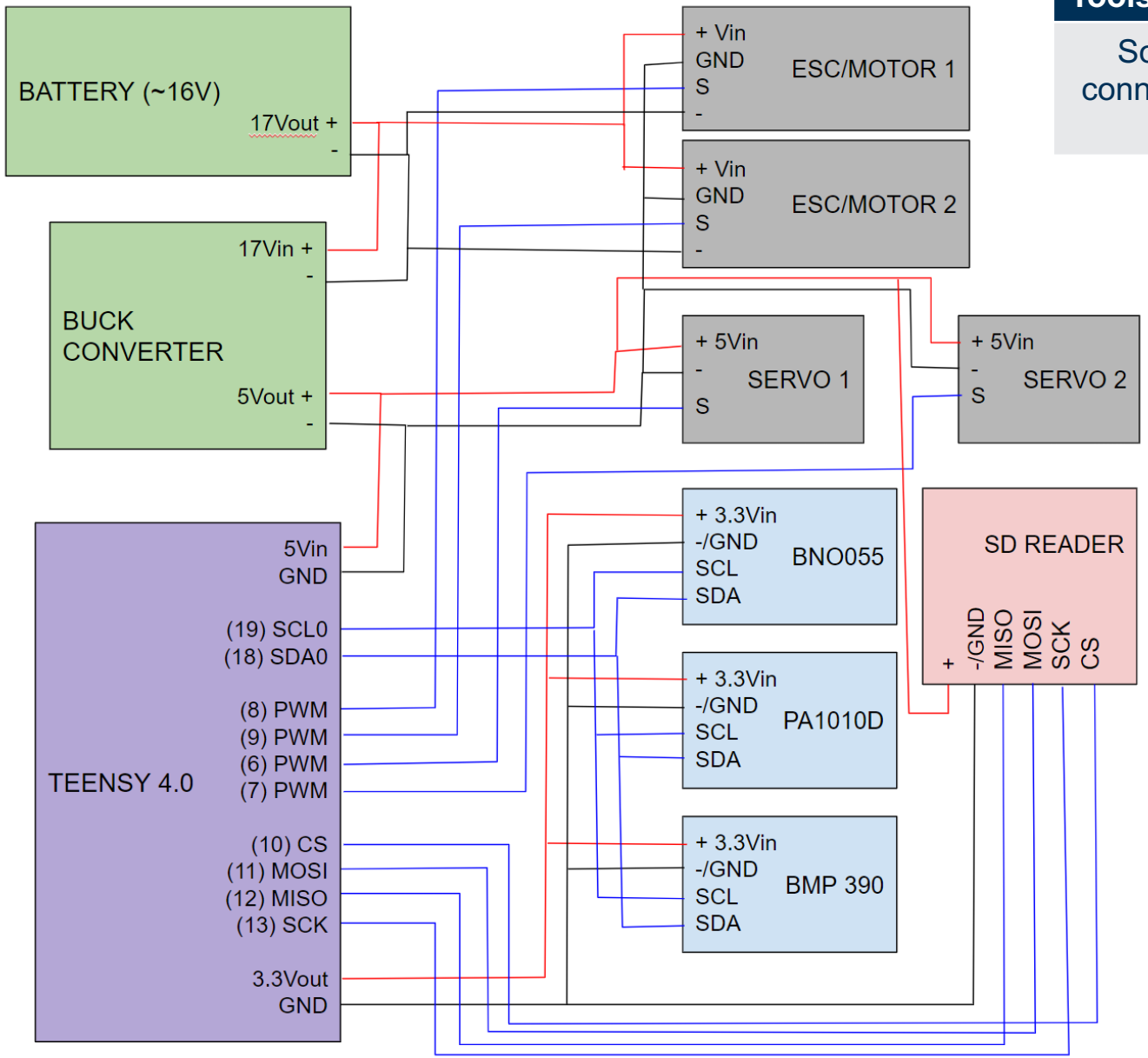
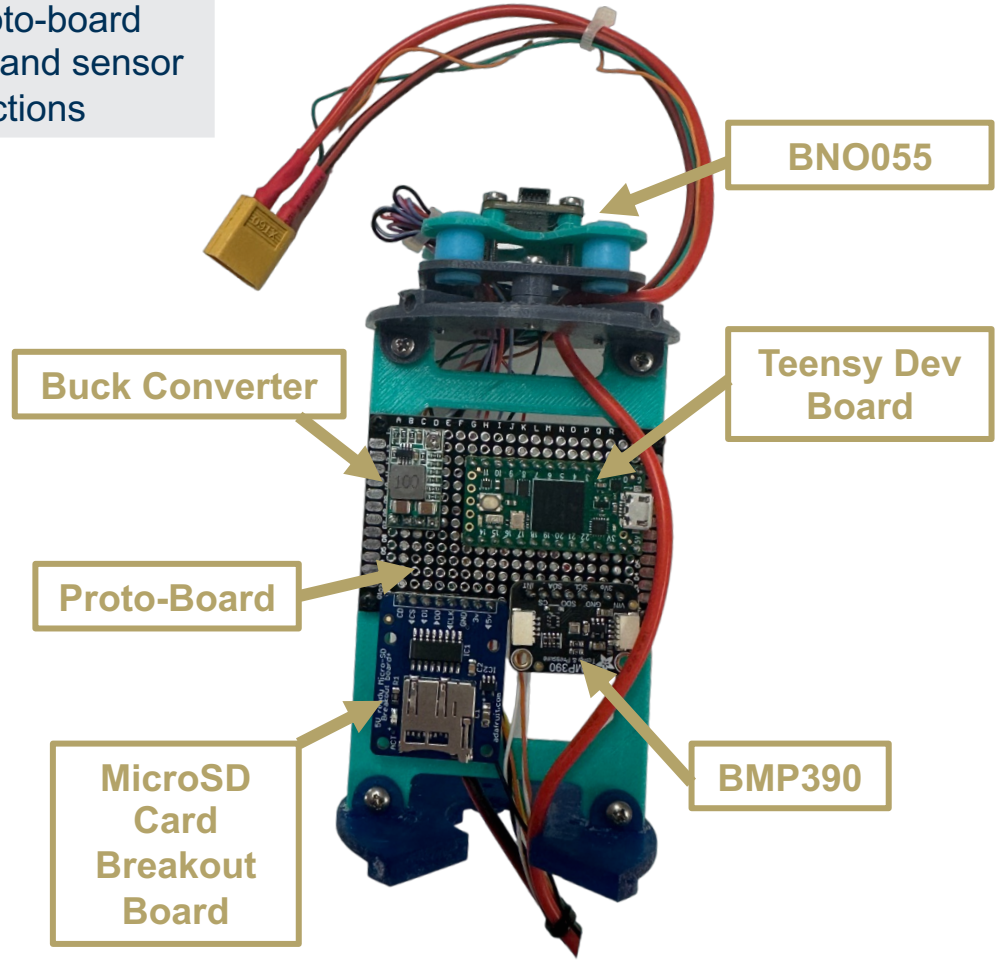
Materials:	E2-5 E8-11
Tools:	HT5

Solder proto-board connections and sensor connections



Sensor Location Reference



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Assembly

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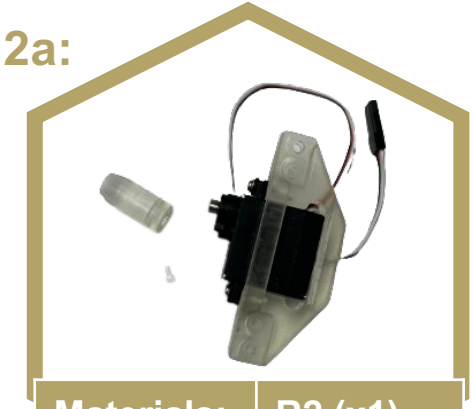
Step 1:

x2

Materials:	R1 (x2) E6 (x2)
Tools:	HT2

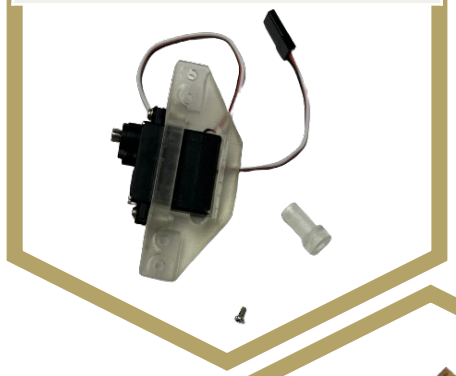
Secure servos to leg mounts using included screws

Step 2a:



Materials:	R2 (x1) R3 (x1)
Tools:	HT2

Attach rod mounts to servo assembly



Step 2b:

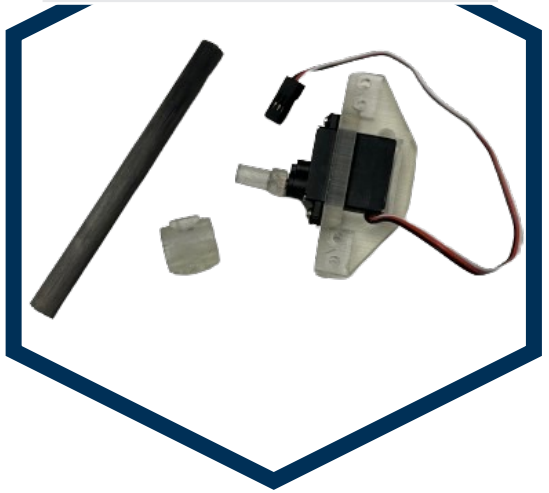
Materials:	H4 (x1) H5 (x1)
Tools:	HT1 HT6

Cut CF Rods to Length
Small Diameter: 150 mm
Large Diameter: 93 mm

Step 3:

Materials:	R6 (x1) R7 (x1)
Tools:	HT8

Glue cut rods to fit in mounts and glue pivot adapters to place



Assembly Reference:

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Step 4:

x2

Materials:	R4 (x2) E7 (x2)
Tools:	HT3

Attach adapter plate to base of motor using included screws

Step 5a:

Materials:	R5 (x1) H7 (x4)
Tools:	HT3

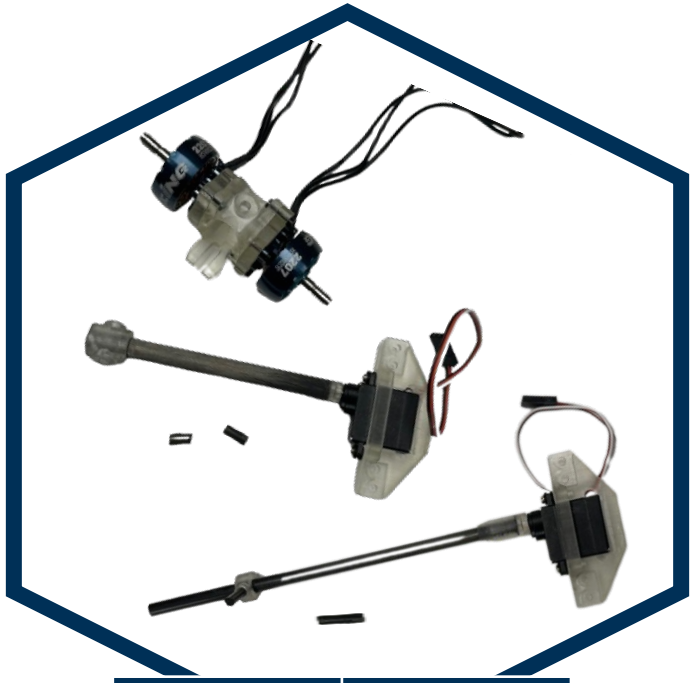
Connect both motor assemblies to coupler

Step 5b:

Materials:	H6 (x1)
Tools:	HT1 HT6

Cut solid CF rod into 5 mm (x2) and 10 mm (x1) pieces

Step 6:



Materials:	-
Tools:	HT8

Glue together CF rod pieces and attach to motor assembly

Assembly Reference:

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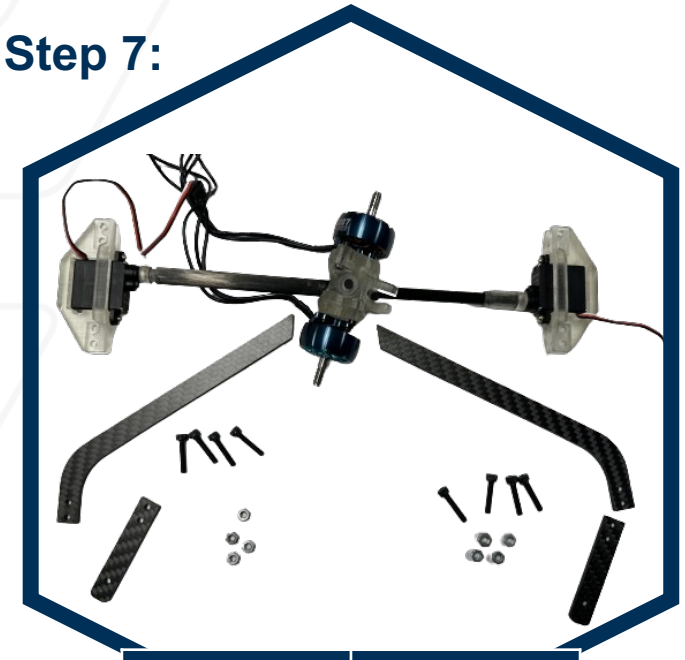
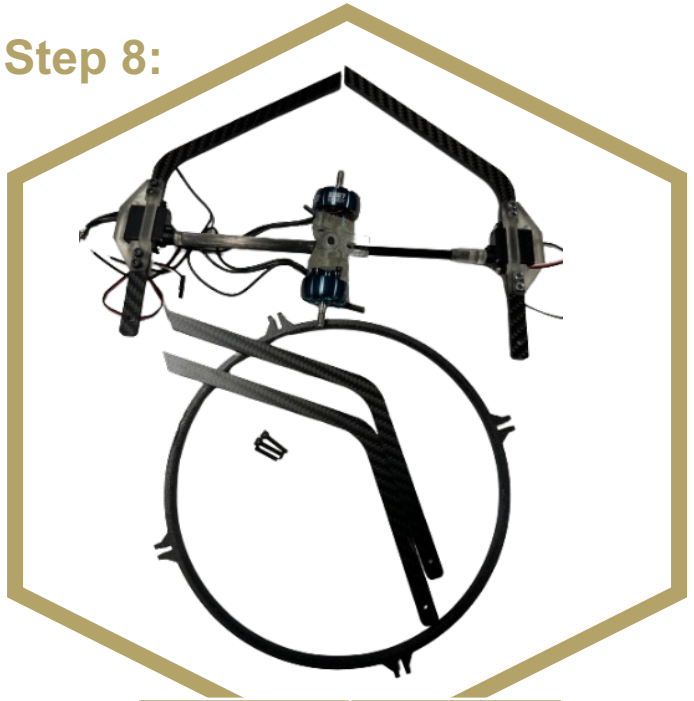
Step 7:



Materials:	H8 (x8) C2 (x2) C3 (x2)
Tools:	HT3

Secure first pair of legs to TVC mechanism

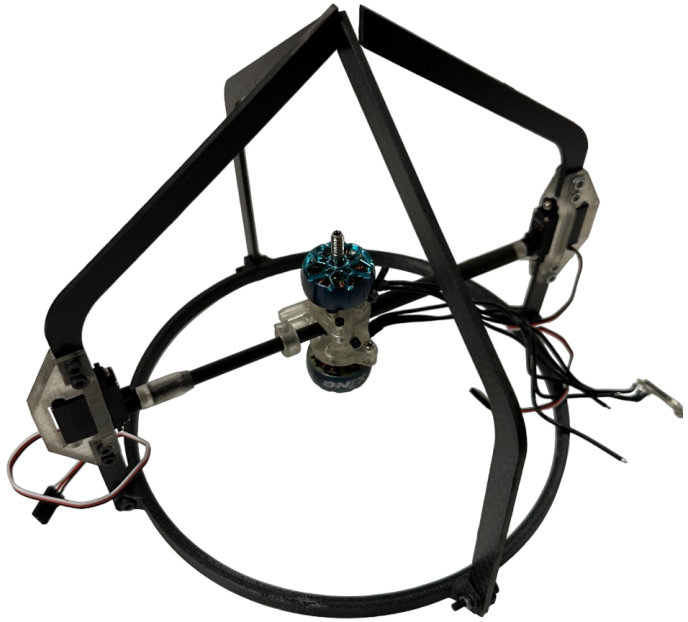
Step 8:



Materials:	H8 (x4) PLA7 (x1) C1 (x2)
Tools:	HT3

Attach final two legs and ring stiffener

Assembly Reference:



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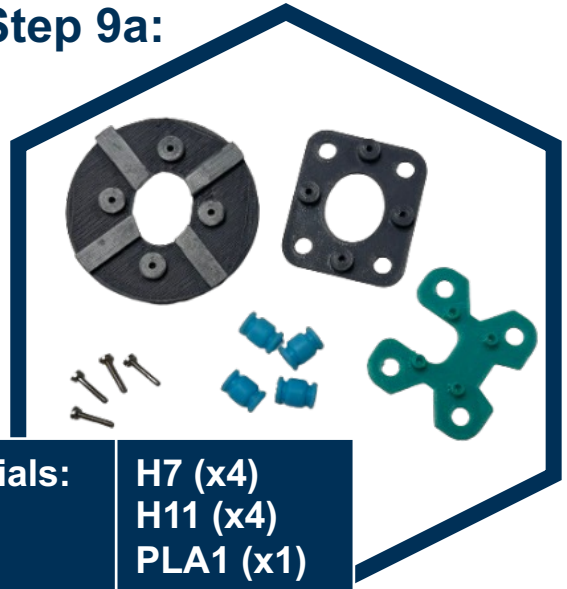
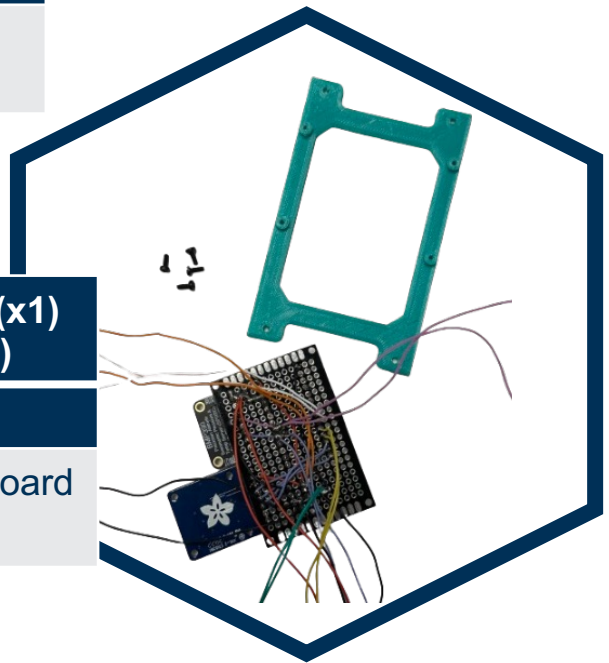
Step 9a:



Materials:	H7 (x4) H11 (x4) PLA1 (x1) PLA2 (x1) PLA4 (x1)
Tools:	HT2

Assemble vibration damping platform

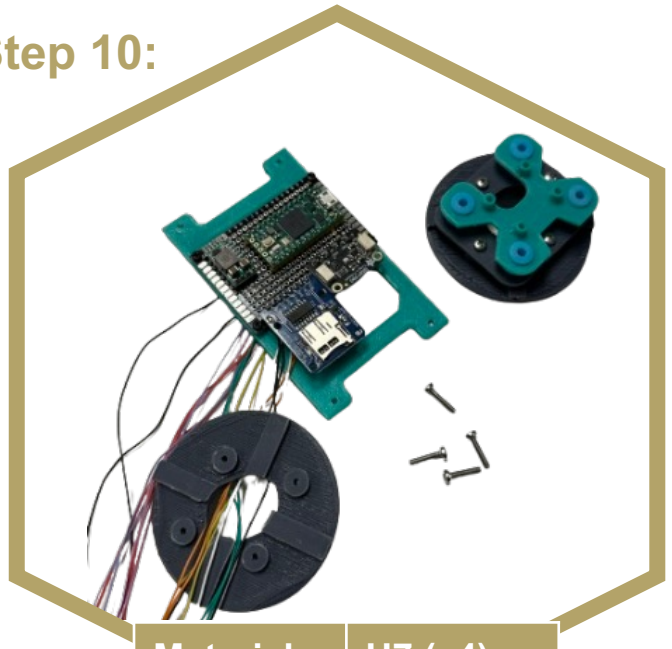
Step 9b:



Materials:	PLA5 (x1) H7 (x4)
Tools:	HT2

Secure wired-protoboard to sensor plate

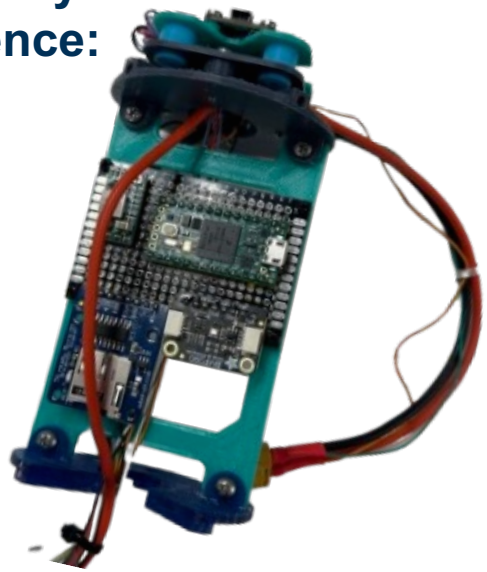
Step 10:



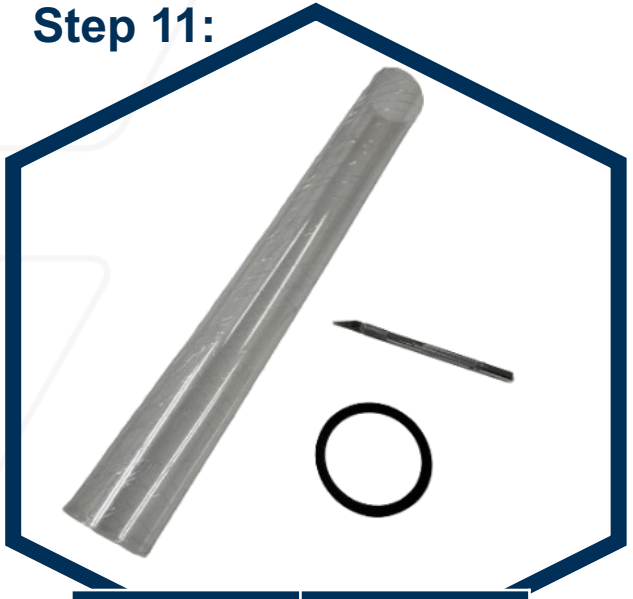
Materials:	H7 (x4) PLA6 (x1)
Tools:	HT2

Fit sensor mount into rocket body attachment plates

Assembly Reference:



Step 11:



Materials:	H1 (x1) PLA9 (x1)
Tools:	HT6 HT9

Using 3D printed-guide to cut tube to 300 mm

Step 12a:

Materials:	E1 (x1) H10 (x8) PLA3 (x1) PLA8 (x1)
Tools:	HT5

Place heat set inserts into appropriate holes and set. Mount battery into nose cone

Step 12b:

Step 13:

Materials:	-
Tools:	HT4

Drill 16 holes to align with sensor mount, nose cone and TVC connector

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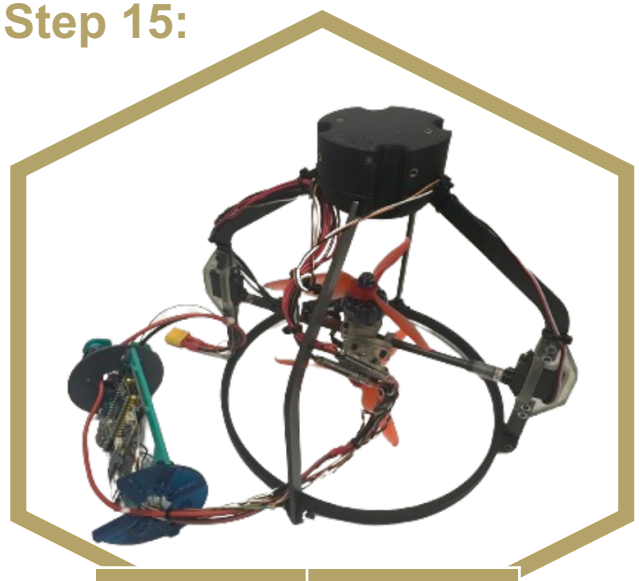
Step 14:

Materials:	H2 (x2)
Tools:	HT7

Epoxy the legs into place within the TVC mount and attach propellers to motor

Step 15:



Materials:	E3 (x2) E5 (x1)
Tools:	HT5

Wire connections between sensor assembly, servos and motors

Step 16:

Materials:	H8 (x12) H12 (x15)
Tools:	HT3

Combine all subassemblies to form full rocket and organize wiring

Final Assembly Reference:

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