

Update History:

20.01.24: Updated Arduino Code and added Debouncing to pushbutton.

If you purchased my model before **20.01.24**, I have updated the Arduino code. Please copy it below. You will need to install the “ezButton” package by *ArduinoGetStarted.com*. if you do not have it already. You can install it by going **Tools > Manage Libraries** then search **ezButton** and install.

```
/* CADLY BY ADRIAN BARSOTTI

ELECTRIC TURBO FAN MODEL WITH FUNCTIONAL REVERSE THRUSTING CODE FOR ARDUINO

*/

#include <Servo.h>;
#include <ezButton.h> //To download this go to "Tools" > "Manage Libraries" and install ezButton.

const int buttonPin = 4;
const int servoPin = 9;
Servo servo;
Servo ESC;
int counter = 0;
int potValue;
ezButton button(buttonPin);

void setup()
{
  servo.attach (servoPin);
  pinMode(buttonPin, INPUT_PULLUP);
  ESC.attach(2,1000,2000);
  button.setDebounceTime(50);
}

void loop() {
  button.loop();

  if(button.isPressed()) {
    counter++;
  }

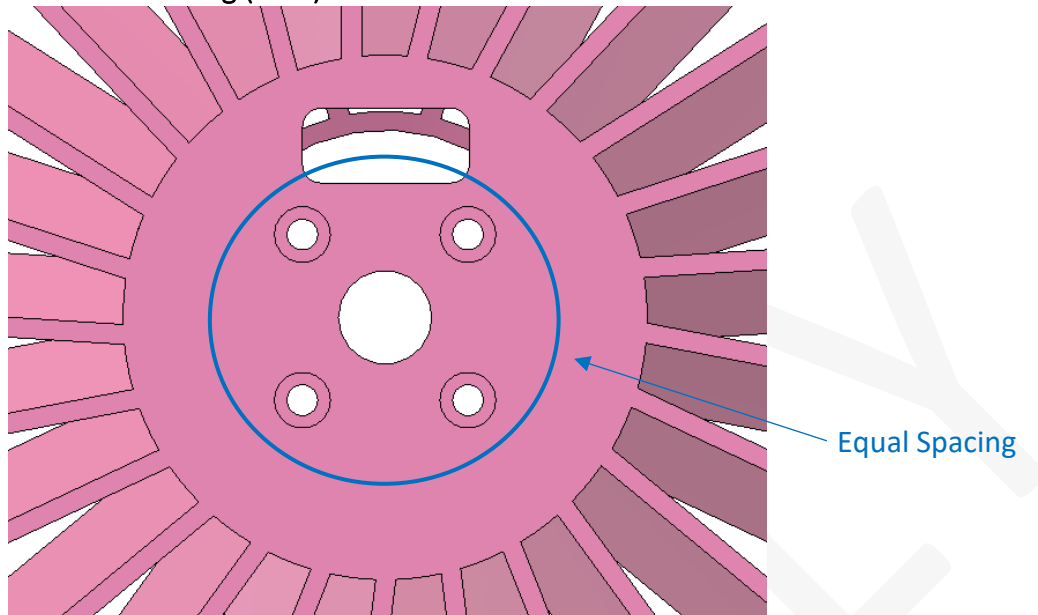
  if(counter == 0)
    servo.write (5);
  else if(counter == 1)
    servo.write(152);
  else if (counter == 2)
    counter = 0;

  potValue = analogRead(A1);
  potValue = map(potValue, 0, 1023, 0, 180);
  ESC.write(potValue);
}
```

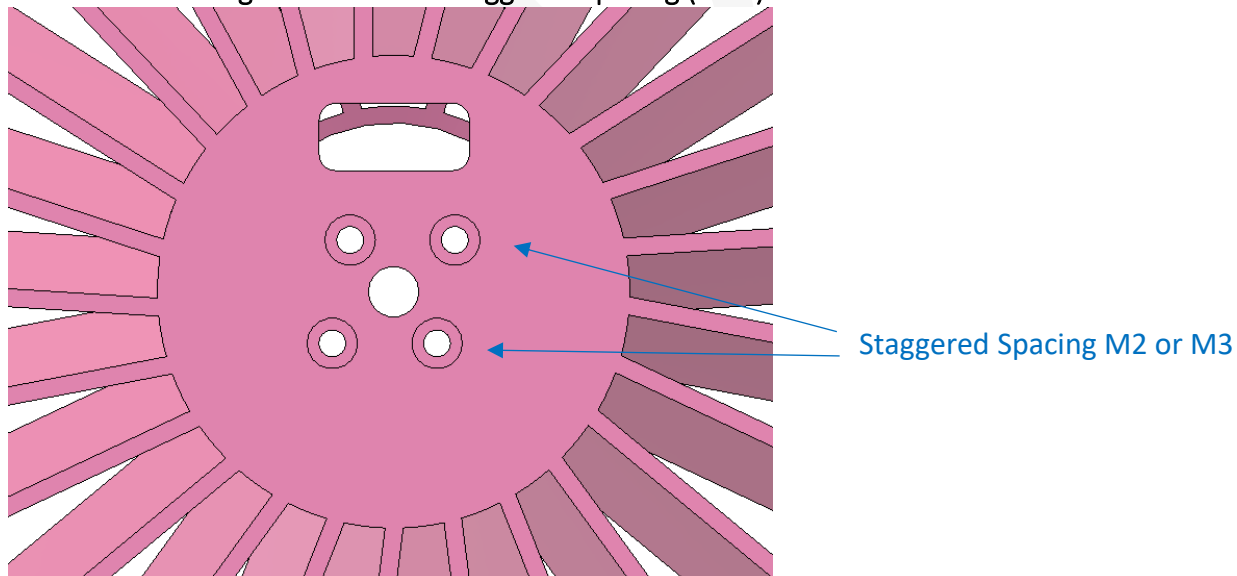
21.01.24: I have included two different motor mounts to give you flexibility with your brushless motor choice. If you purchased before 20.01.24 you most likely not have Part **46** & **47**. Use the link below to download it:

https://drive.google.com/drive/folders/1gu_XbazSC4cAUOE9Kex_fm0sLgv5SgQJ?usp=drive_link

Part 5. Fan Casing (Rear):



Part 46. Fan Casing Motor Mount Staggered Spacing (Rear):



Hardware Needed:

Hardware	Quantity
M3x8 Hex Screws	52
M2x8 Hex Screws	57
M2x5 Hex Screws	2
4mm Linear Rods Length = 140mm	4
MG996R Servo with Disc Attachment	1
10k Linear Potentiometer	1
Momentary Push Button	1
Arduino Nano	1
ESC with 5V BEC (I used a Hobbyking YEP 80A with 5V BEC)	1
Brushless motor 25x25MM hole spacing, M5 Shaft (I used a Turnigy 3536 1400kv)	1
LiPo Battery (I used a 3S)	1
20mm Velcro Straps	2
6mm Wire Wrap	1
JST Male and Female Connectors 4 of each (Optional)	8
22awg Wire (Approx. 500mm from potentiometer to the Arduino)	N/A

Parts to be printed:

Part No.	Part Desc.	Qty:	Material:	Colour:	Layer Height:	Infill:	Support:
1	Inlet	1	PLA	Dark Grey	0.15	20%	No
2	Inlet Mount	1	PLA	White	0.15	20%	No
3	Inlet Insert	1	PLA	Dark Grey	0.15	20%	No
4	Fan Casing (Front)	1	PLA	Dark Grey	0.15	20%	Yes
5	Fan Casing (Rear)	1	PLA	Iron Grey Metallic	0.15	20%	Yes
6	Compressor A	1	PLA	Iron Grey Metallic	0.15	20%	Yes
7	Compressor B	1	PLA	White	0.15	20%	No
8	Pylon A	1	PLA	Iron Grey Metallic	0.15	20%	Yes
9	Pylon B	1	PLA	White	0.15	20%	Yes
10	Pylon Top Cover	1	PLA	White	0.15	20%	Yes
11	Reverse Thrust Door A	1	PLA	Iron Grey Metallic	0.15	20%	Yes
12	Reverse Thrust Door B	1	PLA	Iron Grey Metallic	0.15	20%	Yes
13	Reverse Thrust Door Cowling	1	PLA	White	0.15	20%	Yes
14	Cascade Mount A	1	PLA	Dark Grey	0.15	20%	No
15	Cascade Mount B	1	PLA	Dark Grey	0.15	20%	No
16	Blocker Door A	1	PLA	Iron Grey Metallic	0.15	20%	Optional

17	Blocker Door B	1	PLA	Iron Grey Metallic	0.15	20%	Optional
18	Cascade A1	1	PLA	Iron Grey Metallic	0.15	20%	No
19	Cascade A2	1	PLA	Iron Grey Metallic	0.15	20%	No
20	Cascade A3	1	PLA	Iron Grey Metallic	0.15	20%	No
21	Cascade B1	1	PLA	Iron Grey Metallic	0.15	20%	No
22	Cascade B2	1	PLA	Iron Grey Metallic	0.15	20%	No
23	Cascade B3	1	PLA	Iron Grey Metallic	0.15	20%	No
24	130MM Bypass Fan	1	PLA	Black	0.15	20%	Brim
25	130MM Fan Cone	1	PLA	Black	0.15	20%	Yes
26	130MM Fan Cone Swirl	1	PLA	White	0.15	20%	Yes
27	Blocker Door Linkages	12	PLA	Iron Grey Metallic	0.15	20%	No
28	Blocker Door Linkage Mount	1	PLA	Iron Grey Metallic	0.15	20%	No
29	Reverse Thrust Actuator Rack	1	PLA	Blue	0.15	<u>80%</u>	No
30	Linear Bearings	1	PLA	Blue	0.15	20%	Yes
31	Reverse Thrust Actuator A & B	1	PLA	Blue	0.15	<u>80%</u>	No
32	30T Reverse Thrust Actuator Gear	1	PLA	Blue	0.15	20%	No
33	Stand Front	1	PLA	Black	0.15	20%	No
34	Stand Rear	1	PLA	Black	0.15	20%	No
35	THR & REV Housing	1	PLA	Blue	0.15	20%	Yes
36	Thrust Lever	1	PLA	Iron Grey Metallic	0.15	20%	No
37	Thrust Lever Knobs	1	PLA	White	0.15	20%	No
38	Cadly Logo	2	PLA	Blue	0.15	20%	No
39	Warning Decal	2	PLA	Red	0.15	20%	No
40	Stand Wire Loom Clips	1	PLA	Black	0.15	20%	No
41	Cadly By Adrian Barsotti Logo	1	PLA	Black/Blue	0.15	20%	No
42	Fan Cowling A	1	PLA	White	0.15	20%	Yes
43	Fan Cowling B	1	PLA	White	0.15	20%	Yes
44	Pylon Insert	1	PLA	White	0.15	20%	No
45	130MM Fan Nose Cone (Multi-Material Part)	1	PLA	Multi-Material	0.15	20%	No
46	Fan Casing Motor Mount Staggered Spacing M3 (Rear)	1	PLA	Iron Grey Metallic	0.15	20%	Yes

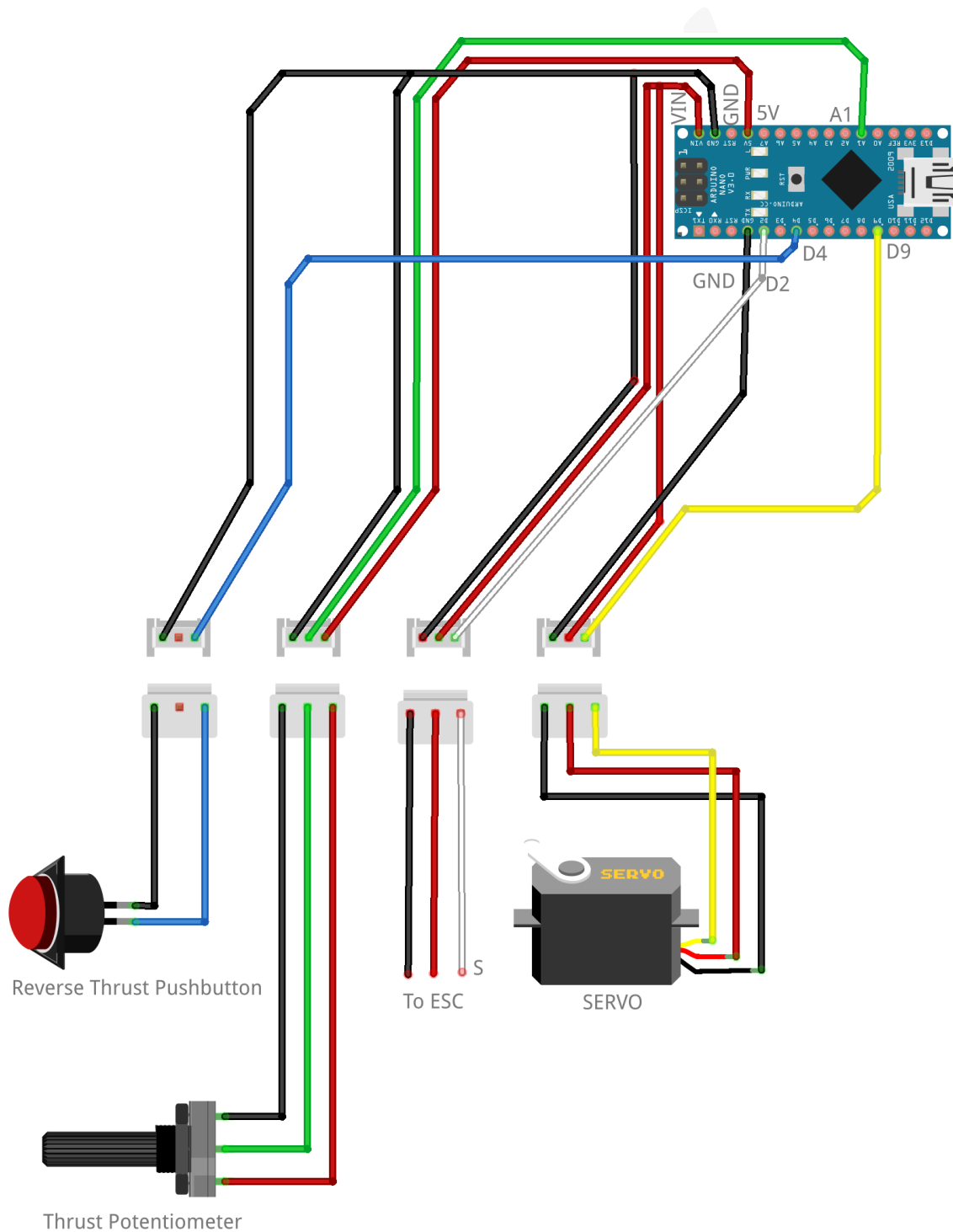
46	Fan Casing Motor Mount Staggered Spacing M3 (Rear)	1	PLA	Iron Grey Metallic	0.15	20%	Yes
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Recommended Tools:

- Hex Screwdrivers
- Soldering Iron
- Sandpaper
- Pliers

NOTE: Do not overtighten Screws, they are only self-tapped into the plastic!

Wiring Diagram:



Step 1: Inlet Assembly

Hardware	Quantity
M3x8 Hex Screws	3

Part No.	Part Desc.	Quantity
1	Inlet	1
2	Inlet Mount	1
3	Inlet Insert	1

Secure 1 with 2 using 3 M3x8 Hex Screws. Press fit 3 and rotate until flush with 2. Ensure 2 is in the correct orientation showing the 3 counterbore holes facing upwards as shown in third photo:



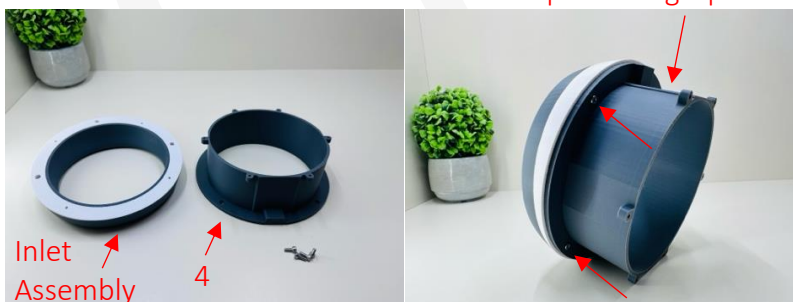
Step 2: Fan Casing Assembly

Hardware	Quantity
M3x8 Hex Screws	4

Part No.	Part Desc.	Quantity
4	Fan Casing Front	1

Secure 4 to Inlet Assembly using 4 M3x8 Hex Screws:

Flat Spot Facing Upwards

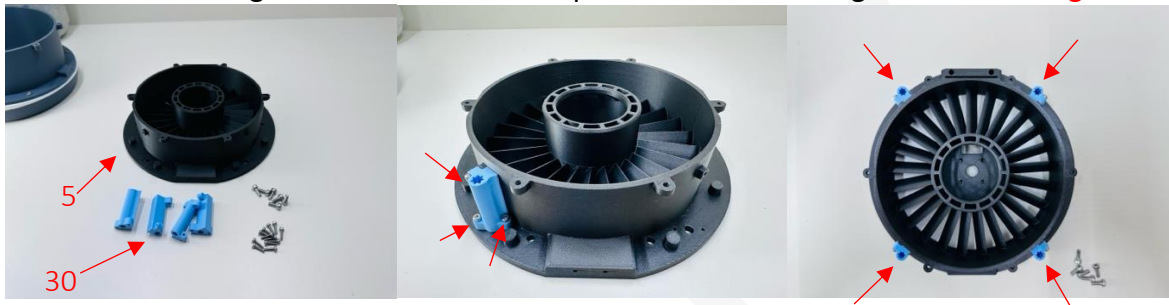


Step 3: Fan Casing Rear Assembly

Hardware	Quantity
M3x8 Hex Screws	6
M2x8 Hex Screws	12

Part No.	Part Desc.	Quantity
5	Fan Casing Rear	1
30	Linear Bearings	4

Attach 30 to 5 using 3 M2x8 Hex Screws. Repeat for the remaining 3 Linear Bearings:



Pre-install 6 M3x8 Hex Screws as shown below: **Tip – There are holes to allow a screwdriver to access these Screws from underneath.**



Step 4: Fan Assembly

Hardware	Quantity
M3x8 Hex Screws	2
Brushless Motor with washer	1

Part No.	Part Desc.	Quantity
24	130mm Bypass Fan	1
25	130mm Fan Cone	1
26	130mm Fan Swirl	1

Press fit **26** into **25** to create the **Nose Cone Assembly**. Insert M5 nut from brushless motor into **24**:

*Tip – If **26** does not press fit into **25**, lightly sand the top and bottom surface of the swirl.*



Secure the **Nose Cone Assembly** to **24** using 2 M3x8 Hex Screws ensuring M5 nut is inserted. Attach brushless motor **Washer** to the shaft. Attach **Fan Assembly** onto the brushless motor and tighten:



Step 5: Fan Assembly to Casing Assembly

Hardware	Quantity
M3x8 Hex Screws	4

Attach the **Fan Assembly** to the **Fan Casing Rear Assembly** ensuring to feed the brushless motor wiring through the inside of the rectangular **slot**. Secure brushless motor with 4 M3x8 Hex Screws:

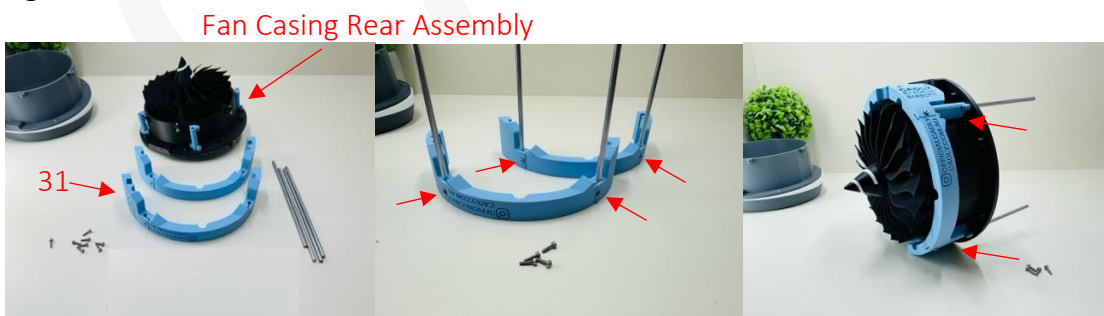


Step 6: Reverse Thrust Actuator Assembly

Hardware	Quantity
M2x8 Hex Screws	8
4mm Linear Rods	4

Part No.	Part Desc.	Quantity
31	Reverse Thrust Actuator A & B	1
29	Reverse Thrust Actuator Rack	1

Secure 4 linear rods into pairs **31** using 4 M2x8 Hex Screws. Insert the pair of **31** into **Fan Casing Rear Assembly** guiding the linear rods through the linear bearings. **NOTE: Do Not Over-tighten.**



Insert **29** into **Fan Casing Rear Assembly** through the large rectangular slot from the rear. Slide **31** or **29** to line up the 4 M2x8 Hex Screws and fasten:

Fan Casing Rear Assembly

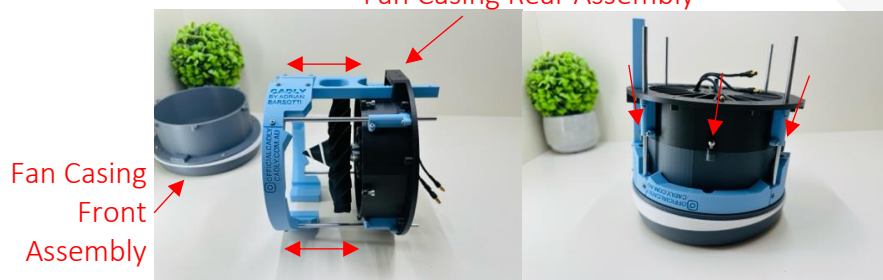


Slide the reverse thrust actuator back and forth and ensure it moves freely with minimal resistance.

Tip – If the reverse thrust actuator does not move freely, lightly sand the side, top and or bottom surfaces of **29 until it moves freely. This part has the most part-to-part contact when moving!**

Secure **Fan Casing Rear Assembly** to **Fan Casing Front Assembly** using the 6 pre-installed M3x8 Hex Screws from Step 3. There are holes above each screw to allow screwdriver access:

Fan Casing Rear Assembly



Step 7: Compressor Assembly

Hardware	Quantity
M3x8 Hex Screws	6
M2x8 Hex Screws	2

Part No.	Part Desc.	Quantity
6	Compressor A	1
7	Compressor B	1

Secure **7** to **6** using 2 M3x8 and 2 M2x8 Hex Screws:



Secure the MG996R Servo into the **Compressor Assembly** using 4 M3x8 Hex Screws and route the wire down and through the larger hole of the **Compressor Assembly**. Ensure to orientate the servo correctly, a rectangular slot is for the **Protruding Servo Wire**:



Step 8: Blocker Door Linkage Mounts

Hardware	Quantity
M2x8 Hex Screws	6

Part No.	Part Desc.	Quantity
28	Blocker Door Linkage Mount	2

Secure pairs of **28** to **Compressor Assembly** using 6 M2x8 Hex Screws:



Step 9: Compressor to Fan Casing Assembly

Hardware	Quantity
M3x8 Hex Screws	8

Slide **Compressor Assembly** onto **Fan Casing Assembly** by lining up the linear rods and reverse thrust actuator. Ensure brushless motor wires are fed through the smaller rectangular slot on the **Compressor Assembly**:



Secure using 8 M3x8 Hex Screws:



Step 10: Blocker Door and Linkages Assembly

Hardware	Quantity
M2x8 Hex Screws	8

Part No.	Part Desc.	Quantity
11	Reverse Thrust Door A	1
12	Reverse Thrust Door B	1
16	Blocker Door A	6 ea.
17	Blocker Door B	6 ea.
27	Blocker Door Linkages	12

Attach **27** to **16 & 17**. Repeat for all 12 Blocker Doors. These linkages should move freely, if not lightly sand.

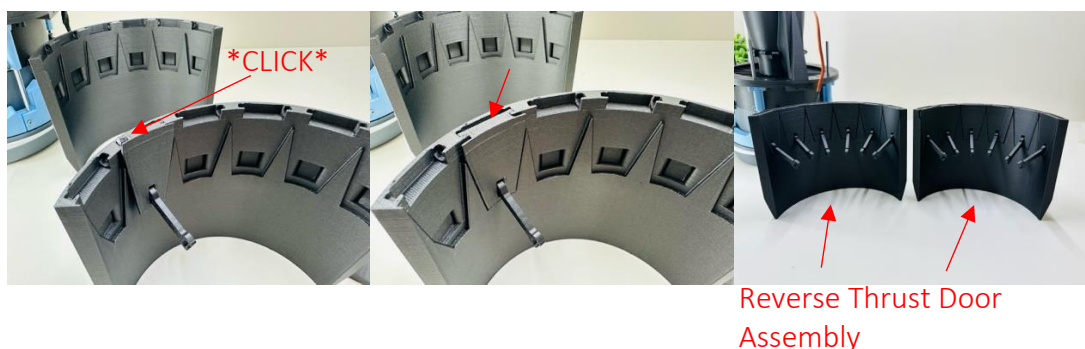


Not all blocker doors are the same, pay attention to the cutouts in **11 & 12** to ensure the correct blocker door is in the correct position.

There are two methods demonstrated to assemble step 10 that might make it easier for you. **Method 1** is to fully assemble the **11 & 12** with the **Blocker Door Assembly**, then attach to the linear rods. **Method 2** is to attach **11 & 12** first to the linear rods and individually attach the **Blocker Door Assembly**.

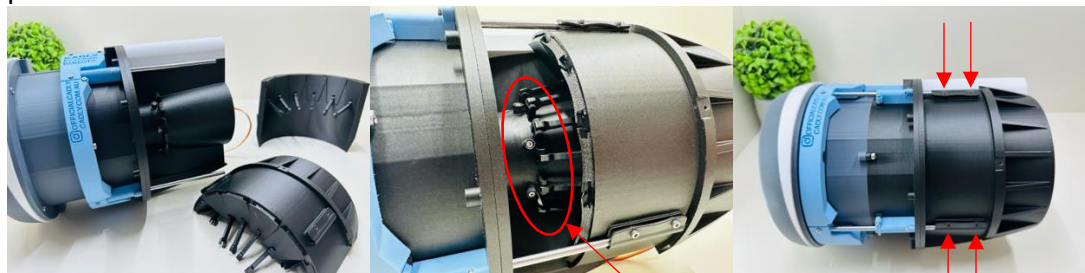
Method 1:

Secure **Blocker Door Assembly** to **11 & 12** by inserting one pin then pushing down on the other pin. You will hear a ***CLICK***. **Blocker Door Assembly** should sit flush and freely move within **11 & 12**. Repeat for remaining 11 **Blocker Door Assemblies**:



Slide Reverse Thrust Door Assembly onto the linear rods while keeping the linkages forward.
Tip - slide the reverse thrust actuator backwards to allow more linear rod.

Once in place, attach **Reverse Thrust Door Assembly** to **28** from **Step 8**. Before securing, slide the reverse thrust actuator forward until it bottoms out. Adjust **Reverse Thrust Door Assembly** and secure with 8 M2x8 Hex Screws. **NOTE: Do Not Over-tighten.** It should look like the third photo below:



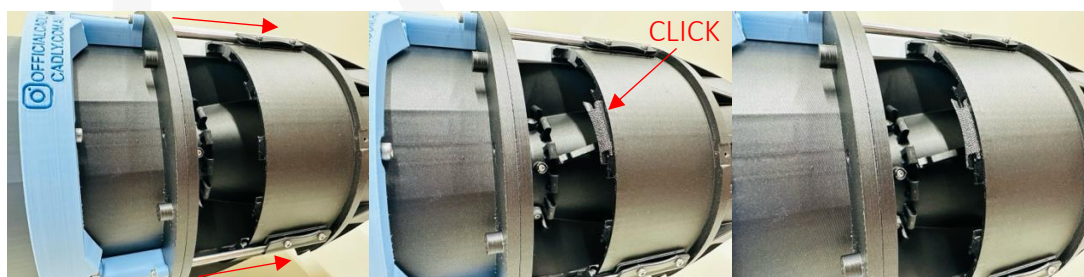
CLICK

Method 2:

Attach **11** and **12** to **Turbo Fan Assembly**, ensure to orientate according to each side. Slowly tighten to secure with 8 M2x8 Hex Screws: **NOTE: Do Not Over-tighten.** It should look like the second photo below:

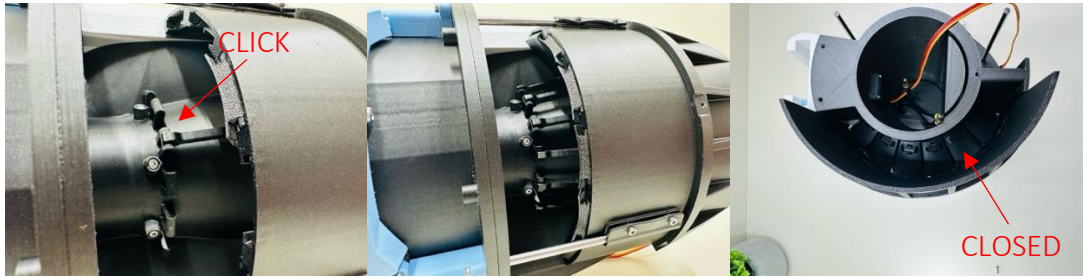


Slide Reverse Thrust Actuator to expose blocker door linkage mount. Insert **Door Blocker Assembly** into **Reverse Thrust Door** by inserting a pin first, then click the other pin: **NOTE:** You should hear a ***CLICK***:



Attach **Reverse Thrust Door Assembly** to **Turbo Fan Assembly** and attach **Door Blocker Assembly**. Repeat for remaining 11 Door Blockers.

Slide reverse thrust actuator back and forth and ensure all blocker doors open and close:

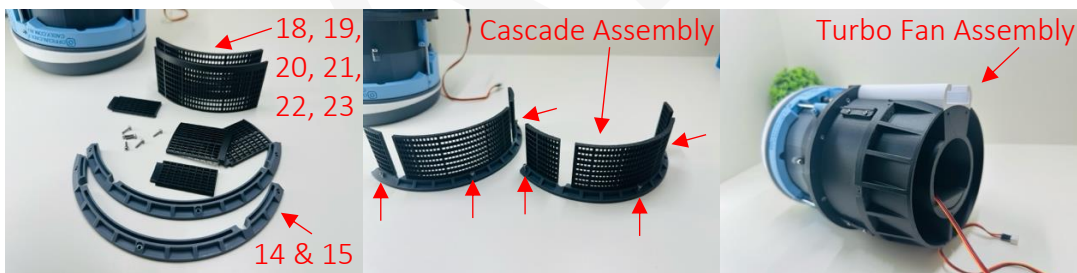


Step 11: Cascades Assembly

Hardware	Quantity
M2x8 Hex Screws	6

Part No.	Part Desc.	Quantity
18	Cascade A1	1
19	Cascade A2	1
20	Cascade A3	1
21	Cascade B1	1
22	Cascade B2	1
23	Cascade B3	1
14	Cascade Mount A	1
15	Cascade Mount B	1

Press fit all 18, 19, 20, 21, 22 & 23 into 14 & 15 and pre-install 6 M2x8 Hex Screws:



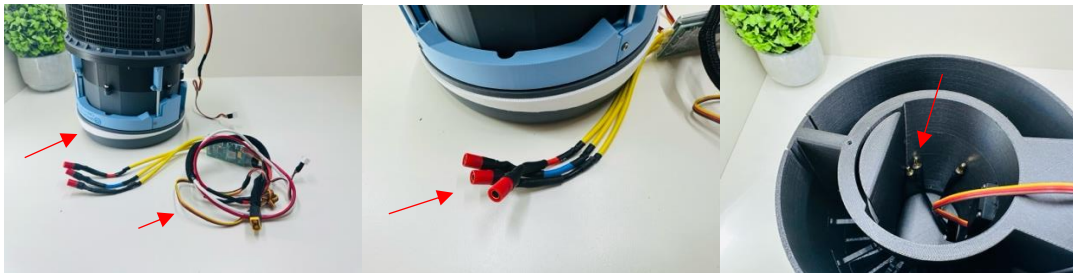
Secure both Cascade Assemblies to Turbo Fan Assembly using the 6 pre-installed M2x8 Hex Screws.



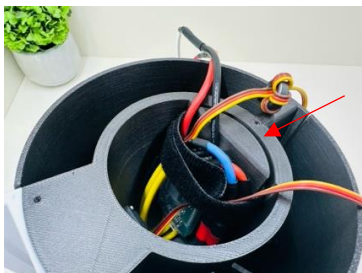
Step 12: ESC Assembly

Hardware	Quantity
ESC	1
Turbo Fan Assembly	1
20mm Velcro Strip	1

Attach **ESC** to **Turbo Fan Assembly** using the 3 ESC motor connections to the brushless motor inside:



Secure **ESC** to **Turbo Fan Assembly** using the **20mm Velcro Strip** utilising the rounded slot:



Step 13: Pylon Assembly

Hardware	Quantity
M3x8 Hex Screws	7
Arduino NANO	1

Part No.	Part Desc.	Quantity
8	Pylon A	1
9	Pylon B	1
44	Pylon Insert	1

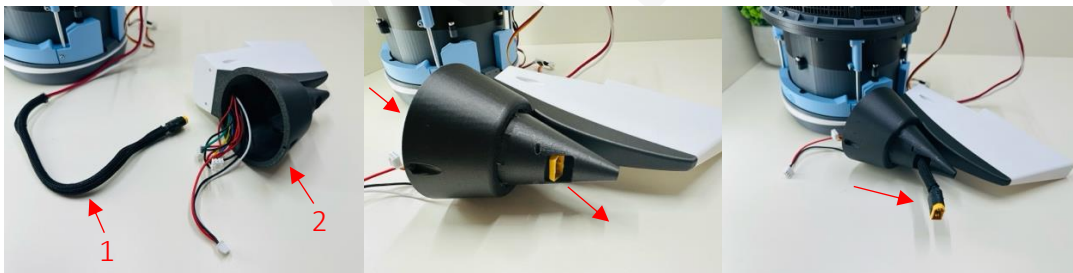
Secure 9 to 8 using 2 M3x8 Hex Screws (* you may need to use a long thin screwdriver to access a deeper screw).

Feed Arduino NANO wiring through rectangular slot and secure diagonally using 2 M3x8 Hex Screws. Press fit 44 into 9:



Step 14: ESC Power Cable

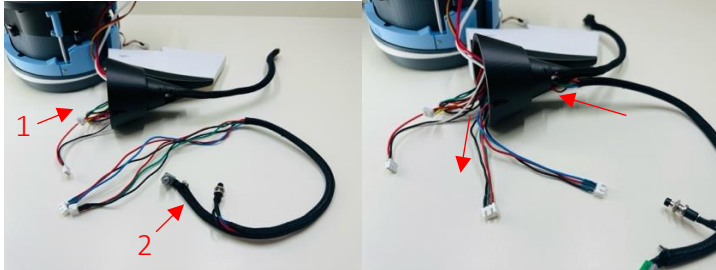
Feed the ESC power cable 1 through the larger opening of 2 through the exhaust cone:



Step 15: Potentiometer and Push Button Cable

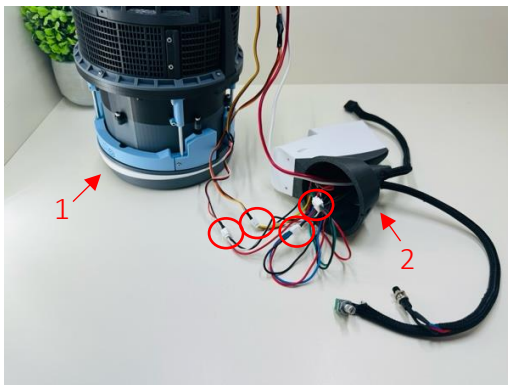
Hardware	Quantity
10K Linear Potentiometer	1
Momentary Push Button	1

Feed wiring loom of **2** through the exhaust cone and exit through the larger hole of **1**:



Step 16: Connections

Make the final connections from the Servo, Potentiometer, Push Button & ESC BEC Signal wire to the Arduino Nano:



Step 16: Securing the Pylon

Hardware	Quantity
M3x8 Hex Screws	3

Secure **2** to **1** using 3 M3x8 Hex Screws. Ensure all wires are tucked into the larger hole:



Step 17: Securing the Cowlings

Hardware	Quantity
M2x8 Hex Screws	8

Part No.	Part Desc.	Quantity
42	Fan Cowling A	1
43	Fan Cowling B	1
41	Cadly Logo	1
39	Warning Decal	1
	Turbo Fan Assembly	1

Attach 42 and 43 to Turbo Fan Assembly using 8 M2x8 Hex Screws (4 on top and 4 underneath):



NOTE: 41 and 39 Logo/Decals were printed separately and glued.

Hardware	Quantity
M2x8 Hex Screws	6

Part No.	Part Desc.	Quantity
13	Reverse Thrust Cowling	1

Attach 13 to Turbo Fan Assembly using 6 M2x8 Hex Screws:



Step 18: Stand Assembly

Hardware	Quantity
M2x8 Hex Screws	8

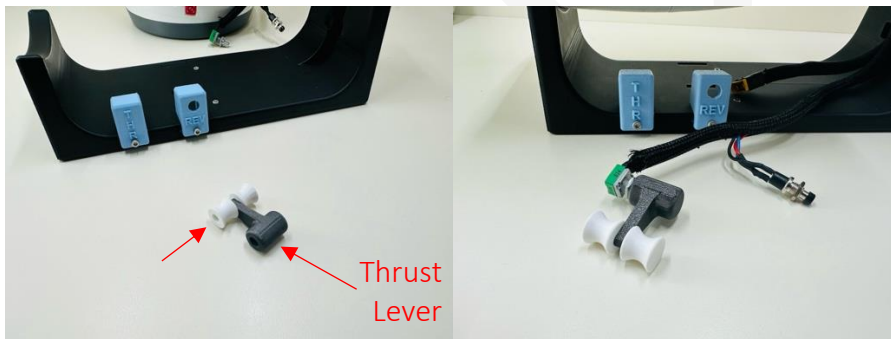
Part No.	Part Desc.	Quantity
33	Stand Front	1
34	Stand Rear	1
35	THR & REV Housing	1 ea.
36	Thrust Lever	1
37	Thrust Lever Knobs	2
40	Stand Wire Loom Clips	2

Secure **33** and **34** using 2 M3x8 Hex Screws and pre-install 2 more where the **Exhaust Cone Mounts**. Attach **35** to **Stand Assembly** using 2 M3x8 Hex Screws.

Exhaust Cone Mount



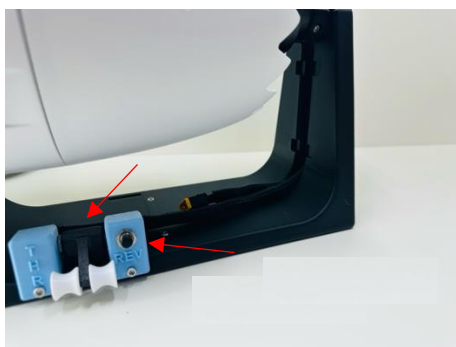
Assemble **36 & 37** using a single M3x8 Hex Screw. Press fit **Thrust Lever** to the potentiometer:



Place **Turbo Fan Assembly** onto **Stand Assembly** and fasten using the 2 pre-installed Hex Screws to the Exhaust Cone while routing the wiring looms through the notch in the stand. Press fit **40** to secure the wiring looms:



Thread and screw the potentiometer and pushbutton into 35. THR = Potentiometer & REV = Pushbutton:



Step 19: Attaching the Battery

Hardware	Quantity
LiPo Battery	1
20mm Velcro Strip	1

Thread 20mm Velcro Strip to Stand Assembly using the slot, secure the battery with 20mm Velcro Strip:



Step 20: Calibrating the Servo - **IMPORTANT**

Before the servo gear can be attached to the reverse thrust actuator, program the Arduino with the provided code to set the rotation angle.

Unscrew the 2 Hex Screws from Step 13 to access the Micro USB plug.



Once the program has been loaded on the Arduino, the reverse thrust actuator can be tested using the pushbutton. Some servo motors may be different so the angle may need to be adjusted slightly. You can test the pushbutton using USB power (without LiPo powering the Arduino).

If the reverse thrust actuator does not open or close properly. Adjust the following values in the code until you find the sweet spot:

```
if(counter == 0)
| servo.write (5); //Edit these values, Clockwise
else if(counter == 1)
| servo.write(152); //Edit these values, Anti-clockwise
else if (counter == 2)
| counter = 0;
```

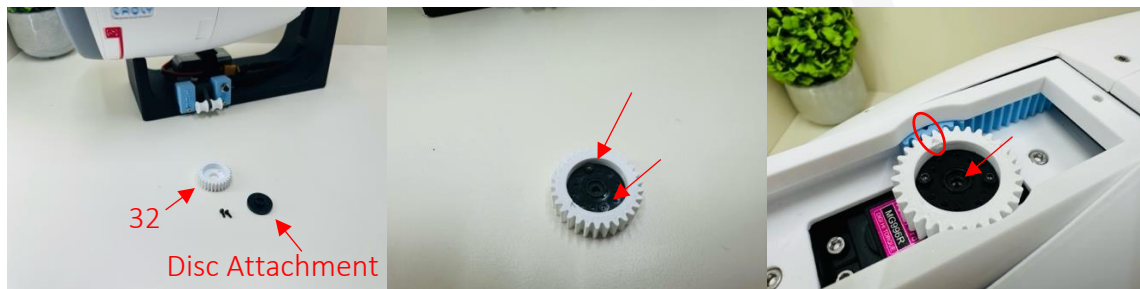
Before attempting [Step 21](#), Ensure the servo is rotated in the reverse thrust **closed** position.

Step 21: Attaching the Reverse Thrust Actuator Gear

Hardware	Quantity
M2x5	2
MG996R Servo Disc Attachment	1

Part No.	Part Desc.	Quantity
32	30T Reverse Thrust Actuator Gear	1

Secure **Servo Disc Attachment** to **32** using 2 M2x5 Hex Screws. Ensure the servo is rotated to the reverse thrust closed position and insert the gear lining up the two arrows on the gear and reverse thrust actuator. Secure the disc attachment using the included servo screw:



Final Step: Attaching the Pylon Cover

Hardware	Quantity
M3x8	2

Part No.	Part Desc.	Quantity
10	Pylon Top Cover	1

Secure **10** using 2 M3x8 Hex Screws:



CONGRATULATIONS!



Please contact me if you have any feedback or questions!

Email: officialcadly@gmail.com