

# **Assembly Manual**

*Collegiate Wind Competition Mechanical  
Team*

*By:*

*Devon Hardy*

*Dakota Sallaway*

*Spencer McMahon*

*Jacob Peterson*

*Soud Alsahli*

*Kory Joe*

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# Tools required

- 10mm Socket
- 14mm Socket
- Impact drill
- M10, M6, M4, and M3 Allen Keys
- Snap Ring pliers
- Phillips head Screwdriver

# Design Components

- A36 Steel Base plate and tower
- 6061 T6 Aluminum Top and Bottom Nacelle
- ABS Filament Slip Ring mount
- 6061 T6 Aluminum Generator mount
- 6061 T6 Aluminum Yawing Fins and mounts
- 6061 T6 Aluminum and ABS Filament Active Pitching Hub assembly
- 7075 Steel Shaft
- 6061 T6 Aluminum latching Brake assembly

# Specifications

Table 1: Turbine Performance Specification

Performance Specification	
Cut in Wind Speed	3 m/s
Cut out Wind Speed	20 m/s
Rated Power	26 W
Rated Wind Speed	10 m/s

Table 2: Airfoil Specifications

Blade Length (cm)	Cord length (cm)	Twist Angle	Airfoil
1.95	8.86	36.3	NACA 4410
3.9	9.66	24.5	NACA 4410
5.85	8.48	16.9	NACA 4410
7.8	7.17	11.9	NACA 5408
9.75	6.1	8.48	NACA 5408
11.7	5.3	6.05	NACA 5408
13.6	4.65	4.24	NACA 5408
15.6	4.13	2.85	NACA 6308
17.5	3.71	1.75	NACA 6308
19.5	3.37	0.85	NACA 6308

# Turbine Assembly

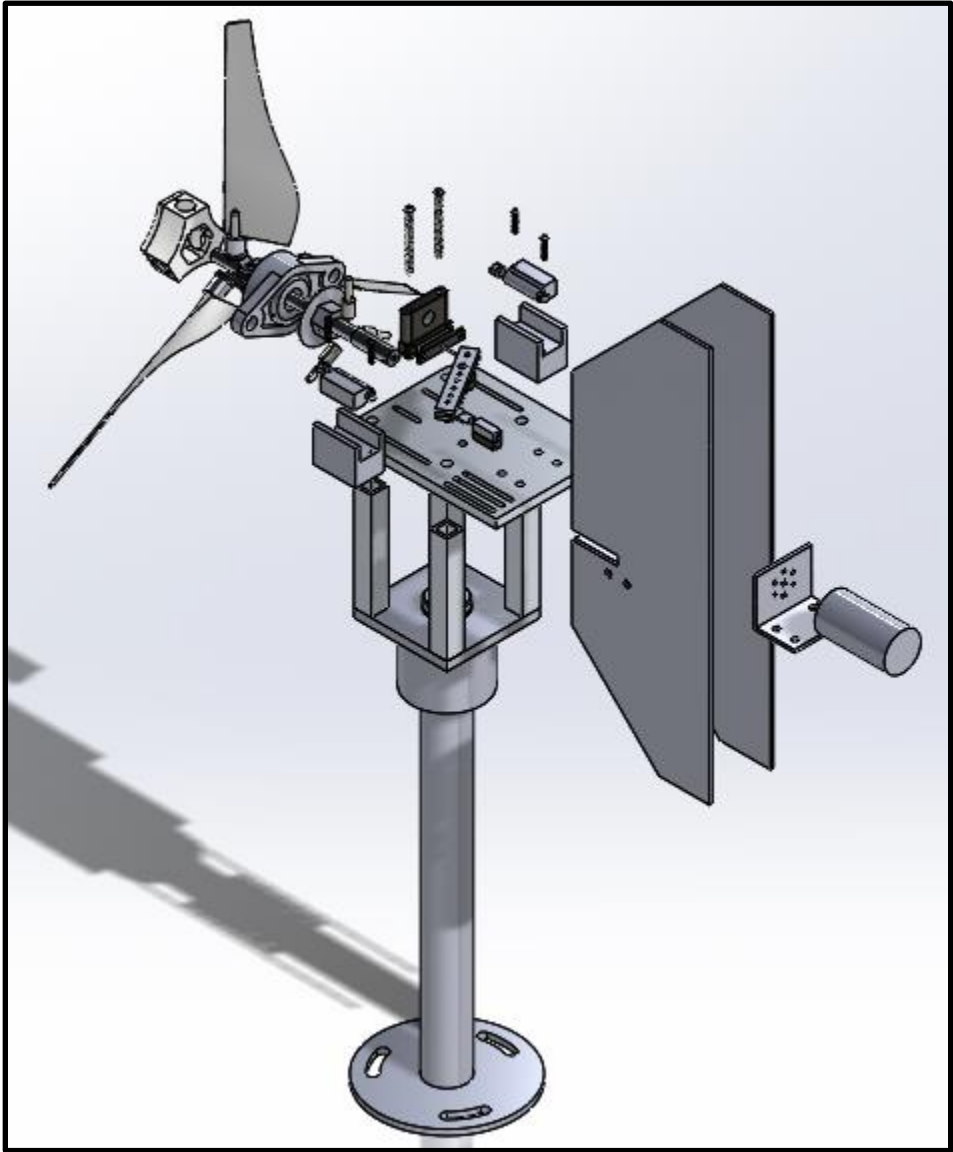


Figure 1: Exploded view of Turbine

Table 3: Bill of Materials

Name of Component	Number of components needed	Name of Component	Number of components needed
Yaw Bearing	2	Generator mounting bolts	4
Tower Spacer	2	Generator set screw	1
Lower Nacelle	1	Yaw Fin	2
Snap Ring	1	Yaw Fin Mounts	2
Slip Ring	1	Yaw Fin Mounting bolts	8
Slip Ring mount	1	Linear actuator	2
Shaft bearing	1	Linear actuator mounts	2
Top Nacelle	1	Hub Bearing and Swoosh Connector	1
Brake mounting bolts	2	Actuator Hub Bolts	3
Fixed Brake Pad	1	Swoosh arms	3
Shaft	1	Blade Mounts	3
Brake hex and disk	1	Hub Body	1
Brake set screw	1	Dynamic Braking Pad	1
Generator	1	Blades and Blade Roots	3
Generator Mount	1	Brake Solenoid	1

1. Press fit the lower Yaw Bearing, Tower Spacer, and upper Yaw Bearing on to the Base Plate and Tower assembly.
2. Slide Lower Nacelle over Yaw Bearings And Tower Spacer.
3. Install Snap Ring on to top of Tower to fit within Snap Ring Slot above the Bottom Nacelle.
4. Bolt Slip Ring to Slip Ring mount and feed wires through center of Tower.
5. Mount Shaft bearing to Top Nacelle by using the Brake mounting bolts.
6. Fixed Brake Pad should be installed onto the Bearing before Shaft is installed.
7. Install Brake hex and disk on to Shaft by the Brake set screw.
8. Mount Generator to Generator Mount with Generator mounting bolts.
9. Insert Shaft through bearing and Mount to shaft by the Generator set screw to make the Generator assembly.
10. Bolt Yaw Fin Mounts to Yaw Fins.
11. Install Generator assembly and Yaw Fins to Top Nacelle using the four Yaw Fin Mounting bolts to attach all three components.
12. Attach Linear actuator mounts to the top of the Top Nacelle by the Actuator mounting Bolts.
13. Align the Nacelle Spacers and Bolt Top Nacelle to the Bottom Nacelle by the four Nacelle Mounting Bolts going through the Nacelle Spacers.
14. Install the Linear Actuators on the Linear Actuator Mounts by the Mounting Bolts.
15. Attach the Hub Bearing and Swoosh Connector to the Linear Actuators by the Actuator Hub Bolts.
16. Insert the Blade Mounts and Swoosh Arms into the Hub Body and Thread Hub onto the shaft.
17. Connect the Swoosh arms to the Swoosh Connector by the Swoosh Bolts.
18. Add loctite to Blade Mounts then, Thread Blades into Blade Mounts and augment the Blades to be collinear with the Swoosh arms.
19. Attach Dynamic Braking Pad onto Shaft Bearing and mount Brake Assembly to the Top Nacelle by Brake Mounting Bolt.
20. Attach Brake Solenoid to Top Nacelle by the Solenoid Mounting Bolts.

## Operations

The operation of the mechanical system is straight forward. There are a few things that may need to be adjusted before use. Make sure that the brake solenoid is setup such that the pull of the solenoid, into the latching position, is sufficient to clench the brake disc. This might require moving the solenoid mount forward or backward slightly along the allotted slots. It is important that the disc is clenched tightly to ensure safety of the operator. To operate the turbine; Place turbine in a windy area, Disengage the brake, Monitor wind speed, AC voltage, DC voltage, shaft RPM, and frequencies for proper operation.

# Maintenance

1. Before and after each test, inspect blades by looking for cracks or damages in plastic,replace if found to be defective..
2. Before and after each test, inspect brake assembly for abnormal wear on disk or pads,replace if found to be defective.
3. Before and after each test, inspect all actuator/solenoid mounts to ensure no deformation occurred during testing, replace if found to be defective.
4. Test augmentation of blades before each test is conducted to ensure optimal performance.
5. Before and after each test, inspect all fasteners to ensure effectiveness, tighten or replace if found to be defective.
6. Before and after each test, inspect all electrical connections to ensure connections were not compromised during testing.