# Wind Turbine Power Augmentation Unit

*Chris Blakeway*
*David Dearman*
*Bobby Navarro*
*Thomas Stryker*
*Kevin Walters*

*Senior Advisor:*
*Dr. Rudy Martinez*

*Department of Marine Engineering Technology*

**Abstract**

Ships at sea rely on electrical power created onboard by generators. These generators are typically driven by either diesel or steam power. Should the generator system fail completely, the vessel needs the ability to create emergency power independently of the onboard generator system. The Wind Turbine Power Augmentation Unit is a rapid-deploy system that provides minimum emergency power to a vessel in need. The unit is small enough to be stored efficiently, simple enough to be reliable, and is easily erected at pre-installed receiver locations on the ship. Multiple units can be deployed adjacent to power-need locations such as the engine room, below-deck spaces, and the bridge. The unit is designed to operate in a sea-going environment and deliver power reliably at the time when it is most needed by the crew.

**Project Overview**

Wind turbine generator system designed to provide minimum emergency power to a vessel in need.

**System Prototype Highlights**

- *Delivers up to 900 watts of stable AC power*
- *Designed for sea-going environment*
- *Protection for winds up to 60 knots*
- *Small storage footprint*
- *Rapidly deployable*
- *Simple and reliable*

**Engineering Areas of Interest**

- Fluid Dynamics
- Heat Transfer
- Structural Analysis
- Fatigue Analysis
- Electrical Power
- Systems Engineering
- Parametric Modelling

**Systems Engineering Approach**

Design of the prototype was accomplished using a systems engineering approach. Individual systems were identified and assigned based on each team member's abilities.

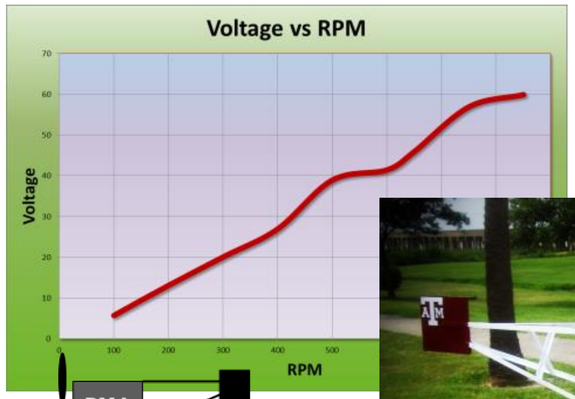
**Assignments**

*Chris Blakeway – Structures*
*David Dearman – Electrical System*
*Bobby Navarro – Electrical System*
*Thomas Stryker – Braking System*
*Kevin Walters - Nacelle*

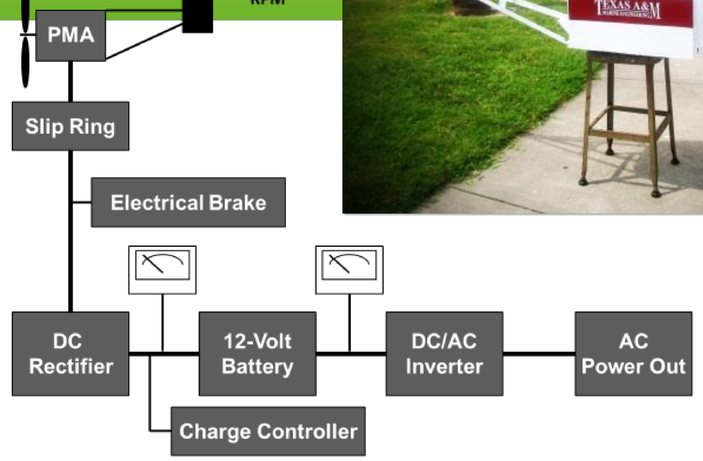
Texas A&M University at Galveston

**System Highlights**

- *1.6kW Permanent Magnet Alternator*
- *Centrifugal clutch for over-speed protection*
- *Mountain bike brake disc and caliper for shaft braking*
- *Induced air flow system for PMA cooling*
- *Nacelle housing for weather protection*
- *"Lazy Susan" bearing and electrical slip-ring allow 360$^0$ operation*








**Power Collection and Distribution System**

- *Three phase AC power transferred from PMA through slip-ring to collection station via eight gauge, three wire cable*
- *Power converted to DC via three Phase, 90 Amp, 1000 Volt Diode Bridge Rectifier*
- *DC power charges a 12-volt deep-cycle marine battery*
- *Power from battery converted back to stable 60 Hz AC power*
- *Power distributed via standard AC outlets*
- *Metering provided for both incoming and outgoing power*
- *Electrical braking provided as backup braking system*
- *Charge controller prevents overcharging of battery*

**Design Tools**

- *Preliminary design was done in Creo Elements Pro Engineer*
- *All parts were parametrically modeled and assembled*
- *Technical drawings were created using the parts files*