

2008 – 2009 University of Utah Design Team GRAND CANYON ALTERNATIVE MOTOR PROJECT



PROJECT SPONSOR: Grand Canyon River Outfitters Asso.
PROJECT ADVISORS: Dr. Daniel Adams & Dr. Kent Udell
DESIGN TEAM: Dim Alexander, Mike Coli, Clint Holley, Tyler Jones, Chris Parks, Colby Radmall, Justin Tidwell, Mitch Underwood, Sean Wilson

PROJECT GOALS

- Replace 30hp outboard motors in Grand Canyon with clean and quiet battery powered alternative system
- Produce power using river flow and turbine to recharge battery system
- Maintain highest safety and reliability standards

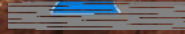
SUMMARY & FUTURE GOALS

The nature of the Grand Canyon allows for many different alternative propulsion systems to be considered. A Gorlov river turbine was chosen for its high efficiency and feasibility. A Darius prototype was manufactured as an intermediary step towards a Gorlov turbine and was successfully field tested. With more field tests, a properly sized electric generator to charge the batteries will be chosen.

The alternative motor has been assembled and preliminary testing completed. Testing will begin in the coming weeks to collect data for comparison with gasoline outboards. Transmission designs will be modified to provide maximum efficiency. The motor and turbine assembly will be field tested in late March.



37' S-RIG IN HERMIT RAPID



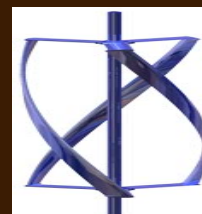
TURBINE PROTOTYPE

The generation sub-team was able to examine current technology and explore new alternatives to generating power in the Grand Canyon. The river kinetic energy was selected as the energy source. Two types of turbines were selected for prototype candidates: the Darius turbine and the Gorlov turbine.

A Darius turbine was selected as a first prototype due to its ease of manufacture compared with the Gorlov turbine. A turbine frame mounted to a small cataraft was used to field test the Darius prototype and gather turbine RPM data based on a controlled water flow speed.

ALTERNATIVE MOTOR SYSTEM

The alternative motor system consists of an electric motor adapted to the existing outboard chassis and lower unit. Lithium-Polymer batteries with a modulating controller and throttle successfully power and control the system. To meet design requirements, the LEMCO LEM-200 series, brushed, DC permanent magnet motor was chosen as the optimum motor. An adapter plate allows for motor and hardware mounting, and a high-speed bearing assembly reinforces the drive shaft.



A GORLOV TURBINE

The helical nature of a Gorlov turbine allows for a portion of the blades to always be at an optimal angle of attack, which eliminates the torque pulses that are found in the Darius style turbine designs. The Gorlov turbine design needs no external torque to start the rotation, unlike a Darius, and it is approximately 15% more efficient than a Darius design.