

Electric Motorboat Drag Racing: A hands-on physics project that motivates students from start to finish

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Electric Motorboat Drag Racing is a culminating high school physics project designed to apply and bring to life many content standards for physics. Students need to be given several weeks at home to design and build their model-sized electric motorboats for the 5-meter drag racing competition down rain gutters. In the process, they are discussing and applying physics concepts from the entire course, including topics from motion, forces, energy, and electricity and magnetism. Bottom line: students of all skill levels are racing to apply physics and loving it.

All of the information necessary to implement the project is available at www.electricboatproject.com. The site includes four main pages: Project Rules, Photo Gallery, Resources, and Information for Teachers. The first three will help guide students through successful completion of the project while the Information for Teachers provides the printable handouts and instructions to set up and run the competition, including a followup worksheet.

The Project Rules lists requirements and ideas for the boats and can also be downloaded (PDF). The boats can be based on speed boat, fan boat, paddle wheel, or submarine designs. The boat cannot have a manufactured toy boat body and cannot be wider than the rain gutter or more than 35 cm long. The battery power is restricted to common household batteries, but not more than a single 9V or 6 AAA, AA, C, or D batteries. No other energy source is allowed. The boat must be propelled by at least one electric motor and propeller of the student's choice; both can be purchased or taken from an available toy.



Fig. 1. With a record time of 1.7 seconds, this boat won the 2007 drag racing tournament. About 100 boats competed.

The Photo Gallery includes pictures and times of recent winning boats. The pictures can be enlarged to show more details and give students further design ideas. A video clip also shows some of the fastest boats. Many students are surprised to see that the fastest boats can complete the 5-meter drag race in less than 2 seconds!

The Resources page breaks the project into four steps for students. First, they can view real or hobby boat designs to get ideas. Second, they can find local stores and look for parts online if necessary. Third, they can view how to assemble a balsa wood boat body and see how the wires from the battery should attach to the motor. Fourth, they are given tips and encouraged to test their boat to improve its performance.

The Information for Teachers page has everything a teacher needs to implement the project, except the rain gutters, water, and stop watches. A chart

summarizes the project and includes the following downloadable (PDF) sheets: Project Rules, Grade Sheet, Tournament Tree, and an Electric Motorboat Physics Worksheet. Further Investigations questions are given for higher level inquiry and lab work to enhance students' understanding and boat performance. Teachers are also provided with some relevant physics standards, a recommended project timeline, and tips on setting up the rain gutters as well as officiating the tournament.

Having a final tournament with the best boats is a great opportunity to invite local media and reward students for their hard work and success. Electric Motorboat Drag Racing is an exciting opportunity to

build electric boats, physics programs, and the nation's next generation of scientists and engineers. Ladies and gentlemen, "Start your engines."

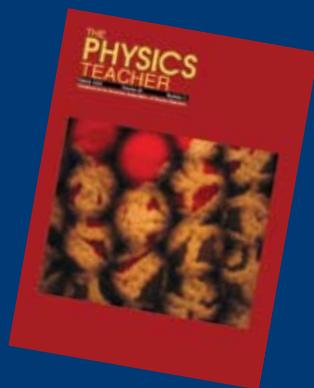
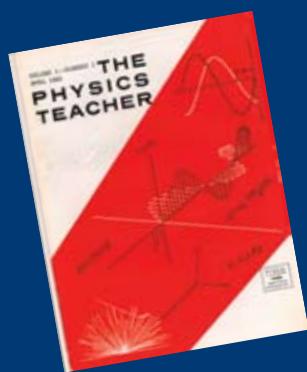
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Reno Barry received his BS in geophysics in 1995 and teaching credential in 1996 at UC Riverside. For the past 12 years, he has taught high school physics and developed the Electric Motorboat Drag Racing project. In 2006, he completed his MA in Education at CSU San Bernardino, developing the website as part of his final project.

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