2003 Transportation Education Academy Activities

High School Activities: Water

Solar-Powered Waterborne Cargo Transport

LEARNING AREA: Inquiry & Research
EDUCATIONAL LEVEL: High School
CONTENT STANDARDS: New Product Development

STANDARD: A student shall design, construct and test a vessel that is powered by solar energy and that is capable of transporting two (2) eggs. The vessel will be evaluated on its stability in the water with and without cargo and its efficiency in the water.

WHAT THE STUDENTS WILL LEARN:

The student will:

1. Design a waterborne vessel that is powered by solar energy.
2. Calculate displacement for the craft with and without cargo.
3. Construct the vessel that has been designed.
4. Test the craft for stability and its speed.

OVERVIEW:

Environmental concerns have demanded that alternative energy solutions be sought in all areas of transportation including marine. The open decks of barges may provide placement of solar panels that could help alleviate the need for fossil fuels as the only energy source for tugs.

The students will design and construct a solar-powered vessel that is capable of carrying two eggs as its cargo. Students will be provided with two solar panels and a 1.5-volt electric motor for its power plant. Propulsion may be from a screw immersed below the waterline or from a propeller that provides thrust from the atmosphere. The hull of the vessel may be constructed from any material that is suitable to the environment that it will be operating in. A designated space or spaces must be provided in the craft for the secure transportation of two eggs. The vessel needs to be stable on the water with and without its egg cargo.

The displacement will be determined by weighing the components that will be used in the vessel's construction. The maximum cargo capacity will be determined by weighing two eggs. The student will then mathematically determine the volume of the vessel's hull and calculate the volume of water the hull will displace by its weight.

Testing will involve launching the empty craft in a container of water to determine its stability unloaded. Test in an unloaded condition and then load the cargo to check its stability under loaded conditions. Conduct speed trials in a 12-foot long by 2-foot wide trough.

CHECKLIST:

Student	Teacher	
_____	_____	Design that meets the specifications for the project.
_____	_____	List of components and their weights.
_____	_____	Calculations for displacement.
_____	_____	Complete construction of solar-powered vessel.
_____	_____	Stability test, loaded and unloaded.
_____	_____	Speed trials of solar-powered vessel.