

Fuel-efficient commuter vehicle



ring, explains the TWV's function as a

report prepared for the Research Council.

"The body is one-inch thick urethane sandwiched by layers of fiberglass, which makes it a very strong type of construction," Miller explained.

"The fiberglass resin really gives you the strength.

"Roll-over protection is given by an additional roll bar and a side crash bar welded into the frame to reinforce the outer body," he added.

The TWV is presently powered by a 20-horsepower, two-cylinder engine donated by the Onan Corporation, but Miller hopes to someday "convert it to an all-electric vehicle or possibly a hybrid, with a much smaller internal combustion engine driving a generator which, in turn, would produce electricity to run the electric motor."

Although it would initially be more costly, Miller said, "The hybrid would be the ideal system for running the TWV. The small engine, while running, continually charges the battery. This means less weight and more efficiency since we wouldn't need the extra batteries required by an all-electric vehicle."

The transmission of the TWV is a variable-ratio, belt-drive type used in snowmobiles, according to Miller.

"It is similar to an automatic transmission, but possesses infinite ratios so the transmission always selects the correct ratio for the varying road conditions.

"I intended the project as a challenge to the students to build a car from the ground up."

**Donald Miller,
Assistant Professor
of Engineering**

"The students drove it all over campus and found that there wasn't a hill that the TWV couldn't climb."

One of the refinements still needed is a viable reversing system. With a smile, Miller said,

"I hate to mention it, but as it stands now we can only go forward. There is no reverse. That is a project for the future, to design a very simple forward/reverse gearbox."

The forward/reverse system isn't needed right away because the TWV will be licensed as a motorcycle. Any vehicle with less than four wheels is considered such by the Pennsylvania Department of Transportation. Before registration and licensing, the TWV will have to be inspected and approved by both PennDOT and the State Police.

The project began when Miller assigned his winter, 1982 class to build a small, lightweight, though safe and energy-efficient commuter vehicle. Statistics cited by Miller show that the average vehicle used to commute to and from work carries an average of 1.2 persons, with the vehicles weighing 2,500 to 3,000 pounds.

The TWV can carry two adults sitting one behind the other and weighs only 1,000 pounds. The tandem seating arrangement means that the passengers would always be seated on the central axis of the vehicle for perfect balance. It also allows for a smaller frontal area and the better aerodynamic shape, Miller said.

"There have been no specific



Dr. Miller inspects back of TWV.

Photos by Jeffrey G. Shatzer

road tests done to determine exact fuel efficiency," he went on, "though we estimate by various calculations that the TWV will get 60 miles-per-gallon. We also hope for a top speed of 60 to 70 miles-per-hour."

The research vehicle contains a variety of monitoring instruments. An auto-computer, purchased at retail for \$100, continuously registers speed, miles-per-gallon, battery voltage, engine air intake temperatures and other functions; a tachometer and torque meter

permit the operator to determine how many horsepower the engine is producing at any time.

Final testing and preliminary evaluation are only months away, according to Miller.

"I intended the project as a challenge to the students to build a car from the ground up," he said.

"They did, and hopefully, future classes will be able to do various research with me on the TWV. Who knows what it will all lead to?"