FACT SHEET

INFORMATION OFFICE
U. S. ARMY
ENGINEER R&D LABORATORIES
Fort Belvoir, Virginia 22060
780-1100 Ext. 45813

ITEM: First fuel cell powered, electrically propelled Army vehicle

DESCRIPTION: 3/4-ton truck in which four 5 KW fuel cell modules (Monsanto), a static d.c. voltage-controller (GE), and a standard industrial 3900 rpm d.c series-traction motor replace the regular 94 HP engine. Fuel is hydrazine-monohydrate, 64% hydrazine, 36% water.

OPERATION: Hydrazine is oxidized electrochemically with ambient air to produce electrical power. Exhaust of water vapor and nitrogen is non-noxious Static controller matches constant voltage of cell to variable motor voltage required by operator and load. Demonstration vehicle rated at 20 KW, about 27 HP Four added modules will give 40 KW (53 HP) for performance approximating the regular engine

PURPOSE: Under development at the U. S. Army Mobility Equipment Command's Engineer Research and Development Laboratories, Fort Belvoir, Va., as a research vehicle for electric propulsion systems. These systems will permit major improvements in operational characteristics, such as cross-country mobility and precise vehicle control,

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in fuel consumption, and in silence of operation. They also will provide on-board electric power for vehicle-mounted weapons, communications and surveillance systems. Objective of research is fuel cell powered electrical vehicles operating on logistically-available hydrocarbon fuels. Exhaust would be non-pollutant carbon dioxide and water vapor.

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D—86,573—Ft Belvoir

NEWS from **MONSANTO RESEARCH CORPORATION**
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FOR RELEASE IMMEDIATELY

WASHINGTON, D.C. -- The four fuel cells which supply power for the Army M-37 3/4-ton truck were developed by Monsanto Research Corporation for the U.S. Army Engineer Research & Development Laboratories. These chemical power sources combine oxygen from the air with hydrazine to produce 5,000 watts of electricity per unit.

Hydrazine fuel cells deliver more electric power per pound than any other readily available electrochemical power source. Their reliability has been demonstrated by many hours of operation in the truck. Although they probably do not represent the ultimate fuel cell for propelling cars and trucks, they do demonstrate the feasibility of such propulsion.

Other versions of the hydrazine-air fuel cell are currently being produced at Monsanto Research Corporation's Boston, Mass. laboratory. Many of these are under U.S. Army sponsorship to provide silent power sources for such uses as communication, signaling and surveillance

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MONSANTO RESEARCH CORPORATION
FUEL CELL SPECIFICATION SHEET

Module

Power output: 5 KW

Size: 9 x 9 x 22-1/2 inches

Weight: 95 lbs., including electrolyte (KOH)

Power density: 4.38 KW/cu. ft.

Specific weight: 19 lb./KW

Operating efficiency: 50% over-all thermal efficiency

Rated power: 0.78 volt/cell

Construction: 140 cells/module, arranged anode-to-anode

Fuel Cell

Four modules, 20 KW total

Load: 100 v. (4 module system, connected in series)

Weight: 525 lb./4 modules, 915 lb./8 modules

Radiation: finned tube

Cooling: motor-driven fan, thermostatically controlled

Parasitic power drain: 600w/40 KW system

Battery

Self-contained electrochemical power supply

Fuel Cell

Electrochemical power supply in which the reactive chemicals are continuously fed into the "reactor" while combustion products are removed (as in an internal combustion engine)

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GENERAL ELECTRIC

A. Blodgett

FOR RELEASE MONDAY, P.M., MARCH 13, 1967:

WASHINGTON, D. C., March 13--The first successful control system that will do for a fuel-cell powered electric truck what the automatic transmission did for gasoline-powered automobiles has been designed and constructed by engineers at the General Electric Research and Development Center.

GE's "automatic transmission" for electric trucks is constructed from solid-state electronic components and has no moving parts. The only driver controls are an accelerator on the floor of the cab, a brake, and an on-off switch and a forward-neutral-reverse switch mounted on the dashboard.

By contrast, the driver of a gasoline-powered truck must manipulate--in addition to the accelerator and brake--a clutch pedal and a gear shift with several forward and reverse positions.

First application for GE's "automatic transmission" system is in an electrically-propelled truck that was demonstrated publicly here today by the Engineer Research and Development Laboratories of the U.S. Army Mobility Equipment Command.

The test vehicle--an M-37 truck capable of carrying a 3/4 ton load--participated in a convoy of electric vehicles that made a seven-mile trip through the streets of Washington, D. C., to the Capitol, where they were inspected by members of the Senate Committee on Commerce and the Subcommittee on Air and Water Pollution of the Committee on Public Works.

A joint hearing on electric vehicles and the pollution problem will be opened tomorrow

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The M-37 truck weighs 8,000 pounds, more than three times the weight of a passenger automobile, and is powered by a 40-horsepower, GE traction motor.

A 20-kilowatt fuel cell, mounted under the hood of the truck, generates the direct current that operates the traction motor. GE's "automatic transmission" matches the constant voltage output of the power source to the variable voltage demands of the motor.

In acceleration tests at the Engineer Research and Development Laboratories at Fort Belvoir, Virginia, the 40-horsepower electric truck--while powered by 40-kilowatts of effective electric power--has out performed a 100-horsepower gasoline-powered truck equipped with a gear shift. The electrically-powered M-37 currently has a top speed of 55 miles per hour.

Electric drive systems ultimately are expected to provide Army vehicles with a form of propulsion that combines quiet and exhaust-free operation with improved mileage and ease of maintenance.

GE's "automatic transmission" system was designed and constructed at the company's Research and Development Center in Schenectady, New York, by W. Russel Oney, project engineer, and William McMurray, assisted by Douglas G. Gruber and Robert B. Crandell. The project was directed by Robert H. Guess, manager of the center's solid-state motor control program.

The project was sponsored by the Engineer Research and Development Laboratories. Contract responsibility for the system was assigned to GE's Transportation Systems Division, Erie, Pennsylvania.

Automatic transmission systems have been available for small electric vehicles--such as golf carts and industrial fork-lift trucks--for many years. However, it was not practical to scale up a conventional system to handle the massive power requirements of a truck. The excessive weight of such a system would have seriously reduced the load that the truck could carry.

GE solved this weight problem by developing unique control circuits utilizing solid-state components, including silicon controlled rectifiers and diodes, which are highly sophisticated versions of those used in portable radio and television sets. The resulting system is packaged out of the way under the driver's seat.

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GE's solid-state "automatic transmission" performs many functions, including limiting maximum current out of the fuel cell, maximum current to the motor, maximum power input to the motor, and maximum speed of the vehicle.

The input to the system can be either 112 volts or 224 volts of direct current. The output is continually adjustable from zero to 375 volts of direct current. This allows freedom of choice of motor and fuel cell voltages, and allows the maximum efficiency point to be set on convoy speed.

The solid-state components used in the "automatic transmission" system are manufactured by GE's Semiconductor Products Department, Syracuse, New York. The direct current traction motor is a product of the company's Transportation Systems Division, Erie, Pennsylvania.

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NEWS BUREAU

GENERAL ELECTRIC

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W. A. Blodgett

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This system, which is made from solid-state components and has no moving parts, has been installed in an electrically-propelled, M-37 truck demonstrated here today by the U.S. Army. The only driver controls in this "automatic transmission" system are an accelerator on the floor of the cab, a brake, and an on-off switch and a forward-neutral-reverse switch mounted on the dashboard.

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The M-37 truck is powered by a 40-horsepower, GE traction motor. A fuel cell, mounted under the hood of the truck, generates the direct current that operates the motor. GE's "automatic transmission" continuously matches the constant voltage output of the power source to the variable voltage demands of the motor.

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