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Stopping Cars with Radiation

A beam of microwave energy could stop vehicles in their tracks.

By Brittany Sauser

Researchers at Eureka Aerospace (http://eurekaaerospace.com/) are turning a fictional concept from the movie *2 Fast 2 Furious* into reality: they're creating an electromagnetic system that can quickly bring a vehicle to a stop. The system, which can be attached to an automobile or aircraft carrier, sends out pulses of microwave radiation to disable the microprocessors that control the central engine functions in a car. Such a device could be used by law enforcement to stop fleeing and noncooperative vehicles at security checkpoints, or as perimeter protection for military bases, communication centers, and oil platforms in the open seas.

The system has been tested on a variety of stationary vehicles and could be ready for deployment in automobiles within 18 months, says James Tatoian, the chief executive officer of Eureka Aerospace and the project's leader.

To bring an opposing vehicle to a halt, the 200-pound device is attached to the roof of a car. The car's alternator serves as the system's power source, whose direct-current (DC) power feeds into a power supply. This generates a stream of 50-nanosecond-duration pulses of energy. These pulses are amplified to 640 kilovolts using a 16-stage Marx generator.

The 640 kilovolts of DC power are then converted into microwaves using an oscillator that consists of a pair of coupled transmission lines and several spark-gap switches. Finally, a specially designed antenna beams the microwave energy toward an opposing vehicle through a part of the car, such as the windshield, window, grill, or spacing between the hood and main body, that is not made of metal. (Metal acts as a shield against microwave energy.)

The radiated microwave energy will upset or damage the vehicle's electronic systems, particularly the microprocessors that control important engine functions, such as the ignition control, the fuel injector, and the fuel-pump control. However, electronic control modules were not built into most cars until 1972, hence the system will not work on automobiles made before that year.

The concept of disabling vehicles' electronic system with microwaves was first tested in 1997 by the U.S. Army using bulky and heavy military equipment. But the Eureka Aerospace system is only six to eight feet long (antennae included) and not quite three feet wide. "It is much more efficient and compact than anything previously used in military vehicles," says Tatoian.

The device's peak power output is two gigawatts, although the average power emitted in a single shot is about 100 watts. Each radiated pulse lasts about 50 nanoseconds. All the test cars' engines were shut off using a single pulse at a distance of approximately 15 meters, making the total energy output 100 joules, says Tatoian. His company is currently developing a more compact high-power microwave pulse system with the goal of disabling engines at ranges from as far away as 200 meters.

"I have no doubt that if you set up a microprocessor and get a high-powered, well-focused beam of energy on [a car], you can disrupt its operation," says Peter Fisher (mailto:david.schmidt@technologyreview.com) , a professor of physics and the division head in particle and nuclear experimental physics at MIT. But to be able to deploy such a system safely will take some work, he says.

Imagine if a police officer is in a high-speed chase near a shopping mall and turns on one of these systems to stop the perpetrator: a lot of elevators have microprocessor controls, so if the officer is pointing the device in the

direction of the mall, he or she could end up trapping 12 people in an elevator, says Fisher. Many other electronic systems, such as an automated teller machine or a security system, could also be disrupted.

Furthermore, Fisher cautions that, while the system may seem like an easier and more efficient solution than spike strips, it could still cause a huge accident if a car is disabled and a driver loses steering control. The system could pose a safety concern as well: radiation can burn human skin, and microwaves have long been suspected of being a cancer-causing agent.

At the moment, the most practical application for the system would be in the U.S. Army or Marine Corp, for perimeter protection of areas that are generally remote, says Fisher. Initial funding for the project came from the U.S. Marine Corp, but now Eureka Aerospace is looking to other governmental agencies for financial support as the company continues to work to make the device smaller, lighter, and more efficient. (Tatoian says that details regarding future work with the military are confidential.)
