

At a Glance

What is it?

■ The Ion Tiger is an unmanned aerial vehicle that operates with a high-power fuel cell propulsion system. It is designed for increased flight endurance and durability in warfare environments.

How does it work?

■ This UAV uses a 550-watt polymer fuel cell with a high specific power system. High-pressure, lightweight hydrogen storage tanks are employed to decrease weight. The fuel cell produces little noise and emits less infrared energy than traditional engines or batteries.

What will it accomplish?

■ The Ion Tiger is capable of high endurance flight in excess of 24-hours with a 6-pound payload. It will increase mission distance and/or time while featuring more stealth. Low-cost surveillance vehicles, such as the Ion Tiger, will give ground forces a distinct surveillance advantage.

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The U.S. Navy is converging two separate research efforts — unmanned air vehicles (UAVs) and fuel cell systems — to significantly improve battlefield surveillance capability.

The Ion Tiger is a hydrogen-powered fuel cell UAV in development at the Naval Research Laboratory, the corporate laboratory of the Office of Naval Research (ONR). Previously flown with battery power, it has demonstrated sound aerodynamics, high functionality, and low-heat and noise signatures. Test flights of Ion Tiger have exceeded 24 hours with a 6 lb payload. Tests demonstrated how an enduring surveillance solution can operate at a low cost with less possibility of detection. The trials exceeded previous flight duration seven-fold from previous designs.

Across the board, the military is seeking quieter and more efficient sources of energy. ONR is leading the Navy with support for alternative fuel research, and has been a leader and key supporter of fuel cell research for 20 years. By leveraging other ONR research, and cooperating with partner agencies, ONR and its partners anticipate success in this mission.

Here's why: Fuel cells create an electric current by converting hydrogen and oxygen into water, making them very attractive as energy sources. Fuel cell technology is pollution-free, and expected to deliver twice the efficiency of an internal combustion engine. The fuel cell engine runs more quietly but with greater endurance than battery-powered systems. The relatively small 550-watt fuel cells provide an additional advantage for the UAV.

Fuel cell technology allows UAVs to conduct surveillance for longer periods of time, thus reducing the number of daily launches to collect data. It saves time and effort for the crew, and ultimately results in less wear to the UAV.

Research Opportunities:

- Lightweight hydrogen storage
- High power fuel cells
- Integration of components of the airframe, aerodynamics group efforts, fuel cell, tanks, etc.
- Weight management of vehicle and payload

