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Navy breaks record with railgun test shot

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DAHLGREN, VA. — The Navy set a new world record for the most powerful electromagnetic railgun when it fired a test shot here Thursday morning.

The gun fired an aluminum projectile at 10.68 megajoules. A joule is the work needed to produce one watt of energy for one second. A megajoule is 1 million joules.

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Guests including Chief of Naval Operations Adm. Gary Roughead and Rear Adm. William Landay, head of the Office of Naval Research, witnessed the shot via a live video feed at the Naval Surface Warfare Center in Dahlgren. The gun was launched from a control center after approximately four minutes of charging the electromagnetic rails. After the charge, the gun fired and witnesses saw a quick burst of flame as the projectile, traveling at 2,500 meters per second, or Mach 7, hit its target.

Roughead called the gun a “revolutionary approach to naval warfare.” He acknowledged the Navy is “a ways from seeing this in the fleet,” but said it is important that the service “never loses sight of the next big thing.”

The previous railgun record of 9 megajoules was held by the Center for Electromagnetic Materials and Devices at the University of Texas, according to the Office of Naval Research. The Institute for Advanced Technology, also at the university, certifies electromagnetic railgun launches.

An EM railgun is powered by electricity rather than gunpowder. A shell is launched at Mach 7 through the electromagnetic rails into the atmosphere for about one minute, flies out of the atmosphere for four minutes, and then descends to Earth toward its target at Mach 5 in approximately one minute. The projectile is guided using the Global Positioning System.

In November, defense contractor BAE Systems delivered a 32-megajoule laboratory gun and launcher to Dahlgren. Eventually, the Navy wants to produce a 64-megajoule railgun that will be able to strike targets on land from more than 200 nautical miles away. General Atomics is also building a gun, program officials said. In years to come, the Navy will decide which gun will work better on a ship.

The program wants to demonstrate more than 100 shots by fiscal 2011. The objective is to fire 3,000 rounds per gun barrel. The barrels should be changeable onboard ship, according to program officials.

The Navy hopes an EM railgun onboard a ship could increase ship design options because the gun weighs less and requires less infrastructure than traditional guns that use gunpowder and magazines.

Traditional fire-protection and ammunition-handling requirements are not necessary using an electromagnetic-pulse power system. Potentially, this could change the way the service thinks about naval gunnery, Landay, the head of ONR, told reporters after the test firing.

The Navy plans to have an EM railgun onboard a ship, potentially its next-generation cruiser CG(X), between 2020 and 2025. Officials declined to say what ship would be a good candidate for the gun.

“The gun can fit on any electric ship,” said Elizabeth D’Andrea, the EM railgun program manager at ONR.

Program officials are “watching ships that are being planned,” D’Andrea added.

The Marine Corps is particularly interested in the EM railgun because it could provide high-speed, over-the-horizon fire support from the sea. The Army is developing a much smaller version of the gun for use on land. The Navy and Army programs share information regularly as their programs progress, Landay said.

Nonetheless, the EM railgun remains in the early stages of development. The program faces four major technological challenges, D’Andrea noted: insuring the gun tube can withstand multiple shots; reducing the size of the gun’s power generator; ensuring the projectile is safe and reliable; and ship integration.

The Navy has yet to determine a cost estimate for an EM railgun, Landay said. The program is conscious of cost and is working with Naval Sea Systems Command to monitor “cost drivers,” the admiral explained, but for now the Navy is “trying to get the science and technology right” before moving toward a finished product.

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