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Airborne Laser Shoots Down Missile

A flying Boeing 747 jumbo jet equipped with a massive laser gun shot down a Scud-like missile over the Pacific, marking what analysts said was a major milestone in the development of the nation's (United States) missile defense system.

The test shoot-down at 8:44 p.m. Thursday, 11 February 2010, over a military test range near Point Mugu, is expected to renew debate over spending billions of dollars for a system that is years behind schedule and derided by some as irrelevant in today's conflicts. "Proving this technology is game-changing," said Loren Thompson, a military analyst for the Lexington Institute, a think tank in Arlington, Va. "The program's funding has been hanging on by a thread. A successful shoot-down of a ballistic missile will demonstrate to Capitol Hill that the airborne laser has potential."

In Thursday's test, a chemical laser affixed to the 747's rotating nose turret shot a super-heated, basketball-size beam at a missile traveling 4,000 mph. The aircraft used onboard sensors to track the missile, which was launched from an ocean platform.

It took just a few seconds for the beam to create a stress fracture in the missile, causing it to split into pieces, the Pentagon's Missile Defense Agency said. Pentagon officials declined to say how far the aircraft was from the missile, saying the information was a military secret. But analysts have said the distance may have been about 100 miles.

Less than an hour later, the aircraft was able to shoot a laser at a second missile that was launched from San Nicolas Island. The heavily modified 747, which flew out of Edwards Air Force Base in the Mojave Desert, did not have to refuel or reload the chemicals needed to fire the second shot.

With the second shot, the test confirmed the possibility of attacking "multiple targets at the speed of light, at a range of hundreds of kilometers, and at a low cost per intercept attempt compared to current technologies," the Missile Defense Agency said Friday.

Boeing Co. of Chicago was the prime contractor for the airborne laser program and provided the aircraft and the battle management system and oversaw the test. Northrop Grumman Corp. engineers in Redondo Beach developed the laser while Lockheed Martin Corp. of Bethesda, Md., designed the beam and fire control system. Modification and testing of the aircraft have taken place at Edwards Air Force Base, home to many aviation firsts.

It has taken nearly 15 years and at least $4 billion to develop the airborne laser. Pentagon planners initially envisioned using the aircraft to shoot down ballistic missiles near the launch pads. It was part of a multibillion-dollar defense system that would shield the U.S. from missile attacks.

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How Real Is The Threat Of Laser Weapons?

On February 12, 2010, the U.S. Missile Defense Agency (MDA) used the Airborne Laser Test Bed (ALTB) mounted on a Boeing B-747 jumbo jet to shoot down a liquid-propellant and a solid-propellant target missile. The ALTB project is one of the MDA's most ambitious and long-term programs. Washington launched its initial research in this sphere in the 1970s.

At that time, an NKC-135-ALL aircraft, a modified version of the KC-135 Stratotanker, was built and used as an airborne laboratory. United Technologies built a 10-ton, 04-0.5-MWt CO2 laser system for the program. The NKC-135-ALL was involved in a series of tests in the late 1970s and the early 1980s. Although the tests proved that a laser weapon was feasible, it had a range of just a few kilometers and therefore lacked any military prospects. In 1985, a laser weapon used in ground tests heated up the stationary fuel tank of a Titan-1 intercontinental ballistic missile simulating a Soviet ICBM a thousand meters away, causing it to explode.

Such tests, as well as the NKC-135-ALL program, were conducted under the Strategic Defense Initiative (SDI) program. However it was impossible to develop a feasible missile defense system based on airborne laser weapons because most of the technical problems remained unsolved.

The Soviet Union also implemented an airborne laser weapon program and built a Beriev A-60 aircraft, an upgraded version of the Il-76 transport aircraft. Although Moscow virtually mothballed the program after the break-up of the U.S.S.R. in late 1991, the media reported last year that it had been resumed.

The United States resumed work on airborne laser weapons in the late 1990s after the issue of implementing the National Missile Defense Program (NMD) was raised. Initially there were plans to build two prototype and five production aircraft by 2012. However, it was later decided to scale down the program, due to skyrocketing costs. Although a prototype aircraft was scheduled to be completed by 2012, Washington decided not to build it and retained only one YAL-1 prototype, work on which began in 2000.

What is the ALTB's potential? Although there is no exhaustive information on the February 12 tests, some conclusions can be drawn on the basis of available reports. The Boeing YAL-1 Airborne Laser (ABL) weapons system has three laser systems, namely, a Track Illuminator Laser (TILL) for illuminating the target and adjusting the parameters of the laser weapon's optical system, a Beacon Illuminator Laser (BILL) for reducing atmospheric aberration, and the six-module High-Energy Laser (HEL) weapon system. The YAL-1 can hit ballistic missiles during their boost phase and has a range of 200-250 km. The effective range is limited by the laser unit's power, the laser beam's atmospheric dissipation, atmospheric aberration affecting sighting accuracy and the laser-beam gas breakdown effect which has not yet been eliminated. Moreover, an excessively powerful laser unit could overheat the fuselage and cause the plane to crash. These factors and the system's low rate of fire currently make it possible only to intercept individual missiles at short range. It appears that such systems will be unable to neutralize an all-out nuclear strike in the next 20-30 years.

Speaking of a hypothetical Russian-U.S. conflict, airborne laser weapons would have to be deployed in Russian air space in order to be able to intercept Russian missiles in their boost phase and during the separation of their multiple independently targetable re-entry vehicles (MIRVs). In fact, they would have only 3-5 minutes to accomplish this objective. However, even Russia's problem-ridden air-defense system would not allow a B-747 to roam free in national air space. Airborne laser weapons present a greater threat to strategic ballistic missile submarines which either patrol Russian territorial waters or international waters. However, there is one limitation. As the submarines spend most of their time underwater, laser-carrying aircraft could not quickly reach the optimal firing position necessary for a successful missile interception.

Consequently, this project's current version threatens only countries such as Iran or North Korea which have a small territory and are therefore unable to deploy missile bases far from their borders.

In the next several decades, the potential for laser weapons may be enhanced, especially if it becomes possible to deploy them on hypersonic sub-orbital platforms operating in the upper atmosphere where laser dissipation is minimized. However, it would be pointless to deploy such weapons aboard spacecraft, unless payload mass is increased drastically because it would otherwise prove impossible to orbit high-power laser units.

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Threat Of Laser Weapons cont.

It is impossible to struggle against the development of laser weapons. Practical experience shows that legal documents seldom effectively limit technical progress. Consequently, we must start preparing for a new round of the arms race now.

It is common knowledge that Russia is currently developing new-generation ballistic missiles which will be able to breach missile-defense systems with laser weapons. This objective can be accomplished by reducing a missile's boost phase, enhancing the manoeuvrability along this flight leg, etc. Analysts are discussing other measures that can shield missiles from laser beams. Naturally, Russia must conduct independent research in this area to be able to manufacture airborne laser weapons and to effectively cope with similar enemy systems. Media reports about the reinstatement of the A-60 program are particularly important in this context.

Article by: Ilya Kramnik
http://www.spacedaily.com/reports/How_Real_Is_The_Threat_Of_Laser_Weapons_999.html

Navy Takes Next Step Towards Laser 'Holy Grail'

U.S. Navy ships could one day knock down incoming missiles with energy weapons that never run out of shots, and tune themselves to slice through the ocean air.

On Monday, 12 April 2010 the Office of Naval Research awarded contracts to both Raytheon and Boeing worth an initial $6.9 million each for preliminary design work on a new free electron laser, or FEL. This model would be about seven times strong than any similar laser — reaching up to 100 kilowatts, or weapons-grade. Eventually, that could pave the way for a directed-energy weapon that can replace the Navy's current system for close-in ship defense, the radar-guided Phalanx gun.

The Phalanx system — which also protects against rocket and mortar attacks on land — is limited by the range and magazine capacity of its 20mm autocannon. In theory, a laser-based system would offer greater range, and a potentially unlimited number of shots. Plus, it might be fast enough to defend against "new, challenging threats, such as hyper-velocity cruise missiles," as Boeing puts it. Directed energy is also an appealing option for countering rocket and mortar fire, because it could theoretically be used to defend populated areas.

Blasts from other energy weapons have a tendency to get absorbed by the moist, salty atmosphere around the sea. When that happens, those lasers are out of luck, because they only fire at one particular wavelength. But the free electron laser (FEL) can fire at lots of different points along the spectrum. So sailors can pick which frequency will cut through the ocean air best — and blast away. It's one of several reasons why the FEL has been called the "Holy Grail of lasers."

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Laser Shoot-down cont.

But because of cost overruns and delays -- plans called for the laser to be operational in 2002 -- Defense Secretary Robert M. Gates slashed its budget last year. In a congressional hearing in May, Gates said that even if the laser was successful, its operational distance, which is classified, was not far enough to be considered useful in a conflict. "The reality is that you would need a laser something like 20 to 30 times more powerful than the chemical laser in the plane right now, to be able to get any distance from the launch site to fire," Gates said.

The recent shoot-down could sway Congress to take another look, analyst Thompson said. "Up until now, the airborne laser's success has been theoretical," he said. "After more than a decade of waiting, Boeing and its partners have demonstrated that intercepting and destroying a missile with an airborne laser is possible. It could erase all doubts in legislators' minds and reinstitute the funding."

Article by: W.J. Hennigan, Los Angeles Times, 13 February 2010

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This document is published by the Director of Maritime Strategy in order to help to create, communicate, and guide the execution of Canada's naval vision and strategy to produce the "Navy after Next".

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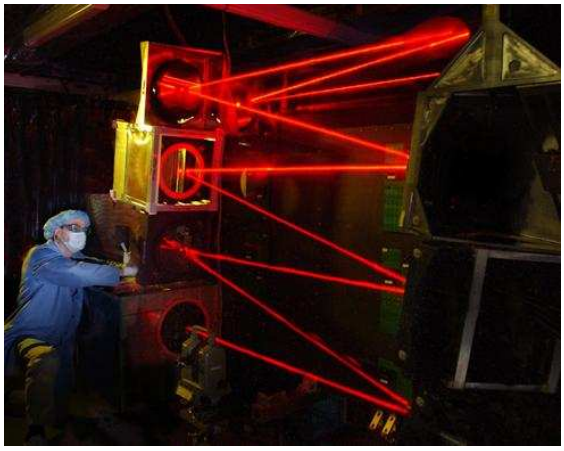
Laser 'Holy Grail' Cont.

But FELs have been promised for decades and decades. (During the Star Wars era, the government sank ten years and a half a billion into a FEL. All it could only muster a meager 11 watts.) To make the energy weapons finally come true this time, the Navy and its contractors will have to do more than just build a better laser. The whole thing will depend on the development of all-electric ships that would have enough onboard juice to power these futuristic weapons.

Article By: Nathan Hodge and Noah Shachtman, 16 April 2009
http://www.wired.com/dangerroom/2009/04/navy-seeks-free/#ixzz0oOEOlSyo



Editor' s Note

After a hiatus of several months the former Maritime Technology Outlook Bulletin has a new name and a new, broader perspective. The name of this publication is now the Maritime Future Outlook Bulletin. The Maritime Future Outlook Bulletin will continue to look at scientific and technical issues that may have an impact on naval operations but it will also examine other domains that will influence how navies operate in the future.

The aim for each future issue of the Maritime Future Outlook Bulletin is to have a central theme and to publish on a monthly basis. This issue includes several articles regarding Directed Energy weapons, their potential and their present limitations.

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