



# Backgrounder

Integrated Defense Systems  
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## Missile Defense Systems

### Description and Purpose:

The Missile Defense Systems (MDS) division of The Boeing Company provides integrated missile defense solutions for all phases of ballistic missile threats – boost, midcourse and terminal.

In addition, the Directed Energy Systems (DES) unit of MDS is developing systems to address multiple defense needs and customers.

### Customer:

Boeing is the prime contractor for the Ground-based Midcourse Defense system and the Airborne Laser, both U.S. Missile Defense Agency programs.

Boeing and Israel Aerospace Industries co-produce the Arrow II interceptor for the Israel Ministry of Defense.

Among key DES programs are the Advanced Tactical Laser, sponsored by the U.S. Air Force; the High Energy Laser Technology Demonstrator, funded by the U.S. Army; the Free Electron Laser, commissioned by the U.S. Navy; and the Tactical Relay Mirror System being developed for the Air Force and the Office of the Secretary of Defense/Director of Defense Research and Engineering.

### Ground-based Midcourse Defense

The Missile Defense Agency's Ground-based Midcourse Defense (GMD) program is developing, testing and deploying a ground-based system to detect, track and destroy hostile long-range ballistic missiles in their midcourse phase of flight. The system uses kinetic "hit-to-kill" technology that employs the force of collision between an interceptor and an enemy missile to destroy the target.

Boeing, as prime contractor, is responsible for developing and integrating the GMD system elements, including the Ground Based Interceptor, the Sea-Based X-Band Radar (photo above), Upgraded Early Warning Radars and the Battle Management Command, Control and Communication systems.

Boeing in 2004 delivered the first national missile defense capability with GMD sites at Fort Greely, Alaska, and Vandenberg Air Force Base, Calif.

In December 2008, Boeing, working with industry teammates and the Missile Defense Agency, completed the successful intercept of a target warhead in the most challenging test to date of the United States' only long-range ballistic missile defense system. The test, GMD's eighth intercept overall, was the third intercept since September 2006 using an interceptor with the same design and capabilities as those protecting the United States.

### **Airborne Laser**

As part of the Missile Defense Agency's committed contractor team, Boeing is leading the development of ABL, a precise, airborne, high-energy laser weapon system that will be capable of destroying ballistic missiles in their boost phase of flight.

The ABL platform will achieve missile interception by focusing and maintaining a high-powered laser on a target until it achieves catastrophic destruction.

The first prototype has been built using a modified Boeing 747-400F aircraft. It is undergoing flight testing to set the stage for a lethal demonstration against a boosting ballistic missile in 2009.

### **Arrow**

The Arrow Weapon System is a ground-based, ballistic missile defense system that uses a two-stage interceptor with a fragmentation warhead to protect Israel against short- and medium-range missiles. Under an agreement with Israel Aerospace Industries, the prime contractor for the Arrow Weapon System, Boeing provides several Arrow II interceptor components.

Boeing built part of the Arrow II interceptor that successfully shot down a ballistic missile target in April 2009 in a test of Israel's national missile defense system. The event marked the co-produced Arrow II's second intercept in two attempts, as well as its third successful flight test.

Israel and the United States have jointly developed the Arrow Weapon System to defend Israel against the growing threat of short- and medium-range ballistic missiles.

### **Directed Energy Systems**

The Advanced Tactical Laser (ATL), which Boeing is developing for the U.S. Air Force, is equipping a C-130H aircraft with a high-energy chemical laser for engagements against ground targets. ATL will destroy, damage or disable targets with no collateral damage, supporting missions on the battlefield and in urban operations.

Boeing has been awarded a U.S. Army contract valued at approximately \$36 million to continue developing a truck-mounted, high-energy laser weapon system that will destroy rockets, artillery shells and mortar rounds. Under the High Energy Laser Technology Demonstrator (HEL TD) Phase II contract, awarded in August 2008, Boeing will complete the design of, then build, test and evaluate, a rugged beam control system on a Heavy Expanded Mobility Tactical Truck. Boeing also will develop the system-engineering requirements for the entire HEL TD laser weapon system.

Boeing has been awarded a U.S. Navy contract valued at up to \$163 million, with an initial task order of \$6.9 million, to develop the Free Electron Laser (FEL) weapon system, which will transform naval warfare in the next decade by providing an ultra-precise, speed-of-light capability and unlimited magazine depth to defend ships against new, challenging threats, such as hyper-velocity cruise missiles. Under the task order, awarded in April 2009 by the Office of Naval Research, Boeing will complete the preliminary design of the electric-powered Free Electron Laser, the key step toward building a FEL prototype for realistic tests at sea.

Relay mirror systems developed by Boeing will greatly enhance the performance of laser weapon systems by reducing the atmosphere's effects on laser beams, extending their range beyond line of sight and expanding potential laser engagement geometries. Boeing is under contract to the Air Force and the Office of the Secretary of Defense to design, fabricate and test the Tactical Relay Mirror System, which could be carried on unmanned aerial vehicles or balloon-like aerostats and be used with tactical ground and airborne lasers.

Boeing is investing its own money in several efforts that promise to equip the warfighter with real directed energy capability. These efforts include Laser Avenger, a system that integrates a laser on a Humvee-based Avenger system to destroy improvised explosive devices, unexploded ordnance and unmanned aerial vehicles.

**Background:** MDS is headquartered in Huntsville, Ala., and also has major business activities in Alaska; Albuquerque, N.M.; California; Colorado; Hawaii; Huntsville, Ala.; Seattle, Wash.; Washington, D.C., and Wichita, Kan.

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