

Airborne Laser (ABL)

Executive Summary

- The Missile Defense Agency (MDA) achieved its 2004 objectives of first light of the high-energy laser in the System Integration Lab (SIL) and first flight of the Airborne Laser (ABL) with the Beam Control/Fire Control (BC/FC) installed.
- SIL testing demonstrated that the high-energy laser modules can be routinely energized when commanded.
- Flight testing demonstrated the capability to command and point the turret, and expose the conformal window through which the laser beam exits.

System

The ABL is a prototype missile defense weapon system consisting of:

- A modified Boeing 747-400F commercial aircraft
- A megawatt-class chemical oxygen-iodine laser
- A laser turret on the aircraft nose and two illuminator lasers on a bench in the fuselage
- Optical benches with highly sensitive cameras, sensors, and mirrors
- Hardware and software for battle management, command, control, communications, computers, and intelligence
- Ground support equipment for storing, mixing, handling, and loading laser chemicals



Mission

Combatant commanders will use the ABL to destroy threat ballistic missiles in the boost phase before they have an opportunity to deploy reentry vehicles, submunitions, or countermeasures. ABL accomplishes this by:

- Using passive infrared sensors to autonomously acquire and track threat ballistic missiles
- Using the illuminator lasers to establish precise track on the missile nose and an aimpoint on the tank of a liquid-fuel missile, or on the motor case of a solid-fuel missile
- Placing laser thermal energy on the tank or motor case to weaken the casing, allowing internal pressure to rupture the tank and destroy the missile

Activity

- Accomplished first light of the high-energy laser modules in the SIL on November 10, 2004.
- On December 6, 2005, completed all planned firings of the chemical kill laser in the SIL including a full power lase of more than 10 seconds duration.
- Including first flight on December 3, 2004, completed 28 flight tests of the passive BC/FC subsystem on July 28, 2005.
- Completed numerous aircraft airworthiness and envelope expansion test points.
- Demonstrated the capability to command and point the turret.
- Verified that BC/FC optics assemblies could be stabilized and aligned in flight.
- Demonstrated initial BC/FC software integration by simulating onboard engagements.
- Boresighted the passive surveillance system, which includes the six infrared search and track sensors.
- Demonstrated Link-16 connectivity with other command and control nodes.
- Ferried the aircraft to Boeing facilities in Wichita, Kansas, on August 3, 2005, to accomplish additional aircraft modifications, and to install the BC/FC illuminator lasers.

- As part of the ABL LFT&E program, conducted Rolling Missile Vulnerability ground tests and analysis to establish the laser-induced, burst-failure requirements for rolling threat missiles.

Assessment

- The 2005 flight tests evaluated the passive components of ABL's BC/FC. The BC/FC's Beacon Illuminator Laser and the Tracking Illuminator Laser are being integrated into the aircraft at Boeing/Wichita. A key objective in 2006 is to complete ground tests of the BC/FC with these new lasers.
- SIL testing was successfully completed December 6, 2005.
- MDA has made progress in gaining approval for its decentralized predictive avoidance methodology to clear the lasers for open-air testing and future operational employment.
- The shelf life of the Basic Hydrogen Peroxide, a chemical fuel for the high-energy laser modules, is more than two times longer than predicted. This should increase the deployability and operational availability of the ABL system.

BALLISTIC MISSILE DEFENSE SYSTEM

Recommendation

1. Laser lethality investigations must continue. Additional data is needed to establish laser engagement parameters for both testing and operational employment.