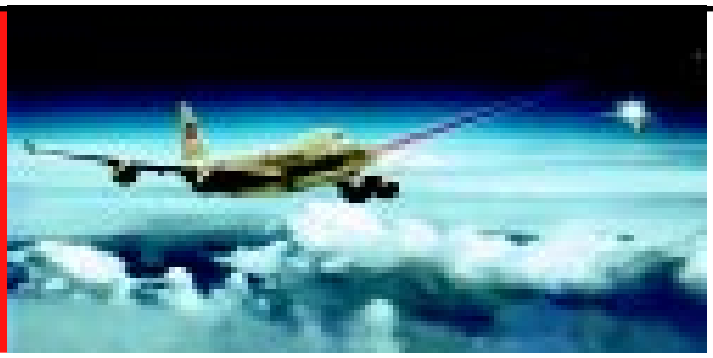
Ongoing AFOSR Support Contributes to the Success of the Airborne Laser (ABL) Program



As with many of today's weapons systems, the Airborne Laser program is a living testament to the importance of basic research to the Air Force.

ABL is a cost-effective airborne high-energy laser system designed to provide a credible deterrent and lethal defensive capability against theater ballistic missiles in the boost phase. The ABL design uses an active tracking system for precision tracking of missile targets. The active tracking system uses an illuminator laser directed from the ABL to the target to provide the signal from which the target position is determined.

AFOSR management of the basic research program has and continues to contribute to the development of the ABL. AFOSR-supported research to enable the ABL began more than three decades ago.

Professor George Pimentel and J.V. Kasper at the University of California, Berkeley, under AFOSR support, in 1964, demonstrated the first iodine laser. Further critical understanding of the disposition of energy in chemical reactions was gained from AFOSR funded research by Professor Dudley Hershbach of Harvard University and Professor John Polanyi of the University of Toronto, for which they were awarded the Nobel Prize in Chemistry.

Several technologies have enabled the ABL system. One key technology of the ABL is the Chemical Oxygen Iodine Laser. The COIL device converts the energy of chemical reactions into a powerful, infrared laser beam that can travel through the atmosphere and destroy targets at very long distances. An extensive legacy of AFOSR-sponsored basic research to understand, control and optimize the kinetics of molecular interactions led to the invention and development of the COIL. The first COIL device was demonstrated in 1977 at the Air Force Weapons Laboratory at Kirtland AFB, NM.

Continuing AFOSR support over the last two decades enabled COIL technology to mature to the point where high power output with excellent beam quality and long duration run times will meet ABL requirements. The performance requirements of the ABL are established by operational scenarios and support requirements defined by the user, Air Combat Command, and measured target vulnerability characteristics provided by the Air Force lethality and vulnerability community.

Another key technology critical to the ABL is adaptive optics, a control strategy that compensates for atmospheric turbulence effects on the laser beam. Advanced compensation techniques extend the lethal range of the ABL by 50 percent. This technology has been under development at the Air Force Research Laboratory's Directed Energy Directorate for approximately 20 years.

Currently, AFOSR-funded research is being conducted within the AFRL in the area of atmospheric characterization. Understanding of the atmosphere, including high altitude cloud ice crystal formation, moisture content, winds, etc, will be used to optimize ABL performance.

Research Highlights

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