Team ABL Continues Making Progress with Delivery of Two Airborne Laser Steering Mirrors

A team of engineers has delivered two prototype, fast-steering mirrors for the Airborne Laser (ABL) theater-ballistic-missile defense system to Lockheed Martin Space Systems in Sunnyvale, Calif.

These steering mirrors are part of Lockheed Martin's overall ABL Beam Control/ Fire Control (BC/FC) system that is designed to autonomously detect, track and destroy hostile theater ballistic missiles. Lockheed Martin now will begin integrating the steering mirrors with beam-control software. Boeing engineers at the company's Laser & Electro Optical Systems organization in West Hills, Calif., under direction of the Lockheed Martin Space Systems BC/FC team, were responsible for the development and delivery of the mirrors.

"Delivery of these mirrors in 18 months underscores the significant teamwork between Lockheed Martin and Boeing on this critical national initiative," said Steve Sauve, Boeing vice president and ABL program director.

"This delivery allows us to continue our robust risk-reduction activities on the program and positions the team to move into full-up integration and test of the Beam Control/ Fire Control system," Paul Shattuck, Lockheed Martin Space Systems ABL program manager, said.

Three types of steering mirrors have been developed to meet demanding requirements throughout the ABL aircraft. The 31-centimeter "slow mirror" is a lower bandwidth mirror that maintains high-energy laser alignment as the plane flexes in flight. The mirror is responsible for ensuring the mega-watt-class laser beam stays aligned within the aircraft structure. The 31-centimeter "fast mirror" is a high-bandwidth design responsible for targeting the laser. It must correct high-frequency tilt errors caused by atmospheric turbulence. A 13-centimeter mirror meets both low- and high-bandwidth applications in the illuminator laser path.

Steering mirror development is challenging, the engineers noted, since the technology incorporates a broad spectrum of engineering sciences. In addition to being very precise electro-mechanical structures, they also must have highly reflective flat optical surfaces. The team of mechanical, electrical, optical and fabrication engineers at Boeing, in conjunction with Lockheed Martin experts, worked together to produce the best design solutions.

The mirror substrates will be coated to protect against heating from the high-energy laser and to reflect all other illuminator, infrared and alignment wavelengths in the beam control system. The coating and application processes were previously validated to satisfy all requirements by rigorous risk-reduction testing.

Lockheed Martin is part of an industry team selected by the U.S. Air Force to develop and demonstrate the revolutionary ABL weapon system. Team ABL includes the Air Force, Boeing, TRW and Lockheed Martin. Boeing is the team lead for weapon system integration, and supplies the 747-400 Freighter aircraft and the battle management, command, control, communications and computers. Lockheed Martin Space Systems is designing, developing, and building the BC/FC system. TRW provides the chemical-oxygen-iodine laser and ground support.

The team is developing a high-energy chemical-oxygen-iodine laser carried aboard a 747-400 wide-body platform that is to be capable of shooting down theater ballistic missiles while hundreds of miles from their launch site. ABL will locate and track missiles in the boost phase of their flight above the clouds, then accurately point and fire the laser with such energy that the missiles will be destroyed near their launch areas and may fall onto the adversary's territory.

The initial wide-body flying platform flew to the Boeing modification center in Wichita, Kan., in January to begin an 18-month modification effort. ABL system component installation is to start at Edwards Air Force Base, Calif., in July 2001.

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