

ABL FOCUS

January - March 2003

Vol. IX • No. 1



Airborne Laser Demonstrates Refueling Ability

The Airborne Laser demonstrated its ability to refuel in the air during a recent test over California. The air-to-air refueling system was installed during a two-year-long modification process at the Boeing facility in Wichita, KS, which started the conversion of the assembly-line 747-400 freighter into a directed energy weapon system. The aircraft



now is at Edwards Air Force Base, CA, where its lasers and optical systems will be installed.



Installation of the laser modules is a key event leading up to two very important near-term milestones for the SIL – Module Final Alignment this spring and First Light in the summer. As soon as the integration and single-circuit checkout of the SIL are complete, the focus will shift toward testing the laser system. First Light represents the first time photons are simultaneously produced from all six laser modules.

However, several exciting integration activities lay ahead prior to achieving these milestones. Remaining integration efforts include the installation of additional laser system components and the Optics and Diagnostics Subsystem; checkout of chemical mixing facilities/

operations; and completion of the software required to operate the SIL.

Once the laser subsystem proves successful inside the SIL, it will then be disassembled and installed inside the ABL YAL-1 aircraft later this year in preparation for aircraft ground testing activities. The importance of the SIL cannot be underestimated, and it is paving the way for the program's goal of shooting down a ballistic missile in boost phase.

Contributed by Priscilla Pelletier, ABL SPO

Systems Integration Laboratory

Another major accomplishment was achieved in December 2002 for the Systems Integration Laboratory (SIL) located at Edwards Air Force Base, CA. All six laser modules were installed for the first time inside the SIL's 747 fuselage. The SIL fuselage is a 747-200 commercial aircraft that was purchased from a boneyard located in Mojave, CA, and serves as a test bed for integration of the laser segment prior to testing on the actual ABL YAL-1 aircraft. It is fulfilling its purpose very well.

Beam Control/Fire Control End-to-End System

Lockheed Martin is in the final phase of integrating the Beam Control/Fire Control (BC/FC) into one end-to-end system. This test configuration comprises the Turret Ball, Beam Transfer Assembly (BTA), Multi-Beam Illuminator Lasers (MBIL), Surrogate High Energy Laser (SHEL), and Range Simulator.

The BTA and MBIL bench structures, a joint project between Lockheed Martin and Applied Aerospace Structures, were the first large assemblies delivered. They form the backbone for integrating the subsequent beam control hardware deliveries. The large optics (primary mirror and conformal window) were the first long

lead items procured for the ABL program. With completion of the critical integration of the large optics, the turret ball rapidly achieved final integration and alignment at Brashear LP in Pittsburgh. The turret ball has arrived at Lockheed Martin's Sunnyvale facility and is the last piece needed to complete the end-to-end test configuration.

One of the most significant accomplishments for BC/FC was the successful coating of the flight primary mirror at Exotic Electro-Optics. This milestone marks the first time in history that such a high performance coating has been attempted on an optical element 1.5 meters in diameter.

The surrogate turret completed a successful flight test series, proving we have a structurally sound design. During the flight test series the full range of roll and yaw commands were exercised. Important aerodynamic data was also gathered, anchoring the jitter beam-walk and wave-front models used to design the control systems.

The Beacon Illuminator Laser (BILL) modules were successfully aligned at low power during the week of 20 Jan, and the two BILL modules successfully fired at high power during the week of 3 Mar. This was the first time that the two modules were simultaneously exercised at high power. Two module high-power tests gathered data for beam quality and electromagnetic interference radiation/susceptibility. The BILL lasers probe the atmosphere to the target and allow the wave-front control system to measure the optical path differences to the target. A deformable mirror pre-distorts the beam so that it self-corrects on the way to the target.

On 5 Feb, the BC/FC end-to-end test turret ball (BEE Ball) was positioned in the high bay clean room in the end-to-end test configuration. The BEE Ball contains a Cassegrain telescope housing an f/1, 1.5-meter diameter primary mirror. The telescope is mounted on a fine pitch/yaw gimbal ring. The BEE Ball also includes the 1.71-meter uncoated conformal window. This completes the BC/FC system configuration. Also in February, the BEE optical turret ball was optically tested and the inertial reference transfer unit (IRTU) was installed on the back of the primary mirror. The next step, optically aligning the BEE Ball, Beam Transfer Assembly bench and the Surrogate High Energy Laser, will complete the IRTU optical path.

Lockheed Martin plans to deliver a fully tested beam control/fire control system this summer to Edwards Air Force Base for installation into the 747-400F aircraft.

Contributed by Lockheed Martin

International Security Issues and ABL

Should personnel be concerned with International Security in the ABL program? Emphatically – Yes! As the program progresses and matures we are standing more in the spotlight. Though the ABL program does not

have any international partners, the potential does exist that the program may involve foreign nationals and companies and joint exercises. The ABL Acquisition Security Office is currently developing the guidelines and procedures necessary to handle foreign visits, contractors, companies, and governments. We must be vigilant and deliberate in the way we handle such situations to prevent the illegal transfer of defense articles and related technical data to foreign entities. There are numerous laws and regulations that govern how we interact with foreign nationals, companies, and governments. In the short term, if you become aware of any existing or potential foreign involvement with the ABL program, contact the ABL Acquisition Security Office to ensure that all of the necessary organizations/agencies are appropriately engaged. Contact Mr Dan Clarke at 505-846-7690 or DSN 246-7690 to assist in any questions/concerns you may have.

Contributed by Dan Clarke, ABL SPO

“Miracle Man” TSgt Ron Jones Returns to GAHH

TSgt Ron Jones of the ABL SPO is definitely the “miracle man” of the Greater Albuquerque Habitat for Humanity (GAHH). He is the survivor of the only serious accident GAHH has ever had on a construction site. TSgt Jones walked into the GAHH office on Valentine’s Day, the seven-month anniversary of his fall from the roof of a Habitat house in July 2002. It was hugs and congratulations all around as standing before the staff was a healthy, happy Ron. He had come to say thank you to all the caring people on the construction site that day who responded with skill and training to his fall. Without their response he knows that things would have turned out very differently for him.



Photo by Tom Spross

John DeVerna (GAHH) and TSgt Ron Jones (ABL SPO)

There were two “angels of mercy” also working on the house that day, both with extensive first aid training and the ability to respond properly – MSgt Tim Uding, a

military colleague of Ron's and a certified EMT, and John DeVerna, who has been a nationally certified paramedic and was also certified in Advanced Cardiac Life Support. These two men, with their training and skill, had Ron breathing and stabilized by the time paramedics arrived on the scene. Today, after several surgeries and months of continuing therapy, TSgt Jones can look forward to a life of activity. Yes, he has two rods in his spine, but fortunately they are in an area that doesn't affect mobility. He also has a titanium rod in his leg, but can walk without assistance and will continue to grow stronger with therapy. He is looking forward to getting back to work on a Habitat house – although he intends to stay off the roof in the foreseeable future.

Catherine Woodward, Executive Director, Greater Albuquerque Habitat for Humanity. Used by permission

Awards and Recognition

Air Force Reserve Junior Officer of the Year Award Nominee

Captain Lucinda (Cindy) Aspden of the ABL System Program Office was selected recently as the Air Force Materiel Command (AFMC) nominee for the Air Force Reserve Junior Officer of the Year award.

Captain Aspden returned to active duty in May 2002 to assume the lead of the Emergency Operation Capability (EOC) Deployment Planning Team for ABL. She has had extensive experience as a pilot of a KC-135 and is currently a commercial airline pilot.

If the projected shutdown of a ballistic missile over the Pacific Ocean is successful, ABL could be available for emergency service as early as 2005.

2002 Giller Award Winners

On 27 Feb, Dr Larry Wright, Dr Darryl Sanchez, and Lt Larry Parten of the Air Force Research Laboratory's ABL Technologies Branch were awarded the 2002 Giller Award for research in directed energy. The ABL Beam Control Simulation Team received the award based on results achieved in both technology development and technology transition in support of the ABL acquisition program. The Simulation Team conceived and developed innovative active tracking technologies, as part of the ABL Advanced Technology Demonstration (ATD), for possible transition into the Block 2008 ABL weapon system. Specifically, the Simulation Team led the development of two critical ABL ATD active track technologies: the "Track Illumination Laser Pre-focus" (TILL Pre-focus) and the "Beacon Illuminator Tracking" (BILL Tracking) techniques. Both techniques significantly improve ABL track performance, resulting in lethal range extensions up to 25% against ballistic missiles in the boost phase.

The foremost technical accomplishment by the Simulation Team has been their creation, modeling, and development of the TILL Pre-focus technique which would require minimum hardware changes to the baseline ABL design, thereby producing negligible transition costs. The technique reduces track jitter and improves ABL laser energy-on-target over the baseline ABL performance, and has been confirmed through simulations using the ABL Wave-Optics Propagation Model (ABLOWPM) and at the Advanced Concepts Laboratory at MIT's Lincoln Laboratory. The TILL Pre-focus technique improves performance through more uniform illumination of the ballistic missile tip during ABL engagements.

In addition to the TILL Pre-focus technique, the Simulation Team also provided pivotal direction to the North Oscura Peak (NOP) BILL Tracking experiment, the centerpiece field test of the ABL ATD advanced tracking program. The NOP BILL Tracking test series comprises several field demonstrations conducted at the NOP laser test facility on White Sands Missile Range, NM, and is the final validation requirement before its transition to the Block 2008 ABL weapon system. Through simulations and experiments, BILL Tracking has shown up to 50% improvement in energy-on-target.

The ABL Beam Control Simulation Team efforts have played a vital role in confirming the viability of advanced beam control concepts, and ensuring the ABL ATD technologies will see service in our nation's first operational directed energy ballistic missile shield.

Contributed by Lt Col George Birsic, ABL SPO

<http://www.airbornelaser.com/>

*To be added to our distribution list,
contact Judy Sherman, Newsletter Editor,
e-mail: judith.sherman@kirtland.af.mil*