

ABL FOCUS

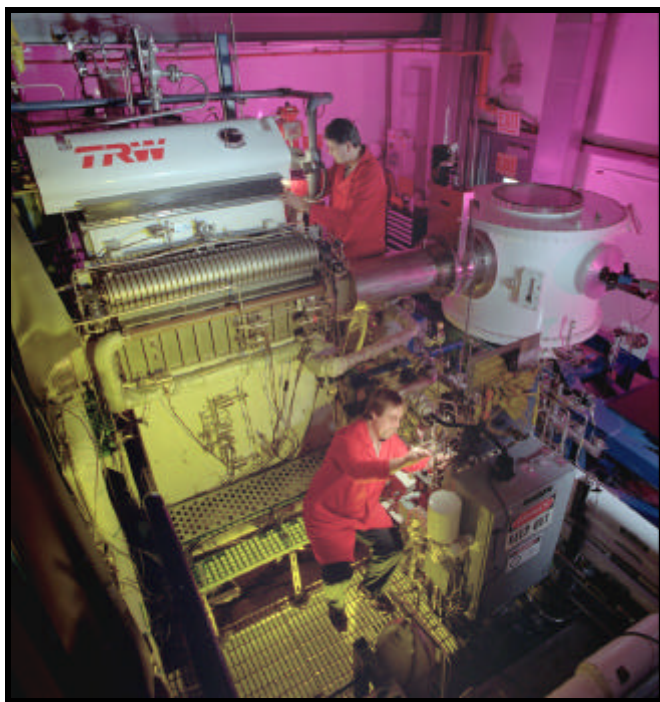
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"Coming to a Theater Near You ... in 2003!"

TEAM ABL COMPLETES TESTING OF UPDATED LASER MODULE

During a four-month long test program at TRW's Capistrano Test Site, the Flight-weighted Laser Module-3 (FLM-3), a multi-megawatt class chemical oxygen iodine laser (COIL), exceeded by a significant margin the laser power and beam quality requirements for the operational ABL system. Output power and beam quality are a measure of the laser's ability to put "energy on target" to destroy a boosting theater ballistic missile.



Technicians prepare FLM-3 for one of several tests designed to measure the module's output power and beam quality.

According to Steve Toner, TRW's ABL program manager, the success with the FLM-3 stems largely from improvements that TRW made in the design of the components that regulate the flow and recirculation of chemical reactants through the laser. These hardware changes incorporate "lessons learned" from

the extensive FLM test program conducted throughout the summer of 1998.

"We tested the FLM-3 under its full operating range — from conditions representing its first shot with a 'fresh' chemical magazine to conditions representing its last shot with a 'spent' magazine," explained Toner. "Under all test scenarios," he said, "the laser produced sufficient power to exceed by a significant margin the range requirements of an operational ABL system. We now know with certainty that our module design contains sufficient laser reactants to meet the ABL mission requirements while staying within the weight budget for the first ABL system."

The other significant characteristic of the test program, added Toner, was that TRW made all the critical FLM-3 power and beam quality measurements under hot, high pressure cavity conditions representative of actual ABL laser operating conditions.

Completion of the FLM-3 testing paves the way for Team ABL to finalize the design of the flight laser modules and begin manufacturing the first of six modules required for the PDRR system. Fabrication of the first flight version hardware is scheduled to begin in 2000, with testing to follow.

Contributed by TRW

FIRST ABL ULTRA-SENSITIVE EBCCD CAMERA SYSTEM DELIVERED

A major ABL Beam Control/Fire Control (BC/FC) program milestone was achieved on 20 Sep when the first camera fitted with an Electron-Bombarded Charge-Coupled Device (EBCCD) focal plane array was delivered to Lockheed Martin at



John Boyle (Draper Labs), Col Booen, Dr Paul Shennum (Boeing), and others at the EBCCD delivery ceremony

Intevac, Inc. headquarters, Santa Clara, CA. Col Mike Booen (ABL SPO) and Paul Shattuck (Lockheed Martin) thanked the international team of Intevac, MIT-Draper Lab, and English Electric Valve (EEV) for the innovative and dedicated effort that evolved this important new capability for low noise, high gain, and high quantum efficiency in the near infrared. Six more units will be delivered in early 00. These devices will be incorporated into the common path/common mode wavefront and tracking assemblies in the ABL. Also, two cameras will soon be supplied to the Air Force Research Lab (AFRL) North Oscura Peak (NOP) facility for use in ABL propagation demonstrations.

Contributed by Dr. Ken Billman, Lockheed Martin

OTHER BEAM CONTROL/FIRE CONTROL NEWS

Contraves-Brashear Systems Team Takes Delivery of ABL Conformal Window #1



At the delivery, from left to right: John Hraba, Andrew Clarkson, William Arnold, Michael Walsh (LMMS), Sandra Bader, Lloyd Harkless, William Decker, Mark Young, and David Williams.

Corning, Inc., Canton, NY has completed the coarse grind generation of the first Conformal Window (CW#1) for the ABL PDRR aircraft. On 7 Aug, delivery was made to Contraves-Brashear Systems (CBS) in Pittsburgh, PA, the Lockheed Martin Missiles and Space (LMMS) subcontractor responsible for the ABL telescope and large optics. The CW#1 is made of Infrasil 302 glass manufactured by Heraeus Quarzglas, GmbH of Frankfurt, Germany. This material has high optical quality and extremely low water content, leading to extremely low near-IR bulk absorption. CBS will now fine grind and optically polish CW#1 to the required spherical prescription. The completion of the nearly 2 1/2-year process of CW#1 manufacture will come with anti-reflection coating depositions on the inside and outside faces. Then, after first installing the ABL telescope and ancillary optics into the LMMS-supplied turret ball, CBS will cap the ball with the 1.7-

meter diameter, 2.34-cm thick CW#1. The window will be the final ABL optic through which the high-energy laser passes as the BC/FC sends it on its way to the target.

BC/FC Design Review

The BC/FC Integrated Product Team (IPT) held a major design review at Lockheed Martin, Sunnyvale, CA on 9-13 Aug. In addition to the Air Force and contractors, selected Independent Review Team (IRT) members were also in attendance. The two meeting goals were to extensively review all system design elements as a means to freeze the design, and to act as a dry run for our Critical Design Review (CDR). By all indications these goals were achieved with the review.

The Beam Control team has now demonstrated the necessary power and repetition rate for both the Track and Beacon Illuminator Lasers. Both the illuminator test beds have proven the design meets requirements prior to the BC/FC CDR scheduled for Spring 00. The second Conformal Window (CW#2) is proceeding, with the flow-out and slump process beginning in Fall 99. The seam from the previous flow out has been determined to be structurally sound, and CW#2 is a viable spare for low power testing at a minimum. Further analysis will determine its suitability for high power testing capability.

BC/FC Semi-Annual Photon Wizard Awards

Also as part of the BC/FC design review, the semi-annual Photon Wizard Awards were presented. After Maj Juan Echeverry explained the award's purpose – to recognize outstanding contributions by contractor and ABL SPO IPT members – he recognized Ed Wong (LMMS) for his timely direction of the processor team to a well thought-out, substantiated, and detailed processor baseline design. Maj Echeverry's IPT co-lead, Gary Swart (LMMS), then presented the government award to Terry Brennan, the Optical Sciences Corp., for the excellent assistance that he has provided in the brassboard upgrade; ABL Events 4, 10, and 15; ABL Wave Optics Code (ABLWOC) upgrades; and in the Advanced Adaptive Optics analyses and NOP simulations.

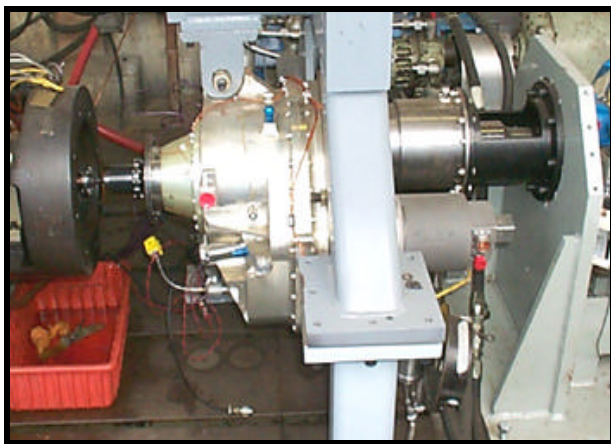


*Left Photo: Ed Wong receives his award from Maj Echeverry.
Right photo: Terry Brennan receives his from Gary Swart.*

Contributed by Dr. Ken Billman, Lockheed Martin

TEAM ABL COMPLETES CRITICAL TURBOPUMP TESTING

In a significant risk reduction activity, Team ABL has successfully completed testing for its turbopump gearbox. The ABL turbopump, being developed for Team ABL by Allied Signal, is a critical piece of hardware used to pump Basic Hydrogen Peroxide through the laser module. The gearbox uses a series of gears to reduce the speed of the turbine rotor down to the speed required by the pump impellers. It is considered the highest risk element of the turbopump. With 60 hours of testing at high speed and no signs of wear on the gears, the gearbox has now demonstrated more than 40 times the expected duration of high-speed operation for the turbopump on the airplane. The turbopump is run at high speed only when the laser is firing.



ABL turbopump gearbox test setup at Allied Signal's test facility in Torrance, CA

"First pass success of a turbopump gearbox is extremely unusual," said Steve Toner, the Team ABL Laser Program Manager. "In this case, it is even more impressive due to the fact that this particular gearbox is fairly complicated. This first pass success speaks volumes about the design that Allied Signal came up with, and is yet another triumph for the ABL program."

Contributed by TRW

LIVE FIRE TEST AND EVALUATION (LFT&E) UPDATE

Lt Col Dean Illinger briefed Mr Joe Diamond (AFPEO/WP) and an AF/TE representative on ABL's LFT&E Survivability strategy. The near-term goal is to perform a preliminary susceptibility and vulnerability assessment so a recommendation on the covered system status can be made to OSD/DOT&E by Fall 00. Also, the Fracture Mechanics "Blue Ribbon" Panel met from 28-30 Sep to review past work, provide guidance and recommendations to increase the fidelity of our research and models, and keep us abreast of the

state-of-the-art in fracture mechanics. A final report will be out in mid-November.

QDR-8

The 8th Quarterly Design Review (QDR-8) was held at Boeing Seattle from 24-26 Aug. Attendees included representatives from Air Combat Command (ACC), ASC, Air Force Operational Test & Evaluation Center (AFOTEC), and SAF/AQ. QDR-8 went very well with no major design or interface problems encountered and 35 Change Requests approved.

BMC⁴I

On 12 Aug, the BMC⁴I IPT concluded the design review for Software Build 1B in Boeing Seattle. The successful completion of the design marked the start of coding for Build 1B. In mid-Sep, BMC⁴I completed the Communication Subsystem CDR in Boeing Seattle and now has the go-ahead to continue communication system procurement.

AIRCRAFT IPT UPDATE

The Aircraft IPT held a segment spec review in preparation for the upcoming Heavy Structures CDR. They released a new flow detailing over 1400 events in the modification process, a big step toward delivery of the modified ABL to the Air Vehicle Integration and Test (AVIT) Analysis & Integration Team (AIT). In addition, long term exposures of critical aircraft materials to ABL chemicals were concluded this month.

EESTIRR

The AVIT AIT hosted its second "End-to-End System Test and Evaluation Risk Reduction" (EESTIRR) offsite in Las Vegas, NV from 30 Aug-2 Sep. Nearly 80 participants representing all IPTs and AITs, in addition to numerous experts outside the program, were assembled to take an objective and critical look at current AVIT test requirements, plans, and processes. The objective of EESTIRR was to identify, quantify, and prioritize the technical and schedule risk associated with ABL system integration and test; and to recommend risk mitigation requirements, plans and processes to further reduce that risk.

EESTIRR members were briefed on the current status of AVIT test plans and test-derived requirements, then assigned to one of four assessment teams (Aircraft and BMC⁴I, Laser, BC/FC, or System I&T). Each team member performed an individual risk assessment, the individual evaluations aggregated by team, and the evaluations made available for group assessment.

The aggregated risk lists helped each team focus their discussions, enabling them to produce a team-prioritized risk list.



Attendees at the EESTIRR conference

After briefing the EESTIRR members on the final aggregated team risk lists, each team gave a 90-minute assessment surrounding their piece of the ABL system integration and test effort. The opinions were sometimes controversial, the assessments insightful, and the recommendations invaluable. In the end, AVIT learned much about the strengths and weaknesses of the evolving test program, and found out where to refocus near-term efforts, particularly regarding requirements, to ensure that an integrateable and testable system is delivered at CDR. One of the intangibles that is difficult to quantify – but nonetheless every bit as real – was the new insight gained by the IPTs and AITs into AVIT planning.

Contributed by Major Gary Henry, ABL SPO

BRIEFINGS

- 3 Aug - ABL briefed Gen Richard Myers, Commander, AF Space Command, at Peterson AFB, CO
- 11 Aug - ABL briefed Lt Gen Gregory Martin and Dr Lawrence Delaney of SAF/AQ on ABL software and computing systems
- 18 Aug - ABL briefed Maj Gen Dennis Haines, Director of Requirements, ACC, with an update of the program
- 19 Aug - Mr Les Brownlee, SASC Staff Director, visited the SPO and received a program update
- 24 Aug - Lt Gen Nicholas Kehoe, Inspector General of the AF, visited the SPO and received a program update
- 31 Aug - Maj Gen Robert Bongiovi, Director of Requirements for Air Force Materiel Command, visited the SPO and received a program update
- 1 Sep - ABL briefed Mr Charlie Huoy, staffer for Sen Inouye (D-HI) with a program overview
- 13 Sep - ABL briefed Maj Gen Haines, ACC/DR, on adjunct mission and Residual Operational Capability POM inputs
- 13-15 Sep - ABL briefed numerous AF leaders at the Air Force Association Conference
- 17 Sep - ABL briefed Mr Phillip Coyle, Director, Operational Test & Evaluation, on ABL's test program