From the lab *to the field*

Albuquerque employees refine laser-tracking algorithms

By Walter Polt

On a sun-drenched field in Albuquerque, N.M., the scene looks like model aircraft hobbyists flying a radio-controlled airplane. But, attached to the craft with a rubber band and 20 feet (6 meters) of fishing line is a model rocket. As the airplane arcs in the sky, the foot-long (30-centimeter) rocket zips even faster. Less than 200 yards (meters) away, a sophisticated sensor tracks the movements of both the airplane and the rocket.

These folks aren't RC hobbyists. They're employees of Boeing SVS, part of Missile Defense Systems' Directed Energy Systems unit, responsible for advancing directed energy technology—a huge part of tomorrow's weaponry. They're testing the hardware and algorithms used in the Dual Line of Sight (DLOS) tracking system. This system is designed to extend the reach of Boeing's laser systems without compromising precision. The plane simulates an incoming unmanned aerial vehicle challenging the tracking system. The rocket simulates an incoming mortar round.

Because laser beams affect only what they touch, the DLOS system allows warfighters to focus on targets, without affecting nearby property or bystanders. The system also can repel incoming mortar rounds, giving warfighters a lifesaving advantage.

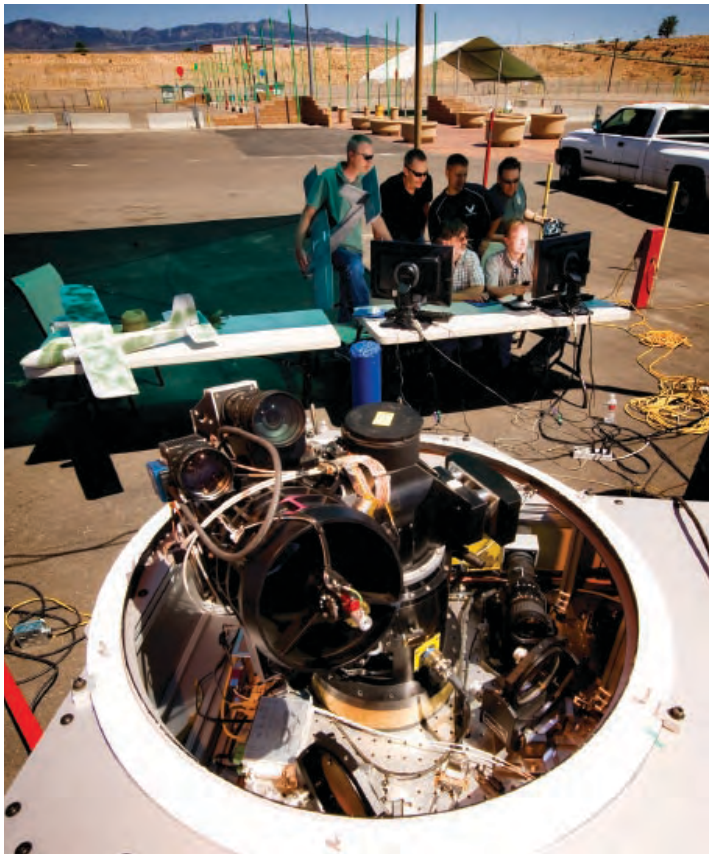
The DLOS laser-relay demonstrator will be suspended half a mile (0.8 kilometers) in the air, below a small blimp. It has a receiving telescope, designed to pick up a ground-based laser's high-energy beam, and a sending telescope. Looking through the latter, a remote operator can patrol the territory below. And if, for example, someone launches an unmanned aerial vehicle (UAV), the operator can in seconds dispatch a speed-of-light laser beam up from the ground laser and through the relay system to the UAV, destroying it in flight.

With Rick Lapinsky, Boeing technician, at the controls, Drew Riedle, Dual Line of Sight (DLOS) program manager, launches a test at Albuquerque's Balloon Fiesta field. The radio-controlled plane simulates an unmanned aerial vehicle challenging the DLOS tracking system. Lapinsky and Riedle have attached a foot-long model rocket to the plane by a 20-foot line to simulate an incoming mortar round. Riedle said these models "are harder than any real target we'll track." BOB FERGUSON/BOEING

"We've totally rebuilt and light-weighted DLOS to 700 pounds and tested it," said Drew Riedle, DLOS program director. "We hung it from a crane and maintained the connection between a surrogate laser and the receiving end for several hours—while doing surveillance with the sending end, tracking moving objects on the ground."

Matt Ross, embedded-software engineer, described what's next: "If we are successful as planned, by this fall we will have proven that we can put to use these very pristine tracking capabilities we have been refining to shoot down an unmanned aerial vehicle by relaying a beam from a directed-energy weapon—to put energy on a target and only the target [not its surroundings]."

"It's time for the payoff—after years of investment—for (warfighters) to be comfortable with lasers, and for the laser to save lives," said Lee Gutheinz, site executive and program director, Boeing SVS Inc. ■



RIGHT: Dwarfed by Rocky Mountains in the distance, this gimbal (multidirectional-movement-and-balance mechanism) points a camera aligned with DLOS's low- and high-resolution telescopes. The system automatically and smoothly tracks a radio-controlled model airplane flying fast circles and figure eights a mere 100 to 200 meters/yards away—and even tracks the model rocket careening frantically behind it. Using a computer mouse and joystick, Boeing SVS employees (seated, from left) Frank Zoltowski, optics engineer, and Matt Ross, embedded-software engineer, and (standing, from left) Chris Kiser, embedded-software engineer, Riedle, Jeff Waitkus, field-test engineer and DLOS deputy program manager, and Lapinsky test algorithms they updated since the last field-testing trip.

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Frank Zoltowski, optical engineer, studies the rugged design of the mirrors on the new Dual Line of Sight (DLOS) demonstrator system. When carried aloft, DLOS takes a high-energy laser beam sent from the ground and precisely redirects it toward targets such as improvised explosive devices, shoulder-fired missiles, unmanned aerial vehicles or in-flight mortar rounds.

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