

Holographic Diffraction Sight For Law Enforcement and Military

Weapon sights using an illuminated reticle pattern, often a red dot, and mounted on the Colt M16/AR-15 series now prevail in both law enforcement and military circles. The U.S. Army purchased 80,000 Aimpoint Comp M electronic reflex sights in 1997 for their M16A2 M4 assault rifles. There is, in my opinion, a better alternative.

EOTech, Inc. (Dept. SOF, P.O. Box 134010, Ann Arbor, MI 48113; phone: 734-994-1200, ext. 3661; fax: 734-741-8868; Email: vdonohue@hotmail.com) developed and now markets exclusively to law enforcement and military personnel and agencies, the amazing Holographic Diffraction Sight (HDS). The HDS features advanced technology previously encountered only on the heads-up displays of weapon targeting systems found in the cockpits of modern fighter aircraft.

Holography is the technique of producing visual images by means of wave-front reconstruction, especially by using lasers to record on a photographic plate or screen from which a three-dimensional image can be projected. A hologram, or holograph, is the pattern or image generated in this way. EOTech's revolutionary HDS uses a hologram of a reticle pattern recorded on a heads-up display window. When illuminated by laser (an acronym which stands for "Light Amplification by Stimulated Emission of Radiation") light, the holographic image becomes visible at the target plane, where it remains in focus with the target and provides instant target acquisition.

EOTech, Inc., which was founded in the summer of 1995, is a subdivision of the Environmental Research Institute of Michigan (ERIM). ERIM, a non-profit R&D organization, is now 50 years old. For the first 25 years of its existence it was part of the University of Michigan. With 425 scientists on its staff and a support staff of 200-300, ERIM conducts core research and development for the U.S. Department of Defense, NASA, and the intelligence community (NSA and CIA). ERIM concentrates on image processing and sensor technology, and more recently, battle surveillance equipment.

ERIM is a think tank which develops and conducts feasibility studies, but does not manufacture equipment. Ninety percent of their work is classified. Holography was invented at ERIM in 1962 by Dr. Emmett Leith. The original Holographic Diffraction Sight was developed under contract with Wright Patterson Air Force base (the Air Force's R&D center) for deployment on helicopter gun ships in Vietnam and for anti-aircraft weaponry. At that time the unit cost approximately \$800 and had a 4x5-inch window, which made it unfeasible for small arms applications.

This holographic technology was shelved and then revived in 1994. An agreement was reached in 1996 with Bushnell for the commercial market. In 1998, EOTech introduced the archery equivalent of the HDS and they have recently entered the law enforcement and military arena. They have strong alliances with DefTech, Sage International, Bushmaster, Armalite, Heckler & Koch and General Dynamics (where it has been mounted on the GAU19 five-

barrel, .50 caliber Gatling gun). GG&G (Dept. SOF, 3602 East 42nd Stravenue, Tucson, AZ 85713; phone: 520-748-7167; fax: 520-748-7583; Email: gggaz@aol.com), which makes rear sights for the M16A2E4 and M4 flat top receivers that cowitness with the HDS, is an EOTech distributor.

Manufactured entirely in the United States, the EOTech HDS is a transmission-type hologram and thus projects what appears to be an illuminated reticle pattern directly on the target. Yet no forward light is actually projected. To me, the HDS's most important salient feature is the operator's ability to acquire the target without regard to a cheek weld or consistent alignment of the shooter's eye, the

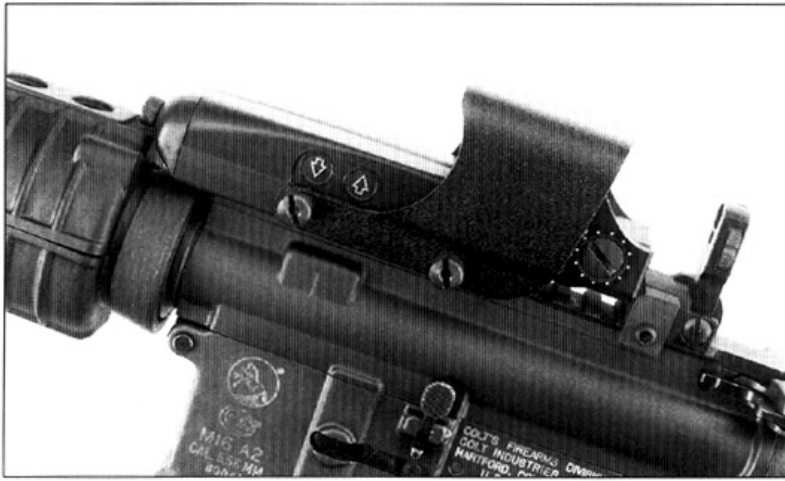
sight's reticle pattern and the target. No matter how you move your head and eye about, the reticle pattern will always remain in exactly the same place on the target. This is an incredibly important phenomenon, especially when rapid and accurate target acquisition under stress becomes literally a matter of life and death during a gunfight.

Mud or other obstructions do not affect the operator's ability to effectively see the reticle pattern and engage targets, even if the display window is almost completely covered. The heads-up display window is 3/8-inch thick, with three panes of glass bonded together to form a shatter-proof laminate. The two outside panes have an antireflective coating. Reticle patterns can be changed in the field in less than 30 seconds with no more than a 2 to 3 MOA change in the point of impact. There is a wide range of interchangeable reticle patterns. The HDS sent to us for test and evaluation was equipped with the standard reticle which is a two-dimensional ring (65 MOA in diameter) with tick marks and a center 1 MOA dot. The exit aperture is 45 degrees. There is provision for attaching filters to obtain night-vision compatibility.

After adjustment of elevation and windage zero, you simply look through the sight assembly's window, place the reticle image on the target, and fire. The eye relief on the HDS is an incredible 1 inch to infinity. The elevation adjustments are in 1/2 MOA click increments and those for windage adjustments are in 1/4 MOA-click increments.

In a tactical environment the operator's peripheral vision is almost unlimited and up to 50% on each side of the target. That's because there is no tube, the reticle window remains close to the eye, and the large reticle pattern neither covers up or obscures the target. As no light is cast upon the target, there is no signature to compromise the operator's position. Glint screens are not necessary.

The HDS has 20 levels of brightness adjustment. When the sight is turned on, the brightness level is automatically set at the factory to level 15. The user can program the sight himself to turn on automatically at level 1 (minimum brightness setting) or level 20 (maximum brightness setting), but he must do so each time the sight is turned on or the sight will move back to the factory default setting. The HDS is also equipped with a battery check indicator.



There is also an auto shutdown mode and the unit will automatically shut itself off eight hours after the last push-button control has been pressed. The user can also program the HDS for a two-hour shutdown mode. The HDS is powered by two commonly available Type N 1.5-volt batteries. As the batteries run down the reticle brightness will remain at the set intensity and then shut down abruptly.

Options for two different mounting interfaces that do not require a tool are available. Although it is slotted, the battery cap screw can be removed by hand as well. A rugged, steel roll bar hood is also available. The HDS costs about \$350.

Recoil testing equipment at the EOTech plant simulates the recoil of the .454 Casull (3,500 Gs for 0.5 milliseconds). The first 22,000 HDS units produced were all cycled on this test bed.

The HDS can be mounted for co-witness with emergency iron sights. We attached the HDS to an M16A2, equipped with an upper receiver (from the Colt law enforcement AR-15A3 Tactical Carbine, #AR6721) that features a 16.1-inch heavy barrel (chrome-lined with 1:9-inch twist) and removable carrying handle. Attached directly to this flat top receiver's MIL-STD-1913 rail, a GG&G MAD (Multiple Aperture Device) BUIS (Back Up Iron Sight) was mounted to the rear of the HDS and, together with this upper receiver's GG&G folding front sight, zeroed at the range for co-witness with the HDS.

The MAD was originally developed to fulfill a request from Naval Surface Warfare for a back up iron sight that provided both a large and small aperture on the same plane and would thus be zeroed to the same point of impact. The MAD has four apertures, two of each size (so that rotating the aperture in either direction will bring the next size into view). The small aperture diameter is 0.073-inch and the large aperture is 0.199-inch in diameter. It uses the standard Colt windage knob and windage screw. One click of the windage knob provides approximately 0.48 MOA change when mounted on the M16A2E4 rifle and about 0.65 MOA on the M4 carbine.

The MAD mount body is manufactured from 6061 T6 aluminum, hard anodized per MilSpec. The stem and aperture disc are made from 4140 steel, black magnesium-phosphated per MilSpec. The MAD overhangs the rear of the receiver by 0.200-inch. This provides a lip so that the sight can be easily deployed even with a gloved hand. The unit locks in the up and down position with a positive detent. It sells for \$141.

Technology in these areas moves rapidly, but for now the hot ticket for the M16A2E4, M4 and AR-15A3 is without doubt the EOTech HDS together with the GG&G MAD BUIS. The HDS clearly outperforms the Aimpoint, Trijicon and C-More, with advanced technology and superior optical attributes.

— Peter G. Kokalis ✕