



# HOLOgraphic Weapon Sight Product Introduction

NDIA/EOTech presentation

June 2004

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# NDIA/EOTech discussions

## ■ Agenda:

- Background on EOTech
- Technical description of HOLOgraphic Weapon sight
- Overview of features/functionality
- “Futures” or Adaptations to Core sight

# EOTech's technical roots ... from the Environmental Research Institute of Michigan

- Founded in 1946 - Originally part of the University of Michigan
- Nonprofit Research and Development Institute (at peak 600+ engineers)
- Specialties - Image Processing, Remote Sensing, Battlefield Surveillance, & Advanced Optics
- Core Contracts with Intelligence Agencies, NASA, etc ...mostly classified programs
- Some Industrial Applications - Collision Avoidance/Medical Imaging/Metrology
- Holography 1<sup>st</sup> demonstrated at ERIM in 1962

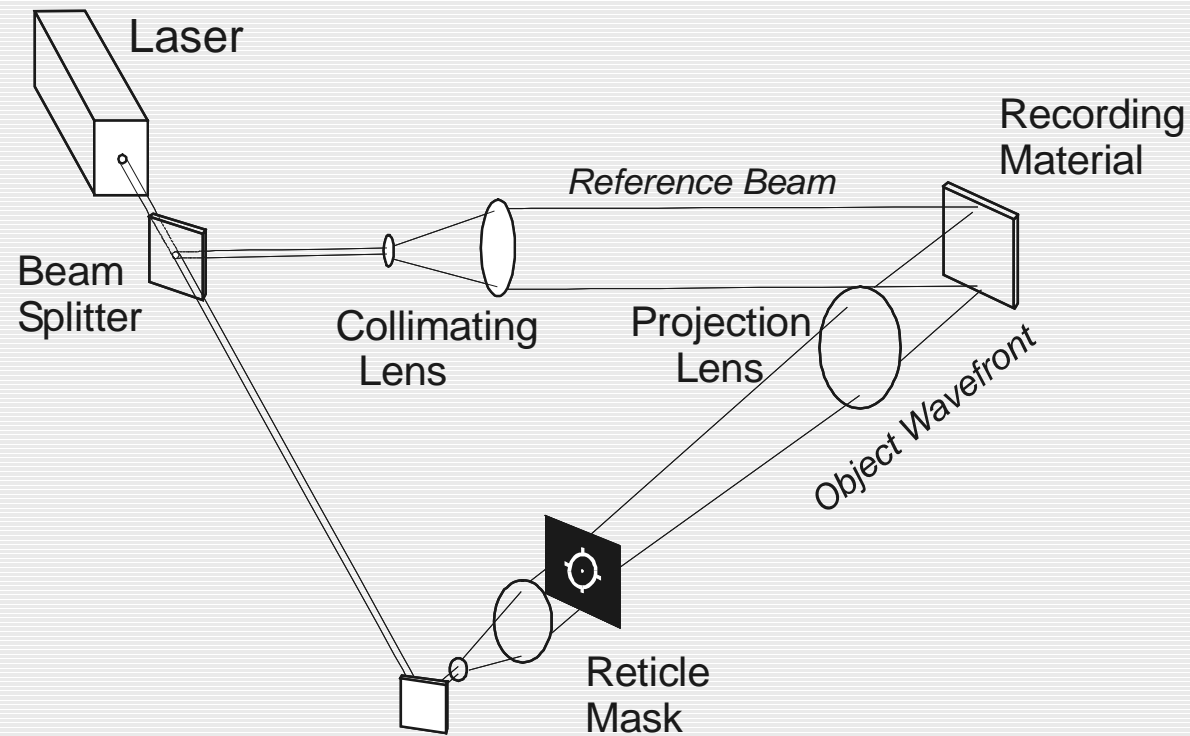
# EOTech Summary

- Invented, designed, & manufacture the 1st Holographic based weapon sight
- Patented technology & proprietary manufacturing position
- All technology and manufacturing rights reside with EOTech
  - manufacture all transmission holograms in house (2 per sight)
  - perform assembly, Q/C, qualification & testing in house
- Outsource all sub-components
  - 85% of component cost fabricated in US
  - 40-45% in SE Michigan
- 200,000 sights shipped in 7.5 Yrs of production ...
- Large DoD contracts since Dec 03: ARDEC, MARCORSSYSCOM, USSOCOM SOPMOD

# History of HOLOgraphic Sight Development

- ERIM invents laser holography in 1962
- Prototype sight completed for US Military in 1971 (ERIM contract)
  - helicopter gunships for Wright Patterson (Air Force R&D) contract
  - anti-aircraft weaponry for Army contract
- In early 1990's ... Laser miniaturization and diode cost reduction made the sight "feasible to market"
- In 1996, partnered with Bushnell - released commercial HOLOsight
  - won top awards at SHOT show
  - Generation 1 HOLOsight did not meet requirements for military application
  - Army awarded Aimpoint M68 contract
- Generation 2 HOLOsight released in Jan'00 ... for commercial markets
  - based on modular design ... built with military upgrade in mind
  - solved NV, AA, weight, length issues, but kept same core optical performance
- Official release of Gen 2 Military grade HWS in '01

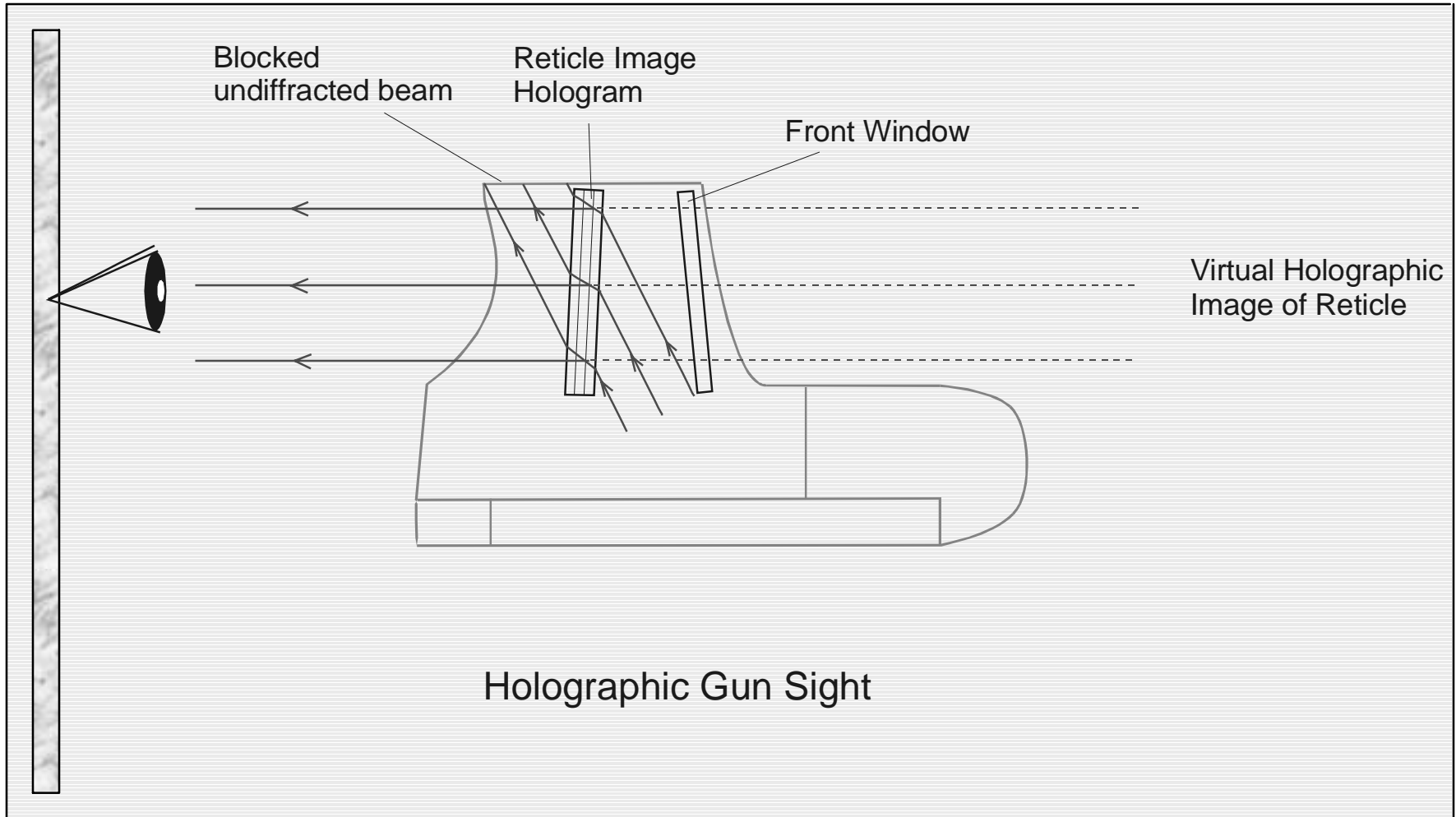
# Holographic Gun Sight – Basic Concept



Recording of Reticle Hologram

# Holographic Gun Sight – Basic Concept

(continued)



# EOTech Alliances

- Bushnell is marketing partner for commercial shooting sports sector (since '96)
- ITT relationship secured for tandem operation behind NV monocular
- Diemaco places HWS on C7/C8 weapon ... resell only in NATO countries (i.e. Holland, Norway, and Denmark)
- FN Herstal/Armor Holdings/Sage/CTS on their respective Less Lethal Launchers - with ranging/trajectory reticle
- Smaller M16/M4 suppliers (7-8 mfgs) as well as IMI/Singapore Tech as “system integrators”
- General Dynamics on Tri-barrel .50 Electronic Gatling Gun for Helo/Hummer applications; and XM-312 and 307 sighting system
- Informal arrangements with H&K, Litton & Sig ... quote as option to their weapon/NV platforms
- Working with Talley Defense & Bofors on light armour launcher with specialized reticle image



# HOLOgraphic Sight Product Line

- M550 - a military grade unit with NV compatibility & AA battery option
  - Both versions listed on GSA
- Model 510 – a tactical law enforcement unit without NV (N or AA battery option)
- Model 510 for specialized less lethal launchers
- Model 500 – called Bushnell HOLOsight for resell to commercial firearms market
- Model 520 – archery product sold direct by EOTech thru its commercial channels
- Various weapon mounting platforms to ensure secure positioning on weapon platforms

# HWS's #1 Feature - Speed

- Full, large, “see through” reticle images provide quicker eye recognition ... easier and faster than a single dot
  - Speed advantages over Red Dots are very apparent ... especially when users or targets are moving
  - A more “forgiving” reticle & sight picture
    - Improper cheek weld, sloppy weapon presentations
    - Awkward shooting position or engaging around physical barriers
  - Standard pattern provides no compromise between speed & precision accuracy
    - 65 MOA ring for natural centering
    - 1 MOA Dot -smallest in the industry
- Reticle does not “cover up” target area at 300m+ ranges

# Heads Up - Eyes Searching Vision

- Rectangular Heads Up Display - like looking through a windshield (a greater FOV)
- Tubeless design eliminating “blind spots” or constricting view
- Streamline design with no blockage from battery compartments, mounting rings, lens protectors, ...
- True 2 eye open shooting is achieved
- Maintain Use of Peripheral Vision – assists in engaging multiple threats
- Optical Field of View is between 25-50% greater than Red Dots

## Other Key HOLONight Features

- No physical blockage of light source to make Sight inoperable (exposed light source)
- Functional if window covered with mud, snow, sand, water, etc. - **AND** - Zero maintained
- “Shatterproof” laminate 3/16” thick - bonding of 3 optical surfaces creating a “hardened” Heads Up Display
- Functional if window is broken/cracked
- Elimination of Muzzle Side Signature
  - No light emitting beams to give up user’s position
  - Reflective glare is eliminated due to A/R coated flat surface
  - Non -detectable even with muzzle side NVGs

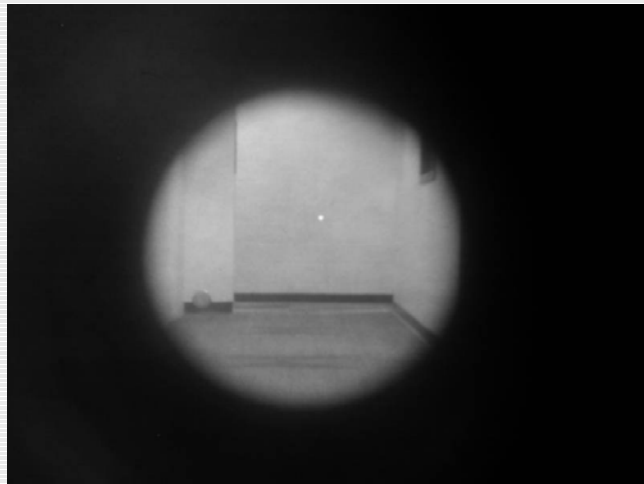
# Compatibility with Night Vision

- Works in tandem with Gen I – Gen III+ intensifier tubes
- Tube saturation is eliminated – no “halo” affect of reticle on target scene
- A passive weapon aiming system - no user signature
- Flexibility to witness reticle with either head mounted or weapon mounted NV monocular
- Minimal target obstruction with 1 MOA aiming dot ... improved accuracy

# HWS Night Vision specifics

- Instantaneous drop to NV mode – fractions of a second
- 10 settings within NV mode – supports 128:1 brightness contrast ratio
  - Variances in tube sensitivity
  - Ambient light conditions
  - Variances in human eye sensitivity in NV mode
- 30 total settings – 20 for normal day/low light operation (28,000:1 contrast ratio)
- Toggle between NV and normal day operation
- Auto-turn-on for NV mode with setting at NV brightness level 4

# Operation with Night Vision Scope



Seen through M-68



Seen through HWS

# Additional HWS Capabilities

- Parallax Free optics - eliminates critical eye, sight, target alignment
  - Eliminates multi-plane focusing error
  - Cheek weld is not needed to engage
  - Very simple for soldiers to use .... A point and shoot weapon optic
- Unlimited eye relief - adaptable to various weapon platforms or user preferences
- Common AA battery source – unique among Military Red Dot competitors
- No reticle “wash out” in bright sunlight, white targets, or desert/artic conditions ... Reticle clearly visible in ALL types of lighting conditions
- Tool-less User Interfaces for battery change-out, mounting, W/E adjustments, etc.



# Battery options & electronic features

Universally available AA batteries (M552 and M512 only)

- Use Lithiums, Alkaline, or re-chargeable AA
- Adds 1 inch to length – spatial issue on Picatinny rail
- Common battery source and interchangeable to NV, Flashlights, IR pointers, GPS, etc ...
- 5X greater battery life with Lithiums
  - At default (Level 4) to 800 hours at 70 F
  - At 7 F to 400 hours – at default setting
- N Alkaline battery option available ... used when space is limited (sub guns)
  - available at K-Mart/WalMart at \$3/set (camera batteries)
  - Battery Life ranging from 200 hours (default setting 12) to 500 hours (at setting 5) at room temperature
- Auto Battery Check upon start-up with blinking reticle at 20% or less
- Auto shut down at 8/4 hrs

# Environmental Parameters

- Operating Temp = -40 to 150 F; Storage to -40F
- Waterproof & Submersible
  - M550 to 33 ft (10m)
  - M510 to 10 ft (3m)
- Fog-proof internal optics
- Scratch Resistant, A/R coated and maintenance free optical surfaces
- Corrosion resistant components
- Hardened/Anodized finish
- Typically used solvents do not affect operation

# Durability

- Survives 10 ft drop tests - holds zero to 1-2 MOA
- Tested in various environmental chambers including salt spray, thermal shock, pressure, etc.
- Recoil testing at 3,300 G's/0.5 Msec (.454 Casull) with 100% sampling
- Field tested on heavy resonance weaponry – General Dynamic's Tri Barrel .50 Gatling Gun

# Mounting Accessories

- Interfaces to standard Picatinny rail for Flattop configurations ... with flip up iron sights (co-witnessing)
- Repeatable to within 1 MOA upon re-mounting
- M-16A1 fixed carrying handle configurations
  - Cantilever mount to achieve co-witnessing
  - Carrying handle mount ... access to iron sights or for NV mounting
- For most weapon platforms - no changes to the receiver or user's trained cheek weld position
- 1 thru bolt/clamp ... allows user flexibility for placement anywhere along the rail
- Mounting brackets/rings available for ITT PVS 14 and Litton 983 monocular tandem setup

# Upgrades and Releases in CY03

- New battery contact design ... standard on all military models
- New membrane switch design for M550
  - Much sharper tactical feel ... especially with cold weather gloves
  - Larger switches ... much easier to operate
  - Separation of NV switch with round inlay ... avoid user error
  - Now standard on all military models
- Standardized to 33 ft water immersion depth
- A battery cap tether design is being worked on ... no decision to offer yet
- Release of 2 x less lethal reticle images ... for Sage and FN Herstal
- In testing for a hydrophobic lens coating to minimize external condensation and raindrop occlusion

# Adding Magnification for Long Range Engagement

- Holographic sight provides true point source as aim point
- Dot size limited only by eye resolution to 1 m.o.a.
- Placing 4X scope behind sight magnifies target scene 4X but dot size remains 1 m.o.a.
- Effective dot size is 0.25 m.o.a. or 1 " at 400 yards
- Aiming dot provided by holographic sight, placement of magnified scope not critical
- Not true with red-dot sight where image of LED is projected
  - If magnified scope is placed behind sight, dot is magnified with target scene – no gain in aiming precision
  - If magnified scope is in front of sight, target scene is shifted relative to aiming dot, re-zeroing is required. Long eye relief also severely restricts FOV

# Optical magnification for longer range engagement

- CQB/MOUT capability is seriously compromised by operating a variable power 1X-4X scope at 1X as CQB/MOUT optics.
- Better solution is to add 4X magnification to a CQB/MOUT optics to provide long range engagement capability
- The unique feature of a holographic reticle makes such an approach feasible
- Together with a night vision scope, the sighting system meets the needs of DoD ground forces in various mission scenarios

# HWS used in Different Configurations



CQB



With Night Vision Scope



With Backup sight



With 4X scope



# Summary of HWS Attributes

- Superior Product for a CQB/MOUT weapon sight - optically, user features, enhanced user performance
- Clear performance gain in tandem with NV and magnified systems
- Pricing is comparable to military grade Red Dots
- No change to M-16 style weapons ... all mounting/co-witness platforms are in place
- Adaptability to a host of small arms weapon platforms ... with no weapon modification
- Flexibility to adapt to crew-served weapons platforms
- Rich technology company with strong electro-optics resources