NON-LETHAL DEFENSE IV

ANTI-PERSONNEL LASER ILLUMINATORS:

EFFECTIVENESS TESTING OF HALT AND DISSUADER

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Briefing Outline

- AFSFC laser illuminator CONOPS
- The SABER 203 and lessons learned
- The HALT and Dissuader™* laser illuminators
- Technical evaluation of Dissuader™
- Recommendations for using Dissuader™
- Legal and medical clearance
- Fielding laser illuminators
- Direction of laser illuminator programs

* COTS product of Science & Engineering Associates, Inc.

Support Agencies

◆ AFSFC/SFO	PROGRAM DIRECTION
◆ OSD PSEAG	FUNDING
◆ DOD JNLWD	FUNDING
◆ ESC/FD	FORCE PROTECTION C^2 SPO
◆ ACC	REQUIREMENTS
◆ AF/JAI	LEGAL REVIEW
◆ AFMOA	MEDICAL REVIEW
◆ AFRL/DELS (KIRTLAND AFB)	LASER SYSTEMS CONSULTANT
◆ AFRL/HEDO (BROOKS AFB)	BIOEFFECTS, LASER SAFETY
◆ 46TW	CTE
◆ DET 2 AFOTEC	OT&E

Lethal Force

40mm Beanbag
40mm Wooden Baton
40mm Foam
40mm Sponge Grenade

12-ga. Beanbag
12-ga. Wooden Baton
12-ga. Single Pellet
12-ga. Pellets

RCS (CS gas)

Stingballs

Flashbangs

Baton

Oleorisin Capsicum (OC)

Sticky Foam

Barrier Foam

Physical Force

HALT

DISSUADER™

Expressed Threat

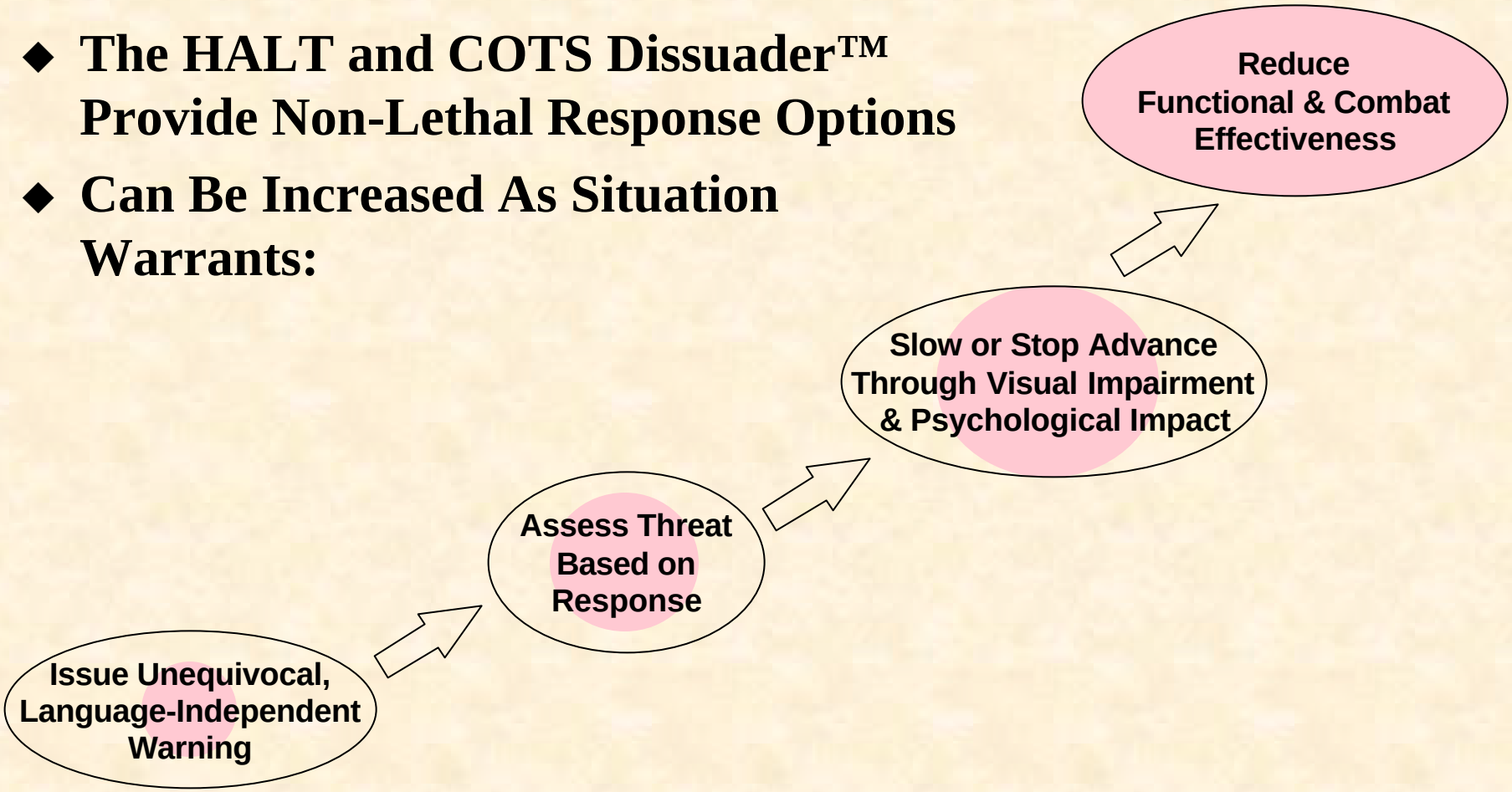
Implied Threat

Physical Presence

No Force

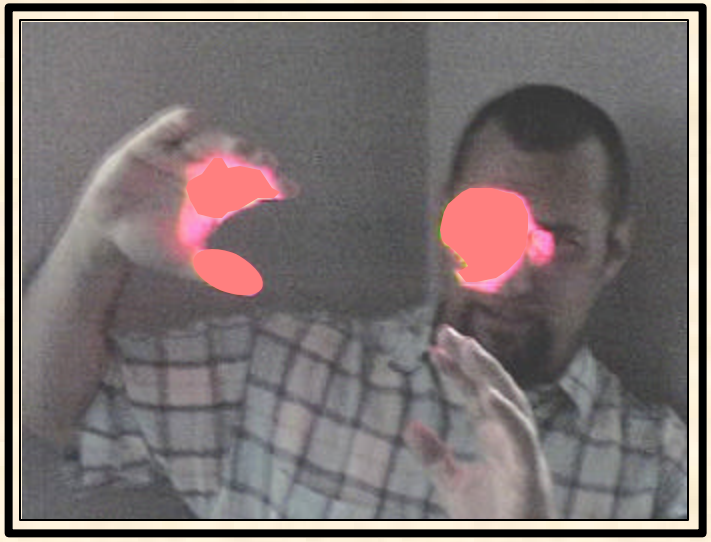
Laser Illuminator Capabilities

- **The HALT and COTS Dissuader™ Provide Non-Lethal Response Options**
- **Can Be Increased As Situation Warrants:**



Laser Illuminator CONOPS

- **The concept of operations (CONOPS) was written by HQ AFSFC/SFOR**
  - **Illuminate the threat area**
  - **Tag the intruder with a bright red laser spot**
    - > **Unequivocal language-independent warning**
    - > **Signal intruder intent**
  - **Impede the intruder's progress by shining the beam into their eyes (visual jamming)**

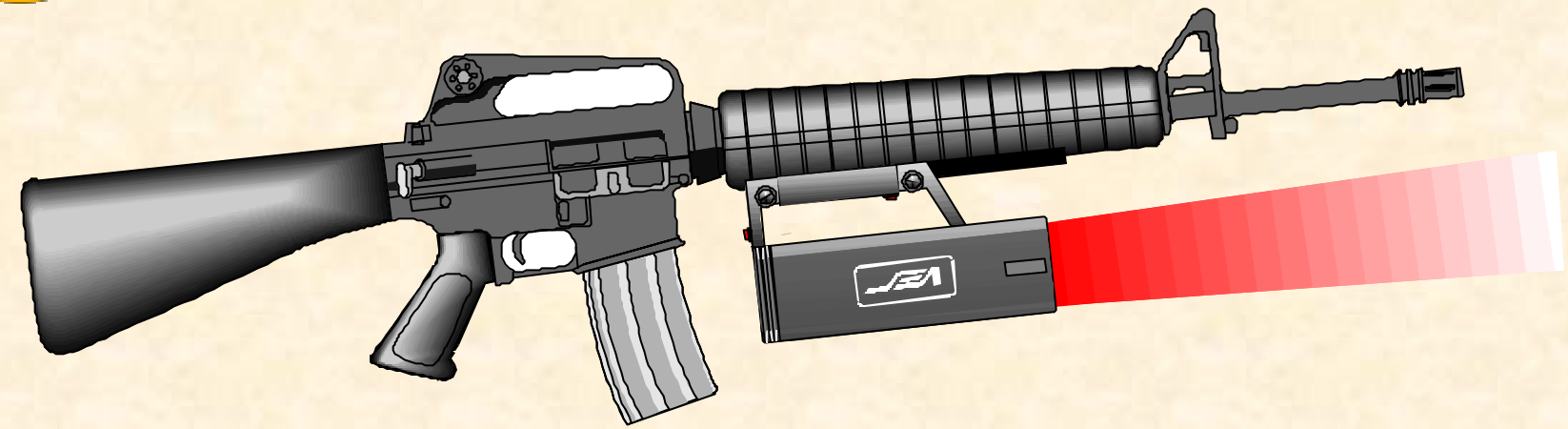


SABER 203 Laser Illuminator

SABER 203 - Lessons Learned

- **SABER 203 laser beam was not bright enough for all tasks**
  - **Effectiveness limited by optical design and eye hazard zone**
- **The laser beam diameter was too small to keep in the eyes of a moving target**
  - **Slight head movement avoided the laser glare cone**
  - **Laser illuminators need a beam expansion capability**
- **The operator's position was compromised when the SABER lighted up a target**
  - **SABER is a NLW and not designed for use with live fire**
  - **The psychological ramifications of tagging the subject with a red light may be more important than visual jamming**

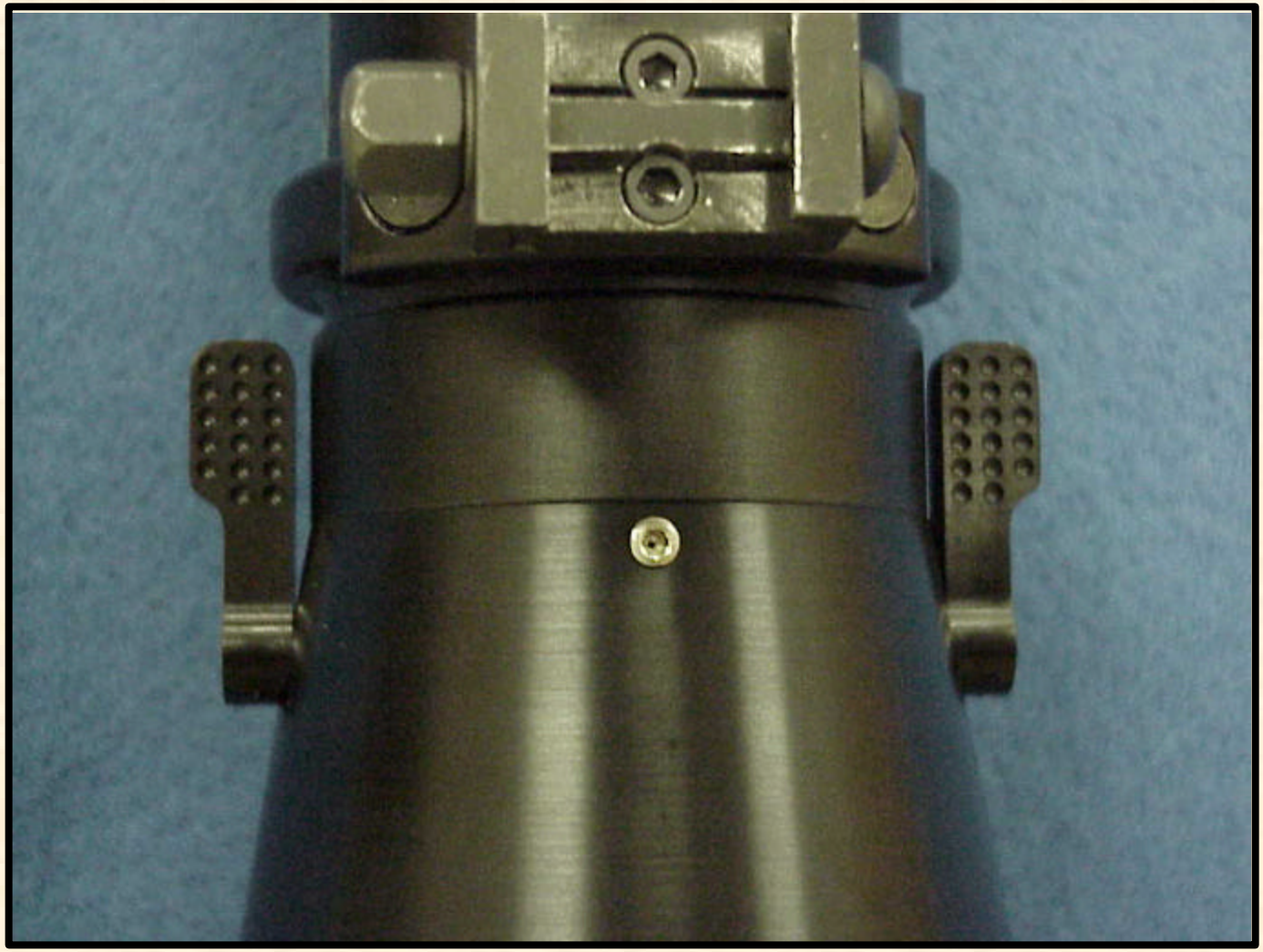
HALT



- **Hinder Adversaries with Less-then-lethal Technology**
  - **Similar optics as the Dissuader™**
  - **Universal rail mount to meet multi service needs**
  - **Discrete two field-of-view focusing design**
    - > **One finger operation**
    - > **Actuating levers on both sides**
    - > **Narrow FOV - tagging at long ranges**
    - > **Wide FOV - visual jamming and disorienting at short ranges**

HALT Laser Illuminator

HALT Actuating Levers

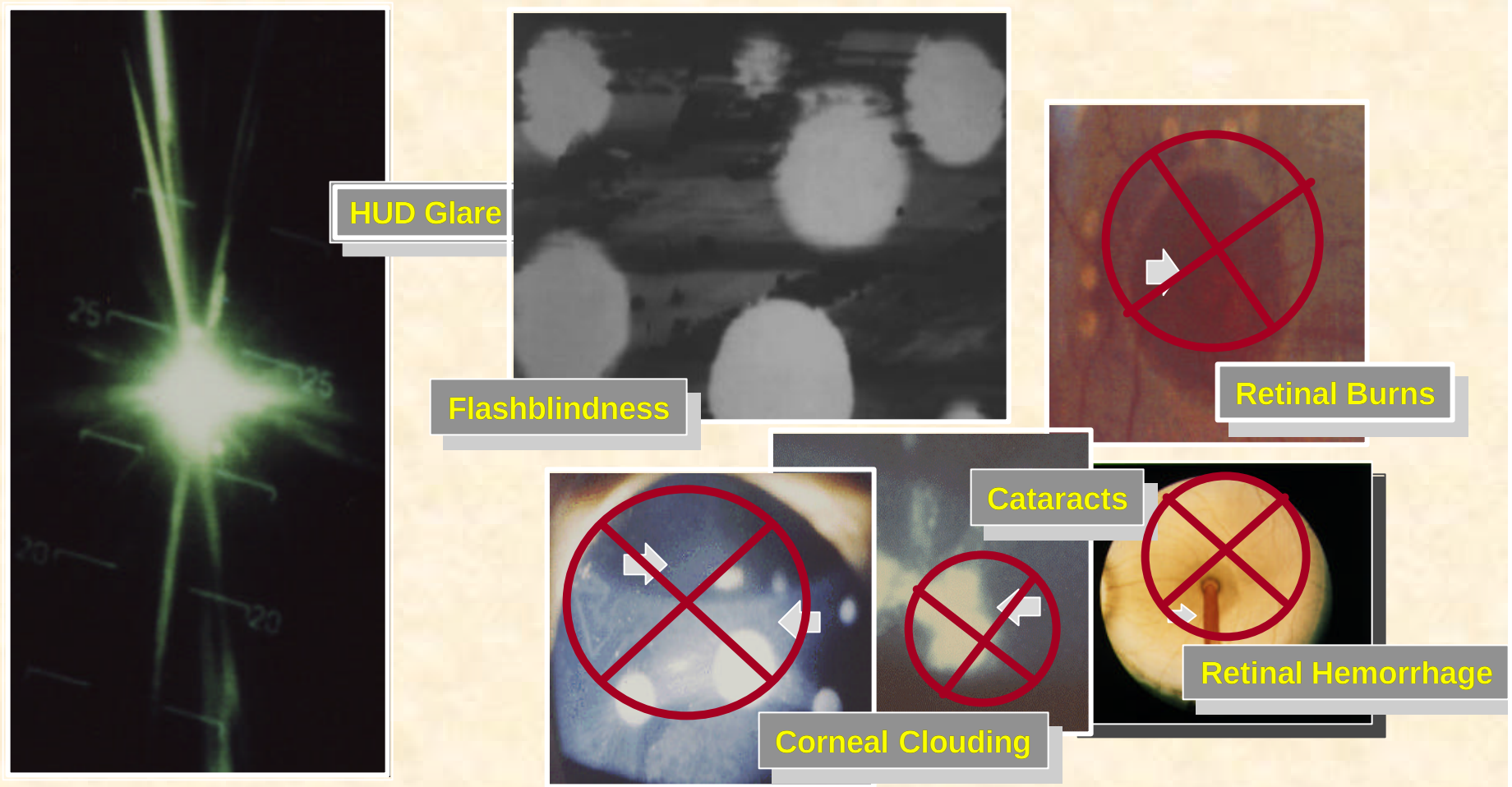


The Dissuader™

Dissuader™ Specifications

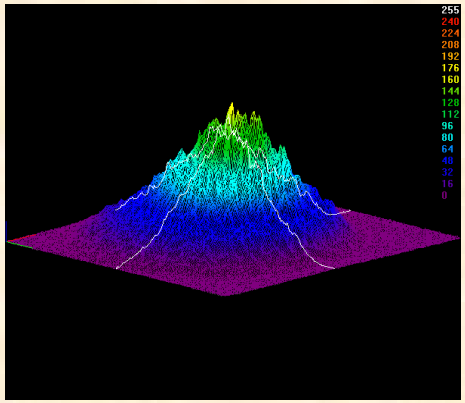
- Dissuader™ handle houses a 250 mW diode laser
- Laser produces approximately 68 mW at the aperture
- Eye-safe at the aperture for a 1/4 s exposure
- Large aperture (2.8” vs. .9” for SABER)
- Laser beam emits at 650 nm (red)
- Continuous wave (CW) for first 10 s of operation
- Beam flickers at 8-9 Hz after 10 s until the activation button is released

PERSONNEL SUSCEPTIBILITIES
VISUAL JAMMING
Glare and Flashblindness only

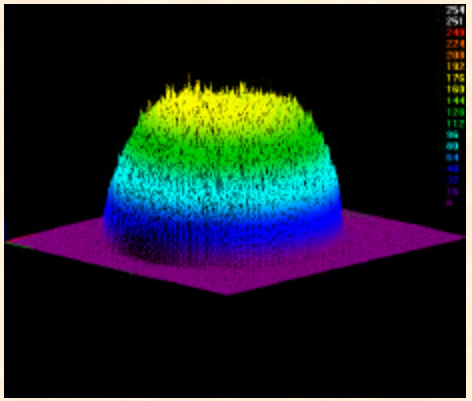


Medical Risk Analysis

- **AFRL/HEDO characterized forty Dissuaders in the focused position before CTE**
  - **Output power, beam divergence, and beam profile**
  - **Determined the irradiance at the aperture - all devices were measured at or below the 1/4 s MPE**
  - **Maintains AF independent data base for future reference**
- **Human use protocol reviewed by Brooks AFB IRB and signed by HQ AFMOA**



SABER



DISSUADER

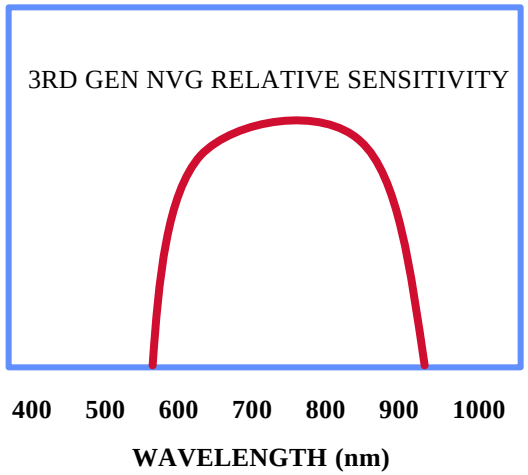
Dissuader™ Test Plan

- Combined technical evaluation (CTE) managed by 46th Test Squadron at Eglin AFB, FL C-3 laser range site
- One week test length
- Eight security force/federal marshal volunteer subjects from the Hurlburt/Eglin AFB area
- Laser eye exams at the Hurlburt optometry clinic
  - Dilated retinal exams before and after CTE
- AFRL/HEDO experimental tasks
  - Visibility threshold, glare cone determination, flashblindness testing, and the effect on a vehicle operator

Experimental Tasks

- **Visibility threshold**
  - **Daytime only**
  - **Fatigues and white shirt**
- **Glare cone determination**
  - **Daytime and nighttime**
  - **Focused and diverged positions**
- **Flashblindness testing during nighttime**
- **Effect of Dissuader™ on a vehicle operator**

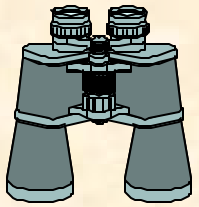
Effects of the Dissuader™ With Night Vision Goggle Wear



- **Beam highly visible from all angles through NVG**
- **Direct view of the beam causes NVG to "bloom"**
- **Dissuader™ could be used by NVG wearing SF to target intruder for live fire at night**

Viewing the Dissuader™ Through Enhanced Optics

- Viewing a laser source through a telescope or binoculars will increase the retinal irradiance by as much as the square of the magnifying power of the optical system, substantially increasing the hazard
- When viewed with a 7 x 50 direct-view optic (binoculars), the Dissuader™ beam falls below the:
  - 1/4 s MPE @ 116 m
  - 1 s MPE @ 141 m
  - 10 s MPE @ 193 m
  - 20 s MPE @ 212 m



Dissuader™ Operational Effectiveness

- **Daytime operational effectiveness**
  - **Visibility threshold less than 25 m during bright sunlight**
  - **Larger diverged beam is a minimal annoying glare source**
  - **Effectiveness increases somewhat on a cloudy day and near dusk and dawn**
- **Nighttime operational effectiveness**
  - **Effective glare source in the focused position on a vehicle operator at over 600 m during CTE**
  - **Dense glare cone in the focused position at 50 m**
  - **Minimal flashblindness effects at 50 m**
  - **Significant but less dense glare cone in the unfocused position at 25 m and 50 m**

Legal Review

- Legal review required of all new weapons during development and prior to acquisition
- Address concerns about misuse, collateral effects, eye safety/risk of injury data, and training/safety regulations
  - HQ AF/JAI coordinated the Dissuader™ and HALT legal reviews - prime criterion: “no unnecessary suffering”
  - Dissuader™ legal review was completed and signed by AF/JAG on 25 Jun 99 while HALT review will be signed in March 00
  - Review must demonstrate that the laser illuminator meets DoD and international guidelines on laser weapons
  - Dissuader™ and HALT do comply with the law of armed conflict obligations of the United States

Medical Approval

- **Dissuader™ eye safety package distributed to the medical and user communities by HQ AF Medical Operations Agency, Bolling AFB, DC on 29 September 1999**
- **AFRL/HEDO has assigned Dissuader™ and HALT a class 3b laser system designation requiring medical surveillance**
- **Eye examination is required by ANSI Z136.1-1993**
  - **Exam required when assigned to unit and following a suspected injury**
  - **No periodic or dilated retinal eye exams are required**
  - **Eye examination includes a medical history, monocular visual acuities, monocular Amsler grid exams, and monocular color vision tests**

Dissuader™ Eye Safety Recommendations

- 25 m minimum visual jamming distance in the focused position
- Use in the diverged position for visual jamming within 25 m
- Store unused devices in the armory and treat as a weapon
- Remove batteries after use to prevent accidental exposures
- Operational and eye safety briefing on entry into unit and annually
- Adhere to medical surveillance
- Comprehensive educational package - CD ROM

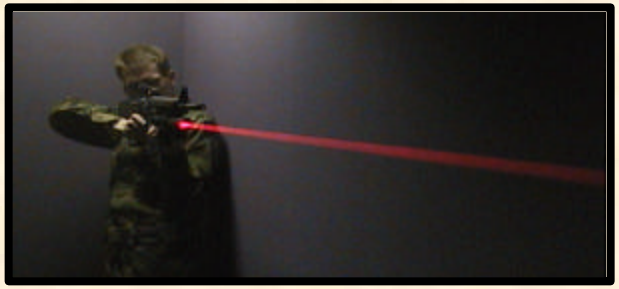
Fielding Laser Illuminators

- **Multi-service Pentagon senior level meeting (2 Dec 99) addressing dazzling laser illuminator training and doctrine**
  - **No further SecDef policy guidance indicated on the development and deployment of laser illuminators**
    - > **Dissuader™ and HALT are already compliant with the stated DOD policy and international guidelines**
  - **All lasers do not cause eye damage**
  - **Laser illuminators are eye safe - the homework has been done and is well documented**

Summary
Non-lethal Laser Illuminators: Where We Are Going

- **SABER 203 EMD program**
  - **OT&E deficiencies identified - program terminated**
- **HALT technical demonstration program and retrofit**
- **Dissuader™ commercial off-the-shelf product demonstrator**
- **AFSFC distributed HALT and Dissuader™ demonstrators in Feb 00 to MAJCOMS and other DOD organizations for operational evaluation**
- **Expected authorization for an EMD start on HALT or a military hardened Dissuader™ in Mar 00**

System Comparison



	SABER	Dissuader
l	650 nm	650 nm
MPE	2.55 mW/cm²	2.55 mW/cm²
POWER	28 mW	68 mW
APERTURE	0.9 in	2.8 in
NOHD	6 m	0 m
DIAM @ 50 m	35 cm	16 - 183 cm
PRF	8 Hz	8 Hz
IRRAD @ 50 m	66 mW/cm²	200 mW/cm² (focused)
FOCUS	Fixed	Variable