



U.S. Army Research, Development and Engineering Command



***TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.***

# ***Non-Lethal Fuzing Requirements***

**40mm Proximity Fuze Design Team**

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## **NON-LETHAL FUZE REQUIREMENTS**

- Non-Lethal requirements need to be understood to progress and refine a fuze design.
  - How is the fuze required to perform?
  - How will the munition be used?
  - How will it be identified as non-lethal?
- What is non-lethal?
  - What effect will non-lethal requirements have on fuzing?
- XM1158 fuze has been designed for non-lethal use.
  - For the XM1112 Airburst Non-Lethal Munition (ANLM)
  - Proximity function

## WHY NON-LETHAL?

# What are the Military's Escalation of Force options? Shout.....then Shoot?



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## WHAT IS NON-LETHAL? - DEFINITION



Weapons, devices, and munitions that are **explicitly designed** and primarily employed to **incapacitate targeted personnel or materiel immediately**, while minimizing fatalities, permanent injury to personnel, and undesired damage to property in the target area or environment. Non-lethal weapons are intended to have **reversible effects** on personnel or materiel. (paraphrased from DoDD 3000.3)

### Counter-Personnel



### Counter-Materiel



Key Attributes: Explicitly Designed, Immediate Incapacitation, and Reversibility

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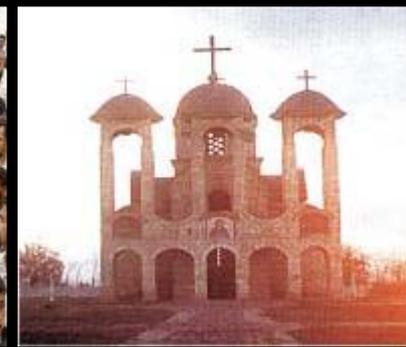
**MILITARY  
PRESENCE**

**NON-LETHAL  
WEAPONS**

**LETHAL  
FORCE**

**“NLWs Provide Operating Forces Needed Capabilities”**

*“Increasing RANGE increases OPTIONS”*



**Target selected  
individuals**

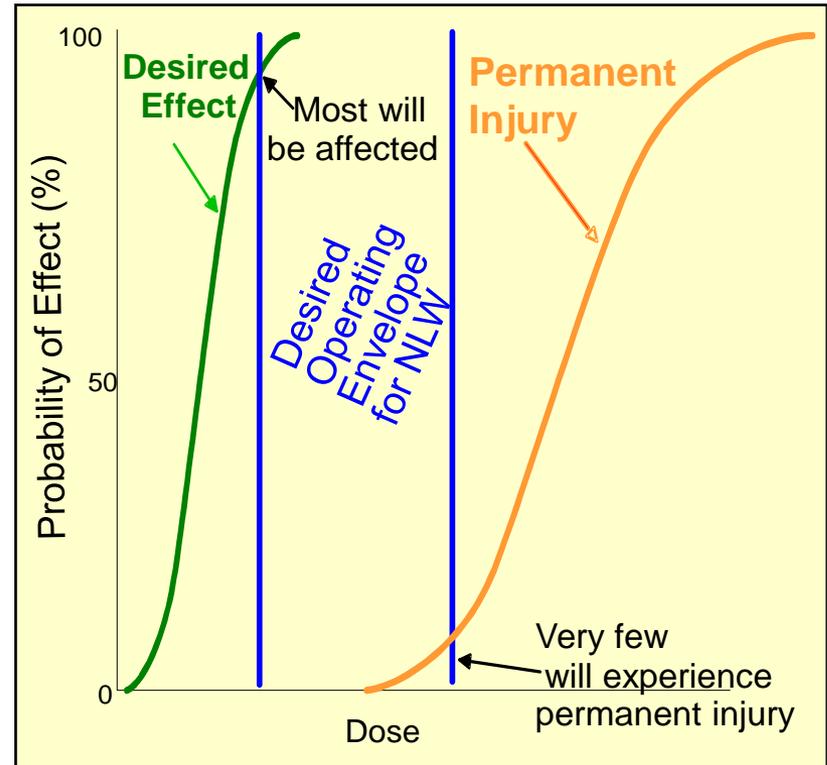
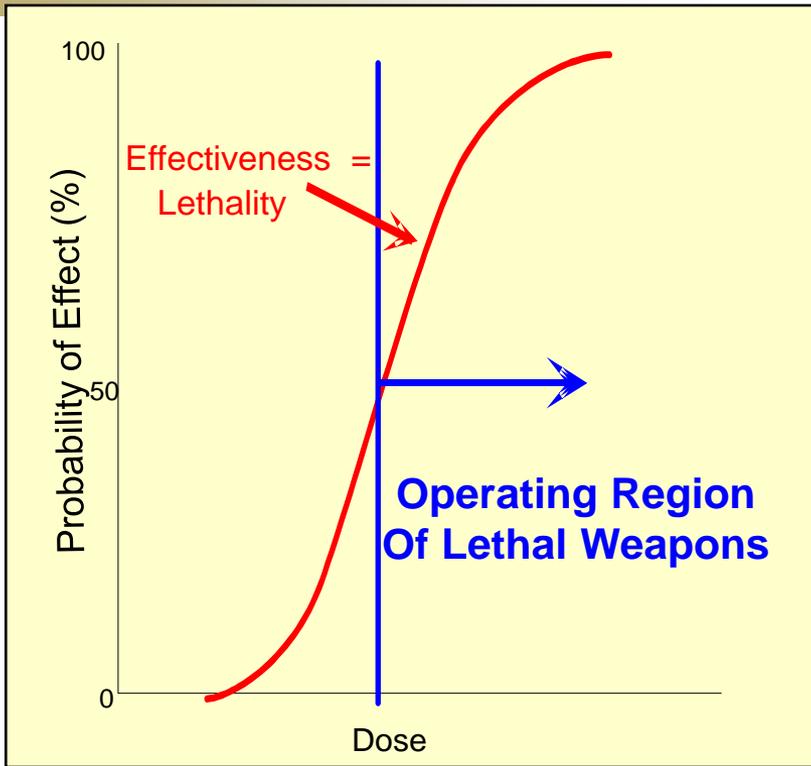
**Clear  
personnel**

**Control group  
movements**

**Secure without  
Destroying**



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- Non-Lethal Weapons have two competing objectives: cause desired effect, while minimizing permanent injury.
- Understanding human effects is critical for legal/treaty reviews, policy acceptability, and warfighter awareness.
- Human Effects Center of Excellence (HECOE), Brooks AFB, provides human effects models & expertise



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# DoD NON-LETHAL WEAPONS PROGRAM MANAGEMENT STRUCTURE



Mr. Mike Vickers ASD  
Special Operations/Low Intensity Conflict

USD(P)  
ASD(SO/LIC)  
Policy Oversight

USD(AT&L)  
Principal Oversight

Mr. Jose Gonzalez (Acting  
DepDir Land Warfare  
and Munitions)

## DoD Non-Lethal Weapons Program

DoD NLW Program  
Executive Agent  
CMC

General  
Conway

### Joint Non-Lethal Weapons Program

Chairman, JNLW  
Integrated Product Team  
(DC PP&O)

LtGen  
Waldhauser

Col Tracy  
Tafolla

Joint Non-Lethal  
Weapons Directorate

Service-Unique  
Non-Lethal Weapons  
Programs

Joint  
S&T

Joint  
R&D

Service  
S&T

Service  
RDT&E

Service  
Procurement

Service  
O&M

———— Direct Oversight

- - - - - Coordination

<https://www.jnlwp.com/>



Established by DoDD 3000.3 (1996)

## TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.



**Army Lead for NL  
Capabilities**



The U.S. Army Military Police School\* located at Ft. Leonard Wood, MO, has the overall lead for all Army Non-Lethal capabilities and corresponding combat developments and concepts.



**Project Manager  
for  
Close Combat  
Systems**



The Project Manager – Close Combat Systems located at Picatinny, NJ, has program management responsibility for Army Non-Lethal Materiel programs, and fielding the Army's Non-Lethal Capabilities Sets.



**Systems Manager  
for Army  
NL Technology  
Integration**



The Research Development and Engineering Command - Armament, Research, Development and Engineering Center (RDECOM-ARDEC), located at Picatinny, NJ, has responsibility for leading the coordination of Army Non-Lethal Technology integration & development.

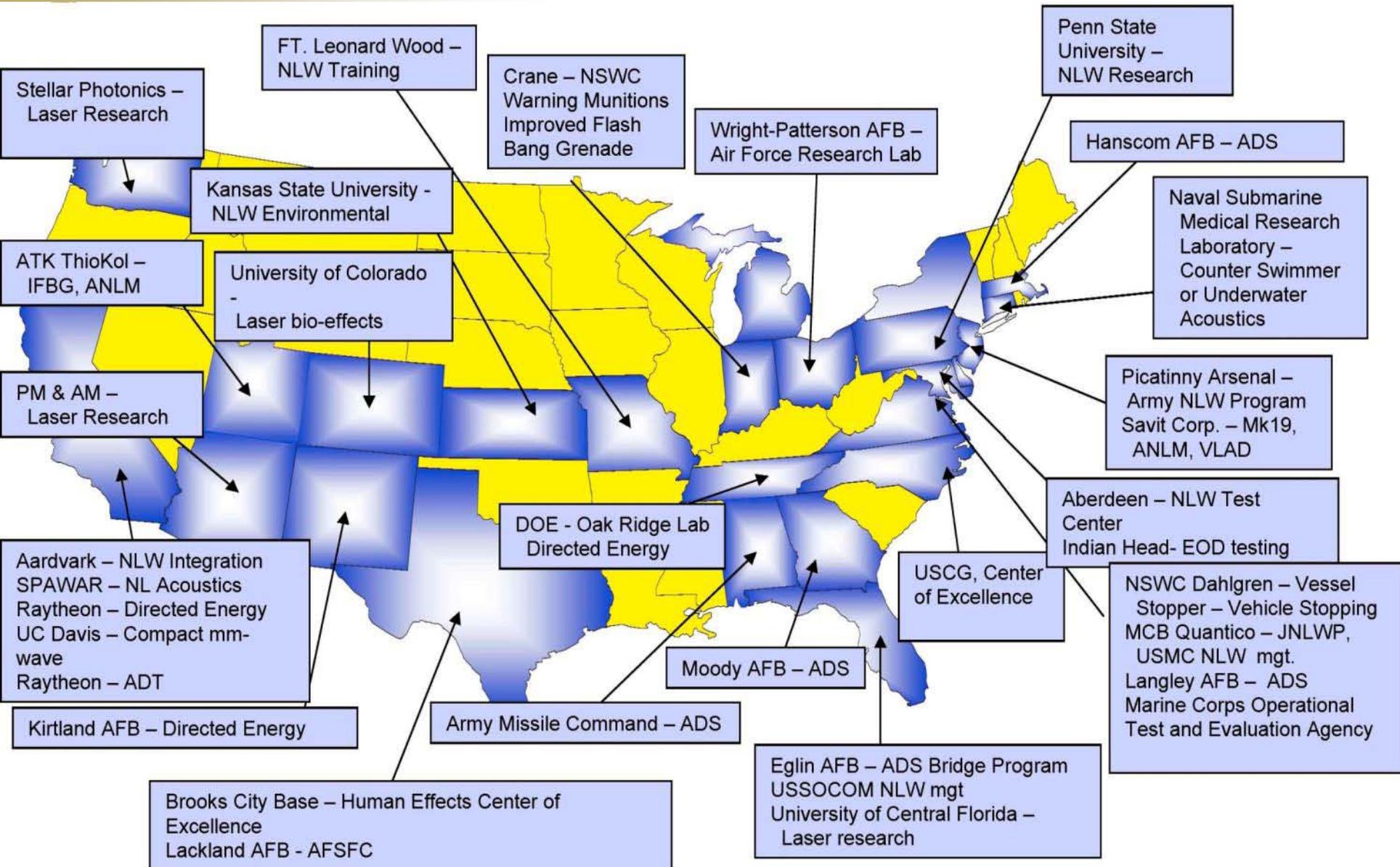


2007 Award \*  
Recipient

Army Nonlethal Scaleable Effects Center (ANSEC)

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**DoD NON-LETHAL WEAPONS  
PROGRAM EFFORTS**



# DoD NON-LETHAL TECHNOLOGIES

Technology Bins

Vehicle Stopping

Warning Devices

Launcher Systems

Non-Lethal Munitions



Technologies

- Nets
- Spikes
- High Power Microwave (HPM) or Radio Frequency (RF) Based
- Laser Based
- High Voltage Based
- Obscurants

- Ocular
- Acoustics

- Human Electro-Muscular Incapacitation (HEMI)
- NL Capable Launchers
- NL Capable Remote Weapon Systems (RWS)
- Active Denial Technology

- Blunt Impact
- Flash Bang
- Air Burst
- HEMI
- HPM/RF



Portable Vehicle Arresting Device



Acoustic Hailing Device



X26 Taser



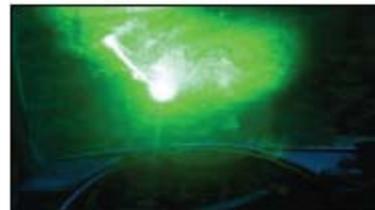
12 Ga , 40mm & 66mm Munitions, Hand Grenades, and NL "Claymore"



FN303



Single Net Solution (SNS)



Green Laser Dazzler effect on driver windshield



ADS/ADT



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- The XM1112 Airburst Non-Lethal Munition (ANLM)
  - Provides selective area denial, crowd dispersion, or individual/crowd behavior control capability
    - Two mode operation: proximity & proximity delay
  - The system will provide consistent non-lethal effects & increase range capabilities.
  - The XM1158 proximity fuze enables airburst delivery of NL payloads throughout the operational range
- Program Sponsors
  - DoD Non-Lethal Executive Agent: Joint Non-Lethal Weapons Directorate (JNLWD)
  - U.S. Army PM Soldier Weapons
- The XM1112 Program Management - US Army Lead Service
  - Until MS C - PM Soldier Weapons
  - After MS C - PM Close Combat Systems



- Emphasis on leveraging existing technologies from other fuzes
  - Proximity technology for use in Direct-Fire scenario (EX433 & M734A1)
  - Existing mechanical S&A – M550
  - Lithium liquid reserve-cell battery
  - Piston actuator
- U.S. Army ARDEC Fuze Division developed, designed, and demonstrated this proximity fuze.
- Transitioned the ARDEC XM1158 Fuze Design in 2008 to Savit Corp for design refinements
- The XM1112 ANLM is the first low velocity 40mm non-lethal munition with a fuze.
  - Consistent standoff distance provides consistent non-lethal effect
  - Munition identified by lime green projectile nose – proposed non-lethal color standard

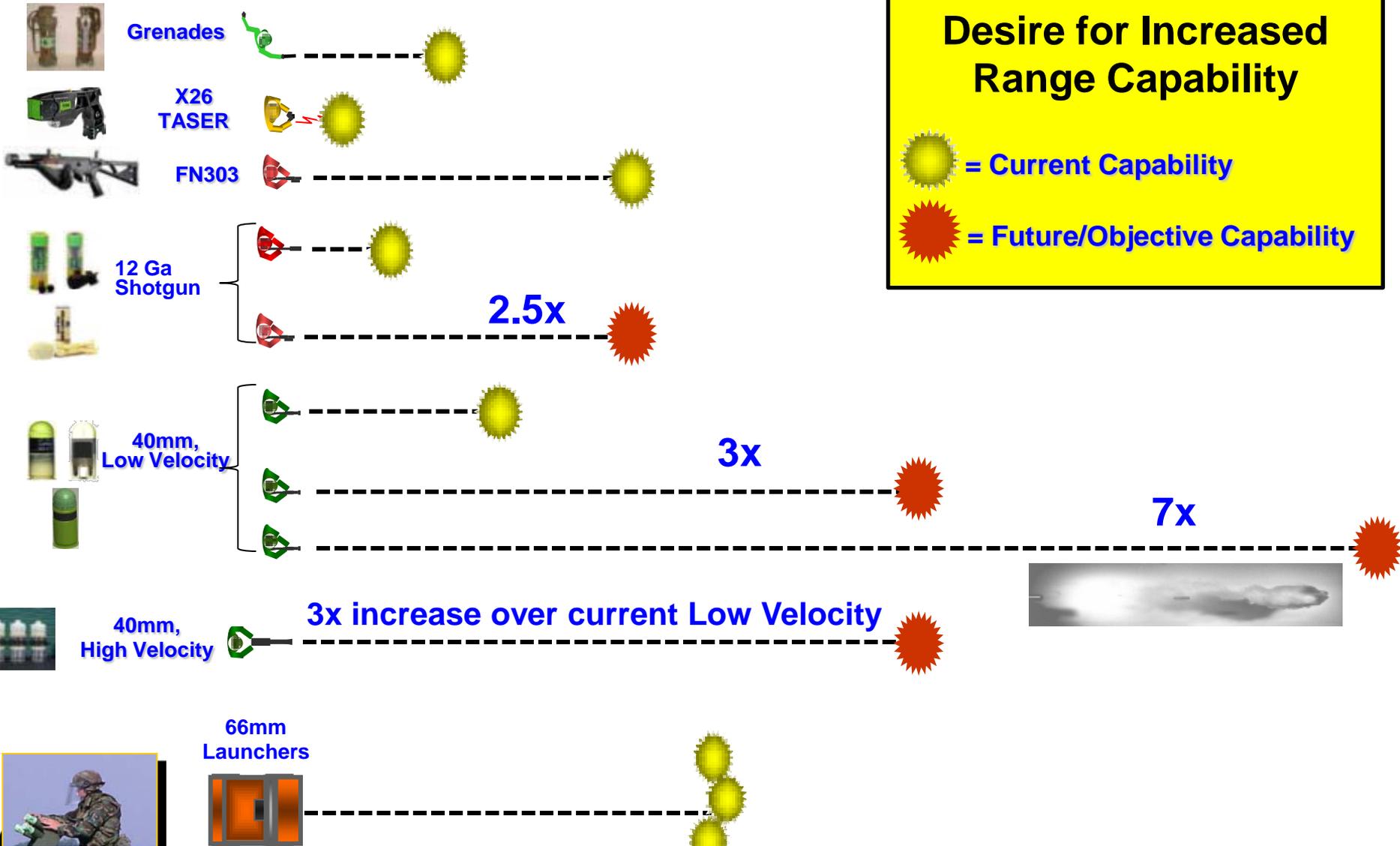
# U.S. ARMY NON-LETHAL MUNITIONS MAXIMUM RANGE COMPARISON



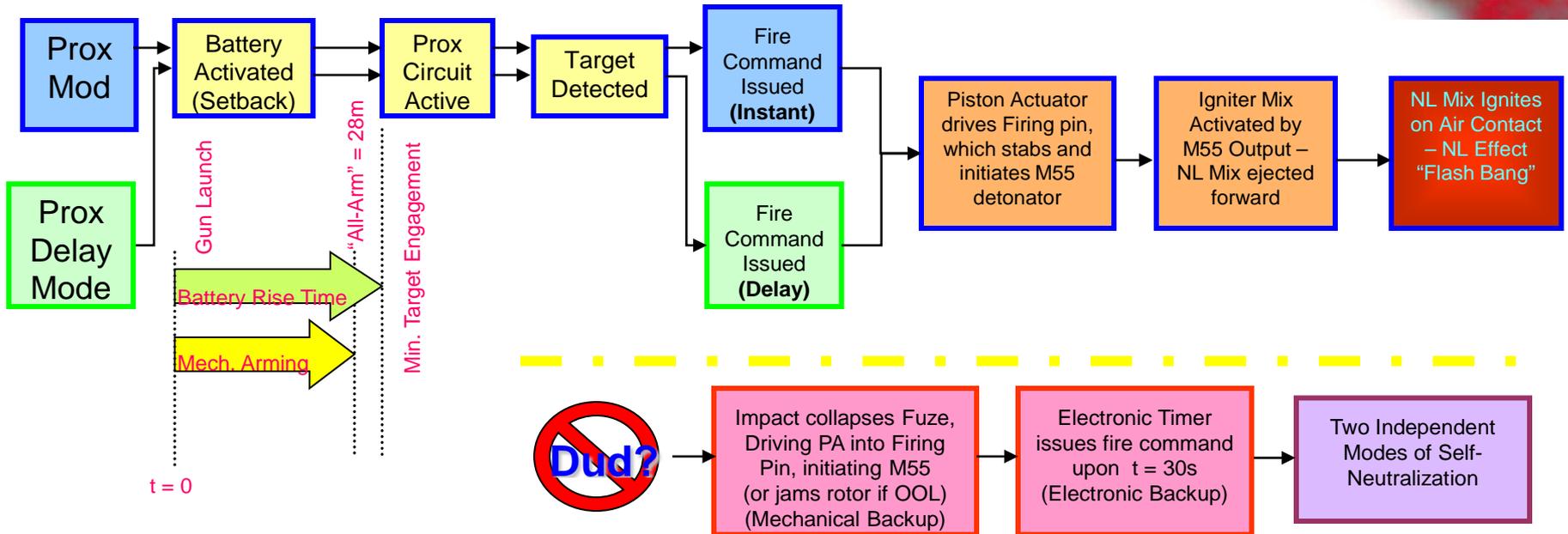
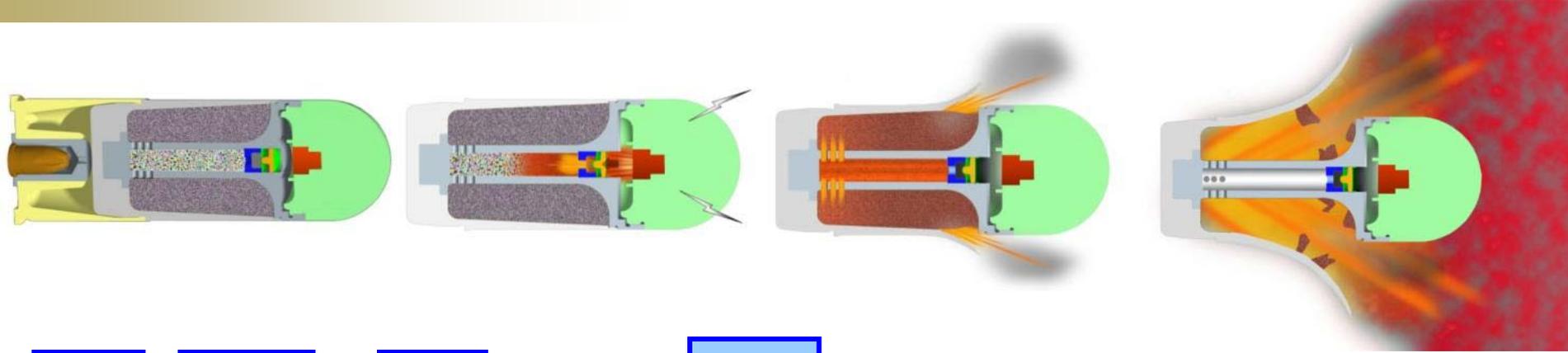
**Desire for Increased Range Capability**

= Current Capability

= Future/Objective Capability



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- Non-lethal fuzing requirements are the same as lethal but must take into account additional non-lethal requirements
- Requirements that are the same as lethal munitions
  - Fuze safety to shooter & weapon
    - MIL-STD-1316
    - MIL-STD-1911
  - Munition unique Requirement Document(s)
    - CDD, CPD, etc. - Key Performance Parameter & Key System Attribute
- Requirements that are unique to non-lethal munitions
  - Munition unique Requirement Document(s)
    - P(nle/s) : probability of non-lethal effect per shot
    - Non-lethal effect duration
    - P(RSI) : probability of risk of significant injury
  - Human Effect Center of Excellence (HECOE)
    - Defining non-lethal effect & duration models
      - Different targets will experience different effects
    - Developing non-lethal standard for Risk of Significant Injury
      - Plan Tri-Service Validation

- Non-Lethal Weapons
  - Employed against personnel, material, and capabilities
  - Immediate & reversible effect (temporary disable)
  - Expands military's escalation of force options
- Non-lethal fuze safety requirements are currently the same for lethal applications plus
  - Non-lethal munition unique Requirement(s)
  - Non-lethal standard being developed
- XM1158 Fuze will provide
  - Fuzing to the XM1112 Airburst Non-Lethal Munition
  - Uniform proximity initiation resulting in a consistent non-lethal effect



## NON-LETHAL RESOURCES

- DoD Directive 3000.3 - Nonlethal Weapon Policy <http://www.dtic.mil/whs/directives/corres/pdf/300003p.pdf>
- DoD Joint Non-Lethal Weapons Program <https://www.jnlwp.com/>
- USAF AFRL Human Effect Center of Excellence (HECOE), Brooks AFB, TX  
[https://www.jnlwp.com/future\\_capabilities/organizations.asp](https://www.jnlwp.com/future_capabilities/organizations.asp) POC: [James.Simonds@brooks.af.mil](mailto:James.Simonds@brooks.af.mil)
- US Army Non-Lethal Scalable Effects Center, Fort Wood, MO  
[atsjdsn@wood.army.mil](mailto:atsjdsn@wood.army.mil), [http://www.wood.army.mil/usamps/usamps\\_non-lethal.htm](http://www.wood.army.mil/usamps/usamps_non-lethal.htm)
- US Army Non-Lethal Weapons, PM CCS, [http://www.pica.army.mil/pmccs/D3IEDProtect/D3\\_2NLCS/Default.htm](http://www.pica.army.mil/pmccs/D3IEDProtect/D3_2NLCS/Default.htm)
- Doctrine: FM 3-19.15, FM 3-22.40, 3-19.1, 3-19.4, 3-19.10, 3-19.11, 3-19.40, AR 190-14 Use of Force, DA Pam 350-38 (STRAC), TRADOC Pamphlet 525-99 (Nonlethal Capabilities in Army Operations)
- NLW Tactical Employment of Nonlethal Weapons, 15 JAN 2003  
FM 3-22.40, MCRP 3-15.8, NTTP 3-07.3.2, AFTTP(I) 3-2.45, USCG 3-07.31  
<https://www.us.army.mil/suite/doc/16548186>
- TRADOC Pam 525-99 - Concept for NL in Army Ops



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