MEDUSA 66MM LAUNCHER SYSTEM

Aggressor Suppression via the use of Non-lethal Projectiles and Launchers

GENERAL DYNAMICS
Ordnance and Tactical Systems

Presentation Overview

- Review the warfighter's "Escalation of Force" (EoF) needs in regards to convoy security and crowd control
- Review quad chart submitted by GD-OTS Orlando for "Shove Capability"
- Review GD-OTS Orlando's similar Army programs
- Discuss MEDUSA: a vehicle-mounted, non-lethal, grenade launcher system developed by General Dynamics – Ordnance and Tactical Systems
  - 66mm Grenade Launchers
  - Grenades (Thermobaric, Malodorant, Obscurant/Screening, Stingball)
  - Demonstration Videos
- Summary

Source:
Headquarters U.S. Marine Corps
Deputy Commandant, Combat Development & Integration
Fires & Maneuver Integration Division
Escalation of Force Branch

Warfighter Needs

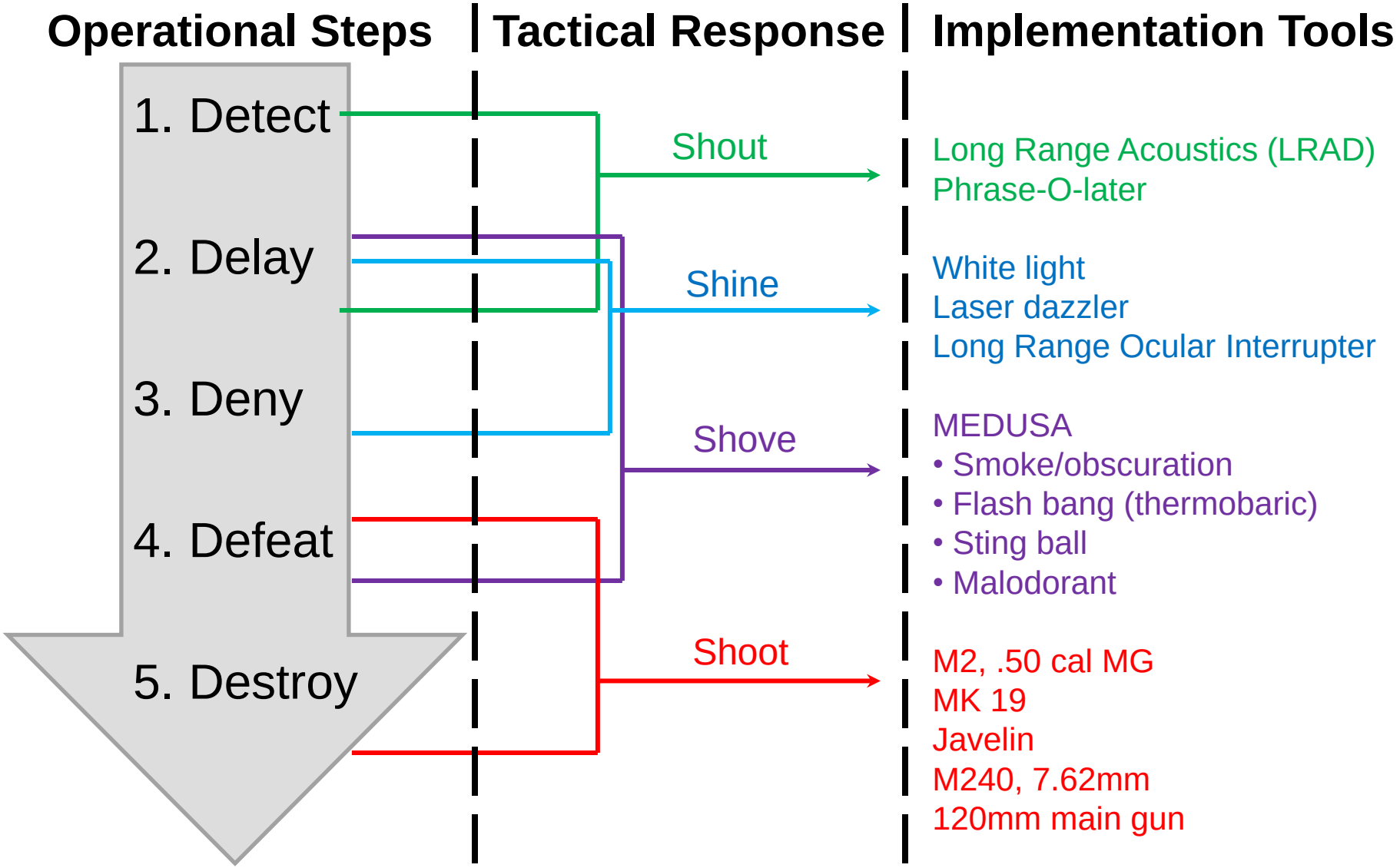
- In this asymmetric environment, the enemy attempts to **blend in with the civilian population**, while attacking through direct and/or indirect means without regard to inflicting civilian casualties
- The warfighter will need the ability to **employ graduated series of capabilities** that protect the force from complicated asymmetric enemy tactics
- Operational and tactical challenges require **providing Operating Forces broader capabilities** to respond using both lethal and non-lethal force
- It is essential to provide these small unit leaders **a greater range of options** when faced with the complex warfighting environments of today and the foreseeable future
- **Escalation of Force (or EoF) is designed** to identify key enabling capabilities **to support small unit leaders** in escalation of force tactical situations

Non-lethal Weapon System Requirements

- The Non-lethal Weapon System (NLWS) must be capable of being easily installed on any tactical vehicle (light weight, high reliability, low maintenance, environmentally robust and, of course, low cost)
- The non-lethal effect must be capable of suppressing the aggressors for an extended period of time without introducing the risk of significant or permanent injury
- The non-lethal effect must be capable of being delivered with great precision anywhere between 30 to 250 meters so as to meet the warfighter's tactical needs
- The NLWS must have the capability to support urban patrolling, convoy operations, crowd control and area denial operations



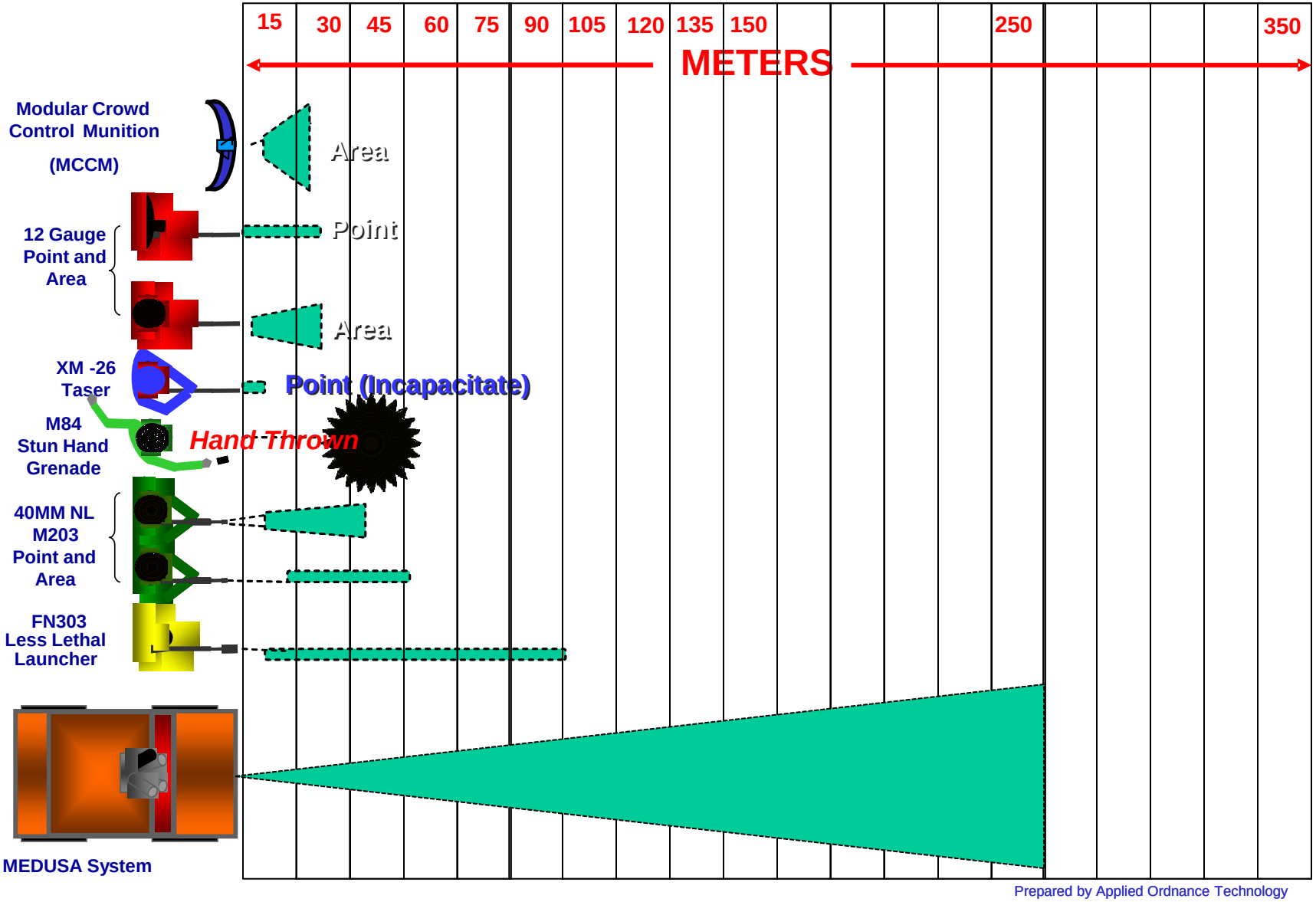
Implementing Escalation of Force



GD-OTS' MEDUSA System

- In response to the US Government's non-lethal EoF needs, GD-OTS Orlando is developing the MEDUSA 66mm grenade launcher system.
- MEDUSA is a lightweight, self contained, modular system that easily adapts to most platforms.
- The MEDUSA Launchers and Fire Control Unit are a next-generation spin-off of a system developed for the Army's Escalating Response System (ERS).
- Medusa deploys grenades based on each grenades employment concept. It knows which grenade is loaded and where to place it relative to the target area. "Load, Aim & Fire" technology.
- MEDUSA provides longer range, greater coverage area, extended effects duration, low risk of permanent injury, better scalability of effects, and supports the government's EoF needs better than any currently fielded non-lethal weapon system.

Non-Lethal Munitions (Counter Personnel) Effective Ranges

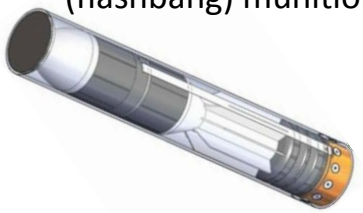


Prepared by Applied Ordnance Technology

Medusa (TD phase – CY2012)

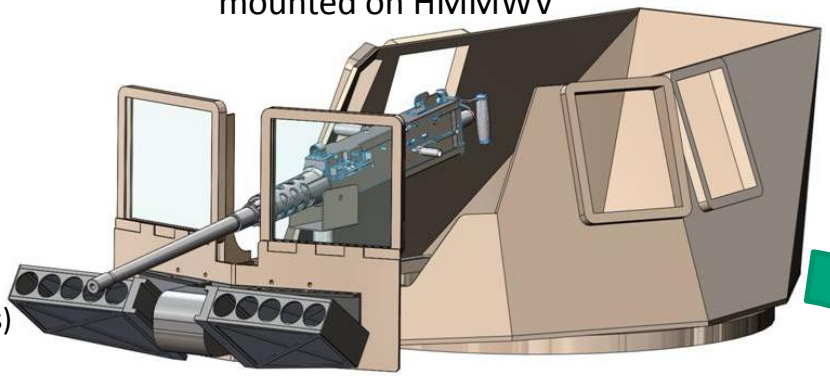
Medusa (EMD phase)

Non-lethal thermobaric
(flashbang) munition



(Load 10 munitions)

Launcher System
mounted on HMMWV



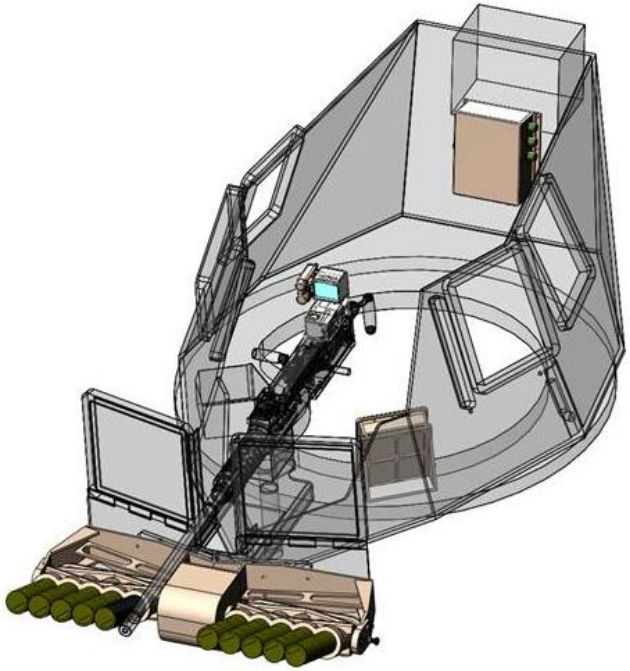
Marine gunner launches munition
via Fire Control Panel (FCP)

(Effective range:
30m to 150m)

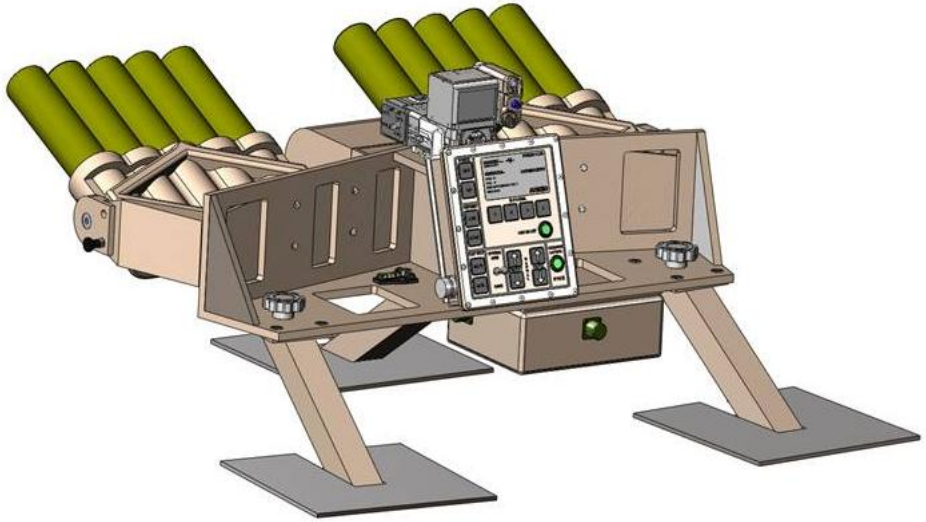
Actual GD-OTS Grenade Effect Pictured (DT Phase)

Launcher System - Two configurations

"Mounted" on HMMWV

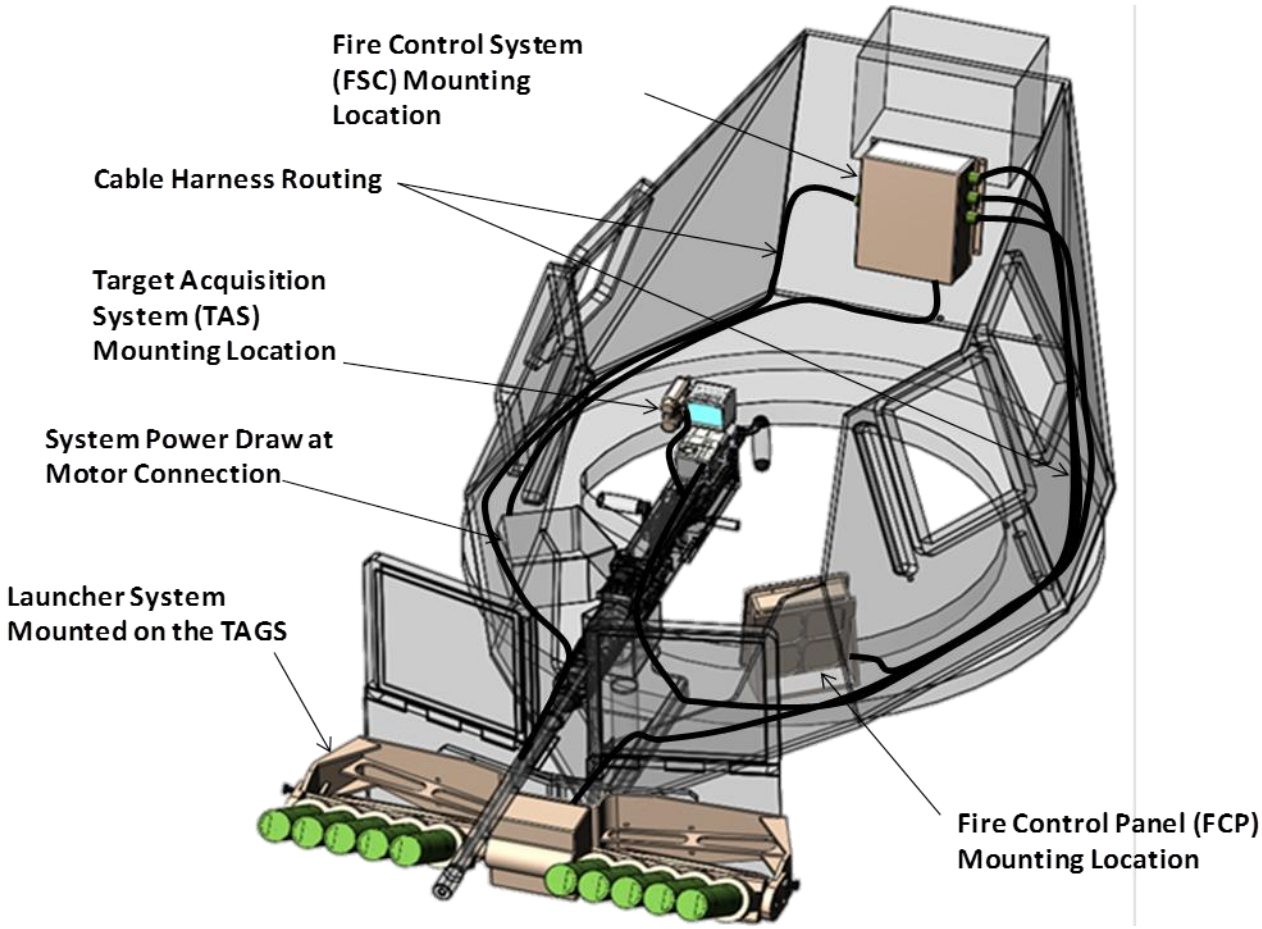


"Dismounted" on tripod



Every Launcher System is required to be shipped with A/C and D/C charging systems, two 12 volt military grade batteries, and 10 training munitions (with flashing LEDs)

System Overview



Platform Applications

MINE RESISTANT AMBUSH-PROTECTED
(MRAP) PATROL VEHICLES
3 Variants, 16,000 produced to date

Joint Light Tactical Vehicle
PM-Future Tactical Vehicles

HBCT Vehicles: M113, Abrams,
and Bradley

ICV-FSEP VEHICLE
PM-Stryker/TACOM

High-Mobility
Multipurpose
Wheeled Vehicle

U.S. NAVY COMBATANT CRAFT

STRYKER FAMILY OF
COMBAT VEHICLES
(10 Variants)

Armored Security
Vehicle (ASV)
PM-Medium TV
Lt Col Alfred Grein
500 fielded to date
48 new vehicles/month

UNMANNED GROUND VEHICLES:
FCS ARV and MULE, MDARS

Grenade Overview

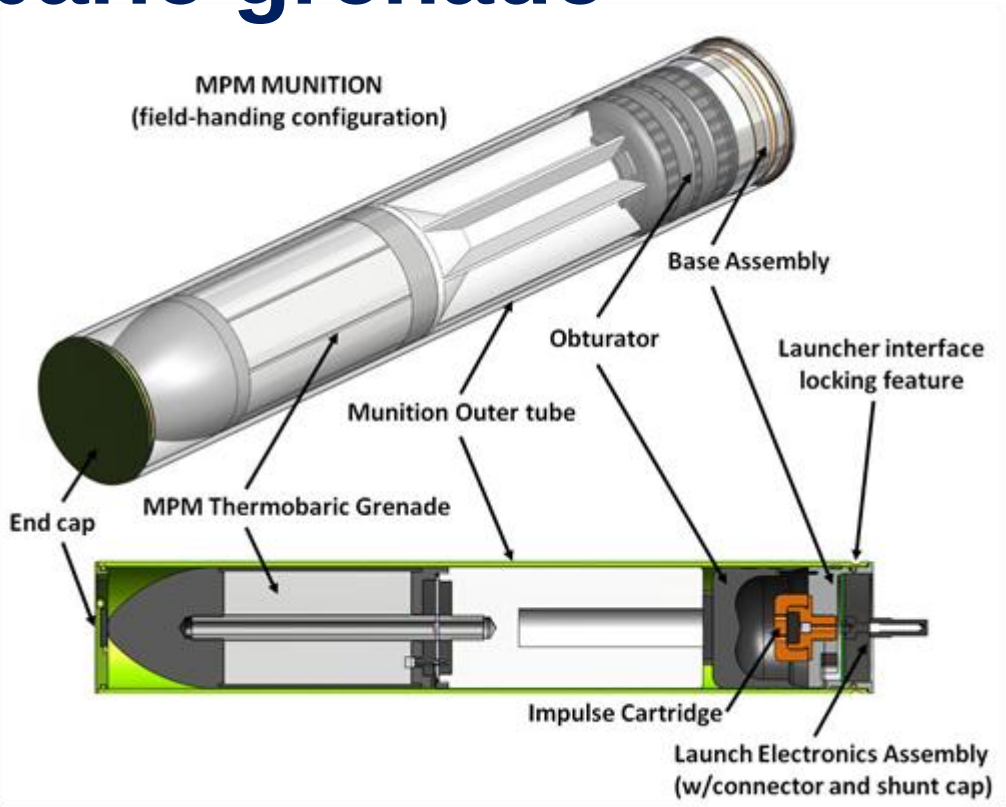
- Due to the available payload volume of the 66mm design, its suppression and/or effects on targets are far superior (i.e., coverage area and overall suppression time) to any 40mm product boasting similar capabilities
- Internal to the grenade is a Circuit Card Assembly which provides “smart” capabilities that are not currently present in any of the legacy 66mm grenades in the US Government’s inventory (i.e., M90, M98, M99)
- “Smart” capabilities include:
  - The ability for the Fire Control Unit (FCU) to identify the type of grenade in each tube when various smart grenade types are loaded and how to employ them relative to the target based on the grenade’s concept of employment
  - Grenade built-in-test (BIT) in the launch tube; this will reduce the chance of unexploded ordnance (UXO)
  - Scalability: the user can scale the level of effects up or down using controls on the FCU
  - Redundant safety interlocks

Grenade	Effect	Range	TRL level
M90E	Smoke	100m	TRL 7
M98E	Distraction	100m	TRL 7
M99E	Sting Ball/Blunt trauma	100m	TRL 7
Thermobaric	Visual and Audible Suppression	250m	TRL 7
Illumination	Area Illumination	250m	TRL 4
Malodorant	Liquid Dispensing	250m	TRL 4

Thermobaric Grenade

- Visual and audible suppression
- Range 30 to 250 Meters
- The thermobaric formulation was developed by ATK and integrated into GD-OTS' 66mm grenade payload
- Testing has shown the grenade to be accurate to within 2 meters (SEP) of the selected target at a distance of 150 meters (SEP of less than 1 meter at ranges up to 90 meters). Grenades have been launched out to 250 meters.
- The payload effects have been measured and assessed by the Air Force's Human Effects Center of Excellence (HECOE) using their advanced software

Thermobaric grenade



How is suppression achieved?

- The grenade payload temporarily incapacitates targeted personnel through the use of **intense physiological (auditory/visual) human effects**
- **Light stimuli:** the intense light (approx 25000 lux-sec with a fireball diameter of approx 3 meters) emitted by the grenade will temporarily blind aggressors for several minutes. This light can be seen several miles away
- **Sound stimuli:** the intense sound (approx 146 dBA measured 1 meter from the burst) will affect hearing so that an aggressor will not be able to hear (i.e., take or give commands) for several minutes
- **Pressure stimuli:** the intense pressure (approx 5.2 psi measured 1 meter from the burst) will have the ability to disorient an aggressor when he is within several meters of the burst
- **Psychological effects**: the burst will have the ability to separate aggressors from non-aggressors. Non-aggressors will almost certainly leave the area after the effects wear down; those who don't leave are more likely to be true aggressors who will have to be dealt with

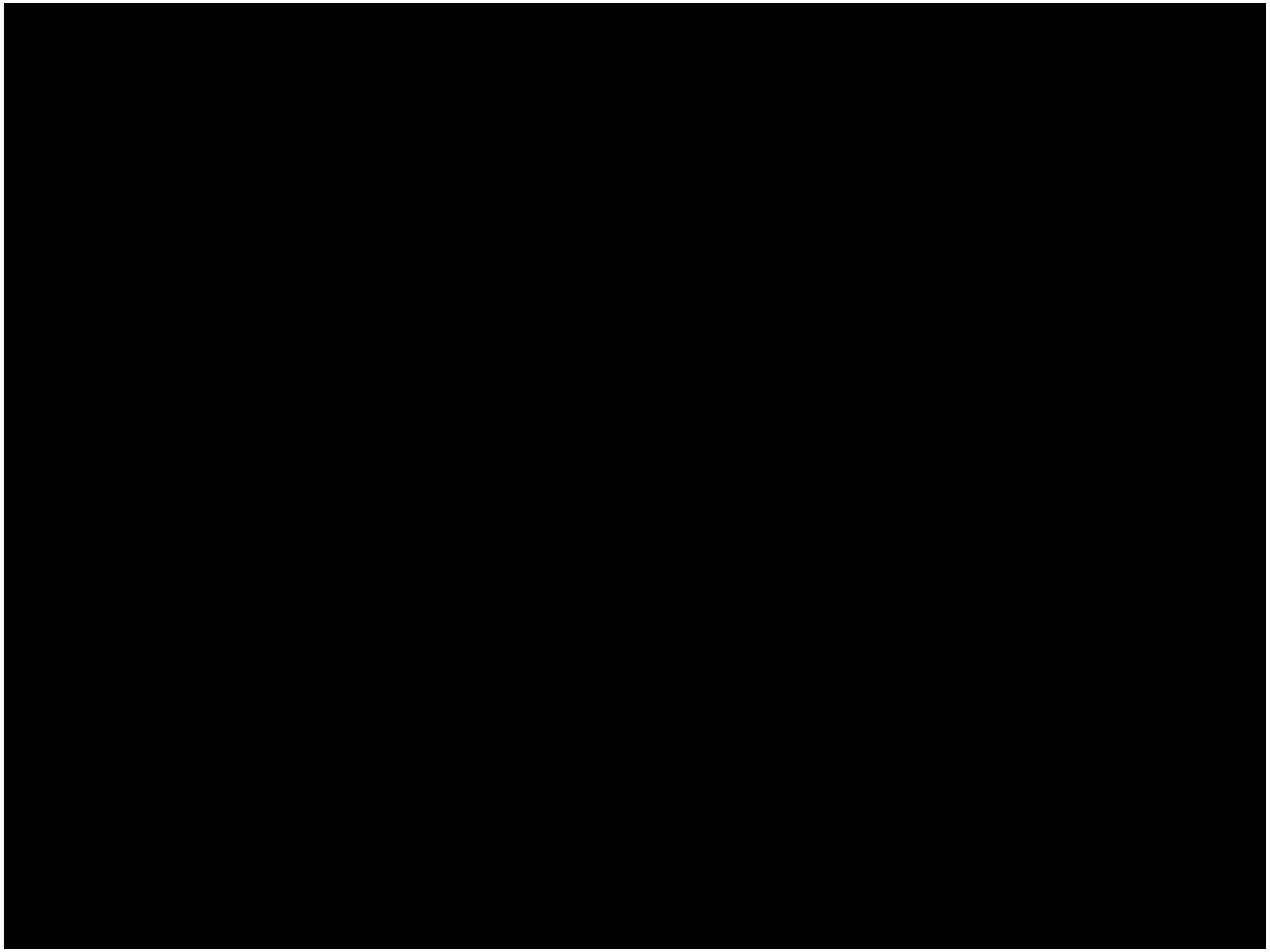
MEDUSA PERFORMANCE DEMONSTRATION

- In 2011, GD-OTS launched thermobaric grenades at three dummy targets so as to demonstrate the MEDUSA capabilities
- These live fire demonstrations have been captured on camera and several small clips follow

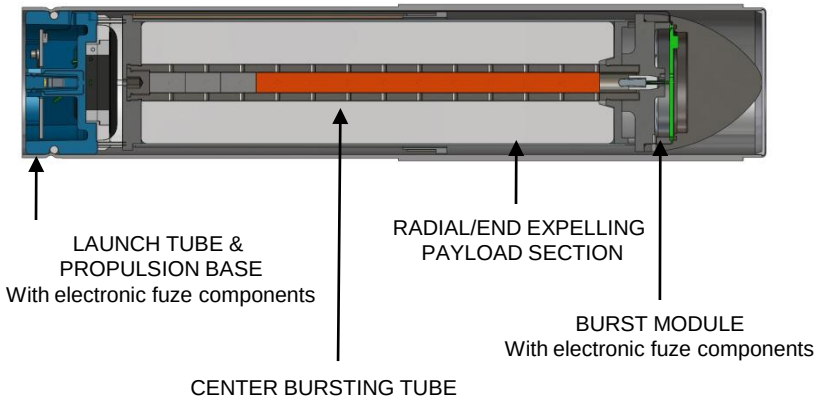
REAL TIME FOOTAGE

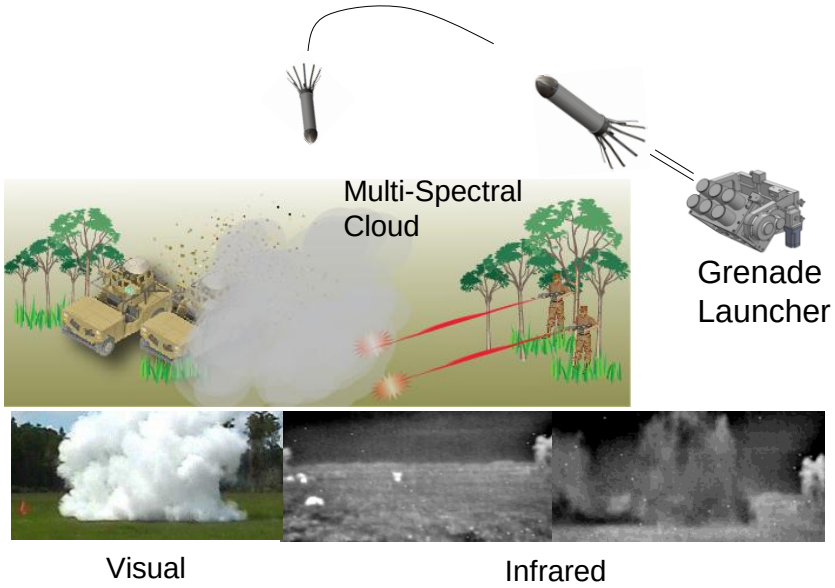
HIGH SPEED DAY SHOT

HIGH SPEED NIGHT SHOT



Bi-Spectral Grenade





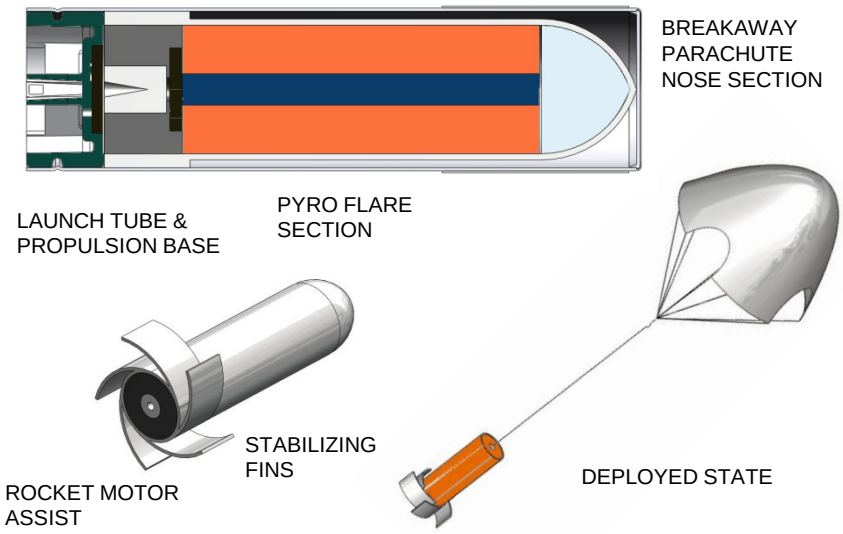
Description of Technical Functioning:

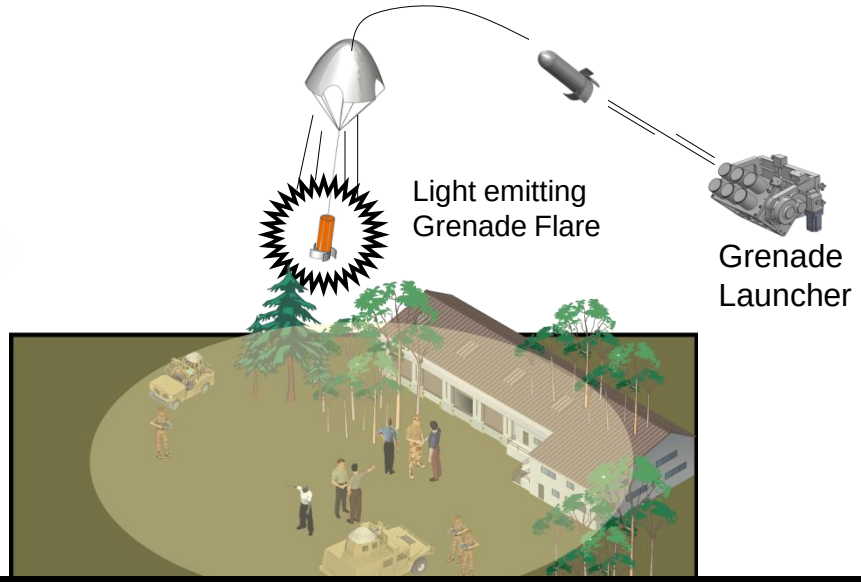
- Launch phase ejects grenade, leaving launch tube and base at grenade launcher
- Stabilizer deploys and grenade travels to desired range
- Electronic fuzing bursts the payload at desired range, expelling its powdered multi-spectral payload (visual, Infrared, MM wave)

Benefit Description:

- Effects produce desired multi-spectrum attenuation
- Friendly force movements are obscured from observation by potential threats using either naked eye or aided by most vision enhancing devices
- Extended range capability (30-250m+), coupled with electronic fuzing increases reliability and increases placement accuracy of the burst event
- Non-Explosive (pyrotechnic) expulsion, reduces EOD hazards

White Light/Infrared Illumination Grenade





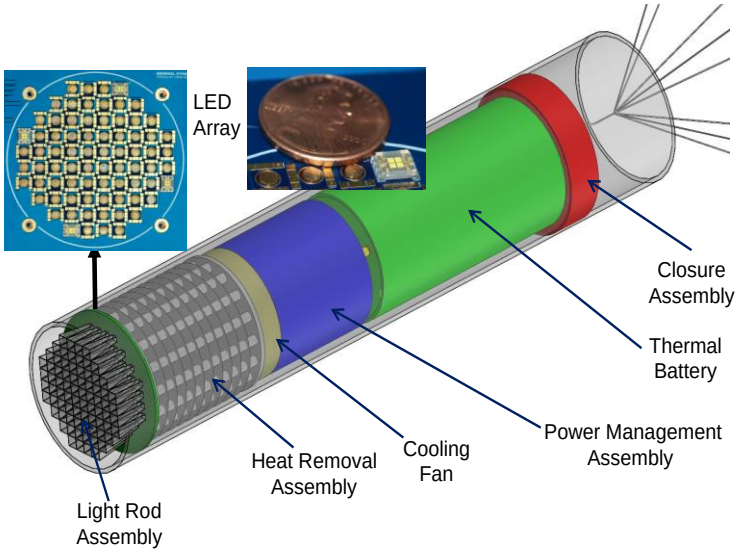
Functional Description:

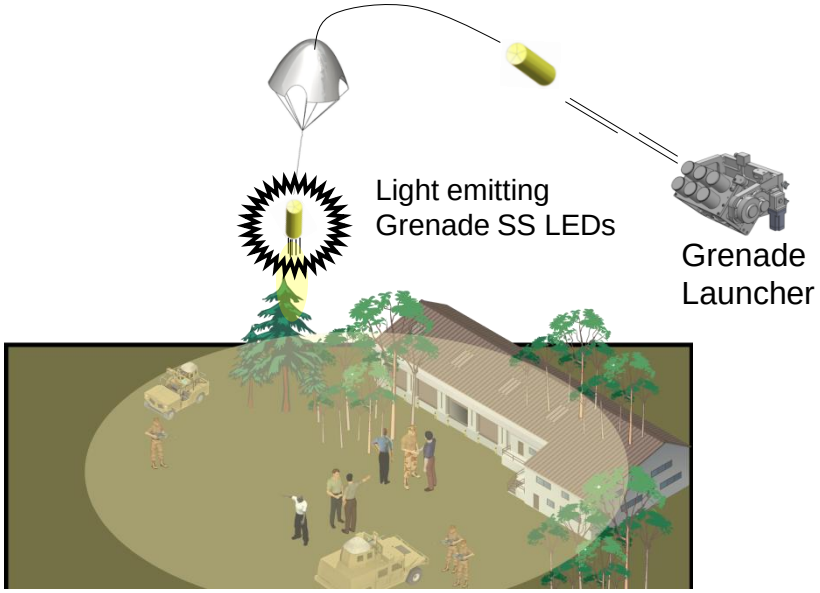
- Launch phase ejects grenade assembly and initiates small rocket motor assist.
- Motor burn-out, ignites flare section.
- Parachute is deployed
- Pyro flare section composition tailored for bright white light emission for visible spectrum or low visible emission with high Infrared (IR) emission

Benefit Description:

- Provides on-demand wide area illumination available without waiting for positive response to requests for aircraft, artillery, or mortar support
- Lowers logistics burden for separate flare capability
- Gives projected illumination as part of larger 66 mm effects suite
- Soldier can choose between visible and IR illumination

Solid State Infrared Illumination Grenade





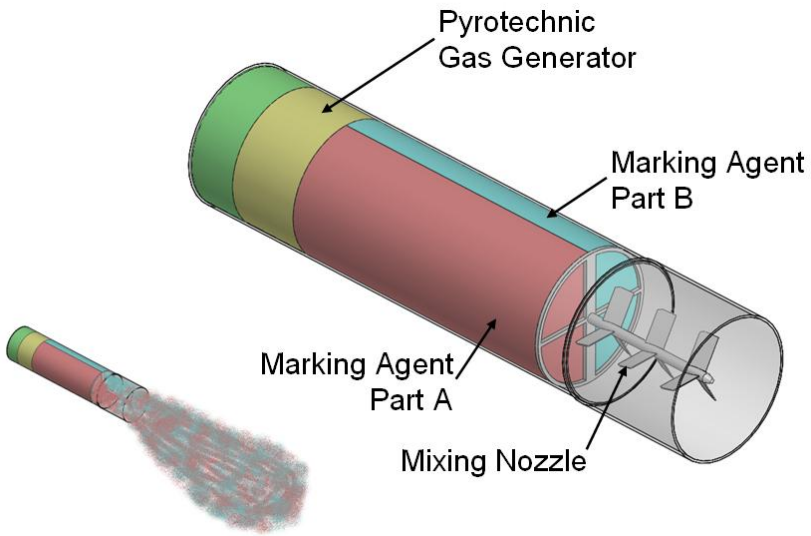
Functional Description:

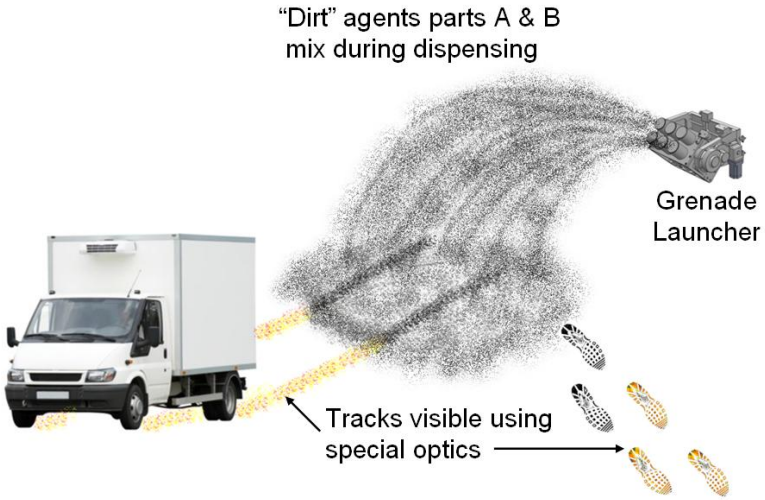
- Approach based on successful demonstrations for replacing current 2.75" Hydra rocket pyrotechnic payload
- Launch phase ejects grenade assembly and initiates small rocket motor assist and parachute is deployed
- An array of high-efficiency light-emitting diodes (LEDs) powered by a thermal battery are activated. Solid-state IR beacon assembly (configured to fit within the envelope of the 66mm grenade payload) produces tailored bright white light emission for visible spectrum or high Infrared (IR) emission

Benefit Description:

- Non-pyrotechnic illumination more reliable with fewer undesirable side effects such as fires or visible smoke
- Provides significantly increased, on-demand, wide area illumination
- Organic capability provides immediate operational availability
- Lowers logistics burden for separate flare capability
- Illumination becomes part of larger 66 mm effects suite
- Flexibility – Soldier can choose between visible and IR illumination

Idirt – IR Marking of Earth Grenade





Functional Description:

- Grenade launches and travels to key location
- On function, grenade mixes components
- Dispensed mixture appears to be soil
- Mixture emits infrared light for up to 2 weeks
- Marked area can be observed with IR goggles to detect traffic
- Individuals and vehicles that pass through area can be observed with IR viewers

Benefit Description:

- Allows non-observable detection of ground disturbances associated with foot or vehicle traffic or IED emplacement
- Marks individual or vehicles that pass through marked areas

Summary

- ✓ MEDUSA provides a unique combination of tactical range, deployment accuracy, payload capability and scalability
- ✓ MEDUSA meets the government's requirements to provide a more tiered approach for Escalation of Force TTPs (Tactics, Techniques & Procedures) in support of the warfighter's missions
- ✓ MEDUSA has been designed to be a "modular" system, capable of being seamlessly integrated onto most tactical vehicles
- ✓ With support of a major DoD client, GD-OTS will type-classify the Launcher System and non-lethal munitions

Questions?

GENERAL DYNAMICS

Strength On Your Side™