ENGINEERING
TECHNOLOGY
INCORPORATED

Application of Propellant Dissemination Technology for Non-Lethal Aerosols

Engineering Technology Incorporated (ETI)

DANIEL HARTMAN, P.E

EDGARDO MALDONADO

NOEL GONZALEZ, P.E.

U.S. Army
Edgewood Chemical and Biological Center (ECBC)

Smoke and Target Defeat Team

WILLIAM G. ROUSE, P.E.

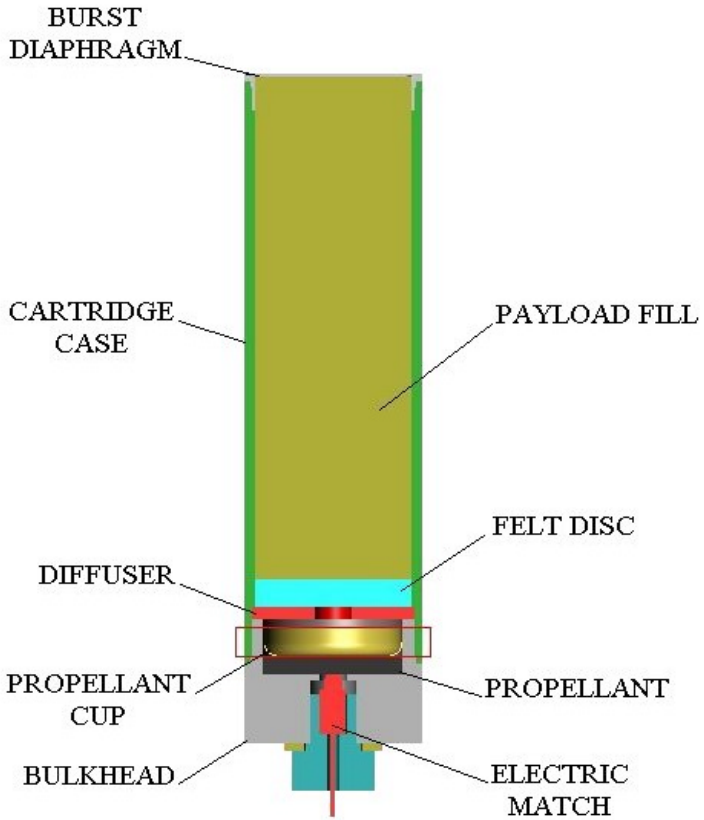
BRIEFING AGENDA

DESCRIBE A NEW METHOD FOR GENERATING MILITARY AEROSOLS

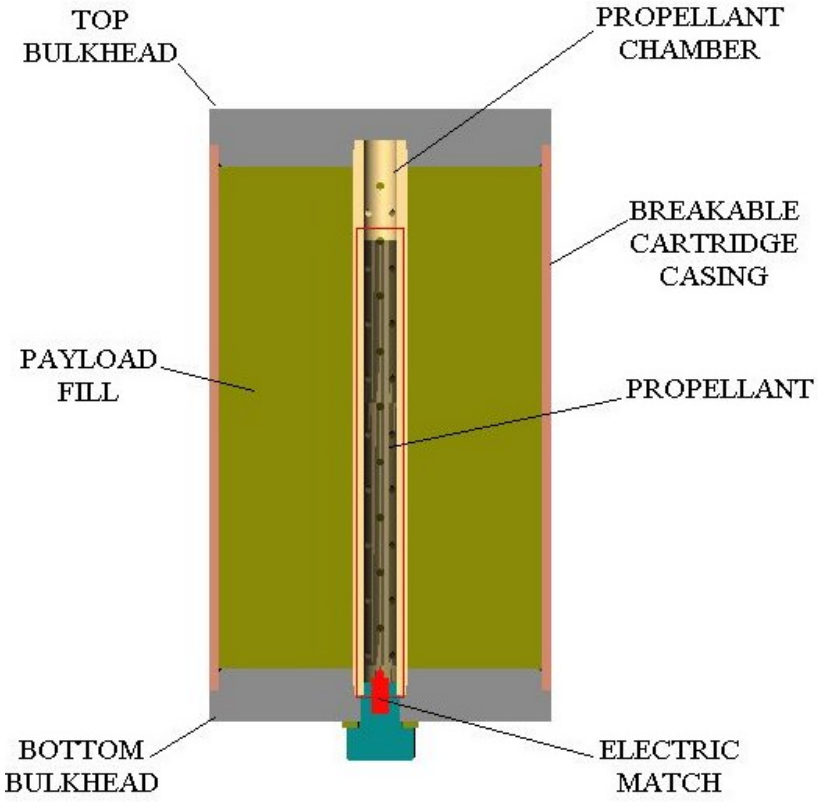
DESCRIBE BENEFITS

SHOW TECH DEMO APPLICATIONS

GENERAL ARRANGEMENT OF A PROPELLANT DISSEMINATION DEVICE

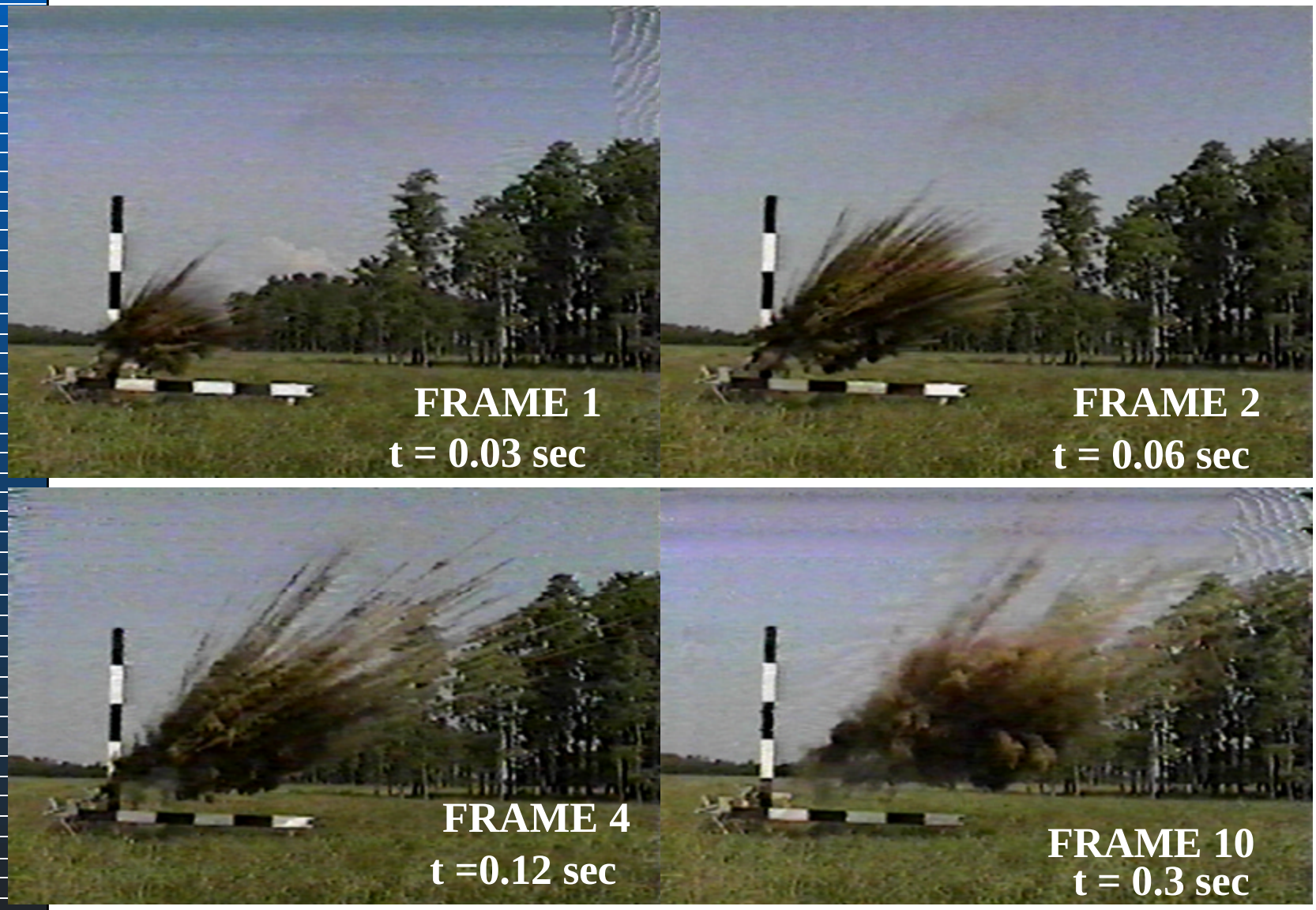


END EXPULSION DEVICE

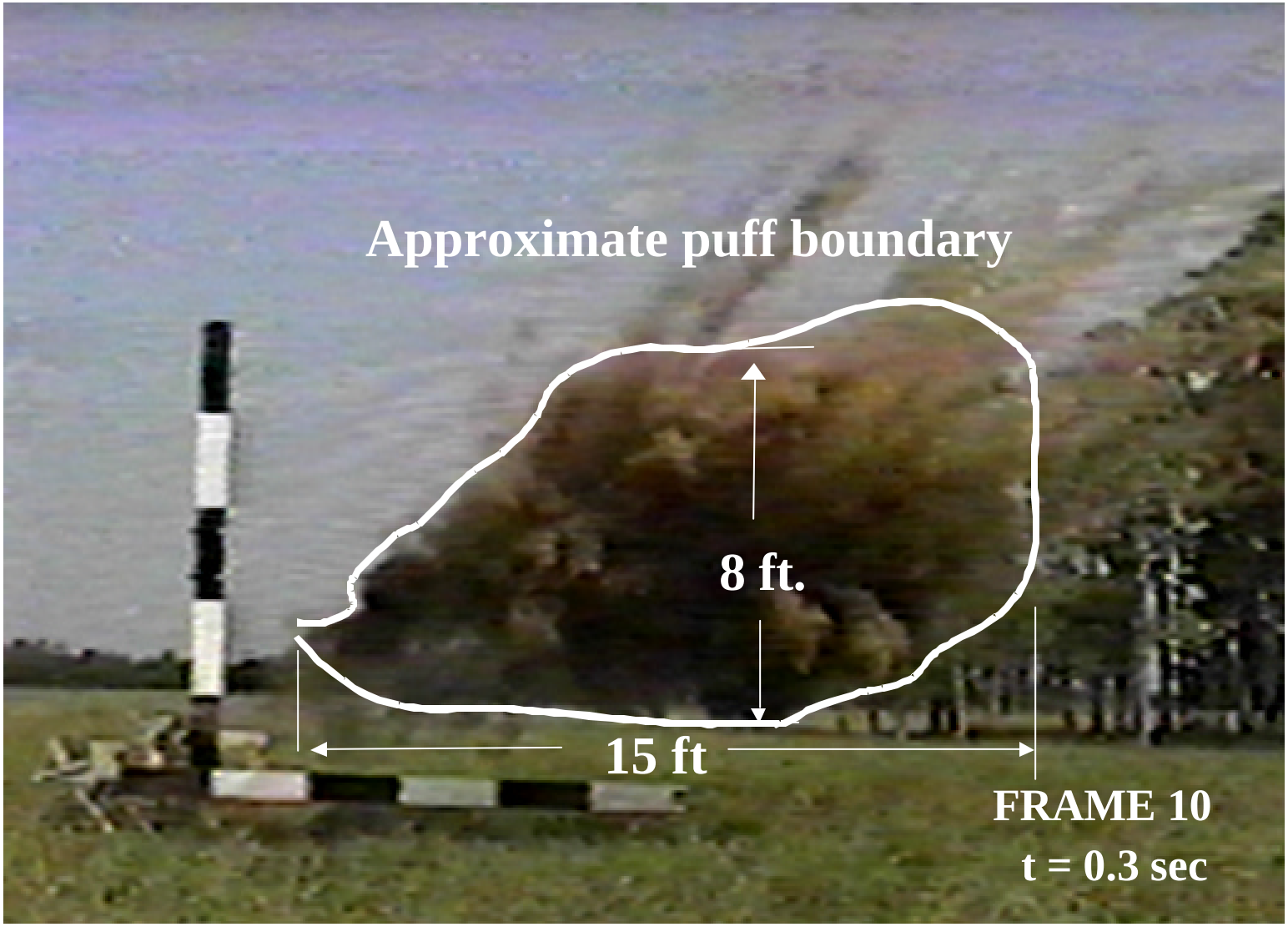


RADIAL EXPULSION DEVICE

SINGLE-CHAMBER FUNCTION OF A PROPELLANT DISSEMINATION DEVICE



SINGLE-CHAMBER FUNCTION OF A PROPELLANT DISSEMINATION DEVICE



PROPELLANT DISSEMINATION TECHNOLOGY

- **Improved expulsion and aerosolization of fill agent.**
- **Multi-agent compatibility; dry powders.**
- **Less hazardous operation; no brisance or fragmentation. Low flame hazard.**
- **Precision electronic control of initiation timing, rate of function and location.**
- **Stand-alone, self-contained operation.**

PROPELLANT DISSEMINATION TECHNOLOGY PATENT

US006047644A

United States Patent [19]

Malecki et al.

[11] **Patent Number: 6,047,644**

[45] **Date of Patent: Apr. 11, 2000**

[54] **PROPELLANT BASED AEROSOL GENERATING DEVICE AND METHOD OF USE**

[75] Inventors: **Raymond J. Malecki**, Perryhall; **William G. Rouse**, Havre De Grace, both of Md.; **Daniel J. Hartman**, Orlando, Fla.; **Samuel Morgan**, Orlando, Fla.; **Tom Mills**, Oviedo, Fla.

[73] Assignee: **The United States of America as represented by the Secretary of the Army**, Washington, D.C.

[21] Appl. No.: **09/045,968**

[22] Filed: **Mar. 18, 1998**

[51] **Int. Cl.**[7] **F42B 12/70**; F42B 12/46

[52] **U.S. Cl.** **102/367**; 102/505; 102/334; 280/741; 342/3

[58] **Field of Search** 102/505, 334, 102/367, 345; 342/1, 3, 4; 239/654, 655; 222/630; 280/741

[56] **References Cited**

U.S. PATENT DOCUMENTS

H146	10/1986	Decker	239/323
H151	11/1986	Rouse	239/654
H769	4/1990	Rouse	102/334
H775	5/1990	Rouse	86/20.1
3,238,143	3/1966	Ainsley .	
3,785,674	1/1974	Poole	280/150
4,446,990	5/1984	Stevenson	222/82
4,726,295	2/1988	Eanbury, Jr.	102/334
5,148,173	9/1992	Rouse	342/3
5,494,312	2/1996	Rink	280/737
5,772,243	6/1998	Green	280/741

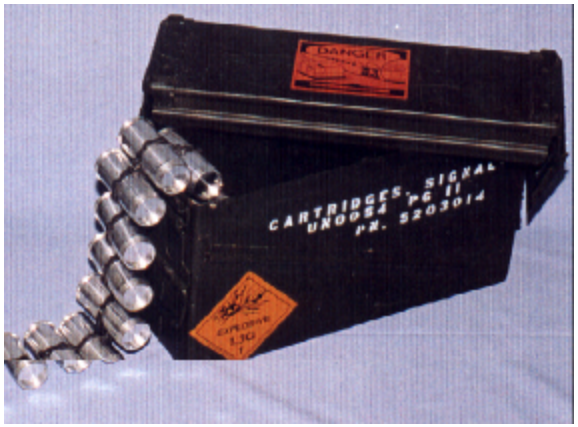
Primary Examiner—Jack W. Lavinder
Attorney, Agent, or Firm—Ulysses John Biffoni

[57] **ABSTRACT**

An aerosol generating device comprising a casing having a base end and a retainer end, with a firing primer mounted through the base end and extending into a propellant zone which contains a propellant. The firing primer is thereby detonationally connected to the propellant. A diffuser plate is mounted inside of the casing on a side of the propellant zone opposite to the firing primer. A filler area inside of the casing is adjacent to the diffuser on an opposite side to the propellant zone. The filler area contains particles of a powder having interstitial void space between the particles. A frangible end seal is attached to the casing within the retainer end, with the frangible end seal being positioned adjacent to the filler area on an opposite side of the diffuser. When activated, propellant gases expand through the diffuser into the fill area deagglomerating and fluidizing the powder particles and increasing pressure until the end seal ruptures and releases an aerosol cloud. A method for disseminating an aerosol using the device is also disclosed.

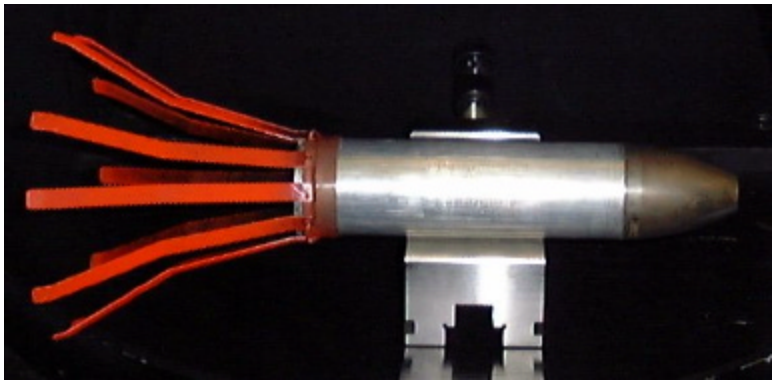
20 Claims, 1 Drawing Sheet

PROPELLANT DISSEMINATION DISPENSER SYSTEMS



38mm/ 40mm CARTRIDGE

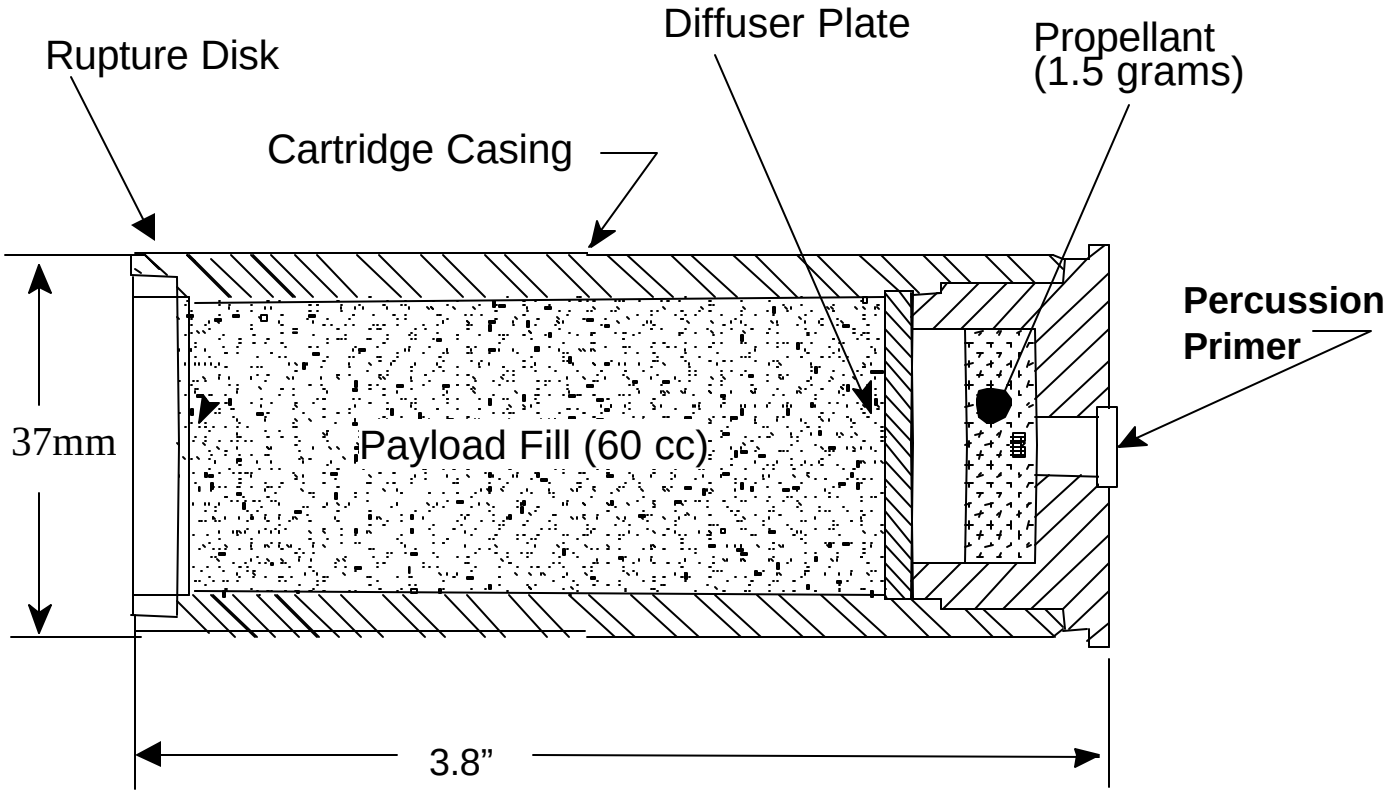
18 and 54-CHAMBER DEVICES



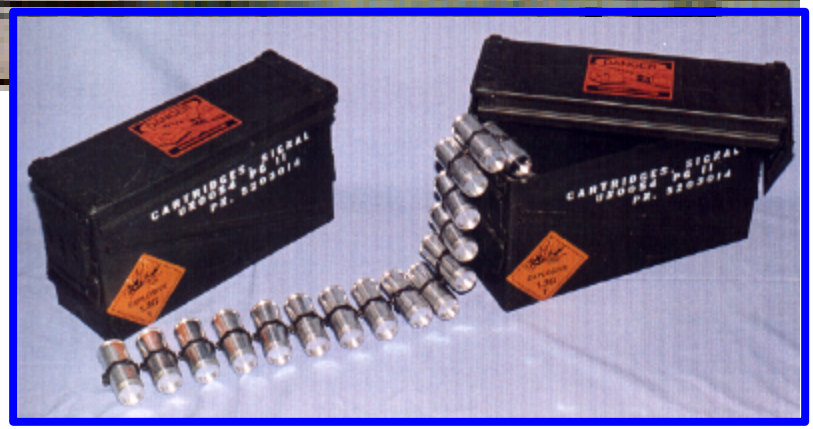
PROJECTED CARTRIDGE

BULLET TRAP RIFLE GENADE
CARGO PROJECTILE

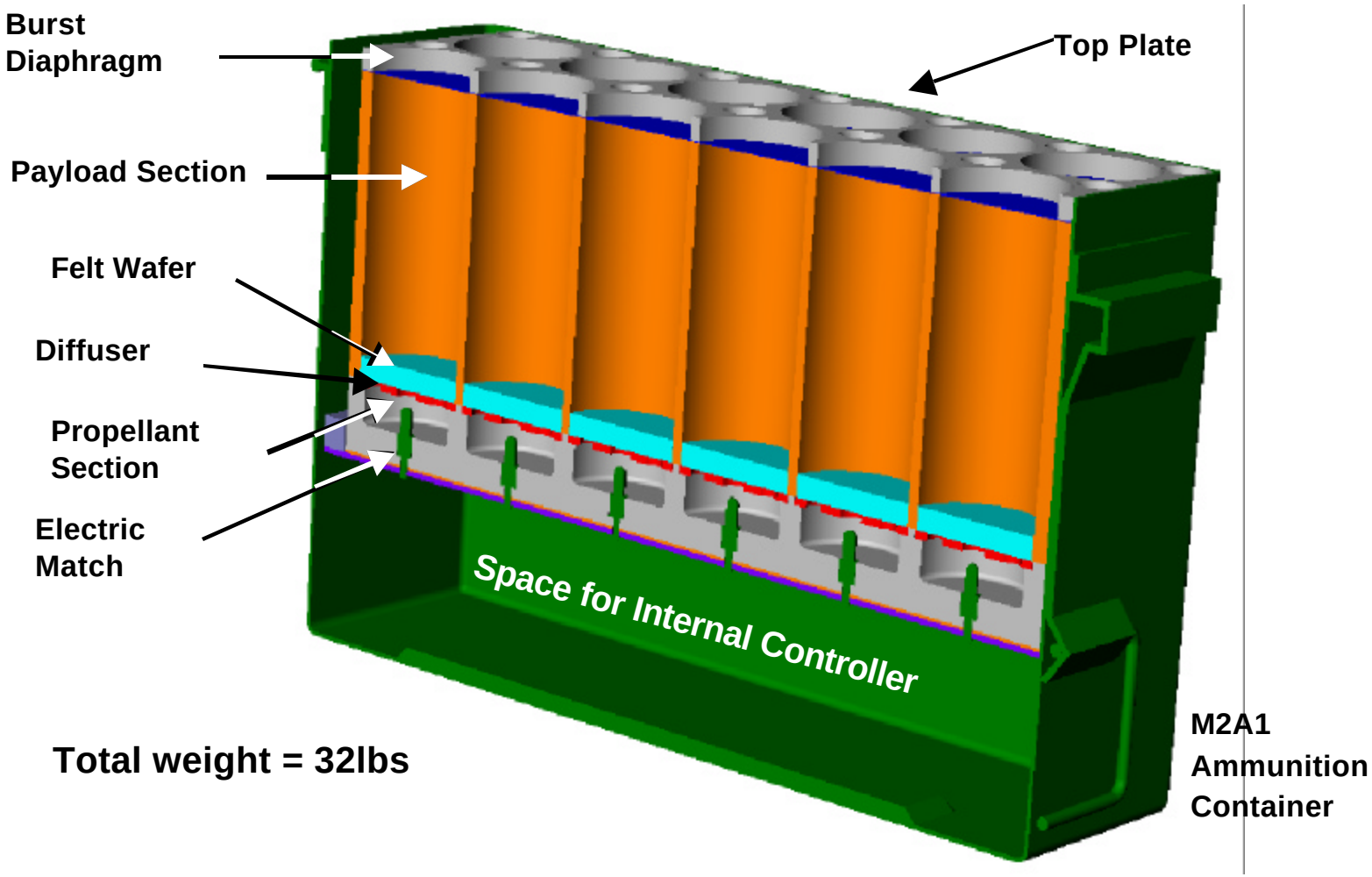
37mm CARTRIDGE



37mm AEROSOL CARTRIDGE



PROPELLANT DISSEMINATION AEROSOL DISPENSERS



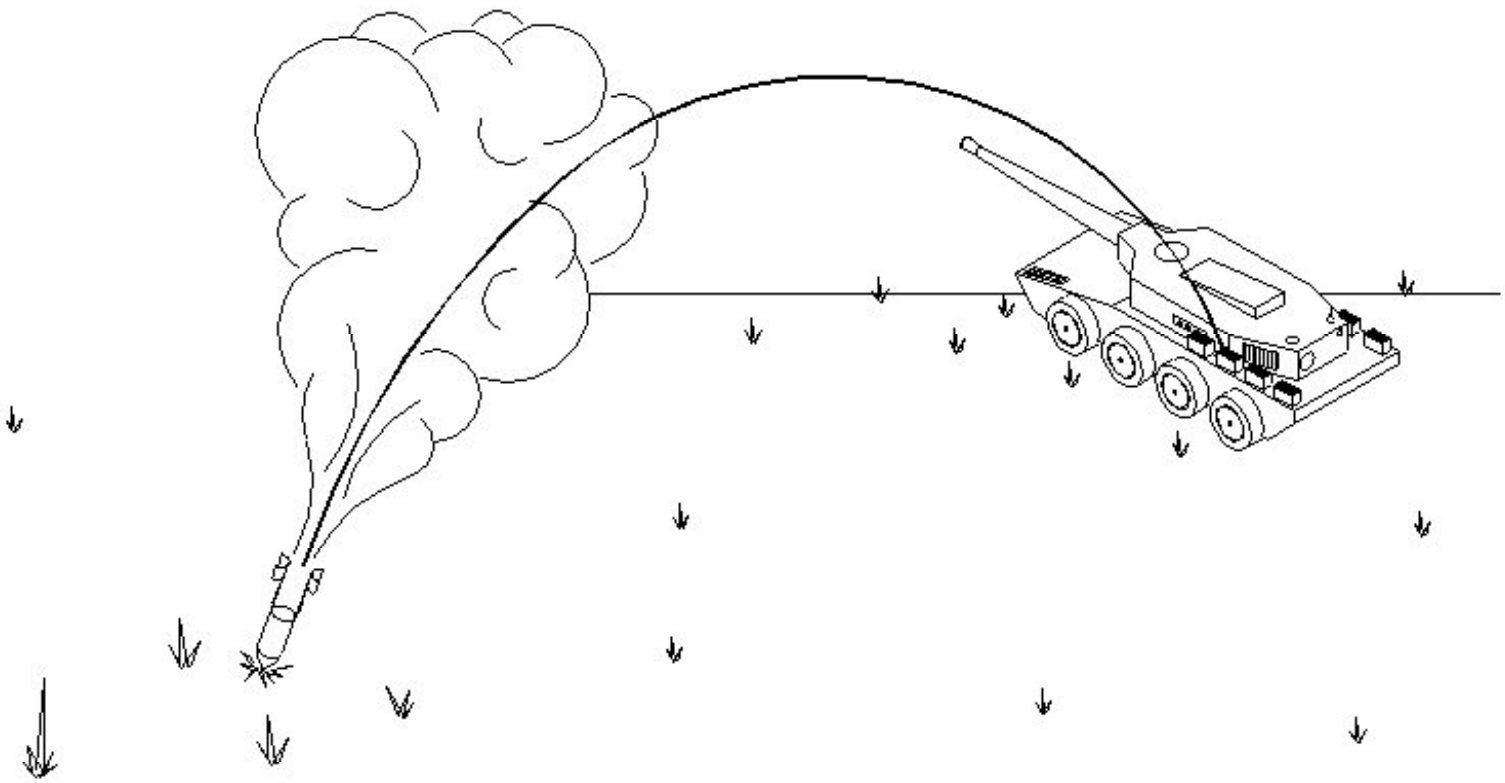
Total weight = 32lbs

PROPELLANT DISSEMINATION AEROSL DISPENSERS

PROPELLANT DISSEMINATION DISPENSERS VIDEO

PLACE CURSOR OVER FRAME TO START VIDEO PLAYBACK

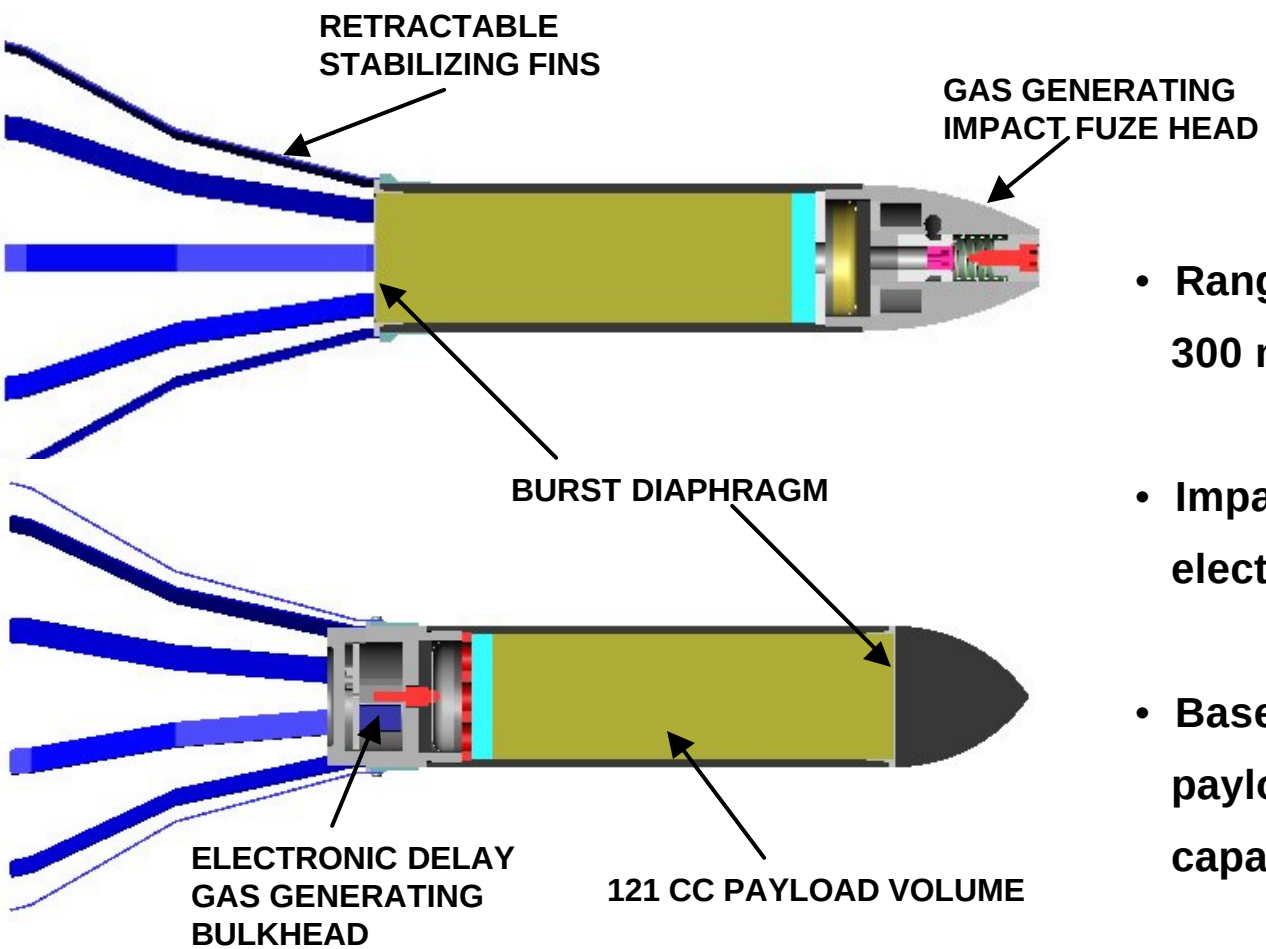
PROJECTED SCREENING CARTRIDGE



Concept illustration of projected cartridge

PROJECTED SCREENING CARTRIDGE

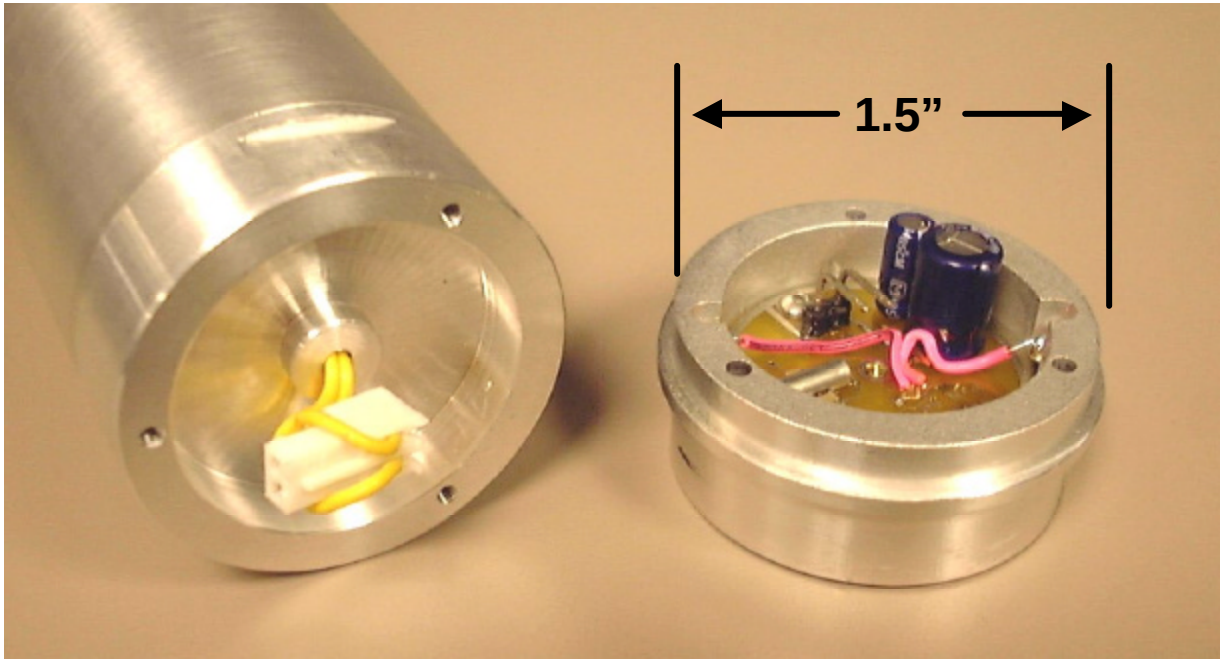
Projected Cartridge Configurations



- Ranges from 25 to 300 meters
- Impact or in-flight electronic initiation
- Base or forward payload ejection capability

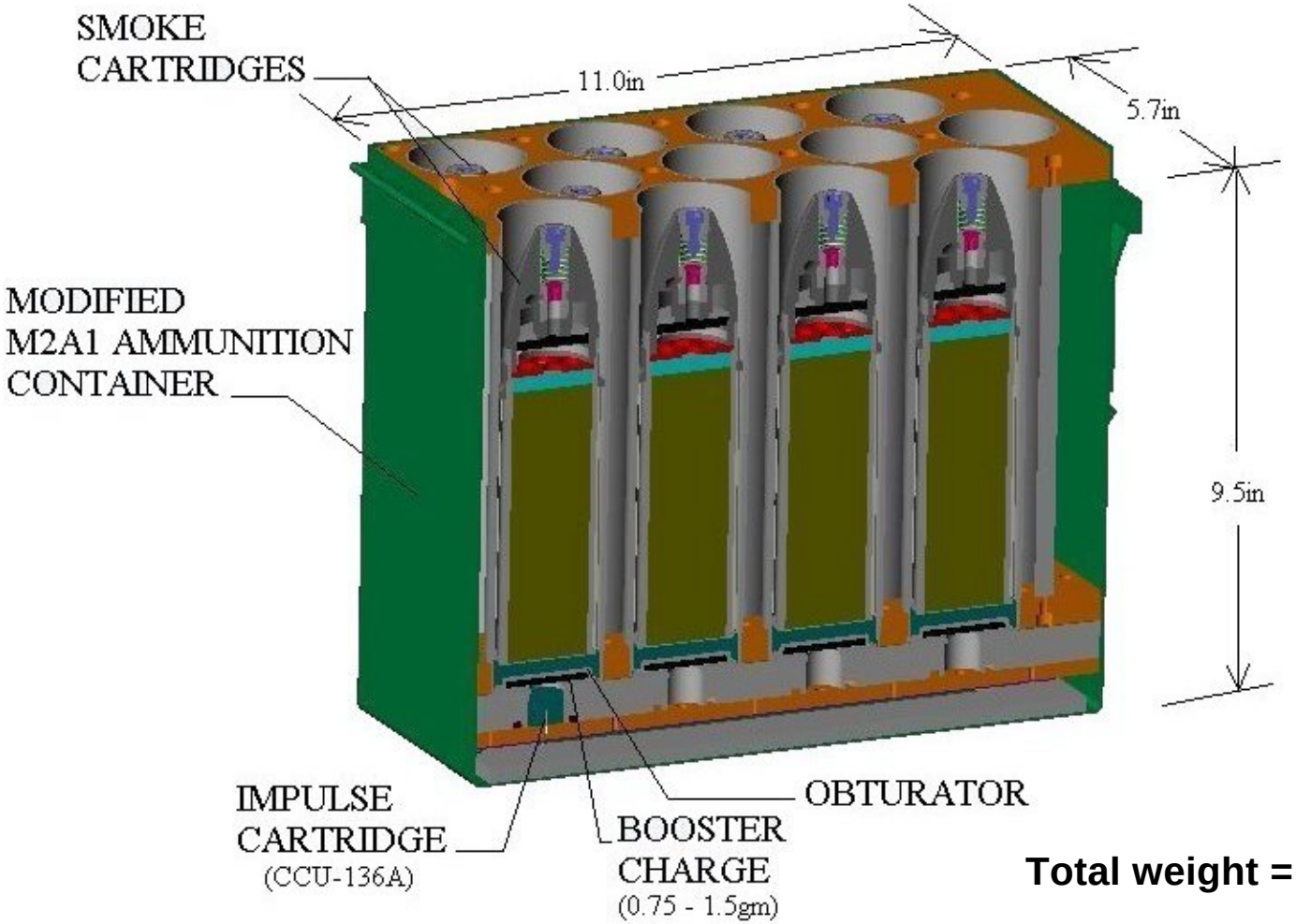
ENGINEERING
TECHNOLOGY
INCORPORATED

PRECISION ELECTRONIC DELAY



- Adapted from aerial display technology to synchronize fireworks with laser, lights and sound (music).
- Variable duration and digital precision; 0.3s to 9.0s ± 0.001 sec.
- Dynamic programming of delay immediately prior to launch.
- Safety:
  - BIT verification prior to launch,
  - Safe separation sensing
  - No-fire firing energy dissipation

PROJECTED SCREENING CARTRIDGE



Total weight = 42lbs.

Cutaway Section of 12-Shot Projected Cartridge Launcher

PROJECTED SCREENING CARTRIDGE

12-Shot Projected Cartridge Launcher

PROJECTED SCREENING CARTRIDGE VIDEO

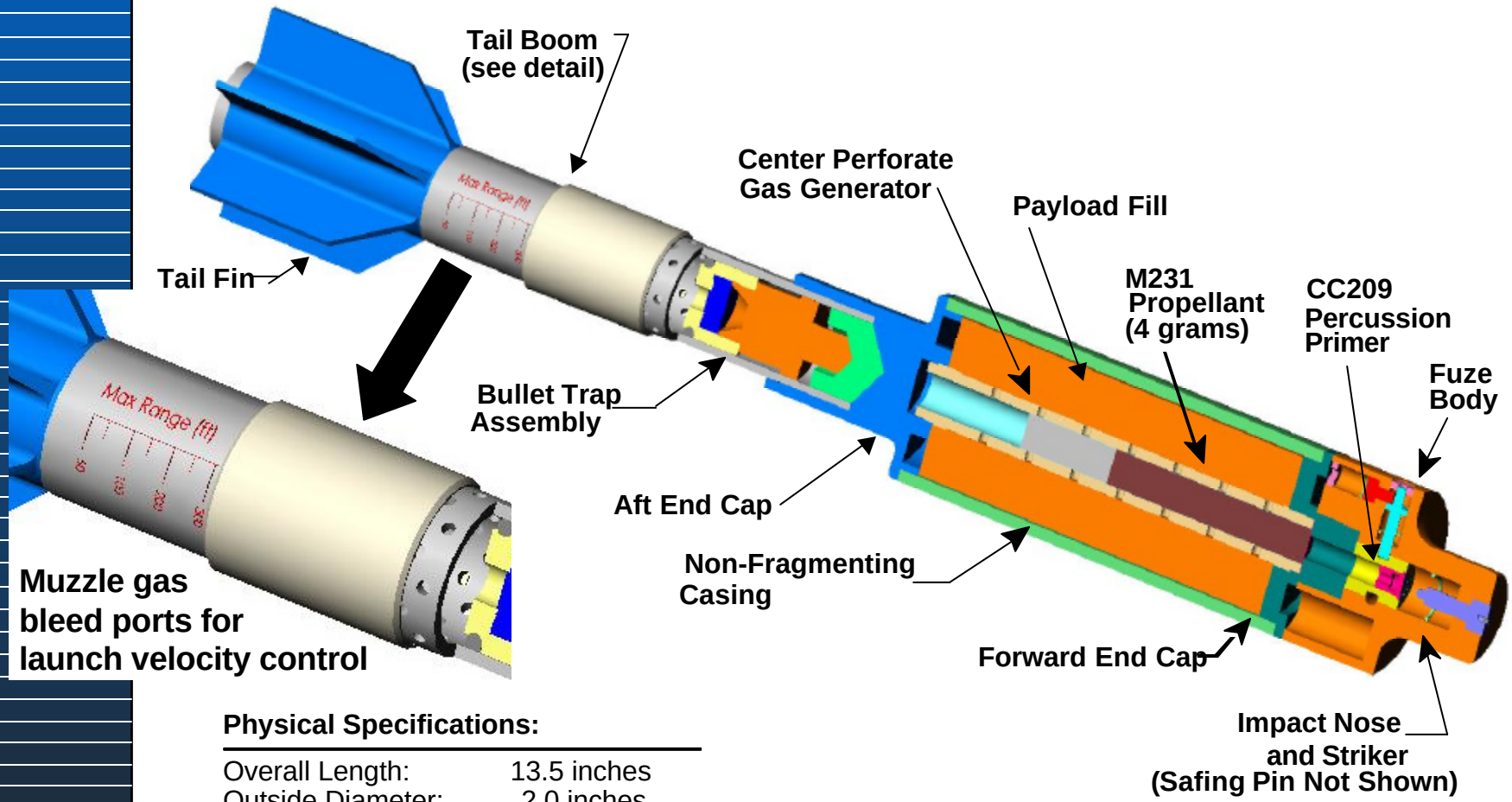
PLACE CURSOR OVER FRAME TO START VIDEO PLAYBACK

VEHICLE INTEGRATED SYSTEM

Propellant disseminators mounted on (HMMWV)

- **Dispensers can be functioned for rapid or sustained operation.**
- **The firing control system can be integrated to the vehicle's sensors.**

BULLET TRAP RIFLE GRENADE CARGO PROJECTILE



Physical Specifications:

Overall Length:	13.5 inches
Outside Diameter:	2.0 inches
Total Mass:	1.50 pounds
Fill Mass:	230 grams
Maximum Range:	517 feet

ETI Part Number: 8277072
Bullet Trap Rifle Grenade Smoke Projectile

ETI BTRG Smoke Projectile for IR Screening

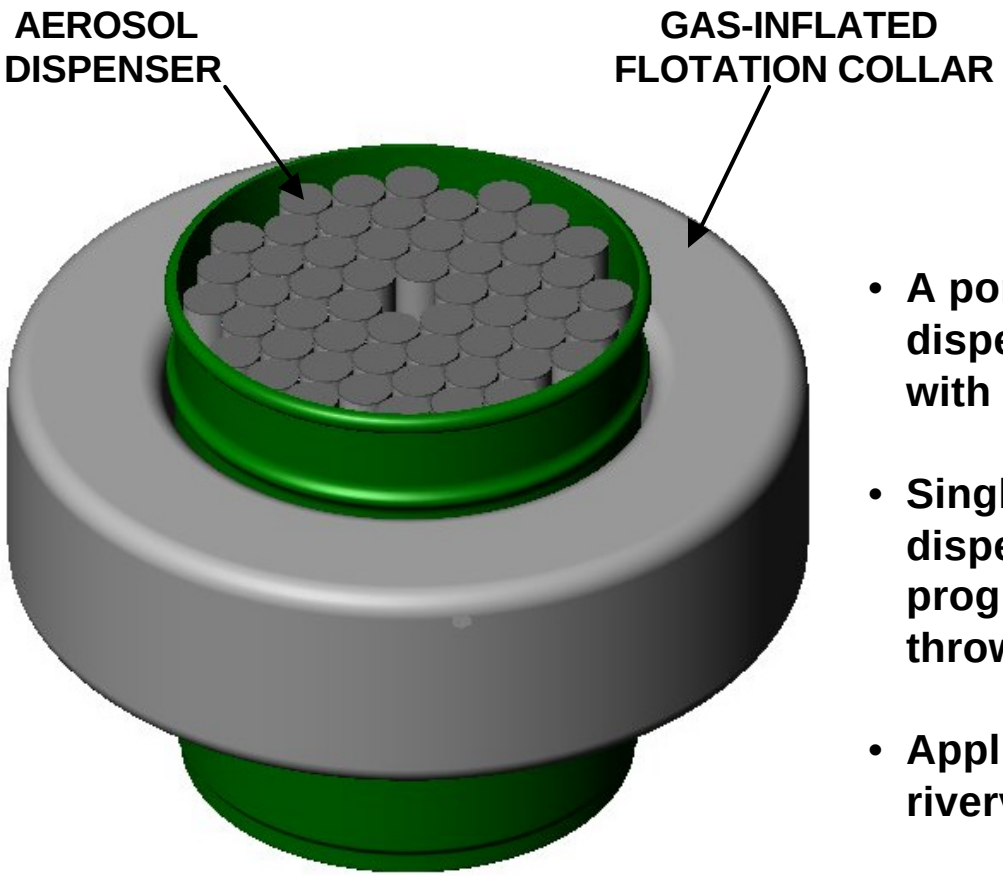
BULLET TRAP RIFLE GRENADE CARGO PROJECTILE VIDEO

PLACE CURSOR OVER FRAME TO START VIDEO PLAYBACK

BULLET TRAP RIFLE GRENADE CARGO PROJECTILE

- Projectile can be launched from a M16 or Colt AR15 assault rifles using standard ball ammunition.
- Cargo section is adaptable to a variety of non-lethal payloads:
  - obscurants
  - NL aerosol agents
  - flash-bang grenade
  - sting ball payload
  - unattended sensors
- Wide range of applications
- Mechanism to control launch velocity and range

FLOATING DISPENSER



- A portable, stand-alone dispenser with controller fitted with flotation equipment.
- Single or multiple smoke dispensers could be programmed to function when thrown overboard.
- Applications may be suited for rivervine or coastal watercrafts.

PROPELLANT DISSEMINATION TECHNOLOGY SUMMARY

- **Propellant dissemination technology is a new means of providing a high quality aerosol.**
- **Less hazardous operation - no explosive events**
- **Multi-Agent compatibility: dry powders, mixtures**
- **Electronic control of initiation timing, rate of function and location.**
- **Suited to a variety of non-lethal applications:**
  - **Tactical concealment**
  - **Sniper countermeasure**
  - **Crowd control and dispersal**
  - **Building clearing operations**
  - **Area denial to personnel**

ENGINEERING
TECHNOLOGY
INCORPORATED

Application of Propellant Dissemination Technology for Non-Lethal Aerosols

Engineering Technology Incorporated (ETI)

DANIEL HARTMAN, P.E

EDGARDO MALDONADO

NOEL GONZALEZ, P.E.

U.S. Army
Edgewood Chemical and Biological Center (ECBC)

Smoke and Target Defeat Team

WILLIAM G. ROUSE, P.E.