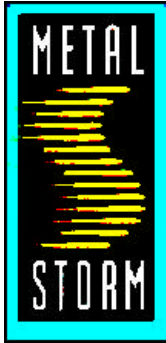


**Where the Seemingly
Impossible Happens !**

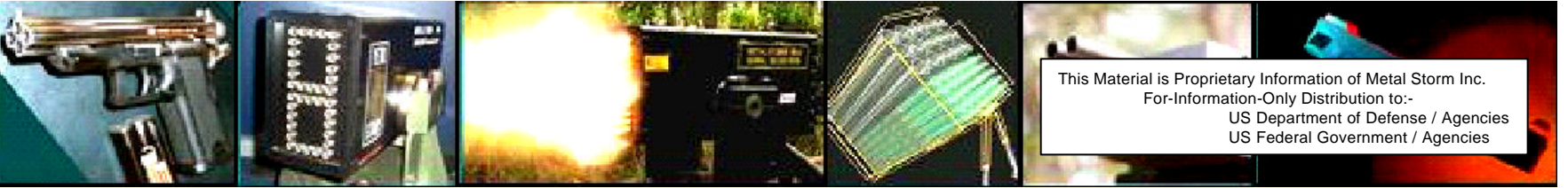
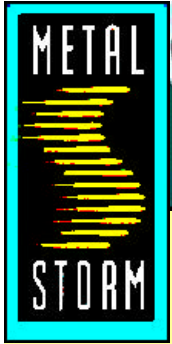


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Metal Storm

Technology Briefing And Very Close in Ship Defense

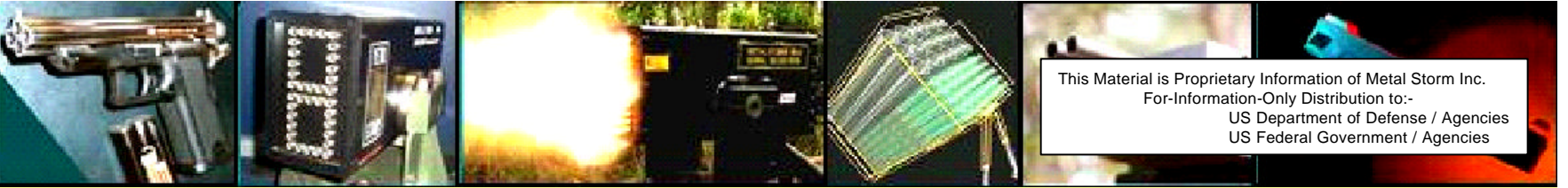
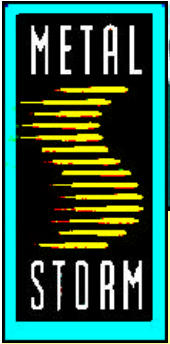
NDIA Symposium
27 March 2003



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Purpose

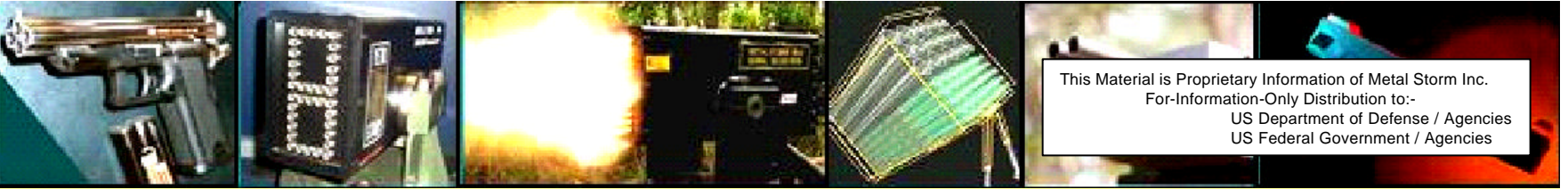
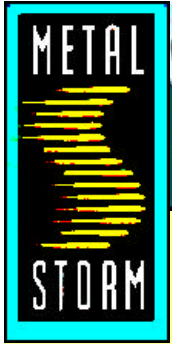
- **Metal Storm Technology Update**
- **Define how this technology can provide for Very Close In Ship Defense (VCSD) and other high value assets.**



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Contents

- **Business Background**
- **Technology**
- **VCSD / Other Applications**

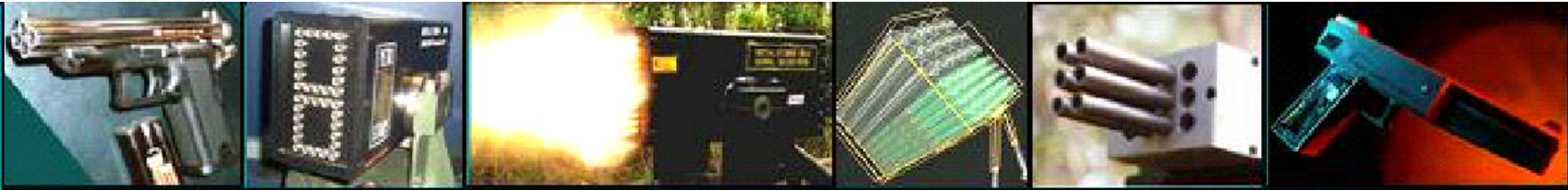


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Who is Metal Storm?

- **Metal Storm is a transformational electronic munitions company.**
- **Inventor: Mike O'Dwyer**
- **Australian based – Metal Storm Ltd.**
- **US Company – Metal Storm Inc. USA**
- **Located Arlington, Va.**

**METAL
STORM**



ADM Bill Owens, USN, Ret, CHAIRMAN
Retired Vice Chairman, Joint Chiefs of Staff

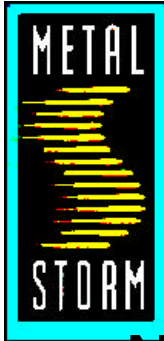
United States Directors



LTG D. Christman USA, Ret
Superintendent of United States Military Academy
Degrees in Civil Engineering and Law



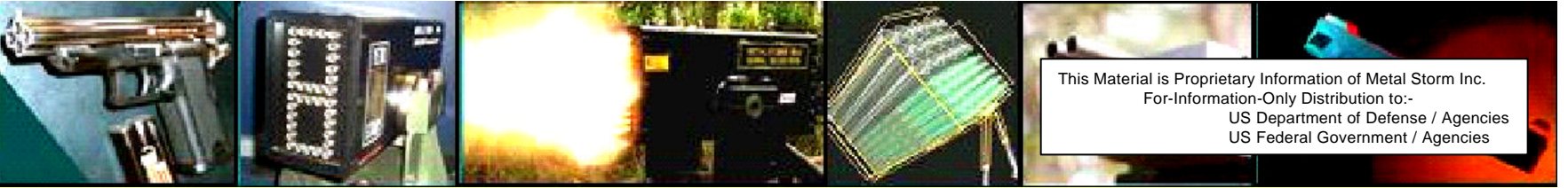
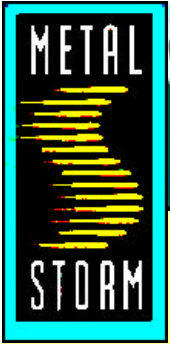
GEN Wayne Downing USA, Ret
Retired 1996 as Commander-in-Chief US
Special Operations Command



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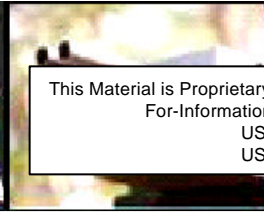
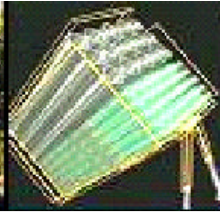
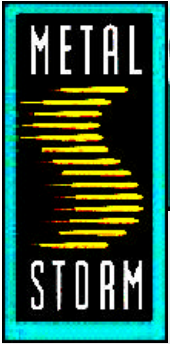
Metal Storm Bus Opportunities

- National Institute of Justice – Smart Gun
- Missile Defense Agency – Missile Defense SBIR
- Missile Defense Agency – Missile Intercept SBIR
- US Army Picatinny – Robotic Crowd Control SBIR
- US Navy – Littoral Combat Ship Defense
- US Army FCS – Area Defense Weapons System
- Defense Contractor – small caliber development
- Defense Contractor – Submarine Defense against high speed torpedoes
- USMC – Chaff and flare dispensers for aircraft
- USAF – Integrated Base Defense Security System USMC and Defense Contractor – 60mm mortars
- Naval Surface Warfare (Crane) – Very Close-in Ship Defense



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Technology Basics

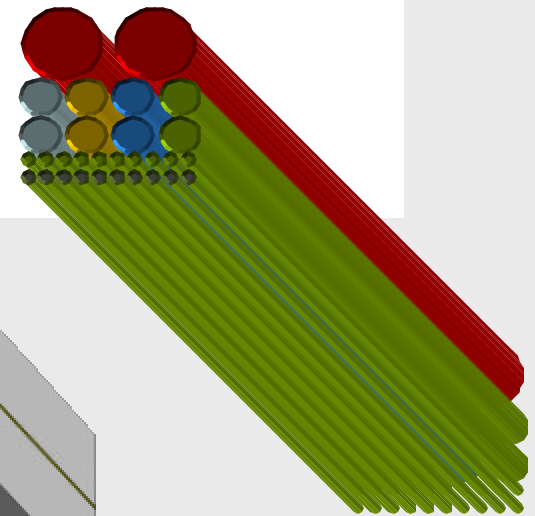


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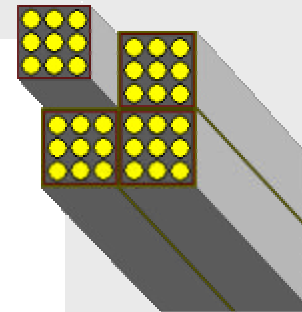
Metal Storm: The projectiles are stacked in-line in the barrel

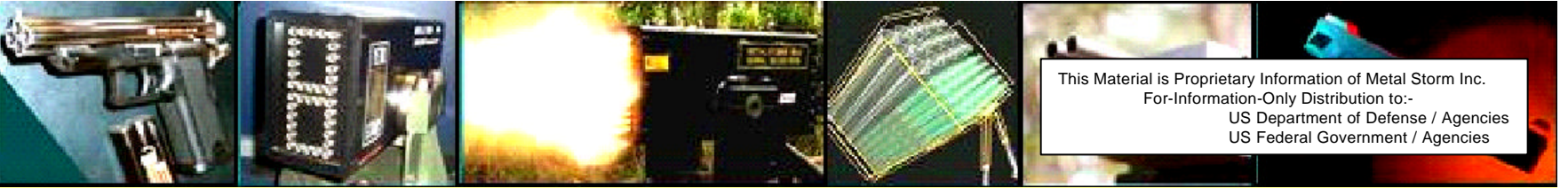
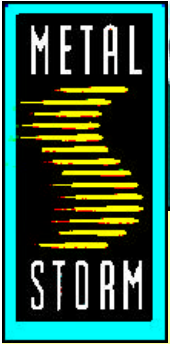


Multiple Tubes, Multiple Calibers,
 and Multiple Projectile types...
 can combine as a Compact Pod



- Fire one round..or fire any number of rounds
- Fire any combination of barrels
- No moving parts: Only the bullets move
- Multiple Barrels, Calibers, Lethalities in One Weapon
- Electronically variable rate of fire to beyond 1M rpm
- Can be tightly packed, stored and easily transported
- The ammunition box is the weapon !





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DARPA Testimonials



SYSTEM CONCEPT



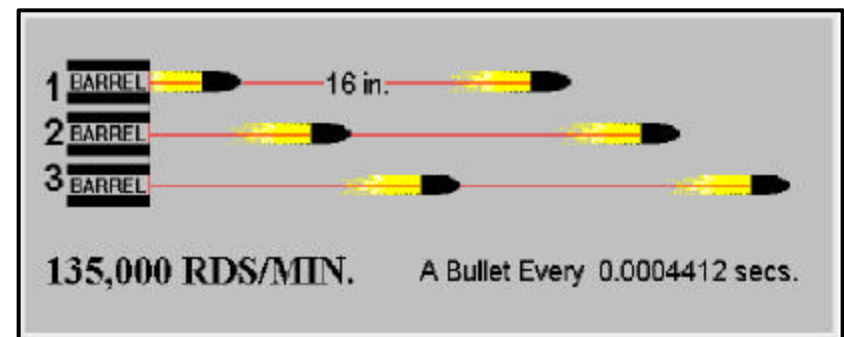
Revolutionary New Weapon Technology



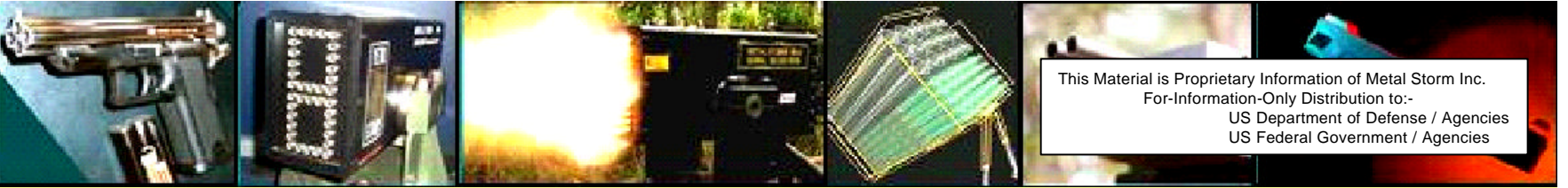
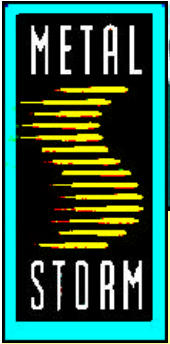
To develop a unique 100% solid state system for:

- tightly packing/ storing / transporting/ firing projectiles in multiple tubes
- electronically variable sequenced rate of fire, up to 1 Mil rds/min

Applications to a wide range of small arms and crew-served weapons for military and law enforcement.



The System has no conventional equivalent!



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Metal Storm is continuing the development of Stacked-Ammunition

Metal Storm Stacked-Ammunition

60mm Mortar Round:

Weight	1.6 Kg
Length	265mm
Pressure	80MPa
Muzzle Velocity	250 m/s
Maximum Range	3.5 Km

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40mm Grenade: Rates to 20K rpm per barrel

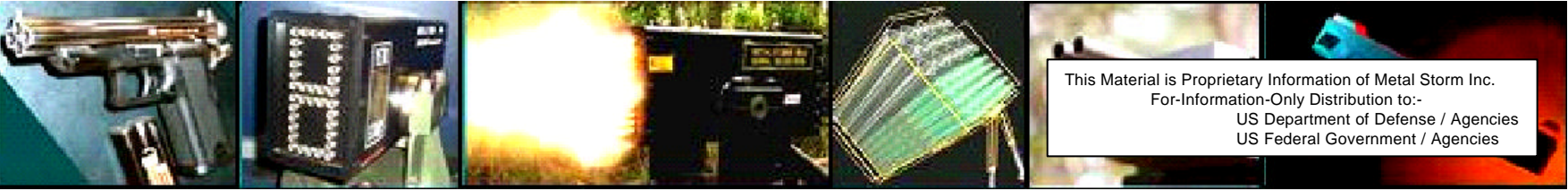
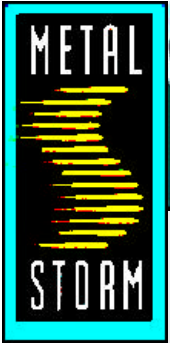
Weight	270g
Length	96mm
Pressure	110 / 150 MPa
Muzzle Velocity	240 / 316 m/s
Maximum Range	1,700m

.50 Caliber High Pressure: [Not Shown]
Approx 70,000psi. Multi-Shot Cartridge

2nd Generation: [Tested in 15.7mm]
Wireless Ammunition. [Under Development]

9mm Small Arms:
102 -158 Grain. Fired in VLe Hand Gun
and 36 Barrel Prototype Pod. @ 1M RPM





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DSTO AMMUNITION TESTING



DSTO:

* The Metal Storm technology has been exhaustively tested at launch pressures equivalent to 40-45,000 psi.

The test firing using a 40mm concept demonstrator at DSTO confirms the integrity of the sealing mechanism.

It would be possible to develop the use of light weight composite materials that can be used to launch 20/40mm projectiles, thus reducing the weight and cost of the weapon.



Cartridge unit is completely self contained



600
Rounds/Min

15. Close up 36 rounds
at 30,000 rds/min.

A Burst at 30,000 rds/min



A Burst at 60,000 rds/min



**Impact:
180 Rounds
at
1,000,000 Rds/Min.**

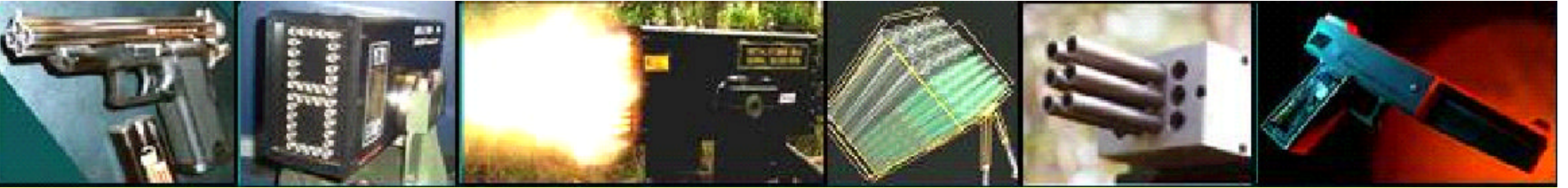
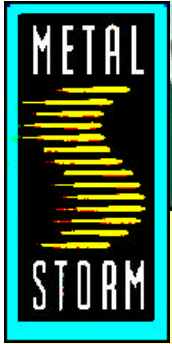
METAL STORM

An Electronic Firing Demonstration

Blossom Point, Maryland

Live Firing Demonstrations

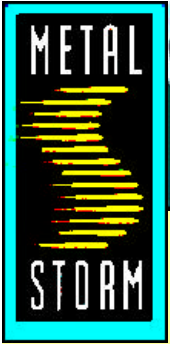




We are Accelerating some Key Applications with a Rapid Build Program

- **40mm Multi-Barrel Demonstration**
- **Ship Defense System Demonstration**

**Targeting Defense and Homeland Security,
building off our Govt R&D Technical Successes**



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Metal Storm Very Close in Ship Defense

Very-Close-in Defense

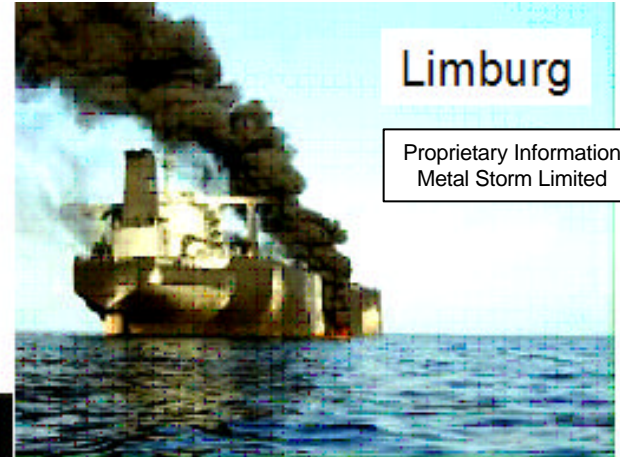
Operation:

1. Acquire and Target the Threat
2. Defeat with either 15.7mm or 40mm or both
3. Move on to next Target.



The Threat

Swarming Small Craft Attack



Limburg

Proprietary Information
Metal Storm Limited

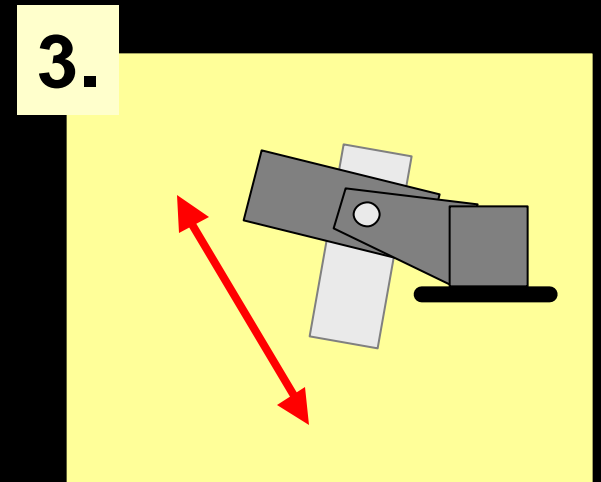
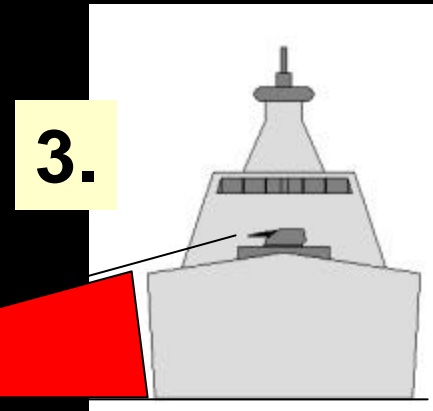
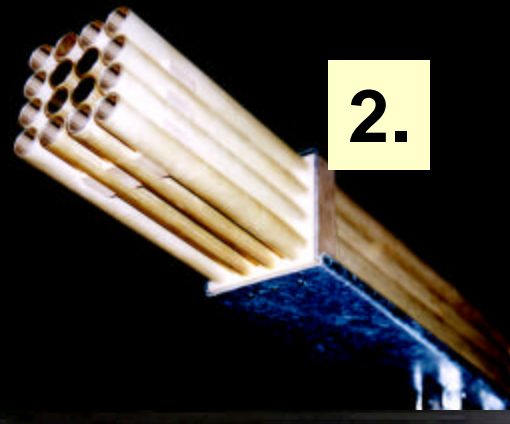
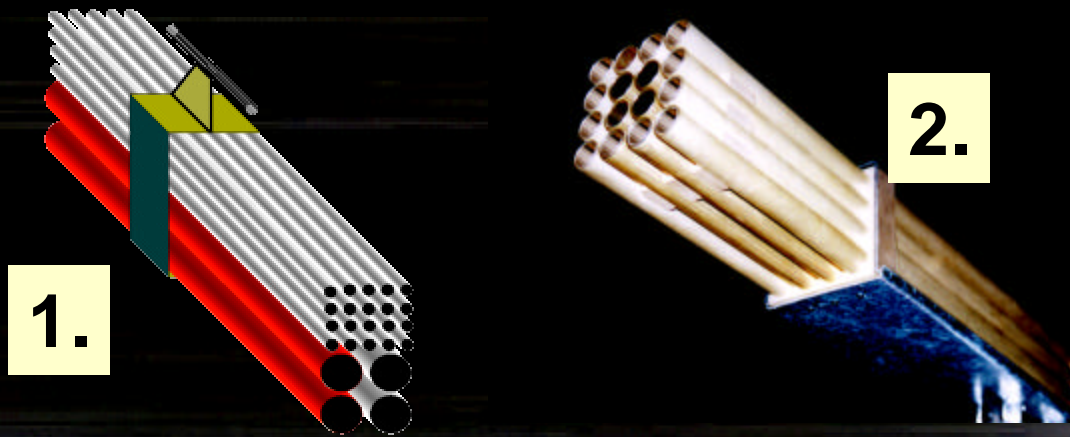


USS Cole

Close-in Pod Defense System
Low Tech
Low Cost
Low Maintenance
Dumb Kinetic Rounds
Simple Operation
Rapidly Engage Multiple Targets
High Pk: 1,000 rds in 0.01 Secs
Graduated-Lethality Selection

The Unresolved Threat Area:- Inside 500yds:

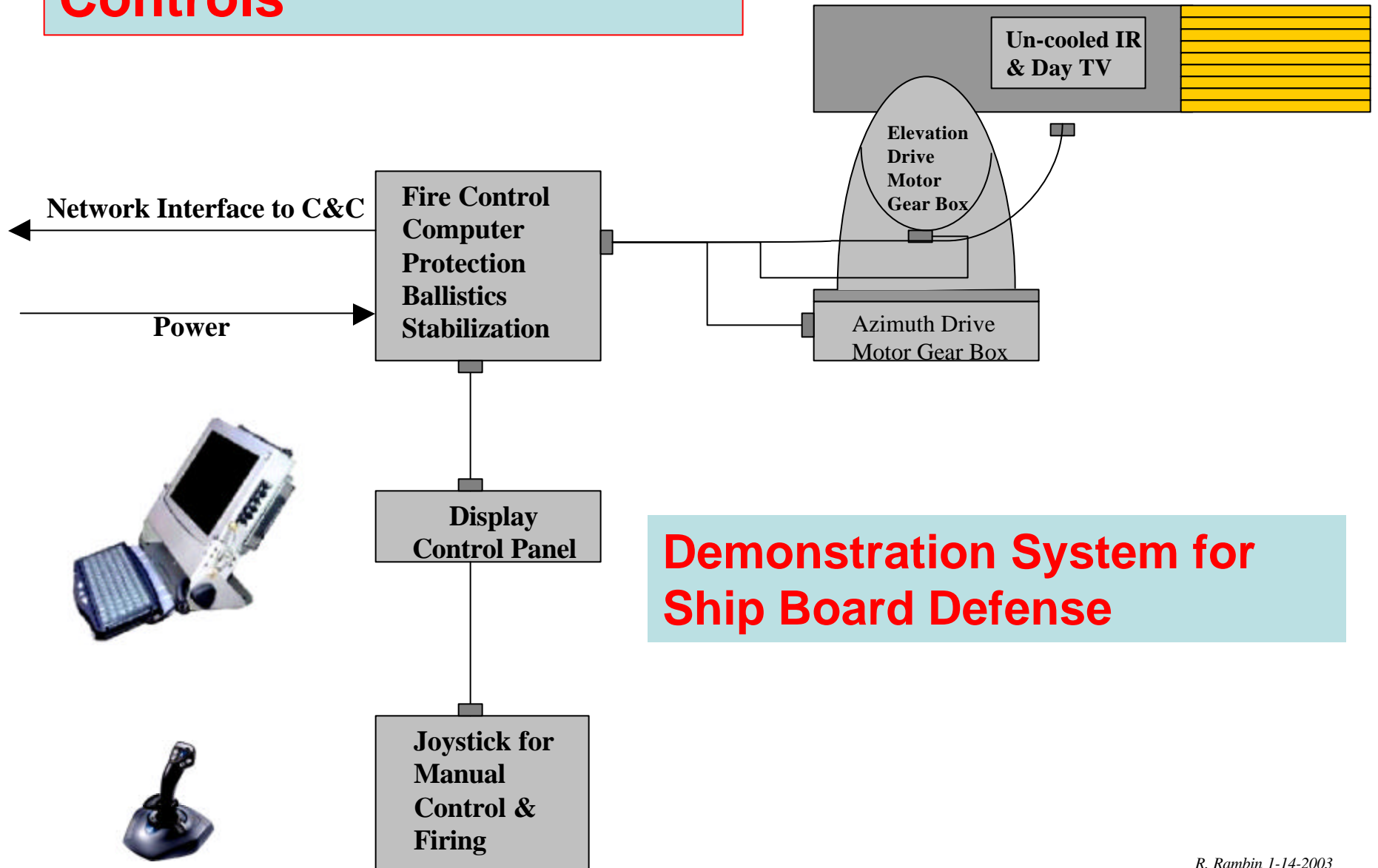
- Dockside Crowd Control / Lethal / Less Than Lethal
- Swarming attacks emerging at Very Close range
- Swarming or individual attacks emerging under-the-gun



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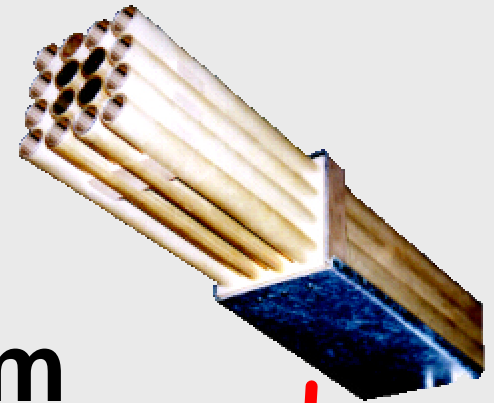
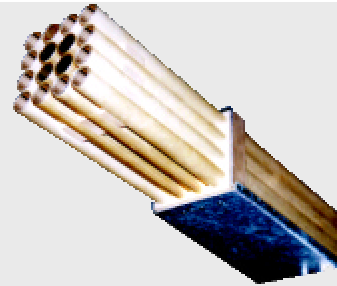
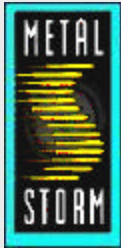
The Threat: Swarming Small Craft Attack

Metal Storm / Vista Controls



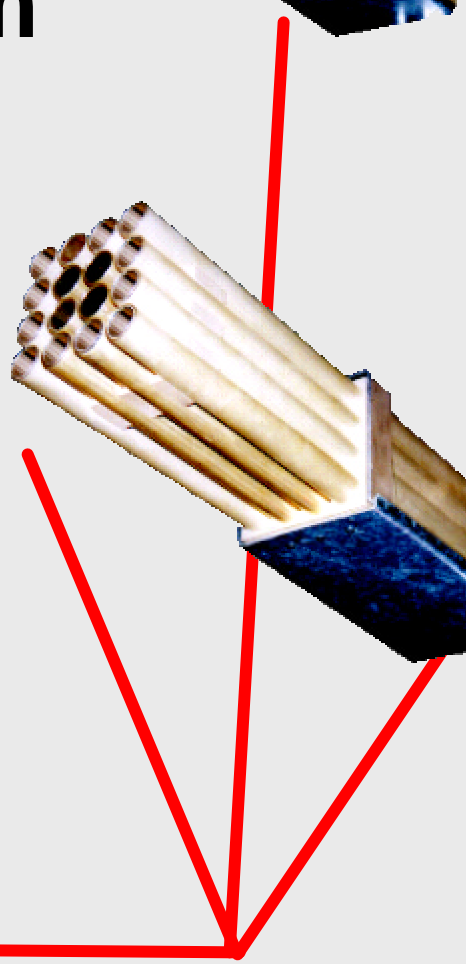
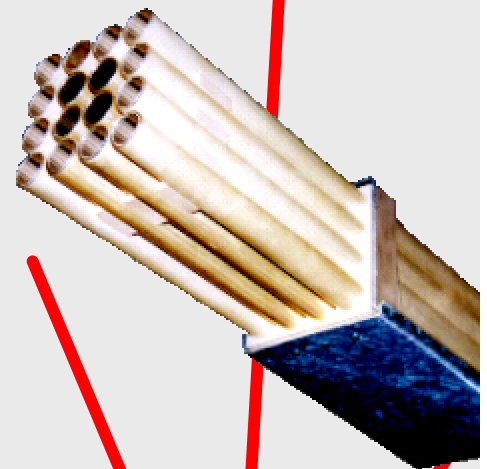
Demonstration System for Ship Board Defense

Very-Close-in Defense

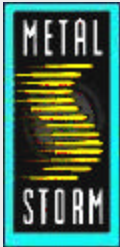


Demonstration System Description

- Weapon Assembly
- Two Axis Weapon Turret
- Sensor Suite
- Fire Control Computer
- Display & Weapon Control Panel



Very-Close-in Defense



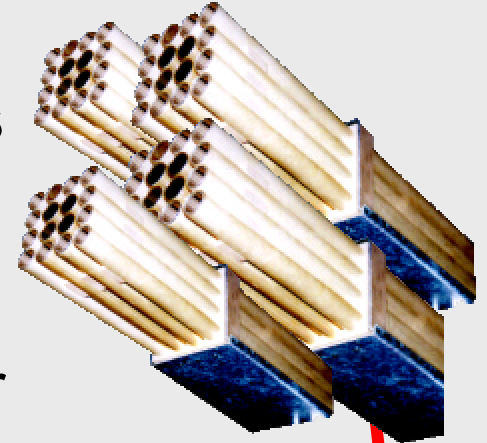
Demonstration with Multiple Calibers

Each pod contains four reload sleeves and can be configured with 100% 15.7mm rounds, 100% 40mm rounds, or 50/50.

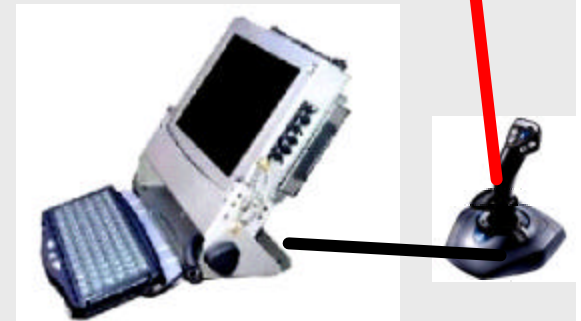
Advantages:

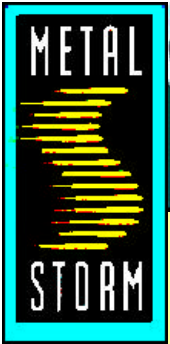
15.7mm provides excellent coverage out to 500 meters.

40mm provides direct fire coverage up to one mile.



Cartridge unit is completely self contained

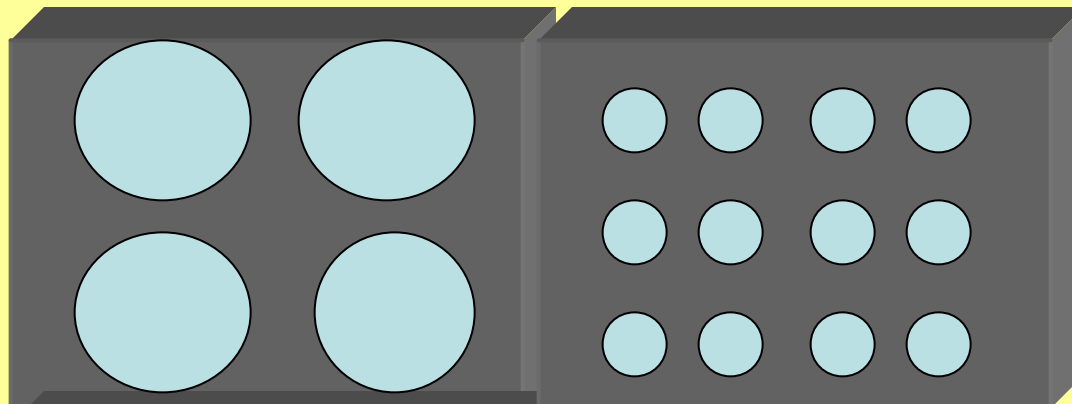




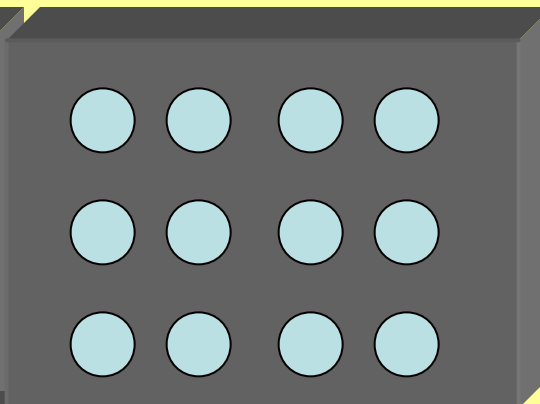
Configuration Options

480 rds of 15.7mm or 80 rds of 40mm or 240 rds of 15.7mm and 40 rds of 40mm

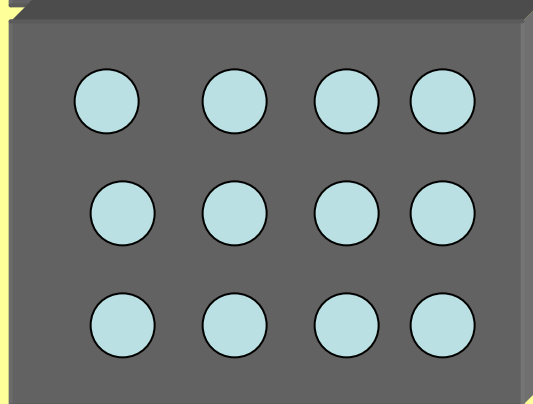
40MM
20 rds



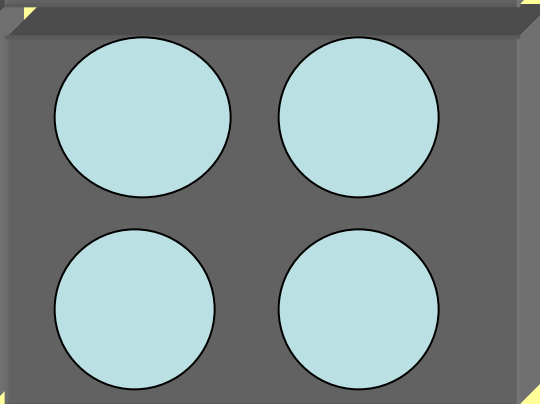
15.7MM
120 rds



15.7MM
120 rds



40MM
20 rds



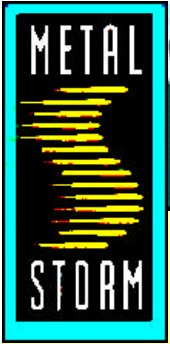
SPECIFICATIONS: 15.7mm RELOAD SLEEVES

- 12 barrels per sleeve with 10 rds each for 120 rounds. Each pod contains 4 reload sleeves for a total of 480 rounds. This would accommodate four engagements.
 - Each sleeve is 4in x 3.5in. in section, and 3 ft. long. The barrels are low cost 15.7mm ID extruded smooth bore tubes.
 - The projectiles are approx 29 grams, and 50mm long. Their nested length is 45mm.
 - MV is 1,000fps.
 - Sleeve weight empty = approx 20lb. Full = approx 28lb.
 - Max rate of fire per sleeve = 100k rpm. Max rate of fire per pod = 400k rpm
 - No barrel is center line in the system. Opposed firing balances torque.
 - Max rate for each 120 shot sleeve if fired at 100k rpm is 1,666 rounds per second for a duration of 0.06 secs
- Projectile swarm is 60 feet long. Nose to nose in flight is approx 7 inches..

SPECIFICATIONS: 40mm GRENADE RELOAD SLEEVES

- 40mm rds per barrel = 5. Total per sleeve = 20
- External dimensions remain same as 15.7 sleeve.
- 40mm is direct fire capable.
- 40mm length 78mm stacked.
- Weight [dummy round] 270gm.
- Tested Pressure 110/ 150 Mpa.
- Tested MV's 240/ 316 Meters/ Sec.
- Maximum Range > 1 mile
- Max rate of fire = 20, 000 rpm per barrel.

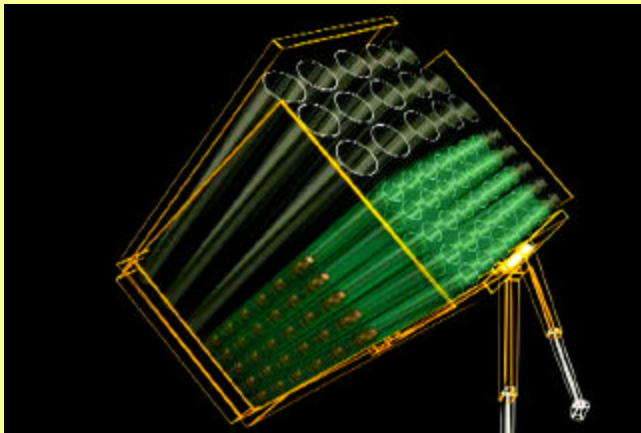
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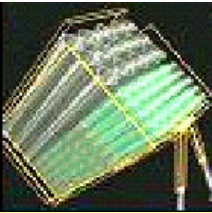
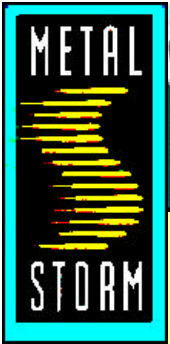


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Metal Storm Australia

Current Applications / Products





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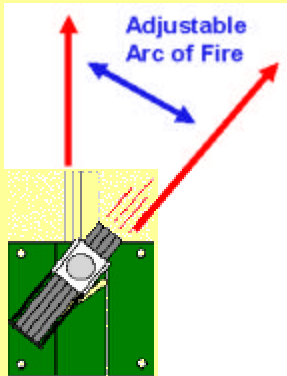
Other Applications

Repeatable Access Denial Defense Systems

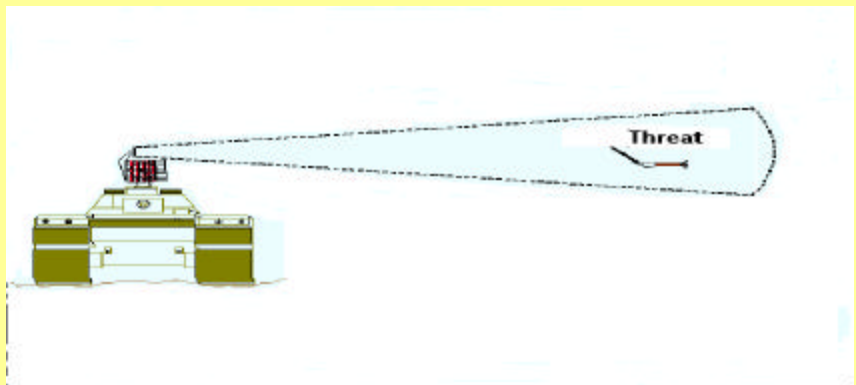
RADS



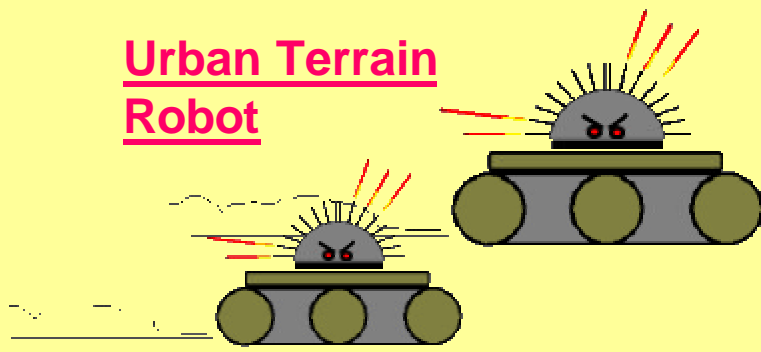
Repeatable Claymore



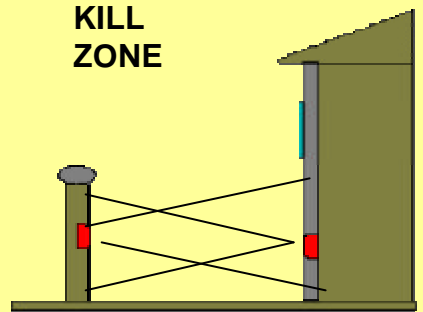
Vehicle Defense

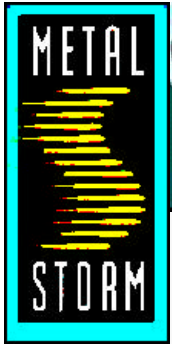


Urban Terrain Robot



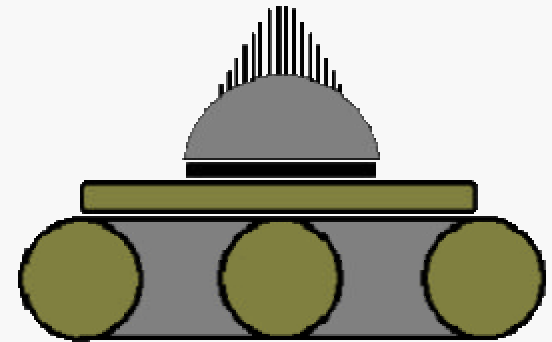
Embassy



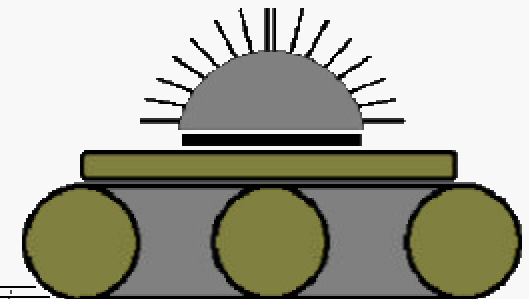


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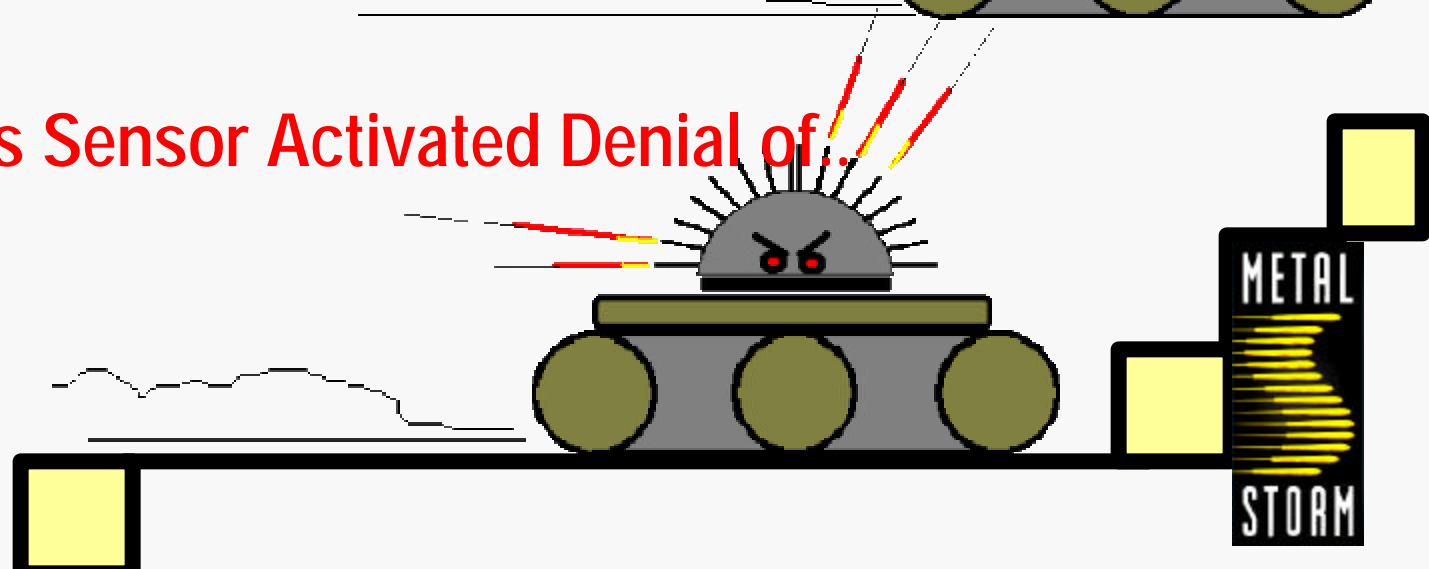
- **Urban-Terrain Combat Robot** [Folding-Barrels]
Approx Length 2.5 ft. Height 20 in.



- **Unfolded:** 116 Barrels [Carbon Composite]
1,508 Projectiles 7mm x 11mm. Ammo load = 15 lb.
Minimum Turreting time to Engage Hemispherical Targets

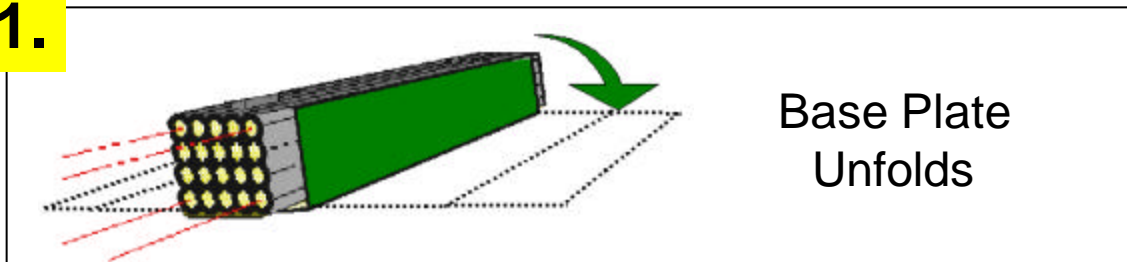


- **Autonomous Sensor Activated Denial of..**
Choke Points
Stairs
Doorways



The Virtual Soldier[s]: Smart Boxes of Ammunition

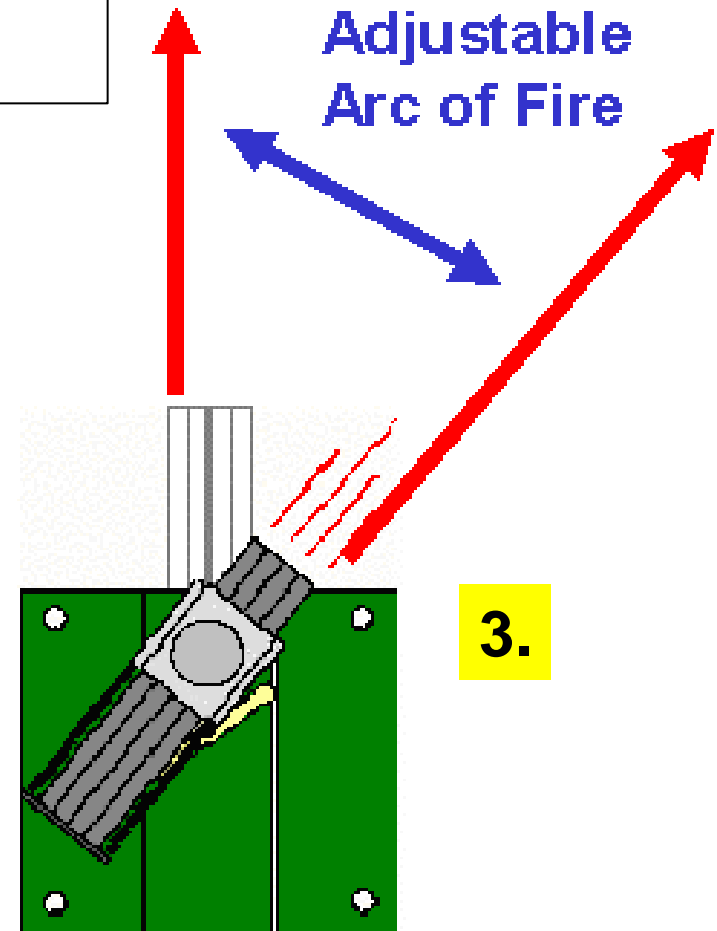
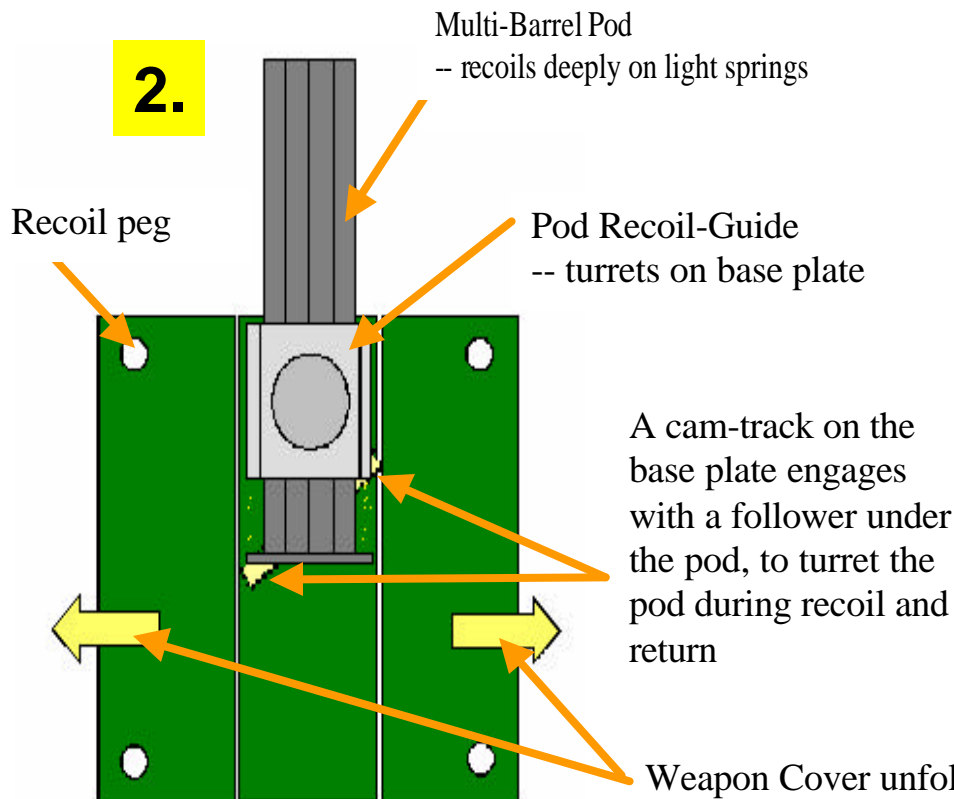
1.



Repeatable Access Denial (RAD)

Adjustable Arc of Fire

2.

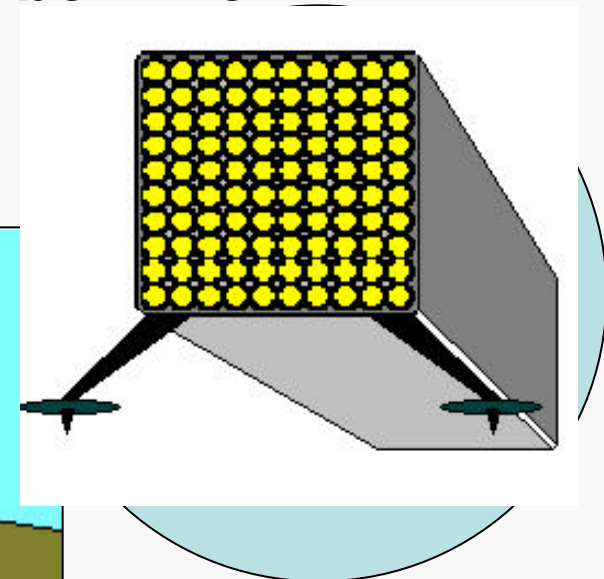
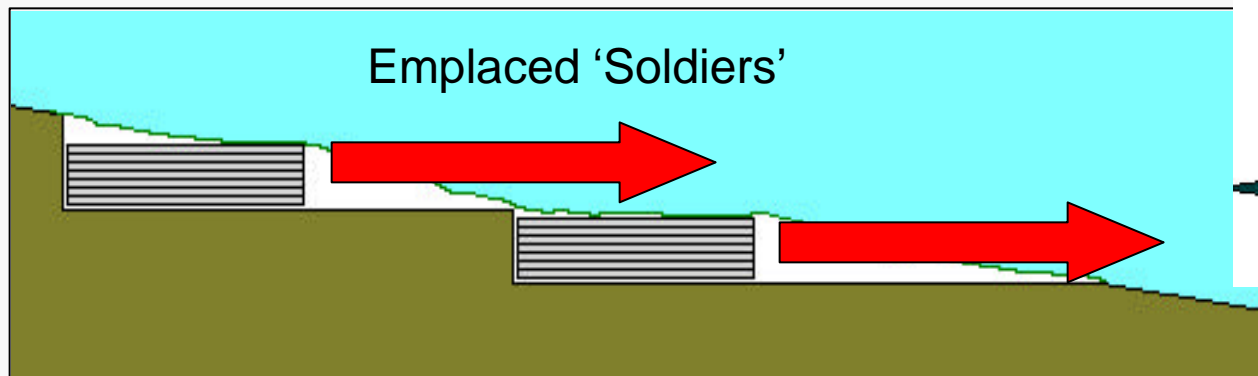


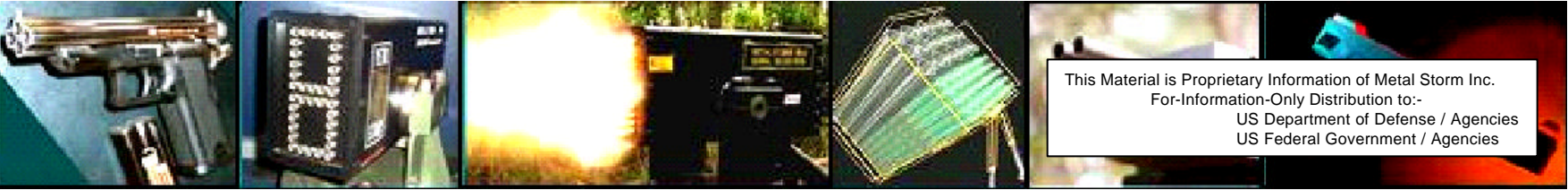
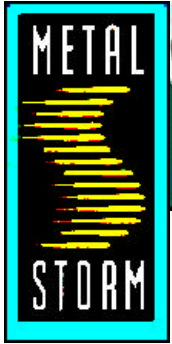
The Virtual Platoon[s]: **Smart Boxes of Ammunition**

VLe2

- **Cover Withdrawal / Set Ambush / Asset protection**
- **100 Barrels. 400 Rounds [if .22 caliber]**
- **40 Secs. of fire at 600 rpm**
- **'Explosive' Fire at 4.5 million rpm.**
- **Programmable to Imitate heavy Caliber Fire**
- **4in square. 6in long. 5lb.**

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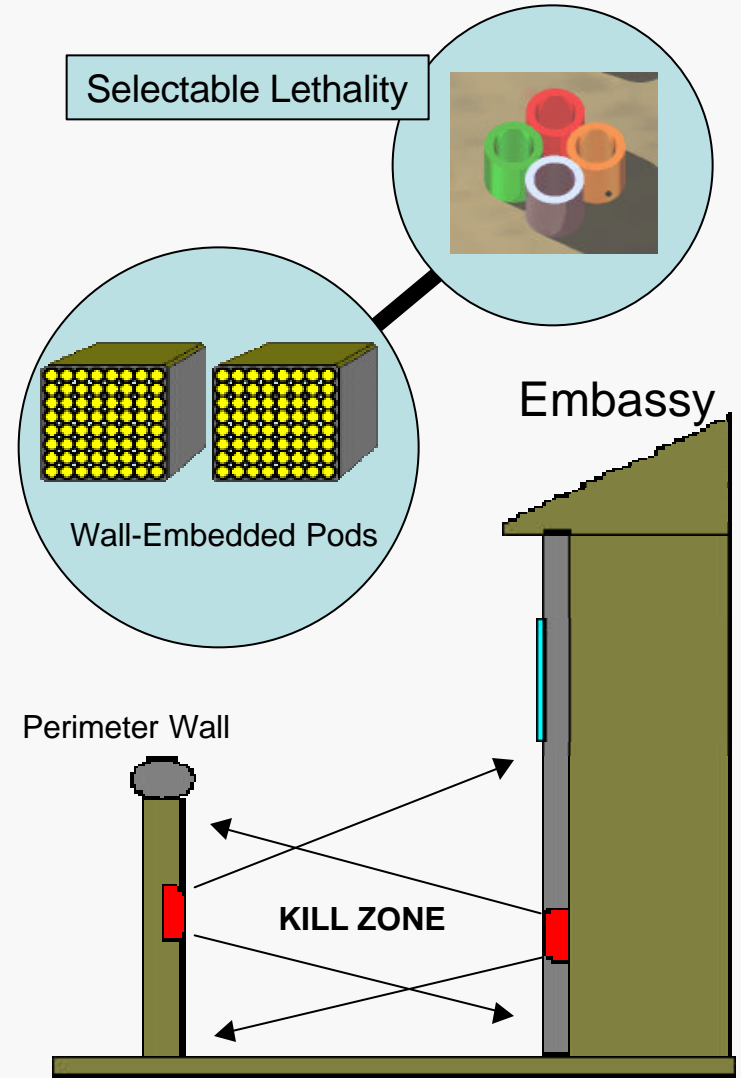


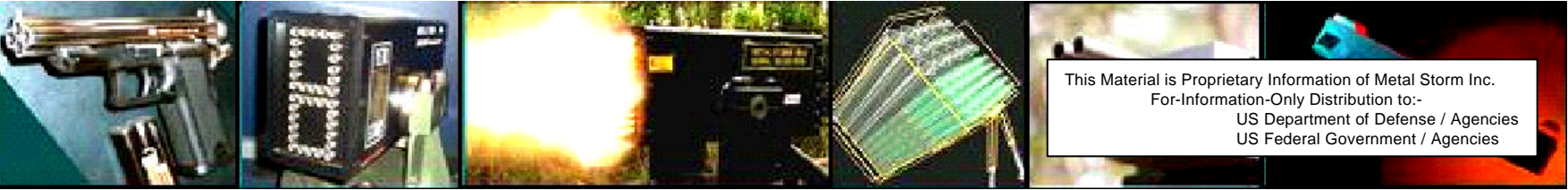
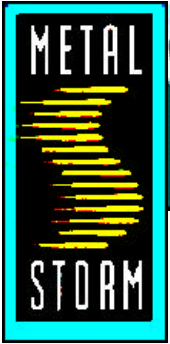
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Embassy Kill-Zone Perimeter Defense

Operational Capability

- Selectable-Lethality pods fixed to fire against an impact absorbing perimeter wall..... to form a contained and overwhelming kill-zone to protect against a massed attack by up to Hundreds.
- Each pod will measure 0.5 meter square and 0.3 m deep, will contain 1,000 common-walled barrels and 15,000 rounds, and can be remotely operated from a secure location, such that a small number of personnel can defeat repeated attacks.
- With one pod every 6 meters, a 30 meter section of embassy wall is protected by nearly 100,000 rounds.
- Publication of this capability, of itself, is likely to deter an attack.





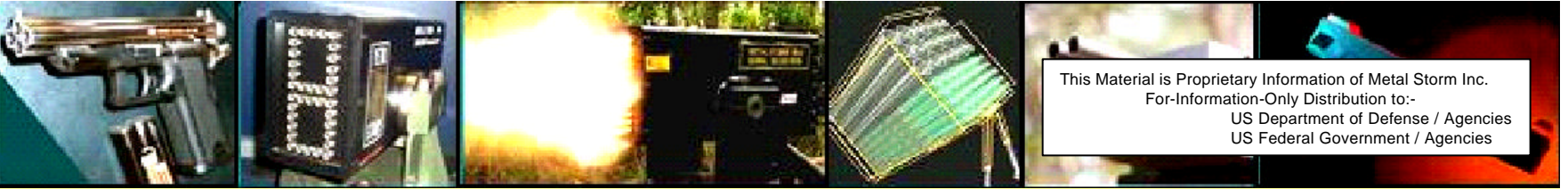
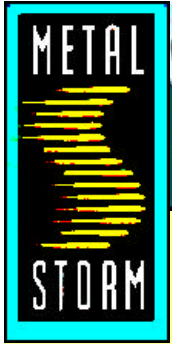
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CRITICAL INFRASTRUCTURE DEFENSE

The Major Question....

How to Provide a **Workable** and **Affordable**
Multiple-Threat Close-in Defense System ..
to Protect Critical Infrastructure Nationwide ?





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Summary:

- **A New Source of Power.**
- **A Modular, Digital, and Scalable Delivery System.**
- **Network Compatible.**
- **Significant Logistics savings and Manpower costs**
- **Elegantly Simple Family of Systems from one Base that supports Multi-Function, Multi-Capable Modules.**
- **A marriage of Information and Firepower**
- **Supports Low-Cost, Near-Term, Multiple-Platform System Experimentation.**