US ARMY RDECOM

U.S. Army Research, Development and Engineering Command

J·S·S·A·P JOINT SERVICE SMALL ARMS PROGRAM

Malcolm Baldrige National Quality Award 2007 Award Recipient

ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER PICATINNY ARSENAL, NJ

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Small Arms Grenade Munition Integration & Demonstration

Chris Gandy
US ARMY ARDEC
Joint Service Small Arms Program Office(JSSAP)
RDAR-EIJ
chris.gandy@us.army.mil

Joint Armaments Conference, Exhibition and Firing Demonstration

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Agenda

- *40mm Low Velocity Grenade Problems*
- *JSSAP Solution – Autonomous Air Bursting 40mm*
- *Program Objectives, Metrics & Constraints*
- *The Challenges*
- *Status & Path Forward*

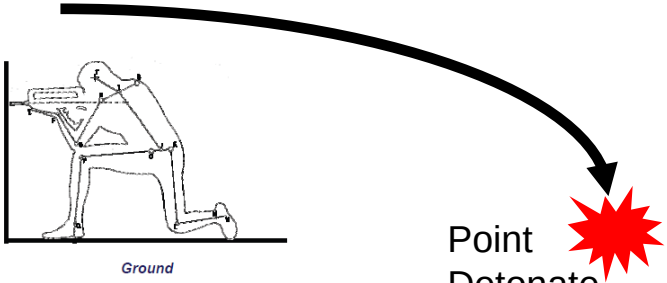
40mm Problems

Functional Problems:

– Warfighter lacks ability to engage combatants in defilade
- ➢Improper ranging
- ➢Grenade overshoots the target

– Grenadier load is excessive
- ➢Average fighting load ~ 71 lbs
- ➢3 Days of supply

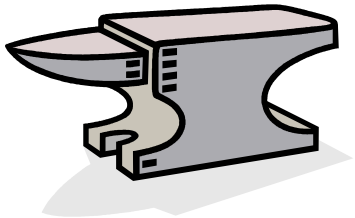
~ 140lbs w/o uniform, boots or special munitions

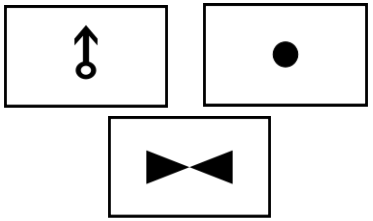


Opportunity Cost of Available Solutions:

– Programmable Grenade Launchers
- ➢Heavy & Expensive
- ➢Additional Power Required
- ➢Joint rifle/grenade capability vs. grenade capability only

– Supporting Fire
- ➢Takes Time
- ➢Requires External Resources





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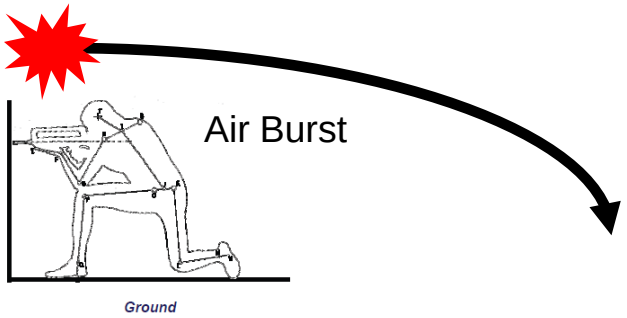
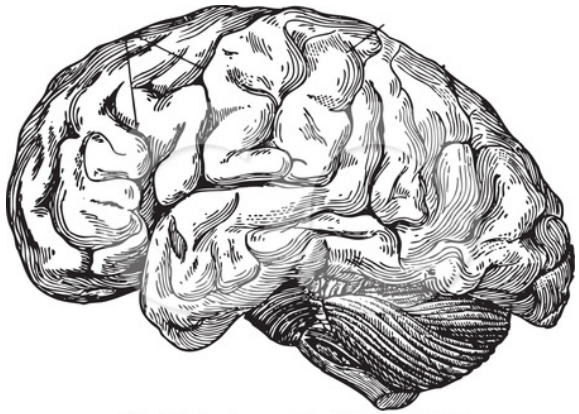
Autonomous Air Bursting 40mm Low Velocity Grenade

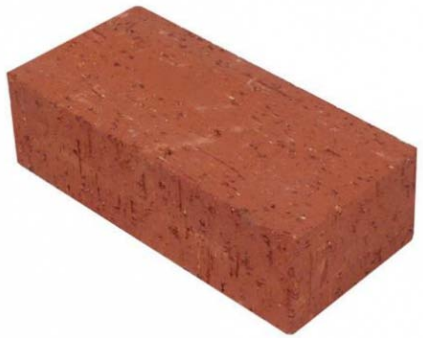
- Enables warfighter to better engage combatants in defilade
- Increases capability without increasing soldier load
- Works with existing M203/M320 weapons
- Does not require additional power or weapon accessories



The Path

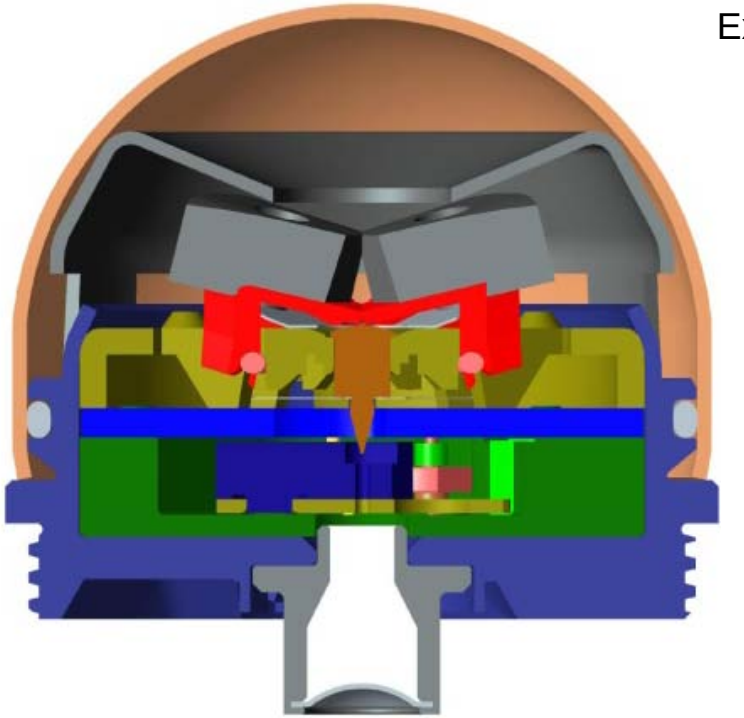
- Phase I – Small Fuze (FY12)
- Phase II – Smart Fuze (FY13)
- Phase III – Doesn't Fly Like A Brick (FY14)





Small Fuze (Phase I)

M550 Fuze



Benefits:

Unit Cost Reduction

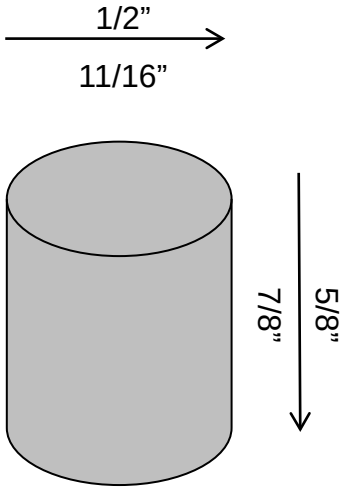
- Common Fuze Across Multiple Calibers

Improved Output

- Multiple Fuze Positions (Front, Middle or Base)

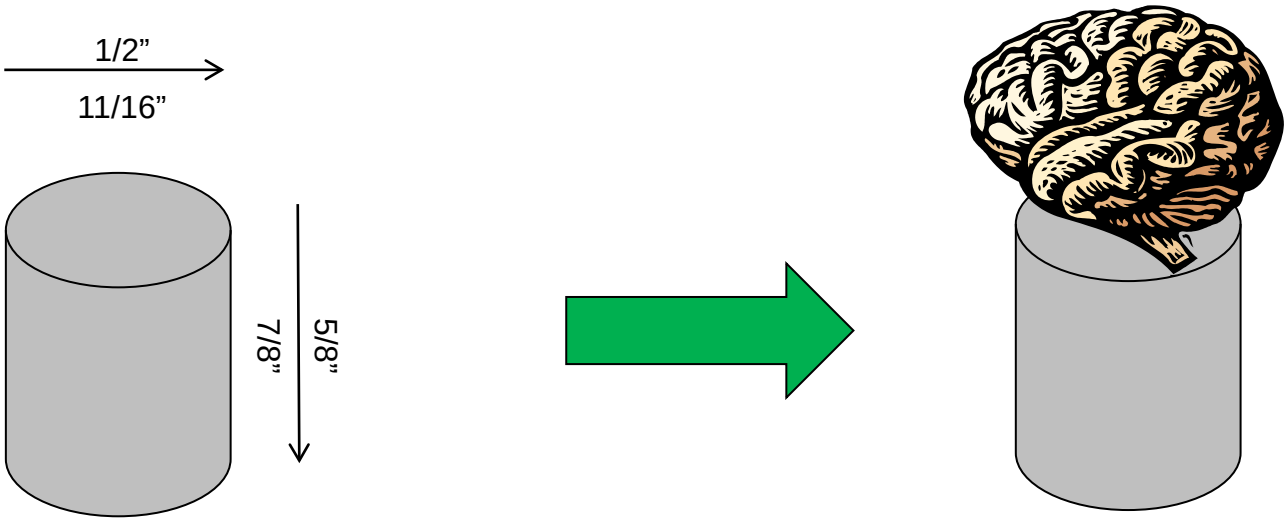
Extra Real Estate

- \+ Sensors
- \+ Guidance
- \+ Electronics



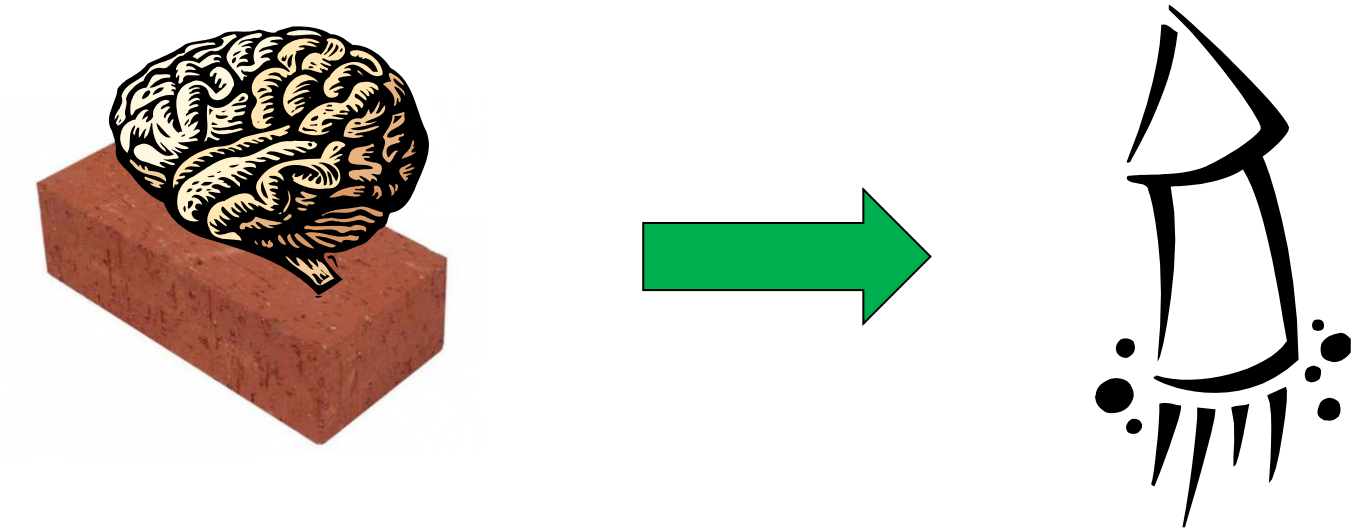
Smart Fuze (Phase II)

Integrate sensors and logic devices to scan the environment, filter the environment and autonomously burst the fuze in the ideal spot.



Integration (Phase III)

Integrate smart fuze with state of the art warhead technology and demonstrate an integrated solution that doesn't fly like a brick.



Metrics

Measure	Current	Effort Obj	Army Obj	TRL
Phase I PD Fuze Module* Size Fuze Module* Weight	M550 PIBD	Circular cylinder $^{11}/_{16}$" Dia. X $^{7}/_{8}$" Long (<20g)	Circular cylinder ½" Dia. X $^{5}/_{8}$" Long (<15g)	TRL 6
Phase II Smart Fuze Size Fuze Weight	None	M550 Fuze Envelope (~ 53g)	< M550 Fuze Envelope & Weight	
Phase II Smart Fuze Initiation Mode	PD (Point Detonation)	PD + 1 Alternate Mode	PD + 2 Alternate Modes	
Phase II Smart Fuze Burst Location Side Of Target Above Ground Behind Target	None	± 2M 1M <0.5M	± 2M 1M <0.5M	
Phase III Ballistics Exterior Drag Coefficient	0.13	0.12	0.11	

Fuze Constraints

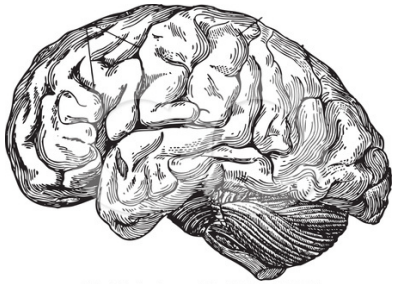
Constraints	Threshold	Objective
Operating Temperature	-45°F to 145°F	-65°F to 160°F
Storage Temperature	-65°F to 160°F	
Power Rise Time	<0.170s	<0.129s
Power Operating Time	>22s	>30s
Launch Survivability	Setback 50,000g Set-forward 9,000g 12,000 RPM	Setback 100,000g Set-forward 9,000g 60,000 RPM
Minimum Launch Input	12,000g 3,750 RPM	
Self Destruct	<5s After Impact	<1s After impact
Shelf Life	20 years	30 years
Fuze Compliance	Compliance with MIL-STD-1316	
Arming Tolerance (No Arm –All Arm)	0.017s	0.010s
Extensibility	Fuze circuit pass through of an external fire signal	
Output	Equivalent to M55 detonator	

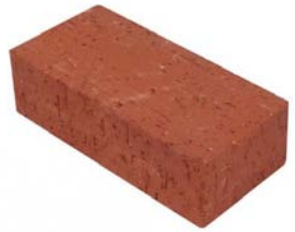
System Constraints

Constraints	Threshold	Objective
Operating Temperature	-45°F to 145°F	-65°F to 160°F
Storage Temperature	-65°F to 160°F	
Recoil* (M4A1/M320 Config)	20 ft-lb	15ft-lb
ICD	40MM ICD DWG XXXX To be provided pending contract award	
Range	Minimum 400m	
Graze Impact Performance	1°	0.5°
Soft Target Performance	½" Celotex	¼" Celotex
ESD/HERO	ESD/Hero Compliance with MIL-STD-464	
Penetration	No degradation to current performance	

Schedule

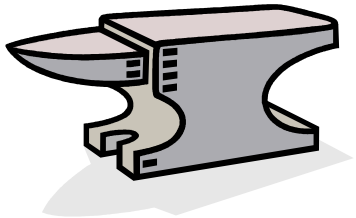
- Award 2 Independent Design Contracts
  - Dec ’11
  - May ’12
- FY12 - Design & Demonstrate Small Fuze
- FY13 - Design & Demonstrate Smart Fuze
- Sept ‘13 - Shoot-off & Down-select (Smart Fuze in 40mm Test Vehicle)
- FY14
  - Design Low Drag Projectile
  - Demonstrate Integrated Warhead and Smart Fuze @ TRL 6





Challenges

- Unit Cost
- Autonomous Air-burst
  - No input from external fire control devices
  - Ability to detect environmental objects/ threats
  - Ability to filter environmental objects/ threats
  - Ability to detonate when required
- SWAP (Size, Weight & Power)



Summary & Path Forward

- ***Small Arms Grenade Munition Integration & Demonstration Program will Develop an Autonomous Air bursting Grenade in FY14 (TRL 6)***
- ***Standalone 40mm LV Grenade will enable the warfighter to better engage combatants in defilade***
- ***Two independent design teams will compete to demonstrate the better smart fuze in FY13***
- **Program is on PM MAS 40mm Road Map and will transition in FY14**