XM242 Pyrotechnic Self Destruct Fuze (p-SDF) For 155mm M864E2 Recap

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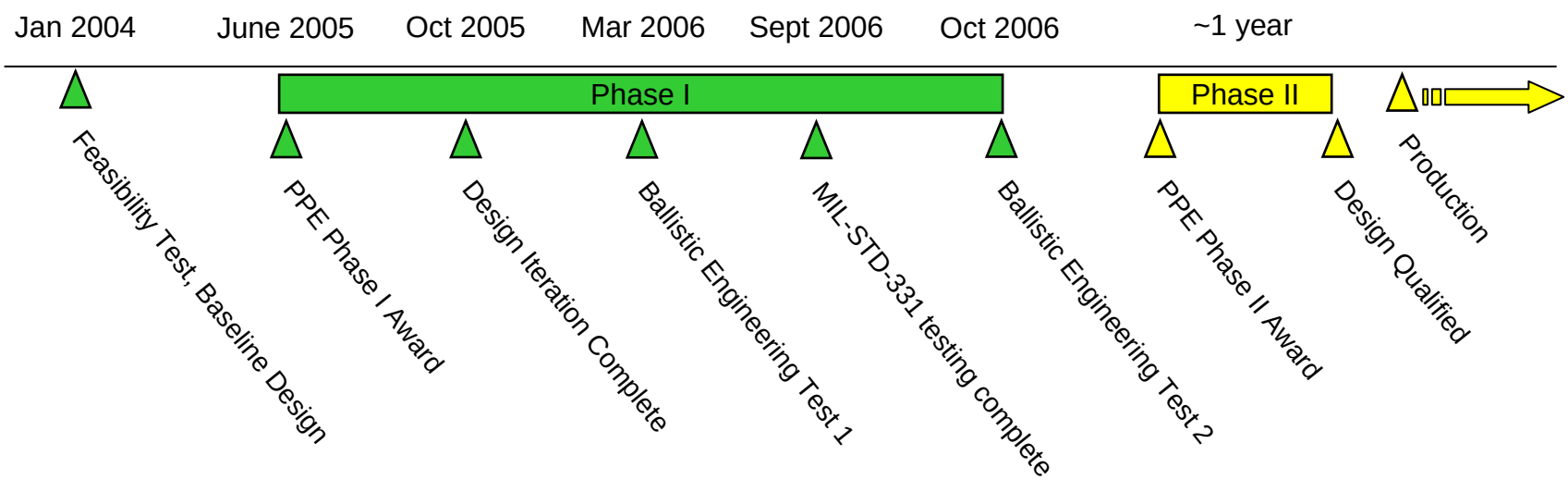
Overview

XM242 Pyrotechnic Self-Destruct Fuze (p-SDF)

- Based on fielded IMI fuze for M85 grenades
- Developed to meet <1% Unexploded Ordnance (UXO) for M42/M46 grenades
  - Costs to clear UXO from combat areas is extremely high
  - UXO is both a combat and a humanitarian issue
  - DoD Policy is to reduce UXO to less than 1%

Time Line of XM242 Development



Feasibility Demonstration Test

Baseline for XM242 tested in January 2004

M864 Fuze Results

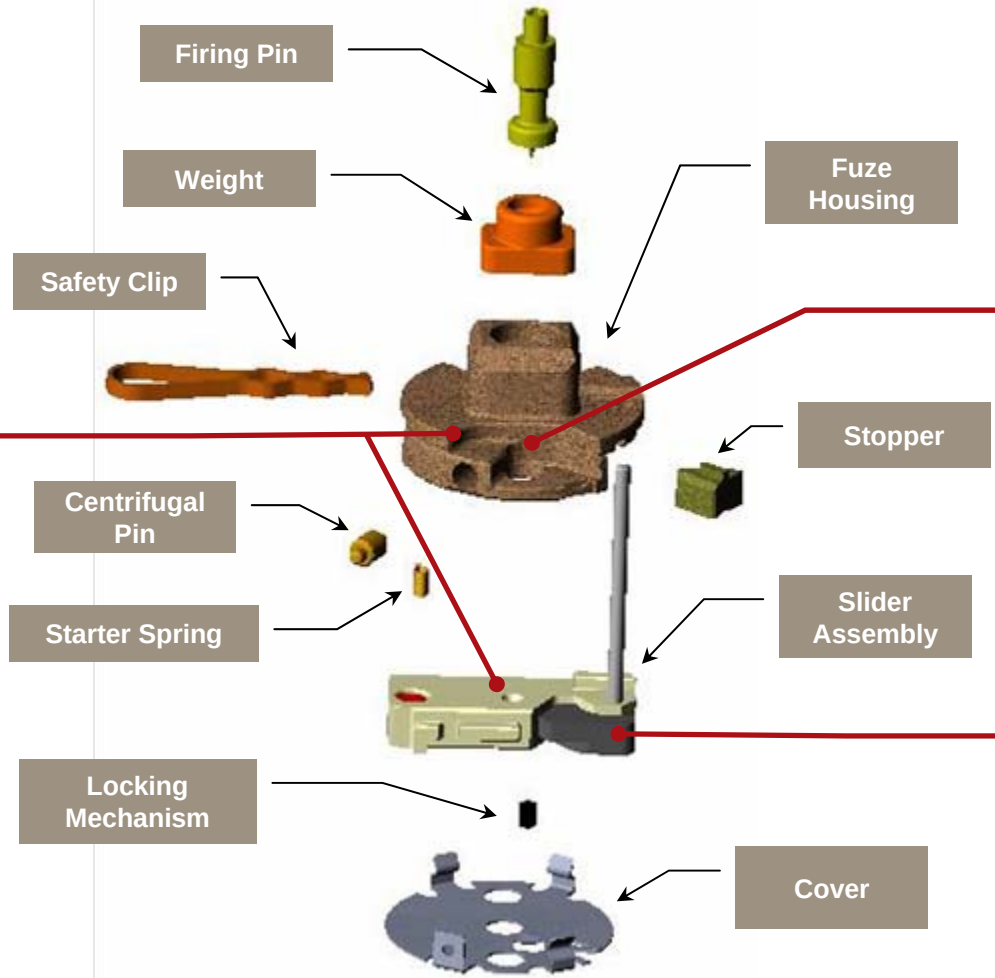
Mode	Range	Charge	Fired	Funct'd	% Funct'd	UXO	% UXO	Haz Dud	% Haz Dud
Primary	24km	5-H	60	56	93.33%	4	6.67%	N/A	N/A
SD	24km	5-H	240	240	100.00%	3	1.25%	0	0.00%
Tactical	24km	5-H	132	130	98.48%	2	1.52%	0	0.00%
Total			432	426		9	2.08%	0	0.00%

UXO = Live HE in grenade or fuze
Haz Dud = Live HE in grenade and Live primary energetics in fuze

From ATK Self Destruct Fuze Presentation to NDIA 48Th Annual Fuze Conference

XM242 Baseline Design Modifications

Design Improvements Implemented on the Baseline Design



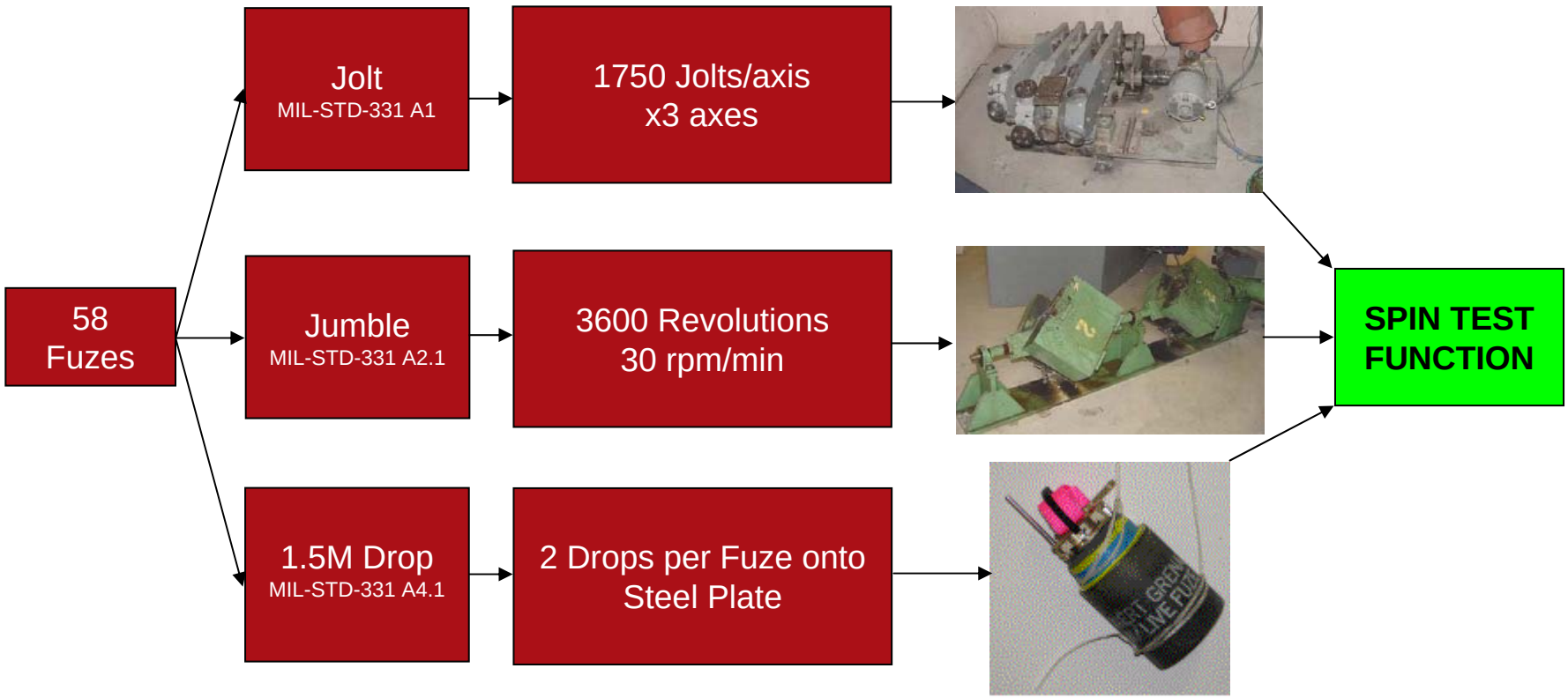
Fuze Housing and Slider cored to reduce weight

Incorporated barrier in Housing between Slider and Grenade Stud to reduce binding

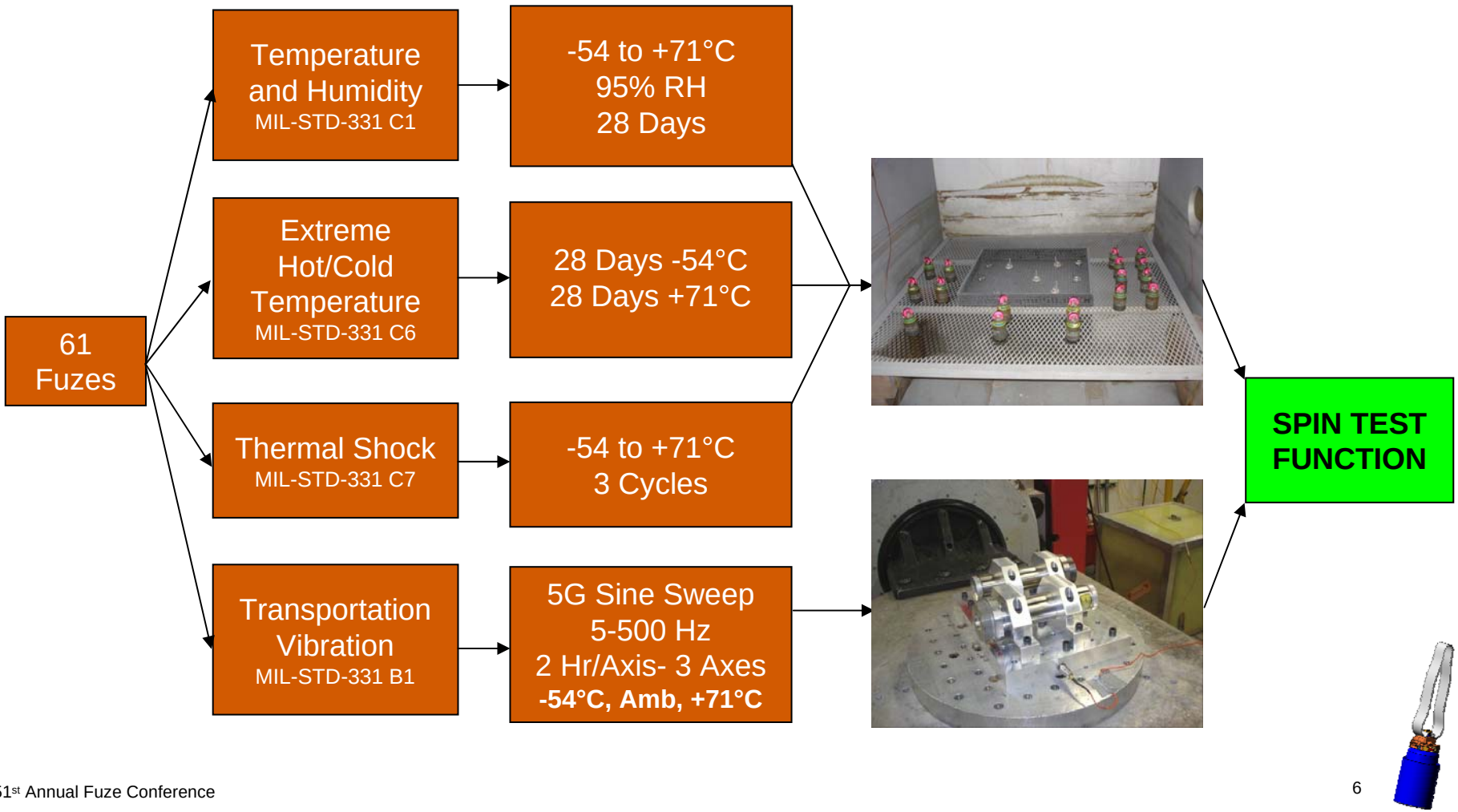
Increased Striker strength for delay initiation reliability

Safety Critical Environments

- **Completed Testing to Specified Safety Critical MIL-STD-331C Environments**



- **Completed Testing to Specified Life Cycle Environments**



Ballistic Engineering Test 1 - Configurations

Several Designs Analyzed through DOE's

Fuze Design

Configuration Number	Housing Diameter		Slider Length		Unarmed Neutralization Feature	
	Baseline	Smaller	Baseline	Shorter	Stopper	Stopper combined with Housing
6-1	X		X		X	
6-1-1		X	X		X	
6-2		X		X	X	
6-3	X			X	X	
6-5	X			X		X

Fuze/Grenade Attachment

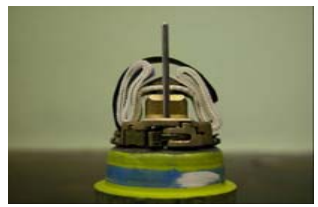
Conventional Staking

Orbital Riveting

Ribbon Configuration

Orbital Riveting

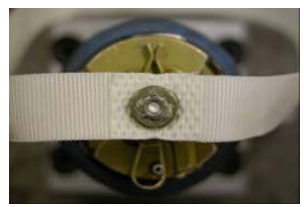
M85 Hardware

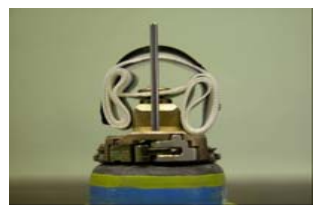


M85 Ribbon Winding

Conventional Staking

M223 Hardware



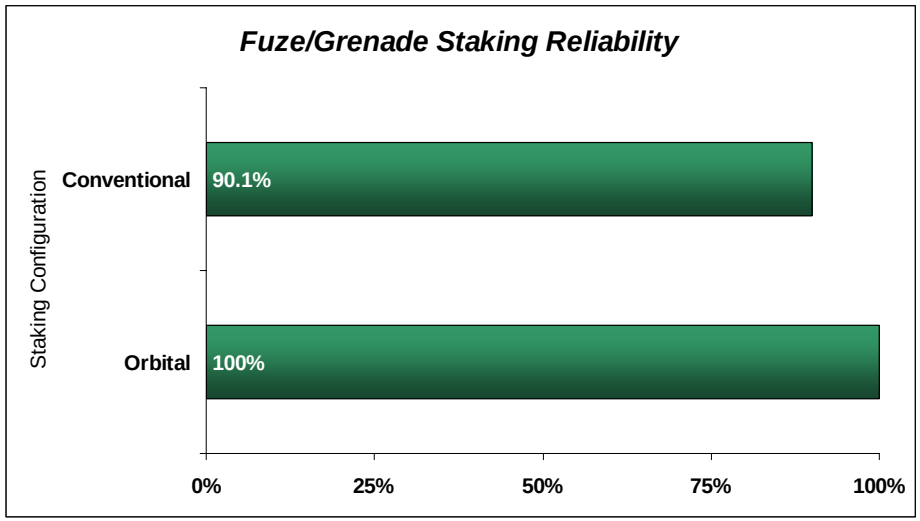


M223 Ribbon Winding

BET 1 Firing Conditions

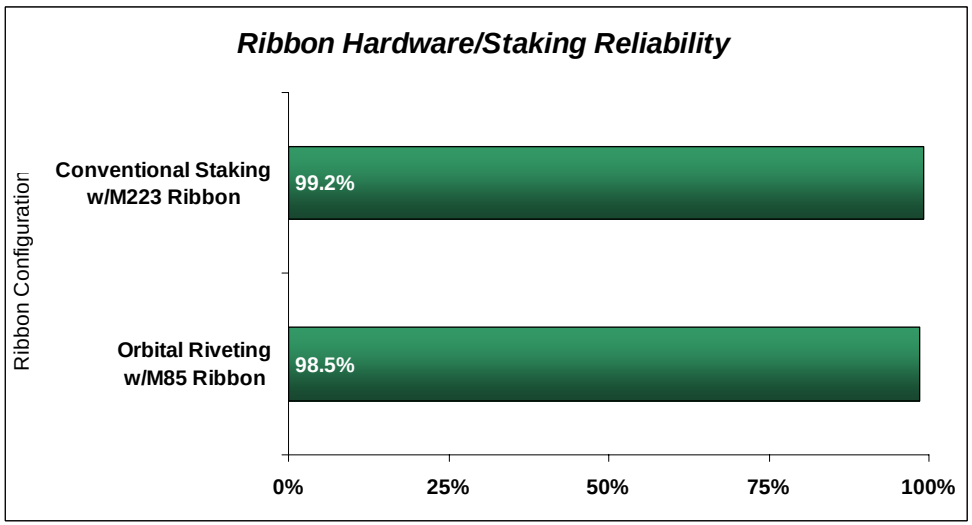
Test	Rounds	Fuzes	Charge	Temp (ºF)	QE (mils)
Strength of Design	5	360	M203+	+145	450
	2	144	M203	+145	1185
	2	144	M203	-50	1115
Modified Baseline	6	432	M203	+145	1190
	3	216	M203	+145	475
	4	288	M203	-50	1145
Totals	22	1584			

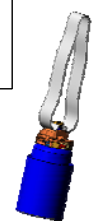
Ballistic Engineering Test 1 - Results



Down-selected Fuze/Grenade Staking Configuration: Orbital

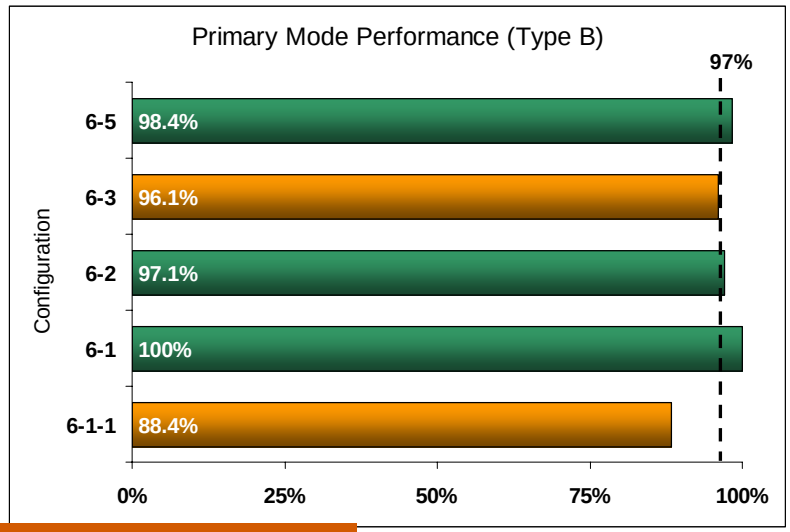
Down-selected Ribbon Configuration: Conventional Staking with M223 Ribbon



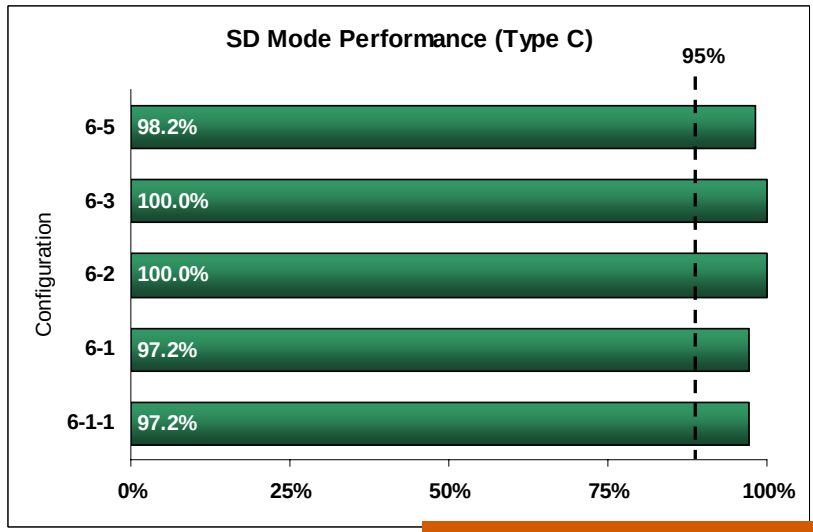


Ballistic Engineering Test 1 - Results

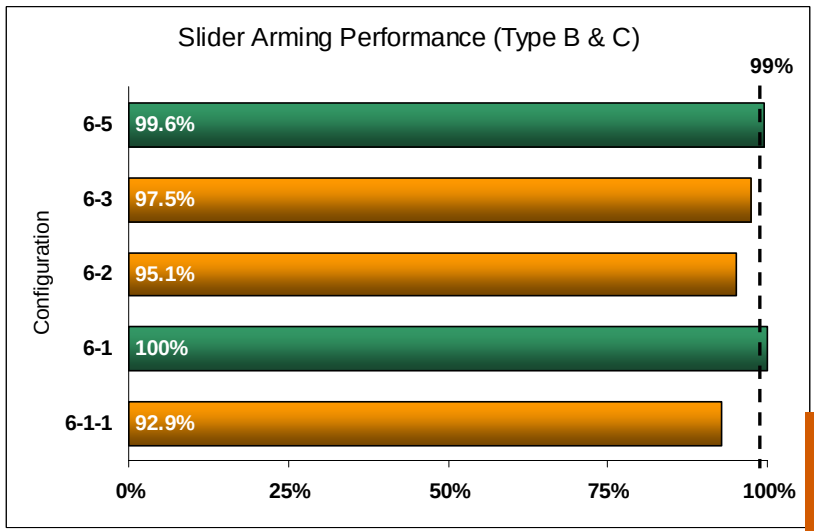
An advanced weapon and space systems company



6-1, 6-2, and 6-5 had greater than 97% Primary Mode Reliability



All Configurations had greater than 95% SD Mode Reliability



6-1 and 6-5 had greater than 99% Arming Reliability

Ballistic Engineering Test 1 - DOE Analysis

Housing Diameter and Slider Length DOE

Configuration	Housing Diameter	Slider Length
6-1-1	Smaller (-1)	Standard (1)
6-1	Standard (1)	Standard (1)
6-2	Smaller (-1)	Shorter (-1)
6-3	Standard (1)	Shorter (-1)

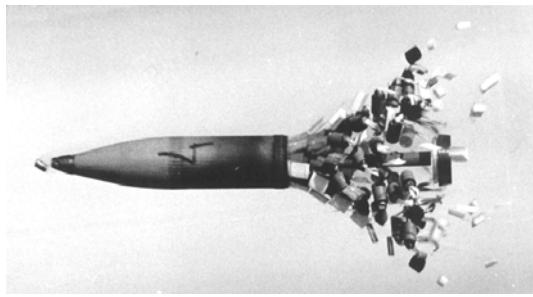
Primary Mode ***Delay Mode*** ***Slider Arming***

Configuration 6-3 performed statistically better than all other configurations.

Unarmed Neutralization Feature (Stopper) DOE

Configuration	Stopper Integrated into Housing
6-3	No (-1)
6-5	Yes (1)

Configurations 6-3 and 6-5 not statistically different.



Down-selected Fuze Configurations: 6-3 and 6-5

Ballistic Engineering Test 2 - Configurations

The design was further optimized through conducting a DOE in BET 2:

Fuze Design

Configuration Number	Slider Locking Mechanism		Unarmed Neutralization Feature	
	Single Lock	Dual Lock	Stopper	Stopper combined with Housing
6-3	X		X	
6-3-2		X	X	
6-5	X			X
6-5-2		X		X

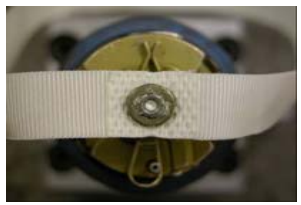
Fuze/Grenade Attachment

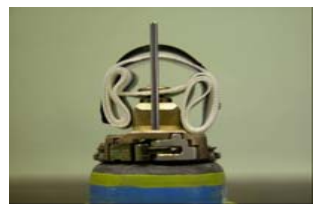
Orbital Riveting

Ribbon Configuration

Conventional Staking

M223 Hardware





M223 Ribbon Winding

Ballistic Engineering Test 2 - Firing Conditions

BET 2 Firing Conditions

Test	Rounds	Fuzes	Temp (ºF)	QE (mils)
Strength of Design	2	144	+145	440
Worn Tube	2	144	+145	460
Tactical Vibration	2	144	+145	445
	1	72	+145	1205
	2	144	+145	505
	2	144	-50	520
	1	72	-50	1140
	2	144	-50	595
Modified Baseline	4	288	+145	450
	1	72	+145	1205
	2	144	+145	505
	3	216	-50	520
	1	72	-50	1140
	1	72	-50	595
Totals	26	1872		

Ballistic Engineering Test 2 - Results

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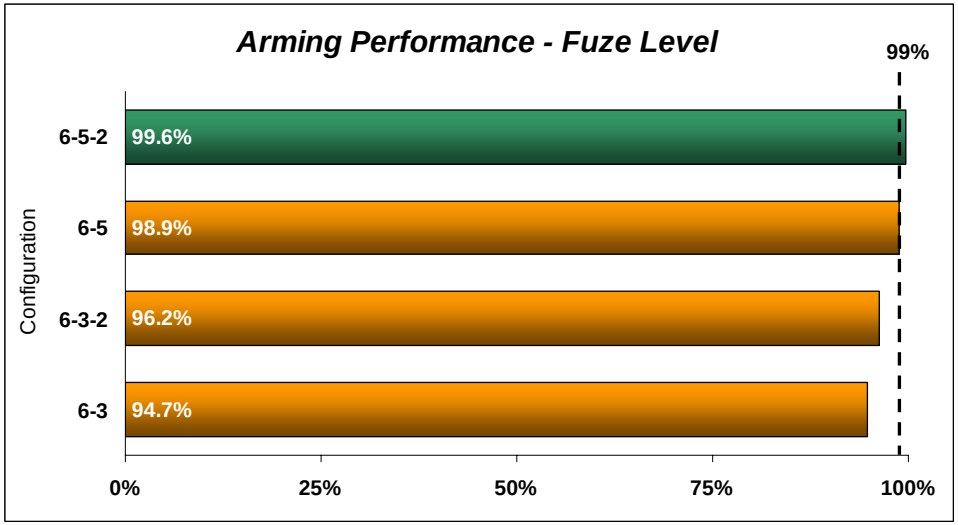
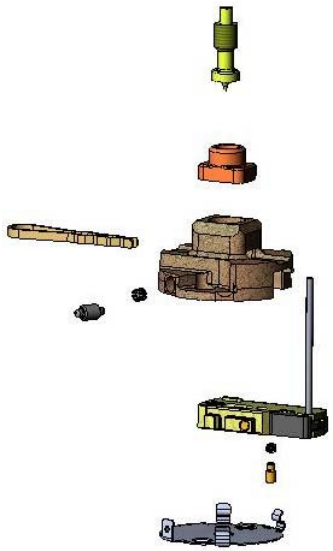
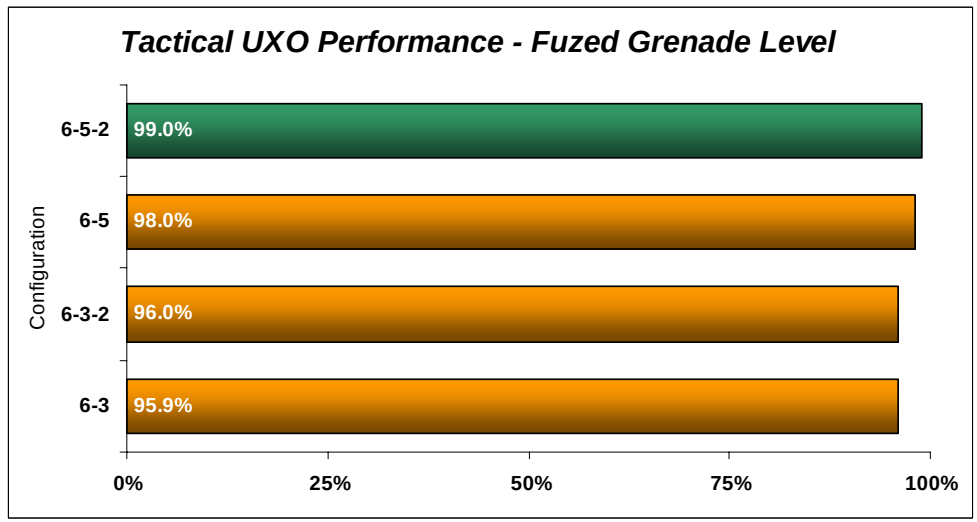


Configuration 6-5-2 meets the 1% UXO Requirement!





XM242 Phase I Summary

Phase I of the PPE effort:

- Proved recap process is feasible
- Verified fuze can survive stringent ballistic tests
- Performed MIL-STD-331 environmental testing
- Completed program on an accelerated schedule
- Performed maximum ballistic testing with minimum hardware via DOE's
- Down-selected a design that meets the 1% UXO Requirement

XM242 Future Activities

Phase II Proposal submitted for Qualification of the M864E2 with the XM242 fuze

Proposal is in the evaluation process

Phase II tasks:

- Perform MIL-STD-331 tests on down-selected design from BET 2
- Perform Environmental and Ballistic tests on 220 rounds, live grenades

XM242 Summary

Effective Government / Industry IPT

- U.S. Army
- Alliant Techsystems
- Israel Military Industries
- Day & Zimmerman

The IPT looks forward to Qualifying the design, which provides a solution to the UXO issue for the U.S. Army

The ATK / IMI XM242 fuze design meets the UXO requirement, <1% UXO

End of Presentation