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Mortar Lightweighting Programs NDIA Joint Armaments Conference 2014



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

David C. Smith, P.E.
Development Project Officer
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- Objectives: Provide an overview of recent activities to develop and field technologies to reduce the weight of the US Army and Marine Corps Mortar Systems. In addition to the weight reductions, performance and cost impacts will be addressed.



**M224 60 mm Lightweight
Company Mortar System**
60 mm M225 Mortar Cannon
System Weight: 46 lbs



**M252 81 mm Medium Extended
Range Mortar**
81 mm M253 Mortar Cannon
System Weight 93 lbs

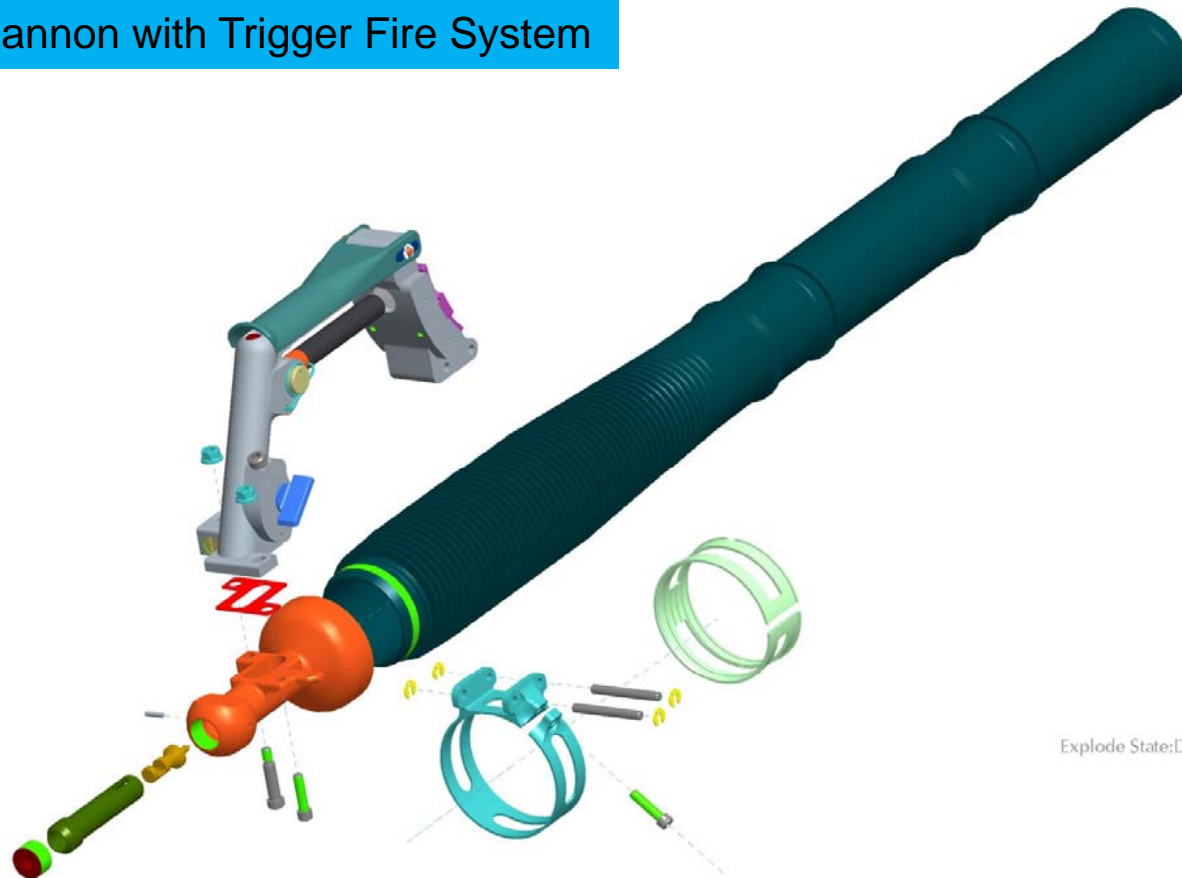


M121 120mm Heavy Mortar (Carrier)
120 mm M298 Mortar Cannon
System Weight 330 lbs



2007 Award
Recipient

M225 Cannon with Trigger Fire System



Explode State:Default Explode

M225A1 Cannon with Trigger Fire System

Other lighter alloy parts
Clamp Screw
Clamp
Gasket
End Plug

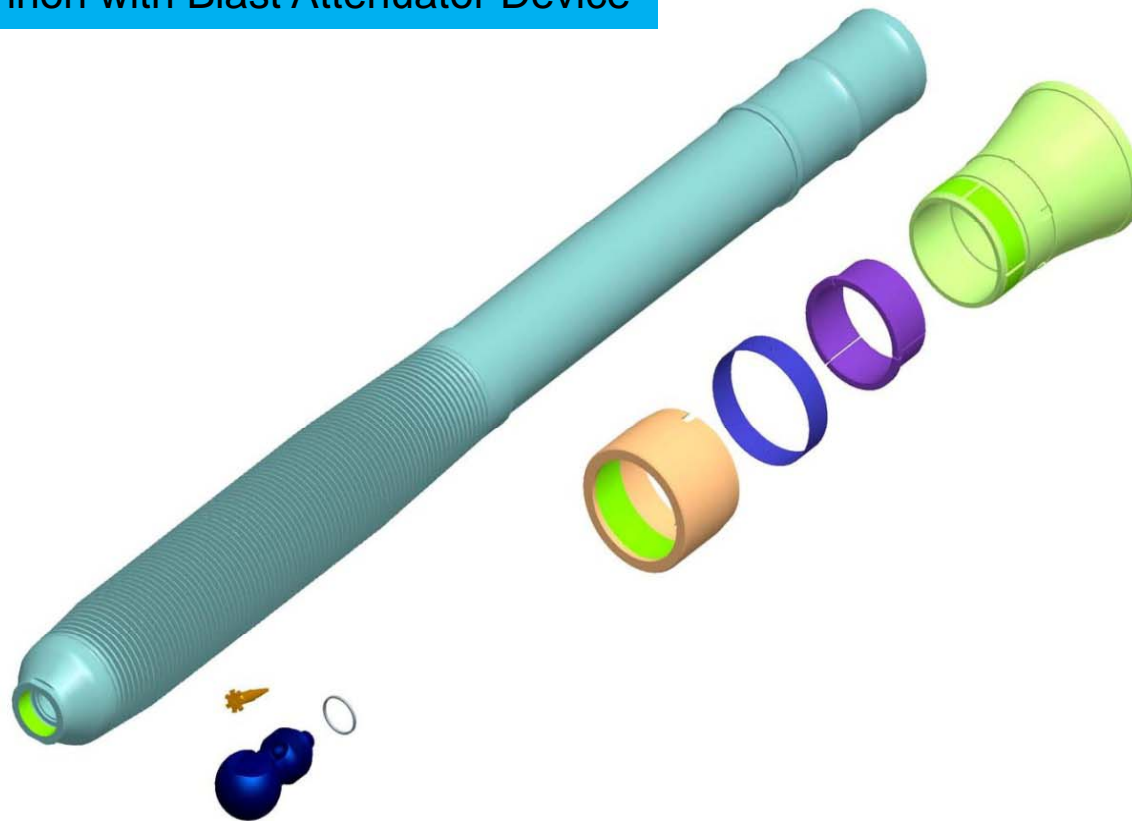


Nickel Based Super Alloy Tube
Fins Removed

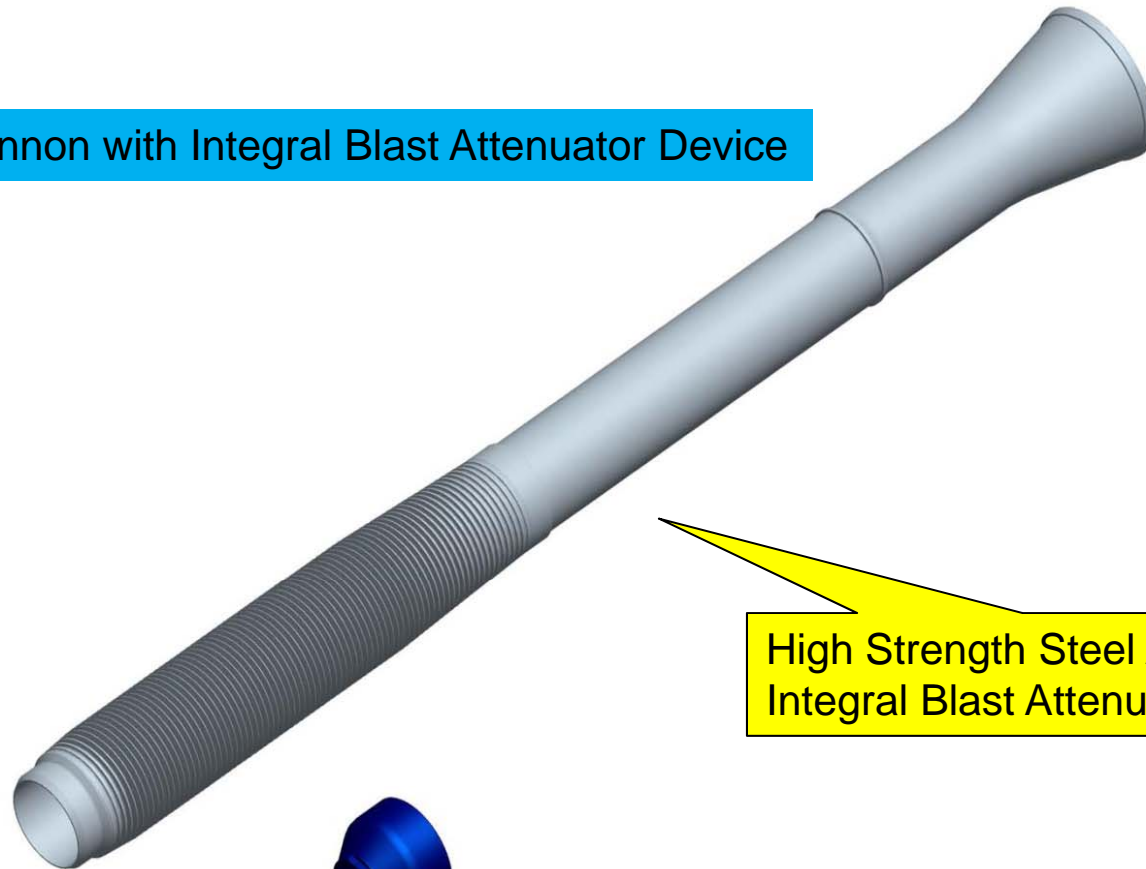
1.2 lbs WEIGHT SAVINGS



M253 Cannon with Blast Attenuator Device



M253AX Cannon with Integral Blast Attenuator Device



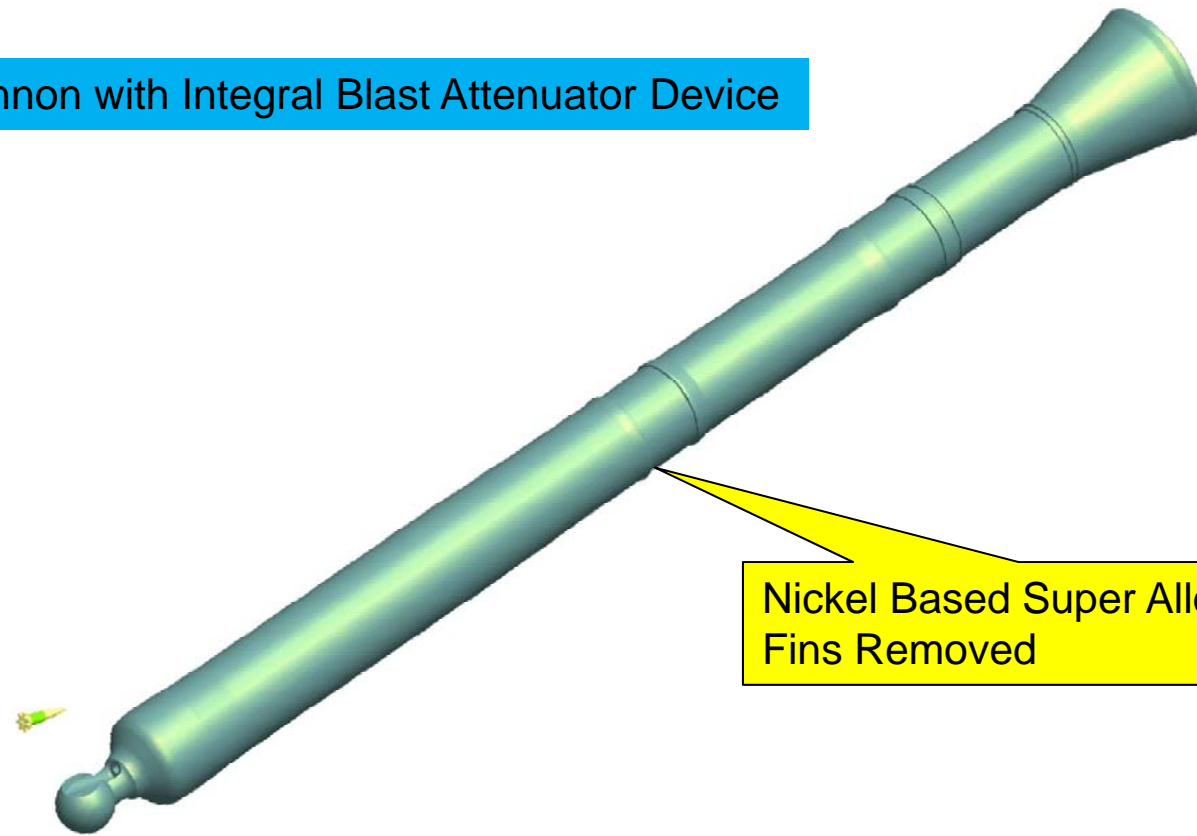
High Strength Steel Alloy Tube
Integral Blast Attenuation Device

Improved Breech
Cap Design

4.3 lbs WEIGHT SAVINGS



M253A1 Cannon with Integral Blast Attenuator Device



Nickel Based Super Alloy Tube
Fins Removed

5.8 lbs WEIGHT SAVINGS

Integral Cap
Saves Weight





15.2 LBS



11 LBS

High strength Aluminum alloy changes drove weight reduction



System Weight Reduction – 81 mm - Bipod



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FS15149



M177 Bipod

27.0 lbs / 12.2 kg



177A1 Bipod

21.3 lbs / 9.7 kg

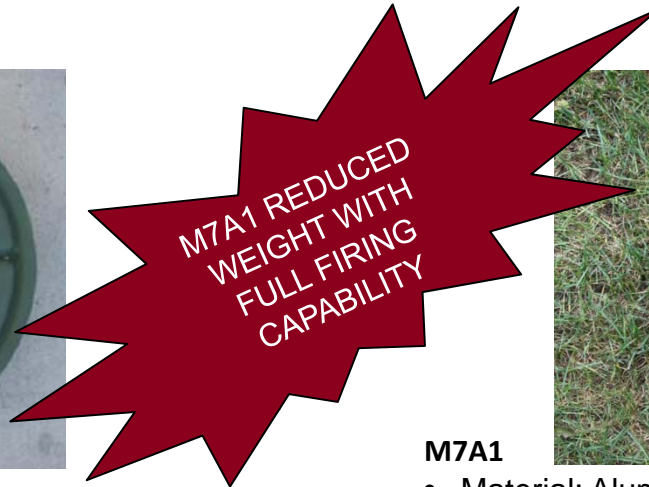


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M7

- Material: Aluminum 2014-T6
- Diameter: 19 Inches
- Weight: 14 lbs



M7A1

- Material: Aluminum 7175-T74
- Diameter: 18"
- Weight: 8 lbs



M8

- Material: Aluminum 2014-T6
- Size: 10" x 7"
- Weight: 3.8 lbs
- Capability: charge 0 and 1



M8A1

- Material: Aluminum 7175-T74
- Diameter: 12"
- Weight: 5 lbs
- Capability: Charges 0-4



System Weight Reduction 81 mm Baseplate



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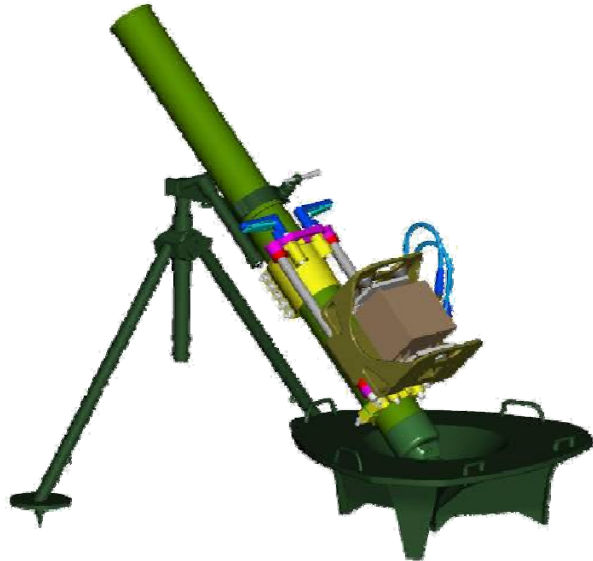




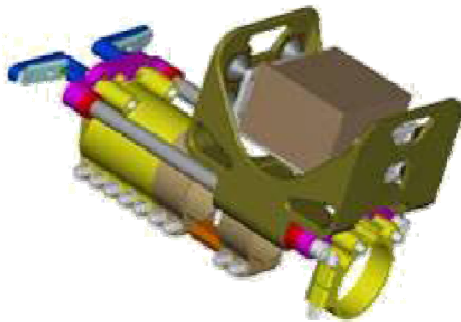
System Weight Reduction – 120 mm - Bipod



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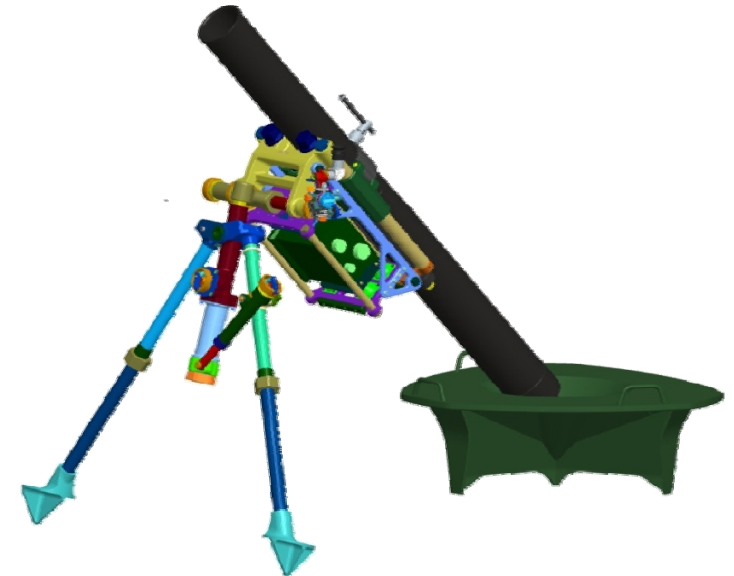
M191 bipod with Cannon mounted
MFCS-D PDMA – 200 lbs



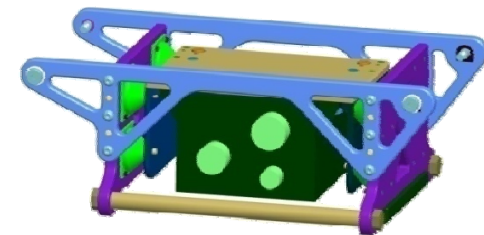
Cannon Mounted MFCS-D PDMA – 113 lbs

System
Weight
Savings (up
to) 70 lb

System Cost
Target <\$14K



M191A1 bipod with MFCS PDMA – 130 lbs



M191A1 MFCS PDMA – 34.4 lbs



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Cannon: Nickel Alloy (Inconel®)

- 1.2 lb (8.3%) weight reduction

Bipod: Light weight materials & composites

- 4.2 lb (27.6%) weight reduction

Baseplate : High Strength Aluminum Alloy

- Baseplate 6.4 lb (44.4%) weight reduction

60 mm Mortar System Total

- 11.8 lb (26.8%) weight reduction



**April 2011 US Army fielded
June 2011 USMC fielded**

US Army Lightweight Steel Cannon

- 4.3 lb weight reduction (12.8%)

USMC Nickel Alloy (Inconel®) Cannon

- 5.8 lb weight reduction (16.5%)

Bipod Light weight materials & composites

- 5.7 lb weight reduction (21.1%)

Baseplate - High Strength Aluminum Alloy

- 3.5 lb weight reduction (12.1%)

81 mm Mortar System 13.5 lb (14.8%)



Systems are in qualification & verification testing

Cannon: Unchanged

Bipod + Fire Control Assembly

Light weight materials & composites

- 70± lb weight reduction

Baseplate : High Strength Aluminum Alloy

- 50% Cost Reduction

120 mm Mortar System Total

- 8.9 lb (20.3%) weight reduction
- Cost Targets in tradeoff

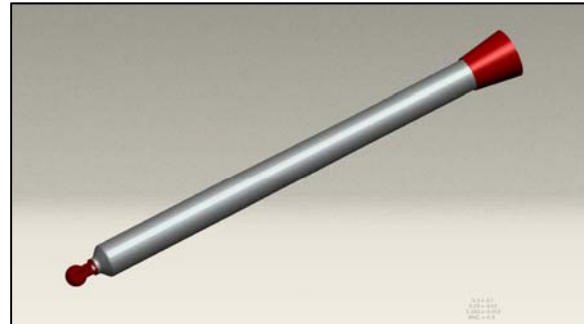


**Final stages of design for
Critical Design Review**

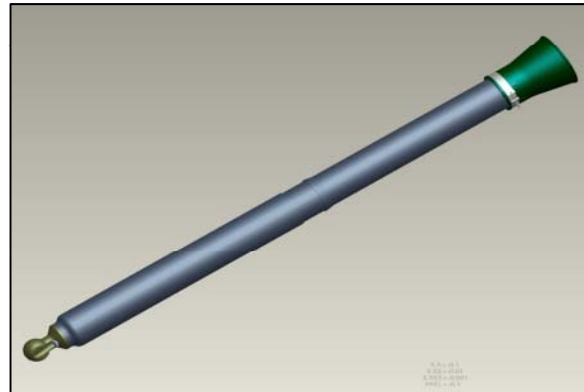


OBJECTIVES:

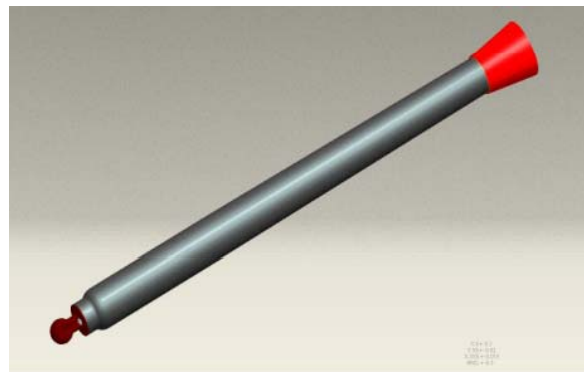
- At least 40% weight reduction over current steel 81mm system
- Provide War Fighter the firepower of an 81mm at the approximate weight of the 60mm system.
- Improved maneuverability and war fighter survivability
- Fires 800 series ammunition
- Fit, form and function are the same as legacy steel 81mm mortar system components



Aluminum Metal Matrix



Phenolic Resin Composite



Carbon Carbon Composite

OBJECTIVES:

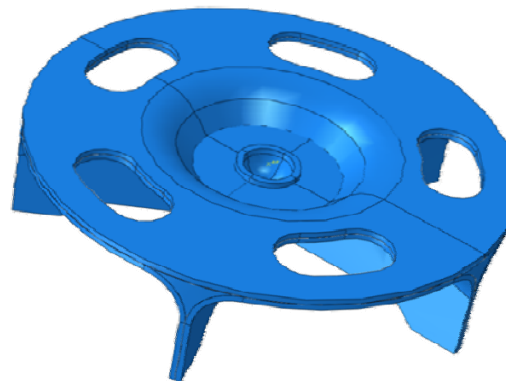
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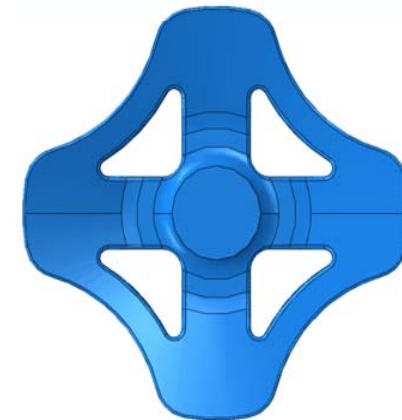
Unique Composite Design



Prototype Ready For Test



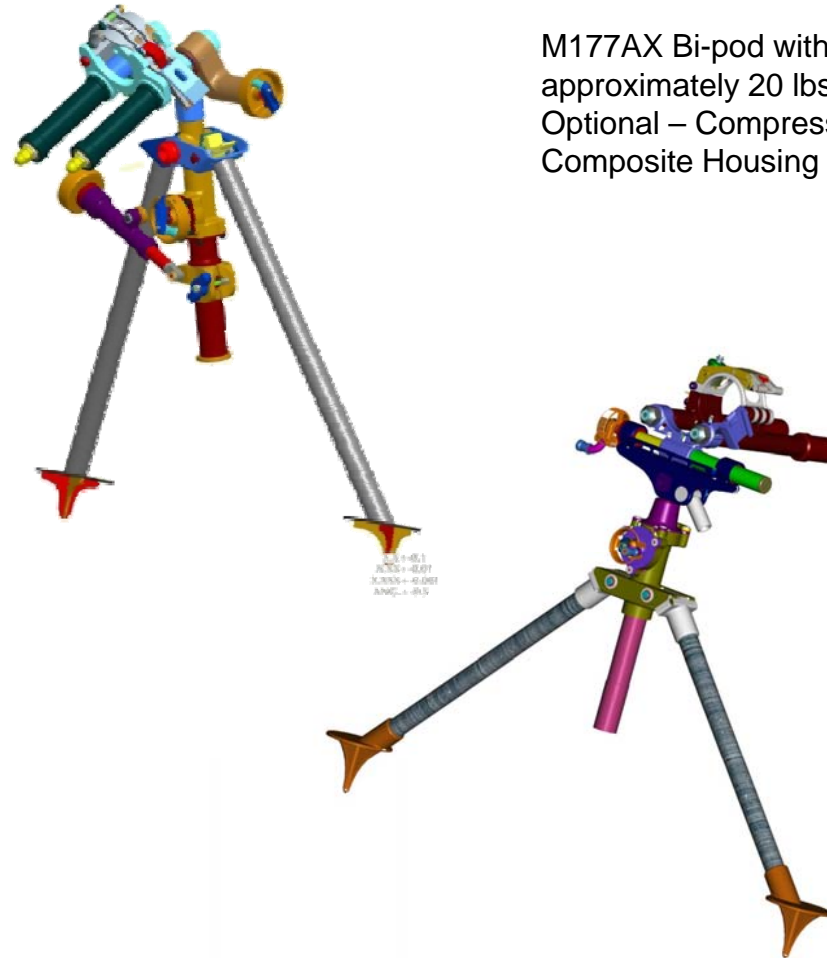
Modular Composite Option
Prototypes in Process



High Strength Aluminum Alloy < 20lbs

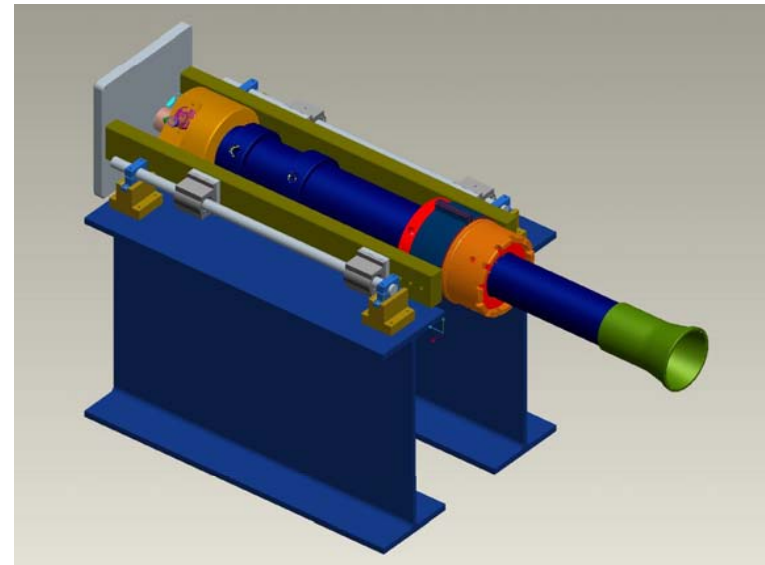
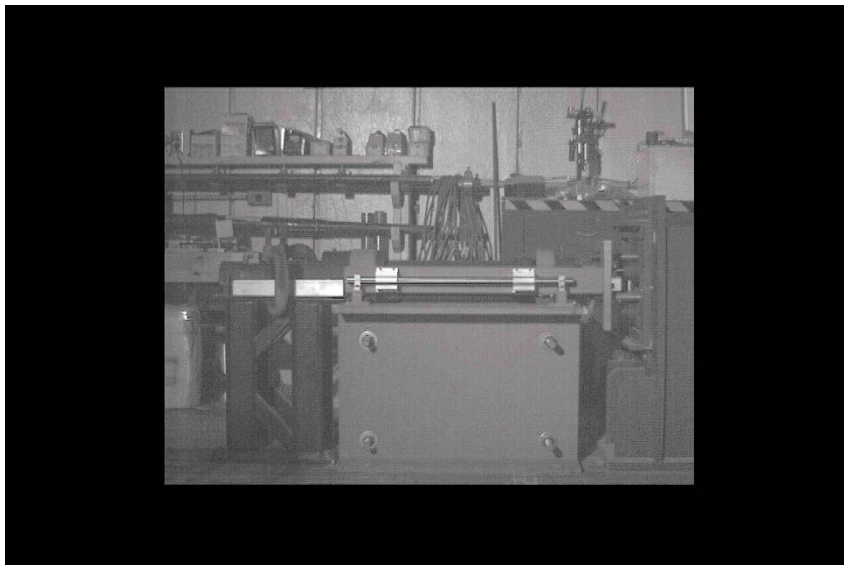
OBJECTIVES:

- At least 25% weight reduction over current steel 81 mm system
- Provide War Fighter the firepower of an 81 mm at the approximate weight of the 60 mm system.
- Improved maneuverability and war fighter survivability
- Fires 800 series ammunition
- Fit, form and function are the same as legacy steel 81mm mortar system components



M177AX Bi-pod with composite legs
approximately 20 lbs
Optional – Compression Molded
Composite Housing

- Tube with Ablative Liner
 - SOCOM Oriented Effort
 - Develop a limited life – One (1) basic ammo load – Tube
 - Extremely lightweight
 - Very low cost – essentially a disposable tube
 - 2 different concepts being explored: Carbon-Carbon & Unique Lined Tube
 - Scale model components of option A currently in ballistic testing at Benet firing range



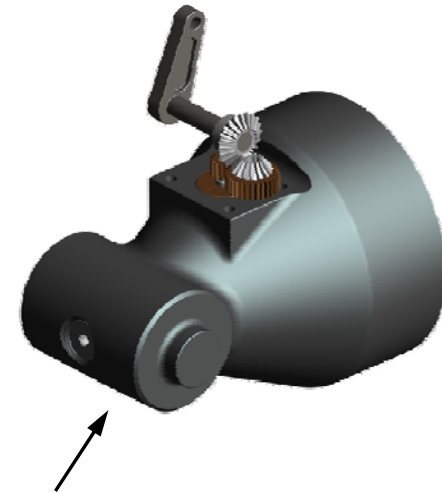


120 mm Future Mortar



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- Breech: 120 mm Future Mortar
 - Cylinder Ball with swiveling socket
 - Ruggedized mechanism
 - Gearbox converts 70 degrees of lever rotation to 180 degrees at the switch
 - Gearbox will contain Safe, Drop and Lever Fire switch
- Tube: 120 mm Future Mortar
 - Planned for Extended Range (TBD)
 - Higher Elastic Strength Pressure profile
 - Improve blast attenuation - maximize allowable number of rounds (ANOR) daily
- Base Plate: 120 mm
 - Modify M9X baseplate design to accommodate higher pressures
- Ammunition:
 - Extended Range Ammunition being developed



Traditional ball is replaced with a cylinder to better distribute load (mating socket must swivel in baseplate)



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QUESTIONS?

