155 Third Generation Maritime Fire Support (155 TMF)

Robert McClure
BAE Systems Global Combat Systems
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155mm Third Generation Maritime Fire Support (TMF)
AS90 Self Propelled Howitzer

- Entered service in 1993 following competitive tender
- 179 vehicles over six UK regiments
- JBMoU 39 cal 155mm ordnance
  - Two piece ammunition
  - 24.7km range
  - HE, Illum, Smoke
  - Precision Guided Munitions capability
- Operational service in Op Telic
  - NAO reported 95% availability
- Contract to ‘up-gun’ to 52 cal barrel in 2002
  - Cancelled due to failure of modular charge system to meet requirements
  - Design experience and trials data pull-through
Mk8 4.5” Naval Gun

- Designed by RARDE – built by BAE Systems
  - First prototype 1966
  - Entered service (Iran) 1971
  - UK Service 1973 HMS Bristol
- UK Royal Navy standard Medium Calibre Gun
  - Type 21, 22, 23 frigates
  - Type 42, Type 45 destroyers
- In service in Brazil, Chile, Pakistan
- 4.5” one piece ammunition
  - Range 22km
  - 21kg shell
  - Base-bleed extended range
- BAE contacted in 1998 to develop mod 1 upgrade
  - Addresses obsolescence, reliability and maintainability
  - Tranche 1 completed by BAE Systems
  - Tranche 2 ongoing by DML
155 TMF Concept Objectives

- Affordable route to provide a significant increase in Naval Gun capability
  - Retain 4.5” Mk8 Mod 1 mount structures and high value components
  - Adapt AS90 ordnance
  - Modify for environment

- UK research driven by FSC

- Additional opportunities
Maritime Fires Capability Requirement

- **Factors**
  - Future Surface Combatant to replace Type 23/22
  - Enduring need for Naval gun capability identified
  - Capability requirements evolving: effect, range, rate of fire
  - Objective to reduce whole life cost
  - 155TMF key programme for industrial capability

- **FSC Options**
  - No gun
  - Use existing gun: Mk8 4.5” - 114mm
  - Buy new
  - Upgrade: 155mm TMF

- **So What?**
  - UK Research programme mitigating technology risk
  - BAE Systems strategy based on 155mm TMF
Commonality with Mk8 drives low acquisition cost
Commonality with AS90 reduces development cost
Projectile commonality drives lower through-life cost

155mm target effect
Long range
Light weight
Growth potential

Cost
Capability
Coherence

Provides an affordable enhancement in capability with low through-life costs.
Commonality enables a coherent strategy for land and naval fires

Reduced logistics burden
Exploit land investment
Joint development opportunities
### 155TMF Current Programme

<table>
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<th>Phase</th>
<th>Year</th>
<th>Design Options</th>
<th>Technology Review</th>
<th>Ordnance Demonstrator</th>
<th>Land Based Technical Demonstrator</th>
<th>Qualification and Production Build</th>
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Contract through the UK MoD Defence Technology and Innovation Centre
Main stakeholder: Director of Equipment Capability (Above Water Effects)
155mm Naval - Future Coastal Suppression Study

- 155mm Weapon System
- Ammunition Handling
- Retained Structures
- Ship Installation
- Risk Reduction Prototype
155mm Naval - Future Coastal Suppression Study

- 155mm WEAPON SYSTEM
  - Ordnance Automation
155mm Naval - Future Coastal Suppression Study

- 155mm Weapon System
  - Ordnance Automation
  - Charge Ignition
155mm Naval - Future Coastal Suppression Study

- 155mm Weapon System
  - Ordnance Automation
  - Charge Ignition
  - Cradle Design
155mm Naval - Future Coastal Suppression Study

- 155mm Weapon System
  - Ordnance Automation
  - Charge Ignition
  - Cradle Design
  - Balance System
155mm Naval - Future Coastal Suppression Study

- 155mm Weapon System
  - Ordnance Automation
  - Charge Ignition
  - Cradle Design
  - Balance System
  - Recoil System
155mm Naval - Future Coastal Suppression Study

- 155mm Weapon System
  - Ordnance Automation
  - Charge Ignition
  - Cradle Design
  - Balance System
  - Recoil System
  - Elevation & Training Drives
155mm Naval - Future Coastal Suppression Study

- 155mm Weapon System
  - Ordnance Automation
  - Charge Ignition
  - Cradle Design
  - Balance System
  - Recoil System
  - Elevation & Training Drives
  - Thermal Management

Pulse Bore Spray Arrangement

Grooved Barrel with Cooling Sleeve
Barrel Thermal Management
155mm Naval - Future Coastal Suppression Study

- Ammunition Handling
  - Feedring
155mm Naval - Future Coastal Suppression Study

- Ammunition Handling
  - Feedring
  - Hoist
155mm Naval - Future Coastal Suppression Study

- Ammunition Handling
  - Feedring
  - Hoist
  - Loading Arm
155mm Naval - Future Coastal Suppression Study

- Ammunition Handling
  - Feedring
  - Hoist
  - Loading Arm
  - Rammer System
155mm Naval - Future Coastal Suppression Study

- Ammunition Handling
  - Feedring
  - Hoist
  - Loading Arm
  - Rammer System
  - Charge Retention
155mm Naval - Future Coastal Suppression Study

- Ammunition Handling
  - Feedring
  - Hoist
  - Loading Arm
  - Rammer System
  - Charge Retention
  - Charge Protection Case

PROTOTYPE CPC ASSEMBLY
155mm Naval - Future Coastal Suppression Study

- Ammunition Handling
  - Feedring
  - Hoist
  - Loading Arm
  - Rammer System
  - Charge Retention
  - Charge Protection Case
  - CPC Ejection
155mm Naval - Future Coastal Suppression Study

- Ammunition Handling
  - Feedring
  - Hoist
  - Loading Arm
  - Rammer System
  - Charge Retention
  - Charge Protection Case
  - CPC Ejection
  - Rammer Test Rig
155mm Naval - Future Coastal Suppression Study

- Retained Structures
  - Turntable And Carriage
  - Training Bearing
  - Training Drive Arc
  - Elevation Drive Arc
  - Pedestal Base
  - Gun House Floor
155mm Naval - Future Coastal Suppression Study

• Ship Installation
  • Type 23 Ship Structural Interfaces
    • Minor reinforcement
  • Type 45 Ship Structural Interfaces
    • Minor reinforcement and minor structural stiffening
  • Electrical System Modifications
    • Additional control and drive systems defined and power requirements estimated
    • Harmonic limits for ships supply met
• Fire Control Interfaces
  • Ballistic calculations can be updated
  • Capacity available to control future intelligent munitions
  • Existing system interfaces will allow integration with wider battlefield command and control systems
Key Success Factors

Need to demonstrate value for money vs. “do nothing” option (Mk 8 4.5”)
- Development and Qual
- UPC
- Integration Cost
- Through Life Support

Key integration aspects
- Ship Installation
- Fire Control
- Ammunition Stowage and Handling
- Land / Maritime Coherence

Key technical areas
- Ordnance Automation
- Dual Stroke Rammer
- Thermal Management

Wider Strategic Aims
- Support Home Market strategy: make wider BAE expertise available to the customer through UK business unit
Key Success Factors

Need to demonstrate value for money vs. OTS options and "do nothing" option (4.5"

- Development
- UPC
- Integration
- Through Life Support

**Key Risk Area For TMF**
- Raised in Options Report for FSC
- Not included in UK MoD research contract
- Ship builders require information to support PV Programmes
- Core Capability of US Combat Systems
- **So What?**
  - W&V PV committed in 2007 & 2008
  - Report passed to UK MoD and Naval Design Partnership

**Wider Strategic Aims**
- Support Home Market strategy: make wider BAE expertise available to the customer through UK business unit
Future Work

- Research test programme 2009
  - Ordnance firing demonstrator
    - Demonstrate strength of design
  - Dual full stroke rammer test rig demonstration
  - Thermal management test rig
    - Model validation
  - Laser Ignition demonstration

- Land based Integrated Demonstrator 2009 – 2011
  - Integration of ordnance and ammunition handling
  - Demonstrate system and technology maturity

- Full development 2011 – 2014
155 TMF Summary

• 155TMF is design that integrates the AS90 155mm ordnance with the Mk8 Naval Gun

• Key Attributes
  • Enhanced capability
  • Affordable through-life cost
  • Land and Naval fires coherence

• UK funded research programme to inform the Future Surface Combatant requirements
  • Mitigating technology risk
  • Excellent progress to date
Questions