



# UAS Weaponisation

## UK/USA Rapid Development and Test

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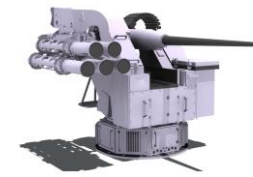
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## LMM family: low cost, accurate and effective

- ◆ **Modularity and Re-Use at its core**
- ◆ **LMM Laser Beam Riding**
  - ◆ Precision strike against aerial and ground targets. Multi-purpose warhead
- ◆ **Freefall LMM**
  - A lightweight precision guided freefall round for UAV launch against static and moving targets.
- ◆ **LMM Semi-Active Laser**
  - Precision strike against ground targets.

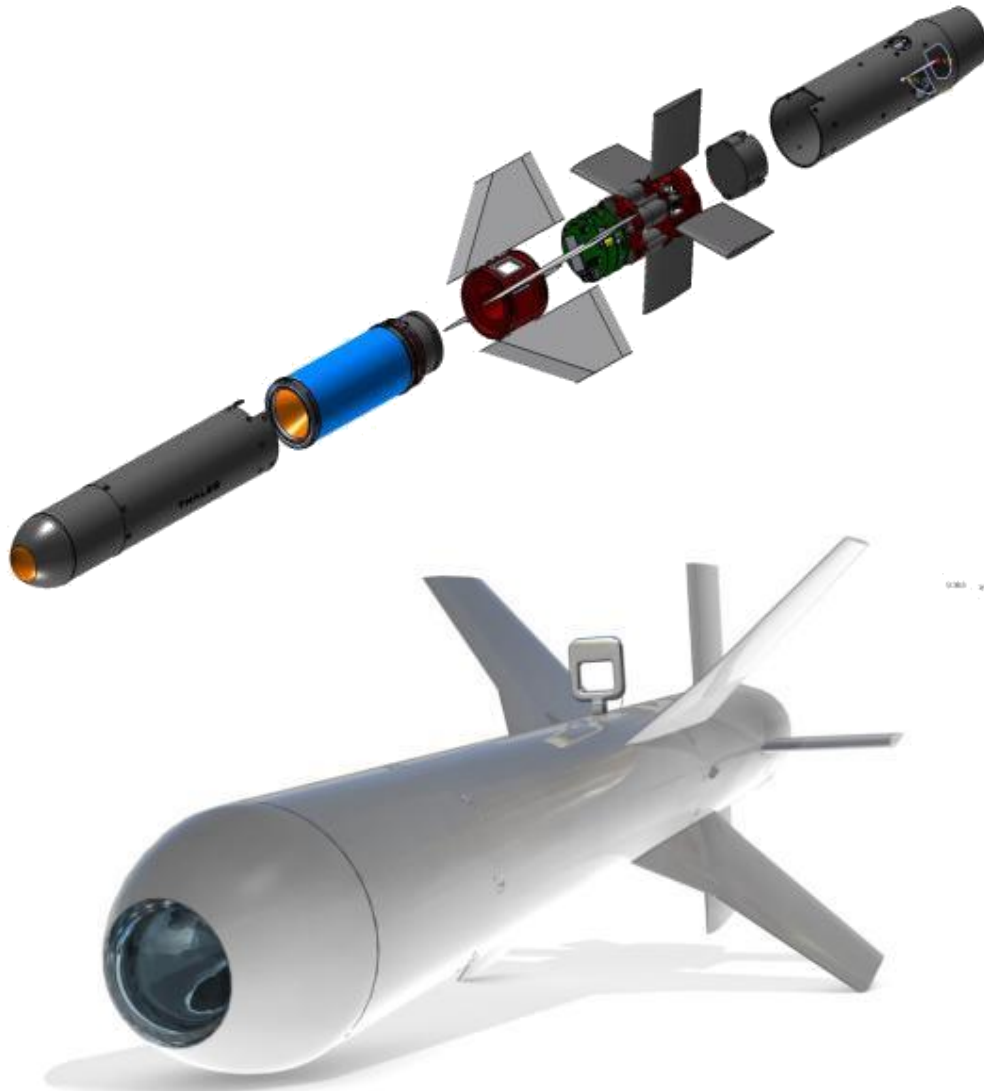


**LMM – Lightweight Multi-role Missile**

## **FURY (FreeFall Lightweight Multi-Role Missile)**

- ◆ Precision Guided Munition for air platforms (Shadow 200)
- ◆ Derived from the Lightweight Multi-Role Missile
- ◆ Proportional effect with low collateral damage . Dual effect warhead
- ◆ Precision strike capability from INS/GPS & SAL guidance system
- ◆ Primary roles are Armed ISTAR and Close Air Support (CAS) missions
- ◆ Effective in open and urban environments against fixed and moving targets, including armoured vehicles
- ◆ Minimal impact on platform performance and endurance





## ◆ Re-use from Lightweight Multirole Missile:

- Warhead – Blast Fragmenting and Shaped Charge
- Control Actuation System
- Guidance Processing Unit
- Inertial Measurement Unit

## ◆ New Subsystems:

- GPS unit
- SAL Seeker
- Height of Burst sensor

## ◆ Interface to Off the Shelf Stores Release Unit

## ◆ Low cost

## Rapid Flight Demonstration of Freefall LMM/Fury and the Weapon Integration Kit on Shadow M2 required :

### ◆ People

- Excellent working relationship between Engineering Teams
- Teaming Agreement between Thales/Textron
- Experienced and well respected engineering teams empowered to make decisions and supported by Senior Management.
- Early planning to manage transfer of technology (TAA's etc).

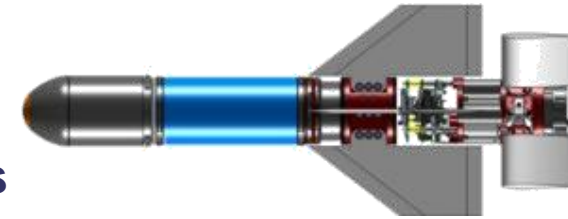
### ◆ Product

- Leverage from proven LMM subsystems reduced timescales.
- Rapid development of ESAD in Textron.

### ◆ Process

- Aggressive approach to Internal Process. Rigorous but not Rigid.
- Tailored Rapid Development Process
- Scrutiny Panel consisting of relevant departmental heads and experts.
- All designs and specifications fully documented and approved.

- ◆ Munition design baselined
- ◆ ITAR and Export Management Process defined
- ◆ Teaming agreement with Textron Defense Systems
- ◆ ESAD ICD and specification
- ◆ Datalogger (black box) designed
- ◆ Wind-tunnel testing of weapon release
- ◆ Environmental & Structural Testing
- ◆ Shadow M2 integration
  - Stores Management system
  - Stores Release Unit
- ◆ Deliveries:
  - Marketing model to Textron/USA (To+3mths)
  - 2 off Mass Representative Munitions (To+5mths)
  - 2 off Functional Telemetry Munitions delivered (To+6mths)



### ◆ Shadow M2 integration

- Stores Management system
- Stores Release Unit
- Munition

### ◆ Captive carriage flights

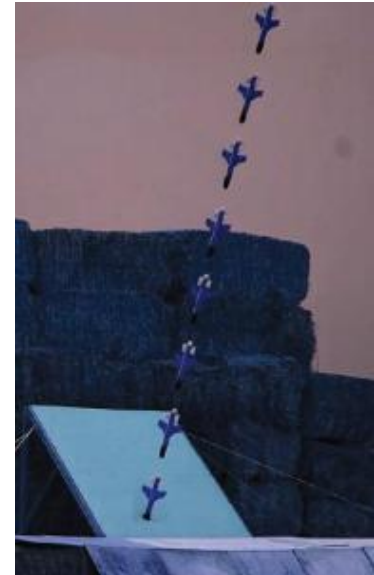
- Endurance/ Handling
- Small reduction in aircraft endurance

### ◆ Numerous SAL survey flights

- Novel method of collecting SAL data on aircraft
- Static target

### ◆ 2 Off Guided Flight Tests

- Release from UAV at cruising velocity
- Aircraft Target stand off
- 2 direct hits on target



### ◆ Shadow 200 integration

- In service aircraft
- Weapon Integration Kit and munition
- Captive carriage flights
- Endurance
- Handling

### ◆ SAL survey flights

- Variety of targets including moving land vehicles
- 3rd Party and Self Designation

### ◆ 1 off Telemetry munition released

- Textron ESAD arming confirmed
- Direct Hit on Target
- Textron ESAD initiation confirmed from recovered hardware





- ◆ Telemetry Munition
  - Targetting 4x4 vehicle
- ◆ Impact beside target
- ◆ ESAD arming and initiation
  - Confirmed by telemetry analysis
  - Hardware recovery & test
  - Successful Function confirmed



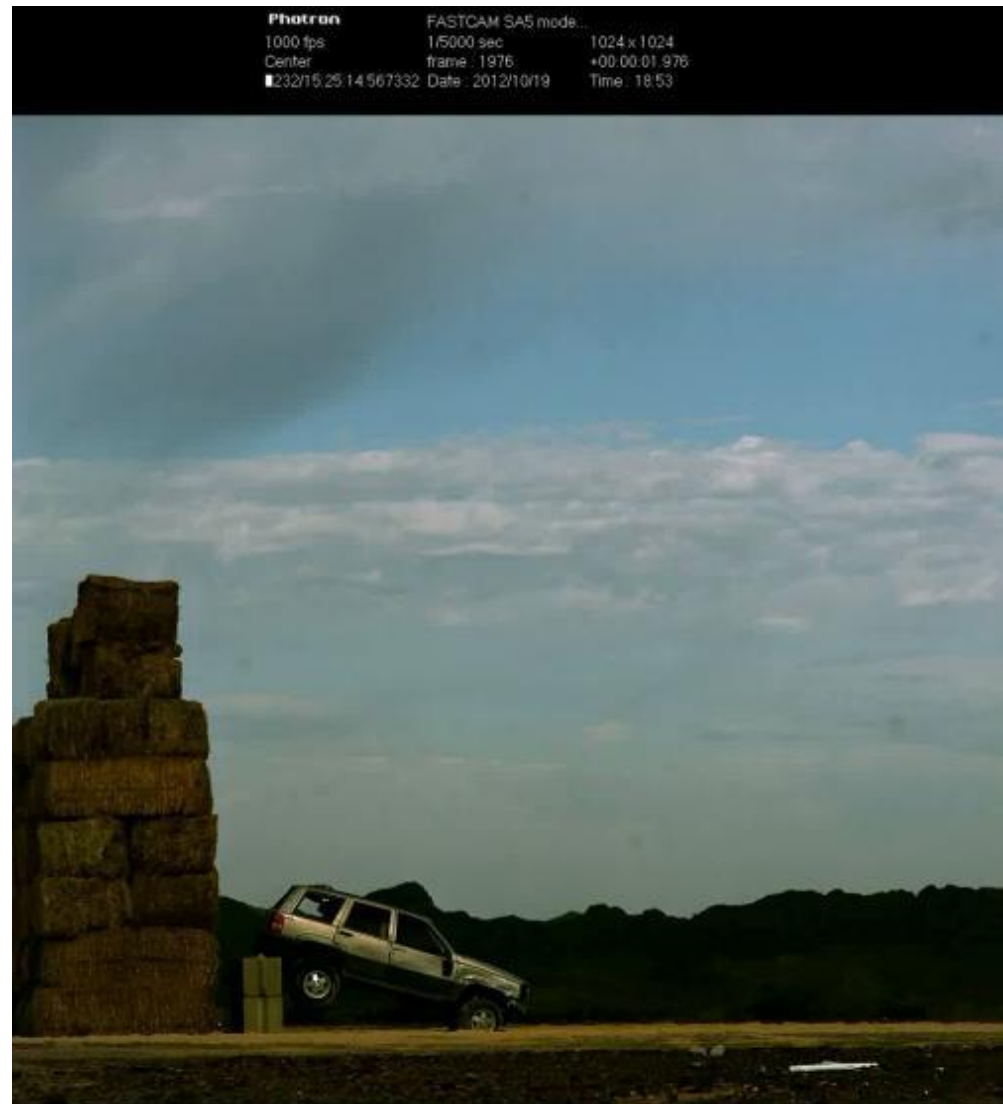
- ◆ Live Munition engagement on representative vehicle
  - Painted aluminium on wooden frame
- ◆ Successful Impact
  - Impact on target rear body
- ◆ Warhead detonated on impact
  - Target badly damaged and on fire



### Designated Spot



- ◆ Live warhead engagement
  - ◆ Target: 4x4 vehicle
- ◆ Successful Impact
- ◆ Successful ESAD operation
- ◆ Warhead Detonation observed < 1 metre from designated spot
- Severe blast and fragmentation damage observed (vehicle kill)



◆ **Effective Teamwork was key to successful rapid development of Fury/Freefall LMM**

- Thales/Textron/AAI
- Engineering Team
- Management team

◆ **Effective Processes**

- Clear objectives
- Rigorous but not Rigid
- Empowered teams
- Management Support

◆ **Leverage Mature Technologies**

- LMM subsystems
- Previous FFLMM work in UK
- Textron ESAD



- ◆ High tempo programme delivered by enthusiastic and capable team.
- ◆ Excellent working relationship with Thales/Textron/AAI
- ◆ High rate of success : 4 target hits out of 4 shots
- ◆ Potential application on Shadow 200
- ◆ A weapon for current global issues



**Rapid, Rigorous, Right**

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