

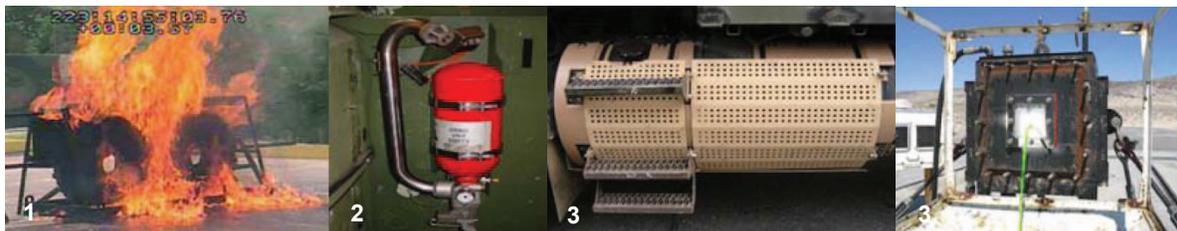
## 4.5 Fuel Containment/Fire Suppression

| Bottom Line Up Front  |   |
|---|---|
| Challenge   |   |
| Tactical Ground Vehicle fires continue to pose a significant threat to our warfighters. Loss of life, critical cargo, and vehicle platforms presents Commanders with significant challenges in executing their mission. Providing suitable fuel containment, fire detection and extinguishing capabilities presents a critical challenge to vehicle programs given space/weight/performance limitations as well as factors such as cost and levels of survivability required. |   |
| Potential Solutions   |   |
| <b>PEO LS</b>   | MTVR Fire Suppression<br>LVSR Fire Suppression<br>Fuel Tank Protection Systems (ONR SwampWorks)   |
| <b>TARDEC</b>   | Fire Protection Research<br>Advanced Fire Protection R&D<br>Fire Protection SIL<br>Simulations of Actual Military Ground Vehicle AFES System Design   |
| <b>SBIRs / STTRs</b>  | Modular Lightweight External Fuel Tank System (SBIR)<br>Lightweight self-sealing Fuel Tank with Hydraulic Ram Mitigation (SBIR)<br>Mitigation of Fuel Tank Explosions and Fires from IED Blasts (STTR)<br>Mitigation of Fuel Tank Explosion and Fires Using a Hybrid Electrochemical Oxygen Extraction and Explosion Suppression Foam System (STTR) |

### Potential Solutions

PEO LS S&T representatives continue to work with ONR, TARDEC, MCSC, Naval Innovation Laboratory (NaIL), other Government Agencies, Industry and Academia in investigating areas such as:

- Dry Bay Fire Mitigation Technologies
- Powder Panels
- Self Healing Polyurea
- Self-Sealing Tanks
- Tire Fire Suppression Technologies
- Engine and Crew Compartment Suppression Systems



**(1) Fire Suppression, (2) Self Healing Polyurea and (3) Powder Panel Testing.**

These and other potential technology solutions are being considered to address crew and vehicle survivability.

MTVR Fire Suppression

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### Medium Tactical Vehicle Replacement (MTVR) Fire Suppression System (FSS) Status







**Fuel Tank Fire Protection**

**Fire Extinguishing Capability**

**Uses Powder Panel Technology**

**Program Description**

- The MTVR replaced the aging M809/M939 series 5-ton trucks with state-of-the-art commercial automotive technology beginning in 2001. The MTVR cargo truck has a 7.1-ton off road and 15-ton on road payload, and a 22-year service life. MTVR Variants include the Dump, Wrecker, and Tractor (5<sup>th</sup> Wheel). There is a high level of commonality across the family of vehicles.
- The MTVR Armor System (MAS) provides complete 360-degree protection as well as overhead and underbody protection for the crew compartment. The MAS is a permanent modification to the vehicle and includes an upgraded front suspension and cab rebuild. The kit includes a removable personnel carrier (with ballistic glass), air conditioning system, and machine gun mount. All vehicles in theater include MAS armor.

IOC (vehicle): 4QFY99    FOC: Dec 09(O) / Jun 10(T)    AAO: 10,139

**FSS Status**

- Status: MTVR armored vehicles include fuel tank fire protection kits. Armored and unarmored vehicles have hand held fire extinguishers mounted inside the cab. There are currently no automatic fire suppression systems in MTVRs.
- Ongoing efforts:
  - Leveraging LVSR automatic fire suppression system study. Intent to develop common system with LVSR.
  - Submitted POM-12 initiative for funding fire suppression upgrades for all vehicles per agreement with MCDDC.
  - Coordinating efforts with MCCDC, MCSC, and other vehicle PMs.

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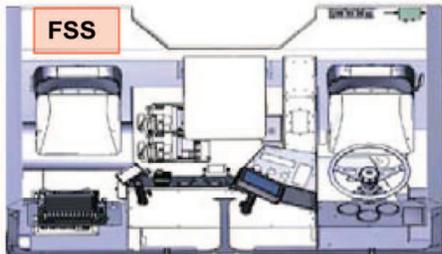
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### LOGISTICS VEHICLE SYSTEM REPLACEMENT (LVSR) Fire Suppression System (FSS) Status







**Program Description**

The Logistics Vehicle System Replacement (LVSR) will replace the current Marine Corps heavy-tactical wheeled vehicle, the Logistics Vehicle System (LVS). As the Marine Corps' heavy-tactical distribution system, the LVSR Cargo variant will transport bulk liquids (fuel and water); ammunition; standardized containers; bulk, breakbulk, palletized cargo, and bridging equipment. The LVSR Wrecker variant will perform heavy wrecker/recovery missions, while the LVSR Tractor variant will tow heavy engineer equipment and combat vehicles with the M870A2 40 ton Medium Heavy Equipment Trailer (MHET).

IOC: 3QFY09    FOC: FY13    AAO: 1699

**FSS Status**

- Status: Current LVSR fire protection consists of hand held fire extinguisher inside crew cab. Currently no automatic fire suppression systems.
- Ongoing efforts:
  - Working with OEM (Oshkosh Corp) to develop automatic fire suppression system for crew compartment, engine compartment, and exterior tires (2 front cab axles).
  - Working with Oshkosh to design fuel tank fire protection kit (similar to MTVR kit).
  - Submitted POM-12 initiative for funding fire suppression upgrades for all vehicles per agreement with MCDDC.
  - Coordinating efforts with MCCDC, MCSC, and other vehicle PMs.

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## **ONR SwampWorks**

PEO LS S&T has teamed with the MCSC Program Manager for Materials, System Engineering, Interoperability, Architecture and Technology (SIAT) and ONR SwampWorks in an effort to address Fuel Tank Protection Systems for Tactical Vehicles. This effort seeks to develop a new class of integrated fuel tank protection for combat vehicles. This will encompass a singular coating technology that (1) self-seals upon small arms ballistic threats / impacts, (2) self-protects against pool-fire threats, and (3) provides fire suppression for IED and EFP events. The intent of this effort is to develop a military specification and qualify potential permanently self-sealing coatings for Tactical Vehicles to be used on current and future vehicle fuel tanks as stand-alone protection against ballistic threats.

## **TARDEC Efforts**

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PEO LS S&T continues its work with TARDEC to investigate technology enhancements for Fire Protection. Current TARDEC efforts include:

### **Fire Protection Research**

Goal:

- Provide new platforms and legacy vehicle modernization programs with improved fire protection technologies to increase warrior and system survivability against current and emerging battlefield threats.

Operational Impact/Benefit to the Warfighter:

- Tolerant fuel container designs which reduce the likelihood of catastrophic loss of crew and system
- Robust fire suppression systems with latest agents and improved reaction time to battlefield threats
- Ability to predict performance of crew AFES to reduce risk and the need for system testing

### **Advanced Fire Protection R&D**

Goal:

- Provide new platforms and legacy vehicle modernization programs with improved damage mitigation techniques to protect against current and emerging fire threats.

Operational Impact/Benefit to the Warfighter:

- Reduced probability of crew incapacitation and vehicle kills from fire and fragment threats
- Damage tolerant fuel containers that reduce likelihood of catastrophic vehicle fires
- Reduced potential for injury from fire by-products
- Capability to validate system-level AFES performance

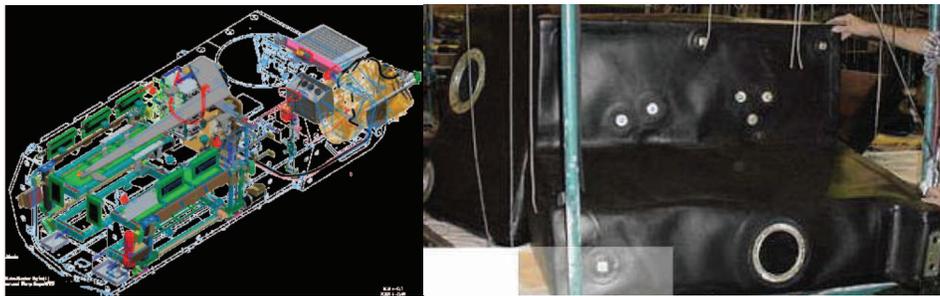
## **Fire Protection Research to Support Convoy Operations**

Goal:

- Provide fire protection solutions currently available to customers for Ground Combat Vehicle modernization and retrofit programs. Perform basic research and develop system specifications for survivable fuel tanks and materials which increase Soldier and system survivability while providing vehicle design flexibility.

Operational Impact/Benefit to the Warfighter:

- Reduced implementation and life-cycle costs for tactical vehicle fire protection
- M&S tools for optimization of ground vehicle design and analysis



*TARDEC M&S and Fuel Tank Fire Protection Tests*

## **Fire Protection SIL**

Goal:

- The Fire Protection Laboratory will provide in-house integration and evaluation of fire protection system technologies. The in-house M&S capability will allow prediction of fire extinguishing system performance and compare multiple configurations.

Operational Impact/Benefit to the Warfighter:

- Reduced integration and test costs while improving response to customers
- Enhanced ability to develop and transfer innovations to vehicle PMs and the field with potentially life-saving technologies

## **Simulations of Actual Military Ground Vehicle AFES System Design**

Goal:

- Provide fire protection solutions currently available to customers for Ground Combat Vehicle modernization and retrofit programs. Perform basic research and develop system specifications for survivable fuel tanks and materials which increase soldier and system survivability while providing vehicle design flexibility.

Operational Impact/Benefit to the Warfighter:

- Reduced implementation and life-cycle costs for tactical vehicle fire protection
- M&S tools for optimization of Ground Vehicle design and analysis

### **SBIR and STTR Efforts**

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The competing requirements of ballistic protection, fuel containment, and vehicle weight present a significant engineering challenge for Marine TGVs. PEO LS S&T representatives are continuing to monitor the following SBIR and STTR efforts:

- **Modular Lightweight External Fuel Tank System (SBIR)**
- **Lightweight self-sealing Fuel Tank with Hydraulic Ram Mitigation (SBIR)**
- **Mitigation of Fuel Tank Explosions and Fires from IED Blasts. (STTR)**
- **Mitigation of Fuel Tank Explosion and Fires Using a Hybrid Electrochemical Oxygen Extraction and Explosion Suppression Foam system (STTR)**

Technologies and capabilities identified as a result of these efforts can potentially have application across the PEO LS portfolio.