



## High Mobility Multipurpose Wheeled Vehicle (HMMWV)

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The High Mobility Multipurpose Wheeled Vehicle Expanded Capacity Vehicle (HMMWV ECV) is the 4th generation design of the HMMWV and is replacing the aging fleet of Base variant, A1, and some A2 variants. The HMMWV was originally fielded to Marine Corps units in the mid-1980s. The ECV is the latest generation and upgrades include: 6.5L Turbo engine; microprocessor-controlled engine electrical start system; more powerful Environment Protection Agency compliant engine; increased payload (500lbs); improved corrosion prevention; and access panels to facilitate maintenance. Current Armor Guidance from Marine Corps Combat Development Command (MCCDC) is 100% of the HMMWV fleet to have Integrated Armor Package (IAP) at a minimum, with 60% fully up-armored.

To successfully accomplish its mission, Marine Air-Ground Task Forces (MAGTFs) require a light tactical vehicle for command and control, troop transport, light cargo transport, shelter carrier, towed weapons prime mover, and weapons platform throughout all areas of the battlefield or mission area. Also, there are 71 United States Marine Corps (USMC) component programs that use the HMMWV as their prime mover. For units that require specific vehicle configurations, the detailed requirements will be provided in kit form, capable of being installed at General Support (GS) maintenance level or below, or by incorporation of Component of Major End Items (CMEI)/Component of End Items (COEI) by the system integrator. To meet the new AAO requirement and achieve a HMMWV fleet of 100% IAP and 60% fully up-armored, a major transition of HMMWV types and configurations is on-going.

The USMC has procured, fielded, and supported large numbers of HMMWVs for many years; therefore, the infrastructure and processes are established to support fielding Expanded Capability Vehicle (ECVs), and to phase-out Base, A1, and some A2 variants. Marine Corps HMMWV Inspect and Repair only as Necessary (IROAN) and SLEP Recapitalization projects have been ongoing at Marine Corps and Army depots. The Marine Corps began depot repairs to IROAN legacy HMMWVs in the early 1990s which continued through 1999. IROAN of HMMWV by Marine Corps depots was discontinued at that time. In 2007, IROAN began again

on the HMMWVs as a basic total rebuild due to issues with corrosion and failing parts. In 2009, the depots were directed to only IROAN HMMWVA2s with Marine Armor Kit (MAK) armor and Enhanced Capability Vehicles (ECVs). Since 2007 over 7,000 HMMWVs and ECVs have been IROANed by Marine Corps depots since 2007. The Marine Corps currently does all IROANs, RESETs, and rebuilds in-house at USMC depots, but has in the past contracted with the Army to IROAN vehicles at the Red River Army Depot in Texarkana, Texas.

As a result of the armoring levels required to meet the demands of Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF), HMMWV fleet performance has been significantly degraded due to overloaded conditions created by the armoring of the vehicle. As a result the HMMWV platform has exhibited increased maintenance demands, increased braking distances, increased acceleration times, reduced side slope and grade performance and degraded on/off road performance. Currently the Marine Corps HMMWV program office has initiated an effort to improve the HMMWV through a series of upgrades to gain back vehicle performance degraded by the need to armor the platform. This effort, known as the HMMWV Product Improvement Program (PIP), will focus on cost effective improvements in the areas of performance, safety, survivability and reliability. These targeted improvements will focus on the fully armored variants that will not be replaced by the upcoming Joint Light Tactical Vehicle (JLTV). Key areas of the modification include improving safety to include upgrades to braking, suspension components, wheels and tires for better vehicle stability, driver control and reduction of roll-overs. The modification will also look at improving performance by upgrading engines and transmissions for increased fuel efficiency and performance as well as upgrading the cooling system to prevent overheating and reduced failures. Optimizing suspension solutions will improve reliability by reducing forces transmitted to the vehicle chassis which will lead to a reduction in operation and maintenance costs. Finally the incorporation of a Central Tire Inflation System (CTIS) will allow for reduced tire pressures during off-road use to improve mobility and ride quality. These upgrades will provide the means to facilitate the necessary service life extension of the HMMWV platform to 2030 and beyond.

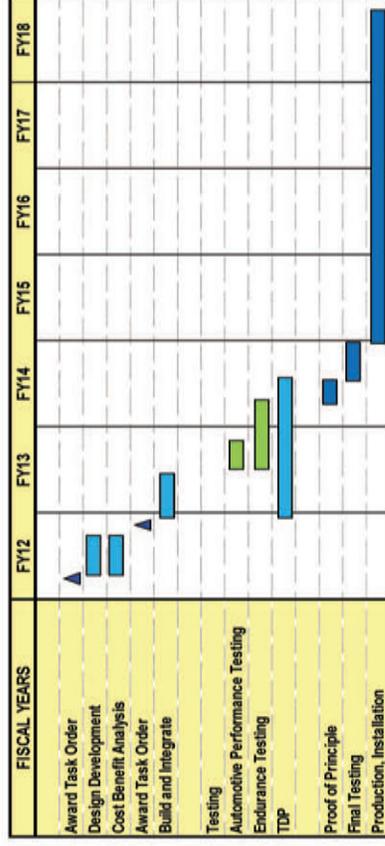
In December 2011, The HMMWV program was transferred out from under the formerly chartered authority of Program Manager, Motor Transportation (PM MT), Marine Corps Systems Command, Quantico, Virginia, to Program Executive Officer Land Systems, Program Manager, Light Tactical Vehicles, Quantico, Virginia.



# High Mobility Multipurpose Wheeled Vehicle (HMMWV)



## Modification Schedule



## Program Description

Serve as the primary light tactical ground transport platform for command and control, troop transport, light cargo transport, shelter carrier, towed weapons prime mover, and weapons platform throughout all areas of the battlefield or mission area. Currently, approximately 70 other TAMCNS are associated to the HMMWV for employment.

The High Mobility Multipurpose Wheeled Vehicle Expanded Capacity Vehicle (HMMWV ECV) is the 4th generation design of the HMMWV. The HMMWV fleet includes a mix of A2 and ECV variants. Current armoring guidance is for a mixed fleet of 60% fully up-armored and 40% IAP.

ECV upgrades include: 6.5L Turbo engine; microprocessor-controlled engine electrical start system; more powerful EPA compliant engine; increased payload (500lbs); improved corrosion prevention; and access panels to facilitate maintenance.

## Program Status

- ACAT: IC
- Full Rate Production Decision – mid 1980s
- Fielding beginning: 1984 4<sup>th</sup> qtr
- IOC: 1986 1<sup>st</sup> qtr
- FOC: TBD
- AAO: 24,241
- Contract Type: Requirements based multi-year
- Prime Contractor: AM General
- Award Date: 1984
- Fleet consists of A2 and ECV variants



# High Mobility Multipurpose Wheeled Vehicle (HMMWV)



FISCAL YEARS	FY12	FY13	FY14	FY15	FY16	FY17	FY18
Award Task Order	▲						
Design Development	■						
Cost Benefit Analysis	■						
Award Task Order	▲						
Build and Integrate		■					
Testing							
Automotive Performance Testing		■					
Endurance Testing		■					
TDP		■	■				
Proof of Principle			■				
Final Testing			■				
Production, Installation						■	



## High Mobility Multipurpose Wheeled Vehicle (HMMWV)

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### HMMWV'S Top Three Program Technology Issues:

1. **Performance** - As a result of the armoring levels required to meet the demands of Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) the HMMWV fleets performance has been significantly degraded. This degradation stems from the consequences of overloading the vehicles with the currently installed B-Kit and Fragmentation (FRAG) armor kits. Additional payload and armoring or any off-road operational scenarios further diminish automotive performance causing reduced vehicle stability, reduced ride height, and poor ride quality, hindering overall automotive performance.

2. **Survivability** - While significant improvements have been made to improve the survivability of both the A2 and ECV HMMWV fleet via the employment of the Marine Armor Kits (MAK) kits for A2 variants and B-kits in combination with FRAG kits for the ECVs, there are still capability gaps in the current platforms. The Marine Corps HMMWV Program office is currently exploring technologies and methods to improve the underbody survivability of the HMMWV platform, specifically the ECV platform, in combination with on going efforts to extend the service life to meet the Light Tactical Vehicle need of the Marine Corps.

3. **Reliability/Durability** - Evaluation of the operational Reliability and Maintainability (RAM) data gathered from current combat operations and vehicle testing have shown that HMMWV up-armoring has resulted in a significant degradation of performance, vehicle reliability and availability. Incidents of collapsed springs, broken upper and lower control arms, failed suspension bushings, cracked frames, crushed air conditioning condensers, cracked radiators, and failed gear drive hubs have increased significantly. HMMWV components are unable to withstand the additional stresses produced by the suspension bottoming out, coil spring binding, and the jarring effects of overloaded suspension components and reduced suspension travel. The results of the decrease reliability and durability performance has been decreased readiness and significantly increased operational costs.

#### 1. **Performance:**

##### 1a. Active S&T Initiatives for HMMWV

###### **Other**

- Spaceframe Technology HMMWV
- HMMWV Suspension Upgrade (HSU)
- HMMWV 3 – Axis Stability

## **1.b Potential S&T Initiatives for HMMWV**

### **Small Business Innovation Research (SBIR)**

- Semi-active Damped Seating (ACV SBIR III)

### **Discovery and Invention (D&I)**

- CSTV Shock Mitigating Seats
- Integrated Mobility Dynamics Control

### **Other**

- JLTV Phase 'A' Light Weight Armor Study

## **2. Survivability:**

### **2.a Active S&T Initiatives for HMMWV**

#### **Discovery and Invention (D&I)**

- Energy Absorbing Structures for Blast Mitigation

### **2.b Potential S&T Initiatives for HMMWV**

#### **Discovery and Invention (D&I)**

- CSTV Shock Mitigating Seats
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#### **Small Business Technology Transfer (STTR)**

- Low Cost, Low Weight, Self-Sealing Fuel Tank Technology Development (ACV STTR II)

#### **Exploration and Development (E&D)**

- Survivability Analysis of Alternatives Tool
- Future Naval Capability (FNC)
- Advanced LAV Suspension

#### **Other**

- Fuel Tank Protection System Swampworks

## **3. Reliability/Durability:**

### **3.a Active S&T Initiatives for HMMWV**

#### **Discovery and Invention (D&I)**

- Energy Absorbing Structures for Blast Mitigation Light Tactical Vehicles

**Other**

- HMMWV Trade Space M&S
- Spaceframe Technology HMMWV
- HMMWV Suspension Upgrade (HSU)
- HMMWV 3 – Axis Stability

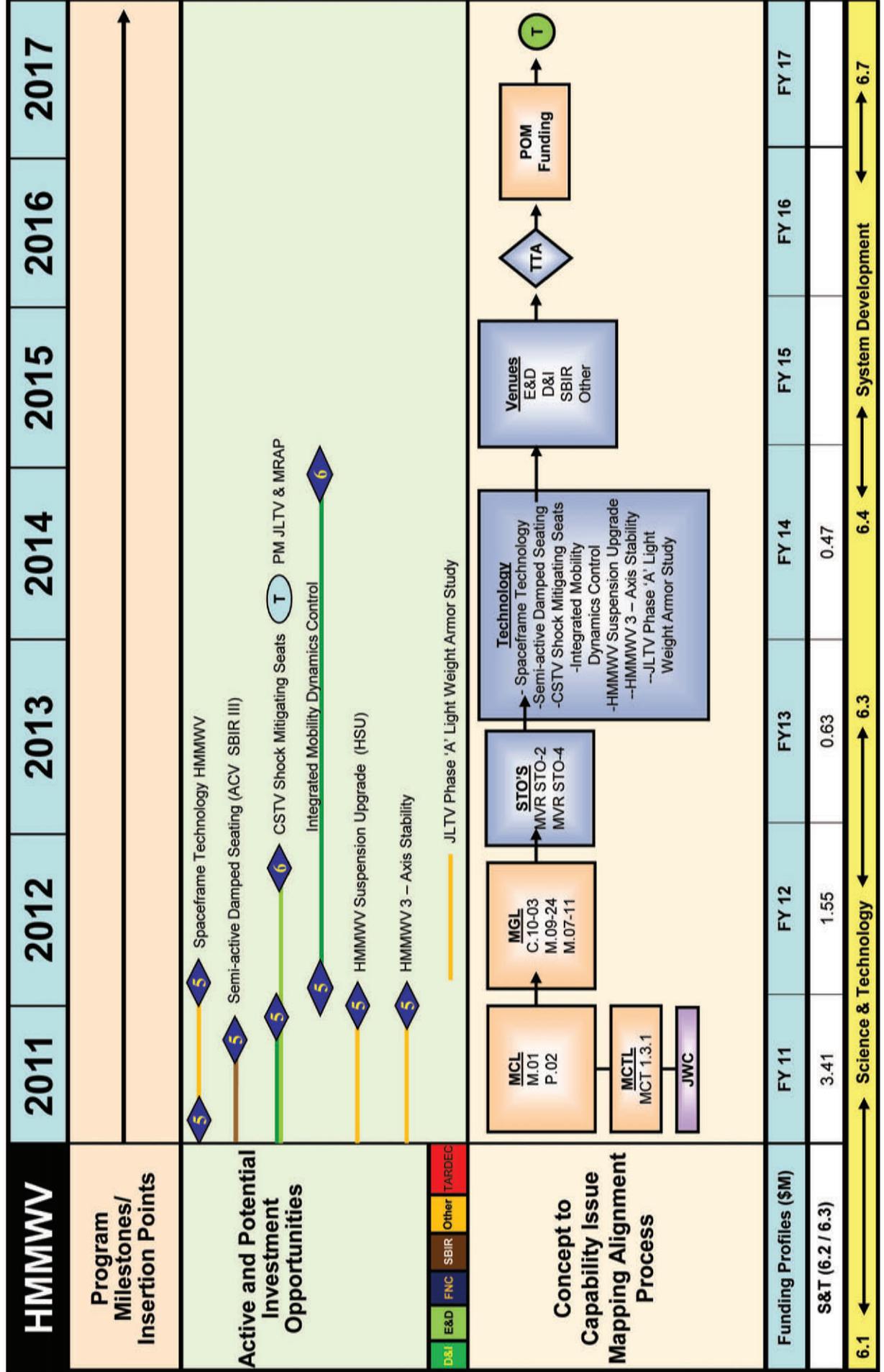
**3.b Potential S&T Initiatives for HMMWV****Other**

- Military Vehicle High Performance Capabilities (MVHPC)
- Fuel Tank Protection System Swampworks
- JLTV SE Toolkit

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# HMMMWV Technical Issue #1 Performance



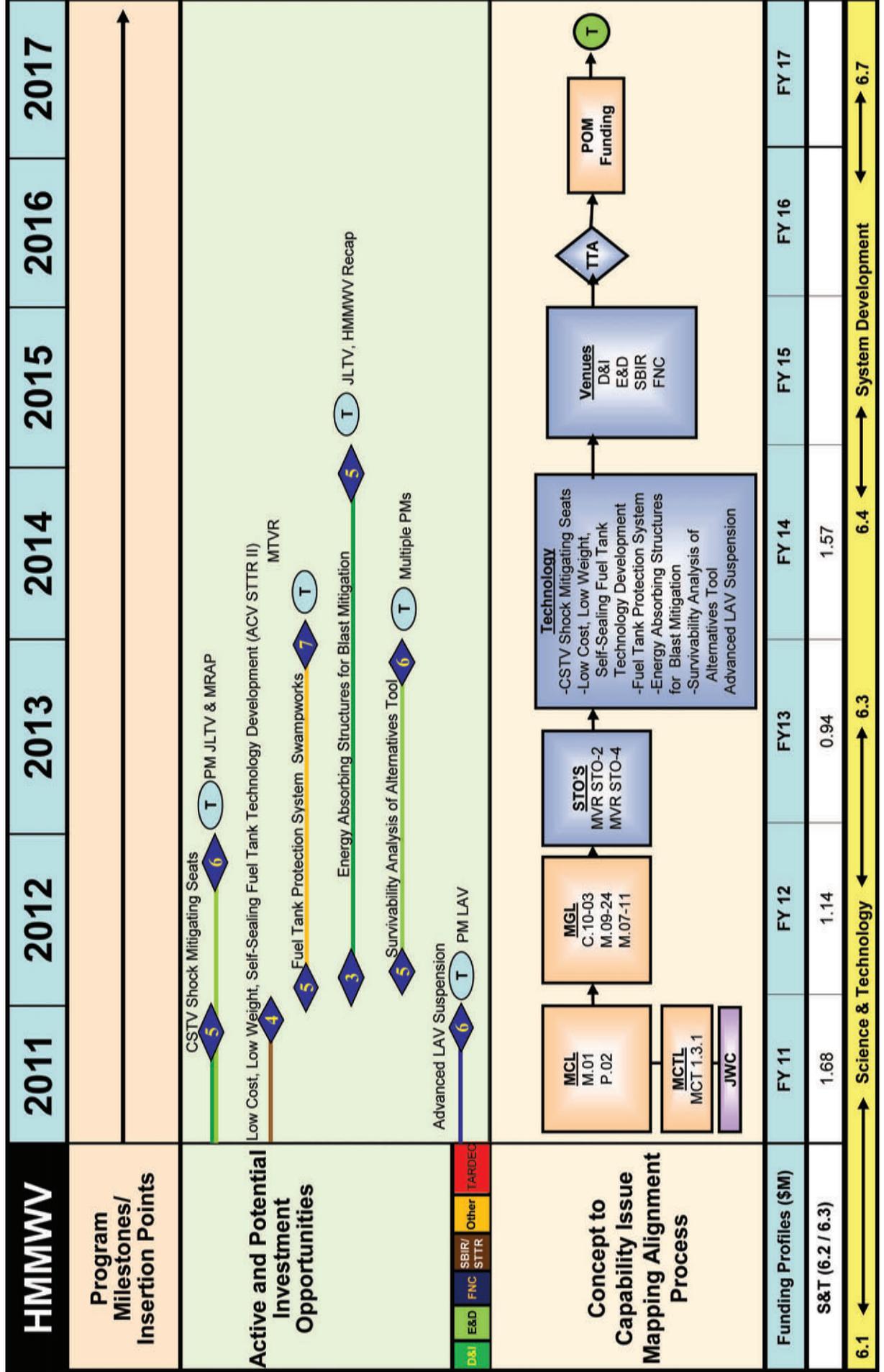


# HMMWV Technical Issue #1 Performance

<b>MCL</b>	M.01 Maneuver to Secure P.02 Protect personnel, physical assets and LOCs
<b>MCTL</b>	MCT 1.3.1 Conduct Maneuver
<b>MGL</b>	C.10-03 Limited transport capability M.09-24 Force protection M.07-11 Mobility in all terrain and climates
<b>STO'S</b>	MVR STO-2 Ground vehicle mobility MVR STO-4 Advanced materials and survivability technology to enhance the performance and survivability of combat vehicles and surface craft
<b>Technology</b>	Active: -Spaceframe Technology -HMMWV Suspension Upgrade -HMMWV 3 – Axis Stability  Potential: -Semi-active Damped Seating -CSTV Shock Mitigating Seats -Integrated Mobility Dynamics Control -JLTV Phase 'A' Light Weight Armor Study
<b>Venues</b>	E&D, D&I, SBIR, Other
	N/A
<b>POM Funding</b>	MCCDC integration Division
	Transition to a program of record  Comments/Issues:



# HMMWV Technical Issue #2 Survivability





# HMMWV Technical Issue #2 Survivability

<b>MCL</b>	M.01 Maneuver to Secure P.02 Protect personnel, physical assets and LOCs	
<b>MCTL</b>	MCT 1.3.1 Conduct Maneuver	
<b>MGL</b>	C.10-03 Limited transport capability M.09-24 Force protection M.07-11 Mobility in all terrain and climates	
<b>STO'S</b>	MVR STO-2 Ground vehicle mobility MVR STO-4 Advanced materials and survivability technology to enhance the performance and survivability of combat vehicles and surface craft	
<b>Technology</b>	Active: Energy Absorbing Structures for Blast Mitigation	Potential: -CSTV Shock Mitigating Seats -Low Cost, Low Weight, Self-Sealing Fuel Tank Technology Development -Fuel Tank Protection System -Survivability Analysis of Alternatives Tool -Advanced LAV Suspension
<b>Venues</b>	D&I, E&D, SBIR, Other (Swampworks), FNC	
<b>TTA</b>	Advanced LAV Suspension	T Transition target for PM LAV
<b>POM Funding</b>	MCCDC integration division	
<b>T</b>	Transition to a program of record	Comments/Issues:





# HMMWV Technical Issue #3 Reliability/Durability

<b>MCL</b>	<p>M.01 Maneuver to Secure  P.02 Protect personnel, physical assets and LOCs  L.02 Maintain equipment</p>
<b>MCTL</b>	<p>MCT 1.3.1 Conduct Maneuver</p>
<b>MGL</b>	<p>C.10-03 Limited transport capability  M.09-24 Force protection  M.07-11 Mobility in all terrain and climates</p>
<b>STO'S</b>	<p>MVR STO-2 Ground vehicle mobility  MVR STO-4 Advanced materials and survivability technology to enhance the performance and survivability of combat vehicles and surface craft</p>
<b>Technology</b>	<p>Active:  - Energy Absorbing Structures for Blast Mitigation Light Tactical Vehicles  -HMMWV Trade Space M&amp;S  -Spaceframe Technology HMMWV  -HMMWV Suspension Upgrade  -HMMWV 3 – Axis Stability</p> <p>Potential:  -Military Vehicle High Performance Capabilities  -Fuel Tank Protection System  -JLTV SE Toolkit</p>
<b>Venues</b>	<p>D&amp;I, Other</p>
	<p>N/A</p>
<b>POM Funding</b>	<p>MCCDC Integration Division</p>
	<p>Transition to a program of record</p> <p>Comments/Issues:</p>