

# M-ATV/COUGAR/BUFFALO



Left to right, top to bottom: Buffalo; Cougar 4x4; Cougar 6x6; M-ATV

## Program Background

The Marine Corps' MRAP All-Terrain Vehicle (M-ATV), Category (CAT) I and CAT II Cougar variants, and the CAT III Buffalo are designed to reduce casualties and increase the survivability of personnel subjected to mine explosions, Improvised Explosive Device (IED) detonations, and Small Arms Fire (SAF). These vehicles were designed under the Mine-Resistant Ambush Protected (MRAP) umbrella to meet requirements identified during Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF), with a focus on continual improvements in force protection and vehicle survivability through technology insertion. Now incorporated into

the Medium and Heavy Tactical Vehicles fleet, the USMC will retain M-ATVs, Cougars, and Buffalos to satisfy the enduring requirement established by the Marine Corps Requirements Oversight Council (MROC) in October 2014.

The M-ATV, designed to operate in rugged terrain and on the primitive road network in OEF, provides better overall mobility characteristics than Cougar and Buffalo variants. It supports mounted patrols, reconnaissance, security, convoy protection, data interchange, and command and control functions. The addition of the Underbody Improvement Kit (UIK) further enhances the platform's protection against underbody threats. This kit combines

armor and interior occupant upgrades, as well as automotive enhancements to increase survivability while maintaining platform safety and off-road capability.

The Cougar platform includes two primary vehicle variants, the CAT I and CAT II, all fielded with the upgraded Independent Suspension System (ISS). The CAT I (4X4) variant is capable of transporting five crew members and one gunner and supports small unit combat operations in urban and confined areas such as mounted patrols, reconnaissance, communications, and command and control. The CAT II (6X6) variant is capable of transporting nine crew members and one gunner and supports multi-mission combat operations in urban or confined areas such as convoy security, troop and cargo transportation. In addition to these two primary variants, a select number of Cougar CAT I vehicles have been fitted with the Saber Tube-launched, Optically tracked, Wire-guided (TOW) system, which is an anti-heavy armor missile system. The TOW-integrated Cougars provide a survivable platform from which armored and urban enclosed threats can be defeated. Similarly, a select number of the Cougar CAT II vehicles have been modified into ambulance variants providing the ability to transport and conduct emergency care on multiple critical battlefield casualties while in close proximity to enemy troops. The Cougar ambulance can transport up to four wounded patients or two patients carried on litters plus three crew members.

The USMC CAT III MK2A2 Buffalo is a six-wheel, six-passenger, all-wheel drive vehicle that was developed to conduct route clearance operations. The Buffalo is a blast-protected vehicle that operates in explosive hazardous environments and provides route clearance capability and personnel protection against IEDs, anti-personnel, and anti-tank mines. The Buffalo has a 30-foot articulating arm used to investigate suspected buried IEDs and enable the crew to classify the explosive hazard with precision while protecting the operator.

## Program Status

M-ATVs, Cougars, and Buffalos are currently fielded to all three Marine Expeditionary Forces (MEFs). A total of 2,017 of the 2,510 Enduring Requirement (ER) vehicles are scheduled to receive a maintenance reset at Marine Corps and Army depots and a commercial repair facility through calendar year 2018.

## Top Technical Issues

### 1. Stress Cracks in Welded Construction and Monolithic Hulls Both Using High-hard Steel

The fleet is currently going through reset at various depots and commercial locations CONUS. As hulls are stripped and inspected, stress cracks are being discovered throughout the welded high-hard construction of Cougars and in high hard panels of M-ATVs. The reset lines are being delayed and significant cost is being added to the process due to the extensive repair of cracks, replacement of high hard panels. It is critical that the types of cracks be characterized, the root causes discovered, and depot-level repair procedures established that will maintain structural integrity, reduce future cracking, and provide required ballistic protection.

### 2. Transparent Armor

Advancements are needed in the area of transparent armor. The current transparent armor meets the requirements for ballistic performance; however, significant logistics and financial burdens are realized as a result of delamination. Delamination reduces visibility and makes it more difficult for the crew members to operate safely and view the surroundings effectively. Finding a solution that retains the armor's ballistic performance and maintains visibility would provide the USMC significant cost savings due to replacement and reduce the logistics burden.

### **3. Reduction in Occupant Accelerations with Minimal Stroke Distance Availability**

The ground vehicle survivability community and vendors have developed high performing blast attenuating occupant seats that protect against significant mine blast charge weights over the last 10-15 years. Many of these seats function by allowing the seat to stroke downwards while an energy attenuating mechanism absorbs the accelerative load. Finding improved seating systems that can provide blast attenuation with minimal downward stroke while allowing components or stowage under the seat is optimal for supporting the Marines and their internal vehicle load plan.

# M-ATV

## ACAT III / SUSTAINMENT

**Description:** The M-ATV provides protected ground mobility capable of operating in a threat environment involving ambushes employing the use of mines, Improvised Explosive Devices (IEDs), Rocket Propelled Grenades (RPGs), Explosively Formed Penetrator (EFPs), and Small Arms Fire (SAF).

### Key Events

- MROC Decision Memorandum 03-2017 published 4 January 2017 maintains AAO of 705
- Reset production line at Red River Army Depot nearing completion Feb/Mar 2017 time frame
- Redistribution of reset vehicles to prepositioned locations will continue through FY18
- 17 January- 14 February: Logistics Demonstration of Operators Manual being conducted in Oshkosh, Wisconsin

### Program Status/Issues/Concerns

- AAO 705
- Army is PICA
- Program is in sustainment
- Reset activities are ongoing at Red River Army Depot, Maintenance Center Barstow
- Redistribution of reset vehicles to the MEFs is complete



PROGRAM	PRIOR	FY16				FY17				FY18				FY19				FY20				FY21				FY22							
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Milestones & Phases																																	
SETR Reviews						Fuel Efficiency				A-Kit Upgrades																							
Test Events						Trailer Test				ECM																							
Contract Events						Rear Wall/Door Sill Kits																											

MROC Decision Service Life 2024



# Buffalo

## ACAT III / SUSTAINMENT

**Description:** The Buffalo is a heavy-category CAT III vehicle which provides a route clearance capability and personnel protection against anti-personnel (AP) and anti-tank (AT) mines. The Buffalo has an extendable boom with an attached claw and air digger. Because its primary mission is route clearance it was designated as a B0035K and assigned to Combat Engineer units. Since the vehicle has no weapon systems it cannot operate in a combat environment alone.



### Key Events

- Windshield Cracking
- Root cause analysis/testing – 27 Jan 17
- Design./procedure changes - 01 Mar 17 - 30 Apr 17
- Solution to Depot – 01 May 17
- Emergency Egress Lighting Product Improvement
- Prototypes - 15 Mar 17
- Testing - 30 Mar 17 - 30 Apr 17
- Receive production kits - 15 Jul 17

### Program Status/Issues/Concerns

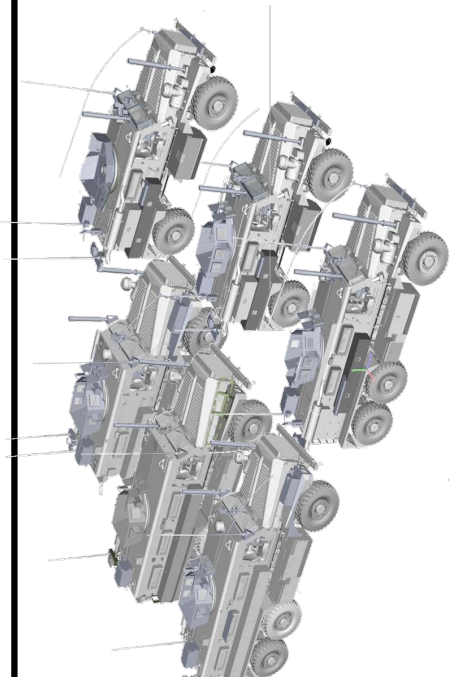
- Programmatic
- Block III Upgrade Effort includes over 60 individual improvements to the Buffalo (EEL, 3<sup>rd</sup> Plane of Egress, Electrical System Mitigation, etc.)
- Logistics
- Windshield frame Production and Integration
- Complete Block III Upgrade at LOGCOM at Production Plant Albany (PPA)
- Complete MIs for IETM Integration and EMSS Software Update

PROGRAM	PRIOR	FY16				FY17				FY18				FY19				FY20				FY21				FY22			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Milestones & Phases		★ TAU WC Production				★ Electrical Mitigation																							
SETR Reviews		ECP 3D CAD Mod & TPD				FOV ECPS (Cougar, Buffalo)																							
Test Events		EEL				Rebaseline				Product Improvement Plan Testing Events																			
Contract Events		FSR				FoV FSR																							
		EEL Dev & Prod				IETM				Final IETM																			

# Cougar

## ACAT III / SUSTAINMENT

**Description:** The Cougar FoV is an infantry mobility vehicle designed to resist anti-vehicle mines, IED detonations, and small arms fire. The Cougar FoV is comprised of a four-wheel (4x4 CAT I) version and a six-wheel (6x6 CAT II) version. The Cougar FoV is used for small unit combat operations in urban or confined areas. The Cougar FoV mission includes mounted patrols, reconnaissance, communications, and command and control.

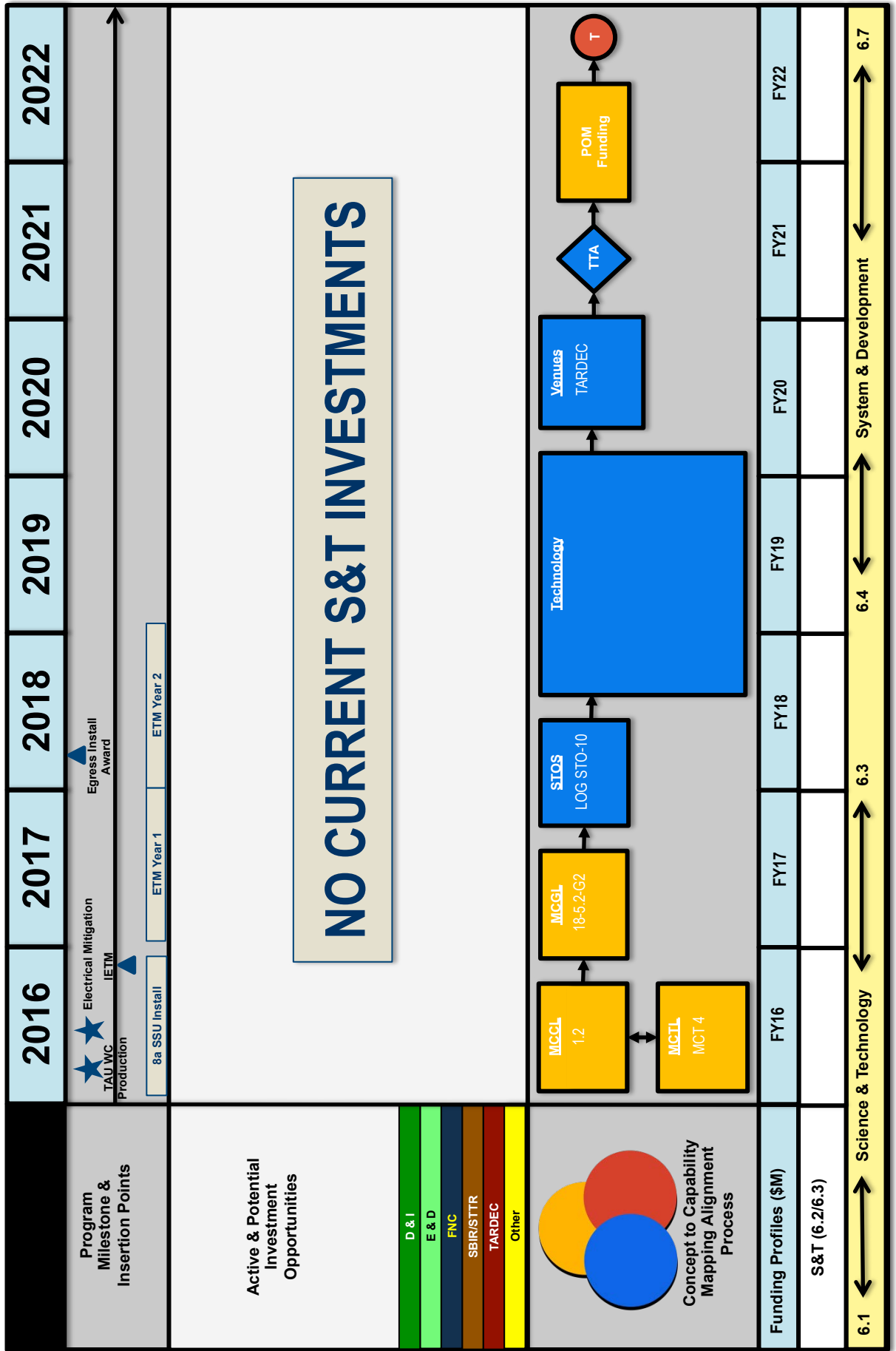


<u>Key Events</u>		<u>Program Status/Issues/Concerns</u>	
<ul style="list-style-type: none"> <li>Egress Test Events – (End of Test 17 Mar 17)                             <ul style="list-style-type: none"> <li>360-Degree Rollover Event: 15 Mar 17</li> </ul> </li> <li>Egress Installs – Organic Site Visits – mid-Feb 17</li> <li>Egress FRPD - Egress SVR/PRR – mid-Mar 17</li> <li>Egress FRPD – mid-Apr 17</li> <li>Egress First Rate Production delivery – Aug 17</li> </ul>	<ul style="list-style-type: none"> <li>Logistics                             <ul style="list-style-type: none"> <li>Post Reset ECP Installation</li> <li>ETM development</li> <li>Transparent Armor supply</li> </ul> </li> </ul>		

PROGRAM	PRIOR	FY16				FY17				FY18				FY19				FY20				FY21				FY22			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Milestones & Phases		★ TAU WC Production ★ Electrical Mitigation																											
SETR Reviews		Cougar Master Model Complete Cougar Model Development				Cougar FOV EGFS Cougar Model Development																							
Test Events		CRVJ V2 Egress Test Cougar FL FSR FOV FSR 8a SSU Install IETM				ECOM Trailer Test Cougar FL Rebaseline A-Kit Upgrade Test				Egress Install Award																			
Contract Events						ETM Year 1				ETM Year 2																			

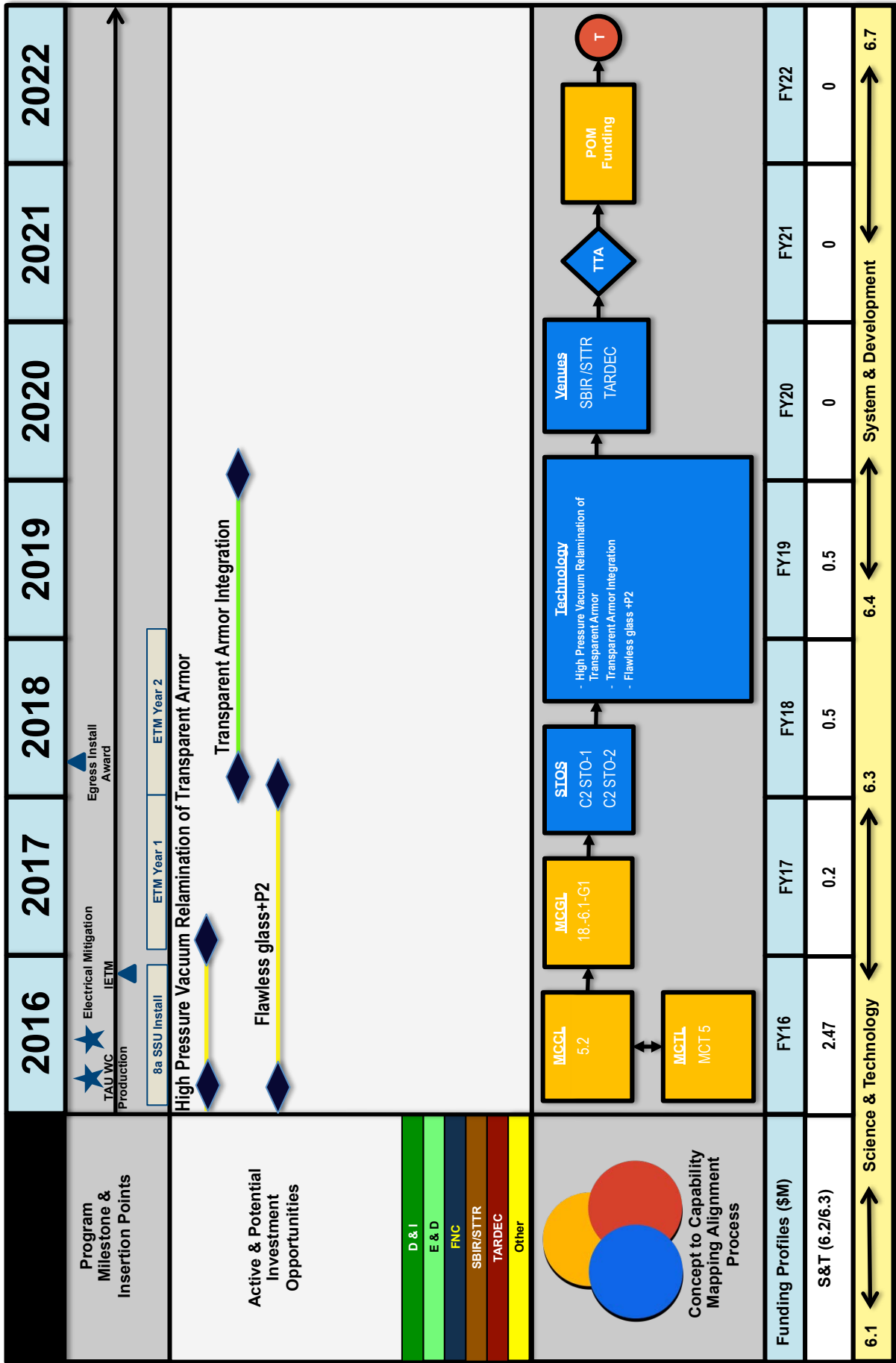


# MRAP Technical Issue #1 Stress Cracks in Welded Construction and Monolithic Hulls Both Using High-Hard Steel





# MRAP Technical Issue #2 Repair of Delaminated Transparent Armor







# MRAP Technical Issue #3 Reduction in Occupant Accelerations with Minimal Stroke Distance Availability

