Survivable Vehicles for the Warfighters

Mine Resistant Ambush Protected (MRAP) Requirements Management Process

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Systems Engineer PEO CS&CSS
Agenda

1. MRAP Overview
2. Process Overview
3. Gates
   1. Requirements Prioritization Process (Gate 1)
   2. Design Solution Analysis (Gate 2)
   3. Prioritized Execution Analysis (Gate 3)
   4. Management Decision Review (Gate 4)
4. MRAP Requirements Management System (MRMS)
5. Logistics Impact
1. MRAP Overview
MRAP Team

- Joint MRAP Vehicle Program
- MRAP Team
- DoN
- ASN RDA
- LOGCOM
- DoAF
- SAF AC
- DLA
- DoA
- USMC
- DCMA
- ATEC
- LOGCOM
- Aberdeen Test Center
- SAF AC
- DoN
- DCMA
- NAVFAC
- PEO CS&CSS
- ATEC
- SOCOM
Service & Congressional call for added vehicle protection drove rapid requirements growth.

Increased Army totals from 2,500 to 10,000 vehicles and included 100 test vehicles.

Supported increased vehicle reqts for OEF.

Supported increased reqts for OEF.

Established Army final reqt at 12K, SOCOM final reqt at 378 and final ballistic test reqt at 133 vehicles.

Supported M-ATV reqts for OEF.

Operational Demand Signal

185, May 06 MNF-W Commander

4,066, Nov 06 Army-USMC board

6,738, Feb 07 MROC validated

7,774, May 07 JROC validated

15,374, Sep 07 JROC validated

15,838, Jul 08 JROC validated

16,238, Nov 08 JROC validated

21,482, Jul 09 JROC validated

25,839, Jul 10 JROC validated

Increased Army totals from 2,500 to 10,000 vehicles and included 100 test vehicles.
Trade-Offs

- Speed to field
- Multiple variants
- Urgent Fielding
- COTS
- Multiple LRIPS
- Variations along the way

VS

- Complete Testing
- One variant
- Fully supported
- Designed for Services
- Configuration controlled
MRAP Requirements Timeline

- **9 Awarded 5 Passed Test** (BAE LS & TVS, NVDF, FPI, GD)
- **BAE LS & TVS, NVDF, FPI, GD**
- **Oshkosh**

**MRAP 1 LRP1-LRP9**

- **Dec-06** MRAP 1 Performance Specification
- **Nov-06** JUONS
- **May-07** CPD v1.0

**MRAP 2**

- **Jun-07** MRAP 2 Performance Specification
- **Jun-07** Series of JUONS

**MRAP 1 ECP LRP10-LRP14**

- **Aug-08** M-ATV Performance Specification
- **CC-0325**

**MRAP ATV**

- **Nov-08** MRAP ATV Performance Specification
- **Jun-09** CPD v1.1

**JUONS Field Issues**
- **CA, PA, DR**

- **Jul-09 - Sep-10** Ongoing ECPs

**1/1/2006**

**9/30/2010**

**MRAP Block Upgrade**
2. Process Overview
“Current State” Process

APMs

- APM 1
  - APM Works with Engineering Staff to develop capability.
- APM 2
  - APM Works with Engineering Staff to develop capability.
- APM 3
  - APM Works with Engineering Staff to develop capability.
- APM 4
  - APM Works with Engineering Staff to develop capability.
- APM 5
  - APM Works with Engineering Staff to develop capability.
- APM 6
  - APM Works with Engineering Staff to develop capability.
- APM 7
  - APM Works with Engineering Staff to develop capability.

Finance Team

EFAR Process

- Submit Funding Request to Finance
- Submit Funding Request to Finance
- Submit Funding Request to Finance
- Submit Funding Request to Finance
- Submit Funding Request to Finance
- Submit Funding Request to Finance

Contracts

- Review Request Based on FY Budget
  - Approved
  - Rejected
  - Rework

Logistics

RSA

DDRT

SPAWAR
To consolidate, prioritize and develop a **funding plan** for executing MRAP requirements.

**Purpose**

This Process:

- Embraces the Complexity that is MRAP
  - Cost, Schedule and Performance
  - Down to the sub-variant

- Focuses on capability across the fleet

- Supports centralized, holistic, informed decision making

- Is flexible, repeatable, maintainable and executable
Roles and Responsibilities

- **Chief Engineer**
  - Lead of the MRAP Requirement Prioritization Process (Gate 1)

- **PM Vehicle Systems**
  - Lead of the Prioritized Execution Analysis (Gate 3)

- **Requirements IPT**
  - Complete Gate 1
  - Complete Gate 3

- **APM SE/JPO Engineering (modification owner)**
  - Complete Gate 2
  - Execute approved Execution plan for modification
3. Requirements Prioritization Process
(Gate 1)
The prioritization will be at the MRAP capability level as opposed to the specific platform level.
- I.E. RPG Defeat vs. Bar Armor on the MaxxPro Dash

Criteria developed will be used consistently for all MRAP Capabilities
Output – GATE 1

- Approved MRAP Requirements Prioritization Process
- Approved the list of MRAP Capabilities
- Approved ranking criteria for the MRAP capabilities
- A prioritized list of MRAP Capabilities to support the Execution analysis
- Categorization of each APM modification under the appropriate MRAP Capability
# Ranking Criteria

<table>
<thead>
<tr>
<th>Scoring Impact</th>
<th>Weight</th>
<th>Criteria</th>
<th>Scoring Method</th>
<th>Score</th>
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<tbody>
<tr>
<td>28.21%</td>
<td>11</td>
<td>Safety/Survivability</td>
<td>Catastrophic / Defeat (First Order)</td>
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<tr>
<td>23.08%</td>
<td>9</td>
<td>User Need</td>
<td>JUONS/ONS</td>
<td>9</td>
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<tr>
<td>17.95%</td>
<td>7</td>
<td>Operational Availability</td>
<td>Non-Mission Capable</td>
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<tr>
<td>12.82%</td>
<td>5</td>
<td>Ease of Installation</td>
<td>Soldier Level - No Special Tools</td>
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<tr>
<td>10.26%</td>
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<td>Theater</td>
<td>OEF</td>
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<tr>
<td>7.69%</td>
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<td>Commonality</td>
<td>Logistics Footprint: Common A/B Kits</td>
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</table>

## Scoring Method Details

- **Catastrophic / Defeat (First Order)**: Impact of catastrophic or defeat events.
- **Critical / Disruption (Partial First Order)**: Impact of critical or partial first order events.
- **Marginal / Detection (Third Order)**: Impact of marginal or third order events.
- **Negligible**: Impact of negligible events.
- **JUONS/ONS**: Importance of joint operations and support networks.
- **KPP**: Impact of key performance parameters.
- **JUWG TOP 10**: Impact of joint warfighting group top 10 criteria.
- **CPD/P-SPEC shortfall**: Impacts of capability and performance shortfalls.
- **Field Issue**: Impact of field issues.
- **Non-Mission Capable**: Impact of non-mission capable operations.
- **Theater Specific (NMC)**: Impact of theater specific non-mission capable operations.
- **Mission Capable**: Impact of mission capable operations.
- **Soldier Level - No Special Tools**: Impact of soldier level installation without special tools.
- **FSR Level - No Special Tools**: Impact of FSR level installation without special tools.
- **Sustainment Level**: Impact of sustainment level operations.
- **OEF**: Impact of operations in the Middle East.
- **OIF**: Impact of operations in Afghanistan.
- **Logistics Footprint: Common A/B Kits**: Impact of logistics footprint with common A/B kits.
- **Logistics Footprint: Common B Kits**: Impact of logistics footprint with common B kits.
- **None**: Impact of none.
Gate 1 Formulation

**Formula for Weighted Score:**

Safety/Survivability \((\text{Weighting } \times \text{ Score})\) + 
User Need \((\text{Weighting } \times \text{ Score})\) + 
Availability \((\text{Weighting } \times \text{ Score})\) + 
Ease of Design Integration \((\text{Weighting } \times \text{ Score})\) + 
Commonality \((\text{Weighting } \times \text{ Score})\) + 
Theater \((\text{Weighting } \times \text{ Score})\) = **Weighted Score**

**Formula for Normalized Weighted Score:**

\[
\frac{\text{Weighted Score}}{\text{Maximum (Weighted Score)}} = \text{Normalized Weighted Score}
\]
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<tr>
<th>Capabilities</th>
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<th>Safety/Surv</th>
<th>User Need</th>
<th>Oper. Avail.</th>
<th>Ease of Install</th>
<th>Theater</th>
<th>Commonality</th>
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<th>Normalized WtdScore-Rd 5</th>
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Current and Future Status

- Current shows status by platform and sub-variant “as is”
- Future shows potential state if all currently working actions are implemented
- Still does not get us to fulfilling the 100% solution on all platforms
# Capability Gap Analysis - Top 9

<table>
<thead>
<tr>
<th>Capabilities</th>
<th>Current Performance of Variants</th>
<th>Future Performance of Variants</th>
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</thead>
<tbody>
<tr>
<td><strong>Technology</strong></td>
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<td><strong>Variant</strong> A</td>
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<tr>
<td>Gunner Restraint</td>
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<td>PIR Defeat (Rhino)</td>
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<td>Ability to Accept Sparks Rollers</td>
<td>0.723</td>
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</table>

Legend:
- ✅: Meets/ will meet after upgrade, but has reached cost/ performance
-.: Does not meet requirement and no upgrade planned
- □: Not applicable
- □: Data not provided
Design Solution Analysis

(Gate 2)
Gate 2 - Purpose

- Platform owners analyze each variant for compliance to the capability list generated in Gate 1.

- Identify and develop design solutions for platform shortfalls and capture cost, schedule, performance and acquisition data in the MRAP Requirements Management System (MRMS)
Gate 2 - Data Obtained

- **Specific Vehicle**
  - Variant (i.e. MaxxPro, MaxxPro Plus, MaxxPro Dash)
  - # of vehicles per variant impacted

- **Cost per variant**
  - Unit cost of modification
  - NRE

- **Performance**
  - Current Performance (identify level of current performance i.e. No AFES, 50 mph)
  - Proposed Performance with Modification (identify level of proposed performance i.e. AFES engine and crew, 65 mph)

- **Schedule**
  - First Unit Equipped (months from Contract Award (CA) to deliver to DDRT/Albany)
  - Completed (months from CA to delivery of last unit to DDRT/Albany)

- **Acquisition Information**
  - Contract vehicle and Status
Output – GATE 2

- Completed Design Solution Analysis for each platform modification

- Consolidated Database for each platform modification to include
  - Unit Cost
  - NRE
  - Other Cost
  - CY10/CY11/CY12/CY13 (Number of vehicles that can be updated)
  - Variant Affected
  - Number of months to FUE & Number of months to complete
  - Current Performance & Proposed Performance
  - Acquisition method and status
Prioritized Execution Analysis

(Gate 3)
Gate 3 Expectations/Output

- Review of each modification for tractability to requirement
- List of funded requirements
  - By Capability
  - By vehicle variant
  - By Fiscal Year budget
- List of unfunded requirements
- Acquisition Plan for each modification.
Gate 3 Criteria

- **Cost:**
  - $0 = Perfect Score of 1
  - $15,000+ = Worst Score of 0

- **Schedule**
  - Schedule to FUE
    - 0 month = Perfect Score of 1
    - 9+ Months = Worst Score of 0
  - Monthly Production Rate
    - 1200+/month = Perfect Score of 1
    - 0/month = Worst Score of 0

- **Performance (% of performance increase)**
  - 100% increase = Perfect Score of 1
  - 0% increase = Why are we doing this?
  - Guidelines used for safety Issues
    - Negligible Safety Issue = 25% increase
    - Marginal Safety Issue = 50% increase
    - Critical Safety Issue = 75% increase
    - Catastrophic Safety Issue = 100% increase

- **Prioritization**
  - Based on the Gate 1 Capability Priority (normalized score)
Gate 3 Weighted Criteria

- **Cost** – 30%
- **Schedule** – 30%
  - Schedule to FUE – 15%
  - Monthly Production Rate (MPR) – 15%
- **Performance** – 40%

**EQUATION:**
Priority \* (.3(Cost) + .15(FUE) + .15(MPR) + .4(Perf.))

Example GRS:
1.00 \* (.3(.83) + .15(.56) + .15(1) + .4(1)) = .883
JPO Management Decision Review
(Gate 4)
Gate 4

- Purpose is to provide MRAP PM an executive summary of each of the capabilities and the status by each APM.
- PM Vehicle Systems presents quad charts of each Capability to obtain funding decision and prioritization by MRAP PM.
  - Supported by APM and APM Lead SE’s
- Approval by JPO MRAP to execute.
Joint MRAP Vehicle Program
Gate 4 - Decision Format

**WORK PACKAGE DESCRIPTION**
- ID: 2043
- Status: New
- Variant: Cougar Cat 2
- Description: ISS Kits for CAT IIs

**PERFORMANCE IMPROVEMENTS**
- Current Performance:
  - 17K-3G front/23K-3G rear
- Proposed Performance:
  - Increase mobility and strength

**ACQUISITION STRATEGY**
- Procurement Type: IDIQ
- MIPR Location:
- Current Acquisition Phase: EFAR Not Yet Submitted
- Installation Man Hours: 96
- Installation Location: MSF / OEF
- Production Rate:

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<th>USAF#</th>
<th>USMC#</th>
<th>SOCOM#</th>
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Notes:

**CURRENT QUARTER COST/QUANTITY**
- FY10 Qty.: 0
- Unit Cost: $0
- NRE: $0
- Other: $0
- Total Cost: $0
- Funding Comments: ISS kits for remaining USA, USN and USMC CAT II requirements

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<th>FY11</th>
<th>FY12</th>
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**SCHEDULE**

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Funded
- Quantity Funded:
- Amount Funded:
- Notes: 0

Obligated
- Amount Obligated:
- Notes: 0
4. MRAP Requirements Management System (MRMS)
MRAP Requirements Management System (MRMS)

- Online **database** to track and manage the Req Mgmt Process
- Developed in response to needs identified after first round
- Developed in coordination with PEO CS&CSS CIO and PM AcqBus with potential for **wider use across other PEOs/PMs**.
- Incorporated requirements from Logistics, Finance, Acquisition, and Engineering

- **Principle enhancements:**
  - **Controlling** the data (who *can do* what when)
  - **Tracking** the data (who *did* what when)
  - **Standardized** format and content
  - **Database** systems vs. spreadsheets
  - **Breaks the** verify-change-reverify-change **cycle**
5. Logistics Impact
Limitations for Installation

- Assuming the vehicles will be available the throughput in the MRAP Sustainment Facility (MSF) and the RSA’s in OEF and OND are constraints on the ability to install capabilities.

- Identify install Man-hours per Mod.(Gate 2)
- Sum of install Man-Hours per variant
- Facility Capability – Bays, Shifts, Mechanics, etc
- Theater Priority
- Identify Quantity per variant needed
Joint MRAP Vehicle Program

MSF Through Put

Solver Parameters

Set Target Cell: $B12$

Equal To: Max

By Changing Cells: $D2:D7$

Subject to the Constraints:
- $D2:D5 <= B2:B5$
- $D2:D5 = integer$
- $D6 = 0$
- $D9 <= B14$
- $D9 >= 0$
- $F6:F7 = B6:B7$
Cost Avoidance

- **MSF Throughput analysis (Round 1)**
  - Limited upgrade fleet to most capable vehicles due to constraints of installation capability.
  - Identified the optimum mix of vehicle variants for installation of upgrades through the MSF.

- Generated a cost avoidance of $2.0B over FY11-17.

- MSF, OEF and OND analysis is currently underpinning the expected modification procurement quantity for all variants.
Execute the process on a Quarterly basis
- Completed 5 rounds currently executing round 6

Work Packages
- Approved Work Packages: 275
- Done: 419
- Under Consideration / New: 49

Total dollars

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Recipient of the Department of the Army, Lean Six Sigma Excellence Award Program (LEAP)
Questions?