Survivable Vehicles for the Warfighters

Systems Engineering and Logistics: Gunners Restraint

Systems Engineering Conference
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Agenda

- MRAP Overview
- Systems Engineering and Logistics
- Implementation of Systems Engineering to save lives: Gunners Restraint System (GRS)
Change in enemy tactics generated an urgent Warfighter need for:
- Mine Resistant Ambush Protected Vehicle
- Large quantities

MRAP Program is the response to this urgent need
- Unprecedented effort
- Unprecedented speed
- Unprecedented Gov / Industry Teamwork

Delivering Survivable, Fully Capable Vehicles …

…With Speed and Urgency!
Service & Congressional call for added vehicle protection drove rapid requirements growth.

- **1,185, Dec 06**: Army-USMC board JROC validated
- **185, May 06**: MNF-W Commander
- **185, May 06**: M-ATV reqts for OEF
- **4,066, Nov 06**: M-ATV reqts for OEF
- **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, Jun 09**: AT&L ADM

Supported increased vehicle reqts for OEF

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

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

Supported M-ATV reqts for OEF

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MRAP Vehicle Variants

- To meet the requirement as quickly as possible, 5 IDIQ contracts were awarded.

- Requirements were written to the capability industry had at this time.

- GDLS RG-31 CAT I/EM
- BAE SOCOM (RG-33) CAT I/Plus
- Navistar MaxxPro CAT I/Plus/Dash
- BAE-TV Caiman CAT I/Plus
- BAE RG-33L CAT II/Plus
- BAE HAGA CAT II/Plus
- FPI Cougar CAT I/Plus
- FPI Cougar CAT II/Plus
As we support the operations in OIF/OEF it is critical that we continue to integrate logistics into our SE process closely.

Specific processes are in place bringing logistics in at the front end of engineering decisions:

- Requirements Decomposition
- Design
- Feedback from the Warfighter

Systems Engineering and Logistics Cannot Be Separated.
MRAP Integrated SE and Logistics

- Only PdM with a Chief Systems Engineer for Logistics

- PdM Logistics has implemented a planning cell that uses SE processes to accomplish each levied requirement
  - Integrated Master Schedule/Critical Path analysis
  - Risk analysis and Mitigation Strategies
  - Roles and Responsibilities
  - End to end Life Cycle Analysis (example: follow-on roll over trainers)

- Logistics is a heavily weighted factor in the requirements management process to include commonality, install level and theater of operation
Requirement/Requirements Analysis:

- MRAP vehicles are more prone to rollover due to their weight and higher center of gravity
  - Gunners were being thrown from the vehicle due to rollover
- Sept. 20, 2008 during a visit to Bagram Air Field in Afghanistan Secretary of the Army Pete Geren was informed that the MRAP didn’t have a gunners restraint like other tactical vehicles.
  - All MRAPs received a GRS
  - All GRSs were fielded by February 1 2009
24 September 2008 RDECOM was tasked to design a GRS for MRAP in 72 hours.

- Integration of the existing gunners restraint of the BAE M1114
- Systematic approach to designing the minimum amount of A-Kits for 9 different variants.
- No CAD of any of the MRAP vehicles.

Design Completed and User Jury conducted at TARDEC before sending to test at ATC

ILSC tech writer sitting side by side with designers to produce install instructions and parts and special tools list.
Upon arrival at ATC, redesign was required due to a human factors issue.

All parties pulled together to analyze the issue, redesign/update the drawings and prototype the part for test over night.

Testing completed on 3 variants by Sept 27 allowing production to begin at Rock Island Arsenal and Blue Grass Army depot. The remaining variants following closely behind.

Design/Integration/Verification Completed in less than 72 hours
GRS Timeline

- Sec. of the Army travels to OEF and notices MRAPs without GRS
- TARDEC Tasked to design GRS kits for MRAP in 72 Hours
- User Jury at ATC with CSMs, redesign and prototype manufactured.
- Integration and testing of 3 GRS kit established with both theaters
- First kits fielded to units in OEF
- Production of 800 per week continues as do installs in both OEF and OIF
- GRS delivery to units for install on all MRAPs in OEF Complete
- GRS delivery to units for install on all MRAPs in OIF Complete
- Frago Released by MNC-I stating all MRAPs without GRS are deadlined

Over 9,500 GRS Systems Delivered in 110 Days
MRAP’s use of systems engineering principles in logistics lead to fielding MRAP as quickly as possible.

Integrating Logistics into the SE process early is critical to support the Warfighter.
MRAP “the Ultimate Team Sport”

Questions?