



U.S. ARMY TANK AUTOMOTIVE RESEARCH, DEVELOPMENT AND ENGINEERING CENTER

Maintenance and Sustainment Initiatives to Support Current and Future U.S. Army Ground Vehicle Readiness

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Mission & Vision



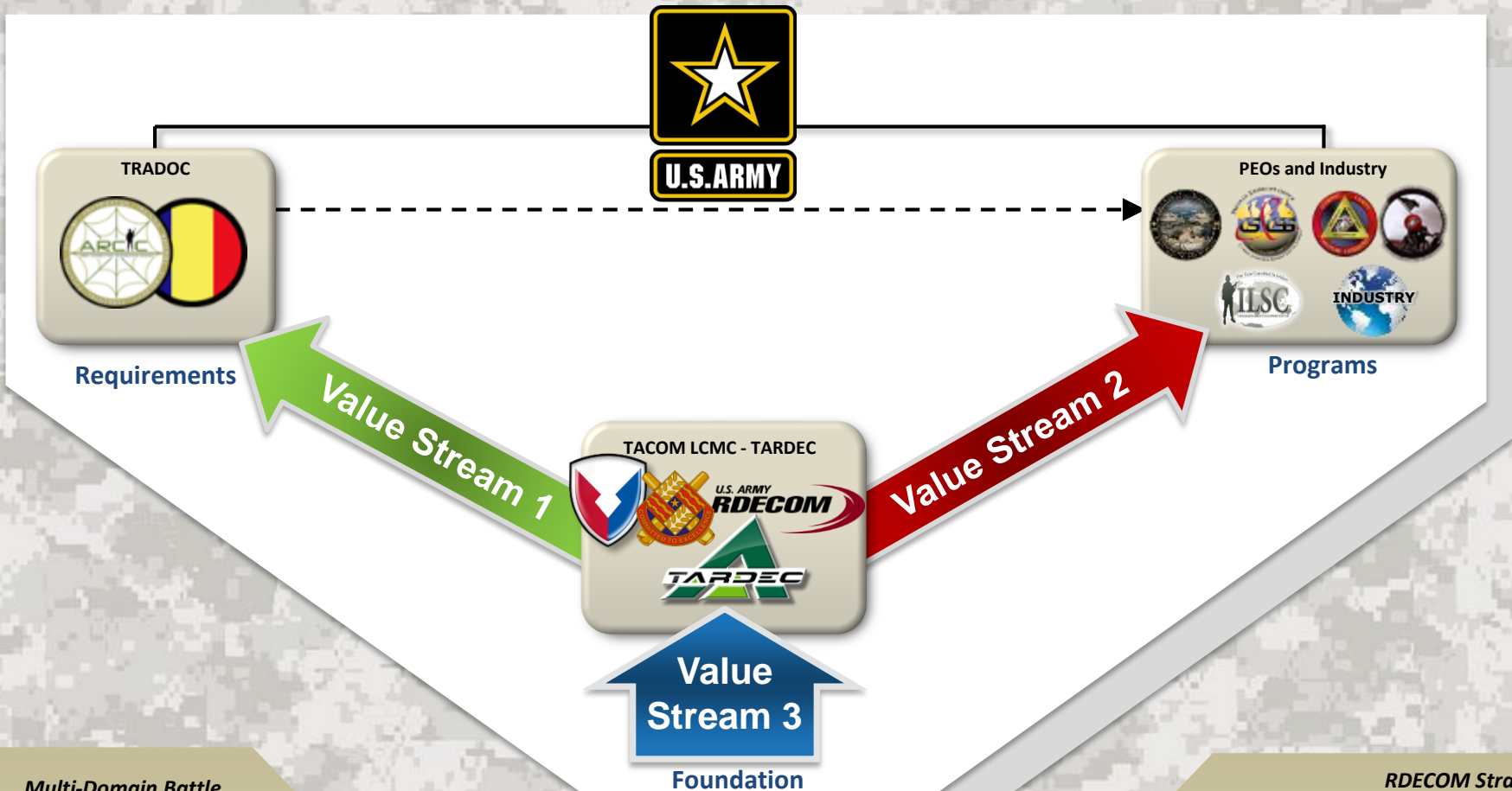
MISSION:

Develop, integrate and sustain the right technology solutions for all manned and unmanned Department of Defense (DOD) ground systems and combat support systems to improve Current Force effectiveness and provide superior capabilities for the Future Force.

VISION:

Be the first choice of technology and engineering expertise for ground vehicle systems and support equipment - today and tomorrow.

TARDEC's Support to the Army



Multi-Domain Battle

3RD OFFSET STRATEGY

Director's Strategic Cohort Analysis

Army Operating Concept & Movement Maneuver FC

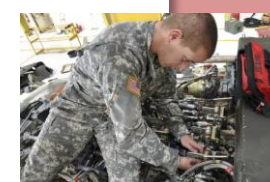
RDECOM Strategic Priorities

AMC Strategic Priorities

CSA S&T Priorities

TARDEC's 30 Year Strategy is Built upon Army Priorities and Foundational Strategies to Shape the Future Ground Vehicle Fleet

Improving Readiness Today and Tomorrow



Sustainment

- Obsolescence Management
 - RTCH
- Sustainment Engineering Support
 - CVE, TVE, FPT
- Corrosion Prevention & Control Engineering Support
 - M872 Trailers
- Configuration Management
 - ECPs, ERRs, Drawing Updates

Maintenance

- Condition Based Maintenance Plus (CBM+)
 - Ground and Sea Platform Community of Interest (G&SP COI)
- Logistics Engineering (LE)
- Additive Manufacturing (AM)

Future Force



Sustainment Operations

Technologies

- Expedited Leader/Follower
- Advanced Combat Engine (ACE)
- Liquid Logistics
 - Fuel Metering and Modeling, Small Unit Water Purifier, Single Common Powertrain Lubricant

Process/ Analysis

- Design for Supportability (DfS)
 - Foundational to technical review process
- Joint Operational Energy Initiative (JOEI)
 - Operational/Sustainment Analysis



Current Force



Expedited Leader/Follower



Description: Issue 70 leader follower enabled PLS trucks to soldier at Ft. Polk and Ft. Sill for an operational assessment.

- Accelerate getting L/F capability into hands of soldiers by 5 years from Army Requirements Oversight Council (AROC) proposal
- Support the develop of capability documents (CDD and CPD)
- Establish Tactics, Techniques, and Procedures (TTPs) for L/F logistics



Soldier Testimonials

“It will work in resupply missions and field missions from Houston to El Paso when you **don’t have enough Soldiers to fill the trucks**”

“The equipment is amazing, you can use it for a Kuwait mission with a **small amount of Soldiers**”

“When I saw it at 50M, through a canopy course and MOUT site it made me comfortable. I feel like I could take this system and **put it at 30M and get it through a city in Iraq or traffic in Kuwait**”

“With this system you can have a **constant 15 trucks on the road and you are distributing more** than you would normally distribute in a week”

“If I had a say and I was the one who was undecided about manufacturing...once it went through the canopy I would sign and **start getting it out to our formations**”

Payoff:

- Increased cargo throughput capability
 - Allows for 24/7 convoy operations
 - All weather delivery capability
- Logistics footprint reductions
 - Increased throughput efficiency
 - Increased standoff for improved force protection
- Reallocation of personnel to other critical Military Occupation Specialties (MOSs)

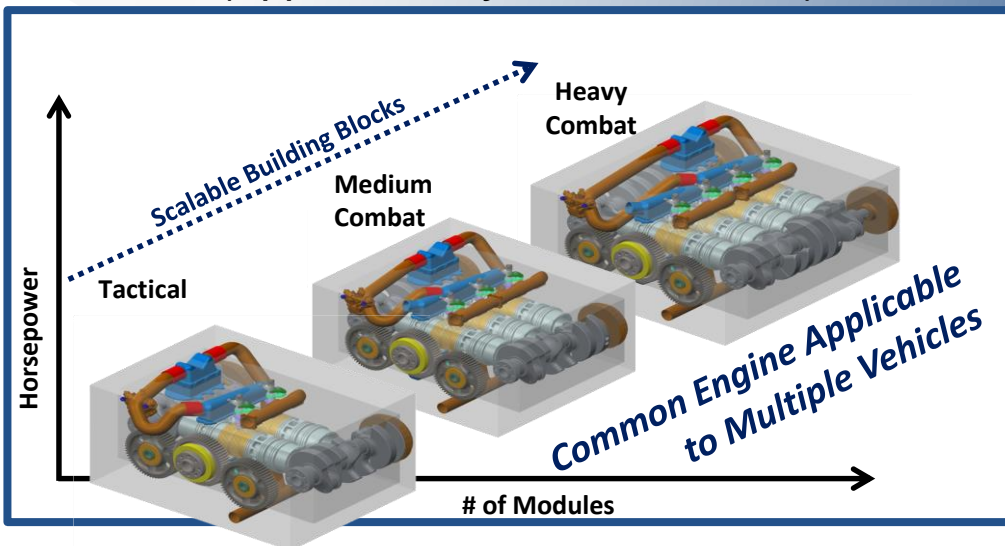
Expedited Leader/Follower Technologies Enables Delivery of More Tons of Cargo per Day

Advanced Combat Engine



Power Dense, Common, Modular Engine

- Increased Power Density
(> 70 hp/L)
- Increased Efficiency
(> 48%)
- Decreased Heat Rejection
(≤ 30 BTU/hp-min)
- Common Engine Components
(i.e. Family of Engines)
- Less Moving Parts
(Approximately 20% Reduction)



Payoff:

- Reduced logistics burden
 - Less fuel consumed
 - Greater part commonality for reduced number of items stocked, stored, and issued
- Decreased training requirements
- Increased reliability
- Technical manual efficiencies

Common Solutions Bring Efficiencies to the Sustainment Community

Liquid Logistics to Enable Distributed Operations



Foundational capabilities to support semi-independent & distributed operations required for Multi-Domain Battle

70-80% of resupply weight in theater consists of fuel & water... 18% of US casualties in OIF & OEF were related to ground resupply

FUEL METERING & MONITORING

Developing technology to perform fuel quality surveillance & fuel gauging capability to enable an automated fuel management system



Reduces fuel distribution burden & risks through asset visibility & management as well as quality verification & management

WATER PRODUCTION

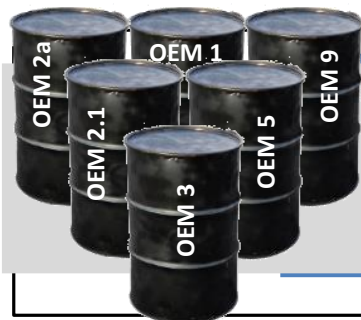
Developing a Small Unit Water Purifier to support Platoons and small units. Modular, adaptable system that is light weight, produces 120 gallons per hour on fresh water and 18 gallons per hour on sea water



Embeds water purification within semi-independent & distributed units - little to no resupply needed

NEW LUBRICANT TECHNOLOGY

Developing synthetic oils to increase fuel efficiency, extend drain intervals, reduce the number of grades, without modifying current hardware to reduce logistic footprint



Modern lubricants will improve fleet readiness (RAM) by extending fluid maintenance intervals by at least 2X and fuel economy by at least 2%

Extending Operational Reach, Prolong Endurance, and Allowing freedom of Action for the Joint Force

Current TARDEC Additive Manufacturing Efforts

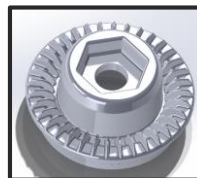


Part Repair: Abrams Road Arm

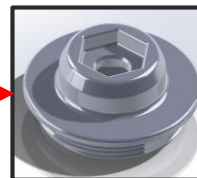


- Part prone to corrosion & pitting
- Hard-to-source part: 50+ week lead time
- Repair provides improved corrosion/wear properties
- Cost savings of \$1,100 (Repair vs. New)
- Production repair can be done at ANAD

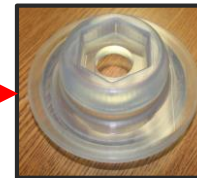
Design Validation: Abrams Hub Caps



Original CAD



Improved Design



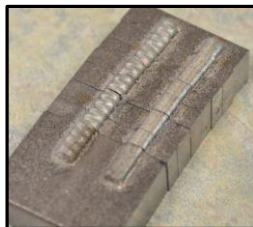
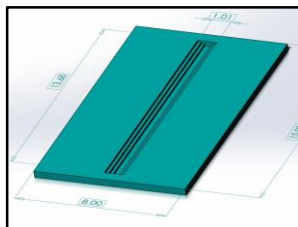
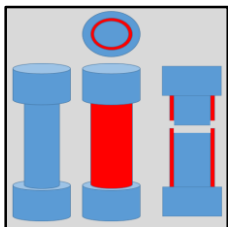
Printed Prototype



Function Check & Validation

- Inadequate design: prone to crack
- Hard-to-source part; “out-of-print” & “out-of-stock”
- Redesigned part was printed and validated within 13 hours
- Low quantity / short-term production can be 3D printed

Process Optimization: Direct Energy Deposition

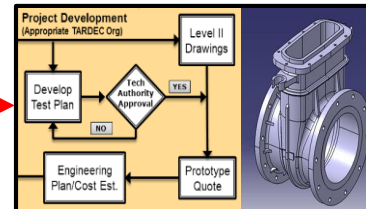


- Development of a validation mil standard / Process optimization for repair, build up, and coatings
- Supports MIL-STD-3049
- Allows TARDEC to quickly react to customer needs
- Supports DLA strategic goals of utilizing AM technologies to reduce sustainment burden

Sustainment Parts: FMTV Display Box



Original Part



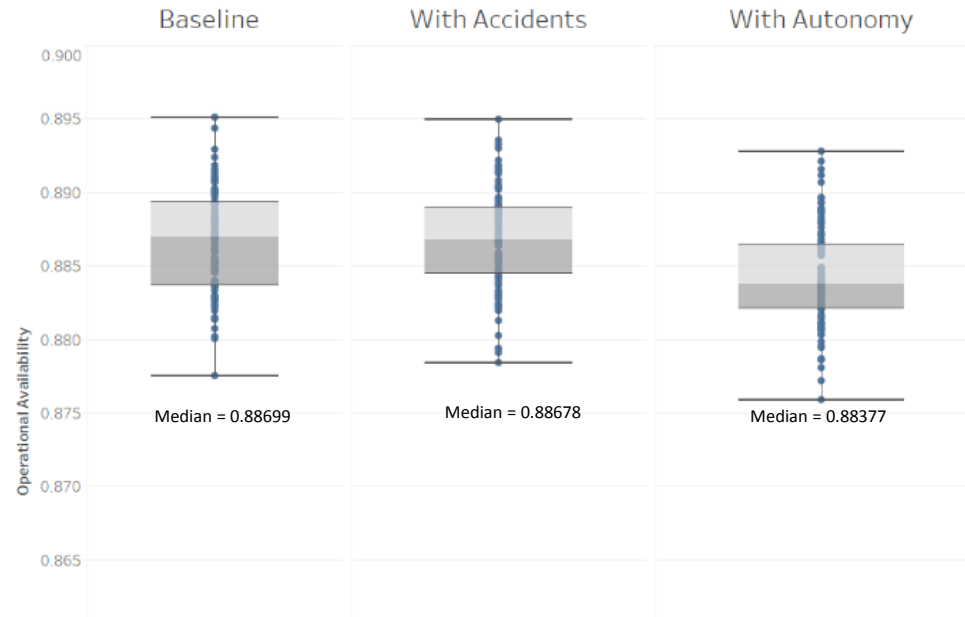
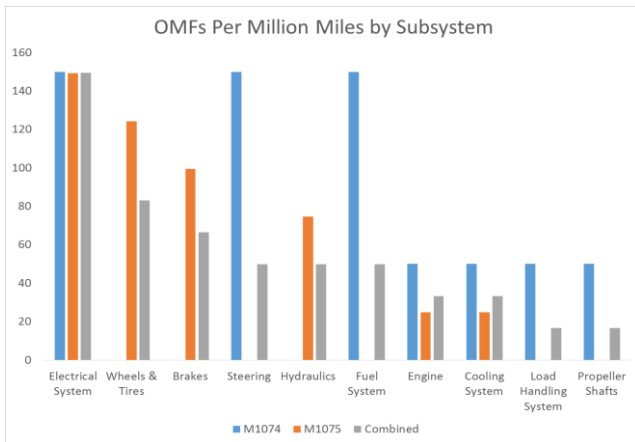
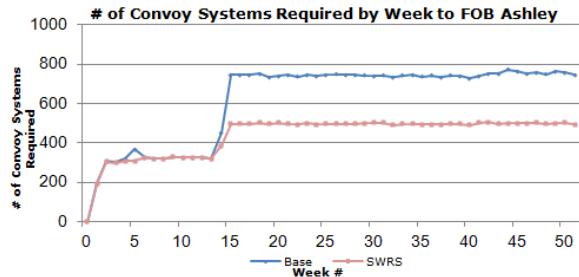
Reverse Engineering



Sample AM Parts

- Hard to source part: 6-8 months lead time
- Printed using Material Extrusion Technology in 8 Hours
- Cost: \$1K each set
- Support DLA strategic goals of using AM to reduce our sustainment burden

Joint Operational Energy Initiative (JOEI)



Example Analysis Conducted:

- Operational availability impacts of Autonomous Ground Resupply kits on existing vehicles
- Vehicle Reliability Requirements/Thresholds
- Operational Availability & Materiel Availability (accredited by testing agencies for KPP evaluation)
- Maintenance Man-hour impacts of new systems
- Fuel Cell performance and sustainment infrastructure impacts

Key Sustainment Outputs/Metrics

- Operational Availability
 - Reliability, MTTR, part availability, etc.
- # of failures over time (system, sub-system)
- Maintenance man-hours required (by MOS)
- Logistics Impacts
- Combat Effective Operational Endurance

Summary



Sustainment innovation is valued throughout the TARDEC organization

- *Cornerstone of mission statement*

Innovative capabilities are identified through TARDEC's 30 Year Strategy

- *Evolving document that has a focus on innovation for both current and future force*
- *People, processes, and tools necessary to support readiness across Army*

Processes and analysis capabilities exist

- *Embed supportability considerations into technology development phases*

Design for Supportability (DfS)

- *Answer the "Operational and Sustainment So-What"*

Joint Operational Energy Initiative (JOEI)

Innovative technologies/capabilities supporting readiness

- *Expedited Leader/Follower*
- *Advanced Combat Engine*
- *Water, Fuel, and Lubricants*
- *Additive Manufacturing*



Backup





Design for Supportability

Integrated approach consisting of Design for Reliability, Maintainability and Logistics

Quantitative and Qualitative methods to embed supportability considerations up front in development phases

Increases a chance for a successful transition of a fully supportability and sustainable solution to meet Warfighters future needs

