

Joint Light Tactical Vehicle (JLTV) Automotive Requirements Development

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Overview



- US Army Aberdeen Test Center (ATC) recently finished Technology Demonstration (TD) testing of the JLTV, supporting testing at ATC, Yuma Test Center (YTC), and Accredited Test Services (ATS)
- With the support/encouragement of Program Manager (PM)-JLTV, ATC influenced and enhanced the acquisition process
 - Note: Existence of the TD test phase gave ATC a unique opportunity to interface more with the PM office and re-think the role of testers and our methods
 - Testing is conducted to reduce risk!
- Today's presentation will highlight our contributions

TD Vehicle Demonstrators





JLTV Technology Demonstrators



JLTV TD Phase Overview



- JLTV Family of Vehicles Technology Demonstration (aka "Tech Demo") testing occurred May 2010 – May 2011
- Test Objectives:
 - Shakedown Purchase Description requirements
 - Demonstrate prototype vehicles and new technologies
 - Electronic stability control, active suspensions, on-board power generation, integrated Command, Control, Communications, Computers, and Intelligence (C4I)
 - Identify and develop new test methodologies to deal with new technologies and related safety risks
 - Fording of high voltage systems can present additional risks



ATC's Roles During TD



- Army Aberdeen Test Center (ATC)
 - Automotive performance (17 vehicles)
 - Reliability, Availability, Maintainability (RAM) of Australian vehicles (2 vehicles)
 - Power management
 - Integrated C4I
 - **Transportability**
 - **Human Factors**
 - **Toxic Fumes**
 - Test Course Characterization (Profilometer and instrumented Land Rover)
 - Weapons compatibility
- Yuma Test Center (YTC)
 - Instrumentation support for RAM (9 vehicles)
 - Test course characterization (Profilometer and instrumented Land Rover)
 - Measurement of vehicle loads on RAM courses



ATC's Roles During TD



- Accredited Test Services
 - Located in Monegeetta, Victoria, Australia
 - Instrumentation support for RAM (5 vehicles)
 - Test course characterization (Profilometer and instrumented Land Rover)
- Engineering Research and Development Center (ERDC)
 - Located in Vicksburg, MS
 - Vehicle support
 - Technical interface with PM-JLTV



Automotive Performance Tests



- Vehicle Characteristics
- Standard Obstacles
- Grades and Slopes
- Steering and Handling
 - Including Electronic
 Stability (ESC) testing
- Ride Quality
- Speed and Acceleration
- Braking

- Full-load Cooling
- Soft-Soil Mobility (support ERDC)
- Central Tire InflationSystem (CTIS)
- Fording
- Fuel Consumption
- Weapon Compatibility
- Armor Compatibility



TD Planning

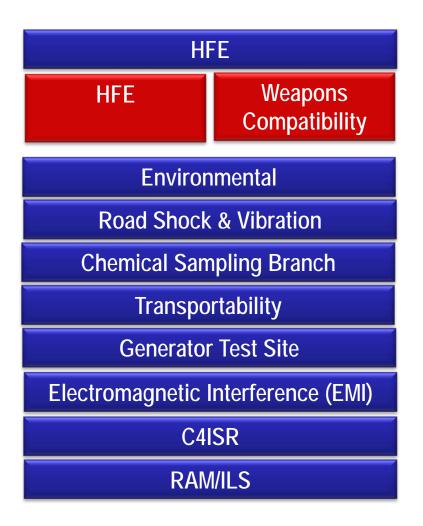


- Sorted all requirements into "testable" categories
 - Requirements initially grouped by vehicle subsystems
 - Re-grouped the requirements by pre-existing functional test teams at ATC
 - Some requirements spanned more than one test team and were identified early
- Drafted Detailed Test Plan (DTP)
 - ATC functional groups worked with PM staff to review requirements and draft the detailed test plan
 - Hundreds of requirements reviewed
 - Subtest priority list was developed based on:
 - Need to inform PM of results from high risk requirements early
 - Safety information required to support the Limited User Evaluation (LUE)
 - Cost and time considerations





Performance Engineering	
Steering & Handling	Vehicle Characteristics
Braking	CTIS
Towing & Recovery	Standard Obstacles
Fuel Consumption	Gradeability & Side Slopes
Full Load Cooling	Speed & Acceleration
Mobility	Fording





TD Planning



- Identified instrumentation, methodology, personnel, and facilities needed to execute new/unusual test requirements:
 - C4ISR bay station assembled to support data transfer
 - Military Operations on Urban Terrain (MOUT) course built to reflect Operational Mode Summary/Mission Profile (OMS/MP)
 - Initial Electronic Stability Control (ESC) test processes determined
 - Robotic operator for fording with high voltage systems required
- Coordinated test planning and provided resources across multiple test centers
 - Created synergy across all test centers by utilizing the same test methodologies, instrumentation, data collection process





MOUT Course Obstacles





Rubble Pile

Construction of Staircase



TD Planning



- **Lessons Learned**
 - Identified non-testable requirements:
 - "The ground pad on each rear stabilizer leg shall have sufficient ground contact area to support the JLTV-T at GVW under wet and muddy conditions."
 - No clear pass/fail criteria, multiple ways to interpret success
 - Identified conflicting or competing requirements

ATC communicated potential issues like these with PM-JLTV so they could be addressed by the respective Subject Matter Experts (SMEs)



TD – Test Execution



- Traditional Role Test Execution
- **Enhanced Roles:**
 - Attended PM Knowledge Point (KP) reviews
 - Provided insight from testing
 - Proposed requirement improvements
 - Attended PM System Engineering meetings
 - Provided additional technical assistance to system engineers drafting and modifying PD requirements
 - Proposed new PD requirements to improve reliability and reduce safety risks
 - ATC personnel served as SMEs to assist PM-JLTV and contractors with failure mode analysis



Post-TD and Pre-EMD



Traditional Roles

- Write reports
- Identify and discuss lessons learned
- Update Test Operating Procedures (TOPs) to reflect current technologies and lessons learned
- Develop new TOPs as needed
- Participate in Test and Evaluation Master Plan (TEMP) reviews

Enhanced Roles

- ATC worked with PM staff to draft new requirements to reduce risk in addressing user needs
- Conducted additional excursion tests to better "inform the requirements"
- Supported contractor and TARDEC modeling and simulation efforts by making extensive force environment and terrain data available
 - Intent is to help vendors build better military trucks
- Currently working on means to accelerate durability testing



Summary



- ATC is focused on helping PM/Army reduce risk on JLTV program
 - Testing is all about reducing risk
- Influenced PD Requirements
- Developed draft test protocol for ESC testing
 - Never done before on military vehicles of this class
- Created sets of force and terrain data to help vendors improve designs and to assist TARDEC with analysis
 - Includes YTC and ATC off-road terrains



Ouestions?



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