

ATEC



Joint Light Tactical Vehicle (JLTV) Automotive Requirements Development

Dr. Gregory Schultz, Ms. Camille Robbins
March 13, 2012

*Army Proven
Battle Ready*



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 Inflation System (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



ATC Functional Groups



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

HFE	
HFE	Weapons Compatibility
Environmental	
Road Shock & Vibration	
Chemical Sampling Branch	
Transportability	
Generator Test Site	
Electromagnetic Interference (EMI)	
C4ISR	
RAM/ILS	



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



Questions?



- **PM-JLTV**
 - Mr. John Wozniak, Army JLTV APM
586-239-5416, john.louis.wozniak@us.army.mil
 - Mrs. Erin Thompson, USMC JLTV T&E Lead
703-432-5152, erin.thompson@usmc.mil
- **ATC**
 - Ms. Camille Robbins, ATC JLTV Test Officer
410-278-8831, camille.e.robbins.civ@mail.mil
 - Dr. Gregory Schultz, ATC Senior Test Engineer
410-278-3510, gregory.a.schultz.civ@mail.mil
 - Mr. Frederick Scriba, ATC JLTV Test Officer
410-278-5380, frederick.j.scriba.civ@mail.mil