USMC Logistics Vehicle System Replacement Technology Demonstration

The Logistics Vehicle System Replacement (LVSR) is a United States Marine Corps program to replace the Corps aging heavy fleet vehicle system. The Marine Corps has contracted with the Nevada Automotive Test Center in Silver Springs Nevada to fabricate, test and create virtual prototypes of Technology Demonstrators to prove concepts and provide information in order to advance the program into the next phase. Priorities are to improve the safety and performance of the Logistics Vehicle System (LVS) fleet and to address both immediate and future fleet deficiencies/requirements.

NATC will fabricate and test several technology demonstrators: LVS-Mod Demo (Modification Demonstrator), a limited technology insertion effort, focused on immediate technical impact; and the LVSR-Tech Demo (Technology Demonstrator), a future fleet replacement vehicle.

The LVS-Mod Demo approach focuses on current and emerging technology that can modify the current LVS vehicle to demonstrate modest improvements to correct current deficiencies and anticipated requirements. The focus of this effort is focusing on optimizing vehicle performance within the current vehicle design configuration utilizing a variety of different suspensions and commercially available electronics.

The LVSR-Tech Demo is being designed and built as a concept demonstrator for the operational term of 2004 to 2024. The LVSR-Tech Demo is a prototype that includes all available and even emerging technologies. This vehicle system is anticipated to push the heavy tactical vehicle market and drive future technology.

- The LVSR-Tech Demo began as a generic LVS and was converted to a straight frame (no articulation) truck with integral multi-axle steering. The system still remains the hallmark of the LVS, and will accommodate multiple rear body units (RBUs). Key technologies featured on the LVSR Tech Demo are: Electronically controlled powertrain (includes CTI, ABS, ATC all linked into powertrain settings), CAN 2.0 network on SAE J1939/J1587 protocols for operations and on-board diagnostics, single lubricant and reservoir for powertrain and hydraulics, fully independent suspension, customized flat panel displays, and GPS/email in the cab.

LVSR Technology Demonstrator Major Features -

- Multi-Module Straight Frame Truck (Built on Current LVS Frame)
- 600 Hp, In-Line, 6-Cylinder Engine
- Special Automatic Transmission, 6 Speed
- Independent Suspension, “All Steer” Steering Axles #1, #2, #4, #5
- 16 ½” Wheel Travel
• Interoperability with Raydan, Hendrickson – Mod Tech Rigid Axle Vehicle, and Existing LVS Rear Module
• 10 x 10 Vehicle Configuration
• Rapid Action Central Tire Inflation System
• 16R20 Tires
• Anti-Lock Braking System/ATC, Advanced Braking Control
• Collision Warning System
• Integrated Electronic Vehicle Network (J1939)
• Dual Voltage Alternator, 14/28 V
• High Efficiency Coolant System
• High Volume Air Compressor
• Hydrostatic Retarder
• Integrated Hydraulic Supply/Transmission
• Extreme Service Brake Compounding
• Integrated Engine, Retarder and Operator Applied Service Brakes
• Single Lubricant/Operating Fluid, Single Fill Point
• Elimination of Articulation Joint
• FMVSS Compliant Headlights
• Improved Frontal Impact Crash Protection
• 5-Point Safety Harnesses, Bucket Seats
• Improved Tie-Down Provisions
• Larger Cab, Improved Ergonomics
• 80 Hour Air Cleaner Capability
• Insulated Muffler
• Standard Frame Width (34 inches)
• Transfer Case Eliminated
• Large Capacity Air Dryer
• Lubed-For-Life Prop-Shaft
• Improved Crew Storage Provisions, Mirrors, Cab Step, and Interior Lighting
• Rapid Warm-Up Capability
• Permanent Engine Oil Filtration
• Flat Panel Instrument, Diagnostic and GPS Map Displays
• On-Board Electronic Manuals
• Night Driving System
• Emergency Steering
• Electronic Hydraulic Filter Monitoring
• Multi-Purpose Main Hydraulic Pump
  - Fan Drive
  - Auxiliary Hydraulics
  - Retarder
  - Oil Heater
• Multi-Compartment Hydraulic Reservoir
• Reduced Cold Weather Cranking Torque Provisions
• Quick Detachable Hydraulic Connections
- Hydraulic Intensifier in RBU Eliminated
- 600+ Hp Retardation Capability
- 184 Hp Integral Hydraulic Supply
- Single Side Refueling
- Closed Circuit Refueling
- Quick Disconnect Transmission Output Shaft
- LVSR MK48/18A1 30 Inches Shorter Than LVS MK48/18A1

**LVSR Program Goals:**

Payload - 22.5 Ton On-Road, 16.5 Ton Off-Road
Speed on Grade - 55 on 2% Grade with 22.5 Ton Payload
Gradeability - 60% Grade with 16.5 Ton Payload
Stability - 0.4 g Lateral Acceleration
Braking - FMVSS 121 Compliant
Turning Radius - Comparable to Current Articulated Vehicle
Load Handling Interface - Flatrack/NATO Compatible
FPU/RBU Hookup - Current Vehicle
Lift - LPD17, LSD41, CH53E, LHD

**LVSR Modeling Validation:**

The LVSR Tech Demo vehicle is being modeled through a physics-based kinematic program called ADAMS. The modeling shall be used throughout the vehicle acquisition process to evaluate future design alternatives. Once the models are developed and validated, they shall be put in a template format so that changes can easily be made by potential contractors. The models shall be used during the concept development phase to reduce test cost. For example, end-limit stability maneuvers shall be conducted through the modeling. Additionally, multiple high center of gravity payloads and offset payload configurations can be investigated. The modeling and simulation tools currently being developed shall provide sufficient accuracy to develop relationships for predictive life cycle cost, critical component fatigue and mode of failure, ABS performance, traction control, electronic control optimization and virtual representation of other vehicle response and performance parameters critical to the Marine Corps mission.