Hybrid Electric Vehicle Experimentation and Assessment (HEVEA)

No industry or SAE standards for measuring fuel economy of hybrid vehicles in military environments.

Objectives

- Develop Hybrid Electric Vehicle (HEV) Fuel Economy and performance Test Operating Procedures (TOP)
- Determine the fuel economy benefits of HEV using quantifiable test data
- Develop and validate TARDEC M&S models
- Provide a tool to predict hybrid electric drive cycle performance and fuel economy

Programmatic Intent

- Enhance future Tactical Wheeled Vehicles (TWV) mobility thru experimentation and performance analyses using hybrid vehicle capabilities.
- Support JLTV Acquisition Strategy with sufficient and relevant HEV test data and lessons learned

Testing

9 conventional and 7 hybrid electric vehicles are being tested

A. Conventional:
   - 2 - HMMWVs
   - 2 - 1/2T LMTVs
   - 1 - 5T MTV
   - 1 - MTV CVT
   - 2 - HEMTTS
   - 1 - AM GEN UV

B. Hybrid Electric
   - 1 – HMMWV
   - 1 – RSTV
   - 1 - IMG UV
   - 1 – LM UV
   - 1 – AH/SS MSV
   - 1 – BAE FMTV
   - 1 – OSHKOSH HEMTT A3
**Title:** Hybrid Electric Vehicle Experimentation and Assessment

**Author:** MAJ Allen

**Performing Organization:** RDECOM TARDEC 6501 E 11 Mile Road Warren, MI 48397-5000

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**Notes:** Presented at the Power & Energy Conference, The original document contains color images.
## Major Accomplishments

<table>
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<tr>
<td>Draft TOP developed for Fuel Economy testing on Hybrid Electric Vehicles</td>
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<tr>
<td>Analysis of system level trades for cost and payload on Hybrid Electric Vehicles vs Mechanical vehicles</td>
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<td>Initial ballistic impact on Li-Ion and NiMH batteries</td>
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<td>Extreme Temperature Testing (Arctic and Desert)</td>
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<td>Modeling and Simulations: VPSET, HMMWV models</td>
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</table>
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Emerging Results

Fuel Economy on Churchville (Hilly Terrain)

- Standard HMMVV: -11,500 lbs -6.5L turbo 190hp
- Hybrid HMMVV: -11,500 lbs -2.2L turbo 139hp
- Uparmored HMMVV: -15,200 lbs -6.5L turbo 190hp

Based on the given statistical models of the test data, over the range of speeds, the Hybrid HMMVV showed a 9.4% improvement in Mean Fuel Economy over the Standard HMMVV.

Fuel Economy on Munson (Flat Paved Terrain)

- Hybrid HMMVV: -11,500 lbs -2.2L turbo 139hp
- Standard HMMVV: -11,500 lbs -6.5L turbo 190hp
- Uparmored HMMVV: -15,200 lbs -6.5L turbo 190hp
- RSTV: -9,980 lbs -2.8L turbo 140hp

Based on the given statistical models of the test data, over the range of speeds, the Hybrid HMMVV showed a 10.2% improvement in Mean Fuel Economy over the Standard HMMVV.

Fuel Economy Varies with Terrain & Driving Conditions

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