1. Introduction

This nomination is for the Joint Program Office, Joint Light Tactical Vehicle (JPO JLTV), an Acquisition Category (ACAT) ID program, Environmental, Safety, and Occupational Health (ESOH) Working Group (ESOH WG). The nomination covers the JLTV ESOH WG's efforts and accomplishments over the last 2 Fiscal Years (FY). The key members of the JLTV ESOH WG include the following: (note that positions listed are representative of the last 2 FYs and not the current organization).

Table 1. Nominees

Name	Title	Office
COL John Cavedo, Jr.	Program Manager, JPO JLTV (ESOH WG Chair)	JPO JLTV
Michael Sprang	Product Director, JLTV Alpha	JPO JLTV
LtCol Mathew Pfeffer	Product Director, JLTV Bravo	JPO JLTV
COL Shane Fullmer	Product Director, JLTV Charlie	JPO JLTV
LTC Anthony Gibbs	Product Director, JLTV Charlie	JPO JLTV
Karen Ames-Nocera	JLTV System Safety Lead	TACOM Safety Office
Brett Johnson	JLTV Chief Engineer	JPO JLTV
Michelle L. Davis	JLTV Environmental Lead	TARDEC Environmental Team
Don Soulard	JLTV Safety/Survivability Lead	JPO JLTV
Kristin Thompson	USMC ESOH Representative	Booz Allen Hamilton
Rich Goetz	System Engineer, PD Alpha	JPO JLTV
Jeff Shtogrin	System Engineer, PD Bravo	JPO JLTV
Nadia Rubenkov	System Engineer, PD Charlie	JPO JLTV

2. Background

The JLTV ESOH WG has been formally chartered in lieu of the traditional System Safety Working Group (SSWG). The ESOH WG serves as a technically qualified advisory group for the JPO JLTV through the Systems Engineering (SE) Integrated Product Team (IPT) in the area of system safety and environmental management to ensure safe and environmentally acceptable design, production, fielding, operation and mission effectiveness of the JLTV. The ESOH WG is responsible for ESOH risk management and hazard tracking, developing ESOH design requirements, preparing the Programmatic Environmental, Safety, and Occupational Health Evaluation (PESHE) and National Environmental Policy Act (NEPA) documentation, coordinating ESOH risk acceptance, providing regulatory guidance, tracking hazardous materials and keeping the PM Office aware of any ESOH related program risks.

3. Program Description

The JPO JLTV is comprised of the United States Army (USA) and the United States Marine Corps (USMC) services; USA being the lead agency. The JLTV Family of Vehicles concept was initiated to address capability gaps first identified in the Ground Combat Forces Joint Light Tactical Mobility Initial Capability Document. Capability gaps present in the existing tactical vehicle fleet are the result of an imbalance of protection, payload and performance (i.e. increasing protection on an existing system reduces the available payload and lessens performance). In addition to providing a platform for the seamless integration of current and future Command, Control, Communications, Computers, Intelligence, Surveillance & Reconnaissance systems, the JLTV platform will restore the balance with an emphasis on protected mobility in an expeditionary environment.

The JLTV will be a part of the Light Tactical Vehicle (LTV) class used to transport military personnel and a variety of mission payloads. The JLTV Technology Development (TD) Phase

was initiated in December 2007 and ended in 2012. During the subsequent Engineering, Manufacturing and Development (EMD) Phase the program awarded contracts to 3 vendors to build competitive prototype vehicles. Defense acquisition programs use Milestones to assess a program's readiness to proceed to the next phase or the program. The JLTV successfully completed the EMD Phase of the program in August 2015 with a Milestone C decision to move into the Production and Deployment Phase from the EMD Phase. Following the Milestone C decision, JPO JLTV awarded a Low Rate Initial Production (LRIP) contract to a single vendor.

The JLTV program office has established the following IPTs to manage the various program elements: Test and Evaluation (T&E), Systems Engineering (SE), Business Management, Acquisition, Requirements, and Logistics. ESOH has been integrated into the JLTV SE process by establishing an ESOH WG under the SE IPT. Through the SE IPT, the ESOH WG can coordinate with all other program elements including the Logistics IPT, Acquisition IPT, T&E IPT, and Business Management IPT ensuring that ESOH related requirements are addressed throughout the JLTV program.

The ESOH WG is comprised of the ESOH core, principal and advisory members including representatives from the PM office, the user community, and the test community, as shown in Table 2. The ESOH Core is responsible for the day to day management of the JLTV ESOH program. An ESOH WG Charter has been developed detailing the full membership and the roles and responsibilities of the members.

Table 2: ESOH WG Membership

ESOH WG		
Core Members	Principal Members	Advisory Members
• Safety Lead • Environmental Lead • USMC ESOH Representative • JLTV Engineer—Safety Systems	• PM JPO JLTV or Designee • Product Director • JLTV Engineer(s) • Army MANPRINT Representative • USMC HSI Representative • Army CBTDEV Safety Representative • USMC User Representative	• JLTV Test & Evaluation Representative(s) • JLTV Supportability Representative(s) • JLTV Logistician(s) • US Army Test & Evaluation Command Representative • CASCOM Training Representative • US Army PHC Representative • US Army Combat Readiness Center (DA Observer) • ASA(ALT) ESO • MARCORSYSCOM Safety Office • HQMC Combat Development & Integration • Contractor's Safety Lead • Contractor's Environmental Lead

4. ESOH Integration into Systems Engineering (SE)

By formally establishing the ESOH WG, the JLTV Program fully integrated ESOH into the SE process. The Systems Engineering Plan (SEP) explains that the ESOH WG is responsible for managing the overall ESOH program, including the day-to-day efforts for the JLTV program to include the development of ESOH design requirements. The JLTV PESHE serves as both an ESOH planning document and repository of ESOH related information. The PESHE was updated throughout the EMD Phase and finalized in support of Milestone C. The JLTV PESHE defines: the ESOH roles and responsibilities (to include interactions with other IPTs), integration of ESOH into SE Process and program requirements, the ESOH Risk Management Program, Hazardous Materials Management Program, and the Safety and Health Program.

A NEPA compliance schedule was also included in the PESHE and used as a planning tool for the development of the JLTV Programmatic Environmental Assessment (PEA) which was completed prior to Milestone C. JLTV fielding locations have not yet been defined but the PEA was distributed to the Army Environmental Command (AEC), Army Test and Evaluation Center (ATEC), and Assistant Chief of Staff for Installation Management (ACSIM) for visibility until the fielding locations are defined. At that point, the ESOH WG will work with the JLTV Material Fielding Team to ensure the PEA is provided to receiving installations as well as any additional information they require in support of NEPA.

As members of the SE IPT, the ESOH WG was integral to the development of the JLTV contracts and Purchase Description. As a result, the JLTV contract includes requirements for the vendor to: maintain an ESOH Program In Accordance With (IAW) MIL-STD-882E; participate in the JLTV ESOH WG; and deliver a Safety Assessment Report (SAR), a Hazardous Materials Management Report (HMMR), a Lithium Battery Safety Package, and a Hazard Tracking Log (HTL). In addition the Purchase Description includes ESOH design requirements including but not limited to: compliance with several Federal Motor Vehicle Safety Standards (FMVSS) and Federal Motor Carrier Safety Regulations (FMCSR) regulations, as well as, requirements for safe crew egress, noise limits, whole body vibration, hazardous materials restrictions, and engine emission requirements.

5. ESOH Risk Management

The JLTV ESOH risk management process is based on the principles of MIL-STD-882E, Army Regulation (AR) 385-10, Department of Army Pamphlet (DA PAM) 385-16, and Marine Corps Systems Command (MARCORSYSCOM) Acquisition Policy Letter 1-05.

The JPO JLTV PM has the ultimate responsibility for tracking ESOH issues throughout the life of the system (per DoDI 5000.02, Section 16 of Enclosure 3), and uses the ESOH WG for this purpose. The ESOH WG uses a closed-loop hazard management process for the identification, tracking, and management of ESOH hazards and their respective risks. Hazard tracking is accomplished through use of a Government Hazard Tracking System (HTS). Over the past t2 FYs the ESOH WG reviewed Hazard Tracking Logs (HTL) developed by each of the three vendors and performed risk assessment as a group. These hazards were used to populate the Government HTS. Following down-select only the selected contractor's HTS will be maintained and will be updated throughout the life of the vehicle. The HTS includes a list of hazards, risk assessments, and the status of each entry. ESOH-related program risks, those that impact cost, schedule, and/or performance, are tracked on JPO JLTV's Program risk register.

Sources of information for JLTV hazard identification included: lessons learned, hazard analyses from legacy/similar systems, vehicle hardware and software analyses, accident data, Manpower and Personnel Integration (MANPRINT) assessments, operational experience, research, testing,

contract deliverables and program personnel. All identified ESOH hazards associated with the JLTV are evaluated by the ESOH WG to determine the validity of the identified hazard and its respective risk assessment. Any residual risk will be accepted per DODI 5000.02 and formally coordinated with the user representatives prior to fielding.

Notable ESOH Risk Management Activities:

- The ESOH WG Core members reviewed over 14,000 Test Incident Reports (TIR)s during vehicle testing to identify potential hazards not previously documented and gather supporting information for existing categories. These incidents were discussed during ESOH WG Meetings and were often used to re-evaluate or verify risk assessments levels assigned to hazards.
- The ESOH WG Core members cross-walked the HTS with the JLTV Purchase Description to ensure that design mitigations for identified high and serious hazards were included as requirements for the LRIP Contract. As a result, it is anticipated that all ESOH hazards will be reduced to Low or Medium, as defined by MIL-STD-882, prior to fielding of vehicles. By proactively including mitigations in the requirements the significant cost of design changes following fielding will be reduced.

- User representatives participate in the ESOH WG in an effort to ensure ESOH hazards are coordinated with the user community throughout the program rather than just when risk acceptance is required.
- Both USMC and USA were represented on the ESOH WG to ensure hazards were coordinated with both Services and any differing requirements were met.
- The ESOH WG ensured hazards associated with the integration of Government Furnished Equipment (GFE) systems into the JLTV were identified and assessed.

6. Hazardous Materials Management and Pollution Prevention

As part of its overall risk reduction strategy, the JLTV ESOH WG is working to reduce the use of hazardous materials and integrate Pollution Prevention (P2) into the overall program. The JLTV P2 and Hazardous Materials Management Programs are documented within the JLTV PESHE.

The ESOH WG has worked with the SE IPT to include several design requirements to effectively minimize air, soil, noise and water pollution. These efforts will reduce pollution during maintenance and operations following fielding as well. The LRIP contract incorporates the following P2-related requirements:

- Oil level and pressure indicators to notify user of potential leaks
- Non Ozone-depleting refrigerant and fire suppressants
- Low Volatile Organic Compound (VOC) or water reducible Chemical Agent Resistant Coating (CARC) paint
- Use of Society of Automotive Engineers (SAE) certified brake and hydraulic hoses and fittings
- All fuel tanks shielded by JLTV structure to prevent fuel tank rupture and fuel spills
- On-board vehicle power (eliminates external generator emissions)
- Health Management System allowing for detection of fault (i.e., loss of pressure due to leak)
- Minimization of hazardous materials (discussed further below)
- MIL-STD-1474 Table 2 "Category D" steady state noise limits (85 dBA)
- Improved fuel efficiency requirements during both stationary and mobile operations

Tracking of all hazardous materials used on the JLTV, used for final vehicle assembly, or required for operation or sustainment, as well as anticipated hazardous wastes, was accomplished by vendor prepared Hazardous Materials Management Reports (HMMRs). HMMRs have been required for each previous program phase and will be required for the production vehicles as well. Reduction of hazardous materials is being accomplished through the restriction of certain hazardous materials via contractual requirements. Hazardous materials management efforts over the past 2-year period have focused on reviewing vendor prepared HMMRs, working with vendors for the continued reduction of hazardous materials, and refining contract requirements for the LRIP Contract for the continued minimization of hazardous materials.

JLTV prohibited materials for LRIP include the following:

- Asbestos
- Beryllium,
- Class I and Class II Ozone Depleting Chemicals (ODC)
- Hexavalent chromium
- Cadmium
- Mercury
- Lead
- Radioactive materials
- Group 1 Agents classified as "carcinogenic to humans" by the International Agency for Research on Cancer (IARC) Monographs

The prohibited materials were chosen based on their historical use in military systems and the ESOH hazards related to their use. For example cadmium and hexavalent chromium are still found on many military ground systems but were eliminated from commercial vehicles many years ago. Feasible alternatives therefore exist and vendors should work to integrate them into their designs. Some exceptions have been granted where no suitable alternatives are identified to include: cadmium on military electrical connectors, CARC primers and topcoats, lead solder, lead-acid batteries, and small percentages of lead in alloys. A formal process is in place if the vendor identifies any other uses of prohibited materials for which they do not have a suitable alternative. Compared with other Army ground system programs, the JLTV has made great strides in the elimination of both cadmium and hexavalent chromium. Based on the efforts over the past 2 years it is anticipated that only a handful of parts containing these materials will remain on the production vehicles. Each will be tracked by part number and identified in the JLTV Demilitarization and Disposal Plan when it is prepared. The remaining hazardous materials identified in the HMMRs include typical materials associated with ground vehicles to include petroleum, oil, lubricants, coolants, paints, primer, adhesives, sealants, and batteries all of which can be easily managed.

The data from the HMMR has also been used in support of NEPA analysis and for the identification of hazards in the HTS. Any materials that pose a credible hazard in accordance with MIL-STD-882 is tracked on the JLTV HTS and reviewed by the ESOH WG. Where necessary, warnings and cautions will be included in the JLTV Technical Manuals through ESOH WG coordination with the Logistics IPT.

Notable HMM Activities:

- Elimination of all cadmium except on electrical connectors.
- Elimination of approximately 98% of parts the previously used hexavalent chromium sealer.
- Elimination of hexavalent chromium pretreatment in the painting process.

- Successful enforcement of prohibited uses of lead, beryllium, Class I and II ODC, radioactive materials, and Group 1 carcinogens.

7. External Coordination of ESOH Risk Management

ESOH is not solely a SE function and, depending on the phase of the program, becomes an important factor for testing, logistics, fielding, and demilitarization & disposal. As shown in Table 2 the ESOH WG membership includes stakeholders from both the USMC and USA user community, test community, Army Public Health Command, Vendors, as well as representatives from all JLTV functional areas including T&E, SE, Logistics and Human Systems Integration(HSI)/MANPRINT. ESOH WG Core members are also involved in the SE, T&E, Logistics, and HSI IPTs. Having this level of cross–functional involvement has allowed the ESOH WG to successfully minimize ESOH risks by keeping all stakeholders aware of ESOH risks as we move through the program, as well as, allowed the ESOH WG Core members to know when other IPTs may be planning/executing things that needed to consider ESOH risks/mitigations that may not have been identified otherwise.

As mentioned previously, the ESOH WG Core members were an integral part of the LRIP Contract. Through this involvement the ESOH WG members were able to communicate ESOH risks documented in the JLTV HTS and, as a result, incorporate requirements into the contract to mitigate these risks.

The JLTV Safety Lead is matrix support from the TACOM System Safety Office and the Environmental Lead is matrix support from the TARDEC Materials, Environmental, and Corrosion Team. These two offices provide ESOH support for nearly all Program Executive Office (PEO) Combat Support & Combat Service Support (PEO CS&CSS) and PEO Ground Combat Systems (PEO GCS) programs. Both the Safety Lead and the Environmental Lead have shared lessons learned regarding hazard tracking, hazardous materials management and contract requirements development with their home teams. As a result, improvements are being made throughout all of the PEO CS&CSS and PEO GCS ground system ESOH programs. In addition, as a joint program the USMC ESOH representative has been able to share lessons learned with the USMC organizations.

8. Summary of Accomplishments

The JPO JLTV has embraced the integration of ESOH requirements throughout the acquisition process to avoid program delays and high costs associated with late identification of ESOH hazards. The JLTV program has successfully integrated ESOH principles into the SE process, establishing a strong presence in the program which will carry through the remaining program phases. The JLTV ESOH WG has put forth great effort to ensure the success of the JTLV ESOH Program and to ensure safe and environmentally acceptable design, production, fielding and operation of the JLTV with minimal effect on mission effectiveness and program cost. Some notable accomplishments over the 2015 Army Environmental Award period include:

- Successful integration of ESOH into the SE process through the establishment of a joint service, cross-functional ESOH WG.
- Established a thorough hazard identification process IAW MIL-STD-882 which allows for continual hazard management throughout the life-cycle of the program
- Coordination of ESOH requirements for both the USMC and Army where requirements differ.

- User involvement in ESOH WG to ensure ESOH hazards are coordinated with the user community throughout the program rather than just when risk acceptance is required
- Use of real test data to support ESOH hazard analysis and to justify the inclusion of design requirements in the JLTV Purchase Description as mitigation to those identified hazards.
- Inclusion of ESOH related requirements in the Production and Deployment Phase contract including contractor involvement in ESOH WG and the development of a SAR, HMMR, HTL, and an ESOH Program Plan.
- Integration of pollution prevention P2 initiatives, along with safety and health requirements into JLTV Purchase Description, including energy efficiency requirements and hazardous material minimization.
- Completion of a Programmatic Environmental Assessment IAW NEPA prior to Milestone C.
- Complete update of the JLTV PESHE which documents the overall JLTV ESOH Program in support of Milestone C.
- Successful elimination of hazardous materials including: cadmium, with the exception of military electrical connectors; hexavalent chromium, with the exception of a small number of fasteners; lead with the exception of batteries and solder; beryllium, Group 1 carcinogens, Class I and II ODC, and radioactive materials.

These efforts will result in: reduced safety and occupational health risk to the operator and maintainer; reduced environmental risk and liability; reduced volume of generated hazardous wastes; reduced life-cycle cost of the vehicle; improved sustainability; and reduced burden on Army and USMC installations where the vehicles will be fielded.

Acronyms

ACAT	Acquisition Category
ACSIM	Assistant Chief of Staff for Installation Management
AEC	Army Environmental Command
AR	Army Regulation
ATEC	Army Test and Evaluation Center
CARC	Chemical Agent Resistant Coating
COL	Colonel
DA PAM	Department of the Army Pamphlet
DoDI	Department of Defense Instruction
EMD	Engineering, Manufacturing and Development
ESOH	Environmental, Safety, and Occupational Health
ESOH WG	Environmental, Safety, and Occupational Health Working Group
FMCSR	Federal Motor Carrier Safety Regulations
FMVSS	Federal Motor Vehicle Safety Standards
FY	Fiscal Year
GFE	Government Furnished Equipment
HMMR	Hazardous Materials Management Report
HSI	Human Systems Integration
HTL	Hazard Tracking Log
HTS	Hazard Tracking System
IARC	International Agency for Research on Cancer
IAW	In accordance with
IPT	Integrated Product Team
JLTV	Joint Light Tactical Vehicle
JPO JLTV	Joint Program Office Joint Light Tactical Vehicle
LRIP	Low Rate Initial Production
LtCOL	Lieutenant Colonel
LTV	Light Tactical Vehicle
MANPRINT	Manpower and Personnel Integration
NEPA	National Environmental Policy Act

ODC	Ozone Depleting Chemicals
P2	Pollution Prevention
PD	Product Director
PD	Purchase Description
PEA	Programmatic Environmental Assessment
PEO	Program Executive Office
PEO CS&CSS	PEO Combat Support & Combat Service Support
PEO GCS	PEO Ground Combat Systems
PESHE	Programmatic Environment, Safety, and Occupational Health Evaluation
SAE	Society of Automotive Engineers
SAR	Safety Assessment Report
SE	Systems Engineering
SE IPT	Systems Engineering Integrated Product Team
SEP	System Engineering Plan
SSWG	System Safety Working Group
TD	Technology Demonstration
T&E	Test & Evaluation
TIR	Test Incident Report
USA	United States Army
USMC	United States Marine Corps
VOC	Volatile Organic Compound