Report No. DODIG-2014-120

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INSPECTOR GENERAL

U.S. Department of Defense

SEPTEMBER 22, 2014

Acquisition Practices Used at United States Marine Corps Program Executive Officer Land Systems: Program Manager Medium and Heavy Tactical Vehicles

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Results in Brief

Acquisition Practices Used at United States Marine Corps Program Executive Officer Land Systems: Program Manager Medium and Heavy Tactical Vehicles

September 22, 2014

Objective

We initiated this audit in response to allegations made to the Defense Hotline about the urgent acquisition of the Automatic Fire Extinguishing System (AFES) for the Medium Tactical Vehicle Replacement (MTVR).

Finding

~~(FOUO)~~ The Program Manager Medium and Heavy Tactical Vehicles (PM MHTV) initiated a second procurement of the AFES for the MTVR fleet without addressing environmental, safety, and occupational health (ESOH) risks identified in the initial systems procured. This occurred because the PM MHTV:

- established a performance specification for the maximum noise that the system could emit at a level higher than Army and Navy regulations allowed,
- ~~(FOUO)~~ did not adequately tailor the live fire testing to the actual Molotov cocktail threat, and
- used a process to assess hazards identified in the MTVR AFES Safety Assessment Report (SAR) that misrepresented the safety risks associated with the system.

As a result, the PM MHTV plans to procure an additional 3,500 AFES at a cost of $24 million, with safety risks that could result

Finding (cont'd)

in a warfighter's disability, serious injury, or occupational illness if the AFES units were set off to extinguish a fire within the vehicle.

Recommendations

We recommend the Program Manager, Medium and Heavy Tactical Vehicles:

- perform additional testing to identify system configuration and component changes to address the safety risks identified with the AFES and increase the system's effectiveness before awarding a contract and,
- revise the maximum allowable noise permitted when the AFES are set off in response to a fire to 140 decibels, consistent with Navy and Army guidance.

We recommend the Program Executive Officer Land Systems review the actions taken by the Program Manager, Medium and Heavy Tactical Vehicles to exclude unfavorable information contained in the independent evaluations to support the SAR risk ratings, and determine whether any administrative action should be taken against the program manager.

Management Comments and Our Response

The Project Manager, Medium and Heavy Tactical Vehicles agreed with recommendations 1.a and 1.b, however, his comments did not address specifics on the planned live fire testing for 1.a. Therefore, we request additional comments on the extent of live fire testing planned. The Program Executive Officer Land Systems agreed with recommendation 2, and no further comments are required. Please see the Recommendations Table on the back of this page.

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Recommendations Table

Management	Recommendations Requiring Comment	No Additional Comments Required
Program Manager Medium and Heavy Tactical Vehicles	1.a	1.b
Program Executive Officer Land Systems		2

*Provide Management Comments by October 22, 2014.

INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
4800 MARK CENTER DRIVE
ALEXANDRIA, VIRGINIA 22350-1500

September 22, 2014

MEMORANDUM FOR THE NAVAL INSPECTOR GENERAL

SUBJECT: Acquisition Practices Used at United States Marine Corps Program Executive Officer Land Systems: Program Manager Medium and Heavy Tactical Vehicles (Report No. DODIG-2014-120)

We are providing this report for your review and comment. We determined the Program Manager Medium and Heavy Tactical Vehicles initiated a second procurement of the Automatic Fire Extinguishing System for the Medium Tactical Vehicle Replacement fleet without addressing environmental, safety, and occupational health risks identified in the initial procurement.

This audit is one in a series conducted in response to allegations made to the Defense Hotline concerning acquisition practices within the office of the Program Manager Medium and Heavy Tactical Vehicles. We will issue another report discussing allegations related to funding projects without valid and defined requirements.

We considered management comments on a draft of this report in preparing the final report. DoD Directive 7650.3 requires that recommendations be resolved promptly. Comments from the Program Executive Officer Land Systems were responsive, and we do not require additional comments. The Program Manager Medium and Heavy Tactical Vehicles also provided comments that were generally responsive; however, comments on Recommendation 1.a. were only partially responsive. Therefore, we request additional comments on this recommendation by to October 22, 2014.

Please provide comments that conform to the requirements of DoD Directive 7650.3. If possible, send a Microsoft Word (.doc) file and portable document format (.pdf) file containing your comments to audapi@dodig.mil. Copies of your comments must have the actual signature of the authorizing official for your organization. We cannot accept the /Signed/ symbol in place of the actual signature. If you arrange to send classified comments electronically, you must send them over the SECRET Internet Protocol Router Network (SIPRNET).

We appreciate the courtesies extended to the staff. Please direct questions to me at (703) 604-(b) (6) (DSN 664-(b) (6)).

Jacqueline L. Wicecarver
Assistant Inspector General
Acquisition, Parts, and Inventory

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Introduction

Objectives

This audit was initiated in response to allegations made to the Defense Hotline about Program Executive Officer Land Systems, Program Manager Medium and Heavy Tactical Vehicles (PM MHTV), acquisition practices. This report discusses allegations with the PM MHTV plan to procure additional Automatic Fire Extinguishing Systems (AFES) before addressing safety risks identified in the initial systems purchased. We will issue another report discussing our review of allegations that the PM MHTV:

- requested funding for unknown, future projects without valid and defined requirements;
- initiated acquisitions without a documented and validated requirement;
- committed to equipment solutions without considering lifecycle costs or nonmaterial solutions[1] as alternative solutions; and
- failed to document acquisition decisions and that the proper authority made those decisions.

Background

Evolution of Fire Suppression Requirement

~~(FOUO)~~ On April 21, 2009, the U.S. Marine Corps Forces, Central Command, approved the urgent universal need statement No. 09107UB to obtain an automated fire suppression system for vehicles assigned to support Operation Iraqi Freedom and Operation Enduring Freedom. The statement specified that insurgents' tactics to inflict casualties on Coalition forces had evolved in the wake of wide-scale use of armored vehicles. It also stated that insurgents were adding substances to improvised explosive devices, to deliver not only initial-impact destruction, but also to ignite fires. Those fires increased the threat to crew, especially those incapacitated by an initial detonation, and caused serious damage to the vehicles and materials being transported.

(~~FOUO~~) According to the urgent universal need statement, battlefield solutions at that time were only partially effective in containing secondary fires and posed their own health consequences. They could not contain fires with extremely high temperatures,

[1] Non-material solutions include making changes to doctrine, organization, training, leadership and education, personnel, or facilities training to fulfill the stated requirement.

~~(FOUO)~~ did nothing to solve fires on the outside of the vehicle, and were ineffective on tire fires and those that penetrated the crew compartment. In addition, both gas and dry chemical agents used to extinguish secondary fires were toxic to the crew and caustic to equipment.

~~(FOUO)~~ Therefore, according to the urgent universal need statement, a multifaceted capability to counter those secondary fires was needed to reduce crew casualties and limit losses to vehicles and material. The urgent universal need statement identified the need for a "system of systems" solution to:

- ~~(FOUO)~~ reduce the risk of secondary fires,
- ~~(FOUO)~~ quickly extinguish external fires to prevent the fire from penetrating the crew compartment,
- ~~(FOUO)~~ protect the occupants of the vehicle against fires that did penetrate the crew compartment, and
- ~~(FOUO)~~ provide a capability for personnel from other vehicles to suppress fires and rescue the crew.

Urgent Need Statements Issued to Deliver an Automatic Fire Suppression Capability for the Medium Tactical Vehicle Replacement

~~(FOUO)~~ The Director, U.S. Marine Corps Capabilities Development Directorate (Logistics Integration Division), issued two urgent need documents to deliver the fire suppression capability to MTVRs supporting Operation Iraqi Freedom and Operation Enduring Freedom. The first urgent need statement was issued on December 1, 2009, to the program manager, Motor Transport, U.S. Marine Corps Systems Command. The program manager was tasked to procure a commercially available portable backpack fire suppression and extraction capability system.

~~(FOUO)~~ The Director, U.S. Marine Corps Capabilities Development Directorate (Logistics Integration Division), issued the second urgent need document on September 1, 2010, requesting the Program Executive Officer Land Systems develop and procure an AFES solution capable of protecting vehicle occupants against secondary fires that penetrate the crew compartment. The delivery of the capability was to be in two stages. The first stage was to develop an automatic system able to detect and suppress hydrocarbon fuel fires and explosions from multiple threats

(~~FOUO~~) to protect the crew compartment. The second stage was to develop a liquid based system that provided cooling capabilities to reduce crew injury and the possibility of igniting a secondary fire.

Quick Reaction Assessment Conducted on Commercially Available Automatic Fire Extinguishing System

From September to November 2010, the Naval Air Warfare Center–Weapons Division, China Lake, California, tested commercial fire suppression systems for use in U.S. Marine Corps High Mobility Multi-Purpose Wheeled Vehicle platforms in response to urgent universal Need Statement 09107UB. The U.S. Marine Corps program manager for motor transportation developed the requirements and solicited market research; nine contractors submitted fire suppression systems for consideration. Each contractor's proposed AFES was tested based on its demonstrated ability to:

- extinguish a compartment fire within a prescribed time limit,
- prevent re-flash (reigniting back into flames) and cool the compartment to prevent second-degree burns to any occupants,
- operate at a decibel/pressure level that does not injure or incapacitate the occupants, and
- operate without exposing occupants to acid-gases or diminish oxygen levels below a set level.

(~~FOUO~~) Test personnel from the Naval Air Warfare Center–Weapons Division, Fire Science and Technology unit evaluated the effectiveness of each vendor's AFES against three fire threat scenarios: a hand-delivered firebomb, a flamethrower fireball, and a hybrid of the two. Four of the nine vendor-supplied systems performed well enough for further consideration. However, according to the "Test Results for Automatic Fire Extinguishing System Replacement for Use in High Mobility Multi-Purpose Wheeled Vehicles," January 2011, the decision to test each system against only a single event of each type resulted in conflicting data results. The test results report stated additional testing was needed to explain the data and recommended moving forward with the four vendors that met the published requirements; however, the report did not recommend deployment of any of these systems until further tests resulted in a clear winner.

~~(FOUO)~~ In addition, the test results report noted that the systems tested had differing advantages over the legacy system and stated it may be possible to piece a system together to gain the best of all systems. The report stated, for example, that a detector from one vendor system eliminated from further consideration was much faster than the legacy detector and allowed the legacy system to perform better. The report also stated that this change may result in increased system effectiveness with low acquisition investment.

Automatic Fire Extinguishing System Initial Procurement

~~(FOUO)~~ On June 17, 2011, the PMO MHTV issued contract M67854-11-C-0220 to deliver the fire suppression capability to the 926 MTVRs supporting operations in Afghanistan; however, none of the systems have been fielded. On December 8, 2011, the PM MHTV modified the contract and instructed the contractor to deliver the systems to the U.S. Marine Corps Logistics Center in Albany, Georgia, where the systems remain. According to the Deputy Chief of Staff Operations, U.S. Marine Corps Systems Command, the drawdown of U.S. Marine Corps forces supporting Operation Enduring Freedom had caused the number of MTVRs in Afghanistan to substantially decrease by the time the AFES were ready to be fielded. As a result, the U.S. Marine Air-Ground Task Force and U.S. Marine Corps Central Command instructed the PM MHTV to perform the installation during the next maintenance cycle. According to the Deputy Chief of Staff Operations, U.S. Marine Corps Systems Command, the decision to delay installation was in part based on the time and logistical challenges required to escort the support contractor to install the AFES on the vehicles still in theater. See Appendix C for a detailed timeline of key AFES events and activities.

Review of Internal Controls

DoD Instruction 5010.40, "Managers' Internal Control Program Procedures," May 30, 2013,[2] requires DoD organizations to implement a comprehensive system of internal controls that provides reasonable assurance that programs are operating as intended and to evaluate the effectiveness of the controls. We identified internal control weaknesses with the PM MHTV's establishment of performance specifications,

[2] DoD Instruction 5010.40 "Managers' Internal Control Program Procedures," May 30, 2013, replaced DoD Instruction 5010.40 "Managers' Internal Control Program Procedures," July 29, 2010. The revised instruction did not contain significant changes to the requirement that DoD organizations implement a comprehensive system of internal controls.

test planning, and the procedures for assessing the probability and severity of safety risks associated with systems under development. Specifically, the PM MHTV established incorrect requirements thresholds, failed to tailor test events to actual threats, and did not keep record of quantitative data to support safety risk ratings. We will provide a copy of the final report to the senior official responsible for internal controls in the Navy.

Finding

Program Office Is Procuring Additional Automatic Fire Extinguishing Systems Without Correcting Known Safety Risks

(~~FOUO~~) The PM MHTV initiated a second procurement of AFES for the MTVR fleet without addressing environmental, safety, and occupational health (ESOH) risks identified with the initial systems procured. This occurred because the PM MHTV:

- established a performance specification for the maximum noise the system could emit at a level higher than Army and Navy regulations allowed,
- (~~FOUO~~) did not adequately tailor the live fire testing to the actual Molotov cocktail threat, and
- used a process to assess hazards identified in the MTVR AFES Safety Assessment Report (SAR) that misrepresented the safety risks associated with the system

As a result, the PM MHTV plans to procure an additional 3,500 AFES at a cost of $24 million, with safety risks that could result in a warfighter's disability, serious injury, or occupational illness if the AFES units were set off to extinguish a fire within the vehicle.

Serious Risks Identified During Testing of Initial Automatic Fire Extinguishing Units

The U.S. Army Aberdeen Test Center performed live fire testing of the Stage I and II AFES from April to August 2011. A total of 33 tests were conducted on initial units procured, 12 to evaluate the discharge of the AFES and 21 to measure AFES performance and effectiveness against fire events. Of the 33 tests conducted, 9 discharge and 13 fire tests were directly associated with the Stage I AFES.

(~~FOUO~~) The PM MHTV requested the Navy and Marine Corps Public Health Center (NMCPHC) to perform a health hazard assessment (HHA) for the Stage I AFES. The technical data from the live fire tests was used to perform the assessment. The HHA evaluated data gathered during the test events and identified several serious risks of exposure to carbon monoxide, acid gases, nitric oxide, discharge noise, and

(~~FOUO~~) skin burn. However, according to the representative who prepared the HHA, some test results were insufficient to make an accurate risk estimate. For example, during two Molotov cocktail[3] threat tests, fuel leaks continued after the initial fire was extinguished, causing a secondary fire that the AFES could not extinguish. The U.S. Army Aberdeen Test Center had to use the backup range-protection system to extinguish the fire, which limited the amount of data collected for those events. This prevented the NMCPHC representative from assigning an accurate risk assessment category for the Molotov cocktail threat.

(~~FOUO~~) The U.S. Army Public Health Command also performed a review of the toxic-gas data collected during the AFES live fire testing. Data were evaluated from Agent Discharge, Fireball, and Molotov cocktail test events. According to the memorandum documenting the results of the toxic-gas review, the excessive concentrations of carbon monoxide, nitrous oxide, hydrogen cyanide, and the acid gases experienced during the Molotov cocktail live fire tests could cause death or permanent total disability. The memorandum also identified hazard severity categories with both the fireball and Molotov cocktail test events where oxygen dropped to a low level. The consequences that MIL-STD-882 identifies could result from those hazards associated with those severity categories range from lost work to permanent partial disability.

Additional Testing Not Completed to Address Safety Risks

The PM MHTV plans to award a contract worth an estimated $24 million to procure an additional 3,500 AFES units with no plans to conduct further testing to identify system improvements before purchasing the additional systems even though numerous ESOH risks were identified during the live fire testing. The Naval Air Warfare Center–Weapons Division, NMCPHC,[4] and the U.S. Marine Corps Operational Test and Evaluation Activity identified the need for additional testing to clarify the test results, and identify the best fire suppression solution to mitigate the risks. PM MHTV should perform additional testing to identify system configuration and component changes to address the safety risks identified with the Automatic Fire Extinguishing Systems and increase the system's effectiveness before awarding a contract and procuring additional systems.

[3] Molotov cocktail is a crude bomb made of a bottle filled with a flammable liquid, such as gasoline, and usually fitted with a rag saturated in flammable liquid to be used as a wick. The wick is ignited just before the bottle is thrown. According to Aberdeen Test Center personnel, [redacted] of fuel used for Molotov test events was based on the decision to test the limits of the AFES.

[4] The NMCPHC stated that some of the AFES Stage I tests needed to be repeated to adequately assess risks. Also, planned Stage II and complete AFES system testing was either not conducted or the testing results were not sent to NMCPHC for an HHA.

Performance Specification for Noise Discharge Set Higher Than Allowed by Regulation

The AFES would have failed all agent discharge events associated with live fire testing if the threshold noise level was correctly set at 140 decibels. The PM MHTV established the performance specification for the maximum noise emitted when the AFES is set off in response to a fire event at a level higher than allowed by Army and Navy regulation. The PM MHTV established the threshold (maximum acceptable noise) at 165 decibels in the performance specification for AFES agent discharge events. According to the PM MHTV's performance specification, the threshold and objective values were in accordance with Army Pamphlet 40-501, "Medical Services, Hearing Conservation Program," December 10, 1998. The Army Pamphlet and OPNAVINST 5100.23G,[5] "Navy Safety and Occupational Health Program Manual," December 30, 2005, both state that a noise level exceeding 140 decibels should be considered hazardous and requires personnel to wear hearing-protection devices. Based on the criteria established in the Army and Navy regulations, a threshold noise level should have been set at 140 decibels for agent-discharge events and the objective value (desired noise level) at an even lower decibel level. The PM MHTV stated that the threshold impulse noise was set at 165 dB in the AFES Performance Specification because the urgent need statement focused on the use of commercial-off-the-shelf components and because initial market research with original equipment manufacturers found that current commercial-off-the-shelf components could not meet the 140 dB requirement. With the threshold noise level incorrectly set at 165 decibels, the AFES met the noise-level criteria established during all agent-discharge test events. PM MHTV should revise the maximum allowable noise permitted when the AFES are set off in response to a fire to 140 decibels, consistent with Navy and Army guidance.

~~(FOUO)~~ Molotov Cocktail Live Fire Testing Not Adequately Tailored to the Actual Threat

~~(FOUO)~~ The PM MHTV did not adequately plan the live fire testing. Specifically, the PM MHTV approved a test plan that borrowed tests designed for other tactical vehicles without tailoring the tests to the MTVR. Several risks related to Molotov

[5] The Navy criteria in OPNAVINST 5100.23G, Chapter 18, state that the Navy Occupational Exposure Limit for impact/impulse noise is 140 decibel peak sound pressure level. The Navy instruction further states that single hearing protective devices shall be worn for noise above 140 decibel peak, with double hearing protection required for noise exceeding 165 decibel peak

(~~FOUO~~) cocktail events were identified as a result of the AFES live fire testing. These risks were the result of the system's not meeting the criteria related to skin burn, toxic gases, and oxygen exposure.

(~~FOUO~~) The PM MHTV disregarded the results from Molotov cocktail events because he considered the test event atypical of the actual Molotov cocktail threat. According to the PM MHTV personnel, the fuel mixture for the Molotov cocktail events was based on U.S. Army Aberdeen Test Center established test operations procedures and was not representative of the amount of fuel used in actual Molotov cocktails used against Coalition forces. Specifically, the Aberdeen Test Center used a Molotov cocktail fuel mixture of approximately [redacted] of fuel, which the PM MHTV stated was a larger amount of fuel than what would be typically used in such an event for the MTVR. Based on this conclusion, the PM MHTV did not develop any plans to mitigate the threats for the planned follow-on procurement. However, the PM MHTV was not able to provide any documentation to support that the test event was atypical of the actual Molotov cocktail threat.

PM MHTV Process for Assessing the Impact of Hazards Misrepresented Safety Risks

The process the PM MHTV used to determine the probability (likelihood) and severity (consequence) of hazards identified in the MTVR AFES Safety Assessment Report (SAR) minimized the safety risks associated with the system.

The PM MHTV used a contractor to prepare the "Safety Assessment Report for the Medium Tactical Vehicle Replacement (MTVR) Stage I Automatic Fire Extinguishing System (AFES)." The PM MHTV used the SAR to substantiate that the MTVR Stage I AFES equipment, software, and processes met specified ESOH requirements. The SAR documented the relative safety of the MTVR Stage I AFES, in terms of personnel injury, adverse environmental effects, and equipment damage during its operation in response to a live fire event as well as maintenance of the system. According to the SAR, safety was evaluated in accordance with the systematic hazard analyses process outlined in MIL-STD-882D, "Standard Practice for Safety," February 10, 2000.[6] Appendix B describes how probability and severity are used to assign risk categories to hazards in MIL-STD-882D.

[6] MIL-STD-882D was superseded by MIL-STD-882E on May 11, 2012, but the changes do not affect our conclusions.

~~(FOUO)~~ Insufficient Data Available to Accurately Assess Risks Associated with Molotov Cocktail Threat

~~(FOUO)~~ The SAR identified three risks associated with the Molotov cocktail threat as "Serious": second-degree burns, toxic-gas exposure, and oxygen deficiency. However, the PM MHTV's classification of those risks was based on insufficient data. The SAR stated that Molotov cocktail attacks would only occur occasionally. However, the contractor the PM MHTV used to prepare the SAR stated he did not have any quantitative data to support that conclusion. He further stated the performance specification did not include a mission profile that specified the mission requirements of the AFES and information on the threats to be countered. He also stated the assessment was not based on historical information about the frequency of Molotov cocktail attacks on MTVRs in Afghanistan and did not include input from warfighters.

~~(FOUO)~~ In addition, the SAR referenced risk ratings provided in the NMCPHC HHA but presented the ratings out of context. Specifically, the SAR failed to disclose that the NMCPHC evaluator considered the Molotov cocktail test data to be insufficient for accurate risk estimation. This is an important fact that gives context to the reliability of the risk estimation data provided. Without enough data to properly classify Molotov cocktail risk, there is no assurance that the PM MHTV properly classified three of the four serious risks for the AFES.

~~(FOUO)~~ Toxic-Gas Review Findings Misrepresented

~~(FOUO)~~ The SAR classified the risk of toxic-gas exposure as "Serious." The PM MHTV based its rating on the evaluations the NMCPHC, and the U.S. Army Public Health Command performed of the toxic gases generated during live fire testing. Both reviews noted that excessive concentration levels of carbon monoxide, nitrous oxide, hydrogen cyanide, and the acid gases were identified during the Molotov cocktail live fire tests. The U.S. Army Public Health Command concluded the mishap severity level for the Molotov cocktail test events should be "Catastrophic" (potential to result in death or permanent total disability) as opposed to the less severe SAR rating of "Critical" (has the potential to result in permanent partial disability or injuries or occupational illness resulting in the hospitalization of at least three personnel).

(~~FOUO~~) The PM MHTV adopted the severity rating shown in the NMCPHC HHA, even though the HHA stated that the data collected related to the Molotov cocktail test event were insufficient to make accurate estimations of risk. When asked for the reasoning behind the decision to make the toxic-gas risk "Critical" instead of "Catastrophic," the contractor who prepared the SAR stated that the risk could have been classified as "Catastrophic" or "Critical," but the PM MHTV chose to go with "Critical" because that was what the NMCPHC HHA recommended.

In addition, the SAR presented the U.S. Army Public Health Command's conclusions out of context. The SAR incorrectly stated that the U.S. Army Public Health Command agreed that the toxic-gas hazard was a "Serious" risk. The U.S. Army Public Health Command only commented on the severity of this risk in its review and was silent about the probability that Molotov Cocktail threat events would occur. To label a hazard a "Serious" risk, information is needed to assess both components of risk. If Molotov Cocktail events only "Occasionally" occur and the PM MHTV had accepted the U.S. Army Public Health Command toxic-gas "Catastrophic" severity rating, the toxic-gases risk should have been classified as "High" risk. A "High" risk level would require the Assistant Secretary of the Navy (Research, Development & Acquisition) to accept the risk.

(~~FOUO~~) Safety Assessment Report Did Not Accurately Assign Risks to the Fireball Events

(~~FOUO~~) The SAR incorrectly stated that AFES met all the safety criteria for the fireball tests. However, initial testing conducted in April and May 2011 used a performance specification based on Navy criteria to evaluate toxic-gas concentrations. In those tests, the AFES failed to meet oxygen-level criteria for three of eight Stage I fireball tests and failed the toxic-gas criteria for seven of eight Stage I fireball tests because of high carbon monoxide concentrations.

Carbon Monoxide Risk Not Included in Safety Assessment Report

The NMCPHC classified the carbon monoxide toxic gas risk as "Serious" risk.[7] Less than 1 month after the HHA report was issued, the PM MHTV substituted the more liberal Army toxic-gas criteria for the AFES performance specification. The AFES met the performance specifications for carbon monoxide concentrations because

[7] A Serious risk that has a "Critical" severity level is one that may result in: permanent partial disability, injuries or occupational illness that may result in hospitalization of at least three personnel, loss exceeding $200,000 but less than $1 million, or reversible environmental damage causing a violation of law or regulation.

PM MHTV changed the performance specifications to Army criteria. The substitution of the criteria allowed the PM MHTV to conclude no risk existed and to not mention the risk in the SAR. Table 1 illustrates the difference between Navy and Army toxic-gas criteria.

Table 1. Comparison Between Navy and Army Toxic-Gas Criteria

Navy Specified Criteria		Army Criteria	
Gas Type	**Criteria**	**Gas Type**	**Criteria (0-100%) Incapacitation Thresholds**
CO2	<3% for 1 minute	CO2	<3 % for 1 minute
CO	<200 ppm for 5- min	CO + NO	37,250-62,750 ppm-min
	<1500 ppm		
NO	<80 ppm		
NO2	<125 ppm min	NO2	125-375 ppm-min
HX	<746 ppm-min	HX	746-2237 ppm-min
HCN	<75 ppm-min	HCN	75-225 ppm-min
Acrolein	<26 ppm-min	Acrolein	<26 ppm-min
Formaldehyde	<150 ppm-min	Formaldehyde	<150 ppm min
Oxygen	>16%	Oxygen	>16%

Source: U.S. Army Public Health Command Toxic Gas Review for MTVR Stage I AFES
Abbreviations: ppm—parts per million; min—minute

~~(FOUO)~~ Oxygen Deprivation Risk Not Evaluated

~~(FOUO)~~ The SAR states that oxygen concentrations fell below the minimum requirement in Fireball tests and those low oxygen concentrations could cause personnel to experience impaired judgment and coordination, increased heart and breathing rates, and abnormal fatigue upon exertion. The U.S. Army Public Health Command Toxic Gas Review recommended a severity level of "Marginal" for the low oxygen concentrations in the Stage I fireball tests. A "Marginal" risk could result in injury or occupational illness resulting in 1 or more lost work days. However, the PM MHTV did not assign a probability or severity risk to the fireball oxygen deficiency risk and did not include it in the Health Hazard Log to be tracked. Without formally identifying and assessing this hazard, the PM MHTV cannot verify an effective system safety effort is in place, as documented in MIL-STD-882D. Specifically, there is no assurance that associated safety risks will be eliminated or controlled to an acceptable level and that the hazard will be monitored throughout the system life cycle.

Risk Acceptance and Concurrence Authorities

As shown in Table 2, DoD Instruction 5000.02, "Operation of the Defense Acquisition System," December 8, 2008, requires the Assistant Secretary of the Navy (Research, Development & Acquisition) to accept all "high" risks.

Table 2. ESOH Risk Acceptance and User Concurrence Authorities

Risk Level	Acceptance Authority	User Representative
High	Component Acquisition Executive	Formal Concurrence Required (identify peer level equivalent)
Serious	Program Executive Office Level	Formal Concurrence Required (identify peer level equivalent)
Medium	Program Manager	Coordination Required
Low	Program Manager	Coordination Required

The PM MHTV understated the toxic-gas safety risk, which enabled it to be accepted at a lower command level. By classifying this risk as "Serious" instead of "High," the Program Executive Office was the acceptance authority. The Director, Capabilities Development Directorate, Marine Corps Combat Development Command, as the user representative accepted the ESOH risk identified in the Safety Assessment Report on October 29, 2012. PEO Land Systems accepted the risk on December 28, 2012. This allowed offices within Program Executive Officer Land Systems to accept the risk without an external review from outside the PEO and enabled PM MHTV to proceed with the acquisition. If the PM MHTV had used the recommendation from the U.S. Army Public Health Command of "Catastrophic" for its severity classification, and the same probability classification of "Occasional" as it did with the other three hazards, the toxic gas safety risk would have classified as "High". The "High" risk classification would have required acceptance from the Assistant Secretary of the Navy (Research, Development and Acquisition) as opposed to within the PEO.

Conclusion

The PM MHTV did not include pertinent information from the independent evaluations of the U.S. Army Public Health Command and the NMCPHC, which support the SAR, in an effort to keep risk acceptance at the PEO level and avoid potential program delays. The Program Executive Officer Land Systems needs to review

the actions taken by the Program Manager Medium and Heavy Tactical Vehicles to exclude unfavorable information contained in the independent evaluations to support the Safety Assessment Report risk ratings, and determine whether any administrative action should be taken against the program manager.

PM MHTV also needs to perform sufficient testing and address serious safety risks before procuring additional AFES units. Without such actions, the PM MHTV is at risk of procuring an additional 3,500 AFES units, at a cost of $24 million, that may unnecessarily result in disability, serious injury, or occupational illness to the warfighter.

Program Manager Medium and Heavy Tactical Vehicles Comments on the Finding and Our Response

The program manager provided technical comments on the finding. A summary of the program manager's comments along with our responses is in Appendix D.

Recommendations, Management Comments, and Our Response

Recommendation 1

We recommend that the Program Manager Medium and Heavy Tactical Vehicles:

a. Perform additional testing to identify system configuration and component changes to address the safety risks identified with the Automatic Fire Extinguishing Systems and increase the system's effectiveness before awarding a contract and procuring additional systems

United States Marine Corps Comments

The PM MHTV agreed to perform additional testing to address safety risks identified with the AFES and to increase the systems effectiveness before a contract to buy additional systems is awarded. The PM MHTV stated that qualification test and evaluation, first article testing, and possibly full-scale live fire testing and evaluation would be conducted to verify performance and quality of any potential hardware changes.

Our Response

The PM MHTV's comments are partially responsive. Although the PM MHTV plans to conduct additional testing, live fire testing would provide the data needed to verify performance and quality of any potential hardware changes to the AFES in order to mitigate the safety risks identified with the initial units procured. The PM MHTV needs to conduct full-scale live fire testing to obtain these data. We ask the PM MHTV to provide additional comments on the extent of the planned live fire testing, to verify that the safety risks have been adequately addressed before PM MHTV buys additional units.

b. Revise the maximum allowable noise permitted when the Automatic Fire Extinguishing Systems are set off in response to a fire to 140 decibels, consistent with Navy and Army guidance.

United States Marine Corps Comments

The PM MHTV agreed to revise the AFES performance specification to require any additional systems procured to not exceed the impulse noise requirement of 140 decibels. Impulse noise levels produced by currently fielded AFES will remain unchanged and will continue to require the use of hearing protection. The impulse noise hazard risk of serious will continue for currently fielded AFES.

Our Response

The PM MHTV comments are responsive and meet the intent of the recommendation.

Recommendation 2

We recommend that the Program Executive Officer Land Systems review the actions taken by the Program Manager Medium and Heavy Tactical Vehicles to exclude unfavorable information contained in the independent evaluations to support the Safety Assessment Report risk ratings, and determine whether any administrative action should be taken against the program manager.

United States Marine Corps Comments

The Program Executive Officer Land Systems agreed to review the PM MHTV's actions. In addition, Program Executive Officer Land Systems comments detailed a number of actions taken by the PM MHTV (in his comments) that dispute our conclusion that unfavorable information was excluded to support risk ratings.

Our Response

The Program Executive Officer Land Systems' comments are responsive. We did not dispute that the PM MHTV performed numerous actions in regard to the AFES procurement; however, the findings, conclusions, and limitations from the U.S. Army Public Health Command and NMCPHC evaluations were not fully disclosed and do not support the risk ratings in the SAR. We were provided no evidence to support the assertion that Systems Engineering and Safety Integrated Product Teams (IPT) analyzed the live fire results and reviewed the U.S. Army Public Health Command and NMCPHC independent assessments to develop the final AFES hazard levels. Since the Program Executive Officer Land Systems stated that he would review the actions of Program Manager Medium and Heavy Tactical Vehicles relating to the initial AFES units procured no further comments on this recommendation are required.

Appendix A

Scope and Methodology

We conducted this performance audit from August 2013 through June 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

We interviewed key personnel and performed fieldwork at the following organizations:

- Program Management Office Medium and Heavy Tactical Vehicles (Quantico, Virginia);
- Marine Corps Systems Command (Quantico, Virginia);
- Deputy Commandant, Combat Development and Integration (Quantico, Virginia);
- Navy and Marine Corps Public Health Center (Portsmouth, Virginia); and
- U.S. Army Aberdeen Test Center (Aberdeen, Maryland).

We collected, reviewed, and analyzed documents dated from January 16, 2004, through August 1, 2013. Key documents related to the requirements determination for the AFES included the urgent needs statements for fire suppression systems, Marine Requirements Oversight Council decision memorandums, and the AFES feasibility study. Key documents reviewed related to the acquisition of the AFES included the performance specifications, Test Plan, Live Fire Test Report, NMCPHC HHA, U.S. Army Public Health Command Toxic Gas Review, and the SAR.

Additionally, we reviewed program planning and reporting documents against the policies and guidance in the following DoD, Army, and Navy issuances.

- MIL-STD-882D, "Standard Practice for System Safety," February 10, 2000.
- SECNAVINST 5000.2E, "Department of the Navy Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System," September 1, 2011;

- OPNAVINST 5100.23 G, "Navy Safety and Occupational Health Program Manual," December 30, 2005;
- Army Pamphlet 40-501, "Medical Services, Hearing Conservation Program," December 10, 1998;
- Marine Corps Order 3900.17, "The Marine Corps Urgent Needs Process (UNP) and the urgent universal need statement (Urgent UNS)," October 17, 2008; and
- United States Marine Corps Integrated Test and Evaluation Handbook, May 6, 2010.

Use of Computer-Processed Data

We did not use computer-processed data to perform this audit.

Use of Technical Assistance

We did not use Technical Assistance to perform this audit.

Prior Coverage

No prior coverage has been conducted on the MTVR AFES during the last 5 years.

Appendix B

Risk-Assessment Methodology

The AFES safety risks were evaluated using MIL-STD-882D. Under MIL-STD-882D, safety risks are categorized by severity and probability to determine an overall risk-assessment category. This overall risk category determines the command level that must accept the safety risks before the system can be fielded.

Severity of risk measures the expected degree of illness or injury resulting from exposure to the safety risks. The AFES program used the four severity levels suggested in MIL-STD-882D (shown in Table 3.)

Table 3. MIL-STD-882D Severity Categories

SEVERITY CATEGORIES		
Description	**Severity Category**	**Mishap Result Criteria**
Catastrophic	1	Could result in death; permanent total disability; loss exceeding $1 million; or irreversible, severe environmental damage that violates law or regulation
Critical	2	Could result in permanent partial disability; injuries or occupational illness that may result in hospitalization of at least three personnel; loss exceeding $200,000 but less than $1 million; or reversible environmental damage causing a violation of law or regulation
Marginal	3	Could result in injury or occupational illness resulting in 1 or more lost work days; loss exceeding $10,000 but less than $200,000; or mitigable environmental damage, without violation of law or regulation, for which restoration activities can be accomplished
Negligible	4	Could result in injury or occupational illness not resulting in 1 lost work day; loss exceeding $2,000 but less than $10,000; or minimal environmental damage not violating law or regulation.

Probability of risk measures how likely it is that events will occur and cause the safety problem. The AFES program used the five severity levels suggested in MIL-STD-882D (shown in Table 4.)

Table 4. MIL-STD-882D Probability Categories

PROBABILITY CATEGORIES				
Description	**Level**	**Individual Item**	**Fleet/Inventory**	**Quantitative**
Frequent	A	Likely to occur often in the life of an item.	Continuously experienced.	Probability of occurrence greater than or equal to 10^{-1}.
Probable	B	Will occur several times in the life of an item.	Will occur frequently.	Probability of occurrence less than 10^{-1} but greater than or equal to 10^{-2}.
Occasional	C	Likely to occur sometime in the life of an item.	Will occur several times.	Probability of occurrence less than 10^{-2} but greater than or equal to 10^{-3}.
Remote	D	Unlikely, but possible to occur in the life of an item.	Unlikely but can reasonably be expected to occur.	Probability of occurrence less than 10^{-3} but greater than or equal to 10^{-6}.
Improbable	E	So unlikely, it can be assumed occurrence may not be experienced in the life of an item.	Unlikely to occur, but possible.	Probability of occurrence less than 10^{-6}.

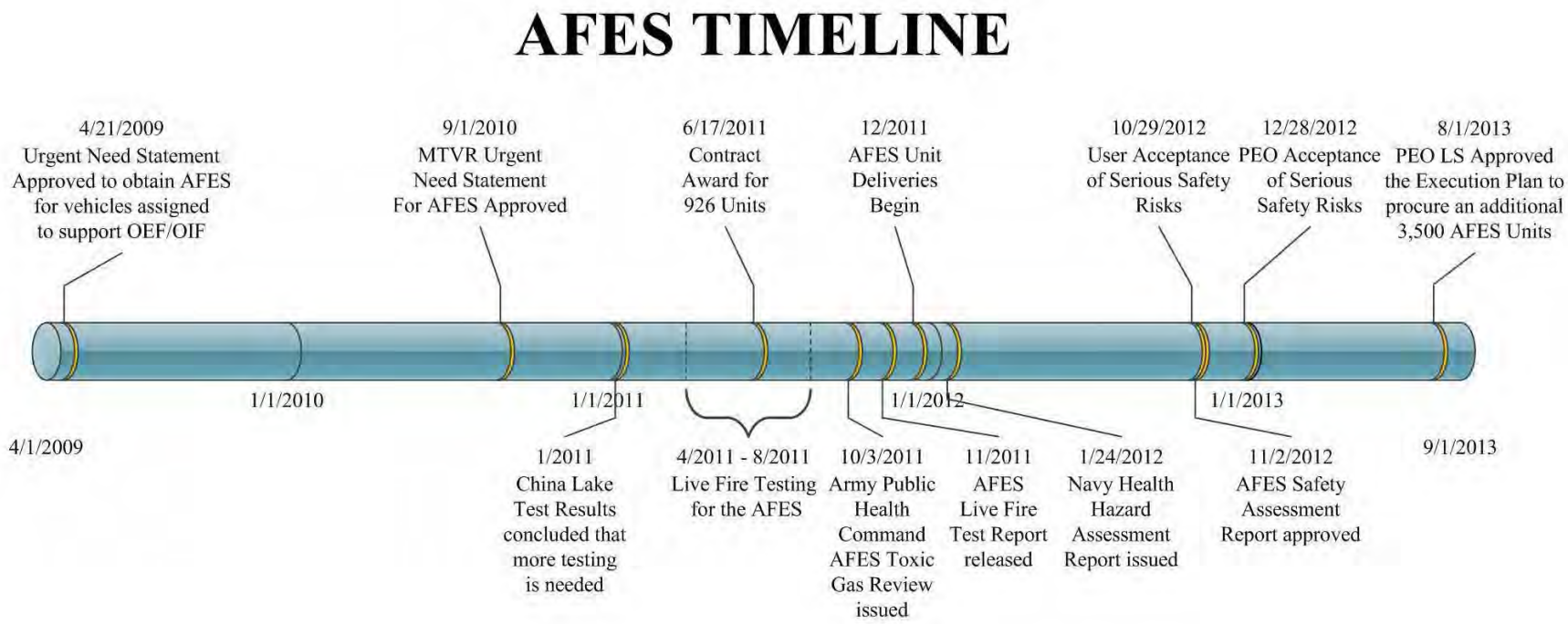
After safety risks are categorized by severity and probability, the overall risk assessment category can be determined. Table 5 shows the risk assessment matrix used for the AFES program.

Table 5. Risk Assessment Matrix

RISK ASSESSMENT MATRIX				
PROBABILITY	**SEVERITY**			
	Catastrophic (1)	**Critical (2)**	**Marginal (3)**	**Negligible (4)**
Frequent (A)	High	High	Serious	Medium
Probable (B)	High	High	Serious	Medium
Occasional (C)	High	Serious	Medium	Low
Remote (D)	Serious	Medium	Medium	Low
Improbable (E)	Medium	Medium	Medium	Low

Appendix C

Timeline of Key Events



Appendix D

Additional Technical Comments on the Finding and Our Response

The Program Manager Medium and Heavy Tactical Vehicles provided additional technical comments to be considered as part of the official United States Marine Corps response.

Management Comments on Hotline Allegations Not Addressed in the Report

Comments 1 and 3. The PM MHTV stated that the specific Defense Hotline allegations addressed in this report were not identified in the report.

Our Response

As was stated in the Objective section of this report, this audit addresses specific allegations regarding the initial AFES procured. The remaining allegations, which relate to PM MHTV acquisition practices, will be addressed in another report.

Management Comments on Findings

Comments 2 and 7. The PM MHTV stated our findings are incorrect and not substantiated by facts. The PM MHTV also stated our finding misrepresents the nature of the second procurement.

Our Response

The findings detailed in the report are accurate. The PM MHTV established that the performance specifications for the maximum level of noise the AFES could emit are above what Navy and Army criteria allow and consider safe. Army Pamphlet 40-501, "Medical Services, Hearing Conservation Program," December 10, 1998, and OPNAVINST 5100.23G,5 "Navy Safety and Occupational Health Program Manual," December 30, 2005, both state that noise exceeding 140 decibels is hazardous and requires personnel to wear hearing protection. PM MHTV established the maximum acceptable noise at 165 decibels in the AFES performance specification.

In addition, the PM MHTV did not adequately tailor the live fire testing to the actual threat. The PM MHTV approved and used the threat configurations and test procedures recommended by the Aberdeen Test Center for these events despite

claiming after the tests were conducted that the Molotov cocktail used in testing was atypical of the actual Molotov cocktail threat. These shortcomings should have been addressed during the development of the AFES performance specification and the live fire test planning.

The PM MHTV used a process to assess hazards identified in the MTVR AFES SAR that misrepresented the safety risks associated with the AFES. Specifically, the PM MHTV classified the three Molotov threat related risks as "Serious" based on insufficient and unsupportable data. The SAR also incorrectly stated that AFES met all the safety criteria for the fireball tests when the AFES failed to meet oxygen-level criteria for multiple fireball test events. Also, the SAR classified the toxic gas exposure risks as "Serious" based on the findings of the NMCPHC HHA as opposed to the "Catastrophic" rating given by the U.S. Army Public Health Command. The PM MHTV did not provide its rationale for why the less stringent classification from the NMCPHC HHA was utilized. The PM MHTV also substituted Navy criteria with the less stringent Army criteria in order to pass toxic gas criteria and avoid what the NMCPHC had classified as a "Serious" carbon monoxide risk. Furthermore, the PM MHTV did not assign a probability or severity risk to a fireball oxygen deficiency identified by the U.S. Army Public Health Command and did not include it in the Health Hazard Log as a risk to be traced.

Management Comments on Scope of Testing

~~(FOUO)~~ Comment 5. The PM MHTV stated the report fails to mention that the systems tested and evaluated by PM Motor Transportation were solely water-based fire suppression systems, a completely different fire suppressant mechanism from that developed for the AFES system.

Our Response

~~(FOUO)~~ The vendor tests PM Motor Transportation performed were not limited to water-based fire suppression systems. The PM Motor Transportation developed requirements and solicited proposals from any interested vendor in response to the urgent need for a fire suppression system for the high mobility multi-purpose wheeled vehicle. Nine vendors submitted a variety of systems including FM-200 based systems, water based systems, and systems that combined the two approaches.

Management Comments on Internal Control Weaknesses

Comment 6. The PM MHTV disagreed that there were internal control weaknesses in the MHTV's processes for establishing performance specifications, test planning, and the procedures for assessing the probability and severity of safety risks associated with systems under development.

Our Response

As detailed in the report, the PM MHTV adopted a performance specification for the maximum noise that the AFES could emit at a level that was considered hazardous by Navy policy. The PM MHTV also approved an event design and test plan despite knowing they were testing the AFES performance against unrealistic threats. Lastly, the process used to assess hazards in the SAR understated the safety risks associated with the AFES and PM MHTV failed to provide a complete picture of the effectiveness of the AFES in the SAR for decision maker's use.

Management Comments on Report Language Related to Risks Identified From Testing of Initial AFES Units

~~(FOUO)~~ Comments 8 through 12. The PM MHTV stated the assessments of the AFES live fire test the two independent organizations provided were not unanimous and contained different and, in some instances contradictory conclusions. The PM MHTV also stated the Systems Engineering and Safety IPTs analyzed all live fire test data and reviewed the independent assessments to develop the final hazard levels documented in the SAR in accordance with MIL-STD-882.

Specifically, the PM MHTV stated the report language on consequences of the low oxygen levels observed in live fire testing were misleading. The PM MHTV stated the 16 percent oxygen threshold was the point at which onset of impaired function occurs and that the symptoms did not directly translate to the severity categories in MIL-STD-882. Therefore, according to the PM MHTV, the Systems Engineering and Safety IPTs performed further assessments that showed personnel will remain conscious for an extended period of time at a 15.6 percent oxygen level. For that reason, PM MHTV stated the Systems Engineering and Safety IPTs did not assess the oxygen deficiency hazard for the fireball generator threat in the SAR. In addition, the PM MHTV stated the report asserted that the hazards identified by the NMCPHC for

the Molotov threat were not sufficiently accurate. Lastly, the PM MHTV claimed the identified risks in the report were misleading because only the hazard severity levels for toxic gas and oxygen deficiency hazards were given in the U.S. Army Public Health Command's Assessment. The PM MHTV claimed that risk levels could not be established because of the absence of probability levels.

Our Response

(~~FOUO~~) The information identified in the report related to oxygen was taken directly from the U.S. Army Public Health Command's evaluation. The evaluation recommended assigning hazard severity ranging from Marginal to Critical for the low oxygen levels observed in the various test events. The report described the range of injuries that MIL-STD-882 identified could result from hazards associated with those severity categories. In addition, as outlined in MIL-STD-882D, one of the elements of an effective system safety effort is that hazards associated with the system are identified, assessed, tracked, monitored, and the associated risks are either eliminated or controlled to an acceptable level throughout the life cycle. The oxygen hazard was mentioned in the U.S. Army Public Health Command Toxic Gas Review and assigned a severity level of Marginal to Critical depending on the threat; therefore, PM MHTV should have disclosed it in the SAR. Last, we did not make any assertion concerning the Molotov threat. As we stated in the report, the limited data collected from the Molotov test events were insufficient for the NMCPHC evaluator to accurately estimate risk for the Molotov cocktail threat. We modified the language in the report on page 7, second paragraph under the Serious Risks Identified During Testing of Initial Automatic Fire Extinguishing Units section, to replace identified risk levels with hazard severity categories.

Management Comments on Additional Testing Not Completed to Address Safety Risks

Comment 13. The PM MHTV disagreed that they had no plans to conduct further testing to identify system improvements to address the known ESOH risks before procuring additional units. The PM MHTV stated that in accordance with the execution plan (AFES ACAT Program Designation Request) dated June 13, 2013, the Command plans to conduct qualification test and evaluation, first article testing, and possibly full-scale live fire testing and evaluation to verify performance and quality of any potential hardware changes.

Our Response

The execution plan approved in support of the AFES Acquisition Decision Memorandum states the program office expects the AFES prime contractor may require minor design changes to the AFES hardware because of parts unavailability, obsolescence or minor improvements implemented since the most recent production of AFES units. As such, a tailored series of tests will be conducted to include qualification test and evaluation, first article testing, and possibly full-scale live fire testing and evaluation to verify performance and quality of any potential hardware changes. However, purpose and extent of the testing that will be conducted will only occur if there is a design change. If the AFES prime contractor makes no minor design changes then no testing will be done. Moreover, we question whether minor modifications will be sufficient to address the ESOH risks identified with the first units procured. In addition, the PM MHTV did not commit to a full-scale live fire testing of the AFES, which would have addressed ESOH risks.

Management Comments on Noise Threshold

Comments 14 and 15. The PM MHTV disagreed that they incorrectly set the maximum noise that AFES could emit at 165 decibels. The PM MHTV stated the maximum noise that AFES could emit was set at that level because the urgent need focused on the use of commercial-off-the-shelf components and initial research indicated that the components available in the commercial marketplace were not capable of meeting the maximum noise requirement. The PM MHTV further stated that they deemed this a serious safety hazard in accordance with MIL-STD-882 and formally obtained Capabilities Development and Integration concurrence and Land Systems acceptance to provide the MTVR crew with hearing protection for impulse noise levels between 140 and 165 decibels.

Our Response

During the audit, the PM MHTV did not state or provide us any documentation that market research was conducted showing that the AFES components commercially available were not capable of meeting the maximum noise level allowed by Navy policy. In addition, with the noise threshold incorrectly set at 165 decibels, the AFES passed the noise threshold criteria associated with AFES discharge events. If the criteria was correctly set at 140 decibels, the AFES would have failed all noise threshold criteria related to AFES discharge events. Although the PM MHTV obtained concurrence for acceptance of serious risks from Capabilities Development and Integration and PEO Land Systems, the acceptance was based in part on information that incorrectly indicated the MTVR AFES had passed noise criteria.

Management Comments on Live Fire Testing Not Adequately Planned

~~(FOUO)~~ Comment 16. The PM MHTV disagreed that the live fire testing was not adequately planned. The PM MHTV stated that the Aberdeen Test Center developed the test plan using standard test operating procedures which PM MHTV leadership approved. The PM MHTV further stated the PM MHTV conducted two test readiness reviews before starting AFES testing.

Our Response

(~~FOUO~~) As stated earlier, the PM MHTV did not adequately tailor the live fire testing to the actual threat. The PM MHTV approved and used the threat configurations and test procedures the Aberdeen Test Center recommended for these events. However, after the tests were conducted, PM MHTV claimed that the Molotov cocktail used during the test was atypical of the actual Molotov cocktail threat. These shortcomings should have been addressed during the development of the AFES performance specification and the live fire test plan.

Management Comments on Molotov Cocktail Test Results

Comment 17. The PM MHTV disagrees that MHTV disregarded the results from the Molotov cocktail events.

Our Response

The test results from the Molotov cocktail threat were the primary reasons for the identified risks. The PM MHTV established no mitigation plans because MHTV considered the Molotov threat tests the U.S. Army Aberdeen Test Center performed to be atypical of a Molotov event. The PM MHTV planned a second procurement of AFES units without confirming MHTV addressed the Molotov-related risks identified with the initial procurement.

Management Comments That PM MHTV Minimized Safety Risks in Safety Assessment Report

Comment 18. The PM MHTV disagreed that the SAR minimized the safety risks associated with the AFES system. The PM MHTV stated that all AFES ESOH hazards were identified and tracked, and that all risks were assessed in accordance with MIL-STD-882. The PM MHTV stated that MHTV obtained independent assessments of AFES live fire tests and assembled Systems Engineering and Safety IPTs of subject-matter experts to correlate test results to hazards and develop the final hazard levels.

Our Response

The PM MHTV did obtain independent assessments of AFES live fire tests from the U.S. Army Public Health Command and NMCPHC, but later presented the risk ratings out of context in the SAR. For example, the SAR did not disclose that the NMCPHC HHA stated there were insufficient data to assess the Molotov threat. In addition, the SAR incorrectly stated that the U.S. Army Public Health Command agreed the toxic-gas hazard was a "Serious" risk. The U.S. Army Public Health Command only commented on the severity of the toxic gas risk in its review and was silent about the probability. To label a hazard a serious risk, both components of risk, severity and probability, are necessary. If the severity recommended by the U.S. Army Public Health Command was paired with the "Occasional" frequency reported in the SAR for the toxic gas threat, the toxic-gas risk would have been classified as a "High" risk. Although the PM MHTV stated that Systems Engineering and Safety IPTs of subject-matter experts developed the final hazard levels after comparing test results with hazards, we were provided no evidence to support the claim that the Systems Engineering and Safety IPTs developed the hazard levels reported in the SAR. The PM MHTV did not identify, track, or assess all AFES ESOH hazards. For example, the oxygen deprivation hazard associated with fireball test events was not included in the hazard database.

Management Comments on Insufficient Data Used to Accurately Assess Molotov Cocktail Threat

~~(FOUO)~~ Comment 19. The PM MHTV disagreed that the classification of risks were based on insufficient data. The PM MHTV stated that the Systems Engineering IPT and Safety IPT used information from the NMCPHC HHA and the U.S. Army Public Health Command Toxic Gas Review to develop the oxygen deficiency and toxic gas hazard assessment in the SAR. The PM MHTV also stated that the Systems Engineering IPT and Safety IPT only used the NMCPHC HHA to develop the second-degree-burns hazard assessment, because the U.S. Army Public Health Command did not address second-degree-burns in its review. In addition, the PM MHTV explained that the Systems Engineering and Safety IPTs only conducted general discussions regarding Molotov events, because the specific instances where the Molotov cocktail threat was used were classified.

Our Response

(~~FOUO~~) The NMCPHC HHA assessment states that there were insufficient data to classify the Molotov cocktail risk. The NMCPHC evaluator considered the Molotov cocktail test data to be insufficient for accurate risk estimation. That conclusion was further supported by statements made by the Principal for ESOH, MTVR, Science Applications International Corporation, who prepared the SAR. The Principal for ESOH, MTVR, stated that there were no quantitative data to support the conclusion that Molotov attacks would occur "Occasionally." The Principal for ESOH, MTVR, further stated that the assessment was not based on historical information about the frequency of Molotov Cocktail attacks on MTVRs in Afghanistan and did not include input from warfighters. Based on the IPT information received from the PM MHTV, there is no evidence that supports the Systems Engineering and Safety IPT developed the hazard levels reported in the SAR.

Management Comments on Risk Ratings in NMCPHC Health Hazard Assessment Presented Out of Context in Safety Assessment Report

(~~FOUO~~) Comments 20 through 22. The PM MHTV stated that the U.S. Army Public Health Command Toxic Gas Review and the NMCPHC HHA were the primary sources for the hazard analysis and that the results were referenced in the Hazard Log in Appendix A of the SAR. The PM MHTV acknowledged that the NMCPHC does question the accuracy of the Molotov data, but pointed out that the NMCPHC documented hazard levels for the Molotov risks. The PM MHTV stated that the Systems Engineering and Safety IPTs analyzed all live fire test data and reviewed the independent assessments to develop the final hazard levels in accordance with MIL-STD-882.

Our Response

(~~FOUO~~) The PM MHTV is correct in stating that the U.S. Army Public Health Command Toxic Gas Review and the NMCPHC HHA were referenced in the Hazard Log, but the report discusses the findings from the U.S. Army Public Health Command Toxic Gas Review and NMCPHC HHA were presented out of context in the SAR. Just including the reports in the appendixes does not validate the incorrect and misleading statements about the reports in the body of the SAR. Based on the IPT information received from the PM MHTV, there is no evidence to support that the Systems Engineering and Safety IPTs developed the hazard levels identified in the SAR.

Management Comments That Toxic Gas Findings Were Misrepresented in the Safety Assessment Report

(~~FOUO~~) Comments 23 through 25 and 27. The PM MHTV stated that the assessments of the AFES live fire test the two independent organizations (NMCPHC and the U.S. Army Public Health Command) provided were not unanimous and contained different and, in some cases, contradictory conclusions. The PM MHTV acknowledged that the NMCPHC questioned the accuracy of the Molotov data, but stated that MHTV did document a hazard level for each threat. The PM MHTV further stated that members of the Systems Engineering and Safety IPT analyzed all live fire test data and reviewed the independent assessments to develop the final hazard levels documented in the SAR.

Our Response

(~~FOUO~~) As stated previously, the SAR misrepresented aspects of both the NMCPHC HHA and the U.S. Army Public Health Command Toxic Gas Review. The SAR did not disclose that the HHA stated the data collected for the Molotov cocktail test event were insufficient to make accurate risk estimations. The SAR also incorrectly stated that the U.S. Army Public Health Command agreed the toxic-gas hazard was a "Serious" risk when the Toxic Gas Review only commented on the severity of the hazard and not the probability. Based on the IPT information received from the PM MHTV, there is no evidence to support the statement that the Systems Engineering and Safety IPT developed the hazard levels identified in the SAR.

Management Comments on Probability Levels

Comment 26. The PM MHTV stated the correct use of MIL-STD-882 is to associate the probability level with the probability of the event occurring and suggested we revise statements that incorrectly associate hazard risk probability levels with the probability of generating similar toxic gas levels.

Our Response

The report was revised to show that probability refers to the probability that a mishap might occur during the planned life expectancy of the system, as defined in MIL-STD-882D. On page 11, we are referring to the probability of Molotov cocktail threat events not toxic gases.

Management Comments on the Presentation of Test Results Data

(~~FOUO~~) Comment 28. The PM MHTV disagreed with our presentation of the live fire test results. Specifically, the PM MHTV took exception to the report's breakdown of the test results by event instead of by data point.

Our Response

(~~FOUO~~) We did not change the live fire test results. We exercised caution to not distort the information and used the actual test results and format from the U.S Army Test Command MTVR AFES Live Fire Test Report. The actual test results are presented in the finding. The reported results are presented in the same manner the U.S Army Test Command used in its MTVR AFES Live Fire Test report.

Management Comments on the Characterization of Events Surrounding the Exclusion of Carbon Monoxide Risk From the Safety Assessment Report

(~~FOUO~~) Comment 29. The PM MHTV disagreed with our characterization of the events surrounding the exclusion of the carbon monoxide risk from the SAR. The PM MHTV stated that the AFES Performance Specification dated January 14, 2011, used the carbon monoxide injury criteria levels taken from the Navy TM – Industrial Hygiene Field Operations. In addition, the PM MHTV stated that all AFES test results were evaluated against these criteria, which resulted in a "Serious" hazard for carbon monoxide injury. The PM MHTV further stated that the Systems Engineering and Safety IPTs used all available injury criteria to assess the live fire test results and, after all AFES testing was completed, the IPTs evaluated the AFES test results using the Army injury criteria.

Our Response

(~~FOUO~~) We requested all IPT meeting minutes from the PM MHTV. In the meeting minutes we received there is no discussion of the merits of the Army injury criteria versus the Navy criteria. A serious hazard was documented for carbon monoxide injury in the NMCPHC HHA, but was not documented in the SAR. The comments from the PM MHTV do not provide an explanation of the oversight.

Management Comments on Absence of Oxygen Deprivation Risk Evaluation

~~(FOUO)~~ Comment 30. The PM MHTV agreed that the oxygen deprivation risk should be part of the AFES hazard database, but did not agree that the absence of this risk in the database is reason to believe an ineffective system safety effort is in place.

Our Response

~~(FOUO)~~ According to MIL-STD-882D, one of the elements of an effective system safety effort is that hazards associated with the system are identified, assessed, tracked and monitored, and the related risks are eliminated or controlled to an acceptable level throughout the life cycle. The oxygen hazard was mentioned in the U.S. Army Public Health Command Toxic Gas Review and assigned a severity level of Marginal, yet it was not tracked or monitored by PM MHTV.

Management Comments on Understated Toxic Gas Safety Risk

Comment 31. The PM MHTV disagreed that the toxic gas safety risk was understated. The PM MHTV stated that they solicited independent assessments from U.S. Army Public Health Command and NMCPHC, but these assessments contained different and, in some instances, contradictory conclusions. The PM MHTV also stated that the AFES Systems Engineering and Safety IPTs openly discussed the AFES test results and SAR hazard assessments. In addition, the PM MHTV stated that members of the IPTs analyzed the live fire test results and reviewed the independent U.S. Army Public Health Command and NMCPHC assessments to develop the final hazard levels in the SAR.

Our Response

Based on the IPT information received from the PM MHTV, there is no evidence to support the Systems Engineering and the Safety IPTs developed the hazard levels identified in the SAR.

Management Comments on the Report Conclusion

Comment 32. The PM MHTV disagreed with the assertion that MHTV did not include pertinent information from the independent evaluations of the U.S. Army Public Health Command and NMCPHC, which support the SAR in an effort to keep the risk acceptance at the PEO level and avoid program delays. The PM MHTV contends that the U.S. Army Public Health Command and NMCPHC evaluations were referenced in the SAR and included as appendixes.

Our Response

Referencing the independent U.S. Army Public Health Command and NMCPHC assessments and including them as appendices does not mean the information contained in those assessments was accurately presented in the SAR. The SAR misrepresented aspects of both the NMCPHC HHA and the U.S. Army Public Health Command Toxic Gas Review. For example, the SAR did not disclose the HHA statement that the data collected related to the Molotov cocktail test event were insufficient to make accurate risk estimations. The SAR also incorrectly stated that the U.S. Army Public Health Command agreed that the toxic-gas hazard was a "Serious" risk when the Toxic Gas Review only commented on the severity of the hazard and not the probability.

Management Comments on Recommendation 2

Comment 33. The PM MHTV stated there was no basis for Recommendation 2 and that MHTV implemented a robust systems engineering process to provide effective and efficient development of the AFES system in fulfillment of an urgent requirement.

Our Response

We did not dispute that the PM MHTV performed numerous actions in regards to the AFES procurement; however, the report identified several examples of the SAR's exclusion of unfavorable information in the independent U.S. Army Public Health Command and NMCPHC evaluations.

For example, the SAR did not disclose that the HHA stated the data collected from the Molotov Cocktail test event were insufficient to make accurate risk estimates. The SAR also incorrectly stated that the U.S. Army Public Health Command agreed that the toxic-gas hazard was a "Serious" risk when the Toxic Gas Review only commented on the severity of the hazard and not the probability. Furthermore, the SAR did not accurately assign risks to the fireball events. Based on the IPT information received from the PM MHTV, there is no evidence to support that the Systems Engineering IPT and Safety IPT developed the hazard levels identified in the SAR.

Management Comments

Program Executive Officer Land Systems

UNITED STATES MARINE CORPS
PROGRAM EXECUTIVE OFFICER
LAND SYSTEMS MARINE CORPS
2200 LESTER ST
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IN REPLY REFER TO:
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PEO LS
0 2 JUL 2014

ENDORSEMENT on PMM 206 ltr 5041 of 26 Jun 14

From: Program Executive Officer Land Systems Marine Corps
To: Project Manager, Office of the Inspector General, Department of Defense
Via: Director, Marine Corps Staff

Subj: DOD INSPECTOR GENERAL DRAFT REPORT, PROJECT NO. D2013-D000AE-0218.000, OF 11 JUNE 2014

1. Forwarded with PEO LS concurrence of the comments provided by Program Manager Medium and Heavy Tactical Vehicles (PM M&HTV) to the subject draft report.

2. My preliminary views of the actions and decisions taken by the PM M&HTV in regards to the management of the AFES acquisition effort are as follows:

a. The PM M&HTV was fully transparent throughout the AFES acquisition process, and Integrated Product Team (IPT) participation, support and review was appropriate and all inclusive.

b. The PM M&HTV followed widely recognized processes, standards and protocols to include those prescribed for the Safety Assessment Report (SAR) in accordance with MIL-STD-882.

c. The SAR process fully acknowledged and critically reviewed AFES hazards, but ultimately determined that the life saving benefits of AFES far outweighed the system's inherent risks and deficiencies.

d. The PM M&HTV fully understood follow-on tasking associated with the need for further AFES testing and correction of system deficiencies, as directed in the 1 August, 2013 Acquisition Decision Memorandum (ADM).

e. The PM M&HTV sought and was fully supported by thorough independent review of test data, findings, opinions and recommendations.

3. I accept the recommendation of the DOD IG Draft Report specific to PEO LS, and intend to conduct a review of the actions taken by PM M&HTV in regards to DOD IG's accusation that PM M&HTV

2

Program Executive Officer Land Systems

Subj: DOD INSPECTOR GENERAL DRAFT REPORT, PROJECT NO. D2013-D000AE-0218.000, OF 11 JUNE 2014

excluded unfavorable information contained in the independent evaluations to support the Safety Assessment Report risk ratings.

W. E. TAYLOR

Copy to:
PM M&HTV, PEO LS
files

3

Program Manager Medium and Heavy Tactical Vehicles

DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
3000 MARINE CORPS PENTAGON
WASHINGTON, DC 20350-3000

IN REPLY REFER TO:
7500
DMCS-A
07 JUL 2014

From: Commandant of the Marine Corps
To: Program Director, Acquisition, Parts, and Inventory, Office of Inspector General, U.S. Department of Defense

Subj: U.S. DEPARTMENT OF DEFENSE OFFICE OF INSPECTOR GENERAL DRAFT AUDIT REPORT D2013-D000AE-0218.000, ACQUISITION PRACTICES USED AT UNITED STATES MARINE CORPS PROGRAM EXECUTIVE OFFICER LAND SYSTEMS: PROGRAM MANAGER MEDIUM AND HEAVY TACTICAL VEHICLES, DATED JUNE 11, 2014

Ref: (a) DODIG Memorandum dtd June 11, 2014

Encl: (1) Marine Corps Responses

1. Official responses required by the reference are provided at the enclosure.

2. The Marine Corps appreciates the opportunity to respond to the report.

3. If you have any questions about the responses, please contact (b) (6) Headquarters, U.S. Marine Corps (b) (6) email HQMCAuditLiaisons@usmc.mil or phone (703) 697-(b) (6) DSN 227-(b) (6)

M. R. REGNER
Staff Director

Copy to:
NAVINSGEN (N11)
DC, CD&I
CMDR, MCSC

Program Manager Medium and Heavy Tactical Vehicles

UNITED STATES MARINE CORPS
PROGRAM MANAGER MEDIUM AND HEAVY TACTICAL VEHICLES
PROGRAM EXECUTIVE OFFICER
LAND SYSTEMS MARINE CORPS
2200 LESTER STREET
QUANTICO VA 22134-6050

IN REPLY REFER TO:
5041
PMM 206
26 Jun 14

From: Program Manager Medium and Heavy Tactical Vehicles
To: Project Manager, Office of the Inspector General, Department of Defense
Via: (1) Program Executive Officer Land Systems
(2) Director, Marine Corps Staff

Subj: UNITED STATES MARINE CORPS COMMENTS TO THE DODIG RECOMMENDATIONS

Ref: (a) HQMC Office of the Staff Director e-mail of 12 Jun 14
(b) DoD Inspector General Draft Report, Project No. D2013-D000AE-0218.000, Acquisition Practices Used at United States Marine Corps Program Executive Officer Land Systems: Program Manager Medium and Heavy Tactical Vehicles of 11 Jun 14

Encl: (1) Program Manager Medium and Heavy Tactical Vehicles Comments to the DODIG Recommendations of 11 Jun 14
(2) Request for Security Marking Review of 11 Jun 14

1. Per the instructions in reference (a), comments are provided with regard to reference (b) at enclosure (1).

2. The Program Office recommendation of FOUO paragraphs can be found at enclosure (2).

3. Point of contact in this matter is (b) (6) 703-432-(b) (6) (b) (6) @usmc.mil.

G. B. PROSSER

Program Manager Medium and Heavy Tactical Vehicles

(U) DEPARTMENT OF DEFENSE INSPECTOR GENERAL (DODIG) DRAFT REPORT DATED 11 JUNE 2014 PROJECT # D2013-D000AE-0218.000

(U) "ACQUISITION PRACTICES AT UNITED STATES MARINE CORPS PROGRAM EXECUTIVE OFFICER LAND SYSTEMS: PROGRAM MANAGER MEDIUM AND HEAVY TACTICAL VEHICLES"

(U) UNITED STATES MARINE CORPS COMMENTS TO THE DODIG RECOMMENDATIONS

(U) RECOMMENDATION 1.A.: DODIG recommends that the Program Manager Medium and Heavy Tactical Vehicles:

a. (U) Perform additional testing to identify system configuration and component changes to address the safety risks identified with the Automatic Fire Extinguishing Systems and increase the system's effectiveness before awarding a contract and procuring additional systems.

(U) USMC RESPONSE: Concur.

(U) Per the AFES Acquisition Decision Memorandum (ADM) dated 1 Aug 2013, PM MHTV plans to conduct Qualification Test and Evaluation, First Article Testing, and possibly full-scale live fire testing and evaluation to verify performance and quality of any potential hardware changes.

(U) RECOMMENDATION 1.B.: DODIG recommends that the Program Manager Medium and Heavy Tactical Vehicles:

b. (U) Revise the maximum allowable noise permitted when the Automatic Fire Extinguishing Systems are set off in response to a fire to 140 decibels, consistent with Navy and Army guidance.

(U) USMC RESPONSE: Concur.

a. (U) PM MHTV will revise the AFES performance specification to require any additional (non-urgent) AFES systems procured to meet the impulse noise requirement of 140 dB (threshold).

b. (U) Impulse noise level produced by currently fielded AFES systems will remain unchanged and will continue to require the use of single hearing protection. The impulse noise hazard risk of serious will continue for these currently fielded AFES systems.

(U) RECOMMENDATION 2: DODIG recommends that the Program Executive Officer Land Systems review the actions taken by the Program Manager Medium and Heavy Tactical Vehicles to exclude unfavorable information contained in the independent evaluations to support the Safety Assessment Report risk ratings, and determine whether any administrative action should be taken against the program manager.

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ENCLOSURE (4)

Program Manager Medium and Heavy Tactical Vehicles

(U) USMC RESPONSE: Concur.

(U) Program Executive Officer Land Systems concurs with the recommendation and will conduct a review of the AFES procurement.

(U) Program Manager Medium and Heavy Tactical Vehicles disagrees with this claim and asserts the following actions clearly dispute this finding:

a. (U) The PM MHTV utilized an extensive team of crew cab/fire suppression/injury experts from the Army (TACOM/TARDEC), Navy(NSWC-Dahlgren), Army Public Health Command (APHC), Navy/Marine Corps Public Health Command (NMPHC), Marine Corps Combat Development & Integration (CD&I), Aberdeen Test Center, Marine Corps Vehicle Engineering and Integration Center (MCVEIC), PEO LS, PM MHTV, SAIC, SURVICE, Oshkosh, and AMEREX as members of the AFES Systems Engineering (SE) IPT and Safety IPT.

b. (U) The AFES SE IPT and Safety IPT analyzed all AFES live fire test results and reviewed the independent assessments (evaluations) provided by the APHC and NMPHC. The AFES SE IPT and Safety IPT developed the final hazard levels in accordance with MIL-STD-882 and documented those in the AFES Safety Assessment Report (SAR).

c. (U) The AFES SAR clearly references both the APHC and NMPHC independent assessments and includes them as appendices. The SAR states "ATC test results, USAPHC Toxic Gas Review (Appendix C), and NMPHC Health Hazard Assessment (Appendix D) are the primary sources for the Hazard Analysis (Appendix A)."

d. (U) The AFES SAR also references both the APHC and NMPHC independent assessments in the Hazard Analysis Log (Appendix A) as Personnel Injury or Death hazards due to a) Burns (Hazard ID# 1.02d) and b) Toxic Gas Exposure (Hazard ID# 1.06a).

e. (U) The assessments provided by the two independent organizations (APHC and NMPHC) were based on the use of MIL-STD-882. The assessments provided by these two organizations were not unanimous, contained differences, and in some instances made contradictory conclusions. For example, the APHC assessed the test results only in terms of severity level and not the hazard risk. On the other hand, the NMPHC assessed the severity level, the probability level, and the resulting hazard risk. In addition, the NMPHC assessed toxic gas results from one of the threats as a serious hazard, whereas the APHC concluded for the same threat that the results did not exceed Army injury criteria. Both assessments raised concerns about the accuracy and sufficiency of the test data collected for the Molotov cocktail threat. However, both organizations still provided a hazard severity level and the NMCPHC even provided a hazard risk level (severity and probability of occurrence) using the test data provided for the Molotov event.

f. (U) The AFES SE IPT and Safety IPT analyzed all of the live fire test results and reviewed the independent assessments from the APHC and NMPHC to develop the final AFES hazard levels. This was done in accordance with MIL-STD-882 as documented in the AFES SAR. As a result, the PM MHTV identified four (4) serious risk hazard levels associated with the AFES system.

g. (U) The PM MHTV affirms no information was excluded or misrepresented from the process used to develop the final AFES hazard risk levels.

Program Manager Medium and Heavy Tactical Vehicles

(U) ADDITIONAL TECHNICAL COMMENTS:

(U) The following types of comments have been applied in this response.

a. (U) Critical - Contentious issue that will cause non-concurrence with publication;

b. (U) Substantive - Factually incorrect material; and

c. (U) Administrative - grammar, punctuation, style, etc.

1. (U) Page i, "Objective" (Substantive). Under the Objective paragraph, the specific allegations addressed in this report are not identified, nor are they identified anywhere else in this report.

(U) **Corrective Action:** Revise paragraph to add specific allegations addressed in this report.

2. (U) Page i, "Finding" (Critical). Recommend three bullets be revised based on adjudication of comments below. Rationale: Findings are incorrect and not substantiated by facts.

3. (U) Page 1, "Objective" (Substantive). Under the Objective paragraph, the specific allegations addressed in this report are not identified nor are they identified anywhere else in this report.

(U) **Corrective Action:** Revise paragraph to add specific allegations addressed in this report.

4. (U) Page 2, para 2, "Background" (Substantive). Recommend paragraph revision for clarification. Rationale: Under the description of "System of Systems" approach, the Urgent Universal Need Statement also mentions that "Virtually all the components of the system described above are available as commercial off the shelf (COTS) technologies." This is worth noting in the Background section of this report because the AFES system is similar to other systems that have already been fielded.

5. ~~(U//FOUO)~~ Page 3, para 1, para 2, and Page 4, para 1 (Critical). Recommend paragraph revision for clarification. Rationale: These three paragraphs describe the unsuccessful efforts by PM Motor Transportation to develop a commercial fire suppression system. The text describes how the test results were conflicting, which resulted in the decision not to recommend deployment of any of the systems they tested. The IG report fails to mention that these systems tested and evaluated by PM Motor Transportation were solely aqueous based fire suppression systems, a completely different fire suppressant mechanism than that (FM200 gas) developed for the AFES system.

6. (U) Page 5, para 1 (Critical). Recommend paragraph deletion. Rationale: Second sentence is not supported by facts. The PM MHTV disagrees and contends that a robust systems engineering process was followed based on the following factual information:

a. (U) A Systems Engineering IPT (SE IPT) and Safety IPT was established and included subject matter experts from the Army (TACOM/TARDEC), Navy(NSWC-Dahlgren), APHC, NMPHC, Marine Corps CD&I, Aberdeen Test Center, Marine Corps Vehicle Engineering and Integration Center (MCVEIC), contractors (SAIC, SURVICE, Oshkosh), PEO LS, and PM MHTV. Meeting minutes, actions items, and attendees were documented and staffed.

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Program Manager Medium and Heavy Tactical Vehicles

b. ~~(U//FOUO)~~ The AFES Performance Specification developed by the SE IPT (dated 11 Jan 2011) was used for the entire development of the urgent capability (initial system). The AFES Performance Specification was updated (dated 31 Jan 2012) after development of the initial system, in preparation for procurement of the follow-on (non-urgent) system.

c. (U) A Safety IPT was established, utilizing a Principal For Safety (PFS) with direct reporting authority to the PM. An AFES hazard database was developed and used to formally identify, track, and assess ESOH hazards.

d. (U) Two Critical Design Reviews were conducted, both with a PMO independent co-chairman from the Marine Corps Vehicle Integration and Engineering Center (MCVEIC).

e. (U) Detailed AFES test plans were developed by the Aberdeen Test Center (ATC) using standard Test Operating Procedures (including TOP 2-2-614, Toxic Hazards Test for Vehicles and Other Equipment, 31 October 2003). These plans were formally approved by PM MHTV leadership.

f. (U) Two Test Readiness Reviews were conducted prior to the start of AFES testing, capturing risks, meeting minutes, and action items.

g. (U) AFES live fire test results were provided to both the Navy Marine Corps Public Health Command and the Army Public Health Command for an independent review and assessment.

h. (U) A Safety Assessment Report (SAR) was developed and approved by PM MHTV leadership identifying all ESOH issues and hazard risks; a formal safety release was obtained from MCSC-00T. The SAR included as appendices both independent assessments from the APHC and the NMPHC, including specific language from these reports in the SAR hazard database. Hazard assessments and all hazard risks were identified and assessed in accordance with MIL-STD-882.

i. (U) AFES test results and hazard risks were briefed to CD&I and PEO LS; formal user concurrence was obtained from CD&I and risk acceptance obtained from PEO LS, all in accordance with MIL-STD-882. The PEO LS risk acceptance stated that the life saving benefits to Marines far outweighs the inherent risks.

7. (U) Page 6, "Finding" (Critical). Finding misrepresents the nature of the second procurement. Recommend three bullets be revised based on adjudication of comments below. Rationale: Findings are incorrect and not substantiated by facts.

a. (U) Per the AFES Acquisition Decision Memorandum (ADM) dated 1 Aug 2013, PM MHTV plans to conduct Qualification Test and Evaluation, First Article Testing, and possibly full-scale live fire testing and evaluation to verify performance and quality of any potential hardware changes.

b. (U) Per the AFES ADM the Program Manager was only authorized to procure a minimum quantity of articles to conduct a tailored series of tests that will satisfy testing requirements.

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Program Manager Medium and Heavy Tactical Vehicles

c. (U) Per the AFES ADM, upon completion of favorable testing and assessments, the Program Manager will request a Full Rate Production Decision from the Program Executive Officer to procure 3,500 AFES.

8. ~~(U//FOUO)~~ Page 7, para 1, fourth sentence (Critical). Recommend sentence revision. Rationale: The sentence is misleading. For the Fireball Generator threat, the lowest oxygen reading was 15.6%. The threshold of 16% is the point at which onset of impaired personnel function occurs. These symptoms do not directly translate to the severity categories in MIL-STD-882, so further assessment was performed by the SE IPT and Safety IPT with the results showing that personnel will remain conscious for an extended period of time at a 15.6% Oxygen level. For this reason the SE IPT and Safety IPT did not assess an Oxygen deficiency hazard for the Fireball Generator threat for the SAR. For the Molotov cocktail threat, a serious hazard was assessed by the AFES SE IPT and Safety IPT and entered into the AFES SAR

9. (U//FOUO) Page 7, para 1, last sentence (Critical). Recommend paragraph revision. Rationale: This sentence is misleading and is based on the assertion that the hazard identified by the NMCPHC for the Molotov threat was not sufficiently accurate. The NMCPHC reviewed all AFES test results and provided a hazard assessment for all test configurations, including the Molotov cocktail threat. Their report does question the accuracy of the Molotov cocktail data; however, the NMCPHC did in fact document a hazard level for each threat. In the case of the Molotov cocktail threat, the NMPHC assessed the toxic gas and second degree burns hazards as serious and the oxygen deficiency hazard as medium.

10. (U) Page 7, para 2 (Critical). Recommend paragraph revision. Rationale: The entire paragraph is misleading. The paragraph does not apply the proper context in that these descriptions from the APHC were only hazard severity levels assessed for the toxic gas and oxygen deficiency hazards. Missing from this description is that specific probabilities must be identified for these events in order to arrive at a risk hazard level.

11. (U) Page 7, para 2 (Critical). Recommend paragraph revision. Rationale: The entire paragraph is misleading. The assessments of the AFES live fire test provided by the two independent organizations (NMCPHC and the APHC) were not completely unanimous and contained differences and in some instances contradictory conclusions. For example, the APHC report assessed the test results only in terms of severity level and not the hazard risk. On the other hand, the NMPHC report assessed the severity level, the probability level, and the resulting hazard risk. In addition, the NMPHC report assessed toxic gas results from one of the threats as a serious hazard, whereas the APHC report concluded for the same threat that the results did not exceed Army injury criteria. Members of the SE IPT and Safety IPT analyzed all of the live fire test data and reviewed the independent APHC and NMPHC assessments to develop the final hazard levels in accordance with MIL-STD-882 as documented in the SAR.

12. (U) Page 7, para 2, fourth sentence (Critical). Recommend sentence revision. Rationale: The sentence utilizes the word risk incorrectly. The term risk, in this context, requires both a severity level and probability of occurrence level, which were not provided in the APHC report. The sentence is therefore an incorrect statement.

13. (U) Page 7, "Additional Testing Not Completed to Address Safety Risks" (Critical). Recommend paragraph revision. Rationale: First sentence is not an accurate statement.

Program Manager Medium and Heavy Tactical Vehicles

a. (U) Per the AFES Acquisition Decision Memorandum (ADM) dated 1 Aug 2013, PM MHTV plans to conduct Qualification Test and Evaluation, First Article Testing, and possibly full-scale live fire testing and evaluation to verify performance and quality of any potential hardware changes.

b. (U) Per the AFES ADM the Program Manager was only authorized to procure a minimum quantity of articles to conduct a tailored series of tests that will satisfy testing requirements.

c. (U) Per the AFES ADM, upon completion of favorable testing and assessments, the Program Manager will request a Full Rate Production Decision from the Program Executive Officer to procure 3,500 AFES.

14. (U) Page 7, para 3, last sentence (Substantive). Recommend sentence revision. Rationale: The PM MHTV previously tasked the AFES OEM (Oshkosh) to conduct a feasibility study and investigate options to reduce the impulse noise of the AFES system used in the LVSR (a very similar AFES system as used in the MTVR). The AFES OEM tested five (5) possible modifications and measured the following improvements in noise reduction: (1) Rubber Plug in Nozzle -9 dB, (2) Inline Baffle in Tube -8 dB, (3) Larger Diameter Tube -6 dB, (4) Hose Section in Tube –4 dB, and (5) Extra Formed Bends in Tube - Negligible.

15. (U) Page 8, para 1 (Critical). Recommend paragraph revision. Rationale: The PM MHTV disagrees with the statement that the threshold noise level was incorrectly set at 165 dB. The threshold impulse noise was set at 165 dB in the AFES Performance Specification (dated 11 Jan 2011) because the urgent need statement focused on the use of COTS components and initial market research with OEMs identified that current COTS components could not meet the 140 dB requirement. In addition, this paragraph fails to state that single hearing protection, a requirement discussed in OPNAVINST 5100.23G for impulse noise levels between 140 dB and 165 dB, is already provided to the MTVR crew. In addition, the PM MHTV assessed this as a serious safety hazard in accordance with MIL-STD-882 and formally obtained CD&I General Officer concurrence and PEO LS SES acceptance.

16. ~~(U//FOUO)~~ Page 8, para 2 (Critical). Recommend paragraph revision. Rationale: The PM MHTV disagrees with the statement live fire testing was not adequately planned. An Event Design Plan (EDP) was developed and approved as part of the AFES Performance specification. Detailed AFES test plans were developed by the Aberdeen Test Center (ATC) using standard Test Operating Procedures (including TOP 2-2-614, Toxic Hazards Test for Vehicles and Other Equipment, 31 October 2003). These test plans were approved and signed by PM MHTV leadership. The AFES Test Plan utilized the existing Test Operating Procedure (TOP) recommended by the Aberdeen Test Center for this type of system. The PM MHTV concurred with and utilized all threat configurations recommended by ATC for these tests, including the Molotov cocktail threat. The PM MHTV conducted two Test Readiness Reviews prior to start of AFES testing, capturing risks, meeting minutes, and action items (all previously provided to the IG team).

17. (U) Page 9, para 1 (Critical). Recommend paragraph revision. Rationale:

a. ~~(U//FOUO)~~ First sentence is incorrect. The PM MHTV disagrees with the statement that results from Molotov cocktail events were disregarded. The results from the Molotov cocktail threat were the primary reason for the serious hazard risks associated with the AFES system.

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Program Manager Medium and Heavy Tactical Vehicles

The hazard assessment using the Molotov cocktail threat was documented in the AFES Safety Assessment Report (SAR) Version 1.0, specifically in the Hazard Log (Appendix A).

b. (~~U//FOUO~~) Second and third sentence incorrect. The PM MHTV disagrees with these two sentences because they are an inaccurate description of the discussion. The PM MHTV was (and still is) of the opinion that the size of the Molotov cocktail used as part of the ATC test procedure was excessive. However, the PM MHTV did not change or tailor this threat and used the Molotov cocktail size that was recommended by the ATC. As previously described, the results obtained from the Molotov events were briefed to PM MHTV, CD&I, and PEO LS.

c. (~~U//FOUO~~) Last two sentences. The two sentences are essentially accurate, but suggest the PM MHTV failed to act. The PM MHTV did not have any documentation to warrant a change to the size of the Molotov cocktail, and as such did not investigate conducting additional tests with a reduced size Molotov cocktail.

d. (~~U//FOUO~~)Molotov Cocktail definition change (footnote on page 7). The PM MHTV opinion that the size of the Molotov cocktail was excessive was consistent with the definition provided by the IG team in the discussion draft report provided initially (page 6 foot note of the discussion draft). In that discussion draft, the IG described the Molotov cocktail as a "generic name for different kinds of simple incendiary weapons . . . consisting of a glass bottle partly filled with flammable liquid". The PM MHTV questions the IG's revised definition in this draft report which now describes the Molotov cocktail as "a crude bomb made of a bottle filled with flammable liquid".

e. (~~U//FOUO~~)Last sentence is misleading. The PM MHTV was (and still is) of the opinion that the size of the Molotov used as part of the ATC test procedure was excessive. However, the PM MHTV did not change or tailor this threat and used the Molotov cocktail size that was recommended by the Aberdeen Test Center (ATC) as part of the AFES live fire testing that used TOP 2-2-614, Toxic Hazards Test for Vehicles and Other Equipment, 31 October 2003.

18. (U) Page 9, para 2 (Critical). Recommend paragraph revision. Rationale: Paragraph is incorrect. The PM MHTV disagrees with the statement that the SAR minimized the safety risks associated with the AFES system. All AFES ESOH hazards were identified, tracked, and hazard risks assessed in accordance with MIL-STD-882. Independent assessments of AFES live fire test results were obtained from the Army Public Health Command (APHC) and Navy Marine Corps Public Health Command (NMPHC) and used as part of the overall hazard assessment. A comprehensive AFES SE IPT and Safety IPT team was assembled that included members from the Army (TACOM/TARDEC), Navy(NSWC-Dahlgren), APHC, NMPHC, Marine Corps CD&I, Aberdeen Test Center, Marine Corps Vehicle Engineering and Integration Center (MCVEIC), contractors (SAIC, SURVICE, Oshkosh), PEO LS, and the PMO. Upon completion of AFES testing, the SE IPT and Safety IPT utilized all available sources of injury criteria in order to correlate test results to hazards. This included the criteria taken from the Navy TM - Industrial Hygiene Field Operations and Army criteria taken from the Army Surgeon General report: Fire Survivability Parameters for Combat Vehicles. Members of the SE IPT and Safety IPT analyzed all of the live fire test data and reviewed the independent APHC and NMPHC assessments to develop the final hazard levels in accordance with MIL-STD-882 as documented in the SAR.

Program Manager Medium and Heavy Tactical Vehicles

19. ~~(U//FOUO)~~ Page 10, para 1, second sentence (Critical). Recommend paragraph revision. Rationale: Second sentence is misleading. The PM MHTV disagrees with the generalization in the report that the classification of risks was based on insufficient data for the following reasons:

a. ~~(U//FOUO)~~ For Oxygen deficiency, the NMPHC assessed the hazard as a 2D (Critical-Remote) resulting in a hazard of medium. The APHC assessed the severity as a 2 critical. The AFES SE IPT and Safety IPT used this information to develop the Oxygen deficiency hazard assessment documented in the SAR.

b. ~~(U//FOUO)~~ For second degree burns, the NMPHC assessed the hazard as a 2C (Critical-Occasional) resulting in a hazard of serious. The APHC did not address second degree burns for any of the AFES testing. The AFES SE IPT and Safety IPT used this information to develop the second degree burns hazard assessment documented in the SAR.

c. ~~(U//FOUO)~~ For toxic gas exposure, the NMPHC assessed the hazard as a 2C (Critical-Occasional) resulting in a hazard of serious. The APHC assessed the severity as a 1 Catastrophic. The AFES SE IPT and Safety IPT used this information to develop the toxic gas hazard assessment documented in the SAR.

d. ~~(U//FOUO)~~ Due to the classified nature of specific instances where the Molotov cocktail threat was utilized, the SE IPT and Safety IPT only conducted general discussions regarding Molotov events. However, the PM MHTV has recently received feedback concerning Molotov events from the Marine Corps Intelligence Activity (MCIA).

20. (U) Page 10, para 2 (Critical). Recommend paragraph revision. Rationale: Entire paragraph is both incorrect and misleading. Both the APHC and NMPHC independent assessments were referenced clearly in the SAR and were included as appendices. The following is taken from the AFES SAR Version 1.0, dated September 2012, beginning with the last paragraph on page 24 which states "ATC test results, USAPHC Toxic Gas Review (Appendix C), and NMPHC Health Hazard Assessment (Appendix D) are the primary sources for the Hazard Analysis (Appendix A)." Also from the same SAR, referenced in the Hazard Analysis Log (Appendix A), were the Personnel Injury or Death hazards due to (a) Burns (Hazard ID# 1.02d) and (b) Toxic Gas Exposure (Hazard ID# 1.06a). Both of these hazards reference the assessments provided by the APHC and the NMPHC.

21. ~~(U//FOUO)~~ Page 10, para 2, last sentence (Critical). Recommend paragraph revision. Rationale: Sentence is misleading. The NMCPHC reviewed all AFES test results and provided a hazard assessment for all test configurations, including the Molotov threat. Their report does question the accuracy of the Molotov data; however, the NMCPHC did in fact document a hazard level for each threat. In the case of the Molotov cocktail threat, the NMPHC assessed the toxic gas and second degree burns hazards as serious and the oxygen deficiency hazard as medium.

22. (U) Page 10, para 2, last sentence (Critical). Recommend paragraph revision. Rationale: Sentence is misleading. Members of the SE IPT and Safety IPT analyzed all of the live fire test data and reviewed the independent APHC and NMPHC assessments to develop the final hazard levels in accordance with MIL-STD-882. MIL-STD-882 provides general definitions that can be used. Note that the statistical numbers were removed in latest revision (MIL-STD-882E), in favor of only general definitions of probability of occurrence.

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Program Manager Medium and Heavy Tactical Vehicles

23. (U) Page 10, para 3 (Critical). Recommend paragraph revision. Rationale: Paragraph is incomplete and misleading. The assessments of the AFES live fire test provided by the two independent organizations (NMCPHC and the APHC) were not completely unanimous and contained differences and in some instances contradictory conclusions. For example, the APHC report assessed the test results only in terms of severity level and not the hazard risk. On the other hand, the NMPHC report assessed the severity level, the probability level, and the resulting hazard risk. In addition, the NMPHC report assessed toxic gas results from one of the threats as a serious hazard, whereas the APHC report concluded for the same threat that the results did not exceed Army injury criteria. Members of the SE IPT and Safety IPT analyzed all of the live fire test data and reviewed the independent APHC and NMPHC assessments to develop the final hazard levels in accordance with MIL-STD-882 as documented in the SAR.

24. (U) Page 10, para 4 (Critical). Recommend paragraph revision. Rationale:

a. ~~(U//FOUO)~~ First sentence. This statement is one sided and is based on the assertion that the hazard identified by the NMCPHS for the Molotov threat was not sufficiently accurate. The NMCPHC reviewed all AFES test results and provided a hazard assessment for all test configurations, including the Molotov threat. Their report does question the accuracy of the Molotov data; however, the NMCPHC did in fact document a hazard level for each threat. In the case of the Molotov cocktail threat, the NMPHC assessed the toxic gas and second degree burns hazards as serious and the oxygen deficiency hazard as medium.

b. ~~(U//FOUO)~~ Second sentence. This statement is misleading. The assessments of the AFES live fire test provided by the two independent organizations (NMCPHC and the APHC) were not completely unanimous and contained differences and in some instances contradictory conclusions. For example, the APHC report assessed the test results only in terms of severity level and not the hazard risk. On the other hand, the NMPHC report assessed the severity level, the probability level, and the resulting hazard risk. In addition, the NMPHC report assessed toxic gas results from one of the threats as a serious hazard, whereas the APHC report concluded for the same threat that the results did not exceed Army injury criteria. Members of the SE IPT and Safety IPT analyzed all of the live fire test data and reviewed the independent APHC and NMPHC assessments to develop the final hazard levels in accordance with MIL-STD-882 as documented in the SAR.

25. (U) Page 11, para 1 (Critical). Recommend paragraph revision. Rationale: This statement is misleading. The assessments of the AFES live fire test provided by the two independent organizations (NMCPHC and the APHC) were not completely unanimous and contained differences and in some instances contradictory conclusions. For example, the APHC report assessed the test results only in terms of severity level and not the hazard risk. On the other hand, the NMPHC report assessed the severity level, the probability level, and the resulting hazard risk. In addition, the NMPHC report assessed toxic gas results from one of the threats as a serious hazard, whereas the APHC report concluded for the same threat that the results did not exceed Army injury criteria. Members of the SE IPT and Safety IPT analyzed all of the live fire test data and reviewed the independent APHC and NMPHC assessments to develop the final hazard levels in accordance with MIL-STD-882 as documented in the SAR.

26. (U) Page 11, para 1, third and fifth sentence (Critical). Recommend sentence revision. Rationale: Both statements incorrectly associate hazard risk probability levels with the

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Program Manager Medium and Heavy Tactical Vehicles

probability of generating similar toxic gas levels. The correct use of MIL-STD-882 is to associate the probability level with the probability of the event occurring that then results in the generation of toxic gases. The use of probability in this manner indicates a clear misunderstanding by the IG team as to the proper use of MIL-STD-882.

27. (U) Page 11, para 1, last two sentences (Critical). Recommend paragraph revision. Rationale: The statements are misleading. Members of the SE IPT and Safety IPT analyzed all of the live fire test data and reviewed the independent APHC and NMPHC assessments to develop the final hazard levels in accordance with MIL-STD-882 as documented in the SAR.

28. (U) Page 11, para 2 (Critical). Recommend paragraph revision. Rationale:

a. ~~(U//FOUO)~~ Third sentence is misleading. To state that three of eight FBG tests failed to meet oxygen deficiency criteria is misleading. Paragraph should accurately report the actual test results provided as follows:

(1) ~~(U//FOUO)~~ For the Fire Ball Generator (FBG) threat, there were eight (8) tests, and data was collected at two locations within the cab, for a total of 16 test data points.

(2) ~~(U//FOUO)~~ For the oxygen deficiency hazard, thirteen (13) of the test data points did not exceed the Oxygen injury criteria of 16% and the other three were measured at 15.6%, 15.7% and 15.8%, easily within experimental error. The oxygen deficiency hazard was documented in the SAR per Appendix D (NMPHC report) as a medium hazard and per Appendix C (APHC report) as having a marginal severity level.

b. (U) Third sentence is misleading. To state that seven (7) of the eight (8) FBG tests failed is misleading. Paragraph should accurately report the actual test results provided as follows:

(1) ~~(U//FOUO)~~ For the Fire Ball Generator (FBG) threat, there were eight (8) tests, and data was collected at two locations within the cab, for a total of 16 data points.

(2) (U) For the toxic gas injury, none of the 16 test data points exceeded the required NO levels nor the required Hx levels. CO injury levels were exceeded for 10 of the 16 test data points. The toxic gas hazard was documented in the SAR per Appendix D (NMPHC report) as a serious hazard. The APHC report assessed the toxic gas test data points as not exceeding the injury criteria.

29. ~~(U//FOUO)~~ Page 11, para 3 (Critical). Recommend paragraph revision. Rationale: Entire paragraph is misleading. The PM MHTV disagrees with this characterization of events. CO level is one of over ten various injury related criteria used within the AFES performance specification. The AFES Performance specification (dated 14 Jan 2011) utilized the CO injury criteria level taken from the Navy TM - Industrial Hygiene Field Operations. All AFES test results were evaluated against this criteria and, as described above, resulted in a Serious hazard for CO injury. After all AFES testing was completed, the SE IPT and Safety IPT did in fact evaluate the AFES test results using the Army injury criteria, which was taken from the US Army, Office of the Surgeon General, Memorandum: Fire Survivability Parameters for Combat Vehicle Crewmen. The SE IPT and Safety IPT utilized all available injury criteria in order to assess the AFES live fire test results. Members of the SE IPT and Safety IPT analyzed all of the

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live fire test data and reviewed the independent APHC and NMPHC assessments to develop the final hazard levels in accordance with MIL-STD-882 as documented in the SAR.

30. (~~U//FOUO~~) Page 12, para 1 (Critical). Recommend paragraph revision. Rationale: Entire paragraph is misleading. The paragraph suggests that because this one marginal hazard was not in the AFES hazard database, the PM MHTV "cannot verify that an effective system safety effort is in place". Again, for the FBG threat, there were 16 test data points. Thirteen (13) of the test data points did not exceed the Oxygen injury criteria of 16% and the other three were measured at 15.6%, 15.7% and 15.8%, easily within experimental error. The PM MHTV agrees that this Marginal hazard should be part of the AFES hazard database, but does not agree that its absence is reason to believe that an effective system safety effort is not in place.

31. (U) Page 13, para 1 (Critical). Recommend paragraph revision. Rationale: The PM MHTV completely disagrees with the assertion that the toxic gas safety risk was understated. The AFES SE IPT and Safety IPT, consisting of members from the Army (TACOM/TARDEC), Navy(NSWC-Dahlgren), APHC, NMPHC, Marine Corps CD&I, Aberdeen Test Center, Marine Corps Vehicle Engineering and Integration Center (MCVEIC), contractors (SAIC, SURVICE, Oshkosh), PEO LS, and PM MHTV, openly discussed the AFES test results and SAR hazard assessments. The PM MHTV solicited an independent review of the AFES live fire test results from both the Army Public Health Command (APHC) and Navy/Marine Corps Public Health Command (NMPHC). The assessments provided by these two organizations contained differences and in some instances contradictory conclusions. For example, the APHC report assessed the test results only in terms of severity level and not the hazard risk. On the other hand, the NMPHC report assessed the severity level, the probability level, and the resulting hazard risk. In addition, the NMPHC report assessed toxic gas results from one of the threats as a serious hazard, whereas the APHC report concluded for the same threat that the results did not exceed Army injury criteria. Members of the AFES SE IPT and Safety IPT analyzed all of the live fire test results and reviewed the independent APHC and NMPHC assessments to develop the final hazard levels in accordance with MIL-STD-882 as documented in the SAR.

32. (U) Page 13, para 2, first sentence (Critical). Recommend paragraph revision. Rationale: The PM MHTV completely disagrees with the assertion that the PM MHTV did not include pertinent information from the independent evaluations of the APHC and NMCPHC, which support the SAR, in an effort to keep the risk acceptance at the PEO level and avoid potential program delays. Both the APHC and NMPHC independent assessments were referenced clearly in the SAR and were included as appendices. The following is taken from the AFES SAR Version 1.0, dated September 2012, beginning with the last paragraph on page 24 which states "ATC test results, USAPHC Toxic Gas Review (Appendix C), and NMPHC Health Hazard Assessment (Appendix D) are the primary sources for the Hazard Analysis (Appendix A)." Also from the same SAR, referenced in the Hazard Analysis Log (Appendix A) were the Personnel Injury or Death hazards due to (a) Burns (Hazard ID# 1.02d) and (b) Toxic Gas Exposure (Hazard ID# 1.06a). Both of these hazards reference the assessments provided by the APHC and the NMPHC.

33. (U) Page 13, para 2, second sentence (Critical). Recommend paragraph revision. Rationale: The PM MHTV contends there is no basis for this recommendation. As described in the above comments, PM MHTV implemented a robust systems engineering process to provide for the effective and efficient development of the AFES system to fulfill an urgent requirement.

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Supporting this claim are the following actions that were taken by PM MHTV during the development of the AFES system:

a. (U) A Systems Engineering IPT (SE IPT) and Safety IPT was established and included subject matter experts from the Army (TACOM/TARDEC), Navy(NSWC-Dahlgren), APHC, NMPHC, Marine Corps CD&I, Aberdeen Test Center, Marine Corps Vehicle Engineering and Integration Center (MCVEIC), contractors (SAIC, SURVICE, Oshkosh), PEO LS, and PM MHTV. Meeting minutes, actions items, and attendees were documented and staffed.

b. (~~U//FOUO~~) The AFES Performance Specification developed by the SE IPT (dated 11 Jan 2011) was used for the entire development of the urgent capability (initial system). The AFES Performance Specification was updated (dated 31 Jan 2012) after development of the initial system, in preparation for procurement of the follow-on (non-urgent) system.

c. (U) A Safety IPT was established, utilizing a Principal For Safety (PFS) with direct reporting authority to the PM. An AFES hazard database was developed and used to formally identify, track, and assess ESOH hazards.

d. (U) Two Critical Design Reviews were conducted, both with a PMO independent co-chairman from the Marine Corps Vehicle Integration and Engineering Center (MCVEIC).

e. (U) Detailed AFES test plans were developed by the Aberdeen Test Center (ATC) using standard Test Operating Procedures (including TOP 2-2-614, Toxic Hazards Test for Vehicles and Other Equipment, 31 October 2003). These plans were formally approved by PM MHTV leadership.

f. (U) Two Test Readiness Reviews were conducted prior to the start of AFES testing, capturing risks, meeting minutes, and action items.

g. (U) AFES live fire test results were provided to both the Navy Marine Corps Public Health Command and the Army Public Health Command for an independent review and assessment.

h. (U) A Safety Assessment Report (SAR) was developed and approved by PM MHTV leadership identifying all ESOH issues and hazard risks; a formal safety release was obtained from MCSC-00T. The SAR included as appendices both independent assessments from the APHC and the NMPHC, including specific language from these reports in the SAR hazard database. Hazard assessments and all hazard risks were identified and assessed in accordance with MIL-STD-882.

i. (U) AFES test results and hazard risks were briefed to CD&I and PEO LS; formal user concurrence was obtained from CD&I and risk acceptance obtained from PEO LS, all in accordance with MIL-STD-882. The PEO LS risk acceptance stated that the life saving benefits to Marines far outweighs the inherent risks.

Acronyms and Abbreviations

AFES	Automatic Fire Extinguishing System
ESOH	Environmental, Safety, and Occupational Health
HHA	Health Hazard Assessment
IPT	Integrated Product Team
MTVR	Medium Tactical Vehicle Replacement
NMCPHC	Navy and Marine Corps Public Health Center
PM MHTV	Program Manager Medium and Heavy Tactical Vehicles
SAR	Safety Assessment Report

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