



## Army Expeditionary Warrior Experiment 2016

PowerPot Canteen Cup

Technology Assessment

05 October 2015—19 February 2016

Battle Lab Report # 346

### AEWE 2016



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## I. EXPERIMENT OVERVIEW

**A. Introduction.** The Maneuver Center of Excellence (MCoE) hosted Training and Doctrine Command's (TRADOC) Army Expeditionary Warrior Experiment (AEWE) 2016 from October 2015-February 2016. AEWE is the Army's live, prototype experiment campaign focused on the Soldier and small unit. AEWE supports the Joint Capabilities Integration Development System (JCIDS) process with early prototype analysis. It is complimentary to other events in the campaign of learning and supports Force 2025 Maneuver objectives. The experiment was supported by ARCIC, all TRADOC Centers of Excellence, the Army Test and Evaluation Command, the Research, Development, and Engineering Command, the Army Material Systems Analysis Activity (AMSAA), the Army Research Institute, and the Joint Deployable Analysis Team.

**B. Purpose.** AEWE provides operational insights on experiment objectives by integrating prototype capabilities into an operational environment. These insights are leveraged to enhance the capabilities and effectiveness of the current force, contribute to future force interoperability and effectiveness, and to inform Brigade Combat Team (BCT) modernization efforts. Additionally, AEWE serves as a venue to provide capability developers, the Science and Technology (S&T) community, and industry a repeatable, credible, rigorous, and validated operational experiment venue to support both concept and materiel development. This technology assessment is intended to inform the Army, S&T community and vendor partners on the performance of systems.

**C. System Description.** The PowerPot Canteen Cup is a thermoelectric power generator integrated with a canteen cup. The dual purpose system is designed to serve as a canteen cup and is capable of producing 5 to 50 Watts of emergency power to Soldiers in austere environments. The system consists of the PowerPot Canteen Cup and power regulator with Universal Serial Bus (USB) output (Figure 1).



**Figure 1, PowerPot Canteen Cup**

## II. METHODOLOGY

**A. Experiment Objectives.** The TRADOC Centers of Excellence collaborated to develop five experiment objectives. The objectives are linked to the Army Warfighting Challenges (AWfC) and include the following five functional areas: situational understanding, small unit sustainment, mission command, lethality, and protection and mobility. The five overarching experiment objectives for AEWE 2016 are:

- **How do we improve the small unit's ability to develop and sustain a high degree of situational understanding while operating in complex environments? (Linked to AWfC 1)**
- **How can we improve small unit sustainment to maintain freedom of movement and action during sustained and high tempo operations at the end of extended lines of communication in austere environments? (Linked to AWfC 16)**
- **How can we facilitate effective command post operations, information gathering and intelligence fusion at the company level? (Linked to AWfC 1)**
- **How can we enhance air-ground operations to conduct forcible entry and transition rapidly to offensive operations to ensure access, seize the initiative and defeat the enemy in close combat? (Linked to AWfC 11, 12, 13, 15)**
- **How can we improve protection and mobility at the Soldier and small unit level in a way that contributes to operational maneuverability with improved survivability? (Linked to AWfC 12, 13, 15)**

Nested within the objectives were assessments of forty-five concepts and capabilities that were nominated by both government and industry partners. To ensure the concepts and capabilities informed the objectives, the MCoE required each vendor and government sponsor to provide three objectives for each technology. These five experiment and technology objectives were decomposed into a data source matrix consisting of Essential Elements of Analysis (EEAs), Measures of Performance (MoPs), and Measures of Effectiveness (MoEs). This matrix identified data requirements and served as the basis for both data collection and analysis planning.

## B. Design.

**1) Personnel and Organization.** The MBL provided overarching Mission Command through the coordinated actions of the White Cell, Analysis Cell and Red Cell which provided a realistic environment for the Soldiers and enabled positive experimental control. AEWE's Experimental Force (EXFOR) consisted of a battalion (BN) Headquarters (HQ), a reconnaissance section, an Infantry company HQ, U.S. Infantry platoon, a United Kingdom (U.K.) platoon, and a third platoon portrayed in constructive simulation (Figure 2). The EXFOR was augmented by a platoon from the U.K.'s Three Rifles Regiment and two Military Intelligence noncommissioned officers from the ICoE. The Infantry Company HQ controlled both live and simulated Infantry platoons. The BN controlled the reconnaissance section whose missions supported the EXFOR's maneuver. AEWE's Opposing Forces (OPFOR) consisted of a platoon from the Third Infantry Division, which replicated the TRADOC Threat Emulation Force (TEFOR) G2 developed and approved, Decisive Action Training Environment and Hybrid threat. The OPFOR platoon fielded advanced technologies such as Soldier Borne Sensors, advanced camouflage, and dismounted direction finding equipment.

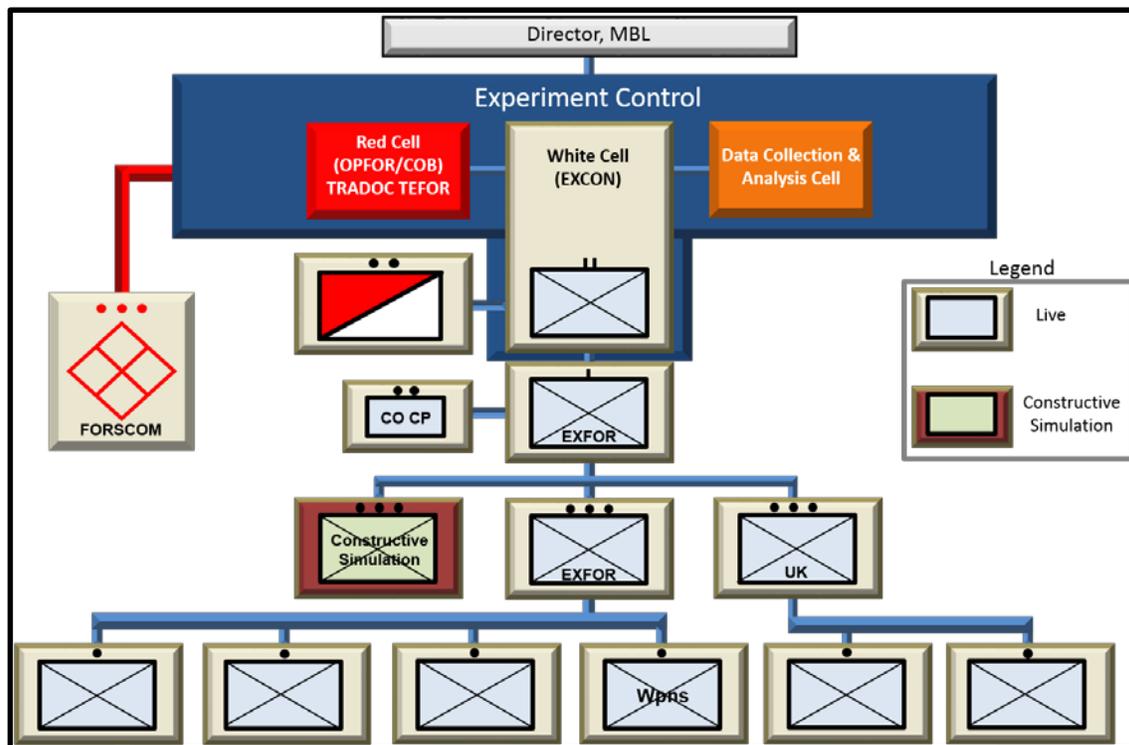


Figure 2, Experiment Organization

**2) Construct.** AEWE 2016 was a live prototype experiment comprised of three distinct phases, each designed to examine the five overarching experiment objectives. The Live Fire Exercise (LFX) phase took place from 06 – 19 October and assessed capabilities that required a live fire venue. The Non-Networked Assessment phase

occurred from 19 October – 19 November 2016 and assessed technologies that did not require a tactical network for assessment. AEWE 2016 culminated with a three week Force-on-Force (FoF) phase, 08 – 19 February 2016, consisting of three pilot missions, and two 72 hour continuous operations experimental cases. The mission cases were designed to provide the operational environment necessary to investigate the issues and exercise the participating technologies. Typical mission types in AEWE 2016 were Attack, Defend, Ambush, and Reconnaissance. Vendors provided technology specific New Equipment Training (NET) to ensure Soldiers were proficient in the employment of the technology. Soldiers utilized the technologies during their collective training prior to execution.

**3) Data Collection.** The MBL analysis team led, coordinated and managed all aspects of data collection planning and execution. This team included members from multiple participating agencies including AMSAA, Intelligence Center of Excellence (ICoE), Cyber Center of Excellence (CCoE) and Subject Matter Experts (SMEs) from the MCoE and ICoE who participated as data collectors. The analysis team collected data through various methodologies to include observations from SMEs, surveys, After Action Reviews, focused interviews, group interviews and experiment excursions designed for a particular capability that could not be addressed during tactical operations.

**4) Technology Specific Methodology.** AEWE assessed the PowerPot Canteen Cup during the Non-Networked Assessment Phase. Soldiers participated in Classroom training then conducted a hands-on practical exercise which required them to employ the canteen cup and charge a Nett Warrior End User Device (EUD). The AEWE analysis team surveyed the Soldiers upon completion of the practical exercise focusing on ease of use and military utility.

### III. SUMMARY

#### A. Findings.

**1) Ease of Use.** All of the Soldiers were able to set up and use the system to charge the Nett Warrior EUD. All 36 Soldiers surveyed reported the system was easy to use.

#### **Soldier Comments on Ease of Use.**

*“VERY SIMPLE”*

*“Very simple and user-friendly.”*

*“Very intuitive”*

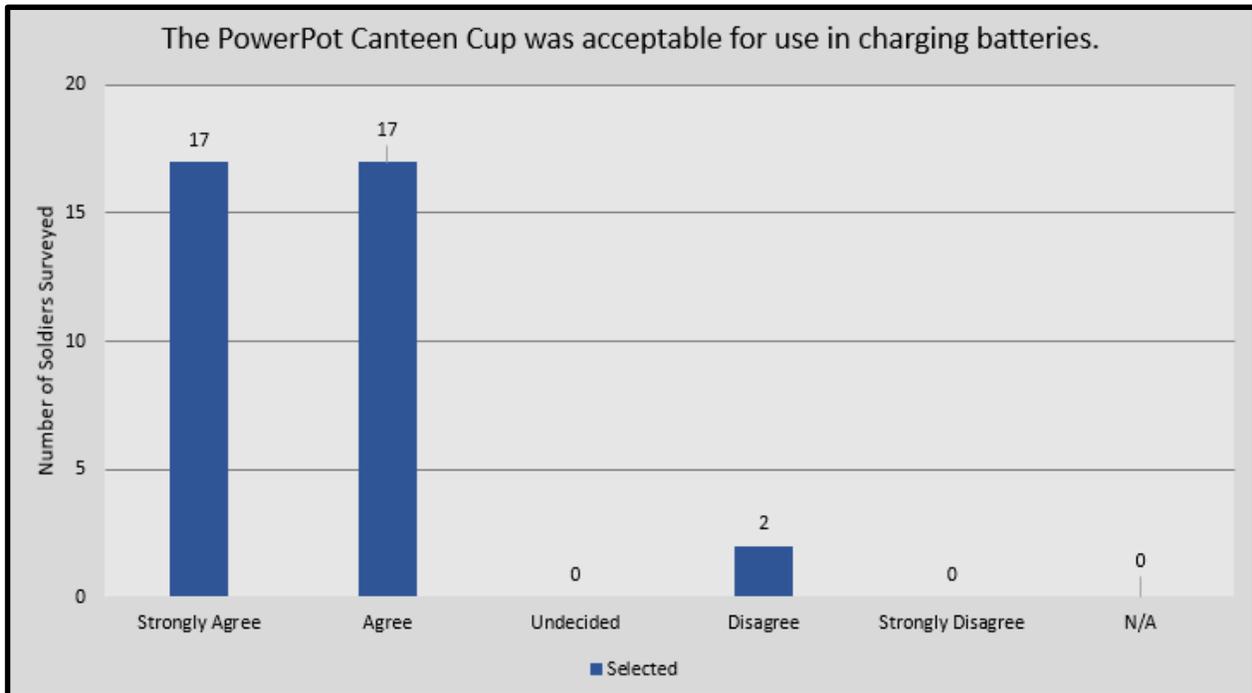
*“I found the canteen a really basic setup which makes it available for a wider range of people.”*

*“Very easy to use, as long as you can plug in a USB and know how to cook food.”*

*“Yes, like I said above the technology is designed from equipment that we are already familiar with, so it’s nothing new and can be used liked any other piece of cooking equipment.”*

**2) Military Utility.** To assess the military utility of the system, AEWE assessed the effectiveness and asked Soldiers to rate the utility of the system.

**a) Effectiveness.** The PowerPot Canteen Cup provided approximately 5% charge to the Nett Warrior EUD with twelve minutes of charging time. In addition the system provided power to a strand of LED lights with no issues. 34 of the 36 Soldiers agreed the PowerPot Canteen Sup was acceptable for use in charging batteries (Figure 3).



**Figure 3, Soldier Ratings on Acceptability**

**Soldier Comments on acceptability in charging batteries.**

*“It was acceptable should you have the required heat source and water.”*

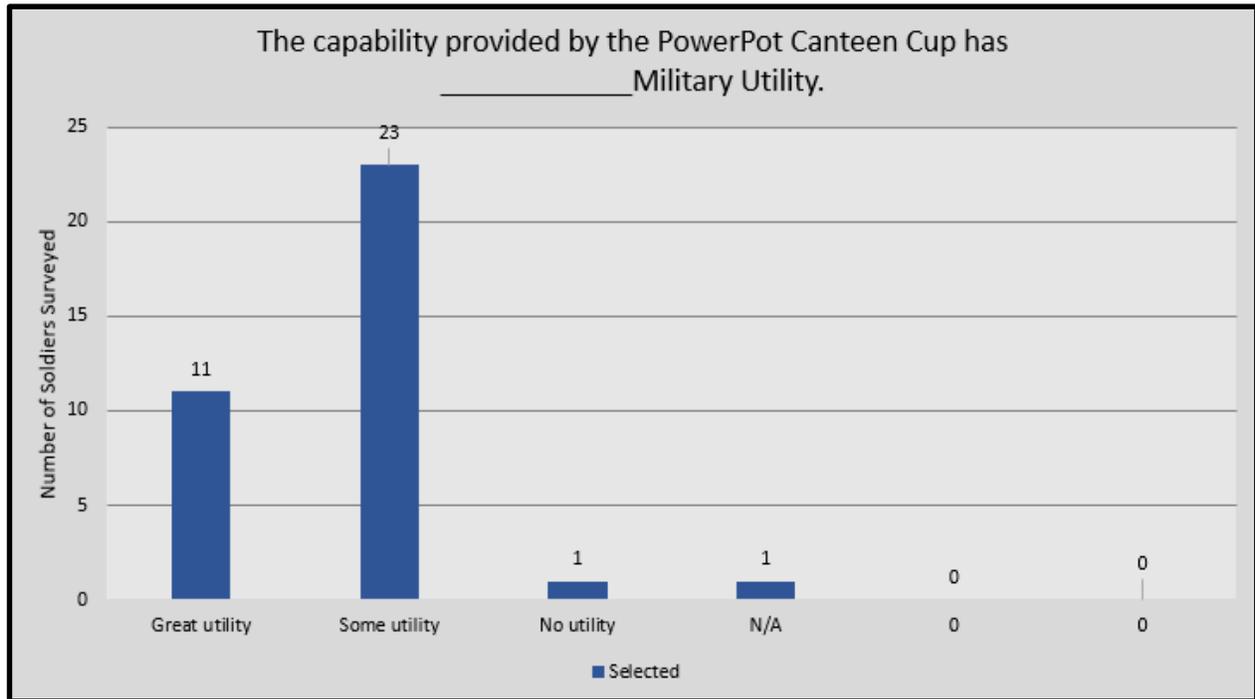
*“Would take to long to charge a battery to full, good for a quick boost”*

*“Charged roughly 5% in 12 mins, so you would get 2% off of one use if you where making a hot drink.”*

*“Yes the powerpot canteen cup is acceptable for charging batteries; However the amount of time an infantry soldier spends cooking or heating water is not great so not much charge would be able to be generated within a soldiers working day in the field. But a great idea for emergencies.”*

*“Given that the cooking pot is able to charge a device at the same speed as a output on a wall, it is more than adequate in its ability.”*

**b) Soldier Ratings on Military Utility.** 34 of the 36 Soldiers felt the PowerPot Canteen Cup has military utility (Figure 4).



**Figure 4, Soldier Ratings on Military Utility**

**Soldier Comments on the PowerPot Canteen’s Military Utility.**

*“The powerpot could be used to charge GPS devices or similar.”*

*“Would work to charge phones for net warrior as well as possibly conformals.”*

*“The powerpot has great use but would only be used as an emergency from a military aspect.”*

*“I like that it can charge our EUD but without our rifleman radio or 155 radio we cant send data to each other so would like the capability for the powerpot canteen to charge those as well and charge faster would be better.”*

*“Every soldiers wants to eat hot food, so why not be able to charge electronic devices while you wait. Id happily purchase one of these pots for in the field.”*

*“It is multipurposeful and when heating your water you can do multi task by charging batteries.”*

*“Some use with the net warrior and can be expanded for camera batteries*

*“The power pot would be a lot more usefull if it could charge other batteries like radio batteries”*

*“Good for an emergency and a back up. If I was to be issued it I would be happy because I could charge my devices while making a brew, however if I had to purchase it myself I would'nt pay the retail price.”*

*The capability for a military environment is useful but only as a back up or in an emergency as the power output is not great and as a soldier does not cook or boil water for very long each day there would not be enoigh power generated to charge the battery fully”*

*“The PowerPot canteen cup would have the most utility to charge small devices like handheld GPS, watches and cameras. Even if the tech fails you still have a canteen cup.”*

**B. Summary.** The PowerPot Canteen Cup was easy to use and well received by Soldiers. The system proved capable of providing a quick charge to the Nett Warrior EUD and functioned as a canteen with no issues.

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## **IV. APPENDICES**

### **Appendix A. Terms and Abbreviations**

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## Terms & Abbreviations

AC	Alternating Current
AEWE	Army Expeditionary Warrior Experiment
AMSAA	Army Materiel Systems Analysis Activity
ARCIC	Army Capabilities Integration Center
ARDEC	US Army Research Development and Engineering Command
ARI	Army Research Institute
ARL	Army Research Lab
ATEC	Army Test and Evaluation Command
AWfC	Army Warfighting Challenge
BCT	Brigade Combat Team
Bn	Battalion
CCoE	Cyber Center of Excellence
CoE	Center of Excellence
DC	Direct Current
EEA	Essential Elements of Analysis
EXFOR	Experimentation Force
FoF	Force-on-Force
ICoE	Intelligence Center of Excellence

JCIDS	Joint Capabilities Integration Development System
JDAT	Joint Deployable Analysis Team
LFX	Live Fire Exercise
LOE	Limited Objective Experiment
MBL	Maneuver Battle Lab
MoEs	Measures of Effectiveness
MoPs	Measures of Performance
NATO	North Atlantic Treaty Organization
NEMA	National Electrical Manufacturers Association
NET	New Equipment Training
OPFOR	Opposing Forces
PEO	Program Executive Office
RDEC	Research Development and Engineering Command
SME	Subject Matter Expert
S&T	Science and Technology
TDA	Tables of Distribution and Allowances
TRADOC	Training and Doctrine Command
TEFOR	Threat Emulation Force
U.K.	United Kingdom
U.S.	United States
USB	Universal Serial Bus
W	Watt

