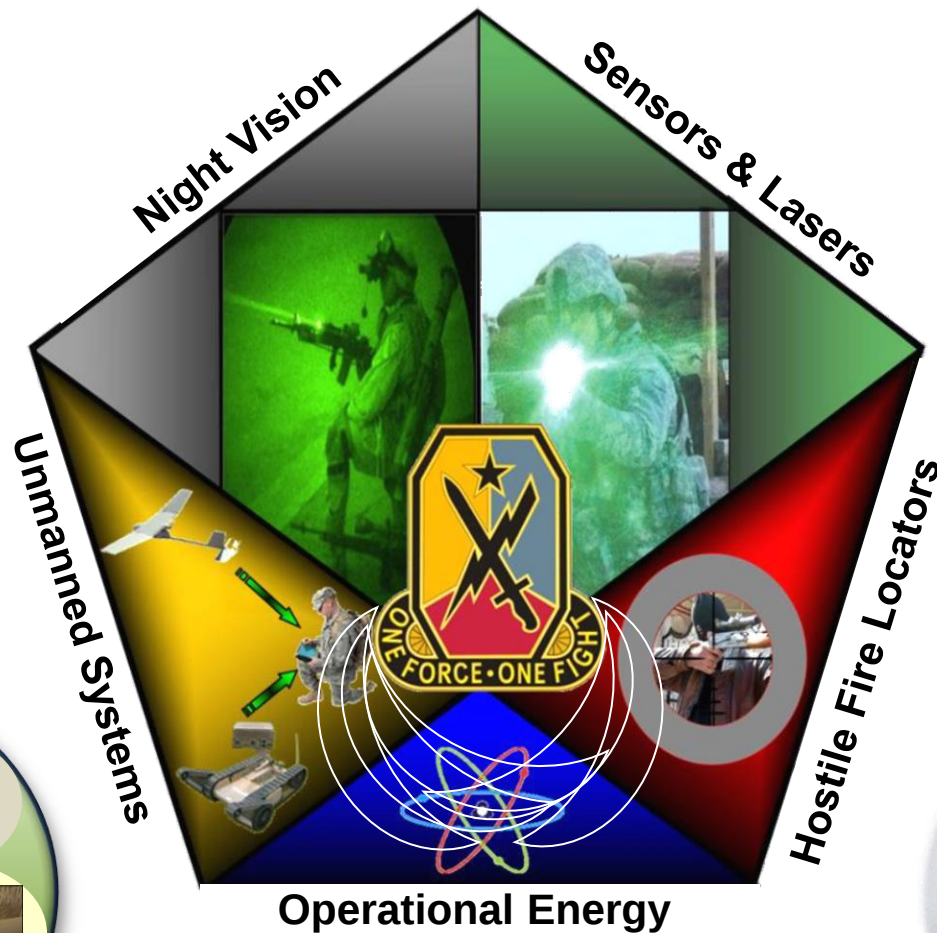




Electronics and Special Development Branch (ESDB)



Fort Benning, Home of the MCoE





ESDB Branch Overview



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- **SD and ESD Mission Statement**
- **ESD Key Tasks**
- **Branch Organization**
- **Community of Interest/Stakeholders**
- **Teams**
 - **Night Vision Sensors and Lasers (NVSL)**
 - **Operational Energy – Small Unit Power (OE)**
 - **Robotics and Autonomous Systems (UMS/RAS)**
- **Questions**



Mission Statement



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Soldier Division Mission Statement

Soldier Division develops future requirements and manages Soldier capabilities for all Soldiers across the DOTMLPF domains, in all formations, with a primary focus on Maneuver Brigade Combat Teams and Squads, in order to strengthen America's Force of Decisive Action and provide the Army with the best trained and capable Soldiers in the world.

ESDB Mission Statement

ESDB develops future requirements and manages Electronics and Specialized capabilities for all Soldiers across all DOTMLPF domains, for all formations, with a primary focus of providing Maneuver Brigade Combat Teams and Squads with Soldier-borne night vision devices, Soldier-borne thermal devices, sensors, lasers, Ground Robotics, Unmanned Aircraft and Small Unit Power/Operational Energy.

Fully integrated solutions to optimize system performance



ESDB Key Tasks



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- Develop and staff Joint Capabilities Integration Development System (JCIDS) documents for emerging requirements
- Determine requirements based on gap analysis and by maintaining contact with Soldiers, Industry and Academia
- Support materiel solutions development through integration with experimentation, Test and Evaluation (T&E), Basis of Issue (BOI) development, fielding and source selection of all systems

Fully integrated solutions to optimize system performance

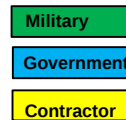
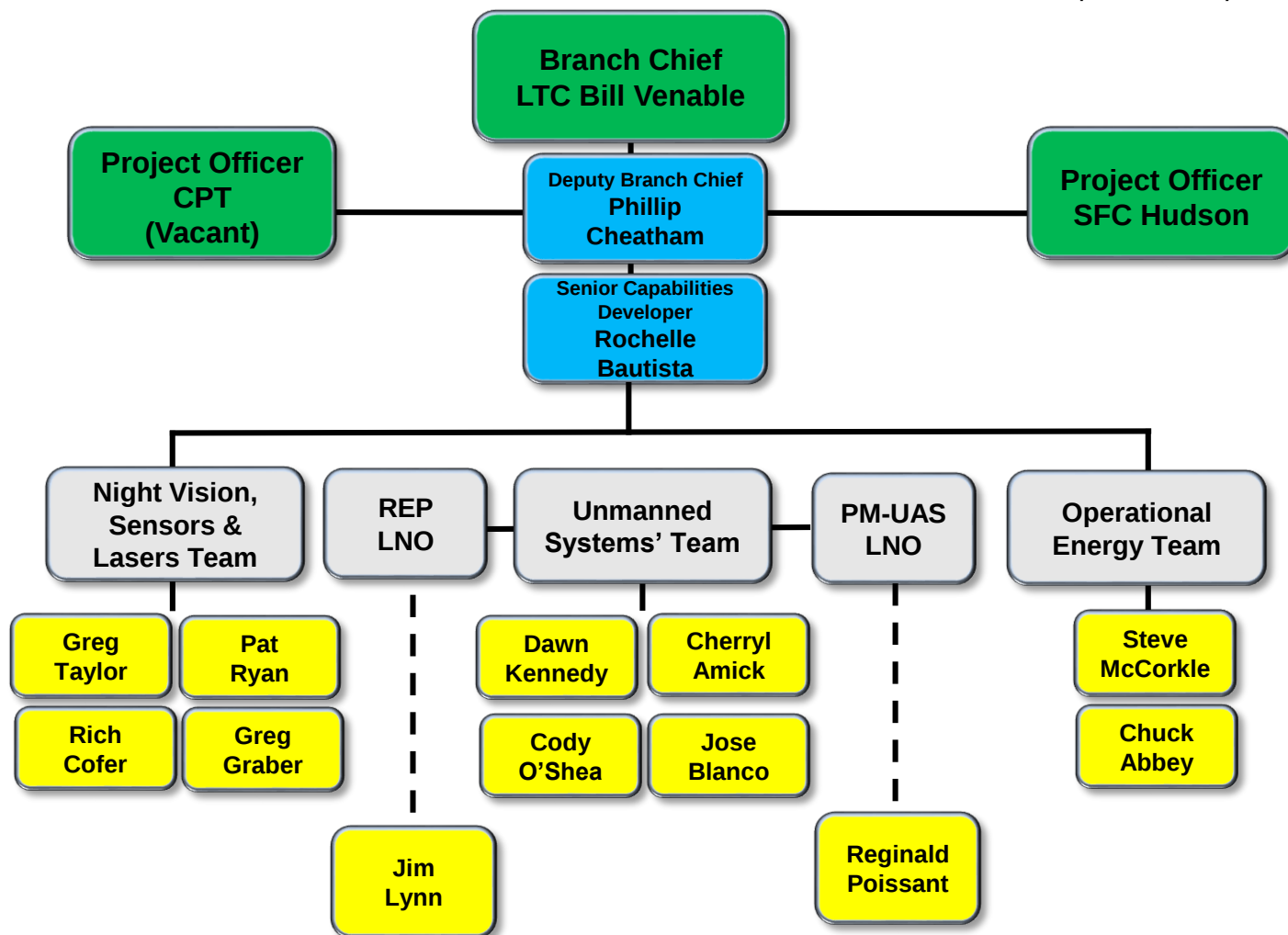


ESDB Organization

Fort Benning, Home of the



Capabilities Development & Integration Directorate





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Robotics & Autonomous Systems (RAS) Industry Day Brief

LTC Bill Venable

Branch Chief, ESDB

Soldier Division

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Agenda



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- **Ground Capabilities:**
 - **Small Unit Ground Robotic Systems (BN and Below)**
 - **Universal Controller**
 - **Unattended Ground Sensors (UGS)**
- **Air Capabilities:**
 - **Short Range Micro (SRM)**
 - **Soldier Borne Sensor (SBS)**
- **Robotics Enhancement Program (REP)**



Dismounted Robotic & Autonomous Systems

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MRAS ICD



Near Term Dismounted Systems

Common Robotic System-Individual (CRS (I))
 Universal Controller (UC)
 Soldier Borne Sensor (SBS)
 Squad Multipurpose Equipment Transport (SMET)
 Short-Range Micro (SRM) UAS
 Light Reconnaissance Robot (LR 2)

Mid Term Dismounted Systems

Leader-Follower Applique
 Lethal and modular payload development
 UAS Swarming and data sharing
 Expendable Ground Sensors
 SMET Increment II
 Manned/Unmanned Teaming and collaboration

Far Term Systems

Bipedal / Quadruped UGS
 Soldier Exoskeleton
 Autonomous Applique kit
 Hands Free control / Heads up Display
 Artificial Intelligence
 Heavy-Fuel Cell

Near-Term (Current thru FY25)

- Increase situational awareness
- Improve platform mobility in complex terrain
- Lighten the Soldier load
- Improve sustainment through Automated Ground Resupply
- Facilitate movement and maneuver
- Protect the force at increased standoff distances

Mid-Term (FY25 – FY35)

- Swarming unmanned aircraft
- Introduce exoskeleton technology
- Improve the autonomy of unmanned ground systems
- Advanced payloads for ground and air platforms
- Improved unmanned ground radios and PNT

Far-Term (FY35 and Beyond)

- Increase situational awareness with autonomous reconnaissance systems.
- Support dismount with true all-terrain unmanned ground systems
- Facilitate maneuver with unmanned combat vehicles
- Increase persistence of unmanned platforms

How Industry Can Help

- Inform requirements community on technology advancements
- Improve day/night optical sensors
- Improve mobility of platforms for all terrain
- Improve autonomous behaviors and algorithms (voice commands, aided cognition, obstacle avoidance)
- Establish common robotic system architecture

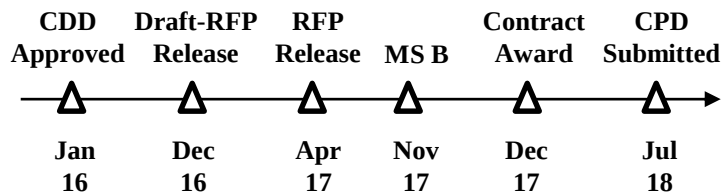
- Improve autonomous behaviors and artificial intelligence
- Improve common robotic architectural framework and interfaces
- Further miniaturization of sensor, radios, & PNT
- Enhance jam-resistance and security of comms
- Develop GPS-denied positioning

- Develop payloads to meet mission requirements
- Smart antennas / Phased arrays
- Dynamic gait and terrain classification
- Advanced power sources
- Limited Artificial Intelligence to aid human decision making

Common Robotic System (Individual)

- Small common robotic platform that can provide the Warfighter with enhanced situational awareness during combat operations, and a standoff capability in urban terrain enabling accurate reconnaissance, detection and acquisition of targets of interest
- Common robotic system that can replace the MC ESR and SUGV Inc 2
- System weight must not exceed 25 lbs (includes a universal controller, the robotic platform chassis, communications, and power)
- Platform must be capable of carrying/interfacing with numerous Payloads and Sensors
- CDD approved JAN 16

Schedule



Example Solutions



Light Reconnaissance Robot (LR2)

- Compact, lightweight, mobile, throw-able, multi-mission Unmanned Ground System.
- Free soldiers from direct exposure to a multitude of lethal threats across a host of common squad-level mission sets.
- Provide soldiers with the standoff distance required to safely investigate threats.
- Develops situational awareness through persistent observation and investigation of target areas and confined spaces such as culverts, rooms, and under vehicles.
- CPD in development

Example Solutions





Squad Multipurpose Equipment Transport (SMET)



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- Unmanned/Optionally Manned Ground System supporting small unit dismounted operations for 72 hour missions.
- Increases small unit ability to maintain momentum during dismounted tactical operations by offloading up to 1000 lbs from Soldiers.
- Generates power to swap and recharge radio and other batteries to support dispersed operations.
- Deployable with current platforms and methods supporting dismounted Infantry: sling-load, internal-load, air-drop, towable at convoy speeds.
- Directed Requirement with down select for limited fielding to 3 IBCTs.

Example Solutions



- Must provide ability to achieve and maintain active and/or passive control of any current Army and Marine Corps PoR battalion and below level Unmanned (Air or Ground) System (UxS) and/or their respective payloads
- Hardware, software and radio agnostic
- Reduces Training, Logistics Tail and Cost of future robotics
- Adds commonality of Battalion and below controllers
- Interoperable with GFE software
- Requirements currently in CRS (I) CDD. Separate CPD for UC in development.
- Expect approved UC CPD 1QFY18

Example Solutions





Unattended Ground Sensors



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- Expendable ground sensor capable of detecting and classifying mounted and dismounted traffic in all environments.
- Individual sensors must not exceed 8 ounces and be capable of sending alerts to existing C2 systems.
- Capable of operating up to 6 months without replacing power source.
- Capable of communicating with Army network (provides ability to send intrusion data to radios, Army Battle Command Systems, and Nett Warrior), current Unmanned Aircraft Systems and Unmanned Ground Systems.
- Must provide Line of Sight, Non-Line of Sight and Beyond Line of Sight communications capability.
- Two Variants: Lethal and Non-Lethal
- CDD in development



Family of SUAS Overview



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Battalion/Company

Organic airborne reconnaissance and surveillance system providing day/night situational awareness to maneuver commanders.

- Recon and security
- Counter rocket and mortar
- Long endurance surveillance



Long Range Reconnaissance Surveillance (LRRS)

**Puma
RQ-20A**

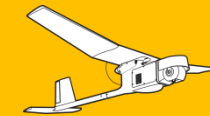
- 15 lbs
- 10km range
- 2.5 hrs flight



Company/Platoon

Organic airborne reconnaissance and surveillance system providing day/night situational awareness to maneuver elements.

- Recon and security
- Counter rocket and mortar



Medium Range Mobile (MRM)

**Raven
RQ-11B**

- 4.5 lbs
- 10km range
- 1.5 hr flight



Platoon

Organic small form factor sensor providing real time surveillance and situational awareness support to maneuver squads.

- Recon and security
- Persistent surveillance (Hover/Perch and Stare)
- IED interrogation
- Bridge/culvert inspection

RDTE FY 17/18
Field FY 19??



(System Not Selected)



Short Range Micro (SRM)

- 3 lbs
- 30 minutes flight
- 60 minutes perch & stare

PEO Soldier

Squad/Team

Provides the small unit the organic capability to perform Beyond Visual Line-Of-Sight (BLOS) RSTA with payloads such as Full Motion Video.

- Exceptionally small form factor
- Intuitive operation; minimal training
- "Over the wall/around the corner" employment



(System Not Selected)

Soldier Borne Sensor

- ~3 ounces
- 500 meters
- 20 minutes

Command and Control/Dissemination

Provides the operators with a full function ground control station capable of controlling current and future UAS, SBS, and other robotics.



**SUAS Tactical Open Government
Architecture (TOGA) Controller**

- Small form factor/low weight and power

- Platoon level SUAS which provides the Warfighter enhanced situational awareness and a standoff capability in urban and complex terrain enabling accurate reconnaissance, detection and acquisition of targets of interest
- It will enhance the current Small UAS by adding a “hover & stare” and “perch & stare” platform to the currently fielded Raven
- Aircraft will weigh 5 lbs or less, have a range of 5km with an endurance of 1hr (System will consist of a universal controller, advanced sensors/mission modules/payloads, and power.

Supports the following tasks:

- Remotely provide reconnaissance capability in a complex battlespace (urban and mountainous terrain)
 - Remotely hover and stare in dead space and other hard to see areas
 - Remotely perch and stare on rooftops and other structure to conduct surveillance
 - Remotely detect IEDs ahead of convoys under bridges/overpasses and along routes
 - Provide Sensor to Shooter information
 - Remotely detect CBRN
- RPUAS CPD approved NOV 13

Example Solutions



Solider Borne Sensor (SBS)

- Force Protection at the Squad and/or Small Unit level often leaves Soldiers exposed while they enter and move thru their surroundings. As a result, the need exists to improve situational awareness and small unit effectiveness thru the development of advanced Intelligence, Surveillance, and reconnaissance (ISR) capabilities that are organic to the Squad, preventing tactical surprise.
- The Squad requires a miniature highly maneuverable airborne sensor with a low visual and acoustic signature to support pre-planned and ad-hoc reconnaissance missions that will serve to reduce risk to Soldiers.
- CPD approved JAN 17 and published.

Example Solutions





Robotic Enhancement Program (REP)



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- REP institutionalizes a process that enables the Army to quickly purchase and evaluate small quantities of emerging state-of-the-art robotic solutions
- REP uses Buy, Try and Inform methodology
- Submission review/approval is semi-annual in February and September
- Anyone can submit proposals at <http://www.peocscss.army.mil/REP.html>
- Ideal submissions are readily available Government Off the Shelf, (GOTS), Commercial Off The Shelf (COTS) or Non-Developmental Items (NDI)
- Submissions must be related to robotic hardware, payloads, accessories and/or software



POCs



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Military

Government

Contractor



Electronics and Special Development Branch (ESDB)



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???QUESTIONS???



Operational Energy – Small Unit Power Industry Day Brief

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Agenda



Fort Benning, Home of the MCoE

- Problem Statement
- Focus Areas
- OE Team Points of Contact
- Questions



Problem Statement



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Soldier's and Squads lack energy sources that are sufficient for a small unit, self-sustained, 72 hour dismounted operation.

- The requirement to reduce the Soldiers combat load and enhance mobility /agility is significantly impacted by the need to sustain a Soldier's system energy demands with performance limited energy sources.
- The Soldier's ability to effectively conduct operations has decreased as a result of continual increases in personal weapon and individual system energy demands, increased sustainment requirements and increased weight.
- Proliferation in power consuming equipment at the small unit level has significantly increased Soldier dependence on energy to accomplish their mission while increasing the Soldier's Load upwards by 10-16 pounds in battery weight alone based on duty position in Squad.
- While the force has successfully implemented a common energy source capability that supports multiple Soldier systems, the current battery-based power architecture still comprises excessive weight and volume to sustain dismounted missions of three days or greater.
- The force lacks the ability to rapidly refuel or recharge Soldier power and energy systems in distributed operational environments.

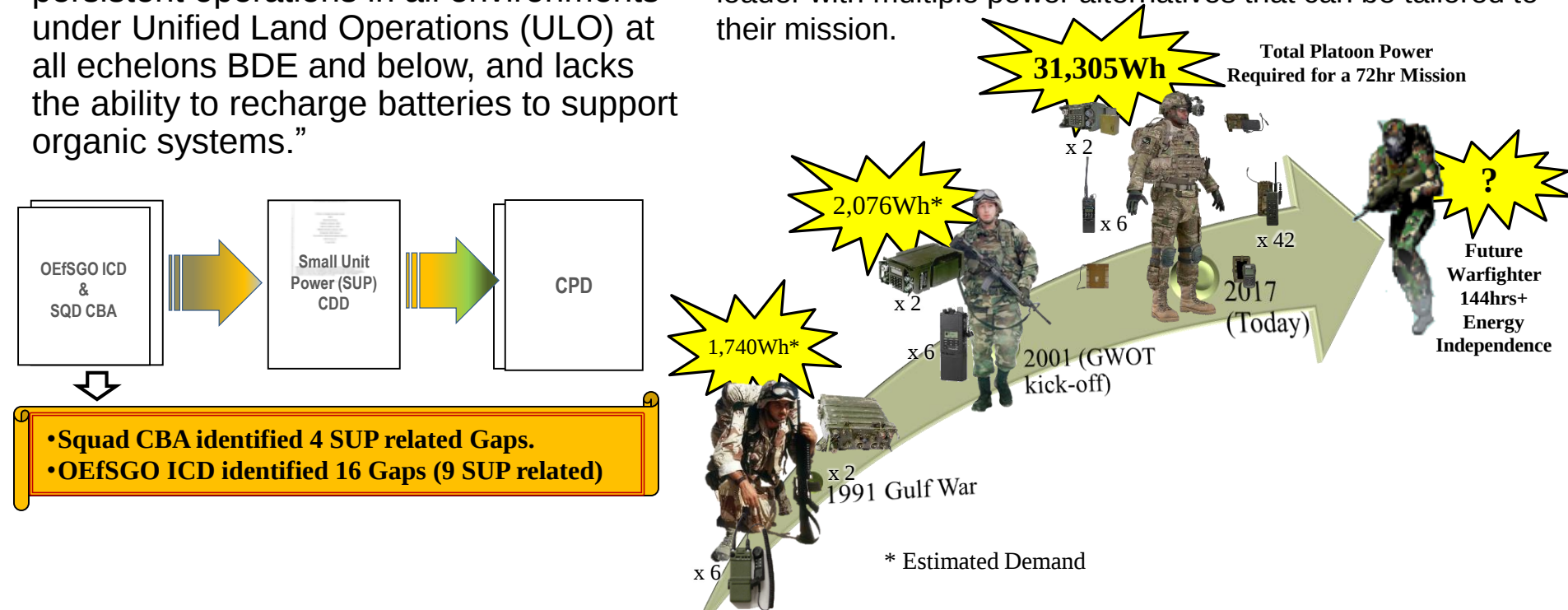
Gap Statement:

Soldiers and dismounted Squads lack the ability to power required systems for the duration of a 72 hour mission (Core + Ground)

CNA FY16 Capability Gap #460081:

“The IBCT lacks the required ability to provide and sustain power during persistent operations in all environments under Unified Land Operations (ULO) at all echelons BDE and below, and lacks the ability to recharge batteries to support organic systems.”

Today's warfighter carries equipment that requires more power than previous conflicts. To manage Soldier load and increase operational effectiveness, Small Unit Power systems need to provide the Soldier with expeditionary power and power management solutions along with organic charging, harvesting, and scavenging solutions. These systems must be designed to support combat operations in austere environments where power resupply is limited or non-existent. These power systems must provide the Soldier and small unit leader with multiple power alternatives that can be tailored to their mission.





Small Unit Power Generation

- Instrumental to Small Unit Power (SUP) success is generating power required forward in the Area of Operations while seamlessly interfacing their systems with a variety of energy sources and the ability to monitor individual and SUP systems energy status. More power generated at the lowest echelons reduces demand for resupply from the next higher echelon
- Soldier – provide supplemental power to the conformal battery thus extending time between battery exchanges, (Energy Harvesting/Scavenging)
 - On the Move recharging Kinetic or Mechanical capability – Warfighter locomotion
 - Power Generation - Fuel Cells - Up to 2kW power
- Squad - Provide sources of power in austere environments where no power source exists, (Renewables)
 - 300-500 watts renewable power source (solar?)
 - Next generation power source (Need to have other solutions besides solar.)
- Platoon – provide sufficient power to recharge and power all Platoon equipment and fulfill residual power gaps at the Squad and Soldier level, (Power Generation)
 - Efficient Multi-fuel Power Generator or Power Cell that provides (Quiet)1kW(+)
 - Next Gen Power Source (Silent)
 - Power Generation over 2.5kW (other solutions besides a generator)

Soldier Carried Batteries/Capacitors

- Fundamental to Small Unit Power (SUP) success is reducing the number and types of batteries a Soldier is required to carry.
- Advanced electrochemical materials
 - Increased energy densities
 - Quick recharge < 6hrs
- Increase power output of power sources (greater power/less weight)
 - Primary batteries >600 Whr
 - Rechargeable batteries >300 Whr
- Future Soldier equipment must address power demands by making end items more efficient.
 - Must be able to interface with Standard Family of Batteries
 - Must be able to interface using Radio Power Adapters (RPA)
- Future power solutions must provide interoperable interfaces between Soldier systems and infrastructure and vehicle-mounted energy systems.





Focus Area



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Power Distribution – Cableless/Wireless Power Transfer

- A wireless power network is the long-term vision for combat formations. MCoE is pursuing an incremental approach to facilitate transition over time.
 - Soldier
 - Integrated Soldier Power and Data System – Core (ISPDS-C) is the baseline system to build upon
 - Elimination of cables (E Textiles)
 - 1 meter radius wireless power transfer from Core power storage device (currently Conformal Battery)
 - Platform
 - Contact/Wireless point charging
 - Contact/Wireless w/in 6" (internal)
 - Proximity (External)
 - Wireless System Integration
 - Challenge: How do we make our systems wireless without massive degradation in efficiency?
 - Can Power and Data be combined into a single wireless network?
 - NSA Classification Challenges
- ✓ **Power solutions must meet the growing electrical demands in the smallest and lightest means possible.**

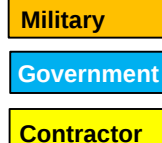


OE Team POCs



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???QUESTIONS???