Soldier Wearable Power System

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Program Objective – Improved Power Sources

Lighten the Load

Present individual Soldier load >> 80 lb vs. 50 lb target[1] which degrades fighting ability. Require improved power sources and power management to decrease the burden.

Lighten the load

Increase Capabilities

Increased information connectivity leads to improved situational awareness and mission command. Tactical network increases power requirements.

Increase capability

Enable Future Soldier Systems

Systems with enhanced lethality and survivability require development of higher density power & energy sources.

Enable Future Sys.

Overall Program Objective: Improved power sources to enable overmatch at the Soldier and Squad Level[2].

1 The Objective Force Soldier / Soldier Team, DA ASB 11/2001
2 Army Equipment Modernization Strategy, DA G-8, 3/2015

Research Focus

Development of a Soldier Wearable Power Source in a fightable form factor

Energy source must support mission duration and be logistically viable

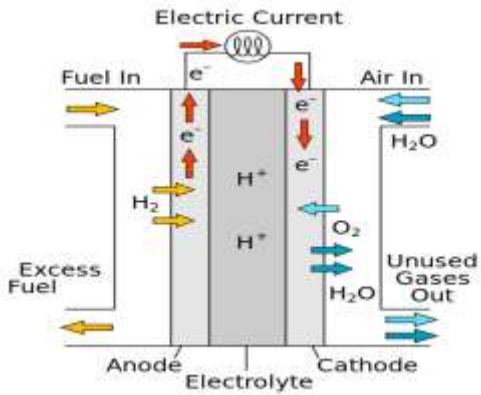
Must be thin, flexible to conform to front, back and side of vest

Centralized power source must power all equipment

Review of Previous Work

Fuel Cells – A promising solution

A electrochemical device that directly converts chemical (fuel) to electrical energy.



Status

DOD partnered with industry have developed systems that has been deployed.

Technology Barrier- Need an improved fuel

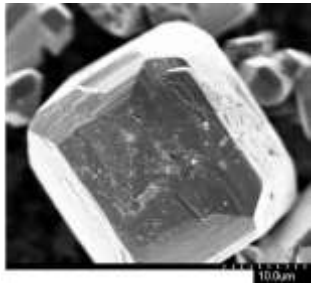
Systems have low power & energy density due to complex fuel to H_2 conversion. This results in system too large for soldier worn applications.

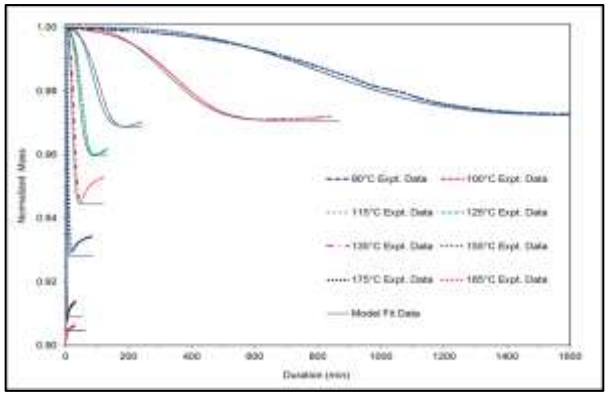
Soldier Wearable Power System Results I

New Fuel Source Identified

AlH_3 selected based on high energy density, high H_2 product purity and simple H_2 generation process

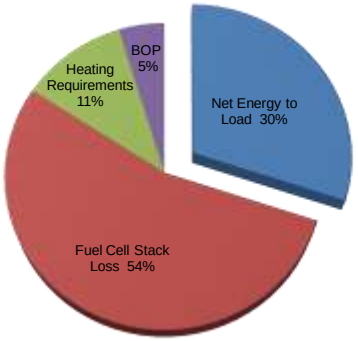
$$2AlH_3 \xrightarrow{\Delta} 2Al + 3H_2$$

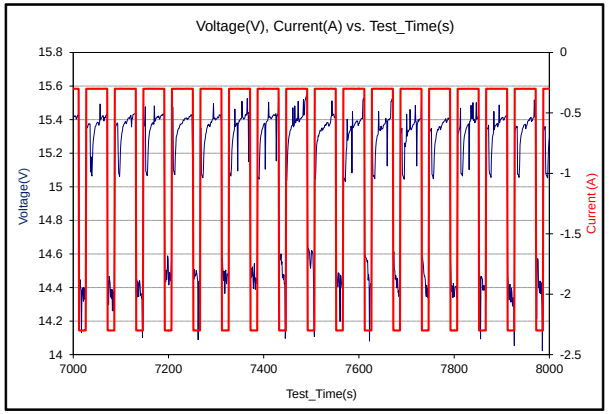




System Prototypes

With commercial partner have developed a high power density AlH_3 prototype systems





Testing & Analysis

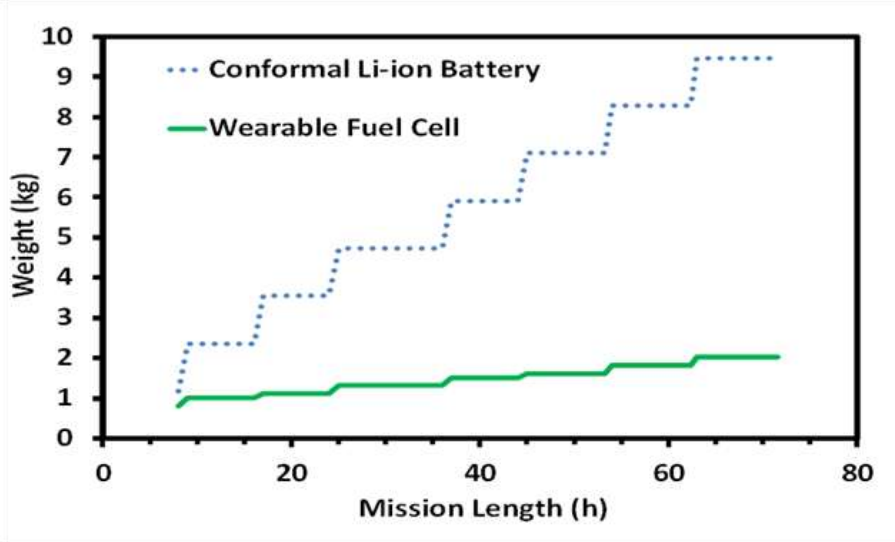
Cartridge ballistic testing was done. Test results provided confidence in a safe wearable system

Soldier Wearable Power System Results II

System Wearable prototype system utilizing an fuel cell with AlH_3 fuel cartridges was developed

Technology	RMFC	DMFC	AlH3
Fuel Energy Density (Wh/kg)	2907	5538	3361
Cartridge Wh/kg	485	780	800
System Power Density (W/kg)	22	13	29
System Vol. Power Density (W/l)	23	11	32
TRL	TRL 8	TRL 8	TRL 6

Shows high power & energy density



Significant weight savings vs. existing soln

Soldier Evaluation
Feedback was positive on form factor, weight and operation.

Conclusion

Prototype systems meet targets for a soldier wearable solution

- Provides significant operational advantages

Technology being transitioned to PEO SOLDIER / PM SWAR

- Small Unit Power Program of Record

Follow on Work

- Ruggedization
- Cost

Power source for other applications

- UUV, UAV