„In-Barrel Power Supply“

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„If you can’t tell it in 15 minutes; Don’t tell it at all“

Geno Leech, Fisher Poet, Chinook WA, USA

… let’s get started
Overview

- History, the large Calibre Fuzes
- Electrolyte Distribution
- High Acceleration and Spin
- Miniaturised Fuze Battery
- Load Management
- Conclusions
Legacy Fuze Batteries

- PS115 (lead)
- MOFA post launch
- DEP 1400x series

Rise-time requirements
- **50 milliseconds or more** to minimum voltage
- for launch velocities between 300 – 1000 m/s
  - trajectory delta < 50 – 200 m

- likely suitable for time- prox- point-detonating- fuze

**Legacy Battery Rise-Time OK for legacy Fuzes!**
New (challenging) Requirements

- Smaller calibre
  - direct fires
  - short muzzle safety distance
  - early functions – in-/shortly after barrel exit
  - more precise timing

- Typical Requirements
  - DoD 2014.1 SBIR 10 ms (low current), 100 ms (max current)
  - various DEP customers single digit ms

Factor of ten or more Rise-Time Reduction!
Electrolyte Distribution

Spin

„low charge“ acceleration and spin

Accelration

barrel

force vector

No Pain, no Gain
The 155 mm Artillery Dilemma

Acceleration and Spin can be rather low
Activation in 40 mm Infantry Grenade

DEP 1400x at RT
Miniature Fuze Battery Activation

- High Acceleration (no/low spin)

DEP 14103 at -46°C
Miniature Battery Rise Time

- Low Acceleration (2500 g’s continuous, no spin)
Load Dependence of Rise Time

DEP14020.03; 2s; -46C, U= 9000 1/min; Dez.15

Voltage [V] vs. time [s]

- Spannung [V] 8R3
- Spannung[V] 12R1#1
- Spannung[V] 12R2#2
- Spannung[V] 20R1
- Spannung[V] 55R1
Load Dependence of Rise Time

**DEP14020.03; 2s; -46C, U= 9000 1/min; Dez.15**
Recommended Load Characteristics

- Load Profile
Conclusion

- Lithium Reserve Batteries provide very short Activation Time
  
  - under high forces
    - Acceleration
    - Spin
  - if properly designed
  - under proper load management
Conclusion

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Lithium Reserve Batteries are able to provide “In-Barrel” Power!
Thank you for your attention!

Questions?
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