# Manufacturing Improvements for DLA Lithium Batteries

## TurnAround Factor

# Overview

- DLA & TurnAround Factor SBIR Project
- Goal: improvements to battery supply chain:
  - PRC-148
  - PRC-152
  - PRC-154
  - BB-2590
  - PLM-4 (USAF test unit)

# Existing Batteries

## Where We Are Today


# 18650 Cells in the Batteries




| Battery | **BB-2590** (BT-70791CG) | Thales AN/**PRC-148** | Harris AN/**PRC-152** |
|---|---|---|---|
| Cell Manufacturer | Panasonic | Panasonic | Panasonic |
| Country of Origin | China | Japan | Japan |
| Cell Model | NCR18650B | CGR-18650HG | CGR-18650DA |
| Cell Quantity | 24 | 6 | 6 |
| Cell Retail Cost | $3.20 ea. ($76.77/pack) | ~2.00 ea. ($12/pack) | ~3.00 ea. ($18/pack) |
| Pack Price Today: | $142.24 | $197.24 | $233.70 |

# Key Observations

- The only part of the packs **failing are the cells**
- All batteries under study use voltage-compatible Lithium-Ion cells in various configurations
- All the cells themselves are COTS and fairly inexpensive relative to the cost of the NSN

Tesla Model S Battery with 8,600 Panasonic 18650 cells

# Key Observations

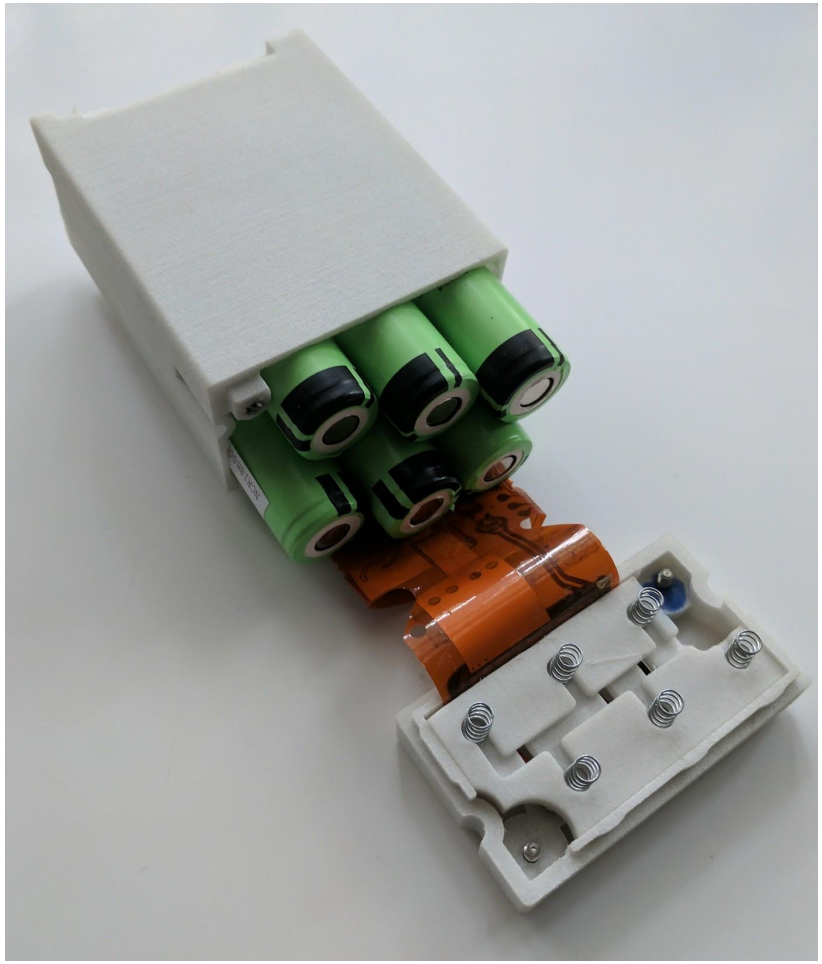
- All use Texas Instruments “Gas Gauge” ICs (BQ2050, BQ20Z655, BQ20862)
- External Comms: SMBus, DQ, HDQ
- All have a ruggedized military case
- **Only the cells are “expended”**
- **Only the cells are shelf life limited**

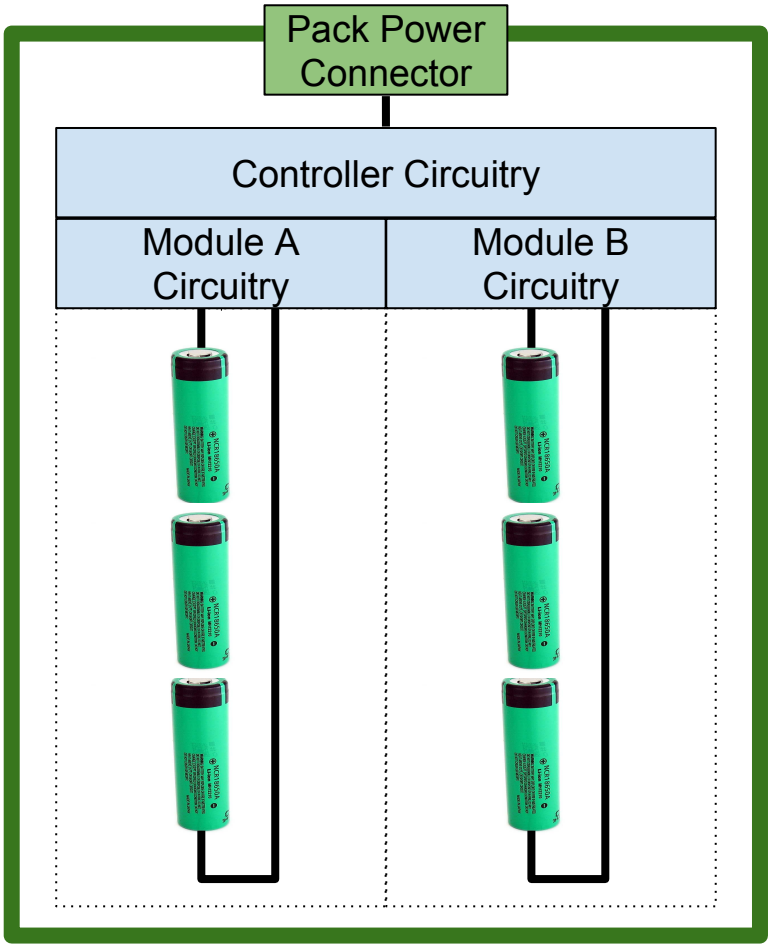
# Teardown Key Takeaways

1. The **cells** cause the majority **inventory management problems**
    - Shelf-life limits and backorders during operations
2. **Cells** are a **COTS** part with **strong industrial base**
    - Mitigates surge issues.
3. Cells and packs have **different supply chain management** characteristics

# Batteries Concept

## Standardized Modular Battery Packs






**6-cell, 2-module battery pack**

# Key Benefits
## Battery Supply Chain

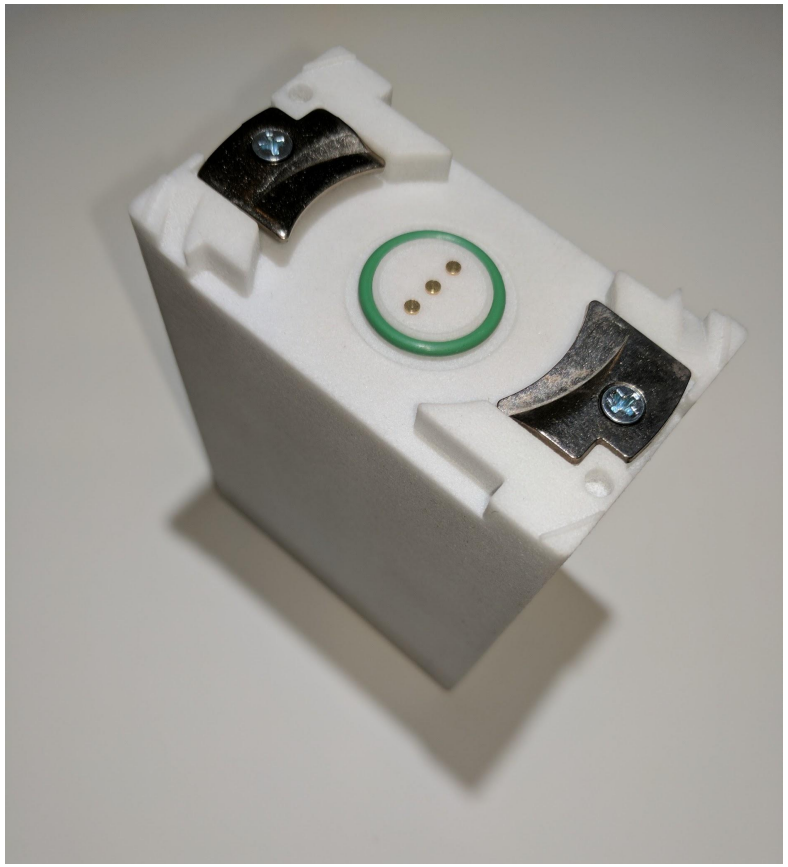
- Creates a non-shelf life military specific case **separate** from the shelf-life limited COTS cells
- Dramatically **Increased Surge Capacity**
  - Allows vendor-managed, government-owned stock of military-specific cases
  - **Simplified COTS cell insertion** process as final step into government-owned stock of cases
- **Competitive Standards** allow reuse of packs across a wide range of future weapons systems

# Key Benefits
## Reduced Lifecycle Cost

- Standardized packs allow for competition (esp. PRC-148/152/154, future systems)
- Recurring Costs
  - Simplified stock management
  - Disposal/retrograde savings
  - Long-term: Stock or Pre-position packs without cells
  - Long-term: Streamline cell technology insertion

# Safeguards & Protections

- Equal or greater protection than existing packs
- All batteries to use modern safety designs
  - Monitor and Balance EVERY cell
  - E.g., -148, -152 don’t monitor each cell
  - Future capability to further improve charge safety
- Additional safety monitoring/protection circuitry to enable simplified COTS cell insertion process



- Demonstrates concept feasibility, safety features
- Compatible with existing chargers
- Establishes baselines for standards

## First Generation PRC-148 Prototype

# Next Steps, Discussion

- Socialize the concept with Army, USMC, SOCOM
- Establish Service SME lines of communication — lay groundwork for eventual pilot testing and adoption
- Refine based on customer input
- **Prototype additional packs**
  - PRC-154, BB-2590, PLM-4, etc.
- Iterate draft standards