Innovative Munitions: JDAM Modularity and Field Repair

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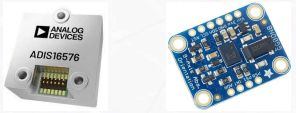
ACCOMPLISHMENTS

- Wrote and tested a **first-of-its-kind field repair guide** for Airmen to perform step-by-step battery replacement.
- **Designed and tested a novel battery holder** across a variety of environmental conditions using COTS Li-ion batteries.
- Fused together **8 different COTS MEMS IMUs** and **created a novel algorithm** to show a more accurate acceleration data stream.
- Conducted **rigorous temperature testing** for Li-ion batteries to understand behavior in the flight envelope.

METHODS

- Utilized subject matter experts and **multiple time trials** to build a comprehensive field repair guide.
- **Rapidly developed** battery prototypes using **CAD.**
- Fused **multiple IMUs** with **machine learning and MATLAB.**
- Collected **accurate voltage data** of batteries in a variety of environments (0C – 55C).



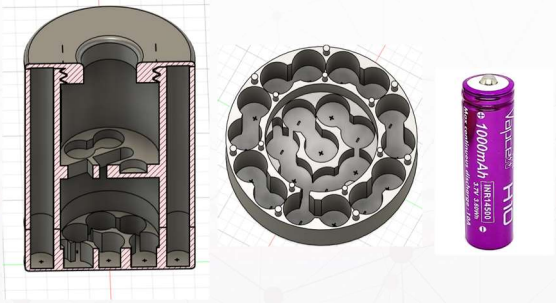
Electronics used in MEMS IMU system fusion

MISSION OVERVIEW

Problem: The **JDAM is vendor locked** by Boeing, which causes **supply chain vulnerabilities and lack of field repair** and modularity.

The Joint Direct Attack Munition (JDAM) is a guidance tail kit used in the USAF and Navy for accurate targeting of air-to-ground munitions. Boeing is **the sole manufacturer** of the JDAM and is therefore the owner of all intellectual property and technological data. Currently, all internal repairs must be conducted at a CONUS Boeing facility, which is a **time-consuming and costly process.**

Solution: This project aims to **enable field repairs** on **critical JDAM subsystems** and introduce modularity for **installation of COTS** (commercial off-the-shelf) parts and technological updates.



Modular Battery Replacement using COTS Li-ion cells

IMPACT

- Demonstrated integration of technological updates into legacy systems through modular "plug and play" architecture – **more lethality without the lengthy and expensive contracting process!**
- Built JDAM resiliency against supply chain disruption by meeting requirements with COTS parts – **build tail kits anywhere on the globe!**
- The USAF could **save $66 million** by performing an in-house battery replacement on every out-of-warranty JDAM **currently sitting in inventory!**

FUTURE PLANS

- Fully integrate cutting edge, COTS, modular technology into the JDAM.

GBU-38 JDAM

UNITED STATES AIR FORCE ACADEMY

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