

SPARRCI

Sensor-based Prognostics to Avoid Runaway Reactions and Catastrophic Ignition



CHALLENGE

Can catastrophic battery failures be avoided to enable safe next-generation ultra-high-energy batteries for propulsive aircraft power?

- New electric aircraft concepts need better performing, safer energy storage.
- Uncontrolled chemical reactions can result in thermal runaway, a catastrophic failure leading to battery fires.
- Existing solutions use bulky containment systems to address safety, which add weight and decrease the aircraft's performance.



GOAL

Early detection of failure conditions to avoid catastrophic battery fires and enhance reliability.



Microsensor for real-time monitoring within battery cells

- 1 Prevent catastrophic battery failures using advanced sensors, analysis, and algorithms.
- 2 Provide a foundation for safer, lighter, and higher energy batteries for the electric aircraft industry.
- 3 Accelerate the adoption of next-generation batteries in aeronautics and beyond.

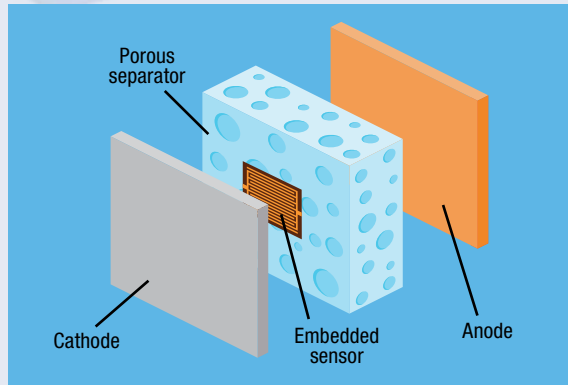
SPARRCI MULTIDISCIPLINARY APPROACH

Battery Failure Analysis

Identify and characterize battery failure mechanisms.

Sensor Development

Monitor a range of changing conditions using sensors embedded within the battery cells.



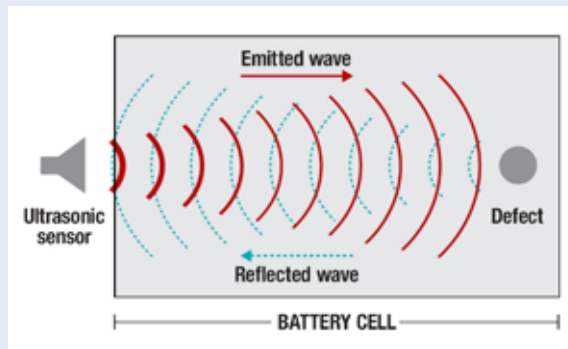
Cell-embedded sensors

Nondestructive Evaluation

Noninvasive inspection of physical conditions for battery health assessment.

Multiphysics Modeling and Prognostics Analysis

Develop and implement modeling tools to accurately predict and mitigate battery failures.



Nondestructive evaluation

IMPACT

SPARRCI research aims to detect failure mechanisms, avoid fires, and enhance reliability. Current methods reduce the severity but not the likelihood of catastrophic failures.



STAKEHOLDERS

Expand the possibilities of next-generation aircraft options for future air travelers. Results and lessons learned here will benefit commercial aircraft, automotive, electronics, space applications, and more.



A feasibility study sponsored by NASA's Convergent Aeronautics Solutions Project

Fostering Innovation, Pushing Boundaries, and Overcoming Barriers

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