

Problem statement:

Thermal runaway from personal devices on airplanes is a growing problem, frequently causing dangerous fires that are difficult to extinguish. Our mission is to create an exterior case for lithium-ion batteries that increases durability and prevents thermal runaway due to blunt damage on airplanes.

Your final deliverables:

1. Your Combobulator final prototype
2. A presentation including:
 - a. Your problem statement and an explanation of how your product combats thermal runaway on airplanes
 - i. Show understanding of TR concepts
 - b. Your use of the design thinking process
 - i. Pictures of early prototypes and experiments
 - ii. Explanations of how you tested and made adjustments to your designs
 - iii. Research with sources
 - iv. How your research and testing informed your design
 - c. Everyone's individual contributions to the project
 - d. If this product went to market, what materials would it use and why

Category 1: Problem Understanding & Research

Criteria	Exceeds Expectations (10)	Meets Expectations (8-9)	Developing (5-7)	Beginning (0-5)
Understanding of Thermal Runaway	Demonstrates comprehensive understanding of thermal runaway mechanisms, triggers, and progression in lithium-ion batteries	Shows solid understanding of thermal runaway causes and effects	Basic understanding present but lacks depth in explaining mechanisms	Limited or inaccurate understanding of thermal runaway
Research Quality	Extensive research using credible sources; cites aviation safety standards, material science data, and case studies	Good research from reliable sources with relevant citations	Some research evident but limited scope or questionable sources	Minimal research or unreliable sources

Category 2: Design & Engineering

Criteria	Exceeds Expectations (10)	Meets Expectations (8-9)	Developing (6-7)	Beginning (0-5)
Material Selection	Excellent justification for materials chosen in the final pitch (not necessarily the prototype); considers thermal conductivity, impact resistance, weight, and aviation regulations	Appropriate materials selected with good reasoning	Materials chosen but justification lacks technical depth	Poor material choices or no justification provided

Structural Design	Innovative design with multiple protective features; includes shock absorption, heat dissipation, and containment strategies	Solid design addressing key safety concerns	Basic design with some protective features	Design lacks essential protective elements
Technical Specifications	Detailed specifications including dimensions, tolerances , assembly methods, and performance metrics	Clear specifications for major design elements	Some specifications provided but incomplete	Vague or missing specifications

Category 3: Prototype Development

Criteria	Exceeds Expectations (10)	Meets Expectations (8-9)	Developing (6-7)	Beginning (0-5)
Innovation & Creativity	Original solution with novel features; demonstrates creative problem-solving	Some innovative elements incorporated	Conventional approach with limited creativity	Lacks originality or creative thinking
Practicality	Design is realistic for manufacturing, cost-effective, and user-friendly; considers real-world constraints	Generally practical with minor feasibility concerns	Some impractical elements that limit viability	Design is unrealistic or impractical
Testing Protocol	Comprehensive testing plan simulating blunt impact, thermal stress, and real-world conditions; includes control variables.	Solid testing approach with relevant scenarios	Basic testing conducted but limited scope	Minimal or no testing performed

Category 4: Documentation & Presentation

Criteria	Exceeds Expectations (9-10)	Meets Expectations (7-8)	Developing (5-6)	Beginning (0-4)
Technical Documentation	Complete documentation including design sketches, CAD drawings, material lists, assembly instructions if applicable, test results, application of Design Thinking process	Good documentation covering major project elements	Basic documentation with some gaps	Incomplete or disorganized documentation
Presentation Skills	Clear, confident presentation; effectively communicates design rationale, process, and results; engages audience	Competent presentation with good communication	Presentation lacks clarity or organization	Poor presentation skills or incomplete delivery