How do the batteries that power our devices affect airplanes, safety, and the planet?

There are 3 parts to this project. Each group will need to document their piece of the project with pictures and/or video/presentation. Each can be presented as a group and individually. The final projects will be presented at the 164th Airlift Wing tentatively March 28, 2026 or on a weekday if school schedules and transportation permit.

Engineering and Testing - What happens when the batteries that power our world become a safety risk in the sky? - 🔋 Thermal runaway (overheating batteries)

- ✓ Centers around containing the lithium-ion battery in case it catches fire to protect surroundings especially in an airplane environment. Cargo bay or in the passenger and crew areas. Luggage compartments, flight deck, individual seats, restrooms, cooking areas.

Recycle and Disposal - ✈️ Aviation safety

- ✓ Students can build a campaign around the proper disposal of lithium-ion batteries maybe in conjunction with Best Buy or other battery company…
- ✓ Additionally, students may possibly find a way to recharge them as a means of recycling or any other recycling ideas.T

Mining and Reclamation - 🌎 Environmental responsibility (battery waste + mining)

- ✓ In the first phase of this exercise, students will be provided materials to build a habitat. Ideally, each student building a habitat would build the habitat on top of a material that makes up the lithium-ion batteries. E.g., one habitat would be built on top of copper, one built on top of lithium, etc.

  Note: Students should not be aware that these habitats will be mined. Remember to take pictures after completion of the original habitat models.

- ✓ The second phase (group)would be to allow a second set of students to "mine" for the minerals. Can be creative using tonka toys or small equipment that would be used to mine the land. Students would need to decide whether the land would be moderately disturbed and if the animals would be displaced or if the ecosystem would be completely destroyed This can be done in accordance with the EPA or any other documents that could be used in this project.

- ✓ Final phase is to determine how to rebuild the habitat by turning it into something else entirely or restoring the initial habitat and what is the effect on the environment with either decision. Maybe a playground would be built in its place as reclaiming the land in a positive perspective.

Reference Guide:

Please allow students to view the content on the Xplorlabs Integration link. Use the **UL Xplorlabs: Portable Electrical Power** module (External Link) to understand the science of thermal runaway.

- **Mission 1: Engineering and Testing (Containment)**

  The primary goal of this phase is to explore the safety challenges of lithium-ion batteries, specifically focusing on **containing a battery in the event of a fire** to protect the surrounding environment.

- **Student Task:** Students will design and test mock prototypes for battery enclosures using materials. (*Students will use accessible substitute materials to model the real components used in a functional prototype.*) These enclosures must be able to withstand or mitigate the effects of thermal runaway to ensure that nearby structures or people remain safe.

  Governing Body Guidance: Students should reference the **CPSC Battery Safety Guidelines** (External Link) to establish safety benchmarks for their containment designs.

- **Mission 2: Recycle and Disposal (Campaign and Recharging)**

  In this phase, students shift from safety to sustainability by focusing on the end-of-life cycle for batteries.

- **Student Task: *Public Awareness Campaign* -** Students will build a campaign to educate the community on the **proper disposal of lithium-ion batteries**. This can be done in conjunction with **Best Buy** or other battery companies to utilize existing recycling infrastructures.

  Innovation Challenge: Students are encouraged to research and propose ways to **recharge batteries as a means of recycling** or develop other creative recycling ideas.

  Governing Body Resource: Refer to the **EPA's Used Household Batteries guidance** (External Link) for factual data to include in the campaign posters and digital media.

- **Mission 3: Mining and Reclamation (Habitat Simulation)**

  This final phase focuses on the environmental impact of sourcing the raw materials (such as **copper and lithium**) required for battery production.

- **Student Task (1 task per student group for this exercise):**

  1: Habitat Construction: Students will build a habitat on top of a specific material used in batteries (e.g., copper or lithium). **Crucially, students should not be told that these habitats will be mined.** Photos must be taken of the pristine habitats upon completion.

2: The Mining Event: A second set of students will act as "miners," using small equipment or Tonka toys to extract the minerals from beneath the habitats.

3: Reclamation Decision: After the "mining" is complete, students must decide the fate of the land based on **EPA documents** or similar guidelines.

Students must choose between the following:

Moderate Disturbance: Attempting to restore the land while acknowledging animal displacement.

Complete Transformation: Treating the ecosystem as destroyed and reclaiming the land for a new purpose, such as building a **playground**, to provide a "positive perspective" on land use.

Governing Body Resource: Utilize the **USGS Mineral Commodity Summaries** (External Link) to learn about the minerals being mined and the **EPA Abandoned Mine Lands** (External Link) site for real-world reclamation examples.