ANALYZER™

Avoiding Drone Battery Safety Hazards: Predictive Safety Management Systems

Israel 3rd UAV Conference

January, 2014

Technion - Haifa

Best Power for Electric Drones: Lithium-ion Batteries

Lithium Ion Batteries

- Valued for their high energy content
- Consistent safety problems in various applications

Li ion battery fires on 787 Dreamliners

JAL Boeing Dreamliner
Boston, January 2013

Li Ion Cell after Fire –
Hot enough to melt plane fuselage

Why are lithium ion cells hazardous ?

Flammable electrolyte

Very high energy density

Can reach 1,000° in a few seconds

Thermal runaway

Safety events can be lethal

Exothermic reactions

Thermal Runaway Reaches 1,000° C

FIRE / EXPLOSION

Heating

Short circuit

Cell Fault*

*Internal short from abuse, manufacturing defects, hot environment

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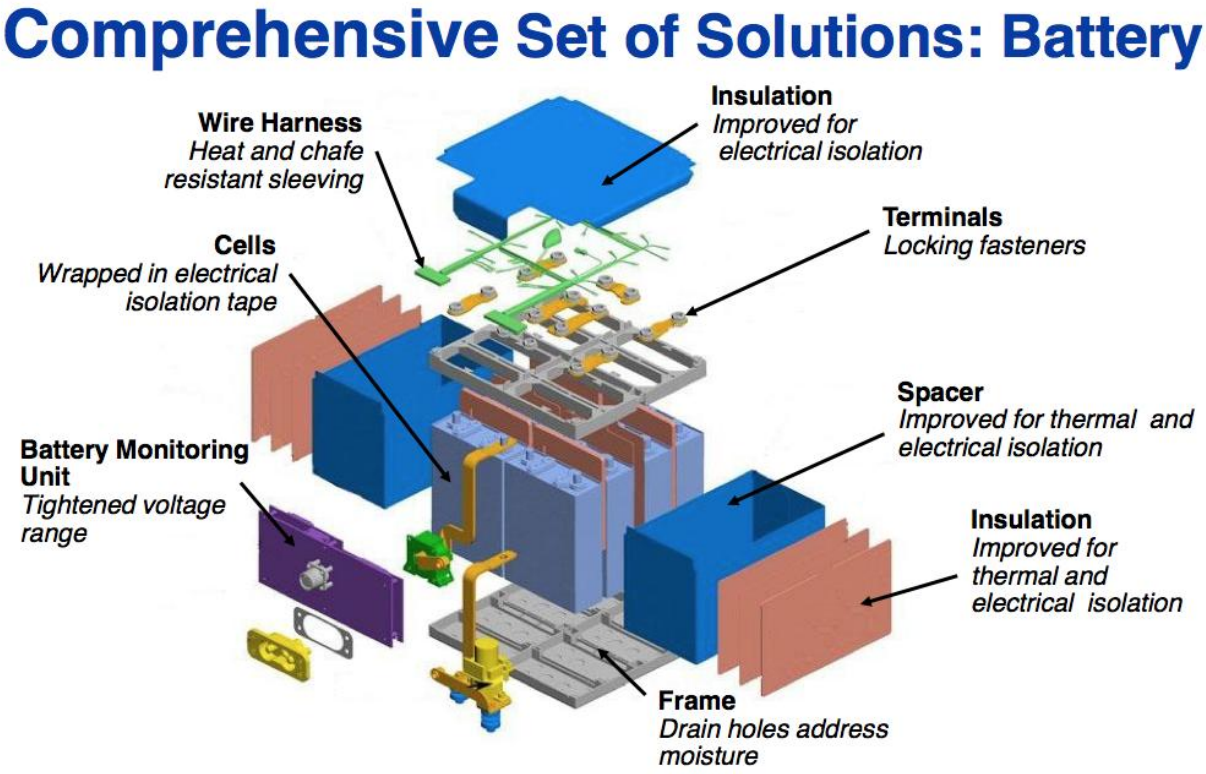
Boeing will put the battery in a Box:

Minimizes harm but doesn't prevent Fires



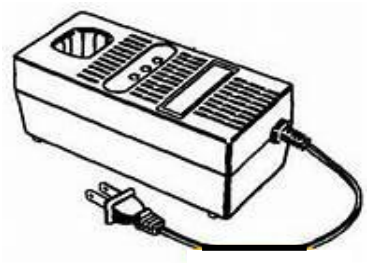
Airbus drops lithium-ion batteries for A350

Fri, Feb 15 2013
By Tim Hepher

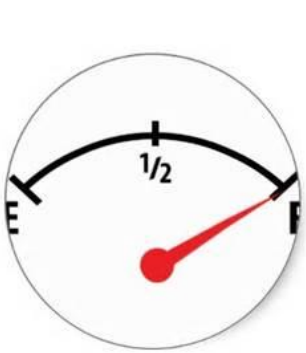
PARIS (Reuters) - Airbus has dropped lithium-ion batteries of the type that forced the grounding of Boeing's 787 Dreamliner and will use traditional nickel-cadmium batteries in its crucially important next passenger jet, the A350.

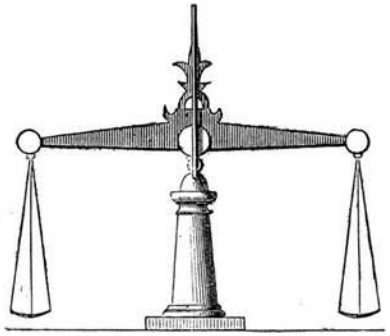
Today's Battery Management Systems can not forecast when a fire will occur

1. **Charge**



2. **Monitor capacity, balances cells**





3. **Alerts you of a fire …**
   but by then its too late

They can't predict this…

Our Solution Can Prevent Fires:

Recognizes the Problem before it Happens

Proactive Algorithm

Identifies Precursors

Forecast Hazards

Preventive Action

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So that this does not happen

The Technology

- **Active algorithm** discovers ‘soft’ pre-shorts

- Adds **electronics** layer to existing charge & management systems

Our Advantages

ANAlyzer	Today's Systems
Detects symptoms before they become dangerous	Detects the event itself – too late
Active protocol of stimulus-response algorithms elicits electrochemical precursors	Passive monitoring of standard operating parameters
Early stage identification of the indicators	Kicks in once the event has started to occur
Tracks a suite of parameters	Tracks normal battery operating values
Advance warning, enables preventive action	Reactive, alerts that fire is taking place

ANAlyzer Features: Drones

Ground device for predicting, managing, charging

Used between missions

Fast: a single multi-functional unit

Simple: one connection to the UAV/battery

Versatile: models for all types of UAVs & batteries

ANAlyzer Benefits for Drones

- Greater Safety
- Higher Reliability
- Lower Operating Costs
- Improved Mission Confidence

The Product

- **Under development** – a suite of models for
  - UAV types
  - Battery chemistries
  - Battery designs

- **Pipeline**
  - Aircraft
  - EVs
  - Electric boats

The Proposition

- Start-up mode
- Seeking partners in battery, charger, drone space
- Seeking seed investments - corporate and VC sources

Thank you . . .

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