8 Required Tests According to UN/DOT 38.3

While lithium battery failure rates are low, there are safety concerns regarding their transport in aircraft. Manufacturers of lithium batteries and products using lithium batteries must account for 8 UN/DOT 38.3 testing requirements in the design, manufacture and distribution of their products. These include:

T1 Altitude Simulation (Primary and Secondary Cells and Batteries)

- Low pressure testing that simulates unpressurized airplane cargo area at 15,000-meter altitude.
- After storing batteries at 11.6kPa for > 6 hours, these criteria shall be met:
  - No mass loss, leaking, venting, disassembly, rupture or fire, and voltage within 10% of pre-test voltage.

T2 Thermal Test (Primary and Secondary Cells and Batteries)

- Test covers changes in temperature extremes from -40°C to +75°C.
- Batteries are stored for 6 hours at -40°C (12 hours for large cells/batteries), then 6 hours at +75°C (12 hours for large cells/batteries), for a total of 10 cycles.

T3 Vibration (Primary and Secondary Cells and Batteries)

- Test simulates vibration during transportation.
- Test is a Sine Sweep: 7Hz – 200Hz – 7Hz in 15 Minutes
  - 12 Sweep (3 hours)
  - 3 mutually perpendicular axes.

T4 Shock (Primary and Secondary Cells and Batteries

- Test also simulates vibration during transportation.
- Test is a Half-Sine pulse: 150G/6ms for small cells/batteries:
  - 5 50G/11ms for large cells/batteries.
  - 3 pulses per direction; 6 directions (+/-z, +/-x, +/-y).

T5 External Short Circuit (Primary and Secondary Cells and Batteries)

- This test simulates an external short to the terminals of the cell or battery.
- At temperature of +55°C, apply short circuit (< 0.1ohm) across terminals.
- Maintain at least an hour after sample temperature returns to +55 +/-2°C. Pass criteria are:
  - Case temperature does not exceed +170°C and no disassembly, rupture, or fire within 6 hours of test.
  - Fuse, current limiting circuit, and venting mechanism activation are allowable.

T6 Impact (Primary and Secondary Cells)

- This test is only applicable to primary and secondary cells.
- For cylindrical cells > 20mm diameter, it simulates impact to case of cell.

T7 Overcharge (Primary and Secondary Batteries)

- This test is for secondary or rechargeable batteries only.
- It simulates an overcharge condition on a rechargeable battery: 2x the manufacturer's recommended charge current for 24 hours.
- Then battery shall be monitored for 7 days for fire or disassembly.

T8 Forced Discharge (Primary and Secondary Cells)

- This testing simulates a forced discharge condition for primary and secondary cells only.

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