 **NPS Guide**

**MANAGING**

**Lithium Batteries**

The **Naval Lithium Battery Safety Program** (NAVSEA 9310.1C) requires management in accordance with TECHMAN S9310-AQ-SAF-01 Revision 3 that specifies controls for acquiring, charging, storage, transport, use, and disposal. For rechargeable lithium batteries commonly used in robots and unmanned vehicles, NPS has additional management guidance (NPS Rechargeable Lithium Battery SOP). R\*=Rechargeable or Secondary batteries.

**Normal disposal:** Contact HM representative. **DRAIN THE ENERGY. DO NOT PUNCTURE.**

* Damaged? Let cool in a safe place 24 hours.
* Otherwise drain to 3.0V/cell or less. Note any other charge state to HM representative.
* Tape terminals and place in or around battery boxes or buckets (locations: [here](https://nps.edu/documents/111291366/111353854/BatteryBucketLocation-15JAN16.xls/9c7e881b-0ed9-4b55-aa86-33b7244038b2?t=1473718893000))
* Contact Marty Hitson (x7661) for a pick-up if battery is damaged or the bucket is overwhelmed

**Acquisition**

* Note as LITHIUM-BATTERIES in NPS KFS under Commodity Code
* On arrival inspect for material hazards. Deficiency = return. Do not repair new batteries.
* (R\*) If possible check charge of each individual cell (3.4V-4.0V)
* (R\*) If possible check imbalance not greater than 0.1V
* Recommend designate with a unique identifier and date (project specific) and begin Log

(R\*) **Charging**

* On ceramic tiles, concrete, or nonflammable surface, AWAY from flammables.
* A charger designed for that battery. Exact match between charger and battery size and chemistry.
* On variable chargers check cells and voltage selected properly– verify cells and voltages match.
* Post an attendant in and around. NO UNATTENDED “OVERNIGHT” CHARGING.
* Maintain standoff of non-attendants and potentially flammable materials.
* Shall not be charged in aircraft or vehicle system unless:
	+ Battery built in as shipped by manufacturer and
	+ Battery Management System (BMS) to manage cell charging and balance

**Storage –** 40-70°F (no refrigeration), **near an ABC fire extinguisher, under fire sprinklers**

* Metal storage cabinet, away from combustible materials, shelves layered with ceramic tiles
* Batteries greater than 1kWh require a “Flammable” rated metal cabinet
* 4 inches clearance between top of battery and next shelf
* Labeled “Lithium Battery Storage Only”. No other fuel (cardboard) or HAZMAT in this locker.
* (R\*) For short term (two weeks or less), at least 3.5V/cell
* (R\*) For longer storage 3.8V-3.9V/cell, inspect voltage every 3 months, recharge if required

**Inventory (recommended):** Log each event – acquisition, duty cycle, crash, repair, charge anomaly, etc

**Repairs or adding connectors:** See NPS Rechargeable Lithium Battery SOP

**Unmanned Aircraft Systems (UAS) Special Procedures**: See NPS Rechargeable Battery SOP

**Use in Marine Research:** See Appendix G of NPS Rechargeable Lithium Battery SOP

**For High Voltage LiPo Battery charging and storage specs (after 2015):** See NPS SOP

POCs: NPS Safety Engineer **Scott Giles x7568**, NPS HAZMAT **Marty Hitson x7661.**  **NPS Field Guide for**

**DEPLOYING**

**LiPo Batteries**

 **BEST PRACTICES, and NPS REQUIREMENTS from** NAVSEA 9310.1C, TECHMAN S9310-AQ-SAF-01 Revision 3, and NPS Rechargeable Lithium Battery SOP

**Have –** Ceramic vessel (flower pot) or fire protective (LiPo) bags, shovel or protective gloves, ABC Fire Extinguisher, extra batteries

**Transport**

1. Sealed, hard cases or LiPO Bags to avoid physical damage, avoid moisture, and contain an ignition.
2. Shipboard UAV operations have required a metal battery transportation container. Check with ship.
3. Do not expose battery packs to direct sunlight (heat) for extended periods.
4. Batteries shall not be charged while being transported.
5. Temporary travel temperatures 20°F to 150°F, greater than 170°F will likely cause a fire.
6. If bad batteries must be transported back to origin for disposal, put them in a dedicated ceramic vessel or LiPO Bag, after no less than 45 minutes of cool-down.

**Charging**

* Only use charger qualified according to manufactures specifications.
* On variable chargers check cells and voltage selected properly– verify cells and voltages match.
* Charge on a ceramic tile, concrete, or another non-flammable surface. Away from flammables.
* Check battery and ambient temperature before charging – DON”T charge hot batteries
* Check voltage: Do not charge if the unloaded individual cell voltages are less than 3.2 V
* Post an attendant. Maintain standoff of non-attendants and any potentially flammable materials.
* Shall not be charged in aircraft or vehicle unless:
	+ Battery built in as shipped by manufacturer and
	+ Battery Management System (BMS) to manage cell charging and balance.

**Use**

* Keep an ABC Fire Extinguisher near, and on the flight line if flying.
* After mission, check for punctures, broken heat shrink, bared wires, dents, scratches, and swollen or ruptured cells.
* Recommend any suspect battery gets sidelined and disposed. High system risk.

**Fire or Crash with smoldering**

1. Let the battery finish its ignition – usually about 45 long seconds. If charging, unplug the charger at the wall.
2. See and avoid the hot toxic fumes – they are hot and toxic.
3. If unable to see and avoid the fumes, vacate the area and call fire emergency services.
4. If possible to avoid the fumes, use the fire extinguisher to prevent the spread of fire (secondaries).
5. After the ignition is complete and all fire out, monitor the battery for 45 minutes.
6. After 45 minutes extract the battery carcass with shovel or protective gloves to a ceramic vessel (flower pot) or fire protective (LiPo) bag.
7. After at least 24 hours, dispose of battery remains as any battery at end of life.

POCs: NPS Safety Engineer **Scott Giles x7568**, NPS HAZMAT **Marty Hitson x7661.**