Battery Statistics & Operation:

1. 2 x Multistar -> 16000mAh, 18-22.2-25.2 V (Min-Nom-Max), 10C (160A Continuous, 320A 10 second burst), 6S1P, Off-the-shelf
    a. Alternative: 1 x Zippy Flightmax -> 8000mAh, 12-14.4-16.8 V (Min-Nom-Max), 30C (240A Continuous, 300A 10 second burst), 4S1P, Off-the-shelf
2. Current Draw: **Max Total = 10A**
    a. 5A, Compact Rio (cRIO) and modules
    b. 3A, solenoids (6 x 0.5A each)
    c. 2A, SpaceX NAP (50W @ 12V)
3. Fuses: Single 15A Fuse, In Line after power relay
4. Max Temperature: 70˚C (Battery Operation Range:
    a. 4 Battery temperature sensors (one at each corner of the battery)
5. Vacuum Information:
    a. Pot internal is pressurized to 1atm which is primary mitigation for vacuum conditions
    b. All main computer systems are in pod with only key sensors outside
    c. Batteries are further protected via pressure pot which mitigates a sudden pod depressurization causing the batteries to explode
6. Power On/Off Measures:
    a. Low Power Switch on High Power Relay
    b. Software On/Off button (Kill's all power including cRIO's)
    c. XT90 Connections
    d. Removing Fuse

Battery Unloading Procedure:

1. Clear area of any flammable materials
2. Place the batteries (and boxes) in the cleared area
3. Remove from batteries from box (if in box)
4. Visually inspect battery for puffiness or other defects
    a. If defects, look up exact procedures on manufacturers website
5. Check for nominal voltage using voltmeter
    a. If close or below nominal value setup charging using LiPoly charger
6. Done

Battery Install Procedure:

1. Follow Battery Unloading Procedure
2. Visually verify that all circuit connection points and cards are secured to the pod and will not vibrate free
3. Visually verify that wires aren't shorted to the pod
4. Visually verify that fuse is correctly installed and that current rating is correct

5. Visually verify that high power relay is locked down and correctly wired such that batteries first pass through the 12V regulators before the 12V relay and switch
6. Inspect batteries:
    a. Check for welts or boils on the battery surface due to cell damage or problems
    b. Check voltage using voltmeter to ensure proper charge (>22.2 for Multistar, >14.8 for Zippy)
7. Inspect internals of pressure pot to make sure no metal has been exposed that might short the battery or regulators once pot is closed
8. Place one Multistar or Zippy into pot sitting power side up
9. Place AFO Fireball beside the battery offering support (use cardboard or foam to make snug)
10. Visually verify that no unexpected shorts have occurred in the regulator circuit and wiring
11. Link XT90 connectors between pot pass through and battery
12. Ensure that no battery heat generation is occurring using the laser temperature probe
    a. If heat generation quickly unplug the XT90 connectors
13. Link XT90 connector between pot pass through and power relay
14. Ensure that no battery, regulator or relay heat generation is occurring using the laser temperature probe
    a. If heat generation quickly unplug the XT90 connectors
15. Continue to probe all areas using laser temperature probe for roughly 120 seconds
16. Verify correct regulator and power relay operation using voltmeter to probe circuit points (should be ~12V)
17. Done

Power On Procedure:

1. Follow Battery Install Procedure to correctly install the batteries
    a. If batteries were installed previously use temperature probe and voltmeter to probe key circuit and battery areas for irregularities
2. Visually verify no shorts or unexpected connections down line from the high power relay and that low power switch is correctly wired
3. Verify at least nominal voltage coming from battery and through the 12V regulators
4. Supply jump-start high to MOSFET gate to unblock mechanical switch
5. Flip low power switch to on position (turns on high power relay power all systems)
6. Remove jump-start high (MOSFET gate will now be held high by cRIO and can be powered down via software)
7. Ensure that no battery heat generation is occurring using the laser temperature probe
    a. If heat generation quickly flip switch off and unplug the XT90 connectors
8. Probe exit of power relay and various key circuit points using voltmeter to ensure proper power
    a. If unanticipated results, flip switch to off and re-inspect circuits for unintended connections before starting over
9. Done

Battery Off Procedure:

1. Flip switch to Off position (or click power in GUI but should still flip switch)
2. Verify power is off using voltmeter to poll exit of relay and other key areas
3. Done

Battery Removal Procedure:

1. Follow Battery Off Procedure to ensure power is off
2. Probe voltages using voltmeter and check temperatures using temperature laser probe
3. Unplug XT90 from pass through to power relay
4. Vent pressure pot using manual vent pull plug
    a. While venting use temperature laser to estimate internal temperature to ensure no battery fire or explosive situation
5. Carefully remove pressure pot top (use gloves in case of heat release)
6. Remove pressure pot to battery XT90 connector
7. Remove AFO Fireball and battery padding
8. Remove Battery
9. Done