

# Incident Report: Autonomous Car Project Battery Failure

**Date:** 2024-03-04

**Project Title:** Autonomous Car Navigation and Mapping Project

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## Incident Summary

On March 4, 2024, at approximately 7:00 AM, a significant hardware failure occurred in the Autonomous Car Navigation and Mapping project. This incident resulted in an electrical fire and the complete loss of the robotic system. The failure was attributed to a fault in the robot's battery system while charging.

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## Details of the Incident

**Date and Time:** March 4, 2024, at 7:00 AM

**Location:** Carleton University, Ottawa, ON, Canada

### Description:

While conducting routine charging of the HiWonder JetAuto robot, a critical failure in the power supply system resulted in an electrical fire. The battery, an 11.1V 6000mAh Lithium Phosphate Battery, overheated and subsequently exploded, causing significant damage to the robot's chassis and emitting a potent chemical odor associated with Lithium.

### Cause:

The primary cause of the incident was determined to be a fault within the robot's battery system. Contributing factors included:

- **Failed Limiter:** The limiter on the charger, designed to prevent overcharging, had failed.
- **Overheating:** Prolonged operation periods caused the battery and other components to overheat.
- **Power Supply Issues:** The installed battery could not sustain the robot's power demands, leading to frequent shutdowns and requiring a power cycle.

- **Faulty Battery:** After thorough examination with the professors, it was deemed that the primary cause of the incident was a fault within the battery itself.

### Immediate Actions Taken:

- **Fire Extinguishment:** The electrical fire was promptly extinguished using appropriate fire suppression equipment.
  - **Safety Measures:** The area was evacuated, and proper ventilation was ensured to disperse harmful fumes.
  - **System Shutdown:** All power to the robotic system was immediately cut off to prevent further damage.
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### Impact on the Project

#### Loss of Equipment:

- The HiWonder JetAuto robot and its components were severely damaged and rendered inoperable.

#### Project Delays:

- The incident necessitated a shift in the project's focus from physical testing to simulation-based testing, leading to delays in data collection and analysis.
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### Preventive Measures and Recommendations

#### Enhanced Safety Protocols:

- **Battery Storage:** Implement storage protocols for LiPo batteries, including the use of fireproof charging bags and regular inspections for damage or leakage.
- **Temperature Monitoring:** Install temperature sensors to monitor and regulate the temperature of the robot's components during operation.
- **Charging Procedures:** Develop and adhere to strict charging procedures, including supervision and limiting charging times to prevent overcharging.

#### System Improvements:

- **Power Management:** Upgrade the power supply system to ensure it meets the robot's operational demands without risking overload.
- **Component Quality:** Use higher-quality components with reliable protection mechanisms to prevent similar incidents.

**Simulation Focus:**

- Transition to a simulation-based approach using ROS2 and Gazebo to continue the project without relying on physical hardware, ensuring safety and continuity.

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**Conclusion**

This incident underscored the importance of stringent safety measures when working with high-powered robotic systems. The lessons learned will be integral in preventing future occurrences and ensuring the successful completion of the Autonomous Car Navigation and Mapping project. The team is committed to implementing these preventive measures and continuing the project in a safer, more controlled environment.