Presented to: Systems Group

By: FAA Fire Safety

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Background

• SAE is creating a packaging standard.
• The standard includes a chamber that will fill up with battery gasses.
• The gasses in the chamber collect and eventually ignite.
• A foundation for the test method is the dispersion of flammable gasses in the chamber until the entire volume reaches the LFL uniformly.
Introduction

• Motivation for this work was based on a few experiments that showed smoke stratification.

• Key question: Is smoke stratification an indicator of flammable gas stratification?
Setup

- 14 Cells were placed in a sealed box
- The sealed box was ducted through a heat exchanger and then into the chamber.
Setup (continued)

- Hydrocarbon gas samples were collected at 3 positions in the chamber. The top, the middle and the bottom.

Hydrocarbon Gas Sample Ports
- 2” from top
- Center
- 2” from bottom
Video
Battery Gas Stratification

Hydrocarbon Concentration vs. Time (minutes)

- Red circles: low
- Blue circles: mid
- White circles: high

Packaging Tests
September 2017
Discussion

• The height of the smoke shown in the video is consistent with the hydrocarbon measurements.
  – A component of the smoke is flammable hydrocarbon gas.

• More tests could be conducted to study other gasses such as hydrogen and carbon monoxide to assess whether they entrain with the hydrocarbons or stratify differently.
Summary

• Stratification of smoke is an indicator of hydrocarbon gas stratification.
• A mixing fan may be a suitable solution to non-uniform gas mixtures.
Questions?

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