Certification of False Alarm Resistant Cargo Smoke Detectors

Presented to: International Aircraft Systems Fire Protection Working Group
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If certification with cargo or baggage compartment smoke or fire detection provisions is requested, the following must be met for each cargo or baggage compartment with those provisions:

- (a) The detection system must provide a visual indication to the flight crew within one minute after the start of a fire.
- (b) The system must be capable of detecting a fire at a temperature significantly below that at which the structural integrity of the airplane is substantially decreased.
- (c) There must be means to allow the crew to check in flight, the functioning of each fire detector circuit.
- (d) The effectiveness of the detection system must be shown for all approved operating configurations and conditions.
AC 25-9A, 1/6/1994

- Provides guidelines for the conduct of certification tests relating to smoke detection, penetration, and evacuation.
  - Provides a list of acceptable smoke generators for smoke detection tests
  - Emphasizes that only a small amount of smoke should be generated to simulate a smoldering fire
TSO-C1e describes Minimum Performance Standards (MPS) for cargo compartment fire detection instruments

- Requires new models of cargo compartment fire detection instruments meet MPS qualification requirements in SAE Aerospace Standard AS8036
• SAE AS8036 includes criteria for resisting false alarms from various sources

• Section 6. False Alarm Signals
  – Air Velocity
  – Dust
  – Insecticide
  – Ambient Light
  – Combined Temperature, Pressure and Humidity Cycling
Problem

• AS8036 false alarm conditions are similar to theatrical smoke aerosols
  – Detectors that are designed to not alarm for insecticide aerosols may also not alarm for theatrical smoke, thus proving difficult to certify with current smoke generators
A task group was formed to discuss this issue and work together to develop smoke certification procedures that will cause all detectors to alarm, even those that are false-alarm resistant.

Task group met several times either in person or on Webex.

Ideal Smoke Generator Characteristics
- Capable of producing aerosols in the 200-300nm size range with refractive index of 1.4
- More consistent and repeatable, perhaps with control of mass flow rate of liquid
- It was asked of the group to provide what type/brand of smoke generator is being used when testing/developing C1e complaint detectors
- The group agreed that the most critical parameter of an artificial smoke source is the particle size
Task Group Open Items

- FAATC will continue testing C1e compliant detectors vs a variety of smoke sources
- FAATC has potential collaboration with TSI, inc., to evaluate particle measurement technologies and monodisperse aerosol generators
- Detector manufacturers asked to loan C1e compliant detectors to FAATC for this effort
- Detector manufacturers asked to provide make/model of smoke generators used to test C1e compliant detectors

Next Meeting Thursday 11/2 After Systems Fire Protection Working Group Meeting
Related Research

• Particle size measurement of artificially generated smoke aerosols (Tina Emami, Rutgers University)

• Improvements in Aircraft Fire Detection (Jim Milke, University of Maryland)

• Evaluation of response of C1e compliant detector to a variety of smoke sources (Matt Karp, FAATC)
Questions?

For Further Information

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