Full-scale Demonstration Testing with a Solid Aerosol Fire Extinguishing Agent, Discussion Continued

Presented to: International Aircraft Systems Fire Protection Working Group

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Presentation Overview

Major Discussion Points

• Purpose

• Test Conditions

• Project Status

• Various Views of the Test Article

References within this presentation to businesses, their services and/or products does not constitute endorsement.
Full-scale Demonstration Testing, Solid Aerosol

Purpose

- FAA invoked “Part B” of MPSe rev04
  - generally,
    - “part B” is pertinent testing to demonstrate the proposed certification criteria from MPSe “part A” are plausible on an airframe
    - invoked due to differences between (a) the halon-replacement candidate, its use, and/or its measurement, and (b) the state-of-the-art\(^1\)
  - the subject candidate differs from the state-of-the-art
    - is a solid aerosol fire extinguishing agent
    - utilizes a different quantifying concept & analyzer

1. State-of-the-art is defined by the use of halon 1301, stored in a bottle having a pressurized/gaseous ullage, is delivered/injected to the nacelle fire zone by tube, and its distribution within the volume is measured with a Statham-derivative gas analyzer.
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Test Conditions

• Using a JT-9D engine on the FAA-owned 747-SP

• JT-9D nacelle forcibly ventilated externally from atmosphere
  – air mass flow $\approx 0.5 \text{ kg/s (1 lbm/s)}$
  – engine run will precede each test to “heat” the nacelle

• Fire threats are spray- & pool-based, fueled with JP-8

• Industry is providing firex system & concentration analyzer
  – sodium bicarbonate-based solid aerosol
  – optical system used to measure agent distribution
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Project Status

• Currently nearing the end of the “build-up” phase
  – industry decided to use a JT-9D located at the FAATC, May 2011
  – complete external engine nacelle ventilation, Oct 2011
  – finalize aircraft engine use, Nov 2011
  – complete spray & pool fire threats, Feb 2012
  – firex agent distribution, completion imminent; begun Feb 2012

• Anticipating:
  – completion, Jun 2012
  – draft report into publication process, Sep 2012
Various Views, Nacelle Ventilation, Exhaust

EXHAUST DUCT FLOW PATH

JT-9D

IASFP Working Group Meeting, Koeln, Germany
23-24 May 2012
Federal Aviation Administration

IASFP Working Group Meeting, Koeln, Germany
23-24May2012

Various Views, Nacelle Fire Threat, Spray (after 1ST fire)

view, inner face, inboard cowl door, #2 engine, looking from low (05:00ish) to high (12:00ish)
Fuel pan is made from 14 ga steel & approximately 191 x 267 x 64 x mm tall (7.5 x 10.5 x 2.5 in tall)
Fuel puddle depth approximately 13 mm (0.5 in) & freeboard (dry lip) height approximately 25 mm (1 in)
Base of fuel pan is hollow permitting water flow from a water jacket
Various Views, Nacelle Fire Threat, Pool ("new")

FUEL PAN IGNITERS

FWD

POOL FIRE CAMERA

FWD

VIEWING INBOARD TO OUTBOARD

FUEL PAN

VIEWING OUTBOARD TO INBOARD

FUEL PAN

VIEWING LOW/OUTBOARD TO HIGH/INBOARD

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• **Acronyms, definitions, short-hand notations**

  FAA = United States Federal Aviation Administration  
  FAATC = FAA W.J. Hughes Technical Center  
  firex = fire extinguishing or fire extinguishing system  
  FWD = forward  
  MPSe = Minimum Performance Standard for Halon Replacement in Civil Aircraft Engine Nacelle & APU Compartments  
  rev = revision