RTCA Development of a New Flammability Test for Electronic Boxes

Presented to: International Aircraft Materials Fire Test Working Group Meeting
By: Steven Rehn
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Introduction

- **RTCA DO-160G is the current international standard for environmental testing of commercial avionics**
- **Section 26, Category C defines the flammability testing requirements for electronic housings and component parts**
- **Next revision for DO-160(H) is due January 2019**
- **The goal is to create an alternative test procedure where the electronic enclosure with its internal components is tested whole instead of testing each part individually**

Current test standards

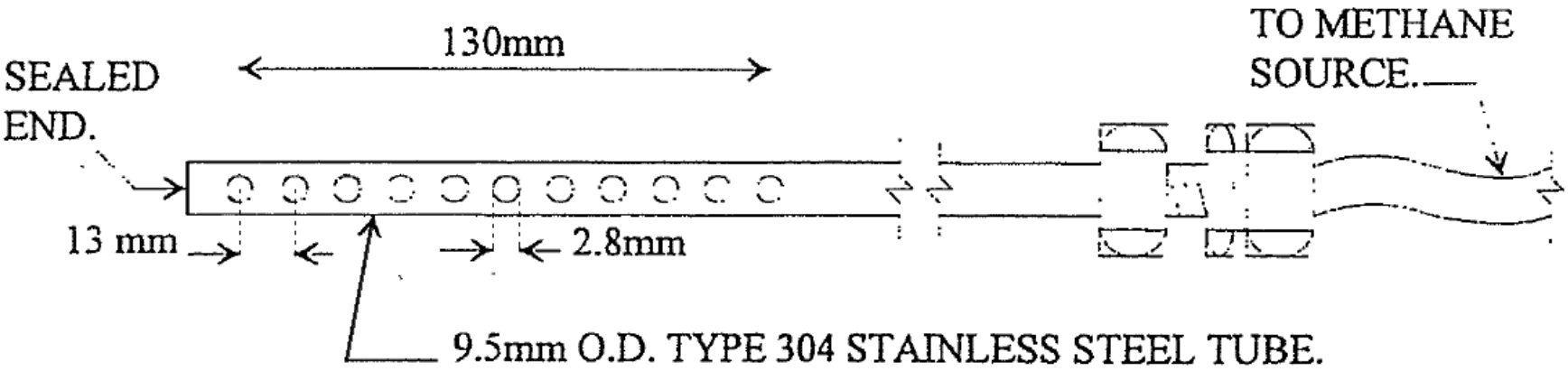
Table 26-2 Type of Test Determination

Components	Method	Paragraph
All materials other than rubber or elastomer parts, wire and cable	Vertical 12 second bunsen burner test	26.6.2
Rubber or elastomer parts	Horizontal bunsen burner test	26.6.3
Wire and cable	60 degree bunsen burner test	26.6.4

- **Small part exemptions**

Draft Test Procedure

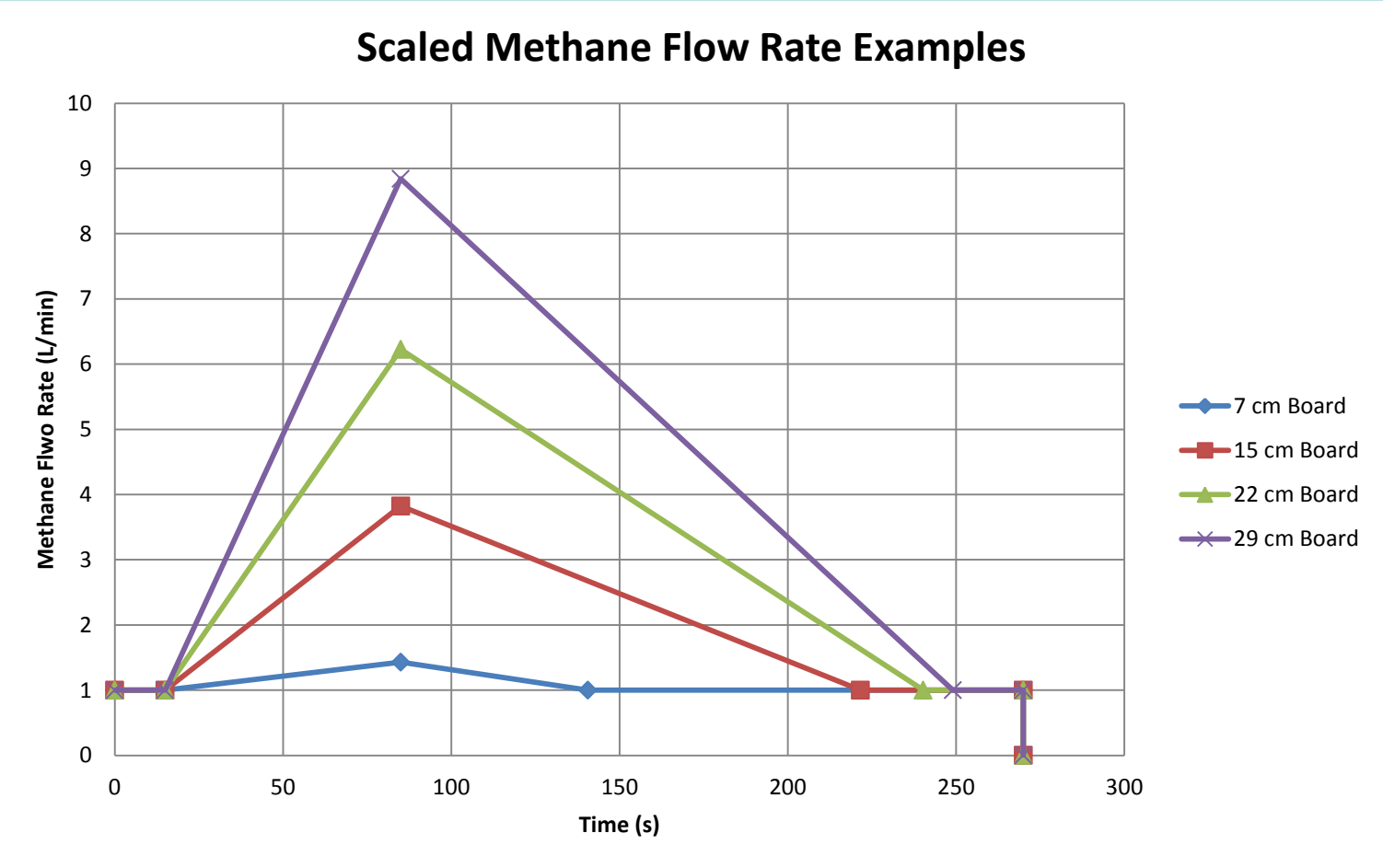
- **First Draft October 2016**
- **Based on telecom Industry test (ANSI T.319)**
- **Methane line burner as fuel source**
- **11 $^{7}/_{64}$" holes spaced $^{1}/_{2}$" apart**
- **Fuel regulated by a methane flow controller (simulates circuit board igniting and burning through to completion)**



Draft Test Procedure

- **If printed circuit boards (PCB) are oriented horizontally, methane flow rate is fixed at 5L/min for 120s**
- **If PCBs are vertical, methane flow rate follows a curve based on PCB height**
- $\boldsymbol{Q_{peak} = \left(0.071 \times h^{1.26} - 0.03\right) \times 1.8}$
  - Q_{peak} = Maximum methane flow rate (L/min)
  - h = vertical dimension of tallest PCB (cm)

Draft Test Procedure

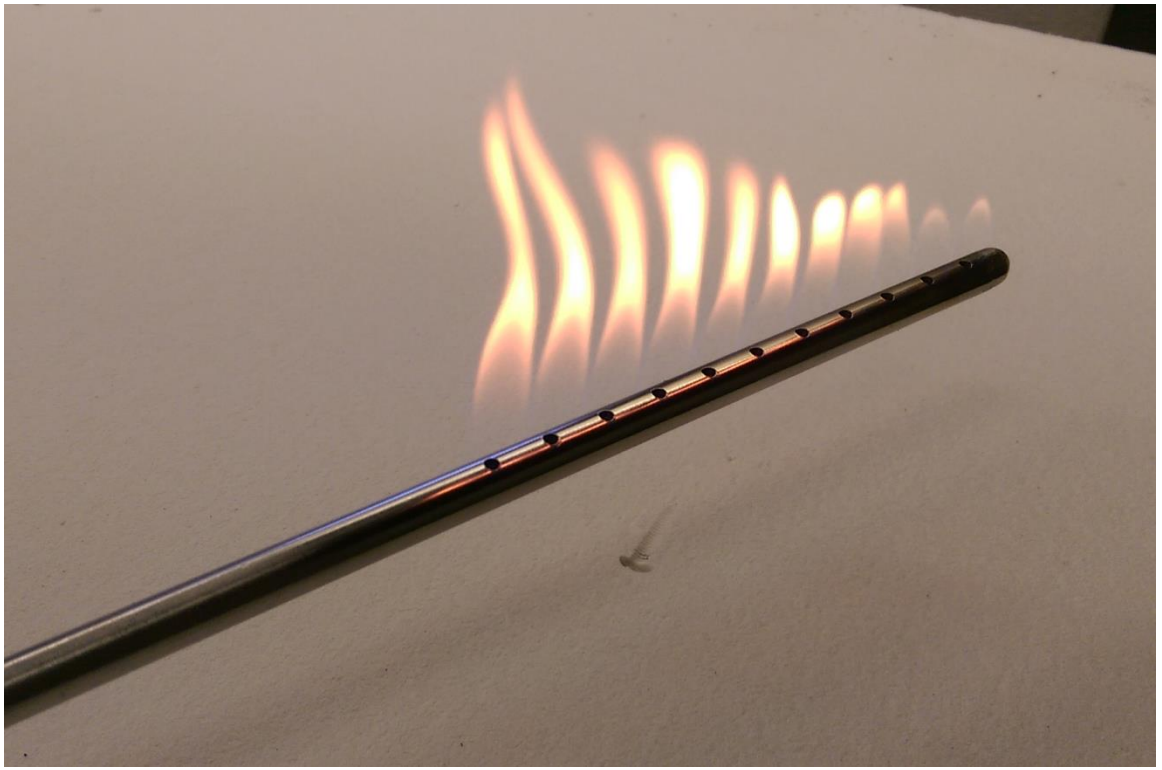


Draft Test Procedure

- **Requires insertion of a programmable burner into the equipment chassis**
- **Flame is placed to impinge area within chassis with most fuel load**
- **Burner placed at 45° angle towards PCB for vertical PCBs.**
- **Pass/Fail Criteria: As a starting point, we agreed to use 12 second flame with 1.5” height as the maximum allowable flame to escape, based on vertical Bunsen Burner test**

FAA Line Burner

- **Line burner set up at FAA Tech. Center for testing**
- **Fully functional, just need to finish the programming which should be done within the next week or two**



Future Work

- **Much more testing needs to be done to refine test procedure**
  - Number of burns required
  - Changes to fuel flow rate?
  - Changes to pass/fail criteria
  - Burner placement for testing wire bundles
  - Placement of burner for vertical and horizontal PCBs
  - Procedure currently states that burner should be placed at the edge of PCB for fan cooled equipment as far from the fan as possible
  - Placed at the middle of the PCB for non-fan cooled equipment
  - Improve test procedure for the burner flame extinguishing when inserted into the box

Planned FAA Testing

- **Comparison testing with Bunsen Burner**
  - Must retain or improve level of safety
  - Compare material ignition times
- **Test horizontal and vertical PCBs**
- **Test fan-cooled equipment**
- **Test different fuel flow rates**
- **Need to source electronic boxes**
- **Possibly make a generic box that can be tested several times with only replacing the insides**

Questions?

Contact:
Steven Rehn
Federal Aviation Administration
William J. Hughes Technical Center
Fire Safety Branch, Bldg. 203
Atlantic City Int'l Airport, NJ 08405
(609) 485-5587
steven.rehn@faa.gov