Oil Burner Testing of Powerplant Components

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http://www.fire.tc.faa.gov
Background

• **Industry is currently utilizing legacy oil and propane burners**
  – Propane burner shown to be less severe than an engine flammable fluid flame
  – Recommending oil burner be used for all powerplant tests

• **FAA Tech Center Fire Safety Branch has been tasked by Transport Standards Branch (TSB) to develop burner performance standards for the Sonic fire test burner for powerplant fire testing**
  – Sonic burner much easier to calibrate, provides more consistent results, and is readily available for industry use
Current Status/Plan

1. **Support Thermocouple Round Robin Testing for SAE**
   - Completed

2. **Support composite material testing round robin**
   - In Progress

3. **Conduct internal comparative testing of Park vs Sonic burner to develop FAA recommended Sonic burner configuration for Powerplant testing**
   - In Progress
T/C Round Robin

• Initiated by Resonate Testing through Powerplant Task Group
• Objective is to investigate effect on temperature readings caused by:
  – External sheath diameter and wire gauge
  – Exposed junction vs sheathed
  – Thermocouple age
• Thermocouples have been procured
  – Testing at FAA Technical Center completed April, 2019
• 14 labs in agreement to participate
T/C Round Robin

- Four T/C types to be evaluated:
  - 1/8” exposed junction
  - 1/16” exposed junction
  - 1/8” Grounded/Sheathed
  - 1/16” Grounded/Sheathed

- Testing to utilize four rakes with a center control T/C in each

- Initial comparison testing of 5 measurements per rake

- Cycling test to consist of 20 measurements per rake
T/C Round Robin

Temperature Measured by #3 Thermocouple

Temperature (°F)

Delta T between Initial and Final Flame Exposure for each Thermocouple Type

Delta T (°F)

1/8" Exposed  1/8" Sheathed  1/16" Exposed  1/16" Sheathed

Temperature (°F)

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Composite Material Evaluation (Spirit Aero)

- Cantilevered weight installed on rear center portion of 4-ply and 8-ply composite panel
- Initial testing at NIAR showed promising results with burnthrough occurring in 2-3 minutes without vibration.
- Burnthrough occurs at the time the weight detaches from panel
- Testing ongoing at NIAR to refine weight loading and ensure repeatability
- Testing at additional labs to ensure reproducibility
Comparative Testing with Park Burner

- Intent is to develop FAA recommended practice for Sonic burner, given current AC 20-135 calibration requirements.

- FAA’s Park oil burner will be operated using current AC 20-135 calibration requirements and utilized as our baseline.

- Run back-to-back comparison testing of materials using both the Park and Sonic burner.

- Recommended Sonic burner settings and operating parameters to produce results equivalent to legacy burners.
Comparative Testing with Park Burner

TexTech PAN Felt

0.125” 2024-T3 Aluminum
Questions?

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