

# Update for Oil Burner Testing of Powerplant Components

International Aircraft  
Materials Fire Test Forum

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**Federal Aviation  
Administration**

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<http://www.fire.tc.faa.gov>



# Current Status/Plan

- 1. SAE Thermocouple Round Robin Testing**
- 2. Composite material testing round robin**
- 3. Conduct internal comparative testing of Park vs Sonic**
- 4. Heat flux comparison testing of propane vs oil burner**

# TC Round Robin

- **Objective is to investigate effect on temperature readings caused by:**
  - Sheath diameter and wire gauge
  - Exposed junction vs sheathed
  - Thermocouple age
- **Four T/C types to be evaluated**
  - 1/8" exposed junction
  - 1/8" Grounded/Sheathed
  - 1/16" exposed junction
  - 1/16" Grounded/Sheathed



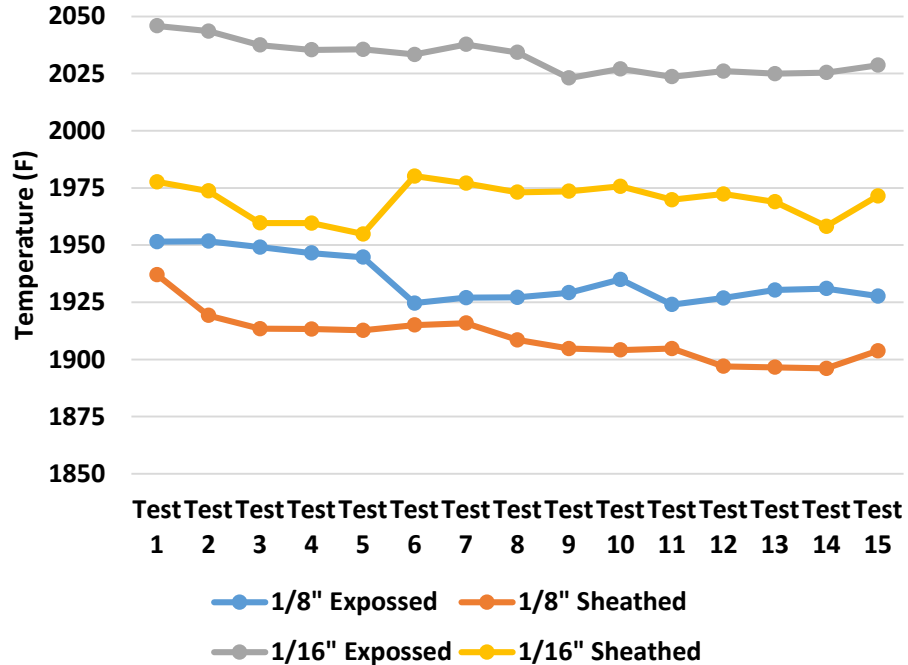
# TC Round Robin

- **Park burner was used for testing and calibrated to AC 20-135 requirements**
  - 2000 F and 4500 Btu/hr
- **TC's were exposed to flame for 20 cycles**
  - 6 minutes per cycle (flame exposure)
- **Data shown for #3 TC only to simplify graph**

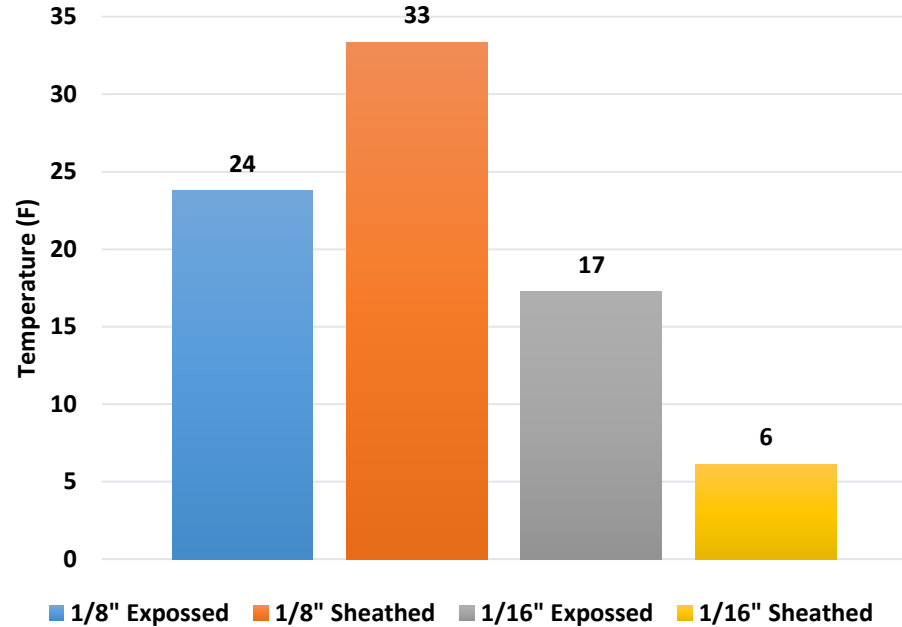


# T/C Round Robin

Temperature Measured by #3 Thermocouple



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



# TC Round Robin Summary

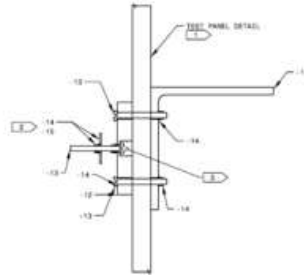
- **1/8" sheathed showed the largest drop in temperatures after cycling**
- **1/16" sheathed showed the smallest drop in temperature after cycling**
- **Smaller diameter TC's read higher temperatures compared to larger TC's**
- **Unsheathed TC's read higher temperatures compared to sheathed TC's of the same diameter**



# Composite Material Evaluation (Spirit Aero)

- Investigate to determine if this test may be used as a means of comparing burner flame intensity from lab to lab
- Attempt to improve test result reproducibility
- Utilizes a cantilevered weight mounted to the back of the composite panel
- Burnthrough occurs at the time of weight detachment
- More precise method of indicating burnthrough rather than visually determining burnthrough which is more subjective

Flame Side  
Shown



Fitting Section View

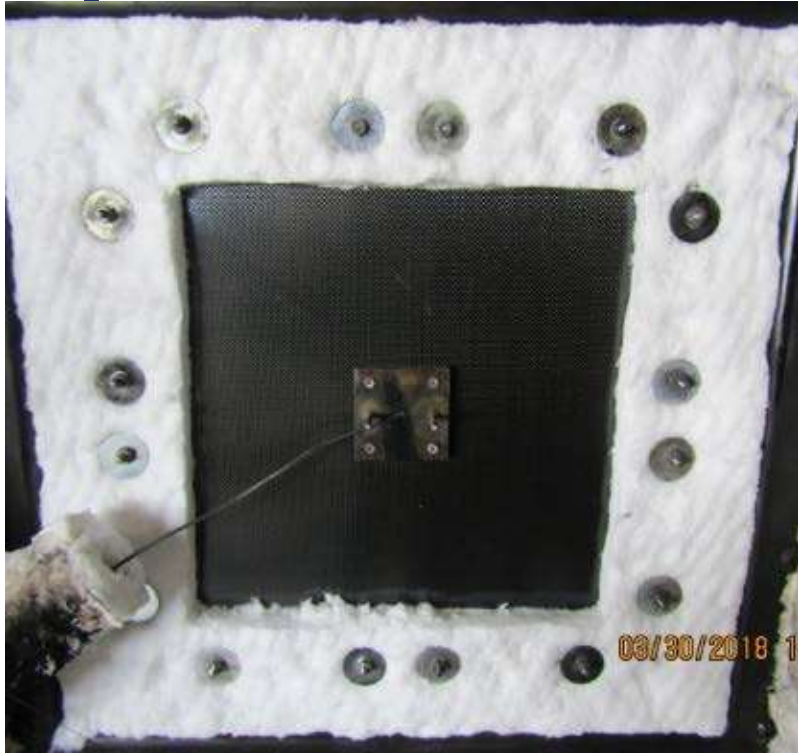
(graphics from Spirit AeroSystems)



Cold Side  
Shown



# Spirit Aero Composite Test Panel





# Comparative Testing with Park Burner

- Purpose is to develop FAA recommended settings and configuration for Sonic burner for use in powerplant testing applications
- FAA's Park oil burner will be operated using current AC 20-135 calibration requirements and utilized the baseline
- Temperature, heat flux, and material testing will be the basis for comparing the two burners

TexTech PAN Felt



0.125" 2024-T3 Aluminum



# Comparative Testing with Park Burner

- **Sonic burner operating parameters will be adjusted such that it will be equivalent to the Park burner**
- **Internal configuration of Sonic burner will utilize the same parts and setup as all other Sonic burner material test methods**
- **Sonic burner will then be added to the chapters in the Fire Test Handbook which pertain to powerplant testing**



# Propane vs. Oil Burner Heat Flux

- Industry is currently utilizing legacy oil and propane burners
- Propane burners have shown to be less severe than an engine flammable fluid flame
- FAA is recommending oil burners be used for all powerplant tests
- Plan to perform comparative testing of heat flux for propane and oil burner
- Purpose is to demonstrate propane is not equivalent to oil burner flame



# Questions?

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