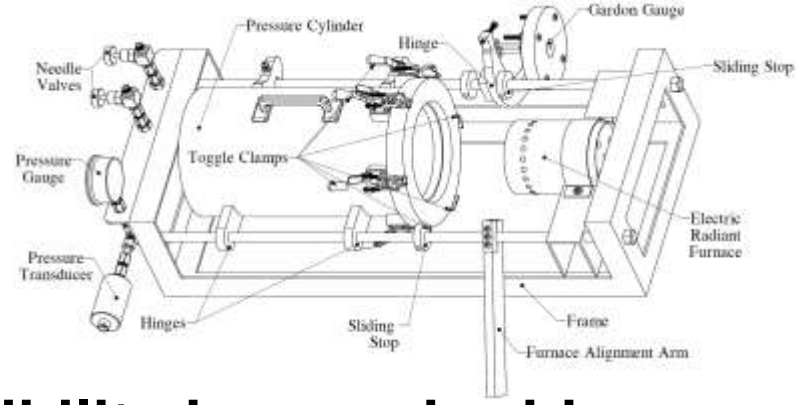
Evaluation of Measuring Input Power for Calibrating the Evacuation Slide Test

Presented to: International Aircraft Materials Fire Test Forum
By: Steve Rehn
Date: 3/10/2020

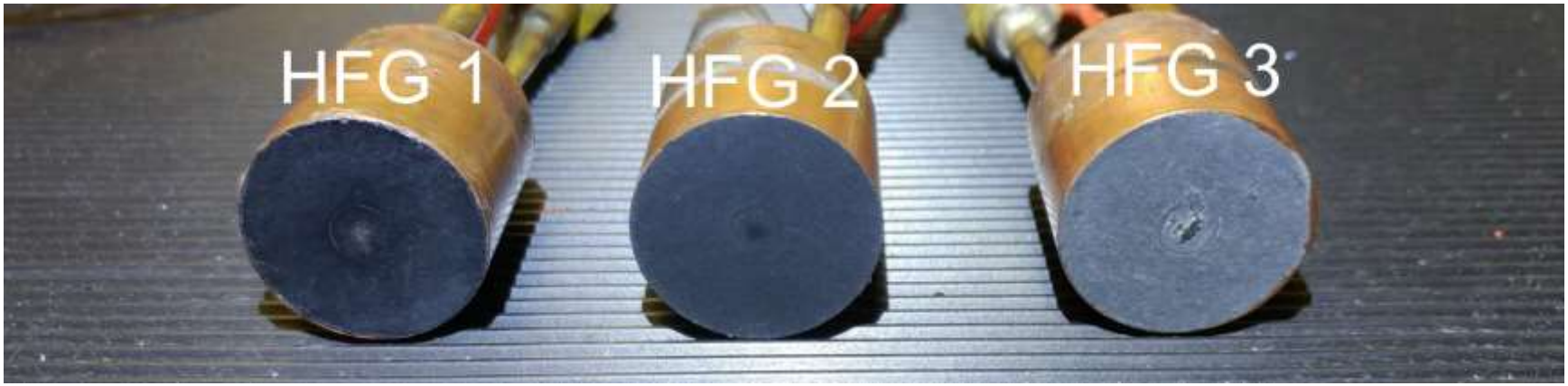
Introduction



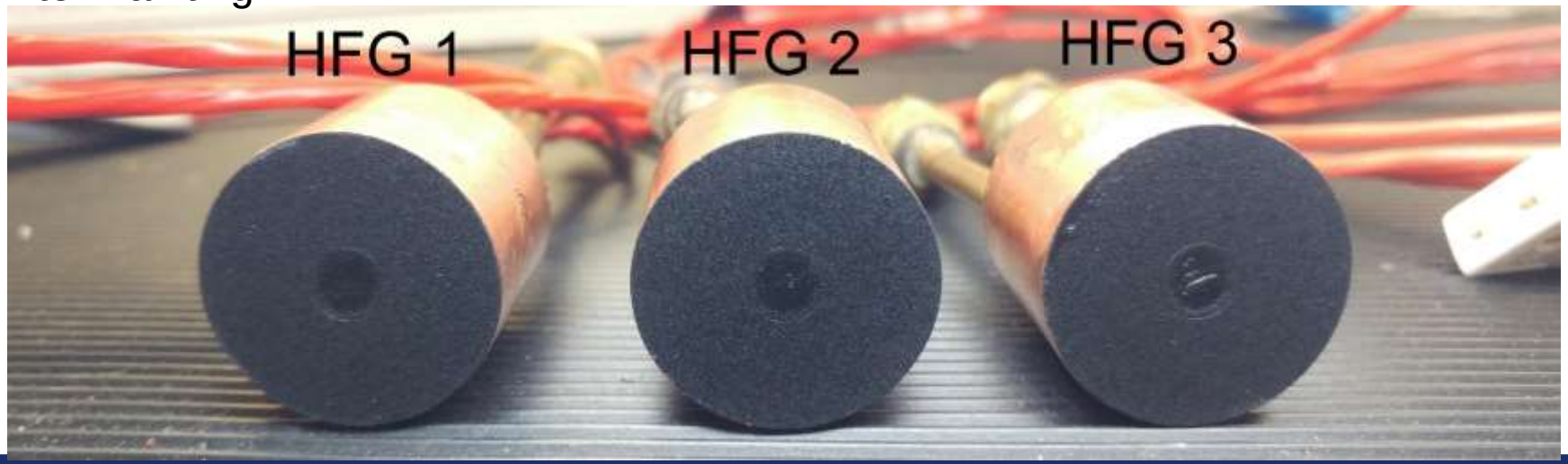
- **After observing poor reproducibility in round robin testing, FAA studied the Evacuation Slide Test to determine if the calibration method can be changed from measuring the heat flux at the sample surface to measuring the input power going to the heater**
- **More recently conducted testing comparing larger number of heaters and heat flux gauges in order to determine the most reproducible method for calibration**

Heat Flux Gauge Comparison

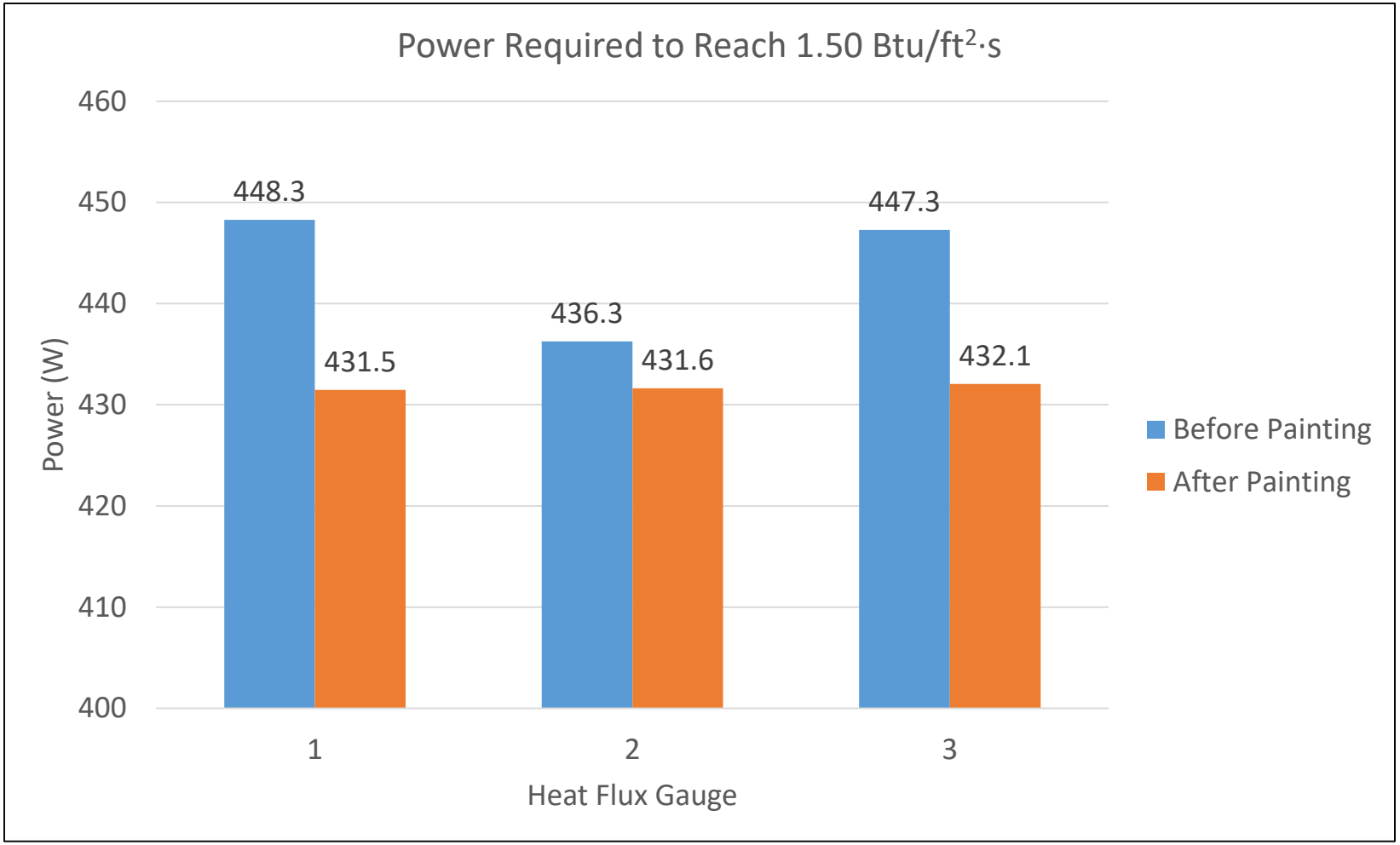
Before Painting:



After Painting:



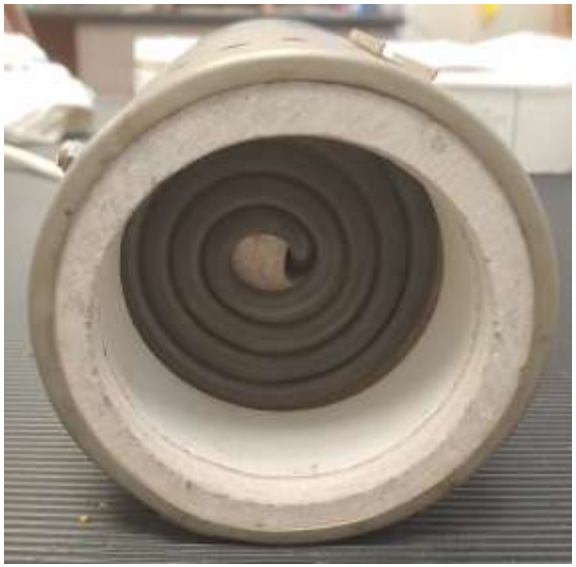
Heat Flux Gauge Comparison



Solid Coil Heater #1, HFG calibrated before and after painting

Heater and HFG Comparison

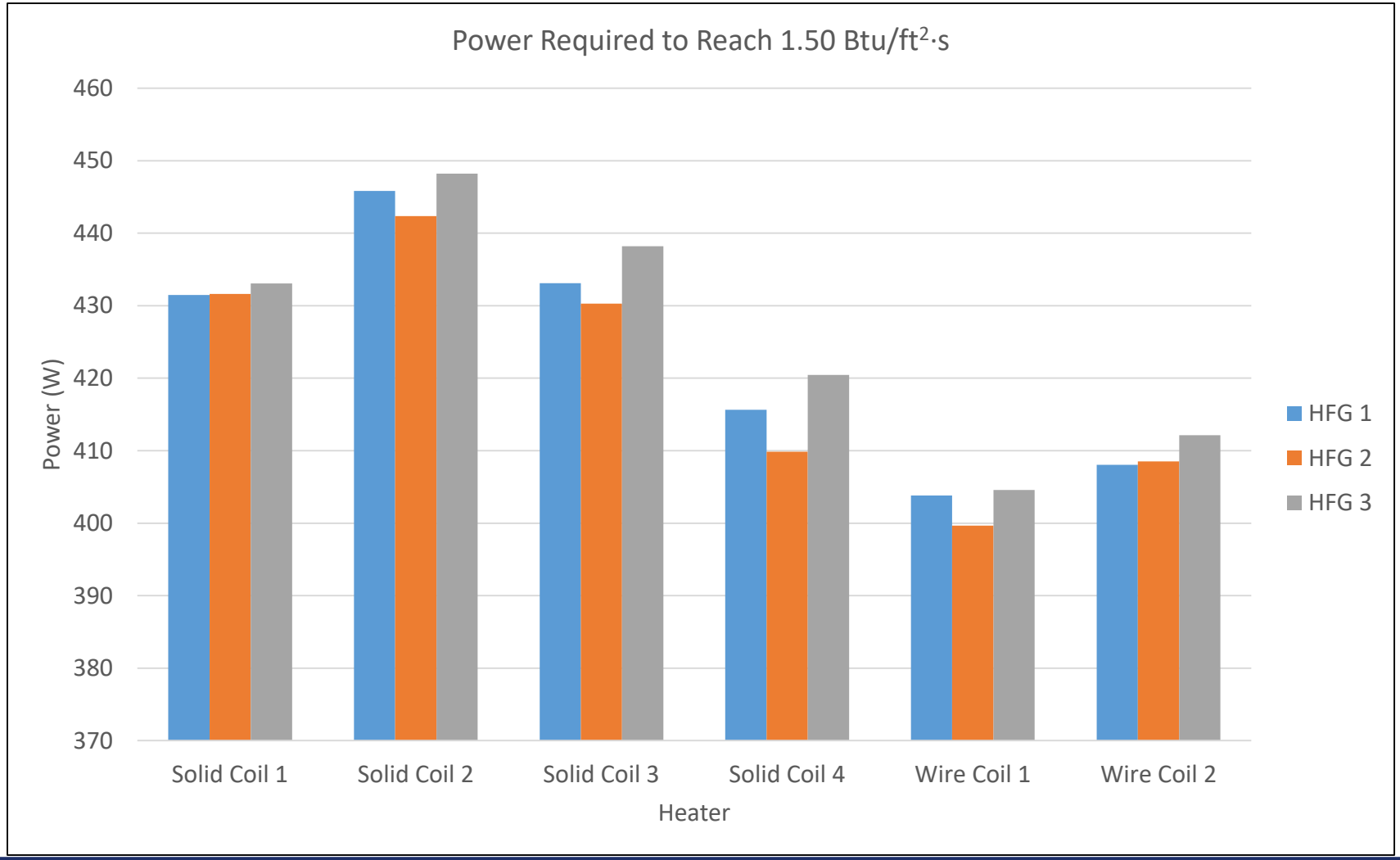
- **Tested 6 heaters and 3 heat flux gauges**
  - 4 solid coil, 2 wire coil



Solid Coil

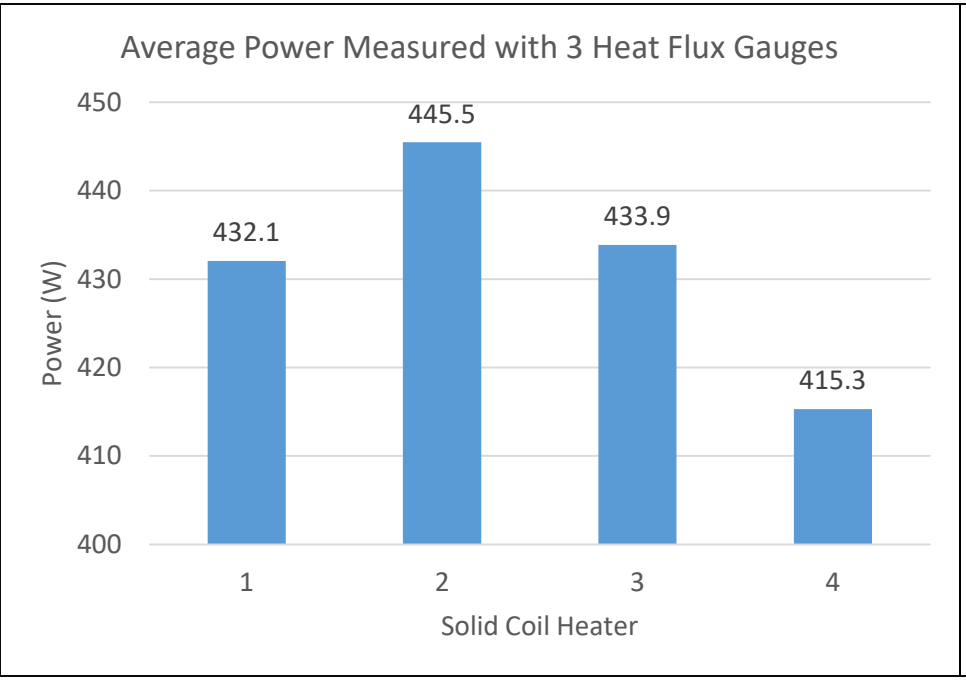
Wire Coil

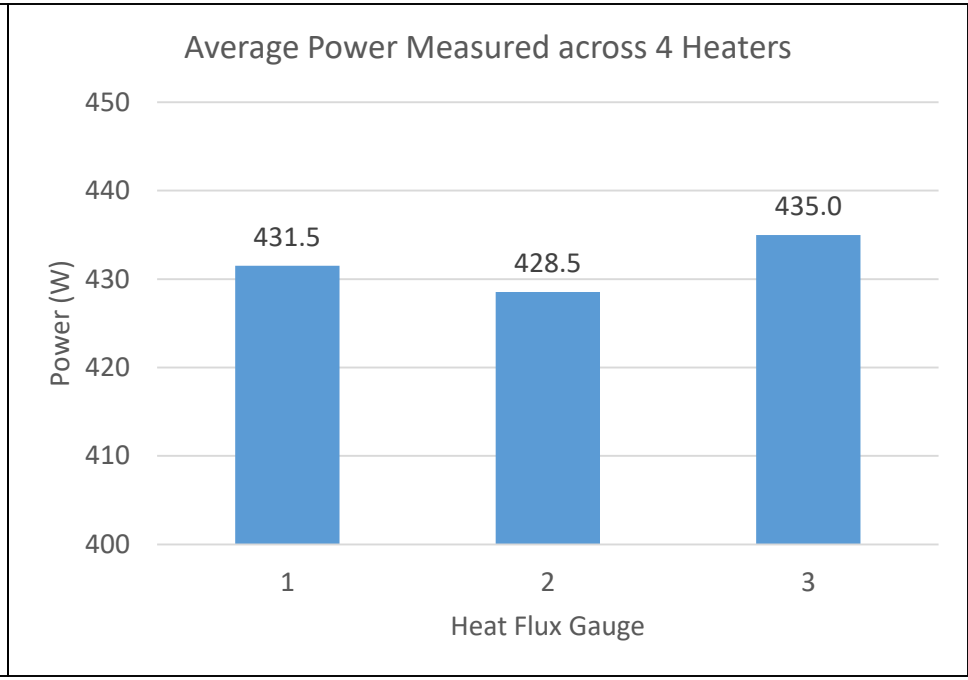
Heater and HFG Comparison



Heater and HFG Comparison

Comparing range of power required for different heaters vs different heat flux gauges to reach 1.50 Btu/ft^2·s (Solid Coil Heaters only)

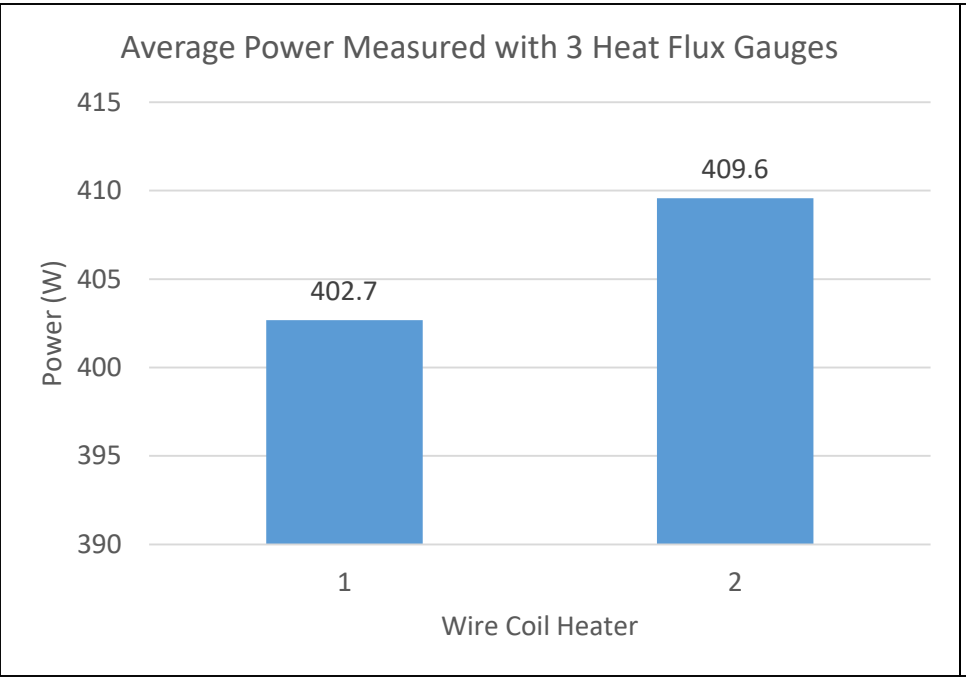


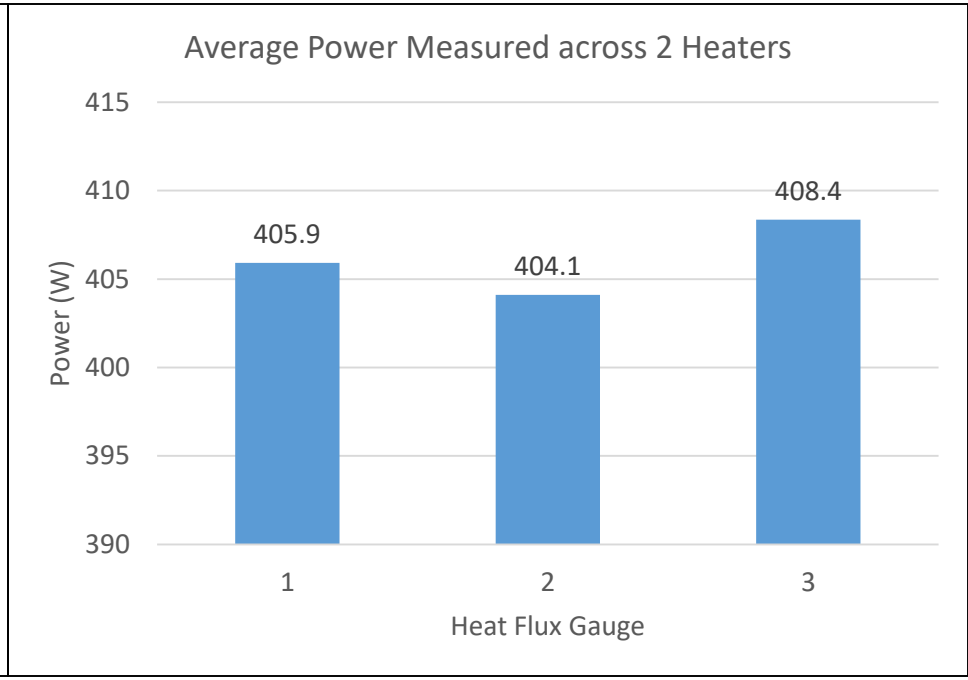


- Different heaters varied from 415 W to 445 W
- Different heat flux gauges varied from 429 W to 435 W

Heater and HFG Comparison

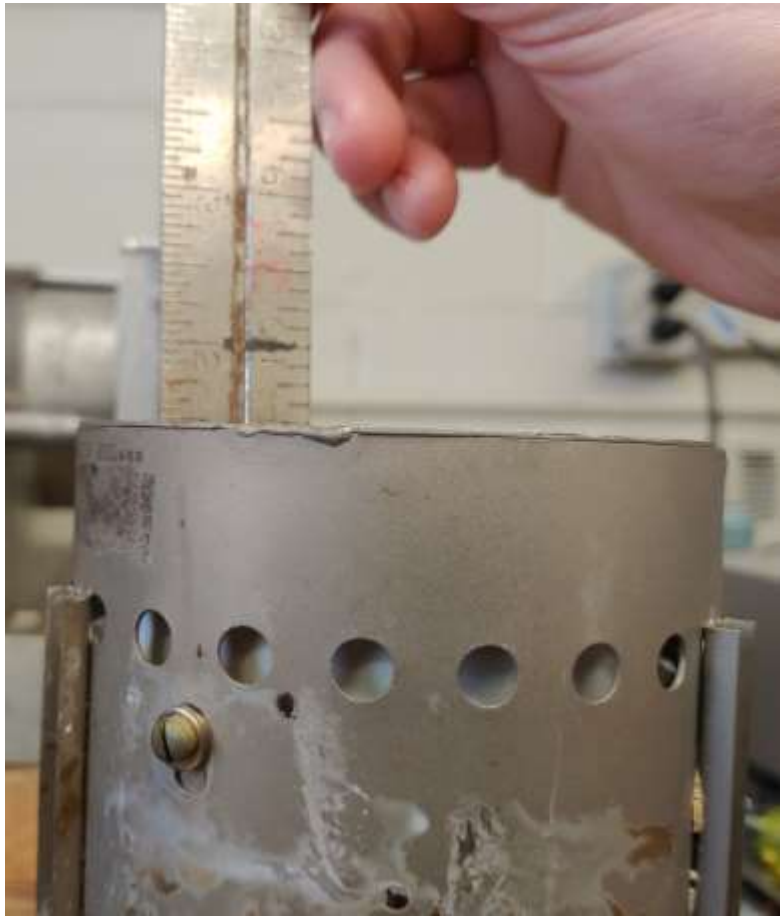
Wire Coil Heater Comparison





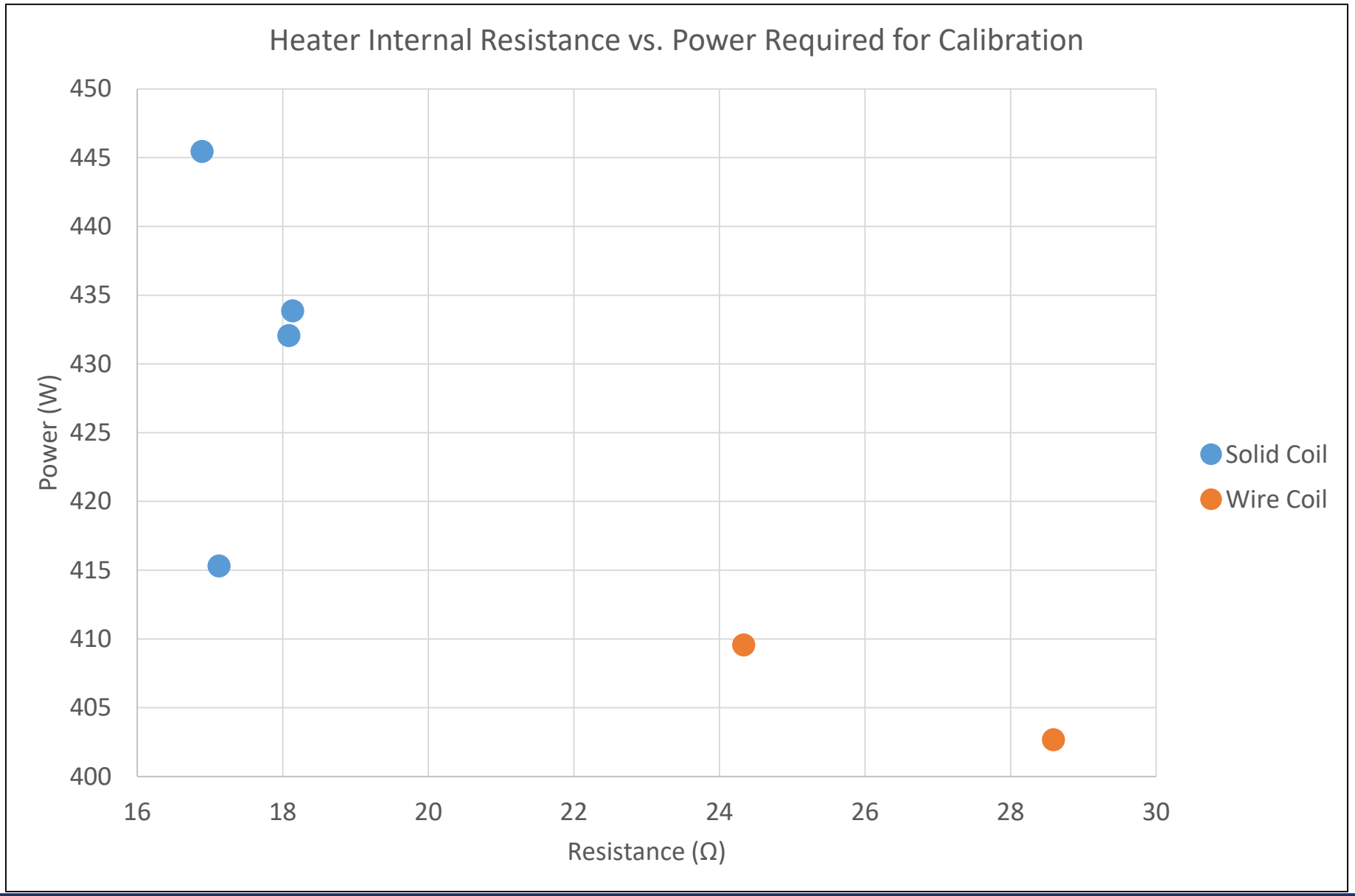
- Different heaters varied from 403 W to 410 W
- Different heat flux gauges varied from 404 W to 408 W

Why are the Heaters so Different?



Set coil to1.5 inch depth

- Coils aren’t all on exactly the same plane (Heater 2 varies 3/16”)
- Condition of surface could affect emissivity


Heater Internal Resistance vs. Power Required for Calibration
450
445
440
435
430
425
420
415
410
405
400
Power (W)
16
18
20
22
24
26
28
30
Resistance (Ω)
Solid Coil
Wire Coil

Report

- **Completed test report combining all round robin testing and experiments from the last few years**
- **Will be published soon**

DOT/FAA/AR-xx/xx

Development of a Revised Test Method for Evaluating the Performance of Evacuation Slide Materials During Exposure to Radiant Heat

Air Traffic Organization
NextGen & Operations
Planning
Office of Research and
Technology Development
Washington, DC 20591

Timothy R. Marker
Dung Do
Steve Rehn
Tina Emami

January 2020

Final Report

This document is available to the U.S. public through the National Technical Information Services (NTIS), Springfield, Virginia 22161.

This document is also available from the Federal Aviation Administration William J. Hughes Technical Center at actlibrary.tc.faa.gov.

U.S. Department of Transportation
Federal Aviation Administration

Conclusion

- **Much more repeatable calibrations changing heat flux gauges vs changing heaters**
- **Measuring heat flux produces more accurate calibration than measuring power**
- **Make sure heat flux gauge surface is in good condition and calibration is up to date**
- **NPRM states to calibrate using power measurement**
  - Will be changed back to heat flux

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