Evaluation of Measuring Input Power for Calibrating the Evacuation Slide Test

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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:

HFG 1  HFG 2  HFG 3

After Painting:

HFG 1  HFG 2  HFG 3
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
Heater and HFG Comparison

Power Required to Reach 1.50 Btu/ft²·s

<table>
<thead>
<tr>
<th>Heater</th>
<th>Solid Coil 1</th>
<th>Solid Coil 2</th>
<th>Solid Coil 3</th>
<th>Solid Coil 4</th>
<th>Wire Coil 1</th>
<th>Wire Coil 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Coil 1</td>
<td>430</td>
<td>435</td>
<td>430</td>
<td>425</td>
<td>420</td>
<td>425</td>
</tr>
<tr>
<td>Solid Coil 2</td>
<td>440</td>
<td>450</td>
<td>445</td>
<td>440</td>
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<tr>
<td>Solid Coil 3</td>
<td>435</td>
<td>445</td>
<td>440</td>
<td>435</td>
<td>430</td>
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<tr>
<td>Solid Coil 4</td>
<td>425</td>
<td>430</td>
<td>425</td>
<td>420</td>
<td>415</td>
<td>415</td>
</tr>
<tr>
<td>Wire Coil 1</td>
<td>420</td>
<td>425</td>
<td>420</td>
<td>415</td>
<td>410</td>
<td>410</td>
</tr>
<tr>
<td>Wire Coil 2</td>
<td>415</td>
<td>420</td>
<td>415</td>
<td>410</td>
<td>405</td>
<td>405</td>
</tr>
</tbody>
</table>

Legend:
- HFG 1
- HFG 2
- HFG 3
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?

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

Set coil to 1.5 inch depth
• Completed test report combining all round robin testing and experiments from the last few years
• Will be published soon
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?

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