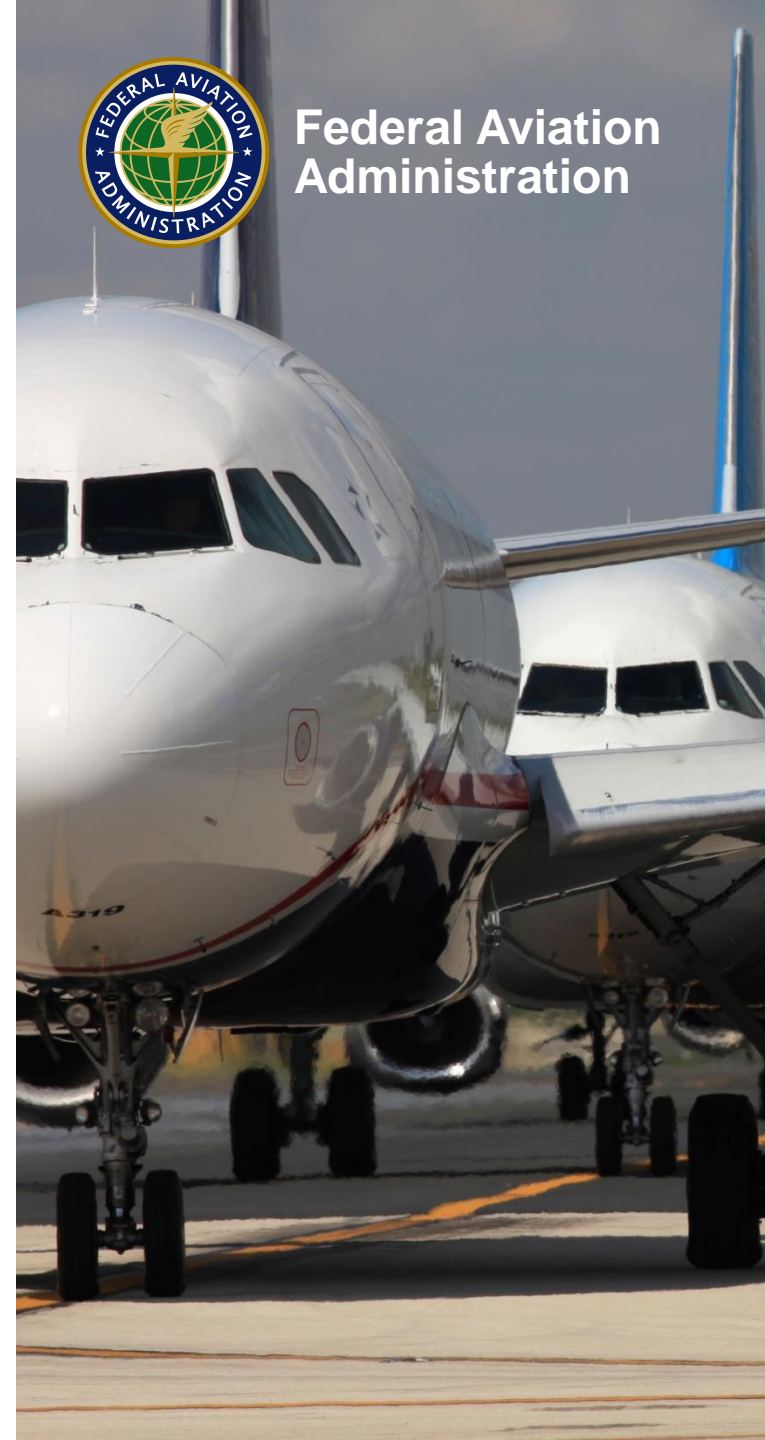


# Radiant Panel Update

Presented to: International Aircraft Materials Fire  
Test Working Group Meeting  
By: Steven Rehn  
Date: 6/7/2016



Federal Aviation  
Administration



# Introduction

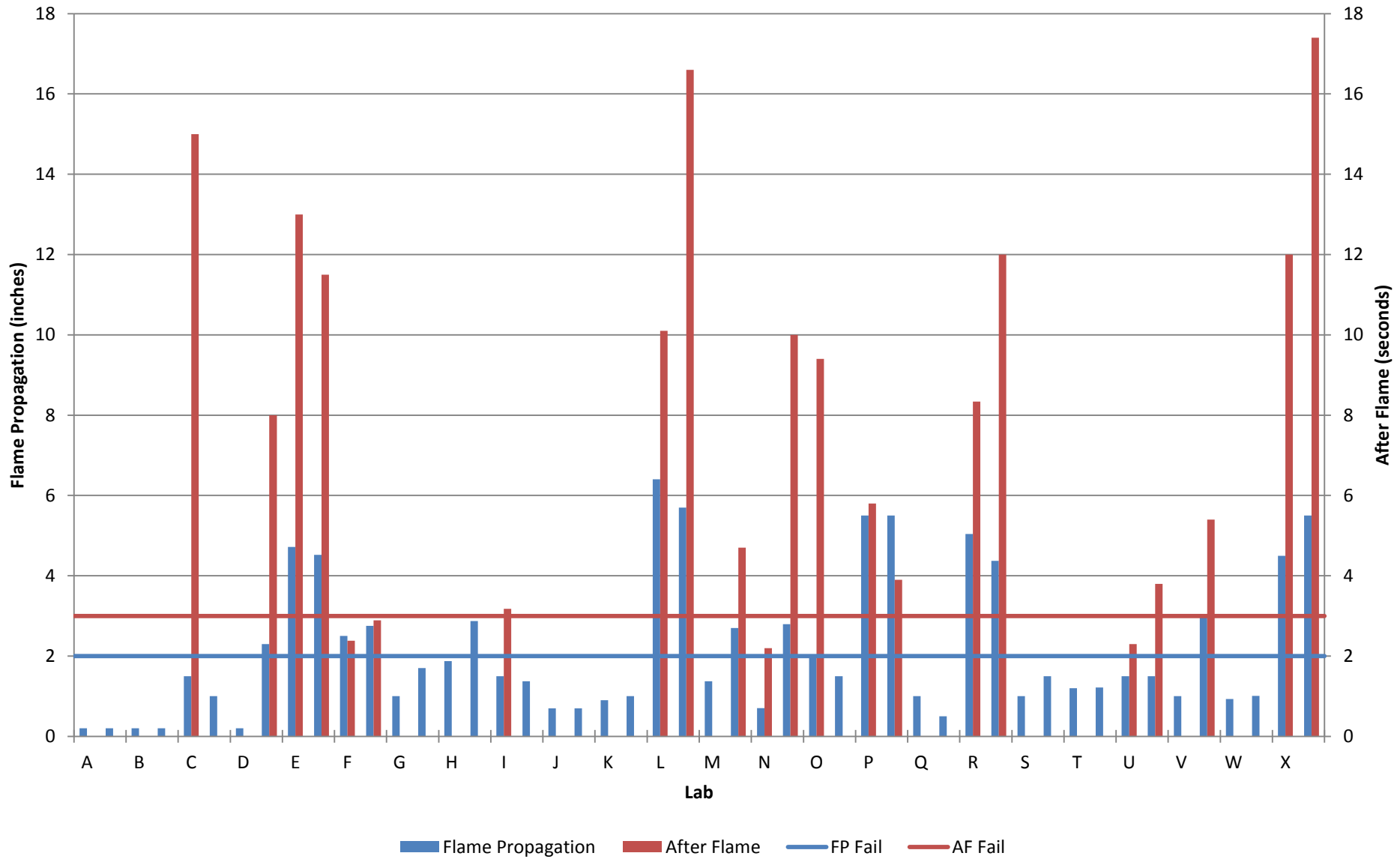
- **Round Robin**
  - Most of the test results are in.
- **Air Flow Study**
  - Varied openings around the sliding platform to test how it affected air flow and material test results.
  - Future Work

# Round Robin

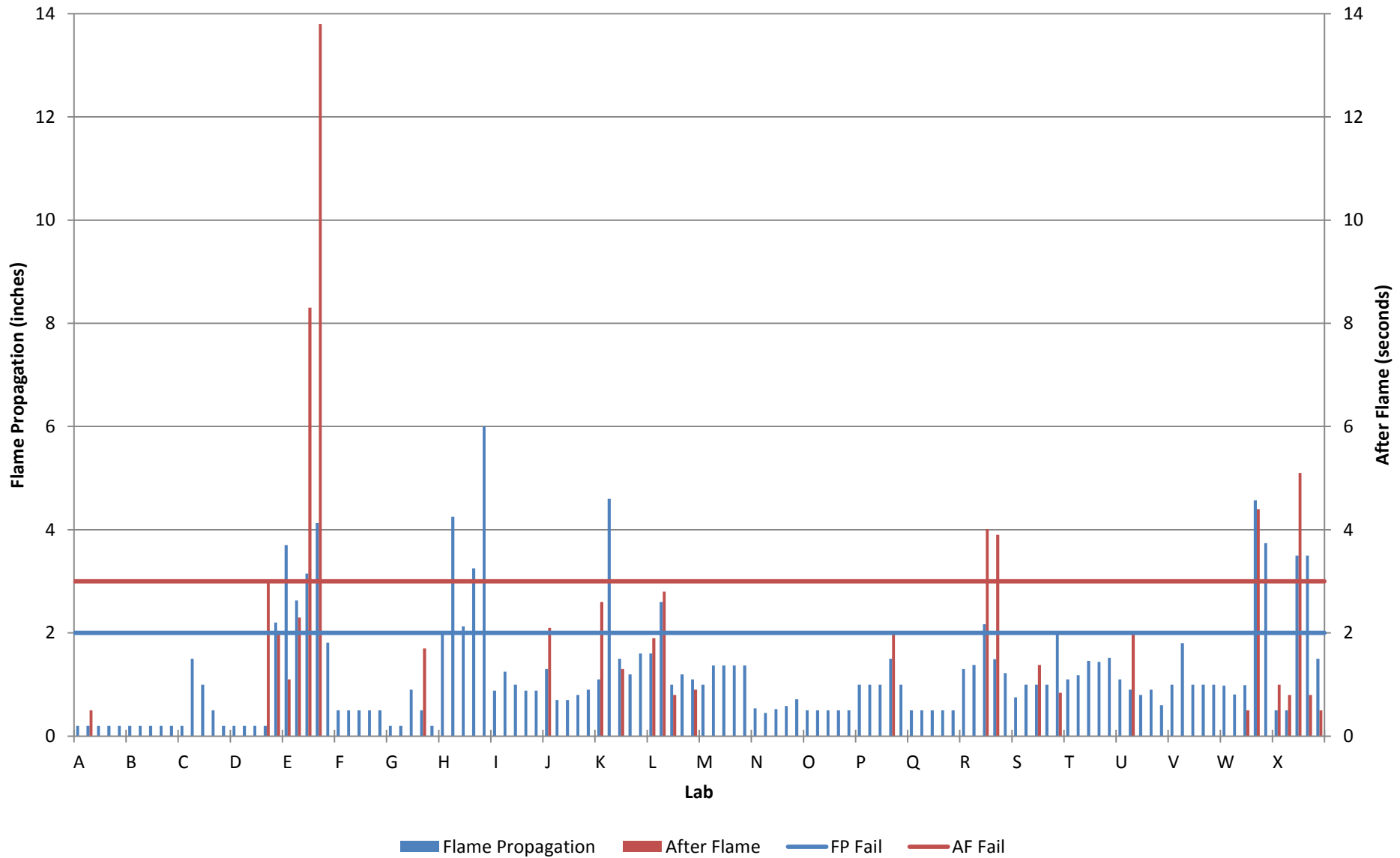
- **Materials sent out to 28 labs (including FAA)**
- **24 Responses so far**
- **12 samples for each lab**



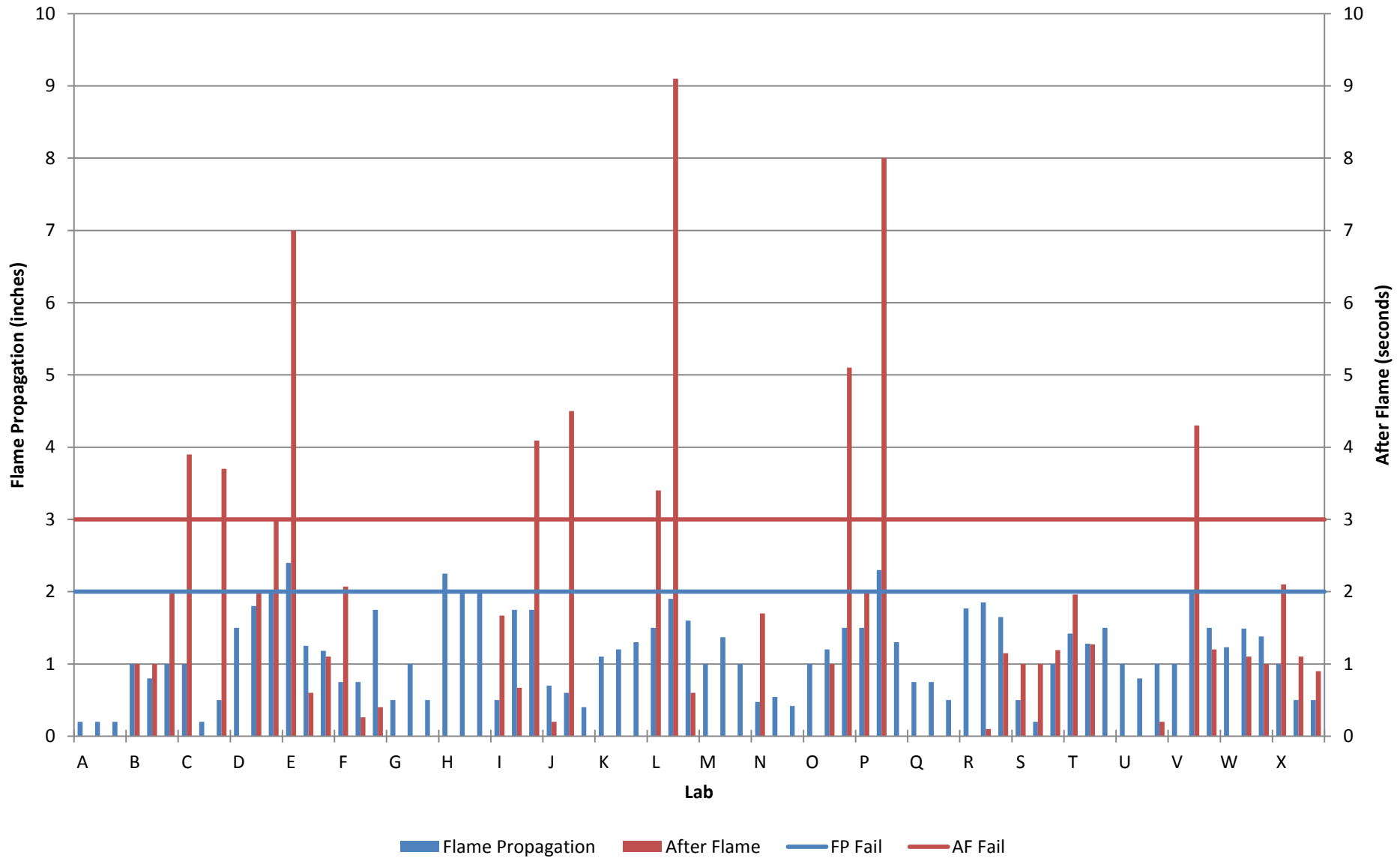
# Metalized PEEK



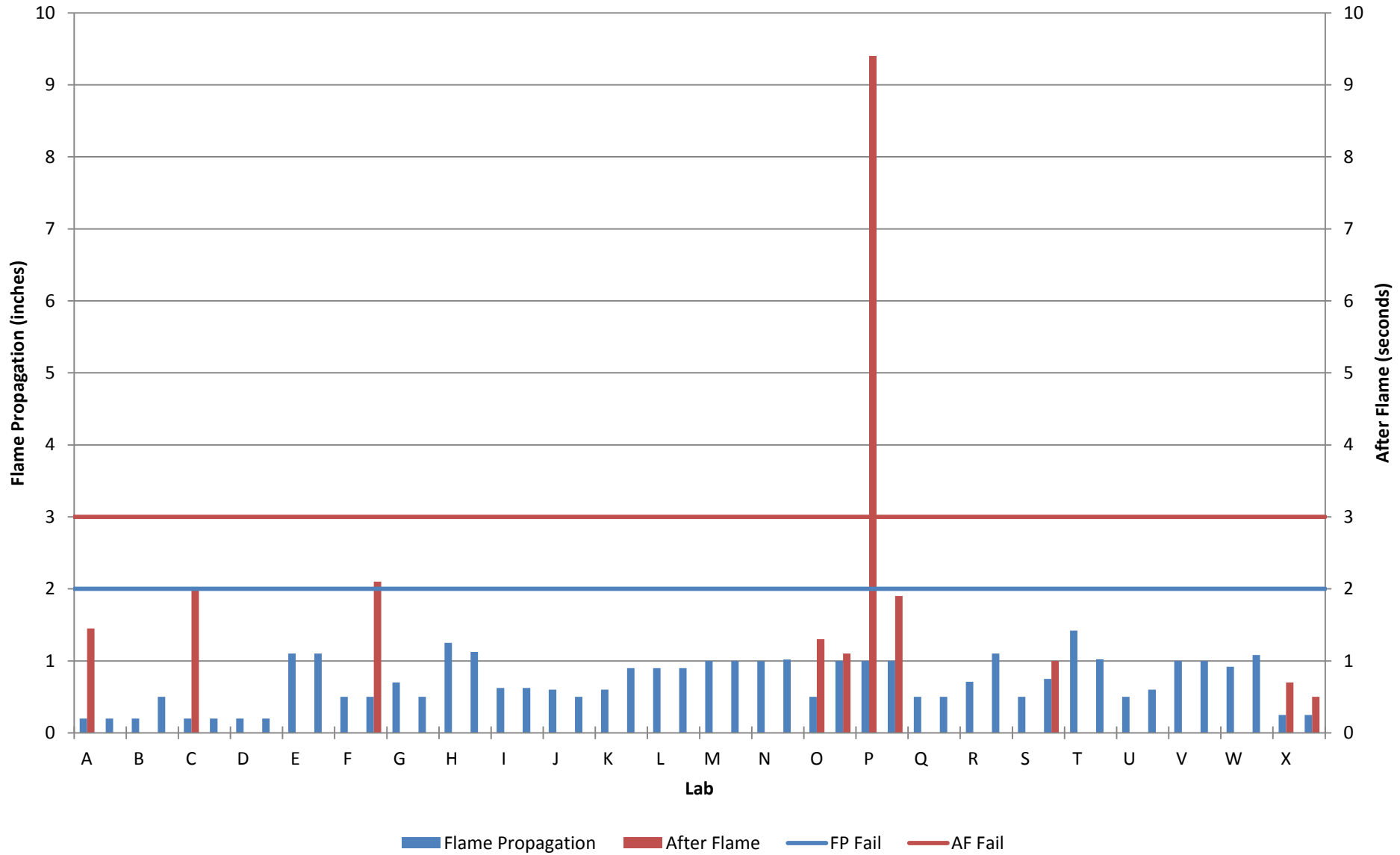
# Unmetalized PEEK



# Metalized PEEK w/ Tape



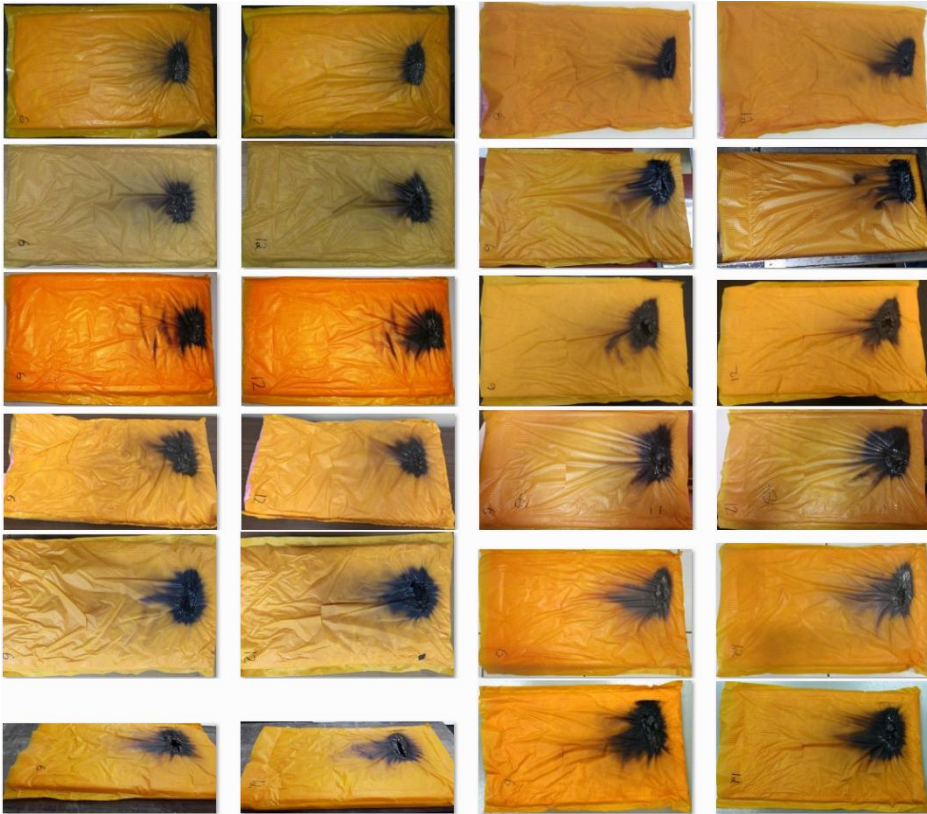
# Polyimide



# Polyimide

1-12

13-24





# Polyimide



FAA's test result



- Same test, completely different results.

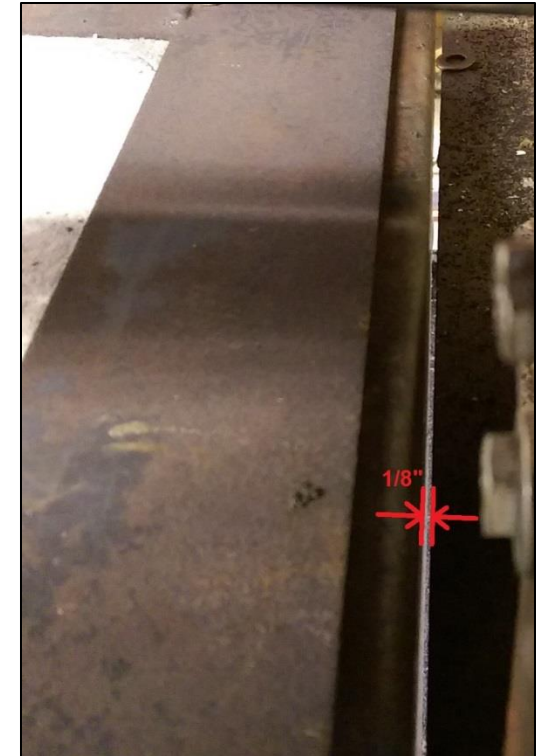
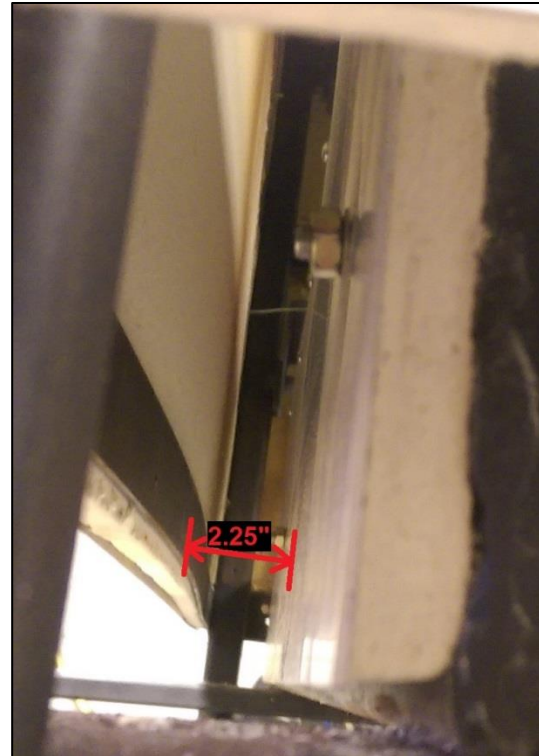
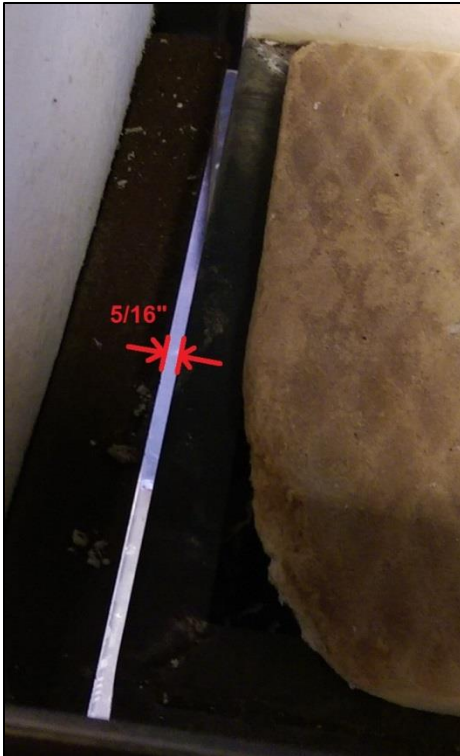
# Air Flow Study

- **New handbook has a larger drawer length compared to the current handbook.**
- **This was done to allow less air to flow into the chamber during testing.**
- **Larger drawer isn't necessary – the openings around the drawer are what we need to standardize.**
- **We ran some tests to see how changing the size of these openings affects calibration and test results.**

# Air Flow Study

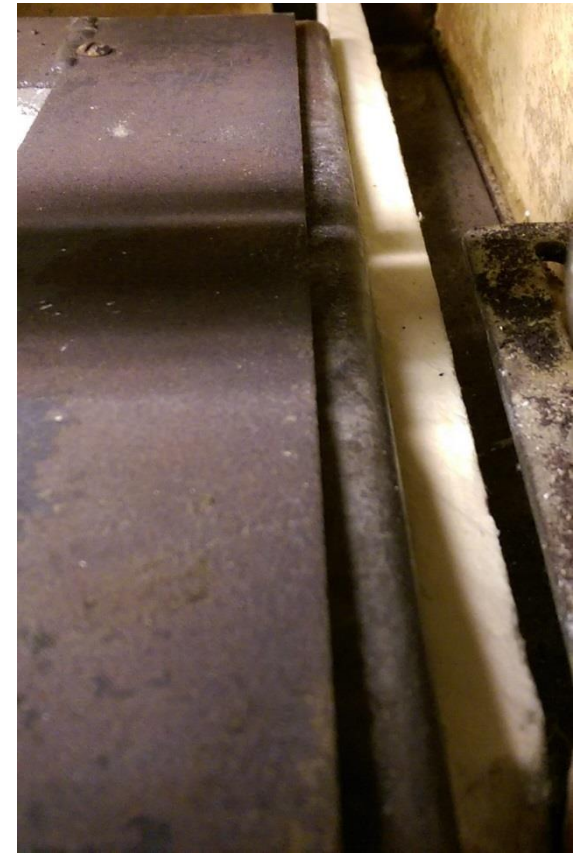
- Normal openings around the FAA's radiant panel

Left	Right	Front	Back
5/16"	1/8"	0"	2.25"



# Air Flow Study

- Closed off left, rear, and right gaps

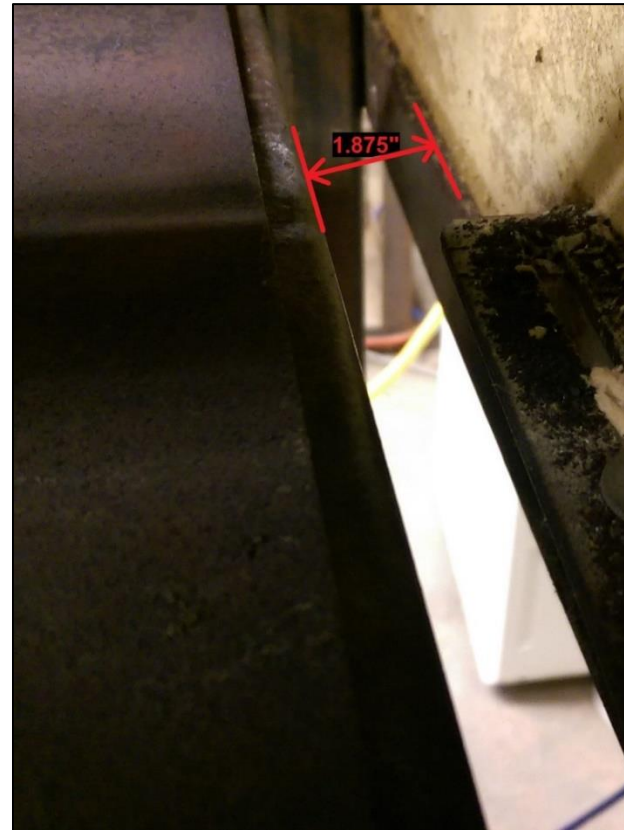


# Air Flow Study

- Gaps around the drawer fully open



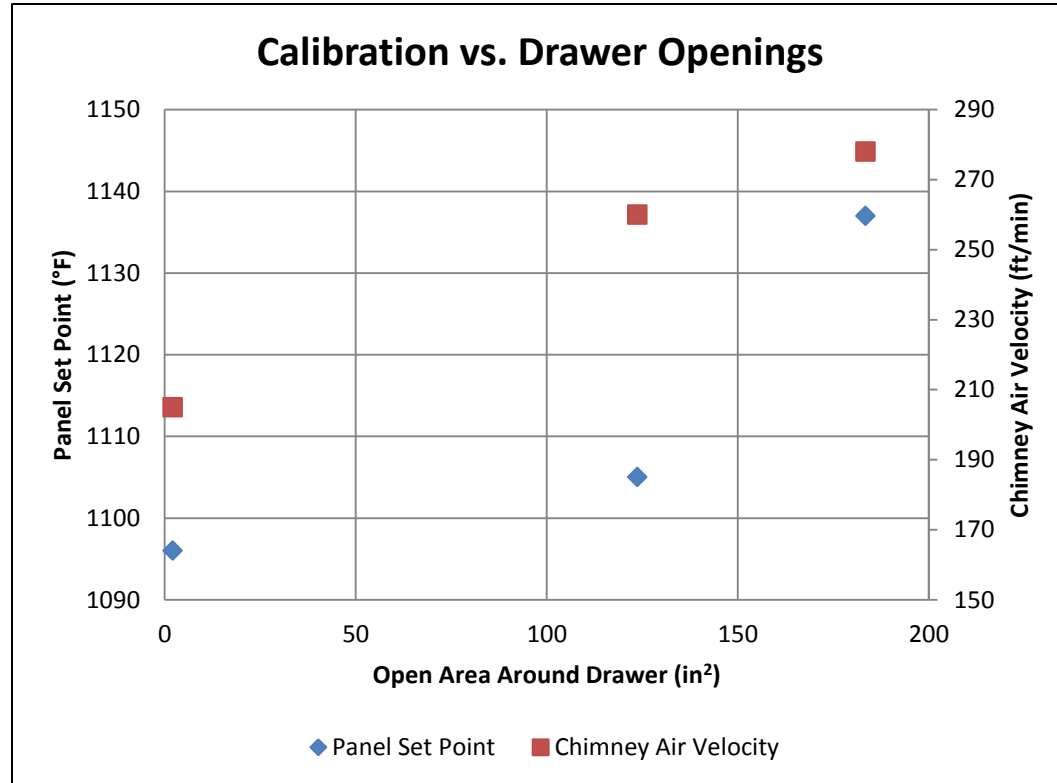
2.125" Left Gap



1.875" Right Gap

# Air Flow Study

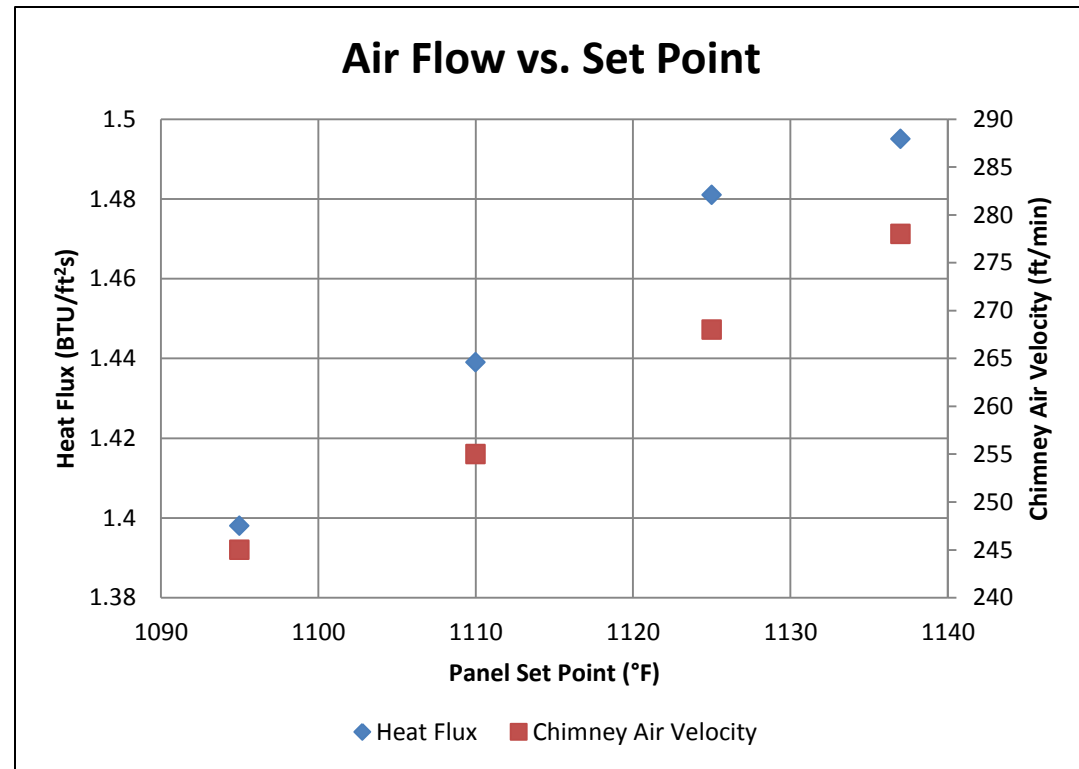
	Closed Around Drawer	Normal Around Drawer	Open w/ ~2" Gap on Each Side
Open Area Around Drawer(in <sup>2</sup> )	2.09	123.77	183.44
Panel Set Point (°F)	1096	1105	1137
Heat Flux (BTU/ft <sup>2</sup> s)	1.501	1.502	1.495
Chamber Temperature(°F)	381	366	425
Chimney Air Velocity (FPM)	205	260	278



# Air Flow Study

- Openings Around Drawer: 2.125" left, 1.875" right, 2.25 rear

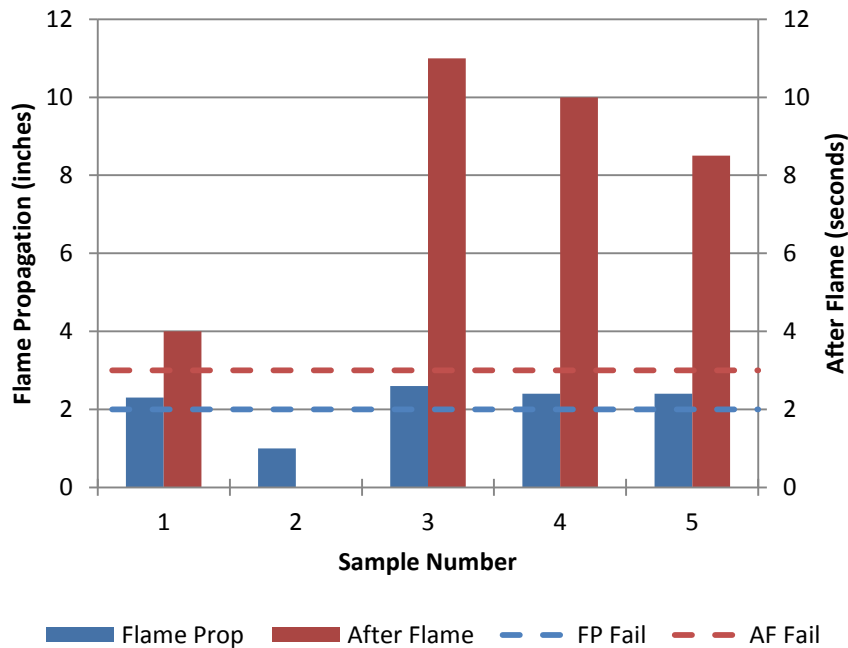
Set Point (°F)	1095	1110	1125	1137
Heat Flux (BTU/ft <sup>2</sup> s)	1.398	1.439	1.481	1.495
Thermocouple (°F)	385	395	410	425
Chimney (FPM)	245	255	268	278
Under Right Side of Drawer (FPM)	90	91	95	95
Under Left Side of Drawer (FPM)	65	60	65	65



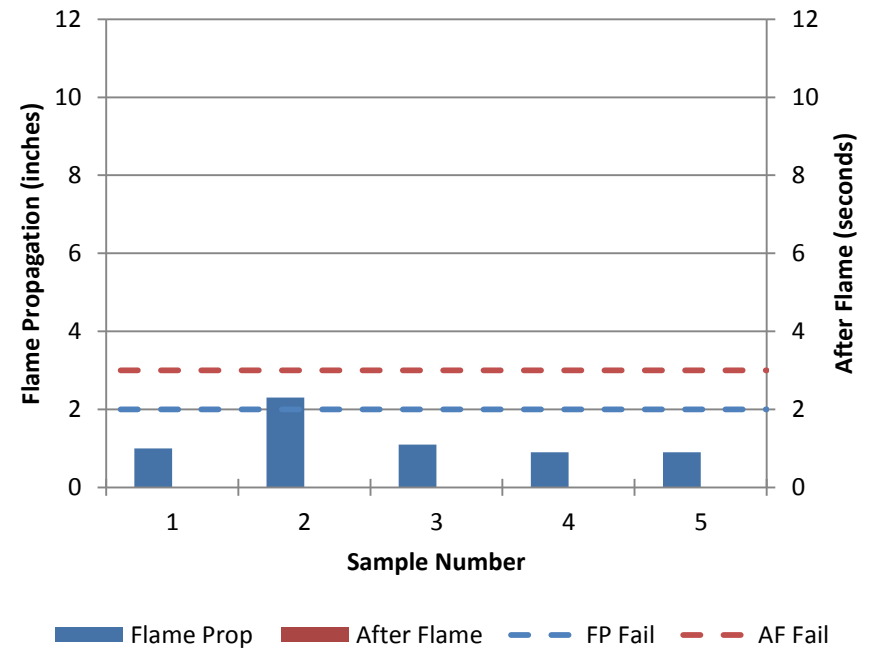
- As the panel temperature increases, the air flow into the chamber increases causing you to need to increase the panel temperature further to compensate

# Air Flow Study

## Gaps Closed - Metalized PEEK



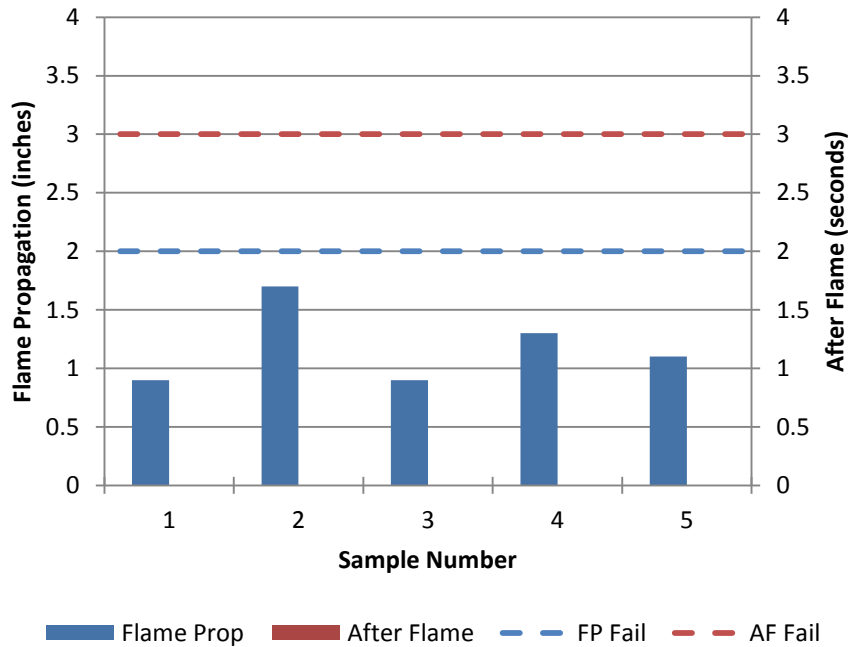
## Gaps Open - Metalized PEEK



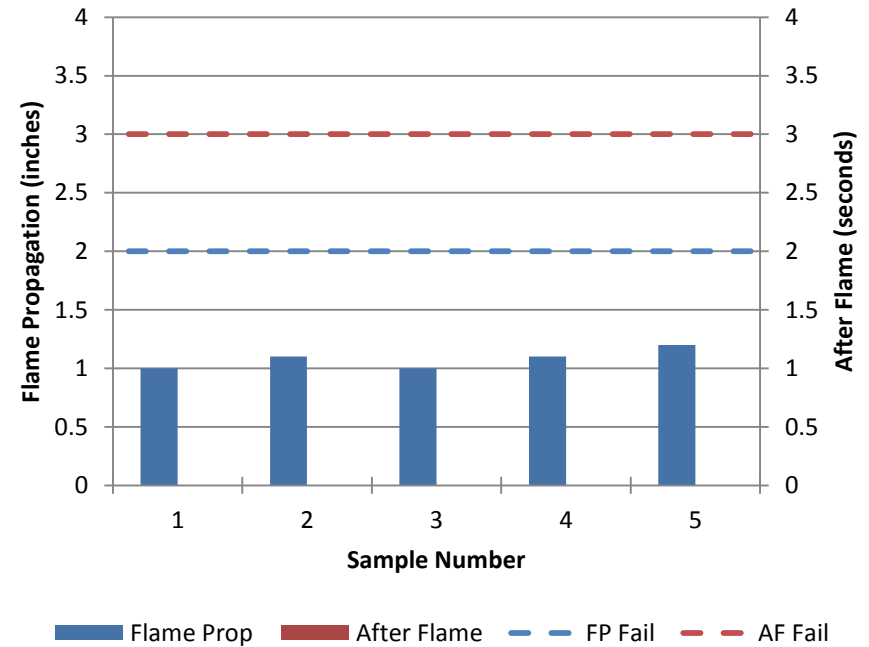


# Air Flow Study

## Gaps Closed - Unmetalized PEEK

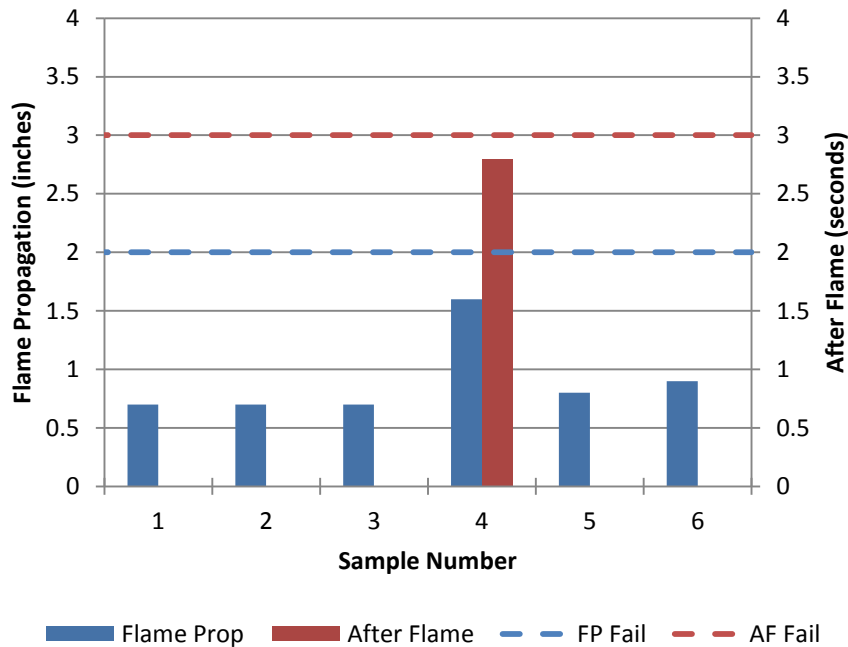


## Gaps Open - Unmetalized PEEK

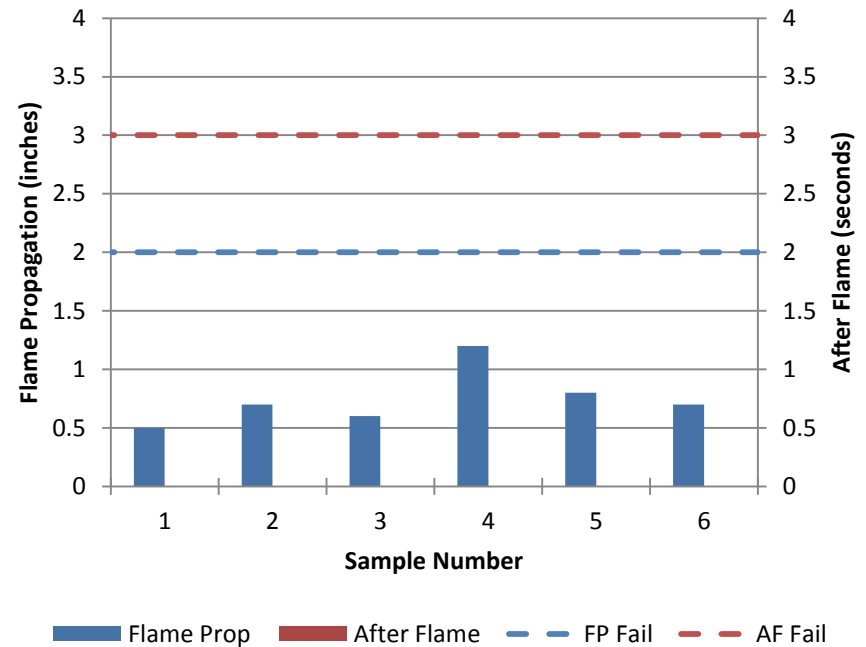


# Air Flow Study

## Gaps Closed - Shrinking Material

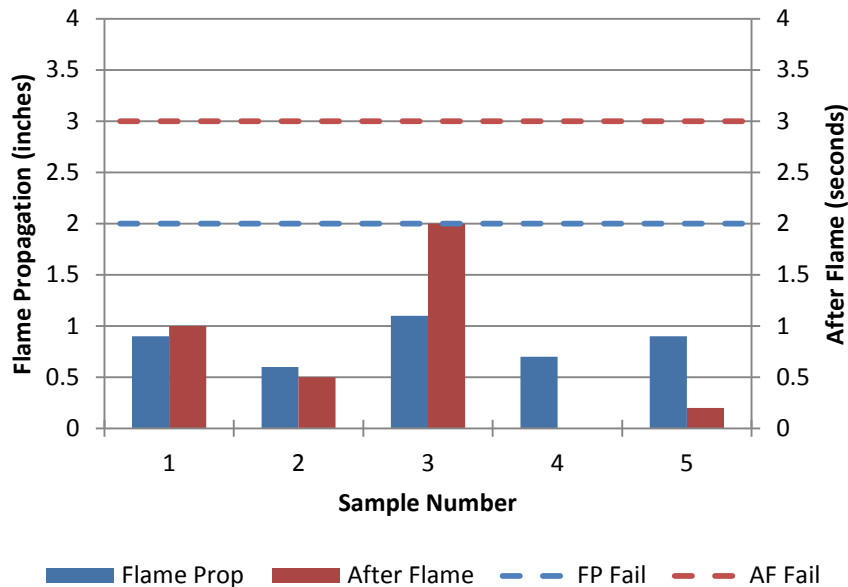


## Gaps Open - Shrinking Material

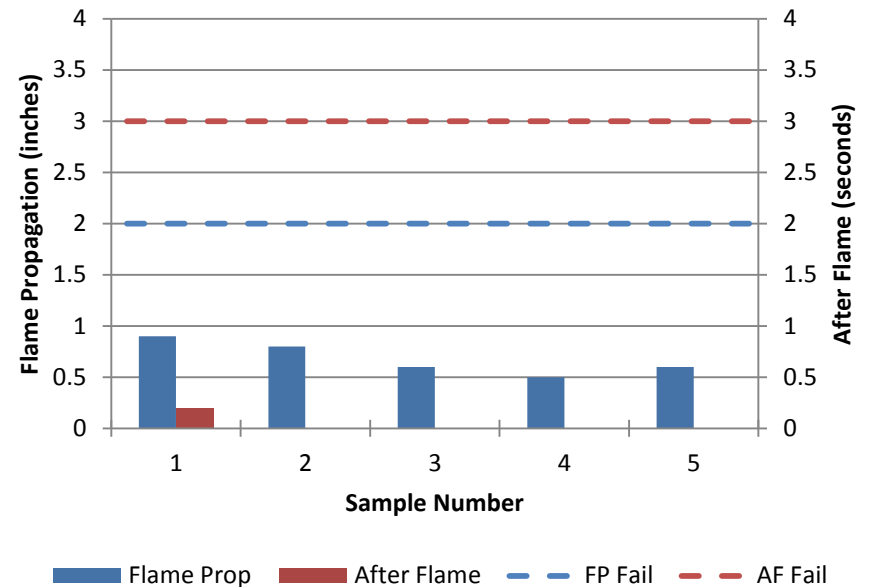


# Air Flow Study

## Gaps Closed - Metalized PEEK with Tape



## Gaps Open - Metalized PEEK with Tape

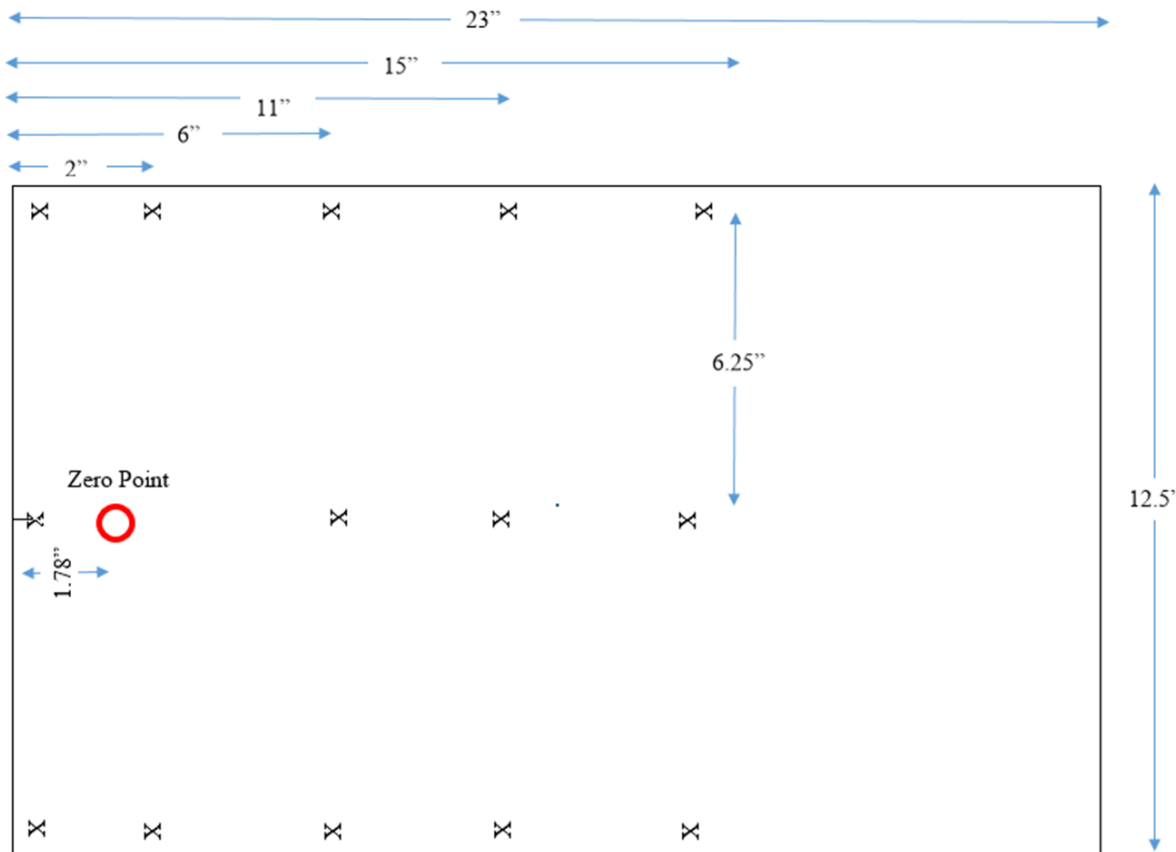


# Future Work

- **Continue conducting tests with 3 different air gap levels**
  - Fully open
  - Partially open
  - Fully closed
- **Place 3 anemometers in the chimney for more accurate air velocity measurements**
- **Place array of thermocouples in the retaining frame to test how material temperature changes**
- **More material tests**

# Future Work

Boeing's proposal for thermocouple array:



- Place thermocouples through an insulation board placed in the retaining frame at the same level as the test sample
- Test at all 3 air gap levels

# Future Work

- Statistically determined that at least 20 samples of a material would be required at each air gap level to get the best results
- 60 samples total

```
One-way ANOVA
Alpha = 0.05  Assumed standard deviation = 1

Factors: 1  Number of levels: 3

      Maximum      Sample      Target
Difference      Size      Power      Actual Power
      0.5          79          0.8          0.804941
      0.8          32          0.8          0.811864
      1.0          21          0.8          0.814770

The sample size is for each level.
```

# Questions?

