

# Thermal Acoustic Insulation Contamination & Aging

## International Aircraft Materials Fire Test Working Group – Niagara June 2008



# Thermal Acoustic Insulation Contamination & Aging

- TSB Recommendation A02-05:

*“The Department of Transport take action to reduce the short term risk and eliminate the long term risk of contaminated insulation materials and debris propagating fires, and coordinate and encourage a similar response from other appropriate regulatory authorities.”*

# Thermal Acoustic Insulation Contamination & Aging

- Transport Canada has made the following statement to TSB:

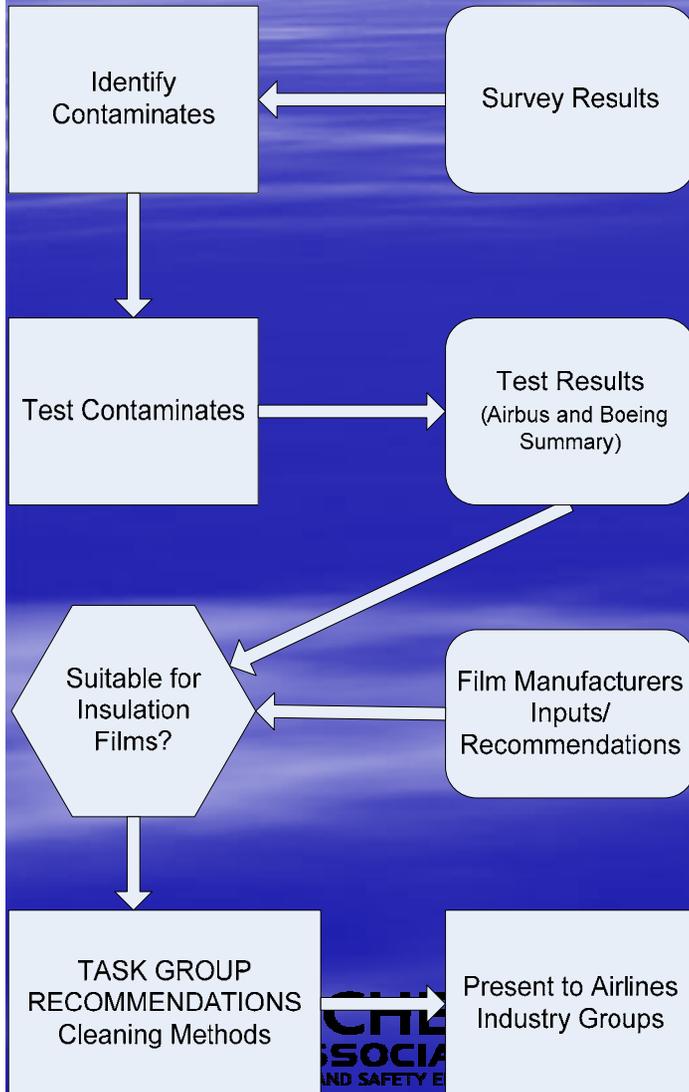
*“The International Aircraft Materials Fire Test Working Group (IAMFTWG) has formed an industry Task Group to recommend means for reducing the risk of hidden in-flight fires from contaminated or aged TAI.”*

# Overview

- The IAMFTWG activities in relation to the initiatives that have already been taken by the Airframe Manufacturers and Aircraft Operators
- The development of an Arc Fault simulation test rig for testing of materials

# Current Position

## Contamination Task Group Roadmap



- The procedure currently being adopted by the industry is based on the FAA Advisory Circular 25-27 and the Enhanced Zonal Analysis Procedures (EZAP) defined in ATA MSG-3

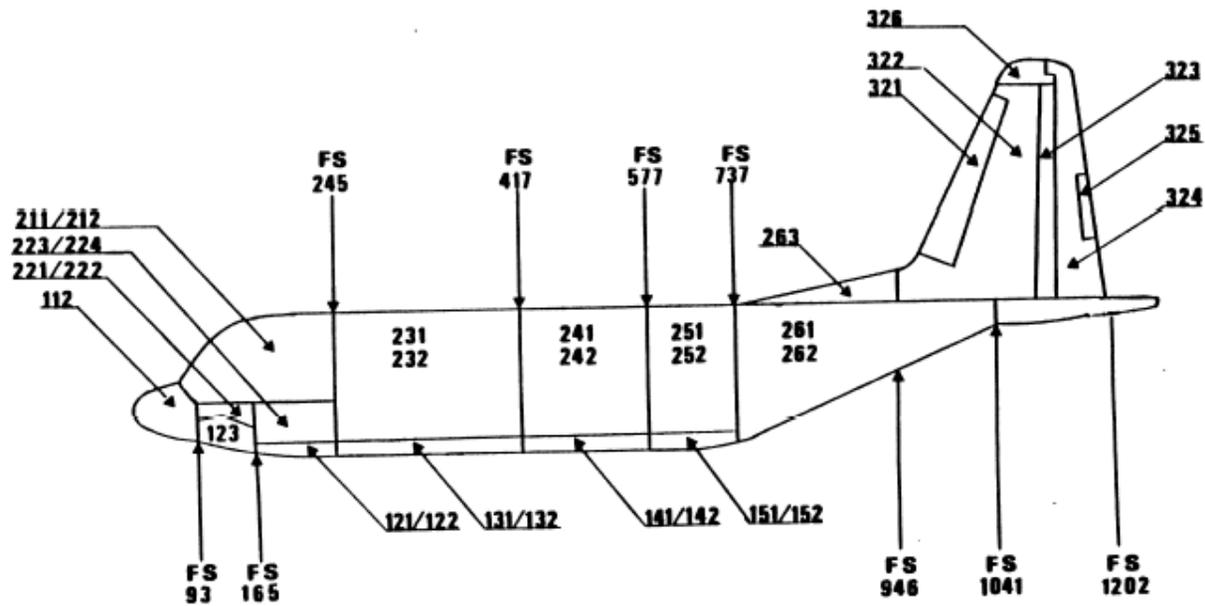
“Operator/Manufacturer Scheduled Maintenance Development”

IAMFTWG JUNE 2008

Transport Canada



Identify Aircraft Zones,  
including boundaries



Identify Aircraft Zones,  
including boundaries

List details of zone, for example:

- Access
- Installed Equipment
- Lightning/HIRF protection features
- Wire bundle installations
- Possible combustible Materials

Does the zone  
contain wiring?

YES

NO

Are there, or are  
there likely to be,  
combustible  
materials in the  
zone?

No Further  
action is  
required

# Overview of EZAP

Are there, or are there likely to be, combustible materials in the zone?

YES

Is there an effective task to significantly reduce the likelihood of accumulation of combustible materials?

YES

Define the task and assign an interval for performing it.

The Information generated, and to be generated, by the Task Group concerning the “combustibility” of contaminated Thermal Acoustic Insulation should be made available to the EZAP analysts





# Overview of EZAP

- *So, for zones of the aircraft that contain wiring, and are likely to contain combustibles, a determination is made as to whether there are effective maintenance tasks that would significantly reduce the accumulation of combustible materials.*
- However it is likely that there are little data available to the EZAP analysts regarding the degree to which TAI/ contaminant combinations are combustible

# Overview of EZAP

- **Advisory Circular 25-27 gives guidance with respect to the factors that might influence the likelihood of combustible materials within the zone including the following:**

# Overview of EZAP

*“With respect to commonly used liquids (oils, hydraulic fluids, corrosion prevention compounds, for example) refer to the product specification to assess potential for combustibility. The product may be readily combustible only in vapor mist form. If so, an assessment is required to determine if conditions might exist in the zone for the product to be in this state.”*

# Proposed Route Forward

It is evident that much work has been done already to mitigate the threat and it is considered imperative that the work of the Task Group is supportive of this initiative.

# Proposed Route Forward

- An earlier methodology that was considered by the Group for assessing combustibility was to assign a *Flammability Grouping* to TAI /contaminant combinations.
- The proposal was to categorise TAI/contaminant combinations into one of 4 groups on the basis of their flammability
- These Groups have not as yet been fully defined

# Proposed Route Forward

Group 1 – Very little change in the flammability of the contaminated Thermal Acoustic Insulation beyond that of the uncontaminated material. (This Group includes instances where the contamination results in a reduction in the flammability of the insulation material.)

# Proposed Route Forward

Group 2 – To be determined

Group 3 – To be determined

Group 4 – Extensive increase in the flammability of the contaminated Thermal Acoustic Insulation beyond that of the uncontaminated material.

# Proposed Route Forward

It is suggested that the Group formulate the way in which they can support the current initiatives and present their proposals to the Industry Groups to obtain their agreement as to the desired way forward



# Proposed Route Forward

The following are suggested areas where the Task Group may support the current initiatives and issues that might remain to be addressed

# Proposed Route Forward

It is therefore proposed that at an early stage the Industry Groups are approached and appraised of:

The test work that has been carried out, and is intended to be carried out by Task Group members

# Proposed Route Forward

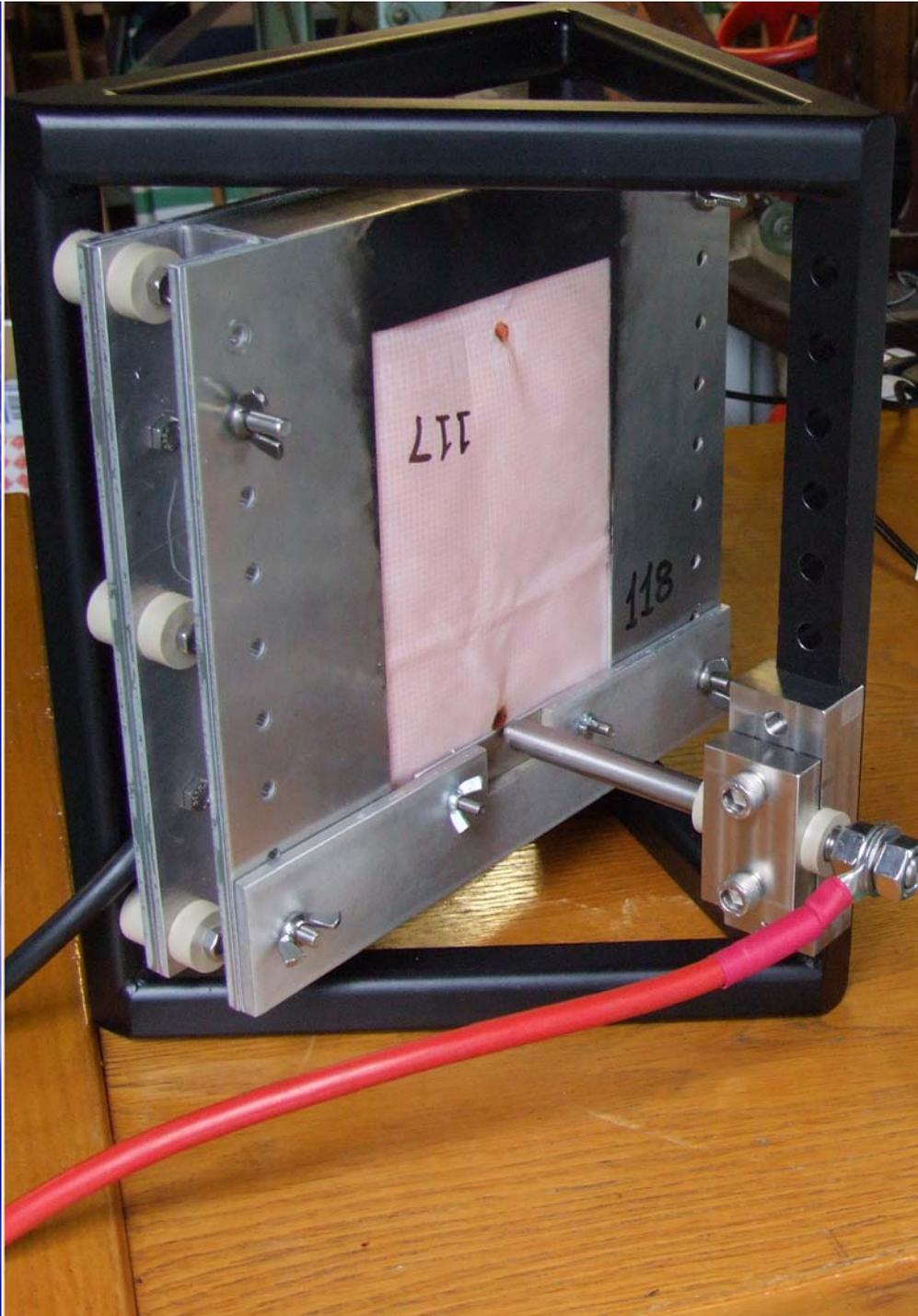
The current initiative by the industry does not accommodate aging of TAI and hence the Task Group needs to decide how this issue is to be addressed.

# Electrical Arc Fault Simulation for Testing of Aircraft Materials

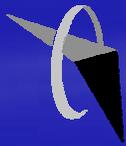
# Electrical Arc Fault Simulation for Testing of Aircraft Materials

## Objective

The purpose of developing an Arc Fault Test Rig is to simulate an electrical Arc Fault and to gauge the threat that they pose to aircraft materials – with particular emphasis on Contaminated Thermal Acoustic Insulation



# Electrical Arc Fault Simulation for Testing of Aircraft Materials

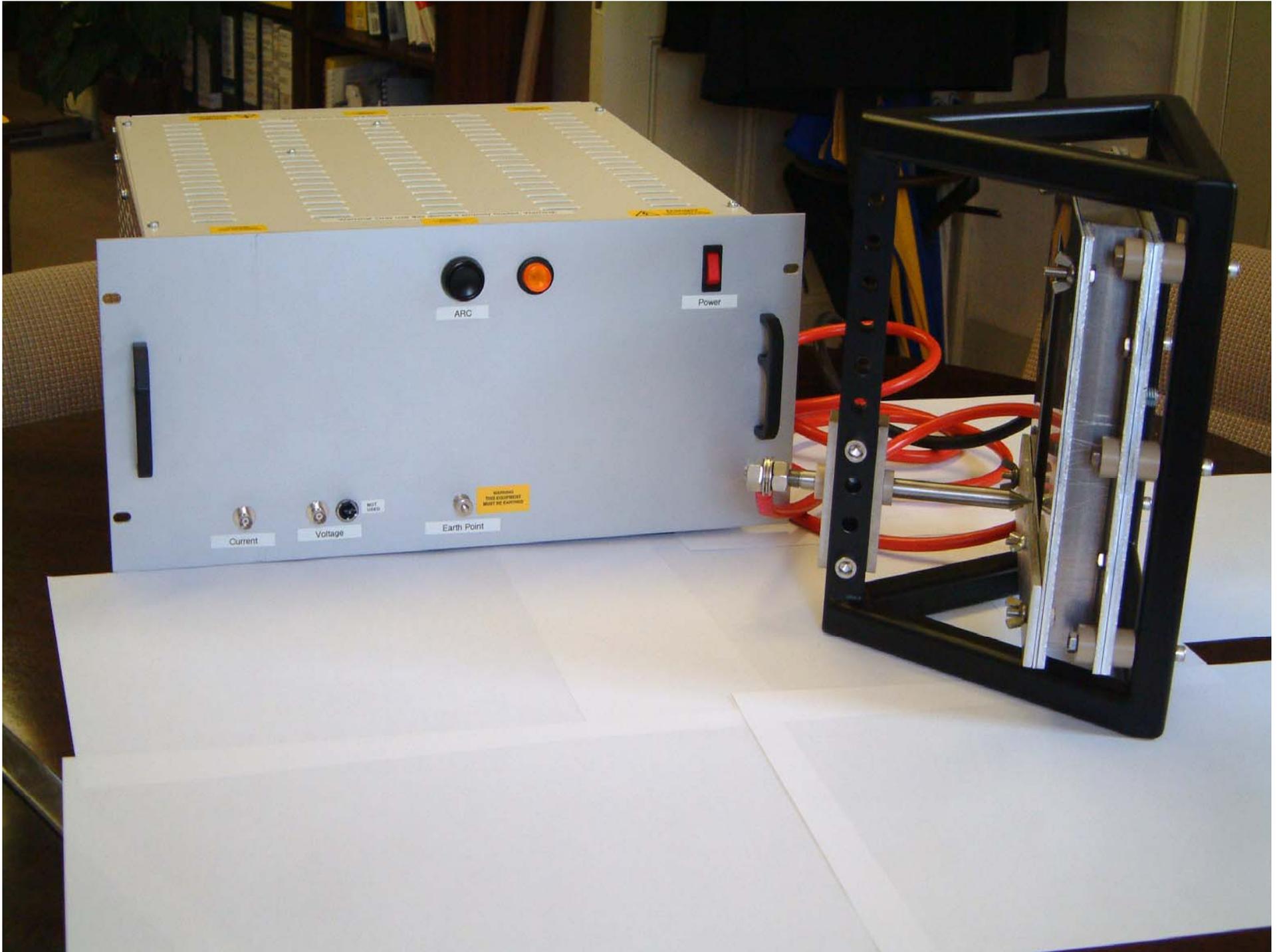


Transport Canada



# Overview of EZAP

- **Culham Lightning Limited advised on the arc characteristics and designed and developed the Arc Generator**





# Electrical Arc Fault Simulation for Testing of Aircraft Materials

## Achievements to Date

1. The rig has been commissioned and the methodology for testing defined
  - Inclined at 1 in 3 gradient
  - Arc Power 400 watts

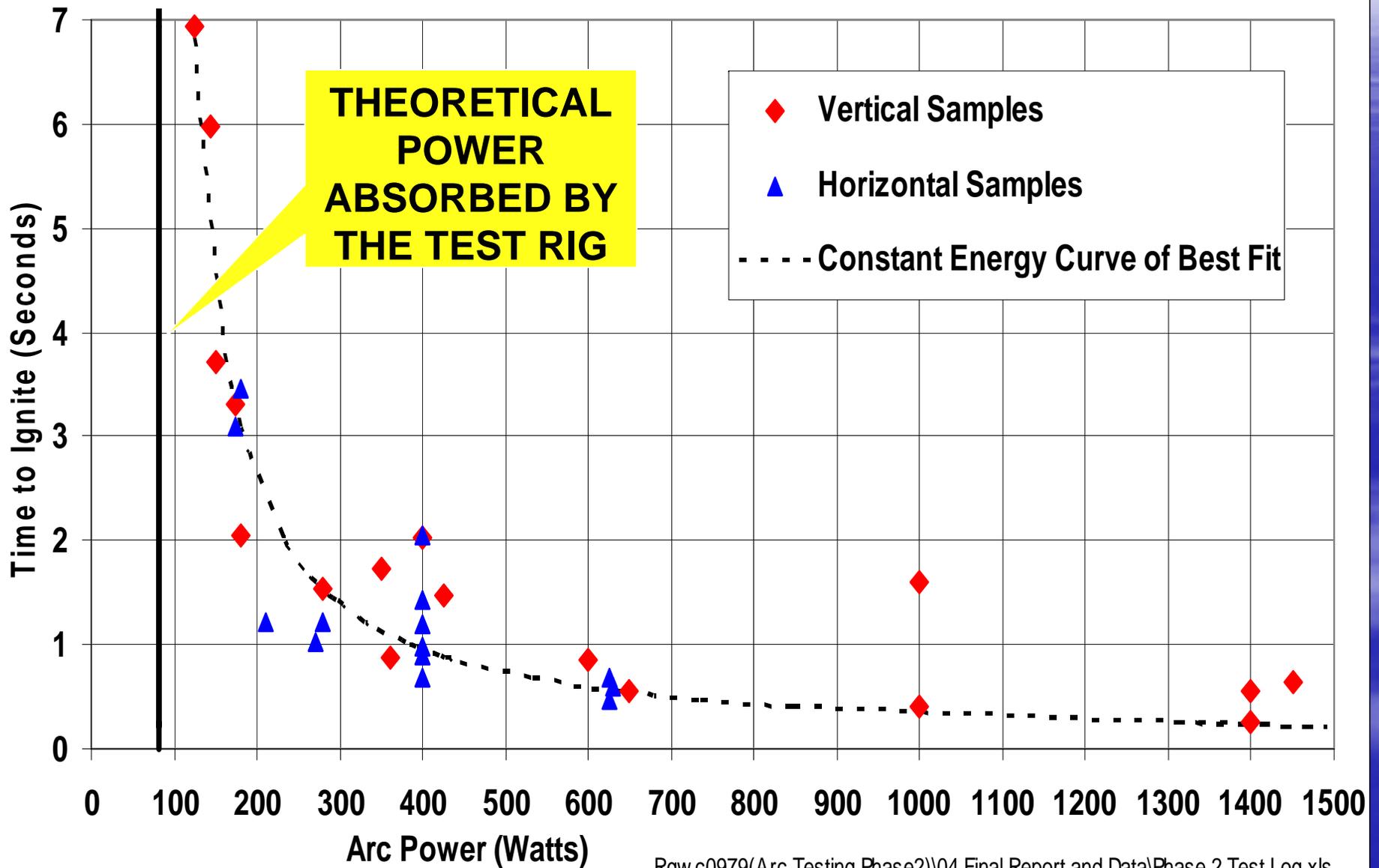
# Electrical Arc Fault Simulation for Testing of Aircraft Materials

## Achievements to Date

2. Testing has been carried out on

1. PVF – No Flame
2. PET – Small Transient Flames
3. Polyimide – No Flame
4. Commercial Grade MPET – Flame Spread
5. Aircraft Grade MPET – Flame Spread
6. AN-26 – Flame Spread

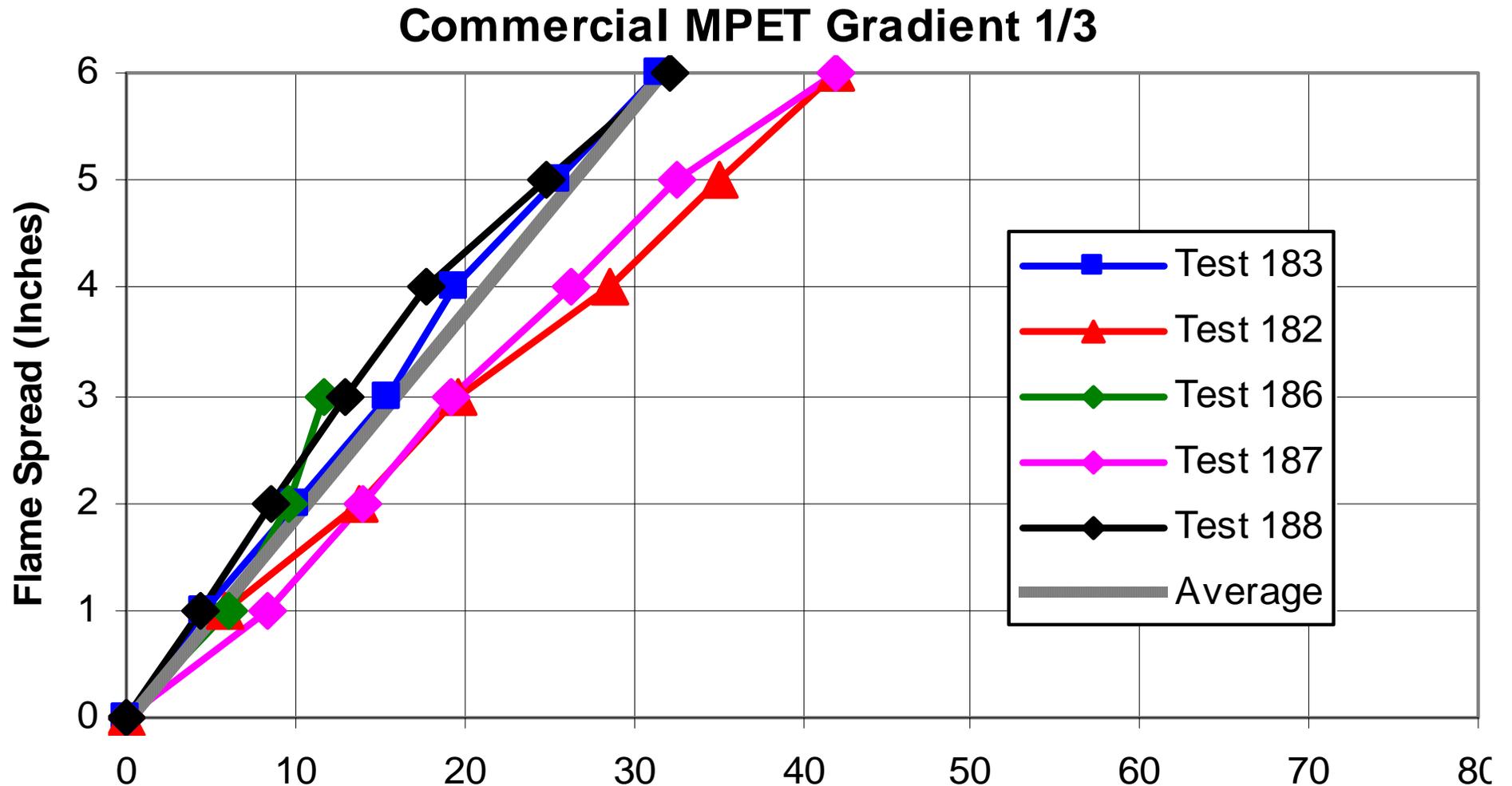
# AIRCRAFT GRADE MPET



# Electrical Arc Fault Simulation for Testing of Aircraft Materials Achievements to Date

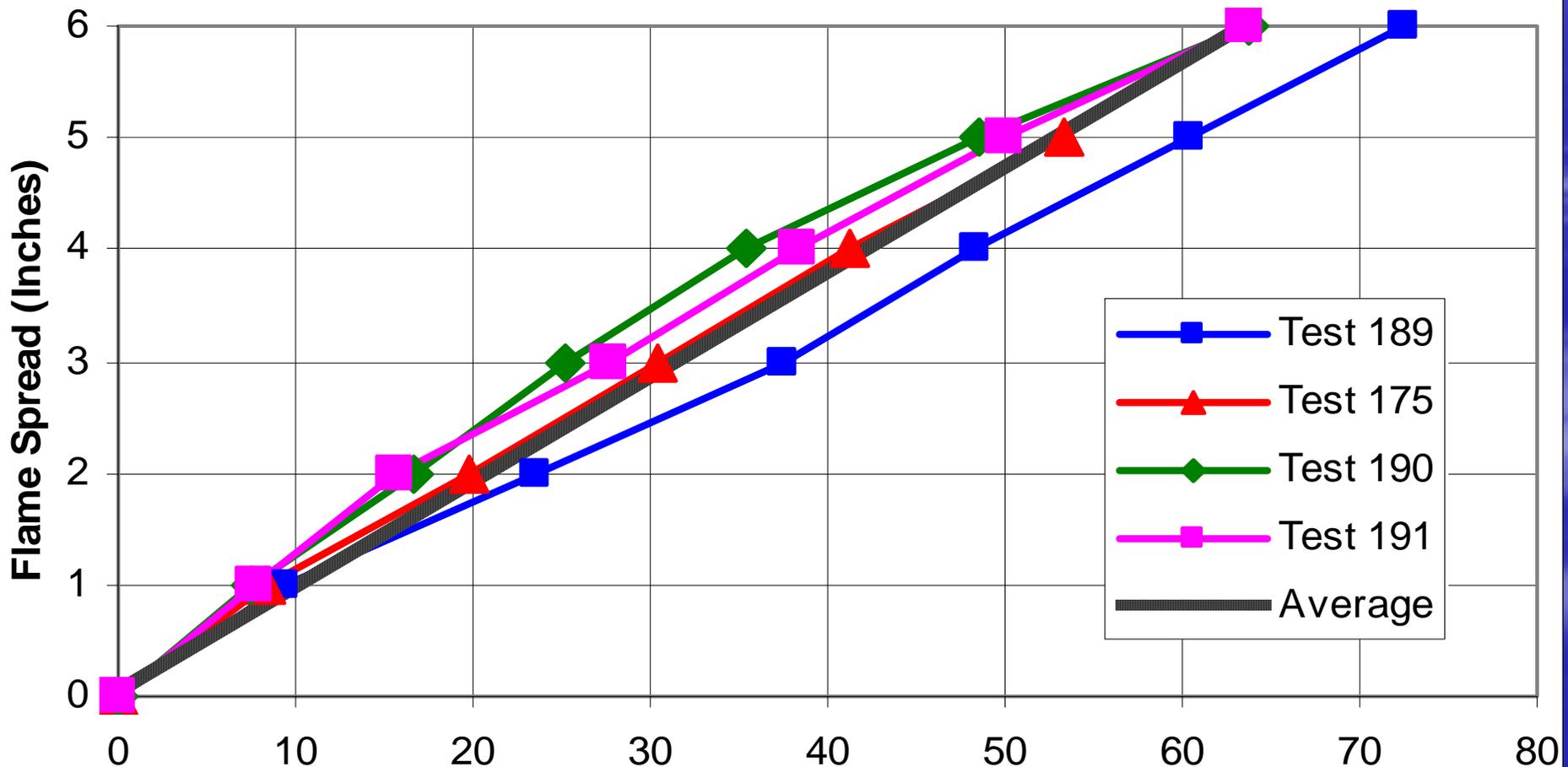
## 3. Flame Speed Measurement

# Electrical Arc Fault Simulation for Testing of Aircraft Materials

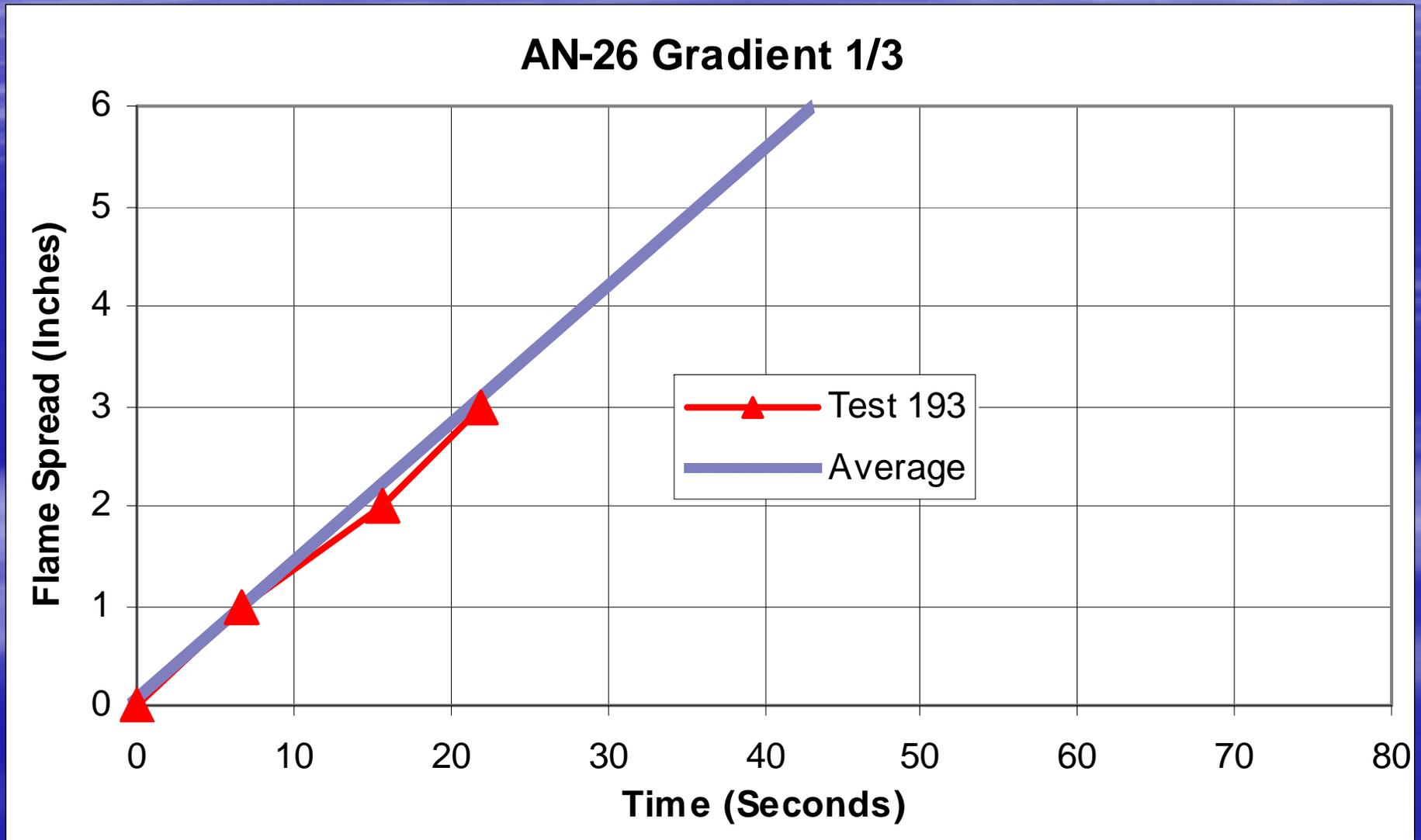


# Electrical Arc Fault Simulation for Testing of Aircraft Materials

MPET Gradient 1/3

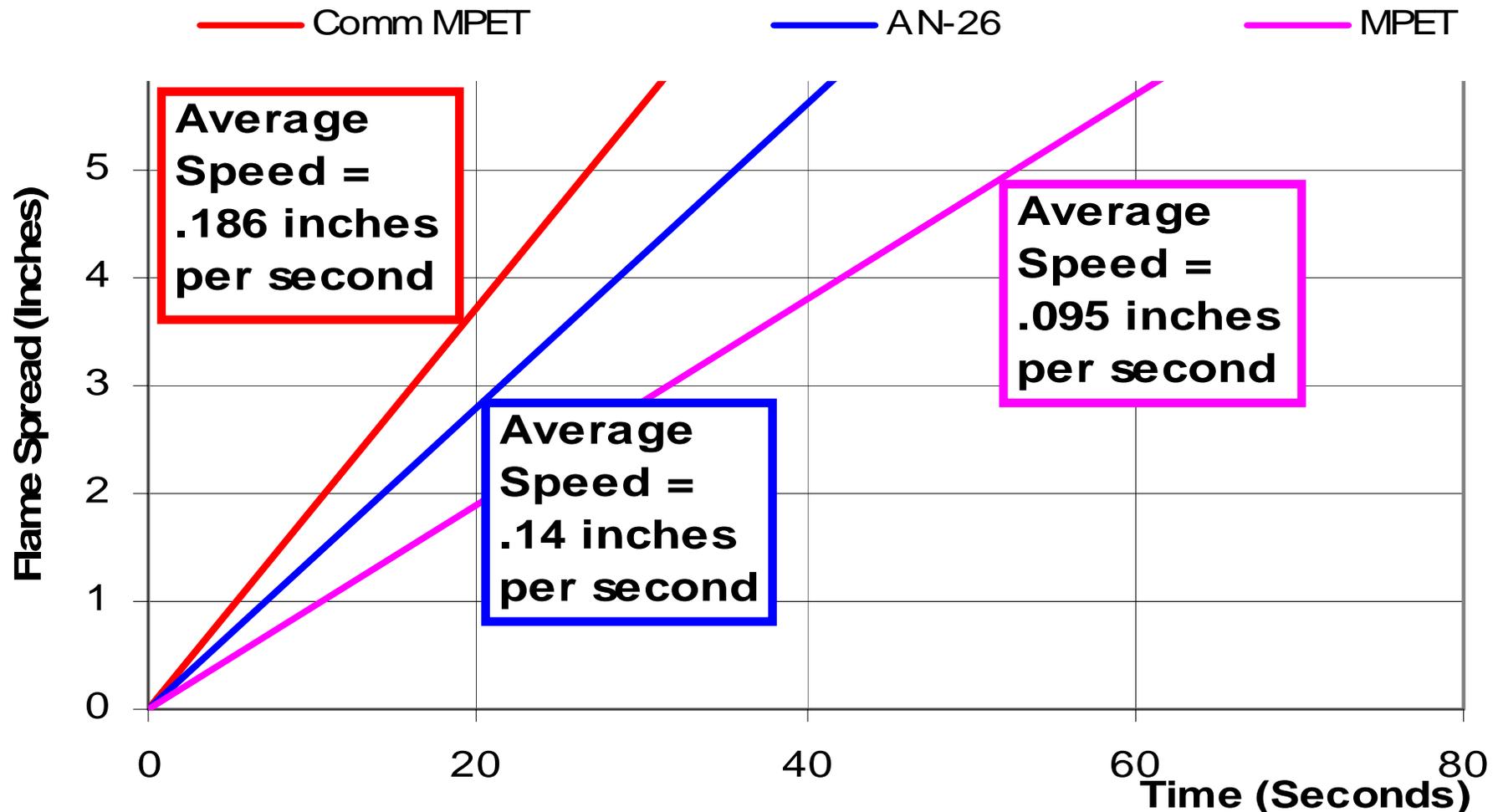


# Electrical Arc Fault Simulation for Testing of Aircraft Materials



# Electrical Arc Fault Simulation for Testing of Aircraft Materials

## Average Flame Spread Curves at 1/3 Gradient





# Electrical Arc Fault Simulation for Testing of Aircraft Materials

## Achievements to Date

### 4. Next Steps – Testing with Contaminants

- Corrosion Inhibiting Compounds
- Cleaning Fluids