



**Federal Aviation
Administration**

International Aircraft Materials Fire Test Working Group Meeting

Restraining Leather Cushions for the Seat Oil Burner Test

Presented to: International Aircraft Materials Fire Test
Working Group

By: Tim Salter, FAA Technical Center

Date: March 4-5, 2014, Savannah, Georgia



Why are restraints necessary for testing of leather seat cushions?

- Typical fabric covered seat cushions burn away but do not deform when tested (top)
- Leather cushions will tend to shrink and pull away from the burner flame (bottom)
- If the cushion pulls away from the flame during testing, does this decrease weight loss and burn lengths? Are the results still valid?



From the Handbook

7.3.5 Specimen Mounting Frame

- The mounting frame for the test specimen will be fabricated of 1 by 1 by 1/8-inch (25 × 25 × 3-mm) steel angle, as shown in figure 7-1. **A wire can be added to the mounting frame for the seat back cushion to secure the specimen into place. More than one wire may be used to restrain leather seat components as long as the wires do not impede or redirect the flame.** The mounting stand will be used for mounting the test specimen seat bottom and seat back, as shown in figure 7-2. Reference paragraph 7.3.5 of Chapter 7 Supplement.



Leather Cushion Restraints

- **Current definition of leather cushion restraint method is vague and open to interpretation**
- **Different methods of restraint among test labs can lead to disparities in test results and be the difference between a specimen that passes or a specimen that fails**
- **Testing and research has been done in the past, but no final decisions were made regarding a standardized leather cushion restraint method**
- **Past data has shown that there is not necessarily a correct or incorrect method of restraining leather cushions, so long as restraints do not impede the flame**
- **A standardized restraint method used by all labs should increase test result repeatability**



Selecting a Restraint Method

Things to consider when deciding on a restraint method:

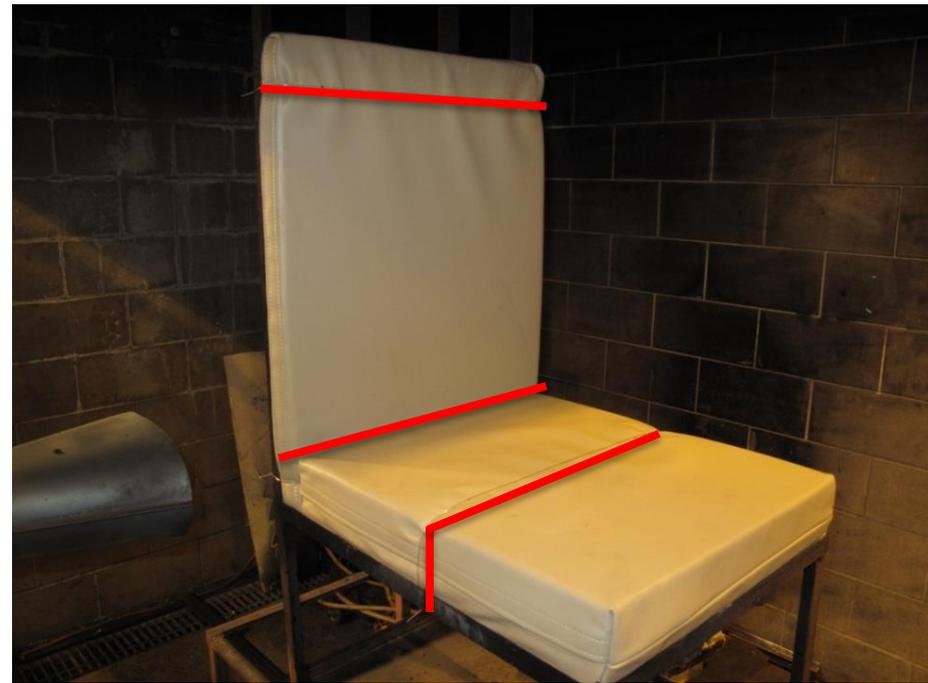
- **Configuration**
 - The arrangement of the restraints
- **Quantity**
 - The number of individual restraints
- **Materials**
 - Steel rod, safety wire, hook and loop, etc.
- **Goal**
 - Devise a method of restraint to maximize repeatability, but not overcomplicate restraint method in order minimize sample preparation time

Standardized Restraint Configuration

- After testing numerous configurations, it was determined that the most effective and simple method of restraint uses only three pieces of 0.032" steel wire wrapped around the cushions and frame

Wire placement:

- 2 ± 0.5 inches from top of vertical cushion
- 2 ± 0.5 inches from bottom of vertical cushion
- Center of horizontal cushion



Restraint Materials

- Initial testing involved the use of safety wire wrapped around the cushion and frame
- Alternatively, pre-bent 1/8 inch stainless steel rod was selected as an option due to its ease of use
- The rod can quickly be “clipped” onto the cushion and frame, and reused for many tests
- Safety wire is more tedious to attach, and must be disposed of for each test run
- Using the clip-on SS rod can save time and money if it can demonstrate to be an effective method of restraint



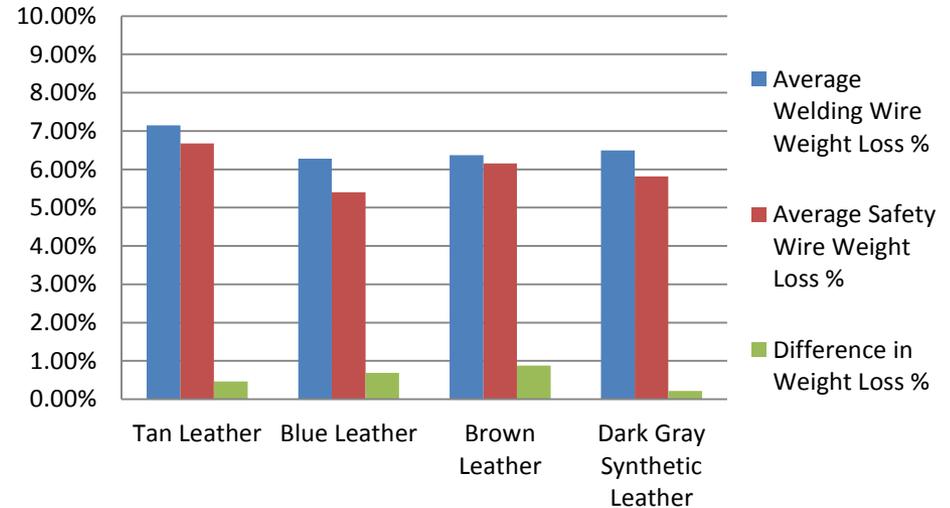
Interlab Study

- **A “mini round robin” is currently underway to test the effectiveness of the new configuration, as well as compare the performance of SS rod compared to 0.032” steel wire**
- **The FAA Tech Center and Accufleet are conducting the round robin**
- **The test specimens being used are fire hardened foam cushions covered in four different materials**
 - 3 different styles of leather
 - 1 synthetic type leather
- **3 specimens of each type are being tested for both the SS rod and safety wire restraint configurations**
 - 3 specimens x 4 leather types x 2 configurations = 24 tests per lab

Round Robin Status

- Currently, Accufleet has completed testing of the leather cushions
- The FAA Technical Center will begin testing by the end of March
- The round robin final results and standardized restraint method will be presented at the next working group meeting in June 2014

Accufleet Leather Seat Cushion Round Robin Results



	Tan Leather	Blue Leather	Brown Leather	Dark Gray Synthetic Leather
Average Welding Wire Weight Loss %	7.14%	6.28%	6.37%	6.50%
Average Safety Wire Weight Loss %	6.68%	5.40%	6.15%	5.81%
Difference in Weight Loss %	0.46%	0.68%	0.88%	0.21%

Questions?

