Federal Aviation Administration

International Aircraft Materials Fire Test Working Group

Discussion of Full-Scale Testing of Leather Seat Cushions

Presented to: IAMFT WG, Naples, FL

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Testing of Leather Seat Cushions

Background

- Renewed interest in type of restraints used during lab-scale testing
- Current Handbook specification calls for minimal wire restraint of vertical sample
- Handbook specification makes no mention of wire restraint of bottom sample

Current Handbook Language in Chapter 7

7.7.4 Replace the calorimeter bracket with the thermocouple rake, ensuring that the distance of each of the seven thermocouples is 4± 1/8 inches (102 ± 3 mm) from the vertical plane and offset 1 ± 1/16 inch (25.4 ± 1.6 mm) above the horizontal centerline of the burner cone exit (see figure 7-6). More than one wire may be used to restrain leather seat components as long as the wires do not impede or redirect the flame.

7.3.5 A length of wire can be used to aid in securing the vertical seat cushion to the specimen frame (see figure 7-2). The wire should be uninsulated, solid, 0.032 inch (0.8 mm) or less in diameter and be located no more than ½ inch (13 mm) from the top surface of the vertical specimen as it sits on the frame. The wire should not disturb the flame spread behavior of the material(s) being tested. If the flame spread is affected, another wire configuration should be used.

Current Language in Advisory Circular

d. Similar Dress Covering

(1) Similar, as used in paragraph ^(a)(3), refers to dress covering materials having the same material composition, weave style, and weight. Material blends may be considered similar when the constituent materials' fractions are the same, ±6 percent, as the tested material. Examples of different weave styles include: plain, jacquard, or velvet. With regard to weight, lighter fabrics are generally more critical than heavier fabrics. Due to severe shrinking and unpredictable distortion experienced by leather dress cover materials, similarity approvals for leather are not recommended.

Questions to be Answered Regarding Use of Wire:

Does the use of wire in the lab for restraining cushions create a more severe condition than an actual cabin fire? "artificial restraint"

Does the use of wire in the lab for restraining cushions create a less severe condition than an actual cabin fire? "artificial flame stop"

Is it possible the use of wire in the lab for restraining cushions can create a more severe condition in some types of leather, and a less severe condition in other types when compared to an actual cabin fire?

Example Using a Particular Configuration:

Leather Type A - During testing, unrestrained material moves substantially, so restraint may create more severe condition by keeping material immersed in fire.

Leather Type B - During testing, unrestrained material only moves slightly, so restraint may create less severe condition by preventing flame propagation.

Questions to be Answered Regarding Use of Wire:

What is the most appropriate method for conducting the lab test so that the results are not adversely affected?

Could a Full Scale Seat Test Be Conducted to Help Define Appropriate Restraint Configuration?

How Do We Run The Full-Scale Test?

Proposed Full-Scale Testing of Leather Seats

Conduct 3 full-scale tests, postcrash fire scenario

Baseline using (OEM or mock-up) seats with FB leather seat cushions

Repeat baseline test, seat cushions restrained with wire configuration 1

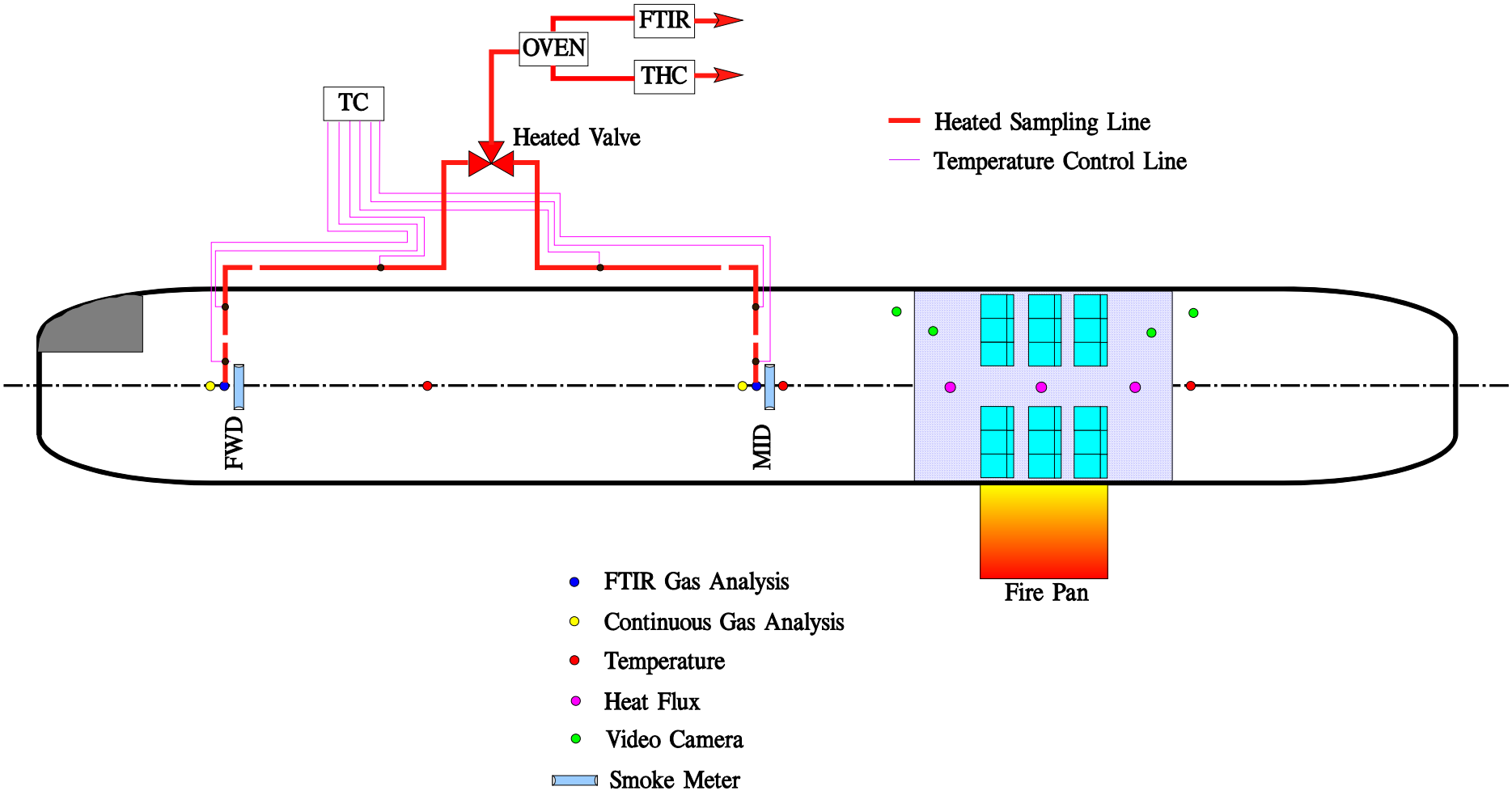
Repeat baseline test, seat cushions restrained with wire configuration 2

Expected Outcomes

Determine if any difference in unrestrained vs. restrained methods

Use findings to incorporate most appropriate restraining method

Full-Scale Test Apparatus



Typical OEM Test Configuration

Typical Mock-up Test Configuration

Next Steps

Finalize full-scale test parameters, such as:

- OEM or Mock-up seats?
- Full interior panels or not?
- How many different types of restraining methods?
- What is the basis for evaluation?

Future Considerations

All full-scale test results would help define an appropriate method or methods of restraining the leather-wrapped samples, which is the primary goal of the research.

Although post crash full-scale test results will help in determining the most appropriate restraining methodology, other scenarios and testing may also be used.

If a more appropriate restraining method is developed, it would be incorporated into the Fire Test Handbook.

Industry Welcome to “Look Over Our Shoulder”