



Exterior Wash

Thousands of aircraft,
spotless results!



Lavatory & Potable Water

More than 650,000 service events
per year — on time, every time.



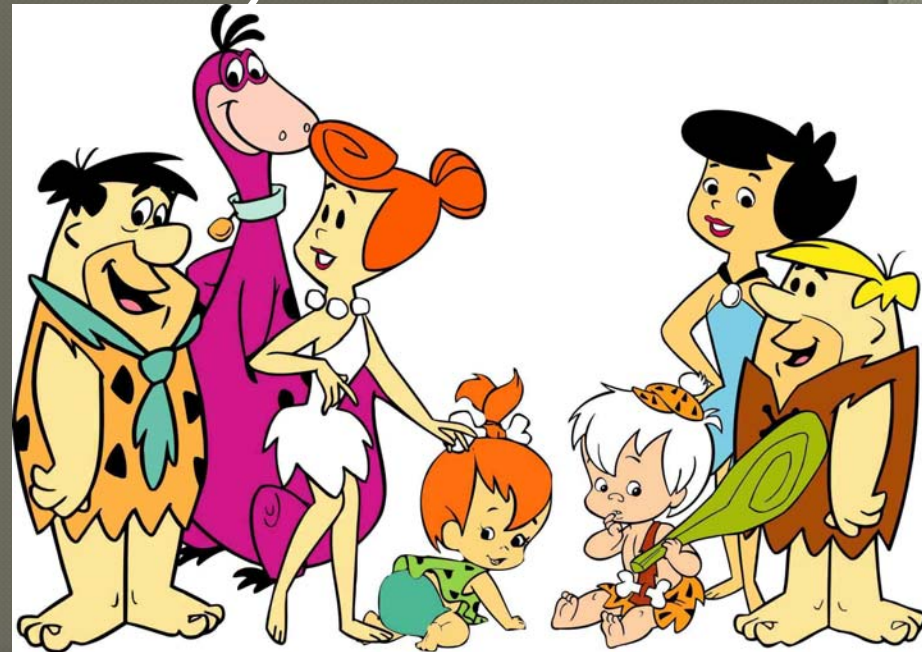


LEATHER UPHOLSTERY ON AIRCRAFT

**FLAMMABILITY TESTING
CHALLENGES**

Aviation Means: Space Age Materials

- Aircraft use carbon fiber, nanotechnology, exotic metal alloys.....
- And upholstery made of either:
- Dead animal skins (Leather)
- Animal hair (Wool)



WHY LEATHER ?

- ◉ 10,000 years of experience
- ◉ PERCEIVED LUXURY
- ◉ PERCEIVED DURABILITY
- ◉ PERCEIVED EASE OF MAINTENANCE

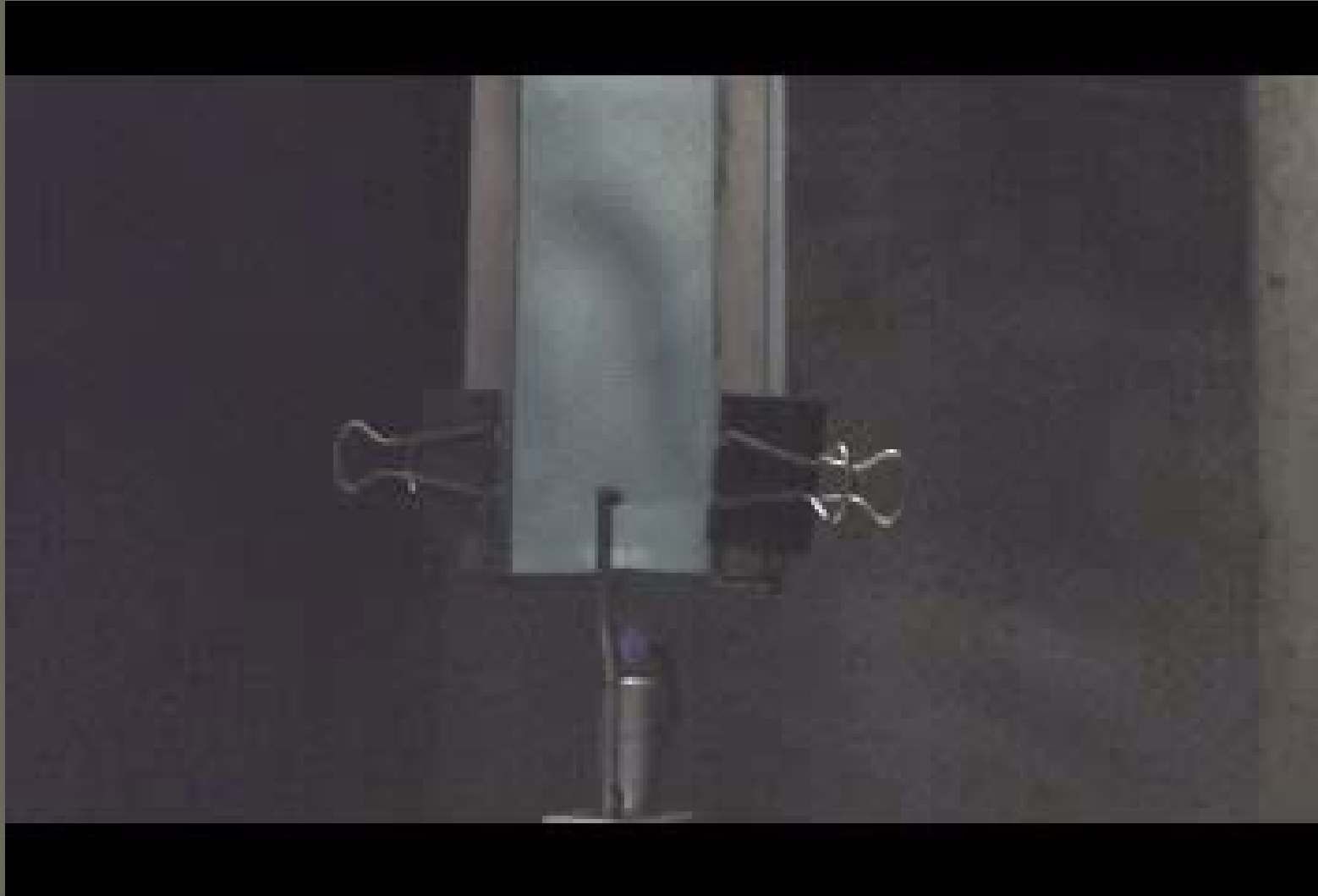
WHERE IS LEATHER ?

- CORPORATE JETS
- FIRST CLASS
- COACH CLASS – DELTA, SOUTHWEST,
JET BLUE

Basic test overview

- CURRENTLY - VERTICAL TEST FOR MATERIAL
- OIL BURNER TEST FOR SEATING SYSTEM

VERTICAL TEST



Vertical Test for Leather



OIL BURNER TEST



Material Concern

- Highly variable levels of shrinkage and deformation during flame exposure.
- Why?
- How to test?

Aviation Leather: Technical Review of Material Precursors



The Journey from Animal to Aircraft Seat

- ◉ Breed differences
- ◉ Tanning methods
- ◉ Shaving / Cutting
- ◉ Coloring Methods
- ◉ Lamination / Substrate materials
- ◉ Top Coat materials / Perforations



Specifying “LEATHER” for Seats...

- ...is like specifying “METAL” for turbine blades.
- ...is like specifying “WOOD” for roof beams.

Leather Supplier Differences

- Tannery
- Finisher
- Distributor
- Supplier (open source)

Variations and Averaging

- The wool fibers in a seat cover come from 1000 different sheep.
- Most of the leather in a seat cover comes from a single cow.



Material Concern

- Highly variable levels of shrinkage and deformation during flame exposure.
- Why?
- How to test?

Regulation

- Mount the seat bottom and seat back cushion test specimens on the test stand as shown in Figure 2, securing the seat back cushion specimen to the test stand at the top.

Guidance

- A wire can be added to the mounting frame for the seat back cushion to secure the specimen into place.
- **** NEW **** More than one wire may be used to restrain leather seat components as long as the wires do not impede or redirect the flame.

One Wire to Secure Specimen...



Multiple Wires



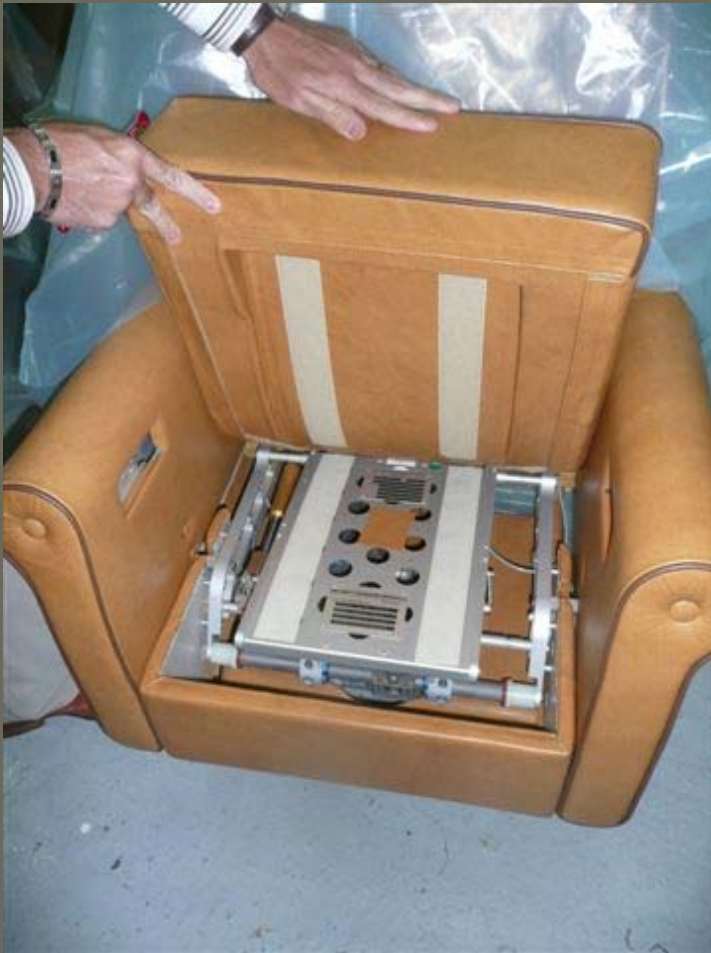
Actual performance in tests



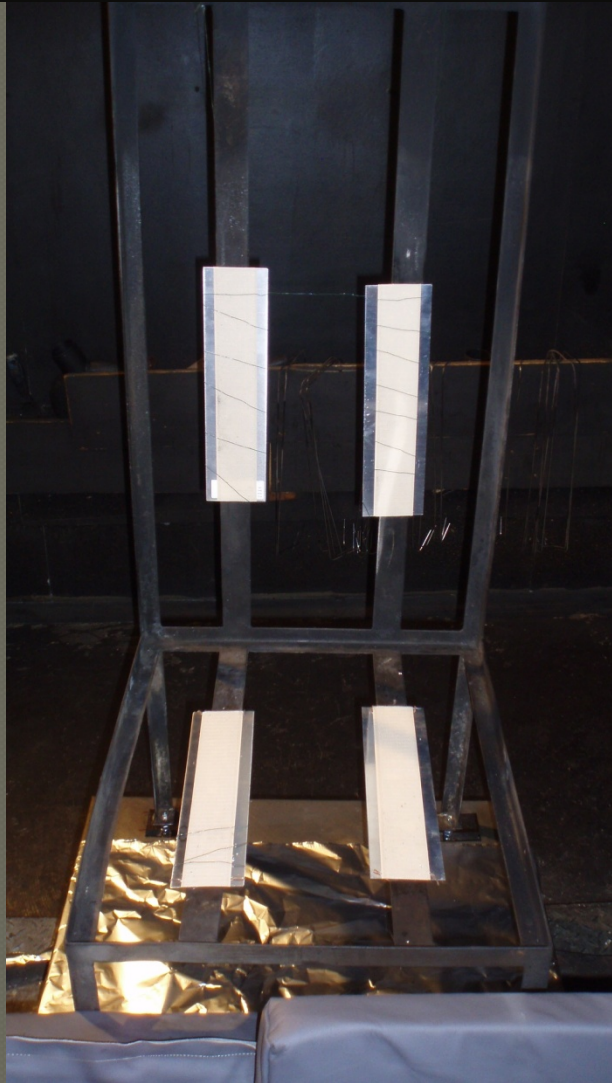
Basic Research on Topic:

- Google:
- “Leather restraints”
- Amazing amount of information available!

Real World Seat Fastening



Hook and Loop Cushion Fastening Burn Test



Hook and Loop Cushion Fastening Burn Test



Recommendations

- Fasten samples well before testing.
- Consider allowing hook and loop fasteners in testing procedure.
- Look at Production Quality Assurance and Process Control from your Leather Source.

Questions?
