

FAA Research on Effects of Disinfectants on Aircraft



Federal Aviation
Administration

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**FAA William J. Hughes
Technical Center**

FAA Research on the Effects of Disinfectants on Aircraft

Research Purpose

- Investigate effects of disinfecting materials (e.g., **cleaning fluids**) and methods (e.g., **UV, electrostatic fogging, ionization**) on performance of aircraft materials
- **Provide public information** that can be used by any interested party, such as OEMs, operators, and industry standards groups

Research Scope:

- Effects on cabin seats
- Effects on cabin interiors
- Effects on cockpit environment

All testing being coordinated through Wichita State University (WSU) through research grants administered through the FAA Joint Centers of Excellence for Advanced Materials (**JAMS**)

- 2 grants awarded to date
- 1 grant request is being processed - expected award date Oct 2021

Credit: <https://www.iata.org/en/about/worldwide/europe/blog/safety-and-flight-operations-in-times-of-covid-19--part-ii>



Credit: <https://www.travelandleisure.com/airlines-airports/united-airlines/united-airlines-covid-electrostatic-sprayer>



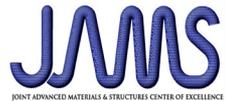
Credit: <https://www.bizjournals.com/bizwomen/news/latest-news/2020/04/southwest-airlines-sprayers.html?page=all>



Credit: <https://www.goodmorningamerica.com/travel/story/jetblue-test-uv-cleaning-inside-planes-72028631>

FAA, Academia, Industry Collaboration:

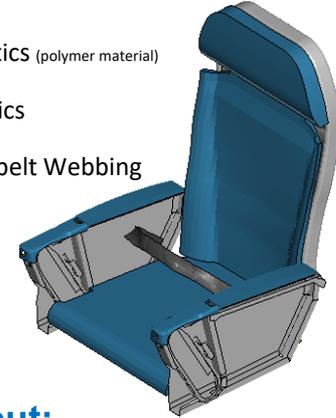
- FAA - Aviation Safety Office, Policy and Innovation (AIR-600) and NextGen, Aviation Research, Structures and Materials Section (ANG-E281)
- National Institute of Aviation Research Institute at the Wichita State University
- Industry involvement
 - Jamco America, AmSafe, American Airlines, Boeing, Airbus, Embraer, and Rockwell Collins
 - Other SAE Seat Committee members



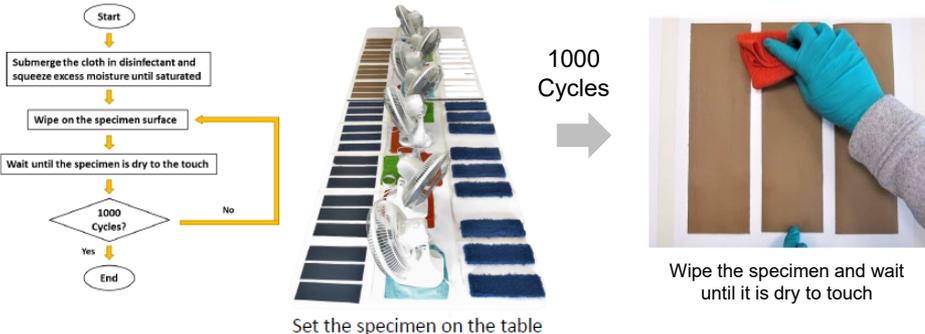
Effects of Disinfectants on Aircraft Cabin Seats Testing – Disinfecting Fluids

- Evaluated effects of 5 **disinfecting fluids** on 4 **polymer materials**, 1 **webbing material** and 11 **fabrics** through tensile testing on the polymer and webbing materials, and flammability effects on all materials (**Completed**)
 - Two fluid conditioning methods used:
 - 7 day soak for full saturation
 - one surface being wiped 1000 times with a wet cloth saturated in disinfecting fluid
 - Flammability evaluated as comparative performance under a vertical self-extinguishing test condition, rather than as a pass/fail to regulations

- Plastics (polymer material)
- Fabrics
- Seatbelt Webbing



Specimen Wiping Conditioning Method



Research Output:

- Results from testing seating materials with liquid disinfectants has been published in an FAA Technical Report: [DOT/FAA/TC-21/18 Effect of Disinfectants on Aircraft Seating Materials](#).
 - No effects on polymer strength or webbing strength
 - Some materials demonstrated reduced flammability performance after being treated with some of the fluids
- **The SAE Seat Committee issued an update to their recommendations for disinfecting methods based on our research results.**

Effects of Disinfectants on Aircraft Cabin Seats Testing – Ultraviolet-C Irradiation

- **UV disinfection** is being studied for effects on polymer strength. We evaluated UVC for color effects and strength effects (**Ongoing**)
- Testing was performed on polymer materials that were exposed to the equivalent of 4 and 8 years of exposure at a rate of one treatment/day
 - Impact on color: no effect at 280nm, some effect at 254 and all materials affected at 222 nm
 - There is a general decrease in tensile performance (yield strength, ultimate tensile strength, or percent elongation) at 222 nm for most materials, some materials were affected at 254 nm, but no materials were affected at 280 nm exposure.
 - We are evaluating data provided by industry under the cockpit program to see if there is any correlation with their results



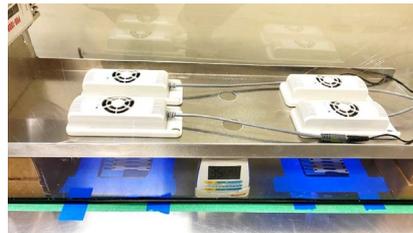
Wavelength Configuration: 222 nm

- Single treatment dose: 3 mJ/cm²
- Cumulative Dose calculated based on single dose per day
 - 4 years: 4,380 mJ/cm²
 - 8 years: 8,760 mJ/cm²



Wavelength Configuration: 254 nm

- Single treatment dose: 40 mJ/cm²
- Cumulative Dose calculated based on single dose per day
 - 4 years: 58,400 mJ/cm²
 - 8 years: 116,800 mJ/cm²

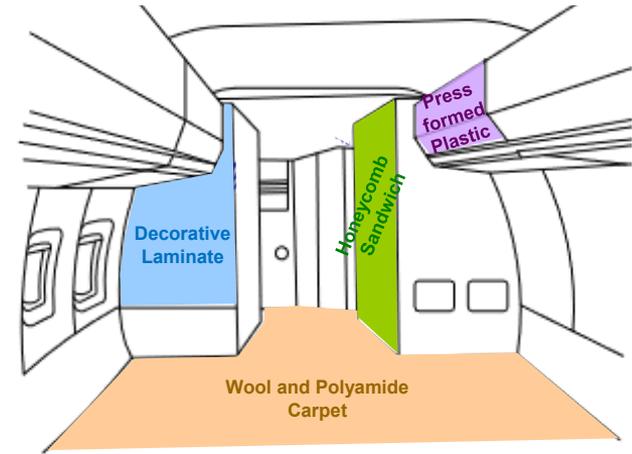


Wavelength Configuration: 280 nm

- Single treatment dose: 37.5 mJ/cm²
- Cumulative Dose calculated based on single dose per day
 - 4 years: 54,750 mJ/cm²
 - 8 years: 109,500 mJ/cm²

Effects of Disinfectants on Aircraft Cabin Interiors (Ongoing)

- **Honeycomb sandwich panels** made with phenolic facesheets are being conditioned with disinfecting fluids.
 - They will be tested for flammability and flexural strength (check effects on facesheets), compression strength (check effects on core) and peel strength (check effects on adhesive).
 - Will also perform UVC conditioning with the equivalent of 4 and 8 years of exposure.
 - Looking for a supplier of honeycomb sandwich panels with epoxy facesheets.
- Tested **wool and polyamide carpet materials**
 - found no effects on flammability after 1000 wipes with disinfecting fluids and found no significant effect on flammability performance and no discoloration.
- Three **decorative laminates** were conditioned with disinfecting fluids.
 - Preliminary observations based on very small sample size: Some combinations had discoloration and/or changed texture of the laminate. No significant effects on flammability. One laminate/fluid combination had a decrease in tensile yield strength, but no other tensile behaviors were affected in any other combinations.
- Specimens of Ultem polymer materials (**typical press formed plastic panel material**) are being conditioned for effects of UV-C exposure



Effects of Disinfectants on Aircraft Cockpit Environment (Preliminary Planning Phase)

- **Steering group established** with members of WSU, FAA, American Airlines, Boeing, Airbus, Embraer, and Rockwell Collins. De Havilland is interested in joining as well.
- FAA **Flight Standards surveyed operators** to understand their current disinfecting practices.
 - There is no consistency between operators as to how and when they disinfect their aircraft, although there are certainly trends, such as most operators only use wiping to disinfect the cockpit.
 - This data (with airlines de-identified) was shared with research partners and will be used to inform development of the test plan.
- **OEMs shared their company disinfecting test data** directly with us.
- A **summary report based on the FAA and industry data** will be published by the FAA Tech Center.
- Use **industry data as a starting point to develop a test matrix**



Image credit: <https://www.alpa.org/news-and-events/air-line-pilot-magazine/health-watch-flight-deck-cleanliness>

FAA Technical Report:

DOT/FAA/TC-21/18 Effect of Disinfectants on Aircraft Seating Materials

Link: <http://www.tc.faa.gov/its/worldpac/techrpt/tc21-18.pdf>



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