

AEROSPACE RECOMMENDED PRACTICE

ARP8463™

Issued

2022-03

Methods for Determining the Effect of Liquid Disinfectants on Seats in Transport Aircraft

RATIONALE

Due to the outbreak of the COVID-19 disease (caused by SARS-CoV-2 virus), there was an increased need for disinfecting of seating products on aircraft. FAA regulations require continued airworthiness for the life of the product, prompting the need to evaluate the effect of the application of disinfectants to the various seating materials. In the absence of guidance on methodologies to identify the potential impact of disinfectants on aircraft seat materials, SAE Aircraft Seat Committee members, FAA, NIAR, and others performed tests to establish acceptable protocols.

1. SCOPE

This SAE Aerospace Recommended Practice (ARP) defines acceptable methods for determining the effect of disinfectants application to passenger and crew seating products in transport aircraft. This ARP selected a standard application process for all disinfectants in order to remove one variable from the investigation, which, at the time, was more concerned with the unknown effect of disinfectant chemicals on seat materials. The SAE Aircraft Seat Committee noted that most disinfectant manufacturers have their own application regimens to ensure the effectiveness of their product and that these differ from those defined in the ARP. Consequently, the standard application methodology defined in the ARP is not suitable for qualifying disinfectants, but is rather a standard method to compare the disinfectant's behavior across a range of seat materials. Acceptance of individual disinfectants for specific application regimens is outside the scope of this ARP.

The herein described application of disinfectants furthermore might be overcritical in terms of structural integrity, flammability, aesthetics and corrosion. Consequently, this ARP does not form the basis for any certification requirement.

1.1 Scope Applicability

The testing methodology in this ARP applies to the following seat materials:

- a. Plastics: Armrests and shrouds.
- b. Soft goods: For seat upholstery dress covers.
- c. Seat belt webbing: For seat restraint systems.
- d. Paint and decorative laminate: For seating trim.
- e. Metals: For seating structural components.

[Figure 1](#) shows a flowchart of the tests required of each material type.

SAE Executive Standards Committee Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2022 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
<http://www.sae.org>

SAE WEB ADDRESS:

Full document details: SAE ARP8463

For more information on this standard, visit
<https://www.sae.org/standards/content/ARP8463/>

Documents

Document Sharing Hub

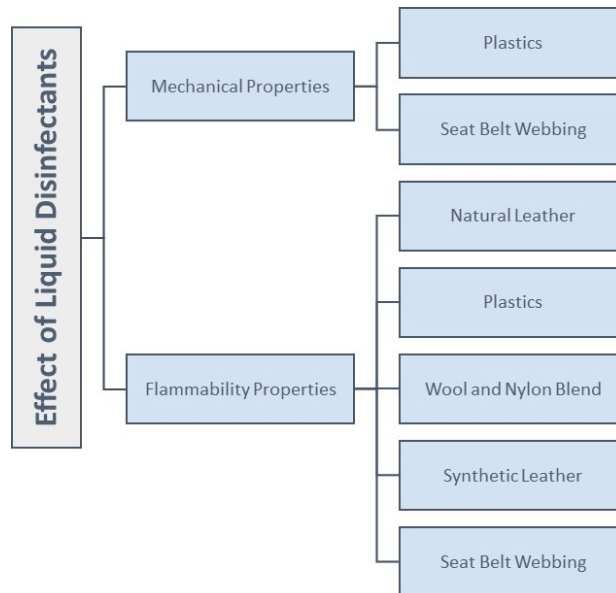


Figure 1 - Flowchart outlining project overview

In addition to the testing depicted in [Figure 1](#), the effects of liquid disinfectants on the color and weight of materials should be evaluated.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AS8043 Restraint Systems for Civil Aircraft

CMH-17 Composite Materials Handbook

2.1.2 Code of Federal Regulations (CFR) Publications

Available from the United States Government Printing Office, 732 North Capitol Street, NW, Washington, DC 20401, Tel: 202-512-1800, www.gpo.gov.

14 CFR Part 25, Appendix F

2.1.3 EASA Publications

Available from European Union Aviation Safety Agency, Konrad-Adenauer-Ufer 3, D-50668 Cologne, Germany, Tel: +49 221 8999 000, www.easa.europa.eu.

CS-25, Appendix F Certification Specifications and Acceptable Means of Compliance for Large Aeroplanes

2.1.4 RTCA Publications

Available from RTCA, Inc., 1150 18th Street, NW, Suite 910, Washington, DC 20036, Tel: 202-833-9339, www.rtca.org.

RTCA DO-160 Environmental Conditions and Test Procedures for Airborne Equipment

RTCA DO-388 Guidance Document on Aircraft Cleaning and Disinfection

2.1.5 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D638 Standard Test Method for Tensile Properties for Plastics

2.1.6 NIAR Publications

Available from The National Institute for Aviation Research (NIAR) upon request.

FAATP-001 Effect of Disinfectants in Aircraft Interior: Strength Characterization of Plastics - Test Plan 2020-08-25

FAATP-002 Effect of Liquid Chemical Disinfectants in Aircraft Interior: Flammability Evaluation of Materials - Test Plan 2020-09-28

FAATP-003 Effect of Ultraviolet-C Exposure On Aircraft Interiors: Strength Characterization of Plastics - Test Plan 2020-09-08

FAATP-004 Effect of Disinfectants in Aircraft Interior: Strength Characterization of Seat Belt Webbing - Test Plan 2020-09-29

FAATP-005 Effect of Disinfectants in Aircraft Interior: Permeability Evaluation of Materials - Test Plan 2020-12-04

FAATP-006 Effect of Liquid Chemical Disinfectants in Aircraft Interior - Cabin Materials: Strength Characterization of Plastics - Test Plan 2021-01-19

FAATP-007 Effect of Liquid Chemical Disinfectants in Aircraft Interior - Cabin Materials: Flammability Evaluation of Materials - Test Plan 2021-01-19

2.1.7 FAA Publications

Available from Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591, Tel: 866-835-5322, www.faa.gov.

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

2.1.8 SpectraCal Publications

Available from SpectraCal, <http://studio.spectracal.com>.

Visual Color Comparison, A Report on Display Accuracy Evaluation.

2.2 Definitions

AMBIENT HUMIDITY: 50% ± 5%.

ROOM TEMPERATURE: 70 °F ± 5 °F (21.1 °C ± 2.7 °C).

WEBBING: Seat belt webbing or webbing used in restraint systems as a structural element. Other materials considered webbing, which are not structural, should be considered as a textile for the purposes of this document.

2.3 Acronyms

ASTM	American Society for Testing and Material
CFR	Code of Federal Regulations
CMH-17	Composite Materials Handbook-17
FAA	Federal Aviation Administration
IPA	Isopropyl Alcohol
NIAR	National Institute for Aviation Research

3. TEST ARTICLE PREPARATION

In preparing the test articles, geometric considerations and disinfectant conditioning needs to be considered. The geometric aspect of the test articles will be different between the mechanical testing and flammability testing while the disinfectant conditioning will be the same for both. For the disinfectant conditioning, worst-case methods have been provided. They are conservative in comparison to standard in-service application in aircraft interiors.

3.1 Geometric Preparation of Plastic Mechanical Test Articles

Visual inspection of the plastic sheets the samples will be cut from should be conducted for any evident damage or discontinuities. Any area of the sheets that may pose a concern for specimen extraction or testing should be discarded. Specimen geometry shall be in accordance with ASTM D638. All test specimens should be numbered to ensure control and identification.

3.2 Geometric Preparation of Seat Belt Webbing Mechanical Test Articles

Visual inspection of the webbing should be conducted for any damaged fibers or weaving discrepancies. Any findings should be documented. All test specimens should be numbered to ensure control and identification.

3.3 Geometric Preparation of All Flammability Test Articles

Visual inspection of the materials should be conducted for any evident damage or discontinuities. Any findings that may pose a concern should be documented. Specimen geometry for vertical flammability test per Title 14, Code of Federal Regulations Part 25 (14 CFR 25) Appendix F, is according to [Tables 1](#) and [2](#). No change is to be made to the thickness of any material received. For webbings, no modifications are to be made to the width as well. In general: T = production thickness; W = production width.

For webbing and fabric materials, the direction of weave corresponding to the most critical flammability conditions should be parallel to the longest dimension. Identify the critical direction for the flammability test. If the critical direction cannot be identified, a control test is to be conducted by testing both warp and fill directions and selecting the worst results as the critical direction.

Table 1 - Specimen nominal dimensions for plastics and fabrics

Length [L], inches (mm)	12.00 (304.8)
Width [W], inches (mm)	3.00 (76.2)
Thickness [T], inches (mm)	T

Table 2 - Specimen nominal dimensions for webbing

Length [L], inches (mm)	12.00 (304.8)
Width [W], inches (mm)	W
Thickness [T], inches (mm)	T

**Figure 2**

3.4 Liquid Disinfectant Conditioning of Test Articles

There are three methods of conditioning test samples with disinfectant. See [A.3.3](#) for further clarification on conditioning methods.

1. One-week soak: Plastic materials only.
2. One-day soak: Webbing, leathers, and textiles only.
3. Wiping method for all materials.

Table 3 - Conditioning of specimens

Specimen	Method	Store	Application	Dry	Store/Ship	Condition
Plastics	Soaking	24 hours	Submerge 1 week (168 hours)	24 hours	1 day min (24 hours min) 7 days max (168 hours max)	24 hours
Webbing, leathers, textiles	Soaking	24 hours	Submerge 1 day (24 hours)	48 hours	1 day min (24 hours min) 7 days max (168 hours max)	24 hours
All materials	Wiping	24 hours	Wipe per procedure in 4.4.3	Dry per procedure in 4.4.3	1 day min (24 hours min) 7 days max (168 hours max)	24 hours

When referring to cycle testing in the remainder of Section [3](#), the application of a disinfectant solution to a seat material is meant.

3.4.1 One-Week Soak

This conditioning approach simulates accelerated cycle testing and is considered to represent the worst-case scenario for the materials exposed to this method compared to on-aircraft wiping application. Each specimen is to be conditioned following the procedure described in the flammability and mechanical evaluation test methods. [Figure 3](#) shows an example of plastic specimens submerged in one of the selected liquid disinfectants. Ensure that each specimen is entirely immersed.

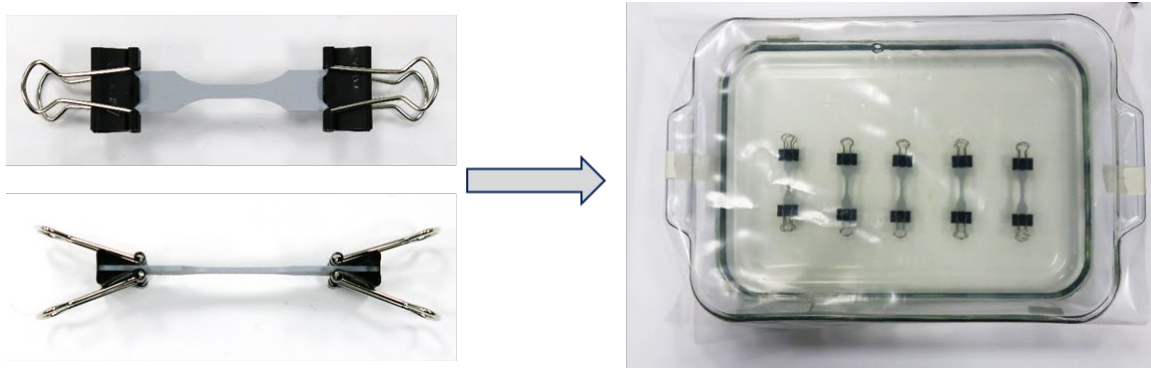


Figure 3 - Specimen conditioning of plastic specimens for strength characterization

1. Each specimen should be wiped with a dry cloth or a suitable solvent to get rid of any residues as result of any machining process.
2. An initial weight measurement should be recorded for specimens to the nearest 0.01 g.
3. Test specimens should be stored at room temperature and relative ambient humidity for a minimum of 24 hours prior to disinfectant submersion.
4. Prior to the submersion process, specimen should be wiped with cleaning fluid and images (front and back) should be taken to highlight any discoloration or surface defect. Ensure that lighting conditions are always consistent or retain one specimen for comparison.
5. One-week submersion: Specimens should be placed in glass containers filled with the corresponding disinfectant. It should be ensured that each specimen is entirely immersed in the disinfectant. The containers are to be made of glass resistant to heat, chemicals, and electricity. A representative container is shown in [Figure 4](#). The containers should be stored at room temperature and relative ambient humidity throughout the submersion period. The submersion procedure is as follows:
 - a. Clean the container with soap and water prior to starting the submersion process.
 - b. Label each container with the corresponding disinfectant identification (ID).
 - c. Fill each container with the required disinfectant to ensure the specimen is completely submerged.
 - d. Secure each test specimen between binder clips. Check that only the “gripping” region (per ASTM D638) is in contact with the binder clip. (Note: Corrosion-resistant binder clips are preferred since any corrosion could artificially discolor the test article.)
 - e. Place specimen in the corresponding containers. A submerged specimen is shown in [Figure 5](#).
 - f. The top of the container should be covered to keep the solution clear of dirt and reduce the chance of the disinfectant to evaporate. This could be done using a plastic cling film.
 - g. Ensure that the specimen is entirely immersed in the disinfectant at all times. Add more disinfectant to the container if required during the submersion period.
6. Once the submersion period has concluded, the specimens are to be removed from the disinfectant containers one at a time. Remove the clips, wipe the specimen with a dry cloth, and then weigh them immediately.
7. Take images of each specimen post-submersion (front and back). Ensure that lighting conditions are the same as the pre-submersion images (step 4). This will allow documentation of any changes in the specimen color or surface due to the submersion process. Retain one specimen for comparison if there are questions regarding image capture similarity.

8. Document any changes in color or surface texture and allow to dry as described below:
 - a. Each specimen should be allowed to dry for 24 hours at room temperature and relative ambient humidity. Specimens should be dried by hanging them as shown in [Figure 6](#). Record final weight after 24 hours of drying time.
 - b. After 24 hours, place the specimens in a bag and label with specimen ID and date of conditioning. Store bagged specimens a minimum of 1 day and maximum of 7 days at room temperature conditions before conducting the test. This includes any shipping time to a test facility.
 - c. Once specimens are received by testing facility, they should be taken out of the bag, stored and conditioned for 24 hours as per 14 CFR 25, Appendix F Part 1 (b)(1).
9. Specimen weight is to be measured again prior to the test.



Figure 4 - Glass container for conditioning



Figure 5 - Submerged specimen



Figure 6 - Materials drying example