

Cleaning & Disinfection recommendations in the Aircraft

ICAO CAPSCA EUR-MID 13 Meeting, 7-9 Oct 2026 (Paris)

COMMERCIAL AIRCRAFT

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Cleaning and Disinfection in Aircrafts



FAST CLEANING
(e.g. 30 min TAT)

SPACE CONSTRAINTS
(manual work, Special materials)

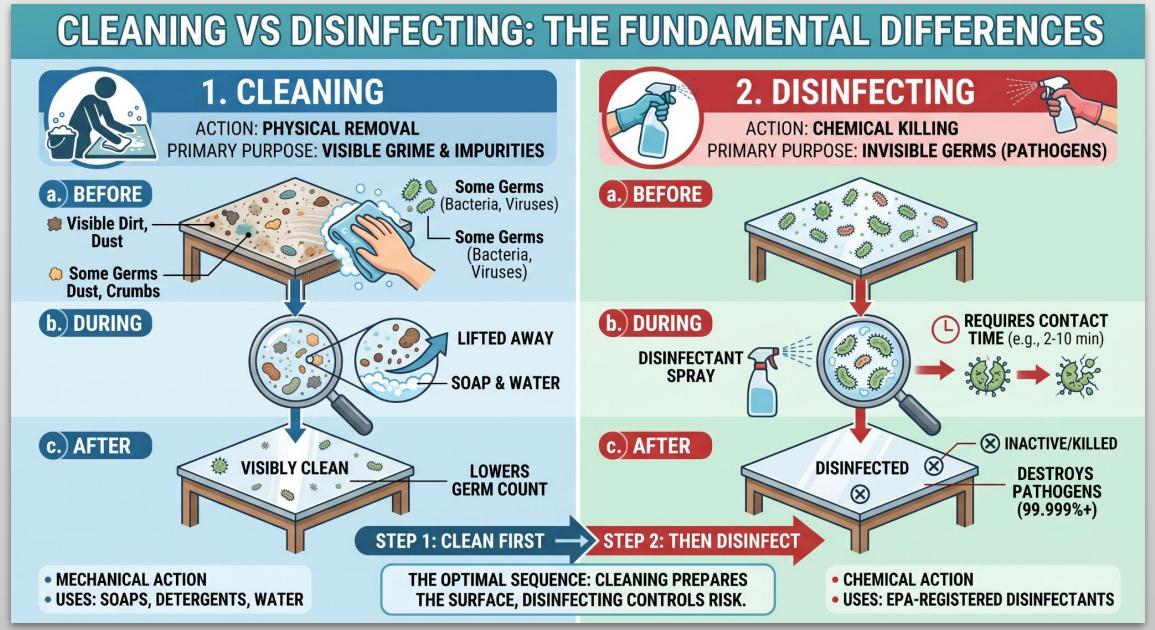
AIRCRAFT FRIENDLY
(avoiding corrosion, material friendly, protect fire resistance…)

INVISIBLE
(process discrete to passengers, but visible effects)

CLEAN & SAFE
(odorless and appropriate)

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Cleaning versus Disinfection



- **Cleaning** removes most germs, dirt, and impurities from surfaces. Clean with water, soap, and scrubbing.
- **Sanitizing** reduces germs to levels public health codes or regulations consider safe. Sanitizing is done with weaker bleach solutions or sanitizing sprays. Clean surfaces before you sanitize them.
- **Disinfecting** kills most germs on surfaces and objects. Disinfecting is done with stronger bleach solutions or chemicals. Clean surfaces before you disinfect them.

CDC

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Aircraft Cleaning & Disinfection - Rules & Procedures

3. Preventive cleaning and disinfection of aircraft

3.1 The aim of the programmes for preventive aircraft cleaning and disinfection should be the disinfection of all passenger aircraft. The size and ground time (stopover time) of the aircraft should also be taken into account. Aircraft cleaning and disinfection should be performed in accordance with the relevant part of the Aircraft Maintenance Manual (AMM).

EASA

Cleaning: Removal of visible dirt or particles through mechanical action undertaken on a routine and frequent basis. **Cleaning intervals:**

(a) **Turnaround cleaning**: Performed on aircraft while on ground prior to departure within a defined ground time.
(b) **Transit cleaning**: Type of turnaround clean that may be performed with transit passengers onboard
(c) **Layover/Night-stop cleaning**: Performed when the aircraft is on a longer predefined time. The clean doesn't involve removal of cabin panels and/or gallery inserts.
(d) **Inflight cleaning**: Performed by cabin crew while the aircraft is airborne.
(e) **Deep cleaning**: Performed when the aircraft is on a longer predefined time. The cleaning may include the removal of cabin panels and/or galley inserts under the supervision of maintenance; This type of cleaning is NOT addressed in the scope of this document.

Disinfection: The procedure whereby measures are taken to control or kill infectious agents on a human or animal body, on a surface or in or on baggage, cargo, containers, conveyances and goods by direct exposure to chemical or physical agents. This definition is based on WHO Guide to Hygiene and Sanitation in Aviation and ICAO Annex 9 .

IATA

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Aircraft Cleaning & Disinfection - “Public” Recommendations

c. Surface Cleaning and Disinfection

All surfaces, including tray tables, sidewalls, and control panels, are wiped using non-corrosive, aviation-grade disinfectants that meet OEM standards.

Only disinfectants (including detergent/disinfectants) that are nationally approved for use on aircraft against any of the agents of concern *and* that have been approved by the original equipment (aircraft) manufacturer should be used.

WHO

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OPERATORS INFORMATION TRANSMISSION - OIT

During the Covid-19 Pandemic detailed recommendations for cleaning and disinfecting twere provided to Aircraft Operators by Airbus

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Aircraft **Cleaning** - Manufacturer Recommendations

Cleaning and disinfection products must be compliant to SAE Standards (SAE-AMS 1452/SAE-AMS 1453)!

The Aircraft Maintenance Manual (AMM) contains relevant information today:
Follow procedures strictly!

CLEANING

1. Prepare your aircraft for cleaning & disinfection (e.g. power, items removal, aeration, protection caps…)
2. Use clean water and equipment without contamination with particles that can damage surfaces
3. Use brush to remove loose particles from surfaces
4. Use aqueous solutions and lint-free cloth
5. Clean surfaces with sponge and clean warm water
6. Dry surfaces with lint-free cloth

Aircraft **Disinfection** - Manufacturer Recommendations

Cleaning and disinfection products must be compliant to SAE Standards (SAE-AMS 1452/SAE-AMS 1453)!

The Aircraft Maintenance Manual (AMM) contains relevant information today:
Follow procedures strictly!

DISINFECTION

1. Prepare your aircraft and yourself for disinfection (e.g. Personal Prote… …uipment)
2. Only use disinfectants products compliant with SAE standards
3. Apply manual spray and wipe method for surfaces

SELECTION OF APPROPRIATE DISINFECTION PRODUCT AND DOSAGE

On demand only

In case of a suspicious or confirmed passenger suffering a highly infectious disease (HID), a special, additional disinfection of the aircraft is mandatory. For this purpose, all used disinfectants must be aircraft component compatible, i. e., must not have any negative effects on individual parts or the structure of the aircraft, while also fulfilling national healthcare requirements [13, 14].

Klaus et al, Lufthansa, 2016

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Aircraft **Disinsection** regulations



AMM:

- Refer to list of approved consumables
- Only persons necessary inside aircraft
- Apply (..) to the floor (...) / cabin area (...)
- Dry wet all surfaces after treatment
- Close all doors (...) for 45 min
- Obey material manufacturer's instructions and the local regulations to do the ground air preconditioning to remove the insecticide from the cabin and cockpit
- Clean all surfaces (...)

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Aircraft Cleaning & Disinfection & Disinsection - Corrosion risk







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Aircraft Cleaning & Disinfection - Hot Topics for Research

„Hot topics“ regarding mitigation of microbial risks for Aerospace:

DLR



“Redesign” of Airplane cabins built materials (passive countermeasures)



Real-time Microbial Monitoring



Active microbial countermeasures (disinfection)



Pathogen Transmission In-Flight



Computational studies on contaminant transport in aircraft cabins

- Efficacy of Natural Antimicrobials?
- Self-sanitizing surfaces?
- Coated surfaces vs. Retrofit surfaces vs. fully antimicrobial surfaces?
- **Impact of chemical composition, surface structures, and physicochemical properties of materials surfaces** on the adhesion, colonization, tenacity, and potential transmission of microorganisms within the aircraft cabin?
- UV light inactivation? Blue – light inactivation? Photocatalytic surfaces?
- Cleaning agents of the future?
- Targeted/automatized Detection Methods in Aviation Microbiology?
- Sensors for microbial live – monitoring?
- Collector for Pathogen Detection?

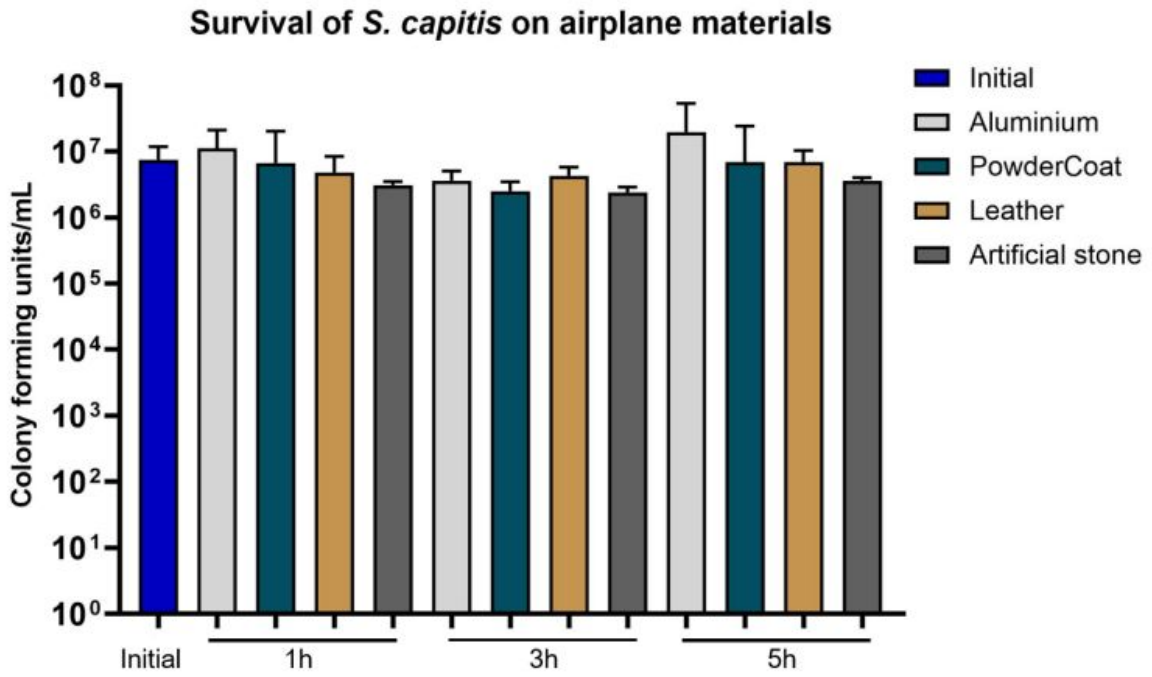
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Aircraft Cleaning & Disinfection - Independent Research

Stability of microorganisms on state of the art cabin surfaces

DLR

How **long do microorganisms stay alive on surfaces?**



→ Baseline: currently used airplane materials do not harbor any antimicrobial properties (after 1, 3 & 5h)

→ Potential pathogenic microorganisms will survive on surfaces

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Aircraft Cleaning & Disinfection - Product and Dosage

Product

Reagent	Manufacturer	Active ingredient	Application Context
ARDROX 1820	Chemtel?	1,2-benzenedicarboxylic acid	Disinfectant and cleaner - Aircraft general
CALLA 1452 / CALLA 1452RTU	ZIP CHEM	Tetrasodium ethylene diamine tetraacetate(EDTA)	
KI-OSE 321/323/324/325/326/350	PSA/Callington	0.2% w/w didecyldimethylammonium chloride (quartary ammonium compound)	Disinfectant and cleaner - Aircraft general
KI-OSE 327	PSA/Callington	0.2% w/w didecyldimethylammonium chloride (quartary ammonium compound)	Disinfectant and cleaner - Aircraft general
NETBIOKEM DSAM	PSA/Callington	Laurylamine dipropylenediamine 1% w/w	Disinfectant and cleaner - Aircraft interior
QUARTASEPT		Didecyldimethylammoniumchlorid, N-(3-Aminopropyl)-N-dodecylpropan-1,3-diamin (quartary ammonium compound)	Aircraft General
RTU cleaner disinfectant	ZEP Industrie	diethylene glycol monobutyl ether & tetrasodium ethylene diamine tetraacetate (EDTA)	Aircraft General; Disinfectant and cleaner - Aircraft general
SATWIPES-SAT-C3-7030		Propan-2-ol	Disinfectant and cleaner - Aircraft interior specific areas

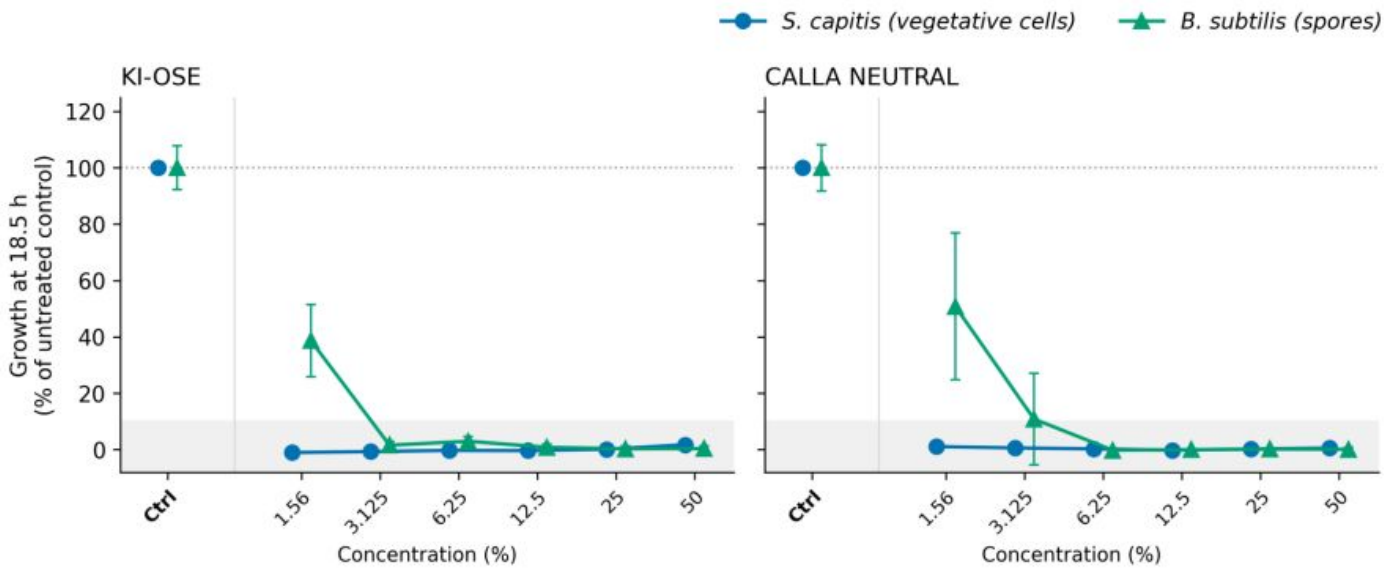


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Aircraft Cleaning & Disinfection Efficacy - Independent Research

Efficacy of cleaners and disinfectants

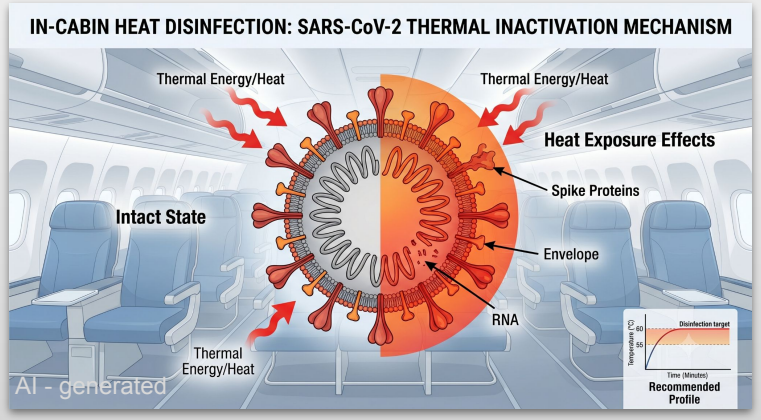
DLR

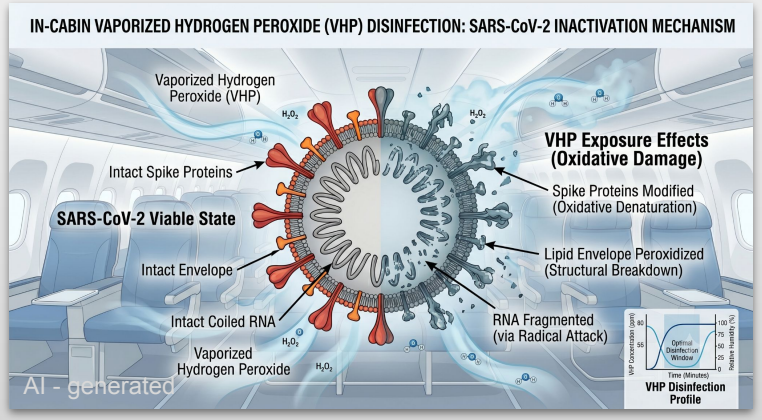


- All products remained fully effective at a small fraction of the manufacturer-recommended concentration
- Even bacterial endospores, the most resistant target, were suppressed at 1/32 to 1/16 of the recommended concentration
- Efficacy is not the limiting factor: it is large enough to absorb imperfect dosing in real cleaning practice

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Aircraft Cleaning & Disinfection - Considerations







- ✓ Minimum time for effectivity
- ✓ Technical challenge
- ✓ External electrical power source
- ✓ Human exposure limitation
- ✓ Shadowed areas (tray tables)
- ✓ Material degradation
- ✓ Fire Safety Concern

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Aircraft Cleaning & Disinfection

Disinfectants

Disinfectants are approved for use on Airbus aircraft if they have no damaging effects on the aircraft in terms of aircraft structure (i.e. corrosion), electronics and avionics (i.e. insulation of cables), sensors (i.e. smoke detection) or the interiors (i.e. installations, seat covers, curtains, monitors, media devices, windows, galleys, countertops, restrooms, etc.).

Due to the delicate nature of instruments, screens and components installed onboard the aircraft, only approved procedures and products must be used in accordance with Airbus guidance (AMM 12-21-12 and AMP 51-26 and AMP 51-31 for A220).*

On the contrary, some disinfecting substances must not be used on aircraft, such as biocidal substances for general disinfection. Operators should refer to the latest AMM (AMP for the A220).

*AMM: Aircraft Maintenance Manual - *AMP: Aircraft Maintenance Procedure

FAST (Airbus)

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Aircraft Cleaning & Disinfection - Take Away Message

Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center

- Current cleaning and disinfection - if correctly applied - is sufficiently effective
- Spray and Wipe technique is still the most efficient method
- OEM recommended chemical products are appropriate and concentration could even be slightly lowered (research still ongoing)
- Other technological solutions did not yet show superior results, but should be further explored

Aircraft Cleaning & Disinfection - Outlook

Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center

Exploration of

- Alternative antimicrobial surfaces (e.g. material development)
- Aircraft friendly surface treatment (e.g. coating)
- Automated cleaning/disinfection methods (e.g. technology research)
- Appropriate touchless solutions

Airbus Health Onboard

Thank you

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Refs

IATA https://www.iata.org/contentassets/094560b4bd9844fda520e9058a0fbe2e/aircraft-cleaning-guidance-covid.pdf

CDC https://www.cdc.gov/port-health/php/airline-guidance/preventing-spread-of-disease-guidance-for-cabin-crew.html

EASA https://www.easa.europa.eu/en/document-library/general-publications/guidance-aircraft-cleaning-and-disinfection

WHO https://www.who.int/publications/i/item/9789241547772, https://www.who.int/publications/i/item/9789240080317

LH https://www.springermedizin.de/disinfection-of-aircraft/10985762

https://www.bfr.bund.de/veroeffentlichung/neues-verfahren-zur-flugzeugdesinsektion-schont-passagiere-und-besatzung/

DLR internal reference

Australia/NZ Government