

Interim guidance on Aircraft Cleaning and Disinfection

in relation to the SARS-CoV-2 pandemics

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1 Background

Since December 2019 an outbreak of a new type of coronavirus was identified in the province of Hubei, China. Since that time the evolution of the outbreak was very rapid reaching out to the most of the countries worldwide. Consequently the outbreak was declared by the World Health Organisation (WHO) as a public health emergency of international concern (PHEIC) on the 30th of January and further characterised as a pandemic on 11th of March. Since mid-February a cluster developed in the province of Lombardy, in the north of Italy. The evolution of this cluster and of additional imported cases from clusters in Iran and China have led to a rapid development which affected all the European Member States generating secondary clusters.

In this context EASA has developed, issued and updated a Safety Information Bulletin to provide operational recommendations for the European stakeholders in accordance with the official communications of WHO and European Centre for Disease Prevention and Control (ECDC) as well as facilitating access to guidance developed by other stakeholders (e.g. IATA, ACI, EU Healthy Gateways, etc.)

Furthermore, on 13th of March, EASA issued a 2 Safety Directives (SD) one for the EASA Member States and the other for the third country operators performing commercial air transport of passengers into, within or out of the territory subject to the provisions of the Treaty on European Union. The SDs mandate the disinfection of aircraft after each flight arriving from the high risk areas in order to protect the passengers against secondary contamination. In this regard EASA has been considering recent research regarding the resistance of the SARS-CoV-2 on inanimate surfaces (GünterKampf, 2020) (van Doremalen, et al., 2020) as well as research materials regarding efficient disinfecting agents (Klaus, et al., 2016) (ECDC - Baka, Agoritsa; Cenciarelli, Orlando, 2020) in the context of a potential coronavirus contamination.

Consequently, EASA has developed the following guidance giving proper considerations to the publications of WHO (Guide to Hygiene and Sanitation in Aviation, 2009) (Operational considerations for managing COVID-19 cases or outbreak in aviation, 2020) and ECDC (ECDC - Baka, Agoritsa; Cenciarelli, Orlando, 2020) in order to provide support to its stakeholders in terms of how the cleaning and disinfections are expected to be performed in the context of the above mentioned SDs.



2 General considerations

Possible routes of infection transmission that might occur on board aircraft fall into three categories:

1. directly inhaled respiratory droplets and/or suspended airborne particles;
2. direct contact with saliva, faecal matter or other potentially contaminated body fluids;
3. contact with saliva, faecal matter or other potentially contaminated body fluids deposited on surfaces or, for maintenance crews, entrained in ventilation systems.

The main source of infection for other travellers is from an infected person, and proximity to an infected person is an important risk factor for droplet propagated infection. Once an infected person has left the scene, most of the risk from droplet exposure will have been reduced. Nevertheless, the scientific evidence (GünterKampf, 2020) (van Doremalen, et al., 2020) showed that the SARS-CoV-2 aerosol and fomite transmission is plausible, since the virus can remain viable and infectious in aerosols for hours and on surfaces up to days depending on the type of surface and the environmental conditions. In this context, the possibility that the virus can remain in the aircraft environment by contaminating common surfaces after the infected passenger has departed requires mitigating action in order to prevent further dissemination.

Sometimes, a case of communicable disease is known only several days (or longer) after the infected person has travelled and may have deposited pathogens on surfaces in the aircraft. The risk of infection upon contact with such contaminated surfaces will depend on the viability of the virus on the specific surface, the number of organisms, the environment (e.g. temperature, humidity), whether the surface has been properly cleaned and/or disinfected and, of course, the personal susceptibility of the persons touching the contaminated surfaces.

For commercial aircrafts the disinfection the aircraft operators and ground handling companies providing cleaning and disinfection services should take into account the specific characteristics of the aircraft (cockpit design and passenger cabin design for both fixed wing and rotary wing aircrafts) and the type of surfaces involved as well as the recommendations of the aircraft manufacturer in terms of disinfecting agents which can be used.

For this purpose, all used disinfectants, in addition to their disinfecting capabilities on the specific SARS-CoV-2, must be aircraft component compatible, namely they must not have any negative effects on individual parts or the structure of the aircraft, while also being approved for use at national level. When choosing a disinfectant, it must be ascertained that their application will not be likely to have damaging effects regarding the human health or the aircraft in terms of:

- aircraft structure (i.e., corrosion),
- electronics and avionics (i.e., insulation of cables),
- sensors (i.e., smoke detection),
- interior (i.e., installations, seats, monitors, media devices, windows, galleys, countertops, restrooms)

It is therefore necessary to exercise caution in selecting suitable products and before applying these products in aircraft. It is important to protect the health of the cleaning personnel, aircrew and passengers, as well as to ensure effective action.

Consequently, only cleaning and disinfecting substances that are nationally approved for use on aircraft against SARS-CoV-2 and that have been approved by the aircraft manufacturer should be used.

Note 1: the approval process of cleaning and disinfecting substances at national level varies within the European Member States. It may be performed by national agencies for chemical, environment or health safety. Nevertheless, the companies providing cleaning and disinfecting services should be aware of this process and the list of approved substances in their country.

The Agency has been made aware that certain cleaning and disinfecting substances recommended by aircraft manufacturers may be approved in some states but not in all EU member states. In such cases, the Agency urges the National Aviation Authorities to collaborate as much as possible with the relevant national agencies to expeditiously allow the use of those cleaning and disinfecting substances that have been already approved in another EU Member State.

A list with efficient substances against SARS-CoV-2 to be used for disinfection was published by ECDC (ECDC - Baka, Agoritsa; Cenciarelli, Orlando, 2020) at the following link:

<https://www.ecdc.europa.eu/en/publications-data/interim-guidance-environmental-cleaning-non-healthcare-facilities-exposed-2019>

Furthermore, the US Environmental Protection Agency published their “EPA’s Registered Antimicrobial Products for Use Against Novel Coronavirus SARS-CoV-2, the Cause of COVID-19” available at the following link: https://www.epa.gov/sites/production/files/2020-03/documents/sars-cov-2-list_03-03-2020.pdf

The cleaning personnel should be adequately trained so they understand and respect the procedures that will ensure effectiveness of the cleaning and disinfecting agents, use the proper personal protective equipment, prevent contamination of other areas and minimize occupational health and safety risks to personnel, including ensuring adequate ventilation in confined areas such as lavatories.

Compressed air and/or water under pressure for cleaning, or any other methods that can cause splashing or might re-aerosolize infectious material should not be used. Vacuum cleaners may be used, but only after proper disinfection was performed.

The cleaning crew should protect themselves with appropriate personal protective equipment, such as gloves, face masks and protective clothing, according to standard operating procedure requirements. Face masks should be replaced regularly in accordance with the producers’ indications (e.g. most surgical masks lose their efficiency after 4 hours of use).

Note 2: proper consideration should be given also to the national guidelines for cleaning and disinfection published by the national public health authorities, where available.

There are several cleaning and disinfection sequences possible:

- Aircraft routine cleaning
- Aircraft preventive disinfection
- Aircraft inflight disinfection
- Aircraft disinfection after an event

In the present guide we will focus on the preventive disinfection and the disinfection after an event.



3 Aircraft preventive disinfection

Programmes for preventive disinfection should aim disinfecting all passenger aircrafts arriving from high risk areas. This should take into account the size and ground time (stopover time) of aircraft.

The operator's engineering department provides a technical review of each cleaning and disinfecting product used, taking into consideration the list of effective substances published by the publish health authorities (ECDC - Baka, Agoritsa; Cenciarelli, Orlando, 2020) and on manufacturer's recommendations (approved products are normally listed in the aircraft maintenance manual).

In terms of practicalities you may find below a list of recommended practices to ensure efficient disinfection is dispatched. The cleaning crew should:

- use different cleaning utensils (e.g. the cloths and mops) used in each area, potentially using colour coding, in order to reduce cross-contamination.
- avoid to be detrimental to aircraft components, rub the surfaces with disinfectant for adequate contact time and remove it immediately.
- spray the floor from front to back before disinfection and then spray again in opposite direction.
- disinfect the key areas as noted below, begin at the top and proceed downward progressively working from clean to dirty areas:

- - AisleCeiling, overhead bins, reading lights, air outlets, sidewall panels, windows, seats (tray tables, armrests, passenger control units, and decorative panels), cabinets/lockers, bulkheads, magazine racks, cabin attendant seats.

- Lavatory

The disinfection in lavatory should be progressed from contaminated to clean areas, as follow: toilet bowls, waste bins, basins, lavatory sidewall, ceiling, door assembly (door surfaces, door handles, locking device, and, if installed, ashtrays).

- Galley

Ceiling, ovens, water boilers, coffee makers, galley facilities, lockers/drawers, waste bins.

- Cockpit

For aircraft where the cockpit is separated from the passenger cabin, preventive disinfection should be considered only when the flight crew had a longer layover resulting in the crew traveling outside of the airport restricted area (e.g. travel to the hotel for a rest period) in the high risk areas. Otherwise cockpit should be subject to routine cleaning.

For aircraft where rigid separation between the cockpit and the passenger cabin is not available the frequency of preventive disinfection of the cockpit should be the same as for the passenger area.

Programmes for preventive disinfection should aim disinfecting all passenger aircraft arriving from high risk areas. This should take into account the size and ground time (stopover time) of aircraft. Disinfection should follow the general principle of thorough disinfection from out ring-to-centre, top-down and encompassing approach.

4 Aircraft disinfection after an event

The procedure for disinfection after an event in this particular context should be understood as disinfection after the transport of a symptomatic passenger (having fever, persistent cough or other flu-like symptoms) which also has an epidemiological context (having been in direct contact with a confirmed case). Additionally, this type of disinfection should address also the situation when there is an event causing heavy contamination of certain surfaces with sputum or other potentially contaminated body fluids/substances (e.g. vomit).

In case of body fluids/substances (e.g. vomit from the ill traveller) heavy contamination the first step should be to take up the excess from overtly contaminated surfaces by using an absorbent material or absorbent disinfectant ensuring that it will take a solidified form which should then be disposed of. Large contaminated areas (e.g. covering most of a tray table) should be treated with disinfectant after removal of the excess contaminants as described above, then thoroughly cleaned and given a final disinfection treatment. Carpeting and/ or seat covers with a substantial contaminated area should be removed carefully, placed in sealed plastic bag labelled as 'Bio-Hazard' and laundered in accordance with the manufacturer's instructions. Alternatively, if proper cleaning and disinfection is not possible the contaminated carpeting and/or seat covers should be destroyed. In case of seat contamination that has penetrated the seat cover, the underlying seat upholstery may need to be removed for adequate disinfection.

After disembarkation of passenger and crew is finished, the cabin doors should be closed and the air conditioning adjusted to the maximum volume to ensure all air exchange is completed.

Once the air exchange is finished, the first area to be disinfected should be the sitting area of suspected/ill passengers and designated lavatory (as defined in the suspect passenger's management section below) should be disinfected, then clean and disinfect other areas in accordance with the preventive disinfection requirements.

In addition to a preventive disinfection, the disinfection after an event should include thorough cleaning of the seat area of the suspected case and of the seat area in the close proximity (2 seats in every direction), including the following:

- armrests
- seatbacks (the plastic and/or metal part)
- tray tables
- seatbelt latches
- light and air controls, cabin crew call button and overhead compartment handles
- adjacent walls and windows
- PEDs made available to passengers
- individual video monitors, touchscreens and remote controls

Thorough cleaning and disinfection (allowing adequate contact time between the disinfectant and the surface) of the lavatory or lavatories used by the suspected case, including the disinfection of:

1. door handle,
 2. locking device,
- toilet seat,
 - tap,
 - washbasin,
 - adjacent walls and counter



The air conditioner must be turned off during the disinfection operation, and the passenger cabin must be fully ventilated after disinfection.

Suspected passenger's management

When a suspected passenger (as described in the first paragraph of this subpart) is identified, measures should be taken to the extent practicable, ensuring that the respective passenger is quarantined on board. Depending on the configuration of the aircraft and, and to the extent this is practicable:

- the last 3 rows of seats should be cleared and reserved as quarantine area
- taking into consideration the air circulation system of the aircrafts, where possible, the suspect passenger should be seated in the last right window seat
- the right rear lavatory should be specifically designated for quarantine purpose
- specific crew members should be designated to provide necessary in-flight service for quarantine areas. This cabin crew member should be the one that already had contact with the suspected passenger. The designated crew members should minimize close contacts (within 2 meters) with other crew members and avoid unnecessary contacts.

Regarding suitable disinfectants the WHO provides the following statement in their “Guide to Hygiene and Sanitation in Aviation” (World Health Organisation, 2009) hydrogen peroxide–based disinfectants containing additives such as surfactants and chelators have shown good results in scientific studies, and some industries already using these products are reporting excellent results. Ethanol has also been found to be an effective and suitable disinfectant for aircraft. However, other materials could be considered if they are approved or registered for surface disinfection and sanitization on aircraft by an appropriate government or independent organization, as applicable.

Note 3: it must be noted that ethanol-based agents are flammable and the explosive level has to be closely observed during their use. Furthermore, the use of such agents in the close proximity of the oxygen system should be avoided.

The recommendation of the Chinese Civil Aviation Authority, based on their findings and experience during the SARS-CoV-2 outbreak in terms of disinfecting agents is to use hydrogen peroxide or chlorine-containing disinfectant. The concentration of hydrogen peroxide should be no higher than 3% and reaction time should be 20 minutes, and the effective concentration of chlorine should be 1000mg/L, for 30 minutes.

When cleaning and disinfecting are complete the protective equipment should be carefully removed as follows:

- disinfect the gloves before removing them
- remove the gloves
- hand disinfection after the removal of the gloves
- remove the protective suit
- hand disinfection
- removal of face mask and goggles
- clean hands and other body parts which may have been exposed to contaminants with soap and water or an alcohol-based hand rub
- avoid touching the face with gloved or unwashed hands.

5 Helicopter Operations

Helicopters, while their operation tends to be more local, should also be subject to regular disinfections when operating in high risk areas depending on the type of operation, even more so considering that most helicopter cabins do not have any internal compartments, therefore protecting passengers and crew is very important.

In particular, Air Ambulance and HEMS operations, considering the specific medical circumstances, should exercise heightened caution during this outbreak. Flight crew should, as much as possible, avoid being involved in the handling of the medical passenger in order to maintain some separation. Medical crew on board should be the ones involved with the patient. Operator's crew and medical staff should respect social distancing. As social distancing is not effective inside the helicopter, operators of multi-crew operations may consider crewing the same persons together to avoid cross-contamination. Road ambulance should be the preferred option for patients known to be infected. Flight crew should wear personal protective equipment such as gloves and face mask, as compatible with the mission. Further protection measures may be imposed for the Air Ambulance and HEMS flight based on the epidemiological risk assessment of the medical crew.

Proper consideration should be given to the general recommendations made in part 2 of this guide in terms of suitability of substances and protection of the crew.

The interior of aircraft should be cleaned prior to disinfection in accordance with the established operators' procedures. The disinfection should be performed after each flight when operating from a high risk area or where after transporting a COVID-19 suspect passenger. The operator may implement different disinfection frequency based on a risk assessment which takes into account the operational circumstances and the duration of the disinfecting effects of the substance used. In such a case, the operator shall ensure that the aircraft is fully cleaned and disinfected at least once in 24 hours. Furthermore, for the Air Ambulance and HEMS operators the frequency of cleaning may be adjusted based on the epidemiological assessment of the medical crew.

Whenever practicable, remove any interior items including; seat cushions, protective covers, curtain, cabinets and equipment for improved access. The removed equipment should be disinfected in accordance with the appropriate manufacturer specifications (if any) or applying generally accepted procedures.

Disinfection products should be applied, using pre-impregnated wipes (scrub and wipe technique) to keep the materials localized. Disinfectants can be used on the installed aircraft interior and exterior handles including:

- Covers
- Floor
- Panelling, including: sides, overhead and the cargo compartment
- Windows
- Internal and external handles
- Seat belt buckles (Do not apply to Seat belt webbing)
- Seats and seat covers
- Medical interior
- Medical retainers
- Stretcher platform and stretcher (handles and surfaces)
- Door handles inside/outside



In order to avoid damage during disinfectant application, prevent the following:

- Spraying, evaporation or uncontrolled application in the interior of the helicopter
- Puddle formation and penetration in crevices / joints etc.
- Contact with electric or electronic components
- Contact with cockpit displays, glass covers on flight instruments and any equipment screen surfaces.

Personnel using such disinfection products shall follow the manufacturer's safety advice and use appropriate Personal Protection Equipment (PPE).

For additional materials on this topic please refer to the resources available at

<https://www.easa.europa.eu/document-library/general-publications/coronavirus-advice-airlines-and-their-crews#group-easa-related-content>

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