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SUBJECT: NATIONAL INTERIM GUIDANCE ON AIRCRAFT CLEANING AND DISINFECTION IN RELATION TO THE COVID-19 PANDEMIC

ATTENTION: Ethiopian air operators

1. Background

Around 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 majorly by air travel. The World Health Organization (WHO) declared the outbreak as a Public Health Emergency of International Concern (PHEIC) on the 30th of January 2020 and further declared it as a pandemic on 11th of March 2020.

Person-to-person transmission has been established between people who are in close contact with one another (within about 2 meters/6 feet), primarily via respiratory droplets. Droplet transmission occurs when respiratory droplets generated via coughing, sneezing or talking contact susceptible mucosal surfaces, such as the eyes, nose or mouth. Transmission may also occur indirectly via contact with contaminated fomites with hands and then mucosal surfaces. Respiratory droplets are large and are not able to remain suspended in the air thus they are usually dispersed over short distances.

The purpose of this Guidance is to provide information and guidance for Aircraft Cleaning and Disinfection in Relation to the COVID-19 Pandemic.

2. General considerations

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

1. Direct human-to-human transmission primarily via respiratory droplets from, or direct contact with, an infected individual;
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 COVID-19 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 aircraft the disinfection of the aircraft by 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 aircraft) 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 COVID-19 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 internationally approved for use on aircraft against COVID-19 and that have been approved by the aircraft manufacturer should be used.

A list with efficient substances against COVID-19 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: proper consideration should be given also to the national guidelines for cleaning and disinfection published by the Ethiopian Public Health Institute, 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 aircraft 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 public 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:
 - Aisle
Ceiling, 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 at disinfecting all passenger and cargo 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 a suspected case

The procedure for disinfection after a suspected case 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 case's management

When a suspected case (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.
- Additional procedures prescribed in WHO Operational considerations for managing COVID-19 cases or outbreak in aviation: Interim guidance should be followed.

Regarding suitable disinfectants the WHO provides the following statement in their "Guide to Hygiene and Sanitation in Aviation" (World Health Organization, 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: 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 COVID-19 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, Medevac, 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 Medevac, 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 Medevac, 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).

6. Aircraft Routine Maintenance



During ground operation and maintenance, aircraft auxiliary power unit (APU) should be used for ventilation, the use of bridge load air supply should be avoided. After arrival, doors of cabin

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and cargo hold should be opened for ventilation before maintenance work is performed, and natural ventilation time should be extended.

High Efficiency Particulate Air (HEPA) filters should be replaced in accordance with standards specified in the manufacturer's manual, in strict compliance with the prevention and protection requirements of the Aircraft Maintenance Manual, and based on the personal prevention and protection program for aircraft maintenance personnel. Used HEPA should be placed in a special plastic bag, disinfected with chlorine disinfectant and sealed.

After the task is completed, the maintenance staff should disinfect their hands and remove their protective equipment in the specified order before disinfecting their hands again thoroughly.


7. Other Aviation Facilities

Though this Circular is focused on the aircraft due to its safety critical nature, it may also be used as a general guide for disinfection of other aviation facilities like the airports taking into consideration specific instructions from Original Equipment Manufacturers of equipment at those facilities. Hygiene services should be enhanced in accordance with national health authority's recommendations. Guidance from Airport Council International (ACI) should be followed: <https://aci.aero/about-aci/priorities/health/documentation/>

Please, be guided accordingly.

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