



Bhutan Civil Aviation Authority

Guidance on aircraft cleaning and disinfection

in relation to the COVID-19 pandemic

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Revision record

Issue	Date of issue	Summary of changes
01	08/07/2020	Initial issue

1. Background

- 1.1 In December 2019, the outbreak of a new type of coronavirus was identified in the province of Hubei, China. Since then, the evolution of the outbreak has been very rapid, affecting most of countries worldwide. Consequently, on 30 January 2020 the outbreak was declared by the World Health Organization (WHO) as a public health emergency of international concern (PHEIC) and on 11 March 2020, further characterised as a pandemic. In mid-February 2020, a cluster began to develop in Europe, which evolved to a pan-European outbreak. In most European States, the outbreak reached its peak in mid-/late-April 2020 and it has been going downwards since then. Nevertheless, new clusters have developed globally in most areas of the world that are currently in various stages of evolution of the outbreak. Furthermore, a considerably high number of newly confirmed cases has been recorded every day in the past weeks.
- 1.2 In this context, BCAA has developed, issued and updated a safety information Issue 01 and 02 – **Operators Guide to Cleaning and disinfection of Aircrafts** to provide operational recommendations to Operators in accordance with the International Civil Aviation Organization (ICAO), World Health Organization (WHO), International Air Transport Association (IATA), and European Union Aviation Safety Agency (EASA) etc...
- 1.3 Consequently, BCAA has updated this guidance, giving proper consideration to the publications of the WHO¹ and IATA in order to provide support to its stakeholders in terms of how cleaning and disinfection are expected to be performed in the context of the above-mentioned guidelines.

¹ WHO *Guide to Hygiene and Sanitation in Aviation*, Third Edition, 2009 (https://www.who.int/water_sanitation_health/publications/aviation_guide/en/)

WHO *Cleaning and disinfection of environmental surfaces in the context of COVID-19*, 16 May 2020 (<https://www.who.int/publications/item/cleaning-and-disinfection-of-environmental-surfaces-in-the-context-of-covid-19>) WHO *Operational considerations for managing COVID-19 cases or outbreak in aviation: interim guidance*, 18 March 2020 (<https://www.who.int/publications/item/operational-considerations-for-managing-covid-19-cases-or-outbreak-in-aviation-interim-guidance>; <https://apps.who.int/iris/bitstream/handle/10665/331488/WHO-2019-nCoV-Aviation-2020.1-eng.pdf>)

2. General considerations

- 2.1 There are three possible ways by which infection can be transmitted on board aircraft:
- (1) direct inhalation of respiratory droplets and/or suspended airborne particles;
 - (2) direct contact with saliva, faecal matter or other potentially contaminated body fluids;
 - (3) direct contact with saliva, faecal matter or other potentially contaminated body fluids deposited on surfaces or, for maintenance staff, entrained in ventilation and air conditioning systems.
- 2.2 The main source of infection for other air travellers is from an infected person, and close proximity to an infected person is an important risk factor for droplet-transmitted infections. Once the infected person is no longer in close proximity, the risk of exposure to respiratory droplet is considerably reduced. Nevertheless, scientific evidence (GünterKampf, 2020) (van Doremalen, et al., 2020) shows 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 several days, depending on the type of surface and the environmental conditions. In this context, the possibility for the virus to remain in the aircraft environment through the common surfaces contaminated by the infected passenger, and after the infected passenger has disembarked, requires mitigating action in order to prevent further contamination.
- 2.3 Sometimes, a case of a communicable disease is known only several days (or longer) after the infected person has travelled, and may have deposited pathogens on the interior surfaces of 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 environmental conditions (e.g. temperature, humidity), whether the surface has been properly cleaned and/or disinfected and, of course, the personal susceptibility of the persons that touch the contaminated surfaces.
- 2.4 For the disinfection of commercial air transport aircraft, operators together with ground-handling companies that provide cleaning and disinfection services should take into account the following:
- specific characteristics of the aircraft (flight-crew compartment design and passenger cabin design for both fixed-wing and rotary-wing aircraft);
 - the type of surfaces involved; and
 - the recommendations of the aircraft manufacturer in terms of disinfecting products and agents that are allowed to be used.
- 2.5 For this purpose, all disinfectants used, in addition to their disinfecting properties as regards SARS-CoV-2 and being health safe, must be aircraft-component compatible, meaning they must not have any negative effects on the individual parts or the structure of the aircraft, while also being nationally approved for use. When choosing a disinfectant, it must be ascertained that its application is not likely to have damaging effects on the human health or on 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, worktops, lavatories).
- 2.6 It is, therefore, necessary to exercise great caution in selecting cleaning and disinfecting products that are suitable for aircraft use. It is important to protect the health of cleaning staff, aircrews and passengers, as well as to ensure effectiveness against SARS-CoV-2.
- 2.7 Consequently, only those cleaning and disinfecting substances should be used that are nationally approved for aircraft use against SARS-CoV-2 and that have been recommended by the aircraft manufacturer for this purpose (see also point 3.2).
- 2.8 Cleaning staff should be adequately trained so they understand and follow the procedures that will ensure the effectiveness of the cleaning and disinfecting substances, use the proper personal protective equipment (PPE), prevent contamination of other areas, and minimise occupational health and safety risks to other staff, including ensuring adequate ventilation of confined areas, such as lavatories.
- 2.9 Compressed air and/or water for cleaning, or any other methods that can cause splashing or might re-aerosolise infectious material, should not be used. Vacuum cleaners may be used, but only after being properly disinfected.
- 2.10 Cleaning staff should protect themselves by wearing appropriate personal protective equipment (PPE), such as gloves, face masks, face shields, and protective clothing, according to standard operating procedure requirements. Face masks should be replaced regularly in accordance with the manufacturer's instructions (for example, most surgical face masks do not provide protection after 4 hours of use).
- Note 2: Proper consideration should be given also to the national guidelines, where available, for cleaning and disinfection, published by the national public health authorities.*
- 2.11 There are several types cleaning and disinfection possible:
- routine aircraft cleaning,
 - preventive cleaning and disinfection of aircraft,
 - cleaning and disinfection of aircraft in flight,
 - cleaning and disinfection of aircraft after an occurrence (when identifying a symptomatic person onboard).
- 2.12 This guidance focuses on the following:
- preventive cleaning and disinfection of aircraft,
 - cleaning and disinfection of aircraft in flight, and
 - cleaning and disinfection of aircraft after an occurrence.

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).

3.2 The aircraft operator's engineering department should provide a technical review and approval of use for each cleaning and disinfecting product/substance used, taking into consideration the list of effective substances published by the national public health authorities and the manufacturer's recommendations (recommended cleaning and disinfecting substances are normally listed in the AMM).

3.3 In terms of practicalities, the list below contains recommended practices to ensure that efficient disinfection is performed.

Cleaning staff should:

- (1) use different cleaning tools (e.g. cloths and mops) for each area, potentially colour-coding them, in order to reduce cross-contamination;
- (2) not cause damage to the aircraft components, should rub and visibly wet the surfaces with disinfectant for the entire contact time (also known as 'wet time') indicated on the product label, and remove it afterwards;
- (3) apply disinfectant on the floor from front to aft, and then again in the opposite direction before any other cleaning and disinfection manoeuvres;
- (4) typically perform thorough cleaning before disinfection;
- (5) clean and disinfect the key areas as noted below, beginning from the top (ceiling) and moving progressively downwards (floor), working from clean-to-dirty areas:

(a) *Aisles*

Ceiling, overhead bins, reading lights, air-supply nozzles, sidewall panels, windows and window shades, seats (tray tables, armrests, passenger control units, and decorative panels), cabinets/lockers, bulkheads, magazine racks, cabin crew seats (jump seats).

(b) *Lavatories*

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

(c) *Galleys*

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

(d) *Flight crew compartment*

For aircraft where the flight crew compartment is separated from the passenger cabin, relevant flight crew compartment surfaces and equipment should be thoroughly cleaned before starting the flight preparation. Preventive disinfection should be considered following layovers in which the flight crew had to leave the airport's restricted areas (e.g. transfer to a hotel for a rest period) in areas with confirmed local transmission of SARS-CoV-2. Otherwise, the flight crew compartment should be routinely cleaned.

For aircraft where the flight crew compartment is not separated from the passenger cabin, the frequency of preventive disinfection of the flight crew compartment should be the same as for the passenger cabin.

Cleaning and disinfection of the flight crew compartment should be performed by properly trained staff.

(e) *Cabin*

All galley surfaces and equipment, such as the equipment used for pre-flight safety demonstration, communication equipment and cabin crew seat harnesses should be thoroughly cleaned and disinfected before starting the flight preparation.

Frequently touched cabin equipment, such as interphones, should be thoroughly cleaned and disinfected before and after every flight and, if necessary, during the flight. Approved disinfectant/sanitiser should be available on board.

All passenger seats and seat belt buckles should be thoroughly cleaned and disinfected. The cleaning procedure should be adjusted depending on the material used for the seat/seat covers, for example:

- Woven Fabrics – Seat Covers need to be removed and either dry-cleaned or machine washed to eliminate the risk of transmission to safe levels. Whilst the top surfaces may be able to be cleaned, the woven nature of the product means that the bottom layer and section where the yarns intersect cannot be sufficiently cleaned or disinfected without removal of the dress cover.
- Leather – Genuine leather has a wipe clean surface but should only be cleaned with mild soap or surfactant solution so as to avoid irreparable damage to the product. Genuine leather cannot be dry-cleaned or machine washed.
- Coated Fabrics (e.g. synthetic leather) – provided the product has a polycarbonate top coat, the following preventive disinfection should be considered:
 - Clean the seat cover using an approved cleaning solution and/or vacuum cleaner to remove any foreign objects or debris and clean the surface.
 - Using one of the approved disinfection products, apply the disinfection product and allow to sit on the surface as per the manufacturer's recommended dwell time.
 - After the dwell time, wipe the surface down with a damp cloth to remove any residual disinfectant.

Items that are frequently used should be cleaned and disinfected, including overhead stowage compartment handles, passenger control units, touch-screen monitors.

(f) *Oxygen-dispensing equipment and emergency equipment*

Should oxygen-dispensing equipment (i.e. therapeutic oxygen, drop-down oxygen masks and quick-donning masks) or other emergency equipment be used during the flight, it should be thoroughly cleaned and disinfected after use.

3.4 Any residual disinfection substances that may be harmful to humans should be removed from the seat covers or any other surfaces. This is essential especially when using cleaning and disinfection products which can cause skin irritation or harm.

3.5 Disinfection should follow the general principle of thorough disinfection from out ring-to-centre, top-down and all-around approach.

3.6 The cleaning and disinfection activities should be documented by making use of the Annex 1 – Aircraft COVID-19 disinfection control sheet.

4. Cleaning and disinfection of aircraft in flight

- 4.1 Aircraft operators should increase the in-flight cleaning and disinfection frequency for items/equipment frequently used by passengers or aircrew members, such as lavatories, door handles, latches, and interphones. These frequently touched surfaces should be regularly cleaned and disinfected, as well as when they become visibly soiled. Only approved disinfectant/sanitiser should be available on board. Aircraft operators should adjust the inflight cleaning and disinfection frequency based on an assessment of the target population and the specificities of their operations (e.g. duration of the flight, number of passengers, route, etc.).

5. Cleaning and disinfection of aircraft after an occurrence

5.1 Cleaning and disinfection of the aircraft

- 5.1.1 The procedure for disinfection after an event in this particular context should be understood as the disinfection of an aircraft after the transport of a symptomatic person (having fever, persistent cough or other flu-like symptoms) who also has an epidemiologically-relevant context (having been in direct contact with a confirmed case). Additionally, this type of cleaning and disinfection should be also performed in situations where there is an event that causes heavy contamination of certain surfaces with sputum or other potentially contaminated body fluids/substances (e.g. vomit).
- 5.1.2 In case of heavy contamination of certain areas or surfaces with body fluids/substances (e.g. sputum or vomit from the ill person), the first step should be to remove the excess from the overly contaminated areas or surfaces by using an absorbent material or absorbent disinfectant, ensuring that the excess contaminant will be solidified and should then be disposed of. Large contaminated areas or surfaces (e.g. covering most of a tray table) should be treated with disinfectant after removing first the excess contaminants as described above, and then thoroughly cleaning and disinfecting them. Carpeting and/or seat covers with a substantially contaminated area should be carefully removed, placed in a sealed plastic bag labelled as 'biohazard' and laundered in accordance with the manufacturer's instructions. Alternatively, if proper cleaning and disinfection are 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 efficient disinfection.
- 5.1.3 After the disembarkation of passengers and aircrew is completed, the cabin doors should be closed and the air-conditioning system adjusted to the maximum volume to ensure complete air exchange.
- 5.1.4 Once the air exchange is completed, the first area to be disinfected should be the sitting area of the suspected/ill passenger(s) and the designated lavatory (as defined in the section on the management of suspected passengers below), then the other areas should be cleaned and disinfected in accordance with the preventive disinfection requirements.
- 5.1.5 In addition to the 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 (two (2) seats in every direction), including the following:
- (1) armrests;
 - (2) seatbacks (the plastic and/or metal part);
 - (3) tray tables;
 - (4) seat belt buckles;

- (5) light and air supply controls, cabin crew call button, and overhead compartment handles;
- (6) sidewall panels and windows/window shades;
- (7) portable electronic devices (PEDs) made available to passengers;
- (8) individual video monitors, touchscreens and remote controls.

5.1.6 Thorough cleaning and disinfection (allowing for the full contact time as indicated on the product label between the disinfectant and the surface) of the lavatory or lavatories used by the suspected case, including the disinfection of:

- (1) door handle(s),
- (2) locking device(s),
- (3) toilet seat(s),
- (4) tap(s),
- (5) washbasin(s),
- (6) sidewall panels and counter.

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

5.1.8 Regarding suitable disinfectants, the WHO provides the following statement in its '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 sanitisation on aircraft by an appropriate government or independent organisation, 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.

Hydrogen peroxide-based hand sanitisers can increase the probability of false alarms with Explosive Trace Detection (ETD) (source: ACI)

5.1.9 Aircraft manufacturers recommend the use of a 70% aqueous solution of Isopropyl Alcohol (IPA) as a disinfectant for the touch surfaces. Based on the findings and experience gained during the SARS-CoV-2 outbreak in terms of disinfecting agents, hydrogen peroxide or chlorine-containing disinfectants may also be used as efficient disinfectants for SARS-CoV-2. The concentration of hydrogen peroxide should not be higher than 3 % and the contact time should be 20 minutes, and the effective concentration of chlorine should be 1 000 mg/L, for 30 minutes.

5.1.10 When cleaning and disinfection are completed, the personal protective equipment (PPE) should be carefully removed and treated as follows:

- (1) disinfect the gloves before removing them;
- (2) remove the gloves;
- (3) disinfect your hands after removing the gloves;
- (4) remove the protective suit;
- (5) disinfect your hands;
- (6) remove the face mask and the goggles;

- (7) clean your hands and other parts of your body, which may have been exposed to contaminants, with soap and water or an alcohol-based hand rub;
- (8) avoid touching the face with gloved or unwashed hands.

5.2 Managing of a symptomatic passenger

- 5.2.1 If, after take-off, a passenger shows COVID-19 compatible symptoms, such as fever, persistent cough, difficulty breathing or other flu-like symptoms, the recommendations detailed in Section 3.5 of the COVID-19 Aviation Health Safety Protocol³ on 'Management of passengers on-board the aircraft with COVID-19-compatible symptoms' should be followed.

6. Helicopter operations

- 6.1 While helicopter operations tend to be more local, helicopters should also be regularly disinfected when operating in high-risk areas, depending on the type of operation — also considering that most helicopter cabins do not have any internal compartments; therefore, the protection of passengers and flight crews is very important.
- 6.2 In particular, for air ambulance and helicopter emergency medical service (HEMS) operations, considering the specific medical circumstances, extreme caution should be exercised during the COVID-19 outbreak. The flight crew should avoid, as much as possible, being involved in the handling of the medical passenger, in order to maintain some physical distancing. Medical crew members on board should be the ones taking care of the patient. The aircraft operator's flight crew and medical staff should respect and observe physical distancing. As physical distancing is not effective inside a helicopter, aircraft 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. The flight crew should wear personal protective equipment (PPE) such as face masks, if compatible with the mission. Further protection measures may be imposed for air ambulance and HEMS operations based on the epidemiological risk assessment of the medical crew.
- 6.3 Proper consideration should be given to the general recommendations made in Section 2 of this guidance in terms of suitability of cleaning and disinfecting substances and protection of aircrews.
- 6.4 The aircraft interior should be cleaned before disinfection in accordance with the established operator procedures. The disinfection should be performed after each flight when operating from a high-risk area or after transporting a COVID-19 suspected passenger. The aircraft operator may adjust the frequency of cleaning and disinfection based on a risk assessment that takes into account the operational circumstances and the duration of the disinfection effects of the substances used. In such case, the aircraft operator should ensure that the aircraft is fully cleaned and disinfected at least once every 24 hours. Furthermore, for air ambulance and HEMS operators, the frequency of cleaning and disinfection may be adjusted based on the epidemiological assessment of the medical crew.
- 6.5 Whenever practicable, any interior items (including seat cushions, protective covers, curtains, cabinets and equipment) should be removed to assist access. The removed interior items should be disinfected in accordance with the applicable manufacturer specifications (if any) or by applying generally accepted procedures.

- 6.6 Disinfection products should be applied, using pre-impregnated wipes (scrub and wipe technique) to keep the materials localised. Disinfectants can be used on the installed aircraft interior and exterior handles, including:
- (1) covers;
 - (2) floor;
 - (3) panelling, including sides, overhead and cargo compartment;
 - (4) windows;
 - (5) internal and external handles;
 - (6) seat belt buckles (does not apply to seat belt webbing);
 - (7) seats and seat covers;
 - (8) medical interior;
 - (9) medical retainers;
 - (10) stretcher platform and stretcher (handles and surfaces);
 - (11) inside/outside door handles.
- 6.7 In order not to cause damage to the helicopter during the application of disinfectants, the following should definitely be avoided:
- (1) spraying, evaporation or uncontrolled application of disinfectants in the interior of the helicopter;
 - (2) puddle formation and penetration in crevices/joints, etc.;
 - (3) contact with electric or electronic components;
 - (4) contact with cockpit displays, glass covers on flight instruments and any equipment screen surfaces.
- 6.8 Cleaning staff that use such disinfection products should follow the manufacturer's safety instructions and should use appropriate personal protection equipment (PPE).

Annex I – AIRCRAFT COVID-19 DISINFECTION CONTROL SHEET

Aircraft Registration: _____

Aircraft disinfection was made in accordance with the recommendation of the EASA Guidance on aircraft cleaning and disinfection.

Date (dd/mm/yy)	Time (24hr -UTC)	Airport (ICAO code)	Remarks	Disinfector name
Aircraft areas treated		Disinfectant material	Comments	Disinfector signature
Flight deck <input type="checkbox"/> Passenger cabin <input type="checkbox"/> Cargo compartment(s) <input type="checkbox"/> Other: _____ _____				

Date (dd/mm/yy)	Time (24hr -UTC)	Airport (ICAO code)	Remarks	Disinfector name
Aircraft areas treated		Disinfectant material	Comments	Disinfector signature
Flight deck <input type="checkbox"/> Passenger cabin <input type="checkbox"/> Cargo compartment(s) <input type="checkbox"/> Other: _____ _____				

Date (dd/mm/yy)	Time (24hr -UTC)	Airport (ICAO code)	Remarks	Disinfector name
Aircraft areas treated		Disinfectant material	Comments	Disinfector signature
Flight deck <input type="checkbox"/> Passenger cabin <input type="checkbox"/> Cargo compartment(s) <input type="checkbox"/> Other: _____ _____				

(ICAO, 2020)

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