The Satair Guide to Aircraft Decontamination Options

SATAIR

AN **AIRBUS** SERVICES COMPANY

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Introduction

Throughout the global COVID-19 pandemic, one of the most pressing challenges that airlines and the aviation industry will need to solve is the reestablishment of public trust in air travel

In this guide, we will have a look at some of the reputable and independent reports on passengers' outlook and proposed safety protocols. We will also investigate why decontamination needs to be as high a priority as the air travel experiences itself, and how solutions need to look beyond the current pandemic. Lastly, we will examine the newest technologies available for providing current and future-proof decontamination efficacy.

Reestablishing public trust in air travel is essential for a return to pre-2020 normality, and in this guide, you will find everything you need to know about airport and aircraft decontamination.

Chapter 1

Why is environment sterility more important than ever?

The global COVID-19 pandemic is forcing the aviation industry to rethink decades of infrastructure

According to a report issued by Statista, the total number of scheduled passengers boarded by the global aviation industry peaked at 4.723 billion. This was a period of unprecedented growth, due, in part, to many low-cost carriers driving the market to be more cost-competitive.

Throughout this period, air travel became more of a close-quarters affair. Airport foot traffic increased, and the steady growth of the economy class meant that passengers needed to be comfortable with rubbing elbows with strangers.

That all changed in the first quarter of 2020, and the airline industry has been forced to rethink decades of infrastructure built around maximising throughput.

In their Glimpses of Recovery report issued in June 2020, Oliver Wyman reported that “When it comes to choosing whether or not to fly, most travelers cite improvements in aircraft and airport cleaning as significant criteria”.

At the airport

Airports play a critical role in returning the industry to some form of normality, and effective and continuous decontamination of vast structures is no small task. However, this has not stopped some airports from leading by example and leveraging technology or deploying stricter decontamination protocols to mitigate risk and ease passenger minds.

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When it comes to choosing whether or not to fly, most travelers cite improvements in aircraft and airport cleaning as significant criteria.

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Glimpses of Recovery

Oliver Wyman, June 2020

According to a survey conducted by IATA, not being able to maintain social distance is chief among the concerns of many potential passengers. 56% of the people asked in the survey report concerns about travelling in close proximity, with 42% expressing concerns with the queuing process during check-in, baggage handling, and security checks.

Practical concerns about using public facilities such as lavatories are closely followed by more general concerns about social distancing. 38% of the respondents showed concerns about using airport facilities, such as restrooms and lavatory facilities.

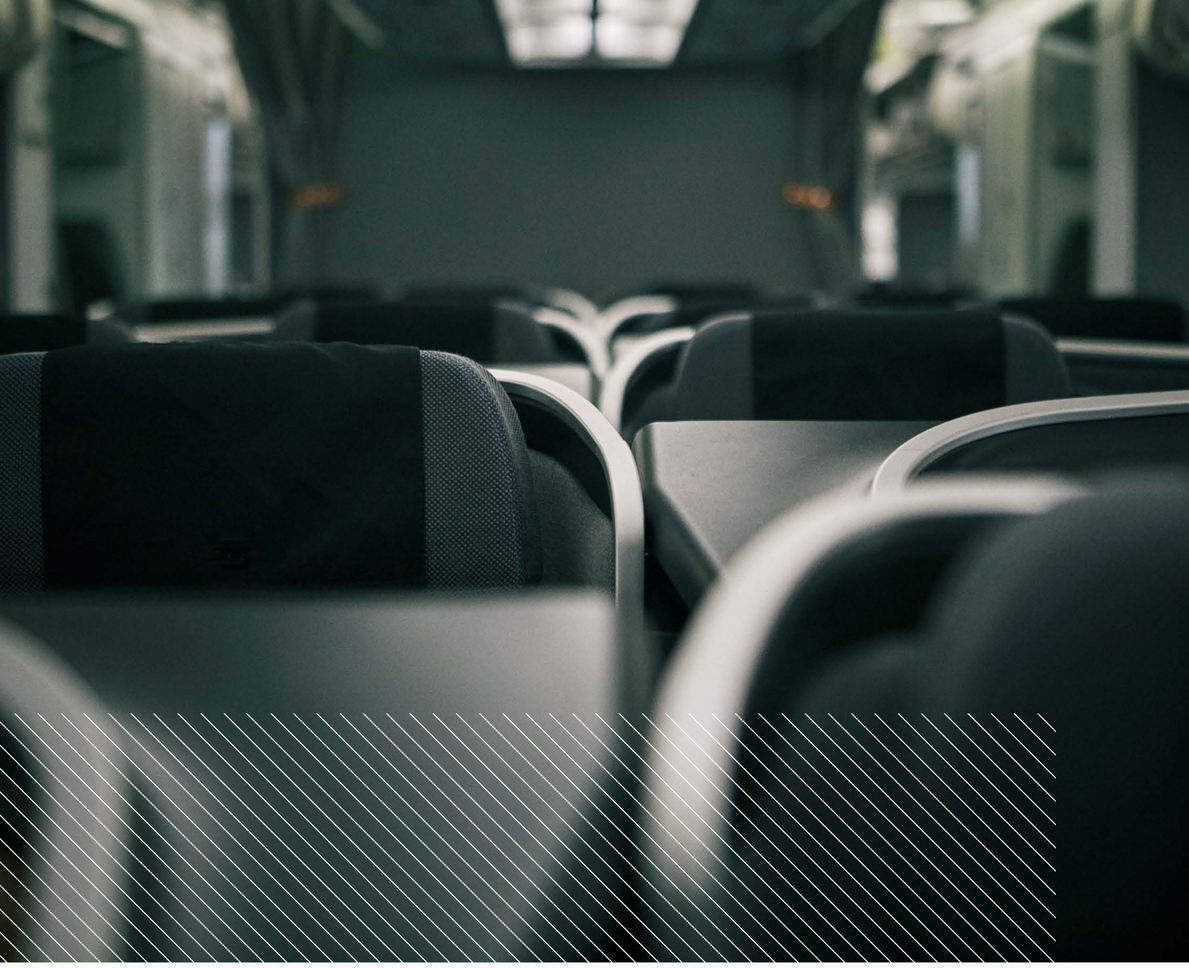
↘ Inside the aircraft

Furthermore, passengers seem to take these concerns of social distancing and cleanliness with them into the aircraft cabin. In the same study conducted by IATA, an overwhelming

68% of passengers expressed fear over sitting next to someone who is contagious. A matching 42% of passengers remained concerned about using aircraft facilities. However, in a differentiating statistic, 37% of the passengers also stated concern with breathing the recirculated cabin air.

Chapter 2

Who is being affected by reduced air travel?



Travel is a fundamental part of global society and the diminished passenger numbers has affected both airlines and the tourism industry

Much of the focus of COVID-19 pandemic's effect on the aviation industry has been on its direct effect on passengers and staff—both from a safety and economic standpoint. However, it is important to not forget that air travel is a fundamental part of the bedrock of global society and that there has been a vast trickle-down effect due to diminished passenger travel.

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The global unemployment rate has seen a sharp spike in various regions of the world due to dramatic decreases in tourism.

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Global air traffic - scheduled passengers 2004-2021

Statista, June 2020

Impact on airlines

- Loss from downtime May to June
- Increased cost due to new cleaning protocols
- Loss of revenue by blocking middle seat
- Cost in PPE

Impact on passengers

The effect of reduced air travel is not as quantifiable when it comes to passengers. One could argue that the long term effects of the sudden lockdown are more existential and societal. In the report by Statistica mentioned earlier, air travel was at an all-time high in January 2020. However, within a few months, the vast majority of air travel had been halted and the globe was in lockdown.

Half a year later, reports are still going out on major news outlets of families being trapped in foreign countries, unable to get back to their homes. In addition, many infectious disease experts like UC San Francisco's infectious disease doctor Peter Chin-Hong, MD have spoken about the risk to various types of travel—with airline travel still being viewed as one of the highest risks.

Effectively, the long-term effects on passengers come down to a diminished trust in air travel altogether.

The indirect effects of reduced air travel

One of the most obvious factors of reduced airline travel is its detrimental effects on tourism. According to a report by Statistica, the global unemployment rate has seen a sharp spike in various regions of the world due to dramatic decreases in tourism.

The report predicts that 2020 will display an unprecedented loss of 100.8 million jobs worldwide in the global travel and tourism sector.

A trickle-down effect from this is an indirect effect on the global GDP. In August 2020, the UN Secretary-General stated that the vast decline in tourism could predictably reduce the global GDP by 2.8% by the end of 2020. In the first four months of 2020 The United States alone was predicted to show the highest losses, with a $30.7b tourism revenue loss—a number that is 3 times higher than the second runner up Spain, with a predicted revenue loss $9.74b.

However, these numbers are relative to the size and strength of these nations, and arguably, small island nations like the Maldives, Kiribati, Aruba, Grenada, and so forth, have been hit much harder.

Chapter 3

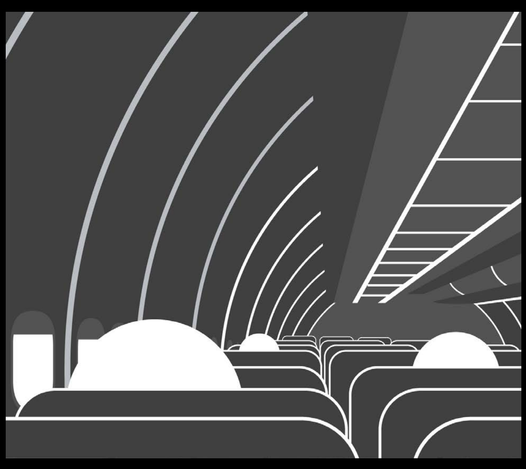
Passenger exposure to harmful contaminants

EASA and ECDC has outlined strict protocols for decontamination and end-to-end passenger management

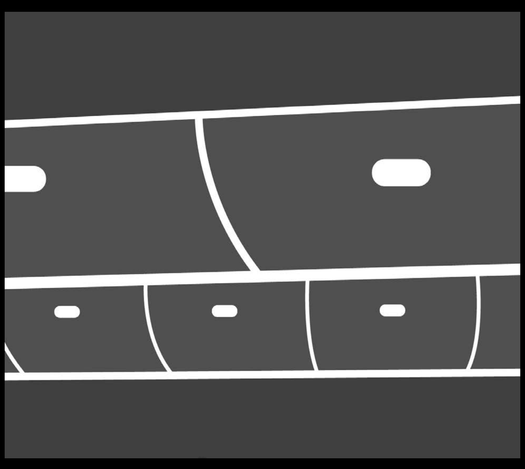
According to the Aviation Health Safety Protocol issued by EASA and ECDC, the greatest exposure areas for passengers is in high traffic areas, frequently used surfaces, and cabin air. The report, which culminated as a concerted effort between the two major agencies, outlines strict protocols for decontamination and end-to-end passenger management.

In this chapter we will look at the various high-risk contamination areas and what can be done to mitigate the risks.

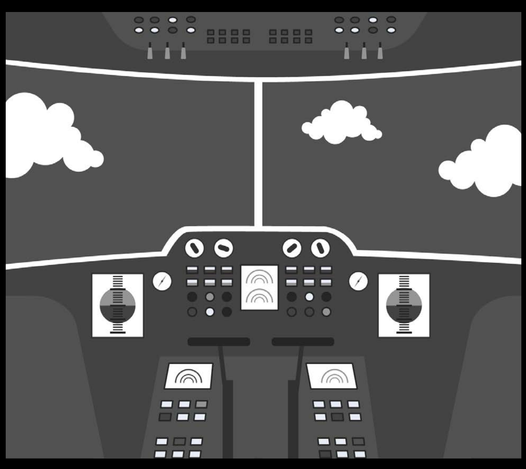
High Risk Areas



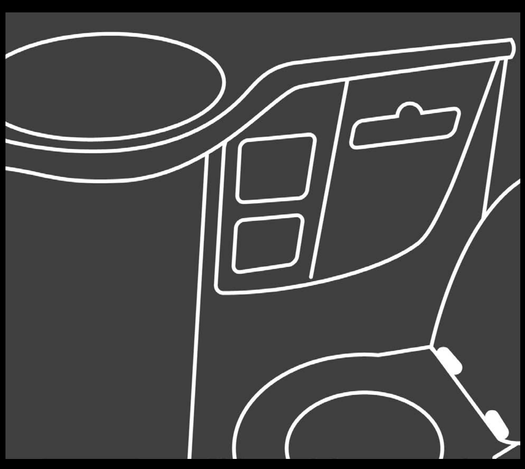
Cabin



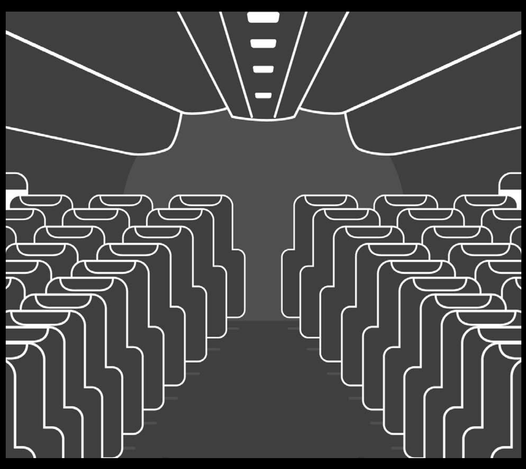
Overhead compartments



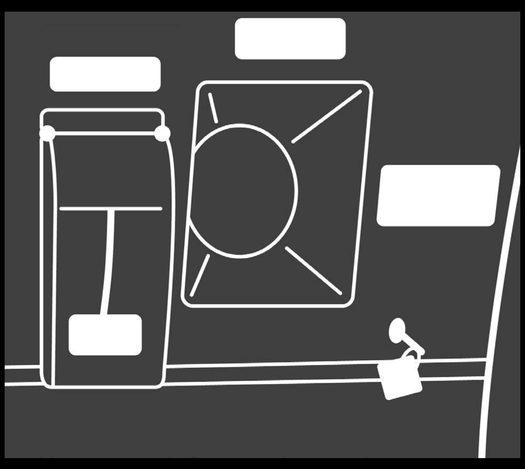
Cockpit



Lavatories



Seats



Handles

High traffic areas and surfaces

Both within the airport and on board the aircraft, cleaning, and disinfection should be a paramount concern for all operators. High traffic areas such as lavatories, baggage handling, check-in, and security check, all pose significant risks due to the volume of passengers. According to the guidance provided by the ECDC, operators should have systematic methods in place that follow these guidelines:

- Both within the airport and on board the aircraft, there needs to be a more extensive focus on thoroughly decontaminating frequently used surfaces. In the airport this would be surfaces such as door handles, sink faucets, railings, escalators, elevator buttons, etc. On board the aircraft, lavatory handles, doors, and surfaces should be regularly cleaned during the flight, and

passenger overhead instrumentation should be thoroughly disinfected between flights.

- A study has shown that security screening trays within the airport hold significant potential risk for transmitting viral contaminants, so special attention should be given towards mitigating this risk. It is suggested that passengers be required to use hand sanitizer before handling the security trays, or that single-use tray covers be used.

- Both passengers and aviation staff have voiced concerns regarding the exposure risks that common toilets pose, both within the airport and on board the aircraft. In addition to the more rigorous cleaning and disinfection protocols, passengers should be informed and encouraged to thoroughly wash and disinfect their hands both before and after using public toilet facilities in both the airport and on board the aircraft.

Protective screens have shown significant success in mitigating respiratory droplets from passing between passengers and airport staff. However, it is essential to regularly clean and disinfect these surfaces to prevent

transmission between anymore coming into physical contact with these surfaces.

Air ventilation

Of the most pressing concerns amongst passengers is the thought of breathing contaminated air. Passengers' concern is slightly less in terms of airport air in comparison to on board the aircraft, as we will discuss in Chapter 4. However, it is a concern that is eroding public trust in air travel.

While establishing a clean air environment is a paramount goal in both airport and aircraft, the EASA and ECDC guidance for how to achieve this differs.

At the airport

Proper air ventilation should be ensured, minimising the percentage of air recirculation and favouring the use of fresh air when

possible in accordance with the international guidelines for ventilation of indoor public spaces.

Inside the aircraft

HEPA can still be considered the gold-standard for filtering out particulates throughout recirculated cabin air. However, HEPA filters only capture particulate matter. The filter does not neutralise pathogens on surfaces.

Regardless of that fact, HEPA is a required based minimum for minimising spread. The ECDC recommends that operators that use cabin air recirculation in their aircraft are recommended to either install, use and maintain HEPA filters, according to the aircraft manufacturer's specifications, or to avoid the use of cabin air recirculation entirely, provided it is confirmed that this will not compromise any safety-critical functions.

Chapter 4

Reports from authorities and agencies

Social distancing is the most significant concern amongst potential travellers–but passengers are eager to return to air travel when deemed safe by authorities

To understand the concerns and guidance from the numerous studies throughout the aviation industry, let’s take a look at them individually. But first, we need to look at the most important opinions namely, thoese of the passengers.

IATA

Passenger insights in the times of a pandemic was a report issued by IATA in July 2020 based on a series of surveys conducted in concert with Oliver Wyman. The survey was made to try and learn more about the current global view of air travel.

In the report, conducted with nearly 4700 participants, social distancing was the most significant concern amongst potential travellers. Sitting in a close range of someone infected with COVID-19 was a concern for 65% of the respondents. However, the report also found that around 60% of the participants were eager to return to the luxuries of air travel, but only when deemed safe by a health agency such as the WHO.

The cleanliness of aircraft and airports was also a concern, with 47% of participants worrying about using using facilities like

lavatories and 37% expressing concern with breathing recirculated cabin air.

EASA

In June 2020, EASA published Review of Aviation Safety Issues Arising from the COVID-19 Pandemic which looks at potential safety issues that might arise as a result of the COVID-19 pandemic. The survey and follow-up discussions identified many different potential safety issues across a wide range of operational activities. The overarching theme to all of these safety issues was the need for well-functioning management systems, which ensure that the aviation industry are able to identify and manage the risks effectively.

Given the very different degrees of preparedness needed for airlines and airports to be prepared for potential future crises (including new waves of COVID-19), the report

emphasises the need to extract, communicate and apply lessons learned as the aviation sector progresses through the pandemic.

ECDC

In June 2020, the European Center for Disease Control issued a 37-page guidance report covering the “Operational guidelines for the management of air passengers and aviation personnel.” The report covers suggested safety protocols for the entire travel experience–from airport to aircraft.

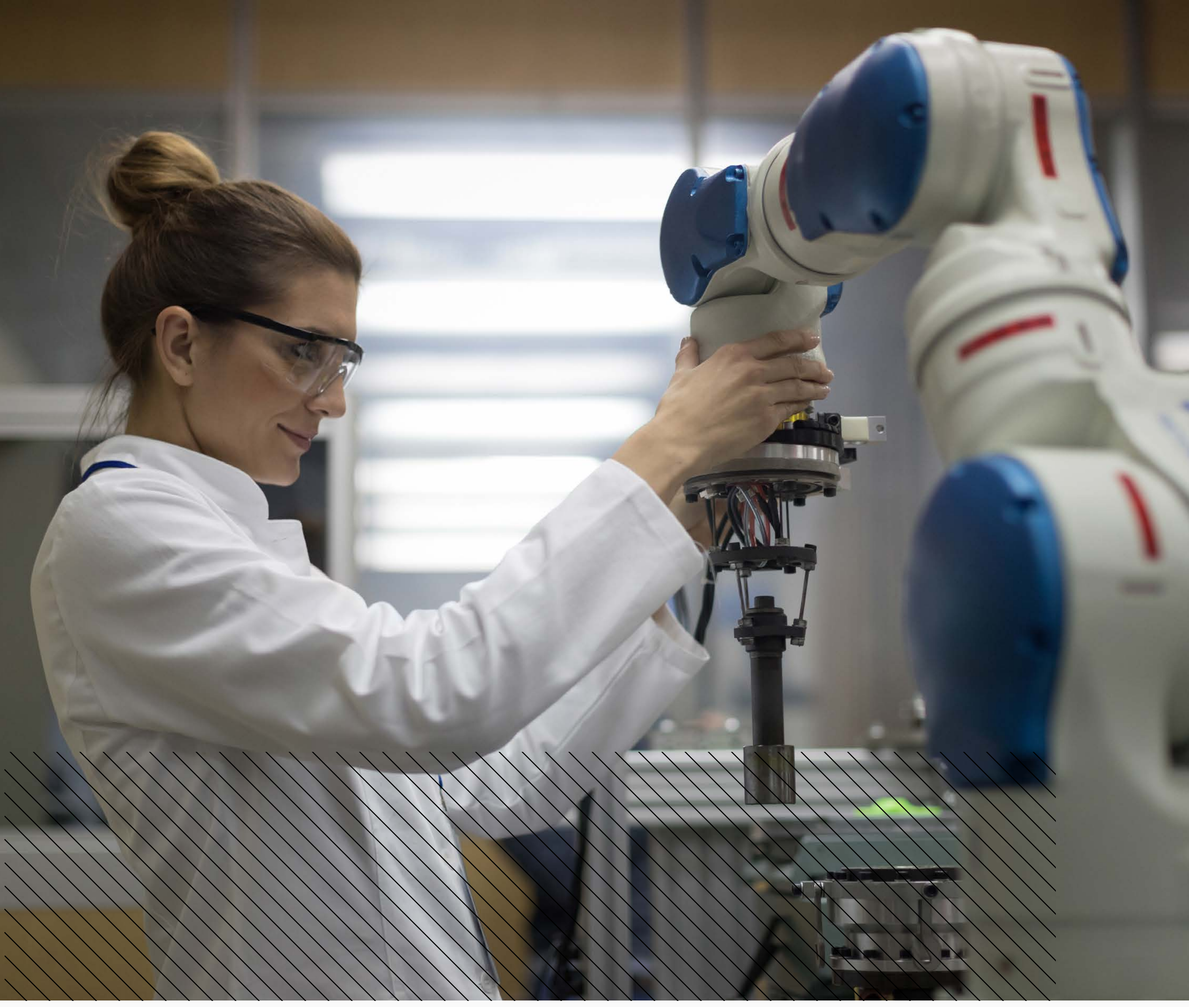
A part of the protocols, the Risk Assessment Guidance for Infectious Diseases transmitted on Aircraft (RAGIDA), pertains to onboard passenger management.

According to its guidelines, RAGIDA suggests that all airlines distribute information to their inflight passengers that covers how the airlines cover these six areas:

- Proper hand hygiene, particularly before eating or drinking and after using the lavatory.
- The appropriate use of face masks.
- Respiratory etiquette.
- Limiting contact with cabin surfaces.
- Reducing in-flight service.
- Reducing the use of the individual air-supply nozzles to the maximum extent possible, unless otherwise recommended by the aircraft manufacturer.

Chapter 5

Decontamination solutions



All eyes are on soloutions for minimising the risks of COVID-19–with a heavy focus on technologies that can decontaminate the aircraft cabin

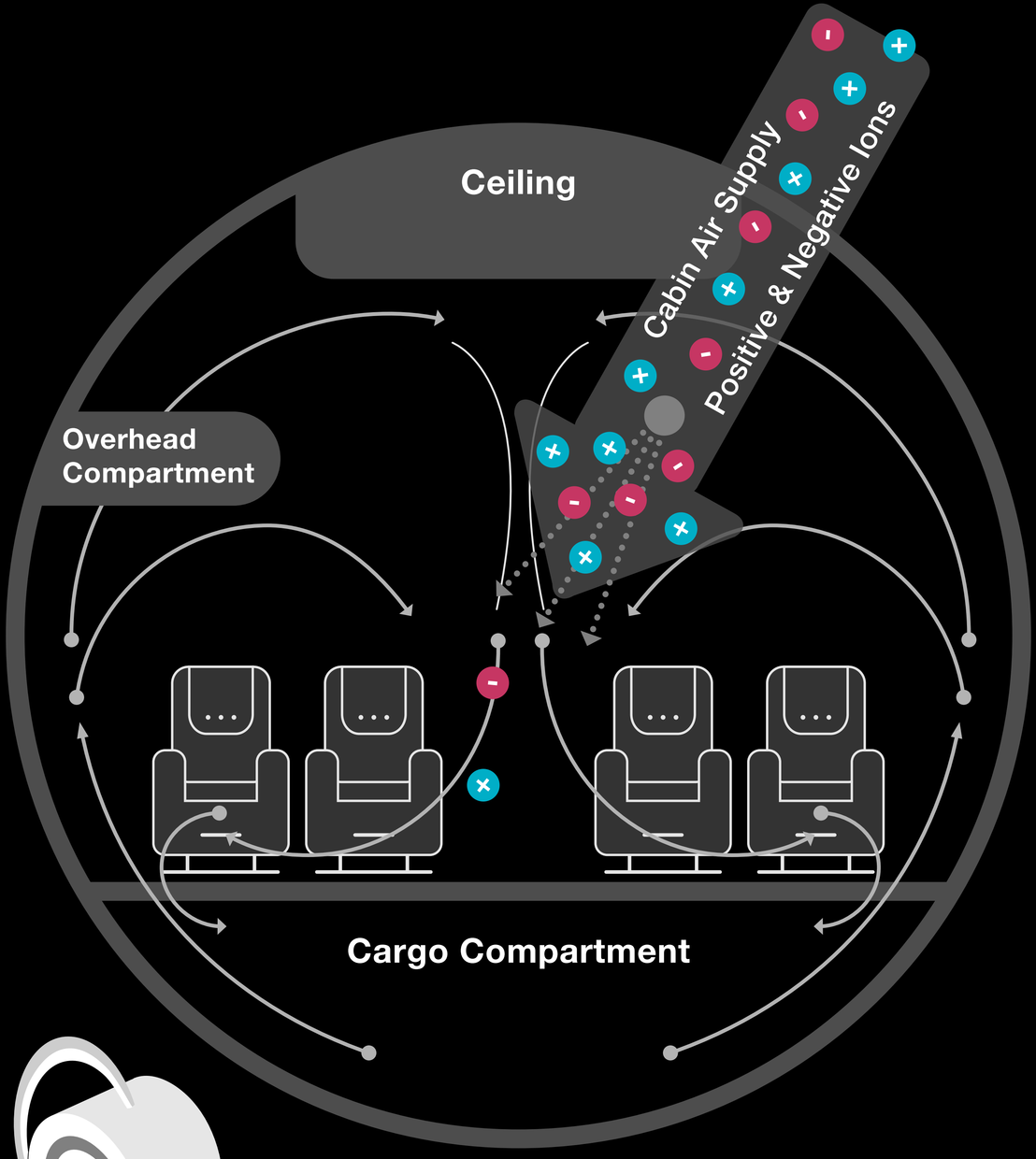
Currently, due to the urgency of managing the problems brought about by the global pandemic, a lot of potential solutions for minimising the risks of COVID-19 are being explored by the aviation industry. In this chapter we are going to look at these various solutions and their effectiveness.

How does it work?

Air circulation treatment

Air Ionisation & Purification System

Installed in ECS (Enviromental Control System)



Ground Unit

Ideal for airport, gate or jet bridge use.

Bipolar ionisation

Introducing ions into an enviroment is a technology that has been around for several years and in various degrees across the household and medical environments. Also, if you look to nature, ionisation is a fundamental part of the ecosystem.

Ionisation is one of nature’s regulatory systems. In natural open-air, ion density can be anywhere from 400 to 800 ions per cubic centimetre. The advantage of ionisation inside an aircraft cabin is that we have an enclosed environment, so you can effectively increase that ion density through the ECS, or an environmental control system.

Ions are pushed out into the cabin to neutralise pathogens. Then, the HEPA filtration system captures those inert pathogens and removes them from the cabin air. In other words, ionisation of the cabin

air and surfaces acts as an extra safeguard, neutralising the pathogens before even reaching the HEPA filter.

This ionisation technology has been tested to be effective against the airborne and surface spread of viral strains H1N1, H5N1, and SARS, as well as bacterial contaminants like Staphylococcus (STAPH), Methicillin-resistant Staphylococcus aureus (MRSA), Mycobacterium tuberculosis (MTB), Clostridioides difficile (C.Diff), and Escherichia coli (E.coli).

However, the most pressing concerns are the airborne and surface spread of SARS-CoV-2 (COVID-19). Recent tests conducted by independent laboratories have found that ACA's NPBI™ technology can render 99.4% of COVID-19 viral particles inactivated on a stagnant surface within thirty minutes.

UV lighting

UV light has been proven to eliminate virus that can cause covid-19 and the flu and has been used in hospitals and labs for disinfection for years. However, this technology has not yet been tested in the disinfection of cabin surfaces.

There are challenges that UV lighting poses in effectively neutralising pathogens, for example choosing the optimal lighting system. Mercury vapour lamps, operating around 250 nm in a wavelength band known as UV-C, are currently the most common lamps for disinfection purposes. Higher wavelengths, for example, UV-B sources around 300 nm, are not as effective and present higher risk in cases of accidental exposure to the UV light. Lower wavelengths, for example, sources around 200 nm, can be more effective, but they can create ozone that would need to be removed from the transportation environment.

In addition, the process requires the manual operation of sweeping UV light emitters over surfaces to disinfect, leaving the chance that some surfaces could be missed or overlooked. Most importantly, this method not neutralise any pathogens in the air, as they are not designed to do so. Furthermore it only cleans the surface here and now, as it will be contaminated again the second a passenger touches it.

↘ Electrostatic fogging

Similar to UV lighting, this is a manually operated procedure that would need to be performed by the crew, and similar to UV it is not designed to decontaminate cabin air and is subject to human error.

Electrostatic fogging delivers charged droplets that are actively attracted to surfaces, including the backsides and crevices of surfaces regardless of the

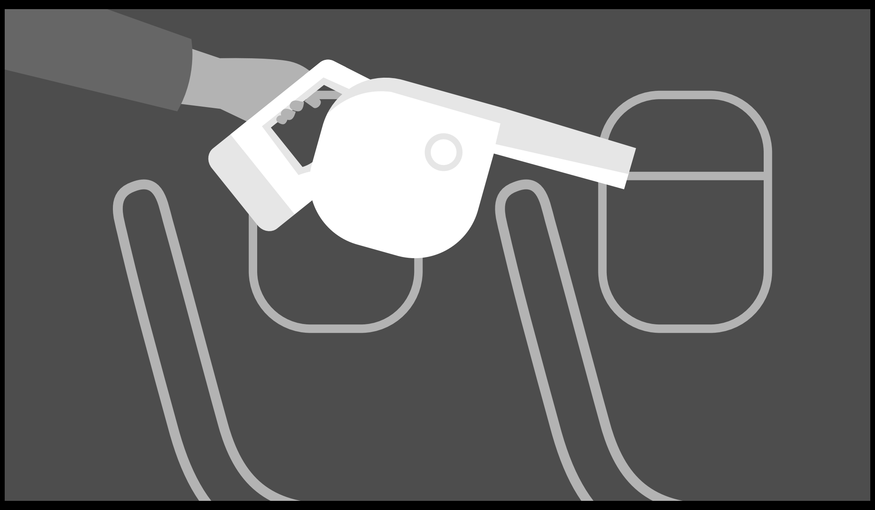
direction of spray for complete wrap-around disinfection coverage.

Also, there is no data on the long-term effects of electrostatic fogging on aircraft cabin materials, as the method only provides a clean surface until a passenger touches it again.

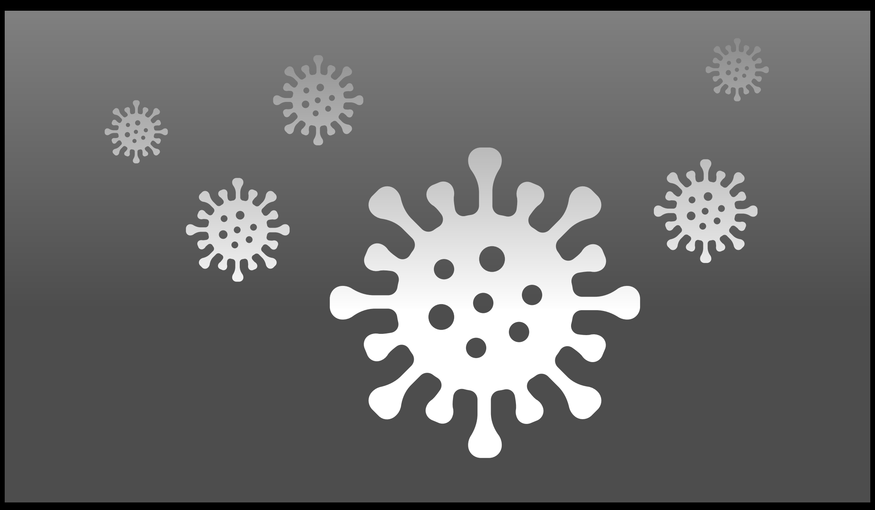
↘ Cabin heating

It was reported in FlightGlobal in June, that airlines could use the aircraft's interior heating as a method of killing coronavirus and other biological contaminants. However, this test was conducted for use in military aircrafts and required a heating of 50 celcius for six hours to show any effective result. It is not likely that this solution can be replicated for use in commercial aircrafts.

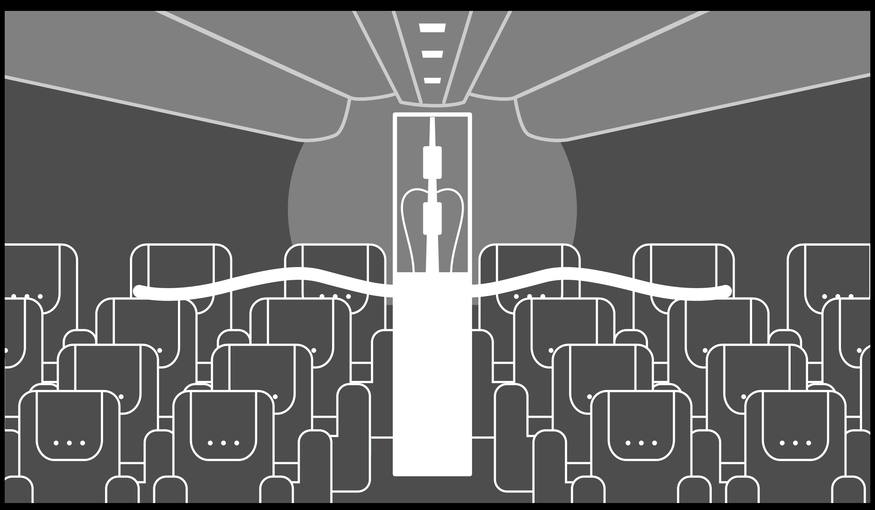
Electrostatic fogging



UV lighting



Cabin heating



Infographic by SATAIR

Conclusion

A return to normality is built upon restablishing public trust achieved through effective and continuous decontamination

Air travel was at an all-time high in January 2020. However, within a few months, the vast majority of air travel was brought to a standstill and the world was in lockdown.

Reestablishing public trust in air travel is essential for a return to pre-2020 normality as most travellers find improvements in airport and aircraft cleaning a significant criteria in choosing whether to fly or not.

Both airports and aircraft play significant roles in returning the industry to normality but effective and continuous decontamination of vast structures and more confined aircraft cabins is no small task.

According to the Aviation Health Safety Protocol issued by EASA and ECDC the greatest exposure areas for passengers is in high traffic areas, frequently used surfaces, and cabin air. The two agencies have outlined strict protocols for decontamination and end-to-end passenger management.

Both within the airport and on board the aircraft, cleaning, and disinfection should be a paramount concern for all operators. Of the most pressing concern among passengers is the thought of breathing contaminated air. In airports, proper air ventilation should be ensured, minimising the percentage of air recirculation. Inside the aircraft, HEPA can still be considered the gold-standard for filtering out particulates throughout recirculated cabin air. However, the filter does not neutralise pathogens in the air or on surfaces.

Introducing ions into the aircraft cabin can neutralise pathogens. Then, the HEPA filtration system captures those inert pathogens and removes them from the cabin air. Recent tests have found that ionisation of the cabin air can render 99.4% of COVID-19 viral particles inactivated in a stagnant surface within thirty minutes.

UV lighting and electrostatic fogging has also been explored as solutions for decontamination but has not shown the same level of ability to eliminate virus under the circumstances present in aircraft cabins.

↘ Decontaminate the aircraft environment with ionisation

Satair offers Aviation Clean Air's system, the only proactive system that immediately decontaminates interior air and neutralises pathogens throughout the aircraft.

Reduce the risk of viral and bacterial spread

Meet the cabin environment safety expectations required by passengers with the patented needlepoint bipolar ionization (NPBI™) technology. This solution neutralises many pathogens, including SARS-CoV-2, without representing any health risks, as this is the only FAA approved ionisation technology for aicraft.

Discover More

Our Knowledge Hub is filled with many more insights and expertise on the topics that were covered in this eBook. Visit blog.satair.com to learn more and discover something new.

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