

COVID-19 in the Airline Industry: The Good, the Bad, and the Necessary

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Abstract

The COVID-19 pandemic has significantly affected flight attendants' health, safety, and security. Members of this group work in a densely occupied and enclosed space where social distancing is virtually impossible, compliance with mask rules is uneven, aggressive passenger incidents are at an all-time high, and the vaccination status of passengers on domestic flights is unknown. Here is a description of the response by the federal government and the United States (U.S.) airline industry from the perspective of a flight attendant union between the early days of the COVID-19 pandemic and this writing. Specifically, the issues of ventilation, face masks, aggressive passengers, quarantine and isolation, and vaccinations are reviewed, including actions taken by the executive branch of the U.S. government, regulators, airlines, manufacturers, and our crew member union. Although there will be regional differences around the globe, many of these issues are universal.

Keywords

COVID-19, aircraft, flight attendant, ventilation, mask

Introduction

On January 30, 2020, the World Health Organization (WHO) declared COVID-19 a Public Health Emergency of International Concern (PHEIC). By March 11th of that year, it was a global pandemic¹ and by April 4th, more than a million cases had been documented in every region of the globe.² In the United States (U.S.), to stem the spread of disease, indoor environments—particularly those with higher occupant density, such as schools, theaters, and places of worship—went virtual. By the end of the third quarter of 2020, the revenue of the online meeting platform Zoom had risen 760 percent.³

The relative contributions of aerosol, droplet, and contact transmission were undefined, but packing into the economy section of an aircraft cabin did not seem wise. So, amid the rising case counts, hospitalizations, and deaths, the global airline industry experienced a sharp downturn in passenger loads on commercial flights. By mid-April 2020, some 17,000 aircraft—comprising 64 percent of the world's fleet—were grounded.⁴ In the U.S., airlines flew 41 percent fewer flights in 2020 than in 2019 and the average load factor (defined as the percentage of available seats that are occupied) also dropped significantly.⁵ Fewer and less crowded flights translated into fewer fare-paying passengers with the most dramatic reduction recorded in April 2020—96 percent down compared to April 2019.⁶ While most

Americans were told to stay home, flight attendants and pilots were expected to report for work—without federally mandated masks and without cures or vaccines—to operate the subset of the fleet that kept cargo and essential travel moving.

Throughout 2020, the executive branch of the U.S. government and the federal agencies took a hands-off approach to the pandemic. This reflected the philosophy of the administration of then-President Trump who had, early in his term, signed an executive order that, for every one new regulation issued, at least two would have to be “eliminated.”⁷ Consistent with this philosophy, masks were not required in any form of public transportation, and there were no rules to limit onboard food and beverage service, maximize the ventilation air supplied on aircraft, provide hand sanitizing stations in airports, or mandate High-Efficiency Particulate Air (HEPA) filtration of recirculated air, for example. Onboard, passenger loads were generally low enough that people were separated by more space than

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usual, but that was because of low ticket sales, not regulatory intervention.

In July 2020, presumably, to try to recoup some confidence in the safety of travel, three U.S. agencies issued a joint report titled “Runway to Recovery.”⁸ The R2R report, as it became known, announced that the “U.S. economy is reopening after the [COVID-19] public health emergency.” The report included strong language about the utility of face masks in the transportation sector and the need to socially distance, both onboard and in the airport; it described the need for thorough cabin disinfection and provision of hand sanitizer; it included catch phrases like “layered approach” to safety. However, the report used the word “pandemic” only once (embedded in a website address) and, while the word “should” was used 127 times, the word “shall” never appeared.

In the meantime, U.S. airlines were parking unused aircraft in the desert, where possible, to slow the corrosion of metal parts. With revenue at an all-time low and with an uncertain time line, the aviation industry recognized the urgency of convincing passengers that they could travel safely. To address the regulatory void and to recover passenger confidence, airlines established policies that included face mask rules, cabin disinfection routines, empty middle seats, and reduced food/drink options onboard.

What follows is a description of the response by the federal government and the United States airline industry from the perspective of a flight attendant union between the early days of the COVID-19 pandemic and this writing. Specifically, the issues of ventilation, face masks, aggressive passengers, quarantine and isolation, and vaccinations are reviewed, including actions taken by the executive branch of the U.S. government, regulatory agencies, airlines, manufacturers, and our crew member union.

Ventilation

On January 30, 2020, the WHO declared COVID-19 a PHEIC but it did not formally recognize the airborne route of transmission—specifically, the potential for COVID-19 to spread via small particles (aerosols) that can stay suspended and travel long distances—until July 9, 2020.⁹ Even then, the agency was equivocal about airborne transmission, only noting that—beyond healthcare settings, “airborne transmission may ... potentially [occur] in indoor crowded poorly ventilated settings.” The WHO published this brief two days after the publication of an open letter signed by 239 scientists urging the medical community and “relevant national and international bodies” to recognize the potential for airborne spread of COVID-19. The signatories were united in recognizing the need to limit exposure to “virus-carrying respiratory microdroplets released into the air by infected people.”¹⁰ They emphasized that the potential for airborne spread of disease “is especially acute in indoor or

enclosed environments, particularly those that are crowded and have inadequate ventilation.”¹⁰

The aircraft cabin is one such environment. Coincident with the spread of COVID-19 and a growing recognition of increased risk of transmission in crowded indoor environments,^{11–13} there was a movement in the aircraft industry to emphasize the low risk of disease transmission in the aircraft cabin. For example, in May 2020, the Boeing Company launched its “Confident Travel Initiative.”¹⁴ As part of that initiative, the company conducted and released the findings of its onboard computational fluid dynamics (CFD) modeling data for particle spread in different indoor environments, concluding that “the design of the cabin and airflow system creates the equivalent of over [seven] feet of physical distance between every passenger.”¹⁵ Airbus Industries launched its “Keep Trust in Air Travel Initiative” and published similar findings to Boeing—that seated in the economy section separated by one foot and wearing a mask is equivalent to six feet of distance without a mask.¹⁶ And in case any doubts remained, the CEO of the International Air Transport Association—a trade group representing 290 airlines in 120 countries—noted the small number of documented cases of onboard transmission and was quoted as saying that “the risk of contracting the virus on board appears to be in the same category as being struck by lightning.”¹⁷ However, positive cases can be asymptomatic,¹⁸ so without either mandatory testing before domestic flights or consistent contact tracing post-flight, the rate of onboard transmission is unknown.

Also during this time, researchers at the Harvard School of Public Health (HSPH) conducted their “independent” Phase I study, funded by Boeing, Airlines for America (A4A), and airport operators.¹⁹ The authors reported that officials at nine airlines “mentioned having high air exchange rates of approximately every [two] to [three] minutes ... while cruising, a rate that is similar to, or even higher than the recommended air exchange rates for an operating room in a hospital.”

Industry-funded studies emphasize how quickly the cabin air is “renewed” as apparent evidence of its cleanliness.^{16,19} However, the fact that the cabin air is replaced every number of minutes is only one driver of the ambient concentration of gaseous and particulate bioeffluents, including infectious particles, (assuming a continuous source); the other driver is occupant density. When “occupant density” is defined as the number of persons per unit floor area, then an aircraft is the same as an auditorium. But when “occupant density” is defined in terms of how much “dilution volume” of air is assigned to each person, then aircraft have a higher occupant density than auditoria, which is the reality. In part because of this high occupant density, modeling data illustrate that the concentration of bioeffluents in aircraft cabin air gets higher (and does so faster) when compared to other indoor spaces like offices or auditoria.²⁰ In-cabin measurements have confirmed this for gaseous bioeffluents such as

carbon dioxide gas (sourced to people's exhaled breath), especially during ground operations.^{21,22} These factors will also impact the concentration of infectious aerosol particles, although likely to a lesser degree.

Another point on the risk of disease transmission onboard not captured in ground-based modeling studies is that the outside air drawn into the cabin air supply systems inflight is dry. As a result, aircraft cabin air has a low relative humidity (below 15 percent is typical), especially on long-haul flights.²² When relative humidity is that low, droplets can desiccate into aerosols which can stay in the air longer, travel farther,²³ and are more likely to inoculate the respiratory system than the nasal system²⁴ which can cause more serious health effects.

Even though aircraft air supply systems have a laminar (smooth, without much turbulence or mixing) pattern, there is some forward and back motion of air which has been reported in studies of disease transmission onboard. This may result from the aircraft system design, thermal plumes, and the movement of occupants and service carts through the aisle(s). During the severe acute respiratory syndrome (SARS) epidemic (also a coronavirus), the potential for virus particles to travel forward and backward in the aircraft cabin air was noted. Specifically, the WHO defined contacts of a case as those persons sitting in the same seat row or in the two rows forward and back, plus all cabin crew.²⁵ During another flight, there was an apparent transmission of SARS from a single symptomatic index case to 22 people during a 3-h flight, including passengers seated as far as seven rows in front and five rows behind, plus two flight attendants.²⁶ There have also been reports of COVID-19 transmission associated with air travel, including between people on the aircraft and between passengers who spent time in the same gate area or transit lounge.^{27,28}

There is no question that manufacturers design aircraft ventilation systems with a laminar flow, that masks are an essential part of preventing onboard disease transmission, and the airline industry has created a "layered approach" to preventing disease transmission, as described. But one important problem with the cited industry studies is that the test conditions do not mimic the messy reality of human beings on aircraft. For example, in an oft-quoted research study that was commissioned by the United States Transportation Command (TRANSCOM), United Airlines, Boeing, and some sensor and defense companies partnered to measure the aerosol transmission of 1–3 μm diameter particles between mannequins wearing three-ply surgical masks on aircraft.²⁹ Unlike real passengers, the mannequins sat still and faced forward without talking, eating, or drinking.

Similarly, HSPH described modeling data presented by Boeing and Airbus as "important evidence that optimally operated [ventilation systems] under the quasi-static conditions during cruise conditions, and assuming passengers are complying with airline policies to wear appropriate face masks, would provide a very low risk cabin environment."¹⁹

The more important question, though, is what is the risk when the ventilation system is not operating optimally, the conditions are not static, and mask compliance is uneven? How can disease transmission be estimated and mitigated under those circumstances? Modeling is a reasonable first step but should not be applied to the real-world without caveats. Mannequins and CFD models are not comparable to sitting next to someone in the economy section who wears a cloth mask that they remove to communicate their food and beverage order to the flight attendants in a loud voice, and then keep it off while they eat and drink. Also, the models do not incorporate other cabin realities such as a service cart entraining air as it moves up and down the aisle, or people leaving their seat.

To their credit, the authors of the TRANSCOM-commissioned study published a post-script to their online report, which acknowledged that the impact of human behavior on aerosol transport, such as "[m]ovement of people up and down the aisles or even simply the act of turning your head to talk to your neighbor," had not been considered.²⁹ In their subsequently published peer-reviewed article, the authors said that "[c]onclusions outside of specifically tested seats and breathing zones assumes extrapolation of the data to new conditions."³⁰ Still, these finer points are not reflected in the results of a Google search about this study which include a long list of headlines like, "It's almost impossible to get COVID-19 on an airplane."

Face Masks

The SARS studies, at least, likely describe onboard disease transmission between passengers and crew who did not wear masks, whereas inflight transmission of COVID-19 is more likely to involve people who wear masks at least some of the time. When worn consistently and properly, masks have been shown to at least mitigate the risk of infection via the airborne route on aircraft.^{30,31} It has been suggested that, in addition to trapping some virus particles by impaction, masks may add protection by increasing the humidity of the wearer's inhaled air.³² So, given the enclosed and crowded nature of the cabin with higher bioeffluent concentrations, low humidity, and at least some forward and backward motion of air, masks provide an important line of defense.

The type of mask and the consistency with which it is worn will affect disease transmission. In one modeling study, the estimated "average infection probability" for a 12-h flight without masks ranged from 0.8 percent to 11 percent.³³ When modeled with all passengers wearing masks, those numbers dropped by 32 percent to 73 percent, depending on the mask quality. And if all passengers were assumed to remove their masks for 1 h to eat, then the model predicted an increase in the average infection probability, ranging from 8 percent to 59 percent.

Starting in the spring of 2020, flight attendants were assigned the unenviable task of enforcing the airlines' mask policies onboard. They did so without official backing from the federal government and without the force of law. Throughout the first year of the COVID-19 pandemic, they were typically instructed to "remind" a non-compliant passenger and then, at some point, issue a card which included another polite reminder. At one airline, however obnoxious a passenger may have been during a flight, if they were wearing their mask when the aircraft arrived at the gate, then their failure to comply was not logged.

Some relief came on January 21, 2021, when President Biden issued an executive order requiring that all passengers and workers wear a mask onboard all forms of transportation and at transportation hubs.³⁴ A week later, the Centers for Disease Control and Prevention (CDC) published its mask order,³⁵ noting that "[m]asks help prevent people who have COVID-19, including those who are pre-symptomatic or asymptomatic, from spreading the virus to others." The CDC order stated that "... this Order shall be enforced by the Transportation Security Administration [TSA] under appropriate statutory and regulatory authority ... [and] ... shall be further enforced by cooperating state and local authorities ..." Within days, the TSA published a security directive³⁶ which translated the CDC transportation industry mask order into unequivocal mask policy requirements for airlines to implement. In doing so, the TSA facilitated an effective and consistent standard for airlines across the industry. Flight attendants could finally instruct passengers that the CDC and TSA required everyone to wear a mask, and that failure to do so would violate the law. And they did so until a federal judge's decision vacated the CDC mask mandate on April 18, 2022.³⁷ As of this writing, the CDC continues to recommend that travelers wear masks in indoor public transportation settings, although it is not required.

The majority of passengers complied with both the spirit and the letter of the mask requirements. However, both the CDC order and the TSA security directive offered loopholes. For example, the CDC has provided guidance to airlines on how to manage requests for exemptions to the mask order.³⁵ In response, flight attendants anticipated online sales of fake medical letters to passengers who wanted to claim a mask exemption, akin to the cottage industry that grew to satisfy passengers who wanted to get their pet ferret or pig qualified as an emotional service animal to travel in the aircraft cabin.³⁸ But this did not happen—instead, people who chose not to comply with the mask order generally did so for one of three reasons: they were eating or drinking (which was technically allowed, but only "for brief periods" under both the CDC and TSA orders); they were intoxicated (fueled by sales of alcohol-to-go at the airport and onboard service offerings to help offset lost revenue); or they chose to politicize the wearing of masks.³⁹ Some airlines offered loopholes, too; for example,

one airline had a six-step procedure for flight attendants to encourage compliance with the mask policy, but if—at the end of the six steps—the passenger refused to confirm their name, then the report would not be sent to the Federal Aviation Administration (FAA).

Aggressive Passengers

Most passengers recognize the logic and importance of wearing a mask to protect themselves and others. From March 2020 through the end of that year, though, there was a noticeable uptick in the reports of harassment and aggression from non-compliant passengers. In early 2021, the prevalence and intensity of aggressive passenger incidents surged, coincident with intensified efforts to politicize masks. It is hard to point to a single factor but the combination of politicizing masks, less civility, higher passenger loads, pandemic fatigue, and expanded alcohol service have fueled these occurrences. In 2021, 72 percent of such incidents reported to the FAA involved non-compliance with masks.⁴⁰

Passenger non-compliance with mask policies has come in many forms; in some cases, it is passive (e.g. the passenger who takes hours to consume a snack and a soda) and, in other cases, it is active (e.g. the passenger who removes their mask after pushback and openly refuses to wear it, either properly or at all). The reactions to flight attendants' efforts have also come in many forms; our members have been struck, spat on, verbally harassed, and ignored. The label "unruly passengers" is a sanitized reference to threatening, violent, or abusive behavior.

Early in 2021, the FAA published an order which emphasized FAA's commitment to legal enforcement action in response to violations of its regulations that prohibit interference with crew members.³⁹ In that order, the agency explicitly noted that it had "... recently observed a proliferation of [disruptive passengers] ... including conduct stemming from the failure to wear masks in response to the COVID-19 pandemic-related health measures in place onboard aircraft ..." The agency produced a "toolkit" for what they referred to as their "Zero Tolerance Policy for Unruly and Dangerous Behavior" which included airport signage and public service videos. In mid-March 2021, FAA Administrator Dickson extended the order because "the number of cases ... is still far too high, and it tells us urgent action continues to be required."⁴¹

So how does the FAA collect and act upon disruptive passenger reports? In 2006, the FAA issued a bulletin in which the agency recommended methods to manage and report instances of passenger interference with crew members.⁴² The bulletin described four "threat levels"—ranging from suspicious behavior to breach of the flight deck—which pilots were encouraged to report to FAA Air Traffic Control facilities. In 2015, the FAA officially canceled that bulletin.⁴³ But their approach leaves so many unanswered

questions: Why isn't threat reporting mandatory? Are there estimates on the number of unreported incidents? When a flight attendant notifies the pilot of an aggressive or threatening passenger onboard, why isn't a law enforcement officer reliably assigned to meet the aircraft at the gate?

In 2021, the FAA received 5981 reports of "unruly" passengers. Of those, it initiated 1081 investigations (18 percent) and 350 enforcement actions (5.9 percent).⁴⁰ The FAA also referred about 10 percent of the 350 enforcement action cases to the FBI because it does not have authority to prosecute criminal cases. But why, if there is zero tolerance, is the number of incidents still so high? And why did only 5.9 percent of documented incidents lead to any enforcement action? How does the FAA decide which reports to investigate? If 19 of every 20 cases reported to the FAA are not met with enforcement action (and if the 20 are only a fraction of the actual events), those are good odds for passengers who choose to not wear their masks, to drink too much, or to harass either the crew or other passengers. When a law enforcement officer or federal agent is either not requested or available to be at the gate, then the flight lands, and the customer service agents have no authority or training to detain anyone. As such, the offender walks away, whether to catch a connecting flight or taxi, or to drive home. If law enforcement does meet the flight, then the crew member may have the option to file criminal charges but doing so could mean they miss their next flight or must subsequently travel to a hearing. Our union has received stories of some crew members being harassed and followed out of the airport by the very person they reported. Unless and until passengers who behave this way are consistently held accountable, crew members do not expect that much will change.

Quarantine/Contact Tracing

In February 2020, the FAA published its first official bulletin on COVID-19 guidance for crew members. It reflected the general perception at the time that the risk of disease transmission was specific to flights to and from China.⁴⁴ In March, a new bulletin—this one for all flights—telling crews to "pay attention to their health," take their temperature twice a day, and stay home if sick.⁴⁵ In April 2020, as it became more obvious that disease transmission could occur at work, the FAA got more specific. The agency defined "exposure of concern" for crews which meant being within six feet of a "sick person" (including co-workers and passengers) for 10 min or longer. If a crew member was either exposed (per the FAA's definition) or tested positive, then the FAA and CDC recommended that they not work for the next 14 days.⁴⁶ By September, though, the FAA had redefined "exposure" as being within six feet of a sick person for 15 min or longer.⁴⁷ By mid-December 2020, it was those same 15 or more minutes but for a cumulative total of 15 min or longer. And while a 14-day quarantine was still recommended, 10 days could be acceptable.⁴⁸ By March

2021, for an exposure to qualify a crew member for quarantine, it had to be at least 15 min within six feet of a person who had tested positive for COVID-19 (not just someone who was "sick").⁴⁹ And by May 2021, the FAA said that no quarantine was necessary for fully vaccinated crew members, unless they had symptoms.⁵⁰ Finally, in late December 2021, the CDC cut its core quarantine and isolation recommendations from 10 days down to five, even for people who are unvaccinated.⁵¹ They did so within days of receiving that specific request from the CEOs of Delta Air Lines, JetBlue, and A4A.

To the uninitiated, these details may sound trivial. But changing the definition of "exposure" from a minimum of 10 min near a sick person to a minimum of 15 min near a COVID-19-positive person has had significant ramifications for crew members. Flight attendants will generally not know if a passenger is positive. Certainly, a passenger could be asymptomatic such that nobody would know, but even if a passenger develops a cough and fever onboard, all consistent with COVID-19, being in close proximity for any number of minutes would not qualify that flight attendant for quarantine. They would simply be expected to "self-monitor," whether that means doing so at home with small children or continuing to work for flights.

Also, while vaccinations offer protection—especially from hospitalization and death—some fully vaccinated people will still have a breakthrough infection.⁵² If a fully vaccinated crew member tests positive—whether for omicron, delta, or another strain—they should be able to isolate for up to 10 days without losing pay. The literature on how long a COVID-positive person should isolate does not define a single "one-size-fits-all" number of days. Fully vaccinated people may be less infectious—and infectious for less time—than unvaccinated people, but the data seem insufficient to parse the difference between necessary isolation time for vaccinated people and those who are unvaccinated. Perhaps this is, at least in part, because the term "fully vaccinated" represents a spectrum of protection depending on the type of vaccine, the time elapsed since the last dose, whether a booster injection was given, age, and immune status. The necessary number of isolation days is also complicated by the fact that people are being infected by different strains of COVID-19 which are not equally contagious. Still, the CDC's 10-day recommendation seemed to represent a fair middle ground, and cutting it in half seems short-sighted.

In closing, the issue is not that the FAA definitions and the CDC recommendations have evolved over time; changes are to be expected given the rapid and unpredictable developments of this pandemic. The issue is that the FAA has allowed the airlines to set the exposure bar unreasonably high such that crew members who meet the spirit of the "exposure" definition must, nonetheless, continue to work as usual. Also, the CDC has not erred on the side of caution by ensuring a suitable number of isolation days so

that people who remain either infectious, symptomatic, or both are not circulating and infecting others. This is particularly important for crew members and other transportation sector workers to maintain services in a way that protects their health and the health of the traveling public.

Vaccinations

In the U.S., the FDA authorized the first COVID-19 vaccine for emergency use in mid-December 2020⁵³; soon, other vaccines followed. Because demand was so much higher than supply, the CDC issued guidance on eligibility. The first vaccines were allocated to healthcare personnel and residents of long-term care facilities (“Phase 1a”).⁵⁴ Next, anyone 75 years and older and all other essential workers were eligible, including transit workers but not airline crews (“Phase 1b”).⁵⁵ Airlines provide essential services and flight attendants are front-line employees. Since the start of the pandemic, they have been working in a densely occupied and enclosed space where social distancing is virtually impossible, passenger compliance with mask rules is uneven, and the vaccination status of passengers on domestic flights is unknown. As such, flight attendants should have been classified as Phase 1b.

At first, the issue for crew members was getting prompt access to vaccines. Then it was getting the right to a day off with pay (or at least without discipline) to manage any vaccine side effects. In early November 2021, OSHA issued its Emergency Temporary Standard intended to protect workers from COVID-19.⁵⁶ The standard required employers with 100 or more workers—including airlines—to develop and enforce “vaccinate-or-test” rules. In mid-January 2022, the Supreme Court ruled that OSHA did not have that authority, other than for certain healthcare workers.⁵⁷ Still, many large employers (including airlines) choose to require that their employees get vaccinated, some offering various incentives (e.g. bonuses) or disincentives (e.g. more expensive health insurance premiums). U.S. airlines currently claim considerably higher vaccination rates than the national average of 67 percent.⁵⁸

Recommendations

Federal policy on managing COVID-19 in the airline industry has improved considerably during the Biden administration. Still, there is room for more:

- On ventilation, the FAA should require airlines to operate systems to maximize the flow of total ventilation air and to pass any recirculated air through at least a HEPA filter.
- On masks, it is important that federal policy ensures that employers allow frontline transportation employees to wear a mask at work, if they choose to do so.
- On aggressive passengers, airlines need to limit—not promote—onboard alcohol sales and airport authorities need to stop “alcohol-to-go” offerings. Also, airlines

should train crews to work together to report threats. When crew members report an incident involving either physical or verbal assault, then the FAA and the Department of Justice should ensure that law enforcement meet the flight at the gate. Passengers who have mistreated anyone onboard should be escorted off first, serving as an example to other passengers of the embarrassment, paperwork, inconvenience—and the legal consequences, where applicable—when they fail to act appropriately. If the crew must wait to submit a statement, then they should be processed first and pay-protected if they must drop their next trip. TSA should also work with the FAA and airlines to establish and maintain a system-wide air travel ban for passengers who fail to follow crew member instructions or otherwise disrupt a flight.

- On exposure and quarantine, the FAA needs to revise its definitions to ensure that crew members who had reasonable contact with a potentially infected person can quarantine without losing pay.
- On vaccinations, airline crew members should get priority access because of the risks they face as essential transportation workers.
- And passengers? They just need to follow the golden rule.

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