Summer 2020, COVID-19, Flying: Yes or No?

Six questions for... Dieter Scholz, Professor of Aircraft Design, Flight Mechanics and Aircraft Systems at the Faculty of Engineering and Computer Science, Head of the Aircraft Design and Systems Group (AERO) in the Department of Automotive Engineering and Aircraft Construction. He warns against all too careless flight operations in the Corona pandemic. The probability of contracting an infection in an aircraft is not "extremely low" as claimed by the aviation industry, but quantifies "real". The decision to "fly: yes or no?" must be made by each individual after weighing up all the arguments, the doctor of engineering is convinced.

Prof. Dr.-Ing. Dieter Scholz, MSME

As an expert for cabin systems, would you fly on holiday in the current situation?

In the summer of 2020 I actually wanted to take a trip to China by train. After the events in Wuhan, I had planned a trip to Uganda instead - by plane. I also had to give up this planning in the wake of the pandemic. But Germany also offers so much. During the lockdown, I followed the European long-distance hiking trail E1 in stages, which also leads around my place of residence. During the holidays I would like to be on the road somewhere in northern Germany by bike.

"there are ways of getting around without any risk of infection"

Everyone has to decide for themselves where to go on holiday this summer and how to get around. If we take a holiday in the immediate vicinity of our home, there is no need for transport. There are also ways of getting around without any risk of infection: walking, cycling, motorcycling and driving a car are all part of it. Motorcycling involves other risks.

"the size of the group, distance and duration are the three factors of danger together with the technology of the ventilation system"

It is well known that the risk of infection increases when 1) you are together in large groups, 2) you are in close contact with other people and 3) if this is the case for a long time. These three dangers are present in airplanes, trains and long-distance buses. In detail, however, there are differences in

group size, seat spacing and travel time. Furthermore the technology of the ventilation system must be considered. In the bus, the insufficiently filtered recirculated air must be switched off; otherwise viruses would spread via the air conditioning system. Aircraft are ventilated with outside air which is compressed in the engine and enters the cabin unfiltered. This is highly problematic, but a very separate issue. Aircraft also use recirculated air, which is comparatively well filtered. In old trains, the windows can be opened. What more do you want?

What are the risks of flying?

"there is a real danger of contracting SARS-CoV-2 on board an airplane"

Actually, it would have been the task of the European Aviation Safety Agency (EASA) to first identify the risks of flying in the pandemic and then to derive instructions for action. Unfortunately, the EASA did not carry out a risk assessment and only issued recommendations for action, which are not fully observed by airports and airlines in Germany. I then made up my own mind and presented a calculation. The text has been available for a month in the Online News of the Faculty of Engineering and Computer Science, among other locations. I will come to the summary of the calculation in a moment. I maintain that there is a real danger of contracting SARS-CoV-2 on board an airplane. The EASA was confronted with my calculation and only states that it is up to each passenger to follow the hygiene instructions. But the airlines only demand community masks (cloth masks). These and washing hands are not sufficient for protection in the aircraft. Viruses can still be inhaled.

"about one passenger in 1,000 is on the plane with Corona"

The relevant hazard begins when a person suffering from COVID-19 is on the aircraft. The following considerations can be understood with a pocket calculator. Multiplication and division are sufficient. At present, about 6,000 people in Germany are ill with COVID-19. According to the Robert Koch Institute[1] (RKI), the underreporting has a factor of about 16. 83 million people live in Germany and there is no testing before departure. Together, this means that about one passenger in 1,000 is on the plane with Corona. In a typical aircraft for 200 passengers, this would be one person for every 5th flight.

"the probability of an infection with COVID-19 would then be 1 in 1,000"

There is little data available in the literature about the infection rate. I don't want to exaggerate. Let us calculate that a sick person infects only 0.1% of the other people in the aircraft every hour of flight. In a plane with 200 seats and a flight of five hours, one person would be infected. But since this only happens every 5th flight, the probability of an infection with COVID-19 would then be 1 in 1,000. This corresponds to 4 correct numbers in the famous lottery where you choose 6 numbers out of 49. Therefore I say: There is a real danger of contracting SARS-CoV-2 on the plane. Everyone has to decide for himself/herself whether he/she wants to get involved in a flight with this probability and the dangers of COVID-19. How important is the flight? Which mask do I want to use to protect myself when I am exposed to the danger? Only an individual consideration can answer the question "Do I want to fly?

[1] The Robert Koch Institute (RKI) is the most important governmental institution for the safeguarding of public health in Germany.

"Lufthansa would produce over 100 COVID-19 sick persons per day"

Before the Corona pandemic, Lufthansa carried 350,000 people a day and now wants to resume 40% of its flights. This would mean that Lufthansa would produce over 100 COVID-19 sick persons per day.

"air transport could have an important share in a second corona wave without this being noticed"

This will not be noticed any further, because in Germany there is no pre-flight or post-flight testing of any kind. Airports have a large catchment area. The catchment area of Hamburg Airport, for example, comprises 10 million inhabitants and extends from Lower Saxony to southern Denmark. In contrast to slaughterhouses, the people who are infected in the aircraft are spread over a much larger area. Therefore, the proportion of cases caused by air traffic can hardly be attributed to air traffic. Air transport could therefore have an important share in a second corona wave without this being noticed.

"air traffic was triggering the pandemic and is spreading the viruses around the world again"

Only air traffic connects continents so quickly. This is a blessing, but it also spread the corona virus extremely quickly around the world, thus triggering the pandemic. Air traffic is now back on the scene and is thus inevitably spreading the viruses around the world again. Airplanes are also reaching Germany again from risk areas such as the USA or Brazil. It is not being tested. Protection is then only provided by the quarantine regulations of the German federal states.

How do viruses spread on an aircraft?

"no seat on the plane is safe,
but if we sit close to a sick person, the probability of infection is particularly high"

Of the possible infection mechanisms, the most important is obviously the airborne spread of the viruses. We have to differentiate between three ways in which the virus spreads in an aircraft.

1.) When a COVID-19 sufferer is on board, he breathes, coughs and sneezes. The cloud of virus emanating from the patient expands. The concentration of the viruses decreases in the process. At some point, this virus cloud hits the person sitting next to him. The further away the person is sitting, the lower the concentration of the viruses inhaled.

2.) Cabin cross-sections are ventilated in the aircraft. The rows of seats are not separated by walls. Therefore, air exchange through the air conditioning system takes place within a few rows. In order to ventilate the cabin cross-section completely, the air escapes in the upper part of the cabin and leaves the cabin through two slots on the right and left between the wall and the cabin floor. This results in a circulating air flow. In detail, the airflow depends on the type of aircraft. A person next to the window on the left could thus also infect a person next to the window on the right in an adjacent row of seats.

3.) When breathing, coughing and sneezing, even the smallest droplets containing the virus are released, so-called aerosols. Through turbulence and diffusion, the aerosols can be distributed

throughout the cabin, comparable to the smell of a cigarette. The turbulence of the air is caused by the air currents of the air conditioning system, by the individual air nozzles and by the fact that people walk through the aisle. The distribution throughout the entire cabin is known from flow simulations but also from the evaluation of events in which persons in the aircraft were infected, sitting many rows of seats away from the sick person.

This means that we are not safe in any seat on the plane. But if we sit close to a sick person, the probability of infection is particularly high.

What factors determine the probability of infection?

"for effective protection of us and others we should use filtering half masks without exhalation valve"

In order to become infected with a viral disease, a certain minimum number of ingested viruses is required. The probability of infection in an aircraft is determined by the distance to the sick person and the duration of the flight. The longer the flight, the more likely we are to be infected.

The proposal to free up seats on the aircraft in order to increase the distance between passengers was rejected by the airline industry because it would not make any profit. The airlines have now created facts. The planes are full.

Effective protection of us and others is only achieved by filtering half masks without exhalation valve. At least one FFP2 mask (protective effect at least 95%) should be used. A respirator with at least a P filter (particle filter) would also be possible. However, EASA only recommends medical face masks in accordance with EN 14683, which are primarily used for protection of others. In the aircraft, only community masks are used, which are taken off for eating. However, the community masks are probably better than nothing.

Do you consider the current measures taken by the airlines to be sufficient? What could the aviation industry do better?

"the airlines reject anything that costs money"

The measures are not sufficient. Not even the mild recommendations of EASA are fully implemented. The airlines reject anything that costs money or could reduce demand. They take it for granted to be the first considered when corona measures are relaxed, but do not really bear responsibility for this. The population is lured into the aircraft with false statements. With all due understanding for employees and shareholders, but with such selfishness, we as a community will not get anywhere in this crisis. Other industries are also having to accept considerable financial consequences and are not being rescued with such large sums of money as some airlines are.

"the population is lured into the aircraft with false statements"

The aviation industry should provide passengers with factual information. Unfortunately, this is not happening at present. Extensive false statements are being spread to persuade passengers that flying

in times of Corona is safe, stress-free and comfortable. Such things are immoral and should not be done.

"the German Aviation Association (BDL) was particularly brazen in using the Robert Koch Institute (RKI) wrongly as a kind of seal of approval"

I try to inform with technical background information and to convince aviation organizations in Germany to adapt their statements on the Internet to the facts. Sometimes I succeed in convincing them with factual information. But sometimes the resistance is greater. Then the "Fourth Power" [2] can increase the pressure. In this way, results could already be achieved. The German Aviation Association (BDL) was particularly brazen in using the Robert Koch Institute wrongly as a kind of seal of approval with the statement: "The risk of contracting the virus during a flight is extremely low. This is also confirmed by the Robert Koch Institute (RKI)". The RKI had confirmed nothing of the sort - even on request - and was anything but pleased with the statement of the BDL. As a result, the website in question was finally deleted by the BDL.

"government would be well advised to check technical facts with a neutral body before making far-reaching concessions to lobby groups"

The aviation industry does not have a monopoly of knowledge on aviation technology. Public bodies such as the German Federal Ministry of Transport and Digital Infrastructure (BMVI) would therefore be well advised to check technical facts with a neutral body before making far-reaching concessions to associations and lobby groups on the wrong technical basis.

"the aviation industry has thoroughly embarrassed itself and thus damaged its own reputation"

The omnipresence of the aviation lobby in the media on the subject has now been broken. There have been many critical reports recently on the subject of "Corona and flying". With the statement "The air in an aircraft is as pure as in an operating theatre", the aviation industry has thoroughly embarrassed itself (see, among others, ZDF/3sat nano of 03.07.20) and thus damaged its own reputation. In the future, passengers will probably be very critical of all statements made by the aviation industry.

How could passengers behave under the given circumstances?

"a good mask is more important than any other measures"

Do not trust anyone who tells you that something is safe or unsafe (including me). Weigh it yourself. In the end, you must also bear the consequences of your actions yourself. If you put yourself in danger, you should protect yourself accordingly. By this I do not mean taking out insurance. When flying, high-quality professional masks can help to protect yourself and others and reduce the probability of infection in the aircraft. The masks must sit close to the face and should not be removed during the flight. No seat in the aircraft is safe. If you have the choice, take a window seat.

[2] In view of the separation of powers (executive, legislative, and judicial), public media (press, radio and TV) are often seen as the "fourth power".

Close the air jet to avoid further turbulence. Stay in your seat and do not walk around unnecessarily. A good mask is more important than any other measures mentioned here.

Think about the possible financial consequences. Who will pay if your travel plans cannot be realized because of Corona? Who pays for any additional costs that arise? Distinguish between the full-bodied promises of the travel industry and the small print.

Think of possible legal consequences. You could be denied a flight if you show conspicuous symptoms - regardless of the illness that causes the symptoms. You may not be admitted to the country of destination, or you may fall ill abroad and have difficulty returning to your home country.

If you can't make up your mind, then postpone the flight until better times.

The interview was conducted by Hans-Jörg Munke in German.

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This document can be downloaded from: https://purl.org/corona/INT2020-07-16

Further information: http://corona.ProfScholz.de