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9th International Conference on Air Transport – INAIR 2020, CHALLENGES OF AVIATION DEVELOPMENT

Analysis of Recommended Measures in the Conditions of the COVID-19 Pandemic at Croatian Airports

Igor Štimac\textsuperscript{a,b,*}, Matija Bračić\textsuperscript{b}, Jelena Pivac\textsuperscript{b}, Ivan Oleksa\textsuperscript{c}

\textsuperscript{a}Zagreb Airport Ltd, Rudolfa Fizira 1, 10410, Velika Gorica, Croatia
\textsuperscript{b}Faculty of Transport and Traffic Sciences, Vukučićeva 4, 10000 Zagreb, Croatia
\textsuperscript{c}Zagreb International Airport Jsc. Rudolfo Fizira 1, 10410, Velika Gorica, Croatia

Abstract

Although air transport is one of the highly stable transport modes with a continuous positive growth trend, for the first time in history with the new COVID-19 pandemic, it will have a substantial long-term negative impact that many aviation stakeholders will go under bankrupt or with high losses. Comparing with other crisis which influence aviation sector, no crises has such measures that influence so hard in infrastructure modifications and operational procedures at the airport. Those changes dramatically change the way of thinking regarding terminal and traffic flows design and capacity optimization. The level of service that we knew from the past is not achievable due to the World Health Organization recommendation. This paper explains how personal at the Zagreb Airport Croatia react in fighting against COVID-19 virus and what kind of measures can be implemented at other airports to ensure safe, healthy, and comfortable air travel in this “new normal” life.

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Peer-review under responsibility of the scientific committee of the 9th International Conference on Air Transport – INAIR 2020, CHALLENGES OF AVIATION DEVELOPMENT

Keywords: COVID-19; world pandemic; airport; air travel; level of service; anti-virus measures

1. Introduction

Air transport is necessary for the economy and all the other social activities. The need for air transport has reduced, i.e., the general cessation of air traffic can occur due to many reasons, such as war, declines in GDP, epidemics, etc.

* Corresponding author. Tel.: +385 99 212 3998
E-mail address: istimac@fpz.unizg.hr

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Peer-review under responsibility of the scientific committee of the 9th International Conference on Air Transport – INAIR 2020, CHALLENGES OF AVIATION DEVELOPMENT
10.1016/j.trpro.2020.11.016
In March 2020, due to the COVID-19 virus pandemic, travel was interrupted, many airports were closed, which resulted in the most significant drop in aviation history. In June 2020, most airports re-established routes that had been shut down for some time. In the circumstances of the COVID-19 virus pandemic, air traffic demand is significantly reduced, which is mostly related to tourist and leisure travel. For the time being, there is a very lack of knowledge about the duration of the pandemic, so the final impact on airports and the economy as a whole cannot be predicted. The World Health Organization has proposed a series of measures that have proven effective in reducing the infection from the COVID-19 virus, and according to which airports must adapt their facilities and processes (World Health Organization, 2020). Analyzing ICAO, IATA, ACI, and WHO recommendations in the passenger transport activity at the airport during the coronavirus epidemic (COVID-19), it can be seen that they are always informing passengers and staff about hygiene measures, social distancing, setting barriers where physical distance cannot be provided, hand disinfection and wearing a face masks. This adjustment primarily refers to the implementation of new procedures for the passenger's movement, resizing the area and main components of the terminal, and optimizing the already complex traffic flows to prevent delays in the subsystems and maintain the desired Level of Service to passengers. Airports will need to conduct new capacity assessments if the risk of COVID-19 is present. It is necessary to develop new estimates about passenger quantity and analyze and understand the nature of the queues and customers' needs. This research shows the current impact of the COVID-19 virus pandemic on both global and Croatian airports, with a special focus on Zagreb Airport as case study. The currently recommended measures that airports should apply in their terminals will be listed and analyzed. Although the procedures about COVID-19 are still establishing in airports, Zagreb Airport develops anti-COVID-19 measures recognized as best practice. Those measures are shared inter Europe airports. This paper shows what kind of measures was recognized as suitable for the airports in this COVID-19 pandemic.

2. Analysis of the impact of the COVID-19 virus pandemic on airport operations

The COVID-19 pandemic is having a significant impact on aviation and the air travel industry. Air transport is one of the branches most affected by the virus pandemic on the global level. This event will significantly mark the history of aviation. In aviation, the positive trend in passenger air transport lasted for a full 12 years. Although during the past decade there were lots of crises with short duration, this one with COVID-19 is still with lots of unknowns in many aspects such as duration, number of casualties, and the economic impact.

As a result of the pandemic, due to travel restrictions and a slump in demand among travelers, airlines like Air Mauritius, Virgin Australia and Flybe have already bankrupt, and some are expected to bankrupt in the next months (Begley Bloom, 2020). After several months of this COVID-19 pandemic, it is clear that some airlines that have had financial problems so far will hardly survive this crisis. Low-cost carriers such as Ryanair have absolute financial reserves that will allow them to overcome this crisis more efficiently, which is not the case with full-service carriers as it is Croatian national carrier Croatia Airlines, who have had financial problems even before the crisis (Croatia Airlines, 2019). However, full-service carriers are counting on financial aid from the state, which have been approved, for example, to Lufthansa (European Commission, 2020).

A prolonged suspension of air transport would lead to the closure of airports. Although the consequences for airports and other air transport stakeholders are mostly negative, this pandemic also has a positive aspect, which is primarily reflected in the reduction of external traffic costs such as environmental pollution due to reduced traffic (aircraft), noise reduction, etc. There is no doubt that every airport will feel the consequences of this pandemic, which will reflect on travelers in the future. It is expected that there will be an increase in ticket prices, while at the same time, there will be a decline in GDP (purchasing power), which directly affects the air traffic.

When a ‘lockdown’ occurred in mid-March 2020, there was a disruption of air traffic. A considerable amount of aircraft was grounded planes at most of the airports in the world, including Croatia. Comparing the number of passengers at Croatian airports in March 2020 with March 2019, the analysis shows that the number of passengers declined by more than 50% (Croatian Bureau of Statistics, 2020). Since most Croatian airports are tourist-oriented and there is a significant drop in traffic in the winter months, they are additionally affected because the introduced measures to combat the virus's spread coincided with the beginning of the summer flight schedule is a significant increase in traffic. Croatian airports have been oversized for most of the year due to high seasonality, which is an unfavorable fact from the economy's aspect. It is necessary to single out the Zagreb Airport, whose character in terms
of the number of operations, passengers and revenue is not exclusively seasonal. The failure of the summer season due to the virus pandemic will significantly affect both airports and the entire airline industry. According to IATA, it is estimated that the decline in international arrivals globally will be from 40% to 70%, depending on the duration of the pandemic. Also, airlines are expected to lose 84.3 billion dollars in 2020 (IATA, 2020a).

Most airports in Croatia are in a similar situation. The impact of the pandemic on the tourist season is enormous, and consequently, on airport traffic. During the lockdown, the state tried in various ways to reduce the cost of airports by deciding to shorten the working hours of many services since there is no traffic. Although airports are in an unenviable position, they are still in a slightly better position than other air transport stakeholders such as air traffic control or airlines. To stimulate the reintroduction of flights, airlines will have to reduce prices to airlines in the future. Analyzing data trend from the past (9/11, Great Recession) in response airlines to COVID-19, it can be seen that lower ticket prices can be expected in the short term, and in the long run, as travel demand increases, air ticket prices will rise significantly above 2019 levels (BTS, 2020). It takes years to stabilize the economy as well as to recover the sector. It will also take time for people to start traveling without fear and with the same intensity as before. Each airport has its way of doing business, and access to the alleviation of the consequences should be individualized. Each airport should consider the number of employees, total revenue, expenses, the existence of credit commitments, and the like.

Forecasts for the recovery of aviation is very negative and long. It can be stated that the next few years will be challenging in the air transport sector. However, the overall impact on air traffic will mostly depend on the duration and the size of the pandemic. It is still unknown whether there will be more waves of pandemics, whether there may be a vaccine in the meantime and the like. The question is how the market will react even after pandemic passes, how long it will take to restore passenger confidence because even when the overall situation normalizes, there will be some uncertainty on the part of passengers. Given that this year the sector is supported by states/ministries, it is expected that the real challenges for airports will not follow until next year, primarily if the risk of COVID-19 virus continues. It remains to be seen how significant the negative consequences of this pandemic will be on both air traffic in the world and Croatia.

2.1. Passenger traffic statistics

Fig. 1 shows total passenger traffic on selected airports worldwide to emphasize the impact of COVID-19 on global air traffic. Although the COVID-19 pandemic breakthrough happened in China, it quickly seized the whole world. Many countries introduced restrictions on border crossings to stop the spread of coronavirus, which vastly affected the number of passengers. Soon enough, airline companies would fly empty aircraft. In terms of passenger traffic, the lowest numbers in history were recorded during the outbreak of COVID-19.

![Fig. 1. Total passenger traffic on selected airports worldwide (April 2019-April 2020). Source: Official Airport statistics, 2020.](image-url)
World’s busiest airport (by passenger traffic) – Atlanta Airport recorded, according to its official report, scarce 453,362 passengers in April 2020, compared to 9,233,034 in the same month last year (2019) which represents -95.09% change (Hartsfield-Jackson Atlanta International Airport, 2020).

European hubs also recorded the lowest passenger figures ever. London Heathrow Airport reported that it had served 96.97% fewer passengers in April 2020 than the same month year before - 206,324 in April 2020 compared to 6,798,212 in April 2019 (Heathrow Airport Limited, 2020). Paris’s largest airport – Aéroports de Paris SA reported that Charles de Gaulle Airport recorded a change of -98.03% passenger traffic (128,152 to 6,496,273 in the same period) (Groupe ADP, 2020).

Asia region was also profoundly struck in terms of low passenger numbers. For example, a report from Hong Kong International Airport states that airport recorded only 32,000 passengers in April 2020, compared to 6,491,000 the year before (-99.51% change) (Airport Authority Hong Kong, 2020).

Figures also do not change if we consider the type of passengers at an airport. Airports that frequently serve tourists were also impacted. For example, Aéroports de Paris SA’s owned Antalya Airport in Turkey reported only 2,613 passengers in April 2020, compared to 2,213,756 in April 2019, representing the difference of -99.88% (Groupe ADP, 2020).

Airports in Croatia were also heavily affected, as shown in Fig. 2. According to their official reports, Dubrovnik and Zadar Airports did not have any passengers during April 2020, while Split and Rijeka reported a mere 6 and 14 passengers, respectively. These numbers are even more worrying if the fact that the summer flying schedule started last week in March is considered. Last year, in April 2019, Dubrovnik recorded 210,803 passengers, Zadar 74,497, Split 156,381 and Rijeka 7,696 passengers. Compared to 20 passengers in total this year, that is 449,357 passengers less than the year before on these 4 Croatian coastal airports combined. These are worrying numbers for the Croatian economy, especially if it is taken into consideration that those airports mostly serve tourists (Dubrovnik Airport, 2020; Rijeka Airport, 2020; Split Airport, 2020; Zadar Airport, 2020).

Zagreb Airport which is under concession for 30 years by ADP, Bouygues Bâtiments and TAV, and which is still the biggest Croatian airport by passenger traffic volume, reported that it handled 5,118 passengers in April 2020 compared to 280,790 passengers in April 2019, which represents a change of -98.18%. With one daily connection to Frankfurt and few charter repatriation flights, Zagreb was, during the lockdown, the only way for Croatian citizens outside Croatia to arrive home and vice-versa (Groupe ADP, 2020).

![Fig. 2. Total passenger traffic on selected airports in Croatia (April 2019-April 2020). Source: Official Airport statistics, 2020.](image)

Even though the pandemic is not yet over, Fig. 3 shows traffic recovery (in terms of passenger quantity) on five Croatian Airports (including three biggest), according to their official statistics for June 2020. Those numbers are still incomparable to the June 2019 figures, but they still show improvement compared to April 2020. Zagreb Airport recorded 44,402 passengers in June 2020 compared to 336,618 passengers in June 2019 (Zagreb Airport, 2020b).
Dubrovnik Airport handled 10,592 passengers in June 2020 as opposed to 415,876 in June 2019, and Split Airport handled 26,150 in June 2020 compared to 513,706 in June 2019 (Dubrovnik Airport, 2020; Split Airport, 2020). Besides those three biggest airports in Croatia, passenger statistics from Zadar and Rijeka Airport are shown in Fig. 3 as well.

Fig. 3. Total passenger traffic on selected airports in Croatia (April 2019-June 2020). Source: Official Airport statistics, 2020.

Fig. 4 graphically represents that passenger numbers on Zagreb Airport were in 2020 on 1.82% (April) and 13.19% (June) of 2019 levels. Since Dubrovnik Airport handled no passengers in April 2020 due to the airport closure, the traffic level was also 0% compared to April 2019, the same as Split Airport, which handled only six passengers in April 2020. Traffic recovery can be seen in June 2020, where Dubrovnik Airport recorded 2.55% and Split Airport 5.09% of June 2019 traffic, respectively.

The main reason why Zagreb Airport handled more passengers in June than the other two in comparison is the nature of the airport. While Zagreb Airport serves the capital city of Croatia and is a hub for national carrier Croatia Airlines, Dubrovnik and Split Airports are mainly focused on leisure travelers, and due to the many restrictions on border crossings and current state of pandemics in Europe and the world, the number of tourists is significantly lower.

Fig. 4. Level of passenger traffic on selected airports in Croatia (April 2020/April 2019 and June 2020/June 2019). Source: Official Airport statistics, 2020.
2.2. Air traffic recovery forecast

The next significant question is when will things go back to normal. Even though the World has not come to any solution to stop the spread of coronaviruses or a vaccine, things start to get back to normal with new disinfection, distancing, and protection measures. According to IATA, air traffic is expected to get normalized (on 2019 figures in terms of passenger numbers) at the start of 2023 (IATA, 2020b). There are many different cases and scenarios, but it all depends on more things than just passenger demand. It is still unclear when will rules on immigration are the same as before pandemics, which personal protective equipment (PPE) passengers are obliged to wear and which not; do all countries, respective airports, and airlines have the same rules and many more questions which are still unanswerable. According to Eurocontrol, all stakeholders must coordinate measures as it will help to recover traffic more quickly, as shown in Fig. 5 (Eurocontrol, 2020a). Big setback in achieving that coordination will be in many different regulations on the national level regarding COVID-19 pandemic. In countries like Austria, UAE, Serbia, wearing a mask is obliged while others only recommended it. It is the same with body temperature monitoring and social distancing. That is why it is essential to make the same regulations for every stakeholder in any country – to implement them more quickly and habituate passengers to the „new normal“.

![Fig. 5. Eurocontrol air traffic recovery forecast. Source: Eurocontrol: Aviation recovery – Importance of a coordinated approach, April 2020.](image_url)

Eurocontrol stated in July that the given forecast is considerably precise, at least for the first two months. As shown in Fig 5 and 6, realized air traffic in its network was only 1% lower than predicted in comparison to the same months last year (Eurocontrol, 2020a, 2020b).

![Fig. 6. Eurocontrol air traffic recovery forecast – update July 2020. Source: Eurocontrol: Aviation recovery – Importance of a coordinated approach, July 2020.](image_url)
3. Measures adopted at airports as a result of COVID-19 implementation measures at airports

With pandemic ravenging the passenger numbers all across the globe, all the airports had to and still have to adapt to the “new normal” to ensure passengers’ and employees’ safety and health. It is not only for possible transmission within the airport, which would profoundly affect the airport’s reputation but also promote an airport as a safe place for commuting and traveling. With the aim to achieve that goal, many airports took sets of measures to prove to both passengers and airline companies that their ambiance is safe, and everything is done to minimize the risk of disease spreading. On 15 April 2020, the European Commission adopted the Joint European Roadmap, which set out recommendations for combating COVID-19 measures (EASA, 2020). Furthermore, following the first wave of the pandemic, on 13 May 2020, the Commission adopted further guidelines on the restoration of transport services, connectivity, and free movement as far as the health situation allows, while protecting the health of passengers and staff. Some of the most important work recommendations in the passenger transport activity on airlines during the coronavirus epidemic, primarily for the protection of passengers and aircrew in air transport are (ACI, 2020):

- putting up notices and constantly informing passengers and staff about the maintenance of hygiene measures (displays, floor stickers, voice messages)
- social distance: in the areas of the passenger terminal where the seats are located, it is necessary to arrange them in such a way that they are 1.5 m away from each other. The airport must comply with the rules of the maximum number of persons allowed indoors in accordance with the defined criteria of physical distance of 1.5 m
- setting up barriers: the physical distance cannot be ensured in any other way, consideration should be given to setting up physical barriers and/or staff at critical points, in particular at the check-in counter, security control, passport control, boarding control and similar.
- hand disinfection
- morning daily temperature measurement of employees
- face masks.

These recommended measures will be regularly evaluated and updated in accordance with knowledge about the risk of virus transmission, as well as with the development of other preventive measures (including technological) and the evolution of the pandemic itself. As the COVID-19 virus pandemic continues, airports around the world are working to provide passengers with a sense of security and, above all, protection from disease. Due to the reduced number of passengers, airports are trying to reduce costs in all areas except for self-service technologies. A large number of airports are increasingly testing this type of technology, from self-service baggage handling to new technologies in toilets that exclude physical contact with devices. Also, the world's busiest airports are rapidly introducing biometric systems in which the passenger's face serves as a boarding pass. Airports like Gerald R. Ford International Airport have introduced new technologies in the field of disinfection, including ultraviolet radiation that destroys microbes before they enter the air conditioning system (Center, 2020). Certainly, the accelerated testing and application of new technologies that were considered crucial for its effectiveness will be the biggest change for a large number of airports in the coming years. If, for example, the application of biometric technology at airports proves successful, in the future, face recognition technology could completely replace the use of classic airline tickets, boarding passes, and passports.

At the same time, to adapt to the new situation, more and more hub airports (Vienna, Frankfurt) now offer passengers the opportunity to undergo molecular biological testing at airports for COVID-19 (PCR test) (Frankfurt Airport, 2020; Vienna Airport, 2020). The test results are available within about three to six hours. Although the implementation of this idea is a way to stop the spread of coronavirus, this is still a private service for passengers arriving or departing from a particular airport. It remains to be seen to what extent it will be used and ultimately how much it will help combat the spread of the virus. Furthermore, the temperature measurement is one of the recommendations, as well as additional protection that is also widely used by most airports in the application of employees who come into contact with customers during the coronavirus pandemic, as well as passengers. One of the solutions being considered by airports is the introduction of smart thermal cameras to quickly and unobtrusively scan the temperature of a large number of passengers. This type of innovative technology reduces queues and speeds up
the entire passengers and baggage handling process, but also minimizes contacts. Smart thermal cameras could be placed in appropriate locations to screen arriving passengers (ICAO, 2020).

All of these measures aim to minimize the impact of the pandemic on the health of both employees and passengers. Adherence to these measures would reduce the risk of disease transmission and mitigate the impact of the pandemic on airport operations so that they can continue to run smoothly and safely. Only in this way can public confidence be maintained, which is essential for the resumption of air transport and the economy as a whole.

4. Implementation on the Anti-COVID-19 measures at in the Case Study of Zagreb Airport

Even before official operational guidelines were provided by EASA, Zagreb Airport obliged all stakeholders at the airport premises to obey the rules with the aim to maximize effectiveness in fighting the disease with everyone’s effort. The airport has started a project named “Trust” to prepare for increased traffic in the incoming period. Rules mostly prescribe the highest hygiene standards, PPE usage, and social distancing between passengers and employees. Those rules were later fine-tuned with both European guidelines and national regulations what made that whole process much convenient for both passengers and staff. Below are the list of the main rules for passengers:

- keeping a social distance of 1.5 meters between passengers, when possible,
- wearing a mask at all times going through passenger flow (except children, passengers with the respiratory problem and PRMs (Passengers with Reduced Mobility) who cannot put a mask on the face by themselves)  
  o from the entrance of the terminal to the aircraft  
  o from deboarding from the aircraft to the terminal exit,
- maintaining hygiene standards by washing hands in lavatory facilities,
- hand disinfection is mandatory at the terminal entrance,
- passengers should use the possibility of online check-in and/or self-check-in to reduce contact with others (Zagreb Airport, 2020a).

All these rules apply to the whole passenger flow, in both departures (check-in, boarding pass control, security check, passport control, departure area, boarding) and arrivals.

Airport Operator had to implement some adjustments to the infrastructure to make all that possible. Also, all tenants at the airport are obliged to follow the same rules. The passenger terminal is equipped with self-standing hand disinfectant dispensers throughout the passenger and staff flow (20 units in total). Changeable points of passenger flow like check-in (and other) counters and gates are equipped with bottled hand disinfectants. To ensure social distancing, visual and audio measures have been adopted. Every 15 minutes, there is a public announcement in Croatian and English to remind everyone in the terminal to keep their social distance. Banners, floor, and wall stickers are placed in queues and elevators, as shown in Fig. 7.

![Fig. 7. COVID-19 banners, hand disinfectant and floor markings are placed throughout the passenger flow. Source: Zagreb Airport, 2020.](image-url)
Also, the maximum number of people in elevators, smoking cabins, and commercial areas is lowered to a number with which it is possible to maintain social distance. It is the same with the seating area, where every second seat is blocked, as shown in Fig. 8.

To further minimize the risk of spreading the virus, physical barriers made of acrylic glass are provided on all counters where it is not possible to keep social distance, as shown in Fig. 9. Those counters include check-in, boarding pass control, transfer desks, and gates. There is also a change in the boarding process. Before pandemic, gate staff scanned boarding passes on readers, but now passengers need to do that themselves and show their documents through the barrier to minimize physical contact.

At the end of July 2020, there still wasn’t mandatory to measure the passenger body temperature, except where airline requested it, and in that case, it was made by airline for their own passengers. Terminal Duty Managers are the ones who are making sure that everyone is following stated rules and procedures, and that all provided equipment is in place. They do it by filling out daily COVID-19 measures check-lists. On the other hand, it is also essential that employees follow the rules. Not only for safety and health reasons but also as an example to passengers. Employees are also obliged to wear PPE, maintain hygiene, and comply with social distancing rules. Besides, employees need to measure their body temperature before their shift starts, and if it is higher than 37.2 °C or if the employee shows any sign of illness, he or she needs to report to the supervisor and ask for a medical exam. To minimize contact with more persons than required, an online meeting should be organized instead of face-to-face one, where possible. All employees need to be instructed about the importance of self-hygiene, PPE, and COVID-19 disease risks.

Cleaning and disinfection frequency were also increased, especially on passenger and staff high-frequency touchpoints. These include handrails, doorknobs, office premises, seating area, floors, security screening tubs, and totes, as well as many others.

All these measures have affected the earlier layout of the terminal. Passengers are now occupying more area because of the social distancing. Check-in and immigration procedure times are far longer due to the different
conditions and rules to enter the desired country. There are still those passengers who manage to check-in themselves to their destination but still can’t enter the desired country without quarantine, self-isolation, or negative COVID-19 test.

5. Conclusion

The ongoing global health crisis is an unprecedented event in recent world history. As time goes on, it is increasingly certain that air transport (like other segments of the world economy) will not recover so easily or quickly. Circumstances caused by the spread of COVID-19 disease directly affected the decline in traffic at both global and Croatian airports. It is expected that GDP will decline soon, as well as the decrease in purchasing power, and consequently, there will be an increase in ticket prices in the aviation industry. According to forecasts, it will take 3 to 5 years for the 2019 figures to return. However, the overall impact on air traffic will depend mostly on the pandemic’s duration, so each airport must adapt its processes and facilities to the new conditions as soon as possible. Some of the more important recommendations that need to be applied at airports are social distancing, face masks, hand disinfection, and physical barriers where necessary. The recommended social distance of 1.5 m indoors has the most significant impact on traffic processes and flows as a whole. The specified distance applies both to the processing facilities, holding facilities, and flow facilities. This research provides an analysis of the currently recommended measures and the passenger terminal adaptation of the Zagreb Airport the new requirements regarding the recommended measures in the passenger terminal to adapt it to the new situation.

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