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Impact of COVID-19 pandemic on the Turkish civil aviation industry

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A B S T R A C T

COVID-19 pandemic, which has announced to the world from Wuhan in China, has naturally formed economic shocks in air transport. As a result of the COVID-19 crisis, governments closed international borders and almost all airlines have drastically reduced their available seat capacity. The aim of this study is to examine the early and late responses such as financial decisions, managing and recovering flights, human resources management and hygiene measures taken by Turkish air carriers in a crisis environment during pandemics and economic shocks. Turkish Civil Aviation Industry (TCAI) is analyzed pre and during COVID-19 in terms of market overview. Finally, we also present current and future directions, and provide examples of the reactions from Turkish and global carriers. The results show that TCAI is heavily impacted by the COVID-19 Pandemic and the market is re-shaping with fewer carriers in the recovery phase. Airline staff faced significant salary decreases in TCAI due to revenue decrease of the airlines. Cargo-only flights are increased crucially in the TCAI, although passenger figures are dropped.

1. Introduction

The airline industry has experienced several important economic and natural shocks such as SARS and MERS epidemics, 11th September terror attacks or Indonesian volcano ash clouds in the past two decades. Each of these shocks had its own characteristics, but they all affected the industry economically. COVID-19 Pandemic is also one of these shocks. COVID-19 is a contagious disease caused by the novel coronavirus which was announced in Wuhan, China in December 2019. It has spread all over the world and caused a global crisis. The World Health Organization has declared the outbreak as a pandemic on 12th March 2020. According to the COVID-19 Report of Johns Hopkins University on 30th November 2021, the number of confirmed cases worldwide has reached 262,208,788 while the total number of death is over 5,207,855 and more than 237,041,329 have recovered.1 COVID-19 pandemic has deeply affected the health of communities as well as all kinds of sectors and industries. One of the most affected sectors by this pandemic has undoubtedly been the aviation industry. Hundreds of airlines have had to ground thousands of aircrafts due to the international flight bans and border closures brought by countries [17]. Almost all of the countries have stopped their all passenger flights in March and April 2020. Countries have shifted flight bans gradually. Some of the countries have reinstated flight bans in the winter season due to increase in case numbers and mutations. This pandemic has deeply affected international air passenger traffic, airports, airlines, tourism, trade and the global economy. [24].

The current COVID-19 pandemic has caused a humanitarian crisis which has limited public life and made many companies temporarily or permanently closed. Many countries across the world have applied serious restrictions which may vary from country to country to minimize the spread of the virus. Huge part of commercial or operational activities has been lost and air traffic has been massively reduced [7]. According to the estimation of ACI Europe [2], Decrease in the passenger figures of the European Airports was 100 million passengers, which means only the airport industry will lose €2 billion of passenger revenue in the first quarter of 2020.

COVID-19 pandemic crisis has done serious damage to the aviation industry which has not been encountered in the history of civil aviation. Regrettably, it will be very difficult to repair these damages that have already occurred. In early estimates by IATA in February 2020, while the outbreak was only in China, the loss of the aviation sector was $113 billion [19]. This figure has reached $252 billion in March [20], $314 billion in April [21]. Therefore, the negative impact of COVID-19 pandemic on the sector increased exponentially day by day. It is pre-

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dicted that there will be a decrease in international passenger traffic by 50% and airport revenues by $97 billion, revenue from a passenger per kilometer by approximately 48% (both international and domestic), revenues from international tourism by between $300 and $450 billion, volume of global merchandise trade by between 13% and 32%; and as a result it is expected −3% projected contraction in Gross Domestic Product (GDP) across the world in 2020 compared to 2019 [24].

This is the first time in the world that the aviation industry has had such a global impact. Many airlines have entered a financially troubled period. The main globally affected airline companies are including but not limited to Qatar Airways, Emirates, Delta Air Lines, American Airlines, Southwest Airlines, United Airlines, China Southern and China Eastern Airlines, Ryanair, EasyJet, Lufthansa, and Turkish Airlines. These are both low-cost and flag carriers of the aviation industry and COVID-19 Pandemic affected the aviation industry as a whole. [35]. These global airlines are estimated to lose billions of revenue, which is mentioned in the previous paragraph, due to COVID-19 Pandemic.

In parallel with the rapid progress experienced in the world of aviation in Turkey, with a number of record-breaking passenger traffic and aircraft movement, it has reached an important position in the international civil aviation field [5]. The commercial liberalization in 2003 has been a milestone in the development process of Turkish Civil Aviation Industry (TCAI). Until 2002, only the Turkish Airlines had been operating domestic flights from two hubs to twenty-five destinations. Along with the liberalization steps in aviation, private companies have started to operate scheduled domestic and international flights. Currently, 11 airlines offer services from 125 countries to 357 destinations with 546 aircraft. In the 2000s, the total number of domestic and international flights passengers was 33 million; whereas at the end of 2019, it increased to 208 million [13]. The total number of aircrafts owned by the airline companies in Turkey has increased in recent years as the number of domestic and international flights have risen. Alongside this growth, the increase in the number of passengers and the amount of cargo carried by airlines explicitly reveals the rapid growth in TCAI. Undoubtedly, the COVID-19 pandemic also had a negative impact on the Turkish Civil Aviation Industry. For example, there was a −89% decrease in Istanbul Airport air traffic compared to 2019 statistics [18]. Therefore, this study examines the impact of the novel coronavirus pandemic on Turkish Civil Aviation Industry.

The main contributions of our study can be summarized as follows: (i) the market structure and market share analytics of TCAI are examined, (ii) the impact of COVID-19 pandemic on network, fleet, schedule and passenger figures of TCAI are investigated, (iii) financial, operational, health, workforce and hygiene measures taken by Turkish aviation authorities, airports and airlines against new coronavirus are presented.

The rest of this paper is arranged as follows: Section 2 presents a recent literature review on COVID-19 pandemic and aviation. Section 3 analyzes Pre-COVID-19 situation of TCAI in detail. The economic impact of COVID-19 on TCAI are examined in Section 4. Section 5 presents early and late responses to avoid the effects of the COVID-19 pandemic. Finally, we summarize our findings and conclude the paper with a discussion in Section 6.

2. Literature review on COVID-19 pandemic and aviation

Within two years, many studies have been published related to COVID-19 pandemic in the Aviation Industry. Several recent studies are as follows: Abate et al. [1] evaluated government support measures for the air transport sector from two perspectives after the COVID-19 pandemic. First, they explore the factors that shape governments’ willingness to support airlines. Secondly, they analyze the results of government support in three dimensions regarding air transport policy. Adrienne et al. [3] investigated the scope of grounded aircraft at UK airports and the challenges of restarting post-COVID flights in terms of airport operations. Albers and Rundshagen [4] examined the airline's responses to the COVID-19 crisis in the spring of 2020, along typical crisis intervention strategies of saving, persistence, innovation, and exit. Bauer et al. [6] analyzed an emerging business model accelerated by COVID-19 for the novel phenomenon of Ultra Long Haul (ULH) operations. Brown and Kline [8] investigated the managerial preparedness of U.S. commercial airline management teams for the largest systematic exogenous shock to date, the COVID-19 outbreak in 2019 and 2020. Czerny et al. [10] conducted a study on the recovery of the post pandemic aviation market, experience and lessons from China, the first aviation market in the world severely affected by COVID-19. This study’s discussion and findings are thought to help improve aviation policy responses. Dabachine et al. [12] proposed a simulation model on the strategic design of preventive measures for airport passengers in times of the global health crisis COVID-19. Forsyth et al. [14] analyzed the price response of airports to a demand collapse caused by COVID-19. Gössling [15] investigated the risks, resilience, and pathways to sustainable aviation in terms of COVID-19 perspective. This study discusses the COVID-19 outbreak as an opportunity to reconsider the fundamentals of the global aviation system. Graham et al. [16] examined the attitudes of aging passengers towards air travel since the coronavirus pandemic. Kierzkowski and Kisieli [25] presented a simulation model of the security control lane operation in the state of the COVID-19 pandemic. The aim of this study was to check the impact of social distancing on the performance of safety check lanes. Lamb et al. [26] identified three key factors predicting passengers’ willingness to fly during and after the COVID-19. These factors perceived from COVID-19 are compatibility, influence, and fear. Li [27] discussed the situation that China’s air cargo industry faces with the COVID-19 pandemic by conducting a SWOT analysis. Linden [28] conducted a study on what aviation managers exposed to pandemics and environmental shocks should learn from COVID-19 for long-term planning. Macilree and Duval [29] reviewed selected aero politics issues that could affect the international aviation industry post-COVID-19. In addition, issues related to national airline recovery, recapitalization and international ownership have also been explored. Maneenop and Kotcharin [30] investigated the short-term impact of the 2019 COVID-19 pandemic on 52 globally listed airlines using the event study methodology. The result showed that after the three major COVID-19 announcements were made, airline stock returns fell more than market returns. Massaro and Rossetti [31] examined the links between the tourist traffic of some airports and the related development of the cities where they are located in terms of pre-Covid-19. Naboush and Alnimer [32] aimed to identify situations where the air carrier is responsible for the transmission of COVID-19 during air transport. In addition, this study examined the extent of security measures required by the International Civil Aviation Organization (ICAO) to prevent the spread of COVID-19 and protect the safety of passengers. Pereira and Mello [11] evaluated the operational efficiency of Brazilian airlines regarding the COVID-19 pandemic. Samanci et al. [36] revealed how to improve and define service quality issues in the airline sector after the COVID-19 pandemic, how different customer needs and expectations will be, and priorities of airline sector managers in terms of resource allocation, costs, planned strategies, and operational efficiency and effectiveness. For this, they used a new hybrid method with VIKOR and Fuzzy Importance, Expected Performance, and Priority Analysis (FIEPA). Schultz et al. [37] studied future aircraft turnaround operations regarding post-pandemic requirements. Sun et al. [38] investigated the impact of the COVID-19 pandemic on global aviation. Tisdall and Zhang [40] examined the impact of COVID-19 on the general aviation community in Australia. Zhang et al. [41] proposed a risk index to measure one country’s imported case risk from inbound international flights.

Many new studies have been published in the literature analyzing the negative impact of COVID-19 on the aviation industry. To the best of our knowledge, none of the previous studies considers the impact of COVID-19 on TCAI (see Table 1). Our study contributes to the literature with a detailed analysis of COVID-19 effects on TCAI. We present the changes in business environment of the TCAI in terms of economics of the airlines,
competition in the market, labor relations and public health preventive measures due to changes by COVID-19 Pandemic. The findings of this study can be extrapolated to other countries in the Europe-Middle East-Africa (EMEA) region as TCAI has become a prominent sector in this region and a global hub for transit flights from East (Middle East, Central Asia, Far East, India Subcontinent) to West (Europe, North and South America) axis.

3. Turkish civil aviation industry on pre-COVID-19 pandemic

As of 2019, there are 546 aircrafts belonging to 11 airline companies (5 passengers, 3 charter, 3 cargo) in Turkey. These companies are presented in Table 2. Atlaglobal, established in 2001, declared bankruptcy on February 14, 2020, as it could not continue its operations due to economic reasons with COVID-19 pandemic. In terms of passenger numbers in 2019, a total of 209 million passenger traffic was experienced, which includes 100 million in domestic flights, 108 millions in international flights, and 537 thousand in transit flights. In terms of aircraft and cargo traffic, there were 839 thousand domestic flights, 716 thousand international flights, 478 thousand transit flights operated; which makes total of more than 2 million aircraft traffic and 4 million tons of cargo traffic [13].

Table 1
Summary of available some COVID-19 studies on Aviation Industry.

| Author(s)       | Year | Subject                                                                 | Country/Airlines/Airport | Methods             |
|-----------------|------|-------------------------------------------------------------------------|--------------------------|---------------------|
| Abate et al.    | 2020 | Government support measures to the air transport sector                 | General                  | Statistical analysis|
| Adrienne et al. | 2020 | Investigation of extent of grounded aircraft at UK airports            | United Kingdom           | Statistical analysis|
| Albers and Rundhagen | 2020 | Analysis of airline reactions to the COVID-19 crisis                    | European airlines        | Statistical analysis|
| Bauer et al.    | 2020 | Study of the new phenomenon of Ultra Long Haul operations               | Top 20 international airports | Statistical analysis |
| Brown and Kline | 2020 | Exogenous shocks and managerial preparedness                            | United States Airlines   | Statistical analysis|
| Czerny et al.   | 2020 | Post pandemic aviation market recovery                                  | Chinese airlines         | Statistical analysis|
| Dubach et al.   | 2020 | Simulations on the possible effects of the social distancing            | Morocco                  | Mathematical model   |
| Furst et al.    | 2020 | The collapse in passenger demand and airport charges                   | European airports        | Statistical analysis|
| Goßling         | 2020 | Opportunity to reconsider the foundations of the global aviation system | General                  | Based on Research   |
| Graham et al.   | 2020 | Attitudes of aging passengers to air travel                             | United Kingdom           | Survey and data analysis |
| Kierzkowski et al. | 2020 | Analysis of the social distance on the performance of security control | Wroclaw airport          | Simulation model     |
| Lamb et al.     | 2020 | Prediction of passengers willingness to fly during                       | United States            | Survey and data analysis |
| Li              | 2020 | Discussion of the situation of China’s air cargo sector                 | China’s air cargo        | SWOT analysis        |
| Linden          | 2021 | Pandemics and environmental shocks                                      | General                  | Statistical analysis|
| Macleer et al.  | 2020 | Study of aeropolitics issues                                            | General                  | Based on Research   |
| Manene and Kotchin | 2020 | Examination of the short-term impact of the COVID-19                   | 52 airline companies      | Statistical analysis|
| Massaro et al.  | 2021 | Comparing proximity for couples of close airports                      | Italy, Norway, Cyprus    | Network analysis     |
| Nabouh et al.   | 2020 | Safety of passengers and carrier’s liability                            | General                  | Based on Research   |
| Pereira and Mello | 2002 | Efficiency evaluation of Brazilian airlines operations                 | Brazilian airlines       | Data envelopment analysis |
| Samanci et al.  | 2021 | Definition of the issues of service quality                             | General                  | Fuzzy sets and VIKOR |
| Schulte et al.  | 2020 | Aircraft ground operations and operational changes                      | General                  | Mathematical model   |
| Sun et al.      | 2020 | Investigation of COVID-19 impact on air transportation                  | 150 airlines             | Empirical analysis   |
| Tisdall et al.  | 2020 | COVID-19 a challenge to general aviation in Australia                  | Australia                | Based on Research   |
| Zhang et al.    | 2020 | Country’s imported case risk from inbound international flights         | China                    | Mathematical model   |

Table 2
Airline Companies in Turkey by Operation Type in 2020.

| Types      | Airline Companies                                                                 |
|------------|-----------------------------------------------------------------------------------|
| Passenger  | Turkish Airlines (THY), Pegasus Airlines, Sunexpress, Onur Air and Atlaglobal     |
| Cargo      | MNG Airlines, ACT Airlines and ULS Airlines                                       |
| Charter    | Corendon Airlines, Tailwind Airlines and Freebird Airlines                       |

Table 3
The number of destinations and countries operate flights to/from Turkey.

| Carrier       | Number of Destination | Number of Country |
|---------------|-----------------------|-------------------|
| Turkish Airlines | 284                  | 122               |
| Pegasus Airlines | 118                  | 41                |
| Sunexpress     | 52                    | 18                |
| Atlaglobal     | 37                    | 20                |
| Onur Air       | 18                    | 7                 |
| Foreign Carriers | 144                  | 52                |
| Grand Total    | 357                   | 125               |

in Fig. 1(d) is examined, a similar situation is observed. The only difference is that the foreign carriers have 29% share [33].

As of August 2019, flight network of Turkish Airlines consists of 284 airports in 122 countries. The network map of Turkish Airlines is shown in Fig. 2(a). The flight network of Pegasus Airlines comprises 118 airports in 41 countries as shown in Fig. 2(b). The flight network of Atlasglobal, Sunexpress and Onur Air consist of 37 airports in 20 countries, 52 airports in 18 countries, and 18 airports in 7 countries as illustrated in Fig. 2(c)-(e), respectively. Foreign carriers operate flights from 144 airports in 52 countries as shown in Fig. 2(f). It is important to mention that there are not any flights from the American continent operated by foreign carriers. In addition, neither Turkish carriers nor foreign carriers operate flights from the Australia continent. The number of destinations and countries that have direct flights from Turkey are summarized in Table 3 [33].

Pegasus Airlines has announced to commence new flights from its base, Istanbul Sabiha Gokcen International Airport, to Batum in Georgia, Helsinki in Finland, Medina in Saudi Arabia, Karachi in Pakistan in 2020. Turkish Airlines was planning to add direct flights from Istanbul Airport to Newark in USA, Vancouver in Canada, Malabo in Equatorial
Guinea, Tokyo Haneda in Japan to its flight network in 2020. It was also planned to restart flights to Osaka in Japan that was suspended in 2017. However, due to demand decrease caused by COVID-19 Pandemic, these new routes are postponed to 2021.

According to IATA Reports, the top five busiest international passenger traffic of Turkey are Germany, United Kingdom, Northern Cyprus, Russian Federation and Saudi Arabia. Top five busiest cargo routes are Germany, the United States of America, Saudi Arabia, United Arab Emirates and Netherlands. The number of passengers to and from Turkey are illustrated in Fig. 3. Europe is the largest market by passenger flows to and from Turkey with 86.8% of the total; second place is Middle East with 6.5% and third one is Asia-Pacific with 4.1% [23].

4. Effects of the COVID-19 pandemic on Turkish civil aviation market outlook

As of 31 December 2020, there are 9 active airline companies (3 passengers, 3 charter, 3 cargo) in Turkey. These companies are given in Table 4 [13]. Atlasglobal which has operations in 2019 (see Table 2), ceased their operations in 2020. Onur Air has not yet started its operations after suspending the flights in March 2020. As a result of the COVID-19 pandemic, TCAI undoubtedly suffered from passenger traffic losses. Turkish Airlines and Pegasus Airlines are two major airline companies whose shares are traded in Istanbul Stock Exchange in Turkey. According to passenger traffic results for the first quarter of 2020, the total number of passengers carried by Turkish Airlines was 74.2 million in January-December 2019 period. However, it has dropped to 27.9 million which is a decrease of 62% in the same period of 2020. The number of passengers decreased by 54.6% in domestic and 67.8% in international flights. Seat load factor is 71.0% with 10.6 points decrease [39]. The number of passengers of Pegasus Airlines, which was 30.7 million in the January-December 2019 period, has dropped to 14.7 million in the same period of 2020 with a 52% decrease. The number of passengers decreased by 40% in domestic and 65% in international flights. Seat load factor is 80.2% with an 8.4-point decrease [34].

As of 31 Dec 2020, the number of destinations and countries that have direct flights from Turkey are presented in Table 5 [33]. When we compare the table with 2020, Turkish Airlines and Pegasus Airlines are still way to reach their level of network in 2020 in terms of destination and country. An interesting fact is that Sunexpress has increased their number of destinations and countries compared to 2020. It can be concluded that Sunexpress has taken advantage of the market withdrawal by Onur Air and Atlasglobal.

Fig. 4(a) shows the weekly frequency share of the airlines operating in the domestic market of Turkey. The biggest share belongs to Turkish Airlines with 66% and Pegasus Airlines is the second with 29% share. The weekly available seat share by each airline in the domestic market is shown in Fig. 4(b). International weekly frequency shares by each airline are shown in Fig. 4(c). When international markets which have

![Fig. 1. Market structure of the TCAI before COVID-19 Pandemic.](image)

![Table 4](table)

| Types       | Airline Companies                                      |
|-------------|--------------------------------------------------------|
| Passenger   | Turkish Airlines (THY), Pegasus Airlines, Sunexpress  |
| Cargo       | MNG Airlines, ACT Airlines and ULS Airlines           |
| Charter     | Corendon Airlines, Tailwind Airlines and Freebird Airlines |

![Table 5](table)

| Carrier     | Number of Destination | Number of Country |
|-------------|-----------------------|-------------------|
| Turkish     | 268                   | 108               |
| Pegasus     | 114                   | 41                |
| Sunexpress  | 63                    | 25                |
| Atlasglobal | 0                     | 0                 |
| Onur Air    | 0                     | 0                 |
| Foreign Carriers | 157               | 45                |
| Grand Total | 314                   | 11                |
direct flights from Turkey are examined, Turkish Airlines ranks first with a frequency share of 51%. Pegasus Airlines comes in second place with 16% frequency share. Foreign carriers have a 23% share in total. When Turkey-International seat market share in Fig. 4(d) is analyzed, a similar situation is observed. The only difference is that the foreign carriers have 22% share [33].
market share 1 percent. Due to ceasing operations in 2020, Atlasglobal and Onur Air have not any seat availability in the inventory distribution systems in 2021.

5. COVID-19 responses from Turkish civil aviation industry

While the novel coronavirus outbreak continues to have a major impact on the aviation industry, most of the aviation authorities and airline companies have started to take some measures for normalization. The purpose of each action is to prevent the spread of COVID-19 with air transportation and to define new operation standards for aviation in the Post-COVID era. The measures taken by the airlines, airports and authorities in the aviation sector to control and prevent the spread of COVID-19 through air transportation have been listed in Table 6. We have grouped these responses as early responses and late responses. Early ones are commonly applied by global industry since the beginning of the pandemic, as well as TCAI. Late responses presented in this section may not only be TCAI specific, however examples and comments are given for TCAI to reflect the effects of the pandemic on TCAI.

Table 6
The list of some measures.

| Early Responses                                      | Late Responses                                      |
|------------------------------------------------------|-----------------------------------------------------|
| 1 Domestic and International Flights Restrictions    | 6 Fleet Reduction                                    |
| 2 Face Masks and Disposables Requirements             | 7 Network Changes and Flight Cancellations           |
| 3 Catering Service                                  | 8 Cargo Operations with Passenger Aircrafts          |
| 4 Repatriation Flights                              | 9 Financial Measures for Protecting Cash Flow        |
| 5 Isolate or Quarantine                              | 10 Impact on the Workforce                           |

(1) Domestic and international flights restrictions

In conformity with decisions taken by authorities, almost all international flights have been suspended to protect public health against COVID-19 in April and May 2020. Many airlines have restarted their operations with small size flight schedules for June and July 2020. For example, according to the Lufthansa Group announcement, 160 aircraft would fly to 106 destinations around the world following the gradual lifting of the restrictions and limitations. Another example is Turkish Airlines, which were planning to start all domestic flights in June 2020 and to perform its international flights gradually. Depending on the flight bans, 60% of the flights were planned to be performed in the first phase. According to the three-month flight planning, 75 flights were carried out to 23 destinations in 19 different countries weekly in June 2020. These countries and destinations were Canada-Toronto, Kazakhstan-Almaty, Afghanistan-Kabul, Japan-Tokyo,

2 https://newsroom.lufthansagroup.com/
Table 7
The recommendations for cabin and cockpit crew [9].

| Personnel Type | Flight Risk | Masks | Disposables | Goggles |
|----------------|-------------|-------|-------------|---------|
|                |             | Surgical | KN95/N95 | Medical | Protective suit | Medical rubber gloves | Shoe covers | Medical cap |
| Cabin Crew     | Low and Medium | x  |           |         |         | x  | x  | x  | x  |
|                | High         | x  | x         |         |         | x  | x  | x  | x  |
|                | Special Transport Missions | x  | x         |         |         | x  | x  | x  | x  |
|                | Emergency Handling | x  | x         |         |         | x  | x  | x  | x  |
| Cockpit Crew   | Low and Medium | x  |           |         |         | x  | x  | x  | x  |
|                | High         | x  | x         |         |         | x  | x  | x  | x  |
|                | Special Transport Missions | x  | x         |         |         | x  | x  | x  | x  |

(6) **Fleet reduction**
- Many airline companies have canceled or postponed their orders from manufacturers or aircrafts are given back to the leasing companies to protect cash flow of the company. i.e Turkish Airlines has postponed the delivery of the first new generation wide body Airbus 350–900 aircraft from March 2020 to August 2020 due to the travel restrictions of teacher pilots and decrease in travel demand. Turkish Airlines has announced on the stock market that undelivered Airbus orders have been rescheduled in line with the airline’s operational and financial capabilities.

(7) **Network changes and flight cancellations**
- Turkish Airlines was planning to open Vancouver, Newark, Osaka and Tokyo Narita new route openings in 2020. Due to demand shock caused by the pandemic, they have been postponed to the 2021 summer season. Pegasus Airlines also postponed its Karachi opening to the 2021 summer season.

(8) **Cargo only flights - Cargo operations with passenger aircrafts**
- After decrease in the belly cargo supply and increase in the demand for air cargo, especially to transport urgent medical supplies and humanitarian cargo, many airlines have decided to use their passenger aircrafts, especially the wide bodies, for freighter operations without changing seat configuration of aircrafts. These airlines are as follows: Turkish Airlines, Pegasus Airlines, Onur Air, KLM Airlines, Delta Airlines, United Airlines, American Airlines, Ryanair, Air Canada, Qatar Airways and Cathay Pacific. They have used both belly of the aircraft and filled passenger seats with cargo to meet demand. Fig. 7 shows the inside of a Pegasus Airlines, from Turkey, passenger aircraft filled with Cargo.

(9) **Financial measures for protecting cash flow**
- Turkish Airlines and Pegasus Airlines have offered different options to passengers in order to protect their cash flow because of the flight cancellations in early periods of the pandemic. Main aim was to prevent the company from running out of cash and survive until the flights are re-started. Some of these measures from airline companies can be listed as follows:

3 https://www.trtworld.com/turkey/
4 https://www.airporhaber.com/
5 shorturl.at/tksAH
6 shorturl.at/btNQ0

[3] https://www.kap.org.tr/tr/Bildirim/883212
[8] https://www.reuters.com/article/
Table 8
The list of 55 countries and regions that applied quarantine [22].

| Region                  | Countries                                                                 |
|-------------------------|---------------------------------------------------------------------------|
| Europe                  | Austria, Belarus, Belgium, Bulgaria, Crotia, Czech Republic, Finland, Germany, Greece, Ireland, Iceland, Italy, Lithuania, Montenegro, Netherlands, North Macedonia, Norway, Poland, Romania, Serbia, Slovakia, Spain, Ukraine, and United Kingdom |
| Middle East             | Israel, Jordan, Saudi Arabia and Tunisia                                   |
| Africa                  | Namibia, Tanzania, Zambia and Ethiopia                                     |
| North America           | United States, Canada,                                                    |
| South America           | Chile, Costa Rica, Puerto Rico, Dominica and Jamaica                       |
| Australia and New Zealand | Australia and New Zealand                                               |
| Asia                    | Bangladesh, China, Hong Kong, Japan, Indonesia, Malaysia, Myanmar, Singapore, South Korea, Thailand, Taiwan, Vietnam and Azarbaijan |

Fig. 5. Countries applying quarantine for 14-days to all arrivals from abroad.

Fig. 6. Candidate aircraft types of Emirates and Delta Airlines for retirement.

(a) A Delta MD-90 aircraft (Source: https://www.delta.com/)
(b) An Emirates Airbus 380 aircraft (Source: https://www.emirates.com/)
Pegasus Airlines adopted a new measure that is called sell and lease back agreements of the aircrafts. In these types of the agreements, airlines sell their aircrafts to a lessor and lease back the same aircraft. Actually, aircraft never leave the fleet until the lease agreement expires.

10. Impact on the workforce

There were difficulties in paying employees’ salaries, as airlines in Turkey have reduced or completely stopped their operations, and thus their revenues have decreased due to COVID-19 pandemic. In this regard, airlines tend to seek alternative solutions before terminating the employment contracts as a first option. The most important of these are employee’s unpaid leave, administrative paid leave, annual leave, reduced working hours, delayed wage payments due to force majeure, and telecommuting (home office). In addition, due to the COVID-19 outbreak, short-term working allowance conditions have been facilitated by the Turkish Government while adding a temporary article to the Unemployment Insurance Law No. 4447 [17]. All of the airline companies registered in Turkey have applied for the short-term employment allowance for 6 months starting from April 2020.

Short-term employment is defined as the temporary shortening of the employment period by at least one third of the whole or a part of the workplace due to general economic, industrial, regional crisis or compelling reasons, or stopping of full or partial activity for at least four weeks. It is a support tool for employees that provides income to the insured period when they cannot work. The daily short-time employment allowance is 60% of the average daily gross earnings calculated based on the earnings of the insured for the last 12 months. This amount calculated in this way cannot exceed 150% of the gross amount of the minimum monthly salary.10

After the short term employment period, Pegasus Airlines utilized its pilots on a part time basis. Turkish Airlines has agreed with the union and cut the salaries 30% for ground staff, 35% for cabin crew and 50% for pilots.

6. Conclusion and discussion

Airline companies are struggling to overcome the COVID-19 crisis which has an impact on the financial viability. It is not possible for the aviation sector to recover in a few years around the world as statistical foresight. Airlines had to restart their operations with very limited demand and highly tight operation regulations. In general, domestic flights have started first, and then the neighboring border gates have opened to each other. Later, short-haul international flights and long-haul flights have gradually started.

COVID-19 caused a demand shock globally for passenger flights due to the travel restrictions and passengers unwillingness to travel brought by the negative effects of the pandemic. In contrast, The demand for cargo flights has increased for the rapid transportation of medical equipment, vaccines and PCR tests. In addition, the supply of “belly cargo” carried in passenger flights is also restricted, which is another reason for the increase in demand for cargo flights. Due to the insufficient financial actions taken, the decrease in passenger demand, quarantine measures, etc., airlines have not yet reached their pre-2019 flight Fig. 2 airlines completely stopped their operations from TCAL. Revenue that is generated by the aviation and tourism industry is decreased due to cut in the flights.

We consider that some of the measures implemented during this period will have longer-term effects. Because of the fact that international travel restrictions are still in place, changes in the network and fleets will not be at the desired level. Airlines will continue to suffer in these matters. However, it will be possible for these effects to recover in a shorter time in case of governments open international travel to people who have been vaccinated for COVID-19.

In the recovery period, Airlines should not increase the available seat capacity quickly, as passenger demand is not expected to return very quickly, and countries still maintain certain restrictions in effect. Airlines should adjust staff salaries as passenger numbers and capacities approach pre-COVID-19 levels.

Cargo transportation will continue to be a very important revenue source for airlines in the post-COVID-19 period. Airlines of sufficient size can incorporate cargo units.

With the restart of the flights, aviation services will not be the same as before the pandemic. There are important changes such as security measures and new operational standards. Airlines have to replan their network, fleet, crew, cash-flow in order to adapt to these changes. Another important aspect for demand recovery is that airlines have to investigate the reasons behind the decrease in passenger confidence and how to regain it. Regarding 2021 and 2022, business travels could be expected to be very low. Visiting Friends and Relatives (VFR) and domestic travels for touristic reasons would be the first segment to recover faster than any other. This crisis will be overcome with the integration and cooperation of airlines, airports and civil aviation authorities by increased usage of the technology. Future studies could investigate the effects of the COVID-19 pandemics on TCAL whether they are permanent or temporary in terms of market share of the airlines, passenger figures, network, fleet and schedule structures.

Declaration of Competing Interest

Please check the following as appropriate:

All authors have participated in (a) conception and design, or analysis and interpretation of the data; (b) drafting the article or revising it critically for important intellectual content; and (c) approval of the final version.

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