

Study on the Impact of the Aviation Industry in the Post-Epidemic Era and its Causes and Solutions

Jingyi Luo *

School of Economics and Management, Civil Aviation University of China, Tianjin 300300 China

* Corresponding Author Email: 200540111@cauc.edu.cn

Abstract. Since 2020, the COVID-19 outbreak, the biggest 'black swan' event of recent years, has been spreading rapidly around the world, with serious consequences for the world economy, livelihoods, and various industries. One of the most severely affected sectors has been aviation, as travel restrictions, blockades, and quarantines have led to a sharp decline in air traffic. Firstly, this paper systematically analyses the impact of the epidemic on the aviation industry from four perspectives: society, industry, companies and employees, and analyses the specific causes of the impact. This paper then proposes measures for national, and regional governments, industries, and enterprises to cope with the post-epidemic era and help the aviation industry to overcome the crisis through multiple efforts. Finally, this paper provides an outlook on the aviation industry in the post-epidemic era. Despite the persistence of the epidemic, the aviation industry has started to recover gradually. In the future, technological developments and the implementation of new travel policies will change the face of the aviation industry. These changes also bring new challenges and opportunities that will require a joint response from the state, government, the aviation industry and aviation companies, which will be an important insight into the future development of the aviation industry.

Keywords: "Black Swan" event; aviation industry; post-epidemic era.

1. Introduction

1.1. Background

A "black swan" event is an unusual and unpredictable small probability risk event with a high degree of unexpectedness, usually causing a chain of negative market reactions or even disruptions. It exists in all areas of nature, economics and politics, and although it is a chance event, it can lead to systemic risk and serious consequences if not handled properly.

The outbreak of COVID-19 in 2020 had a significant negative impact on social and economic life and, in the light of relevant data and references, the outbreak of COVID-19 can be considered a "black swan" event [1].

In the context of global risks arising from a "black swan" event, the stable operation of air corridors is an important means of maintaining the safety of people's lives and property, maintaining regional stability and reducing the impact of risks [2]. The COVID-19 outbreak is a typical "black swan" event at global risk. During the epidemic, the aviation industry effectively played a role in transporting critical supplies. At the same time, however, the industry has faced unprecedented challenges due to the impact of the epidemic. The turbulent social environment and the restrictive government policies set up for the airline industry in response to the epidemic saw a significant drop in market demand and passenger travel intentions, resulting in a significant loss of operating revenue. Many airlines have accumulated significant debt and cash flow difficulties due to ticket pre-sales, and airline companies have been forced to downsize their operations and reduce production, resulting in an impact on the interests of those working in the airline industry. In short, the COVID-19 epidemic has caused irreversible damage to the entire aviation industry.

1.2. Current Situation

In 2023, the world officially enters the post-epidemic era with a gradual return to economic and social normalcy. The aviation industry is gradually recovering, and the number of flights and

passengers is on the rise. The country and the government are increasingly involved in the management of the aviation industry. This paper provides an in-depth analysis of the impact and causes of the epidemic on the aviation industry, which has important implications for the future development of the industry. The country, society, industry, and business should work together to identify the profound impact of the COVID-19 epidemic on the aviation industry, seize this opportunity, help the industry recover in the context of the times, and prepare for future "black swan" events [3].

2. Literature Review

As a strategic national industry and an essential part of the global supply chain, the aviation industry is vital to every country [4]. In times of global or regional risk, aviation logistics is a lifeline for the rapid delivery of strategic goods [5]. A "black swan" event is an unusual and unpredictable risk event that is highly unexpected and usually causes a chain of negative market reactions or even disruptions. COVID-19 was identified as a "Black Swan" event based on the figures and facts in the reference material published by the World Health Organisation [1]. In recent years, the aviation industry has suffered greatly from the impact of this "Black Swan" event.

The impact of COVID-19 on the aviation industry has been extensively studied by scholars. From a social perspective, Feng Kengzhong and Sun Yang Yang suggested that the rampant Newcastle pneumonia epidemic has already caused a serious impact on the normal functioning of the world economy and society, with the global supply chain forming a robust rupture due to the structural impact of nodes and the disruption of cross-regional corridors, triggering production stagnation, sales decline, logistics delays and liquidity difficulties [4]; Zhan Jianhua suggested that COVID-19 has not only made it difficult for the airline industry to day-to-day production and business activities difficult to continue, but also brought about a significant impact on the stock yields of the relevant airlines in the capital markets [6]; Chen Guicai proposed that COVID-19 had a strong short-term and strong impact effect on China's socio-economic and capital markets, and the market returns of the entire aviation industry in the Chinese capital market were significantly negatively correlated with the emergence of a perturbation relationship with COVID-19 [7]. From an industry perspective, Milan Jan suggests that air cargo networks can be affected by such large-scale disruptive events [8]; Xie Siwei and He Mingjuan suggest that COVID-19 diminishes the resilience of the aviation industry and has a significant negative impact on the industry in terms of transportation efficiency, job staffing, and operating cost budgets [2]. From a business perspective, Joseph Amankwah-Amoah, Zaheer Khan, and Ellis L.C. Osabutey, through their observation and study of two South Asian airlines, suggested that COVID-19 has weakened the financial position of airlines, thus pushing many of them into bankruptcy and their original business models to lose their vitality in the crisis [9]; Xie Siyuan and He Mingjuan suggested that air logistics companies faced many challenges, such as broken capital chains, increased pressure to return payments and disruptions in import and export trade, in which small and medium-sized enterprises with relatively weak resilience to risk suffered irreversible blows [2]. From a practitioner perspective, Alpo Vuorio and Robert Bor correlated this "black swan" event with the risk of pilot suicide, demonstrating that COVID-19 was detrimental to the physical and psychological health of pilots, leading to a significant increase in medical risk in the aviation industry [10].

The above studies are all about the impact of COVID-19 on a specific aspect of the aviation industry, lacking an overall generalized and integrated analysis, and they were conducted earlier, in 2023 when the world officially entered the post-epidemic era, which is not closely integrated with the post-epidemic era. Based on the background of the post-epidemic era, this paper will summaries and analyze the impact of the "Black Swan" event on the aviation industry, and systematically design improved countermeasures for countries, regional governments, aviation industries, and enterprises. This study not only fills a gap but is also crucial to developing the resilience and recovery of the aviation industry in response to the "Black Swan" events, and is of great practical significance in

enhancing the core competitiveness of the aviation industry and promoting the high-quality development of the global aviation industry [3].

3. Analysis of the Impact of COVID-19 on the Aviation Industry and its Causes

3.1. Society

3.1.1. Impacts

The COVID-19 epidemic has had an unprecedented negative global impact on public health, socio-economic and capital markets that almost all countries and regions have been unable to avoid. Individual health and general health in society have been shaken dramatically. Global supply chains were subject to structural shocks at nodes and disruptions in cross-regional corridors, creating robust breakdowns, stagnant production processes, declining sales performance, sluggish logistics and transport, difficulties in the flow of goods, and stagnant capital flows. This has affected several parts of the supply chain, such as purchasing, production, inventory, distribution, etc. [4]. As a result of the depressed consumer and market economy, socio-economic levels are lowered, productivity decreases, and unemployment rise. Due to the persistence of the epidemic, many countries implemented quarantine measures to restrict the movement of people, resulting in the disruption of many social activities. In addition, the COVID-19 epidemic has caused many social problems such as panic, depression, and vaccine-control prejudice. These problems urgently require a concerted effort from all sectors of society to address them, including through awareness and education.

3.1.2. Causes

The epidemic has had a huge impact on social life with its pathogenicity and epidemic nature. The epidemic potentially pushes people towards a life of low desire. With many businesses going bankrupt and workers losing their jobs, people will be more inclined to reduce their risk. Investors, uncertain of their future expectations, invest conservatively and there are even fewer job opportunities. People postpone plans to buy homes, delay marriage and childbirth, lower their consumption expectations, and leave big cities to live in smaller ones. Social savings increase, investment and consumption decrease, and people prepare for unknown risks due to a lack of security. Isolation prevents people from operating their social circles properly, leaving people with a lack of contact with other people, a loss of emotional and financial security, and a serious impact on their mental health and daily lives, interrupting the education of students. This leads to people being at increased risk of depression, anxiety, and sleep disorders. As a result of these stresses and potential problems, people's productivity gradually declines, creating more instability in the family - the basic organizational unit of society - and leading to a stagnation of productive social activities.

3.2. Aviation Industry

3.2.1. Impact

Depending on who is being transported, air transport can be divided into freight and passenger transport. Under the influence of the COVID-19 epidemic, the global industry chain and supply chain cycle were hindered, the resilience of air logistics development suffered, and the air cargo network was severely damaged [8]. Passenger aircraft, one of the most important means of transport to facilitate economic globalization, have suffered a global passenger shutdown and the air travel market has stagnated. Both cargo and passenger traffic in the airline industry has been significantly affected, with transport efficiency greatly reduced, operating costs accumulating, staffing arrangements in need of urgent adjustment, and increasing instability in the industry. At the same time, many small and medium-sized airlines in the industry may be merged and restructured or eliminated from the market, and the competitive landscape is constantly being restructured, causing turmoil in the industry.

3.2.2. Causes

The aviation industry is highly cyclical in nature, as it is heavily influenced by major world economic, political, and social events. Given this characteristic, there is uncertainty as to how the global aviation industry will change in the future. The epidemic has impacted every part of the industry, the external environment is changing dramatically and unpredictably, internal companies are challenging business strategies and restructuring, and the aviation industry will be reshaped, and the competitive landscape will change accordingly. The aviation industry is changing rapidly in the post-epidemic era and the pattern of regional industry chains will be adjusted and optimized, with the old system between the global aviation industries fundamentally changing.

3.3. Businesses

3.3.1. Impact

The epidemic has significantly weakened the financial position of the business [8]. Due to the sharp drop in passenger turnover, the huge drop in international oil prices, and changes in currency exchange rates, airlines' stock yields in the capital markets have fallen sharply and the market value of listed airline shares has been deeply affected [6,7]. Airlines and air logistics companies have suffered from disruptions in their import and export trade, increased pressure to make repayments, and are at risk of breaking their capital chains [2]. To maintain cash flow and avoid bankruptcy, airline companies have to manage costs. In terms of cost savings, they control budgets, reduce funding, suspend aircraft introduction and procurement, identify market demand, return leased passenger aircraft appropriately, etc. In terms of opening up new sources of revenue, they have tried to resume operations, convert passenger traffic to cargo on a large scale, seek tax incentives, and accelerate corporate restructuring.

Small and medium-sized airlines are less resilient to risk, and some have been merged and restructured, while others have been eliminated from the market. Airline companies took the initiative to try to make changes, and airlines with vastly different service models began to seek cooperation among themselves to tide over the difficulties, contributing to some extent to the improvement of the business environment of the airline industry.

3.3.2. Causes

Some airline companies lacked good management systems and were unable to maintain their strong competitive edge in response to the risky shock and were unable to recover quickly after the shock. The restrictive policies issued by the government for airline companies to effectively control the epidemic also brought about the crisis. In the post-epidemic era, some airline companies will inevitably seize the opportunity to innovate their business strategies, adjust their development paths, open up new markets, and breathe life into the aviation landscape.

3.4. Practitioners

3.4.1. Impact

The COVID-19 epidemic can bring about many negative symptoms in the human body pathologically, damaging the human respiratory, digestive, and nervous systems. Due to the working environment and the nature of their work, it is difficult for aviation workers to avoid contact with large numbers of people, which greatly increases the risk of contracting COVID-19 and its impact on physical health, increasing the medical risk to the aviation industry. And according to studies, COVID-19 outbreaks can not only damage the physical health of workers but can also have an impact on mental health. The "black swan" events represented by the COVID-19 epidemic are significantly associated with the risk of pilot suicide. As a direct result of the economic impact of the epidemic, pilots are suffering from severe psychological problems as a result of the stress and distress caused by the epidemic [10]. In fact, not only pilots but also those working in the aviation industry are facing the same problems. As a result of the national policy of quarantining people entering and leaving the country for long periods, airline crews and flight attendants are constantly in isolation, which not only

reduces their work opportunities but also increases their mental stress and leads to "burnout". High levels of work and stress can lead to emotional exhaustion and depersonalization.

3.4.2. Causes

Airlines have to manage costs and save money in an epidemic. However, unlike other industries, safety is particularly important in the airline industry. If any airline fails to meet safety audits due to compressed maintenance costs, they will be severely punished by the management, which is more than worth the loss to them and will bring about a reputation crisis. So, airlines have no choice but to reduce labor costs by cutting back or even eliminating various performance, allowances, and year-end bonuses, which directly leads to a reduction in staff salaries. At the same time, the epidemic has led to a reduction in working hours and a further reduction in the salaries of employees who are paid according to the number of hours worked. The struggle against the epidemic, the frequent quarantine, and the reduction in wages have seriously dampened the motivation of the employees.

4. Recommendations

The impact of COVID-19 on the aviation industry and its causes have been summarised and analyzed in four areas: society, industry, companies, and employees. In the post-epidemic era, in the face of the risk impact of the "black swan" event, it is very important to improve the existing operating system and build up the resilience and recovery of the aviation industry. This paper proposes systematic measures to improve the aviation industry in the post-epidemic era, taking into account the impacts and causes of the epidemic at four levels: society, industry, enterprises, and employees.

4.1. Countries

(1) Building an International Pattern of Mutual Assistance

Under the epidemic, many developing countries are struggling, and their economic recovery is weak. To promote the benign development of the world aviation industry and help economically disadvantaged countries out of their difficulties, an effective pattern of mutual assistance must be established between countries, which can not only accelerate economic development but also open up new aviation markets and help enhance international status and influence.

(2) Developing Emergency Response Mechanisms

The country should sum up the experience of the epidemic, improve the emergency response mechanism comprehensively and make contingency plans. When risks emerge, various departments can respond at first time and do a good job of safeguarding all aspects of the situation, maintaining the stability of the social environment, and helping the stable development of the national economy.

4.2. Regional governments

(1) Developing New Policies with a Regional Dimension

The regional government should give full play to its regional advantages, effectively coordinate the efforts of various government departments and all sectors of society, unify the deployment of various tasks and introduce new policies for the development of the aviation industry with regional characteristics, promote the resumption of production by enterprises in the post-epidemic era, and attract funds, enterprises and talents for regional development. In particular, in terms of passenger transport, regional governments can maintain a minimum profit margin for regional airlines using reduced fees and subsidies, or by purchasing routes that are beneficial to the operation of regional airlines through capacity to ensure the stable development of regional airlines.

(2) Encouraging Market Innovation through Industrial Layout and Policy Guidance

Regional governments should support key regional aviation enterprises and help them grow bigger and stronger. Through industrial layout and policy guidance, the aviation industry market should be encouraged to develop competitive advantages through technological innovation, nurture industry-leading enterprises, and enhance their international competitiveness.

(3) Increasing Investment in Improving Aviation Infrastructure and Airspace Resources

Regional governments should focus on infrastructure, lack of space resources, and other outstanding areas of infrastructure, and increase investment in basic R&D. They should not only make up for the shortcomings of the industry's infrastructure but also include investment in the R&D of basic safety equipment to improve confidence in the development of the aviation industry. The government should collaborate with the relevant state departments to make joint efforts to break the constraints of airspace, promote the improvement of the airspace management system and improve the scientific and technological support capacity for the sustainable development of civil aviation. The government should assist airlines to reduce costs and consolidate resources, and use efficient experience to accelerate the recovery of the global passenger and cargo markets in the post-epidemic era.

4.3. Industry

(1) Focusing on the Application of Information Technology in the Field of Emergency Response

Digital systems, big data, cloud computing, and other aviation logistics information technologies have a very important role to play in the field of aviation industry emergencies. New technologies can simulate, predict and evaluate crises caused by "black swan" events, effectively guaranteeing the stability of the industry. At the same time, digitalization is a major source of competitiveness for the aviation industry in the future. Digital marketing systems will enable an accurate understanding of passenger needs and product preferences, and provide the industry with accurate marketing, services, and advice. The development of aviation logistics technology can advance the development and production of aircraft, realize the intelligence and information technology of the aviation industry, and enhance the competitiveness of the aviation industry.

(2) Strengthening the Cultivation of Talents

In the post-epidemic era, market demand has begun to surge, with more and more travelers choosing air travel, and travelers demanding more safety and quality from the aviation industry. The industry needs to train a large number of aviation industry counterparts with composite talents. It should not only cooperate with Funny to establish a talent training base but also form a complete and reasonable education system for aviation industry talents to continuously deliver new professionals.

(3) Establishing a Medical Mechanism to Protect the Physical and Mental Health of Practitioners

The current status quo of the aviation industry is rapid development, a surge in traffic, and increasing safety hazards. The aviation industry is constantly improving its rules and regulations in terms of personnel training, but not enough attention is paid to the work pressure and physical and mental health of its employees. However, people are the most important, dynamic, and unstable factor in the entire aviation service system. In recent years, safety problems have been caused by human factors, making the "human factor" an increasingly important and serious risk factor. The aviation industry needs to establish a set of effective medical mechanisms to help employees manage their physical and mental health, improve their stress levels and consequently their physical and mental health, effectively control the risks to the safe operation of civil aviation and minimize the interference of the "human factor".

4.4. Companies

4.4.1. Airlines

(1) Establishing a Good and Stable Management Mechanism and Developing "Passenger to Cargo"

Airlines should establish a good and stable management mechanism, actively sink idle capacity, explore feeder markets, speed up cash inflows, and make reasonable use of financial derivatives to ensure the smooth flow of capital chains and company operations. In the post-epidemic era, the demand for international transportation of medical supplies remains high, and the recovery of passenger traffic is far less than that of cargo. The airline can change its operational focus from passenger aircraft to cargo aircraft and introduce all-cargo aircraft. Adopting a parallel operating model of passenger and cargo aircraft can enhance the airline's ability to resist risk shocks.

(2) Cultivating Passenger Loyalty and Developing Frequent Flyer Programmes

Airlines should cultivate passenger loyalty and vigorously develop frequent flyer programs, which can provide a stable operating environment for airline development. In the post-epidemic era, the criteria that travelers consider for airlines have changed. Airlines should study the specific needs of passengers in depth and design new frequent flyer marketing strategies to cultivate passenger loyalty and increase regain rates, thereby increasing route load factors and gaining stable profits.

4.4.2. Air Logistics Companies

(1) Cooperating with Logistics Companies to Improve the Tightness of the Articulation between Ground and Aviation

Aviation logistics enterprises should cooperate with logistics companies, use advanced information technology to optimize the flow of information in the aviation logistics service chain, allocate resources rationally, bring into play the scale effect, and reduce time and space costs. At the same time, they should strengthen the joint transportation of multiple modes, expand ground services, extend the supply side of services, improve the tightness of the connection between ground transportation and aviation, and provide consumers with diversified and personalized comprehensive logistics.

(2) Focusing on the Operation and Layout of Cargo Aircraft

Airline enterprises should attach importance to the operation of cargo aircraft and lay out the freight market. Air logistics enterprises should deeply integrate with the global industry chain, grasp the opportunities of developing international economic cycles and favorable national policies, flexibly adopt leasing and credit, etc., deploy all-cargo aircraft capacity, strengthen cooperation with aviation manufacturing enterprises and local governments, and develop niche markets.

5. Conclusion

5.1. Research Findings and Conclusions

This paper provides an in-depth discussion of the impact and causes of the aviation industry based on the research context of the post-epidemic era. Firstly, the impact of the epidemic on the aviation industry is sorted out, including a reduction in the number of flights, a sharp drop in passenger traffic, and a significant drop in revenue for airports as well as airlines. Secondly, the causes of these impacts are analyzed, including the travel restrictions imposed by countries as a result of the spread of the epidemic, and the sharp drop in market demand due to passenger concerns and fears. Finally, responses from international and regional governments, industry, and businesses are proposed.

This paper finds through its research that the impact of the epidemic on the aviation industry is a widespread problem on a global scale. Despite the impact and influence on the aviation industry, these changes have also brought new challenges and opportunities. In the post-epidemic era, countries, governments, industries, and enterprises will surely be able to better cope with the challenges and explore new opportunities by maintaining innovative, collaborative, and flexible strategies on multiple fronts.

5.2. Research Implications

This paper differs from previous research on the impact of the epidemic on the aviation industry from a single perspective. It summarises the various impacts of the epidemic on the aviation industry and analyses the causes, and designs improved countermeasures for countries, regional governments, industries, and enterprises that can cope with the changing post-epidemic era. This research not only fills a gap, but is also crucial to the development of the aviation industry's resilience and recovery from the "Black Swan" event, and is of great relevance to enhancing the core competitiveness of the aviation industry and promoting the quality development of the global aviation industry.

5.3. Outlook

Through this crisis, we are acutely aware of the fragility of human civilization. We have constantly improved science and technology, and have created increasingly sophisticated research results, but we are still very vulnerable to the crisis brought about by the "Black Swan" event. This study has not gone far enough in terms of the impact of the epidemic on the aviation industry and is limited by the fact that it is only qualitative in nature and does not quantify the extent of the impact. Future research scholars can start with a quantitative perspective to precisely analyze the extent of the impact of the epidemic on the aviation industry, helping us to better understand the complexity of the aviation industry and adopt sustainable strategies to cope with the changing future, helping to promote the quality development of the global aviation industry.

References

- [1] Antipova, T.: Coronavirus pandemics as black swan events. Integrated Science in the Digital Age 2020. ICIS 2020. Lecture Notes on Networks and Systems Vol. 136 (2020).
- [2] Milan Jani.: Modelling the resilience of air cargo transport networks affected by large-scale disruptive events. Transportation Research Part D 2019 (7), 425-448(2019).
- [3] Liu Yue.: A study on the resilience of Chinese civil aviation based on epidemic shocks. Civil Aviation Management No.355(05):17-19(2020).
- [4] Feng Kengzhong, Sun Yang Yang.: The impact of COVID-19 on economy and society from the perspective of supply chain. Journal of Xi'an Jiaotong University (Social Science Edition) 2020,40(04),42-49(2020).
- [5] Lemke, Michael Kenneth PhD, Apostolopoulos, Yorghos PhD, Gallos, Lazaros K. PhD, Sönmez, Sevil PhD.: Commercial transport during pandemics: Reconciling COVID-19 dispersal and critical supply chain resilience through network analysis. Journal of Occupational and Environmental Medicine 62(9), e537-e538(2020).
- [6] Zhan, J.: Research on the impact of public health emergencies on stock returns of Chinese airlines. Fujian Normal University (2021).
- [7] Chen Guicai.: The impact of the New Guan epidemic event on China's civil aviation industry. Guangdong University of Foreign Studies (2021).
- [8] Xie Sixin, He Mingjuan.: The improvement path and strategy design of air logistics development resilience - based on the double-loop pattern in the post-epidemic era. Price Monthly No.531(08):77-89(2021).
- [9] Joseph Amankwah-Amoah, Zaheer Khan, Ellis L.C. Osabutey.: COVID-19 and business renewal: Lessons and insights from the global aviation industry, International Business Review Vol. 30, No. 3(2021).
- [10] Alpo Vuorio, Robert Bor.: Black Swan Pandemic and the Risk of Pilot Suicide. Public Health, Occupational Health and Safety Volume 8 (2020).