Problems and Solutions of the Aviation Industry in the Post-epidemic Era

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Abstract. Three years after the outbreak, the year 2023 has officially entered the post-epidemic era. The aviation industry, which was severely hit by the epidemic, is gradually recovering. This article describes the current situation of the aviation industry after the epidemic, taking the Civil Aviation of China (CAAC) as the subject of the study, and analyses the problems it faces: the number of international flights has been slow to recover and unable to meet market demand; the financial crisis has been highlighted due to severe losses; supply chain shortages have prevented the timely delivery of aircraft; and the rapid increase in environmental pollution has led to a serious decarbonization situation. Potential solutions were also proposed for these four problems. These include increasing the number of flights through government consultation and communication, increasing revenue streams and reducing unnecessary spending to tide over the financial crisis, achieving supply chain resilience to avoid the obstacles posed by supply chain shortages, and developing new sustainable technologies for aviation to reduce air pollution.

Keywords: Aviation, post-epidemic era, CAAC.

1. Introduction

The rapid development of the aviation industry in recent decades has had a far-reaching impact in several areas around the world. Aircraft, as one of the important means of transport, both passenger and cargo, has provided convenience to people's lives. Passenger transport allows people to travel more quickly to different destinations, to enjoy the beauty and architecture of the world, and to experience the language, customs and culture of different countries. Freight transport allows people to receive goods faster. It can deliver fresh vegetables and fruits to people's tables in time, can transfer valuable goods safely to the hands of customers, and can complete a relay of life in organ transplantation. In addition, the aviation industry contributes significantly to global economic growth, contributing $3.5 trillion (4.1%) to the global gross domestic product (GDP). Tourism development cannot be achieved without the support of the air transport industry, and it is estimated that more than half (58%) of all international travelers travel by air, which generates economic benefits for tourist destinations. What's more, the airline industry itself creates jobs for pilots, flight attendants, mechanics, dispatchers, etc., providing lots of employment opportunities for people. Obviously, the study of the aviation industry is of considerable significance to people's lives and even global economic activity. However, the outbreak of covid19 at the end of 2019 dealt the aviation industry a major blow of historic proportions. Fortunately, through the tireless efforts of governments, 2023 is already in the post epidemic era. Due to the importance of the aviation industry, this paper focuses on the current state of the aviation industry after the outbreak, the problems it is facing, and suggests potential solutions to the problems.

2. Current situation

In December 2019, the outbreak of covid 19 dealt an extremely severe blow to the global aviation industry. in 2020, the number of global flights fell sharply from 38.9 million in 2019 to 16.9 million. The number of passengers booked into the global aviation industry also fell from 4,543 million in 2019 to 1,807 million in 2020. Subsequently, the aviation industry gradually recovered as governments continued to optimize their outbreak control measures. According to 2022 data, the

number of global flights reached 27.7 million and the number of passengers recovers to 3,781 million respectively. In addition, the discounted graph below shows that global commercial airlines reduced their losses significantly from $13.77 billion in 2020 to $1.16 billion in 2022. Fortunately, the successful development of the covid 19 vaccine and its worldwide shipment have further accelerated the aviation recovery process. 2023 officially entered the post-epidemic era, and the aviation industry accelerated its recovery process. According to data released by International Air Transport Association (IATA), total global air passenger traffic grew by 36.9 per cent year-on-year in 2023, further approaching pre covid 19 levels. International passenger traffic has increased by 41.6 per cent year-on-year, recovering to 94.1 per cent of 2019 levels, while domestic passenger traffic has increased by 30.4 per cent year-on-year, already exceeding pre-epidemic levels. Furthermore, the data also demonstrates that global air cargo capacity, measured in terms of available cargo ton kilometers, grew by 11.3% year-on-year in 2023 (See Fig. 1). Although the aviation industry has made significant improvements in these areas, there are still problems that cannot be ignored.



Fig. 1 Global Commercial Airline Profit and Loss from 2012 to 2022 (in billion U.S. dollars)

3. Problem

3.1. Low Number of International Flights

Flight means a mission performed at a specific time and on a specific route. A flight consists of a complete journey from one airport of origin to another airport of destination. During the outbreak of covid 19, an average of half the destinations per airport were lost [1]. In post epidemic era, China sees fewer flights than before the epidemic. According to the statistic from Civil Aviation Administration of China, By the end of 2023, China's international scheduled passenger flights were at approximately 62.8% of their pre-scare level, with Chinese airlines accounting for 67% and foreign airlines accounting for 33% respectively. However, 25 countries, including the UK, has already had more flights than before the pandemic. It is noticeable that the number of flights between China and the United States resumed under 20% by the end of 2023 owning to various issue. For passengers, the lack of flights means higher airfares and time costs for connecting flights. Overall, the current number of flights in China cannot meet the market demand.

3.2. Financial Crisis

In order to stop the spread of covid 19, the air transport industry was severely disrupted and suffered huge losses. Even if the planes do not fly, the expensive fixed costs hit the airlines' financial position heavily. Between the start of the epidemic and October 2020, more than 40 airlines have already bankruptcy due to financial difficulties [2]. A great number of airlines are still struggling to

survive. China's civil aviation industry is facing a serious financial crisis. Over the three years from 2020 to 2022, the civil aviation industry has accumulated losses of more than 400 billion yuan. The Civil Aviation Administration of China pointed out that in 2023, although it had significantly reduced its losses, there was still no profit income and the industry as a whole was losing nearly 30 billion yuan. In addition, civil aviation is under debt pressure in the post epidemic era, and the inability to repay debt on time is considered to be a large part of reason for the company's bankruptcy [3]. For instance, Air China's gearing ratio is 65.55% in 2019, but 92.69% in 2022, up 14.76 percentage points from 2021. The year-on-year increase in gearing ratio shows Air China's huge financial pressure. Therefore, the financial crisis in the civil aviation sector deserves to be highlighted.

3.3. Supply Chain Shortage

The supply chain is the entire chain from the procurement of raw materials to delivery of the final product to the customer. The supply chain of plane includes aero-engine manufacturers, aircraft component manufacturers, material suppliers, etc. Covid 19 has caused major disruptions in the global supply chain, and the manufacture of aircraft is facing unprecedented challenges [4]. Insufficient delivery of aircraft will have an adverse effect on the development of China's aviation industry. In 2020, a great deal of cancelled aircraft orders has forced the famous aircraft manufacturer, Airbus, to cut 15,000 jobs to reduce its financial burden [5]. In the post epidemic era, the aviation industry is gradually recovering, and the number of orders has increased. However, the shortage of skilled labor has led to an imbalance between supply and demand, which is one of the important factors of supply chain problem. According to the reports, Airbus has announced that deliveries of aircraft that were supposed to be delivered in 2024 could be delayed by several months. As Spring Airlines shows some of its aircraft may not be delivered on time due to Airbus supply chain issues. For airlines, delayed deliveries mean rescheduling flights, adjusting capacity layouts and even cause economic loss. In short, supply chain shortages pose a considerable threat on the whole aviation industry.

3.4. Environmental Pollution

During the outbreak of covid 19, airport closures and flight cancellations contributed to the environment. NASA reports demonstrated that in 2020, nitrogen dioxide (NO2) and carbon dioxide (CO2) witnessed decrease in 30% and 25% respectively [6]. In the post epidemic era, aviation's pollution of environment increases rapidly as aircraft resumed flying. China's aviation industry is confronted with the challenge of transitioning to a fully green environment, since China aims to peak carbon by 2030 and become carbon neutral by 2060. International Civil Aviation Organization adopt "Carbon Offsetting and Reduction Scheme for International Aviation" (CORSIA) in 2016. With the increase in per capita income level, the scale of China's civil aviation market continues to expand, and ten carbon emissions generated by jet fuel continue to rise, making it difficult to achieve zero emission in the aviation industry. To conclude, China's civil aviation decarbonization situation is grim after epidemic.

4. Solution

4.1. Increase the Number of Flights

Increasing the number of international flights requires help government, since the majority of governments attach great importance to maintaining air transport connectivity to protect economic and cultural activities between countries [7]. The Chinese government needs to engage in friendly negotiations and consultations with the governments of other countries and express its strong desire to resume international flights as soon as possible in order to strengthen international cultural communications and promote international economic development, such as tourism. What's more, the Chinese government should share experience and information through channels such as diplomatic and international platforms and coordinate multinational cooperation to further increase

the number of flights aimed at meeting the large market demand for overseas study, family visits and business travel.

4.2. Increase Revenue and Reduce Expenditure

Increasing revenue and reducing expenditure is a necessary solution for airlines to save themselves when facing financial crisis in the post epidemic era. The economic deterioration of airlines is mainly due to the significant difference between revenue and expenditure, so airlines cannot rely on government subsides, self-help is the long-term approach [8]. In terms of increasing revenue, airlines should broaden their revenue channels, such as taking digital transformation as an idea, actively carrying out the currently popular selling of commodities through live broadcasting, inviting corporate executives and celebrities to promote products, and selling traditional air tickets, airline derivatives, and international commodities. At the same time, airlines can take advantage of the export of Chinese commodities to engage in the more profitable cargo business to alleviate financial constraints. The data shows that cargo flights made good progress, with China Eastern Airlines Logistics contributed 3.5 billion yuan in 2021. In terms of reducing expenditure, airlines can reduce purchasing costs by negotiating with suppliers for lower purchasing costs. In addition, manpower costs can be reduced by arranging for one person to perform more than one job, for instance, flight attendants not only have to fulfil traditional tasks such as checking tickets and cleaning, but also have to work part-time to sell products.

4.3. Achieve Supply Chain Resilience

An effective way to address supply chain shortage is to achieve supply chain resilience. The aviation supply chain is both capital-intensive and labor-intensive and relies on many ancillary industries [9]. In the face of a crisis such as covid 19, this complex industry can be severely affected by its vulnerability, and supply chain resilience can enhance its ability to withstand risks. Firstly, diversification of sourcing is significant. The supply chain of aviation manufacturers cannot be dependent on a single country and factory but have to broaden their sources and look for alternative products so that this supply chain is not interrupted when a factory closes. Second, supply chain localization may be a wise decision, as airlines moving certain manufacturing to the country, and having local suppliers can help reduce transport costs and speed up the aircraft manufacturing process. Additionally, local governments can encourage supply chain localization through policies such as tax reductions and land incentives to reduce dependence on foreign countries. Thirdly, airlines should also take a holistic view of their supply chain from low-level to high-level, anticipate possible supply chain risks and adjust their strategies quickly.

4.4. Reduce Environmental Pollution

Innovations in technology is a crucial approach for civil aviation to reduce environmental pollution, as innovative technology, as a core element, can develop the aviation industry rapidly [10]. Chinese airlines need to accelerate the research, development and application of alternative fuels. Currently, Sustainable Aviation Fuels (SAF), including biofuels and synthetic fuels, are promising options, and airlines require to conduct in-depth research on production methods, technical barriers and mass production. In addition, Airlines can invest in the development of a new generation of aeroengines, such as hydrogen propulsion, electric propulsion technology, and make efforts to reduce the structural weight of aircraft, improve the efficiency of fuel combustion in order to reduce carbon emissions.

5. Conclusion

The epidemic has dealt a heavy blow to the aviation industry. Fortunately, with governments continuously optimizing anti-epidemic measures, the aviation industry has embarked on a path of recovery. In the post epidemic era, although the losses of the aviation industry have been significantly reduced and the passenger and cargo traffic are close to the pre-epidemic level, China's civil aviation

industry, for example, is still facing some important problems. The slow recovery in the number of international flights has left the market supply unable to meet demand; unprofitable revenues and debt pressures are giving airlines the threat of bankruptcy; disruptions in the supply chain of aircraft manufacturers are delaying the delivery of planes; and the increase in environmental pollution by the aviation industry is making it even more challenging to achieve carbon neutrality targets. Possible solutions to these four problems are then given respectively. Increasing the number of flights through negotiation and consultation between governments; Completing self-help by broadening company's revenue streams and reducing spending; Achieving supply chain resilience to reduce dependence on a single supplier; and investing greatly in the invention of promising aviation decarbonization technologies to reduce pollution emissions.

This paper has only raised four problems from the perspective of China's civil aviation industry, and there are still many other issues that not mentioned cannot be ignored. Moreover, in terms of measures, this paper only suggests possible solutions for the aviation industry, and different airlines should formulate specific measures for their own actual situation. Additionally, the lack of empirical research also makes the article limited.

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