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The future of civil aviation in relation to Covid-19

A Resilient future

Metropolia University of Applied Sciences

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Abstract

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The aim of this thesis is to analyse the effects of the “Covid-19” pandemic on civil aviation and how the events catapulted its recovery from the effects of the pandemic. It also aims to look at the future of aviation and how the pandemics lessons drive future innovations. Being a very broad topic this delves into a variety of topics regarding the pandemic and its grips on the airline industry all over the world. Using this context we analyse how it recovered in particular and how the future of aviation looks.

Keywords: Pandemic, Covid-19, recovery, impact, Innovation

Thesis statement:

"The post-pandemic recovery and future prospects of civil aviation are shaped by the profound impacts of the COVID-19 pandemic, as evidenced by statistical trends in passenger demand, financial resilience, and industry adaptation, revealing both challenges and opportunities for sustainable growth and innovation."

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1 Introduction

The Covid-19 pandemic crippled the the aviation industry, and to this day it is regarded as the biggest disaster in aviation history. In context it was a pandemic that halted major operations for several months and caused billions of dollars in loss. The civil aviation industry was always at risk, particularly airlines. The damages were across the whole sector and not only civil aviation. This created a chain reaction and put other companies at risk.

A pandemic of this magnitude can only be spread rapidly using aviation as a primary means of infecting the world. To further contextualise how this spread occurred and how the risks of it were multiplied with civil aviation. It was always a problem during the virus' initial outbreak by the general public who voiced their concerns for months of this issue.

The aim is to present how the risks were assessed, to what extent was civil aviation affected, and the implications of this disaster for the future of commercial transport globally. To also highlight the important differences across regions and what change there lies.

The topics that will be addressed in this paper are in the following order, the importance of aviation first to give context on what civil aviation contributions are. A brief overview on trends before the pandemic. The effects of the pandemic on the functions globally to continue, and how the concerns of the general public affected civil aviation. To also further expand on Governments and their aim to minimise the damages of the pandemic, and its support to civil aviation.

Other touch points include, the failure in preparation and where they succeeded. The state of the industry today in relation to covid-19 regionally and their disparities. To also highlight the opportunities today, and the challenges still facing the industry. All of these points to finalise the implications for the future of civil aviation.

2 Importance of aviation and the pandemic

2.1 Aviation and its significance around the world

Civil Aviation is a form of transport that includes commercial transport (Airlines), non commercial flying (Private flying), commercial non transport such as crop dusting,

infrastructure, and manufacturing. These aspects all make up civil aviation and are distinct from “Aviation” as aviation can include all the aforementioned areas as well as military and other non commercial fields.

It is a global industry that amounts to 2.5 trillion USD, nearly 4% of the world's gdp. It is one of two major flight categories and does not include military and governmental aviation. This is the major distinction between general aviation and civil aviation. Aviation is the fastest mode of transport, therefore its necessity in the world increases day by day.

General Aviation hosts 65 million jobs globally, which makes it one of the largest industries in terms of employment size. Civil aviation includes 10.2 million jobs directly, 3.2 million of those being airports, air traffic control and other facilities that aid commercial travel and the remaining related to tourism, manufacturing and infrastructure.

Civil aviation contributes economically both directly and indirectly. For consumers, it directly provides travel, freight and mail services around the world. For businesses it contributes to the use of manufacturing, navigation services, carrier operations, and other mediums that allow them to operate efficiently. This is why civil aviation's reach, global use and sheer size is the reason it is so important to the world as most businesses in several ways rely on aviation to function and grow. (ICAO, 2019)

2.2 Pre-covid

Not all sub categories of the aviation industry were at their best pre-covid. A lot of aspects of civil aviation was labelled as a value destroyer during the pandemic. A lot of industries as well were negatively impacted by issues related to aviation before the pandemic hit. It can be indicated using data that there were several millions in value lost during the last year of aviation right before covid 19’s surge.

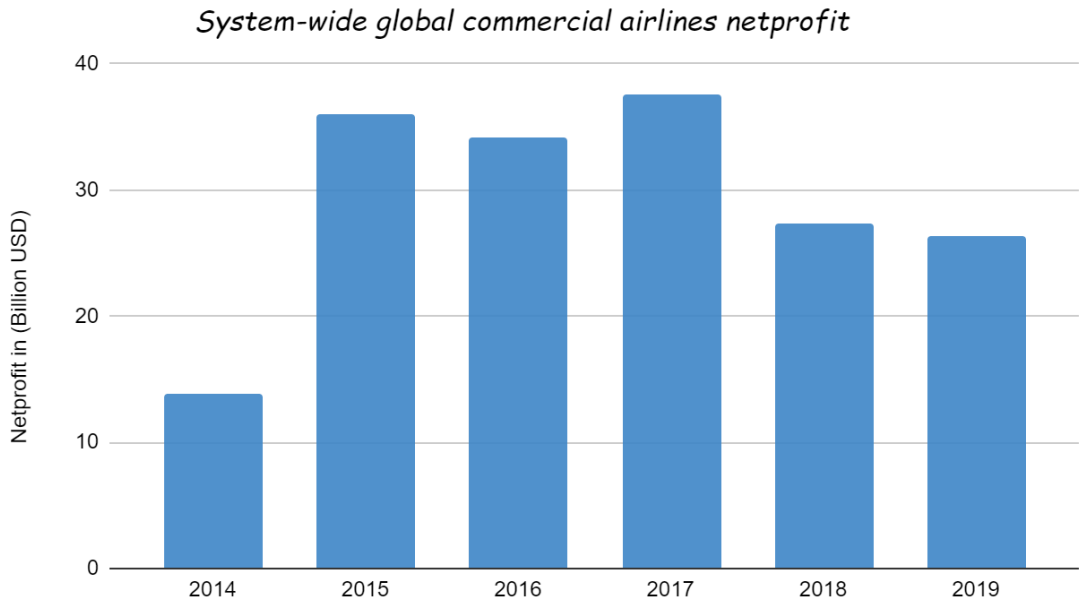

Figure 1. Net Profit (Statista, 2023)

Fuels are a big chunk of airline expenses and the fluctuates annually in particular for jet fuel, which creates uncertainty to some extent. The most noticeable gap in net profit is from 2014 till 2015. These two years were in tandem with overall expenses, the majority being fuel. The annual fuel expenses dropped from 224 billion USD in 2014 to 175 billion USD in 2015. This is due to the drop in price for both crude oil and jet kerosene, which was the biggest expense for both years. (IATA 2021)

Airlines slightly matched and peaked the next two years, but regressed in net profit for the last 2 years. This correlates with the patterns of fuel costs for airlines which over the years the price for fuel was fluctuating slightly. Although not as significant as the disaster to come, the industry peaked and slowly regressed.

The year 2019's data on cargo and passenger travel roughly ranges from 3.2 million flights to 4.2 million at its peak. This is relatively normal for this year and only regressed during the beginning of the year after the 2018 oil price hike. Although coming off the best years in civil aviation. Its small regression in 2019 is surprising, as the use of civil aviation seems to always increase. The demands were increasing and more calls for expansion grew. As the time came closer to 2020, the industry changed for many years to mark the biggest event that shook the industry to its core.

2.3 The covid 19 pandemic

The Coronavirus pandemic was a major outbreak that occurred in 2020. Initially discovered in Wuhan, China, the virus would surge through the globe infecting nearly 800 million people today, and unfortunately killing 6 million people. Although the origin of the virus is largely unidentified there have been few reports speculating that it originated in bats, and cattle, but later evolved to infect Human hosts. Regardless of its origin, its damage on the global economy was significant and till this day certain industries are still recovering from the chaos that it caused, in particular the aviation industry.

The main issue with International travel during this time period, was the general health risk of travelling. Covid-19's transmission in tight areas is higher and the infection rate increases the longer people are together. This does not work well for airlines and other airline related jobs as it involves contact with other people. During this time, the "push" for sanitation and overall knowledge on how to avoid the spread of viruses was not the same. It was only after the pandemic were people more aware of how to mitigate spread. This is why it was catastrophic in many ways as the awareness of the severity of this pandemic was only evident during the "lockdown" period. (NIAIA,2022)

This is not unforeseen as outbreaks in the past have happened of this nature, it just never amounted to the speed and ease of transmission globally. If we consider other "scares" of this sort like Ebola or dengue, they were contained before they reached "epidemic" let alone pandemic levels. (Prevent epidemics, 2022)

3 Impacts of the pandemic

3.1 Directly

In comparison to 2019, initially the potential scale of the pandemic was unpredictable, and later on became evident on the potential damages it could cause. It was only during March of the year 2020, when the growing concerns became a reality. This was soon followed by an immediate shutdown of air travel and civil aviation operations.

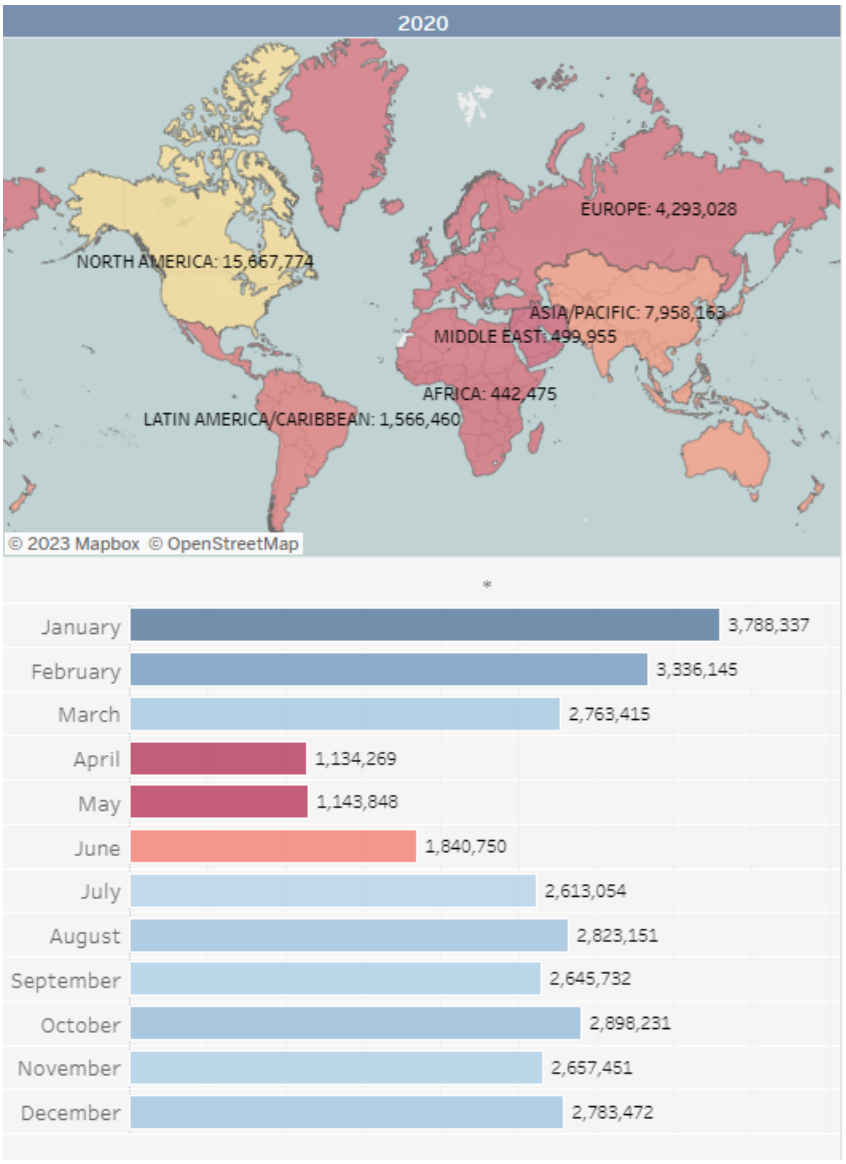

Figure 3. Passenger and cargo flights 2020, (Icao.int, 2020)

The effect of covid-19 on civil aviation was disastrous, the year after the initial outbreak is the worst year in aviation history. This is due to halting international travel, and revenue generated by tourism. Another report states that the current loss is at 220 billion USD, across the 2 years of the pandemic's height. 160 billion usd in the first year, which is then almost halved the year after. (Hardiman, 2022)

Other sectors in aviation that were affected briefly were cargo, the “stay at home” order decreased demand on goods and use of services, thus decreasing sales. Another issue with the Coronavirus is workplace closures, in particular ones related to aviation which caused overall earnings to go lower therefore decreasing purchasing ability/demand. Although demand was low for most items, some goods were higher in demand during the pandemic like medical equipment,sanitary goods and electronics to work from home. Which led to the market fluctuating heavily. This affected the speed but increased the demand for cargo, as transportation issues were rising due to borders being closed.(Iata, 2023)

Initially, when the virus spread across the world, the main concern for businesses were health and safety. This eliminated most businesses that relied on tourism and airline related jobs, therefore halting any potential work around indefinitely. Which then resulted in several damages to the economy, the industry and many that relied upon it. It is to be noted that all disruptions related to business are mainly due to civil aviation's inability to function efficiently. This can be related to demand and supply chain disruptions. In a supply chain you have steps to transport goods/raw materials, when there is a hindrance in the chain it can be felt across the board. When the hindrance is of a global scale like a pandemic it can affect everything that functions using these steps I.e. a business.

Loss of Revenue was the main issue, as Airlines experienced a significant decline in demand due to travel restrictions and concerns about the virus. This caused ticket sale reduction and a loss of revenue. In 2020 during the pandemics height, the seating fill capacity dropped to 50%, this means airlines on average could only fill half the flight. The revenue dropped by 342 billion USD in 2020, and nearly the same the year after to 324 Billion, a 4.9% decrease.This was the main issue with civil aviation as it caused loss for other industries. It can be said that it is the backbone of most functions because it is faster than sea freight and vehicle transport. (ICAO, 2021)

Another important issue with the pandemic is unemployment whether permanent or temporary. In an industry that employs 10.2 million people directly, it is said that these positions were put at risk during the height of the pandemic. To cut costs, companies commenced with laying off or furloughing their employees. This dented the industry's workforce, and other related businesses like manufacturers for airlines, inspectors, airline repairs, and other airport services, which employs 3 million in itself.

3.2 Impacts on other aspects

Operations being halted was a big part of the negative impacts of Covid-19, airlines had to reduce flights due to ticket sale reductions and to balance out expenditures. This affected businesses like airports, companies that handled ground operations like inspections, cleaning and stowing aeroplanes away awaiting for travel. Airport revenues include other things that generate revenue from landing fees,passenger fees and retail outlets. These are all direct operations that go on to aid commercial travel.

Additional impacts involve aircraft orders and parts of manufacturing. Airlines were either cancelled or postponed, especially orders for new aircrafts, leading to hardships for aircraft manufacturers like Boeing and Airbus. Since manufacturing was reduced, this affected their suppliers and the sector. Although not directly part of civil aviation, it does help with operations related to the flow of functions that are needed for commercial and cargo transport. (ICAO , 2021)

Leasing and finances were altered during this period, companies that leased aircrafts, and financed them faced issues as the timeframe for leases and loans could not be met, therefore resulting in changes and in some cases defaults. (DelGrande, 2022)

Businesses in destinations heavily dependent on tourism and hospitality, such as hotels, restaurants, and tour operators, suffered as international travel restrictions limited the influx of tourists. Regions highly reliant on tourism, especially through international flights, experienced severe economic consequences, with job losses and decreased business activity.

Companies reduced or eliminated business travel, impacting airlines and related businesses focused on corporate travel services. Businesses that provided components and services to the aviation industry, such as aircraft parts manufacturers, were affected by supply chain disruptions and reduced demand.

Overall, the economic damages caused by the pandemic on businesses dependent on civil aviation were significant and widespread, with many facing financial challenges, layoffs, and long-term impacts on their operations. (Bouwer et al., 2022)

3.3 Societal pressure on civil aviation as a result of the pandemic

The COVID-19 pandemic brought about a seismic shift in the world of civil aviation, significantly altering the way people and businesses engaged in air travel. As the virus spread globally, societies grappled with the challenge of containing it, leading to widespread changes in the aviation industry. This explores how society's perception of the coronavirus shaped the civil aviation sector, resulting in travel restrictions, reduced passenger demand, health and safety measures, financial strain on airlines, shifts in industry priorities, and long-term changes.

Public concerns about the virus led to a substantial decrease in passenger demand. People cancelled or postponed their travel plans, leading to airlines struggling with empty seats and declining revenue. Airlines were forced to cut back on flights and ground aircraft to cope with the reduced demand. This shift in demand dynamics presented a unique challenge to the industry.(Garaus and Hudáková, 2022)

Mental health was campaigned heavily during this period as it was a lonely time for the world. People were not allowed out of their homes out of fear, some were even separated from their families for extensive periods of time. Mental health priority was evident especially when the pandemic itself caused a lot of panic. People did not know if things were going to be as they once were. Once it was evident that travel would not commence, issues with isolation, flying being a health risk all created a reluctance for people to travel. This resulted ín a lot of unrest in people which in turn affected aviation's ability to control demand as there was a crash.

The unemployment issue is one that affected a lot of people mentally as individuals in certain civil aviation sectors could not maintain their jobs as the last results were made by airlines. Being a doubt on where you can get income from also created a lot of distaste and distrust for the situation. (ICAO, 2020)

3.4 Health and safety priority risk management

Airlines had to implement extensive health and safety measures to reassure passengers and crew that flying was safe. This included mask mandates, enhanced cleaning protocols, social distancing measures, and reduced in-flight services to minimise interactions and reduce the risk of virus transmission. These measures were essential for instilling confidence in passengers but also added to operational complexities.

Airlines and the aviation industry had to shift their priorities towards adapting to the "new normal." This included exploring cargo operations as passenger flights decreased, repurposing aircraft for medical supply transportation, and exploring new business

models and routes. The industry attempted to adapt in the face of unprecedented challenges.(ACI Insights, 2020)

Predicting when air travel would return to pre-pandemic levels became challenging, and airlines had to adapt their strategies for a more viable recovery. The industry is challenged by uncertainty and the need for new strategies, hence the constant changes in health and safety regulations throughout pandemics time and the implementation of new innovations.(Whitely, 2020)

4 Government intervention in minimising the effects of the virus on civil aviation

4.1 Financial Assistance variability, Regulations

Since it was unattainable in the beginning, there were various methods explored by airlines as its passenger utilisation was collapsing at a fast rate. This is due to the impact to the industry's economy. It prompted many requests for assistance in helping to control the damage to financials.This is when governments of various nations offered to step in and offer support.

It was a crucial role by governments in offering financial support to airlines that were heavily impacted. governments provided grants, loans, and financial packages, aiming to ensure the financial stability of airlines and safeguard jobs within the industry. Since unemployment numbers in airports and various commercial functions were at risk.

Another incentive to help was the pending unemployment crisis that was to come if the damages were to go for a long period of the time., preventing this from unfolding was paramount as this was a matter that could cause civil unrest and not good for the wellbeing of society and industries that aid commercial travel.

Governments also sought to prioritise national carriers. The importance of domestic flights, and cargo can be seen by the boost in overall economy. In isolated countries specifically, carriers aid in domestic travel and cargo, this incentivises governments to help financially, as in reverse can affect the economy .(Lee, 2021)

4.2 Travel restrictions expanded and safety measures

In response to risks in tackling the virus there were necessary changes needed to be made. While these measures had a significant impact on air travel, they were deemed necessary to curb the spread of the virus.

In addition to financial aid, governments introduced regulatory interventions. These included travel restrictions, such as border closures, travel encroachment, and quarantine requirements. While these measures had a significant impact on air travel, they were deemed necessary to curb the spread of the virus.

The scope of travel restrictions differed across nations, with some implementing stringent measures, including lockdowns, while others adopted more moderate approaches like social distancing. A few countries established travel corridors or bubbles to facilitate limited international travel while minimising the pandemic's impact on aviation.

governments mandated that airlines and airports had to have comprehensive safety measures to protect passengers and staff. These measures included mandatory mask-wearing, social distancing, thorough cleaning protocols, and health scans. Health and safety protocols were also introduced at airports and on planes, such as self check-in and improved ventilation systems. Some airlines conducted rapid testing for passengers before boarding. (Iata, 2020)

4.3 Role in Reparations and innovations

Governments played a pivotal role in mitigating the pandemic's impact on civil aviation by providing financial support, implementing regulatory interventions, and cooperating with the industry. The extent of these measures differed among countries, with some offering financial assistance, while others chose a more indirect approach.

In a complex and ever evolving crisis, governments worldwide worked to strike a balance between health concerns and the need of supporting the aviation industry during this challenging period. Governments organised compensated flights to bring their citizens home when commercial flights were unavailable due to restrictions. This demonstrated their commitment to safety and welfare of their citizens abroad, while sustaining important air routes.

Innovative solutions were also explored, including touchless technology and advanced cabin filtration systems, to reduce the risk of virus transmission on board. These innovations aimed to develop passenger safety and overall confidence in air travel. Another implementation was the push for a more digitised approach to air travel,

starting with corona pass, self-checkin and boarding passes all available via smartphone. (iata, 2020)

4.4 Failure in preparation, nature of the virus and Resource constraints

The civil aviation sector was largely unprepared, despite the historical concern regarding pandemics.This can be explained in three categories: the unprecedented nature of the pandemic, resource constraints, and complacency.

Covid-19 being a novel virus, with very easy transmission, spread rapidly and globally. The speed and severity of its impact took the world by surprise, making it challenging to anticipate and respond effectively. Previous pandemics like SARS and H1N1 (Spanish flu) offered learning points, but the scale and impact of COVID-19 were unprecedented.

To be prepared for a pandemic of this stature, requires a lot of resources. The aviation industry, often operating in tight spaces, was not financially equipped to deal with the extent of the crisis, we can see examples in many airlines going bankrupt and many needing to be supported by governments. Hence in part a reason why the focus was not there to begin with.

The aviation industry had historically focused on concerns like safety, security, and more common infectious diseases. The potential for a highly contagious respiratory virus to disrupt global air travel to the extent seen with COVID-19 wasn't the primary focus. This differing in focus played a role in the sector's lack of readiness. (National Academies , 2021)

4.5 Hindered by Complexity, complacency and globalisation

Effective preparation for a pandemic involves intricate coordination between governments, international organisations, airlines, airports, and health authorities. The logistics of such coordination are complex, and not all systems were in place to facilitate this level of coordination. Pandemics are a concern, but their timing, origin, and specific characteristics are difficult to predict accurately. This unpredictability makes proactive preparation for a specific pandemic, like COVID-19, challenging.

There may have been a level of complacency, as the world had not experienced a pandemic of this magnitude in recent memory. This complacency could have led to underestimating the potential impact and the need for change in how they operate from a risk management perspective. Natural disasters of this sort have always been a factor in all industries, and their impacts have always shown to be uncontrollable, therefore the level of consideration of the impact is in doubt hence the speculation for the industries complacency.(The lancet, 2022)

Complexity is another aspect that hinders any sort of proper planning, when an issue of this difficulty arises issues that are too complex to predict and deal with. This can be attributed to why it levelled the industry completely. To deal with a disease this complex requires understanding of the core nature of it and the potential impacts are always disputed. There have been scares of this type, if we take Small pox for example, all of the similar types (viruses), but the spread of these two was not even comparable to that of the coronavirus. The nature of transmission differs so when you consider how dangerous they are but how they act out in nature the outcomes were different.(Ulvestad, 2020)

The ease of global travel and the high volume of international passengers made it challenging to prevent the rapid spread of the virus, catching the aviation sector off guard. The interconnected nature of global travel posed unique challenges in pandemic containment.Although globalisation is a great connector of the world, it has its downsides for the general traffic of air travel in the case of the pandemic as its very nature allowed for the influx of people from all parts of the world and aided the spread of the virus to other nations more quickly. (Bickley et al., 2021)

The COVID-19 pandemic has highlighted the need for better preparedness in various sectors, including civil aviation, for global health emergencies. While the factors contributing to the lack of preparedness are diverse. As a result of the pandemic, there's been an increased focus on strengthening pandemic preparation and response measures in the aviation industry, aiming to better address such challenges in the future.

4.6 Where they Succeeded

The vaccination program had its controversies in the beginning which is largely unavoidable. This part is in the hands of health specialists who deem when a vaccination is ready for the public. This process took a long time in response to the growing concerns about the vaccination possibly enhancing the virus. A lot of aviation companies aided in transporting and campaigned for its use to the general public. This was in turn a positive as it can assure safe travelling. This is where they succeeded.

Another aspect that proved useful is the rapid testing, which was implemented at airports. This could get results within 15 minutes allowing for shorter wait times for passengers. instead of booking a time, one could get a test at the airport for a fee and leave with a pass that shows you have a negative test result.

Partly which they succeeded in largely due to government assistance is compensation for passengers that could not travel due to issues regarding their corona pass. Some passengers were left stranded for days in countries before transitioning to their home nation. This was a big issue which they attempted to resolve for the most part successfully.

Digitalising the process of flight is also a great way to keep traffic at a low and avoid unnecessary contact, this is slowly picking up pace in the industry. The biggest airports around the world, like Frankfurt and Heathrow have adopted a more digital approach to check-in, and boarding passes. This is more common today but at the time of the pandemic ,was not widespread across all airports around the world. This was one aspect they explored almost immediately and proved to be useful later on in the year. Initially however this could have avoided damages. (Jaumotte et al., 2023)

4.7 Criticism

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5 Recovery, Disparities, Challenges and opportunities

5.1 Estimates before recovery

It was forecasted by some data collectors during the pandemic that it would take several years before civil aviation returns to pre pandemic levels. In some cases the predictions were well into the future to the point it wasn't estimated to even make a full recovery again. This could be seen as unrealistic however considering the crippling damage on the industry there is a basis for this argument.

Eurocontrol in 2020 delivered estimates on how long it would take for each region to return to what it was before. These estimates range up to 5 years and were based on a lot of factors to make them. Examples being turnover, expenditures,flight prices , frequency of flying ,overall traffic data, Economic growth of regions and The vaccination program.

”Air passenger” recovery estimates range from 2..4 years on average globally and for Asia Pacific, 2.4 years for North Americas and 2.7 years for Europe. Air freight is estimated to be a fraction quicker with 2.2 years mean, 1.5 years for North America and 2.2 years for Europe and Asia. (EUROCONTROL Five-Year Forecast 2020-2024)

Air Passenger transport was affected more by the pandemic as it was directly shut down first. Air cargo was not affected by the pandemic as expected. For all things cargo transport is important and therefore was never hindered greatly by the pandemic as a work around was found. This is also the reason why the supply chain did not fluctuate as heavily as it should’ve as it maintained a consistent demand after the initial lockdown period.

5.2 Recovery after regulations were alleviated

As more borders began to open up in 2022, the aviation industry progressed in recovery. What was labelled as the worst year in aviation history by many in 2020, slowly contributed to a progressive future.

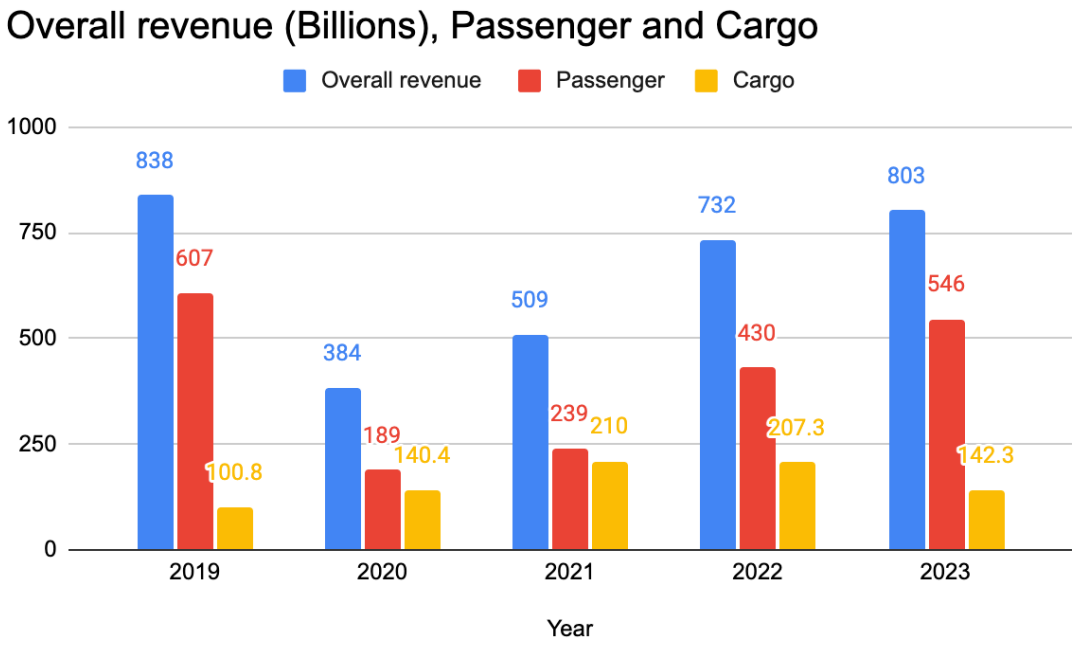

Figure 4. Revenue change since 2019, Passenger and Cargo included

Judging off the incomes of civil aviation, we can see that industry is slowly returning to pre-pandemic levels. Following projections in 2020, the estimated time to when it would return to normal was roughly 3 years. We can see that the predictions came close to the actual figures. Today it has reached nearly 95% recovery and in the coming years it is reasonable to state that it will exceed it.

To add some context, in the fall of 2021 the first phase of international travel began, this period saw increased passenger demand in relation to vaccination programs. Most international travel at this time required a vaccination certificate but in some cases it was enough to provide a negative corona test. This is exclusive to certain nations as the level of risk was lower than most therefore the need for restricting travel was not seen positively. This came with its downsides as during this phase new variants and spikes in positive test results became a concern.

It was only after this phase in 2022, where travel restrictions began to be alleviated, it can be attributed to vaccination injections being more widespread and overall decrease in cases. Once the borders opened up and air travel was deemed safe in tandem with the requirements. This however, was different in each region globally, some areas took longer than expected.

It is also interesting to see how revenue generated through Air freight or Cargo, rose during the pandemic greatly. Since passenger travel has returned closer to pre pandemic levels, we can see the drop in cargo. Although not a direct correlation between the two, when over 50% of the revenue generated is through passenger flights it could be foreseen that cargo revenue will drop. This can be due to the adapting focus and diversifying revenue to compensate for the lack of air travel during this time. Then when passenger travel becomes the backbone it restores cargo to its original function right behind it. (Kulisch, 2023)

5.3 Regional analysis in recovery

The recovery in august 2023, as explored in the data provided by the International Air Transport Association (IATA), is an indicator that shows how the industry is coping with the challenges caused by the pandemic. This section aims to provide a region by region analysis of the data, whilst highlighting the implications it makes for the future of civil aviation in the recovery phase post pandemic.

Air Passenger Market in Detail

AUGUST 2023 (%YEAR-ON-YEAR)	WORLD SHARE *1 RPK		ASK	PLF (%PT) *2	PLF (LEVEL) *3
Total Market	**100%**	**28.4%**	**24.9%**	**2.3%**	**84.6%**
Africa	2.1%	24.8%	24.3%	0.3%	76.4%
Asia Pacific	22.1%	73.4%	57.7%	7.4%	82.2%
Europe	30.8%	11.6%	10.2%	1.1%	87.6%
Latin America	6.4%	17.6%	14.5%	2.2%	85.1%
Middle East	9.8%	26.4%	21.6%	3.2%	83.0%
North America	28.8%	12.6%	13.0%	-0.3%	85.8%

(*1) % of industry RPKs in 2022 (*2) Change in load factor (*3) Load factor level

Figure 5. Air Passenger market in different regions (*iata.org,2023)*

To begin with the global overview of the data section, in August 2023, the civil aviation industry experienced significant growth and recovery. Revenue Per Kilometre increased by 28.3% compared to the previous year. This figure represents the revenue generated per kilometre flown. It indicates how effectively airlines are monetising their operations. The increase in RPK is a positive sign for the industry as it reflects an improved financial performance and indicates a growing demand for air travel.

Available Seat Kilometres (ASK) increased by 24.90%, and reflects on the industry capacity expansion. ASK represents the overall number of seat kilometres available. This growth indicates that airlines are adding new routes, flights and are increasing in seat capacity, which suggests their confidence in recovery in the civil aviation sector. However, an important restriction is that this increase in ASK should be ideally proportionate with the increase in RPK to maintain a balance between capacity and demand.

Passenger load factor is another important metric that scales the efficiency of seats utilised on flights. It is displayed as a percentage point change (%PT) and a level (%. In the month displayed the global PLF increased by 2.3% (%PT) and reached a level of 84.6%. This increase shows that flights around the world were at 84.6% capacity (Full). This also demonstrates a balance that is better between the amount of available seats and number of passengers which is in turn pivotal for airlines to operate more efficiently.

5.3.1 **Africa, Europe and Asia pacific**

Africa has a global market share of 2.1%. Although a relatively small share, it showed glimpses of resilience in 2023 particularly compared to the year before. The 24.8% increase in revenue per kilometre (RPK) points towards the airlines in the region successfully exchanging operations for value. The 24.3% growth in Available seat kilometres (ASK) indicates the airline's confidence in the revival of demand. The Passenger Load factor (PLF) in Africa increased by 0.3% to reach a level of 76.4%. This showcases an improvement in seats occupied. They also imply that the future for civil aviation in the continent of Africa could see it recovering steadily and growing economy wise.

The Asia pacific region has a meaningful share in the global market at 22.1%. The staggering 73.4% year on year increase in RPK shows that the growth in revenue can be attributed to the demand for air travel. The 57.7% increase in ASK also highlights the airline's foresight anticipation of sustaining demand. The 7.4% growth in Passenger Load factor also reflects the development in utilising more seats. The numbers suggest that the future for Asia Pacific looks bright as it has grown greatly in the past year.

Europe has by far the biggest market share at this current moment, accounting for 30.8% of the global market share. It has experienced a more conservative recovery as of August 2023. The 11.6% increase in RPK and 10.2% increase in ASK portrays fairly moderate revenue and capacity increase. The 1.1% increase in Passenger Load Factor (PLF) encapsulates only a slight improvement in seat occupancy. Using this data, we can imply that the growth overall is steady but cautious recovery for the continent.

5.3.2 **Latin America Middle East, North America**

In Latin America, it experienced a moderate recovery in regards to the data. The region has a global market share of 6.4%, which is relatively small for a region of this size. It could be due to economic reasons like consumer behaviour. This segment however enjoyed an increase of 17.6% in Revenue per kilometre (RPK). This growth can be attributed to positive trends in revenue generated. However, compared to other regions around the world it is relatively small.

The 14.5% increase in available seat kilometres suggests that the region is cautiously expanding its capacity, and indicates the recovery still to be ongoing. The Passenger Load Factor increased by 2.2% reaching a level of 85.1% compared to last year. This shows that there is an improvement in seat occupancy however minimal it may seem,

implying that the trust in travel safety is contributing to more seats. Just like Europe the growth is steady.

The Middle East represents a global market share of 9.8%, this could grow very comfortably in the future. The data shows a remarkable 26.4% increase in RPK, projecting great revenue growth in the past year. This increase can be a result of increased passenger demand but also the importance of the region as a travel hub connecting other regions to each other.

The recovery appears to be strong and contributing factors suggest government policies and economic support to have played a pivotal role. The Middle East has also experienced a cultural shift in recent times, the region has increased in tourism, and could potentially in the future be a tourist destination for many, without disregarding their recent success in this aspect. (Khan, 2023)

The 21.6% growth in ASK underlines airlines' confidence in sustained demand. These statistics are accompanied by a 3.2% increase in the Passenger Load Factor (PLF), reaching a level of 83.0%. This high PLF level demonstrates efficient capacity management and reflects growth in seat occupancy.

North America is a big player in the global market along with Europe and Asia, it accounts for 28.8% of the global market share in 202. Its revenue per kilometre increased by 12.6% and experienced a growth of 13% in ASK. Slightly modest growth in capacity however the recovery is comparably slower than the other regions. This however in North America's case is interesting, because it was one of the first nations to reach close to pre-pandemic levels, A big reason why america recovery was speedy is that domestically they fly more than any other nation, and the sheer size of the country increases this demand as trekking can be very long if not by air travel.

The passenger load factor (PLF) in North America decreased by a small -0.3%, the only region in this regard to show signs of slight slowing down. This suggests that the seat occupancy is lowkey, possibly indicating change in consumer behaviour, or possibly other regional factors like economy, or general flight trends.

Data of this nature involves metrics like RPK, ASK and PLF, as mentioned earlier. It serves as a lens through which there is possibility to understand disparities in recovery. In the context of a “post-pandemic world" this type of data is relevant for stakeholders to analyse performance.It also provides information on passenger behaviour which allows for them to tailor their services to meet the needs and demands. In regions with higher” PLF” levels, it could offer focus on expanding routes and changing customer experience, while regions with more modest “PLF”levels can choose to alter their services to meet these preferences.

5.4 Understanding possibilities for regional disparities

The industry has always been marked by regional disparities. These differences have drawn significant attention from experts,policymakers and analysts in the industry, as they offer unique insight in the multidimensional nature of the revival of the industry. In this section the aim is to delve into the possible reasons that could further expand on why disparities of this sort exist, and how they contribute to it. This in hopes can give an idea on the implications for the future of civil aviation.

Economic growth in aviation has historically been linked with passenger and cargo transportation demand. Economic growth in regions such as Asia Pacific has also seen a rise in air travel demand. As consumers regain their confidence in travelling and finances, they would be more involved in undertaking journeys for business and leisure. In contrast, if slower economic growth is noticeable in regions like Europe for example, it can be seen to affect the recovery of air travel. This also highlights the effects of the pandemic on employment and income of people, making it more difficult for travellers to spend in airfares.

Vaccination campaigns across regions also varied in terms of pace and use, this in general for civil aviation helped shape their recovery. Regions with higher vaccination rates witnessed stronger demand. The availability of these vaccines along with successful campaigns helped increase the public's trust in air travel safety. In turn, regions with faster rollouts of said vaccines rebounded quiver. On the contrary, regions where access to vaccines were limited faced slower rebounds and more prolonged issues with containing resurfacing of the virus which in turn hindered civil aviation in the region.

Government policies like travel restrictions as mentioned before, are also contributing factors to regional disparities. Some regions experienced a more strict method, while some offered more lenient approaches. It is also dependent on a number of factors such as wave of the pandemic, overall infection rates if they resurfaced multiple times. These impeded aviation recovery as it was forced to go through with limiting their operations to cargo and in some cases private travels. Europe for example recovered slowly as its closures were more strict than countries in oceania for example. This contrasts the more flexible policies that Asia pacific experienced as they were hit differently aiding the swift recovery. These policies have a big impact as we have noticed and aligned with recovery goals to be essential.

Consumer behaviour as in the change in preferences is another aspect that influenced recovery patterns in regions. Since air travel was the most affected part of civil aviation irrespective of cargo, we can see that with decreased passenger confidence in safety, and health measures, the demand dropped. Since the development in this regard has shifted, and more consumer trust has been built especially in regions where the recovery was more noticeable, it can be pointed to a correlation between the two. On the contrary, areas riddled with consumer concerns experienced a slower recovery.

These are all aspects that could contribute to regional disparities in regards to the pandemic, although there are more detailed sides to it on a base level this can be motioned to be explanations for potential regional disparities. It would require extensive analyses of statements and data from each individual region to uncover the full picture more empirically.

5.5 Transparency and adaptability boosted recovery

Civil aviation was always bound to recover, it just needed thorough thinking. The pandemic taught many lessons and the need for change grew. In this recovery process , there were many lessons that did not seem like learning points at the time. Like any disaster, for example the housing crisis in 2008, and now the pandemic in 2020, they all have one thing in common. All disasters of the sort accelerate civil aviation risk management and development, whether it is security, financial replanning or in the pandemics case technology.

When faced with the pandemic there were a lot of questions on Air travel and the gap that needed to be bridged was the “transparency and reliability” of airlines and their concerns. Even after the cases dropped substantially people were afraid to travel, a form of scepticism that led to many pondering if this was a “risk” they were willing to take.

Since passenger demand dropped, the first step airlines made was to rope people back in. This required assurances from airline companies, as society was still recovering from the isolation that the pandemic caused. Although there were a lot of eager travellers, the transition had to be fault free and imperatively “safe”. Airlines enhanced safety protocols and processed new methods like flight safety programs, and expressed the importance of self diagnosis. Flying was not recommended for those experiencing flu like symptoms and repeated “awareness” on the issue weeded out any potential misunderstanding and misinformation (iata.org, n.d. 2021)

5.6 Remaining challenges and how it can be assessed using different paradigms to risk management

In the midst of significant transformation due to the pandemic, it involves a big reassessment of how the industry considers risk. In particular how global crises appear in context. Traditional risk management plans are focused usually on response and recovery, however the pandemic has exposed weaknesses that demand thought on how the industry perceives,minimises and prevents these risks. Exploring the ongoing vulnerabilities and their implications for assessing risks in particular how it can be emphasised to shift towards risk prevention wherever possible as a core process.

A paradigm shift from risk management to embracing risk prevention if possible as a response to ongoing challenges could shape the future for civil aviation. Although largely theoretical it can be a central element for the industry. Instead of being solely focused on risk mitigation and boosting recovery, why not shift the piece to proactive identification and decision making before issues materialise. This can address vulnerabilities and uncertainties driven by a learning curve deriving from the pandemics impacts. Obviously not all issues are preventable, but for the once that can be it can be offensively tackled, instead of riding the wave.

Economic vulnerability is an ongoing challenge, especially stemming from the pandemic in recent years. The cause of this issue is a drop in demand, which in turn highlights the need for a different approach to risk management strategies that consider the consequences of economic shocks, before they take hold. Proactivity in the sense that there are measures, safety nets, diversity in revenue and engaging in planning to withstand it. An offensive defence. (eurocontrol.int, n.d.)

Since this vulnerability exists it can also impact the supply chain, this spurs the need for a more effective supply chain diversification and contingency planning. A diverse supply chain can reduce reliance on specific sources, which minimises the risk of future disruptions. Contingency planning also involves the developing of effective responses, this ensures the continuation of critical supplies in unforeseen events. This was demonstrated towards the latter period of civil aviation, as demand was always high for cargo as it facilitates other industries as well. It is utilised heavily and acts as backbone

for other industries hence the ripple effect that is caused once this particular part of civil aviation is halted. (linkedin.com, Bromiley 2023)

In addition, the acceleration of digital transformation during the pandemic has brought new vulnerabilities in the form of cybersecurity. As the industry increasingly relies on digital technologies, safeguarding these systems against cyber threats becomes more evident. Risk prevention in this context can entail identifying and addressing all the possible threats in a proactive manner. This can come in the form of cybersecurity measures like antivirus checks and protocols for IT, and diligent behaviour in scanning for the possible weaknesses in the system. (aviator, 2023)

Workforce, a highly volatile industry like civil aviation, has had its downsides in generating value in the past. This lack of security financially creates instability in terms of employment for the industry. Seeing how the pandemic put several jobs at risk, it can be stated that this is an issue that needs to be pondered on. Having the uncertainty of maintaining your position as an employee in times of crises creates distrust and unrest within the industry. It has already been an issue in the industry with the delays and cancellations being a result of the lack of a strong workforce but for it to be unstable like we have seen in the pandemic is not the best outlook. Risk prevention measures should explore ways to be able to stop laying off workers as a last result to cut down on costs. This is extremely difficult as this is a part of every industry around the world.

This is just to highlight a few challenges that face the future for civil aviation in the form of Economic vulnerability, supply chain risks, cybersecurity challenges, and prioritising the needs of passengers and employee job security, continue to influence the industries risk management. This is the general point of having risk prevention wherever preventable as a fundamental method. It can demonstrate the perks of proactivity in reducing shocks and fluctuations in the global economy, ensuring a more resilient industry and its evolving challenges.

5.7 Opportunities for sustainable growth and innovation

Excusing the challenges that pandemic brought to the future of civil aviation, the industry still has a lot of opportunity for sustainable growth and innovation. These opportunities are essential for constructing a more resilient and eco-conscious flight, which coincides with the central question regarding the impact of the pandemic and its implications for the future. These opportunities focus on environmentally responsible practices, transformation and adaptation to the travel patterns that vary.

In part, the impacts of the pandemic grounded has given civil aviation an emphasis on sustainability. This is where having Sustainable Aviation Fuels (SAF), which significantly reduces carbon emissions, is a critical step toward achieving this goal. Airlines investing is SAF, demonstrating a commitment to the global environmental goals that other industries have focused on adopting more recently, whilst encouraging long term resilience. Green initiatives are not new and procuring a more fuel efficient aircraft and implementing eco friendly methods for operation can help distinguish airlines in a post pandemic world. Introducing ethics and responsibility to our environment can attract a passenger that is eco-conscious and provide a “marketable” advantage. Hence the pursuit of a green future in this day and age. (matthey.com, n.d.)

Earlier we touched on the challenges of digital transformation, but with it comes a lot of opportunity. Solutions like artificial Intelligence systems in aircrafts have been explored in the past, however it is still in the development stage and has not been adopted extensively. Biometrics and contactless systems are other opportunities that are being explored currently by commercial airlines to enhance safety for passengers. This type of enhancement offers seamless technology driven passenger experience.

Recognizing this opportunity and investing in digital transformation can redefine the journey a traveller gets, with a more defiant contactless system like check-ins, self-service kiosks, and personalised in-flight entertainment for a more luxury setting. These innovations are not only important for improving customer satisfaction but also develops the sector's resilience as stated to be a pivotal part of all innovations. (Thales Aerospace Blog)

For civil aviation there has always been a surge for international travel in the past but as a result domestic travel has not peaked the same way. Since the pandemic surfaced the domestic and regional travel has become more prevalent. This change in travel patterns can shift the opportunity to cater to more evolving needs of local travel like more routes. This can capture a new market and also contributes to economic growth, tourism and more jobs. Focusing on this section of travel can be more strategic and aid a sustainable future. (Travelpulse, 2020)

Despite any challenges, the doors are open for growth and innovations in the industry, prioritising sustainability, and developing digitization, and tracking travel patterns incurs a more stable future. These are all crucial opportunities for the future in a post pandemic world. By seizing it, it can put the sector in a great position to pursue a resilient future.

5.8 Conclusion

5.8.1 Recap of the key points and trends

To conclude, revisit the journey taken, highlighting key points, trends and touch on the crux of this paper, which is the implications for the future of civil aviation using the pandemic as a point of reference and assessing how risk management aimed to do so. Before the pandemic, the civil aviation industry was steadily soaring. It boasted impressive key performance indicators for the most part. It registered increasing passenger numbers yearly and positive market trends. These optimistic implications changed after it faced the unprecedented challenge in Covid-19.

The pandemic caught the industry off guard, with a staggering decline in passenger numbers, and resulting in civil aviation facing heavy financial losses. As the industry grappled with this event, governments intervened, and provided support, which turned out to be a lifeline for many airlines and operations as a result of aviation.

Amid the passing storm of the pandemic, a hint of hope emerged as statistics began showing gradual increase in passenger demand. People wanted to travel again but there were obstacles in the way. Airlines had adapted to the situation and displayed resilience and innovating new ideas like safety protocols and adjusting business models to keep up with the changing landscape of commercial transport. The recovery phase symbolised the industries determination to rebound from such adversity.

However, the path to full recovery was not the same across regions, statistics highlighted the significant variations in recovery rates, and posed several possible factors that influence this in the form of vaccination rates,government policies and regional economic growth. The data underscored the industry's adaptability as it was evident it needed to cater to the varying conditions across the world.

The future for civil aviation is approaching and it comes with several challenges. Since the pandemic passenger confidence, public health concerns and vaccine distribution has spurred a change in the industry but still casts a shadow on their efficiency. These challenges also highlight the opportunities present for sustainable growth and digital innovations. This spurs the industry to adapt and embrace change for a more resilient future.

5.8.2 Implications for the future of civil aviation

The pandemic's impact was unprecedented, its effects will still be felt for years to come. The resilience shown is commendable and the adaptability proven during the pandemic displayed thought. Considering the dire circumstances, airlines and business persevered, implementing solutions to address the challenges, therefore this can be taken as an asset in the future for tackling similar issues.

The future implies that safety and health will always remain important as the pandemic generated a renewed focus on safety and health within the civil aviation industry. These sorts of protocols and health measures introduced will likely stay in the future. It ensures a safer, more comfortable travel experience from a consumer perspective.

Government collaboration is also a really important aspect of modern day civil aviation. The support displayed during the crisis were pivotal in helping the industry ride the wave. The aviation sector flourishes due to ongoing collaboration as evident in recent events, especially in addressing regional disparities.

The recovery is evidence of the industry's vitality. Statistics showed the industries recovery in a globalised world. As the world starts to open up the demand for air travel will increase, the industry to follow through with the increase, must be prepared. Meeting these demands is essential whilst continuing to prioritise safety and sustainablity.

In the angle of sustainability, it is a growing concern globally, therefore we can understand why it is the way forward. The pandemic offered opportunities to the aviation sector to welcome a more sustainable and environmentally responsible future. This can be seen from the green initiatives and progress in sustainable aviation fuels. This is slowly becoming a central strategy for growth as these opportunities will help airlines reduce their carbon footprint and attract environmentally conscious travellers.

Digitalization is a part of the future. The acceleration in this department during the pandemic has paved the way for a more technological based sector. Airlines should continue to invest in digital solutions and offer passengers a more contactless travel experience. This ensures a more convenient and safe alternative when facing the challenges of the future.

The Covid-19 pandemic was a test for the industry. It tried the sector's tenacity and it came with valuable lessons and opportunities. The path forward is one that can couple character with innovation, health with safety and adaptability with sustainability. The future for civil aviation is highlighted by the implications of its exploration of potential. Ready to rise when given the chance. The journey was challenging but it assures the industry’s significant role in connecting people and the world. It signals to the aviation sector to continue its goal of shaping the future where the skies are not just a destination but also a journey of enduring change.

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