CAT 10 FUTURE TRENDS

Group 10-24

Rejuvenating Changi: The Future of Air Travel

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Challenges

Challenge 1: Hindered Recovery - Domestic vs International

Singapore is a tiny island, with only one major international airport and one smaller regional commercial airport. During the COVID-19 pandemic, many countries around the world, including Singapore, closed their borders to prevent the spread of COVID, causing nearly all operations to cease. To add fuel to fire, with Singapore being only 40 kilometres in length, a domestic market was not feasible, further hampering our aviation sector. For instance, in April 2020, Singapore Airlines and SilkAir only flew 308 flights, a 97% reduction in flight volumes. This resulted in severely reduced revenue, and with the added financial pressure of maintaining grounded planes, it is only logical to assume that Singapore's aviation industry will take a turn for the worse. According to CNA, Singapore Airlines has to use over 15 silica gel bags a day in order to remove moisture to prevent engine damage. Singapore Airlines also has to prevent wildlife intrusion which may cause fatal damage to electrical systems. Ensuring that the plane is properly maintained when grounded demands much financial resources and manpower, which the industry ultimately lacks during the pandemic. This is also proven by our interview with a Singapore Airlines engineering department officer who is in charge of such operations, citing that it is extremely costly to keep and maintain the grounded planes, bringing up a notable point of the cost of parking, which is around 300 dollars an hour. Thus, the need to revive the international aviation industry in Singapore is of paramount importance. The amount of time planes are left on the ground is in direct correlation to the worsening of the situation in the aviation sector. Unlike other larger countries such as the United States and China where the domestic market still allows for limited operations, Singapore is at a major disadvantage, with a completely stagnant aviation industry. This will cause recovery to be hindered and painful, posing a huge challenge in the reopening of our aviation sector.

Challenge 2:

Lack of confidence - Persistent beliefs

After the devastating effects from the COVID-19 pandemic, people are generally more cautious with their travel decisions, and with the majority of infection rates here consisting of imported cases, many people doubt the safety of air travel. Potential travellers now do not trust the aviation industry and are not confident in them providing safe services. Especially with the perception of packed airport terminals and the ease of transmission, it ingrains in travellers that air travel is dangerous. According to a survey of 9,500 respondents from 12 countries, only a third (34%) of passengers surveyed have taken a commercial flight since the pandemic began. Additionally, four in ten passengers (41%) expect to travel less by any means and a third (31%) plan to fly less and these sentiments are even higher among Asian passengers. To add on to that, we have also conducted a survey investigation among HCI students and their parents, where over 45% feel unconfident in air travel 5 years from now. Therefore proving that the belief of travellers heavily influences the recovery of our aviation sector.

Challenge 3:

Inefficient Contact Tracing - Technological limitations

Contact tracing has emerged as a fundamental part in curbing the spread of COVID-19. If a government can identify problem spots or clusters, they can isolate that area such that the spread is contained, or they will know where to concentrate their resources, such as tests. In March 2020, only about 2 months after Singapore's first confirmed case, the government launched TraceTogether to aid with contact tracing. When a confirmed case is identified, TraceTogether will identify who the person has been in close contact with for the past 14 days, so that the government can identify clusters. However, TraceTogether relies on dated Bluetooth technology with no precise location feedback or personal detail tracking, this makes contact tracing extremely inefficient. Coupled with the inherent inaccuracy of Bluetooth location pinging (20-30 meters) and limited range, TraceTogether is incapable of ensuring safety in the scale of the aviation industry. An example of this is the number of unlinked COVID-19 cases in the community recently, with upwards of 40 unlinked cases out of 100 daily cases. Furthermore,

MOH specifies that “(Out of) 25,000 close contacts of COVID-19 cases so far, of which 160 were eventually tested positive COVID-19 cases”. To pick out over 25000 people to confirm 160 cases is extremely inefficient and will not fit the needs of resuming air travel. Thus, technological limitations challenge the proposal to resume air travel.

Challenge 4:

Globalisation - The Super Spreaders

As the world progresses further into the 21st century, it becomes increasingly globalised and interconnected. This has resulted in a net increase of movement of people from one country to another. According to a report by the United Nations, globalisation in the 21st century has helped global GDP grow from around 50 trillion USD to around 75 trillion USD from 2000-2016. Hence countries are undoubtedly becoming more reliant on globalisation for economic growth. Being the fourth largest financial hub in the world, and the world’s largest logistics hub, it is inevitable that the resumption of air travel will result in an overflowing amount of traffic in and out of Singapore, causing potential “super spreaders”, which will eventually cause a cease in operations once again. Before the COVID-19 pandemic, Singapore Changi Airport was the second busiest in Asia, indicating that a large volume of passengers transit through Singapore. According to IATA, 11.8% of Singapore’s GDP is supported by air transport and foreign tourists arriving by air, making a reopening of the aviation sector lead inherently to a high volume of people transiting in and out of Singapore. This leaves us in a vulnerable position in our battle against the spread of COVID-19 and Globalisation is therefore a formidable challenge in the reopening of our aviation sector.

Challenge 5:

Financial Struggles - The problem of money

The COVID-19 pandemic has seen international air travel come to a virtual standstill, and with governments around the globe shutting borders, airlines are taking the brunt of the economic impacts this has brought about. According to Statistica, airlines have been making profits every year since 2010. However, due to the COVID-19 pandemic in 2020, these corporations lost over 126 billion dollars. The prevalence of empty flights, maintenance fees and employee remunerations, led to many airlines being unable to meet the break-even point (the point at which revenue = costs). While the Air Cargo industry has taken less of a hit due to the increase in demand for medical supplies around the world, revenue from the Cargo industry is not enough to fill the gap in the otherwise non-existence of international air travel. According to CNBC, over 40 major airlines have gone out of business due to the economic impacts brought about by the pandemic. Many of such airlines are low-cost carriers, such as Germanwings, which went out of business in 2020. With competing airlines ceasing operations, prices for operating airlines are driven upwards to maintain profit margins, thus causing a multifaceted challenge to both consumers (by higher prices) and airlines (financial recessions).

Underlying Problem:

Forward Thinking - COVID ends at Changi

Given that the COVID-19 crises may be a potential challenge to the recovery of the aviation sector 5 years from now, which will impact the financial viability of the aviation industry in general and Changi Airport in particular, how might we improve the safety levels of Changi Airport through the use of advanced technology, so that Changi Airport can play its part to eliminate the possibility of COVID-19 transmissions before travellers board their flights, thus ensuring a safe environment for potential travellers and boost the confidence of potential travellers to ensure a safe and successful reentry into air travel in 2030 and beyond?

Proposed Solutions

Solution 1: Integrated Recovery System

We, Changi Airport Group, together with the Ministry of Home Affairs, would implement an Intelligent Recovery System in all terminals by September 2022. This is done so as to eliminate COVID-19 exposure and spread levels before travellers board their flight to reinstate Changi Airport as the gateway to the reopening of the aviation sector, and maintain our customers' expectations and experiences. This Intelligent Recovery System will make use of multiple advanced technologies, such as early detection algorithms, neural processing units, LiDAR (Light detection and ranging), Big Data management systems, biometric technology, etc. in order to **eliminate** the possibility of COVID transmissions **within airport premises** and **before** passengers board their flight. All of this will be managed by AI.

Solution 2: Campaigning

Changi Airport can showcase the measures that they are putting in place in order to ensure that there is no spread of COVID-19 in the Airport. They can publish promotional videos showing the sanitisation process of high risk areas, such as toilets and restaurants and the positive effects of social distancing implementation. This will reassure the public that Singapore's Changi Airport is working to ensure that it will do everything possible to prevent the spread of COVID-19. This would allow people to feel safe returning to Changi Airport, and return to the skies.

Solution 3: Cooperating with Government

Changi Airport can work with the government to improve TraceTogether such as increasing the range or accuracy of the software. We can also work to reduce the power consumption of the program to encourage more widespread use. With the emergence of future technologies, TraceTogether may finally possess the capability to work on the scale of the aviation industry, and thus help in resuming air travel.

Solution 4: Safety Ambassadors

Safety Ambassadors can be deployed throughout the airport, manually looking for potentially sick or unwell individuals, and to remind individuals to keep a safe distance from each other. This will ensure that there is a lower chance of the Covid-19 virus spreading amongst people in the airport, and people who are infected can be immediately isolated. People will thus be less likely to catch the Covid-19 virus at airports and pass it on to others, making air travel safer.

Solution 5: Compulsory Vaccination Status and Swab Test

Changi Airport can enforce rules that ensure people are fully vaccinated and tested negative of COVID before boarding flights. This will ensure that people on flights do not carry COVID at the time of departure, preventing the spread of COVID within the airplane. This will lead people to believe that air travel is safe, encouraging more people to resume air travel.

*COVID Testing and Vaccination status verification is not yet compulsory in all countries (UAE for example)

Criteria

Criteria 1: Speed Which solution is the fastest to implement, so that it will be able to resume the aviation sector as quickly as possible to lessen the impact of COVID on the aviation sector?	**Criteria 2: Cost** Which solution is the cheapest to implement, so that the least amount of strain is caused on the aviation industry financially?	**Criteria 3: Effectiveness** Which solution is the most effective, so that it will be able to prevent a rebound in COVID cases and ensure that the resumption of the air travel is permanent
Criteria 4: Reliance on manpower Which solution is the least reliant on manpower, so that lapses in contact tracing is kept to the minimum and cost for salaries is eliminated to reduce the financial burden on the already stricken aviation industry. *Lower reliance receives higher score	**Criteria 5: Ease of implementation** Which solution is the easiest to implement, so that the implementation process will be effective and puts the least strain on the industry	

Application

No.	Suggested Solution	Criteria					Total /25
		1	***2***	***3***	***4***	***5***	
1.	Integrated Recovery System	3	3	5	5	3	***19***
2.	Campaigning	3	5	1	2	4	15
3.	Improving TraceTogether	3	3	4	4	3	17
4.	Safety Ambassadors	4	1	2	1	4	12
5.	Enforce vaccination and testing	3	3	5	1	3	15

*1 represents worst, 5 represents best

Selected solution: Integrated Recovery System

Action Plan

Overview:

We, Changi Airport Group, together with the Ministry of Home Affairs, would implement an Intelligent Recovery System in all terminals and by March 2022, this system will be fully functional in T1,2 and 3, and by September 2022, will be in T4. This is done so as to eliminate COVID exposure and spread levels before travellers board their flight to reinstate Changi Airport as the gateway to the reopening of the aviation sector, and maintain our customers' expectations and experiences. This Intelligent Recovery System will make use of multiple advanced technologies, such as early detection Algorithms, Neural processing units, LiDAR (Light detection and ranging), Big Data management systems, etc. and Biometric technology. All of this will be managed by AI.

Part 1: Early detection

Terahertz technology is also placed at the entrance of the airport, allowing us to earlier detect the presence of infection and react to first threats and possibly prevent transmission from occurring. The system will be a major improvement over current measures, as it does not have problems such as lapses and inconsistencies of bluetooth transmissions, therefore giving more consistent and conclusive results.

Part 2: Holistic assessment

Together with the early detection system at the entrance, each and every passenger's health is thoroughly monitored through the use of LiDAR scanners in place throughout the airport, and binaural beamforming microphones will be constantly detecting and monitoring the presence of coughs and or sneezes.

Part 3: Increasing Reliability

All of the data will be processed locally and encrypted with an anonymous identifier which only the on-location neural processor can read. This information will be traced back to the passenger via his boarding pass and he/she will be notified via an sms to go for further testing.
To increase the reliability of this system, trace together information will be used and stored in the database, which will rank the severity of each case and determine the cause for concern on a case by case basis.

Part 4: Privacy Concerns

To maintain user privacy and confidentiality, all information stored will be deleted once the passenger boards the flight. With this system in place, the current concerns about safety of air travel, customer confidence and overall recovery of our aviation sector will be fully addressed. This therefore, pushes towards a smooth reentry into aviation, enabling seamless travel experience, upholding our reputation, customers' expectations and experiences, while not compromising passenger safety.

Part 5: Impacts and Consequences

The implementation of the Intelligent Recovery System will positively impact the aviation industry. With AI monitoring the airport at all times, the efficiency and effectiveness of COVID prevention is exponentially increased. While the current system can help us get by in our daily lives, factoring in the prospect of international mobility presents a different and more complex set of challenges, that only a multi pronged approach, such as the IRS can ensure effectiveness. By detecting threats early on and monitoring the situation constantly, IRS is able to identify and neutralise potential COVID threats and heighten safety levels throughout the entire process of air travel, thereby contributing to greater customer confidence and leading ultimately to a smooth reentry into COVID resilient air travel

Implementation timeline

This is our implementation timeline of our action plan:

1. 2021: Investment into different technologies
2. 2022: Implementation and usage of Intelligent Security System across T1,2 and 3.
3. 2022 Fall: Implementation and usage of Intelligent Security System in T4

References

IATA, E. (2018). *THE IMPORTANCE OF AIR TRANSPORT TO SINGAPORE*. IATA Economics. https://www.iata.org/en/iata-repository/publications/economic-reports/singapore--value-of-aviation/ .

Yahya, F. (2021, February 18). *Commentary: This is why Singapore needs to save its airlines and aviation sector*. Channel News Asia. https://www.channelnewsasia.com/commentary/singapore-needs-to-save-airlines-aviation-budget-sia-support-359436.

Gov.sg, CAAS. (2017, September 18). *Learn About Singapore Aviation*. CAAS. https://www.caas.gov.sg/public-passengers/learn-about-singapore-aviation.

Sobie, B. (2020, August 12). *Commentary: The outlook for Singapore Airlines has gone from bad to worse*. Channel News Asia. https://www.channelnewsasia.com/commentary/outlook-will-worsen-for-sia-sq-singapore-airlines-travel-bubble-617761#.

Tan, DJ. (2021, January 6). *Quick Take: Singapore's aviation sector faces an uncertain outlook in 2021*. FSMOne. https://secure.fundsupermart.com/fsm/article/view/rcms219880/quick-take-singapore-s-aviation-sector-faces-an-uncertain-outlook-in-2021.

Sobie, B. (2021, January 27). *Despite promising signs, SIA and Changi Airport could see fewer passengers in 2021 than 2020* Today. https://www.todayonline.com/commentary/despite-promising-signs-sia-and-changi-airport-could-see-fewer-passengers-2021-2020.

Iwamoto, K. (2021, May 19). *Singapore Airlines recovery 'unclear' as COVID resurges in Asia*. Nikkei Asia. https://asia.nikkei.com/Business/Transportation/Singapore-Airlines-recovery-unclear-as-COVID-resurges-in-Asia.

Goh, J. (2021, May 14). *Aviation's Post-Crisis Recovery Series: Singapore Changi Airport*. International Airport Review. https://www.internationalairportreview.com/article/158862/aviation-recovery-changi-airport/.

Chia, L. (2020, August 15). *COVID-19 grounded thousands of planes. Here's what happens to them*. Channel News Asia. https://www.channelnewsasia.com/cnainsider/covid-19-grounded-thousands-planes-this-is-what-happens-airlines-621331.

Josephs, L. (2020, January 1). *U.S. airlines' 2020 losses expected to top $35 billion as pandemic threatens another difficult year*. CNBC.

https://www.cnbc.com/2021/01/01/us-airline-2-losses-expected-to-top-35-billion-in-dismal-2020-from-pandemic.html.

Mazareanu, E. (2021, May 11). *Profit and loss of commercial airlines worldwide from 2010 to 2021, by region*. Statista. https://www.statista.com/statistics/275603/profit-loss-of-commercial-airlines-worldwide/.

Halmare, M., & Muretja, S. (2021, March). *Air Freight Market by Service (Freight, Express, Mail, and Other Services), Destination (Domestic and International), and End-Use (Private and Commercial): Global Opportunity Analysis and Industry Forecast, 2020–2027*. Allied Market Research. https://www.alliedmarketresearch.com/air-freight-market-A06421.

Centre, A. (2021). *airberlin Airline Profile*. CAPA. https://centreforaviation.com/data/profiles/airlines/airberlin-ab

The Future Of Air Travel, R. C. (2021, July 3). *Survey Result 5.png*. Survey. https://drive.google.com/file/d/1gtiiG56JVZUxbKqo3YiGCNM8WZktVlgf/view?usp=sharing

20 Year Passenger Forecast. (2021, January 3). IATA. https://www.iata.org/en/publications/store/20-year-passenger-forecast/

Bogaisky, J. (2020, December 29). *What's Ahead For Airlines And Aviation In 2021*. Forbes. https://www.forbes.com/sites/jeremybogaisky/2021/12/29/whats-ahead-for-airlines-and-aviation-in-2021/?sh=68cc3f0336ad

Deep Losses Continue Into 2021. (2020, November 24). Geneva. https://www.iata.org/en/pressroom/pr/2020-11-24-01/

International Airport Review. (2021, April 13). *2021: A signal for the aviation industry to enter stand-by*. https://www.internationalairportreview.com/article/156375/2021-signal-aviation-enter-stand-by/

Luman, R. O. S. (2021, March 17). *Aviation sector outlook: The pandemic is testing airlines for far longer*. ING Think. https://think.ing.com/articles/outlook-aviation-lasting-restrictions-put-airlines-longer-to-the-test/

Moody's sees negative outlook for global airlines in 2021 due to COVID-19. (2020, November 18). S&P Global Market Intelligence. https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/moody-s-sees-negative-outlook-for-global-airlines-in-2021-due-to-covid-19-61351546

Reduced Losses but Continued Pain in 2021. (2021, April 21). Geneva. https://www.iata.org/en/pressroom/pr/2021-04-21-01/

Subramanian, S. (2020, October 23). *Inside the airline industry's meltdown*. The Guardian. https://www.theguardian.com/world/2020/sep/29/inside-the-airline-industry-meltdown-coronavirus-pandemic

What COVID-19 did to European Aviation in 2020, and Outlook 2021. (2021, January 1). EUROCONTROL. https://www.eurocontrol.int/publication/what-covid19-did-european-aviation-2020-outlook-2021

Zhi, N. S. J. Y. C. (2021, May 18). *S&P Global Platts*. Platts. https://www.spglobal.com/platts/en/market-insights/latest-news/oil/051821-new-covid-19-waves-burst-travel-bubble-hopes-dimming-aviation-outlook