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STARTUPS: Founding airlines during COVID-19 - A hopeless endeavor or an ample opportunity for a better aviation system?

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A B S T R A C T

The devastating impact of COVID-19 on aviation is unprecedented and undoubted in the recent scientific literature, with many studies having dissected different facets of COVID-19-induced changes to the industry. A few studies have stepped further and highlighted that the COVID-19 pandemic could have positive long-term impacts on aviation. Given that traditional air carriers are known to be reluctant for performing high-risk experiments outside their business-as-usual, parts of hope for a better aviation future rests on novel players entering the industry. The pandemic - against common perception and odds - might have created a rare opportunity for airline startups to enter the market. In this study, we first dissect the impact of the COVID-19 pandemic on aviation and how it possibly created a breeding ground for new airlines. We propose a framework of eight facets, STARTUPS, covering flight Suspensions, Talents, Aircraft, Recovery, Travel demand, Uniquity, Policy making, and Strategy. Moreover, we analyze the business model and markets of 46 airline startups, established or becoming active during the pandemic. Our study is concluded with a discussion on the risk factors for airline startups during the COVID-19 pandemic and induced policy challenges. Our analysis, we believe, is complementary to existing studies on COVID-19, leveraging a novel perspective on the pandemic and the aviation industry.

1. Introduction

The air transportation industry has consistently outperformed many other sectors in terms of growth rates, with mostly excellent predictions into the near-term and mid-term future, given increasing desire to travel and emerging new markets. The industry has faced several historical setbacks - each of which was temporarily considered a major tragedy by aviation stakeholders. We revisit a few examples. First, following the 9/11 attacks, the aviation industry was in a big shock, envisioning a major setback in travel patterns and aviation procedures (Blunk et al., 2006; Gordon et al., 2007). A second example is the Global Financial Crisis (GFC) in 2007–2008 (Harvey and Turnbull, 2009). A third example is the Ash cloud over parts of Europe in 2010 (Mazzocchi et al., 2010). While being fundamentally different in their causal structure, the impact on aviation shares significant commonalities. While aviation stakeholders were quick to ask for financial support, which is partially caused by the fact that typical airlines can only cover around two months of revenue loss with its cash reserves (Zhang and Zhang, 2018), the overall industry showed a high degree of resilience. In either of these three examples, the industry recovered and performed arguably stronger than before the crisis. The interested reader is referred to Klenka (2019) for a review on major historical incidents shaping the aviation industry and Abeyratne (2017) for a broad discussion on crises categories in aviation.

COVID-19 is the latest crisis on aviation’s horizon. Many studies in the literature have dissected the impact of COVID-19 on aviation (Suau-Sanchez et al., 2020; Sun et al., 2021d; Tisdall et al., 2021; Ng et al., 2021). The most direct impact on aviation was an unprecedented reduction in demand and the number of flights; the latter not only caused by less demand but also was due to excessive international flight

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The impact of COVID-19 on aviation has been discussed widely in the recent scientific literature. We refer the reader to a few selected surveys and overview for details (Suuau-Sanchez et al., 2020; Sun et al., 2021d; Tisdall et al., 2021). Here, we first summarize the key impact of COVID-19 on aviation by distinguishing eight facets of COVID-19 and how they have influenced the aviation industry. Our discussions on these facets are accompanied with pointers into the recent literature. An overview of the eight facets is provided in Fig. 1. The overall framework is abbreviated as STARTUPS.

1. Suspensions: Starting from March 2020, many airlines started to implement flight suspensions (Suzumura et al., 2020). These suspensions were mainly driven by the increasing number of flight bans between countries, and the declaration of COVID-19 as a pandemic by the World Health Organization, in face of rising toll of reported COVID-19 cases. This reduction in the number of flights and (temporary) loss of markets was an extreme setback for existing air carriers, since the major share of their revenue comes from operating flights. One of the few exceptions is China, whose domestic air transportation recovery was rather quick in 2020 (Czerny et al., 2021).

2. Talents: Given the extreme cuts in revenue and uncertainty about the future development of the pandemic, many airlines and other aviation companies placed off a significant amount of their workforce, particularly those tightly bounded to the operations of aircraft, e.g., pilots and crews (Iacu et al., 2020; Mogaji, 2020). The pool of aviation talents on the job market was extraordinary, which possibly discouraged future generations from following higher education in aviation.

3. Aircraft: Given the forced suspension of flights and a lack of alternatives, airlines had to reconsider their operations, including served markets, fleet management, and aircraft maintenance. In line of these reconsiderations, several airlines decided to retire older aircraft earlier or make a commitment to a smaller number of aircraft types, with the ultimate goal to reduce costs (da Silveira Pereira and Soares de Mello, 2021).

4. Recovery: It seems likely that the aviation industry will recover from the direct impact of COVID-19, given experiences with earlier disasters. The time horizon for recovery, however, is subject to discussion and is region-dependent (Serrano and Kadda, 2020; Dube et al., 2021; Czerny et al., 2021; Rothengatter et al., 2021; Gudmundsson et al., 2021). Several models have predicted a strong rebound for air transportation in the years 2022–2024, but an exact date for ultimate recovery of domestic and international travels is hard to decide.

5. Travel demand: The future, post-pandemic travel demand comes with huge uncertainties, not only for aviation (Santos et al., 2021; Gallego and Font, 2021), but for other transportation modes as well (Thombre and Agarwal, 2021). It is believed that leisure travel will see earlier rebounds; signs for such rebounds can be seen in July 2021 across the world. Business travel, on the other hand, could be affected for a much longer period of time (Lamb et al., 2020). The major reason is that video conferencing and efforts for cost savings have led companies to assess the need for business travels more carefully. It is uncertain, whether these changes to travel demand patterns will be permanent. Similarly, there seems to be a much greater emphasis on domestic and regional travel, at least in parts of the world, such as China.

6. Uniquity: Overall, the aviation sector went through a year of chaos, with unprecedented effects on the aviation industry (Adrienne et al., 2020; Sun et al., 2021a; Linden, 2021). The event of COVID-19 on its own might be considered a singularity, but the future of aviation will presumably see more pandemic outbreaks, given tremendous increases in long-distance transportation efficiency and,
First and foremost, it was known for at least one decade that air transportation has the potential to be a disease spreading medium, with high risk to turn an epidemic outbreak into a fully-blown pandemic (Budd et al., 2009; Gossling, 2020; Zhang et al., 2020). The universal pattern for such a disease spreading process is well understood: From the perspective of network science, the air transportation system provides a perspective of network science, the air transportation system provides a network, where the disease spreads correlating to the number of passengers between airports (Brockmann and Helbing, 2013). The relevant historical cases include Ebola (Pigott et al., 2014), SARS/MERS (Poletto et al., 2016), and Malaria/Dengue fever (Semenza et al., 2014), most of which could be contained in time, with mostly local effects on populations. And it is also exactly these cases which led to the development of effective tools to predict the spread of a disease in the network. What is missing nowadays in the aviation system is the effective use of such tools and adequate, corresponding decision making by relevant stakeholders. It can only be hoped that the aviation industry is learning the lessons from COVID-19 and does not perform business-as-usual until we stumble into the next pandemic. Achieving pandemic-resilient air transportation requires systemic thinking and collaboration across all levels in the industry, since actions of individual players can subvert otherwise concentrated efforts (Tisdall et al., 2021). Another important direction for better aviation is bound to the reduction of climate change risks (Dessens et al., 2014; Ryley et al., 2020; Gossling et al., 2021). While this topic has been on the wider aviation agenda for at least two to three decades now, it has become tremendously important in recent years for two major reasons. On one hand, the flight shame debates around the Fridays for Future movement have led to a measurable change of social norms, threatening aviation to lose the future generations of passengers (Gossling et al., 2020). On the other hand, it becomes apparent that the current efforts of aviation in reducing greenhouse gas emissions are not sufficient for reaching the goals in 2050 (Santos and Delina, 2021). COVID-19 may provide an excellent opportunity to start implementing some required changes. For instance, some airlines have retired older aircraft from their fleet (Dube et al., 2021), which is a first start, but more needs to be done and in a more sustainable way (Rothengatter et al., 2021). Further, an emphasis on emission charges by governments in coming years may favor a point-to-point network structure (Brueckner and Zhang, 2010), which is often the business model used by airline startups (see the discussion below). To achieve effective measures, there is a need for national-level policy initiatives (Gossling and Lyle, 2021). There exists a range of additional elements of a better aviation future. Communication and cooperation among all aviation stakeholders, especially under shocks, should be significantly strengthened by better management techniques (Linden, 2021).

7. Policy making: Several airlines could only be saved by heavy governmental bailouts, which were often done given their key role as a strategic sector (Zhang and Graham, 2020). These bailouts put a huge financial burden on the existing airlines. It has been argued in the literature that letting some of these airlines go bankrupt would have been a better societal choice (de Rugy and Leff, 2020). There is a lack of policy and guidelines for how to deal with such situations. For instance, it has been argued that the help of airlines should be bound to reaching societal targets (Truxal, 2020), but little has been heard about such effects in reality.

8. Strategy: Throughout the COVID-19 pandemic, one could have the impression that many major airlines are acting helpless and with an apparent lack of strategy. Airlines had an extremely hard time to wait and arguing for governmental bailouts and help. A crisis can encourage businesses and policy makers to take a step back and reflect on the status quo; leading to previously impossible or previously highly impractical solutions and ways of thinking (Bezemer, 2021). It is not feasible to review all elements of a better aviation and all existing literature in this section; please refer to a recent survey which discusses many of these elements and literature in the context, together with a collection of future work recommendations (Sun et al., 2021d). First and foremost, it was known for at least one decade that air transportation has the potential to be a disease spreading medium, with high risk to turn an epidemic outbreak into a fully-blown pandemic (Budd et al., 2009; Gossling, 2020; Zhang et al., 2020). The universal pattern

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https://www.bbc.com/news/business-54519322
Relatively, there is a strong need for a better global leadership, by ICAO and similar organizations (Macilre and Duval, 2020).

The aviation industry does not appear to be keen on disruptive changes and novel technologies. The scientific literature on COVID-19 and aviation largely focuses on the traditional carriers. These traditional air carriers are known to be reluctant for performing high-risk experiments outside their business-as-usual operations, unless they are forced to do so by external factors, such as fierce competition or major policy changes. Accordingly, it seems plausible to assume that there is a chance that COVID-19 becomes history - sooner or later - and the aviation industry goes back to business-as-usual, without addressing the challenges outlined above.

Disruptive changes and novel technologies, on the other hand, are two concepts inherently connoted with startups. The so-called Cambrian moment refers to the entrepreneurial explosion during the last two decades across many industries, where small startup companies increasingly challenge established players through the usage of novel high-technology, not being bound to business-as-usual, nurtured in a venture capital culture where failure is not considered the end of the day. For instance, the automotive industry is undergoing extreme disruptions by startups from niches to whole cars (Perrais-Hernández et al., 2017). Another recent example would be the dynamic ICT (information and communication technology) industry.

The underlying question in our study and major motivation is: Could the same happen to the aviation industry (Sun et al., 2021b)? Before COVID-19, a presumable answer would have been that it is impossible for a wider range of aviation startups to pull the undertaking of building an own airline, given the tremendous risks and required amount of financial resources. Nevertheless, the impact of COVID-19 on air transportation had several side effects which could become tremendously supportive for the successful establishment of airlines. We revisit the key impacts of COVID-19 on aviation with respect to the eight facets established in our STARTUPS framework (Fig. 1) presented above, and discuss how they could be beneficial for airline startups:

1. **Suspensions**: For the existing large carriers, unpredictable flight suspensions are fatal, given that their business model and processes are largely built around historical data. These extremely optimized operations were broken during COVID-19, leaving airlines in the dark about where the demand is. Agile startups, on the other hand, are more flexible in route choice, not only regarding the exploration of new markets, but also the quick revision of market potentials for the successful establishment of airlines. We revisit the key impacts of COVID-19 on aviation with respect to the eight facets established in our STARTUPS framework (Fig. 1) presented above, and discuss how they could be beneficial for airline startups:

2. **Talents**: The laid-off aviation workforce is desperate to get back into their job; particularly pilots come with extremely specific qualifications and rather high expectations. The presence of a workforce willing to accept jobs at lower conditions than before, just to avoid taking jobs much outside their educational background (e.g., from pilot to taxi driver⁵), is ideal for startups to hire employees. The same holds for crew members and other aviation-related workforce, such as maintenance staff, which can be directly hired from the aviation job market.

3. **Aircraft**: Reasons for retiring aircraft are unrelated to the ability of flying, but rather airline-specific, e.g., reconsiderations of markets, fleet/manufacturer revision, or simply a rejuvenation of their fleets due to environmental or technology concerns. The oversupply of aircraft on to the market makes it easier than ever for airline startups to get flying, especially if they are willing to make trade-offs. The discounts available throughout COVID-19 are of tremendous value, especially for low-cost carriers. In addition, the sharp decline in aircraft orders makes it even possible for well-funded airline startups to obtain brand new aircraft (without mass orders).

4. **Recycle**: Many existing carriers are beleaguered, dependent on government money. The startup scene is known for supporting risky opportunities, venture capital is always on the look for new markets. Given that the aviation market has not been disrupted by the startup scene yet, it is conceivable that more venture capitalists give airline startups a try.

5. **Travel demand**: Airline startups are often created around digital technologies, have an outstanding potential to exploit the currently not-well-understood demand across populations and fill in travellers’ needs in a demand-driven way. Given that a stronger recovery of the leisure market is expected, airline startups could jump into serving holiday destinations, while neglecting traditional concerns around business travel or mixed travel.

6. **Uniquity**: In the midst of chaos, there is also opportunity. In times when the big players are crippled, there is a lack of global coordination and leadership, together with a highly-uncertain future, it is the moment in which novel businesses have the highest chance to jump into a market and succeed with revolutionary ideas and disruptive technology.

7. **Policy making**: The COVID-19 crisis, coupled with the absence of effective policies for sustainable airline support, led several of these carriers into high debts. These debts presumably limit their ability for innovation in the near future. Airline startups can exploit this opportunity to enter the markets while avoiding head-to-head competition with the incumbents.

8. **Strategy**: Like the discussion on travel demand, startup airlines may have a competitive advantage here, as they can build a new product around a new market and business model. This is easier compared to being bound to an existing fleet and personnel structure, which often restricts the degree of innovation possible.

Given these anti-cyclic perspectives on the impact of COVID-19, one should not easily reject the idea that some airline startups founded during the time of COVID-19 might turn out very well, and indeed change aviation as we know it.

3. **Airline startups during COVID-19**

In this section, we provide an overview on airline startups during COVID-19. Given the nature of the subject, the selection of airlines is unlikely exhaustive since startups often (intentionally) run under the radar to keep their business models secretive until launch. Along this line, collecting reliable information on startups is a tedious task, given that there exists no public database of such startups, contrary to existing air carriers. Finally, startups frequently undergo re-brandings, as part of business strategy changes or for market testing purposes. We have carefully analyzed the related airline websites, aviation magazines, and travel forums for information on airline startups during COVID-19, particularly the World Airline News, Simple Flying, Airways magazine, AirlineGeeks, One Mile At a Time, and Travel Weekly⁶. The collected data has also been crosschecked with ICAO and IATA announcements, as far as applicable.

Fig. 2 provides an overview on the 46 airline startups collected as part of this study. The logo of each airline is annotated with an arrow to

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⁵ https://worldairlinenews.com/.
⁶ https://simpleflying.com/.
⁷ https://airwaysmag.com.
⁸ https://airlinegeeks.com/.
⁹ https://onemileatime.com/.
¹⁰ https://www.travelweekly.com/.
the airline’s country of origin. We can see that a large number of countries with airline startups in the Northern hemisphere, particularly in the European area. Table 1 provides a tabular overview on these airlines, together with selected properties, i.e., ICAO/IATA code if available, a link to the airline’s website, and a brief description of its major targeted market. The targeted market for each airline startup in the table is directly obtained from the airlines’ announcements, if available, or derived from its proposed route networks, otherwise. Please note that the terms medium/long-haul denote international services which are long distance. Heston Airlines is a rather special airline startup in the table, providing wet-leasing with origin in Lithuania. A wide range of markets and business models can be observed, with the major trends summarized as follows:

**Low-cost, long-haul airlines**: The first category of airline startups is low-cost, long-haul air-lines. Selected examples for such type of airlines include Aero K, Eurowings Discover, flypop, Norse Atlantic Airways, and PLAY. The potential for profitability of such airlines has received increasingly attention in the last two decades, in an attempt to copy the success stories of low-cost, short-haul carriers (e.g., Ryanair, Southwest airlines) to long-haul flight operations (Zuidberg and de Wit, 2020). It was believed that this attempt has significantly lower chances for profitability (Morrell, 2008) and requires the un-bundling of traditional full-service carrier products and identification of suitable trunk routes (Daft and Albers, 2012). Since low-cost airlines mainly target low-income travellers (Serio et al., 2018), these new airline startups might hope for getting passengers for markets who would not fly with traditional carriers; see Ferrer-Rosell and Coenders (2017) for compositional data analysis on the passenger structure regarding low-cost airlines and traditional carriers.

**Ultra-low-cost airlines**: The second category of airline startups concerns ultra-low-cost airlines. Selected examples for such type of airlines include Avelo Airways and Ultra Air. The markets for (common) low-cost carriers is limited, as it has been shown by de Wit and Zuidberg (2012). Ultra-low-cost airlines put an extreme emphasis on cost efficiencies and unbundled service offerings (Bachwich and Wittman, 2017), thereby undercutting the costs of traditional airlines and other low-cost airlines. These airlines often have minimum fare inclusions and a wide range of add-on fees applicable.

**Premium at reasonable price**: The fourth category in this study composse airine startups which aim particularly at the premium market, possibly at lower prices for passengers. Ex-amples for such airline startups include Air Premia, Connect Airlines, and PragUSA. The airlines aim to exploit the passengers’ willingness to pay for better service (Kuo and Jou, 2017); a business model which gives opportunities for differentiation potential from the in-creasing number of low-cost carriers (Franke, 2007).

**Virtual airlines**: The growing competition and search for cost efficiencies increases the incentives for outsourcing (Rutner and Brown, 1999), gradually opening the pathway to the concept of a virtual airline; an airline which does not own assets beyond its own brand name (Kjel-gaard, 1996). Examples for such airline startups include FlyBAIR, Green Airlines, Lübeck Air, Skyalps, and Sky Cana. The concept of virtual airlines is rather typical for airline star-tups, compared to large carriers, given the significantly reduced costs and risks in the early phase (Rhoades and Reynolds, 2007).

In Table 2, we provide a summary for the evolution of airline startups during COVID-19, as obtained from press releases and announcements in airline-related forums, covering the airlines discussed above. We can see that during the period of January 2020 to May 2020, there was no apparent progress, given the tremendous uncertainty in the aviation industry. Starting from June 2020, we can observe more startup announcements, often referring to ambitious starting dates like Summer 2020 or end of the year 2020. Coming closer to Summer 2021, we can...
Table 1
Overview on the airline startups during COVID-19, together with selected properties.

| Airline                  | ICAO | IATA | Airline website                        | Major market                                      |
|--------------------------|------|------|----------------------------------------|--------------------------------------------------|
| Aero K (former K-AIR aviation) | aerok.com | | Regional/ international from South Korea | Domestic/regional from South Korea                |
| Airbahn                  | https://www.airbahn.com/ | | From California, United States         | Regional from California, United States           |
| Air Demerara             | airdemerara.com | | Regional/ international from Guyana    | Regional from Guyana                             |
| Air Premia (former AP air, Airplamia) | airpremia.com | | Medium/long-haul from South Korea     | Medium/long-haul from South Korea                 |
| AirSial                  | SIF  | PF   | airsial.com                            | Domestic/regional from Karachi, Pakistan         |
| AVA Airways              | avaraikairs.com | | Domestic/ regional across Dominican Republic | Domestic inside the United States                |
| Avelo Airlines (based on XTRA Airways) | VXP  | XP   | aveloair.com                           | Domestic inside the United States                 |
| Bees                     | UBE  | 7B   | bees.aero                              | International from Kiev, Ukraine                 |
| Breeze (former Mox)      | MXY  | MX   | flybreeze.com                          | Domestic inside the United States                |
| Connect Airlines         |      |      |                                       | From Toronto, Canada to the United States        |
| Ecuatoriana              | ecuatoriana.com | | Regional from Ecuador                  | Regional from Ecuador                            |
| EGO Airways              | EGW  | E3   | egooairways.com                        | Domestic inside Italy                            |
| Eurowings Discover (former Ocean) | OCN  | 4Y   | discover.aero                          | Long-haul from Frankfurt/Munich, Germany         |
| FlyBAIR                  | flybair.ch | | International from Bern, Switzerland | International from Bern, Switzerland             |
| Flybig                   | FLG  | S9   | flybig.in                              | Domestic across Indonesia                        |
| FLY CORALway (formerly Air Corail) | flycoralway.com | | Medium-haul across the Pacific Ocean | Domestic across the Pacific Ocean                 |
| flypop                   | flypop.co.uk | | International from London, Great Britain | International from London, Great Britain         |
| Flyr                     | FOX  | FS   | flyr.com                               | Domestic/ continental from Oslo, Norway          |
| Greater Bay Airlines (former Baunhia Airlines) | | |                       | From Hongkong to Southeast Asia                 |
| Green Africa             | Q9   |      | greenafrica.com                        | Domestic from Lagos, Nigeria                     |
| Green Airlines           | green-airlines.com | | Regional within Europe                 | Regional within Europe                           |
| GullivAir                | TJJ  | G2   | gullivair.com                          | Long-haul from Sofia, Bulgaria                   |
| Hans Airways            | hansairways.com | | From the United Kingdom to India       | From the United Kingdom to India                  |
| Heston Airlines          | hleston.aero | | Offers wet-leasing from Lithuania     | Offers wet-leasing from Lithuania                |
| HiSky                    | hisky.aero | | From Chisinau, Slovakia              | From Chisinau, Slovakia                          |
| ITA Transportes Aéreos (former Linhas Aéreas) | IPM  | 8I   | voeita.com.br                          | Domestic inside Brazil                           |
| Latitude Hub (former Canarian Airways) | latitudehub.com | | Regional across the Canarian islands | Regional across the Canarian islands            |
| Lift                     |      |      | lift.co.za                            |                                                   |

Table 1 (continued)

| Airline                  | ICAO | IATA | Airline website                        | Major market                                      |
|--------------------------|------|------|----------------------------------------|--------------------------------------------------|
| Lübeck Air               | 6I   |      | luebeck-air.de                        | Domestic/Regional from South Africa               |
| Moov (former Swiss Skies) |      |      | flymoov.com                           | Regional from Lugano, Switzerland                 |
| Nella Linhas Aereas (part of Nella Airlines) |      |      | voennelairlines.com.br | Domestic inside Brazil                           |
| Norse Atlantic Airways   |      |      | flynorse.com                          | International from Oslo, Norway                   |
| Northern Airlines        |      |      | northernairlines.com                  | International from Stockholm, Sweden             |
| PLAY                     | FFY  | OG   | flyplay.com                           | Medium/long-haul from Reykjavik, Iceland          |
| PRAGUSA.ONE              |      |      | pragusa.one                           | Long-haul from Czech Republic and Croatia         |
| Prince Air               |      |      | princeair.in                          | Domestic inside India                             |
| Qanot Sharq              |      |      | qanotsharq.com                        | Medium/long-haul from Uzbekistan                  |
| Skyalps                  |      |      | skyalps.com                           | Regional/ international from Bolzano, Italy       |
| Skyscape                 |      |      | skyscape.com                          | Regional from Santo Domingo and Miami, USA       |
| Skycana                  |      |      | skycana.com                           | Domestic across the Philippines                   |
| Sunlight Air (former Sunlight Express Airways) | SEA  |      | sunlightair.ph                        | Domestic across the Philippines                   |
| Upfly                    |      |      | upfly.com                             | Regional across Balearic Islands                  |
| Ultra Air                |      |      | ultraair.com                          | Domestic/ international from Colombia            |
| Vietravel Airlines       | VAG  | VU   | vietravelairlines.com                 | From Vietnam to East Asia                         |
| Webclift Airways         | WBC  |      | webclift.com                          | From South Africa to North America               |
| Wizz Air Abu Dhabi       | WAZ  | 5W   | wizzair.com                           | International from Abu Dhabi, UAE                 |
| World2Fly                | WFL  | 2W   | w2fly.es                              | From Spain and Portugal to Latin America         |

observe much more activity regarding the handout of air operations certificates and also reports/announcements for the first flights of these airlines.

4. Risk factors for airline startup success

Below, we discuss the challenges on the way to a successful airline startup. Our list is likely in-complete but covers a wide range of aspects including underestimation of competition, management mistakes, pandemic considerations, and several more. We believe that our list can aid operators and policy makers to pave a road into a safer and more robust environment for airline startups.

4.1. Timing as the most decisive factor

It is an open secret in the startup scene that timing is the single most important factor inducing startup success.\footnote{https://www.inc.com/chris-dessi/this-ted-talk-explains-the-5-reasons-why-startups-succeed.html.} The rationale is that if the customers are not ready for the product/service, then the best ideas and the best management team cannot bring the company to success. An
Table 2: Overview on airline startup evolution, in terms of founded date, air operators certificate (AOC) and first operation.

| Date       | Founded | AOC                  | First operation         |
|------------|---------|----------------------|-------------------------|
| 2015       | Green Africa |  |                      |
| 2016       | Flypop, GulliV Air, Lübeck Air |  |                      |
| 2017       | Air Premia, Air Sial |  |                      |
| 2018       | Avelo Airways, Breeze, Moov, Weblift Airways |  |                      |
| 2019       | Air Demerara, Bees, EGO Airways, FlyBAIR, Northern Airlines, PLAY, skylaps, Sunlight air, Vietravel Airlines, Wizz Air Abu Dhabi |  |                      |
| January    | 2020    |                      |                         |
| February   | 2020    | HiSky, ITA Transportes Àéroes |                      |
| March 2020 |         |                      |                         |
| April 2020 |         |                      |                         |
| May 2020   |         | Green Airlines       | Wizz Air Abu Dhabi      |
| June 2020  |         | Eurowings Discover, Greater Bay Airlines | GulliV Air          |
| August 2020|         | FlyCAralway, PragUSAone | Lübeck Air          |
| September  | 2020    | Flybig               |                         |
| October    | 2020    | Flyn, Hston Airlines | GulliV Air            |
| November   | 2020    | Lift                 | EGO Airways            |
| December   | 2020    | Sky Cana, World2Fly | Flybig, HiSky          |
| January    | 2021    |                      | Air Sial, Lift         |
| February   | 2021    | Latitude Hub, Qanot  | Skarq, PragUSAone      |
| March 2021 |         | Norse Atlantic Airways, upify | Bees, EGO Airways, Green Airlines, HiSky, Avelo Airways, Sky Cana, Breeze |
| April 2021 |         | Connect Airlines     |                          |
| May 2021   |         | Hston Airlines, ITA Transportes Àéroes, PLAY |                     |
| June 2021  |         | Eurowings Discover, Flyr | Flyn, Latitude Hub*, PLAY, skylaps, World2Fly |
| July 2021  |         | Green Africa         | Air Premia, Eurowings Discover, ITA Transportes Àéroes, Qanot Sharq, upify | Green Africa |
| August 2021|         |                      |                         |
| September  | 2021    |                      |                         |
| October    | 2021    | Flypop, Norse Atlantic Airways | Connect Airlines, FLY CORALway, Flypop, Greater Bay Airlines |
| November   | 2021    |                      |                         |
| December   | 2021    | Norse Atlantic Airways, Northern Airlines | Moov, Weblift Airways |
| 2022       |         |                      |                         |

often used example for this observation is ride-sharing/hailing. While the taxi industry had been known to have many limitations and flaws for decades, it was the emergence of digital technologies and penetration of mobile phones, that helped startup companies to enter the market successfully. Without these technologies at the right time, attempts to enter the market were doomed to fail.

4.2. Running out of time and money

Startups heavily rely on venture capital. In recent years, investors are rarely long-term layers; rather, they want to see short-term growth and profits. Given the above constraints on time and competition, usually beyond the control of a startup, it seems very unlikely that multiple unicorns emerge in the airline industry. And although the startup story in times of COVID-19 is appealing to investors, given tumbling traditional carriers, reality will come back at these startups very soon as well. In July 2021, we have found first notices of successfully-launched airline startups cutting down initially proposed routes and capacities, after having found out the actual in-profitability of (parts of their) business model. It must be seen, whether these airlines can survive with the remaining markets or to-be-explored alternatives; as these airlines have started real operations, they are incurring real costs now. A related issue is the lack of visibility. Despite providing services (and announcing them through their social media channels), the reach of such advertisements is rather small. Many travel agencies and booking companies give preference to existing airlines, compared to startups. While there are a few specific webpages and governmental intervention plans, startups need to find better channels for distribution, otherwise they will run out of time or money.

4.3. Underestimation of certification efforts

The startup process is inherently agile, with short-timed decision making and a high degree of flexibility. This is one of the strengths of startups after all, and often a reason why they are able to outperform existing players. Aviation is special in that regard, given that some steps take an incredible amount of time; which can hardly be shortened under influence of the startup. This poses a strong conflict in time horizons. The most important step for an airline startup is to obtain the air operators certificate, and the duration of this process takes between months and years. During that time, a startup might already be out of money or out of business, in volatile environments as we are in now.

4.4. Underestimation of existing airlines’ defense mechanisms

Relatively, in their announcements and descriptions of future business models, airline startups often describe their future markets by stating that no existing airline is serving these markets right now - at least with direct flights. The argument is - obviously - that it enables the startup to enter a market which immediately yields sufficient demand and returns. This view, however, underestimates the ability of existing carriers to push into these markets once they turn out highly profitable. Accordingly, the planning step of airline startups need to change from static thinking to dynamic modeling. In the recent scientific literature, several studies have proposed airline scheduling models under competition, by computing equilibrium solutions in which no airline has incentives to change its schedule further. Given recent advances in operations research techniques, it is possible to solve scheduling models in reasonable time for medium-sized airlines. Startups may use these

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12 e.g., https://www.alternativeairlines.com/.
13 President Biden has signed an executive order which enforces, among others, the effective flight information dissemination to passengers in favor of less known airlines, see https://www.whitehouse.gov/briefing-room/president-s-actions/.
4.5. Underestimation of startup competition

Startup announcements often refer to established airlines, if at all. We have not found announce-ments which discuss the direct competition with other startups in work. This poses a potential problem, particularly given the increasing number of startups. For instance, in our dataset, we found two airline startups which plan to target point-to-point connections between UK and India. Both argue about the tremendous demand for such direct travel, compared to transferring in a hub. It is not clear, how their business models will work out in presence of startup competition. Another facet of aviation startups might turn out important in this context. Several companies have started to provide artificial intelligence-based services for airline optimization and decision making. While these services can aid airline startups to grow quickly based on outsourced knowledge, it can be presumed that these services will also be of interest to the major airlines. Once major airlines make use of modern technology through airline service startups, one major competitive advantage of airline startups - innovation - could disappear.

4.6. Underestimation of reliability and reputation

The agility of startups can easily turn into a major disadvantage from the passenger perspective. First of all, these startups sell tickets for routes whose actual load factor is unclear. If the load factor turns out too low, flights have to be canceled. This is a natural decision and comes even faster for airline startups, as they usually lack the ability to cross-fund routes with insufficient demand by revenues from other routes. It must be seen how passengers react to such cancellations and whether the reputation of startups will undergo waves of changes, particularly in the presence of social media. Second, and related, in preparation for this study, we have found a surprising number of re-namings and re-branding over time - so much, that it sometimes turned out difficult to even judge what is the latest brand. We might enter an age of aviation, where re-branding becomes a rule rather than an exception. Finally, the emergence of aircraft and crew leasing companies (already in 2019, 50% of all Airbus and Boeing produced aircraft were given to leasing companies), will likely increase the number of virtual airlines further; including airlines without a well-thought-of business model. Such virtual airlines are not only easy to create, but also easy to fail and disappear. These next years will likely see several such airlines come and go, with unpredictable effects on passenger perception and satisfaction. It can be conceived that the reputation of the airline startup sector will face severe challenges.

4.7. COVID-19 or COVID-X

Two of the most crucial questions in aviation are: How long will it take to return to normalcy and how long will normalcy hold until the next pandemic? Neither of these questions has easy answers. Several predictions indicate that aviation will reach pre-COVID-19 level in the year 2022–2024, e.g. Gudmundsson et al. (2021). But there are many uncertain factors, many of which are not (directly) in the hand of airlines. Most importantly, this includes the emerging (new) variants of concern and up to what degree existing vaccines can deal with these variants. Relatedly, without significant changes to our concept of transportation, the next pandemic is inevitable, even if we were able to fully eliminate COVID-19 successfully. A strong and more sustainable recovery of air transportation will increase the chances that traditional airlines undergo quick economic recovery. In this case, it is presumably difficult for startups to enter (even remote) markets and obtain significant market shares. If, on the other hand, these startups implement novel technologies in support of pandemic-resilient air transportation, they are much more likely to survive.

5. Conclusions

The aviation industry faces an - at first sight - counter-intuitive growth of airline startups during the COVID-19 pandemic. This study sheds light on the drivers for such developments together with the risks involved. We found that many of the novel airline startups focus on low-cost operations. Intuitively, this makes a lot of sense, given that the fixed costs for operating an airline are historically low due to COVID-19, e.g., capital spent on the acquisition of aircraft or airline personnel. Of particular interest seems to be the operation of low-cost, long-haul carriers, with the goal to provide direct flights for passengers who have to take multiple hops otherwise. In addition, some of the airlines in this study emphasize their positive attitude towards greener aviation and sustainability, presumably in hope for market segments across younger generations.

It can be conceived that the near future might see a further boom of airline startups. The reason for such an event could be excellent timing and due comparisons with other industries. The future might belong to virtual airlines, independent of their business model. After all, many big players in the 21st century operate successfully without any real assets: Facebook is originally built around an ecosystem without producing own content, Uber does not physically own vehicles, and Airbnb does not own actual apartments. It is the smart and technology-driven service provision which made these companies big. Maybe the same could hold for some of the airline startups in the future.

Towards the end of this study, we would highlight one additional concern neglected so far. With the ongoing bloom of airline startups, one should not easily rule out the option that, maybe in a few years, we will remember the year 2021 as the year of the airline startup SCAM. With the hype around airline startups and an increasing amount of capital available to support them, the incentives for black sheep to join in are rather high. In fact, for several of the startups we have tried to track for this study, it seems like they have just secretly died out. What happened to their venture capital, was not announced publicly.

Based on the findings in our study, we summarize the major streams for policy provision as follows. The aviation industry must provide efforts to become more sustainable. Startup airlines have the potential to become role models, by the employment of modern technologies. Governments and international organizations need to develop policies in support of such sustainability-concerned airlines, possibly in terms of monetary incentives. Not only will this support the emergence of role models, but presumably leads to replication by the big industry stakeholders. Another important area for policy development is the fair competition between airlines. A leading example is the repeated airport slot waiver for established airlines. Such a decision can be reasonable for a period of time, but it should not become a permanent wildcard for blocking new entrants from the market. Airline startups have the potential to connect novel, untrodden markets; leaving them out from the majority of European hubs would not be a very sound decision. Accordingly, policy makers need to find a better trade-off between ensuring survival of the established airlines and ensuring competitiveness of airline startups. Finally, the threat for an airline startup scam leads to a need to develop policies in order to protect passengers, aviation stakeholders and investors from the impact of such companies.

We see ample opportunity for future work. First, it will be interesting to analyze and understand the development of specific airline startups. It is beyond the scope of our study to report the founding process of each airline in detail. Similar analyses have been performed on other newcomers in the past, e.g., on Ryanair and Southwest Airlines. Second, an analysis of the financial backing of these airline startups would be of tremendous interest, not only for the scientific community. Little is

14 https://bruktkasten.com/aeroficial-intelligence-startup-portrait/.
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