



COVID-19

Aeronautics, Defense & Space Industry Outlook

How to reshape and beat headwinds?





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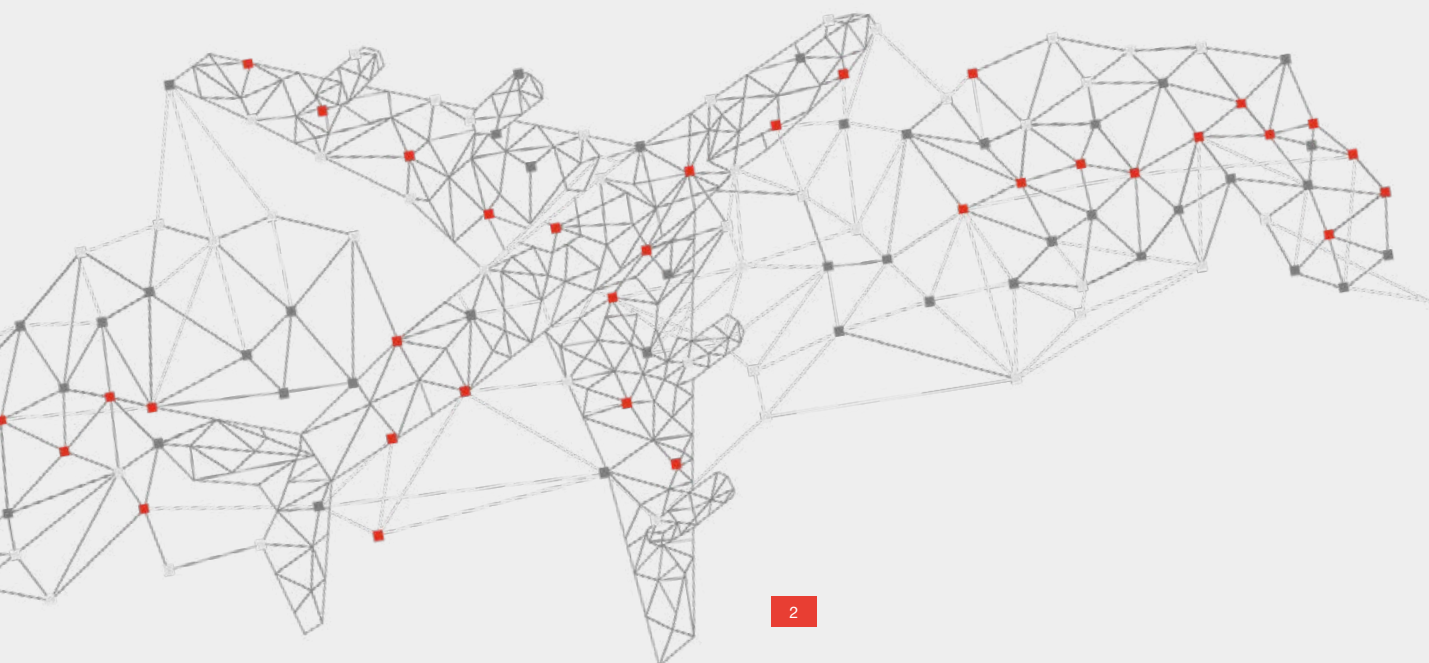


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Introduction

Air travel around the world has gone into a tailspin on the back of the COVID-19 pandemic, which brings unprecedented change to commercial aviation and to the Aeronautic, Space & Defense (A&D) industry. The past 12 months have wrought havoc and disruption, not only on the aviation industry, but on every aspect of life for the world's population.

Impacts are being felt across each of the A&D industry's three main sectors, with commercial aviation, space and defense affecting the whole of the value chain at different points but at the same time, thereby eliminating any hope of a speedy recovery. While A&D is down, it would be unreasonable to assume that it will not pick up again. Strongly influenced by and reliant on the economic climate, the A&D industry remains one of the most resilient sectors through the years, and has already proved its capacity to survive major crises caused by different factors in the 80s, the 90s and on several other occasions since the turn of the century.

COVID-19 has disrupted economies and businesses, locked down billions of people, closed borders and brought airlines to their knees. The pandemic's impact on aviation, in terms of financial losses, airline failures, unemployment and global connectivity, is already immense and has not yet reached its peak. The consequences will include significant and permanent structural changes to the airline industry and its stakeholders. As a reminder, Aviation is part of a 12-trillion dollar global travel and tourism industry that has been severely disrupted as the COVID-19 pandemic continues to have tragic consequences around the world. Even though this is the worst crisis the aviation market has ever endured, now more than ever, the A&D sector needs catalysts for change, innovation, disruption and transformation as not all A&D stakeholders are suffering from the crisis in the same proportions or coping with the same resilience.

Together with Automotive and Travel, the aeronautics industry is certainly one of the hardest hit by the devastating consequences of COVID-19. And it may be the slowest to recover. The freefall in global air traffic following lockdown and confinement measures around the world led to an almost immediate shut-down in the supply of new aircraft and delays in the substantial cash payments that are usually made on delivery.




COVID-19 is the worst crisis since 1929, and one that has had a major impact on certain sectors of activity. There are winners and there are losers, with some companies doing better than ever in R&D and technologies, and others at rock bottom.

In aeronautics, the fallout has been extensive and will have lasting repercussions.

Thales is coming out of the crisis in a "satisfactory" way and can congratulate itself on having a diversified portfolio of activities. While 20% of its portfolio is directly impacted by the Aeronautic sector crisis in the broadest sense, 50% of Thales, concentrated around the Defense sector, is on a different trajectory. To date, there has been no real impact for Thales and even some growth in some markets.

Philippe Keryer – Executive Vice President
Strategy, Research & Technology – Thales



While passenger airlines are clearly front-line in this crisis and will get most coverage in this industry outlook, their problems quickly cascade down to impact all other industry stakeholders. The pandemic has written a new tale of two air transport industries: a passenger segment that has all but collapsed – with a full recovery expected to take years – and a cargo segment that has demonstrated exceptional resilience and is expected to post double-digit year-over-year percentage traffic growth in 2021.

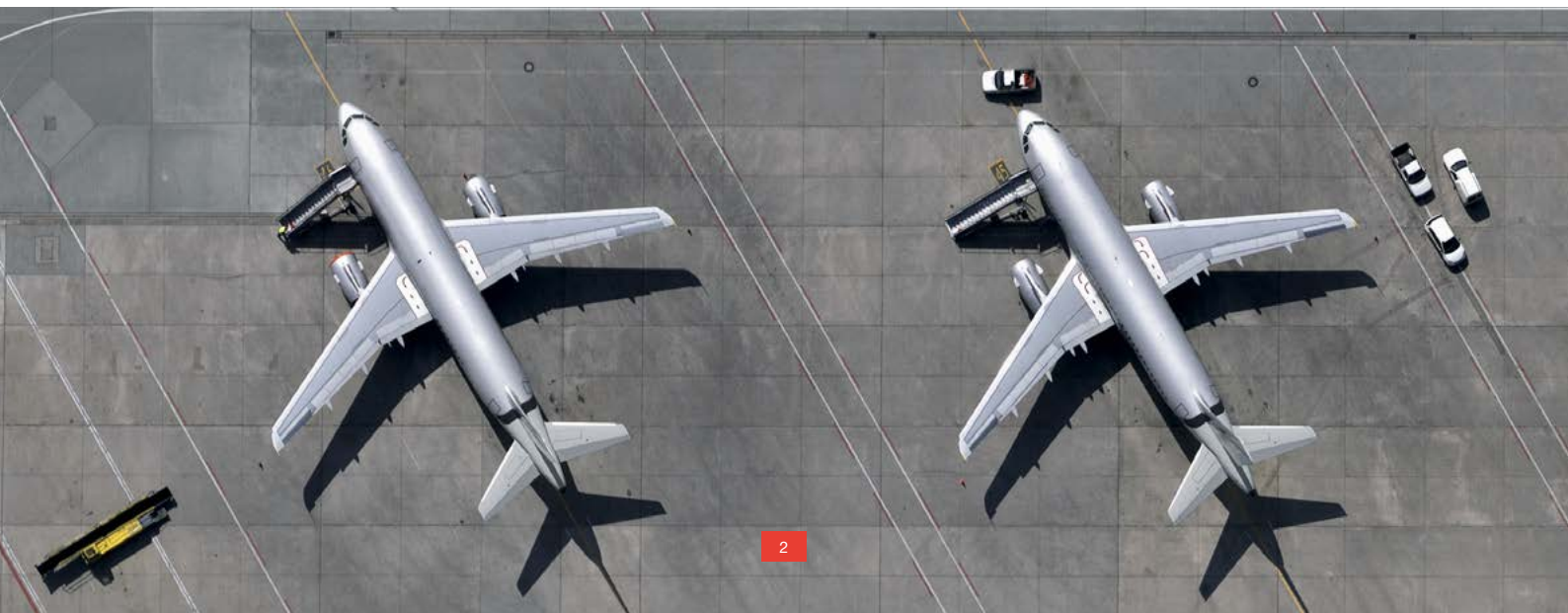
In an end-of-the-year briefing, IATA Chief Economist Brian Pierce noted that while passenger traffic is generally 70% below pre-pandemic levels, cargo traffic is down just 7%.

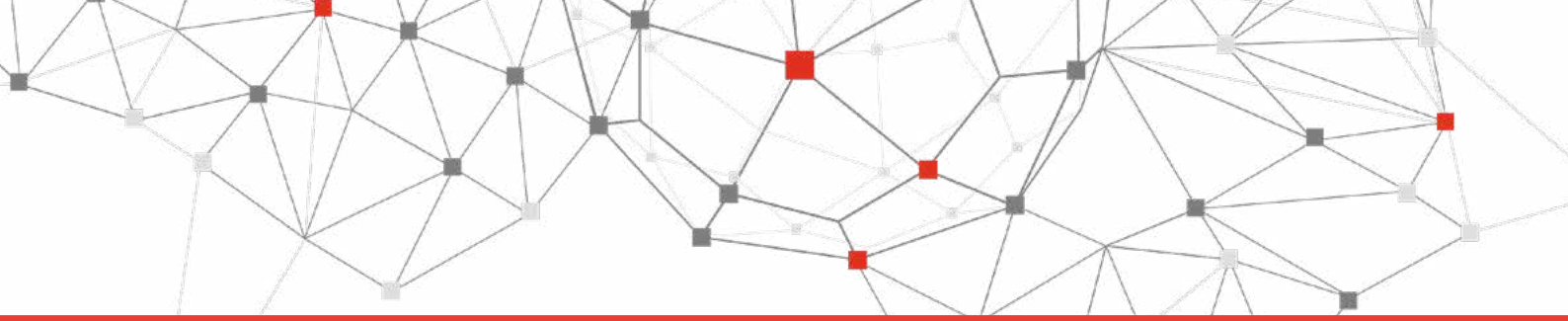
What is more, the uncertainty shrouding today's "Post-COVID world" has also prompted airline companies to request deferred payments or different models and even the cancellation of orders for the short term. In the longer term, this uncertainty is also jeopardizing the order backlog that, historically, has always been one of the sector's key strengths. No surprise then that share prices fell sharply in March/April 2020, and market capitalizations were US\$426 billion lower than in January 2020. They have bounced back since, although admittedly with varying degrees of fortune.

Lenders and lessors have also been counting the cost of their exposure to airlines that can no longer meet their financial obligations as revenues collapse. Many of the traditional aviation lending banks are out of the market, with others repricing transactions and taking a more conservative approach to risk. While lessors are starting to see revenues flow in again, the majority of their leases remain in arrears or have been substantially restructured and they have their own funding obligations to service.

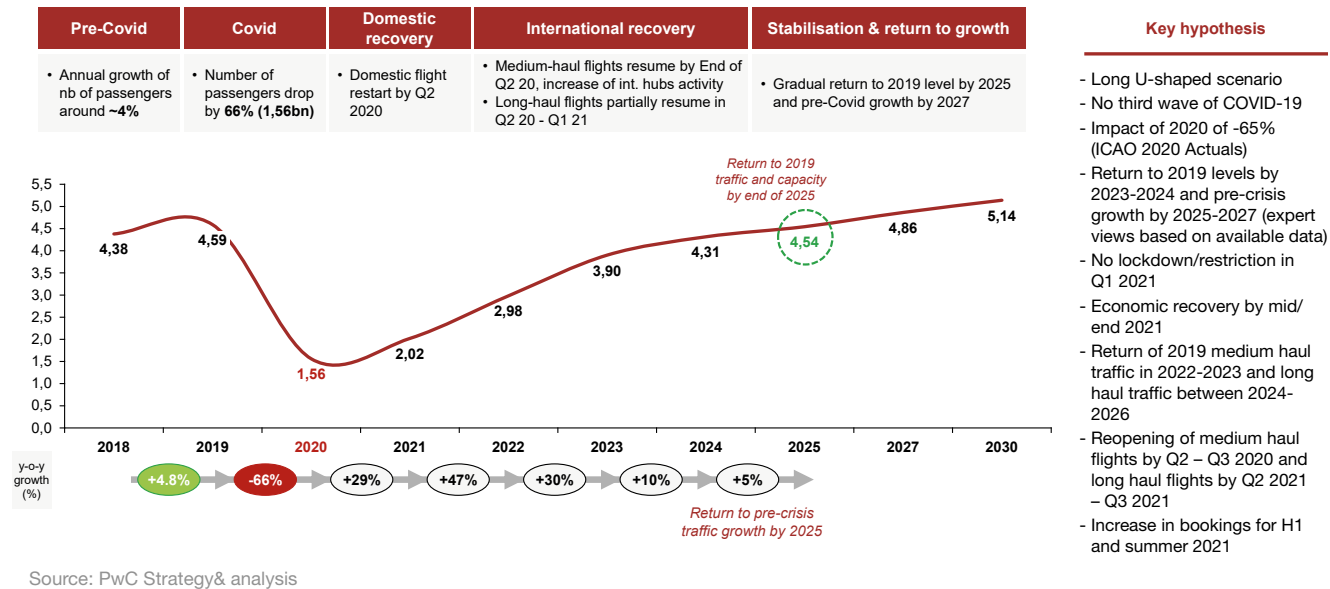
MROs and part-out businesses are facing lean times as airlines cut their maintenance spend to the bone and utilize their inactive fleets to keep the rest flying rather than repair and restore engines and components. OEMs have come through their worst year ever in terms of both orders and deliveries, compounded by Boeing's 737MAX problems that are only now starting to be resolved. The lack of demand for new aircraft, added to an estimated 5,000 surplus aircraft already in the system, is impacting asset values, with larger, older and less efficient models expected to suffer permanent value reductions.

Yet, at the same time, seemingly record numbers of investors are lining up in anticipation of finding real value in distressed aviation-related transactions, arguably for the first time in over a decade. While many of them are still in the early stages of their due diligence of the sector, and even seasoned players mostly feel that it is too early to commit in scale, capital should be available as the recovery trajectory becomes better defined.





As the market cannot rebuild itself alone, most A&D players must feel like they have their backs to the wall as they are forced to come up with new product and system roadmaps and new technologies and disruptive business models to streamline supply chain strategies and aftermarket services.



Primarily affected by border closures and an unprecedented drop in demand, airlines have engaged costs and treasury management measures to save cash and help them survive the crisis.

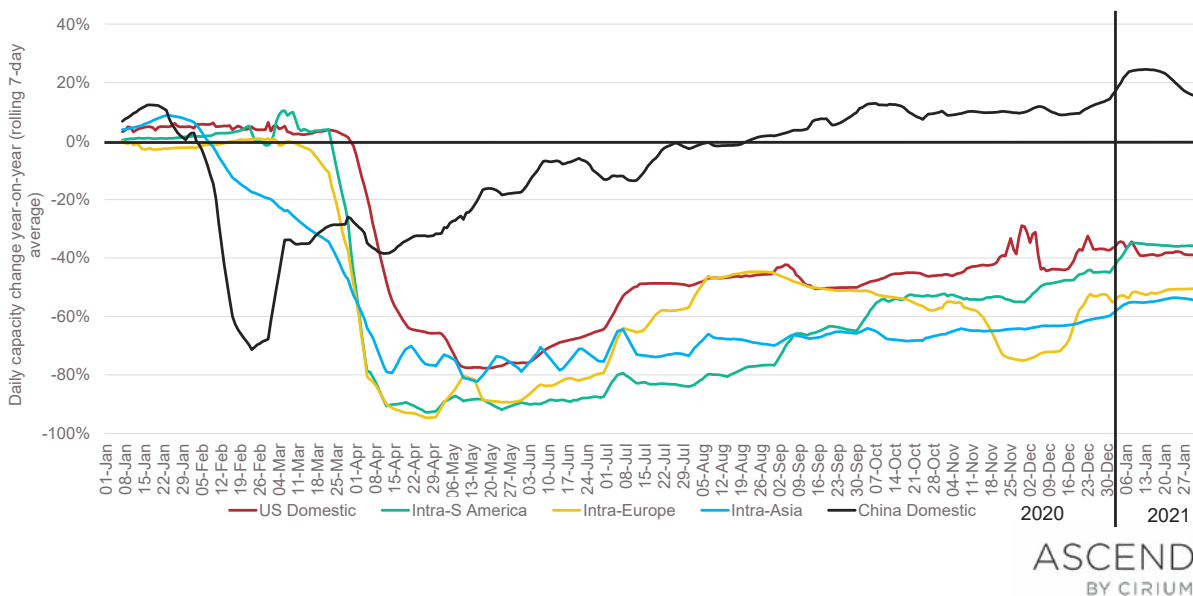
Leaders with a well-informed outlook on potential trade scenarios can begin their recovery from a position of strength.



Daher and other A&D Leaders had interviews with Airbus on their forecasts. Airbus is changing its forecast, shifting it to the right with a time lag. Until the end of 2020, Airbus thought Asia (mostly China which amounts to one-third of business) would hold out and restart. With local lockdowns and market tensions, forecast recovery for Short Haul is foreseen around 2023 and 2024/25 for Long Haul”.

Didier Kayat – Daher





Source: Cirium Schedules: data as at December 13, 2020 and 2021, year-on-year versus 2019

As long as there are traffic restrictions in Europe a wait-and-see attitude will dominate, leading to lower aircraft utilization rates and tensions across the entire sector.

Didier Kayat – Daher

Despite the virus having a significant and lasting impact on the economy, trade volumes will recover, mostly supported by e-commerce and medical/vaccine supplies. IATA has revised its 2021 outlook three times since the start of the pandemic. The latest forecast, published in late November, predicts an industry net loss of US\$118.5 billion in 2020 and a further loss of US\$38.7 billion in 2021. Cash outflows for Q2 to Q4 2020 are estimated at US\$125 billion, with potentially another US\$45 billion of cash burn over the next three quarters before turning marginally positive in Q4 2021.

The companies that will emerge with a competitive advantage in the “next normal” will be those that are able to develop granular scenarios on how demand will evolve, ascertain which playbooks to use in each case, and adopt mechanisms that recognize which scenario will become the new reality. It may come as a surprise to learn that the level of airline failures in 2020 did not reach a new record high. The extent of government support, estimated to be at least US\$180 billion to date, has played a major role in saving a number of weak legacy carriers from collapse, but in doing so has created a long-term imbalance in the level of the playing field.

While the COVID-19 pandemic continues to evolve, airline companies need to address immediate fleet management and fixed cost responses and act now to limit risks and protect operations if they are to counter the unprecedented drop in activity (at Paris-Orly, for example, air traffic fell 60% before the complete closure of the airport). Managing a coordinated response for cuts in revenues and fixed costs is the hardest challenge airlines face as of now, with revenues freefalling faster than costs.

How to come up with a sustainable future for passengers and employees against the current backdrop?

In addition, it is highly unlikely that the situation will change for some time due to the crisis in demand linked to the general economic recession on one hand and the strong correlation between GDP and an aviation sector plagued by company bankruptcies, an avalanche of aircraft order cancellations and company restructurings on the other.

2020 passenger traffic, measured in RPKs¹, was down 65% on average compared to 2019, and by more than 70% on average in the last three months. The number of flights operated was down 50%, with ASKs² down 60%, reflecting the more severe restrictions on long-haul international services.

The average passenger load factor consequently dropped from a record 82.5% in 2019 to below 60%, and active fleet utilization was also well below pre-COVID levels, compounding the airlines' economic conundrum of minimizing cash outflows while trying to anticipate any kind of recovery in demand.

Fleet planning processes have shrunk from a 12 to 18-month horizon to less than four weeks in some cases and cost-per-trip has temporarily replaced cost-per-seat as a key metric in aircraft deployment decisions.

¹ RPK: Revenue Passenger Kilometer. Main airline management KPI: Revenue breakdown by commercial passengers carried x Distance flown (in kilometers, also expressed in miles in the US)

² ASK: Available Seat Kilometer. Total number of seats offered x Distance flown (in kilometers)

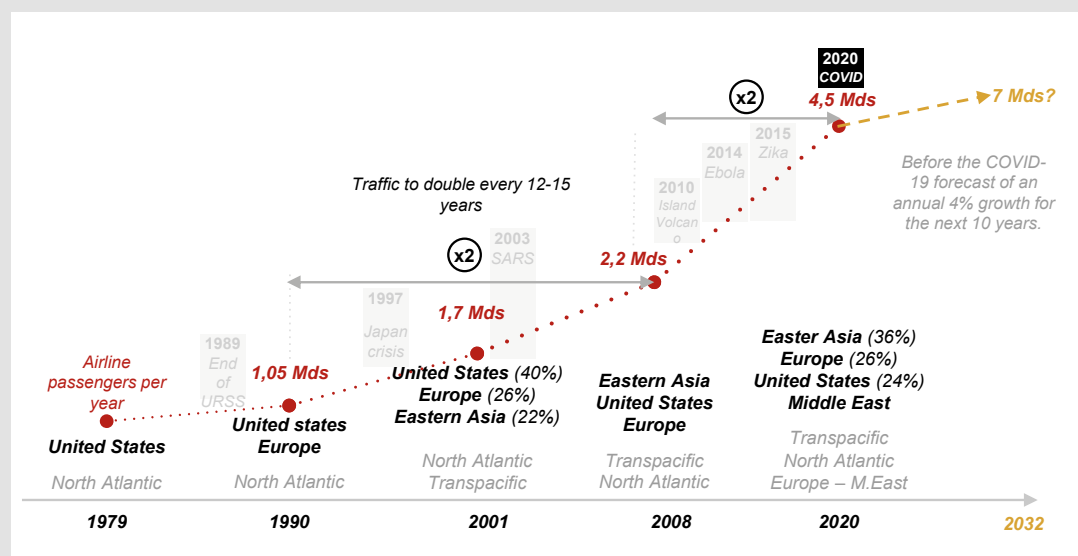


While 2020 ended with 30% of the global passenger airliner fleet inactive – a substantial improvement on the mid-April peak of over 60% – this still equates to more than 8,500 aircraft standing idle. Furthermore, having remained broadly stable for several months, hopes of an improvement have been quashed since the start of the winter season, with further deterioration now inevitable as a resurgence of the virus, in a more virulent form, has led to the reintroduction of blanket travel restrictions and a variety of new testing and quarantine requirements in many parts of the world.

Before COVID-19, passenger numbers worldwide were predicted to increase by 4% to 5% on a yearly basis and to varying degrees depending on regions.

Overall, growth was expected at around 6%, with the Middle East accounting for 10%, Asia for 8%, Europe for 4% and the United States for a steady 3%. Keep in mind at this stage that passenger flows double almost every 12 to 15 years as a result of this trend, prompting forecasters to predict 7 billion passengers by 2032-2035, underpinned by changes to the world's main hubs and long-haul connections (Source: IATA & Oxford Economics).

Annual Worldwide Air Passenger Volume Kinetics since 1979 & Main Long Haul Routes



Despite the stop-start nature of the COVID-19 crisis, the level of passenger recovery in a small number of key markets is encouraging, with the return of China's domestic market to pre-pandemic levels and a strong uptick in US demand around Thanksgiving supporting a view that the desire to travel is deeply embedded in our DNA and that, when appropriate levels of safety can be ensured and governments remove their widespread restrictions on movement, leisure passengers, at least, will return.

Nevertheless, for the moment, air travel in most parts of the world largely consists of VFR³ trips, where the urge to travel, linked to family ties, is

arguably the strongest. With the borders of up to 60 countries still closed to all except residents and citizens, the return of international vacation travel remains a more distant prospect. The fact that many hotels, restaurants and leisure facilities around the world, not to mention ground transportation systems, remain closed or can only provide a limited service is not conducive to strong advance bookings for the 2021 peak vacation season, which traditionally starts to build early in the new year.

³ VFR: Visiting Friends & Relatives. A passenger category like Leisure and Business.

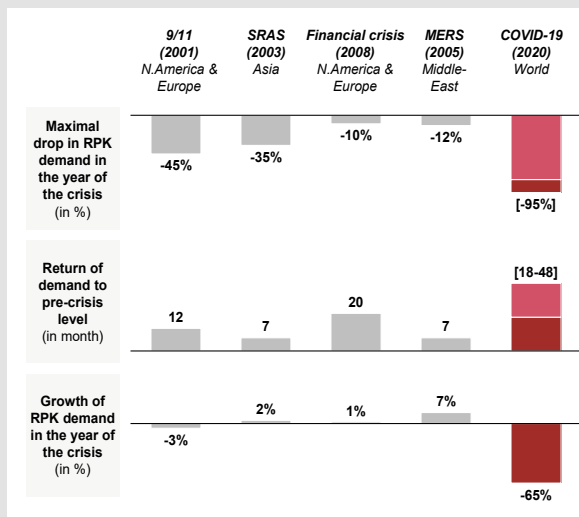
Business travel has been all but extinguished by a combination of economic recession, travel restrictions and the unwillingness of companies to accept the liability implications of their employees' health when travelling at the request of their employer. As the global economy begins to find its feet again, high yielding long-haul business travelers will be amongst the last to return, and in smaller numbers since non-essential company travel (between corporate locations, or for conferences or off-site and other non-core activities) will bear the brunt of corporate budget trimming.

This is especially worrying for full-service network carriers that are strongly dependent on premium traffic and revenues for their overall profitability. Many such airlines have disproportionately large business class cabins and will struggle to attract sufficient premium business to cover the costs: a business class seat typically requires three to four times the revenue coverage of an economy seat just to make up for the additional cabin volume occupied. With the most lucrative business travel market in the world, the North Atlantic, closed until further notice, the outlook for network carriers on both sides of the Atlantic, as well as further afield, is looking bleak.

Despite the mounting evidence that COVID-19 cannot be eradicated by banning overseas visitors, many governments continue to restrict or block access to air travelers. Unless governments apply rational and plausible procedures and, critically, reach cross-border agreements on how to coordinate their approaches, there will be no let-up from the current situation. Unfortunately, the likelihood of material changes in the way that governments behave and interact is small.

Effective vaccines are on the way, but with widely varying levels of capability when it comes to getting needles to arms, it remains unclear as to when normality may start to return. The northern hemisphere summer season still seems a long way off, but, unless there is a marked increase in the rate of global vaccine delivery, many airlines face losing their second peak season.

Comparison with other crises



So what will we take away from history?

What are the impacts of COVID-19 on fleets?

Managing the coming months in a way that preserves liquidity will be especially challenging for airlines, as they face an unprecedented situation that turns the normal fleet planning challenges of a downturn on their head. Rather than the simple management of capacity reduction in an orderly fashion, the across-the-board grounding of the majority of the world's fleet has left airlines with the more challenging task of determining which aircraft will be returned to active service, and in what order. As was the case following the events of 9/11 and the global financial crisis, they also have to consider which aircraft to retire on an accelerated basis, the difference here being the scale on which this is to be done.

Many airlines have already announced their plans for significant parts of their fleets to be taken out of service, either permanently or for an extended period until demand has substantially recovered. The affected passenger fleets obviously include classic ageing models like the 757 and 767, but also the 747-400, A340 and A380, as well as older vintages from the 737NG and A320 families.

Storage itself adds another dimension to the retirement process, since the cost and amount of technical work required



to bring aircraft out of storage increases rapidly with the length of time spent in storage. The challenges also increase with the size and vintage of aircraft, with a return to active service for older widebodies quickly becoming uneconomical. In the event of a prolonged recovery, the number of aircraft moving from storage to eventual retirement will increase, but, even in an optimistic recovery scenario, it is likely that around 5,000 aircraft will not fly again, i.e., around 20% of the previously active fleet.

For models – and indeed airlines – that were already in difficulty, the crisis has been unforgiving. Four-engined aircraft have obviously been especially affected, but airlines have also phased out or accelerated retirement plans for more popular twinjets.



A380

Facts are compelling. One example is that the crisis has drastically accelerated the decline in the use of four-engine passenger widebodies. Air France has said farewell to the A380 and become the first carrier to permanently withdraw the superjumbo, accelerating a plan to prematurely retire its ten A380s⁴ by the end of 2022. In fact, the A380 program was already in trouble before the crisis. In 2019, Airbus announced the end of production after the manufacturer struggled for years to secure any new or even any follow-up business from airlines other than Emirates. The Dubai-based carrier has eight more on order, and production is set to end in 2021. Singapore Airlines, the type's second largest operator, has decided to permanently retire seven of its 19 stored A380s as a result of the crisis.

As airlines massively parked their aircraft amid the COVID-19 outbreak, the Airbus A380 was probably the most prominent target for widespread decommissioning, with the uncertain prospect of the aircraft ever returning.

Across the border in Germany, Lufthansa has removed all A380s and A340-600s from future planning. Qatar Airways, meanwhile, does not see its ten A380s currently in storage returning for at least two years, while another Middle Eastern operator, Etihad Airways, which also has a 10-strong fleet, is awaiting "sufficient appetite to reassess [the A380's] viability".

⁴ As of December 8, Cirium fleet data shows that there were 22 A380s in service.

A340

Another model heavily affected by the crisis is the A340. Cirium fleet data shows that, as of December 8, the number of A340s in passenger or cargo service has more than halved to 50 from 118 at the end of 2019. The number of A340s "in storage" has grown from 70 to 120, and the number in retirement from 157 to 175. Iberia withdrew its entire A340-600 fleet from service because of the pandemic. At the end of 2019, the IAG-owned Spanish carrier had

17 A340-600s, including one in storage. Lufthansa grounded its entire A340-600 fleet in April. Out of 17 A340-600s operated by the German carrier at the end of 2019, no more than ten are set to be recommissioned, and even then only in the event of an unexpectedly rapid recovery. Other airlines that suspended A340 operations amid the crisis include Air France, SAS, South African Airways which is currently undergoing restructuring, and Virgin Atlantic.

B747


In any discussion of existing widebodies, the Boeing 747 naturally looms large. However, British Airways decided to no longer use the "Queen of the Sky" in March, when the largest operator of 747 passenger jets (with a peak fleet of 75 in 1998) had 31 747-400s in operation. Four months later, the airline announced that none would return to service. "It is a heart-breaking decision to have to make," said BA's former CEO Alex Cruz.

In June, Qantas retired its remaining half-dozen 747 passenger jets six months earlier than previously planned, and commenting on its stored A380 fleet Qantas CEO Alan Joyce said "While most of the group's long-haul aircraft are expected to steadily return to service over time, there is significant uncertainty as to when flying levels will support its 12 Airbus A380s".

Lufthansa likewise accelerated its 747-400 retirement plan. Having previously intended to operate the aircraft until the end of the decade, the carrier has moved the timeframe forward to 2025.



Others



In May, Delta Airlines announced its decision to retire its 18-strong 777 fleet this year (along with, less surprisingly, its 26 MD-90 narrow bodies).

And in September, the Atlanta-based carrier said it would retire its 90 717-200s and 56 767-300ERs by December 2025, and its 22 Bombardier CRJ200 aircraft by December 2023. For the former B763s, the outlook is more interesting, with a portion of the fleet acquired by Amazon to be converted into Cargo aircraft. Noting that these withdrawals were “earlier than previously scheduled”, the carrier warned that it “may continue to consider further opportunities for early aircraft retirements”.

Amid the pandemic, American Airlines has retired its A330s among other aircraft, including its 15 A330-200s, which are around nine years old on average. The Fort Worth-based major is also retiring its 757s, 767s, CRJ200s and Embraer 190s.

In October, experts highlighted the influence of maintenance costs on aircrafts’ post-crisis deployment prospects. “*The 777 overhaul costs are among the highest in the industry for any aircraft type, and A330s are in excess supply with many younger aircraft available. The result is that older A330s and 777s are getting retired sooner than initially expected and are being replaced with newer-generation, more economical widebody aircraft like the A350 and 787.*” explains Syed Zaidi (Cirium).

Releasing its half-year results in late October, All Nippon Airways said 22 777s were among the 35 aircraft being retired in 2020, which is 28 more than originally planned. Days later, fellow country airline Japan Airlines announced its intention to withdraw 24 777s over the next three years.

As fleets start to be brought out of storage, and this applies more widely than just the 737MAX, we can expect to hear more news of technical delays and in-flight engine shutdowns. Aircraft do not take kindly to being stored and the amount of planned and unscheduled maintenance required to bring aircraft safely out of hibernation can be significant. At the other end of the age and efficiency spectrum, airlines will favor low-risk, low-cost trip fleet recovery plans, which will mean a

return for smaller family and fleet members and/or the youngest and most fuel-efficient first. Regional aircraft may experience a boost until demand shows clear signs of a stable recovery, as they have the lowest trip costs and generate the highest load factors. In Europe and North America, utilization rates for regional capacity providers have been well above pre-COVID levels relative to larger mainline narrow body fleets. That being said, the longer-term outlook for regional aircraft remains uncertain, since

airlines will, at some point, revert to cost-per-seat economics from the current cost-per-trip analysis. If business travel fails to fully recover, airlines may well decide to trade frequency (valued by business travelers) for capacity (lower seat costs), which would favor mainline narrow bodies at the expense of regional aircraft.

Which Future?

Based on the growth forecasts commonly shared by all players in the sector, most carriers were expecting to return to profitability in 2020, but obviously the COVID-19 pandemic was not on their radar, putting them in a delicate financial position.

High structural costs due to government taxes, low occupancy rates and a lack of consolidation of the air transport market for the continent are weighing on companies. Hence the second and consecutive losses of US\$200 million forecast for 2020.

In the Middle East, airline companies continue their restructuring efforts but remain grounded by low GDP growth in 2019 and a third year running of losses estimated at US\$1 billion in 2020 after US\$1.5 billion in 2019.

The Latin American aviation market was challenged by weak currencies in 2019, and a sharp slowdown in growth of 0.2% linked to problems in Mexico and recession in Argentina and Venezuela. Despite this, a profit of US\$100 million was nonetheless forecast for 2020 in accordance with the IMF's model of 1.8% of growth after a reported loss of US\$500 million in 2019.

On the flipside, North American carriers remain top performers, recouping 65% of industry profits in 2019 and 56% of total revenues forecast for



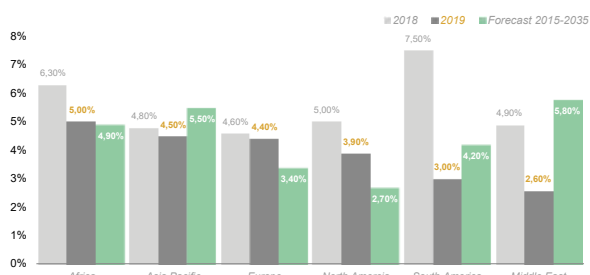
2020. US\$16.9 billion in net profit was booked in 2019 against US\$16.5 billion in net profit forecast for 2020, for a profit margin of 6% and a net profit by passenger of US\$16.

In Europe, net profit increased from US\$6.2 billion in 2019 to a forecast figure of US\$7.9 billion in 2020 for a profit margin of 3.6% and a net profit by passenger of US\$6.4.

In financial terms, the average net margin for airlines stood at 4%, for an average occupancy rate of 82.6%. North America and Europe were the most mature regions with 9% and 6% in operating profit.

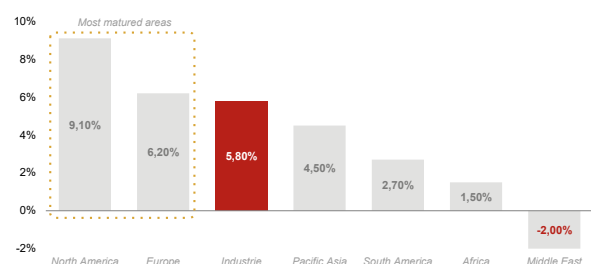
Global capacity growth amounted to 3.4% and was almost in line with the 4.1% increase in global passenger volumes. In terms of nationalities on long-haul (LH) routes, passengers from the United Kingdom represented 8.6% (126m) of all LH air traffic, passengers from the United States

Airline growth by region



Source: IATA

Airline operating profit rate by region in 2019



Source: IATA



The travel industry is intrinsically linked. Everyone is facing the same crisis, and to survive, we need to collaborate.



Karen Chan, CEO, Air Asia

International and Domestic most frequented routes in 2019

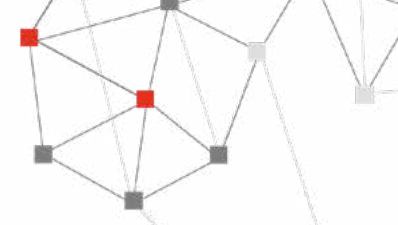
Most frequented international lines

Hong Kong – Taipei	5.4m
Hong Kong – Bangkok	03.4m
Singapore – Jakarta	03.2m
Seoul Incheon – Osaka Kansai	02.9m
Singapore – Kuala Lumpur	02.8m

Most frequented domestic lines

Seoul Gimpo – Jeju	14.5m
Tokyo Haneda – Fukuoka	07.6m
Sydney – Melbourne	07.6m
Tokyo Haneda – Sapporo	07.3m
Beijing – Shanghai Hongqiao	06.4m

Source: IATA 2019



represented 7.6% (111m), passengers from China represented 6.6% (97m), passengers from Germany represented 6.4% (94m) and passengers from France represented 4.1% (60m). These five countries account for one-third of all long-haul passengers.

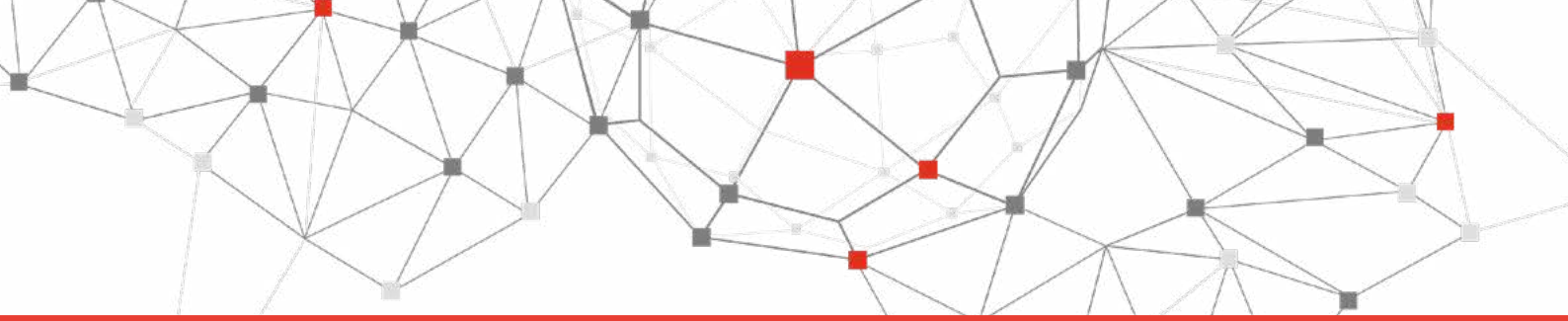
The most frequented international lines are concentrated in the Asia-Pacific region, where five lines manage over 2.5m passengers per year and the Hong Kong-Taipei line alone accounts for 5.4m passengers.

Domestic markets were also in good shape, with average growth of 4.5%, in particular in the Asia-Pacific region, the center of the world's densest traffic flows. The Seoul Gimpo-Jeju domestic line, for instance, counts more than 14.5m passengers per year.

However, economic trends have radically changed following COVID-19, with the situation fast converging between a cyclical setback and a structural crisis among all players in the aerospace sector. While the COVID-19 crisis in itself is not the only reason for such large-scale financial losses, it did inevitably push A&D companies that were already on the brink with minimum margins over the edge and companies that were over-confident soon learnt that they had to improve and speed up restructurings. Industry partners and governments need to work together to ensure the safe reopening of the wider travel sector.



RWY AHEAD



The extraordinary levels of additional indebtedness secured by airlines, through a combination of government support, loans, capital markets and lender and lessor concessions, will permanently realign the financial balance of the industry and impose an onerous burden on management teams that, in many cases, are not equipped to deal with the fundamental changes that will be required simply to survive. For sure, there will be more airline casualties ahead, but for those that survive the ability to subsequently thrive will be more elusive.

Success will require not only an efficient cost structure that is not over-burdened with debt and a rock-steady brand and franchise, but also a leadership that has the vision and experience to challenge the broader industry norms and constraints, to embrace and harness technology and data and to champion sustainability and diversity.

These qualities, that will define success over the next decade, will also, through their absence, define failure as the industry faces an inevitable down-sizing.

A In order to survive and thrive in the post-COVID world, airlines will have to fundamentally re-think their fleets, their business models and their cost structures. Cutting costs has been much harder and much slower than the cut in revenues that airlines have had to face since the pandemic. While this will not always lead to change, for most operators a return to “business as usual” is not going to be a

viable option.


- To put it bluntly, there are too many aircraft in the system relative to the realistic prospects for medium-term recovery. The new normal in many markets, and for the industry as a whole, is going to be a smaller industry – a market of 4.5 billion passengers will not return overnight.
- Airlines will not be able to simply pick up where they left off. Not only have markets shrunk, but the profile of their customers and their needs will have changed, and the way that they are required to serve their markets may have become uneconomical.

- A heightened duty of care towards customers and front-line staff is not just a priority for the immediate term, but will reshape customer service and product delivery well into the future, with cost as well as operational implications.
- The crippling debt burden that is building across much of the airline industry will require root and branch restructuring in order to bring financial metrics back into line with long-term solvency and profitability.



There are no guarantees. Despite having done what was needed to absorb the shock and to continue to produce in a very difficult environment, the whole sector is still on life support and the risk of failure is high. As a result, the much-needed consolidation will have to be brought forward.

Didier Kayat – Daher

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- In many cases, drastic surgery will be needed to right-size fleets, restructure business models and recapitalize businesses. This will regrettably also mean widespread job losses, well beyond those which have already been announced or implied.
 - The fleet rationalization process is already underway of course, but the process will continue and accelerate, as fleet decisions address multiple objectives. In the interests of efficiency, many airlines have already chosen to retire their oldest, least efficient and least reliable fleets or, if they are in storage, to bring them back into service last.
 - In line with the experience of previous shock events, most early generation and obsolete aircraft will not see active service again on any level. These range from the handfuls of remaining DC9s and 737-200s to MD80s and classic 737s, A340s, older A330s, and the majority of the remaining passenger 747s, 757s and 767s.
 - As airlines look for greater efficiency, they will also seek to simplify and streamline their fleets, cutting down on sub-fleets and eliminating models that do a similar job to others that they will retain; or sacrificing a multi-supplier OEM policy for a single solution with the benefits of shared crews, training and maintenance.

B. While the post-COVID era will see fewer airlines sharing the skies, each of them will probably be larger than existing companies with the return of global demand. More flexible models and the ability to do business remotely from anywhere in the world will help place international travel back on track.

- Right-sizing will play a key role in airline restructuring plans, as traffic levels will no longer support the largest family members in the proportions that had been envisaged for the current fleet mix.
- This presents an obvious challenge for A380s, but is also likely to extend to 777s, A350-1000s and 787-10s in the widebody spectrum, as well as having an impact on the mix of A321neos and larger 737MAXs delivered within the single-aisle programs.
- Regional aircraft, including the small mainline A220s and E-Jets, may well have an early advantage in this re-mix, as they present significantly lower risk in a world of uncertain demand. However, looking further into the future, an alternative scenario might see lower frequencies traded for larger gauge aircraft, especially if business travel remains subdued.
- This right-sizing process will extend well beyond delivered fleets and have a significant impact on existing order books and future order activity. However, few airlines will be looking to add new capacity for a while – there is more than enough surplus capacity to deploy among idle fleets. Equally, lease extensions are likely to be fewer and farther between and new lease placements harder to secure.
- Another category of aircraft becoming surplus to requirements are those that are released from failed or failing airlines. A higher proportion of these aircraft will be relatively young vintages that ordinarily would quickly be re-deployed to other operators. Under the new normal, however, they are likely to hang around in the surplus inventory park for longer, competing with other similar aircraft released by right-sizing airlines, those naturally coming to the end of their lease and new builds delivered by OEMs.



The crisis has reinforced Thales' positioning (its portfolio) and the implementation of shared services. As a larger company that has expanded into technology, data protection, cyber security and so on, it will continue to grow.

Main axes for development:

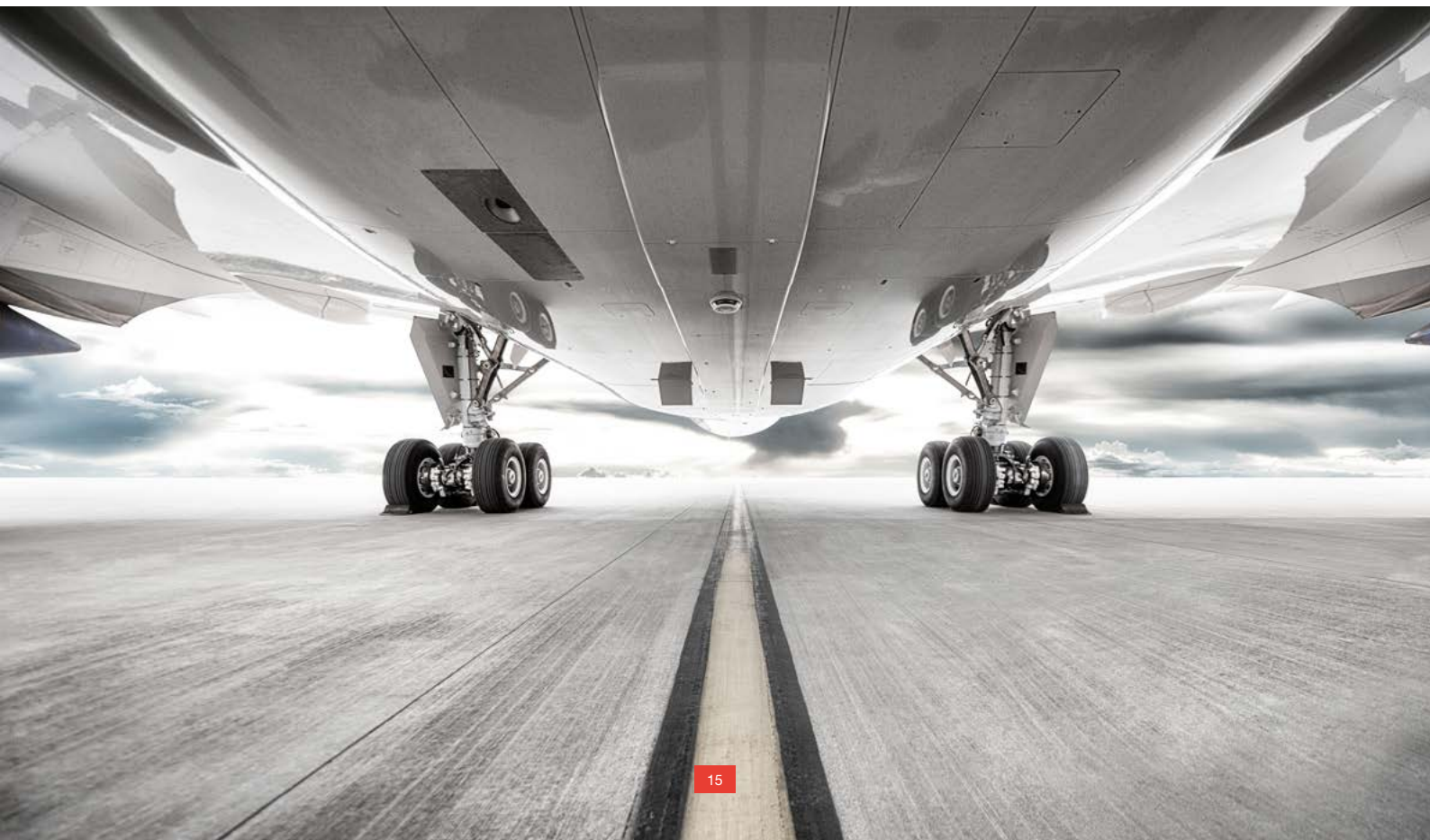
- Research to optimize engineering and manufacturing which shows that, even in a crisis environment, Thales is a reliable and healthy player that is able to maintain its appeal.
- Work to extend its leadership in AI and quantum physics.
- Successful execution of projects, cash management, etc.

Philippe Keryer – Thales

- Combining these different channels for fleet reduction will result in around 5,000 aircraft becoming available, one half of which will be surplus to requirements and will have to compete for future placement as the market recovers, and the other half of which will either find their way into the cargo conversion pipeline or be permanently withdrawn from use. 5,000 aircraft represent almost 20% of the delivered fleet, but this may not be the final tally, as the

process will extend over several iterations as the industry fine-tunes its requirements.

- The maxime of “never let a good crisis go to waste” is generally attributed to Winston Churchill (even if it is doubtful that he actually spoke those words), and the advice is particularly sound today. Airlines have never been in a more pressing existential situation and bold and far-reaching decisions need to be taken.





C. Re-shaping a business to survive and thrive in the new normal will require a holistic multi-step process, in which each stage is intrinsically linked with the next and with the wider industry picture.

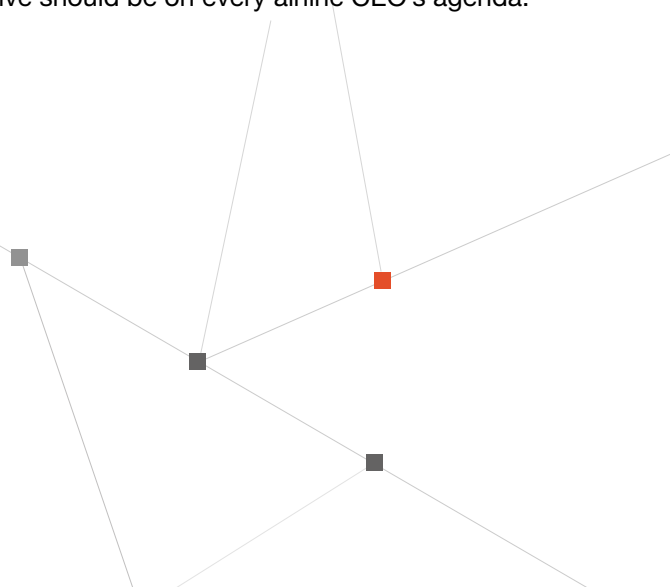
- While the fleet is the most tangible of moving parts in an airline business model, fleet changes will inevitably be influenced by decisions taken on the route network and the traffic flows across the network. These in turn will be influenced by the core elements selected for the business going forward and, to the extent that this focus changes, will have consequences for the product offering, the brand and the franchise.
- Arguably, this last area should be the starting point for deeper introspection. What is the franchise going to look like in a post-COVID world and in the context of a changing cast of players and competitors? However strong the brand and franchise have been in the past, do they hold up and continue to have a role in the future marketplace? Most importantly, how can the business be profitable or, more specifically, which parts of the business can be profitable?
- The crisis therefore presents a unique opportunity to build back the business layer by layer with a laser eye on enterprise value and profit contribution. The future airline industry route map is likely to be a good deal less dense than the pre-COVID one. This is the time to lop off overgrown branches, cut out dead wood and eliminate loss-making sectors flown to utilize excess capacity or to protect slots.
- Environmental issues and sustainability may have taken a back seat as airlines deal with immediate existential issues, but they have neither gone away nor diminished in importance in the 2021 Aviation Industry Outlook 11. The industry has set some extremely challenging targets, including a 50% reduction in carbon emissions by 2050 compared to 2005.



Supported by CORAC, Daher was able to quadruple its R&D and work on reducing its carbon footprint in aviation. Thanks to the EcoPulse system developed jointly with Airbus & Safran, the TBD Hybrid demonstrator aircraft has been launched. Hybridization analysis on a real aircraft is now live. Daher aims to maintain the programme in 2022 and move forward on green aviation. The development of thermoplastics will be a game changer in the recyclability of aircraft.

Didier Kayat – Daher

- Achieving these goals will require considerable investment in developing new technologies. However, the challenge is considerable. A reversion to the pre-COVID industry growth trend will push aviation's share of man-made CO₂ emissions from 2.5% to 10%, and potentially as high as 24% by 2050 if the pace of technological change does not accelerate, and additional measures will likely be required. The initiatives and actions required to make real progress on this front need to be embedded in the business plans that emerge from the wreckage of COVID-19, and developing a positive ESG narrative should be on every airline CEO's agenda.



Thierry Antinori

Chief Strategy and Transformation Officer at Qatar Airways

Thierry Antinori started his career in 1986 at Air France. He joined Lufthansa in 1997, where he became Chief Marketing and Sales Officer and member of the Board. He left the German carrier in 2011 to join Emirates Airlines as Executive Vice President for Passenger Sales Worldwide, with a term that included Commercial Operations, Revenue Optimization, Network Development and the Skyward Frequent Flyer Program. After several years of service, he was named Executive Vice President Chief Commercial Officer, strongly tipped to become the next president of Emirates Airlines. In September 2019, he moved to Qatar Airways.



Cutting fixed costs is key for the sustainability of airlines. Overheads must be drastically reshaped if companies are to survive. We also need to develop an integrated model of Airport, Airline, Alliance and Partners to capitalize on partnership synergies and develop

integrated Airline Factories.

PwC - What is Qatar Airways' situation currently?

T.A - Qatar has seen a tremendous decrease in top line, which it has been unable to offset with a reduction in costs at the same speed with which revenues have vanished. Every previously known marker on the market has disappeared. Today, corporate survival hangs on taking risks – adding capacities on key markets to serve new catchment areas and combining that with Cargo – and doing that ahead of others as even a couple of weeks can count these days. It is about taking a bigger share of the smaller top line pie and generating cash rather than direct operating costs.

PwC - What are the main challenges you face in the short term and/or near future (2 to 3 years)?

T.A - 1. Tracking the changes in KPIs

- P&L is important from a mid-term perspective combined with a drastic cut in fixed costs. Airlines need to focus on becoming more agile rather than on planning

as they have in the past.

- Businesses need to concentrate on their cash margin rather than their direct operating costs, with the ratio between top line and costs becoming the most tracked financial KPI for monitoring a business. P&Ls are no longer the only way for airlines to manage their business. Qatar has made tremendous efforts to increase its cash margin versus direct operating costs by more than 10 points (including PAX and Cargo revenues). Cash flows from Commercial and careful cost management (top line versus variable operating costs) are the keys. Simply killing costs is likely to drive airlines into the trap.
- Cutting fixed costs is key for the sustainability of airlines. Overheads must be drastically reshaped if companies are to survive. Turning a significant portion of fixed costs into variable costs is a lever. It's the first time ever that Qatar Airways has decided to go so low in managing its fixed costs, taking them to the ground point of interception.

2. Finding the right balance in crisis management, reducing cash burn as much as possible but also not setting the ground point of interception for Commercial too low.

- Taking advantage of the crisis to gain market share, and, more importantly, "win over a larger share of a smaller pie"; is the main challenge today. Airlines will have one chance to retain part of this market share increase when the pie begins to grow again and to emerge in a potentially stronger competitive position than pre-COVID.
- Companies need to use the fact that airlines are currently at critical size to better understand the market and be able to read between the lines.
- They need to develop more confident and personal relationships of trust to gain market share and defend it down the line.

3. Carefully managing fleets and direct operating costs

- Investing in fleets, and, above all, in the latest generation of aircraft to benefit from the latest products that are adapted to the network



and financial sustainability (cf. direct operating cost management). Defining the best fleet mix to make sure you keep a handle on changes in direct operating costs, whatever happens.

- Absorbing the strong impact on P&L margins; despite the crisis, Qatar Airways generated more cash than direct operating costs in Q2 2020 than in 2019, resulting in a better P&L performance.

4. Reshaping the business approach

- Agility and Proximity with the markets have been key words in aviation since the beginning of the COVID-19 crisis, and will be for years to come. Seat Factor remains a key indicator for the industry. With an average load factor of 35%, Qatar is one of the world's major airlines to benefit the most from the situation (versus 12% for Singapore and 50% for Emirates during peak season but mostly head-to-head). By comparison, Cathay sold 40,000 seats last month versus around 600,000 for Qatar Airways
- Planning-centric approaches are outdated due to the volatility of the situation and the uncertainty plaguing the business.
- Agility and Flexibility must be implemented by airlines to develop new systems for managing pilots and crews so that they can be called and/or recalled as effectively as possible in a lapse of six to eight weeks in the event a market recovery does happen in the short term.

PwC - What are the main pillars you will continue to strengthen in 2021 and the next years?

T.A - "If I was an Airline C-Level executive like any other, I would have said "being closest to the client". But the game is much more complicated..."

In the short term:

- **Brand Positioning** -- Being a forward-looking and reliable airline for clients and trade partners.
- **Network Management** -- Being a reference airline in Big Countries and Big Cities.

In the medium term:

- **Demographics and VFR** (Visit Friends & Relatives) will play a greater role than in the past.
- Traditional **catchment areas** will shift slightly to emerging countries like Iran, Pakistan, Nepal, Bangladesh and Iraq, obliging businesses to rapidly morph in parallel.

PwC - From your perspective, what are the main strategic challenges in reshaping the industry and airlines after this unprecedented period?

T.A - Lever #1 – Achieving the right combination of network and fleet to be able to provide the services needed and not compromising on network configurations. Network configurations need to be as accurate and as efficient as possible to ensure the critical density needed and a suitable portfolio of destinations. Qatar has always thought in terms of its global network to capture worldwide flows. Domestic business or a region-centric approach will not be enough in 2021 to be a true leader. A global customer base is essential, and Qatar will continue to be a pioneer in this respect in order to strengthen its leading position.

Lever #2 – Forming partnerships with other airlines and/or trade partners. Eradicating the competition by taking advantage of strategic routes and gaining market share by offering a broad scope of routes and connections is the way forward. "Hub to Hub" is the next "war" to win over passengers and use the freedoms of the air to extend networks as far as

possible. However, partnerships will soon change slightly to become more "entrepreneurial" than past major alliances.

Lever #3 – Stabilizing air fares with partners on strategic legs by taking alliances to a new level of integration, mostly on commercial routes.

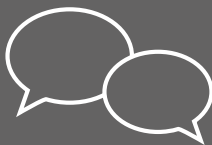
Lever #4 – Strengthening assets like Cargo, which has a key role to play, enabling airlines to take more risks and keeping operations afloat on routes where there is virtually no demand. Cargo helps with decision-making thanks to its impact on overall revenues, direct operating costs and cash margins.

Similarly, new trade agreements that turn unusual partners into opportunity partners will become an overriding asset. Repatriation has opened new catchment areas and opportunities (Canada has been the biggest client, followed by France and Kuwait), allowing companies to increase flight frequencies whilst at the same time disrupting agreements with competitors, thereby stimulating competition and prices.

Next steps:

- Continue to develop the integrated model between **Airport, Airline, Alliance, Partners** to win new market share.
- **Partnerships mean reciprocity for businesses**, so Qatar intends to defer these benefits to a later stage in order to help its trade partners and strengthen ties between airlines.
- **Network and codeshares are today's keys for success.** How to set up sustainable business from a long-term perspective – one that is based on reciprocity in sales, the integration of Frequent Flyer Programs (FFPs) and Corporate business?

Partnerships are often described as a network and a series of agreements. It's a mistake. Airlines have a duty to conduct



their business based on structured Corporate partnerships that go beyond integration (e.g. combining of FFPs, integration of purchasing, etc.).

PwC - What is your view on potential future trends in A&D business models?

T.A - Corporate travel will take time (and more time than expected) to come back onboard.

It's highly probable that a portion (significant in some markets) will never come back, primarily as a result of changing travel policies, the wider use of digital meeting resources and changes in travel and meeting frequencies.

#1 Adapting sales to maintain a competitive position.

- British Airways and Heathrow Airport, for example, have lost several places in the latest industry rankings, probably due to a less aggressive sales strategy during the pandemic. Guangzhou airport in China became the #1 airport in the world in 2020 as Chinese demand and cargo catchment enabled it to have a more aggressive strategy.

#2 Overcoming the difficulties in defining the correct critical size for an airline in the coming years.

- More than defining models, it is important to recognise that nobody knows what might happen next. It will be much more efficient to switch to an increasingly agile

approach – thinking more in terms of stages and successfully reaching the next plateau will be the best way to react and adapt to uncertainty. Designing tools and solutions that allow us to maintain the agility acquired during the crisis will be fundamental.

Reshaping business models takes vision and cannot be achieved without experienced C-level airline executives and high-quality advisors.

PwC - What are the keys for the future?

T.A - Being more competitive in terms of costs, by staying agile 24/7/365. Agility goes hand-in-hand with competitiveness and cost management

- Pricing will be another key; changing from a traditional pricing strategy to a “pricing of the future” approach, based on a better understanding of the customer and tailored offers (cf. dynamic pricing - combination of CRM, pricing and data to shape new pricing trends)

1. Pricing of the Future

- It seems highly likely that revenue management will be obsolete in ten years time, at least revenue management as we know it today. Product + Price mix will be a thing of the past.
- Current trends point to the increasing definition of individual offers powered by a combination of CRM, data and of course

technologies in order to increase our knowledge of the customer and consumer patterns.

- In these difficult times, when premium classes remain virtually empty, a key challenge for airlines is to increase their share of the portfolio of customers, to attract them and get them to consume more and more premium products than they used to.

New pricing mechanisms are crucial: They will be a major asset in the recovery battle and passenger catchment.

2. Frequent Flyers

- When all is said and done, frequent flyers are a limitation for airlines. Frequent flyer programmes need to be considered more as a tool to help airlines extend their activities to new commercial sectors. They are a label which offers access to new resources insofar as they have a key role to play in obtaining customer information and will become platforms for offering new products and services to frequent flyers.

3. The Hub as a Factory

- Hubs remain the best networking asset for airlines – they require technique and they require expertise and experience. Hubs need to be used as an analytical tool to better measure market health.

4. Additional products and services

- To broaden your revenues portfolio, but which will work only if you know your customers very well.

Interview recorded on January 26, 2021 by Olivier Joffet.

We would like to sincerely thank Mr Thierry Antinori and Qatar Airways for their hospitality and sharing their qualitative vision with transparency and trust.

Beyond COVID-19

COVID-19 was the spark that ignited a fire and brought areas for improvement to the fore.

From early September, communities worldwide have watched the relentless rise in the second wave of COVID-19 cases in many parts of the globe. The dreaded “W scenario” seems to have come around, except in Mainland China where the pandemic seems to be under control, giving a tremendous boost to economic recovery thanks to local consumer demand.

Despite the upturn in Asia, the number of executives in Europe and in the US who are convinced that better economic conditions are on the way has fallen since September. Nonetheless, the scales are still tilted toward a positive outlook, especially where profits and customer demand are concerned. At the time of this report, some countries are looking to re-establish links and progressively reopen their borders in the hope of a decline in the pandemic, tentatively allowing cross-border and/or overseas traffic to start moving again.

However, in other regions like Europe, the rebound in the pandemic has had a heavy toll. Restrictions are back in place after a promising summer and travel bubbles make things difficult to predict.

Traveller confidence has remained at an all-time low for a long time, initiatives to boost traffic are few and far between, and bookings are flattening at low levels.

COVID-19 will likely affect trade more profoundly than any other recent crisis. Nevertheless, some surprising news about the ongoing COVID-19 vaccine trial came in recent weeks, namely that leading candidates have found an efficacy rate of around 90 percent and over. There is still a long way to go, but the news was most welcome.

Against this backdrop, we look at how the coronavirus pandemic has impacted the entire ecosystem

and how the situation will evolve into broader perspectives, forcing the entire A&D value chain to provide solutions to rebuild a devastated industry

as of today. That being said, another thing to keep in mind is that A&D remains a strategic industry to support travel, freight and by extension the economic flow of goods and value on a global scale.

.....

Currently, short-haul is at 50% capacity, medium-haul at 40%, and long-haul at 10-15% after stabilizing over the last three weeks. The total number of aircraft in service represented 86.4% of the entire global fleet at the end of January 2020, against 38.8% at the end of April 2020 with a small increase to 46% in July. There were around 31,000 commercial aircraft in service worldwide in late January, with just over 16,800 of them under lease. Since July 2020, a little more than 16,500 aircraft are in service and just under 7,100 are leased¹.

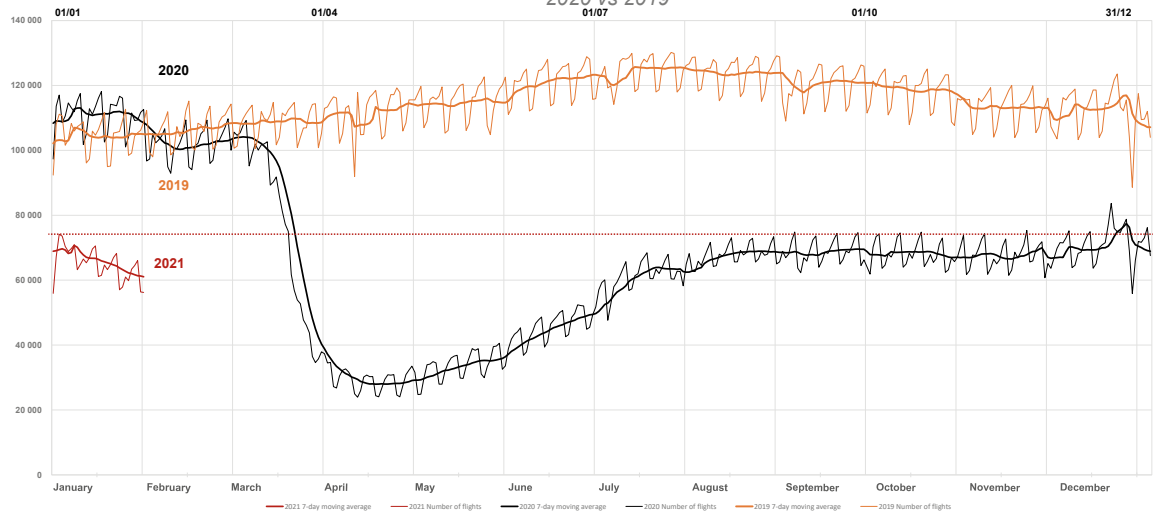
COVID-19 is not going away on its own and all indications are that it will get worse before it gets better. In the meantime, governments should not be expected to change their stance on movement, travel, border controls, quarantine, etc. Flight schedules will continue to stop-start, subject to uncertain and intermittent demand and requiring frequent amendments.

¹ Source : CAPA Fleet Database



Daily Commercial Flights

2020 vs 2019



Sources: Flightradar24 + OAG Database

Passenger airlines will therefore need ongoing access to emergency liquidity, including government support, for the foreseeable future. Where this is not forthcoming, some airlines will fail. The level of fleet inactivity will get worse before getting better, resulting in more aircraft that are never returned to active service.

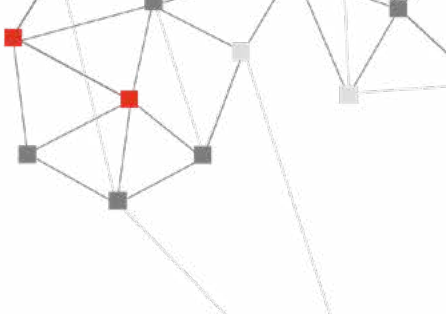
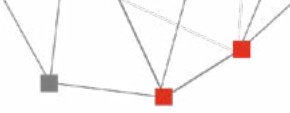
Demand for additional capacity will remain muted, making lease extensions and placements more difficult, and OEM production rates may not return to 2018/19 levels before 2025. Pressure on lenders and lessors will also continue well into 2021. More lending banks will find themselves in the position of unwilling operating lessors as defaults rise, and the leasing sector will see more restructurings and M&A activity.

Nevertheless, the outlook for operating leasing is very positive as airlines increase their use of the lessor channel to finance deliveries. This in turn will create more opportunities for investors to put equity and debt to work in the sector, perhaps initially as partners jointly financing aircraft with established leasing platforms; then, as confidence in the recovery grows, making direct investments in existing lessor platforms or establishing new ones.

The most efficient aircraft technologies and smaller-gauge family members will continue to be the most attractive fleet choices for airlines seeking to minimize operating risk and cash outflows.

Their values are unlikely to experience permanent reductions. Conversely, the largest and least efficient aircraft types will remain under-utilized for longer with an elevated risk of permanent value impairment. Once the coronavirus has been subdued, passenger demand will return as there is already evidence that the desire to travel is firmly embedded in our DNA and, given the opportunity and the confidence to fly again, the majority will do so.

The industry has demonstrated its resilience many times in the past and will survive and thrive again, albeit with some sorely needed changes to its structure. For investors considering opportunities in the sector, the downside risks should not be under-estimated, but there is real value out there, arguably to a greater extent than in any of the past ten years or more. Timing and forensic due diligence will be critical factors in making sound investment decisions, supported and guided by industry professionals with multi-cycle experience.



54% or **2.27 billion** seats proposed in 2019 may disappear this year

1/3 airlines on offer in 2019 may disappear by 2020

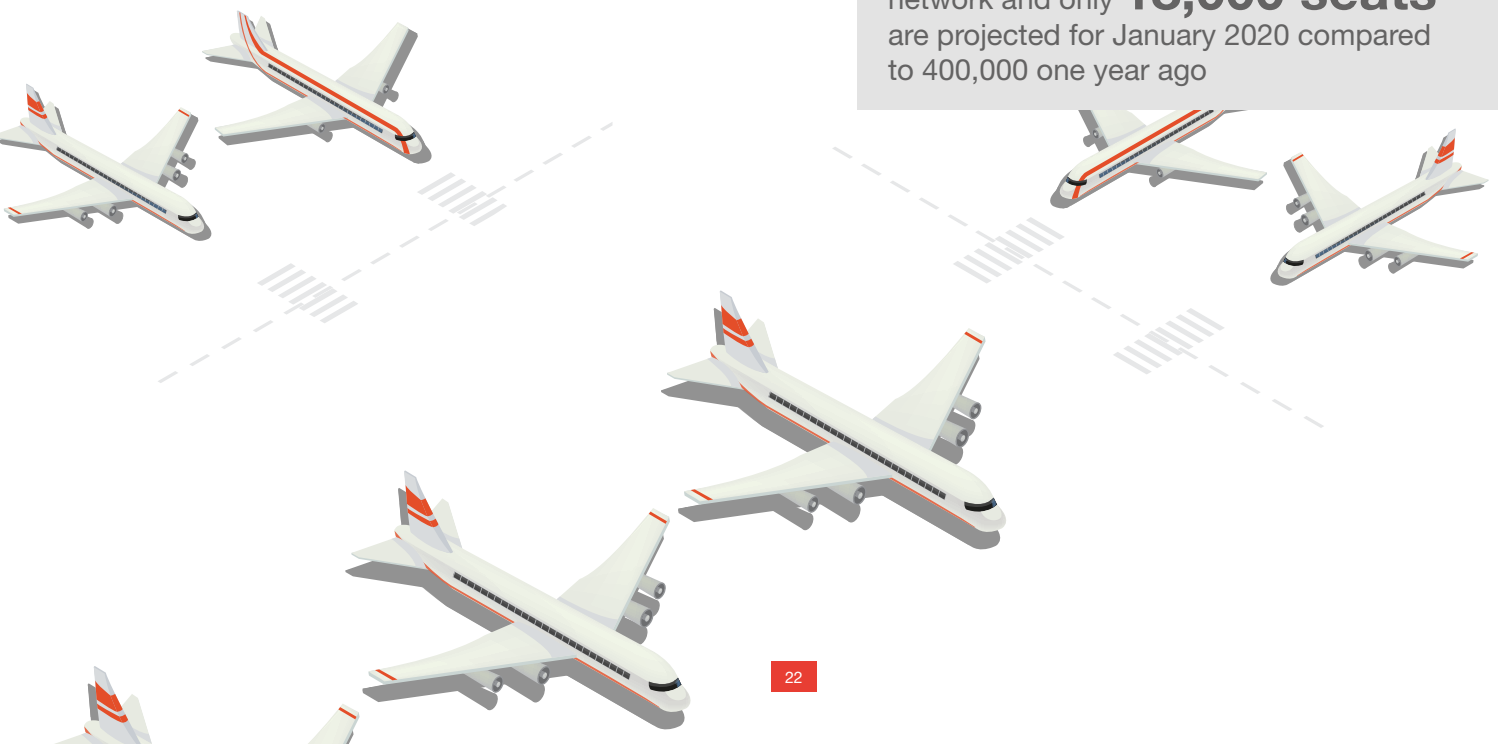
Currently, Western Europe is only at **30%** of its seat capacity level compared to January 2020

British Airways has cancelled more than **100,000 seats** per week

The United Kingdom is at **20%** of its pre-COVID seat capacity levels and **75 airline** companies are operating there compared to 121 last January

The focus of airlines is increasingly on getting planes back into the skies, as carriers seize opportunities to reopen routes and launch new services

easyJet cut an additional **78,000 seats** from its British network and only **18,000 seats** are projected for January 2020 compared to 400,000 one year ago





Focus on Defense

The Defense supply chain is under new sources of pressure. Not only is COVID-19 contributing to

logistical issues and program delays, it is also putting severe strain on the commercial aerospace supply chain, which has been a source of strength for the broader industry over the past several years.

When it comes to defense, this crisis is leading to a paradox: the sector's industrial and technological base is also in danger, even though its prospects should be guaranteed by the execution of several long-term military

programs that are already underway and the fact that the level of threats is only getting worse.

From now on, and even more so in the coming months, many defense players will need to fight for their survival, particularly those that serve both markets since this crisis first affects the civil sector. There may be a temptation for even the strongest companies, to sacrifice investments

to maintain short-term equilibrium. This is the main threat, silent and painless at first, that is hanging over the defense industry: to be forced to sacrifice the future to save the present.

However, while commercial aviation and tourism have faced an almost complete shut-down as a result of the crisis, the defense industries still have orders to fill, largely due to the lengthy duration of defense programs, which, for major programs, is counted more in years than in months.

Defense shows resilience, but...

1

Production/manufacturing facilities and supply chains – With COVID-19 cases on the rise in Western Europe/USA, the operations of many defense firms may be hampered by partial or complete shutdowns or regulated functioning, thus affecting production queues and deliveries.

3

Demand for defense equipment and related services could go down – It is likely that most governments around the world will have to spend a lot more on healthcare and social security in the medium term, although defense spending shows resiliency.

2

Business development efforts could be affected – characterized by long negotiation periods and government to government linkages. Also, a cessation or reduction in military exercises may result in harmful side-effects.

4

Companies may have to make tough choices that could impact finances and competencies – Maintaining all assembly lines and an active workforce in the face of reduced sales is a challenging situation defense companies could face.

Changes in military spending around the world

Governments & Administrations

- Temptation to revise military spending for economic reasons
- Defense demand to support industry in the country is considered as a strategic asset

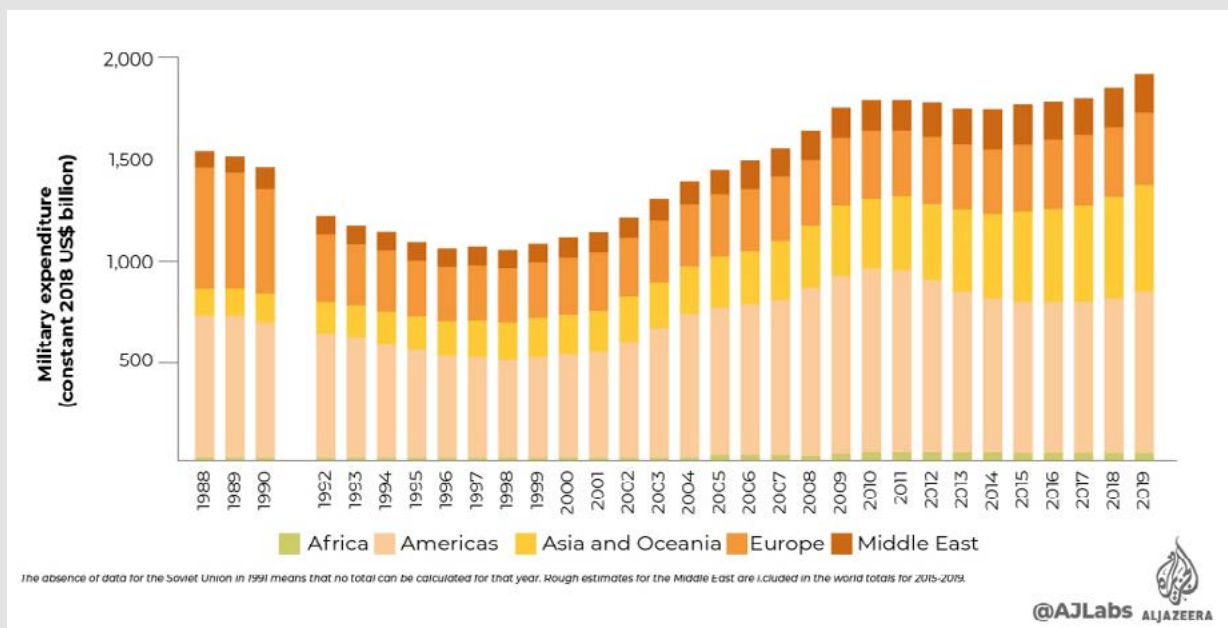
Countries feeling under threat

- Geopolitical issues
- Temptation to continue to maintain and develop their ammunition and military resources

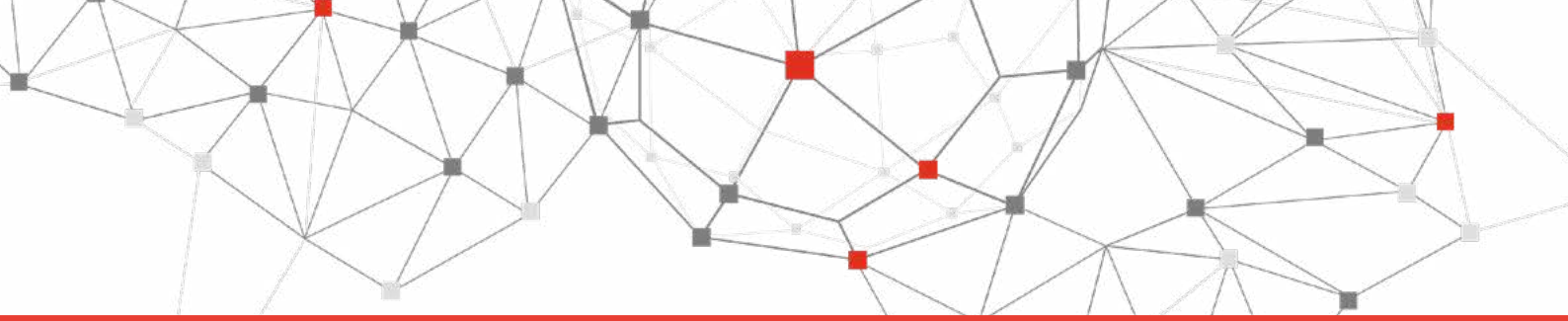
Countries that are consumers of defense materials

- Countries needing to protect themselves from external threats
- Countries facing direct or indirect threats that need to revise their military investments as a result of crises
- Countries that can influence ongoing military and defense programs

Global military spending

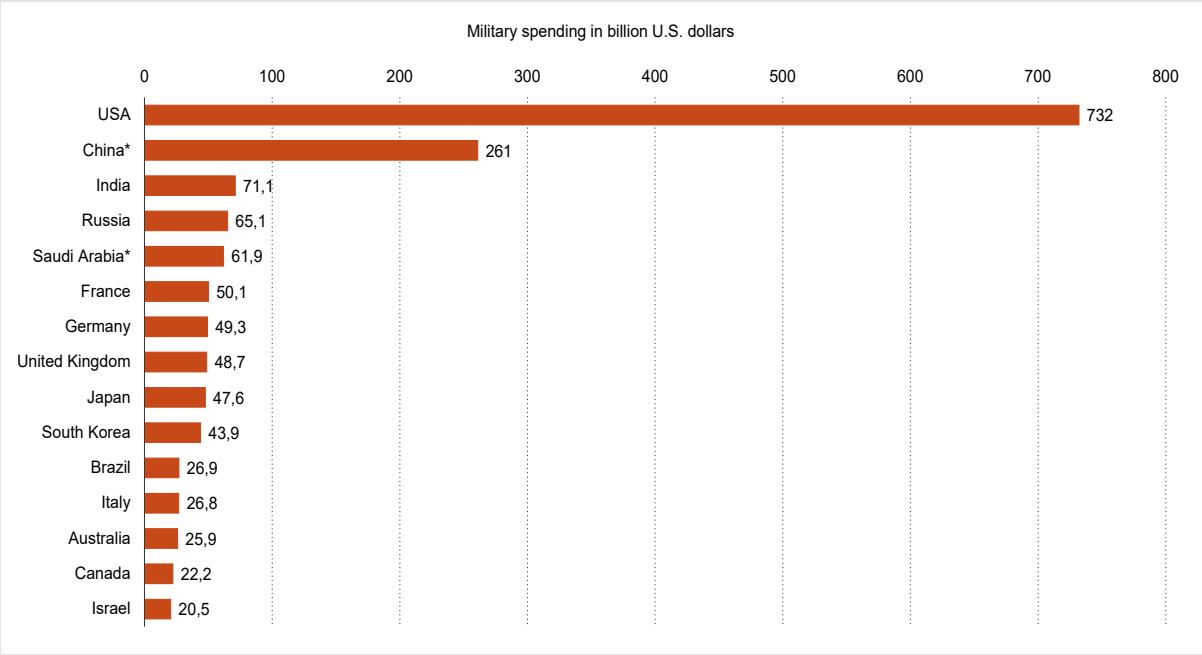


Source: SIPRI - April 27, 2020



The 15 countries with the highest military spending worldwide in 2019 (in US\$ billion)

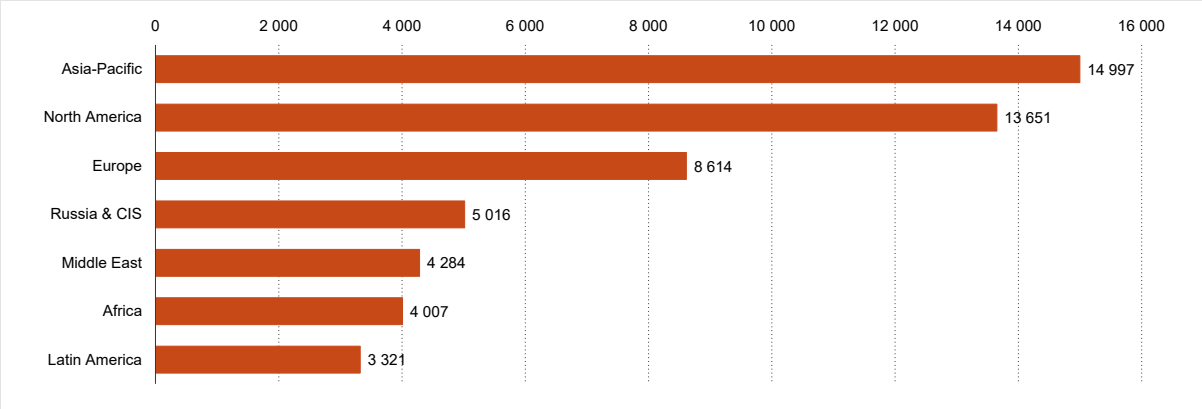
Countries with the highest military spending in 2019



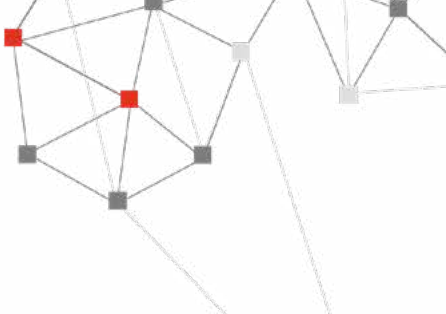
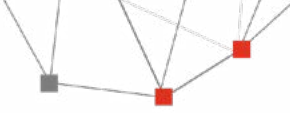
Source(s): SIPRI; ID 262742

Size of the global military aircraft fleet in 2019, by region (in units)

Global military aircraft fleet by region 2019



Source(s): Flightglobal; ID 1185373




Meanwhile, new cyber security and supply chain integrity requirements are taking root while the industry faces increasing defense budget risk. While defense spending is expected to remain at elevated levels, mostly supported by US military reinforcement, the industry is facing strategic changes in programs and priorities as a result of the upcoming elections or new crises at Europe's edges that will require a reinforcement in defense supplies.

- Defense is more insulated from softening demand in the near term due to budgeted defense spending and robust firm backlogs, particularly in the US.
- Recession will bring new dilemmas for governments as they are forced to arbitrate between maintaining their forces as they stand or acquiring additional technologies and the means to build a coherent arsenal to match their short- to medium-term ambitions.

■ Supply chain disruption has been minimal thus far, but risks are emerging as the virus spreads.

- Recent government financial measures and stimulus packages seek to build safeguards; national security is deemed “essential” (orders for Airbus A330-MRTT, Dassault Rafales, etc.).

Current risk is mainly tied to the financial strain on smaller suppliers of critical parts and increasing pressure to shut down workforces that are not suited to remote work. In addition, commercial aerospace supply chains may eventually impact on defense. Governments are helping defense sectors through added cash facilities (the US has made cash available by increasing staggered payments for small businesses), loans (the US offered US\$17 billion in loans) and purchases (the French Army moved up €600 million in orders).



Despite the pandemic, the industry continued to make progress in sustainability, aviation, defense, space, and more.

At PwC, we worked on what new ventures are on the horizon for A&D sector?

Which global mega-trends for 2021 and how they'll impact aviation and travel?

1. Fewer Operators? Fewer Routes? A&D industry consolidation has not yet begun but the new supply and demand paradigm will certainly resize the industry and change what is fit-for-purpose.

“The outlook for M&A in the sector is mixed in our view. There are two very different stories to be told between the commercial and defense sub-sectors.”

In our view, the outlook for M&A in the sector is mixed. The commercial and defense sub-sectors tell two very different stories. Commercial aerospace has suffered an enormous setback under COVID-19, with passenger traffic down massively in 2020 versus 2019. Industry analysts see the recovery from these levels to be measured in years rather than months. Our view is that this will no doubt translate into depressed transaction volumes, as companies focus on day-to-day operations, fleet rationalization, where there are “weaker airline credits” (cf. Altman Z-Score).

More than 40 airlines have collapsed since the beginning of 2020. In November 2020, the International Air Transport Association (IATA) put airline net losses at US\$119 billion in 2020 (i.e., more than the US\$84 billion forecast in June), while a net loss of US\$39 billion is expected for 2021.

This will inevitably lead to an increase in cash burn next year compared with 2020, even if modestly higher traffic and cost-cutting efforts will help

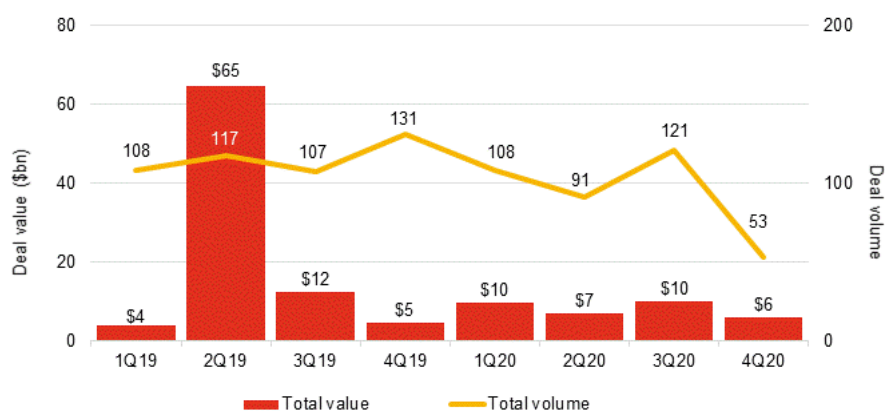
stem the flow. Moreover, the combination of higher debt and prolonged weakness in operating profits will drive weaker credit metrics for the sector over the next 18-24 months at least.

The multiple spiking in COVID-19 cases across various regions and inconsistent travel restrictions will keep airline traffic low, at least through the first part of 2021, though recent positive news about vaccine development along with pent-up leisure demand may drive a more robust rebound in the second half of next year. The successful development and distribution of effective coronavirus

vaccines and/or treatments will be essential for air traffic to rebound toward pre-crisis levels.

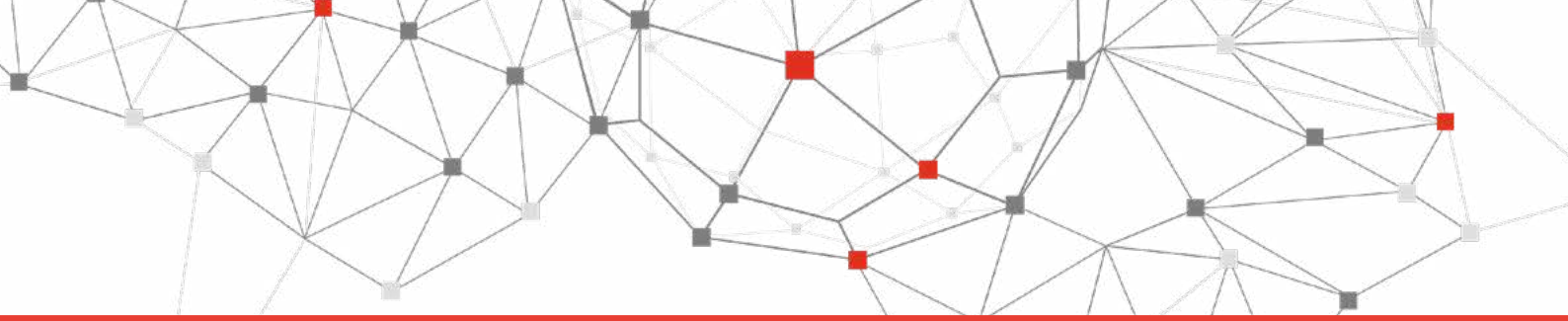
The sector will experience a loss of weighting in companies in the short term (bankruptcies). More airline failures are expected as operators struggle to deal with mounting debt and depressed revenues. PwC Airline analysts expect a “few more airline casualties across the world” over the next 12 months, particularly across Europe and the Asia-Pacific region.

Total deal value and volume over the last eight quarters



Note: Deals included in this graphic are total announced deals (with disclosed and undisclosed values). There were 173 deals in 2020 with disclosed values totaling \$32.1 billion.

Source: Refinitiv



Greater consolidation calls for focused strategies and partnerships

Further consolidation and vertical integration are anticipated in the next five to ten years. A large majority of A&D C-Suite expect more M&A between Tier-1 suppliers and to see a rise in vertical integration. This could result in a handful of super-tier 1 suppliers delivering aircraft systems to OEMs, resulting in another significant industry disruption.

With the likelihood that disruptive technologies will accelerate that M&A phenomenon, vertical integration and increasing pressure

on sustainability will drastically transform the landscape. Executives must be ready and become more agile and flexible in order to stay ahead of the game and start the recovery in the best seat. Investing through crisis time will allow them squeeze the fat, keep only muscles and upbeat the competition with a reshaped and adjusted conditions in the battlefield.

Focus on technologies combined with the development of clear strategies to overcome specific challenges are the first steps before gaining the right operating model to then deliver accurately; keys to survive the economy in the post-COVID era.

On the defense side, the horizon is brighter. Deal-making has not suffered the setbacks seen in commercial transactions, and the uncertainty surrounding election results has now lifted. Defense budget growth during the Trump administration will likely flatten, but we believe certain areas will drive transaction activity, including cyber, unmanned, space, hypersonic and IT modernization. The impact of COVID-19 on defense players has been far more muted than commercial air, and the natural requirement for key defense programs to continue uninterrupted has been – and will likely continue to be – fundamental to deal volumes going forward.

2. New-Generation aircraft market boost to match the necessary network changes, benefits of the latest products, and financial sustainability, mostly in terms of direct operating costs

More than ever in recent history, the commercial aerospace industry faces a dilemma. To ensure its future, it must achieve a transformational improvement in both financial and environmental performance, and it must start that expensive work now.

Yet the industry's perilous financial state, caused by the COVID-19 pandemic, seems to make that necessary task impossible for the time being. However, more than ever before, investing in the most efficient aircraft is key to comply with Business Models disruption and the vital necessity to reach new financial outcomes.

Thanks to the crisis, new opportunities have emerged for airlines such as the strong

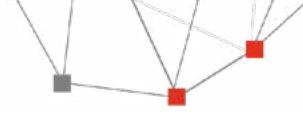
appeal for newer aircraft (A220, A320NEO, 737MAX) and their cost-savings on fuel burn. In addition, following trends and government calls, airlines have clear objectives to ensure “greener skies” and de facto use aircrafts with the latest technologies.

Airbus announced the development of hydrogen powered aircraft with zero-emissions by 2035. This is a major challenge because all the supply chains will need to adapt with the technical

restrictions that that implies to produce and transport hydrogen. To have the same energy delivered as fuel, an aircraft needs four times the volume in hydrogen.

Plus, the hydrogen needs to be stored in liquid form at -253°C. But Airbus can count on the expertise of its subcontractors, such as Safran, on hydrogen and on the support of the French government with its €7 billion plan to create the aircraft of the future.

Lack of demand and volatility also require operators to shift from widebodies to the narrowbodies needed for domestic flights and



to adapt capacities to current passenger traffic levels and control direct operating costs to reach acceptable cash margins. The Airbus A321NEO and A350 are the popular choice, providing excellent range with extended maintenance cycles and the most fuel-efficient engines in its category.

Coupled with state-of-the-art products and operated in the most recent airports in the world with the highest standards of quality, these new cash machines are gamechangers and will contribute to reshaping the skies in the next years.

3. Fleet and direct cost management; keys to taking advantage of the current paradigm shifts to develop new sources of growth

Despite the difficult times, investing in fleets has never been so meaningful. Defining the best fleet mix to make sure you keep a handle on changes in direct operating costs, whatever happens. Our conviction is that it is time for airlines to invest in their fleets, and mostly in the latest generation of aircraft to benefit from the latest products that are adapted to the network and financial sustainability, thereby avoiding the strongest impacts on P&L margins when recovery returns.

Cargo activity experienced cyclical over-capacities before COVID-19 even appeared, leading to a surplus of aircraft or empty flying aircraft that made little sense. An estimated 30% of the

world's cargo fleet is still grounded (mainly Bellies and Combis but passenger aircraft carrying cargo as well), with demand looking quite slow to recover unless the COVID-19 pandemic ends.

With the new situation, many operators have switched focus and revised their ways of operating.

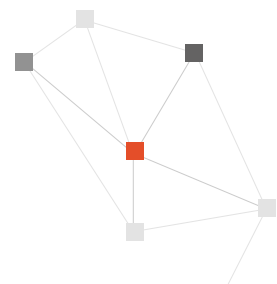
Some aircraft types will be converted to carry cargo. In fact, at least 66 aircraft conversions are projected to be completed this year. Significant increases, further rises driven by strong growth in the e-commerce market and changing customer spending habits are expected in the next two years.

Three main factors have convinced PwC Experts to bet on a Cargo Boom in the short and medium-term:

1. Many people have increased their digital spending and companies' latest acquisitions have taken this route (Amazon bought 19 Boeing 767s last December with the goal of retrofitting these former Delta and American PAX aircraft into cargo carriers, Qatar Airways has tripled its freight fleet in the last three years).

2. The supply of vaccines is needed, meaning that countries that have ordered large amounts of vaccines need reliable and fast logistics systems supported by air travel.

3. Airlines have taken heed of the importance of cargo segments and are looking to turn their cargo activities into a brighter future.






4. Aviation management KPIs to be revised to better suit uncertain and volatile environments.

During 2020, traffic nosedived, down 95% compared with the same period in 2019. Beyond the criticality of figures, volatility, an uncertain context and lack of demand make forecasts for bookings and demand an

extremely complex exercise. Last-minute purchasing conversions and travel restrictions are the main factors leading to changes in demand forecast management and ways to secure customer loyalty.

Airlines have had a harder time using historical data and need new indicators instead. PwC Experts think Data and the spread of dynamic pricing will help define new ways of forecasting, including online searches, price comparisons, marketing data and social media.

Steering models and KPIs should take precedence over any other secondary factors and are likely to become primary indicators for predicting demand, developing pricing strategies and better anticipating flight operations and cost management.

- 
- Turn mindsets to agile strategies rather than planning as was the case in the past.
 - Manage businesses according to cash margins rather than direct operating costs.
 - No longer assume P&L is the only way to manage airline businesses.
 - P&L becomes important from a medium-term perspective when combined with a significant reduction in fixed costs.
 - Cash margins versus direct operating costs, and top line versus direct operating costs have become the most tracked financial KPIs for monitoring the business.
 - As an illustration of the efforts made by Qatar Airways, QTR now has a cash margin of 57% compared to 27% last year.
 - Qatar made tremendous efforts to increase its cash margin by more than 10 points compared to direct operating costs (PAX and Cargo revenues included).


Thierry Antinori - Qatar Airways



Pricing of the Future

- It seems highly likely that revenue management will be obsolete in ten years time, at least revenue management as we know it today.
- Product + Price mix will be soon be a thing of the past.
- Current trends point to the increasing definition of individual offers powered by a combination of CRM, data and of course technologies in order to increase our knowledge of the customer and consumer patterns.
- In these difficult times, when premium classes remain virtually empty, a key challenge for airlines is to increase their share of the portfolio of customers, to attract them and get them to consume more and more premium products than they used to.
 - New mechanisms for pricing are crucial: They will be a major asset in the recovery battle and passenger catchment.

Thierry Antinori - Qatar Airways



5. Reshape business approaches to make operations more flexible, by driving integrated models between Airports, Airlines, Alliances and Partners

Airports, airlines and the wider industry must collaborate more closely than ever before to survive the threat posed by COVID-19. A lack of consistency in application of rules and guidance threatens will undermine public confidence and the drive to rebuild demand.

Before the crisis, operators used six-to-twelve month windows for scheduling flights. This has since changed to quarterly and mostly six-to-eight week windows, fed by uncertainty and higher volatility.

.....
The COVID-19 crisis has created an urgent need for companies to reconfigure their operations, and an opportunity to transform them. Providing that they do, greater productivity will follow.

Information from clients and our network call for A&D operators to switch to this new dynamic scheduling as the value chain must transform itself and react more quickly within more flexible frameworks, mainly as regards

pricing to suit demand, the use of equipment and raw material purchases. Breaking the silos that existed by connecting networks, merging commercial planning teams with revenue management, and deploying Lean approaches within organizations will be a core pillar in reshaping the stakes for A&D.

Operational resilience will not happen by itself: seamless integration between planning, operations and steering will be key in the post-COVID era.

“

Agility and Proximity with the markets have been key words in aviation since the beginning of COVID-19 crisis, and will be for years to come. Planning-centric approaches are outdated due to the volatility of the situation and the uncertainty plaguing the business. Agility and Flexibility must be implemented by airlines to develop new systems for managing pilots and crews so that they can be called and/or recalled as effectively as possible in a lapse of six to eight weeks in the event a market recovery does happen in the short term.

Seat Factor remains a key indicator for the industry. With an average load factor of 35%, Qatar is one of the world's major airlines to benefit the most from the situation (versus 12% for Singapore and 50% for Emirates during peak season). By comparison, Cathay sold 40,000 seats last month versus around 600,000 for Qatar Airways.

Cash flows from Commercial and careful cost management (top line versus variable operating costs) are the keys. Simply killing costs is likely to drive airlines into the trap.

Thierry Antinori - Qatar Airways



6. New opportunities and a shot in the arm for the freighter market as a result of the crisis


A year ago, no one had heard of the new coronavirus; in fact it had not yet even been named COVID-19. The air cargo industry had survived a tough 2019 – its worst year since 2009 – and operators were hoping e-commerce growth would boost their fortunes in 2020.

The growth of e-commerce has led to an increasing appetite for aircraft manufacturers to offer cargo versions of their jets and turboprops. Since the coronavirus pandemic began

last spring, quick modifications have been offered to help airlines accommodate accelerated demand for freight transportation, especially of medical supplies.

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Re-emergence of Cargo and Military segments that have been in cyclical decline for years is one of the biggest surprises emerging from COVID-19 crisis.

Fast forward through 12 months of the world adapting to what was previously unthinkable, and the air cargo sector is undertaking its biggest-ever challenge as it plays a vital role in distributing COVID-19 vaccines around the world and helping to bring the pandemic under control – all the while battling with its own related crisis of a severe shortage of capacity. Air cargo sector expects to see growing demand from the e-commerce, with IATA estimating that over two billion people shopped online in 2020.



Cargo is proving to be the one stream of the airline sector that is surviving the COVID-19 crisis. If nothing else, cargo is a key means of support for getting pharmaceuticals and medicines around. Belly cargo is allowing many of the longer-haul routes to be cash positive, replacing the high-yield business passengers who are absent. Air cargo is playing an important role in maintaining and reestablishing connectivity between countries and cities. Demand for air cargo is still robust in most parts of the world.

Brian Pierce – IATA Chief Economist

80% of e-commerce that moves across a border travels by air, which places additional stress on an already short supply capacity.

Exposure to the commercial aviation segment and the weight of government orders in the mix appear to better explain market trends in recent months. The most resilient groups such as Lockheed Martin and Northrop Gruman, whose market capitalizations are more or less in line with the levels seen at the beginning of 2019, are those that are backed by recurring and profitable government/military orders.

Heightened international tensions in the Pacific between the US and China or in South Asia between India and China are attractive prospects for the defense industry. If we adhere to that theory, the higher a company's exposure to the commercial aviation segment, the worse their shares perform.

There are nonetheless a few exceptions and specific cases that do not fully fit the mould.

Boeing, for example, had to cope with the 737 Max crisis on top of COVID-19, and although it has a greater share of its activity with the US government, it still lost 50% of its market capitalization. Raytheon's merger with UTC was approved on April 3, 2020 and its market performance slowed after rallying at the end of 2019.

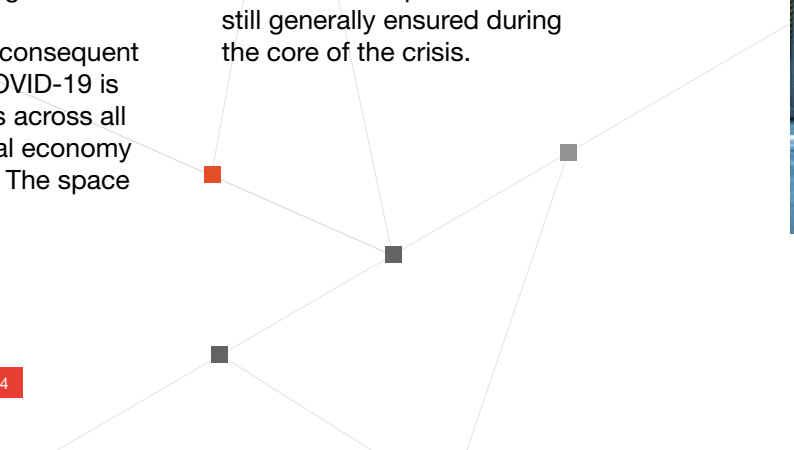
But the diligence of governments in announcing new orders for the military segment to fill production capacity can tell us a lot about the importance of having a balanced portfolio between commercial and military activities. While the French government has just unveiled its COVID-19 recovery plan from which the defense industry is all but absent, US firms (in red in the opposite graph) will most likely continue to benefit from strong orders from the US government.

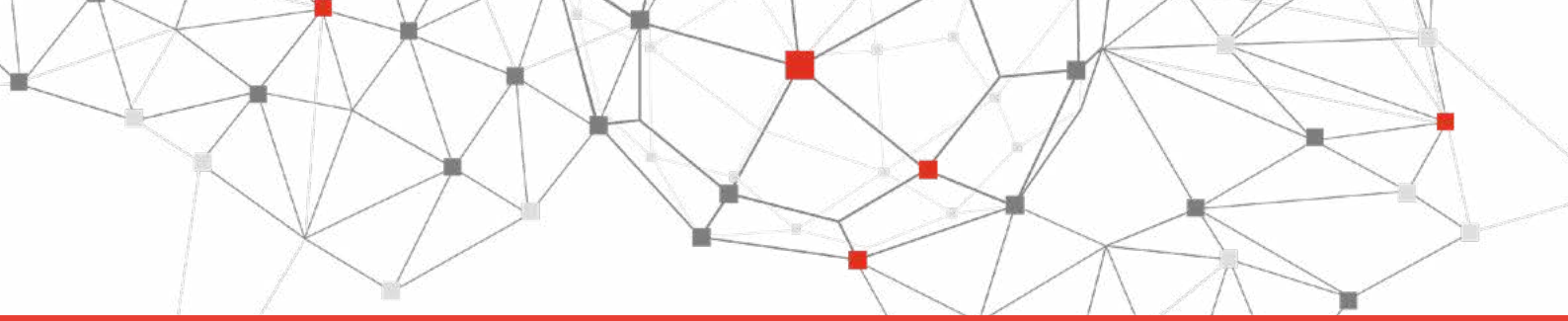
The shock and the consequent crisis caused by COVID-19 is creating disruptions across all sectors of the global economy to varying degrees. The space

industry, while less exposed than other industries like commercial aviation, tourism and others, is also impacted, with launches getting postponed, supply chains being disrupted, problems with access to financing threatening the survival of start-ups, and events getting cancelled. Given the diversity of the broad space sector, the expected degree of impact varies for each specific space domain. In this paper, we analyse the recorded and expected impacts of the crisis on specific segments of the space value chain and on

individual space domains including Satellite Manufacturing, Access to Space, Earth Observation, Satellite Communications, Navigation, Space Exploration and Space Situational Awareness and Space Surveillance & Tracking., in order to develop a view of the resilience of the space sector as a whole. We look at the impact of the crisis on demand, supply, public policy and strategy, and on access to finance, in order to obtain a qualitative view of the resilience of each space domain. Our goal is to ascertain, to the extent possible, its direct impacts (i.e., its impacts during the core of crisis) and its medium-to-long term impacts (i.e., once we have overcome the main shocks).

The direct operational impacts of the COVID-19 crisis are delays in the supply chain, while mission operations are still generally ensured during the core of the crisis.





7. The boom in Aircraft Leasing (cf. post-COVID liquidity crisis and the search for new optimum ways to improve cash burning and operational management)

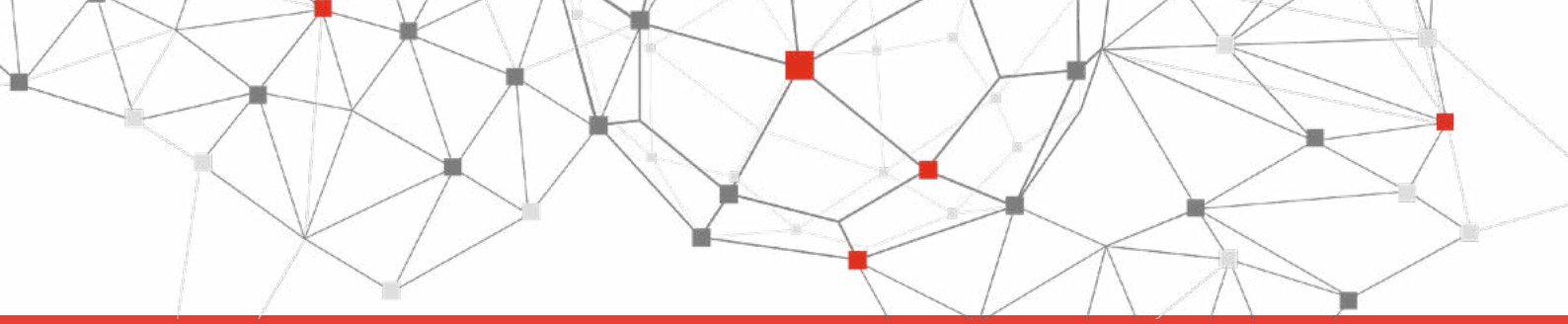
Given the financial upheaval resulting from the pandemic, leasing and finance in aviation are likely to play an even greater role in the A&D value chain going forward. The lack of new orders, the decrease in both the leasing and value of second-hand aircraft and the discrepancies in financing aircraft capacities from customers are reasons to expect a boom

in lease finance in the coming months to move away from current cash burning thresholds.

In fact, PwC Experts think it reasonable to expect leasing companies to exceed the symbolic level of a 50% ownership share of the global worldwide fleet. In addition, due to limited liquidity levels, more and more airline

operators will push – some in desperation – for sale-and-leaseback contracts to obtain new sources of cash or develop a different mix in their fleets. PwC already works on models for fleet management and the crucial need for liquidity optimization at a time when cash will definitely become a more rare and more expensive commodity.





How to survive in an environment where demand is at its lowest? How to react when COVID-19 is still not under control? and How to convince passengers to fly again?

This white paper has several goals. The first is to provide a summary of the aeronautics, space and defence sectors around the world and from different perspectives.

In the coming weeks, we will publish a set of analyses that will focus on the impact of COVID-19 on the entire value chain.

Our second goal is to publish a benchmark document that serves as a compass. We will assess each sector's situation for the coming years in the light of the projections that various players, including PwC, have made. We will then be able to adjust and dissect the consequences of the crisis.

Finally, as with every crisis, there are opportunities. We will propose different scenarios that will contribute to accelerating an exit from the crisis.

For this, we have structured our white paper around three axes that are:

- Consequences & Perspectives – Commercial Aviation
- Consequences & Perspectives – Defense
- Consequences & Perspectives – Space

We hope you enjoy reading it. Get in touch if you have any questions or would like any further information before our next publication.

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