

# The Art and Science of Airline Network Planning to ramp up for recovery

By:

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## 1.0 Introduction: Time to change focus

Covid-19 made 2020 a year like no other in our lifetimes, one characterized by stay at home orders, quarantines, furloughs, layoffs, touchless business transactions, mask wearing, and social distancing. Now, more than halfway into 2021, with many countries well on their way to vaccinating much of their populations, we are beginning to see light at the end of the tunnel, while at the same time contending with virus mutations that may cause the crisis to persist worldwide at some level. Many adjustments required by the pandemic will cease to be necessary while others will become part of the “new normal”. From an aviation perspective, from mid-2021 is the time to change the outlook from crisis mode with a focus on only the immediate term to again taking on a more strategic view, analyzing market and fleet adjustments for the seasons and years to come.

## 2.0 A year like no other

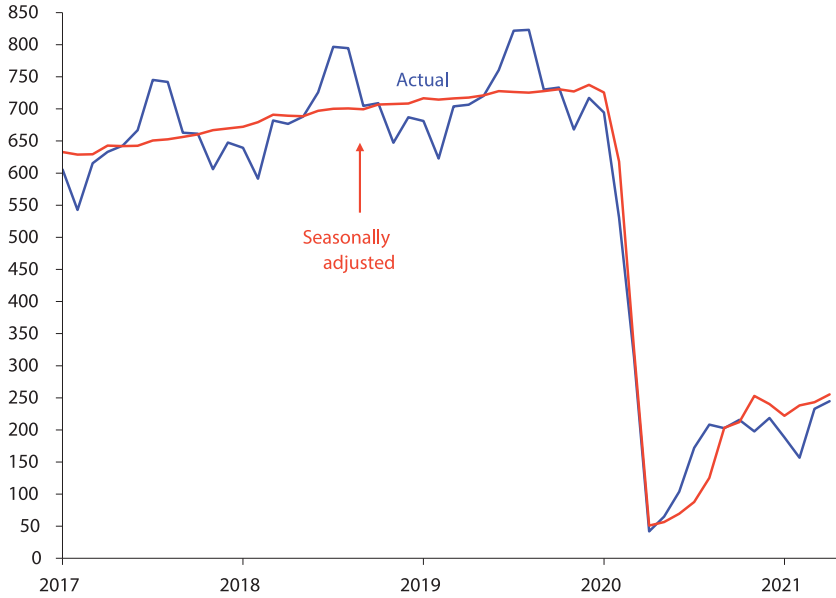
Almost all economic sectors were affected by Covid-19 during the past year, but the aviation industry was particularly impacted. Fear of infection and limitation of activity caused millions to cancel or defer travel plans. Government restrictions such as border closures and post-arrival quarantines continue to depress air travel demand today. Shifts by corporations to work-from-home arrangements and remote meetings using tools like Zoom drove a sharp reduction in business travel that has continued into 2021. Event cancellations and crowd limitations continue to impact certain types of leisure travel as people avoid crowded venues in 2021 just as in 2020 (e.g., no Mardi Gras parades in 2021 and the 2021 Olympics are set to go ahead in Tokyo without overseas visitors). As a result of all these factors, industry-wide revenue passenger kilometers (RPKs) were 65.4% lower in April 2021 compared to the same month pre-crisis (April 2019) (see Figure 1\*).



## Industry RPKs (billion per month)

### Chart 1 - Air passenger volumes

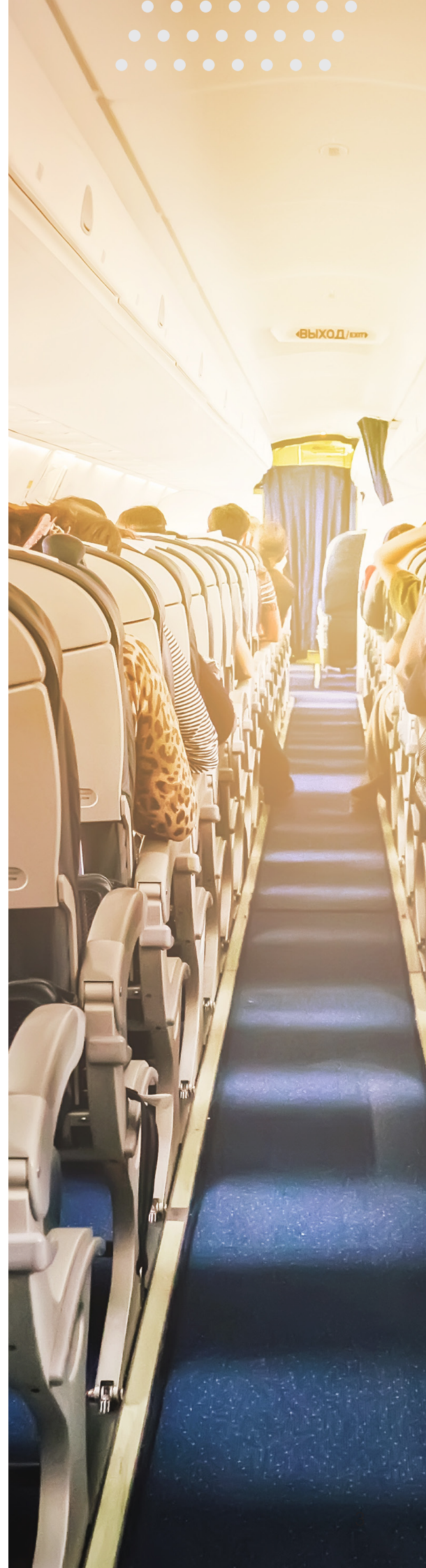
Industry RPKs (billion per month)



Sources: IATA Economics, IATA Monthly Statistics

Source: IATA Air Passenger Monthly Analysis, April 2021 (Figure 1\*)

*Air passenger demand recovery may take years to return to pre-pandemic levels even with the vaccines that are now being administered, but with much variation by country and with significant distribution hurdles that will last for some time*







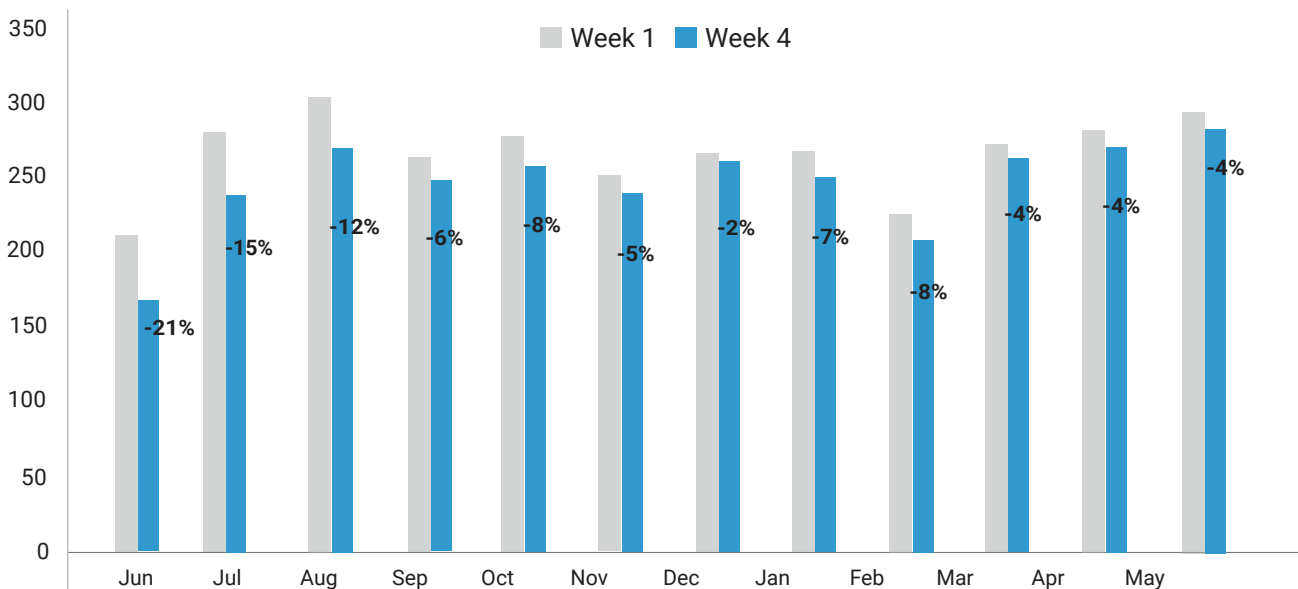
### 3.0 Airline capacity management during the Covid-19 period

Airline managers and their Network Planning & Scheduling (NPS) departments worked tirelessly this past year adjusting schedules to account for sharp demand reductions. To save costs during this low-traffic period, flights were cancelled, and aircraft were grounded. In early 2021, NPS departments continue to focus on the short-term, reducing current and next month schedules while giving less attention to future season scenarios.

So, how have airlines developed their schedules during the past year in this environment? Most published in advance “full” schedules that were similar in capacity levels to 2019. The NPS team then drastically reduced these full schedules 2 to 6 weeks before operation based on advance booking data. See (Figure 2\*) which displays this trend for global schedules.

You can see that each week in the month, capacity for the full month continues to be revised downwards as carriers adjust capacity. However, the capacity reductions are not as great as they were earlier in the pandemic. For June 2020, for example, capacity was reduced by 21%, while for April and May 2021, capacity has been reduced by just 4%.

#### Global Seat Capacity by Month



Source: Official Airline Guide (Figure 2\*)

At Sabre, we have noted that some airlines did reduce capacity as early as 3-4 months before the week of operation. However, most did not do that, and the sharper drop came in the final two months before operation. This is evident in the steep capacity decline seen earlier in the pandemic. This tactic of using “close-in” cancellations is effective in the current environment where booking curves are much later with passengers not likely to book until very close to date of departure.



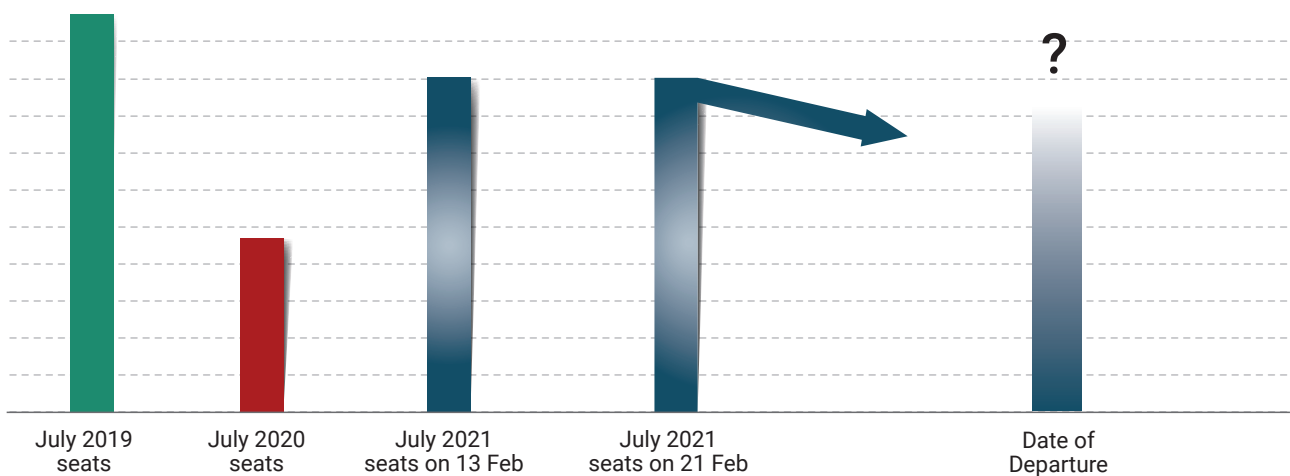


Planners use internal advance booking data to identify the best candidate for reduction in the short-term. These cancellations result in cost savings by not flying segments that would likely achieve load factors below 40% or 50% and would thus not cover level 1 variable costs. That said, this close-in cancellation approach has drawbacks. It means incurring re-accommodation costs for booked passengers whose itineraries get cancelled as well as associated loss of customer satisfaction for having planned itineraries disrupted for those passengers who did book in advance. In addition, once past the current IATA Summer 2021 season there may be slot retention implications for not operating what has been allocated.

### Adjustment in 2021

While the pattern seen above held true during the last two quarters of 2020, there has already been some adjustment in the first half of 2021. After having 12 or so months where capacity needed to be reduced close-in each time, airlines have now adjusted such that the schedules they produce four or more months in advance are no longer at peak 2019 levels. In other words, airlines are not expecting a return to pre-pandemic demand to be right around the corner only to slash that capacity the month before departure. Instead, there has been acceptance by many airlines that the demand will take time to rebound. That said, some U.S. airlines are not only planning full schedules but committing to them. For example, United Airlines has announced the hiring of hundreds of pilots, and American Airlines has announced it was ungrounding all its aircraft in May 2021. China Eastern has also recently indicated that the grounded fleet size at its Shanghai base has fallen to zero. It may be that in the very short-term future the pattern of the past year of heavy cancellations performed in the final two months before departure may start to go away (see Figure 3\*).

### What will happen in July 2021?



Source: Official Airline Guide (OAG) via Sabre Market Intelligence (Figure 3\*)



As demand gradually increases in the latter half of 2021, NPS mindset will shift back to the medium and long-term. In this way, airline managers can better prepare for a future return to profitability and, in some cases, determine strategies to gain share in routes abandoned by less financially sustainable competitors. After all, network planners will need to find uses for those newly hired pilots and returning aircraft. Furthermore, publishing schedules more representative of what is likely to operate will give returning consumers more confidence in their itinerary purchases which is something they have not had during the late cancellation pattern common in aviation during the past year.

#### **4.0 Covid-19 impact on forecasting methodology**

Shifting from a purely short-term scheduling focus back to a full timeline network planning view will not be easy in the current environment. In addition to difficulties brought on by reduced passenger revenue and the resulting reduction in NPS staff sizes in some instances, there are other challenges to performing seasonal or medium-term network planning during this unprecedented time. Data that airline managers could rely on in the past to reasonably estimate future O&D (Origin& Destination)-level demand beyond the next few weeks is no longer as reliable. While it is known that capacity may still need to be cut in the short-term, it is not clear as to when capacity should be ramped back up to pre-pandemic levels and where it should be reinstated first.

Typically, airlines have relied on MIDT-based demand estimations such as Sabre Global Demand Data to forecast performance of their planned schedules. With this data, NPS managers could effectively develop bottom-up network forecasts of alternative schedule scenarios and implement a schedule that maximized future profitability. Such underlying data sources were never 100% predictive of future demand, and other factors such as market stimulation and unexpected economic changes had to be considered. That said, this data usually produced network-level forecast results within an acceptable level of error during “normal” times.

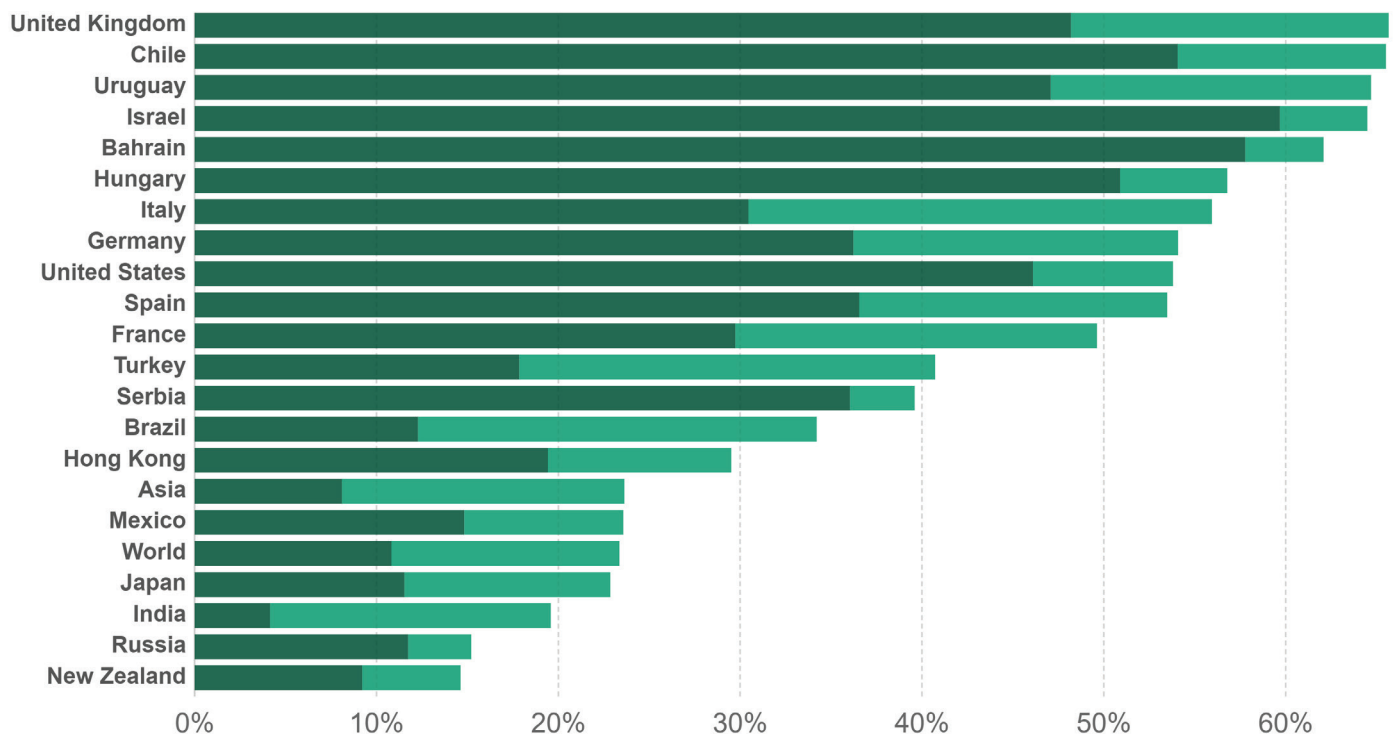
However, we are no longer in normal times. Families skipped their traditional 2020 vacations and may have pent-up demand to match their accumulated savings. Will their 2021 demand be halfway between 2019 and 2020, or will it be as high as ever? Corporations cancelled their 2020 and early 2021 conventions. When will that demand return? International passengers were and are sometimes still subject to quarantines upon arriving in their destination country. When will countries revoke those hurdles, and when will businesses develop confidence to send their people back on the road? These questions and others leave planners with much uncertainty as to what will happen with their networks.



## Share of people vaccinated against COVID-19, Jun 29, 2021

This data is only available for countries which report the breakdown of doses administered by first and second doses.

■ Share of people fully vaccinated against COVID-19 ■ Share of people only partly vaccinated against COVID-19



Source: Our World in Data (share of people vaccinated) (Figure 4\*)

Even as 2021 infections come down spurred by vaccine distribution efforts (see above), the base data used to forecast the coming season and year have pandemic-driven distortions. Prior data calibrations that fed airline forecasting systems relied heavily on the prior year's O&D market sizes along with growth factors to predict next year's demand. For example, planners in 2018 used 2017 O&D market sizes along with growth assumptions to predict 2019 demand. This usually reliable method fell apart in 2020 when trying to use 2019 as a base to forecast 2021 or 2022 given the impact of Covid-19 to both demand and capacity levels. The traditional O&D market sizing method simply does not work right now and will likely not for some time.

So how can airlines adjust planning methodology given this breakdown? We all know demand has dropped significantly, and the overall approximate 50% capacity cut seen in most regions in 2020 reflects that, but this percentage is not uniform to all countries or O&Ds. One cannot expect Paris-Kinshasa demand influenced by the mining industry traffic to be impacted at the same rate as New York-Cancun or London-Phuket passengers who seek a beach vacation. Some city-pairs are down 90% and others are only down 20%. Plus, it is a continually evolving situation.





The complicated part for network planners is matching their reduced capacity levels to optimally reflect the varying recovery patterns we are seeing and will continue to see for different route types. An airline that uniformly drops capacity on all segments and entities at the same rate will have too much capacity in slower recovering routes and too little capacity in faster recovering ones. Predicting which city-pairs will recover next requires as much art as science though the early months of the pandemic can provide some lessons.

## 5.0 Passenger Segmentation and Sub-segmentation

Airline sales teams view their customers in terms of business, leisure, and VFR (visit family and relatives) segmentations. Network Planning teams are also cognizant of these segment types, but usually focus more on total historical O&D market sizes when forecasting future demand. Planning in 2021 requires a deeper focus on segmentation and its impact on determining medium-term demand. It was generally assumed VFR would recover first followed by leisure, and that recovery has already started with some variation by region and market. Business demand, on the other hand is still very depressed on a global level. Recovery of that demand will be a key component to watch during the rest of 2021 and into 2022 as more vaccinations are administered and corporations gradually approve a return to pre-pandemic travel levels.

**Business demand can be sub-divided into various groupings such as:**



MICE travel - meetings, incentives, conferences, and exhibitions



Sales or consulting trips  
(i.e., traveler visiting a different corporation than his/her own)



Internal trips  
(i.e., regional personnel visiting headquarters or vice-versa within same company)



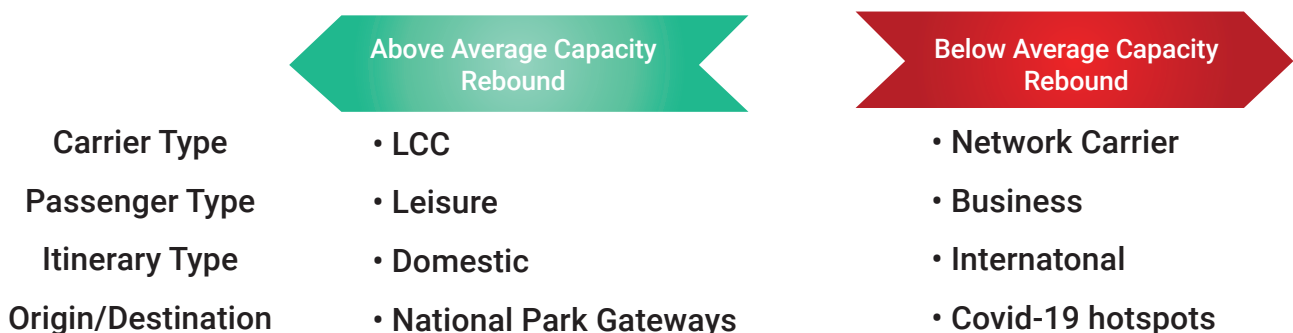
Manufacturing, pharmaceuticals, mining, or factory business travel



Many companies are continuing to defer category 1 and 2 travel in 2021, temporarily replacing these forms of business trips with virtual methods such as video conferencing. As a result, the normally popular Las Vegas annual company meetings and similar events around the world have not occurred much this past year, although we have now started to see an increase in in-person events. On the other hand, travel associated with categories 3 and 4 is more essential. Planners must determine which of their O&Ds have more demand from groups 3 and 4 and plan earlier capacity builds for routes that carry traffic between those city/airport-pairs.

Meanwhile, the rate of leisure demand recovery has also varied based on the target leisure activity. While many types of vacations are in low demand due to avoidance of crowds and cancellation of popular events, many travelers are instead choosing nature-themed vacations where social distancing can be maintained. A Sabre analysis of Q3 2020 OAG capacity trends indicated that airport destinations near national parks or other natural attractions had fewer capacity reductions than other types of destinations. For example, destinations such as Fresno (near tranquil Yosemite National Park) were barely down in capacity or demand versus 2019 while destinations such as Orlando (near crowded Disney World) were more substantially reduced. A re-examination of this analysis in Q1 2021 indicated a continuation of this trend that is expected to continue through the northern summer. While most markets have less capacity than before Covid-19, US markets like Montrose (MTJ), Vail (HDN), Jackson Hole (JAC), Glacier National Park (FCA), and Idaho Falls/Yellowstone (IDA) are experiencing capacity growth when looking at 1Q 2021 vs. prior years. One noteworthy market of this type, Bozeman Yellowstone (BZN) is scheduled this summer with 80% more capacity than it had in the summer of 2019. See (Figure 5\*) below for more conclusions from that analysis.

It may be that there are lessons to be learned from the above not only for network planners, but also for marketers who can focus their messaging about rural or uncrowded destinations close to the airports they serve. In this way, they can hopefully look to increase capacity on certain routes, in turn providing more certainty for planners.



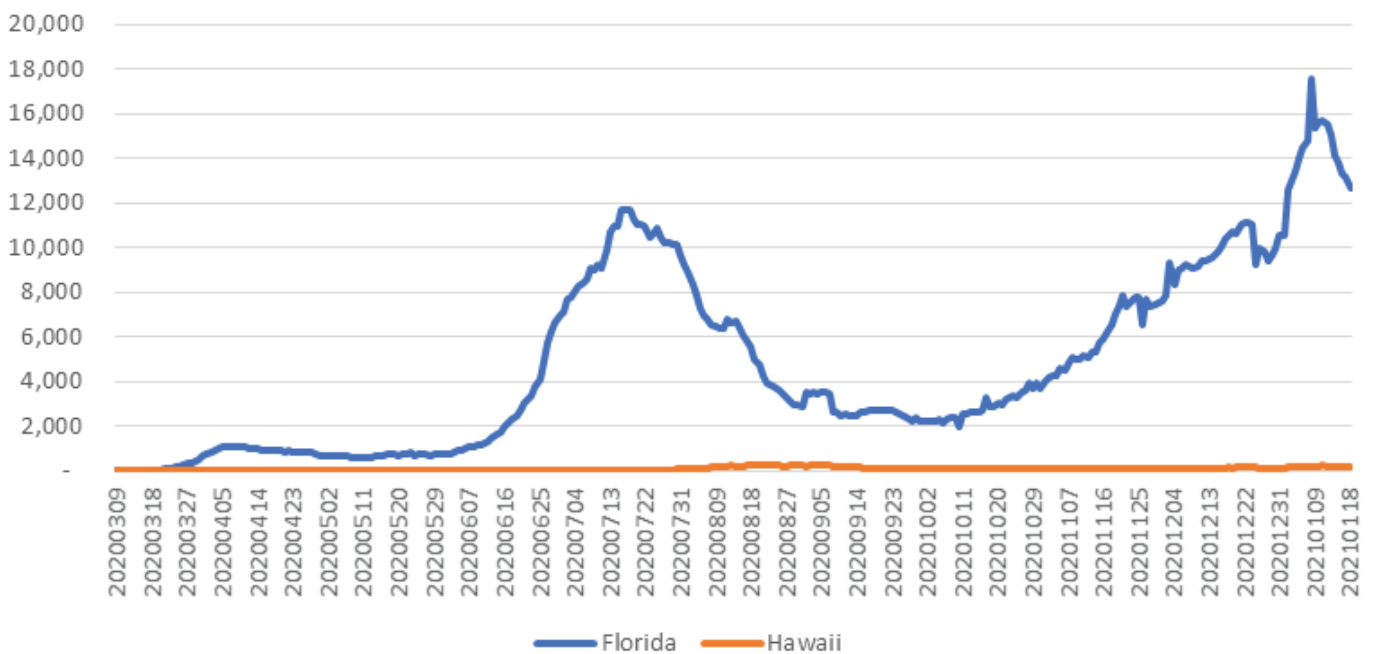
(Figure 5\*)



The one factor, though, that overrides the levers describe above when it comes to capacity offer is level of restrictions. A case study can shed some light on this. In (northern hemisphere) summer 2020, the USA was the global center of the pandemic, and the state of Florida while it has recently improved was the “center of the center” for some time averaging over 9,000 new infections per day from late June through early August 2020 and again in December/January 2021. Meanwhile, a better story for the U.S. was the state of Hawaii which kept the pandemic infections to a minimum.

See (Figure 6\*) for a contrast between these two U.S. states.

**Florida vs. Hawaii**  
**New Cases, 7 Day Average**

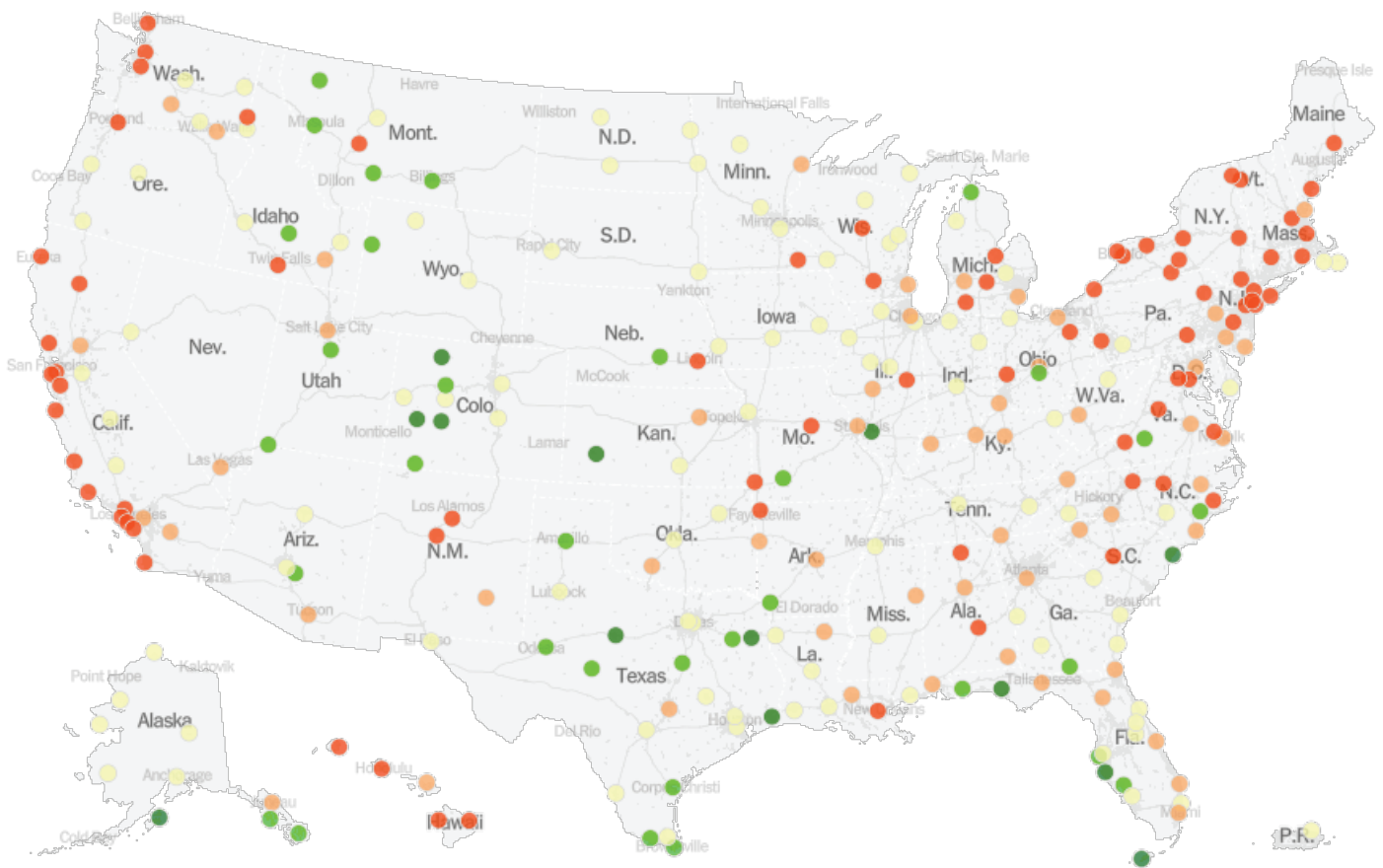
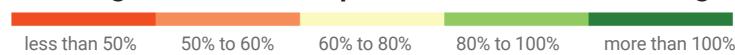


Source: The COVID Tracking Project (Figure 6\*)

Based on the graph above, as it stood one might expect that airlines would cancel most flights to severely infected Florida and maintain most flights to safer Hawaii with passenger demand following suit. Somewhat surprisingly, the opposite occurred. See (Figure 6\*) which graphs U.S. destinations based on both ASKs and Traffic for Q3 2020 vs.Q3 2019. Excluding South Florida and Orlando, the rest of Florida saw the smallest year-over-year capacity and demand reductions. Meanwhile Hawaii experienced the most severe cuts.



## Passenger volume compared to Feb. 2020 average



As of March 13, 2021. Source: Transportation Security Administration, analysis by Kevin Williams

Source: Transport Security Administration and New York Times (Figure 7\*)

Why did this counter-intuitive result happen? One of the reasons Hawaii was able to maintain such a low rate of Covid-19 infection was that starting in March 2020 it required all arriving passenger to quarantine for 14 days. This was renewed several times through September. Meanwhile despite its high infection rate, Florida implemented few restrictions. As one of the earlier states to “re-open” it ended up enjoying the benefit of more air travelers while not surprisingly also paying the cost of having more Covid-19 infections. Nonetheless, this contrast does demonstrate that quarantines, while effective in reducing infection, also act as a giant deterrent to air travel. In the coming months, NPS managers and analysts must actively track which destinations require such restrictions so that network planning decisions can be made with those in mind.

As we look globally for other examples, it can be said that there are a mix of findings. The countries with the most resilient air capacity include countries that handled Covid-19 well, such as Vietnam and Korea, but also countries that have had difficulty keeping infection rates down, like Mexico, Tanzania, and Pakistan. Brazil has had an average -42% drop in capacity year-over-year in Q1 2021, versus a worldwide average of -43%, while having substantial issues keeping infections under control. However,



their more capacity resilient destinations are leisure points in the northeast of the country that are not reliant on business demand. Mexico’s most resilient destinations are a mix of leisure and border cities like Tijuana. The pattern is similar to what we saw in the U.S. with destinations where leisure markets have seen the least reduction to capacity and traffic.

**6.0 Impact on Asia and Oceania destinations**

Asia/Oceania route-level capacity and demand results do not necessarily follow the same patterns as the rest of the world when looking at year-over-year measures since much of Asia, particularly China, experienced Covid-19 driven reductions earlier than March 2020. As a result, Q1 2021 vs Q1 2020 traffic and capacity comparisons like the rest of the world show markets with reductions but also some (mostly in China) with significant increases. These can be identified from (Figure 8\*) below.

TOP TWENTY AIRPORTS					
Airports	Seats in Jun-21	Change v Jun-19	% Change	Change v May-21	% Change
Atlanta	4,381,970	-20.3%		4.3%	
Dallas/Fort Worth	3,779,563	-4.3%		13.4%	
Denver	3,429,707	-3.4%		11.7%	
Chicago O'Hare	3,238,905	-27.8%		20.0%	
Los Angeles	2,987,147	-33.7%		13.3%	
Chengdu	2,963,863	11.6%		-5.3%	
Beijing	2,850,231	-44.5%		-7.3%	
Shanghai Pudong	2,771,027	-28.5%		0.1%	
Guangzhou	2,759,996	-23.5%		-26.3%	
Shenzhen	2,639,871	0.1%		-8.6%	
Chongqing	2,594,392	24.3%		-4.1%	
Xi'an Xianyang Apt	2,502,708	8.1%		-5.2%	
Jakarta	2,376,308	-27.5%		18.8%	
Charlotte	2,372,673	-3.5%		-0.2%	
Kunming	2,329,909			-3.5%	
Beijing Daxing	2,293,701	>100%		-5.1%	
Shanghai Hongqiao	2,289,261	2.6%		-8.7%	
Seattle	2,286,703	-16.7%		9.8%	
Orlando	2,206,393	-7.9%		1.7%	
Las Vegas	2,178,746	-12.8%		5.5%	

Source: OAG Frequency and Capacity Statistics June 2021 (Figure 8\*)



### **Some highlights that can be taken from the prior graphic.**

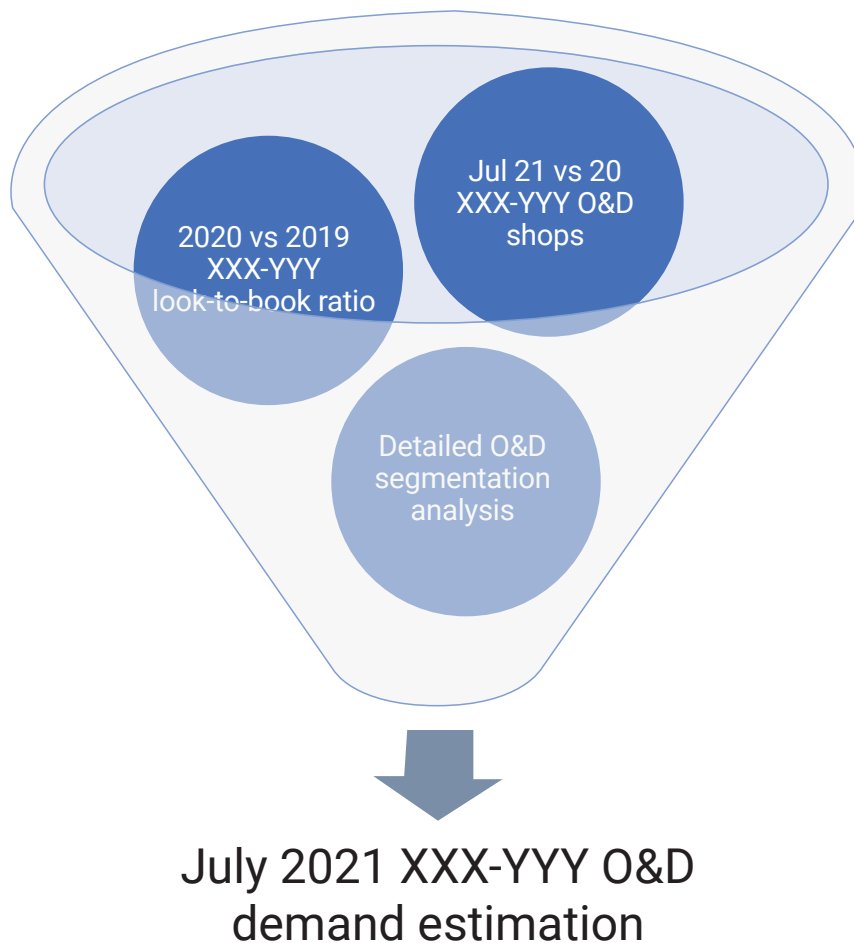
- China markets are en route to developing pre-pandemic capacity though not yet pre-pandemic traffic levels
- Leisure markets in other parts of the world, specifically in the US, have also maintained healthy capacity levels.

### **7.0 Demand estimation during the crisis**

Covid-19 has made network planning more complicated. NPS analysts have been forced to utilize more qualitative analysis (analyze segmentation drivers, track national restrictions, etc.) to complement their quantitative work. However, there are new quantitative approaches being developed that leverage technical advances that were already underway before Covid-19, but now become more important to advance. It is possible to utilize Shopping Data at an O&D level to get a picture of demand in the short to medium-term. Sabre is pioneering new methodologies that can leverage its GDS shopping and booking data in conjunction with its historical Global Demand Data to predict demand in a manner that works effectively even when prior year results become less representative as is the case now. See (Figure 9\*) below for a visual of the components that will drive this estimation.





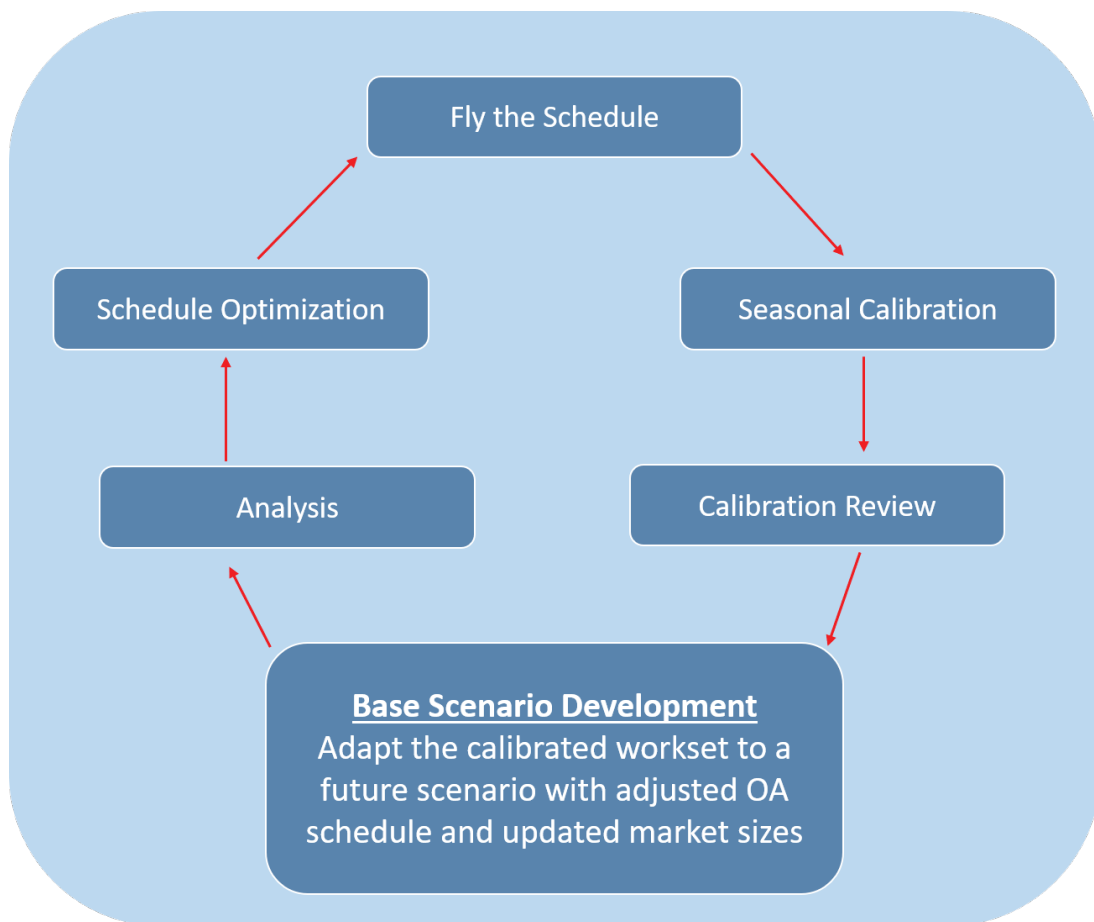


(Figure 9\*)

## 8.0 Capacity adjustments during the crisis

Additionally, Sabre has developed alternative 2021 schedules that are more reflective of what is likely to occur than the typical advance “full” schedules that have typically been published during the crisis. In this time where recent historical demand and future published schedules may not sufficiently represent what will actually occur, the activity of “Base Scenario Development” becomes a more essential activity for NPS departments. This activity combines unpublished capacity change projections with market size demand adjustments post calibration to enable network planners to more accurately project network performance than would be possible relying solely on the traditional history-based calibration process (see Figure 10\*).

## Planning & Scheduling Cycle



(Figure 10\*)

### 9.0 Conclusion

“Planning is not about the plan. It is about the ability to think of what could be and might be in the future. Planners should not be frustrated by uncertainty. This is probably the greatest time to be a planner”

***Michael Swiatek, Chief Planning Officer - Avianca***

The quote above perfectly encapsulates the role of the network planner today. Airlines are experiencing a drastically changed landscape that has necessitated new approaches and mindsets. Network Planning & Scheduling (NPS) specifically must adapt and apply modified procedures with new data to sufficiently perform its role going forward. Some prior methods must be altered to account for the new normal.

Often it is said that necessity is the mother of invention. This pandemic, as terrible as it has been, has driven innovation to an NPS processes that had been quite static over the prior two decades. A more complete, innovative process that incorporates segmentation analysis, shopping data and more robust industry schedule outlooks will be the outcome. At Sabre, we have the tools, the data, the insights and the creativity to think about the time that is ahead of us. Feel free to contact us for our strengthened methodology – that innovates on customer segmentation, demand, and industry capacity – to achieve a more robust form of forecasting for the next decade.

### **About Sabre Corporation**

Sabre Corporation is the leading technology provider to the global travel industry. Sabre's software, data, mobile and distribution solutions are used by hundreds of airlines and thousands of hotel properties to manage critical operations, including passenger and guest reservations, revenue management, flight, network, and crew management. Sabre also operates a leading global travel marketplace, which processes more than US\$120 billion of global travel spend annually by connecting travel buyers and suppliers. Headquartered in Southlake, Texas, USA, Sabre serves customers in more than 160 countries around the world.

[www.sabre.com](http://www.sabre.com)

### **Sources**

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*Official Airline Guide Frequency and Capacity Reports*

*Our World in Data Covid Vaccination Tracking*

*Transport Security Administration USA and New York Times*

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*Official Airline Guide (OAG) via Sabre Market Intelligence*

*Sabre analysis of Q3 OAG capacity trends*

*The COVID Tracking Project*

*Johns Hopkins University*

*CNBC - United Airlines to hire pilots*

*One Mile at a Time – American Airlines to unground planes*

*Grounded fleet size of China Eastern Airlines reduced to zero*