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Innovations in Airline Revenue Management Since 2020

Laurie A. Garrow

Professor at the Georgia Institute of Technology & President of AGIFORS

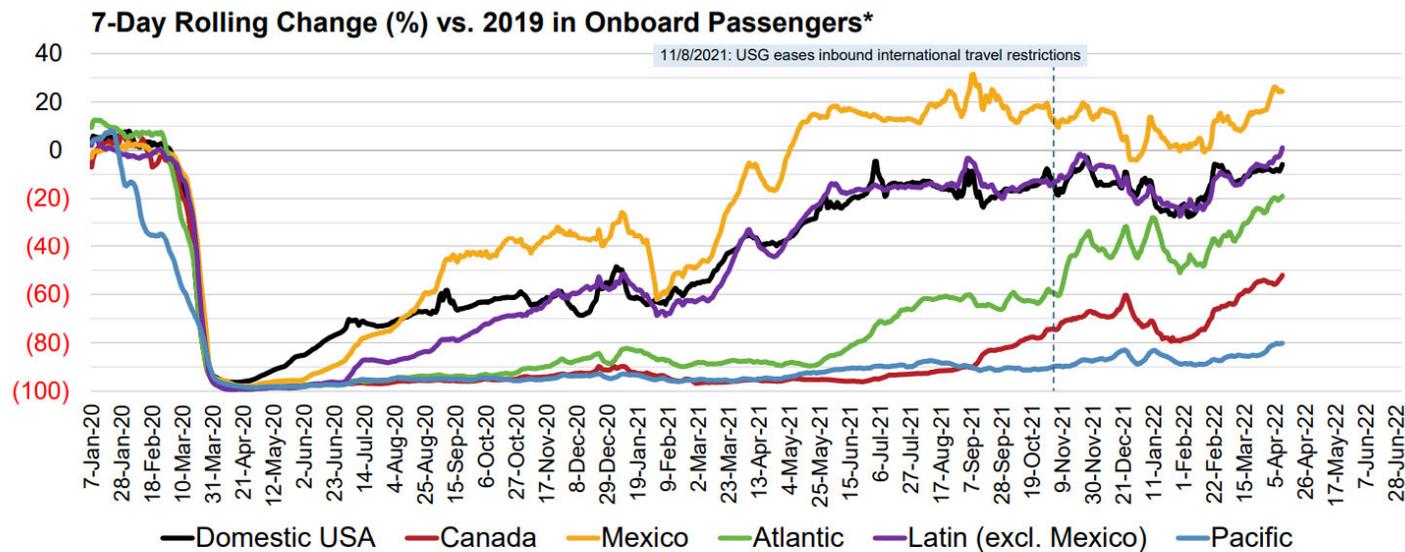
Northwestern University Transportation Center (NUTC)
Industry Workshop on Revenue Management
May 5, 2022
Evanston, IL

Background

- 2020 and 2021 were unprecedented in aviation – never before have we seen such a dramatic and **sustained** drop in passenger traffic
- But now we have a surge in demand. March 2022 saw **record-levels** of bookings for some US carriers...

April 4-10: A4A Member Airline Passenger Volumes Were 7% Below 2019 Levels

Domestic Air Travel Down 6%, International Air Travel Down 14%



Source: A4A member passenger airlines (Alaska/American/Delta/Hawaiian/JetBlue/Southwest/United) and branded code share partners

* Onboard ("segment") passengers

Source: Airlines for America. April 22 2022 update. <https://www.airlines.org/dataset/impact-of-covid19-data-updates/>

How Did Airlines Respond? The “AGIFORS” Perspective



How COVID-19 is impacting and reshaping the airline industry

Laurie Garrow¹ · Virginie Lurkin²

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FEATURE

The First 100 Days: How Airlines Responded to the COVID-19 Crisis

Airline executives around the world discussed the impact the pandemic...

BARRON'S

America's Airlines Face a Long Road Back to Normal

COMMENTARY By Laurie Garrow Jan. 26, 2022 4:30 am ET

Text size — +



About the author: **Laurie Garrow** is a professor at the Georgia Institute of Technology and the president of AGIFORS, a nonprofit organization that focuses on airline research.

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Obstacles such as new Covid variants and pilot shortages stand in the way of a swift airline industry recovery.
Spencer Platt/Getty Images

Many travelers returned to the skies in 2021. The Sunday after Thanksgiving, 2.4 million individuals were screened

by the Transportation Security Administration, a number just shy of the 2.5 million who were screened on the same day in 2019, as reported by the [Bureau of Transportation Statistics](#).

Article published in *Operations Research Forum*



Airline OR Innovations Soar During COVID-19 Recovery

Laurie A. Garrow^{1*}, Virginie Lurkin² and Lavanya Marla³

¹School of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta, GA, USA.

²HEC Faculty of Business and Economics, University of Lausanne, Lausanne, Switzerland.

³Industrial and Enterprise Systems Engineering, University of Illinois at Urbana-Champaign, Urbana, IL, USA.

*Corresponding author(s). E-mail(s):

Laurie.garrow@ce.gatech.edu;

Contributing authors: virginie.lurkin@unil.ch;

lavanyam@illinois.edu;

Abstract

[The Airline Group of the International Federation of Operational Research Societies (AGIFORS) held four conferences during May to July 2021 that focused on how COVID-19 was impacting and reshaping the airline industry. Dozens of airline representatives from around the world spoke about how fundamental changes in passenger demand and booking patterns are reshaping the airline industry and driving innovation and research needs. Customers are booking much closer to departure and are canceling or exchanging their tickets more frequently than before COVID-19. Volatility in demand has increased as travel restrictions change and borders reopen. Consequently, greater uncer-

5 Study group meetings / special sessions

64 Technical presentations

25 Sponsor presentations

16 Airline panelists

2 Airline keynotes

Airline Panelists from Across the World



Changes in Demand are Reshaping the Industry

- Lead time for bookings have exhibited high volatility
 - 80 days at beginning of the pandemic
 - 30 days when travel volumes were drastically lower than historic norms
- Elimination of exchange fees give travelers new flexibility on booking ... and rebooking flights
- Border closures and ever-changing travel restrictions lead to surges in demand ... and surges in cancellations



Photo credits: iStock

Just About Everything Changed ...

Where should we fly?

Is historical data worth anything?

What is demand going to be?

How many crew do we need when are planes are parked, but could be reactivated soon?

Should we put a lot capacity in the market, even if it means cancelling flights close to departure?

Innovations in Demand Modeling

Can I use past data for forecasting the future?



YES! Fiig and Wittman decompose forecast into resilient and volatile components to use historic data for predicting demand during COVID-19.

Photo credit: iStock

Innovations in Demand Modeling

Can we use any other data to help us predict demand?



YES! Airlines have used TSA volumes, % population vaccinated, number of COVID-19 cases, % purchasing WiFi onboard, and many other data sources but shopping data appears to be the key...

Shopping Data – Multiple Uses



During the first and second wave in the U.S., we saw a lot of correlation of bookings to searches in coronavirus dashboards. And the big breakout term for recovery was ‘vaccine appointment.’ We took those trends and incorporated them as one-week leading indicators for bookings. – Alex Matson, Alaska Airlines



Lakshmanan (Sabre) combines shopping data with historic booking data for market size analysis using machine learning methods (XBoost algorithm) and reduces mean absolute percentage error to 6.3 from 17.2 using just historical data



Etihad and Richard Ratliff (Sabre) gave presentations describing how shopping data could be used for dynamic pricing and availability and other applications

Looking Ahead in RM



The one good thing about a crisis is people now see why dynamic or continuous pricing is relevant and how it would complement an RM system. – Dennis Buitendijk, Qatar

General sense that there will be a “new normal” after the pandemic, with more flexible products, shorter booking lead times, and more uncertainty in demand predictions until close to departure

Many airlines are placing a greater focus on dynamic pricing and continuous pricing (Air Canada, United, Qatar)

New approaches are being developed to use simulated data as a complement to or replacement for RM controls and to set RM controls under different future scenarios (Air Canada, Jonas Rauch, PROS)



Connections Among RM, Scheduling, and Operations in the News



AIRLINES

JetBlue shares slump after airline drastically cuts 2022 growth plans

PUBLISHED TUE, APR 26 2022 12:18 PM EDT | UPDATED TUE, APR 26 2022 4:10 PM EDT



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KEY POINTS

- JetBlue is scaling back its 2022 growth plans to no more than 5% to avoid further flight disruptions.
- The airline previously said it expected to grow as much as 15% this year.
- Airlines have been forced to rethink growth plans as they grapple with weather delays, tight staffing and higher fuel costs.

Source: <https://www.cnbc.com/2022/04/26/faa-airlines-to-meet-on-florida-flight-disruptions-as-travel-booms.html>

Source: <https://www.cnbc.com/2022/04/26/jetblue-shares-fall-after-airline-cuts-2022-growth-plans.html>

Source: <https://www.nbcmiami.com/news/local/overnight-flight-delays-cancelations-at-south-florida-airports/2731861/>

By NBC 6 and Victor Jorges • Published April 8, 2022 • Updated on April 8, 2022 at 6:18 am



NBC 6's Victor Jorges has the latest on the mass flight cancellations that are frustrating flyers at the Miami and Fort Lauderdale airports.

AIRLINES

FAA calls meeting with airlines to discuss flight disruptions in Florida as travel booms

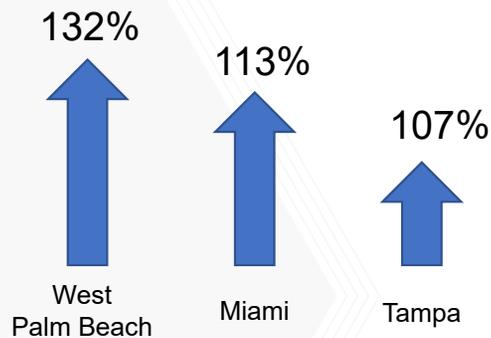
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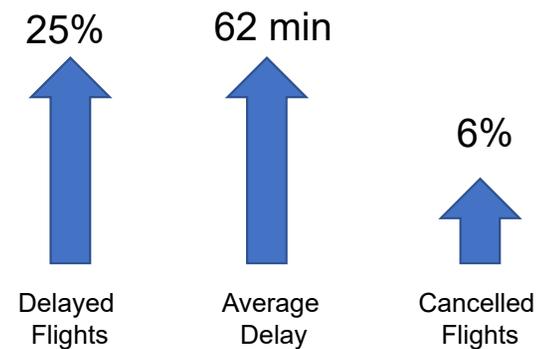
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Connections Among RM, Scheduling, and Operations

Demand April 2022 vs. Pre-Covid



Operational Stats April 1-3 (US carriers)



The more flights we schedule to meet demand...



The less reserves we have to recover in irregular operations...

Source: <https://www.cnn.com/2022/04/26/faa-airlines-to-meet-on-florida-flight-disruptions-as-travel-booms.html> (demand stats from FAA)

Source: <https://public.tableau.com/app/profile/flightaware/viz/AirlineCancellationDelayUpdate/USAirlineCancellationsDelays> (operational stats from FlightAware)

Image credit: Shutterstock

Looking Ahead for RM and Scheduling

Need to design schedules that are robust to different recovery scenarios and maintain flexibility for downline processes

Much closer collaborations between RM and scheduling that were built during COVID-19 expected to continue



Role of big data is increasing and being used to train more junior staff

What Lies Ahead for 2022?



Nearly 17,000 employees at Delta chose to depart the company through a voluntary package. The average tenure of departing employees was almost 25 years, with nearly 400,000 combined years of service to Delta – Georgia Center of Innovation's Aerospace Team

Reactivating an airline is expensive! Maintenance costs are looming ahead. Not to mention that fuel prices are now on the rise...

Workforce shortages place additional cost pressures on airlines

- Bonuses for new pilots, significant overtime pay to pilots

Early retirement packages reduced cost in the short term, but a lot of institutional memory also left a gap in institutional knowledge

- Impacts seen not just at airlines, but at FAA and airports as well
- Role of big data is increasing and being used to train more junior staff (American Airlines with operations control center)

The Big Unknowns

We are probably not returning to the past, but a new normal

- How are we going to manage an environment where few restrictions are placed on products and booking lead times are shorter?
- What will business travel look like in the future?
- Will international travel requirements remain fragmented and if so will new services emerge for travelers to manage the entire experience?

From a methodology perspective, there is a lot of interesting work occurring on continuous pricing and continuous optimization. Will continuous optimization provide speed and integration opportunities we haven't thought of before?



Continuous is the new black
An efficient framework aligned with continuous pricing for joint optimization of fares across competing itineraries

Anubhav Jain¹, Burak Ozdaryal¹,
Indrajit Chatterjee¹, Bazyli Szymański^{1,2}

2022 AGIFORS RM Study Group Meeting

¹United Airlines; ²MIT International Center for Air Transportation
A STAR ALLIANCE MEMBER

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Markov Chain Choice on a Real Interval

AGIFORS RM Study Group Meeting
26 April 2022



Jonas Rauch
Lead Scientist

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Thank You!



Laurie Garrow, President of AGIFORS
Professor, Georgia Tech

Laurie.garrow@ce.gatech.edu or
Laurie.garrow@agifors.org

Photo credit: Semi Gabteni