A Tale of Two Continents

AMAZON AIR EXPANDS HUBS & CAPACITY IN NORTH AMERICA WHILE DOWNSIZING IN EUROPE

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By Joseph P. Schwieterman and Toni Jahn

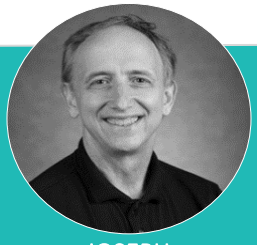
Our analysis of Amazon Air's moves since March 23, 2023, shows that the carrier has:

- Pursued diverging strategies in North America and Europe, expanding and investing in hubs in the former while trimming and eliminating its largest hub in the latter;
- Simplified its U.S. network, ending service to six airports while modestly expanding daily flights;
- Doubled down on U.S. hubs, growing at Cincinnati-Northern Kentucky (CVG) from 58 to 63 daily flights, and at Lakeland, FL, San Bernardino, and Wilmington, OH, while reducing non-hub flying;
- Emphasized schedule regularity, night flights, and arrival/departure clustering at CVG;
- Systemwide, reduced the number of flights by 1.8% but expanded tonnage capacity by 4.9%

Amazon Air's push to simplify its network and improve the utilization of cargo space came despite strong economic headwinds facing online retailers and cargo airlines. The unit stands out for bucking the trend toward large-scale reductions in the air-cargo sector and has increased its cargo capacity by prioritizing larger planes. This independently produced Brief reviews Amazon Air's initiatives between March 2023 and March 2024 using publicly available data and builds upon our previous Amazon Air Brief released early last year and the newly completed European analysis by Toni Jahn, who is a co-author of this report.[1] The opinions expressed are solely those of the authors. For a primer on Amazon Air, see the sidebar on page 4 of our 2023 Brief.

CHADDICK INSTITUTE FOR METROPOLITAN DEVELOPMENT
DEPAUL UNIVERSITY | CHICAGO, IL| PHONE: 312.362.5732
EMAIL: CHADDICK@DEPAUL.EDU

PHOTO (ABOVE): BOEING 737 AT GERMANY'S LEIPZIG/HALLE AIRPORT IN EARLY 2023 (M. NAIBERG PHOTO)



JOSEPH SCHWIETERMAN PH.D.

TONI JAHN

FINDINGS FROM OUR ANALYSIS

The analysis draws on publicly available sources of information, including:

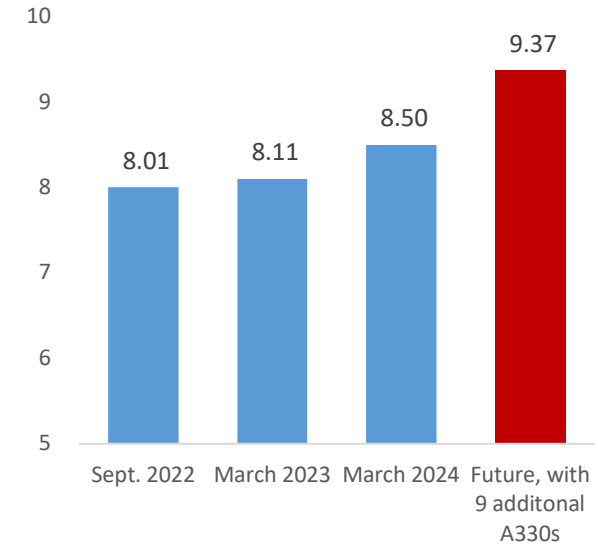
- Flight data on 8,800 Amazon Air takeoffs and landings from flightaware.com and flightradar24.com since 2020, including analysis of activity from February 5 – March 12, 2024.[2] We define the term "flights" as the sum of takeoffs and landings at an airport;
- Geographic analysis of Amazon flights using ArcGIS Pro software and U.S. Census data;
- Fleet registration information from the FAA and other sources, including planespotters.net; and
- Time-series analysis of the European network discussed on page 8.

FINDING 1. Amazon Air simplified its North American network while expanding cargo capacity by emphasizing larger planes and major hubs and dropping flights to six U.S. airports. The unit's tonnage capacity grew by 4.9% over the past year by adding three Boeing 767 freighters and an Airbus 330. If all ten A330s join its fleet as anticipated, Amazon Air's capacity will be 17% higher than a year ago.

The tumultuous environment for online retailers and cargo airlines over the past year is almost certainly a major factor in Amazon Air's recent moves. Amid the air cargo slump, the ability to sell unneeded payload space at premium prices to third-party retailers has diminished. The cost of pilots at contract carriers has risen sharply as of late, and the shortage of pilots persists, even as truck driver shortages ease. The incentives to shift to lower-cost but slower truck transport have grown as a result. All the while, the prospect that autonomous vehicles (drones or ground transport vehicles) will dramatically reduce fulfillment costs over the next several years has waned.

FIGURE 1: Amazon Air Payload Capacity

In millions of pounds



Yet, Amazon is enjoying strong retail sales and had a successful holiday season, beating analyst expectations. Its Amazon Air unit has taken deliberative steps to redesign its network as the economic landscape changes. Its three added B767-300 planes, all operated by Air Transportation International, and the first A330-300 (with tonnage capacity about 17.6% greater than the 767s) represents a significant strategic shift. In the process, the percentage of the fleet comprised of B737 or smaller planes has fallen from 38% to 33% over the past year. The first A330, operated by Hawaiian Airlines, took to the skies in October and has been assigned to

At Cincinnati-Northern Kentucky Intl. (CVG), Amazon Air planes are being loaded for the afternoon departure bank in February 2024.

domestic duty. Several months prior, Amazon Air stopped using all five of its ATR-72s turboprops, which had been operated by Silver Airways and filled gaps in U.S. coverage. These planes each had a mere 36% of the tonnage capacity (and 41% of the volume capacity) of a 737-800, making them fuel- and labor-intensive.

The push to simplify the U.S. airport network ended regular flights to Des Moines Intl. (DSM), Mobile Intl. (BFM), Omaha Eppley (OMA), San Jose (Mineta) Intl. (SCJ), Tampa Intl. (TPA), and Wichita/Eisenhower National (ICT), several of which had only seen the turboprops. Amazon Air halved service to Las Vegas, NV, which is less than a four-hour truck trip from its San Bernardino hub, and cut service by roughly a third at Baltimore-Washington Marshall Intl. (BWI), which is approximately 7.5 hours from the Wilmington, OH, hub. No new U.S. airports gained regular service, giving Amazon Air a consistent presence in 47 U.S. airports, down from 53 last year.

As a result of these changes, Amazon Air has 4.9% more tonnage capacity and 4.6% more payload capacity than a year ago despite having one fewer plane. While total daily flights fell by 1.8%, its available ton-miles grew. Plus, Amazon apparently still intends to expand its A330 fleet to 10, all of which are being converted from passenger service. If this occurs, Amazon Air's tonnage capacity will grow by 17.1%, and its volume capacity will expand by 15.6%. Nevertheless, A330s are not considered suitable planes for high-intensity freighter operations due to their performance characteristics. As such, they might not be used as intensively as Amazon's Boeing fleet.

FINDING 2. Amazon Air's growing emphasis on hubs and diminished point-to-point flying make its U.S. network more like FedEx and UPS's. These changes and heightened day-to-day schedule regularity indicate that the network is being reconfigured to support rapid fulfillment and overnight parcel shipment rather than general inventory movements.

Amazon Air's network has gradually grown to be more like that of FedEx and UPS. These air cargo integrators have long been hub-centric, with nearly identical schedules day after day (except for weekends and holidays). Their networks have been gradually fine-tuned to maximize their versatility for guaranteed delivery the next morning or afternoon.

Amazon is pursuing a similar strategy in North America. More than four in five Amazon Air flights (80.5%) within the U.S. mainland operate to or from its five largest hubs, up from 65.6% in early 2021. Flight activity at four of its five busiest hubs, Cincinnati-Northern Kentucky (CVG), San Bernardino Intl., CA (SBD),

FIGURE 2: Amazon Air route network, U.S. Mainland, February 6, 2024

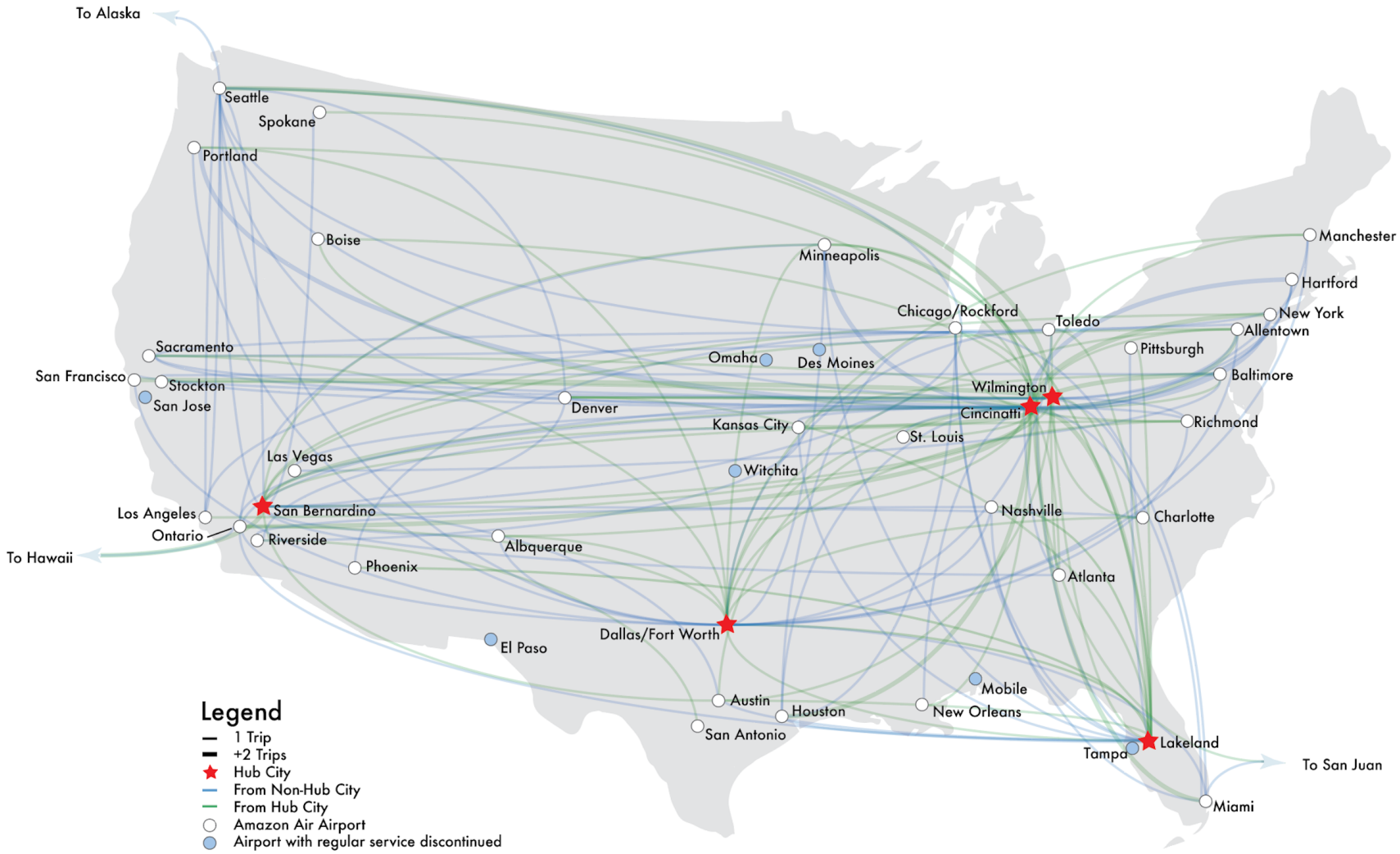
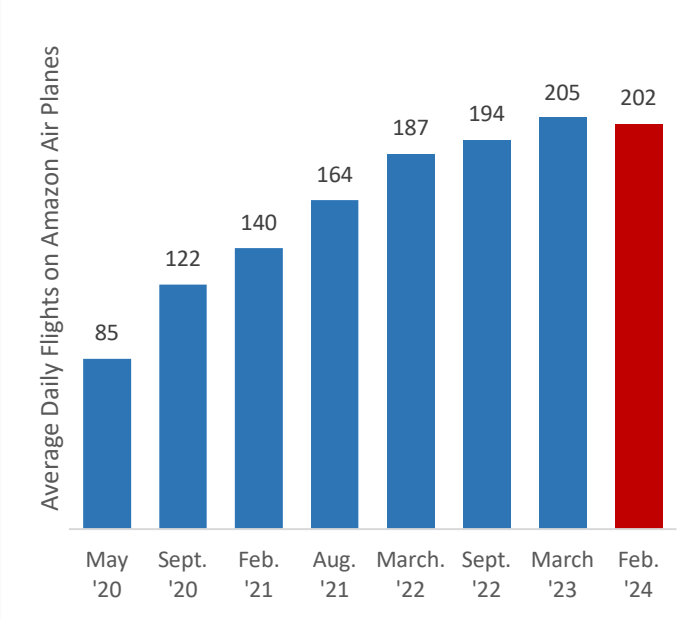


FIGURE 3: Number of Daily Amazon Air Flights



Ohio's Wilmington Air Park and Florida's Lakeland-Linder all grew. CVG had the most significant absolute growth over the past year, which we discuss in Finding 4. Only Fort Worth Alliance (AFW) diminished among the five largest hubs, a result almost entirely attributable to the discontinuance of the turboprops, which barely affected the airport's tonnage capacity.

Lakeland, now the second busiest hub, grew from 20.3 to 21.4 flights, reaching nearly twice as much activity as in 2021. This former general aviation airport was bereft of cargo activity as recently as 2020. Amazon Air's service to Tampa Int'l (TPA), less than an hour's drive away, was dropped, but it expanded at Miami Intl. (8.9 flights), now Amazon Air's second busiest Florida airport.

San Bernardino (SBD), ranking third, grew from 17.1 to 20.3, nearly doubling the number of flights from two years ago. Amazon Air's largest A330 plane regularly shuttles between CVG and SBD. Amazon Air's dual-hub strategy in the Inland Empire continues, having also expanded at Ontario Intl. (just 23 miles from SBD) from 9.3 to 10.6 daily over the past year. When adding Riverside March Air Reserve's three flights, Amazon Air, for the first time, has more than 33 daily flights to/from the Inland Empire, a number exceeded only by greater Cincinnati (defined here to include Wilmington) among metro regions. As it doubled down on its hubs, non-hub flying in North America fell by around 3%.[3]

Seattle-Tacoma Int'l has supplanted Portland, OR, as its Pacific Northwest focus, having grown from 10 to 14.3, more than twice that of Portland (7.1). More than ever, however, Amazon is shying away from large concentrations of flights at major passenger-focused airports. For example:

- Chicago-Rockford Intl. grew from 12 to 14 flights, whereas Chicago O'Hare activity diminished.
- Lehigh Valley Intl. in Allentown, PA, grew to eight daily flights, thus eclipsing New York John F. Kennedy Airport (which held steady at six).
- Sacramento Intl grew to six flights daily, whereas activity dropped at San Francisco Intl. and ended entirely at San Jose (Mineta) Intl.

The results show that Amazon still prefers airports with ample room for warehouse development and amenable to tight cargo drop-off times. Our analysis indicates that cargo-oriented airports are better positioned to provide these benefits than large mixed-purpose airports and thus have an outsized Amazon Air presence.

FIGURE 4: Number of daily flights at Amazon Air airports, 2020–2024

Total takeoffs and landings by airport, excluding partner flights

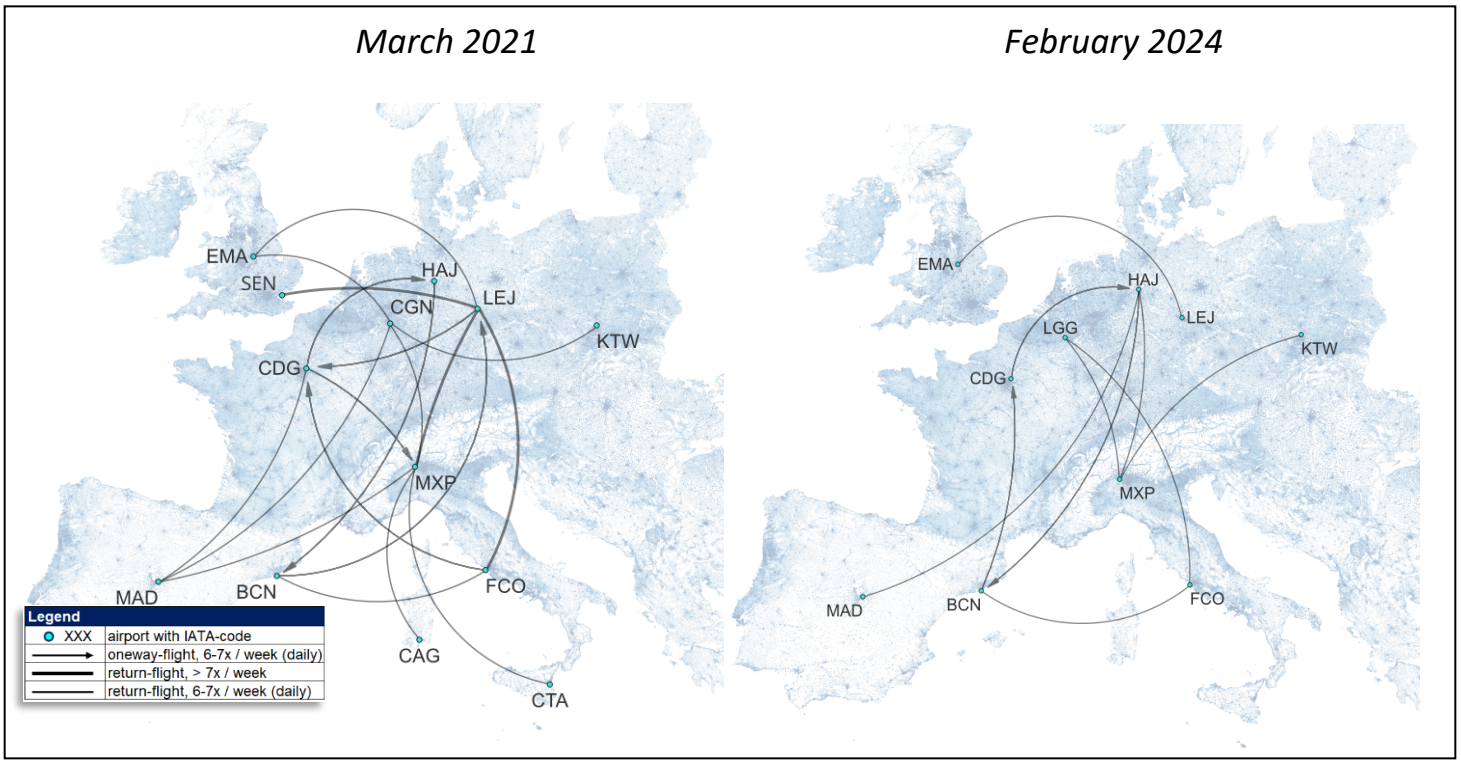
	Earlier Time Periods- Amazon Air						Current
Airport	April 2020	August 2020*	February 2021*	March 2022	September 2022	February 2023	February 2024
Albuquerque International Sunport (ABQ)				4.8	1.9	2	3.1
Allentown Lehigh Valley Int'l (ABE)	6	5.0	4.3	1.4	2.3	4.6	8.0
Anchorage Ted Stevens Int'l (ANC)	4	2.0	2.0	2	2	2.0	2.3
Atlanta Hartsfield-Jackson Int'l (ATL)	0	2.0	2.5	3.2	4	4.9	4.0
Austin-Bergstrom International (AUS)	0	4.0	4.2	5.8	6.1	5.9	7.7
Baltimore-Washington Marshall Int'l (BWI)	6	9.0	10.5	19.2	18	14.6	9.6
Boise (BOI)						2.0	2.0
Charlotte Douglas Int'l (CLT)				5	3.7	4.3	4.0
Chicago O'Hare International (ORD)	0	2.7	3.5	7.2	6	4.6	2.0
Chicago Rockford International (RFD)	15	16.5	15.8	9.2	11.7	12.0	14.0
Cincinnati/Northern Kentucky Int'l (CVG)	24	25.7	27.8	25.6	43.9	57.7	63.3
Denver International (DEN)	4	3.7	4.2	2.2	3.9	6.0	8.0
Des Moines International (DSM)				1.6	2	1.9	
El Paso (ELP)					1.7		
Fairbanks Int'l (FAI)				1.8	1.7	1.7	1.1
Fort Worth Alliance (AFW)	8	16.7	17.2	36.6	29.9	34.1	21.4
Honolulu Daniel K. Inouye Int'l (HNL)	4	4.3	3.8	5.6	3.1	4.0	4.1
Houston G. Bush Intercontinental (IAH)	9	10.2	10.0	3.2	3.6	3.3	6.6
Kahului (OGG)	2	2.2	1.8	2	1.7	2.0	1.4
Kailua-Kona/Kona International (KOA)	0	1.7	2.0	2	1.7	2.0	1.4
Kansas City International (MCI)				2.2	6.1	4.9	7.1
Lakeland Linder International (LAL)	0	11.5	11.5	16.2	17.9	20.3	21.4
Las Vegas (LAS)					2.6	4.0	1.7
Liuhe (LIH)					2	2.0	2.0
Los Angeles International (LAX)	0	0.0	2.0	6	3.7	2.0	3.9
Manchester-Boston Regional (MHT)						3.3	4.1
Miami International (MIA)	6	7.3	6.7	6.8	8.1	4.7	8.9
Minneapolis-Saint Paul International (MSP)	2	3.7	2.0	6	4.4	6.0	8.1
Mobile Regional Airport (BFM)						1.9	
Nashville International (BNA)				3.8	4	2.0	3.7
New Orleans, Louis Armstrong Int'l (MSY)	0	0.0	2.0	2	2	2.0	2.1
New York John F. Kennedy Int'l (JFK)	0	8.0	8.8	8.2	4	6.0	6.0
Omaha Ebbly (OMA)				2.4	2	1.4	
Ontario International (ONT)	13	21.5	20.5	12	12.4	9.3	10.6
Phoenix Sky Harbor International (PHX)	4	6.5	9.5	6.2	4	4.0	2.3
Pittsburgh International (PIT)				6.2	2	2.0	2.0
Portland International (PDX)	6	8.2	10.5	13.8	12.4	9.3	7.1
Richmond International (RIC)	0	5.0	4.0	2	3.7	5.9	4.9
Riverside March Air Reserve Base (RIV)	4	5.7	6.5	9.2	5.4	4.1	3.0
Sacramento International (SMF)	4	6.2	4.5	2	2	0.6	6.0
San Antonio/Kelly Field (SKF)	2	3.2	2.0	2	4.1	1.7	3.4
San Bernardino International (SBD)				11	10.3	17.1	20.3
San Francisco International (SFO)	2	2.8	7.0	3.8	5.7	4.3	4.0
San Jose (Mineta) International (SJU)						2.9	
San Juan Luis Muñoz Marin Int'l (SJU)	0	2.7	2.0	1.8	1.7	0.1	4.1
Seattle-Tacoma International (SEA)	9	9.3	11.2	16	10.3	10.0	14.3
Spokane International (GEG)				1.8	2	4.0	2.0
St. Louis Lambert International (STL)				1.8	4.3	1.9	1.7
Stockton Metropolitan (SCK)	4	4.0	6.2	4.8	4	4.0	3.4
Tampa International (TPA)	16	11.3	13.2	6	8.1	4.7	
Toledo Express (TOL)				4	4	4.0	3.1
Wichita (Eisenhower National) (ICT)				1.2	1.4	4.0	
Wilmington Air Park (ILN)	13	13.7	14.8	24.2	20.4	15.3	20.6
Windsor Locks Bradley (Hartford) (BDL)	2	6.8	8.0	5.6	10	4.3	4.1
Outside United States							
Canadian Airports				10.2	10.0	10.3	13.7
Asia Pacific Airports (India-only after 2023)	1					9.1	10.0
Western Europe Airports	0	0.7	16.8	36.4	44.3	48.0	30.0
Total takeoffs & landings	170.0	243.5	279.3	374.0	388.2	410.7	403.1
Total flights	85.0	121.8	139.7	187.0	194.1	205.3	201.6

FINDING 3. Amazon Air has been "a tale of two continents," with North American flight activity growing modestly while European activity dropped by more than a third over the past year. As it invests in U.S. hubs, it is moving *away* from a European hub design in favor of a point-to-point orientation. Amazon's changing relationship with DHL is likely a significant factor in eliminating activities at Cologne/Bonn and closing its Leipzig/Halle hub.

Although flight activity grew 1.5% in the U.S., and there has been expansion in Canada (where Amazon Air added 3.4 flights/day) and India (0.9 more flights per day), European flights fell 37.5%.[4] This significant cut constitutes the most considerable reduction for the unit since our first Brief in early 2020.

To understand the changing European situation, we tracked the number of flights on Amazon missions flown with branded Amazon Air and unbranded aircraft (i.e., "whitetail" planes operated by its contractors identified using the criteria noted on the Page 8 sidebar). In September 2020, near the start of its European operations, Amazon Air had roughly a quarter as many flights in Europe as in the U.S. Over the next 18 months, Europe expanded just 19% compared to the U.S.'s 35%. Then, European activity dropped 29% in the summer of 2022 and another 38% last summer. The tendency for summer to see less activity than winter is common throughout Europe, but these cuts were permanent.[5] The average number of daily flights, including those on unbranded aircraft (see the chart on page 12), dropped from 39.4 in early 2022 to 29.0 in early 2023 and then to the present 15.1. This occurred as the U.S. network continued to grow, albeit more slowly. The European operation is now only about one-sixth as large as the U.S.

FIGURE 5: Amazon Air route network in Europe



Deeper Insights into Amazon Air's European Strategy

This Brief offers a more detailed analysis of Amazon Air's European network than our past ones due to a year-long investigation by Toni Jahn, the co-author of this report, in a master's thesis at Frankfurt University of Applied Sciences. Using flightradar24.com flight information validated by a separate dataset of 2022 from Spire, Jahn tracked Amazon Air flights over time and developed a method to identify unbranded aircraft on Amazon missions (called "partner flights" in this report). This method involved identifying planes operated under the same trip number as branded planes on earlier or successive days. Jahn's full study can be accessed here.

Three moves are significant.

a) Leipzig/Halle Airport (LEJ), until recently regarded as having significant strategic value, ceased being an Amazon Air hub in 2023. This airport's importance stemmed heavily from its role as DHL's primary European hub, a facility functioning much like its Cincinnati CVG hub. From 2017 to 2021, DHL subsidiary European Air Transport reportedly operated up to two Boeing 757s exclusively for Amazon Air.[6] In early 2022, Leipzig's flights peaked at 18/day and were clustered into three inbound and three outbound arrival and departure banks (each bank consisting of just two to three aircraft). Schedules were not logistically designed for sorting packages between the banks, as the time available for this, in our view, was too short--far less than the several hours at CVG. Nevertheless, properly consolidated Unit Load Devices (ULDs) could be transferred between planes. Starting in late 2023, all but one route was shifted to northern Germany's Hannover (HAJ) and Belgium's Liege (LGG).[7] Leipzig now sees only 1.7 flights/day (a daily roundtrip six days a week).

b) At Cologne/Bonn Airport (CGN), the cuts predated Leipzig's. Amazon Air's presence in Cologne began in April 2019.[8] Activity peaked at ten flights/day in autumn 2020; by early 2022, only a pair had remained. The last flights departed in late 2022. Much of the activity moved to Liege, where capacity had been freed up by FedEx's downsizing in 2021 in favor of Paris Charles de Gaulle, making the latter FedEx's lone European hub.[9]

An Amazon Air plane, operated by ASL Ireland, takes off from Leipzig/Halle Airport in December 2022 (G. Najberg photo)

c) In the United Kingdom, Amazon Air's presence at East Midlands (EMA), which is near Birmingham, and Southend (SEN), near London, has diminished sharply. These airports were mainstays through late 2020, when EMA had ten flights/day and SEN eight, but activity was more than halved by late 2021, with Brexit likely largely to blame.

Milan (MXP), Amazon Air's busiest Italian airport, has stabilized its activity level. Nevertheless, Milan's dispersed flight patterns have not been set up for rapid and synchronized transfers between planes. Milan's activity peaked at 12 flights/day in 2021, second only to Leipzig, and is down to 5.4 today. Hannover (HAJ) is now number two in Europe, with an average of 5.1 flights/day.

Despite the drop-off in flights, the number of European airports Amazon Air serves has primarily held steady over the past year. The unit currently serves ten airports, down from a high of 13 in early 2021. In 2023, between 35% and 40% of the European population lived within 100 miles of an Amazon Air airport, a range which, while less than the 75% in the U.S., has changed little over the past two years. More than 80% of Europe's population remains within *300 miles* of an Amazon Air airport. Such distances can be covered within a day by a truck. Road feeder services are commonly regarded as serving larger catchment areas for cargo airports in Europe than those on other continents.

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FINDING 4. The Ohio Valley is more than ever Amazon Air's strategic center, accounting for more than half of flights within the U.S. mainland. Flights at CVG grew from 57.5 to 63.3 daily, which does not include a handful of partner flights, and nearby Wilmington Air Park is seeing a more significant role. Although CVG is not yet the "superhub" we expect it to become eventually, it now has nearly three times the daily operations of any other airport. Tight arrival/departure clustering and larger airplanes provide much greater overnight shipment capabilities than two years ago.

Over the past year, CVG and Wilmington Airport grew to 63.3 and 20.1 daily flights, respectively. These airports, just 60 air miles apart, now account for more than half (52%) of all flights within the U.S. mainland. CVG alone accounts for almost two in five (39.2%) of those flights, up from around 25% in early 2021. The tightly woven afternoon and early-morning departure banks account for nearly all flights (Figure 6). Almost all of

FIGURE 6: Like a Clock: Consistency of Departures at Cincinnati CVG

Departure Times, February 5–11, 2024

	Monday	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*	*Sunday*
Destination	**February 5**	**February 6**	**February 7**	**February 8**	**February 9**	**February 10**	**February 11**
		Early Morning Bank					
Lakeland (LAL)	00:30	00:30	00:30	00:30	0:30	0:30	0:30
Miami (MIA)	00:30	00:30		00:30	00:30	0:30	0:30
Boise (BOI)	00:40	00:40	00:40	00:40	0:40	0:40	0:40
Houston (IAH)	00:40	00:40	00:40	00:10	0:10	0:10	0:10
Manchester (MHT)	00:40	00:40	00:40	00:40	0:40	0:40	0:40
New York (JFK)	00:50	00:50	00:50	00:50	0:30	0:50	0:50
Windsor Locks (BDL)	00:50	00:50	00:50	00:20	0:50	0:50	0:20
Allentown (ABE)	01:00	01:00	01:00	01:00	0:30	1:00	0:30
New Orleans (MSY)	01:00	01:00	01:00	01:00	1:00	1:00	01:45 & 2:25
St. Louis (STL)	01:45	01:45	01:45	01:45	1:45		1:45
Chicago (ORD)	02:00	02:00	02:00	02:00	2:00	2:00	2:00
Kansas City (MCI)	02:00			02:00	2:00	2:00	2:00
Austin (AUS)	02:53						
		Afternoon Bank					
Atlanta (ATL)	14:10	14:30	14:00	14:30	14:30	14:30	14:30
Kansas City (MCI)	14:30	14:30	14:30	14:30	14:30	14:30	14:30 (two)
Windsor Locks (BDL)	14:30	14:00	14:30	14:00	14:30	14:30	14:30
Minneapolis (MSP)	14:40	14:40	14:40	14:40	14:40	14:40	14:40
Richmond (RIC)	14:40	14:40	14:40	14:40	14:40	14:40	14:40
Houston (IAH)	14:50	14:50	14:50	14:50	14:50	14:50	14:50
Miami (MIA)	14:50	14:50	14:50	14:50	14:50	14:50	14:50
Spokane (GEG)	14:50	14:50	14:50	15:00	14:50	14:50	14:50
Albuquerque (ABQ)	15:00	15:00	15:00	15:00	15:00	15:00	15:00
New York (JFK)	15:00	14:30	15:00	15:00	15:00	15:00	15:00
San Juan (SJU)	15:00	15:00	15:00	15:00	15:00	15:00	15:00
Denver (DEN)	15:10	14:40	15:10	14:40	15:10	15:10	15:10
Portland (PDX)	15:10	15:10	15:10	15:10	15:10	15:10	15:10
Stockton (SCK)	15:50	15:50	15:50	15:50	15:50	15:50	15:50
Baltimore (BWI)	16:00	15:30	15:10	16:00	14:30 & 16:00	16:00 & 16:30	16:00
San Bernardino (SBD)	16:30	16:30	16:30	16:30	16:30	16:30	16:30

This chart shows scheduled departure times at Cincinnati CVG using 24-hour clock times. With few exceptions, the destinations and departure times change little across the week.

CVG's 32 daily departures are clustered between midnight and 1:45 am, as they were last year, but now there are more flights.

CVG's early-morning departure bank now has around 16 flights, up from 14 last year. This estimate includes 4–8 "partner flights" (flights by Amazon contractors on planes not branded as Amazon Air but having itineraries and schedules similar to Amazon Air on another day). The afternoon cluster is nearly as large.

An Amazon Air 737 departs San Bernardino Intl. in 2023 (Peiwen Chen)

Arrivals at CVG are also clustered, albeit not as tightly as departures. Turnaround times are somewhat longer than those of FedEx and UPS, with planes typically on the ground for about five hours, much more than the air cargo integrators' two to three hours. Wilmington's departures remain heavily concentrated between midnight and 1:15 a.m. (see our 2023 Brief). On a typical day, flights leave CVG and Wilmington for more than two dozen destinations between midnight and 4 am.

No other Amazon hub has arrival and departure clustering as tight as CVG and Wilmington's schedule patterns. Although flights at these other hubs are grouped in banks, and they, too, have much schedule regularity, their banks have only a handful of flights. The interval between arrivals and departures is suitable for package sorting at Amazon facilities adjacent to parked aircraft. This supports our view that Cincinnati is preeminent in Amazon's air-oriented logistic network. Illustrative of the synergy between truck and plane, all but a few aircraft operate to places with more than an eight-hour truck drive from the Ohio Valley.

SHORT-TERM OUTLOOK AND PREDICTIONS

We offer five predictions for the next 12 months and beyond.

Prediction 1: The growth of Amazon Air's flight network will resume, but the pace will be measured due to the air-cargo slump, and most emphasis will be placed on its five largest U.S. hubs and selected international routes. Amazon Air's restraint over the past two years and the redesign of its network have laid the groundwork for focused expansion aimed at further expanding its next-day package delivery capabilities. We believe the retailer will primarily emphasize CVG (see Prediction 2) and growth in Fort Worth, Lakeland, and San Bernardino. Amazon's entry into India foreshadows new routes in developing countries, with South America, the Pacific Rim, and Middle East flying being solid possibilities. However, we expect Amazon to start small in these regions.

Prediction 2: By mid-2025, the combined daily flight activity at hubs at CVG and Wilmington will grow to more than 125, including partner flights, with CVG alone having at least 85. Currently, CVG has

around 70 daily flights, including an estimated 4 – 8 partner flights. This hub and Wilmington together have 102–104 daily flights, including partner flights. With the ground facilities at CVG tailor-made for more intensive hub operations, we expect 20% more flights there by the summer of 2025, with concurrent reductions in non-hub flying. The recent shift toward nighttime flying in the U.S. will likely continue.

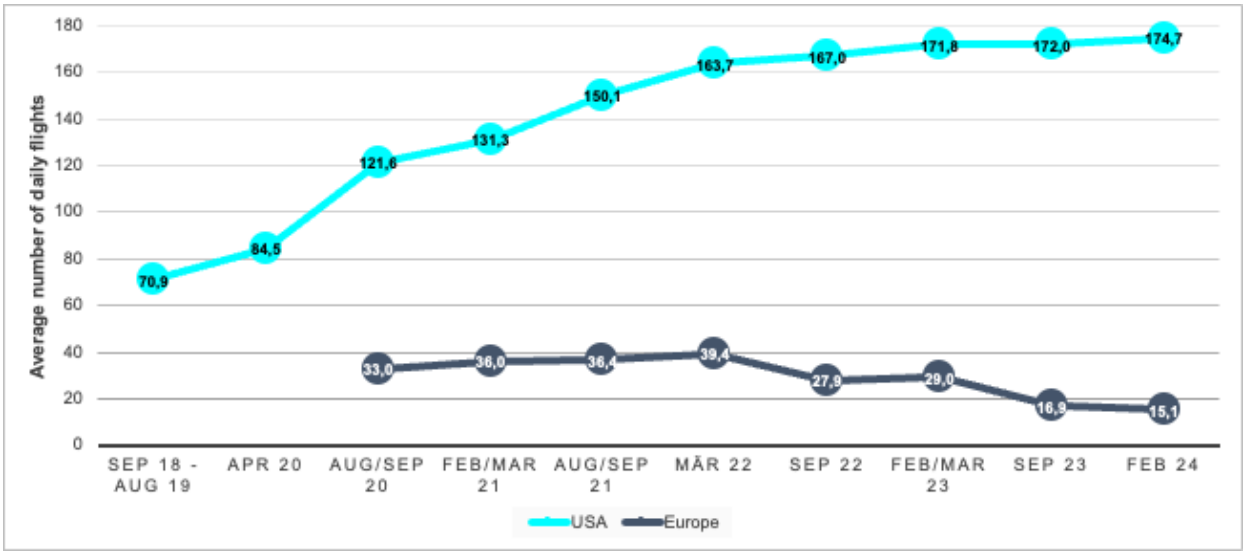
Prediction 3: Amazon will remain relatively small in Europe, but it will at least partially bounce back while continuing to adjust its flight schedule more frequently than the air cargo integrators. We expect most of the growth to be where its logistics infrastructure, including fulfillment or sorting centers, is expanding. Scandinavia and Southeast Europe, including Greece and the Balkan countries, are particularly positioned for more service. However, the ability to transport cargo by truck or in aircraft from other providers will prevent U.S.-style hub development.

Prediction 4: Amazon Air will buck the downsizing trend and expand its A330 fleet to 10, as previously announced. We expect all nine additional widebodies to enter its fleet for North American duty on routes 1,500 miles or more, much like the first one deployed. Hawaii-to-mainland U.S. flying will be part of the mix. Due to the capacity availability of general cargo airlines, we do not expect them to be used for transoceanic missions, such as factory-to-warehouse shipments. The rapid rebalancing of inventory between warehouses and the delivery of its parcels will remain a hallmark of Amazon Air.

Prediction 5: Once seemingly imminent, plans for creating a hub in the northeast U.S. will remain mothballed due to heightened trucking and the growing capabilities of the CVG-Wilmington hub complex. The Northeast generates a considerable share of U.S. retail sales, and FedEx and UPS have large hubs in the region. At various points over the past several years, the development of an Amazon Air hub at Allentown, PA, BWI Marshall, or Newark Liberty Intl. appeared on the horizon. Indeed, BWI was once Amazon Air's third busiest airport and plans for a large Newark operation generated headlines (and controversy) in 2022. Nevertheless, the desire for such a hub has subsided partly because most of the region's population is a single-day truck drive from CVG and Wilmington and an associated heightened emphasis on cost containment.[10] We expect flight expansion to the Northeast to be limited and service spread over numerous airports without a dominant hub emerging. ■

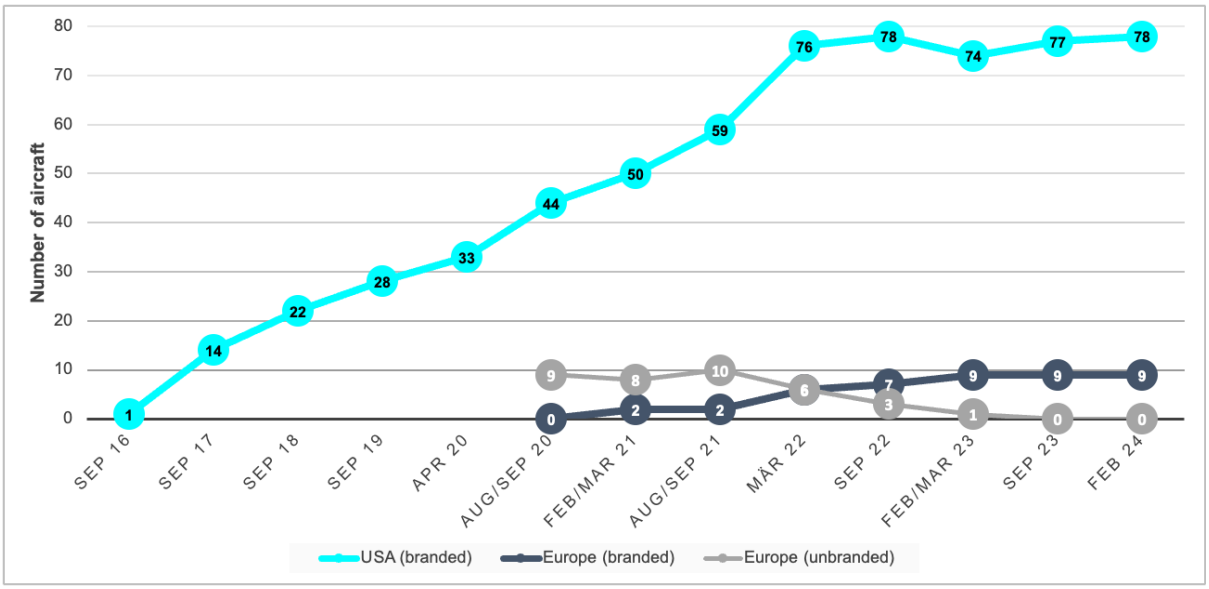
APPENDIX: AMAZON AIR'S EUROPE VS. U.S. NETWORK

FIGURE 7: Changing Number of Flights, Europe vs. US, including European partner flights



This chart shows the average daily flights in Europe and North America. Unlike the estimates provided in Figure 4, these figures include "partner flights" operated in Europe (i.e., flights with contractors on planes not branded as Amazon Air but having characteristics suggesting they are on Amazon missions) by Amazon Air, which accounted for a large share of flights before 2022. European flight activity peaked during our March 2022 review. Subsequently, the elimination of Saturday flights also pushed European flight activity downward.

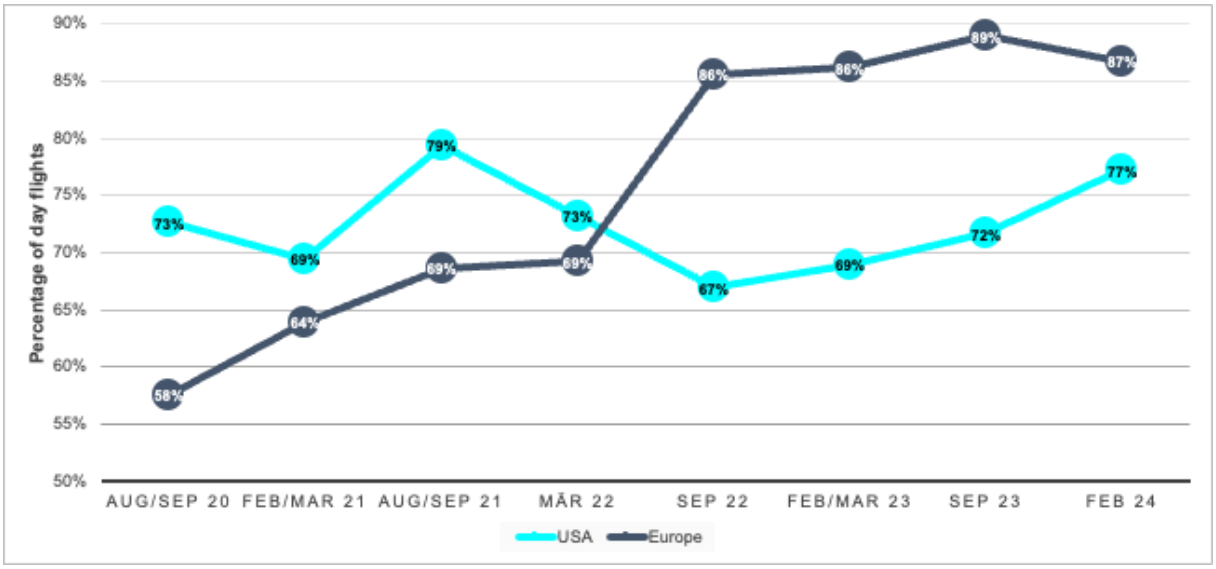
FIGURE 8: Changing Size of Amazon's Air's Fleet, U.S. vs. Europe, 2016–2024



The chart shows the changing size of the Amazon Air fleet in Europe and the U.S. The U.S. fleet, which enjoyed sharp and continuous growth from 2016 to early 2022, plateaued in September 2022. Europe has been more steady, remaining in the 9–12 range. Although we have not formally estimated the number of unbranded ("whitetail")

aircraft in the U.S., we provide one for Europe, drawing upon Jahn's detailed analysis. Europe's unbranded fleet rose to 10 in August 2022 before falling to just one in early 2023 and disappearing entirely by September 2023. Since early 2023, the retailer has generally had eight branded planes in active European service and the ninth plane apparently on standby duty. The European fleet now has a cubic volume capacity of 52,320 ft,[3] about 27% more than in mid-2020, with the increase mainly stemming from a shift from unbranded B734s to branded B738s. The U.S.'s volume capacity is roughly 20 times Europe's. Our estimates do not consider flights on unbranded planes that may operate between airports not regularly served by Amazon Air.

FIGURE 9 Daytime vs. Nighttime Flying, Europe vs. U.S., 2020–2024



This chart shows the percentage of daytime and nighttime departures in Europe and the U.S. over time based on actual (rather than scheduled) departure times, with the daytime period defined as 6 a.m. to 9:59 p.m. Until March 2022, Europe had a much higher emphasis on nighttime flying than the U.S., but starting that summer, the proportion of daytime flights increased significantly. This was primarily a result of a shift in Europe away from hub-focused flying and toward a more point-to-point orientation (a design apparently less acclimated toward next-day delivery). More than 85% of European flights are now during daytime, while in the U.S. network, this number has dropped from a high of 79% to 72%, mainly due to the expansion of the CVG hub (which opened in mid-2021).

AUTHORS & STUDY TEAM

AUTHOR: JOSEPH P. SCHWIETERMAN, PH.D., a professor of Public Service Management and director of the Chaddick Institute for Metropolitan Development at DePaul University, is a nationally known authority on transportation and urban economics. He is the author of the book *Air Cargo and the Opening of China* and editor-in-chief of *Issues in Aviation Law and Policy*, a DePaul journal.

CO-AUTHOR: TONI JAHN is a graduate of the MBA Aviation and Tourism program at Frankfurt University of Applied Sciences and works for a large German aviation company. His master thesis examined the topic *"Strategic Fleet and Network Analysis of Amazon Air in Europe: A Comparison with the USA"* (link). This scientific research was supervised by the Chaddick Institute for Metropolitan Development at DePaul University.

EDITORIAL TEAM: STEVE RUDOLPH, M.ED., J.D., is manager of Chaddick's Air Transport Policy Initiative and managing editor of DePaul's *Issues in Aviation Law and Policy* journal. He was formerly executive director of the International Aviation Law Institute at DePaul's College of Law.

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Akshara Das

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Emily Hamilton

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ENDNOTES

[1] This Brief is prepared as an extension of the Chaddick Institute's mission to promote public understanding of the evolution of transportation systems. The findings are based entirely on the Chaddick Institute's independent analysis of publicly available data, without proprietary Amazon data or perspective. Any opinions expressed are those of the authors.
[2] The estimates in Figure 3, which are used to compute the growth rate, are based on flights from March 5 – 12, 2023.
[3] Non-hub flights are those that do not operate to or from the five largest hubs noted in this report.
[4] India and Canada's increases made it possible to increase utilization of the airplane fleet, with those fleets remaining at two 737s and four B767s, respectively.
[5] See Morrell, 2019, p. 38, listed in the references above.
[6] See Link, 2019, listed in the references above.
[7] See Mescher, 2023, listed in the references above.
[8] This date is mentioned in Amazon's 2019 Annual Report.
[9] See Wunderlich, 2021, listed in the references above.
[10] Apart from CVG–BWI Marshall and Windsor Locks (Hartford) trips, no flights regularly link the Ohio Valley hubs to the Northeast. None of Amazon Air's nine busiest airports are in the Northeast region. The busiest, BWI Marshall, has just 9.6 daily flights—about half the number from 2021. We expect flight activity to remain dispersed across numerous airports.

V1,3