3. Activity Levels and Forecasting

Air passenger activity and aircraft operations at Logan Airport are reported in **Environmental Status and Planning Reports (ESPRs)** and **Environmental Data Reports (EDRs)**, and provide input into operational and environmental analyses. Over the past several decades, even with increases in passengers and flights, most environmental measures have improved compared to historical conditions. This is primarily the result of cleaner and quieter aircraft, cars, trucks, and equipment; more efficient buildings and Airport operations; and continued efforts by Massport, the Federal Aviation Administration (FAA), and business partners to reduce the overall impact of Airport operations.

This chapter reviews current and recent trends in passenger levels; **aircraft operations**, or takeoffs and landings; and ground access modes, and then compares them to historical benchmarks. As discussed in this chapter, 2022 passenger levels and flight activity in the form of aircraft operations continued to recover from the historic lows experienced in 2020 due to the COVID-19 pandemic, though activity in 2022 did not surpass activity levels experienced in 2019.

This ESPR also presents an updated forecast for Logan Airport activities for the next 10- to 15-year **Future Planning Horizon**. In 2019, Logan Airport reached an all-time high of 42.5 million annual passengers (MAP) and the *2017 ESPR* looked at possible growth to 50 MAP. The *2022 ESPR* is based on a Future Planning Horizon of 53.5 MAP in the next 10 to 15 years as the basis for consideration of potential future operating and environmental conditions.

In reviewing past trends of Logan Airport activity, it is clear that the primary factors influencing activity are the regional and national economy, and international shocks to the aviation system such as the events of September 11, 2001, and the more recent COVID-19 pandemic. The updated forecast considers current and emerging trends in passenger travel and aviation technology, and given the data available, presents Massport's best estimate of how Logan Airport could evolve over the next 10 to 15 years.

Massport's unique ESPR process facilitates the regular reconsideration and updating of growth and activity trends as well as the ability to preview potential future environmental conditions. Specific projections of potential future conditions regarding air quality, noise, and ground transportation are presented in those individual chapters. Efforts to reduce those impacts are also discussed in the subject chapters as well as Chapter 10, *Project Mitigation*.

2022 Activity Levels Key Findings

The following details key findings of activity levels at the Airport in 2022:

- From 2014 to 2019, passenger levels grew by an average of 5.4 percent annually, and in 2022, Logan Airport was the 16th busiest U.S. airport by passenger count.
- Although Logan Airport reached an all-time high in passenger counts in 2019 at 42.5 million passengers, the impacts of the pandemic on the entire aviation transport system significantly reduced the Airport's passenger and flight operation activity levels.
- Logan Airport served 36.1 million passengers in 2022, which was roughly equivalent to its 2016 passenger count, but overall, Logan Airport's 2022 passenger activity levels were still about 15 percent below 2019 levels.
- In 2022, Logan Airport handled 378,613 aircraft operations, which is 11.4 percent less than the 427,176 aircraft operations seen in 2019, but 31.0 percent more than 2021 operations.
- On average, there were 132 passengers per aircraft operation in 2022, which more closely resembled the 2019 average of 130 passengers per aircraft operation.

Future Forecast Activity Levels Key Findings

In 2022, Logan Airport was the **16th busiest airport in the U.S.** by passenger count.

The methodology used for the activity forecasts considered the near-term rebound from the COVID-19 downturn and the return to longer-term growth trends in the airline industry. The process involved reviewing historical data, and analyzing recent developments and the future outlook of demand drivers like local and national economies. As discussed in Section 3.5.1, changes in Logan Airport activity are closely tied to local, regional, and national economic trends. The forecast methodology was developed in accordance with industry best practices, and the forecast analysis considered key trends in the regional economy, the national airline industry, COVID-19 recovery, and competition within the airline industry, among others. Outcomes from the activity forecast are used to inform model inputs for predicted future conditions over the Future Planning Horizon for on-airport vehicle use and traffic conditions, noise, and air emissions. **Table 3-1** provides a historical summary of aircraft operation and passenger activity levels in 2022 as well as the future forecast for operations and passengers over the Future Planning Horizon.

Table 3-1 Air Passengers and Aircraft Operations, 1990, 2019, 2021, 2022, and Future Planning Activity Levels (PAL)

Historical Activity Levels				
Year	Air Passengers	Percentage Change from 2019	Aircraft Operations	Percentage Change from 2019
1990	22,878,191	-	424,568	-
2019	42,522,411	-	427,175	-
2021	22,678,499	-46.7%	266,034	-37.7%
2022	36,090,716	-15.1%	378,613	-11.4%
Forecasts				
Year	Air Passengers	Percentage Change from 2017	Aircraft Operations	Percentage Change from 2017
Future PAL Forecast (2017)[1,3]	50,000,000	-	486,000	-
Future PAL Forecast (2022)[2,3]	53,500,000	7.0%	495,000	1.85%

1 Forecast prepared for *2017 ESPR*
2 Forecast prepared for *2022 ESPR*
3 Planning Activity Level (PAL): See Key Terminology Table

The following highlights some of the key findings for the Future Planning Horizon:

- Future passenger activity is anticipated to reach 53.5 million annual passengers in the next 10 to 15 years, as shown in **Table 3-1**. If realized, this would represent an increase of almost 26 percent compared to 2019.
- Future aircraft operations are anticipated to reach 495,000 annual operations in the next 10 to 15 years, as shown in **Table 3-1**. This is almost 16 percent greater than 2019, but below the 1998 historic peak[1] for operations. Projected aircraft operations are 2.0 percent greater for the *2022 ESPR* than what was estimated in the *2017 ESPR*.
- Annual future passengers in this *2022 ESPR* forecast are 7.0 percent greater than previous passenger forecast included in the *2017 ESPR*. These comparisons are shown in **Table 3-1.**

1 Historical data for passenger and air operations activity levels are provided in Appendix F, *Activity Levels Supporting Documentation*.

3.1 Passenger, Aircraft Operations, and Cargo Activity Levels in 2022

In 2022, Logan Airport and the aviation industry continued to recover from the impacts of the global COVID-19 pandemic. Before the pandemic, Greater Boston experienced strong passenger growth driven by favorable economic conditions, low unemployment, a diverse job market, and on-going investments in commercial and residential real estate, particularly in the fields of life sciences, finance, healthcare, and higher education.

At the beginning of the pandemic, airlines suspended many services to prioritize their networks and operations given imposed travel restrictions and the subsequent suppressed demand for air travel. Prior to the onset of COVID-19, air passengers and airlines had scheduled air travel they anticipated would occur at some point during the two years affected by the COVID-19 pandemic. Once the pandemic commenced, these travel plans may not have been permanently cancelled, but rather were postponed or deferred until the pandemic abated and travel restrictions were lifted. In 2021 when conditions began to permit a return to air travel, an unprecedented surge in travel demand was observed as a result of passengers trying to resume their deferred travel almost immediately. This emergent demand for air travel both benefited and strained the U.S. airline industry as airlines continued to manage route economics, **seat capacity**, and operations during this recovery period. The situation was further exacerbated as this emergent demand was in addition to the travel demand normally expected in a given year. On-going issues related to supply chains, labor shortages, new aircraft delivery delays, and fuel costs posed challenges for airlines at Logan Airport and across the national system.

Logan Airport is the principal airport for the Boston Metropolitan Area, and is an international and long-haul travel gateway for much of New England.

In 2022, the pandemic's decline and its overall impact on the aviation industry was marked by widespread vaccination and diminishing case numbers. As a result, international borders and foreign tourist markets gradually reopened. This shift triggered the return of Logan Airport's international traffic, which played a pivotal role in the Airport's recovery towards 2019 levels; in addition to domestic travel as it also rebounded. Passenger activity in 2022 mirrored levels observed in 2016, and Logan Airport is expected to return to 2019 activity levels by about 2025 as airlines continue to resume suspended services, expand destination offerings from Logan Airport, and find new opportunities to serve the market demand in the Greater Boston regional area. This section provides an update on the significant changes and the developing trends across the airline industry and at Logan Airport in 2022, and provides context for air transport performance levels relative to the pre-pandemic era in 2019.

3.1.1 Air Passenger Levels in 2022

Logan Airport was ranked the 16th busiest airport in the U.S. by passenger count in 2022[2] and served 36.0 million passengers, which was 13.4 million more passengers than in 2021. Air travel demand is strong and the U.S. aviation industry is approaching a new normal, given lifted COVID-19 restrictions and widespread vaccine availability. Logan Airport, however, has been recovering more slowly than the national average, with 2022 passenger counts still 15 percent less than in 2019.[3]

3.1.1.1 Logan Airport Passenger Markets 2022

In 2022, Logan Airport ranked 6th in the U.S. for transatlantic passengers, and approximately 4.1 million passengers flew to Europe, Africa, and the Middle East. As COVID-19 cases declined globally and vaccines became widely available in 2022, **international air travel** gradually resumed. This international travel rebound was primarily attributed to governments gradually lifting travel restrictions and quarantine requirements for foreign visitors to the U.S. As a result, 2022 transatlantic traffic at Logan Airport served nearly 4 million more international passengers than in 2021. Despite the rebound, transatlantic travel from Logan Airport to international destinations was still 17.6 percent less than in 2019. Comparatively, however, 2022 transatlantic passenger traffic nationwide was 19.2 percent less than in 2019, demonstrating Logan Airport's international travel demand is returning more rapidly than for airports nationally. These positive trends reflect the resilience and growth opportunities within Logan Airport's regional market.

Historically, factors contributing to increases in demand for air travel within Massachusetts and Greater Boston include:

Economic growth and increased travel demand nationwide, particularly in leisure-oriented markets and business-related travel;

Growth by airlines in response to local and national economic conditions, including jetBlue Airways, Delta Air Lines, and American Airlines at Logan Airport, along with emerging airline partnerships, which can expand service offerings and destinations;

Introduction of new international destinations served by U.S. domestic and foreign carriers, which expands their respective route networks and increases travel appeal to a wider variety of potential customers; and

Advancements in aircraft technology, including the introduction of longer-range aircraft equipped with fuel-efficient engines and new noise level reduction technologies.

2 U.S. DOT T-100 database, latest international data available through December 2022.

3 U.S. DOT T-100 database.

However, additional challenges and potential economic obstacles may impede activity level growth at the Airport, including:

Economic slowdowns or uncertainty in economic development activity at the state, regional, national, or international level;

Airline labor supply constraints, especially for pilots, flight crew, and maintenance services, along with supply chain disruptions that could delay delivery of aircraft, goods, or materials;

Air traffic control labor shortages or other staffing issues that could impact daily operations and efficiency;

Fluctuating fuel prices, limited fuel availability, or changes in fuel service providers or suppliers that could affect operations or consumer airfare costs;

Future business and corporate travel policy trends along with the evolving nature of business travel; and

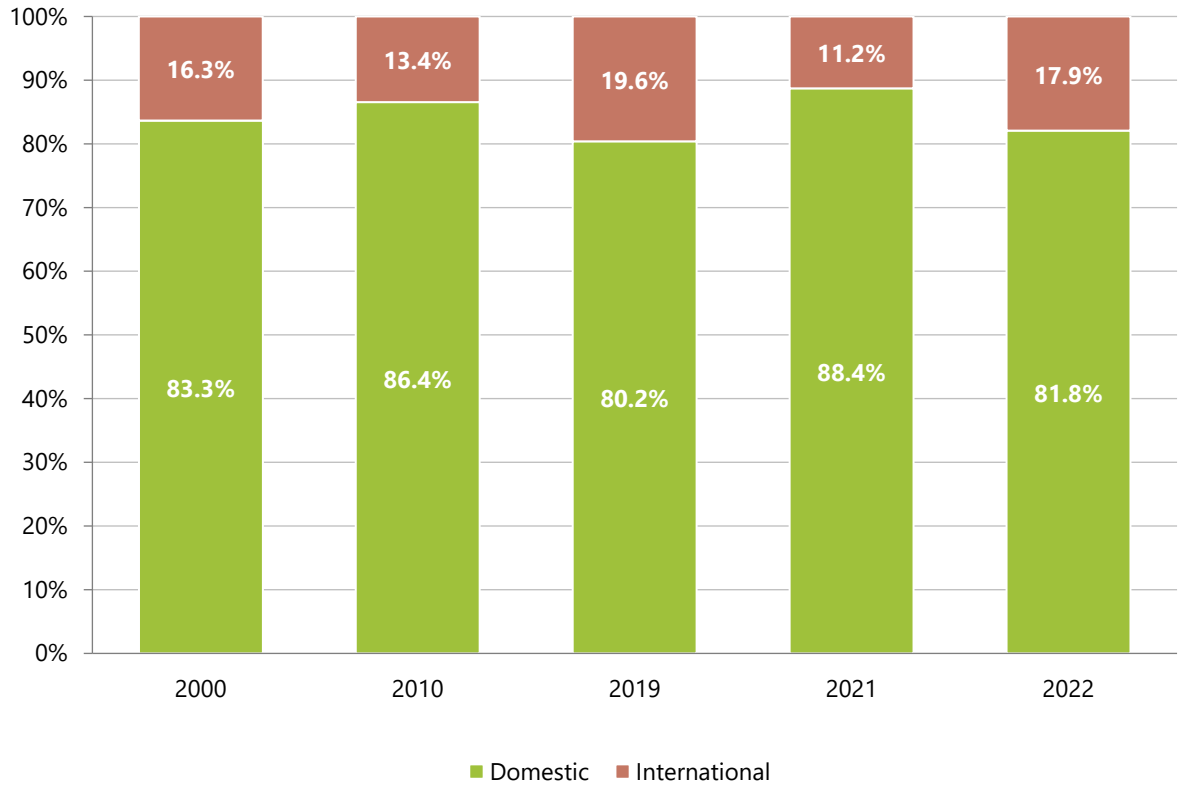
Regulatory challenges that impact airport and airline operations, growth, or airline consolidation or solvency.

At the beginning of the COVID-19 pandemic, air travel demand was suppressed by border closures; rigorous testing, quarantine, and vaccine documentation requirements; and reduced flight options. Strong domestic activity was driven by a resilient demand for leisure travel; particularly to destinations with outdoor recreational activities and desirable weather. **Domestic air travel**, in general, recovered faster than international air travel, which saw a slower rebound as foreign countries gradually eased entry requirements and restrictions on border crossings for travelers. In 2022, as borders reopened allowing for easier access to international markets, international air travel improved more quickly than in 2021. This was primarily due to widespread public vaccination, the aviation industry adoption of additional hygiene protocols, and passengers' demand to resume previously deferred trips.

As shown in **Table 3-2** and illustrated in **Figure 3-1**, the share of domestic air passengers in relation to total passengers in 2022 was higher than the share of total domestic passengers in 2019. Domestic passenger numbers increased by almost 9.5 million passengers between 2021 and 2022. However, domestic passenger levels at the end of 2022 remained almost 4.6 million passengers fewer than 2019 levels.

International passenger numbers increased substantially between 2021 and 2022 by an additional 3.9 million passengers, although this was still almost 1.8 million fewer passengers than 2019. At the end of 2022, as illustrated in **Figure 3-1**, the mix of international passenger and domestic passenger numbers was similar to the mix reported prior to the pandemic.

Figure 3-1 Domestic and International Commercial Passenger Market Share Distribution



Source: Massport
Note: May not add up to 100 percent due to rounding.

Table 3-2 Air Passengers by Market Segment for 1990, 2000, 2010, 2019, 2021 and 2022

	1990	2000	2010	2019	2021	2022	Annual % Change (2021-2022)	2022 as % Above / Below 2019 Levels
Domestic	19,519,247	23,100,645	23,688,471	34,098,788	20,040,839	29,527,910	47.3%	-13.4%
International	3,358,944	4,513,192	3,681,739	8,317,993	2,549,976	6,450,000	152.9%	-22.5%
Europe / Middle East / Africa [1]	N/A	2,948,452	2,672,635	5,003,881	1,168,625	4,124,245	252.9%	-17.6%
Bermuda / Caribbean [2]	N/A	693,620	518,088	1,278,045	1,054,440	1,322,723	25.4%	+3.5%
Canada	N/A	833,669	486,911	985,051	142,088	602,835	324.3%	-38.8%
Asia / Pacific [3]	N/A	374,513	-	602,004	43,938	149,452	240.1%	-75.2%
Central / South America	N/A	-	4,105	449,012	140,885	250,745	78.0%	-44.2%
General Aviation	N/A	112,996	58,752	105,630	87,684	112,806	28.7%	+6.8%
Total Passengers	**22,878,191**	**27,726,833**	**27,428,962**	**42,522,411**	**22,678,499**	**36,090,716**	**59.1%**	**-15.1%**

Source: Massport.

Notes: Reported international passengers include only international passengers using Logan Airport as an international gateway; a significant number of international origin and destination (O&D) passengers also board domestic flights from Logan Airport to connect to other U.S. gateways to international destinations.

Average Annual Growth Rates calculate the Compound Annual Growth Rate (CAGR).

N/A indicates data was not available.

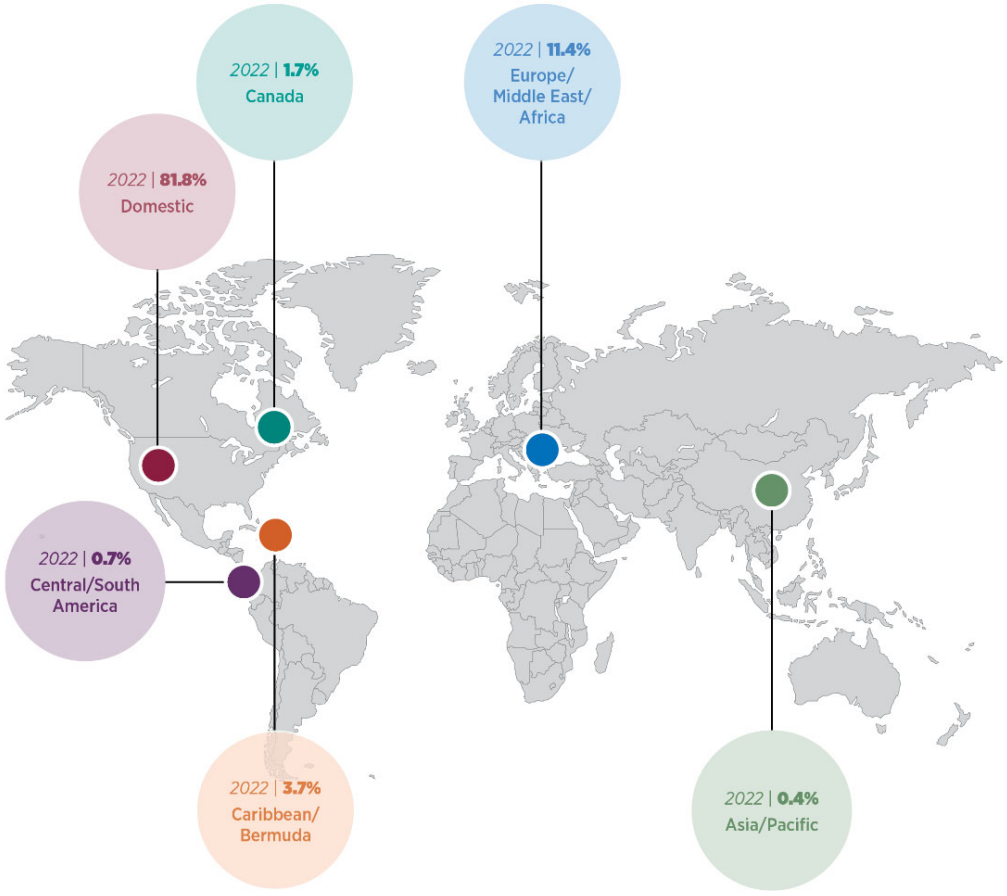
1 Royal Air Maroc (RAM), a Moroccan air carrier, commenced service to Casablanca, Morocco (North Africa) in June 2019. However, the carrier was not scheduled to return to service in 2022, although as of December 2021, online petitions had been circulating to "bring back" direct flights between Boston and Casablanca (Morocco World News, published December 6, 2021).

2 Includes Puerto Rico and U.S. Virgin Islands.

3 Between 1996 and 2001, Korean Air served Logan Airport with one-stop service via John F. Kennedy International Airport (JFK) in New York, NY or Washington Dulles International Airport (IAD) in Washington, DC. This service was discontinued in February 2001; however, starting in May 2019, Korean Air re-commenced service out of Boston with a direct connection to Seoul, Korea via Incheon International Airport (ICN), interchanging between their Boeing B787 Dreamliner and Boeing B777 aircraft.

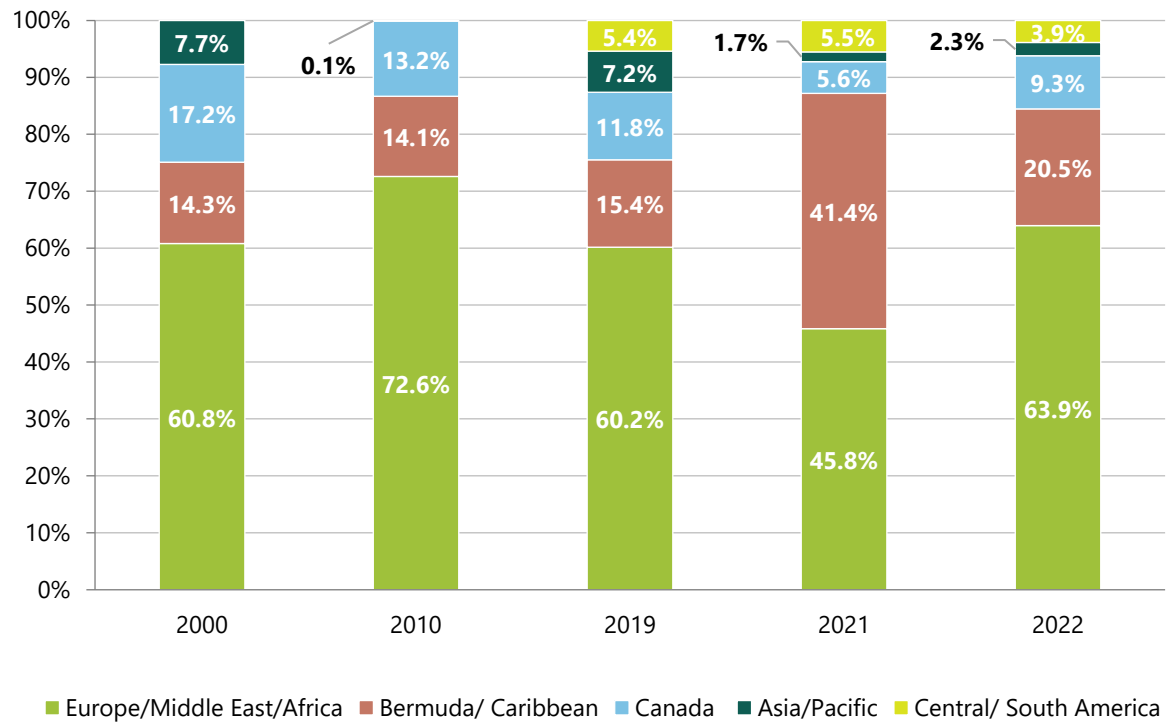
Figure 3-2 depicts the 2022 Logan Airport passenger distribution by market segment, and **Figure 3-3** illustrates the passenger destination distribution from 2000 to 2022. Between 2021 and 2022, the domestic passenger segment remained the largest share of total passengers, although the relative percentage declined 6.6 percent as international air travel volumes began to recover. The U.S. reopened its borders to fully vaccinated foreign visitors in November 2021, and by mid-June 2022, negative COVID-19 test results were no longer required for air arrivals to the U.S. In 2022, the transatlantic international segment, which includes flights to Europe, the Middle East, and Africa, remained the dominant market segment in terms of volume; accounting for 63.9 percent of total international air travel and 11.4 percent of total passenger traffic. The Bermuda and Caribbean market segment recorded the fastest return to previous passenger traffic levels among market segments between 2021 and 2022, as shown in **Table 3-1**. Bermuda and Caribbean market increased its share among total international air travel to 20.5 percent, compared to 15.4 percent in 2019.

Figure 3-2 Distribution of Logan Airport Passengers by Market Segment, 2022



Source: Massport
Note: General Aviation (GA) accounted for 0.3 percent of total Logan Airport passengers in 2022.

Figure 3-3 Logan Airport International Market Segment Passenger Distribution Over Time



3.1.1.2 2022 Passenger Service by Airline

Passenger commercial air service is provided by legacy carriers, such as American Airlines, Delta Airlines, and United Airways; **Low-Cost Carriers (LCCs)**, such as jetBlue Airways and Southwest Airlines; and **Ultra-Low-Cost Carriers (ULCCs)**, like Spirit Airlines. Each offers different levels of service and connectivity. Logan Airport is primarily an **Origin and Destination (O&D)** market, and as such is an important gateway for international air traffic.

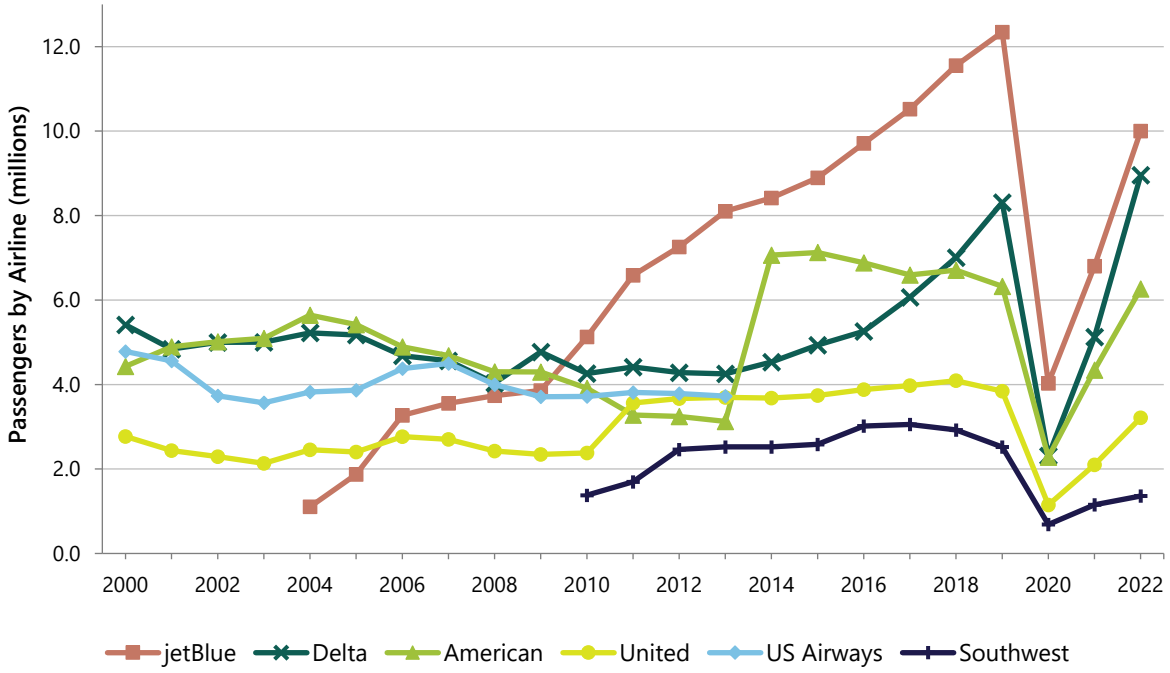
Figure 3-4 shows the annual passengers served by the six major airlines at Logan Airport. Overall, LCCs' passenger activity levels increased significantly at the Airport over the past decade, surpassing traffic volumes among legacy carriers at Logan Airport.[4] Since jetBlue Airways entered the market in 2004, the carrier has expanded and made Logan Airport one of its largest focus markets.

Logan Airport's strong air travel demand and market position, coupled with its emergence from the pandemic, makes it a strategic airport location for international expansion by jetBlue Airways, Delta Air Lines, and American Airlines, along with their partner airlines. New nonstop services introduced by

4 Airline industry consolidation includes the merger of Delta Air Lines and Northwest Airlines in October 2008; United Airlines and Continental Airlines in August 2010; Southwest Airlines and AirTran Airways in April 2011; American Airlines and U.S. Airways in December 2013; and Alaska Airlines and Virgin America in December 2016.

foreign airlines cater to O&D traffic and enable connecting opportunities through airline codeshares and interline agreements.[5,6] The Airport benefits from its O&D passenger market strengths, making Logan Airport an attractive entry point for foreign carriers. Particularly in transatlantic markets, foreign carriers' partnerships and codeshares with U.S. airlines can facilitate seamless connections to international flights. The adoption of newer aircraft technology also allows airlines to expand their fleets and utilize smaller and more fuel-efficient aircraft, like the Airbus A321LR and Boeing 737 MAX. This benefits mid-size O&D markets such as the City of Boston. The economic viability of using longer-range **widebody aircraft**, like the Airbus A350, Boeing 787, and upcoming Boeing 777X, also supports increased connectivity and seat capacity on fewer flights.

Figure 3-4 Annual Passengers Served by Logan Airport's Major Airlines, 2000–2022



Source: Massport
Notes: U.S. Airways totals in this chart include America West Airlines beginning in 2006 (following 2005 merger);
Delta Air Lines totals include Northwest Airlines beginning in 2009 (following 2008 merger);
United Airlines totals include Continental Airlines beginning in 2011 (following 2010 merger); and
Southwest Airlines totals include AirTran Airways beginning 2012 (following 2011 merger).

5 An airline interline agreement is a commercial agreement between two or more airlines that allows passengers to travel on multiple flights operated by different airlines using a single ticket and checked-through baggage. It enables airlines to provide seamless travel experiences to passengers by facilitating the transfer of passengers and their baggage between connecting flights.

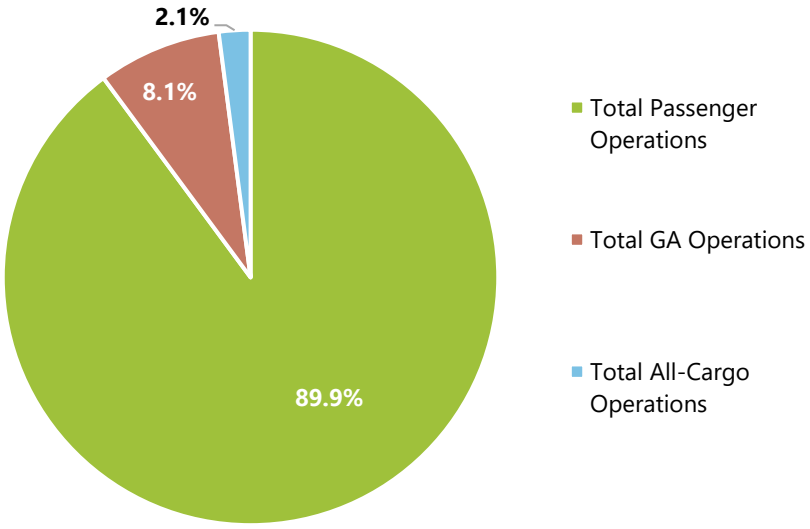
6 An airline codeshare agreement is a commercial agreement where two or more airlines sell seats on the same flight using their own respective flight numbers. This allows airlines to offer more flights to more destinations without as many associated costs, and provides similar benefits to passengers as interline agreements.

3.1.2 Aircraft Operation Levels in 2022

This section reports on aircraft operations levels for Logan Airport, including commercial passenger aircraft, **General Aviation (GA)** aircraft, and cargo aircraft operations as well as aircraft passenger **load factors** in 2022. The load factor is the percentage of actual passengers on a flight relative to the number of seats potentially available on the aircraft of the given flight.

As shown in **Figure 3-5**, passenger aircraft operations in 2022 accounted for 89.9 percent of total aircraft operations at Logan Airport, about 1.7 percent less than its 2019 share of 91.6 percent. GA and cargo operations exceeded 2019 levels by 1.3 and 0.5 percent, respectively. Passenger operations increases are attributed to positive economic activity, federal financial support, improved local and state **gross domestic product (GDP)**, lower unemployment rates, demand for previously deferred leisure or non-essential air travel due to COVID among New Englanders, and the return of business and corporate travel segments.

Figure 3-5 Logan Airport Passenger, GA, and Cargo Aircraft Operations in 2022



Source: Massport
Note: May not add up to 100 percent due to rounding

3.1.2.1 Logan Airport Aircraft Operations

The total number of aircraft operations at Logan Airport declined from its recent historic peak of 427,176 operations in 2019 to 378,613 operations in 2022. However, the number of aircraft operations increased between 2021 and 2022, as shown in **Table 3-3**. The Airport's total aircraft operations were less than 2019 levels, primarily due to fewer passenger flight operations as commercial airlines continued to adjust their scheduled network plans. Airlines focused on identifying nonstop service pairs, in addition to balancing labor supply and seat capacity, while responding to the return of passenger demand and desired market connections in post-pandemic economic and travel demand conditions.

Table 3-3 Logan Airport Aircraft Operations Over Time and Aircraft Operations by Type

	2000	2010	2019	2020	2021	2022	% Change (2021-2022)	2022 as a % Above / Below 2019 Levels
Total Aircraft Operations	**487,996**	**352,643**	**427,176**	**206,702**	**266,034**	**378,613**	**28.7%**	**-11.4%**
Passenger Jet	254,968	214,307	296,514	146,071	185,010	244,971	+50.1%	-17.4%
Passenger Regional Jet	37,600	66,498	49,417	10,484	15,778	60,891	+61.8%	+23.2%
Passenger Non-Jet	147,913	50,882	45,492	28,712	33,431	34,449	+3.0%	-24.3%
Total Passenger Operations	**440,481**	**331,687**	**391,424**	**185,268**	**234,219**	**340,311**	**+45.3%**	**-13.1%**
GA Jet Operations	20,595	11,430	19,328	10,110	18,123	24,078	+32.9%	+24.6%
GA Non-Jet Operations	14,638	3,252	9,594	3,748	5,919	6,426	+8.6%	-33.0%
Total GA Operations	**35,233**	**14,682**	**28,922**	**13,858**	**24,042**	**30,504**	**+26.9%**	**+5.5%**
Cargo Jet	11,788	5,332	6,402	7,208	7,655	7,390	-3.5%	+15.4%
Cargo Non-Jet	494	942	428	368	118	408	+245.8%	-4.7%
Total Cargo Operations	**12,282**	**6,274**	**6,830**	**7,576**	**7,773**	**7,798**	**+0.3%**	**+14.2%**

Source: Massport.

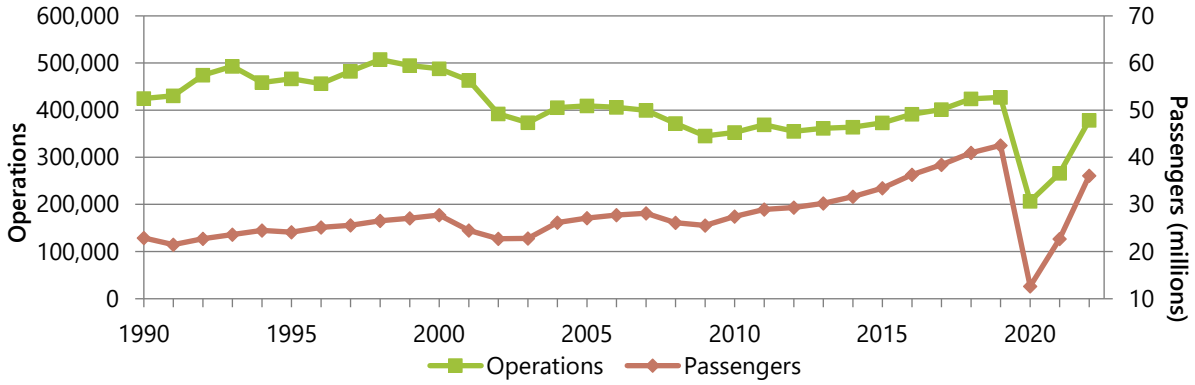
Notes: The Passenger Regional Jet category includes the Embraer E-190 aircraft, which is a regional jet configured with 88 to 100 seats, but is similar in size to some traditional narrowbody jets.
N/A indicates data was not available.

Throughout the year, several airlines increased service frequencies to existing markets from Logan Airport and introduced new point-to-point nonstop services to cater to travel demand trends.

- Total passenger aircraft operations in 2022 increased by 106,092 operations from 2021. Between 2021 and 2022, total passenger operations increased more than total GA operations and cargo operations. Among passenger aircraft operations, **Regional Jet (RJ) aircraft** operations had an additional 23,300 flights, specifically from domestic, short- and medium-haul routes served by regional airline operators affiliated with legacy network carriers, such as Delta Connection and American Eagle. There were more RJ operations in 2022 than in 2019, as carriers optimized their hub airport networks for connecting opportunities and continued to implement strategies to resume pre-pandemic services.
- Dedicated cargo operations, which do not carry commercial passengers in addition to cargo, experienced minimal growth in 2022 compared to the previous year, but still exceeded 2019 levels. The revival of passenger aircraft movements supports related growth in cargo operations because cargo is also often transported as **belly cargo** on passenger aircraft. This factor remains significant for foreign carriers operating widebody jets as international operation volumes recover.
- Although Logan Airport's 2022 GA operations surpassed 2019 levels, they were nearly 2.0 percent short of the 2017 peak. This trend is attributed to the on-going shift of GA operations towards smaller airports across New England, including Laurence G. Hanscom Field and Worcester Regional Airport.

Figure 3-6 depicts past and current passenger levels and aircraft operations. The data shows a historical trend of passenger levels increasing and operations decreasing, though not as rapidly as passenger activity levels are increasing. Between 2000 and 2019, there was a 53.4 percent increase in the annual passenger count at Logan Airport, accompanied by a 12.5 percent decrease in the annual number of aircraft operations. This indicates the growing trend among air carriers towards greater aircraft load factors, or more passengers per flight; greater efficiencies; and more seats per aircraft.

Figure 3-6 Logan Airport Annual Passenger Levels and Aircraft Operations, 1990-2022



Source: Massport

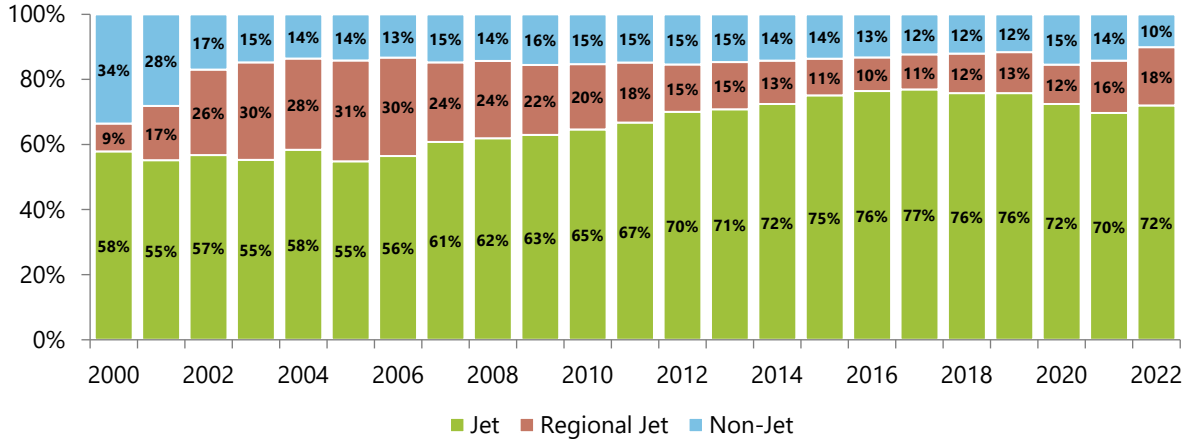
3.1.2.2 Passenger Aircraft Operations

Logan Airport had fewer passenger aircraft operations in 2022 than in 2019. Delta Air Lines, jetBlue Airways, American Airlines, Cape Air, United Airlines, and Southwest Airlines accounted for nearly 79 percent of total aircraft operations in 2022.[7]

While **Table 3-3** shows year-over-year changes in passenger jet, RJ,[8] and **non-jet aircraft** operations, the change in the mix of passenger aircraft operations since 2000 is shown in **Figure 3-7**.

- Since 2012, passenger jet aircraft operations have accounted for 70 percent or more of the total number of passenger aircraft operations at Logan Airport. Although jet aircraft operations were 72 percent of the total passenger aircraft operations in 2022, this was still less than jet aircraft operation levels in 2019.
- RJs accounted for 17.9 percent of total passenger operations in 2022, compared to 31.0 percent at the peak level in 2005, and 12.0 percent in 2019.
- Non-jet operations, including turboprop aircraft like the DHC-8, or Dash-8, aircraft, demonstrated the least recovery among the passenger segment of total aircraft operations, remaining 24.3 percent below 2019 levels.

Figure 3-7 Passenger Aircraft Operations at Logan Airport by Jet, Regional Jet, and Non-Jet, 2000-2022



Source: Massport.

Notes: Jet includes the Embraer E190, which is a regional jet configured with 88 to 100 seats but is similar in size to some traditional narrow-body jets.
Compared to the *2017 ESPR* and *2020/2021 EDR*, E-175 domestic passenger regional jet types were reclassified and therefore result in revised RJ share values for 2017, 2020 and 2021.

7 Aircraft operation numbers for airlines include regional partners and subsidiaries.

8 In this report, the term regional jet (RJ) refers to small jet aircraft with fewer than 90 seats, while large jet aircraft are considered those with 90 seats or more. The Embraer-190, operated by jetBlue Airways at Logan Airport, carries up to 100 passengers and is considered a jet.

Passenger Jet Aircraft Operations

In 2022, large passenger jet operations totaled 244,971 takeoffs and landings, less than 2019 levels. This is equivalent to 72.0 percent of the previously mentioned 340,311 passenger aircraft operations. Notably, Delta Air Lines exceeded its 2019 passenger jet operations by 11.0 percent. However, several major airlines at Logan Airport like Southwest and Spirit Airlines are still more than 30.0 percent below 2019 levels, as measured by 2019 operation counts. Meanwhile, jetBlue Airlines and American Airlines have been affected the average decline, operating between 18.0 to 20.0 percent below 2019 volumes. The differences between rates of recovery among passenger jet aircraft operations are further emphasized by the on-going recovery in the international long-haul segment, operated by non-U.S. based carriers such as Virgin Atlantic, British Airways, Copa Airlines, and Cathay Pacific, among others.

Passenger Regional Jets

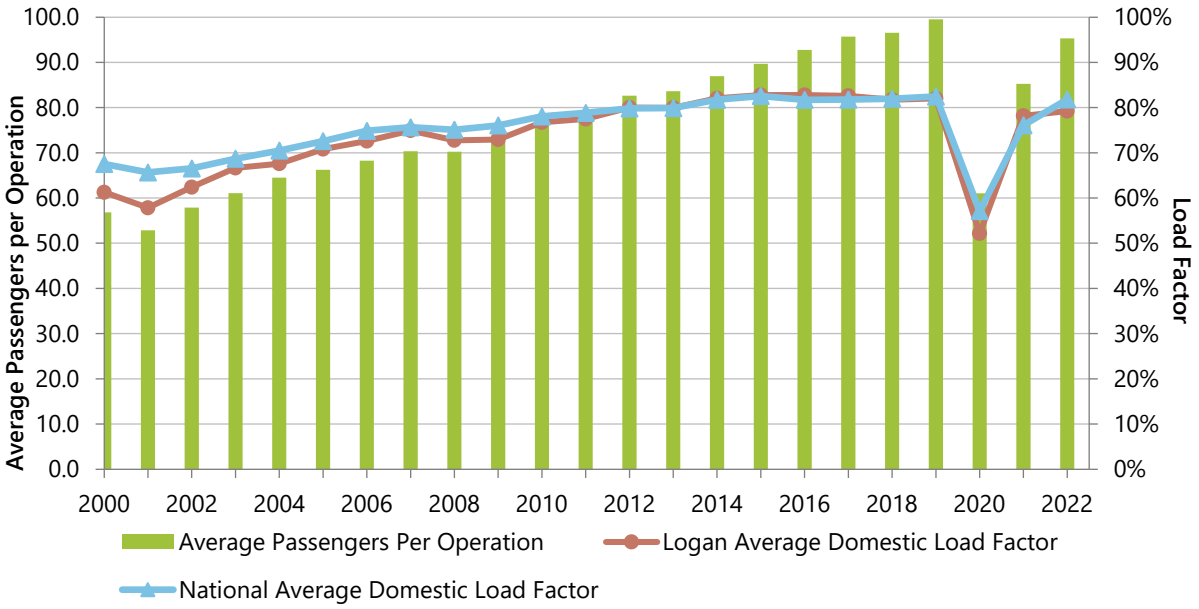
The number of RJ operations increased the most in 2022 with 45,113 more flights than in 2021, and 2022 RJ operations exceeded 2019 operations by 23.2 percent, or 11,474 flights. From 2006 to 2016, RJ operations steadily declined as airlines discontinued unprofitable services to smaller markets and consolidated operations following airline mergers. However, by 2019, passenger RJ operations surged once again by 35.0 percent over 2016 levels, which is attributed to lower fuel costs. This led mainline or legacy carriers' regional partners to increase RJ utilization. During the COVID-19 pandemic in 2020, RJ activity at Logan Airport declined at the same rate as jet operations. This was due to airlines suspending or reducing route frequencies to nonviable markets while simultaneously introducing new services to cities that experienced heightened demand. This strategy optimized smaller RJ aircraft redeployment to maximize onboard passenger load factors.

3.1.2.3 Passengers per Aircraft and Load Factors

After reaching a peak in 2019 with an average of 99.5 passengers per aircraft operation, in 2022, the average number of passengers per flight at Logan Airport was returning to pre-pandemic levels at 95.3 passengers per flight. International services, primarily operated by larger widebody aircraft with over 200 seats, resumed in 2022 as both U.S. and foreign carriers reinstated previously suspended nonstop flights and introduced new market connections. Legacy carriers have also utilized smaller RJ aircraft for short-haul domestic segments, connecting passengers from Logan Airport to their respective U.S. hub markets. Newer and larger aircraft, like the Airbus A350, Boeing 787, Boeing 777, and Airbus A380 superjumbo jets, were instrumental in boosting the average number of passengers per operation before the pandemic, particularly on high-demand transatlantic routes such as Boston to London. This trend is expected to continue in the post-pandemic era. **Figure 3-8** illustrates the changes in the number of passengers per operation and load factors at Logan Airport.

More people are flying year-over-year, while the number of flights are fewer year-over-year, indicating increased efficiency per flight operation, including greater **load factors**.

Figure 3-8 Passengers per Aircraft Operation and Aircraft Load Factors, 2000-2022



Source: Massport; U.S. Department of Transportation (U.S.DOT), T-100 Database via Airline Data, Inc., accessed June 2023.
Notes: Includes scheduled passenger service only.

The rise in the average number of passengers per aircraft operation at Logan Airport reflects an increase in aircraft seating capacity,[9] a larger load factor as a percentage of seats occupied by passengers, or a combination of both.

Table 3-4 presents the average number of passengers accommodated per flight over a time interval spanning from 2000 to 2022 as well as the percent change year-over-year. Despite increased demand and peak travel seasons, airlines in 2022 carried more passengers on fewer flights, focusing on load factor performance. This involved using smaller aircraft temporarily, minimizing empty seats, and utilizing older and higher operating cost aircraft on shorter routes. As international and transcontinental flights resumed, larger aircraft within the fleet that were impractical to fly during the height of the pandemic were returned to service. Airline network and fleet planning teams closely monitored increases in seat capacity utilization rates as more fuel-efficient aircraft were brought back into service. Logan Airport saw an improvement in its average domestic load factor to 79.2 percent in 2022, a 1.0 percent increase compared to the previous year. However, it remained 2.8 percent below the 2019 load factor. The national average domestic load factor in 2022 remained constant at 81.8 percent.[10]

9 The number of onboard passengers as a percentage of total available seats operated on a flight segment at the Airport.
10 U.S. DOT T-100 Database; includes scheduled passenger service only.

Table 3-4 Past and Current Air Passengers and Aircraft Operations and Load Factors

Year	Air Passengers	Percent Change from Previous Year	Aircraft Operations (Flights)	Percent Change from Previous Year	Average Number of Passengers per Operation	Net Change from Previous Year	Average Domestic Load Factor	Net Change from Previous Year
2000	27,726,833	+2.5%	487,996	-1.4%	56.8	+2.1	61.3%	+0.4%
2010	27,428,962	+7.5%	352,643	+2.1%	77.8	+3.9	76.8%	+3.8%
2015	33,449,580	+5.7%	372,930	+2.5%	89.7	+2.7	82.8%	+0.7%
2016	36,288,042	+8.5%	391,222	+4.9%	92.8	+3.1	82.8%	0.0%
2017	38,412,419	+5.9%	401,371	+2.6%	95.7	+2.9	82.6%	-0.2%
2018	40,941,925	+6.6%	424,024	+5.6%	96.6	+0.9	81.8%	-0.8%
2019	42,522,411	+3.9%	427,176	+0.7%	99.5	+3.0	82.0%	+0.3%
2020	12,618,128	-70.3%	206,702	-51.6%	61.0	-38.5	52.2%	-29.8%
2021	22,678,499	+79.7%	266,034	+28.7%	85.2	+24.2	78.3%	+26.1%
2022	36,090,716	+59.1%	378,613	+42.3%	95.3	+10.1	79.2%	-1.0%

Source: Massport; U.S. DOT, T-100 Database.

Notes: Includes scheduled passenger service only.
Refer to Appendix F, *Activity Levels Supporting Documentation*, Section F.1, for additional passenger and operations data dating back to 1980.

In 2022, airlines continued to adjust their schedules and operations post-pandemic to meet profitability goals, improve labor productivity, and mitigate rising fuel costs[11] and labor shortages. These efforts were necessary to reduce the adverse impacts to airline businesses from the COVID-19 pandemic and to avoid unnecessary operational disruptions. This came at a time when emergent demand for COVID-19 deferred travel added additional stress to key airline hub systems; particularly during traditional peak travel seasons, like holidays and over the summer months.

3.1.3 General Aviation Operations

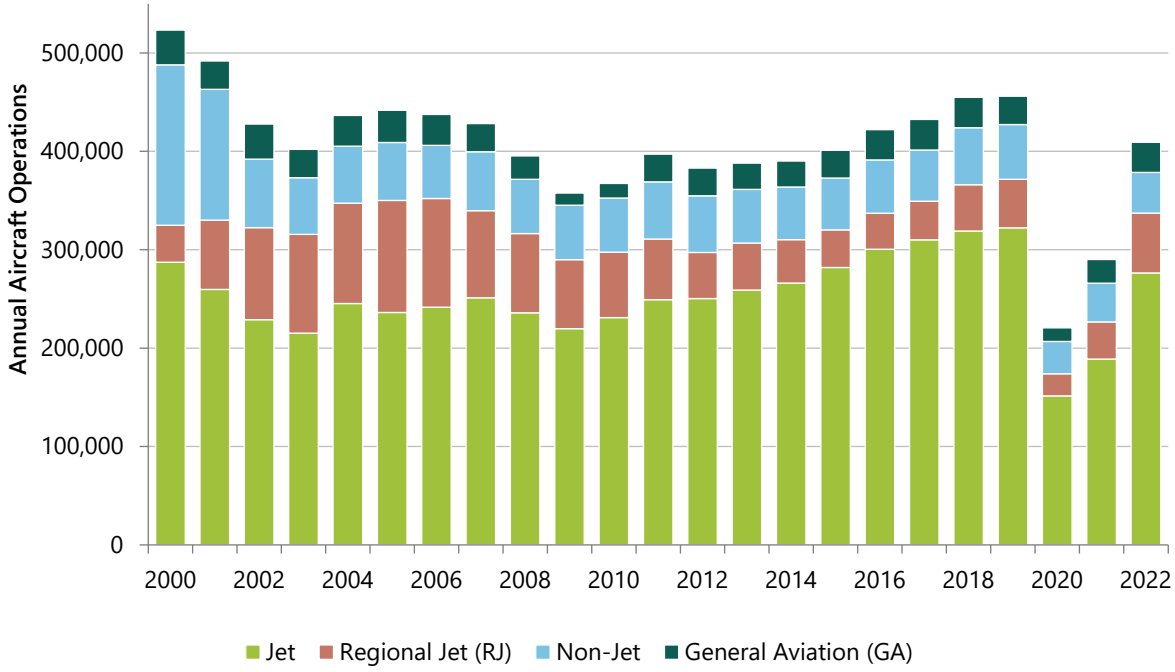
General aviation, or GA, is generally considered to encompass civilian, non-scheduled, and non-commercial aviation activities. GA usually refers to activities and aircraft like sport aviation and acrobatics; personal aviation with privately owned jets or piston aircraft; agricultural services like crop-dusting planes; or gliders and sailplanes, to name a few. Activities like scheduled commercial passenger or cargo airline services and military operations are excluded from the GA category. GA encompasses a variety of aviation activities at Logan Airport, including private corporate or business aviation, private business jet charters, law enforcement flights, and emergency medical flights or air

11 Fuel costs (Kerosene type jet fuel spot prices) increased 82 percent between 2021 and 2022, from $1.858 per gallon to $3.374 per gallon. Per the U.S. Energy Information Administration (EIA) (https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EER_EPJK_PF4_RGC_DPG&f=A/)

ambulance services. Operations are conducted by a diverse group of private individuals and businesses, and aircraft range from single-engine piston-driven aircraft to high-performance, long-range jets.

GA operations in 2022 accounted for 30,504 operations out of the total aircraft operations at Logan Airport, but remained less than the Airport's recent decade record high of 31,120 flights in 2017. GA operations in 2022 exceeded 2019 operations by 5.5 percent. **Table 3-3** in Section 3.1.2.1 shows year-over-year changes in GA operations.[12] **Figure 3-9** depicts changes in the number of Logan Airport aircraft operations and relative distributions among total operations by category since 2000.

Figure 3-9 Aircraft Operations at Logan Airport by Aircraft Class, 2000-2022



Source: Massport
Notes: Jet, regional jet, and non-jet operations are associated with commercial passenger and cargo only airlines.
GA operations also include jet and non-jet aircraft but are associated with private charter and corporate use.

12 Hanscom Field remains the primary GA airport for the Greater Boston region, accommodated over four times the number of GA operations than Logan Airport reported. Hanscom Field accommodated 119,961 GA operations in 2022, which represented 98.2 percent of Hanscom Field's total aircraft activity. See Chapter 5, Regional Transportation, for additional information on Hanscom Field.

3.1.4 Cargo Operations

Cargo carriers at Logan Airport include FedEx, United Postal Service (UPS), DHL, and a few other carriers that operate widebody freight aircraft. After reaching historic highs of greater than 2.5 percent of the total aircraft activity during the pandemic, the share of operations by aircraft dedicated to only transporting cargo declined to 2.1 percent of aircraft activity at Logan Airport in 2022. This signals a return to cargo operation levels experienced prior to the pandemic, which typically ranged between 1.6 and 2.0 percent. The marked increase in cargo operations relative to the total number of operations conducted at Logan Airport was primarily due to the concurrent decline in commercial passenger activity and operations in 2020 and 2021. **Table 3-3** in Section 3.1.2.1 shows the year-over-year changes in cargo operations.

3.2 2022 Service Developments at Logan Airport

Seat capacity is the total number of seats available, or the system's capacity.

Load factor is the number of those seats occupied per flight, or the system's efficiency.

Airlines can adjust service at an airport or on a specific route in two ways: by changing the number of flights operated or changing the size of the aircraft. Changes in flight frequency and changes in aircraft size both affect the number of seats available to passengers, or the seat capacity. Airline services are therefore typically discussed in terms of seat capacity as well as the number of flight departures.[13] Seat capacity differs from load factor as seat capacity is the total number of seats available, or the capacity of the system, while load factor is the number of those seats occupied per flight, or the efficiency of the system.

This section examines changes in airline departures and seat capacity at Logan Airport in 2022. It also presents an overview of routes that are new, suspended, or discontinued, all influenced by the pandemic's impact on passenger demand and airlines' reprioritizations of economically feasible routes. When relevant, forthcoming 2023 airline announcements are noted. For context, schedule analyses in this section are compared with figures from 2019 as well as prior years, where appropriate.

3.2.1 Airline Passenger Service

According to OAG Analyzer[14] schedules, in 2022, 40 airlines offered non-stop, scheduled passenger service from Logan Airport to 139 global destinations. This is compared to 2021, when 36 airlines offered scheduled passenger service to 125 global destinations.[15] The average non-stop stage length[16]

13 A departure is an aircraft take-off at an airport. While aircraft operations include both departures and arrivals, airline services are typically described in terms of departures, as the number of scheduled departures generally equals the number of scheduled arrivals. Changes in departures translate to changes in overall operations.

14 The OAG Analyzer is an online data platform published by OAG Aviation which provides in-depth information related to airline and airport operations, including schedules, passenger traffic, as well as data provided by the U.S. DOT.

15 Based on OAG Analyzer schedules.

16 Stage length refers to the average length of a non-stop flight.

in 2022 for scheduled domestic flights from Logan Airport were relatively unchanged at a distance of 1,095 miles, compared to 1,093 miles in 2019. The average non-stop stage length of scheduled international flights decreased slightly in 2022 compared to 2019, from 3,199 miles to about 3,091 miles. This was due to airlines resuming greater activity to closer international destinations less than 2,500 miles from Logan Airport, such as the Central America and Caribbean regions, as compared to long-haul flight routes to destinations across either the Atlantic or Pacific Oceans. Major changes in Logan Airport's scheduled passenger services in 2022 are described below.

3.2.2 Changes in Domestic Passenger Service

Table 3-5 shows year-over-year changes in domestic air passenger operations. The total number of scheduled domestic flights at Logan Airport in 2022 remained 11.8 percent less than 2019. For comparison, 2021 scheduled flights were 44.2 percent less than 2019. Overall, scheduled jet operations by legacy carriers and LCCs increased considerably in 2022 compared to 2021, while regional and commuter flights increased relatively less.

Table 3-5 Scheduled Domestic Air Passenger Operations by Airline Category, 2000, 2010, 2019-2022

Category	2000	2010	2019	2020	2021	2022	% Change (2021-2022)	2022 as % Above / Below 2019 Levels
Scheduled Jet Carriers	233,993	203,081	257,202	119,153	143,520	211,384	+47.3%	-27.8%
Legacy Carriers[1]	222,564	117,877	121,387	57,211	72,990	108,796	+49.1%	-10.4%
Low-Cost Carriers[2]	11,429	85,204	135,815	61,942	70,530	102,588	+45.5%	-24.5%
Regional / Commuter Jet	160,041	94,535	79,736	47,257	68,029	85,707	+26.0%	+7.5%
Total Scheduled Domestic	**394,034**	**297,616**	**336,938**	**166,410**	**211,549**	**297,091**	**+40.4%**	**-11.8%**

1 Includes legacy carrier large jet operations only, or mainline carrier operations; regional jet and non-jet operations operated by regional affiliates or subsidiaries of legacy carriers are included in the "Regional / Commuter Jet" category.

2 LCCs that provided domestic service at Logan Airport in 2020 and 2021 included jetBlue Airways, Southwest Airlines, Spirit Airlines, Sun Country Airlines, Frontier Airlines, and Allegiant Air. Prior to 2019, Virgin America was aggregated with the low-cost, or LCC, subtotals.

Trends observed after comparing scheduled domestic passenger flight activity in 2022 against 2019 levels are summarized below.

- **Legacy carrier service did not fully return to 2019 levels by the end of 2022.** Although legacy carrier jet operations increased in 2022 compared to the prior year, operations remained below 2019 levels.
- Among the top five legacy carriers, Delta Air Lines has recovered to pre-pandemic conditions, ending 2022 about 12.0 percent above its 2019 performance. This metric excluded Delta Air Line's regional carrier affiliate activity. Delta Air Lines was followed by American Airlines and United Airlines, which recovered approximately 80 percent of their respective 2019 operations.
    - By year-end 2022, Delta Air Lines commenced new operations to Nashville, TN; New Orleans, LA; Denver, CO; San Diego, CA; Kansas City, MO; and Jacksonville, FL. American Airlines did not launch substantial new mainline[17] services in 2022, but continued to operate nonstop flights to Austin, TX. Mainline connectivity to St. Louis, MO ended in late 2022 and was replaced with American Eagle service by Envoy Air and Republic Airways. United did not add mainline activity in 2022.
- **In 2022, LCC and ULCC services recovered to 24.5 percent below 2019 operations levels.** LCC and ULCC operations accounted for 34.5 percent of Logan Airport's total scheduled domestic operations in 2022.[18] Pre-pandemic shares ranged between 40 and 42 percent.
    - The largest carrier in this group, jetBlue Airways, conducted approximately 20 percent fewer operations in 2022 than in 2019. However, jetBlue concurrently introduced new nonstop routes to Milwaukee, WI; Kansas City, MO; and Asheville, NC.
    - By year-end 2022, 10 of jetBlue Airways' 48 metropolitan markets returned to at least 80 percent of their respective 2019 operations levels. These markets had more than once-daily departures in 2019. The greatest number of departures were to New York, NY, Washington DC, Orlando, FL, San Francisco, CA, Tampa, FL, Los Angeles, CA, San Diego, CA, and Nashville, TN.
    - By year-end 2022, Spirit Airlines returned to 40 percent below its 2019 operations levels and Southwest Airlines returned to 47 percent below its 2019 operations levels. Frontier Airlines, however, only returned to 5 percent of its 2019 operations levels. Sun Country continued to exceed its 2019 levels by about 44 percent, although it had the smallest network among the LCCs and ULCCs. It should be noted that Sun Country operated 60 percent fewer flights than its peak activity levels in 2018.
    - In 2022, Allegiant Air added Flint, MI, growing its Logan Airport network to 8 destinations less than 1,300 miles away.

17 Mainline refers to a flight operated by an airline's principal operating unit rather than a regional alliance airline, codeshare, or subsidiary.

18 Southwest Airlines decreased domestic operations by 14.2 percent from 23,191 operations in 2018 to 19,907 operations in 2019.

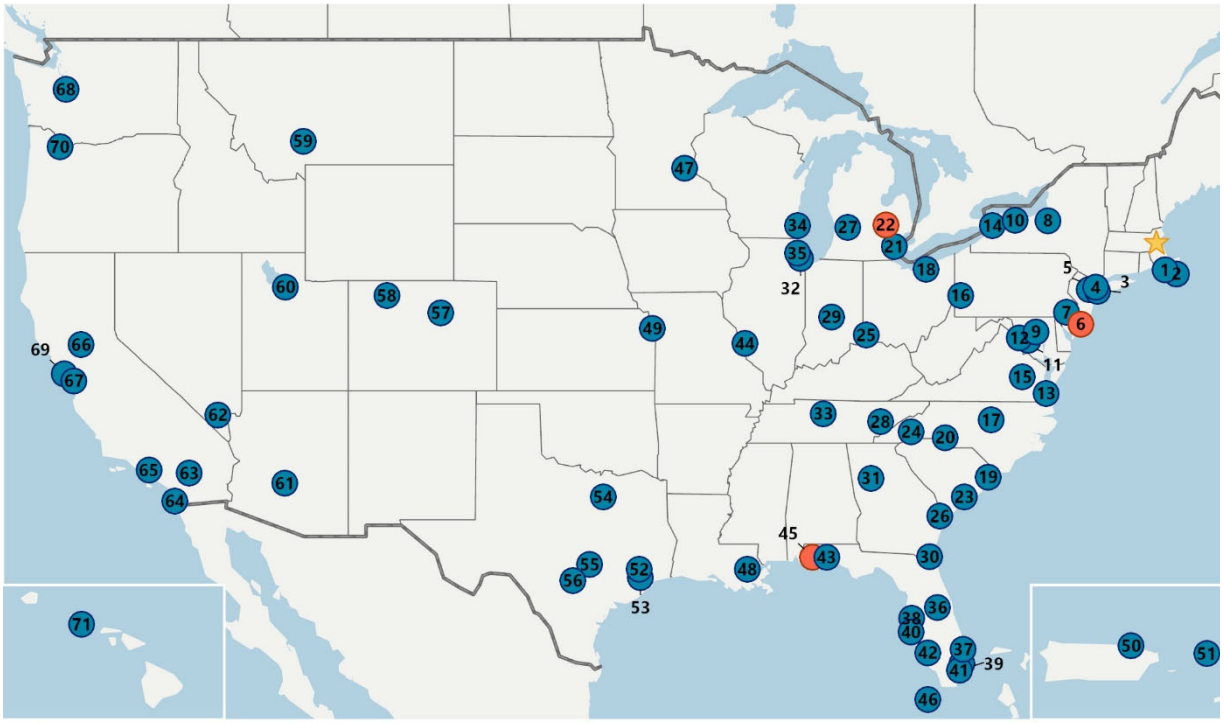
- **Regional and commuter service recovered the fastest in 2022, exceeding 2019 levels by 7.5 percent.** Republic Airlines'[19] 2022 operations recovered a remarkable 205 percent compared to its 2019 levels. This represented 52 percent of the airline's domestic regional and commuter operations.
  - Republic Airlines' aircraft operations count grew from 29,983 in 2021 to over 44,600. This was primarily because GoJet, a Delta Connection-branded carrier, exited Boston after Delta Air Lines terminated its operating agreements with GoJet and another Delta Connection-branded carrier, Compass Airlines. This led to reduced Delta Connection-branded operator flights operating at Logan going into 2020; resulting in Republic Airlines gaining market share in the regional segment.
  - The shift in regional segment market share discussed above coincided with RJ pilot shortages, which led SkyWest to drop regional routes systemwide throughout 2021 and 2022. By 2022, SkyWest operated less than 800 flights from Logan Airport, mainly as Delta Connection and United Express, but in 2019, SkyWest managed 4,800 flights out of Logan Airport.
  - Hyannis Air Service, operating as Cape Air, was the largest regional operator at Logan Airport prior to 2022, but dropped in rank to second. Cape Air accounted for 34 percent of domestic regional and commuter flights in 2022. Cape Air operated 6 percent fewer flights year-over-year but continues to operate services to the same destinations flown pre-pandemic, except for service to Albany, NY. Within Cape Air's network of flights from Logan Airport, four routes experienced reduced route frequencies since 2021. These reduced routes included Portland, OR with 84 percent fewer flights than in 2021; Hyannis, MA with 35 percent fewer flights than in 2021; Adirondack, NY with 28 percent fewer flights than in 2021; and Bar Harbor, ME with 11 percent fewer flights than in 2021. Altogether, six of Cape Air's Logan Airport destinations are eligible for classification as Essential Air Service (EAS) communities[20] in the New England and New York regions.

Logan Airport's scheduled domestic **Large Jet** and domestic regional services are illustrated in **Figure 3-10** and **Figure 3-11**. A complete listing of all changes in scheduled departures by domestic destination is in Appendix F, *Activity Levels Supporting Documentation*, Section F.1.2.

19 Republic Airlines is affiliated with American Airlines, Delta Air Lines and United Airlines.

20 The EAS program was established to guarantee those small communities that were served by certificated air carriers before airline deregulation maintained a minimal level of scheduled air service. The U.S. DOT is mandated to provide eligible EAS communities with access to the National Air Transportation System. This is generally accomplished by subsidizing two daily roundtrips with 30- to 50-seat aircraft, or additional frequencies with aircraft with 9-seat or fewer, usually to a large- or medium-hub airport.

Figure 3-10 Domestic Non-Stop Large Jet Markets Served from Logan Airport, 2022

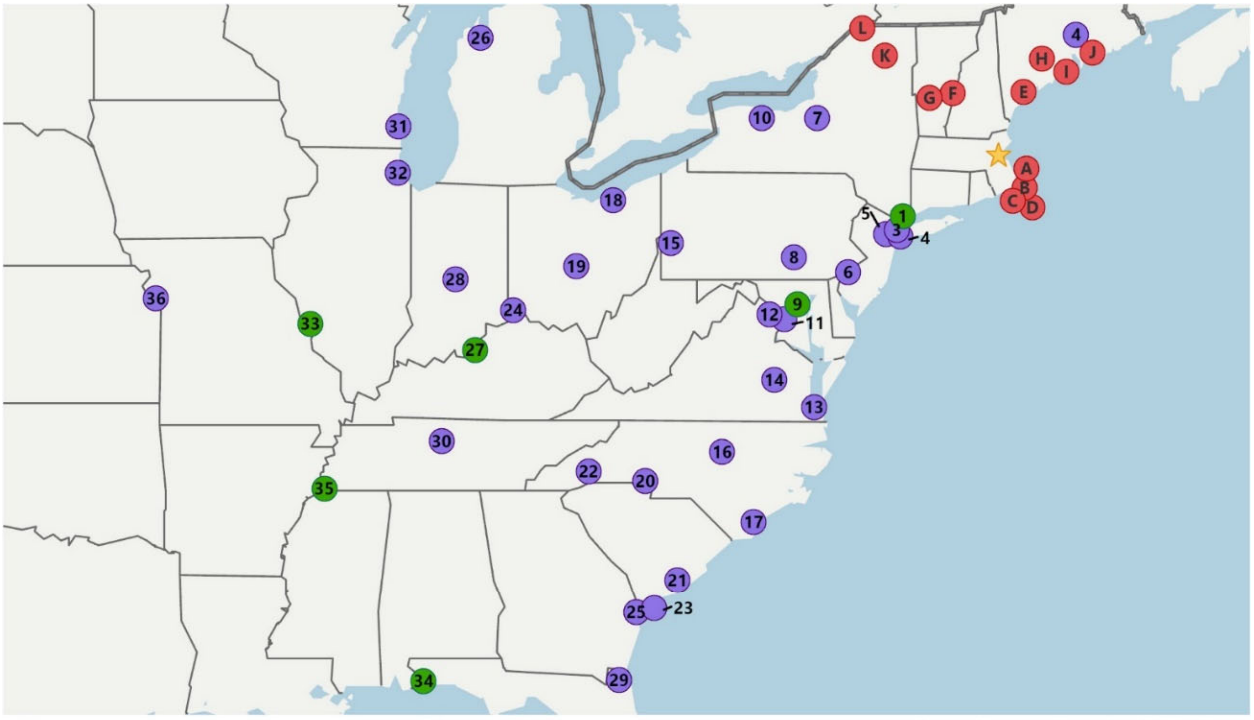


#	Location	#	Location	#	Location	#	Location
1	Martha's Vineyard, MA	19	Myrtle Beach, SC	37	West Palm Beach, FL	55	Austin, TX
2	Nantucket, MA	20	Charlotte-Douglas, NC	38	Tampa, FL	56	San Antonio, TX
3	New York, NY (JFK)	21	Detroit, MI	39	Fort Lauderdale, FL	57	Denver, CO
4	New York, NY (LaGuardia)	22	Flint, MI	40	Sarasota/Bradenton, FL	58	Steamboat Springs/Hayden,
5	New York, NY (Newark)	23	Charleston, SC	41	Miami, FL	59	Bozeman, MT
6	Atlantic City, NJ	24	Asheville/Hendersonville, NC	42	Fort Myers, FL	60	Salt Lake City, UT
7	Philadelphia, PA	25	Cincinnati, OH	43	Destin-Ft Walton Beach, FL	61	Phoenix, AZ
8	Syracuse, NY	26	Savannah, GA	44	St. Louis, MO	62	Las Vegas, NV
9	Baltimore, MD	27	Grand Rapids, MI	45	Pensacola, FL	63	Palm Springs, CA
10	Rochester, NY	28	Knoxville, TN	46	Key West, FL	64	San Diego, CA
11	Washington, D.C. (Reagan)	29	Indianapolis, IN	47	Minneapolis/St. Paul, MN	65	Los Angeles, CA
12	Washington, D.C. (Dulles)	30	Jacksonville, FL	48	New Orleans, LA	66	Sacramento, CA
13	Norfolk, VA	31	Atlanta, GA	49	Kansas City, KS	67	San Jose, CA
14	Buffalo, NY	32	Chicago, IL (Midway)	50	San Juan, PR	68	Seattle, WA
15	Richmond, VA	33	Nashville, TN	51	St. Thomas, USVI	69	San Francisco, CA
16	Pittsburgh, PA	34	Milwaukee, WI	52	Houston, TX (Bush)	70	Portland, OR
17	Raleigh/Durham, NC	35	Chicago, IL (O'Hare)	53	Houston, TX (Hobby)	71	Honolulu/Oahu, HI
18	Cleveland, OH	36	Orlando, FL	54	Dallas/Fort Worth, TX		

Source: OAG Analyzer.

Note: There were three new domestic, non-stop large jet routes in 2022 to Flint, MI, Pensacola, FL, and Atlantic City, NJ; all of which are seasonally served.

Figure 3-11 Domestic Non-Stop Regional Jet and Non-Jet Markets Served from Logan Airport, 2020 and 2022



Regional Jet

#	Location	#	Location	#	Location
1	White Plains, NY	13	Norfolk, VA	25	Savannah, GA
2	New York, NY (JFK)	14	Richmond, VA	26	Traverse City, MI
3	New York, NY (LaGuardia)	15	Pittsburgh, PA	27	Louisville, KY
4	Bangor, ME	16	Raleigh/Durham, NC	28	Indianapolis, IA
5	New York, NY (Newark)	17	Wilmington, NC	29	Jacksonville, FL
6	Philadelphia, PA	18	Cleveland, OH	30	Nashville, TN
7	Syracuse, NY	19	Columbus, OH	31	Milwaukee, WI
8	Harrisburg, PA	20	Charlotte-Douglas, SC	32	Chicago, IL
9	Baltimore, MD	21	Charleston, SC	33	St. Louis, MO
10	Rochester, NY	22	Asheville/Hendersonville, NC	34	Pensacola, FL
11	Washington, DC (Reagan)	23	Hilton Head Island, SC	35	Memphis, TN
12	Washington, DC (Dulles)	24	Cincinnati, OH	36	Kansas City, KS

Non Jet

ID	Location
A	Provincetown, MA
B	Hyannis, MA
C	Martha's Vineyard, MA
D	Nantucket, MA
E	Portland, ME
F	Lebanon/Hanover, NH
G	Rutland, VT
H	Augusta, ME
I	Rockland, ME
J	Bar Harbor, ME
K	Saranac Lake, NY
L	Massena, NY

Source: OAG Analyzer.

Note: There were six new domestic, non-stop regional jet routes in 2022, to Baltimore, MD, Louisville, KY, Memphis, TN, White Plains, NY, and St Louis, MO. There were no new routes added on non-jet aircraft.

3.2.3 2022 Changes in International Passenger Service

Total scheduled international passenger aircraft operations at Logan Airport increased to 43,172 operations in 2022. The number of operations was less than 2019 but represented a 90.6 percent annual increase compared to 2021 levels. Foreign governments eased international travel restrictions throughout 2022 and the U.S. lifted its international travel entry bans in November 2021 for fully vaccinated foreign nationals. By mid-June 2022, the U.S. Centers for Disease Control and Prevention (U.S.CDC) rescinded the order requiring negative COVID-19 tests prior to boarding U.S. flights. By this time, the pandemic had shifted to a new phase due to widespread immunization with highly effective COVID-19 vaccines and effective therapeutics had lowered the risk of both transmitting or contracting the disease. In May 2023, noncitizen, nonimmigrant visitors to the U.S. arriving by air, land, or sea no longer needed to show proof of being fully vaccinated against COVID-19.[21] These decisions and factors contributed favorably towards the U.S. international air travel segment's return to previous demand levels at Logan Airport.

Table 3-6 summarizes U.S. and foreign airlines increased scheduled international operations in 2022. For details on the changes in operations by carrier, see Appendix F, Section F.1.2.

Table 3-6 Scheduled International Passenger Operations by Market Segment, 2000, 2010, 2019-2022

Category	2000	2010	2019	2020	2021	2022	% Change (2021-2022)	2022 as % Above / Below 2019 Levels
Canada	26,067	16,399	17,074	3,808	3,060	10,406	+240.1%	-39.1%
Europe / Middle East / North Africa	13,345	12,750	21,590	7,385	9,180	21,122	+130.1%	-2.2%
Bermuda / Caribbean[1]	3,205	4,116	9,682	5,925	8,274	8,803	+6.4%	-9.1%
Asia	0	0	2,854	823	1,008	1,179	+17.0%	-58.7%
Central / South America	314	0	3,268	860	1,134	1,662	+46.6%	-49.1%
Total Scheduled International Passenger Operations	**42,931**	**33,265**	**54,468**	**18,801**	**22,656**	**43,172**	**+90.6%**	**-20.7%**

1 Includes Puerto Rico and U.S. Virgin Islands.

21 USA.gov "COVID-19 international travel advisories" https://www.usa.gov/covid-international-travel#:~:text=As%20of%20May%2012%2C%202023,a%20negative%20COVID%2D19%20test/.

In 2022, international aircraft operations showed varied rates of change across different segments. Flights to Asia returned at the slowest rate, recovering minimally between 2021 and 2022, and remaining significantly lower than 2019 levels. The sluggish operation count recovery for flights to Asia can be attributed to challenges stemming from border and tourism reopening in several Asian markets, particularly China. Additionally, U.S. carriers managed to leverage connecting opportunities through their Pacific coast hubs, while air service between the U.S. and China faced limitations due to evolving bilateral agreements that affected the combined roundtrips per week allowed between the two nations. Although Japan Airlines and Korean Air recovered their operational levels in 2022, Hong Kong-based Cathay Pacific operated at around 11 percent of its 2019 capacity. Notably, Hainan Airlines' flights from Logan to Shanghai and Beijing remained suspended, despite representing 36 percent of total jet flights to Asia in 2019.

Compared to its 2021 performance, Canadian operations experienced an uptick in activity, mainly due to the nation's decision to reopen its borders with the U.S. starting in August 2021. The Canadian segment rebounded to approximately 60.9 percent of 2019 levels in 2022.

Services connecting Europe and the Middle East, and the Caribbean surpassed 90 percent of pre-pandemic levels by year-end 2022. The Caribbean market's closer proximity as well as the mix of nonstop service offerings by jetBlue Airways, Delta Air Lines, and American Airlines supported a return to pre-pandemic operations levels. Spirit Airlines also played a role, initiating flights to the Caribbean in 2020, and increasing flight frequencies by 25 percent since 2021.

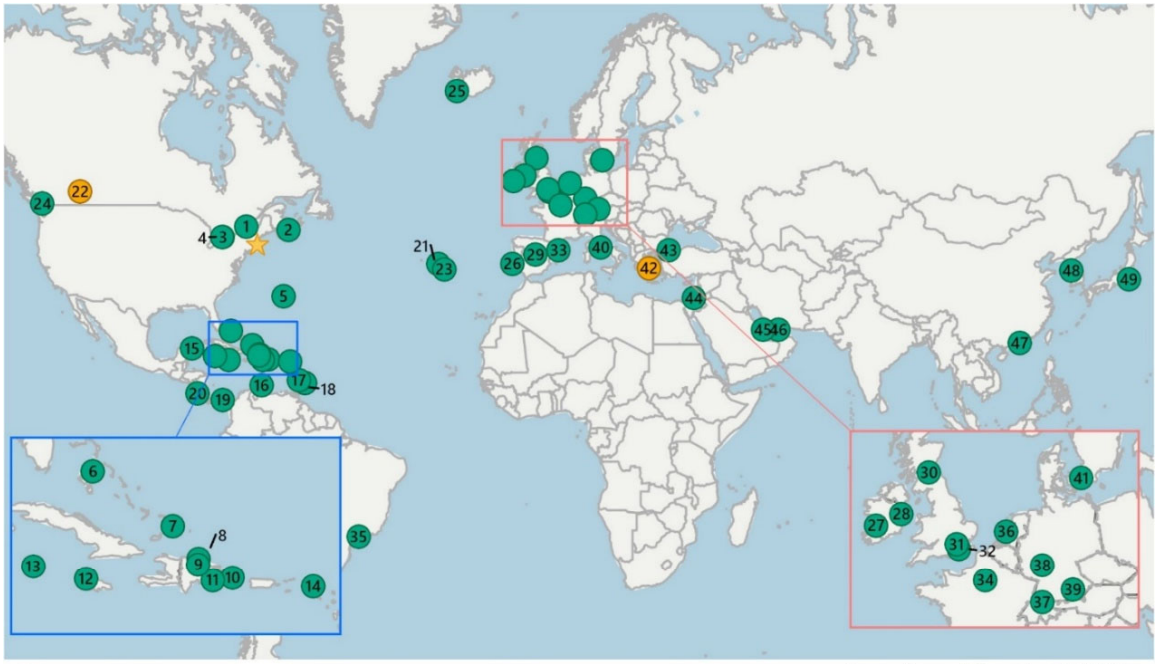
European transatlantic flights experienced improvements as airlines reinstated previously suspended services and capitalized on new opportunities to enhance their networks. In the prominent London market, American, United, and jetBlue launched new flights in 2022, amplifying the competition to a total of six airlines. Notably, Icelandair increased departures to Reykjavik in 2022 by more than 50 percent of its 2019 schedules. This was partially due to the entry of ULCC Fly Play (PLAY Airlines) into the market. Additionally, Delta Air Lines expanded its international presence at Logan Airport with flights to Athens and Rome.

By year-end 2022, traffic to Central and South American destinations remained well below 2019 operations levels. However, according to OAG Analyzer projected schedules, all the destinations served in these two regions prior to the pandemic will be reinstated in 2023.

Overall, the international passenger segment at Logan Airport lags in recovery compared to the domestic segment. This is largely a consequence of government travel restrictions as well as various geopolitical, global economic, and health-related issues. The recovery of international travel was unequally distributed across the regions served by the Airport. **Table 3-6** shows year-over-year changes in scheduled international passenger aircraft operations by market segment compared to 2019 levels, and the annual change since 2021.

Logan Airport served 50 nonstop international destinations in 2022, compared to 58 in 2019, and 28 in 2021.[22] In addition, the Airport has benefited from Delta Air Lines' and jetBlue Airways' commitment to expanding Logan Airport's international network in recent years. Logan Airport's scheduled international air service markets are shown in **Figure 3-12**.

Figure 3-12 International Non-Stop Markets Served from Logan Airport, 2022



#	Location	#	Location	#	Location
1	Montreal, Canada	18	Bridgetown, Barbados	35	Sao Paulo, Brazil
2	Halifax, Canada	19	Panama City, Panama	36	Amsterdam, Netherlands
3	Toronto, Canada (Billy Bishop)	20	Liberia, Costa Rica	37	Zurich, Switzerland
4	Toronto, Canada (Pearson)	21	Terceira, Portugal	38	Frankfurt, Germany
5	Bermuda	22	Calgary, Canada	39	Munich, Germany
6	Nassau, Bahamas	23	Ponta Delgada, Portugal	40	Rome, Italy
7	Providenciales, Turks and Caicos	24	Vancouver, Canada	41	Copenhagen, Denmark
8	Puerto Plata, Dominican Republic	25	Reykjavik, Iceland	42	Athens, Greece
9	Santiago, Chile	26	Lisbon, Portugal	43	Istanbul, Turkey
10	Punta Cana, Dominican Republic	27	Shannon, Ireland	44	Tel Aviv, Israel
11	Santo Domingo, Dominican Republic	28	Dublin, Ireland	45	Doha, Qatar
12	Montego Bay, Jamaica	29	Madrid, Spain	46	Dubai, UAE
13	Grand Cayman, Cayman Islands	30	Edinburgh, Scotland	47	Hong Kong
14	St. Maarten	31	London, U.K. (Heathrow)	48	Seoul, South Korea
15	Cancun, Mexico	32	London, U.K. (Gatwick)	49	Tokyo, Japan
16	Aruba	33	Barcelona, Spain		
17	St. Lucia-Vieux Fort, Saint Lucia	34	Paris, France		

Source: OAG Analyzer.

Note: In 2022, Logan Airport welcomed ULCC, Fly Play and Condor, which offered non-stop services to Reykjavik, Iceland and Frankfurt, Germany, both of which began in May 2022. ITA Airways (rebranded from Alitalia) commenced service to Rome, Italy, while United Airlines launched nonstop service London, United Kingdom in April 2022.

22 OAG Analyzer Schedules.

3.3 Cargo Volume Activity Levels in 2022

In 2022, Logan Airport ranked 25th among U.S. airports in total air cargo volume.[23, 24] Cargo volume increased to nearly 674 million pounds, representing a 3.8 percent year-over-year change. Air cargo is carried either in the compartments of passenger aircraft as belly cargo or by dedicated **cargo airlines**, such as FedEx, UPS, and DHL, in cargo-only aircraft. The express and small package segment remained dominant, accounting for 56.8 percent of non-mail cargo volumes. The freight segment increased the most over 2022, reaching approximately 279 million pounds. This was slightly below 2019 levels.

Table 3-7 shows cargo aircraft operations and cargo volumes at Logan Airport. The number of dedicated cargo aircraft operations at Logan Airport in 2022 exceeded 2019 cargo activity levels, while total cargo volumes remained below 2019 volumes.

Cargo shipments at Logan Airport have experienced a decline over the past two decades following its peak of over 1.0 million pounds in 2000. Cargo carriers, especially integrators[25] offering door-to-door delivery, have increasingly relied on trucks for deliveries over shorter distances. Ground transportation modes can be more cost-effective than air transport options, especially when shipments originate from carriers' superhub distribution centers. Additionally, the globally widespread adoption of the internet and email has significantly reduced mail volumes.

- FedEx was the largest cargo air carrier by cargo volume carried through Logan Airport in 2022, transporting over 277 million pounds.[26] This represented 41.2 percent of Logan Airport's total cargo volume.
- FedEx was the 11th largest air carrier at the Airport based on total flights in 2022. Although it was ranked 10th in 2021, it moved up from its position of 16th in 2019.
- UPS followed as the next largest cargo operator and accounted for 11.1 percent of Logan Airport's cargo volume in 2022.
- **Passenger airlines** carried the greatest share of Logan Airport's cargo as belly cargo in 2022. That year, commercial passenger airlines' share of cargo was 44.3 percent, or 298 million pounds, compared to 375 million pounds flown on exclusively cargo carriers (see **Figure 3-13**). This was a result of international flights and their associated belly cargo capacity returning to the market.

23 U.S. DOT. T-100 Database. Total cargo volume includes mail.

24 Air cargo includes express and small packages, freight, and mail.

25 Integrators are logistics companies that have end-to-end control of packages or deliveries, managing them from pick-up to drop-off. They operate their own fleets of trucks, planes, and sorting centers to ensure complete control throughout the process. Some of the globally recognized integrators include FedEx, UPS, and DHL, all of which have extensive fleets.

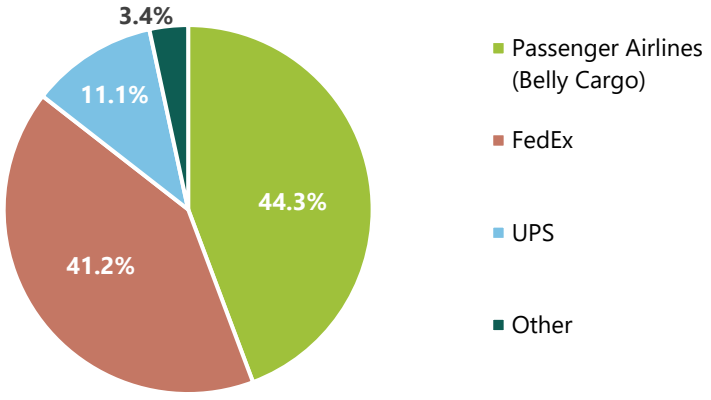
26 This includes express and small packages, freight, and mail.

Table 3-7 Cargo and Mail Operations and Volume, 2000, 2010, 2019–2022

Category	2000	2010	2019	2020	2021	2022	% Change (2021-2022)	2022 as % Above / Below 2019 Levels
Operations								
Cargo Aircraft Operations[1]	12,282	6,724	6,830	7,576	7,773	7,798	+0.3%	+14.2%
Volume (lbs.)								
Express / Small Packages	484,490,143	339,485,424	395,108,073	407,904,726	385,957,887	366,647,422	-5.0%	-7.2%
Freight	367,857,011	206,893,979	293,831,074	167,567,238	232,004,509	278,860,406	+20.2%	-5.1%
Mail	194,902,513	25,904,205	28,536,921	24,954,698	31,268,249	28,401,227	-9.2%	-0.5%
Total Cargo and Mail Volumes	**1,047,249,667**	**572,283,608**	**717,476,068**	**600,426,662**	**649,230,645**	**673,909,055**	**+3.8%**	**-6.1%**

Source: Massport.
Notes: Dedicated cargo operations only

Figure 3-13 Cargo Carriers – Share of Logan Airport Cargo Volume, 2022



Source: Massport.
Note: Includes mail.
Passenger airlines carrying cargo as belly cargo.
Wiggins Airway and Mountain Air Cargo operated for FedEx, and as such are grouped as part of FedEx.
21 Air, ABX Air, Amerijet International, Atlas Air, and Kalitta Air operated for DHL (grouped as part of "Other").

3.3.1 Cargo Volume Trends in 2022

Despite the COVID-19 pandemic, in 2022 the global air cargo business had rebounded and operated close to pre-pandemic levels. The resumption of international passenger flights in 2022 increased cargo capacity and transport options, including both belly cargo and dedicated cargo freighter and integrator cargo activity. According to the International Air Transport Association (IATA), global air freight demand in 2022 slightly declined from 2021 levels but remained close to 2019 levels. After playing a crucial role in transporting medical supplies and other essentials like pharmaceuticals, life science products, perishable goods during 2020 and 2021, air cargo volumes declined due to geopolitical and economic uncertainties.

Despite the decline in freight volumes, e-commerce and express package markets became increasingly reliant on the speed of air shipping. Overall, DHL reported[27] economic indicators of high inflation that reduced purchasing power and resulted in lower demand for air freight. This was seen particularly in sectors that experienced lower sales and high inventory levels such as retail and manufacturing. However, logistics companies are diligently and actively addressing disruptions, working to overcome global and regional supply chain challenges, and striving to improve overall operations efficiency.

Air cargo volumes have shown more resilience to the pandemic than passenger traffic, although it is still too early to observe fully normalized trading patterns. According to the U.S. T-100 databases, the 10 largest U.S. cargo airports have experienced exceptional cargo growth rates, surpassing 2019 levels by approximately 3.0 percent in 2022.

Cargo volumes at Logan Airport showed a year-over-year increase of approximately 3.8 percent in 2022, returning to 93.9 percent of 2019 volumes. Although the domestic mail and express and small package markets remain an important share of cargo volumes, they declined in 2022. This was due to global supply chain challenges and inflation impacting demand within the online shopping and e-commerce sectors. Express and small package volumes at Logan Airport were less than 2019 levels at year-end 2022 and were 28.4 million pounds less than 2021 reported volumes. While mail volumes also decreased 9.2 percent in 2022 compared to 2021, they remained close to 2019 levels.

3.4 Future Aviation Activity Forecast Methodology

This section summarizes the methodology used to prepare the updated aviation activity forecasts presented in this *2022 ESPR*. The updated Logan Airport planning forecast incorporated considerations of both the near-term continued recovery from the COVID-19 downturn and the return to longer-term growth trends. The different considerations of near-term trends and longer-term trends are described in the following sections presenting the forecast results. These trends and assumptions, and the

27 DHL Insights. "Has COVID-19 Changed Asia's E-Commerce Landscape Forever?" https://lot.dhl.com/has-covid-19-changed-asias-e-commerce-landscape-forever/ and https://supplychaindigital.com/logistics/inflation-is-dampening-air-freight-demand-says-dhl.

forecasts derived from them, are important inputs into the analyses for noise, ground transportation, and air quality discussed in later chapters of the *2022 ESPR*. Massport's unique ESPR process allows and encourages development of frequent forecast updates. This facilitates use of the latest economic and aviation trends and the ability to adjust as conditions evolve.

The updated forecasts include a base year of 2022 to reflect the current status of the airline industry and emerging trends expected to influence future aviation activity levels at Logan Airport. Given the substantial changes over the past five years, and the uncertainty in predicting future aviation activity levels, a specific future forecast year is not used. Instead, Massport considers a **Future Planning Horizon** for a 10- to 15-year timeframe.

The future forecast was developed by applying standard industry forecasting techniques analyzing:

- Historical trends
- Recent developments, including the return to pre-COVID conditions
- Outlook for future demand drivers, such as the local and national economy

The forecast methodology was developed with reference to and consistent with industry best practices documented in the FAA's *Forecasting Aviation Activity by Airport*. This forecast guidance document identifies reliable data sources and accepted statistical analysis techniques, such as econometric analyses of the relationship between airport passengers and socioeconomic demand drivers. The FAA issues a **Terminal Area Forecast (TAF)** each year designed to assist the FAA in its regional planning, budgeting, and staffing requirements. The TAF forecasts are prepared at the individual airport level and are based on local and national trends, but are not reconciled directly to the national FAA Aviation Forecast. As a result, the TAF does not contain the local nuances and market-specific conditions that a site-specific forecast, such as developed for the ESPRs, can provide.

Additional, widely accepted aviation industry guidance that Massport follows for aviation demand forecasting includes:

- Annual editions of *FAA Aerospace Forecast*[28]
- Annual editions of *FAA Forecast Process for Terminal Area Forecast*[29]
- Annual editions of *Boeing - Commercial Market Outlook*[30]
- Quarterly editions of *Airports Council International (ACI) – Impact of COVID-19 on Airports and The Path to Recovery*[31]
- Semi-annual editions of *IATA – Global Outlook for Air Transport*[32]

28 FAA, 2023. FAA Aerospace Forecasts. Federal Aviation Administration, U.S. Department of Transportation. Website. Last updated May 8, 2023. https://www.faa.gov/data_research/aviation/aerospace_forecasts.

29 FAA, 2024. Terminal Area Forecast (TAF). Federal Aviation Administration, U.S. Department of Transportation. Website. Last updated January 22, 2024. https://www.faa.gov/data_research/aviation/taf.

30 https://www.boeing.com/commercial/market/commercial-market-outlook.

31 https://aci.aero/2023/02/22/the-impact-of-covid-19-on-airportsand-the-path-to-recovery-industry-outlook-for-2023/.

32 https://www.iata.org/en/publications/economics/.

- *Airport Cooperative Research Program (ACRP) Report 25 - Airport Passenger Terminal Planning and Design*[33]
- *ACRP Report 82 - Preparing Peak Period and Operational Profiles*[34]
- *IATA Airport Development Reference Manual (ADRM) 12th edition,* Chapter 2[35]
- *FAA's Office of Aviation Policy and Plans (APO) Advisory Circular (AC) 150/5070-6B Change 2, Airport Master Plans,* Chapter 7[36]
- *FAA APO Report - Forecasting Aviation Activity by Airport*
- *ACRP Synthesis 2 - Airport Aviation Activity Forecasting*[37]

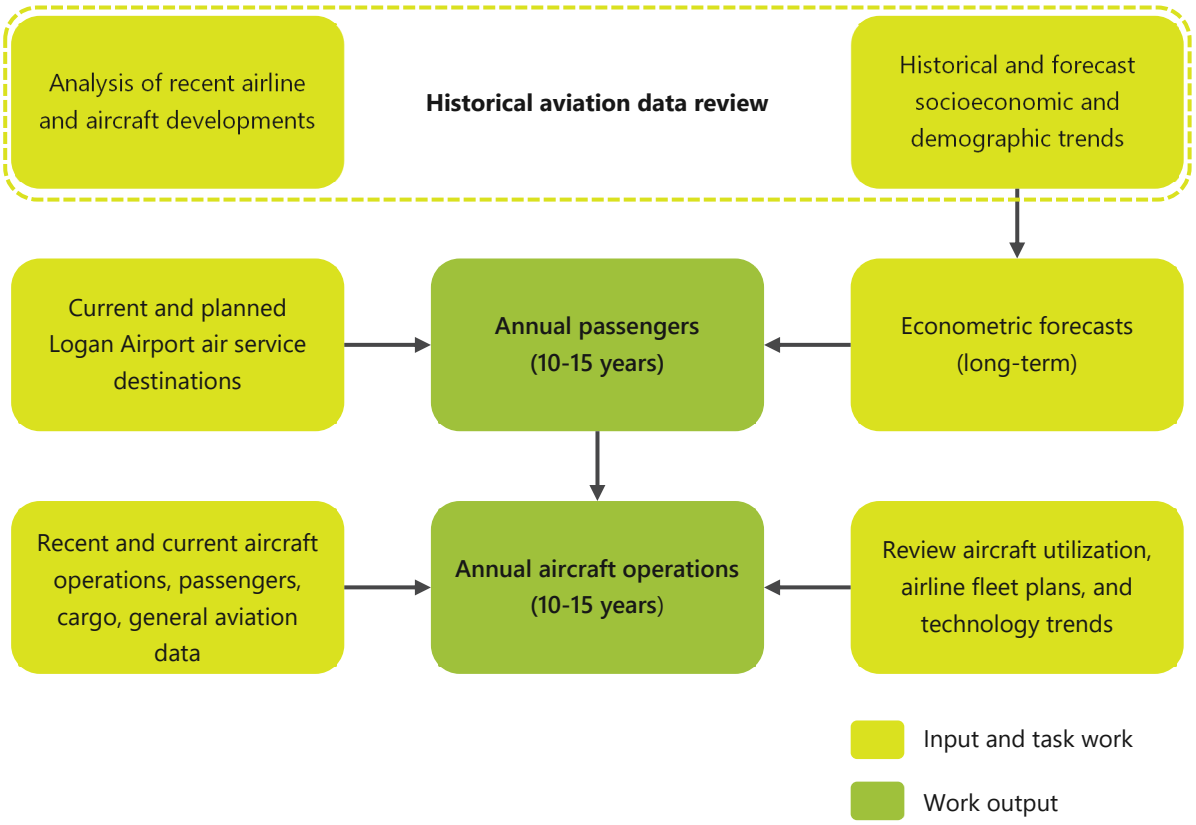
This forecast, derived specifically for Logan Airport, serves as the basis for the planning and environmental evaluations and analyses in the later chapters of this *2022 ESPR*. The strategic planning forecasts include projections of both domestic and international air passengers; commercial passenger, cargo, and GA aircraft operations; and cargo volumes. **Figure 3-14** illustrates the forecast methodology for the *2022 ESPR*. The key elements of the methodology are detailed below:

- **Historical Aviation Data Review:** Review 20 years of data on summary trends in total passengers and aircraft operations at Logan Airport. Conduct a more detailed review of the most recent 5 years of passenger data since the previous *2017 ESPR* by activity categories, including domestic passengers, international passengers, passengers by airline, and passengers by world region.
- **Historical Socioeconomic Data Review:** Examine 20 years of data on regional population, employment, and **gross regional product (GRP)** for the Boston **Metropolitan Statistical Area (MSA)**, as well as growth trends for the nation as a whole.
- **Current and Planned Air Service Analysis:** Assess recent developments of airline air service at Logan Airport, both pre-pandemic and during the recovery.
- **Massport Consultations:** Knowledgeable staff provide input on airline service developments expected in the near future.
- **Economic Trends Forecast:** Review regional and national economic data and economic forecasts for use in an econometric analysis of the relationship between economic drivers and passenger levels.
- **Econometric Analysis:** Complete a statistical analysis of the relationship between underlying economic drivers and annual passengers at Logan Airport and the development of forecast long-term growth rates.

33 https://crp.trb.org/acrpwebresource2/acrp-report-25-airport-passenger-terminal-planning-and-design-volume-1-guidebook/.
34 https://crp.trb.org/acrpwebresource2/acrp-report-82-preparing-peak-period-and-operational-profiles-guidebook/.
35 https://www.iata.org/en/publications/store/airport-development-reference-manual/.
36 https://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.current/documentnumber/150_5070-6.
37 https://nap.nationalacademies.org/catalog/23192/airport-aviation-activity-forecasting.

- **Annual Passengers Forecast:** Using the various analyses, derive the forecast of near-term passengers, based on pandemic recovery trends, and long-term forecast, based on econometric analysis and long-term historical trends.
- **Historical Aircraft Operations Analysis:** Assess historical aircraft operations at Logan Airport in the primary categories of passenger airline aircraft operations, cargo airline aircraft operations, and GA aircraft operations. Review aircraft operations data by aircraft type, in the main categories of large jet, RJ, and non-jet aircraft, as well as data on individual aircraft types.
- **Airline Fleets Analysis:** Assess airline aircraft fleets serving Logan Airport and aircraft orders for the future fleet. Review industry data on expected changes in future airline aircraft fleets; and
- **Annual Aircraft Operations Forecast:** Based on the relationship between annual passengers and annual aircraft operations, develop the forecast of annual aircraft operations by category.

Figure 3-14 Forecast Methodology



Source: InterVISTAS

Key Trends

Key factors used to inform the updated long-range planning forecast, including important trends in the regional economy and the national airline industry, are presented in Section 3.5. These trends are integral to the forecast methodology and analysis, and include:

- Regional economic trends – Historical and forecast economic growth in the Boston MSA, and comparison to national growth trends.
- Airline industry trends – Consideration of airline industry trends that could influence future aviation activity at Logan Airport, including:
  - COVID-19 recovery – Recent trends in recovery from the COVID-related downturn in aviation activity.
  - Airline competition – Analysis of airline competition, including the growth of LCCs.
  - Airline finances – Review of airline financial performance, and recovery of profitability since the COVID downturn; and
  - Aircraft fleets – Review of airline aircraft fleet changes in recent years, including aircraft retirements and transition to newer-generation aircraft.

3.4.1 Passenger Forecast Methodology

The passenger forecasts were prepared using accepted industry standard forecasting techniques analyzing historical patterns of passenger traffic at Logan Airport; recent trends at Logan Airport and in the airline industry; and the outlook for future aviation demand based on economic factors. The updated Logan Airport planning forecast incorporated considerations of both the near-term continued progress toward rebounding from the COVID-19 downturn; and the return to longer-term growth trends.

Analysis of recent airline service developments and passenger recovery trends were used to develop the near-term forecast of passengers. The COVID-19 downturn in passenger activity was unprecedented for Logan Airport and airports nationwide. This fact, combined with the significant renewal of activity over the past few years, makes it difficult to consider typical or traditional references to annual growth rates in the near-term, or to fully understand the relationship of annual passengers to underlying economic factors. Instead, the methodology for analysis of passenger traffic levels in the near-term is based on the assessment of absolute traffic levels, and particularly the return to pre-pandemic activity levels. Factors considered include:

- COVID-19 factors and the gradual reopening of travel markets;
- The revival of market segment demand for domestic and international air travel;
- Potential changes in passenger behavior, such as increased use of virtual communication during the pandemic; and
- Airline service responses to the patterns in returning demand.

Econometric analysis is used to examine statistical correlations between underlying drivers, also referred to as explanatory variables, and the ability to predict annual changes and levels in the dependent variable, in this case, Logan Airport passengers. Over the longer term, the forecast methodology assumed there would be a return to more typical passenger growth patterns exhibiting a more traditional relationship to underlying economic drivers, based on the econometric analysis of historical and pre-pandemic data trends.

The **econometric analysis** objective was not to develop a single "best" statistical equation to predict future conditions.

Rather, the analysis results inform assumptions regarding potential and **reasonable growth** of Logan Airport **over the Future Planning Horizon**.

The underlying economic drivers were used in different combinations and for different historical time periods to assess the statistical relationships between these drivers and annual growth in Logan Airport passenger levels, and to produce ranges of statistical coefficients for forecasting future passenger levels. Various reasonable arguments typically arise in support of using different underlying drivers or combinations of variables, as well as how different historical time periods are represented. Considering the unprecedented conditions and resulting limitations previously discussed, the objective of the econometric analysis was not to develop a single "best" statistical equation to predict future conditions, but instead to use the results of analysis to inform opinions and assumptions regarding potential and reasonable long-term growth of Logan Airport passenger levels.

3.4.2 Aircraft Operations Forecast Methodology

The aircraft operations forecast for Logan Airport was developed based on the forecast of annual passenger levels, expected trends in aircraft fleet composition, and key metrics such as average seats per aircraft and load factors. For example, an increase in the average number of passengers per operation, and the associated decrease in aircraft operations relative to passenger levels, would indicate an increase in the average number of seats per aircraft per operation as well as an increase in the average load factor value, or the percentage of seats occupied by passengers.

Data analysis methodology included inputs for annual aircraft operations by airline and aircraft type. This methodology also considers aircraft utilization by aircraft type, both before the pandemic and during the subsequent return to pre-COVID conditions. For the methodology, these historical trends were considered when developing the assumptions regarding future aircraft operations. Other information used in this methodology included industry forecasts of airline aircraft fleets, and aircraft orders by airlines serving Logan Airport. Section 3.5.3 presents the results of the forecast analysis.

3.4.3 Derivative Forecast Methodology

Using the top-level passenger and aircraft operations numbers, a series of **derivative forecasts** are derived to provide details for the detailed noise, air quality, and transportation forecast analyses. These derivative forecasts based on the Future Planning Horizon are important for supporting the technical analyses presented in the following chapters as shown in **Table 3-8**. The derivative forecasts include:

- Annual aircraft operations by aircraft type, which support air quality modeling.
- Average daily arriving and departing operations by aircraft type and stage length used to support noise modeling; and
- Peak month, average day arriving and departing O&D passengers by time of day, which supports **vehicle miles traveled (VMT)**[38] modeling.

The methodology to prepare derivative forecasts of activity at Logan Airport is based on industry standard practices. Detailed analysis of historical data is used to develop assumptions regarding the relationship of annual activity data to the more detailed derivative activity such as daily and hourly activity. These data sources include Massport airline activity reports; U.S. Department of Transportation (U.S.DOT) airline activity data reports; FAA aircraft operations reports; and airline schedule filings. Additional sources include analysis of activity metrics such as aircraft fleet share annual and daily, airline service domestic and international by season and airline use of terminals.

Based on these data inputs, assumptions were developed regarding future ratios of derivative activity in relation to annual activity, as reflected in the results presented in Appendix F, Section F.2. One key assumption includes the industry standard practice of peak demand flattening.[39] Additionally, the airlines are anticipated to use terminal facilities in the Future Planning Horizon similarly to today, so as international demand increases and new airlines initiate service, the utilization of Terminal E, Logan's international arrivals and departures terminal, is expected to increase relative to the other terminals. This aligns with the addition of four gates at Terminal E between 2022 and the **Future Planning Activity Level (PAL)**.

38 Vehicle miles traveled (VMT) measures the amount of travel for all vehicles in a specific geographic area over a specific period of time, typically a one-year period.

39 Peak demand flattening refers to when airlines plan operations so that demand growth occurs during less busy times of the day. This allows for increased service to markets as well as better utilization of terminal and airside facilities. As such, passenger demand over the course of the peak month average day planning period grows faster than the peak period.

Table 3-8 Forecasting Inputs, Assumptions, Models, and Outputs

	Ground Transportation	Noise	Air Quality and Emissions Reductions
Historical Inputs	• Passenger levels • Mode choice • Terminal usage • Automated traffic monitoring system (ATMS) • Roadway configuration and mileage • Parking garage and lot usage • Curb Dwell time	• Total aircraft operations • Aircraft fleet mix • Runway use • Radar flight lengths • Stage length • Night / Day operation	• Aircraft operations by aircraft and engine type • Aircraft taxi and delay • Ground service equipment (GSE) • Motor vehicle volumes, vehicle miles traveled (VMT), and curb usage • Energy usage • Stationary and other sources
Inputs from Forecast	• Average day of peak month (ADPM) – arriving and departing local passengers by terminal and time of day	• Annual average day (AAD) • Aircraft type • Origin and destination • Day / Night schedule	• AAD • Moter vehicle volumes, VMT and curb usage (from ground)
Future Assumptions	• Future mode choice • Future traffic volumes (based on MAP) • Future roadway configuration and mileage • Future parking garage and lot usage	• Runway use	• Future GSE use • Energy usage • Stationary sources
Model	• VISSIM Model	• FAA Aviation Environmental Design Tool (AEDT)	• AEDT • Motor Vehicle Emissions Simulator (MOVES)
Outputs	• Total traffic circulation by mode • On-Airport vehicle miles traveled (VMT)	• Current Day-night noise contours • Future Day-night noise contours • Population impact assessment for current and future conditions • Comparison of measured and modeled noise levels • Supplemental metrics	• Emissions Inventory

3.5 Future Aviation Activity Forecast Background

This section presents Massport's updated long-range planning forecasts for passenger activity levels and aircraft operations for Logan Airport, as required by the Certificate of the Massachusetts Secretary of the Executive Office of Energy and Environmental Affairs (EEA) issued January 30, 2023, which is provided in Appendix A, *MEPA Certificates and Responses to Comments*). The methodology is summarized in this section for the forecast results presented in this chapter with additional detail provided in Appendix F, Section F.2.

The updated forecasts include a base year of 2022 to reflect the status of the airline industry and emerging trends expected to influence future aviation activity levels, with a review of pre-pandemic conditions in 2019. The forecasts also consider both the near-term continued rebound from the COVID-19 downturn and the anticipated return to long-term growth trends. Given the dramatic changes in the past five years and the uncertainty in predicting future aviation activity levels, like previous ESPRs, Massport is using a Future Planning Horizon of a 10- to 15-year timeframe. The strategic planning forecasts include projections of passengers (domestic and international), aircraft operations (passenger, cargo, and GA), and cargo. To support the technical noise, ground transportation, and air quality analyses, derivative forecasts were developed that break down the overall forecast into greater detail to derive assumed aircraft fleet mix, flight schedules and destinations, and terminal usage. The forecast is presented below and serves as the basis for the planning and noise, ground access, and air quality analyses in this *2022 ESPR*.

3.5.1 Regional Economic Trends

To set the stage for this long-range planning forecast, important trends in the regional economy and the national airline industry are presented in the following sections. Logan Airport users are primarily O&D passengers, rather than passengers connecting through Logan Airport to reach their final destinations. The high percentage of O&D passengers at Logan Airport relative to other major airports used primarily as connecting hubs means that overall activity levels at Logan Airport are less vulnerable to fluctuations in connecting traffic resulting from airline-specific factors such as airline route restructuring.

Historically, activity levels at Logan Airport tend to reflect national economic conditions, regional economic and demographic trends, and the economics of the airline industry. Once the nation and the Boston region have fully recovered from the COVID-19 pandemic downturn, economics will largely determine long-term aviation market growth at Logan Airport as has been the case over time.

The Boston MSA is defined by the U.S. government to include the five Massachusetts counties of Essex, Middlesex, Norfolk, Plymouth, and Suffolk and the two New Hampshire counties of Rockingham and Strafford. According to census data, the Boston MSA is the tenth largest in the U.S. by population. The Boston MSA is among the nation's leaders in the areas of finance, technology, bioscience, healthcare,

and education--economic sectors that contribute to above-average income levels and travel demand. The average income level in the Boston MSA was about 45.0 percent higher than the national average as of 2022.

Table 3-9 shows historical and projected growth in economic product and personal income for the Boston MSA and the nation. As shown, the Boston MSA has historically experienced economic growth exceeding national averages as measured between 2002 and 2022. This trend is projected to continue, from 2022 to 2042.

The projected continued economic growth in the Boston MSA, and in particular the participation in leading industry sectors that contribute to income growth and travel demand, is expected to continue to drive activity at Logan Airport.

Table 3-9 Historical and Projected Growth in Economic Product and Personal Income

	2002-2022	2022-2042
GDP/GRP		
U.S.	2.0%	2.0%
Boston MSA	2.3%	2.1%
Per Capita Income		
U.S.	1.5%	1.5%
Boston MSA	1.9%	1.6%

Source: Woods & Poole

3.5.2 Airline Industry Trends

This section provides information on the airline industry trends affecting future aviation growth nationally and at Logan Airport. This includes airline industry advancements since the COVID-19 downturn, and comparison of the post-pandemic upward trends at Logan Airport with national trends as well as more general indicators of historical and future aviation activity, including airline competition, airline profitability, aircraft fleet composition changes, and regional airports. Airline industry trends include, as noted, data reported airport and airline trade organizations including the ACI and IATA, and the U.S.DOT.

3.5.2.1 COVID-19 Recovery and Industry Outlook

The U.S. airline industry has exhibited a strong rebound from the COVID-19 economic downturn that began in March 2020. According to ACI, total U.S. passengers reached 98 percent of pre-pandemic 2019 levels as of March 2023, with domestic passengers at 100 percent of 2019 levels and international passengers at 91 percent of 2019 levels. ACI has projected that North American passenger traffic will

exceed pre-pandemic 2019 levels in 2024. IATA forecasts that global passenger levels are also expected to return to pre-pandemic levels in 2024.

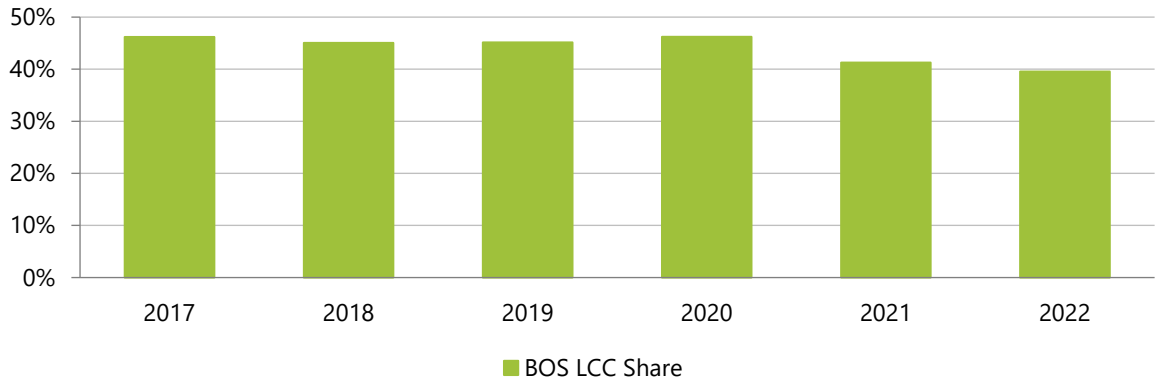
The actual number of passengers at Logan Airport in 2022 represented 85 percent of pre-pandemic 2019 passenger numbers. Airline service filings through September 2023 indicated passenger activity at Logan Airport was approximately 95.0 percent of 2019 passenger activity levels by the end of 2023. Thus, passenger activity at Logan Airport is expected to meet or exceed pre-pandemic levels in 2024 or 2025. Beyond 2025, aviation activity at Logan Airport is anticipated to resume the long-term growth trends driven primarily by underlying economic growth.

3.5.2.2 Airline Competition and Industry Structure

The U.S. airline industry is extremely competitive, and over time there are developments which affect industry dynamics. These include new entrant airlines, airline cooperation and mergers, airline failures, and general competitive adjustments and strategic decisions around each airline's share of service at airports. These factors impact the industry's structure and the market shares of individual airlines nationwide and at each airport. Over the long-term, strong O&D airports such as Logan Airport tend to continue to attract and retain airline service providers based on underlying economic factors, although the mix of individual airlines may fluctuate.

Legacy carriers and their affiliated regional airlines continue to account for the majority of total domestic air travel activity, which was about 64.0 percent in 2022. The remaining 36.0 percent was accounted for by LCCs. The growth of LCCs has contributed to competition and traffic growth in the U.S. airline market. Examples of LCCs operating at Logan Airport include Allegiant Air, Frontier Airlines, jetBlue Airways, Southwest Airlines, and Spirit Airlines. **Figure 3-15** shows the share of domestic passengers at Logan Airport who fly with LCCs for the period between 2017 and 2022.

Figure 3-15 Low-Cost Carrier Shares of Domestic Passengers at Logan Airport, 2017-2022



Source: U.S. DOT, T-100 database.

At Logan Airport, the share of domestic passengers represented by LCCs increased significantly from 22.0 percent in 2007 to 46.0 percent in 2017. This increase was driven primarily by jetBlue Airways service development and the airline's focus on the Boston market during this period. After 2017, the LCC share at Logan Airport remained around 45.0 percent until the COVID-19 pandemic. In 2021 and 2022, the LCC share at Logan Airport was somewhat lower at around 40.0 percent, due to uneven recoveries among individual airlines. However, this still represented a significant share of the Airport total domestic passenger levels. It is anticipated that LCCs will continue to account for a significant share of domestic passengers at Logan Airport, consistent with the range of domestic passenger shares exhibited in the past five years.

Other recent developments affecting competition at Logan Airport include the "Northeast Alliance" codeshare arrangement between American Airlines and jetBlue Airways at airports in Boston and New York, and the proposed merger of jetBlue Airways and Spirit Airlines. In May 2023, the U.S. Department of Justice ordered termination of the Northeast Alliance, citing concerns over limits on competition, and jetBlue Airways has indicated its intent to comply with the ruling.

Overall, while there is likely to be additional airline competition in the future, it is expected that these will primarily affect the shares of individual airline passengers at Logan, and not overall demand for air travel, which is responsive to underlying drivers such as socioeconomic conditions. This is because of the Airport's role serving primarily O&D passengers.

3.5.2.3 Airline Finances and Profitability

After a sustained period of profitability from 2010 to 2019, the U.S. airline industry experienced major financial losses in 2020 and 2021 due to the COVID-19-related travel downturn beginning in 2020, which can be seen in **Figure 3-16**.

In 2022, the U.S. airline industry reported a modest operating profit due to continued traffic demand recovery and airline structural adjustments. ACI reported an optimistic outlook for U.S. airlines' financial results by year-end 2023, reflecting a return to pre-pandemic passenger activity levels nationwide, or possibly exceeding them. IATA forecasts that profits for airlines globally should be positive by 2024. Although the recovery from COVID-19 is uneven when considering the global aviation industry, North America reported to be in the lead. It is assumed that, while subject to cyclical changes, the airline industry will generate sufficient financial results to serve market demand over the next 10 to 15 years.

3.5.2.4 Regional Airport Competition

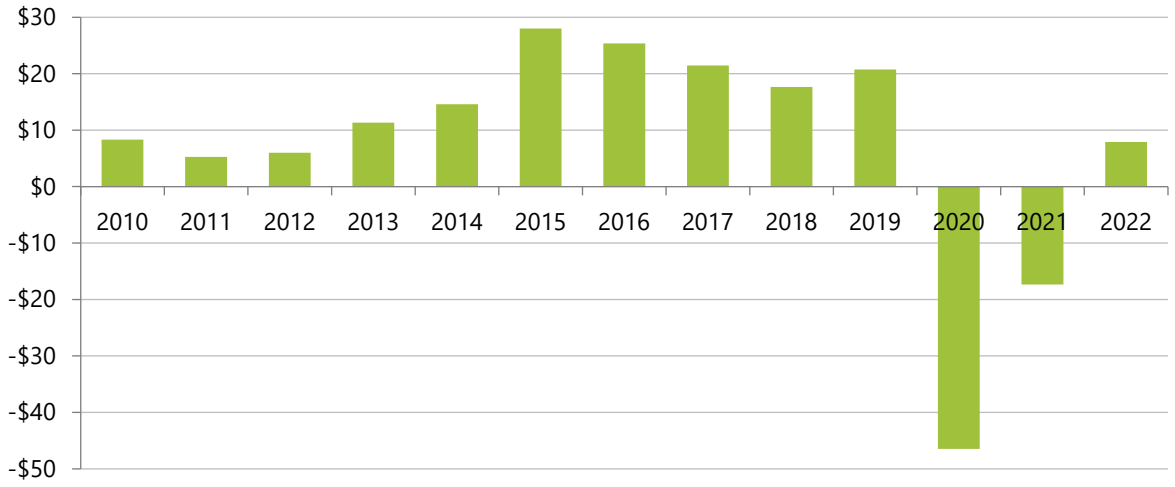
Large metropolitan areas in the U.S. frequently have multiple commercial airports that can compete for regional passenger demand. In the Boston area, the closest regional airports to Logan Airport are T.F. Green Airport in Rhode Island and Manchester-Boston Regional Airport in New Hampshire. From 2012 to 2022, the share of regional passengers at Logan Airport increased from 83.0 percent to 88.0 percent, attributed significantly to the development of LCC service offerings at Logan Airport by jetBlue Airways and others, and the relatively greater number and geographical diversity of airline services at Logan Airport.

3.5.2.5 Aircraft Fleet Changes and Average Seats per Aircraft

The COVID-19 downturn led to airlines grounding and retiring significant portions of the U.S. airline fleet beginning in 2020, as well as defer or extend orders scheduled for future delivery. This accelerated the transition to cheaper and more modern, efficient aircraft as demand recovered and airlines resumed ordering and taking delivery of new aircraft.

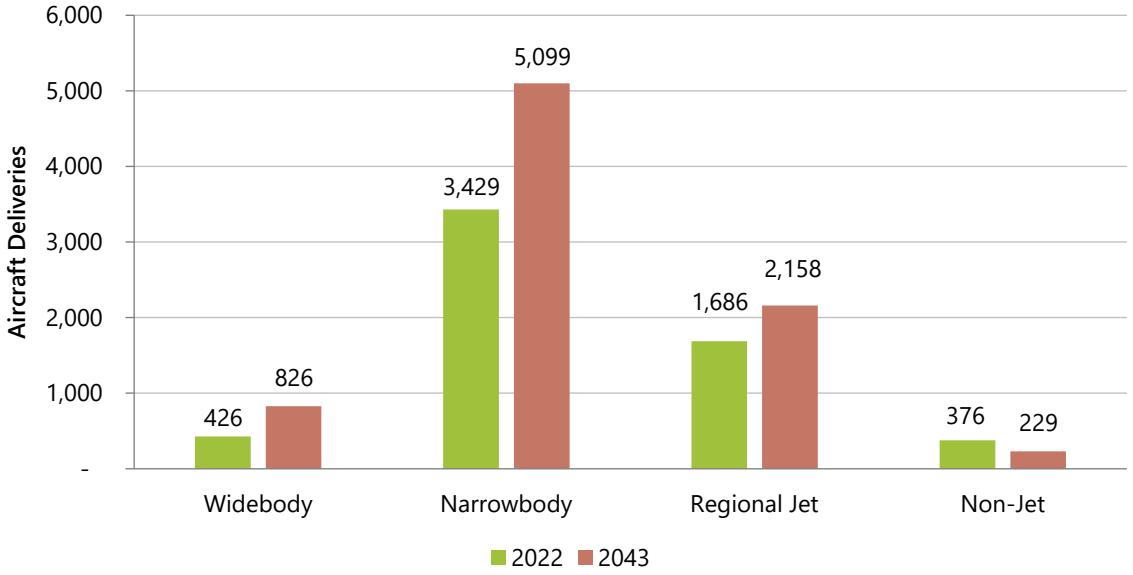
The long-term trend in aircraft fleet development in the U.S. airline industry is focused substantially on **narrowbody aircraft**. As of 2022, narrowbody aircraft represented about 60.0 percent of U.S. airline aircraft operations, and about 65 percent of Logan Airport aircraft operations. Within the narrowbody aircraft category, airlines can gradually increase average seating capacity per aircraft, particularly with transition to newer generation narrowbody aircraft. These aircraft provide greater average seating capacity than the aircraft they replace. These newer generation narrowbody aircraft include the Airbus A321neo and the Boeing 737 MAX.

Figure 3-16 Annual U.S. Airline Operating Profits in Millions of U.S. Dollars, 2010-2022



Source: U.S. DOT, Bureau of Transportation Statistics.

Figure 3-17 Forecast Change in U.S. Airline Fleet, 2022-2043



Source: FAA Aerospace Forecast, Fiscal Years 2023-2043

Airlines are also using newer-generation narrowbody aircraft to replace older, smaller, and less popular RJ aircraft. For example, large **network airlines** are phasing out 50-seat RJs, and jetBlue is taking delivery of new Airbus A220 aircraft to replace its smaller Embraer 190 aircraft.

According to FAA and as shown in **Figure 3-17**, U.S. passenger airlines will add about 1,600 narrowbody aircraft between 2022 and 2043, compared to about 400 widebody aircraft. This forecast is based on the combination of new aircraft deliveries and retirements. U.S. regional carriers are projected to add about 400 regional aircraft, primarily larger RJs.

The number of average seats per aircraft operation at Logan Airport has historically increased over time. Between 2010 and 2019, the number of average seats available to convey passengers per aircraft operation increased from 108 to 130. With the pandemic-related decline in international flights, the average number of seats decreased slightly to 126 in 2021 as larger aircraft with more seats are generally associated with international or long-haul flights. The absence of these aircraft from the service fleet shifted the average to a lower number. With resumed activity, the average number of seats increased back to 132 in 2022 as larger aircraft came back into service. The trend of increasing average seats per aircraft operation has led to airlines utilizing the Logan Airport airfield more efficiently with more passengers per flight operation and generally fewer environmental impacts.

The average number of seats per aircraft operation at Logan Airport is expected to increase in future years, based on the fleet evolution trends described above. Specific assumptions regarding future average seats per departure are presented in Section 3.5.5.

3.5.3 Updated Logan Airport Future Planning Activity Level Forecast

Massport periodically assesses and updates planning forecasts due to global and local economic and market conditions that have an impact on aviation activity levels. As shown in **Table 3-3** in Section 3.1.2.1, Logan Airport's passenger traffic increased from 27.7 million air passengers in 2010 to 45.2 million in 2019. The long-term growth was attributable to underlying regional and national economic growth and airline service development at Logan Airport. With the onset of the COVID-19 pandemic, passenger activity levels at Logan Airport declined to 12.6 million passengers by the end of 2020. Since then, passenger activity levels have increased to 36.1 million air passengers in 2022.

Since the publication of the *2017 ESPR*, the following developments that have affected aviation activity at Logan Airport include:

- Continued strong growth through 2019, reflecting the primary O&D base of Logan Airport passenger traffic and the strength of the regional economy.
- The unprecedented downturn during the COVID-19 pandemic began in 2020, at Logan Airport, nationally, and globally.
- Relatively strong recovery from the pandemic downturn as of 2022 and continued positive outlook.
- Continued service from the largest airlines at Logan Airport, supporting the on-going recovery from the COVID-19 downturn and the anticipated resumption of long-term growth; and
- Aircraft fleet retirements and transition to new-generation aircraft.

The updated Logan Airport planning forecast incorporated considerations of both: the near-term continued return to pre-pandemic conditions; and the return to longer-term growth trends. The different considerations of near-term trends and longer-term trends are described in the following sections presenting the forecast results.

3.5.4 Passenger Activity Level Forecast

The Boston metropolitan area has significant activity in leading economic sectors that produce above-average incomes and a high propensity for air travel. Logan Airport is principally an O&D airport, and future passenger activity is primarily determined by underlying market demand and not dependent on airlines **connecting passengers** that transfer from one flight to another. The price of air travel can also affect passenger demand, as shown by the growth associated with the development of LCC service at Logan Airport.

The Boston Metropolitan Area's economic growth is the primary driver of current and future air passenger growth at Logan Airport, which serves the **10th largest metropolitan area** in the nation.

Advances in technology also have the potential to impact passenger demand and growth. For example, aircraft manufacturers are developing electric and hypersonic aircraft, which may have increased efficiencies or could improve the travel experience. However, the long-term impacts of new technologies are still uncertain, so the Logan Airport passenger forecast is based on proven, traditional

metrics and forecasting techniques. The passenger forecasts were prepared using standard industry forecasting techniques analyzing:

- Historical patterns of passenger traffic at Logan Airport;
- Recent trends at Logan Airport and in the airline industry; and
- The outlook for future aviation demand based on economic factors.

The updated Logan Airport planning forecast incorporated considerations of both the near-term continued recovery from the COVID-19 downturn and the return to longer-term growth trends.

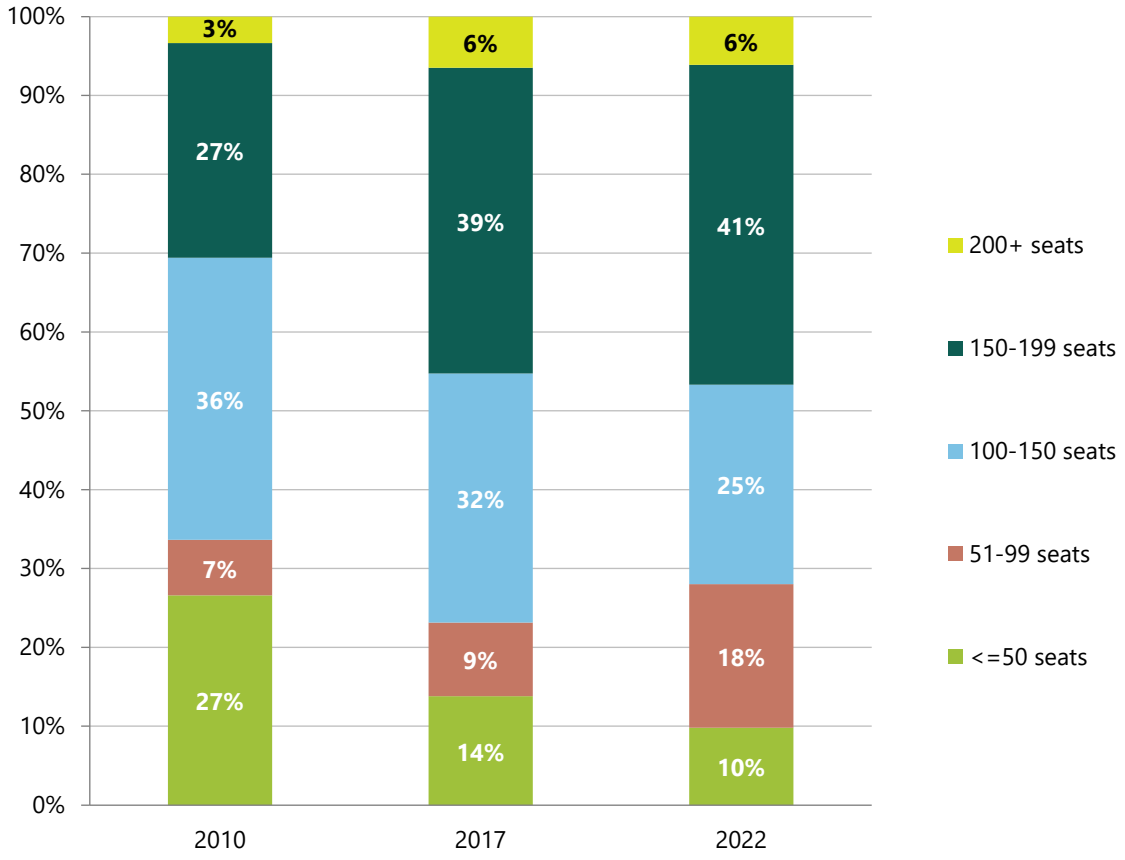
The COVID-19 downturn in passengers was unprecedented at Logan Airport and airports nationwide. Combined with the subsequent recovery of activity over the past few years, it is difficult to consider typical references to annual growth rates in the near-term. At Logan Airport, passenger levels declined by 70 percent in 2020 before recovering by 80 percent in 2021, albeit from a much smaller 2020 base level. Passenger levels increased again by 59 percent between 2021 and 2022. These are not percentage growth changes that can be related to average historical trends or underlying economic factors. Rather, the analysis of traffic levels in the near-term is based on the assessment of absolute traffic levels, and in particular the return to pre-pandemic activity levels and beyond. Most near-term airport traffic forecasts prepared since 2019 focus on the return to pre-pandemic levels first and then consider the recovery to anticipated long-term growth patterns. Forecast considerations included COVID-19 factors and the gradual reopening of travel markets; market segment demand recovery, for example, domestic and international travel demand; and airline service responses to the demand recovery patterns.

Figure 3-18 shows the significant annual passenger activity level increases from 2020 to 2022, reaching 85 percent of the 2019 levels in 2022, where 2019 is equal to 100 percent. This trend is forecast to continue through 2026, with annual percentage growth exceeding long-term average growth rates, but at the same time returning to at or slightly above 2019 levels. This pattern of near-term passenger growth is typical of large U.S. airports, although there are variations around the average.

In the longer-term, after COVID-19 recovery and assuming no other shocks to the industry, it is forecast that more typical and traditional passenger growth patterns and their relationship to underlying economic drivers will return. This is based on econometric analysis of historical, pre-pandemic data trends.[40] **Table 3-10** shows key input variables used in the econometric analysis of Logan Airport passengers.

40 Econometric analysis was used to examine statistical correlations between underlying drivers or factors, also referred to as "explanatory variables," and the ability to predict annual changes and levels in the dependent variable, in this case Logan Airport passengers.

Figure 3-18 Fleet Mix at Logan Airport, 2010, 2017, and 2022



Source: Inter*VISTAS*, from U.S. DOT T-100 data. Aircraft of 200+ seats are widebody, 100-199 seats are narrowbody, and less than 100 seats are regional jets and turboprops.

Table 3-10 Passenger Forecast Assumptions

Econometric Factor	Average Annual Growth
U.S. Gross Domestic Product	2.0%
Gross Regional Product	2.1%
U.S Per Capita Income	1.5%
Regional Per Capita Income	1.6%
Airfares	-1.0%

Source: InterVISTAS, Woods & Poole.
Notes: Regional is defined as the Boston MSA.

The underlying economic drivers were considered in different combinations and for different historical time periods to assess the statistical relationship to annual growth in Logan Airport passengers. They were also used to produce ranges of statistical coefficients for forecasting future passengers. There are typically various reasonable arguments in support of different underlying drivers or combinations of variables, as well as how different historical time periods are represented. The objective of the econometric analysis was not to develop a single "best" statistical equation, for reasons stated above, but to use the results of analysis to inform opinions and assumptions regarding potential and reasonable long-term growth of Logan Airport passengers.

Table 3-11 shows the forecast of Logan Airport passengers to a Future Planning Horizon of 10 to 15 years, based on the combination of the near-term and long-term trends described above. In this *2022 ESPR*, the Future PAL serves as the basis for assessing potential future environmental impacts of Logan Airport. Additionally, **Table 3-11** shows percentage change comparisons from both the most recent actual result in 2022, and the pre-pandemic peak in 2019.

Table 3-11 Actual and Forecast Logan Passengers, 1990, 2019, 2022, and Future Planning Horizon

Passengers	1990	2019	2022	Future Planning Horizon	% Change 2019-Future	% Change 2022-Future
Scheduled/Charter						
Domestic	19,519,247	34,098,788	29,527,910	41,826,300	+23%	+42%
International	3,358,944	8,317,993	6,450,000	11,556,000	+39%	+79%
Europe / Middle East / Africa	N/A	5,003,881	4,124,245	6,586,920	+32%	+60%
Canada	N/A	985,051	602,835	1,617,840	+64%	+168%
Latin America / Caribbean	N/A	1,727,057	1,573,468	2,311,200	+34%	+47%
Asia	N/A	602,004	149,452	1,040,040	+73%	+596%
Total Scheduled / Charter	22,878,191	42,416,781	35,977,910	53,382,300	+26%	+48%
General Aviation	N/A	105,630	112,806	117,700	+11%	+4%
Total Passengers	22,878,191	42,522,411	36,090,716	53,500,000	+26%	+48%

Source: Massport and InterVISTAS Logan Airport Forecast.

Domestic air passengers are forecast to increase from 29.5 million in 2022 to 41.8 million in the next 10 to 15 years. This is a significant increase from 2022, although a smaller increase compared to 2019 levels. The domestic share of total passengers was 80.0 percent in 2019 and 82.0 percent in 2022. This is contrary to the long-term trend of a somewhat decreasing share of domestic air travel as international routes and markets continue to develop. The change from 2019 to 2022 reflects the fact that domestic activity recovered more quickly than international activity from the pandemic downturn. In the Future Planning Horizon, it is forecast there will be a return to the trend of gradually reducing domestic share to 78.0 percent as international markets grow somewhat faster than domestic.

International air passenger activity levels are forecast to increase from 6.45 million in 2022 to 11.6 million in the 10- to 15-year Future Planning Horizon. The share of international passengers decreased from 20 percent in 2019 to 18 percent in 2022, as international air travel was slower to recover from COVID-19 compared to domestic air travel. In the future, it is forecast that the share of international passengers will increase to about 22 percent. The forecast growth in the different international regions is based on the assessment of the near-term COVID-19 recovery, which has been uneven across regions, and assumptions regarding prospects for growth in relation to current market size. Europe is forecast to continue to account for more than half of all international activity. Asia is expected to exhibit strong growth from a delayed recovery base in 2022, particularly as newer routes are further developed.

Total Logan Airport air passengers are forecast to increase from 36.1 million in 2022 to **53.5 million** over the course of the 10- to 15-year **Future Planning Horizon.**

GA passengers represent less than one percent of the total, and there is only a small amount of growth forecast in this category.

The recent COVID-19 downturn and resumption of passenger activity at Logan Airport, while much different in magnitude and severity, is consistent with the general experience and data presented earlier. These data show that historically Logan Airport is resilient to external shocks and periods of weak demand, and ultimately the long-term trend is positive despite interruptions. The strong regional economy, local O&D market, and diversified mix of airlines have made Logan Airport resilient to past external shocks and contributed to the on-going recovery from COVID-19.

3.5.5 Aircraft Operations and Fleet Mix Forecast

The total number of passengers at Logan Airport increased 53.0 percent from 2000 to 2019, while aircraft operations decreased 12 percent because of more efficient operations. The number of passengers per aircraft operation increased from 57 passengers per operation in 2000 to 100 passengers in 2019. After 2019, the number of passengers per operation decreased due to lower demand levels before increasing to 95 passengers per operation in 2022.

The historical increase in the average number of passengers per operation, and the associated decrease in aircraft operations relative to passengers, is due to increases in the average number of seats available per aircraft operation and average load factor, or percentage of seats occupied by passengers.

Total Logan Airport aircraft operations are forecast to increase from 389,000 in 2022 to **495,000** over the course of the 10- to 15-year **Future Planning Horizon**.

Between 2010 and 2017, the number of seats per operation increased from 108 to 127, as smaller RJs and turboprops were replaced with larger narrowbody aircraft of 100-200 seats. From 2017 to 2022, the number of seats per operation further increased from 127 to 132, due to a combination of factors (see **Figure 3-18**). These factors included: continued declines in small RJs; an increase in the use of large RJs such as Embraer 175; and continued growth of narrowbody aircraft numbers compared to the Airport's total aircraft fleet. Average load factors increased from 77.0 percent in 2010 to 82.0 percent in 2019, then decreased somewhat after 2019 due to the COVID-related downturn.

Average load factors are forecast to increase somewhat through the 10- to 15-year Future Planning Horizon but remain similar to 2019 levels as shown in **Table 3-12**. More significant in terms of future passengers per operation is the forecast increase in average seats per aircraft from 123 in 2022 to 129 in the Future Planning Horizon for domestic operations; from 196 to 204 for international operations; and from 132 to 141 for total Passenger Airline operations.

Table 3-13 shows the forecast of Logan Airport aircraft operations. Within the Future Planning Horizon, passenger aircraft operations are forecast to increase significantly above 2022 levels while increasing slight above 2019 levels. Passenger aircraft operations are forecast to account for over 90.0 percent of total Airport operations. Passenger jet aircraft continue to account for the largest share of operations. RJ aircraft will further increase, but within this category larger RJs will replace smaller RJ. Non-jet aircraft levels will increase from 2022 but remain below 2019 levels. These aircraft are assumed to continue to be used by airlines such as Cape Air to serve nearby markets.

Table 3-12 Average Load Factors and Seats, 2019, 2022 and Future Planning Horizon

	Average Load Factors			Average Seats per Operation		
	2019	2022	Future Planning Horizon	2019	2022	Future Planning Horizon
Domestic	82%	79%	84%	121	123	129
International	82%	77%	83%	188	196	204
Total	82%	79%	84%	130	132	141

Source: Inter*VISTAS*, from U.S. DOT T-100 database.

Table 3-13 Actual and Forecast Operations, 1990, 2019, 2022, and Future Planning Horizon

Category	1990	2019	2022	Future Planning Horizon	% Change 2019-Future	% Change 2022-Future
Passenger						
Jet	N/A	296,514	244,971	344,223	+16%	+41%
Regional Jet	N/A	49,417	60,891	67,939	+37%	+12%
Non-jet	N/A	45,492	34,449	40,763	-10%	+18%
Subtotal	N/A	391,423	340,311	452,925	+16%	+33%
Cargo	N/A	6,830	7,798	9,900	+45%	+27%
General Aviation	24,976	28,922	30,504	32,175	+11%	+5%
Total Operations	424,568	427,175	378,613	495,000	+16%	+31%

Source: Massport and Inter*VISTAS*.

Cargo aircraft operations are forecast to increase moderately above 2022 levels and continue to represent a relatively small share of total Airport operations. GA aircraft operations are forecast to increase only moderately, consistent with historical trends. while the total number of Logan Airport passengers are forecast to exceed the historical highs in the next 10 to 15 years, the forecast number of aircraft operations is still somewhat below the historical high of 507,000 in 1998. This is because of the continued increase in average passengers per operation, due to the increases in average seats per operation and load factor, as discussed earlier.

3.5.6 Future Cargo Forecast

Cargo activity is historically related to underlying economic growth but is also subject to different key factors when compared to passenger activity. Dedicated cargo airlines such as FedEx and UPS seek to optimize air express package delivery efficiency, with consideration of door-to-door customer preferences, while also factoring in the use of trucking networks with related tradeoffs of cost and speed. Belly cargo contributes to passenger aircraft flight revenue, but the aircraft routing priorities are determined by passenger demand.

At Logan Airport and nationwide, cargo activity did not decline during the COVID-19 pandemic to the same extent as passenger activity. While passengers largely "stayed home," economic activity continued. E-commerce increased in importance, producing continued demand for air cargo services. From 2019 to 2022, the level of air cargo at Logan Airport declined by only 6 percent.

Table 3-14 shows the forecast of cargo volumes at Logan Airport. Total cargo volume is forecast to increase moderately above 2022 levels to the Future Planning Horizon, and slightly above 2019 levels. The share of cargo carried by cargo airlines is forecast to remain around 55 percent of the total, with the remaining 45 percent carried as belly cargo.

Table 3-14 Actual and Forecast Logan Airport Cargo (in pounds), 1990, 2019, 2022, and Future Planning Horizon

Category	1990	2019	2022	Future Planning Horizon	% Change 2019-Future	% Change 2022-Future
Cargo	N/A	397,676,068	375,509,055	466,697,050	+17%	+24%
Belly Cargo	N/A	319,800,000	298,400,000	381,843,040	+19%	+28%
Total	**753,253,075**	**717,476,068**	**673,909,055**	**848,540,090**	**+18%**	**+26%**

Source: Massport and Inter*VISTAS*.

3.5.7 Comparison of Previous and Current ESPR Forecasts

Prior to this *2022 ESPR* forecast, the previous *2017 ESPR* presented a long-range planning forecast. Conditions and trends changed from 2017 to 2022, most notably the COVID-19 downturn and subsequent recovery. **Table 3-15** below compares the *2017 ESPR* planning forecast to the updated *2022 ESPR* planning forecast. The current *2022 ESPR* forecast of 53.5 million passengers is higher by about 3.4 million, or 7.0 percent, than the previous *2017 ESPR* forecast of 50.1 million passengers. The current *2022 ESPR* forecast of 495,000 aircraft operations is higher by about 8,600, or 2.0 percent, than the previous *2017 ESPR* forecast of 486,400 aircraft operations.

Forecast aircraft operations within the 10- to 15-year Future Planning Horizon is projected to remain below the historical peak for operations in 1998.

The *2022 ESPR* planning forecast has an average of 108 passengers per aircraft operation compared to 103 passengers per aircraft operation in the *2017 ESPR* forecast. The increase in passengers per operation is related to the anticipated continued increase in average aircraft size, based on the fleet mix trends discussed earlier. The 10- to 15-year Future Planning Horizon of the *2022 ESPR* is further into the future than the 10- to 15-year Future Planning Horizon of the *2017 ESPR*, and therefore reflects further evolution of the airline aircraft fleet, with generally the same broad themes.

Updates to the Future Planning Horizon forecasts will continue to be based on the most current trends and data available during the next ESPR cycle, approximately five years after this *2022 ESPR*, as necessary.

Table 3-15 Comparison of *2017 ESPR* and *2022 ESPR* Logan Airport Planning Forecasts

Activity	*2017 ESPR* Forecast	*2022 ESPR* Forecast	Absolute Difference	Percent Difference
Passengers	50,113,905	53,500,000	+3,386,095	+7%
Operations				
Jet (>100 Seats)	339,365	344,223	+4,858	+1%
Regional Jet (<100 seats)	62,857	67,939	+5,082	+8%
Non-Jet	45,079	40,763	+4,316	-10%
Cargo	7,377	9,900	+2,523	+34%
GA	31,685	32,175	+490	+2%
Total	486,364	495,000	+8,636	+2%
Percent of Total Operations				
Jet (>100 Seats)	69.8%	69.5%	-0.3	
Regional Jet (<100 seats)	12.9%	13.7%	0.8	
Non-Jet	9.3%	8.2%	-1.0	
Cargo	1.5%	2.0%	+0.5	
GA	6.5%	6.5%	0.0	
Total	**100.0%**	**100.0%**		
Passengers Per Operation	**103**	**108**	**+5**	

Source: Massport, Inter*VISTAS*.

3.5.7.1 Comparison to FAA Terminal Area Forecast

FAA prepares an annual TAF for commercial service airports in the U.S., including Logan Airport. The TAF forecasts are based in part on the FAA's national aviation forecast. The methodologies used to develop the Logan Airport 2022 passenger forecast and the FAA TAF differ slightly. The Logan Airport forecast incorporates short-term service assumptions incorporating discussions with airlines serving the Airport while also relying on traditional econometric modeling over the longer term. The FAA TAF methodology uses a general structure based on economic conditions and national aviation industry factors. The FAA considers a local airport forecast "reasonable" or "consistent" if it is within 10 percent of the FAA TAF in the 5-year forecast period and within 15 percent in the 10-year forecast period. The *2022 ESPR* forecast presented for Logan Airport is within 5 percent of the most recent FAA TAF for Logan Airport through the 10- to 15-year Future Planning Horizon.