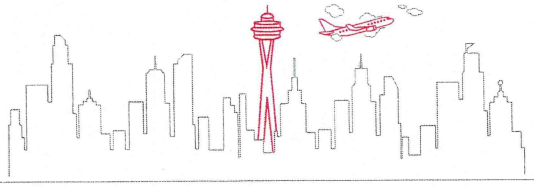


DELTA'S 5-YEAR SEATTLE HUB-IVERSARY

HOW DELTA BUILT A GLOBAL HUB AT SEA-TAC

GROWING WITH SEATTLE

"Delta helping to drive roaring Sea-Tac traffic"
—Seattle Times

"Delta has big plans for growing Sea-Tac hub"
—Seattle Times

"Delta's next initiative: The Seattle hub"
—Aviation Week

"Delta expanding again in Seattle"
—USA Today

June 2014 - June 2019

25 to 53
↑112%
Total Destinations

76 to 174
↑129%
Peak-Day Departures

343K to 690K
↑101%
Total seats

COMPETITION CREATES OPPORTUNITY

"Delta attacks Silicon Valley-to-Seattle route with A220 launch"
—The Points Guy

"Delta Air Lines CEO Ed Bastian praises progress of International Arrivals Facility at Sea-Tac Airport"
—Puget Sound Business Journal

"Delta to bring more options to Seattle trans-Pacific flights this summer"
—Travel Pulse

"Aeromexico affiliate of Delta Air Lines to launch nonstop Seattle-Mexico City flights"
—Puget Sound Business Journal

"Air France returns to Sea-Tac Airport with Boeing 777 flights to Paris"
—Puget Sound Business Journal

"Why Delta is adding new seatback screens while other airlines get rid of them"
—Travel + Leisure

"Delta defies trend, keeps adding seatback screens to planes"
—Conde Nast Traveler

"Delta announces first Airbus A330-900neo routes to Shanghai, Tokyo and Seoul this summer"
—Forbes

"Delta Sky Club at Sea-Tac Airport wins award for North America's leading lounge"
—Puget Sound Business Journal

39%* Higher Demand

9%* Lower Fares

New in 2020

450,000 sq. ft. International Arrivals Facility offering faster passport checkpoint clearance and:

12 to 20
↑66%
International Gates

4 to 7
↑75%
Baggage Carousels

1,200 to 2,600
↑116%
Passenger Capacity

Colocation with JV partners, working closer together for customers

New **flight attendant lounge**

New **Airbus A220** and **A330-900neo** aircraft

Wi-Fi on all flights

The most **seat-back entertainment** of any other carrier

INVESTING IN OUR PEOPLE & COMMUNITY

"Delta's Seattle-based employees get $47 million in bonuses"
—Seattle Times

"Seattle Sounders FC stays onboard with Delta"
—Atlanta Business Chronicle

"Delta Air Lines, Habitat for Humanity kick off final blitz build of veterans community"
—Auburn Reporter

"Fly on 'Seahawks Air'? Hawks, Sounders team up with Delta"
—Q13 FOX

"Delta Air Lines courts Seattle football fans with new perk-filled program"
—USA Today

"Delta Air Lines, YMCA spread holiday cheer at Sea-Tac for dozens of Washington students"
—Q13 FOX

"Seahawks partner with Delta to offset the team's travel emissions"
—Climate Action

"The North Pole exists in a Delta Air Lines hangar"
—Seattle Refined

Delta has grown its SEA team from **2,200 to 3,500 employees** from 2014 to 2019

Nearly **$240 million in profit sharing** has been paid to SEA-based employees since 2014

Delta supports the city's beloved local teams **Seahawks** and **Sounders FC**

More than **10,000 volunteer hours** spent by employees in the Seattle community

Delta has built **6 Habitat homes** and **5 KaBOOM! playgrounds** in Seattle

Delta employees have donated nearly **1,000 pints of blood** across more than **30 Delta-hosted blood drives** in Seattle

More than **100 employees** have volunteered at the Mobile Canteen during SeaFair Fleet Week

Employees have helped package more than **2,000 care packages** in partnership with USO Northwest

Nearly **500 employees** have volunteered at Holiday in the Hangar events in Seattle

Nearly **300 employees** have walked in AIDS Walk Seattle

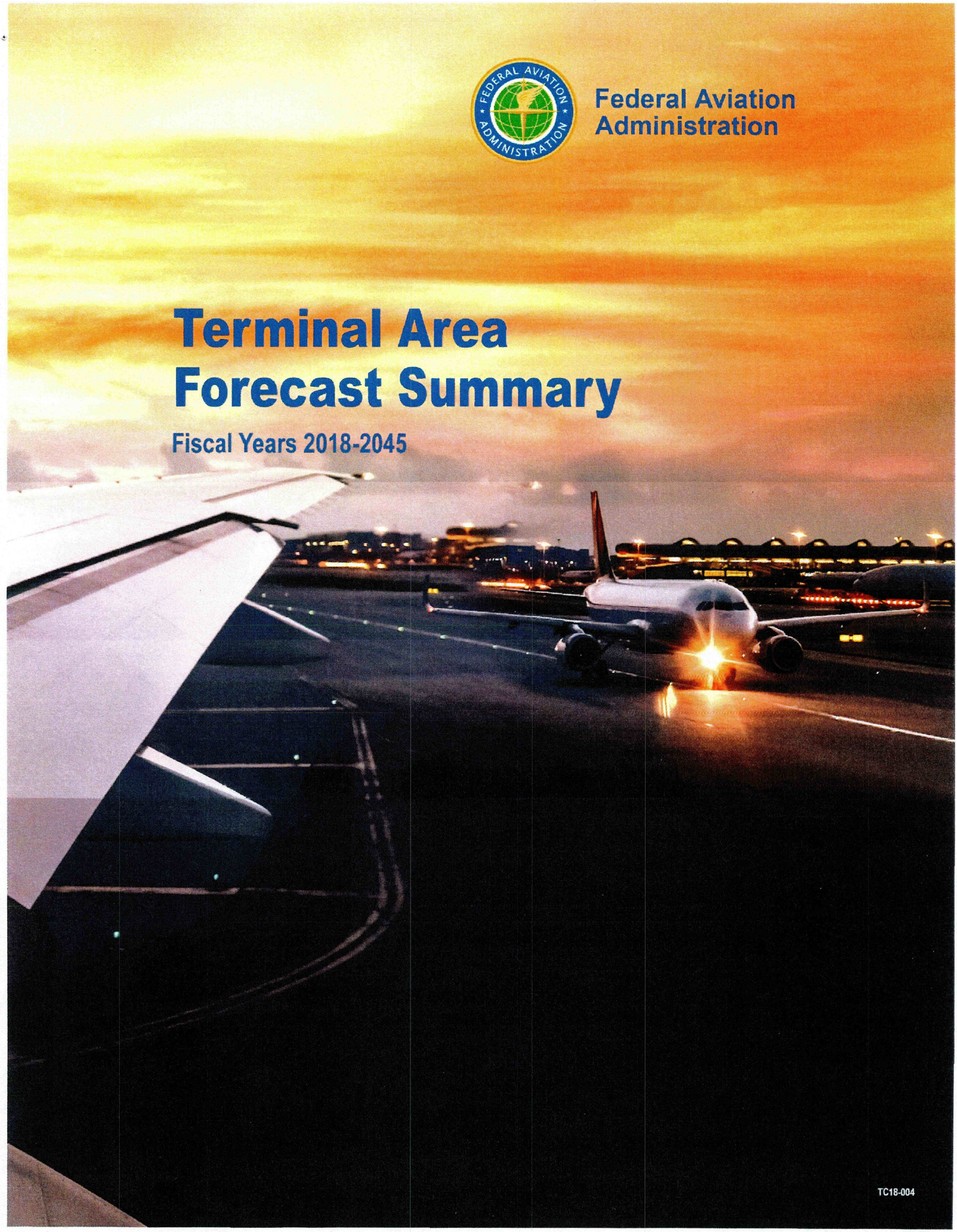
Nearly **700 employees** have taken part in Seattle PrideFest and Clean Sweep festivities

Delta partners with **3 Seattle community colleges** to provide career help to aviation maintenance students

Source: US DOT data from Diio for the average total fare on Seattle-originating domestic flights offered by all carriers for the period of 2013 compared to 2018.

For more information visit news.delta.com.

DELTA


Federal Aviation
Administration
Terminal Area
Forecast Summary
Fiscal Years 2018-2045
TC18-004

Preface

This publication provides aviation data users with summary historical and forecast statistics on passenger demand and aviation activity at U.S. airports. The summary level forecasts are based on individual airport projections.

The Terminal Area Forecast (TAF) includes forecasts for active airports in the National Plan of Integrated Airport Systems (NPIAS). The Federal Aviation Administration's (FAA) Forecast and Performance Analysis Division, Office of Aviation Policy and Plans, develops the TAF. As its primary input, the TAF initially used the national forecasts of aviation activity contained in FAA Aerospace Forecasts, Fiscal Years 2018-2038. The final TAF considers the forecasts and assumptions contained in FAA Aerospace Forecasts, Fiscal Years 2019-2039. Beginning April 25, 2019 the tables for the national forecasts can be found at:

http://www.faa.gov/data_research/aviation/aerospace_forecasts/

The TAF is available on the Internet. The TAF model and TAF database can be accessed at:

http://www.faa.gov/data_research/aviation/taf

The TAF model allows users to create their own forecast scenarios. It contains a query data application that allows the public to access and print historical (1990 to 2017) and forecast (2018 to 2045) aviation activity data by individual airport, state, or FAA region.

The FAA welcomes public comment on the forecasts, as well as suggestions for improving the usefulness of the TAF.

Roger Schaufele, Jr.
Manager
Forecast and Performance Analysis Division
Office of Aviation Policy and Plans

Table S-1 Enplanements at Large Hub Airports (in thousands)

Loc ID	Region	Airport Name	2017	2017 Percent*	2018	2022	2045	Rate** 2017-2045	Airport ranking 2017	Airport ranking 2045
ATL	ASO	HARTSFIELD - JACKSON ATLANTA INTL	50,422	5.96	51,358	56,460	84,069	1.84	1	1
LAX	AWP	LOS ANGELES INTL	40,908	4.83	42,388	46,612	73,212	2.10	2	2
ORD	AGL	CHICAGO O'HARE INTL	38,169	4.51	39,775	44,814	67,017	2.03	3	3
DFW	ASW	DALLAS-FORT WORTH INTL	31,433	3.71	32,890	36,837	54,537	1.99	4	5
DEN	ANM	DENVER INTL	29,574	3.49	30,850	35,133	51,487	2.00	5	6
JFK	AEA	JOHN F KENNEDY INTL	29,504	3.49	29,890	33,970	56,168	2.33	6	4
SFO	AWP	SAN FRANCISCO INTL	26,483	3.13	27,895	30,360	49,563	2.26	7	7
LAS	AWP	MC CARRAN INTL	23,106	2.73	23,633	25,813	39,273	1.91	8	11
SEA	ANM	SEATTLE-TACOMA INTL	22,450	2.65	23,700	27,367	44,944	2.51	9	8
CLT	ASO	CHARLOTTE/DOUGLAS INTL	21,694	2.56	22,316	24,645	37,632	1.99	10	12
EWR	AEA	NEWARK LIBERTY INTL	21,205	2.50	22,564	25,908	44,936	2.72	11	9
PHX	AWP	PHOENIX SKY HARBOR INTL	21,116	2.49	21,488	23,488	34,639	1.78	12	17
MCO	ASO	ORLANDO INTL	20,996	2.48	22,407	26,027	40,312	2.36	13	10
MIA	ASO	MIAMI INTL	20,490	2.42	20,733	22,645	36,367	2.07	14	13
IAH	ASW	GEORGE BUSH INTERCONTINENTAL/HOUSTON	19,557	2.31	20,694	23,544	36,183	2.22	15	14
BOS	ANE	GENERAL EDWARD LAWRENCE LOGAN INTL	18,508	2.19	19,649	22,432	35,563	2.36	16	15
MSP	AGL	MINNEAPOLIS-ST PAUL INTL/WOLD-CHAMBERLAIN	18,336	2.17	18,414	19,603	28,513	1.59	17	18
DTW	AGL	DETROIT METROPOLITAN WAYNE COUNTY	16,964	2.00	17,346	18,545	25,188	1.42	18	19
FLL	ASO	FORT LAUDERDALE/HOLLYWOOD INTL	15,331	1.81	16,843	19,983	35,416	3.04	19	16
LGA	AEA	LAGUARDIA	14,439	1.71	15,050	17,080	19,938	1.16	20	23
PHL	AEA	PHILADELPHIA INTL	14,162	1.67	15,125	17,152	23,831	1.88	21	20
BWI	AEA	BALTIMORE/WASHINGTON INTL THURGOOD MARSHALL	12,761	1.51	13,343	14,023	19,857	1.59	22	24
SLC	ANM	SALT LAKE CITY INTL	11,527	1.36	12,068	13,462	20,480	2.07	23	22
DCA	AEA	RONALD REAGAN WASHINGTON NATIONAL	11,477	1.36	11,458	13,190	17,373	1.49	24	28
IAD	AEA	WASHINGTON DULLES INTL	10,947	1.29	11,414	12,893	19,792	2.14	25	25
MDW	AGL	CHICAGO MIDWAY INTL	10,901	1.29	10,774	11,331	17,247	1.65	26	29
SAN	AWP	SAN DIEGO INTL	10,889	1.29	12,001	13,859	22,206	2.58	27	21
HNL	AWP	DANIEL K INOUYE INTL	9,703	1.15	9,565	9,956	13,383	1.16	28	30
PDX	ANM	PORTLAND INTL	9,399	1.11	9,715	10,901	17,446	2.23	29	27
TPA	ASO	TAMPA INTL	9,354	1.10	10,184	11,753	18,785	2.52	30	26
Total			611,804	72.27	635,531	709,787	1,085,356	2.07		

*Percent of total US enplanements.
**Annual compound growth rate.

Graph S-1 Enplanements Growth Rates for the Large Hub Airports Fiscal Years 2017 to 2045

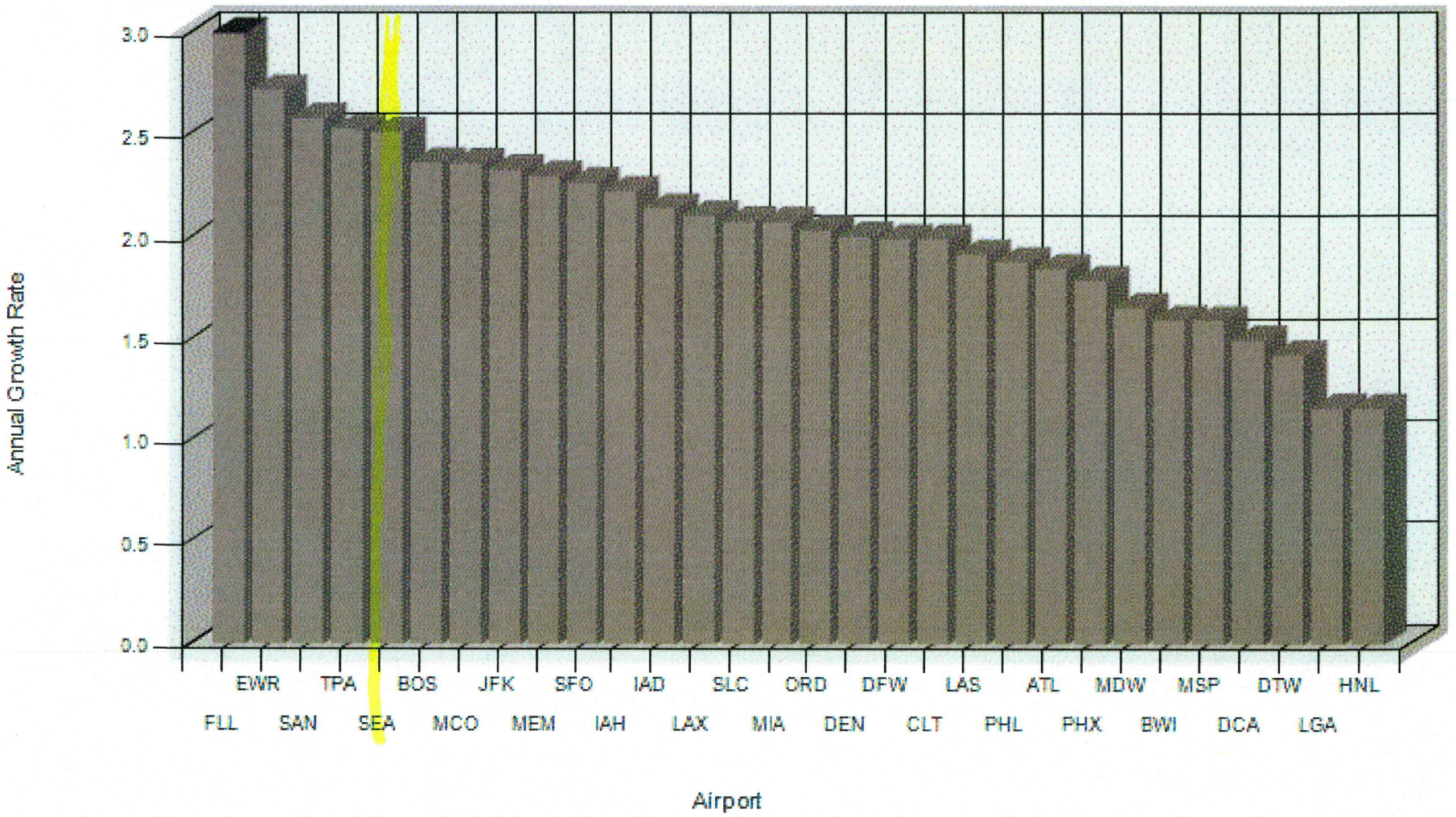
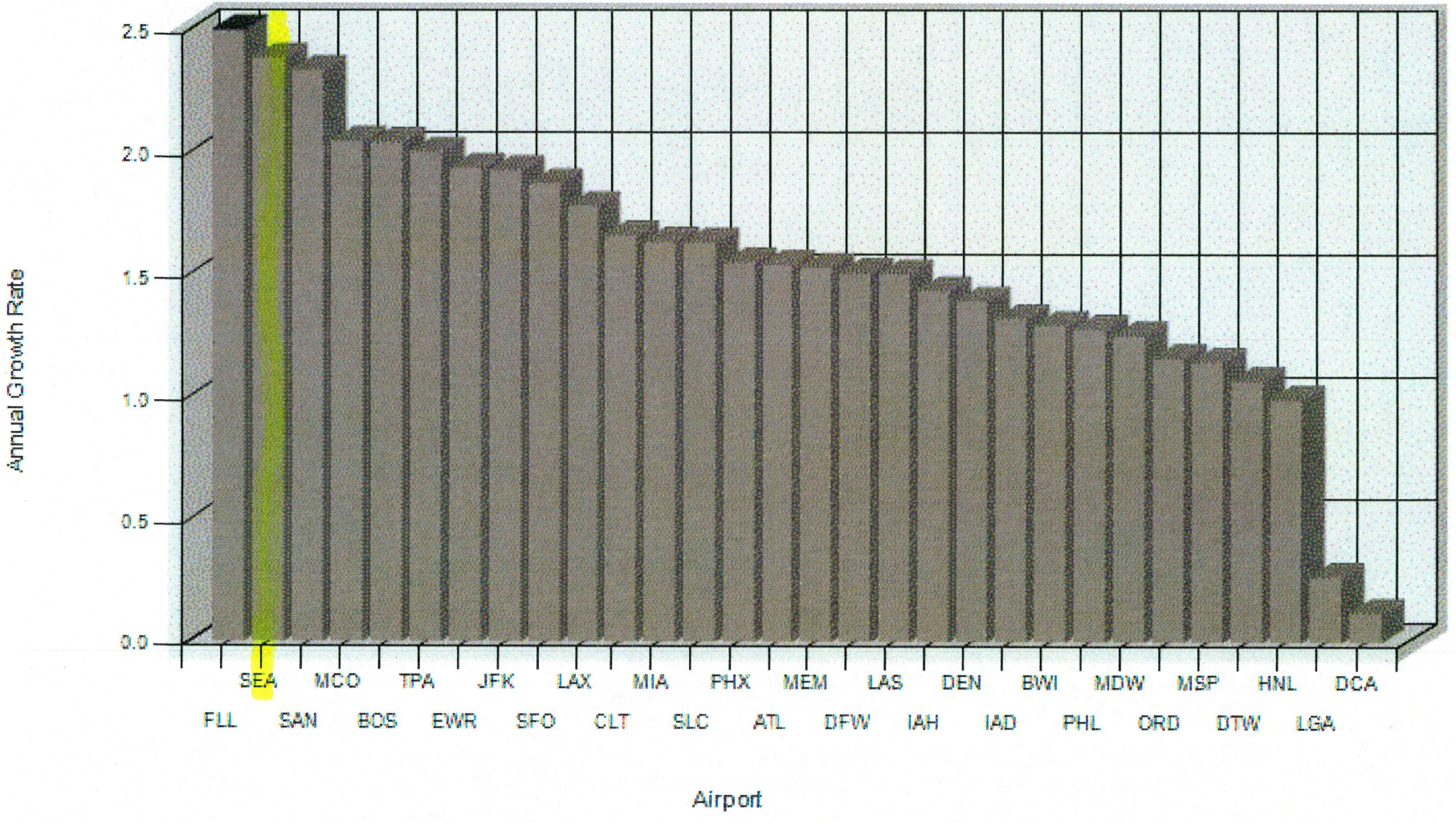


Table S-2 Airport Operations at Large Hub Airports (in thousands)

Loc ID	Region	Airport Name	2017	2017 Percent*	2018	2022	2045	Rate** 2017-2045	Airport ranking 2017	Airport ranking 2045
ATL	ASO	HARTSFIELD - JACKSON ATLANTA INTL	885	0.91	890	935	1,357	1.54	1	1
ORD	AGL	CHICAGO O'HARE INTL	859	0.88	893	873	1,187	1.16	2	2
LAX	AWP	LOS ANGELES INTL	703	0.72	707	753	1,152	1.78	3	3
DFW	ASW	DALLAS-FORT WORTH INTL	656	0.67	664	705	997	1.51	4	4
DEN	ANM	DENVER INTL	584	0.60	595	621	860	1.39	5	6
CLT	ASO	CHARLOTTE/DOUGLAS INTL	552	0.57	548	596	876	1.66	6	5
LAS	AWP	MC CARRAN INTL	544	0.56	537	580	825	1.50	7	7
JFK	AEA	JOHN F KENNEDY INTL	454	0.47	456	497	775	1.93	8	9
SFO	AWP	SAN FRANCISCO INTL	453	0.47	473	493	762	1.87	9	10
IAH	ASW	GEORGE BUSH INTERCONTINENTAL/HOUSTON	452	0.46	463	474	674	1.43	10	13
EWR	AEA	NEWARK LIBERTY INTL	441	0.45	451	474	754	1.93	11	11
PHX	AWP	PHOENIX SKY HARBOR INTL	432	0.44	431	462	665	1.55	12	14
MSP	AGL	MINNEAPOLIS-ST PAUL INTL/WOLD-CHAMBERLAIN	415	0.43	410	413	571	1.14	13	18
SEA	ANM	SEATTLE-TACOMA INTL	414	0.43	434	498	800	2.38	14	8
MIA	ASO	MIAMI INTL	409	0.42	418	433	644	1.64	15	15
BOS	ANE	GENERAL EDWARD LAWRENCE LOGAN INTL	401	0.41	423	468	706	2.04	16	12
DTW	AGL	DETROIT METROPOLITAN WAYNE COUNTY	394	0.40	395	401	530	1.07	17	20
PHL	AEA	PHILADELPHIA INTL	372	0.38	375	400	531	1.28	18	19
LGA	AEA	LAGUARDIA	366	0.38	368	371	394	0.27	19	24
MCO	ASO	ORLANDO INTL	332	0.34	349	390	586	2.04	20	17
SLC	ANM	SALT LAKE CITY INTL	325	0.33	335	364	511	1.63	21	21
HNL	AWP	DANIEL K INOUYE INTL	312	0.32	311	322	412	0.99	22	23
FLL	ASO	FORT LAUDERDALE/HOLLYWOOD INTL	306	0.31	330	371	611	2.50	23	16
DCA	AEA	RONALD REAGAN WASHINGTON NATIONAL	298	0.31	298	307	308	0.12	24	30
IAD	AEA	WASHINGTON DULLES INTL	294	0.30	301	311	424	1.32	25	22
BWI	AEA	BALTIMORE/WASHINGTON INTL THURGOOD MARSHALL	258	0.26	268	271	369	1.29	26	27
MDW	AGL	CHICAGO MIDWAY INTL	252	0.26	245	253	357	1.25	27	28
PDX	ANM	PORTLAND INTL	229	0.23	232	258	393	1.95	28	25
SAN	AWP	SAN DIEGO INTL	205	0.21	222	251	391	2.33	29	26
TPA	ASO	TAMPA INTL	193	0.20	204	223	335	2.00	30	29
Total			12,789	13.14	13,025	13,769	19,757	1.57		

*Percent of total US operations.
**Annual compound growth rate.

Graph S-2 Airport Operations Growth Rates for the Large Hub Airports Fiscal Years 2017 to 2045



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Forecast Highlights (2019–2039)

Since its deregulation in 1978, the U.S. commercial air carrier industry has been characterized by boom-to-bust cycles. The volatility that was associated with these cycles was thought by many to be a structural feature of an industry that was capital intensive but cash poor. However, the great recession of 2007-09 marked a fundamental change in the operations and finances of U.S Airlines. Since the end of the recession in 2009, U.S. airlines revamped their business models to minimize losses by lowering operating costs, eliminating unprofitable routes, and grounding older, less fuel-efficient aircraft. To increase operating revenues, carriers initiated new services that customers were willing to purchase and started charging separately for services that were historically bundled in the price of a ticket. The industry experienced an unprecedented period of consolidation with three major mergers in five years. The results of these efforts have been impressive: 2018 marks the tenth consecutive year of profitability for the U.S. airline industry. Looking forward, there is confidence that U.S. airlines have finally transformed from a capital intensive, highly cyclical industry to an industry that generates solid returns on capital and sustained profits.

Fundamentally, over the medium and long term, aviation demand is driven by economic activity, and a growing U.S. and world economy provides the basis for aviation to grow over the long run. The 2019 FAA forecast calls for U.S. carrier domestic passenger growth over the next 20 years to average 1.8 percent per year. The uptick in passenger growth since 2014 will continue into 2019 driven by generally positive economic conditions in the U.S. and the world. Oil prices averaged $64 per barrel in 2018 edging down to $61 in 2019, and our forecast assumes they will increase beginning in the early 2020s to reach $98 by the end of the forecast period. After a year of solid economic growth in 2018 for the U.S. and generally around the world, conditions are beginning to gradually ease. Some headwinds that have been present over the past few years remain, such as the uncertainty surrounding "Brexit" and the difficulty China faces in managing the slowdown of its economy. Meanwhile, new headwinds have developed, including a broad slowdown in global trade, political tensions in several countries, and economic slumps in Italy and Germany. The U.S. economy is showing signs of moderating from the above-trend pace in 2018 as the expansion is poised to become the longest on record. Growth is expected to ease back towards trend with domestic demand supported by positive financial conditions, a strong labor market, and continuing effects of the 2017 Tax Cuts and Jobs Act.

System traffic in revenue passenger miles (RPMs) is projected to increase by 2.2 percent a year between 2019 and 2039. Domestic RPMs are forecast to grow 1.9 percent a year while International RPMs are forecast to grow significantly faster at 3.0 percent a year. System capacity as measured by available seat miles (ASMs) is forecast to grow in line with the increases in demand. The number of seats per aircraft is growing, especially in the regional jet market, where we expect the number of 50 seat regional jets to fall to just a handful by 2030, replaced by 70-90 seat aircraft.

Although the U.S. and global economies saw solid growth in 2018, a combination of higher energy prices and labor cost increases resulted in profits for U.S. airlines falling further from 2016's record levels. The FAA expects U.S. carrier profitability to remain steady or increase as solid demand fed by a stable economy offsets rising energy and labor costs. Over the long term, we see a competitive and profitable aviation industry characterized by increasing demand for air travel and airfares growing more slowly than inflation, reflecting over the long term a growing U.S. and global economy.

The long-term outlook for general aviation is stable to optimistic, as growth at the high-end offsets continuing retirements at the traditional low end of the segment. The active general aviation fleet is forecast to remain relatively level between 2019 and 2039. While steady growth in both GDP and corporate profits results in continued growth of the turbine and rotorcraft fleets, the largest segment of the fleet – fixed wing piston aircraft continues to shrink over the forecast. Against the stable fleet, the number of general aviation hours flown is projected to increase an average of 0.8 percent per year through 2039, as growth in turbine, rotorcraft, and experimental hours more than offset a decline in fixed wing piston hours.

With increasing numbers of regional and business jets in the nation's skies, fleet mix changes, and carriers consolidating operations in their large hubs, we expect increased activity growth that has the potential to increase controller workload. Operations at FAA and contract towers are forecast to grow 0.9 percent a year over the forecast period with commercial activity growing at five times the rate of non-commercial (general aviation and military) activity. The growth in U.S. airline and business aviation activity is the primary driver. Large and medium hubs will see much faster increases than small and non-hub airports, largely due to the commercial nature of their operations.

Review of 2018

An improving economy at home and solid growth abroad translated into another good year for U.S. aviation in 2018. Airlines posted their tenth consecutive year of profits as they boosted revenue growth at the fastest rate since the recession. Revenues grew as the U.S. airline industry continues to shift its emphasis from gaining market share to seeking returns on invested capital. U.S. airlines are continually updating their successful strategies for capturing additional revenue streams such as charging fees for services that used to be included in airfare (e.g. meal service), charging for services that were not previously available (e.g. premium boarding and fare lock fees), as well as for maximizing fare revenue with more sophisticated revenue management systems. At the same time, the U.S. airline industry has become nimbler in adjusting capacity to seize opportunities or minimize losses, helping to raise yields for the first time in four years. These efforts secured industry profitability in 2018 even as energy prices and new labor contracts lifted costs higher.

Demand for air travel in 2018 picked up again after cooling in 2017 as economic growth in the U.S. accelerated. In 2018, system traffic as measured by revenue passenger miles (RPMs) increased 4.8 percent while system enplanements grew 4.7 percent. Domestic RPMs were up 5.4 percent while enplanements were up by 5.0 percent. International RPMs increased 3.4 percent and enplanements grew by 2.8 percent. The system-wide load factor was 83.8 percent, up three tenths of a percent from the 2017 level.

System yields increased for the first time since 2014. In domestic markets, expansion by ultra-low cost carriers such as Spirit and Allegiant, as well as by mainline carriers such as United, helped to keep a lid on fare increases despite rising energy and labor costs as yields were unchanged. International yield rose a strong 5.6 percent as both the Atlantic and Latin regions gained sharply and the Pacific region reversed course after years of declines and posted a solid gain. Despite rising energy and labor costs, U.S. airlines remained solidly profitable in FY 2018. Data for FY 2018 show that the reporting passenger carriers had a combined operating profit of $17.6 billion (compared to a $21.5 billion operating profit for FY 2017). The network carriers[1] reported combined operating profits of $12.5 billion while the low cost carriers[2] reported combined operating profits of $4.5 billion as all carriers posted profits.

The general aviation industry recorded an increase of 9.2 percent in deliveries of U.S. manufactured aircraft in 2018, with pistons up by 5.5 percent and turbines up by 12.8 percent. As the higher priced turbine deliveries improved significantly (as opposed to a flat performance last year), U.S. billings increased 9.0 percent to $11.6 billion. General aviation activity at FAA and contract tower airports recorded a 3.3 percent increase in 2018 as local activity rose 5.2 percent, more than offsetting a 1.8 percent decline in itinerant operations.

Total operations in 2018 at the 518 FAA and contract towers were up 2.9 percent compared to 2017. This marks the first time since FY 1997-2000 that operations at FAA and funded towers have increased for four consecutive years. Air carrier activity increased by 4.3 percent, more than offsetting a decline in air taxi operations, while general aviation rose 3.3 percent and military activity decreased 2.1 percent. Activity at large hubs rose by 1.9 percent, while medium hub activity increased by 3.5 percent and small hub airport activity was up 1.5 percent in 2018 compared to the prior year.

[1] Network carriers are: Alaska Airlines, American Airlines, Delta Air Lines, and United Air Lines.

[2] Low cost carriers are: Allegiant Air, Frontier Airlines, JetBlue Airways, Southwest Airlines, Spirit Air Lines, Sun Country Airlines.

Manage Flight Demand or Build Airport Capacity?

MEGAN S. RYERSON AND AMBER WOODBURN

Airports can manage air traffic congestion in two ways: 1) add infrastructure or 2) manage flight demand. The environmental and economic implications of these options, however, often conflict. New runways have significant financial and environmental costs, but they can also stimulate economic development and increase a city's appeal to businesses. Managing demand saves construction costs and encourages fuel efficiency but may limit opportunities for regional growth. Our research finds that airports in the US underestimate or ignore these tradeoffs and, as a result, frequently fail to consider managing demand as an alternative to building new runways.

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The Airport Congestion Problem

Following federal deregulation in the 1970s, airlines increased their use of hub-and-spoke operations. Rather than offering a nonstop route, flights connect through hub airports. Deregulation allowed airlines to set their own routes, service frequency, and type of aircraft. As a result, fares fell, services increased, and the demand for air travel surged. Increased flight frequency at hubs, however, created congestion and exacerbated environmental impacts such as noise, air pollution, and greenhouse gas emissions. While airlines can benefit from expanding hub airport capacity, it is unclear whether it is the best long-term solution to airport congestion. One alternative is for airports to manage demand.

Airports and the Federal Aviation Administration (FAA) currently have two strategies to manage demand: 1) caps on flights and 2) congestion pricing. The FAA has sole authority to cap the number of flights at an airport. FAA policy, however, does not support caps as a long-term solution, stating that caps are not in the public interest and should be imposed to alleviate air traffic delays only after other alternatives have been tried.

As an alternative to caps, the FAA allows airports to charge congestion fees for landings during peak hours. Congestion charges encourage airlines to 1) shift their flights from peak to off-peak hours, 2) use larger aircraft to consolidate flights, 3) shift traffic to other airports in the region, or 4) eliminate flights altogether. While the FAA allows congestion pricing, the agency does not promote it, stating that such pricing should be employed only when "airport development projects cannot be built in time to prevent congestion." Furthermore, the FAA limits the total revenue that airports can collect from congestion charges. No US airports currently charge congestion fees.

FAA policy is clear: building capacity is preferred to either congestion pricing or flight caps. As stated in the FAA Authorization Act of 1994, "It is FAA policy that projects that increase [airport] capacity be undertaken to the maximum feasible extent so that safety and efficiency increase and delays decrease."

FAA policy is clear: building capacity is preferred to either congestion pricing or flight caps.

Demand Management in Airport Planning

Airports have two opportunities during the planning process to evaluate the tradeoffs between adding capacity and managing demand. The first is with an Environmental Impact Statement (EIS). When an airport sponsor—usually a city government or an airport authority—proposes to construct a new runway, it must prepare an EIS in cooperation with the FAA. An EIS includes a detailed description of the proposed project's environmental and socio-economic impacts, as well as the impacts of all *feasible* project alternatives and the no-build scenario. An EIS is required for airports to comply with the National Environmental Policy Act (NEPA) and to maintain eligibility for federal funds.

To complete an EIS, the FAA and airport sponsor must craft a Purpose and Need Statement to define project objectives and the overarching problems that motivate the project. The EIS must also include alternatives to the preferred project design. Alternatives may include different runway configurations, demand management strategies such as congestion pricing, or other actions that satisfy the project objectives. Airports begin the analysis by evaluating whether the alternatives are technically and economically possible and whether they satisfy the EIS's Purpose and Need Statement. The alternatives that are deemed feasible advance to the next stage for a full environmental review.

Another opportunity to evaluate tradeoffs occurs during regional planning efforts. The FAA helps regional planning organizations prepare a Regional Airport Systems Plan (RASP). RASPs generally study the regional outcome of demand management (e.g., How will regional flight demand change after demand management policies are in place at a major airport?). ➢

They rarely study alternative strategies to achieve the desired outcome (e.g., Should a major airport use peak pricing or operations policies to limit capacity?). RASPs focus on the regional impacts of different airport demand scenarios rather than directly comparing airport-specific policies. But regional planning agencies can examine and demonstrate demand management tradeoffs using RASPs, and provide this knowledge to airports and the FAA to promote demand management.

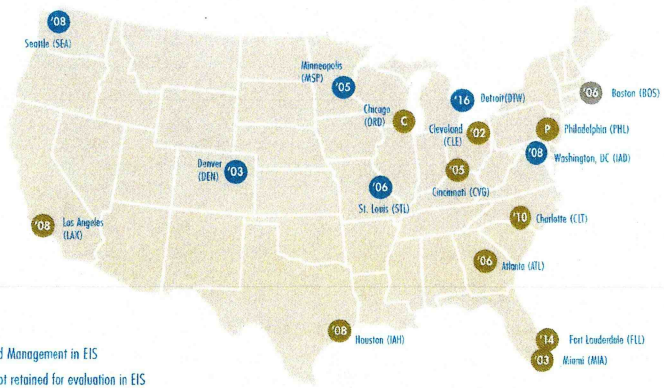
It should be noted, however, that while all airports must prepare an EIS to receive FAA funding for expansion, not all regions require a RASP. Even among those that do, there is no guaranteed coordination between regional planning and airport expansion efforts. Federal funding for regional airport capacity studies and runway construction projects are both funded through the same federal program. The division between the two, however, is anything but equal. From 1992 to 2009, 32 percent of total FAA airport improvement funding went to runway construction, while less than 2 percent supported planning activities.

A Poor Record of Evaluating Tradeoffs

We collected EISs from the 35 US airports the FAA classified as "nationally significant," meaning their congestion and delay can spread and cause delays at airports around the world. These airports can reasonably be expected to assess demand management as an alternative to adding capacity. Of the 17 airports that increased or planned to increase runway capacity after 2000 and completed an EIS (Figure 1), only one—Boston Logan International Airport—conducted a comprehensive analysis of demand management as an alternative to a new runway.

FIGURE 1

Demand Management in Airport Environmental Impact Statements



Year deployed
C In construction
P Planned
No discussion of Demand Management in EIS
Demand Management not retained for evaluation in EIS
Demand Management retained for evaluation in EIS

What Makes Boston Unique?

The New England Airport Coalition, formed in 1994, includes the six New England state aviation agencies, all airport sponsors with scheduled jet passenger service, and a regional economic development council. One of the airport sponsors is Massport, the port authority responsible for Boston Logan Airport. From 2002 to 2006, the regional coalition published two phases of their New England Regional Air Service Study, part of a RASP that ran parallel to Massport's EIS preparation. The study analyzed underutilized regional airports in New England, documented their available capacity, and assessed the economic impact of shifting service from Logan to those airports. Massport stated that this regional planning effort allowed them to understand the impact of demand management at Logan and thus incorporate peak pricing into their EIS.

After documenting the tradeoffs between a new runway and demand management strategies, Massport ultimately chose to build the runway and keep congestion pricing as a potential mitigation measure. As of 2015, they had not used congestion pricing.

Why Do Airports Reject Demand Management?

Some airports mention demand management in their EIS but state it is not a feasible alternative to building a runway. Others avoid the subject altogether. Three overarching barriers cause airport sponsors to reject demand management as an alternative to runway growth: 1) narrow Purpose and Need Statements; 2) policy conflicts and uncertainty; and 3) emphasis on airports as a tool for regional economic development.

Narrow Purpose and Need Statements

Seventeen airports in our sample prepared an EIS for runway expansion. Of these, 16 did not include demand management as a feasible alternative, citing the need to accommodate growing demand while keeping delay at an acceptable level (generally 15 minutes per flight, as suggested by the FAA). An EIS that defines a project's purpose and need strictly in terms of physical capacity will reject demand management—and any other no-build policies—as a feasible alternative. For example, Cleveland Hopkins International Airport set a specific goal of building a longer runway, and thus did not evaluate demand management as a feasible alternative.

Narrow Purpose and Need Statements indicate a deeper conflict between the National Environmental Policy Act's procedural requirements and its core objectives. If airport sponsors define project goals in ways that preclude feasible project alternatives, they may be following the letter of NEPA law but not its spirit of environmental stewardship. Additionally, there are legal incentives to produce narrow Purpose and Need Statements. Judges generally defer to the FAA in approving these statements and in interpreting the feasibility of alternatives.

The alternatives analysis in the EIS can generate useful, policy-changing information only if the Purpose and Need are broad enough to entertain nontraditional solutions. As an example from another agency, in 1986, a US Forest Service EIS documented the hazards of herbicides and suggested alternatives that were both reasonable and environmentally superior. The findings prompted the agency to support nonchemical approaches to vegetation management whenever possible rather than accepting herbicides as the only solution. Planners and stakeholders can do something similar by considering a shift in traffic from major airports to regional ones in the EIS alternatives analysis. This analysis can help show the value of demand management. ➢

Demand management holds great potential for airline and airport cost savings and reduced environmental impacts.

FURTHER READING

Jan Brueckner. 2009. "Airport Congestion Management: Prices or Quantities?" *ACCESS*, 35: 10–15.

Megan S. Ryerson and Amber Woodburn. 2014. "Build Airport Capacity or Manage Flight Demand: How Regional Planners Can Lead American Aviation into a New Frontier of Demand Management." *Journal of the American Planning Association*, 80(2): 138–152.

Amber Woodburn, Megan S. Ryerson, and Mikhail Chester. 2013. "Challenges to Analysis of Air and Rail Alternatives in Government Environmental Impact Review Processes." *Transportation Research Record*, 2336: 9–17.

Policy Conflicts and Uncertainty

Four of the eleven EIS documents that initially considered demand management cited legal uncertainties as a reason not to advance it as a feasible alternative. Of these, three airports—Fort Lauderdale-Hollywood, Chicago (O'Hare), and Philadelphia—discussed how federal law explicitly promotes increasing capacity. Additionally, the FAA restricts airports from generating revenue in excess of their costs. Thus some airports—Cleveland, Charlotte, and Fort Lauderdale-Hollywood—asserted they could not charge a congestion fee high enough to encourage airlines to shift flights from the peak hours without violating this revenue cap.

In short, demand management is legal and possible to implement, yet airport sponsors can refuse to advance it as a feasible alternative by citing FAA policy and pro-build language. In contrast, RASP efforts can help circumvent policy conflicts since these are exploratory planning studies that occur outside the NEPA process. Unlike in an EIS, where the underlying mission is to build infrastructure, FAA pro-build policy does not immediately deter RASP planners from exploring alternatives to new runways.

Economic Development and Airline Hubs

The link between airports and economic development in the US has roots from the 1920s. In her look at the history of US airports, Professor Janet Bednarek at the University of Dayton writes that "a city had to have [an airport] in order to achieve its 'destined' growth and development to match or, better, overwhelm its urban rivals." Such urban competition remains today, as seen by airport EIS documents that argue in favor of airport expansion to preserve the city's hub status.

Across all reviewed airport EIS documents, the most frequently cited reason for increasing capacity was to enhance the airport's ability to accommodate flights and, in some cases, remain a hub airport. The sponsors of eleven hub airports (three of which are no longer hubs as of 2015) explicitly cited a desire to protect the hub operation of their primary airline. Eight airports considered demand management but cited their hub status as a reason not to advance it as a feasible alternative. There is limited research on whether expanding capacity helps airports maintain their hub status, or on whether the environmental impacts of constructing a larger airport are offset by the promise of business growth. Therefore, the tradeoffs between increasing capacity and managing demand remain unknown.

CONCLUSION

Demand management holds great potential for airline and airport cost savings and reduced environmental impacts. Strengthening the role of regional planners in the airport planning process would lead to greater consideration of demand management and may bring innovative solutions to airport congestion. We recommend that 1) the FAA play a more direct role in funding regional airport planning and creating regional airport planning coalitions; 2) regional planners collaborate early in the airport EIS process; and 3) planners encourage the FAA to make demand management a mandatory alternative in an EIS for increased airport capacity.

With some creative thinking, airport planners could create a regional planning process that improves the value of EISs, inspires changes to FAA policy, and explores critical alternatives to increased capacity. EIS methods in aviation planning are not set in stone; if new ideas and new people come to the table, more environmentally innovative solutions to airport congestion may arise. ◆

This article is adapted from "Build Airport Capacity or Manage Flight Demand? How Regional Planners Can Lead American Aviation into a New Frontier of Demand Management," originally published in the *Journal of the American Planning Association*.