

# AIR TRAFFIC BY THE NUMBERS

May 2022



Federal Aviation  
Administration

## FAA Contributors to ATO By the Numbers

- **Air Traffic Organization (ATO)**
    - **AJR - System Operations**
      - **AJR-G Performance Analysis**
      - **AJR-B Flight Service**
    - **AJI - Safety and Technical Training Services**
      - **AJI-3 Policy and Performance**
    - **AJM – Program Management Organization**
      - **AJM-33 Aviation Weather & Aero Services**
    - **AJT – Air Traffic Services**
  - **Non-ATO**
    - **AOC – Office of Communications**
    - **ABP-230 – Data Analysis and Reporting Services Branch**
    - **APO – Aviation Policy & Plans**
    - **AST – Office of Commercial Space Transportation**
    - **AVS – Aviation Safety**
- 

## Data Sources

<u>Database Name</u>	<u>Owned/Managed by</u>
Aviation System Performance Metrics (ASPM)	AJR-G
Operations Systems Network (OPSNET)	AJR-G (archive), AJM and AJW
National Traffic Management Log (NTML)	AJR-G (archive), AJM and AJW
Traffic Flight Management System (TFMS)	AJR-G (archive), AJM and AJW
National Offload Program (NOP)	AJR-G (archive) and AIT
U.S. Civil Airmen Statistics	APO
Runway Incursion Data	AVS
BTS T-100 Market and Segment Data	Bureau of Transportation Statistics

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## Introduction

*Air Traffic By the Numbers*, or the *ATO Fact Book*, is a source book containing annual U.S. airport and air traffic control operations and performance data from the Federal Aviation Administration (FAA). It also includes information on air passenger travelers, runway incursions, commercial space launch activity, the economic impact of aviation, and so on.

The *Fact Book*, first published by the Office of Performance Analysis, Air Traffic Organization (ATO) of the FAA in 2017, is updated annually, with data now current up until FY2021. This document represents the sixth edition of *Air Traffic By the Numbers*; five previous editions appeared in August 2017, November 2018, June 2019, August 2020, and October 2021.

The storyline behind this year's *Fact Book* continues to be the negative impact of the current COVID-19 pandemic on the volume of air traffic. This impact began in March 2020 and extended through the rest of FY2020 and FY2021. Since the pandemic continues beyond FY2021, its influence will affect next year's FY2022 *Fact Book* numbers as well.

Organization of the *ATO Fact Book* is unchanged from last year. Section 1 includes some overall aviation-related statistics. NAS demand and efficiency measures appear in Section 2. New delay, diversion, go-around, and cancellation information follow in Section 3. Section 4 includes the latest data on various traffic management initiatives (TMI). Updated safety metric results are reported in Section 5. Other ATO Topics of interest, such as flight service and commercial space, are available in Section 6.

Below are selected results for FY2021.

- The number of air traffic controllers decreased by 2.8 percent, to 13,850 (in Section 1).
- The number of pilot certificates increased by 4.2 percent in CY2021 to 720,603; and remote (or drone) pilot certificates increased by 23.4 percent, to 254,587 (Section 1).
- The number of passengers flown by air carriers increased by 4.1 percent, to 597.9 million (Section 1). This was far less than the pre-pandemic (FY2019) level of 1,057.6 million passengers.
- IFR flights in the U.S. rose by 6.2 percent, to 13 million (Section 1). Before the pandemic, IFR flights numbered 16.4 million (FY2019).
- Core 30 airport operations rose by 2.3 percent, to 9.5 million; operations handled by stand-alone TRACONS rose by 4.4 percent, to 16.4 million, while operations handled by centers rose by 6.2 percent, to 34.1 million (Section 2). Before the pandemic, airport, TRACON, and center operations were higher; at 13.2 million, 20.3 million, and 43.7 million, respectively.

Work on this publication benefited from the contributions from many offices and individuals throughout the Air Traffic Organization and the Federal Aviation Administration. As always, we thank everyone who participated in this effort.

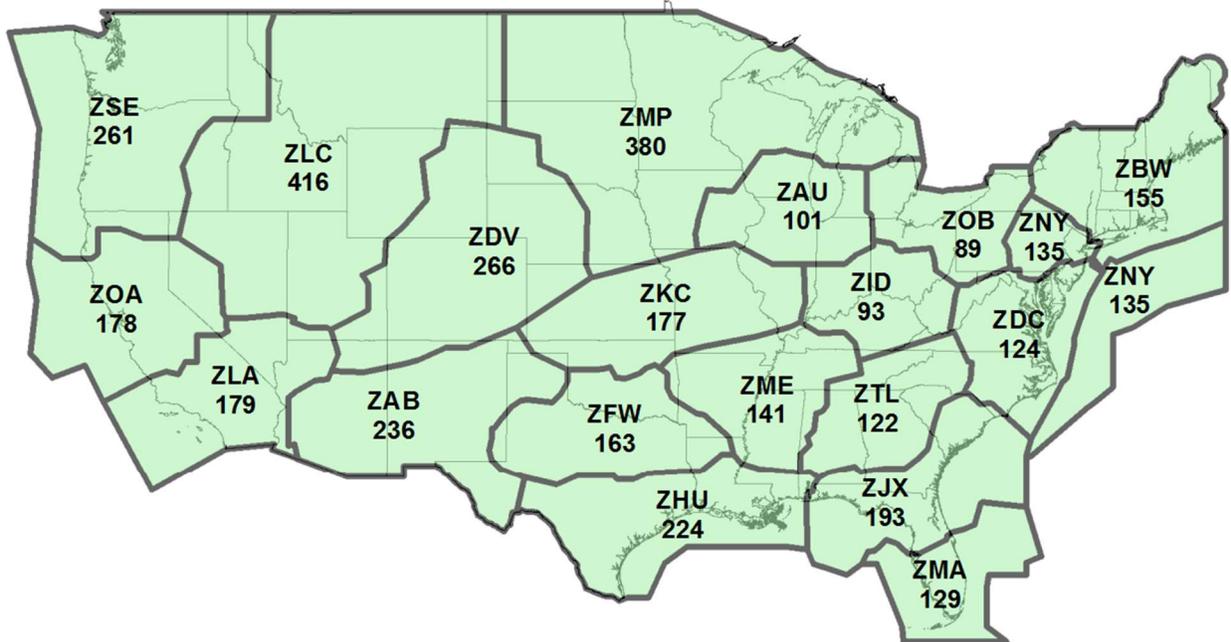
System Events and Analysis Group (AJR-G3)  
Office of Performance Analysis  
System Operations Services  
Air Traffic Organization  
Federal Aviation Administration  
U.S. Department of Transportation

May 2022

# Air Traffic Organization Leadership

[www.faa.gov/about/office\\_org/headquarters\\_offices/ato/leadership](http://www.faa.gov/about/office_org/headquarters_offices/ato/leadership)

## ARTCC Airspace Area (x 1,000 square miles)



## Section 1. FAA Air Traffic Management System Overview for FY2021

<b>ATO Program and Financing</b>	<b>\$8.2</b>
<b>Operations Budget Estimate (in \$billions) (FY2021)</b>	
<b>Flights Handled</b>	<b>13,028,643</b>
Scheduled	7,014,671
Unscheduled	6,013,972
<b>Airspace (in millions of sq mi)</b>	<b>29.4</b>
Oceanic	24.1
Domestic	5.3
<b>Airports</b>	<b>19,723</b>
Public Airports	5,184
Private Airports	14,539
<b>Federal Air Traffic Control Facilities</b>	<b>313</b>
Stand-Alone ATC Tower Facilities	139
Stand-Alone TRACON Facilities	25
Combined ATC Tower/TRACON Facilities*	124
Centers and Combined Control Facilities	25
ARTCC	21
CCFs	4
<b>Contract Air Traffic Control Towers**</b>	<b>260</b>
<b>NAVAIDS</b>	<b>12,948</b>
<b>Alaska Weather Cameras</b>	<b>235</b>
<b>Controllers</b>	<b>13,850</b>
<b>GA Aircraft (CY2020)</b>	<b>204,100</b>
Fixed Wing	161,600
Rotorcraft	9,700
Experimental/Lightcraft/Other	32,800
<b>GA Flight Hours (CY2020)</b>	<b>22,492,000</b>

\*Combined ATC Towers and TRACONs are located within the same building.

\*\*Includes two new contract towers introduced during FY2022.

### Sources:

**ATO Program and Financing:** U.S. Dept. of Transportation, [Budget Estimates: FY2022, Federal Aviation Administration](#), p. 2.

**Flights Handled:** Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), January 20, 2022; Innovata, [Flight Schedule Database](#), accessed March 22, 2022.

**Airspace:** Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G).

**Airports and NAVAIDS:** Federal Aviation Administration, Air Traffic Organization, Airport Safety, [Airport Data and Information Portal \(ADIP\)](#), March 14, 2022. <https://adip.faa.gov/agis/public/#/airportSearch/advanced>; Federal Aviation Administration, Air Traffic Organization, Technical Operations (AJW), Facility Service and Equipment Profile, October 5, 2021. [https://employees.faa.gov/org/linebusiness/ato/operations/technical\\_operations/ajw1/ajw1B/fsep/](https://employees.faa.gov/org/linebusiness/ato/operations/technical_operations/ajw1/ajw1B/fsep/)

**ATC Towers, TRACONs, and En Route Centers & CCFs:** Federal Aviation Administration, Air Traffic Organization, Air Traffic Services (AJT).

**Alaska Weather Cameras:** Federal Aviation Administration, Air Traffic Organization, Aviation Weather & Aeronautical Services (AJM-33), [FAA Aviation Weather Cameras](#), accessed February 26, 2022. <https://avcams.faa.gov/sitelist.php>

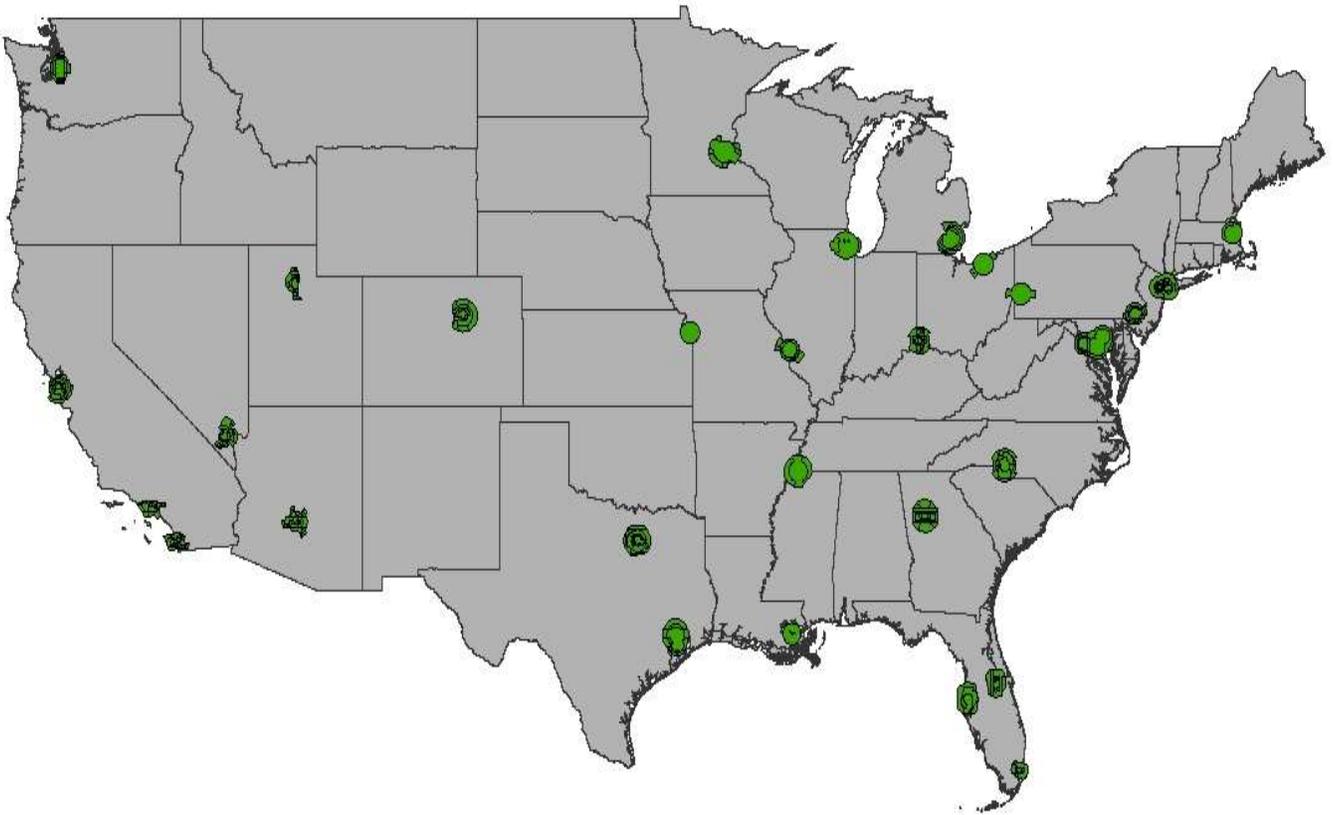
**Controllers:** Federal Aviation Administration, Office of Finance and Management, Data Analysis and Reporting Services Branch (ABP-230), [Air Traffic Controller and Academy Movement Report - September FY2021](#), October 7, 2021.

**GA Aircraft and GA Flight Hours:** Federal Aviation Administration, Aviation Safety (AVS), [General Aviation and Part 135 Activity Surveys – CY2020](#), Tables 1.1 and 1.3, January 25, 2022.

[https://www.faa.gov/data\\_research/aviation\\_data\\_statistics/general\\_aviation/](https://www.faa.gov/data_research/aviation_data_statistics/general_aviation/)

## ***Class B Airspaces (Airspace around Busiest US Airports)***

Note: Airspaces accurately represented for coverage area

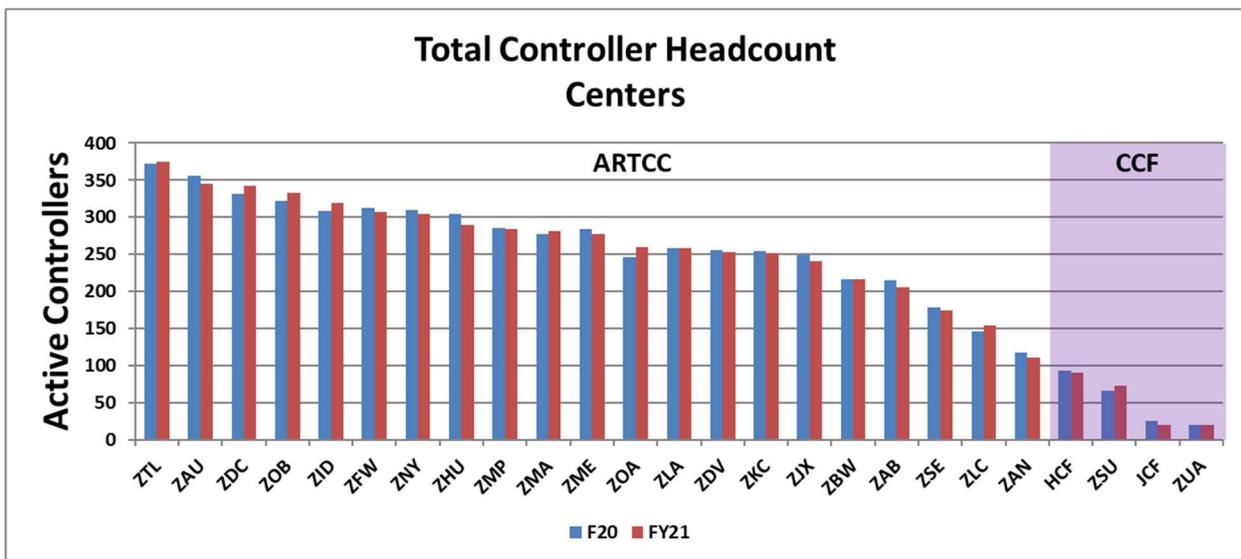
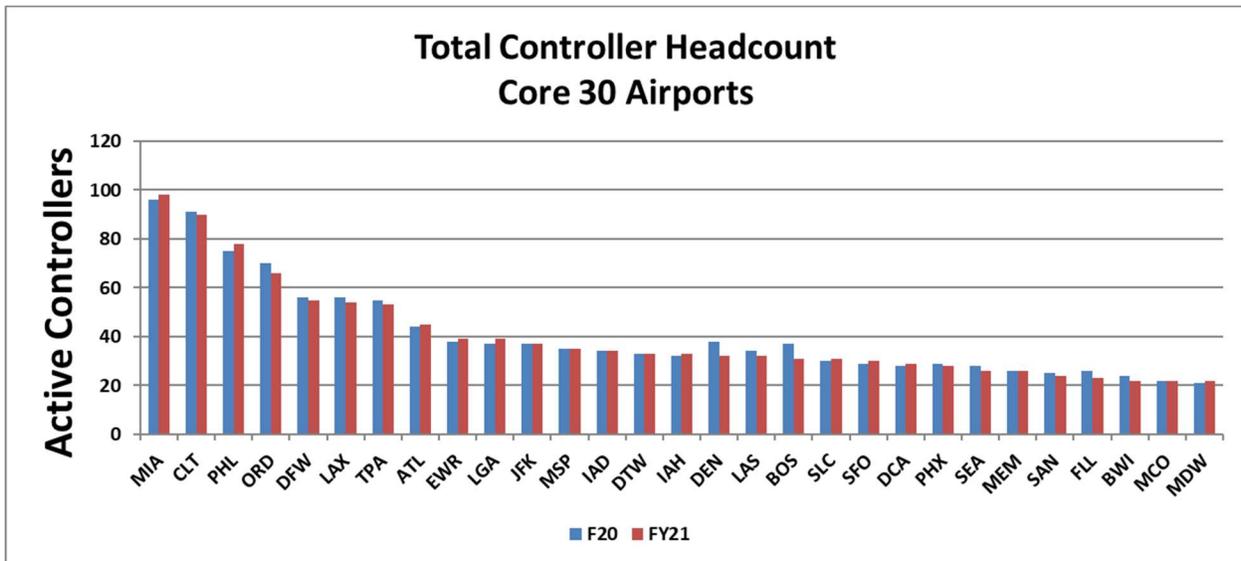


## Air Traffic Controllers

As of the end of FY2021, the FAA air traffic controller total was 13,850, a decrease from 14,242 at the end of FY2020.

	FY2020	FY2021
Academy Graduate (AG)	873	917
Developmental (D1)	213	196
Developmental (D2)	645	534
Developmental (D3)	522	457
Certified Professional (CPC)	10,268	10,580
Certified Professional in training (CPCIT)	1,309	1,031
<b>Controllers</b>	<b>13,830</b>	<b>13,715</b>
<b>Academy</b>	<b>412</b>	<b>135</b>
<b>Total HeadCount</b>	<b>14,242</b>	<b>13,850</b>

Among Core 30 airports, Miami (MIA), Charlotte (CLT), and Philadelphia (PHL) reported large headcounts because these are combined ATCT TRACONS. PHL had the highest net gain of controllers at three, while DEN and BOS had the highest net loss at six. (See, Appendix I for explanations of the Core 30 airport and Center codes.)



Source: Federal Aviation Administration, Office of Finance and Management, Data Analysis and Reporting Services Branch (ABP-230), Air Traffic Controller and Academy Movement Report - September FY2021, October 7, 2021.

## Pilot Certificates

The table below shows the number of pilot certificates held by age group (upper panel below) and by year (lower panel). The upper panel illustrates that student, commercial, and remote (or drone) pilots tend to be younger, while airline transport pilots tend to be older. The lower panel informs us that the number of total active pilot certificates held in the U.S. increased by 4.2 percent, from 691,689 in CY2020 to 720,603 in CY2021, mainly due to an increase in student pilot certificates from 222,629 to 250,197. Further, the number of remote pilot certifications (which began in August 2016) increased by 23.4 percent, from 206,322 in 2020 to 254,587 in 2021. (Note, the pilot total does not include flight instructors and remote pilots.)

**Estimated Active Pilot Certificates Held by Category and Age Group of Holder,  
as of December 31, 2021**

By Age Group	Type of Pilot Certificates							Certified Flight Instructor 2/	Remote Pilot 2/
	Total	Student	Sport	Recreational	Private 1/	Commercial 1/	Airline Transport 1/		
<b>Total</b>	<b>720,603</b>	<b>250,197</b>	<b>6,801</b>	<b>86</b>	<b>173,606</b>	<b>119,827</b>	<b>170,086</b>	<b>121,270</b>	<b>254,587</b>
14-15	552	552	0	0	0	0	0	0	0
16-19	24,568	18,615	10	1	5,613	329	0	117	2,977
20-24	75,925	41,178	82	3	19,161	14,481	1,020	7,264	16,120
25-29	89,307	49,116	152	4	14,152	19,366	6,517	11,828	31,449
30-34	76,933	39,706	254	6	13,230	12,923	10,814	12,264	36,647
35-39	69,460	28,513	314	3	13,102	10,667	16,861	13,933	35,646
40-44	60,499	20,740	319	1	12,217	8,262	18,960	12,772	30,444
45-49	50,597	13,375	373	6	10,703	6,493	19,647	11,184	25,365
50-54	56,118	11,754	520	5	13,181	7,357	23,301	11,664	23,302
55-59	59,212	9,753	799	5	15,512	7,829	25,314	10,639	19,293
60-64	56,972	7,335	1,050	13	17,927	8,096	22,551	9,328	14,938
65-69	43,117	4,802	1,091	19	16,941	8,082	12,182	7,928	10,232
70-74	28,915	2,862	883	13	11,814	6,904	6,439	6,109	5,360
75-79	17,718	1,314	578	4	6,567	5,259	3,996	3,999	2,133
80 & over	10,710	582	376	3	3,486	3,779	2,484	2,241	681

By Year									
<b>2015</b>	<b>590,038</b>	122,729	5,482	191	186,786	116,291	158,559	102,628	N/Ap
<b>2016</b>	<b>584,361</b>	128,501	5,889	178	174,517	112,056	163,220	104,382	20,362
<b>2017</b>	<b>609,306</b>	149,121	6,097	157	174,516	114,186	165,228	106,692	69,166
<b>2018</b>	<b>633,316</b>	167,804	6,246	147	175,771	115,776	167,572	108,564	106,321
<b>2019</b>	<b>664,563</b>	197,665	6,467	130	173,080	116,572	170,649	113,445	160,302
<b>2020</b>	<b>691,689</b>	222,629	6,643	107	172,945	119,245	170,120	117,558	206,322
<b>2021</b>	<b>720,603</b>	250,197	6,801	86	173,606	119,827	170,086	121,270	254,587

1/ Includes pilots with an airplane and/or a helicopter and/or a glider and/or a gyroplane certificate. Pilots with multiple ratings are reported under highest rating. For example a pilot with a private helicopter and commercial airplane certificates are reported in the commercial category.

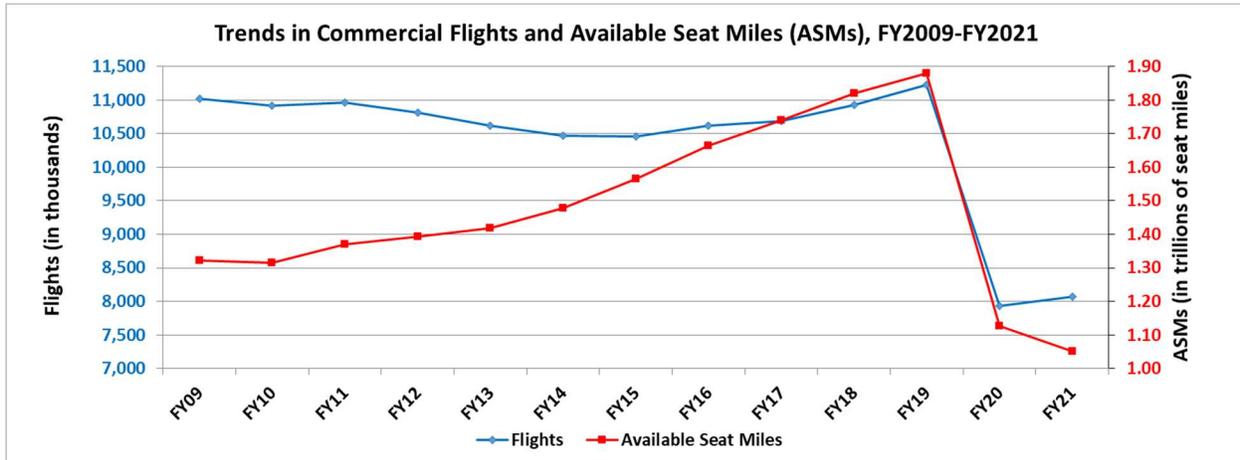
2/ Not included in total active pilots.

N/Ap Not applicable.

Source: Federal Aviation Administration, Office of Aviation Policy and Plans (APO), U.S. Civil Airmen Statistics, 2019, Table 12, February 1, 2022. [https://www.faa.gov/data\\_research/aviation\\_data\\_statistics/civil\\_airmen\\_statistics/](https://www.faa.gov/data_research/aviation_data_statistics/civil_airmen_statistics/)

## Commercial Flight and Available Seat Mile (ASM) Trends

This far, the COVID-19 pandemic affected FY2020 and FY2021 commercial air passenger travel. In FY2021, the number of scheduled commercial flights and number of passengers only partly recovered to pre-pandemic levels; the number of flights rose by 1.9 percent to 8.1 million and the number of passengers rose by 4.1 percent to 597.9 million. Revenue passenger miles (RPMs) and available seat miles (ASMs) fell by 13.5 and 6.7 percent, to 0.67 and 1.05 trillion, respectively. Load factor, the percentage of available seat miles flown by paying commercial passengers, fell from 69.2 to 64.1 percent. The table below shows passenger statistics for the three most recent fiscal years.



Source: U.S. Dept. of Transportation, Bureau of Transportation Statistics, [T100 Segment Data](#), March 17, 2022.

Passengers			
	FY 2019	FY 2020	FY 2021
<b>Yearly Passengers</b>	1,057,645,399	574,412,723	597,945,147
<b>Average Daily Passengers</b>	2,897,659	1,569,434	1,638,206
<b>Revenue Passenger Miles (trillions)</b>	1.57	0.78	0.67
<b>Available Seat Miles (trillions)</b>	1.88	1.13	1.05
<b>Passenger Load Factor (%)</b>	83.36%	69.19%	64.15%

Economic Impact of Civil Aviation		
	CY2015*	CY2016*
<b>Aviation in US generates # jobs</b>	10,710,000	10,857,000
<b>Earnings of (billions)</b>	\$481.90	\$488.20
<b>Aviation contributes annually (trillions)</b>	\$1.75	\$1.77
<b>Constitutes % of GDP</b>	5.3%	5.2%

\*Estimates for more recent years are not yet available.

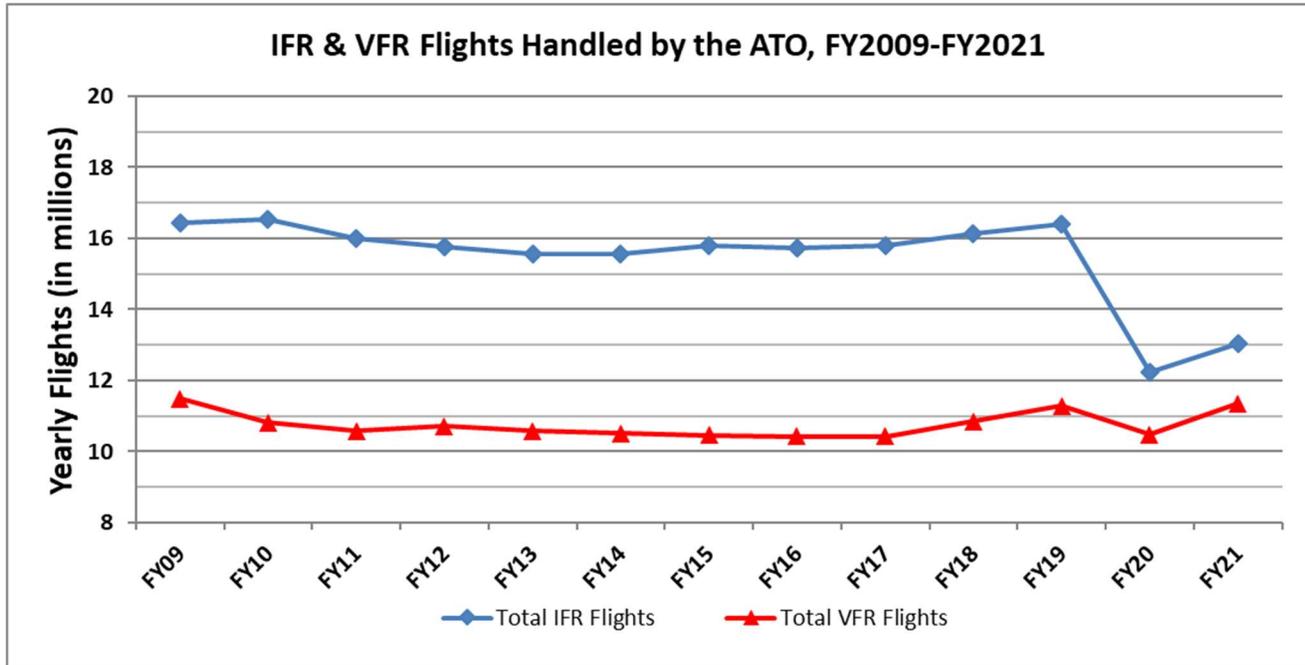
Sources:

**Passenger Statistics:** U.S. Dept. of Transportation, Bureau of Transportation Statistics, [T100 Segment Data](#), March 17, 2022.

**Economic Impact of Civil Aviation:** Federal Aviation Administration, Office of Aviation Policy and Plans, Forecast and Performance Analysis Division (APO-100), [Economic Impact of Civil Aviation on the U.S. Economy](#), January 2020.  
[https://www.faa.gov/about/plans\\_reports/media/2020\\_jan\\_economic\\_impact\\_report.pdf](https://www.faa.gov/about/plans_reports/media/2020_jan_economic_impact_report.pdf)

## ***Instrument Flight Rule (IFR) and Visual Flight Rule (VFR)\* Flights across the NAS***

Office of Performance Analysis (AJR-G) data show the number of IFR flights rose by 6.2 percent to 13 million, and the number of VFR flights rose by 8.2 percent to 11.3 million in FY2021. In FY2019, prior to the COVID pandemic, IFR flights numbered 16.4 million, while VFR flights numbered 11.3 million.



\*Note: OPSNET reports VFR activity as total operations (arrivals + departures). Total VFR flights are approximated by dividing total operations by 2.

Total numbers of fiscal year annual IFR and VFR flights also appear in the table below.

<b>Year</b>	<b>IFR Flights</b>	<b>VFR Flights</b>
FY2005	18,645,898	13,795,861
FY2006	18,066,360	13,378,426
FY2007	17,970,314	13,448,515
FY2008	17,908,487	12,812,585
FY2009	16,428,893	11,480,136
FY2010	16,522,406	10,815,975
FY2011	15,992,536	10,581,301
FY2012	15,760,241	10,714,777
FY2013	15,576,396	10,574,201
FY2014	15,546,452	10,506,576
FY2015	15,782,675	10,455,324
FY2016	15,724,478	10,416,280
FY2017	15,800,679	10,415,828
FY2018	16,122,488	10,843,622
FY2019	16,416,056	11,287,366
FY2020	12,270,055	10,478,603
FY2021	13,028,643	11,342,324

Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), January 20, 2022 (for IFR), February 25, 2020 (VFR).

## Section 2. Demand and Efficiency in the NAS

The NAS is composed of 521 airport towers (263 Federal and 260 contract towers), 149 terminal radar control (TRACON) facilities (25 stand-alone and 124 combined ATCT), and 25 control centers (21 air route traffic control centers (ARTCC) and 4 combined control facilities (CCF)).

TRACONs handle descending flights received from a center or ascending flights received from an ATC tower (see figure below). Of the 149 TRACONs in the NAS, 124 of them are combined such that the TRACON exists in the same location as the ATC tower. Such facilities include the Miami, Charlotte, and El Paso towers.

Centers handle all en route flights operating on Instrument Flight Rule (IFR) flight plans. Centers receive flights from or hand off flights to other centers throughout the flight's en route phase of operation. They also receive flights or hand off flights to TRACONs when flights enter or exit the en route phase of operation.



This report reveals the demand observed at some of the busiest facilities, represented by the Core 30 airport towers, the 25 stand-alone TRACONs, and all 25 centers (which include 4 CCFs). Efficiency is also reported based on the following metrics:

**Number of Flights at Any Given Minute**

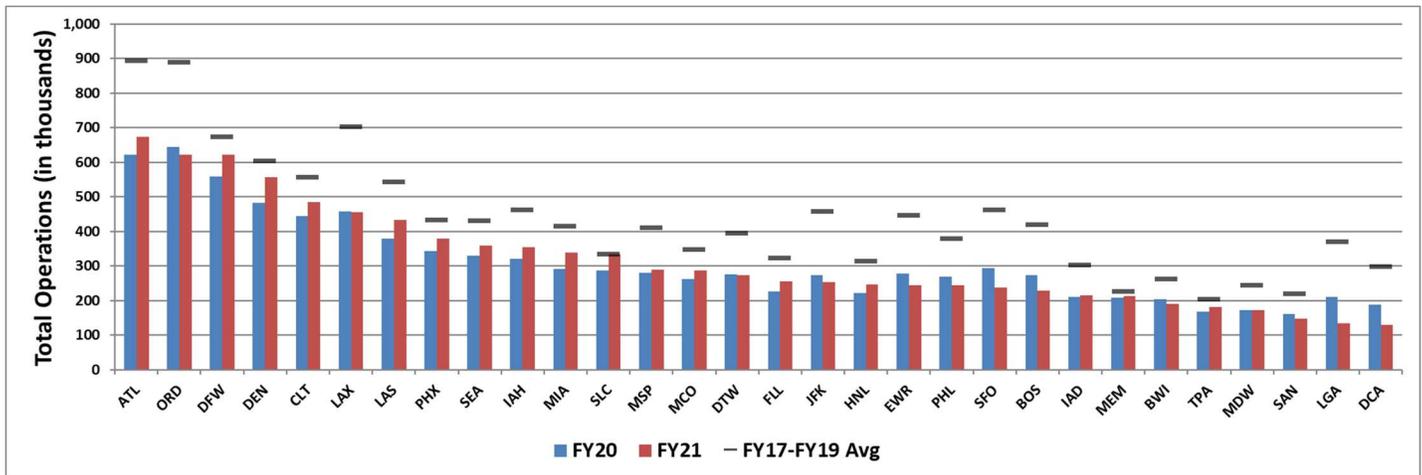
**Average Hourly Capacity**

**Average Daily Capacity**

## Core 30 Airport Operations

Airport operations are the sum of the number of airport arrivals and departures. Airport traffic controllers handle such operations. Each flight has a departure and arrival, meaning each flight roughly consists of two airport operations. In FY2021, Core 30 airport operation numbers rose by 2.3 percent, from 9.3 million in FY2020 to 9.5 million (table below). During the three years before the pandemic (FY2017-FY2019), Core 30 airport operations averaged 13 million; therefore operations remain below this pre-pandemic level. Across all 521 airports that operate Federal towers, operations rose by 7.4 percent, from 44.4 to 47.7 million. Before the pandemic (FY2017-FY2019), operations averaged 51.8 million.

Also shown below are airport operations for each Core 30 airport. In FY2021, Atlanta (ATL), Chicago O'Hare (ORD), and Dallas-Fort Worth (DFW) had the highest number of operations; ATL and DFW operations rose by 8.3 and 11 percent, respectively, while ORD operations fell by 3.3 percent. Operations did not return to pre-pandemic levels at any of the Core 30 airports. (See, Appendix I for explanations of the Core 30 airport codes.)



Total Core 30 Airport Operations			
FY17-19Avg	FY20	FY21	%Change
13,014,040	9,327,422	9,544,243	2.3%

Airport	Rank*	FY17-19 Avg	FY20	FY21
ATL	1	892,531	621,012	672,509
BOS	22	418,820	273,560	227,621
BWI	25	262,185	203,297	189,216
CLT	5	556,837	443,933	483,811
DCA	30	297,834	188,757	128,542
DEN	4	602,692	483,345	555,640
DFW	3	674,069	559,315	620,831
DTW	15	394,476	275,412	272,631
EWR	19	446,791	278,420	244,372
FLL	16	322,202	225,470	256,235
HNL	18	314,595	222,451	246,518
IAD	23	301,318	209,638	215,390
IAH	10	462,986	320,900	354,045
JFK	17	458,526	273,181	253,542
LAS	7	543,391	377,933	431,773

Airport	Rank*	FY17-19 Avg	FY20	FY21
LAX	6	701,467	457,397	456,013
LGA	29	369,527	210,873	133,538
MCO	14	348,469	261,674	286,958
MDW	27	243,601	172,418	172,735
MEM	24	225,764	208,133	212,459
MIA	11	414,830	290,478	338,878
MSP	13	410,011	279,768	288,979
ORD	2	889,128	643,751	622,411
PHL	20	378,600	268,220	243,795
PHX	8	433,000	343,118	378,744
SAN	28	218,941	160,310	147,571
SEA	9	431,030	329,778	358,336
SFO	21	462,422	292,390	236,631
SLC	12	334,366	285,900	333,155
TPA	26	203,632	166,590	181,364

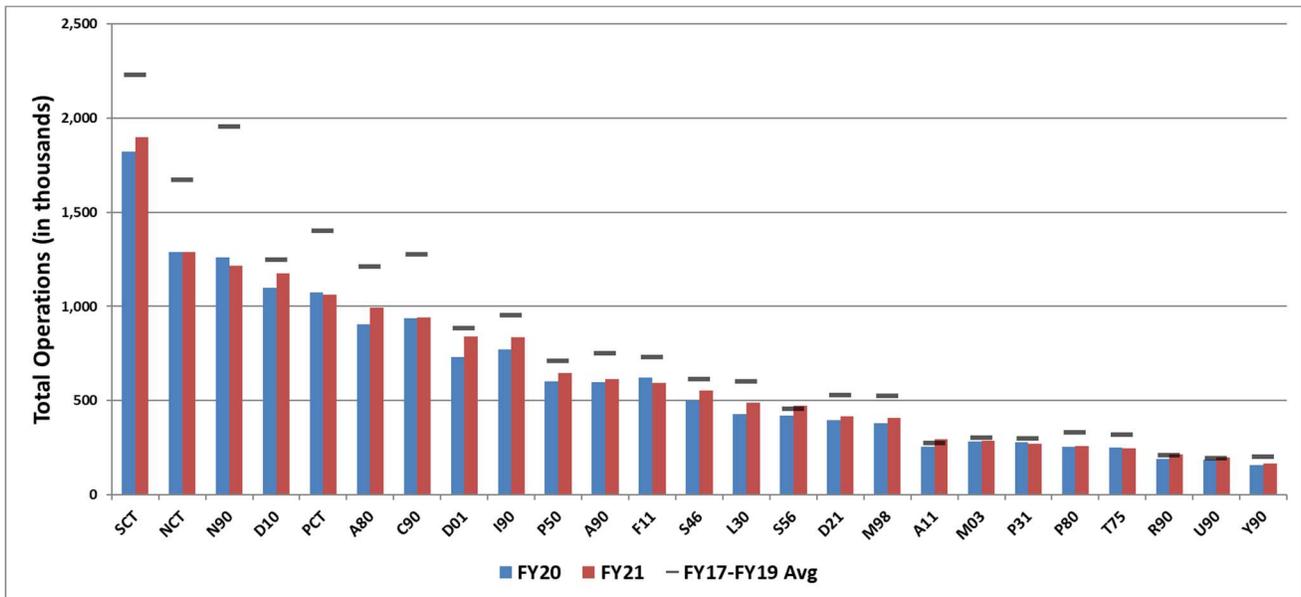
\*Ranked by FY21 operations.

Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), Operations Network (OPSNET), March 3, 2022.

## Stand-Alone Terminal Radar Control (TRACON) Facilities

TRACON operations are IFR and VFR itinerant operations passed to and from area airports, other TRACONs, or centers, including overflights through TRACON airspace. In FY2021, among the 25 stand-alone TRACONs, operations rose by 4.4 percent to 16.4 million in FY2021. Before the pandemic (FY2017-FY2019), stand-alone operations averaged 19.9 million, meaning operations remain below pre-pandemic levels (table below). Across all 149 TRACONs, in FY2021, operations rose by 7.2 percent, from 31.3 to 33.5 million; before the pandemic, these operations averaged 38.5 million.

Below are operation counts for each of the 25 stand-alone TRACONs for the pandemic years FY2020 and FY2021 and the pre-pandemic annual average (FY2017-FY2019). In FY2021, Southern California (SCT), Northern California (NCT), and New York (N90) had the highest number of operations with more than 1.2 million each. Operations at SCT rose, while N90 fell; operations at NCT remained about the same. Operations recovered to FY2017-FY2019 pre-pandemic levels at Salt Lake City (S56), Anchorage (A11), Omaha (R90), and Tucson (U90) (graph and table below). (See, Appendix I for explanations of the TRACON facility codes.)



Total Stand-Alone TRACON Operations			
FY17-19 Avg	FY20	FY21	%Change
19,940,704	15,671,413	16,364,414	4.4%

TRACON	Rank*	FY17-19 Avg	FY20	FY21
A11	18	275,585	254,078	294,150
A80	6	1,213,101	902,906	991,544
A90	11	750,414	597,631	615,069
C90	7	1,277,423	935,168	941,746
D01	8	885,750	730,400	840,243
D10	4	1,247,768	1,097,424	1,175,788
D21	16	530,295	396,458	417,218
F11	12	730,043	623,047	592,316
I90	9	951,472	771,209	836,841
L30	14	602,603	426,421	486,361
M03	19	301,072	280,901	286,852
M98	17	526,313	377,139	406,278
N90	3	1,953,783	1,259,869	1,214,509

TRACON	Rank*	FY17-19 Avg	FY20	FY21
NCT	2	1,674,540	1,288,097	1,288,200
P31	20	300,023	279,704	270,391
P50	10	708,956	601,545	644,049
P80	21	329,709	252,141	258,594
PCT	5	1,400,750	1,073,967	1,062,059
R90	23	209,962	187,852	214,037
S46	13	615,142	500,178	551,590
S56	15	457,064	421,110	470,777
SCT	1	2,230,827	1,820,271	1,900,186
T75	22	316,870	251,047	246,676
U90	24	193,273	186,157	195,501
Y90	25	201,964	156,693	163,439

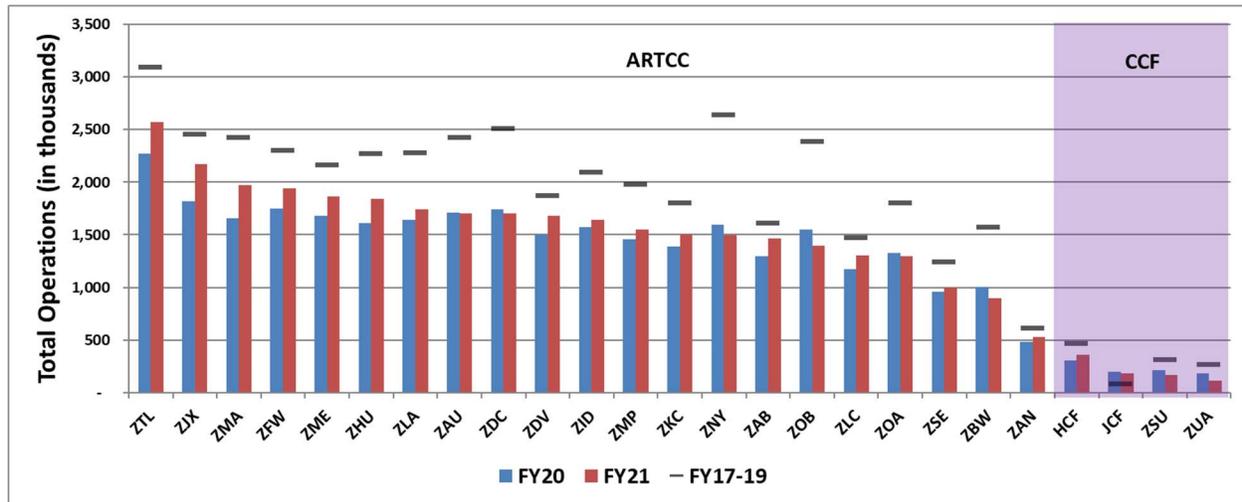
\*Ranked by FY2021 operations.

Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), Operations Network (OPSNET), March 3, 2020.

## Air Route Traffic Control Centers (ARTCC) and Combined Control Facilities (CCF)

Air route traffic control centers (ARTCC) or en route operations are the number of IFR and VFR itinerant operations passing from a TRACON to a center, or from one center to another center, or from a center to a TRACON. It includes U.S. overflights and oceanic traffic through center air space that do not arrive at or depart from U.S. territory. In FY2021, en route operation numbers for the 21 ARTCC and 4 CCFs (combined control facilities) rose by 6.2 percent, from 32.1 to 34.1 million; however, operations have yet to recover to the FY2017-FY2019 pre-pandemic average levels of 44.1 million (table below).

Also shown below are operation counts for FY2020 and FY2021 and the pre-pandemic average for FY2017-FY2019 by center. In FY2021, the Atlanta (ZTL), Jacksonville (ZJX), and Miami (ZMA) centers reported the highest number of operations among the centers, each with more than 1.9 million. Other than Joshua Tree (JCF), center operations at each center did not recover to pre-pandemic average levels (graph and table below). (See, Appendix I for explanations of the ARTCC and CCF codes.)



Total ARTCC & CCF Operations			
FY17-19 Avg	FY20	FY21	%Change
44,147,204	32,108,181	34,097,779	6.2%

Center	Rank*	FY17-19 Avg	FY20	FY21
HCF	22	466,374	308,811	360,312
JCF	23	87,067	202,926	187,619
ZAB	15	1,609,158	1,293,774	1,462,863
ZAN	21	611,191	485,113	529,551
ZAU	8	2,421,304	1,708,664	1,705,425
ZBW	20	1,574,246	1,001,726	895,499
ZDC	9	2,509,288	1,739,401	1,704,591
ZDV	10	1,874,490	1,501,039	1,678,040
ZFW	4	2,301,123	1,753,078	1,940,351
ZHU	6	2,271,141	1,610,420	1,839,184
ZID	11	2,092,253	1,573,605	1,645,185
ZJX	2	2,452,192	1,820,539	2,173,040
ZKC	13	1,800,362	1,390,474	1,501,894

Center	Rank*	FY17-19 Avg	FY20	FY21
ZLA	7	2,282,499	1,643,612	1,744,128
ZLC	17	1,471,415	1,176,574	1,302,555
ZMA	3	2,424,266	1,658,655	1,973,782
ZME	5	2,162,893	1,681,424	1,865,497
ZMP	12	1,983,224	1,458,236	1,546,621
ZNY	14	2,637,886	1,595,944	1,492,646
ZOA	18	1,802,700	1,323,889	1,299,124
ZOB	16	2,389,671	1,550,757	1,392,770
ZSE	19	1,246,442	957,248	994,163
ZSU	24	315,178	217,431	171,663
ZTL	1	3,092,693	2,268,717	2,573,266
ZUA	25	268,149	186,124	118,010

\*Ranked by FY2021 operations.

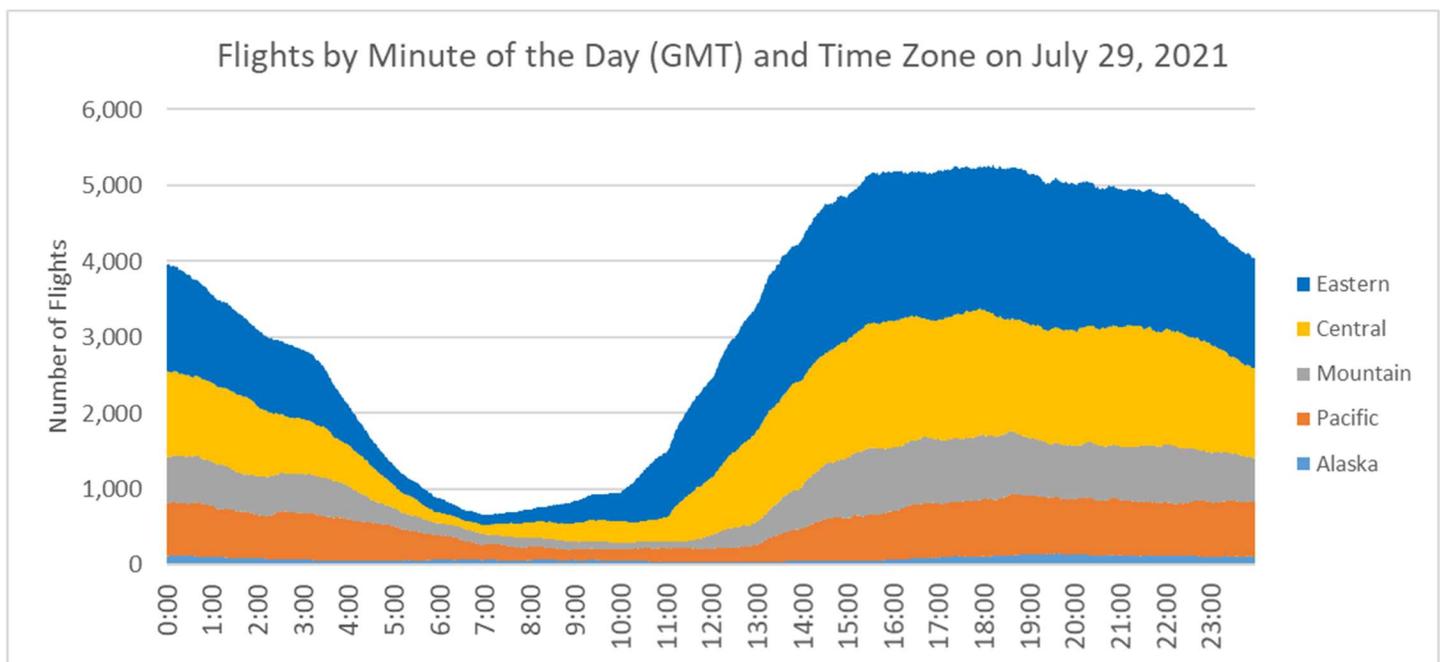
Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), Operations Network (OPSNET), March 4, 2022.

## Number of IFR Flights at Any Given Minute during Peak Operational Times

### 5,000 Flights

Traffic flow management system (TFMS) flight data were used to determine the number of flights en route every minute of the day and by U.S. time zone on July 29, 2021. Peak operational times in the NAS range between 1500 GMT and 2200 GMT. During peak operational times in the NAS on that day, there were approximately **5,300** flights en route in the NAS every minute.

The figure below shows the average number of flights en route per minute and flights under air traffic control by time zone. The Eastern Time zone has the largest share of flights in the NAS on average and, in this analysis, also includes flights under air traffic control from Puerto Rico and Bermuda. The Pacific Time Zone category includes all west coast air traffic as well as oceanic operations controlled by Oakland center (ZOA), including Hawaii and Guam.

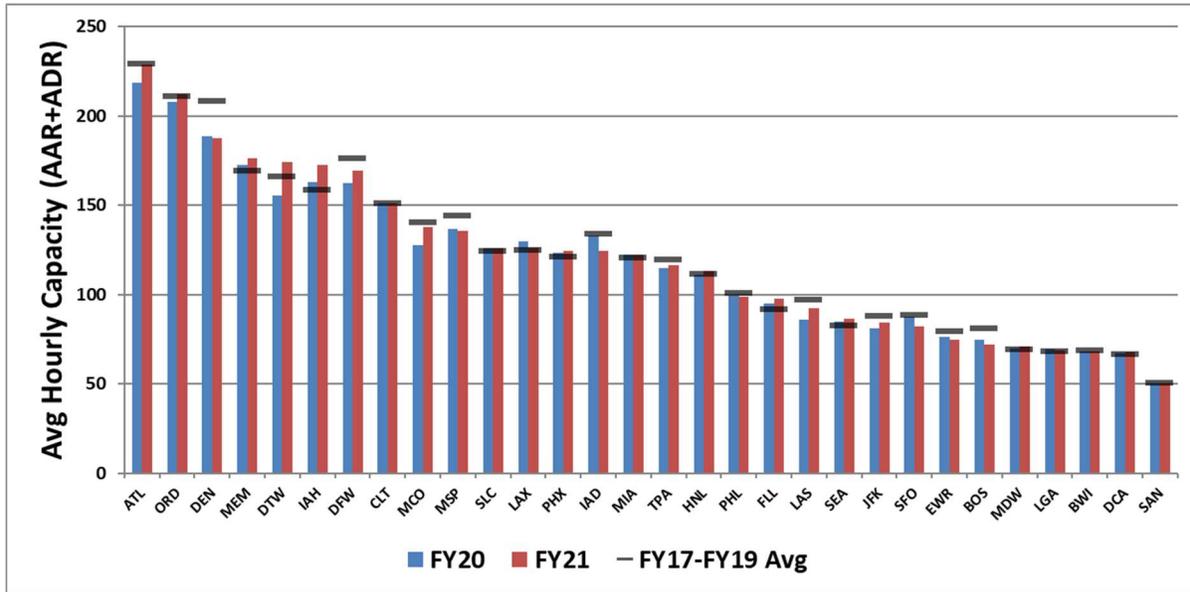


Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), April 5, 2022.

## Average Hourly Capacity (Called Rate) at Core 30 Airports

In general, airport capacity is determined by its runways and surrounding airspace. For the purpose of this report, capacity is represented by an airport's called rates for reportable hours. In FY2021, average hourly capacity across all Core 30 airports was 3,611 (table below). Note, airport capacity is not determined by circumstances such as the pandemic.

In FY2021, data for each of Core 30 airport shows that the highest average hourly called rates were at Atlanta (ATL) and Chicago O'Hare (ORD). Each had an average called rate of over 200 operations per hour. The highest increases occurred at Detroit (DTW) (up 12.1 percent) and Orlando (MCO) (up 8.1 percent). (See, Appendix I for explanations of the Core 30 airport codes.)



AHC Across All Core 30 Airports			
FY17-19 Avg	FY20	FY21	%Change
3,643	3,553	3,611	1.6%

Airport	Rank*	FY17-19 Avg	FY20	FY21
ATL	1	229	219	229
BOS	25	81	74	72
BWI	28	69	68	68
CLT	8	151	151	151
DCA	29	67	67	68
DEN	3	209	188	188
DFW	7	176	162	169
DTW	5	166	156	174
EWB	24	79	76	74
FLL	19	92	95	97
HNL	17	112	111	113
IAD	14	134	133	124
IAH	6	158	163	172
JFK	22	88	81	84
LAS	20	97	86	92

Airport	Rank*	FY17-19 Avg	FY20	FY21
LAX	12	125	130	126
LGA	27	68	69	69
MCO	9	140	128	138
MDW	26	70	70	71
MEM	4	169	172	176
MIA	15	121	122	122
MSP	10	144	137	136
ORD	2	211	208	212
PHL	18	101	99	99
PHX	13	121	123	124
SAN	30	51	51	51
SEA	21	83	85	87
SFO	23	88	87	82
SLC	11	124	126	126
TPA	16	119	115	116

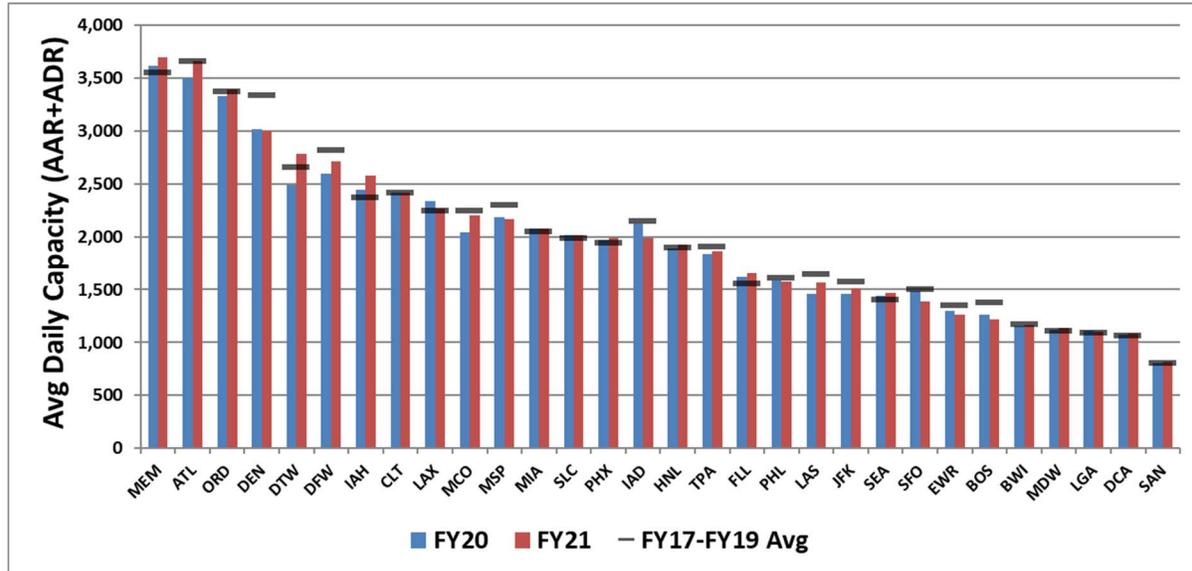
\*Ranked by FY2021 call rates.

Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), [Aviation System Performance Metrics \(ASPM\)](#), March 5, 2022.

## Average Daily Capacity (ADC) - Based on Called Rates at Core 30 Airports

In general, airport capacity is determined by its runways and surrounding airspace. For the purposes of this report, capacity is represented by the airport's called rates for reportable hours. Average daily capacity (ADC) is the ATO's official tracking method for determining an airport's capacity during a day. In FY2021, capacity across all Core 30 airports was 59,705 (table below). Airport capacity is not determined by circumstances such as the pandemic.

In FY2021, data for the Core 30 airports show that the highest ADCs were found at Memphis (MEM), Atlanta (ATL), Chicago (ORD) and Denver (DEN); each with an average of over 3,000 operations per day. Note, ADC is larger for Memphis (MEM) than all other airports because all 24 hours are reportable there. (See, Appendix I for explanations of the Core 30 airport codes.)



ADC Across All Core 30 Airports			
FY17-19 Avg	FY20	FY21	%Change
60,222	58,777	59,705	1.6%

Airport	Rank*	FY17-19 Avg	FY20	FY21
ATL	2	3,664	3,498	3,662
BOS	25	1,381	1,265	1,222
BWI	26	1,171	1,158	1,162
CLT	8	2,414	2,421	2,419
DCA	29	1,068	1,076	1,081
DEN	4	3,336	3,013	3,003
DFW	6	2,821	2,597	2,709
DTW	5	2,657	2,488	2,789
EWR	24	1,349	1,298	1,265
FLL	18	1,557	1,618	1,656
HNL	16	1,898	1,891	1,923
IAD	15	2,147	2,126	1,987
IAH	7	2,375	2,441	2,583
JFK	21	1,580	1,463	1,512
LAS	20	1,650	1,463	1,571

Airport	Rank*	FY17-19 Avg	FY20	FY21
LAX	9	2,246	2,338	2,263
LGA	28	1,093	1,108	1,101
MCO	10	2,243	2,040	2,206
MDW	27	1,112	1,118	1,136
MEM	1	3,556	3,619	3,697
MIA	12	2,054	2,081	2,078
MSP	11	2,302	2,188	2,171
ORD	3	3,376	3,328	3,392
PHL	19	1,610	1,584	1,576
PHX	14	1,942	1,973	1,988
SAN	30	809	810	812
SEA	22	1,409	1,440	1,471
SFO	23	1,503	1,484	1,392
SLC	13	1,986	2,013	2,015
TPA	17	1,910	1,837	1,863

\*Ranked by FY2021 daily capacity.

Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), Aviation System Performance Metrics (ASPM), March 5, 2021.

## Section 3. NAS Delay, Diversions, Go-Arounds, and Cancellations

Only flights departing from or arriving at their destination at least 15 minutes late are counted as a NAS system delay. The charts that appear below are based on OPSNET numbers, ATO's official source for delay data. Many factors contribute to delay, with weather is the most frequently cited reason. Delay imposes stress on the NAS, air traffic controllers, passengers, and the economy.

Diversions occur when a flight is rerouted to a different airport than its original destination. This usually occurs due to convective weather. Other less frequent reasons for diversions are medical emergencies, security, issues with the aircraft, or issues with passengers or crewmembers.

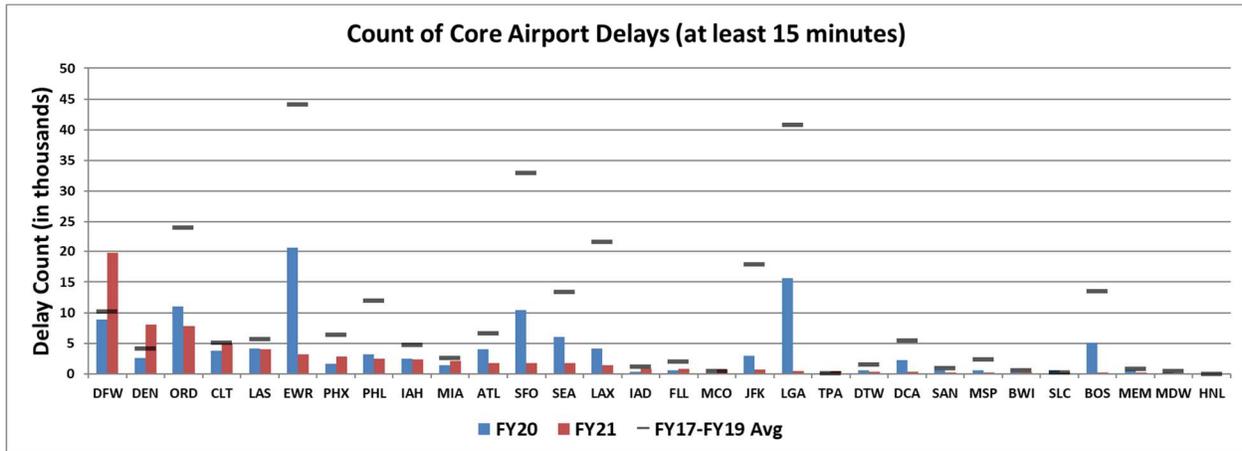
Go-Arounds occur when an aircraft is on approach to the runway but suddenly aborts the landing. This occurs if there is a sudden shift in the wind, an obstruction on the runway, or possibly, the aircraft inadvertently overshooting the runway. Go-arounds result in the aircraft returning to the landing queue to attempt another landing.

Cancellations can occur for numerous reasons due to weather, extensive delays in the system, equipment issues, etc. Air carriers cancel their own flights in response to these issues. Since the three-hour tarmac rule was imposed after 2010, more flights have been cancelled. This increase in cancellations means reductions in the number of recorded delays. During FY2020, the sudden decrease in the demand for air transportation due to the COVID-19 pandemic led to flight cancellations by airlines.

## Counts of NAS Delay at Core 30 Airports

During FY2021, OPSNET data show that the number of Core 30 airport departure delays of at least 15 minutes fell significantly, by 38.7 percent to 70,305. Since FY2017-FY2019, before the pandemic began, Core 30 airport departure delays fell by 75.1 percent from 281,899 (table below).

The graph and table below show, in FY2021, delays were highest at Dallas (DFW), Denver (DEN), and Chicago O’Hare (ORD), each with 5,000 or more delays. Together these three airports accounted for slightly over one-half of all Core 30 airport delays. All but four airports show decreases in delays during the pandemic (Dallas-Fort Worth (DFW), Denver (DEN), Orlando (MCO), and Tampa (TPA)). (See, Appendix I for explanations of the Core 30 airport codes.)



Core 30 Total Delay Counts			
FY17-19 Avg	FY20	FY21	%Change
281,899	114,760	70,305	-38.7%

Airport	Rank*	FY17-19 Avg	FY20	FY21
ATL	11	6,645	4,041	1,805
BOS	27	13,473	5,036	185
BWI	25	585	193	233
CLT	4	5,118	3,730	4,951
DCA	22	5,422	2,268	359
DEN	2	4,178	2,640	8,075
DFW	1	10,245	8,854	19,767
DTW	21	1,539	599	398
EWR	6	44,129	20,681	3,192
FLL	16	1,943	526	787
HNL	30	38	2	2
IAD	15	1,127	400	855
IAH	9	4,774	2,473	2,334
JFK	18	17,849	2,972	649
LAS	5	5,683	4,118	4,051

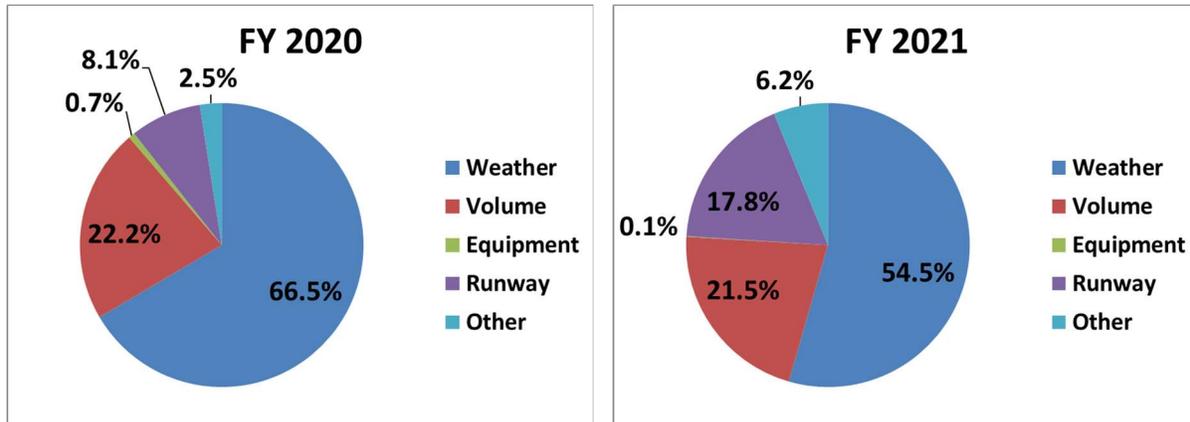
Airport	Rank*	FY17-19 Avg	FY20	FY21
LAX	14	21,631	4,192	1,404
LGA	19	40,819	15,619	480
MCO	17	425	109	650
MDW	29	449	188	78
MEM	28	812	529	166
MIA	10	2,579	1,373	2,092
MSP	24	2,316	527	245
ORD	3	24,115	10,970	7,790
PHL	8	11,946	3,221	2,468
PHX	7	6,387	1,646	2,888
SAN	23	934	625	259
SEA	13	13,432	6,060	1,715
SFO	12	32,947	10,387	1,758
SLC	26	278	612	213
TPA	20	80	169	456

\*Ranked by number of FY2021 delays.

Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), Operations Network (OPSNET), March 7, 2022.

## Delays by Category

The two charts below show the sources of delays at Core 30 airports by type of delay.



Note: System impact delays are delays assigned to causal facilities in OPSNET and are composed of delays due to TMIs, departure delays, and airborne delays. System impact delays are also the basis for delays by class and delays by cause in OPSNET. (<http://aspmhelp.faa.gov/index.php/OPSNET> Reports: Definitions of Variables)

Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), Operations Network (OPSNET), March 7, 2022.

## Total Cost of Delay

The total cost of flight delays is the sum of costs to airlines, passengers, lost demand, and indirect costs. FAA Office of Aviation Policy and Plans (APO) estimates for 2019 show the cost of delayed flights rose by 9.3 percent, from \$30.2 to \$33.0 billion, an increase of \$2.8 billion. Most of this rise was due to an increase in the impact of delays to passengers, from \$16.4 to \$18.1 billion, a \$1.7 billion difference. Between 2012 and 2019, the total cost of delays rose from \$19.2 to \$33.0 billion, an increase of \$13.8 billion. The cost of delays to passengers accounted for \$8.4 billion of this increase.

\$Billions	2012	2013	2014	2015	2016	2017	2018	2019*
Airlines <sup>1</sup>	5.7	6.0	5.8	5.8	5.6	6.4	7.7	8.3
Passengers <sup>2</sup>	9.7	11.0	10.5	13.3	13.3	14.8	16.4	18.1
Lost Demand <sup>3</sup>	1.3	1.4	1.4	1.8	1.8	2.0	2.2	2.4
Indirect <sup>4</sup>	2.5	2.7	2.6	3.1	3.0	3.4	3.9	4.2
<b>Total</b>	<b>19.2</b>	<b>21.1</b>	<b>20.3</b>	<b>24.0</b>	<b>23.7</b>	<b>26.6</b>	<b>30.2</b>	<b>33.0</b>

\*Estimates for CY2020 are not yet available.

Notes:

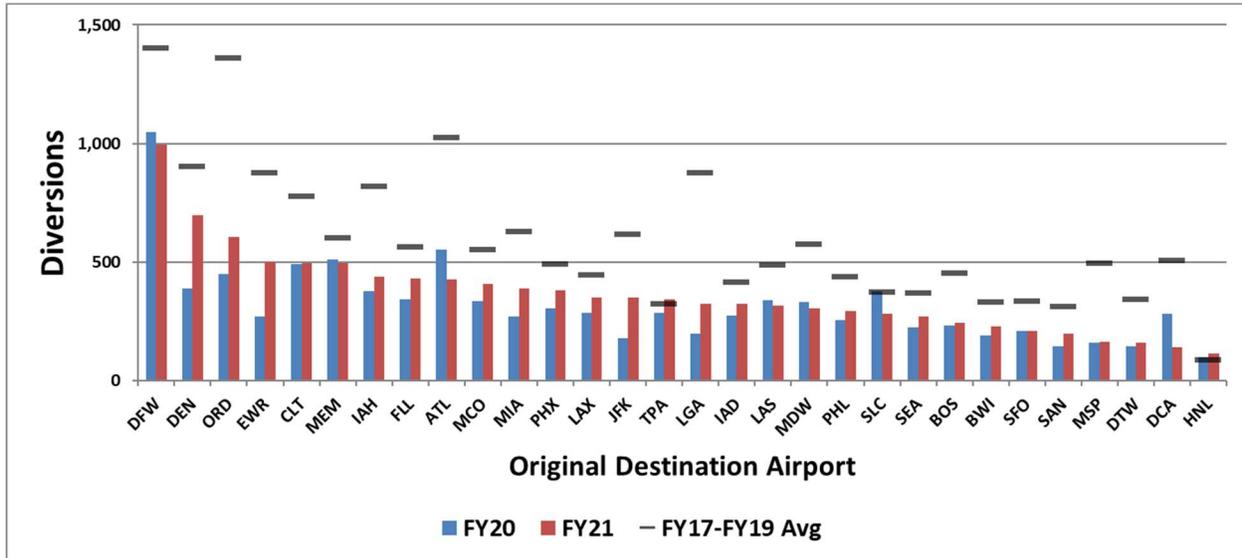
- Airlines** (cost of delay to airlines): Increased expenses for crew, fuel, maintenance, etc.
- Passengers** (cost of delay to passengers): Time lost due to schedule buffer, delayed flights, flight cancellations, and missed connections.
- Lost Demand** (cost of passenger decisions to avoid future air travel): Estimated welfare loss incurred by passengers who avoid future air travel as the result of delays.
- Indirect** (indirect cost of delay): Other business sectors depend on air travel for transportation. Air travel delays impact these sectors by increasing costs in terms of dollars and time.

Source: Federal Aviation Administration, Office of Aviation Policy and Plans, Forecast and Performance Analysis Division (APO-100), July 8, 2020.

## Diversions at Core 30 Airports

The airports reported below are the original intended destinations for the diverted aircraft. Increases in the number of diversions can indicate capacity issues at the airport due to weather, construction, or volume. Over all Core 30 airports, the number of diversions rose by 13.7 percent in FY2021; however, since before the start of the pandemic, Core 30 airport diversions fell by 39.1 percent from 17,779 (table below).

Airports with the highest increases in diversions were JFK (with 97.7 percent), Newark (EWR) (86.2 percent), and Denver (DEN) (79.9 percent). Airports with the highest decreases were Washington National (DCA) (-50.2 percent), Salt Lake City (SLC) (-26 percent), and Atlanta (ATL) (-23.3 percent). All but two airports show decreases in diversions since before the pandemic (Honolulu (HNL) and Tampa (TPA)) (graph and table below). (See, Appendix I for explanations of the Core 30 airport codes.)



Core 30 Total Diversions			
FY17-19 Avg	FY20	FY21	%Change
17,779	9,534	10,844	13.7%

Airport	Rank*	FY17-19 Avg	FY20	FY21
ATL	9	1,025	553	424
BOS	23	454	232	243
BWI	24	331	188	228
CLT	5	778	492	496
DCA	29	507	279	139
DEN	2	902	388	698
DFW	1	1,404	1,049	993
DTW	28	344	143	157
EWR	4	874	268	499
FLL	8	562	343	429
HNL	30	85	97	112
IAD	16	415	275	324
IAH	7	819	377	438
JFK	14	618	176	348
LAS	18	488	338	314

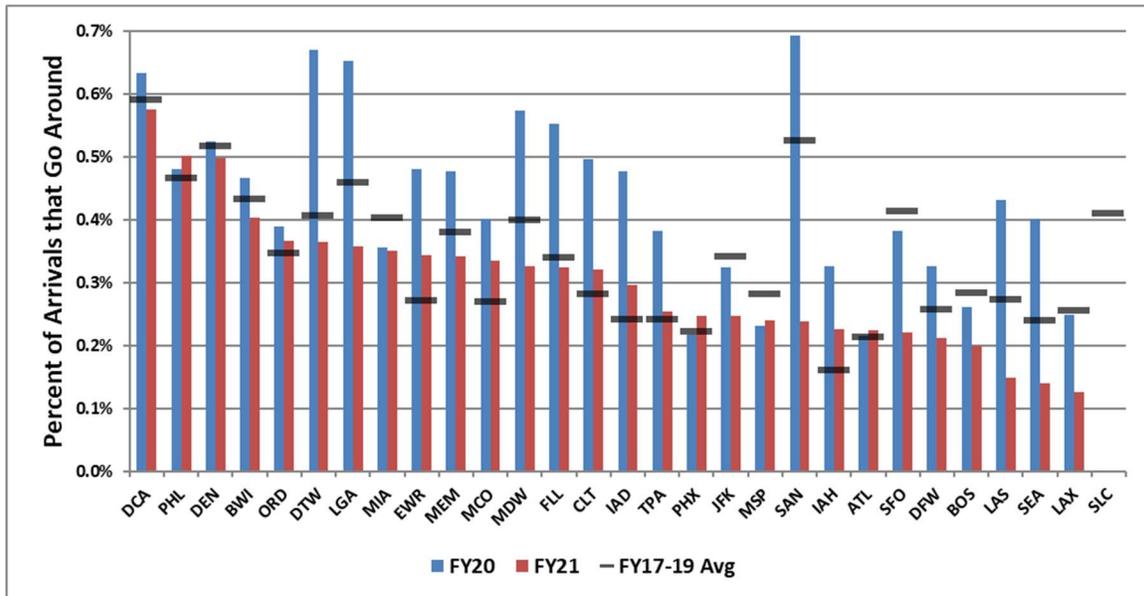
Airport	Rank*	FY17-19 Avg	FY20	FY21
LAX	13	445	286	349
LGA	16	876	198	324
MCO	10	552	334	407
MDW	19	574	330	305
MEM	6	603	510	494
MIA	11	628	271	388
MSP	27	493	159	162
ORD	3	1,359	447	607
PHL	20	439	254	293
PHX	12	492	305	381
SAN	26	311	145	195
SEA	22	369	225	270
SFO	25	336	209	208
SLC	21	374	377	279
TPA	15	325	286	340

\*Ranked by number of FY2021 diversions.

Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), [Aviation System Performance Metrics \(ASPM\)](#), March 16, 2022.

## Go-Arounds at Core 30 Airports

Go-arounds as a percent of arrival operations at each Core 30 airport (except Honolulu) appear below. In FY2021, go-arounds at each Core 30 airport, did not exceed 0.6 percent. Average go-arounds as a percent of arrivals across all Core 30 airports fell slightly, to about 0.3 percent (tables and graph below). This occurred mainly due to a decline in go-arounds relative to a small increase in arrival operations. (The estimates presented here are based on ASPM and CountOps data.) (See, Appendix I for explanations of the Core 30 airport codes.)



Core 30 Go Arouns As Percent of Arrivals			
FY17-19 Avg	FY20	FY21	%Change
0.3%	0.4%	0.3%	-28.5%

Airport	FY17-19 Avg	FY20	FY21
ATL	0.2%	0.2%	0.2%
BOS	0.3%	0.3%	0.2%
BWI	0.4%	0.5%	0.4%
CLT	0.3%	0.5%	0.3%
DCA	0.6%	0.6%	0.6%
DEN	0.5%	0.5%	0.5%
DFW	0.3%	0.3%	0.2%
DTW	0.4%	0.7%	0.4%
EWR	0.3%	0.5%	0.3%
FLL	0.3%	0.6%	0.3%
IAD	0.2%	0.5%	0.3%
IAH	0.2%	0.3%	0.2%
JFK	0.3%	0.3%	0.2%
LAS	0.3%	0.4%	0.1%
LAX	0.3%	0.2%	0.1%

Airport	FY17-19 Avg	FY20	FY21
LGA	0.5%	0.7%	0.4%
MCO	0.3%	0.4%	0.3%
MDW	0.4%	0.6%	0.3%
MEM	0.4%	0.5%	0.3%
MIA	0.4%	0.4%	0.3%
MSP	0.3%	0.2%	0.2%
ORD	0.3%	0.4%	0.4%
PHL	0.5%	0.5%	0.5%
PHX	0.2%	0.2%	0.2%
SAN	0.5%	0.7%	0.2%
SEA	0.2%	0.4%	0.1%
SFO	0.4%	0.4%	0.2%
SLC	0.4%	NA	NA
TPA	0.2%	0.4%	0.3%

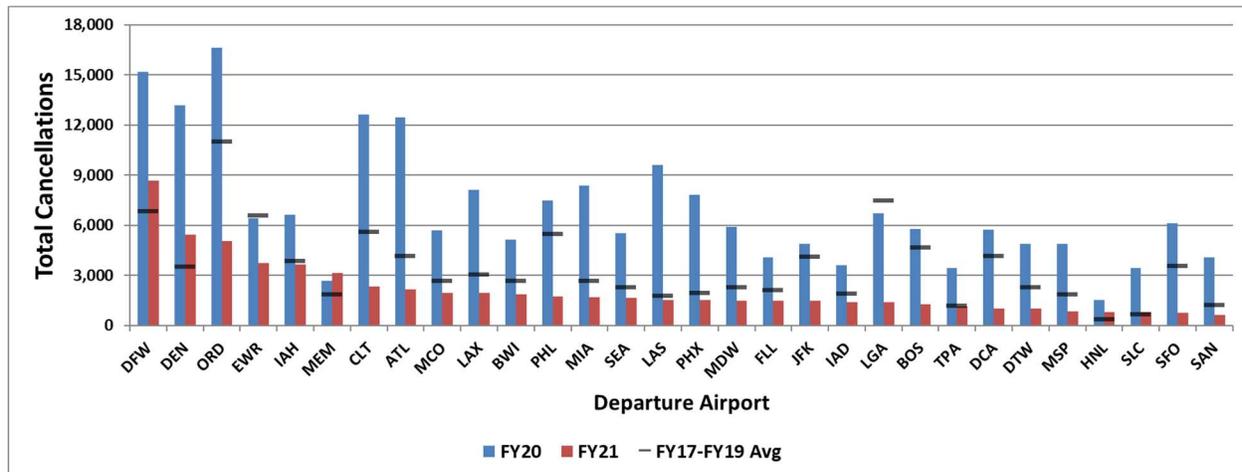
\* FY2020 and FY2021 data for Salt Lake City (SLC) are not yet available.

Sources: Go-arounds: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), Aviation System Performance Metrics (ASPM), April 6, 2022; Arrivals: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), CountOps, April 6, 2022.

## Cancellations at Core 30 Airports

During FY2021, flight departure cancellations at Core 30 airports fell by 69.4 percent. Cancellations fell at every airport, except Memphis (MEM) (table below). A year earlier cancellations almost doubled, increasing by 96.5 percent, rising at every airport. Cancellations may be due to weather, system delays, equipment issues, or other reasons, such as the March 2020 unforeseen precipitous fall in air travel and high flight cancellation levels due to the COVID-19 pandemic.

During FY2021, the airports with the highest number of cancellations were Dallas-Fort Worth (DFW), Denver (DEN), and Chicago O’Hare (ORD); each with over 5,000 cancellations. Five airports show increases in cancellations since before the pandemic (Dallas-Fort Worth (DFW), Denver (DEN), Memphis (MEM), Honolulu (HNL), and Salt Lake City (SLC)) (table and graph below). (See, Appendix I for explanations of the Core 30 airport codes.)



Core 30 Total Cancellations			
FY17-19 Avg	FY20	FY21	%Change
104,156	208,759	63,779	-69.4%

Airport	Rank*	FY17-19 Avg	FY20	FY21
ATL	8	4,153	12,459	2,173
BOS	22	4,667	5,773	1,273
BWI	11	2,674	5,128	1,888
CLT	7	5,597	12,652	2,324
DCA	24	4,160	5,751	1,034
DEN	2	3,551	13,169	5,456
DFW	1	6,856	15,207	8,697
DTW	25	2,294	4,885	1,018
EWR	4	6,578	6,416	3,733
FLL	18	2,144	4,103	1,486
HNL	27	384	1,532	800
IAD	20	1,927	3,601	1,420
IAH	5	3,863	6,633	3,666
JFK	19	4,134	4,904	1,485
LAS	15	1,771	9,605	1,550

Airport	Rank*	FY17-19 Avg	FY20	FY21
LAX	10	3,058	8,112	1,956
LGA	21	7,473	6,709	1,411
MCO	9	2,666	5,705	1,964
MDW	17	2,293	5,916	1,488
MEM	6	1,891	2,694	3,132
MIA	13	2,667	8,375	1,694
MSP	26	1,873	4,881	845
ORD	3	11,030	16,617	5,068
PHL	12	5,501	7,488	1,729
PHX	16	1,952	7,838	1,543
SAN	30	1,228	4,096	620
SEA	14	2,315	5,537	1,647
SFO	29	3,586	6,110	759
SLC	28	659	3,433	788
TPA	23	1,207	3,430	1,132

Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), Aviation System Performance Metrics (ASPM), March 16, 2022.

## **Section 4. Traffic Management Initiatives**

Traffic Management Initiatives (TMIs) are programs and tools that ATC may use to manage air traffic. These initiatives can take a number of forms, depending on the need and situation. Some TMIs are used to manage excess demand or a lowered acceptance rate at a particular airport. Other TMIs are used to manage traffic issues in the en route environment usually caused by convective weather. The TMIs reported in this report include:

**Ground Delay Programs (GDP)**

**Ground stops (GS)**

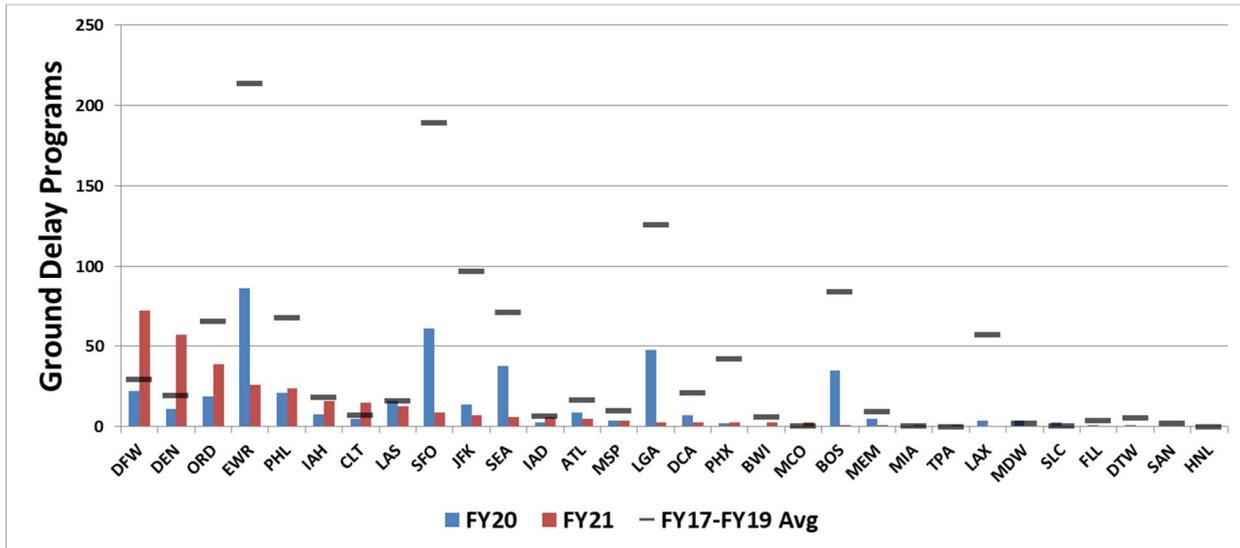
**Airspace Flow Programs (AFP)**

**Holdings**

## Ground Delay Programs at Core 30 Airports

A ground delay program (GDP) is a TMI where aircraft are delayed at their departure airport in order to reconcile demand with capacity at their arrival airport. GDPs are airport-specific, therefore, each GDP is reported for a particular airport. During FY2021, GDPs decreased by 25.5 percent across all Core 30 airports, from 427 to 318. Before the pandemic (FY2017-2019), the average number of GDPs was 1,190 (table below).

In FY2021, Dallas-Fort Worth (DFW), Denver (DEN), Chicago O'Hare (ORD), and Newark (EWR) had the highest number of GDPs. Together, these three airports accounted for 53 percent of all GDPs at Core 30 airports. Since before the pandemic (FY2017-2019), GDPs rose at Dallas-Fort Worth (DFW), Denver (DEN), Charlotte (CLT), Orlando (MCO), Tampa (TPA), and Salt Lake City (SLC) (graph and table below). (See, Appendix I for explanations of the Core 30 airport codes.)



Total Core 30 GDPs			
FY17-19 Avg	FY20	FY21	%Change
1,190	427	318	-25.5%

Airport	FY17-19 Avg	FY20	FY21
ATL	17	9	5
BOS	84	35	1
BWI	6	0	3
CLT	7	5	15
DCA	21	7	3
DEN	19	11	57
DFW	29	22	72
DTW	5	1	0
EWR	214	86	26
FLL	4	1	0
HNL	0	0	0
IAD	7	3	6
IAH	18	8	16
JFK	97	14	7
LAS	16	16	13

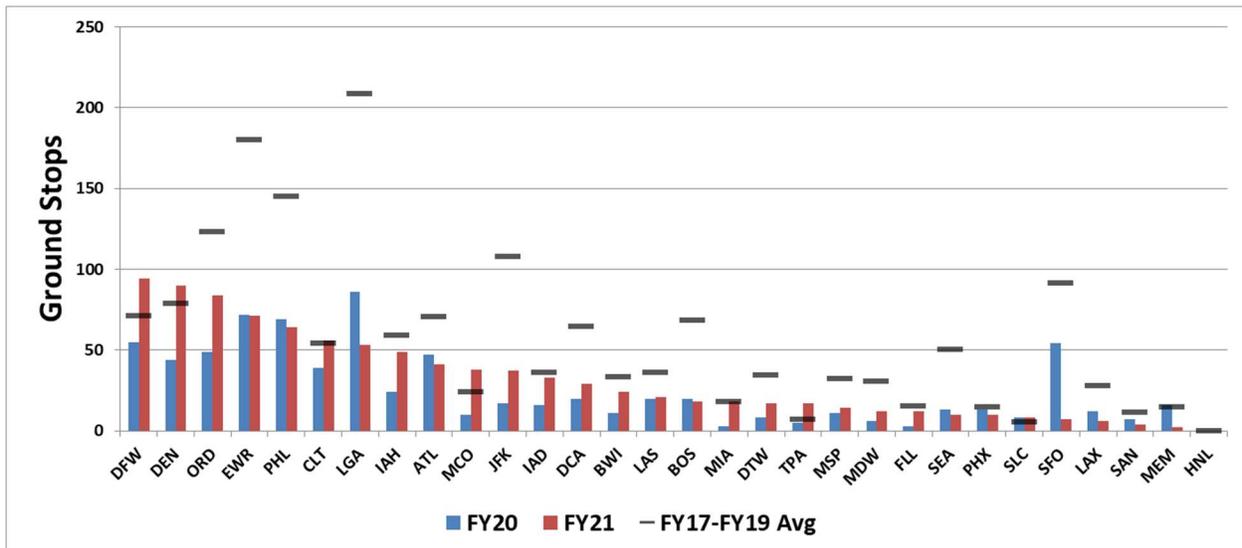
Airport	FY17-19 Avg	FY20	FY21
LAX	57	4	0
LGA	126	48	3
MCO	1	0	3
MDW	2	4	0
MEM	10	5	1
MIA	1	0	1
MSP	10	4	4
ORD	66	19	39
PHL	68	21	24
PHX	42	2	3
SAN	2	0	0
SEA	71	38	6
SFO	190	61	9
SLC	0	3	0
TPA	0	0	1

Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), Operations Network (OPSNET), March 24, 2022.

## Ground Stops at Core 30 Airports

Ground stops are the most restrictive form of TMI because they hold all aircraft, within the scope of the ground stop, at their departure airports until conditions at the destination airport allow for their arrival. Ground stops only affect arrivals to a specific airport (not departures) and, like GDPs, are airport-specific. During FY2021, the number of ground stops increased by 23.9 percent across all Core 30 airports, from 758 to 939. Before the pandemic (FY2017-2019), the average number of ground stops was 1,716 (table below).

FY2021, Dallas Fort-Worth (DFW), Denver (DEN), and Chicago O'Hare (ORD) had the highest number of ground stops. Since before the pandemic (FY2017-2019), ground stops rose at Dallas-Fort Worth (DFW), Denver (DEN), Charlotte (CLT), Orlando (MCO), and Tampa (TPA) (graph and table below). (See, Appendix I for explanations of the Core 30 airport codes.)



Total Core 30 Ground Stops			
FY17-19 Avg	FY20	FY21	%Change
1,716	758	939	23.9%

Airport	FY17-19 Avg	FY20	FY21
ATL	71	47	41
BOS	68	20	18
BWI	34	11	24
CLT	54	39	56
DCA	65	20	29
DEN	79	44	90
DFW	71	55	94
DTW	34	8	17
EWR	180	72	71
FLL	15	3	12
HNL	0	0	0
IAD	36	16	33
IAH	59	24	49
JFK	108	17	37
LAS	36	20	21

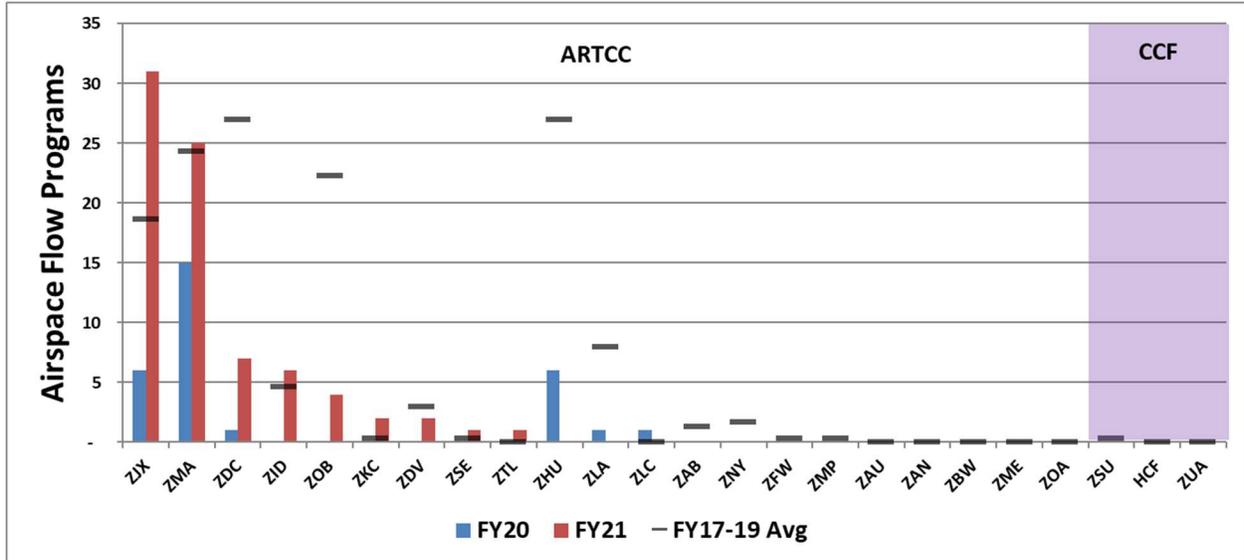
Airport	FY17-19 Avg	FY20	FY21
LAX	28	12	6
LGA	208	86	53
MCO	24	10	38
MDW	31	6	12
MEM	15	16	2
MIA	18	3	18
MSP	32	11	14
ORD	123	49	84
PHL	145	69	64
PHX	15	13	10
SAN	11	7	4
SEA	51	13	10
SFO	91	54	7
SLC	6	8	8
TPA	7	5	17

Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), Operations Network (OPSNET), March 24, 2022.

## Airspace Flow Programs by Center

Imagine a line drawn in space in association with a constraint, usually convective weather. Under an airspace flow program, any flights filed that crosses the line (usually only in one direction) are assigned an expected departure clearance time (EDCT), to ensure that it arrives at the line, or “boundary,” at a time when it can be accommodated. In FY2021, there were 79 airspace flow programs (AFP) imposed by air traffic managers versus 30 in FY2020, an increase of 163.3 percent. The main reasons for the 79 AFPs in FY2021 were weather conditions and traffic volume. Before the pandemic (FY2017-2019), the average number of AFPs was 140 (table below).

In FY2021, AFPs mainly affected Jacksonville (ZJX) and Miami (ZMA). Together, these centers accounted for 56 of the 79 AFPs. Since before the pandemic (FY2017-2019), the largest increase in AFPs occurred at Jacksonville (ZJX) (graph and table below). (These estimates are based on National Traffic Management Log (NTML) data.) (See, Appendix I for explanations of the ARTCC and CCF codes.)



\* Data for CCF JCF are not available.

Total Centers Air Flow Programs			
FY17-19 Avg	FY20	FY21	%Change
140	30	79	163.3%

Center	FY17-19 Avg	FY20	FY21
HCF	0	0	0
ZLA	8	1	0
ZLC	0	1	0
ZMA	24	15	25
ZME	0	0	0
ZMP	0	0	0
ZNY	2	0	0
ZOA	0	0	0
ZOB	22	0	4
ZSE	0	0	1
ZSU	0	0	0
ZTL	0	0	1
ZUA	0	0	0
ZDC	27	1	7
ZDV	3	0	2
ZFW	0	0	0
ZHU	27	6	0
ZID	5	0	6
ZJX	19	6	31
ZKC	0	0	2

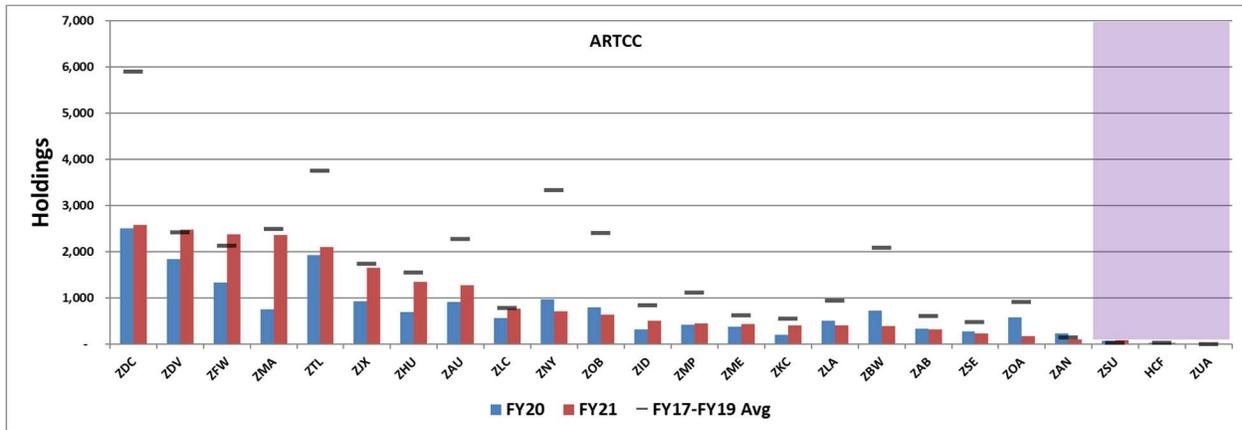
Center	FY17-19 Avg	FY20	FY21
HCF	0	0	0
ZLA	8	1	0
ZLC	0	1	0
ZMA	24	15	25
ZME	0	0	0
ZMP	0	0	0
ZNY	2	0	0
ZOA	0	0	0
ZOB	22	0	4
ZSE	0	0	1
ZSU	0	0	0
ZTL	0	0	1
ZUA	0	0	0
ZDC	27	1	7
ZDV	3	0	2
ZFW	0	0	0
ZHU	27	6	0
ZID	5	0	6
ZJX	19	6	31
ZKC	0	0	2

Source: Federal Aviation Administration, Air Traffic Organization, Technical Operations (AJW), National Traffic Management Log (NTML), March 22, 2022.

## Holdings by Center

A holding occurs when an aircraft is deliberately delayed en route by flying in a repeating rotational pattern. They are typically implemented when there is traffic congestion or convective weather at the destination airport or an adjacent facility. During FY2021, there were 21,860 holdings, rising 26.1 percent from FY2020. Before the pandemic (FY2017-2019), the average number of holdings was far higher at 37,166 (table below).

During FY2021, OPSNET data shows among Air Route Traffic Control Centers (ARTCC), the highest numbers of airborne holdings occurred in DC (ZDC), Denver (ZDV), Fort Worth (ZFW), and Miami (ZMA). Holdings slightly surpassed pre-pandemic levels at three Centers (Denver (ZDV), Fort Worth (ZFW), and San Juan (ZSU)) (graph and table below). (See, Appendix I for explanations of the ARTCC and combined control facility (CCF) codes.)



\* Data for CCF JCF are not available.

Total Center Flight Holdings			
FY17-19 Avg	FY20	FY21	%Change
37,166	17,337	21,860	26.1%

Center	FY17-19 Avg	FY20	FY21
ZAB	611	329	322
ZAN	146	234	103
ZAU	2,270	913	1,274
ZBW	2,093	728	389
ZDC	5,894	2,504	2,585
ZDV	2,427	1,837	2,480
ZFW	2,129	1,342	2,384
ZHU	1,552	704	1,347
ZID	846	325	513
ZJX	1,738	935	1,648
ZKC	553	200	410
ZLA	945	510	409

Center	FY17-19 Avg	FY20	FY21
ZLC	789	565	769
ZMA	2,492	750	2,359
ZME	619	372	438
ZMP	1,122	418	453
ZNY	3,330	966	707
ZOA	912	578	176
ZOB	2,409	802	640
ZSE	482	273	234
ZTL	3,748	1,935	2,106
ZSU	26	79	84
HCF	36	38	30
ZUA	0	0	0

Source: Federal Aviation Administration, Air Traffic Organization, Office of Performance Analysis (AJR-G), Operations Network (OPSNET), March 16, 2022.

## Section 5. Safety Metrics

The U.S. national airspace system is the safest air transportation system in the world. This report presents metrics used to measure the safety of the NAS:

**Runway Incursions**

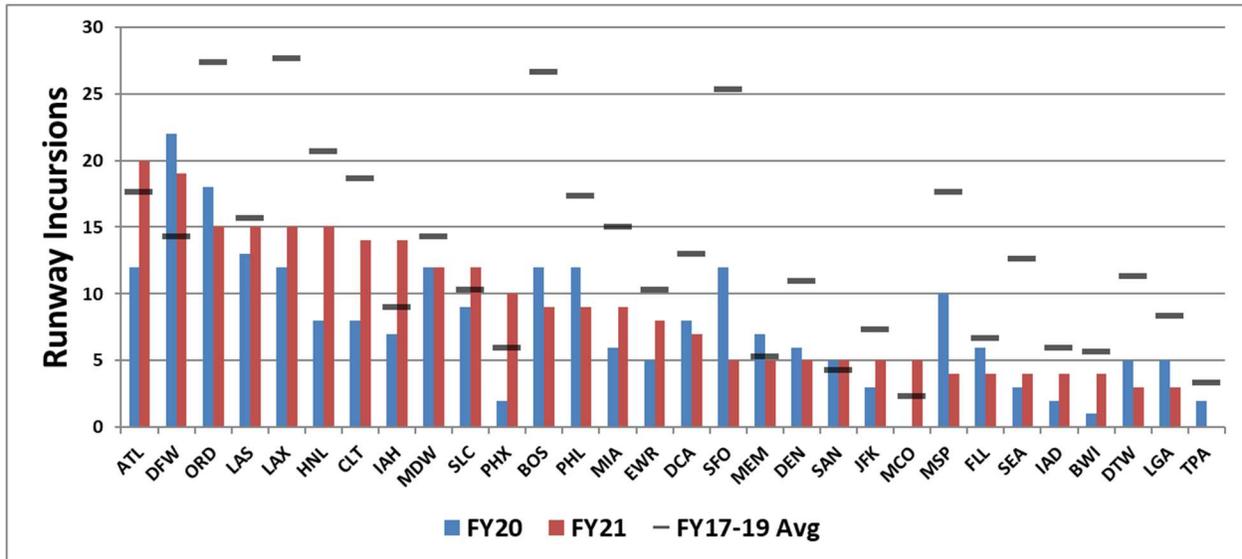
**Incursions by Type**

**Loss of Standard Separation Count**

## Runway Incursions at Core 30 Airports

A runway incursion is any occurrence involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft. Across all Core 30 airports, the number of runway incursions rose from 233 in FY2020 to 259 in FY2021. Before the pandemic (FY2017-2019), the average annual number of runway incursions was higher, at 391 (table below).

In FY2021, the highest numbers of runway incursions occurred at Atlanta (ATL) and Dallas-Fort Worth (DFW). The number of runway incursions exceeded pre-pandemic levels at seven airports, most notably at Dallas-Fort Worth (DFW) and Houston (IAH) (graph and table below). Incursions by airport and by type appear on the next page. (See, Appendix I for explanations of the Core 30 airport codes.)



Core 30 Total Runway Incursions			
FY17-19 Avg	FY20	FY21	%Change
391	233	259	11.2%

Airport	FY17-19 Avg	FY20	FY21
ATL	18	12	20
BOS	27	12	9
BWI	6	1	4
CLT	19	8	14
DCA	13	8	7
DEN	11	6	5
DFW	14	22	19
DTW	11	5	3
EWR	10	5	8
FLL	7	6	4
HNL	21	8	15
IAD	6	2	4
IAH	9	7	14
JFK	7	3	5
LAS	16	13	15

Airport	FY17-19 Avg	FY20	FY21
LAX	28	12	15
LGA	8	5	3
MCO	2	0	5
MDW	14	12	12
MEM	5	7	5
MIA	15	6	9
MSP	18	10	4
ORD	27	18	15
PHL	17	12	9
PHX	6	2	10
SAN	4	5	5
SEA	13	3	4
SFO	25	12	5
SLC	10	9	12
TPA	3	2	0

\*Honolulu is coded as HNL or HCF in the source data.

Source: Federal Aviation Administration, Air Traffic Organization, Safety and Technical Training (AJT), March 23, 2022.

## *Incursions by Type at Core 30 Airports, FY2021*

<b>Airport</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>Totals</b>
ATL	0	1	11	8	0	20
BOS	0	0	4	5	0	9
BWI	0	0	2	2	0	4
CLT	0	0	11	3	0	14
DCA	0	0	6	1	0	7
DEN	0	0	5	0	0	5
DFW	0	0	11	8	0	19
DTW	0	0	0	3	0	3
EWR	0	0	5	3	0	8
FLL	0	0	4	0	0	4
HNL	1	0	8	6	0	15
IAD	0	0	1	3	0	4
IAH	0	0	6	8	0	14
JFK	0	0	0	5	0	5
LAS	0	0	5	10	0	15
LAX	0	0	6	9	0	15
LGA	0	0	1	2	0	3
MCO	0	0	4	1	0	5
MDW	0	0	8	4	0	12
MEM	0	0	2	3	0	5
MIA	0	1	2	6	0	9
MSP	0	0	3	1	0	4
ORD	0	0	9	6	0	15
PHL	0	0	7	2	0	9
PHX	0	0	7	3	0	10
SAN	0	2	2	1	0	5
SEA	0	0	3	1	0	4
SFO	0	0	2	3	0	5
SLC	0	0	9	3	0	12
TPA	0	0	1	3	0	4

**Category A** - A serious incident in which a collision was narrowly avoided.

**Category B** - An incident in which separation decreases and there is a significant potential for collision, which may result in a time critical corrective/evasive response to avoid a collision.

**Category C** - An incident characterized by ample time and/or distance to avoid a collision.

**Category D** - An incident that meets the definition of a runway incursion such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and take-off of aircraft of aircraft but with no immediate safety consequences.

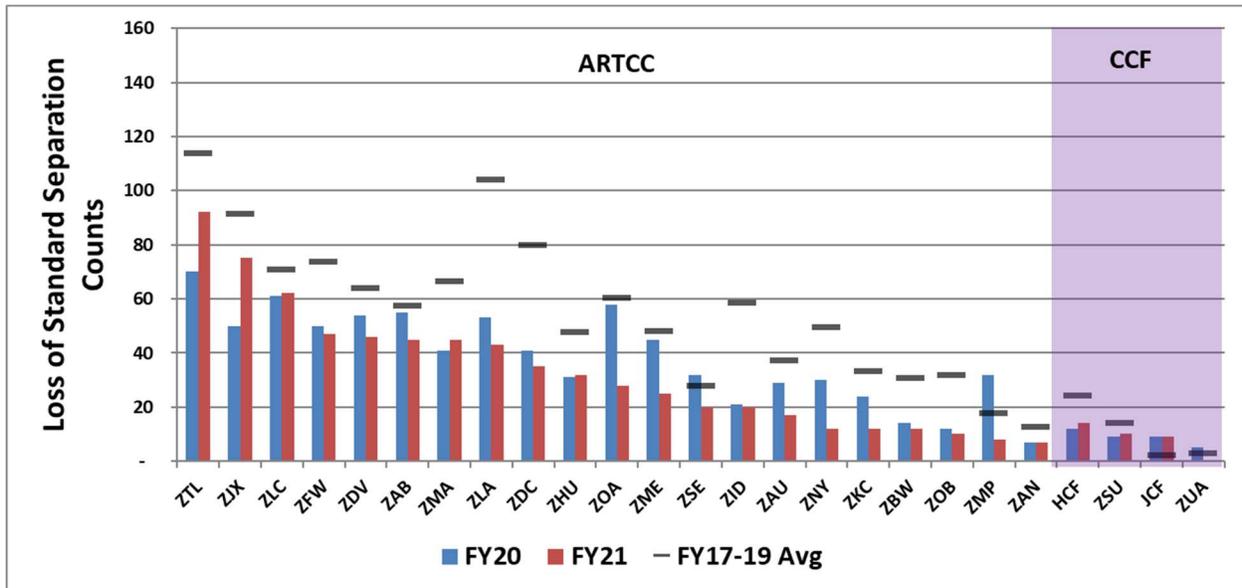
**Category E** - An incident in which insufficient or conflicting evidence of the event precludes assigning another category.

Source: Federal Aviation Administration, Air Traffic Organization, Safety and Technical Training (AJI), March 23, 2022.

## Loss of Standard Separation Count, by Center

Standard separation is a specified separation minima between airborne aircraft in controlled airspace. Breaches of such minima are based on airborne loss event data. Losses of standard separation are reported by Air Route Traffic Control Center (ARTCC). Across all centers, the number of losses of standard separation fell from 845 in FY2020 to 726 in FY2021. Before the pandemic (FY2017-2019), the average annual number of losses of standard separation was higher at 1,221 (table below). This means losses of standard separation remain below pre-pandemic levels.

In FY2021, the centers with the highest losses of standard of separation were Atlanta (ZTL), Jacksonville (ZJX), and Salt Lake City (ZLC). The number of losses of standard of separation exceeded pre-pandemic levels at only one CCF, Joshua Tree (JCF) (graph and table below). (See, Appendix I for explanations of the ARTCC and combined control facilities (CCF).)



Total Losses of Standard Separation			
FY17-19 Avg	FY20	FY21	%Change
1,221	845	726	-14.1%

Center	FY17-19 Avg	FY20	FY21
HCF	24	12	14
JCF	2	9	9
ZAB	57	55	45
ZAN	13	7	7
ZAU	37	29	17
ZBW	31	14	12
ZDC	80	41	35
ZDV	64	54	46
ZFW	74	50	47
ZHU	48	31	32
ZID	59	21	20
ZJX	91	50	75
ZKC	33	24	12

Center	FY17-19 Avg	FY20	FY21
ZLA	104	53	43
ZLC	71	61	62
ZMA	66	41	45
ZME	48	45	25
ZMP	18	32	8
ZNY	50	30	12
ZOA	60	58	28
ZOB	32	12	10
ZSE	28	32	20
ZSU	14	9	10
ZTL	114	70	92
ZUA	3	5	0

Source: Federal Aviation Administration, Air Traffic Organization, Office of Policy and Performance (AJI-3), unpublished Airborne Loss Event data, March 23, 2022.

## **Section 6. Other ATO Topics**

There are a variety of other aspects of the NAS which are of special interest. This report presents the following:

**Flight Service Stations**

**Commercial Space Launch Activity**

## ***Flight Service Stations***

Flight services are delivered nationwide through certified professional controllers in Alaska and the contiguous United States, Hawaii, Puerto Rico. Services include preflight weather briefings, flight planning, inflight advisory services, search and rescue (SAR), and processing notices to air missions (NOTAMs). Self-briefing and other automated services are provided through an online web portal. Web services include interactive graphical capabilities to view a wide range of weather and aeronautical information, flight planning, activating and closing flight plans, and more. Pilots may also access automated voice services to receive current and forecast conditions at specific airports, and receive updates for adverse conditions, including TFRs.

Flight Service also delivers the FAA Weather Camera Program. This program features an expanding network of nearly 300 camera sites in Alaska, Colorado, and Montana (other sites, including Hawaii, coming soon) and over 175 sites hosted by NAV Canada, Canada's civil air navigation service provider. The weather cameras website provides pilots with additional information for improved situational awareness and decision-making. On the website, pilots can see current images at specific locations, compare the images to clear day views, or playback a loop of past images to establish weather trends. The website also delivers a variety of safety of flight information including adverse conditions, current and forecast conditions, pilot reports, and aeronautical information.

<b>ALASKA FSS</b>	<b>Barrow FSS (BRW)</b> <b>Cold Bay FSS (CDB)</b> <b>Deadhorse FSS (SCC)</b> <b>Dillingham FSS (DLG)</b> <b>Fairbanks FSS (FAI)</b> <b>Homer FSS (HOM)</b> <b>Iliamna FSS (ILI)</b> <b>Juneau FSS (JNU)</b> <b>Kenai FSS (ENA)</b> <b>Ketchikan FSS (KTN)</b> <b>Kotzebue FSS (OTZ)</b> <b>McGrath FSS (MCG)</b> <b>Nome FSS (OME)</b> <b>Northway FSS (ORT)</b> <b>Palmer FSS (PAQ)</b> <b>Sitka FSS (SIT)</b> <b>Talkeetna FSS (TKA)</b>
<b>FEDERAL CONTRACT FSS</b>	<b>Leidos FCSS Washington Hub (DCA)</b> <b>Leidos FCSS Fort Worth Hub (FTW)</b>

## FAA Flight Services

FAA Facilities – Alaska Flight Service							
Year	Pilot Briefs	Flight Plans Filed	Preflight Calls	Aircraft Contacts	Airport Advisories	NOTAMs Issued	Total SAR
FY 2017	94,553	194,641	52,504	485,847	305,915	135,226	3,662
FY 2018	89,592	210,626	52,200	521,048	325,140	158,003	4,869
FY 2019	92,070	209,024	52,980	542,550	327,130	166,848	6,924
FY 2020	71,570	141,492	39,031	400,181	243,844	166,954	3,021
FY 2021	67,999	151,946	37,339	445,942	280,499	180,364	3,099

Federal Contract Flight Services							
Year	Pilot Briefs	Flight Plans Filed	Preflight Calls	Inflight Contacts	Flight Data Calls	NOTAMs Issued	Total SAR
FY 2017	829,909	515,868	1,344,640	314,363	175,203	216,997	8,145
FY 2018	797,746	462,207	1,255,510	286,392	178,110	216,249	9,337
FY 2019	747,731	387,694	1,158,005	257,701	166,546	200,192	9,728
FY 2020	541,004	195,635	782,145	175,361	121,118	179,612	13,195
FY 2021	483,675	168,094	660,369	186,628	125,186	190,118	33,769

Web Services/DUATs		
Year	Pilot Briefs*	Flight Plans Filed
FY 2017	29,079,619	2,592,214
FY 2018	26,349,042	2,229,961
FY 2019	18,946,978	1,690,246
FY 2020	17,290,280	1,272,098
FY 2021	15,550,689	1,328,714

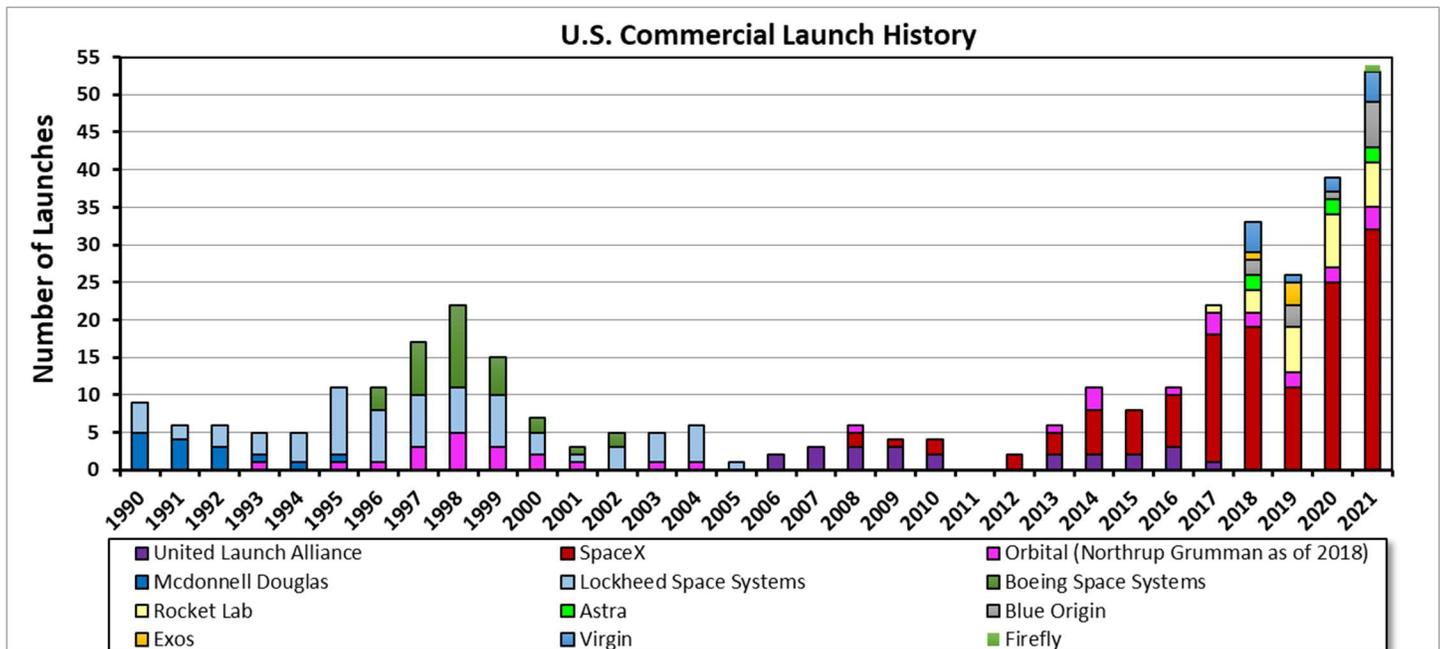
\* Represents the number of hits to contract web services including DUATs (DUATs decommissioned May, 2018).

United States NOTAM Office (USNOF)		
Year	Domestic	International
FY 2017	1,455,238	760,015
FY 2018	1,569,386	874,091
FY 2019	1,670,499	969,951
FY 2020	1,474,047	873,025
FY 2021	1,620,681	953,125

Sources: FAA, Air Traffic Organization, Flight Service (AJR-B), Email communication, March 29 and April 8, 2022; FAA, Air Traffic Organization, U.S. NOTAM Office (AJV-A370), Calculations based on email communication, March 9, 2022.

## Commercial Space Launch Activity

In CY2021, the FAA licensed 54 U.S. orbital commercial space launches. These launches were carried out by the following companies: SpaceX, 32 launches; Blue Origin, 6; Rocket Lab, 6 (from New Zealand); Virgin, 4; Orbital, 3 (part of Northrup Grumman Innovation Systems as of 2018); Astra, 2; and Firefly, 1. A graph showing annual numbers of commercial launches, by company, appears below.



Note: A commercial launch is a launch that is internationally competed (i.e., available in principle to international launch providers) or whose primary payload is commercial in nature. FAA-licensed launches carrying captive government (NASA and DOD) or industry payloads are counted here. Data for 2018-2021 include launch failures and successes, and subspace and suborbital launches.

Sources: Federal Aviation Administration, Commercial Space Transportation (AST), The Annual Compendium of Commercial Space Transportation, various years; FAA, Commercial Space Transportation (AST), Launches, as of March 28, 2022. [https://www.faa.gov/data\\_research/commercial\\_space\\_data/launches/?type=license](https://www.faa.gov/data_research/commercial_space_data/launches/?type=license); U.S. Dept. of Transportation, Bureau of Transportation Statistics, National Transportation Statistics, Table 1-39, January 17, 2019. <https://www.bts.gov/browse-statistical-products-and-data/national-transportation-statistics/national-transportation-8>

## U.S. Spaceports

U.S. commercial space launches are carried out from FAA-licensed spaceports located throughout the country. At present, there are 13 active FAA-licensed commercial spaceports. For a map of these locations, and to learn more about U.S. spaceports, please consult the FAA Office of Spaceports web page at:

[https://www.faa.gov/about/office\\_org/headquarters\\_offices/ast/programs/office\\_spaceports](https://www.faa.gov/about/office_org/headquarters_offices/ast/programs/office_spaceports)

## Appendix I. Facility Codes

### Core 30 Airports

(Source: System Data and Infrastructure Group, Office of Performance Analysis, Systems Operations Services, Air Traffic Organization, FAA (AJR-G2).)

Code	Airport	Code	Airport
ATL	Hartsfield-Jackson Atlanta International	LAX	Los Angeles International
BOS	Boston Logan International	LGA	New York LaGuardia
BWI	Baltimore/Washington International	MCO	Orlando International
CLT	Charlotte Douglas International	MDW	Chicago Midway
DCA	Ronald Reagan Washington National	MEM	Memphis International
DEN	Denver International	MIA	Miami International
DFW	Dallas-Fort Worth International	MSP	Minneapolis/St. Paul International
DTW	Detroit Metropolitan Wayne County	ORD	Chicago O`Hare International
EWR	Newark Liberty International	PHL	Philadelphia International
FLL	Fort Lauderdale/Hollywood International	PHX	Phoenix Sky Harbor International
HNL	Honolulu International	SAN	San Diego International
IAD	Washington Dulles International	SEA	Seattle/Tacoma International
IAH	George Bush Houston Intercontinental	SFO	San Francisco International
JFK	New York John F. Kennedy International	SLC	Salt Lake City International
LAS	Las Vegas McCarran International	TPA	Tampa International

### Stand-Alone Terminal Radar Control (TRACON) Facilities\*

LocID	TRACON	LocID	TRACON
A11	Anchorage TRACON	NCT	Northern California TRACON
A80	Atlanta TRACON	P31	Pensacola TRACON
A90	Boston TRACON	P50	Phoenix TRACON
C90	Chicago TRACON	P80	Portland TRACON
D01	Denver TRACON	PCT	Potomac TRACON
D10	Dallas-Fort Worth TRACON	R90	Omaha TRACON
D21	Detroit TRACON	S46	Seattle TRACON
F11	Central Florida TRACON	S56	Salt Lake City TRACON
I90	Houston TRACON	SCT	Southern California TRACON
L30	Las Vegas TRACON	T75	St Louis TRACON
M03	Memphis TRACON	U90	Tucson TRACON
M98	Minneapolis TRACON	Y90	Yankee TRACON
N90	New York TRACON		

\*Cape Cod (K90) merged with Boston TRACON (A90); Meridian (NMM) is now a military, not a civilian TRACON.

### Air Route Traffic Control Centers (ARTCC) and Combined Control Facilities (CCF)

LocID	Center	LocID	Center
HCF	Honolulu Control Facility	ZLA	Los Angeles CA ARTCC
JCF	Joshua Tree Control Facility	ZLC	Salt Lake City UT ARTCC
ZAB	Albuquerque NM ARTCC	ZMA	Miami FL ARTCC
ZAN	Anchorage AK ARTCC	ZME	Memphis TN ARTCC
ZAU	Chicago IL ARTCC	ZMP	Minneapolis MN ARTCC
ZBW	Nashua NH ARTCC (Boston)	ZNY	New York NY ARTCC
ZDC	Leesburg VA ARTCC (DC)	ZOA	Oakland CA ARTCC
ZDV	Denver CO ARTCC	ZOB	Cleveland OH ARTCC
ZFW	Fort Worth TX ARTCC	ZSE	Seattle WA ARTCC
ZHU	Houston TX ARTCC	ZSU	San Juan PR Control Facility
ZID	Indianapolis IN ARTCC	ZTL	Atlanta GA ARTCC
ZJX	Jacksonville FL ARTCC	ZUA	Guam Control Facility
ZKC	Kansas City KS ARTCC		

## Appendix II. Other FAA Airport Lists

In addition to the Core 30 airports, FAA also uses several other airport lists, including ASPM 77, OEP 35, and OPSNET 45 airports and 34 Select TRACONS.

### **ASPM 77 Airports**

This is an FAA list of 77 airports, including the Core 30, OEP 35, and other airports. The ASPM (Aviation System Performance Metrics) data includes flights to and from the 77 ASPM airports and all flights by ASPM carriers, as well as flights by those carriers to international and domestic non-ASPM airports. (Source: System Data and Infrastructure Group, Office of Performance Analysis, Systems Operations Services, Air Traffic Organization, FAA (AJR-G2).) (See, Appendix I for the list of Core 30 airports. For OEP 35 airports, see the OEP 35 airport list on the next page.)

<b>Code</b>	<b>Airport</b>	<b>Code</b>	<b>Airport</b>
ABQ	Albuquerque International Sunport	MEM	Memphis International
ANC	Ted Stevens Anchorage International	MHT	Manchester
ATL	Hartsfield-Jackson Atlanta International	MIA	Miami International
AUS	Austin-Bergstrom International	MKE	Milwaukee General Mitchell International
BDL	Bradley International	MSP	Minneapolis/St. Paul International
BHM	Birmingham International	MSY	Louis Armstrong New Orleans International
BNA	Nashville International	OAK	Oakland International
BOS	Boston Logan International	OGG	Kahului
BUF	Buffalo Niagara International	OMA	Omaha Eppley Airfield
BUR	Bob Hope (Burbank/Glendale/Pasadena)	ONT	Ontario International
BWI	Baltimore/Washington International	ORD	Chicago O'Hare International
CLE	Cleveland Hopkins International	OXR	Oxnard
CLT	Charlotte Douglas International	PBI	Palm Beach International
CVG	Cincinnati/Northern Kentucky International	PDX	Portland International
DAL	Dallas Love Field	PHL	Philadelphia International
DAY	Dayton International	PHX	Phoenix Sky Harbor International
DCA	Ronald Reagan Washington National	PIT	Pittsburgh International
DEN	Denver International	PSP	Palm Springs International
DFW	Dallas/Fort Worth International	PVD	Providence Francis Green State
DTW	Detroit Metropolitan Wayne County	RDU	Raleigh/Durham International
EWR	Newark Liberty International	RFD	Greater Rockford
FLL	Fort Lauderdale/Hollywood International	RSW	Southwest Florida International
GYG	Gary Chicago International	SAN	San Diego International
HNL	Honolulu International	SAT	San Antonio International
HOU	Houston Hobby	SDF	Louisville International
HPN	Westchester County	SEA	Seattle/Tacoma International
IAD	Washington Dulles International	SFO	San Francisco International
IAH	George Bush Houston Intercontinental	SJC	Norman Mineta San Jose International
IND	Indianapolis International	SJU	San Juan Luis Munoz International
ISP	Long Island Mac Arthur	SLC	Salt Lake City International
JAX	Jacksonville International	SMF	Sacramento International Airport
JFK	New York John F. Kennedy International	SNA	John Wayne Airport-Orange County
LAS	Las Vegas McCarran International	STL	Lambert Saint Louis International
LAX	Los Angeles International	SWF	Stewart International
LGA	New York LaGuardia	TEB	Teterboro
LGB	Long Beach	TPA	Tampa International
MCI	Kansas City International	TUS	Tucson International
MCO	Orlando International	VNY	Van Nuys
MDW	Chicago Midway		

### **OEP 35 Airports**

This is an FAA list of 35 commercial U.S. airports with significant air traffic. These airports serve major metropolitan areas and some also serve as hubs for airline operations. The OEP 35 (Operational Evolution Partnership) is made up of the Core 30, plus five other airports. In 2005, this list was replaced by the Core 30 list. (Source: System Data and Infrastructure Group, Office of Performance Analysis, Systems Operations Services, Air Traffic Organization, FAA (AJR-G2).

[https://aspm.faa.gov/aspmhelp/index/OEP\\_35.html](https://aspm.faa.gov/aspmhelp/index/OEP_35.html).) (See, Appendix I for the list of Core 30 airports.)

<b>Code</b>	<b>Airport</b>	<b>Code</b>	<b>Airport</b>
ATL	Hartsfield-Jackson Atlanta International	LGA	New York LaGuardia
BOS	Boston Logan International	MCO	Orlando International
BWI	Baltimore/Washington International	MDW	Chicago Midway
CLE	Cleveland Hopkins International	MEM	Memphis International
CLT	Charlotte Douglas International	MIA	Miami International
CVG	Cincinnati/Northern Kentucky International	MSP	Minneapolis/St Paul International
DCA	Ronald Reagan Washington National	ORD	Chicago O'Hare International
DEN	Denver International	PDX	Portland International
DFW	Dallas/Fort Worth International	PHL	Philadelphia International
DTW	Detroit Metropolitan Wayne County	PHX	Phoenix Sky Harbor International
EWR	Newark Liberty International	PIT	Pittsburgh International
FLL	Fort Lauderdale/Hollywood International	SAN	San Diego International
HNL	Honolulu International	SEA	Seattle/Tacoma International
IAD	Washington Dulles International	SFO	San Francisco International
IAH	George Bush Houston Intercontinental	SLC	Salt Lake City International
JFK	New York John F Kennedy International	STL	Lambert Saint Louis International
LAS	Las Vegas McCarran International	TPA	Tampa International
LAX	Los Angeles International		

### **OPSNET 45 Airports**

The FAA list of OPSNET 45 airports appear below. In the late 1990s, these were airports that contributed to 75 percent of NAS delays and that each had 500 or more operations per day. (Note, by FY2019, the number of OPSNET 45 airports with at least 500 operations per day fell to 36 airports.)

<b>Code</b>	<b>Airport</b>	<b>Code</b>	<b>Airport</b>
ABQ	Albuquerque International Sunport	MCO	Orlando International
ATL	Hartsfield-Jackson Atlanta International	MDW	Chicago Midway
BNA	Nashville International	MEM	Memphis International
BOS	Boston Logan International	MIA	Miami International
BWI	Baltimore/Washington International	MSP	Minneapolis/St Paul International
CLE	Cleveland Hopkins International	MSY	Louis Armstrong New Orleans International
CLT	Charlotte Douglas International	OAK	Oakland International
CVG	Cincinnati/Northern Kentucky International	ORD	Chicago O'Hare International
DCA	Ronald Reagan Washington National	PBI	Palm Beach International
DEN	Denver International	PDX	Portland International
DFW	Dallas/Fort Worth International	PHL	Philadelphia International
DTW	Detroit Metropolitan Wayne County	PHX	Phoenix Sky Harbor International
EWR	Newark Liberty International	PIT	Pittsburgh International
FLL	Fort Lauderdale/Hollywood International	RDU	Raleigh/Durham International
HOU	Houston Hobby	SAN	San Diego International
IAD	Washington Dulles International	SEA	Seattle/Tacoma International
IAH	George Bush Houston Intercontinental	SFO	San Francisco International
IND	Indianapolis International	SJC	Norman Mineta San Jose International
JFK	New York John F	SLC	Salt Lake City International
LAS	Las Vegas McCarran International	STL	Lambert Saint Louis International
LAX	Los Angeles International	TEB	Teterboro
LGA	New York LaGuardia	TPA	Tampa International
MCI	Kansas City International		

### **34 Select TRACONS**

The 34 Select are the TRACONS support the OPSNET 45 airports. (See, above for the list of OPSNET 45 airports.) (Source: System Data and Infrastructure Group, Office of Performance Analysis, Systems Operations Services, Air Traffic Organization, FAA (AJR-G2). [https://aspm.faa.gov/aspmhelp/index/34\\_Select.html](https://aspm.faa.gov/aspmhelp/index/34_Select.html))

<b>LocID</b>	<b>TRACON</b>	<b>LocID</b>	<b>TRACON</b>
A80	Atlanta TRACON	MEM	Memphis International
A90	Boston TRACON	MIA	Miami International
ABQ	Albuquerque International	MSY	New Orleans International/Moisant
BNA	Nashville International	N90	New York TRACON
C90	Chicago TRACON (Elgin)	NCT	Northern California TRACON
CLE	Cleveland Hopkins International	P50	Phoenix TRACON
CLT	Charlotte/Douglas International	P80	Portland TRACON
CVG	Covington/Cincinnati International	PBI	Palm Beach International
D01	Denver TRACON	PCT	Potomac TRACON
D10	Dallas/Ft Worth TRACON	PHL	Philadelphia International
D21	Detroit TRACON	PIT	Pittsburgh International
I90	Houston TRACON	RDU	Raleigh Durham International
IND	Indianapolis International	S46	Seattle/Tacoma TRACON
L30	Las Vegas TRACON	S56	Salt Lake City TRACON
M98	Minneapolis TRACON	SCT	Southern California TRACON
MCI	Kansas City International	T75	St Louis TRACON
MCO	Orlando International	TPA	Tampa International

## Glossary of Terms

34 Select TRACONS	The 34 Select are the TRACONS support the OPSNET 45 airports. (See, Appendix II for the lists of 34 Select TRACONS and OPSNET 45 airports.)
AAR	See, Airport Arrival Rate (AAR).
ADC	See, Average Daily Capacity (ADC).
ADR	See, Airport Departure Rate (ADR).
AFP	See, Airspace Flow Programs (AFP).
Airport Arrival Rate (AAR)	The number of arriving aircraft which an airport or airspace can accept from an ARTCC per hour.
Airport Departure Rate (ADR)	The number of aircraft that can depart an airport and the airspace can accept per hour.
Airport Operations	See, Operations.
Airspace Flow Programs (AFP)	Airspace flow programs (AFPs) manage demand-capacity imbalances through the issuance of estimated departure clearance times (EDCT) to flights traversing a flow constrained area (FCA). An AFP might be used, for example, to reduce the rate of flights through a center when that center has reduced en route capacity due to severe weather, replacing mile-in-trail (MIT) restrictions for a required reroute, managing airport arrival fix demand or controlling multiple airports within a terminal area.
Air Route Traffic Control Center (ARTCC)	A facility established to provide air traffic control service to aircraft operating on IFR flight plans within controlled airspace and principally during the en route phase of flight. When equipment capabilities and controller workload permit, certain advisory/assistance services may be provided to VFR aircraft. Also known as en route or centers, there are 21 ARTCCs in the continental U.S. A list of the 21 ARTCCs appears in Appendix I.
Air Traffic Control (ATC)	A service operated by appropriate authority to promote the safe, orderly and expeditious flow of air traffic.
Air Traffic Control Tower (ATCT)	A terminal facility that uses air/ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity of an airport or on the movement area. Authorizes aircraft to land or takeoff at the airport controlled by the tower or to transit the Class D airspace area regardless of flight plan or weather conditions (IFR or VFR). A tower may also provide approach control services (radar or nonradar).
Army Radar Approach Control (ARAC).	An FAA air traffic control facility using radar and air/ground communications to provide approach control services to aircraft arriving, departing, or transiting the airspace controlled by the facility. Service is provided to both civilian and U.S. Army airports. Currently, the U.S. does not operate any ARACs.
ASM	See, Available Seat Miles (ASM).
ASPM	See, Aviation System Performance Metrics (ASPM).
ASPM 77 Airports	The ASPM 77 is an FAA list of 77 airports, including the Core 30, OEP 35, and other airports. The ASPM (Aviation System Performance Metrics) data includes flights to and from the 77 ASPM airports and all flights by ASPM carriers, as well as flights by those carriers to international and domestic non-ASPM airports. (See, Appendix II for the list of ASPM 77 airports.) (See, Appendix I for the list of Core 30 airports and Appendix II for the list of OEP 35 airports.)
ATC	See, Air Traffic Control.
ATCT	See, Air Traffic Control Tower.
Available Seat Miles (ASM)	The aircraft miles flown in each inter-airport segment, multiplied by the number of seats available for fare paying passenger use on that segment. Available seat miles are computed by summation of the products of the number of miles on each interairport segment, multiplied by the number of available seats on that segment.

Average Daily Capacity (ADC)	Average daily capacity is calculated as the sum of the airport departure rates (ADR) and the capacity airport arrival rates (AAR), divided by the number of days in the period under consideration.
Average Hourly Capacity (Called Rate)	See, Called Rate.
Aviation System Performance Metrics (ASPM)	<p>Aviation system performance metrics (ASPM) data includes flights to and from 77 ASPM airports (including the Core 30 and OEP 35 airports) and all flights by ASPM carriers, as well as flights by those carriers to international and domestic non-ASPM airports. All IFR and some VFR flights are included. View this data on the OPSNET website.</p> <p>ASPM flight records fall into two groupings: (1) Efficiency flights are intended to capture all traffic handled by controllers at the ASPM airports and include flights with complete records and flights for which accurate estimates are possible due to only a few pieces of missing data; and, (2) ASPM flights exclude general aviation and military traffic, as well as local (non-itinerant) traffic and records for international flights missing data on the non-U.S. portion of the flight.</p> <p>ASPM contains key event times including actual, scheduled as well as the airline reported gate and runway times. It also synthesizes key times from the traffic flow management system (TFMS) and flight level information from the national traffic management log (NTML).</p>
Called Rate	The hourly throughput that an airport's runways are able to sustain during periods of high demand. Called rates include all arrival and departure traffic that an airport can support. The called rate, or average hourly capacity, is the sum of the average arrival rate (AAR) and the average departure rate (ADR).
Cancellations	The set of cancelled departures as determined by a combination of scheduled flights not flown and TFMS flight plans that were cancelled and not re-filed for ASPM carriers and all other carriers reporting schedule data; and ASQP flight cancellations.
CCF	See, Combined Control Facility (CCF).
Center	Also known as air route traffic control center (ARTCC) or en Route. See, Air Route Traffic Control Center (ARTCC).
Center Operations	See, Operations.
CERAP	See, Combined En Route Radar Approach Control (CERAP).
Class B Airspaces	Generally, that airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of IFR operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers (some Class B airspace areas resemble upside-down wedding cakes), and is designed to contain all published instrument procedures once an aircraft enters the airspace.
Combined ATCT TRACONS	See, Terminal Radar Control Facility (TRACON).
Combined Control Facility (CCF)	An air traffic control facility that provides approach control services for one or more airports as well as en route air traffic control (center control) for a large area of airspace. Some may provide tower services along with approach control and en route services. The U.S. has four CCFs. A list of the 4 CCFs appears in Appendix I.
Combined En Route Radar Approach Control (CERAP)	An air traffic control facility that combines the functions of an ARTCC with a TRACON facility.
Core 30 Airports	The 30 airports with the highest number of operations. A list of the Core 30 Airports appears in Appendix I.
Delays	See, OPSNET Delays.
Diversions	Gate return/air return and en route diversion are considered a diversion. However, a planned stop for fuel, known before departure from the gate, where the flight has been dispatched to is not.

Direct User Access Terminal Service (DUATS)	DUATS, or direct user access terminal service is a weather information and flight plan processing service contracted by FAA for use by United States civil pilots and other authorized users. The DUAT Service is a telephone- and Internet-based system which allows the pilot to use a personal computer for access to a Federal Aviation Administration (FAA) database to obtain weather and aeronautical information and to file, amend, and cancel domestic IFR and VFR flight plans.
DUATS	<i>See</i> , Direct User Access Terminal Service (DUATS).
EDCT	<i>See</i> , Expected Departure Clearance Time (EDCT).
Enhanced Traffic Management System (ETMS)	<i>See</i> , Traffic Flow Management System (TFMS).
En Route	Also known as Air Route Traffic Control Center (ARTCC) or, simply, Center. <i>See</i> , Air Route Traffic Control Center (ARTCC).
En Route Operations	<i>See</i> , Operations.
Expected Departure Clearance Time (EDCT)	The runway release time assigned to an aircraft in a traffic management program. <i>See also</i> , Ground Delay Programs (GDP).
FCA	<i>See</i> , Flow Constrained Area (FCA).
Flight	The period from the start of the takeoff roll to the first landing.
Flight Service Station (FSS)	A flight service station (FSS) is an air traffic facility that provides information and services to aircraft pilots before, during, and after flights, but unlike air traffic control (ATC), is not responsible for giving instructions or clearances or providing separation.
Flow Constrained Area (FCA)	A defined region of airspace, a time interval, or other characteristic used to identify flights subject to a constraint. This constraint may be due to convective weather, military exercises, or other reasons.
FSS	<i>See</i> , Flight Service Station (FSS).
GDP	<i>See</i> , Ground Delay Programs (GDP).
Go Around	A go around (sometimes called overshoot) is an aborted landing of an aircraft that is on final approach.
Ground Delay Programs (GDP)	<p>Ground delay programs are implemented to control air traffic volume to airports where the projected traffic demand is expected to exceed the airport's acceptance rate for a lengthy period of time. Lengthy periods of demand exceeding acceptance rate are normally a result of the airport's acceptance rate being reduced for some reason. The most common reason for a reduction in acceptance rate is adverse weather such as low ceilings and visibility.</p> <p>How it works:  Flights that are destined to the affected airport are issued expected departure clearance times (EDCT) at their point of departure. Flights that have been issued EDCTs are not permitted to depart until their expected departure clearance time. These EDCTs are calculated in such a way as to meter the rate that traffic arrives at the affected airport; ensuring that demand is equal to acceptance rate. The length of delays that result from the implementation of a ground delay program depends upon two factors: how much greater than the acceptance rate the original demand was, and for what length of time the original demand was expected to exceed the acceptance rate.</p>

Ground Stops (GS)	<p>Ground stops are implemented for a number of reasons. The most common reasons are:</p> <ul style="list-style-type: none"> <li>• To control air traffic volume to airports when the projected traffic demand is expected to exceed the airport's acceptance rate for a short period of time.</li> <li>• To temporarily stop traffic allowing for the implementation of a longer-term solution, such as a ground delay program.</li> <li>• The affected airport's acceptance rate has been reduced to zero.</li> </ul> <p>How it works:</p> <ul style="list-style-type: none"> <li>• Flights that are destined to the affected airport are held at their departure point for the duration of the ground stop.</li> </ul>
Holdings	Holding (or flying a hold) is a maneuver designed to delay an aircraft already in flight while keeping it within a specified airspace.
IFR Flights	Instrument Flight Rules. A set of rules governing the conduct of flight under instrument meteorological conditions.
Level-Offs	Level-offs are tracked from the top-of-descent (TOD) point or 200 nautical miles (NM) from the airport, whichever is closer. A trajectory segment is considered as a level-off if the change in altitude of position reports is less than or equal to 200 feet and the segment is at least 50 seconds in duration. The metric is calculated as the sum of the count of level-offs for each flight within a scope (i.e. non-military instrument flight rules (IFR) operations arriving into Core 30 airports), divided by the total number of flights within the scope. The metric is derived from flight position reports from the National Offload Program (NOP).
Load Factor	The summation of the number of revenue passenger miles (RPM), divided by the summation of the number of available seat miles (ASM), on revenue paying commercial flights. This quotient is expressed as a percentage. <i>See also</i> , available seat miles (ASM) and revenue passenger miles (RPM).
Loss of Separation Events	A defined loss of separation between airborne aircraft occurs whenever specified separation minima in controlled airspace are breached. Minimum separation standards for airspace are specified by air traffic service (ATS) authorities, based on International Civil Aviation Organization (ICAO) standards.
Miles-in-Trail (MIT)	A specified distance between aircraft (in nautical miles), normally, in the same stratum associated with the same destination or route of flight.
National Airspace System (NAS)	The common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material. This includes system components jointly shared with the military.
Notices to Airmen (NOTAM)	A NOTAM is a notice containing information essential to personnel concerned with flight operations, but not known far enough in advance to be publicized by other means. It states the abnormal status of a component of the national airspace system (NAS) – not the normal status.
OEP 35 Airports	This is an FAA list of 35 commercial U.S. airports with significant air traffic. These airports serve major metropolitan areas and some also serve as hubs for airline operations. The OEP 35 (Operational Evolution Partnership) is made up of the Core 30, plus five other airports (Cincinnati, Cleveland, Pittsburgh, Portland, and St Louis). In 2005, this list was replaced by the Core 30 list. (Source: System Data and Infrastructure Group, Office of Performance Analysis, Systems Operations Services, Air Traffic Organization, FAA (AJR-G2). <a href="https://aspm.faa.gov/aspmhelp/index/OEP_35.html">https://aspm.faa.gov/aspmhelp/index/OEP_35.html</a> .) (See, Appendix I for the list of Core 30 airports and Appendix II for the list of OEP 35 airports.)
Operations	<ul style="list-style-type: none"> <li>• Airport operations: The number of arrivals and departures from the airport at which the airport traffic control tower is located.</li> <li>• Tower operations: Airport operations, plus airport tower overflights.</li> <li>• TRACON operations: The number of operations passed to and from area airports or centers, including overflights through TRACON airspace.</li> <li>• En route or center operations: The number of operations passing to and from a TRACON to a center, or from one center to another center, or from a center to a TRACON. It includes U.S. overflights and oceanic traffic through center air space that do not arrive at or depart from U.S. territory.</li> </ul>

Operational Network (OPSNET)	OPSNET is the official source of national airspace system (NAS) air traffic operations and delay data. This data are used to analyze the performance of the FAA's air traffic control facilities. Reportable delay includes information such as the constrained facility, the reason for delay (weather, equipment, runways, volume, etc.), and the traffic management initiative (TMI) employed in delaying the aircraft.
OPSNET 45 Airports	The FAA list of OPSNET 45 airports appear below. In the late 1990s, these were 45 airports that contributed to 75 percent of NAS delays and had 500 or more operations per day. (Note, by FY2019, the number of OPSNET 45 airports with at least 500 operations per day fell to 36 airports.) (See, Appendix II for the list of OPSNET 45 airports.)
OPSNET Delays	<p>Delays to instrument flight rules (IFR) traffic of 15 minutes or more, which result from the ATC system detaining an aircraft at the gate, short of the runway, on the runway, on a taxiway, or in a holding configuration anywhere en route, must be reported. The IFR controlling facility must ensure delay reports are received and entered into OPSNET. These OPSNET delays are caused by the application of initiatives by the traffic flow management (TFM) in response to weather conditions, increased traffic volume, runway conditions, equipment outages, and other causes.</p> <p>Below are descriptions of the categories of delay causes resulting in a reportable delay:</p> <ul style="list-style-type: none"> <li>• Weather: The presence of adverse weather conditions affecting operations. This includes wind, rain, snow/ice, low cloud ceilings, low visibility, and tornado/ hurricane/thunderstorm.</li> <li>• Volume: Delays must only be reported as volume when the airport is in its optimum configuration and no impacting conditions have been reported when the delays were incurred.</li> <li>• Runway/Taxiway: Reductions in facility capacity due to runway/taxiway closure or configuration changes.</li> <li>• Equipment: An equipment failure or outage causing reduced capacity.</li> <li>• Other: All impacting conditions that are not otherwise attributed to weather, equipment, runway/taxiway, or volume, such as airshow, aircraft emergency, bomb threat, external radio frequency interference, military operations, nonradar procedures, etc.</li> </ul> <p>Non-reportable delays are delays incurred by IFR traffic, but which should not be reported in OPSNET.</p>
Overflights	<ul style="list-style-type: none"> <li>• Terminal overflight: A terminal IFR flight that originates outside the TRACON's/RAPCON's/Radar ATCT's area and passes through the area without landing.</li> <li>• En route overflight: An en route IFR flight that originates outside the ARTCC's area and passes through the area without landing.</li> </ul>
Radar Approach Control (RAPCON)	An FAA air traffic control facility using radar and air/ground communications to provide approach control services to aircraft arriving, departing, or transiting the airspace controlled by the facility. Service is provided to both civilian and U.S. Air Force airports. Currently, the U.S. does not operate any RAPCONs.
Radar ATC Facility (RATCF)	An FAA air traffic control facility using radar and air/ground communications to provide approach control services to aircraft arriving, departing, or transiting the airspace controlled by the facility. Service is provided to both civilian and U.S. Navy airports. Currently, the U.S. does not operate any RATCFs.
RAPCON	See, Radar Approach Control (RAPCON).
RATCF	See, Radar ATC Facility (RATCF).
Revenue Passenger Miles (RPM)	One revenue passenger (fare paying passenger) transported one mile. Revenue passenger miles are computed by summation of the products of the revenue aircraft miles on each interairport segment, multiplied by the number of revenue passengers carried on that segment.
Runway Incursions	A runway incursion is any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and takeoff of aircraft.
Stand-Alone TRACON	See, Terminal Radar Control Facility (TRACON).
Terminal Radar Control Facility (TRACON)	An FAA air traffic control facility using radar and air/ground communications to provide approach control services to aircraft arriving, departing, or transiting the airspace controlled by the facility. A TRACON located in an air traffic control tower is a combined TRACON. A TRACON that does not share a facility is a stand-alone TRACON. The U.S. has 149 civilian TRACONs. There are 124 TRACONs in shared facilities and 25 stand-alone TRACONs. A list of the 25 stand-alone TRACONs appears in Appendix I.

Top-of-Descent (TOD)	Top-of-Descent is the transition from the cruise phase of a flight to the descent phase, the point at which the planned descent to final approach altitude is initiated.
Tower Operations	See, Operations.
TRACON	See, Terminal Radar Control Facility (TRACON).
TRACON Operations	See, Operations.
Traffic Flow Management System (TFMS)	TFMS is a data exchange system for supporting the management and monitoring of national air traffic flow. TFMS processes all available data sources such as flight plan messages, flight plan amendment messages, and departure and arrival messages. TFMS is restricted to the subset of flights that fly under instrument flight rules (IFR) and are captured by the FAA's en-route computers. Formerly known as the enhanced traffic management system (ETMS).
VFR	See, Visual Flight Rules (VFR).
VFR flights	Flights operated under visual flight rules.
Visual Flight Rules (VFR)	Visual flight rules are rules that govern the procedures for conducting flights under visual conditions. The term "VFR" is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate a type of flight plan.

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