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GAO

Report to the Committee on Commerce, Science, and Transportation, U.S. Senate

May 2010

NATIONAL AIRSPACE SYSTEM

Setting On-Time Performance Targets at Congested Airports Could Help Focus FAA's Actions

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GAO-10-542

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Highlights

Highlights of GAO-10-542, a report to the Committee on Commerce, Science, and Transportation, U.S. Senate

Why GAO Did This Study

Flight delays have beset the U.S. national airspace system. In 2007, more than one-quarter of all flights either arrived late or were canceled across the system, according to the Department of Transportation (DOT). DOT and its operating agency, the Federal Aviation Administration (FAA), are making substantial investments in transforming to a new air traffic control system—the Next Generation Air Transportation System (NextGen)—a system that is expected to reduce delays over the next decade. This requested report explains the extent to which (1) flight delays in the U.S. national airspace system have changed since 2007 and the contributing factors to these changes, and (2) actions by DOT and FAA are expected to reduce delays in the next 2 to 3 years. We analyzed DOT and FAA data for FAA's Operational Evolution Partnership (OEP) airports because they are in major metropolitan areas, serving over 70 percent of passengers in the system. We reviewed agency documents and interviewed DOT, FAA, airport, and airline officials and aviation industry experts.

What GAO Recommends

GAO recommends that FAA develop airport-specific on-time performance targets to better prioritize its actions and demonstrate their benefits. DOT and FAA provided technical comments, which we incorporated as appropriate, and officials noted that airport-specific targets are one of the many tools that FAA can use to manage and measure delays.

View GAO-10-542 or key components.
For more information, contact Susan Fleming at (202) 512-2834 or flemings@gao.gov.

What GAO Found

Flight delays have declined since 2007, largely because fewer flights have been scheduled by airlines as a result of the economic downturn, but some airports still experience and contribute substantial delays to the system. The percentage of flights that were delayed—that is, arrived at least 15 minutes after their scheduled time or were canceled or diverted—decreased 6 percentage points from 2007 to 2009, according to DOT data. Even with this decrease in delays, during 2009, at least one in four U.S. passenger flights arrived late at 5 airports—Newark Liberty International (Newark), LaGuardia, John F. Kennedy (JFK), Atlanta Hartsfield International (Atlanta), and San Francisco International—and these late arrivals had an average delay time of almost an hour or more. In addition to these airports having the highest percentage of flights with delayed arrivals, these 5 airports, along with Chicago O'Hare International and Philadelphia International (Philadelphia), were also the source of most of the departure delays within FAA's air traffic control system. FAA measures delays within the air traffic control system to assess its performance because an inefficient air traffic control system contributes to higher levels of delayed flights. An FAA air traffic control tower or other facility may delay flights departing from or destined to an airport because of inclement weather or heavy traffic volume at that airport. In 2009, of the 34 OEP airports in GAO's analysis, about 80 percent of departure delays occurring at airports across the national airspace system were the result of conditions affecting air traffic at just these 7 airports.

DOT's and FAA's actions—including near-term elements of NextGen and other air traffic management improvements—could help reduce delays over the next 2 to 3 years and are generally being implemented at the airports that contribute to the most delays in the system. However, the extent to which these actions will reduce delays at individual airports or contribute to the agency's overall target is unclear. FAA has an 88 percent on-time arrival performance target for the national airspace system to measure how its actions help to improve systemwide on-time performance. This target, however, masks the wide variation in airport performance. For example, in fiscal year 2009, Newark had an on-time arrival rate of 72 percent, while St. Louis International exceeded the target with 95 percent. FAA has not established airport-specific performance targets, making it difficult to assess whether FAA's actions will lead to the desired on-time performance at these airports or whether further actions are required to improve performance, especially at airports affecting delays systemwide. Also, FAA's modeling indicates that even if all ongoing and planned NextGen and other improvements are implemented, a few airports, such as Atlanta, Washington Dulles International, and Philadelphia, may not be able to meet the projected increases in demand, and if market forces do not dampen that demand, additional actions may be required at these airports. However, without airport-specific targets, FAA cannot determine what additional actions might be required to achieve a targeted level of performance at these airports.

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Abbreviations

ARC	Aviation Rulemaking Committee
ASDE-X	Airport Surface Detection Equipment-Model X
ASPM	Aviation System Performance Metrics
ASQP	Airline Service Quality Performance
ASV	annual service volume
BTS	Bureau of Transportation Statistics
DOT	Department of Transportation
FAA	Federal Aviation Administration
FACT 2	*Capacity Needs in the National Airspace System*, *2007-2025*
JFK	John F. Kennedy International Airport
NAS	national airspace system
NEPA	National Environmental Policy Act
OAG	*Official Airline Guide*
OEP	Operational Evolution Partnership
OPSNET	Operations Network
RNAV	Area Navigation
RNP	Required Navigation Performance
TMA	Traffic Management Advisor
TRACON	terminal radar approach control facility

United States Government Accountability Office
Washington, DC 20548

May 26, 2010

The Honorable John D. Rockefeller IV
Chairman
The Honorable Kay Bailey Hutchison
Ranking Member
Committee on Commerce, Science, and Transportation
United States Senate

Flight delays have beset the U.S. national airspace system over the last decade and are forecast to increase in the future. In 2007, more than one-quarter of the flights either arrived late or were canceled across the system, while some airports had up to one-third of their flights delayed or canceled, according to the Department of Transportation (DOT). Additionally, delays at one airport can also affect other airports, causing a ripple effect across the national airspace system and delaying passengers across the country. In addition to inconveniencing passengers, flight delays impose economic costs on passengers, airlines, airports, and the economy. A 2008 report by the Senate Joint Economic Committee found that collectively, passengers were delayed 320 million hours in 2007 and estimated that domestic flight delays that year cost as much as $41 billion to the U.S. economy.[1] Airlines incur increased costs for crews, fuel, and maintenance while planes sit idling on the airfield or circle in holding patterns. Additionally, flight delays can have negative impacts on the environment, such as increased emissions from aircraft.

Over the next decade, the number of flights, and accordingly delays, in the U.S. aviation system is predicted to increase. In response, DOT and its operating agency, the Federal Aviation Administration (FAA), are making substantial investments in transforming to a new air traffic control system that will use satellite-based technologies and new procedures to handle the increasing volume of air traffic while further improving safety and security—referred to as the Next Generation Air Transportation System (NextGen). In addition to making airport infrastructure investments, FAA expects NextGen technologies and procedures to help reduce congestion, improve efficiency, and meet the projected demand.

[1]Senate Joint Economic Committee, *Your Flight Has Been Delayed Again: Flight Delays Cost Passengers, Airline and the U.S. Economy Billions.* (Washington, D.C.: May 2008).

In testimony before your committee in July 2008, we reported that the actions that DOT and FAA took to respond to peak delays in 2007 were expected to provide little improvement in flight delays in the summer of 2008.[2] Given this work, you asked us to provide an update on trends in flight delays and DOT's and FAA's actions to reduce flight delays. In response to your request, we examined the extent to which (1) flight delays in the U.S. national airspace system have changed since 2007 and the factors contributing to these changes, and (2) DOT's and FAA's actions are expected to reduce delays in the next 2 to 3 years.

To determine how delays have changed since 2007, we analyzed DOT and FAA data on the number of flights and delayed flights by airport and for the entire aviation system for 2007, 2008, and 2009. For our airport-specific data, we focused on 34 of the 35 airports in FAA's Operational Evolution Partnership (OEP) program because they serve major metropolitan areas located in the continental United States and handled over 70 percent of passengers in the system in 2008; additionally, much of the current delays to air traffic can be traced to inadequate capacity relative to demand at these airports, according to FAA.[3] All data in the report are by calendar year, unless otherwise noted. To understand the effect of each airport on the air traffic control system, we analyzed FAA's Operations Network (OPSNET) data on delays attributed to these 34 OEP airports. We are also issuing an electronic supplement to this report that shows additional flight delay data from calendar years 2000 through 2009 for the 34 OEP airports.[4] To determine the factors affecting these trends, we analyzed DOT and FAA data on flights, delays, and capacity; reviewed relevant agency documents; and interviewed DOT, FAA, airline, and airport officials and industry experts to understand the status of DOT's and FAA's actions and their intended effects. We assessed the reliability of DOT and FAA data and found the data to be sufficiently reliable for our purposes. To evaluate the

[2]GAO, *National Airspace System: DOT and FAA Actions Will Likely Have a Limited Effect on Reducing Delays during Summer 2008 Travel Season*, GAO-08-934T (Washington, D.C.: July 15, 2008).

[3]According to FAA, the 35 OEP airports are commercial airports with significant activity and were selected in 2000 on the basis of lists from FAA and Congress as well as a study that identified the most congested airports in the United States. For purposes of this report, we excluded the Honolulu International airport; while it is a large airport, it is outside the 48 contiguous states.

[4]GAO, *National Airspace System: Summary of Flight Delay Trends for 34 Airports in the Continental United States, an E-supplement to* GAO-10-542, GAO-10-543SP, (Washington, D.C.: May 2010).

extent to which DOT's and FAA's actions are expected to reduce delays in the next 2 to 3 years, we interviewed agency, airport, and airline officials and industry experts; reviewed related GAO reports; and examined relevant agency reports and analyses of estimated delay reduction benefits of DOT's and FAA's actions, when available. We conducted this performance audit from May 2009 through May 2010 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. See appendix I for more information on our scope and methodology.

Background

The national airspace system is a complex, interconnected, and interdependent network of systems, procedures, facilities, aircraft, and people that must work together to ensure safe and efficient operations. DOT, FAA, airlines, and airports all affect the efficiency of national airspace system operations. DOT works with FAA to set policy and operating standards for all aircraft and airports. As the agency responsible for managing the air traffic control system, FAA has the lead role in developing technological and other solutions that increase the efficiency and capacity of the national airspace system. FAA also provides funding to airports. The funding that airports receive from FAA for airport improvements is conditioned on open and nondiscriminatory access to the airlines and other users,[5] and the airlines are free to schedule flights at any time throughout the day, except at airports that are subject to limits on scheduled operations. The airlines can also affect the efficiency of the airspace system through the number and types of aircraft that they choose to operate.

As we previously reported, achieving the most efficient use of the capacity of the aviation system is difficult because it depends on a number of interrelated factors.[6] The capacity of the aviation system is affected not only

[5]As a condition to receiving federal Airport Improvement Program funds, an eligible airport is required to be available for public use on reasonable conditions and without unjust discrimination. 49 U.S.C. § 47107.

[6]GAO, *Air Traffic Control: Role of FAA's Modernization Program in Reducing Delays and Congestion*, GAO-01-725T (Washington, D.C.: May 10, 2001), and *National Airspace System: Long-Term Capacity Planning Needed Despite Recent Reduction in Flight Delays*, GAO-02-185 (Washington, D.C.: Dec. 14, 2001).

by airports' infrastructure, including runways and terminal gates, but at any given time, can also be affected by such factors as weather conditions, resulting in variation in available airport capacity. For example, some airports have parallel runways that can operate simultaneously in good weather but are too close together for simultaneous operations in bad weather, a fact that reduces the number of aircraft that can take off and land. Another factor affecting capacity, apart from the capacity of individual airports, is the number of aircraft that can be safely accommodated in a given portion of airspace. If too many aircraft are trying to use the same airspace, some may be delayed on the ground and/or en route. Achieving the most efficient use of the national aviation system is contingent on a number of factors, among them the procedures and equipment used by FAA, the proficiency of the controllers to efficiently use these procedures and equipment to manage traffic, and whether and in what ways users are charged for the use of the airspace and airports.

DOT and FAA can address flight delays primarily through enhancing and expanding capacity and implementing demand management measures.

- *Capacity improvements*: Capacity improvements can be in the form of expanding capacity or enhancing existing capacity in the system. Expanding capacity includes the addition of new runways, taxiways, and other infrastructure improvements, which can reduce delays by increasing the number of aircraft that can land and depart and provide an airport with more flexibility during high-demand periods and inclement weather. Enhancing capacity includes improvements in air traffic control procedures or technologies that increase the efficiency of existing capacity thereby reducing delays and maximizing the number of takeoffs and landings at an airport.

- *Demand management measures*: Examples include using administrative measures or economic incentives to change airline behavior. Administrative measures include DOT issuing limits on hourly operations at specific airports, while economic incentives include FAA's amended policy on rates and charges that clarified the ability of airport operators to charge airlines landing fees that differ based on time of day.

FAA's actions to address flight delays are outlined in the agency's strategic and annual business plans and the NextGen Implementation Plan. FAA's 2009-2013 strategic plan, titled the Flight Plan, provides a 5-year view of the agency's goals, related performance measures, and actions to achieve those goals. FAA's Flight Plan and related annual business plans include four primary goals: Increased Safety, Greater Capacity, International

Leadership, and Organizational Excellence. FAA's goal of greater capacity is to "work with local governments and airspace users to provide increased capacity and better operational performance in the U.S. airspace system that reduces congestion and meets projected demand in an environmentally sound manner."[7] As part of this goal, FAA has outlined three objectives, one of which is to increase the reliability and on-time performance of the airlines.[8] FAA's progress toward meeting this goal is measured by its ability to achieve a national airspace system on-time arrival rate of 88 percent at the 35 OEP airports and maintain that level through 2013.[9] Additionally, FAA's Flight Plan and annual business plans assign actions across the agency—within FAA's Air Traffic Organization and Office of Airports—to achieve this and other Flight Plan goals.

In addition to outlining actions in FAA's Flight Plan, the agency also issues an annual NextGen Implementation Plan that provides an overview of FAA's ongoing transition to NextGen and lays out the agency's vision for NextGen, now and into the midterm (defined as 2012 to 2018). The plan moreover identifies FAA's goals for NextGen technology and program deployment and commitments made in support of NextGen. Recognizing the importance of near-term and midterm solutions, FAA requested that RTCA, Inc.—a private, not-for-profit corporation that develops consensus-based recommendations on communications, navigation, surveillance, and air traffic management system issues—create a NextGen Midterm Implementation Task Force to reach consensus within the aviation community on how to move forward with NextGen.[10] The latest version of the NextGen Implementation Plan, issued in March 2010, incorporated the task force's recommendations, which identified operational improvements

[7]FAA Flight Plan, 2009-2013.

[8]FAA's three objectives to achieve this goal include (1) to increase the reliability and on-time performance of the airlines (as noted above), (2) to increase capacity to meet projected demand and reduce congestion, and (3) to address environmental concerns associated with capacity enhancements.

[9]To measure the performance of its ability to increase capacity, FAA uses an average daily airport capacity for the 35 OEP airports and seven metro areas, annual service volume, and adjusted operational availability at the facilities supporting the 35 OEP airports.

[10]The task force included representation from the four major operating communities—airlines, business aviation, general aviation, and the military—as well as participation from air traffic controllers, airports, avionics and aircraft manufacturers, and other key stakeholders.

that can be accelerated between now and 2018.[11] FAA's actions described in these plans are designed not only to reduce delays, but can also improve safety, increase capacity, and reduce aviation's environmental impact.

Although these actions might reduce delays, flight delays can also be affected by factors generally outside FAA's control, such as airline scheduling and business practices. For example, some airline business models rely on tight turnaround times between flights, which could make it more likely that flights scheduled later in the day are delayed. Additionally, except at slot-controlled airports,[12] airlines can schedule flights at any time throughout the day without consideration of the extent to which the number of scheduled flights during a particular time period might exceed the airport's available capacity.

DOT and FAA collect information on aviation delays through three primary databases—Airline Service Quality Performance (ASQP), Aviation System Performance Metrics (ASPM), and OPSNET. As table 1 shows, these databases vary in their purposes, scope, and measurement of delays.[13]

[11]In October 2009, we testified on the NextGen challenges that affect FAA's response to the task force's recommendations, including (1) directing resources and addressing environmental issues, (2) adjusting its culture and business practices, and (3) developing and implementing options to encourage airlines and general aviation to equip aircraft with new technologies. See GAO, *Next Generation Air Transportation System: FAA Faces Challenges in Responding to Task Force Recommendations*, GAO-10-188T (Washington, D.C.: Oct. 28, 2009).

[12]Limitations on operations have been in place at New York's LaGuardia airport since January 2007, John F. Kennedy International (JFK) since March 2008, and Newark Liberty International (Newark) since June 2008. See 71 Fed. Reg. 77854 (Dec. 27, 2006) (LaGuardia), 73 Fed. Reg. 3510 (Jan. 18, 2008) (JFK), 73 Fed. Reg. 29550 (May 21, 2008) (Newark).

[13]These databases also include information on sources of delays. The ASQP database provides data on airline-reported sources of delays, which we discuss later in this report. The OPSNET database includes data on conditions affecting delays within the air traffic control system, such as adverse weather (i.e., rain or fog), FAA equipment failure, runway construction, or heavy traffic volumes. ASPM includes ASQP and OPSNET delay causes for the flights recorded within ASPM.

Table 1: DOT and FAA Aviation Delay Databases

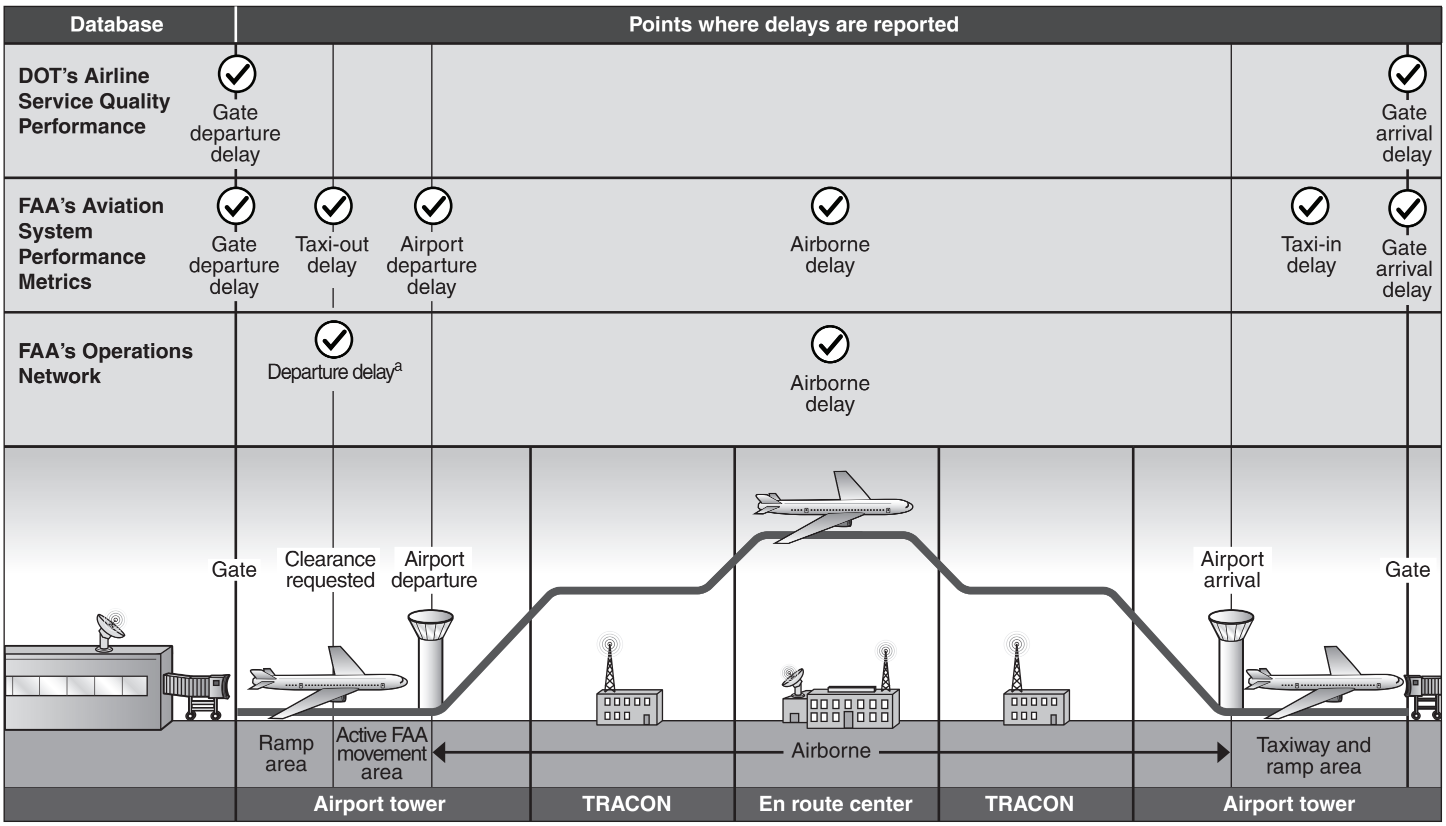
DOT's ASQP	FAA's ASPM	FAA's OPSNET
Purpose		
Serves as a source of air travel information to consumers and helps to ensure more accurate reporting of flight schedules by the airlines.	Serves as a tool for FAA to track delays for all flight phases, including gate departure, taxi-out, airport departure, airborne, taxi-in, and gate arrival. See delay measurement section for more information on delays in these flight phases.	Designed to measure the performance of FAA's air traffic control facilities and efficiency of the air traffic control system. This database is FAA's official system of record for traffic counts and delays.
Scope of airlines and airports		
Includes U.S. commercial airlines that handle 1 percent or more of all domestic scheduled passenger services and submit data on operations and delays for U.S. airports accounting for 1 percent of scheduled domestic passengers, although these carriers generally submit their entire operations.	Includes 28 U.S. commercial and freight airlines at 77 U.S. airports and includes international traffic that departs and arrives at these U.S. airports.	Includes all operations—commercial airlines, freight airlines, air taxi, general aviation, and military—under FAA's control, including departures, arrivals, and overflights.
Delay measurement		
A flight is considered delayed if it departed or arrived at the gate 15 minutes or more past its scheduled gate departure or arrival time that is shown in the airline's reservation system. These delays are captured as gate arrival delays, gate departure delays, and block delays (i.e., delays occurring between gate departure and gate arrival).	As with ASQP, a flight is considered delayed if it departed or arrived 15 minutes or more after its scheduled flight time or flight plan. Additionally, arrival and departure delays of 1 minute or more are also captured. This system captures delays in the time (1) departing from the gate at the originating airport (gate departure), (2) between pushback from the gate and takeoff (taxi-out), (3) departing from the airport (airport departure), (4) airborne, (5) between landing at the airport and arriving at the gate (taxi-in), (6) arriving at the gate at the destination airport (gate arrival), and (7) block delay.	A flight under instrument flight rules is considered delayed if, while under FAA's control, it accumulates a delay of 15 minutes or more between the time that a pilot requests to taxi and the time that the aircraft is cleared for takeoff or when the aircraft exits a holding pattern en route to its destination.

Source: DOT and FAA documents and officials.

Note: In addition to importing data from ASQP and OPSNET, ASPM also imports from several other databases, including the Enhanced Traffic Management System, Operational Information Systems, Automated Surface Observing System, ARINC's Out-Off-On-In, and Innovata's airline schedule data.

Figure 1 illustrates FAA facilities that control and manage air traffic over the United States and how each database captures points where flights could be delayed. For example, ASQP and ASPM measure delays against airlines' schedules or flight plans, while OPSNET measures delays that occurred while an aircraft is under FAA's control.

Figure 1: Points where Delays Are Reported in DOT and FAA Databases



Source: GAO analysis of DOT and FAA documents and data.

Note: Within the FAA's air traffic control system, 517 air traffic control towers manage and control the airspace within about 5 miles of an airport. They control departures and landings, as well as ground operations on airport taxiways and runways. One hundred and seventy terminal radar approach control facilities (TRACON) provide air traffic control services for airspace within approximately 40 miles of an airport and generally up to 10,000 feet above the airport, where en route centers' control begins. Terminal controllers establish and maintain the sequence and separation of aircraft. Twenty-one en route centers control planes over the United States—in transit and during approaches to some airports—for different regions of airspace. The Air Traffic Control System Command Center (not shown in this graphic) manages the flow of air traffic within the United States. This facility regulates air traffic when weather, equipment, runway closures, or other conditions place stress on the national airspace system. In these instances, traffic management specialists at the command center take action to modify traffic demands in order to keep traffic within system capacity.

[a]Departure delays in OPSNET can include, among other things, delays due to problems at the airport, such as volume or runway construction, or traffic management initiatives instituted by FAA, such as ground delay programs and ground stops, to control air traffic volume to airports where the projected traffic demand is expected to exceed the airport's capacity. Under these programs, FAA decreases the rate of incoming flights into an airport by holding a set of flights destined for that airport on the ground, resulting in additional departure delays at other airports.

The difference in how delays are measured in these data sets will result in some flights being considered delayed in one database but not in another, and vice versa. For example, a delay relative to an airline's schedule can occur if a flight crew is late, causing the flight to leave the gate 15 minutes or more behind schedule, which would be reported as a delay in the ASQP and ASPM databases. If that flight, once under FAA control, faces no delay in the expected time it should take taxiing to the runway and lifting off as well as traveling to the destination airport, it would not be reported as a delayed flight in OPSNET, even if it reaches the gate at the destination airport late, relative to its scheduled arrival time. Conversely, a flight could be ready to take off on time, suffering no departure delay in pushing back from the gate. However, if once under FAA control, the flight is held on the ground at the departure airport by more than 15 minutes because of an FAA facility instituting a traffic management initiative in response to weather conditions, increased traffic volume, or other conditions, it will be recorded as experiencing an OPSNET delay—even if, relative to the airline's schedule, it is actually able to reach the gate at the destination airport within 15 minutes of its scheduled arrival time.

Flight Delays Have Declined since 2007, Largely because of Fewer Flights, but Some Airports Still Experience and Contribute Substantial Delays to the System

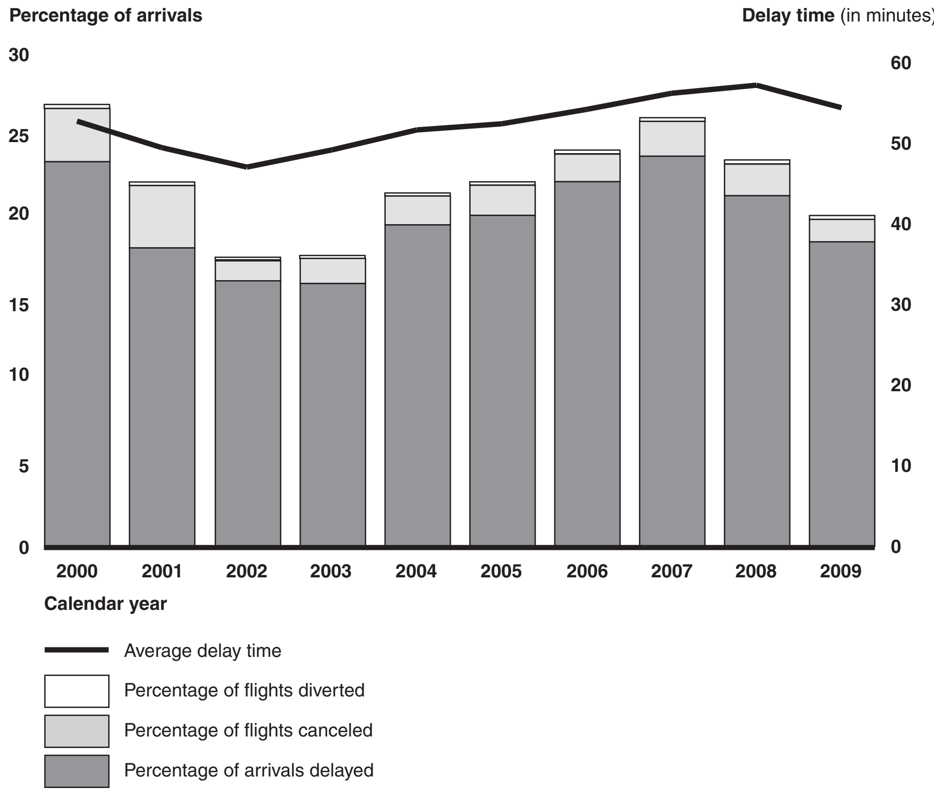
Flight Delays Have Decreased across the National Airspace System since 2007

The percentage of delayed arrivals has decreased systemwide since 2007, according to ASQP data.[14] As shown in figure 2, in 2009, about 21 percent of flights were delayed systemwide—that is, arrived at least 15 minutes late at their destination or were canceled or diverted[15]—representing a decrease of 6 percentage points from 2007.

[14]Our analysis focuses on arrival flight delays and does not necessarily reflect the total delays experienced by passengers. For example, ASQP data do not capture delays experienced by passengers because of missed connections that result in delayed or overbooked flights. Additionally, over time, airlines have been adding time to their schedules in order to account for anticipated inefficiencies at some of the most congested airports and maintain on-time performance, resulting in increased average travel times. In April 2008, DOT's Office of Inspector General examined 2,392 city pair routes between 2000 and 2007 and found that 63 percent of these routes had increases in actual flight times ranging from 1 minute to 30 minutes.

[15]A flight is recorded as diverted if it lands at an airport other than its scheduled destination because of severe weather or security concerns, for example.

Figure 2: Percentage of Delayed Arrivals and Canceled and Diverted Flights and Average Delay Time for Delayed Arrivals Systemwide, 2000-2009



Source: ASQP data.

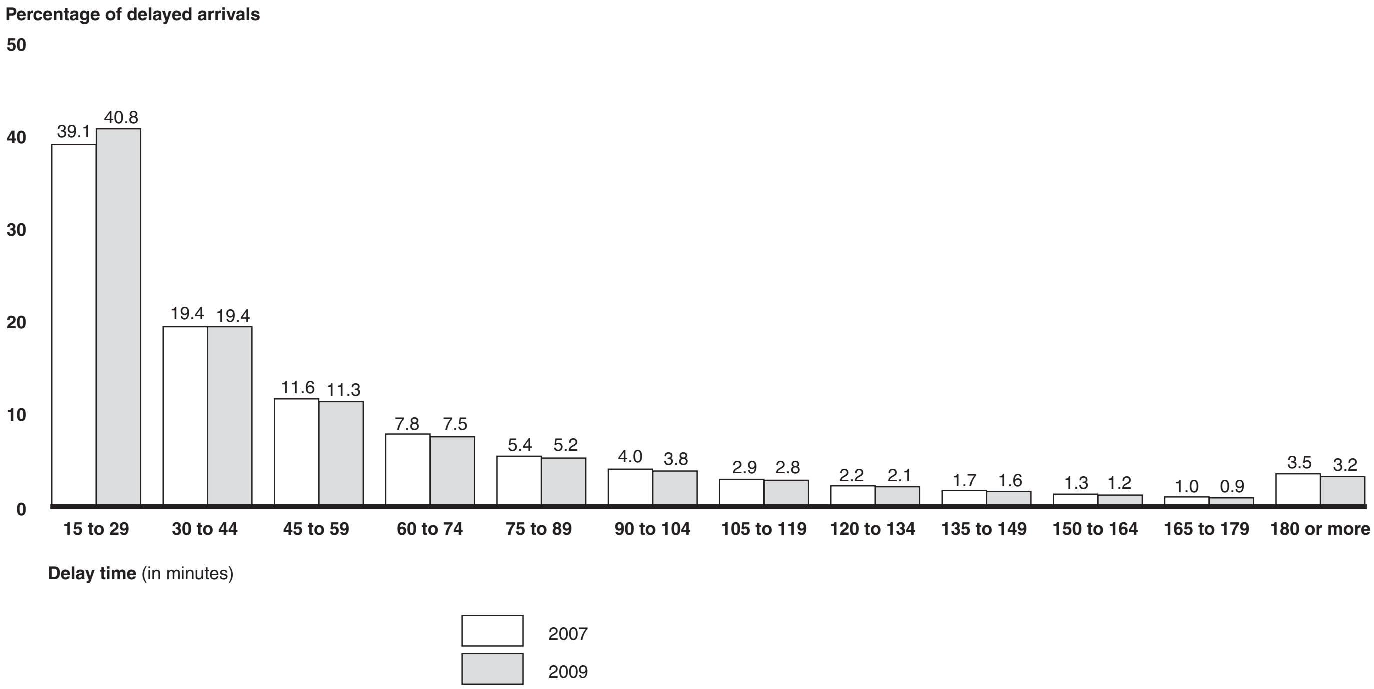
Notes:

In 2009, 89,377 flights (1.4 percent of total flights) were canceled and 15,463 flights (0.2 percent of total flights) were diverted, which was a 0.8 percent decrease and 0.01 percent increase from 2007 levels, respectively.

Average delay time in this graphic is only for delayed arrivals and does not include the delay times for canceled or diverted flights.

Arrival delay times have also decreased systemwide since 2007 (fig. 2). Average delay times for delayed arrivals decreased by about 2 minutes—from 56 minutes in 2007 to 54 minutes in 2009. However, there was a 1-minute increase in average arrival delay time from 2007 to 2008, likely because of the slight increase in the percentage of arrivals delayed 3 hours or more from 2007 to 2008. As figure 3 shows, in 2009, about 41 percent of delayed arrivals had delays of less than 30 minutes. Also, the percentage of arrivals delayed more than 30 minutes decreased from 2007 through 2009.

Figure 3: Percentage of Delayed Arrivals by Minutes of Delay, 2007 and 2009



Source: ASQP data.

Note: This analysis excludes over 5 million flights that arrived early, on time, or within 15 minutes of their scheduled arrival time and are considered on time, according to DOT.

In addition to the decrease in arrivals delayed more than 30 minutes, the number of flights experiencing tarmac delays of over 3 hours also decreased—from 1,654 flights in 2007 (0.02 percent of total flights) to 903 flights in 2009 (0.01 percent of total flights).[16] As of April 29, 2010, DOT requires airlines to, among other things, adopt contingency plans for tarmac delays of more than 3 hours that must include, at a minimum, making reasonable accommodations (i.e., offer food, water, or medical

[16]Beginning in October 2008, DOT required carriers to submit long tarmac delay statistics for three additional categories: flights that are subsequently canceled or diverted or have multiple gate departures. The reporting of these categories resulted in an additional 299 tarmac delays captured in 2009 and represented one-third of all long tarmac delays in 2009.

services) during such delays.[17] Failure to comply will be considered an unfair or deceptive practice[18] and may subject the airline to enforcement action and a fine of up to $27,500 per violation.[19] See appendix II for trends in long tarmac delays from 2000 through 2009.

The percentage of delayed arrivals also decreased across almost all of the 34 OEP airports since 2007, according to ASPM data, although the declines varied by airport.[20] As shown in figure 4, such decreases ranged from about 3 percentage points to 12 percentage points. For example, New York's LaGuardia (LaGuardia) and John F. Kennedy International (JFK) airports registered decreases of about 10 percentage points—to 28 percent and 26 percent in 2009, respectively. Arrival delays at Newark Liberty International (Newark) decreased about 5 percentage points, to about 32 percent in 2009.

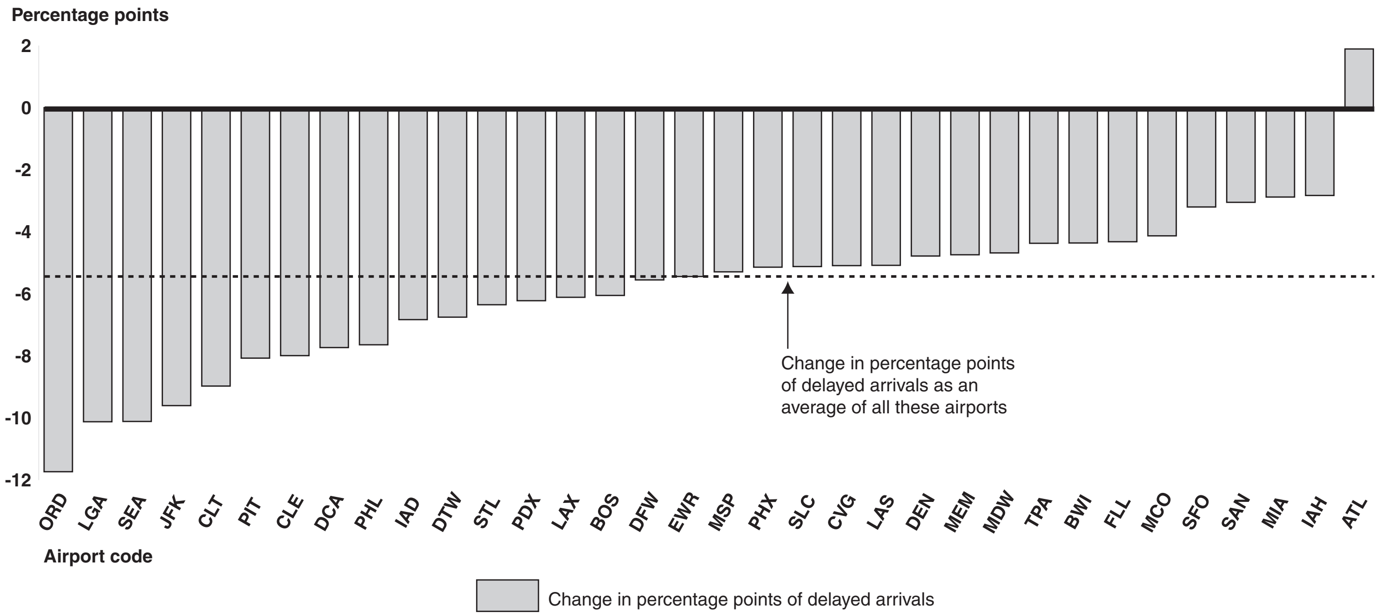
[17]Enhancing Airline Passenger Protections, 74 Fed. Reg. 68983 (Dec. 2009). Among the provisions in the rule, DOT can also fine airlines for "holding out" (advertising and/or operating) chronically delayed flights—that is, any domestic flight that is operated at least 10 times a month and arrives more than 30 minutes late (including canceled flights) more than 50 percent of the time during that month—for more than four consecutive 1-month periods. The rule states that this practice is a form of unrealistic scheduling and is, consequently, an unfair or deceptive practice and an unfair method of competition within the meaning of 49 U.S.C. § 41712. 74 Fed. Reg. 68983 (Dec. 2009). In addition, the FAA reauthorization bill, which has in separate versions passed both the House and Senate, contains several provisions to ensure passenger needs are met during long tarmac delays, including a mandate requiring airlines and airports to submit emergency contingency plans that must describe, among other things, how they allow passengers to deplane following excessive delays. Aviation Safety and Investment Act of 2010, H.R. 1586, § 407, 111th Cong. (2009).

[18]49 U.S.C. § 41712.

[19]14 C.F.R. § 383.2(A) prescribes penalties for civil violations, including those under 49 U.S.C. § 41712.

[20]As previously noted, our analysis of the OEP airports excluded Honolulu International airport because it is outside the 48 contiguous states. Also, we used ASPM for the individual airport analysis because its data include both domestic and international flights.

Figure 4: Change in Percentage Points of Delayed Arrivals by Airport, 2007-2009



Source: ASPM data.

Notes:

These data do not include canceled or diverted flights because ASPM does not include these data.

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

An increase in delayed arrivals at Atlanta Hartsfield International (Atlanta) occurred between 2008 and 2009, primarily driven by an increase in the number of scheduled flights and the extent of the peaks in scheduled flights throughout the day. Although Atlanta experienced a 0.6 percentage point decrease in the number of delayed arrivals from 2007 to 2008, the percentage of delayed arrivals increased 2.5 percentage points from 2008 through 2009—to about 27 percent. According to FAA analysis, the average number of scheduled flights exceeded the airport's average called rate—that is, the number of aircraft that an airport can accommodate in a quarter hour given airport conditions—for more periods in March 2009 than in March 2008, demonstrating how changes in the airlines' schedules likely contributed to Atlanta's increased delays.[21]

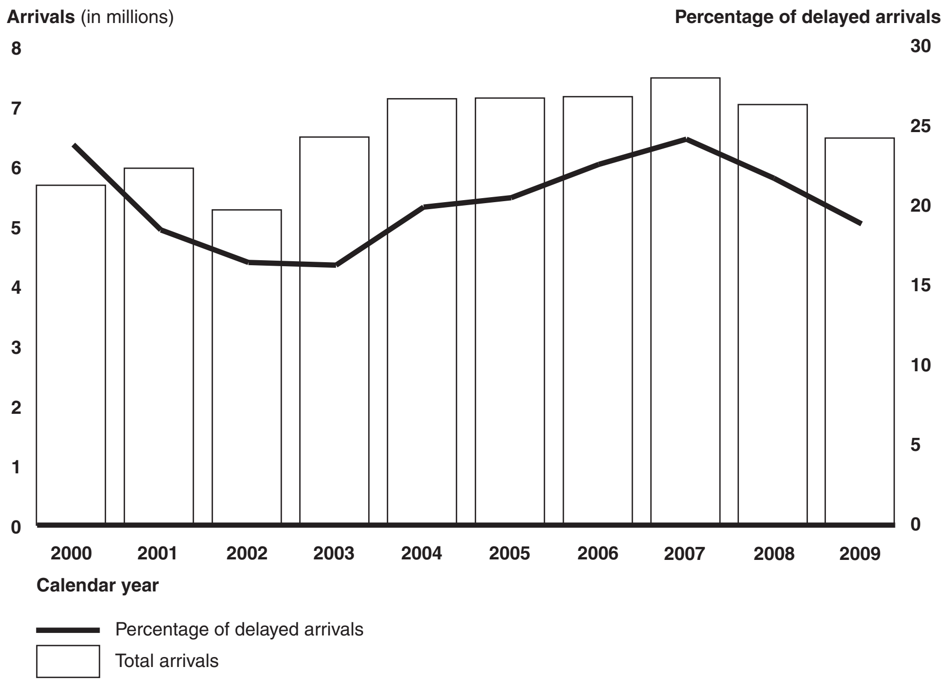
Fewer Flights and New Runway Capacity Are Likely the Principal Reasons for Reduced Flight Delays

Fewer flights since 2007, because of a downturn in passenger demand and airline cuts in capacity, have likely been the largest contributor to the decrease in delayed arrivals. FAA, airport, and airline officials that we spoke with attributed the majority of improvements in delays to the systemwide reduction in the number of flights. As shown in figure 5, trends in the percentage of delayed arrivals appear to generally track with trends in the number of arrivals. For example, when the number of total arrivals in the system decreased 7 percent from 2000 through 2002, the percentage of delayed arrivals decreased systemwide by 7 percentage points, according to DOT data. To corroborate FAA and stakeholder views on the relationship between the recent reductions in flights and declines in delays, we performed a correlation analysis between the number of total arrivals and delayed arrivals. This analysis found a significant correlation between these two factors, confirming the various stakeholders' views that the recent decrease in flights from 2007 through 2009, therefore, is likely a significant driver of the decrease in delays.[22]

[21]Specifically, FAA found that the average number of scheduled flights exceeded the airport's average called rate for 11 quarter hours per day in March 2008; this increased to 18 quarter hours per day in March 2009.

[22]To corroborate the views of FAA officials, stakeholders, and experts who told us that recent reductions in delays are likely associated with the recent declines in the number of flights, we used ASPM data to run a simple correlation between the number of total arrivals and delayed arrivals for each month from 2000 through 2009 for the OEP airports (excluding Honolulu). We found that the level of arrivals and delayed arrivals had a 0.72 level of correlation. Although this result likely indicates that arrival delays will rise with increases in arrivals, for several reasons, it should not be viewed as highly predictive of the exact pattern with which delays will track arrivals. Many other factors—that we do not account for—also affect delays at a given airport or set of airports and thus affect the measured relationship between the number of flights and delays. As such, we view this analysis as providing some additional confirmation of the experts' views. For additional information on our correlation analysis, see appendix III.

Figure 5: Arrivals and Percentage of Delayed Arrivals Systemwide, 2000-2009



Source: ASPM data.

Note: This analysis does not include flights that were canceled or diverted.

Recent runway improvements also helped reduce delays at some airports. As shown in table 2, from 2007 through 2009, new runways at Chicago O'Hare International (Chicago O'Hare), Seattle-Tacoma International (Seattle), and Washington Dulles International (Washington Dulles) and a runway extension in Philadelphia International (Philadelphia) have opened.

Table 2: Runway Projects Completed between 2007 and 2009 and Their Estimated Delay Reduction Benefits

Opening date	Airport	Project	Estimated increase in annual capacity (in flights)	Estimated delay reduction benefit per flight (in minutes)
November 2008	Seattle-Tacoma	New runway	175,000	3.4
November 2008	Chicago O'Hare	New runway	52,300	0.7
November 2008	Washington Dulles	New runway	100,000	2.5
February 2009	Philadelphia	Runway extension	Not intended to increase capacity	1.4

Source: FAA Office of Airport Planning and Programming.

According to project estimates, the new runway projects are expected to provide these airports with the potential to accommodate over 320,000 additional flights annually[23] and decrease the average delay time per operation by about 1 minute to 3.5 minutes at these airports.[24] For example, since 2007, Chicago O'Hare has seen the largest decrease in the percentage of arrivals delayed for the 34 OEP airports, according to FAA data, and some of this improvement is likely because of the new runway. In examining Chicago O'Hare's called rates,[25] we found that after Chicago O'Hare's new runway opened in the summer of 2009, the airport had the potential to accommodate, on average, about 9 percent more flights than it had been able to handle in the summer of 2008.[26] According to FAA officials, the new runway allowed Chicago O'Hare to accommodate an additional 10 to 16 arrivals per hour because of additional options with respect to its runway configuration. More importantly, this increased capacity helps reduce delays the most when an airport is constrained because of, for example, weather or runway construction. For example, Chicago O'Hare's new runway allows it to accommodate 84 arrivals per hour during poor weather, whereas prior to the new runway, it could accommodate only 68 to 72 arrivals in such weather. This increased capacity results in fewer delayed flights during bad weather. However, not all of the reduction in delayed arrivals can be attributed to the new

[23]FAA calculated the projected increase in capacity by examining the capacity of the airport—as measured by the annual service volume (ASV)—before and after the runway projects. Specifically, the ASV is the number of flights that an airport can handle given a certain level of delay per flight; in this case, a 7-minute average delay was used. The increase in capacity was derived by determining the number of flights the airport could handle before and after the new runway, holding the average delay per flight of 7 minutes constant.

[24]Taxiway improvement projects at Boston Logan International and Dallas-Fort Worth International may have also provided delay reduction benefits by improving the flow of aircraft on the airfield, but delay reduction estimates are not calculated for these projects. For example, FAA officials in Boston said that prior to the new taxiway, the airport's departure queue was one holding line; therefore, if the first aircraft was being held because of problems in the air traffic control system, all aircraft within the queue would be delayed. According to the officials, controllers can stage delayed aircraft out of the departure queue and onto the new taxiway, thereby reducing the number of delayed flights.

[25]As previously noted, the airport called rate is the number of aircraft that an airport can accommodate in a quarter hour given airport conditions.

[26]Our analysis looked at the number of flights by hour that Chicago O'Hare could handle in the summer of 2008 versus the summer of 2009. However, our analysis does not account for any changes that are due to outside factors, such as weather.

runways because another key factor—the decline in the number of flights—also helped to reduce delays.

According to FAA officials, FAA does not analyze the extent to which the estimated delay benefits are realized once a runway is opened because delay reduction is expected. They also noted that measuring the benefits of these projects is difficult because a myriad of factors, such as the installation of new technologies or procedures or changes in airline schedules, may also affect the number of flights and delays at an airport, making it difficult to isolate the benefits of the new runway. More notably, the recent drop in the number of flights was outside the bounds of FAA's analysis of these projects' delay estimates, making it is difficult to determine the actual realized benefits. Despite these challenges, by not measuring the actual benefits against estimated benefits, FAA cannot verify the accuracy of its analysis or modeling for future runway projects.

The extent to which FAA's operational and policy actions contributed to reduced delays since 2007 is unclear, although they likely resulted in some limited delay reduction benefits.[27] In 2007, the DOT-convened New York Aviation Rulemaking Committee (New York ARC) developed a list of operational improvements targeted at the three New York area airports—Newark, JFK, and LaGuardia.[28] To avoid a repeat of 2007 delays, FAA also instituted hourly limits on the number of scheduled flights at these airports. As we reported in July 2008, the collective benefit of DOT's and FAA's actions was expected to be limited.[29]

- FAA's hourly schedule limits at Newark, JFK, and LaGuardia likely contributed to some delay reduction benefits beginning in 2008 by reducing the level of peak operations and spreading flights throughout the day.[30] During the summer of 2008, each of these airports experienced an

[27] GAO-08-934T.

[28] The New York Aviation Rulemaking Committee consisted of stakeholders representing government, airlines, airports, general aviation users, and aviation consumers and was tasked with identifying available options for changing current policy and assessing the potential impacts of those changes on airlines, airports, and the traveling public.

[29] GAO-08-934T.

[30] Orders limiting scheduled operations maintain an average of 81 hourly operations at JFK and Newark and 71 hourly operations at LaGuardia. See 74 Fed. Reg. 51650 (Oct. 7, 2009) (JFK), 74 Fed. Reg. 51648 (Oct. 7, 2009) (Newark), and 74 Fed. Reg. 51653 (Oct. 7, 2009) (LaGuardia). At all three airports, the orders have extended limitations on operations through October 29, 2011.

increase in the number of arrivals and a decrease in the percentage of arrivals delayed. For example, the number of arrivals at JFK increased by 2 percent from the summer of 2007 through the summer of 2008, while arrival delays decreased by about 5 percentage points. The effect of these limits in 2009 was likely less pronounced because these three airports experienced fewer flights as a result of the economic downturn. However, without these limits, the number of flights and delays might have increased in 2008 given that airlines proposed to increase their schedules by 19 percent over 2007 levels.[31] See appendix V for more information on how the limits were set and FAA's analysis of the effect of the limits at the three New York area airports for 2007, 2008, and 2009.

- According to FAA, as of March 2010, 36 of the 77 operational and procedural initiatives identified by the New York ARC have been "completed," meaning that these procedures are in place and available for use.[32] However, as we reported in our July 2008 testimony, operational and procedural initiatives are designed to be used only in certain situations. Furthermore, although some of the procedures are available for use, they are not currently being used by the airlines, because some of the procedures were designed to reduce delays when the airports were handling more flights and experiencing higher levels of delay. For example, airlines have opted not to use one procedure that involves routing aircraft around the New York airports, which lengthens the route and could increase the airlines' fuel and crew costs. According to FAA officials, airlines have opted not to use this procedure, not only because of these additional costs, but also because delays are down with the current reduction in flights, making it unnecessary.

- FAA has also implemented various systemwide actions that may have had some effect in reducing delays. For example, in 2007, FAA implemented the adaptive compression tool—which identifies unused arrival slots at

[31]In determining the limits on operations at the three New York area airports, FAA requested that the airlines provide proposed schedules for the summer of 2008 without limits on flights. These data show that carriers suggested that they might have operated more flights during peak hours, which would have likely increased delays at these airports.

[32]According to FAA, in addition to 36 initiatives being completed, 30 initiatives are considered ongoing—that is, work is under way to complete the initiative—while 11 initiatives have been canceled because the initiative was not clearly defined or is no longer feasible. In the past, FAA and the DOT Inspector General have disagreed on the number of initiatives designated as completed. For example, in October 2009, the DOT Inspector's General report noted that while FAA reported completing 30 of the 77 initiatives, it found that 13 of these initiatives required more work, such as making procedures routinely available or obtaining controller buy-in for use of the procedure.

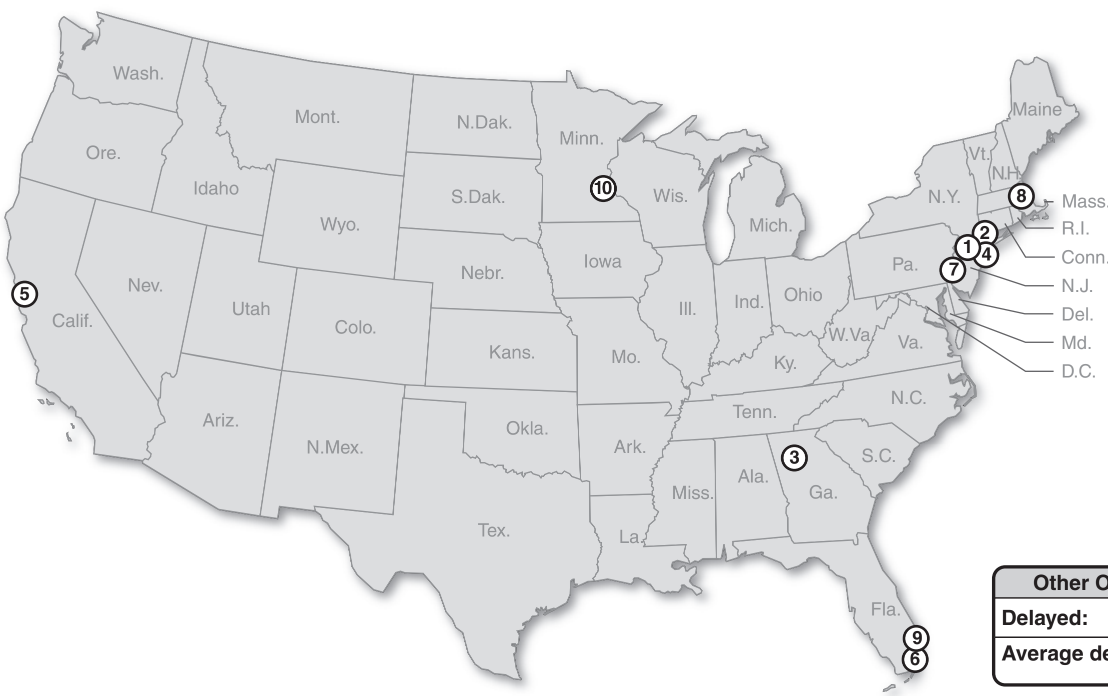
airports that are due to FAA's traffic management initiatives, such as initiatives that delay aircraft on the ground, and shifts new flights into these otherwise unused slots. FAA estimated that this tool reduced delays and saved airlines $27 million in 2007. See appendix VI for additional information on DOT's and FAA's actions to reduce delays at locations across the national airspace system.

Although Delays Have Decreased since 2007, Some Airports Still Experienced Substantial Delays

Despite fewer delayed flights since 2007, some airports still experienced substantial delays in 2009, according to FAA's ASPM data. For example, five airports—Newark, LaGuardia, Atlanta, JFK, and San Francisco—had at least a quarter of their arrivals delayed in 2009 (fig. 6). In addition, these delayed arrivals had average delay times of almost an hour or more. Excluding the 10 airports with the highest percentage of delayed flights, the remaining OEP airports had fewer than one in five arrivals delayed, with average delay times of about 53 minutes.

Figure 6: Ten Airports with the Highest Percentage of Delayed Arrivals and Average Delay Minutes for Delayed Arrivals, 2009

Rank	Airport	Delayed:	Average delay:
1	Newark (EWR)	31.7%	73.0 minutes
2	LaGuardia (LGA)	28.3%	61.3 minutes
3	Atlanta (ATL)	26.6%	57.0 minutes
4	John F. Kennedy (JFK)	25.6%	62.2 minutes
5	San Francisco (SFO)	25.1%	61.6 minutes
6	Miami (MIA)	24.7%	57.5 minutes
7	Philadelphia (PHL)	24.4%	58.7 minutes
8	Boston (BOS)	21.8%	59.1 minutes
9	Fort Lauderdale (FLL)	21.4%	50.4 minutes
10	Minneapolis/St. Paul (MSP)	20.2%	53.8 minutes



Other OEP airports	
Delayed:	17.7%
Average delay:	52.8 minutes

Delay rank

# Airport name (APN)	
Delayed:	00.0%
Average Delay:	00.0 minutes

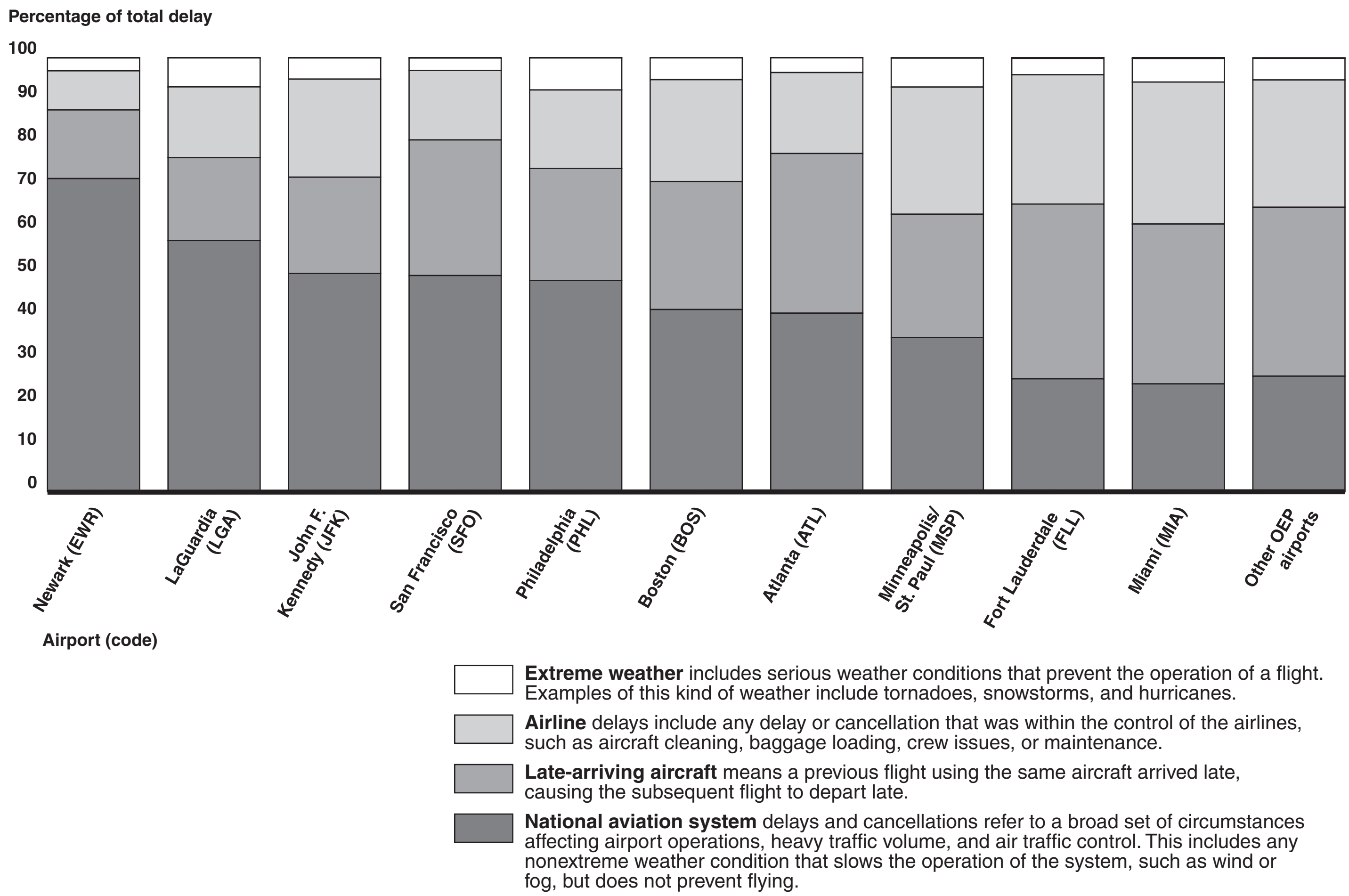
Airport name and code
Percentage of flights delayed
Average delay per delayed arrival

Sources: GAO analysis of ASPM data; Map Resources (map).

The 10 airports with the highest percentage of delayed flights generally had more delays associated with the national aviation system than other OEP airports, according to ASQP data.[33] For example, over 70 percent of Newark's delays were reported as national aviation system delays, which refer to a broad set of circumstances affecting airport operations, heavy traffic volume, and air traffic control, including nonextreme weather conditions such as wind or fog (fig. 7). In addition, these 10 airports accounted for about half of all the reported national airspace system delays for the 34 OEP airports in 2009, according to DOT data. See appendix IV for airline-reported sources of delay for delayed and canceled flights for the 34 OEP airports.

[33]Since 2003, airlines have reported the cause of delay to DOT in one of five broad categories: late-arriving aircraft, airline, national aviation system, extreme weather, and security. However, as we reported in GAO-08-934T, these data provide an incomplete picture of the sources of delay because the categories are too broad to provide meaningful information on the root causes of delays. For example, the second largest source of systemwide delay—late-arriving aircraft—masks the original source of delay. Additionally, since weather-related delays are captured in different delay categories, DOT's Bureau of Transportation Statistics (BTS) estimates these delays by summing extreme weather delays, national aviation system delays that FAA assigns in OPSNET as caused by weather, and an estimated portion of weather-related delays from late-arriving aircraft delays from DOT's ASQP data. Using this calculation, BTS estimated that in 2009, about 42 percent of delayed flights were weather-related delays.

Figure 7: Airline-Reported Delay Causes for the 10 Most Delayed Airports, 2009



Source: GAO analysis of ASQP data.

Note: Security delays do not show up on this graphic because they make up less than 1 percent of the delays at these airports.

The high percentage of national aviation system delays at these airports likely reflects that these airports are more sensitive to changes in airport capacity because they frequently operate near or exceed their available capacity. For example, the DOT Inspector General reported that at Newark, LaGuardia, JFK, and Philadelphia, airlines scheduled flights above the average capacity in optimal conditions at these airports in the summer of 2007.[34] In further examining the relationship between the level of delay and the relationship of scheduled flights to an airport's available capacity, we selected the 4 airports with the highest percentage of delayed flights—Newark, LaGuardia, JFK, and Atlanta—along with 2 airports that are among the 34 OEP airports with the lowest percentage of delayed flights—Chicago Midway and Lambert-St. Louis International (St. Louis)—and analyzed data on the number of scheduled flights and available capacity at these 6 airports. We found that all 4 of the delay-prone airports had flights scheduled above the airports' capacity levels for at least 4 hours of the day, while the 2 airports with lower levels of delay never had the number of scheduled flights exceeding capacity.[35] Operating close to capacity becomes especially problematic when weather conditions temporarily diminish the capacity at an airport. In particular, while flights to and from an airport operating close to or exceeding capacity might become very delayed in inclement weather conditions, flights to and from another airport that has unused capacity may not be delayed by a similar weather event.

Seven Airports Are the Source of about 80 Percent of All Departure Delays Captured in FAA's OPSNET

While the flight delay data from DOT and FAA data sources previously discussed serve as the primary source of air travel information for consumers, OPSNET helps the agency understand which FAA facilities are experiencing delays, why the delays are occurring (e.g., weather or heavy traffic volume), and uniquely, which facilities are the source of that delay. Unlike the other databases, which measure delays against airline schedules, OPSNET database collects data on delays that occur solely while flights are under FAA control.[36] For example, a flight would be recorded as delayed in OPSNET if it is held on the ground at the departure airport for more than 15 minutes because of an FAA facility instituting a traffic management initiative in response to weather conditions, increased

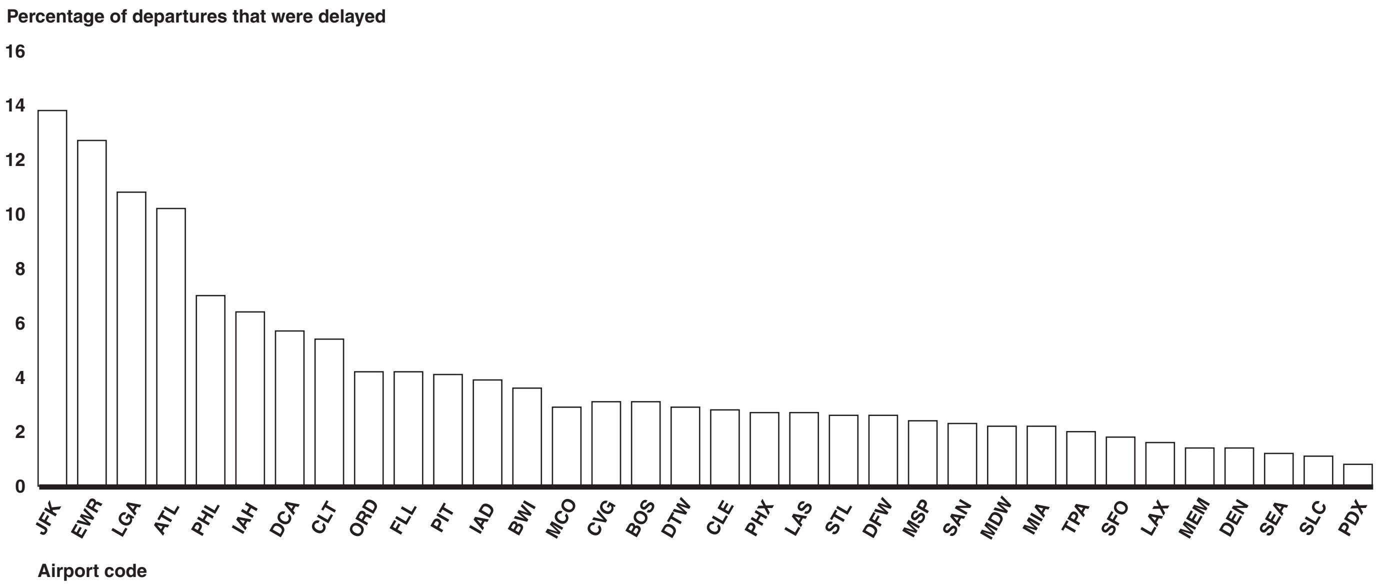
[34]DOT Inspector General. *Status Report on Actions Underway to Address Flight Delays and Improve Airline Customer Service.* CC-2008-058. (Washington, D.C.: Apr. 9, 2008).

[35]This analysis was based on airlines' schedules and airport called rates (i.e., the number of aircraft that an airport can accommodate in a quarter hour given airport conditions) for 1 day in August 2009. We considered an airport to be overscheduled in any hourly slot if either the number of scheduled arrivals or scheduled departures in a given hour exceeded the called arrival rate or called departure rate, respectively.

[36]As previously noted, a flight is delayed in OPSNET if while under FAA's control, it accumulates a delay of 15 minutes or more between the time that a pilot requests to taxi and the time that the aircraft takes off or anywhere en route for an aggregate of 15 minutes or more.

traffic volume, or other circumstances. FAA measures delays within the air traffic control system to assess its performance because an inefficient air traffic control system contributes to higher levels of delayed flights. As figure 8 shows, many of the delay-prone airports that we identified earlier in the report based on our analysis of arrival delays also experience the most departure delays, according to OPSNET. In OPSNET terminology, these delays are called occurred-at delays because they represent delays that happened at the given airport.

Figure 8: Percentage of Departures That Were Delayed According to OPSNET, 34 OEP Airports, 2009



Source: GAO's analysis of OPSNET data.

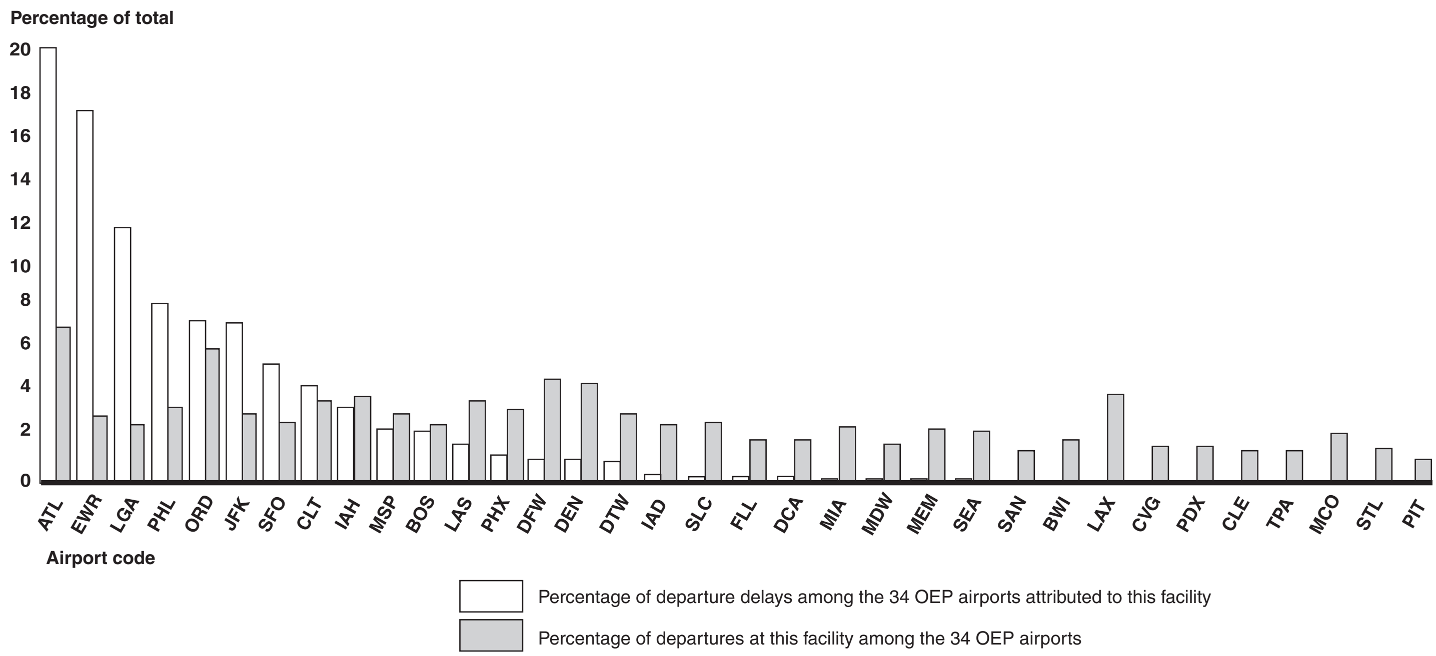
Note: JFK = New York John F. Kennedy International, EWR = Newark Liberty International, LGA = New York LaGuardia, ATL = Atlanta Hartsfield International, PHL = Philadelphia International, IAH = George Bush Intercontinental, DCA = Ronald Reagan Washington National, CLT = Charlotte/Douglas International,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

In addition to capturing where the delay occurred (as shown above), OPSNET provides information on what facility the delay was attributed to—that is, which facility instituted a traffic management initiative that resulted in flights being delayed. If, for example, a flight departing Atlanta was delayed because of weather problems in Atlanta, Atlanta would be recorded as both the occurred-at facility and the attributed-to facility in OPSNET. However, if fog in San Francisco delays a flight leaving Minneapolis bound for San Francisco, Minneapolis is the occurred-at facility, but San Francisco is the attributed-to facility. This concept of assigning attribution for delays is different than the notion of "propagated delay," in which a delayed flight early in the day may cause delays to flights later in the day because of a late-arriving aircraft or crew. Instead, delay that is attributed to a facility in OPSNET relates only to a given flight segment and is determined to be associated with the airport or other air traffic control facility that had a traffic management initiative in place that held flights at a particular location.

As figure 9 shows, almost half—49 percent—of all departure delays occurring at the 34 OEP airports were attributed to just 3 airports—Atlanta, Newark, and La Guardia, according our analysis of OPSNET.[37] However, these 3 airports accounted for only 13 percent of departures among these 34 airports in 2009.

[37]While OPSNET captures delays experienced by and attributed to all FAA facilities, our analysis of OPSNET includes delays attributed to and experienced by the OEP airports (excluding Honolulu) and its associated TRACONs. See appendix I for more information on how we isolated departures and departure delays for our analysis. Additionally, unless otherwise specified, we combined each airport with its TRACON to show the total departure delay caused by each airport and its corresponding TRACON and refer to this combination by the airport name. These airports and TRACONs represent about 85 percent of the total departure delays within OPSNET.

Figure 9: Percentage of Total Departures and Attributed-To Delays, 34 OEP Airports , 2009



Source: GAO analysis of OPSNET data.

Notes:

This graphic represents the percentage of total departures and delayed departures each airport tower handled in 2009. We excluded each airport's TRACON because TRACON operations include departures, arrivals, and overflights.

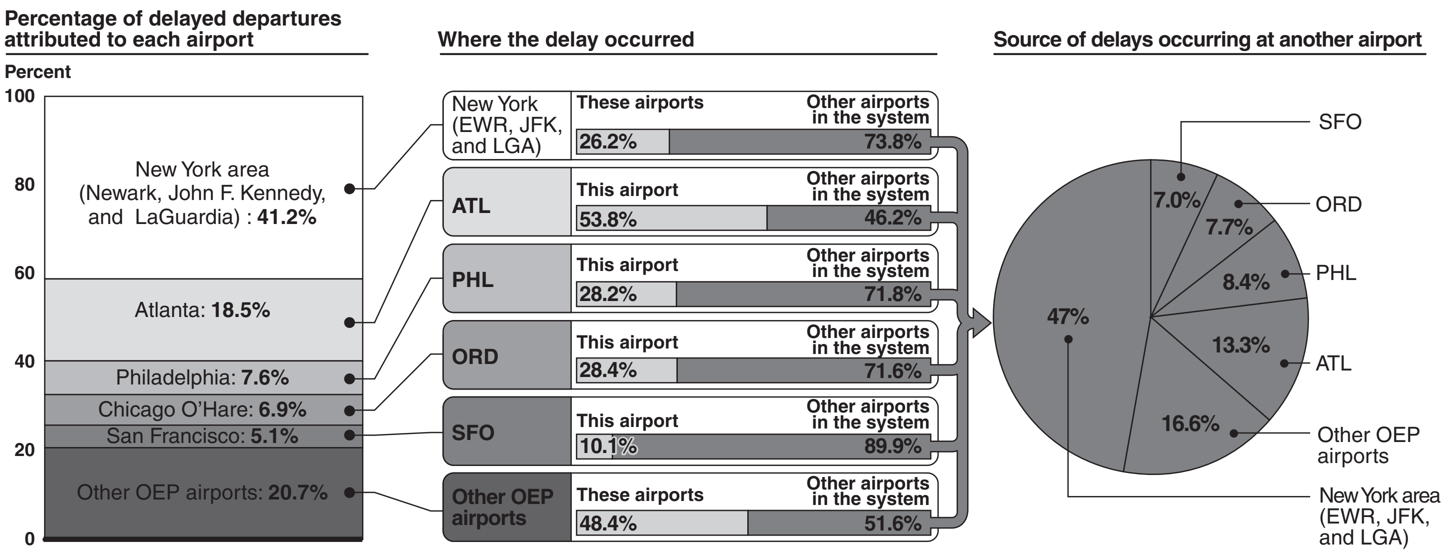
ATL = Atlanta Hartsfield International, EWR = Newark Liberty International, LGA = New York LaGuardia, PHL = Philadelphia International, ORD = Chicago O'Hare International, JFK = New York John F. Kennedy International, SFO = San Francisco International, CLT = Charlotte/Douglas International, IAH = George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

In addition, 7 airports and their associated TRACONs were the source of approximately 80 percent of all departure delays captured in OPSNET in 2009 (see fig. 10).[38] Figure 10 also shows that in the case of the combined

[38]For our analysis, we grouped the 3 New York airports together to show the combined contribution to delays of these airports and the New York TRACON.

New York airports as well as for 3 of the 4 remaining airports (the exception is Atlanta), a majority of the departure delays that were attributed to these airports actually occurred at—or were experienced at—other airports. For example, Philadelphia was the source of over 26,000 delayed departures[39] throughout the national airspace system in 2009, but fewer than 7,500 of these delays[40] (or 28.2 percent) occurred at Philadelphia. Further analysis (see pie chart in fig. 10) shows that for all of the departure delays among the 34 OEP airports that occurred at an airport other than the airport that generated the delay, 83 percent were attributed to these 7 airports. FAA has identified these same 7 airports as among the most delayed airports in the system in need of further monitoring for possible changes in airline schedules and potential delays—a process that we discuss later in this report.

Figure 10: Total Delays within the Air Traffic Control System Attributed to Each OEP Airport and Where the Delay Occurred, 2009



Source: GAO analysis of OPSNET data.

Notes:

Each airport includes data from its corresponding TRACON.

EWR = Newark Liberty International, JFK = New York John F. Kennedy International, LGA = New York LaGuardia, ATL = Atlanta Hartsfield International, PHL = Philadelphia International, ORD = Chicago O'Hare International, and SFO = San Francisco International.

[39]Of these 26,000 departure delays, 25 delays were attributed to Philadelphia's TRACON.

[40]These 7,500 delays do not include the other delays experienced by Philadelphia that are attributed to other airports.

Actions Could Reduce Delays, but FAA Lacks Airport-Specific On-Time Performance Targets, Limiting Its Ability to Prioritize Actions and Demonstrate Benefits

FAA's Actions to Reduce Delays Are Generally Being Implemented at the Most Congested Airports, but Many Actions Face Implementation Challenges

FAA's actions have the potential to reduce delays in the next 2 to 3 years and are generally being implemented at airports that experience and contribute substantial delays to the system, including the 7 airports that are the source of a majority of the delays in the system (Newark, LaGuardia, Atlanta, JFK, Philadelphia, Chicago O'Hare, and San Francisco). While FAA's long-term solution to expanding capacity and reducing delays is NextGen improvements that will not be fully implemented until 2025, we used FAA's Flight Plan and NextGen Implementation Plan to identify several actions that are slated to be implemented in the next 2 to 3 years, have the potential to help meet short-term capacity needs, and improve the operational performance of the U.S. aviation system. These actions include implementing near-term elements of NextGen, constructing runways, implementing a new airspace structure for the airports serving the New York/New Jersey/Philadelphia metropolitan area,[41] and revising air traffic control procedures.[42] More detailed information on the actions and their locations can be found in appendix VI. According to FAA, the purpose of many of these actions is not only to reduce delays, but just as importantly, they can also improve safety, increase capacity, and reduce fuel burn.

[41]GAO, *FAA Airspace Redesign: An Analysis of the New York/New Jersey/Philadelphia Project*, GAO-08-786 (Washington, D.C.: July 31, 2008).

[42]FAA has many ongoing and planned initiatives—such as longer-term NextGen procedures and technologies—that could also reduce delays, but these actions are not included in our discussion because they are not expected to realize delay reduction benefits in the next 2 to 3 years.

Many of the actions for reducing delays over the next 2 to 3 years are being implemented at some of the most congested airports in the system. For example,

- Actions that FAA has in place or planned for the New York area airports—such as the New York ARC initiatives, the New York/New Jersey/Philadelphia airspace redesign, and hourly schedule limits—are being implemented to help address widespread delays at the congested New York airports. The remaining ARC initiatives and other actions to reduce delays at the New York airports were recently incorporated into the New York Area Delay Reduction Plan, which FAA expects to update monthly. The agency continues to maintain the schedule limits, which were designed to limit airline overscheduling and limit delays in the New York area to below the levels experienced in summer 2007. Additionally, FAA issued an order in January 2009 outlining its plans to reduce the number of hourly scheduled flights at LaGuardia from 75 to 71 through voluntary reductions and retirements of slots by the airlines.[43]

- FAA has also continued to implement various air traffic management improvements and begun implementation of NextGen procedures and technologies, many of which are expected to be implemented at the most congested airports. The RTCA NextGen Mid-Term Implementation Task Force recommended that FAA target key airports when implementing NextGen capabilities between now and 2018. FAA used these recommendations to help develop its 2010 NextGen Implementation Plan, which includes actions to be implemented in the next 2 to 3 years, including additional Area Navigation (RNAV) and Required Navigation Performance (RNP) procedures, often called performance-based

[43]74 Fed. Reg. 2646 (Jan. 15, 2009). According to FAA officials, the agency is currently working to reduce the number of scheduled flights to reach its new hourly limit of 71, but still operates at more than that level in most hours of the day. FAA officials noted that reaching 71 scheduled hourly operations at LaGuardia may be difficult to do voluntarily. While hourly limits on scheduled operations were set at 81 for both JFK and Newark, FAA originally allowed more than this level in some afternoon hours. FAA continues to work with airlines at JFK and Newark to reduce the number of flights where they exceed the hourly limit of 81 scheduled operations at these airports.

navigation procedures.[44] In response to the RTCA recommendations, FAA plans to focus on increasing the use of performance-based navigation at some of the key airports identified by the task force. According to FAA air traffic officials, an automated metering tool used to help manage arrival aircraft—Traffic Management Advisor (TMA)—has contributed to more efficient departure and arrival performance at several OEP airports, including Atlanta and Newark. To help reduce delays at San Francisco and other busy airports, FAA has also tested tailored arrival procedures, which allow the pilot to fly the most efficient descent into the arrival airport.

- Over the next 2 to 3 years, Chicago O' Hare, JFK, Charlotte/Douglas International (Charlotte), and Portland International (Portland) will continue to pursue infrastructure projects to increase the capacity of their airports and surrounding airspace. Chicago O'Hare—one of the airports that contributes substantial delays to the national airspace system—is scheduled to open another new runway in 2012 that is expected to provide the airport with the potential to accommodate as many as 30,900 additional flights annually.[45] At Charlotte, a new runway opened in February 2010 that has the potential to accommodate as many as 80,000 additional flights annually. Later this year, Portland is expected to complete a runway extension, although benefits for this project are not estimated. Airport infrastructure projects such as these will help reduce delays at these airports and should also help decrease delays elsewhere in the system.[46]

Many delay reduction actions face implementation challenges that may limit their ability to reduce delays in the next 2 to 3 years. For example,

[44]Opportunities to optimize throughput, improve flexibility, enable fuel-efficient climb and descent profiles, and increase capacity at the most congested metroplex areas should be a high-priority initiative in the near term. *RTCA NextGen Mid-Term Implementation Task Force Report*. (September 9, 2009). In addition, some elements of NextGen require aircraft equipage before technologies can be used and benefits realized. RNAV enables aircraft to fly on any path within coverage of ground- or space-based navigation aids, permitting more access and flexibility for point-to-point operations. RNP, like RNAV, enables aircraft to fly on any path within coverage of ground- or space-based navigation aids, but also includes an onboard performance-monitoring capability. RNP also enables closer en route spacing without intervention by air traffic control and permits more precise and consistent arrivals and departures.

[45]The 2012 runway is the third project in Phase 1 of the O'Hare Modernization Program. The first two runway projects were completed in 2008 at Chicago O'Hare.

[46]As mentioned earlier in this report, about 72 percent of delays attributed to Chicago O'Hare occur at other airports.

according to officials, one challenge FAA faces in implementing the remaining New York ARC initiatives is that airlines do not have a current need for or interest in using some of the procedures because of recent declines in air traffic. Implementation may be difficult for other air traffic management tools—such as TMA—because, according to the DOT Inspector General, they represent a significant change in how air traffic controllers manage traffic.[47] Effective training will be required to ensure air traffic managers and controllers become familiar with and gain confidence in newly automated functions. However, TMA has been deployed and is currently being used at many airports, including Newark, LaGuardia, and JFK. Some airline officials noted that TMA implementation has been beneficial, but there have been some implementation challenges because of the transition to an automated system.

While introducing new RNAV and RNP procedures could help reduce delays in the next 2 to 3 years, as we have previously reported, developing these procedures in a timely manner is a challenge.[48] In the New York area, for example, some of these procedures cannot be implemented until the New York/New Jersey/Philadelphia airspace redesign is completed, which is currently behind schedule. FAA did not fully account for future use of new technology such as RNAV in its analysis, so the New York/New Jersey/Philadelphia airspace redesign has to be completed in order to implement new performance-based navigation procedures in the study area.[49] In addition, most procedures that FAA has implemented are overlays of existing routes rather than new procedures that allow more direct flights. Overlays can be deployed more quickly and do not involve an extensive environmental review, but they do not maximize the delay reduction benefits of RNAV and RNP. FAA's goals for RNAV and RNP focus on the number of procedures produced, not whether they are new routes or the extent to which they provide benefits or are used. For example, FAA believes that it can annually develop about 50 RNAV and

[47] DOT Inspector General, *Observations On Short-Term Capacity Initiatives.* AV-2008-087 (Washington, D.C.: Sept. 26, 2008).

[48] GAO, *Next Generation Air Transportation System: FAA Faces Challenges in Responding to Task Force Recommendations*, GAO-10-188T (Washington, D.C.: Oct. 28, 2009).

[49] GAO-08-786.

RNP procedures, 50 RNAV routes, and 50 RNP approaches.[50] Given that FAA plans to implement a total of 2,000 to 4,000 RNAV and RNP arrival and departure procedures alone, it is clear that only a limited number of new procedures—which could provide delay reduction benefits—will be implemented in the next 2 to 3 years.

Implementation of NextGen also faces several challenges, including operating in a mixed equipage environment, addressing environmental issues, and changing FAA's culture. For example, it is difficult for air traffic controllers to manage aircraft equipped with varying NextGen capabilities, particularly in busy areas, because controllers would have to use different procedures depending on the level of equipage. It is also difficult for FAA to complete all the required environmental reviews quickly because any time an airspace redesign or new procedure changes the noise footprint around an airport, an environmental review is initiated under the National Environmental Policy Act (NEPA). FAA also faces cultural and organizational challenges in integrating and coordinating activities across multiple lines of business. Sustaining a high level of involvement and collaboration with stakeholders—including operators, air traffic controllers, and others—will also be necessary to ensure progress. More recently, software and other technical issues experienced at test sites have delayed systemwide implementation of core NextGen functionality.

FAA Uses an On-Time Performance Target to Help Measure Performance and Analyzes Benefits of Some Delay Reduction Actions Under Way

FAA has various tools for measuring and analyzing how its actions might reduce delays, including establishing an on-time performance target, estimating delay reduction benefits for NextGen and some individual initiatives, and regularly monitoring system performance across the national airspace system and at individual airports.

- *FAA measures improvements in delays through its NAS on-time performance target*: FAA established an 88 percent national airspace system (NAS) on-time arrival performance target to measure how its actions help meet its Flight Plan goal of increasing the reliability and on-time performance of the airlines. According to FAA, this performance target provides information on FAA's ability to provide air traffic control

[50] According to FAA officials, the agency is in the process of revising key performance metrics to better track the performance and the agency may move away from measuring RNAV and RNP procedure development by counting the number of procedures implemented.

services to the airlines and is set based on 3 years of historical trending data. Because DOT's ASQP data are used for this target and contain flight delays caused by incidents outside FAA's control—such as extreme weather or carrier-caused delay—FAA removes such delays not attributable to the agency to provide a more accurate method of measuring FAA's performance. [51] Even with these modifications to the data, FAA notes that the actual measure can still be influenced by factors such as airline schedules or nonextreme weather.

- *FAA analyzes the delay reduction benefits of some actions*: FAA has modeled and estimated total delay reduction benefits from NextGen.[52] In addition to benefits from safety, fuel savings, and increased capacity, FAA estimates that, in aggregate, planned NextGen technologies—including the New York/New Jersey/Philadelphia airspace redesign and RNAV and RNP routes—and planned runway improvements will reduce delays by about 21 percent by 2019 as measured against doing nothing at all (fig. 11).[53] In particular, given the estimated growth in traffic, FAA estimates that NextGen and other planned efforts will keep delays from growing as fast as they would without them, but delays are still expected to grow from today's levels. According to FAA's model simulations, total delay minutes are predicted to double from current levels, even when assuming all planned NextGen and other runway improvements occur. At the airport level, FAA provided us with additional results from its simulations that suggest that, even after taking into consideration the benefits of new runways and NextGen technologies, flights at several airports may

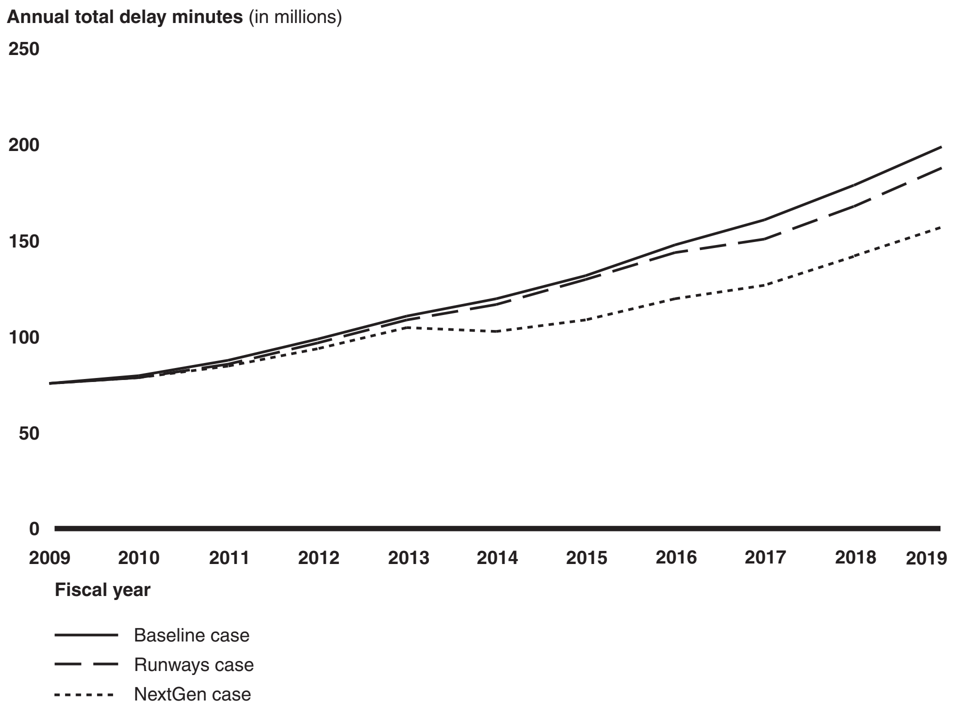
[51]The 2009-2013 FAA Flight Plan Performance Target: NAS On-Time Arrival is the percentage of all flights arriving at the 35 OEP airports equal to or less than 15 minutes late, based on the carrier flight plan filed with FAA (not the airlines' scheduled flight times), and excludes minutes of delay attributed by airlines to weather, airline actions, security delays, and prorated minutes for late-arriving flights at the departure airport.

[52]In addition to delay reduction, FAA also models NextGen program benefits for safety, environmental, and operational improvements. Delay reduction is not the agency's only goal, as increasing throughput, decreasing total travel times and distances, and fuel savings are all expected benefits of some NextGen programs.

[53]While we reviewed some of FAA's assumptions and analyses, we did not verify the accuracy of the model. Moreover, the various modeling efforts under way to estimate the impacts of NextGen technologies are somewhat preliminary and still under development. At present, FAA officials told us that the model results do not appear to simulate current year delays well for some airports, but the focus of the analysis is on growth rates over time.

experience higher average delays per flight in 2020 than experienced today.[54]

Figure 11: FAA's Estimated Delay Benefits of NextGen



Source: FAA.

Note: The baseline case estimates the delays that may occur if no improvements are made to the system. The runways case estimates the delays that may occur if only runway improvements are made over the next 10 years, but no NextGen air traffic management improvements. The NextGen case estimates the delays that may occur if planned runway improvements and NextGen technologies and procedures are implemented over the next 10 years. FAA uses a set of rules to produce feasible schedules for modeling NextGen benefits because without doing so, an FAA official told us, demand projections would not realistically reflect anticipated airport infrastructure constraints.

[54]FAA officials noted that there could be some inconsistencies between the results from this model and FAA Airports office estimates of future capacity and delay because the NextGen modeling may not reflect detailed information on individual airport capacity needs developed by the Airports office. Through its report entitled *Capacity Needs in the National Airspace System, 2007–2025* (FACT 2), FAA identified airports that are forecast to be significantly congested by 2015 and 2025, whether or not currently planned improvements are carried out. FAA is currently in the process of updating this analysis. FAA, *Capacity Needs in the National Airspace System, 2007–2025: An Analysis of Airports and Metropolitan Area Demand and Operational Capacity in the Future* (Washington, D.C.: May 2007), a study prepared by the MITRE Corporation, Center for Advanced Aviation System Development.

FAA has also analyzed delay reduction benefits for elements of some major projects and individual actions, though we did not verify or evaluate these analyses or estimates. For example, postimplementation analysis for the first phase of the New York/New Jersey/Philadelphia airspace redesign showed that both Newark and Philadelphia airports experienced increases in the number of departures during times when the new departure headings were used, resulting in an estimated decrease of almost 1 minute of taxi time and a 2.5 percent decrease in the time between when the aircraft pushes back from the gate to when it takes off from the airport—which is referred to as "out to off time"—during the morning departure push at Newark. FAA also assessed capacity and delay reduction benefits for some air traffic management improvements. For example, FAA estimates that the implementation of TMA improved FAA's ability to manage aircraft, resulting in capacity increases of 3 to 5 percent. As part of the review process for the New York ARC initiatives, FAA officials selected some of the ongoing and completed initiatives for further analysis based on their potential to reduce delays. For example, FAA conducted a study of the simultaneous instrument approaches at JFK that showed an increase in arrival capacity of 12 flights per hour.[55] According to FAA officials, it is difficult to isolate the overall benefit of an individual initiative given the complexity of assessing all the actions in place and all of the factors affecting the system at any given time.

- *FAA monitors system performance*: FAA also monitors airport and system delays using tools, such as targeted analysis and performance dashboards, that track operational performance on a daily basis. This routine monitoring allows officials to try to assess how a given event may have affected performance. FAA officials recently added data to its dashboards to enable users to compare current performance with that for previous days, months, or years and to provide additional insight on performance trends. Also, FAA recently began to implement a process for monitoring airport performance. In response to peak summer delays in 2007, FAA officials began using airline schedules to estimate delay trends at the OEP airports and identify airports that may experience significant delays in the next 6 to 12 months. If an airport is expected to experience significant delays—that is, aircraft waiting to depart for more than 5 minutes—FAA would then evaluate whether a congestion action team should be formed to develop actions in response to these potential delays.

[55] Simultaneous runway approaches allow increased arrival rates on a given runway configuration when weather conditions are classified as instrument meteorological conditions.

However, because of the recent decline in the number of flights systemwide, FAA has yet to take any new actions based on this monitoring.

FAA's Use of Average On-Time Performance Masks Variations in Airport Performance and Limits FAA's Ability to Prioritize Its Actions to Reduce Delays

Although FAA's target of 88 percent on-time arrival performance provides a measure of the agency's overall goal to provide efficient air traffic control services, it masks the wide variation in airport performance, making it difficult to understand how individual airport performance relates to the overall target. For example, in fiscal year 2009, Newark had an on-time arrival rate of only 72 percent, while St. Louis easily exceeded the target with 95 percent on-time performance. Despite this variability in performance, FAA has not established airport-specific targets for on-time performance. FAA officials noted that they are trying to develop airport-specific on-time performance targets, but efforts in developing these targets are in the very early stages, and they do not currently have plans to make these targets publicly available or hold FAA officials at the local airport or national level accountable for achieving these targets.

The absence of performance targets for individual airports hinders FAA, aviation stakeholders, and the public from understanding a desired level of on-time performance for individual airports and results in FAA lacking a performance standard by which it can prioritize and demonstrate how its actions reduce delays at the most congested airports and throughout the system. For example, as previously noted, FAA's implementation of new departure headings resulted in performance improvements at Philadelphia and Newark, according to the MITRE analysis.[56] Yet those improvements lack a performance standard against which FAA might prioritize its actions and determine if the improvements helped meet or exceed, or still fall short of, the overall targeted level of performance for these airports or how they affected the overall on-time performance goal. For example, reducing delays at the airports that currently impose approximately 80 percent of all departure delays within the air traffic control system could not only have a measurable benefit at these airports, but could also improve performance of the overall national airspace system.

[56]MITRE is a not-for-profit organization chartered to work in the public interest. MITRE manages four federally funded research and development centers, including one for FAA. MITRE has its own independent research and development program that explores new technologies and new uses of technologies to solve problems in the near term and in the future.

Furthermore, although FAA's analyses of delay reduction benefits demonstrate improvements at various airports, it remains unclear whether further actions are required to achieve a targeted level of performance at these airports since targeted levels of airport performance have not been established. As part of its NextGen Mid-Term Implementation Task Force recommendations, RTCA is encouraging FAA to move away from traditional national deployments of new technologies to an airport-centric approach that deploys solutions at key airports and for large metropolitan areas where problems with congestion and delay are most acute. Airport-specific performance targets could help in measuring the extent to which FAA's airport-focused actions are helping to improve performance or whether additional actions are needed to address delays at the most congested airports. Moreover, although NextGen will keep delays at many airports from getting worse than would be expected without NextGen, FAA's NextGen modeling indicates that even if all ongoing and planned NextGen technologies are implemented, a few airports, such as Atlanta, Washington Dulles, and possibly Philadelphia, may not be able to meet the projected increases in demand, and if market forces do not dampen that demand, additional actions may be required at these airports. However, without airport-specific targets, FAA cannot determine what additional actions might be required to achieve a targeted level of performance at these airports.

Conclusion

Over the next 2 to 3 years, FAA has numerous actions planned or under way that are expected to increase capacity and improve the performance of the overall aviation system. Although these actions may reduce delays and help FAA achieve its overall on-time performance goal, FAA's ability to prioritize these actions and communicate their benefits is inhibited by the absence of individual airport on-time performance targets. Identifying performance targets for individual airports and how these targets relate to the overall agency goal will provide a standard by which FAA can measure and prioritize its actions to reduce delays at these airports and overall. This is particularly important in understanding the extent to which FAA's actions are addressing delays at the 7 airports—Newark, LaGuardia, Atlanta, JFK, San Francisco, Chicago O'Hare, and Philadelphia—that are currently responsible for about 80 percent of the delays across the air traffic control system. Although airport-specific on-time performance targets should not be the only measure of FAA's performance in reducing delays in the system, by setting these targets, FAA may be motivated to better focus its actions at these airports, resulting in reduced delays not only at these airports but also at other airports in the national airspace system. Airport-specific goals would also help FAA better communicate how actions at the airport and national levels contribute to the agency's overall goals, improve airport performance, and demonstrate how its actions are affecting delays. Additionally, even with NextGen, delays at some of the most congested airports are expected to continue and could get worse, requiring FAA to consider additional policy actions to maintain airport performance. Airport-specific goals could help FAA identify and communicate what additional actions might be required to achieve a targeted level of performance at these airports.

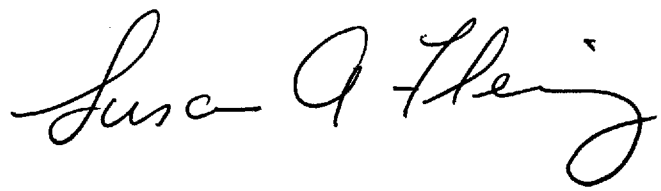
Recommendation for Executive Action

We recommend that the Secretary of Transportation direct the Administrator of FAA to develop and make public airport-specific on-time performance targets, particularly for the most congested airports that impose delays throughout the air traffic control system, to better prioritize FAA's actions to reduce delays and demonstrate benefits of those actions.

Agency Comments and Our Evaluation

We provided a draft of this report to DOT for its review and comment. DOT and FAA officials provided technical comments that we incorporated as appropriate. In addition, in e-mailed comments, an FAA official reiterated that the agency has been working to develop and implement airport-specific performance targets, but that this process remains ongoing given the complex nature of compiling historical data and airport-specific performance information to create baseline targets. The official also noted that airport-specific on-time performance targets are one of the many tools that FAA can use to manage and measure delays at the airport level and systemwide and that the agency continues to identify ways to improve how it measures performance. For example, FAA plans to use new radar and airport surface detection data to help refine its causal delay data. While we agree that these measures could help FAA further understand delays, we continue to believe that airport-specific on-time performance targets could help FAA demonstrate how its actions are affecting delays at individual airports and throughout the national airspace system, but they could also help FAA, aviation stakeholders, and the public understand the desired level of airport performance. Furthermore, establishing airport-specific targets in addition to the agency's overall on-time performance target would help FAA focus its actions on those airports where improvements could result in the greatest impact and communicate to stakeholders how its actions relate to its goals.

We are sending copies of this report to the Secretary of Transportation and the Administrator of the Federal Aviation Administration. In addition, the report will be available at no charge on the GAO Web site at http://www.gao.gov. If you or your staff have any questions concerning this report, please call me at (202) 512-2834 or flemings@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report are listed in appendix VII.



Susan Fleming
Director, Physical Infrastructure Issues

Appendix I: Objectives, Scope, and Methodology

In this report, we examined the extent to which (1) delays in the U.S. national aviation system have changed since 2007 and the factors contributing to these changes, and (2) actions by the Department of Transportation (DOT) and the Federal Aviation Administration (FAA) are expected to reduce delays in the next 2 to 3 years.

To determine how delays have changed, we analyzed DOT and FAA data on U.S. passenger airline flight delays by airport and for the entire aviation system through 2009. Using DOT's Airline Service Quality Performance (ASQP) data, we analyzed systemwide trends in flight delays, including cancellations, diversions, long tarmac delays, and average delay minutes, for calendar years 2000 through 2009. Using FAA's Aviation System Performance Metrics (ASPM) data, we analyzed airport-specific trends in the number of total flights, delayed flights, and delay time for 34 of the 35 airports in FAA's Operational Evolution Partnership (OEP) program for calendar years 2007 through 2009.[1] We focused on these 34 OEP airports because they serve major metropolitan areas located in the continental United States and handled more than 70 percent of passengers in the system in 2008; additionally, much of the current delays in air traffic can be traced to inadequate capacity relative to demand at these airports, according to FAA.[2] We also analyzed DOT's ASQP data on airline-reported sources of delayed and canceled flights for these 34 airports for calendar year 2009.

To assess the extent to which these 34 airports experienced and contributed delays to the aviation system, we analyzed calendar year 2009 data from FAA's Operations Network (OPSNET), which measures departure delays, airborne delays, and delays resulting from traffic management initiatives taken by FAA in response to weather conditions, increased traffic volume, runway conditions, equipment outages, and other affecting conditions. Our analysis included data from the OEP airports (excluding Honolulu) and their associated terminal radar approach control

[1]Since FAA's ASPM data are not finalized until approximately 90 days after the end of the fiscal year, the data for the last 3 months of calendar year 2009 (October, November, and December) are current as of February 26, 2010, and are subject to change.

[2]According to FAA, the 35 OEP airports are commercial airports with significant activity and were selected in 2000 on the basis of lists from FAA and Congress as well as a study that identified the most congested airports in the United States. For purposes of this report, we excluded the Honolulu International airport; while it is a large airport, it is outside the 48 contiguous states.

facilities (TRACON).[3] Since 16 location identifiers are used for a combination of airports and TRACONs, resulting in combined data, we worked with FAA to determine how to identify the number of departures and departure delays to attribute to each individual airport and TRACON in our universe. To separate out these data, we examined the different categories of OPSNET delays: departure delays (flights incurring a delay at the origin airport prior to departure), airborne delays (flights held en route), and two categories of traffic management delays—delays occurring at one facility resulting from a traffic management initiative instituted by another facility ("traffic management from" delays) and delays charged to the facility instituting the traffic management initiative, which may occur at another facility in the system ("traffic management to" delays). Since TRACONs handle airborne flights only and airports handle flights preparing for takeoff or landing, we allocated all airborne delays to the TRACONs and all departure and traffic management from delays to the airport for these combined facilities. In separating out the traffic management to delays, we allocated all of these delays to the OEP airport, unless the delay occurred at another airport associated with that TRACON—in which case, we allocated those delays to the TRACON.[4] Our analysis focused on departures, departure delays, and both categories of traffic management delays because the majority of delays recorded in OPSNET occur before an aircraft takes off from an airport and therefore are captured in these delay categories.

Once we separated the delay for each air traffic control tower and TRACON, we calculated the following measures for the facilities in our universe: the number of departures at a facility as a percentage of the total; percentage of delayed departures occurring at each facility; and percentage of delayed departures charged, or attributed to each facility

[3]TRACONs provide air traffic control services for airspace within approximately 40 miles of an airport and generally up to 10,000 feet above the airport, where en route centers' control begins. For our analysis, we used FAA's aggregated TRACON data, referred to as the 34 select TRACONs. According to FAA, this group of TRACONs covers the terminal operations of the 34 OEP airports along with the terminal operations for airports serving Albuquerque, New Mexico; Nashville, Tennessee; Indianapolis, Indiana; Kansas City, Missouri; New Orleans, Louisiana; West Palm Beach, Florida; and Raleigh/Durham, North Carolina.

[4]This allocation was discussed with officials at FAA's Air Traffic Control Center Command Center, who agreed that this allocation was the most accurate way to partition the data. We excluded the traffic management to delays allocated for the airports for the seven TRACONs that shared a common identifier with a non-OEP airport from our data set because these data were outside the scope of our analyses.

and where that delay occurred. Our analysis of OSPNET includes only calendar year 2009 because in recent years, FAA has made changes in how data are collected for OPSNET, including automating the collection of its data in fiscal year 2008 and capturing additional delay categories in fiscal year 2009, making it difficult to do year-over-year comparisons of these data.

To assess the reliability of ASQP, ASPM, and OPSNET data, we (1) reviewed existing documentation related to the data sources, (2) electronically tested the data to identify obvious problems with completeness or accuracy, and (3) interviewed knowledgeable agency officials about the data. We determined that the data were sufficiently reliable for the purposes of this report.

To determine the factors affecting changes in flight delays since 2007, we reviewed relevant FAA reports; interviewed DOT, FAA, airport, and airline officials and industry experts; and examined estimated delay reduction benefits of actions, when available. To understand the relationship between the number of flights and delays, we performed a simple correlation analysis between the number of monthly arrivals and delayed arrivals from calendar years 2000 through 2009 for the OEP airports (excluding Honolulu). See appendix III for additional information on this analysis.[5] To determine the extent to which DOT's and FAA's actions reduced delays since 2007, we reviewed FAA analysis of estimated delay reduction benefits of its actions, including runway projects and other capacity improvements, and interviewed agency officials about these analyses. Additionally, using FAA data on Chicago O'Hare's called rate (a measure of capacity reflecting the number of aircraft that an airport can accommodate within a 15-minute period), we determined the extent to which capacity had increased after the new runway was opened. To assess the effect of the hourly limits on scheduled arrivals and departures at LaGuardia, John F. Kennedy International (JFK), and Newark Liberty International airports, we examined analysis done by the MITRE

[5]Our analysis looked at the correlation between the log function of arrivals and the log function of delayed arrivals under the assumption that the relationship between arrivals and delayed arrivals is not linear.

Corporation on airline schedules before and after the schedule limits were established.[6] See appendix V for more information on this analysis.

To identify DOT's and FAA's ongoing and planned actions to reduce delays in the next 2 to 3 years, we analyzed key FAA documents, including the agency's strategic plan (referred to as the Flight Plan), the NextGen Implementation Plan, FAA's Response to Recommendations of the RTCA NextGen Mid-Term Implementation Task Force, and the New York Aviation Rulemaking Committee Report. In assessing these documents, we identified a set of capacity improvements and demand management policies with the potential to reduce delays by 2013. FAA has many ongoing and planned initiatives—such as longer-term Next Generation Air Transportation System (NextGen) procedures and technologies—that could also reduce delays, but these actions are not included in our discussion because they are not expected to realize delay reduction benefits in the next 2 to 3 years. These actions to reduce delays are available or planned at various OEP airports, but we did not assess the extent to which they are being used at a given location. To determine the extent to which DOT and FAA actions are being implemented at the most congested airports, we reviewed related reports and studies, including FAA's 2009 Performance and Accountability Report, the RTCA NextGen Mid-Term Implementation Task Force Report, and FAA's *Capacity Needs in the National Airspace System, 2007-2025* (FACT 2), and interviewed airport officials at some of these airports and FAA officials at both the national and local airport levels.

To determine the status of DOT's and FAA's actions to reduce delays and their potential to reduce delays, we interviewed officials in FAA's Air Traffic Organization; Office of Aviation Policy, Planning and Environment; Office of Airport Planning and Programming; and local airport officials. To gain an understanding of aviation stakeholder perspectives on the expected impact of DOT's and FAA's actions in the next 2 to 3 years, we spoke with industry and academic experts, airport and airline officials, the DOT Inspector General, the Air Transport Association, the Airports Council International-North America, the National Air Traffic Controllers Association, the National Business Aviation Association, the Air Carrier

[6] MITRE is a not-for-profit organization chartered to work in the public interest. MITRE manages four federally funded research and development centers, including one for FAA. MITRE has its own independent research and development program that explores new technologies and new uses of technologies to solve problems in the near term and in the future.

Association of America, and the Regional Airline Association. To identify the extent to which FAA has modeled or assessed the delay reduction impact of its actions, including NextGen, we interviewed officials from MITRE, FAA's Performance Analysis and Strategy Office, and FAA's Air Traffic Organization NextGen offices. FAA officials also provided information based on model simulations that examine future benefits of NextGen technologies. In particular, we received analysis of expected delay minutes for the OEP airports in future years under various assumptions—a baseline scenario that estimates the delays that may occur if no improvements are made to the system; a runway scenario that estimates the delays that may occur if only runway improvements are made over the next 10 years, but no NextGen air traffic management improvements; and the NextGen case that estimates the delays that may occur if planned runway improvements and NextGen technologies and procedures are implemented. As part of the assumptions underlying these analyses, FAA also provided us with the extent to which future demand growth is "trimmed" under these scenarios as a means of limiting future traffic projections to reflect anticipated airport infrastructure constraints.[7] While we reviewed some of FAA's assumptions and analyses, we did not verify the accuracy of the models.

To identify how FAA measures whether its actions contribute to changes in delays, we reviewed FAA's Flight Plan and related documents to determine how FAA measures its performance in achieving its goal of increasing the reliability and on-time performance of the airlines. We also interviewed FAA officials on the agency's performance targets and any planned improvements to these targets. Finally, we reviewed previous GAO reports, including our prior work on aviation infrastructure, NextGen, aviation congestion, and regional airport planning.

[7]According to FAA, using unconstrained schedules to model benefits can be problematic because of the nonlinear relationship between growth in flights and delay. Small changes in demand can produce large changes in model results, which not only produce instability in the model but also generate a large "benefit" because of delay reduction, which would be overstated given that the number of flights and delays would not grow to those levels. Instead, FAA develops limits on demand based on historic demand-capacity-delay relationships and then "trims" the schedule at individual airports to keep demand from growing to unreasonable levels. Because flights to and from these airports start or end at other airports included in the model, removing flights to bring down delays at these airports to levels that were consistent with sustainable aviation operations actually resulted in reduced flights at nearly all airports included in the modeling. This "feasible schedule" is used to calculate delay and other performance statistics and a list of unaccommodated flights that may be valued.

We conducted this performance audit from May 2009 to May 2010, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

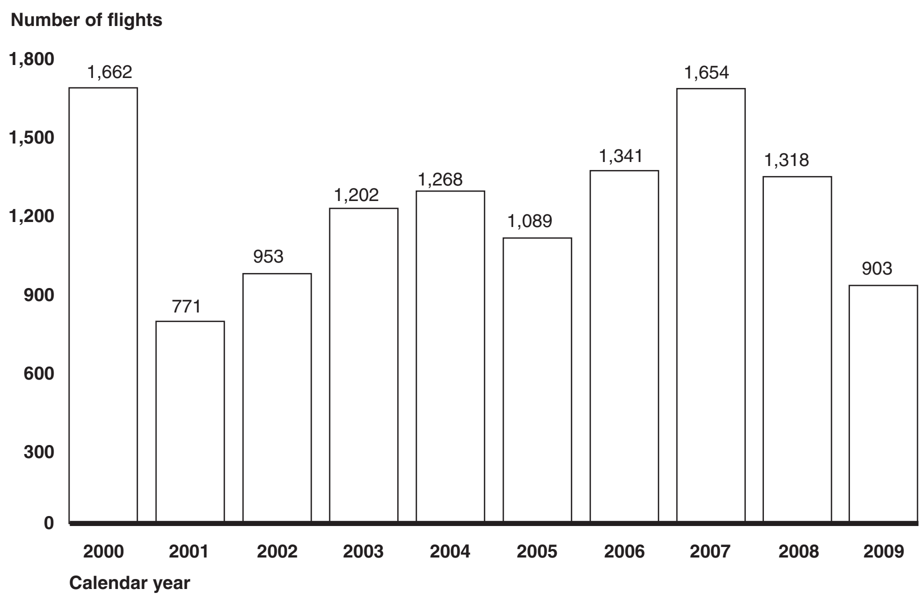
Appendix II: Tarmac Delay Data

A tarmac delay occurs when a flight is away from the gate and delayed either

- during taxi-out: the time between when a flight departs the gate at the origin airport and when it lifts off from that airport (i.e., wheels-off);
- during taxi-in: the time between a flight touching down at its destination airport (wheels-on) and arriving at the gate;
- prior to cancellation: flight left the gate but was canceled at the origin airport;
- during a diversion: the tarmac time experienced at an airport other than the destination airport; or
- as a result of a multiple gate departure: the flight left the gate, then returned, and then left again; the tarmac time is the time before the return to the gate.

Figure 12 shows trends in tarmac delays greater than 3 hours from calendar years 2000 through 2009.

Figure 12: Tarmac Delays Greater than 3 Hours, 2000-2009



Source: ASQP data.

Note: Beginning in October 2008, DOT required carriers to submit long tarmac delay statistics for three additional categories: flights that are subsequently canceled or diverted or have multiple gate departures. The reporting of these categories resulted in an additional 299 tarmac delays captured in 2009 and represented one-third of all long tarmac delays in 2009.

Table 3 shows the breakdown of tarmac delays by month and phase of flight since October 2008, when these more detailed data were first collected.

Table 3: Phase of Flight where Long Tarmac Delays Occurred, October 2008 to December 2009

				When or where the long tarmac delay occurred				
Date	Number of scheduled flights	Total flights with tarmac delays greater than 3 hours	Percentage of total flights	Prior to cancellation	Multiple gate departure	Taxi-out	Taxi-In	At diversion airport
October 2008	556,205	49	0.01	2	6	35	0	6
November 2008	523,272	7	0	0	1	4	0	2
December 2008	544,956	187	0.03	40	14	116	7	10
January 2009	532,339	87	0.02	7	10	70	0	0
February 2009	488,410	43	0.01	5	4	34	0	0
March 2009	557,422	88	0.02	6	9	66	0	7
April 2009	537,793	81	0.02	12	10	47	0	12
May 2009	546,832	35	0.01	7	2	25	1	0
June 2009	557,594	278	0.05	40	42	172	1	23
July 2009	580,134	164	0.03	21	20	105	0	18
August 2009	568,301	70	0.01	7	11	45	0	7
September 2009	510,852	6	0	0	0	4	0	2
October 2009	531,799	12	0	0	0	12	0	0
November 2009	509,540	4	0	0	1	2	0	1
December 2009	529,269	35	0.01	5	3	22	0	5

Source: ASQP data.

Note: According to DOT, January 2009 includes one flight with two separate 3-hour tarmac times. Northwest Flight 1491, on January 28, 2009, was on the tarmac for 188 minutes before returning to the gate. The flight departed the gate a second time and was on the tarmac for 199 minutes before wheels-off. Details of the flight are listed as a 3-hour multiple gate departure delay and a 3-hour taxi-out delay.

Appendix III: GAO's Correlation Analysis of Total Arrivals and Delayed Arrivals

To corroborate FAA and stakeholder views on the relationship between the recent reductions in flights and declines in delays, we performed a correlation analysis between the number of total arrivals and delayed arrivals. Our correlation analysis yielded a correlation coefficient that captures only the relationship between the number of arrivals and arrival delays at the 34 OEP airports (excluding Honolulu). Coefficient variables take a value between negative 1 and 1. A correlation coefficient of zero would indicate that there was no relationship between the variables. A correlation coefficient close to 1 would indicate a strong positive relationship, while a correlation coefficient close to negative 1 would indicate a strong negative relationship. Our results showed a correlation coefficient of 0.72, indicating a significant relationship between arrivals and arrival delays.[1] Although this result likely indicates that arrival delays will rise with increases in arrivals, for several reasons, it should not be viewed as highly predictive of the exact pattern with which delays will track arrivals.

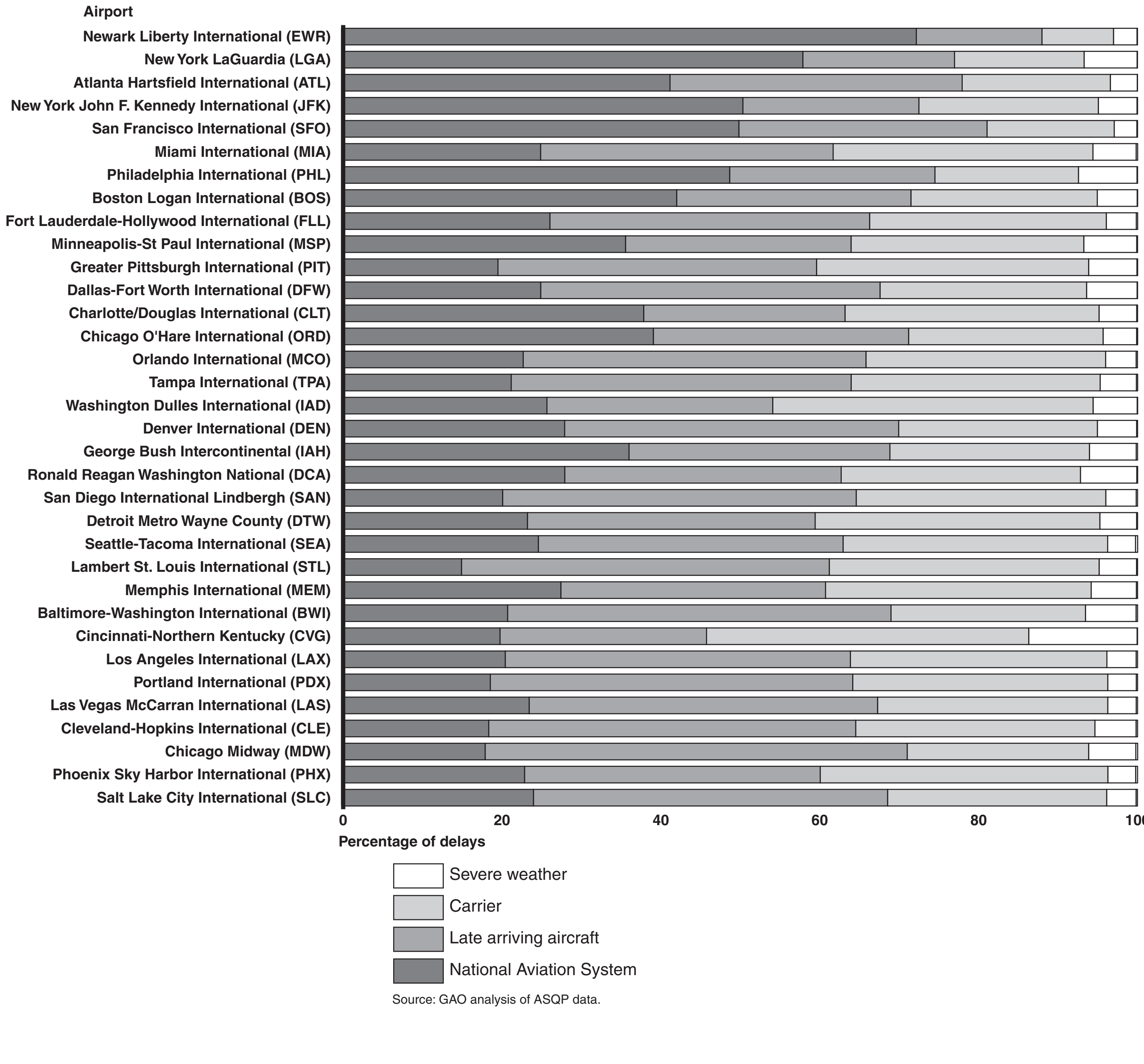
Many other factors—that we do not account for—also affect delays at a given airport or set of airports and thus affect the measured relationship between the number of flights and delays. For example, how close the number of flights is to the airport's capacity—i.e., the number of flights an airport can handle in a given period of time—is a key factor underlying the relationship between the number of flights and delays. In particular, the relationship between the number of flights and delays is likely not stable in the sense that as the number of flights grows and becomes closer to the capacity of an airport, the influence of *additional* flights on delays becomes greater. For example, in addition to looking at the relationship for all airports, we also performed a correlation for all airports that were among the 10 airports with the highest percentage of delayed flights in any year since 2007. In total, there were 15 airports used for this most delayed airports analysis. Our analysis yielded a correlation coefficient of 0.79, indicating that the most delay-prone airports—which likely handle a number of flights closer to their capacity than others—experience a stronger relationship between the level of flights and delays than airports that have more available capacity. Additionally, a host of factors—such as airport infrastructure (e.g., available airport gates, taxiways, and runways)—influence an airport's capacity at a given time and, therefore,

[1]Our analysis looked at the correlation between the log function of arrivals and the log function of delayed arrivals under the assumption that the relationship between arrivals and delayed arrivals is not linear.

how many flights an airport can handle. Capacity can be a changing value hour to hour or day to day, depending on such elements as weather, the mix of aircraft used at the airport, and air traffic procedures. Airport projects that provide greater capacity—such a new runway, taxiway improvements, or additional gates—will enable more flights with fewer impacts on delays and therefore also affect the relationship between the number of flights and delays. Also, the level of delays at one airport or throughout the national airspace system can affect delays elsewhere. For example, FAA officials provided an analysis to us suggesting that as the number of flights, and therefore delays, rapidly grew at the John F. Kennedy (JFK) airport after 2007, other airports—that did not see a significant rise in the number of flights they handled—had measurably worse delays. Finally, how airlines use airport infrastructure can affect the relationship between the number of flights and delays. Notably, FAA officials told us that airlines scheduling large numbers of flights at the same time (e.g., airline peaking) at the busy airports is a key factor that affects the relationship between the number of flights and delays. That is, a given number of flights will likely result in more delays if there are strong peaks in the number of flights scheduled that tax the airport's capacity at certain times of the day rather than a more evenly spaced schedule of flights across the entire day.

Appendix IV: Airline-Reported Sources of Delays for Delayed and Canceled Flights Ranked by Airports with the Highest Percentage of Flight Delays, 2009

Figure 13: Airline-Reported Sources for Delayed Flights Ranked by Airports with the Highest Percentage of Flight Delays, 2009



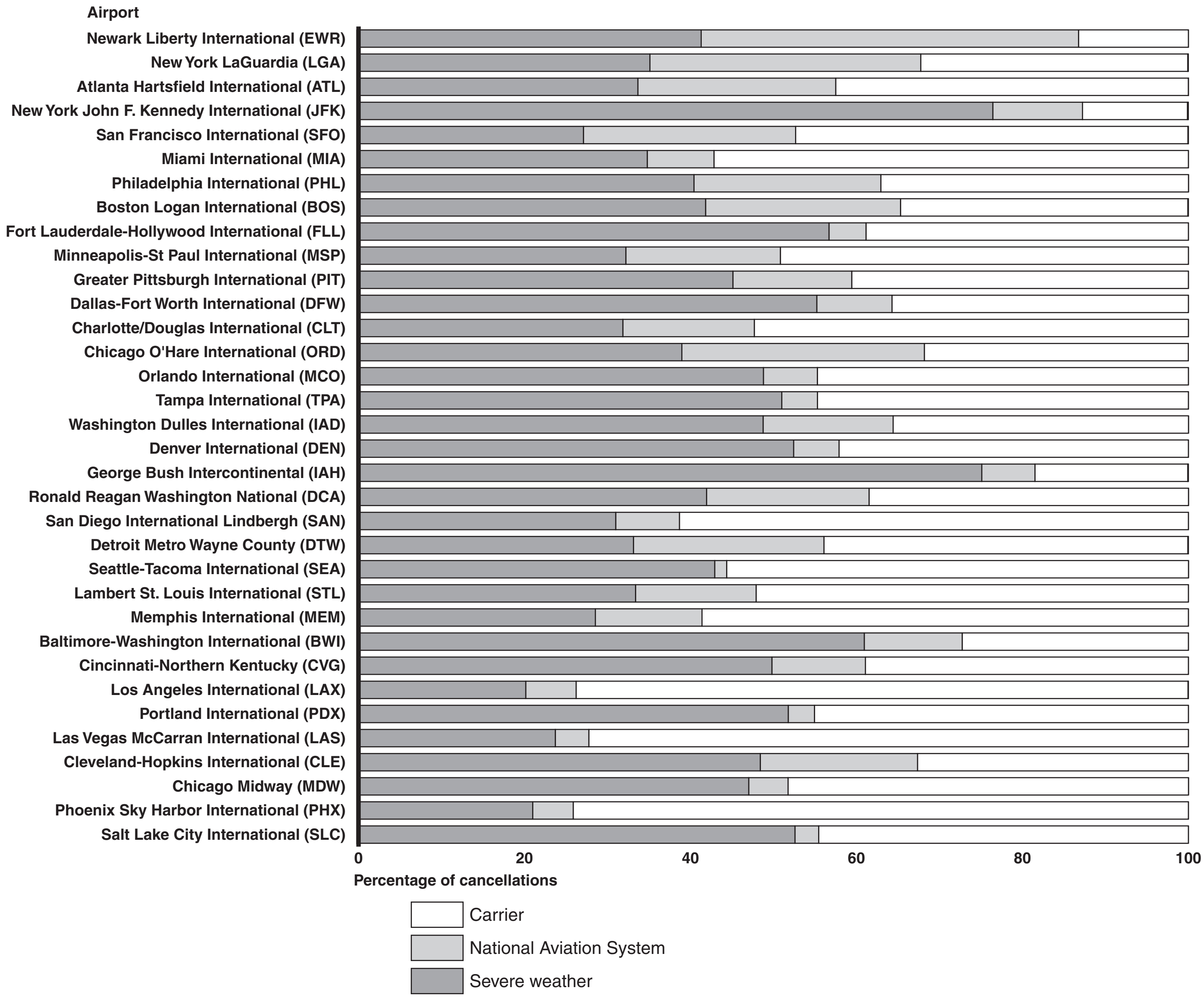
Source: GAO analysis of ASQP data.

Notes:

DOT collects delay data in one of five causal categories: national aviation system (i.e., a broad set of circumstances affecting airline flights, such as nonextreme weather that slows down the system, but does not prevent flying), late-arriving aircraft (i.e., a previous flight using the same aircraft arrived late, causing the subsequent flight to depart late), airline (i.e., any delay that was within the control of the airlines, such as aircraft cleaning, baggage loading, crew issues, or maintenance), extreme weather (i.e., serious weather conditions that prevent the operation of a flight, such as tornadoes, snowstorms, or hurricanes), and security (i.e., evacuation of an airport, reboarding because of a security breach, and long lines at the passenger screening areas).

Security delays do not appear this graphic because they make up less than 1 percent of the delays at these airports.

Figure 14: Airline-Reported Sources for Canceled Flights Ranked by Airports with the Highest Percentage of Flight Delays, 2009



Source: GAO analysis of ASQP data.

Notes:

DOT collects cancellation causal data in one of four categories: national aviation system (i.e., a broad set of circumstances affecting airline flights, such as nonextreme weather that slows down the system, but does not prevent flying), airline (i.e., any delay that was within the control of the airlines, such as aircraft cleaning, baggage loading, crew issues, or maintenance), extreme weather (i.e., serious weather conditions that prevent the operation of a flight, such as tornadoes, snowstorms, or hurricanes), and security (i.e., evacuation of an airport, reboarding because of a security breach, and long lines at the passenger screening areas).

Security delays do not appear on this graphic because they make up less than 1 percent of the delays at these airports.

Appendix V: FAA's Analysis of the Capacity Limits at the Three New York Area Airports—JFK, Newark, and LaGuardia

In 2008, FAA and its federally funded research and development center, the MITRE Corporation's Center for Advanced Aviation System Development, undertook an analysis to set limits on scheduled operations (often called slots) for Newark and JFK airports in the New York area in order to address congestion and delay at these airports. Because the level of operations and associated delays had increased during 2006 and 2007 at JFK, and airlines were indicating further increases in planned operations for the summer of 2008, FAA determined that schedule limits needed to be applied to that airport. While LaGuardia already had a schedule cap in place, Newark airport did not, and FAA decided to also set a cap for Newark so that a limit on operations at JFK did not lead to increased operations and delays at Newark. From a performance perspective, the goal in setting the level of caps at these airports was to reduce average delays at JFK by about 15 percent compared with their 2007 level, and to keep delays at Newark from worsening over their 2007 level.

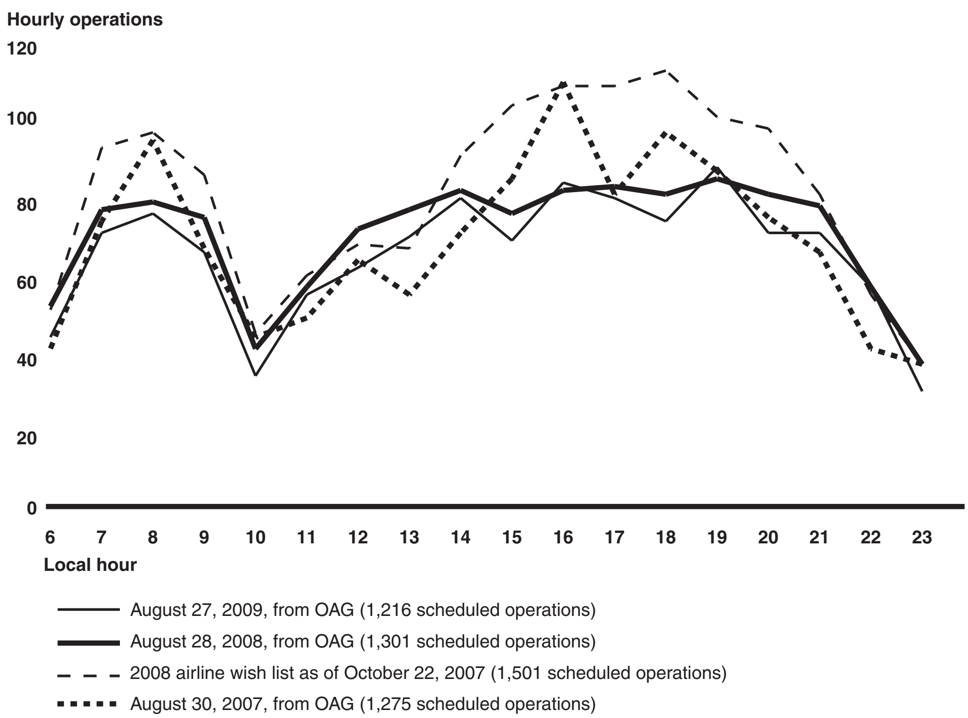
To determine how schedule limitations would be applied, FAA and MITRE used a model that estimated the level of delay associated with various levels of operations at both JFK and Newark airports. The first key model input is a level of demand on a particular busy day in August 2007. The source of that data is airlines' scheduled departure and arrival operations at the two airports for that day according to the *Official Airline Guide* (OAG). In addition to scheduled operations, each day the airports also service nonscheduled operations (i.e., operations not in the OAG). To properly capture the total demand levels at these airports, nonscheduled operations are added as part of the demand input to the model. Thus the "demand" input is a profile of all scheduled and nonscheduled *operations* across that day. The second key model input is airport capacity—the number of operations an airport can handle in any given time period. The level of airport capacity is not a constant; it varies on an ongoing basis with runway configuration, weather, and other factors. For the analysis, airport capacities for each hour across all weekdays over many months were determined. As an input, the model used what is called adjusted capacities. Adjusted capacities are based upon an airport's called rates—the projected level of operations the airport could handle based on conditions at the airport at that time, and actual throughput—the number of aircraft that landed and departed. With few exceptions, the adjusted capacities in the model were set at the maximum of actual throughput or called rate for any specific hour.

For each of the airports, multiple iterations of the demand profile were run against the adjusted capacities, and the model provided "predicted delays." These predicted delays were compared with actual delays that had occurred at those airports across varied combinations of operations and capacity. FAA and MITRE found that the model's predicted delays followed patterns that were in line with the patterns of actual delays. That is, the manner in which the predicted level of delay responded to changes in operations and/or capacity in the model paralleled the patterns of actual delay response to those factors. These parallels helped to validate the model's structure. The results of the model were used in part to determine the limits on scheduled operations by evaluating the amount of delay that would be associated with varying levels of operations at each airport. In particular, MITRE staff provided model results that indicated, for sequentially lower levels of hourly operations, the level of delay that could be expected across the day at each airport. For both JFK and Newark airports, this exercise resulted in scheduling limitations set at 81 operations per hour, with some hourly exceptions, as this level of operations was predicted to result in the target level of delay for each of the airports. While LaGuardia already had a schedule cap in place, FAA and MITRE used this same approach to model estimated levels of delay at various levels of operations. More recently, this analysis was used in issuing a new order decreasing the limit of scheduled hourly operations at LaGuardia from 75 to 71. Existing flights were not affected, but slots that are returned or withdrawn by FAA will be limited to the 71 per hour limit.

Figures 15 through 17 illustrate how the schedule limits affected hourly operations at the three New York area airports, using a busy day in August—typically a very busy month—to be representative of the summer schedules. More specifically, the figures show how airlines scheduled operations throughout the day in 2007, the schedule they planned to submit for 2008 without caps—or the "wish list"—and the actual operations scheduled in 2008 and 2009 with the caps in place. The 2008 wish list data are based on the proposed schedules submitted by the airlines during the negotiations and discussions held to determine the limits on scheduled operations at the airports.

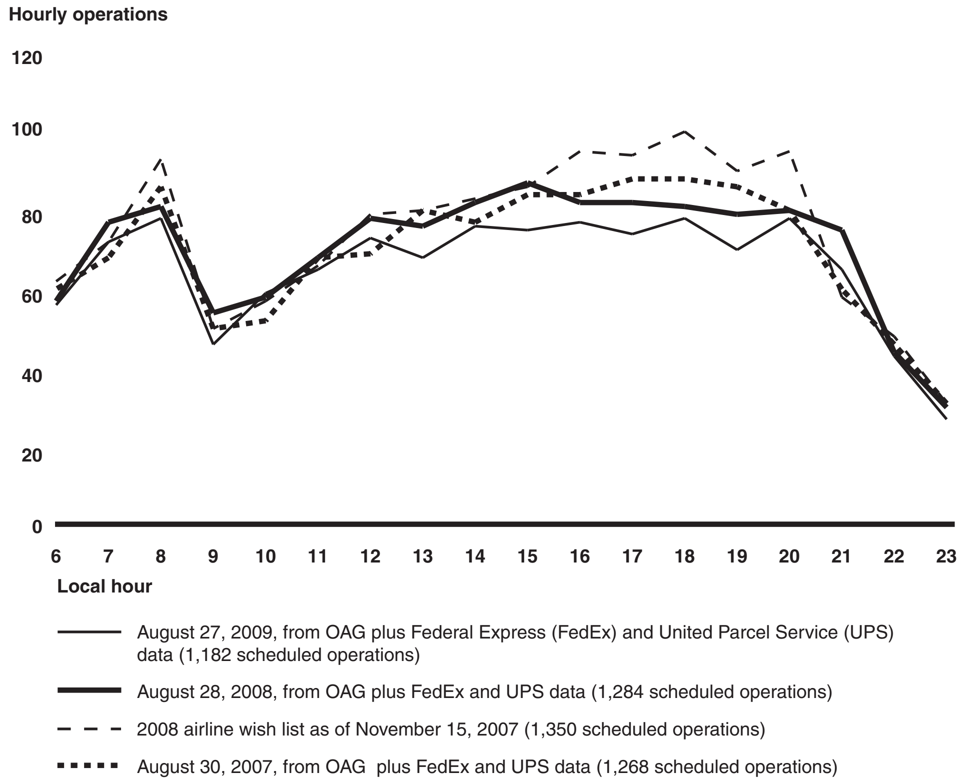
The JFK and Newark figures show that peak period operations have smoothed and fallen since the caps were put in place. This change in peak hour operations has enabled the airports to provide more throughput with less impact on delay than a more peaked profile of operations would have provided. Other factors may also have had an impact on hourly operations at the three airports (i.e., the economic downturn has led airlines to reduce their scheduled operations below the scheduling limits during some hours at these airports). For Newark, the decline in peak hour operations is most significant when comparing the actual 2008 schedule with the airlines' 2008 wish list, especially during the busy afternoon and evening period. Because LaGuardia has capped operations for many years, and the orders have roughly maintained the same caps, the airport has experienced significantly less variation in hourly operations over the last 3 years. In addition, the carriers never submitted a 2008 wish list because the airport was already capped.

Figure 15: Daily Planned Operations at JFK by Hour, 2007-2009



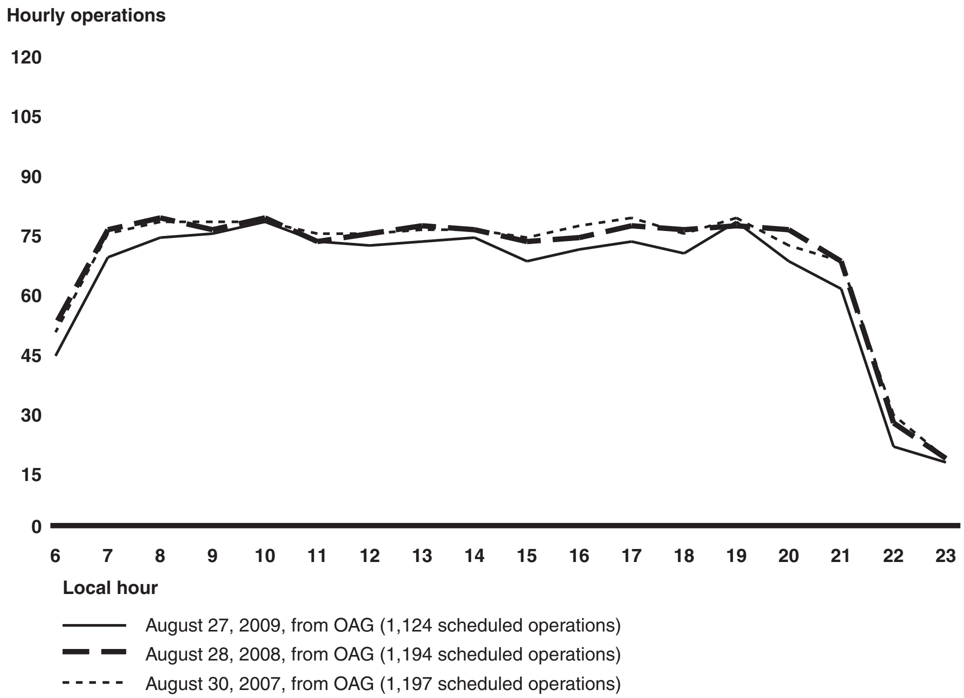
Source: FAA and MITRE analysis of OAG data.

Figure 16: Daily Planned Operations at Newark by Hour, 2007-2009



Sources: FAA and MITRE analysis of OAG plus FedEx and UPS data.

Figure 17: Daily Planned Operations at LaGuardia by Hour, 2007-2009



Sources: FAA and MITRE analysis of OAG data.

Appendix VI: DOT and FAA Actions to Reduce Delays in the Next 2 to 3 Years

Our report examined DOT and FAA actions to reduce delays over the next 2 to 3 years. Table 4 describes how each action could help reduce delays and demonstrates that most of the ongoing and planned actions are capacity improvements designed to address flight delays by enhancing and expanding existing capacity.

Table 4: Description of DOT and FAA Actions to Reduce Delays

Action	Description
Capacity improvements	
New York Aviation Rulemaking Committee (ARC) initiatives	Operational and infrastructure improvements designed to reduce delays through more efficient airport surface movement; departure, arrival, and airspace efficiency; and technology for the three New York area airports.
New York/New Jersey/Philadelphia airspace redesign	Designed to increase the efficiency and reliability of the airspace structure and air traffic control system in the New York area airspace.
New runways/airfield enhancements	New runways increase capacity, allowing an airport to handle more operations and potentially reduce delays.
Holiday use of military airspace	Coordination with the Department of Defense in advance of busy holiday periods for use of available military airspace.
Performance-based navigation, including Area Navigation (RNAV) and Required Navigation Performance (RNP) and tailored arrivals	RNAV and RNP are designed to more efficiently utilize airspace and procedures. Improved access and flexibility for flights help enhance reliability and reduce delays by defining more precise terminal area procedures. Tailored arrivals allow aircraft to descend from cruise altitude to final approach using the most efficient profile, avoiding inefficient flight.
Traffic Management Advisor	Designed to allow controllers to more efficiently manage aircraft.
Traffic flow management system programs: Airspace flow program and adaptive compression	Airspace flow programs are designed to more efficiently and precisely meter demand through constrained en route airspace by developing and distributing expected departure times for flights filed through the constrained airspace. Airspace flow programs are not associated with specific airports, but focus on addressing traffic flow. Adaptive compression identifies unused slots during ground delay and airspace flow programs and moves flights into these otherwise unused slots, allowing for more effective and efficient traffic management initiatives.
Airport Surface Detection Equipment-Model X (ASDE-X)	System designed to improve surface situational awareness and allow air traffic controllers to see the location of aircraft and vehicles on airport runways and taxiways and keep them safely separated.
Demand management policies	
Orders limiting scheduled operations (slot caps)	Intended to prevent a return to the summer 2007 peak delays, and to prevent delays from shifting from one New York airport to another.
Rates & Charges Policy Amendment	Clarifies the ability of airport operators to charge a two-part landing fee, giving flexibility to vary charges based on time of day and traffic volume. While the policy is available to airports, it is currently in litigation and has not been implemented at any airports.

Source: GAO analysis of DOT and FAA documents.

As table 5 demonstrates, these actions generally are being implemented at the most delayed airports in the country. For example, DOT convened a special aviation rulemaking committee (New York ARC) in the fall of 2007 specifically to address delays and other airline service issues in the New York metropolitan area, and one of the committee's working groups assessed 77 operational improvement initiatives for the New York area. In addition to being implemented at the most delayed airports, many of these actions are also available at other OEP airports across the national airspace system. These actions are available or planned at various locations, but we did not assess the extent to which they are being used at a given location. For example, we did not assess the extent to which RNAV and RNP procedures are in use at these airports.

Table 5: DOT and FAA Actions to Reduce Delays in the Next 2 to 3 Years

Actions to reduce delays in next 2 to 3 years	Ten airports with the highest percentage of delayed flights, 2009										Other OEP airports
	EWR	LGA	ATL	JFK	SFO	MIA	PHL	BOS	FLL	MSP	
New York ARC initiatives	√	√		√							
New York/New Jersey/Philadelphia airspace redesign	√	√		√			√				
New runways/airfield enhancements				√							√
Holiday use of military airspace	√	√	√	√	√	√	√	√	√	√	√
Performance-based navigation including RNAV, RNP and tailored arrivals	√	√	√	√	√	√	√	√	√	√	√
Traffic Management Advisor	√	√	√	√	√	√	√	√	√	√	√
ASDE-X	√	√	√	√		√	√	√	√	√	√
Orders limiting scheduled operations (slot caps)	√	√		√							
Rates & Charges Policy Amendment[a]											

Source: GAO analysis of DOT and FAA documents.

Note: EWR = Newark International, LGA = New York LaGuardia, ATL = Atlanta Hartsfield International, JFK = New York John F. Kennedy International, SFO = San Francisco International, PHL = Philadelphia International, MIA = Miami International, BOS = Boston Logan International, FLL = Fort Lauderdale-Hollywood International, and MSP = Minneapolis-St. Paul International.

[a]The Rates & Charges Policy Amendment is available nationwide, but is currently in litigation and according to FAA officials, has not been implemented at any airports.

Appendix VII: GAO Contact and Staff Acknowledgments

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Susan Fleming (202) 512-2834 or flemings@gao.gov

Staff Acknowledgments:

In addition to the contact named above, Paul Aussendorf (Assistant Director), Amy Abramowitz, Lauren Calhoun, Colin Fallon, Heather Krause, John Mingus, Sara Ann Moessbauer, Josh Ormond, Melissa Swearingen, and Maria Wallace made key contributions to this report.

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