Memorandum

U.S. Department of Transportation
Office of the Secretary of Transportation
Office of Inspector General

Subject: ACTION: Report on the Audit of Small Community Aviation Delays and Cancellations
Report No. CR-2006-049

Date: May 19, 2006

From: Todd J. Zinser
Acting Inspector General

Reply to Attn. of: JA-50

To: The Secretary
Deputy Secretary
Acting Assistant Secretary
for Aviation and International Affairs
Federal Aviation Administrator

Air service in markets of all sizes has declined since 2000 but none more so than in small communities.[1] Scheduled flights at small communities for the first 3 months of 2006 were 17 percent lower than the number of flights scheduled in the same period in 2000.[2] By contrast, scheduled flights at larger communities were down only 5 percent over the same time period. In the nation's smallest communities, flight options have become increasingly more limited, and as a result, passengers from small airports may experience travel disruptions more acutely than travelers from larger airports with a broader range of alternative travel options. Eighty-seven percent, or 450, of the airports receiving scheduled passenger air service in the United States are small airports. Flights to and from small airports—roughly 7,400 scheduled per day—account for 25 percent of scheduled domestic service.

Citing this concern, on August 9, 2005, the Senate Committee on Commerce, Science, and Transportation; Subcommittee on Aviation requested that our office

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[1] For the purposes of this report, the term "small community" represents the communities served by the combined FAA categories of small hub, non-hub, and primary commercial service airports (airports enplaning less than 0.25 percent (1.8 million passengers) of the total U.S. enplanements in 2004). Large communities in this report refer to those served by the combined FAA categories of medium hub and large hub airports.

[2] At the smallest of the communities (non-hubs), the number of flights was down 29 percent from the first 3 months of 2006 when compared to the same period of 2000.

determine and quantify whether flights originating in small communities are delayed or cancelled at a rate that is disproportionately higher than flights from larger airports.[3] The Committee also requested that we explain the roles of the Federal Aviation Administration (FAA) and the airlines in determining which flights are delayed or cancelled during periods of reduced airport capacity or excessive demand.

To conduct this analysis, we obtained delay and cancellation data for flights into five selected large hub airports.[4] Since airspace congestion mostly affects flights arriving at the large hub airports, we analyzed flight delay and cancellation data for flights *into* the sampled hub airports.

We analyzed cancellation and delay patterns to determine whether either or both had a relationship to community size or flight length. At the request of the Subcommittee, we also analyzed delay and cancellation patterns for flights in 14 small community markets. We focused our analysis on January 2005, a peak seasonal period for flight delays and cancellations. To determine the roles played by FAA and airlines in determining which flights are delayed or cancelled, we surveyed FAA, airports, and airlines. A more detailed discussion of our scope and methodology is included in Exhibit A. We conducted this performance audit under Generally Accepted Government Auditing Standards prescribed by the Comptroller General of the United States. We are not making any recommendations in this report.

RESULTS IN BRIEF

In our analysis of cancellations and delays of flights into five large hub airports, we found that delay rates were essentially the same for small and large communities. However, both the length of delays and cancellation rates were higher for flights from small communities, and this difference was statistically significant.[5] We also found that short-haul flights were more likely to be cancelled than medium-haul flights and long-haul flights.[6] Most small communities are within 500 miles of their hubs.[7]

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3 A flight is considered delayed if its actual gate arrival time is 15 or more minutes after its published scheduled arrival time.

4 Chicago O'Hare, Washington Dulles, Denver International, Salt Lake City, and Minneapolis-St. Paul. These hub airports link to several of the 14 small community markets we analyzed in this review.

5 The relationship between minutes of delay or cancellations and community size was unlikely to have occurred by chance. We considered findings to be statistically significant if their probability of occurring randomly was less than or equal to 5 percent.

6 For the purposes of this report, short-haul is defined as within 500 miles, medium-haul as between 500 and 999 miles, and long-haul as 1000 miles or more.

7 Average distance for small community flights in 2005 was 379 miles.

Higher cancellation rates at small communities may occur due to differences between the capability of aircraft and the sophistication of navigational aids serving small communities, airline operating methods that provide for spare aircraft and crew in larger communities, FAA decisions regarding the use of traffic management techniques, and airline priorities used in making decisions on which flights to delay and cancel when the aviation system is constrained. How these factors converge is a process that is not readily transparent to consumers, who generally only experience the end result.

When capacity is constrained, the airlines and FAA work together to balance demand with available capacity. If constraints are severe, FAA may moderate demand by temporarily halting flights or delaying the pace of arriving flights. Under the latter case, FAA assigns delayed arrival times to flights in the order in which they are originally scheduled to arrive; the airlines then have some flexibility to manage the delay by "swapping" the order of delayed flights (Figure I), cancelling flights and moving others up in the queue, or trading vacated slots with other airlines. While FAA can assign delays, only an airline can choose to cancel a flight.

Figure I. Airlines May Swap the Order of Their Delayed Arrivals

Airline	Flight	Original time of Arrival	Controlled time of Arrival	Delay
A	1	7:00	7:00	0
A	2	7:00	7:10	10
B	**3**	**7:05**	**7:20**	**15**
B	4	7:05	7:30	25
B	5	7:10	7:40	30
B	6	7:10	7:50	40
A	7	7:20	8:00	40
C	8	7:20	8:10	50
B	9	7:40	8:20	40
C	10	7:40	8:30	50
A	11	8:20	8:40	20
B	12	8:40	8:50	10
Total Delay				330

Neither Community Size nor Distance from the Hub Affected the Rate of Flight Delays

In our analysis of all flights in January 2005 into each of the five selected hubs, the delay rates were essentially the same for flights connecting small and large communities to their hubs. We found similar results in the 14 city-pairs that we analyzed at the request of the Subcommittee—delay rates were not significantly different than flights from all-sized communities to the same hubs (Table I). In our analysis of flight delays by distance (short-haul, medium-haul, and long- haul), we found about the same rate of delays across the three mileage groupings.

Table I. Percent of Flights Delayed*		
Flights Inbound to:	Originating From Community Size	
	Small	Large
Chicago-O'Hare	***37***	36
Washington-Dulles	28	28
Minneapolis-St. Paul	23	26
Denver International	25	26
Salt Lake City	24	24

* Results are based on averages weighted by the number of flights in each market.

Delays Were Longer on Flights from Small Communities and Flights from Communities Closest to the Hub

Flights from small communities experienced, on average, longer delays than did flights from large communities. The average differences ranged from 4 to 10 minutes, or 7 to 18 percent, and were statistically significant (Table II). We found similar results in the 14 individual markets. Flights from 11 of the 14 city-pairs were delayed longer than the average hub delays. The differences ranged from 1 to as much as 19 minutes. Flights in short-haul markets were delayed slightly longer than flights in both medium-haul and long-haul markets.

Table II. Average Minutes of Arrival Delay*		
Flights Inbound to:	Originating From Community Size	
	Small	Large
Chicago-O'Hare	***75***	70
Washington-Dulles	***62***	56
Minneapolis-St. Paul	***55***	51
Denver International	***66***	56
Salt Lake City	***54***	48

* Results are based on averages weighted by the number of flights in each market.

Flights from Small Communities and Flights in Short-Haul Markets had Higher Cancellation Rates

At four of the five hub airports, the rate of cancelled flights from small communities exceeded cancellation rates for flights from large communities (Table III). The differences in those four cases were statistically significant.

Flights in short-haul markets were cancelled at higher rates than flights in both medium-haul and long-haul markets.

Table III. Percent of Flights Cancelled*

Flights Inbound to:	Originating From Community Size	
	Small	Large
Chicago-O'Hare	***9.7***	6.8
Washington-Dulles	4.8	6.3
Minneapolis-St. Paul	***6.2***	3.2
Denver International	***4.4***	1.7
Salt Lake City	***7.2***	2.5

* Results are based on averages weighted by the number of flights in each market.

In our 14 city-pair analysis, we compared the cancellation rates in those markets to the overall hub cancellation rates. We found that the cancellation rates were higher in 8 of the 14 small community city-pairs than the overall rates at the hubs connected to the small communities (Table IV).[8]

Table IV. Percent of Flights Cancelled – January 2005
Comparison of Small Community Markets With Hub Airport Total

State	From Small Community	Flights Inbound to:	Small Community	Hub Average
ARKANSAS	Fayetteville	Chicago-O'Hare	***14.4***	7.8
		Dallas/Ft. Worth	***3.2***	2.6
	Texarkana	Dallas/Ft. Worth	1.1	2.6
		Houston Bush	0.0	0.6
MONTANA	Butte	Salt Lake City	***5.5***	4.5
	Helena	Salt Lake City	***7.3***	4.5
NEBRASKA	Lincoln	Chicago-O'Hare	7.4	7.8
		Denver International	2.4	2.6
		Minneapolis-St. Paul	***9.5***	4.4
	McCook	Denver International	0.0	2.6
WEST VIRGINIA	Bluefield	Washington-Dulles	***11.5***	5.9
	Charleston	Cincinnati	***7.6***	5.8
		Washington-Dulles	5.2	5.9
	Parkersburg	Pittsburgh	***6.6***	5.0

8 Tables presenting the percentage of flights delayed and average minutes of delay for the 14 markets are located later in the body of the report.

Certain Characteristics of Air Service at Small Communities May Make Them More Susceptible to Flight Disruptions

- **Aircraft.** Small communities are primarily served by aircraft with restricted capability to fly over some weather patterns or to land in certain wind conditions.

- **Technology.** Major airports and airlines are equipped with more sophisticated navigational aids than their smaller airport and airline counterparts.

- **Airline Operating Methods.** Spare aircraft and crew are usually not stationed at small communities. Cancelled or late-arriving flights in the evening may cause a cancellation or a late departure the following morning in order to comply with FAA's "minimum hours of rest" rule. Larger communities often have crew bases where reserve crews can be called into service under these circumstances and spare aircraft available to substitute for those with mechanical problems.

- **FAA Management Decisions.** If FAA implements a Ground Stop or Ground Delay Program on a regional basis (versus nationwide), short-haul flights (including many from small communities) are more likely to be affected, since the stop or delay is not imposed on long-haul flights.[9]

- **Airline Economic Decisions**. During periods of constrained capacity, airlines may choose which flights to delay or cancel; taking into consideration the number of passengers affected, access to alternative routings, or other factors. These decisions might affect small communities either positively or negatively.

FAA and the Airlines Both Have a Role in Managing Traffic During Periods of Constrained Capacity, but the Airlines Determine Which Flights Are Cancelled

During calendar year 2005, 28 percent of aviation delays and 52 percent of flight cancellations were caused directly by weather. Severe weather conditions reduce system capacity, requiring the airlines and FAA to adjust demand (level of operations) to better match the constrained conditions.[10] During January 2005, the FAA implemented traffic management initiatives—halting or moderating the flow of flights—on more than 400 occasions at 37 airports. The efforts were focused

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[9] Ground Stops and Ground Delay Programs are FAA traffic management practices that, respectively, halt or delay flights. They are each described in greater detail later in the report.

[10] There are conditions other than weather that constrain capacity, including runway construction or failure of navigational equipment. The same principles apply when demand exceeds normal levels, such as for special events.

on eight airports (accounting for two-thirds of the occasions) where flight operations were severely constrained for a total of more than 700 hours.

FAA May Reroute, Halt, and Delay Flights

Under the most severe of conditions, FAA may (1) re-route flights around congested airspace, (2) implement a Ground Stop program that will halt all flights destined to constrained airports or airspace, or (3) implement a Ground Delay Program that assigns delays to specific flights destined to constrained airports or airspace. The delays are neutrally assigned in the order of the original flight schedules, resulting in the longest delays assigned to flights later in the original order.

Airlines Have Some Flexibility to Reassign Delays or Cancel Flights to Meet Their Operational Priorities

Prior to an FAA implementation of a Ground Stop or Ground Delay Program, airlines may take the initiative to reroute or cancel flights to meet their operational priorities. Once FAA implements a Ground Delay Program, airlines may (1) swap the order of delayed flights among its FAA-assigned delayed arrival positions, (2) cancel any of its delayed flights and move another of its delayed flights into that vacated arrival position, or (3) cancel any of its delayed flights and attempt to trade that vacated arrival position for a later position held by another airline. FAA can assign delays to airline flights, *but only an airline can cancel a flight.*

FINDINGS

Flight Delay Rates are Not Affected by Either Community Size or Distance from the Hub

Flights From Small and Large Communities Experienced Similar Rates of Flight Delays

We found no evidence of disproportionate levels of flight delays in small community air service markets in our sample of hub airports. Statistical analysis of flights into five major US hub airports showed no relationship between flight delays and community size. Average delay rates for flights from small and large communities are presented in Table 1.

Table 1. Percent of Flights Delayed*

Flights Inbound to:	Originating From Community Size	
	Small	Large
Chicago-O'Hare	***37***	36
Washington-Dulles	28	28
Minneapolis-St. Paul	23	26
Denver International	25	26
Salt Lake City	24	24

* Results are based on averages weighted by the number of flights in each market.

Flights from Sampled Small Communities Were Not Delayed at a Greater Rate than Their Hub Airport Average

At the request of and in coordination with the Subcommittee, we compiled the flight delay rates, length of arrival delay, and cancellation rates in markets connecting 14 small communities with one or more of their connecting hub airports. We compared the delay rates in the small community markets with the rates for the hub airports overall. Flight delay rates for the sampled small community markets were not greater than the hub airport averages. As illustrated in Table 2, in only one of the 14 sampled small community markets did the percent of flights delayed exceed the average for its hub airport.

Table 2. Percent of Flights Delayed – January 2005 Comparison of Small Community Markets With Hub Airport Average				
State	**From Small Community**	**Flights Inbound to:**	**Small Community**	**Hub Average**
ARKANSAS	Fayetteville *	Chicago-O'Hare	35.8	36.1
		Dallas/Ft. Worth	18.3	20.7
	Texarkana	Dallas/Ft. Worth	6.6	20.7
		Houston Bush	14.3	20.0
MONTANA	Butte	Salt Lake City	20.8	24.2
	Helena	Salt Lake City	23.5	24.2
NEBRASKA	Lincoln	Chicago-O'Hare	34.8	36.1
		Denver International	24.0	25.4
		Minneapolis-St. Paul	***27.6***	25.0
	McCook	Denver International	22.6	25.4
WEST VIRGINIA	Bluefield	Washington-Dulles	26.1	27.8
	Charleston	Cincinnati	24.6	26.4
		Washington-Dulles	17.9	27.8
	Parkersburg	Pittsburgh	18.1	25.7

* Represents communities served by Northwest Arkansas Regional Airport.

Short-Haul Flights Experience About the Same Rate of Delays as Medium-haul and Long-Haul Flights

Because flights serving small communities are, on average, less than 500 miles, our study of flights into the five sampled hub airports also included analysis based on the communities' distance from the hub. We analyzed flight delay rates, length of arrival delays, and cancellation rates for short-haul, medium-haul, and long-haul flights. On average, short-haul flights to the sampled hub airports did not incur greater rates of delays than flights in medium-haul and long-haul markets. As shown in Table 3, the percent of flights delayed at each hub was about the same across the three mileage groupings.

Table 3. Percent of Arrivals Delayed—January 2005			
	Short-Haul (less than 500 miles)	**Medium-Haul** (500 to 999 miles)	**Long-Haul** (1000 or more miles)
Flights Inbound To:			
Chicago O'Hare	35.8	36.5	35.7
Washington Dulles	***29.6***	25.5	22.6
Minneapolis	23.8	26.4	25.3
Denver	24.4	24.7	28.7
Salt Lake City	25.5	20.7	31.1

Delays Were Longer on Flights from Small Communities and Flights from Communities Closest to the Hub

Delays Were Longer On Flights from Small Communities

At the five hub airports examined, the average length of arrival delay for flights from small communities exceeded average delay lengths for flights from large communities. As shown in Table 4, the differences, on average, ranged from 4 to 10 minutes or 7 to 18 percent. The differences were statistically significant.

Table 4. Average Minutes of Arrival Delay*

Flights Inbound to:	Originating From Community Size	
	Small	Large
Chicago-O'Hare	***75***	70
Washington-Dulles	***62***	56
Minneapolis-St. Paul	***55***	51
Denver International	***66***	56
Salt Lake City	***54***	48

* Results are based on averages weighted by the number of flights in each market.

Flights from Sampled Small Communities Were Delayed Longer Than the Average for Their Hub Airport

We found that the average length of arrival delays was greater for flights from the sampled small communities compared to all flights into the hub airport. Table 5 shows that in 11 of the 14 small community markets, the average length of delay was greater than the average length of delay at their connecting hub airport. The differences ranged from 1 minute to as much as 19 minutes.

Table 5 on the following page compares the average minutes of delay in small community markets to the hub airport average.

Table 5. Average Minutes of Arrival Delay – January 2005 Comparison of Small Community Markets With Hub Airport Average				
State	**From Small Community**	**Flights Inbound to:**	**Small Community**	**Hub Average**
ARKANSAS	Fayetteville *	Chicago-O'Hare	***82***	72
		Dallas/Ft. Worth	***59***	51
	Texarkana	Dallas/Ft. Worth	***62***	51
		Houston Bush	***50***	46
MONTANA	Butte	Salt Lake City	***62***	50
	Helena	Salt Lake City	39	50
NEBRASKA	Lincoln	Chicago-O'Hare	***91***	72
		Denver International	***71***	59
		Minneapolis-St. Paul	***53***	52
	McCook	Denver International	***77***	59
WEST VIRGINIA	Bluefield	Washington-Dulles	47	58
	Charleston	Cincinnati	46	51
		Washington-Dulles	***70***	58
	Parkersburg	Pittsburgh	***74***	55

* Represents communities served by Northwest Arkansas Regional Airport.

Short-Haul Flights Incur Longer Delays Than Medium-Haul and Long-Haul Flights

Of all delayed arrivals at the five sampled hub airports, those in short-haul markets experienced slightly longer delays than the delayed flights in medium-haul and long-haul markets, as illustrated in Table 6.

Table 6. Average Length of Arrival Delay Minutes – January 2005			
	Short-Haul (less than 500 miles)	**Medium-Haul** (500 to 999 miles)	**Long-Haul** (1000 or more miles)
Flights Inbound To:			
Chicago O'Hare	***73***	70	71
Washington Dulles	***59***	57	51
Minneapolis	***55***	52	49
Denver	***66***	59	51
Salt Lake City	***55***	46	47

Flights from Small Communities and from Communities Closest to the Hub Airports had Higher Cancellation Rates

Flights From Small Communities Had Higher Cancellation Rates Than Flights From Large Communities

In our analysis of five hub airports, we found that flights from small communities were cancelled at higher rates in four of five cases (as shown in Table 7). In those four cases, small community flights to their hubs were cancelled up to nearly three times as often as flights from large communities. These differences were statistically significant.

Table 7. Percent of Flights Cancelled*

Flights Inbound to:	Originating From Community Size	
	Small	Large
Chicago-O'Hare	***9.7***	6.8
Washington-Dulles	4.8	6.3
Minneapolis-St. Paul	***6.2***	3.2
Denver International	***4.4***	1.7
Salt Lake City	***7.2***	2.5

* Results are based on averages weighted by the number of flights in each market.

Flights from Sampled Small Communities Were Cancelled at a Greater Rate than the Average of All Flights to Hub Airports

In the 14 individual markets we looked at, our results were generally consistent with our overall analysis of small community air service at five hub airports.[11] In more than one-half of the 14 small community markets, the percentage of departing flights cancelled was greater than the average percentage of cancellations for all flights destined to the market's hub airport. Table 8 on the following page identifies these 14 markets and highlights where the rate of flight cancellations for the small community to the hub airport was greater than the hub airports overall rate of cancellations.

[11] Since these are not randomly selected observations, testing for statistical significance is not appropriate.

Table 8. Percent of Flights Cancelled – January 2005 Comparison of Small Community Markets With Hub Airport Total				
State	**From Small Community**	**Flights Inbound to:**	**Small Community**	**Hub Average**
ARKANSAS	Fayetteville *	Chicago-O'Hare	***14.4***	7.8
		Dallas/Ft. Worth	***3.2***	2.6
	Texarkana	Dallas/Ft. Worth	1.1	2.6
		Houston Bush	0.0	0.6
MONTANA	Butte	Salt Lake City	***5.5***	4.5
	Helena	Salt Lake City	***7.3***	4.5
NEBRASKA	Lincoln	Chicago-O'Hare	7.4	7.8
		Denver International	2.4	2.6
		Minneapolis-St. Paul	***9.5***	4.4
	McCook	Denver International	0.0	2.6
WEST VIRGINIA	Bluefield	Washington-Dulles	***11.5***	5.9
	Charleston	Cincinnati	***7.6***	5.8
		Washington-Dulles	5.2	5.9
	Parkersburg	Pittsburgh	***6.6***	5.0

* Represents communities served by Northwest Arkansas Regional Airport.

Short-Haul Flights Are Cancelled More Frequently Than Medium-Haul and Long-Haul Flights

As Table 9 shows, short-haul flights into five sampled hub airports were cancelled more frequently than medium-haul and long-haul flights. The differences were most pronounced when comparing short-haul flights with long-haul flights. In this comparison, flights of less than 500 miles were cancelled two to four times more often than flights in markets of 1,000 or more miles. This skewing of the distribution of cancellations towards short-haul flights was statistically significant.

Table 9. Percent of Flights Cancelled – January 2005			
	Short-Haul (less than 500 miles)	**Medium-Haul** (500 to 999 miles)	**Long-Haul** (1000 or more miles)
Flights Inbound To:			
Chicago O'Hare	***9.1***	8.5	3.7
Washington Dulles	***6.8***	5.5	1.7
Minneapolis	***6.2***	3.8	1.9
Denver	***4.1***	1.9	2.1
Salt Lake City	***6.9***	2.7	2.4

Characteristics of Air Service at Small Community Airports and the Airlines That Serve Them May Affect Flight Cancellation Rates

We examined the characteristics of air service in an effort to explain the disproportionately higher rate of cancellations for flights from small communities compared to flights from large communities. We found that differences in aircraft, airports, airline operating methods, and decisions by FAA and airlines can all contribute to the higher flight cancellation rates of flights from small communities.

Aircraft

Small communities are primarily served by aircraft (turboprop and regional jets) that have restricted capability to fly over some weather patterns or land in certain wind conditions. Small airports may not have cross-wind runways of sufficient length to accommodate some regional aircraft.

Technology

Major airports and airlines are equipped with more sophisticated levels of navigational aids than their smaller airport and airline counterparts. Many small airports have a single Category I Instrument Landing System (ILS) on the prevailing wind runway. This instrumentation allows landings with 200 feet of vertical visibility above touchdown and a ½ mile of frontal visibility. If the visibility drops below these minimums, the arriving flight may be cancelled, which then affects the subsequent departure scheduled from the small community. Also, if the wind changes, the cross-wind runway may not be equipped with the appropriate navigational aids. In contrast, large airports and the large aircraft that fly into them are equipped with Category II or Category III navigational aids that allow landing on multiple runways in much lower visibility conditions (Category IIIc landings may take place with no visibility). If weather conditions at the large hub airport are very poor, large aircraft, with the more sophisticated equipment, may be able to land when smaller aircraft are unable.

Airline Operating Methods

Small communities are usually located at the outlying ends of airline hub-and-spoke route structures. Unlike their operations at large airports, airlines usually do not station maintenance personnel or spare crew or aircraft at small airports and, thus, are not able to maintain schedule reliability when mechanical or crew availability problems arise there. In addition, late-arriving flights in the evening may cause a cancellation or late departure the following morning in order to comply with the FAA-enforced "minimum hours of rest" requirements. Larger communities often have crew bases with reserve crews who can be called into service.

FAA Management Decisions

If FAA implements a Ground Stop or Ground Delay Program on a regional rather than nationwide basis, short-haul markets (including many from small communities) can incur more delays.[12] When FAA plans a Ground Stop or Ground Delay program to manage demand into a constrained airport, it must take into consideration the estimated duration of the constraint and the amount of the reduction in traffic that is necessary. This is then translated into a decision on the geographic scope of the imposed halt or delay. The more severe the constraint and expected duration, the wider the geographic halt or slow-down imposed on flights into the constrained airport. FAA may elect to impose the program on less than a nationwide basis when the anticipated start of a constraint is uncertain or the duration is not expected to exceed 2 or 3 hours.[13]

Airline Economic Choices

When FAA implements a Ground Delay Program, airlines have limited flexibility to swap delayed arrival positions among their flights and to cancel flights and move others of their delayed flights into the arrival positions of the cancelled flights.

Airlines have many competing priorities to consider when deciding whether to further delay or cancel a flight. Airlines may decide to sacrifice a flight in a large market with frequent service in order to accommodate a flight from a small market with limited service. Or, alternatively, an airline may further delay or cancel a flight from a small community in order to accommodate a flight from a large community, for example the aircraft may be needed for an international departure or is carrying more connecting passengers.[14] During operational disruptions, the major airlines use a suite of complex software programs to track aircraft routing requirements, remaining crew time, spare aircraft and crew availability, and alternative passenger routing options. The intent of the airlines is to maintain an efficient operation, minimize the amount of inconvenience, and recover the schedule as quickly as possible.

[12] During January 2005, FAA implemented Ground Stop programs at Chicago O'Hare airport 19 times over 12 days for a total of 26 hours of duration. However, in 13 of the 19 instances, FAA applied the total halt only to flights departing from airports within the Midwest (for a combined 16 of the total hours). During the balance of the cases, the Midwest was included in the halts applied to flights on a wider or nationwide geographic scope.

[13] FAA may not want to halt flights from far distant airports on the speculation of the start of or duration of constraints at the destination airport in the event that the flight might be able to land by the time it actually arrives. This is opposed to flights from closer airports that permit FAA to make delay management decisions closer to the start of actual constraining events and hold flights on the ground prior to scheduled departure.

[14] Another reason for a cancellation during a Ground Delay Program may be that the visibility conditions at the arrival airport are sufficient to only accommodate aircraft with more sophisticated navigational aids, so flights with some regional aircraft serving small communities are cancelled because they lack the highest level of landing aids.

FAA and Airlines Each Make Decisions Affecting Flight Delays, but Only Airlines May Cancel a Flight

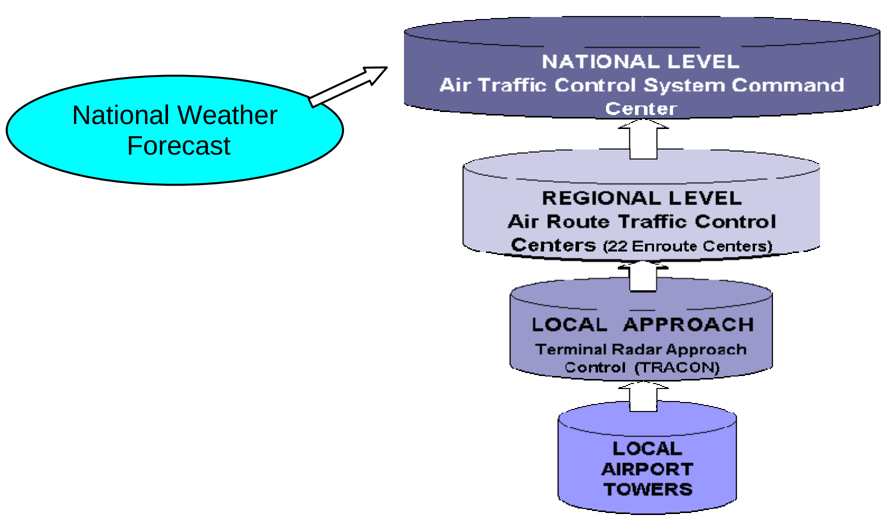
Throughout each day, FAA, airlines, and other aircraft operators (general aviation and military) together orchestrate a complex symphony of 25,000 flights, working to safely maximize the efficient use of the airspace and airports and minimize delays and cancellations. All parties must work collaboratively for this to be effective.

FAA Determines Available Airspace and Airport Capacity Throughout the Day

FAA's Air Traffic Management role is to determine the daily capability of the National Aviation System components (airports and enroute airspace) and, where constrained, manage the aircraft operators' demand for that enroute and terminal airspace capacity. The goal of the process is to balance demand and efficiency with safety and capacity.

Each day FAA determines the capacity of enroute airspace and airports that can support flight activity both safely and efficiently. From the bottom up, each airport, approach control, and enroute control center assesses its capacity, taking into consideration the weather forecast (the cause of half of all flight delays), airport construction, and other factors that may limit usual ability to accommodate flight activity (see Figure 1). This information enables FAA to determine the capacity of the components of the National Airspace System and monitor conditions throughout the day. This effort is coordinated by FAA's Air Traffic Control System Command Center, located in Herndon, Virginia.

Figure 1. FAA Determines Available Airspace Capacity From the Local Level to the National Level



The Command Center conducts regular conference calls every 2 hours throughout the day to discuss the condition, capacity, and management of the National Airspace System. Local and regional air traffic control facilities, air traffic flow managers, airlines, and other aviation system users participate in system status conference calls. The Command Center discusses those anticipated weather conditions that will affect capacity, anticipated restrictions, and potential and actual actions by FAA that will reduce demand when insufficient capacity exists. The practice is part of the Collaborative Decision-Making technique employed to bring FAA and the airspace users together to solve airspace management issues.

Airlines Supply FAA With Real-Time Data on Flight Status and Intended Operations

Airlines supply FAA with real-time information on flight status[15] to enable FAA to determine the demand for National Airspace System resources and measure the potential effects of FAA Traffic Flow Management actions. These data also communicate schedule readjustments when FAA imposes delay controls. In return, FAA provides real-time information on intended departure release times. In addition, when FAA institutes demand management programs, the airlines are permitted some flexibility to again adjust their schedules to manage the FAA-assigned delay.

When Capacity Constraints Are Identified, FAA and Airlines Take Action

When demand for air traffic services exceeds the available capacity of the National Aviation System (either due to constraints on usual capacity or above-usual demand), FAA moves to balance demand and capacity through the use of various management initiatives.

During calendar year 2005, weather was the direct cause of 28 percent of aviation delays and 52 percent of all flight cancellations. Figure 2 on the following page highlights the major causes of delays and cancellations. Severe weather conditions reduce capacity in the system, requiring FAA and the airlines to adjust demand to accommodate those constraints. Some airports are so heavily scheduled even for good weather conditions that moderate storms or wind shifts can cause constraints that lead to delays. Runway construction or national sporting events are other examples of capacity constraints or excessive demand that might require FAA to implement flight management initiatives.

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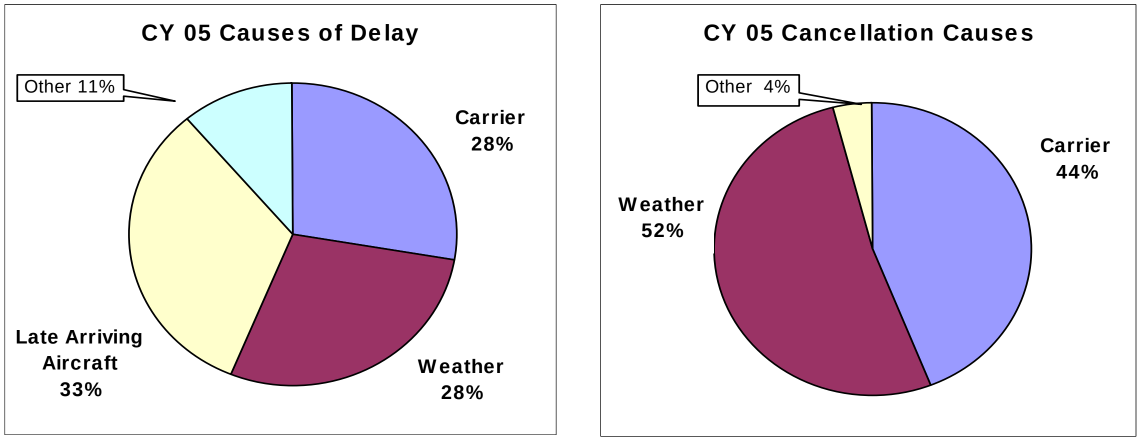
[15] Airlines periodically file flight schedules, which represent planned operations, with the Official Airline Guide (OAG). When weather or other events disrupt normal operations, the airlines rearrange and reschedule operations to accommodate the reduced capacity. These are the real-time data that FAA needs in order to keep the National Airspace System functioning efficiently, especially under constrained capacity.

Figure 2. Weather Is a Leading Cause of Delays and Cancellations



Local Air Traffic Control Manages Immediate, Short-Term Capacity Constraints and Demand Spikes

Air Traffic Control (ATC) exercises direct control over individual aircraft arriving and departing from airports and their movement in airspace between airports. When airspace or airport capacity becomes temporarily constrained (a delay of less than 30 minutes) or demand is excessive, local towers, approach control centers, or enroute control centers may institute Tactical Management Initiatives such as:

- minor departure holding,
- vectoring (circuitous routing to destination),
- circular holding (requiring arriving flights to circle the airport until a landing opportunity exists).

Nationally, FAA Traffic Flow Management Manages More Severe Congestion Strategically

Under the most severe conditions, FAA may (1) reroute flights around congested enroute airspace (usually caused by weather), (2) implement a Ground Stop program that will halt all flights destined to constrained airports or airspace, or (3) implement a Ground Delay Program and assign delayed arrival times (and, thus, delayed departure times) to specific flights destined to constrained airports or airspace.

Rerouting Flights Around Congestion and Weather Reduces Bottlenecks

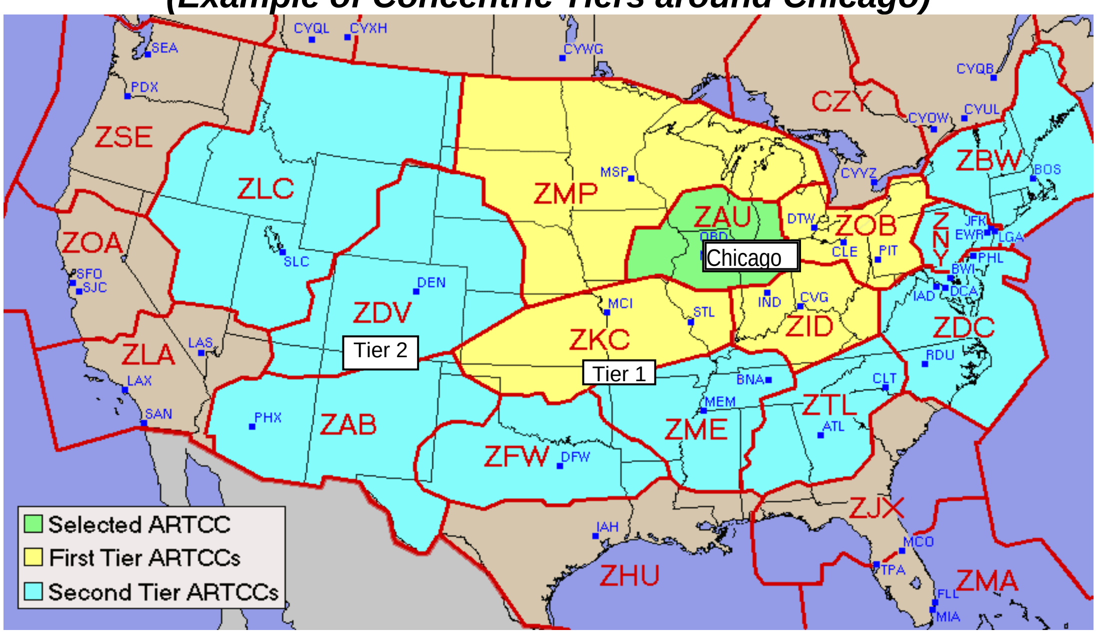
Weather or high demand may congest enroute airspace, preventing airlines from taking the most desirable flight route or imposing considerable delays on that route. In these cases, FAA may reroute flight paths around the congestion. Using a collection of predetermined routing segments contained in FAA's "Play Book," the Command Center can advise airlines of congestion, thus allowing the airlines to reroute on their initiative or accept FAA-assigned rerouting directions to the flights destined for the affected airspace.

Ground Stops Hold Flights Destined for Constrained Areas at Their Departure Airports

A Ground Stop is a procedure that requires aircraft that meet specific criteria to remain on the ground until the Ground Stop is lifted. Ground Stops are implemented when ATC is unable to safely accommodate additional aircraft in the system. The Ground Stop may affect a specific airport, a geographic area, or a category of aircraft.[16]

Ground Stops may be implemented in an ever-widening circle (tiers) around the affected airport, as Figure 3 indicates. When applied on a less-than-nationwide basis, flights from airports within the Ground Stop tier(s) will absorb the delays. The short-haul flights—which includes most of those coming from small communities—will be delayed more than those from airports farther away.

Figure 3. FAA May Implement Ground Stops and Ground Delays in Ever-expanding Circles Around the Affected Airport (Example of Concentric Tiers around Chicago)



[16] As visibility at the arrival airport deteriorates, flights with less sophisticated onboard navigational aids (Category II and Category I) may be unable to land.

Ground Stops are most frequently used for severely reduced capacity situations such as:

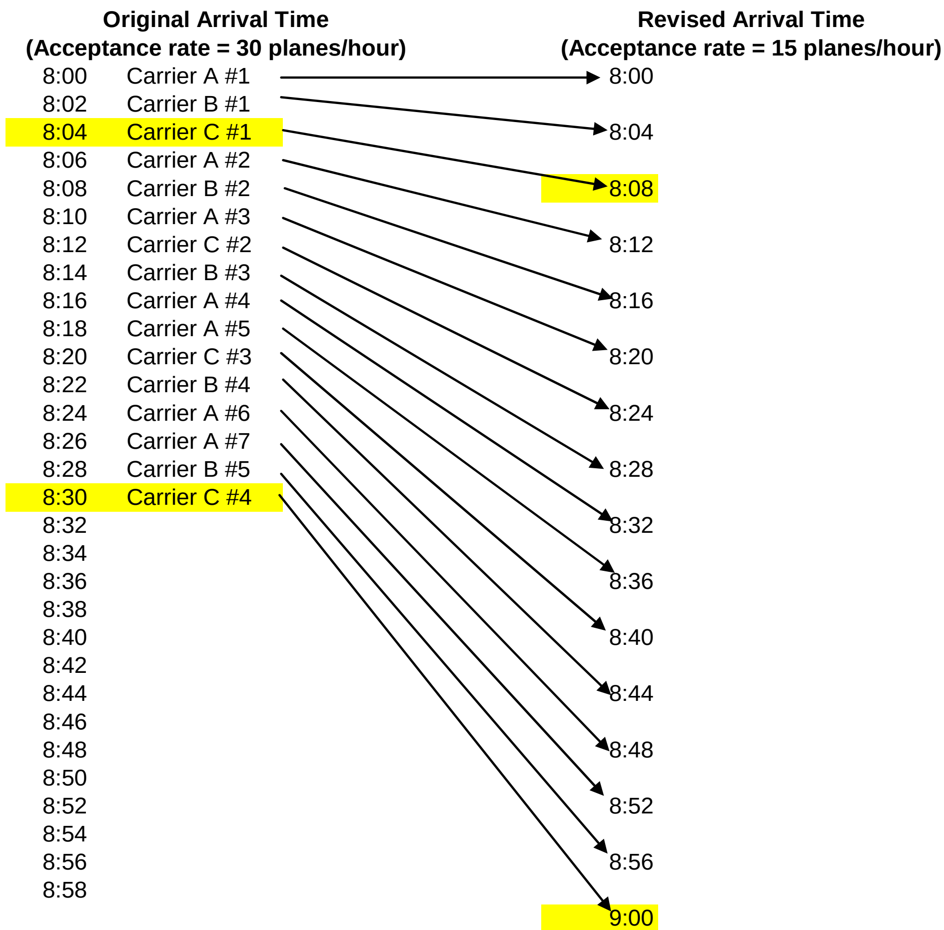
- weather below user arrival minimums (visibility),
- severe weather that reduces usable routes,
- major equipment outages, and
- catastrophic events.

Ground Delay Programs Pace Demand by Delaying Departures and Arrivals

A Ground Delay Program is a traffic management procedure that delays aircraft at their departure airports in order to spread scheduled arrivals at a constrained destination airport over a longer period of time. FAA assigns arrival times (and, thus, delayed departure times) in the order in which the flights were originally scheduled to arrive. The result is that flights scheduled later in the order are assigned the greatest amount of delay. Unlike a Ground Stop under which FAA halts all flights, the Ground Delay Program allows airlines some flexibility in managing their FAA-assigned delays.

In the following hypothetical model, an airport that can accept 30 aircraft per hour under normal conditions is reduced to 15 arrivals per hour. As illustrated in Figure 4 on the next page, Carrier C's Flight #1, which was scheduled to arrive at 8:04, is reassigned a slot at 8:08, a 4-minute delay. In their original order, flights are assigned escalating levels of delay so that by Carrier C's scheduled Flight #4, the delay has grown to 30 minutes.

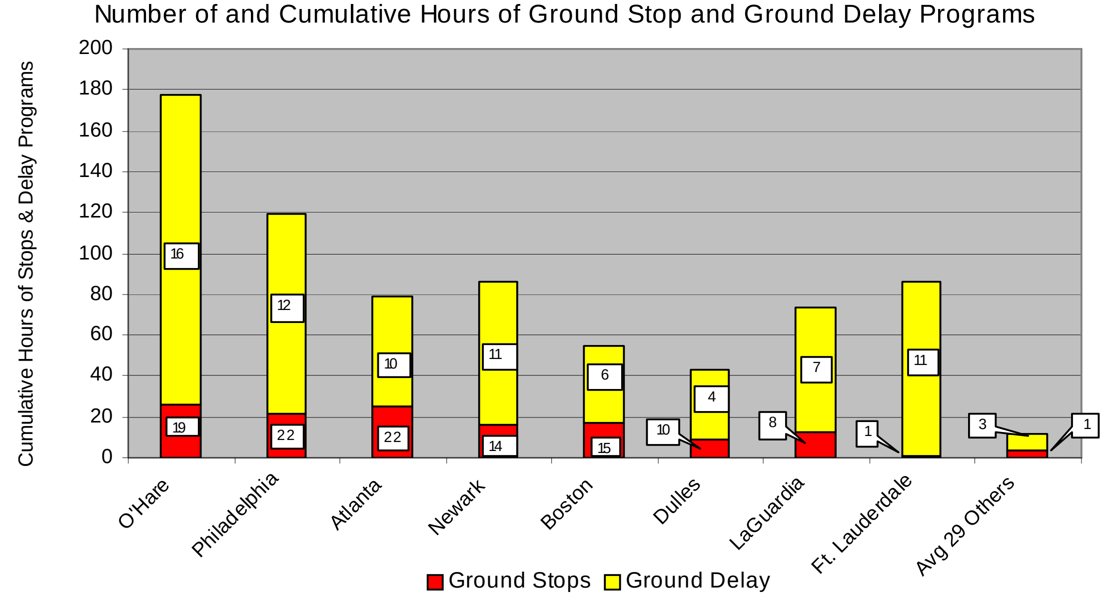
Figure 4. FAA Spreads Out the Demand By Delaying Arrivals: Delays Imposed on Flights Later in the Order Are Longer



Similar to a Ground Stop, a Ground Delay Program may be implemented in tiers, and when imposed on a less-than-nationwide basis, flights from airports within the region affected by the Ground Delay absorb most of the delays.

During January 2005, of the more than 300 occasions when FAA stepped in to halt or moderate the flow of flights, nearly two-thirds occurred at eight airports, for a cumulative duration of more than 700 hours (see Figure 5 on the following page). Two of the airports included in our hub-specific analysis—Chicago-O'Hare and Washington-Dulles—were among those eight airports. While Ground Stop and Ground Delay programs are imposed at only a limited number of destination airports, the effect is more far-reaching, as flights from dozens of communities to each destination airport may be included in the traffic flow management initiative.

Figure 5. Flights Into Only A Few Airports Were Subjected to FAA Management Programs



Airlines Have Some Flexibility To Rearrange Delays or They Can Cancel Flights

A complex process starts once FAA decides that a Ground Delay Program is necessary. FAA assigns a new (delayed) arrival time slot to flights scheduled to arrive during the estimated period of congestion. While the delays are initially assigned to specific flights as they appear in the arrival order, the airlines then have some flexibility to (1) swap the order of delayed flights among its FAA-assigned delayed arrival positions, (2) cancel any of its delayed flights and move another of its delayed flights into that vacant arrival position, or (3) cancel any of its delayed flights and attempt to trade that vacant arrival position with another airline. *Only airlines can make the decision to cancel a flight.*

Airlines May Swap Flights Among Delayed Arrival Positions

Once flights are assigned delays by FAA, airlines are permitted to rearrange their schedule to accommodate their priorities. Figure 6 on the following page is an example of a simple flight swap within a Ground Delay Program. Carrier B swaps the delayed arrival order of its Flight #3 and Flight #6, so that Flight #6 experiences the 15-minute delay originally assigned to Flight #3, which then inherits the 40-minute delay.

Figure 6. Airlines May Swap the Order of Their Delayed Arrivals

Airline	Flight	Original time of Arrival	Controlled time of Arrival	Delay
A	1	7:00	7:00	0
A	2	7:00	7:10	10
B	**3**	**7:05**	**7:20**	**15**
B	4	7:05	7:30	25
B	5	7:10	7:40	30
B	6	7:10	7:50	40
A	7	7:20	8:00	40
C	8	7:20	8:10	50
B	9	7:40	8:20	40
C	10	7:40	8:30	50
A	11	8:20	8:40	20
B	12	8:40	8:50	10
Total Delay				330

Airlines may decide to further delay one flight and bring another forward in the queue due to factors such as:

- minimizing disruption for the maximum number of passengers,
- expiring crew duty time,
- need to accommodate large numbers of connecting passengers, or
- positioning aircraft for subsequent departures.

Only an Airline May Cancel a Flight

Within the flexibility of the Ground Delay Program, airlines may cancel a flight and move another of its delayed flights into the cancelled flight's arrival position. Cancellation of a flight during a Ground Delay Program may result in sizable reductions in the duration of delay for other flights. *Only an airline may make the decision to cancel a flight.*

During a Ground Delay Program, airlines are constantly reviewing their operating and customer service priorities in an attempt to affect the fewest customers as possible, minimize disruption to the airline's schedule, and recover from disrupted operations as quickly as possible. To accomplish these ends, an airline may decide to cancel a delayed flight, or flights, and move other of their flights up in the delay queue. In making those decisions, airlines evaluate the condition of their flight operations and available options to mitigate passenger inconvenience (e.g., alternative connections, availability on other airlines, flight diversion, hotel availability, or ground transportation). Some of the reasons for cancelling a flight during a Ground Delay Program are:

- flights in high-frequency markets might be cancelled to minimize delays of flights in markets with few frequencies,
- weather conditions contributing to the Ground Delay Program may reduce visibility below the minimums required for some aircraft, and
- aircraft may be so late that the continuation of its routing may make it unavailable (out of position) for its first flight the next day.

When airlines cancel flights, FAA compresses the remaining queue of delayed flights into the vacated arrival position in order to use the limited capacity efficiently. This schedule compression may result in sizable reductions in delays for all carriers affected by the Ground Delay Program.

In the hypothetical example shown in Figure 7, Airline B cancels Flight #3 and moves Flight #6 up in the queue into Flight #3's delayed arrival position. With the elimination of Flight #3, FAA moves all flights positioned to arrive after Flight #6's original position up in the queue. As the hypothetical schedule in Figure 7 illustrates, the cumulative delay of all flights is reduced from 330 minutes to 225 minutes, avoiding approximately one-third of the combined delay that all flights would have experienced during that period of constrained capacity.

Figure 7. Cancellation of a Flight May Result in Sizable Reductions in Overall Delay

Schedule Before Cancelling Flight 3, Moving Flight 6, and Compression

Airline	Flight	Original time of Arrival	Controlled time of Arrival	Delay
A	1	7:00	7:00	0
A	2	7:00	7:10	10
B	**3**	**7:05**	**7:20**	**15**
B	4	7:05	7:30	25
B	5	7:10	7:40	30
B	**6**	**7:10**	**7:50**	**40**
A	7	7:20	8:00	40
C	8	7:20	8:10	50
B	9	7:40	8:20	40
C	10	7:40	8:30	50
A	11	8:20	8:40	20
B	12	8:40	8:50	10
Total Delay				**330**

Schedule After Cancelling Flight 3, Moving Flight 6, and Compression

Airline	Flight	Original time of Arrival	Controlled time of Arrival	Delay
A	1	7:00	7:00	0
A	2	7:00	7:10	10
B	**6**	**7:10**	**7:20**	**10**
B	4	7:05	7:30	25
B	5	7:10	7:40	30
A	7	7:20	7:50	30
C	8	7:20	8:00	40
B	9	7:40	8:10	30
C	10	7:40	8:20	40
A	11	8:20	8:30	10
B	12	8:40	8:40	0
Total Delay				**225**

Total delay reduced by 105 minutes

Airlines May Cancel a Flight and Offer the Delayed Arrival Slot in Exchange for the Arrival Slot of Another Airline

For any number of reasons, airlines may find that they are unable to use an assigned arrival slot under a Ground Delay Program. In that event, the slot risks being unused and becomes a waste of a valuable resource. Rather than allow the delayed arrival slot to go unused, FAA permits the airlines to offer the arrival slot in trade to other airlines in return for a later arrival position from the recipient. These trades are "blind" to preclude the possibility of bias in the process—for example, an airline preventing the slot from being used by a competitor in the same market.

EXHIBITS A. SCOPE AND METHODOLOGY

Scope

In a letter to the Inspector General, the Chairman of the Senate Commerce Committee Subcommittee on Aviation requested that our office determine and quantify whether flights originating in small or non-hub airports are delayed or canceled at a rate that is disproportionately higher than flights from larger airports. In addition, the Committee requested that we explain the roles of FAA and the airlines in determining which flights are delayed or canceled during periods of reduced airport capacity or excessive demand.

Our review was concentrated on a few small community airports, as requested by the Subcommittee, from the states of Arkansas, Nebraska, West Virginia, and Montana. We also examined the flights from communities of all sizes into five large hub airports. To maximize the potential number of observations, the analysis was limited to one delay-prone month, January 2005. We analyzed flight activity at judgmentally selected airports, using airport size (i.e., small-hubs, non-hubs, and primary commercial points), flight service (i.e., number of flights and destinations), and availability of flight delay and cancellation data as selection criteria.

Data in the report were obtained from FAA. These data were used to perform the analyses detailed below.

The identification of roles and the decision-making process in flight delays and cancellations during airspace capacity constraints was limited to FAA, Metron Aviation, and the airlines.

There has been no prior audit coverage in this area by the Department of Transportation's Office of Inspector General.

Methodology

<u>Analysis</u>. We examined the flight delay and cancellation experience for January 2005 to determine if small communities experienced a disproportionate level of flight disruptions compared to large communities. Our initial analysis compared flight delay and cancellation measures in 14 markets connecting small communities with their connecting hub airports (9 hubs in total) with the measures for all flights into each hub airport. Since airspace congestion mostly affects flights arriving at large hub airports, we analyzed flight delay and cancellation data for flights *into* these sampled hub airports. Following the results of our initial

analysis, we expanded our examination to compare flights from communities of all sizes. For our analysis, we selected the flights into five large connecting hub airports.

We analyzed airport-pairs that represented predominantly domestic scheduled passenger service.[17] We downloaded summary counts of operated flights, delayed arrivals, and cancellations and rates of delayed arrivals and average minutes of delay by directional airport-pair from FAA Aviation System Performance Metrics database. We calculated the average percent of flights cancelled for each directional airport-pair. We assigned the FAA hub category designation (for 2004) to each airport-pair based on the origin airport of the directional airport-hub pair to aid in the comparison of results by community size.

The analysis compared weighted average rates of arrival delays, minutes of arrival delay, and rates of flight cancellations for flights in markets between small communities and the large hub with the weighted average for the flights in markets from the large communities and the large hub. We also conducted analyses comparing the same performance measures for short-haul, medium-haul, and long-haul flights from all communities into the same hub airport.

Statistical Testing of the Effects of Community Size. We calculated the weighted and unweighted average cancellation rates for both small and large communities for flights scheduled to arrive in each of the five hub airports. Since the number of cancellations and scheduled flights in our data set were reported by market, each unweighted average represented an average cancellation rate across markets. We were more concerned with the cancellation rate across flights and, thus, calculated weighted averages using the share of flights in each market as the weighting factor.

A t-test was performed on the difference between the cancellation rates for the two groups for each airport and overall, for both the weighted and unweighted averages.[18] The t-test for the weighted averages was performed by running a weighted regression on a constant and a dummy variable that indicated whether the community was large or not.

We used the same analysis to test differences in delay rates and minutes of delay.

Statistical Testing of the Effects of Distance from Hub Airport. We performed Chi-square goodness-of-fit tests[2] on the distributions of flight cancellations and of flight delays across the three distance groupings. We assumed the expected

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[17] We excluded international markets, airport-pairs with less than 21 flights for the month, and airport-pairs that were known to be only air-cargo markets.

[18] The t-test and the Chi-square goodness-of-fit test are statistical measures that are commonly used in business, social, and scientific studies.

distribution of cancellations to be in proportion to scheduled flights. The expected distribution of delays was assumed to be in proportion to actual flights.

Data

We did not systematically audit or validate the data contained in any of the databases. However, in prior work, we conducted trend analyses and sporadic checks of the data to assess reasonableness and comprehensiveness. We also held discussions with managers responsible for maintaining the databases to understand and attempt to resolve any noted inconsistencies. Based on our understanding of the data through discussions with knowledgeable agency officials, as well as checks for obvious errors in accuracy and completeness, we determined that the data were sufficiently reliable for our purposes. However, we note that our evaluation of recent revisions to FAA's flight cancellations data indicate it is not reliable for extending or updating these analyses.

We conducted statistical analyses of history, trends, and aviation system performance; scheduled airline service; and the categorization of airports using ATC delay and operational statistics, airline schedule information, and passenger boarding data obtained from FAA sources. We performed analyses of the causes of flight delays and cancellations using traffic and operational statistics obtained from FAA sources. A list of our data sources follows.

1. Flight Schedule Data System (FSDS). An FAA-maintained database of published airline flight schedules. Scope: worldwide, 1995 through March 2006.

2. Aviation System Performance Metrics (ASPM). A database of FAA air traffic control performance measures, including delays, cancellations, operations, and causes for delays. Scope: 55 major airports across the country and all enroute control centers, calendar years 2004 and 2005.

3. Air Carrier Activity Information System (ACAIS). An FAA database that contains revenue passenger boarding (enplanement) data; the data supports the FAA classification of airports into hub types. Scope: calendar year 2004.

4. Airline Service Quality Performance (ASQP). An FAA database of on-time flight statistics. Scope: passenger flights scheduled, delayed, and cancelled for the 12 months ended December 31, 2005.

5. Ground Delays and Ground Stops. FAA reports on Ground Delay and Ground Stop programs including airport, scope, date, and time. Scope: January 2005.

To gain an understanding of roles and decisions in flight delays and cancellations, we had discussions with staff at the following locations.

- FAA's Air Traffic Control System Command Center in Herndon, VA
- Midwest United States Air Traffic System Operations in Des Planes, IL
- Chicago Air Traffic Control Center in Aurora, IL
- United Airlines in Elk Grove Village, IL
- the Regional Airline Association in Washington, DC
- Metron Aviation, an aviation consultant to FAA in Herndon, VA

We interviewed airport managers to obtain information on the effects of flight delays and cancellations on small community airports, including those from these locations.

- Bluefield, WV
- Butte, MT
- Charleston, WV
- Helena, MT
- Lincoln, NE
- Northwest Arkansas Regional Airport, Bentonville, AR
- Parkersburg, WV

We also interviewed executives at the Lincoln, NE, Chamber of Commerce to gain an insight on how flight disruptions affect travelers in small communities.

Terms and Definitions for the Current Report

Hub Airport. A ranking designation of U.S. airports by FAA based on the airport's percentage share of total passenger enplanements at all U.S. airports. FAA categorizes airports based on the following enplanement criteria.

Percentage of Annual Passenger Enplanements in the U.S. by Hub Type

Large Hub	1.0% or more of total enplanements
Medium Hub	at least 0.25% but less than 1%
Small Hub	at least 0.05% but less than 0.25%
Non-hub	at least 2,500 enplanements but less than 0.05%

Based on calendar year 2004 data, the selected airports in this review were in the following hub categories:

State	Airport	Hub Category
ARKANSAS	Northwest Arkansas	Small
	Texarkana	Non-hub
MONTANA	Butte	Non-hub
	Helena	Non-hub
NEBRASKA	Lincoln	Non-hub
	McCook	Non-hub
WEST VIRGINIA	Bluefield/Princeton	Non-hub
	Charleston	Non-hub
	Parkersburg	Non-hub

EXHIBIT B. MAJOR CONTRIBUTORS TO THIS REPORT

THE FOLLOWING INDIVIDUALS CONTRIBUTED TO THIS REPORT:

Name	Title
Leila D. Kahn	Program Director
Stephen Smith	Project Manager
Ralph W. Morris	Economist
Betty Krier	Economist
Petra Swartzlander	Statistician
Gina Ronzello	Analyst
Jenny Shin	Student Intern

The following pages contain textual versions of the graphs and charts contained in this document. These pages were not a part of the original document but have been added here to accommodate assistive technology.

Table I. Percent of Flights Delayed*

Flights Inbound to:	**Originating From Community Size**	
	Small	**Large**
Chicago-O'Hare	***37***	36
Washington-Dulles	28	28
Minneapolis-St. Paul	23	26
Denver International	25	26
Salt Lake City	24	24

* Results are based on averages weighted by the number of flights in each market.

Table II. Average Minutes of Arrival Delay*

Flights Inbound to:	**Originating From Community Size**	
	Small	**Large**
Chicago-O'Hare	***75***	70
Washington-Dulles	***62***	56
Minneapolis-St. Paul	***55***	51
Denver International	***66***	56
Salt Lake City	***54***	48

* Results are based on averages weighted by the number of flights in each market.

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Table III. Percent of Flights Cancelled*

Flights Inbound to:	**Originating From Community Size**	
	Small	**Large**
Chicago-O'Hare	***9.7***	6.8
Washington-Dulles	4.8	6.3
Minneapolis-St. Paul	***6.2***	3.2
Denver International	***4.4***	1.7
Salt Lake City	***7.2***	2.5

*Results are based on averages weighted by the number of flights in each market.

Table IV. Percent of Flights Cancelled – January 2005 *Comparison of Small Community Markets With Hub Airport Total*				
State	**From Small Community**	**Flights Inbound to:**	**Small Community**	**Hub Average**
ARKANSAS	Fayetteville	Chicago-O'Hare	***14.4***	7.8
		Dallas/Ft. Worth	***3.2***	2.6
	Texarkana	Dallas/Ft. Worth	1.1	2.6
		Houston Bush	0.0	0.6
MONTANA	Butte	Salt Lake City	***5.5***	4.5
	Helena	Salt Lake City	***7.3***	4.5
NEBRASKA	Lincoln	Chicago-O'Hare	7.4	7.8
		Denver International	2.4	2.6
		Minneapolis-St. Paul	***9.5***	4.4
	McCook	Denver International	0.0	2.6
WEST VIRGINIA	Bluefield	Washington-Dulles	***11.5***	5.9
	Charleston	Cincinnati	***7.6***	5.8
		Washington-Dulles	5.2	5.9
	Parkersburg	Pittsburgh	***6.6***	5.0

*Table 1. Percent of Flights Delayed**		
Flights Inbound to:	**Originating From Community Size**	
	Small	**Large**
Chicago-O'Hare	***37***	36
Washington-Dulles	28	28
Minneapolis-St. Paul	23	26
Denver International	25	26
Salt Lake City	24	24

* Results are based on averages weighted by the number of flights in each market.

Table 2. Percent of Flights Delayed – January 2005 Comparison of Small Community Markets With Hub Airport Average				
State	**From Small Community**	**Flights Inbound to:**	**Small Community**	**Hub Average**
ARKANSAS	Fayetteville *	Chicago-O'Hare	35.8	36.1
		Dallas/Ft. Worth	18.3	20.7
	Texarkana	Dallas/Ft. Worth	6.6	20.7
		Houston Bush	14.3	20.0
MONTANA	Butte	Salt Lake City	20.8	24.2
	Helena	Salt Lake City	23.5	24.2
NEBRASKA	Lincoln	Chicago-O'Hare	34.8	36.1
		Denver International	24.0	25.4
		Minneapolis-St. Paul	***27.6***	25.0
	McCook	Denver International	22.6	25.4
WEST VIRGINIA	Bluefield	Washington-Dulles	26.1	27.8
	Charleston	Cincinnati	24.6	26.4
		Washington-Dulles	17.9	27.8
	Parkersburg	Pittsburgh	18.1	25.7

* Represents communities served by Northwest Arkansas Regional Airport

Table 3. Percent of Arrivals Delayed—January 2005			
	Short-Haul (less than 500 miles)	**Medium-Haul** (500 to 999 miles)	**Long-Haul** (1000 or more miles)
Flights Inbound To:			
Chicago O'Hare	35.8	36.5	35.7
Washington Dulles	***29.6***	25.5	22.6
Minneapolis	23.8	26.4	25.3
Denver	24.4	24.7	28.7
Salt Lake City	25.5	20.7	31.1

Table 4. Average Minutes of Arrival Delay*		
Flights Inbound to:	**Originating From Community Size**	
	Small	**Large**
Chicago-O'Hare	***75***	70
Washington-Dulles	***62***	56
Minneapolis-St. Paul	***55***	51
Denver International	***66***	56
Salt Lake City	***54***	48

* Results are based on averages weighted by the number of flights in each market.

Table 5. Average Minutes of Arrival Delay – January 2005 Comparison of Small Community Markets With Hub Airport Average				
State	**From Small Community**	**Flights Inbound to:**	**Small Community**	**Hub Average**
ARKANSAS	Fayetteville *	Chicago-O'Hare	***82***	72
		Dallas/Ft. Worth	***59***	51
	Texarkana	Dallas/Ft. Worth	***62***	51
		Houston Bush	***50***	46
MONTANA				
	Butte	Salt Lake City	***62***	50
	Helena	Salt Lake City	39	50
NEBRASKA	Lincoln	Chicago-O'Hare	***91***	72
		Denver International	***71***	59
		Minneapolis-St. Paul	***53***	52
	McCook	Denver International	***77***	59
WEST VIRGINIA	Bluefield	Washington-Dulles	47	58
	Charleston	Cincinnati	46	51
		Washington-Dulles	***70***	58
	Parkersburg	Pittsburgh	***74***	55

* Represents communities served by Northwest Arkansas Regional Airport.

Table 6. Average Length of Arrival Delay Minutes – January 2005			
	Short-Haul (less than 500 miles)	**Medium-Haul** (500 to 999 miles)	**Long-Haul** (1000 or more miles)
Flights Inbound To:			
Chicago O'Hare	***73***	70	71
Washington Dulles	***59***	57	51
Minneapolis	***55***	52	49
Denver	***66***	59	51
Salt Lake City	***55***	46	47

Table 7. Percent of Flights Cancelled*		
Flights Inbound to:	**Originating From Community Size**	
	Small	**Large**
Chicago-O'Hare	***9.7***	6.8
Washington-Dulles	4.8	6.3
Minneapolis-St. Paul	***6.2***	3.2
Denver International	***4.4***	1.7
Salt Lake City	***7.2***	2.5

* Results are based on averages weighted by the number of flights in each market.

Table 8. Percent of Flights Cancelled – January 2005 Comparison of Small Community Markets With Hub Airport Total				
State	**From Small Community**	**Flights Inbound to:**	**Small Community**	**Hub Average**
ARKANSAS	Fayetteville *	Chicago-O'Hare	***14.4***	7.8
		Dallas/Ft. Worth	***3.2***	2.6
	Texarkana	Dallas/Ft. Worth	1.1	2.6
		Houston Bush	0.0	0.6
MONTANA	Butte	Salt Lake City	***5.5***	4.5
	Helena	Salt Lake City	***7.3***	4.5
NEBRASKA	Lincoln	Chicago-O'Hare	7.4	7.8
		Denver International	2.4	2.6
		Minneapolis-St. Paul	***9.5***	4.4
	McCook	Denver International	0.0	2.6
WEST VIRGINIA	Bluefield	Washington-Dulles	***11.5***	5.9
	Charleston	Cincinnati	***7.6***	5.8
		Washington-Dulles	5.2	5.9
	Parkersburg	Pittsburgh	***6.6***	5.0

* Represents communities served by Northwest Arkansas Regional Airport.

Table 9. Percent of Flights Cancelled – January 2005			
	Short-Haul (less than 500 miles)	**Medium-Haul** (500 to 999 miles)	**Long-Haul** (1000 or more miles)
Flights Inbound To:			
Chicago O'Hare	***9.1***	8.5	3.7
Washington Dulles	***6.8***	5.5	1.7
Minneapolis	***6.2***	3.8	1.9
Denver	***4.1***	1.9	2.1
Salt Lake City	***6.9***	2.7	2.4

Figure 5. Flights Into Only A Few Airports Were Subjected to FAA Management Programs

Number of and Cumulative Hours of Ground Stop and Ground Delay Programs

Airport	Number of Ground Stops	Number of Ground Delay Programs	Total Hours of Ground Stops	Total Hours of Ground Delay Programs	Combined Hours of Ground Stops and Ground Delay Programs
O'Hare	19	16	26	152	178
Philadelphia	22	12	22	97	119
Atlanta	22	10	25	54	79
Newark	14	16	11	70	86
Boston	15	6	17	38	55
Dulles	10	4	9	34	43
LaGuardia	8	7	13	60	73
Fort Lauderdale	1	11	1	85	86
Average of 29 Other Airports	3	1	4	8	12