
Office of Inspector General

Audit Report

Air Carrier Departure Data

Department of Transportation

Report Number: CE-1999-054

Date Issued: February 5, 1999





**U.S. Department of
Transportation**

Office of the Secretary
Of Transportation

Office of Inspector General

Memorandum

Subject: ACTION: Report on the Audit of Air Carrier
Departure Data, DOT
CE-1999-054

Date: February 5, 1999

From: Lawrence H. Weintrob
Assistant Inspector General for Auditing

Reply to JA-2
Attn of:

To: Federal Aviation Administrator

Director, Bureau of Transportation Statistics

Assistant General Counsel for Aviation Enforcement
and Proceedings

BACKGROUND AND OBJECTIVES

This is our report on the audit of air carrier departure data. The objectives of the audit were to assess: (1) the methodologies and systems used by air carriers to report departure times and (2) the accuracy of air carrier reported departure times. In addressing these objectives, we analyzed 10 years of data relating to air carrier departure times. We also met with representatives of the air carriers regarding their reporting systems and conducted unannounced observations of departing flights at 14 domestic airports. During the course of the audit, we also analyzed air carrier data to assess changes in gate-to-gate times for flights to and from the 28 largest domestic airports. (Gate-to-gate time is the period between gate departure from the origin airport to gate arrival at the destination airport.) See Appendix A for a full discussion of the audit scope and methodology.

Title 14, Code of Federal Regulations, Chapter II, Part 234.4, Reporting on On-Time Performance, and Department of Transportation's (DOT) implementing instructions (Technical Directive No. 2), define a flight as on time when it arrives at, or departs from, the "*gate or passenger loading area*" less than 15 minutes after its scheduled arrival or departure time. As such, an aircraft could land at an airport within 15 minutes of its scheduled arrival and be reported as late if it did not reach the gate in time. In addition, an aircraft could wait an hour or more on the airport runway for takeoff and be reported as having departed on time if it left

the gate within 15 minutes of its scheduled departure. Late flights also include those which are: (1) delayed 15 minutes or more due to mechanical problems or (2) cancelled within 7 calendar days of the scheduled departure.

Domestic air carriers that individually account for at least one percent of domestic scheduled passenger revenues are required to submit monthly arrival and departure flight data to DOT's Office of Airline Information, Bureau of Transportation Statistics (BTS). From 1988 to 1998, the 10 reporting air carriers were:

Alaska Airlines	Northwest Airlines
American Airlines	Southwest Airlines
America West Airlines	Trans World Airlines
Continental Airlines	United Airlines
Delta Air Lines	U.S. Airways

DOT's Office of Aviation Enforcement and Proceedings, Office of the General Counsel, in turn, uses the data to generate the Air Travel Consumer Report. This monthly report provides consumers with information on the quality of air carrier services—including such measures as percentage of on-time departures at nearly 200 domestic airports, the number of passengers denied boarding,¹ and the number of consumer complaints (e.g., flight delays and cancellations).

RESULTS-IN-BRIEF

AIR CARRIERS USE FOUR DIFFERENT METHODS FOR REPORTING GATE DEPARTURE

DOT provides no clear definition of what constitutes departure “*at the gate or passenger loading area.*” As a consequence, air carriers are using four different methods to report departure times: (1) rolling of the aircraft wheels, (2) release of the parking brake, (3) closure of the passenger and/or cargo doors, and (4) a combination of closing the aircraft doors and releasing the parking brake. Differences between these methods could result in an aircraft being reported as departing on time, when another aircraft, in the same situation, could be reported as departing late. For example, of the seven air carriers using release of the parking brake and/or closing of the passenger/cargo doors as a definition of gate departure, we found their reported departure times averaged 1 to 4 minutes earlier than our observed times (which were based on wheels rolling).

¹ In accordance with 14, CFR, Chapter 11, Part 250.2a, “*In the event of an oversold flight, every carrier shall ensure that the smallest practicable number of persons holding confirmed reserved space on that flight, are denied boarding involuntarily.*”

TWO AIR CARRIERS MAY BE REPORTING INACCURATE
DEPARTURE TIMES

In addition to different reporting methods, we identified two air carriers that may be reporting inaccurate departure times to DOT. Of the flights we observed, the two air carriers reported departure times that averaged 3 minutes earlier than those recorded by the Office of Inspector General (OIG)—even though we used the same method (wheels rolling) for determining gate departure as the two carriers. *One air carrier actually reported departure for 16 flights that—based on our observations—still had the passenger door open.* Both of these air carriers rely on their flight crews to manually report their departure times, instead of the automated system used by 7 of the 10 air carriers.

GATE-TO-GATE TIMES HAVE INCREASED ON
MOST DOMESTIC ROUTES

Because a flight can have an on-time gate departure, but still expend considerable amounts of time on the runway awaiting takeoff or in the air, we did an initial look at whether gate-to-gate times had increased on domestic routes, and, if so, how much of this increase was attributable to additional ground (taxi-out and taxi-in)² or flight time. Overall, between 1988 and 1997, we found that 1,544 of 2,115 domestic routes³ (or 73 percent) to and from the 28 largest U.S. airports witnessed increases in their actual gate-to-gate times, with the remainder either decreasing or showing no change. Of these routes, we identified 113 that had increased gate-to-gate times of 10 to 20 minutes. The following table lists the five routes with the largest increases in actual gate-to-gate times over the 10-year period. Such increases not only affect the flying public (especially those routes with increases of 15 minutes or more), but also result in significant monetary costs to the air carriers—ranging between \$275 and \$553 million in additional operating expenditures in 1997. We also found that taxi-out, flight, and taxi-in times represented approximately 37, 44, and 19 percent, respectively, of the increases in gate-to-gate time between 1995 and 1997.⁴

No.	Departure Airport	Arrival Airport	1988-97 (minutes)
1	Atlanta, GA	San Diego, CA	+20:14
2	Philadelphia, PA	Kennedy, NY	+19:35
3	Newark, NJ	Los Angeles, CA	+19:01
4	Newark, NJ	San Juan, PR	+17:55
5	LaGuardia, NY	Louisville, KY	+17:48

² Taxi-out time comprises the period between an aircraft departing the gate and lift off (wheels off). Likewise, taxi-in time is the period between the aircraft landing (wheels on) and arrival at the gate.

³ Our review excluded those with fewer than 100 flights in 1988 and 1997.

⁴ Starting in 1995, BTS—at the request of FAA—began collecting wheels off and wheels on times from the 10 reporting air carriers. Such data now allows FAA (as well as the air carriers, airport operators, and aviation consumer groups) to calculate airport taxi-out, flight, and taxi-in times.

According to representatives from the Federal Aviation Administration (FAA) and the air carriers,⁵ various factors can affect gate-to-gate times, including: airport runway and gate configurations, weather conditions, air carrier operations, volume of air traffic, airport and airway capacity, air traffic control, and airspace design. Although FAA is monitoring many of these factors, additional analysis is needed to identify potential areas for minimizing or avoiding future increases in gate-to-gate times. OIG plans on reviewing the conditions leading to these increases as well as FAA's on-going efforts in this area.

OTHER MATTERS

In our analysis of air carrier data submissions to BTS, we also found an increase in the number of flights reported as having departed prior to scheduled departure. For instance, in 1988 approximately 17 percent of the 10 air carriers' flights were reported as having departed at least 1 minute early. By 1997, this had doubled to nearly 34 percent. Similarly, the number of flights reported as having departed 5 minutes or more early increased from 1 to 4 percent between 1988 and 1997. These trends are supported by air carrier internal policies that allow flights to push back from the gate up to 5 minutes early "*if all confirmed passengers are on board the aircraft.*" We also identified 25 flight numbers involving four air carriers that reported departures 11 minutes or more early at least 25 percent of the time during 1997. While early departures benefit consumers, since such flights have a greater likelihood of arriving on-time or ahead of schedule, those that are regularly departing 11 or more minutes early risk denying walk-up customers the opportunity to board the flight.

RECOMMENDATIONS

Based on our findings, we recommend:

1. Director, BTS, establish one common definition of gate departure and require all air carriers to report accordingly, and work with the two air carriers in question to ensure accurate reporting of their departure data submissions to DOT. If reporting problems persist, BTS should refer the case to DOT's Assistant General Counsel for Aviation Enforcement and Proceedings for possible enforcement action.
2. DOT's Assistant General Counsel for Aviation Enforcement and Proceedings take action to ensure consumers are notified of those flights that regularly depart (e.g., 25 percent or greater) 11 or more minutes early.

⁵ FAA representatives included management officials from the Office of Aviation Policy and Plans, Office of Airport Planning and Programming, and Air Traffic Control System Command Center, Herndon, Virginia. Air carrier representatives ranged from senior systems analysts to Vice Presidents in charge of operations.

We also suggest FAA further assess the conditions leading to increases in gate-to-gate times on domestic flight routes and work with relevant stakeholders (e.g., air carriers and airport operators) in identifying and implementing cost-effective solutions.

FINDINGS

AIR CARRIERS USE DIFFERENT METHODS FOR REPORTING GATE DEPARTURE

Title 14, CFR, Chapter II, Part 234.4, Reporting on On-Time Performance, states: “actual . . . departure time shall be measured by the time at which the aircraft departed from the gate or passenger loading area.” No further guidance, such as what is considered actual departure, is provided by DOT on determining gate departure times. As a consequence, the 10 air carriers are using four different methods for reporting departure times (see following table).

Table 1: Air Carrier Methods for Reporting Gate Departures

Air Carriers	Gate Departure Methods
American, Northwest, and United	➤ Releasing aircraft parking brake.
Alaska, America West, and Southwest	➤ Rolling of aircraft wheels.
Continental and Delta	➤ Closing aircraft passenger and/or cargo doors.
Trans World Airlines and US Airways	➤ Closing aircraft doors and releasing parking brake.

Based on our analysis of the 794 flights that we observed unannounced at 14 airports, we found that these different methods can result in variations in reported departure times. For instance, of the seven air carriers using the release of the parking brake and/or closing of the passenger/cargo doors as a definition of gate departure, we found their reported times, on average, were 2 minutes earlier than our observed times (which were based on wheels rolling). For individual air carriers, the average variance between their reported times and our observations ranged from a low of 1 minute early to a high of nearly 4 minutes early. Table 2 notes the number and percentage of reported departure times that were earlier than, equivalent to, or later than our observed times.

Table 2: Comparison of the Seven Air Carriers Reported Departure Times with OIG Observed Departure Times

	Earlier Than OIG Observed Times	Equivalent to OIG Observed Times	Later Than OIG Observed Times	Total
Number of Flights:	383	191	28	602
Percentage:	63.6%	31.7%	4.7%	100%

Although these variances had little effect on the flights we observed (i.e., the flight would have been recorded as departing on time or late no matter which method was used),⁶ they do indicate the potential advantage one methodology may have over another in reporting departure times, especially when only 1 minute can make the difference between a flight being on time or late. To ensure consistency of departure data, one method should be required for all air carriers.

TWO AIR CARRIERS MAY BE REPORTING INACCURATE DEPARTURE TIMES

In fulfilling DOT’s data reporting requirements, air carriers use a combination of electronic and manual systems for collecting flight data. Those using an electronic system rely on the Aircraft Communication Addressing and Reporting System (ACARS).⁷ ACARS is an air/ground satellite communication network that receives transmissions from an aircraft’s onboard computer system, which is then transmitted to the air carriers’ host computer. The system, which is maintained by Aeronautical Radio, Incorporated, costs about \$60,000 per aircraft to install. Beyond recording departure and arrival times, ACARS supports a number of air traffic control and operational requirements of the participating air carriers. Of the 10 reporting air carriers, only 3 do not use ACARS, relying instead on their pilots, gate agents, and/or ground crews to manually record departure times.⁸

In our analysis of the three non-ACARS air carriers, we found significant discrepancies between our observed times and those reported by two of the air carriers. All three air carriers used wheels rolling as their method for defining gate departure (which we also used). For one of the three air carriers, the variance between our observed times and theirs was less than 30 seconds (the lowest level for any of the 10 air carriers). For the other two air carriers, however, their reported times averaged more than 3 minutes earlier than our observed times. The

⁶ If wheels rolling had been the standard methodology for determining gate departure for the seven air carriers, 17 additional flights would have been classified as delayed departures—resulting in a 2.8 percent reduction in the carriers’ on-time departures (i.e., 82.7 to 79.9 percent).

⁷ DOT does not require air carriers to use ACARS, or any other electronic or manual reporting system.

⁸ Of the remaining seven air carriers, four use ACARS exclusively and three use a combination of ACARS and manual reporting systems.

following chart illustrates the distribution of the two air carriers' observed departures (i.e., 66) by the variance between their reported times and those recorded by the OIG. Furthermore, for one of the two air carriers, we observed 16 of 37 flights in which the air carrier had reported gate departure (i.e., wheels rolling) even though we observed the passenger door had not yet been closed (see Table 3). In one case, the air carrier reported wheels rolling 8 minutes before we observed the passenger door being closed and 10 minutes before the aircraft's wheels began rolling.

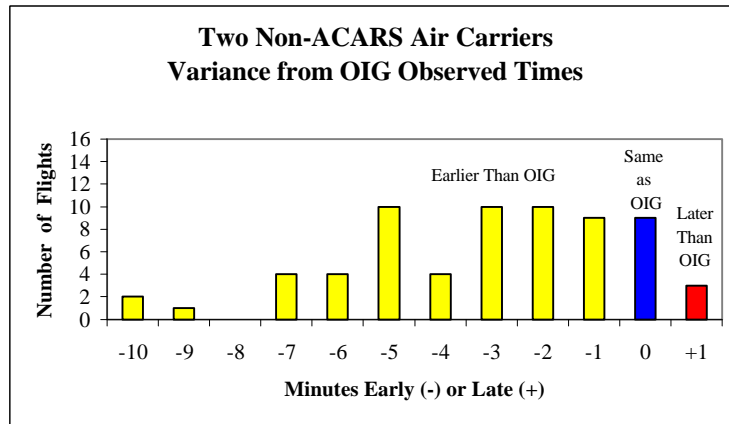


Table 3: Flights in Which Gate Departure Was Reported Prior to Closing The Passenger Door

No	Scheduled Departure Time	Airline Reported Wheels Rolling	OIG Recorded Passenger Door Closed	Minute Variance	OIG Recorded Wheels Rolling	Minute Variance
1	10:00 AM	10:00 AM	10:08 AM	8	10:10 AM	10
2	2:29 PM	2:34 PM	2:39 PM	5	2:40 PM	6
3	9:11 AM	9:30 AM	9:34 AM	4	9:37 AM	7
4	10:39 AM	10:45 AM	10:49 AM	4	10:52 AM	7
5	9:35 AM	9:35 AM	9:39 AM	4	9:40 AM	5
6	9:07 AM	9:07 AM	9:10 AM	3	9:14 AM	7
7	6:30 AM	6:30 AM	6:33 AM	3	6:35 AM	5
8	11:57 AM	11:57 AM	12:00 PM	3	12:02 PM	5
9	3:00 PM	3:30 PM	3:32 PM	2	3:34 PM	4
10	1:18 PM	1:18 PM	1:20 PM	2	1:21 PM	3
11	11:00 AM	11:00 AM	11:02 AM	2	11:03 AM	3
12	11:05 AM	11:05 AM	11:06 AM	1	11:10 AM	5
13	12:00 PM	12:10 PM	12:11 PM	1	12:15 PM	5
14	1:24 PM	1:24 PM	1:25 PM	1	1:28 PM	4
15	8:38 AM	8:38 AM	8:39 AM	1	8:40 AM	2
16	7:01 AM	7:01 AM	7:02 AM	1	7:03 AM	2

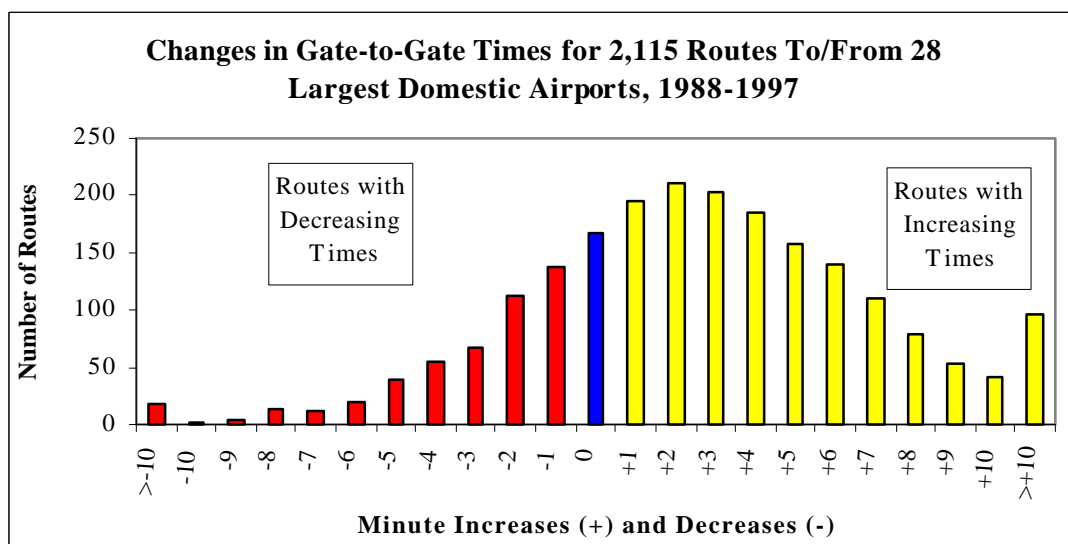
In discussion with officials from the two non-ACARS air carriers, both indicated that they suspected that their flight crews may be incorrectly reporting departure times. An Executive Vice President of one of the air carriers pointed to the financial incentives for flight crews to report early departures.⁹ Nevertheless, both

⁹ Since flight crew pay for 9 of the 10 air carriers is based on the greater of actual or scheduled gate-to-gate times, any inaccurate reporting that would add time to the overall flight (i.e., early departures or late arrival) would increase the likelihood of the flight crew receiving more pay.

air carriers noted that they have been unable to prove their suspicions—in part due to their reliance on a manual system based on “self-reporting.”

*GATE-TO-GATE TIMES HAVE INCREASED ON
MOST DOMESTIC ROUTES*

Because a flight can have an on-time gate departure, but still expend considerable amounts of time on the runway or in the air, we did an initial look at whether gate-to-gate times had increased on domestic routes, and, if so, how much of this increase was attributable to additional taxi-out, flight, or taxi-in time. As illustrated by the following chart, we found that actual gate-to-gate times had increased on most domestic flight routes departing from or arriving at the



28 largest U.S. airports between 1988 and 1997, with the remaining routes either decreasing or showing no change. Overall, 1,544 of 2,115 routes¹⁰ (or 73 percent)¹¹ had increased gate-to-gate times.

Of these routes, we identified 113 with increases of 10 to 20 minutes (see Appendix B).¹² Table 4 (see following page) lists the 10 routes with the largest increases in actual gate-to-gate times between 1988 and 1997. Such increases not only affect the flying public (especially those routes with increases of 15 minutes or more), but also result in significant monetary costs to the air carriers. Based on figures provided by the air carriers, we estimate that overall increases in gate-to-gate times—which averaged nearly 3 minutes—may have cost the 10 air carriers

¹⁰ This sample comprised over 4.5 million flights, representing approximately 86 percent of all commercial departures for the 10 air carriers in 1997.

¹¹ As an additional measure, we examined the 200 highest volume routes in 1997 for changes in gate-to-gate times. Our findings, which are listed in Appendix C, also concluded that gate-to-gate times had increased on nearly 75 percent of these routes between 1988 and 1997.

¹² In comparison, the largest decrease was 20:49 minutes for the Seattle, WA to Newark, NJ route.

between \$275 to \$553 million in additional operating expenditures (e.g., crew pay, maintenance, and fuel) in 1997.

Table 4: Routes with Largest Increases in Gate-to-Gate Times, 1988-1997

No.	Departure Airport	Arrival Airport	Flights in 1997	1988-97 (minutes)
1	Atlanta, GA	San Diego, CA	1,080	+20:14
2	Philadelphia, PA	Kennedy, NY	198	+19:35
3	Newark, NJ	Los Angeles, CA	4,678	+19:01
4	Newark, NJ	San Juan, PR	2,043	+17:55
5	LaGuardia, NY	Louisville, KY	304	+17:48
6	Anchorage, AK	Chicago O'Hare, IL	189	+17:28
7	Philadelphia, PA	Kansas City, MO	1,009	+16:51
8	Dayton, OH	Dallas/Ft. Worth, TX	719	+16:20
9	Philadelphia, PA	Sarasota, FL	162	+15:59
10	Kennedy, NY	San Juan, PR	3,121	+15:53

In further analysis of these increases,¹³ we found some routes—when grouped by airport—had significantly higher increases in gate-to-gate times than others.¹⁴ For example, routes departing Boston, Kennedy, Miami, and Newark had average increases in gate-to-gate times of 5 to 7-1/2 minutes between 1988 and 1997 (see Table 5). In comparison, those routes departing Baltimore, Denver, and O'Hare had decreases in average gate-to-gate times. We also found that, in many instances, much of the change in gate-to-gate times for these routes occurred between 1995 and 1997. This was the case with routes departing Boston, Denver, Kennedy, Newark, and O'Hare, in which over 50 percent of the increases in gate-to-gate times occurred during the last 3 years (see Appendix D).

Table 5: Changes in Gate-to-Gate Times for Routes Departing Selected Domestic Airports

Routes Departing From	Commercial Departures in 1997*	Change 1995-97	Change 1988-97
Newark, NJ	166,817	+4:01	+7:29
Miami, FL	154,353	+0:05	+6:34
Boston, MA	121,165	+3:55	+5:39
Kennedy, NY	112,622	+2:45	+5:11
O'Hare, IL	371,132	+0:44	-0:05
Denver, CO	170,937	+0:44	-1:56
Baltimore, MD	77,199	-0:11	-1:58

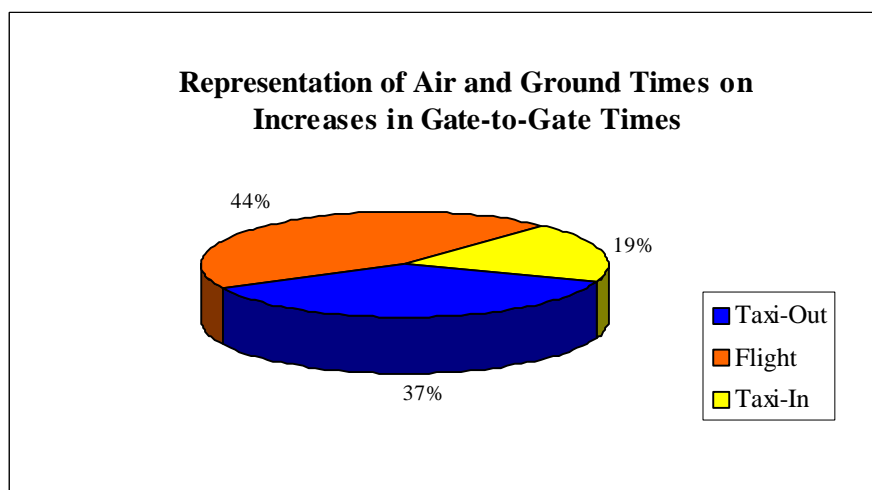
* Source: FAA.

¹³ We found the air carriers, in an effort to compensate for growing actual times, had increased their scheduled times on nearly 75 percent of the 200 highest volume domestic routes. We also found that the extent to which scheduled times exceeded actual times increased, on average, from 27 to 42 seconds between 1988 and 1997—giving air carriers a small, but growing, buffer for achieving on-time arrivals.

¹⁴ We limited our analysis to those routes with 100 or more flights in 1988 and 1997.

BOTH GROUND AND AIR TIMES ARE MAJOR CAUSES OF INCREASES IN GATE-TO-GATE TIMES

As illustrated by the following chart, flight time (44 percent) comprised the largest portion of increases in actual gate-to-gate times between 1995 and 1997, followed by taxi-out (37 percent) and taxi-in (19 percent) times.



The relative importance of ground and flight times, however, also varied by airport. For example, between 1995 and 1997, the average gate-to-gate times for routes departing both Newark and Boston increased by approximately 4 minutes. Yet, taxi-out time represented over 82 percent of the increases in gate-to-gate times for those routes departing Newark and only 32 percent of those routes departing Boston. For the Boston routes, the leading factor was flight time, which represented 61 percent of the increases in gate-to-gate time (see Appendix D). Table 6 illustrates how taxi-out, flight, and taxi-in times affected the 10 routes with the largest increases in actual gate-to-gate times between 1995 and 1997.

Table 6: Impact of Taxi-Out, Flight, and Taxi-In Times on Top 10 Routes, 1995-97 (In Minutes)

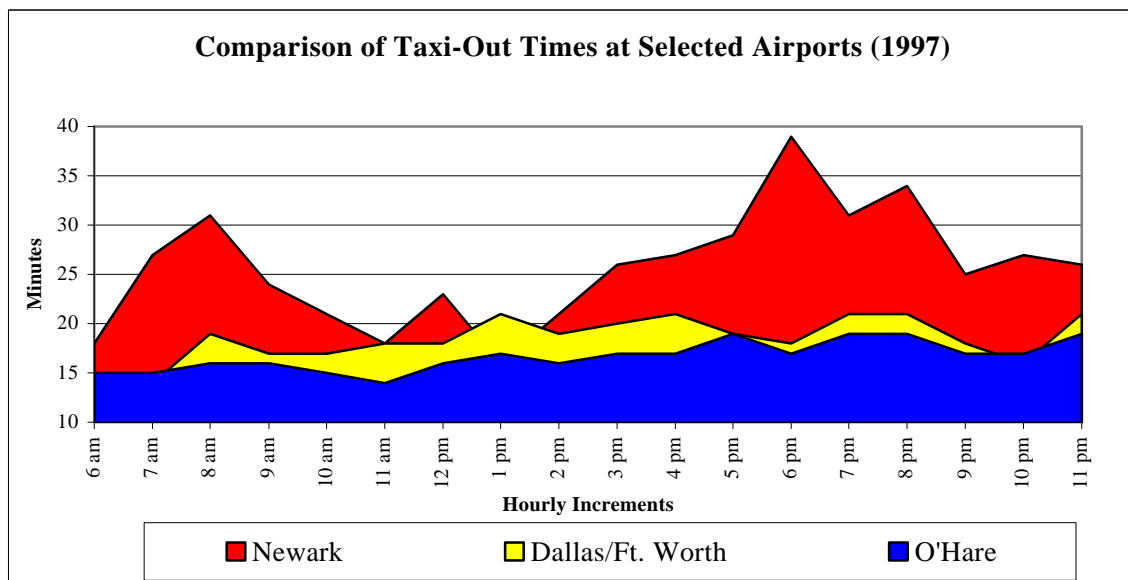
No.	Origin Departure Airport	Destination Arrival Airport	Ground Time		Air Time	Increase
			Taxi-Out	Taxi-In	Flight	Total
1	Newark, NJ	Dallas/Ft. Worth, TX	+5:14	+1:19	+0:21	+6:55
2	Boston, MA	Dallas/Ft. Worth, TX	+0:57	+1:55	+3:43	+6:35
3	Charlotte, NC	Atlanta, GA	+2:44	+0:28	+3:06	+6:16
4	Denver, CO	Salt Lake City, UT	+0:25	+0:30	+4:36	+5:31
5	Boston, MA	Philadelphia, PA	+1:16	+1:21	+2:35	+5:13
6	LaGuardia, NY	Dallas/Ft. Worth, TX	+1:16	+1:05	+2:52	+5:11
7	Philadelphia, PA	Atlanta, GA	+2:43	+0:22	+1:58	+5:02
8	Newark, NJ	Los Angeles, CA	+4:47	+1:36	-1:22	+5:01
9	Newark, NJ	Boston, MA	+5:08	-0:58	+0:46	+4:56
10	Philadelphia, PA	Orlando, FL	+3:10	-0:34	+2:03	+4:39

* The areas with the highest increases are highlighted.

INCREASES IN GROUND TIME VARIED BY AIRPORT AND TIME OF DAY

In an analysis of ground times at the 28 airports, we found that average taxi-out and taxi-in times ranged from 11 to 26 minutes and 3 to 10 minutes, respectively, in 1997. We also found that between 1995 and 1997, average taxi-out times had increased between 1 and 4 minutes at 12 of the airports and decreased 1 minute at 6 airports, with the remainder showing no change. In contrast, only 8 airports witnessed any change in their average taxi-in times—which in all cases were either an increase or decrease of 1 minute. (See Appendix E and F for a listing of taxi-out and taxi-in times for the 28 airports for 1995 and 1997.) When divided by hourly increments, however, we identified several airports that witnessed larger increases between 1995 and 1997—especially in taxi-out times. For example, Newark’s average taxi-out time increased 9 minutes (30 to 39) at the 6:00-7:00 PM time period.¹⁵ Likewise, Philadelphia’s average taxi-out time increased 7 minutes (10 to 17) at the 9:00-10:00 PM time period. Such increases, however, tended to be the exception, with most airports experiencing smaller increases (or decreases).

The following chart illustrates the significant variance between three of the largest U.S. airports with respect to hourly taxi-out times. For example, Newark’s taxi-out times ranged between 16 and 39 minutes, with sizable increases occurring in the morning and early evening time periods. In comparison, taxi-out times for Dallas/Ft. Worth and O’Hare (which handle roughly twice the volume of



¹⁵ Of the 28 airports, Newark also had the highest number of taxi-out times that were 1 hour or more in 1997. Totalling 3,869, these incidents represented 3.27 percent of all departures from Newark and were more than double the airport’s 1995 total. New York’s Kennedy airport had the second-highest percentage of taxi-out times at least 1 hour, with 2.24 percent of all its 1997 departures.

commercial departures as Newark) were more constant, ranging between 14 and 21 minutes and 14 and 19 minutes, respectively.¹⁶

According to representatives from FAA and the air carriers, various factors can affect gate-to-gate times, including: airport runway and gate configurations, weather conditions, air carrier operations, volume of air traffic, airport and airway capacity, air traffic control, and airspace design. Such factors, which will be the subject of future OIG audits, need to be analyzed in order to identify potential areas for minimizing or avoiding future increases in gate-to-gate times. Although FAA is monitoring many of these factors and their impact on air travel, we suggest the Agency further assess the conditions leading to increases in gate-to-gate times on domestic flight routes and work with relevant stakeholders (e.g., air carriers and airport operators) in identifying and implementing cost-effective solutions.

OTHER MATTERS

In our analysis of air carrier data submissions to BTS, we also identified an increase in the number of flights reported as having departed prior to scheduled departure. For instance, in 1988 approximately 17 percent of the 10 air carriers' flights were reported as having departed at least 1 minute early. By 1997, this had doubled to nearly 34 percent. Similarly, the number of flights reported as having departed 5 minutes or more early increased from 1 to 4 percent between 1988 and 1997. These trends are supported by air carrier internal policies that allow flights to push back from the gate up to 5 minutes early "*if all confirmed passengers are on board the aircraft.*"¹⁷ We also identified 25 flight numbers involving four air carriers which reported departures 11 minutes¹⁸ or more early at least 25 percent of the time during 1997 (see Table 7 on the following page).

Based on our discussions with the four air carriers, most of these early departures involved short-haul routes between small markets. In these cases, few local passengers normally boarded, since the flights were continuations from larger markets. For example, five of Northwest's seven flight numbers were short-haul flights, originating from Minneapolis-St. Paul, through Kalamazoo, to Lansing, Michigan—with few passengers ever boarding at Kalamazoo. According to a Northwest official, once all confirmed passengers were on board these flights and

¹⁶ While taxi-in times also varied by time of day, the variances tended to be far smaller than those associated with taxi-out times (e.g., Newark's average taxi-out times ranged from a low of 16 minutes to a high of 39 minutes in 1997, as compared to its taxi-in times of 6 to 9 minutes). See Appendix F for a complete listing of taxi-in times for each of the 28 airports.

¹⁷ Specifically, 5 of the 10 air carriers cited internal policies or guidelines allowing flights to depart early if all confirmed passengers were on board the aircraft. Two other air carriers had guidelines with respect to closing the passenger door 2 to 5 minutes early.

¹⁸ All 10 air carriers require ticketed passengers to check in at least 10 minutes prior to scheduled departure or risk losing their seats on the aircraft.

a check for walk-up passengers had been made at the local ticket counter and gate area, the airline made the decision to depart.

Table 7: Flights Regularly Departing 11+ Minutes Early, 1997

No.	Air Carrier	Flight	Departure Airport	Arrival Airport	Flights 11+ Min. Early	Total Flights	% of Total
1	TWA	601	Lincoln, NB	Sioux Falls, SD	20	24	83.33%
2	Northwest	1798	Kalamazoo, MI	Lansing, MI	44	59	74.58%
3	Northwest	708	Kalamazoo, MI	Lansing, MI	17	31	54.84%
4	Northwest	707	Great Falls, MT	Missoula, MT	175	346	50.58%
5	Delta	224	Portland, ME	Bangor, ME	46	94	48.94%
6	Delta	1517	Montgomery, AL	Monroe, LA	159	358	44.41%
7	Delta	752	Portland, OR	Dallas/Ft Worth, TX	79	185	42.70%
8	Northwest	709	Great Falls, MT	Missoula, MT	112	264	42.42%
9	Delta	1936	Pasco, WA	Spokane, WA	95	244	38.93%
10	Delta	537	Harrisburg, PA	Allentown, PA	56	147	38.10%
11	Northwest	1733	Kalamazoo, MI	Lansing, MI	20	53	37.74%
12	Northwest	1264	Kalamazoo, MI	Lansing, MI	19	51	37.25%
13	Northwest	1702	Kalamazoo, MI	Lansing, MI	40	114	35.09%
14	Delta	2244	Mobile, AL	Pensacola, FL	119	351	33.90%
15	Delta	599	Fort Myers, FL	Sarasota/Bradenton, FL	46	149	30.87%
16	Delta	1894	Tulsa, OK	Oklahoma City, OK	110	361	30.47%
17	Delta	1540	Anchorage, AK	Fairbanks, AK	33	113	29.20%
18	Delta	1282	Pasco, WA	Spokane, WA	27	94	28.72%
19	Delta	1088	Pasco, WA	Spokane, WA	6	21	28.57%
20	Delta	1912	Shreveport, LA	Monroe, LA	101	357	28.29%
21	Delta	880	Daytona Beach, FL	Atlanta, GA	40	149	26.85%
22	Delta	340	Albany, NY	Portland, ME	92	347	26.51%
23	American	5	Honolulu, HI	Kahului/Maui, HI	95	365	26.03%
24	Delta	721	Portland, ME	Bangor, ME	38	147	25.85%
25	TWA	255	Sacramento, CA	Reno, NV	7	28	25.00%

While early departures benefit the traveling public, since such flights have a greater likelihood of arriving on-time or ahead of schedule, significantly early departures risk denying a walk-up customer an opportunity to board the flight. Consumers, therefore, should be given adequate notice of those flights that are regularly departing 11 or more minutes early. Such notification would minimize the risk of walk-up customers—who are relying on the air carriers’ published departure schedules—of missing flights that, in some cases, are departing 50 minutes or more early.¹⁹

¹⁹ For example, Northwest Flight 1798 between Kalamazoo to Lansing, MI, had 13 flights that departed between 50 and 66 minutes early in 1997.

RECOMMENDATIONS

We make the following recommendations:

1. Director, BTS, establish one common definition of gate departure and require all air carriers to report accordingly, and work with the two non-ACARS air carriers in question to ensure accurate reporting of their departure data submissions to DOT. If reporting problems persist, BTS should refer the case to DOT's Assistant General Counsel for Aviation Enforcement and Proceedings for possible enforcement action.²⁰
2. DOT's Assistant General Counsel for Aviation Enforcement and Proceedings take action to ensure consumers are notified of those flights that regularly depart (e.g., 25 percent or greater) 11 or more minutes early.

MANAGEMENT COMMENTS

Senior DOT officials agreed with our report findings and recommendations. The Director, Office of Airline Information, noted that BTS will establish a uniform definition of gate departure and require all air carriers to report accordingly. They will also work with the two non-ACARS air carriers in question to ensure accurate reporting of their departure data submissions to DOT. The Assistant General Counsel for Aviation Enforcement and Proceedings noted that they will include in the Department's Air Travel Consumer Report a monthly listing of those flights²¹ which regularly depart (i.e., 25 percent or greater) 11 or more minutes early.

ACTION REQUIRED

Please provide written comments within 30 days on specific actions taken or planned. We appreciate the courtesies and assistance of DOT and air carrier representatives. If you have any questions, or require additional information, please contact me at (202) 366-1992, or Mark Dayton at (202) 366-2001.

²⁰ Section 46310 of Title 49, USC, "Reporting and Recordkeeping Violations," provides for air carriers and their officers, agents, and employees to be fined under Title 18 (the criminal code) for the intentional filing of a false report or record.

²¹ Excluded from this list will be shuttle flights. Since additional aircraft are frequently brought in—if needed—to accommodate subsequent walk-up passengers, there is little or no impact to consumers from early departures involving shuttle flights.

AUDIT SCOPE AND METHODOLOGY

We met with DOT representatives from the Office of Aviation Enforcement and Proceedings; Office of Airline Information, BTS; and FAA's Office of Aviation Policy and Plans, Office of Airport Planning and Programming, and Air Traffic Control System Command Center, Herndon, Virginia. We also interviewed representatives from the 10 reporting air carriers, Aeronautical Radio Incorporated, Aviation Consumer Action Project, and Air Travelers Association.

To determine the accuracy of the air carriers' reported data, we recorded—through unannounced²² on-site observations at 14 airports—the departure times of 794 flights during June and July 1998. The airports included: Atlanta, Baltimore, Chicago O'Hare, Dallas/Ft. Worth, Dallas Love Field, Houston Intercontinental, John F. Kennedy, LaGuardia, Minneapolis, Newark, Phoenix, Seattle, St. Louis, and Washington National. We also obtained and analyzed air carrier data submissions to BTS for 1988 to 1997 to assess changes in departure times and flight schedules, as well as taxi-out and taxi-in times at the 28 largest domestic airports.

The audit was conducted from May to October 1998, and was performed in accordance with Government Auditing Standards prescribed by the Comptroller General of the United States.

²² None of the 10 air carriers were notified of our activities at the 14 airports until after our observations had been completed.

APPENDIX B

**113 ROUTES WITH INCREASES IN GATE-TO-GATE TIMES OF
10 MINUTES OR MORE, 1988-1997**

No.	Departure Airport	Arrival Airport	No. of Flights 1997	Average Gate-to-Gate Time 1988	Average Gate-to-Gate Time 1997	Change 1988-97 (minutes)
1	Atlanta, GA	San Diego, CA	1,080	4:12:25	4:32:38	+20:14
2	Philadelphia, PA	NY Kennedy, NY	198	0:51:19	1:10:54	+19:35
3	Newark, NJ	Los Angeles, CA	4,678	5:37:59	5:57:00	+19:01
4	Newark, NJ	San Juan, PR	2,043	3:37:20	3:55:16	+17:55
5	NY LaGuardia, NY	Louisville, KY	304	2:00:35	2:18:23	+17:48
6	Anchorage, AK	Chicago O'Hare, IL	189	5:32:07	5:49:35	+17:28
7	Philadelphia, PA	Kansas City, MO	1,009	2:40:05	2:56:56	+16:51
8	Dayton, OH	Dallas/Ft. Worth, TX	719	2:18:54	2:35:14	+16:20
9	Philadelphia, PA	Sarasota, FL	162	2:34:25	2:50:24	+15:59
10	NY Kennedy, NY	San Juan, PR	3,121	3:33:26	3:49:19	+15:53
11	NY Kennedy, NY	Salt Lake City, UT	724	4:48:13	5:04:04	+15:51
12	Pittsburgh, PA	San Francisco, CA	1,791	5:04:07	5:19:28	+15:21
13	Newark, NJ	Kansas City, MO	1,099	2:55:28	3:10:47	+15:19
14	Boston, MA	Ft. Lauderdale, FL	462	3:06:10	3:11:28	+15:18
15	Miami, FL	Charlotte Amalie, St. Thomas, VI	499	2:27:55	2:42:49	+14:54
16	Phoenix, AZ	Philadelphia, PA	1,379	4:10:44	4:25:25	+14:41
17	Boston, MA	Dallas/Ft. Worth, TX	4,883	3:55:37	4:10:15	+14:38
18	Phoenix, AZ	Atlanta, GA	3,414	3:16:27	3:31:01	+14:34
19	Greensboro, NC	Dallas/Ft. Worth, TX	719	2:40:20	2:54:52	+14:32
20	New Orleans, LA	Salt Lake City, UT	721	3:15:56	3:30:28	+14:32
21	San Juan, PR	NY Kennedy, NY	3,103	3:37:01	3:51:31	+14:31
22	Boston, MA	Tampa, FL	1,755	3:04:49	3:19:17	+14:29
23	Boston, MA	Miami, FL	1,706	3:08:57	3:23:08	+14:11
24	Newark, NJ	Nashville, TN	1,006	2:14:57	2:29:06	+14:09
25	Ft. Myers, FL	Dallas/Ft. Worth, TX	299	2:41:32	2:55:07	+13:35
26	Huntsville, AL	Atlanta, GA	2,855	0:42:52	0:56:17	+13:25
27	San Juan, PR	Atlanta, GA	1,769	3:37:36	3:51:01	+13:25
28	Miami, FL	Boston, MA	1,705	2:58:43	3:12:06	+13:23
29	Detroit, MI	Atlanta, GA	4,668	1:45:55	1:59:08	+13:13
30	Ft. Wayne, IN	Atlanta, GA	362	1:28:19	1:41:24	+13:05
31	NY LaGuardia, NY	Kansas City, MO	563	2:58:35	3:11:40	+13:05
32	Detroit, MI	Portland, OR	634	4:33:22	4:46:20	+12:59
33	Newark, NJ	Atlanta, GA	7,117	2:12:51	2:25:46	+12:55
34	Newark, NJ	Indianapolis, IN	1,023	2:02:03	2:14:58	+12:55
35	Colorado Springs, CO	Las Vegas, NV	252	1:39:14	1:52:07	+12:53
36	Pittsburgh, PA	Phoenix, AZ	1,177	4:15:55	4:28:43	+12:48
37	Phoenix, AZ	Milwaukee, WI	728	3:11:34	3:24:22	+12:47
38	Philadelphia, PA	San Juan, PR	1,748	3:32:31	3:45:10	+12:38
39	Anchorage, AK	Portland, OR	213	3:15:54	3:28:28	+12:34
40	Greensboro, NC	Atlanta, GA	2,583	1:07:56	1:20:31	+12:34
41	Pittsburgh, PA	Las Vegas, NV	932	4:27:46	4:40:19	+12:33
42	Ft. Myers, FL	Cincinnati, OH	724	2:09:28	2:22:01	+12:33
43	Charlotte, NC	Minneapolis, MN	1,777	2:34:19	2:46:44	+12:26
44	San Juan, PR	Newark, NJ	2,040	3:49:34	4:02:00	+12:26
45	Atlanta, GA	Phoenix, AZ	3,424	3:45:29	3:57:50	+12:21
46	Miami, FL	St. Louis, MO	1,503	2:42:47	2:55:07	+12:20
47	Boston, MA	Richmond, VA	292	1:32:05	1:44:19	+12:14
48	Newark, NJ	Dallas/Ft. Worth, TX	5,392	3:36:16	3:48:26	+12:11
49	Pittsburgh, PA	Los Angeles, CA	1,869	4:52:02	5:04:12	+12:10
50	Louisville, KY	Dallas/Ft. Worth, TX	1,066	2:03:08	2:15:16	+12:08
51	Dallas/Ft. Worth, TX	Dayton, OH	717	2:05:29	2:17:35	+12:06

APPENDIX B

113 ROUTES WITH INCREASES IN GATE-TO-GATE TIMES OF
10 MINUTES OR MORE, 1988-1997 (CONTINUED)

No.	Departure Airport	Arrival Airport	No. of Flights 1997	Average Gate-to-Gate Time 1988	Average Gate-to-Gate Time 1997	Change 1988-97 (minutes)
52	Boston, MA	Salt Lake City, UT	717	5:01:37	5:13:41	+12:04
53	Newark, NJ	Rochester, NY	338	1:07:36	1:19:40	+12:04
54	Newark, NJ	St. Louis, MO	2,953	2:32:37	2:44:38	+12:02
55	Cincinnati, OH	San Diego, CA	1,170	4:12:15	4:24:16	+12:01
56	Cleveland, OH	Atlanta, GA	3,604	1:36:42	1:48:42	+12:00
57	Boston, MA	Orlando, FL	4,552	2:55:44	3:07:40	+11:56
58	NY LaGuardia, NY	Dallas/Ft. Worth, TX	6,988	3:38:33	3:50:22	+11:49
59	Atlanta, GA	Las Vegas, NV	1,295	4:01:38	4:13:26	+11:48
60	Dallas/Ft. Worth, TX	Los Angeles, CA	7,777	3:03:53	3:15:35	+11:43
61	Phoenix, AZ	Charlotte, NC	365	3:42:02	3:53:42	+11:40
62	Charlotte, NC	Dallas/Ft. Worth, TX	3,820	2:36:45	2:48:22	+11:37
63	Newark, NJ	Charleston, SC	558	1:57:28	2:09:03	+11:35
64	Orlando, FL	Providence, RI	1,863	2:25:37	2:37:11	+11:34
65	Miami, FL	Cincinnati, OH	1,085	2:23:41	2:35:11	+11:30
66	Toledo, OH	Atlanta, GA	721	1:34:56	1:46:26	+11:30
67	San Juan, PR	Chicago O'Hare, IL	1,595	4:47:10	4:58:39	+11:29
68	Birmingham, AL	Atlanta, GA	3,229	0:45:46	0:57:13	+11:26
69	Newark, NJ	Columbia, SC	338	1:50:53	2:02:20	+11:26
70	Greenville, SC	Atlanta, GA	2,932	0:47:23	0:58:49	+11:26
71	Miami, FL	San Juan, PR	2,906	2:22:30	2:33:53	+11:23
72	Indianapolis, IN	Las Vegas, NV	362	3:43:07	3:54:26	+11:19
73	Richmond, VA	Newark, NJ	1,114	1:07:30	1:18:49	+11:19
74	San Antonio, TX	Newark, NJ	338	3:37:52	3:49:11	+11:19
75	Charlotte, NC	Phoenix, AZ	364	4:18:15	4:29:32	+11:17
76	NY Kennedy, NY	Seattle, WA	928	5:44:41	5:55:56	+11:16
77	Dayton, OH	Newark, NJ	406	1:37:42	1:48:53	+11:11
78	Philadelphia, PA	San Francisco, CA	1,968	5:45:34	5:56:44	+11:10
79	Dallas/Ft. Worth, TX	Des Moines, IA	722	1:41:46	1:52:52	+11:07
80	Charlotte, NC	Seattle, WA	421	5:24:45	5:35:51	+11:06
81	West Palm Beach, FL	St. Louis, MO	208	2:41:08	2:52:10	+11:02
82	Philadelphia, PA	Wilkes-Barre, PA	353	0:36:14	0:47:14	+11:00
83	Ft. Myers, FL	Atlanta, GA	2,804	1:34:12	1:45:11	+10:59
84	Newark, NJ	Dayton, OH	389	1:45:32	1:56:17	+10:44
85	St. Louis, MO	Los Angeles, CA	2,296	3:46:26	3:57:09	+10:43
86	Newark, NJ	Richmond, VA	1,118	1:15:14	1:25:55	+10:40
87	Houston Intercontinental, TX	Nashville, TN	1,037	1:40:23	1:51:02	+10:39
88	Phoenix, AZ	Indianapolis, IN	729	3:11:35	3:22:14	+10:39
89	Charlotte Amalie, St. Thomas, VI	Miami, FL	499	2:43:31	2:54:09	+10:38
90	Cincinnati, OH	Dallas/Ft. Worth, TX	2,843	2:15:19	2:25:56	+10:37
91	Raleigh-Durham, NC	Detroit, MI	1,567	1:39:22	1:49:58	+10:35
92	Salt Lake City, UT	New Orleans, LA	720	3:00:38	3:11:13	+10:34
93	Anchorage, AK	Seattle, WA	7,150	3:08:57	3:19:29	+10:32
94	Billings, MT	Minneapolis, MN	1,059	1:51:13	2:01:44	+10:31
95	Gunnison, CO	Dallas/Ft. Worth, TX	120	1:46:10	1:56:41	+10:31
96	Detroit, MI	Dallas/Ft. Worth, TX	4,052	1:42:10	2:52:41	+10:31
97	Philadelphia, PA	St. Louis, MO	2,001	2:19:43	2:30:08	+10:25
98	St. Louis, MO	Ontario, CA	712	3:47:06	3:57:28	+10:22
99	Cincinnati, OH	Newark, NJ	2,090	1:44:42	1:55:00	+10:18
100	Dallas/Ft. Worth, TX	Charlotte, NC	3,838	2:13:47	2:24:05	+10:18
101	Newark, NJ	Cleveland, OH	2,710	1:30:45	1:41:00	+10:15
102	NY LaGuardia, NY	Indianapolis, IN	902	2:04:26	2:14:40	+10:13
103	Philadelphia, PA	Indianapolis, IN	1,324	1:47:59	1:58:10	+10:11

**113 ROUTES WITH INCREASES IN GATE-TO-GATE TIMES OF
10 MINUTES OR MORE, 1988-1997 (CONTINUED)**

No.	Departure Airport	Arrival Airport	No. of Flights 1997	Average Gate-to-Gate Time 1988	Average Gate-to-Gate Time 1997	Change 1988-97 (minutes)
104	Birmingham, AL	Dallas/Ft. Worth, TX	1,084	1:49:08	1:59:18	+10:10
105	Cleveland, OH	Detroit, MI	2,431	0:45:40	0:55:50	+10:10
106	Las Vegas, NV	Pittsburgh, PA	931	3:59:28	4:09:36	+10:08
107	Minneapolis, MN	Bozeman, MT	780	2:21:29	2:31:34	+10:05
108	Salt Lake City, UT	Minneapolis, MN	2,554	2:19:32	2:29:37	+10:05
109	Philadelphia, PA	Cincinnati, OH	1,430	1:37:40	1:47:44	+10:04
110	Minneapolis, MN	Dallas/Ft. Worth, TX	4,493	2:19:15	2:29:19	+10:04
111	Monroe, LA	Atlanta, GA	361	1:18:47	1:28:50	+10:02
112	Albuquerque, NM	Pittsburgh, PA	371	3:10:58	3:20:59	+10:01
113	Hartford, CT	Atlanta, GA	1,897	2:19:06	2:29:07	+10:01

- Bolded routes are also included in 200 highest volume routes.

**AVERAGE GATE-TO-GATE TIMES FOR THE 200 HIGHEST VOLUME ROUTES
1988-97**

No.	Departure Airport	Arrival Airport	No. of Flights 1997	Average Gate-to-Gate Time 1988	Average Gate-to-Gate Time 1997	Change 1988-97 (minutes)
1	Newark, NJ	Los Angeles, CA	4,678	5:37:59	5:57:00	+19:01
2	Boston, MA	Dallas/Ft. Worth, TX	4,883	3:55:37	4:10:15	+14:38
3	Detroit, MI	Atlanta, GA	4,668	1:45:55	1:59:08	+13:13
4	Newark, NJ	Atlanta, GA	7,117	2:12:51	2:25:46	+12:55
5	Newark, NJ	Dallas/Ft. Worth, TX	5,392	3:36:16	3:48:26	+12:11
6	NY LaGuardia, NY	Dallas/Ft. Worth, TX	6,988	3:38:33	3:50:22	+11:49
7	Dallas/Ft. Worth, TX	Los Angeles, CA	7,777	3:03:53	3:15:35	+11:43
8	Anchorage, AK	Seattle, WA	7,150	3:08:57	3:19:29	+10:32
9	Philadelphia, PA	Atlanta, GA	5,842	1:59:31	2:09:10	+9:38
10	Miami, FL	Chicago O'Hare, IL	4,899	3:01:08	3:10:37	+9:29
11	San Francisco, CA	Dallas/Ft. Worth, TX	4,936	3:14:50	3:23:59	+9:10
12	Charlotte, NC	Atlanta, GA	5,142	1:04:27	1:13:32	+9:05
13	Newark, NJ	Boston, MA	6,691	1:07:15	1:15:57	+8:42
14	NY Kennedy, NY	Los Angeles, CA	7,932	5:44:34	5:53:09	+8:35
15	Salt Lake City, UT	Los Angeles, CA	4,675	1:42:10	1:50:41	+8:31
16	Atlanta, GA	Dallas/Ft. Worth, TX	10,289	2:08:28	2:16:17	+7:49
17	Washington National, DC	Atlanta, GA	4,923	1:43:05	1:50:49	+7:44
18	Los Angeles, CA	Dallas/Ft. Worth, TX	7,796	2:53:45	3:01:26	+7:41
19	Chicago O'Hare, IL	Miami, FL	5,234	2:49:08	2:56:44	+7:36
20	Atlanta, GA	Detroit, MI	5,054	1:45:01	1:52:35	+7:34
21	Seattle, WA	Anchorage, AK	7,179	3:21:24	3:28:58	+7:34
22	Boston, MA	Washington National, DC	5,133	1:29:29	1:36:55	+7:25
23	Chicago O'Hare, IL	Los Angeles, CA	12,014	4:07:22	4:14:44	+7:23
24	St. Louis, MO	Dallas/Ft. Worth, TX	5,655	1:45:17	1:52:37	+7:20
25	Las Vegas, NV	Los Angeles, CA	16,625	0:58:12	1:05:13	+7:01
26	NY LaGuardia, NY	Atlanta, GA	5,578	2:19:13	2:26:00	+6:47
27	Boston, MA	Philadelphia, PA	5,538	1:15:57	1:22:44	+6:47
28	Washington National, DC	Dallas/Ft. Worth, TX	5,280	3:09:35	3:16:04	+6:29
29	Memphis, TN	Atlanta, GA	5,020	1:10:01	1:16:29	+6:28
30	Detroit, MI	Newark, NJ	4,715	1:34:09	1:40:34	+6:25
31	Orlando, FL	Philadelphia, PA	5,513	2:14:20	2:20:45	+6:25
32	Los Angeles, CA	Newark, NJ	4,624	5:01:16	5:07:34	+6:17
33	Miami, FL	Atlanta, GA	5,507	1:47:34	1:53:50	+6:16
34	Minneapolis, MN	Detroit, MI	4,877	1:36:28	1:42:41	+6:13
35	Miami, FL	Dallas/Ft. Worth, TX	4,826	3:03:31	3:09:33	+6:02
36	Newark, NJ	Chicago O'Hare, IL	11,693	2:18:43	2:24:38	+5:55
37	Phoenix, AZ	Dallas/Ft. Worth, TX	6,745	2:11:40	2:17:30	+5:50
38	Dallas/Ft. Worth, TX	Atlanta, GA	10,565	1:58:25	2:04:10	+5:46
39	Dallas/Ft. Worth, TX	San Francisco, CA	4,982	3:36:51	3:42:31	+5:40
40	Atlanta, GA	Newark, NJ	7,110	2:06:03	2:11:37	+5:34
41	Houston Intercontinental, TX	Dallas/Ft. Worth, TX	9,521	1:00:19	1:05:52	+5:33
42	Dallas/Ft. Worth, TX	San Diego, CA	4,693	2:56:10	3:01:43	+5:32
43	Detroit, MI	Chicago O'Hare, IL	7,190	1:07:09	1:12:37	+5:28
44	Tucson, AZ	Phoenix, AZ	5,077	0:37:27	0:42:55	+5:28
45	Seattle, WA	Los Angeles, CA	8,222	2:24:40	2:30:05	+5:25

APPENDIX C

**AVERAGE GATE-TO-GATE TIMES FOR THE 200 HIGHEST VOLUME ROUTES
1988-97 (CONTINUED)**

No.	Departure Airport	Arrival Airport	No. of Flights 1997	Average Gate-to-Gate Time 1988	Average Gate-to-Gate Time 1997	Change 1988-97 (minutes)
46	Atlanta, GA	Miami, FL	6,251	1:41:35	1:46:56	+5:22
47	Newark, NJ	Orlando, FL	5,821	2:37:23	2:42:43	+5:20
48	Dallas/Ft. Worth, TX	Houston Intercontinental, TX	9,643	0:58:01	1:03:19	+5:19
49	St. Louis, MO	Atlanta, GA	4,825	1:31:38	1:36:25	+4:47
50	Chicago Midway, IL	Detroit, MI	5,817	0:53:12	0:57:56	+4:44
51	Denver, CO	Los Angeles, CA	6,305	2:16:59	2:21:44	+4:44
52	Denver, CO	Salt Lake City, UT	4,733	1:20:52	1:25:35	+4:43
53	Dallas/Ft. Worth, TX	NY LaGuardia, NY	7,037	3:10:32	3:15:14	+4:42
54	Dallas/Ft. Worth, TX	St. Louis, MO	5,666	1:40:47	1:45:28	+4:41
55	Portland, OR	Los Angeles, CA	5,019	2:09:26	2:14:05	+4:40
56	Philadelphia, PA	Orlando, FL	5,537	2:21:13	2:25:48	+4:35
57	Atlanta, GA	Philadelphia, PA	5,533	1:51:17	1:55:46	+4:29
58	Salt Lake City, UT	Phoenix, AZ	6,083	1:27:05	1:31:29	+4:24
59	Houston Intercontinental, TX	Atlanta, GA	4,924	1:51:19	1:55:38	+4:19
60	Detroit, MI	Chicago Midway, IL	5,780	0:56:19	1:00:30	+4:11
61	St. Louis, MO	Phoenix, AZ	5,304	3:12:08	3:16:14	+4:06
62	Atlanta, GA	St. Louis, MO	4,826	1:36:17	1:40:18	+4:01
63	Chicago O'Hare, IL	Atlanta, GA	9,818	1:48:28	1:52:23	+3:56
64	Seattle, WA	San Francisco, CA	9,653	1:55:12	1:59:07	+3:55
65	Dallas/Ft. Worth, TX	San Antonio, TX	6,087	1:00:46	1:04:40	+3:54
66	Las Vegas, NV	Phoenix, AZ	11,645	0:56:32	1:00:25	+3:53
67	Dallas/Ft. Worth, TX	Austin, TX	6,702	0:51:41	0:55:34	+3:52
68	St. Louis, MO	Kansas City, MO	7,339	0:59:49	1:03:36	+3:47
69	Chicago O'Hare, IL	Newark, NJ	11,383	1:59:46	2:03:30	+3:44
70	St. Louis, MO	Minneapolis, MN	5,434	1:32:16	1:35:58	+3:42
71	Phoenix, AZ	Las Vegas, NV	12,321	0:56:35	1:00:14	+3:39
72	St. Louis, MO	Houston Hobby, TX	4,930	1:58:19	2:01:56	+3:37
73	Orlando, FL	Atlanta, GA	4,880	1:25:07	1:28:40	+3:32
74	San Antonio, TX	Dallas/Ft. Worth, TX	6,443	1:01:03	1:04:34	+3:31
75	Austin, TX	Dallas/Ft. Worth, TX	6,705	0:54:56	0:58:22	+3:25
76	Boston, MA	Chicago O'Hare, IL	10,478	2:34:32	2:37:55	+3:23
77	Los Angeles, CA	Seattle, WA	7,746	2:28:27	2:31:49	+3:22
78	Dallas/Ft. Worth, TX	Boston, MA	4,896	3:31:33	3:34:55	+3:22
79	San Francisco, CA	Los Angeles, CA	16,455	1:15:32	1:18:49	+3:17
80	Philadelphia, PA	Boston, MA	5,491	1:09:59	1:13:10	+3:11
81	Los Angeles, CA	Chicago O'Hare, IL	11,107	3:50:14	3:53:24	+3:10
82	Las Vegas, NV	Salt Lake City, UT	5,060	1:09:43	1:12:53	+3:10
83	Boston, MA	Newark, NJ	6,696	1:16:28	1:19:37	+3:09
84	St. Louis, MO	Detroit, MI	6,155	1:28:08	1:31:15	+3:07
85	Albuquerque, NM	Phoenix, AZ	6,911	1:07:05	1:10:10	+3:05
86	Philadelphia, PA	Chicago O'Hare, IL	9,798	2:07:34	2:10:37	+3:03
87	Salt Lake City, UT	Las Vegas, NV	5,381	1:12:03	1:15:05	+3:02
88	Houston Intercontinental, TX	Chicago O'Hare, IL	6,261	2:21:14	2:24:14	+3:00
89	Detroit, MI	St. Louis, MO	6,143	1:35:05	1:38:04	+2:59
90	Phoenix, AZ	Tucson, AZ	4,728	0:38:02	0:40:52	+2:50

APPENDIX C

**AVERAGE GATE-TO-GATE TIMES FOR THE 200 HIGHEST VOLUME ROUTES
1988-97 (CONTINUED)**

No.	Departure Airport	Arrival Airport	No. of Flights 1997	Average Gate-to-Gate Time 1988	Average Gate-to-Gate Time 1997	Change 1988-97 (minutes)
91	Phoenix, AZ	Los Angeles, CA	15,014	1:14:59	1:17:41	+2:42
92	Atlanta, GA	Chicago O'Hare, IL	9,965	1:53:15	1:55:52	+2:37
93	Dallas/Ft. Worth, TX	Phoenix, AZ	7,256	2:24:58	2:27:22	+2:23
94	New Orleans, LA	Houston Intercontinental, TX	4,679	1:05:32	1:07:56	+2:23
95	Houston Hobby, TX	St. Louis, MO	4,914	1:51:16	1:53:28	+2:11
96	Chicago O'Hare, IL	Seattle, WA	5,135	4:13:50	4:16:02	+2:11
97	Atlanta, GA	Orlando, FL	5,111	1:19:58	1:22:07	+2:09
98	Chicago O'Hare, IL	Houston Intercontinental, TX	6,222	2:27:32	2:29:41	+2:08
99	Phoenix, AZ	San Francisco, CA	6,740	1:55:32	1:57:33	+2:01
100	Chicago O'Hare, IL	Dallas/Ft. Worth, TX	10,971	2:20:23	2:22:22	+1:58
101	Atlanta, GA	Memphis, TN	5,377	1:12:57	1:14:55	+1:58
102	Seattle, WA	Chicago O'Hare, IL	4,805	3:39:29	3:41:19	+1:50
103	Seattle, WA	Oakland, CA	5,425	1:53:59	1:55:46	+1:47
104	Washington National, DC	Boston, MA	5,161	1:24:56	1:26:42	+1:46
105	San Diego, CA	Phoenix, AZ	7,890	1:02:08	1:03:54	+1:46
106	Atlanta, GA	NY LaGuardia, NY	5,607	2:03:50	2:05:35	+1:45
107	Orlando, FL	Newark, NJ	5,787	2:29:56	2:31:41	+1:45
108	Atlanta, GA	Houston Intercontinental, TX	5,144	2:01:35	2:03:17	+1:41
109	San Francisco, CA	Seattle, WA	9,644	1:53:41	1:55:20	+1:40
110	Phoenix, AZ	Salt Lake City, UT	6,062	1:27:53	1:29:32	+1:39
111	San Diego, CA	Las Vegas, NV	5,538	0:59:02	1:00:40	+1:38
112	NY LaGuardia, NY	Chicago O'Hare, IL	11,556	2:21:05	2:22:40	+1:35
113	Los Angeles, CA	NY Kennedy, NY	7,915	5:08:47	5:10:21	+1:34
114	Dallas/Ft. Worth, TX	Denver, CO	7,781	1:56:26	1:58:01	+1:34
115	Sacramento, CA	Los Angeles, CA	4,880	1:15:34	1:17:01	+1:27
116	Las Vegas, NV	San Diego, CA	5,586	0:56:32	0:57:58	+1:25
117	Los Angeles, CA	Las Vegas, NV	16,418	0:56:43	0:58:07	+1:23
118	Los Angeles, CA	Salt Lake City, UT	4,696	1:42:09	1:43:25	+1:16
119	Chicago O'Hare, IL	Minneapolis, MN	12,643	1:20:53	1:22:08	+1:15
120	San Francisco, CA	Phoenix, AZ	6,762	1:48:54	1:50:05	+1:11
121	Phoenix, AZ	Denver, CO	6,474	1:40:37	1:41:48	+1:11
122	Dallas/Ft. Worth, TX	Newark, NJ	5,383	3:21:40	3:22:50	+1:10
123	Chicago O'Hare, IL	Boston, MA	10,468	2:13:57	2:25:01	+1:04
124	Minneapolis, MN	Chicago O'Hare, IL	12,907	1:14:02	1:15:06	+1:04
125	Ontario, CA	Phoenix, AZ	7,409	1:03:20	1:04:22	+1:02
126	Chicago O'Hare, IL	Detroit, MI	7,524	1:10:08	1:11:11	+1:02
127	Dallas Love Field, TX	San Antonio, TX	4,985	0:52:17	0:53:17	+1:00
128	Houston Intercontinental, TX	New Orleans, LA	4,689	1:00:38	1:01:37	+0:59
129	Phoenix, AZ	Albuquerque, NM	6,603	1:02:08	1:03:07	+0:59
130	Atlanta, GA	Charlotte, NC	5,130	0:58:40	0:59:36	+0:56
131	Denver, CO	Dallas/Ft. Worth, TX	7,409	1:50:19	1:51:12	+0:53
132	Chicago O'Hare, IL	NY LaGuardia, NY	11,006	1:58:01	1:58:49	+0:48

APPENDIX C

**AVERAGE GATE-TO-GATE TIMES FOR THE 200 HIGHEST VOLUME ROUTES
1988-97 (CONTINUED)**

No.	Departure Airport	Arrival Airport	No. of Flights 1997	Average Gate-to-Gate Time 1988	Average Gate-to-Gate Time 1997	Change 1988-97 (minutes)
133	Dallas Love Field, TX	Houston Hobby, TX	10,567	0:52:41	0:53:25	+0:44
134	San Francisco, CA	San Diego, CA	8,786	1:22:24	1:23:05	+0:41
135	Kansas City, MO	St. Louis, MO	7,338	0:58:16	0:58:56	+0:40
136	Phoenix, AZ	San Diego, CA	7,565	1:02:07	1:02:45	+0:38
137	Atlanta, GA	Washington National, DC	4,960	1:36:55	1:37:32	+0:37
138	Seattle, WA	Spokane, WA	5,420	0:52:20	0:52:57	+0:37
139	Houston Hobby, TX	Dallas Love Field, TX	11,366	0:51:13	0:51:50	+0:37
140	Los Angeles, CA	Portland, OR	5,389	2:15:52	2:16:20	+0:28
141	NY Kennedy, NY	San Francisco, CA	5,046	6:08:22	6:08:46	+0:25
142	Denver, CO	Phoenix, AZ	6,472	1:45:50	1:46:14	+0:23
143	Oakland, CA	Seattle, WA	5,458	1:49:40	1:49:57	+0:17
144	Los Angeles, CA	Phoenix, AZ	15,138	1:12:04	1:12:13	+0:10
145	Phoenix, AZ	St. Louis, MO	4,951	2:53:51	2:53:58	+0:07
146	Minneapolis, MN	St. Louis, MO	5,417	1:32:25	1:32:31	+0:05
147	Denver, CO	San Francisco, CA	5,409	2:33:25	2:33:30	+0:05
148	Spokane, WA	Seattle, WA	5,380	0:55:52	0:55:52	+0:01
149	Los Angeles, CA	San Francisco, CA	16,434	1:15:40	1:15:39	-0:01
150	Kansas City, MO	Chicago Midway, IL	5,555	1:10:53	1:10:50	-0:02
151	Dallas/Ft. Worth, TX	Chicago O'Hare, IL	10,286	2:12:51	2:12:47	-0:04
152	San Francisco, CA	Chicago O'Hare, IL	7,248	3:58:41	3:58:31	-0:10
153	Chicago O'Hare, IL	St. Louis, MO	7,616	1:11:53	1:11:39	-0:14
154	Portland, OR	San Francisco, CA	5,966	1:40:00	1:39:46	-0:14
155	San Francisco, CA	Denver, CO	5,238	2:22:18	2:21:58	-0:20
156	Los Angeles, CA	Denver, CO	6,587	2:12:10	1:11:45	-0:25
157	San Diego, CA	San Francisco, CA	8,791	1:24:02	1:23:34	-0:28
158	Phoenix, AZ	Ontario, CA	7,574	1:03:59	1:03:29	-0:30
159	Dallas/Ft. Worth, TX	Washington National, DC	5,282	2:45:13	2:44:41	-0:32
160	Las Vegas, NV	San Francisco, CA	5,980	1:26:23	1:25:49	-0:34
161	San Francisco, CA	NY Kennedy, NY	5,036	5:19:25	5:18:45	-0:40
162	Los Angeles, CA	Sacramento, CA	4,881	1:16:11	1:15:26	-0:45
163	San Francisco, CA	Portland, OR	6,012	1:38:23	1:37:26	-0:56
164	Phoenix, AZ	Chicago O'Hare, IL	5,033	3:15:35	3:14:29	-1:05
165	Oakland, CA	Los Angeles, CA	12,308	1:12:47	1:11:40	-1:08
166	NY LaGuardia, NY	Boston, MA	6,054	1:04:22	1:03:13	-1:09
167	San Francisco, CA	Burbank, CA	4,657	1:06:13	1:05:04	-1:10
168	Phoenix, AZ	El Paso, TX	4,959	1:04:51	1:03:37	-1:14
169	St. Louis, MO	Chicago O'Hare, IL	7,616	1:12:06	1:10:49	-1:17
170	New Orleans, LA	Houston Hobby, TX	7,032	1:03:17	1:02:00	-1:17
171	Chicago O'Hare, IL	Philadelphia, PA	9,481	1:54:59	1:53:38	-1:20
172	Houston Intercontinental, TX	Denver, CO	4,581	2:19:38	2:18:17	-1:21
173	Houston Hobby, TX	New Orleans, LA	7,093	0:57:07	0:55:36	-1:31
174	Chicago Midway, IL	Kansas City, MO	5,580	1:17:34	1:16:00	-1:34

APPENDIX C

**AVERAGE GATE-TO-GATE TIMES FOR THE 200 HIGHEST VOLUME ROUTES
1988-97 (CONTINUED)**

No.	Departure Airport	Arrival Airport	No. of Flights 1997	Average Gate-to-Gate Time 1988	Average Gate-to-Gate Time 1997	Change 1988-97 (minutes)
175	NY LaGuardia, NY	Washington National, DC	5,430	1:06:52	1:05:18	-1:34
176	San Jose, CA	Los Angeles, CA	4,933	1:09:05	1:07:28	-1:37
177	Denver, CO	Chicago O'Hare, IL	7,310	2:16:11	2:14:28	-1:43
178	Chicago O'Hare, IL	Washington National, DC	9,906	1:42:41	1:40:50	-1:51
179	Chicago O'Hare, IL	Cincinnati, OH	4,812	1:10:36	1:08:34	-2:02
180	Boston, MA	NY LaGuardia, NY	6,042	1:04:16	1:02:11	-2:05
181	Honolulu, HI	Los Angeles, CA	4,771	5:07:50	5:05:43	-2:07
182	Chicago O'Hare, IL	Phoenix, AZ	4,931	3:35:22	3:33:07	-2:14
183	Washington National, DC	Chicago O'Hare, IL	9,890	2:01:35	1:59:14	-2:21
184	Chicago O'Hare, IL	San Francisco, CA	7,089	4:26:42	4:24:14	-2:28
185	Oakland, CA	Orange County, CA	4,609	1:20:12	1:17:14	-2:58
186	San Francisco, CA	Las Vegas, NV	5,985	1:22:52	1:19:50	-3:02
187	Los Angeles, CA	Oakland, CA	12,265	1:11:49	1:08:44	-3:05
188	San Antonio, TX	Dallas Love Field, TX	4,988	0:54:27	0:50:55	-3:32
189	Oakland, CA	Burbank, CA	5,386	1:02:47	0:59:09	-3:38
190	St. Louis, MO	Chicago Midway, IL	5,220	1:01:33	0:57:54	-3:39
191	Cincinnati, OH	Chicago O'Hare, IL	4,802	1:14:31	1:10:35	-3:56
192	Washington National, DC	NY LaGuardia, NY	5,422	1:01:15	0:57:04	-4:11
193	Burbank, CA	San Francisco, CA	4,649	1:14:22	1:09:25	-4:57
194	Orange County, CA	Oakland, CA	4,645	1:21:23	1:16:21	-5:02
195	Chicago Midway, IL	St. Louis, MO	5,249	1:06:07	1:00:59	-5:08
196	Chicago O'Hare, IL	Denver, CO	6,951	2:30:48	2:25:37	-5:11
197	Burbank, CA	Oakland, CA	5,405	1:08:11	1:02:52	-5:19
198	Chicago Midway, IL	Cleveland, OH	4,963	1:09:05	1:01:59	-7:05
199	Los Angeles, CA	San Jose, CA	4,921	1:08:12	1:00:05	-8:07
200	Cleveland, OH	Chicago Midway, IL	4,946	1:15:39	1:07:17	-8:22

APPENDIX D

**CHANGES IN AVERAGE TAXI-OUT, FLIGHT, AND TAXI-IN TIMES FOR ROUTES
DEPARTING FROM 28 AIRPORTS, 1995-97 AND 1988-97**

No.	Departure Airport	Routes Analyzed	Number of Departures 1997	Taxi-Out Time	Flight Time	Taxi-In Time	Overall Change 1995-97	Overall Change 1988-97
1	Philadelphia	49	101,856	+2:31	+1:41	+0:16	+4:28	+5:35
2	Newark	45	112,790	+3:28	+0:43	-0:10	+4:01	+7:29
3	Boston	33	88,868	+1:14	+2:23	+0:16	+3:55	+5:39
4	NY LaGuardia	40	92,981	+1:53	+1:28	+0:06	+3:28	+3:59
5	Cincinnati	45	65,230	+1:31	+0:50	+0:46	+3:06	+3:55
6	NY Kennedy	26	38,458	+1:05	+1:03	+0:36	+2:45	+5:11
7	Washington National	37	79,270	+0:45	+1:14	+0:17	+2:16	+2:32
8	Phoenix	46	160,024	+0:59	+0:36	+0:17	+1:53	+2:29
9	San Francisco	43	133,055	+1:05	+0:36	+0:07	+1:48	+1:40
10	Las Vegas	36	108,585	+1:17	+0:14	+0:07	+1:37	+2:43
11	Dallas/Ft. Worth	77	239,557	+0:05	+0:52	+0:23	+1:20	+4:10
12	Salt Lake City	46	84,551	+0:28	+0:28	+0:25	+1:20	+3:42
13	Charlotte	51	108,235	+0:16	+0:52	+0:09	+1:16	+2:24
14	Minneapolis	66	125,763	+1:02	-0:02	+0:13	+1:13	+3:32
15	Los Angeles	44	181,936	-0:04	+1:04	+0:07	+1:07	+0:56
16	Chicago O'Hare	90	285,346	+0:22	+0:25	+0:18	+1:05	-0:05
17	Detroit	62	139,864	+0:19	+0:21	+0:22	+1:02	+3:57
18	Houston Intercontinental	49	110,927	+1:11	-0:13	-0:10	+0:49	+1:47
19	San Diego	25	64,047	+0:05	+0:34	+0:08	+0:47	+0:06
20	Denver	60	131,176	+0:05	+0:28	+0:11	+0:44	-1:56
21	Pittsburgh	64	105,511	-0:25	+0:44	+0:17	+0:37	+2:38
22	Orlando	37	84,949	-0:46	+0:52	+0:13	+0:19	+2:37
23	Atlanta	88	241,490	-0:49	+0:25	+0:31	+0:05	+3:41
24	Miami	31	61,733	-0:24	+0:11	+0:18	+0:05	+6:34
25	Portland	22	49,017	+0:10	-0:13	+0:06	+0:04	+1:01
26	Seattle	35	93,771	-0:13	+0:05	+0:10	+0:03	+2:16
27	Baltimore	32	54,333	-0:43	+0:29	+0:02	-0:11	-1:58
28	St. Louis	68	167,845	-0:56	-0:11	+0:11	-0:55	+1:56
Total/Average:		1,347	3,311,168	+0:28	+0:37	+0:14	+1:19	+2:40

APPENDIX E

CHANGES IN TAXI-OUT TIMES AT 28 AIRPORTS BY HOURLY INCREMENTS, 1995-97
In Minutes

Airport	Year	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	Avg.
Atlanta, GA	1997	13	13	18	14	17	14	20	17	15	17	16	20	17	21	17	19	15	14	17
	1995	11	12	17	12	20	12	20	18	17	18	15	23	18	21	16	20	15	12	18
	Change	+2	+1	+1	+2	-3	+2	0	-1	-2	-1	+1	-3	-1	0	+1	-1	0	+2	-1
Baltimore, MD	1997	11	11	12	11	10	9	11	10	10	10	12	12	11	11	11	11	12	12	11
	1995	11	11	12	11	10	9	11	10	10	11	13	12	11	12	12	10	13	13	12
	Change	0	0	0	0	0	0	0	0	0	-1	-1	0	0	-1	-1	+1	-1	-1	-1
Boston, MA	1997	16	17	19	17	15	15	15	14	16	17	19	21	18	17	14	16	17	17	
	1995	14	16	17	16	14	14	15	14	13	15	16	17	18	16	14	14	16	19	15
	Change	+2	+1	+2	+1	+1	+1	0	+1	+1	+1	+1	+2	+3	+2	+3	0	0	-2	+2
Charlotte, NC	1997	13	12	16	15	13	16	12	14	13	14	14	15	14	14	14	12	14	15	14
	1995	11	11	15	13	15	14	12	12	14	14	13	16	14	13	14	12	13	11	14
	Change	+2	+1	+1	+2	-2	+2	0	+2	-1	0	+1	-1	0	+1	0	0	+1	+4	0
Cincinnati, OH	1997	12	13	14	18	12	14	12	12	17	19	13	13	15	20	17	15	13	14	15
	1995	10	12	11	17	11	12	12	13	14	17	11	12	12	15	13	15	14	13	14
	Change	+2	+1	+3	+1	+1	+2	0	-1	+3	+2	+2	+1	+3	+5	+4	0	-1	+1	+1
Dallas Ft. Worth, TX	1997	14	14	19	17	17	18	18	21	19	20	21	19	18	21	21	18	16	21	19
	1995	13	14	20	17	15	17	17	21	19	18	19	23	19	21	20	18	15	16	19
	Change	+1	0	-1	0	+2	+1	+1	0	0	+2	+2	-4	-1	0	+1	0	+1	+5	0
Denver, CO	1997	16	16	14	14	16	15	15	13	14	15	14	15	16	16	16	14	17	17	15
	1995	13	15	16	15	17	15	15	13	13	15	14	14	15	15	15	13	13	21	15
	Change	+3	+1	-2	-1	-1	0	0	0	+1	0	0	+1	+1	+1	+1	+1	+1	+4	-4
Detroit, MI	1997	14	19	13	20	16	14	18	17	16	18	16	22	17	22	18	21	16	17	18
	1995	13	18	13	19	15	12	18	17	15	18	17	21	16	20	20	17	17	18	18
	Change	+1	+1	0	+1	+1	+2	0	0	+1	0	-1	+1	+1	+2	-2	+4	-1	-1	0
Houston Int'l., TX	1997	11	13	16	16	15	14	14	17	15	15	15	15	16	19	16	14	12	11	15
	1995	10	14	12	14	13	14	14	16	14	14	13	15	16	16	15	13	10	11	14
	Change	+1	-1	+4	+2	+2	0	0	+1	+1	+1	+2	0	0	+3	+1	+1	+2	0	+1
Kennedy, NY	1997	23	20	23	24	20	20	18	17	21	25	26	28	33	31	29	22	22	19	25
	1995	18	19	22	25	20	19	19	16	19	22	23	25	31	30	26	21	21	34	24
	Change	+5	+1	+1	-1	0	+1	-1	+1	+2	+3	+3	+3	+2	+1	+3	+1	+1	-15	+1
LaGuardia, NY	1997	16	22	23	22	19	18	19	17	17	24	21	25	25	25	25	19	19	17	21
	1995	14	19	22	19	16	17	16	17	16	21	20	20	22	22	21	17	14	14	19
	Change	+2	+3	+1	+3	+3	+1	+3	0	+1	+3	+1	+5	+3	+3	+4	+2	+5	+3	+2
Las Vegas, NV	1997	12	14	12	15	15	15	15	13	14	14	13	12	12	12	10	10	14	16	13
	1995	11	13	11	13	14	13	14	12	12	12	12	11	10	11	10	10	11	15	12
	Change	+1	+1	+1	+2	+1	+2	+1	+1	+2	+2	+1	+1	+2	+1	0	0	+3	+1	+1

**CHANGES IN TAXI-OUT TIMES AT 28 AIRPORTS BY HOURLY INCREMENTS, 1995-97
In Minutes (CONTINUED)**

Airport	Year	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	Avg.
Los Angeles, CA	1997	13	15	17	14	15	17	19	18	15	15	12	12	13	14	12	13	17	15	15
	1995	12	15	17	14	15	16	20	20	15	15	11	12	13	12	12	12	16	13	15
	Change	+1	0	0	0	0	+1	-1	-2	0	0	+1	0	0	+2	0	+1	+1	+2	0
Miami, FL	1997	15	17	16	14	17	23	15	20	18	18	18	25	18	25	18	18	17	18	19
	1995	15	19	17	14	14	21	16	23	21	18	19	24	17	26	19	16	17	19	20
	Change	0	-2	-1	0	+3	+2	-1	-3	-3	0	-1	+1	+1	-1	-1	+2	0	-1	-1
Minneapolis, MN	1997	13	17	14	16	14	18	15	20	15	16	18	18	20	17	24	16	16	16	18
	1995	13	15	13	14	13	16	13	19	13	13	18	16	22	21	18	14	14	18	16
	Change	0	+2	+1	+2	+1	+2	+2	+1	+2	+3	0	+2	-2	-4	+6	+2	+2	-2	+2
Newark, NJ	1997	18	27	31	24	21	18	23	16	21	26	27	29	39	31	34	25	27	26	26
	1995	15	19	26	25	19	16	20	17	19	21	24	26	30	25	26	25	23	23	22
	Change	+3	+8	+5	-1	+2	+2	+3	-1	+2	+5	+3	+3	+9	+6	+8	0	+4	+3	+4
O'Hare, IL	1997	15	15	16	16	15	14	16	17	16	17	17	19	17	19	19	17	17	19	17
	1995	13	14	16	16	15	14	17	17	16	17	16	19	17	19	17	15	15	18	16
	Change	+2	+1	0	0	0	0	-1	0	0	0	+1	0	0	0	+2	+2	+2	+1	+1
Orlando, FL	1997	12	13	12	12	12	14	14	14	14	12	13	13	13	13	13	12	11	13	13
	1995	13	13	13	14	13	15	14	14	14	13	14	14	15	13	13	11	12	12	14
	Change	-1	0	-1	-2	-1	-1	0	0	0	-1	-1	-1	-2	0	0	+1	-1	+1	-1
Philadelphia, PA	1997	12	14	20	15	16	11	12	16	14	13	16	21	19	20	14	17	15	16	16
	1995	12	14	17	15	12	11	11	13	12	12	14	15	15	17	12	10	11	22	14
	Change	0	0	+3	0	+4	0	+1	+3	+2	+1	+2	+6	+4	+3	+2	+7	+4	-6	+2
Phoenix, AZ	1997	11	13	15	16	15	13	14	13	12	12	12	12	13	12	11	10	10	11	13
	1995	10	12	14	15	13	13	13	12	11	10	10	11	12	11	11	10	10	10	12
	Change	+1	+1	+1	+1	+2	0	+1	+1	+1	+2	+2	+1	+1	+1	0	0	0	+1	+1
Pittsburgh, PA	1997	13	13	14	13	13	11	12	12	13	12	13	13	15	13	15	13	15	15	13
	1995	13	14	15	13	14	11	13	11	13	13	15	14	15	12	15	13	16	17	14
	Change	0	-1	-1	0	-1	0	-1	+1	0	-1	-2	-1	0	+1	0	0	-1	-2	-1
Portland, OR	1997	13	12	11	11	10	10	12	13	10	10	10	11	11	11	10	12	12	11	11
	1995	13	14	10	10	10	10	11	12	10	10	10	10	11	11	10	10	10	10	11
	Change	0	-2	+1	+1	0	0	+1	+1	0	0	0	+1	0	0	0	+2	+2	+1	0
Salt Lake City, UT	1997	14	13	17	17	21	16	13	13	14	16	16	13	15	11	18	18	17	16	16
	1995	11	12	14	18	20	18	14	12	13	18	14	12	15	11	16	18	18	14	16
	Change	+3	+1	+3	-1	+1	-2	-1	+1	+1	-2	+2	+1	0	0	+2	0	-1	+2	0
San Francisco, CA	1997	16	16	20	18	14	19	19	21	17	15	16	14	14	15	13	15	19	14	17
	1995	13	16	17	20	14	18	16	19	18	15	14	12	13	14	11	13	17	13	16
	Change	+3	0	+3	-2	0	+1	+3	+2	-1	0	+2	+2	+1	+1	+2	+2	+2	+1	+1

APPENDIX E

CHANGES IN TAXI-OUT TIMES AT 28 AIRPORTS BY HOURLY INCREMENTS, 1995-97
In Minutes (CONTINUED)

Airport	Year	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	Avg.
Seattle, WA	1997	14	16	14	13	14	14	15	15	13	13	12	12	13	13	12	13	13	13	14
	1995	14	18	14	13	14	14	14	15	13	13	12	12	13	15	13	13	13	13	14
	Change	0	-2	0	0	0	0	+1	0	0	0	0	0	0	-2	-1	0	0	0	0
St. Louis, MO	1997	11	18	18	22	18	18	15	19	16	18	16	21	20	21	22	16	14	15	18
	1995	11	17	19	22	19	17	20	19	17	19	16	22	22	24	22	17	14	15	19
	Change	0	+1	-1	0	-1	+1	-5	0	-1	-1	0	-1	-2	-3	0	-1	0	0	-1
San Diego, CA	1997	14	13	13	12	11	12	13	12	10	11	10	11	11	11	11	10	12	12	12
	1995	11	13	14	13	13	12	12	12	11	10	10	10	11	10	11	12	11	11	12
	Change	+3	0	-1	-1	-2	0	+1	0	-1	+1	0	+1	0	+1	0	-2	+1	+1	0
Wash. National, DC	1997	17	14	15	15	15	12	13	13	14	14	14	15	16	16	13	10	7	N/A	14
	1995	13	14	14	14	12	12	12	13	13	14	15	17	16	15	13	11	12	11	14
	Change	+4	0	+1	+1	+3	0	+1	0	+1	0	-1	-2	0	+1	0	-1	-5	N/A	0
28 Airport Average	1997	14.0	15.4	16.5	16.1	15.2	15.1	15.3	15.5	14.9	15.9	15.6	16.9	17.2	17.6	16.8	15.1	15.2	15.0	16.1
	1995	12.5	14.8	15.6	15.8	14.6	14.4	15.0	15.3	14.5	15.2	14.9	16.3	16.4	16.7	15.5	14.3	14.3	15.6	15.7
	Change	+1.5	+0.6	+0.9	+0.4	+0.6	+0.7	+0.3	+0.3	+0.4	+0.7	+0.7	+0.7	+0.8	+0.9	+1.3	+0.9	+0.9	-0.6	+0.5

APPENDIX F

CHANGES IN TAXI-IN TIMES AT 28 AIRPORTS BY HOURLY INCREMENTS, 1995-97
In Minutes

Airport	Year	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	Avg.
Atlanta, GA	1997	7	7	8	8	8	7	8	7	7	7	8	8	7	8	8	8	7	7	7
	1995	6	6	7	7	7	6	8	6	6	7	7	8	7	8	7	8	7	7	7
	Change	+1	+1	+1	+1	+1	+1	0	+1	+1	0	+1	0	0	0	+1	0	0	0	0
Baltimore, MD	1997	6	5	5	4	4	4	4	4	4	5	4	5	4	4	5	5	4	4	4
	1995	4	2	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3	4	3
	Change	+2	+3	+2	+1	+1	+1	+1	+1	+1	+1	+3	+2	+2	+1	+1	+2	+2	+1	0
Boston, MA	1997	8	7	7	7	6	6	6	6	6	7	7	8	8	7	7	6	6	7	7
	1995	6	7	7	6	6	6	7	6	6	7	7	8	8	8	7	6	6	6	7
	Change	+2	0	0	+1	0	0	-1	0	0	0	0	0	0	-1	0	0	0	+1	0
Charlotte, NC	1997	5	5	6	6	5	6	5	5	5	5	5	5	6	6	5	5	5	5	5
	1995	6	4	5	5	6	5	5	4	5	5	5	5	5	6	5	6	6	5	5
	Change	-1	+1	+1	+1	-1	+1	0	+1	0	0	0	0	+1	0	0	-1	-1	0	0
Cincinnati, OH	1997	6	6	6	5	5	5	5	6	6	6	6	6	6	7	6	6	7	6	6
	1995	6	5	5	6	5	5	5	5	6	6	5	5	6	6	6	6	5	5	6
	Change	0	+1	+1	-1	0	0	0	+1	0	0	+1	+1	0	+1	0	0	+2	+1	0
Dallas Ft. Worth, TX	1997	6	8	11	10	10	10	10	11	10	10	11	11	10	12	13	11	9	7	10
	1995	6	8	10	9	9	9	9	11	9	9	11	14	11	11	12	11	10	8	10
	Change	0	0	+1	+1	+1	+1	+1	0	+1	+1	0	-3	-1	+1	+1	0	-1	-1	0
Denver, CO	1997	6	6	6	6	8	9	7	6	6	6	6	7	8	6	7	7	6	6	7
	1995	10	6	6	6	9	9	7	6	6	6	6	7	6	6	7	7	6	7	7
	Change	-4	0	0	0	-1	0	0	0	0	0	0	0	+2	0	0	0	0	-1	0
Detroit, MI	1997	7	6	7	10	8	8	10	10	9	9	9	10	10	10	10	13	8	6	9
	1995	7	6	7	10	9	7	10	9	7	9	8	9	8	10	10	13	7	7	9
	Change	0	0	0	0	-1	+1	0	+1	+2	0	+1	+1	+2	0	0	0	+1	-1	0
Houston Int'l., TX	1997	6	6	6	6	6	6	6	7	7	6	6	6	6	7	8	6	6	7	6
	1995	6	7	6	6	6	7	7	7	6	6	6	7	7	7	8	6	6	6	7
	Change	0	-1	0	0	0	-1	-1	0	+1	0	0	-1	-1	0	0	0	0	+1	-1
Kennedy, NY	1997	8	9	8	8	7	6	7	6	6	7	9	11	17	10	9	9	9	8	9
	1995	9	8	7	9	8	7	7	6	6	7	8	11	12	11	10	9	9	8	9
	Change	-1	+1	+1	-1	-1	-1	0	0	0	0	+1	0	+5	-1	-1	0	0	0	0
LaGuardia, NY	1997	0	6	6	6	6	6	6	5	6	6	6	7	7	7	8	6	6	6	6
	1995	5	6	6	5	6	5	5	5	6	6	6	7	6	6	7	6	6	6	6
	Change	-5	0	0	+1	0	+1	+1	0	0	0	0	0	+1	+1	+1	0	0	0	0
Las Vegas, NV	1997	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	8	5
	1995	3	3	3	3	4	4	4	4	3	4	4	3	3	3	4	4	4	6	4
	Change	0	+1	+1	+1	0	0	0	0	+1	0	0	+1	+1	+1	0	+1	+1	+2	+1

**CHANGES IN TAXI-IN TIMES AT 28 AIRPORTS BY HOURLY INCREMENTS, 1995-97
In Minutes (CONTINUED)**

Airport	Year	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	Avg.
Los Angeles, CA	1997	7	8	8	7	8	10	11	10	8	7	6	7	8	8	8	9	9	8	8
	1995	6	7	8	7	8	9	11	10	8	7	6	7	7	7	8	9	9	7	8
	Change	+1	+1	0	0	0	+1	0	0	0	0	0	0	+1	+1	0	0	0	+1	0
Miami, FL	1997	7	6	5	6	7	6	7	6	6	7	8	9	11	9	7	6	6	6	7
	1995	7	7	7	6	6	7	7	7	7	7	7	8	10	9	7	6	6	6	7
	Change	0	-1	-2	0	+1	-1	0	-1	-1	0	+1	+1	+1	0	0	0	0	0	0
Minneapolis, MN	1997	5	5	6	5	5	6	6	6	5	5	6	7	7	7	8	6	5	5	6
	1995	5	5	5	5	5	5	5	5	4	5	5	6	7	7	8	5	5	4	6
	Change	0	0	+1	0	0	+1	+1	+1	+1	0	+1	+1	0	0	0	+1	0	+1	0
Newark, NJ	1997	8	8	8	7	7	6	7	6	7	8	8	9	9	9	9	8	7	7	8
	1995	8	7	7	7	7	7	7	7	6	7	8	8	8	9	8	7	7	7	7
	Change	0	+1	+1	0	0	-1	0	-1	+1	+1	0	+1	+1	0	+1	+1	0	0	+1
O'Hare, IL	1997	5	6	6	7	6	6	7	7	7	8	7	8	7	8	8	8	7	7	7
	1995	5	6	6	7	6	6	6	6	6	7	8	8	7	9	9	8	8	7	7
	Change	0	0	0	0	0	0	+1	+1	+1	+1	-1	0	0	-1	-1	0	-1	0	0
Orlando, FL	1997	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	1995	4	5	5	5	5	6	6	6	6	5	6	5	5	6	5	6	6	6	6
	Change	+1	0	0	0	0	-1	-1	-1	-1	0	-1	0	0	-1	0	-1	-1	-1	-1
Philadelphia, PA	1997	5	5	6	6	6	5	5	5	5	5	6	7	9	6	6	6	5	6	6
	1995	5	5	6	5	4	5	4	5	5	5	5	6	6	6	5	5	5	5	5
	Change	0	0	0	+1	+2	0	+1	0	0	0	+1	+1	+3	0	+1	+1	0	+1	+1
Phoenix, PA	1997	3	4	5	5	5	5	5	4	4	4	5	5	5	5	5	4	4	4	5
	1995	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Change	0	+1	+1	+1	+1	+1	+1	0	0	0	+1	+1	+1	+1	+1	0	0	0	+1
Pittsburgh, PA	1997	7	6	6	6	5	6	6	5	6	6	6	6	6	6	7	7	7	6	6
	1995	6	6	6	6	6	5	6	5	6	6	6	6	6	6	7	7	6	8	6
	Change	+1	0	0	0	-1	+1	0	0	0	0	0	0	0	0	0	0	+1	-2	0
Portland, OR	1997	5	3	3	4	4	4	4	4	3	3	3	4	4	4	4	4	4	5	4
	1995	5	3	3	3	3	4	4	4	3	3	3	3	4	4	4	4	4	4	4
	Change	0	0	0	+1	+1	0	0	0	0	0	0	+1	0	0	0	0	0	+1	0
Salt Lake City, UT	1997	0	5	5	5	7	4	4	5	5	5	4	5	4	5	6	6	5	5	5
	1995	2	4	4	4	7	4	4	4	4	4	4	4	5	3	5	5	5	4	5
	Change	-2	+1	+1	+1	0	0	0	+1	+1	+1	0	0	+1	0	+1	+1	0	+1	0
San Francisco, CA	1997	5	5	7	5	6	6	6	7	5	5	5	5	5	5	5	6	6	6	5
	1995	4	4	6	5	5	6	6	7	5	4	4	4	5	5	5	5	6	5	5
	Change	+1	+1	+1	0	+1	0	0	0	0	+1	+1	+1	0	0	0	+1	0	+1	0

**CHANGES IN TAXI-IN TIMES AT 28 AIRPORTS BY HOURLY INCREMENTS 1995-97
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Airport	Year	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	Avg.	
Seattle, WA	1997	5	5	4	4	5	5	5	5	4	4	4	4	4	5	5	5	5	5	5	5
	1995	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Change	+1	0	0	0	+1	+1	+1	+1	0	0	0	0	0	+1	+1	+1	+1	+1	+1	+1
St. Louis, MO	1997	4	6	6	6	6	5	5	6	5	5	6	6	6	7	8	7	6	5	6	6
	1995	4	5	6	7	6	5	6	6	5	6	5	6	7	7	8	7	5	5	6	6
	Change	0	+1	0	-1	0	0	-1	0	0	-1	+1	0	-1	0	0	0	+1	0	0	0
San Diego, CA	1997	2	2	3	2	3	3	3	3	2	2	2	3	3	3	3	3	4	4	3	3
	1995	4	2	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3	4	3	3
	Change	-2	0	0	-1	0	0	0	0	-1	0	0	0	0	0	0	0	+1	0	0	0
Wash. National, DC	1997	6	5	5	6	5	4	5	5	7	5	5	6	5	6	6	5	5	5	5	5
	1995	3	4	5	6	5	4	5	5	6	5	5	5	5	6	6	5	5	5	5	5
	Change	+3	+1	0	0	0	0	0	0	+1	0	0	+1	0	0	0	0	0	0	0	0
28 Airport Average	1997	5.3	5.7	6.0	5.9	6.0	5.8	6.0	5.9	5.7	5.8	6.0	6.6	6.8	6.6	6.8	6.5	6.0	5.9	6.1	6.1
	1995	5.3	5.2	5.6	5.7	5.8	5.6	5.9	5.7	5.4	5.5	5.6	6.3	6.2	6.5	6.5	6.3	5.8	5.7	6.0	6.0
	Change	-0.1	+0.5	+0.4	+0.3	+0.2	+0.2	+0.1	+0.2	+0.3	+0.3	+0.4	+0.3	+0.6	+0.1	+0.3	+0.3	+0.2	+0.2	+0.1	+0.1

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