policy report

Office of the New York City Comptroller
Office of Policy Management
William C. Thompson, Jr., Comptroller

Grounded:

The Impact of Mounting Flight Delays on New York City's Economy and Environment

1 Centre Street
New York, NY 10007
(212) 669-3500

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William C. Thompson, Jr.
Comptroller

Gayle M. Horwitz
First Deputy Comptroller

Danica Gallagher
Assistant Comptroller for Policy & Communications

Glenn von Nostitz
Director, Office of Policy Management

Steve Strauss
Transportation Policy Analyst, Office of Policy Management

Joan Westmeyer
Policy Liaison, Office of Policy Management

Over the last year, airline on-time performance across the nation has sunk to nearly unprecedented poor levels. Congress recently held hearings on what is widely viewed as an aviation crisis and President Bush has promised help to remedy the nation's worsening flight delays in addition to temporary actions to avoid severe disruptions at the New York airports implemented during the recent Thanksgiving holiday.

The Office of the Comptroller has attempted to identify key causes of the deterioration in on-time performance and its impact on local air and water quality and New York City's economic competitiveness. This analysis has included assessment of trends in recent years in the numbers of scheduled flights and passengers, departure and arrivals delays, cancellations, and taxi-out times at the three major airports serving New York City and interviews with experts in aviation management and air traffic control.

Key Findings

On-time performance has decreased and taxi-out times have increased much faster in New York than they have nationally. New York's flight cancellation rates are among the highest in the nation.

- **Airline on-time performance at the major New York airports has plummeted, and according to an analysis by the Office of the Comptroller, the decrease has been much greater than in other cities.** Over the last five years—2003 to 2007—on-time *arrival* rates at the three major New York City airports for the first nine months of the year plunged from an average of 77 percent, which was five percentage points below the national average of 82 percent, to 60 percent of scheduled flights, or 13 percentage points below the national average of 73 percent. New York on-time *departure* rates also plunged and the decrease was significantly greater in New York than elsewhere.

- **The average taxi-out—the period between gate departure and "wheels up"—has increased more in New York than elsewhere.** For the first nine months of 2007, the average taxi-out time was 36 minutes at John F. Kennedy International Airport, 29 minutes at Newark Liberty International Airport, and 28 minutes at LaGuardia Airport. The national average was 16 minutes. Since 2003, the average taxi-out has increased by 14 minutes at Kennedy, four minutes at LaGuardia, and five minutes at Newark compared to an increase of 1.3 minutes nationally.

- **New York airports have among the nation's highest flight cancellation rates.** From August 2006 to July 2007**,** 4.8 percent of U.S. carriers' flights at LaGuardia were cancelled, the nation's highest rate, 3.6 percent were cancelled at Newark, the nation's third highest rate, and 3.2 percent were cancelled at Kennedy, the sixth highest rate. The national cancellation rate was 2.2 percent.

An antiquated air traffic control system, poor management by the Federal Aviation Administration, and overcrowding in the airspace which is compounded by added flights at peak hours, are leading causes of delays.

Between 2000 and 2006, the number of passenger aircraft take-offs and landings at the three major New York City airports increased by 6.7 percent overall—1.6 percent at Newark, 5.8 percent at LaGuardia Airport, and 14.4 percent at Kennedy Airport. Congress removed capacity restrictions at Kennedy Airport at the end of December 2006 and for the first eight months of 2007 scheduled flights increased by 23.5 percent above the same period the year before. The fact that on-time performance has also declined markedly at Newark and LaGuardia, where the total number of flights increased only modestly, suggests that factors other than increasing numbers of flights are causing on-time performance to slide. Among these are:

- **The failure of the FAA to modernize the air traffic control system.** For decades, the FAA has been planning to replace the nation's outmoded, radar-based air traffic control system.

- **Insufficient air traffic controller staffing in New York, high controller retirement rates, and the lack of a current labor agreement.** These are leading to poor employee morale and contributing to poor on-time performance.

- **Airlines' increasing utilization of each aircraft**. With airlines flying each plane more hours a day and with less buffer time between flights, flight delays earlier in the day are having a ripple effect and causing subsequent flights with the same aircraft also to be late. The share of total minutes of flight delay attributable to "aircraft arriving late"—defined by the U.S. Department of Transportation as, "A previous flight with the same aircraft arrived late, causing the present flight to depart late"—has risen steadily from 30.9 percent in 2003 to 38.2 percent in the first half of 2007.

- **The large volume of private aircraft ("general aviation") planes using New York's airspace**. It is estimated that general aviation aircraft comprise approximately 30 percent of the air traffic in the New York-Philadelphia air space. Teterboro Airport, which serves only general aviation, had as many take-offs and landings in 2006 as Delta Airlines did at all three major New York airports. Each private jet is another "blip" on controllers' radar screens to track in the extremely congested New York air space.

New York's economic competitiveness may be harmed unless on-time performance improves.

Unless it is reversed, the sharp decline in airline on-time performance at the New York airports could discourage employers from locating new jobs and facilities in New York and encourage some firms that are considering relocating jobs from New York to do so.

- **The greater deterioration in airline on-time performance in New York than elsewhere could hurt the city's economic competitiveness.** On-time airline performance at local airports is one of the factors businesses consider when deciding where to locate facilities and jobs, according to business location consultants. The five-year trend in airline local on-time performance was one of the indicators used by the New York City Citizens Budget Commission when in 2001 it last ranked the economic competitiveness of 13 major U.S. metropolitan areas. New York ranked eleventh out of 13 cities. If this indicator were recalculated for the same cities for the 2003 to 2007 period (first nine months of 2007) the New York metro area would come in last, and by a substantial margin.

- **The increase in flight delays in New York is financially costly.** In a soon-to-be-published study of the economic impact of airport congestion, economists Steven A. Morrison and Clifford Winston estimate that in 2005 dollars, pleasure and business air travelers' time value ranges from $27.13 to $79.16 per hour with a median of $47.97. Comptroller staff calculates that comparing the increased average taxi-out at the New York airports for 1995-1997 with 2005-2007, in 2007 the increases in average taxi-outs at three major New York City airports over this period are costing passengers 3.9 million extra hours waiting for their plane to take off after it leaves the gate. Based on the median hourly amount, in 2007 this additional time on the ground cost travelers $187 million.

- **Because 26 percent of air cargo is carried in passenger planes, flight delays impact air cargo delivery as well as passengers.** Passenger flight delays have a direct cost impact on businesses shipping through New York airports.

Increases in aircraft movements and flight delays are contributing to airport pollution.

Aircraft jet engines emit an array of pollutants, including nitrogen and sulfur oxides, volatile organic compounds (VOCs), particulates, and carbon monoxide. Nitrogen oxides and VOCs contribute to ozone. A 1996 study of the environmental impact of major airports by the Natural Resources Defense Council found that Kennedy Airport was the second largest stationary source of VOCs in the state. In 2005, an FAA report on aviation and emissions stated that "the total mass of emissions coming from an airport may be comparable to a power plant or petroleum refinery."

- **The approximately 70,000 increase in take-offs and landings a year from the three New York area airports in 2006 compared to 2000—and the more than 20 percent increase in flights at Kennedy Airport in 2007 alone—are producing substantial additional amounts of VOCs and nitrogen oxides, both of which contribute to ozone.** Thirty percent of aircraft carbon monoxide and VOC emissions and ten percent of nitrogen oxide and other pollutant emissions are produced during ground operations (which includes taxi-in and out) and landing and take-off. The large expansion in aircraft movements at Kennedy Airport may also be contributing to the degradation of Jamaica Bay through untreated storm water runoff containing deicer chemicals and other toxins.

- **Longer taxi-outs are exacerbating airport vicinity air pollution**. The average taxi-out at Kennedy Airport increased from 24 minutes in 1995 to 29 minutes in 2000, 32 minutes in 2006, and 36 minutes in 2007. The increase since 2000 was responsible for aircraft running their engines at Kennedy 8,600 additional hours in 2006. Compared to 1995, at Kennedy Airport aircraft are running their engines 22,900 more hours because of longer taxi-outs.

Key Recommendations

One of New York City's major competitive advantages is its outstanding air connections with the nation and the world. This advantage is now being degraded by the declining reliability of air travel into and out of New York. Traffic congestion on the highways leading to New York's airports compounds the flight delay frustrations experienced by business and pleasure travelers. As the volume of air traffic has increased and taxi-out periods have lengthened, air pollution in the vicinity of the airports and the possibility of additional pollution being discharged into Jamaica Bay has become a growing concern, especially for residents of Flushing, Springfield Gardens, and other neighborhoods adjacent to the airports.

Decisive action is necessary. To improve airline on-time performance and reduce airport pollution, the Office of the Comptroller recommends:

- **The FAA accelerate modernization of the nation's air traffic control system and prioritize New York**. The FAA recently let a $1.8 billion contract for national Automatic Dependent Surveillance-Broadcast, or ADS-B, the first piece of a $15 billion-plus modernized national air traffic control system called NextGen. ADS-B uses global positioning system (**GPS**) satellite signals to provide air traffic controllers and pilots with more accurate and more frequently updated information on aircraft position, allowing for more efficient use of limited air space. The first ADS-B ground facilities, with a value of $207 million, will be installed by 2010 in Alaska, the Gulf of Mexico, Louisville, and Philadelphia, and the remainder of the system is to be installed by 2013.

Inasmuch as a majority of the nation's flight delays originate in New York, the Port Authority of New York and New Jersey and the airline industry should **press the FAA to add New York airports to those that will be ground-equipped by 2010.**

The full benefits of ADS-B cannot be realized until all aircraft are equipped with complementary avionics. With this equipment, for example, pilots and air traffic controllers will be able to view the same real-time screens showing all planes in the vicinity, enabling a pilot to independently choose the least congested route. Although all ADS-B ground equipment is to be installed nationally by 2013, the FAA is not requiring all aircraft to have the complementary avionics until 2020. **This date should be advanced to 2015.**

- **The FAA employ enough certified professional air traffic controllers to handle all air traffic**. Even after accounting for conflicting statements from the FAA and the National Air Traffic Controllers Association about the adequacy of staffing, it is clear that the New York region needs additional air traffic controllers to fill vacant positions and prepare for expected retirements. There are fewer controllers in New York today than there were five years ago, despite the fact that there are many more flights.

- **Congress enact legislation to assess the general aviation industry its fair share of the cost of operating and modernizing the air traffic control system.** The region's air space capacity constraints should be shared equitably with corporate jets, pleasure craft, and other general aviation aircraft. All users should pay their fair share of air traffic control system operating and capital costs.

The situation is urgent. This summer, as few as 34 percent of flights that were scheduled to arrive at Kennedy Airport between 6:00 PM and 7:00 PM were on time. The FAA projects that between August 2007 and August 2008 there will be additional large increases in operations at Kennedy Airport, primarily in the early morning and early evening hours when the airport is already at its busiest.

The FAA has called meetings with airlines to press for voluntary reductions in peak hour schedules and is instituting additional remedial measures such as changes in landing procedures. In September 2007, the FAA also approved a "redesign" of outmoded flight paths in the New York-Philadelphia air space that it promises will reduce flight delays; some of the changes will be implemented in the near future and others over the next four years.

If within a reasonable period of time such measures do not substantially improve on-time performance in New York and ensure that the extraordinarily low on-time performance of summer 2007 is not repeated, stronger action may become necessary. Two different alternatives that should be considered are:

- **Market-based landing fees—**that is, "congestion pricing." Currently, landing fees are based on aircraft weight. Market-based landing fees would induce airlines to "de-peak" their schedules. The operational savings could be substantial. According to an analysis of 2005 data, the improved on-time performance resulting from market-based landing fees would save airlines and passengers $256.8 million a year at Kennedy Airport alone.

- **Temporary caps on the number of flights at Kennedy Airport** and, depending on the number of flights that spill over, possibly also at Newark Airport. Caps should not necessarily be set at the 80 flights per hour sought by the FAA. The Port Authority has indicated that as many as 120 flights an hour can be accommodated at Kennedy under ideal conditions and up to 110 an hour were scheduled this summer. The optimal cap is somewhere between 80 and 110.

A full analysis using computer modeling and simulations of various capping levels at Kennedy Airport and the impact of caps at Kennedy on congestion at Newark should be undertaken now and publicly released so that if temporary caps are needed, optimal levels can be implemented**.** The inconvenience of not being able to fly at a preferred time might be more than offset by the benefits of a much greater likelihood that a flight will leave or arrive on time. The Port Authority opposes the FAA-proposed cap of 80 flights an hour, arguing that it would eliminate hundreds of flights with thousands of passengers at the airports and would result in job losses. But ample harm is already being done to both business and pleasure travelers by taxi-outs that frequently take an hour or more and peak hour on-time performance of well under 40 percent. American Airlines and JetBlue and have indicated their support for temporary caps at a reasonable level at Kennedy Airport if the FAA uses the opportunity to move ahead expeditiously with long-term technological improvements.

Although jet engines placed in service in recent years are more efficient and less polluting than their predecessors, the FAA reports that total aviation emissions have increased because of the expansion in air travel. The FAA also projects that air travel will increase substantially in coming years and aviation emissions will therefore continue to rise. To address concerns about the environmental impact of recent and anticipated increases in flights at New York's airports:

- **Landing fees should be structured to encourage airlines to fly lower emission aircraft in place of dirtier ones**. This is being done at Heathrow Airport near London.

- **The Legislature should enact legislation introduced by State Senator John Sabini and Assembly Member Jeffrion Aubry (S1636/A6422) to require the State Department of Environmental Conservation to install air monitoring equipment within a one-mile radius of LaGuardia and Kennedy airports**. According to the sponsors' memorandum in support of the legislation, "Increased airplane emissions from area airports further aggravate the City's air quality, dumping additional exhaust and fume discharges on neighborhoods, especially Queens," and "the emissions from one plane are equivalent to 3,000 cars." Under the federal law mandating a State and Local Air Monitoring Stations Network there are currently at least 80 air monitoring stations statewide, but there are "none near these two airports," according to the sponsors' memorandum. Data on ozone and fine particle pollution that the stations produce would be essential in assessing the health impact of airport emissions on nearby communities and setting baseline readings so that progress in reducing emissions can be gauged. Considering that steady growth in flights at the New York airports is projected to continue—one study projects a 20 percent increase in flights at Kennedy Airport between 2005 and 2025—the need for these air monitoring stations will only grow.

A. Schedule Adherence Has Decreased More in New York Than Elsewhere

Surging flight delays across the nation during the summer of 2007 have made declining airline on-time performance a major public policy issue. At New York's three major airports, the deterioration in on-time performance in recent years has been much worse than in the nation as a whole.

On-time performance has worsened most in New York than elsewhere.

1. On-time performance. The U.S. Department of Transportation (DOT) reports the percentage of scheduled flights that are on time by airline and airport. Table 1 below shows that the New York airports' on-time performance has steadily worsened in the last five years. Appendix A additionally compares the change in on-time departure and arrival performance at New York's three major airports since 2003[1] with on-time performance at the 17 busiest domestic airports.[2] A flight is considered delayed if it arrived at or departed from the gate 15 minutes or more after the scheduled arrival or departure time.

Table 1. Percentage of flights departing from and arriving at major New York airports on time, 2003-2007, January to September of each year

	2003	2004	2005	2006	2007*	2007 rank (of 32)	2003- 2007, percentage point change	2003-2007 % change
Kennedy								
On-time departures	83.1%	80.2%	76.4%	76.7%	66.9%	31	-16.2	-19.5%
On-time arrivals	80.1%	75.7%	70.2%	71.0%	60.9%	30	-19.2	-23.9%
LaGuardia								
On-time departures	84.7%	81.5%	78.5%	75.2%	72.2%	25	-12.5	-14.7%
On-time arrivals	77.3%	73.1%	68.0%	65.2%	59.8%	31	-17.5	-22.6%
Newark								
On-time departures	83.3%	80.1%	76.2%	72.1%	67.6%	32	-15.7	-18.9%
On-time arrivals	73.2%	72.2%	66.2%	63.7%	59.6%	32	-13.6	-18.6%
Nationwide*								
On-time arrivals	82.3%	78.4%	77.4%	76.2%	73.2%	—	-9.1	-11.0%

Source: U.S. Dept. of Transportation, Bureau of Transportation Statistics
*DOT Bureau of Transportation Statistics does not provide on-time departures data for years-to-date.

On-time arrivals. As Table 1 shows, during the first nine months of 2007, between 59.6 percent and 60.9 percent of flights arriving at New York's three major airports arrived on time. The three airports ranked last in on-time arrivals among the 32 airports DOT calls "major." For most of the 17 other major airports shown in Appendix A, the on-time arrival rate substantially exceeded 70 percent.

From 2004 to 2007, on-time arrival and departure rates declined each year from the year before except for slight increases at Kennedy Airport from 2005 to 2006.

During certain hours of the day, on-time arrival performance at New York's airports was much lower than shown in Table 1. For example, for the 12 months ending July 2007 the lowest on-time performance at any of the 32 major airports during any hour of the day was at Kennedy Airport, where only 34.3 percent of flights scheduled to arrive between 6:00 PM and 7:00 PM on weekdays were on time.

Table 1 also shows that, since 2003, the on-time arrival rate decreased 22.6 percent at LaGuardia, 18.6 percent at Newark, and 23.9 percent at Kennedy. The average decline for the 17 non-New York airports in Appendix A was 11.5 percent, ranging from 4.9 percent at Atlanta to 16.5 percent at Chicago-O'Hare. On a percentage point basis, Table 2 shows that the decreases in on-time arrival rates at the New York airports ranged from 13.6 at Newark to 19.3 at Kennedy, while the average for the 17 non-New York airports was 9.6 percentage points.[3]

[1] Both Appendix A and Table 1 show on-time performance for January through September of each year.

[2] These 17 airports are those with at least 140,000 flights during 2006.

[3] Percentage and percentage point averages are not weighted for the number of flights per airport.

In 2003, the average of the on-time arrival rates for the three major New York airports was 77 percent, about five percentage points below the national rate of 82.3 percent. By 2007, the New York average had plummeted to only 60 percent. While the national average also declined, to 73 percent, the drop was much greater in New York; for the first nine months of 2007 the New York rate was *13 percentage points* below the national average for the same period.

On-time departures. On-time departures at airports outside of New York City can be affected by ground holds that result from excess air traffic around New York City.[4] This was noted by the U.S. Secretary of Transportation in September 2007 when she said that "one-third of the nation's air traffic goes in, out or over New York airspace every day."[5] It is significant, therefore, that the deterioration in on-time departure rates has also been markedly worse at the New York City airports than at other major airports. As Table 2 shows, since 2003, the on-time departure rate at Kennedy declined by 19.5 percent and at Newark, by 18.9 percent. Among the 17 non-New York airports in Appendix A, the next largest decrease was 18.1 percent at Chicago-0'Hare. The average of the decreases in on-time departure rates at the 17 non-New York City airports in Appendix A was 12.0 percent (not weighted for individual airport flight volume). The average of the on-time departure rates (weighted to account for airport flight volume) for the three major New York airports plummeted from 83.7 percent in 2003 to 69.0 percent in 2007, nearly a 15 percentage point drop.

In 2007, the on-time departure rate at Kennedy of 66.9 percent was the second lowest rate among the airports in Appendix A; Chicago-O'Hare was only slightly lower, at 66.5 percent. Newark closely followed Kennedy at 67.6 percent.

Appendix A also shows that, by a significant margin, the 19.5 percent 2003-2007 decline in the on-time departure rate at Kennedy and the 18.9 percent decline at Newark substantially exceeded the declines at other major airports except for the 18.1 percent decline at Chicago-O'Hare during this period.

2. Taxi-out and taxi-in times. The U.S. Department of Transportation defines taxi-out as the time elapsed between departure from the gate and "wheels off the ground." During taxi-out at a busy airport, the plane is typically waiting on a queue of planes to depart. Taxi-in is the time elapsed between "wheels down" (hitting the tarmac) and arrival at the destination airport gate.

For the first nine months of 2007, the average taxi-out was 28 minutes at LaGuardia, 29 minutes at Newark, and 36 minutes at Kennedy. Of the 17 major airports in Appendix B, the next longest taxi-outs were at Philadelphia (25 minutes) and Houston Intercontinental (20 minutes). The national average was 16.2 minutes.

Appendix B shows that from 2003 to 2007 (first nine months for 2007), average taxi-out increased by eight percent nationally. In contrast, it increased by 64 percent at Kennedy,[6] 17 percent at LaGuardia, and

[4] A ground delay program is put into effect when a plane is held at the gate at the origin airport due to delays at the destination airport.

[5] U.S. Department of Transportation press release issued September 27, 2007, "DOT Announces New Steps to Tackle Aviation Congestion and Delays in New York Area, Across the Nation".

[6] According to *The New York Times*, some "key taxiways" at Kennedy have been blocked due to construction to prepare for the Airbus A380 super jumbo jet, adding to delays. However, even if average Kennedy Airport taxi-outs return to 29 minutes as recorded in 2000 once A380-related construction is complete, they would remain the longest in the nation by a significant margin, assuming taxi-out times at other airports remain level. Alan Levin, "At JFK, web of problems tangles gateway to the USA; crowded skies, tension in the tower help fuel flight delays that ripple though aviation system," *The New York Times,* July 10, 2007.

21 percent at Newark. From 2003 to 2007, the national average increased 1.3 percentage points, but at Kennedy it increased by 14 percentage points, at LaGuardia by four percentage points, and at Newark by five percentage points.

Looking farther back and averaging three years, the average taxi-out for the three-year period 1995-1997 was 19 minutes at LaGuardia, 25 minutes at Kennedy, and 24 minutes at Newark.[7] But for 2005-2007, the average taxi-out had increased to 26 minutes at LaGuardia (up six minutes), 32 minutes at Kennedy (up seven minutes), and 28 minutes at Newark (up four minutes). In contrast, average taxi-out increased nationally from 14 minutes in 1995-1997 to 16 minutes in 2003-2007, up only two minutes. (See Appendix B for average taxi-in and taxi-out.)

The U.S. DOT tracks flights with taxi-outs of more than three hours. In July 2007, there were 272 flights where the taxi-out was at least three hours. More than half of these flights departed from one of the three major New York City airports. In June 2007, more than half the 474 flights with taxi-out in excess of three hours left from one of the New York airports.

Through August 2007, the following 11 major U.S. airports had an average taxi-in time of at least eight minutes. Kennedy Airport was tied with Detroit International for the nation's longest average taxi-in and Newark was seventh.

Table 2. Average taxi-in, minutes, 2007 (to August)*

National average	*6.63*
Kennedy	10.57
Detroit	10.57
Atlanta	10.31
Dallas-Fort Worth	9.93
Indianapolis	9.29
Houston Intercontinental	9.19
Newark	8.99
Los Angeles	8.71
Westchester County, NY	8.49
Chicago-O'Hare	8.22
Denver	8.02

*Airports with taxi-in of at least eight minutes.

Since 2003, the national average taxi-in time has decreased by 0.42 minutes, from 7.05 minutes to 6.63 minutes (2007 through August). However, it increased by 2.11 minutes at Kennedy and 0.64 minutes at Newark.

3. Flight cancellation rates. New York's three major airports have among the highest domestic flight cancellation rates of the nation's 32 major airports. From August 2006 to July 2007, 20 domestic airports had a cancellation rate of at least 1.5 percent. (See list in Appendix C.). LaGuardia had the highest rate in the nation (4.78 percent of flights cancelled), Newark the third highest (3.58 percent canceled) and Kennedy the sixth highest (3.20 percent canceled). So far in 2007, there have been 4,546 flight cancellations at Newark Airport, 3,348 at Kennedy Airport, and 4,944 at LaGuardia Airport. Because airlines are flying their planes with higher load factors (the percentage of seats that are occupied) that often exceed 90 percent, it has become more difficult for passengers on cancelled flights to find a seat on a subsequent flight to the same destination.

[7] This is the three-year average of the annual average taxi-outs. It is not weighted to account for year-to-year variances in numbers of flights.

B. Why Airline On-Time Performance Has Declined

The fact that on-time performance has declined markedly at Newark and LaGuardia, where the number of flights has increased only modestly, suggests that factors other than increasing numbers of flights are causing on-time performance to deteriorate. The increases in flights at the three airports are shown below.

By a substantial margin, from 2000 to 2006, Kennedy Airport experienced the greatest increases. FAA capacity restrictions were lifted at Kennedy Airport at the end of December 2006 and, according to the Port Authority, for the first eight months of 2007 scheduled flights at Kennedy increased by 23.5 percent above the same period the year before.

Table 3. Number of passenger aircraft movements

	2000	2005	2006	2000 to 2006 increase
Newark	396,456	393,273	402,657	1.6%
LaGuardia	363,925	388,778	385,030	5.8%[8]
Kennedy	301,182	313,209	344,419	14.4%
TOTAL	1,061,563	1,095,260	1,132,106	6.7%

Source: PANYNJ 2006 Airport Traffic Report

The main reasons for increasing delays are discussed below. Many of these reasons are long-standing, but because the air traffic control system was already over-stressed, it has not been able to adequately handle the increases in flights shown in Table 3.

An antiquated air traffic control system and outmoded flight paths

Airlines and the Port Authority blame the congested airspace and mounting flight delays on outmoded flight paths and an antiquated air traffic control system. Because the air traffic system is under extreme stress, it has been unable to handle the increases in flights seen in recent years, and any small disruption such as a thunderstorm can cascade into extensive delays.

The current radar-based air traffic control system is not very precise. Ample space therefore must be kept between planes, generally at least three miles horizontally when landing. This makes for inefficient use of airspace.

Aircraft in the New York-Philadelphia region must share flight paths that are very restricted and congested and have not been updated in decades. The main flight path, known as J80, is especially congested for flights going west. Because the antiquated air traffic control system requires aircraft to be kept so far apart and because aircraft have to stick closely to a pre-filed flight plan, pilots are not able to independently choose and fly the most direct routes that bypass congestion.

[8] It should be noted that at LaGuardia Airport, FAA capacity management regulations, referred to as the High Density Rule (HDR), or caps, have been in effect for more than 40 years. Caps have kept scheduled take-offs and landings close to the level which the FAA believes LaGuardia can safely and reliably handle. In 2000, Congress granted a number of exemptions to capacity rules at LaGuardia in order to allow new airlines to serve the airport and to increase direct service to small hub and non-hub airports. Within a few months, airlines added more than 300 flights at LaGuardia and on-time performance at the airport fell sharply. In response, in the fall of 2000 the FAA revoked some HDR exemptions and established the current 75 aircraft movements per hour rule.

The FAA has implemented a number of air traffic control procedural improvements at the New York airports to deal with these issues, such as:

- Domestic Reduced Vertical Separation Minimums (DRVSM), a reduction in aircraft separation minimums from 2,000 to 1,000 feet, which allows more aircraft to use a given flight path at peak times.
- Area Navigation, or RNAV. RNAV allows aircraft to fly on any desired flight path rather than having to link to a ground-based navigation aid. This allows for more direct routes, which can help reduce air space congestion as well as save fuel and reduce emissions. As of October 2008, the FAA had approved 170 RNAV procedures at 57 airports, including Kennedy and Newark.
- Required Navigation Performance (RNP). "RNP takes advantage of an airplane's onboard navigation capability to fly a more precise flight path into an airport."[9] According to the FAA, RNP enables "reduced obstacle clearance or closer route spacing without intervention of air traffic control."

Unfortunately, these improvements still did not prevent on-time performance at New York's three major airports from declining in 2006 and 2007.

Poor labor relations and shortages of air traffic controllers

Poor labor relations between the FAA and the National Air Traffic Controllers Association and insufficient numbers of air traffic controllers are often cited as causes of the poor on-time performance at New York City airports. Staffing levels have indeed declined in the New York City area. For example, according to the National Air Traffic Controllers Association, in 2004 Kennedy Airport had 37 certified professional controllers; in August 2007 there were 27 and by the end of summer 2008 there will be 21.[10] It has been difficult to recruit new controllers because the FAA recently lowered starting salaries (although later increases bring annual compensation to $90,000 after five years of service.)[11]

Nationwide, at the end of the federal fiscal year on September 30th, there were 11,256 certified air traffic controllers, a four percent decline from a year earlier and the lowest number of air traffic controllers since 1992. In the same period, there were 856 retirements, more than seven percent of the workforce.[12]

These and other issues have contributed to a tense relationship between labor and management, which is hampering efforts to optimize take-offs and landings and run the air traffic control system effectively. There are numerous accounts of controllers appearing to conduct rule book slowdowns.[13] According to the ATA, a decline in air traffic controller productivity in New York in 2007 compared to 2006 "is a key driver of

[9] States News Service, "NextGen Goal: Performance-Based Navigation," May 8, 2007.

[10] According to Stephen J. Abraham, National Air Traffic Controllers Association representative at Kennedy Airport, letter to the editor of the *The New York Times*, August 28, 2007.

[11] Sewell Chan, "Metro Briefing New York: Schumer Warning on Controllers," *The New York Times*, sec. B, page 6, February 12, 2007.

[12] Press release, "Lack of Contract Fuels Record Surge of Air Traffic Controller Retirements and Total Attrition", National Air Traffic Controllers Association, October 22, 2007, www.natca.net.

[13] A rule book slowdown occurs when, to express their displeasure with contract negotiations, employees follow written procedures to the letter, ignoring standard practice that often develops in response to real-world situations not contemplated or addressed in written procedures.

delays in the New York area." More specifically, the ATA charges, the System Airport Efficiency Rate (SAER)—which measures how well airports handle the number of aircraft operations they say they can accommodate—declined for the three New York area airports in 2007.

Over-scheduling of flights at peak times

Congress has vested almost all regulatory authority over civil aviation with the FAA, an agency within the U.S. DOT. However, since 1978, fares, routes and domestic market entry and withdrawal have not been regulated by the agency, and since then, the FAA has regulated flight activity only at a small number of airports where departure and arrival demand exceeds the airports capacity. With federal caps on the numbers of take-offs and landings limited to Reagan National, LaGuardia, and Chicago-O'Hare airports, airlines have aggressively expanded schedules beyond the capacity of many airports and the air traffic control system.

When asked about over-scheduling of flights in the early morning and early evening, the industry responds that in order to maximize works days at a destination, those are the times when their customers prefer to fly. Similarly, customers have come to prefer point-to-point flying as opposed to the older hub and spoke system which frequently involves a change of planes.

Nevertheless, FAA capacity rules limited the number of arrivals and departures at Kennedy between 3:00 PM and 8:00 PM until they expired on January 1, 2007 under the Aviation Investment and Reform Act for the 21st Century (AIR-21). This allowed airlines to increase the number of flights scheduled at Kennedy by 23.5 percent in the first eight months of 2007 compared to the same period in 2006.[14] Appendix E details the growth in scheduled aircraft movements at Kennedy Airport during peak summer hours in selected years 1990 to 2007.[15] During some of the most crowded hours, arrivals increased by as much as 54 percent and departures by as much as 95 percent. By June 2007 there were between 80 and 90 scheduled flights during the busiest hours and a peak of 111 flights from 4:00 PM to 5:00 PM, an increase from 82 flights during this hour in August 2006. The expansion in scheduled flights at Kennedy Airport has added considerably to the challenges facing the air traffic control system.[16]

The impact of chronic over-scheduling on flight delays has been exacerbated by airlines' increasing utilization of each plane and the resulting reduction in ground time between flights. The financial difficulties that have recently plagued the aviation industry, especially the higher-cost "legacy" carriers, have prompted airlines to wring as much revenue from each plane as possible. But with more flying time each day and less time between flights, a flight delay earlier in the day can have a ripple effect and cause subsequent flights with that aircraft also to be late. As recently as 2006, major airlines were continuing to trim aircraft ground time notwithstanding declining airline on-time performance. In January 2006, for example, United Airlines cut ground time by four to 12 minutes at San Francisco International Airport and stated that it would do so at other hubs as well.[17]

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[14] Ken, Belson, "Ending a Limit on Kennedy Flights Increases Passengers and Delays", *The New York Times,* July 12, 2007, NY region.

[15] August for all months except 2007, which is June.

[16] There is considerable disagreement over the good-weather hourly capacity of the New York airports. According to the Port Authority of New York and New Jersey, in ideal operating conditions, Kennedy Airport should be able to accommodate up to 66 landings and 55 departures per hour, or 120 combined. The FAA has proposed a cap of 80 movements per hour, just five more than the existing cap at LaGuardia even though Kennedy is a much larger airport with two more runways.

[17] The airline said this would free up 10 planes that could be used to produce more revenue from additional flights. "Has United changed enough?; Airline touts its new plan, but others fear it's trying to be too much to too many," *USA Today*, January 23, 2007.

The impact of shortened periods between flights is seen in DOT statistics on the total length of flight delays nationally. The Department breaks out the reasons for the delays into five categories. "Aircraft arriving late" is defined by DOT as, "A previous flight with same aircraft arrived late, causing the present flight to depart late."[18]

Total minutes attributable to the category "aircraft arriving late" increased from 30.9 percent of total delayed minutes in 2003 (June to December), to 33.6 percent in 2004, 34.2 percent in 2005, 37.0 percent in 2006, and 38.2 percent in 2007 (January to July).

General aviation crowds the sky

General aviation's share of New York air traffic

There is considerable disagreement among aviation industry stakeholders about the impact of the general aviation industry, primarily small private jets and turboprop planes, on the mounting delays and congestion in the nation's airspace. The general aviation industry, including manufacturers of corporate aircraft, argues that general aviation has played little or no role in causing the deterioration in on-time performance at major airports. The airlines and their industry counter that while general aviation aircraft constitutes a small percentage of the landings at the major airports, it comprises a significant portion of the traffic in the nation's and especially the New York region's airspace. According to the Air Transport Association (ATA), which represents the commercial aviation industry, private planes now represent around "30 percent of all New York Terminal Radar Approach Control activity".[19]

More specifically, while general aviation is only a very small percentage of take-offs and landings at New York's major airports, it comprises all of the flights from smaller New York regional airports in Teterboro and Morristown, New Jersey and Republic Airport on Long Island, most flights at Westchester County Airport and Atlantic City and significant shares at Stewart and MacArthur-Islip. To put it in perspective, each day there are a total of more than 300 general aviation take-offs that utilize the air traffic control system from Teterboro, Morristown and Westchester County combined, compared to approximately 600 at Newark and 475 at Kennedy. The number of Teterboro general aviation operations in 2006 alone exceeded the total operations of Delta Airlines at all three major New York airports last year. Each general aviation plane is another "blip" on the radar screens that air traffic controllers have to monitor. It is clear that general aviation contributes very substantially to congestion in the New York air space.

The impact of general aviation on air space congestion is bound to increase with the introduction of a new type of less expensive, very light weight private jet. These very light weight jets cost less to purchase and operate than existing corporate jets and have the potential to significantly increase the number of private jets in the air over the next few years according to many industry analysts.

Funding fairness and general aviation

The aviation industry fight over the impact of the general aviation industry on air space congestion has become especially intense because the authorizing legislation for the FAA expired on September 30th. A temporary reauthorization bill, expiring at the end of 2007, has passed Congress and a new reauthorization

[18] The other reasons and their percentages in 2007 are "air carrier delay" (28.0 percent), "security delay" (0.2 percent), "national aviation system delay" (27.6 percent), and "extreme weather" (6.1 percent).

[19] Ibid.

bill has passed the House. The Bush administration, supported by the commercial aviation industry, is seeking to change the way the FAA is funded so that private planes would pay a larger share of costs.

According to the FAA, general aviation accounts for about 16 percent of air traffic nationwide but pays only about three percent [20] of the cost of the air traffic control system. The FAA has proposed several changes in the fees it collects from all flights as part of the reauthorization legislation, including sharply increasing aviation fuel taxes and charging private planes a surcharge when they land at any of the 30 most congested airports in the country.[21]

Greater use of smaller aircraft

Since 2000, the utilization of smaller, regional jet aircraft has increased a very substantial 45.4 percent in the New York region. Meanwhile the number of large planes has declined by 7.2 percent. Table 4 highlights the shifts that have occurred in the size of aircraft at each of the major airports. From 2000 to 2006, Newark and LaGuardia Airports experienced similar, large decreases of approximately 21 percent in the number of full-sized, commercial aircraft movements. Concurrently, the number of commuter or regional jet landings and take offs grew by 89 percent at Newark and 71 percent at LaGuardia. (Commuter planes or regional jets are defined as having 70 or fewer seats.)

Table 4. Change in aircraft composition at New York airports, by number of flights

	2000	2005	2006	2000 to 2006
Newark large planes	315,125	241,016	249,025	-20.98%
Newark regional planes	81,331	152,257	153,632	88.90%
LaGuardia large planes	257,679	209,699	203,004	-21.22%
LaGuardia regional planes	106,246	179,079	182,026	71.33%
Kennedy large planes	209,285	248,092	273,702	30.78%[22]
Kennedy regional planes	91,897	65,117	70,717	-23.05%
TOTAL large planes	*782,089*	*698,807*	*725,731*	*-7.2%*
TOTAL regional planes	*279,474*	*396,453*	*406,375*	*+45.4%*

Source: PANYNJ 2006 Airport Traffic Report. Additional details in Appendix E.

The increasing use of smaller planes has permitted airlines to offer much more direct service to more cities (many with smaller airports) from Newark and LaGuardia. They also have been used to increase service between larger cities. For example, three 120-passenger jets per day between LaGuardia and Chicago-O'Hare can be replaced by five 70-passenger planes, allowing for more choice of departure and arrival times.

[20] Some reports estimate the contribution to be as high as six percent.

[21] Nelson Schwartz, "It's Bird Eat Bird in a Cluttered Sky" *The New York Times* , August 26, 2007, Week in Review, pps. 1 and 4.

[22] During the last few years Kennedy Airport has witnessed a rapid expansion in domestic service, in part to take advantage of underutilized runways and gates. JetBlue Airlines has rapidly expanded there, becoming the airport's biggest carrier. JetBlue flies only full size planes. Delta Airlines also has rapidly expanded both its domestic and international service at Kennedy Airport. Delta's domestic expansion uses a combination of regional jets and full-sized planes and the international expansion uses large aircraft. American Airlines, number two at Kennedy in passengers flown, also has expanded and recently opened a new terminal at the airport.

While the additional frequencies and increased number of non-stop flights to more cities are positive developments for air travelers, the net result has been that using smaller planes has reduced the number of passengers that can fly in and out. As airlines have scheduled additional flights using regional jets, in part to make up for reduced capacity, congestion and delays have increased.

Weak FAA leadership

While blame for the rapid deterioration in on-time performance in the Northeast can be spread among many parties, the failure to expeditiously modernize the air traffic control system and the FAA's delays in implementing incremental operational improvements at the airports are the major culprits. In an environment of limited take-off and landing capacity, if the regulatory agency fails to manage the system, it is to be expected that each stakeholder—airport operators, airlines, general aviation—will advance its own agenda. The FAA's leadership has been weak.

To be sure, Congress has given conflicting signals on how strongly it wishes the FAA to regulate aircraft movements. In 2001, Congress initiated a phase-out of legislated take-off and landing caps at a number of congested airports. The move stemmed from members' interest in getting more regional jet service to their districts and a wish to loosen the constraints on new airlines seeking to start or expand service at major airports. As air service rapidly expanded and delays multiplied, both Congress and the FAA have been slow to react.

C. Deteriorating Airline On-Time Performance and the New York City Business Climate

On-time performance influences corporate location decision-making

New York is a comparatively high cost place to do business. Nevertheless, for many businesses, when it comes to deciding where to locate new facilities and hire employees, New York's outstanding air connections with the rest of the nation and the world offset some of the city's higher costs. Whether the destination is Shanghai or Seattle, having a wide selection of flights from Newark, LaGuardia, and Kennedy, as well as from Westchester County, MacArthur-Long Island and Stewart airports means that it is likely there is a direct flight at a convenient time from the New York region. The value of being able to get to almost anywhere directly is enormous.

But according to consulting firms who advise corporations on where to locate offices, the on-time record of the airlines that use a locality's airports also is a factor to consider.[23]

And the importance of airport on-time performance in a location's business climate was recognized by the New York City Citizens Budget Commission (CBC) in its July 2001 ranking of the competitiveness of 13 U.S. metropolitan areas.[24] Among the seven "Physical Infrastructure" indicators that made up the scorecard

[23] Jeannette T. Goldsmith, Principal, McCallum Sweeney Consulting, "The Top Five Things You Need to Know About HQ Relocations: What you can't afford to forget when relocating your corporate headquarters," *Business Facilities*, April 2004. According to one such consultant, the ability to get to most major cities as well as cities where your company has other operations with just one flight is critical… In addition, the frequency of flights to key destinations is important, as are the ease of access to the airport and *the on-time record of the airport.*"

[24] Citizens Budget Commission, New York's Competitiveness: A Scorecard for 13 U.S. Metropolitan Areas. The 12 metropolitan areas to which New York was compared were: Boston, Chicago, Dallas, Detroit, Houston, Los Angeles, Philadelphia, Phoenix, San Antonio, San Diego, San Francisco, and Washington, DC.

was the five-year change (1995-2000) in the locality's airport on-time arrival percent. During this period, New York's on-time percent declined by 14.9 percent, ranking New York 11th out of the 13 metropolitan areas. Chicago was 13th (down 17.9 percent) and Philadelphia was 12th (down 16.4 percent).

The CBC has not repeated its scorecard. However, if the change in on-time performance is calculated for the five-year 2003 to 2007 period, New York would come in last, and by a substantial margin, because the five-year on time arrival rate declined by at least 25 percent at New York's three major airports. The next greatest decline was 18 percent at Dallas-Ft. Worth airport, while the on-time arrival rate at most of the other metropolitan areas in the study declined between five percent and 15 percent.

Rising flight cancellation rates in New York compound the harmful impact of poor on-time performance on business location decision-making. Not only are flights increasingly likely to be late, but there is a significant possibility—nearly five percent at LaGuardia—that a New York flight will not depart at all.

In addition, because the air traffic control system is over-stressed, airlines are choosing not to expand service in New York, even though there may be customer demand for more flights. This September, American Airlines Executive Vice President Bob Reding told a U.S. Senate subcommittee that American Airlines has not added capacity "to delay-plagued JFK International Airport" in order to help "mitigate delays caused by scheduling more flights than today's ATC [air traffic control] system can handle."[25]

Because it, too, is located in the congested northeastern U.S. air corridor, Philadelphia International Airport has also seen its on-time performance decrease more than at most other airports. As reported in the *Philadelphia Inquirer*, in 2006, Mark S. Schweiker, President and CEO of the Greater Philadelphia Chamber of Commerce, said that he wants the FAA to know business leaders believe flight delays at the Philadelphia International Airport "are reaching unacceptable levels" and "an efficient airport with fewer delays is vital to the region's growth." He urged the FAA to adopt a new air traffic routing system to reduce flight delays in Philadelphia and New York.

Flight delays in New York are financially costly.

In a soon-to-be published study of the economic impact of airport congestion, economists Steven A. Morrison and Clifford Winston have estimated that for pleasure and business travelers, "passengers' values of time in 2005 dollars ranged from $27.13 to $79.16 per hour with a median of $47.97."[26]

Comptroller staff calculates that comparing the increased average taxi-out at the New York airports for 1995-1997 with 2005-2007 (three year averages), in 2007 the increases in the average taxi-out at three major New York City airports over this period[27] resulted in 3.9 million extra hours of passengers waiting for

[25] Statement of Bob Reding, Executive Vice President Operations, American Airlines, at hearing of the Subcommittee on Aviation Operations, Safety and Security of the U.S. Senate Committee on Commerce, Science, and Transportation, September 27, 2007.

[26] Steven A. Morrison (Northeastern University), Clifford Winston (Brookings Institution), Another *Look at Airport Congestion Pricing.* (To be published in *American Economic Review,* December 2007.)

[27] Comparing the annual averages for 1995-1997 with the annual averages for 2005-2007, average taxi-out increased by approximately seven minutes at Kennedy Airport, six minutes at LaGuardia Airport, and four minutes at Newark Airport. The number of passengers who are affected in 2007 is based on the number of enplanings at each of the three airports in 2005; inasmuch as flight activity at all three airports has increased since 2005, this number may actually understate the number of affected passengers in 2007.

their plane to take off after it already left the gate in 2007. Based on the median hourly amount, in 2007 this additional time on the ground cost travelers $187 million.[28]

Delays are also costly for airlines because of higher operating costs due to increased fuel consumption and crew expenses and less efficient utilization of aircraft.

***Flight delays also affect air cargo operations*.**

Many New York City businesses heavily rely on timely cargo shipments. Shipping cargo on passenger planes can be especially attractive to businesses because there are hundreds of flights in the region from which to choose. Because 26 percent of air cargo is carried in the holds of passenger planes,[29] passenger aircraft flight delays and cancellations can adversely impact businesses that depend on timely delivery or receipt of air cargo.

The amount of cargo shipped on passenger aircraft through the major New York airports is enormous. The two largest cargo carriers, Federal Express and United Parcel Service, do not carry passengers. However, in terms of tonnage carried, UPS was closely followed by American and Continental Airlines, neither of which operates all-cargo flights.[30]

D. More Flights and Longer Delays = More Pollution at the Airports

Jet aircraft engines emit large amounts of Volatile Organic Compounds (VOCs), nitrogen oxides (NOx), carbon dioxide,[31] carbon monoxide, sulfur oxides, and soot. NOx is a contributor to acid rain and NOx and VOCs react together in the atmosphere to form ozone, a respiratory irritant. The total amount of pollution generated by airport activities is enormous. According to the FAA, "the total mass of emissions coming from an airport may be comparable to those of a power plant or petroleum refinery in the same region." [32] Nevertheless, aircraft emissions are lightly regulated in the United States and local efforts to limit aircraft pollution at airports have been restricted by the FAA and Congress.

With the FAA projecting a doubling of U.S. airline passengers between 2005 and 2025, pollutant emissions are destined to grow, even as new more fuel-efficient aircraft are added to airline fleets and older, dirtier planes are retired. In 1999, a U.S. Environmental Protection Agency (EPA) study estimated the amount of increase in VOC and NOx emissions attributable to increased flight activity at the New York airports. The

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[28] This does not take into account instances where the plane, after taking off, made up for some or all of the lost time in flight.

[29] Source: U.S. Department of Homeland Security, Transportation Security Administration, accessed at www.tsa/gov/what_we_do_/tsnm/air_cargo/index.shtm.

[30] In 2006, Federal Express and United Parcel Service carried 683,297 and 181,062 short tons through the New York airports, respectively. They were followed by American Airlines, with 178,992 short tons and Continental Airlines, with 134,175 short tons, virtually all of which was carried through Kennedy and Newark airports, according to the Port Authority of New York and New Jersey *Statistical Summary*.

[31] Twenty pounds of carbon dioxide are emitted for every gallon of jet fuel that is burned, according to the FAA, as reported in, "*US Air Traffic Delays Increase Fuel Burn And Emissions," Jet Fuel Intelligence, June 18, 2007.*

[32] U.S. Federal Aviation Administration, Office of Environment and energy, *Aviation & Emissions Primer,* January 2005, p. 9.

study projected an 18.2 percent increase in landings and take-offs at the New York airports from 1990 to 2010, a 59.7 increase in VOC, a 67.7 percent increase in NOx, and a 46.7 percent increase in carbon monoxide emissions.[33]

The environmental consequences of the recent increases in aircraft movements are not limited to airports and adjoining communities. Aviation accounts for approximately three percent of gases and particles, including carbon dioxide, associated with global warming. In 2000, the burning of jet fuel in the U.S. produced 68.5 million metric tons of carbon, which constituted 4.3 percent of total U.S. carbon dioxide emissions[34]

Experts agree that projected growth in aviation could make aircraft emissions one of the fastest-growing contributors to global warming.[35]

Environmental impact of New York airports

Two studies of airport emissions have found that if airports were classified as stationary source of emissions like a power plant, commercial incinerator or large industrial manufacturing site, they would rank among the dirtiest fixed sources for pollution in a given community. The first study, a 1996 report by the Natural Resources Defense Council (NRDC), placed New York City's two airports on a list of the five largest sources of Volatile Organic Compounds (VOCs) in New York State and both airports were major sources of Nitrogen Oxide (NOx).[36] Other sources of NOx include power plants and garbage incinerators, while VOCs are also emitted by oil refineries, oil storage facilities and gas stations.

The second study, by the Northeast States for Coordinated Air Use Management, a consortium of the state air quality agencies in the Northeast including New York and New Jersey, reported how airports and airplanes contribute to the region's air pollution problems.[37] Since air service is steadily expanding while other major sources of air pollution are getting cleaner, aircraft and airports are responsible for an increasing share of the region's air pollution, the study found.

In addition, the FAA has calculated the contribution of airport-produced nitrogen oxide to the nitrogen oxide inventory in nine major metropolitan areas. In 2000, the three major New York airports accounted for 4.0 percent of the area's nitrogen oxide inventory, more than in any other area except for 6.1 percent in Dallas-Fort Worth.[38]

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[33] "Evaluation of Air Pollutant Emissions from Subsonic Commercial Jet Aircraft", U.S. EPA, Air and Radiation division, April 1999, p. 3-2.

[34] Most recent year available. Source: U.S. Department of Transportation, Research and Innovative Technology Administration, U.S. Carbon Dioxide Emissions from Energy Use by Sector (Million metric tons of carbon).

[35] As reported in, "Concern grows over pollution from jets; aviation emissions will take off with worldwide air travel," *USA Today*, Dec 19 2006, p. 1A.

[36] *Flying Off Course*, op. cit. pps. 36-37.

[37] Northeast States for Coordinated Air Use Management (NSCAUM), Controlling Airport-Related Air Pollution, June 1, 2003.

[38] Ibid. p. 7. The other eight areas and their airports' NOx contributions were: Atlanta (2.8%), Chicago (0.8-2.0%), South Coast California (1.5 %), Dallas-Fort Worth (6.1%), Houston (0.7%), Seattle-Tacoma (1.9%), St. Louis (1.4%), and Boston (0.7%).

Impact of increases in flights and flight delays on New York airport pollution

According to the FAA, about 10 percent of aircraft emissions, other than VOCs and carbon monoxide, occur during airport ground operations, which include taxi-in and taxi-out, and landing and take-off. About 30 percent of VOC and carbon monoxide emissions are produced during this same period.[39]

Therefore, the large increase in aircraft movements at New York's three major airports in recent years is resulting in a substantial increase in pollutant emissions at the airports. The impact on air quality has been especially pronounced at Kennedy Airport, as opposed to Newark and LaGuardia, because of the far greater increase in flights at Kennedy and because the increase there is attributable to full size aircraft, while at LaGuardia and Newark there was a shift from larger aircraft to smaller regional planes.

Apart from additional emissions being generated during take offs and landings, increases in taxi-out periods are contributing significantly to airport air pollution. For example, based on average taxi-out time of 32 minutes in 2006, the roughly 21,600 additional take-offs at Kennedy Airport in 2006 compared to 2000 resulted in about 11,520 additional hours of aircraft taxi-out engine use in 2006. Increases in the duration of taxi-out periods have accounted for a substantial portion of the increase engine running time and emissions. For example, at Kennedy, the three minute increase in the average taxi-out from 2000 to 2006 translated into approximately 8,610 more hours of aircraft operating their engines in 2006, assuming engines were not turned off.[40] Looking farther back, the eight minute increase in average taxi-out between 1995 and 2006 was responsible for 22,900 additional hours of engine use in 2006.

Longer taxi-outs contribute especially to VOC emissions. Ninety-three percent of the VOC emissions from an aircraft's landing-take-off cycle occur when the plane is either taxiing to or from a runway or idling at a gate or on a taxiway. This is because VOC emissions are highest during idling.

Non-aircraft engine sources of airport air pollution

While the vast majority of pollution created at airports arises from aircraft, a study of three airports in New England showed that auxiliary power units (APUs) and ground service equipment were responsible for about 15 percent of the VOCs and NOx.[41] APUs are small engines on planes that provide electricity and Heating-Ventilation-Air Conditioning requirements while planes are sitting at gates.

Table 5. Emission sources at Logan Airport, Boston, 1999

Source	VOCs	NOx
Ground service equipment	9%	5%
Airport-related motor vehicles	24%	7%
Aircraft	42%	85%
Other (primarily fueling)	25%	3%
Total	100%	100%

[39] Aircraft emissions that affect ground-level pollution occur primarily when aircraft operate below a height of 3,000 to 4,000 feet. This so-called mixing zone varies in height based on weather, the seasons and airport elevation above sea level. Most of a plane's operation in this mixing zone occurs as part of the aircraft's landing and take-off (LTO) cycle. The LTO cycle occurs primarily during that portion of a flight when an aircraft is below the mixing zone ceiling.

[40] It should be noted that airlines have adopted certain practices to reduce fuel consumption and emissions during taxi-out and taxi-in such as single-engine taxiing.

[41] Northeast States for Coordinated Air Use Management, *Controlling Airport-Related Air Pollution,* June, 2003. p.29.

Although the EPA has the authority under the Clean Air Act to regulate aircraft emissions, the agency is somewhat more restricted as to its regulatory authority over airplanes compared with other mobile sources. The EPA has not actively pursued tighter aircraft emissions standards and tends to follow standards set by the International Civil Aviation Organization. Most new aircraft engines have emissions profiles which are cleaner than current standards.

In the last ten years, the EPA has begun regulating emissions from off-road vehicles including aircraft-service equipment with diesel and gasoline engines and the inventory of off-road vehicles is slowly getting cleaner as old equipment is retired and replaced with lower emission vehicles. States are preempted under federal law from regulating aircraft emissions. As with automobiles and trucks, however, if California adopts stricter emission standards than the federal government for off-road vehicles, states may choose to adopt the California standards. To date, California has not enacted lower emission standards for this category of engines.[42]

The Port Authority and the airlines are moving to reduce non-aircraft engine emissions at the airports. Most gates at the airports now have gateside power, eliminating the need for airlines to run aircraft engines or APUs while parked.Work is underway to provide gate side power at Stewart Airport's seven gates. Gateside power saves fuel for the airlines and reduces emissions.

Most of the Port Authority's active shuttle bus fleet is made up of low-emission diesel-electric hybrids. The Port Authority is also planning to construct a geo-thermal HVAC plant at Kennedy Airport which would use a closed-loop circulation system with water at a near constant 55 degrees to generate either heating or cooling depending on the ambient air temperature.[43]

Airlines are also taking action. The Delta Shuttle has converted all of its ground service equipment to electric power at LaGuardia, and Continental, the dominant carrier at Newark, is evaluating this action, too. American has utilized electric ground service equipment for over ten years and continues to introduce additional electric-powered equipment as it retires gasoline and diesel ground service vehicles. At Kennedy, American Airlines tows planes from hangers to gates rather than using jet engine power. But more remains to be done, such as requiring that the rental car buses which circle the airports 24 hours a day be low-emission models.

Effects of airport pollution

Air quality

Ozone forms when VOCs and NOx combine in a chemical reaction accelerated by heat and sunlight. High ozone levels cause lung irritation, aggravate asthma and other respiratory diseases, make breathing more difficult and affect plant growth. Children, senior citizens, individuals with lung and respiratory problems, and individuals who work or exercise strenuously outdoors are at higher levels of risk for ozone-related medical problems.

Much of the New York City metropolitan area currently exceeds federal maximums for ozone exposure and the area is classified as a moderate ozone non-attainment area. On a number of days each year, primarily in warmer months, ozone levels in New York City exceed the EPA's Air Quality Standards.[44]

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[42] Ibid. pp. 6-8.

[43] Telephone conversation with Port Authority of NY & NJ aviation staff. October 3, 2007.

[44] American Lung Association website, www.lungaction.org/reports, State of the Air: 2007, "Health Effects of Ozone and Particle Pollution".

By law, New York State's [Clean Air Act] Implementation Plan is required to lower ozone levels to national standards by the summer of 2010. Greater aircraft emissions due to increased flight activity and worsening flight delays have the opposite effect.

The limited regulation of aircraft emissions creates an additional burden on state Clean Air Plans. These Plans must achieve even greater emission reductions from other, highly regulated sources such as automobiles, power plants, landfills and industrial facilities in order to make up for the limited regulation of and rising emissions from airports.

Jamaica Bay ecology

The Watershed Protection Plan for Jamaica Bay issued by the New York City Department of Environmental Conservation (DEC) on October 1, 2007 examined the probable causes for the steady and accelerating disappearance of the Jamaica Bay salt marshes. Among these causes are changes in sediment distribution patterns effected by residential and commercial development and dredging of navigational channels, global warming, and water pollution. Water pollution sources include increased nitrogen discharges from the four city waste treatment plants that empty into the bay, from combined sewer overflow when there is a heavy rainfall, and from untreated storm water flows from the Belt Parkway and Kennedy Airport.

Kennedy Airport runoff enters Jamaica Bay through 27 discharge points. Environmental advocacy organizations including the Jamaica Bay Eco Watchers, the Natural Resources Defense Council, and the New York-New Jersey Baykeeper have long been concerned that the outfalls send untreated water into the bay.[45] These discharges include aircraft deicing chemicals and other fluids[46] that leak onto the tarmac.[47] The main chemical in deicing fluids, glycol, is not considered highly toxic, but additives including chemicals known as tolyltriazoles (inhibits corrosion) and alkylphenol ethoxylates (a surfactant), can be highly toxic.[48] The large increases in aircraft movements at Kennedy in recent years—a 23.5 percent increase in the first eight months of 2007 compared to the same period in 2006, alone—is likely to be producing substantial increases in discharges of toxic pollutants into Jamaica Bay.

Environmental advocates have long prodded the New York State Department of Environmental Conservation to revise and upgrade the storm runoff discharge permit granted to the Port Authority for Kennedy Airport. In October 2007 a new permit for Kennedy Airport's storm water and deicing fluid runoff was issued which requires the Port Authority to more frequently sample Kennedy Airport discharges into the

[45] Runoff from outfalls serving fuel tank areas is partially treated.

[46] A comprehensive three-year (1991-1993) study of water quality in the Blind Brook watershed adjacent to Westchester County Airport by researchers at SUNY-Purchase found a number of human-made toxics present, including deicers and organophosphate, which can be found in aircraft hydraulic fluids, as well as a chemical which is added to flame retardants. Source: Natural Resources Defense Council, *Flying Off Course: Environmental Impact of America's Airports*, October 1996, p.60.

[47] A member of the Jamaica Bay Watershed Protection Plan Advisory Committee told Comptroller staff that tire rubber is burned when aircraft land and studies of highways adjacent to wetlands have documented adverse environmental effects from the rubber that tires leave on the highway when washed into the wetland.

[48] Environmental News Network staff, "Airplane deicer found to pollute groundwater," Cable News Network, posted January 8, 1999.

bay.[49] Also, according to the Jamaica Bay Watershed Protection Plan Advisory Committee, by next summer the airport must implement a set of "best management practices" to control storm water pollution, including runoff of de-icing and anti-icing chemicals. The Port Authority is also required to regularly collect from the airlines detailed data on deicer usage rates. The degree to which these actions may offset increases in storm water pollution resulting from increased flight activity at Kennedy needs to be closely monitored.[50]

E. Modernization Efforts Will Not Necessarily Accommodate Short-Term Demands

Air traffic control system modernization

The FAA has been slow to modernize and expand air traffic control systems to accommodate growing demand and the public's preferences for when to fly. In February 2007, the FAA held a groundbreaking ceremony for a new air traffic control tower at LaGuardia Airport. The ceremony occurred ten years to the month after the initial Environmental Assessment for the tower was approved. It took the FAA nine years to complete the design. The new tower, which is expected to open in 2010, will replace a 42-year-old structure with a larger facility and space to install long-awaited enhanced air traffic monitoring and control equipment.[51]

The delay in constructing a non-controversial control tower is emblematic of the shortcomings of the nation's air traffic control system. Plans to convert the system from radar to a full satellite-based (GPS) aircraft tracking, known as the Next Generation Air Transportation System (NextGen), are moving at a similarly glacial pace. NextGen is not expected to be completed until 2025.

The first component of NextGen is Automated Dependent Surveillance-Broadcast or ADS-B, which is the GPS-based tracking and locator component of the modernization effort. ADS-B provides much more accurate location information on airplanes than the current radar system. The current radar based system broadcasts only position and does so only once every five seconds near airports and every 12 seconds en route. ADS-B broadcasts aircraft identification, speed, and position almost continuously and without interrogation from air traffic controllers and tracks planes to within three feet as compared to as much as up to one mile under the current system. ADS-B therefore allows for closer spacing of planes, which raises throughput (take-offs and landings per hour) in congested air corridors and increases safety.

In 2007, the FAA awarded a $1.8 billion contract to ITT Corporation to install and operate ADS-B ground stations in four regions by 2010 and stations covering the rest of the nation by 2013. The initial ADS-B installations, with a contract value of $207 million, will be in Alaska, where early ADS-B testing has

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[49] The permit covers 33 discharge pipes into Jamaica Bay and adjacent tributaries and expires on May 31, 2011. The permit requires extensive testing of effluent from 36 percent of the discharge pipes, primarily those associated with refueling and power generation facilities and the two remediation plants which collect petroleum-contaminated groundwater.

[50] The Port Authority recently opened next to Hangar 12 a central InfraTek de-icing facility that uses infrared radiant deicing and a minimal amount of chemicals. This is a new FAA-approved alternative to full-chemical deicing. However, according to the manufacturer's web site, an InfraTek facility at Newark Airport takes 6.5 minutes to deice the average plane. Applying this time to the facility at Kennedy Airport, the Kennedy infrared deicer can handle approximately ten planes per hour, a fraction of the number of peak-hour takeoffs. Additional time may also be required to move the plane to and from the IntraTek facility.

[51] States News Service, "Crowley, Schumer and Lowey Laud Groundbreaking for New LGA Air Traffic Control Tower," February 28, 2007.

already occurred,[52] the Gulf of Mexico, where there is currently no radar coverage,[53] and in Louisville and Philadelphia, which are United Parcel Service hubs[54] to support GPS efforts by this freight carrier.

United Parcel Service Airlines already has installed an earlier version of ADS-B technology at its hub at Louisville[55] and on 300 of its planes.[56] UPS Airlines reports that the new technology allows simultaneous approaches to parallel runways and fuel-saving continuous descent, which saves fuel, reduces emissions, and increases throughput (flights per hour).[57] Delta Airlines has installed ADS-B equipment in Atlanta and has experienced similar benefits.[58]

Under the current schedule, it will be as many as six years before ADS-B ground equipment is installed in New York. Because there is no dominant airline in New York as UPS is in Louisville, none of the airlines that serve New York have installed any ADS-B equipment on their own.

While there are clear benefits to the air traffic control system solely from ground-based ADS-B installation such nearly continuous updates and gives the plane's velocity, to reap the full benefits from this technology, ADS-B avionics must to be installed on aircraft. On-board ADS-B gives pilots and air traffic controllers identical screens showing all of the aircraft in the vicinity. It gives pilots greater freedom of action and allows them to "self separate" and to choose a more direct flight path. However, recently proposed FAA rules would not require airlines to equip planes with ADS-B until 2020, seven years after the national rollout of the ground-based component is complete in 2013.

Flight path modernization

The FAA is looking toward modernization of flight paths—in effect, roadways in the sky—as another measure to reduce congestion in New York air space. Flight paths have not been updated since the 1960s and the existing main flight path, designated J80, becomes severely congested, especially for westbound departures.

FAA efforts to modernize flight paths to the three major airports in New York and at Philadelphia International Airport, which shares New York's air space, to increase capacity have been drawn out. Finally, however, in 2007 the FAA approved the Mitigated Preferred Alternative, which will revamp the air space over five states and "create more efficient arrival and departure routes." There will be an increased number

[52] The Capstone Program uses ADS-B technology and is reported to have reduced general aviation accidents in Alaska by 40 percent.

[53] ADS-B is intended to serve helicopters that service oil rigs in the Gulf of Mexico, some of which already participate in test programs.

[54] Capitol Hill Testimony of FAA Deputy Administrator Robert Sturgell before the Senate Commerce, Science and Transportation Committee, March 22, 2007, Congressional Quarterly Testimony.

[55] The Louisville airport has prototype ground receivers, according a telephone conversation by Comptroller staff with Robert Hansman, Jr., Professor, Department of Aeronautics and Astronautics at the Massachusetts Institute of Technology.

[56] As reported in *Avionics Magazine*, "UPS pioneered ADS-B when system was virtually unknown in aviation circles." Ryan Evans, "In trail, on-time," *Avionics Magazine*, June 15, 2007,

[57]The ADS-B equipment on UPS aircraft allows UPS planes to "see" each other and for UPS to line up landings in even intervals.

[58] These applications have been successful in part because of each airline's dominant position at these airports.

of jet routes and access points, new usages of Newark Airport runways, more routing flexibility during severe weather, and increased numbers of departure headings, among other modifications. The FAA believes the changes will reduce delays by more than 20 percent in the five-year implementation period. Airlines will save fuel and aircraft emissions will decrease as a result of more direct landing paths.[59]

The FAA also claims that 600,000 fewer people will be affected by "day-night level" aircraft noise levels of 45 decibels or more. The FAA considers a level of more than 45 to be a "slight to moderate noise impact."

Improvements versus soaring demand

Recent, imminent, and proposed longer-term improvements to the air traffic control system are unlikely to do more than barely keep up with expected growth in New York area aviation, particularly at Kennedy Airport. A recently completed study of airport capacity projected a 14.3 percent increase in aircraft operations at Kennedy from 2005 to 2010 and a 20.7 percent increase in operations between 2005 and 2015.[60]

It will take full implementation of the NextGen system to adequately handle current and expected air traffic.With NextGen, both pilots and air traffic controllers will view the same real-time displays of the positions of all aircraft in an area, allowing pilots on their own to choose the most efficient routes, called "self-separation," without necessarily asking for permission from controllers. This will make it easier for pilots to take more direct routes and avoid congestion. NextGen converts the entire air traffic control system to digital communications and introduces much more automation, with humans serving more of a back-up and oversight role. It is projected that NextGen will double flight capacity.

Recommendations

It is imperative for the well-being of New York's residents and businesses that on-time performance at the region's three major airports be substantially improved. The Comptroller recommends the following actions.

Modernization, better management, and fair allocation of system costs

- **Accelerate modernization of the nation's air traffic control technology from outmoded radar to a satellite-based system, prioritizing New York.**

  Compared with a satellite-based system, radar is slow and, because it can be inaccurate by up to a mile, it requires planes to be spaced far apart. The present air traffic control system is unable to provide digitalized data and automated communication in real time, both plane-to-plane and plane-to-controller.

  Given the disproportionate impact that New York airport delays have on the entire nation's air traffic, the FAA should make the three New York airports a priority in the modernization program. ADS-B measures aircraft positions with up to three foot accuracy, allowing planes to be spaced closer together. Yet the first

[59] FAA fact sheet, *Redesign of the New York, New Jersey and Philadelphia Airspace*, dated September 5, 2007 at www.faa.gov.

[60] Port Authority of New York and New Jersey in association with the FAA, NYS DOT and the Delaware Valley Regional Planning Commission, "FAA Regional Air Service Demand Study" Summary Report, May 2007 p. 18.

ADS-B ground stations under the recently let $1.8 billion ADS-B system ITT contract will cover Alaska, the Gulf of Mexico, Louisville and Philadelphia. **New York should be included with this group.** In a press release on October 23, 2007, the Port Authority called ADS-B "a central component to the Next Generation Air Traffic System" and stated, "This system needs to be implemented in the New York/New Jersey area first, prior to being deployed nationally."

Although ADS-B ground stations will make a difference in operational efficiency, the full potential of ADS-B will not be realized until all aircraft are equipped with ADS-B avionics. **This should be required by 2015, not 2020 as has been proposed by the FAA**. A recent editorial in *Aviation Week* criticized the FAA for a "lack of urgency" in developing the "longer term, high technology answer to congestion." The editorial said that it was "disappointing" that although the ADS-B infrastructure will be in place "as early as 2013," the FAA proposes to give airlines until 2020 "to equip themselves for it." *Aviation Week* called this a "curious deadline" and commented, "There's no rush, evidently."[61] And George Donohue, a former senior FAA official who directs the Center for Air Transportation System Research at George Mason University, told *Aviation Week*, "The 2020 deadline is at least five years too late."[62]

In several instances, airlines are moving ahead of the FAA in installing ADS-B equipment on their own. For example, the United Parcel System-installed ADS-B equipment at its Louisville Worldport and on UPS Airline aircraft is allowing for an increase in landings and take-offs there. ADS-B is effective at Louisville because UPS is by far the dominant airline there overnight and most of the planes that are able to "see" each other via ADS-B are UPS planes.

Thus, the Port Authority should pursue a partnership with JetBlue Airlines at Kennedy Airport and Continental Airlines at Newark—the largest airlines at those airports—to install ADS-B equipment on their aircraft in the near future. At the same time as the FAA installs ADS-B ground stations in New York—which we recommend be accomplished by 2010—the largest airlines at the New York airports should concurrently install ADS-B avionics on their aircraft and not wait until the FAA requires it. At Newark, Continental has a 77.5 percent market share and at Kennedy, JetBlue has a 38 percent market share.[63]

- **The FAA employ sufficient numbers of certified professional air traffic controllers and resolve its disputes with the air traffic controllers union.** At the least, current vacancies must be filled and the number of air traffic controllers assigned to the New York air space must be increased to appropriate levels.

- **General aviation bear its fair share of the region's air space capacity constraints.** The Air Transport Association recently called on the FAA to share the inconvenience of temporary ground delay programs at New York's three major airports with nearby Teterboro Airport. This is a valid request.When holds are placed on take-offs or landings at Kennedy, Newark and LaGuardia to ease congestion in the region's air

[61] Editorial, "Like it or not, U.S. aviation needs demand management," *Aviation Week & Space Technology*, October 15, 2007.

[62] David Hughes, "2020 Mandate; Aircraft must have ADS-B Out avionics by the end of the next decade, FAA says," *Aviation Week & Space Technology*, October 8, 2007.

[63] At LaGuardia, the largest carrier, American Airlines and American Eagle, had approximately 33 percent of the market.

space, such holds should include Teterboro and Westchester County airports. This would reduce the length of holds, generally, by clearing the airspace faster, and would better distribute the burden of delays and reduce the number of individual travelers affected by these delays.

Additionally, Congress should seriously consider legislative proposals to increase the share of the cost of the air traffic control system borne by the general aviation industry, particularly in areas with highly congested airspace. A more equitable sharing of the system's costs might shift some travel back from private planes to commercial aviation, freeing up space in the overcrowded skies.

Congestion pricing and caps

The commercial airline industry has publicly expressed a willingness to reduce peak hour operations and to make other changes. JetBlue and Delta Airlines have said they will reschedule some peak time flights at Kennedy Airport to less busy hours. Yet at the same time airline officials have stated that by eliminating peak hour flights they run the risk of losing passengers to competitors and that they must do what is necessary not to lose market share.

Ideally, various actions now underway or proposed, such as expanding taxiways at Kennedy Airport, approving RNAV and RNP flight procedures, voluntary "de-peaking," and adding more ground time between flights, will be effective in the short-term. To alleviate delays during Thanksgiving 2007 peak traveling days, the Bush administration permitted commercial airlines to utilize military air corridors off the Eastern seaboard and the FAA placed a moratorium on non-essential maintenance and operations. However, these were temporary expedients and cannot be sustained indefinitely.

If within a reasonable time—certainly prior to next summer's peak travel season—permanent measures do not very substantially improve on-time performance, stronger measures may become necessary. Two different alternatives that should be considered are:

- **Market-based landing fees—"congestion pricing"**

  Traditionally, landing fees at United States airports have been based on aircraft weight and closely tied to the cost of operating and maintaining the airport. An increasing number of economists urge that landing fees be restructured to provide an incentive for airlines to offer more flights during off-peak periods and trim their flight schedules during the most congested periods. The change from weight-based landing fees to a more complex fee structure could be designed to be either revenue raising or revenue neutral to the Port Authority.

  Airlines note that landing fees are only a small part of the cost of operating aircraft and suggest they are unlikely to change their behavior due to higher landing fees. However, airlines also would stand to significantly reduce operating costs if on-time performance is improved. According to an analysis based on 2005 costs, improved on-time performance resulting from market-based landing fees would save airlines and passengers $256.8 million a year at Kennedy Airport, $169.3 at Newark Airport, and $116.3

million at LaGuardia Airport. The analysis, *Another Look at Congestion Pricing*, found, "Overall, efficient pricing of takeoffs and landings for commercial carriers at the 74 airports would yield annual net benefits of $2.7 billion."[64] [65]

- **Temporary caps on the number of flights arriving at and departing from Kennedy Airport.** Ultimately, there may be no choice but to implement caps at Kennedy and, if this results in spillover of flights to Newark, possibly there as well. The inconvenience of not always being able to fly at a specified time because of caps might be more than offset by a substantially increased likelihood that a flight leaves and arrives on time. (LaGuardia Airport already has a 75 aircraft movement per hour regulation.)

  Caps should not necessarily be set at the 80 per hour sought by the FAA. The Port Authority has said that as many as 120 flights an hour can be handled at Kennedy Airport in ideal conditions. During summer 2007, as many as 111 an hour were scheduled. The optimal cap may lie somewhere between 80 and 110. A full analysis with computer modeling and simulations of the probable impact of various capping levels at Kennedy Airport and the impact of caps at Kennedy on Newark should be undertaken now—and released to the public—so that if temporary caps are needed, optimal capping levels can be implemented without undue delay.

  The Port Authority, in a letter to the FAA, has stated that the agency's proposed caps would eliminate hundreds of flights, affecting hundreds of thousands of passengers. It has also been noted that arrival and departure controls make it more difficult for new airlines to initiate service to New York and thus protect the status quo allocation of take-offs and landings. Yet the current situation is untenable. Substantial harm is already being done to both business and pleasure travelers by taxi-outs that frequently take an hour or more and by peak hour on-time arrival performance as low as 34 percent this summer.

  Notably, American Airlines and JetBlue and have indicated their support for temporary caps at a reasonable level at Kennedy if the FAA uses the opportunity to move ahead expeditiously with short and long-term technological improvements that substantially increase capacity.

  Caps should be ended as soon as physical, operational and technological improvements such as ADS-B and air space "redesign" are implemented and prove sufficiently effective.

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[64] Steven A. Morrison (Northeastern University) and Clifford Winston (Brookings Institution), *Another Look At Airport Congestion Pricing*. (To be published in *American Economic Review*).

[65] In addition, in 2004 and 2005, the FAA and DOT requested a series of government-industry strategic simulations to be conducted of the likely impact of congestion pricing on capacity at LaGuardia Airport. The simulations found that congestion pricing can be effective; specifically, it would have the effect of increasing passenger capacity by nine percent compared to the caps in place in 2004. As discussed in a policy brief written by participants describing the findings, the simulations "highlighted that the schedules were very sensitive to the time when prices either increased of decreased substantially, i.e. the airlines concentrated flights just prior to price increases or following price decreases." They also found, "Overall gauge [size of individual aircraft that are utilized] increased significantly at almost all times of the day" and due to the up-gauging, "LGA [LaGuardia Airport] is likely to find that they handle the same or a greater number of passengers with less congestion on their runways and gate facilities." Dr. George L. Donohue, Dr. Karla Hoffman, *Evidence That Airport Pricing Works*, Reason Foundation, Policy Brief No. 6.

Additional measures to curb airport air pollution

It is clear that shortening the long taxi-out and taxi-in periods associated with flight delays would substantially reduce airport air pollution. According to a recent analysis of the relation between aircraft emissions and taxi time prepared for a recent FAA workshop, taxi time reduction at the 113 airports studied could potentially reduce emissions of carbon monoxide by 21 percent, sulfur oxides by 16 percent, non-methane hydrocarbons and VOCs by 15 percent, particulate matter by 13 percent, and nitrogen oxides by six percent. As the analysis concluded, "Mitigation of round/terminal area delays has a positive change on local air quality." Inasmuch as taxi periods at the major New York airports are much longer than they are nationally, shortening taxi times in New York could surely reduce pollution by substantially more than these percentages.[66]

In addition to the measures to reduce delays recommended above, airport-generated pollution should be addressed by:

- **Restructuring landing fees at the three New York airports to provide incentives for airlines to fly cleaner airplanes.** Heathrow Airport near London currently charges dirtier and noisier aircraft higher fees. Sweden and Switzerland impose emission-based landing fees at their major airports.

- **The Legislature enacting legislation introduced by State Senator John Sabini and Assembly Member Jeffrion Aubry (S1636, A6422) to require the State Department of Environmental Conservation to install air monitoring equipment within a one-mile radius of LaGuardia and Kennedy Airports**. According to the sponsors' memorandum in support of S1636/6422, "Increased airplane emissions from area airports further aggravate the City's air quality, dumping additional exhaust and fume discharges on neighborhoods, especially in Queens, which hosts both John F. Kennedy International and LaGuardia Airports," yet under the federal law mandating a State and Local Air Monitoring Stations Network, there are currently "80+" air monitoring stations statewide, "but none near these two airports."

  More specifically, S1636/A6422 would require airport vicinity ambient air quality monitors to continuously measure for ozone, sulfur dioxide, oxides of nitrogen, carbon dioxide, meteorological data, and small particles. Separate photochemical assessment monitoring stations and an ambient toxic trend station would monitor for volatile organic compounds as ozone precursors during the summer ozone season. The measure also would require the Department of Environmental Conservation to periodically meet with site engineers, local community organizations and local elected officials of an area in which an airport is located to inform them of the results of the air quality monitoring and, if necessary, to recommend or establish programs to mitigate any adverse air quality. The data that would be obtained from the stations would be essential in assessing the health impact of airport emissions on nearby communities and setting baseline readings so that progress or the lack of progress in controlling and reducing airport-related emissions can be gauged.

- **The Port Authority promoting additional procedures and policies to reduce airport pollution.** As the landlord and operator of New York's three major airports and two smaller airports, Teterboro and Stewart, the Port Authority can significantly influence practices of airlines using its airfields.

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[66] This analysis compared actual operations to unimpeded operations, that is, to no delays between leaving the gate and "wheels up." The analysis was presented at NEXTOR (National Center of Excellence for Aviation Operations Research) Workshop 2007 by CSSI., Inc. and was funded by federal contracts. The analysis was based on 2005-2006 data.

Since most VOC emissions from aircraft occur when they are taxiing or sitting at a gate with either their jet engines or a smaller auxiliary power unit running to provide lighting and heating-ventilation-air conditioning to the plane, expanded gate electrification offers an opportunity to run these engines less and save jet fuel. The Port Authority and the airlines should commit to a multi-year retrofit plan for all three airports.[67] A limited amount of federal grant money is available under the Voluntary Airport Low Emissions program to assist airports in reducing their emissions profile.

Another way to reduce pre-takeoff aircraft emissions would be to tow aircraft from the gate to a "starting grid" near the end of the runway. Aircraft would not start their engines until reaching the grid. Virgin Atlantic Airways is promoting this operational change and reports that a trial using a Boeing 747 at London's Gatwick Airport was a "huge success." Virgin Atlantic claims that towing aircraft during most of the taxi-out could reduce pre-takeoff carbon dioxide emissions by 90 percent at Kennedy Airport. Among the concerns that would have to be addressed with such a towing scheme are the whether aircraft could move quickly enough to avoid runway incursions. The Port Authority should work with airlines to test the feasibility of towing aircraft to a starting grid.

Airlines are converting ground servicing equipment to battery-electric and compressed natural gas (CNG)-fueled engines. The car rental company vehicles which circle the terminals 24 hours a day are excellent candidates for conversion to low-emission engines. The Port Authority should require emission reduction plans in all new leases signed with automobile rental companies for their airport buses.

- **Encouraging shift of passengers to rail.** Another way to ease delays at Kennedy, Newark and LaGuardia is to shift short distance travel from air to rail. According to the Port Authority, over the last five years the share of flights from Kennedy Airport to destinations less than 250 miles away has fluctuated between 8.6 percent and 12.6 percent of all flights.

  Good rail links connect New York City with several destinations that also have air service to New York, including Washington (227 miles), Boston (215 miles), Albany (155 miles) and Philadelphia (98 miles). In most cases the rail service is as frequent or nearly as frequent as the air service and generally time competitive in today's travel environment. Moderate levels of additional capital investment in upgrading the rail infrastructure would allow for a further shift of travel in these markets from air to rail.

Conclusion

The delays at New York's major airports are the worst in the nation, and they are having an adverse impact on business and the environment. Steps must be taken to improve this situation, both in the short and long term.

Implementation of the recommendations in this report will bring immediate relief to our over-crowded airspace through either voluntary or mandatory capping of the number of arrivals and departures permitted each hour, especially at Kennedy Airport.

In the longer term, however, the FAA must carry out its responsibilities. This means improving relations with air traffic controllers and increasing their number, promptly implementing technological

[67] The new American Airlines and JetBlue terminals at Kennedy Airport have gate electrification.

improvements with New York as a priority, and addressing the number of general aviation planes using the limited air space over New York. It also means providing incentives to for airlines to fly larger aircraft and to adopt more rational scheduling of flights. And, to address environmental concerns, it means the Port Authority charging dirtier planes more and taking other steps to minimize pollution at the airports, such as requiring clean fuel vehicles and electrifying gates.

New York is a world class city. It must have world class air service. ■

Appendix A

On time arrival and departure performance

See Appendix D for airports abbreviation key

Airline on time arrival performance, January through September, rank among major U.S. airports and % on time.

	LGA	JFK	EWR	ATL	BOS	CLT	CVG	DEN	DFW	DTW	Total airports
2003	27	21	31	29	22	23	24	4	10	6	
	77.28	80.12	73.21	78.55	80.61	81.10	80.89	87.08	84.16	84.79	31
2004	29	25	30	28	22	1	9	3	7	11	
	73.11	75.69	72.21	73.56	77.95	83.63	81.19	83.15	81.82	81.37	31
2005	32	31	33	28	27	12	4	6	6	16	
	67.99	70.21	66.17	71.25	72.37	79.69	82.19	81.22	81.09	78.48	33
2006	31	28	32	25	26	19	1	6	8	10	
	65.19	71.04	63.67	72.41	71.42	77.20	84.41	79.94	79.49	78.67	32
2007	31	30	32	11	26	27	12	13	24	19	
	59.85	60.86	59.60	74.65	68.63	69.34	76.24	75.97	70.97	73.32	32
2003-2007%	**-22.5%**	**-24.0%**	**-18.6%**	**-4.9%**	**-14.9%**	**-14.5%**	**-5.8%**	**-12.7%**	**-15.7%**	**-13.5%**	
2003-2007#	**-17.43**	**-19.26**	**-13.61**	**-3.90**	**-11.98**	**-11.76**	**-4.65**	**-11.11**	**-13.19**	**-11.47**	

	IAH	LAS	LAX	MCO	MSP	ORD	PHL	PHX	SEA	SLC	Total airports
2003	12	9	2	20	8	28	30	7	11	1	
	84.21	84.97	87.71	81.89	84.94	78.48	76.55	85.61	84.20	89.49	31
2004	16	19	2	24	16	31	27	4	20	5	
	81.13	78.59	82.59	76.71	80.18	68.71	74.49	81.58	78.52	82.69	31
2005	5	21	9	20	15	25	30	7	26	1	
	81.44	77.74	79.90	77.77	78.68	74.89	70.85	80.37	74.69	83.57	33
2006	16	21	20	5	3	30	27	4	24	2	
	76.07	76.71	77.12	80.08	81.08	69.87	71.22	80.74	75.13	83.62	32
2007	9	8	5	15	16	29	28	6	18	2	
	78.34	77.08	77.38	75.71	72.76	65.83	65.61	77.73	72.15	80.31	32
2003-2007%	**-6.9%**	**-9.3%**	**-11.8%**	**-7.5%**	**-14.3%**	**-16.5%**	**-14.3%**	**-9.2%**	**-14.3%**	**-10.2%**	
2003-2007#	**-5.87**	**-7.89**	**-10.33**	**-6.18**	**-12.18**	**-12.65**	**-10.94**	**-7.88**	**-12.05**	**-9.18**	

Airline on time departure performance January to September, rank among major airports and % on time.
See Appendix D for airports abbreviation key.

	LGA	JFK	EWR	ATL	BOS	CLT	CVG	DEN	DFW	DTW	Total # airports
2003	18	25	23	30	22	27	20	7	21	17	
	84.73	83.08	83.35	80.73	83.53	82.46	84.54	88.66	83.63	85.11	31
2004	17	23	24	29	15	13	16	9	18	14	
	81.52	80.25	80.12	77.04	82.13	83.31	81.72	85.38	81.35	82.60	31
2005	21	27	29	30	22	16	5	11	24	14	
	78.51	76.45	76.16	75.34	78.39	79.56	83.31	81.55	78.07	81.29	33
2006	26	22	29	30	21	19	2	17	24	15	
	75.17	76.65	72.12	72.06	77.21	78.04	86.31	78.57	76.11	79.12	32
2007	25	31	30	26	21	28	12	17	27	16	
	72.21	66.88	67.59	70.97	74.53	69.47	77.37	76.17	69.87	76.41	32
2003-2007%	**-14.8**	**-19.5**	**-18.9**	**-12.1**	**-10.8**	**-15.7**	**-8.5**	**-14.1**	**-16.4**	**-10.2**	
2003-2007 #	**-12.52**	**-16.20**	**-15.76**	**-9.76**	**-9.00**	**-12.99**	**-7.17**	**-12.49**	**-13.76**	**-8.70**	

	IAH	LAS	LAX	MCO	MSP	ORD	PHL	PHX	SEA	SLC	Total # airports
2003	3	14	5	13	10	28	31	19	12	1	
	90.47	85.72	90.37	86.81	87.35	81.22	78.88	84.62	86.93	91.28	31
2004	1	26	6	21	9	31	30	22	20	2	
	87.47	78.93	85.69	80.90	84.44	71.78	75.42	80.41	81.05	86.81	31
2005	1	26	7	13	14	31	33	20	25	2	
	84.78	76.73	83.21	80.16	79.87	74.17	70.72	79.14	76.41	84.72	33
2006	12	25	9	10	6	32	28	14	13	1	
	79/77	75.27	80.89	80.88	82.31	69.81	72.25	79.28	79.51	86.33	32
2007	7	18	4	8	10	32	29	13	14	2	
	78.89	75.98	80.70	78.21	77.41	66.52	68.20	76.97	76.68	83.72	32
2003-2007%	**-12.8**	**-11.4**	**-10.7**	**-9.9**	**-11.4**	**-18.1**	**-13.5**	**-9.0**	**-11.8**	**-8.3**	
2003-2007#	**-11.58**	**-9.74**	**-9.67**	**-8.60**	**-9.94**	**-14.70**	**-10.68**	**7.65**	**-10.25**	**-7.56**	

Appendix B

Average taxi-out and taxi-in, in minutes

See Appendix D for airport abbreviations key

Taxi out averages, minutes, 1995 to *2007.

	U.S.	LGA	JFK	EWR	ATL	BOS	CLT	CVG	DEN	DFW	DTW
1995	13.7	19	24	22	18	15	14	17	15	18	17
1996	13.9	19	26	24							
1997	14.1	20	25	25							
1998	14.4	23	27	27							
1999	15.3	25	28	28							
2000	15.7	28	29	27	19	19	16	17	15	19	20
2001	14.8	23	24	25							
2002	15.1	22	24	23							
2003	15.0	24	22	24	20	17	17	17	15	17	18
2004	15.7	24	24	26	21	19	16	17	15	18	18
2005	15.4	23	28	26	18	18	17	16	14	17	19
2006	15.7	26	32	29	20	18	16	15	15	17	18
2007*	16.3	28	36	29	20	20	19	16	16	17	20
1995-2007	**+18.9%**	**+47%**	**+50%**	**+32%**	**+11%**	**+33%**	**+36%**	**-6%**	**+7%**	**-5%**	**+18%**
	+2.5	**+9**	**+12**	**+7**	**+2**	**+5**	**+5**	**-1**	**+1**	**-1**	**+3**
2003-2007	**+8.7%**	**+17%**	**+64%**	**+21%**	**+0%**	**+18%**	**+12%**	**-6%**	**+7%**	**+0%**	**+11%**
	+1.3	**+4**	**+14**	**+5**	**+0**	**+3**	**+2**	**-1**	**+1**	**+0**	**+2**

	IAH	LAS	LAX	MCO	MSP	ORD	PHL	PHX	SEA	SLC
1995	14	12	15	14	16	16	14	12	14	16
1996										
1997										
1998										
1999										
2000	18	15	16	14	19	19	21	15	14	17
2001										
2002										
2003	19	15	14	13	18	19	22	15	13	15
2004	22	16	14	14	18	20	23	15	14	16
2005	20	16	14	13	19	20	23	15	14	16
2006	22	16	15	13	17	19	23	15	15	18
2007*	20	17	16	14	19	19	25	15	16	18
1995-2007	**+43%**	**+42%**	**7%**	**+0%**	**+19%**	**+19%**	**+79%**	**25%**	**+14%**	**+12%**
	+6	**+5**	**+1**	**+0**	**+3**	**+3**	**+11**	**+3**	**+2**	**+2**
2003-2007	**+5%**	**+13%**	**+14%**	**+8%**	**+6%**	**+0%**	**+14%**	**+0%**	**+23%**	**+20%**
	+1	**+2**	**+2**	**+1**	**+1**	**+0**	**+3**	**+0**	**+3**	**+3**

*To September

Taxi-in averages, minutes, 1995 and 2003 to **2007

	National	Kennedy	Newark	LaGuardia
1995	Na	8.59	7.29	5.81
2003	7.05	8.46	8.35	8.41
2004	7.57	9.38	8.52	8.31
2005	7.57	9.67	8.43	7.54
2006	7.06	9.97	8.89	7.70
2007*	6.63	10.57	8.99	7.62
2003-2007%	*-5.9%*	*+24.9%*	*+7.7%*	*-9.4%*
1995-2007%	*Na*	*+23.0%*	*+23.3%*	*+31.3%*

**To August

Appendix C

U.S. airport flight cancellation rates

Domestic flight cancellations by U.S. carriers, 1.50% or greater among the 32 DOT-designated major airports. Descending order by 2007 cancellation percentage.
NY airports are in italics.

Airport	2006	2007*
LaGuardia (LGA)	*3.70%*	*4.78%*
Chicago O'Hare (ORD)	3.46%	4.54%
Newark (EWR)	*2.88%*	*3.58%*
Washington National (DCA)	2.64%	3.52%
Dallas-Fort Worth (DFW)	1.83%	3.38%
Kennedy (JFK)	*1.75%*	*3.20%*
Boston (BOS)	2.56%	3.14%
Washington-Dulles (IAD)	2.32%	2.97%
Philadelphia (PHL)	1.79%	2.52%
Detroit (DTW)	1.51%	2.51%
Cincinnati (CVG)	1.42%	2.36%
Denver (DEN)	1.90%	2.26%
St. Louis (STL)	1.55%	2.25%
Minneapolis/St. Paul (MSP)	0.98%	1.93%
Atlanta (ATL)	1.62%	1.86%
San Francisco (SFO)	1.75%	1.83%
Charlotte (CLT)	1.34%	1.72%
Baltimore (BWI)	1.05%	1.61%
Chicago Midway (MDW)	1.11%	1.58%
Miami (MIA)	1.13%	1.52%

*August 2006 to July 2007

Appendix D

Key to airport abbreviations, busiest U.S. airports

Abbreviation	Airport	Domestic flights, 2007*
JFK	*Kennedy/New York*	*151,102*
LGA	*LaGuardia/New York*	*179,687*
EWR	*Newark*	*138,947*
ATL	Atlanta	438,999
BOS	Boston	167,648
CLT	Charlotte	216,190
CVG	Cincinnati	149,850
DEN	Denver	279,517
DFW	Dallas-Fort Worth	304,569
DTW	Detroit	210,143
IAH	Houston Intercontinental	222,408
LAS	Las Vegas	195,974
LAX	Los Angeles	245,952
MCO	Orlando	153,504
MSP	Minneapolis-St Paul	195,061
ORD	Chicago-O'Hare	404,828
PHL	Philadelphia	208,973
PHX	Phoenix	223,158
SEA	Seattle	150,309
SLC	Salt Lake City	152,209

Appendix E

JFK Hourly Scheduled[1] Flight History[2] Across Direction and Year

Peak periods for 1990, 1995, 2000, 2005, 2006, 2007

Passenger plus Freighter Flights (* Note: August for all months except 2007 which uses June)

Hour	Inbound						Outbound						Hour
	August				June*	*Arrivals Growth by Hourly Cohort*	August				June*	*Departures Growth by Hourly Cohort*	
	1995	2000	2005	2006	2007		1995	2000	2005	2006	2007		
00	6.42	8.42	10.14	13.72	8.86	*38.0%*	1.42	1.28	5.72	1.86	2.14	*50.7%*	00
01	1.86	2.86	7.42	4.42	4.42	*137.6%*	0.42	3	2.58	2.58	4.58	*990.5%*	01
02	1.42	1.42	1.28	2.72	3.14	*121.1%*	1	0.86	1.86	2.14	1.72	*72.0%*	02
03	0.58	1.14	0.72	0.72	1.14	*96.6%*	2.14	1.86	2.86	2.86	3	*40.2%*	03
04	0.28	2	2.72	0.28	0.42	*50.0%*	0.42	1.14	3.14	0.72	1.86	*342.9%*	04
05	3.72	5	15.72	11.72	15	*303.2%*	0.86	1.72	3.28	3.72	4.14	*381.4%*	05
06	19.58	22.58	18	16.42	15.28	*-22.0%*	2	8.42	23.58	19.72	22	*1000.0%*	06
07	18.86	34.58	19.42	29.58	39.28	*108.3%*	20.14	33.14	31.28	30	33.58	*66.7%*	07
08	24.72	11.72	16.14	19.86	30.28	*22.5%*	39.28	34.14	33.86	48.86	58	*47.7%*	08
09	13.86	15.58	15	13.86	19.86	*43.3%*	38.72	29.58	30.28	39.72	49.86	*28.8%*	09
10	16.28	21.86	20.72	16.28	16.58	*1.8%*	12.86	16.58	24.42	24.72	27.42	*113.2%*	10
11	18.14	12.58	12.86	17.86	23.42	*29.1%*	10.42	18.72	22.42	20.86	23	*120.7%*	11
12	11.72	21.86	25.86	38.86	37.72	*221.8%*	29.14	18.72	17.28	33.72	25.58	*-12.2%*	12
13	27.86	34.58	19.14	19.58	28.72	*3.1%*	11.28	9.14	15.28	19.72	33	*192.6%*	13
14	41.28	24.86	29	35.58	46.14	*11.8%*	16.28	26.28	20.14	15.86	20.72	*27.3%*	14
15	52.14	47.42	47.86	59.14	59.14	*13.4%*	27.14	26.58	20.28	23.58	22	*-18.9%*	15
16	59.28	58.72	51.58	50	51.42	*-13.3%*	30.58	28.58	24	32.28	59.72	*95.3%*	16
17	22.28	24.14	20.14	29.28	34.42	*54.5%*	58.86	59.72	51.28	62.72	50.28	*-14.6%*	17
18	30	30.72	28	32	43.28	*44.3%*	54	40.28	44.72	50	44.28	*-18.0%*	18
19	31.28	27	33.14	41	32.42	*3.6%*	40.14	37.72	33.14	36.28	53.72	*33.8%*	19
20	24.72	25.28	29.14	26.72	40.28	*62.9%*	24.72	31.28	28	40.14	37.28	*50.8%*	20
21	27.14	33.42	26.86	31.86	38.28	*41.0%*	18.58	19.72	22.14	19.28	27	*45.3%*	21
22	11.58	16	22.72	22.14	23.28	*101.0%*	24.42	26.28	19.14	13.42	16	*-34.5%*	22

23	10.14	15.42	23	22.42	22	*117.0%*	10.28	20.72	12.42	10.28	12.58	*22.4%*	23
	475.1	***499.1***	***496.6***	***556***	***634.9***	*33.6%*	***475.1***	***495.4***	***493.1***	***555***	***633.4***	*33.3%*	

[1] All flights shown are hourly daily-each-way arrivals or departures averaged over a typical week in the month

[2] Does not include general aviation, helicoptors, non-revenue or charter flights, which averaged 7.9% in 1993, 5.7% in 2000 and 3.5% in 2006.