

# **SUMMER 2010 CANCELLATIONS AND THE FIVE-MONTH IMPACT OF THE THREE-HOUR TARMAC RULE**

**NOVEMBER 18, 2010**

STUDY MATERIALS AVAILABLE AT  
[WWW.TARMACLIMITS.COM](http://WWW.TARMACLIMITS.COM)

**MARKS**  
AVIATION

**Joshua Marks**  
(301) 841-2596 Phone  
[josh@marksaviation.com](mailto:josh@marksaviation.com)



**Darryl Jenkins**  
(540) 364-6913 Phone  
[airjenkins@aol.com](mailto:airjenkins@aol.com)



Summer 2010 Cancellations and the  
Five-Month Impact of the Three-Hour Tarmac Rule

Release Date November 18, 2010

Joshua Marks  
Darryl Jenkins

Revised federal aviation regulations that prohibit lengthy on-board delays in excess of three hours (the “tarmac rule”) took effect on April 29, 2010. DOT has threatened fines of 100x revenue on board a flight for tarmac rule violations. During the first five months of the rule, airlines have mitigated fine risk by aggressively cancelling operations with even minor exposure to the multi-million dollar fine. Flights have also been cancelled to open ramp and terminal resources for flights returning to gate.

From May 1 to September 30, 2010, the three-hour rule prevented 534 lengthy on-board delays. We estimate 59,500 fewer passengers experienced an on-board delay greater than three hours this summer versus last year. However, during the same period, systemwide cancellations at the 19 largest U.S. carriers increased by 5,064 flights (18%), impacting 384,000 incremental passengers at those 19 airlines, even though weather conditions were on average 30% more favorable than in the same period of 2009. Cancellation rates of flights with exposure to tarmac fines rose 25%. Since the time required to bring an aircraft back to the gate during inclement weather varies significantly, the threat of overly punitive fines causes ultra-conservative behavior by airlines and far more cancellations than required to effectively enforce a three-hour limit. The evidence of this ultra-conservative behavior can be directly observed in elevated cancellation levels since the rule became effective.

We recommend that DOT (1) issue a graduated fine structure, with a \$27,500 fine for minor (3-3.5 hour) violations and an increasing scale to multi-million dollar penalties for egregious violations of the tarmac rule; (2) provide clear enforcement guidance to resolve uncertainty and clarify conflicting regulatory language; (3) explicitly waive enforcement action when the pilot in command of impacted flights initiates a return to gate no later than 2.5 hours into an on-board delay; (4) collect specific data about flights cancelled due to tarmac rule factors; and (5) postpone any further expansion of the tarmac rule for small airports or international flights until at least another full summer of data can be collected. We believe these actions will have a significant and immediate impact on airline cancellations and will balance policy objectives.



### Summer 2010 Cancellations and the Five-Month Impact of the Three-Hour Tarmac Rule

Release Date November 18, 2010

On April 29, 2010 new U.S. Department of Transportation regulations banning taxi-out, taxi-in and diversion ground times greater than three hours (the “tarmac rule”) became effective. The tarmac rule resulted from over a decade of debate by airlines, regulators and consumer groups about how to manage customer expectations and comfort during extended ramp delays. On July 20, 2010, we released a preliminary study and supporting materials that demonstrated:

- That flight cancellations resulting from the tarmac rule would be significant, and would greatly exceed the cancellation assumptions made by the DOT in its rulemaking analysis;
- That the threat of punitive fines, combined with ambiguous and opaque enforcement guidelines by DOT, were causing cancellations of flights that would have departed prior to the three-hour mark;
- That while aggregate system cancellations depended on many factors, under equal weather conditions year-over-year, the increase in cancellations due to tarmac delays were, and would continue to be, observable; and
- Significant increases in cancellations could be expected to continue across all phases of flight, before departure, after lengthy taxi-outs and at diversion airports, as airlines proactively managed operations to avoid punitive fine risk.

Our report presented an exploratory model that incorporated delay, cancellation and schedule trends. Our report concluded that flight cancellations in the aggregate for reporting air carriers would increase between 315 annual cancellations (using conservative estimates of gate returns and cancellations) and nearly 6,000 annual cancellations (using trends observed in May 2010, the first month of effectiveness).<sup>1</sup> The DOT Regulatory Impact Analysis used to support implementation of the tarmac rule projected an annual increase of just 41 cancellations. Our report projected that the higher level of cancellations would drive a net public welfare cost of between \$185 million and \$3.9 billion.

---

<sup>1</sup> Reporting air carriers for calendar year 2010 includes airlines with more than 1% of the scheduled domestic passenger revenues, for the year ending June 30, 2009. Carriers reporting in 2010 include AirTran, American, Alaska, American Eagle, Atlantic Southeast, Comair, Continental, Delta, ExpressJet, Frontier, Hawaiian, JetBlue, Mesa, Northwest (part of Delta), Pinnacle, SkyWest, Southwest, United and US Airways. Pinnacle and ExpressJet are not required to file but volunteer their information.

## EXECUTIVE SUMMARY

DOT strongly opposed the report's findings, claiming that the analysis was "misleading" and "premature". DOT claimed that initial data on cancellations did not support our "claims about rising numbers of cancellations," even though tarmac-related cancellations in the first month *alone* exceeded DOT's annual projection. Trends and cancellation increases observed in May continued through the summer, while DOT repeated its claim that cancellations due to the new rule are only "slight increases."

The increase in cancellations has been more than "slight." DOT-reported data, analyzed using our large-scale database systems along with contextual weather and operational information, demonstrates an 18% increase in general systemwide cancellations year-over-year, a 25% increase in cancellations for flights with exposure to tarmac fines and similar increases in cancellations before gate departure and at diversion airports. At key hub airports, the increases in cancellations are even more significant.

Significantly more passengers have been impacted by cancellations than would have been subjected to lengthy on-board delays. We estimate that 59,500 fewer passengers during May through September 2010 experienced an on-board delay on reporting carriers greater than three hours.<sup>2</sup> In comparison, 384,000 passengers were impacted by cancellations on the 19 reporting carriers, and including non-reporting carriers such as Virgin America and Spirit Airlines, we project that over 521,500 passengers were impacted by cancellations.<sup>3</sup>

These increases are particularly noteworthy because they have occurred during a summer period with more favorable weather compared to the same period of May through September 2009. Bad weather conditions from May through September 2010 at 26 hubs nationwide were down more than 30% year over year, and were 27% lower than the historical 10-year average.

Given the strong correlation between tarmac delays and weather conditions demonstrated in our July 2010 report, the increase in cancellations year over year is statistically significant. In this paper, we demonstrate that the initial observations in our exploratory model have been validated by subsequent data reports. We show that the increase in cancellations during favorable weather conditions validates our methodology.

Our objective is not to recommend an immediate end to the tarmac rule. As we noted in July, even DOT's Regulatory Impact Analysis suggested that an alternative standard would have higher public benefits than the three-hour rule. The choice of a three-hour limit was political. The question is not whether the three-hour limit, as enacted, prevents long on-board delays. It certainly does. The question is what fallout results from the three-hour standard, and how to adapt enforcement standards and fine structures to minimize unnecessary flight cancellations and ensure that the fewest number of consumers are negatively impacted, either from lengthy on-board delays or from cancelled flights.

---

<sup>2</sup> See Exhibit 28B, Passengers Impacted by Long On-Board Delays

<sup>3</sup> See Exhibits 26 and 27

## EXECUTIVE SUMMARY

Enforcement transparency and graduated fines are the pathway to reducing public harm from the tarmac rule. In July, we recommended that DOT clarify enforcement policy, but the agency chose not to. Enforcement has run amok, with DOT even issuing fines to airlines for *over-disclosing* information, even when disclosure standards conflict between 14 CFR Parts 234 and 259.

Based on our more extensive analysis, we present five concrete policy recommendations based on retaining three-hour cutoff for domestic flights while partially mitigating collateral consumer harm from the rule.

Our policy recommendations include:

1. Clarification of key regulatory language in 14 CFR Part 259 and 41 U.S.C. 41712 including the specific interpretation of a “violation,” inconsistencies in the definition and calculation of a tarmac delay, and specific enforcement guidance about mitigating circumstances;
2. Publication of a transparent and graduated fine structure. We recommend an escalating fine structure with \$27,500 per flight fines for minor violations increasing to punitive multi-million dollar fines for egregious violations;
3. Agreement by DOT not to pursue detailed investigations or enforcement actions for taxi-out tarmac delays where the pilot in command initiates a return to gate no later than two hours and 30 minutes after the last opportunity to deplane;
4. Collection of cancellation data from airlines that specifically tie cancelled flights to tarmac-related causes, filling information gaps from non-reporting airlines including national low-fare carriers and express airlines; and
5. Deferral of any expansion of fixed tarmac limits to international flights or to small airports until enforcement changes and other measures lead to a meaningful reduction in cancellations related to the tarmac rule.

In this update, we review the new data that justify this policy rationale and demonstrate how the combination of these measures can establish a base of reliable operational data from which to base future decisions, all the while avoiding unnecessary cancellations.



### Key Findings: Passenger Impact

1. The tarmac rule has virtually eliminated tarmac delays and has been accompanied by a significant increase in system cancellations.
2. Compared to the same period in 2009, 3+ hour on-board delays declined by 534 flights while systemwide cancellations increased by 5,064 flights (18%).
3. We estimate 59,500 fewer passengers experienced long on-board delays during May through September 2010 versus the same period last year. (See Exhibit 28)
4. We estimate 384,000 more passengers on flights by reporting U.S. carriers were impacted by cancellations in 2010 vs. 2009. Including non-reporting carriers, we estimate 521,500 more passengers were impacted. (See Exhibits 26 and 27)
5. Weather conditions in 2010 do not explain the dramatic systemwide increase in cancellations. Observed systemwide weather conditions were 30% more favorable than in 2009. Instead, operational strategies at airlines that result from the tarmac rule and associated fines are a primary driver.
6. The punitive fine structure threatened for tarmac rule violations has caused extremely risk-averse behavior by airlines. The magnitude of proposed fines has created absolute incentives for airlines to avoid penalties. This leads to aggressive cancellation of flights that may have even minor exposure to the tarmac rule.
7. The variability of taxi-in times at airports, particularly during weather conditions and airspace events that cause long on-board delays, has combined with the threat of multi-million dollar fines to drive conservative decisions in gate returns. The number of gate returns has risen by 19%. As a result, data show more than 75% of the increase in cancellations can be traced to last-minute cancellation decisions made by airlines either to avoid tarmac exposure or to free gate capacity for flights returning to gate.
8. Cancellations of diverted flights also have increased as airlines emphasize deplaning over continuing flights to their planned destinations, further inconveniencing passengers to ensure compliance with the tarmac rule.

## **KEY FINDINGS**

### **Key Findings:**

#### **The Rule**

1. The tarmac rule imposes a taxi time limit of three hours before passengers must be offered the chance to deplane. Enforcement guidelines do not define when or how passengers (as a group) may waive their rights to deplane, or what specific weather and/or operational conditions constitute a waiver to deplane.
2. DOT has threatened fines of up to \$27,500 per violation of the tarmac rule. The agency has not defined whether a violation is per-passenger or per-flight, but airlines operate under the assumption that the violation is assessed on a per passenger basis. This is disproportionate to revenue, which could be far less than \$27,500 per flight.
3. Airline uncertainty about enforcement has driven risk-averse behavior. A survey of airlines conducted in November 2010 confirms that airlines initiate returns to gate as early as 90 minutes after gate departure to avoid fine exposure. This leads to flight cancellations that can and should be avoided under the consumer protection objectives of the rule.
4. Unnecessary cancellations of flights that would not otherwise violate the tarmac rule can be reduced through (1) clarity in enforcement and (2) a graduated and transparent fine structure that contains meaningful but not punitive fines for minor violations of the rule and more stringent penalties for willful violations by airlines.
5. The five-month period from May through September offers a statistically meaningful sample of tarmac delays for analyzing trends. During 2009, more than 60% of annual tarmac delays occurred during this five-month window. Similar trends are observable in prior years.

### Key Findings:

#### Cancellations Trends Observed

1. Data are sourced from airline Part 234 Airline Service Quality Reports from DOT. Information on weather conditions, airline operations and delays are sourced from the U.S. Department of Commerce, NOAA and the FAA.
2. We analyzed weather in 15-minute increments during daytime hours (7am-8pm local time) over a five-month period. Weather conditions observed during May-September 2010 were the most favorable for aviation operations observed since 2000.
  - a. For all U.S. airports, bad weather conditions (Instrument Meteorological Conditions) were observed in 10.3% of weather samples taken every quarter-hour during daytime hours at the nation's top 26 airports. This compares to 13.8% in 2009 and a 10-year trailing average of 13.3%.
  - b. For a full 24-hour sample period at all US airports, IMC conditions were reported 11.1% of the time compared to 16.0% in 2009 and a 10-year trailing average of 15.3%.
  - c. At the 26 largest U.S. airports, IMC conditions were observed 25% less often in 2010 than in the same period of 2009, while cancellations increased dramatically. Improved weather conditions were a nationwide phenomenon this year, occurring similarly in all regions of the country.
3. Compared to the five-month period of May through September 2009, total flight operations by U.S. airlines declined by more than 3,000 flights. (See Exhibit 1)
4. Year over year, an additional 5,068 flights cancelled. (See Exhibit 2)
5. Pre-departure cancellations increased by 4,793 flights year over year as airlines managed exposure to fines by cancelling flights before departure. (See Exhibit 2)
6. An increased number of gate-returning flights now cancel, as crew duty time restrictions and other factors prevent re-departure for some flights. In 2010, flights with taxi-out times greater than 90 minutes were more than 50% more likely to cancel than in 2009. Gate returns after 30+ minute taxi-out times increased, as did the number and rate of cancellations of those flights. (See Exhibit 6)
7. At key hub airports, the increase in cancellations is pronounced. At 18 large hubs for Southwest, Delta, United/Continental, US Airways and JetBlue, flight cancellations increased by 24% year over year, or more than 2,900 flights. Flights with taxi-out times greater than 90 minutes were 69% more likely to cancel in 2010 versus 2009.

## KEY FINDINGS

8. When reporting flight performance to the government, airlines code each cancellation with a causal factor. Year over year, airspace-related cancellations decreased, reflecting both lower aggregate flight operations and improved weather conditions. There was no change in cancellations related to security. The entire change in cancellations can be attributed to Carrier and Weather factors, both of which are connected to the tarmac rule. (See Exhibit 6)
9. Carrier-related factors account for 60% of the increase in cancellations. There was a significant increase in pre-departure cancellations due to Carrier factors as airlines opened gate capacity for flights returning to gate, and cancelled flight operations before departure that were likely to have long taxi-out times. Despite far better weather in 2010, weather-related cancellations were up significantly, both before and after gate departure, and particularly for flights with extended taxi-out times. These trends both strongly suggest that tarmac rule related cancellations have increased significantly. (See Exhibit 6)

### Key Findings: Implications for Public Welfare

1. DOT predicted a public welfare gain of \$69.1 million (over a 20 year period, discounted at 7%, with inflation) from the overall package of consumer changes of which the tarmac delay rules were a component.
2. This welfare estimate was based on a cancellation rate based on the number of flights that would have had three-hour tarmac delays. DOT assumed trivial incremental cancellations (41 flights per year) from the rule. Ramp, de-icing, diversion and other critical costs were excluded. DOT excluded any follow-on cancellation estimates resulting from tarmac-related events.
3. To project public welfare based on observed trends, we introduced an exploratory model to that projected a **minimum cancellations scenario** (based on May 2010 cancellations of tarmac delayed flights with 2-3 hour taxi time, no pre-cancellations and no follow-on cancellations) and an **observed scenario** (based on comprehensive modeling, flight analysis and other data that established a 4:1 trend against prevented tarmac delays).
4. Using May 2010 data, we projected a range of annualized cancellations, normalized for weather conditions, between 315 flights (for the minimum cancellations scenario) and 5,800 flights (for the worst-case observed scenario using May results). We concluded that the lack of specific enforcement guidance and the punitive fine structure would result in a sustained trend of higher cancellations, both before departures, after gate returns and during diversions.
5. Airlines appear to have made behavioral changes as they manage risk of punitive fines. There has been a significant increase in pre-cancellations, particularly last-minute cancellations. Instead of risking a taxi-out or diversion delay where operating conditions would prevent a return to gate by the three-hour mark, airlines have cancelled 1,000 more flights at the last minute due to weather conditions versus the same period of 2009, in an environment where weather conditions were significantly more favorable. (See Exhibit 6)
6. Based on observed trends, we believe our projected range of cancellations (between 315 and 5,800 annually) due to the tarmac rule remains accurate, with the likely outcome towards the high end of the range. If DOT introduces a graduated fine structure and clarifies enforcement standards, incremental cancellations due to the tarmac rule are highly likely to decline.

## **KEY FINDINGS**

### **Key Findings: Recommendations**

1. The ratio of cancellations directly related to the rule appears to be at least four times the number of prevented tarmac delays. Systemwide cancellations, which include other factors, have risen by nearly ten times the number of prevented tarmac delays.
2. The passenger impact is substantial. On a systemwide basis, year over year 59,500 fewer passengers experienced lengthy on-board delays while 384,000 more passengers were impacted by flight cancellations.
3. We attribute this abnormal cancellation trend to (a) vague and inconsistent language in the regulation and in enforcement guidelines, (b) the threat of punitive fines wholly disproportionate to the economic gain from completing a given flight, and (c) the wide variability of taxi-in times during abnormal and severe weather conditions, which requires premature returns to gate. DOT should take action to clarify the rule and penalties to reverse this trend.
4. The tarmac rule should not be expanded or repealed until at least a second summer's worth of operating data and cancellations can be collected and analyzed.
5. Enforcement practices should be changed to (1) create a graduated and transparent fine structure, (2) establish clear guidelines for what constitutes an incident of violation and other rule language, (3) avoid pursuing detailed investigations and enforcement actions if an airline demonstrates that the pilot in command initiated a return to gate by two hours and 30 minutes after departure from gate, and (4) collect cancellation information from airlines to determine which flights were cancelled or otherwise impacted by the tarmac delay rule.
6. Any expansion of the tarmac delay rule to international flights should be postponed until additional data can be collected, and until changes in enforcement strategies reduce the high number of cancellations occurring.

**1. INTRODUCTION**

On April 29, 2010, revised aviation regulations that limited tarmac delay times to 3 hours for domestic flights (the “tarmac rule”) became effective. The tarmac rule followed a lengthy initiative by DOT, Congress, and consumer groups to prevent incidents where passengers were held on aircraft without the option to deplane. Airlines, trade associations and some consumer groups believed the imposition of inflexible tarmac delay limits would increase flight cancellations. The Regulatory Impact Analysis issued by DOT in support of the rules concluded that flight cancellations would be minimal, and that the public benefit from eliminating lengthy tarmac delays outweighed the public cost of cancellations.<sup>4</sup>

The maximum statutory penalty for violation of the tarmac limits is \$27,500 per incident, and public and legal consensus is that incidents are measured on a per passenger basis. DOT has not specifically clarified its interpretation of a violation. The maximum financial penalty for a violation is potentially more than 100 times the revenue that the airline would collect in gross revenue from the passengers on an impacted flight, and is disproportionate to the fares paid.<sup>5</sup>

As of November 17, 2010, DOT has not published criteria that transparently illustrate to airlines or consumers how the tarmac limits will be enforced. To date, DOT has issued two fines related to tarmac incidents, in both cases fining airlines for reporting tarmac events that did not ultimately qualify as violations. It remains unclear whether DOT intends to seek maximum penalties for minor violations of the rule. In April 2010, the Secretary of Transportation suggested that the Department would seek “strong enforcement” of the rule at the maximum levels permitted by statute.<sup>6</sup> Predictably, the lack of transparency has driven highly risk-averse behavior by airlines.

Airlines and industry groups recognized that the combination of three-hour limits and punitive fines would demand risk-averse behavior that would impact many more flights than the 903 tarmac-delayed cases in all of 2009. Airlines changed operating procedures in 2010 to identify cases where aircraft were at risk of lengthy tarmac delays. Today, when even a slight risk of exposure is identified, airlines are cancelling flights before gate departure, and for flights on the tarmac longer than 30 minutes, there has been a significant rise in cancellations as these flights are brought back to gate.

These new operating policies are inflexible. They mandate early action by pilots, dispatchers and airport managers. Mandatory action begins at some carriers at 2 hours after aircraft pushback, and by 2.5 hours the largest US carriers return all flights to the terminal. More flights returning to the gate drives a higher cancellation percentage as airlines free gates for passenger disembarkation.

---

<sup>4</sup> DOT Regulatory Impact Analysis (HDR Decision Economics), available at [www.tarmaclimits.com](http://www.tarmaclimits.com)

<sup>5</sup> Based on an average fare of \$75 per passenger for regional flying (SkyWest Airlines, 2009 Annual Report, \$2.61 billion revenue over 34.5 million passengers) and \$119 per passenger for other domestic flights (Southwest Airlines, 2009 Annual Report, \$10.35 billion revenue over 86.31 million revenue passengers).

<sup>6</sup> Secretary Ray LaHood, DOT Press Conference, 4/27/2010. Secretary LaHood said “[DOT] just leveled a \$16 million fine which was the maximum fine we could level against Toyota. So I don’t think anybody thinks that [DOT] is not going to have strong enforcement.”

## SECTION ONE

The combination of a stringent rule and punitive fines have indeed stopped the operational practice of keeping aircraft “live” on the tarmac for extended periods of time while awaiting takeoff clearance. But punitive fines have clearly driven an abnormally high trend in cancellations, far in excess of the number of tarmac delays prevented.

The inherent uncertainty about fine structures and DOT enforcement strategies and ambiguous language in the final regulations drives extremely risk-averse behavior by airlines in making operational decisions about delayed flights. In July 2010, we published a comprehensive review of tarmac delays and presented an exploratory model that calculated consumer welfare impact from flight cancellations based on initial operating trends post-rule established in May 2010.

In this paper, we update the models and analysis from July 2010 with figures reported by DOT. The five-month sample of data is statistically significant, both because more than half of tarmac delays historically occur within this period, and because the volume of cancellations already demonstrated far exceeds the assumptions made by DOT during the rulemaking process, meriting a closer look at the rule itself.

Our July 2010 publication sparked debate among consumer groups of the relative merits of cancellations versus extended on-board delays. Some advocates of a fixed tarmac limit preferred cancellations to extended on-board delays, even if the cancellation meant not arriving at the intended destination for 12-24 hours. Other advocates expressed a preference for delays, where the passenger traded a period of potential discomfort on board for the ability to arrive at the planned destination. Our research has indicated that passenger displacement (time required to reach the intended destination) has worsened significantly as capacity has dropped and airline load factors have risen beyond 85%. There are simply fewer alternative seats available to transport passengers from cancelled flights.

We do not take a position on whether passengers should prefer cancellations to extended on-board delays, and we recognize that there is diversity of opinion. However, from a societal standpoint, cancellations drive significant public harm by forcing additional “hard” cost on society (hotel rooms, food, and lost productivity) versus the “soft” psychological cost of extended on-board delays. DOT has the jurisdiction to continue or change the three hour rule at its discretion. We continue to advocate against any expansion or change to the rule until a second operational summer can be assessed, but we strongly recommend immediate adjustments to enforcement policy and fines.

Airlines assume worst-case enforcement and penalties and DOT has done nothing to discourage this view. This has caused unnecessary cancellations. If DOT chooses to introduce a fine structure that graduates the fine by the length of the delay – potentially reaching maximum penalties by the fourth or fifth hour – fewer passengers will be subjected to the hassles of flight cancellations.

## 2. THE NEW RULE & SUMMARY OF JULY 2010 FINDINGS

On April 29, 2010, new consumer protection rules contained in 14 CFR Part 259, entitled Enhancing Airline Passenger Protections, took effect. These revised regulations required commercial airlines to implement contingency plans for lengthy tarmac delays, respond to consumer complaints regarding tarmac delays, and post information on web sites. The rule was intended to “mitigate hardships for airline passengers during lengthy tarmac delays” and to “bolster air carriers’ accountability to consumers.”<sup>7</sup> The rules apply to all certificated airlines that operate aircraft “originally designed” to have 30 or more passenger seats. The maximum aggregate fine is understood by industry to be \$27,500 for each passenger per incident, although it is unclear how DOT actually will fine carriers.<sup>8</sup>

The regulation defines a tarmac delay as “the holding of an aircraft on the ground either before taking off or after landing with no opportunity for its passengers to deplane.”<sup>9</sup> As of November 2010, tarmac delay rules apply at all airports with more than 0.25% of total annual enplanements in the United States, translating to airports with more than about 2 million annual enplanements.<sup>10</sup> In June 2010, DOT proposed expanding tarmac delay rules to all essentially all airports in the United States with commercial air service, but a final determination of this has not yet been reached.<sup>11</sup>

14 CFR Part 259 states that “the air carrier will not permit an aircraft to remain on the tarmac for more than three hours” unless there is a “safety-related or security-related reason (e.g. weather, a directive from an appropriate government agency) why the aircraft cannot leave its position on the tarmac to deplane passengers” or air traffic control advises that deplaning “would significantly disrupt airport operations.”<sup>12</sup> Both during and after the rulemaking process, stakeholders expressed concern that the regulation does not define specific “safety” or “security” exemptions, nor which directives are “appropriate” for *not* deplaning. This ambiguity of this language impacts airline decision-making.

For international flights, the DOT rules also mandate a contingency plan, but the air carrier may set the limit for tarmac delays across its system. As with domestic flights, the airline must enact the contingency plan at all large and medium airports, allowing passengers to deplane before that limit.<sup>13</sup> DOT has subsequently proposed the imposition

---

<sup>7</sup> 14 CFR Part 259.1

<sup>8</sup> 14 CFR Part 383 (\$25,000 per incident) and 49 U.S.C. §46301 (\$2,500 per incident)

<sup>9</sup> 14 CFR Part 259.3

<sup>10</sup> In 2008, there were 28 large hub airports and 41 medium hub airports. Large hub airports are ATL, BOS, BWI, CLT, DCA, DEN, DFW, DTW, EWR, FLL, HNL, IAD, IAH, JFK, LAS, LAX, LGA, MCO, MIA, MSP, ORD, PHL, PHX, SAN, SEA, SFO, SLC AND TPA. Medium hub airports were ABQ, ANC, AUS, BDL, BNA, BUF, BUR, CLE, CMH, CVG, DAL, HOU, IND, JAX, MCI, MDW, MEM, MHT, MKE, MSY, OAK, OGG, OKC, OMA, ONT, ORF, PBI, PDX, PIT, PVD, RDU, RNO, RSW, SAT, SDF, SJC, SJU, SMF, SNA, STL and TUS. The Department will enforce based on 2008 metrics until an update to 2009 metrics in mid-2010. (OAEF, April 28, 2010).

<sup>11</sup> NRPM June 8 2010

<sup>12</sup> 14 CFR Part 259.4(b)(1)

<sup>13</sup> 14 CFR Part 259.4(b)(2)

## SECTION TWO

of these rules for international carriers, and raised the potential of a fixed on-board delay time limit to parallel the limit on domestic flight operations.

*Enforcement Guidance.* Immediately before revisions to 14 CFR Part 259 became effective, the Department of Transportation issued guidance about both the rule and proposed enforcement. On April 26, 2010, Secretary LaHood issued guidance about “strong enforcement” of the rules, drawing parallels to the Department’s maximum fine strategy against Toyota. The Office of Aviation Enforcement and Proceedings issued guidance on April 28, 2010 stating:

- That the Enforcement Office “considers a number of factors in determining the civil penalty it would seek in an enforcement proceeding.” The lack of specificity, combined with concurrent comments from Secretary LaHood about “strong enforcement,” created concern among airlines that maximum fines would be sought for all infractions. Airline operational decisions have been based on the prospect of maximum fine exposure.
- That a “tarmac delay begins when passengers no longer have the option to get off of the aircraft, which usually occurs when the doors of the aircraft shut. However if an aircraft is at the gate with the doors open, and passengers are not allowed off the aircraft, the time limit would start at the point when passengers were no longer permitted to deplane.” This definition creates ambiguity given that the passenger door usually remains open once all passengers have boarded so that paperwork can be exchanged between ground personnel and the flight crew. This definition also conflicts with the calculation of taxi time under 14 CFR Part 234, which measures tarmac time based on gate departure.
- That “a carrier must give passengers the opportunity to deplane at the three-hour mark. It is not sufficient for a carrier to begin the process of returning to the gate or another disembarkation point at that time.” To avoid exposure to the fine, airlines must begin the return to gate well ahead of the three-hour mark.

The ambiguity of what constitutes a tarmac delay has actually generated more fines than actual violations of the tarmac delay.<sup>14</sup> Both United Airlines and Pinnacle Airlines have been fined by DOT (\$12,000 and \$10,000 respectively) for reporting flights that they initially believed were tarmac rule violations, but later proved to be compliant under the new rule. There is little, if any, ongoing constructive engagement between DOT and airlines to address enforcement guidance and clarity.

Five full months of airline operational data have been published since the new rules went into effect. In this section, we review the data used in assessing the impact of the tarmac delay rule on consumer welfare and we review the core findings from our July 2010 publication.

---

<sup>14</sup>There are inherent inconsistencies between reporting requirements for airlines under 14 CFR Part 234 (monthly service quality reports) and 14 CFR Part 259 (tarmac-related reporting). The definition of a taxi-out delay is different between the two regulations. This is discussed in more detail in Section Five.

### Data Analyzed

We continue to base our analysis solely on publicly available information. We do not access, nor do we have access to, proprietary airline operating data unless specifically noted. The primary source for our analysis is the Part 234 Airline Service Quality Performance (ASQP) databases available for download by month from the Department of Transportation RITA website. In addition to ASQP, we use weather data sourced from the FAA and NOAA, and we use data output from the FAA Enhanced Traffic Management System and Aviation Performance Metrics databases to cross check taxi data and provide statistical trends.

### July 2010 Analysis and Findings

Below are the key findings from our July publication. These findings form the basis for our conclusions and trend analysis using updated data through September 2010.

- 1) Tarmac delays on taxi-in, taxi-out and diversions are caused by different factors, occur at different frequencies and have differential impact on passenger welfare. The vast majority of tarmac delays that are reported occur on taxi-out. Of 1,257 reported tarmac delays between October 2008 and April 2010, 1,142 (91%) occurred on **taxi-out at the point of origin**. In comparison, **taxi-in tarmac delays** since 2008 have been very rare, primarily because airline policy after 2007 has been to prioritize the unloading of flights on arrival. Taxi-in delays therefore tend to be uncontrollable by airlines and in most cases should meet new guidelines for “safety” exemptions. **Diversion-related tarmac delays** have been visible and problematic for both consumers and airlines, although they represent less than 10% of overall tarmac delays. Diversion tarmac delays usually result from aircraft diverted to secondary or small fields due to severe weather at their primary destinations, and when fuel on board does not permit diversion to an “on-line” station with that airline’s personnel and equipment.
- 2) Tarmac delays are highly seasonal and correlate strongly to months with high thunderstorm and winter weather occurrences: 64% of tarmac delays occurring during June, July and August. Another 24% occur during December through March. November is the quietest month. 53% of tarmac delays historically occur in the five-month period between May and September, with the remainder distributed across the winter months. The seasonality of tarmac delays is caused by the unpredictability of severe summer weather.
- 3) Tarmac delays occur in clusters, across airlines at specific airports. Tarmac delays are strongly concentrated onto peak days. The top 20 days between May 1, 2008 and April 30, 2010 represent more than 50% of the total taxi-out tarmac delays during a 730 day period. Fourteen of the peak 20 days were in June, July and August. During winter, tarmac delays show an even distribution through the day. During summer, tarmac delays are concentrated in the afternoon and are unpredictable.

## SECTION TWO

- 4) Tarmac delays are driven by severe weather that block airports and airspace. They tend to occur when weather events, impacting either airports or surrounding airspace, are prolonged. Flights that exhibit tarmac delays are spread across a four-hour window on average, indicating that the underlying factors take several hours to clear a given region.
- 5) Tarmac delays on taxi-out are primarily three to four hours in length, caused by weather and airspace factors that often lessen within a four-hour window. While very isolated cases do exist where passengers are trapped on aircraft for more than four hours, they are extremely rare in a transportation system with more than 10,000,000 annual departures. Most tarmac delays are between two and four hours in length. The incidence of historical tarmac delays longer than four hours is rare. On average, 15 out of 100,000 departures are delayed more than three hours on the tarmac. Only 3 of 100,000 have a delay between 4 and 5 hours, and just 1 has a delay longer than 5 hours. A strong explanation for the incidence of delays in this time period is the duration of convective weather activity across airports and airspace.
- 6) Tarmac delays are concentrated at specific airports and relatively rare elsewhere. Taxi-out tarmac delays evidence a clear pattern, with the significant majority of occurrences in the corridor between New York (including LaGuardia, JFK and Newark), Philadelphia and the Washington area. There are isolated events in Atlanta (on July 14, 2008 and March 2, 2009), Houston (on December 11, 2008) and Dallas (on February 12, 2010) but few delays show repeatable patterns at any given airport outside New York. In contrast, diversion-related tarmac delays are well distributed across the United States, as aircraft divert into regional airports when their primary destinations have weather that prohibits landing (below “approach minimums”) or are closed due to severe weather or other operational disruptions. There is no discernable pattern to the distribution of diversion events. Taxi-in tarmac delays are so rare that it is best concluded that each incident is likely unique to that day, that airport or a single disruptive action.
- 7) Most tarmac delays historically ended in a completed flight, delivering passengers to their planned destinations. Of 1,257 flights with a 3+ hour tarmac delay between October 2008 and April 2010, 1,147 (91%) of those flights completed with passengers at their final destinations. The remaining 110 (9%) flights cancelled, either on taxi-out or at the diversion airport where passengers were re-booked to their destination.
- 8) Airport and gate constraints force airlines to choose between cancellations and tarmac delays. Gate availability is a critical driver of tarmac delays; if an airline has available gate space, it can hold flights on the gate during severe weather events and wait until conditions improve before pushing back. Similarly, open gates allow inbound flights and diversions to disembark passengers without delay. Gate availability explains why carriers operating at the same airport (and therefore subject to the same airspace constraints) can have significantly different rates of tarmac delays.

## SECTION TWO

- 9) Flight scheduling cannot reasonably reduce exposure to tarmac delays. Moderate schedule changes to reduce capacity will not eliminate exposure. Airlines plan schedules based on gate availability factors, allowing for moderate disruptions. In fact, airlines reduce flight schedules during bad weather events, but these actions alone have not prevented tarmac delays.

Airlines face a clear choice during irregular operations: cancel flights, or push from the gate before weather or airspace clears and risk a tarmac delay. In our July publication, we demonstrated that the ability to push loaded aircraft from the gate, in order to free capacity for incoming flights, was critical to maintaining passenger throughput at key airports. Re-scheduling, de-peaking and capacity changes would not solve the core exposure to long-term severe weather events that close airports for hours, or congest key airspace. During the winter, flight cancellations are less disruptive for passengers, but during the summer months, they can significantly disrupt travel plans and cause harm.

We also demonstrated that uncertainty about enforcement had led to ultra-conservative behavior by airlines to minimize exposure to fines. We showed that excessively conservative behavior by airlines, while virtually guaranteeing that tarmac delays will be close to zero, negatively impact hundreds of thousands of passengers each year who otherwise would have completed their flights. A multi-million dollar fine represents more than 100 times the revenue that an airline could earn from completing a flight operation, creating a clear risk-management preference to cancel flights with any potential of tarmac rule exposure.

We analyzed how these changes have been implemented at Delta and American Airlines. We outlined how Delta started recalling aircraft to the gate at two hours after push-back, with limited exceptions until two hours and thirty minutes after departure. We showed how American had adopted a more flexible approach, giving airline dispatchers and pilots authority to manage tarmac delays but also imposing a hard limit to initiate returns to gate and avoid exposure to the tarmac fines.

In a case study of American's Dallas/Ft. Worth operation in May 2010, we showed that tarmac-delay related cancellations cause a follow-on flight cancellation in order to balance hub arrivals and departures. In most cases, the cancellation ratio to rebalance networks was 1:1, but for some aircraft routings, tarmac-related cancellations caused more than one subsequent flight cancellation. Our case study also showed that gate availability can be traced as a direct causal factor in arrival cancellations through the mid-afternoon, when weather had cleared but the impact of cancelled outbound flights had yet to be felt.

Finally, we used our historical analysis and case studies to present an exploratory model that estimated the impact over the long term of tarmac delay rules on cancelled flights. Based on historical tarmac delays, we identified an average annual occurrence of inclement weather events, and used this historical trend to quantify the likely impact on cancellations. We calculated both direct cancellations (flights cancelled in order to

## SECTION TWO

reduce or avoid direct exposure to tarmac limits) and indirect (follow-on) cancellations caused by network rebalancing and aircraft repositioning.

We concluded that based on normalized weather patterns, if airlines continued the behavioral patterns observed in May 2010, new tarmac delay rules would have a significant incremental impact on flight cancellations. We estimated that more than 2,600 flights would be cancelled directly at impacted airports *that would not have been cancelled prior to the rule*. Indirect cancellations, based on a 1:1 ratio of direct to indirect cancellations through empirical analysis, would double the impact each year.

In aggregate, we estimated that the May operating results suggested an annual cancellation total of 4,600 flights with more than 400,000 passengers impacted on cancelled flights. We concurred with DOT that the new tarmac rules would virtually eliminate tarmac delays, presumably saving over 100,000 passengers from a lengthy on-board delay. While we did not recommend an immediate repeal of the three-hour rule, we did recommend immediate changes to enforcement strategy and fine structures in order to reduce unnecessary cancellations.

**3. CANCELLATIONS, MAY THROUGH SEPTEMBER**

We have identified a strong correlation between seasonal tarmac delays and inclement weather. In presenting an exploratory model for measuring and predicting the impact of tarmac rule limits and punitive fines on airline cancellation and delay decisions, we showed that exposure to tarmac delays peaked during two key periods of the year.

First, and most importantly, the summer period from May through September offered a critical data set for assessing tarmac exposure. Historically, most thunderstorm activity across the U. S., and particularly in the congested Northeastern U. S., is concentrated in this time period. Changes in operational behavior related to the tarmac rule would therefore be most visible during this timeframe, particularly since summertime convective activity is a nationwide phenomenon.

Second, December, January and February will offer a regional window of insight into how airlines respond to rapidly changing winter weather. Because sudden icing events and other unpredicted phenomena are intermixed with predictable snow systems, assessing cancellations caused by tarmac delays will require a more granular analysis.

Using operational data from the shoulder months of October, November, March and April to assess incremental cancellations and other operational changes due to tarmac rule exposure is difficult. The calm fall weather patterns observed nationwide, particularly in October, do not provide the necessary test cases for assessing tarmac rule impact. This is particularly evident in years such as 2010 when weather conditions are already significantly more favorable for aviation compared to both 2009 and historical 10-year averages.

We therefore determined that the set of data from May through September offered the most relevant pool of operational and weather data to update our predictions about the tarmac delay rule.

**Data Review**

To illustrate the impact of the tarmac delay rule on flight cancellations and operating behavior by airlines, we have focused on the following seven questions.

1. Have flight operations, cancellations and diversions increased in meaningful numbers since the rule took effect on April 29, 2010?
2. Has the profile of pre-departure (gate) cancellations, cancellations after taxi-out and cancellations at diversion airports changed? Is this consistent across the United States or a local/regional phenomenon?
3. Have the relative frequencies of the causes of cancellations (weather, carrier-specific causes, airspace congestion and security) changed post-rule?

## SECTION THREE

4. To what extent are increases in weather cancellations supported by historical trends and by actual weather conditions observed during May through September 2010 versus historical periods?
5. Are cancellation trends more pronounced at hub airports?
6. Have the number of gate returns increased, and if so, has the rate at which these flights cancel also increased?
7. What conclusions can be drawn from the operational data available?

Based on these questions, we have reviewed the operational data available on a flight-by-flight basis. We neither utilized nor relied on third-party database systems (or on the BTS website) to review flight information on a systemic basis. We built cancellation, delay and scheduling models based on actual flight schedules operated by airline during May through September 2010, and during the same period of 2009. For historical information, we used detailed information available from the Federal Aviation Administration's ASPM database.

Charts summarizing operational performance are provided in Exhibits at the end of this report. In addition, Excel files containing each exhibit are available for download at the report website, [www.tarmaclimits.com](http://www.tarmaclimits.com).

### Key Trends Observed

Data from May through September clearly indicates the following trends that are investigated through the following analysis and associated Exhibits:

- The operational practice of tolerating lengthy on-board delays to maximize flight completions was eliminated. Year over year, there were 523 fewer lengthy on-board delays of three hours or more.
- We estimate 59,500 fewer passengers were impacted by lengthy on-board delays in May through September 2010 than in the same period of 2009.
- Flight cancellations increased on a systemwide basis by 18%, or 5,068 incremental flights cancelled year over year.
- We estimate that 384,000 more passengers were impacted by cancellations in 2010 than in the same period of 2009. Including non-reporting carriers, we estimate that 521,500 more passengers were impacted.
- Incremental cancellations were distributed across all phases of flights, including pre-departure cancellations, cancellations after short and lengthy taxi-outs at the departure airports, and cancellations at diversion airports.

## SECTION THREE

- Weather conditions did not appear to be a causal factor in explaining the increase in flights. Weather surveys indicate a 30% improvement in inclement weather conditions year-over-year, and indicate that the summer months of 2010 were an anomaly based on trailing 10-year averages of inclement weather. FAA reports confirm the abnormally favorable weather conditions this summer, as do DOT's own monthly reports.
- There was a significant shift in the reasons for cancellations. More flights this year were cancelled for weather and carrier reasons, tags used by airlines for tarmac-rule related cancellations.
- The number of flights cancelled after returning to the gate increased significantly.
- The number of flights in 2010 that (a) experienced long taxi-out delays and (b) returned to the gate significantly exceeded the number of flights in 2009 that had been experienced 3+ hour tarmac delays. Gate returns increased as airlines managed the risk of punitive fines. Gate returns also drove higher cancellation levels, both of flights after taxi-out and of flights that would have departed from the now-occupied gates.

### Connecting Fines and Cancellations

Before examining cancellations, it is helpful to review why punitive fines at the three-hour mark are key drivers of cancellations. Our July 2010 report demonstrated that all U.S. airlines, faced with threatened fines 100x or more revenue on board, had introduced hard limits on on-board delays significantly less than three hours. In some cases, gate returns are initiated as early as 60 minutes. Airlines must balance three factors when assessing gate return decisions:

- The expected departure time of the impacted flight, based on departure flow rates, weather conditions and the departure queue;
- Resource constraints, including crew duty limits, gate availability, and ramp personnel (for unloading baggage and aircraft servicing); and
- The time required for a given flight to return to the gate, taking into account both the average taxi-in time during inclement weather conditions and the variability of those times.

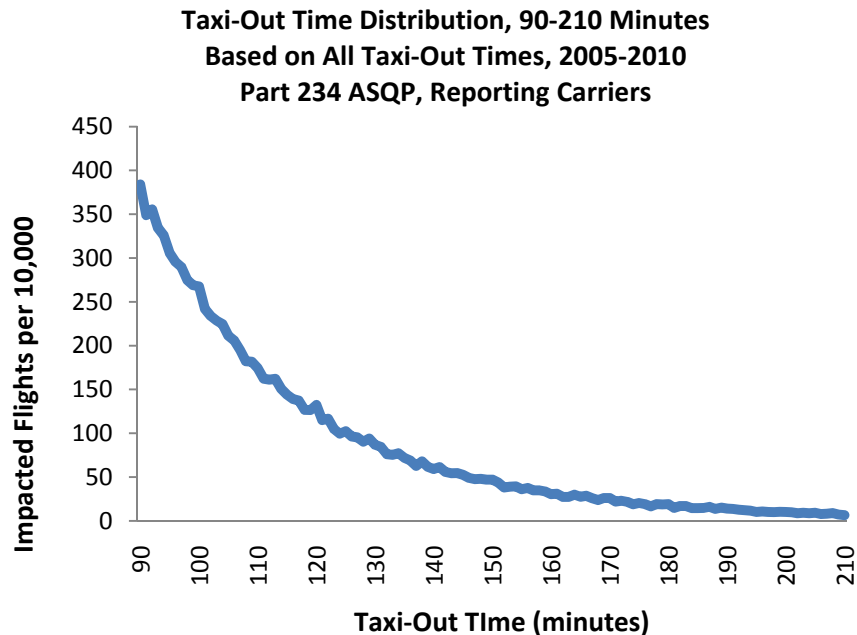
Airlines can estimate taxi-in times both through operational analysis at an airport level and through consultation with FAA tower and system control personnel during inclement weather events. As outlined in Exhibit 15, over a ten-year period, during inclement IFR conditions (with visibility less than one mile) the mean taxi-in time ranged from 6.7 minutes at Washington Dulles to 13.1 minutes at Dallas/Ft. Worth. Since taxi-in times are based on transit from runway to gate, the location of holding pads for long on-board delayed flights can make a difference. But observing historical taxi-in performance, combined with the observed standard deviations, provides a meaningful

## SECTION THREE

“must-return” checkpoint based on the airline’s desired confidence interval in achieving a successful gate return by the three-hour mark.

As we outline in more detail in Section 4, if the ratio of revenue on board to the potential tarmac fine is 0.7% (not atypical based on \$27,500 per passenger penalties) then airlines, all other factors equal, will demand a 99.3% confidence interval in assessing the point of last gate return. At airports such as Dallas/Ft. Worth and Chicago, the standard deviation is more than 7 minutes. With an 11-13 minute mean time, a 99.3% confidence interval requires taxi-in time allowances of between 35 and 40 minutes.<sup>15</sup> That in turn demands a gate return well before the 2.5 hour mark. Even if ATC advises that a flight is likely (but not certain) to take off between 2.5 and 3.0 hours into its on-board delay, the airline will still initiate a gate return.

Why is this relevant? The chart below shows the average taxi-out time distribution for all flights by DOT Part 234 reporting airlines between January 2005 and September 2010, for the interval between 90 minutes and 210 minutes of taxi-out time.



By 90 minutes after gate departure, 99.85% of departing flights have taken off. By 120 minutes, 99.91% have departed, and by 150 minutes (2.5 hours) 99.96% have departed. But these percentages can be deceiving given the large base of annual flights: 6,413,543 annual departures occurred between October 2009 and September 2010. Translating these percentages to flights for the 2005-2010 data set, in the interval between 2.5 and 3.0 hours of taxi-out time, an average of 1,363 flights each year

<sup>15</sup> A 99.3% confidence interval requires three standard deviations from the mean. For Dallas/Ft. Worth, the mean IMC taxi-in time with visibility less than 1 mile is 13.1 minutes. Three standard deviations (7.53 minutes) is 22.59 minutes. The gate return allowance will be 36 minutes, so the maximum on-board time before initiating gate returns will be 2 hours and 24 minutes. Source for Taxi-In Times: FAA ASPM (2000-2010).

## SECTION THREE

successfully departed. These flights will not have the chance to depart without a gate return in the current environment. Punitive fines force these aircraft back to gate.

DOT's threats of punitive fines are more than 100x the expected revenue on-board most flights. This revenue-to-fine ratio demands extraordinary risk management by airlines. The higher the fine threatened at the three hour mark, the more flights return to gate prematurely that would otherwise have departed successfully prior to three hours. On an annual basis, the difference between 2.5 hours and 3.0 hours for gate returns impacts 1,363 incremental flights and 151,000 incremental passengers. Because taxi-out distribution is a downward sloping curve, a threshold just 15 minutes earlier (2 hours and 15 minutes, the standard for several carriers) impacts 2,723 more flights versus three hours and another 301,000 passengers.

When DOT conducted its regulatory evaluation analysis, it neither predicted nor incorporated gate returns for flights other than those that would have a three hour delay. The problem for airlines is how to handle the increase in gate returning flights. By analyzing gate return times for flights between May 2010 and September 2010, using Part 234 ASQP filings, we calculated the median time to "turn" a gate return at 64 minutes. While some gate turns were faster, others were much longer. In reality, airlines simply cannot return an aircraft to gate, unload passengers and depart in less than 30 minutes. In addition, because crew duty times are limited (and in some cases maintenance checks are required) and deplaning passengers and their baggage can be complex, the cancellation rates of these gate-returning flights are high. Between May and September 2010, 21.6% of gate returns after 120 minutes of taxi time cancelled.

DOT's policy of maximum fines and opaque enforcement cause early gate returns, in much higher numbers than otherwise required. We recognize that eliminating (as opposed to minimizing) even *minor* on-board delays is politically expedient for DOT. However, this policy objective has real costs by forcing premature gate returns. When flights return to gate, they displace other departures that would have used the same gates. They trip duty time limits and in some cases maintenance requirements. This is also a primary reason why airlines have strongly favored advance cancellations in the post-rule environment over testing taxi-out times and risking fines.

### **Flight Operations and Cancellations: System Level**

*Total flight operations.* During May-September 2010, the 19 reporting U.S. carriers scheduled a total of 2,760,546 flight segments, a decrease of 3,167 flights (0.1%) from the same period of 2009. Reporting air carriers in 2010 included the 17 airlines with annual revenues of \$720 million or greater (for the year ending June 2009) plus 2 airlines that voluntarily reported information. Notable absences from the reporting group include Spirit Airlines and Virgin America, both of which will likely begin reporting flight-level data starting in January 2012. Since Spirit Airlines is not a reporting carrier, cancellations related to Spirit's 2010 pilot strike are not included in the data set analyzed.

1. Flight operations in aggregate remained largely constant year over year. Some carriers reduced flight departures (e.g. United) while others grew.

## SECTION THREE

2. There were no notable labor actions or mechanical trends that would drive significant changes in flight completion rates.
3. Because 2009 and 2010 had similar levels of flight operations, comparing delays and cancellations between the two years does not require adjustment to reflect differences in airport and gate utilization, scheduling and other factors. In contrast, the significantly higher levels of capacity deployed in the period from 2005 through 2008 make direct comparisons with 2009 and 2010 less meaningful.<sup>16</sup>

*Quantity and location of flight cancellations.* In the five-month period from May through September 2010, a total of 33,532 flights cancelled, compared to a total of 28,464 flights during 2009. This is an increase of 5,068 cancellations year over year. Incremental cancellations were concentrated in May, July and September.

Table 1 presents the change in flight cancellations for selected airports. Data for a more complete list of airports is presented in Exhibit 13. As the initial May 2010 data suggested, central hubs were hard-hit by cancellations. The largest increases in cancellations were observed at Chicago O’Hare (+852 flights), Detroit Metro (+699), Houston Intercontinental (+368), San Francisco (+344), Minneapolis (+318) and Atlanta (+256). The largest decreases occurred in Dallas (-208), Boston (-285) and LaGuardia (-293). Both Boston and Dallas were hard-hit in June 2009 by paralyzing weather events, leading to a high baseline of cancellations. The New York area generally benefitted from a significant reduction in capacity at New York JFK, driven by runway construction during May and early June 2010.

**Table 1:** Flight Cancellation Increases/Decreases at Key Airports With Significant Changes 2010 vs. 2009 (May through September)

Airport	May	Jun	Jul	Aug	Sep	Change
ORD	288	424	208	(61)	(7)	852
DTW	130	80	305	96	88	699
IAH	104	59	156	3	46	368
SFO	91	108	5	49	91	344
MSP	12	58	142	72	34	318
ATL	215	(62)	106	20	(23)	256
MEM	53	13	50	76	55	247
PHX	(32)	(51)	(18)	0	(14)	(115)
PHL	(63)	(69)	(6)	(20)	2	(156)
DFW	45	(236)	(63)	(50)	96	(208)
BOS	(68)	(124)	(110)	(45)	62	(285)
LGA	(78)	(231)	(41)	(55)	112	(293)

Source: DOT Part 234 Reports, full list in Exhibit 13

<sup>16</sup>See Exhibit 16.

## SECTION THREE

Each flight cancellation by a reporting carrier is attributed with a causal code, and the cancellation is reported with associated detail about the scheduled origin and destination, time of gate push-back (if any) and whether an aircraft had been assigned to operate the flight prior to cancellation. Carriers may select from four causal codes when classifying cancellations, either (a) National Airspace System, (b) Carrier-related causes, (c) Security reasons or (d) Weather-related factors.<sup>17</sup>

*Carrier-Related Causes.* DOT defines “Carrier” causes as factors that are under the control of the airline, including but not limited to cleaning, damage, airport curfew, gate availability, baggage loading, cabin servicing, cargo loading, catering, carrier-related computer outages, crew availability and legality, fueling and paperwork. For tarmac-related cancellations, gate resource availability is considered a primary causal factor.

*Weather-Related Causes.* Weather cancellations include conditions below flight minimums, icing and de-icing, extreme temperatures, hail, en-route weather, lightning, snow and thunderstorms. For tarmac-related cancellations, pre-planned cancellations that result from predicted weather systems are considered weather-related.

*Airspace Causes (NAS).* Cancellations related to airspace include general airport congestion, construction, ATC holds and quota programs, closed runways, flow control and ramp congestion. For tarmac-related cancellations, situations where en-route weather forces a cancellation are considered Airspace related.

*Security Causes.* Cancellations related to security include bomb threats, inoperative TSA equipment, and long lines at security checkpoints. Tarmac-related cancellations are unrelated to security causes.

Each airline is free to assign a cancellation code based on its judgment and records, without significant audit risk by DOT or other parties. As a result, cancellation code assignments do vary by airline, particularly for cancellation events driven by a combination of factors (e.g. airspace blocked because of severe weather). Cancellation code assignments are therefore relevant at an airport level on a year-over-year basis when the same carrier(s) assign codes for the same relative proportion of flights. They are also relevant on a systemwide basis where differences among carriers are averaged.

Table 2 below lists the change in cancellation code assignments by U.S. airport for the five-month period of May through September. A more complete list of airports can be found in Exhibit 14. Because this is a year-over-year comparison, it is useful for general trend analysis only.

---

<sup>17</sup>For more information on causal codes, see the BTS reporting directives at [http://www.bts.gov/programs/airline\\_information/accounting\\_and\\_reporting\\_directives/technical\\_directive.html](http://www.bts.gov/programs/airline_information/accounting_and_reporting_directives/technical_directive.html).

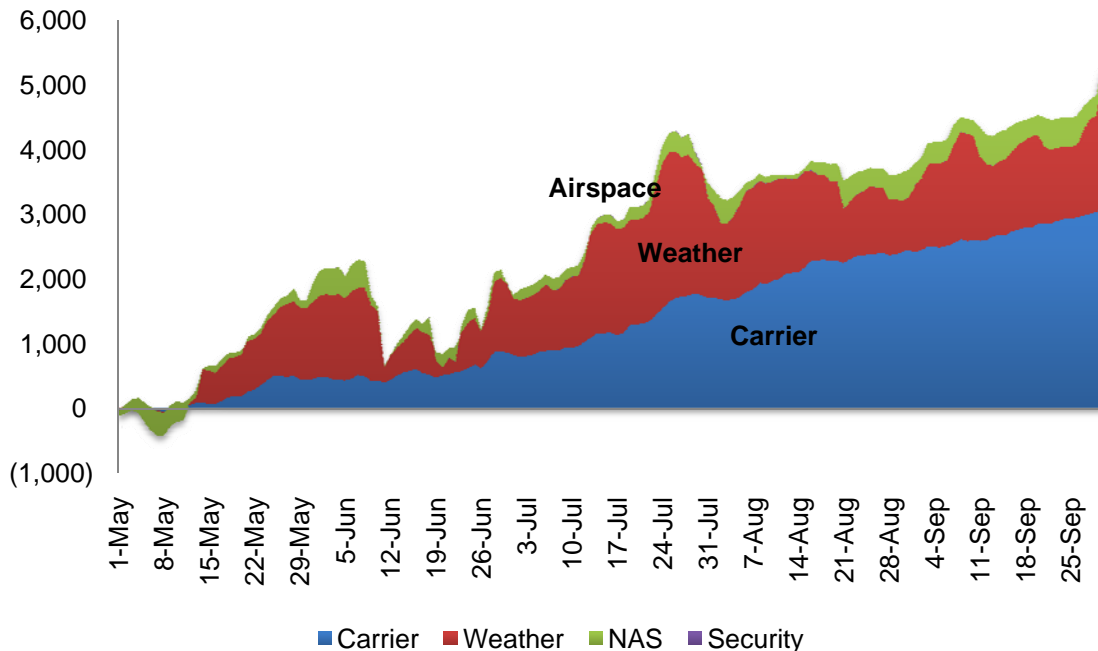
## SECTION THREE

**Table 2:** Change in Cancellation Codes By Airport  
May through September 2010 vs. 2009, Codes Assigned by Airline

Airport	Airspace	Carrier	Security	Weather	Change
ORD	381	-63	0	534	852
DTW	7	523	-1	170	699
IAH	7	39	0	322	368
SFO	174	58	1	111	344
MSP	-33	302	0	49	318
ATL	-195	296	0	155	256
MEM	12	196	0	39	247
MIA	25	114	0	54	193
DCA	-3	133	0	19	149
ACV	12	1	0	90	103
SLC	2	86	0	12	100
PHX	12	-117	0	-10	-115
PHL	-102	12	0	-66	-156
DFW	54	-95	0	-167	-208
BOS	-176	25	-1	-133	-285
LGA	-240	135	-3	-185	-293

Source: DOT Part 234 Reports, See **Exhibit 14** for more complete list of airports

**Cumulative Change in Flight Cancellations by Cause  
May through Sep 2010 vs. 2009, by Day**



In several cases, this table quickly explains why cancellation counts at specific airports changed year over year. LaGuardia benefitted from more open airspace with JFK capacity-restricted due to runway construction. Boston benefitted from better

## SECTION THREE

weather, as did Dallas. Increases due to airspace, weather and carrier factors can also be observed, particularly at Chicago O'Hare where inclement weather during June 2010 drove more than 400 incremental flight cancellations.

*Weather Factors.* As Exhibit 7 shows, flight cancellations due to weather-related causes accounted for 40% (2,171 of 5,068) of the total increase in flight cancellations. This is particularly notable given the favorable weather conditions reported on a systemwide basis across the airports analyzed.

To quantify the degree to which weather conditions were more favorable in 2010 versus comparable months in the period from 2000 through 2009, we collected airport weather data at fifteen-minute intervals dating back to January 1, 2000. The weather data collected contains information on ceilings, winds, temperatures, visibility, and IFR weather conditions. Through independent analysis of each factor, and through combined analysis to trace convective thunderstorm activity and other short-burst events, we determined that inclement weather conditions (on a nationwide basis) were 30.5% less prevalent in 2010 versus 2009.

1. Weather cancellations increased by 2,171 flights, driven by significant increases in May, July and September. The increase was observable throughout the sample period.
2. Bad (IFR) weather conditions were 30.5% less prevalent during the period from May 2010 through September 2010.
3. Total flight delays due to weather factors (including both severe weather and airspace delays related to weather events) decreased 8.3% year over year.
4. While certain airports were impacted by significant thunderstorm and frontal events, general conditions year over year were more favorable.

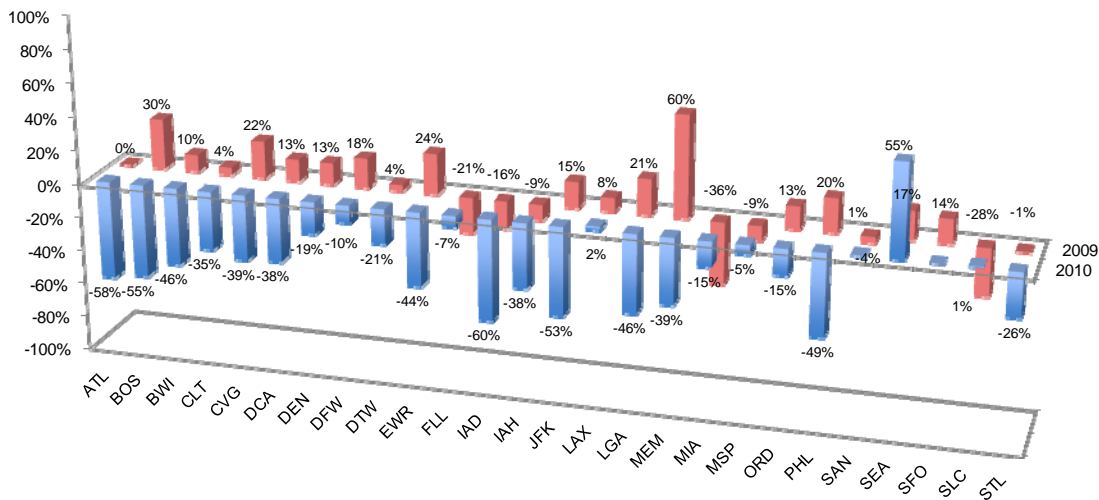
## SECTION THREE

**Table 3: Weather Differences, Systemwide, Chart and Graph**  
 May through September 2010 vs. 2009  
 Full Data Set in Exhibit 7

Source: DOT, FAA ASPM and NOAA

Category	May	Jun	Jul	Aug	Sep	Total
Weather Cancellations, 2010	2,389	2,524	2,513	886	1,616	9,928
Weather Cancellations, 2009	1,197	2,665	1,795	1,416	684	7,757
Change in Weather Cancels	<b>1,192</b>	<b>(141)</b>	<b>718</b>	<b>(530)</b>	<b>932</b>	<b>2,171</b>
Inclement Weather, % of Time, 2010	15.9%	13.0%	11.7%	3.5%	9.5%	10.7%
Inclement Weather, % of Time, 2009	21.8%	16.5%	11.4%	11.9%	15.5%	15.4%
Percentage Point Change, Weather	-5.9pp	-3.5pp	0.3pp	-8.4pp	-5.9pp	-4.7pp
% Change Year over Year	<b>-27.1%</b>	<b>-21.2%</b>	<b>2.8%</b>	<b>-70.4%</b>	<b>-38.4%</b>	<b>-30.5%</b>
DOT Weather Delays, 2010	39.2%	40.4%	37.6%	35.1%	34.5%	37.4%
DOT Weather Delays, 2009	47.0%	43.5%	39.4%	39.3%	34.6%	40.8%
Percentage Point Change, Weather	-7.8pp	-3.1pp	-1.8pp	-4.2pp	-0.1pp	-3.4pp
% Change Year over Year	<b>-16.7%</b>	<b>-7.0%</b>	<b>-4.6%</b>	<b>-10.7%</b>	<b>-0.2%</b>	<b>-8.3%</b>

**Inclement Weather Conditions, 2010 and 2009 vs. 10 year mean**  
 Blue Bars 2010, Red Bars 2009



Weather reported was significantly improved year-over-year across the Northeast, South and Central United States:

- At Northeastern hub airports (including Boston, Baltimore, Washington, Newark, New York, and Philadelphia) IFR conditions were reported 7.8% of the time, compared to 17.6% in 2009 and a trailing 10-year average of 15.7%. Ceilings

## SECTION THREE

below 3,000 feet were reported 12.7% of the time, versus 17.2% in 2009 and a 10-year average of 14.2%. Visibility less than 1 mile was reported 0.4% of the time, versus 1.0% in 2009 and a trailing average of 0.8%. See Exhibit 18 for more detail.

- At hubs located in the southern U.S. (including Atlanta, Dallas/Ft. Worth and Houston) IFR weather conditions were reported in 9.1% of samples taken, versus 15.7% in 2009 and a trailing 10-year average of 15.9%. Ceilings were reported below 3,000 feet 10% of the time (versus 12.1% in 2009) and visibility less than 1 mile was reported 0.1% of the time (versus 0.4% in 2009). See Exhibit 19 for more detail.
- At Midwest hubs (including Cincinnati, Detroit, Chicago, Minneapolis and St. Louis) IFR conditions were reported 9.6% of the time, compared to 12.5% in 2009 and 12.5% over the previous 10 years. Ceilings below 3,000 feet increased to 12.9% of reported periods versus 10.1% in 2009 and a 10-year average of 9.5%. Visibility of less than one mile, however, declined to 0.2% of samples in 2010 versus 0.4% in 2009 and a trailing 10-year average of 0.4%. However, severe weather during June and July drove increases of 682 flights during those months at O'Hare and 385 flights at Detroit. See Exhibit 20 for more detail.

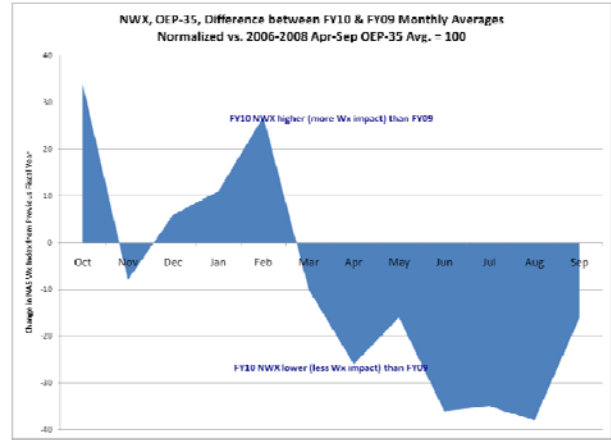
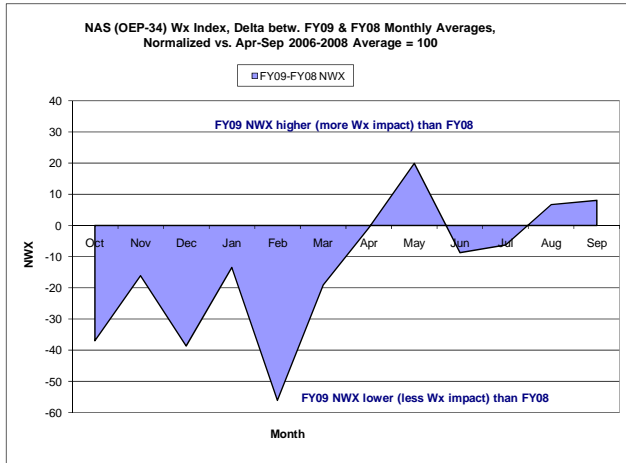
However, at Western hubs (including Denver, Las Vegas, Los Angeles, Seattle, San Francisco, and Salt Lake City) weather was generally less favorable than prior years. IFR conditions were reported 14.9% of the time, versus 14.7% in 2009 and a trailing 10-year average of 13.2%. Ceilings below 3,000 feet were reported 19% of the time, versus 13.3% in 2009 and over the previous 10 years. Visibility below 1 mile was reported 0.8% of the time, versus 0.3% in 2009 and 0.5% over the previous 10 years. See Exhibit 21 for more information.

*Weather from Other Sources.* Our data set analyzed IFR conditions, visibility levels, wind speed, ceilings and temperatures during the summer months, over an 11 year period from January 2000 through September 2010. At a systemwide level, we conclude that weather conditions were a contributing, but not primary, cause of the increase in cancellations. Severe weather incidents were dramatically reduced versus 2009.

The FAA Air Traffic Organization weekly analysis of weather conditions, which covers the previous (fiscal) year, offers insight into year-over-year weather impact. The ATO measures systemwide weather impact on flight delays and operations at the top 35 national airports. While our data set incorporates general weather conditions, the ATO data set also includes convective activity analysis.

## SECTION THREE

**Chart A:** Federal Aviation Administration Air Traffic Organization  
Weather Impact on Systemwide Operations and Delays, OEP-35 Airports  
Left Chart: Year over Year, 2009 vs. 2008 (Normalized)  
Right Chart: Year over Year, 2010 vs. 2009 (Normalized)



Above in Chart A are two charts that capture the FAA-ATO analysis of weather conditions in 2009 and 2010. The left chart shows the relative impact of weather in 2009 versus 2008, normalized based on data from 2006 through 2008 (to reduce variability in the data set).

From the left chart, which compares 2009 against 2008, we conclude that 2009 was a reasonable base year for comparison of summer months, since on a systemwide basis weather conditions over the five-month period were largely average. May 2009 had 20% higher impact than May 2008 but June and July were more favorable. August and September had less than 10% increases over the prior year.

From the right chart, we observe that after a harsh winter, the weather impact from March through September is dramatically better than the same period of 2009. This is particularly noticeable for June, July and August, where the change in weather impact exceeds 30%. Our analysis demonstrated a 30.5% reduction in weather impact year over year, and the FAA-ATO numbers support that analysis.

A second source of external data is the weather-related flight summary reported by DOT each month in the Air Travel Consumer Report, which contains on-time performance and flight cancellation statistics. The DOT report calculates weather-related flight delays, combining delay information from both severe weather and airspace data sets to create an integrated picture of weather impact on flight operations.

**Table 4:** Weather-Related Delays, DOT Consumer Reports by Month  
May through September 2010 vs. 2009

	2010	2009	Change
<b>May</b>	38.2%	47.0%	-18.7%
<b>June</b>	40.4%	43.5%	-7.0%
<b>July</b>	37.6%	39.4%	-4.6%
<b>August</b>	35.1%	39.3%	-10.7%
<b>September</b>	34.5%	34.6%	-0.2%
<b>Average</b>	37.4%	40.8%	-8.3%

Source: DOT Air Travel Consumer Reports, May through September 2010

The DOT weather-related delay data shows a significant decrease year-over-year, and because it reflects the actual impact on flight operations, it weights more heavily weather conditions at large hub airports than smaller airports with fewer flight operations. As such, the DOT data incorporates the severe weather observed at Chicago O’Hare and Detroit discussed with stronger weighting than weather conditions observed at airports such as Richmond or Sacramento.

From both the FAA-ATO and DOT data sets we conclude that weather conditions were more favorable to airline operations this year than last. On a general systemwide basis (not weighted by airline operations) weather conditions were 30% more favorable during the study period. Those favorable conditions translated to an 8.3% aggregate reduction in weather-related delays and operational disruptions.

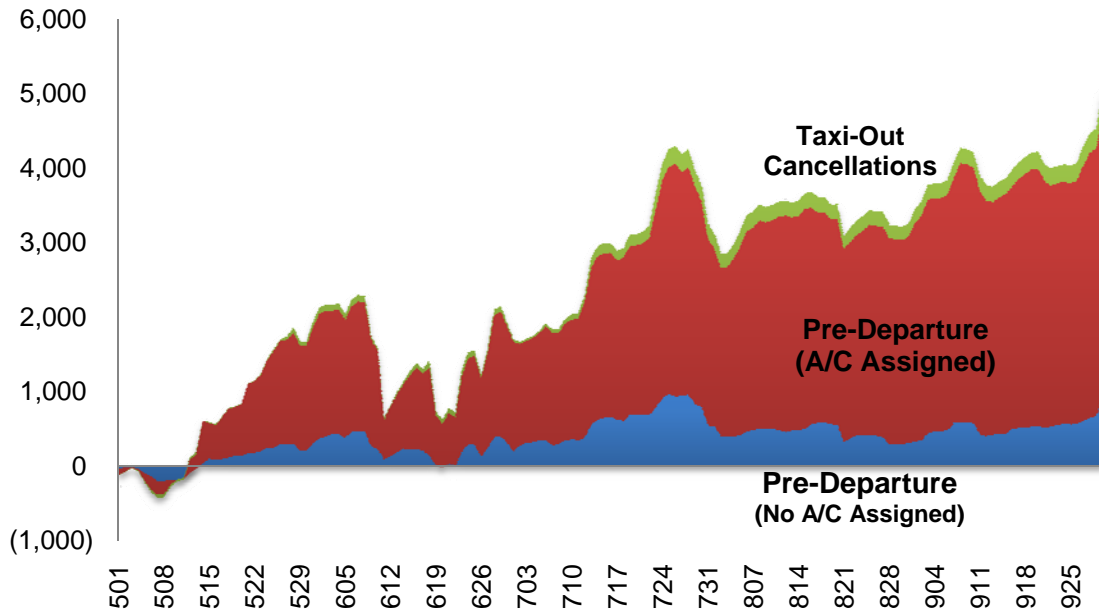
*Cancellations by Phase of Flight.* Flight cancellations increased at each stage of flight, from pre-departure through diversions. Year over year:

- Pre-departure cancellations without an aircraft assignment (with a significant number reflecting “advance” cancellations by airlines) increased by 938 flights;
- Pre-departure cancellations with an aircraft assignment (last-minute cancellations) increased by 3,855 flights;
- Cancellations of flights after gate departure increased by 244 flights; and
- Cancellations of flights that diverted to alternate airports increased by 31 flights.

The following chart shows when cancellations occurred by phase of flight. The vast majority of cancellations occurred prior to gate departure, reflecting the general operating strategy of not allowing flights with material tarmac exposure to leave the gate. To a smaller extent, taxi-out cancellations increased as well.

**SECTION THREE**

**Cumulative Change in Cancellations by Phase  
2010 vs. 2009 May-Sep  
Causes: Weather + Airspace + Carrier Factors**



*Comparing Cancellations by Cause and Phase of Flight*

More detail on cancellation by phase of flight can be found in Exhibit 29. We divide our analysis into sections: a review of cancellations before push-back from gate (both with and without aircraft assignments, a reasonable proxy for advance pre-cancellations and last-minute cancellations) and a review of cancellations after gate departure and at diversion airports. Table 5 below shows that pre-cancellations without aircraft assignments (in many cases “advance” cancellations) increased by 11% year-over-year, pre-cancellations with aircraft assignments (in many cases “last-minute”) jumped by 21%, and cancellations after gate returns grew 19% (15.7% for taxi-times below 1.5 hours, 21.3% for times above). The majority of the increase in long taxi cancellations came from carrier-related causes.

**Table 5: Cancellations Matrix**  
Year over Year, May through September 2010 vs. 2009

Change in Flights May-Sep 2010 vs. 2009	Pre-Cancel w/o Aircraft Assigned	Pre-Cancel w/Aircraft Assigned	Taxi-Out Cancels		Total Flight Cancellations
			< 90 min	> 90 min	
Airspace	(169)	(12)	3	(33)	(211)
Carrier	63	2,851	142	52	3,108
Security	0	(1)	1	0	0
Weather	1,044	1,017	59	51	2,171
<b>Incremental Cancellations</b>	<b>938</b>	<b>3,855</b>	<b>205</b>	<b>70</b>	<b>5,068</b>
% of Total	19%	76%	4%	1%	100%

Percentage change in flights May-Sep 2010 vs. 2009	Pre-Cancel w/o Aircraft Assigned	Pre-Cancel w/Aircraft Assigned	Taxi-Out Cancels		Total w/o Aircraft Assigned
			< 90 min	> 90 min	
Airspace	-10.1%	-0.3%	1.5%	-18.3%	-3.4%
Carrier	1.4%	<b>31.7%</b>	16.6%	<b>200.0%</b>	21.5%
Security	0.0%	-14.3%	0.0%	0.0%	0.0%
Weather	<b>46.2%</b>	19.9%	<b>23.6%</b>	41.5%	28.0%
<b>Change in cancellations (%)</b>	<b>11.0%</b>	<b>21.0%</b>	<b>15.7%</b>	<b>21.3%</b>	<b>17.8%</b>

Source: Part 234 Monthly Reports

#### *Pre-Departure Cancellations without Aircraft Assigned*

Certain scheduled flights are cancelled (1) prior to gate departure and (2) where an aircraft is not assigned to the flight operation. Since airlines generally assign aircraft to given routes by the scheduled day of departure, these cancellations often reflect advance decisions made by carriers to reduce flight schedules well in advance of departure. They can be identified by records where both an actual departure time and an assigned tail (aircraft) number are missing.<sup>18</sup>

The number of pre-departure cancellations without aircraft assignments increased from 8,509 flights during the May through September period of 2009 to 9,447 flights in 2010, an increase of 938 flights or 11% year over year. As shown in Exhibit 8 advance cancellations were distributed across airports, with the most notable increases at Detroit, Houston and Chicago O'Hare. Significant decreases in advance cancellations were reported at Boston, Denver and New York LaGuardia.

Weather was the primary driver of the increase in pre-departure cancellations without aircraft assignments, which we believe signifies airline preferences to thin

<sup>18</sup>Not all carriers have the same methodology and timing for assigning aircraft to flights, making direct inter-carrier comparisons difficult for pre-cancellation data. In addition, a blank aircraft tail number field in Part 234 flight reports may indicate that tail number information was missing or unavailable for that cancelled flight segment. For the overall data set, 0.2% of records for completed flights (not cancelled) are missing tail number information, and we believe a similar ratio of advance pre-cancellations may actually be last-minute cancellations where the aircraft tail number was unavailable, and therefore not material to our analysis.

### SECTION THREE

schedules and avoid exposure during conditions that might cause on-board delays. The year-over-year change in weather-related cancellations, systemwide, was 1,044 flights, more than the overall increase of 938 flights. This supports our July 2010 observations that airlines have changed their operating practices when severe or inclement weather is predicted, cancelling flights instead of risking long on-board taxi delays and the associated punitive fines. Weather-related pre-cancellations are coded as “weather” by airlines under Part 234 requirements.

**Table 6:** Change in Pre-Departure Cancellations without Aircraft Assigned, by Category Year over Year, May through September 2010 vs. 2009

	Airspace	Carrier	Weather	Total
<b>2010</b>	1,505	4,637	3,305	9,447
<b>2009</b>	1,674	4,574	2,261	8,509
<b>Change</b>	-169	63	1,044	938

Source: Airline Part 234 Reports

- Pre-cancellations demonstrate risk-averse operating practices by airlines. When faced with expected conditions that cause on-board delays, the rate of cancellations increased.
- Minor changes in airspace and carrier-related factors isolate the primary cause of this increase as tarmac-rule related.

#### *Pre-Cancellations with Aircraft Assigned*

The most significant portion of cancellation increases came for flights that cancelled before departure and where aircraft were already assigned to operate the route. The significant majority of these pre-departure cancellations were driven by carrier-specific factors, strongly suggesting that tarmac rule avoidance (clearing gate capacity, freeing ramp resources, and cancelling flights when tarmac-conducive weather is expected but not present) is a causal factor. Viewed year over year, aircraft assignment is a helpful indicator that incremental flight cancellations were *last-minute* versus *advance* decisions.

Pre-departure cancellations with aircraft assigned increased 21% year over year from 18,321 flights in 2009 to 22,176 flights in 2010, an increase of 3,855 flights. The increase in these cancellations is distributed across U.S. airports, with significant increases reported at Detroit, Chicago O’Hare, San Francisco, and Minneapolis. Significant decreases were reported at Boston, Dallas and New York LaGuardia.

There are several primary causes:

- Maintenance events, where aircraft are placed out of service for repairs;
- Crew availability;

## SECTION THREE

- Aircraft availability, where the incoming aircraft that will operate the planned flight segment is cancelled or significantly delayed;
- Weather and airspace factors, including weather conditions and airspace conditions that make a long on-board delay likely; and
- Gate returns, where flights returning to tarmac place unexpected demands on gate resources.

Analyzing the causal codes assigned by airlines to Pre-Departure Cancellations with Aircraft Assigned in May through September 2010 and the same period of 2009, we observe a different pattern than for those without aircraft assigned. Both carrier and weather factors are drivers, but carrier-related cancellations significantly outweigh weather-related cancellations. While some of the difference can be explained by which airlines were impacted by cancellations, it also reflects changed behavior by airlines as they manage tarmac risk.

**Table 7:** Pre-Departure Cancellations with Aircraft Assigned, by Category  
Year over Year, May through September 2010 vs. 2009

	Airspace	Carrier	Security	Weather	Total
<b>2010</b>	4,187	11,843	6	6,140	22,176
<b>2009</b>	4,199	8,992	7	5,123	18,321
<b>Change</b>	-12	2,851	-1	1,017	3,855

The mixed increase of carrier and weather causes is central to observing the impact of the tarmac delay rule and punitive fines on airline behavior. All flights in Table 7 reflect decisions to cancel prior to departure. The increase in Weather-related cancellations can be partially explained by inclement weather conditions at key hub airports this summer, but the increase in Carrier-related cancellations directly parallels the changes in airline operating strategies in response to the tarmac delay rule.

Because there is not yet a cancellation code that directly connects flight cancellations and the airlines' responses to the tarmac rule, definitive connections between carrier, weather and tarmac factors cannot be made. The combined increases in carrier and weather factors, however, support the following statements:

- Airlines are more cautious about pushing aircraft from the gate into environments conducive to lengthy on-board delays;
- Airline conservatism is driving a significantly higher cancellation rate than flights that would (statistically) be subject to on-board delays longer than two hours; and
- Weather conditions are not a sufficient explanation for the increase in cancellation. Given equal flight operations levels and general improvements in inclement weather conditions, the increase in carrier-related factors demonstrates a link between the rule, punitive fines and cancellations.

## SECTION THREE

### *Cancellations After Gate Return*

Next, we analyze flights that (1) departed from the gate at the origin airport, (2) returned to the gate after a lengthy on-board delay and (3) either re-departed or cancelled. In comparing reported flight data from June through September against the initial May 2010 data set, we found that over time airlines have simply shifted their operating strategies to favor pre-departure cancellations over “testing” the ability to depart with an on-board delay before takeoff. This is not surprising, given DOT’s strong statements about fines and enforcement.

**Table 8: Gate Returns, Re-Departures and Cancellations**  
**All Gate Returns (Taxi Time > 0)**  
May through September 2010 vs. 2009

	<b>Gate Returns That Re-Depart</b>	<b>Gate Returns That Cancel</b>	<b>Gate Returns Total</b>
<b>May-Sep 2010</b>	14,194	1,534	15,728
<b>May-Sep 2009</b>	14,039	1,290	15,329
<b>Change (Flights)</b>	+155	+244	+399
<b>Change %</b>	<b>+1%</b>	<b>+19%</b>	<b>+3%</b>

More detail on the composition of gate returns between May and September 2010 (versus the same period of 2009) can be found in Exhibits 11 and 12. Key observations in those Exhibits include:

- **More flights with lengthy taxi-times are returning to gate.** The number of taxi-out gate returns after between 60 and 120 minutes of taxi-out increased by 11% from 1,395 to 1,549 flights. The number of flights returning after 120 minutes of taxi-out time remained steady. This reflects airlines’ post-rule strategy of bringing aircraft back to the gate when there is even a marginal exposure to the punitive tarmac fines.
- **Cancellations gate-returning flights are significantly higher.** For flights returning to gate after more than 120 minutes of taxi time, 21.6% cancel, versus 8.5% in 2009. This represents a 13.1 percentage point or 154% overall increase in cancellations for flights with long taxi-out times. The rate of cancellations for flights with taxi-out times between 60 and 120 minutes doubled.
- **On a percentage basis, gate returns are significantly higher.** In 2010, 37.7% of flights with tarmac-times greater than 120 minutes returned to the gate. This compares to 20.6% in 2009, an increase of 17 percentage points or 83%. Gate returns of flights with taxi-out times between 60 and 120 minutes is up by 41%.

There is clear evidence that aircraft not *certain* (as opposed to *probable*) to depart by three hours are returning to the gate. The problem is that the requirement for *certainity* in gate returns is driving a significant increase in overall cancellations, both of the

## SECTION THREE

returning flights themselves and of flights at-gate as airlines free gate resources to deplane passengers.

To better connect gate-return cancellations to tarmac-rule exposure, we reviewed Cancellations by Cause for gate-returns after taxi-out delays of (1) less than 30 minutes, (2) 30 to 90 minutes and (3) more than 90 minutes. As expected, we found that the significant majority of incremental cancellations for flights with taxi-out delays less than 30 minutes were due to carrier factors, with aircraft maintenance issues discovered on engine start a likely driver. Weather and airspace were offsetting factors that are not statistically meaningful.

**Table 9: Cancellations by Cause, May through September  
Gate Returns After Taxi-Time < 30 Minutes**

	Airspace	Carrier	Weather	Security	Total
<b>2010</b>	34	434	50	0	518
<b>2009</b>	37	396	47	0	480
<b>Change</b>	<b>(3)</b>	<b>38</b>	<b>3</b>	<b>0</b>	<b>38</b>

Source: Airline Part 234 Monthly Reports

As summarized in our July 2010 paper, airlines responded to the threat of punitive fines by bringing aircraft back to the gate as early as 60 minutes after gate departure if conditions were present that could cause lengthy on-board delays. Cancellations of gate returns of flights after taxi-out times between 30 and 90 minutes increased 27.5% year over year. Of those incremental cancellations, the same 2:1 ratio was present between carrier and weather factors as observed for pre-departure cancellations with aircraft assignments, suggesting that the same factors (tarmac rule and fine avoidance) were at work.

**Table 10: Cancellations by Cause, May through September  
Gate Returns After Taxi-Time between 30 and 90 minutes**

	Airspace	Carrier	Weather	Security	Total
<b>2010</b>	141	342	127	1	611
<b>2009</b>	122	269	88	0	479
<b>Change</b>	<b>19</b>	<b>73</b>	<b>39</b>	<b>1</b>	<b>132</b>

Source: Airline Part 234 Monthly Reports

The last category of gate returns involve flights that return to gate after at least a 90-minute taxi-out. Cancellations of these flights increased by 22%. These flights are directly impacted by the tarmac delay rule, and prior to the rule taking effect most of these flights would have completed. Notably, the ratio between carrier and weather causes is balanced, as many of these flights may have held on the tarmac awaiting expected improvement in weather conditions that did not materialize. These are flights where carriers took “risk” in holding aircraft on-tarmac in order to attempt a completed flight. The increase in cancellations appears to be driven by both (a) crew legality issues

## SECTION THREE

when these flights return to gate (having spent longer on-tarmac, using up available time) and (b) persistent severe weather conditions.

**Table 11:** Cancellations by Cause, May through September  
Gate Returns After Taxi-Time > 90 Minutes

	Airspace	Carrier	Weather	Security	Total
<b>2010</b>	148	80	177	0	405
<b>2009</b>	181	24	126	0	331
<b>Change</b>	<b>(33)</b>	<b>56</b>	<b>51</b>	<b>0</b>	<b>74</b>

Airports with significant increases in gate return cancellations include O'Hare (+59), Atlanta (+33) and New York LaGuardia (+32). These airports share several characteristics, including overall flight volumes, capacity utilization, and difficulty in managing taxi-out times given ramp congestion. Airports with significant decreases in return-to-gate cancellations include Phoenix (-11), Washington Dulles (-21) and Boston (-33), as detailed below in Table 12. For a full list of airports, see Exhibit 8.

**Table 12:** Change in Gate Return Cancellations (Top 10)  
All Taxi Times, By Airport, Year-Over-Year  
May through September 2010 vs. 2009

Airport	Change	Airport	Change
<b>ORD</b>	+59	<b>SDF</b>	-4
<b>ATL</b>	+33	<b>JAN</b>	-5
<b>LGA</b>	+32	<b>BWI</b>	-6
<b>DTW</b>	+25	<b>EVV</b>	-6
<b>MEM</b>	+20	<b>MKE</b>	-6
<b>MSP</b>	+17	<b>OMA</b>	-6
<b>DCA</b>	+14	<b>PHL</b>	-10
<b>LAS</b>	+12	<b>PHX</b>	-11
<b>DEN</b>	+11	<b>IAD</b>	-21
<b>CLT</b>	+10	<b>BOS</b>	-33

In summary, there have been significant changes in cancellations related to gate returns, symptomatic of the impact of the tarmac rule and associated fines. The number of gate returns and cancellations significantly exceeds the number of flights that would (statistically) have been subjected to 3+ hour on-board delays. Airline operating strategies appear to be adapting to fine risk through a strong preference towards pre-cancellations versus risking on-board delay fines. This negatively impacts passengers who face potentially long waits for re-booking, versus a likely flight completion after a lengthy on-board delay on taxi-out.

### *Diversion-Related Cancellations*

Lengthy on-board delays related to flight diversions are driven by a different set of criteria than delays that occur at departure airports. Flight diversions can be broken into two categories:

## SECTION THREE

- Emergency diversions, where the pilot-in-command elects to divert to an alternate field for safety or medical reasons. In these circumstances, pilots are trained to select the closest available field where the operating airline may not have ground facilities or resources available to deplane passengers.
  
- Planned diversions, where decisions are made between pilots and dispatch centers to divert into “on-line” stations where the airline has ground handling facilities. Planned diversions are usually made when weather conditions are expected to improve and there is a network advantage in positioning aircraft closer to the destination airport to minimize inconvenience and recovery time.

Lengthy on-board delays have often occurred during emergency diversions, when the diversion airport does not have the facilities, equipment or other resources to handle the incoming aircraft. Since the Final Rule became effective, airlines have introduced contingency plans to coordinate response among airlines and airports to emergency diversions. The existence of tarmac delay limits creates a strong incentive for airlines to plan diversions instead of risking an emergency diversion when fuel, weather or other operational impacts are predicted.

Lengthy on-board delays can also occur during planned diversions, particularly when too many aircraft are diverted into a specific airport. In our July 2010 report, we illustrated how American Airlines had changed its diversion procedures during inclement weather to scatter planned diversions among online stations. We observe similar practices now implemented at other airlines. While this practice does significantly reduce exposure to lengthy on-board delays, it does create passenger inconvenience when weather conditions at the planned destination clear faster than anticipated.

The number of flight diversions did not change substantially year over year. Diversions increased from 7,272 flights in 2009 to 7,617 flights in 2010, an increase of 5%. The number of cancellations of diverted flights increased 9%, from 352 flights to 385 flights. Including only diversions to airports other than the origin, the number increased to 375 flights in 2010 from 344 flights in 2009.

**Table 13:** Cancellations by Cause, May through September  
Diversions to Airport Other Than Origin

	Airspace	Carrier	Weather	Total
<b>2010</b>	24	222	129	375
<b>2009</b>	37	195	112	344
<b>Change</b>	-13	27	17	31

The ratio of carrier to weather cancellations also supports the trends seen for last-minute pre-cancellations and cancellations after taxi-out. In the majority of cases, carrier-related factors trigger the cancellation. Crew legality is a key factor with

## SECTION THREE

diversions, since crews have already operated at least one inbound flight segment. Deplaning can trigger crew illegality and therefore can force a cancellation.

### Conclusions

In the five-month period from May through September 2010, a total of 33,532 flights cancelled, compared to a total of 28,464 flights during 2009. This is an increase of 5,068 cancellations year over year. Cancellation data collected from May through September 2010 demonstrates a statistically significant deviation in patterns year-over-year, with the tarmac rule a clear driver of at least a portion of the change observed.

**Table 14:** Cancellation Summary, May through September  
All Scheduled Departures for Reporting Airlines

Summary of Key Changes	2010	2009	Change	%
Scheduled Departures by Reporting Airlines	2,760,546	2,763,713	(3,167)	0%
Cancellations before gate departure	31,623	26,830	4,793	18%
Cancellations at origin, taxi less than 30 min	515	477	38	8%
Cancellations at origin, taxi more than 30 min	1,009	805	204	25%
Cancellations at diversion airport	385	352	33	9%
<b>Total systemwide cancellations</b>	<b>33,532</b>	<b>28,464</b>	<b>5,068</b>	<b>18%</b>

In aggregate, flight cancellations rose, with the increase driven by carrier and weather factors, not airspace or security issues. Carrier and weather factors are the relevant cancellation codes for assessing the impact of tarmac delays, since they incorporate the crew legality, gate resource availability and lengthy taxi-out times inherent in managing long on-board delays. Weather was not the primary driver of this increase in cancellations. On a system wide basis, weather conditions were more 30.5% more favorable year-over-year.

**Table 15:** Passengers Impacted by Cancellations and Long On-Board Delays  
All Scheduled Departures for Reporting Airlines Only  
See Exhibits 26 and 28 for methodology and detail

PASSENGERS ON CANCELLED FLIGHTS	May	Jun	Jul	Aug	Sep	Period
2010	516,966	666,667	685,774	459,858	333,637	2,662,902
2009	378,715	669,500	563,866	446,052	220,413	2,278,546
<b>Change</b>	138,251	(2,833)	121,908	13,806	113,224	<b>+384,356</b>

PASSENGERS ON LONG ON-BOARD DELAYS (180+MIN)	May	Jun	Jul	Aug	Sep	Period
2010	134	431	132	160	391	1,248
2009	3,064	29,686	19,739	7,588	694	60,771
<b>Change</b>	-2,930	-29,255	-19,607	-7,428	-303	<b>-59,523</b>

## SECTION THREE

The passenger impact was significant. We estimate that in 2009, 2.28 million passengers were impacted by flight cancellations. In 2010, based on the seat capacity and estimated passenger loads of cancelled flights, we estimate that 2.66 million people were impacted by cancellations. While 59,500 fewer passengers experienced lengthy on-board delays, an estimated 384,000 more passengers experienced cancellations.

Severe weather was a contributing factor in cancellation increases, but not the explanatory factor. Carrier responses to severe weather at major hub airports appear to be the core driver of cancellation increases. Carriers changed their operating practices to avoid exposure to the punitive fines associated with the three-hour rule. Airlines are simply unwilling to test multi-million dollar penalties and are returning flights to gate. As gate returns increase, so too do cancellations, both of the returning flights and of other flights awaiting gate departure that are displaced to make room for passenger deplaning.

The sample set of May through September 2010 offers a relevant pool of data to assess flight cancellations and the potential impact of the tarmac delay rule and fines. First, this period in 2010 was notable for calm weather conditions. Given good weather and no change in flight operations levels, systemwide cancellations should not have risen significantly unless new factors (such as the tarmac limits and fines) create operational changes. Second, the comparable period of 2009 was relatively average in weather conditions. While certain airports (such as Boston and Dallas) were impacted by severe weather, we can isolate those cases on a year-over-year basis and assess systemwide conditions.

For these reasons, assessing the tie between cancellations and the tarmac rule will be more challenging, certainly during the fall and winter months (when sudden weather changes and inclement conditions generally do not trigger large-scale exposure to on-board delays) and next summer (when the comparable baseline of favorable 2010 weather will make it imperative to isolate weather factors in the analysis). As a result, we strongly advocate that both industry and government entities assess the cancellation patterns from the summer of 2010 and determine how the aggregate number of flight cancellations can be reduced. We propose several specific steps to accomplish this objective in the next section.

It is critical that moderate changes to enforcement and fine structures are made now, so that airlines will operate next summer under a revised framework of financial risk and customer welfare priorities. This summer, airlines prioritized exposure to the tarmac rule over completing flights, with direct implications for passengers on cancelled segments. Next summer, when weather conditions are likely less favorable than 2010, and if the number of flight operations rises, it is likely that cancellations will increase significantly if tarmac enforcement does not change. We believe that a transparent fine structure, waived enforcement where airlines initiate returns to gate well before three hours, and better information collection can all address the current imbalance between cancellations and prevented long on-board delays.

## SECTION THREE

#### **4. RECOMMENDATIONS**

We recognize the importance of the three-hour tarmac limit to the Department of Transportation, Congress and a portion of the general public. The number of passengers subjected to lengthy on-board delays should be minimized, whether on taxi-out, diversion or taxi-in, and we recognize that many passengers prefer the flexibility of waiting out inclement weather at the terminal versus on board an aircraft.

The DOT based its economic analysis on the assumption that just 41 incremental annual flights would be cancelled because of a hard three-hour on-board delay limit. The logic and research methodology used in preparation of the Regulatory Impact Analysis was flawed, as it did not incorporate the behavioral changes by airlines when faced with economic penalties of 100x (or more) of the potential revenue gain from completing a given flight. Clearly, the threat of punitive fines has changed airline behavior. While that behavior has effectively stopped tarmac delays, it has also created the strong negative of cancellations, with multi-billion dollar implications for public welfare.

In the long term, we do not believe that three hours is the appropriate cut-off point for lengthy on-board delays with the current structure. We conclude that a four-hour limit would provide the optimal flexibility for carriers to manage large-scale convective weather events while preventing the disastrous on-board delays that sparked consumer outrage and regulatory action. DOT's own economic analysis confirmed that public welfare was higher with a four-hour cutoff versus three.<sup>19</sup> The choice of three-hours was driven by political factors.

That said, for the rule to have positive impact on passengers, the number of cancellations caused by the rule must be reduced. The good news for tarmac delays is that airline behavior changed. The bad news for cancellations is that it changed too much, and actions should be taken before next summer to balance decisions and optimize system operations.

#### **Our recommendations are focused in five areas:**

- 1. Provide transparent enforcement guidance**
- 2. Establish a graduated fine structure and enforcement thresholds**
- 3. Collect tarmac-related cancellation data**
- 4. Real-time information exchange between tower facilities and airlines**
- 5. Collect operational data from Summer 2011 before any imposition of tarmac limits for small U.S. airports or for international flights.**

---

<sup>19</sup> See the DOT Regulatory Impact Analysis for the Final Rule, prepared by HDR Decision Economics. Comparison of the three-hour limit is contained on p61. Alt 1 (as defined on p3 of the RIA) represents a 4-hour limit and drives net benefits of \$73.4 million. The Final Rule drives net benefits of \$69.1 million.

## SECTION FOUR

### 1. Provide Transparent Enforcement Guidance

We outlined several aspects of the final rule that required further elaboration to help guide airline decision-making. At present, vague and sometimes inconsistent language creates uncertainty about how the Aviation Enforcement Office (AEO) will enforce the rule, which in turn creates an unnecessarily risk-averse airline cancellation strategy.

#### *Definition of a “Violation”*

AEO must definitively answer the question of whether 49 U.S.C. 41712 and related rules governing tarmac delays will be assessed on per passenger or per flight bases. In April 2010, DOT simply stated that airlines would be assessed a penalty of \$27,500 “per violation” without any further explanation of whether “per violation” implied per passenger or per flight.<sup>20</sup>

The implications of this simple definition are fundamental to passenger welfare. Airlines are operating under the interpretation that 49 U.S.C. 41712 applies per passenger, not per flight, making the fines prohibitive and negatively impacting operational decisions. Cancellation increases result. If DOT’s intent is not to prosecute on a per passenger basis, clarification of the rule will have immediate and positive benefits to consumers by reducing unnecessary cancellations.

#### *Mitigating Factors*

Specific exemptions related to safety, security and other “mitigating factors” must be presented by DOT with appropriate examples and analysis. Of particular concern are scenarios where aircraft initiate a return to gate with a reasonable allowance for taxi-in time, but do not deplane passengers until after the three-hour mark. Observed situations this summer include gate returns where an unrelated flight vacating the intended gate to permit deplaning is held unexpectedly by ATC. Under current rules, it is unclear whether an ATC hold (of a flight other than the tarmac-delayed operation) constitutes an exemption from enforcement.

Other examples where clarification could be helpful include:

- The definition of a “day” for purposes of violations. This is relevant for evening departures where a multi-hour on-board delay could span two calendar days.
- A single and simple standard for when passengers are no longer “able to deplane”, particularly in situations when the cabin door is open for maintenance or paperwork reasons prior to gate departure.

---

<sup>20</sup> DOT Enforcement Guidance, April 28, 2010, p2

*Part 234 & Part 259 Reporting Inconsistencies*

DOT should address the inconsistencies between 14 CFR Part 234 reporting requirements and parallel obligations under 14 CFR Part 259. Part 234 requires airlines to submit scheduled flight performance data that includes tarmac delay times. In Part 234 Reporting Directives, the tarmac delay is defined as the period of time from when the “pilot releases the aircraft parking brake after passengers have loaded and aircraft doors have been closed.... [C]arriers using a Docking Guidance System may record the official ‘gate departure time’ based on aircraft movement.”

In contrast, Part 259 (which outlines the tarmac rule) contains reporting requirements for long on-board delays. Part 259 defines a tarmac delay as the period where a flight is “on the ground before taking off... with no opportunity for its passengers to deplane.” There are obvious conflicts between Part 234 and 259, most frequently when aircraft doors are closed but the parking brake is still activated. Airlines are therefore asked to keep track of multiple data points.

This would be a trivial matter but for the fact that DOT has imposed fines on airlines for over-reporting information and for using Part 234 definitions in Part 259 reports. A single definition for what constitutes taxi-out times and tarmac delays would reduce misunderstandings.

We are optimistic that these points can be addressed expeditiously and thoroughly by the Office of Aviation Enforcement and Proceedings. We believe that clarification of these points will significantly improve airline decision-making and reduce unnecessary flight cancellations.

**2. Establish a Graduated Fine Structure & Taxi-In Threshold of Enforcement**

Since the rule took effect, there have been a total of 12 tarmac delays greater than three hours. Enforcement investigations are ongoing for these events, but weather conditions at the time of these delays (including lightning, which necessitates ramp closure) suggest that in most cases violations were safety-driven. As of November 17, 2010, there have not yet been fines issued for tarmac violations, although DOT has issued fines related to incorrect information disclosures.

With no fines yet issued, and no guidance from OAE about the definition of a “violation”, carriers are operating under the assumption that 3+ hour delays will be met with “strong enforcement” and maximum fines, per the Secretary’s guidance earlier this year. Under this assumption, a flight which returns to gate 2:59 after departure will have no fine, while a flight returning 3:01 after departure could be met with a multi-million dollar fine.

Ambiguity about the fine structure drives cancellations. Current guidance simply states that the OAE will “consider a number of factors in determining the civil penalty it

## SECTION FOUR

would seek in an enforcement proceeding” but provides no quantitative detail. Accordingly, the worst-case scenario is assumed.

While the worst-case assumption by airlines eliminates any voluntary on-board delays longer than three hours, it also causes pre-mature returns to gate and consequential cancellations as crews time out, maintenance checks are triggered or as future departures are cancelled to make room for deplaning. During the first five months of the tarmac rule, there were 523 fewer 3+ hour on-board delays and 5,068 more cancellations. As shown in the previous section, the cancellation trends are pronounced, nationwide, and consistent. The pace of cancellations implies a multi-billion dollar societal cost.

Next summer, weather conditions may not be as benign as they were in 2010. It is imperative therefore that heading into next summer, airlines manage their tarmac risk exposure to better balance consumer objectives. The three-hour on-board time limit will remain in effect. Reducing cancellations must happen through changed enforcement practices and rule clarifications.

First, if DOT does indeed define a “violation” on a per-flight basis, and not per-passenger, then simply stating this in a written communication to industry will dramatically reduce cancellations. \$27,500 is a meaningful fine, greater than the revenue on board most flight segments, and will be a strong deterrent to tarmac delays. Some flights, for example, bring in less than \$10,000 per flight for airlines. The implications of a maximum fine of \$27,500 versus \$3 million or more, though, are fundamental.

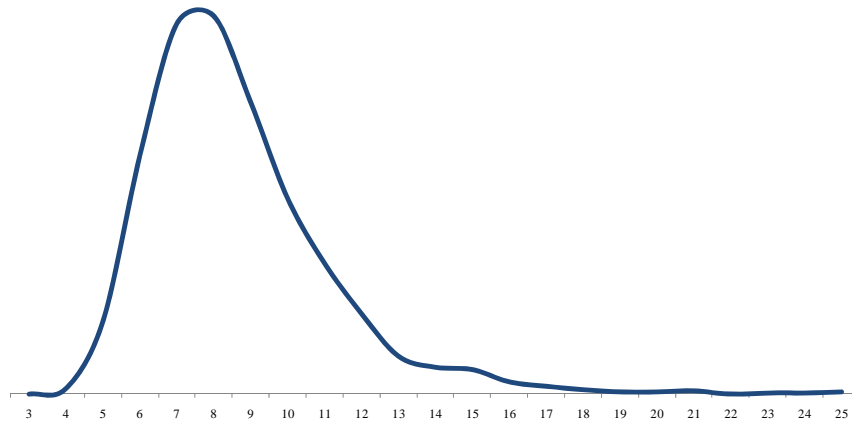
At potentially \$3 million per incident, flights return to gate long before the three-hour mark. The reason is the high variability of taxi-in times at airports nationwide during inclement weather conditions. As Table 16 shows below, during inclement weather conditions (IFR conditions with visibility less than a half-mile, considered “minimums” by air carriers) taxi-in times vary on average from about seven minutes at Washington Dulles to more than twelve minutes at JFK.

**Table 16:** Mean Taxi-In Time (min) by Weather Condition and LAX Chart  
Source: FAA ASPM

All dates 2000-2010 meeting weather criteria, rates per quarter hour  
Standard Deviation and 95% Confidence Interval based on IFR with Visibility < 0.5 mi

Airport Visibility	VFR 3+ mi	IFR > 1 mi	IFR < 1 mi	IFR < 0.5 mi	Standard Deviation	95% Conf. Interval
JFK	9.5	11.3	12.3	12.1	4.82	21.6 min
EWR	8.7	8.7	9.8	10.2	4.54	19.1 min
IAD	6.1	6.1	6.6	6.7	2.97	12.5 min
ORD	8.2	8.4	10.8	11.1	7.72	26.2 min
DFW	10.4	10.7	13.1	13.1	7.53	27.8 min
LAX	7.9	8.0	8.5	8.6	2.53	13.6 min

Taxi-In Time, Los Angeles International (2000-2010)  
Conditions: IFR Visibility < 0.5 mi, minutes



Consider the case of a 182-seat Boeing 757 departing Chicago O’Hare during inclement weather that causes a long on-board delay, but where ramp-closing factors such as lightning are not present. With an 85% load factor and average fare of \$200 per passenger, a departing B757 carries over \$30,000 in revenue if the flight segment is completed. At an 85% load factor, however, the maximum fine (per passenger) of \$27,500 translates to a total penalty of \$4.24 million. The airline will tolerate an on-board delay until the expected fine (equal to the probability of a violation multiplied by the potential fine) equals revenue on board. In this case, as shown in Table 17 below, the airline will begin a gate return starting no later than 2:25 after push-back.

**Table 17:** Premature Returns to Gate Driven by Punitive Fines

Aircraft Type	Boeing 757-200 with 182 Seats departing ORD	
Passengers on Board	154 (85% load factor)	(1)
Average Fare	\$200 net per passenger	(2)
Net Revenue on Board	\$30,800	= (1) * (2)
Per-passenger fine for 3+ hour rule	\$27,500	(3)
Flight Penalty for 3+ hour rule	\$4.235 million	(4) = (1) * (3)
Revenue to Penalty Ratio	0.7%	(5) = (1) / (4)
Confidence Interval Required for Rational Decision Maker	99.3% or 3 standard deviations (Assumes normal distribution)	= 100% - (5)
O’Hare Mean & Deviation Taxi-In Time for IFR with Visibility < 0.5 mi	Mean: 11 min Standard Deviation: 7.7 min	
99% Interval Taxi-In Time	35 minutes (equals the mean + 3 std. deviations)	
Return to Gate Cutoff, Best Case	2:25 after push-back	

The statistical variability of taxi-in times, particularly during inclement weather conditions, drives a critical conclusion: *the higher the fine structure, the earlier flights will return to gate.* With ambiguous but potentially punitive fines more than 100x revenue on board, the fine risk drives premature returns to gate. This is predictable and rational behavior by airlines seeking to balance revenue and cost.

## SECTION FOUR

The Boeing 757 example in Table 17 with 154 passengers on a typical short-haul flight will have a revenue-to-penalty ratio of 0.7%. To balance the benefits of completing a flight (and earning the revenue on board) versus paying a fine, the airline will set a return to gate time limit of no later than 2:25 after departure. If the flight departs before 2:25 after gate push-back, it will continue to its destination. But past 2:25, the flight must return, and even then 7 out of 1,000 flights could violate the rule. Given that airlines face hundreds of similar situations annually, most have set the target return to gate time even earlier.

The larger the time allowance for taxi-in, the more likely that the flight would have departed successfully. As observed in the previous section, the returns to gate drive an increase in cancellations which carry real cost for both airlines and passengers, estimated by DOT at more than \$14,000 for airlines and at least \$200 per passenger in lost time. Recent data show that one in five gate returns after long taxi-out delays cancel. The collateral cancellations, even from successful gate re-departures, are significant. These are real costs that DOT should seek to minimize through policy action.

**We therefore recommend two policy changes regarding enforcement. DOT should pursue one or both of the following actions:**

### *Graduated Fine Structure*

The all-or-nothing fine structure threatened by DOT has created absolute disincentives that have ended taxi-out delays. This has been politically expedient but has been accompanied by a significant increase in cancellations.

It is imperative that the risk-reward balance be realigned through a graduated fine structure for tarmac-related cancellations. We recommend that DOT publish a fine structure that specifically outlines fines based on the duration of a tarmac violation. For example, a fine structure of \$27,500 for on-board delay violations between three hours and four hours (essentially forfeiting revenue on board) and increasing to multi-million dollar penalties for violations longer than five hours, would address the expectations imbalance shown in Table 16 while both discouraging violations and accomplishing DOT's political and consumer protection objectives.

### *Enforcement Threshold*

We propose that DOT should institute a conditional policy whereby DOT enforcement actions against an airline will be deferred when the pilot in command of a flight states that a return to gate was initiated no later than 2.5 hours after gate departure. The wide variability of taxi-in times shown in Table 15 is a key reason why a fixed return-to-gate threshold makes sense from both operational and policy perspectives.

From an operational perspective, such a standard internalizes decision making in the airline. The variability of ramp congestion, weather conditions and air traffic control priorities during long on-board events, combined with the penalty incentives discussed

above, force airlines to initiate gate returns well in advance. A fixed point of 2.5 hours after gate departure would provide a transparent standard against which airlines can manage. This will reduce unnecessary gate returns and therefore reduce cancellations.

In addition, standardizing this portion of decision-making also lowers the burden on air traffic controllers during already stressful situations. Currently, as airlines consider whether to bring an aircraft back to the gate, there may be multiple calls to ATC to seek to determine where exactly a specific aircraft is in line for takeoff. Removing the need to make multiple calls to controllers may also provide a better safety environment in the control tower.

Such an arrangement also benefits DOT. Given the normal distributions of taxi times at airports nationwide, over 99% of flights should successfully return to gate within 30 minutes. A very small number, less than 10 in 1,000 flights, would arrive at the gate between 3.0 and 3.25 hours after first departure. In reality, these slightly late gate returns are already observable in the post-rule environment. DOT should not waste enforcement and airline resources investigating these minor violations when airlines demonstrate the return to gate was initiated at the statistically appropriate point well before three hours.

### **3. Establish Tarmac-Related Cancellation Reporting**

Part 234 monthly reports provide an informative base from which to identify trends and conduct systemwide analysis. However, Part 234 is not optimal for airport-level or inter-airline comparisons where a significant portion of airline operations may be conducted by non-reporting carriers. It is also difficult in Part 234 to show multiple causal factors in tarmac rule cancellations, which would reveal patterns and focus compliance strategy by airlines.

*Reporting carriers.* The absence of large, growing carriers such as Virgin America, Spirit, and Allegiant from the Part 234 data set creates an incomplete picture of flight operations at specific airports. Similarly, the absence of certain regional airlines (which comprise one in every five departures) creates an incomplete picture of cancellations and delay information at major airlines.

*Cancellation codes and historical data for tarmac-related cancellations.* When reporting flight performance through Part 234 filings, airlines must choose a single code that describes the primary causal factor for that flight. Airlines have significant differences in how they determine what constitutes a carrier-caused cancellation versus a weather-caused cancellation, and thus while year-over-year comparisons for given airlines are statistically valid, inter-airline comparisons are less so. This makes it difficult to make meaningful inter-carrier comparisons and determine best practices for managing gate resources and tarmac delay exposure.

The ability to report multiple causes (for example, the flight crew timed out while awaiting airspace clearance to depart) will also help model more optimal responses by airlines and air traffic managers.

## SECTION FOUR

We recommend that DOT request that all Part 121 scheduled airlines (regardless of size or Part 234 reporting status) submit on a voluntary basis to the Department a report of flight performance, tarmac delays and cancellations for the time period starting May 1, 2010 and ending October 31, 2010. Carriers should provide a list of flights that returned to the gate and provide explanatory detail for why each flight cancelled, with multiple codes for weather factors (thunderstorm activity, conditions below minimums, etc.), carrier factors (crew timing, gate resource availability, passenger services issues, ramp congestion, mechanical events, crew availability and legality, etc.) and airspace factors (congestion, airport delays, en-route disruptions) relevant to tarmac delays, in addition to standard reporting standard out, off, on and in times. Marketing carriers should be responsible for collecting information from contract and express flying.

The information collected should be treated as confidential and shared only among the participating carriers, government agencies and advisors. It is critical that the information be collected in a timely manner such that analysis and best practices can be implemented before the summer of 2011.

### **4. Real-Time Information Exchange between Tower Facilities and Airlines**

In our operational interviews with airlines, we consistently heard frustration about receiving real-time information from Air Traffic Control (ATC) regarding aircraft position and sequencing during lengthy on-board delays. Without clear guidance from tower controllers, who may already be overburdened during bad weather or long delay situations, both pilots and dispatch centers must make conservative decisions, resulting in potentially unnecessary gate returns.

The Air Traffic Control System Command Center (ATCSCC) in Herndon, VA is responsible for coordinating air traffic demand among airports and airlines. Traffic flow management, including steps to minimize delays and expedite resolution of bottlenecks at airports, are coordinated from the Command Center. Airlines usually coordinate with the Command Center when resolution is needed on specific flights.

During severe weather and other conditions that cause lengthy on-board delays during departure and arrival, both airlines and the Command Center receive information directly from the Control Tower at the impacted airport. Airlines can request updated sequencing information from the Tower, but information does not flow quickly or easily. Tower controllers prioritize flight handling and safety over communication with airline dispatch operations.

The FAA is currently deploying tracking tools for aircraft prior to takeoff. The technology, called Airport Surface Detection Equipment, Model X (ASDE-X) uses surface surveillance technology to track aircraft movements on the ground. ASDE-X offers both the Command Center and individual airlines the opportunity to view positioning, sequencing and better estimate departure flows without requiring direct contact with control towers.

ASDE-X feeds are operational at just eight airports: Hartford (BDL), Milwaukee (MKE), Atlanta (ATL), St. Louis (STL), Orlando (MCO), Seattle (SEA), Providence (PVD) and Houston Hobby (HOU). By 2013, key airports including Chicago O'Hare and Midway, Boston Logan, Baltimore/Washington, Dallas-Fort Worth, Detroit, Houston Intercontinental, New York JFK and LaGuardia, Newark, Philadelphia, and Washington Dulles and National will be operational with ASDE-X.<sup>21</sup>

During the interim period when some but not all major airports are using ASDE-X, both DOT and FAA should ensure that real-time surface movement information is shared with airlines during weather conditions conducive to lengthy on-board delays. This can be accomplished through more proactive coordination via the Command Center, through open hotlines and through web-based tools.

The benefit of a pro-active communication strategy will lead to better decision making at the airline level of when to initiate gate returns. If on-board taxi-out delays cross the two-hour threshold and no updated information is available from the tower about the expected departure time, airlines (facing punitive fines) must be conservative and return the flight to the gate. If the tower can confirm, verbally or electronically, that the flight is likely to depart within 30 to 45 minutes, potential cancellations can be prevented. In addition, coordinating response will consolidate the point of contact for tower controllers and allow more efficient communication and time management.

### **5. Operational Review prior to Rule Expansion**

DOT has proposed the following amendments to Part 259, expanding the scope of the tarmac rule:

- Foreign carriers would be required to implement and coordinate contingency plans for lengthy on-board delays.
- U.S. carriers would be required to coordinate contingency plans with Customs and Border Patrol (CBP) to ensure passengers can deplane after lengthy tarmac delays and after diversions of international flights.
- U.S. carriers and foreign carriers would be required to coordinate on-board delay contingency plans with all U.S. airports that have more than 10,000 passenger enplanements, which would essentially make every U.S. airport subject to the rule (as opposed to medium and large airports today).

We are generally supportive of the premise that all carriers operating international service from a given airport should be subject to the same set of rules regarding passenger obligations and service standards. Doing anything less can disadvantage U.S. carriers relative to foreign competition. As a result, we support having foreign carriers

---

<sup>21</sup>For more information, see [http://www.faa.gov/air\\_traffic/technology/asde-x/](http://www.faa.gov/air_traffic/technology/asde-x/).

## SECTION FOUR

create and coordinate contingency plans, selecting their own tarmac limits, serving food and water after two hours, and providing regular updates to passengers during lengthy on-board delays. We also support coordination between airlines and CBP, since lengthy on-board delays are a chronic issue for safety-related diversions into airports with minimal CBP staffing. The obligation to coordinate should apply equally to U.S. and foreign carriers.

However, we believe that any expansion of a fixed tarmac time limit to cover international flights or small airports must be held until at least a second summer of operational data can be collected under the tarmac delay rule. Data from the first summer demonstrate a significant rise in cancellations, with several factors pointing to tarmac delay responses as a key driver. The DOT should take the opportunity this winter to adjust its enforcement strategy, clarify its requirements and language, and measure the effectiveness of such changes before expanding the rule to cover either small airports or international flights. Tarmac-related information collection as described above will be invaluable in determining the magnitude of the link between cancellations, punitive fines and on-board delays, and allow public policy objectives to be better realized.

### Summary

In April, DOT Secretary Ray LaHood's threats of "strong enforcement" and maximum fines created a position of extreme risk aversion among airlines. Since April, tarmac delays have stopped, but cancellations have soared. While statistical data establishes a link between the airline response to tarmac delays and flight cancellations, more study on the rule's necessity and effectiveness is required. It is not too early, however, to make necessary adjustments to the rule's fines and enforcement that can reduce cancellations heading into the winter weather season and next summer.

We recommend a five-part strategy for mitigating the unintended consequences from the rule.

**First**, DOT must clarify its enforcement objectives, defining what constitutes a violation of the rule, establishing specifics about mitigating factors, and resolving incompatibility and differential definitions in its regulations. Doing so will give airlines a clear legal standard to manage against.

**Second**, DOT should transparently publish a graduated fine structure with a meaningful but not punitive fine for minor violations of the rule, increasing to multi-million dollar fines for egregious violations of the tarmac rule. We recognize that the total elimination of tarmac delays has been DOT's priority, and it therefore has maintained the stance of maximum penalties. However, the consequences of such a position are now clearer, and to bring cancellations down a nuanced position is required.

Significant fines (e.g. \$27,500 per incident) will strongly discourage airlines from allowing on-board delays greater than three hours, while halting the unnecessary cancellations, gate returns and operational disruption caused by the threat of punitive fines. DOT should also commit to waiving or deferring enforcement actions in cases

## SECTION FOUR

where the airline initiates a return to gate no later than 2.5 hours after push-back. FAA data confirms that more than 99% of flights will return to the gate before three hours under such a condition, but managing against a fixed 2.5 hour decision point will maximize the number of successful departures (and therefore completed flights) in the system.

**Third**, while systemic analysis and general trends can be established through existing Part 234 data reporting, more information is needed on tarmac delay cancellations to identify trends among non-reporting national carriers and express airlines. We believe that even basic cancellation detail from airlines (allowing reporting of multiple causes, and specifically tying certain flight cancellations to tarmac rule management) will enhance the discussion between DOT and airlines about how best to accomplish DOT's policy objectives without unintended consequences.

**Fourth**, we recommend that information exchange between control towers and airlines be enhanced, particularly at airports where ASDE-X feeds are not yet activated. Understanding where departing flights are in the sequence, and estimating departure flow correctly, are critical factors in managing taxi-out tarmac delays. While the ATCSCC has existing capability today to coordinate airline and ATC resources during on-board delays, we believe a more pro-active approach to manage communication among airlines and traffic managers during lengthy on-board delays will be beneficial to airlines and passengers on flights that would otherwise be cancelled.

**Finally**, we strongly recommend that any further expansion of the tarmac delay rule, whether to small airports or international flights, be held until an additional summer's data can be assessed, and until enhanced cancellation information can be reviewed. The tarmac rule as implemented achieved a core objective (eliminating most taxi-out delays) with a steep price in cancellations and operational disruption. We believe that enforcement changes and a transparent fine structure can mitigate cancellations and provide a better baseline to measure the rule's effectiveness.



## 5. CONCLUSIONS

“Cancellations could go up, but it’s not a bad thing... the cancellations are going to prevent people from being stuck on the tarmac.” Kate Hanni, FlyersRights.org

“Rigid and inflexible application of the new tarmac delay rule would have the unintended and undesirable effect of exacerbating passenger inconvenience and disruption by forcing the cancellation of flights that could otherwise be operated” Delta, March 5, 2010

“This was a landmark rule for airline passengers. And the sharp drop in lengthy tarmac delays during the last four months combined with no significant increase in flight cancellations is a sign it’s working as we intended it to.” Secretary LaHood, Fastlane Blog, October 13, 2010

When the Department of Transportation finalized revisions to 14 CFR Part 259 to create a three-hour limit for lengthy on-board delays, its primary objective was to end the operational practice of holding aircraft off the gate, ready for departure, until weather or airspace conditions improved. Airlines had used this practice (albeit rarely) in order to free needed gate capacity for incoming flights, and to ensure that the maximum number of flight operations were successfully completed.

DOT achieved its objective. In the first five full months of the tarmac rule’s effectiveness, there were 523 fewer lengthy on-board delays compared to the same period of 2009. DOT has been vocal that the rule was a success, since tarmac delays have been virtually eliminated. However, DOT has not commented on the collateral cancellations caused by the rule.

With little change in the amount of systemwide flight operations, flight cancellations rose by 5,068 flights, an 18% increase year over year. Weather conditions were a positive anomaly during the summer of 2010, in many cases the most favorable recorded from 2000 to present. Nationwide, inclement weather conditions improved 30% year over year, and associated delays declined by 8%. We estimate that while 59,500 fewer passengers experienced lengthy on-board delays, 384,000 were impacted by cancellations.

The question of why cancellations rose is critical to understanding whether the rule or associated enforcement should be changed to reduce unintended consequences. Weather is not a sufficient factor in explaining the increase, nor is an increase in flight operations. The cause appears to be driven by internal factors at airlines. Therefore, if airline risk management and operational strategies can be adjusted to reduce cancellations while maintaining the three-hour limit, a more positive outcome will be achieved for the travelling public, for airlines, and for regulators.

DOT’s initial guidance to airlines about how it would enforce the tarmac delay rules was vague. The Department did not specify what constituted a “violation” under regulations, leading airlines to conclude that each “violation” would be calculated on a per passenger basis. The implications of \$27,500 fines per passenger were profound, particularly when the fares paid by individual passengers rarely exceeded \$300. Faced

## SECTION FIVE

with punitive fines 100x the revenue on board a plane, air carriers determined that fine avoidance would take priority over all other factors, including flight completions. Under the rule, returns to gate have increased, but so too have flight cancellations as carriers choose not to push flights that have even a 1% chance of being stranded on-tarmac for longer than three hours. Since April, DOT has not provided any further guidance about the rule, about what specific fines will be imposed, or about inconsistencies in the regulatory language that create ambiguity and confusion among carriers.

Reviewing data from May through September 2010 offers a meaningful window into the impact of the rule on flight performance and system cancellations. Starting in October 2008, airlines reported return-to-gate and diversion detail that is critical to understanding how lengthy on-board delays are managed. As a base year for comparison, 2009 offers several advantages. First, the total level of flight operations was similar to 2010, and was a significant decrease from the same periods in 2005 through 2008. Second, 2009 was relatively average in weather conditions. While certain cities such as Boston and Dallas had abnormal weather conditions for periods of time, on a systemwide basis weather conditions were decidedly average. Third, as detailed in our July 2010 report, carriers implemented internal restrictions on taxi-out delays during 2008 and 2009 that are reflected in the number of taxi-out delays in 2009. While taxi-out delays certainly occurred – and were accompanied by an equally notable number of on-board delays at diversion airports – 2009 offers a reasonable pre-rule basis to evaluate post-rule results.

The results show significant changes in how airlines managed operational risk to weather and long on-board delays. Cancellations rose by 18% to 21% across all phases of flights, including pre-departure, after both short and lengthy taxi times, and at diversion airports. Gate returns rose. Cancellation increases were most prevalent at mid-Continent hub airports such as Chicago, Detroit, Houston, Minneapolis and Atlanta. Boston and Dallas had significant cancellations, but experienced a relative decline given extended severe weather conditions during the same periods of 2009. New York delays and cancellations improved, but overall capacity in the New York market was reduced due to construction at JFK that forced a significant pull-down of flight schedules (and therefore airspace demand).

Cancellation analysis using Part 234 data reports offers insights into how carriers managed exposure to the tarmac rule. Long on-board delays declined, and cancellations increased by a multiple of prevented tarmac delays. While these trends were identifiable in May as carriers first implemented tarmac response strategies, they are now clearly identifiable.

First, airlines are using pre-departure cancellations to prevent exposure to the rule and fines when conditions are forecast that may cause lengthy on-board delays.

Second, airlines are using pre-departure cancellations to open gate capacity for aircraft returning to gate after lengthy on-board delays. This is identifiable in the significant number of carrier-related pre-cancellations, which reflect resource availability.

## SECTION FIVE

Third, airlines are returning aircraft to gate far earlier than expected during the rulemaking process. A critical reason is the ambiguous and punitive fine structure. As we outline, the wide standard deviation of taxi-in times during inclement weather, combined with fines potentially more than 100x the revenue on board a flight, lead to extremely conservative behavior by airlines in managing fine risk. Airlines must be nearly 100% certain a flight will reach the gate before three hours, because the economic penalties (as presumed by airlines in the absence of more transparent guidance) are extreme for even minor violations.

Finally, airlines are diverting more aircraft to alternate airports when inclement weather conditions impact destination airports. Diverting to alternate stations, even if those facilities are a significant distance from the planned destination, mitigate exposure to taxi-in onboard delays. Excessive diversions inconvenience passengers and extend travel times, but they do offer passengers the opportunity to deplane.

We do not call for the repeal of the tarmac rule. Properly implemented, we think the rule can have public benefits. In July 2010, however, we identified significant cancellation trends and showed the strongly negative welfare implications if such trends continued. They have. The sample set of May through September provides a useful basis for adjusting enforcement strategies to address the negative externalities caused by the rule. It is important that adjustments be made expeditiously in order to reduce consumer harm during the next tarmac exposure window of mid-winter snowstorms.

First, we call for immediate enforcement guidance from DOT in a transparent format. DOT should clarify what constitutes a violation under 49 U.S.C. 41712 and whether such violations will be enforced on a per passenger or per flight basis. DOT should clearly define what constitutes a mitigating factor and resolve inconsistencies between Part 259 and Part 234 reporting requirements.

Second, we call for the publication of a clear, graduated fine structure that provides airlines with clear penalties for violations that can be managed against. Fines should be meaningful but not punitive for minor violations; for example, \$27,500 per flight. This will discourage minor violations of the rule. The fines can escalate to punitive levels beyond five hours of on-board time. DOT must recognize that all-or-nothing fine structures inconvenience many more passengers than intended by the statute and policy objectives. This can be addressed without sacrificing the consumer intent of the three-hour rule.

We also call for a conditional policy whereby DOT agrees not to pursue enforcement actions against airlines when the pilot in command of a given flight initiates a gate return no later than 2.5 hours prior to departure. Such a standard will give airlines a clean target against which to manage, and reduce unnecessary gate returns and passenger inconvenience. Such a standard will also minimize minor enforcement actions and allow regulators to focus on more important objectives.

## SECTION FIVE

Third, we recommend that DOT work with airlines to collect more detailed information about flight cancellations related to tarmac delays. This information should not be for public disclosure. Reasons to collect this data include filling in gaps caused by non-reporting carriers, including low-fare and express airlines, as well as building a more complete picture about whether specific flight cancellations are caused by tarmac compliance or other factors.

Fourth, we recommend that DOT and FAA enhance real-time communication between the FAA Air Traffic Control System Command Center, control towers and airlines during extended on-board delays. While the FAA is currently implementing ground surveillance radar systems that will provide airlines with a more complete picture of departure sequencing, flows and expected wheels-off times, key airports are still without this important technology. The ATCSCC should take a more proactive role in coordinating information flow on tarmac-delayed flights between the relevant tower facilities and airline dispatch centers.

Finally, we recommend that any further expansion of the tarmac delay rule, whether to international flights or to small airports, be postponed until enforcement changes and other measures to mitigate cancellations can be effected, and until a second summer's operating data can be evaluated.

We understand that DOT has a strong interest in consumer protection initiatives, and that lengthy on-board delays have been a priority for vocal consumer groups and advocates. While the rule has succeeded in its nominal objective – tarmac delay rules have all but stopped – the rule's language, ambiguous enforcement standards and threatened punitive fines have had profound and negative effects for consumers nationwide.

The ratio of flight cancellations to prevented delays in the first five months is nearly 10 to 1. We believe that clear enforcement standards, a graduated and transparent fine structure and better coordination between DOT, FAA and airlines can mitigate some of the cancellation impact and have an immediate, positive impact on consumer welfare. Before rushing to expand the rule, however, DOT should work to minimize unintended consequences, collect information and make adjustments to reduce cancellations.

*Full study materials and downloadable Excel files of Exhibits are available at the project website,*

[www.tarmaclimits.com](http://www.tarmaclimits.com)

**APPENDIX ONE: 14 CFR PART 259.4  
TARMAC DELAY RESTRICTIONS**  
AS PUBLISHED DECEMBER 30, 2009; EFFECTIVE APRIL 29, 2010

Section	Language
259.4(a)	<p><b>Adoption of Plan.</b> Each covered carrier shall adopt a Contingency Plan for Lengthy Tarmac Delays for its scheduled and public charter flights at each large and medium hub U.S. airport at which it operates such air service and shall adhere to its plan's terms.</p>
259.4(b)	<p><b>Contents of Plan.</b> Each Contingency Plan for Lengthy Tarmac Delays shall include, at a minimum, the following:</p> <ol style="list-style-type: none"> <li>1) For domestic flights, assurance that the air carrier will not permit an aircraft to remain on the tarmac for more than three hours unless:               <ol style="list-style-type: none"> <li>a. The pilot-in-command determines there is a safety-related or security-related reason (e.g. weather, a directive from an appropriate government agency) why the aircraft cannot leave its position on the tarmac to deplane passengers; or</li> <li>b. Air traffic control advises the pilot-in-command that returning to the gate or another disembarkation point elsewhere in order to deplane passengers would significantly disrupt airport operations.</li> </ol> </li> <li>2) For international flights that depart from or arrive at a U.S. airport, assurance that the air carrier will not permit an aircraft to remain on the tarmac at a large or medium hub U.S. airport for more than a set number of hours, as determined by the carrier and set out in its contingency plan, before allowing passengers to deplane, unless:               <ol style="list-style-type: none"> <li>c. The pilot-in-command determines there is a safety-related or security-related reason why the aircraft cannot leave its position on the tarmac to deplane passengers; or</li> <li>d. Air traffic control advises the pilot-in-command that returning to the gate or another disembarkation point elsewhere in order to deplane passengers would significantly disrupt airport operations.</li> </ol> </li> <li>3) For all flights, assurance that the air carrier will provide adequate food and potable water no later than two hours after the aircraft leaves the gate (in the case of departure) or touches down (in the case of an arrival) if the aircraft remains on the tarmac, unless the pilot-in-command determines that safety or security considerations preclude such service;</li> <li>4) For all flights, assurance of operable lavatory facilities, as well as adequate medical attention if needed, while the aircraft remains on the tarmac;</li> <li>5) Assurance of sufficient resources to implement the plan; and</li> <li>6) Assurance that the plan has been coordinated with airport authorities at all medium and large hub airports that the carrier serves, including medium and large hub diversion airports.</li> </ol>

## APPENDIX

259.4(c)	<b>Amendment of plan.</b> At any time, an air carrier may amend its Contingency Plan for Lengthy Tarmac Delays to decrease the time for aircraft to remain on the tarmac for domestic flights covered in paragraph (b)(1) of this section, for aircraft to remain on the tarmac for international flights covered in paragraph (b)(2) of this section, and for the trigger point for food and water covered in paragraph (b)(3) of this section. An air carrier may also amend its plan to increase these intervals (up to the limits in this rule), in which case the amended plan shall apply only to those flights that are first offered for sale after the plan's amendment.
259.4(d)	<b>Retention of records.</b> Each air carrier that is required to adopt a Contingency Plan for Lengthy Tarmac Delays shall retain for two years the following information about any tarmac delay that lasts at least three hours: <ol style="list-style-type: none"><li>1) The length of the delay;</li><li>2) The precise cause of the delay;</li><li>3) The actions taken to minimize hardships for passengers, including the provision of food and water, the maintenance and servicing of lavatories, and medical assistance;</li><li>4) Whether the flight ultimately took off (in the case of a departure delay or diversion) or returned to the gate; and</li><li>5) An explanation for any tarmac delay that exceeded 3 hours (i.e., why the aircraft did not return to the gate by the 3-hour mark).</li></ol>
259.4(e)	<b>Unfair and Deceptive Practice.</b> An air carrier's failure to comply with the assurances required by this rule and as contained in its Contingency Plan for Lengthy Tarmac Delays will be considered an unfair and deceptive practice within the meaning of 49 U.S.C. 41712 that is subject to enforcement action by the Department.

**SUMMARY OF EXHIBITS DISTRIBUTED WITH THIS REPORT**

Supporting exhibits are available for download from [www.tarmaclimits.com](http://www.tarmaclimits.com).

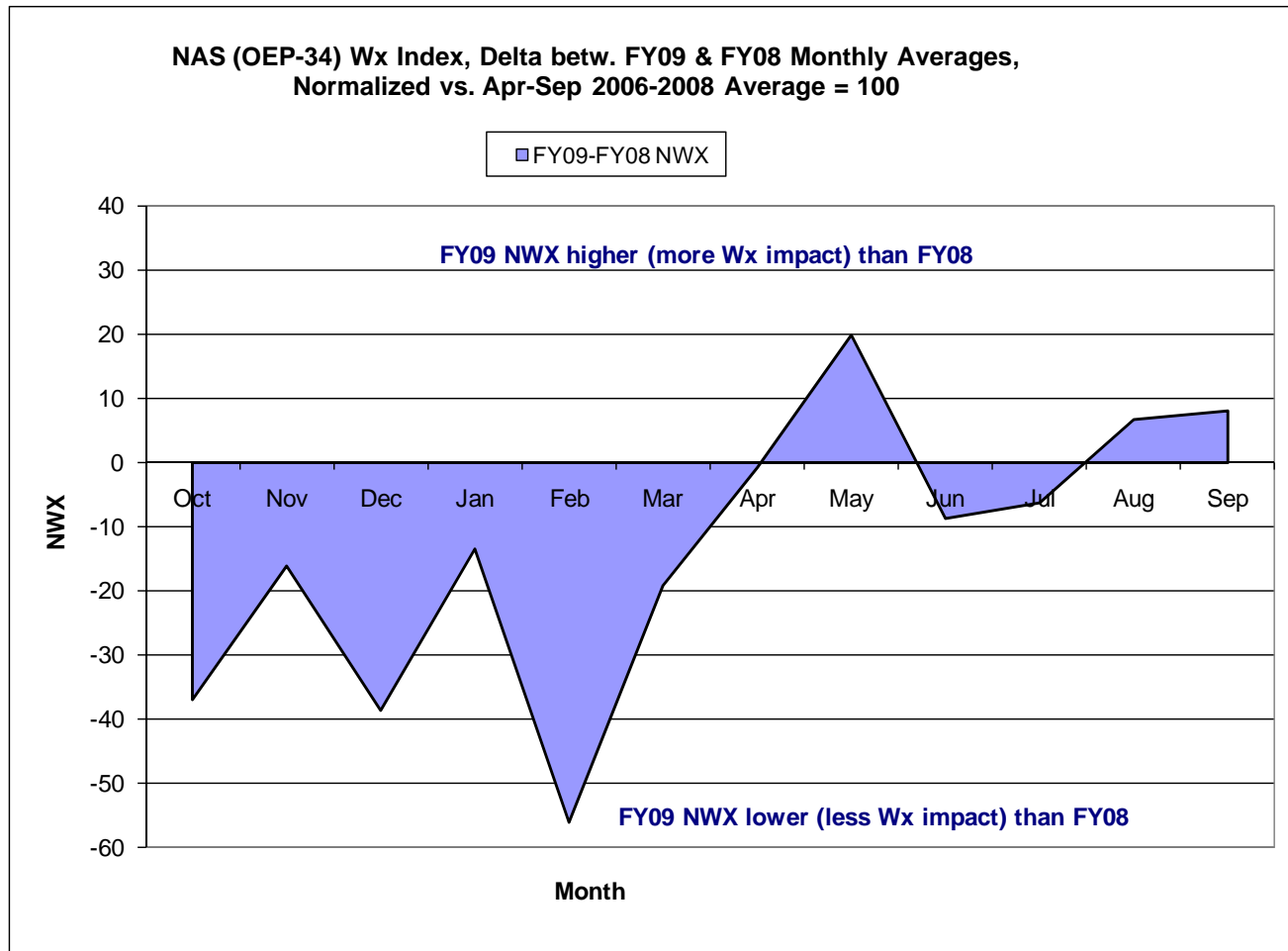
<b>EXHIBIT 1</b>	On-Time Performance, Delay Categories and Cancellations Summary
<b>EXHIBIT 2</b>	Flight cancellation trends, all US airports
<b>EXHIBIT 3</b>	Flight cancellation trends, key US hubs
<b>EXHIBIT 4</b>	Departures, taxi delays and cancellations
<b>EXHIBIT 5</b>	Weather conditions & weather cancellations, nationwide
<b>EXHIBIT 6</b>	Cancellations by cause, reporting U.S. carriers
<b>EXHIBIT 7</b>	Assessing cancellations within predicted ranges
<b>EXHIBIT 8</b>	Comparing cancellation components by major airport
<b>EXHIBIT 9</b>	When tarmac delays occur (by month)
<b>EXHIBIT 10</b>	Tarmac delays, occurrences by month
<b>EXHIBIT 11</b>	Tarmac delays, gate returns & rates of gate return
<b>EXHIBIT 12</b>	Cancellations after gate returns
<b>EXHIBIT 13</b>	Change in flight cancellations by airport
<b>EXHIBIT 14</b>	Change in causal factors related to cancellations, by airport
<b>EXHIBIT 15</b>	Standard taxi-in times for airports
<b>EXHIBIT 16</b>	Flight operations, on-time departures and cancellations
<b>EXHIBIT 17</b>	General weather conditions, Systemwide
<b>EXHIBIT 18</b>	General weather conditions, Northeast US
<b>EXHIBIT 19</b>	General weather conditions, Southern US
<b>EXHIBIT 20</b>	General weather conditions, Midwest US
<b>EXHIBIT 21</b>	General weather conditions, Western US
<b>EXHIBIT 22</b>	IMC Prevalence by Airport, 24 Hour Day
<b>EXHIBIT 23</b>	IMC Prevalence by Airport, 7am to 8pm only
<b>EXHIBIT 24</b>	IMC Conditions at Tarmac-Prone Airports

## APPENDIX

- EXHIBIT 25** Taxi-in and Taxi-out tarmac delays of 60+, 120+ and 180+ minutes, 15 year trend (May through September time series)
- EXHIBIT 26** Calculating Passengers on Incremental Passenger Flights
- 26A: Average seats per cancelled flight
- 26B: Reported load factors, U.S. domestic mainline & regional
- 26C: Average passengers per cancelled flight
- 26D: Cancellations by airline and month
- 26E: Passengers on cancelled flights, total 2010 and 2009
- EXHIBIT 27** Ratio of operations, Part 234 reporting carriers and non-reporting carriers
- EXHIBIT 28** Estimating Passengers on 3+ Hour On-Board Delays, 2010/2009
- 28A: 3+ Hour On-Board Delays, by Airline and Month
- 28B: Estimated Passengers on 3+ Hour On-Board Delays
- EXHIBIT 29** Causes of Cancellations vs. Phase of Flight
- 29A: Total cancellations matrix, 2009
- 29B: Total cancellations matrix, 2010
- 29C: Change 2010 vs. 2009 (flights)
- 29D: Change 2010 vs. 2009 (%)
- EXHIBIT 30** Plot of Cumulative Changes in Cancellations By Causal Factor, 2010 vs. 2009
- EXHIBIT 31** Plot of Cumulative Changes in Cancellations By Phase of Flight, 2010 vs. 2009
- EXHIBIT 32** Plot of Cumulative Changes in Cancellations Airspace factors only (by phase), 2010 vs. 2009
- EXHIBIT 33** Plot of Cumulative Changes in Cancellations Weather factors only (by phase), 2010 vs. 2009
- EXHIBIT 34** Plot of Cumulative Changes in Cancellations Carrier factors only (by phase), 2010 vs. 2009
- EXHIBIT 35** Change in reported IMC conditions by Airport
- EXHIBIT 36** Change in flight cancellations by Airport

APPENDIX

**Exhibit A: Normalized Weather Comparison, 2009 versus 2008**  
**Monthly Weather Impact versus prior year, normalized for 2006-2008**  
Source: Federal Aviation Administration ATO



APPENDIX

**Exhibit B: Normalized Weather Comparison, 2010 versus 2009**  
**Monthly Weather Impact versus prior year, normalized for 2006-2008**  
**Source: Federal Aviation Administration ATO**

