

*Late News:*

*Punctuality and  
Congestion in the  
Twilight of THISGEN*

*Arnold Barnett and Paul Wehner*

*MIT*



*In these troubled times, the **Dow Jones Industrial Average** is by far the “leading indicator” that shapes public perceptions about stock-market movements.*

**“Stocks Pull Back on Bank Worries; Dow Sinks Below 8,000”**

*Los Angeles Times 4/8/09*

*Do you know how it is  
calculated?*

*Likewise, the **Department of Transportation's on-time statistic** is the leading indicator of US airline punctuality.*

*Do you know how it is calculated?*

*The **DOT On-Time Statistic** is the **percentage** of relevant flights that reach their arrival gates **less than 15 minutes** after their scheduled arrival times.*

*Might there be **alternatives** to the DOT statistic that, **whether singly or in combination**, can give us a clearer idea about **systemwide delays and schedule reliability**?*

*Let's explore some alternate possibilities now, starting with perhaps the most obvious:*

*Average Arrival Delay*

# *Two problems in computing average delay:*

- *What do we do about flights that reach the gate **early**?*
- *What do we do about **cancelled** (and diverted) flights?*

## *Some Solutions:*

- *Treat an early arrival as **better** than an on-time arrival.*
- *Delete cancelled flights from the calculation, in a manner that offers “**rewards**” for fewer cancelled flights.*



# *Example:*

*Period 1: 96%*

*4%*

*Period 2: 96%*

*2%*

*2%*

*Red: Cancelled*

*Blue: Deleted*

*Yellow: Counted in Calculation*

*(Yeah: Not Drawn to Scale)*

*Some Other Promptness Statistics:*

- *90% ile of (Cancellation-Adjusted) Distribution for Arrival Lateness*
- *95% ile of Distribution*

## *And Yet Some Others:*

- *The **worse-outcome probability** for two periods being compared*
- *A Nonlinear Delay-Cost Function*

*We will use monthly DOT data to compute **all** these statistics.*

*We will proceed to compare **nearly all scheduled US flights** in the summer of **2007** with those for the summer of **2006**.*

*DOT on-Time Statistic:*

*74.13 % for Summer 2006*

*69.85% for Summer 2007*

# *The Other Statistics:*

<u><i>Metric</i></u>	<u><i>Summer 2006</i></u>	<u><i>Summer 2007</i></u>
<i>Average</i>	<b>8.89</b> (min)	<b>14.26</b> (min)
<i>90% ile</i>	<b>44</b> (min)	<b>57</b>
<i>95% ile</i>	<b>74</b> (min)	<b>95</b>
<i>Nonlinear</i>	<b>31.32</b> (min)	<b>45.40</b>
<i>Worse</i>	<b>47.03</b> %	<b>52.97</b> %

*A **problem** with these comparisons is that “On Time” assessments are based on **scheduled arrival times** provided by the airlines, which are already **adjusted** to some extent to reflect expected delays and congestion.*

***No consistent “thermometer” is used.***

*To achieve **greater comparability** between 2006 and 2007, **wouldn't it be nice** if we could see what would have happened in 2007 if the **block times** from 2006 had stayed in place?*

*Sure it would, but could we possibly do that?*



*Well, the answer is “yes, we can!”*

- *For every flight on every date in summer 2007 that had a counterpart in 2006, we can find and use the 2006 block time in assessing lateness in 2007.*
- *Indeed, we can match the 2007 flight with its counterpart a year earlier. For example, we could compare UA 828 ORD-BOS on Wed 7/17/07 with UA 828 ORD-BOS on Wed 7/16/06.*

*DOT on-Time Statistic:*

**74.90 %** *for Summer 2006*

**68.39 %** *for Summer 2007*

***using 2006 block times***

# *The Other Statistics:*

<u><i>Metric</i></u>	<u><i>Summer 2006</i></u>	<u><i>Summer 2007(Adjusted)</i></u>
<i>Average</i>	<b>7.87 (min)</b>	<b>15.69 (min)</b>
<i>90% ile</i>	<b>41 (min)</b>	<b>59</b>
<i>95% ile</i>	<b>71 (min)</b>	<b>100</b>
<i>Nonlinear</i>	<b>29.15 (min)</b>	<b>47.70</b>
<i>Worse</i>	<b>44.26 %</b>	<b>55.74 %</b>

*But might differences in punctuality between 2006 and 2007 largely be reflections of differences in weather conditions between the two summers?*

*Not an easy question. But, **as a first approximation**, we can classify flights by whether **VFR or IFR** conditions prevailed when they reached their **destination airports**.*

# *DOT On-Time Scores for Matched Flights, Summers 2006 and 2007, with 2006 Block Times*

## *VFR/VFR:*

*Summer 2006*                      **76.14 %**

*Summer 2007*                      **68.66 %**

## *IFR/IFR:*

*Summer 2006*                      **66.26 %**

*Summer 2007*                      **66.79 %**

# *Average Arrival Delays for Matched Flights, Summers 2006 and 2007, with 2006 Block Times*

## *VFR/VFR:*

<i>Summer 2006</i>	<i>6.48 (min)</i>
<i>Summer 2007</i>	<i>15.43 (min)</i>

## *IFR/IFR:*

<i>Summer 2006</i>	<i>17.54 (min)</i>
<i>Summer 2007</i>	<i>16.47 (min)</i>

## *Two final points:*

*(1) All these calculations are based on data that are readily available to the public from DOT and FAA. In this electronic age, it is easy to go well beyond comparing on-time percentages.*



*(2) If we are to **expand** the calculation of **performance metrics** about punctuality and congestion, it would be highly desirable to do so **before NEXTGEN** is in place.*