AIR TRAVEL CONSUMER PROTECTION: A METRIC FOR PASSENGER ON-TIME PERFORMANCE

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Abstract:

The *raison d'etre* for the air transportation system is the movement of passengers and cargo. Consumer information and regulatory consumer protection for airline services provide measures of the performance using percentage of on-time flights and the percentage of cancelled flights. Researchers have shown that these "flight-based" metrics are a poor proxy for measuring passenger trip time performance that includes passenger trip delays accrued by cancelled flights and missed connections.

This paper describes a Passenger On-Time Performance metric and an analysis of the performance of the U.S. air transportation system in 2005 using a "passenger-based" metric. This metric represents the percentage of passengers that arrive within 45 minutes of the schedule arrival time and includes delays accrued by passengers due to cancelled flights as well as delayed flights. The analysis shows that in 2005, on the routes between major U.S. airports passengers arrived on-time 90% of the time. This performance was not uniform across airports or routes. The percentage of passenger on-time arrivals at destination airports ranged from 82% (EWR) to 94% (SLC), and from 66% (EWR toPHL) to 98% (SLC to TPA) by routes between major U.S. airports. The implications of these results on passenger choices and on consumer protection are discussed.

1 INTRODUCTION

Passenger trip time is an important property of the air transportation system. Passenger trip time informs passenger choices of flights, airlines, and airports and has been positively correlated with customer satisfaction and brand loyalty that drives airline profits [1, 2]. Conversely, poor service reliability on specific routes has been shown to lead to reduced airfares on these routes [3]

Passenger itineraries, protected under civil liberties laws and considered proprietary information to airline marketing departments, are not publicly reported and therefore prevent the measurement and reporting of actual passenger trip times. Instead, airlines and U.S. consumer protection regulators publish flight-time statistics. For example, the most complete consumer information is made available by the Department of Transportation's Office of Aviation Enforcement and Proceedings (OAEP) in a monthly report -. *Air Travel Consumer Report*. This report, "designed to assist consumers with information on the quality of services provided by the airlines," includes the percentage on-time performance (OTP) of arrivals of flights within 15 minutes of the schedule arrival time. This metric is known as the 15-OTP. The report also provides the percentage of cancelled flights.

Researchers have shown that these "flight-based" metrics are a poor proxy for the passenger trip experience that includes delays accrued by passengers following re-booking due to cancelled flights or missed connections [4]. For example, Wang [5] estimates that 40% of the total trip delays accrued by passengers on single segment flights are the result of delays due to cancelled flights. The remaining 60% of total trip delays are attributed to flight delays.

This paper describes the Passenger On-Time Performance (45-POTP) metric and demonstrates the use of the metric in an analysis of the performance of air transportation of passengers between major U.S. airports during 2005.

Section 2 provides an overview of air travel consumer protection and the related research on passenger trip time. Section 3 describes the Passenger On-Time Performance metric. Section 4 describes the results of an analysis of the 45-POTP for single segment routes between OEP-35 airports in 2005. Section 5 provides conclusions and future work.

2 AIR TRAVEL CONSUMER PROTECTION

Consumer protection for airline passengers is provided by both government and private "watch dog" organizations. The Department of Transportation (DOT) Office of Aviation Enforcement and Proceedings (OAEP) Aviation Consumer Protection Division (ACPD) publishes a monthly *Air Travel Consumer Report* (ATCR) [7]. This report is "designed to assist consumers with information on the quality of services provided by the airlines. The University of Nebraska – Omaha, and Wichita State University publish a monthly Airline Quality Rating (AQR) Report [8]. Both reports use publicly available data from the Bureau of Transportation Statistics (BTS) and other government agencies such as the Transportation Safety Administration (TSA). Other reports are based on survey data such as the J.D. Power Airport Satisfaction Report [12] that is based on survey of travelers.

Overview of the Air Travel Consumer Report

The DOT Air Travel Consumer Report includes six types of information. Flight Delays (1), Mishandled Baggage (2), and Oversales (3) are derived from the Bureaus of Transportation Statistics (BTS) data. Consumer Complaints (4) and incidents involving the loss or injury of animals during air transportation (5) are generated by the DOT Aviation Consumer Protection Division based on complaints submitted by customers. Customer Service Reports (6) are based on information submitted to the Transportation Security Administration related to airline and airport security.

Flight Delays and Cancellations

The information in the report on airline on-time performance, flight delays, and cancellations, is generated from data provided to the DOT by airlines that carry at least 1% of annual passenger enplanements on scheduled domestic service according government regulations 14 CFR Part 234. In 2006, 18 U.S. carriers met this requirement. This information is published and available to the public by the Bureau of Transportation Statistics (BTS).

In the BTS data-base [6], a flight is considered "on-time" if it is operated less than 15 minutes after the scheduled gate arrival/departure time shown on the airlines Computerized Reservation System (CRS). The actual departure and arrival time is recorded automatically by 13 airlines using ACARS. Four airlines record the times manually. Three airlines use a combination of ACARS and manual methods.

The organization of the "flight delay" information is provided in tables in the ATCR is summarized in Table 1.

TABLE 1: Overview of the contents and organization of the DOT Air Travel Consumer Report

ATCR Table	By Airlines	By Airports	By Time of day	By Flight Number
1	% On-Time			
2	% On-Time	% On-Time		
3		% On-Time	% On-Time	
4		% On-Time	% On-Time	
5				Flight Numbers > 80% Late
6	% Late More than 70% of Time			
7		% On-Time		
8	%			

Table 1 in the ATCR lists the On-Time Performance (15-OTP) for each airline. For example in July 2006, Hawaiian Airlines reported the best performance with on-time arrivals at the 33 major U.S. airports of 85%. The worst performance at these airports was recorded by Air Tran with 59.6%. The industry average was 70.7% for the 33 major U.S. airports and 70.9% for all airports reported. Table 2 in the ATCR lists the same information broken down by arriving airport. For example, in July 2006, JFK experienced the worst on-time arrival performance of 57%. Salt Lake City (SLC) experienced the best performance of 83.5%.

Table 3 and 4 in the ATCR lists the On-Time performance for all airlines servicing the airport for 1 hour increments throughout the day. For example, arriving aircraft at ATL in July 2006 experienced an on-time performance of 27.7% from 8pm to 9pm. The cumulative totals for each hour of the day are reported. The best performance in July 2006 occurred between 7am and 8am (85%). The worst performance occurred during the 10pm to 11pm period (51.5%).

Table 5 in the ATCR, known as the "Hall of Shame," lists the flights by flight number and airline that arrive more than 15 minutes late more than 80% of the time. Information includes scheduled departure time, origin/destination, and mean and median minutes late. Table 6 in the ATCR list the percentage of flights for each airline that arrive more than 15 minutes late more than 70% of the time.

Table 7 in the ATCR lists the on-time percentage of arrivals and departures for each airport serviced by schedule operations by airlines with more than 1% annual enplanements. This list includes the 33 major airports, plus other airports that the 1%-enplanment airlines report.

Table 8 in the ATCR list s the percentage of flights cancelled by each airline.

Flight-based vs. Passenger-based Metrics

Researchers have shown that flight-based metrics, like the metrics reported in the ATCR are a poor proxy for passenger experience. [9, 10, 11, 5]. Bratu & Barnhart [4] used proprietary airline data to study passenger trip times from a hub of a major U.S. airline. This study showed that that flight-based metrics are poor surrogates for passenger delays for hub-and-spoke airlines as they do not capture the effect of missed connections, and flight cancellations. For example, for a 10 day period in August 2000, Bratu & Barnhart (4, page 14) cite that 85.7% of passengers that are <u>not</u> disrupted by missed connections and cancelled flights arrive within one hour of their scheduled arrival time and experience an average delay of 16 minutes. This is roughly equivalent to the average flight delay of 15.4 minutes for this period. In contrast, the 14.3% of the passengers that are disrupted by missed connections or cancelled flights experienced an average delay of 303 minutes.

The restriction for developing improved passenger performance metrics is the absence of passenger itinerary that is protected by civil liberties laws and proprietary to airline marketing departments. This limitation has been overcome using some assumptions and the merging of data from several publicly available data-bases by Wand (2006). This algorithm is described in the next section.

3 PASSENGER ON-TIME PERFORMANCE (45-POTP) METRIC.

Wang [5] developed an algorithm to compute the Estimated Total Passenger Trip Delay (ETPTD) for each passenger on single segments flights. The algorithm includes trip delays that are a result of delays caused by rebooking passengers on later flights due to cancelled flights and/or delays incurred by flight delays.

The algorithms are designed to operate from two sources of publicly available data [6]:

1. Airline On-Time Performance (AOTP) Database – This database provides departure delays and arrival delays for non-stop domestic flights by major air

carriers. The data also includes additional information such as origin and destination airports, flight numbers, cancelled or diverted flights. Each record in the data-base represents one flight.

2. Air Carrier Statistics (known as T-100) Database [6] – This database provides domestic non-stop segment data by aircraft type and service class for passengers, freight and mail transported. It also provides available capacity, scheduled departures, departures performed and aircraft hours. Each record in the data-base represents monthly aggregated data for a specific origin/destination segment.

ETPTD is computed using two algorithms to process the data from the data-bases described above: (Algorithm 1) TPTD due to Delayed Flights, and (Algorithm 2) Estimated TPTD due to Cancelled Flights.

Algorithm 1: TPTD due to Delayed Flights

TPTD due to Delayed Flights is computed by processing the data for each flight in the AOTP database for a given route and specified period (e.g. 365 days) to compute the *delay time for the flight*. This time is them multiplied to the average number of passengers for this flight (from the T-100 data-base) to derive the *passenger delay time for the flight*.. The *total passenger delay time for delayed flights* is computed by summing the *passenger delay time for the flight* for all the flight for the specified period.

Algorithm 2: Estimated TPTD due to Cancelled Flights

Estimated TPTD due to Cancelled Flights is computed based on the assumption that a passenger displaced by a cancellation will be rebooked on a subsequent flight operated by the same carrier with the same origin/destination pair. The passenger will experience a trip time that now includes both the flight delay of the re-booked flight plus the additional time the passengers must wait for the re-booked flight. The ability to re-book passengers on subsequent flights is determined by the load-factor and aircraft size of the subsequent flights. In general, passengers from a cancelled flight will be relocated to 2 or 3 different flights due to limited empty seats on each available flight.

The process is as follows. The algorithm processes data for each flight in the AOTP database for a given route and a specified period (e.g. 365 days). For each flight that is listed as cancelled, the algorithm checks the T-100 data-base for the average aircraft size and average passengers loaded for the cancelled flight as well as the aircraft size and load factor for the next available flights operated by the same carrier on the same route segment. Passengers for the cancelled flight are then "re-booked" on these subsequent available flights up to 15 hours from the scheduled departure time of the cancelled flight. The 15 hours upper-bound is derived from Bratu & Barnhart (2005) and reflects an estimate of the upper bound of passenger trip delays due to cancelled flights. Also it should be noted that the algorithm described in this paper allows passengers to be re-booked on flights operated by subsidiary airlines (e.g. American Airline (AA) and it's subsidiary American Eagle (MQ)), but not on other airlines.

The delay time accrued by waiting for the re-booked flight is added to the delay time for the re-booked flight.

Passenger On-Time Performance (POTP-45)

For each route between airports, the EPTD for each passenger that is in excess of 45 minutes is summed. This total is divided by the total number of passengers on that route yielding the POTP-45- Route for that route. The POTP-45-Route is summed for all the routes departing from an airport and divided by the number of routes to yield the POTP-45-Departing Airport. The POTP-45-Route is also summed for all the routes between the OEP-35 airports and divided by the number of routes to yield the POTP-45-NAS.

Approximations in Algorithm

The original research on passenger trip time by Bratu & Barnhart [4] was conducted using data from a major U.S. airline that included the exact itinerary of individual passengers and the load factors of each flight. This data is proprietary to the airline and is also subject to civil liberties laws. To overcome this limitation, the algorithm used in this paper, includes a technique for estimating passenger load factors based on publicly available monthly average data for flights on specific routes. When the algorithm "re-books" passengers from cancelled flights it assumes the load factor is the average load factor for that flight for that month. As a consequence, less passengers on cancelled flights from high load factor peak-hours will be re-booked than would actually occur. Likewise, more passengers on cancelled flights for low load factor, non-peak-hour flights are "re-booked" than would actually occur. Assuming, that the ratio between non-peak-hour and peak-hour flights is not significantly larger or lower than unity, the estimate should yield results not that different than actual data. Conformation of the ration between peak-hour and non-peak-hour flights and the sensitivity to load factors is an area for further work.

4 CASE STUDY: POTP-45 FOR OEP-35 AIRPORTS

The algorithm described above was used to conduct an analysis of flights between the 35-OEP airports in 2005. The input data was derived from the Bureau of Transportation Statistics (BTS) data-bases [6]. Results for routes with less than 50 flights scheduled in 2005 were discarded. The results of the analysis are summarized in Table 2.

POTP-45 Air Transportation System

In 2005, there were 2,942, 222 flights scheduled on 1030 routes between the OEP-35 airports. Seventy-six percent (76%) of the flights arrived within 15 minutes of their scheduled arrival time and were considered on-time. The percentage of flights cancelled was 1.8%. The average number of seats per aircraft was 134 seats. The average load factor for all flights was 78%. The results are as follows:

- on average 90% of the passengers arrived within 45 minutes of their scheduled arrival time
- for the 10% of the passengers delayed in excess of 45 minutes, 60% of the passengers experienced a trip delay due to delayed flights only, while 40% of passengers experienced a trip delay due to cancelled flights and delayed flights.

POTP-45 Destination Airports

The POTP-45 for the air transportation system can be broken down into the performance of the flights at the destination airport (Figure 1). The average POTP-45 for passengers arriving at an airport varied between a low of 82% at Newark (EWR) to a high of 94% at Salt Lake City (SLC). The average POTP-45 between airports was 90%.

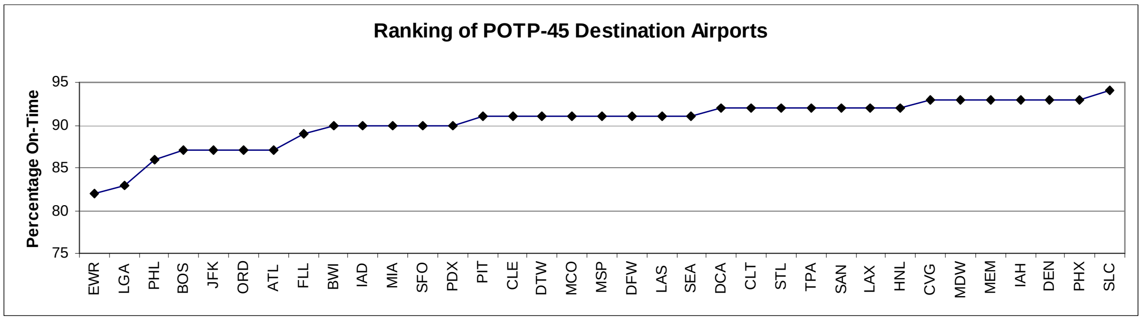
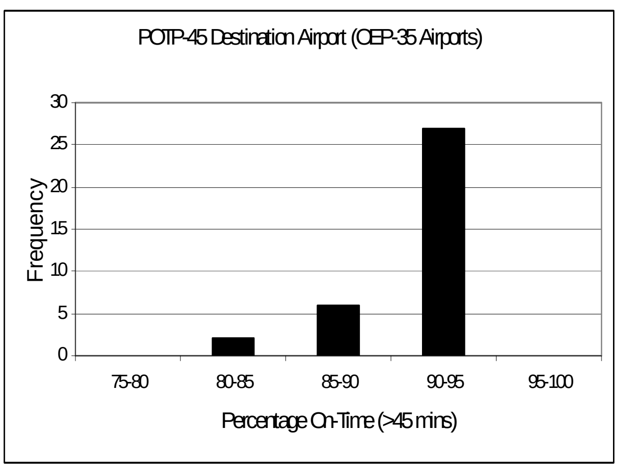


Figure 1: Destination airports ranked by POTP-45.

There exists a high degree of asymmetry in POTP-45. The first 14, of the 35 airports, generated 50% of the POTP-45 delays. The first 7, of the OEP-35 airports, generated 30% of the POTP-45 delays. These airports were EWR, LGA, PHL, BOS, JFK, ORD, and ATL



POTP-45 for Destination Airports
Figure 2

The Passenger On-Time Percentages for the 35 OEP airports are summarized in the histogram in Figure 2. The majority of major U.S. airports operate with POTP-45 in excess of 90%. Two airports (LGA and EWR) exhibit POTP-45 of 83% and 82% respectively. Six airports exhibited POTP-45 greater than 85% but less than 90%: BOS, JFK, PHL, ORD, ATL, FLL. Improving the performance of the POTP-45 at these

Table 2: POTP-45 for routes between OEP-35 airports.

PASSENGER ON-TIME PERFORMANCE (POTP-45)

O/D	BOS	LGA	JFK	EWR	PHL	BWI	DCA	IAD	PIT	CLE	DTW	CLT	CVG	MDW	ORD	ATL	STL	MCO	MSP	MEM	TPA	FLL	MIA	DFW	IAH	DEN	SLC	PHX	LAS	SEA	SAN	LAX	SFO	PDX	HNL
BOS		90%	83%	76%	82%	87%	91%	87%	93%	92%	87%	91%	91%	92%	86%	86%	90%	91%	91%		90%	89%	85%	90%	90%	90%	94%	93%	92%	86%	94%	91%	91%		
LGA	90%				94%		91%	85%	92%	86%	85%	91%	90%	88%	84%	80%	91%	89%	86%	93%	88%	86%	86%	87%	90%	93%									
JFK	81%				77%	86%	83%	86%	83%	77%	80%	70%	84%		66%	85%	83%	88%	83%		87%	83%	81%	79%	91%	90%	86%	90%	89%	85%	89%	89%	90%	82%	
EWR	82%				66%	78%	86%	80%	77%	88%	82%	85%	84%	89%	83%	79%	84%	88%	85%	90%	90%	86%	91%	88%	91%	92%	89%	93%	90%	90%	91%	89%	89%	88%	88%
PHL	82%	76%	79%	69%		83%	84%		86%	87%	84%	87%	88%	90%	83%	80%	76%	85%	86%	92%	85%	83%	85%	88%	87%	89%	91%	92%	85%	84%	85%	83%	85%		
BWI	85%		85%	78%	89%				89%	93%	91%	92%	93%	91%	91%	84%	96%	91%	92%	90%	92%	89%	90%	92%	96%	96%	94%	93%	94%		93%	93%	96%		
DCA	89%	88%	87%	78%	88%				89%	93%	92%	95%	95%	96%	88%	85%	95%	93%	93%	94%	94%	91%	91%	92%	94%	94%	95%	96%	97%	92%		96%			
IAD	85%	87%	85%	76%					92%	91%	91%	91%	91%	87%	88%	83%		90%	92%		90%	89%	90%	91%	91%	91%	96%	93%	92%	90%	93%	93%	92%	88%	
PIT	90%	89%	88%	72%	89%	87%	93%	93%			93%	94%	90%	95%	88%	84%		94%	91%		96%	91%	95%	92%	93%	93%		95%	93%	90%	88%	93%	93%		
CLE	85%	79%	81%	84%	82%	94%	92%	91%			91%	95%	93%	93%	84%	86%	95%	95%	91%	97%	97%	94%	93%	89%	96%	94%		96%	93%	93%		95%	92%		
DTW	81%	80%	84%	75%	81%	87%	89%	89%	92%	90%		92%	88%	91%	88%	80%	90%	88%	90%	92%	89%	83%	90%	90%	93%	88%	92%	91%	88%	88%	83%	86%	83%	87%	
CLT	89%	87%	80%	77%	86%	90%	93%	91%	93%	94%	92%		91%		88%	84%	95%	92%	92%	95%	93%	89%	93%	93%	93%	94%		93%	91%	93%	95%	91%	92%		
CVG	90%	88%	86%	77%	89%	92%	95%	91%	93%	92%	92%	92%		93%	86%	87%	93%	95%	92%	91%	93%	92%	92%	92%	91%	92%	95%	94%	94%	94%	95%	95%	96%	94%	95%
MDW	87%	81%		80%	88%	93%	96%	83%	95%	91%	93%		91%			80%	92%	95%	92%		92%	92%		93%		94%	93%	95%	94%	94%	94%	93%	92%	92%	
ORD	81%	77%	86%	73%	82%	89%	87%	87%	88%	84%	88%	89%	87%			81%	88%	88%	87%	91%	88%	86%	85%	87%	90%	88%	88%	88%	85%	87%	87%	88%	87%	87%	92%
ATL	84%	81%	87%	77%	81%	85%	90%	85%	86%	85%	86%	85%	91%	84%	83%		87%	89%	88%	87%	88%	86%	88%	88%	87%	89%	91%	92%	89%	90%	90%	90%	89%	88%	90%
STL	85%	84%	90%	77%	74%	92%	95%			93%	91%	97%	92%	94%	88%	83%		95%	94%	97%	98%	94%	91%	94%	94%	94%	96%	94%	92%	96%	97%	95%	94%		
MCO	90%	85%	88%	81%	86%	93%	93%	93%	93%	95%	91%	93%	95%	94%	90%	87%	96%		93%	95%		90%	89%	92%	96%	94%	96%	92%	91%	87%		93%	92%		
MSP	82%	79%	86%	78%	80%	90%	89%	87%	91%	91%	92%	90%	89%	93%	87%	88%	91%	89%		93%	90%	89%	93%	91%	94%	90%	91%	91%	91%	90%	90%	90%	85%	87%	84%
MEM		83%		82%	86%	94%	92%			96%	93%	97%	91%		88%	84%	95%	92%	95%		93%	89%	91%	93%	92%	92%		94%	93%	95%		92%	88%		
TPA	91%	84%	90%	81%	89%	93%	96%	93%	95%	95%	94%	94%	94%	94%	90%	87%	93%		92%	94%		89%	92%	92%	95%	94%	97%	94%	97%			94%			
FLL	88%	80%	83%	79%	85%	89%	92%	90%	90%	94%	88%	92%	94%	90%	87%	84%	89%	91%	86%	91%	88%			88%	92%	92%	93%	90%	83%			88%			
MIA	78%	82%	79%	82%	85%	87%	91%	88%	94%	92%	93%	93%	89%		84%	83%	91%	89%	90%	93%	90%			90%	93%	89%		96%	90%	90%		88%	87%		
DFW	86%	82%	84%	79%	86%	91%	92%	89%	91%	90%	93%	93%	93%	94%	87%	85%	90%	91%	92%	94%	92%	88%	89%		92%	92%	94%	92%	91%	90%	91%	90%	87%	91%	93%
IAH	89%	81%	95%	89%	86%	95%	94%	93%	94%	95%	94%	94%	92%		86%	82%	94%	95%	93%	94%	95%	91%	92%	93%		94%	94%	94%	93%	93%	95%	93%	89%	92%	96%
DEN	88%	89%	88%	87%	87%	90%	94%	90%	94%	93%	93%	93%	94%	93%	88%	90%	91%	91%	91%	94%	90%	94%	92%	92%	93%		94%	92%	91%	91%	92%	92%	89%	91%	90%
SLC	93%		95%	93%	93%	97%	96%	97%			95%		98%	95%	90%	94%	91%	97%	94%		97%	95%		95%	95%	94%		95%	94%	95%	97%	95%	88%	94%	94%
PHX	93%		91%	91%	93%	94%	92%	94%	96%	96%	95%	98%	97%	94%	89%	93%	94%	94%	94%	93%	95%	93%	96%	92%	95%	93%	94%		92%	92%	93%	93%	90%	93%	95%
LAS	92%		88%	90%	91%	92%	96%	94%	94%	95%	91%	95%	96%	94%	88%	93%	94%	90%	93%	95%	92%	89%	94%	92%	96%	92%	94%	92%		88%	92%	92%	88%	91%	92%
SEA	91%		87%	91%	95%		91%	94%	94%	96%	94%	94%	97%	96%	89%	95%	98%	92%	94%	95%			92%	92%	95%	94%	96%	91%	89%		87%	90%	87%	95%	94%
SAN	95%		92%	93%	94%	96%		95%	97%		94%	96%	98%	95%	90%	94%	98%		96%					93%	96%	94%	97%	93%	91%	88%		96%	90%	92%	94%
LAX	92%		92%	91%	93%	96%	93%	94%	95%	94%	95%	96%	98%	95%	90%	93%	96%	95%	94%	97%	94%	91%	90%	94%	95%	94%	95%	93%	92%	88%	96%		89%	91%	93%
SFO	89%		91%	89%	94%	91%		92%	97%	95%	97%	97%	97%	93%	91%	93%	95%	92%	94%	93%			93%	91%	95%	93%	91%	91%	90%	89%	93%	92%		90%	91%
PDX			87%	93%				95%			94%		98%	99%	90%	95%			95%					95%	96%	95%	96%	94%	90%	96%	90%	93%	90%		94%
HNL				96%									96%		98%	98%			94%					97%	97%	97%	96%	97%	92%	96%	96%	96%	95%	95%	
						7																													
Median	88%	83%	87%	80%	86%	91%	92%	91%	93%	93%	92%	93%	93%	93%	88%	85%	92%	91%	92%	93%	92%	89%	91%	92%	93%	93%	94%	93%	91%	90%	92%	92%	90%	91%	93%
Mean	87%	83%	87%	82%	86%	90%	92%	90%	91%	91%	91%	92%	93%	93%	87%	87%	92%	91%	91%	93%	92%	89%	90%	91%	93%	93%	94%	93%	91%	91%	92%	92%	90%	90%	92%
90th %	92%	89%	92%	92%	94%	95%	96%	94%	95%	95%	95%	97%	97%	95%	90%	94%	96%	95%	94%	96%	96%	94%	94%	94%	96%	94%	96%	96%	94%	95%	96%	95%	94%	94%	95%
Std Dev	0.043566	0.040421	0.042282	0.072893	0.063685	0.043884	0.034896	0.040013	0.043354	0.043396	0.039764	0.052517	0.037915	0.03192	0.048792	0.052379	0.046519	0.028979	0.031939	0.023767	0.032978	0.033468	0.034694	0.031564	0.02643	0.022686	0.026669	0.019554	0.030047	0.033545	0.036437	0.029482	0.031161	0.033931	0.029446
Skewness	-0.25388	0.020557	-0.07221	0.317569	-1.15217	-0.91805	-0.97403	-0.74201	-1.56643	-1.66625	-1.22108	-2.65443	-0.4037	-0.87378	-2.46759	0.484934	-1.53392	-0.0606	-0.98205	-0.3746	0.091667	-0.3668	-0.89953	-1.57922	-0.67324	-0.42217	-0.99964	-0.28908	-0.68228	0.007784	-0.64471	-0.69108	0.012121	-0.78461	-1.38604

airports would reduce the overall variance in the POTP-45 for the air transportation system and increase the average system-wide performance.

POTP-45 Routes between OEP-35 Airports

The POTP-45 for the air transportation system is broken-down by routes between the OEP-35 airports in Table 2. The maximum route POTP-45 is 98% for the Saint Louis (STL) to Tampa Bay (TPA) route. The minimum route POTP—45 is 66% for the Newark (EWR) to Philadelphia (PHL) route.

The distribution of POTP-45 by routes is shown in Figure 3. The distribution is skewed towards the right with sixty-two percent of the routes with a POTP-45 of greater than 90%. As shown in Table 2, the lower percentages of POTP-45 are concentrated in the upper-left of the Table representing the routes in the north-east corridor along with major hub-airports Atlanta (ATL) and Chicago O'hare (ORD). Routes arriving Newark (EWR) exhibit the minimum POTP-45 of 82% amongst all routes. This airport also has the greatest distribution in routes of with a standard deviation of 0.07% and a range from 90th percentile (92%) to 50th percentile (82%) of 12%. Routes arriving La Guardia (LGA), New York (JFK), Philadelphia, Atlanta (ATL), and Chicago (ORD) also exhibit a wide degree of variation (see Table 2).

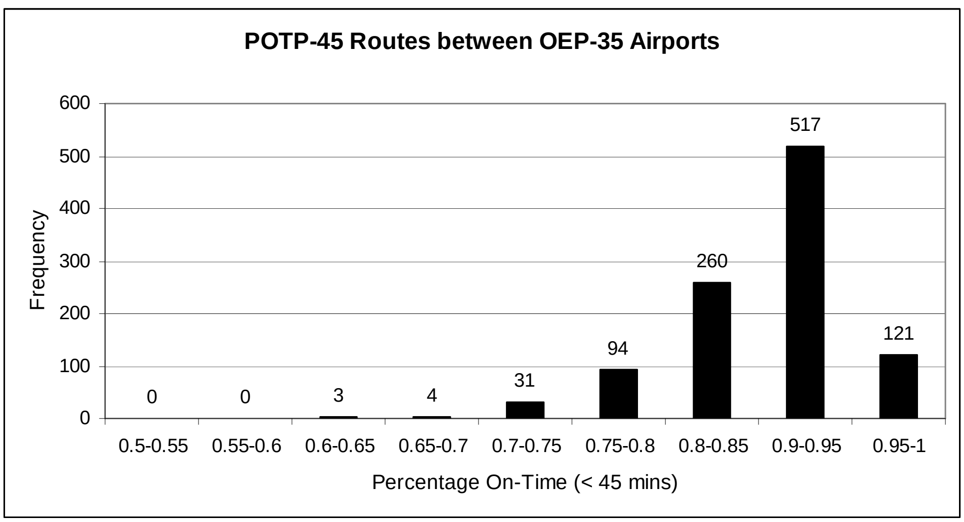


Figure 3: Distribution of POTP-45 for routes between OEP-35 airports. Sixty two percent of the routes have a POTP-45 greater than 90%. All of the routes with POTP-45 performance of less than 80% are all associated with routes in the north-east corridor and hub-airports Atlanta and Chicago O'hare.

5 CONCLUSIONS

The air transportation service, purchased by passengers, has the objective of affordable, reliable and safe movement between origin location (e.g. home) and destination location (e.g. hotel). The air transportation service is purchased based on the price, on-time performance, and safety of the transportation between alternative airports at either the origin and destination "markets" as well as between airlines. This choice is also made between trips with alternative connection points. POTP-45 has significant implications for the way passengers think about air transportation and should choose flights, and the way consumer protection of airline travelers is provided.

Using POTP-45 for Passenger Flight Reservations

When passengers purchase an airline ticket they have made a commitment to a specific flight. This flight has historically exhibited a degree of randomness in it's on-time performance. For example, an origin-destination pair that exhibits a POTP-45 of 98% provides a significantly more robust performance than a flight on an origin-destination pair with a POTP-45 of 68%. As a consequence, from the passenger perspective, this is akin to "rolling the dice" with the "odds" associated with route POTPT-45. Routes with greater probability of trip delays in excess of 45 minutes should be avoided in favor of routes with lower probability of delays reducing the odds of excessive delays. The POTP-45 provides the basis for this type of decision.

Passenger choices of flights from and to large metropolitan areas have expanded over the past decade to include choice of departure and arrival airport. For example, Boston, New York, Washington D.C., San Fransisco, Los Angeles, and South Florida are all serviced by multiple airports. The choice of airport pairs provides the passenger with an additional degree of freedom in selecting flights. POTP-45 for routes between the Washington, D.C. and Chicago are as follows: DCA to ORD 88%, DCA to MDW 96%, IAD to ORD 88%, IAD to MDW 87%, BWI to ORD 91%, BWI to MDW 91%. The highest reliability route is DCA to MDW with a 5% differential over routes departing BWI for either ORD or MDW, and 9% differential for flights on the IAD to MDW route.

Using POTP-45 for Consumer Protection for Airline Travelers

The traditional view of consumer protection – the one adopted by the Department of Transportation – is to provide a comparison of flight-based services provided by the airlines to the passengers. This approach is based on the premise that the difference in service is derived only by the performance of the airlines. This view of consumer protection fails to recognize the roles of the airports (managed by regional port authorities, and municipalities), and air traffic control (managed by the federal government) play in air transportation service that is generated by the interaction between the airline, airport, air traffic control and their supply chains.

This paper has demonstrated a metric for consumer protection for airline travel that captures the integrated performance of all the agents. This metric will enable passengers to make choices about the air transportation system, not just the airlines:

1. passenger on-time performance (not flight on-time performance) as discussed in this paper
2. comparison between routes with alternative origin/destination airport pairs

3. comparison between routes with alternative connecting airports.

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