10. OTHER ECONOMIC VALUES

10.1 DELAY PROPAGATION MULTIPLIERS

FAA has long emphasized the need for airport benefit-cost analyses to consider system-wide delay reductions associated with airport investment projects. Failure to incorporate such delay reductions frequently understates the true benefit of a proposed project. To aid airport sponsors in developing more reliable measures of system-wide delay reduction for incorporation in their airport benefit-cost analyses, FAA in collaboration with the MITRE Corporation has recently developed an approach, using Airline Service Quality Performance (ASQP) data, for deriving delay propagation multipliers for use in airport benefit-cost analyses. This multiplier is a measure of the change in system-wide delay as a result of a change in delay at a particular airport. The multipliers have been developed for all major U.S. commercial airports and are provided below for use in airport benefit-cost analyses. While delay propagation multipliers were originally developed to support the evaluation of airport infrastructure projects, these multipliers are also applicable to FAA investment and regulatory analyses that also reduce passenger delay.

An airport specific delay propagation multiplier is defined as:

$$DM(i) = \frac{D(i) + Dp(i)}{D(i)}$$

Where:

DM(i) is the Delay Multiplier for airport (i);
D(i) is the original delay at airport (i); and
Dp(i) is the propagated delay that results from original delay at airport (i).

A detailed description of the methodology used to calculate the multipliers can be found in a report titled *Calculating Delay Propagation Multiplier for Cost-Benefit Analysis,* MITRE Corporation, February 2010. This report is available on the following FAA website: Benefit-Cost Analysis

The multipliers identified in Table 10-1 are designed to be used on an airport-specific basis show the propagated delay associated with a minute of original delay at the airport. For example, a multiplier of 1.65 means that, on average, a one-minute reduction in original delay at an airport results in 0.65 minute reduction of propagated arrival delay at downstream airports.

The national composite multiplier, based on the 304 airports, is estimated to be 1.51 for three year average 2016-2018. The use of this multiplier could be used in cost benefit analyses in which the analyst needed a generalized measure of the system-wide impact of Federal action designed to reduce airport delay. It is also possible to construct other composite multipliers for a combination of airports. This approach would be useful when assessing the system-wide economic impact of an airport investment which would affect more than one airport within a region or metropolitan area. In theory, the calculation of composite multipliers should not be

based on a simple average of the individual airport multipliers, but instead should be adjusted to avoid the double counting of delay minutes. However, research indicates that there is little, if any, bias introduced by using a simple average when constructing these composite multipliers. Other custom multipliers, such as time of day, can also be derived from the data base used to construct these individual airport multipliers. To facilitate more robust airport benefit-cost analyses as well as more generalized aviation investment studies, specialized multipliers base on this methodology, can be obtained from FAA's Office of Policy and Plans.

Table 10-1: Delay Propagation Multipliers (Three Year Average 2016-2018)

Airport	Delay Propagation Multipliers
ABE	1.40
ABI	1.41
ABQ	1.58
ABR	1.31
ABY	1.44
ACK	1.93
ACT	1.39
ACV	1.68
ACY	1.89
ADK	1.19
ADQ	1.35
AEX	1.48
AGS	1.51
AKN	1.18
ALB	1.54
AMA	1.61
ANC	1.32
APN	1.89
ASE	1.54
ATL	1.52
ATW	1.37
AUS	1.53
AVL	1.56
AVP	1.35
AZO	1.52
BDL	1.53
BET	1.28
BFL	1.44
BGM	1.49
BGR	1.50
BHM	1.53
BIL	1.36
BIS	1.35
BJI	1.44
BLI	1.56
BMI	1.41
BNA	1.57
BOI	1.55
BOS	1.60
BQK	1.52

Airport	Delay Propagation Multipliers
BQN	1.49
BRD	1.16
BRO	1.39
BRW	1.43
BTM	1.22
BTR	1.55
BTV	1.51
BUF	1.63
BUR	1.78
BWI	1.63
BZN	1.40
CAE	1.48
CAK	1.59
CDC	1.56
CDV	1.56
CHA	1.53
CHO	1.43
CHS	1.56
CID	1.46
CIU	1.22
CLE	1.56
CLL	1.33
CLT	1.48
CMH	1.53
CMX	1.36
COD	1.27
COS	1.50
CPR	1.42
CRP	1.62
CRW	1.45
CSG	1.60
CVG	1.64
CWA	1.40
DAB	1.55
DAL	1.78
DAY	1.54
DCA	1.56
DEN	1.50
DFW	1.45
DHN	1.67
DLG	1.11
DLH	1.43

Airport	Delay Propagation Multipliers
DRO	1.51
DSM	1.45
DTW	1.53
DVL	1.72
EAU	1.40
ECP	1.54
EGE	1.32
EKO	1.17
ELM	1.60
ELP	1.60
ERI	1.42
ESC	1.69
EUG	1.57
EVV	1.43
EWN	1.57
EWR	1.43
EYW	1.41
FAI	1.24
FAR	1.36
FAT	1.53
FAY	1.51
FCA	1.36
FLG	1.40
FLL	1.59
FNT	1.51
FSD	1.38
FSM	1.45
FWA	1.56
GCC	1.40
GCK	1.23
GEG	1.50
GFK	1.40
GGG	1.47
GJT	1.36
GNV	1.49
GPT	1.49
GRB	1.46
GRI	1.32
GRK	1.32
GRR	1.51
GSO	1.50
GSP	1.48
GST	1.70
GTF	1.32

Airport	Delay Propagation Multipliers
GTR	1.50
GUC	1.34
HDN	1.47
HIB	1.37
HLN	1.37
HNL	1.36
HOB	1.30
HOU	1.78
HPN	1.61
HRL	1.80
HSV	1.51
HYA	1.88
HYS	1.44
IAD	1.42
IAG	1.43
IAH	1.37
ICT	1.42
IDA	1.38
ILM	1.47
IMT	1.59
IND	1.58
INL	1.64
ISN	1.33
ISP	1.76
ITH	1.45
ITO	1.63
JAC	1.37
JAN	1.49
JAX	1.54
JFK	1.46
JLN	1.47
JMS	1.61
JNU	1.39
KOA	1.31
KTN	1.49
LAN	1.44
LAR	1.24
LAS	1.57
LAW	1.52
LAX	1.47
LBB	1.64
LBE	1.73
LCH	1.38
LEX	1.41
LFT	1.49
LGA	1.52
LGB	2.00
LIH	1.34
LIT	1.53
LNK	1.35
LRD	1.34
LSE	1.54

Airport	Delay Propagation Multipliers
LWS	1.19
MAF	1.67
MBS	1.47
MCI	1.56
MCO	1.61
MDT	1.40
MDW	1.64
MEI	1.51
MEM	1.49
MFE	1.41
MFR	1.50
MGM	1.63
MHT	1.55
MIA	1.31
MKE	1.54
MKG	1.62
MLB	1.58
MLI	1.40
MLU	1.42
MMH	1.24
MOB	1.54
MOT	1.36
MQT	1.34
MRY	1.74
MSN	1.46
MSO	1.36
MSP	1.44
MSY	1.57
MTJ	1.46
MVY	1.90
MYR	1.73
OAJ	1.49
OAK	1.72
OGG	1.32
OKC	1.53
OMA	1.47
OME	1.35
ONT	1.75
ORD	1.48
ORF	1.46
ORH	1.46
OTH	1.89
OTZ	1.59
PAH	1.35
PBG	1.49
PBI	1.58
PDX	1.48
PGD	1.85
PHF	1.46
PHL	1.46
PHX	1.45
PIA	1.50

Airport	Delay Propagation Multipliers
PIB	2.28
PIH	1.33
PIT	1.53
PLN	1.57
PNS	1.52
PPG	1.21
PSC	1.44
PSE	1.44
PSG	1.74
PSP	1.47
PVD	1.54
PWM	1.52
RAP	1.44
RDD	1.89
RDM	1.49
RDU	1.55
RHI	1.32
RIC	1.55
RKS	1.27
RNO	1.62
ROA	1.57
ROC	1.55
ROW	1.53
RST	1.53
RSW	1.59
SAF	1.39
SAN	1.54
SAT	1.55
SAV	1.52
SBA	1.64
SBN	1.54
SBP	1.75
SCC	1.81
SCE	1.47
SDF	1.51
SEA	1.43
SFO	1.46
SGF	1.40
SGU	1.35
SHV	1.48
SIT	1.38
SJC	1.62
SJT	1.39
SJU	1.46
SLC	1.47
SMF	1.64
SNA	1.57
SPI	1.50
SPS	1.37
SRQ	1.53
STL	1.55
STT	1.26

Airport	Delay Propagation Multipliers
STX	1.20
SUN	1.64
SWF	1.41
SYR	1.48
TLH	1.44
TPA	1.56
TRI	1.47
TTN	1.97
TUL	1.50
TUS	1.55
TVC	1.46
TWF	1.37
TXK	1.44
TYR	1.39
TYS	1.53
VLD	1.55
VPS	1.56
WRG	1.82
WYS	1.35
XNA	1.41
YAK	1.73
YUM	1.32