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bcc

Subject text edits

Shawn

Attached are the methodology and money fare section edits we discussed earlier today. The methodology discussion can be incorporated into the supplemental on page 4 after the bullet, "Determine Benefits" and associated description of types of benefits

For the money fare section, you will see the edit includes a placeholder for the change in the average annual reduction in money fare as well as the recommended table layout for explaining the changes in travel time and money fare each year.

If questions, let's touch base as early as possible on Monday.
thanks

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APP-510, Financial Analysis and PFC Branch

202-493-4890 1509 Plausibility of Money Fare 09Sep05.doc

INSERT TO SUPPLEMENTAL BCA METHODOLOGY: PAGE 4

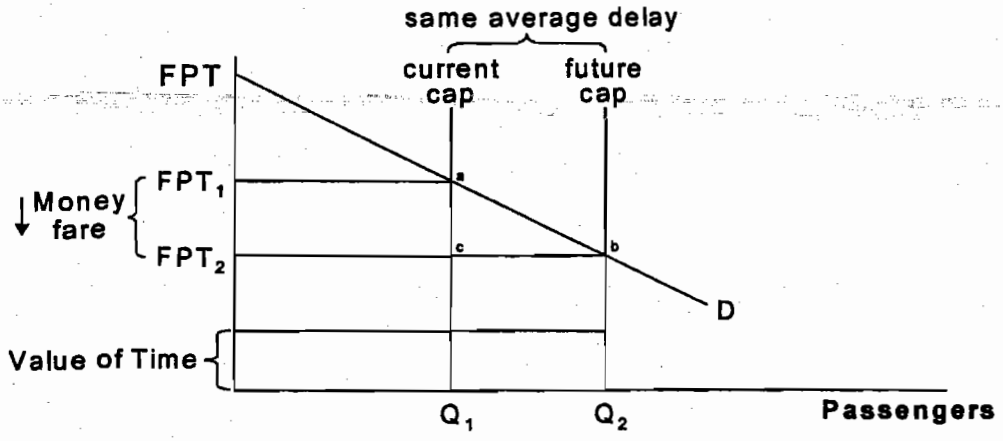
In the present analysis, benefits have been estimated using an economic framework suggested in *FAA Airport Benefit-Cost Analysis Guidance* (December 15, 1999) as reported in Appendix C of this document. Benefits are estimated using the economic concept of consumer surplus, defined as the difference between what consumers must pay for a given level of service and what they would be willing to pay. In passenger transportation markets, consumer surplus is usually defined in the context of the full price of travel. The full price of travel includes both the money fare that a consumer must pay and the value of his or her time in transit (including both the scheduled time and any expected delays).

Interpretation of the full price of travel in the context of consumer surplus is straightforward. A consumer would not choose to purchase a transportation service unless it was worth more to him or her than the sum of the money price and the value of his or her time. Consumer surplus is the value of air transportation in excess of the full price of travel.

To illustrate the application of the full price of travel framework to the OMP-1 project, refer to Exhibit X. The horizontal axis shows the annual number of passengers accommodated at the airport, while the vertical axis reports the full price of travel, made up of the money fare and the value of time. In any given year, in the base case where no project is undertaken, there is an equilibrium defined by Q_1 passengers and FPT_1 (the full price of travel). This occurs at the intersection of the demand curve (showing the total number of passengers accommodated at different levels of prices) and the cap on operations at the airport.[1]

[1] The cap at O'Hare is on the number of aircraft operations during the day, which can then be translated into passenger counts.

Exhibit X: When Delay is Equal in Base Case and Scenario Cases



In the OMP-1 case, more passengers are accommodated, and the average price paid must fall, so that Q_2 passengers and FPT_2 (full price of travel) is the new equilibrium.

In the OMP-1 case (except in the first few years after the completion of construction), the expected delay for passengers will be identical. There will be small variations in unimpeded travel time. But for the most part, the value of time for each of the cases will be approximately the same. As a consequence, the reduction in the full price of travel will be largely attributable to a reduction in the money fare. This means that in order to draw out more passengers at the airport, money fares will have to fall. This is consistent with standard microeconomics principles.

The benefits of the OMP-1 case can be measured in the exhibit. In the base case, consumer surplus, defined as the area under the demand curve but above FPT_1 would be the triangle (FPT, FPT_1a). In the OMP-1 case, where the full price of travel is lower, the benefits would be defined by (FPT, FPT_2b).[2] The difference between the base case consumer surplus and

[2] As explained in Appendix C, it has been assumed to the extent there is producer surplus in the base case, carriers would seek to preserve it in the OMP-1 case. Because carriers have influence over the approval of the OMP-1 case, their expectation must be that they can preserve whatever producer surplus exists in the base case, otherwise they would not be in favor of the project.

the OMP-1 consumer surplus is the net benefit of the project, defined by the polygon (FPT_1 FPT_2ba).

Interpretation of the net benefit is straightforward. Existing consumers at O'Hare would benefit from the reduction in the full price of travel resulting from the OMP-1 project. Most of this reduction in the full price of travel would be due to the reduction in money fare, for the reasons discussed above. The benefit to existing consumers is defined as the rectangle (FPT_1 FPT_2ca). Additional consumers accommodated as a result of the expansion would also benefit. Their benefits are defined by the triangle *abc*.

It is important to note that the exhibit represents a snapshot for computing benefits in each year of the analysis. For each year, the change in consumer surplus (the difference between base case and OMP-1 benefits) would be computed. The benefit stream would then be discounted back to 2001, the base year for the analysis, which is consistent with the evaluation in the LOI request, the OMP EIS and the airport master plan.

In the present BCA, the analysis is conducted at the aggregate level. This facilitates the use of the TAF forecast and TAAM simulation results reported elsewhere in this document and used in other evaluations of the OMP-1 case, including the EIS. Specifically, to facilitate the analysis the following information was collected:

- Forecasts for passengers accommodated for the period 2007 through 2027
- The unimpeded travel times for both the base and OMP-1 cases
- Expected delays in both the base and OMP-1 cases
- The average segment money fare at ORD
- The value of passenger time as reported by the FAA
- A range of elasticities to define the demand curve.

To identify the demand curve in each year, we first compute the full price of travel in the base case, which is defined as the money fare plus the value of unimpeded travel time plus the value of expected delay time, given the projected number of operations at the airport. The full price of travel in the base case and the projected number of passengers defines point *a* in the graph.

Then, we use the projected number of passengers that would be accommodated in the OMP-1 case and the elasticity of demand as recommended by the FAA in its guidance document to compute the full price of travel in the OMP-1 case, using the equation:

$$FPT_2 = -FPT_1 (1+x)/(1-x)$$

where $x = E_D (Q_1+Q_2)/Q_2-Q_1)$, and E_D is the arc elasticity of demand, and Q_1 and Q_2 are base case and OMP-1 passengers.[3]

With the estimate for the full price of travel in the OMP-1 case and the projected number of passengers that would be accommodated in that case, point *b* in the graph is also defined. In order to computer the net benefits of OMP-1 in each year, a further assumption is made that the demand curve is linear. It is then possible to calculate the polygon (FPT_1 FPT_2ba).

As noted previously, the net benefits of the OMP-1 case would be computed for each year of the analysis, and then discounted back to the year 2001. There are numerous ways to test the plausibility of the results including conducting sensitivity studies as described below. One important test for plausibility relates to the reduction in the money fare in the OMP-1 case over the entire analysis period. As noted previously, most of the reduction in the full price of travel in the OMP-1 case will be due to a reduction in the money fare. If these reductions appear plausible, that will lend credence to the results. This matter is discussed further below. Note that

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[3] The arc elasticity is defined as $E_D = \frac{Q_2 - Q_1}{(Q_1 + Q_2)/2} x \frac{FPT_1 + FPT_2}{(FPT_2 - FPT_1)/2}$. The *FPT* equation in the text is derived by solving this formula for FPT_2.

the money fare in the OMP-1 case can be easily computed from the information available by subtracting the value of time in transit and the value of passenger delay from FPT_2.

The methodology for computing net benefits in each year of the analysis is summarized in the table taken from Appendix C of this document. Details on assembling the data are provided below.

Exhibit Y: Estimating Consumer Benefits Due to Infrastructure Expansion at a Congested Airport

ESTIMATING CONSUMER BENEFITS DUE TO INFRASTRUCTURE EXPANSION AT A CONGESTED AIRPORT

	1	2	3	4	5	6	7	8	9	10	11	12
	Average Travel Time per Operation (minutes)	Value of Time per Minute	Base Case Value of Travel Time	Average Segment Money Fare	Base Case Full Price of Travel	Base Case Total Passengers (millions)	Scenario Total Passengers (millions): TAF unconstrained	Scenario Full Price of Travel	Benefits to Existing Passengers ($ mil)	Benefits to Incremental Pax ($ mil)	Total Benefits ($ Mil)	PV of Total Benefits @ 7%
Source	Simulation Studies	FAA Critical Values	(1) x (2)	DB1a Database	(3) + (4)	TAF Constrained	Unconstrained TAF [1]	see footnote [2]	((5)-(6))*(6)	0.5*((5)-(6))*((7)-(8))	(9)+ (10)	PV in Year 20XX
Year 1												
2												
3												
-												
-												
20												

1. The unconstrained TAF would be used up to the point where congestion reaches levels beyond which airlines are unwilling to schedule added flights
2. Col 8: -Col (5) *(1+x)/(1-x) where x = elasticity of demand * (col 7 + col 6)/(col 7 - col 6)
Recommended values for elasticity of demand for these analyses can be found in the Guidance document on page C.2.

V.2.4. PLAUSIBILITY OF THE MONEY FARE

One of the more important questions concerning the plausibility of the analytical results reported above relates to the pattern of changes in the money fare in the OMP-1 case. Recall that most of the decline in the full price of travel in the OMP-1 case is attributable to the reduction in the money fare. This is the case because there are very small differences in the unimpeded travel time between the base and OMP-1 cases and except in the first few years of the OMP-1 case, the expected delays are identical. As a consequence, the primary source of variation in the full price of travel between the two cases must be a decline in the money fare. If this decline is very large, one would be concerned about the plausibility of the results.

A good way to evaluate the plausibility of the reduction in the money fare is to compare it to airline experience since deregulation. The Air Transport Association publishes data on airline yields, both nominal and real dollars, since 1926. The data on real yields since 1978 (the first year of deregulation) are reported in Table V-5a. The annual rate of decline for domestic, international and system-wide yields are reported at the bottom of the table. The average annual reduction in real yields in all three theaters averages –2.6 percent.

Table V-5b reports the money fare in the OMP-1 case in each year. Shown in the table for each year are values for the full price of travel, the unimpeded travel time in the OMP-1 case, the portion of the full price of travel made up of the value of time, and the money fare. It should be noted that the money fare in this analysis is the residual computed by subtracting the value of time from the full price of travel. Table V-5b shows that average annual reduction in the money fare is (_____). The average annual reduction in money fare in the OMP-1 case is only a fraction of the average airline industry annual rate since deregulation.

Table V-5a

Annual Passenger Prices (Yield)
U.S. Airlines - Scheduled Services

Year	Real Yield (in 1978 cents)		
	DOM	INT	SYS
1978	8.49	7.49	8.29
1979	8.05	6.88	7.81
1980	9.09	6.96	8.70
1981	9.14	6.79	8.85
1982	8.12	6.47	7.95
1983	7.89	6.39	7.61
1984	8.03	5.89	7.60
1985	7.40	5.62	7.07
1986	6.59	5.73	6.50
1987	6.57	5.59	6.38
1988	6.78	5.73	6.55
1989	6.88	5.45	6.54
1990	6.70	5.40	6.37
1991	6.34	5.42	6.10
1992	5.97	5.37	5.81
1993	6.20	5.09	5.89
1994	5.77	4.92	5.54
1995	5.78	4.76	5.51
1996	5.72	4.54	5.41
1997	5.68	4.45	5.35
1998	5.63	4.15	5.24
1999	5.46	3.94	5.06
2000	5.52	4.01	5.12
2001	4.88	3.72	4.57
2002	4.35	3.57	4.15
2003	4.36	3.59	4.17
2004[P]	4.16	3.66	4.04
Rate/Year	**-2.6%**	**-2.6%**	**-2.6%**

Source: The Air Transport Association of America, Inc. 1995-2005
http://www.airlines.org/econ/print.aspx?nid=1035

Table V-5b

This finding is important for the following reasons. The OMP-1 program will increase the capacity of the airport and result in an increase in the number of passengers that will utilize the facility. As a consequence, the full price of travel in the OMP-1 case must be lower than it is in the base case. Virtually the entire difference in the full price of travel between the two cases is attributable to a decline in the money fare. With more capacity at the airport and more flights, it can be expected that the money fare would fall in the OMP-1 case relative to the base case, ceteris paribus. If the reduction had far exceeded the typical experience since deregulation, this would be cause for concern. The finding here that the implied money fare reduction in the OMP-1 case is only a fraction of the historic experience lends credence to the results.