76

MEMORANDUM

DATE: September 16, 2005

FROM: Frank Berardino

TO: Jeffrey Wharf

SUBJECT: ORD BCA SCENARIO: LOSS OF A HUB

At the request of FAA, GRA prepared a scenario regarding the loss of a hub at ORD using materials prepared by Ricondo Associates and others involved in the preparation of the benefit cost analysis and other materials for the ORD OMP-1 project. The overall methodology used in the benefit-cost analysis is described in the "Supplemental Benefit-Cost Analysis" prepared by Ricondo Associates, dated September 13, 2005. In developing the analysis of the loss of a hub, we have applied the methodology from the Ricondo study and developed the scenarios using the following assumptions:

- First, and most important, we have assumed that the bankruptcy of a hub carrier at ORD is completely independent of whether the OMP-1 case is built or not; thus, it is important to adjust operations and passenger demand levels to reflect the loss of a hub carrier in both scenarios in the benefit-cost study.
- To make these adjustments, we refer to the Environmental Impact Statement, Appendix R, which presents a "low side" forecast for ORD that corresponds to the loss of a hub carrier. This forecast suggests that the immediate effect of

the loss of a hub carrier would be an 11 percent reduction in both operations and passengers.

- In the benefit-cost analysis, benefits and costs are evaluated over the period 2007 through 2028. The same evaluation period was applied here. Thus, in both the base case and OMP-1 case, operations in 2007 were reduced by 11 percent.
- In the base case, for every year thereafter, we assumed that operations grew at the same rate (1.2 percent) shown in the original BCA for the years 2003 – 2006, the period before operations are capped. For the scenario case, for the period 2007 – 2018, operations are given in the "low side" forecast from Appendix R of the EIS and then grow at the same average rate (1.2 percent) thereafter. We further assumed that operations would be capped at the same levels as in the original BCA (974,000 in the base case and 1,150,000 in the scenario case).
- We followed a similar procedure with respect to the passenger forecast, reducing each by 11 percent in the year 2007 and growing them back. In the base case, passenger counts from the original BCA were reduced by 11 percent each year until 2018, the year when passenger counts are capped. Thereafter, because passenger counts are lower in the "lose a hub" scenario, they are permitted to grow at the same average growth rate (1.8 percent) shown in the original BCA. In the scenario case, passenger counts from Appendix R of the EIS, "low side forecast" were used through 2018; thereafter

they grow at the same rate (2.4 percent) shown in the original BCA. Passenger counts were capped at the same levels as in the original BCA.

- We used results from the TAAM simulations conducted for the OMP-1 project to estimate the changes in average delay per operation in both the base and scenario cases resulting from the reduced levels of demand in the "lose a hub" scenario.
- We utilized the change in average delay to adjust the expected travel times per passenger in the original benefit-cost analyses for both the base and scenario cases. In both instances, the average travel time was lower as a result of the reduced level of operations resulting from the loss of a hub carrier.
- We also adjusted the average money fare in the base case to reflect the forecast in Appendix R of the EIS that 25 percent of connecting passengers would be lost in the event of the loss of a hub carrier. The result was a reduction in the money fare in the base case from $220.05 to $213.16.

Using the foregoing adjustments to the baseline benefit-cost analysis, resulted in a revised estimate of OMP-1 benefits in the event of the loss of a hub carrier at ORD. The results are summarized in the following table.

Table 1:

ORD LOSE A HUB CARRIER SIMULATION

EXCLUDES SYSTEM BENEFITS

	Base Case						OMP-Phase 1		Benefit Calculations			
	1 Average Travel Time per Operation (minutes)	2 Value of Time per Minute	3 Base Case Value of Travel Time	4 Assumed Average Money Fare	5 Base Case Full Price of Travel	6 Base Case Total Passengers (millions)	7 OMP-1 Total Passengers (millions): EIS App R	8 OMP-1 Full Price of Travel	9 Benefits to Existing Passengers ($ mil)	10 Benefits to Incremental Pax ($ mil)	11 Total Benefits ($ Mil)	12 PV of Total Benefits @ 7% (2001 $ mil)
Source	Revised for fewer ops	Ricondo Table E-3	(1) x (2)	reduce connect pax 25%	(3) + (4)	less 11%	per EIS App R	see footnote	((5)-(8))*(6)	0.5*((5)-(8))*((7)-(6))	(9)+ (10)	PV in 2001 $
2002												
2003												
2004												
2005												
2006												
2007	139.5	$0.54	$74.62	$213.16	$287.79	64.4	65.8	$282.88	$316.4	$3.2	$319.7	$213.0
2008	142.3	$0.54	$76.13	$213.16	$289.29	65.8	67.7	$282.33	$457.7	$6.7	$464.3	$289.2
2009	145.2	$0.54	$77.66	$213.16	$290.82	67.1	69.7	$281.67	$614.0	$11.8	$625.9	$364.3
2010	147.8	$0.54	$79.06	$213.16	$292.22	68.5	71.7	$281.24	$752.9	$17.4	$770.3	$419.0
2011	150.4	$0.54	$80.48	$213.16	$293.64	69.9	73.8	$280.36	$926.8	$26.0	$952.7	$484.3
2012	153.1	$0.54	$81.93	$213.16	$295.09	71.4	75.9	$280.01	$1,076.4	$34.4	$1,110.7	$527.7
2013	155.9	$0.54	$83.40	$213.16	$296.56	72.8	78.2	$279.23	$1,261.7	$46.5	$1,308.2	$580.9
2014	157.2	$0.54	$84.12	$213.16	$297.28	74.2	80.3	$278.08	$1,425.3	$58.4	$1,483.8	$615.7
2015	158.6	$0.54	$84.87	$213.16	$298.04	75.6	82.5	$276.56	$1,622.9	$74.9	$1,697.7	$658.4
2016	160.1	$0.54	$85.66	$213.16	$298.82	77.1	84.7	$275.76	$1,777.1	$88.3	$1,865.4	$676.1
2017	161.4	$0.54	$86.34	$213.16	$299.50	78.5	87.0	$274.48	$1,963.8	$106.5	$2,070.2	$701.3
2018	162.0	$0.54	$86.66	$213.16	$299.83	79.4	89.4	$271.06	$2,282.4	$144.3	$2,426.7	$768.2
2019	162.0	$0.54	$86.66	$213.16	$299.83	80.2	90.7	$270.29	$2,369.2	$154.3	$2,523.5	$746.6
2020	162.0	$0.54	$86.66	$213.16	$299.83	81.1	92.0	$269.52	$2,457.4	$164.7	$2,622.1	$725.0
2021	162.0	$0.54	$86.66	$213.16	$299.83	82.0	93.3	$268.75	$2,547.1	$175.6	$2,722.6	$703.6
2022	162.0	$0.54	$86.66	$213.16	$299.83	82.9	94.6	$267.99	$2,638.2	$186.9	$2,825.1	$682.3
2023	162.0	$0.54	$86.66	$213.16	$299.83	83.8	96.0	$267.23	$2,730.9	$198.7	$2,929.6	$661.3
2024	162.0	$0.54	$86.66	$213.16	$299.83	84.7	97.3	$266.46	$2,825.0	$211.1	$3,036.1	$640.4
2025	162.0	$0.54	$86.66	$213.16	$299.83	85.6	98.2	$266.90	$2,818.6	$207.5	$3,026.1	$596.6
2026	162.0	$0.54	$86.66	$213.16	$299.83	86.5	98.2	$269.36	$2,636.7	$177.8	$2,814.5	$518.6
2027	162.0	$0.54	$86.66	$213.16	$299.83	87.5	98.2	$271.84	$2,448.5	$150.1	$2,598.6	$447.5
2028	162.0	$0.54	$86.66	$213.16	$299.83	88.4	98.2	$274.34	$2,253.8	$124.6	$2,378.4	$382.8
2029												
2030												
2031												$12,402.6

Finally, we evaluated whether the changes in the money fare in the scenario case were plausible. To do this, we used the revised estimates of travel time in the scenario case (discussed above) to estimate a revised value of travel time for each year 2007 through 2008. We then subtracted this from the estimated full price of travel in each year. The resulting difference is the estimated money fare in the scenario case. Over the 20-year evaluation period, the implied reduction in the money fare averages 0.44 percent per year, well within the average decline in the real money yield (2.6 percent) since deregulation.

Master Plan Phase 1 -- LOSE A HUB SCENARIO

Value of Pax Time per Hour:	$32.10	> VARIABLE
Elasticity of Demand	[redacted]	> VARIABLE

	Base Case						Scenario Case				Benefit Calculations			
	1	2	3	4	5	6	7a	7b	7c	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	Passengers with Cap on Unconstr Opns (millions)	Adjusted 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% ($ mil)
Source	Simulation Studies	FAA Critical Values	(1) x (2)	DB1a Database	(3) + (4)	2002 TAF Constrained	2002 Unconstrained TAF 1/	See Footnote 1/	Lesser of (7a) or (7b)	See Footnote 2/	((5)-(8))*6	0.5*((5)-(8))*((7c)-(6))	(9) + (10)	PV in Year 2001
2001	V VAR'BL			V VAR'BL		V VAR'BL	V VAR'BL	V VAR'BL						
2002														
2003														
2004														
2005														
2006														
2007	139.4826695151	$0.535	$74.62	[redacted]	$287.78	64.44	65.76		65.76	$282.88	$316.21	$3.24	$319.4	$212.86
2008	142.3005962774	$0.535	$76.13	$213.16	$289.29	65.77	67.69		67.69	$282.34	$457.35	$6.67	$464.0	$288.96
2009	145.1514299930	$0.535	$77.66	$213.16	$290.82	67.11	69.69		69.69	$281.67	$613.64	$11.80	$625.4	$364.01
2010	147.7735086326	$0.535	$79.06	$213.16	$292.22	68.53	71.70		71.70	$281.24	$752.36	$17.40	$769.8	$418.70
2011	150.4337315142	$0.535	$80.48	$213.16	$293.64	69.87	73.78		73.78	$280.39	$926.13	$25.96	$952.1	$484.00
2012	153.1350621606	$0.535	$81.93	$213.16	$295.09	71.38	75.94		75.94	$280.02	$1,075.64	$34.34	$1,110.0	$527.34
2013	155.8807236364	$0.535	$83.40	$213.16	$296.56	72.80	78.16		78.16	$279.24	$1,260.90	$46.43	$1,307.3	$580.47
2014	157.2360172710	$0.535	$84.12	$213.16	$297.28	74.23	80.31		80.31	$278.09	$1,424.38	$58.39	$1,482.8	$615.30
2015	158.6429697082	$0.535	$84.87	$213.16	$298.03	75.56	82.53		82.53	$276.57	$1,621.78	$74.83	$1,696.6	$657.98
2016	160.1057444166	$0.535	$85.66	$213.16	$298.82	77.07	84.74		84.74	$275.77	$1,775.94	$88.27	$1,864.2	$675.68
2017	161.3758713333	$0.535	$86.34	$213.16	$299.50	78.50	87.01		87.01	$274.50	$1,962.46	$106.40	$2,068.9	$700.79
2018	161.9893043333	$0.535	$86.66	$213.16	$299.82	79.35	89.38		89.38	$271.08	$2,280.93	$144.18	$2,425.1	$767.73
2019	161.9893043333	$0.535	$86.66	$213.16	$299.82	80.22	90.66		90.66	$270.31	$2,367.65	$154.16	$2,521.8	$746.11
2020	161.9893043333	$0.535	$86.66	$213.16	$299.82	81.09	91.96		91.96	$269.54	$2,455.80	$164.58	$2,620.4	$724.56
2021	161.9893043333	$0.535	$86.66	$213.16	$299.82	81.97	93.27		93.27	$268.77	$2,545.42	$175.46	$2,720.9	$703.13
2022	161.9893043333	$0.535	$86.66	$213.16	$299.82	82.86	94.61		94.61	$268.01	$2,636.50	$186.80	$2,823.3	$681.86
2023	161.9893043333	$0.535	$86.66	$213.16	$299.82	83.77	95.96		95.96	$267.24	$2,729.08	$198.62	$2,927.7	$660.82
2024	161.9893043333	$0.535	$86.66	$213.16	$299.82	84.68	97.33		97.33	$266.48	$2,823.18	$210.92	$3,034.1	$640.04
2025	161.9893043333	$0.535	$86.66	$213.16	$299.82	85.60	98.20		98.20	$266.92	$2,816.76	$207.33	$3,024.1	$596.19
2026	161.9893043333	$0.535	$86.66	$213.16	$299.82	86.53	98.20		98.20	$269.37	$2,634.98	$177.68	$2,812.7	$518.23
2027	161.9893043333	$0.535	$86.66	$213.16	$299.82	87.47	98.20		98.20	$271.85	$2,446.89	$150.05	$2,596.9	$447.18
2028	161.9893043333	$0.535	$86.66	$213.16	$299.82	88.42	98.20		98.20	$274.35	$2,252.33	$124.51	$2,376.8	$382.51
2029														
2030														
2031														
2032														
Total											$40,176.3	$2,368.0	$42,544.3	$12,394.4
Plus salvage														$51.4
Total														$12,445.8
													PV Costs	$2,715.6
													B/C Ratio	4.58

1/ The unconstrained TAF would be up to the point where congestion reaches levels beyond which airlines are unwilling to scheduled added flights.

2/ Col 8: -Col (5) * (1+x) / (1-x), where x = elasticity of demand * (col 7c + col 6) / (col 7c - col 6).
Recommended values for elasticity of demand for these analyses can be found in the Guidance document on page C.2.

Source of Column (1): Ricondo BCA report, Table E-3.
Source of Column (4): Ficticious for the time being.
Source of Column (6): Ricondo BCA report, Table E-4 (=DEIS/BCA constrained forecast).
Source of Column (7): Capped in 2015 per DEIS delay curve, Exhibit D-8 (approx. point in time where delay again reaches 15.9 minutes).

Master Plan Phase 1 -- LOSE A HUB SCENARIO

ELASTICITY & MONEY FARE SENSITIVITY ANALYSIS

Money Fare
Elasticity of Demand

	-75%	-50%	-25%	-10%		10%	25%	50%	75%
	$53.29	$106.58	$159.87	$191.84	**$213.16**	$234.48	$266.45	$319.74	$373.03
-0.50	4.75								15.71
-0.60									
-0.70									
-0.80									
-0.90									
-1.00									
-1.10									
-1.1808	2.13			4.26	4.58				
-1.30									
-1.40									
-1.50									
-1.60									
-1.70									
-1.80									
-1.90									
-2.00									
-2.10									
-2.20	1.18								
-2.30	1.13	1.55							
-2.40	1.08	1.49	1.90						
-2.50	1.04	1.43	1.83	2.06					3.40

Master Plan Phase 1 -- LOSE A HUB SCENARIO

ELASTICITY & FUTURE DEMAND SENSITIVITY ANALYSIS

Future Demand Change

Elasticity of Demand

	-10%	-9%	-8%	-7%	-6%	-5%	-4%	-3%	-2%	-1%	0%
-0.50	0.99	1.55				4.62					
-0.60	0.83	1.30				3.89					
-0.70	0.72	1.12				3.37					
-0.80	0.63	0.99				2.96					
-0.90	0.57	0.88				2.65					
-1.00	0.51	0.80				2.39					
-1.10	0.47					2.18					
-1.1808	0.44					2.04					
-1.30	0.40					1.86					
-1.40	0.37					1.73					
-1.50	0.35					1.62					
-1.60	0.33					1.52					
-1.70	0.31					1.43					
-1.80	0.29					1.36					
-1.90	0.28					1.29					
-2.00	0.27					1.23					
-2.10	0.26					1.17					
-2.20	0.24					1.12					
-2.30	0.23					1.07					
-2.40	0.23					1.03					
-2.50	0.22					0.99					

Master Plan Phase 1 -- LOSE A HUB SCENARIO

MONEY FARE & FUTURE DEMAND SENSITIVITY ANALYSIS

Money Fare			$213.16						
Future Demand Change			[redacted]						
	-75%	-50%	-25%	-10%		10%	25%	50%	75%
	$53.29	$106.58	$159.87	$191.84	**$213.16**	$234.48	$266.45	$319.74	$373.03
-10%	0.21	0.29	0.36	0.41	0.44				
-9%	0.33	0.44	0.56	0.63	0.68				
-8%	0.46	0.63	0.80	0.90	0.97				
-7%	0.61	0.83	1.06		1.28				
-6%	0.77	1.06	1.52		1.64				
-5%	0.96	1.32	1.68	1.90	2.04	2.18	2.40	2.76	2.04
-4%	1.16	1.60			2.48				
-3%	1.38	1.91			2.95				
-2%	1.62	2.24			3.47				
-1%	1.88	2.60			4.03				
0%	2.13	2.95			4.58				