RICHARD M. DALEY
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EXECUTIVE DIRECTOR

CHICAGO O'HARE INTERNATIONAL AIRPORT
O'HARE MODERNIZATION PROGRAM

Request for Letter of Intent to provide a

Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

March 1, 2004

Updated February 2005

City of Chicago
Richard M. Daley, Mayor

O'Hare Modernization Program

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February 15, 2005

Mr. Phillip Smithmeyer
Airports District Office Manager
Federal Aviation Administration
2300 East Devon Avenue
Des Plaines, Illinois 60018

Subject: Letter of Intent for AIP Funding
Chicago O'Hare International Airport

Dear Mr. Smithmeyer:

On March 1, 2003, the City of Chicago (City) submitted a request for a Letter of Intent (LOI) for a multi-year commitment of Airport Improvement Program (AIP) funding for Phase 1 of the O'Hare Modernization Program (OMP-Phase 1) at O'Hare International Airport. The LOI was requested while awaiting completion of the simulation modeling for the Environmental Impact Statement, which is the same modeling used for the Benefit-Cost Analysis (BCA) conducted to support this LOI request. The purpose of the amended LOI request is to include the BCA required from the City to complete the application process.

Consistent with the original LOI application, this amended request is for $300 million in AIP discretionary grants over a 10-year period with the City committing $55.8 million of its entitlement grants to the implementation of OMP- Phase 1. While we have provided a preferred reimbursement schedule, we would be amenable to working with the FAA to define an alternative schedule. The City intends to submit an LOI request for OMP-Phase 2 at a later date.

Thank you for your consideration of this request. We believe that the OMP is an effective use of the LOI funding mechanism and provides significant capacity enhancing benefits to the Airport and the National Airspace System. If you need any additional information, please do not hesitate to contact Rosemarie S. Andolino at 773-557-4742.

Sincerely,

[ORIGINAL SIGNED BY]

Rosemarie S. Andolino
Executive Director
O'Hare Modernization Program

[ORIGINAL SIGNED BY]

John A. Roberson
Commissioner
Department of Aviation

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RICHARD M. DALEY
MAYOR

CHICAGO O'HARE INTERNATIONAL AIRPORT
O'HARE MODERNIZATION PROGRAM

Executive Summary

Executive Summary

Request for Letter of Intent to provide a

Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

Executive Summary

The City of Chicago (the City or Sponsor) is requesting federal assistance in the form of a Letter of Intent (LOI) to provide a multi-year commitment of Airport Improvement Program (AIP) grant-in-aid funding for airfield projects at O'Hare International Airport (the Airport or O'Hare) as part of Phase 1 of the O'Hare Modernization Program (OMP-Phase 1). The City intends to submit an LOI request for OMP-Phase 2 projects at a later date.

Purpose of the OMP

The purpose of the full OMP is to reduce current and projected delays at O'Hare and enhance capacity of the National Airspace System (NAS). Under the OMP, the airfield is to be reconfigured into a modern parallel runway system, allowing more efficient operations.

Delays at O'Hare adversely affect regional and national air transportation. The need to reduce delays at O'Hare has been historically recognized by the FAA and others, as the following list demonstrates:

- *Air Traffic Congestion and Capacity in the Chicago, Illinois Region and Its Effects on the National Air Transportation System, U.S. Senate Committee on Commerce, Science, and Transportation* field hearing, June 15, 2001*;*
- *Airport Capacity Benchmark Report 2001,* FAA*;*
- *Order Limiting Scheduled Operations, Docket FAA-2004-16944-1,* FAA and U.S. Department of Transportation, January 2004 (the *January 2004 FAA Order*);
- *Order Limiting Scheduled Operations at Chicago O'Hare International Airport, Docket FAA-2004-16944-55*, FAA and U.S. Department of Transportation, August 2004 (the *August 2004 FAA Order)*; and
- *Airport Capacity Benchmark Report 2004,* FAA.

O'Hare delays are a consequence of the Airport's converging runway configuration, which does not provide balanced capacity in instrument flight rules (IFR) and visual flight rules (VFR) conditions or between arrivals and departures. Currently, these limitations significantly impact the NAS even in good weather during peak periods of the day, as recognized by the *January 2004 FAA Order* and the *August 2004 FAA Order* limiting scheduled operations during peak operating hours.

Consistent with statutory requirements for the use of LOI grants, the OMP will enhance system-wide airport capacity. The O'Hare Modernization Draft Environmental Impact Statement dated January 2005 (DEIS) defines the purpose and need of the proposed action (OMP development) as follows:

- Address the projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.
- Ensure that existing and future terminal facilities and supporting infrastructure (access, landside, and related ancillary facilities) can efficiently accommodate airport users.

Additional benefits of the OMP include:

- Providing flexible opportunities for increasing terminal and landside capacity;
- Creating opportunities for enhanced competition among air carriers;
- Enhancing the ability of the Airport to accommodate new large aircraft (NLA); and
- Mitigating noise impacts.

Description of the OMP

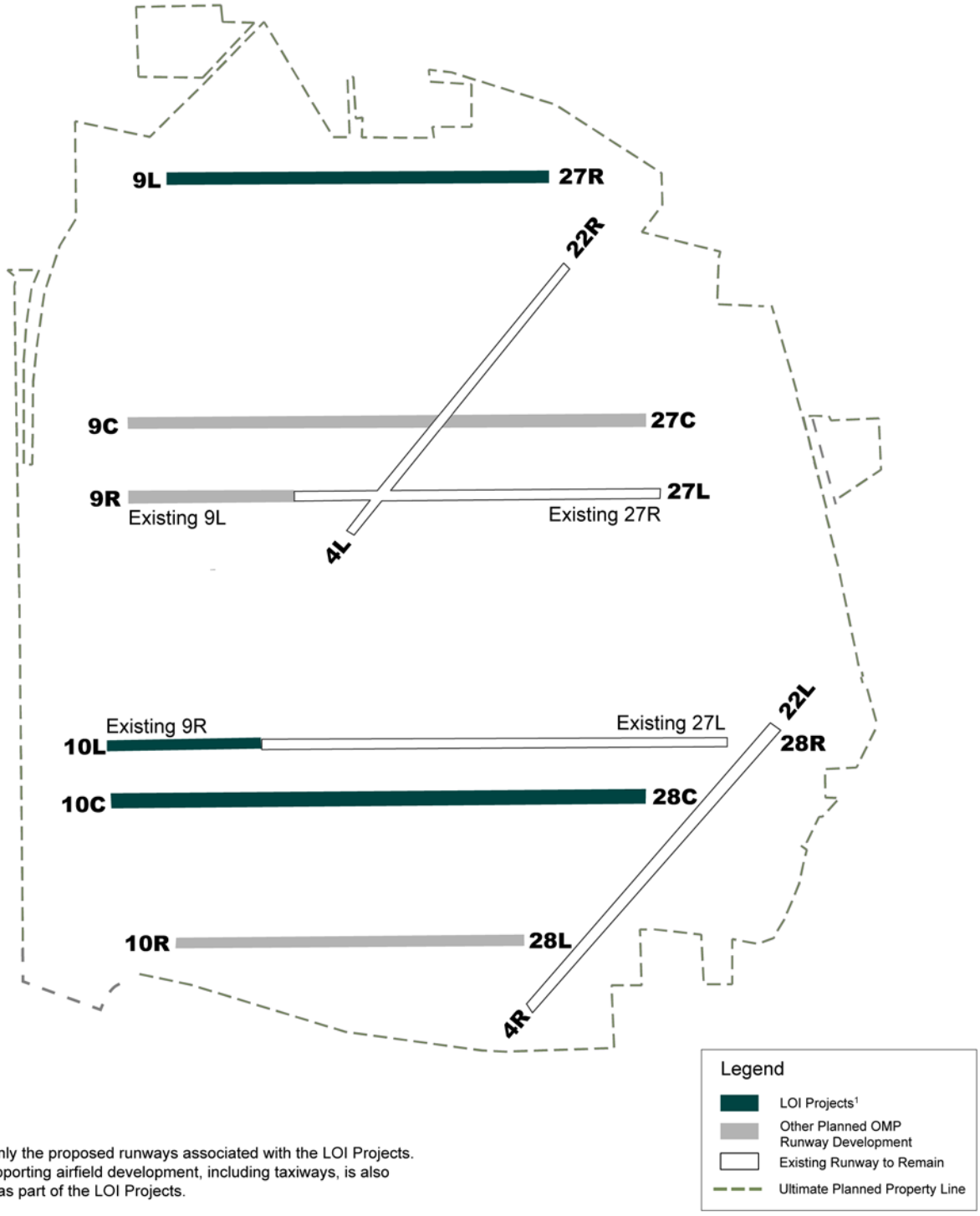
Implementation of the OMP will reduce delays and enhance capacity by modernizing the airfield configuration. O'Hare's existing layout of converging runways will be reconfigured into a predominantly parallel runway configuration (as shown in **Exhibit ES-1**) typical of modern, large-hub airports. These parallel runways will allow operation of a combination of arrival and departure runways, providing balanced and flexible capacity in all weather conditions.

The OMP will be implemented in phases and is expected to be a multi-year process entailing the reconfiguration of the runway layout; relocation of other existing facilities; construction of a new western terminal complex, including supporting roadway and parking facilities; noise mitigation; and land acquisition. Various improvements will also be implemented to relocate and expand existing utilities and infrastructure, including stormwater collection and detention facilities, water supply lines, electrical systems, sanitary sewer systems, vehicle service roads, and perimeter fencing.

LOI Projects

The projects in this LOI request include the following (the LOI Projects):

- New Future Runway 9L-27R;
- Extension of Future Runway 10L-28R (Existing Runway 9R-27L);
- Future Runway 10C-28C (Relocation of Existing Runway 18-36); and
- Associated runway enabling projects, generally including associated taxiway systems, navigation aids installation and upgrade, site utilities construction, and existing facilities relocation



[1]Depicts only the proposed runways associated with the LOI Projects. Other supporting airfield development, including taxiways, is also included as part of the LOI Projects.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit ES-1

north

Not to Scale

OMP Airfield Projects (Runways Only)

Z://ORD Financial/LOI/Exhibits/LOI Exhibit Pack.pdf

Benefit-Cost Analysis

As required for this LOI request, a Benefit-Cost Analysis (BCA) has been performed for the OMP-Phase 1 Airfield Projects, which consist of the LOI Projects and the supporting Program-Wide Requirements projects. Program-Wide Requirements include the following projects: preliminary engineering, wetlands mitigation, OMP-Phase 1 noise mitigation, land acquisition, and other miscellaneous program-wide requirements. The results are shown in **Table ES-1**. In addition, several sensitivity analyses were conducted. Summarized in **Table ES-2**, the sensitivity analyses include (1) increasing capital investment costs by 25 percent, (2) delaying the construction schedule by 5 years, (3) decreasing benefits by 25 percent, and (4) combination of all three of the items. Additionally, a sensitivity analysis stating the costs and benefits in 2004 dollars (instead of stated in 2001 dollars consistent with the DEIS and Master Plan) is also provided. For all of the analyses, the results exceed the FAA thresholds of a benefit-cost ratio of 1.0 and a positive net present value (NPV). The full BCA is included in Section IV. In addition, various sensitivity analyses are also presented to demonstrate the economic justification for the OMP-Phase 1 Airfield Projects if project benefits, costs, or timing differ from those envisioned. This analysis and the sensitivity analyses *do not* attempt to quantify or consider all benefits associated with the project, but rather illustrate that the aircraft travel time savings alone are sufficient to produce benefits that in all cases exceed project costs. Thus, the benefit-cost ratios and NPVs presented here are based on underestimated benefits and would be expected to be higher if a full accounting of project benefits were performed.

Table ES-1

Benefit-Cost Ratio and Net Present Value (2001 dollars) – OMP-Phase 1 Airfield Projects
Aircraft Travel Time Benefits Only

Project	Present Value Benefits (billions)	Present Value Costs (billions)	Net Present Value (billions)	Benefit-Cost Ratio
OMP-Phase 1 Airfield Projects	$4.1	$1.9	$2.2	2.13

Sources (Costs): Ricondo & Associates, Inc. and O'Hare Partners, based on cost estimate analyses from TOK LLC, and AOR.
Source (Benefits, NPV, Benefit-Cost Ratio): Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Table ES-2

Benefit-Cost Ratio and Net Present Value (2001 dollars) – Sensitivity Analyses
Aircraft Travel Time Benefits Only

Projects	Evaluation Period End Year	Present Value Benefits (billions)	Present Value Costs (billions)	Net Present Value[1] (billions)	Benefit-Cost Ratio
Increase capital costs by 25 percent	2028	$4.1	$2.4	$1.7	1.69
Delay construction schedule by 5 years	2033	$2.9	$1.4	$1.5	2.13
Decrease benefits by 25 percent	2028	$3.1	$1.9	$1.2	1.61
All of the above	2033	$2.2	$1.7	$0.4	1.27
Project using 2004 base year and 2004 dollars	2028	$5.1	$2.5	$2.6	2.06

[1] Totals may not add due to rounding.

Sources (Costs): Ricondo & Associates, Inc. and O'Hare Partners, based on cost estimate analyses from TOK LLC, and AOR.
Source (Benefits, NPV, Benefit-Cost Ratio): Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

The City is requesting $300 million in an LOI discretionary grant over a 10-year period for OMP-Phase 1 and intends to submit an LOI request for OMP-Phase 2 at a later date. The City's initial request is formulated on the basis of the airfield components of OMP-Phase 1, two new/relocated runways at $125 million each plus one runway extension at $50 million, for a total of $300 million in discretionary AIP grants. This formulation is consistent with the amount of LOI grants received by other U.S. airports for similar projects. The $300 million request reflects the distribution of runway improvements between the development phases and is consistent with the conditions of airline funding commitment described later in Section I. Federal grants (entitlement and discretionary) would provide approximately 12 percent of the funding sources for the OMP-Phase 1 Airfield Projects, and local funds would provide approximately 88 percent. The requested LOI discretionary grant represents a relatively small share funding sources for the LOI Projects and an even smaller share in the context of total funding sources for the OMP-Phase 1 Airfield Projects.

Table ES-3 presents the LOI Projects expenditures in 2001 dollars and **Table ES-4** presents the proposed LOI reimbursement schedule.

Table ES-3

LOI Projects Expenditures Schedule (2001 dollars)

Calendar Year	LOI Projects Expenditures ($ millions) [1]
2003	$64.1
2004	355.5
2005	495.5
2006	455.3
2007	294.7
2008	286.4
2009	0.0
2010	0.0
2011	0.0
2012	0.0
2013	0.0
2014	0.0
Total [2]	$1,951.5

[1] Expenditures are shown in calendar years as originally planned by the City in 2001 dollars. The timing of expenditures is subject to change, and amounts shown for 2003 and 2004 do not represent actual amounts spent.

[2] Totals may not add due to rounding.

Source: O'Hare Partners.
Prepared by: Ricondo & Associates, Inc.

Table ES-4

Proposed LOI Reimbursement Schedule

Federal Fiscal Year	Proposed LOI Reimbursement ($ millions)
2003	$0.0
2004	0.0
2005	30.0
2006	30.0
2007	30.0
2008	30.0
2009	30.0
2010	30.0
2011	30.0
2012	30.0
2013	30.0
2014	30.0
Total	$300.0

Source: City of Chicago, Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

RICHARD M. DALEY
MAYOR

CHICAGO O'HARE INTERNATIONAL AIRPORT
O'HARE MODERNIZATION PROGRAM

I. Introduction

Request for Letter of Intent to provide a

Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

I. Introduction

The City of Chicago (the City) requests federal assistance in the form of a Letter of Intent (LOI) to provide a multi-year commitment of Airport Improvement Program (AIP) grant-in-aid funding for airfield development as part of Phase 1 of the O'Hare Modernization Program (OMP-Phase 1). The LOI request is for $300 million in AIP discretionary grants over a 10-year period, with the City proposing to commit approximately $55.8 million of AIP entitlement grants. The City intends to submit an LOI request for OMP-Phase 2 at a later date.

The OMP is a $6.6 billion (in 2001 dollars), multi-year plan to reduce aircraft delay and enhance the capacity of the Airport. The following proposed runway projects are included as part of the full OMP airfield development, along with the associated proposed supporting airfield infrastructure (the OMP Airfield Projects):

- New Future Runway 9L-27R
- Extension of Future Runway 10L-28R (Existing Runway 9R-27L)
- Future Runway 10C-28C (Relocation of Existing Runway 18-36)
- Extension of Future Runway 9R-27L (Existing Runway 9L-27R)
- Future Runway 9C-27C (Relocation of Existing Runway 14L-32R)
- Future Runway 10R-28L (Relocation of Existing Runway 14R-32L)

Consistent with statutory requirements for the use of LOI grants, the OMP will enhance system-wide airport capacity. The DEIS defines the purpose and need of the proposed action (OMP development) as follows:

- Address the projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.
- Ensure that existing and future terminal facilities and supporting infrastructure (access, landside, and related ancillary facilities) can efficiently accommodate airport users.

Additional benefits of the OMP include:

- Providing flexible opportunities for increasing terminal and landside capacity;
- Creating opportunities for enhanced competition among air carriers;
- Enhancing the ability of the Airport to accommodate new large aircraft (NLA); and
- Mitigating noise impacts.

1.1 Background

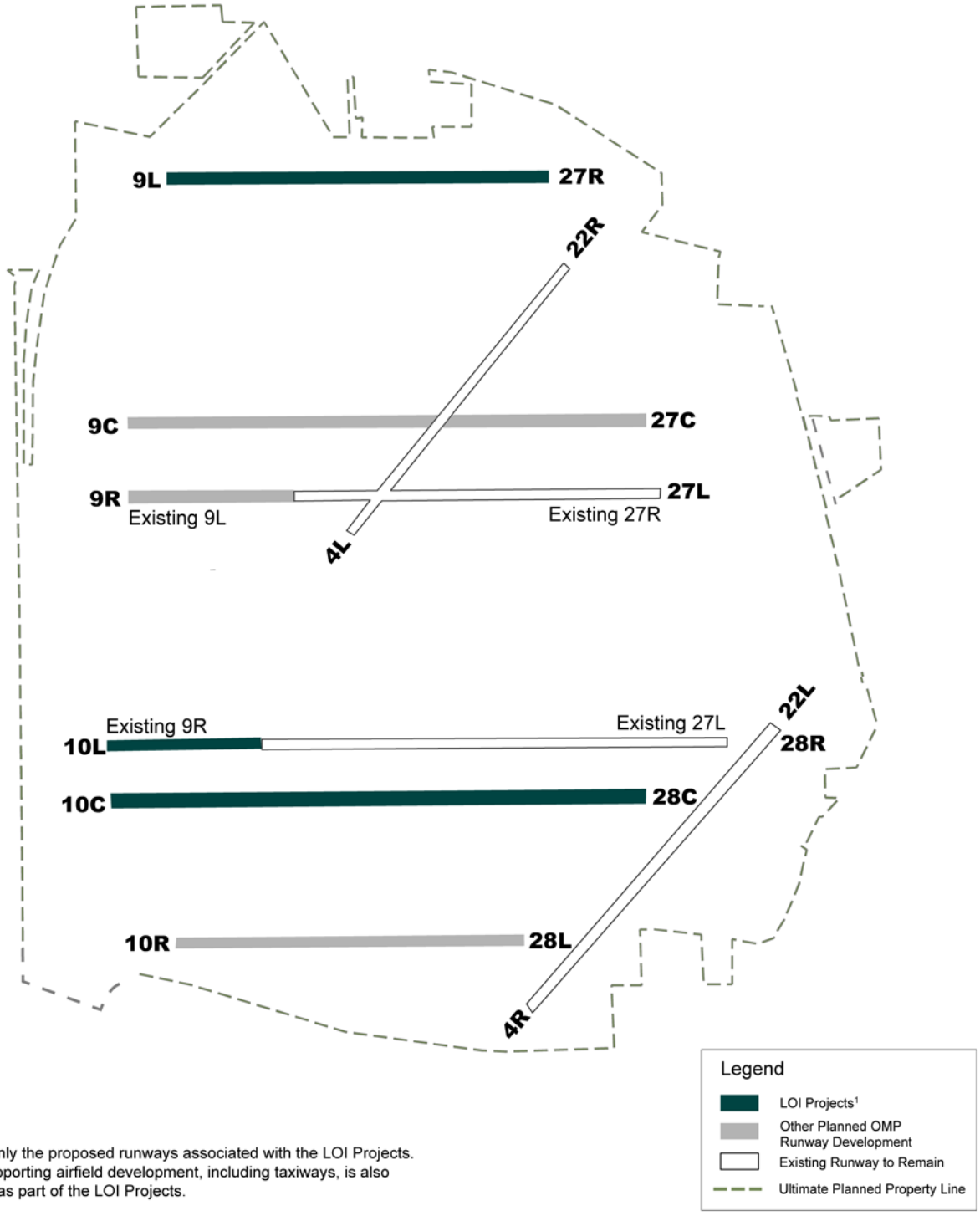
Aircraft delay historically has been a major issue at the Airport. The City and others have undertaken numerous studies over the past two decades aimed at identifying solutions to the increasing delay problem. These studies, which include the *1991* and *2002 Delay Task Force Studies*, have been conducted to investigate opportunities for runway development to mitigate escalating delays. While these studies concluded that several options were available to mitigate existing delays, few options studied prior to the OMP provided long-term capacity growth consistent with potential demand.

In response to the national interest in airport capacity and delay in Chicago, the U.S. Senate Committee on Commerce, Science and Transportation held a field hearing in Chicago on June 15, 2001, on *Air Traffic Congestion and Capacity in the Chicago, Illinois Region and Its Effects on the National Air Traffic System*. Testimony was provided by proponents of O'Hare expansion, proponents of a third airport in the Peotone area, and opponents of O'Hare expansion. While the Senate Committee did not take specific actions, it made clear its desire that local and State officials act soon on the issue of aviation capacity in Chicago, or face the possibility of federal intervention.

In response to the Committee's challenge, the City presented its OMP proposal for the future of O'Hare on June 29, 2001. The OMP proposal provided for the addition of one new runway, relocation of three runways, and extension of two existing runways, resulting in an airfield configuration with six runways in the east-west direction. **Exhibit I-1** depicts the proposed OMP runway projects. As presented, designations of two of the existing runways would change and the Airport's north and south airfields would be distinguished through the parallel runway naming convention. Specifically, the proposed parallel runways in the north airfield will be designated 9-27, and the proposed parallel runways in the south airfield would be designated 10-28. For the purposes of this document, the proposed runways will be identified by their proposed ultimate designations as presented on Exhibit I-1. Additional development is also proposed as part of the OMP, including construction of new taxiways, relocation of certain buildings, new Airport Traffic Control Towers, development of new terminal facilities on the west side of the Airport, and associated ground transportation access.

Subsequent to the City's proposal of the OMP, the State of Illinois held hearings on the proposed plan in the communities surrounding O'Hare. In December 2001, the City and the State agreed on the future OMP proposed development concept. On May 31, 2003, the Illinois General Assembly approved the O'Hare Modernization Act (Illinois Public Act 93-0450) and the Governor signed it into law on August 6, 2003. The O'Hare Modernization Act is intended to expedite and facilitate the OMP.

The OMP has business, community, and airline support (see **Appendix A** and **Appendix B**). Airline support for the OMP generally, and the LOI Projects specifically, has been reflected through a series of Majority-in-Interest (MII) funding approvals. These funding approvals are subject to certain conditions including the receipt of a $300 million LOI commitment for the LOI Projects.



[1]Depicts only the proposed runways associated with the LOI Projects. Other supporting airfield development, including taxiways, is also included as part of the LOI Projects.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit I-1

north

Not to Scale

OMP Airfield Projects (Runways Only)

Z://ORD Financial/LOI/Exhibits/LOI Exhibit Pack.pdf

1.2 Outline of Application

In its 1994 LOI Policy, the FAA outlined three major criteria that it would use to evaluate LOI applications, including a proposed project's (1) effect on overall system capacity, (2) benefits and costs, and (3) financing and timing. The subsequent sections of this LOI request discuss these criteria in depth.

- *Section II: System Role and Existing Conditions.* The purpose of this section is to illustrate the importance of the Airport's role in the NAS. Historical and forecast aviation activity and current airfield limitations at the Airport are identified.
- *Section III: The O'Hare Modernization Program.* This section summarizes the OMP purpose and need and expected system capacity benefits. Descriptions of the OMP and LOI Projects, cost estimates, and implementation schedule are provided.
- *Section IV: Benefit-Cost Analysis.* The FAA requires a qualitative and quantitative analysis of any capacity-enhancing project for which an LOI or AIP discretionary funding of $5 million or more is sought. This section summarizes the BCA methodology and results. The BCA was performed in accordance with the procedures outlined in the FAA's Benefit-Cost Analysis Guidance dated December 15, 1999 (the *BCA Guidance*).
- *Section V: Financial Plan.* The LOI request must demonstrate a sound financial representation of the relevant capital development program. The financial plan will place the request for LOI funds in the context of the total cost of OMP-Phase 1 Airfield Projects and highlight the local financial commitment.

Supporting documentation is provided in the following appendices:

- *Appendix A*: Community Support. Summary of OMP supporters.
- *Appendix B*: Airline Support. Transmittal letters from airline MII approvals.
- *Appendix C*: FAA and USDOT Documents. The appendix includes (1) *Airport Capacity Benchmark Report 2001*, FAA; (2) *Order Limiting Scheduled Operations, Docket FAA-2004-16944-1*, FAA and U.S. Department of Transportation, January 2004 (the *January 2004 FAA Order*) (3) Remarks by Secretary Mineta, Chicago O'Hare News Conference, January 21, 2004 (the *Secretary's Remarks*), (4) *Order Limiting Scheduled Operations at Chicago O'Hare International Airport*, Docket FAA-2004-16944-55, FAA and U.S. Department of Transportation, August 2004 (the *August 2004 FAA Order*), and (5) *Airport Capacity Benchmark Report 2004*, FAA.
- *Appendix D*: Supplemental Information
- *Appendix E*: BCA Tables
- *Appendix F*: Airport Master Plan – Capital Development Program

RICHARD M. DALEY
MAYOR

CHICAGO O'HARE INTERNATIONAL AIRPORT
O'HARE MODERNIZATION PROGRAM

II. System Role and Existing Conditions

Request for Letter of Intent to provide a

Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

1.2 Outline of Application

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- *Appendix D*: Supplemental Information
- *Appendix E*: BCA Tables
- *Appendix F*: Airport Master Plan – Capital Development Program

II. System Role and Existing Conditions

To further describe the Airport's role in the NAS, the following are discussed in this section: (1) the specific nature of airline operations at the Airport; (2) historical, current, and forecast aviation activity; (3) current capacity constraints at the Airport; and (4) the resulting effect of these limitations on the NAS.

2.1 Role of the Airport

The Airport, located approximately 18 miles northwest of downtown Chicago, has been the primary commercial airport serving the Chicago Region[1] since 1962. The current airfield configuration consists of six main runways used primarily by commercial service air carriers and one runway used for general aviation. The six main runways are configured in three sets of parallel runways: two east-west runways, two northwest-southeast runways, and two northeast-southwest runways.

Based on statistics from Airports Council International, the Airport ranked first worldwide in total operations in 2003[2] and second worldwide in total passengers (see **Exhibit II-1**). The Airport has been ranked first worldwide in total operations in 39 of the last 42 years and first worldwide in total passengers in 36 of the last 42 years.

The Airport is an integral component of the NAS as evidenced by its high level of aviation activity. Based on preliminary City statistics subject to change for calendar year 2004, O'Hare had 990,957 total aircraft operations, which is an increase of 6.7 percent from 2003.

2.1.1 Transportation Hub

The Chicago Region's large population and economic base provide a strong demand for local origin-destination (O&D) traffic at the Airport. This O&D traffic base, coupled with Chicago's location near the center of the United States along heavily traveled east/west air routes, make it a natural location for airline hubbing operations.

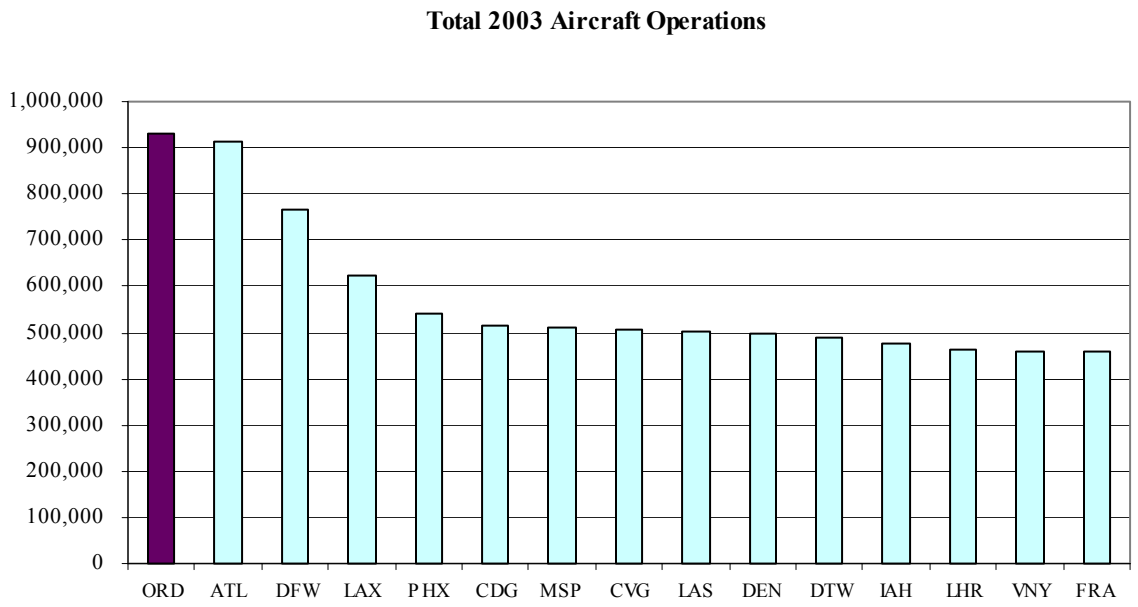
As noted in the *January 2004 FAA Order*, "O'Hare enjoys a unique status within the NAS. O'Hare serves as a network hub for two of the largest domestic airlines [American Airlines and United Airlines], an origin and destination for many international flights by both U.S. and foreign carriers, and given its location a logical connecting point for significant passenger flows across the United States."

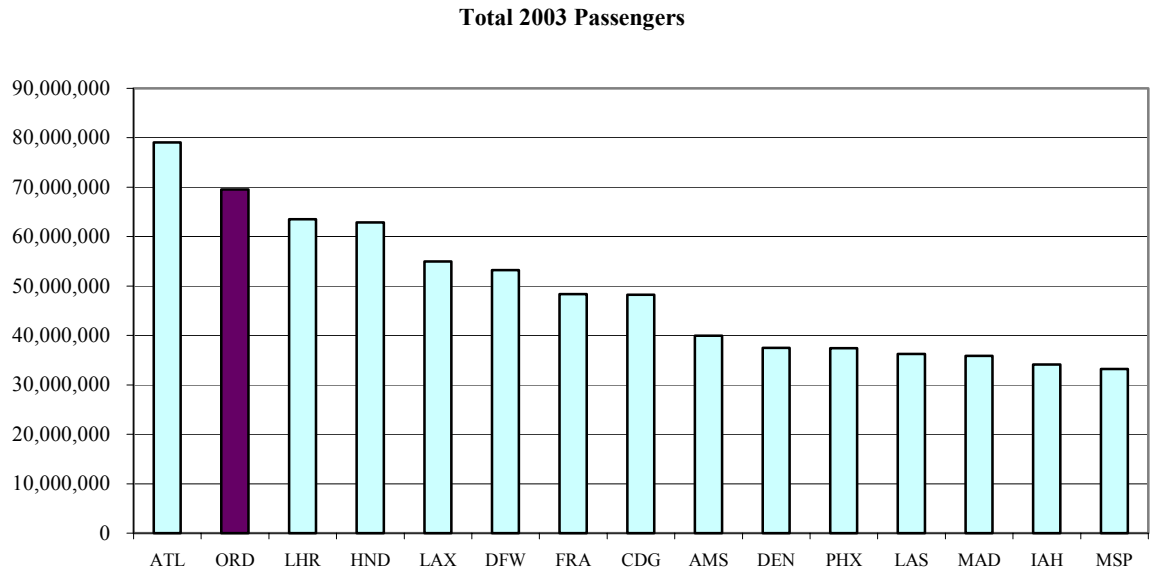
[1] Defined as the 13-county Chicago-Gary-Kenosha Consolidated Metropolitan Statistical Area (CMSA), which consists of the Chicago, Gary, Kankakee, and Kenosha MSAs, which are adjoining.

[2] 2004 annual statistics unavailable at the time of publishing.

Exhibit II-1

Top 15 Worldwide Ranking of Activity - 2003





Source: Airports Council International; City of Chicago, Department of Aviation Management Records.
Prepared by: Ricondo & Associates, Inc.

2.1.2 Economic Benefit

The Airport is an important part of the NAS, and it significantly contributes to both regional and national economic growth. Based on a July 2001 study by Booz•Allen & Hamilton, *Economic Impact of Chicago's Airports*, O'Hare's economic benefit to the region in 2000 was substantial and included the following:

- Contributed 400,000 to 480,000 jobs to the Greater Chicago Region.[3] The Airport generated between 15 and 20 percent of the employment in its immediate vicinity.
- Included 30,000 airline personnel based at O'Hare; 130,000 persons employed by the Airport and its tenants; 170,000 persons employed in tourism and visitor services; and 100,000 to 180,000 persons employed in access-sensitive businesses (i.e., corporate headquarters, research and development facilities, manufacturing, etc.) whose locations require proximity to an airport. The proximity itself promotes further business.
- Contributed $34 billion to $41 billion in annual economic activity to the Greater Chicago Region.

2.1.3 Air Service

The Chicago Region's strong economic base provides a significant O&D market of business and leisure travelers. The number of large corporations in the Chicago Region creates a significant demand for air transportation. Over the 10-year period from 1994 through 2003, O&D passengers have accounted for 43.2 percent of enplaned passengers.

The Airport has had a strong and stable base of air carriers. In 2004, the Airport had scheduled passenger service provided by 20 U.S. flag air carriers, scheduled and nonscheduled service by 27 foreign flag carriers, and non-scheduled service by 8 airlines, as shown in **Table II-1**. In addition, 26 all-cargo carriers provided cargo service at the Airport. Of the nation's 13 major air carriers, 12 serve the Airport.

In December 2004, nonstop service was provided to 129 domestic cities with a total of 8,144 weekly departing flights.[4] Each of the Airport's top 25 domestic O&D markets was served with nonstop service. As shown on **Table II-2**, the New York market was provided with the most service with 375 weekly nonstop departing flights during this period. **Exhibit II-2** illustrates the Airport's nonstop domestic markets as of December 2004. During the same period in December 2004, nonstop service was provided to 50 international cities with a total of 786 weekly departing flights, as shown on **Table II-3. Exhibit II-3** illustrates the Airport's nonstop international markets as of December 2003. Outside of North America, the London market was provided with the most service with 73 weekly nonstop departing flights during this period. This time period is reflective of current market service and traffic levels at the Airport.

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[3] In the Booz•Allen report, the Greater Chicago Region includes five economic regions around O'Hare: Chicago Downtown; O'Hare Vicinity Area, including the Northern and Western Suburbs and first set of townships in Lake and Kane Counties; Midway Vicinity, including the suburbs centered around Midway Airport; Northern Outer Suburbs, including the first set of townships along the lake shore north of Chicago, McHenry, Lake, Kane, and DuPage Counties; Southern Suburbs, including Will County, and a portion of Cook County not already included in the Chicago Downtown or Midway Vicinity.

[4] Source: *Official Airline Guide* - December 11, 2004 through December 17, 2004.

Table II-1

Airlines Serving O'Hare – 2004

Scheduled U.S. Carriers (20)	Foreign Flag Carriers (27)	Other/Nonscheduled Carriers (8)	All-Cargo Carriers (26)
Air Wisconsin (United Express)	Aer Lingus	Air 2000	Air China
Alaska	AeroMexico	American Trans Air	Airborne Express
America West	Air Canada	Casino Express	Air Trans International
American	Air France	Champion Air	(BAX Global)
American Eagle	Air India	Miami Air	Asiana
Atlantic Coast (United Express)	Air Jamaica	Ryan International	Atlas Air
Atlantic Southeast	Alitalia	Transmeridian	CAL Cargo
(Delta Connection)	Aviacsa	U.S.A. 3000	Cathay Pacific
Chautauqua	British Airways		China Airlines
Comair (Delta Connection)	British Midland		China Cargo
Continental	Cayman Airways		China Eastern
Continental Express	Condor		China Southern
Delta	Cross/Swiss		DHL Worldwide
Independence Air	El Al Israel		Emery/ACF
Mesa	Iberia		EVA Airways
Northwest	Japan		Evergreen
Sky West	KLM Royal Dutch		FedEx
Spirit	Korean		Gemini Air
Trans States	Kuwait		Kalitta
United	Lacsa		Lufthansa Cargo
US Airways	LOT Polish		Martin Air Holland, N.V.
	Lufthansa		Nippon
	Mexicana		Polar
	Pakistan		Singapore Cargo
	Royal Jordanian		Southern Air
	Scandinavian		United Parcel Service
	Turkish		World

Source: City of Chicago, Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

Table II-2

Top 25 Domestic Nonstop Passenger Markets

Rank	Market	Scheduled Weekly Nonstop Departing Flights [1]
1	New York/Newark	375
2	Washington	325
3	Minneapolis/St. Paul	174
4	Philadelphia	175
5	Los Angeles	193
6	Dallas/Ft. Worth	167
7	Atlanta	166
8	Cincinnati	153
9	Boston	145
10	Cleveland	141
11	Detroit	135
12	St. Louis	127
13	Denver	123
14	Madison	121
15	Houston	119
15	Pittsburgh	119
17	Las Vegas	117
18	Phoenix	113
19	Charlotte	112
20	Milwaukee	104
21	Indianapolis	103
22	Columbus	102
22	San Francisco	102
24	Cedar Rapids/Iowa City	97
24	Nashville	97
	Other Markets	4,439
	Total	8,144

[1] For the week of December 11, 2004 through December 17, 2004.

Source: Official Airline Guides, Inc. *Official Airline Guide.*
Prepared by: Ricondo & Associates, Inc.

Source: *Official Airline Guide, Inc.,* (December 11, 2004 - December 17, 2004).
Prepared by: Ricondo & Associates, Inc.

Exhibit II-2

north

S://Graphics Library/Misc Maps/non-stop domestic flights.ai

Chicago-O'Hare's Nonstop Domestic Markets

Table II-3

Top International Nonstop Passenger Markets

Rank	City	Country	Scheduled Weekly Nonstop Flights [1]
1	Toronto	Canada	121
2	Montreal	Canada	74
3	London	U.K.	73
4	Ottawa	Canada	61
5	Frankfurt	Germany	38
6	Mexico City	Mexico	37
7	Tokyo	Japan	28
7	Winnipeg	Canada	28
9	Birmingham	U.K.	21
9	Calgary	Canada	21
11	Paris	France	20
12	Manchester	U.K.	15
13	Amsterdam	Netherlands	14
13	Edmonton	Canada	14
13	Guadalajara	Mexico	14
13	Vancouver	Canada	14
17	Monterrey	Mexico	13
18	Cancun	Mexico	12
19	Beijing	China	7
19	Brussels	Belgium	7
19	Buenos Aires	Argentina	7
19	Copenhagen	Denmark	7
19	Dublin	Ireland	7
19	Hong Kong	China	7
19	Los Cabos	Mexico	7
19	Madrid	Spain	7
19	Milan	Italy	7
19	Morelia	Mexico	7
19	Munich	Germany	7
19	Osaka	Japan	7
19	Sao Paulo	Brazil	7
19	Seoul	Korea	7
19	Shanghai	China	7
19	Stockholm	Sweden	7
19	Warsaw	Poland	7
19	Zurich	Switzerland	7
	Other Markets		42
	Total		786

[1] For the week of December 11, 2004 through December 17, 2004.

Source: Official Airline Guides Inc., *Official Airline Guide.*
Prepared by: Ricondo & Associates, Inc.

Source: *Official Airline Guide, Inc.,* (December 11, 2004 - December 17, 2004).
Prepared by: Ricondo & Associates, Inc.

Exhibit II-3

north

Chicago-O'Hare's Nonstop International Markets

S://Graphics Library/Misc Maps/non-stop international flights2.ai

2.2 Aviation Activity

2.2.1 Historical Growth

Table II-4 presents aircraft operations at the Airport between 1995 and 2004. As shown, total operations at the Airport increased from 900,279 in 1995 to 990,957 in 2004 as preliminarily reported by the City. This increase represents a compounded annual growth rate of 1.1 percent during this period, compared to an FAA forecast of nationwide growth rate of 0.4 percent. Total aircraft operations at the Airport increased 0.3 percent in 2001, 1.2 percent in 2002, 0.6 percent in 2003, and 6.7 percent in 2004 as preliminarily reported by the City.

Table II-4

Historical Aircraft Operations (1995-2004)

Year	Total Aircraft Operations [1]
1995	900,279
1996	909,593
1997	883,761
1998	896,110
1999	896,228
2000	908,989
2001	911,917
2002	922,817
2003	928,691
2004[2]	990,957

[1] Includes general aviation, helicopter, and other miscellaneous operations.

[2] 2004 aircraft operations are preliminary data and subject to change.

Source: City of Chicago, Department of Aviation.
Prepared by: Ricondo & Associates, Inc

Table II-5 presents historical enplanements (domestic and international) for the Airport from 1995 through 2004. As shown, enplanements at the Airport increased from approximately 32.9 million enplanements in 1995 to approximately 35.9 million in 1999. This increase represents a compounded annual growth rate of 1.0 percent during this period. Due in large part to labor troubles at United, enplanements decreased 0.7 percent in 2000 from 1999 levels. Enplanements at the Airport decreased 6.7 percent in 2001 from 2000 levels, and an additional 1.2 percent in 2002 due primarily to the events of September 11, 2001 and the national economic slowdown. These three years of decreasing activity caused enplanements to decline from approximately 35.9 million in 1999 to approximately 32.9 million in 2002. However, by 2004, enplanements exceeded pre-September 11, 2001 levels reaching 37.4 million, an 8.8 percent increase over 2003 enplanements.

Table II-5

Historical Enplanements (1995-2004)

Year	Enplanements
1995	32,861,460
1996	34,067,885
1997	34,774,114
1998	35,758,810
1999	35,946,964
2000	35,700,525
2001	33,310,203
2002	32,918,936
2003	34,406,667
2004[1]	37,431,122

[1] 2004 enplanements are preliminary data and subject to change.

Source: City of Chicago, Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

2.2.2 Forecast Growth

Future aviation demand at the Airport is based on forecasts previously developed by FAA. As shown in **Table II-6**, according to the 2002 TAF as converted to calendar years (CY) in the DEIS, aircraft operations at the Airport are forecast to increase from 976,544 in CY 2004 to 1,194,000 in CY 2018, at a compound average annual growth rate of 1.4 percent over the 14-year period. The number of enplanements at the Airport is forecast by the FAA to increase from approximately 33.6 million in 2004 to 50.4 million in 2018, a 2.9 percent compound average annual growth rate over the same 14-year period.

Air transportation demand is strongly influenced by the demographic and economic characteristics of an airport's O&D passenger market, which includes passengers that either begin or end their trip at the airport. As a result, the strength of the City's underlying economic base remains an important element of passenger demand. The Chicago Region, which includes the nation's third-largest city, has an economic base that will generate increased demand for air travel at the Airport during the forecast period.

Table II-6

2002 FAA Terminal Area Forecasts for O'Hare International Airport – Total Operations and Enplanements
Unconstrained Schedule

Calendar Year	2002 TAF Operations	2002 TAF Enplanements
2002	922,787	31,710,512
2003	960,500	32,609,000
2004	976,544	33,633,730
2005	992,855	34,696,477
2010	1,072,706	40,280,622
2015	1,149,402	46,367,491
2018	1,194,000	50,372,000

Source: FAA, *O'Hare Modernization Draft Environmental Impact Statement*, January 2005.
Prepared by: Ricondo & Associates, Inc.

2.3 Aircraft Delay and Airfield Limitations

Given the changing conditions in the aviation industry and the high levels of current and forecast airline traffic at the Airport, several issues currently impact O'Hare's ability to fulfill its critical role in the NAS. These include the following:

- Aircraft Delay
- Lack of Arrival and Departure Balance
- Peak Period Demand
- Lack of Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) Capacity Balance
- VFR Delay
- Land and Hold Short Operations
- Runway Length
- Regional Jet Operations
- New Large Aircraft

A description of each of these issues follows.

2.3.1 Aircraft Delay

Aircraft delay has historically been a major issue at the Airport. The City and others have undertaken numerous studies over the past two decades aimed at identifying solutions to the increasing delay problem. These studies, which include the *1991* and *2002 Delay Task Force Studies*, investigated opportunities for runway development to mitigate escalating delays. While it was concluded that several options were available to mitigate existing delays, few options studied prior to the OMP provided long-term capacity growth consistent with potential needs.

In the late 1990s delays rose substantially, primarily as the result of changes in the use of land and hold short operations (LAHSO) procedures and the increased use of regional jet (RJ) aircraft, which have aircraft performance limitations. Due to weather and airline labor issues, the summer of 2000 was a particularly delay-prone period at O'Hare and throughout the NAS, resulting in national attention being focused on airport delay issues.

In response to the system-wide increases in delay experienced in the summers of 1999 and 2000, and notwithstanding FAA initiatives to mitigate those delays, the U.S. Congress requested that the FAA develop capacity benchmarks for the busiest airports in the nation. The current capacity benchmark is defined as an achievable level of performance for a particular airport. The following are excerpts from the FAA's *Airport Capacity Benchmark Report 2001*[5] relevant to O'Hare:

- The optimum acceptance rate for aircraft operations at Chicago O'Hare is 200-202 flights per hour in good weather with unlimited ceiling and visibility.
- Current capacity decreases to the reduced rate of 157 to 160 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- In 2000, O'Hare was ranked the third most delayed airport in the country in terms of number of flights delayed per 1,000 operations. Overall, slightly more than 6 percent of all flights were delayed more than 15 minutes.

[5] Since the publication of the *Airport Capacity Benchmark Report 2001*, the FAA has also published an *Airport Capacity Benchmark Report 2004* dated Setpember 2004, which is included in Appendix C.

- On good weather days, scheduled traffic is at or above the capacity benchmark for three and one-half hours of the day and about two percent of the flights are delayed more than 15 minutes.
- In adverse weather, O'Hare's airfield capacity drops and scheduled traffic exceeds capacity for eight hours of the day. The number of flights delayed over 15 minutes jumps to 12 percent.
- Technology and procedural improvements are expected to increase O'Hare's airfield capacity benchmark in good weather by 6 percent over the next 10 years.
- The adverse weather airfield capacity benchmark will increase by a total of 12 percent compared to today, given expected technology and procedural improvements.
- Demand at O'Hare is forecast to increase 18 percent over the next decade. This imbalance between capacity and demand growth is expected to significantly increase delays at O'Hare.

As a reaction to record aircraft delays since November 2003, the FAA, with the consent of American Airlines and United Airlines, issued its *January 2004 FAA Order,* which required American and United to reduce their number of aircraft operations and those of their regional affiliates by 5 percent during peak hours at the Airport for 6 months. Based on FAA Aviation System Performance Metrics (ASPM) data for November and December 2003, 39 percent of O'Hare's arrivals were delayed. During this period, there were an average of 492 aircraft delays per day and an average of 57 minutes of delay per flight. Upon announcement of this order, it was stated in the *Secretary's Remarks*, "As many of you are aware, delays at Chicago O'Hare International Airport have increased sharply in recent months, reaching what I believe to be an unacceptable level." Secretary Mineta recognized that this action is not the ultimate solution towards addressing the delay situation at the Airport, as he stated, "While this Department continues working toward a comprehensive, long-term solution to this challenge, this order provides American travelers with necessary and immediate action to alleviate potential travel delays."

Subsequent to expiration of the *January 2004 FAA Order*, the FAA issued its *August 2004 FAA Order*. Effective November 1, 2004, the FAA and the domestic airlines serving O'Hare, agreed to voluntarily limit scheduled arrivals to 88 per hour between 7:00 a.m. and 8:00 p.m. United and American, which represented a total of approximately 80 percent of enplanements (including affiliates) at O'Hare in the past 5 years agreed to the largest reductions. United agreed to reduce 20 arrivals per hour and American agreed to reduce 17 arrivals per hour, both between 7:00 a.m. and 8:00 p.m. United (including United Express) will still have 588 daily arrivals between 7:00 a.m. and 8:00 p.m., and American (including American Eagle) will have 492 daily arrivals during the same period. The voluntary agreement is expected to reduce delays at O'Hare by 20 percent. The measures contained in the voluntary agreement are scheduled to expire on April 30, 2005.

The FAA considers two main measures of delay for airports, the number of flights delayed and average annual delay per aircraft operation. The first measure is intended to quantify how many aircraft operations experience a delay at a given airport. The second measure is used to describe the average severity of aircraft delays at a given airport.

2.3.1.1 Number of Flights Delayed

Since completion of the FAA's *Airport Capacity Benchmark Report 2001*, delays at O'Hare have continued at high levels. **Table II-7** presents the number of aircraft delayed 15 minutes or more at 20 large hub airports in 1997 though 2003, the latest available final data. As shown, O'Hare ranked first in number of delays per 1,000 flights in 2002 and 2003. Since 1997, the number of flights at

O'Hare delayed 15 minutes or more has increased 216 percent, from 23.5 flights per 1,000 in 1997 to 74.3 flights per 1,000 in 2003.

Table II-7

Number of Operations Delayed 15 Minutes or More Per 1,000 Operations at Scheduled Airports

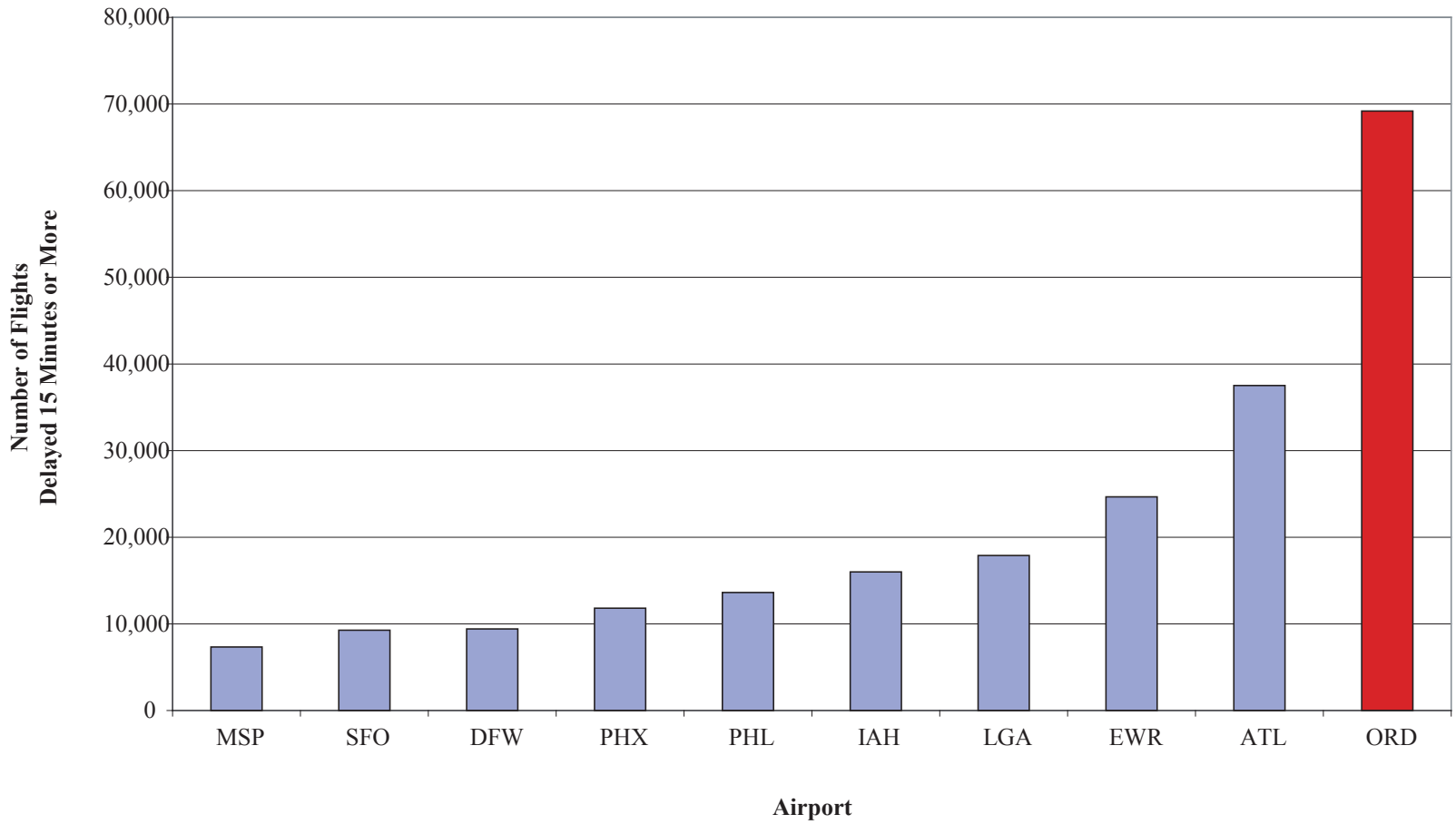
2003 Rank	City and Airport	1997	1998	1999	2000	2001	2002	2003
1	**Chicago - O'Hare (ORD)**	**23.5**	**32.0**	**54.8**	**63.3**	**59.5**	**57.6**	**74.3**
2	Newark (EWR)	57.9	69.2	78.9	81.2	60.3	33.6	60.0
3	New York - LaGuardia (LGA)	49.0	68.4	77.3	155.9	77.0	34.4	47.2
4	Atlanta (ATL)	31.8	32.8	36.0	30.9	24.3	33.5	41.2
5	Houston (IAH)	12.9	22.2	20.5	28.1	33.0	41.4	33.4
6	Philadelphia (PHL)	16.2	24.6	30.2	44.5	40.4	35.1	30.6
7	San Francisco (SFO)	43.0	68.1	48.0	56.9	38.3	35.3	27.8
8	New York-Kennedy (JFK)	18.3	36.3	38.1	38.8	24.6	25.2	20.9
9	Phoenix (PHX)	9.2	22.2	20.9	22.0	15.3	14.7	20.0
10	Washington D.C. - Dulles (IAD)	5.9	12.1	19.2	19.5	8.1	10.0	16.0
11	Chicago - Midway (MDW)	3.5	5.1	9.7	11.9	8.1	9.8	15.2
12	Minneapolis-St. Paul (MSP)	6.7	7.2	17.2	12.7	14.5	17.2	14.4
13	Cincinnati (CVG)	11.9	15.2	18.5	15.4	10.2	13.7	13.8
14	Fort Lauderdale (FLL)	1.9	2.2	2.8	3.7	5.3	7.0	13.5
15	Las Vegas (LAS)	4.1	6.4	7.1	8.0	5.4	7.3	13.1
16	Dallas-Fort Worth (DFW)	14.6	11.3	19.3	23.8	22.0	24.1	12.1
17	St. Louis (STL)	30.5	31.6	19.2	18.2	18.1	15.4	12.1
18	Miami (MIA)	6.8	6.3	8.2	11.3	11.3	8.6	11.8
19	Boston (BOS)	25.2	31.8	29.8	47.5	34.4	10.7	10.2
20	Detroit (DTW)	8.3	9.4	20.6	17.6	15.4	12.9	9.8

Source: FAA, OPSNET.
Prepared by: Ricondo & Associates, Inc.

When compared according to total number of flights delayed (delays equal to or greater than 15 minutes), O'Hare experiences significantly greater delays than the other delayed airports in the system. **Exhibit II-4** depicts the total flights delayed at top 10 most-delayed airports in 2003. The number of flights delayed at O'Hare was almost double the number at the second most-delayed airport. In November 2003, delays of 15 minutes or more at O'Hare reached 152.6 flights per 1,000. Based on United States Department of Transportation (USDOT) standards, on-time performance for November 2003 was only 57.3 percent at the Airport compared to 80.3 percent nationwide.

2.3.1.2 Average Annual Delay

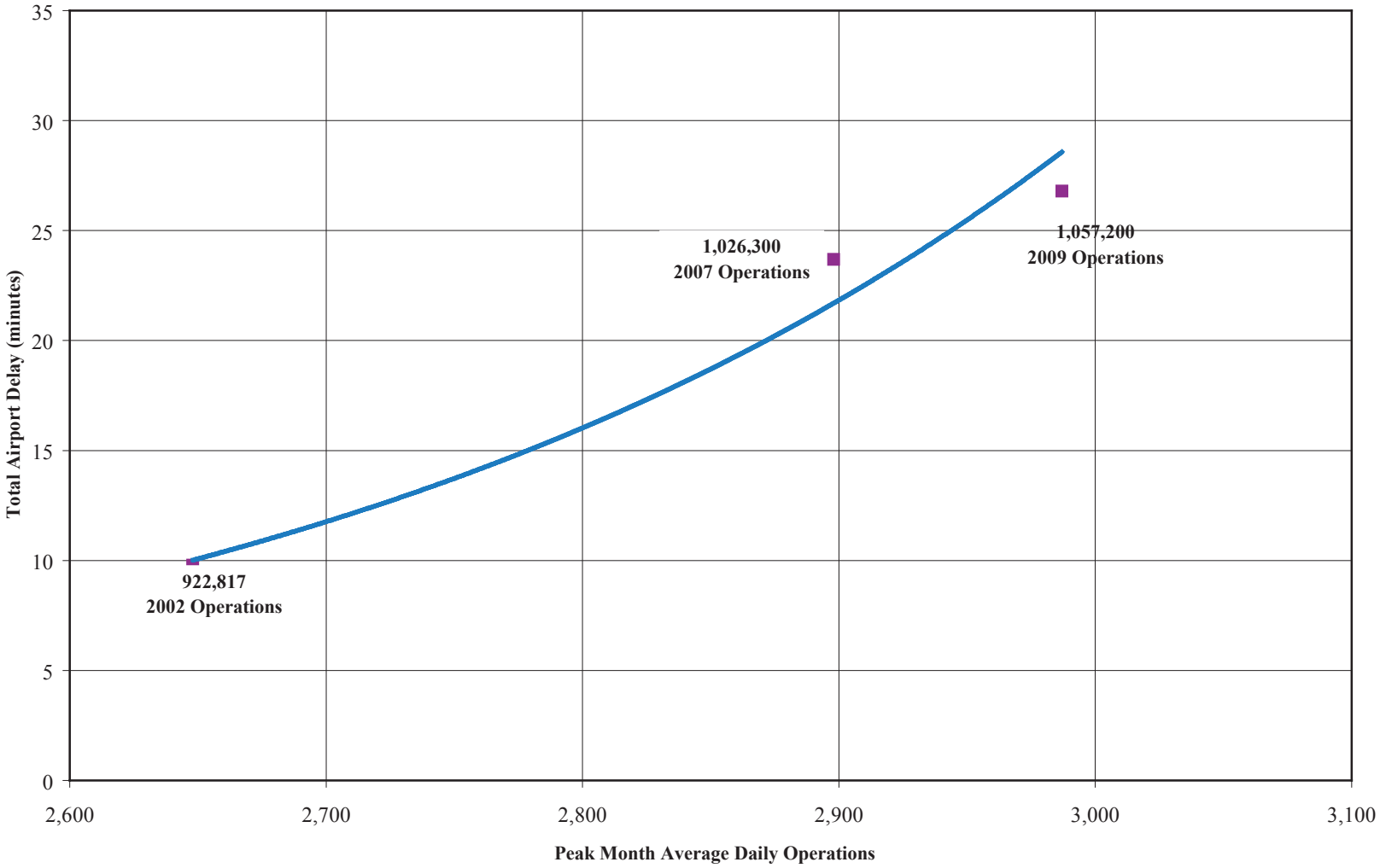
According to the *BCA Guidance*, average annual delays of 10 minutes or more per operation are considered "severe", and operations would generally stop increasing when average annual delays reach 20 minutes per operation. As presented on **Exhibit II-5**, average annual delay at the Airport under the unconstrained forecast will exceed these levels in the near-term future.



Source: FAA OPSNET 2003 data.
Prepared by: Ricondo & Associates, Inc.

Exhibit II-4

Total Number of Delayed Flights for Top 10 Most Delayed U.S. Airports in 2003



Source: Total Airport and Airspace Modeler, FAA 2002 Terminal Area Forecast, Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit II-5

Annualized Average Delay with Existing Airfield

Furthermore, because the Airport has been operating near or at capacity, relatively large increases in average annual delay per aircraft operation are expected to occur as a result of relatively minor increases in demand.

O'Hare reached 990,957 operations in 2004 according to preliminary City statistics, which resulted in airline and FAA actions to limit operations at the Airport to reduce delay. As O'Hare continues to be one of the most delayed airports in the United States and the intensity of these delays also continues to increase, the reliability of the overall NAS will continue to be compromised given the Airport's critical role. Further analysis of expected delay impacts is presented in the BCA.

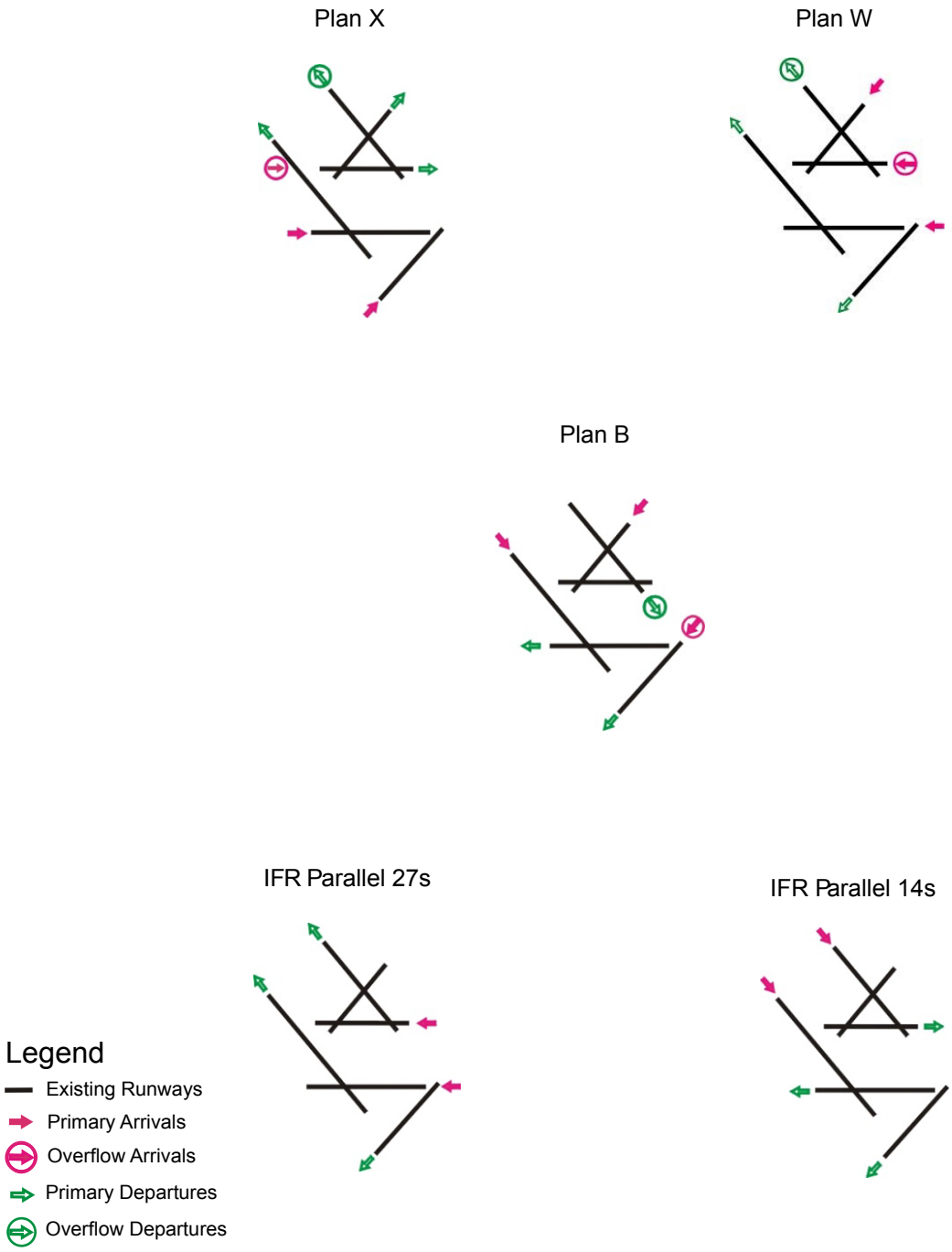
2.3.2 Lack of Arrival and Departure Balance

The existing runway geometry of the Airport accommodates the use of a variety of converging runway operating configurations under VFR conditions. The most commonly used configurations are described as follows and are illustrated on **Exhibit II-6.**

- Plan X: Under this operating configuration, aircraft arrive on Runways 4R and 9R and depart on Runway 32L from the intersection of Taxiway T10, Runway 9L, and Runway 4L. During periods of high arrival demand, Runway 9L is used as a third arrival runway.
- Plan W: Under this operating configuration, aircraft arrive on Runways 27L and 22R. During periods of high arrival demand, Runway 27R is used as a third arrival runway, which requires aircraft landing on Runway 22R to land and hold short of Runway 27R. Aircraft depart on Runways 22L and 32L from the intersection of Taxiway T10. During the later afternoon periods, Runway 32R is also used for international departures.
- Plan B: Under this operating configuration, aircraft arrive on Runways 14R and 22R and depart on Runways 14L, 22L, and 27L. During periods of high arrival demand, Runway 22L is used as a third arrival runway.

During IFR and certain VFR conditions, converging approaches are not permitted. As a result, only two arrival streams are available and arrival capacity is significantly diminished. The two predominant IFR operating configurations are described below and also illustrated on the attached Exhibit II-6.

- IFR Parallel 27s: Under this configuration, Runways 27R and 27L are used as the arrival runways, while Runways 32R, 22L, and 32L from the intersection of Taxiway T10 are used for departing aircraft.
- IFR Parallel 14s: Under this configuration, Runways 14R and 14L are used as the arrival runways and Runways 27L, 22L, and 9L are used as the departure runways.



Sources: Ricondo & Associates, Inc., ORD ATCT
Prepared by: Ricondo & Associates, Inc.

Exhibit II-6

North

Operating Configurations
Existing Airfield

Z://ORD Financial/LOI/Exhibits/LOI Exhibit Pack.pdf

Under most VFR conditions, operating configurations are available which provide either a third arrival runway or a third departure runway, which are used effectively to meet the peaking pattern of the hubbing operations. However, the ability to accommodate a balanced arrival/departure operation at current peak hour volumes is not available.

2.3.3 Peak Period Demand

Both capacity and demand are dynamic with demand changing through the day based on aircraft activity, and capacity changing as different runway configurations are used to match weather conditions and arrival and departure banks. A bank is generally defined as a group of arriving or departing operations scheduled by a hubbing airline during a specific period of time. In order to facilitate the transfer of passengers from an arriving flight to a departing flight in a timely fashion, an arrival bank traditionally precedes a departing bank by approximately 60 to 90 minutes. Therefore, banks are a natural occurrence at hubbing airports due to the transfer of passengers. Given that O'Hare is a hub airport for American Airlines and United Airlines, a major portion of its flights have historically been operated in banks, as follows:

- American Airlines and United Airlines schedule banks of flights in alternating hours and directions (e.g., east/west) throughout the day.
- The duration of a bank is approximately 15 to 25 minutes depending on time of day.
- Within these banks, scheduled flights are typically evenly spread because of capacity/flow constraints.
- Banks tend to overlap; however, the beginning and end of banking periods are less intense than the middle of the bank, and the overlap can be accommodated.

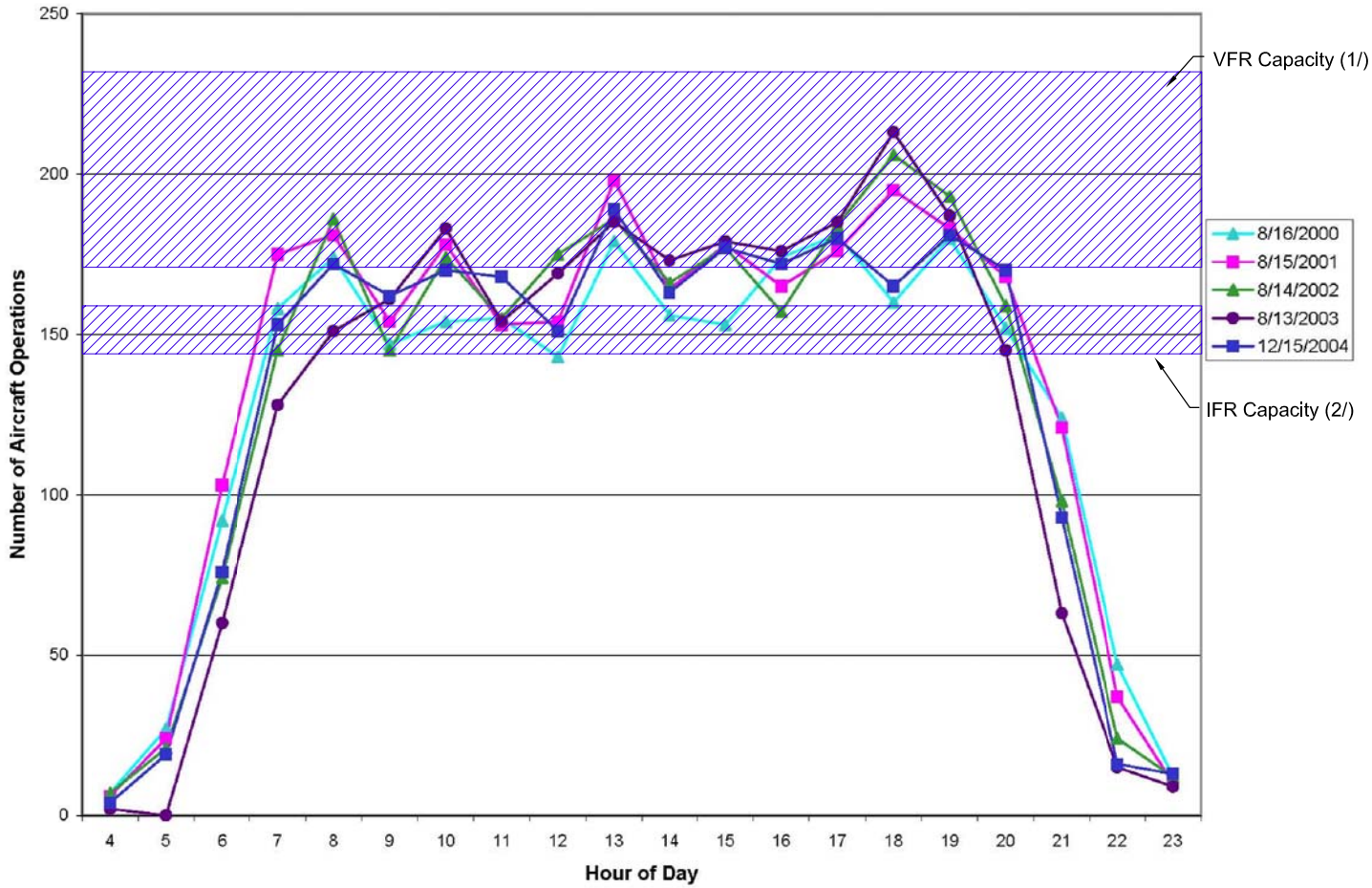
A further review of airline operations at O'Hare reveals that the demand distribution throughout the day has changed over the past few years. As illustrated on **Exhibit II-7,** changes in airline schedules post-September 11, 2001 have resulted in an increase in peak hour demand but an overall decrease in daily demand. Exhibit II-7 illustrates the various daily demand distributions and their relationship to the peak hour throughput of the existing airfield under both VFR and IFR conditions. Demand frequently is at or exceeds capacity throughout the day, especially during IFR conditions, resulting in aircraft delay.

2.3.4 Lack of VFR and IFR Capacity Balance

Current traffic demands require airlines at O'Hare to schedule their operations to the VFR capacity of the airfield. As a result, during conditions of reduced capacity, significant operational delays are incurred. While a third arrival runway is available under most VFR conditions through the use of converging approaches, converging approaches are not utilized during IFR conditions. As a result, airfield capacity during IFR conditions is greatly reduced, causing significant operational delays. This imbalance in VFR and IFR capacity is a significant cause of delay at O'Hare, which propagates throughout the system.

2.3.5 VFR Delay

VFR delays generally occur because of the inability of the airfield to provide a balanced capacity consistent with demand. For example, departure delays occur during VFR conditions with strong easterly winds. In an east runway configuration (Plan X), aircraft are landing on



Notes:
1/ VFR capacity low-range is 171 based on high-arrival demand for Plan X, and high-range of 232 based on high departure demand for Plan X.
2/ IFR capacity low-range of 144 is based on a 50/50 arrival and departure mix for IFR Runways 14L and 14R, and high-range of 159 based on a high departure demand for IFR Runways 14L and 14R or 27L and 27R.

Source: For aircraft operations - Official Airline Guides, Inc. (August 16, 2000; August 15, 2001; August 14, 2002; August 13, 2003 and December 15, 2004),
For IFR & VFR Capacity - FAA Capacity and Delay Model based on LAHSO rules and configurations prior to recent changes.
Prepared by: Ricondo & Associates, Inc.

Exhibit II-7

Typical Daily Air Carrier Operations

Drawing: Z:\Chicago\ORD Financial\LOI\Exhibits\OMP LOI Sched Weekly Air Carrier Ops.dwg_Layout: Layout1_Feb 14, 2005, 2:54pm

Runways 9L, 9R, and 4R. Departures can occur on Runways 4L and 9L, however, only when Runway 9L is not being used for arrivals. Another example of departure delay during VFR conditions occurs during southerly winds and when the Airport is operating in a Plan B configuration. Arrivals occur on Runways 14R, 22R, and as an overflow (during peak arrival periods), Runway 22L. Aircraft depart on Runway 22L and Runway 27L, "shooting the gap" between Runway 14R arrivals. Therefore, aircraft delay occurs when departures are required to hold for runway clearance. In both of these examples, the unbalanced arrival/departure condition results in VFR delay.

In addition, O'Hare's existing airfield relies on several operating configurations during VFR conditions. These various configurations are used primarily based on wind conditions and arrival/departure balance; therefore, a change in operating configuration is required as wind conditions change. A change in configuration typically results in aircraft delay due to the workload requirements on the air traffic system to implement a change in operating configuration.

2.3.6 Land and Hold Short Operations

As explained previously, aircraft delay during VFR conditions is primarily due to the inability of the airfield to provide balanced capacity consistent with demand. This is further exacerbated when relatively minor degradations in VFR weather occur, such as a brief rain shower or a tailwind, which preclude the use of LAHSO procedures.

When the airfield is operating under the Plan W configuration, LAHSO procedures are in effect, and the FAA's established acceptance rate for the airfield is approximately 100 arrivals per hour. However, as the runways become wet, LAHSO is suspended and a third arrival runway is no longer available. As a result, the FAA's acceptance rate drops from 100 arrivals per hour to a maximum of 80 arrivals per hour. This reduction in capacity generally results in a ground delay program and/or ground stops for aircraft at other airports destined for O'Hare.

2.3.7 Runway Length

Some operating configurations reduce the available departure distance of the Airport's longest runway. When pilots require longer runways than available under the operating configuration, the airfield's arrival capacity is impacted as air traffic controllers must delay arrivals on crossing runways to allow a gap for the aircraft to depart. Existing Runway 14R-32L is the longest runway at O'Hare, at 13,000 feet. During a VFR west operation (Plan W), Runway 32L is used as a departure runway from the Taxiway T10 intersection resulting in approximately 8,700 feet of available departure distance. For those aircraft requiring additional departure distance, pilots are offered Runway 32L from the Taxiway M intersection (approximately 9,600 feet of available departure distance). Both of these intersection departure options permit independent arrivals on Runways 27L and 27R with no impact on arrival throughput. For aircraft requiring more than 9,600 feet of departure distance, pilots are offered either Runway 32R or 32L at full length (10,000 and 13,000 feet, respectively). Use of either of these options requires coordination with other runway operations thus reducing capacity.

In a VFR east operation (Plan X), the impact of full-length departures is even greater as aircraft requiring Runway 32L at full length create a requirement for simultaneous arrival gaps on both Runway 9L and 9R.

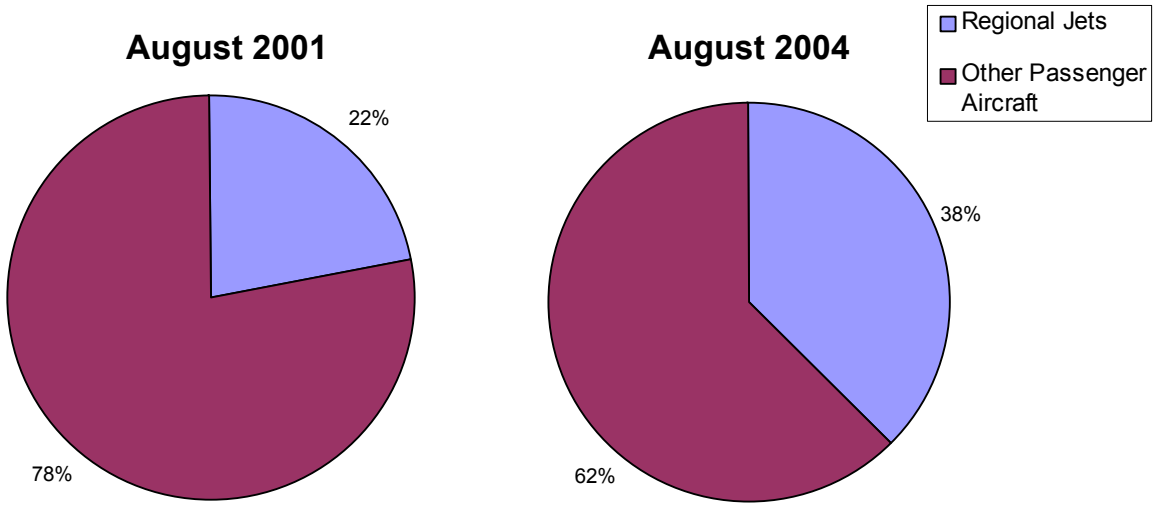
2.3.8 Regional Jet Operations

Since its introduction, the RJ has become the fastest growing aircraft type within the airline industry. The RJ provides service levels similar to mainline jet aircraft with operating characteristics and costs that make it a feasible and attractive replacement to turboprop commuter aircraft on many routes. As shown on **Exhibit II-8**, use of the RJ increased to 38 percent of daily operations at O'Hare in August 2004 from 22 percent in August 2001. The RJ is used both as a replacement for commuter turboprop aircraft and for narrow-body aircraft in traditional mainline markets. RJs are also being used to provide supplemental service to high frequency, short-haul airports near other large markets, such as the airports in Manchester, Hartford, and White Plains in lieu of the more congested airports in Boston and New York.

When airlines use RJs as replacements for mainline aircraft, increased operations are required to provide the same number of seats. Given the aforementioned airfield capacity constraints at the Airport, minor increases in aircraft operations create incremental aircraft delays at the Airport. Therefore, during periods when the number of passengers has decreased, the number of delays has continued to increase. Additionally, the lower operating speeds of RJs compared to mainline aircraft and increased in-trail separation requirements cause further airspace congestion.

Exhibit II-8

Share of Regional Jet Aircraft and Other Passenger Aircraft Operating at O'Hare



Source: City of Chicago, Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

2.3.9 New Large Aircraft

The NLA category, or Airplane Design Group (ADG) VI, most notably includes the Airbus A380, which is projected to enter service in 2007. Several airfield limitations at the Airport restrict access for this aircraft. Only one runway at O'Hare meets the FAA's runway width design criteria for ADG VI aircraft (Runway 14R-32L). However, the parallel taxiway for Runway 14R-32L does not have

adequate separation to allow for unrestricted ADG VI taxiing. Significant operational limitations on specific taxiways would occur when an A380 is operating on the existing airfield.

2.4 National Airspace System Capacity Implications

Among the FAA's major concerns is the impact that increased delays at busy airports have on the efficiency of the NAS. While considerable emphasis has been placed on improving system capacity without adding new pavement (e.g., through refinements in air traffic control procedures and improvements in navigational aids technology), the FAA acknowledges the significant role of building new runways, particularly at major connecting hubs. In its *2001-2005 NPIAS* report, the FAA stated that the largest increases in capacity at the worst delayed airports could be achieved through new runway construction. The report also notes that the ability of connecting hub airports to accommodate future growth and retain hub carriers is predicated on the provision of additional runway capacity. The *2002 Aviation Capacity Enhancement Plan*, which outlines the FAA's initiatives to improve NAS performance, clearly states that the construction of new runways and the extension of existing runways are the most significant and direct ways to improve capacity at existing airports.

The NAS consists of individual airports that form interconnected and interdependent components of a network. A delay at one airport can propagate throughout the system, disrupting traffic well beyond the original location of the delay. Of particular importance are large-hub airports (e.g., O'Hare), which are critical elements of the network and must be able to process significant numbers of operations to maintain system efficiency. Air traffic at one airport must be seen in a system-wide context, in which delays can significantly affect operations at other airports.

One of O'Hare's major benefits to the NAS stems from its role as a connecting hub and the competitive options it provides to travelers in other Midwestern markets and throughout the United States. The Airport's geographical location in the central United States and its large O&D base support its function as a major east-west connecting hub airport, as well as a major Midwest hub providing service to other regions. Given its large share of aviation activity and the overall system's dependency on its connecting capacity, delays at the Airport cause ripple effects throughout the NAS. In the *Secretary's Remarks*, it was noted that in December 2003 alone, delays at O'Hare caused more than a 10 percent increase in the average flight delay at the nation's top 35 airports.

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O'HARE MODERNIZATION PROGRAM

III. The O'Hare Modernization Program

III. The O'Hare Modernization Program

Request for Letter of Intent to provide a

Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

III. The O'Hare Modernization Program

The purpose of this section is to present (1) an overview of the OMP, including the program's purpose and benefits; (2) a description of proposed improvements; (3) estimated capital costs and implementation schedule; and (4) identification of the OMP-Phase 1 development that constitute the LOI Projects that are the subject of this LOI request.

3.1 Purpose and Benefits of the OMP

The purpose of the OMP is to reduce current and projected delays at O'Hare and throughout the NAS and add incremental capacity for the Airport to accommodate demand. The OMP includes a reconfiguration of the airfield into a modern parallel runway system that will allow the Airport to operate more efficiently. The 2002 FAA TAF forecasts continued growth at the Airport. Delays at O'Hare adversely affect regional air transportation and the NAS.

O'Hare delays are a consequence of the Airport's converging runway configuration, which does not provide balanced capacity in IFR and VFR conditions or between arrivals and departures. Currently, these limitations significantly impact the national system even in good weather during peak periods of the day, as recognized by the *January 2004 FAA Order* and the *August 2004 FAA Order* limiting scheduled operations during peak operating hours.

Consistent with statutory requirements for the use of LOI funds, the OMP will enhance system-wide airport capacity. The DEIS defines the purpose and need of the proposed action (OMP development) as:

- Address the projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.
- Ensure that existing and future terminal facilities and supporting infrastructure (access, landside, and related ancillary facilities) can efficiently accommodate airport users.

Additional benefits of the OMP include:

- Providing flexible opportunities for increasing terminal and landside capacity;
- Creating opportunities for enhanced competition among air carriers;
- Enhancing the ability of the Airport to accommodate NLA; and
- Mitigating noise impacts.

3.2 Description of the OMP

Implementation of the OMP will reduce delays and enhance capacity by modernizing the airfield configuration. O'Hare's existing layout of converging runways will be reconfigured into a predominantly parallel runway system typical of modern, large-hub airports. These parallel runways will allow operation of a combination of arrival and departure runways at the Airport, providing balanced and flexible capacity in all weather conditions.

The OMP is to be implemented in phases and is expected to be a multi-year process entailing the reconfiguration of the runway layout; relocation of other existing facilities; construction of a new

western terminal complex including supporting roadway and parking facilities; noise mitigation; and land acquisition. Major components of the OMP are described below, along with associated supporting projects. Various improvements will also be implemented to relocate and expand existing utilities and infrastructure, including stormwater collection and detention, water supply lines, electrical systems, sanitary sewer systems, vehicle service roads, and perimeter fencing.

Runway projects included in OMP-Phase 1 are described in Sections 3.2.1 through 3.2.4. Projects included in OMP-Phase 2 are described in Sections 3.2.5. through 3.2.9.

3.2.1 New Future Runway 9L-27R

New future Runway 9L-27R, including associated taxiways and other supporting development will be the first runway constructed as part of OMP-Phase 1 and is presented on Exhibit I-1. The purpose of this runway is to reduce aircraft delay during IFR conditions, as it will allow for a third stream of independent arriving aircraft during IFR conditions. The construction of this runway is dependent on the relocation and/or reconfiguration of various facilities, roads, and waterways, and the acquisition of land near the northwest quadrant of the Airport. The following enabling projects are associated with this proposed runway development:

- Acquisition of approximately 135 acres of land near the northwest quadrant of Airport property (existing facilities in this area are required to be demolished);
- Relocation of a portion of Willow-Higgins Creek and associated culvert development;
- Relocation of a major water main crossing the alignment of the proposed runway;
- Expansion of the northern stormwater detention facilities;
- Development of a new Airport Traffic Control Tower (ATCT) in the north airfield; and
- Realignment of an Airport service/employee access roadway along Mt. Prospect Road, and relocation of the associated guard post and security facilities.

3.2.2 Extension of Future Runway 10L-28R (Existing Runway 9R-27L)

Construction of a proposed 2,859-foot westward extension to existing Runway 9R-27L (future Runway 10L-28R), associated taxiways, and other support facilities will also be undertaken as part of OMP-Phase 1, as presented on Exhibit I-1. This proposed extension will increase the available runway length to 13,000 feet. The runway will become the longest at the Airport after existing Runway 14R-32L is shortened and ultimately decommissioned as part of the OMP. The relocation of navigational aids and runway approach light systems are the major enabling projects required as part of this proposed runway extension.

3.2.3 Future Runway 10C-28C (Relocation of Existing Runway 18-36)

Future Runway 10C-28C, associated taxiways, and required support facilities are also to be developed as part of OMP-Phase 1, as presented on Exhibit I-1. The following are the associated enabling projects required with this proposed runway:

- Relocation of a segment of the Union Pacific Railroad line in the southwest corner of the Airport;
- Acquisition of approximately 298 acres of land near the southwest quadrant of Airport property;

- Relocation of St. Johannes and Resthaven Cemeteries;
- Reconfiguration of the South Detention Basin. Additional stormwater capacity will also be constructed in the existing detention basin west of Runway 14R-32L;
- Relocation of certain cargo facilities located in the south airfield; and
- Rerouting of the Bensenville Ditch.

3.2.4 Proposed West Satellite Concourse

The proposed West Satellite Concourse is a remote airside facility to be developed in an area west of existing Runway 14R-32L. Associated taxiway and aircraft apron development are also included as part of this project. The concourse facilities will accommodate a mix of RJ and larger aircraft; appropriate aircraft parking and maneuvering areas will also be provided. In part to support future terminal development, dual parallel ADG VI taxilane capacity, capable of supporting NLA, is planned on the west side of the West Satellite Concourse. Dual parallel ADG IV taxilanes are planned on the east side of the West Satellite Concourse. Other facilities associated with the West Satellite Concourse include:

- Construction of two airport surveillance radar facilities, one each at the north and south airfields;
- Construction of a secure automated people mover (APM) to allow the transfer of passengers and employees between the existing Terminal Core Area and the new West Satellite Concourse; and,
- Construction of a service road tunnel under Taxiway T and Runway 14R-32L for the proposed vehicle service road connecting the existing Terminal Core Area to the West Satellite Concourse.

The West Satellite Concourse is included in the Airport Master Plan as part of OMP-Phase 1. Because this LOI request includes only OMP-Phase 1 airfield projects, the West Satellite Concourse is excluded from the BCA.

3.2.5 Extension of Future Runway 9R-27L (Existing Runway 9L-27R)

OMP-Phase 2 includes an approximate 3,594-foot westward extension of existing Runway 9L-27 R (future Runway 9R-27L), including associated taxiways and other supporting airfield development. This extension will provide an ultimate runway length of 11,260 feet. The proposed runway extension is also depicted on Exhibit I-1.

3.2.6 Future Runway 9C-27C (Relocation of Existing Runway 14L-32R)

This OMP-Phase 2 project includes the proposed construction of future Runway 9C-27C with associated taxiways and other supporting airfield development, as depicted on Exhibit I-1. During this phase of construction, several facilities must be relocated before construction can be completed. After the proposed Runway 9C-27C is commissioned, it is planned that Runway 14L-32R will be decommissioned. In addition, the following associated projects are included:

- Relocation of maintenance facilities located in the northwest area of the Airport;
- Relocation of military/general aviation area facilities;
- Construction of a tunnel for the service road located in the northwest area of the Airport;

- Creation of new detention pond capacity; and
- Relocation of the very high frequency omnidirectional range/tactical air navigation facility.

3.2.7 Future Runway 10R-28L (Relocation of Existing Runway 14R-32L)

The final runway project in OMP-Phase 2 entails construction of the southernmost runway, future Runway 10R-28L, associated taxiways, and other supporting airfield development, as presented on Exhibit I-1. Upon commissioning of the runway, it is planned that Runway 14R-32L will be decommissioned and partially converted to a taxiway. In addition to this development, associated projects include:

- Construction of service road tunnels below proposed airfield pavement within the south airfield;
- Relocation of Irving Park Road; and
- Construction of a south ATCT (the ultimate location and characteristics of this facility will be subject to ATCT line-of-sight requirements and will be established in coordination with the FAA).

3.2.8 Proposed West Terminal Building/Concourse

The proposed West Terminal Building/Concourse includes development of passenger terminal facilities and additional aircraft gate capacity to the west of the proposed West Satellite Concourse. Also included as part of this project are the supporting ground access/landside facilities. The West Terminal Building/Concourse is planned to be constructed after Runway 10R-28L is commissioned and Runway 14R-32L is subsequently decommissioned. An APM station serving the West Terminal Building/Concourse is also planned, which will provide access to the proposed West Satellite Concourse and the existing terminal facilities. The West Satellite Concourse and West Terminal Building/Concourse are collectively referred to as the West Terminal Complex.

3.2.9 Noise Mitigation

The City, in accordance with criteria established by the O'Hare Noise Compatibility Commission, plans to continue providing sound insulation of eligible schools and single-family, owner-occupied homes. Sound insulation may include, but is not limited to, the following: installation of heating and air conditioning systems, replacement of windows and exterior doors with sound insulating windows and doors, addition of insulation to exterior walls and ceilings, and addition of baffling devices to exterior vents.

3.3 Capital Costs and Implementation Schedule

The estimated capital cost of the OMP is approximately $6.6 billion in 2001 dollars. **Table III-1** summarizes the estimated costs of the OMP.

As indicated previously, the OMP is to be implemented in two phases. The major airfield projects associated with each phase along with a preliminary implementation schedule for the OMP are presented on **Table III-2**. The original construction and commissioning schedule is presented on **Exhibit III-1**. These schedules are based on the anticipated durations of the various OMP phases and facility development needs. The planned implementation dates necessitate significant coordination of the phases of development defined in the prior sections. These dates will be further refined during the design development and construction planning process. It is also important to note that the

schedules presented here assumed start of construction in mid-2004 concurrent with the originally expected date of the FAA Record of Decision.

3.4 Proposed LOI Project

Certain components or projects of OMP-Phase 1 have been identified that are ideally suited for LOI funding. Because the Airport is a major component of the NAS, excessive delays at O'Hare have a serious impact on national system efficiency. As described in Section II, enhancing O'Hare's facilities to increase airfield capacity will benefit not only the Airport, but also the entire NAS. The City is requesting LOI funding at this time for the LOI Projects, which consist of the following:

- New Future Runway 9L-27R
- Extension of Future Runway 10L-28R (Existing Runway 9R-27L)
- Future Runway 10C-28C (Relocation of Existing Runway 18-36)
- Associated runway enabling projects, generally including associated taxiway systems, navigational aids installation and upgrade, site utilities construction, and existing facilities relocation

Table III-1

OMP Cost Estimates (2001 Dollars)

	Project Cost ($000s)
Program Wide Requirements:	
Program Wide Requirements	$58,277
Preliminary Engineering	43,689
Wetlands Mitigation	24,272
Noise Mitigation	220,000
Land Acquisition	339,296
Land/Environmental Contingency	223,301
Subtotal – Program Wide Requirements Costs	$908,835
Other Program Costs:	
Miscellaneous Operations Budget	$19,418
Program Contingency	301,660
Subtotal – Other Program Costs	$321,078
Airfield (Design and Construction/Decommission):	
Runway 9L-27R	$548,543
Runway 10L-28R Extension	494,175
Runway 10C-28C	908,739
Runway 18-36 Decommission	2,322
Runway 9R-27L Extension	138,032
Runway 9C-27C	642,789
Runway 14L-32R Decommission	1,422
Runway 10R-28L	365,166
Runway 14R-32L Decommission/Taxiway Conversion	110,157
Subtotal – Airfield Costs	$3,211,345
West Terminal Complex (Design and Construction):	
Western Airside Concourse	$579,832
Energy Plant	59,307
Fuel Storage and Distribution Improvements	61,168
Western Terminal	918,297
Parking Facilities	108,115
Subtotal – West Terminal Complex Costs	$1,726,719
On-Airport Circulation (Design and Construction):	
People Mover	$418,903
Maintenance Facility	13,120
Subtotal – On-Airport Circulation Costs	$432,023
Total OMP Costs (2001 dollars)	$6,600,000

Source: Ricondo & Associates, Inc. and O'Hare Partners, based on cost estimate analyses from TOK, LLC, and AOR.
Prepared by: Ricondo & Associates, Inc.

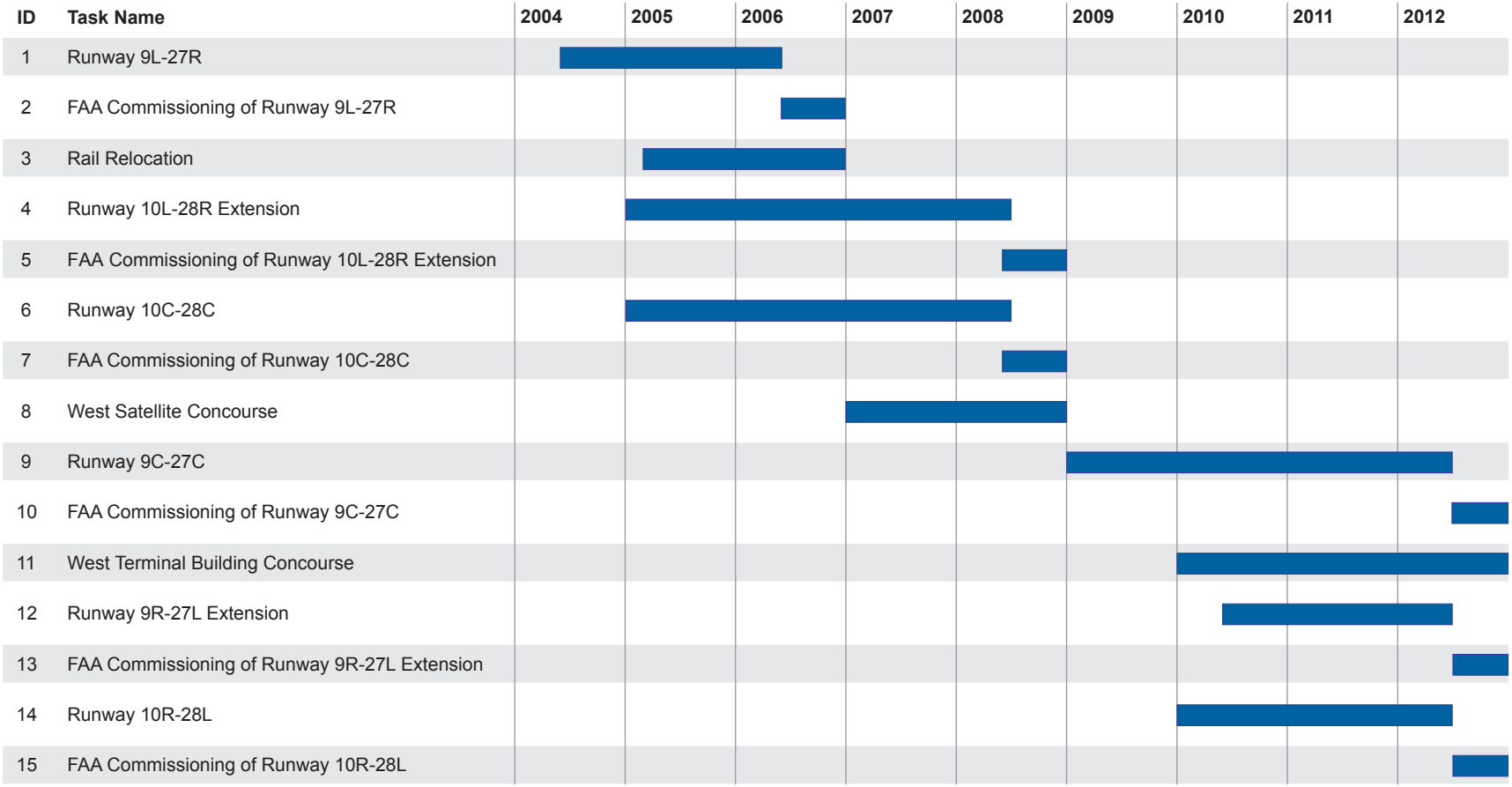
Table III-2

Preliminary Implementation Schedule for OMP Airfield Projects

Major OMP Airfield Projects	First Full Year of Operation
OMP-Phase 1:	
Runway 9L-27R	2007
Runway 10L-28R Extension	2009
Runway 10C-28C	2009
OMP-Phase 2:	
Runway 9R-27L Extension	2013
Runway 9C-27C	2013
Runway 10R-28L	2013

Note: Schedule based on assumed start of construction concurrent with the originally-assumed issuance of the FAA Record of Decision in mid-2004.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.



Note: Start of construction assumed issuance of ROD in mid-2004.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit III-1

Schedule of Major Construction and Commissioning Events

Z://ORD Financial/LOI/Exhibits/LOI Exhibit Pack.pdf

IV. Benefit-Cost Analysis Summary

Request for Letter of Intent to provide a

Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

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O'HARE MODERNIZATION PROGRAM

IV. Benefit-Cost Analysis Summary

IV. Benefit-Cost Analysis Summary

In 1994, the FAA implemented its *Policy Regarding Revision of Selection Criteria for Discretionary Airport Improvement Program Grant Awards* and *Policy for Letter of Intent Approvals under the Airport Improvement Program*. These policies establish the requirement for preparation of a BCA to demonstrate the merits of capacity projects and justify federal grant funding. As of 1997, airport sponsors are required to submit a BCA if they are either:

- Seeking $5 million or more in AIP discretionary grants over the life of an airport capacity project, or
- Requesting grant funding through an LOI.

A BCA demonstrates a project's economic viability if the present value of its benefits exceeds the present value of its costs. The calculation of a positive NPV and a benefit-cost ratio (i.e., ratio of the discounted benefits divided by the discounted costs) equal to or greater than 1.0 indicate economic justification of the project. The FAA does not, however, use the benefit-cost ratio for ranking projects to assess how AIP discretionary grants are to be allocated.

The primary purpose of this BCA is to present the economic justification (i.e., demonstrate that the project has a positive NPV and its benefit-cost ratio equals or exceeds 1.0) for federal funding of the OMP-Phase 1 Airfield Projects, which consist of the LOI Projects and the supporting Program-Wide Requirements projects. Program-Wide Requirements projects include the following: preliminary engineering, wetlands mitigation, OMP-Phase 1 noise mitigation, land acquisition, and other miscellaneous program-wide requirements.

In addition, various sensitivity analyses are also presented to demonstrate the economic justification for the OMP-Phase 1 Airfield Projects if project benefits, costs, or timing differ from those envisioned. This analysis and the sensitivity analyses *do not* attempt to quantify or consider all benefits associated with the project, but rather illustrate that the aircraft travel time savings alone are sufficient to produce benefits that in all cases exceed project costs. Thus, the benefit-cost ratios and NPVs presented here are based on underestimated benefits and would be expected to be higher if a full accounting of project benefits were performed. To facilitate review of this material, this document is divided into the following sections:

- BCA Methodology
- Aviation Activity Forecasts
- Project Costs
- Project Benefits
- Benefit-Cost Comparison
- Recommendation

Exhibit I-1 depicts the proposed OMP runway projects, and highlights the OMP-Phase 1 Airfield Projects.

4.1 BCA Methodology

The following assumptions and methodology used to prepare the BCA are in accordance with the FAA's *Benefit-Cost Analysis Guidance* dated December 15, 1999 (the *BCA Guidance*); the *Economic Values for Evaluation of FAA Investment and Regulatory Decisions, A Guide*, dated June 1998; and FAA-APO-03-1*, Treatment of Values of Passenger Time in Economic Analysis,* dated March 2003 (the *APO Bulletin*). The methodology for the BCA process is outlined in the *BCA Guidance* and generally consists of the following steps:

- *Establish the Objectives:* As stated by the DEIS, the proposed Federal action, which is the subject of the EIS, encompasses the following purposes:
  - Address the projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.
  - Ensure that existing and future terminal facilities and supporting infrastructure (access, landside, and related ancillary facilities) can efficiently accommodate airport users.

  OMP-Phase 1 is the initial step in implementation of the OMP and the entire Master Plan.

- *Formulate Assumptions:* Assumptions about future conditions at the airport being analyzed must be clearly explained and documented because they form the framework against which the alternatives are to be evaluated.

  The FAA, as part of the Environmental Impact Statement (EIS) analysis for O'Hare, defined a constrained forecast of activity that would be anticipated to occur without airfield development at the Airport. The 2002 TAF, the most recent demand forecast available when the EIS analysis began, was used for the unconstrained scenarios in the DEIS. For consistency, both of these forecasts, as appropriate, are used in this BCA. Additional discussion of the forecasts is provided in Section 4.2 of this document.

- *Identify the Base Case:* The Base Case is a reference point from which incremental benefits and costs can be quantified. In the absence of major airfield construction (such as the OMP), opportunities to increase airfield capacity at the Airport are limited. As such, the Base Case for this BCA is defined as the no action scenario. The Airport's ongoing Capital Improvement Program (CIP), which would occur regardless of the proposed LOI Projects' implementation, is included in the Base Case.
- *Identify and Screen Alternatives:* As part of the EIS analysis, alternatives to the proposed plan were developed, analyzed, and considered. As stated in the DEIS, "The FAA in this Draft EIS has not made a determination regarding the preferred alternative for this project … The Agency will identify, for purposes of statutory obligations, its determination regarding the feasibility and prudence of alternatives or any other required findings in the Final EIS or in the Record of Decision." The City believes that the OMP is the best development option and, therefore, alternatives are not analyzed as part of this BCA.
- *Define Evaluation Period:* Consistent with the BCA Guidance, the evaluation period assumed for this BCA is 20 years after the completion of construction. For the OMP-Phase 1 Airfield Projects, the evaluation period ends in 2028.
- *Determine Costs:* Costs must be identified, quantified, and evaluated in total dollar amounts and for each year of a project's life. Typical costs include initial investments, such as

planning and construction of the main project as well as any enabling projects, and recurring investments, such as operation and maintenance (O&M) costs. OMP costs are discussed in Section 4.3 of this document.

- *Determine Benefits*: Typical benefits include reduced delays, the ability to accommodate more efficient aircraft and/or larger aircraft, safer and more secure air travel, and reduced environmental impacts.

  For purposes of this BCA, only local delay savings in travel times for aircraft and passengers and system-wide delay savings resulting from O'Hare's role as a major transportation hub are considered. Quantification of these benefits is discussed in Section 4.4 of this document. Other benefits of the OMP-Phase 1 Airfield, including greater schedule predictability, ability to accommodate larger aircraft, and safety improvements are not considered at this time. Monetary quantification of these other benefits is not included in this analysis to avoid speculation. While this approach underestimates the overall benefits of the project, these benefits are not needed to demonstrate the program's justification. The specific project benefits, including those that have not been quantified, are shown in **Table IV-1**.

Table IV-1

Inventory of Benefits Quantified and Not Quantified in the BCA

Project Type	Typical Benefit	Benefits Quantified in BCA	Benefits Not Quantified in BCA
Airside Capacity	• Reduced aircraft, passenger, and cargo delay during normal airport operations	x	
	• Greater schedule predictability including (1) aircraft operator able to make more efficient use of equipment and personnel and (2) passenger able to take later flight and arrive at destination on time		x
	• Improved efficiency of traffic flows (reduced vectoring and taxiing distances)	x	
	• Airport's ability to accommodate faster, larger, and/or more efficient aircraft		x
	• Bringing pre-existing infrastructure into compliance with FAA safety and security standards		x
	• Safety improvements		x

Source (Typical Benefits): FAA, *BCA Guidance*.
Source (Assessed Benefits): Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

- *Compare Benefits and Costs:* Most airport investments require resources at the outset of a project in return for an annual flow of benefits over the long-term future. Because the costs are incurred up front, and the benefits are returned over a longer time period, an analysis recognizing the time value of money must be conducted to appropriately compare the benefits and costs of alternatives to inform ultimate selection of the preferred alternative for development. In the BCA, discounted benefits and costs are used to accurately compare project scenarios by their NPVs and benefit-cost ratios. Section 4.5 presents the comparison of benefits and costs.

- *Conduct Sensitivity Analysis:* Sensitivity analyses are conducted to assess the ability of the project to meet the BCA requirements under alternative assumptions regarding cost and

schedule. In addition to the sensitivity analyses in the BCA, the Sponsor has included additional supplemental analyses presented in Appendix D.

- *Make Recommendation:* Finally, a BCA must state whether a project should be pursued based on the quantified benefits and costs, non-quantified benefits and costs, and sensitivity analysis. Section 4.6 presents the BCA recommendation.

4.2 Aviation Activity Forecasts

As previously discussed, the 2002 TAF is being used as the basis for the OMP EIS analysis. The 2002 TAF, which presents aircraft operations and enplaned passengers by user category at the Airport through the year 2020, was prepared by FAA assuming the absence of any constraints to growth in activity at the Airport. Selected at the initiation of the OMP EIS analysis, the 2002 TAF remains the basis for EIS analysis even though subsequent TAFs were published in 2003 and 2004. To maintain consistency with the DEIS, the 2002 TAF is the primary unconstrained forecast used in this BCA.

Table IV-2 presents the 2002 TAF of operations and enplaned passengers converted from federal fiscal years, which end September 30, to calendar years, and extrapolated through the evaluation period using linear extrapolation. As shown, the 2002 TAF forecasts grow to approximately 1.2 million operations and 50.4 million enplaned passengers in 2018, the last year of the EIS analysis.

Since initiation of the EIS analysis, the FAA has published a 2003 TAF and 2004 TAF, as shown on **Exhibit IV-1** and **Exhibit IV-2** in federal fiscal years. Both the 2003 and 2004 TAFs contain operations and enplaned passenger forecasts greater than those in the 2002 TAF. As previously mentioned, the 2002 TAF is used in this BCA to maintain consistency with the EIS analysis.

In addition to the unconstrained forecast represented by the 2002 TAF, the FAA, as part of the EIS analysis, developed a constrained forecast to represent the potential activity at the Airport if no action is undertaken to improve Airport capacity. This constrained forecast was developed based on simulation modeling efforts to reflect the assumption that growth in aircraft operations will cease once delays exceed the level the airlines and FAA consider "acceptable". **Exhibit IV-3** and **Exhibit IV-4** present the FAA-developed constrained forecasts in comparison to the unconstrained forecasts. Further discussion of the constrained forecast and its use in the BCA is provided in Section 4.4.

Table IV-2

2002 FAA Terminal Area Forecast for O'Hare International Airport –
Total Operations and Enplaned Passengers (Unconstrained Schedule)

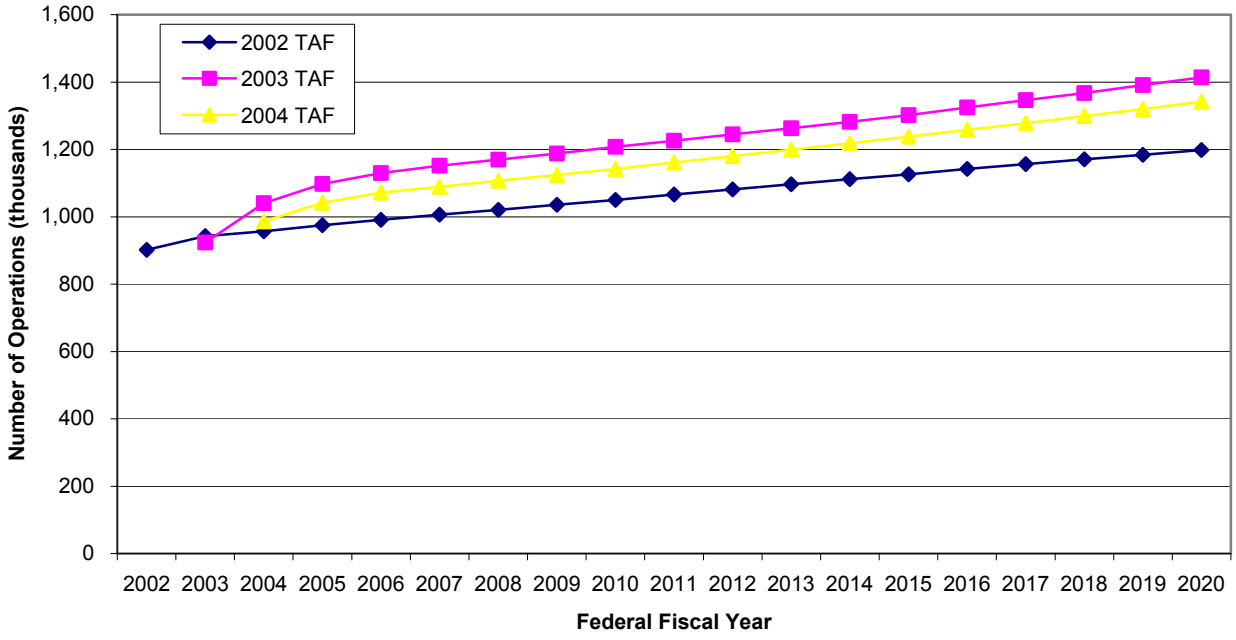
	Total Operations	Enplaned Passengers	
Calendar Year	2002 Terminal Area Forecast	2002 Terminal Area Forecast	Extrapolation [1]
2002	922,787	31,710,512	
2003	960,500	32,609,000	
2004 [2]	976,544	33,633,730	
2005	992,855	34,696,477	
2010	1,072,706	40,280,622	
2015	1,149,402	46,367,491	
2018	1,194,000	50,372,000	
2020			52,224,100
2025			58,060,253
2030			63,896,405
2032			66,230,866

[1] Linear extrapolation based on calendar year projections.
[2] 2004 data are preliminary and subject to change.

Source (Forecast): FAA, *O'Hare Modernization Draft Environmental Impact Statement,* January 2005.
Source (Extrapolation): Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit IV-1

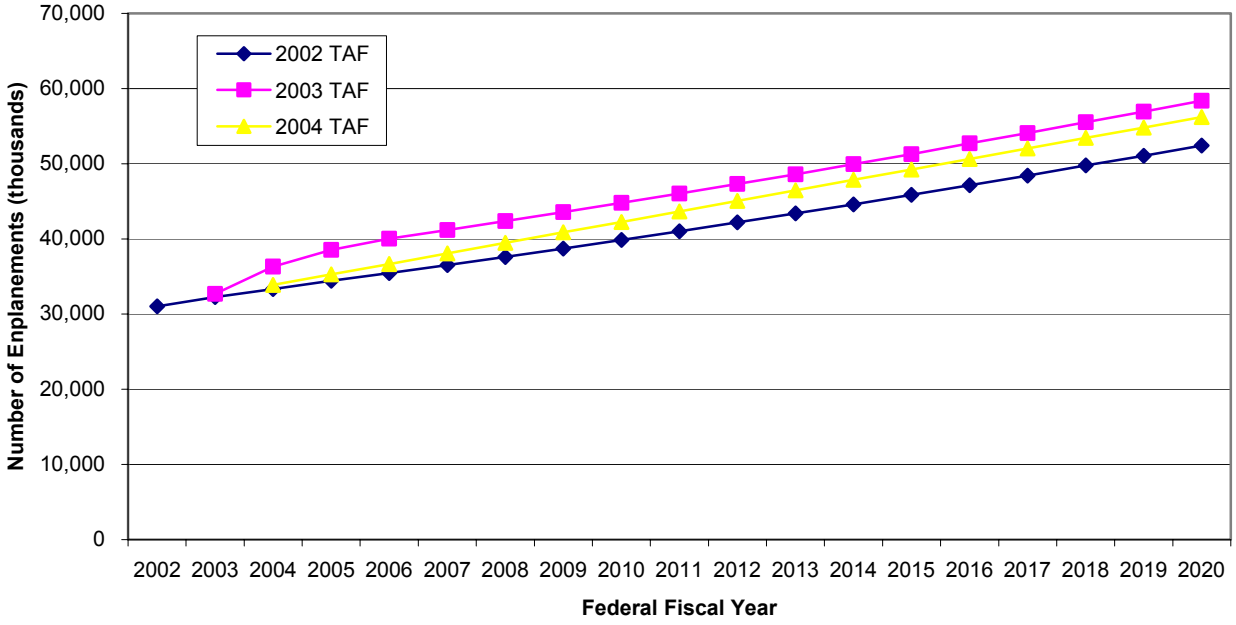
FAA Terminal Area Forecast Comparisons for O'Hare International Airport – Total Operations



Source: FAA.
Prepared by: Ricondo & Associates, Inc.

Exhibit IV-2

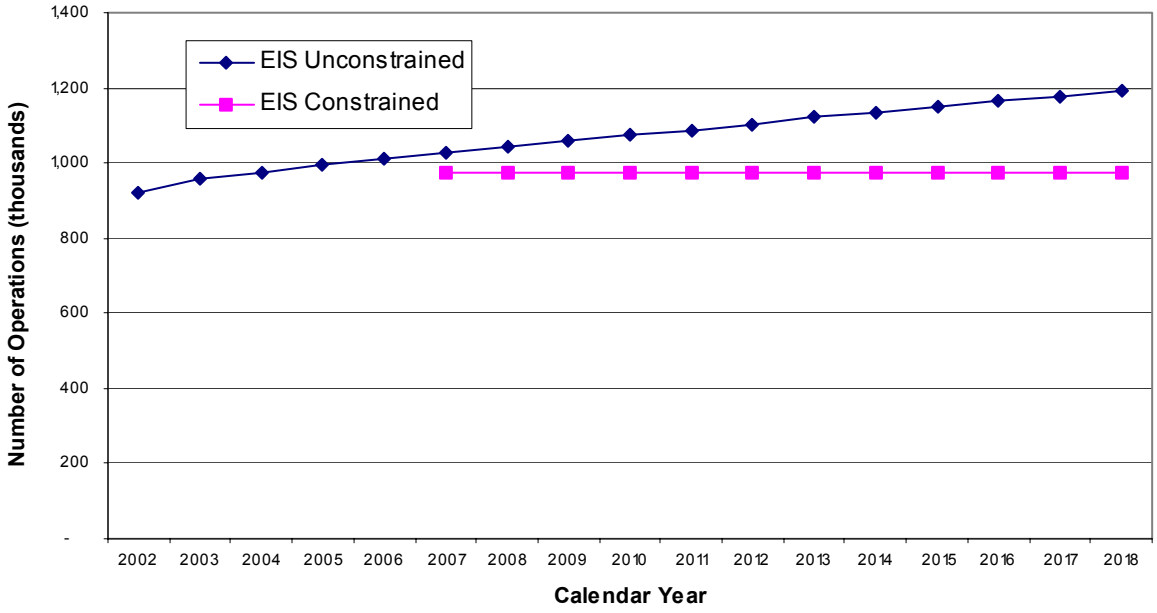
FAA Terminal Area Forecast Comparisons for O'Hare International Airport – Enplaned Passengers



Source: FAA.
Prepared by: Ricondo & Associates, Inc.

Exhibit IV-3

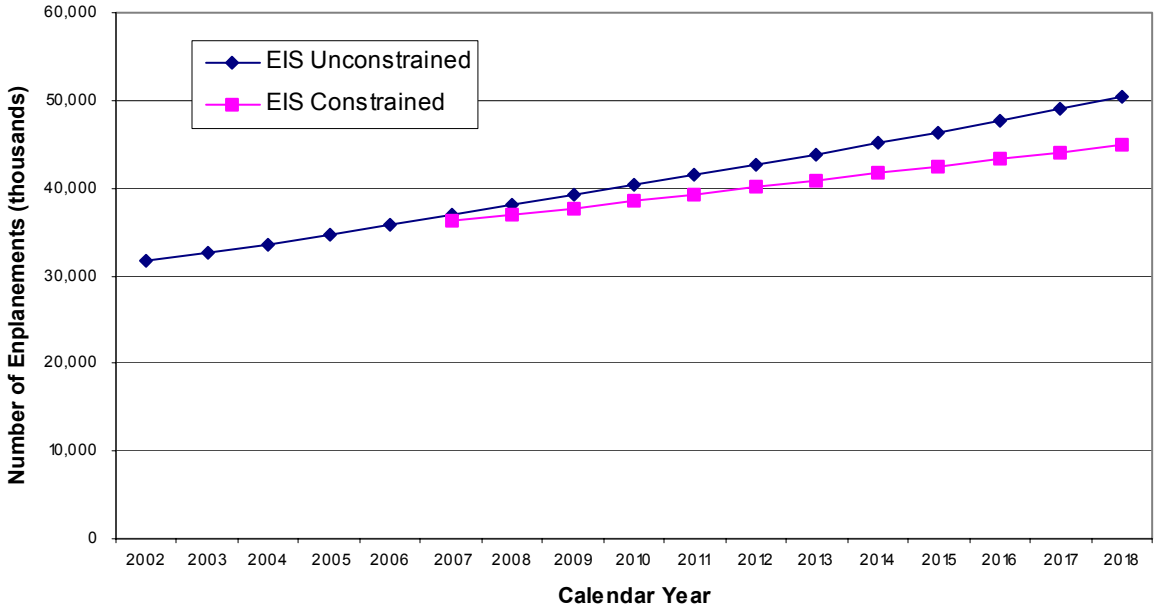
Unconstrained and Constrained Forecast Comparison for O'Hare International Airport – Total Operations



Source: FAA.
Prepared by: Ricondo & Associates, Inc.

Exhibit IV-4

Unconstrained and Constrained Forecast Comparison for O'Hare International Airport – Enplaned Passengers



Source: FAA.
Prepared by: Ricondo & Associates, Inc.

4.3 Project Costs

To provide the basis for the BCA and NPV calculations, costs associated with the project must be quantified to the extent possible. Quantifiable costs to be considered should consist of capital investment and incremental O&M costs. Only those costs that are attributable to a project being undertaken are to be considered. In other words, costs that would be incurred regardless of whether or not a project is undertaken should not be considered.

Table IV-3 lists project elements and their capital investment costs for OMP-Phase 1 Airfield Projects. Included in these costs are necessary land acquisition, supporting facilities (taxiways, lighting, utilities, etc.), planning, design, and construction. Table IV-3 presents these costs in 2001 dollars. The year 2001 was used as the base year in this analysis because OMP cost estimates as originally scheduled are stated in 2001 dollars in the LOI request, DEIS, and Airport Master Plan.[6] The capital investment costs of the OMP-Phase 1 Airfield Projects are estimated to be approximately $2.6 billion in 2001 dollars.

[6] As part of the sensitivity analyses, BCR and NPV calculations are also presented in 2004 dollars.

Table IV-3

Project Capital Costs as Originally Scheduled – OMP-Phase 1 Airfield Projects
(in thousands of 2001 dollars)

Project Element Description	Total	2001[1]	2002 [1]	2003 [1]	2004 [1]	2005	2006	2007	2008	2009
Program-Wide Requirements										
Program-wide Requirements [2]	$58,277	$0	$17,500	$21,607	$19,170					
Preliminary Engineering	43,689			21,845	15,291	6,553				
Wetlands Mitigation	24,272			1,942	22,330					
Noise Mitigation (OMP-Phase 1)	140,000			20,000	20,000	20,000	20,000	20,000	20,000	20,000
Land Acquisition	339,296		31,958	67,532	72,816	82,524	60,194	14,563	9,709	
Subtotal—Program-Wide	**$605,534**	**$0**	**$49,458**	**$132,926**	**$149,607**	**$109,077**	**$80,194**	**$34,563**	**$29,709**	**$20,000**
Airfield										
Runway 9L-27R										
Design	$34,951			$23,301	$11,650					
Construction	513,592				114,132	199,730	199,730			
Runway 10L-28R Extension										
Design	20,388			20,388						
Construction	473,787				88,081	130,333	146,491	82,893	25,989	
Runway 10C-28C										
Design	40,777			20,389	20,388					
Construction	867,962				121,251	165,469	109,034	211,763	260,445	
Subtotal—Airfield	**$1,951,457**	**$0**	**$0**	**$64,078**	**$355,502**	**$495,532**	**$455,255**	**$294,656**	**$286,434**	**$0**
Total—Capital Costs	**$2,556,991**	**$0**	**$49,458**	**$197,004**	**$505,109**	**$604,609**	**$535,449**	**$329,219**	**$316,143**	**$20,000**

[1] Actual expenditures from 2001 through 2004 varied from originally scheduled expenditures.
[2] Includes $17.5 million of program formulation costs.

Sources: TOK LLC, AOR, and O'Hare Partners; As presented in the Airport Master Plan, Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

In addition to capital investment costs, estimated incremental O&M costs are included for the evaluation period. Incremental O&M costs for additional runway pavement were estimated at the unit rate for budgeted 2004 Airfield Area O&M expenses for the existing runways adjusted to 2001 dollars using the GDP Implicit Price Deflator. The annual incremental O&M costs for OMP-Phase 1 Airfield Projects are shown in **Table IV-4** in 2001 dollars.

Table IV-4

Incremental Project Recurring Operation and Maintenance Costs – OMP-Phase 1 Airfield Projects
(in thousands of 2001 dollars)

Calendar Year	Incremental O&M Cost [1]
2001	$0
2002	0
2003	0
2004	0
2005	0
2006	0
2007	4,800
2008	4,800
2009	15,600
2010	15,600
2011	15,600
2012	15,600
2013	15,600
2014	15,600

Calendar Year	Incremental O&M Cost [1]
2015	15,600
2016	15,600
2017	15,600
2018	15,600
2019	15,600
2020	15,600
2021	15,600
2022	15,600
2023	15,600
2024	15,600
2025	15,600
2026	15,600
2027	15,600
2028	15,600
Total	$322,100

[1] Rounded to nearest $100,000.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

4.4 Project Benefits

Because the OMP, and OMP-Phase 1 in particular, consists largely of airfield capacity improvements in the form of new, relocated, and/or extended runways, aircraft operational delay savings constitute the primary benefits to be considered. Delay savings can be measured as time saved as a result of avoided delay (i.e., the difference in travel time between any scenario and the Base Case), and can be applied to aircraft operations as well as passengers.

4.4.1 Simulation Modeling

In the analyses undertaken as part of OMP planning and the EIS , operational delay and travel times were assessed for the Base Case, OMP-Phase 1, and the OMP Total Airfield. These assessments were undertaken using the *Total Airspace and Airport Modeler* (TAAM), developed by Preston Aviation Solutions, a Boeing Company. TAAM is a fast-time gate-to-gate simulator of airport and airspace operations that facilitates decision-making, planning, and analysis. TAAM has been used in the United States for airfield and airspace assessments by the FAA, the National Airspace Redesign team, American Airlines, Continental Airlines, Delta Air Lines, and Boeing Air Traffic Management, among others. The FAA and its EIS consultant, known as the third party contractor (TPC), have been actively involved in the TAAM simulation analysis of the OMP. As documented in the DEIS:

> "An unprecedented series of TAAM simulation analyses were conducted by the City of Chicago's Consultant Team (CCT) with direction, oversight, review and approval by the FAA and the TPC. The FAA and TPC participated in an intensive, nine-month review process during the simulation effort. The objective of this process was to ensure that TAAM input assumptions, modeling methodologies, and output data conformed to the industry best practices in modeling and accurately reflected air traffic control rules and procedures. In total, FAA invested over 2,000 hours reviewing assumptions, draft results, animations, and final results. The FAA review was conducted by an Air Traffic Work Group, which consisted of FAA Management and National Air Traffic Controller Association (NATCA)

representatives from O'Hare Tower, the Chicago Terminal Radar Approach Control Facility (TRACON), and the Chicago Center (ZAU); FAA Airports Division; and the FAA's TPC." [4]

The results of the TAAM modeling for the unconstrained forecasts are presented for the Base Case and full OMP on **Exhibit IV-5**

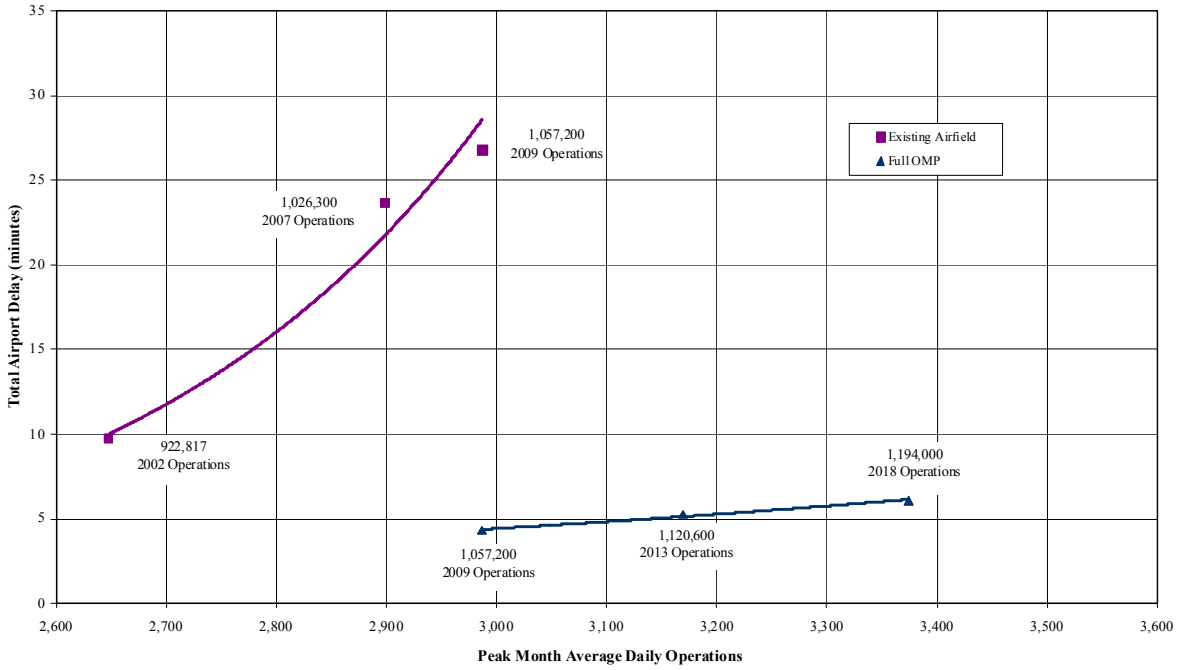
As shown on Exhibit IV-5, the simulation modeling showed that delays increase exponentially under the Base Case as demand approaches capacity. Theoretically, delays can continue to increase to unrealistically high levels as demand exceeds capacity for more and more hours of the day. However, these excessively high levels of delay may not be experienced, as the airlines and passengers may change their behavior to avoid these delays. In response to increasing delays, airlines might increase average aircraft size to accommodate forecast demand, shift connecting passenger traffic through other hub airports.

The FAA in its *BCA Guidance* recognizes the limitations on delay growth, and suggests the need to modify demand growth when delays exceed 15 minutes per operation and that demand should be capped at approximately 20 minutes of delay per operation. Consistent with the *BCA Guidance*, the FAA developed constrained activity forecasts in the DEIS for the Airport to reflect the level of aircraft operations at which FAA believes further growth in aircraft activity would cease due to delays reaching "unacceptable" levels. As indicated in the DEIS, the constrained forecasts developed by FAA result in maximum average aircraft delays at the Airport of approximately 17 minutes per aircraft, which is lower than the 20 minutes per aircraft threshold outlined in the *BCA Guidance*. Therefore, by using the constrained forecast, this BCA underestimates the delay savings benefits of the project. A comparison of the DEIS constrained forecast to the 2002 TAF is presented on Exhibit IV-3 and Exhibit IV-4 for aircraft operations and enplaned passengers, respectively. In assessing delays under the Base Case, the constrained forecast is used to prevent the measurement of excessively high apparent delay savings. To allow for proper comparison, the OMP-Phase 1 Airfield Projects and the sensitivity analyses are also assessed using the constrained forecast. While the proposed plan is capable of accommodating the unconstrained forecast activity, as demonstrated by the FAA's simulations illustrated in Exhibit IV-5, performing the BCA with different forecasts between the Base Case and the proposed plan would necessitate either the monetary quantification of a value for the added operations and passengers under the proposed plan, or of the additional costs incurred by passengers unable to use O'Hare under the constrained Base Case. These analyses would require assumptions regarding the value of additional passengers that can be accommodated with the proposed plan or the cost incurred by passengers who are not accommodated because the proposed plan is not constructed. The effect of these passengers could be difficult to quantify. Using the constrained forecast for the proposed plan produces a BCA that demonstrates the ability of the delay savings alone to justify the project, regardless of the potential for accommodating additional demand.

[4] Source: FAA, *O'Hare Modernization Draft Environmental Impact Statement*, January 2005.

Exhibit IV-5

Total Airport Delay (in minutes)



Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

4.4.2 Simulation Results

As discussed earlier, simulation modeling using TAAM was performed to provide quantitative information on the performance of the OMP-Phase 1 Airfield Projects relative to the Base Case airfield. The Base Case simulations used in this analysis are those originally prepared for the FAA EIS analysis. For the OMP-Phase 1 Airfield Projects and OMP Total Airfield simulations, the EIS models were also used, but constrained schedules of activity developed for the EIS Base Case were applied in both cases. The methodologies and assumptions used in the simulation modeling have been documented in numerous data packages developed and published by the FAA in support of the EIS process.

Delay and travel time statistical results from the simulation analyses are presented in **Table IV-5** for the Base Case, OMP-Phase 1 Airfield Projects, and OMP Total Airfield. Delay, as presented in the table, is the difference between unimpeded travel time and total travel time. Travel time is the time from gate departure at the origin airport to gate arrival at O'Hare, or the time of gate departure at O'Hare to gate arrival at the destination airport. **Exhibit IV-6** and **Exhibit IV-7** graphically present average delay per operation, and average travel time per operation, for the Base Case, OMP-Phase 1 Airfield Projects, and the OMP Total Airfield.

As shown, the differences in average delay between (1) the Base Case and OMP-Phase 1 Airfield Projects and (2) the Base Case and OMP Total Airfield are greater than the differences between the average travel times in any given year. This results because the proposed plan increases unimpeded

travel times due in part to the increase in taxi distance associated with the new runways. Therefore, this BCA uses the differences in travel times to calculate benefits in order to ensure that these benefits are understated.

Table IV-5

Simulation Modeling Results for Constrained Forecast (in minutes)

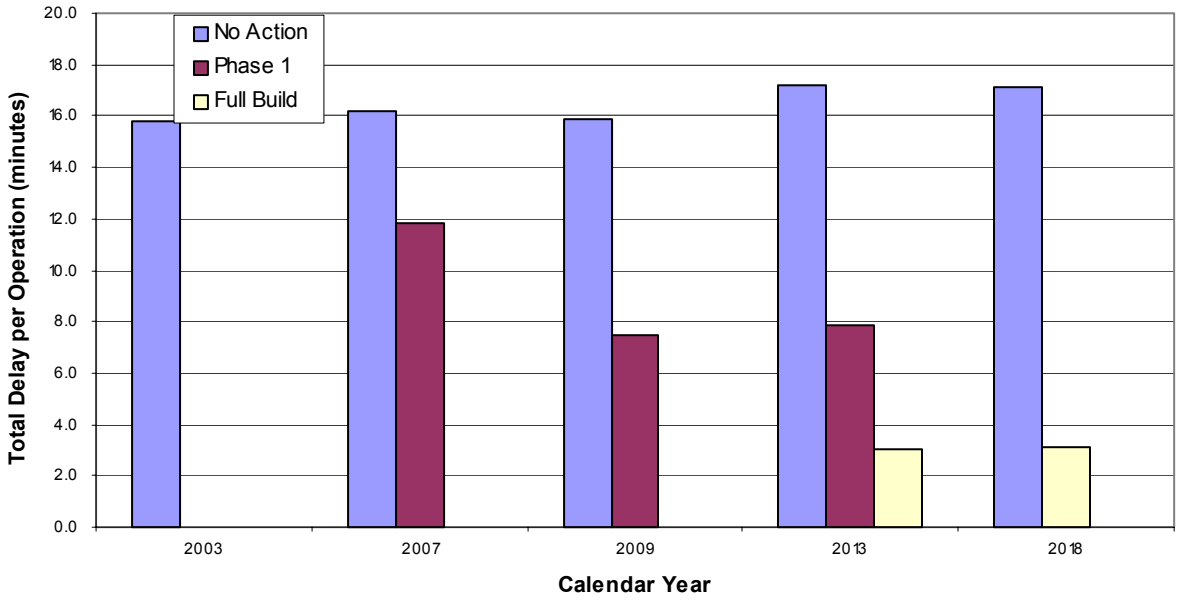
Scenario	Annual Operations	Average Total Travel Time per Operation	Average Unimpeded Travel Time	Average Delay per Operation [1]
Base Case – No Action				
2007	974,000	146.1	129.9	16.2
2009	974,000	150.7	134.8	15.9
2013	974,000	158.9	141.7	17.2
2018	974,000	162.0	144.8	17.1
OMP-Phase 1 Airfield Projects				
2007	974,000	143.6	131.8	11.9
2009	974,000	146.2	138.8	7.5
2013	974,000	153.6	145.7	7.9
OMP Total Airfield				
2013	974,000	151.2	148.2	3.0
2018	974,000	154.4	151.3	3.1

[1] Totals may not add due to rounding.

Source: FAA; Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit IV-6

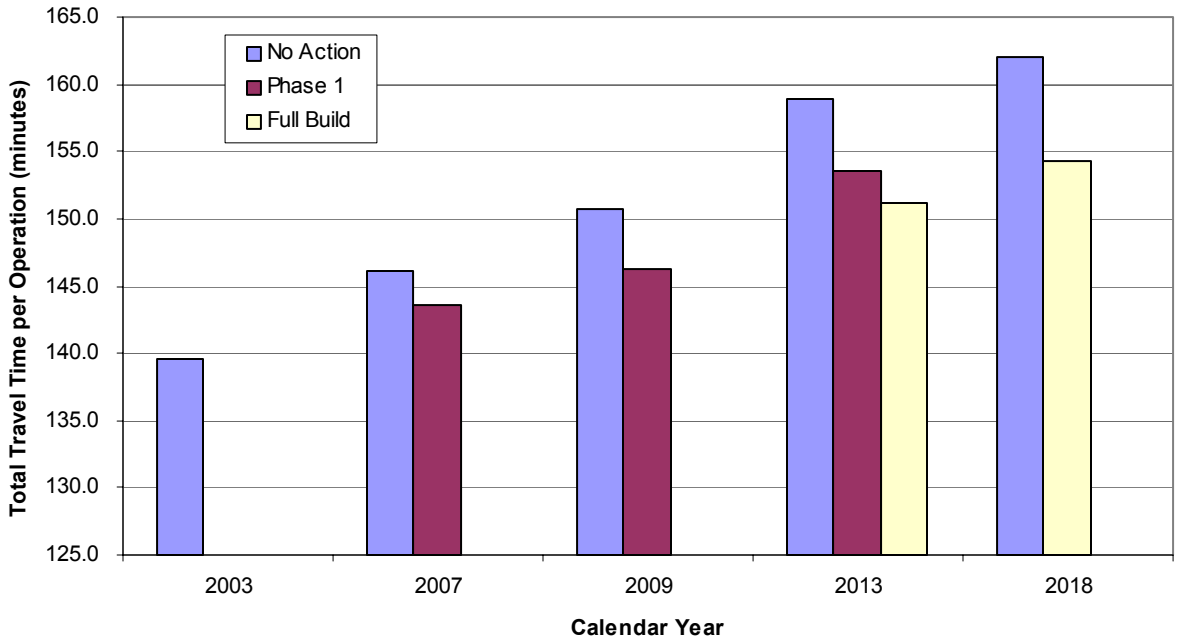
Average Delay per Operation (in minutes) – Constrained Forecast



Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit IV-7

Average Travel Time (in minutes) per Operation – Constrained Forecast



Note: Travel time benefits illustrated are based on the constrained forecast and do not consider benefits associated with growth in demand beyond 974,000 annual operations.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

4.5 Benefit - Cost Comparison

The comparison of benefits and costs involves the calculation of NPVs and benefit-cost ratios (BCRs) based on recognition of the time value of money in discounting the benefits and costs. Additionally, time savings must be converted into monetary values based on appropriate assumptions regarding the value of passenger time and aircraft operating costs.

As noted previously, this BCA considers only delay savings in travel times for aircraft and passengers, and system-wide delay savings resulting from O'Hare's role as a major transportation hub. Table IV-1 summarizes other benefits not considered in this BCA, which if considered, would further increase the value of the economic benefits attributed to the project(s). The analyses performed in this section provide the benefit-cost comparison for the OMP-Phase 1 Airfield Projects. The following points outline relevant assumptions associated with the quantification of these benefits and **Table IV-6** summarizes the assumptions.

- *Base Year.* Project benefits were evaluated using 2001 as the base year because OMP cost estimates are in 2001 dollars in the LOI request, OMP DEIS, and Airport Master Plan.

Project benefits and costs are stated in 2001 dollars in the year of accrual/expenditure, and benefits and costs are discounted 7 percent per year in accordance with the *BCA Guidance* to calculate present value.

- Aircraft Operating Costs. Variable aircraft operating costs consist of costs for crew, fuel and oil, taxes, and maintenance. Each aircraft model has a unique operating cost. These costs are provided on U.S. Department of Transportation Form 41.[5] To develop an aggregate variable aircraft operating cost for O'Hare, a weighted average of the operating costs for aircraft types in the fleet mix serving O'Hare in each of the simulation years was calculated. Values for years not simulated were linearly interpolated or extrapolated. The block hour cost assumption is approximately $1,800 per hour (or $30 per minute) for the fleet mix of any year in a constrained schedule environment. In an unconstrained schedule environment, the change in fleet mix would produce slightly lower aircraft block hour costs.
- *Passenger Value of Time.* As set forth in the *BCA Guidance*, a blended rate accounting for the value of O'Hare's personal and business travelers' time may be used. The value of passenger time is set forth in the *APO Bulletin*, and the specified value is $40.10 per hour for business travelers and $23.30 for personal travelers.[6] Results of the *In-Flight Air Survey* in 1997 by Landrum & Brown indicated that business travel was the main purpose of the trip 52.4 percent of the time and personal travel 47.6 percent of the time. Based on this passenger distribution, the weighted average passenger cost for O'Hare is $32.10 per hour or $0.54 per minute.
- *Downstream Passenger Multiplier.* Because delays at a particular airport can propagate throughout the NAS, downstream delay savings should also be considered as a benefit as permitted by the *BCA Guidance*.[7] As stated in the BCA Guidance, "an example of a potentially usable methodology is one developed by Lincoln Laboratory." The Massachusetts Institute of Technology's Lincoln Laboratory published a paper titled *Analysis of Downstream Impacts of Air Traffic Delay* in 1997. In the paper, it is suggested that downstream delay savings should consist of savings accrued by passengers only. The formula for calculating the downstream passenger delay savings is the product of aircraft delay savings (in units of time), the average number of downstream enplaned passengers per departure, the dollar value of passenger time, and a downstream multiplier. Lincoln Laboratory derived a general-purpose value of 0.8 for the downstream multiplier, as published in its paper, and this number was used for the entire evaluation period in this BCA.
- *Salvage Value.* As set forth in the *BCA Guidance*, salvage value of the project may be considered. The salvage value of improvements at the end of the 20-year evaluation period is

[5] The time period for data used is the last three months of calendar year 2003 and the first nine months of calendar year 2004, the latest data available. Costs were discounted to 2001 dollars using the Gross Domestic Product Implicit Price Deflator, in accordance with the *BCA Guidance*.

[6] The *APO Bulletin* provides passenger value of time in 2000 dollars and states that the values may not be adjusted for inflation.

[7] In the *BCA Guidance*, FAA states "Simulation modeling of delay at the study airport does not capture the effect of 'follow-on' delays e.g., delays that results at other airports as a result of delays originating due to congestion at the subject airport. Whereas FAA attempts to consider systemwide delay impacts in its capacity analyses, it has been unable to develop a robust simulation methodology for measuring these impacts … However, in the case of projects with major average delay reductions (5 minutes or more), the analyst may attempt to quantify follow-on effects. FAA will consider follow-on delay reduction estimates developed from any methodology that is well documented. An example of a potentially usable methodology is one developed by Lincoln Laboratory."

estimated to include only the value of the land acquired for the projects. For purposes of this analysis, it was assumed that the value of the land remains the same as on the purchase date, and the discounted value is included in the project benefits.

- *Sunk Costs*. As set forth in the *BCA Guidance*, sunk costs of the project should be excluded from the BCA. Through 2003, approximately $105.1 million has been spent on Program-Wide Requirements and land acquisition. Therefore, this amount is considered a sunk cost in the BCA.
- *Evaluation Period.* The evaluation period is the time period over which project benefits and costs are calculated. As recommended in the *BCA Guidance*, the evaluation period extends for 20 years after completion of construction.

Table IV-6

Assumptions for Quantified Project Benefits

Fleet Mix in Constrained Schedule	Aircraft Variable Operating Cost (in 2001 dollars)	
	Cost per Hour	Cost per Minute
2002	$1,807	$30.12
2007	1,794	29.90
2009	1,794	29.89
2013	1,762	29.36
2018	1,853	30.88
Value of Passenger Time (in 2000 dollars not escalated)	$32.10	$0.54

Downstream Passenger Delay Multiplier	0.80
Discount Rate	7 percent
Salvage Value NPV Range Depending on Scenario	$44.6 million - $58.4 million
Evaluation Period	20 years after construction completion

OMP-Phase 1 Airfield Projects	Evaluation Period	
	Start Year	End Year
Future Runway 9L-27R	2007	2026
Runway 10L-28R Extension	2009	2028
Future Runway 10C-28C	2009	2028

Source: (Aircraft Operating Cost): U.S. DOT, *Form 41*, fourth quarter of calendar year 2003 through third quarter of 2004, adjusted by Gross Domestic Product Implicit Price Deflator to 2001 dollars.
Source: (Value of Passenger Time): FAA-APO-03-1, *Treatment of Values of Passenger Time in Economic Analysis*, March 2003 and percentages of business and leisure travelers, Landrum & Brown, *In-Flight Survey*, 1997.
Source: (Downstream Passenger Multiplier): Massachusetts Institute of Technology, Lincoln Laboratory, *Analysis of Downstream Impacts of Air Traffic Delay*, 1997. At O'Hare, the average enplanements per aircraft departure is equal to the industry average. As a result, the downstream multiplier can be applied directly to the local passenger delay benefit.
Source: (Discount Rate): FAA, *BCA Guidance*, December 15, 1999.
Prepared by: Ricondo & Associates, Inc.

4.5.1 Project Analysis

Based on the information presented in Table IV-5, and information on costs and travel time benefits presented in prior sections of this document, the benefit-cost ratio and NPV were derived for the OMP-Phase 1 Airfield Projects. These values are presented in **Table IV-7**. As shown, the benefit-cost ratio is greater than 1.0 and the NPV is at $2.0 billion in 2001 dollars. **Appendix D** provides

supplemental information to illustrate the BCRs and NPVs for the Master Plan Phase 1 projects, the OMP total airfield, and the total Master Plan (OMP and World Gateway Program). **Appendix E** presents tabular information detailing the calculation of the BCR and NPV.

Table IV-7

Benefit-Cost Ratio and Net Present Value (2001 dollars) – OMP-Phase 1 Airfield Projects
Aircraft Travel Time Benefits Only

Project	Present Value Benefits (billions)	Present Value Costs (billions)	Net Present Value (billions) [1]	Benefit-Cost Ratio
OMP-Phase 1 Airfield Projects	$4.1	$1.9	$2.2	2.13

[1] Total may not add due to rounding.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

The FAA in its *BCA Guidance* recognizes the limitations on delay growth. FAA developed constrained activity forecasts in the DEIS for the Airport to reflect the level of aircraft operations at which FAA believes further growth would cease due to delays reaching "unacceptable" levels. In assessing delays under the Base Case, the constrained forecast is used to prevent the measurement of excessively high apparent delay savings. To allow for proper comparison, the OMP-Phase 1 Airfield Projects and the sensitivity analyses are also assessed using the constrained forecast. As such, the BCR demonstrates that the OMP-Phase 1 Airfield Projects are justified regardless of growth in activity. Building the OMP-Phase 1 Airfield Projects alone would generate benefits greater than costs even without growth in operational activity.

4.5.2 Sensitivity Analyses

Because of the risks involved in infrastructure development and the number of assumptions regarding future conditions that occur in benefit-cost analysis, the analysis should be evaluated for its sensitivity to certain basic parameters to confirm its economic viability. For this BCA, the following sensitivity analyses were conducted for the OMP-Phase 1 Airfield Projects and the results are shown in **Table IV-8**. These are assumptions used only to demonstrate the continued economic justification for the OMP-Phase 1 Airfield Projects under varying cost and schedule conditions and are not anticipated program changes.

- Increase capital investment cost 25 percent
- Delay construction schedule by 5 years
- Decrease benefits savings 25 percent
- Combination of all three of the items

In addition to these sensitivity analyses, a separate analysis was performed to demonstrate the results of the BCA if costs and benefits are stated in 2004 dollars instead of 2001 dollars as originally developed and stated. Under this analysis, capital investment costs and aircraft operating costs are adjusted as necessary to 2004 dollars using the Gross Domestic Product price inflator, while passenger costs remain fixed in accordance with FAA BCA guidelines. Additionally, capital investment costs originally scheduled for 2002 and 2003 are rescheduled to occur in 2004.

Table IV-8

Benefit-Cost Ratios and Net Present Values (2001 dollars) - Sensitivity Analyses for OMP-Phase 1 Airfield Projects - AircraftTravel Time Benefits Only

Sensitivity Analysis	Evaluation End Year	Present Value Benefits (billions)	Present Value Costs (billions)	Net Present Value[1] (billions)	Benefit-Cost Ratio
Increase capital costs by 25 percent	2028	$4.1	$2.4	$1.7	1.69
Delay construction schedule by 5 years	2033	$2.9	$1.4	$1.5	2.13
Decrease benefits by 25 percent	2028	$3.1	$1.9	$1.2	1.61
All of the above	2033	$2.2	$1.7	$0.4	1.27
Project using 2004 base year and 2004 dollars	2028	$5.1	$2.5	$2.6	2.06

[1] Totals may not add due to rounding.

Source : Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

These sensitivity analyses demonstrate that the overall OMP airfield program is economically justified. In all cases, the BCR and NPV of the sensitivity analyses exceed the FAA thresholds.

This analysis does not attempt to quantify or consider all benefits associated with the project but rather it illustrates that the aircraft travel time savings alone are sufficient to produce benefits that in all cases exceed project costs. Thus, the benefit-cost ratios and NPVs presented here are based on underestimated benefits and would be expected to be higher if a full accounting of project benefits were performed.

4.6 Recommendation

Regardless of the scenario modeled–the OMP-Phase 1 Airfield Projects or any of the sensitivity analyses –the BCR and NPV in each scenario exceed the FAA thresholds. Therefore, the OMP-Phase 1 Airfield Projects were determined to have the economic justification necessary for FAA to consider the project for AIP discretionary grants.

RICHARD M. DALEY
MAYOR

CHICAGO O'HARE INTERNATIONAL AIRPORT
O'HARE MODERNIZATION PROGRAM

V. Financial Plan

Request for Letter of Intent to provide a

Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

V. Financial Plan

This section presents a discussion of (1) funding sources for the OMP-Phase 1 Airfield Projects, (2) the historical funding approach for Airport capital projects, (3) the OMP-Phase 1 funding plan, (4) proposed cash flow for OMP-Phase 1 Airfield Projects, (5) LOI benefits, and (6) the Airport capital development program.

5.1 Funding Sources

Funding sources for the LOI Projects include the following:

- Federal grants-in-aid under the AIP,
- Passenger Facility Charges (pay-as-you-go and leveraged), and
- General Airport Revenue Bonds (GARBs).

5.1.1 FAA Airport Improvement Program Grants

The Airport and Airway Improvement Act of 1982 authorizes funding for the AIP from the Airport and Airway Trust Fund for airport development, airport planning, and noise compatibility planning and programs. The Airport and Airway Trust Fund is funded through several aviation user taxes on airfares, air freight, and aviation gasoline.

FAA AIP grants include (1) entitlement grants based on numbers of enplaned passengers and cargo tonnage for use in undertaking eligible projects and (2) discretionary grants awarded based on project merit. Consistent with requirements, the Airport's AIP grants have been used for airfield improvements, Airport roadways, public areas of terminal projects, and safety and security systems and equipment.

On December 12, 2003, President Bush signed into law FAA reauthorization legislation known as Vision 100 – Century of Flight Authorization Act of 2003. Under the reauthorization, the AIP was extended four federal fiscal years to September 30, 2007. The funding levels for AIP investment are $3.4 billion in the first year, increasing by $100 million per year in each subsequent year. It was assumed in this financial analysis that federal programs similar to the AIP will continue throughout the evaluation period.

5.1.2 Passenger Facility Charges

Since 1991, the imposition of a passenger facility charge (PFC) has been authorized by Title 14 of the Code of Federal Regulations, Part 158, and the PFC program administered by the FAA. The Department of Aviation collects a PFC from eligible enplaned passengers to fund eligible projects. PFC revenues may be used on a pay-as-you go basis or leveraged to support the issuance of PFC-backed bonds. PFC Bonds can be issued either as stand-alone or double-barrel bonds, which are backed by both a pledge of PFCs and general airport revenues. As of December 31, 2004, the City had outstanding approximately $879 million of First and Second Lien PFC stand-alone bonds. The City plans to issue either additional stand-alone or double-barrel PFC bonds in the future to finance project costs.

On September 1, 1993, the City imposed a PFC of $3.00 per enplaned passenger, which was increased to $4.50 per enplaned passenger on April 1, 2001. As of December 31, 2004 the City had authority to impose approximately $3.0 billion in PFCs and use approximately $3.0 billion in PFC

revenues at the Airport. Consistent with requirements, PFC funds are used to support projects that (1) preserve or enhance the capacity, safety, or security of the NAS; (2) reduce noise or mitigate noise effects; or (3) furnish opportunities for enhanced competition between or among air carriers.

5.1.3 General Airport Revenue Bonds

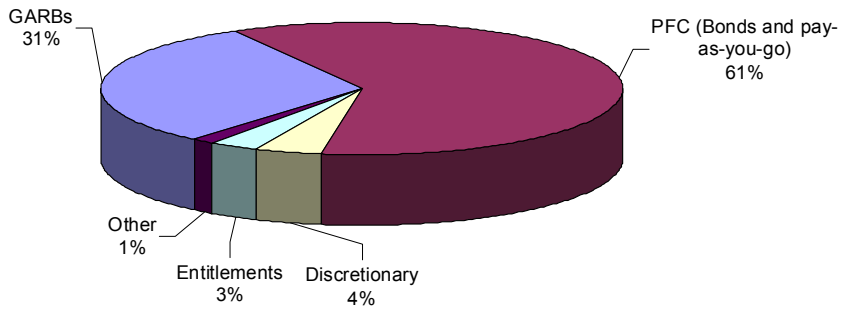
As of December 31, 2004, the City had outstanding approximately $3.2 billion of First Lien, Second Lien, and Third Lien GARBs. The debt service on GARBs is included in airline rates and charges. Generally, issuance of additional GARBs requires airline MII approval under the current Airport Use and Lease Agreement. The City plans to issue additional GARBs to finance project costs and refund existing debt.

5.2 Historical Funding Approach

Historical funding sources for Airport capital development projects have included the following: AIP grants, PFC revenues (pay-as-you-go and backing stand-alone bonds), and GARBs. The Airport has had minimal reliance on federal funding. As shown on **Exhibit V-1**, approximately $1.9 billion in improvements have been constructed at the Airport in the past 10 years (1995 through 2004), funded 93 percent with local funds of $1.8 billion (including PFC revenues and GARBs) and 7 percent with federal funds of $141 million. Of the $141 million in federal funds, approximately 43 percent were entitlement grants and 57 percent were discretionary grants.

Exhibit V-1

10-Year Historical Capital Funding Sources (1995-2004)



Source: City of Chicago.
Prepared by: Ricondo & Associates, Inc.

5.3 OMP-Phase 1 Airfield Projects Funding Plan

Including noise mitigation, the estimated cost of OMP-Phase 1 Airfield Projects is approximately $2.6 billion in 2001 dollars (of which the LOI Projects defined as runway design, construction, and decommissioning projects represent approximately $2.0 billion), or approximately $2.9 billion in

escalated dollars. **Table V-1** presents estimated funding sources for OMP-Phase 1 Airfield Projects.[8] The actual amount of funding available from these sources will depend primarily on future levels of Airport aviation activity, federal reauthorizations, and airline approval.

Table V-1

OMP-Phase 1 Airfield Projects Estimated Sources of Funds [1]

Sources of Funds ($ millions)					
PFCs [2]			FAA AIP Grants		
Pay-As-You-Go	Bond Funds	GARBs [3]	Entitlement [4]	Discretionary [5]	Total [6]
$9.1	$641.6	$1,869.4	$55.8	$304.5	$2,880.3

1 Includes Noise Program and reflects $22.5 million adjustment to May 2003 MII.
2 Includes $40.0 million adjustment from PFC Pay-As-You-Go to PFC Bond Funds.
3 Includes previously issued GARBs and future GARBs for projects with MII approvals.
4 Includes $10.3 million in entitlements already received.
5 Includes a $300 million LOI and a $4.5 million pay-go discretionary award already received.
6 Total may not add due to rounding.

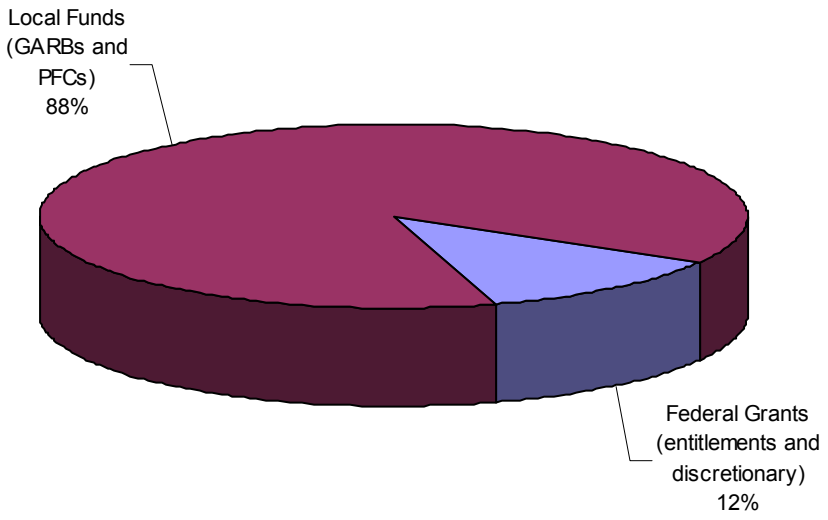
Source: Fullerton & Friar, Inc.
Prepared by: Ricondo & Associates, Inc.

[8] Funding sources as presented in the June 17, 2004 Plan of Finance and subject to change under future MII approvals.

As shown on **Exhibit V-2**, approximately 88 percent of funding sources for the OMP-Phase 1 Airfield Projects (including the Noise Program) are assumed to be local funds including PFC revenues and bonds and GARBs. To date, the airlines serving the Airport have formally granted MII approvals as part of a financing plan to fund more than 88 percent of the OMP-Phase 1 Airfield Projects through a combination of GARBs, pay-as-you-go PFCs, and PFC double-barrel bonds. Funding sources for the remaining 12 percent are assumed in the financing plan to be AIP entitlements and discretionary grants. The financing plan requires a minimum $300 million LOI commitment by the FAA as a condition to the airline funding commitment. In addition, the City intends to commit, as part of this LOI request, approximately $55.8 million in entitlement grants to fund a portion of the construction of the OMP-Phase 1 Airfield Projects.

Exhibit V-2

OMP-Phase 1 Airfield Projects Local Funds and Federal Grants [1]



[1] Includes Noise Program.

Source: Fullerton & Friar, Inc.
Prepared by: Ricondo & Associates, Inc.

5.4 Proposed Cash Flows for LOI Projects

Table V-2 and Table V-3 show the estimated cash flow needs for the LOI Projects (runway projects only) during construction as originally planned by the City in 2001 dollars and the requested flow of funds from the FAA under the LOI for a 10-year timeframe, respectively. The timing of expenditures is subject to change, and amounts shown for 2003 and 2004 do not represent actual amounts spent. The funding needs of the LOI Projects during construction are far greater than the requested funding commitment from the FAA. As permitted, future federal funds will be used to reimburse past expenditures.

Table V-2

Cash Flows for LOI Projects (2001 dollars)

Calendar Year	LOI Projects Expenditures (millions)[1]
2003	$64.1
2004	355.5
2005	495.5
2006	455.3
2007	294.7
2008	286.4
2009	0.0
2010	0.0
2011	0.0
2012	0.0
2013	0.0
2014	0.0
Total [2]	$1,951.5

[1] Expenditures are shown in calendar years as originally planned by the City in 2001 dollars. The timing of expenditures is subject to change, and amounts shown for 2003 and 2004 do not represent actual amounts spent.

[2] Total may not add due to rounding.

Source: O'Hare Partners.
Prepared by: Ricondo & Associates, Inc.

Table V-3

Proposed LOI Reimbursement Schedule

Federal Fiscal Year	Proposed LOI Reimbursement ($ millions)
2003	$0.0
2004	0.0
2005	30.0
2006	30.0
2007	30.0
2008	30.0
2009	30.0
2010	30.0
2011	30.0
2012	30.0
2013	30.0
2014	30.0
Total	$300.0

Source: City of Chicago, Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

5.5 LOI Benefits

Approval of this LOI request will advance FAA's policy goals and assist the City in minimizing the amount of debt necessary to fund the OMP.

5.5.1 Policy Goals

A favorable decision by the FAA on this LOI request will advance two important FAA policy goals. First, the completion of the project will reduce delays and enhance the capacity of the Airport and the NAS. Second, OMP-Phase 1 Airfield Projects will receive significant local commitment with approximately 88 percent local funding.

5.5.2 Financial Implications

If an LOI request is not approved, an alternative method for funding the LOI Projects would be to attempt to secure additional airline MII approvals to issue additional GARBs to finance the construction costs previously identified as being funded with an LOI grant. Estimated debt service payments resulting from an additional $300 million GARB issuance would be approximately $24 million annually. The additional debt service would increase the Airport's cost per enplaned passenger by approximately $0.63 in 2009. The City has an agreement with the airlines to allow it to proceed with construction after the achievement of funding conditions and operational triggers. In 2004, the City met its operational triggers for all subphases of OMP-Phase 1. An LOI commitment will assist the City in moving forward with project construction based on the funding conditions in the agreement.

5.6 Capital Development Program

According to the *AIP Handbook* dated January 8, 2004, the FAA will determine the Sponsor's financial commitment in the analysis of the Airport's financial plan through 2014, the last year of the proposed LOI reimbursement schedule. **Appendix F** contains the Airport's capital development program as developed for the Airport Master Plan dated February 2004.

RICHARD M. DALEY
MAYOR

CHICAGO O'HARE INTERNATIONAL AIRPORT
O'HARE MODERNIZATION PROGRAM

Appendix A
Business and Community Support

Request for Letter of Intent to provide a

Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

Suburban Supporters

Communities

Aurora	Downers	Hillside	Morton Grove	Prospect Heights	Wayne
Bartlett	Grove	Indian Head Park	Naperville	Riverside	West Chicago
Bellwood	Evanston	LaGrange Park	North Riverside	Rolling Meadows	Western Springs
Bolingbrook	Forest Park	Lemont	Northbook	Rosemont	Westmont
Broadview	Franklin Park	Lisle	Northlake	Skokie	Wheaton
Buffalo Grove	Hanover Park	Maywood	Oak Brook	St. Charles	Wheeling
Carol Stream	Highland	Melrose Park	Palatine	Stone Park	Winnetka

DuKane Valley Council

Aurora	Elburn	Lily Lake	Pingree Grove	Virgil
Batavia	Elgin	Maple Park	Sleepy Hollow	Wayne
Big Rock	Geneva	Montgomery	South Elgin	West Chicago
Burlington	Gilberts	Naperville	St. Charles	West Dundee
Carpentersville	Hampshire	North Aurora	Sugar Grove	Wheaton
East Dundee	Huntley	Oswego	Sycamore	Winfield

Lake County Municipal League

Antioch	Fox River Grove	Highwood	Lakemoor	Old Mill Creek	Vernon Hills
Bannockburn	Fox River	Indian Creek	Libertyville	Park City	Volo
Barrington	Gardens	Island Lake	Lincolnshire	Riverwoods	Wadsworth
Barrington Hills	Grayslake	Kildeer	Lindenhurst	Round Lake	Wauconda
Beach Park	Green Oaks	Lake Barrington	Long Grove	Round Lake Beach	Waukegan
Buffalo Grove	Gurnee	Lake Bluff	Mettawa	Round Lake Hts	Wheeling
Deer Park	Hainesville	Lake Forest	Mundelein	Round Lake Park	Winthrop Harbor
Deerfield	Hawthorne Woods	Lake Villa	North Barrington	Third Lake	Zion
Fox Lake	Highland Park	Lake Zurich	North Chicago	Tower Lakes	

Southwest Conference of Mayors

Alsip	Burbank	Hickory Hills	Merrionette Park	Palos Heights	Worth
Bedford Park	Chicago Ridge	Hometown	Oak Lawn	Palos Hills	
Blue Island	Crestwood	Justice	Orland Hills	Palos Park	
Bridgeview	Evergreen Park	Lemont	Orland Park	Willow Springs	

RICHARD M. DALEY
MAYOR

CHICAGO O'HARE INTERNATIONAL AIRPORT
O'HARE MODERNIZATION PROGRAM

Appendix B
Airline Support

Request for Letter of Intent to provide a

Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

CHICAGO O'HARE AIRLINES TOP COMMITTEE

Kate Hill, Chair • P.O. Box 66100, Chicago, IL 60666 • Tel: 847-700-6006
Fax: 847-700-4841

October 8, 2001

John Harris
First Deputy Commissioner
Department of Aviation
O'Hare International Airport
P.O. Box 66142
Chicago, Il 60666

Dear Commissioner Harris:

Enclosed is a certificate reflecting the fact that a Majority-in Interest of Airline Parties has voted to partially approve the GARB funding for the City's project entitled **"Runway Formulation – Phase 1 (245)"** for the not-to-exceed sum of $2,000,000. The allocation of debt service for this project will be to the Airfield Cost Revenue Center.

Kate Hill

Kate Hill
Chair
O'Hare Top Committee

cc: Top Committee
R. DiCamillo
J. Delaney
D. McNabb

KH245

CHICAGO O'HARE AIRLINES TOP COMMITTEE

Kate Hill, Chair • P.O. Box 66100, Chicago, IL 60666 • Tel: 847-700-6006
Fax: 847-700-4841

October 19, 2001

John Harris
First Deputy Commissioner
Department of Aviation
O'Hare International Airport
P.O. Box 66142
Chicago, Il 60666

Dear Commissioner Harris:

Enclosed is a certificate reflecting the fact that a Majority-in Interest of Airline Parties has voted to approve the GARB funding requested for the City's project entitled **"Runway Formulation – Acquisition (246)"** for the not-to-exceed sum of $14,293,000. The funding for this project shall be GARBS with the debt service allocated to the Airfield Cost Revenue Center.

Sincerely,

Kate Hill/jp

Kate Hill
Chair
O'Hare Top Committee

cc: Top Committee
J. Delaney
D. NcNabb

KH246 R1

CHICAGO O'HARE AIRLINES TOP COMMITTEE

Kate Hill, Chair • P.O. Box 66100, Chicago, IL 60666 • Tel: 847-700-6006
Fax: 847-700-4841

December 26, 2001

John Harris
First Deputy Commissioner
Department of Aviation
O'Hare International Airport
P.O. Box 66142
Chicago, Il 60666

Dear Commissioner Harris:

Enclosed is a Certificate reflecting the fact that a Majority-in-Interest of Airline Parties have voted to conditionally approve GARB funding for the City's Project entitled "Runway Land Acquisitions and Planning" for the not-to-exceed sum of $125,000,000. This approval is conditional based on the following:

a. The City will reissue airport rates and charges for signatory airlines for the period commencing January 1, 2002 and ending December 31, 2002 to reflect the refunding and restructuring of certain bond issues as proposed to the TOP Committee on November 1, 2001 and any potential increases in non-airline revenues or activity levels that may, after further review, warrant an increase; and

b. Funding for this project shall be limited to the planning, formulation, and purchase of land for the proposed Northern most 9/27 Runway unless further agreed to by MII.

The debt service for this project shall be allocated to the Airfield Cost Revenue Center.

Sincerely,

Kate Hill

Kate Hill
Chair
TOP Committee

cc: TOP Committee
J. Delaney
P. Harney
D. McNabb

Runway Land Acquisition and Planning
RW - 02

CHICAGO O'HARE AIRLINES TOP COMMITTEE

Kate Hill, Chair • P.O. Box 66100, Chicago, IL 60666 • Tel: 847-700-6006
Fax: 847-700-4841

July 9, 2002

Mr. John Harris
First Deputy Commissioner
City of Chicago
Department of Aviation
P.O. Box 66142
Chicago, IL 60666

Dear First Deputy Commissioner:

On December 26, 2001 the Airlines presented the City with an MII approval for the use of $125 million in GARB funding for the purchase of land outside the existing boundaries of the Airport required for the construction of the proposed northern most 9/27 runway. The condition of the approval was that the funding was to be used for land related to that runway only.

This letter is to confirm our agreement that a portion of the funding previously approved can also be used for the purchase of residential property required for the construction of either of the proposed south side runways. As previously discussed the Airlines are to be notified by the City prior to any land purchases.

This agreement is limited to the use of previously approved funds for land purchase only and does not authorize any additional expenditures for planning or other related soft costs beyond the original amounts authorized.

Runway Planning/Formulation	$ 2,000,000
Runway Master Plan/Environmental	$ 9,000,000
Runway Land Acquisition	$ 114,000,000
	$ 125,000,000

Should you have any questions regarding this change in approval conditions, please call.

Sincerely;

Kate Hill

Kate Hill
Chair
TOP Committee

cc: TOP Committee
P. Harney
J. Delaney
D. McNabb

KH RW-02 Amendment

CHICAGO O'HARE AIRLINES TOP COMMITTEE

Kate Hill, Chair • P.O. Box 66100, Chicago, IL 60666 • Tel: 847-700-6006
Fax: 847-700-4841

May 5, 2003

John Harris
First Deputy Commissioner
Department of Aviation
O'Hare International Airport
P.O. Box 66142
Chicago, Il 60666

Dear Commissioner Harris:

Enclosed is a Certificate reflecting the fact that a Majority-in-Interest of Airline Parties have voted to approve Phase 1A and 1B for the project entitled "OMP Phase 1 Projects (Capital Project Approval Request No. 1 – GARB)" for the not-to-exceed sum of $492,400,000. This GARB approval amount reflects a partial funding for OMP Phase 1A and 1B as described in Attachment 1. The remaining funding for these OMP Phases shall be as described in the funding sources and uses tables (also as described in Attachment A).

As the Airline Parties and the City have discussed, it is our understanding that the City intends to take pursue the following:

a. The City will undertake a series of bond refunding and restructurings that will, in the best efforts of the City, result in the overall debt service savings as presented in the City's financing proposal for this funding request, and that these savings will be immediately reflected in Airline rates and charges.

b. The City will work with the Airlines to implement the Management Procedures as detailed in the attachment to this funding request.

c. The City will take active steps to reduce operation and maintenance expenses at the Airport and will work in a timely manner with the Airlines to minimize O&M Expenses wherever possible.

Sincerely,

Kate Hill

Kate Hill
Chair
O'Hare Top Committee

cc: Top Committee
J. Delaney
P. Harney
D. McNabb

CHICAGO O'HARE AIRLINES TOP COMMITTEE

Kate Hill, Chair • P.O. Box 66100, Chicago, IL 60666 • Tel: 847-700-6006
Fax: 847-700-4841

May 5, 2003

John Harris
First Deputy Commissioner
Department of Aviation
O'Hare International Airport
P.O. Box 66142
Chicago, Il 60666

Dear Commissioner Harris:

Enclosed is a Certificate reflecting the fact that a Majority-in-Interest of Airline Parties have voted to approve Phase 1C and 1D for the project entitled "OMP Phase 1 Projects (Capital Project Approval Request No. 1 – GARB)" for the not-to-exceed sum of $1,235,700,000. This GARB approval amount reflects a partial funding for OMP Phase 1C and 1D as described in Attachment 1, and in conjunction with the GARB approval for Phase 1A and 1B encompasses the full GARB requirement for OMP Phase 1 (as described in Exhibit A). The remaining funding for these OMP Phases shall be as described in the funding sources and uses tables (also as described in Attachment A).

As the Airline Parties and the City have discussed, it is our understanding that the City intends to take pursue the following:

a. The City will undertake a series of bond refunding and restructurings that will, in the best efforts of the City, result in the overall debt service savings as presented in the City's financing proposal for this funding request, and that these savings will be immediately reflected in Airline rates and charges.

b. The City will work with the Airlines to implement the Management Procedures as detailed in the attachment to this funding request.

c. The City will take active steps to reduce operation and maintenance expenses at the Airport and will work in a timely manner with the Airlines to minimize O&M Expenses wherever possible.

Sincerely,

Kate Hill

Kate Hill
Chair
O'Hare Top Committee

cc: Top Committee
J. Delaney
P. Harney
D. McNabb

CHICAGO O'HARE AIRLINES TOP COMMITTEE

Kate Hill, Chair • P.O. Box 66100, Chicago, IL 60666 • Tel: 847-700-6006
Fax: 847-700-4841

May 5, 2003

John Harris
First Deputy Commissioner
Department of Aviation
O'Hare International Airport
P.O. Box 66142
Chicago, Il 60666

Dear Commissioner Harris:

Enclosed is a Certificate reflecting the fact that a Majority-in-Interest of Airline Parties have voted to approve funding for Phase 1A and 1B for the project entitled "OMP Phase 1 Projects and Noise Program (Capital Project Approval Request No. 2 – Double Barrel PFC Bonds)" for the not-to-exceed sum of $420,600,000. This approval is for the issuance of GARBs supported by a pledge of legally available PFC Revenues ("Double Barrel PFC Bonds"). This approval amount reflects a partial funding for OMP Phase 1A and 1B as described in Attachment 1. The remaining funding for these OMP Phases shall be as described in the funding sources and uses tables (also as described in Attachment A).

In addition a Majority-in-Interest of Airlines parties have also voted to approve the issuance of Double Barrel PFC Bonds for the not-to-exceed sum of $80,000,000 to fund the ongoing Noise Program, as described in the City's Funding request entitled "OMP Phase 1 Projects and Noise Program (Capital Project Approval Request No. 2 – Double Barrel PFC Bonds)".

As the Airline Parties and the City have discussed, it is our understanding that the City intends to take pursue the following:

a. The City will undertake a series of bond refunding and restructurings that will, in the best efforts of the City, result in the overall debt service savings as presented in the City's financing proposal for this funding request, and that these savings will be immediately reflected in Airline rates and charges.

b. The City will work with the Airlines to implement the Management Procedures as detailed in the attachment to this funding request.

c. The City will take active steps to reduce operation and maintenance expenses at the Airport and will work in a timely manner with the Airlines to minimize O&M Expenses wherever possible.

Sincerely,

Kate Hill

Kate Hill
Chair
O'Hare Top Committee

cc: Top Committee
J. Delaney
P. Harney
D. McNabb

CHICAGO O'HARE AIRLINES TOP COMMITTEE

Kate Hill, Chair • P.O. Box 66100, Chicago, IL 60666 • Tel: 847-700-6006
Fax: 847-700-4841

May 5, 2003

John Harris
First Deputy Commissioner
Department of Aviation
O'Hare International Airport
P.O. Box 66142
Chicago, Il 60666

Dear Commissioner Harris:

Enclosed is a Certificate reflecting the fact that a Majority-in-Interest of Airline Parties have voted to approve funding for Phase 1C and 1D for the project entitled "OMP Phase 1 Projects and Noise Program (Capital Project Approval Request No. 2 – Double Barrel PFC Bonds)" for the not-to-exceed sum of $41,000,000. This approval is for the issuance of GARBs supported by a pledge of legally available PFC Revenues ("Double Barrel PFC Bonds"). This approval amount reflects a partial funding for OMP Phase 1C and 1D as described in Attachment 1. The remaining funding for these OMP Phases shall be as described in the funding sources and uses tables (also as described in Attachment A).

In addition a Majority-in-Interest of Airlines parties have also voted to approve the issuance of Double Barrel PFC Bonds for the not-to-exceed sum of $60,000,000 to fund Phase 1D of the ongoing Noise Program, as described in the City's Funding request entitled "OMP Phase 1 Projects and Noise Program (Capital Project Approval Request No. 2 – Double Barrel PFC Bonds)".

As the Airline Parties and the City have discussed, it is our understanding that the City intends to take pursue the following:

a. The City will undertake a series of bond refunding and restructurings that will, in the best efforts of the City, result in the overall debt service savings as presented in the City's financing proposal for this funding request, and that these savings will be immediately reflected in Airline rates and charges.

b. The City will work with the Airlines to implement the Management Procedures as detailed in the attachment to this funding request.

c. The City will take active steps to reduce operation and maintenance expenses at the Airport and will work in a timely manner with the Airlines to minimize O&M Expenses wherever possible.

Sincerely,

Kate Hill

Kate Hill
Chair
O'Hare Top Committee

cc: Top Committee
J. Delaney
P. Harney
D. McNabb

Appendix C
FAA and USDOT Documents

Request for Letter of Intent to provide a

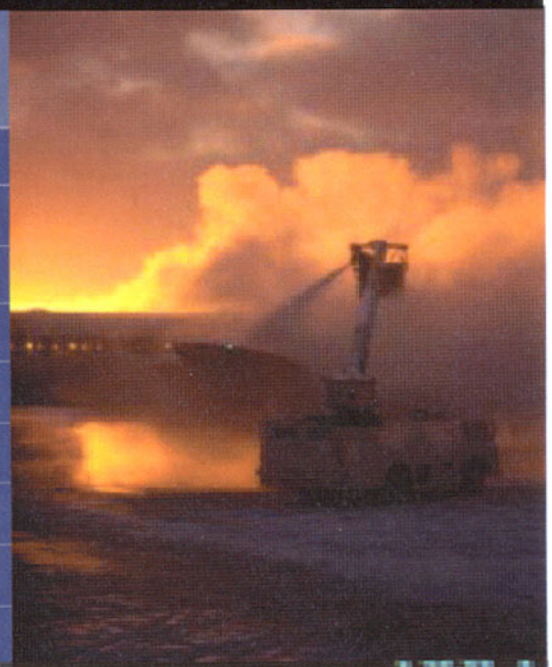
Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

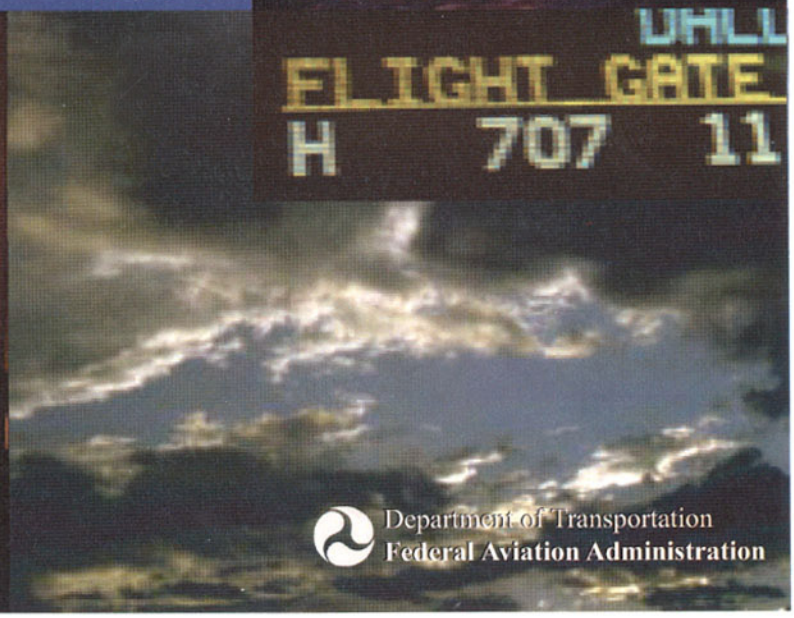
RICHARD M. DALEY
MAYOR

CHICAGO O'HARE INTERNATIONAL AIRPORT
O'HARE MODERNIZATION PROGRAM

Airport Capacity Benchmark Report 2001

FLIGHT NUMBER	DESTINATION	TIME
117	BOSTON	0935
12	LA GUARDIA	0935
4916	NEWARK	0935
296	KENNEDY	0935
377	PHILADELPHIA	0935
576	ATLANTA	0940
213	CHICAGO	0940
385	SAN FRANCISCO	0940





Department of Transportation
Federal Aviation Administration

Executive Summary

Setting the Framework for Benchmarks

The benchmarks in this report are a relatively simple expression of a complex quantity, airport capacity. They serve primarily as a reference point on the state of the airport system at a specific time. They can be updated in the future to mark progress. They can also be used to identify and compare specific types of airports, for instance to determine which airports are most severely affected by adverse weather or to compare the prospects for airports that plan to build new runways to those that do not. The benchmarks also provide a starting point for public policy discussions, because they give a succinct report on the current and future state of major airport capacity.

Benchmarks are useful data that help frame discussions. However, they are not a substitute for the more detailed analysis that should precede major investment and policy decisions. In this sense they might be compared to a vital sign of human health, such as blood pressure. That simple indicator might be the starting point for a diagnosis, but more information would be wanted before recommending surgery. Similarly, capacity benchmarks help identify problem areas but are not, in themselves, an adequate basis for selecting remedies.

This issue is apparent in the case of Atlanta Hartsfield International Airport. The scheduled operations exceed the benchmarks several times daily in optimum weather and frequently under reduced rate conditions. The simple comparison of schedule to benchmarks suggests that some action is needed to curtail the schedule. However, air traffic controllers, airlines, and the airport operator have indicated in discussions that they are relatively comfortable with the current schedule and believe that it makes efficient use of the airport. Their judgment is based on vast experience and a broad understanding of air transportation. Some of the considerations are specific to Atlanta (favorable runway configuration, weather patterns, and airspace structure), some are applicable to transfer hub airports in general (the concentration of traffic into schedule peaks to allow passengers to make convenient transfer between flights, the ability to catch up with traffic between peaks in the schedule, and the ability of hubbing carriers to cancel and consolidate some flights during reduced rate conditions), and some are applicable to all busy airports (the premise that some amount of congestion and delay is not inconsistent with efficient and affordable air transportation).

Purpose

- The FAA has developed capacity benchmarks for 31 of the nation's busiest airports to understand the relationship between airline demand and airport runway capacity and what we in the aviation community can do about it.
- Capacity benchmarks are defined as the maximum number of flights an airport can routinely handle in an hour.
  - These benchmarks are estimates of a complex quantity that varies widely with weather conditions, runway configurations, and the mix of aircraft types. Capacity benchmarks assume there are no constraints in the en route system or the airport terminal area. They are useful for broad policy discussions and the development of long–term strategies.

Methodology

- Between October 2000 and April 2001, the FAA and MITRE/CAASD developed capacity benchmarks for 31 airports.
- There are two rates for each airport – an optimum rate based on good weather conditions and a reduced rate based on adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.

- The optimum rate is defined as the maximum number of aircraft that can be routinely handled using visual approaches during periods of unlimited ceiling and visibility.
- The reduced rate is defined as the maximum number of aircraft that can be routinely handled during reduced visibility conditions when radar is required to provide separation between aircraft. This rate was determined for the most commonly used runway configuration in adverse weather conditions.

- The benchmarks reflect the number of takeoffs and landings per hour for the given conditions. These benchmarks can be exceeded occasionally and lower rates can be expected under adverse conditions.
- The FAA confirmed capacity benchmark rates in three ways:
  - Benchmark rates for each airport were provided by the air traffic team at the facility and the airport operator and were based on their collective operational experience.
  - Benchmark rates provided by the air traffic teams were compared to historical arrival and departure data (Aviation System Performance Metrics) to confirm that they represent the best performance of the airport.
  - Using the FAA's widely accepted airfield capacity computer model, benchmark rates were also calculated based on a set of standard performance characteristics.
- The resulting capacity benchmarks were then compared to carrier schedule data from the Official Airline Guide. Scheduled carrier operations constitute a significant part, but not all, of an airport's traffic. Excluded are general aviation and military operations, non-scheduled flights and some cargo operations. These typically account for between 1 and 30% of the total traffic at the 31 airports studied.
- Human factors play a critical role in the benchmark rates reported by the air traffic facility. Benchmarks are strongly affected by how busy the airport is and how aggressively the management team sets target rates.
- Six airports were selected for on-site visits to validate the methodology: Atlanta, Chicago, Dallas-Fort Worth, St. Louis, Memphis, and Detroit. These on-site visits included discussions with local air traffic personnel, airport authorities, and air carriers serving the airport. For the other airports, discussions were conducted with managers at the local air traffic facility.
- The individual benchmark summaries compare projected growth in capacity with projected growth in demand to understand the relationship between future airline demand and airport capacity. Demand is based on the Terminal Area Forecast, the FAA's projection of aviation activity at select U.S. airports, and is revised annually to reflect current and anticipated economic and social conditions.
- Historically, there are several measures of delay commonly used. (See appendix) The measure used herein to identify the most delayed airports is the percent of aircraft delayed more than 15 minutes from the FAA's Operations Network (OPSNET).

Assumptions

- The improvements that were considered as part of the study included new runways for which plans are sufficiently advanced, and the following technologies and procedures, where they were appropriate to the specific airport:
  - Automatic Dependent Surveillance-Broadcast/Cockpit Display of Traffic Information with Local Area Augmentation System (ADS-B/CDTI with LAAS) – provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
  - Flight Management System/Area Navigation (FMS/RNAV) Routes – allow a more consistent flow of aircraft to the runway.

Operations, Enplaned Passengers, and Selected Delay Rankings Using Selected Databases and Criteria

Airport	OPSNET Delays per 1,000 Operations	Rank	Total Delays	Rank	ASPM Avg. Arrival Delay (Minutes)	Rank	ASQP Flight Arrivals	Percent On Time	Inverse Rank	Enplaned Passengers (thousands)	Rank	OPSNET Total Oper.	Rank
LaGuardia	155.9	1	61,120	1	21.8	1	8,838	73.1	13	10,785	18	392,047	22
Newark	81.2	2	37,132	3	14.3	5	9,686	74.7	15	14,904	12	457,182	18
Chicago	63.3	3	57,545	2	15.8	4	22,365	69.0	7	31,483	2	908,977	2
San Francisco	56.9	4	24,478	5	17.4	2	10,042	60.3	2	16,431	8	430,554	21
Boston	47.5	5	24,120	6	16.6	3	8,647	72.8	12	11,066	17	508,283	11
Philadelphia	44.5	6	21,521	7	13.4	6	9,490	73.7	14	10,346	19	483,567	14
Kennedy	38.8	7	13,930	11	12.2	9	3,386	78.5	23	10,137	20	358,951	26
Atlanta	30.9	8	28,229	4	12.0	10	19,867	72.5	11	37,224	1	913,449	1
Houston	28.1	9	13,785	12	8.9	25	10,153	81.7	28	14,735	13	490,568	12
Dallas/Ft.Worth	23.8	10	20,638	8	9.2	23	18,799	72.5	10	27,581	3	865,777	3
Phoenix	22.0	11	14,024	10	11.0	14	14,818	66.8	5	16,083	9	638,757	5
Los Angeles	21.9	12	17,141	9	12.7	8	16,003	60.0	1	24,007	4	783,684	4
Dulles	19.5	13	9,339	14	11.5	12	4,175	80.5	25	6,830	29	479,931	15
St. Louis	18.2	14	8,837	15	11.1	13	12,726	70.3	9	14,923	11	484,224	13
Detroit	17.6	15	9,780	13	8.8	26	11,570	80.8	26	16,563	7	554,580	6
Cincinnati	15.4	16	7,360	16	10.7	17	5,115	82.0	30	7,610	26	477,654	16
Minn./St. Paul	12.7	17	6,658	17	8.4	29	10,982	75.7	16	18,944	5	522,253	8
Miami	11.3	18	5,849	18	11.9	11	5,237	77.9	21	12,721	15	516,545	10
Seattle	10.4	19	4,653	19	10.3	20	7,687	66.7	4	13,062	14	445,677	20
Las Vegas	8.0	20	4,178	20	10.6	18	10,605	68.1	6	15,311	10	521,300	9
Reagan National	8.0	21	2,727	22	9.1	24	7,084	78.0	22	6,657	30	342,790	28
Balt.-Wash. Intl	6.9	22	2,181	24	10.9	16	7,632	81.7	27	8,002	25	315,348	29
Orlando	6.3	23	2,297	23	11.0	15	7,827	77.1	20	12,529	16	366,278	25
Charlotte	6.0	24	2,748	21	7.9	30	10,113	82.8	31	9,442	21	460,370	17
Pittsburgh	3.8	25	1,695	25	8.6	27	8,146	82.0	29	8,014	24	448,181	19
San Diego	2.5	26	520	28	9.9	21	5,486	65.0	3	7,248	27	207,916	31
Denver	2.2	27	1,177	26	13.4	7	10,469	69.3	8	17,435	6	528,604	7
Salt Lake City	2.0	28	720	27	9.6	22	6,067	76.2	18	8,709	22	366,933	24
Tampa	1.6	29	435	29	10.6	19	5,506	75.8	17	6,912	28	278,632	30
Memphis	0.4	30	143	30	8.5	28	4,418	78.8	24	4,524	31	386,335	23
Honolulu	0.0	31	8	31	N/A	N/A	3,128	76.5	19	8,517	23	345,496	27

Sources: FAA OPSNET and ASPM data are for CY 2000. Honolulu is not included in the voluntarily reported ASPM database.
ASQP data for February 2001 is from the April edition of DOT's *Air Travel Consumer Report*.
Enplaned passengers are from the 1999 edition of DOT's *Airport Activity Statistics of Certificated Route Air Carriers.*

- Passive Final Approach Spacing Tool (pFAST) – assists the controller with runway assignment and sequencing for aircraft and better flow of traffic into the terminal area.
- Simultaneous instrument approaches – allow full independent use of two or more runways for landings in adverse weather conditions.
- Precision Runway Monitor (PRM) – a high update radar system that allows simultaneous instrument approaches to parallel runways as close as 3000 feet apart. Also helps in procedural applications such as Simultaneous Offset Instrument Approaches (SOIA) where applicable.
- Land and Hold Short Operations (LAHSO) – allows independent arrivals for specific aircraft types on intersecting runways, where runway geometries permit.

- Benefits from planned improvements assume that all required infrastructure and regulatory approvals will be in place including aircraft equipment, airspace design, environmental reviews, radio frequencies, training, etc. as needed.
- In general, the benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the National Airspace System. Such constraints may include:
  - Taxiway and gate congestion, runway crossings, slot controls, construction activity;
  - Terminal airspace, especially limited departure headings;
  - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather, or congestion problems at other airports; and
  - Seasonal limitations due to high temperatures that restrict aircraft climb rates.

Observations across all 31 Airports

- The nature and extent of the problem and discussions of potential solutions are site-specific and different for each of the airports. However, there is a general pattern that as the airport traffic volume approaches capacity, delays increase. Thus, airports can achieve maximum capacity only at a reduced quality of service.
- Today there are eight airports that experience significant passenger delays – where three percent or more of the operations experience delays in excess of 15 minutes:
  - New York LaGuardia
  - Newark
  - New York Kennedy
  - Chicago O'Hare
  - San Francisco
  - Philadelphia
  - Atlanta
  - Boston
- The benchmark study predicts that, in 10 years, the first 6 of the 8 airports above plus Los Angeles will still have significant passenger delays. New runways at Atlanta and Boston should alleviate delays at those two airports.
- Table 1 shows the capacity benchmarks for the 31 airports studied.
- The capacity of airports decreases in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation. The reduced rate reflects the capacity benchmark for the

most commonly used configuration in adverse weather. Under very low ceiling/visibility in Instrument Meteorological Conditions (IMC), capacity is even lower.

- Extent of capacity loss during operations at reduced rates (as compared to the optimum) varies widely across the 31 airports, e.g.,
  - At Cincinnati and Minneapolis-St. Paul, it is minimal (2 percent)
  - At some airports like Detroit, Washington Dulles, and Houston, it is relatively small (10 percent or less)
  - At other airports like St. Louis and San Francisco it is very high (about 40 percent)

  These differences are due to different runway configurations and operational procedures in adverse weather at each airport.
- Most airports are able to handle demand under good weather conditions (i.e., optimum capacity). New York LaGuardia is an exception and is the highest ranked airport for delay rates in the year 2000. Looking at the number of aircraft delayed significantly (i.e., greater than 15 minutes), LaGuardia had 156 delays per 1,000 aircraft operations and Newark was a distant second at 81 delays per 1,000 aircraft operations (Table 2).
- During good weather, delays are generally small and manageable.
- During bad weather, capacity is lower and results in even more delays. Overall, LaGuardia, Newark, Chicago O'Hare, and San Francisco have the highest delay rates (57 to 156 delays per 1,000 aircraft operations). Several airports such as Las Vegas, Baltimore-Washington, Denver, and Salt Lake City do not have any significant delay problems (less than 10 delays per 1,000 aircraft operations).
- New runways planned for 14 airports provide significant capacity increases but the amount of the increase varies from site to site.
  - Detailed plans for new runways in the next 10 years were available for Atlanta, Houston, Dallas/Fort Worth, Phoenix, Washington Dulles, St. Louis, Detroit, Cincinnati, Minneapolis-St. Paul, Miami, Seattle-Tacoma, Orlando, Charlotte, and Denver. Additional airport operators are considering new runways, but their plans are not advanced to the point where the impact can be estimated.
  - Nominal increases are in the range of 30 to 60 percent at Atlanta, Houston, Phoenix, Washington Dulles, Seattle-Tacoma, and Minneapolis-St. Paul.
  - Some airports with high capacity configurations at their disposal today have a lower percentage of capacity increase from new runways (e.g., Denver).
- Technology improvements also provide capacity increases – most are in the 3 to 8 percent range.
- Procedural enhancements also hold promise. Depending on the airport, the enhancements could account for an additional 5 to 10 percent improvement in operations.
- For those airports operating close to capacity, technology and procedural changes could have a significant impact in improving capacity.
- Projected demand growth to 2010 at these 31 airports varies from 4 percent at Washington National Airport to 42 percent at Orlando.

Table 1
Capacity Benchmarks for Today's Operations at 31 Airports

	Airport	Optimum	Reduced
ATL	Atlanta Hartsfield International	185–200	167-174
BOS	Boston Logan International	118–126	78–88
BWI	Baltimore-Washington International	111–120	72–75
CLT	Charlotte/Douglas International	130–140	108–116
CVG	Cincinnati-Northern Kentucky	123–125	121–125
DCA	Washington Reagan National	76–80	62–66
DEN	Denver International	204–218	160–196
DFW	Dallas-Fort Worth International	261-270	183-185
DTW	Detroit Metro Wayne County	143–146	136–138
EWR	Newark International	92–108	74–78
HNL	Honolulu International	120–126	60–60
IAD	Washington Dulles International	120–121	105–117
IAH	Houston Bush Intercontinental	120–123	112–113
JFK	New York Kennedy International	88–98	71–71
LAS	Las Vegas McCarran International	84–85	52–57
LAX	Los Angeles International	148–150	127–128
LGA	New York LaGuardia	80–81	62–64
MCO	Orlando International	144–145	104–112
MEM	Memphis International	150–152	112–120
MIA	Miami International	124–134	95–108
MSP	Minneapolis-St. Paul International	115–120	112–112
ORD	Chicago O'Hare International	200–202	157–160
PHL	Philadelphia International	100–110	91–96
PHX	Phoenix Sky Harbor International	101–110	60–65
PIT	Greater Pittsburgh International	140–160	110–131
SAN	San Diego Lindbergh Field	43–57	38–49
SEA	Seattle-Tacoma International	90–91	78–81
SFO	San Francisco International	95-99	67–72
SLC	Salt Lake City International	130–132	95–105
STL	Lambert St. Louis International	104–112	64–65
TPA	Tampa International	110–119	80–87

Table 2
Capacity Benchmark Summary

Airport (ranked by delay in 2000)	Capacity Improvement (percent)						Projected Growth to 2010 (percent)	Delays per 1000 operations (2000)
	New Runway (if planned)		New Technology*		New Runway Plus New Technology**			
	Optimum	Reduced	Optimum	Reduced	Optimum	Reduced		
LGA	—	—	10	3	10	3	17	155.9
EWR	—	—	10	7	10	7	20	81.2
ORD	—	—	6	12	6	12	18	63.3
SFO	—	—	0	3	0	3	18	56.8
BOS	0	0	4	4	4	4	6	47.5
PHL	—	—	17	11	17	11	23	44.5
JFK	—	—	2	3	2	3	18	38.8
ATL	31	27	5	6	37	34	28	30.9
IAH	35	37	5	3	42	41	34	28.1
DFW	3	17	1	3	4	21	21	23.8
PHX	36	60	3	0	40	60	31	22.0
LAX	—	—	11	4	11	4	25	21.9
IAD	46	54	2	4	49	60	20	19.5
STL	14	84	11	3	27	89	30	18.2
DTW	25	17	5	6	31	24	31	17.6
CVG	26	26	2	1	28	27	40	15.4
MSP	29	26	4	4	34	31	32	12.7
MIA	10	20	12	6	24	27	23	11.3
SEA	52	46	3	4	57	51	17	10.4
LAS	—	—	0	12	0	12	30	8.0
DCA	—	—	4	8	4	8	4	8.0
BWI	—	—	0	0	0	0	27	6.9
MCO	23	34	5	3	28	38	42	6.3
CLT	25	15	4	8	30	24	15	6.0
PIT	—	—	3	1	3	1	15	3.8
SAN	—	—	2	3	2	3	33	2.5
DEN	18	4	6	13	25	17	23	2.2
SLC	—	—	5	4	5	4	34	2.0
TPA	—	—	0	19	0	19	18	1.6
MEM	—	—	3	4	3	4	30	0.4
HNL	—	—	2	7	2	7	25	0.0

* Estimates assume that new runways (where applicable) are in place
** Numbers include compounding effects of new runways and new technologies and are not strictly additive

Chicago O'Hare International Airport Benchmarks

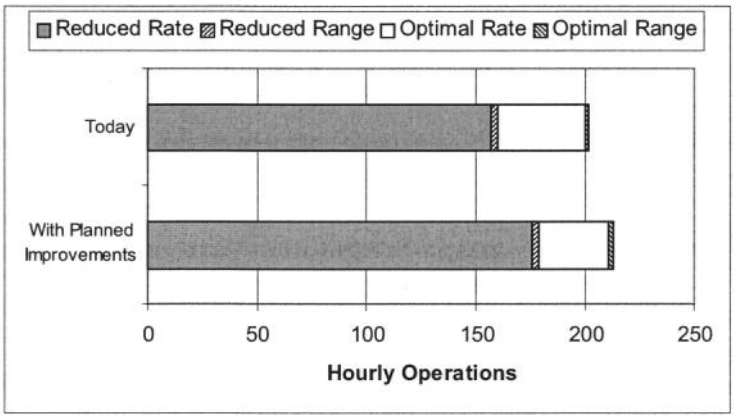
- The current capacity benchmark at Chicago O'Hare is 200-202 flights per hour in good weather.
- Current capacity falls to 157-160 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- In 2000, O'Hare was ranked third most delayed airport in the country. Overall, slightly more than 6% of all flights were delayed significantly (more than 15 minutes).
- On good weather days, scheduled traffic is at or above the capacity benchmark for 3 ½ hours of the day and about 2% of the flights are delayed significantly.
- In adverse weather, capacity is lower and scheduled traffic exceeds capacity for 8 hours of the day. The number of significantly delayed flights jumps to 12%.
- Technology and procedural improvements are expected to increase O'Hare's capacity benchmark by 6% (211-213 flights per hour) in good weather over the next 10 years.
- The adverse weather capacity benchmark will increase by a total of 12% (176-179 flights per hour) compared to today.
- These capacity increases could be brought about as a result of:
  - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
  - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Chicago O'Hare is projected to grow by 18% over the next decade. This imbalance between capacity and demand growth is expected to significantly increase delays at O'Hare.

ORD – Chicago O'Hare International Airport

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	**200-202**	**157-160**
New Runway	**N/A**	**N/A**
With planned improvements	**211-213**	**176-179**



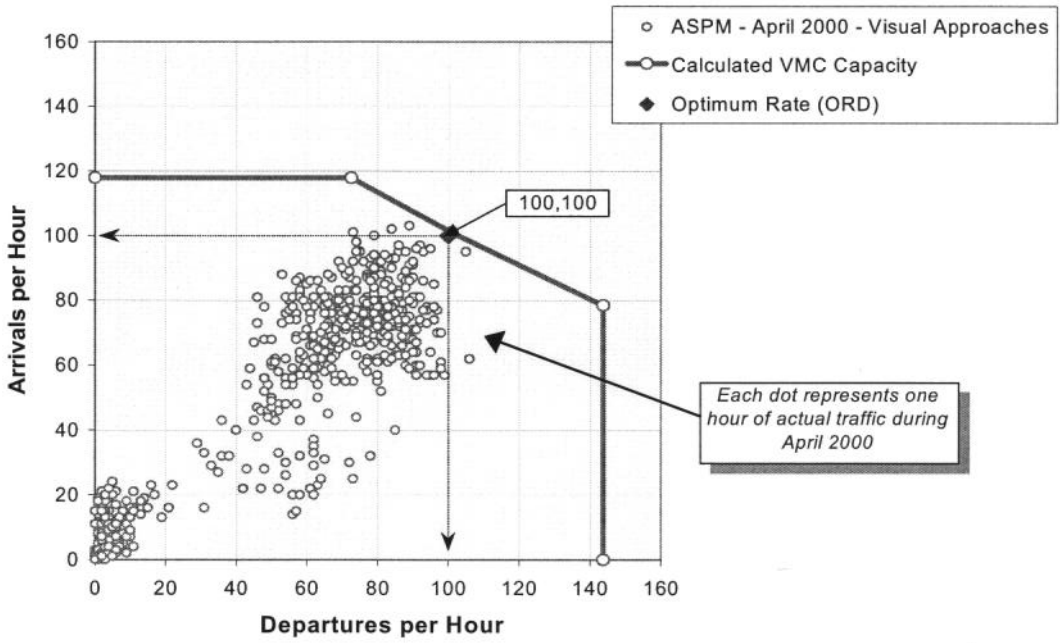
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
  - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
  - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
  - Taxiway and gate congestion, runway crossings, slot controls, construction activity
  - Terminal airspace, especially limited departure headings
  - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

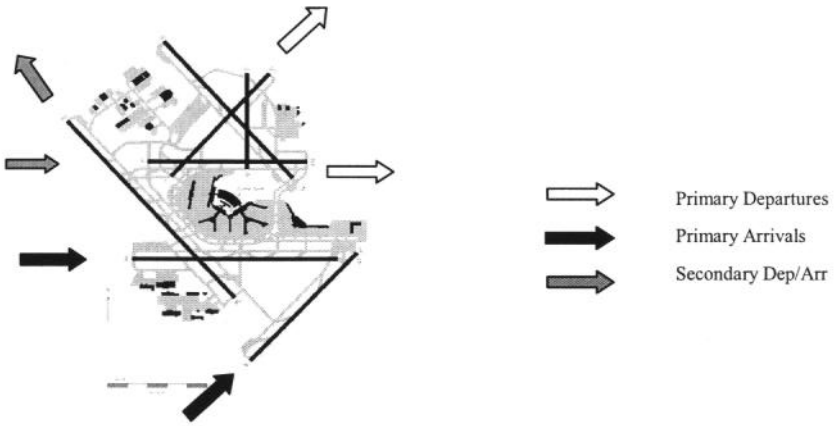
These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

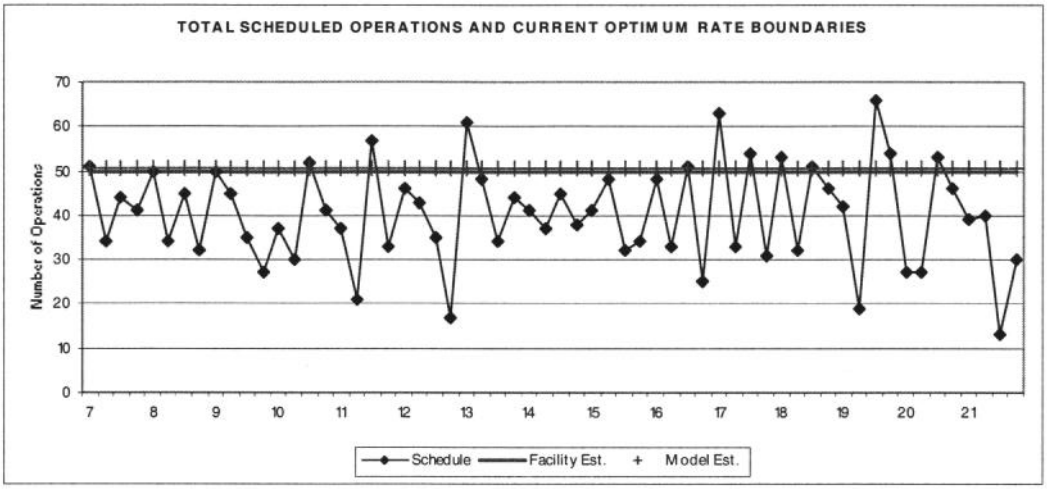
- Visual approaches, visual separation
  - Plan X: Arr: 4R/9R/(9L), Dep: 4L/9L/32L
  - Arrivals primarily to two+ parallel runways, depending on wind direction
  - Departures from two or more runways
- ASPM data is actual hourly traffic counts
- ORD frequently operates close to maximum rate
- Modeled capacity is close to actual throughput

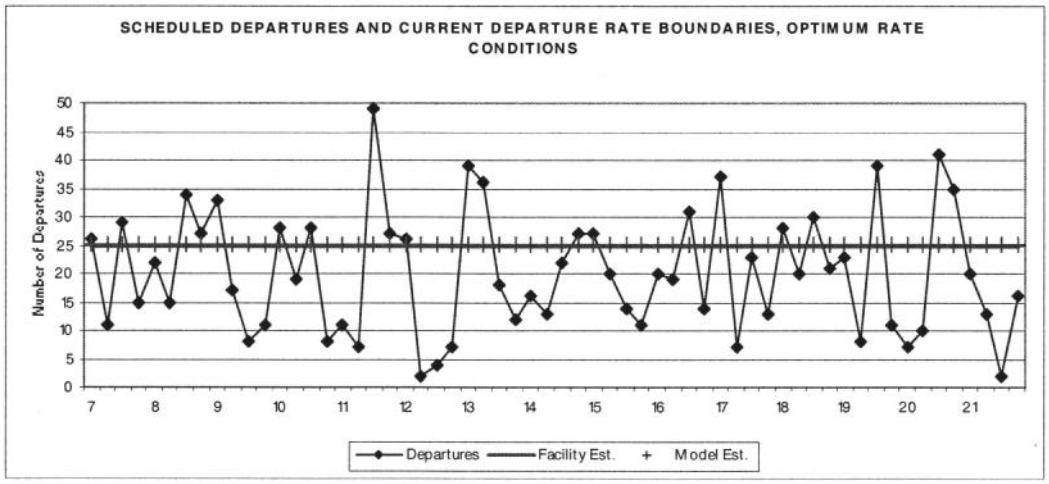


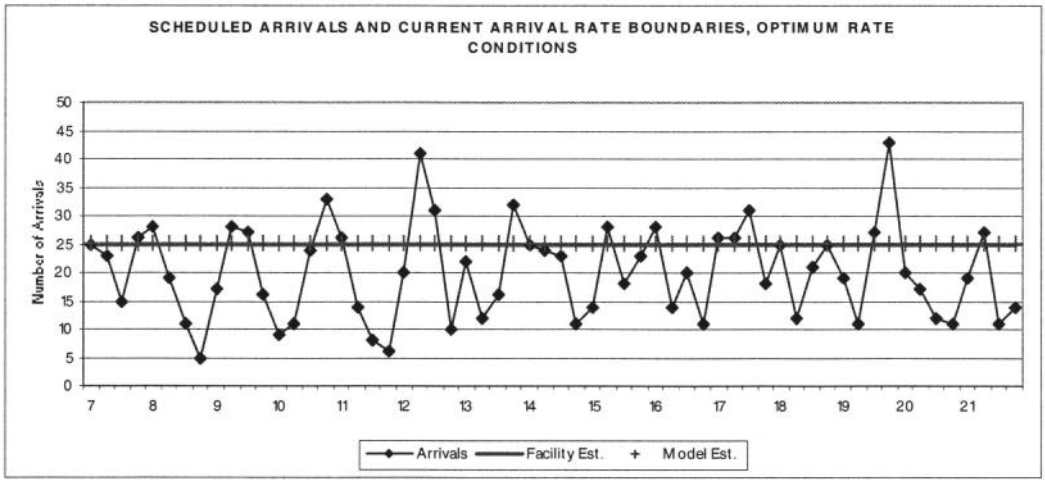


ORD – Chicago O'Hare International Airport

Scheduled Departures and Arrivals and Current Departures and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

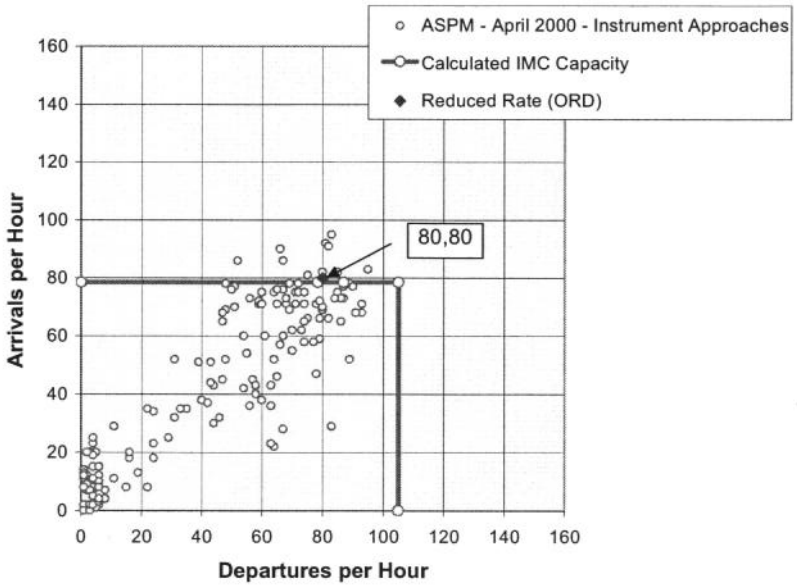


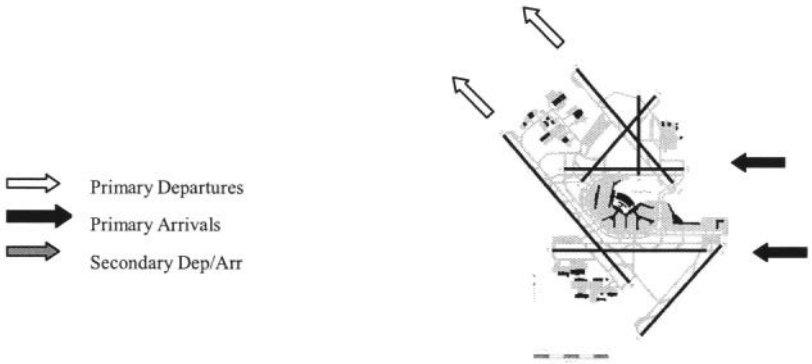




Current Operations – Reduced Rate

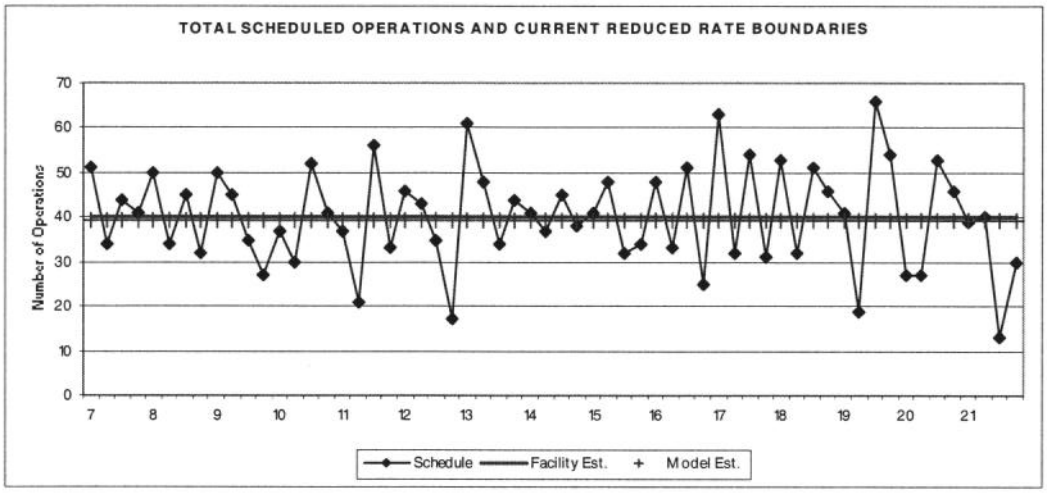
- Instrument approaches (below Visual Approach Minima)
  - Arrivals to two parallel runways
  - Departures from two+ parallel runways
- Calculated capacities are close to reported AAR and ADR
- ASPM data for "Instrument Approaches" can include marginal VFR, with higher acceptance rates.

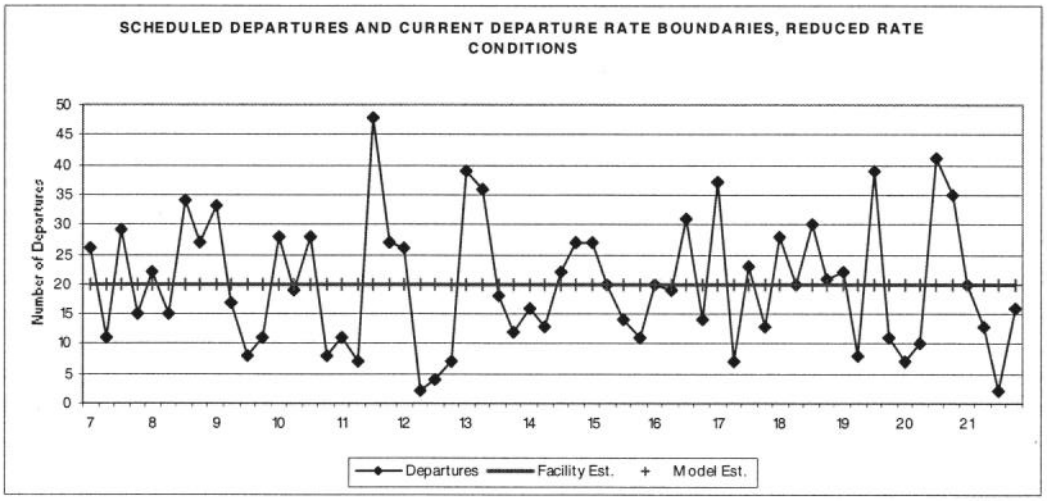


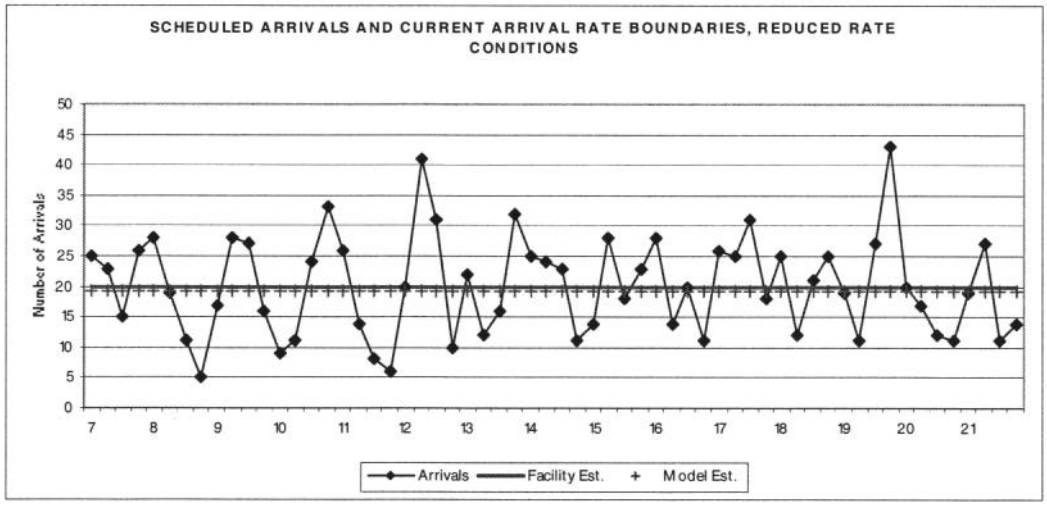


ORD – Chicago O'Hare International Airport

Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions







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2004 JAN 27 A 11:00

Department of Transportation
Federal Aviation Administration

)
) OPERATING LIMITATIONS AT
) CHICAGO O'HARE INTERNATIONAL AIRPORT
)

Docket FAA-2004-16944 ~ /

ORDER LIMITING SCHEDULED OPERATIONS

Introduction

Delays at Chicago O'Hare International Airport (O'Hare) have risen to record levels since November 2003, largely as the result of an increase in flights as well as the compression of schedules by the two largest operators at the airport. In recent weeks, to deal with schedule peaking and congestion, the FAA has imposed traffic management programs, including ground delays at other airports, on aircraft destined for O'Hare. Published airline schedules for February 2004, which call for additional operations at the airport, have the potential to cause further gridlock during peak afternoon hours and, given the ripple effect of delays at O'Hare, degrade the operation of the National Airspace System (NAS) as a whole.

The FAA's new reauthorization bill contained a provision (49 U.S.C. 41722) permitting the Department to convene a public delay reduction meeting of all scheduled airlines at a severely congested airport, such as O'Hare, on a determination of a serious transportation need or important public benefit. In light of the delays at O'Hare and the substantial inconvenience to the traveling public, earlier this month the Department and the FAA determined that a delay-reduction meeting concerning O'Hare would be necessary.

The FAA separately contacted the two air carriers with the most operations at O'Hare to discuss the impact of their schedules on operations and delays at the airport and to ascertain whether each carrier contacted would accept the FAA's imposition of a temporary limit on that carrier's operations during peak hours. Because each carrier independently will reduce its scheduled operations, the Department and the FAA are deferring a schedule-reduction meeting until further notice. Instead, and with the consent of each carrier, the FAA is ordering a five percent reduction in their scheduled operations during the hours of 1:00 p.m. through 7:59 p.m. for a six-month period beginning no later than March 4, 2004.

Even as it issues this Order, the FAA is actively pursuing comprehensive programs to increase capacity at airports critical to the NAS, such as O'Hare.

The FAA also has increased focus on O'Hare operations through on-going, daily operational conference calls with air carriers and other users to maximize throughput and mitigate delays. Additionally, the FAA is evaluating system operations in the O'Hare airspace area, including controller staffing and training, air traffic procedures, and airspace utilization. The agency will actively pursue opportunities for increased capacity or gains in efficiency. The agency disfavors short-term operational caps and similar measures except where they are essential to preserve the efficiency of the system or safety.

We emphasize, therefore, that this Order is designed to deal with a highly unusual situation, one that is unlikely to be replicated except at O'Hare. Moreover, each of the affected carriers recognized that immediate action was required to mitigate substantial inconvenience for their customers and millions of other airline passengers across the country, and each acquiesced in the FAA's exercise of its authority to limit the carrier's operations. Although the FAA will continue to examine *all* its alternatives for O'Hare, by this Order we are not establishing a practice that delays will be addressed in the short-term by restricting scheduled operations.

Background

O'Hare enjoys a unique status within the NAS. O'Hare serves as a network hub for two of the largest domestic airlines, an origin and destination for many international flights by both U.S. and foreign air carriers, and given its location a logical connecting point for significant passenger flows across the United States. In 2003, as cited in FAA's OPSNET[1], O'Hare handled 931,422 operations, making it the busiest airport in the world. Delays at O'Hare can cause significant disruption to the efficiency of the NAS and substantial inconvenience to the traveling public.

Under the High Density Rule (HDR), operations at the airport were limited to 145 scheduled air carrier and commuter operations per hour.[2] This set the scheduled hourly limits below the level feasible under optimal weather conditions but above the level allowable in instrument meteorological conditions. The phase-out of the HDR began on May 1, 2000, with the remaining slot requirements ultimately eliminated in July 2002. During the phase-out carriers serving O'Hare added a significant number of operations overall and retimed other flights, causing congestion during the peak hours of the day.

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[1] The FAA's Air Traffic Operations Network (OPSNET) collects data on air traffic activity counts and delays.

[2] This figure excludes a number of exemption slots that were created for various purposes and ten additional reservations per hour for unscheduled operations. 49 U.S.C. 41715 provided for the phase-out of the HDR (Subparts K and S of 14 C.F.R. Part 93) at O'Hare beginning in May 2000 and the elimination of this rule with respect to O'Hare in July 2002.

Since November 3, 2003, air traffic operations at O'Hare have increased still further as a result of new and retimed service at the airport, principally by the two largest operators at the airport, American Airlines, Inc., and its commuter affiliates ("American") and United Airlines, Inc., and its commuter affiliates ("United").[3] These two airlines now account for 88 percent of all scheduled operations at O'Hare. The airlines have not only been adding flights, but as importantly, compressing their existing operations to peak hours as opposed to spreading them out evenly throughout the operating day. In particular, a significant percentage of flights previously scheduled before 7:00 a.m. or after 8:00 p.m. have been shifted to the middle of the day. Since the carriers have filled in any otherwise slower periods during peak afternoon hours, current schedules create high volumes of traffic throughout much of the day.

All these factors have combined to cause a substantial increase in both total delays and average lengths of delays at O'Hare, particularly during the peak period of 1:00 p.m. to 8:00 p.m. FAA Aviation System Performance Metrics (ASPM) data[4] show that on a daily basis, from November 1 through December 31, 2003, 39 percent of O'Hare arrivals were delayed, with an average of 492 delays per day and an average of 57 minutes delay per delayed aircraft. The percentage of on-time arrivals fell from 85 percent for October 2003 to 62 and 65 percent for November and December 2003, respectively. In November, delays at the airport more than doubled from the prior year period, resulting in the most delays ever reported at any airport in FAA's OPSNET in a single month since the FAA has been compiling daily statistics: over 15,000 delayed arrivals with an average delay of 62 minutes per aircraft. In November and December 2003, arriving passengers experienced a total of 1.7 million delay minutes at O'Hare.

Recent data from the Department's Bureau of Transportation Statistics (BTS) confirm the FAA's findings and illustrate the impact on consumers. According to the BTS data[5] only 57 percent of flights arriving at O'Hare in November were on

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[3] Although American has recently increased its service more than United at O'Hare, overall since April 2000, American has increased operations by 4 percent and United has increased by 14 percent.

[4] Aviation System Performance Metrics (ASPM) provides information on individual flight performance and airport efficiency. The data is updated daily. Metrics computed in ASPM are developed by comparing actual time to scheduled time, excluding taxi metrics, which are computed by comparing actual time to an unimpeded time. No attempt is made to attribute causality of delay. ASPM provides statistics for 21 airports. Flight performance data is derived from Out Off On In (OOOI) data provided by participating carriers, Official Airline Guide (OAG) data, the FAA's Enhanced Traffic Management System, and DOT's On-time file. A flight is counted as "on time" when it departs or arrives within 15 minutes of its posted schedule.

[5] The Department's Air Travel Consumer Report publishes detailed on-time statistics for 31 reportable airports. This report is based on data collected by the Department of Transportation's BTS. (Although the BTS data is derived from a different data set from ASPM, there is a strong

time, compared to 82 and 84 percent in September and October 2003, respectively and 82 percent in November 2002. Similarly, only 60 percent of flights arriving at other airports from O'Hare in November 2003 were on time, compared to 81 and 83 percent in September and October 2003, respectively and 86 percent in November 2002. In addition, of the 60 scheduled flights listed in the November 2003 Air Travel Consumer Report as arriving late 80 percent of the time or more, 50 of them involved O'Hare.

The levels of delays that have become routine at O'Hare, with 39 percent of arrivals delayed for as much as an hour per flight, are comparable to the levels experienced at Newark International Airport and LaGuardia Airport during the most congested time periods in the summer and fall of 2000. Thus, by comparison, from May through August 2000, 31.27 percent of Newark arrivals were delayed, with an average of 172 delays per day with an average delay of 66.79 minutes per delayed aircraft; and from September through November 2000, 58.12 percent of LaGuardia arrivals were delayed with an average of 329 delays per day with an average delay of 59.75 minutes per delayed aircraft.

Schedules in the Official Airline Guide (OAG) for February 2004 show that American and United each plan to add a number of operations. For purposes of demonstration, preliminary analyses indicate that adding 100 operations per day to the November schedules for O'Hare increases delays exponentially regardless of whether the operations are added to peak periods or spread throughout the normal operating day. (For example, on November 6, 2003, with 2,715 OAG scheduled operations, there were approximately 29,000 total delay minutes recorded; 100 more operations, equivalent to a 3.7 percent increase, would result in 52,000 delay minutes, a 43 percent increase.)

Because of O'Hare's unique status, this level of congestion at O'Hare has a detrimental effect on the operational efficiency of the NAS. Air traffic management procedures typically keep aircraft destined for O'Hare on the ground at the originating airport until they can be accommodated. Such ground delays have resulted in gate and ramp congestion at other affected airports, especially those airports with limited aircraft holding areas, which ripples throughout the entire system.

Authority

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correlation in trends and summary level analysis.) On-time numbers are reported each month to BTS by U.S. air carriers that have at least 1 percent of total domestic scheduled-service passenger revenues. In November 2003, there were 16 U.S. air carriers that were required to report plus two other carriers that reported voluntarily. The reports cover nonstop scheduled-service flights between points within the United States (including territories) as described in 14 CFR Part 234 of DOT's regulations. A flight is counted as "on time" if it arrived within 15 minutes of the scheduled time. Arrival performance is based on arrival at the gate. Departure performance is based on departure from the gate.

The FAA has broad authority under Title 49 of the United States Code (U.S.C.), Subtitle VII, to regulate and control the use of the navigable airspace of the United States. Under 49 U.S.C. 40103, the agency is authorized to develop plans for and to formulate policy with respect to the use of navigable airspace and to assign by rule, regulation, or order the use of navigable airspace under such terms, conditions, and limitation as may be deemed necessary in order to ensure the safety of aircraft and the efficient utilization of the navigable airspace. Also, under section 40103, the agency is further authorized and directed to prescribe air traffic rules and regulations governing the efficient utilization of the navigable airspace.[6] The FAA has employed its authority to regulate the use of the airspace by adopting, among other regulations, the HDR.[7]

In addition, the Congress recently granted the FAA new authority to conduct public schedule-reduction meetings with air carriers serving congested airports. This authority was contained in the delay reduction provisions of the aviation reauthorization bill, *Vision 100* (Public Law 108-176). Section 422 of that statute, now codified at 49 U.S.C. 47122 ("Section 422"), authorizes the Secretary of Transportation to ask U.S. airlines to meet with the Administrator to discuss flight reductions at severely congested airports to reduce overscheduling and flight delays during peak hours.

Agency Action

As soon as it became clear that the increases in scheduled service during peak hours at O'Hare were resulting in an unacceptable level of delays and adversely affecting the efficiency of the NAS, officials from the FAA's Air Traffic Services unit acted to ameliorate the congestion at O'Hare. Their activities included ongoing daily conference calls by FAA officials with operational personnel at various air carriers to maximize the airport's throughput and reduce delays during peak periods. User meetings were also conducted at the FAA's Command Center in Herndon, Virginia, on November 19, 2003, and December 11, 2003, to illustrate graphically for industry participants the scheduling problem at O'Hare and its effect on the system as a whole.

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[6] In City of Burbank v. Lockheed Air Terminal, 411 U.S. 624 (1973), the Supreme Court found that a local ordinance setting an airport curfew interfered with the FAA's broad authority under the Federal Aviation Act to manage the navigable airspace, including operations on the ground that affect the efficiency of the national air transportation system. "'Federal control is intensive and exclusive. Planes do not wander about in the sky like vagrant clouds. They move only by federal permission, subject to federal inspection, in the hands of federally certified personnel and under an intricate system of federal commands. The moment a ship taxis onto a runway it is caught up in an elaborate and detailed system of controls.'" Id., at 633-634 (quoting concurring opinion in Northwest Airlines, Inc. v. Minnesota, 322 U.S. 292, 303).

[7] See 33 Fed. Reg. 17896; (December 3, 1968) and DOT Order Granting Discussion Authority, Order 88-12-12 (December 7, 1988).

Such informational meetings occur frequently and provide air carriers with the data needed to adjust their operations so as to alleviate congestion and improve their own schedule reliability. The current level of overscheduling at O'Hare, however, has rendered the airport so severely congested during peak hours that additional action is now required. In particular, the FAA has concluded that there must be a reduction in the total number of air carrier arrivals and departures during the hours of 1:00 p.m. to 8:00 p.m. Although the peak period at O'Hare begins as early as 9 a.m., lowering the volume of traffic in the afternoon is especially critical because doing so may allow air traffic control to respond to delays that build up throughout the morning.

On January 8, 2004, the FAA determined that it would be necessary to convene a schedule-reduction meeting under Section 422 of Vision 100 with respect to O'Hare to pursue flight reductions at that airport during peak hours. On January 16, 2004, the Secretary of Transportation advised the FAA of his determination that such a meeting was necessary to meet a serious transportation need or other public benefit.

The public interest and the FAA's mandate to ensure the efficient use of the navigable airspace require that the FAA act promptly to alleviate congestion at O'Hare and reduce the level of delays currently being experienced at that airport particularly before the busy summer season. The problem is not merely congestion at O'Hare and the delays encountered by passengers at that airport, but, as noted earlier, the impact on the entire system due to the critical role of O'Hare. Congestion at O'Hare, however, presents a unique problem because it can be mitigated only by the actions of two principal operators who are also primary competitors. These two carriers account for the majority of the increase in operations and the retiming of existing operations and as such, primarily account for the congestion at O'Hare.

Starting even prior to any announcement of a schedule-reduction meeting, the FAA thus decided to ascertain whether the two principal operators at O'Hare would simply accept a reduction in their operations temporarily during the critical afternoon hours. Such reductions could obviate the need for a costly industry-wide meeting and, more importantly, bring about a prompt resolution to an urgent problem while allowing the FAA and the industry to focus on longer-term solutions.

The FAA separately contacted operational officials at American and United to discuss the agency's concerns about the increasing congestion at O'Hare, and the public interest in obtaining a prompt reduction in operations at the airport.[8] As a result of these separate discussions, the FAA has determined to issue an order, having the independent consent of each carrier, limiting the total number of operations each carrier may schedule at O'Hare during the hours of 1:00 p.m.

[8] These discussions did not address particular flights, destinations or markets and were strictly limited to operational capacity during the peak afternoon periods.

through 7:59 p.m. The limitation will require a five percent reduction by each carrier from its published OAG schedule for February 2004. Each carrier is required to observe this limitation beginning no later than March 4, 2004, through September 1, 2004, except as otherwise ordered by the Administrator.

It remains to be seen whether the reductions required by the Order will reduce delays to the extent required. The reductions will not be effective if they are spread unevenly throughout the peak period (that is, not in proportion to the five percent target or without commensurate reductions in both arrivals and departures) or if there is a substantial increase during the peak period by air carriers not subject to this Order. Such circumstances would constitute good cause for modification or withdrawal of this Order.

The Department and the FAA will defer convening a schedule-reduction meeting under Section 422, in order to allow the operational limitations described above to take effect in March 2004. The FAA will continue to monitor closely the level of scheduled operations at O'Hare by all air carriers. The Department and the FAA retain authority to convene a delay-reduction meeting at any time and will consider doing so promptly should this Order not result in a substantial reduction of delays at O'Hare.

ACCORDINGLY,

1. This Order shall apply only to the following parties:

    a. American Airlines, Inc., and its affiliates, including any air carrier under its control and any other air carrier conducting code share operations primarily marketed as American/American Eagle, including but not limited to American Eagle ("American"); and

    b. United Airlines, Inc., and its affiliates, including any air carrier under its control and any other air carrier conducting code share operations primarily marketed as United/United Express, including but not limited to United Express carriers, Atlantic Coast Airlines, Air Wisconsin Airlines Corporation (AWAC), Mesa Air Group Inc., SkyWest Airlines, and Trans States Airlines, Inc. ("United").

2. Under the authority provided to me by 49 U.S.C. §§ 40103 and 40113, I hereby order that:

    a. American shall not conduct more than 505 scheduled operations at O'Hare during the hours of 1:00 p.m. through 7:59 p.m. (local time) daily; and

b. United shall not conduct more than 655 scheduled operations at O'Hare during the hours of 1:00 p.m. through 7:59 p.m. (local time) daily.

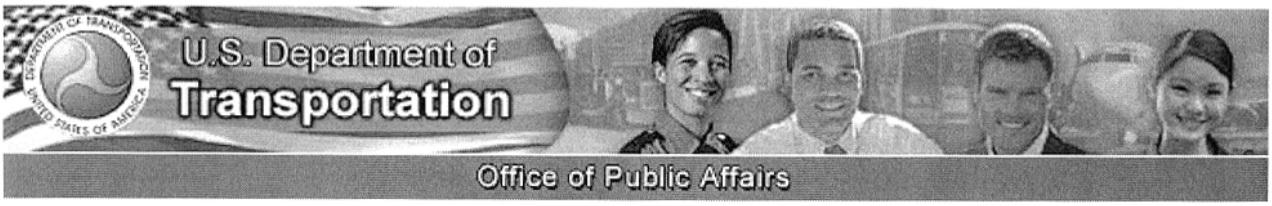
3. The limit on operations specified under Paragraph 2 shall take effect no later than 1:00 p.m. March 4, 2004 and shall expire as of 8:00 p.m. (local time), September 1, 2004.

4. Any party may apply to the FAA on good cause shown for modification or withdrawal of this Order.

Issued in Washington, DC, on January 21, 2004.

Marion C. Blakey

Marion C. Blakey
Administrator



REMARKS BY
THE HONORABLE NORMAN Y. MINETA
SECRETARY OF TRANSPORTATION

CHICAGO O'HARE NEWS CONFERENCE
WASHINGTON, D.C.

JANUARY 21, 2004
3PM

Good afternoon. Thank you for joining us.

As many of you know, delays at Chicago's O'Hare International Airport have increased sharply in recent months reaching, what I believe to be, an unacceptable level.

These delays are clogging our national airspace system and significantly inconveniencing the traveling public.

Congestion across the aviation system is a problem we were addressing before the horrifying events of September 11th. But after 9/11, demand decreased, and our efforts focused on increasing the security of air travel.

Well, the good news is that the passengers are coming back, and security is vastly improved.

The bad news comes in the form of congestion, and it has hit hardest at Chicago O'Hare. In the month of December alone, delays at O'Hare caused more than a 10 percent increase in the average flight delay at the Nation's top 35 airports.

While this Department continues working toward a comprehensive, long-term solution to this challenge, we must provide American travelers with necessary and immediate action to alleviate potential travel delays.

This is important because we want to keep people moving. And, we want the economy to continue to grow. Delays cost time and money. In fact, the economy loses billions of dollars to delays each year. Obviously, that is unacceptable.

So today, we are signing an order to help alleviate the growing problem of delays facing Chicago's O'Hare International Airport.

Effective immediately, American and United airlines have agreed to cut their peak-hour operations by 5 percent. This action will remove a total of 62 aircraft during peak travel times – between the hours of 1 p.m. and 8 p.m. – considerably reducing delays.

This reduction closely returns scheduled O'Hare operations to October 2003 levels – the last month prior to the onset of severe delays.

This announcement is the result of a lot of hard work on the part of the FAA and the airlines to maximize throughput and minimize delays during peak hours.

We have worked independently with American and United to consider schedule reductions, and to find ways to better disperse scheduled flights. And we have studied the impact of the operations of these airlines on the entire aviation system.

It is because of these efforts, that I am confident that today's announcement is the right first step toward getting planes in to, and out of, Chicago on time.

And I applaud the willingness of the airlines to cooperate in solving this issue of great national importance.

However, if we do not achieve a sufficient delay reduction through these voluntary actions, the FAA's reauthorization bill, "Vision 100," that was passed last December by Congress, makes other measures available for achieving results.

I hope that this will not be necessary as the Department and the airlines work toward immediate and mutual, long-term solutions, some of which Administrator Blakey will outline in a moment.

Again, my thanks to Marion Blakey and the FAA for all of their work on this issue. Marion, thanks for all you've done to make this moment possible. And now, now for signing the order.

Thank you again for your attendance today. I must leave for another meeting, but Marion will continue to be available for additional comments and to take your questions.

# # #

213267

THE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

DEPT. OF TRANSPORTATION
DOCKETS

2004 AUG 19 P 3:22

OPERATING LIMITATIONS AT CHICAGO O'HARE INTERNATIONAL AIRPORT	)	Docket FAA-2004-16944-55

ORDER LIMITING SCHEDULED OPERATIONS
AT O'HARE INTERNATIONAL AIRPORT

I. Introduction:

This order establishes a temporary limitation on the number of scheduled operations at O'Hare International Airport (O'Hare). The Administrator of the Federal Aviation Administration (FAA) is issuing this order as a result of persistent overscheduling of flights at O'Hare during peak hours. The order is intended to relieve the substantial inconvenience to the traveling public caused by flight delays and congestion at that airport, which spread through the national airspace. Among other things, this order will reduce delays and provide for the efficient use of the airspace. This order takes effect as of 7:00 a.m., Central Time, November 1, 2004, and will expire at 9:00 p.m., Central Time, April 30, 2005.

This order follows the successful commencement of a scheduling reduction meeting conducted by the FAA with air carriers and the City of Chicago under the authority provided

to it in the FAA's 2003 reauthorization law, Vision 100.[1] The 15 air carriers that attended the meeting also met privately with the FAA to review their schedules. Based on the discussions that occurred between the FAA and each of the participants, this order requires the two largest operators at the airport to reschedule and reduce flight arrivals by approximately 5% during peak hours, freezes the level of arrivals operated by other large incumbent air carriers (while requiring them to reschedule certain flights), and permits a small number of additional flights by limited incumbent air carriers and new entrant air carriers. Although the product of voluntary action by various air carriers, this order is enforceable under the Administrator's civil penalty authority.

II. Background:

O'Hare serves an important and essential role within the U.S. National Airspace System. It is a major network hub for the two largest domestic air carriers, American Airlines and United Airlines, making it a connecting point for flights throughout their domestic and international systems. In addition, because it serves the country's third most populous metropolitan area,[2] O'Hare is, in its own right, a major origin and destination airport for the domestic and

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[1] 49 U.S.C. § 41722.

[2] Ranking Tables for Metropolitan Areas (PHC-T-3), Table 3--Metropolitan Areas Ranked by Population: 2000 (U.S. Census Bureau Apr. 2, 2001).

international flights of both U.S. and foreign air carriers. Moreover, given its central location, O'Hare is a logical connecting point for significant passenger flows across the U.S.

In 2003, O'Hare accommodated 928,691 flight operations, which made it the busiest airport in the world in terms of aircraft arrivals and departures.[3] According to the FAA's Air Traffic Operations Network, which collects data on air traffic activity counts, during the first six months of 2004, 490,987 flights arrived at and departed O'Hare. From January through July 2004, the total airport operations at O'Hare increased approximately 8.7% over the same period in 2003. The total number of enplaned passengers at O'Hare in 2003--at 30,797,513--was ranked second in the U.S.[4]

The U.S. Government has exclusive sovereignty over the airspace of the United States.[5] Under this broad authority, Congress has delegated to the Administrator extensive and plenary authority to ensure the safety of aircraft and the efficient use of the nation's navigable airspace. In this regard, the Administrator is required to assign by regulation or order use of the airspace to ensure its efficient use.[6]

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[3] FAA Air Traffic Operations Network, Traffic Movements 2003.
[4] National Transportation Statistics 2003, Table 1-41--Passengers Boarded at Top 50 U.S. Airports (Bureau of Transp. Statistics Mar. 2004).
[5] 49 U.S.C. § 40103(a).
[6] 49 U.S.C. § 40103(b)(1).

The Administrator may modify or revoke an assignment when required in the public interest.[7] The FAA interprets the statutory command to act in the public interest as implicitly applying to any decision by the FAA to assign the efficient use of the navigable airspace. Furthermore, in carrying out the Administrator's safety responsibilities under the statute, the Administrator must consider, as being in the public interest, controlling the use of the navigable airspace and regulating civil operations in that airspace in the interest of the safety and efficiency of those operations.[8]

The FAA interprets its broad statutory authority to manage "the efficient use of airspace" to encompass management of the nationwide system of air commerce and air traffic control. On a daily basis, that system transports millions of passengers, thousands of tons of cargo, and millions of pieces of mail. The FAA believes that ensuring the efficient use of the airspace means that it must take all necessary steps to prevent extreme congestion at an airport from disrupting or adversely affecting the overall air traffic system for which FAA is responsible. Inordinate delays at a single airport of the sort experienced at O'Hare can have a crippling effect on other parts of the system, causing untold losses in time and

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[7] Id.
[8] 49 U.S.C. § 40101(d)(4).

money for individuals and businesses, as well as the air carriers at O'Hare and throughout the country.

In 1968, under this statutory authority, the FAA designated O'Hare as a high density traffic airport and limited the number of takeoffs and landings at the airport, effective April 27, 1969.[9] The FAA required air carriers to hold a reservation, which came to be known as a "slot," for each instrument flight rules takeoff or landing at a high density traffic airport.[10] The rules related to high density traffic airports remained in effect at O'Hare for over three decades. Near the end of that period, the FAA limited O'Hare's scheduled peak-hour air carrier and commuter operations--including both arrivals and departures--to 145 per hour, with ten additional reservations available for unscheduled operations.[11]

In April 2000, Congress began phasing out the high density traffic airport rules at certain airports, including--effective July 1, 2002--the specific rules then governing O'Hare.[12] As these rules ended at O'Hare, the two air carriers operating hubs at O'Hare, American Airlines ("American") and

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[9] 33 Fed. Reg. 17896 (1968). The FAA codified the rules for operating at high density traffic airports in 14 C.F.R. part 93, subpart K.

[10] See, e.g., 14 C.F.R. § 93.125 (2004).

[11] 14 C.F.R. § 93.123(a)(2004). Through the issuance of regulatory exemptions, the Secretary of Transportation permitted additional flight operations to serve various purposes.

[12] 49 U.S.C. § 41715(a).

United Air Lines ("United") added a significant number of operations and retimed other flights, resulting in congestion during peak hours of the day. From April 2000 through November 2003, American Airlines increased its scheduled operations at O'Hare between 12:00 p.m. and 7:59 p.m. by over 10.4%. Over the same period, United Airlines increased by over 41% percent its scheduled operations at O'Hare between 12:00 p.m. and 7:59 p.m. All other air carriers serving O'Hare collectively increased their scheduled operations between 12:00 p.m. and 7:59 p.m. by approximately 3.25%

According to flight delay information compiled by the Department's Bureau of Transportation Statistics, system performance suffered at O'Hare as the air carriers increased scheduled operations.[13] In November 2003, O'Hare ranked last among the thirty-one major airports reported for on-time arrival performance, delivering on-time arrivals just 57.26% of the time.[14] This performance compares poorly with the FAA's stated goal of achieving an average on-time arrival rate of 82.1%. O'Hare also ranked last in on-time departures during November 2003, yielding on-time departures 66.94% of the

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[13] The U.S. Department of Transportation considers a flight tc be on time if it arrives or departs no later than 15 minutes after its scheduled arrival or departure time. Arrival performance is based on arrival at the gate. Departure performance is based on departure from the gate.

[14] Airline On-time Tables--Nov. 2003, Table 3—Ranking of Major Airport On-time Arrival Performance in Nov. 2003 (Bureau of Transp. Statistics).

time.[15] The Bureau of Transportation Statistics' data for December 2003 reflected a similarly discouraging performance by O'Hare during that month--ranked last with 60.06% of arrivals on time and 67.23% of departures on time.[16] FAA statistical analyses showed that at least part of the decline in on-time performance can be attributed to a scheduled volume of air traffic that exceeded the available airport capacity. Despite the high proportion of delayed flights, however, when the air carriers published their January and February 2004 schedules in the Official Airline Guide, they revealed their intention to add still more operations to the encumbered O'Hare schedule.

When Congress began phasing out the specific high density traffic airport rules at O'Hare in 2000, Congress emphasized that it did not intend the move to affect the FAA's overall authority, including its authority over "the movement of air traffic."[17] More recently, in December 2003, Congress authorized the Secretary of Transportation to ask air carriers to meet with the FAA to discuss flight reductions at severely congested airports to reduce overscheduling and flight delays

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[15] Airline On-time Tables--Nov. 2003, Table 5--Ranking of Major Airport On-time Departure Performance in Nov. 2003 (Bureau of Transp. Statistics).

[16] Airline On-time Tables--Dec. 2003, Table 3--Ranking of Major Airport On-time Arrival Performance in Dec. 2003 & Table 5--Ranking of Major Airport On-time Departure Performance in Dec. 2003 (Bureau of Transp. Statistics).

[17] 49 U.S.C. § 41715(b).

during peak operating hours.[18] Under the authority to request a scheduling reduction meeting, the Administrator found in January 2004 that such a meeting was necessary with respect to O'Hare and the Secretary of Transportation determined that such a meeting was necessary to meet a serious transportation need or achieve an important public benefit.

Before the FAA could convene the scheduling reduction meeting, however, American and United, which together accounted for approximately 88% of the operations at O'Hare, individually agreed to temporary reductions of 5% of their proposed O'Hare schedules between 1:00 p.m. and 7:59 p.m. The FAA ordered the 5% schedule reductions on January 21, 2004, with the schedule reductions to begin no later than March 4. When the reduced schedules by these carriers failed sufficiently to relieve O'Hare's flight delays, the two airlines each agreed to further flight reductions of 2.5% of proposed flights between 1:00 p.m. and 7:59 p.m. and to reschedule some flights concentrated between 12:00 p.m. to 12:59 p.m. The FAA ordered the revised schedule reductions on April 21, 2004, and required the schedule reductions to take effect no later than June 10, 2004. The FAA reserved the right to convene a scheduling reduction meeting if the order did not result in a substantial reduction in flight delays.

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[18] 49 U.S.C. § 41722.

The amended schedule reduction order will expire on October 30, 2004.

At the time of the prior order the Administrator recognized that the effectiveness of the order might depend on the responses of other carriers. The order provided that American and United could seek to have the restrictions on them withdrawn or modified for good cause, which included a "substantial increase" in peak period flights by other carriers not subject to the order. Thus, although the FAA discouraged other air carriers from adding to scheduled operations at O'Hare during peak hours while the schedule reduction order is in effect, the order did not limit the operations of air carriers other than American and United, and their regional air carrier affiliates. As it happened, other air carriers added a net total of 14 scheduled operations at O'Hare from 1:00 p.m. through 7:59 p.m., the hours covered by the FAA schedule reduction orders. These additional flight operations together offset some of the anticipated delay reduction benefits of the schedule adjustments by American Airlines and United Airlines.

The Bureau of Transportation Statistics' data on flight delays and on-time performance for June 2004 reflect only modest overall improvement at O'Hare, while problems associated with congestion persisted, particularly in the late afternoon and early evening when on-time performance is at its

lowest. Under the circumstances, the FAA concluded that it would be neither practical nor equitable to issue an additional order governing two air carriers while all other air carriers remained free to add flight operations during hours in which there is not adequate capacity to accommodate them.

Consequently, in the absence of measures to control scheduling beyond capacity at O'Hare, the FAA expects even the modest gains achieved in O'Hare's June 2004 on-time performance to evaporate when the schedule reduction order expires. Highlighting the FAA's concern, the industry's published schedules for November, as reported in the Official Airline Guide in late-July 2004, reveal that the number of scheduled arrivals during several hours approaches or exceeds the airport's highest possible arrival capacity. During one hour, the number of scheduled arrivals exceeds the airport's capacity under ideal conditions by 32%, virtually ensuring daily delays even when the weather and airport operating conditions are optimal and contributing to potential gridlock when they are not.

In light of the lead time necessary for air carriers to revise and implement their schedules, the Administrator determined once again on July 16, 2004, that it was necessary to convene a meeting of air carriers to discuss flight reductions at O'Hare, as a severely congested airport, to

reduce overscheduling and flight delays during peak hours of operation. On July 19, 2004, the Secretary of Transportation determined that a scheduling reduction meeting regarding O'Hare was necessary to meet a serious transportation need or achieve an important public benefit.

Through a notice issued July 28, 2004, and published in the Federal Register, the Administrator invited all scheduled air carriers to attend the scheduling reduction meeting, commencing on August 4. The Administrator also invited all interested persons to submit information on the subject of flight reductions at O'Hare, including any data and their views, to a public docket for the FAA's and Department of Transportation's consideration in issuing this order. The original deadline for submitting written information was August 11. However, when it became apparent that the FAA's discussions with the air carriers would extend past that date, the FAA extended until 12:00 p.m. on August 13 the deadline for submitting written information to the public docket.

III. Determination of Operational Targets:

The statute authorizing the Administrator to conduct a scheduling reduction meeting requires that the FAA establish operational targets for the efficient scheduling of the airport. To simplify the analysis of the proposed solution and to limit the FAA's intervention in air carrier scheduling, the FAA has focused on establishing a realistic rate of

scheduled arrivals at O'Hare that is sustainable under most operating conditions, rather than scheduled departures or combined arrivals and departures. The number of arrivals in a period naturally correlates closely to the number and timing of departures. Moreover, in the FAA's experience, arrival delays tend to be more disruptive to the system and can delay later flights if the aircraft is not available for an on-time departure.

During 140 weekdays from November 3, 2003, through May 14, 2004, O'Hare averaged in all weather conditions a total of 90 actual arrivals per hour, including both scheduled and unscheduled flights, during the peak hours of 12:00 p.m. through 6:59 p.m., Central Time. These hours reflected a period when demand for the airport was at or above the airport's capacity and therefore indicate the average capacity of the airport under various weather, runway, and operating conditions. The average number of arrivals also correlates closely to the average airport acceptance rate for this period, indicating that there was little or no unused hourly capacity.

Therefore, as the preliminary target for schedule reduction at O'Hare, the Administrator used an arrival rate of 86 scheduled operations per hour, anticipating the historical

average of four additional unscheduled arrivals per hour.[19] Within each affected hour, the FAA targeted an arrival rate not to exceed 22 scheduled arrivals within any fifteen minute period to reduce some of the peaks in the current November schedules. The FAA expressed its intention to apply the targeted arrival rates daily from 7:00 a.m. through 8:59 p.m., Central Time, to address current peak hours and to avoid the creation of new peak times if arrivals are simply shifted from other hours.

At the FAA's request, MITRE Corporation conducted computer modeling to simulate the effect of the FAA's proposed schedule reductions on the number of delayed flights experienced at O'Hare. In the past, the FAA has evaluated the computer model that MITRE Corporation employs to project delays against actual flight delay statistics. In the FAA's experience, the computer model's predictions equate very closely to the flight delays actually experienced. With respect to the operational targets that the FAA proposed, the computer model predicted a 36% reduction in the daily average minutes of delay when compared to the air carriers' published August schedules.

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[19] Unscheduled operations include such operations as general aviation flights, military flights, and charter flights.

IV. The Scheduling Reduction Meeting:

The FAA convened the scheduling reduction meeting with air carrier participants and representatives of the operator of O'Hare on August 4 and continued the meeting on August 5, after which the FAA excused the attendees from further in-person sessions. Telephonic sessions on the subject of schedule reductions thereafter continued with individual air carriers. Representatives of the Department of Justice's Antitrust Division monitored the joint and individual sessions of the scheduling reduction meeting. In addition, all the in-person and telephonic sessions were transcribed.[20]

At the individual air carrier sessions, only American Airlines and United Airlines, which together now account for approximately 86% of all scheduled operations at O'Hare, offered to reduce their scheduled arrivals. Most other participants were agreeable to retiming some scheduled arrivals to reduce scheduling peaks and to produce a more efficient overall schedule. Two incumbent air carriers initially indicated their intention to add arrivals during the peak hours, each noting that it was operating below the schedule that it operated before September 11, 2001. These incumbent air carriers withdrew their requests to add scheduled arrivals during later individual sessions. Three

[20] The Administrator has not yet formally adjourned the meeting. It is anticipated that this may occur closer to the November 1, 2004, effective date of this order.

incumbents providing fewer than eight scheduled arrivals during the peak hours reported that they planned to add at least one arrival during peak hours. Potential new entrants to O'Hare also attended the meeting, but none disclosed immediate plans to begin scheduled service to O'Hare.

Air carriers and other interested parties were invited by Federal Register notice and otherwise, including personally by FAA officials during the carrier sessions, to provide whatever information and opinions they deemed relevant to the Administrator's ultimate decision. During these sessions and otherwise FAA officials made clear the intention of the Administrator to take prompt action immediately following the sessions to incorporate any offered schedule reductions or adjustments into a binding, and final, order of the Administrator. Participating carriers explained that because schedules for November, 2004, were in the process of being finalized, any delay in the issuance of an order that postponed the finalization of their November schedules (or required further adjustments beyond those contemplated in the meetings) would impose extra burden and costs on the airlines involved. Time is also of the essence, because if the published OAG schedules for November were allowed to take effect without change, FAA projections show that the flying public would suffer great inconvenience with a substantial worsening of delays.

Having considered the results of these sessions, and the extensive information received during them and through the

public docket (summarized below), the Administrator has determined that it is now in the public interest to take immediate action to codify the various scheduling reductions and adjustments offered to the FAA.

V. Summary of Information Received:

A. Revised Schedule Limitations

During the individual air carrier sessions of the scheduling reduction meeting, the air carrier participants commonly stated that the target of 86 scheduled arrivals within the identified hours was too low and would result in unused airport capacity under many conditions. They also stated that the use of a 15-minute limitation on arrivals was overly restrictive and would unnecessarily hamper the carriers' scheduling flexibility. The participants proposed that the FAA consider allowing a scheduled arrival rate of at least 90 flights per hour and constrain operations by no longer than 30-minute periods.

During the sessions, the FAA agreed to reexamine the expected reduction in delays based on various other rates and assumptions. After further interaction with the airlines and extensive internal analyses backed by schedule modeling of different scenarios, the Administrator has determined to use a scheduled arrival rate of 88 flights for the period between 0700 and 1959 local and 98 arrivals in the 2000 hour (which is the end of the "service day," when the effect of any delays on

later operations is most limited). The Administrator also determined that the use of a "rolling" constraint over any 30 minute period of no more than 50 arrivals (with the exception of the 2000 hour) will achieve a significant level of delay reduction. Forecasting by MITRE Corporation and the FAA shows that such an arrival rate and constraints will produce a 20% reduction in O'Hare delays against the base case of August 19, 2004.[21] If this order were not issued, we model a 23% increase in delay from current delays to those that would occur given

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[21] To understand the delay impact of various schedules at O'Hare, an airport queuing simulation model was utilized. Modeling the delay impact involved a two-step process. The first step was to develop a schedule that met the proposed constraints on arrivals. The constraints were then applied to the August 19, 2004 schedule for O'Hare. Flights were removed from the baseline schedule as necessary to meet the constraints and then added back to times where capacity was available. In addition to adding back scheduled traffic, a specified number of unscheduled arrivals were added to develop the overall constrained schedule for O'Hare.

The second step was to apply the queuing model to the constrained O'Hare schedule and estimate the resulting delay statistics. Delay from this model is accumulated for each minute of delay not just delays greater than 15 minutes. The resulting delay measures are sensitive to a number of factors; therefore, the model was run one hundred times for each weekday from November 2003 to May 2004 to account for stochastic variations.

Trends observed from the model results follow the theory of queuing delay and are consistent with the trends from observed delay data. Differences between actual and modeled delays would be expected due to factors such as airport weather, enroute weather, airport fix loading, and traffic flow management actions. The model results can be used to evaluate the trends and relative differences of delay impacts of constrained schedules for O'Hare. Because the behavior of the model tracks what is observed in real data, with the proposed schedule constraint and over the long run, we expect an average decrease of 20% in queuing delays at O'Hare.

the published November OAG schedule. Additional forecasting by MITRE also showed that the proposed schedule limits at O'Hare would lessen delays in the entire national airspace system by nearly 5%.[22]

The FAA then contacted each of the participants at the scheduling reduction meeting who had met individually with FAA representatives. During these sessions the FAA reviewed the proposed restrictions on each carrier's schedule as well as the parameters of an order that would implement these restrictions. While preserving certain points raised in their prior sessions and in the docket in this matter, each of these participants indicated that it would voluntarily comply with or consent to an FAA order containing the restrictions outlined.

B. Limited Incumbent and New Entrant Air Carriers

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[22] This study incorporated the use of a national airspace system-wide discrete event simulation model. The model simulates system-wide traffic given demand (i.e., airline schedules and GA traffic) and capacity inputs. Output of the model is a set of statistical data which is analyzed to determine changes in system performance. This model was used to determine likely changes in performance given various airline schedules for O'Hare.

In order to evaluate the O'Hare delay propagation impact, March 2003 was used as the system-wide baseline. Then four alternate schedules for O'Hare were modeled (December 18, 2003, April 22, 2004, August 19, 2004, and November 18, 2004) while all other airport schedules remained the same. The model results measure the trends and relative system-wide delay impacts of schedule changes at O'Hare; these results should be used to compare only relative changes in delay statistics.

Given the 20% average delay reduction of the proposed schedule constraint at O'Hare, we expect an average decrease of 4.9% in system-wide schedule delays.

At the August 4, 2004, scheduling reduction meeting in Washington, the Administrator provided notice to the public that any scheduling limitation order was likely to contain a mechanism that would allow some flight additions by new entrants to the airport and carriers with only a limited presence. She explained the consistency of this potential approach with regimes employed at airports subject to the High Density Rule in which, by statute or regulation, the Department made slot exemptions available to new entrants and limited incumbents. She said it was the FAA's intention to define a limited incumbent as a carrier having eight or fewer scheduled arrivals during the peak period of the day and to allow a new entrant or limited incumbent the right to add arrivals such that they did not exceed a total of eight. During their individual discussions with the FAA and in their filings on the docket, several of the meeting participants questioned the proposed treatment of new entrants and limited incumbents. In this regard, the carriers generally fell into two categories.

The largest incumbents at the airport, American and United, argued that the Department's decision must not afford favorable treatment to new entrants and limited incumbents. American and United pointed out that they bore the brunt of the schedule reductions ordered by the FAA (to which they consented) in January and April. Each complained that the

effectiveness of these reductions was impaired by the addition of flights by Independence Air and others in the industry; United characterized these additions as "gamesmanship" designed to take competitive advantage of the constraints imposed on the two hub operators. Both operators said that additional cuts would not be justified without some assurance that competitors could not add flights in response, and noted that the proposed cap on O'Hare would constrain competition between hub airports. United also contended that requiring it to reduce flights during peak hours while allowing rivals to add service would amount to an unconstitutional taking of United's intangible property consisting of its flight schedules and associated economic interests.

Those carriers with relatively fewer operations at the airport, including America West, Spirit and Atlantic Coast Airlines (d/b/a Independence Air), as well as the Air Carrier Association of America (ACAA), urged the Department to preserve low-fare competition at O'Hare by protecting the rights of smaller carriers to add arrivals. They cited data purporting to show that even the minor presence of such carriers at the airport has materially constrained the hub operators from increasing prices. They claimed that the principal causes of congestion at O'Hare were the addition of flights by American and United, as well as their increased utilization of smaller, regional jets. They argued that the

Administrator's proposed limit of eight arrivals per new entrant or limited incumbent was unreasonably low. America West cited provisions of the 2000 FAA authorization (the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century, or AIR-21) and called for an allowance of up to 15 arrivals (30 flight operations) per such carrier. ACAA stated that the allowance should be 10 arrivals and that smaller carriers should be able to add arrivals up to this limit incrementally over the six month period of the order. Independence Air asserted that its current schedule at O'Hare of 12 arrivals per day represents a 90 percent reduction from the operational levels previously conducted by Atlantic Coast Airlines as a codeshare partner of United.

Having found that the efficient management of the airspace requires some reduction and retiming of flight arrivals at O'Hare during peak hours, we must decide how to allocate such adjustments among air carriers. After consideration of the Department's various statutory goals and the written submission filed in the public docket, which are consistent with the information conveyed to the FAA during the scheduling reduction meetings, we believe an appropriate balance can be struck here between competing policy goals of protecting competition and maintaining the efficiency of the navigable airspace. Thus, this order requires the two airlines who have added the most flights since Congress phased

out the high density traffic airport rules at O'Hare to reduce their schedules. It also permits minor growth by limited incumbents and new entrants while strictly limiting such growth in the afternoon hours when American and United will cut the most flights, and it freezes the level of arrivals throughout the day scheduled by other airlines.

Under 49 U.S.C. § 40103(b)(1), "[t]he Administrator . . . shall develop plans and policy for the use of the navigable airspace and assign by regulation or order the use of the airspace necessary to ensure the safety of aircraft and the efficient use of airspace. The Administrator may modify or revoke an assignment when required in the public interest." In other contexts, the Secretary of Transportation considers a number of matters in the public interest when carrying out the Department's functions, including "placing maximum reliance on competitive market forces and competition." 49 U.S.C. § 40101(a)(6).

While FAA's statutory provisions do not expressly require the consideration of such factors in adopting and administering limits on arrivals at a congested airport, we look to overall Congressional policy as a guide. See, e.g., Delta Air Lines v. CAB, 674 F.2d 1 (D.C. Cir. 1982). Congress has broadly adopted deregulatory, pro-competitive policies for the airline industry. In addition to the Airline Deregulation Act of 1978 and later legislation further reducing the

regulation of domestic and international transportation, Congress authorized slot exemptions at the slot-controlled airports with a preference for awarding them to airlines that had few, if any, operations at the airport. 49 U.S.C. §§ 41714(c), (h), 41716(b), 41717(c), 41718(b)(1). Congress has added provisions to the statutes governing airport grants and passenger facilities charges to encourage airports to adopt policies that will promote competition. 49 U.S.C. §§ 40117(k), 47106(f), and 47107(s).

Past Department and FAA rules and orders restricting flights at the slot-controlled airports also took into account the need to promote competition. See, e.g., 14 C.F.R. § 93.225 (lottery of available slots); *High Density Airports: Notice of Extension of the Lottery Allocation and Notice of Lottery for Limited Slot Exemptions at LaGuardia Airport* 66 Fed. Reg. 41294 (Aug. 7, 2001)(expanding the scope of new entrants eligible to participate in the lottery to those that did not participate in the Dec. 4, 2000, including those that had not applied for the AIR-21 slot exemptions by Dec. 4, 2000); *High Density Airports,* 67 Fed. Reg. 65826 (Oct. 28, 2002)(adopting the new entrant preference procedure for reallocating withdrawn or returned lottery slots at LaGuardia).

Furthermore, given the need to impose some limit on the number of flights at O'Hare, the allocation of flights should

maximize public benefits. To that end, we may take into account the allocation's potential impact on competition, in view of the existing position of United and American at O'Hare. In Northwest Airlines v. Goldschmidt, 645 F.2d 1309 (8th Cir. 1980), the court affirmed the Secretary's decision allocating slots among the airlines that wished to serve Washington National Airport. The Secretary had allocated a large block of slots to New York Air, a new entrant airline, which planned to use the slots to begin a competitive Washington National-LaGuardia-Boston shuttle service. The Secretary took this action by withdrawing slots from several large incumbents, requiring incumbents to slide one slot each, and allocating the yielded slots among new entrant and other carriers. The court held that the Secretary's allocation was reasonable, because he had based it on an agreement tentatively reached by almost all of the airlines serving the airport, and because the allocation would cause the least amount of disruption to the airlines' schedules. 645 F.2d at 1318. The court also agreed with the Secretary that an allocation that increased low-fare service would be consistent with the pro-competitive policy established by the Airline Deregulation Act of 1978. 645 F.2d at 1318-1319.

We emphasize that, by issuing this order, we are not deciding that at congested airports hub operators are expected to yield arrival times to smaller carriers. Nor are we

necessarily determining that the use of regional jets is disfavored versus the use of larger aircraft.[23] Although deregulation favors competition, it does not favor promoting one group of competitors over another. Our decision to permit limited entry by smaller carriers and to allow larger incumbents other than American and United to maintain their current level of operations, however, is consistent with the equities of the situation at O'Hare. United and American have added a very large number of flights in the last three years. While this build up was legal, it also can be seen as contributing to congestion at O'Hare. As stated earlier, American increased scheduled operations during the peak hours of 12:00 p.m. through 7:59 p.m. by 56 (over 10.4%) from April 2000 to November 2003, and United increased scheduled operations during those hours by 225 (over 41%) over the same period.

The net increase of all other air carriers was six scheduled operations during peak hours over this period.

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[23] Another Congressional goal has been the promotion of small community service. For example, the legislation authorizing additional slot exemptions at LaGuardia and other slot-controlled airports removed the limitations from service operated with regional jets to communities that had little or no service to the slot-controlled airport. One reviewing court summarily stated that maintaining service to small communities is a goal that the FAA should consider. City of Houston v. FAA, 679 F.2d 1184, 1191 (5th Cir. 1982). The Department is concerned that size-based limitations on the use of aircraft could have the inadvertent effect of reducing the service via regional jets to small communities.

Several of these carriers are still operating at O'Hare at levels that are below those they maintained before the events of September 11, 2001. Even under this order, American and United will operate the vast majority of flights at O'Hare, and thus the two airlines will have a substantial ability and greater flexibility than rivals to shift flights in response to consumer demand and initiatives taken by competitors.

There is no bright line test for limited incumbency; we believe that allowing up to eight arrivals is consistent with the pro-competition goals of the Act and that it is not necessary to create a more generous exception for such carriers, such as that suggested by America West or ACAA. The threshold for determining limited incumbency--at least for purposes of slot exemptions at airports subject to the high density traffic airport rules--has varied over time. The buy-sell rule as first promulgated in December 1985 protected from FAA withdrawal the slots of air carriers holding 8 or fewer slots, or the equivalent of 4 or fewer arrivals. In August 1992, when the FAA codified the definition of limited incumbent in the rule, it referred to air carriers or commuter operators holding or operating fewer than 12 slots at any particular airport; assuming an equal split between departures and arrivals, this meant a limited incumbent had 6 or fewer arrivals. AIR-21 modified the definition of limited incumbent by increasing the threshold to 20 slots; again, assuming an

even split, this would mean 10 or fewer arrivals. While America West is correct that AIR-21 directed the Secretary to grant 30 slot exemptions from the high density traffic airport rule to any new entrant or limited incumbent to service O'Hare, it did this as an "interim application" of the slot rules at O'Hare.[24]

United contends that the Takings Clause of the Constitution's Fifth Amendment applies if the FAA does not freeze the service of other airlines when requiring United to reduce its service. United asserts that it has a property interest in its flight schedule and that its schedule is needed for the use of its airport assets (that is, its leasehold or other interests in aircraft gates, terminal space, and other facilities). It claims that permitting a competitor the opportunity to operate during these periods would interfere with its reasonable commercial expectations backed by "billions of dollars" of investment at O'Hare.

The Takings Clause argument is mistaken here. No airline owns the airspace at O'Hare and no airline has a license to operate a specific number of flights at the airport. The argument is contrary to Takings Clause precedent, because at

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[24] 49 U.S.C. § 41717. We do not agree with America West's assertion that AIR-21 *mandates* 15 arrivals per day for a new entrant or limited incumbent. Inasmuch as AIR-21 rescinded the slot rules at O'Hare, 49 U.S.C. § 41715(a), any exemptions from those rules also cease to have legal effect. In short, the interim exemption requirement expired with the expiration of the slot rules.

most, the argument is premised on a claimed regulatory taking, not a taking of physical property. See, e.g., Tahoe-Sierra Preservation Council v. Tahoe Regional Planning Agency, 535 U.S. 302 (2002). The Takings Clause does not require compensation whenever the Government requires a business to make some changes in its operation. For example, requiring an airline to continue operating service for several months that the airline wishes to terminate is not a taking, even if the airline obtains no compensation for maintaining the service. Continental Air Lines v. Dole, 784 F.2d 1245 (5th Cir. 1986). The Continental decision quoted Justice Holmes' statement, "Government hardly could go on if to some extent values incident to property could not be diminished without paying for every such change in the general law." 784 F.2d at 1252 (quoting Pennsylvania Coal Co. v. Mahon, 260 U.S. 393, 413 (1922)). Further, the FAA action will not affect any carrier's leasehold interests at O'Hare, because the FAA is not requiring any recapture of these leasehold interests by the airport nor directing a sale, lease, assignment or other type of transfer of them.[25]

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[25] The Supreme Court considers three factors in determining whether government action constitutes a taking: the action's character, its economic impact, and the extent to which the action interferes with investment-backed expectations. Connolly v. Pension Benefit Guaranty Corp., 475 U.S. 211, 224-225 (1986); Concrete Pipe & Products v. Construction Laborers Pension Trust, 508 U.S. 602 (1993). These standards do not support a Takings Clause claim.

First, the FAA order, like many regulatory programs, adjusts the benefits and burdens of economic life in order to promote the common good. This order adjusts schedules at O'Hare in order to relieve the congestion choking the heart of the nation's airspace and to facilitate the movement of air traffic, thereby benefiting the air transportation industry in particular and the national economy in general. Compliance by carriers with the terms of this order will reduce delays by at least 20 percent from today's levels. Further, this order will be in effect for a relatively short period of time so as not to unduly interfere with the marketplace more so than necessary. That type of regulation is not normally deemed a taking of property. Connolly, 475 U.S. at 225. And, unlike the governmental action in Eastern Enterprises v. Apfel, 524 U.S. 498 (1998), the FAA is not unfairly singling out a company based on its conduct far in the past and unrelated to any future commitments or injury they caused. Rather, the dominant O'Hare air carriers significantly increased their flights since late-2003, causing overscheduling and delay conditions.

The second element of the Court's standard involves the order's economic impact. There is no evidence that restricting O'Hare flights will have an unduly harmful impact on any air carrier. To the extent there is an economic impact by virtue of this order, it may be mitigated and moderated by the following factors. First, the schedule reductions are proportionate with the market shares of United and American, the dominant carriers. Connolly, at 225-226. Second, the order is a temporary, stop-gap measure that will not "continue for many years." Cf. Apfel, 524 U.S. 531.

The third element of the Court's standard concerns whether the FAA order will interfere with a firm's investment expectations. Cf. Connolly, 475 U.S. at 226-227. The order will not do so. The FAA relied on its authority in 49 U.S.C. § 40103(b)(1) for many years to administer slot restrictions that limited flights at O'Hare and three other major airports, the FAA more recently imposed additional restrictions at LaGuardia because of increased delays at that airport, and the FAA from time to time has taken other steps to cause airlines to reduce flights in order to prevent unacceptable levels of delays. Further, even though the Airline Deregulation Act of 1978 terminated the Government's regulation of air carriers' rates, routes, and services, the Department and the FAA nonetheless have extensive regulatory authority over domestic airline operations. The Department and the FAA, for example, regulate in the areas of certificates, compliance, handicapped discrimination, records on the movement of traffic, carrier management, unfair and deceptive practices, unfair methods of competition, and airline safety. 49 U.S.C., Subtitle VII—

Reducing congestion and the resulting delays at O'Hare arguably most benefit the airport's two hub air carriers, as their use of O'Hare as a hub gives them the greatest interest in reducing the operating inefficiencies and consumer dissatisfaction caused by serious delays at that airport. We do not agree with America West, however, that no action is necessary now because the hub air carriers' economic incentives will in time cause them to reduce their own schedules to eliminate excessive delays. The delay problem has persisted at O'Hare since last year, and we think the public interest requires that the congestion at the airport be reduced now.

Aviation Programs, Part A--Air Commerce and Safety, subparts I - IV. The OST/FAA's regulation of airport development and noise also affect an airline's investment expectations. 49 U.S.C. Subtitle VII, Part B--Airport Development and Noise.

C. Operational Flexibility

Several air carriers asserted an anticipated need to modify their schedules for competitive or operational reasons while this order is in effect. We acknowledge that this order should provide a mechanism through which air carriers can modify their schedules. However, given the relative saturation of the peak hours of operation, it also is essential that any schedule change preserves the stabilizing effect of the operational limits in this order. Therefore, this order establishes two means through which air carriers can move an arrival scheduled within the period from 7:00 a.m. through 8:59 p.m.

First, because it is necessary to evaluate the effect of any proposed schedule change, an air carrier must obtain the Administrator's written approval before making a schedule change that introduces a scheduled arrival to any half-hour period from 7:00 a.m. through 8:59 p.m. and that has the effect of increasing the number of authorized arrival operations by that carrier during the period in question. If we determine that the schedule change will not adversely affect congestion at O'Hare, the FAA will approve it.

Second, if the FAA is unable to approve a proposed schedule change, the air carrier may still accomplish the change under a procedure to trade a scheduled peak hour arrival on a one-for-one basis with another air carrier. In

order to accomplish such a trade, the air carriers must obtain the Administrator's written approval. Once again, if the Administrator or her delegate determines that the trade will not increase congestion at O'Hare, the FAA will approve it.

In addition to allowing the transfer of scheduled arrival times among air carriers, American proposed in its written submission to the public docket that we permit air carriers to transfer a scheduled arrival for monetary consideration, along the lines of the "buy-sell rule" codified in 14 C.F.R. part 93, subpart S. When we consider intermediate solutions that can serve until O'Hare's capacity more closely matches air carrier demand, the FAA may entertain whether any aspect of the buy-sell rule or a newly conceived secondary market has a place in the intermediate solution. For the purpose of this order, however, which addresses in the short term the flight delays that O'Hare has generated, we believe that one-for-one trading of scheduled arrivals provides air carriers with adequate flexibility during the peak hours of operation.

D. Foreign Air Carriers and Unscheduled Arrivals

Most foreign air carriers provide very limited service into Chicago. Of the 22 foreign air carriers operating into Chicago as of August 19, 2004, 15 offer a single daily roundtrip. (See FAA-04-16944-27.) Of the remaining seven foreign carriers, only two offer as many as three daily roundtrips. As of August 19, 2004, foreign air carrier operations only account for 63 of 2,510 total operations, or about 2.5%, conducted between the hours of 7 a.m. and 9 p.m. In contrast to the 15% growth in daily operations at Chicago between April 13, 2000 and August 19, 2004, foreign air carriers had a slight reduction.

Given the small number of flights offered by any given foreign air carrier, a reduction of even one frequency could impair that carrier's ability to mount a viable service. Such a reduction also would have a disproportionate impact on that carrier vis-à-vis its U.S. competitor, because the schedule reduction order does not affect whether a U.S. carrier conducts domestic or foreign operations at the time periods controlled by this order. Therefore, in light of the small number of foreign air carrier operations at Chicago and for

reasons of comity, we have decided to exempt foreign air carrier operations from this schedule reduction order.[26]

This order terminates on April 30, 2005. The Summer 2005 scheduling season for international operations begins on April 3, 2005.[27] Foreign flag carriers' winter schedules are set and generally reflected in published schedules. There are approximately four weeks during which the order will be in effect when foreign air carriers will be operating their summer schedules. Foreign air carriers currently are planning their summer schedules. To facilitate this process, the Administrator expects to list O'Hare as a Schedules Facilitated Airport, Level 2 (SFA), as specified under the IATA Guidelines. An SFA is an airport where there is potential for congestion at some period of the day, week, or season that is likely to be resolved by voluntary cooperation between carriers.[28] Under IATA Guidelines, air carriers operating to, or intending to operate to a Level 2 airport should submit their proposed schedules in advance, so that

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[26] Given the necessity to adhere to an hourly cap of 88 scheduled arrivals and the lack of any requirement that domestic carriers use arrival times for any particular market, we think it would be ill-advised as requested by United to permit domestic air carriers providing international services to add arrivals for such services in response to schedule additions by foreign air carriers.

[27] The IATA's Northern Summer 2005 scheduling season begins on March 27, 2005. There is a one week difference between the IATA date and the U.S. date due to differences in the introduction of daylight savings time.

[28] See IATA Worldwide Scheduling Guidelines, 10th Edition, July 2004, Section 4.

voluntary solutions to capacity problems can be addressed. If the Administrator makes this election, foreign carriers would provide advance notification to the FAA of their intended operations and the FAA could request carriers to consider scheduling operations at less congested periods, if necessary.

Additionally, American Airlines commented that the schedule reduction order should set operations at the maximum level that still allows all involved to achieve the goal of more dependable operations at O'Hare. American also contends that new limits on unscheduled operations, including general aviation, should be considered as part of maximizing capacity at the airport. This order addresses scheduled operation only. The FAA will review operational data from unscheduled operations and determine whether it is necessary to consider the impacts of general aviation in the future.

E. Usage Requirement

The FAA has considered whether the schedule reduction order should include a usage requirement such as the "use or lose" requirement under the high density traffic airport rule, 14 C.F.R. § 93.227. We have determined not to institute any such requirement in this context. While such a requirement would ensure the maximum utilization of the operating times and might be considered in a future rulemaking context, it is not the intent or purpose of this order to establish a reallocation mechanism for the duration of this order. For

delay reduction purposes, we consider it acceptable in the near term to have fewer operations than the maximum permitted. Moreover, this order encompasses the winter scheduling season and the first several weeks of the summer. Most air carrier winter schedules will be finalized in the immediate future. We do not expect significant modification of those schedules over the next six months. The FAA is accommodating modifications that result in a one-for one exchange for operational purposes.

F. O'Hare Expansion, the O'Hare Modernization Plan, and Other Alternatives

Several submissions to the public docket expressed favorable or negative views on the expansion of O'Hare or on the airport operator's proposed O'Hare Modernization Program (OMP). Some submitters expressed their view that air traffic currently serving O'Hare should instead serve the region via other regional airports, either existing or proposed. The FAA convened the scheduling reduction meeting and solicited views and data from interested persons solely to determine a short-term limitation on the number of scheduled arrivals that will maximize the efficient operation of O'Hare for the six-month duration of this order.

This order is not intended to evaluate or to prescribe any particular long-term avenue for increasing capacity and reducing delays at O'Hare. Independently of the scheduling

reduction meeting and this public docket, the FAA is preparing an environmental impact statement evaluating the City of Chicago's proposal to build new runways at O'Hare and reasonable alternatives. The use of other existing and proposed airports will be considered in the environmental impact statement, consistent with the federal policy of increasing airport capacity and imposing artificial restrictions on capacity to alleviate delays only after other reasonably available and less burdensome alternatives have been tried. The FAA has announced a streamlined environmental review process that calls for an FAA decision by September 2005.

In its public submission to the docket United suggests several modifications of air traffic procedures and other activities that, it states, could alleviate congestion at O'Hare. Although several of these proposals may have merit, a few are not technically achievable in the manner United suggests, others present environmental concerns that must be assessed, and some of them require funding that is not currently available. As a result, although these proposals warrant further consideration, the Administrator has determined that none of them present a reasonably achievable alternative for reducing the delays that are present today and would worsen materially in November 2004, should published OAG schedules be permitted to take effect.

In its public submission to the docket US Airways requests that the FAA include Chicago's Midway Airport (MDW) as part of the analysis of the congestion problem. US Airways points out that MDW traffic has grown significantly since 2001 and can affect overall air space constraints in the Chicago region. The company requests that any carrier serving O'Hare that faces a changed competitive environment because of a rival's service addition at MDW be permitted to respond on a one-to-one basis with new operations at O'Hare. While we acknowledge that congestion at MDW can spill over to O'Hare because of shared air space, our July Federal Register notice implementing the scheduling meeting authority granted to the Secretary and the Administrator, and the guidelines approved by the U.S. Department of Justice citing that authority, do not permit discussion of conditions at airports other than O'Hare; thus, we have considered issues concerning Midway to be outside the scope of the formal meeting. Nevertheless, the Department is mindful of the competitive environment in the airline industry and will consider appropriate measures should schedule additions at MDW undermine the effectiveness of this order.

G. Enforcement of This Order

The FAA may enforce this order through an enforcement action seeking a civil penalty under 49 U.S.C. § 46301(a). An air carrier that is not a small business as defined in the Small Business Act, 15 U.S.C. § 632, is liable for a civil penalty of up to $25,000 for every day that it violates the

limits set forth in this order. An air carrier that is a small business as defined in the Small Business Act is liable for a civil penalty of up to $10,000 for every day that it violates the limits set forth in this order. The FAA also may file a civil action in U.S. District Court, under 49 U.S.C. §§ 46106, 46107, seeking to enjoin any air carrier from violating the terms of this order.

H. Intermediate- and Long-Term Solutions

While this order imposes a limitation on the number of scheduled operations at O'Hare, its duration is temporary, and it is not the FAA's preferred alternative to addressing capacity shortfalls. In the FAA's view, the long-term priority is to expand airport and airway system capacity and to increase the efficient use of existing resources. This is by far the most effective way to serve the traveling public and promote a strong airport and airway system. Over the next few months, the FAA will be actively engaged in public discussions regarding the capacity shortfall at O'Hare. These discussions are expected to yield significant insight into what intermediate measures are appropriate after this order expires.

ACCORDINGLY, with respect to scheduled flight operations at O'Hare, it is ordered that:

1. This order applies to the following:

a. all air carriers conducting scheduled operations at O'Hare as of the date of this order, any air carrier that operates under the same designator code as such an air carrier, and any air carrier that has or enters into a codeshare agreement with such an air carrier.

b. all air carriers initiating scheduled service to O'Hare from 7:00 a.m. through 8:59 p.m., Central Time, while this order remains in effect.

2. Under the authority provided to the Secretary of Transportation and the FAA Administrator by 49 U.S.C. §§ 40101, 40103, and 40113, we hereby order that:

a. from 7:00 a.m. through 7:59 p.m., Central Time, scheduled air carrier and foreign air carrier arrivals will not exceed 88 per hour, except as prescribed in this order.

b. from 8:00 p.m. through 8:59 p.m., Central Time, scheduled arrivals will not exceed 98.

c. from 8:00 p.m. through 8:29 p.m., Central Time, scheduled arrivals will not exceed 73.

d. of the 88 scheduled arrivals per hour from 7:00 a.m. through 7:59 p.m., Central Time, scheduled arrivals will not exceed 50 within any rolling 30-minute period.

e. during the first half of each hour from 7:00 a.m. through 8:59 p.m., the number of scheduled arrivals that each air carrier may conduct will not exceed the sum of the first and second quarters of each hour, as listed for each air carrier and its affiliates in the appendix to this order.

f. during the second half of each hour from 7:00 a.m. through 8:59 p.m., the number of scheduled arrivals that each air carrier may conduct will not exceed the sum of the third and fourth quarters of each hour, as listed for each air carrier and its affiliates in the appendix to this order.

g. any air carrier rescheduling an arrival such that it would increase or decrease the total number of scheduled arrivals for the air carrier in any quarter hour from 7:00 a.m. through 7: 59 p.m., Central Time, as listed in the appendix to this order, shall first provide, via a designated representative of the air carrier, written notification of the proposed schedule change to the FAA Slot Administration Office, facsimile (202) 267-7277 or e-mail 7-AWA-Slotadmin@faa.gov.

3. For the purpose of this order, any air carrier conducting eight or fewer scheduled arrivals at O'Hare from 7:00 a.m. though 8:59 p.m., Central Time, as of the

date of this order, including the scheduled arrivals of any affiliate of the air carrier, is designated a Limited Incumbent Air Carrier.

a. a Limited Incumbent Air Carrier may schedule additional arrivals, as long as its total number of arrivals does not exceed eight from 7:00 a.m. through 8:59 p.m., Central Time.

b. in scheduling additional arrivals, a Limited Incumbent Air Carrier shall not add more than one scheduled arrival from 12:00 p.m. through 8:59 p.m.

c. in scheduling additional arrivals, a Limited Incumbent Air Carrier shall not add an arrival that will cause the total number of scheduled arrivals for the hour to exceed 90.

4. For the purpose of this order, any air carrier that initiates scheduled service to O'Hare from 7:00 a.m. through 8:59 p.m., Central Time, while this order remains in effect, excluding service to be marketed as an affiliate of another air carrier serving O'Hare, is designated a New Entrant Air Carrier. Subject to the approval of the Administrator:

a. a New Entrant Air Carrier may schedule arrivals from 7:00 a.m. through 8:59 p.m., Central Time, up to a total of eight arrivals.

b. in scheduling additional arrivals, a New Entrant Air Carrier shall not schedule more than one arrival from 12:00 p.m. through 8:59 p.m.

c. in scheduling additional arrivals, a New Entrant Air Carrier shall not schedule an arrival that will cause the total number of scheduled arrivals for the hour to exceed 90.

5. An air carrier may request the Administrator's approval to move any arrival scheduled from 7:00 a.m. through 8:59 p.m. to another half hour within that period. The air carrier must receive the written approval of the Administrator, or her delegate, prior to conducting any scheduled arrival that is not listed in the appendix to this order. All requests to move a scheduled arrival must be submitted in writing to the FAA Slot Administration Office, facsimile (202) 267-7277 or e-mail 7-AWA-Slotadmin@faa.gov, and must come from a designated representative of the air carrier. If the FAA cannot approve an air carrier's request to move a scheduled arrival, the air carrier may then apply for a trade in accordance with ordering paragraph six.

6. An air carrier may trade any scheduled arrival from 7:00 a.m. through 8:59 p.m. and identified in the appendix to this order for a scheduled arrival conducted by another air carrier or may transfer such an arrival;

however, an air carrier shall not sell, lease, or otherwise transfer any scheduled arrival to any other air carrier or to any person except on a one-for-one basis. The air carrier must receive the written approval of the Administrator, or her delegate, prior to conducting any scheduled arrival that is not listed in the appendix to this order. All requests to trade a scheduled arrival must be submitted in writing to the FAA Slot Administration Office, facsimile (202) 267-7277 or e-mail 7-AWA-Slotadmin@faa.gov, and must come from a designated representative of the air carrier.

7. The limits on scheduled operations specified in this order shall take effect no later than 7:00 a.m. on November 1, 2004 and shall expire at 9:00 p.m. on April 30, 2005.

8. The FAA may modify or withdraw any provision in this order on its own or on application by any air carrier for good cause shown.

Issued in Washington, DC, on August 18, 2004.

Marion C. Blakey

Administrator of the FAA

APPENDIX

Air Canada

	Hour	Qtr	Arrivals
	8	3	2
	9	1	1
	10	3	1
	11	2	1
	12	4	1
	13	3	1
	14	4	2
	16	4	1
	17	4	1
	18	3	1
	18	4	1
	19	1	1
Total:			14

Alaska Airlines

	Hour	Qtr	Arrivals
	14	3	1
	18	2	1
Total:			2

America West

	Hour	Qtr	Arrivals
	12	3	1
	14	4	1
	15	3	1
	17	1	1
	17	3	1
	20	2	1
Total:			6

American/American Eagle

Hour	Qtr	Arrivals
7	1	13
7	2	9
7	3	12
7	4	7
8	1	9
8	2	9
8	3	8
8	4	6
9	1	9
9	2	9
9	3	9
9	4	4
10	1	9
10	2	9
10	3	8
10	4	10
11	1	9
11	2	10
11	3	13
11	4	13
12	1	4
12	2	8
12	3	10
12	4	13
13	1	6
13	2	8
13	3	3
13	4	13
14	1	5
14	2	9
14	3	10
14	4	11
15	1	5
15	2	10
15	3	5
15	4	13
16	1	5
16	2	9
16	3	8
16	4	10
17	1	10
17	2	7
17	3	8
17	4	7
18	1	12
18	2	7
18	3	10
18	4	7
19	1	11
19	2	11
19	3	9

	Hour	Qtr	Arrivals
	19	4	6
	20	1	14
	20	2	6
	20	3	5
	20	4	12
TOTAL			492

Atlantic Coast Airlines d.b.a. Independence Air

	Hour	Qtr	Arrivals
	7	3	1
	8	4	1
	10	2	1
	11	4	1
	13	4	1
	15	2	1
	16	4	1
	17	4	1
	19	1	1
	20	3	1
Total:			10

Continental/Continental Express

	Hour	Qtr	Arrivals
	7	4	2
	9	4	1
	10	2	2
	12	1	2
	13	1	1
	13	2	1
	14	2	1
	14	3	1
	15	1	1
	15	3	1
	16	1	2
	17	1	1
	17	2	1
	18	2	2
	19	2	1
	20	2	2
Total:			22

Delta/Delta Connection

	Hour	Qtr	Arrivals
	7	2	1
	8	1	1
	9	1	1
	9	3	1
	11	1	1
	11	4	1
	12	1	1
	12	4	2
	13	4	1
	14	2	1
	14	4	1
	15	4	1
	16	3	1
	16	4	1
	18	2	1
	18	3	1
	19	2	1
	19	4	1
	20	1	1
	20	4	1
Total:			21

Kalitta Airlines

	Hour	Qtr	Arrivals
	17	1	1
Total:			1

Northwest/Northwest Airlink

	Hour	Qtr	Arrivals
	7	1	1
	8	1	1
	9	2	2
	10	2	2
	12	1	1
	12	2	1
	14	2	1
	15	2	2
	15	4	1
	16	2	1
	17	2	1
	17	2	1
	18	2	1
	19	1	2
	20	2	2
Total:			20

Polar Air Cargo

	Hour	Qtr	Arrivals
	11	2	1
	14	3	1
	19	1	1
Total:			3

Spirit Airlines

	Hour	Qtr	Arrivals
	9	3	1
	9	4	1
	12	3	1
	13	2	1
	16	4	1
	17	3	1
	19	4	1
	20	3	1
Total:			8

United/United Express

Hour	Qtr	Arrivals
7	1	21
7	2	7
7	3	4
7	4	8
8	1	11
8	2	8
8	3	6
8	4	20
9	1	15
9	2	10
9	3	3
9	4	17
10	1	5
10	2	9
10	3	11
10	4	17
11	1	11
11	2	7
11	3	6
11	4	11
12	1	4
12	2	16
12	3	12
12	4	6
13	1	7
13	2	11
13	3	11
13	4	16
14	1	9
14	2	13
14	3	3
14	4	16
15	1	9
15	2	7
15	3	9
15	4	16
16	1	8
16	2	15
16	3	9
16	4	12
17	1	8
17	2	16
17	3	4
17	4	14
18	1	6
18	2	11
18	3	10
18	4	12
19	1	15
19	2	6
19	3	12

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	Hour	Qtr	Arrivals
	19	4	7
	20	1	31
	20	2	15
	20	3	4
	20	4	1
Total:			588

US Airways

	Hour	Qtr	Arrivals
	7	4	1
	8	1	1
	8	4	1
	9	1	1
	9	3	1
	10	1	1
	11	3	1
	12	2	1
	13	2	1
	13	4	1
	15	2	2
	16	2	1
	16	4	1
	17	1	1
	18	2	1
	18	4	1
Total:			17

USA3000 Airlines

	Hour	Qtr	Arrivals
	15	4	1
Total:			1

Airport Capacity Benchmark Report 2004

U.S. Department of Transportation
Federal Aviation Administration
The MITRE Corporation
Center for Advanced Aviation System Development

September 2004

U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

October 2004

The FAA is delivering on its promise to increase the capacity of the U.S. aviation system. Our five-year strategic map of how to get there, *Flight Plan 2004-2008*, outlines the pledge to make the system run as efficiently as possible. Specifically, we are accelerating the delivery of technology and procedures to boost capacity at America's 35 busiest airports. We have also updated our standardized measurements, providing a better barometer of the steps we are taking to meet our *Flight Plan* goals.

The new version of the Benchmark Report provides information on which factors, such as weather or runway layout, are most important in determining the capacity of our largest airports. Ultimately, this data helps us measure the return on investment for new runways or other technologies designed to increase capacity.

A "capacity benchmark" is the number of departures and arrivals per hour that an airport can handle safely and routinely. Since the first edition of this report was published in 2001, we have refined our methodology to include three rates for each airport. These reflect capacity in three weather conditions:

- ✓ ***Optimum*** represents good weather with visual separation;
- ✓ ***Marginal*** describes weather not good enough for visual approaches, but still better than instrument conditions; and
- ✓ ***IFR*** – instrument flight rules – defined as instrument conditions (ceiling less than 1000 feet or visibility less than 3 miles) when radar is required to separate aircraft.

These benchmarks represent routine operations at the airports and could be exceeded occasionally under favorable conditions. Conversely, lower rates could be expected with less than optimum conditions. For example, a squall or an afternoon rush of departures might trigger a different runway configuration or unavoidable congestion.

The data contained in this report are not only used to determine current and future airport capacity, but to evaluate the benefits from procedural, technological, and runway improvements outlined in the FAA's Operational Evolution Plan, which measures the capacity of the system at key airports across the country.

As we learn more and more about the best ways to make aviation flow more smoothly, the *Airport Capacity Benchmark Report* will help us understand demand as it relates to capacity. This report sets the standard against which we can measure our efforts. I look forward to hearing from you about ways in which we can improve this report and our service to the flying public.

Marion

Marion C. Blakey
Administrator

Introduction and Overview

Purpose and Definition

The Federal Aviation Administration (FAA) has developed capacity benchmarks for 35 of the nation's busiest airports to understand the relationship between airline demand and airport runway capacity. They are useful for broad policy discussions and the development of long-term strategies.

Capacity benchmarks are defined as the maximum number of flights an airport can routinely handle in an hour, for the most commonly used runway configuration in each specified weather condition.

These benchmarks are estimates of a complex quantity that varies widely with weather, runway configuration, and the mix of aircraft types. Capacity benchmarks assume there are no constraints in the en route system or the airport terminal area.

Updating the Capacity Benchmarks

The first study of airport capacity benchmarks was published by the FAA in April 2001.[1] Changes in aviation since then, and a better understanding of potential uses of benchmark data, have led to this update to the 2001 benchmark report.

These updated benchmarks should not be compared to the original benchmarks to identify progress since 2001. Refinements to the methodology and different scenario definitions have produced more meaningful and internally consistent benchmark values, but may make comparisons to the original benchmarks misleading. These changes are explained below in the section titled "Differences from Previous Benchmark Report."

The general definition of the benchmarks, and the purpose for developing them, have not changed from the 2001 report.

The Capacity Benchmarks documented in this report were used as a part of the analytical support for the Future Airport Capacity Task (FACT) study, *Capacity Needs in the National Airspace System.*[2] FACT took a new approach to assessing our country's future needs for airport capacity in metropolitan areas. It looked at population trends, economic and societal shifts, and the changing dynamics of the airline industry. While the FACT took a broad look at future airport capacity, the Benchmark report is a more focused look at capacity at specific airports from an operational perspective.

Setting the Framework for Benchmarks

The benchmarks in this report are a relatively simple expression of a complex quantity, airport capacity. They serve primarily as a reference point on the state of selected U.S. airports at a specific time. They can be used to identify and compare specific characteristics of airports, for instance to determine which airports are most severely affected by adverse weather. The benchmarks also provide a context for public policy discussions, because they give a succinct report on the current and future state of capacity at major airports.

Benchmarks are useful data that can help frame discussions. However, they are not a substitute for the more detailed analysis that should precede major investment and policy decisions. In this sense they might be compared to a vital sign of human health, such as blood pressure. That simple indicator might be the starting point for a diagnosis, but more tests would be performed before recommending surgery. Similarly, capacity benchmarks help identify problem areas but are not, in themselves, an adequate basis for selecting remedies.

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[1] *Airport Capacity Benchmark Report 2001*, Federal Aviation Administration.
[2] Available at *www.faa.gov/arp/publications/reports/index.cfm*.

This issue can be demonstrated by examining busy airports such as Hartsfield-Jackson Atlanta International Airport or Chicago O'Hare. At Atlanta, scheduled operations may exceed the benchmarks in optimum weather, and frequently do so in bad weather. A simple comparison of schedule to benchmarks might suggest that some action is needed to curtail the schedule. However, air traffic controllers, airlines, and the airport operator have indicated in discussions that they are relatively comfortable with the traffic schedule, and believe that it makes efficient use of the airport. Their judgment is based on long experience and a broad understanding of air transportation.

Some of the considerations behind this judgment are applicable to transfer hub airports in general (the concentration of traffic into schedule peaks to allow passengers to make convenient transfers between flights; the ability to catch up with traffic between peaks in the schedule; and the ability of hubbing carriers to cancel and consolidate some flights during poor weather conditions).

Other considerations are applicable to all busy airports, namely the premise that some amount of congestion and delay is not inconsistent with efficient and affordable air transportation.

It should be emphasized that the benchmarks are specific to the airport, and may not represent the actual capacity of the airport when other considerations are included such as airspace structure and congestion, weather patterns, and directional flight limitations.

At Chicago O'Hare, for example, the average arrival and departure rates will be less than the benchmark rate, which represents operations in good weather in the most favorable runway configuration. Wind conditions frequently force the use of other configurations with lower rates. The actual rate of arrivals and departures may also be affected by traffic flow control measures, such as mile-in-trail restrictions caused by en route weather or airspace constraints.

Methodology

The FAA and The MITRE Corporation have updated the capacity benchmarks for the 31 airports published in 2001 and developed capacity benchmarks for four additional airports (Cleveland, Fort Lauderdale-Hollywood, Chicago Midway, and Portland, Oregon), bringing the total to 35. These are the same 35 airports listed in the FAA's Operational Evolution Plan (OEP) version 5.0, released in December 2002.[3] This update reflects the future capacity gains associated with the new runways and technology improvements identified in OEP v5.0.

The benchmarks are the sum of takeoffs and landings per hour that are possible under the given conditions, if the demand is present. The benchmark capacity usually represents balanced operations, with equal numbers of arrivals and departures. However, if air traffic control (ATC) at the airport frequently reports an unbalanced rate, the benchmark value will reflect this. For example, the airport might be able to handle 40 arrivals per hour but as many as 60 departures per hour. Clearly, the airport cannot operate more departures than arrivals for an extended period: such rates describe the capability of the airport to accommodate operations, not necessarily actual hourly traffic.

These benchmarks are based on routine operations at the airports, and therefore they might be exceeded occasionally under favorable conditions. Conversely, lower rates would be expected under adverse conditions, such as a lower capacity runway configuration or very low ceiling and visibility, or if demand is significantly less than capacity.

[3] Available at www.faa.gov/programs/oep.

There are three benchmarks published for each airport, reflecting three different weather scenarios (Optimum, Marginal, and IFR[4]). The benchmark capacity is defined as the maximum number of aircraft that can be routinely and safely handled during each specified condition:

- **Optimum**: periods of unlimited ceiling and visibility, using visual approaches.
- **Marginal**: periods when the weather is not good enough for visual approaches, but is still better than instrument conditions.
- **IFR**: instrument conditions (ceiling less than 1000 feet or visibility less than 3 statute miles), when radar separation between aircraft is required.

The frequency of occurrence of these weather conditions at each airport was determined for this analysis using data from the FAA Aviation System Performance Metric [ASPM] database. The time period selected was from January 2000 to July 2002 (excluding 11-14 September 2001). Only data between 7 AM and 10 PM local time at each airport was used, to avoid periods of very low activity.

Weather data in ASPM is obtained directly from NOAA. Based on the ceiling and visibility data, and the visual approach minima for each airport, ASPM indicates whether visual or instrument approaches are conducted at the airport.

Each rate is based on the *most commonly used runway configuration* for that condition. For example, the most common configuration at New York LaGuardia Airport in Optimum weather is to use Runway 22 for arrivals and Runway 13 for departures.

The FAA confirmed capacity benchmark rates in three ways:

- Rates for each airport were provided by the ATC team at the airport, both control tower and terminal radar control (TRACON) personnel, based on their collective operational experience and a review of the ASPM data on reported rates.
- The rates provided by the air traffic teams were compared to historical traffic data for arrivals and departures (also from ASPM) to confirm that they represent the best performance of the airport.
- Rates were also calculated based on a set of standard performance characteristics, using the FAA's widely accepted airfield capacity computer model.
- In general, bad weather reduces the capacity of the airport but does not reduce the number of scheduled flights. Under good weather conditions (i.e., Optimum weather), delays at most airports are expected to be small and manageable. During bad weather, however, capacity is lower, resulting in more delay. The difference in the benchmarks for the different weather scenarios is one indicator of the potential effect of weather at a specific airport.

Human factors play a critical role in the benchmark rates reported by the air traffic facility. Benchmarks are strongly affected by how busy the airport is and how aggressively the management team sets target rates.

Assumptions

Version 5.0 of the OEP describes improvements to the National Airspace System (NAS) that will be tested, developed, and/or implemented in the period from 2003-2013. Future benchmarks were calculated for 2013 assuming that the technological and procedural improvements described in OEP v5.0 will be implemented at all eligible airports, and will provide the expected benefits. As such, the values presented should be considered as upper limits of the effect of the OEP improvements on benchmark capacity. Please note that the future benchmarks do not substitute for detailed benefit analyses performed for the individual programs.

[4] Conditions when Instrument Flight Rules (IFR) apply.

The improvements listed in OEP v5.0 included new runways at many of the 35 OEP airports. New benchmark capacities were calculated for each of these airports to show the effect of these planned runways. The benchmark capacities associated with the new runways assume that the airspace design, technology, and ATC procedures needed for full operational performance of the new runway have been implemented. These capabilities include but are not limited to the following:

- **Simultaneous Offset Instrument Approaches (SOIA)** refers to instrument approaches to a set of parallel runways less than 3000 feet apart, utilizing a straight-in precision approach to one and an offset approach to the other. With SOIA, the approach course separation meets parallel approach criteria even though the runway separation does not.
- **Precision Runway Monitor (PRM)** is a high update radar system that allows simultaneous instrument approaches to parallel runways as close as 3000 feet apart. PRM can also facilitate other approach procedures such as SOIA.
- **Standard Terminal Automation Replacement System (STARS)** enhancements provide a high-resolution color monitor with alert algorithms, similar to that provided by the PRM but without the high update rate. Such a monitor is required to conduct triple simultaneous instrument approaches when the runway centerlines are at least 4300 but less than 5000 feet apart, or the field elevation is at or above 1000 feet above Mean Sea Level (MSL).

OEP v5.0 also includes several technical and procedural improvements:

- **Traffic Management Advisor (TMA)** provides traffic flow managers with a metering plan that organizes traffic in en route airspace to increase the utilization of the airport's arrival capacity, and implements that plan by displaying specific aircraft schedule and delay information to en route controllers. When the controllers deliver the aircraft to the airport airspace boundary at the TMA scheduled times, the orderly flow of arrival traffic results in more efficient operations. When fully implemented, TMA will help an airport more consistently utilize its capacity.
- **Area navigation (RNAV)** capabilities on the aircraft, in conjunction with advanced TMA functions, are assumed to improve the accuracy with which arrivals are delivered to the runway. In other words, the actual separation between arrivals will be closer to the minimum required separation value.
- **CDTI[5]-Enhanced Flight Rules (CEFR)** allows suitably equipped aircraft to maintain visual separation from other aircraft and continue visual approaches even in Marginal weather conditions. For the purpose of this analysis, it was assumed that all aircraft at these 35 airports will be suitably equipped by 2013; actual equipage will probably be less.
- **Revised wake vortex separation standards for closely spaced parallel runways** would improve arrival and departure capacity when the runways are less than 2500 feet apart. Additional separation for wake turbulence would only be applied between operations on different runways when actually needed, such as for a Small aircraft on one runway trailing a Heavy aircraft on the other runway. Other aircraft would use non-vortex separation, such as 1.5 nautical miles (NM) diagonally between arrivals.
- **Airspace redesigns** may be needed at various airports to allow full operational use of the new runways. This analysis also assumed that the airspace redesign would be successful in eliminating most operational restrictions on arrivals and departures at these airports. Restrictions due to terrain or environmental concerns would not be affected.

The list of Planned Improvements and their expected effects on capacity at each airport does not imply FAA commitment to or approval of any item on the list.

[5] Cockpit Display of Traffic Information.

In general, the benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:

- Taxiway and gate congestion, runway crossings, slot controls, construction activity.
- Terminal airspace, especially limited departure headings.
- Traffic flow restrictions caused by en route miles-in-trail restrictions, weather, or congestion problems at other airports.
- Seasonal limitations due to high temperatures that restrict aircraft climb rates.

These benchmark capacity values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the airport or for the individual programs.

Differences from Previous Benchmark Report

The same general methodology is used for these updated benchmarks as was used to produce the April 2001 benchmark report. However, this methodology has been refined based on responses to the original set of benchmarks and to incorporate additional data now available. As a result, the benchmark values for many airports have changed from the original report. Some of the reasons for these differences are explained below. Because of these refinements to the methodology and different input data used, these updated benchmarks should not be compared to the 2001 benchmarks.

The 2001 benchmark report provided capacities for two weather conditions, Optimum and Reduced rate. "Reduced rate" was based on the runway configuration used most often during less than optimal conditions, which might have been Marginal conditions or IFR conditions, with different ATC procedures. Different airports specified different weather conditions for the "reduced rate" scenario, leading to inaccurate comparisons between airports. Having separate benchmarks for Marginal and IFR conditions should make such comparisons more meaningful.

The 2001 benchmark report also compared scheduled arrivals and departures to Optimum and Reduced rate conditions for a selected day of good and poor weather conditions. This single-day comparison, while a useful indicator of potential airport performance for that day, was originally provided to show the comparative effect of adverse weather at airports having different levels of capacity and demand. This report focuses exclusively on airport capacity and does not include comparative schedule data.

The most common runway configuration and the facility-reported arrival and departure rates are based on more than two years of data in the FAA ASPM database. This better data, together with changes in airport operations and runway configurations, led to modeling different runway configurations and revised facility-reported rates in some cases.

Airport fleet mix is an input parameter to the computer model used to calculate the benchmarks. The fleet mix used in this report is based on recent traffic data, and therefore reflects changes in scheduled operations at the benchmark airports.

The charts of actual traffic versus calculated capacity now include more than two years of ASPM data, and the data points are coded to show frequency of occurrence. This gives a better understanding of routine operations vs. exceptional events.

Observations Across All 35 Airports

Table 1 shows the capacity benchmarks for current operations at the 35 airports studied. These benchmarks are represented as a range between the value reported by the ATC facility, either the control tower or the TRACON, and the value calculated using the capacity model. The benchmarks are also depicted graphically in Figure 1, which plots the calculated benchmark values. The calculated values are used here for consistency with the future capacity values.

Table 1
Capacity Benchmarks for Today's Operations at 35 Airports
(Arrivals and Departures per Hour)

Airport		Optimum	Marginal	IFR
ATL	Atlanta Hartsfield-Jackson International	180-188	172-174	158-162
BOS	Boston Logan International	123-131	112-117	90-93
BWI	Baltimore-Washington International	106-120	80-93	60-71
CLE	Cleveland Hopkins	80-80	72-77	64-64
CLT	Charlotte/Douglas International	130-131	125-131	102-110
CVG	Cincinnati/Northern Kentucky International	120-125	120-124	102-120
DCA	Ronald Reagan Washington National	72-87	60-84	48-70
DEN	Denver International	210-219	186-202	159-162
DFW	Dallas/Fort Worth International	270-279	231-252	186-193
DTW	Detroit Metro Wayne County	184-189	168-173	136-145
EWR	Newark Liberty International	84-92	80-81	61-66
FLL	Fort Lauderdale-Hollywood International	60-62	60-61	52-56
HNL	Honolulu International	110-120	60-85	58-60
IAD	Washington Dulles International	135-135	114-120	105-113
IAH	Houston George Bush Intercontinental	120-143	120-141	108-112
JFK	New York John F. Kennedy International	75-87	75-87	64-67
LAS	Las Vegas McCarran International	102-113	77-82	70-70
LAX	Los Angeles International	137-148	126-132	117-124
LGA	New York LaGuardia	78-85	74-84	69-74
MCO	Orlando International	144-164	132-144	104-117
MDW	Chicago Midway	64-65	64-65	61-64
MEM	Memphis International	148-181	140-167	120-132
MIA	Miami International	116-121	104-118	92-96
MSP	Minneapolis-St Paul International	114-120	112-115	112-114
ORD	Chicago O'Hare International	190-200	190-200	136-144
PDX	Portland International	116-120	79-80	77-80
PHL	Philadelphia International	104-116	96-102	96-96
PHX	Phoenix Sky Harbor International	128-150	108-118	108-118
PIT	Greater Pittsburgh International	152-160	143-150	119-150
SAN	San Diego International - Lindbergh Field	56-58	56-58	48-50
SEA	Seattle-Tacoma International	80-84	74-76	57-60
SFO	San Francisco International	105-110	81-93	68-72
SLC	Salt Lake City International	130-131	110-120	110-113
STL	Lambert-St. Louis International	104-113	91-96	64-70
TPA	Tampa International	102-105	90-95	74-75

Airport capacity generally decreases in adverse weather conditions, which may include poor ceiling and visibility (requiring different ATC procedures), unfavorable winds (so the best runway configuration cannot be used), or heavy precipitation.

The extent of the reduction in benchmark capacity during operations in IFR conditions (as compared to the Optimum scenario) varies widely across the 35 airports, from almost no effect at Minneapolis-St. Paul, to a 47 percent reduction at Honolulu. These differences are due to different runway configurations and operational procedures in adverse weather at each airport.

Table 2 shows the percentage increase in the capacity benchmarks at these airports due to planned new runways and the technological and procedural improvements included in OEP v5.0. The effect of these improvements on the calculated benchmark values is shown in Figures 2 through 4 (Optimum, Marginal, and IFR scenarios respectively).

New runways planned for 12 airports provide significant capacity increases, but the amount of the increase varies from site to site. OEP v5.0 included new runways in the 2003-2013 period at Atlanta, Boston, Cincinnati, Cleveland, Denver, Houston, Miami, Minneapolis-St. Paul, Orlando, St. Louis, Seattle-Tacoma, and Washington Dulles. These planned new runways increased the benchmark capacities by 25 to 50 percent at most airports.

- A smaller increase in the benchmark capacity might occur where there are operational restrictions on the new runway. For example, the new runway at Minneapolis-St. Paul can only be used for operations to or from south of the airport. The new runway at Boston has no effect on the benchmarks because it will only be used when there are strong winds from the northwest, which is not a common occurrence.
- Additional airports such as Chicago O'Hare are planning new runways, but these runways were not included OEP v5.0 and thus were not considered in this analysis. In general, a proposed new runway is not included in the OEP unless the FAA has issued a Record of Decision (ROD) after a satisfactory environmental study. The environmental study for the new runways at O'Hare has not yet been completed.

Technology and procedural improvements also provide capacity increases. CEFR will increase the benchmark capacity in Marginal conditions. The revised wake vortex procedures will increase the benchmarks at airports with closely spaced parallel runways. Airspace redesign has the potential to allow large increases at some airports, but only if the redesign eliminates existing operational restrictions.

For those airports operating close to capacity, technological and procedural changes could have a significant impact in improving the capacity benchmark. In general, the greatest benefit is derived from adding a new runway.

Figure 1
Effect of Weather on Capacity Benchmarks – Today

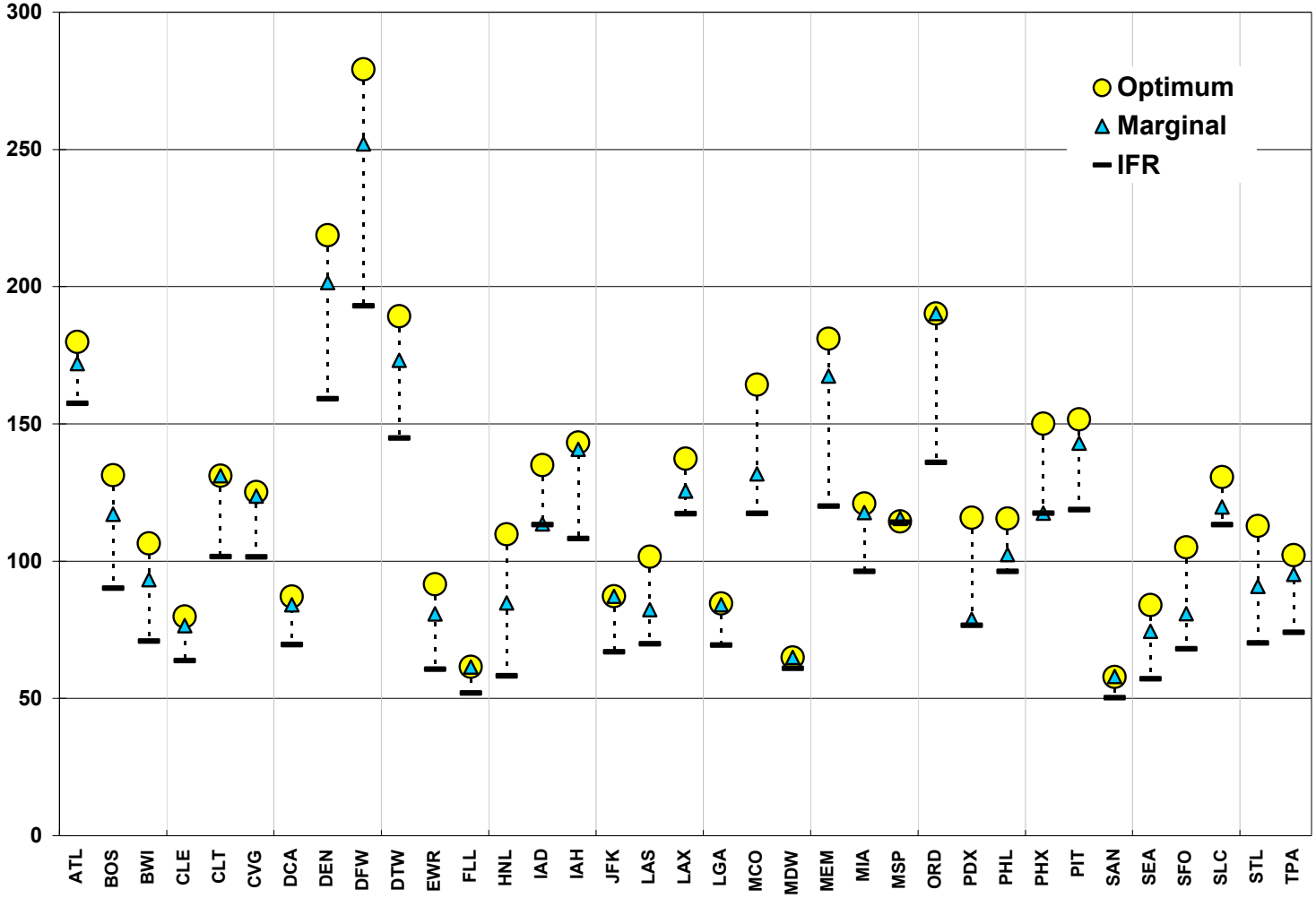


Table 2
Capacity Benchmark Summary

Airport	Capacity Improvement over Today (percent)					
	New Runway (if planned)			Planned Improvements (including new runway)		
	Optimum	Marginal	IFR	Optimum	Marginal	IFR
ATL	32	33	28	35	40	40
BOS	0	0	0	0	11	0
BWI	—	—	—	0	0	0
CLE	44	51	37	44	51	37
CLT	—	—	—	0	0	0
CVG	35	34	30	41	43	39
DCA	—	—	—	0	0	0
DEN	22	24	43	29	39	48
DFW	—	—	—	9	20	6
DTW	—	—	—	0	8	0
EWR	—	—	—	1	7	0
FLL	—	—	—	0	0	0
HNL	—	—	—	0	22	43
IAD	27	51	33	29	53	33
IAH	35	37	22	61	64	27
JFK	—	—	—	0	0	0
LAS	—	—	—	1	21	0
LAX	—	—	—	26	38	9
LGA	—	—	—	0	1	0
MCO	35	47	42	35	54	48
MDW	—	—	—	9	9	0
MEM	—	—	—	6	13	4
MIA	23	7	18	28	29	25
MSP	40	35	10	46	44	20
ORD	—	—	—	0	0	0
PDX	—	—	—	0	38	0
PHL	—	—	—	0	7	0
PHX	—	—	—	0	1	0
PIT	—	—	—	0	6	10
SAN	—	—	—	0	0	0
SEA	22	35	27	22	35	27
SFO	—	—	—	8	40	1
SLC	—	—	—	22	34	0
STL	34	54	63	41	71	68
TPA	—	—	—	0	7	0

Figure 2
Effect of New Runways and Planned Improvements on Capacity Benchmarks – Optimum Weather

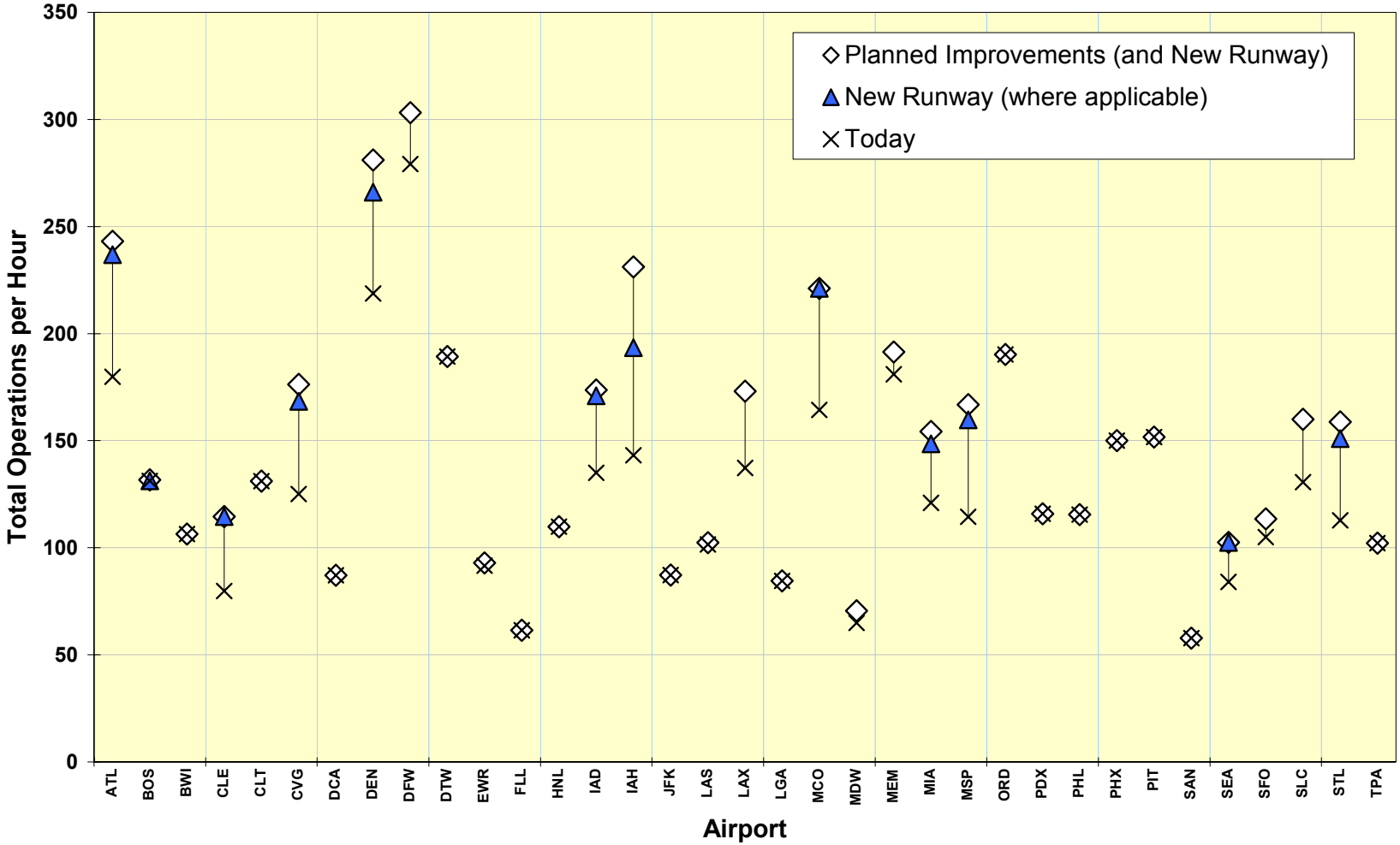


Figure 3
Effect of New Runways and Planned Improvements on Capacity Benchmarks – Marginal Weather

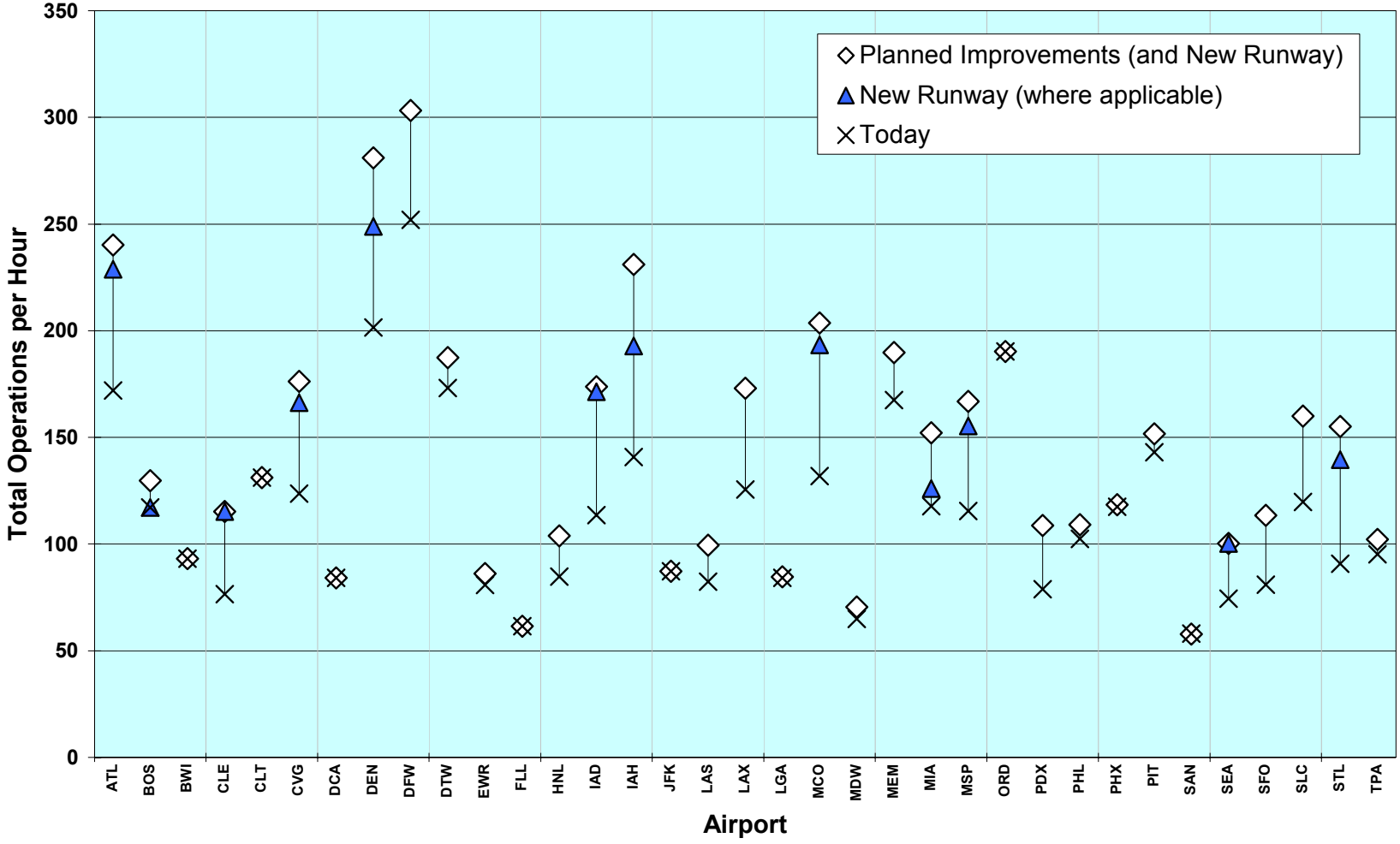
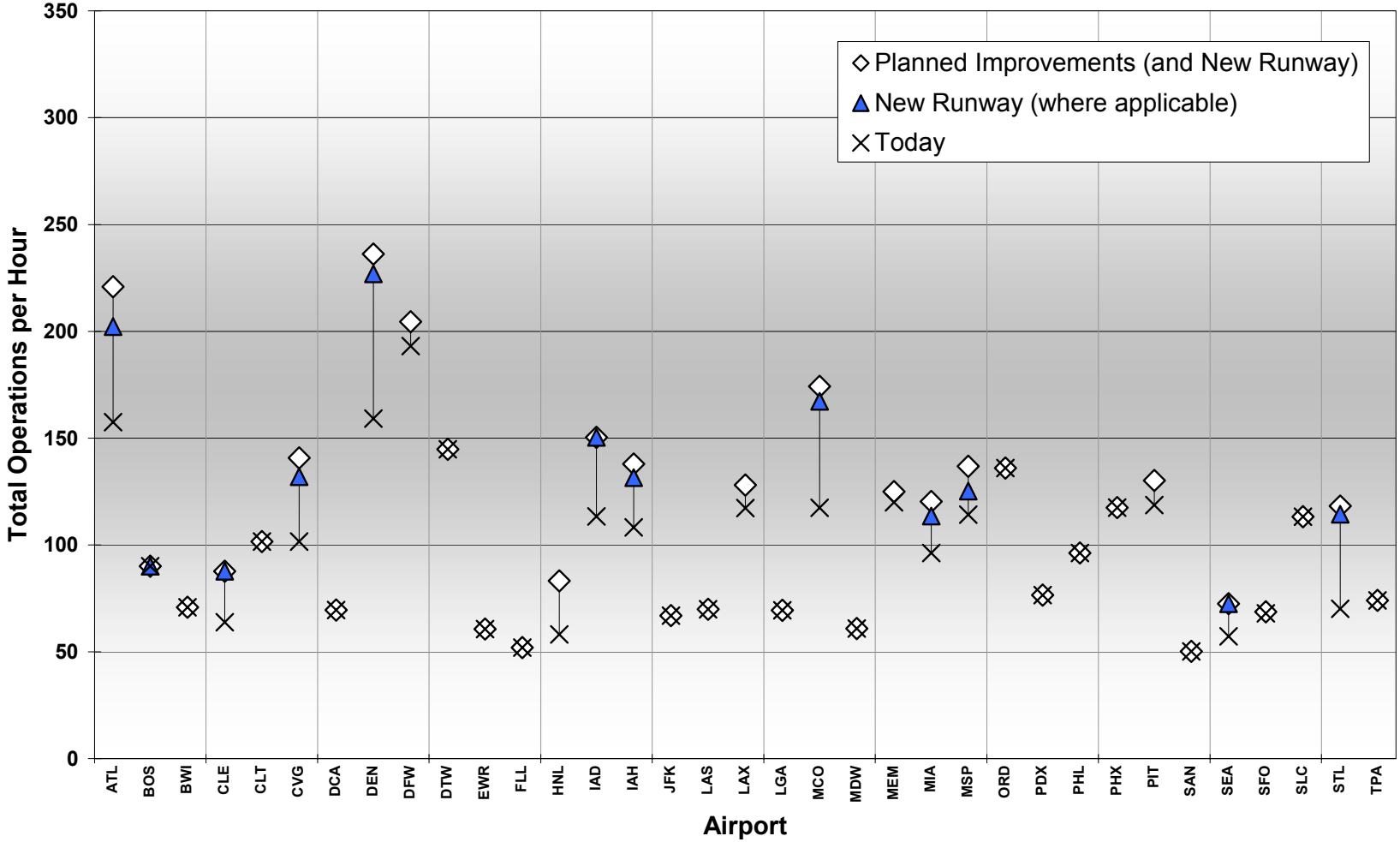


Figure 4
Effect of New Runways and Planned Improvements on Capacity Benchmarks – IFR Weather



Individual Airport Results

The following sections present the benchmark results for each of the 35 airports individually. The airports are presented in alphabetical order by the three-letter airport code, from ATL to TPA, as in the prior tables and figures.

Each section describes the runway configurations that were analyzed for each weather scenario, the air traffic control procedures used, and the effect of planned improvements at the airport. If construction of a new runway has been approved at the airport, the effect of the runway is discussed separately.

Airport capacity was calculated using the FAA's Airfield Capacity Model. This runway capacity is the calculated average number of arrivals and departures per hour, given continuous arrival and departure demand. An airport operating at capacity would experience significant levels of delay.

Capacity results for each weather condition are shown for each airport graphically. Calculated capacity is depicted as a line rather than as a single point, to show the tradeoff between arrival and departure operations at the airport. Typically, the number of arrivals per hour will decrease as the number of departures increases, for at least a section of the "capacity curve," since both arrivals and departures use the same runways (e.g., SAN). But in certain cases (e.g., ATL), arrivals are independent of departures so there is no tradeoff, and the "capacity curve" is a rectangle.

The capacity graphs show the calculated number of arrivals and departures per hour as well as the arrival and departure rate reported by the ATC facility. If the reported rate is, for example, 60 arrivals per hour and 30 departures per hour, it would be abbreviated as (60, 30).[6] The benchmark capacity is usually expressed as a range between the facility-reported rate and the corresponding point on the calculated capacity curve.

Actual traffic data is also shown on the capacity charts. This data represents operations at each airport from January 2000 through July 2002, between the hours of 7 a.m. and 10 p.m. local time (Source: ASPM). Each combination of arrivals and departures may have occurred multiple times during this period. On the following charts, four different symbols are used to depict how frequently these combinations occur, with each symbol used for roughly a quarter of the observed hours.

The ASPM data was also used to determine the runway configuration and weather condition information. However, information on runway configuration usage was not available in ASPM for all airports. The most common configuration was initially determined using ASPM data, where possible, but was confirmed through discussion with the ATC facility.

An airport layout diagram is included for each airport to better understand the various runway configurations that were analyzed. Planned runway construction is shown in these layouts by a different color. These diagrams were taken mainly from the 2001 and 2002 *Aviation Capacity Enhancement Plans*[7] published by the FAA; however, there may be differences between these pictures and the precise details of the runways, taxiways, and buildings at the airport.

Note: These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:

- Taxiway and gate congestion, runway crossings, slot controls, or construction activity.
- Terminal airspace, especially limited departure headings.
- Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports.

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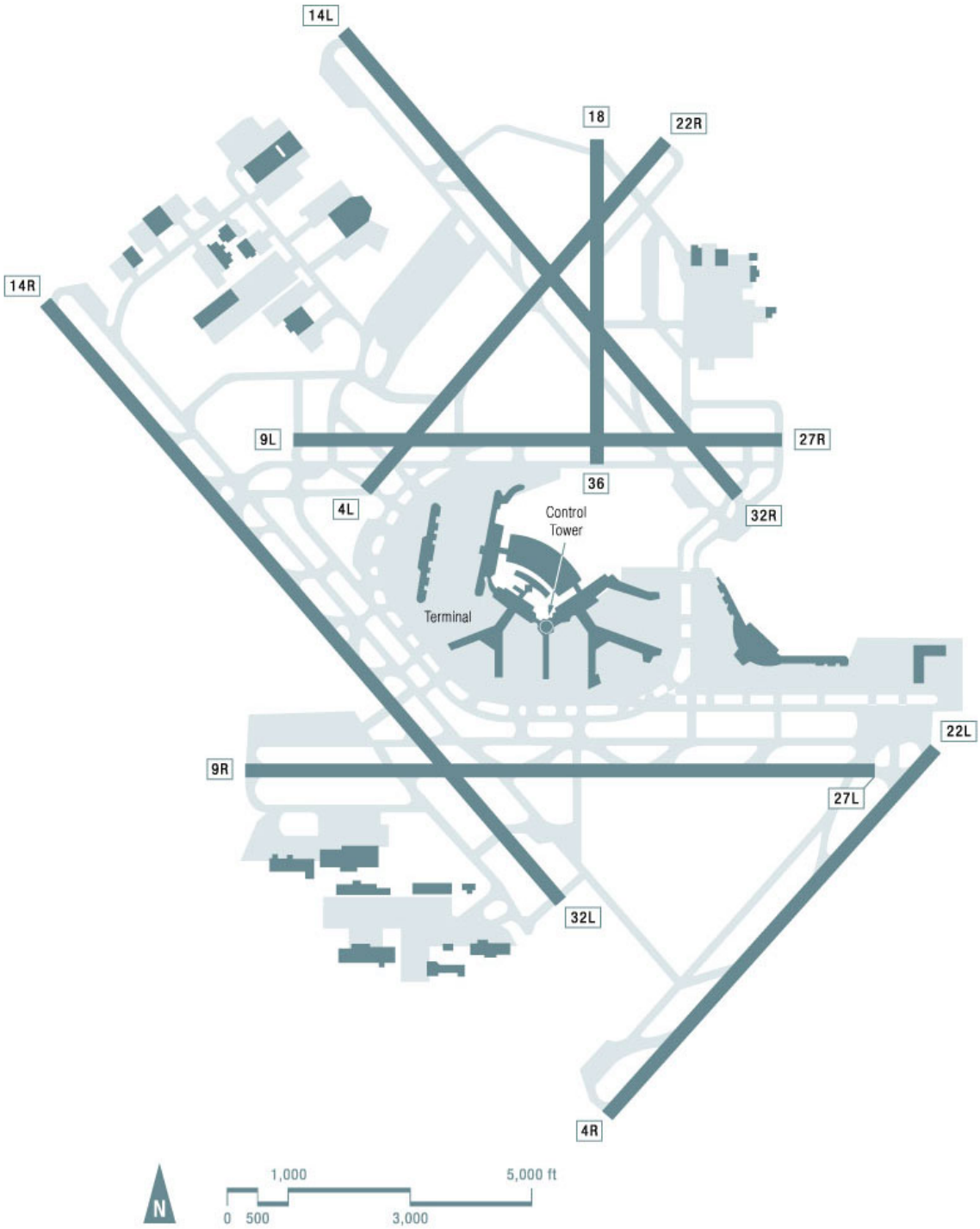
[6] Normally in a graph, the value on the x-axis is presented first. Here, that would be the number of departures. The representation herein is thus the opposite of the conventional presentation.

[7] Available at www.faa.gov/ats/asc/.

Individual Airport Reports

City	Airport	Page
Atlanta	Hartsfield-Jackson Atlanta International	ATL-1
Baltimore	Baltimore-Washington International	BWI-1
Boston	Boston Logan International	BOS-1
Charlotte	Charlotte/Douglas International	CLT-1
Chicago	Chicago Midway International	MDW-1
Chicago	Chicago O'Hare International	ORD-1
Cincinnati	Cincinnati/Northern Kentucky International	CVG-1
Cleveland	Cleveland Hopkins International	CLE-1
Dallas - Fort Worth	Dallas/Fort Worth International	DFW-1
Denver	Denver International	DEN-1
Detroit	Detroit Metropolitan Wayne County	DTW-1
Fort Lauderdale - Hollywood	Fort Lauderdale-Hollywood International	FLL-1
Honolulu	Honolulu International	HNL-1
Houston	Houston George Bush Intercontinental	IAH-1
Las Vegas	Las Vegas McCarran International	LAS-1
Los Angeles	Los Angeles International	LAX-1
Memphis	Memphis International	MEM-1
Miami	Miami International	MIA-1
Minneapolis-St Paul	Minneapolis-St Paul International	MSP-1
New York	New York John F. Kennedy International	JFK-1
New York	New York LaGuardia	LGA-1
Newark	Newark Liberty International	EWR-1
Orlando	Orlando International	MCO-1
Philadelphia	Philadelphia International	PHL-1
Phoenix	Phoenix Sky Harbor International	PHX-1
Pittsburgh	Greater Pittsburgh International	PIT-1
Portland	Portland International	PDX-1
Saint Louis	Lambert-St. Louis International	STL-1
Salt Lake City	Salt Lake City International	SLC-1
San Diego	San Diego International - Lindbergh Field	SAN-1
San Francisco	San Francisco International	SFO-1
Seattle-Tacoma	Seattle-Tacoma International	SEA-1
Tampa	Tampa International	TPA-1
Washington, DC	Ronald Reagan Washington National	DCA-1
Washington, DC	Washington Dulles International	IAD-1

CHICAGO – Chicago O'Hare International (ORD)



Note: *Runway 18/36 at ORD has been decommissioned.*

Benchmark Results

- The capacity benchmark for Chicago O'Hare International Airport today is 190-200 flights per hour (arrivals and departures) in Optimum and Marginal weather.
- The FAA facility at ORD reported a rate of 100 arrivals and 100 departures per hour in Optimum and Marginal conditions when the most common runway configuration was in use. Procedural changes at ORD since January 2003 have reduced the frequency of occurrence of these rates. The average acceptance rate will be lower, since wind conditions frequently force the use of other configurations with lower rates. Arrival and departure rates may also be affected by traffic flow control measures, such as mile-in-trail restrictions caused by en route weather or airspace constraints.
- The benchmark rate decreases in IFR conditions to 136-144 flights per hour, for the most commonly used runway configuration in these conditions. Throughput may be less when ceiling and visibility are low, or when a less-favorable runway configuration is in use. Alternatively, other runway configurations may provide higher capacity.
- Note that these benchmark rates represent balanced operations. Greater throughput may be possible during arrival or departure peaks.
- Planning is underway for an extensive reconfiguration of ORD. The O'Hare Modernization Plan (OMP) envisions six parallel runways and triple simultaneous instrument approaches. These changes would significantly increase the benchmark rate at ORD. However, environmental studies are still underway, and the FAA has not issued a Record of Decision (ROD) for the new runways. The proposed new runways were not included in OEP v5.0. Therefore, the effect of the OMP has not been included in this analysis.
- Planned technological improvements at ORD include CEFR, which could allow suitably equipped aircraft to achieve visual separations in Marginal conditions. However, CEFR is not expected to have a significant effect on the benchmark rates at ORD, since radar separations are typically used even in Optimum conditions.
- Another planned improvement at ORD is revised procedures for operations on intersecting runways. However, these revised procedures were not considered in determining the benchmarks, because insufficient information on the procedures was available to determine whether they would apply to the configurations modeled, or what the effect would be.
- In the following charts, please note that some hourly traffic points fall outside the calculated capacity curves at ORD. There are many possible reasons why this may occur without affecting operational safety. Efficient aircraft sequencing or above-average pilot and controller performance can contribute to higher throughputs. Also, actual weather conditions during the hour may have been better than the hourly readings in the database, allowing more efficient ATC procedures than were modeled.

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the airport or for the individual programs.

The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

CHICAGO – Chicago O'Hare International Airport (ORD)

Weather	*Scenario*	*Configuration*	*Procedures*	*Benchmark Rate (per hour)*
Optimum Rate	**Today**	Arrivals on Runways 9L, 9R, 4R Departures on 32L, 32R, 4L, 9L *Frequency of Use: 35% in Optimum conditions*	Instrument approaches, radar separation	**190-200**
Ceiling and visibility above minima for visual approaches (1900 ft ceiling and 3 mi visibility)	**New Runway**	N/A		**N/A**
Occurrence: 84%	**Planned improvements (2013)**	Same		**190**
Marginal Rate	**Today**	Arrivals on Runways 9L, 9R, 4R Departures on 32L, 32R, 4L, 9L *Frequency of Use: 36% in Marginal conditions*	Instrument approaches, radar separation	**190-200**
Below visual approach minima but better than instrument conditions	**New Runway**	N/A		**N/A**
Occurrence: 7%	**Planned improvements (2013)**	Same		**190**
IFR Rate	**Today**	Arrivals on Runways 9L, 9R Departures on 32L, 32R, 4L, 9L *Frequency of Use: 31% in IFR conditions*	Instrument approaches, radar separation	**136-144**
Instrument conditions (ceiling < 1000 ft or visibility < 3.0 miles)	**New Runway**	N/A		**N/A**
Occurrence: 9%	**Planned improvements (2013)**	Same		**136**

NOTE: Data on frequency of occurrence of weather and runway configuration usage is based on FAA ASPM data for January 2000 to July 2002 (excluding 11-14 September 2001), 7 AM to 10 PM local time.

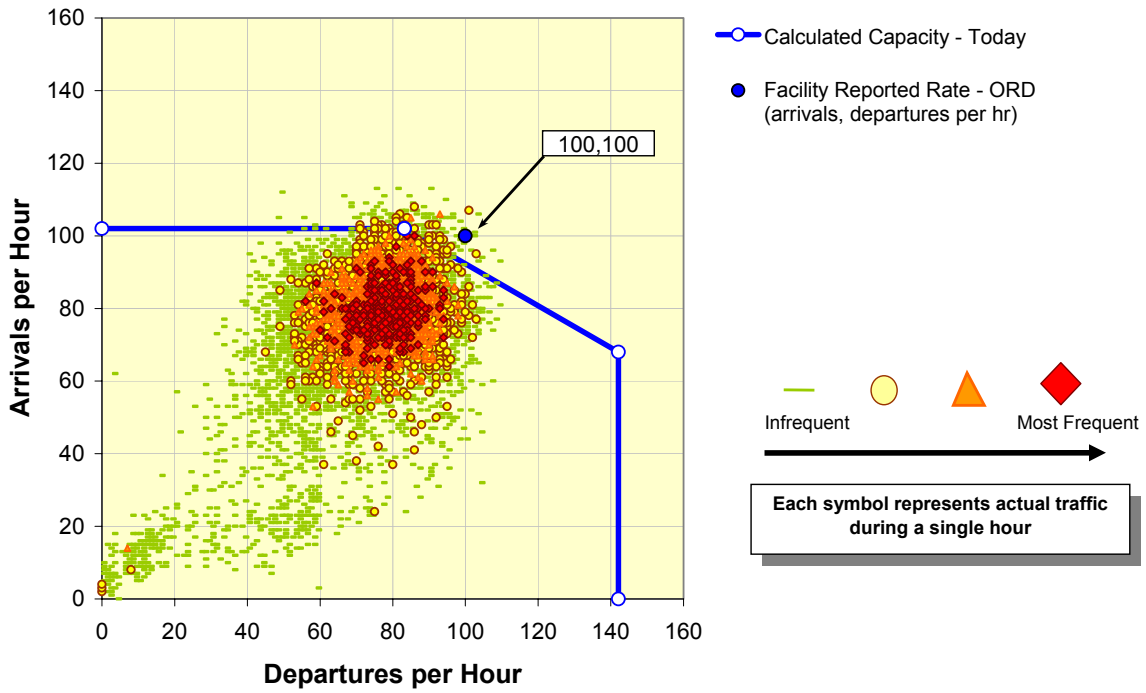
Planned Improvements at ORD include:

- CEFR, for visual approaches in Marginal conditions.
- Improved intersecting runway procedures.

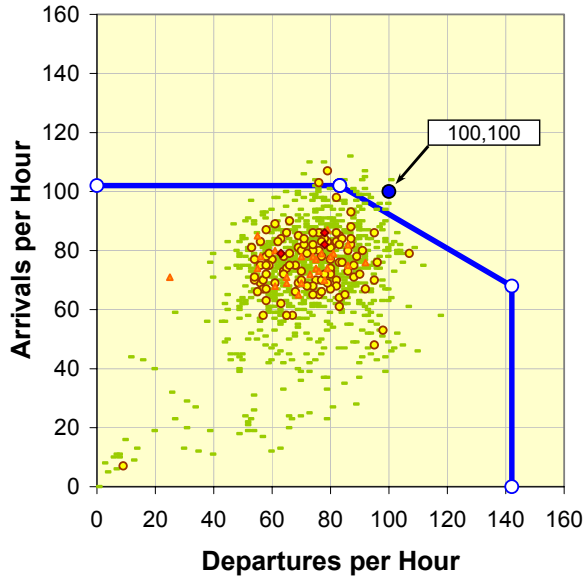
Additional information on these improvements may be found in the Introduction and Overview of this report, under "Assumptions."

Calculated Capacity (Today) and Actual Throughput

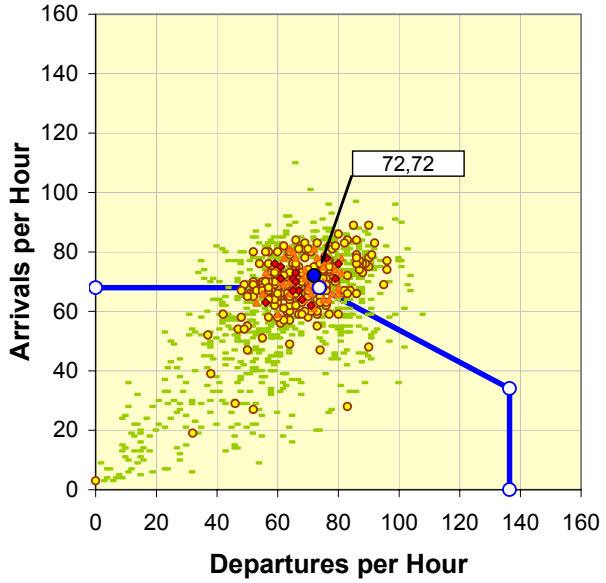
Optimum Rate



Marginal Rate



IFR Rate



Hourly traffic data was obtained from the FAA ASPM database for January 2000 to July 2002 (excluding 11-14 September 2001), 7 AM to 10 PM local time. Facility reported rates were reviewed by ATC personnel at ORD.

RICHARD M. DALEY
MAYOR

CHICAGO O'HARE INTERNATIONAL AIRPORT
O'HARE MODERNIZATION PROGRAM

Appendix D
Supplemental Information

Request for Letter of Intent to provide a

Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

Appendix D: Supplemental Information

Supplemental information is presented to demonstrate (1) the economic justification for the overall OMP airfield program, and (2) that the benefits provided by the airfield projects alone outweigh the costs associated with both airfield and non-airfield elements of the entire Airport Master Plan.

It is important to recognize that the methodology used to quantify the program delay reduction benefits considered the benefits that would materialize under the constrained forecast for the proposed plan to avoid the need to assess the hard-to-quantify value of increased passenger and aircraft activity. Because the benefits analysis already considers the constrained forecast, there is limited potential for non-airfield facilities (terminals, gates, roadways, etc.) to constrain the benefits further. As such, these sensitivity analyses assume that non-airfield facilities are built that may not be needed to accommodate demand.

It is also important to recognize that many of the non-airfield elements of the OMP and Master Plan will produce additional benefits that are not quantified under this analysis. The quantification of these benefits was not necessary to produce a positive BCA result, but may be undertaken in the future to further demonstrate the overall benefits of the plan.

Each of the supplemental analyses are described below, supporting documentation is provided in **Appendix E,** and **Table D-1** summarizes the BCR and NPV for each supplemental analysis:

- *Master Plan Phase 1:* An analysis was conducted to consider the benefits and costs related to development of all OMP-Phase 1 elements as outlined in the EIS, including the airfield, West Satellite Concourse, and other facilities from the World Gateway Program. Only airfield operational travel time benefits are included in this analysis. Other benefits of Master Plan Phase 1 including improved terminal efficiency are not quantified or used in this analysis. These additional benefits would only increase the BCRs and NPVs.
- *OMP Total Airfield:* An analysis was conducted to consider the benefits and costs related to the development of all OMP Airfield Projects. In addition to the OMP-Phase 1 Airfield Projects, design and construction of the following runway projects and their associated enabling projects are included: Runway 9C-27C, Runway 9R extension, and Runway 10R-28L. The decommissioning of Runways 14L-32R and 14R-32L are also included.
- *Total Master Plan:* An analysis was conducted to consider all other OMP projects (airfield, terminal, and enabling) and all WGP projects, in addition to the OMP-Phase 1 Airfield Projects. The purpose of this supplemental analysis is to evaluate the ability of the benefits generated by the airfield projects to outweigh the overall costs of the Master Plan. Only airfield operational travel time benefits are included in this analysis; however, the unconstrained forecast of passenger activity was used to provide a surrogate measure of the costs incurred by the additional passengers that are unable to use the Airport under the Base Case. Under this methodology, each of these additional passengers would incur a benefit equal to the benefit of the passengers using the Airport, approximately $4 each. Other benefits of the Master Plan include improved ground circulation, parking, and terminal efficiency as well as others listed in **Table D-2** that are not quantified or used in this analysis. These additional benefits would only increase the BCRs and NPVs.

Table D-1

Benefit-Cost Ratios and Net Present Values (2001 dollars) – Supplemental Analyses
Aircraft Travel Time Benefits Only

Projects	Evaluation End Year	Present Value Benefits (billions)	Present Value Costs (billions)	Net Present Value [2] (billions)	Benefit-Cost Ratio
Master Plan Phase 1 [1]	2028	$4.1	$2.6	$1.5	1.56
OMP Total Airfield	2032	$5.7	$2.9	$2.9	2.01
Total Master Plan	2032	$6.4	$6.2	$0.2	1.04

[1] WGP costs converted from 1999 dollars to 2001 dollars using the Gross Domestic Product Price Inflator in accordance with the *BCA Guidance*.
[2] Totals may not add due to rounding.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

These supplemental analyses demonstrate that the overall OMP airfield program is economically justified, and that the delay benefits of the airfield program alone outweigh costs, even considering the additional costs associated with non-airfield elements of the program. In all cases, the BCR and NPV of the supplemental analyses exceed the FAA thresholds.

This analysis does not attempt to quantify or consider all benefits associated with the project (LOI Projects, Master Plan Phase 1, OMP Total Airfield, and Total Master Plan), but rather it illustrates that the aircraft travel time savings alone are sufficient to produce benefits that in all cases exceed project costs. Thus, the benefit-cost ratios and NPVs presented here are based on underestimated benefits and would be expected to be higher if a full accounting of project benefits is performed. Other benefits of the OMP, including improved terminal and gate efficiency, and ground transportation system operations are not considered at this time in this analysis. The specific project benefits, which have not been quantified, are shown in Table D-2.

Table D-2

Inventory of Benefits Quantified and Not Quantified in the BCA

Project Type	Typical Benefit	Benefits Quantified in BCA	Benefits Not Quantified in BCA
Airside Capacity	• Reduced aircraft, passenger, and cargo delay during normal airport operations	x	
	• Greater schedule predictability including (1) aircraft operator able to make more efficient use of equipment and personnel and (2) passenger able to take later flight and arrive at destination on time		x
	• Improved efficiency of traffic flows (reduced vectoring and taxiing distances)	x	
	• Airport's ability to accommodate faster, larger, and/or more efficient aircraft		x
	• Bringing pre-existing infrastructure into compliance with FAA safety and security standards		x

Project Type	Typical Benefit	Benefits Quantified in BCA	Benefits Not Quantified in BCA
	• Safety improvements		x
Airport Terminal Building Capacity	• Reduced aircraft, passenger, cargo, and meter/greeter delay (attributable to more gates and faster passenger transfers to connecting flights)		x
	• Improved passenger schedule predictability (ability to allow less time for potential delays at airport terminal building)		x
	• More efficient traffic flows (shortened pedestrian traffic distances)		x
	• Improved passenger comfort		x
	• Lower airport terminal building operating and maintenance costs		x
			x
Landside Access	• Reduced passenger, cargo, and airport and airline employee delay in getting to airport		x
	• Improved schedule predictability (ability to leave later for airport and arrive on time for check in)		x
	• Lower operating and maintenance costs		x
	• Improved safety		x

Source (Typical Benefits): FAA, *BCA Guidance*.
Source (Assessed Benefits): Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Appendix E
BCA Tables

Request for Letter of Intent to provide a

Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

RICHARD M. DALEY
MAYOR

CHICAGO O'HARE INTERNATIONAL AIRPORT
O'HARE MODERNIZATION PROGRAM

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Table E-1
Project Cost Cash Flow Schedule (in 2001 Dollars)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Project Analysis (millions of dollars)														
OMP-Phase 1 Airfield	$0.0	$49.5	$197.0	$505.1	$604.6	$535.4	$329.2	$316.1	$20.0	$0.0	$0.0	$0.0	$0.0	$2,557.0
Supplemental Analyses (millions of dollars)														
Master Plan Phase 1	$0.0	$49.5	$197.0	$516.0	$637.5	$811.8	$614.3	$597.2	$30.1	$25.8	$25.8	$25.8	$0.0	$3,530.8
OMP Total Airfield	0.0	49.5	197.0	505.1	604.6	622.0	425.3	401.3	189.0	398.9	363.8	343.7	20.0	4,120.2
Total Master Plan	0.0	49.5	197.0	554.0	675.9	1,157.0	1,026.3	1,236.6	980.4	1,544.4	1,113.3	811.1	20.0	9,365.4

OMP CASH FLOWS	OMP-Phase 1 Airfield	Master Plan Phase 1	OMP Total Airfield	Total Master Plan	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Program Wide Requirements																		
Program-wide Requirements	X	X	X	X	$0	$17,500,000	$21,607,000	$19,170,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$58,277,000
Preliminary Engineering	X	X	X	X	0	0	21,845,000	15,291,000	6,553,000	0	0	0	0	0	0	0	0	43,688,999
Wetlands mitigation	X	X	X	X	0	0	1,942,000	22,330,000	0	0	0	0	0	0	0	0	0	24,272,000
Noise Mitigation (OMP-Phase 1)	X	X	X	X	0	0	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	0	0	0	0	140,000,000
Noise Mitigation (OMP-Phase 2)			X	X	0	0	0	0	0	0	0	0	0	20,000,000	20,000,000	20,000,000	20,000,000	80,000,000
Land Acquisition	X	X	X	X	0	31,958,000	67,532,000	72,816,000	82,524,000	60,194,000	14,563,000	9,709,000	0	0	0	0	0	339,296,000
Land/Environmental Contingency			X	X	0	0	0	0	0	77,670,000	77,670,000	67,961,000	0	0	0	0	0	223,301,000
Subtotal - Program Wide Requirements					**$0**	**$49,458,000**	**$132,926,000**	**$149,607,000**	**$109,077,000**	**$157,864,000**	**$112,233,000**	**$97,670,000**	**$20,000,000**	**$20,000,000**	**$20,000,000**	**$20,000,000**	**$20,000,000**	**$908,834,999**
Airfield																		
Design of Runway 9L-27R	X	X	X	X	$0	$0	$23,301,000	$11,650,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$34,951,000
Construction of Runway 9L-27R	X	X	X	X	0	0	0	114,132,000	199,730,000	199,730,000	0	0	0	0	0	0	0	513,591,999
Decommission Runway 18-36			X	X	0	0	0	0	0	0	0	0	2,322,000	0	0	0	0	2,322,000
Design of Runway 9C-27C			X	X	0	0	0	0	0	8,930,000	11,907,000	5,953,000	2,977,000	0	0	0	0	29,767,001
Construction of Runway 9C-27C			X	X	0	0	0	0	0	0	0	0	122,877,000	245,754,000	184,316,000	60,075,000	0	613,022,000
Design of Runway 9R Extension			X	X	0	0	0	0	0	0	1,300,000	2,601,000	2,601,000	0	0	0	0	6,502,001
Construction of Runway 9R Extension			X	X	0	0	0	0	0	0	0	0	0	26,306,000	52,612,000	52,612,000	0	131,530,000
Design of Decommissioned Runway 14L-32R			X	X	0	0	0	0	0	0	0	0	0	0	58,000	0	0	58,000
Decommission Runway 14L-32R			X	X	0	0	0	0	0	0	0	0	0	0	0	1,364,000	0	1,364,000
Design of Runway 10L Extension	X	X	X	X	0	0	20,388,000	0	0	0	0	0	0	0	0	0	0	20,388,000
Construction of Runway 10L Extension	X	X	X	X	0	0	0	88,081,000	130,333,000	146,491,000	82,893,000	25,989,000	0	0	0	0	0	473,787,000
Design of Runway 10C-28C	X	X	X	X	0	0	20,389,000	20,388,000	0	0	0	0	0	0	0	0	0	40,777,000
Construction of Runway 10C-28C	X	X	X	X	0	0	0	121,251,000	165,469,000	109,034,000	211,763,000	260,445,000	0	0	0	0	0	867,962,000
Design of Runway 10R-28L			X	X	0	0	0	0	0	0	5,168,000	8,613,000	3,445,000	0	0	0	0	17,226,001
Construction of Runway 10R-28L			X	X	0	0	0	0	0	0	0	0	34,794,000	104,382,000	104,382,000	104,382,000	0	347,940,001
Design for Runway 14R/32L Decommissioning/Taxiway Conversion			X	X	0	0	0	0	0	0	0	0	0	2,421,000	2,421,000	0	0	4,842,000
Construction of Runway 14R/32L Decommissioning/Taxiway Conversion			X	X	0	0	0	0	0	0	0	0	0	0	0	105,315,000	0	105,315,000
Subtotal - Airfield					**$0**	**$0**	**$64,078,000**	**$355,502,000**	**$495,532,000**	**$464,185,000**	**$313,031,001**	**$303,601,000**	**$169,016,001**	**$378,863,000**	**$343,789,000**	**$323,748,001**	**$0**	**$3,211,345,003**
Western Terminal Complex																		
Design of Western Airside Concourse	X	X			$0	$0	$0	$9,722,000	$12,964,000	$9,722,000	$0	$0	$0	$0	$0	$0	$0	$32,408,000
Construction of Western Airside Concourse	X	X			0	0	0	0	0	167,645,000	217,017,000	162,762,000	0	0	0	0	0	547,423,999
Design of Energy Plant	X	X			0	0	0	1,159,000	2,704,000	0	0	0	0	0	0	0	0	3,863,000
Construction of Energy Plant	X	X			0	0	0	0	0	16,633,000	33,266,000	5,545,000	0	0	0	0	0	55,444,001
Design of Fuel Storage and Distribution Improvements	X	X			0	0	0	0	3,672,000	0	0	0	0	0	0	0	0	3,672,000
Construction of Fuel Storage and Distribution Improvements	X	X			0	0	0	0	0	17,249,000	22,998,000	17,249,000	0	0	0	0	0	57,496,001
Design of Western Terminal		X			0	0	0	0	0	0	16,283,000	21,711,000	21,711,000	0	0	0	0	59,705,001
Construction of Western Terminal		X			0	0	0	0	0	0	0	0	257,578,000	343,437,000	171,718,000	85,859,000	0	858,592,000
Design of Western Parking Facilities		X			0	0	0	0	0	0	0	0	3,428,000	3,428,000	0	0	0	6,856,000
Construction of Western Parking Facilities		X			0	0	0	0	0	0	0	0	0	0	40,504,000	60,755,000	0	101,259,001
Subtotal - Western Terminal Complex					**$0**	**$0**	**$0**	**$10,881,000**	**$19,340,000**	**$211,249,000**	**$289,564,000**	**$207,267,001**	**$282,717,000**	**$346,865,000**	**$212,222,001**	**$146,614,000**	**$0**	**$1,726,719,002**
On-Airport Circulation																		
Design of Peoplemover		X			$0	$0	$0	$8,410,000	$8,410,000	$0	$0	$0	$0	$0	$0	$0	$0	$16,820,000
Construction of Peoplemover		X			0	0	0	0	0	160,833,000	160,833,000	80,417,000	0	0	0	0	0	402,083,000
Design of Maintenance Facility		X			0	0	0	230,000	536,000	0	0	0	0	0	0	0	0	766,001
Construction of Maintenance Facility		X			0	0	0	0	0	9,883,000	2,471,000	0	0	0	0	0	0	12,354,001
Subtotal - On-Airport Circulation					**$0**	**$0**	**$0**	**$8,640,000**	**$8,946,000**	**$170,716,000**	**$163,304,000**	**$80,417,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$432,023,001**
Other Program Costs																		
Misc Operations Budget		X			$0	$0	$0	$0	$0	$0	$9,709,000	$0	$0	$0	$0	$9,709,000	$0	$19,418,000
Program Contingency		X			0	0	0	0	0	58,458,000	51,658,000	39,024,000	29,335,000	50,855,000	39,104,000	33,228,000	0	301,659,995
Subtotal - Other Program Costs [1]					**$0**	**$0**	**$0**	**$0**	**$0**	**$58,458,000**	**$61,367,000**	**$39,024,000**	**$29,335,000**	**$50,855,000**	**$39,104,000**	**$42,937,000**	**$0**	**$321,077,995**
OMP Totals					**$0**	**$49,458,000**	**$197,004,000**	**$524,630,000**	**$632,895,000**	**$1,062,472,001**	**$939,499,001**	**$727,979,001**	**$501,068,000**	**$796,583,000**	**$615,115,001**	**$533,299,002**	**$20,000,000**	**$6,600,000,000**

[1] Subtotal includes approximately $2,000 adjustment for rounding and other purposes.

Source: O'Hare Partners, based on cost estimate analyses by TOK, LLC, and AOR.

Table E-1
Project Cost Cash Flow Schedule (in 2001 Dollars)

WGP CASH FLOWS	OMP-Phase 1 Airfield	Master Plan Phase 1	OMP Total Airfield	Total Master Plan	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
WGP Phase 1																		
Taxiway A/B Relocation		X			$0	$0	$0	$0	$0	$0	$3,127,478	$14,790,148	$0	$0	$0	$0	$0	$17,917,626
T1/T2 Expansion		X			0	0	0	0	690,346	6,505,992	0	0	0	0	0	0	0	7,196,338
Concourse K - Allowance		X			0	0	0	0	0	7,028,981	7,028,981	56,221,391	0	0	0	0	0	70,279,353
Terminal 2 - Interior Upgrade		X			0	0	0	0	12,896,926	51,598,162	0	0	0	0	0	0	0	64,495,087
Taxiway November - Facility Relocations		X			0	0	0	0	0	0	1,600,348	22,499,016	0	0	0	0	0	24,099,364
Taxiway M		X			0	0	0	0	0	0	0	0	0	25,801,173	25,801,173	25,801,173	0	77,403,519
Taxiway November - New		X			0	0	0	0	0	0	0	2,008,280	10,146,000	0	0	0	0	12,154,280
Subtotal - WGP Phase 1					**$0**	**$0**	**$0**	**$0**	**$13,587,272**	**$65,133,135**	**$11,756,808**	**$95,518,835**	**$10,146,000**	**$25,801,173**	**$25,801,173**	**$25,801,173**	**$0**	**$273,545,568**
WGP																		
Terminal 6 Apron - Support Facility Relocations				X	$0	$0	$0	$0	$0	$0	$6,411,853	$17,405,097	$0	$0	$0	$0	$0	$23,816,950
Terminal 6 Apron - Utility Relocations				X	0	0	0	0	0	0	826,324	6,192,198	0	0	0	0	0	7,018,522
Terminal 6 - Utility Relocations				X	0	0	0	0	0	0	12,164,740	90,362,157	0	0	0	0	0	102,526,897
Terminal 2 - New Concourse - FIS Facilities				X	0	0	0	27,432,901	27,432,901	27,432,901	0	0	0	0	0	0	0	82,298,702
Terminal 4 Apron - Support Facility Relocations				X	0	0	0	0	0	0	5,669,208	30,678,575	0	0	0	0	0	36,347,783
Terminal 4 - Facility Relocations				X	0	0	0	0	0	0	16,139,462	87,548,472	0	0	0	0	0	103,687,934
Terminal 4 - Drainage Control				X	0	0	0	0	0	0	0	10,460	0	0	0	0	0	10,460
WGP - Airport Wide Off-Site spoil				X	0	0	0	1,972,717	1,972,717	1,972,717	1,972,717	1,972,717	1,972,717	1,972,717	1,972,717	1,972,717	0	17,754,454
Terminal 6 Apron - New [beyond 40 feet]				X	0	0	0	0	0	0	0	1,746,786	15,051,643	15,051,643	0	0	0	31,850,072
Terminal 6 Apron - Grading				X	0	0	0	0	0	0	721,726	1,035,520	983,221	324,254	324,254	0	0	3,388,973
Terminal 6 Apron - Additional Relocations/Demolitions				X	0	0	0	0	0	0	2,886,903	4,142,078	3,953,802	1,443,452	1,317,934	0	0	13,744,169
Terminal 6 Northern Extension - New Apron/Grading				X	0	0	0	0	0	0	0	0	0	627,588	18,011,765	10,198,299	0	28,837,651
Terminal 6 - New Apron [within 40 feet]				X	0	0	0	0	0	0	0	125,518	449,771	1,694,487	0	0	0	2,269,775
Terminal 6 - At-Grade Roadway				X	0	0	0	0	0	0	658,967	491,610	5,962,082	5,962,082	5,135,759	0	0	18,210,501
Terminal 6 - ATS Facilities				X	0	0	0	0	0	0	3,200,697	3,200,697	24,831,550	65,426,009	22,164,303	0	0	118,823,255
Terminal 6 - Elevated Roadway				X	0	0	0	0	0	0	4,257,136	3,190,237	38,659,397	38,659,397	33,283,063	0	0	118,049,231
Terminal 6 - Parking Structure				X	0	0	0	0	0	0	2,499,891	3,336,674	37,017,210	54,903,457	0	0	0	97,757,231
Terminal 6 - Pedestrian Bridge to Parking (2)				X	0	0	0	0	0	0	198,736	261,495	5,826,105	8,294,616	62,759	0	0	14,643,711
Terminal 6 - T5 Surface Lot Reconfiguration				X	0	0	0	0	0	0	177,816	240,575	2,677,707	3,974,722	0	0	0	7,070,820
Terminal 6 - Temporary Roadway				X	0	0	0	0	0	0	20,920	20,920	198,736	198,736	167,357	0	0	606,668
Terminal 6 - Utilities				X	0	0	0	0	0	0	439,311	3,399,433	4,654,608	4,508,171	3,033,340	0	0	16,034,864
Terminal 6 - Terminal 5 Concourse Reconfiguration				X	0	0	0	0	0	0	0	5,763,346	8,650,249	11,526,693	5,763,346	0	0	31,703,634
Terminal 6 - Special Systems				X	0	0	0	0	0	0	1,391,153	10,689,909	14,643,711	14,183,480	9,528,872	0	0	50,437,125
Terminal 6 - SFRB Defeasance - Northwest				X	0	0	0	0	0	0	0	0	0	7,959,903	0	0	0	7,959,903
Terminal 6 - SFRB Defeasance - Delta				X	0	0	0	0	0	0	0	0	0	29,182,824	0	0	0	29,182,824
Terminal 6 - New Terminal and Concourse Building				X	0	0	0	0	0	0	12,122,901	93,269,980	127,776,839	123,739,358	83,165,819	0	0	440,074,896
Terminal 6 - Loading Bridges and Equipment				X	0	0	0	0	0	0	334,713	2,541,730	3,483,111	3,378,513	2,269,775	0	0	12,007,843
Terminal 6 - Landscaping				X	0	0	0	0	0	0	0	0	313,794	585,748	554,369	0	0	1,453,911
Terminal 6 - Baggage Systems				X	0	0	0	0	0	0	993,680	7,635,649	10,449,334	10,125,080	6,798,866	0	0	36,002,610
Terminal 6 - Apron Demolition				X	0	0	0	0	0	0	0	428,852	2,165,177	0	0	0	0	2,594,029
Terminal 6 Northern Extension - Baggage Systems				X	0	0	0	0	0	0	0	0	0	167,357	2,248,856	7,217,258	0	9,633,470
Terminal 6 Northern Extension - Loading Bridges and Equipment				X	0	0	0	0	0	0	0	0	0	52,299	753,105	2,405,753	0	3,211,157
Terminal 6 Northern Extension - New Concourse				X	0	0	0	0	0	0	0	0	0	1,087,819	15,041,183	48,156,890	0	64,285,891
Terminal 6 Northern Extension - Special Systems				X	0	0	0	0	0	0	0	0	0	135,977	1,872,303	6,003,922	0	8,012,202
Terminal 6 - Hydrant Fueling and Fuel Pipeline Extension				X	0	0	0	0	0	0	355,633	3,033,340	3,033,340	3,033,340	0	0	0	6,422,313
Terminal 6 - Thermal System Tunnel				X	0	0	0	0	0	0	1,851,383	14,235,779	19,507,515	18,890,387	12,698,189	0	0	67,183,254
Terminal 6 - Realign. Hydrant Fueling gates M20& M21				X	0	0	0	0	0	0	0	115,058	313,794	1,140,118	0	0	0	1,568,969
Terminal 6 Northern Extension- Hydrant Fueling/Fuel Pipeline Extension				X	0	0	0	0	0	0	0	125,518	0	41,839	41,839	2,269,775	0	2,478,971
Terminal 2 Apron - New				X	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terminal 2 - Utilities and FAA Tower Controls				X	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terminal 2 - Special Systems				X	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terminal 2 - Rebuild Terminal 2 Airside				X	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terminal 2 - New Concourse (Domestic)				X	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terminal 2 - Loading Bridges and Equipment				X	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terminal 2 - Baggage Systems				X	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terminal 2 - Building Demolition				X	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terminal 2 - Hydrant Fueling and Fuel Pipeline Extension				X	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terminal 4 Apron - New				X	0	0	0	0	0	0	0	0	0	0	10,867,726	27,603,395	0	38,471,121
Terminal 4 Apron - Grading				X	0	0	0	0	0	0	0	261,495	5,229,897	4,801,045	0	0	0	10,292,437
Terminal 4 - At-Grade Roadway				X	0	0	0	0	0	0	0	0	62,759	753,105	1,171,497	481,151	0	2,468,511
Terminal 4 - ATS Facilities				X	0	0	0	0	0	0	0	10,460	1,558,509	7,049,901	31,797,773	15,898,886	0	56,315,529
Terminal 4 - Elevated Roadway				X	0	0	0	0	0	0	0	10,460	554,369	5,198,517	8,106,340	3,347,134	0	17,216,820
Terminal 4 - Elevated Walkway				X	0	0	0	0	0	0	0	0	0	1,098,278	4,403,573	0	0	5,501,851
Terminal 4 - Utilities				X	0	0	0	0	0	0	0	3,859,664	12,886,466	9,978,643	0	0	0	26,724,773
Terminal 4 - Underground Utility Relocation				X	0	0	0	0	0	0	0	5,522,771	18,409,237	14,246,239	0	0	0	38,178,247
Terminal 4 - Underground Baggage Room Expansion				X	0	0	0	0	0	0	0	1,056,439	7,635,649	22,906,948	17,384,177	11,589,451	0	60,572,665
Terminal 4 - Temporary Roadway				X	0	0	0	0	0	0	0	0	31,379	345,173	543,909	230,115	0	1,150,577
Terminal 4 - Special Systems				X	0	0	0	0	0	0	0	1,025,060	7,499,672	22,582,694	17,133,142	11,422,095	0	59,662,663
Terminal 4 - New Terminal FIS Facilities				X	0	0	0	0	0	0	0	1,380,693	10,135,540	30,500,758	23,137,063	15,428,196	0	80,582,250
Terminal 4 - New Terminal (Domestic)				X	0	0	0	0	0	0	0	6,809,326	49,872,296	150,160,797	113,896,693	75,927,642	0	396,666,753
Terminal 4 - Loading Bridges and Equipment				X	0	0	0	0	0	0	0	261,495	1,935,062	5,826,105	4,424,493	2,949,662	0	15,396,816
Terminal 4 - Landscaping				X	0	0	0	0	0	0	0	0	0	0	0	31,379	0	31,379
Terminal 4 - Demolition and Site Preparation				X	0	0	0	0	0	0	94,138	1,265,635	6,066,680	0	0	0	0	7,426,453
Terminal 4 - Concourse L Demolition				X	0	0	0	0	0	0	0	125,518	2,227,936	0	0	0	0	2,353,454
Terminal 4 - Baggage Systems				X	0	0	0	0	0	0	0	794,944	5,805,185	17,488,775	13,263,018	8,838,526	0	46,190,449
Terminal 4 - Hydrant Fueling and Fuel Pipeline Extension				X	0	0	0	0	0	0	0	209,196	6,683,808	763,565	0	0	0	7,656,569
Subtotal - Other WGP					**$0**	**$0**	**$0**	**$29,405,618**	**$29,405,618**	**$29,405,618**	**$75,034,375**	**$413,115,824**	**$469,169,858**	**$721,972,610**	**$472,339,176**	**$251,972,244**	**$0**	**$2,491,820,941**
WGP Total					**$0**	**$0**	**$0**	**$29,405,618**	**$42,992,890**	**$94,538,753**	**$86,791,183**	**$508,634,659**	**$479,315,858**	**$747,773,783**	**$498,140,349**	**$277,773,417**	**$0**	**$2,765,366,509**

WGP Cash Flows Source: Landrum & Brown; Project components included in OMP Master Plan selected by Ricondo & Associates, Inc.

Table E-2

Incremental Operating & Maintenance Expense Impacts (millions of 2001 dollars) [1]

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Base Case Phase 1 Scenario																															
Phase 1 OMP Airfield	$0.0	$0.0	$0.0	$0.0	$0.0	$4.8	$4.8	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$0.0	$0.0	$0.0	$0.0
New Phase 1 Scenarios																															
Master Plan Phase 1	$0.0	$0.0	$0.0	$0.0	$0.0	$5.4	$5.4	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$0.0	$0.0	$0.0	$0.0
OMP Total Airfield	0.0	0.0	0.0	0.0	0.0	4.8	4.8	15.6	15.6	15.6	15.6	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7
Total Master Plan	0.0	0.0	0.0	0.0	0.0	4.2	4.2	27.8	27.8	27.8	27.8	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5

	OMP-Phase 1 Airfield	Master Plan Phase 1	OMP Total Airfield	Total Master Plan	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
OMP-Phase 1 Airfield Incremental O&M Impact by Proposed Runway																																			
Runway 9L-27R	X	X	X	X	$0.0	$0.0	$0.0	$0.0	$0.0	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8
Runway 10L-28R Extension	X	X	X	X	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Runway 10C-28C	X	X	X	X	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1
Runway 9C-27C			X	X	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4
Runway 9R-27L Extension			X	X	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Runway 10R-28L			X	X	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Total Phase 1 Airfield					**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$4.8**	**$4.8**	**$15.6**	**$15.6**	**$15.6**	**$15.6**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**
OMP-Phase 1 Terminal incremental O&M Impact																																			
Satellite Concourse		X		X	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7
WGP-Phase 1 Projects Incremental O&M Impact																																			
Concourse K		X		X	$0.0	$0.0	$0.0	$0.0	$0.0	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)
Terminal 2 FIS Facility [2]		X		X	0.0	0.0	0.0	0.0	0.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Total OMP & WGP-Phase 1 DBO Projects					**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.6**	**$0.6**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**
WGP Terminal Incremental O&M Impact																																			
Core Terminal Area																																			
Terminal 1			X		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Terminal 2			X		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Terminal 3			X		0.0	0.0	0.0	0.0	0.0	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)
Terminal 4			X		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
East Terminal Area																																			
Terminal 5			X		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8
Terminal 6			X		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2
Satellite Concourse (T7)			X		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1
West Terminal (T7)			X		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Total WGP Terminal O&M Impact					**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**($1.2)**	**($1.2)**	**$6.8**	**$6.8**	**$6.8**	**$6.8**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**	**$39.4**
Total Incremental O&M Expense Impact					**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$4.2**	**$4.2**	**$27.8**	**$27.8**	**$27.8**	**$27.8**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**	**$76.5**

[1] Totals may not add due to rounding.

[2] Source: Table 2-2 Terminal Functional Area Summary published in the Final Environmental Assessment for the World Gateway Program dated February 8, 2001.

Table E-3

Unimpeded & Average Travel Times

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Phase 1 Scenario																														
OMP-Phase 1 Airfield	137.7	139.8	141.9	144.0	143.6	145.9	146.2	148.1	149.9	151.7	153.6	154.2	154.8	155.4	156.0	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	0.0	0.0	0.0	0.0
New Phase 1 Scenarios																														
Master Plan Phase 1	137.7	139.8	141.9	144.0	143.6	145.9	146.2	148.1	149.9	151.7	153.6	154.2	154.8	155.4	156.0	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	0.0	0.0	0.0	0.0
OMP Total Airfield	137.7	139.8	141.9	144.0	143.6	145.9	146.2	148.1	149.9	151.7	151.2	151.9	152.5	153.1	153.7	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4
Total Master Plan	137.7	139.8	141.9	144.0	143.6	145.9	146.2	148.1	149.9	151.7	151.2	151.9	152.5	153.1	153.7	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4
BASE CASE:	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Total Incremental Aircraft Travel Time Cost																														
Estimated Passenger Airline and All-Cargo Operations (thousands)	900.4	907.0	913.6	920.2	926.8	926.1	925.3	921.3	917.3	913.2	909.2	912.1	915.0	917.9	920.8	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7
Average Travel Time per Operation (with delay)																														
Arrivals					156.3		160.4				169.1					172.4														
Departures					135.8		141.0				148.7					151.5														
Average per Operation	137.7	139.8	141.9	144.0	146.1	148.4	150.7	152.8	154.8	156.9	158.9	159.5	160.1	160.8	161.4	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0
OMP-PHASE 1 TRAVEL TIMES:	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Average Travel Time per Operation (with delay)																														
Arrivals					150.8		151.9				159.5																			
Departures					136.5		140.5				147.7																			
Average Travel Time In Operational Phase	137.7	139.8	141.9	144.0	143.6	145.9	146.2	148.1	149.9	151.7	153.6	154.2	154.8	155.4	156.0	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6				
Travel Time Savings	0.0	0.0	0.0	0.0	2.5	2.5	4.5	4.7	4.9	5.1	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4				
FULL BUILD TRAVEL TIMES:	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Average Travel Time per Operation (with delay)																														
Average Arrivals					150.8		151.9				156.4					159.5														
Average Departures					136.5		140.5				146.1					149.2														
Average Travel Time In Operational Phase	137.7	139.8	141.9	144.0	143.6	145.9	146.2	148.1	149.9	151.7	151.2	151.9	152.5	153.1	153.7	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4
Travel Time Savings	0.0	0.0	0.0	0.0	2.5	2.5	4.5	4.7	4.9	5.1	7.7	7.7	7.7	7.7	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6

Table E-4

Project Benefits - Aircraft Travel Time Benefits Only

AIRCRAFT DELAY PER OPERATION FOR PHASE 1			2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Base Case: Constrained No Action:																																
Total Aircraft Operations (thousands)			928.7	940.0	951.3	962.7	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0
Estimated Passenger Airline and All-Cargo Operations (thousands)			900.4	907.0	913.6	920.2	926.8	926.1	925.3	921.3	917.3	913.2	909.2	912.1	915.0	917.9	920.8	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7
Travel Time (minutes)	[A]		0.0	0.0	0.0	0.0	146.1	148.4	150.7	152.8	154.8	156.9	158.9	159.5	160.1	160.8	161.4	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	0.0	0.0	0.0	0.0
OMP-Phase 1																																
Total Aircraft Operations (thousands)			928.7	940.0	951.3	962.7	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0
Estimated Passenger Airline and All-Cargo Operations (thousands)	[B]		900.4	907.0	913.6	920.2	926.8	926.1	925.3	921.3	917.3	913.2	909.2	912.1	915.0	917.9	920.8	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7
Travel Time (minutes)	[C]		0.0	0.0	0.0	0.0	143.6	145.9	146.2	148.1	149.9	151.7	153.6	154.2	154.8	155.4	156.0	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	156.6	0.0	0.0	0.0	0.0
Difference in Delay per Operation between scenarios (minutes)	[D]	[A-C]	0.0	0.0	0.0	0.0	2.5	2.5	4.5	4.7	4.9	5.1	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	0.0	0.0	0.0	0.0
AIRCRAFT DELAY BENEFITS																																
Total Incremental Aircraft Travel Time Minutes (millions)	[E]	[D*B]	0.00	0.00	0.00	0.00	2.27	2.27	4.15	4.34	4.52	4.70	4.88	4.89	4.91	4.92	4.94	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	0.00	0.00	0.00	0.00
Average Aircraft Operating Savings per Minute	[F]		$0.00	$0.00	$0.00	$0.00	$29.90	$29.90	$29.89	$29.76	$29.63	$29.49	$29.36	$29.67	$29.97	$30.28	$30.58	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88
Total Aircraft Savings (millions)		[E*F]	$0.0	$0.0	$0.0	$0.0	$68.0	$67.9	$124.2	$129.1	$133.9	$138.6	$143.2	$145.1	$147.1	$149.1	$151.0	$153.0	$153.0	$153.0	$153.0	$153.0	$153.0	$153.0	$153.0	$153.0	$153.0	$153.0	$0.0	$0.0	$0.0	$0.0
PASSENGER DELAY BENEFITS																																
Total Passengers (millions)	[G]		0.0	0.0	0.0	0.0	72.4	73.9	75.4	77.0	78.5	80.2	81.8	83.4	84.9	86.6	88.2	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	0.0	0.0	0.0	0.0
Total Incremental Passenger Travel Time Minutes (millions)	[H]	[G*D]	0.0	0.0	0.0	0.0	177.7	181.3	338.6	362.3	386.9	412.4	438.8	447.1	455.6	464.3	473.3	482.4	482.4	482.4	482.4	482.4	482.4	482.4	482.4	482.4	482.4	482.4	0.0	0.0	0.0	0.0
Passenger Delay Savings per Minute [1]	[I]		$0.00	$0.00	$0.00	$0.00	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54
Total Passenger Delay Savings (millions)	[J]	[H*I]	$0.0	$0.0	$0.0	$0.0	$95.1	$97.0	$181.2	$193.8	$207.0	$220.6	$234.8	$239.2	$243.7	$248.4	$253.2	$258.1	$258.1	$258.1	$258.1	$258.1	$258.1	$258.1	$258.1	$258.1	$258.1	$258.1	$0.0	$0.0	$0.0	$0.0
Total Passenger Delay Downstream Savings (millions) [2]		[J*80%]	$0.0	$0.0	$0.0	$0.0	$76.1	$77.6	$144.9	$155.1	$165.6	$176.5	$187.8	$191.4	$195.0	$198.7	$202.6	$206.5	$206.5	$206.5	$206.5	$206.5	$206.5	$206.5	$206.5	$206.5	$206.5	$206.5	$0.0	$0.0	$0.0	$0.0
PROJECT BENEFITS																																
Total Incremental Aircraft Delay Savings (millions)			$0.0	$0.0	$0.0	$0.0	$68.0	$67.9	$124.2	$129.1	$133.9	$138.6	$143.2	$145.1	$147.1	$149.1	$151.0	$153.0	$153.0	$153.0	$153.0	$153.0	$153.0	$153.0	$153.0	$153.0	$153.0	$153.0	$0.0	$0.0	$0.0	$0.0
Total Passenger Delay Savings (millions)			0.0	0.0	0.0	0.0	95.1	97.0	181.2	193.8	207.0	220.6	234.8	239.2	243.7	248.4	253.2	258.1	258.1	258.1	258.1	258.1	258.1	258.1	258.1	258.1	258.1	258.1	0.0	0.0	0.0	0.0
Total Passenger Delay Downstream Savings (millions)			0.0	0.0	0.0	0.0	76.1	77.6	144.9	155.1	165.6	176.5	187.8	191.4	195.0	198.7	202.6	206.5	206.5	206.5	206.5	206.5	206.5	206.5	206.5	206.5	206.5	206.5	0.0	0.0	0.0	0.0
Total Savings (millions)			$0.0	$0.0	$0.0	$0.0	$239.1	$242.5	$450.3	$478.0	$506.5	$535.7	$565.8	$575.7	$585.8	$596.2	$606.8	$617.6	$617.6	$617.6	$617.6	$617.6	$617.6	$617.6	$617.6	$617.6	$617.6	$617.6	$0.0	$0.0	$0.0	$0.0

Table E-4

Project Benefits - Aircraft Travel Time Benefits Only

AIRCRAFT DELAY PER OPERATION FOR FULL AIRFIELD			2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Base Case: Constrained No Action:																																
Total Aircraft Operations (thousands)			922.8	928.7	940.0	951.3	962.7	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0
Estimated Passenger Airline and All-Cargo Operations (thousands)			892.5	900.4	907.0	913.6	920.2	926.8	926.1	925.3	921.3	917.3	913.2	909.2	912.1	915.0	917.9	920.8	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7
Travel Time (minutes)	[A]		137.7	139.8	141.9	144.0	146.1	148.4	150.7	152.8	154.8	156.9	158.9	159.5	160.1	160.8	161.4	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0
OMP-Phase 1																																
Total Aircraft Operations (thousands)			922.8	928.7	940.0	951.3	962.7	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0
Estimated Passenger Airline and All-Cargo Operations (thousands)	[B]		892.5	900.4	907.0	913.6	920.2	926.8	926.1	925.3	921.3	917.3	913.2	909.2	912.1	915.0	917.9	920.8	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7
Travel Time (minutes)	[C]		137.7	139.8	141.9	144.0	143.6	145.9	146.2	148.1	149.9	151.7	151.2	151.9	152.5	153.1	153.7	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4
Difference in Delay per Operation between scenarios (minutes)	[D]	[A-C]	0.0	0.0	0.0	0.0	2.5	2.5	4.5	4.7	4.9	5.1	7.7	7.7	7.7	7.7	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
AIRCRAFT DELAY BENEFITS																																
Total Incremental Aircraft Travel Time Minutes (millions)	[E]	[D*B]	0.00	0.00	0.00	0.00	2.26	2.27	4.16	4.36	4.54	4.72	7.01	6.97	6.99	7.00	7.02	7.03	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	0.00	0.00	0.00	0.00
Average Aircraft Operating Savings per Minute	[F]		$0.00	$0.00	$0.00	$0.00	$29.90	$29.90	$29.89	$29.76	$29.63	$29.49	$29.36	$29.67	$29.97	$30.28	$30.58	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88
Total Aircraft Savings (millions)		[E*F]	$0.0	$0.0	$0.0	$0.0	$67.5	$68.0	$124.3	$129.6	$134.5	$139.2	$205.9	$206.9	$209.4	$212.0	$214.5	$217.1	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$0.0	$0.0	$0.0	$0.0
PASSENGER DELAY BENEFITS																																
Total Passengers (millions)	[G]		0.0	0.0	0.0	0.0	72.4	73.9	75.4	77.0	78.5	80.2	81.8	83.4	84.9	86.6	88.2	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9
Total Incremental Passenger Travel Time Minutes (millions)	[H]	[G*D]	0.0	0.0	0.0	0.0	177.7	181.3	338.6	362.3	386.9	412.4	628.3	639.4	650.8	662.4	674.3	686.6	686.6	686.6	686.6	686.6	686.6	686.6	686.6	686.6	686.6	686.6	686.6	686.6	686.6	686.6
Passenger Delay Savings per Minute [1]	[I]		$0.00	$0.00	$0.00	$0.00	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54
Total Passenger Delay Savings (millions)	[J]	[H*I]	$0.0	$0.0	$0.0	$0.0	$95.1	$97.0	$181.2	$193.8	$207.0	$220.6	$336.2	$342.1	$348.2	$354.4	$360.8	$367.3	$367.3	$367.3	$367.3	$367.3	$367.3	$367.3	$367.3	$367.3	$367.3	$367.3	$367.3	$367.3	$367.3	$367.3
Total Passenger Delay Downstream Savings (millions) [2]		[J*80%]	$0.0	$0.0	$0.0	$0.0	$76.1	$77.6	$144.9	$155.1	$165.6	$176.5	$268.9	$273.7	$278.5	$283.5	$288.6	$293.9	$293.9	$293.9	$293.9	$293.9	$293.9	$293.9	$293.9	$293.9	$293.9	$293.9	$293.9	$293.9	$293.9	$293.9
PROJECT BENEFITS																																
Total Incremental Aircraft Delay Savings (millions)			$0.0	$0.0	$0.0	$0.0	$67.5	$68.0	$124.3	$129.6	$134.5	$139.2	$205.9	$206.9	$209.4	$212.0	$214.5	$217.1	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$0.0	$0.0	$0.0	$0.0
Total Passenger Delay Savings (millions)			0.0	0.0	0.0	0.0	95.1	97.0	181.2	193.8	207.0	220.6	336.2	342.1	348.2	354.4	360.8	367.3	367.3	367.3	367.3	367.3	367.3	367.3	367.3	367.3	367.3	367.3	367.3	367.3	367.3	367.3
Total Passenger Delay Downstream Savings (millions)			0.0	0.0	0.0	0.0	76.1	77.6	144.9	155.1	165.6	176.5	268.9	273.7	278.5	283.5	288.6	293.9	293.9	293.9	293.9	293.9	293.9	293.9	293.9	293.9	293.9	293.9	293.9	293.9	293.9	293.9
Total Savings (millions)			$0.0	$0.0	$0.0	$0.0	$238.6	$242.6	$450.4	$478.6	$507.0	$536.3	$811.0	$822.7	$836.1	$849.9	$863.9	$878.2	$878.9	$878.9	$878.9	$878.9	$878.9	$878.9	$878.9	$878.9	$878.9	$878.9	$661.2	$661.2	$661.2	$661.2

Table E-4

Project Benefits - Aircraft Travel Time Benefits Only

AIRCRAFT DELAY PER OPERATION FOR FULL BUILD OMP			2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Base Case: Constrained No Action:																																
Total Aircraft Operations (thousands)			928.7	940.0	951.3	962.7	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0
Estimated Passenger Airline and All-Cargo Operations (thousands)			900.4	907.0	913.6	920.2	926.8	926.1	925.3	921.3	917.3	913.2	909.2	912.1	915.0	917.9	920.8	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7
Travel Time (minutes)	[A]		137.7	139.8	141.9	144.0	146.1	148.4	150.7	152.8	154.8	156.9	158.9	159.5	160.1	160.8	161.4	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0
OMP																																
Total Aircraft Operations (thousands)			928.7	940.0	951.3	962.7	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0	974.0
Estimated Passenger Airline and All-Cargo Operations (thousands)	[B]		900.4	907.0	913.6	920.2	926.8	926.1	925.3	921.3	917.3	913.2	909.2	912.1	915.0	917.9	920.8	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7	923.7
Travel Time (minutes)	[C]		137.7	139.8	141.9	144.0	143.6	145.9	146.2	148.1	149.9	151.7	151.2	151.9	152.5	153.1	153.7	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4	154.4
Difference in Delay per Operation between scenarios (minutes)	[D]	[A-C]	0.0	0.0	0.0	0.0	2.5	2.5	4.5	4.7	4.9	5.1	7.7	7.7	7.7	7.7	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
AIRCRAFT DELAY BENEFITS																																
Total Incremental Aircraft Travel Time Minutes (millions)	[E]	[D*B]	0.00	0.00	0.00	0.00	2.27	2.27	4.15	4.34	4.52	4.70	6.98	7.00	7.01	7.02	7.04	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05
Average Aircraft Operating Savings per Minute	[F]		$0.00	$0.00	$0.00	$0.00	$29.90	$29.90	$29.89	$29.76	$29.63	$29.49	$29.36	$29.67	$29.97	$30.28	$30.58	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88	$30.88
Total Aircraft Savings (millions)		[E*F]	$0.0	$0.0	$0.0	$0.0	$68.0	$67.9	$124.2	$129.1	$133.9	$138.6	$205.0	$207.6	$210.1	$212.6	$215.2	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8
PASSENGER DELAY BENEFITS																																
Total Passengers (millions)	[G]		0.0	0.0	0.0	0.0	73.9	76.1	78.3	80.6	82.9	85.3	87.8	90.2	92.7	95.3	98.0	100.7	102.1	104.4	106.8	109.1	111.5	113.8	116.1	118.5	120.8	123.1	125.5	127.8	130.1	132.5
Total Incremental Passenger Travel Time Minutes (millions)	[H]	[G*D]	0.0	0.0	0.0	0.0	181.2	186.6	351.5	379.3	408.4	439.0	674.5	692.2	710.5	729.3	748.9	769.0	779.5	797.3	815.1	832.9	850.7	868.6	886.4	904.2	922.0	939.8	957.7	975.5	993.3	1,011.1
Passenger Delay Savings per Minute [1]	[I]		$0.00	$0.00	$0.00	$0.00	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54
Total Passenger Delay Savings (millions)	[J]	[H*I]	$0.0	$0.0	$0.0	$0.0	$97.0	$99.8	$188.0	$202.9	$218.5	$234.8	$360.8	$370.3	$380.1	$390.2	$400.6	$411.4	$417.0	$426.5	$436.1	$445.6	$455.1	$464.7	$474.2	$483.7	$493.3	$502.8	$512.3	$521.9	$531.4	$540.9
Total Passenger Delay Downstream Savings (millions) [2]		[J*80%]	$0.0	$0.0	$0.0	$0.0	$77.6	$79.9	$150.4	$162.3	$174.8	$187.9	$288.7	$296.3	$304.1	$312.2	$320.5	$329.1	$333.6	$341.2	$348.9	$356.5	$364.1	$371.7	$379.4	$387.0	$394.6	$402.2	$409.9	$417.5	$425.1	$432.8
PROJECT BENEFITS																																
Total Incremental Aircraft Delay Savings (millions)			$0.0	$0.0	$0.0	$0.0	$68.0	$67.9	$124.2	$129.1	$133.9	$138.6	$205.0	$207.6	$210.1	$212.6	$215.2	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8	$217.8
Total Passenger Delay Savings (millions)			0.0	0.0	0.0	0.0	97.0	99.8	188.0	202.9	218.5	234.8	360.8	370.3	380.1	390.2	400.6	411.4	417.0	426.5	436.1	445.6	455.1	464.7	474.2	483.7	493.3	502.8	512.3	521.9	531.4	540.9
Total Passenger Delay Downstream Savings (millions)			0.0	0.0	0.0	0.0	77.6	79.9	150.4	162.3	174.8	187.9	288.7	296.3	304.1	312.2	320.5	329.1	333.6	341.2	348.9	356.5	364.1	371.7	379.4	387.0	394.6	402.2	409.9	417.5	425.1	432.8
Total Savings (millions)			$0.0	$0.0	$0.0	$0.0	$242.5	$247.6	$462.7	$494.3	$527.2	$561.3	$854.5	$874.1	$894.3	$915.0	$936.3	$958.3	$968.4	$985.5	$1,002.7	$1,019.9	$1,037.0	$1,054.2	$1,071.3	$1,088.5	$1,105.7	$1,122.8	$1,140.0	$1,157.1	$1,174.3	$1,191.5

[1] Source: Derived from Economic Values for FAA Investment and Regulatory Decisions, A Guide. GRA, Inc. (as shown on page 1-2 of treatment of values of passenger time). Based on DOT policy.

[2] Passenger Delay Downstream Savings represents 80% of total Passenger delay savings as recommended in the report by the MIT Lincoln Laboratory, Analysis of Downstream Impacts of Air Traffic Delay, 1997.

Sources: Activity- Leigh Fisher Associates, FAA 2002 Terminal Area Forecast, and U.S. DOT data, May 2004. Travel & Delay Time- Ricondo & Associates, Inc.

Prepared by: Ricondo & Associates, Inc.

Table E-5

Benefit-Cost Ratio and Net Present Value Table - OMP-Phase 1 Airfield (millions of 2001 dollars)

	Benefits				Costs			Present Value						
Year	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
2002	0.0	0.0	0.0	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	0.0	0.0	16.0	(16.0)
2003	0.0	0.0	0.0	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	0.0	0.0	111.2	(111.2)
2004	0.0	0.0	0.0	0.0	505.1	0.0	505.1	1.2250	0.0	0.0	0.0	0.0	412.3	(412.3)
2005	0.0	0.0	0.0	0.0	604.6	0.0	604.6	1.3108	0.0	0.0	0.0	0.0	461.3	(461.3)
2006	0.0	0.0	0.0	0.0	535.4	0.0	535.4	1.4026	0.0	0.0	0.0	0.0	381.8	(381.8)
2007	68.0	95.1	76.1	239.1	329.2	4.8	334.0	1.5007	45.3	63.3	50.7	159.3	222.5	(63.2)
2008	67.9	97.0	77.6	242.5	316.1	4.8	320.9	1.6058	42.3	60.4	48.3	151.0	199.8	(48.8)
2009	124.2	181.2	144.9	450.3	20.0	15.6	35.6	1.7182	72.3	105.4	84.4	262.1	20.7	241.3
2010	129.1	193.8	155.1	478.0	0.0	15.6	15.6	1.8385	70.2	105.4	84.4	260.0	8.5	251.5
2011	133.9	207.0	165.6	506.5	0.0	15.6	15.6	1.9672	68.1	105.2	84.2	257.5	7.9	249.5
2012	138.6	220.6	176.5	535.7	0.0	15.6	15.6	2.1049	65.8	104.8	83.9	254.5	7.4	247.1
2013	143.2	234.8	187.8	565.8	0.0	15.6	15.6	2.2522	63.6	104.2	83.4	251.2	6.9	244.3
2014	145.1	239.2	191.4	575.7	0.0	15.6	15.6	2.4098	60.2	99.3	79.4	238.9	6.5	232.4
2015	147.1	243.7	195.0	585.8	0.0	15.6	15.6	2.5785	57.0	94.5	75.6	227.2	6.1	221.1
2016	149.1	248.4	198.7	596.2	0.0	15.6	15.6	2.7590	54.0	90.0	72.0	216.1	5.7	210.4
2017	151.0	253.2	202.6	606.8	0.0	15.6	15.6	2.9522	51.2	85.8	68.6	205.5	5.3	200.2
2018	153.0	258.1	206.5	617.6	0.0	15.6	15.6	3.1588	48.4	81.7	65.4	195.5	4.9	190.6
2019	153.0	258.1	206.5	617.6	0.0	15.6	15.6	3.3799	45.3	76.4	61.1	182.7	4.6	178.1
2020	153.0	258.1	206.5	617.6	0.0	15.6	15.6	3.6165	42.3	71.4	57.1	170.8	4.3	166.4
2021	153.0	258.1	206.5	617.6	0.0	15.6	15.6	3.8697	39.5	66.7	53.4	159.6	4.0	155.6
2022	153.0	258.1	206.5	617.6	0.0	15.6	15.6	4.1406	37.0	62.3	49.9	149.2	3.8	145.4
2023	153.0	258.1	206.5	617.6	0.0	15.6	15.6	4.4304	34.5	58.3	46.6	139.4	3.5	135.9
2024	153.0	258.1	206.5	617.6	0.0	15.6	15.6	4.7405	32.3	54.4	43.6	130.3	3.3	127.0
2025	153.0	258.1	206.5	617.6	0.0	15.6	15.6	5.0724	30.2	50.9	40.7	121.8	3.1	118.7
2026	153.0	258.1	206.5	617.6	0.0	15.6	15.6	5.4274	28.2	47.6	38.0	113.8	2.9	110.9
2027	153.0	258.1	206.5	617.6	0.0	15.6	15.6	5.8074	26.3	44.4	35.6	106.3	2.7	103.7
2028	153.0	258.1	206.5	617.6	0.0	15.6	15.6	6.2139	24.6	41.5	33.2	99.4	2.5	96.9
2029	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6488	0.0	0.0	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1143	0.0	0.0	0.0	0.0	0.0	0.0
2031	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6123	0.0	0.0	0.0	0.0	0.0	0.0
2032	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1451	0.0	0.0	0.0	0.0	0.0	0.0
Total	$3,080.2	$5,053.1	$4,042.4	$12,175.7	$2,454.9	$322.1	$2,777.0		$1,038.6	$1,674.1	$1,339.3	$4,052.0	$1,919.6	$2,132.4
Plus: Salvage Value				$44.6								$4,096.6	$1,919.6	$2,176.9

[1] Excludes sunk cost spent in 2001, 2002, and 2003.

Benefit-Cost Ratio of Project: 2.13

Table E-6

Sensitivity 1 - 25 Percent Increase in Costs
(costs in millions of 2001 dollars)

	Benefits				Costs			Present Value						
Year	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
2002	0.0	0.0	0.0	0.0	29.4	0.0	29.4	1.0700	0.0	0.0	0.0	0.0	27.5	(27.5)
2003	0.0	0.0	0.0	0.0	176.6	0.0	176.6	1.1449	0.0	0.0	0.0	0.0	154.2	(154.2)
2004	0.0	0.0	0.0	0.0	631.4	0.0	631.4	1.2250	0.0	0.0	0.0	0.0	515.4	(515.4)
2005	0.0	0.0	0.0	0.0	755.8	0.0	755.8	1.3108	0.0	0.0	0.0	0.0	576.6	(576.6)
2006	0.0	0.0	0.0	0.0	669.3	0.0	669.3	1.4026	0.0	0.0	0.0	0.0	477.2	(477.2)
2007	68.0	95.1	76.1	239.1	411.5	5.9	417.5	1.5007	45.3	63.3	50.7	159.3	278.2	(118.8)
2008	67.9	97.0	77.6	242.5	395.2	5.9	401.1	1.6058	42.3	60.4	48.3	151.0	249.8	(98.8)
2009	124.2	181.2	144.9	450.3	25.0	19.5	44.5	1.7182	72.3	105.4	84.4	262.1	25.9	236.1
2010	129.1	193.8	155.1	478.0	0.0	19.5	19.5	1.8385	70.2	105.4	84.4	260.0	10.6	249.4
2011	133.9	207.0	165.6	506.5	0.0	19.5	19.5	1.9672	68.1	105.2	84.2	257.5	9.9	247.5
2012	138.6	220.6	176.5	535.7	0.0	19.5	19.5	2.1049	65.8	104.8	83.9	254.5	9.3	245.2
2013	143.2	234.8	187.8	565.8	0.0	19.5	19.5	2.2522	63.6	104.2	83.4	251.2	8.7	242.5
2014	145.1	239.2	191.4	575.7	0.0	19.5	19.5	2.4098	60.2	99.3	79.4	238.9	8.1	230.8
2015	147.1	243.7	195.0	585.8	0.0	19.5	19.5	2.5785	57.0	94.5	75.6	227.2	7.6	219.6
2016	149.1	248.4	198.7	596.2	0.0	19.5	19.5	2.7590	54.0	90.0	72.0	216.1	7.1	209.0
2017	151.0	253.2	202.6	606.8	0.0	19.5	19.5	2.9522	51.2	85.8	68.6	205.5	6.6	198.9
2018	153.0	258.1	206.5	617.6	0.0	19.5	19.5	3.1588	48.4	81.7	65.4	195.5	6.2	189.3
2019	153.0	258.1	206.5	617.6	0.0	19.5	19.5	3.3799	45.3	76.4	61.1	182.7	5.8	176.9
2020	153.0	258.1	206.5	617.6	0.0	19.5	19.5	3.6165	42.3	71.4	57.1	170.8	5.4	165.4
2021	153.0	258.1	206.5	617.6	0.0	19.5	19.5	3.8697	39.5	66.7	53.4	159.6	5.0	154.5
2022	153.0	258.1	206.5	617.6	0.0	19.5	19.5	4.1406	37.0	62.3	49.9	149.2	4.7	144.4
2023	153.0	258.1	206.5	617.6	0.0	19.5	19.5	4.4304	34.5	58.3	46.6	139.4	4.4	135.0
2024	153.0	258.1	206.5	617.6	0.0	19.5	19.5	4.7405	32.3	54.4	43.6	130.3	4.1	126.2
2025	153.0	258.1	206.5	617.6	0.0	19.5	19.5	5.0724	30.2	50.9	40.7	121.8	3.9	117.9
2026	153.0	258.1	206.5	617.6	0.0	19.5	19.5	5.4274	28.2	47.6	38.0	113.8	3.6	110.2
2027	153.0	258.1	206.5	617.6	0.0	19.5	19.5	5.8074	26.3	44.4	35.6	106.3	3.4	103.0
2028	153.0	258.1	206.5	617.6	0.0	19.5	19.5	6.2139	24.6	41.5	33.2	99.4	3.1	96.2
2029	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6488	0.0	0.0	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1143	0.0	0.0	0.0	0.0	0.0	0.0
2031	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6123	0.0	0.0	0.0	0.0	0.0	0.0
2032	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1451	0.0	0.0	0.0	0.0	0.0	0.0
2033	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7153	0.0	0.0	0.0	0.0	0.0	0.0
2034	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3253	0.0	0.0	0.0	0.0	0.0	0.0
2035	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9781	0.0	0.0	0.0	0.0	0.0	0.0
2036	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.6766	0.0	0.0	0.0	0.0	0.0	0.0
2037	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4239	0.0	0.0	0.0	0.0	0.0	0.0
Total	$3,080.2	$5,053.1	$4,042.4	$12,175.7	$3,094.2	$402.6	$3,496.8		$1,038.6	$1,674.1	$1,339.3	$4,052.0	$2,422.3	$1,629.7
Plus: Salvage Value				$44.6								$4,096.6	$2,422.3	$1,674.2

[1] Excludes sunk cost spent in 2001, 2002, and 2003.

Benefit-Cost Ratio of Project: 1.69

Table E-7

Sensitivity 2 - 25 Percent Decrease in Benefits
(costs in millions of 2001 dollars)

	Benefits				Costs			Present Value						
Year	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
2002	0.0	0.0	0.0	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	0.0	0.0	16.0	(16.0)
2003	0.0	0.0	0.0	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	0.0	0.0	111.2	(111.2)
2004	0.0	0.0	0.0	0.0	505.1	0.0	505.1	1.2250	0.0	0.0	0.0	0.0	412.3	(412.3)
2005	0.0	0.0	0.0	0.0	604.6	0.0	604.6	1.3108	0.0	0.0	0.0	0.0	461.3	(461.3)
2006	0.0	0.0	0.0	0.0	535.4	0.0	535.4	1.4026	0.0	0.0	0.0	0.0	381.8	(381.8)
2007	51.0	71.3	57.0	179.3	329.2	4.8	334.0	1.5007	34.0	47.5	38.0	119.5	222.5	(103.0)
2008	50.9	72.8	58.2	181.9	316.1	4.8	320.9	1.6058	31.7	45.3	36.2	113.3	199.8	(86.6)
2009	93.1	135.9	108.7	337.7	20.0	15.6	35.6	1.7182	54.2	79.1	63.3	196.6	20.7	175.8
2010	96.8	145.4	116.3	358.5	0.0	15.6	15.6	1.8385	52.7	79.1	63.3	195.0	8.5	186.5
2011	100.4	155.2	124.2	379.8	0.0	15.6	15.6	1.9672	51.0	78.9	63.1	193.1	7.9	185.1
2012	103.9	165.5	132.4	401.8	0.0	15.6	15.6	2.1049	49.4	78.6	62.9	190.9	7.4	183.5
2013	107.4	176.1	140.9	424.3	0.0	15.6	15.6	2.2522	47.7	78.2	62.5	188.4	6.9	181.5
2014	108.8	179.4	143.5	431.8	0.0	15.6	15.6	2.4098	45.2	74.4	59.6	179.2	6.5	172.7
2015	110.3	182.8	146.2	439.4	0.0	15.6	15.6	2.5785	42.8	70.9	56.7	170.4	6.1	164.3
2016	111.8	186.3	149.0	447.1	0.0	15.6	15.6	2.7590	40.5	67.5	54.0	162.1	5.7	156.4
2017	113.3	189.9	151.9	455.1	0.0	15.6	15.6	2.9522	38.4	64.3	51.5	154.2	5.3	148.9
2018	114.8	193.6	154.9	463.2	0.0	15.6	15.6	3.1588	36.3	61.3	49.0	146.6	4.9	141.7
2019	114.8	193.6	154.9	463.2	0.0	15.6	15.6	3.3799	34.0	57.3	45.8	137.0	4.6	132.4
2020	114.8	193.6	154.9	463.2	0.0	15.6	15.6	3.6165	31.7	53.5	42.8	128.1	4.3	123.8
2021	114.8	193.6	154.9	463.2	0.0	15.6	15.6	3.8697	29.7	50.0	40.0	119.7	4.0	115.7
2022	114.8	193.6	154.9	463.2	0.0	15.6	15.6	4.1406	27.7	46.7	37.4	111.9	3.8	108.1
2023	114.8	193.6	154.9	463.2	0.0	15.6	15.6	4.4304	25.9	43.7	35.0	104.5	3.5	101.0
2024	114.8	193.6	154.9	463.2	0.0	15.6	15.6	4.7405	24.2	40.8	32.7	97.7	3.3	94.4
2025	114.8	193.6	154.9	463.2	0.0	15.6	15.6	5.0724	22.6	38.2	30.5	91.3	3.1	88.2
2026	114.8	193.6	154.9	463.2	0.0	15.6	15.6	5.4274	21.1	35.7	28.5	85.3	2.9	82.5
2027	114.8	193.6	154.9	463.2	0.0	15.6	15.6	5.8074	19.8	33.3	26.7	79.8	2.7	77.1
2028	114.8	193.6	154.9	463.2	0.0	15.6	15.6	6.2139	18.5	31.2	24.9	74.5	2.5	72.0
2029	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6488	0.0	0.0	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1143	0.0	0.0	0.0	0.0	0.0	0.0
2031	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6123	0.0	0.0	0.0	0.0	0.0	0.0
2032	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1451	0.0	0.0	0.0	0.0	0.0	0.0
2033	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7153	0.0	0.0	0.0	0.0	0.0	0.0
2034	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3253	0.0	0.0	0.0	0.0	0.0	0.0
2035	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9781	0.0	0.0	0.0	0.0	0.0	0.0
2036	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.6766	0.0	0.0	0.0	0.0	0.0	0.0
2037	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4239	0.0	0.0	0.0	0.0	0.0	0.0
Total	$2,310.1	$3,789.8	$3,031.8	$9,131.8	$2,454.9	$322.1	$2,777.0		$779.0	$1,255.6	$1,004.5	$3,039.0	$1,919.6	$1,119.4
Plus: Salvage Value				$44.6								$3,083.6	$1,919.6	$1,163.9

[1] Excludes sunk cost spent in 2001, 2002, and 2003.

Benefit-Cost Ratio of Project: 1.61

Table E-8

Sensitivity 3 - Project Slipped 5 Years
(costs in millions of 2001 dollars)

	Benefits				Costs			Present Value						
Year	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0700	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1449	0.0	0.0	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2250	0.0	0.0	0.0	0.0	0.0	0.0
2005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3108	0.0	0.0	0.0	0.0	0.0	0.0
2006	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4026	0.0	0.0	0.0	0.0	0.0	0.0
2007	0.0	0.0	0.0	0.0	17.1	0.0	17.1	1.5007	0.0	0.0	0.0	0.0	11.4	(11.4)
2008	0.0	0.0	0.0	0.0	127.3	0.0	127.3	1.6058	0.0	0.0	0.0	0.0	79.3	(79.3)
2009	0.0	0.0	0.0	0.0	505.1	0.0	505.1	1.7182	0.0	0.0	0.0	0.0	294.0	(294.0)
2010	0.0	0.0	0.0	0.0	604.6	0.0	604.6	1.8385	0.0	0.0	0.0	0.0	328.9	(328.9)
2011	0.0	0.0	0.0	0.0	535.4	0.0	535.4	1.9672	0.0	0.0	0.0	0.0	272.2	(272.2)
2012	68.0	95.1	76.1	239.1	329.2	4.8	334.0	2.1049	32.3	45.2	36.1	113.6	158.7	(45.1)
2013	67.9	97.0	77.6	242.5	316.1	4.8	320.9	2.2522	30.2	43.1	34.5	107.7	142.5	(34.8)
2014	124.2	181.2	144.9	450.3	20.0	15.6	35.6	2.4098	51.5	75.2	60.1	186.9	14.8	172.1
2015	129.1	193.8	155.1	478.0	0.0	15.6	15.6	2.5785	50.1	75.2	60.1	185.4	6.1	179.3
2016	133.9	207.0	165.6	506.5	0.0	15.6	15.6	2.7590	48.5	75.0	60.0	183.6	5.7	177.9
2017	138.6	220.6	176.5	535.7	0.0	15.6	15.6	2.9522	46.9	74.7	59.8	181.5	5.3	176.2
2018	143.2	234.8	187.8	565.8	0.0	15.6	15.6	3.1588	45.3	74.3	59.5	179.1	4.9	174.2
2019	145.1	239.2	191.4	575.7	0.0	15.6	15.6	3.3799	42.9	70.8	56.6	170.3	4.6	165.7
2020	147.1	243.7	195.0	585.8	0.0	15.6	15.6	3.6165	40.7	67.4	53.9	162.0	4.3	157.7
2021	149.1	248.4	198.7	596.2	0.0	15.6	15.6	3.8697	38.5	64.2	51.4	154.1	4.0	150.0
2022	151.0	253.2	202.6	606.8	0.0	15.6	15.6	4.1406	36.5	61.1	48.9	146.5	3.8	142.8
2023	153.0	258.1	206.5	617.6	0.0	15.6	15.6	4.4304	34.5	58.3	46.6	139.4	3.5	135.9
2024	153.0	258.1	206.5	617.6	0.0	15.6	15.6	4.7405	32.3	54.4	43.6	130.3	3.3	127.0
2025	153.0	258.1	206.5	617.6	0.0	15.6	15.6	5.0724	30.2	50.9	40.7	121.8	3.1	118.7
2026	153.0	258.1	206.5	617.6	0.0	15.6	15.6	5.4274	28.2	47.6	38.0	113.8	2.9	110.9
2027	153.0	258.1	206.5	617.6	0.0	15.6	15.6	5.8074	26.3	44.4	35.6	106.3	2.7	103.7
2028	153.0	258.1	206.5	617.6	0.0	15.6	15.6	6.2139	24.6	41.5	33.2	99.4	2.5	96.9
2029	153.0	258.1	206.5	617.6	0.0	15.6	15.6	6.6488	23.0	38.8	31.1	92.9	2.4	90.5
2030	153.0	258.1	206.5	617.6	0.0	15.6	15.6	7.1143	21.5	36.3	29.0	86.8	2.2	84.6
2031	153.0	258.1	206.5	617.6	0.0	15.6	15.6	7.6123	20.1	33.9	27.1	81.1	2.1	79.1
2032	153.0	258.1	206.5	617.6	0.0	15.6	15.6	8.1451	18.8	31.7	25.3	75.8	1.9	73.9
2033	153.0	258.1	206.5	617.6	0.0	15.6	15.6	8.7153	17.6	29.6	23.7	70.9	1.8	69.1
2034	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3253	0.0	0.0	0.0	0.0	0.0	0.0
2035	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9781	0.0	0.0	0.0	0.0	0.0	0.0
2036	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.6766	0.0	0.0	0.0	0.0	0.0	0.0
2037	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4239	0.0	0.0	0.0	0.0	0.0	0.0
Total	$3,080.2	$5,053.1	$4,042.4	$12,175.7	$2,454.9	$322.1	$2,777.0		$740.5	$1,193.6	$954.9	$2,889.0	$1,368.7	$1,451.3
Plus: Salvage Value				$31.8								$2,920.8	$1,368.7	$1,483.1

[1] Excludes sunk cost spent in 2001, 2002, and 2003.

Benefit-Cost Ratio of Project: 2.13

Table E-9

Sensitivity 4 - 25 Percent Increase in Costs, 25 Percent Decrease in Benefits, Project Slipped 5 Years
(costs in millions of 2001 dollars)

	Benefits				Costs			Present Value						
Year	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0700	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1449	0.0	0.0	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2250	0.0	0.0	0.0	0.0	0.0	0.0
2005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3108	0.0	0.0	0.0	0.0	0.0	0.0
2006	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4026	0.0	0.0	0.0	0.0	0.0	0.0
2007	0.0	0.0	0.0	0.0	29.4	0.0	29.4	1.5007	0.0	0.0	0.0	0.0	19.6	(19.6)
2008	0.0	0.0	0.0	0.0	176.6	0.0	176.6	1.6058	0.0	0.0	0.0	0.0	110.0	(110.0)
2009	0.0	0.0	0.0	0.0	631.4	0.0	631.4	1.7182	0.0	0.0	0.0	0.0	367.5	(367.5)
2010	0.0	0.0	0.0	0.0	755.8	0.0	755.8	1.8385	0.0	0.0	0.0	0.0	411.1	(411.1)
2011	0.0	0.0	0.0	0.0	669.3	0.0	669.3	1.9672	0.0	0.0	0.0	0.0	340.2	(340.2)
2012	51.0	71.3	57.0	179.3	411.5	5.9	417.5	2.1049	24.2	33.9	27.1	85.2	198.3	(113.1)
2013	50.9	72.8	58.2	181.9	395.2	5.9	401.1	2.2522	22.6	32.3	25.8	80.8	178.1	(97.3)
2014	93.1	135.9	108.7	337.7	25.0	19.5	44.5	2.4098	38.6	56.4	45.1	140.1	18.5	121.7
2015	96.8	145.4	116.3	358.5	0.0	19.5	19.5	2.5785	37.5	56.4	45.1	139.0	7.6	131.5
2016	100.4	155.2	124.2	379.8	0.0	19.5	19.5	2.7590	36.4	56.3	45.0	137.7	7.1	130.6
2017	103.9	165.5	132.4	401.8	0.0	19.5	19.5	2.9522	35.2	56.0	44.8	136.1	6.6	129.5
2018	107.4	176.1	140.9	424.3	0.0	19.5	19.5	3.1588	34.0	55.7	44.6	134.3	6.2	128.1
2019	108.8	179.4	143.5	431.8	0.0	19.5	19.5	3.3799	32.2	53.1	42.5	127.7	5.8	122.0
2020	110.3	182.8	146.2	439.4	0.0	19.5	19.5	3.6165	30.5	50.5	40.4	121.5	5.4	116.1
2021	111.8	186.3	149.0	447.1	0.0	19.5	19.5	3.8697	28.9	48.1	38.5	115.5	5.0	110.5
2022	113.3	189.9	151.9	455.1	0.0	19.5	19.5	4.1406	27.4	45.9	36.7	109.9	4.7	105.2
2023	114.8	193.6	154.9	463.2	0.0	19.5	19.5	4.4304	25.9	43.7	35.0	104.5	4.4	100.1
2024	114.8	193.6	154.9	463.2	0.0	19.5	19.5	4.7405	24.2	40.8	32.7	97.7	4.1	93.6
2025	114.8	193.6	154.9	463.2	0.0	19.5	19.5	5.0724	22.6	38.2	30.5	91.3	3.9	87.5
2026	114.8	193.6	154.9	463.2	0.0	19.5	19.5	5.4274	21.1	35.7	28.5	85.3	3.6	81.7
2027	114.8	193.6	154.9	463.2	0.0	19.5	19.5	5.8074	19.8	33.3	26.7	79.8	3.4	76.4
2028	114.8	193.6	154.9	463.2	0.0	19.5	19.5	6.2139	18.5	31.2	24.9	74.5	3.1	71.4
2029	114.8	193.6	154.9	463.2	0.0	19.5	19.5	6.6488	17.3	29.1	23.3	69.7	2.9	66.7
2030	114.8	193.6	154.9	463.2	0.0	19.5	19.5	7.1143	16.1	27.2	21.8	65.1	2.7	62.4
2031	114.8	193.6	154.9	463.2	0.0	19.5	19.5	7.6123	15.1	25.4	20.3	60.8	2.6	58.3
2032	114.8	193.6	154.9	463.2	0.0	19.5	19.5	8.1451	14.1	23.8	19.0	56.9	2.4	54.5
2033	114.8	193.6	154.9	463.2	0.0	19.5	19.5	8.7153	13.2	22.2	17.8	53.1	2.2	50.9
2034	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3253	0.0	0.0	0.0	0.0	0.0	0.0
2035	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9781	0.0	0.0	0.0	0.0	0.0	0.0
2036	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.6766	0.0	0.0	0.0	0.0	0.0	0.0
2037	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4239	0.0	0.0	0.0	0.0	0.0	0.0
Total	$2,310.1	$3,789.8	$3,031.8	$9,131.8	$3,094.2	$402.6	$3,496.8		$555.4	$895.2	$716.2	$2,166.8	$1,727.1	$388.8
Plus: Salvage Value				$31.8								$2,198.5	$1,727.1	$420.6

[1] Excludes sunk cost spent in 2001, 2002, and 2003.

Benefit-Cost Ratio of Project: 1.27

Table E-10

Sensitivity 5 - Valuation of Project Beginning in 2004
(costs in millions of 2004 dollars)

	Benefits				Costs			Present Value						
Year	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0000	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0000	0.0	0.0	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0	688.2	0.0	688.2	1.0000	0.0	0.0	0.0	0.0	688.2	(688.2)
2005	0.0	0.0	0.0	0.0	636.4	0.0	636.4	1.0700	0.0	0.0	0.0	0.0	594.8	(594.8)
2006	0.0	0.0	0.0	0.0	563.5	0.0	563.5	1.1449	0.0	0.0	0.0	0.0	492.2	(492.2)
2007	71.7	95.1	76.1	242.8	346.0	5.0	351.1	1.2250	58.5	77.6	62.1	198.2	286.6	(88.4)
2008	71.6	97.0	77.6	246.2	332.3	5.0	337.3	1.3108	54.6	74.0	59.2	187.8	257.3	(69.5)
2009	130.9	181.2	144.9	457.0	20.0	16.5	36.5	1.4026	93.3	129.2	103.3	325.9	26.0	299.9
2010	136.1	193.8	155.1	485.0	0.0	16.5	16.5	1.5007	90.7	129.2	103.3	323.2	11.0	312.2
2011	141.2	207.0	165.6	513.7	0.0	16.5	16.5	1.6058	87.9	128.9	103.1	319.9	10.3	309.7
2012	146.1	220.6	176.5	543.2	0.0	16.5	16.5	1.7182	85.0	128.4	102.7	316.2	9.6	306.6
2013	151.0	234.8	187.8	573.6	0.0	16.5	16.5	1.8385	82.1	127.7	102.2	312.0	9.0	303.0
2014	153.0	239.2	191.4	583.6	0.0	16.5	16.5	1.9672	77.8	121.6	97.3	296.7	8.4	288.3
2015	155.1	243.7	195.0	593.8	0.0	16.5	16.5	2.1049	73.7	115.8	92.6	282.1	7.8	274.3
2016	157.2	248.4	198.7	604.3	0.0	16.5	16.5	2.2522	69.8	110.3	88.2	268.3	7.3	261.0
2017	159.2	253.2	202.6	615.0	0.0	16.5	16.5	2.4098	66.1	105.1	84.1	255.2	6.8	248.4
2018	161.3	258.1	206.5	625.9	0.0	16.5	16.5	2.5785	62.6	100.1	80.1	242.7	6.4	236.3
2019	161.3	258.1	206.5	625.9	0.0	16.5	16.5	2.7590	58.5	93.5	74.8	226.9	6.0	220.9
2020	161.3	258.1	206.5	625.9	0.0	16.5	16.5	2.9522	54.7	87.4	69.9	212.0	5.6	206.4
2021	161.3	258.1	206.5	625.9	0.0	16.5	16.5	3.1588	51.1	81.7	65.4	198.1	5.2	192.9
2022	161.3	258.1	206.5	625.9	0.0	16.5	16.5	3.3799	47.7	76.4	61.1	185.2	4.9	180.3
2023	161.3	258.1	206.5	625.9	0.0	16.5	16.5	3.6165	44.6	71.4	57.1	173.1	4.6	168.5
2024	161.3	258.1	206.5	625.9	0.0	16.5	16.5	3.8697	41.7	66.7	53.4	161.7	4.3	157.5
2025	161.3	258.1	206.5	625.9	0.0	16.5	16.5	4.1406	39.0	62.3	49.9	151.2	4.0	147.2
2026	161.3	258.1	206.5	625.9	0.0	16.5	16.5	4.4304	36.4	58.3	46.6	141.3	3.7	137.6
2027	161.3	258.1	206.5	625.9	0.0	16.5	16.5	4.7405	34.0	54.4	43.6	132.0	3.5	128.6
2028	161.3	258.1	206.5	625.9	0.0	16.5	16.5	5.0724	31.8	50.9	40.7	123.4	3.2	120.1
2029	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4274	0.0	0.0	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8074	0.0	0.0	0.0	0.0	0.0	0.0
2031	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2139	0.0	0.0	0.0	0.0	0.0	0.0
2032	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6488	0.0	0.0	0.0	0.0	0.0	0.0
Total	$3,247.8	$5,053.1	$4,042.4	$12,343.3	$2,586.4	$339.6	$2,926.1		$1,341.6	$2,050.8	$1,640.7	$5,033.1	$2,466.5	$2,566.6
Plus: Salvage Value				$47.0								$5,080.1	$2,466.5	$2,613.6

[1] Excludes sunk cost spent in 2001, 2002, and 2003.

Benefit-Cost Ratio of Project: 2.06

Table E-11

Benefit-Cost Ratio and Net Present Value Table - Master Plan Phase 1 Scenario (millions of 2001 dollars)

	Benefits				Costs			Present Value						
Year	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
2002	0.0	0.0	0.0	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	0.0	0.0	16.0	(16.0)
2003	0.0	0.0	0.0	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	0.0	0.0	111.2	(111.2)
2004	0.0	0.0	0.0	0.0	516.0	0.0	516.0	1.2250	0.0	0.0	0.0	0.0	421.2	(421.2)
2005	0.0	0.0	0.0	0.0	637.5	0.0	637.5	1.3108	0.0	0.0	0.0	0.0	486.4	(486.4)
2006	0.0	0.0	0.0	0.0	811.8	0.0	811.8	1.4026	0.0	0.0	0.0	0.0	578.8	(578.8)
2007	68.0	95.1	76.1	239.1	614.3	5.4	619.6	1.5007	45.3	63.3	50.7	159.3	412.9	(253.6)
2008	67.9	97.0	77.6	242.5	597.2	5.4	602.6	1.6058	42.3	60.4	48.3	151.0	375.3	(224.2)
2009	124.2	181.2	144.9	450.3	30.1	25.7	55.9	1.7182	72.3	105.4	84.4	262.1	32.5	229.6
2010	129.1	193.8	155.1	478.0	25.8	25.7	51.5	1.8385	70.2	105.4	84.4	260.0	28.0	232.0
2011	133.9	207.0	165.6	506.5	25.8	25.7	51.5	1.9672	68.1	105.2	84.2	257.5	26.2	231.3
2012	138.6	220.6	176.5	535.7	25.8	25.7	51.5	2.1049	65.8	104.8	83.9	254.5	24.5	230.0
2013	143.2	234.8	187.8	565.8	0.0	25.7	25.7	2.2522	63.6	104.2	83.4	251.2	11.4	239.8
2014	145.1	239.2	191.4	575.7	0.0	25.7	25.7	2.4098	60.2	99.3	79.4	238.9	10.7	228.2
2015	147.1	243.7	195.0	585.8	0.0	25.7	25.7	2.5785	57.0	94.5	75.6	227.2	10.0	217.2
2016	149.1	248.4	198.7	596.2	0.0	25.7	25.7	2.7590	54.0	90.0	72.0	216.1	9.3	206.8
2017	151.0	253.2	202.6	606.8	0.0	25.7	25.7	2.9522	51.2	85.8	68.6	205.5	8.7	196.8
2018	153.0	258.1	206.5	617.6	0.0	25.7	25.7	3.1588	48.4	81.7	65.4	195.5	8.1	187.4
2019	153.0	258.1	206.5	617.6	0.0	25.7	25.7	3.3799	45.3	76.4	61.1	182.7	7.6	175.1
2020	153.0	258.1	206.5	617.6	0.0	25.7	25.7	3.6165	42.3	71.4	57.1	170.8	7.1	163.7
2021	153.0	258.1	206.5	617.6	0.0	25.7	25.7	3.8697	39.5	66.7	53.4	159.6	6.6	152.9
2022	153.0	258.1	206.5	617.6	0.0	25.7	25.7	4.1406	37.0	62.3	49.9	149.2	6.2	142.9
2023	153.0	258.1	206.5	617.6	0.0	25.7	25.7	4.4304	34.5	58.3	46.6	139.4	5.8	133.6
2024	153.0	258.1	206.5	617.6	0.0	25.7	25.7	4.7405	32.3	54.4	43.6	130.3	5.4	124.9
2025	153.0	258.1	206.5	617.6	0.0	25.7	25.7	5.0724	30.2	50.9	40.7	121.8	5.1	116.7
2026	153.0	258.1	206.5	617.6	0.0	25.7	25.7	5.4274	28.2	47.6	38.0	113.8	4.7	109.0
2027	153.0	258.1	206.5	617.6	0.0	25.7	25.7	5.8074	26.3	44.4	35.6	106.3	4.4	101.9
2028	153.0	258.1	206.5	617.6	0.0	25.7	25.7	6.2139	24.6	41.5	33.2	99.4	4.1	95.2
2029	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6488	0.0	0.0	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1143	0.0	0.0	0.0	0.0	0.0	0.0
2031	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6123	0.0	0.0	0.0	0.0	0.0	0.0
2032	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1451	0.0	0.0	0.0	0.0	0.0	0.0
Total	$3,080.2	$5,053.1	$4,042.4	$12,175.7	$3,428.8	$525.2	$3,954.0		$1,038.6	$1,674.1	$1,339.3	$4,052.0	$2,628.4	$1,423.6
Plus: Salvage Value				$44.6								$4,096.6	$2,628.4	$1,468.2

[1] Excludes sunk cost spent in 2001, 2002, and 2003.

Benefit-Cost Ratio of Project: 1.56

Table E-12

Benefit-Cost Ratio and Net Present Value Table - OMP Total Airfield Scenario (millions of 2001 dollars)

	Benefits				Costs			Present Value						
Year	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
2002	0.0	0.0	0.0	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	0.0	0.0	16.0	(16.0)
2003	0.0	0.0	0.0	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	0.0	0.0	111.2	(111.2)
2004	0.0	0.0	0.0	0.0	505.1	0.0	505.1	1.2250	0.0	0.0	0.0	0.0	412.3	(412.3)
2005	0.0	0.0	0.0	0.0	604.6	0.0	604.6	1.3108	0.0	0.0	0.0	0.0	461.3	(461.3)
2006	0.0	0.0	0.0	0.0	622.0	0.0	622.0	1.4026	0.0	0.0	0.0	0.0	443.5	(443.5)
2007	67.5	95.1	76.1	238.6	425.3	4.8	430.0	1.5007	45.0	63.3	50.7	159.0	286.5	(127.5)
2008	68.0	97.0	77.6	242.6	401.3	4.8	406.0	1.6058	42.3	60.4	48.3	151.1	252.8	(101.8)
2009	124.3	181.2	144.9	450.4	189.0	15.6	204.6	1.7182	72.3	105.4	84.4	262.1	119.1	143.0
2010	129.6	193.8	155.1	478.6	398.9	15.6	414.5	1.8385	70.5	105.4	84.4	260.3	225.5	34.8
2011	134.5	207.0	165.6	507.0	363.8	15.6	379.4	1.9672	68.4	105.2	84.2	257.8	192.9	64.9
2012	139.2	220.6	176.5	536.3	343.7	15.6	359.4	2.1049	66.1	104.8	83.9	254.8	170.7	84.1
2013	205.9	336.2	268.9	811.0	20.0	31.7	51.7	2.2522	91.4	149.3	119.4	360.1	23.0	337.1
2014	206.9	342.1	273.7	822.7	0.0	31.7	31.7	2.4098	85.9	142.0	113.6	341.4	13.2	328.2
2015	209.4	348.2	278.5	836.1	0.0	31.7	31.7	2.5785	81.2	135.0	108.0	324.3	12.3	312.0
2016	212.0	354.4	283.5	849.9	0.0	31.7	31.7	2.7590	76.8	128.4	102.8	308.0	11.5	296.5
2017	214.5	360.8	288.6	863.9	0.0	31.7	31.7	2.9522	72.7	122.2	97.8	292.6	10.8	281.9
2018	217.1	367.3	293.9	878.2	0.0	31.7	31.7	3.1588	68.7	116.3	93.0	278.0	10.1	268.0
2019	217.8	367.3	293.9	878.9	0.0	31.7	31.7	3.3799	64.4	108.7	86.9	260.0	9.4	250.7
2020	217.8	367.3	293.9	878.9	0.0	31.7	31.7	3.6165	60.2	101.6	81.3	243.0	8.8	234.3
2021	217.8	367.3	293.9	878.9	0.0	31.7	31.7	3.8697	56.3	94.9	75.9	227.1	8.2	218.9
2022	217.8	367.3	293.9	878.9	0.0	31.7	31.7	4.1406	52.6	88.7	71.0	212.3	7.7	204.6
2023	217.8	367.3	293.9	878.9	0.0	31.7	31.7	4.4304	49.2	82.9	66.3	198.4	7.2	191.2
2024	217.8	367.3	293.9	878.9	0.0	31.7	31.7	4.7405	45.9	77.5	62.0	185.4	6.7	178.7
2025	217.8	367.3	293.9	878.9	0.0	31.7	31.7	5.0724	42.9	72.4	57.9	173.3	6.3	167.0
2026	217.8	367.3	293.9	878.9	0.0	31.7	31.7	5.4274	40.1	67.7	54.1	161.9	5.8	156.1
2027	217.8	367.3	293.9	878.9	0.0	31.7	31.7	5.8074	37.5	63.3	50.6	151.3	5.5	145.9
2028	217.8	367.3	293.9	878.9	0.0	31.7	31.7	6.2139	35.0	59.1	47.3	141.4	5.1	136.3
2029	217.8	367.3	293.9	878.9	0.0	31.7	31.7	6.6488	32.8	55.2	44.2	132.2	4.8	127.4
2030	217.8	367.3	293.9	878.9	0.0	31.7	31.7	7.1143	30.6	51.6	41.3	123.5	4.5	119.1
2031	217.8	367.3	293.9	878.9	0.0	31.7	31.7	7.6123	28.6	48.3	38.6	115.5	4.2	111.3
2032	217.8	367.3	293.9	878.9	0.0	31.7	31.7	8.1451	26.7	45.1	36.1	107.9	3.9	104.0
Total	$4,977.6	$8,246.0	$6,596.8	$19,820.4	$4,018.1	$707.0	$4,725.1		$1,444.3	$2,354.8	$1,883.8	$5,682.9	$2,860.5	$2,822.4
Plus: Salvage Value				$58.4								$5,741.3	$2,860.5	$2,880.9

[1] Excludes sunk cost spent in 2001, 2002, and 2003.

Benefit-Cost Ratio of Project: 2.01

Table E-13

Benefit-Cost Ratio and Net Present Value Table - Total Master Plan Scenario (millions of 2001 dollars)

	Benefits				Costs			Present Value						
Year	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Aircraft Delay Savings	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
2002	0.0	0.0	0.0	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	0.0	0.0	16.0	(16.0)
2003	0.0	0.0	0.0	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	0.0	0.0	111.2	(111.2)
2004	0.0	0.0	0.0	0.0	554.0	0.0	554.0	1.2250	0.0	0.0	0.0	0.0	452.3	(452.3)
2005	0.0	0.0	0.0	0.0	675.9	0.0	675.9	1.3108	0.0	0.0	0.0	0.0	515.6	(515.6)
2006	0.0	0.0	0.0	0.0	1,157.0	0.0	1,157.0	1.4026	0.0	0.0	0.0	0.0	824.9	(824.9)
2007	68.0	97.0	77.6	242.5	1,026.3	4.2	1,030.5	1.5007	45.3	64.6	51.7	161.6	686.6	(525.0)
2008	67.9	99.8	79.9	247.6	1,236.6	4.2	1,240.8	1.6058	42.3	62.2	49.7	154.2	772.7	(618.5)
2009	124.2	188.0	150.4	462.7	980.4	27.8	1,008.2	1.7182	72.3	109.4	87.6	269.3	586.8	(317.5)
2010	129.1	202.9	162.3	494.3	1,544.4	27.8	1,572.2	1.8385	70.2	110.4	88.3	268.9	855.2	(586.3)
2011	133.9	218.5	174.8	527.2	1,113.3	27.8	1,141.1	1.9672	68.1	111.1	88.9	268.0	580.1	(312.1)
2012	138.6	234.8	187.9	561.3	811.1	27.8	838.9	2.1049	65.8	111.6	89.3	266.7	398.6	(131.9)
2013	205.0	360.8	288.7	854.5	20.0	76.5	96.5	2.2522	91.0	160.2	128.2	379.4	42.8	336.6
2014	207.6	370.3	296.3	874.1	0.0	76.5	76.5	2.4098	86.1	153.7	122.9	362.7	31.7	331.0
2015	210.1	380.1	304.1	894.3	0.0	76.5	76.5	2.5785	81.5	147.4	117.9	346.8	29.7	317.2
2016	212.6	390.2	312.2	915.0	0.0	76.5	76.5	2.7590	77.1	141.4	113.1	331.6	27.7	303.9
2017	215.2	400.6	320.5	936.3	0.0	76.5	76.5	2.9522	72.9	135.7	108.6	317.2	25.9	291.3
2018	217.8	411.4	329.1	958.3	0.0	76.5	76.5	3.1588	68.9	130.2	104.2	303.4	24.2	279.2
2019	217.8	417.0	333.6	968.4	0.0	76.5	76.5	3.3799	64.4	123.4	98.7	286.5	22.6	263.9
2020	217.8	426.5	341.2	985.5	0.0	76.5	76.5	3.6165	60.2	117.9	94.4	272.5	21.1	251.4
2021	217.8	436.1	348.9	1,002.7	0.0	76.5	76.5	3.8697	56.3	112.7	90.2	259.1	19.8	239.4
2022	217.8	445.6	356.5	1,019.9	0.0	76.5	76.5	4.1406	52.6	107.6	86.1	246.3	18.5	227.8
2023	217.8	455.1	364.1	1,037.0	0.0	76.5	76.5	4.4304	49.2	102.7	82.2	234.1	17.3	216.8
2024	217.8	464.7	371.7	1,054.2	0.0	76.5	76.5	4.7405	45.9	98.0	78.4	222.4	16.1	206.2
2025	217.8	474.2	379.4	1,071.3	0.0	76.5	76.5	5.0724	42.9	93.5	74.8	211.2	15.1	196.1
2026	217.8	483.7	387.0	1,088.5	0.0	76.5	76.5	5.4274	40.1	89.1	71.3	200.6	14.1	186.5
2027	217.8	493.3	394.6	1,105.7	0.0	76.5	76.5	5.8074	37.5	84.9	68.0	190.4	13.2	177.2
2028	217.8	502.8	402.2	1,122.8	0.0	76.5	76.5	6.2139	35.0	80.9	64.7	180.7	12.3	168.4
2029	217.8	521.9	409.9	1,149.5	0.0	76.5	76.5	6.6488	32.8	78.5	61.6	172.9	11.5	161.4
2030	217.8	531.4	417.5	1,166.7	0.0	76.5	76.5	7.1143	30.6	74.7	58.7	164.0	10.8	153.2
2031	217.8	540.9	425.1	1,183.8	0.0	76.5	76.5	7.6123	28.6	71.1	55.8	155.5	10.0	145.5
2032	217.8	512.3	432.8	1,162.9	0.0	76.5	76.5	8.1451	26.7	62.9	53.1	142.8	9.4	133.4
Total	$4,978.6	$10,060.3	$8,048.2	$23,087.1	$9,263.3	$1,649.4	$10,912.7		$1,444.4	$2,735.9	$2,188.3	$6,368.7	$6,193.7	$174.9
Plus: Salvage Value				$58.4								$6,427.1	$6,193.7	$233.3

[1] Excludes sunk cost spent in 2001, 2002, and 2003.

Benefit-Cost Ratio of Project: 1.04

Appendix F

Airport Master Plan—
Capital Development Program

Request for Letter of Intent to provide a

Multi-Year Commitment of Airport Improvement Program Grant-in-Aid Funding

RICHARD M. DALEY
MAYOR

CHICAGO O'HARE INTERNATIONAL AIRPORT
O'HARE MODERNIZATION PROGRAM

Table F-1

Capital Development Program (2003-2022) Cash Flow Schedule (in Escalated Dollars)

O'HARE MODERNIZATION PROGRAM [1]	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Program Wide Requirements																				
Program-wide requirements	$22,922,866	$20,947,577	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Preliminary Engineering	23,175,361	16,708,888	7,375,459	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Welands Mitigation	2,060,268	24,400,594	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Noise Mitigation	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	0	0	0	0	0	0	0	0	0
Land Acquisition	71,644,699	79,568,009	92,881,489	69,781,344	17,388,984	11,940,845	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Land/Environmental Contingency	0	0	0	90,040,817	92,742,042	83,583,458	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal - Program Wide Requirements	**$139,803,194**	**$161,625,068**	**$120,256,948**	**$179,822,161**	**$130,131,026**	**$115,524,303**	**$20,000,000**	**$20,000,000**	**$20,000,000**	**$20,000,000**	**$20,000,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Other Program Costs																				
Miscellaenous Operations Budget	$0	$0	$0	$0	$11,593,054	$0	$0	$0	$0	$13,439,527	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Program Contingency	0	0	0	67,768,844	61,682,353	47,994,598	37,160,700	66,354,241	52,552,506	45,995,323	0	0	0	0	0	0	0	0	0	0
Subtotal - Other Program Costs	**$0**	**$0**	**$0**	**$67,768,844**	**$73,275,407**	**$47,994,598**	**$37,160,700**	**$66,354,241**	**$52,552,506**	**$59,434,850**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Airfield																				
Design and Construction of Runway 9L-27R	$24,720,031	$137,445,387	$224,797,874	$231,541,810	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Decomission Runway 18-36	0	0	0	0	0	0	2,941,440	0	0	0	0	0	0	0	0	0	0	0	0	0
Design and ConstructionRunway 9C-27C	0	0	0	10,352,318	14,217,581	7,321,439	159,428,082	320,653,229	247,705,291	83,157,850	0	0	0	0	0	0	0	0	0	0
Design and Construction 9R Extension	0	0	0	0	1,552,268	3,198,902	3,294,870	34,323,363	70,706,129	72,827,312	0	0	0	0	0	0	0	0	0	0
Design and Decomission of Runway 14L-32R	0	0	0	0	0	0	0	0	77,948	1,888,095	0	0	0	0	0	0	0	0	0	0
Design and Construction of Runway 10L Extension	21,629,629	96,248,487	146,690,940	169,823,219	98,978,577	31,963,191	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Design and Construction of Runway 10C-28C	21,630,690	154,772,760	186,236,818	126,400,289	252,856,097	320,314,498	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Design and Construction of Runway 10R-28L	0	0	0	0	6,170,863	10,592,904	48,440,022	136,194,835	140,280,680	144,489,100	0	0	0	0	0	0	0	0	0	0
Design and Construction of Runway 14R/32L Decommissioning/Taxiway Conversion	0	0	0	0	0	0	0	3,158,856	3,253,621	145,780,590	0	0	0	0	0	0	0	0	0	0
Subtotal Airfield	**$67,980,350**	**$388,466,634**	**$557,725,632**	**$538,117,636**	**$373,775,386**	**$373,390,934**	**$214,104,414**	**$494,330,283**	**$462,023,669**	**$448,142,947**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Western Terminal Complex (Design and Construction)																				
Western Airside Concourse	$0	$10,623,493	$14,591,096	$205,616,965	$259,129,647	$200,176,730	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Energy Plant	0	1,266,470	3,043,376	19,282,206	39,721,343	6,819,651	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Storage and Distribution Improvements	0	0	4,132,869	19,996,319	27,460,815	21,214,095	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western Terminal	0	0	0	0	19,442,753	26,701,792	353,794,949	448,107,388	230,774,633	118,848,936	0	0	0	0	0	0	0	0	0	0
Parking Facilities	0	0	0	0	0	0	4,342,488	4,472,763	54,433,990	84,099,129	0	0	0	0	0	0	0	0	0	0
Subtotal Western Terminal Complex	**$0**	**$11,889,963**	**$21,767,341**	**$244,895,490**	**$345,754,558**	**$254,912,268**	**$358,137,437**	**$452,580,151**	**$285,208,623**	**$202,948,065**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
On-Airport Circulation																				
People Mover	$0	$9,189,834	$9,465,529	$186,449,527	$192,043,013	$98,902,766	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Maintenance Facility	0	251,327	603,273	11,457,106	2,950,504	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal On-Airport Circulation	**$0**	**$9,441,161**	**$10,068,802**	**$197,906,633**	**$194,993,517**	**$98,902,766**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
OMP Total	**$207,783,544**	**$571,422,826**	**$709,818,723**	**$1,228,510,764**	**$1,117,929,894**	**$890,724,869**	**$629,402,551**	**$1,033,264,675**	**$819,784,798**	**$730,525,862**	**$20,000,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

CAPITAL IMPROVEMENT PROGRAM	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Airfield Improvements	$92,132,048	$67,878,935	$77,118,951	$62,056,319	$73,012,105	$37,519,618	$39,068,871	$40,682,096	$42,361,933	$44,111,134	$45,932,563	$47,829,202	$49,804,156	$51,860,660	$54,002,080	$56,231,924	$58,553,842	$60,971,636	$63,489,265	$66,110,852
Terminal Support Improvements	36,474,384	23,848,981	52,146,578	49,506,281	38,288,232	20,187,746	21,021,335	21,889,344	22,793,194	23,734,367	24,714,402	25,734,904	26,797,545	27,904,064	29,056,273	30,256,059	31,505,387	32,806,301	34,160,933	35,571,500
Terminal Improvements (DT & IT)	107,797,061	105,862,923	103,679,172	99,462,091	8,820,824	42,905,019	44,676,645	46,521,425	48,442,379	50,442,652	52,525,521	54,694,394	56,952,825	59,304,510	61,753,301	64,303,207	66,958,403	69,723,236	72,602,235	75,600,113
H&R Improvements	16,871,370	22,886,314	36,758,040	19,734,916	6,510,587	10,358,890	10,786,628	11,232,027	11,695,818	12,178,759	12,681,642	13,205,290	13,750,561	14,318,346	14,909,577	15,525,220	16,166,285	16,833,820	17,528,919	18,252,720
Security Improvements	20,785,749	35,589,422	72,222,013	13,512,243	3,624,918	14,690,814	15,297,425	15,929,083	16,586,824	17,271,724	17,984,905	18,727,534	19,500,828	20,306,052	21,144,526	22,017,622	22,926,769	23,873,457	24,859,235	25,885,718
Fueling Improvements	6,548,426	26,249,516	26,177,796	26,177,796	13,780,724	9,973,111	10,384,919	10,813,731	11,260,250	11,725,206	12,209,361	12,713,507	13,238,471	13,785,112	14,354,324	14,947,040	15,564,230	16,206,905	16,876,118	17,572,963
Land Support Improvements	3,332,735	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Noise Mitigation Projects	37,305,089	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Year CIP Total	**$321,246,862**	**$282,316,091**	**$368,102,550**	**$270,449,646**	**$144,037,390**	**$135,635,200**	**$141,235,823**	**$147,067,706**	**$153,140,398**	**$159,463,842**	**$166,048,393**	**$172,904,832**	**$180,044,385**	**$187,478,744**	**$195,220,081**	**$203,281,072**	**$211,674,915**	**$220,415,356**	**$229,516,705**	**$238,993,866**

WORLD GATEWAY PROGRAM [1]	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Airport-wide Airfield and Airside Projects	$0	$2,142,514	$17,345,557	$76,731,186	$14,216,806	$87,639,319	$2,425,414	$34,944,000	$35,740,590	$36,537,180	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Terminal 2 FIS Facilities	0	29,794,121	30,580,931	31,367,741	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terminal 4																				
Enabling Projects	0	0	0	0	18,917,327	105,127,995	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apron & Fueling	0	0	0	0	6,644,971	37,403,963	14,647,648	7,001,171	13,985,039	36,312,891	0	0	0	0	0	0	0	0	0	0
Roadway/Access/ATS	0	0	0	0	0	25,120	2,713,480	18,174,091	59,224,418	26,254,261	0	0	0	0	0	0	0	0	0	0
Terminal	0	0	0	0	110,341	15,285,636	112,101,448	313,868,266	243,520,039	166,001,786	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	0	0	11,266,405	38,477,404	30,478,780	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal - Terminal 4	**$0**	**$0**	**$0**	**$0**	**$25,672,639**	**$169,109,119**	**$167,939,981**	**$369,522,308**	**$316,729,496**	**$228,568,938**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Terminal 6																				
Enabling Projects	$0	$0	$0	$0	$12,775,019	$55,302,098	$17,335,408	$1,816,093	$1,695,972	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Apron & Fueling	0	0	0	0	845,947	4,722,596	27,044,780	26,780,793	471,103	2,985,941	0	0	0	0	0	0	0	0	0	0
Northern Extension	0	0	0	0	0	0	0	2,605,699	48,806,305	97,325,152	0	0	0	0	0	0	0	0	0	0
Parking Structure	0	0	0	0	3,371,526	4,609,555	55,967,133	84,514,130	80,761	0	0	0	0	0	0	0	0	0	0	0
Roadway/Access/ATS	0	0	0	0	9,538,354	8,289,663	85,635,373	138,707,401	78,176,232	0	0	0	0	0	0	0	0	0	0	0
Tenant Relocations	0	0	0	0	0	0	0	46,731,497	0	0	0	0	0	0	0	0	0	0	0	0
Terminal	0	0	0	0	17,397,075	143,976,369	203,253,802	205,758,086	139,083,162	0	0	0	0	0	0	0	0	0	0	0
Utilities	0	0	0	0	17,911,999	137,118,557	29,706,819	29,439,133	20,243,983	0	0	0	0	0	0	0	0	0	0	0
Subtotal - Terminal 6	**$0**	**$0**	**$0**	**$0**	**$61,839,919**	**$354,018,838**	**$418,943,315**	**$536,352,832**	**$288,557,517**	**$100,311,093**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
WGP Total	**$0**	**$31,936,635**	**$47,926,489**	**$108,098,927**	**$101,729,364**	**$610,767,276**	**$589,308,710**	**$940,819,140**	**$641,027,603**	**$365,417,211**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

[1] Excludes any costs incurred prior to 2002 because the time period of the Master Plan is 2003-2022.

OMP Source:: O'Hare Partners, based on cost estimate analyses from TOK LLC and AOR.
CIP Source: City of Chicago, Department of Aviation.
WGP Source: Landrum & Brown; Project components included in O'Hare International Airport Master Plan selected by Ricondo & Associates, Inc.