IV. Demand/Capacity Analysis and Facility Requirements

This section summarizes the airfield demand/capacity analysis, as well as the airside and landside facility requirements, for O'Hare through the planning horizon.[1] The various Airport components are analyzed separately to assess their ability to serve existing and future demand levels, which in turn, are used to identify general facility requirements. These facility requirements are then combined to identify Airport development alternatives, documented in Section V. The following Airport components were assessed and are discussed in the remainder of this section:

- *Airfield* includes the runway and taxiway system. The ability of the airfield system to serve the projected demand levels in terms of runway capacity and design standards was evaluated.
- *Passenger Terminal Area* includes the aircraft gates, terminal building, curbfront, and aircraft gates.
- *Support/Ancillary Facilities* include cargo facilities, aircraft/Airport maintenance facilities, GA/FBO facilities, and other support facilities.
- *Ground Access* includes on- and off-Airport ground transportation and circulation systems such as access roads, vehicle parking areas, rental car facilities, and the local roadway network.

4.1 Airfield Demand/Capacity Analysis and Facility Requirements

In recent years (until September of 2001), the U.S. air transportation system has experienced increasing levels of flight delays and cancellations.[2] These delays have been experienced at the nation's busiest airports, including O'Hare. Although total system operations were decreasing, activity at the nation's busiest, most delayed airports was increasing, as were delays. Despite significant reductions in delays from 1990 through 1997, air traffic delays at the Airport and throughout the NAS rose slightly in 1998 and significantly in 1999 and 2000. A significant share of the nation's system delays have been experienced at O'Hare because of its role as a major connecting hub and spoke market. In 2000, the FAA ranked O'Hare the third most delayed airport in the U.S., with slightly more than six percent of all flights delayed more than 15 minutes. Based on number of delayed operations, O'Hare has been the most delayed airport since 2000.[3]

Aircraft delay is derived from the relationship of demand for airport facilities and the capacity or processing capability of those facilities. Aircraft delay increases as demand approaches capacity. An airfield demand/capacity analysis was conducted for the Airport, as discussed in the following section. This exercise concludes with the identification of airfield capacity requirements. The second part of this discussion identifies the physical facility requirements for the airfield.

[1] While the prior chapter extrapolates annual activity from the FAA TAF through 2022, 2018 has been defined as the end of the planning horizon consistent with the analysis years defined in the EIS for the OMP.
[2] *U.S. National Delay Synopsis,* Aviation Daily, October 27, 2000, p.7. The delay events were related to weather, volume, equipment, runway, and "other."
[3] *Airport Capacity Benchmark Report 2001,* Department of Transportation, Federal Aviation Administration. Based on number of delays per 1,000 operations.

4.1.1 Airfield Demand/Capacity Analysis

The operational capacity of airfields like O'Hare with multiple runways in crossing orientations is a complex subject linked to the various operating configurations of the Airport and the range of weather conditions experienced. While extensive simulation modeling has occurred at the facility over the past several years in attempts to identify the best options for delay reduction/capacity enhancement, the basis of O'Hare's capacity and delay problem is fairly well documented as the inability of the airfield to consistently provide adequate arrival and departure capabilities in all weather conditions at a level needed to meet peaking demands.

One of the primary characteristics of a hubbing facility is the pattern of arrival banking followed by departure banking exhibited in a hubbing carrier's schedule. Through this pattern of activity, the hubbing carrier is able to provide service to a significantly greater number of market pairs than could be served by the same number of aircraft providing point-to-point service (See **Exhibit IV-1**)

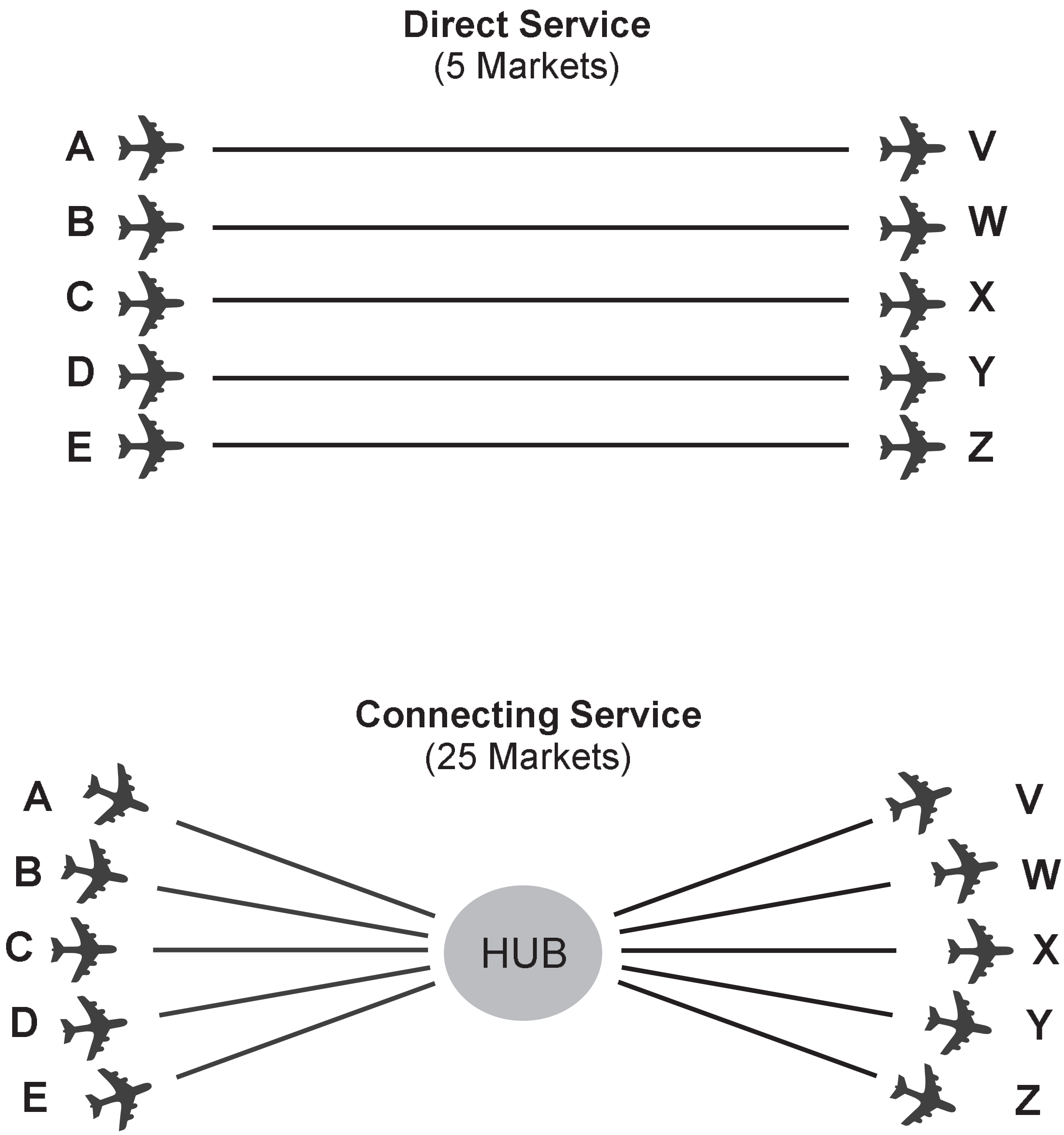
As a result of the hubbing pattern, peak arrival periods at a hub airport typically do not coincide with peak departure periods. Since arriving and departing banks do not coincide, a trade-off of arrival capacity for departure capacity and vice versa can be used to effectively serve the hubbing operation. While O'Hare's pattern of hubbing is complicated by the fact that two hub carriers operate at the facility, typically their patterns of activity have been similar due to market travel time preferences and competitive flight scheduling.

Exhibit IV-2 presents the rolling hour arrivals and departures at O'Hare exhibited in the PMAD 2001 schedule discussed in Section 3.6 and presented in Appendix B. As shown, arrival and departure peaks are offset and do not peak at the same time. During peak periods, departures generally range from 60 percent to 80 percent of the peak arrival periods, and arrivals range from 60 percent to 80 percent of the peak departure periods.

In order to meet the current traffic demands placed on the airfield, FAA Air Traffic has devised airfield operating configurations for O'Hare that allow the airfield to accommodate the arriving and departing peaks associated with the hub operation under most weather conditions.[4] This is accomplished using converging approaches and diverging departures to provide a three-arrival/two-departure or three-departure/two-arrival configuration to meet the banks of the hubs. The operating configurations of the existing airfield presented in Exhibit II-11 depict this ability.[5] As shown, in most of the VFR configurations, opportunities are available for a third arrival runway or third departure runway.

[4] The discussion and analysis presented here assumes that limitations imposed by airspace constraints will be addressed in the National Airspace Redesign effort underway by FAA.

[5] Use of configuration Plan B Modified was discontinued in April 2003 based on guidance received from FAA on LASHO operations.



Sources: Ricondo & Associates, Inc., C90 TRACON
Prepared by: Ricondo & Associates, Inc.

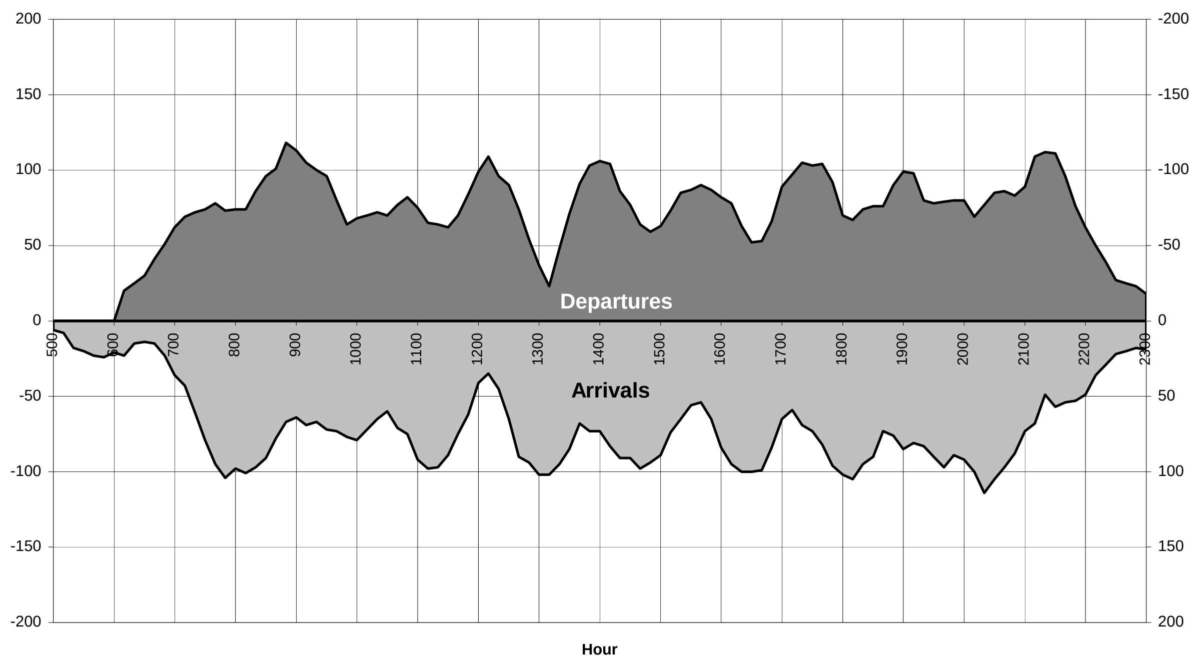
Exhibit IV-1

0 N.T.S. north

Hub Characteristics

Exhibit IV-2

2001 PMAD Hourly Operations (Sum of the Previous Hour)



Source: 2001 PMAD Schedule, Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

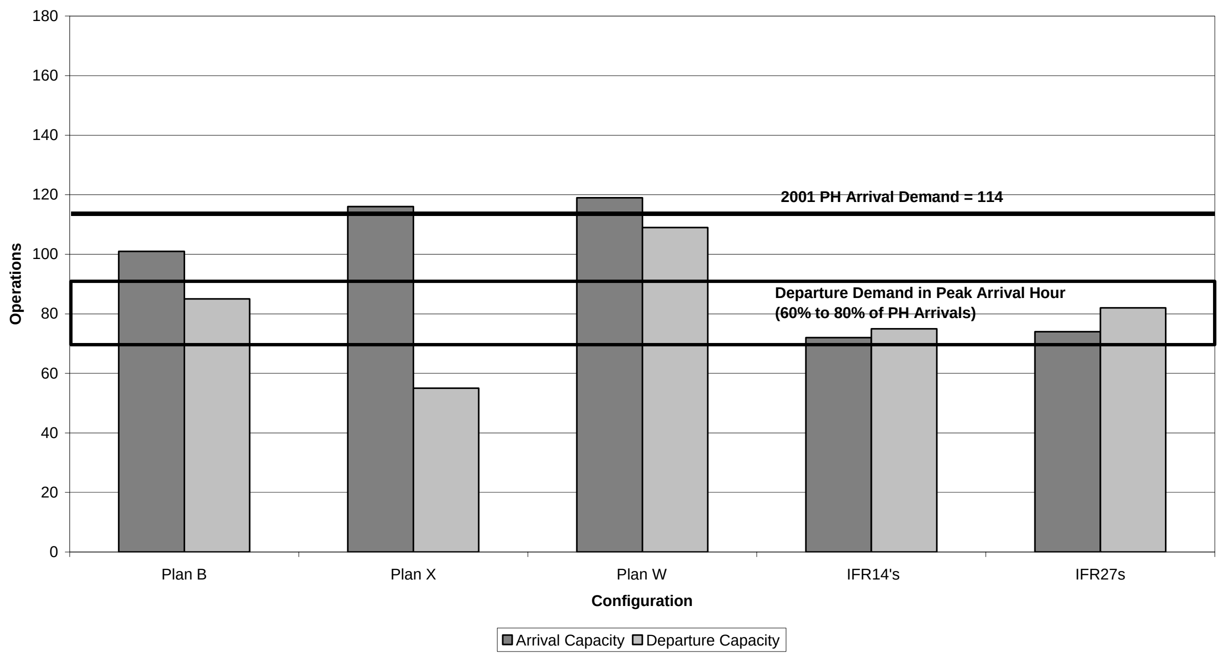
Exhibits IV-3 and IV-4 depict how this ability to trade arrival capacity for departure capacity to meet the fluctuations in demand can be used to accommodate traffic efficiently. Exhibit IV-3 depicts the arrival and departure capacities of the various operating configurations in comparison to the peak hour arrival demand for the base year under arrival priority operations. As shown, under all of the VFR configurations (i.e., Plans B, X, and W), arrival demand can be served by the various configurations when arrivals receive priority. Additionally, the exhibit depicts that the departure demand during the arrival peaks (estimated at 60 percent to 80 percent of arrival operations) can also be accommodated.

Similarly, Exhibit IV-4 depicts the ability of the existing VFR configurations to accommodate peak departure demand under departure priority operations. It also demonstrates that, while significantly diminished from arrival priority throughput, arrival capacity is in the range of expected arrival demand in peak departure periods.

Much of the arrival throughput capability in arrival-priority configurations comes from the ability to utilize converging approaches and LAHSO procedures in some VFR configurations at O'Hare. Utilizing LAHSO, crossing runways can be used to provide independent operations if minimum criteria are met. For example, in Plan W configuration (depicted in Exhibit II-14), arrivals to Runway 22R can occur independent of operations on Runway 27R by requiring the pilot landing Runway 22R to hold short of Runway 27R on landing. Similar LAHSO operations are available on other runway pairs at O'Hare.

Exhibit IV-3

Existing Capacity/Existing Demand – Arrival Priority



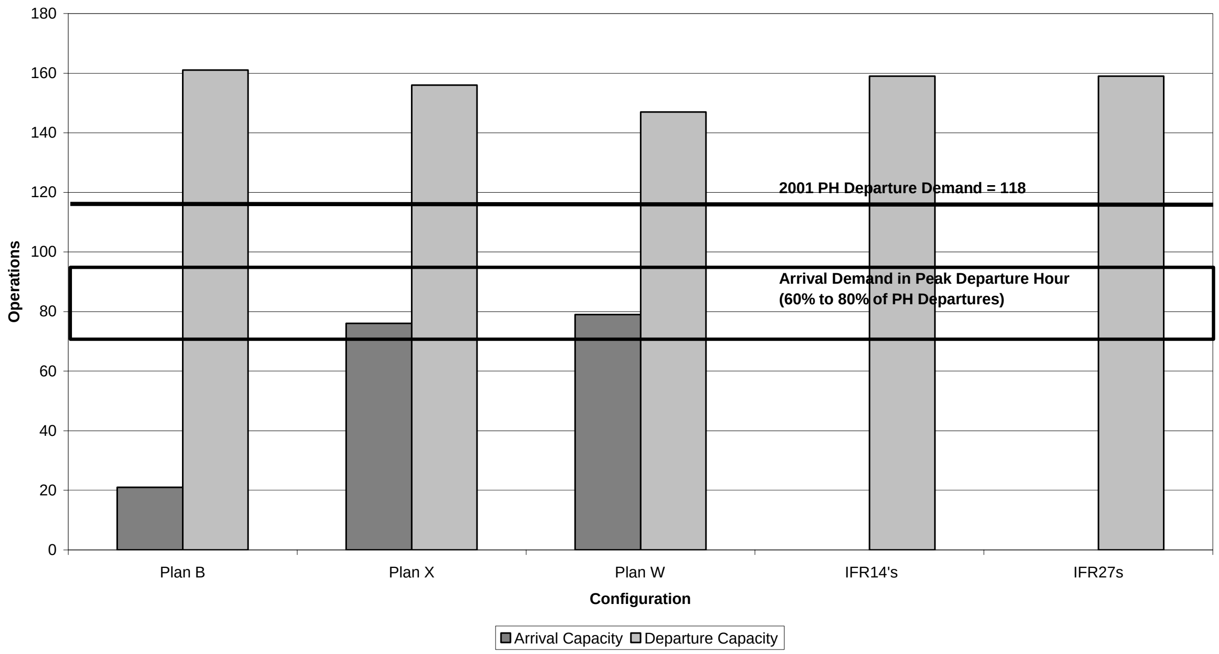
Source: Capacities from the FAA Airport Capacity and Delay Model, Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

While LAHSO provides a level of capacity increase under good weather conditions, it cannot be utilized when weather conditions are below a 1,000-foot ceiling, below three-mile visibility, or in wet runway conditions. Additionally, pilots can refuse LAHSO operations, and many commercial pilot organizations are opposed to their use. Other recent LAHSO revisions issued by the FAA have limited LAHSO operations involving general aviation and foreign flag carriers. As a result, while the use of LAHSO can provide a substantial capacity benefit, its availability is inconsistent.

Exhibits IV-3 and IV-4 also depict the primary source of delay and flight cancellations in today's operating environment – IFR throughput. Even under arrival priority operating conditions, the IFR arrival throughput does not meet the arrival demands under the existing schedule. A significant percentage of delays at O'Hare are due to the limitations in IFR arrival capacity. This is caused primarily by the unavailability of a third arrival stream in poor weather conditions and increased in-trail separation requirements.

Exhibit IV-4

Existing Capacity/Existing Demand – Departure Priority



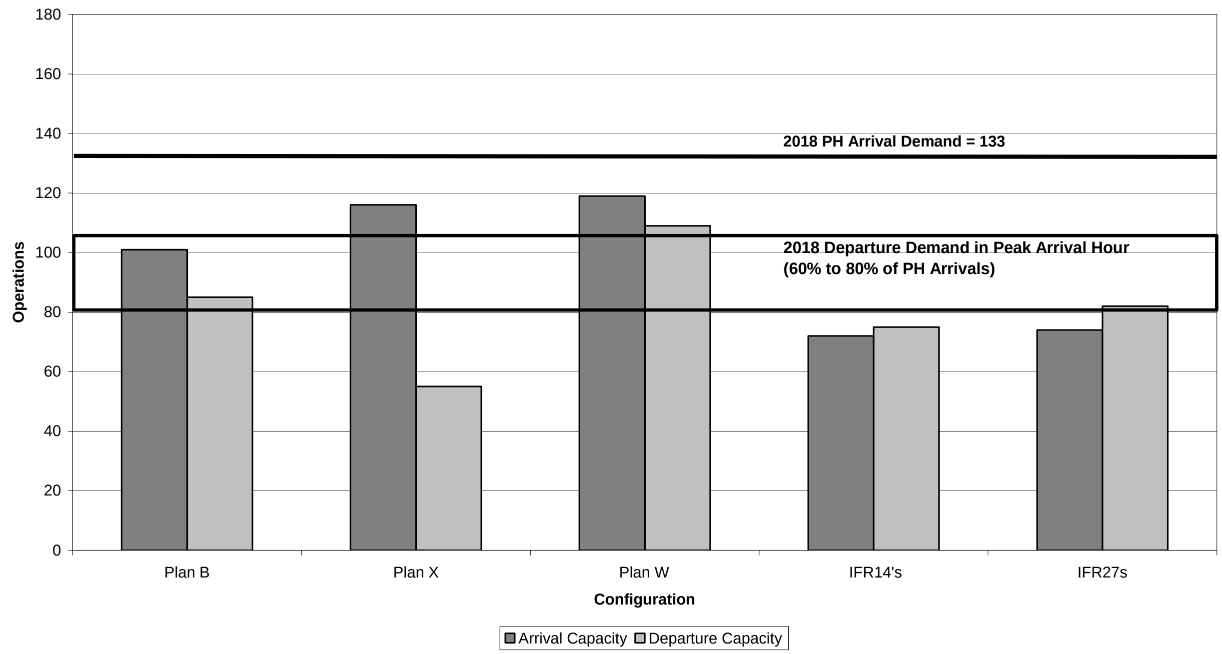
Source: Capacities from the FAA Airport Capacity and Delay Model, Ricondo & Associates, Inc.
Prepared by Ricondo & Associates, Inc.

As traffic grows through the planning horizon, the ability of the existing airfield to accommodate demand through the effective use of arrival priority and departure priority operating configurations will be limited, even in VFR conditions. **Exhibits IV-5 and IV-6** present peak hour 2018 demand compared to the arrival priority and departure priority capacities. As shown, arrival demand is anticipated to exceed arrival priority capacity even in VFR conditions. While departure priority capacity can meet peak departure demand in VFR, the associated arrival capacity (during departure priority configurations) does not meet peak departure period arrival demand.

Exhibit IV-7 presents future arrival and departure capacity under a balanced 50 percent arrivals/50 percent departures operation compared with the existing and future peak hour demand. As discussed in the prior sections, arrival priority and departure priority configurations can be utilized in good weather conditions to accommodate current peaking patterns resulting from the hubbing activity currently present at the Airport. Changes in the pattern of activity could significantly limit the ability of arrival priority and departure priority configurations to accommodate even existing demand. As shown in Exhibit IV-7, with the exception of Plan W, neither arrival capacity nor departure capacity meets the existing peak hour demands under a balanced capacity approach.

Exhibit IV-5

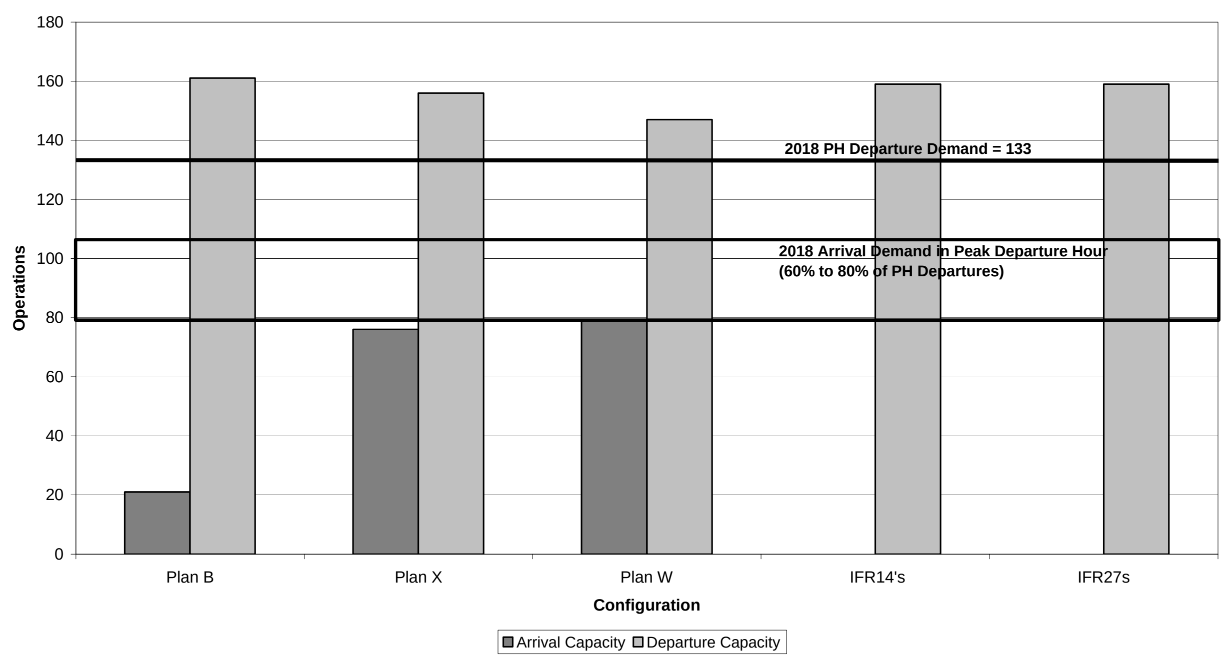
Existing Capacity/2018 Demand – Arrival Priority



Source: Capacities from the FAA Airport Capacity and Delay Model, Ricondo & Associates, Inc.
Prepared by Ricondo & Associates, Inc.

Exhibit IV-6

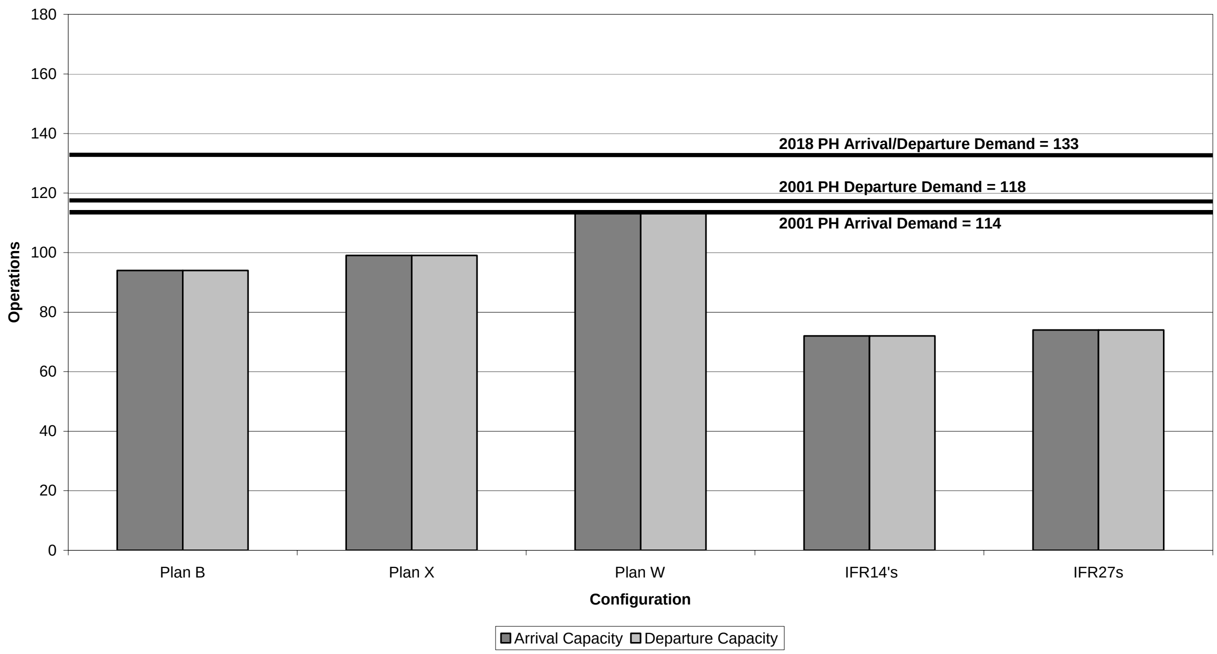
Existing Capacity/2018 Demand – Departure Priority



Source: Capacities from the FAA Airport Capacity and Delay Model, Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit IV-7

Existing Capacity/2001 and 2018 Demand – Balanced Arrivals/Departures



Source: Capacities from the FAA Airport Capacity and Delay Model, Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Based on the review of the existing and future demand levels and the existing airfield capacity, the following points are apparent:

- Additional arrival capacity is currently needed in IFR conditions.
- Currently, IFR departures are metered by limitations in IFR arrival capacity. With the addition of IFR arrival capacity, a commensurate increase in IFR departure capacity is needed.
- While in VMC, the airfield can generally accommodate existing demands using LAHSO. The frequency of weather conditions precluding these operations (e.g., ceiling/visibility conditions, wet pavement, winds) and pilot refusal of these procedures limit their effectiveness.
- Longer-term traffic growth will require increases in capacity in VFR conditions.
- Operational flexibility should be provided to serve banked arrivals/departures or a more even distribution of traffic.

Airfield alternatives, detailed in Section V, will be developed utilizing these requirements/goals.

4.1.2 Airfield Facility Requirements

Airfield facility requirements were identified for each of the following components of the airfield:

- Runway system
- Taxiway system

- Airfield safety areas
- NAVAID

This section includes physical requirements, such as runway length, width, and separation, as well as an analysis of wind conditions to provide an assessment of the orientation of runways needed to support operations at the Airport.

The planning and design of an airport are typically based on the airport's role and the critical aircraft that use the facility. The FAA provides guidance for the planning and design of airports through FAA Advisory Circulars that promote safety, economy, efficiency, and longevity.

For geometric design purposes, it is necessary to establish applicable design standards for future runway and taxiway development at the Airport. These standards were developed from design manuals such as the FAA Advisory Circular 150/5300-13, *Airport Design.*

As discussed in Section I, Airbus Industrie, the European manufacturer of large commercial aircraft, plans to introduce the Airbus A380 New Large Aircraft and A380F Freighter to commercial service in 2006.[6] The A380, with a wingspan of 262 feet and maximum gross takeoff weight of 1.23 million pounds, will be categorized in the ADG VI classification. The Airport is a likely candidate to accommodate this aircraft based on the current list of potential operators. Although O'Hare was built prior to the introduction of the largest aircraft types currently in commercial service (i.e., B-747-400, B-777, A340, etc.), the Airport can accommodate these ADG V aircraft with minor deviations to standards that have been approved by the FAA. With the introduction of the A380, new facilities and Airport upgrades would be provided to accommodate the New Large Aircraft. To minimize the infrastructure costs associated with ADG VI airport design, airfield facility requirements were developed to meet design standards of ADG V and ADG VI (where appropriate).

The following sections discuss the facility requirements for the various airfield components.

4.1.2.1 Runway Orientation

Weather conditions that influence airfield capacity and runway orientation requirements include wind direction and velocity, visibility and ceiling, and presence or absence of precipitation.

The primary direction in which operations can be conducted is determined by the prevailing wind conditions. Occasionally, high crosswind cases are also a factor in determining the primary direction. At towered airports, runway assignment is typically made by air traffic control based primarily on wind conditions or, during periods of calm winds, on other factors such as a preferred operating direction that provides higher capacity or enhanced noise abatement.

Wind coverage is typically used to describe how often an airfield can operate in various wind conditions that occur throughout the year. It is defined as the percent of time during the year that wind conditions allow operations to take place at an airport and is controlled by the direction and velocity of winds, the layout of the airfield, and the types of aircraft that use the airfield. The wind coverage of an airfield can have an impact on the capacity of the airfield as it determines the amount of time during the year that the airfield, or particular runways on the airfield, are available for use.

[6] The Aviation Activity Forecasts in Section III assumes that A380 operations will enter O'Hare's fleet by 2009.

An assessment of wind coverage under various airfield configurations was performed to determine the implications of the reorientation of runways at the Airport. Based on FAA Advisory Circular 150/5300-13, it is desirable to provide at least 95 percent wind coverage for any aircraft that are forecast to use the Airport on a regular basis, based on its allowable crosswind component. The Advisory Circular establishes recommendations for runway wind coverages and for allowable crosswind components for various aircraft categories.

The maximum allowable crosswinds considered were based on the airport reference code designations referred to in FAA Advisory Circular 150/5300-13. The airport reference code is a coding system used to relate airport design criteria to the operational and physical characteristics of the aircraft intended to operate at an airport. The airport reference code has two components relating to an airport's design aircraft. The first component, depicted by a letter, is the aircraft approach category as defined by aircraft approach speed (see **Table IV-1**). The second component, depicted by a Roman numeral, is the ADG as determined by aircraft wingspan (also shown in Table IV-1). Generally, aircraft approach speed applies to runways and runway-related facilities, while aircraft wingspan relates primarily to separation criteria involving taxiways and taxilanes.

Table IV-1

FAA Airport Reference Code

Aircraft Approach Category	Aircraft Approach Speed (knots)	ADG	Aircraft Wingspan (feet)
A	Fewer than 91	I	Fewer than 49
B	91-120	II	49-78
C	121-140	III	79-117
D	141-165	IV	118-170
E	166 or greater	V	171-213
		VI	214-262

Source: FAA Advisory Circular 150/5300-13, *Airport Design.*
Prepared by: Ricondo & Associates, Inc.

The majority of aircraft at the Airport (including narrow-body and wide-body aircraft) have allowable crosswind components of 16 knots or greater based on FAA criteria. It is important to recognize that crosswind criteria discussed here are based exclusively on FAA guidelines. These criteria may not reflect individual airline operating practices or pilot preferences, which are addressed later in this section. Additionally, operating practices typically specify different allowable crosswind components for dry pavement conditions and wet pavement conditions. **Table IV-2** depicts airport reference codes, representative aircraft, and allowable crosswind components.

The Airport's airfield currently includes three sets of parallel air carrier runways with six distinct runway orientations.[7] Runways designated 9-27 are aligned 090 and 270 degrees (east/west), Runways 4-22 are aligned 040 and 220 degrees (northeast/southwest), and Runways 14-32 are aligned 140 and 320 degrees (northwest/southeast). With the existing runway layout, combined wind coverage approaches 100 percent for crosswinds not exceeding 10.5 knots, which significantly exceeds FAA coverage requirements for air carrier aircraft.

[7] Existing Runway 18-36 is not included in this analysis since it currently does not serve significant activity levels.

Table IV-2

Aircraft Operations by Allowable Crosswind

Airport Reference Code	General Description	Sample Aircraft	Allowable Crosswind
A-I and B-I	Small General Aviation	Cessna 172, Piper 310	10.5
A-II and B-II	General Aviation and Small Turboprop	BAE 31, EMB 120	13
A-III through B-III and C-I through D-III	Regional Jet and Narrow-body Jet	B-737-300, A320, CRJ	16
A-IV through D-VI	Wide-body Jet	B-767-300, B-747, B-777, A-380	20

Source: Aircraft groupings and wind limitations based on FAA Advisory Circular 150/5300-13, *Airport Design.*
Prepared by: Ricondo & Associates, Inc.

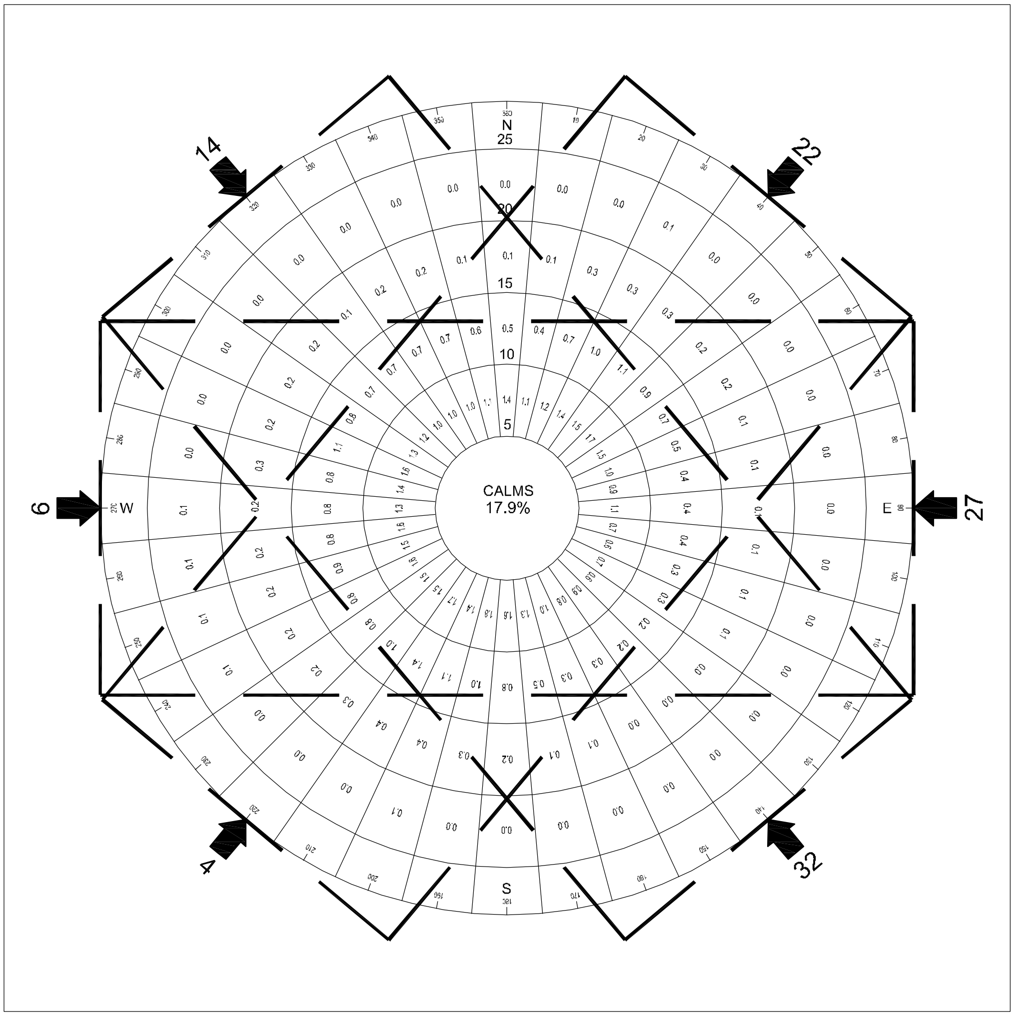
Weather data collected from the National Oceanic and Atmospheric Administration (NOAA) was analyzed to determine wind coverage for each existing air carrier runway orientation. Wind data covering the period 1991 through 2000 was analyzed to assess the coverages under various allowable crosswind components and weather conditions. **Exhibits IV-8** through **IV-10** present wind roses and coverage tables for All Weather conditions, IMC, and VMC. [8],[9] As shown, Runway 4-22 provides the greatest coverage of any single runway orientation, followed by Runway 9-27, and finally Runway 14-32.

As discussed in the prior sections, an increase in the IFR arrival capacity is the initial capacity improvement needed at the Airport. The primary means of providing this improvement is the development of a new independent runway in a direction parallel to one of the existing pairs. With the development of additional IFR arrival capacity, the need to provide additional IFR departure capacity becomes critical to balance with the arrival capabilities. Again, this is best accomplished by providing runway development in a direction parallel to the primary operating orientation to minimize conflicts with other operations. Ultimately, the continued addition of capacity in a single orientation makes the use of operating configurations using multiple runway orientations undesirable.

In order to assess the opportunities eliminating one of the runway orientations currently operated at the Airport, assessments of layouts without either runways in the northwest/southeast (14-32) orientation or northeast/southwest (4-22) orientation were performed.[10] The analyses were

[8] IMC exist when visibility is less than three statute miles and/or cloud ceilings are less than 1,000 feet above ground level (AGL).
[9] VMC exist when visibility is greater than or equal to three statute miles and cloud ceilings are greater or equal to 1,000 feet AGL.
[10] While Runway 4-22 provides the greatest coverage of any single runway orientation, the ability to add parallel runways in this orientation is limited without significant facility impacts.

ALL WEATHER WIND ROSE



ALL WEATHER WIND COVERAGE

CROSSWIND COMPONENT	RUNWAY		
	4-22	9-27	14-32
10.5 KTS	90.4%	87.0%	84.4%
13 KTS	96.3%	94.3%	92.8%
16 KTS	99.0%	98.3%	97.8%
20 KTS	99.9%	99.7%	99.5%

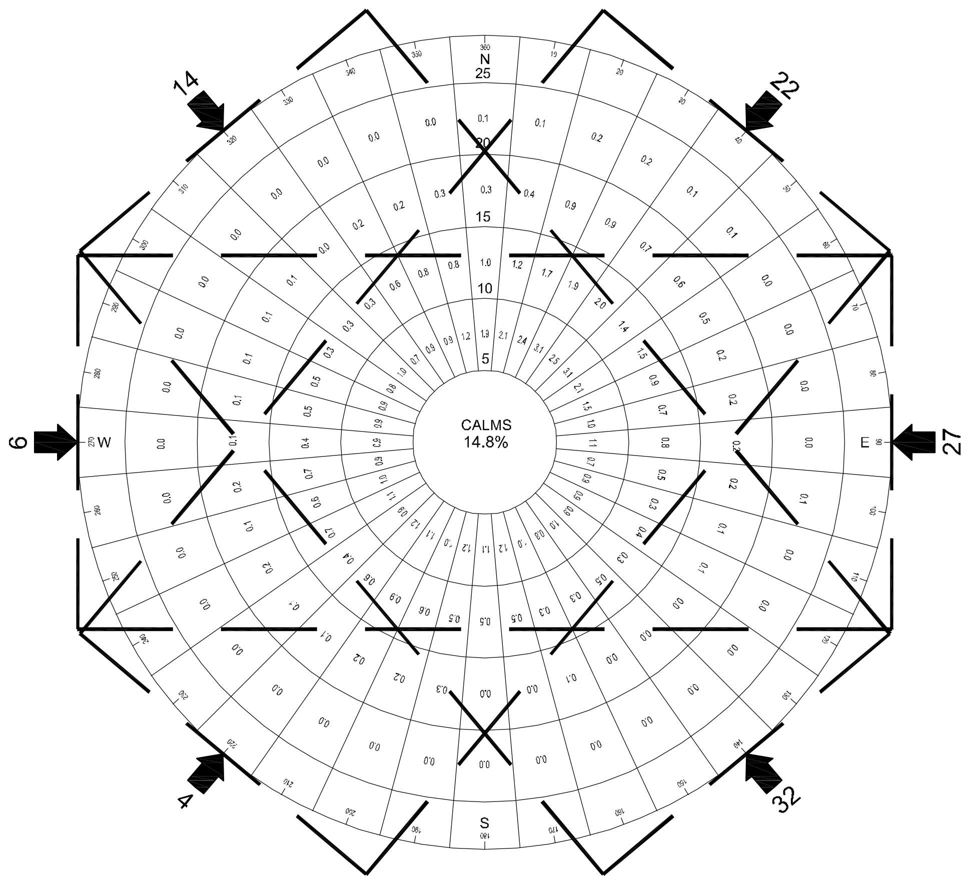
Source: Data from National Oceanic and Atmospheric Administration (1999-2000);
Coverage Calculations by Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit IV-8

0 N.T.S. north

Wind Rose
All Weather Wind Coverage

IFR WIND ROSE



IFR WIND COVERAGE

CROSSWIND COMPONENT	RUNWAY		
	4-22	9-27	14-32
10.5 KTS	91.9%	83.1%	79.9%
13 KTS	96.9%	91.8%	89.5%
16 KTS	99.1%	97.1%	96.5%
20 KTS	99.9%	99.4%	99.4%

Source: Data from National Oceanic and Atmospheric Administration (1999-2000);
Coverage Calculations by Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

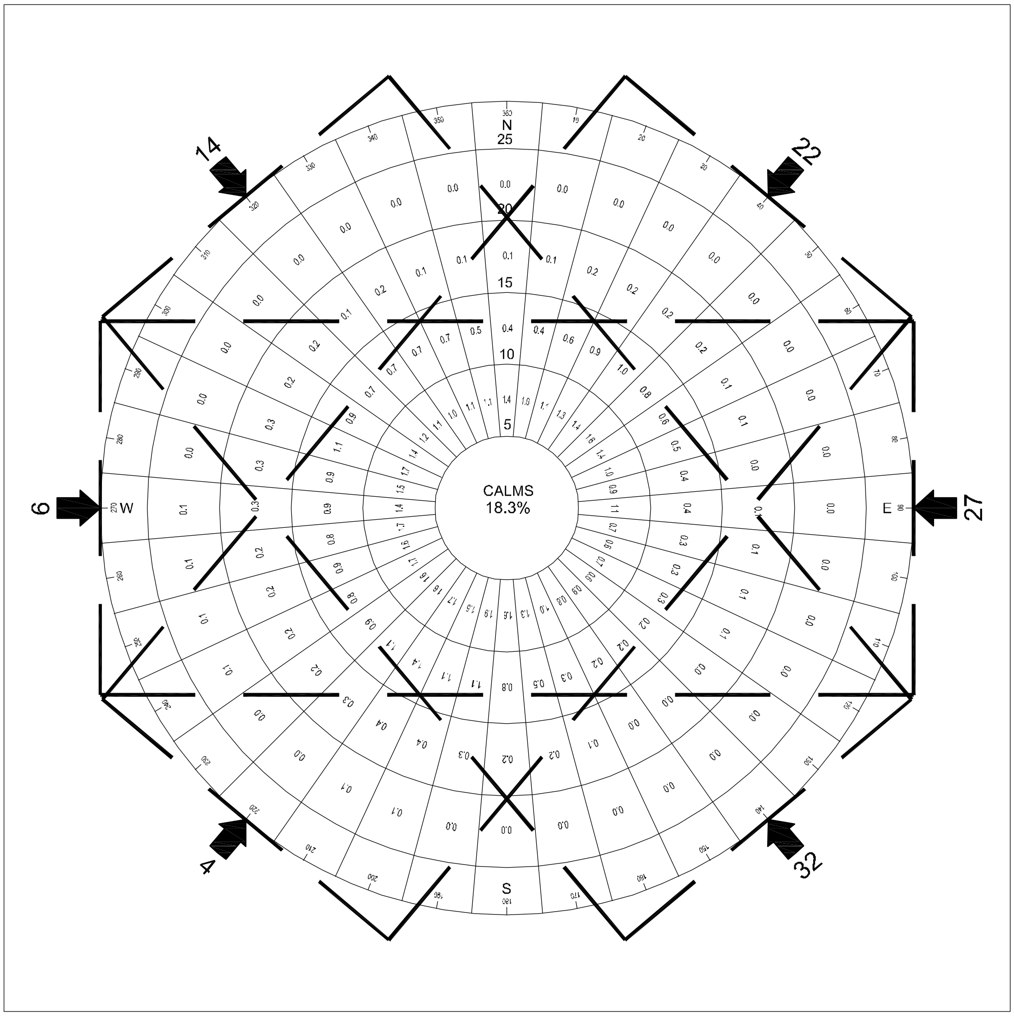
Exhibit IV-9

0 N.T.S.

north

Wind Rose
IFR Wind Coverage

VFR WIND ROSE



VFR WIND COVERAGE

CROSSWIND COMPONENT	RUNWAY		
	4-22	9-27	14-32
10.5 KTS	90.2%	87.4%	84.9%
13 KTS	96.2%	94.5%	93.1%
16 KTS	99.0%	98.4%	98.0%
20 KTS	99.9%	99.8%	99.6%

Source: Data from National Oceanic and Atmospheric Administration (1999-2000);
Coverage Calculations by Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit IV-10

0 N.T.S. north

Wind Rose
VFR Wind Coverage

performed for All Weather, IMC, VMC, and for observations when some form of precipitation was experienced. **Table IV-3** presents wind coverage for the combined northeast/southwest (4-22) and east/west (9-27) configurations, and the combined northwest/southeast (14-32) and east/west (9-27) configurations for both the 24-hour day and primary operating hours (6:00 a.m. to 10:00 p.m.). As shown, under all crosswind conditions, east/west runways (9-27), coupled with northeast/southwest runways (4-22), provide better coverage than east/west runways (9-27) coupled with northwest/southeast runways (14-32). East/west runway (9-27) orientations, coupled with northeast/southwest runway (4-22) orientations, meet the All Weather, VFR, and IFR coverage requirement of 95 percent for all crosswind components, whereas the 9-27 orientation, coupled with the 14-32 orientation, meets the 95 percent requirement for all conditions except the 10.5 crosswind limitation.

Table IV-3 also presents wind coverages for the various configurations under various crosswind components during precipitation events. As shown, the combination of east/west runways (9-27) and northeast/southwest runways (4-22) provides greater coverage during precipitation events than that provided by east/west runways (9-27) and northwest/southeast runways (14-32).

Airlines' flight operations and operational engineering departments provided aircraft performance data used to confirm the assessment of wind coverage.[11] The performance data show that maximum acceptable crosswind components for air carrier aircraft departures range from 30 to 35 knots during dry runway conditions and 20 to 25 knots during wet runway conditions depending on aircraft type. Maximum acceptable crosswind components for arrivals depend on weather conditions, runway conditions, aircraft type, and aircraft braking action. When the braking action of the runway is reported as "Fair" to "Good," the maximum acceptable landing crosswind component is 20 to 30 knots depending on aircraft type. During weather conditions where runway contamination exists and the braking action is reported as "Poor" or "Nil" (e.g., standing water, slush, packed snow, ice, etc.), the maximum acceptable crosswind component for landings, reported from airline data, is 10 to 15 knots depending on aircraft type.

Based on this information, nearly 100 percent wind coverage exists for air carrier operations under conditions when braking action is reported as "Fair" or better, while approximately 98.3 percent and 95.2 percent wind coverage exists for air carrier operations under conditions when braking action is reported as "Poor" or worse for the 9-27 orientation coupled with the 4-22 orientation and the 14-32 orientation, respectively (assuming a 13-knot allowable crosswind during these conditions). Based on this analysis, an airfield configuration that includes an east/west (9-27) orientation and either runways in the northeast/southwest (4-22) orientation or northwest/southeast (14-32) orientation will meet FAA wind coverage criteria. Of these combinations, the east/west (9-27) and northeast/southwest (4-22) orientations provide the better combined wind coverage level.

[11] Information was received through the Airline Parties Construction Representative for American Airlines, United Airlines, Alaska Airlines, Air India, El AL, and Japan Airlines.

Table IV-3

Wind Coverage

Condition	Occurrences	RW 9-27 & RW 4-22	RW 9-27 & RW 14-32
Daytime Operating Hours (06:00 – 22:00)			
10.5-Knot Crosswind			
All Weather	58,365	96.3%	92.6%
VFR	53,034	96.3%	92.9%
IFR	5,331	96.0%	89.7%
Precipitation	4,224	94.0%	88.8%
13-Knot Crosswind			
All Weather	58,365	98.9%	97.2%
VFR	53,034	98.9%	97.3%
IFR	5,331	98.7%	95.4%
Precipitation	4,224	98.3%	95.2%
16-Knot Crosswind			
All Weather	58,365	99.8%	99.2%
VFR	53,034	99.8%	99.3%
IFR	5,331	99.6%	98.4%
Precipitation	4,224	99.6%	98.3%
20-Knot Crosswind			
All Weather	58,365	100.0%	99.9%
VFR	53,034	100.0%	100.0%
IFR	5,331	100.0%	99.9%
Precipitation	4,224	100.0%	99.9%
All Hours (00:00 – 24:00)			
10.5-Knot Crosswind			
All Weather	87,543	96.7%	93.5%
VFR	79,442	96.7%	93.8%
IFR	8,101	96.3%	90.4%
Precipitation	6,534	94.0%	89.0%
13-Knot Crosswind			
All Weather	87,543	99.0%	97.6%
VFR	79,442	99.0%	97.7%
IFR	8,101	98.8%	95.7%
Precipitation	6,534	98.3%	95.2%
16-Knot Crosswind			
All Weather	87,543	99.8%	99.3%
VFR	79,442	99.8%	99.4%
IFR	8,101	99.7%	98.7%
Precipitation	6,534	99.6%	98.5%
20-Knot Crosswind			
All Weather	87,543	100.0%	100.0%
VFR	79,442	100.0%	100.0%
IFR	8,101	100.0%	99.9%
Precipitation	6,534	100.0%	99.9%

Source: Ricondo & Associates, Inc., National Oceanic and Atmospheric Administration; Asheville, North Carolina, 1991 through 2000.
Prepared by: Ricondo & Associates, Inc.

4.1.2.2 Runway Length

According to FAA planning criteria, the recommended length for a primary runway must be determined by considering either the family of aircraft having similar performance characteristics or a specific aircraft needing the longest runway. In either case, the choice should be based on aircraft that are forecast to use the runway on a regular basis, which is considered to be at least 250 operations a year, as defined in Advisory Circular 150/5325-4A, *Runway Length Requirements for Airport Design*.

Runway length requirements were developed based on the existing fleet operating at the Airport and the assumption that future operations would include the A380. The initial assessment of runway length requirements was based primarily on manufacturer's information, with FAA methodologies presented in Advisory Circular 150/5325-4A providing additional information where necessary. **Table IV-4** presents the results of this analysis.

In addition to this initial analysis, airlines' flight operations and operational engineering departments provided aircraft performance data used to assist in the confirmation of the runway length requirements. The performance data show that a runway length of 12,250 feet would be sufficient for all aircraft types and markets (90 degree Fahrenheit temperatures were assumed). Additionally, comments received from advisory sessions held with the FAA and airline representatives indicated a preference to preserve the existing maximum runway length of 13,000 feet currently provided by Runway 14R-32L. For the majority of existing aircraft and markets, the minimum acceptable arrival runway length was reported as 6,000 feet for dry runway conditions and 7,000 feet for wet runway conditions.

Runway 4L-22R, 7,500 feet in length, is the shortest operational runway on the existing airfield utilized by commercial airlines. Aircraft performance data specific to this runway was provided by American Airlines and United Airlines for use in the development of airfield options. Assuming full passenger payloads, 90 degree Fahrenheit field temperatures, and domestic market stage lengths, the length of this runway satisfies 100 percent of landing requirements and over 85 percent of the departure requirements for aircraft in ADG I through IV. The data provided show that B-737-300, B-757, and A320 aircraft originating from O'Hare destined to the West Coast (i.e., range of 1,500 nautical miles) could depart without payload penalty while B737-200, MD-82, and MD-83 aircraft would be payload-restricted. The performance data suggest that as older aircraft are replaced by newer, higher performing aircraft, over 95 percent of the domestic market aircraft fleet mix accommodated at O'Hare would be able to accept a 7,500 foot runway for departure (assuming maximum passenger payload and 90 degree Fahrenheit airfield temperature). To maximize the operational efficiency and flexibility of the airfield, and to minimize the need for Air Traffic to segregate aircraft by providing the ability for the vast majority of aircraft to depart from any given runway, air carrier runways at O'Hare should be at least 7,500 feet in length.

With the predicted introduction of the A380 to the Airport, certain runways should be designated to support New Large Aircraft operations. These runways would need to be built to ADG VI standards. Based on manufacturer's information, new ADG VI runways with departure lengths greater than 10,300 feet should be provided where practicable.

Table IV-4

Runway Length Requirements

Aircraft	Aircraft Weight (pounds)		Runway Length Requirements (feet)		Aircraft Powerplant
	Max. Design Takeoff Weight	Max. Design Landing Weight	Takeoff[1/]	Wet Landing[2/]	
Small Narrow-body					
A319	141,096	134,481	6,150	5,200	CFM56-5A
A320	162,037	142,196	8,100	5,850	IAE V2500
B-737-200	128,100	107,000	8,550	5,700	JT8D-17R/17AR
B-737-300	138,500	115,800	7,850	5,400	CFM 56-3B2
B-737-500	133,500	110,000	9,250	5,250	CFM 56-3B-1 (20,000 LB SLST)
B-737-800	174,200	146,300	8,400	6,300	CFM 56-7B26
DC9-41	114,000	102,000	7,400	5,650	JT8D-15
MD-87	149,500	130,000	8,200	5,600	JT8D-217C
CRJ 100ER	51,000	47,000	7,200	5,000	2 GE CF 34-3A1
CRJ 200ER	53,000	47,000	7,400	5,750	2 GE CF 34-3B1
EMB-145ER	45,415	41,226	6,950	5,250	AE3007A
Fokker-100 (Version II)[3/]	98,000	88,000	6,725	5,400	TAY MK 650
Medium Narrow-body					
B-757-200[4/]	255,000	210,000	7,350	5,750	RB211-535E4B
Medium Wide-body					
B-767-300ER	407,000	320,000	9,900	6,075	CF6-80C2-B6, PW4060, RB211-524H
B-777-200 (Baseline Aircraft)	535,000	445,000	8,000	5,950	Pratt & Whitney Engines
B-777-200 (High Gross Weight)	632,500	460,000	10,900	6,100	Pratt & Whitney Engines
Large Wide-body					
B-747-400[5/]	875,000	630,000	11,000	8,000	RB211-524G2
New Large Aircraft					
A380-800	1,234,588	850,984[6/]	10,300	6,400	TRENT 970/GP 7270
A380-800F	1,300,727	941,374[6/]	9,500	6,900	TRENT 977/GP 7277

1/ Takeoff runway length requirements based on 83.5º Fahrenheit (unless otherwise indicated), calm winds, dry pavement conditions, maximum allowable flaps setting, and maximum certified takeoff weight.

2/ Landing distance requirements based on ISA conditions, calm winds, wet pavement conditions, maximum allowable flaps setting, and maximum certified landing weight.

3/ Fokker-100 takeoff distance required is estimated under 92.5º Fahrenheit.

4/ B757-200 takeoff distance required is estimated under 81.7º Fahrenheit.

5/ B747-400 takeoff distance required is estimated under 89.4º Fahrenheit.

6/ A380 landing distance required is estimated under dry conditions.

Source: Airplane Characteristics for Airport Planning Manuals, various aircraft manufacturers; FAA AC 150/5325-4A, *Runway Length Requirements for Airport Design;* Airbus A380 Airplane Characteristics for Airport Planning- Preliminary Issue.
Prepared by: Ricondo & Associates, Inc.

4.1.2.3 Runway Width

FAA design criteria specify a runway width of 150 feet for ADG V and 200 feet for ADG VI. In addition to the final structural width of the runway, paved or otherwise, stabilized shoulders 35 feet in width (ADG V) and 40 feet in width (ADG VI) on either side of the runway are also required by FAA design standards.

4.1.2.4 Runway Separation

Runway capacity at heavily utilized airports like O'Hare is dependent upon the ability to provide multiple arrival and departure streams. A variety of airfield configurations can accommodate multiple streams; however, per FAA AC/150-5060-5, *Airport Capacity and Delay Manual*, maximum capacity can be achieved with parallel runways. During most instrument meteorological conditions, multiple arrival streams can only be accommodated on parallel runways.

Separations required for simultaneous operations vary depending on the number of runways, operational dependency, and meteorological conditions. **Table IV-5** details separations for a range of possible operational conditions.

Table IV-5

Runway Separation Standards

	Runway Centerline Separation (feet)	
Operational Configuration	Recommended	Minimum
Visual Meteorological Conditions:		
Simultaneous Approaches and Departures[1/]	1,200	700
Instrument Meteorological Conditions:		
Simultaneous Dual Precision Approaches[2/]	4,300	3,000
Simultaneous Triple Precision Approaches[2/]	5,000	4,300
Simultaneous Quadruple Precision Approaches[3/]	5,000	5,000
Simultaneous Departures[4/]	3,500	2,500
Simultaneous Approaches and Departures[5/]	2,500	1,000

1/ Runway separations less than 2,500' are subject to air traffic control restrictions when wake turbulence is a factor.

2/ Separations less than recommended down to the minimum will be considered by the FAA on a case-by-case basis. Special high update radar and monitoring equipment is required.

3/ Quadruple approaches will be considered by the FAA on a case-by-case basis. Special high update radar and monitoring equipment is required.

4/ Simultaneous non-radar departures require 3,500' separation. This can be reduced to 2,500' with radar.

5/ Simultaneous radar-controlled approaches and departures can be approved for separations of 2,500' for non-staggered thresholds. Separations down to 1,000' can be achieved with staggered thresholds. A minimum of 1,200' separation is recommended for ADG V and VI runways.

Source: FAA Advisory Circular 150/5300-13, *Airport Design*
Prepared by: Ricondo & Associates, Inc.

As discussed in the prior sections, development of runways to provide increased IFR arrival and departure capacity, as well as longer-term increases in VFR capacity, will be needed to meet future demand. Where these operational requirements are accommodated on parallel runways, the airfield configuration should provide the appropriate runway centerline separations from the following list, based on the anticipated types of operation on each parallel runway:

- Minimum of 4,300-foot separation between independent IMC arrival runways with the recommended 5,000-foot separation provided where possible;
- Minimum of 2,500-foot separation between independent VMC arrival runways;
- Minimum of 2,500-foot separation between independent departure runways and other runways; and
- Minimum of 1,200-foot separation between dependent departure runways and other runways.

4.1.2.5 Runway Pavement Strength

Runway pavement strength can be expressed as single-wheel loading, dual-wheel loading, and dual-tandem wheel loading. The aircraft gear type and configuration dictate how the aircraft weight is distributed to the pavement and determine pavement response to loading. The FAA provides criteria for use in determining pavement design that considers these variables and others.

Any new or relocated runways at the Airport will be constructed considering the anticipated use of the facility (annual landing/take-off cycles, aircraft fleet, etc.), including the needs of future ADG VI aircraft such as the A380.

4.1.2.6 Taxiway System

The taxiway system at the Airport should provide for free movement of aircraft to and from the runways, terminal/cargo, and aircraft parking areas. It is desirable to maintain a smooth flow with a minimum number of points requiring a change in an aircraft's taxiing speed.

FAA design criteria detailed in FAA Advisory Circular 150-5300-13 provides the basis for defining the taxiway system requirements. Specific criteria in the Advisory Circular includes the need to provide a full-length parallel taxiway to allow for the most efficient and safe movement of aircraft from the runway to the terminal area, crossfield taxiing capability and sufficient queuing areas, and high-speed runway exit taxiways to allow for final approach spacing of 2.5 nautical miles between arriving aircraft. Additional taxiway design principles, as stated in the Advisory Circular, include the following:

- Build taxiways as direct as possible,
- Provide bypass capability or multiple access to runway ends,
- Minimize crossing runways,
- Provide ample curve and fillet radii,
- Provide airport traffic control tower line of sight, and
- Avoid traffic bottlenecks.

Taxiways at the Airport are currently designed to accommodate ADG V aircraft. With the anticipated introduction of ADG VI aircraft into the fleet during the planning period, taxiway development should consider the need to facilitate efficient movement of New Large Aircraft without restricting the movement of other aircraft. If all new taxiways are not built to ADG VI standards, the New Large Aircraft would be restricted to designated taxiways.

4.1.2.7 Airfield Safety Areas

The FAA has established design standards for the various airfield safety areas as part of FAA Advisory Circular 150/5300. These design criteria are established to protect both the movement of aircraft on the taxiway system and in transition to/from flight and people and property on the ground. The following paragraphs discuss the general requirements for airfield safety areas:

- *Runway Safety Area (RSA)* is a rectangular area centered on the runway centerline, which, under normal (dry) conditions, is capable of supporting an aircraft without causing structural damage to the aircraft or injury to the occupants. To serve this function, the FAA requires a safety area to be (1) cleared and graded, (2) drained by grading or storm sewers to prevent water accumulation, and (3) free of objects, except those that need to be located in the RSA because of their function (e.g., approach lighting and NAVAIDs). Based on FAA design criteria, the RSA for a primary runway serving ADG V and VI aircraft should be 500 feet wide and extend 1,000 feet beyond the runway ends.
- *Object Free Area (OFA)* is a rectangular area centered on the runway centerline that is required to be clear of objects protruding above the RSA edge elevation, with the exception of those objects that are essential to air navigation (e.g., NAVAIDs) or aircraft ground maneuvering. Objects that are nonessential for either air navigation or aircraft ground maneuvering are not permitted within the OFA. For runways serving Aircraft Approach Category D aircraft, the OFA should be 800 feet wide (i.e., 400 feet on either side of the runway centerline) and extend 1,000 feet beyond the physical end of the runway.
- *Obstacle Free Zone (OFZ)* is a three-dimensional volume of airspace that supports the transition of ground to airborne operations (or vice versa). The FAA OFZ clearance standards preclude taxiing and parking aircraft or other objects, except frangible NAVAIDs or fixed-function objects, from penetrating the airspace. The OFZ consists of a volume of airspace centered on the runway and, where applicable, on runways equipped with an approach light system, an inner-approach OFZ is provided. In addition, an inner-transitional OFZ is provided for runways serviced with a precision instrument approach procedure.
- *Runway Protection Zone (RPZ)* is a trapezoidal area centered on the extended runway centerline. RPZs are designed to enhance the protection of people and property on the ground. This area should be free of land uses that create glare and smoke, whenever practical. Also, the FAA recommends that airport operators keep RPZs clear of incompatible land uses, specifically residences and places of public assembly (e.g., churches, schools, office buildings, shopping centers, and fuel storage facilities). Typically, a single RPZ is associated with each runway end. However, runways with a displaced threshold may require separate approach and departure RPZs. The length and width of the RPZ is contingent on the size of the aircraft operating on the runway as well as the type of approach available. For a precision approach runway serving large aircraft, the inner width of the RPZ should be 1,000 feet (500 feet either side of the runway centerline) and extend 200 feet from the end of the runway with an outer width of 1,750 feet, at a length of 2,500 feet.

Appropriate RSAs, OFAs, OFZs, and RPZs will be provided on all new runways and runways improved by the proposed plan.

4.1.2.8 NAVAIDs

For this study, required NAVAIDs are divided into two general categories: electronic approach NAVAIDs and visual approach NAVAIDs. These two categories of NAVAIDs are defined as follows, and electronic approach NAVAIDs are discussed in more detail in this section.

- *Electronic approach NAVAIDs* assist the aircraft performing instrument approaches to an airport. An instrument approach is a series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight from the beginning of its initial approach to its landing or to a point from which a landing may be made visually.
- *Visual NAVAIDs* provide aircraft guidance once an aircraft is within sight of an airport and aids aircraft maneuvering on the ground. Each runway end that is CAT II/III capable is required by the FAA to have a high intensity approach lighting system with sequenced flashers (ALSF-2). Other visual NAVAIDs that may be required include the following: Runway End Identification Lights (REIL), Four-box Precision Approach Path Indicator (PAPI), Medium Intensity Runway Lighting (MIRL), and Medium Intensity Taxiway Lighting (MITL).

Electronic approach NAVAIDs include an ILS that allows pilots to land aircraft in poor visibility conditions. During conditions of low visibility or low ceiling, delays are very high because the arrival rate is reduced. As the Airport's operations continue to grow in the future, it will become more important to maintain high arrival rates and minimize delay during all weather conditions. Maintaining a high arrival rate during IMC is critical to reducing delay at the Airport.

IMC are classified under three approach categories. CAT I approach weather criteria include IMC weather down to minimum ceilings of 200 feet and visibility of at least ½ statute mile. CAT II approach criteria includes ceilings below 200 feet and/or visibility less than ½ statute mile down to and including a ceiling height of 100 feet and Standard CAT II RVR minimums of 1,200 feet. CAT III approach weather criteria include ceilings and visibility less than CAT II approach minimums. It is also worth noting that an FAA-approved Surface Movement Guidance and Control System (SMGCS) Plan is required to conduct ground movement of aircraft below 1,200 feet RVR with additional specialized lighting systems and/or vehicle guidance requirements below 600 feet RVR.

Weather data obtained from NOAA shows that the Airport experiences CAT I conditions 8.4 percent of the time, CAT II conditions 0.47 percent of the time, and CAT III conditions 0.28 percent of the time. Because it is critical to maintain runway capacity during all levels of IMC, CAT II/III coverage should be provided wherever possible. The existing airfield is equipped with CAT II/III coverage on Runways 14R and 14L. With the need for additional runway capacity at the Airport, a weather analysis was conducted to determine which runways would need to be equipped with CAT II/III approach lighting and equipment. Physical constraints of the airfield, cost considerations, and weather data may not support the installation of CAT II/III approach lighting systems on all runways. Data collected from NOAA were analyzed to assist in determining runway wind coverage during weather conditions requiring CAT II/III approaches.

An analysis of weather and wind data for the period 1991 through 2000 was performed to determine runway coverage during CAT II/III conditions for the various runway options. **Table IV-6** presents the results of this analysis. In total, CAT II/III weather occurred in 434, or 0.75 percent, of all 58,365 daytime observations over the 10-year period.

Table IV-6

CAT II/III Wind/Weather Coverage

	Crosswind Component			
Runway	10.5 knots	13 knots	16 knots	20 knots
Runway 9	72.4%	76.5%	77.4%	78.1%
Runway 27	28.8%	31.6%	32.0%	33.0%
Runway 9-27	89.9%	96.8%	98.2%	99.3%
Runway 4	65.0%	66.1%	68.4%	69.1%
Runway 22	36.9%	38.0%	38.0%	38.0%
Runway 4-22	94.7%	97.0%	99.3%	100.0%
Runway 14	55.5%	60.4%	64.1%	65.4%
Runway 32	41.9%	47.9%	50.5%	50.9%
Runway 14-32	83.2%	91.9%	97.9%	99.5%

Source: Data from National Oceanic and Atmospheric Administration; Asheville, North Carolina, 1991 through 2000. Coverages calculated by Ricondo & Associates, Inc. for daytime hours between 06:00 and 22:00.
Prepared by: Ricondo & Associates, Inc.

The data suggest that for crosswind limitations of 13 knots or greater, either a 9-27 or 4-22 orientation provides over 95 percent coverage. None of the orientations meet 95 percent coverage for 10.5 knots maximum crosswind. Based on the weather data, provision of CAT II/III approaches in the 9-27 or 4-22 direction would provide the best coverage for these conditions.

4.1.2.9 Airfield Facility Requirements Summary

A summary of airfield facility requirements is shown in **Table IV-7**.

4.2 Passenger Terminal Area Facility Requirements

Facility requirements for passenger terminals focus on the ability to accommodate aircraft at terminal facilities in terms of gates (i.e., an aircraft parking position) and supporting linear ramp frontage. For purposes of this analysis, terminal facility requirements are first discussed in terms of aircraft gates and corresponding linear aircraft apron frontage and then in terms of the passenger terminal buildings.

Table IV-7

Airfield Facility Requirements Summary

Facility Type/Component	ADG V	ADG VI
Runway Requirements		
Minimum Runway Length	7,500 feet	10,300 feet
Runway Width	150 feet	200 feet
Runway Shoulder Width[1/]	35 feet	40 feet
Runway Blast Pad Width	220 feet	280 feet
Runway Blast Pad Length	400 feet	400 feet
Clearway Width	150 feet	200 feet
Independent Arrival Runway Centerline to:		
-Parallel Independent Arrival Runway Centerline		
Minimum	4,300 feet	4,300 feet
Recommended	5,000 feet	5,000 feet
Departure Runway Centerline to:		
-Parallel Runway Centerline		
Minimum	1,200 feet	1,200 feet
Recommended	2,500 feet	2,500 feet
Runway Centerline to:		
-Aircraft Parking Area	500 feet	500 feet
-Taxiway Centerline	400 feet	600 feet
Runway Object Free Area Width	800 feet	800 feet
-Length Beyond Runway End	1,000 feet	1,000 feet
Runway Obstacle Free Zone Width	400 feet	400 feet
-Length Beyond Runway End	200 feet	200 feet
Runway Safety Area Width	500 feet	500 feet
-Length Beyond Runway End	1,000 feet	1,000 feet
Taxiway Requirements		
Taxiway Width	75 feet	100 feet
Taxiway Shoulder Width[1/]	35 feet	40 feet
Taxiway Centerline to:		
-Parallel Taxiway/Taxilane Centerline	267 feet	324 feet
-Fixed or Movable Object[2/, 3/]	160 feet	193 feet
Taxiway Object Free Area Width	320 feet	386 feet
Taxiway Safety Area Width	214 feet	262 feet

1/ Design Groups V and VI normally require stabilized or paved shoulder surfaces.

2/ This value also applies to the edge of service and maintenance roads.

3/ Consideration of the engine exhaust wake impacted from turning aircraft should be given to objects located near runway/taxiway/taxilane intersections.

Source: Ricondo & Associates, Inc., *FAA Advisory Circular 150/5300-13, Airport Design*
Prepared by: Ricondo & Associates, Inc.

4.2.1 Terminal Aircraft Gates

The approach utilized to define terminal gate needs is intended to establish order of magnitude requirements for use in development of long-range conceptual future terminal configurations. For conceptual planning purposes, overall gate requirements were estimated using a general planning factor of 200,000 annual enplanements-per-gate.[12] This planning factor, applied to the 5.3 million annual enplanements projected for 2018, yields a preliminary requirement of 265 gates. This calculation is based on general planning factors predicated on existing conditions and does not account for changes in aircraft gate mix, more efficient utilization of gates, etc. Therefore, this initial 2018 requirement for 265 gates is presented to provide a measure against which to assess reasonability of further refinements of the gate requirements undertaken in the Section 5.2.1 of this document. More detailed program requirements for terminal expansion will be developed in subsequent planning phases.

4.2.2 Apron Frontage Requirements

The gate requirements were converted into apron frontage to provide a planning tool convenient for developing future terminal area configurations and to use to evaluate the extent to which alternative terminal concepts meet projected demand for gate facilities. The apron frontage was calculated using the narrow-body equivalent methodology defined in AC 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*. Using the B-757 as the representative aircraft requiring a narrow-body equivalent gate (125 feet wing-span plus 25 feet wingtip clearance between aircraft for a total width of 150 feet), the future terminal configurations should provide approximately 39,750 linear feet of apron frontage to accommodate the projected requirement for 265 gates. The gate frontage required for the Airport may vary due to changes in schedules, future fleet mixes, the geometric configuration of the terminal, and other factors.

4.2.3 Passenger Terminal Building

For the purpose of developing conceptual terminal configurations, gross terminal area requirements have been evaluated based on the passenger enplanement forecast developed in Section 3.3. The detailed development of a terminal area space program will occur in subsequent planning phases of the project.

FAA planning criteria contained in AC 150/5360-13 were reviewed and compared to the utilization of existing terminal areas at the Airport to evaluate their reasonableness for estimating future terminal space. The FAA criteria suggest that the gross terminal area should provide between 0.08 to 0.12 square feet per annual enplaning passenger. **Table IV-8** shows the analysis of the existing terminal areas at the Airport. The domestic and international facilities of the Airport have been analyzed independently due to differing facility characteristics. This analysis indicates that the existing ratio of terminal area to domestic enplanements of 0.11 square feet per enplanement is consistent with the FAA recommendation. The existing ratio at the Airport of terminal area to international enplanements is 0.28 square feet per enplanement. This higher ratio reflects the significant area required for FIS facilities, large passenger holdrooms, and other terminal facilities unique to international terminals as well as the utilization characteristics of this market. The

[12] This planning factor, appropriate for large hub airports, was considered reasonable given current gate utilization rates at O'Hare. In 2000, 35,700,949 annual enplanements were accommodated at the Airport's approximately 189 gates, resulting in a gate utilization rate of 189,000 enplanements-per-gate.

weighted average of the ratios, reflecting the relationship of total existing terminal area to 2000 annual enplanements, is 0.13 square feet per enplanement.

Table IV-8

2000 Actual Terminal Utilization Characteristics

Terminal Area	Annual Enplanements	Terminal Area (square feet)	Terminal Area per enplanement (square feet)
Domestic	31,652,949	3,620,925	0.11
International	4,048,000	1,136,199	0.28
Total all Terminals	35,700,949	4,757,124	0.13

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

Table IV-9 summarizes the gross terminal area requirements for 2018 activity using the existing Airport terminal utilization ratios. The estimated terminal area necessary to accommodate the projected demand of 5.3 million annual passengers is in the range of 6.9 million to 7.4 million square feet. This is a net increase of approximately 2.5 million square feet, or 53 percent, over the existing terminal area.

Table IV-9

2018 Estimated Gross Terminal Area Requirements

Terminal Area	Annual Enplanements	Enplanements per square foot	Terminal Area (square feet)
Domestic	43,567,049	0.11	4,800,000
International	9,427,177	0.28	2,600,000
Total all Terminals – Maximum	52,994,226		7,400,000
Total all Terminals – Minimum	52,994,226	0.13	6,900,000

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

Ultimately, the operational efficiency of the proposed terminal configurations for both aircraft and passengers will determine their ability to accommodate passenger demand. Because of changes in fleet mix and terminal utilization by different carriers over time, various existing facilities may have to be redeveloped, which will affect future overall facility requirements.

4.3 Support/Ancillary Facility Requirements

Ancillary facilities needed to support the operation of the Airport include the following:

- Cargo
- Airline aircraft maintenance
- Airline (GSE) maintenance
- Flight kitchens
- Airport maintenance/DOA
- GA/FBO

- ARFF Stations

The current support facilities at the Airport have been in continuous development since the beginning of commercial passenger and cargo operations in 1963. The appropriate and efficient utilization of these facilities serves as the basis for the projection of future requirements. The methodology for assessing the support facility requirements has included surveys of major tenants, interviews with DOA staff, projections of cargo facility requirements based on forecasted demand, and the evaluation of current facility utilization.

The support/ancillary facility requirements are projected to increase in total site area from an estimated 609 acres in 2002 to approximately 685 acres in 2018, representing a 12.5 percent increase in area. **Table IV-10** summarizes the facility requirement by each facility category. As shown, only the Cargo, Airline Maintenance, and the Airport Maintenance/DOA facilities have been identified as potentially requiring additional facilities over the planning horizon. The following sections provide relevant details on the development of the facility requirements.

4.3.1 Cargo

In order to develop requirements for cargo facilities at the Airport, the cargo forecasts presented in Section III were reviewed and compared to existing conditions and facilities. In addition, a limited number of preliminary interviews were held with the larger cargo carriers at the Airport. The facility projections were developed based on the information resulting from these tasks.

Cargo forecasts indicate cargo enplaned tonnage growth of 58 percent between 2000 and 2018. Larger carriers were interviewed to determine if and how their facilities would accommodate this growth. The results of these interviews were incorporated into allocation of facility requirements as follows:

- For carriers surveyed that stated that no additional facilities were required, 2018 facility building areas and site acreages were maintained at equal capability to their existing facilities.
- For carriers surveyed stating that additional facilities were required, 2018 facility building areas and site acreages were increased according to the carrier's stated requirement.
- For carriers that did not provide future facility requirement information, the remaining cargo handling facilities were increased proportionally to the cargo tonnage growth through 2018 compared to 2000 tonnage (58 percent), using the assumption that space utilization ratios (facility square footage to enplaned cargo tons) remain the same for each facility and that the carrier's market share at the Airport remains constant through 2018.

Although this methodology projects facility size increases based on existing facilities, ultimate growth could be a combination of existing facility expansion and new facilities. **Table IV-11** presents the breakdown of existing cargo facilities and the future facility requirements in planning year 2018. Existing cargo facilities total approximately 261 acres. A total of approximately 316 acres of cargo development is needed to accommodate 2018 requirements.

Table IV-10

Support/Ancillary Facility Requirements Summary by Facility Component

	Existing Facilities	2007	2009	2013	2018
Cargo Facilities[1/, 2/]					
Building Area (SF)	3,118,400	3,664,900	3,809,900	4,090,900	4,391,900
Number of Parking Stalls	4,541	3,992	4,140	4,425	4,731
Parking Area (SF)	1,774,500	1,414,000	1,461,000	1,552,000	1,650,000
Airside Apron (SF)	3,254,600	3,014,800	3,060,800	3,148,800	3,243,800
Other Area (SF)	3,540,420	4,014,300	4,171,300	4,472,300	4,795,700
Total Site Area (SF)	11,360,200	11,780,280	12,175,280	12,936,280	13,753,680
Total Site Area (Acres)	261	270	280	297	316
Airline Aircraft Maintenance					
Building Area (SF)	1,215,200	Timing for implementation of additional facilities to be determined			1,419,290
Number of Parking Stalls	2,531				2,900
Parking Area (SF)	772,300				892,300
Airside Apron (SF)	3,497,200				3,857,200
Other Area (SF)	4,042,300				4,298,900
Total Site Area (SF)	9,527,000				10,467,690
Total Site Area (Acres)	219				240
Airline GSE Maintenance					
Building Area (SF)	256,100	Requirements remain constant			256,100
Number of Parking Stalls	401				401
Parking Area (SF)	137,900				137,900
Other Area (SF)	906,600				906,600
Total Site Area (SF)	1,300,600				1,300,600
Total Site Area (Acres)	30				30
Flight Kitchens					
Building Area (SF)	286,400	Requirements remain constant			286,400
Number of Parking Stalls	509				509
Parking Area (SF)	177,400				177,400
Other Area (SF)	267,800				267,800
Total Site Area (SF)	730,600				730,600
Total Site Area (Acres)	17				17
Airport Maintenance and DOA					
Building Area (SF)	631,300	Additional facilities are a function of the ultimate airfield layout			631,300
Number of Parking Stalls	1,078				1,078
Parking Area (SF)	448,900				448,900
Other Area (SF)	1,894,000				1,894,000
Total Site Area (SF)	2,974,200				2,974,200
Total Site Area (Acres)	68				68
GA/FBO					
Building Area (SF)	30,400	Existing facility relocated in 2002 – requirement remains constant			30,400
Number of Parking Stalls	70				70
Parking Area (SF)	23,200				23,200
Airside Apron (SF)	574,500				574,500
Other Area (SF)	5,700				5,700
Total Site Area (SF)	633,800				633,800
Total Site Area (Acres)	15				15
Total Area (SF)	26,526,400	26,946,480	27,341,480	28,102,480	29,860,570
Total Area (Acres)	609	619	628	645	685

1/ Includes the U.S. Postal Service facilities (Buildings 600 and 514) with a total site area of 61 acres.

2/ Cargo requirements for 2007, 2009, 2013, and 2018 reflect facilities required for on-Airport cargo only.

Source: Existing – Ricondo & Associates, Inc., compiled from existing 2002 data from DOA Properties and Real Estate, Lease Exhibits, and Aerial Photographs; Future – tenant interviews May-June 2003 and projections by Ricondo & Associates, Inc.

Prepared by: Ricondo & Associates, Inc.

Table IV-11

Existing and Future Cargo Facilities

Building	Annual Enpl. Cargo (tons)	Building [5/] Area (sf)	Employee Parking [1/,2/] Spaces	Employee Parking [1/,2/] Area (sf)	Aircraft Apron (sf)	Other Area [3/,4/] (sf)	Total Site Area sf	Total Site Area acres
Existing--								
Carriers Surveyed	394,847	903,700	1,063	398,500	2,266,600	1,154,500	4,723,300	108.4
510 (former Lynx)	17,391	144,600	330	142,700	310,300	126,500	724,100	16.6
Carriers not surveyed	360,758	2,070,100	3,148	1,233,300	677,700	2,259,420	5,912,800	135.7
Total All Carriers	772,996	3,118,400	4,541	1,774,500	3,254,600	3,540,420	11,360,200	261.0
Future (2018)								
Carriers Surveyed	625,832	1,110,900	1,450	472,000	2,247,800	1,362,800	5,193,500	119.2
510 (former Lynx)	0		0	0	0	0	0	0.0
Carriers not surveyed	599,451	3,281,000	3,281	1,178,000	1,074,000	3,402,000	8,607,280	197.6
Total All Carriers	1,225,283	4,391,900	4,731	1,650,000	3,243,800	4,795,700	13,753,680	315.7

1/ Employee parking spaces for future facilities for the carriers not surveyed are calculated at one space for every 1,000 square feet of building area.

2/ Employee parking area is calculated at 325 square feet for each new parking space.

3/ Other Area includes truck dock parking, staging and circulation and other landside related support space.

4/ Growth in the Other Area for the carriers not surveyed is calculated at 95 percent of the projected overall cargo growth rate.

5/ The El Al Air Cargo Simulation Facility is not included as an airline cargo facility for the purpose of calculating future requirements.

Source: Existing – Ricondo & Associates, Inc., compiled from 2002 data from DOA Properties and Real Estate, Lease Exhibits, and Aerial Photographs; Future – tenant interviews May-June 2003 and forecasted projections by Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Table IV-12 presents the distribution in growth of the cargo facility requirements for each of the planning years between 2000 and 2018 including 2007, 2009, and 2013. For carriers indicating expansion of existing facilities is required, 79 percent of the additional building growth required by 2018 occurs by 2007. Because the capacity of the existing facilities for the carriers surveyed is already strained, the request for additional facilities by these carriers includes area necessary to meet current demands. In the case of the carriers for which facilities have been projected, the forecasted facilities growth is distributed for each of the planning years more evenly, reflecting that there is underutilized capacity in the existing facilities that can accommodate a portion of the future demand before expanded or new facilities need to be brought on line. The increased demand for these additional facilities may be generated by either the existing carriers or potential new carriers to the Airport. A more detailed cargo area planning study will be conducted in later planning phases.

Table IV-12

Allocation of Future Cargo Facilities to Various Planning Years

Description of Carrier Groups for which facilities have been allocated	Annual Enplaned Cargo (tons)	Building Area (square feet)	Employee Parking Stalls	Employee Parking Area (square feet)	Aircraft Apron (square feet)	Other Area (square feet)	Total Site Area (square feet)	Total Site Area (acres)
Allocation of facilities for current carriers indicating expansion of total site area is not required								
Existing – 2000	257,542	779,200	883	322,900	1,779,100	915,600	3,796,800	87.2
Future – 2018	408,204	862,900	1,094	356,000	1,677,600	900,300	3,796,800	87.2
Allocation of facilities for current carriers indicating expansion of existing facilities is required								
Existing – 2000	137,305	124,500	180	75,600	487,500	238,900	926,500	21.3
Future – 2007	171,147	222,000	318	107,000	492,200	439,000	1,260,200	28.9
2009	180,434	227,000	326	109,000	492,200	450,000	1,278,200	29.3
2013	198,372	237,000	340	112,000	492,200	471,000	1,312,200	30.1
2018	217,628	248,000	356	116,000	492,000	493,400	1,349,600	31.0
Allocation of Facilities for Current and Future Carriers for which expanded facilities have been projected[1/]								
Existing – 2000	378,149	2,214,700	3,478	1,376,000	988,000	2,385,920	6,636,900	152.4
Future – 2007	471,352	2,580,000	2,580	951,000	845,000	2,675,000	6,723,280	154.3
2009	496,931	2,720,000	2,720	996,000	891,000	2,821,000	7,100,280	163.0
2013	546,332	2,991,000	2,991	1,084,000	979,000	3,101,000	7,827,280	179.7
2018	599,451	3,281,000	3,281	1,178,000	1,074,000	3,402,000	8,607,280	197.6
Total requirement for all carriers								
Existing – 2000	772,996	3,118,400	4,541	1,774,500	3,254,600	3,540,420	11,360,200	261.0
Future – 2007	963,517	3,664,900	3,992	1,414,000	3,014,800	4,014,300	11,780,280	270.4
2009	1,015,805	3,809,900	4,140	1,461,000	3,060,800	4,171,300	12,175,280	279.5
2013	1,116,788	4,090,900	4,425	1,552,000	3,148,800	4,472,300	12,936,280	297.0
2018	1,225,283	4,391,900	4,731	1,650,000	3,243,800	4,795,700	13,753,680	315.7

1/ Facilities related to Building 510 (former Lynx Cargo) are not included in the projection of expanded facilities for current and future carriers.

Source: Existing – Ricondo & Associates, Inc., compiled 2002 data from DOA Properties and Real Estate, Lease Exhibits, and Aerial Photographs; Future – tenant interviews May-June 2003 and forecasted projections by Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

4.3.2 Airline Aircraft Maintenance

Aircraft maintenance facility requirements at an airport are driven by airlines' system-wide operational plans. It is difficult to link these facility requirements to activity. In order to develop requirements for airline maintenance facilities, preliminary interviews were held with the two major carriers at the Airport. In addition, carriers known to have interest in establishing maintenance facilities at the Airport were interviewed to document their requirements. The results of these interviews were incorporated into allocation of facility requirements as follows:

- For carriers surveyed that stated that no additional facilities were required, 2018 facility building areas and site acreages were maintained at equal capability to their existing facilities.
- For carriers surveyed stating that new facilities were required, 2018 facility building areas and site acreages have been included according to the carrier's stated requirement.
- For carriers that did not provide future facility requirement information, the requirements for future maintenance facilities were held equal to the existing facilities.

Table IV-13 presents the breakdown of existing airline maintenance facilities and the requirement for future facilities in the planning year 2018. Existing airline maintenance facilities comprise approximately 219 acres. Approximately 240 acres of this is needed to accommodate 2018 requirements. This is a net increase of 21 acres, or 10 percent, over the existing airline maintenance site area. It should be noted that a more detailed analysis of all the carriers is needed to identify unutilized or under-utilized airline maintenance facilities. These facilities might be available to accommodate the requirements of the carriers requesting new space in lieu of adding to the existing overall inventory of these types of facilities.

Table IV-13

Aircraft Maintenance Facilities Requirements

	Building Area[2/] (square feet)	Employee Pkg[1/] Stalls	Employee Pkg[1/] Area (square feet)	Aircraft Apron (square feet)	Other Area[3/] (square feet)	Total Site Area (square feet)	Total Site Area (acres)
Existing Facilities	1,215,200	2,531	772,300	3,497,200	4,042,300	9,527,000	219.0
Future Requirements							
Carriers Surveyed	1,244,890	2,338	728,000	3,473,600	3,916,000	9,362,490	214.9
Carriers Not Surveyed[3/]	174,400	562	164,300	383,600	382,900	1,105,200	25.0
Total All Carriers	1,419,290	2,900	892,300	3,857,200	4,298,900	10,467,690	240.0

1/ All the existing airline maintenance facilities are located in the Northwest Maintenance Area. A common employee parking lot is anticipated to be developed in the long-term for this area. The capacity of the planned common employee parking lot would be designed to include the number of existing parking spaces indicated.

2/ Fifteen percent of office component indicated by carriers requesting new facilities has been included in the building requirements footprint.

3/ The Ground Run-up Enclosure is not included as an airline maintenance facility for the purpose of calculating future requirements.

Source: Existing – Ricondo & Associates, Inc., compiled 2002 data from DOA Properties and Real Estate, Lease Exhibits, and Aerial Photographs; Future – tenant interviews May-June 2003 by Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

4.3.3 Airline GSE Maintenance

The approach to identifying the requirements for airline GSE maintenance facilities was the same as described above for the airline aircraft maintenance facilities. Of the three carriers with existing facilities at the Airport, two carriers were interviewed. Both carriers indicated that additional facilities would not be required to support their GSE maintenance operations through 2018. **Table IV-14** presents the breakdown of airline GSE maintenance facilities. The existing airline GSE maintenance facilities, which are anticipated to remain constant throughout the planning period, comprise a total of approximately 30 acres.

Table IV-14

GSE Maintenance Facilities

	Building Area (square feet)	Employee Parking[1/,2/] Stalls	Employee Parking[1/,2/] Area (square feet)	Other Area[3/] (square feet)	Total Site Area (square feet)	Total Site Area (acres)
Carriers Surveyed	244,800	211	77,500	550,700	873,000	20.0
Carriers Not Surveyed	11,300	190	60,400	355,900	427,600	9.8
Total All Carriers	256,100	401	137,900	906,600	1,300,600	29.9
975 American GSE Staging-Terminal 3[4/]	2,400	0	0	117,300	119,700	2.7

1/ All the existing GSE buildings are located in the Northwest Maintenance Area. A common employee parking lot is anticipated to be developed in the long-term for this area. The capacity of the planned common employee parking lot would be designed to accommodate the number of existing parking spaces indicated. Separate employee parking for the future buildings to be relocated will be required if they must be moved before the new common employee parking lot is available.

2/ There are only 11 on-site parking spaces for the existing American GSE Maintenance Facility, because the building is adjacent to a common parking lot for American employees at Hangar No. 2. The existing employee parking of 190 spaces for Continental includes area for employees working in the terminal.

3/ Other Area includes truck docks and equipment storage and staging.

4/ The future American GSE Staging Area for Terminal 3 (Building 975) is assumed to be accommodated within the program for the portion of Terminal 4 provided for under the WGP.

Source: Existing – Ricondo & Associates, Inc., compiled 2002 data from DOA Properties and Real Estate, Lease Exhibits, and Aerial Photographs; Future-Tenant interviews May-June 2003 by Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

As a separate line item on Table IV-14, it is shown that American Airlines does have an existing GSE Staging Area (Building 975) to support their Terminal 3 aircraft apron operations. This facility is located on the south side of Taxiways A and B and across from the end of Concourse K. Should this site be impacted by the proposed airfield improvements, it is assumed this facility would be accommodated within the program for the portion of Terminal 4 provided for under the World Gateway Program. The site area for this GSE Staging Area has not been included in the overall GSE maintenance facility requirements.

4.3.4 Flight Kitchens

The demand for food services is changing significantly. There has been a reduction of food service beyond snacks and beverages for most domestic flights. For the purpose of this phase of the planning process, the existing area for flight kitchens of 17 acres has been held constant throughout the planning horizon. The breakdown of the components of flight kitchens is presented in **Table IV-15**. It should be noted that Gate Gourmet (Building 504) has indicated they intend to expand their building onto unutilized land on their existing site in the future. It is also possible that the two buildings currently housing the operations of Gate Gourmet (Buildings 741 and 742) in the Northwest Maintenance Area would be consolidated into one new facility when airfield improvements cause relocation.

Table IV-15

Flight Kitchens Requirements

		Employee Parking			Total Site	
Building No./Name	Building Area (square feet)	Stalls	Area (square feet)	Other Area (square feet)	Area (square feet)	Area (acres)
504 Gate Gourmet[1/]	61,100	144	46,600	144,300	252,000	5.8
511 LSG/Sky Chef	109,600	365	130,800	26,700	267,100	6.1
741 Gate Gourmet Flight Kitchen No. 1[2/]	59,100	0	0	28,500	87,600	2.0
742 Gate Gourmet Flight Kitchen No. 2[2/]	55,600	0	0	68,300	123,900	2.8
Total	285,400	509	177,400	267,800	730,600	16.8

1/ The DOA has indicated that Gate Gourmet has plans to expand its building on the existing site. There is unutilized land on the site that can accommodate potential building and parking expansion.

2/ The Gate Gourmet Flight Kitchens in the Northwest Maintenance may become one consolidated facility in the future if required to be relocated by the ultimate airfield layout.

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

4.3.5 Airport Maintenance/DOA

Based on comments by Airport personnel, the existing Airport maintenance facilities are generally adequate to meet existing demands.[13] **Table IV-16** indicates the existing Airport Maintenance and DOA Facilities to remain.

4.3.6 GA/FBO

GA activities at the Airport are limited to only one Fixed Base Operator (FBO), Signature Flight Services (SFS). In 2002, SFS relocated their terminal to a new site at the Airport on the former military site west of Bessie Coleman Boulevard and on the south boundary of the Northeast Cargo Apron. These new facilities, located on approximately 15 acres, include a terminal; parking for visitors, employees, and rental cars; and an aircraft apron. Since GA activity is expected to remain constant

[13] Subsequent to this analysis, DOA determined that it would be appropriate to reserve a potential site for future AMC development on the north airfield. This is discussed further in Section 5.3.3.

Table IV-16
Airport Maintenance and DOA Facilities

Building No./Name	Building Area (square feet)	Employee Parking Stalls	Employee Parking Area (square feet)	Other Area (square feet)	Total Site Area (square feet)	Total Site Area (acres)
Existing Facilities to Remain						
502 AMC – Southeast Services Area[1/]	349,900	413	185,800	329,300	865,000	19.9
Other DOA Facilities	281,400	665	263,100	1,564,700	2,109,200	48.4
Total Existing Facilities to Remain	631,300	1,078	448,900	1,894,000	2,974,200	68.3

1/ The area for the existing AMC Complex includes an equipment storage and maintenance building with associated support space, a salt storage building, a glycol and runway deicer facility, a vehicle fuel stand, and a guardhouse for the employee parking lot.

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

throughout the planning period, it is not anticipated that additional area beyond that which is currently provided for the new FBO facility will be needed during this timeframe.

4.3.7 ARFF Stations

The three existing ARFF stations for the Airport are configured such that they can accommodate any anticipated equipment improvements. The requirements for ARFF facilities during this phase of planning has been limited to evaluating their size needs. The location and response requirements are specific to the proposed airfield layout and will be assessed in conjunction with the analysis of alternatives and development of the ALP.

4.4 Ground Access Facility Requirements

This section describes requirements for Airport ground access roadways, vehicle parking areas, and rental car facilities.

To enhance ground access to the Airport to accommodate future terminal development and projected growth in Airport traffic, the following priorities have been established:

- Balance the long-term airfield, terminal, and ground access capability at the Airport
- Enhance the flow and capacity of the on- and off-Airport roadway system to accommodate existing and future growth

4.4.1 Roadways

Airport roadway facilities typically are designed for the peak-hour traffic on the design day allowing for the splitting and recirculation of traffic within the various areas of the Airport property. For purposes of the Master Plan, roadway planning is conceptual. Detailed requirements will be developed following completion of the surface transportation modeling effort.

The preferred airfield, terminal, and support/ancillary facilities concepts dictate roadway development and/or improvement needs. In general, when evaluating roadway concepts, the following criteria were considered:

- must be cost effective from a construction, operation, and maintenance perspective;
- should cause minimal impact to adjacent communities including, but not limited to, right-of-way impacts, construction impacts, and access/circulation impacts; and
- provide for future expansion of the roadway system by state and local transportation agencies to accommodate roadways proposed in the Chicago region long range transportation plan.

4.4.2 Public Parking

Public parking facility requirements were developed based on the existing correlation of peak month originating enplanements to available parking spaces and projected for the planning horizon based on the forecast of peak month originating enplanements. The relationship between the existing (August 2001) peak month originating enplanements and existing (August 2001) available parking stalls yielded a planning factor of 13.4 stalls per thousand peak month originating enplanements. This factor is consistent with FAA guidelines established in Advisory Circular 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities.* Additionally, based on the relationship between the existing number of short-term and long-term parking stalls (i.e., 12,967 and 9,996 stalls, respectively), short-term parking requirements are assumed to be approximately 55 percent of total stalls, while long-term parking requirements are assumed to be approximately 45 percent of total stalls.

Structured parking area is programmed to provide 350 square feet per stall, and surface parking area is programmed to provide 325 square feet per stall. **Table IV-17** summarizes the public parking facility requirements for the forecast years of analysis.

Table IV-17

Summary of Overall Public Parking Facility Requirements

	Existing (2001)	Forecast Year 2007	2009	2013	2018
Peak Month Originating Enplanements	1,714,703	1,997,798	2,110,370	2,336,231	2,600,466
Total Daily Parking Stalls	12,967	14,739	15,570	17,236	19,185
Total Economy Parking Stalls	9,996	12,059	12,739	14,102	15,697
Total Number of Parking Stalls	22,963	26,798	28,309	31,338	34,883

Source: Existing Stalls – *Final Environmental Assessment, Chicago O'Hare International Airport, World Gateway Program and Other Capital Improvements,* Table 2-7: Public Parking Summary, February 8, 2003; Existing Enplanements – 2001 FAA Terminal Area Forecast, U.S. DOT Origin-Destination Survey, Ricondo & Associates, Inc.; Future Enplanements – 2001 FAA Terminal Area Forecast, Ricondo & Associates, Inc.; Forecast Years Stalls – Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

4.4.3 Employee Parking

Demand for employee parking is correlated to the facilities in which employees work. The demand for employees working in the Airport's terminals and flight crews departing from the terminals is dependent upon passenger activity. Parking for these employees is typically located remotely from the terminal in large consolidated lots, from which employees are bused to the terminals. Employees working at other facilities located on the Airport (e.g., maintenance or cargo facilities including cargo flight crews) are dependent upon specific characteristics of those facilities. Facility requirements for employees working at other facilities at the Airport were projected with the requirements for those facilities (see Section 4.5, Support/Ancillary Facility Requirements.) Thus, the development of facility requirements for employee parking focused on the segment of employees working in the terminals and flight crews departing from the terminals.

Employee parking facility requirements for employees working in and flight crews departing from the terminals were developed based on the existing correlation of total annual enplanements to available parking spaces and projected for the planning horizon based on the forecast of total annual enplanements. The relation between the existing (2001) annual enplanements and existing (2001) available employee parking stalls yielded a planning factor of approximately 0.23 employee stalls per 1,000 annual enplanements. **Table IV-18** summarizes parking requirements for the forecast years of analysis for employees working in and flight crews departing from the Airport's terminals.

Table IV-18

Summary of Parking Facility Requirements for Employees Working in Terminals and Flight Crews

	Existing (2001)	Forecast Year			
		2007	2009	2013	2018
Annual Enplanements	33,308,138	41,003,466	43,182,162	47,539,553	52,994,226
Total Number of Parking Stalls[1/]	7,601[2/]	9,360	9,850	10,850	12,090

1/ Total parking stalls based on ratio of 0.23 stalls per thousand annual enplanements.

2/ The existing employee parking lots are located in two areas of the Airport. The lot west of the AMC Building in the Southeast Services Area provides 1,134 employee parking stalls. In addition, United Airlines and American Airlines have approximately 6,467 employee parking stalls in the Northwest Maintenance Area to accommodate employees working in the Terminals. The remainder of the stalls in the Northwest Maintenance Area accommodate employees working at maintenance facilities in this area of the Airport.

Source: Existing Annual Enplanements – City of Chicago Department of Aviation, Airport Management Records; Forecast Years Annual Enplanements – 2001 FAA Terminal Area Forecast, Ricondo & Associates, Inc.; Existing/Forecast Years Stalls– Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

The assumption used to estimate the area requirement for employee parking lots was 300 square feet per stall for surface parking and 325 square feet per stall for structured parking. It is noted that these factors are lower than those used to project public parking needs, as it is assumed that employee parking lots can be configured more efficiently than public parking lots.

4.4.4 Rental Car Facility

Programming materials developed in 1999 during conceptual planning for a consolidated rental car facility were reviewed and verified for their applicability based on the planning horizon. The 1999 conceptual planning exercise identified the requirement for 118-119 acres to meet future requirements of the rental car market at O'Hare. This conclusion was based on the following:

- The requirement would consist of a structured consolidated rental car facility and surrounding surface areas located on Airport property.
- The entire Airport rental car market would be accommodated in the facility, rather than a specific number of companies.
- Deplaning passenger growth and rental car transaction growth would continue according to historic trends.

The 118- to 119-acre requirement was verified in September 2002 based on market conditions of the rental car industry.[14]

4.4.5 Commercial Vehicle Staging Areas

Facility requirements for commercial vehicle staging areas were based on the existing correlation of peak month originating enplanements to area currently provided for the staging of commercial vehicles and projected for the planning horizon based on the forecast of peak month originating enplanements. The relationship between the existing (August 2001) peak month originating enplanements and existing (August 2001) area dedicated to staging of commercial vehicles yielded a planning factor of 0.25 square feet of staging area per originating enplanement.

The above planning factor yields a total square footage for all commercial vehicle staging areas. Typically, components of commercial vehicles are segregated for operational purposes, thus, the existing relationship between the areas of the various components (i.e., City of Chicago taxis, limousines, and other vehicles such as regional buses, suburban taxis, and shuttle buses) was maintained.

The previously approved May 2002 Future ALP included an area (approximately 297,500 square feet) designated to accommodate a new Limo Service Center along the west side of Bessie Coleman Drive. The facility requirements calculation resulted in a smaller requirement; however, it was determined to maintain the larger area for limousines as depicted on the previously approved May 2002 Future ALP.[15]

Table IV-19 summarizes the facility requirements for commercial vehicle staging areas by type of vehicle.

[14] Memorandum from John F Brown Company to Jim Jarvis (Ricondo & Associates, Inc.), "ORD ALP and Rental Car Facilities," September 25, 2002.
[15] O'Hare Construction Operations Working Group, January 24, 2003.

Table IV-19

Summary of Commercial Vehicle Staging Area Requirements

Commercial Vehicle Type	Area (square feet)
City Taxis	233,510
Limousines	297,500
Bus/Suburban Taxi/Other	192,560
Total	723,570

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