2003
ACE PLAN
Aviation Capacity Enhancement Plan

Centennial of Flight 1903–2003

U.S. Department of Transportation
Federal Aviation Administration

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Centennial of Flight 1903-2003

BUILDING CAPACITY TODAY FOR THE SKIES OF TOMORROW

Federal Aviation Administration

December 2003

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The Aviation Capacity Enhancement (ACE) Plan is published annually by the Federal Aviation Administration's (FAA) Office of System Capacity. It contains a summary of the significant accomplishments and near-term goals of FAA-related programs, technologies, and initiatives affecting the capacity of the National Airspace System (NAS). Airports, airlines and aviation organizations use the ACE Plan. In addition to the U.S. and international aviation industry stakeholders, academia and members of the U.S. Congress are also part of its audience.

The ACE Plan discusses various approaches to enhancing airport and airspace capacity. The FAA relies on procedural and technological investments to increase airspace capacity, and while those approaches are also useful in the airport environment, airport capacity is most directly enhanced by building new runways or other airfield infrastructure.

Introduction
Summarizes the challenges that continue for the aviation industry. Features selected milestones in aviation history and technological development affecting the NAS.

Chapter 1 – Aviation Activity in the National Airspace System
Contains a summary of activity by user groups during 2003 and discusses the revised FAA forecasts for aviation activity to FY 2014.

Chapter 2 – National Airspace System Performance and Airport Capacity Analysis
Reports new NAS performance measures. Summarizes recent delays, trends in delays, and the data systems that assist in analysis.

Chapter 3 – Development of Airport Capacity
Summarizes various programs that increase airport capacity. Reports on the progress of capacity analysis projects and runway construction projects.

Chapter 4 – Operational Procedures
Provides new, updated and modified operational procedures. Topics include air traffic management during convective weather (the Spring/Summer Plan), reduced separation minima, the development of RNAV approaches, and simultaneous approaches to closely-spaced parallel runways.

Chapter 5 – Airspace Redesign
Contains program updates to redesign airspace and maximize efficiencies in air traffic flow. Reports on various elements of the National Airspace Redesign Plan, including high-altitude redesign and regional airspace redesign initiatives.

Chapter 6 – Air Traffic Control System Modernization
Contains an overview of the FAA's air traffic control NAS modernization efforts.

These chapters are supported by additional information on aviation activity and construction projects at the busiest 100 U.S. airports in the following appendices:

Appendix A
Provides historical, current, and forecast information on passenger enplanements and aircraft operations.

Appendix B
Summarizes the status of the recommendations for completed Capacity Enhancement Plans.

Appendix C
Summarizes runway construction projects that are proposed for 2009 and beyond.

Appendix D
Presents airport layouts with an update of current and proposed capacity enhancement projects.

Appendix E
Defines acronyms used in this plan.

Appendix F
Lists the references used to prepare the ACE Plan and credits materials from FAA and other sources.

About the Data
Each year the airports that constitute the busiest 100 will slightly change as traffic at some of the airports grow more rapidly. Often several airports near the bottom of the list will be dropped off and replaced by others.

The 2003 ACE Plan contains data for both calendar years (CY) 2002 and fiscal years (FY) 2002. Since FAA forecasts are available only for fiscal years, all data relating to those forecasts are for fiscal years. Other data, such as delays, are presented for relevant calendar years.

Forecasting future aviation activity is always difficult and the further in the future these projections are made, the greater their uncertainty. Therefore, please use these forecasts with the knowledge that they may be significantly adjusted, both up and down.

INTRODUCTION CHARTING THE NEXT CENTURY OF FLIGHT

"Whether outwardly or inwardly, whether in space or time, the farther we penetrate the unknown, the vaster and more marvelous it becomes."

~ Charles A. Lindbergh

Challenges Continue for the Aviation Industry

In 2003, the aviation industry and the U.S. economy as a whole continued a steady but uneven recovery. The recovery of U.S. aviation has been slower than expected, largely resulting from the impact of the war in Iraq and airline industry restructuring. The demand for air travel both within the U.S. and between the U.S. and other world travel regions declined sharply in 2002, resulting in a reduction of scheduled flight, or less system capacity, reflecting an 8.6 percent decline in available seat miles (ASMs) from 2001.

The ripple effect of troubled finances for the airlines continues to impact the nation's airports. Relationships between airlines and airports are changing, as hub airports are most vulnerable when major capital plans rely on one or more of the major carriers as tenants, and lower air traffic has a negative impact on Passenger Facility Charges (PFC) revenue. However, less capacity has not proportionately reduced the demand on air traffic management resources. The complexity of air traffic has increased at many large hub airports because of the increase in regional jets. Low-cost carriers continue to expand point-to-point service as opportunities result from the route consolidations of the larger carriers. Smaller regional jets that require greater separation will operate a greater proportion of flights in the future. Most large air carrier schedule reductions at large hub airports occurred during off-peak periods, and at some airports, peak-period activity levels have increased over pre-September 11th levels. These complexities make the FAA's job more challenging even with less overall traffic.

For commercial aviation to recover its traffic and profitability, business travel must return to pre-2001 levels, currently FAA forecasts this to occur in 2006. The resumption of business travel depends on the recovery and strength of future U.S. and world economic activity. It is also too early to assess whether or not increased security measures at airports may have contributed to the permanent or temporary shift of passengers, particularly higher-yield business travelers, to other modes of transportation. The FAA, along with the stakeholders of the aviation industry, are using this period of traffic recovery to apply measurement systems supportive of a performance-based organization, and to implement new planning initiatives, such as the FAA Flight Plan 2004-2008 and update the FAA's Operational Evolution Plan.

The FAA expects that the Nation's invaluable air transportation system will remain the most popular transportation mode throughout the foreseeable future. The following summary and chapter divider graphics of the 2003 ACE Plan commemorate a century of powered flight, as the FAA continues to operate with an indomitable spirit of dedication and commitment, to "Chart the Next Century of Flight" for the world's largest, busiest and safest aviation system.

Highlights from a Century of Powered Flight

On December 17, 1903, Wilbur and Orville Wright launched the world's first successful flight of a powered, heavier-than-air machine, and went on to perfect a controllable aircraft by 1905. The Wright brothers, pursuing their passions and applying their ingenuity, gave birth to the dynamic aviation industry that continues to succeed through the most trying of times, driven by men and women exhibiting a similar indomitable spirit and love of flight.

The first flight took place in Kill Devil Hills, North Carolina, piloted by Orville, lasted 12 seconds and went a distance of 37 meters. In 2002, the U.S. commercial air carrier passenger fleet reached an inventory of 5,156 aircraft. While the Introduction for the 2003 ACE Plan contains highlights from "A Century of Powered Flight," the chapter dividers will include famous quotations about aviation, to recognize the inspiration that aviation provides, affecting all aspects of our culture. As the FAA and its stakeholders work together to chart the next century of flight, imagine the magnitude of changes that will occur in the aviation and aerospace industry by 2103.

Selected Milestones In Aviation History and Technological Developments Affecting Demand and Capacity in the National Airspace System*

Year		Event
1903	Wright Flyer	First powered airplane
1926	Goddard Rockets	First liquid propellant rocket
1926	Western Air Express	One of the first U.S. airlines to offer regular passenger service
1926	Varney Speed Lines	Carrier established that eventually became Continental Airlines in 1937
1927	Spirit of St. Louis	First solo transatlantic flight
1927	Pitcairn Aviation	Established, 3 years later became Eastern Air Transport operating through its shutdown in 1991
1928	Commerce Department	A partial radio navigation beacon system was developed; teletype machines usage began to transmit aviation weather information
1928	Delta Air Services	Carrier established that became Delta Air Corp in 1930
1929	NY-2 Biplane (Lt. James Doolittle)	First flight guided entirely by instruments
1930	Air Traffic Control (ATC)	First radio equipped ATC tower in Cleveland
1930	American Airways	Formed and changed to American Airlines in 1934
1930	Transcontinental and Western Air	First merger, for the companies that became Trans World Airlines (TWA) in 1950
1930	Cleveland Municipal Airport	First establishment of radio control of airport traffic
1932	Amelia Earhart	First woman to fly solo across the Atlantic Ocean
1938	Civil Aeronautics Authority	CAA created to manage Air Route Traffic Control Centers (ARTCCs)
1942	Bell XP-59A Airacomet	First American turbojet
1942	Tuskegee Airmen	First Group of African American aviators earn their wings
1942	VS-300 (Igor Sikorsky)	First flight of the modern helicopter
1946	Civil Aeronautics Authority	First radar-equipped control tower at Indianapolis
1946	FAAP Act	Established the Federal-aid Airport Program
1947	Bell X-1 aka Glamorous Glennis	First aircraft to travel the speed of sound at a speed of Mach 1.06 or 670 mph
1949	Chicago O'Hare ARTCC	First radiotelephone communications with pilots
1949	Civil Aeronautics Authority	Authorized commercial planes to use Ground Control Approach (GCA) radar for bad weather landings
1951	U.S. Aviation Industry	First time air passenger miles passed train passenger miles
1954	Boeing 707	First U.S. jet transport tested. Speed 550 mph, range: 3,500 mi., passenger capacity: 150
1957	Civil Aeronautics Authority	Establishes control of continental airspace at or above 24,000 ft. via 12 super skyways
1958	Explorer	First successful U.S. satellite launched
1958	FAA	FAA formed by the Federal Aviation Act
1958	NASA	Formation of the civilian space agency
1961	FAA	First national standards for air traffic rules for flights on and around all controlled airports went into effect
1962	Mariner 2	First interplanetary probe
1962	Mercury (John Glenn)	First American in earth orbit
1962	FAA	At Chicago O'Hare, simultaneous instrument approaches on parallel runways was approved to relieve traffic delays at peak periods
1964	XB-70A	First flight of Air Force supersonic aircraft
1965	Gemini IV	First American space walk

* For a more detailed summary of milestones in aviation history, see www.centennialofflight.gov; The FAA web site offers its historic summary for the period 1926-1996 on www.faa.gov.

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Year		Event
1967	American X-15	First hypersonic, high altitude aircraft
1968	U.S. Congress	Established the Aviation Trust Fund for funding FAA programs and operations
1969	Apollo 11 Command Module	First manned lunar landing
1970	FAA	Established the Air Traffic Control Systems Command Center
1976	Concorde	First supersonic passenger flight approved at New York JFK and Washington Dulles airports for Anglo French SST Concorde operation
1978	President Carter	Signed the Airline Deregulation Act that resulted in applications for 248 new airline routes and special provisions boosting commuter airline growth
1981	Columbia (OV-102)	First U.S. space shuttle to fly into orbit
1981	FAA	Adopted a reduced interim air traffic control operations plan “Flow Control 50” due to dismissal of 11,400 controllers
1983	Global Positioning System (GPS)	First aircraft navigated across the Atlantic entirely using GPS cited by the FAA for future civil aviation use
2001	FAA	September 11th terrorist attacks forces the unprecedented 2-day shutdown of U.S. airspace

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CHAPTER 1 AVIATION ACTIVITY IN THE NATIONAL AIRSPACE SYSTEM

"Travelers are always discoverers, especially those who travel by air. There are no signposts in the air to show a man has passed that way before. There are no channels marked. The flier breaks each second into new uncharted seas."

~ Anne Morrow Lindbergh

1 Aviation Activity in the National Airspace System

Measuring aviation activity is a way of estimating the demand on airports and the air traffic control system. Capacity is an expression of their ability to meet that demand, so any analysis of capacity requires an analysis of current and future demand. The FAA measures aviation activity primarily in terms of passenger enplanements, revenue ton miles, and aircraft operations. By definition, only commercial passenger operations produce passenger enplanements and only cargo operations produce revenue ton miles, while all aviation activity produces aircraft operations (takeoffs and landings).

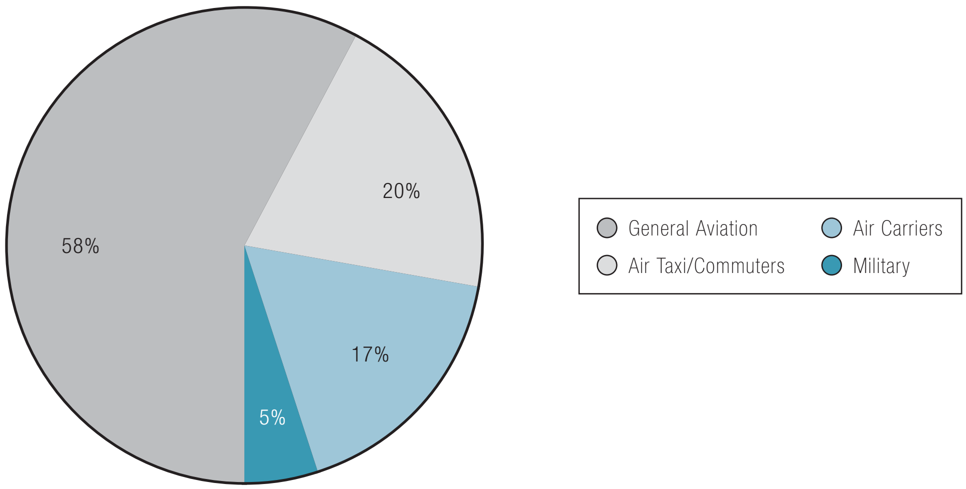
Three general types of aviation activity take place in the National Airspace System: commercial passenger and cargo transportation, general aviation, and military operations. Each type uses different types of aircraft, has its own patterns of operations, and places different demands on airports and the air traffic control system. This chapter briefly describes each type of aviation activity, recent trends in different measures of that activity, and FAA forecasts through FY 2014.

1.1 Aviation Activity

Within each of the general types of aviation activity, there are many kinds of operators that conduct a wide range of operations. Commercial activity includes large commercial air carriers, regional carriers, on-demand air taxis, all-cargo airlines, and others. All commercial activity is conducted within the FAA's air traffic control system, and is concentrated at the largest airports, usually near large metropolitan areas. General aviation includes private pilots flying on business, corporate jets, agricultural applications, and recreational and student pilots. The majority of general aviation activity (but by no means all) takes place at small airports far from urban centers and may have little or no contact with the air traffic control system. Much of the contact that general aviation pilots have is with the specialists at flight service stations rather than with air traffic controllers. However, general aviation does have a significant presence at some major airports. Military operations include flight training, weapons familiarization, and troop and equipment transport. Each of these types of activity use a variety of aircraft, including both fixed wing airplanes and helicopters, from an experimental home-built aircraft to a B-747 or a supersonic jet fighter. Military airports support most of the military traffic and the military's own air traffic control system handles most of their terminal operations.

The FAA tracks aircraft operations for four classes of users: air carriers, air taxis/commuters, general aviation operators, and the military. As Figure 1-1 shows, general aviation accounted for the majority of all aircraft operations in FY 2002, with air carrier and air taxi/commuters accounting for most other operations. Military operations made up a small fraction of all aircraft operations. The proportion of total operations by each user group does not vary much from year to year. Aircraft operations for all user groups for the busiest 100 airports for the past three years (both fiscal and calendar) are shown in Appendix A-2.

Figure 1-1 Aircraft Operations by User Type for FY 2002



1.1.1 Commercial Passenger Activity

Commercial aviation continued to struggle during 2002. Already reduced forecasts were revised downward as the gradual recovery to pre-recession traffic levels failed to take place as expected. However, FAA forecasts do show that passenger enplanements will reach 2000 levels by 2006. The aviation industry also showed signs of segmentation, as low-fare carriers continued to expand and earn small profits, while the hub-and-spoke carriers reduced capacity and incurred substantial losses. The shift of capacity from the hub-and-spoke carriers to their regional partners increased, as they tried to reduce costs, match capacity with demand, and maintain frequency in smaller markets by substituting regional jets with 50 to 70 seats for mainline jets with 110 seats or more.

Airports and aircraft manufacturers continued to be negatively affected as well, with airports facing reduced revenues and postponing some expansion projects and both Airbus and Boeing delivering far fewer aircraft than in recent years. These trends continued during the first nine months of 2003, although a relatively successful summer season resulted in record load factors and reduced losses for the hub-and-spoke carriers, and increased profits for the low cost carriers.

1.1.1.1 Passenger Enplanements

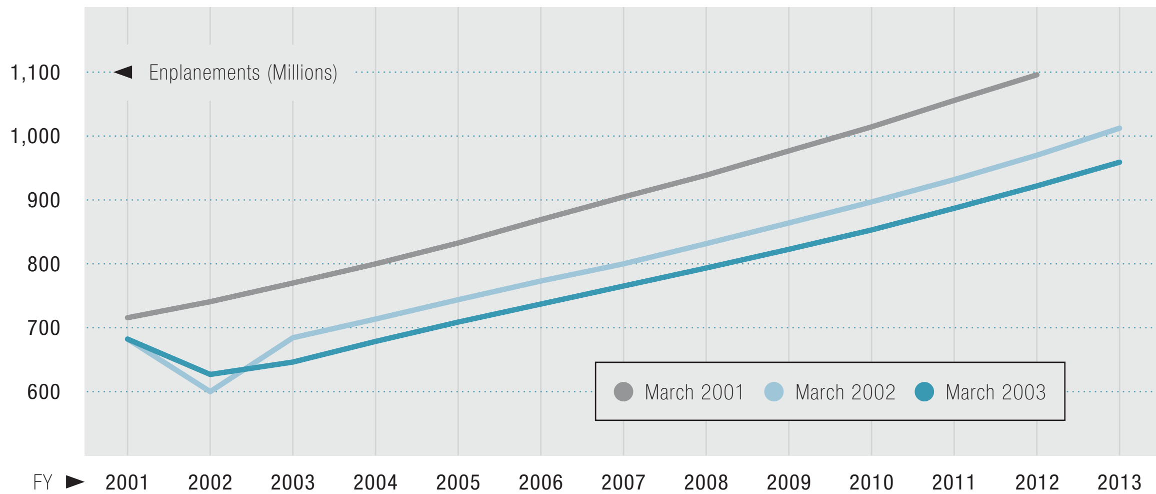
Passenger enplanements continued to decline in FY 2002, falling from the already depressed level of 682.5 million in FY 2001 to only 628.6 million (a decrease of 53.9 million enplanements or 7.9 percent). The total number of enplanements was slightly below the 631.4 million level of FY 1997, five years earlier.

Every year, the FAA prepares a 12-year forecast of aviation activity and presents it at the Annual FAA Aviation Forecast Conference in March.[1] Figure 1-2 compares the March forecasts for passenger enplanements for the past three years. The forecasts for March 2003 and March 2002 are well below the March 2001 forecast throughout the forecast period. During FY 2002, actual enplanements exceeded the March 2002 forecast (628.6 million rather than the forecast 600.3 million). However, the new FAA forecast further lowers projections for FY 2003 and all

1 FAA Aerospace Forecasts, Fiscal Years 2003-2014, U.S. Department of Transportation, Federal Aviation Administration, March 2003. Previous editions from March 2001 and March 2002 were also used.

subsequent years. The gap between the lines in Figure 1-2 shows the projected long-term impact of the economic slowdown and the subsequent restructuring of the aviation industry. The shortfall in enplanements translates into lost ticket revenue for the airlines, less excise tax revenue for the aviation trust fund, and lower passenger facility charge revenue to support airport enhancements.

Figure 1-2 FAA Forecasts of Passenger Enplanements



The United States has more than 400 commercial service airports, yet passenger enplanements are heavily concentrated at the busiest airports. Well over 90 percent of all enplanements take place at the 100 busiest airports. Enplanements for those airports for the past three years (both fiscal and calendar) are shown in Appendix A-1. The FAA forecasts for FY 2014 and the change from FY 2002 for those same airports are presented in Appendix A-3. The changes in enplanements from FY 2001 to FY 2002 are shown in Appendix A-5.

1.1.1.2 Aircraft Operations

As previously shown in Figure 1-1, the majority of aircraft operations in FY 2002 were general aviation operations, but the two categories of commercial activity, air carrier and air taxi/commuter, each accounted for a large number of aircraft operations (20 and 17 percent of all operations respectively). As with passenger enplanements, commercial aircraft operations are heavily concentrated at the nation's busiest airports, with over 80 percent of air carrier operations and 49 percent of air taxi/commuter operations at the top 55 airports.[2]

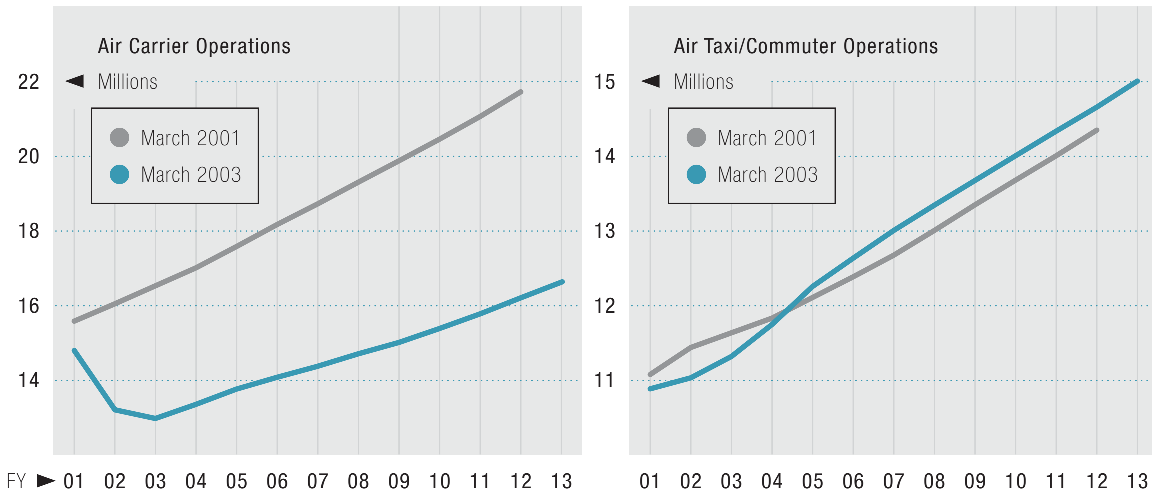
In FY 2002, commercial aircraft operations declined from 25.6 million in FY 2001 to 24.2 million (a decrease of 1.4 million operations or 5.5 percent). The overall figures mask the diverging trends in air carrier and air taxi/commuter operations. In the same period, air carrier operations dropped by 10.5 percent, reflecting the deep decline in the mainline operations of the major carriers. However, air taxi/commuter operations actually increased 1.4 percent, largely because of the substitution of regional jets for larger jets on many routes.

The FAA forecasts indicate that both of these trends will continue, with overall operations far below previous estimates, but with virtually all of the decline in air carrier operations. Figure 1-3

2 There are substantial numbers of general aviation and military operations at some of the nation's busiest commercial service airports.

compares the FAA forecasts for March 2001 and March 2003 for air carrier and for air taxi/commuter operations. The figure shows a sharp decline for air carrier operations for FY 2002 and FY 2003, with a recovery beginning in FY 2004 but with operations remaining far below those of the earlier forecast. In contrast, the figure shows air taxi/commuter operations increasing modestly in the early years of the forecast period, although below the levels of the previous forecast, and by FY 2005 actually exceeding the March 2001 forecast.

Figure 1-3 FAA Forecasts of Air Carrier and Air Taxi and Commuter Operations



1.1.2 Air Cargo Activity

Air cargo includes shipments of air freight, express packages, and mail. Summary data for air cargo activity are collected by the Department of Transportation and published by the FAA. This activity is measured in revenue ton miles (RTMs), where one revenue ton mile represents one ton of cargo flown for one mile. Air cargo is carried aboard both passenger aircraft and all-cargo aircraft, generally referred to as freighters. Aircraft operations for air cargo activity, for both passenger aircraft that carry cargo and all-cargo carriers, are included in the overall totals reported above.

In FY 2002, some 36 percent of air cargo shipments were transported in the belly space of passenger aircraft and 64 percent was transported in all-cargo aircraft. Two large all-cargo carriers dominate the air cargo market: FedEx with 31 percent and United Parcel Service with 16 percent of the total. However, several major passenger carriers also accounted for significant shares, including United Airlines (8 percent), Northwest Airlines (8 percent), and American Airlines (7 percent).

Air cargo activity continues to be affected by the economic slowdown and increasing worries about cargo security. In FY 2002, air cargo volume was approximately 27.3 billion RTMs, a decline of 3.9 percent from the already depressed levels of FY 2001. The FAA forecasts project that air cargo volume won't exceed FY 2000 levels until FY 2005.

Cargo traffic at individual airports is measured in tons loaded and unloaded. Not surprisingly, the airports where FedEx and UPS have hubs for their overnight package services are among the busiest cargo airports. Memphis, the main hub for FedEx, was the busiest cargo airport in CY 2002 and Louisville, the main hub for UPS, was the sixth busiest cargo airport. The ten busiest cargo airports and the change in the tonnage loaded and unloaded in CY 2002 are shown in Figure 1-4, based on data reported by the Airports Council International—North America.

Figure 1-4 Airports with the Most Air Cargo Activity for CY 2002

Airport (ID)	Metric Tons	Change from CY 2001
Memphis International (MEM)	3,390,800	28.8%
Los Angeles International (LAX)	1,779,855	(0.3%)
Ted Stevens Anchorage International (ANC)	1,771,595	(5.5%)
Miami International (MIA)	1,624,242	(0.9%)
New York John F. Kennedy International (JFK)	1,589,648	6.3%
Louisville International (SDF)	1,524,181	3.8%
Chicago O'Hare International (ORD)	1,473,980	13.4%
Indianapolis International (IND)	901,917	(18.9%)
Newark Liberty International (EWR)	850,050	(5.0%)
Hartsfield Atlanta International (ATL)	734,083	(0.2%)

1.1.3 Changes in the Commercial Sector

The commercial airline industry is in the midst of a major restructuring, characterized by a divergence in the growth of network carriers and low fare carriers, the continued replacement of mainline jets with regional jets, and the appearance of a new generation of regional jets with greater seating capacity and passenger comfort.

The divergence between hub-and-spoke carriers and low-fare carriers is clear in their financial performance since the economic downturn began. The hub-and-spoke carriers have incurred unprecedented losses, despite government aid, and two of the largest of them have declared bankruptcy. In the same period, the low-fare carriers have generally recorded profits. During the summer of 2003, as the result of relatively strong traffic and high load factors, the hub-and-spoke carriers' losses were less than had been expected, but observers don't expect to return to profitability for at least another year. In contrast, the low-fare carriers increased their profits during the summer and aviation analysts expect those carriers to continue to increase their profits during the next year.

Another important divergence between the hub-and-spoke and low-fare carriers is the relative change in domestic capacity. The hub-and-spoke carriers have reduced capacity throughout their systems by withdrawing older aircraft from service, deferring or canceling orders of new aircraft, and reducing service at selected hubs and in a large number of smaller markets. Some of the aircraft withdrawn from service have been permanently retired, well ahead of schedule, but a large number have been placed in long-term desert storage (well over 500 relatively new aircraft, some 10 percent of the 2001 fleet, are now in storage). Although the hub-and-spoke carriers have accepted some new aircraft, other orders have been deferred or cancelled, and virtually no new orders have been announced. The low-fare carriers, however, have added aircraft to their fleets by continuing to accept previously ordered aircraft and placing orders with both the mainline and regional jet manufacturers.

The hub-and-spoke carriers have also reduced capacity by scaling back operations at their less-profitable hubs and by either eliminating service in smaller markets or by transferring those routes to their regional affiliates, substituting regional jets for mainline jets. Although such changes preserve service and frequency in those markets, a smaller number of seats are now available, representing a significant reduction in capacity. Once again, the low-fare carriers have taken another path, deploying their new aircraft to both existing and new markets and poised to move into the hub airports that have been de-emphasized by network carriers, such as Pittsburgh and St. Louis. The low-fare carriers now provide about 21 percent of domestic market capacity, up from 15 percent in 2000. Aviation analysts expect their share to reach 40 percent by 2006.

Since the introduction of the regional jet in the early 1990s, the number of regional jets in operation has increased dramatically, from only nine in 1993 to an estimated 976 in FY 2002.[3] The FAA estimates that this rapid growth will continue, topping 1,000 for the first time in FY 2003 and reaching as many as 2,834 in FY 2014. At that point, regional jets will make up 35 percent of the total passenger fleet, nearly doubling their current proportion. Regional jets have been used for a variety of purposes, including replacing turboprop service, providing additional capacity in mainline markets, replacing mainline service, and initiating new point-to-point service in some markets.

The commercial sector is also being affected by the development and introduction of larger regional jets. These jets, with 70 to110 seats, blur the distinction between regional jets and the smaller mainline jets. They are expected to be introduced in a variety of markets, following the pattern of growth of regional jets. Just as regional jets replaced turboprops, the large regional jets may replace smaller regional jets in some markets. In addition, as the airlines adjust capacity in individual markets to meet demand, large regional jets will replace mainline jets. Of particular significance was an order by Jet Blue, the fast-growing low fare carrier, for 100 Embraer EMB-190s, a planned 100-seat aircraft (with an option for another 100), to be delivered beginning in 2005, indicating that the use of regional jets is expanding into new areas. Previously, the low-fare carriers, such as Southwest, Air Tran and Jet Blue, have concentrated on smaller mainline jets for quick turnaround in markets between large cities or secondary airports near large cities. In contrast, Jet Blue is expected to use the EMB-100s to add point-to-point service in markets that are too small for Jet Blue's 162-seat Airbus A320s and to supplement mainline jet service in existing markets.

1.2 Non-Commercial Aviation Activity and Commercial Space Transportation

The non-commercial aviation sector consists of general aviation and military operations. Although these sectors do not receive as much notice as the commercial sector does, general aviation is vitally important to many sectors of the economy and military operations are a key element of national security policy. Commercial space transportation, which refers to the launch of an object into space by a non-governmental entity, is an important component of the economy.

1.2.1 General Aviation Activity

General aviation includes all segments of civil aviation except commercial air carriers. It is remarkably diverse in its activities, its participants, and the equipment they use. General aviation functions range from the training of student pilots to the operation of mainline jets for private individuals or companies. Its uses include sightseeing, agricultural application, the provision of emergency medical services, personal and corporate business travel, cargo movement, and flying for pleasure. The diverse general aviation fleets ranges from gliders and home-built experimental aircraft, to trainers and a variety single-engine piston aircraft, and to multi-engine piston aircraft and an enormous range helicopters, turbo props, and jets.

Most of the thousands of U.S. airports handle only general aviation traffic. Many of these are small, rural airports without an airport traffic control tower. Flights to and from these airports typically have little or no contact with the FAA's air traffic control system and don't contribute to airport

3 These estimates are from the FAA Aerospace Forecasts. The FAA defines a regional jet as an aircraft having 70 seats or less. Therefore, the forecasts do not include the new, larger regional jets, which will have as many as 100 seats.

or airspace congestion. Nonetheless, in FY 2002, almost 30 million general aviation operations took place at airports with airport traffic control towers, over 10 percent of total aircraft operations at those airports. General aviation also has a significant presence at the busiest commercial service airports. General aviation traffic accounted for 15.5 percent of total aircraft operations at the 35 Operational Evolution Plan (OEP) airports in FY 2002. Figure 1-5 shows that the percentage of general aviation operations at these airports varied from just 1.1 percent at Seattle-Tacoma to 25.6 percent at Honolulu.

Figure 1-5 General Aviation Operations at the OEP Airports

Airport (ID)	General Aviation Operations	Total Operations	% General Aviation Operations
Honolulu International (HNL)	80,825	316,089	25.6%
Fort Lauderdale-Hollywood International (FLL)	62,958	275,473	22.9%
Salt Lake City International (SLC)	79,739	401,491	19.9%
Washington Dulles International (IAD)	79,451	401,750	19.8%
Chicago Midway (MDW)	54,625	293,076	18.6%
Tampa International (TPA)	40,499	245,225	16.5%
Phoenix Sky Harbor International (PHX)	93,603	577,820	16.2%
Philadelphia International (PHL)	72,214	467,160	15.5%
Las Vegas McCarran International (LAS)	72,277	491,205	14.7%
Miami International (MIA)	61,577	442,358	13.9%
Minneapolis-St. Paul International (MSP)	68,377	497,934	13.7%
Portland International (PDX)	36,859	277,400	13.3%
Memphis International (MEM)	46,061	393,858	11.7%
Charlotte/Douglas International (CLT)	46,168	465,246	9.9%
Baltimore-Washington International (BWI)	30,417	310,281	9.8%
Orlando International (MCO)	27,891	303,328	9.2%
Cleveland Hopkins International (CLE)	20,559	264,075	7.8%
San Diego International Lindbergh Field (SAN)	15,005	201,604	7.4%
Greater Pittsburgh International (PIT)	23,701	439,360	5.4%
Lambert St. Louis International (STL)	24,122	453,302	5.3%
Greater Cincinnati International (CVG)	24,816	473,084	5.2%
Detroit Metropolitan Wayne County (DTW)	25,309	490,663	5.2%
George Bush Intercontinental (IAH)	23,362	458,649	5.1%
Boston Logan International (BOS)	19,367	405,370	4.8%
San Francisco International (SFO)	16,386	359,133	4.7%
Dallas-Fort Worth International (DFW)	24,917	762,371	3.3%
Newark Liberty International (EWR)	12,619	407,730	3.1%
Chicago O'Hare International (ORD)	24,290	901,703	2.7%
Denver International (DEN)	13,164	495,104	2.7%
New York LaGuardia (LGA)	9,104	354,218	2.6%
New York John F. Kennedy International (JFK)	7,166	291,021	2.5%
Los Angeles International (LAX)	15,306	637,588	2.4%
Hartsfield Atlanta International (ATL)	18,058	882,407	2.0%
Ronald Reagan National (DCA)	2,854	180,743	1.6%
Seattle-Tacoma International (SEA)	3,822	361,814	1.1%

1.2.2 Military Activity

Military operations account for a very small fraction of the activity at the nation's airports, accounting for just five percent of total operations in FY 2002. Military operations have increased slightly in the last two fiscal years as the result of increased training and patrols related to aviation security. The FAA projects a generally stable level of military operations throughout the forecast period.

Despite the relatively small number of military operations, they have a significant impact on navigation in the National Airspace System because substantial amount of U.S. airspace is designated as special use airspace and reserved for military operations. Special use airspace is available to commercial or general aviation operators only when the military opens a particular airspace area to non-military operations, usually for a specified time period. The procedures for sharing special use airspace are discussed in greater detail, later in this report.

1.2.3 Commercial Space Transportation

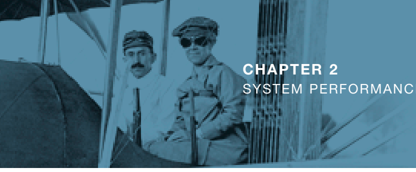
Commercial space transportation is an emerging industry, with new launch and recovery facilities at both inland and sea-based locations. Operators are developing new space vehicles, including evolved expendable launch vehicles and reusable launch vehicles.

Historically, commercial space operations have taken place at coastal ranges, using only expendable launch vehicles. Because of their infrequency and offshore trajectories, these space operations have had a minimal impact on National Airspace System operations. However, changes in the magnitude and complexity of space operations will place new demands on the National Airspace System. The expected increase in commercial launches and reentries, from a broad range of locations, will contribute to competition for airspace with other users. To address these issues, the FAA has developed a Space and Air Traffic Management System that supports both the evolving space transportation industry and existing aviation activities. This represents an expansion of the U.S. air traffic management system to integrate space and aviation operations

CHAPTER 2 SYSTEM PERFORMANCE GOALS AND MEASUREMENTS

"Aviation is proof that given the will, we have the capacity to achieve the impossible."

~ Eddie Rickenbacker



2 System Performance Goals and Measurements

Through extensive planning, the establishment of clear objectives and measurable goals, restructuring, and a commitment to improving customer service, the FAA continues to improve its operational efficiency. The various plans described in the following section highlight the capacity-related initiatives underway. For further information about the FAA's Air Traffic Organization, the Flight Plan or the Operational Evolution Plan (OEP), refer to the web site at www.faa.gov.

In addition to the plans briefly described in the following section, the FAA, under Department of Transportation (DOT) leadership, is committed to working with other government agencies to develop a long-range national plan for our future aviation system. FAA's Joint Planning Office is spearheading this effort with participation from the National Aeronautical and Space Administration, Department of Defense, Department of Homeland Security, and Department of Commerce. Targeted for completion by the year 2025, the plan will lay out a concept of operations, focus research funding, and guide the transformation of air traffic management and our ground-based infrastructure to meet the needs of the 21st century.

2.1 The Air Traffic Organization

In November 2003, the FAA announced its plan for the creation of its Air Traffic Organization, which is the culmination of a decades-long attempt to improve the delivery of air traffic services by adopting best business-like practices. The ATO is an operating entity within the FAA that consolidates the functions previously performed by Air Traffic Services (ATS), Research and Acquisition (ARA), and the Free Flight Program Office (AOZ).

The ATO is headed by the Chief Operating Officer (COO), who reports directly to the FAA Administrator and is a member of the FAA's senior management team. The Secretary of Transportation and the FAA Administrator retain responsibility for general safety and policymaking functions. Beginning in January 2004, the ATO organization will be implemented in three phases, establishing the management information framework, including a cost-accounting system; developing and implementing meaningful performance measures that reflect the needs of FAA customers; and putting a system in place that connects the major top-level goals to daily operation. ATO supports the FAA's long-term strategic plans, and ATO has prime responsibility for achieving many of the goals and objectives of the current FAA Flight Plan.

2.2 The FAA Flight Plan 2004-2008

The FAA Flight Plan for 2004-2008 summarizes the Agency's short-term strategies for achieving success, and monitoring how well it is meeting the expectations of its customers and other stakeholders of the National Airspace System (NAS).

The enormous task of transforming the aviation system to meet the challenges in the second century of powered flight require an ambitious plan engaging both the FAA and the aviation community. The FAA's ability to improve safety and expand capacity in the U.S. and in the international arena depends in part on the willingness of authorities on the state, local, and international levels to cooperate with the Agency in such areas as building new airports, expanding runways, or implementing new technologies.

The Plan contains four goal areas and the programs and initiatives to meet them. The goal areas include: Increased Safety, Greater Capacity, International Leadership, and Organizational Excellence. The Flight Plan provides an overview of all aspects of FAA activity, with an emphasis on operations. The OEP identifies the responsibilities and duties of the key players in the industry, each of whom must make their own contributions in order to increase capacity and efficiency of the NAS.

2.3 The Operational Evolution Plan (OEP)

The OEP is the FAA's rolling ten-year plan to increase the capacity and efficiency of the National Airspace System while enhancing safety and security. Introduced in June 2001, the OEP reflects the ongoing close collaboration among the entire aviation community, which includes passenger and cargo carriers, airports, manufacturers, general aviation, the Department of Defense, the National Weather Service, and the National Aeronautics and Space Administration. The OEP and Flight Plan are discussed in the following section, relative to system capacity.

2.3.1 The Greater Capacity Goal of the OEP

Like safety, additional capacity is also a necessity. The efficient growth of air travel requires growth in aviation capacity. Demand with all its economic benefits will only revive and increase if passengers can move quickly and efficiently through the system, and airline operations can thrive only if they are as streamlined as possible. The greater capacity goal is supported by the FAA, working with local governments and airspace users to provide a national system that meet or exceeds demand. As the OEP is a capacity enhancement plan, the metrics contained in the plan relate to accessibility (capacity and throughput) and efficiency. The OEP Metrics Plan uses effective capacity (measuring the theoretical volume of traffic that can be handled at a fixed level of delay) to capture the synergy between capacity and demand changes. This goal will be attained through a series of objectives:

- Increase airport capacity to provide a system that meets or exceeds air traffic demand.
- Improve efficient air traffic flow over land and sea.
- Increase or improve airspace capacity in the eight major metropolitan areas and corridors that most affect total system delay: New York, Philadelphia, Boston, Chicago, Washington/Baltimore, Atlanta, LA Basin, and the San Francisco Bay Area.
- Increase on-time performance of scheduled carriers.

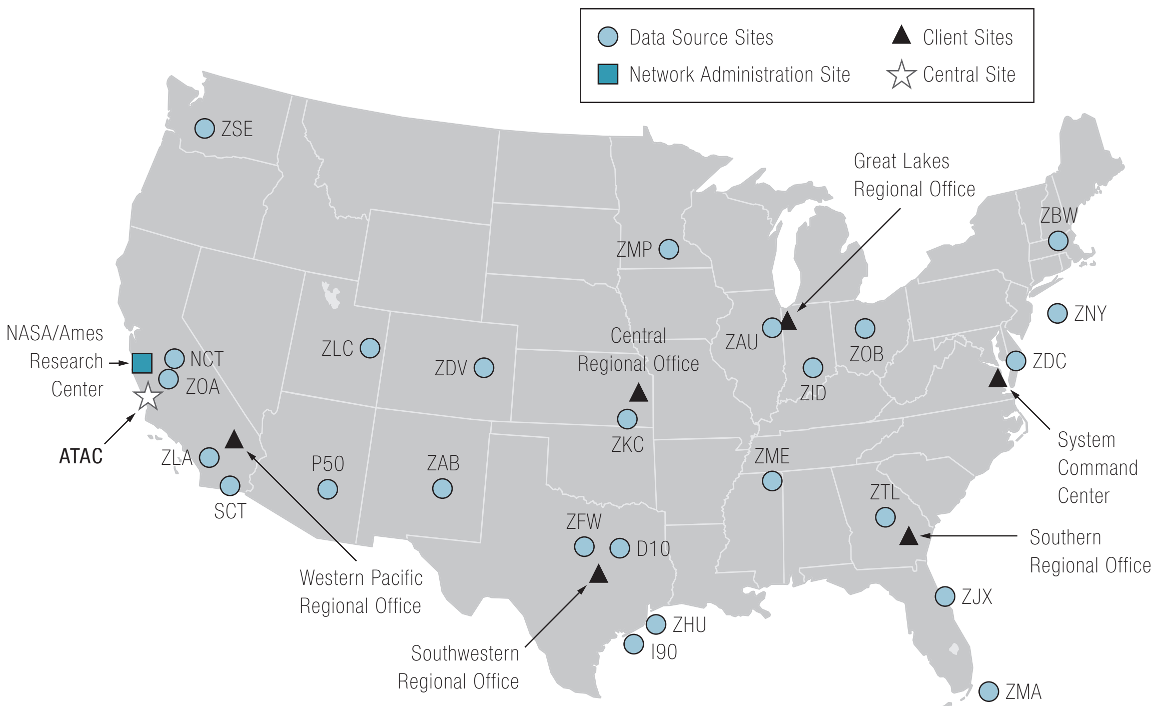
Taking into account the impact of the global economy, the war in Iraq and Severe Acute Respiratory Syndrome (SARS) on US air travel, revised industry forecasts now indicate that demand will not rebound until 2005 at the earliest. Thus, the FAA is engaged in a complex and thorough planning process to ensure that the NAS will be able to accommodate more traffic while easing delays, and increase safety and security while addressing noise and air quality.

2.4 Performance Data Analysis and Reporting System (PDARS)

The previous section discussed performance measures that are used by both government and industry analysts to evaluate performance of the NAS. The FAA is also developing some measurement tools that are more closely tailored to the daily operation of the air traffic control system. The Performance Data Analysis and Reporting System (PDARS) assist ATC facility managers in measuring the performance of their facilities. The FAA's Office of System Capacity and NASA's Aviation Safety Program developed it collaboratively.

PDARS extracts radar data from the Host or ARTS computers and processes and distributes it to FAA facilities via a secure Wide Area Network (WAN). Data can be analyzed to uncover the root causes of impediments to NAS operations. PDARS provides the analyst with a set of interactive tools that can access the distributed database and measure, analyze, and report system performance. PDARS also maintains an archive of historical data, which supports trend analysis, and before and after comparisons. Operational performance data can be depicted both numerically and graphically. The numerical tools provide the capability to quantify the large-scale picture of system performance and enable the analyst to identify opportunities for performance improvements. Reports can be exported to spreadsheet and slide presentation packages. The heart of the graphical depiction system is the Graphical Airspace Design Environment (GRADE), which provides users with an animated three-dimensional view of airspace and air traffic. GRADE graphics can be exported to slide presentation packages. The following Figure 2-1, shows the PDARS deployment locations as of this printing.

Figure 2-1 PDARS Deployment Locations

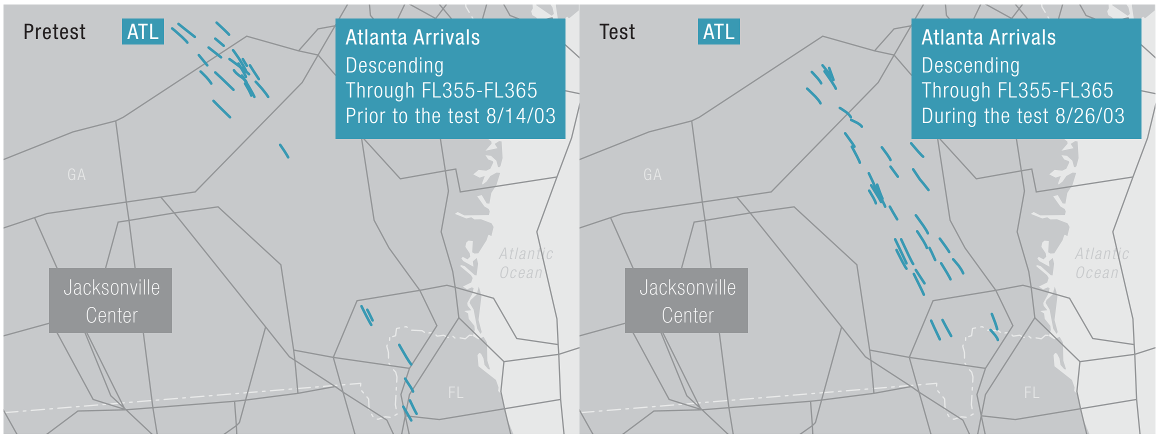


2.4.1 Jacksonville/Atlanta (LOA)

The PDARS\GRADE system was utilized by Jacksonville Center to test and validate in a timely manner the impact of a revised operational procedure involving Atlanta Hartsfield International arrivals from the southeast. The interfacility negotiated Letter of Agreement (LOA) allows for Jacksonville Center to descend Atlanta arrivals to FL330 or lower, prior to handoff to Atlanta Center, providing traffic and workload permit. The descent of the Atlanta arrivals earlier allows Atlanta controllers to provide a more desirable descent profile.

Figure 2-2 is a GRADE graphic highlighting the location and flight track portion of Atlanta arrivals descending through FL355-FL365 within Jacksonville Center airspace using the pretest procedure. Note that the majority of the Atlanta arrivals shown are descended with this altitude stratum in the northwest portion of Jacksonville Center airspace. Figure 2-3 shows the location and flight tracking data for Atlanta arrivals using the test procedure. In comparing the "before and after" operation, GRADE graphics in Figures 2-2 and 2-3 clearly illustrate Jacksonville Center controller's were able to descend more Atlanta arrivals earlier using the test procedure, and provided a more advantageous operation.

Figure 2-2 and 2-3 Proposed Arrival Procedure Modification

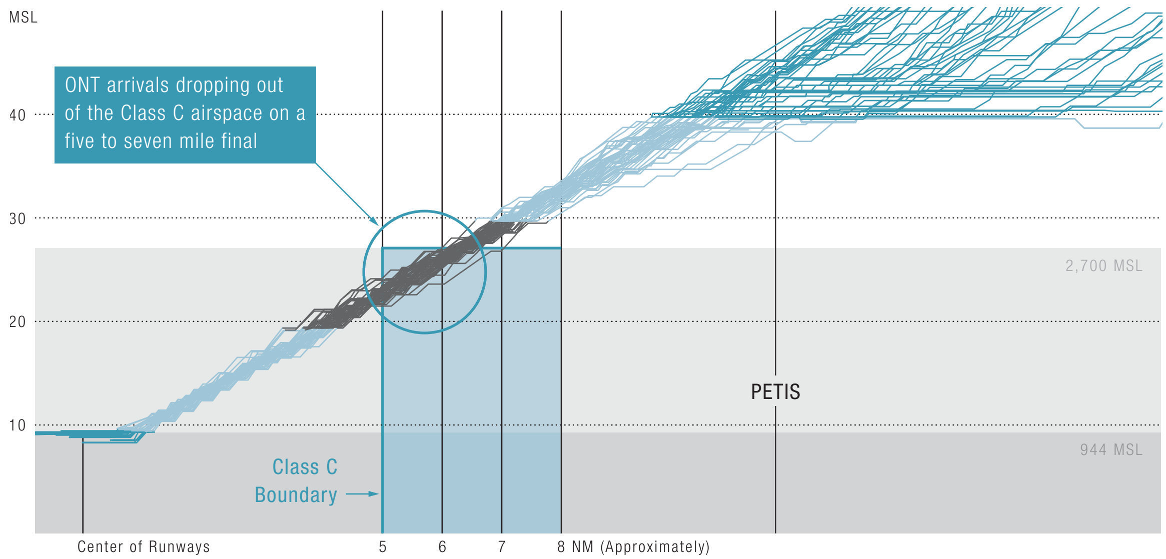


2.4.2 Ontario Class C Airspace Study

This study was commenced as a result of pilot reports indicating that aircraft on the instrument approaches into Ontario International Airport were dropping out of the Class C airspace on both east and west operations. Of concern was the number of visual flight rules (VFR) aircraft navigating close to and around Ontario Class C, and with the possible conflictions that this situation might create. The Southern California TRACON (SCT) Airspace Planning Office was directed to investigate this situation and used the PDARS\GRADE system to examine just how Ontario arrival, departure, and over flight aircraft interact with the Class C airspace and to determine if a Class C extension was necessary.

Figure 2-4 shows one of the GRADE graphics produced during this study and illustrates that Ontario International Airport arrivals under west plan do indeed leave and return to Class C airspace. This egress and ingress generally occurs five to seven miles from the airport while on final approach. The graphic in Figure 2-4, as well as other PDARS/GRADE data, was used in this study as a tool in collaborating with adjacent facilities to implement interim procedural changes, and for development of airspace design improvements. An extension to the Class C has been proposed as a result of these efforts.

Figure 2-4 Ontario International Airport Arrivals Exiting

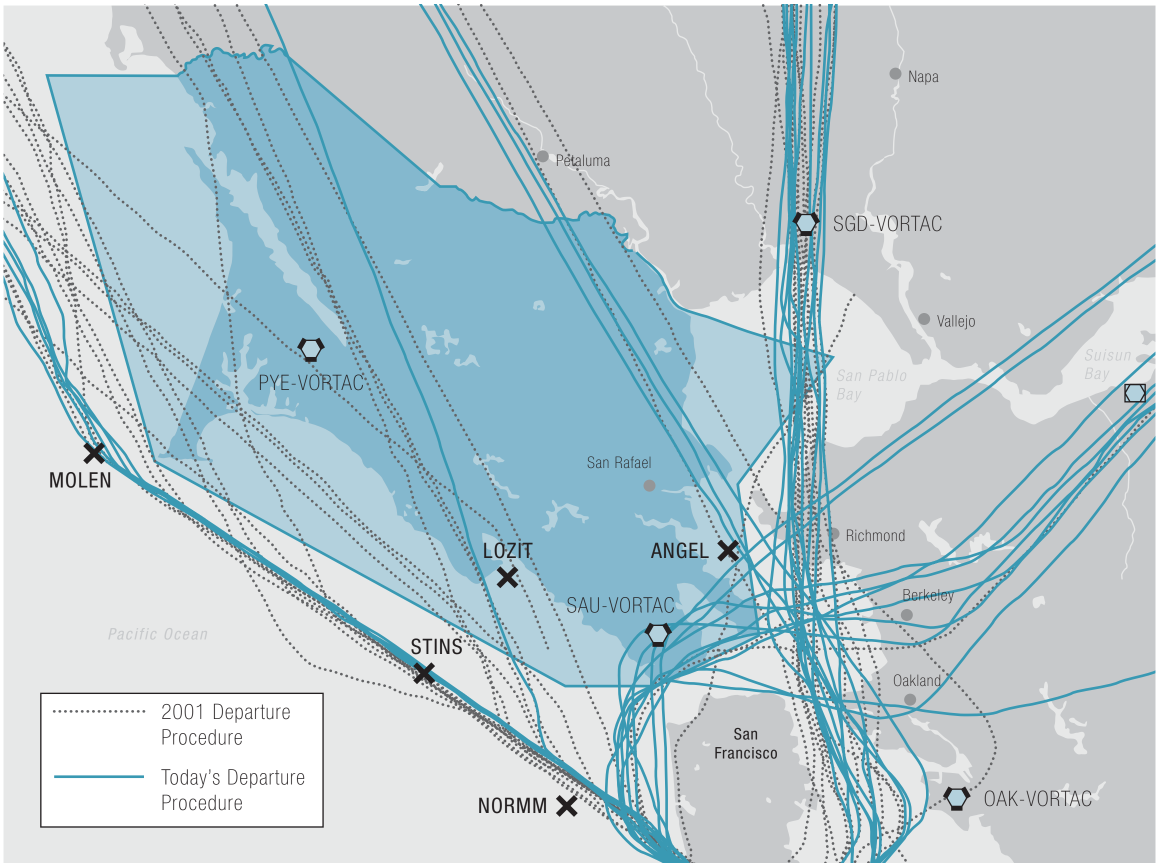


2.4.3 SFO MOLEN Departure Procedure Analysis

The MOLEN Standard Instrument Departure (SID) calls for aircraft to cross the MOLEN intersection, thereby remaining over the ocean for noise abatement purposes. In 2001, it was brought to FAA's attention that San Francisco Departures utilizing the MOLEN SID were at times being expedited prior to reaching MOLEN intersection. This non-standard departure routing was permitted during the day, but was not to be used at night because it would cause flights to fly over the Point Reyes National Sea Shore. Bay TRACON (now part of the new Northern California TRACON) was requested to evaluate the problem and determine if flights were in fact being re-routed during nighttime operations. To accomplish this task, the PDARS/GRADE system was used to analyze the SFO MOLEN Departure Procedure and to determine the extent of compliance with the nighttime restriction.

In Figure 2-5, the SFO departure flights depicted as dotted lines are flight tracks as flown in 2001. Note that several of these flights cross land in the vicinity of the Point Reyes VORTAC (PYE). As a result of the initial PDARS/GRADE analysis, FAA re-emphasized to controllers that compliance with the SID was mandatory during nighttime operations. A follow-on analysis was conducted by Northern California TRACON. The flights depicted as solid blue lines, are SFO departures from 2003 and are representative of current operations. Note, all but one flight are in compliance with the MOLEN Departure Procedure and that the expedited flight it turns out was vectored during the daytime. Figure 2-5 and additional PDARS\GRADE data were presented in briefings requested by the public. Use of this information was essential in assuring the public that the SFO MOLEN Departure Procedure was being followed.

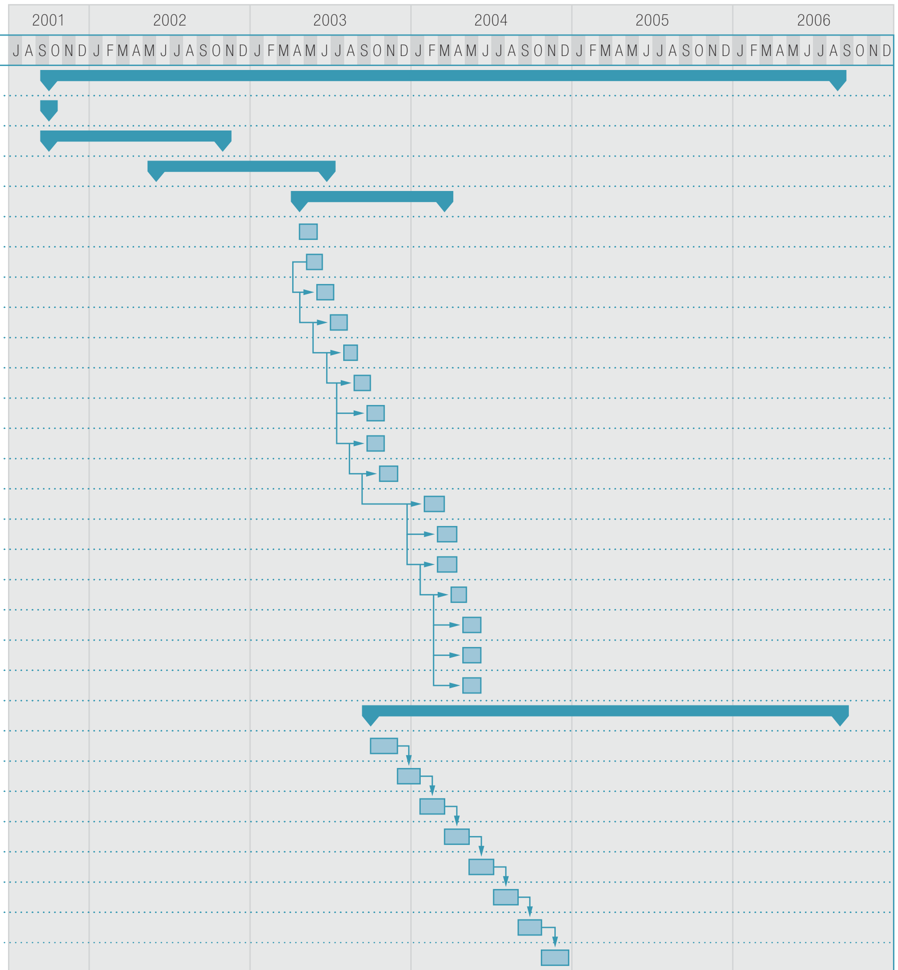
Figure 2-5 SFO MOLEN



PDARS is typically put to work almost immediately after its installation. PDARS will be deployed at all 20 domestic Air Route Traffic Control Centers (ARTCCs) and several Terminal Radar Approach Control Facilities (TRACONs) by the end of CY 2004. Figure 2-6 gives the timeline for PDARS deployment that will occur within five phases planned for completion in 2006.

Figure 2-6 PDARs Deployment Timeline

ID	Task Name	Duration
1	PDARS Deployment	1282 Days
2	Westcoast Prototype	1 Day
9	Phase II	280 Days
17	Phase III	280 Days
24	Phase IV	240 Days
25	ASO	30 Days
26	ZOB	30 Days
27	ZMP	30 Days
28	ZAU	30 Days
29	ACL	30 Days
30	ZMC	30 Days
31	ACE	30 Days
32	ZSE	30 Days
33	ZLC	30 Days
34	ZDV	30 Days
35	ANM	30 Days
36	ZNY	30 Days
37	ZDC	30 Days
38	AEA	30 Days
39	ZBW	30 Days
40	ANE	30 Days
41	Phase V	780 Days
42	ATL	40 Days
43	CLT	40 Days
44	CBC	40 Days
45	MCO	40 Days
46	MEM	40 Days
47	MIA	40 Days
48	STL	40 Days
49	TPA	40 Days



2.5 Delays in the National Airspace System

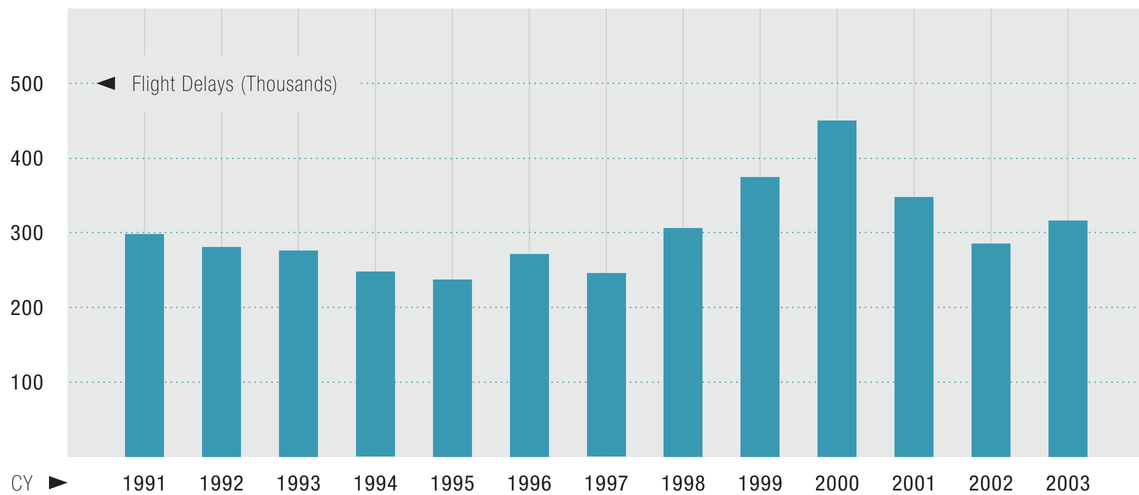
Delay is the traditional measure of NAS performance, but it is not a straightforward measure to calculate for an individual flight, airport, or for the entire system. There are many delay parameters that can be (and are) tracked.

By any measure, indications of a recovery in air traffic are evidenced by the increase in delays by year end 2003, which ended the trend of a significant decrease in delays that occurred between 2000 and 2002. Traffic continues to recover at an uneven rate throughout the system, as many of the largest airports have been operating at or near their theoretical capacity. As observed in prior years, a small increase in the number of operations at certain airports produce a disproportionate increase in the number of delays.

2.5.1 Delays Reported by the Operations Network

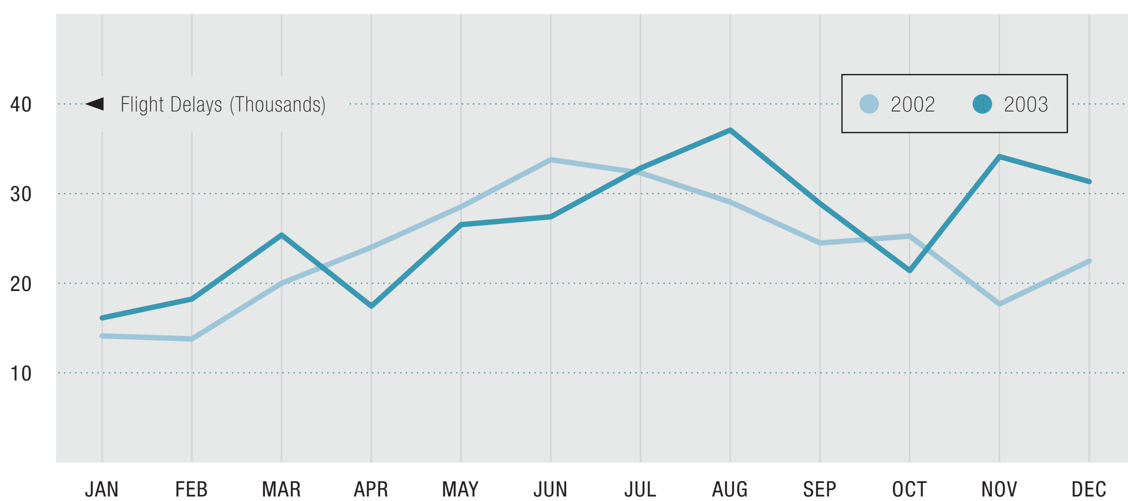
In December 2003, the DOT and FAA expanded its monthly report on airline service, to include reasons for flight delays. This information may be accessed on the Web at www.bts.gov under the Aviation Information Header, see "Airline On-time Performance and Causes of Flight Delays." The FAA reports the delay performance of the NAS every month, using data derived from OPSNET. OPSNET data is generated from observations by FAA personnel, who record only the aircraft that are delayed by 15 minutes or more during any phase of flight. According to OPSNET data 316,888 flights were delayed by 15 minutes in CY 2003, an increase of 31,239 or 10.9 percent from the 285,649 delays in CY 2002. Figure 2-7 shows flight delays for the years for which OPSNET data are available.

Figure 2-7 Annual Flight Delays CY 1991-CY 2003



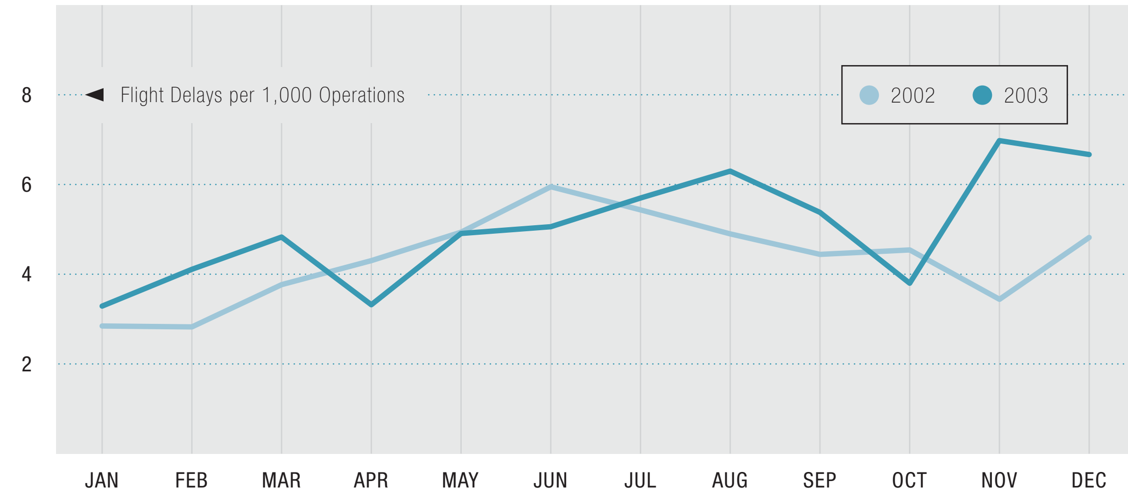
Eight of the months in 2003 had higher delays than the corresponding months of 2002, some significantly higher. As traffic continues to recover, more delay can be expected without increases in capacity. Figure 2-8, highlights the changes in delay by month between CY 2002 and CY 2003.

Figure 2-8 Flight Delays by Month, CY 2002 and CY 2003



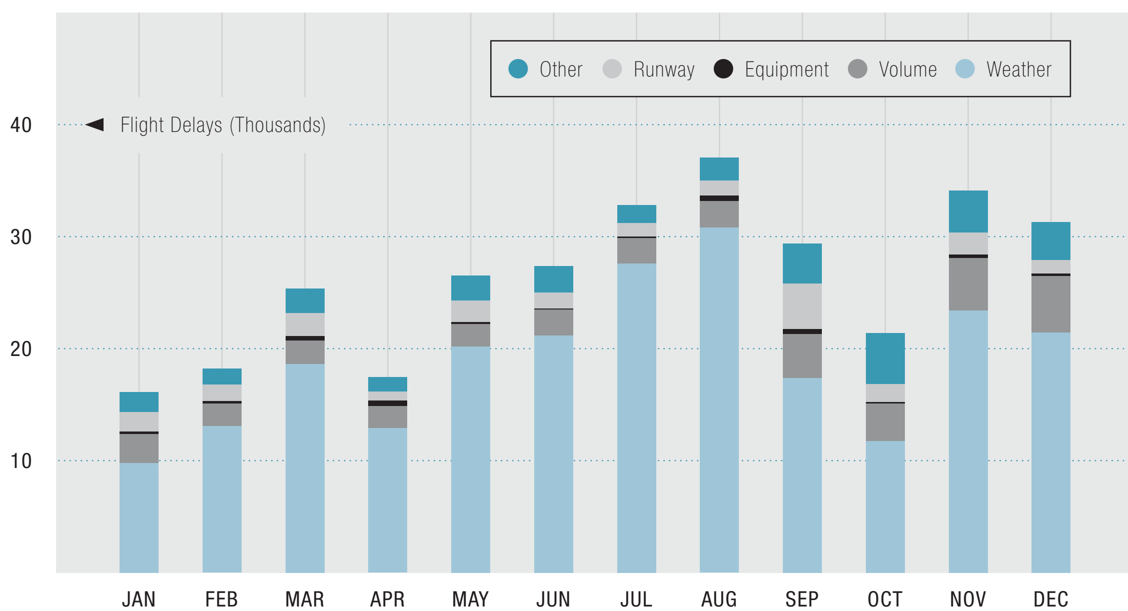
The total number of aircraft operations during the same period was down by only 0.3 percent. Thus, the rate of delays increased as well as the absolute number of delays. Figure 2-9 shows the number of delays per 1,000 aircraft operations, by month, for 2002 and 2003.

Figure 2-9 Flight Delays per 1,000 Operations by Month, CY 2002 and 2003



One of the most valuable aspects of the OPSNET system is that it attributes each delay to one of several causal factors: weather, traffic volume, NAS equipment outages, closed runways, and other causes. The primary causes of delay have varied little year over year, with a large majority of delays attributed to weather (from 65 to 75 percent) and a smaller but significant percentage to traffic volume (12 to 22 percent.) Figure 2-10 shows the distribution of delays by cause for CY 2003.

Figure 2-10 Flight Delays by Cause CY 2003



In response to numerous inquiries in 2002, the FAA began tracking ground delays throughout the NAS. Ground Delay Programs are implemented to control the volume of air traffic to airports where the projected traffic demand is expected to exceed the airport's acceptance rate for a lengthy period of time. The determination that delays are expected to be long lasting rather than temporary is based on the evaluation of weather conditions, forecasts, and projected demand.

The most common reason for the imposition of a Ground Delay Program is the reduction of the airport's acceptance rate, most often because of adverse weather conditions such as low ceilings and visibility. There were 107,841 ground delays recorded in CY 2003, an increase of 28,537 or 36 percent from the previous year's 79,304.

2.5.2 The Aviation System Performance Metrics System

The Aviation System Performance Metrics System (ASPM) was originally developed on a cooperative basis by the FAA and nine air carrier members of the Air Transport Association to measure performance of the NAS by individual flight by phase of flight on a next day basis. Currently, 22 air carriers report flight data for flights to and from 55 airports.

ASPM integrates daily data from two primary sources: the Enhanced Traffic Management System (ETMS) and Out, Off, On, and In data from ARINC. In addition, data are included from the Official Airline Guide (OAG), and monthly carrier filings under 14 CFR Part 234, *Airline Service Quality Reports*, with the DOT.

In 2002 the FAA and DOT jointly agreed a flight was delayed if it arrived at the destination gate 15 minutes or more after its scheduled arrival time. In June 2003, air carriers required to file data under Part 234 for delayed flights began to provide data indicating the cause of such delay in five categories: carrier caused, weather, NAS, security, and late arriving flights. These data are maintained in ASPM, along with a separate breakdown of what carriers identified as NAS caused delays into the same categories that are reported in OPSNET, using information contained in OPSNET.

The ASPM database is the primary data source for the many of the FAA's operational performance metrics in the FAA's Flight Plan, issued in September 2003. Most of these metrics are limited to data for flights to and from the OEP 35 airports. Primary metrics include the percent of flights on-time, airport arrival capacity at the 35 OEP airports, airport arrival capacity at eight congested metropolitan areas, and airport arrival efficiency.

CHAPTER 3 DEVELOPMENT OF AIRPORT CAPACITY

"The airport runway is the most important mainstream in any town."

~ Norm Crabtree

3 Development of Airport Capacity

The FAA's Office of Airport Planning and Programming serves as the principal organization of the FAA responsible for all Airports program matters pertaining to national airport planning, environmental and social requirements, airport grants, property transfers, passenger facility charges, and ensuring adequacy of the substantive aspects of FAA rulemaking actions relating to these programs. The Office of System Capacity participates in the planning of capacity strategies for major U.S. airports, which includes assessing the technical feasibility of new systems and equipment.

This chapter summarizes capacity enhancements that are being achieved through airport development, major airport construction projects and the analyses necessary to support airport development. These analyses include airport design team studies and airport capacity benchmarking, as well as quantifying the benefits of potential capacity projects. Chapter 3 also summarizes other programs and activities affecting airport development, and includes a description of the resources funding these activities.

3.1 Capacity Enhancement Through Airport Construction Projects

There are two main strategies for enhancing airport capacity: build new runways and maximize the efficiency of existing runways. In 2003, new runways were completed at Miami International, Denver International, George Bush Intercontinental, and Orlando International airports. Following are some highlights of these projects, which generally can take up to ten years to plan, construct and commission.

Miami's Runway 8/26 construction project, completed in September 2003, took 51 months—15 months for design and 36 for the contract awarding process and construction. It is estimated that this capital improvement will increase capacity by 20 percent in Instrument Flight Rule (IFR) and 10 percent in Visual Flight Rule (VFR) conditions. The airport anticipates returning to pre-September 11th traffic levels in 2006. The airport has also invested $161 million in further capacity enhancement for an airport that is challenged by a relatively confining space of 3,200 acres.

Denver opened Runway 16R/34L in 2003, which is the longest commercial runway in North America, measuring 16,000 feet long and 200 feet wide. The runway project began in 1989, but the project was stopped in 1995 and did not resume until October 2000. Construction costs were approximately $167 million. It is anticipated that this runway could increase runway capacity at an estimated level of 18 percent in VFR and 4 percent in IFR.

George Bush Intercontinental opened its new 9,000-foot runway, 8L/26R, in early 2003 at an estimated cost of $260 million. The new runway, has the potential to support triple simultaneous IFR approaches when this procedure is approved by the FAA. The new runway will improve VFR capacity by 35 percent and IFR capacity by 37 percent. The airport, opened in 1969, operates on 10,000 acres.

Orlando opened its fourth runway in 2003. The runway will enhance efficient airline operations, by providing a system for simultaneous IFR landings by three aircraft, which is known as "triple simultaneous approaches," expected to provide a capacity gain as high as 23 percent in VFR and 34 percent in IFR. This airport continues construction of a 345-foot above ground level tower, which will be the tallest air traffic control tower in the U.S.

3.1.1 Capacity Enhancement Through Construction of New Runways and Extensions

A number of the busiest airports have completed new runways or other runway construction projects over the past five years. Figure 3-1 shows that ten new runways were opened from

January 1998 to October of 2003. Another 22 construction projects were completed for the same period, including 18 runway extensions, 3 reconstructions and 1 realignment. There are 35 construction projects planned between November 2003 and 2008 shown in Figure 3-2, including the building of 11 new runways.

Figure 3-1 Completed Runway Construction Projects January 1998 to October 2003

Airport (ID)	New	Extension	Renovation	Reconstruction	Realignment	Year	Runway
Grand Rapids Gerald R. Ford International (GRR)					•	1998	17/35
Little Rock Adams Field (LIT)				•		1998	4L/22R
Milwaukee General Mitchell (MKE)		•				1998	7L/25R
Madison/Dane County Regional (MSN)	•					1998	3/21
Palm Springs Regional (PSP)		•				1998	31L/13R
Albuquerque International (ABQ)		•				1999	12/30
Austin-Bergstrom International (AUS)	•					1999	17L/35R
Greenville-Spartanburg (GSP)		•				1999	3L/21R
Philadelphia International (PHL)	•					1999	8/26
Memphis International (MEM)		•		•		2000	18C/36C
Palm Beach International (PBI)		•				2000	9L/27R
Phoenix Sky Harbor International (PHX)	•					2000	7R/25L
Norman Y. Mineta San José International (SJC)		•				2000	12L/30R
Des Moines International (DSM)		•				2001	5/23
Detroit Metropolitan Wayne County (DTW)	•					2001	4L/22R
El Paso International (ELP)		•				2001	4/22
Kahului (OGG)		•				2001	2/20
Phoenix Sky Harbor International (PHX)		•				2001	8L/26R
Albany County (ALB)		•				2002	10/28
Birmingham (BHM)		•				2002	5/23
Boise Air Terminal (BOI)	•					2002	9/27
Cleveland Hopkins International (CLE)	•					2002	6L/24R
Dayton International (DAY)		•				2002	6R/24L
Dallas-Fort Worth International (DFW)		•				2002	18L/36R
George Bush Intercontinental (IAH)		•				2002	15R/33L
Memphis International (MEM)				•		2002	18R/36L
Pensacola Regional (PNS)		•				2002	8/26
Sarasota Bradenton (SRQ)		•				2002	14/32
Denver International (DEN)	•					2003	16R/34L
George Bush Intercontinental (IAH)	•					2003	8L/26R
Miami International (MIA)	•					2003	8/26

Figure 3-2 Runway Construction Projects November 2003 to December 2008

Airport (ID)	New	Extension	Reconstruction	Runway Identifier	Estimated Cost ($M)	Planned Operational Year	In Progress
Orlando International (MCO)	•			17L/35R	$203.0	2003	•
Phoenix Sky Harbor International (PHX)			•	7L/25R	$66.0	2003	•
Norman Y. Mineta San José International (SJC)		•	•	12R/30L	$61.4	2003	
Cleveland Hopkins International (CLE)		•		6L/24R	$230.0	2004	
Greensboro Piedmont Triad (GSO)	•			5L/23R	$96.0	2004	
Minneapolis-St. Paul International (MSP)		•		4/22	$11.4	2004	
Louis Armstrong New Orleans International (MSY)			•	1/19	$31.5	2004	
Louisville International (SDF)		•		17R/35L	$18.0	2004	
Knoxville McGhee-Tyson (TYS)		•		5L/23R	$7.0	2004	
Albany County (ALB)		•		1/19	$7.5	2005	
Buffalo Niagara International (BUF)		•		14/32	$4.9	2005	
Greater Cincinnati International (CVG)	•			17/35	$233.0	2005	•
Greater Cincinnati International (CVG)		•		9/27	$18.2	2005	
Dallas-Fort Worth International (DFW)		•		17C/35C	$25.0	2005	
Fort Lauderdale-Hollywood International (FLL)		•		9R/27L	$898.0	2005	
Lubbock International (LBB)		•		8/26	$15.0	2005	
Manchester (MHT)		•	•	17/35	$65.0	2005	
Minneapolis-St. Paul International (MSP)	•			17/35	$563.0	2005	•
Fort Myers Southwest Florida Regional (RSW)			•	6/24	$15.0	2005	
Hartsfield Atlanta International (ATL)	•			10/28	$133.0	2006	
Boston Logan International (BOS)	•			14/32	$100.0	2006	
Cleveland Hopkins International (CLE)		•		6R/24L	$40.0	2006	
Norfolk International (ORF)	•	•		5R/23L	$120.0	2006	
San Antonio International (SAT)		•		3/21	$20.0	2006	
San Antonio International (SAT)		•	•	12L/30R	$11.0	2006	
Lambert St. Louis International (STL)	•			12R/30L	$1,100.0	2006	
Washington Dulles International (IAD)	•			1W/19W	$200.0	2007	
Indianapolis International (IND)	•			5R/23L	$80.0	2008	
Charlotte-Douglas International (CLT)	•			18W/36W	$187.0	TBD	
Dallas-Fort Worth International (DFW)		•		18R/36L	$400.0	TBD	
Manchester (MHT)		•		6/24	TBD	TBD	

See Appendix C for Runway Construction Projects 2009 and Beyond

3.2 Other Strategies For Improving Airport Capacity

In addition to new runway construction projects, the FAA assists airports in meeting peak demand through a combination of strategies that make better use of existing runways.

Several projects are underway to improve arrival and departure rates at OEP airports. In addition to building new runways, procedures will be evaluated for crossing runway configurations at 18 benchmark airports. Terminal airspace redesigns, planned for most of the benchmark airports and metro areas are aimed at improving the transition of arrivals and departures. Traffic management advisory tools that help in managing the arrival stream will become operational in four sites. Also, the multi-center capability will be evaluated in the Philadelphia area. An update of operational procedures is provided in Chapter 4 and Airspace Redesign is summarized in Chapter 5.

3.2.1 Airport Design Team Studies

The Office of System Capacity (ASC) helps to improve system efficiency by identifying and evaluating initiatives with the potential to increase capacity in the NAS. Among its many responsibilities, ASC supports Airport Capacity Design Teams. These teams evaluate alternatives for increasing capacity at specific airports that are experiencing or projected to experience significant flight delays. An airport study is the product of the Airport Capacity Design Team. Capacity studies are a crucial element in attaining funding for airport development projects. ASC also serves on teams that investigate other airport capacity enhancements, and participate in air traffic control simulations at the request of local and regional air traffic representatives and foreign airport operators.

3.2.1.1 The Dallas/Ft. Worth International Airport Perimeter Taxiway Demonstration

In an effort to reduce arrival and departure delays and the number of active runway crossings (with the added benefit of reducing the likelihood of runway incursions), a perimeter taxiway concept was proposed for DFW. A real-time human-in-the-loop (HITL) simulation was conducted on February 10-13, 2003, by a team consisting of the airport, the FAA, and NASA. This demonstration provided an opportunity to observe and experience the proposed airport improvements with realism and high fidelity, and generated a considerable amount of valuable data for analysis.

Currently, DFW experiences about 1,700 runway crossings per day, which contribute to arrival and departure delays and the potential for runway incursions. The primary objective of the simulation was to provide the airlines, air traffic controllers, and pilots and their unions the opportunity to observe and participate in a demonstration of the proposed airport improvements to gain support of the perimeter taxiways. The secondary objective was to collect and analyze operational data for the purposes of deriving descriptive statistics for runway crossings, taxi times, and pilot and controller transmissions. Overall, the data collected from the participants and the statistics demonstrated that the perimeter taxiways would improve operations in many areas, including average departure rates, average outbound taxi duration and associated runway occupancy times, average inbound and outbound stop rates and duration times, the number of runway crossings, and the amount of controller and pilot communications.

3.2.1.2 The Portland International Airport Study

Portland International Airport is ranked 34 in aircraft operations according to FY 2002 data, and is expected to experience a 26.6 percent increase in operations by 2010, according to 2001 Terminal Area Forecast baseline data. Recently, the Port of Portland decided to adopt low growth forecast figures for decisions regarding the timing of future facility enhancements. Using the Port's local forecast, the Portland International Airport Capacity Design Team updated its 1996 Capacity Enhancement Plan.

The first phase of this multi-phase effort had two goals: one was to evaluate the capacity and delay reduction benefits of the proposed third parallel runway, North/South taxiway and new technology. The second phase of the study, which was initiated in the fall of 2002, will further analyze the capacity and delay reduction benefits of the proposed third parallel runway by comparing the centralized and decentralized terminal options along with the reconfiguration of associated taxiways. The updated study will be completed in the late spring of 2004.

3.2.1.3 Baltimore-Washington International Airport Study

The Baltimore/Washington International Airport Capacity Task Force completed a study to determine when a new runway will be needed at BWI airport. An Airport Master Planning process will determine which of the alternatives should proceed for further capacity, cost and environmental study. The task force is now in phase three of the project. In 2003, BWI released an evaluation of each proposed capacity improvement and simulations were conducted to further evaluate impacts associated with capacity solutions. In 2004, the task force will update the forecasts, conduct further capacity analysis, develop cost estimates and conduct environmental studies.

3.2.1.4 Philadelphia International Airport Simulation Study

The FAA's Modeling and Analysis Group, ACB-320, of the William J. Hughes Technical Center, has been tasked to conduct computer simulations at PHL airport to evaluate two proposed scenarios for runway development. The first involves a parallel concept, which will require the construction of an additional parallel runway to the existing airfield. The second is a diagonal concept involving the rotation of the airfield by approximately 30 degrees. Four runways would be constructed in addition to the relocation of the existing terminal area. Simulation results of the two concepts will be analyzed and compared. This analysis, which began in 2003, will be presented to PHL for their review in late 2004.

3.2.2 Capacity Benchmark Analysis Continues

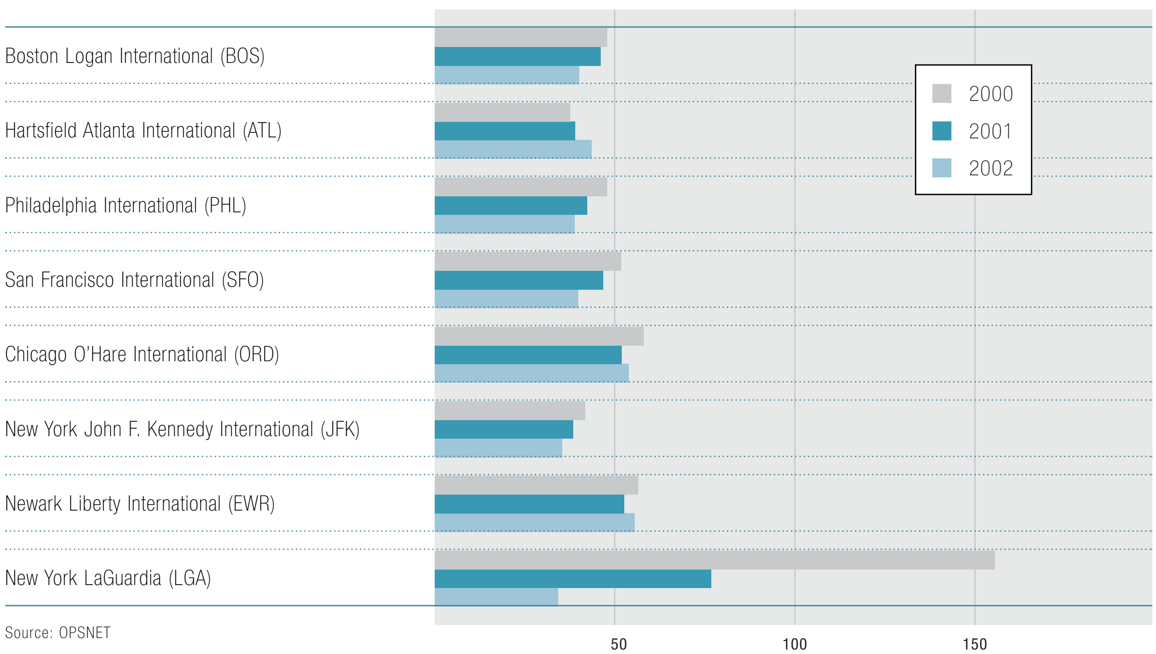
In 2001, the FAA issued the Airport Capacity Benchmark Report that analyzed capacity at 31 airports—the 30 busiest U.S. passenger airports and Memphis, a major cargo airport. Since the original report was published, the number of benchmarked airports has increased to 35 with the inclusion of the Cleveland, Ft. Lauderdale, Portland and Midway airports. The objective of the Benchmark Report was to document the number of flights these airports can handle under optimum and reduced weather conditions, and to project future capacity based upon plans for new runways, revised air traffic procedures, and technology improvements. This report was also prepared to understand the impact of airline scheduling and the relief that could be provided by the ATC modernization effort, new controller procedures and ground infrastructure in both the short and the long term.

Benchmark rates for each airport were derived based on observations of the air traffic controllers for a particular airport based on their experience in handling flights on a daily basis, and calculated using a computer model of airfield capacity. The observed and calculated estimates were compared to historical arrival and departure data to confirm their validity. Two benchmark rates were calculated for each airport: an optimum rate and a reduced rate. The optimum rate was defined as the maximum number of aircraft that can be routinely handled using visual approaches during periods of unlimited ceiling and visibility¸ when there are no traffic constraints in the en route system or airport terminal area, and aircraft operate using Visual Flight Rules (VFR). The reduced rate is defined as the number of aircraft that can be handled during peak periods of poor visibility when radar is required to ensure separation between aircraft, for the runway configuration most commonly used in adverse weather, when Instrument Flight Rule (IFR) conditions apply.

Once the benchmark rates were derived, they were then compared to the air carrier flight schedules to document how frequently scheduled demand exceeded the benchmark capacity under optimum and reduced weather conditions. While capacity benchmarks can be exceeded for a short period of time without producing a large number of delays, when the number of scheduled flights exceeds the benchmark capacity for sustained periods of time, delays are inevitable. When the report was originally produced, eight airports were defined as pacing airports. Those airports were selected given their significant passenger delays – where three percent or more of the operations experienced delays in excess of 15 minutes. Those airports included New York LaGuardia, Newark, New York Kennedy, Chicago O'Hare, San Francisco, Philadelphia, Atlanta and Boston.

The FAA has initiated an update of the Capacity Benchmark Report, scheduled to be complete in 2004. Additional airport configurations are being analyzed for progressively worse weather conditions. The 2001 benchmark capacity is also being adjusted due to the changes that have occurred in operating practices of the airlines, operational procedures, and ground infrastructure improvements. For example, the industry has experienced many changes in growth at secondary airports, fewer hubs as airlines restructure, and rolling hubs are becoming a standard practice. Figure 3-3 shows the delay rates per thousand operations at the 8 pacing airports for CY 2000 and CY 2002.

Figure 3-3 Capacity Benchmark Pacing Airports Delay Rate (2000 through 2002)



Source: OPSNET

Of the eight pacing airports, Atlanta was the only airport that experienced an increase in the delays per thousand operations in 2002 (43.9) as compared to 2000. The 17 percent increase in the delay rate in ATL (2002 as compared to 2000) was in spite of a 2 percent decrease in operations. The new runway, planned for completion in 2006, is expected to improve Atlanta's capacity benchmark substantially. In 2002, Newark's delays per thousand operations (55.7) was relatively flat as compared to the delay rate experienced in 2000 and registered the highest delays per operation of the eight pacing airports.

ASC has conducted capacity enhancement studies at 30 of the 35 benchmarked airports and continues with its plans to improve the operational efficiencies through a combination of airfield construction, enhanced technology, and improved procedures. Following in Figure 3-4 is an update of the studies that have recently been completed or that are underway.

Figure 3-4 OPSNET Delay Data for the Pacing Airports

Delays per 1,000 Operations	LGA	EWR	JFK	ORD	SFO	PHL	ATL	BOS
2000	155.9	56.2	41.8	57.7	51.9	47.5	37.4	48.2
2001	77.0	52.4	38.3	51.9	47.3	42.4	39.4	46.2
2002	34.4	55.7	34.9	54.1	39.9	39.3	43.9	40.7
Operations								
2000	392,047	457,182	358,951	908,977	430,554	483,567	913,449	508,283
2001	376,919	445,082	317,746	911,861	387,599	467,183	887,403	471,989
2002	367,656	411,239	301,160	922,787	351,453	467,717	890,923	404,649

Delays per 1,000 Operations	LGA	EWR	JFK	ORD	SFO	PHL	ATL	BOS
Change 2001 H/(L) than 2000	(51%)	(7%)	(8%)	(10%)	(9%)	(11%)	5%	(4%)
Change 2002 H/(L) than 2001	(27%)	6%	(8%)	4%	(14%)	(7%)	12%	(11%)
Change 2002 H/(L) than 2000	**(78%)**	**(1%)**	**(17%)**	**(6%)**	**(23%)**	**(17%)**	**17%**	**(16%)**
Operations								
Change 2001 H/(L) than 2000	(4%)	(3%)	(11%)	0%	(10%)	(3%)	(3%)	(7%)
Change 2002 H/(L) than 2001	(2%)	(8%)	(5%)	1%	(9%)	0%	0%	(14%)
Change 2002 H/(L) than 2000	**(6%)**	**(10%)**	**(16%)**	**2%**	**(18%)**	**(3%)**	**(2%)**	**(20%)**

Source: OPSNET

3.2.3 International Initiatives Address Global Capacity Enhancement

In addition to its roles as a focal point for airport capacity analyses and facilitation of strategic planning and performance measurement, ASC also coordinates international cooperative efforts to improve system capacity and efficiency. ASC is currently spearheading two international forums: the New Large Aircraft (NLA) Facilitation Group and the International Terminal Benchmark Study.

The New Large Aircraft Facilitation Group meets regularly to discuss issues related to airfield and operational modifications that may be required to allow the passenger and freighter versions of the A380 (currently in production) to operate at airports that do not currently meet national or international standards for such a large aircraft. Participants include representatives from the FAA and International Civil Aviation Organization (ICAO), as well as aircraft manufacturers, and airport, airline, and pilot organizations. As the A-380 will fly many trans-Atlantic and trans-Pacific routes, airports in Australia, Asia, Europe, and the U.S. that are likely to service the A-380 are working to make sure that they will be able to accommodate it without significant interruptions to other aircraft operations. Section 3.4.3 provides more information on the NLA Facilitation Group and the status of A380 airport modification issues.

The International Terminal Benchmark Study is pairing six U.S. terminal control facilities with facilities at similarly-sized airports in other countries for the purpose of studying the relative cost and efficiency of providing terminal and approach control services. The terminal facility pairings are: New Orleans and Dublin, Ireland; San Diego and Auckland; Portland and Copenhagen; Philadelphia and Frankfurt; Tampa and Sydney, and Dulles and Toronto. This study is a follow-up on a Eurocontrol study conducted in 2002 that focused on the comparative cost-effectiveness of en route facilities in Europe and the U.S. That study found that U.S. en route centers are more cost-effective than their European counterparts, and that U.S. en route controllers can handle more traffic when working at their maximum throughput. The terminal benchmark study will assist the U.S. and the other participating countries to better understand the factors that contribute to the provision of effective and efficient terminal ATC services, and will go beyond the en route study in its analysis of service cost drivers. The study will be completed in 2004.

3.2.4 Future Airport Capacity Studies

The FAA is now conducting a study entitled "A Look Into the Future: An Analysis of Airport Demand and Capacity Across the NAS," to identify airports where additional capacity development may be necessary. By combining a variety of data sources to estimate capacity with the socio-economic factors that affect passenger demand, the FAA will develop a comprehensive analysis of future capacity needs.

For the larger airports—those identified in the Operational Evolution Plan (OEP)—multiple criteria were used to identify needed capacity. The Annual Service Volume (ASV), simulation modeling, and updated capacity benchmark criteria needed to be in agreement in order for the airport to be identified as needing additional capacity. For the smaller airports, a simplified approach that relied on an airfield capacity model and socio-economic information was used.

The socio-economic factors being examined include an analysis of existing forecasts of economic and demographic data by metropolitan area. These forecasts were translated into estimates of future passenger demand that in turn were used to forecast future operations for those metropolitan areas. The study's scope goes beyond the OEP airports. However, sufficient funding and support from the community and political stakeholders are necessary for the study to continue. The results of the first phase of the study will be published in the 2004 ACE Plan.

3.3 Resources Affecting Airport Development

Federal interest in capital investment is guided by its commitment to ensure safety and security, preserve and enhance capacity, assist small airports, fund noise mitigation, and protect the environment.

Financing airport development projects is challenging in the current environment given increased operating costs and capital expenditures required to meet safety, security, and capacity requirements. These increased costs are combined with lower airline revenues and have caused some airports to defer and/or reduce certain capital expenditures and operating expenses.

Between 2001 and 2005, the FAA estimated airport capital development costs of $9 billion, annually. This estimate includes only projects eligible for federal funding. Airports Council International (ACI), a key organization that represents the airport industry, estimated costs of $15 billion, annually, which includes projects that may or may not be eligible for federal funding. Neither FAA's nor ACI's estimate includes funding for the terminal modification projects needed to accommodate the new explosives detection systems required to screen checked baggage. From 1999 through 2001, airports received an average of $12 billion annually for planned capital development. The primary source of funding capital development was bonds, followed by federal grants and Passenger Facility Charges (PFCs).[4]

4 "Airport and Airway Trust Fund: Financial Outlook is Positive, but the trust fund's balance would be affected if taxes were suspended," United States General Accounting Office, September 2003.

3.3.1 Airport Improvement Program

The FAA administers the Airport Improvement Program (AIP), a critical source of support for the nation's civilian air transportation infrastructure. The AIP federal grants are financed from taxes and fees collected from and dispensed to civilian airports from the Airport and Airway Trust Fund.

The Airport and Airway Trust Fund was created by Congress more than 30 years ago to fund improvements to airports and to the air traffic control system. It also provides funding for FAA operating expense. Revenues in the trust fund come primarily from airline user fees and/or fuel taxes. The Airport and Airway Trust Fund finances the Airport Improvement Program, the Facilities and Equipment Program, the Research, Engineering and Development Program, and the FAA Operations and Maintenance Programs (allocations vary, usually at 50 percent from the trust fund and the remainder from general funds).

The AIP program provides federal grants for the planning and development of eligible capital projects that support airport operations, including runways, taxiways, aprons, and noise abatement. Airport sponsors and non-federal contributors must provide the portion of the total project cost that is not funded with by AIP grants.

The FY 2003 request for funding is $3.4 billion in AIP grants, which was $0.1 billion higher than the previous fiscal year. Under AIR-21, the annual authorized levels for the Airport Improvement Program, (AIP) increased substantially, as AIP remains a critical source of support for the nation's civilian air transportation infrastructure.

Figure 3-5 Airport Improvement Program Funding History ($ in Billions)

Fiscal Year	Total Authorized	Appropriated
1994	3.0	1.8
1995	2.1	1.5
1996	2.2	1.5
1997	2.3	1.5
1998	2.3	1.7
1999	2.4	2.0
2000	2.5	1.9
2001	3.2	3.2
2002	3.3	3.3
2003	3.4	3.4

Airports that qualify for AIP funding must fit one of the following categories:

- Publicly owned commercial service airports that enplane 2,500 or more passengers annually and have scheduled service;
- Primary airports;
- Cargo service airports, served by aircraft that only provide air transportation of property with an aggregate annual landing weight of more than 100 million pounds;
- Relievers; or
- Remaining airports not specifically defined in the act, referred to as GA airports.

3.3.2 Passenger Facility Charges

Since 1992, airports have applied to the FAA to implement a Passenger Facility Charge (PFC) program. PFCs are fees paid by the enplaning passengers as an add-on to airfare. Originally, the maximum PFC was $3.00 per trip segment. The current maximum PFC is $4.50 per trip segment, with a cap of $18 for a roundtrip ticket. Every PFC application includes a summary of the projects that the airport intends to apply the PFCs remitted. Once authorized by the FAA, the PFC funding is collected by the airlines and remitted to the airport.

The FAA has approved over 300 airports to impose this fee, representing eventual collections of more than $43.8 billion over the next 40 years. Estimated PFC collections for FY 2003 are $2.1 billion. PFCs are used to finance capital improvements to address safety, capacity, airport access, and security needs, as well as noise reduction projects. The reduction in passengers has impacted the amount of funds collected by airports.

3.3.3 User Charges

In addition to airline revenues, there are several other users/tenants at an airport that generate revenue. Parking fees are typically the largest revenue source. Airlines carry a large share of airport expenses, through landing fees, facility rentals, and other costs. With lowered operations by airlines combined with fewer passengers, the level of revenue generated by airlines has been reduced. Airports also generate revenue through airport concessions (which include food, beverage, retail and car rental).

3.3.4 Airport Bonds

Airports rely on the issuance of bonds for a large portion of their capital development. This is particularly true for large and medium hub airports that rely on bonds as the largest source of funding. There are three classes of bonds issued by airports, which include:

- General Airport Revenue Bonds (GARBs),
- Special Facility Bonds, and
- Passenger Facility Charge Bonds.

Each type of bond has varying risk based on many factors including the issuing entity (airport or airline), level of origin and destination passengers, and whether an airport is dominated by a single airline. GARBs have a strong credit history since airline deregulation in 1978. These tax-exempt bonds are secured by an airport's future revenues and are issued directly by the airport entity. Used to finance airport facilities (including consolidated rental car facilities, maintenance hangers, and airport terminal buildings), special facility bonds are obligations of specific airlines (or other tenants) with the airport being a conduit issuer. Payment is made directly from the airline (or other tenants) directly to the bond holders. PFC bonds are backed by the passenger facility charges received, over time, by an airport.[5] With the reduction in passengers, less PFC revenue has been collected which has resulted in narrow margins as compared to the debt service.

5 "Airline Bankruptcies and Airport Bonds: 2003-2006," Fitch Ratings, July 21, 2003.

3.3.5 Other Sources of Funding

Airport staff personnel continuously explore alternate revenue generation methods and have employed innovative ways to generate revenue, reduce operating costs, or eliminate capital expenditures. In addition, private sources of funding may also be available through airport tenants, third-party developers and private entities.

3.4 Other Airport Development Activities

In an effort to explore all possibilities to achieve capacity enhancement, the FAA supports other types of programs that currently show or demonstrate the potential to improve system capacity in the future.

3.4.1 The Military Airport Program

The Military Airport Program (MAP) is another solution that can enhance airport system capacity and help to reduce flight delays at a relatively low cost, by converting military airfields to civilian use in or near major metropolitan areas. MAP is funded through the FAA's Airport Improvement Program. AIP funds are used to provide financial assistance for up to five years to the civilian sponsor of military airfields being converted to, or that have been converted to, civilian or joint-use airfields. MAP funds may be used for projects not generally funded by AIP that aid in the conversion process for civilian use. These projects include building or rehabilitating surface parking lots, fuel farms, hangars, utility systems, access roads, and cargo buildings.

A total of fifteen airports may participate in the program, including one general aviation airport. In 2003, three airports were added to the Map Program: Kalaeloa Airport, the former Naval Air Station Barbers Point, HI is a reliever airport for Honolulu International; Southern California Logistics Airport, Victorville, CA, is re-designated for a two year term, and Castle Airport, Atwater, CA, is the general aviation designation, designated for the first time for one year. Other airports that are currently in the MAP are: Guam International Airport, Guam; Sawyer Airport, Marquette, MI; Mid America Airport, Belleville, IL; Plattsburgh International Airport, Plattsburgh, NY; Cecil Field, Jacksonville, FL; Oskaloosa Regional Airport, Valparaiso, FL; Tipton Airport, Odenton, MD; Mather Airport, Sacramento, CA; March Inland Port, Riverside, CA; and Gray Army Airfield in Killeen, TX.

3.4.2 The Essential Air Service Program

The Essential Air Service Program (EAS) subsidizes air travel to approximately 100 rural communities, since the program was established with the enactment of the 1978 Airline Deregulation Act. The FAA reauthorization bill, known as Vision 100—Century of Aviation Reauthorization Act, has not yet been approved. The bill contains a $115 million annual funding request for the basic EAS program, as well as adding several new pilot programs that will help small airport communities increase their marketability.

3.4.3 Impact of New Transport Aircraft

The FAA's New Large Aircraft (NLA) Facilitation Group continues to meet and assess the potential impact of the Airbus A380. Ongoing issues under review include evaluating the structural and/or operational modifications that might be required to accommodate these aircraft at U.S. airports, and working with the International Civil Aviation Organization (ICAO) to ensure the development of harmonious standards. Airport development and the ability to integrate new capacity in the infrastructure are driven by the unique and varying characteristics of each surrounding airport community.

3.4.3.1 Aircraft Design Impacts Airport Design

Fleet composition at airports is becoming more complex. As air traffic continues to recover unevenly throughout the NAS, airport terminals must quickly adapt to the surge in commuter aircraft operating with mainline jets, while planning for the very few A380's expected in the air traffic system in the near future.

The study of the impact of A380's on airport design includes the evaluating such factors as large capacity aircraft requirements and what airports will need to service them, airside infrastructure impacts, airside capacity impacts, landside impacts, pavement design considerations, noise considerations and the systems approach (such as the impact on aircraft separation). Costly structural airport facility changes and airline personnel costs include supporting dual-level boarding gates, ticketing and service areas for handling 555 to 650 passengers, security processing and apron parking requirements.

A survey was conducted by the General Accounting Office to determine the costs for 14 U.S. airports making the required modifications to accommodate the A380/A380F.[6] While the airports estimated their collective costs at $2 billion, Airbus responded that their study placed the expense at $520 million. Some unresolved issues remain between the airports and Airbus, concerning what contributes to the variation in cost estimates, and under what conditions operational modifications such as restricting the A380's to certain taxiways could be employed to avoid large expenditures on airport upgrades.

Through the FAA-led work groups, a balance can be achieved between minimizing the adaptation costs sustained by airports, the impact on aerodynamic performance sought by aircraft manufacturers and the new operational cost-efficiencies needed by airlines. The ultimate benefit is that as air traffic levels return and surpass 2001 levels, high capacity airports could benefit from lower flight frequencies resulting from NLA operations, assuming that the passenger demand flows are historically consistent.

To give a perspective of how the dynamically-changing mix of passenger jet aircraft may impact airport development, the FAA has forecasted that the fleet will increase from 5,156 aircraft in 2002, to 8,095 by 2014. This group is expected to increase by an average of 21 aircraft per year (3.5 percent). It is also forecasted that there will be a decrease in the three-engine widebody fleet (the MD-11, DC10 and L-1011), from 92 aircraft in 2002 to 34 aircraft in 2014. Four-engine widebody aircraft, (the B-747 and A-340) are also expected to decline from 92 aircraft in 2002 to 78 aircraft in 2014, as two A 380's are scheduled for delivery in three years.[7] In Figure 3-6, wingspan lengths are portrayed according to aircraft type. The two-engine, widebody aircraft, specifically the A-300/310/330 and B-767/777 models, is the fastest growing group in the U.S. fleet.

6 The 14 surveyed airports are: Chicago O'Hare, New York Kennedy, Anchorage, San Francisco, Dallas-Ft. Worth, Indianapolis, Washington Dulles, Memphis, Atlanta, Houston Intercontinental, Orlando, Miami and Denver.

7 *FAA Aerospace Forecasts, Fiscal Years 2003-2014*, FAA-APO-03-1

Figure 3-6 FAA Design Group Aircraft Comparison by Wing Span Length

Design Group	Wing Span (ft.)	Aircraft Type
I	<49'	Cessna 152-210, Beechcraft A36
II	49'-79'	Saab 2000, EMB-120, Saab 340, Canadair RJ-100
III	79'-118'	Boeing 737, MD-80, Airbus 320
IV	118'-171'	Boeing 757, Boeing 767, Airbus A-300
V	171'-214'	Boeing 747, Boeing 777, MD-11, Airbus A-340
VI	214'-262'	A380-800

3.4.3.2 Airbus and Boeing's Perspectives of the Future

Among the nation's system of over 500 airports, there are 14 U.S. airports that are planning to make modifications to accommodate the A380's by 2010. Airbus is strategizing its aircraft design plans to meet the need for much larger aircraft serving connections through congested hubs, where landing slots are a premium. Currently Airbus has 121 firm orders plus 8 commitments, making a total of 129 aircraft, from 11 customers, planning for delivery of the first two A380's in 2006.

Boeing recently announced that it has elected to apply its new technology to the design of the 7E7, a fuel-efficient conventional jet that would seat 200-300 passengers, have a range of 6,600 nautical miles, and a 186-ft. wing span. Boeing's projections for a greater demand in point-to-point service have resulted in the development of the 7E7 jetliner that is due to start commercial flight operations in 2008. The Dreamliner would use 20 percent less fuel and cost 10 percent less to operate than current models. In 2001, Boeing scrapped plans for the 747 Jumbo Jet called the 747X, to build the Sonic Cruiser, which in turn was terminated in 2002 due to the economic downturn and overall drop in air traffic.

CHAPTER 4 OPERATIONAL PROCEDURES

"An airplane stands for freedom, for joy, for the power to understand, and to demonstrate understanding. Those things aren't destructible."

~ Richard Bach

4 Operational Procedures

The FAA continually enhances the procedures governing the operation of aircraft in the NAS. Procedural changes are implemented to increase airspace capacity, take advantage of improved aircraft and avionics performance, maximize the use of a new runway, or simply to make the existing air traffic management system work more efficiently.

Although less expensive and time-consuming than other capacity-enhancing solutions, such as building new runways, the development and implementation of new procedures is a complex process. The collaboration of the air traffic controllers and pilots who will be using the procedures is essential. In addition, both controllers and pilots must receive appropriate training before new procedures can be implemented.

Recent FAA actions to develop new operational procedures are discussed in this chapter. These procedures result in more efficient operations in the en route, arrival and departure, and approach phases of flight, and ultimately give pilots more flexibility in determining their route, altitude, speed, departure and landing times.

4.1 Spring/Summer 2003

In 2003 the FAA and airlines continued to work together to improve processes for managing traffic flow when convective weather disrupts flight schedules. This collaborative effort, referred to as the Spring/Summer plan, began in the year 2000, and the methods of maintaining smooth operations during severe weather have been gradually improved over the years. Two key improvements related to collaborative decision-making were implemented in 2003.

One improvement is a system that encourages airlines to give up a takeoff time in advance when an airport is experiencing delays. If another airline uses the returned slot for a flight that is already delayed 30 minutes or more, the airline that gave up the slot will receive a replacement slot that it can use for another delayed flight. This system, referred to as Slot Credit Substitution (SCS) encourages airlines to give up unneeded slots by compensating them for the loss of the slot. When the FAA knows in advance that an airline is canceling a flight and freeing up a slot, the FAA can recapture the slot, thus better utilizing that scarce resource. The system also gives airlines more flexibility in compensating for bad weather and keeping important connecting flights closer to schedule. Last year there were 1.2 million minutes of delay that could have been eliminated if all canceled slots had been used. In the first few weeks that the slot substitution process was available, it was used for rescheduling dozens of flights during severe weather. An initial analysis on the use of SCS between May and June 2003 showed that 4,032 minutes of delay were avoided, an average of 18 minutes of delay per aircraft.

Another improvement to the system for minimizing flight schedule disruptions due to storms is the implementation of the reroute advisory tool (RAT) graphic display. Previously, airlines had long lists of computer printouts to identify their affected flights; and flights that could have been rerouted often were not. The RAT standardizes the format for reroute advisories and provides a list of affected flights for each reroute. The flight list is provided to system users and FAA facilities to accurately depict what flights are included in a reroute. This allows system users and facilities common situational awareness for a reroute, and allows system users to participate in the pre-departure phase of the reroute process. The initial implementation of the RAT was for transcontinental reroutes that have at least one hour of lead time prior to commencement of the route, which allowed enough time for users to participate in the process of route planning, and was subsequently expanded to other routes. RAT usage leads to improved coordination of available reroutes, which minimizes the impact of severe weather and congestion.

4.2 Area Navigation Procedures

The accuracy of modern aviation navigation systems and user requests for increased operational efficiency in terms of direct routings have resulted in the development of Area Navigation (RNAV) procedures for the en route, terminal, and approach phases of aircraft operations. RNAV is a method of navigation that permits aircraft operation on any desired flight path, without reference to ground-based navigation aids. Aircraft equipped with a qualified Flight Management System (FMS), Global Positioning System (GPS), or Distance Measuring Equipment (DME). DME sensors can safely fly RNAV routes. RNAV operations provide a number of additional advantages over conventional navigation, including:

- Flexibility in permitting user-preferred routes that take advantage of optimal altitude and wind.
- Parallel routing to accommodate a greater flow of en route traffic.
- Establishment of bypass routes around high-density terminal areas and special use airspace.
- More efficient traffic patterns (i.e., between the en route, arrival, and final approach segments of the flight path).
- Fewer voice transmissions between the pilot and controller to execute approaches.
- Smoother and safer descent paths on approach.
- Approaches to more airports in low-visibility conditions.

The concept of Required Navigational Performance (RNP), which defines levels of RNAV accuracy, is explained below, followed by a discussion of the FAA's development of RNAV approach procedures. More information on the implementation of RNAV concepts to enhance airspace capacity en route and in the arrival and departure phases of flight is provided in Chapter 5.

4.2.1 Required Navigational Performance

Required navigational performance (RNP) defines RNAV accuracy requirements for a variety of operations. For example, terminal RNP operations are defined as RNP-1 meaning that the aircraft's navigation system must be able to maintain a total error of plus-or-minus one nautical mile 95 percent of the time. RNP specifies the performance requirements for the aircraft, but does not require that an aircraft be equipped with a specific navigation sensor. RNP concepts have been implemented within the airspace of several countries, as well as some areas of oceanic airspace (see Reduced Oceanic Horizontal Separation Minimum in this chapter).

In July 2003 the FAA published the "Roadmap for Performance Based Navigation," which describes the FAA's plan for evolving RNAV and RNP capabilities in the NAS through the year 2020. In the near term, the FAA will implement a first set of RNAV and RNP procedures for all phases of flight, and will develop criteria for more advanced RNAV and RNP operations. By 2005, the FAA will convert some RNAV routes to RNP-2 routes, and will initiate reduction of route spacing by 2006 where feasible. In addition, the FAA is planning the development of RNP departure procedures

(DPs) and standard terminal arrival routes (STARS), as well as RNP approaches to closely spaced parallel runways.

4.2.2 Area Navigation Approaches

Of the more than 3,000 commercial and general aviation airports in the United States, approximately 340 have a system such as an instrument landing system (ILS) to guide planes to the runway when visibility is poor. The FAA is increasing access to more airports in sub-optimal weather by pursuing an aggressive RNAV approach development schedule. RNAV approaches allow properly equipped airplanes to safely navigate landings in poor visibility to airports or runways that are not equipped with an ILS, or to a runway with an ILS that is out of service.

RNAV approaches can have three differing lines of minima. They are the LNAV (lateral navigation), LNAV/VNAV (lateral navigation/vertical navigation), and LPV (localizer performance with vertical guidance).

The LNAV minima is for a non-precision approach that can be conducted with approach-certified GPS or WAAS receivers. As of September 2003, the FAA had published more than 3,400 RNAV approaches with LNAV minima. The LNAV/VNAV minima falls between a conventional non-precision approach and a true precision approach. RNAV approaches with LNAV/VNAV minima have the lateral accuracy associated with non-precision approaches, but also have a stable, guided, vertical path similar to an ILS glideslope. RNAV approaches with LNAV/VNAV minima require the aircraft to be equipped with an approved barometric-VNAV system or a WAAS-certified receiver. The FAA has published more than 600 RNAV approaches with LNAV/VNAV minima at more than 200 airports.

The RNAV approach with LPV minima provides lateral guidance that is equivalent to or better than an ILS localizer, and vertical guidance that is only slightly less accurate than an ILS. An important benefit of LPV will be bringing vertically guided instrument procedures to several thousand runways that would normally not have a precision or ILS instrument approach, many which serve general aviation users. The use of LPV can provide near precision minima of 250 feet and 3/4-mile visibility at qualified airports.

The FAA has established a production plan schedule accessible to the public, which indicates the Agency's plan for publication of public Standard Instrument Approach Procedures (SIAP's). (See website: http://avn.faa.gov/index.asp?xml=nfpo/production) Initially the plan was created to establish a priority of RNAV production, but in the near future will include a production plan for all new public SIAP's. By 2010, all the U.S. Part 139 airports (those with commercial flights holding 30 or more passengers), and the other public airports with runways over 5,000 feet will have RNAV instrument approach procedures. Procedures for the remaining 1,300 public airports with paved runways (with runways less than 5,000 feet) will be completed after 2010.

The commissioning of WAAS in July 2003 made several hundred previously published RNAV approaches available to any properly-equipped user. While the initial benefits of WAAS will primarily apply to users of airports without an instrumented runway, WAAS offers benefits to the airlines and other users of the larger airports also. For example, airlines may benefit by WAAS opening additional runway ends to precision approach. While airlines primarily use airports equipped with an ILS, operations at smaller airports that feed into hubs will be made more reliable in adverse weather by the existence of RNAV approaches that can be flown by WAAS-equipped aircraft, making these feeder operations more immune to weather delays, and helping to keep hub operations on schedule. In addition, many airports have only a single precision ILS providing service to just one runway. WAAS will make non-ILS runways at the larger airports accessible in low visibility conditions.

Two manufacturers currently produce WAAS-certified receivers, and several others are working toward certification.

4.2.3 RNAV Arrivals and Departures

RNAV allows for the creation of arrival and departure routes that are independent of existing fixes and navigation aids, and provides multiple entries to existing Standard Terminal Arrival Routes (STARS) and multiple exits from Departure Procedures (DPs). Airports with multiple runways or with shared or congested departure fixes benefit the most from segregating departures and providing additional routings. Approximately 40 public-use RNAV's DPs have been implemented within the NAS. Many were commissioned by particular airlines and subsequently converted to public use. In 2004, the FAA will publish several RNP-2 and RNP-1 DPs and STARS where a high percentage of users are adequately equipped and the benefits are substantial, and 30 additional procedures annually in 2005 and 2006. The prioritization and time schedule for implementing these procedures has yet to be determined. Examples of recently implemented RNAV STARS and DPs are listed below:

- Four RNAV STARS and five RNAV DPs at Las Vegas allow efficient paths to and from the airport that are not dependent on the location of ground-based navigation aids. Preliminary results indicate that in at least one STAR, the flight distance was reduced by 25-30 nautical miles and in one DP the reduction was 15-20 nautical miles per flight.
- An RNAV DP at Boston's Logan Airport was implemented to reduce noise in environmentally sensitive areas.
- An RNAV DP at Newark improves access to departure gates due to reduced interaction with traffic from adjacent airports, and increases departure throughput.

4.3 Reduced Separation Minimum

Separation standards in a given airspace are determined by the communication, navigation, and surveillance capabilities available in the specific operating environment. As these capabilities improve due to technological advances, separation standards, also referred to as separation minimums, are being reduced incrementally in various regions of the world. Separation minimums have been already been reduced in large portions of airspace over land and the oceans, and the reduction of the vertical separation minimum for U.S. domestic airspace is expected by 2005.

4.3.1 Reduced Vertical Separation Minimum

Procedures implemented more than 40 years ago required a 2,000-foot minimum vertical separation between IFR aircraft operating above Flight Level (FL) 290, but only a 1,000-foot separation below FL290. The larger separation above FL290 was necessary because the altimetry used at that time had relatively poor accuracy at higher altitudes. The six flight levels available above FL290 became congested during peak travel periods. Over the past several years, the U.S. and other nations, in cooperation with the International Civil Aviation Organization (ICAO) and international air carriers, have reduced the vertical separation minimum from 2,000 feet to 1,000 feet in large portions of the world's airspace, increasing the number of available flight levels from 6 to 12.

In the RVSM environment, aircraft are more likely to receive their requested altitude and route, because more aircraft can be accommodated on the most time- and fuel-efficient tracks or routes available. RVSM also gives air traffic controllers greater flexibility in re-routing traffic around storms, and enabling aircraft to cross-intersecting flight paths above or below conflicting traffic. To ensure that aircraft will be able to maintain separation, aircraft that want to participate in RVSM must meet stringent altimetry system standards.

4.3.1.1 World-Wide Implementation of the Reduced Vertical Separation Minimum

RVSM has been implemented in oceanic airspace in the North and South Atlantic, the Pacific, the South China Sea, and in the portion of the West Atlantic Route System (WATRS) that is in the New York Oceanic Flight Information Region (FIR). RVSM has also been implemented in the continental airspace of Australia and Europe, and northern Canada. Canada is planning to implement RVSM in southern Canadian airspace at the same time that it is implemented domestically in the U.S.

4.3.2 U.S. Domestic Reduced Vertical Separation Minimum

The final rule on domestic RVSM implementation, published in October 2003, contains an implementation date of January 20, 2005. The new separation standards will apply to the 48 contiguous states, Alaska, and portions of the Gulf of Mexico, from FL 290-410 inclusive. With few exceptions, once DRVSM is implemented, aircraft that do not meet DRVSM equipage requirements will not be permitted between FL290 and FL410. Airplanes that are not yet RVSM-certified when DRVSM goes into effect will be handled at lower or higher altitudes. Approximately 38 percent of flights that operate in U.S. airspace above FL290 are already RVSM compliant. When implemented, DRVSM will help reduce en route delays and permit greater maneuverability in the vicinity of severe weather, and will eliminate the need for additional steps to transition aircraft from oceanic airspace, where RVSM is already in place, to domestic airspace.

4.3.3 Reduced Oceanic Horizontal Separation Minimums

Deficiencies in communications and surveillance capabilities over the ocean have required larger horizontal separation minimums for aircraft flying over the ocean out of radar range. But with the improved navigational capabilities made possible by technologies such as the global positioning system (GPS) and controller pilot data link communications, both lateral and longitudinal oceanic horizontal separation standards are being reduced.

Allowing properly equipped aircraft to operate at reduced oceanic separation will enable more aircraft to fly optimal routes, resulting in shorter flight times. Reduced separation laterally may provide space for additional routes, and reduced longitudinal (nose-to-tail) separation will provide more opportunity to add flights without a delay or speed penalty.

Oceanic lateral separation standards have been reduced from 100 to 50 nautical miles over much of the Pacific for aircraft that are RNP-10 approved. By 2005, it is expected that oceanic lateral and longitudinal separation minimums will be reduced to 30 nautical miles in portions of the South Pacific, extending to the entire Pacific in future years. Because flights along the South Pacific routes are frequently in excess of 15 hours, the fuel and time-savings resulting from more aircraft flying closer to the ideal wind route in this region are expected to be substantial. These reduced separation minimums will only apply to aircraft with sufficiently accurate navigation equipment (RNP-4), controller to pilot data link communication, and enhanced surveillance capabilities provided by automatic dependent surveillance.

4.4 Approaches to Closely-Spaced Parallel Runways

At airports with closely-spaced parallel runways, capacity is constrained in low-visibility conditions. When visibility is good pilots can conduct simultaneous visual approaches to closely-spaced parallel runways. But during periods of low visibility, simultaneous approaches to closely-spaced parallel runways monitored by conventional airport surveillance radar are not permitted. For parallel runways separated by 2,500 feet to 4,300 feet, two arrival streams can be maintained but operations are limited to parallel dependent instrument approaches using 1.5 mile staggered separation. For parallel runways spaced less than 2,500 feet apart, operations are restricted to one arrival stream, which effectively reduces the airport's arrival capacity to one-half of its capacity in visual meteorological conditions. To help reduce the negative effect of weather on arrival capacity, the FAA has developed several approach procedures that take advantage of the enhanced surveillance capability of the precision runway monitor (PRM). In addition, the FAA is developing RNP approaches to closely-spaced parallel runways that do not require the use of a PRM.

4.4.1 Approaches Using a Precision Runway Monitor

The PRM is a surveillance radar with enhanced range and azimuth accuracy that updates essential aircraft target information every one second, compared to a 4.8 second update rate for conventional radar. PRM also predicts the aircraft track and provides aural and visual alarms when an aircraft is within ten seconds of penetrating the non-transgression zone. During PRM approaches to closely-spaced parallel runways, a separate controller monitors each runway. Use of the PRM allows air traffic controllers to ensure safe separation of aircraft on the parallel approach courses and maintain an efficient rate of aircraft landings during adverse weather conditions. All pilots must complete special training before they are authorized to conduct a simultaneous ILS PRM approach to closely-spaced parallel runways.

The FAA has commissioned PRMs at Minneapolis, St. Louis, and Philadelphia International Airports. The PRM system at St. Louis is currently use to monitor Localizer Directional Aid (LDA) approaches to parallel runways spaced at 1,300-feet. PRMs are scheduled for commissioning at San Francisco and John F. Kennedy in early 2004, Cleveland in early 2005, and Atlanta in 2006, coincident with the completion of the fifth parallel runway. The FAA has approved the following procedures using a PRM to allow simultaneous instrument approaches in adverse weather.

- Simultaneous instrument approaches for 4,300 feet – 3,400 feet spacing (applicable to Minneapolis).
- Simultaneous instrument approaches down to 3,000 feet spacing with one instrument landing system (ILS) localizer offset by 2.5 – 3 degrees (Philadelphia and proposed for JFK).
- Simultaneous offset instrument approaches (SOIA) for parallel runways spaced at least 750 feet apart, and less than 3,000 feet apart at airports identified by the FAA (proposed for SFO).

Philadelphia began using its PRM for simultaneous approaches to parallel runways spaced 3,000 feet apart in June 2002. Currently, these approaches are permitted only in visual meteorological conditions. In the next phase of operations, scheduled for late 2003, the minimum weather requirements will be reduced as pilots and controllers gain experience with the procedure. The SOIA procedure would allow simultaneous approaches to parallel runways spaced from 750 feet to 3,000 feet apart. It requires the use of a PRM, a straight-in ILS approach to one runway, and an offset localizer directional aid (LDA) with glide slope approach to the other runway. At San Francisco International Airport (SFO) the arrival rate is 60 aircraft per hour in clear weather using both parallel runways, which are 750 feet apart. In times of heavy fog and low-ceiling conditions, aircraft are placed in-trail to one runway, reducing the airport arrival rate by half. The SOIA procedure will enable SFO to maintain an arrival rate of up to 40 aircraft per hour with a cloud base as low as 1,600 feet and four miles visibility. The FAA has completed flyability, collision risk, and preliminary wake turbulence analyses for the SOIA procedure at SFO, but the PRM has not yet been commissioned.

4.4.2 RNP Approaches to Closely Spaced Parallel Runways

The FAA is planning to take advantage of RNAV/RNP capabilities in the terminal area by developing RNP approaches to closely spaced parallel runways called RNP Parallel Approach Transitions (RPAT). RPAT procedures will improve access to airports with parallel runways separated by 4,300 feet or less in marginal visual meteorological conditions (VMC) when the airport acceptance rate is reduced due to discontinued use of simultaneous independent parallel approaches. The RPAT procedure would not require use of a PRM. The FAA plans to implement RPAT at three airports in 2004 and four in 2005. Figure 4-1 shows the initial seven airports and the potential arrival rate increase during marginal weather. Marginal VMC conditions occur from 5 to 20 percent of the time at these airports.

Figure 4-1 Potential Arrival Rates

Airport	Potential Arrival Rate Increase (Aircraft/Hour)
Boston Logan International (BOS)	24
Cleveland Hopkins International ((CLE)	10
Newark Liberty International (EWR)	21
Portland International (PDX)	20
Philadelphia International (PHL)	12
Seattle-Tacoma International (SEA)	14
San Francisco International (SFO)	20

Source: Roadmap for Performance-Based Navigation, July 2003.

CHAPTER 5 AIRSPACE REDESIGN

"The modern airplane creates a new geographical dimension. A navigable ocean of air blankets the whole surface of the globe. There are no distant places any longer: the world is small and the world is one."

~ Wendell Wilkie

5 Airspace Redesign

The FAA is reviewing the structure of the nation's airspace and redesigning it to improve throughput and provide user flexibility, consistent with evolving air traffic and avionics technologies. The processes and systems used to manage air traffic are migrating from navigation constrained by ground-based navigation aids to the flexibility of a satellite-based navigation system. The FAA's approach to redesigning the nation's airspace is two-pronged. It is implementing systems and procedures to allow more free flight capabilities in en route high altitude airspace, and at the same time is redesigning the airspace surrounding congested airports to improve traffic flow in and out of the nations busiest airports.

5.1 High Altitude Redesign

Implementation of high-altitude redesign will be evolutionary. It began in the seven northwest en route centers at FL390 and above in 2003, and will expand to additional centers to the south and east over the next several years, with functionality expansions and enhancements planned through 2008 and beyond. With each increment, benefits will increase consistent with user equipage. The focus on high-altitude airspace allows the FAA to begin to implement Free Flight concepts and deploy new technology and procedures in a controlled environment. As a result, properly equipped users will begin to achieve the economic benefits of flying their preferred routes and altitudes with fewer restrictions. Figure 5-1 illustrates the region in which high altitude redesign will first be implemented. Figure 5-2 illustrates the design concepts for the first phase of high-altitude redesign.

Figure 5-1 Initial Implementation of High Altitude Redesigns

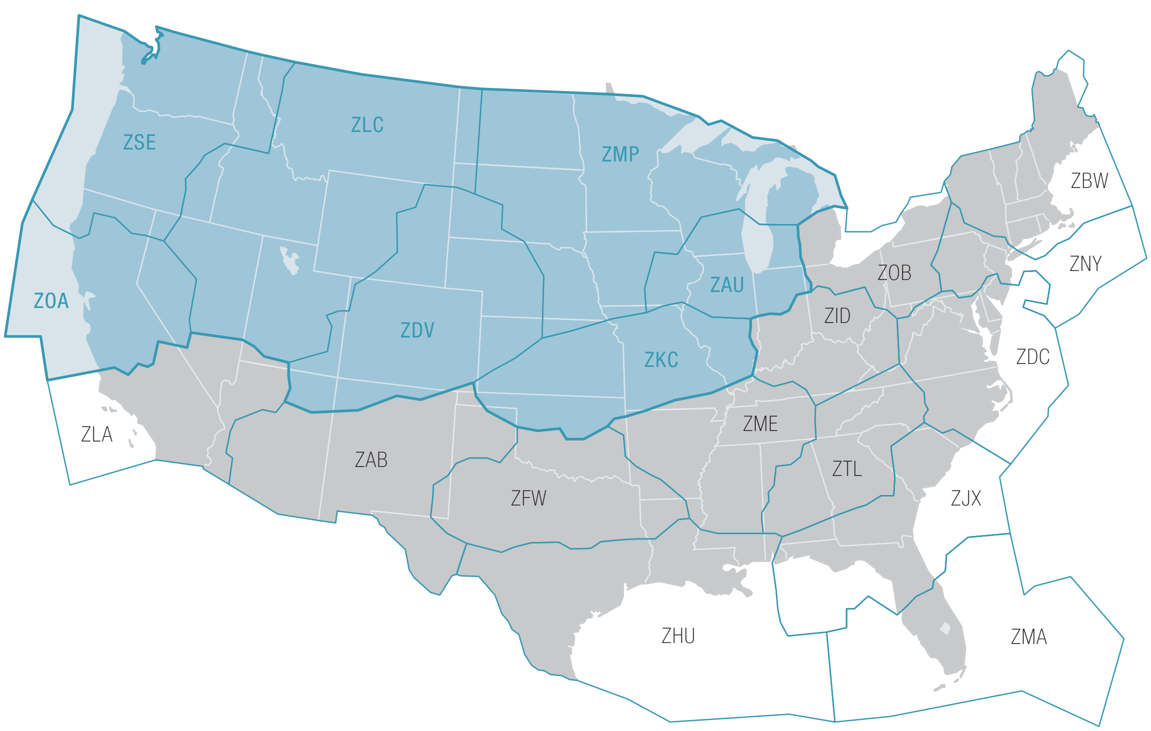
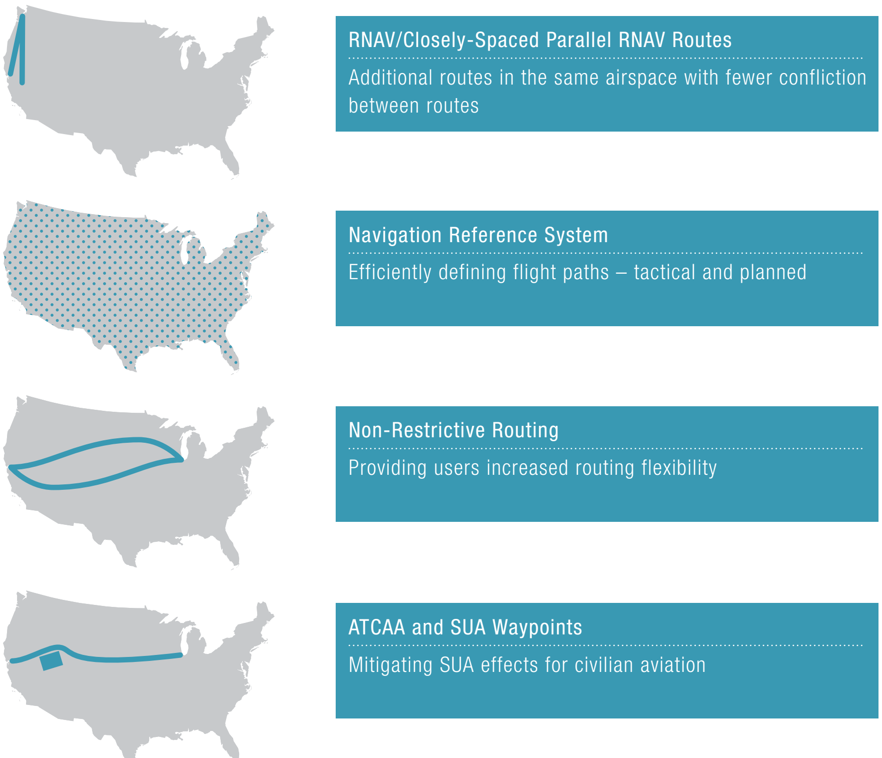


Figure 5-2 High Altitude Airspace Redesign, Phase I Design Concepts



The primary focus of high altitude redesign is to allow point-to-point navigation utilizing both predefined waypoints and a grid of reference points not constrained by ground-based navaids. The predefined waypoints facilitate navigation around Special Use Airspace (SUA), are the basis for RNAV routes and parallel RNAV routes with tracks separated by as little as 8 nautical miles, and allow easy and precise definition of points to and from standard departure and arrival procedures. The points give pilots and controllers the ability to define route segments tactically.

5.1.2 Navigation Reference System Waypoints

The establishment of Navigation Reference System (NRS) waypoints will facilitate RNAV routing and tactical navigation around storm systems and special use airspace by assigning up to 6,500 waypoints over the 48 contiguous states at every ten minutes of latitude and 1 degree of longitude. In the first phase, approximately 600 NRS waypoints will be charted in the seven northwest centers, with approximately 140 of them defined for specific points at which users transition to and from more structured airspace, and along RNAV routes and SUA avoidance routes. Airspace at FL350 and above will be affected. In 2004 the waypoints will be defined for an additional seven centers. The system could be expanded globally, and the International Civil Aviation Authority (ICAO) is considering its application elsewhere. The system will utilize a simple, structured naming convention so the waypoints will be easy to communicate correctly, reducing the likelihood of communication errors. The FAA has begun to chart NRS waypoints, and trials using the NRS waypoints for flight planning began in late 2003. Figure 5-3 illustrates the NRS for the U.S. with waypoints at every 30 minutes of latitude and every two degrees of longitude. Figure 5-4 illustrates how the NRS waypoints will allow users to efficiently circumvent storm systems.

Figure 5-3 Navigation Reference System

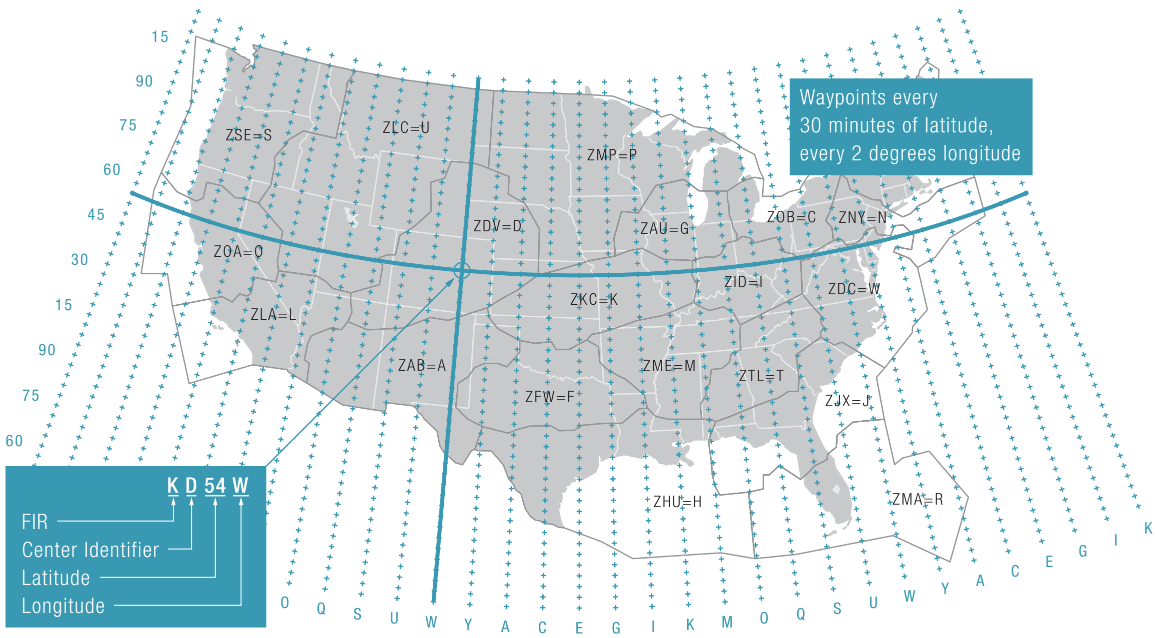
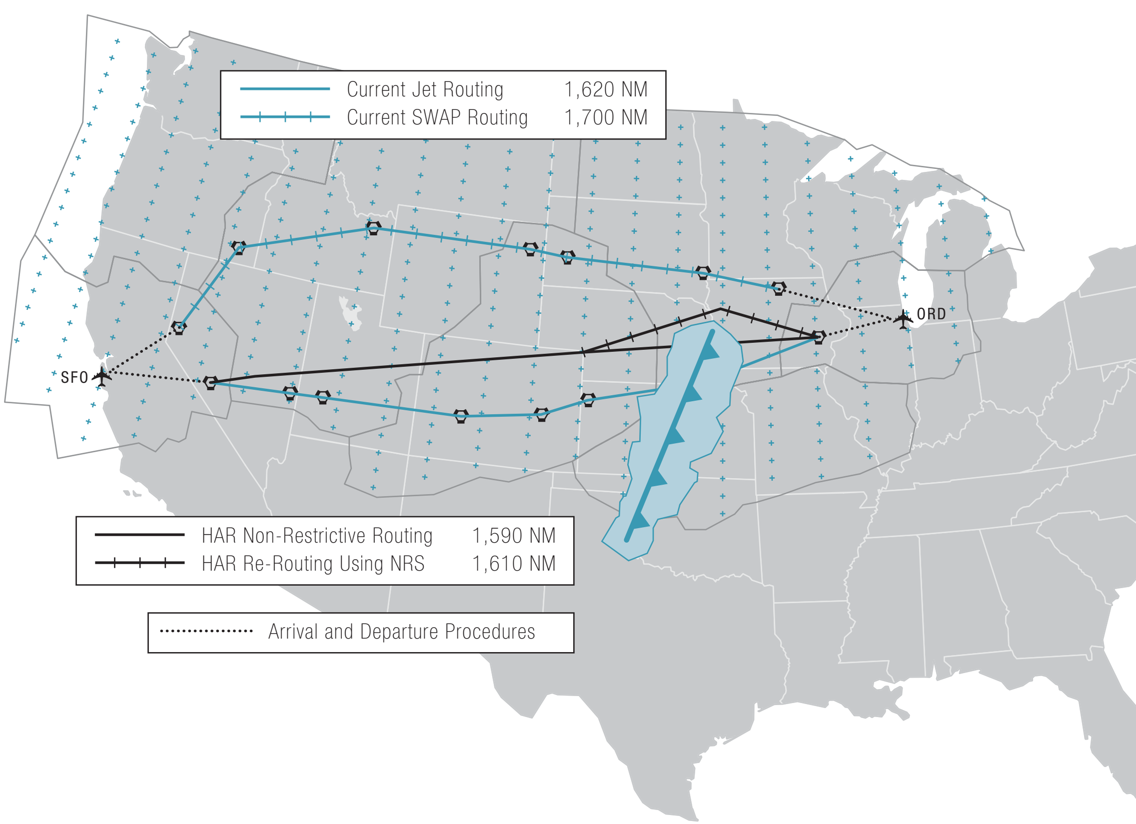


Figure 5-4 Weather Reroute with NRS



5.1.2.1 Waypoints for Navigating Around Special Use Airspace

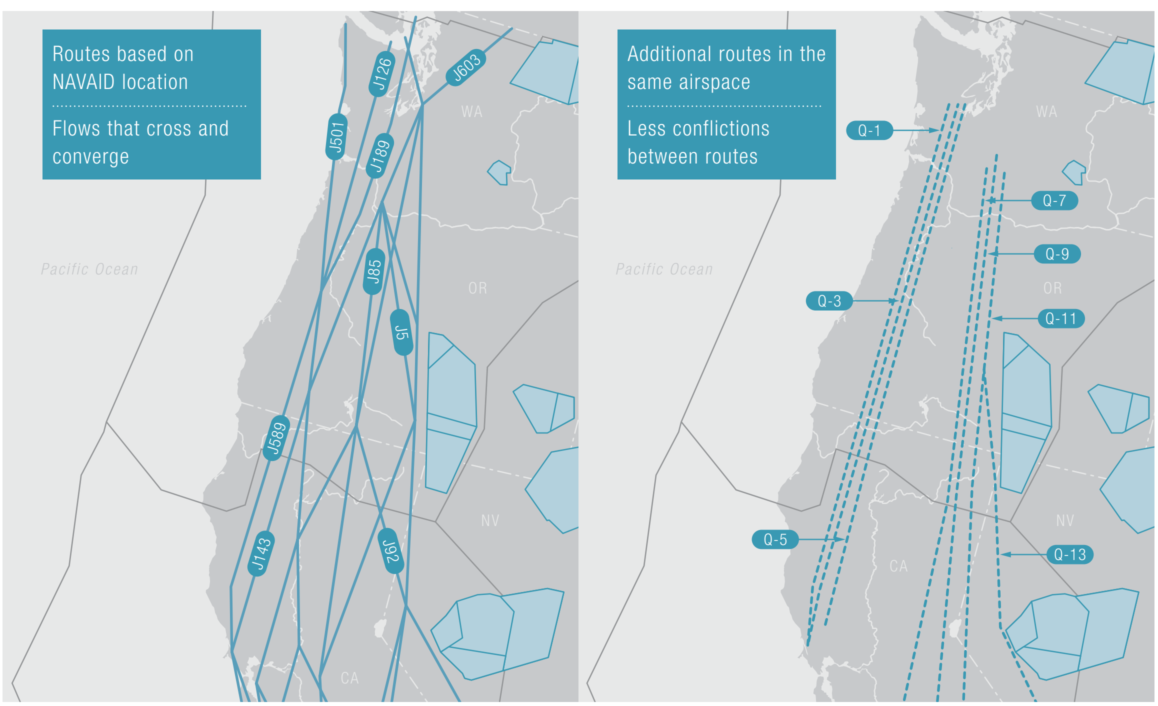
SUA scheduling tends to be in large time blocks, but the airspace may become available for civil use during portions of the scheduled time. To help users gain access to information regarding airspace availability, the FAA has developed a website that provides a 24-hour advance schedule of special use airspace availability for pilots to use for flight planning purposes at http://sua.faa.gov. The site contains waypoints associated with each piece of special use airspace, and provides the ability to filter the data by altitude. Access to the website and the waypoints will assist users in flight planning around restricted airspace.

5.1.3 High Altitude RNAV Routes

The use of RNAV will facilitate less restrictive routing than is commonly available with navigation via radar vectors, allowing efficient routing around active special use airspace and through high-density corridors. Implementation of parallel RNAV routes will further improve system efficiency, and help to reduce the need for miles-in-trail restrictions in congested areas.

In September 2003, eleven new published RNAV "Q" routes were implemented at FL390 and above. "Q" is the ICAO-assigned designator for a published RNAV route in Canada or the U.S. These new Q routes affect Minneapolis, Seattle, Oakland, and Los Angeles Centers. Several of these routes are spaced more closely than standard airways, allowing additional routes in the same airspace. Eventually the Q routes will be available to any RNAV equipped aircraft, but initially aircraft will need to be equipped with global navigation satellite system (GNSS) equipment. In 2006 the FAA will convert Q routes to RNP-2, and will reduce route spacing where operationally feasible. Figure 5-5 illustrates jet routes in the west coast and the high altitude Q routes in the same region. The graphic shows that routes based on ground based navigational aids are indirect and require flows to cross and converge. The Q routes will allow additional routes in the same airspace, and involve fewer conflictions between routes.

Figure 5-5 Jet Routes and High Altitude Q-Routes on the West Coast



In addition to these high altitude RNAV "Q" routes, RNAV routes with fewer altitude restrictions are also being implemented in various regions of the country. For example, in the Northwest and Western Pacific regions, the FAA has developed many advanced RNAV off-airways direct routes between 19 airports, including Seattle, San Francisco, San Jose, Los Angeles, Las Vegas, Vancouver, and Portland. The routes are available for flight plan filing by all RNAV equipped turbojet aircraft, and are filed and flown regularly by airlines and other users. Users file the appropriate DP to a particular fix, and can fly the RNAV route until the appropriate STAR. Several RNAV routes for RNAV equipped Propeller aircraft have been implemented in those regions as well.

5.2 Terminal Area Airspace Redesign

When airport congestion exacerbates airspace congestion, controllers respond by initiating restrictions such as en route holding of aircraft and miles-in-trail restrictions to moderate the flow of aircraft into terminal areas. In addition, at many airports, flights must funnel through common arrival or departure fixes, which reduces throughput rates due to the large number and types of aircraft with varying performance characteristics using the same airspace.

FAA airspace planners are using various approaches to increase terminal airspace capacity and minimize the need for air traffic restrictions, including resectorization, consolidating and expanding terminal airspace, and developing area navigation routes. Sectorization is the process whereby the FAA divides the airspace into appropriately-sized and -shaped volumes that facilitate safe and orderly traffic flows and provides a manageable level of work for the air traffic controllers assigned to each sector. Consolidating terminal airspace reduces the amount of coordination required to handle arriving and departing aircraft, and expanding it frequently allows controllers to begin to reduce aircraft spacing further out from the airport. The development of RNAV arrival and departure procedures allows more efficient use of constrained terminal airspace, because arrival and departure streams can be closer together than those governed by ground-based navigation aids.

Airspace redesign initiatives in New York/New Jersey/Philadelphia, Baltimore/Washington, and Northern California are described below.

5.2.1 New York/New Jersey/Philadelphia Metropolitan Redesign Project

More passengers and planes fly in and out of the New York/New Jersey/Philadelphia metropolitan area than any other area in the U.S. This area services more than 8,000 flights per day, and more than 99 million passengers per year. Routinely, these airports are among the top 10 delayed airports in the U.S., and complexity and congestion continue to be issues even in spite of the continuing industry traffic downturn. No new runways are planned in the NY metropolitan area for 10-15 years.

The proximity of these airports to one another results in complex pilot/controller and controller/controller coordination and fragmented arrival and departure corridors. In addition, during severe weather the airspace in the entire area can be closed off due to lack of alternate routes.

The FAA is analyzing three alternatives to relieve airspace congestion generated by Newark, Kennedy, LaGuardia, Philadelphia and several regional and general aviation airports. The first two alternatives address traffic in the airspace currently controlled by the New York TRACON, roughly a 50-mile radius around the TRACON. The third alternative addresses traffic flow issues by combining the NY TRACON and en route center, and significantly expanding the airspace under terminal control.

The first alternative would make minor adjustments to the existing route structure. The second alternative, referred to as the Ocean Routing Concept is focused on departure procedures for EWR, but affects JFK and LGA flight procedures as well. Under this concept, Newark departures from the south runways (22L/R) would be routed eastbound over the Atlantic, regardless of their destination. Aircraft would turn back toward their destinations after gaining altitude to reduce the impact of aircraft noise on the underlying communities. Environmental and operational analyses on these two alternatives are expected to be complete in late 2003.

The third alternative is referred to as the Integrated Airspace Alternative, or the NY Integrated Control Complex (NYICC). Under this proposal, the NY TRACON and en route center would be combined. The NYICC would provide terminal, en route, and oceanic air traffic control services, and the terminal airspace within the NYICC would be significantly increased. The expansion of terminal airspace would enable controllers to control more aircraft. Existing secondary surveillance radar coverage throughout the area allows terminal separation standards of three miles between aircraft instead of the en route standard of 5 miles between aircraft. Terminal procedures also allow visual separation and more effective staging of arriving aircraft for landing slots as they become available. Expanding the New York TRACON airspace would reduce the fragmentation of arrival and departure corridors across multiple centers, which currently limits the flexibility to address the dynamic nature of the northeast corridor traffic flows. Bringing portions of en route airspace under terminal control will provide additional airspace to support a more even balance of arrivals among arrival fixes and holding patterns within the TRACON. Capacity benefits would include reduced delays, reduced restrictions, and enhanced operations during severe weather events. A Concept of Operations for this proposal is in the final stages of development. The proposal is also beginning the Investment Analysis process, in accordance with Acquisition Management System guidelines.

5.2.2 Potomac Consolidated TRACON

The Potomac Consolidated TRACON (PCT) opened in 2002, and in 2003 the approach control functions for five area airports were consolidated into the new facility—Washington Dulles International (IAD), Ronald Reagan Washington National (DCA), Baltimore-Washington International (BWI), Andrews Air Force Base (ADW), and Richmond International (RIC) airports. The PCT has continuous radar coverage from south of Richmond, Virginia to north of Philadelphia, Pennsylvania, and from as far west as Cumberland, Maryland and east to Cambridge, Maryland. The FAA developed four alternative airspace structures for taking advantage of the consolidated TRACON airspace. Each of the alternatives entailed a significant redesign of PCT airspace, but required varying degrees of coordination and transfer of control with adjacent facilities. The chosen alternative uses existing transfer points between en route and TRACON airspace, with a new internal airspace design. This approach will help resolve air traffic inefficiencies and better handle growth in aviation demand without excessive delays, but will not significantly affect the airspace structure of ATC facilities adjacent to PCT airspace and, therefore, does not require major changes in inter-facility coordination. This alternative will also have the least noise impact on people residing in the study area. Redesigning the combined airspace will allow arriving aircraft to fly at more fuel-efficient high altitudes longer, and departing aircraft to be cleared to higher altitudes earlier. The consolidated airspace has already yielded benefits, even before implementing the airspace redesign. The number of flights canceled or significantly delayed due to summer thunderstorms was substantially less during the summer of 2003 than in previous years, due to the ease of communication with other controllers working the DC/Baltimore area airspace.

5.2.3 Northern California TRACON

In 2003, the FAA completed the transfer of air traffic control responsibilities from four TRACONs in Northern California—Oakland, Monterey, Sacramento, and Stockton—to the consolidated NCT. The NCT monitors flights in and out of more than 20 airports. The last phase of the consolidation plan consists of transitioning portions of Oakland Center en route airspace to NCT. The transition is expected to be completed by October 2004. Redesign of the Oakland Center airspace prior to releasing any airspace to NCT will ensure a seamless transition between the terminal and en route environments.

The FAA's Office of System Capacity is providing Oakland Center (ZOA) and Northern California TRACON with analytical and technical support in the design of the airspace necessary for incorporating portions of the ZOA airspace into the new NCT facility. Current efforts are focused on analyzing traffic flows for the purposes of evaluating potential resectorization options for the NCT expansion and Oakland Center re-design.

CHAPTER 6 TRANSFORMATION OF THE AIR TRAFFIC CONTROL SYSTEM

"Flying has torn apart the relationship of space and time: it uses our old clock but with new yardsticks."

~ Charles A. Lindbergh

6 Transformation of the Air Traffic Control System

The National Airspace System is the largest and most complex aviation system in the world. The FAA's modernization of this interdependent system is being implemented as an evolutionary process that will sustain current NAS operations while new technologies are introduced, proven, and then deployed. The transformation of the FAA's air traffic control system is a key part of this modernization. The FAA is undertaking major changes in the infrastructure of the air traffic control system and at the same time is moving from a centralized command-and-control system to one of air traffic management in which controllers and pilots have a collaborative working relationship.

A more efficient use of the national airspace is the chief object of the transformation of the air traffic control system. Airport capacity can be increased with the construction of new airports and runways at existing airports, but airspace capacity can be increased through the better use of existing airspace. The current airspace structure was created by the FAA to ensure the safe operation of a variety of aircraft, but the constraints of that structure have the effect of restricting the use of that airspace. Easing those restrictions, while ensuring safety, is the primary goal of air traffic management.

The previous two chapters focused on changes in how the FAA manages airspace, by redesigning the existing airspace structure and developing new operational procedures. This chapter shows how the replacement of existing equipment and the introduction of new technologies enables the implementation of those new structures and procedures.

6.1 Free Flight and The National Airspace System

Free Flight, the organizing principle of the transformation of the air traffic control system, is a response to increasing demand on that system. Despite decreases in traffic in the last two years, FAA forecasts call for a gradual return to pre-September 11th levels and a large increase over the next decade. The existing airspace architecture and management will not be able to handle this increase in traffic without an increase in delays. Free Flight will give pilots the flexibility to select their own routes, consistent with safety, bringing substantial benefits, including fuel and time savings, fewer delays and the more efficient use of airspace. Free Flight calls for limiting pilot flexibility only in certain situations, such as to ensure separation at high-traffic airports and in congested airspace, or to prevent unauthorized entry into special use airspace. The FAA designed its Free Flight program to deliver technologies that would benefit passengers, pilots and controllers immediately. The new software includes the following:

- The User Request Evaluation Tool (URET), which gives controllers a 20-minute projection of flight paths.
- The Traffic Management Advisor (TMA), which funnels aircraft from high altitudes toward busy airports.
- The Surface Movement Advisor (SMA), which provides controllers and airlines with precise touchdown times, enabling better management of gates.
- Collaborative Decision Making (CDM), which enables the airlines and the FAA to maneuver aircraft and schedules to reduce congestion and the impact of bad weather.

The Free Flight Phase 1 program has successfully completed the installation of the above technologies at all of its initial sites and has been expanded to others. The new technologies are bringing real and measurable improvements as follows:

- With the User Request Evaluation Tool, Memphis and Indianapolis centers are providing increased direct routings, resulting in savings in aircraft direct operating costs of $1.5 million per month. In addition, the Indianapolis center has eliminated more than 22 static restrictions, saving users nearly $1 million per year in fuel costs.
- The Traffic Management Advisor provides metered traffic flows to the Dallas/Ft. Worth, Denver, and Minneapolis airports, resulting in more fuel-efficient traffic flows and increases of three-to-five percent in peak capacity at these airports.
- Northwest Airlines has estimated that the Surface Movement Advisor has helped it avoid three-to-five diversions a week, especially during inclement weather.

The second part of the program, Free Flight Phase 2, builds on the foundation of Free Flight Phase 1 and features the expansion of Phase 1 elements, including the national deployment of URET and TMA. FFP2 will also provide incremental enhancements to URET and TMA during the period 2003-2005.

6.2 Major Developments in Navigation Systems

The FAA and the aviation community are on the cusp of a revolution in air navigation. The key to the coming changes is the Global Positioning System (GPS) constellation of satellites that provide greater accuracy and reliability than current ground-based navigation systems. GPS-based navigation systems will overcome the limitations of these ground-based systems. Among the most promising of the satellite-based navigation systems are the Wide Area Augmentation System, the Local Area Augmentation System, and Automatic Dependent Surveillance-Broadcast.

6.2.1 Wide Area Augmentation Systems

The Wide Area Augmentation System (WAAS) is a supplement to the basic GPS signal. It provides a signal-in-space, broadcast from Geostationary Earth Orbit (GEO) satellites that improve ranging accuracy, availability, continuity and data integrity. WAAS will support en route navigation, non-precision approaches, and approaches with lateral navigation/vertical navigation operations. WAAS is expected to provide major benefits to the airlines, the traveling public, and the FAA, which include:

- Increased air traffic control efficiencies and NAS capacity through an airspace system that is restructured to accommodate direct routings between airports, as well as reduced separation standards.
- Reduced fuel cost to airlines and reduced travel time to the public through the use of more economical air routes.
- Reduced FAA operating costs through the potential decommissioning of existing ground-based navigation equipment.
- Simplified GPS augmentation infrastructure through the introduction of wide area and interoperability that provides satellite navigation services at a reduced cost.

In January 2003, the FAA accepted WAAS from its primary contractor, eight months ahead of schedule. Then, the FAA commissioned WAAS on July 10, 2003. Commissioning is the process the

FAA uses to define the point where a new system is deemed safe and ready for incorporation into the NAS. The commissioning deems WAAS reliable for pilots who depend on its use in safety-critical situations. The WAAS commissioning represents a key milestone for the aviation community.

The WAAS milestone is the first step toward opening pilot access to more than 500 published satellite runway procedures at more than 200 airports. Pending certification of avionics with vertical navigation capabilities and approval of individual approach procedures, pilots will be able to navigate as low as 350 feet above the runway under instrument flight rules using satellite navigation to provide stable vertical guidance. Later this year, a new procedure will be published for the full capability of WAAS, resulting in approaches down to 250 feet above the runway. WAAS will allow precision instrument approaches at thousands of runways at airports and airstrips that have little or no ground-based capability. WAAS will also provide improved en route capabilities because pilots can fly more direct routes without depending on ground-based navigation aids.

WAAS is also a critical component of Required Navigation Performance (RNP). WAAS can provide the most stringent RNP for area navigation to all classes of users. As air traffic management becomes more global, WAAS can be applied to the civil aviation infrastructure worldwide, enabling global safety improvements. Also, with more stringent RNP standards, inefficiencies in airspace utilization will be reduced.

The FAA continues to work toward final operational capability for WAAS to include a full complement of WAAS satellites, which will ensure that each receiver sees at least two GEO satellites at all times throughout the continental U.S. and most of Alaska. WAAS will be incrementally improved to expand the availability of non-precision approaches and area navigation, increase signal redundancy, reduce operational restrictions, and support precision approach operations. Future phases of WAAS are expected to provide precision approach capability, and potentially enable the decommissioning of some existing ground-based navigation equipment throughout the United States. The FAA is also working with Canada and Mexico to expand the WAAS coverage area to support North American implementation of WAAS.

6.2.2 Local Area Augmentation Systems

In 2003, the FAA awarded a contract for the Local Area Augmentation System (LAAS), which provides for the software and initial hardware design of the Category I LAAS. Phases II and III will cover the final development and full production of the Category I system.

The Local Area Augmentation System is, like WAAS, a supplement of the global positioning system. LAAS will provide highly accurate navigation signals to suitably equipped aircraft. LAAS will provide Category II/III precision approach and landing capability and accurate navigation signals for aircraft and vehicles on the airport surface. LAAS should provide the following efficiencies and cost savings:

- Increased number of instrument approaches, extending all-weather service to more cities and reduce the traffic complexity resulting from back-course approaches and circle-to-land operations.
- Lower landing minima, improving on-time performance by reducing the frequency of flight disruptions such as missed approaches, diversions, delays, and cancellations.
- Increased number of approaches with vertical guidance and improved safety by reducing the risk of controlled-flight-into-terrain accidents.

- ➢ Increased navigation accuracy and flexibility and improved traffic efficiency by facilitating more effective NAS configurations and optimized fuel/time navigation solutions.
- ➢ Reduced infrastructure costs as many surface navigational aids are decommissioned in favor of space-based systems.

LAAS is intended to complement WAAS. The two navigation systems will function together to supply users of the NAS with seamless satellite-based navigation for all phases of flight. LAAS will be used to meet Category I precision approach requirements at those locations where WAAS is unable to meet them. LAAS will also be used to meet the more stringent Category II/III requirements at selected locations throughout the U.S. LAAS augments GPS by focusing navigation service in the airport area (a 20-to-30 mile radius). LAAS broadcasts its correction message via a VHF radio data link from a ground-based transmitter.

The contract for the first phase of the LAAS provides for the software and hardware design of the Category I LAAS. Category I precision landing provides a level of service in poor weather conditions down to a ceiling of 200 feet and visibility of one-half mile. The first system is scheduled to be operational by late 2006. Phases II and III will cover the development and full production of the Category I system. If the Phase II option of the contract is exercised, the operational Low Rate Initial Production LAAS will be installed in Juneau, Phoenix, Chicago, Memphis, Houston, and Seattle, each with a single LAAS providing approach guidance for multiple runway ends. Air carriers will use the six systems to assess operational benefits while in daily service.

The development of the Category I LAAS is a stepping-stone to Category II/III systems. The FAA is continuing research and development activities on Category II/III LAAS to define high-level system performance requirements and to mitigate critical technical risk areas. The full economic benefit for the FAA will come when the FAA is able to eliminate some of the ground-based navigation aids. For the foreseeable future, however, a significant number of navaids will be retained to provide a robust and redundant navigational capacity.

6.2.3 Automatic Dependent Surveillance – Broadcast

The Automatic Dependent Surveillance-Broadcast (ADS-B) system broadcasts aviation information via digital data link between a source and multiple destinations. Aircraft equipped with ADS-B avionics broadcast their position, airspeed, altitude, and planned course changes. Receivers on the ground, as well as ADS-B avionics aboard other aircraft, receive this information. The information can then be processed and displayed to the controller or the pilot, providing a picture of area traffic.

The FAA is testing ADS-B and related data link technologies in a government and industry effort called Safe Flight 21. The Safe Flight 21 initiative focuses on developing suitable avionics, pilot procedures for air-to-air surveillance of other aircraft, and a compatible ground-based automatic dependent surveillance system for air traffic control facilities. Safe Flight 21 demonstration projects are underway at two sites:

- ➢ The FAA is conducting the Alaska Capstone Program to evaluate ADS-B and data link technologies in western and southeastern Alaska. Commercial aircraft are conducting passenger, mail, and freight flights using Capstone avionics provided by the FAA.
- ➢ The FAA is conducting the Ohio River Valley Project to evaluate ADS-B and data link technologies in commercial cargo operations in terminal areas in the Midwest.

6.2.3.1 Alaska Capstone Program

The Capstone Program was developed by the FAA in response to a National Transportation Safety Board (NTSB) safety study, Aviation Safety in Alaska, to address Alaska's high accident rate for small aircraft, which is five times the national average. A recent FAA-sponsored study estimated that 38 percent of commercial operator accidents in Alaska could be avoided if information on position relative to terrain and real-time weather information were available to pilots in the cockpit. The principal objective of the Capstone Program is to improve pilots' situational awareness of the flight environment and to thereby avoid mid-air collisions and controlled flight into terrain. The FAA plans to initially demonstrate the benefits of these technologies in Alaska, but it will eventually extend those technologies to the entire NAS. Although the initial benefits of the Capstone technologies will be to improve safety, the use of GPS-based navigation that is being developed in Alaska will help expand capacity in the rest of the NAS.

In Phase I of the Capstone Program, the FAA equipped 120 commercial aircraft in a non-radar environment in the Yukon-Kuskokwim Delta region of southwest Alaska with Capstone avionics. The avionics suite includes a cockpit multifunction display, a GPS navigation/communications unit, a Universal Access Transceiver data link unit, and a GPS-based terrain database of Alaska. These avionics enable each participating aircraft to broadcast its identification, position, and altitude, climb rate, and direction and to receive similar signals from other aircraft. The FAA has also installed a network of data link ground stations that will transmit radar targets of non-participating aircraft to the Capstone aircraft. In addition, the ground stations will transmit flight information services, including weather reports and forecasts, maps, status of special use airspace, pilot reports, and notices to airmen. The initial improvements of Capstone have been directed towards pilots conducting Visual Flight Rule operations. In the future, the FAA plans to certify systems and equipment and develop enhanced operational procedures for Instrument Flight Rule operations. When this is accomplished, ADS-B will be able to be used for air traffic control functions just as radar is now used.

In Phase II of the Capstone Program, the FAA will equip approximately 200 aircraft, including 50 helicopters, in southeast Alaska, with Capstone Phase II equipment. Capstone Phase II will also provide for implementation of an RNAV infrastructure in southeast Alaska using advanced navigation, communication, and surveillance technologies.

Early in 2003, in a demonstration of Capstone Phase II, LAB Flying Services conducted the first commercial flight of a Capstone-equipped aircraft in southeastern Alaska. Under the authority of a Special Federal Aviation Regulation, they operated a flight from Juneau International Airport based solely on GPS navigation. LAB's Cessna Seneca has been outfitted with the latest version of the Capstone suite of computer equipment and software to receive satellite communications.

The newest suite of Capstone avionics included the first commercial use of an advanced Electronic Flight Information System. Its primary flight display features real-time 3-D terrain modeling, airspeed, groundspeed, altitude, altitude above ground, and many other types of flight information. A second in-cockpit display features an aeronautical map that includes weather data and air traffic information. The map displays the flight plan, along with terrain and traffic near the aircraft's current altitude. Incorporated into the program is a WAAS capability, which uses satellites and ground-based receivers for precise navigation. The new equipment will permit aircraft to fly new lower minimum en route altitudes, opening up thousands of miles of airspace over some 1,500 nautical miles of existing routes.

6.2.3.2 Ohio River Valley Project

The FAA's Ohio River Valley Project is testing ADS-B avionics on commercial cargo aircraft in the Ohio River Valley. These tests are taking place in terminal areas with significant cargo operations, including Memphis, Tennessee; Wilmington, Ohio; Louisville, Kentucky; Scott Air Force Base, Illinois; and, Nashville, Tennessee. The Ohio River Valley Project is co-sponsored by the Cargo Airline Association (CAA) and the FAA. The CAA has purchased, equipped, and is maintaining the avionics for the test aircraft. The CAA members are conducting revenue flights with these aircraft to evaluate the systems' performance in normal operations. This initiative is another step in the evolutionary process of bringing emerging technologies into the NAS. The Ohio River Valley project evaluates the following issues:

- ➢ Addresses pilot and controller human factors issues.
- ➢ Develops and assesses new operational procedures and the associated training.
- ➢ Streamlines certification processes and procedures.
- ➢ Develops a cost-effective avionics and NAS infrastructure.
- ➢ Defines a realistic NAS transition path that is supported by the user community.

The FAA has purchased, installed, and is maintaining ground systems at the five sites. A ground broadcast server has been installed at the Wilmington site that receives data from the other sites and depicts ADS-B targets fused with radar targets. As the project proceeds, fused ADS-B and radar target data will be made available to suitably-equipped aircraft to enable the pilots to see both targets on a cockpit display, along with selected broadcast information such as weather maps, special use airspace status, and wind shear alerts.

As part of the Ohio River Valley Project, the FAA has established or modified operational concepts and procedures, including departure spacing, runway and final approach occupancy awareness, and airport surface operational awareness. In addition, the FAA installed a special Common Automated Radar Terminal System at the Louisville TRACON for evaluation by controllers in their work with airborne ADS-B applications and has installed a multilateration ADS-B surface surveillance system at Memphis in order to conduct an evaluation of surface management. That evaluation was completed in 2001.

As the Ohio River Valley Project continues, the FAA and industry will share the funding of avionics and ground systems to support on ongoing industry initiatives. These include resolving ADS-B technology issues; continuing extensive data collection activities during operational evaluations; and, developing an integrated cockpit display of terrain, traffic, and weather conditions. Throughout the project, the FAA will ensure that controllers and both commercial and general aviation pilots are included in the evaluation of operational enhancements and data link.

6.3 Replacement and Modernization of Air Traffic Control Equipment

Much of the equipment of the FAA's air traffic control system is aging and needs to be replaced. As the FAA replaces this older equipment, it will take advantage of the tremendous advances in computer technology to significantly increase the equipment's capabilities. The FAA will also ensure that new equipment will be in an open architecture that can be easily expanded and updated in the future. The key near-term replacements programs are: the Standard Terminal Automation Replacement System, an upgrade of the terminal air traffic control system; the Advanced

Technologies and Oceanic Procedures, the replacement of the oceanic air traffic control system; and the En Route Automation Modernization, the replacement of the underlying software for the radar processing computers.

6.3.1 Standard Terminal Automation Replacement System

The Standard Terminal Automation Replacement System (STARS) is a joint FAA and Department of Defense program to replace Automated Radar Terminal Systems (ARTS) and other capacity-constrained systems at FAA and Department of Defense terminal radar approach control facilities and associated towers. STARS will work in conjunction with digital radar systems to allow air traffic controllers to track aircraft within the terminal area. The new equipment and software are based on a digital platform and provide higher-resolution screens with color capabilities and higher system reliability. STARS can also be expanded to meet increased traffic demand and to accommodate new automation functions.

The STARS program has been significantly revised since its first definition in 1996. It was originally designed to use off-the-shelf technology, with little specialized software development. However, in consultation with air traffic controllers and the airways facilities maintenance technicians, the FAA concluded that it needed to develop a more customized system and to implement it incrementally. In March 2002, the FAA reduced the number of facilities that will be receiving STARS from 188 to 74 and changed the date to complete installation at all of those facilities from 2005 to 2008.

The first full STARS deployment took place at the Philadelphia TRACON on November 17, 2002. The FAA used the STARS system at Philadelphia to control live traffic, which is considered initial operating capability, but retained the earlier air traffic control system as a backup until the new system was formally commissioned. The STARS system at Philadelphia has eased capacity limitations in the busy terminal airspace. Philadelphia was running out of capacity to track the hundreds of flights either heading for or leaving Philadelphia International Airport or flying overhead en route to different East Coast destinations. STARS is able to track about 750 aircraft simultaneously.

After six months of testing, the FAA commissioned the Philadelphia STARS on June 9, 2003. The commissioning meant the backup ARTS could be turned off. The commissioning signals the start of the nationwide deployment schedule and opens the way for rapid commissioning at other sites. The emphasis is on getting STARS first to the TRACONs with the oldest equipment at the more than 50 sites nationwide still using the ARTS IIIA system.

STARS is also operational, but not yet commissioned, at Portland, Oregon, Syracuse, New York, and El Paso, Texas. In addition, 11 other sites have partial installations, with displays only, that will be upgraded by late 2004. The FAA plans to deploy only seven all-new systems in 2003, down from the 18 previously scheduled, as the result of budgetary constraints. The final number of sites is undetermined, since only the first 74 have been approved for the initial phase through 2005.

6.3.2 En Route Automation Modernization Program

In 1999, the computers for the air traffic control system at the 20 domestic centers were finally withdrawn from service. The Host and Oceanic Computer System Replacement (HOCSR) Program replaced the interim computers that had supported the air traffic control system from the mid-1980's. The new system has extremely high reliability, significantly improved maintainability, and more complete backup than the equipment it replaced.

The new HOCSR computers will be able to be used until at least 2008, but the primary En Route Automation System (the Host Computer System), which receives, processes, coordinates, distributes, and tracks information on aircraft movements throughout the nation's airspace, is based upon the original software. Those programs were written in a computer language that is not widely used now and therefore are difficult to upgrade to meet new requirements.

The FAA is developing the En Route Automation Modernization (ERAM) Program to replace the existing hardware and software in the Host Computer System and its backup, the direct access radar channel (DARC) and associated interfaces, communications, and support infrastructures. The Host processes flight radar data, provides communications support, and generates display data to air traffic controllers. It also connects to air traffic control towers, TRACONs, flight service stations, adjacent flight information regions, and external organizations. The new ERAM automation architecture will provide existing functionality and new capabilities to support the NAS architecture evolution, operational requirements, and information security requirements. ERAM will modernize the en route environment and infrastructure to provide a system that is modular, expandable, and supportable. The ERAM contract was awarded in March 2003. The system will be installed in all centers by 2008. ERAM will also provide:

- Safety Alerts using the backup system.
- Flexible routing around congestion, weather, and restrictions.
- Increased number and type of surveillance sources with improved surface coverage.
- Capabilities for incorporating environments.

6.3.3 Advanced Technologies and Oceanic Procedures System

The Advanced Technologies and Oceanic Procedures (ATOP) System will replace the oceanic systems at Anchorage, New York, and Oakland centers, which handle air traffic in international airspace over the Pacific and Atlantic oceans. ATOP will collect, manage, and display oceanic air traffic data, including electronic flight strip data on the computer displays used by air traffic controllers and integrate capabilities such as flight data processing, and radar data processing. The FAA expects that ATOP will provide huge benefits to the airlines, which will be able to take advantage of improved communications and reduced separation and more flexible routing on oceanic routes.

The FAA took delivery of the Oakland Build I system in July 2003 and will proceed to conduct tests at the FAA Technical Center to ensure that the system can be used operationally. Site acceptance and operational tests for Build I will be carried out at Oakland, followed by controller and technician training and familiarization tests. Initial operating capability will take place in spring 2004 and initial daily use will follow shortly thereafter. Independent operational tests and an evaluation phase will lead to an in-service decision, probably in late 2004. Build I initial operating capability at the New York oceanic center will follow thereafter.

In the second phase of the ATOP program, Build II will be delivered to the Anchorage oceanic center by September 2004. Retrofits to the other oceanic centers will take place a few months later. Anchorage will be the first of the oceanic centers to get Build II and will not get the Build I version. Build II will include integrated radar processing and an improved conflict resolution probe, both of which are needed for 30-nautical mile separation standards and also incorporate automatic dependent surveillance-broadcast. FAA has committed to introduce these reduced separation standards in the South Pacific by mid-2005.

APPENDIX A AVIATION STATISTICS

Table A-1 Passenger Enplanements, by Fiscal and Calendar Years (2000, 2001, and 2002)

		Fiscal Year			Calendar Year		
Airport (ID)	Rank	2000	2001	2002	2000	2001	2002
Hartsfield Atlanta International (ATL)	1	39,375,330	38,403,184	36,377,381	39,277,901	37,181,068	37,720,556
Chicago O'Hare International (ORD)	2	34,153,190	32,861,464	31,036,583	33,845,895	31,529,561	31,706,328
Los Angeles International (LAX)	3	32,332,452	31,501,162	26,262,032	32,167,896	29,365,436	26,911,570
Dallas/Fort Worth International (DFW)	4	28,066,194	26,891,403	24,415,967	28,274,512	25,610,562	24,761,105
Phoenix Sky Harbor International (PHX)	5	18,652,345	18,064,086	16,816,833	18,094,251	17,478,622	17,271,519
Denver International (DEN)	6	18,883,765	18,068,664	16,517,000	18,382,940	17,178,872	16,943,564
Las Vegas McCarran International (LAS)	7	17,530,409	17,215,302	15,987,081	17,425,214	16,633,435	16,600,807
George Bush Intercontinental (IAH)	8	16,564,385	16,576,594	15,888,306	16,358,035	16,173,551	15,865,479
Minneapolis-St. Paul International (MSP)	9	17,203,373	16,462,360	15,351,693	16,959,014	15,852,433	15,544,039
Detroit Metropolitan Wayne County (DTW)	10	17,873,801	16,698,964	15,166,353	17,326,775	15,819,584	15,525,413
San Francisco International (SFO)	11	19,647,516	17,875,926	14,722,632	19,556,795	16,475,611	14,736,137
Newark Liberty International (EWR)	12	17,144,940	16,521,266	14,297,394	17,212,226	15,497,560	14,553,843
New York John F. Kennedy International (JFK)	13	16,080,974	15,734,725	13,963,236	16,155,437	14,553,815	14,552,411
Miami International (MIA)	14	16,716,291	15,740,006	14,262,340	16,489,341	14,941,663	14,020,686
Seattle-Tacoma International (SEA)	15	14,225,451	13,604,468	13,092,774	13,875,942	13,184,630	12,969,024
Orlando International (MCO)	16	15,136,268	14,483,116	12,710,392	14,831,648	13,622,397	12,921,480
Lambert St. Louis International (STL)	17	14,552,733	14,139,923	12,404,296	15,288,493	13,264,751	12,474,566
Philadelphia International (PHL)	18	13,022,732	12,175,642	11,649,324	12,294,051	11,736,129	11,954,469
Charlotte-Douglas International (CLT)	19	11,936,722	11,859,005	11,591,516	11,469,282	11,548,952	11,743,157
Boston Logan International (BOS)	20	13,816,195	12,831,269	10,731,523	13,613,507	11,739,553	11,077,238
New York LaGuardia (LGA)	21	12,567,451	12,342,023	10,490,623	12,697,208	11,352,248	11,076,032
Greater Cincinnati International (CVG)	22	9,185,962	8,951,201	10,039,090	11,223,966	8,586,907	10,316,170
Honolulu International (HNL)	23	10,511,446	10,150,357	9,108,574	11,174,701	9,810,860	9,406,467
Baltimore-Washington International (BWI)	24	10,617,714	10,302,083	9,483,542	9,675,681	10,098,665	9,367,499
Salt Lake City International (SLC)	25	9,297,702	9,285,642	8,938,546	9,522,344	8,951,776	8,997,942
Pittsburgh International (PIT)	26	10,520,627	10,183,267	9,304,145	9,871,995	9,939,223	8,975,111
Fort Lauderdale-Hollywood International (FLL)	27	8,541,532	8,147,642	7,968,172	7,817,173	8,015,055	8,266,788
Chicago Midway (MDW)	28	7,214,205	7,236,415	7,551,934	7,059,520	7,112,784	7,878,438
Washington Dulles International (IAD)	29	8,501,994	8,360,991	7,651,157	9,643,275	8,484,112	7,848,911
Tampa International (TPA)	30	8,200,264	8,102,506	7,563,253	7,969,797	7,901,725	7,726,576
San Diego International Lindbergh Field (SAN)	31	7,953,273	7,780,769	7,257,285	7,898,360	7,506,320	7,392,389
Ronald Reagan National (DCA)	32	7,959,838	7,374,029	5,269,065	7,517,811	6,267,395	6,172,065
Metropolitan Oakland International (OAK)	33	5,821,456	5,623,479	5,802,641	5,196,451	5,566,100	6,164,548
Portland International (PDX)	34	6,553,125	6,438,633	5,901,867	6,754,514	6,168,103	5,978,025
Norman Y. Mineta San José International (SJC)	35	6,886,249	6,309,826	5,196,525	6,170,384	5,981,440	5,248,193
Memphis International (MEM)	36	6,234,454	5,876,534	5,040,988	5,684,619	5,560,524	5,231,998
Kansas City International (MCI)	37	5,888,791	5,879,219	5,288,917	5,903,296	5,614,347	5,161,518
Cleveland Hopkins International (CLE)	38	6,745,903	5,924,679	5,283,887	6,269,516	5,633,495	5,146,975
San Juan Luis Muñoz Marín International (SJU)	39	5,178,299	4,943,132	5,169,232	5,135,591	4,706,307	4,607,290
Louis Armstrong New Orleans International (MSY)	40	4,900,382	4,947,243	4,562,282	4,936,271	4,767,533	4,598,838
Sacramento International (SMF)	41	3,977,530	4,097,754	4,126,102	3,979,043	4,021,102	4,260,514
Raleigh-Durham International (RDU)	42	5,135,074	4,968,382	4,129,284	5,191,077	4,890,606	4,198,873
Nashville International (BNA)	43	4,498,272	4,358,463	3,980,505	4,479,909	4,209,465	4,009,959

Enplanements Table A-1 continued

Airport (ID)	Rank	Fiscal Year 2000	Fiscal Year 2001	Fiscal Year 2002	Calendar Year 2000	Calendar Year 2001	Calendar Year 2002
John Wayne-Orange County (SNA)	44	3,803,407	3,787,262	3,832,501	3,914,051	3,688,304	3,968,978
Houston William B. Hobby (HOU)	45	4,239,410	4,265,788	3,829,712	4,354,609	4,128,980	3,819,306
Indianapolis International (IND)	46	3,848,584	3,750,829	3,393,298	3,833,975	3,595,425	3,411,978
Port Columbus International (CMH)	47	3,499,475	3,402,615	3,206,361	3,441,286	3,296,013	3,283,639
San Antonio International (SAT)	48	3,552,109	3,434,758	3,161,931	3,528,955	3,313,545	3,224,764
Bradley International (BDL)	49	3,630,661	3,571,026	3,167,363	3,651,943	3,416,243	3,221,081
Austin-Bergstrom International (AUS)	50	3,877,600	3,591,420	3,173,554	3,648,600	3,428,202	3,186,381
Ontario International (ONT)	51	3,386,558	3,259,334	3,038,100	3,197,795	3,168,975	3,092,677
Albuquerque International (ABQ)	52	3,177,486	3,149,546	2,985,124	3,148,780	3,095,899	2,973,093
Dallas-Love Field (DAL)	53	3,707,856	3,552,296	2,822,588	3,596,052	3,352,083	2,815,907
Milwaukee General Mitchell International (MKE)	54	3,145,347	2,983,348	2,769,339	3,089,592	2,825,473	2,779,197
Palm Beach International (PBI)	55	2,895,252	2,979,195	2,671,845	2,928,658	2,954,015	2,716,514
Kahului (OGG)	56	2,930,601	2,869,392	2,595,693	2,999,863	2,777,692	2,663,824
T.F. Green (PVD)	57	2,688,902	2,767,789	2,630,373	2,684,204	2,751,762	2,662,721
Fort Myers Southwest Florida Regional (RSW)	58	2,526,879	2,688,420	2,460,091	2,574,322	2,596,005	2,551,187
Jacksonville International (JAX)	59	2,615,286	2,610,899	2,408,114	2,616,211	2,523,809	2,462,399
Ted Stevens Anchorage International (ANC)	60	1,977,515	2,035,781	1,895,745	2,503,138	2,419,261	2,388,563
Burbank-Glendale-Pasadena (BUR)	61	2,449,620	2,322,699	2,245,609	2,380,531	2,250,685	2,305,747
Reno Tahoe International (RNO)	62	2,824,584	2,498,416	2,161,567	2,732,837	2,388,923	2,170,828
Buffalo Niagara International (BUF)	63	2,517,454	2,325,775	2,006,761	2,140,002	2,204,087	2,060,710
Omaha Eppley Airfield (OMA)	64	1,899,827	1,802,980	1,735,032	1,861,057	1,773,894	1,747,320
Louisville International (SDF)	65	1,996,612	1,950,543	1,735,018	1,974,269	1,876,499	1,740,526
Norfolk International (ORF)	66	1,531,236	1,485,273	1,683,310	1,518,552	1,478,687	1,731,105
Tucson International (TUS)	67	1,792,763	1,805,592	1,651,940	1,804,086	1,749,560	1,677,341
Manchester (MHT)	68	1,580,791	1,600,848	1,626,494	1,568,860	1,599,062	1,647,797
Oklahoma City Will Rogers World (OKC)	69	1,760,822	1,729,672	1,517,836	1,739,169	1,675,889	1,579,179
El Paso International (ELP)	70	1,685,686	1,616,621	1,433,423	1,678,287	1,544,734	1,452,631
Tulsa International (TUL)	71	1,715,020	1,668,810	1,429,770	1,737,672	1,627,293	1,450,242
Albany County (ALB)	72	1,343,034	1,512,482	1,374,241	1,407,092	1,463,632	1,448,263
Birmingham (BHM)	73	1,555,779	1,559,770	1,384,082	1,538,007	1,505,133	1,405,395
Boise Air Terminal (BOI)	74	1,531,207	1,471,811	1,360,629	1,524,458	1,425,007	1,380,227
Guam International (GUM)	75	1,648,783	1,657,127	1,316,366	1,665,676	1,489,164	1,375,996
Spokane International (GEG)	76	1,560,577	1,468,964	1,337,035	1,534,342	1,423,624	1,354,085
Greensboro Piedmont Triad International (GSO)	77	1,395,692	1,402,775	1,228,483	1,402,168	1,317,519	1,262,124
Lihue (LIH)	78	1,385,839	1,335,368	1,236,398	1,413,454	1,342,287	1,238,972
Kona International (KOA)	79	1,347,671	1,286,032	1,185,676	1,352,606	1,235,893	1,200,897
Greater Rochester International (ROC)	80	1,202,157	1,207,456	1,115,324	1,218,403	1,132,597	1,176,736
Richmond International (RIC)	81	1,309,985	1,285,536	1,119,205	1,330,487	1,187,681	1,168,023
Dayton International (DAY)	82	1,166,726	1,128,856	1,076,444	1,164,032	1,070,456	1,144,295
Little Rock Adams Field (LIT)	83	1,296,442	1,253,209	1,101,456	1,276,145	1,211,753	1,101,623
Colorado Springs Municipal (COS)	84	1,209,120	1,110,323	1,020,729	1,205,552	1,050,344	1,038,027
Long Island MacArthur/Islip (ISP)	85	1,205,402	1,040,475	945,290	1,120,686	1,009,919	961,601
Grand Rapids Gerald R. Ford International (GRR)	86	950,164	943,620	917,852	960,640	906,768	960,482

Enplanements Table A-1 continued

		Fiscal Year			Calendar Year		
Airport (ID)	Rank	2000	2001	2002	2000	2001	2002
Syracuse Hancock International (SYR)	87	1,071,752	992,105	913,980	1,060,746	936,450	945,066
Savannah International (SAV)	88	866,483	875,158	820,319	879,821	836,791	846,683
Des Moines International (DSM)	89	830,105	823,367	803,147	843,290	789,715	846,301
Charleston AFB International (CHS)	90	826,841	828,260	757,759	843,787	786,326	788,811
Madison/Dane County Regional (MSN)	91	668,869	693,911	720,398	673,451	675,034	759,506
Hilo International (ITO)	92	748,066	718,594	664,925	791,398	714,537	712,162
Long Beach/Daugherty Field (LGB)	93	335,225	297,130	504,845	335,225	297,130	708,686
Knoxville McGhee-Tyson (TYS)	94	876,715	757,743	673,787	863,539	705,607	693,351
Greenville-Spartanburg (GSP)	95	792,339	750,723	663,502	788,807	701,606	688,061
Pensacola Regional (PNS)	96	527,490	518,273	635,090	524,811	520,953	665,881
Harrisburg International (MDT)	97	655,656	584,258	604,146	644,180	556,672	652,552
Orlando Sanford (SFB)	98	454,579	564,244	649,384	508,092	645,944	648,144
Wichita Mid-Continent (ICT)	99	584,014	557,382	580,606	584,160	527,062	635,839
Portland International Jetport (PWM)	100	665,566	665,166	607,632	668,098	625,591	623,093
Total Top 100		673,076,230	650,089,843	594,939,494	667,642,166	622,126,471	607,101,027

Table A-2 Aircraft Operations, by Fiscal and Calendar Years (2000, 2001, and 2002)

		Fiscal Year			Calendar Year		
Airport (ID)	Rank	2000	2001	2002	2000	2001	2002
Chicago O'Hare International (ORD)	1	906,326	927,896	901,703	908,977	911,861	922,787
Hartsfield Atlanta International (ATL)	2	922,016	898,899	882,407	913,449	887,403	890,923
Dallas/Fort Worth International (DFW)	3	875,673	835,748	762,371	865,777	802,587	777,386
Los Angeles International (LAX)	4	781,418	783,160	637,588	783,684	738,679	644,854
Phoenix Sky Harbor International (PHX)	5	624,261	627,561	577,820	638,757	606,666	590,329
Denver International (DEN)	6	520,882	526,204	495,104	528,604	507,826	509,477
Minneapolis-St. Paul International (MSP)	7	524,261	512,102	497,934	522,253	501,252	507,322
Las Vegas McCarran International (LAS)	8	535,935	513,679	491,205	521,300	498,970	498,037
Detroit Metropolitan Wayne County (DTW)	9	561,123	540,966	490,663	554,580	523,039	497,564
Greater Cincinnati International (CVG)	10	485,191	390,306	473,084	477,844	386,388	485,156
Philadelphia International (PHL)	11	484,963	475,577	467,160	483,567	467,183	467,717
George Bush Intercontinental (IAH)	12	483,806	489,987	458,649	490,568	477,367	462,255
Charlotte-Douglas International (CLT)	13	458,697	471,731	465,246	460,370	471,155	459,488
Lambert St. Louis International (STL)	14	489,529	486,503	453,302	484,224	478,947	451,804
Miami International (MIA)	15	516,009	489,058	442,358	516,545	469,871	445,635
Pittsburgh International (PIT)	16	449,168	452,696	439,360	448,181	451,180	424,977
Newark Liberty International (EWR)	17	458,677	462,202	407,730	457,182	445,082	411,239
Salt Lake City International (SLC)	18	369,343	363,682	401,491	366,933	370,282	406,994
Boston Logan International (BOS)	19	510,113	499,474	405,370	508,283	471,989	404,649
Memphis International (MEM)	20	381,746	398,451	393,858	386,335	393,925	398,479
Washington Dulles International (IAD)	21	495,717	430,082	401,750	479,931	424,150	392,179
John Wayne-Orange County (SNA)	22	412,048	385,742	377,073	387,864	384,987	376,335
Orlando Sanford (SFB)	23	368,713	393,027	382,998	371,784	397,557	373,277
Metropolitan Oakland International (OAK)	24	478,558	403,399	374,216	449,050	395,653	371,579
New York LaGuardia (LGA)	25	378,018	404,206	354,218	392,047	376,919	367,656
Seattle-Tacoma International (SEA)	26	444,630	423,903	361,814	445,677	400,670	364,671
San Francisco International (SFO)	27	437,763	407,040	350,133	430,554	387,599	351,453
Long Beach/Daugherty Field (LGB)	28	413,191	362,014	350,974	379,399	358,508	350,913
Honolulu International (HNL)	29	343,296	339,987	316,089	345,496	326,994	323,726
Ted Stevens Anchorage International (ANC)	30	319,235	304,988	304,608	317,763	300,166	309,225
Baltimore-Washington International (BWI)	31	309,516	328,428	310,281	315,348	323,771	305,013
Chicago Midway (MDW)	32	301,879	280,527	293,076	298,437	276,520	303,837
Orlando International (MCO)	33	367,367	342,315	303,328	366,278	326,456	302,843
New York John F. Kennedy International (JFK)	34	358,977	340,459	291,021	358,951	317,746	301,160
Fort Lauderdale-Hollywood International (FLL)	35	287,094	299,773	275,473	292,462	290,124	280,603
Portland International (PDX)	36	321,114	304,896	277,400	317,477	293,902	278,406
Tucson International (TUS)	37	259,906	258,031	265,733	250,943	261,800	272,568
Cleveland Hopkins International (CLE)	38	336,635	305,299	264,075	331,899	291,714	262,108
Port Columbus International (CMH)	39	235,538	243,203	253,325	238,011	243,201	255,630
Albuquerque International (ABQ)	40	232,555	238,200	255,137	233,173	241,673	254,568
Houston William B. Hobby (HOU)	41	254,900	248,111	247,824	251,391	247,173	247,917
Dallas-Love Field (DAL)	42	259,106	249,823	239,732	256,787	243,849	243,910
Tampa International (TPA)	43	277,888	269,948	245,225	278,632	260,859	243,625

Operations Table A-2 continued

		Fiscal Year			Calendar Year		
Airport (ID)	Rank	2000	2001	2002	2000	2001	2002
Raleigh-Durham International (RDU)	44	295,649	293,995	239,091	296,434	273,687	240,362
San Antonio International (SAT)	45	255,622	234,423	236,189	246,200	236,102	234,261
Nashville International (BNA)	46	249,145	241,280	233,392	248,135	237,139	233,163
Norman Y. Mineta San José International (SJC)	47	299,237	363,682	228,447	299,844	272,299	223,199
Colorado Springs Municipal (COS)	48	230,677	199,364	227,869	220,739	206,221	218,166
Long Island MacArthur/Islip (ISP)	49	229,617	232,430	223,063	238,239	226,591	218,053
Austin-Bergstrom International (AUS)	50	203,863	224,575	216,618	212,635	220,439	217,359
Ronald Reagan National (DCA)	51	344,092	328,340	180,743	342,790	270,145	216,753
Milwaukee General Mitchell International (MKE)	52	225,426	214,549	212,232	221,855	211,512	216,050
San Diego International Lindbergh Field (SAN)	53	208,894	213,080	201,604	207,916	206,848	206,605
Indianapolis International (IND)	54	259,861	257,295	206,906	259,860	245,439	206,132
Wichita Mid-Continent (ICT)	55	223,177	212,995	214,341	217,945	216,652	204,007
San Juan Luis Muñoz Marín International (SJU)	56	245,931	210,050	201,425	236,903	205,976	203,137
Kansas City International (MCI)	57	219,388	215,833	195,110	218,194	209,833	191,981
Palm Beach International (PBI)	58	209,241	223,406	187,159	214,327	212,640	189,805
Tulsa International (TUL)	59	204,940	195,669	194,020	198,970	199,533	189,136
Louisville International (SDF)	60	180,819	177,642	177,336	181,535	175,852	177,489
Little Rock Adams Field (LIT)	61	180,547	173,476	178,357	174,802	176,067	177,203
Oklahoma City Will Rogers World (OKC)	62	164,068	172,241	172,089	160,083	176,499	169,437
Boise Air Terminal (BOI)	63	174,892	164,390	164,206	171,010	164,741	167,730
Burbank-Glendale-Pasadena (BUR)	64	162,867	159,832	160,688	160,730	159,705	161,912
Sacramento International (SMF)	65	152,205	151,613	155,747	149,969	151,642	158,202
Kahului (OGG)	66	176,156	165,832	156,086	174,855	160,324	157,868
Knoxville McGhee-Tyson (TYS)	67	151,965	147,689	151,670	148,596	149,342	149,323
Ontario International (ONT)	68	153,396	157,448	149,143	155,026	154,900	148,714
Louis Armstrong New Orleans International (MSY)	69	167,016	162,507	149,061	167,502	157,326	148,080
Bradley International (BDL)	70	176,629	170,322	147,117	169,736	165,029	146,592
Birmingham (BHM)	71	154,143	149,996	145,877	153,917	148,869	146,535
Greater Rochester International (ROC)	72	185,180	173,371	150,953	178,930	168,868	145,509
Reno Tahoe International (RNO)	73	151,589	142,119	144,585	149,873	139,663	145,036
Albany County (ALB)	74	145,889	148,233	146,827	144,761	148,331	144,877
Omaha Eppley Airfield (OMA)	75	178,173	147,163	142,910	167,879	143,973	143,710
T.F. Green (PVD)	76	157,228	148,800	144,655	155,545	148,336	141,774
Buffalo Niagara International (BUF)	77	162,380	172,294	136,785	165,334	161,019	138,165
Richmond International (RIC)	78	143,341	148,993	135,683	149,918	144,902	133,269
Pensacola Regional (PNS)	79	116,932	117,058	130,172	117,791	116,501	130,794
Madison/Dane County Regional (MSN)	80	134,703	124,429	129,453	125,755	128,555	129,498
Syracuse Hancock International (SYR)	81	141,793	146,047	133,659	140,291	145,751	128,460
Norfolk International (ORF)	82	133,482	120,438	127,883	133,856	119,320	126,465
Grand Rapids Gerald R. Ford International (GRR)	83	140,394	127,903	125,910	136,465	126,224	125,622
Dayton International (DAY)	84	148,085	135,992	124,637	145,123	131,651	124,892
Jacksonville International (JAX)	85	149,705	142,561	125,250	148,797	134,572	124,820
Kona International (KOA)	86	91,306	105,510	121,244	97,974	107,813	123,704

Operations Table A-2 continued

		Fiscal Year			Calendar Year		
Airport (ID)	Rank	2000	2001	2002	2000	2001	2002
Charleston AFB International (CHS)	87	140,021	131,638	120,956	136,129	125,499	123,499
El Paso International (ELP)	88	141,768	129,438	125,766	140,618	126,545	122,989
Greensboro Piedmont Triad International (GSO)	89	137,526	138,607	122,809	138,641	133,550	122,342
Des Moines International (DSM)	90	129,896	121,469	118,456	127,668	118,068	120,515
Savannah International (SAV)	91	112,449	110,104	115,170	112,614	109,047	114,318
Spokane International (GEG)	92	119,210	111,739	107,257	117,759	110,314	108,029
Portland International Jetport (PWM)	93	109,179	111,968	105,781	106,252	112,043	102,630
Lihue (LIH)	94	112,198	108,013	102,295	113,842	103,654	102,430
Hilo International (ITO)	95	116,375	103,169	92,127	115,536	96,238	97,540
Manchester (MHT)	96	107,545	109,232	93,706	106,086	106,633	92,271
Harrisburg International (MDT)	97	80,266	77,781	74,220	79,295	75,458	74,462
Fort Myers Southwest Florida Regional (RSW)	98	76,497	77,616	73,496	77,376	75,779	74,152
Greenville-Spartanburg (GSP)	99	68,541	70,092	65,389	70,378	68,201	66,572
Guam International (GUM)	100	60,149	65,467	52,858	63,389	58,405	54,396
Total Top 100		28,824,044	28,090,481	26,336,384	28,619,389	27,309,908	26,490,268

Table A-3 Passenger Enplanements, 2002 and Forecast 2014

		Changes in Enplanements (Fiscal Year)		
Airport (ID)	Rank	2002	2014	Change from 2002
Long Beach/Daugherty Field (LGB)	1	504,845	2,165,332	328.9%
Washington Dulles International (IAD)	2	7,651,157	14,909,995	94.9%
Metropolitan Oakland International (OAK)	3	5,802,641	10,799,542	86.1%
Norman Y. Mineta San José International (SJC)	4	5,196,525	9,365,475	80.2%
Chicago Midway (MDW)	5	7,551,934	13,570,661	79.7%
Manchester (MHT)	6	1,626,494	2,905,013	78.6%
Minneapolis-St. Paul International (MSP)	7	15,351,693	27,095,726	76.5%
New York John F. Kennedy International (JFK)	8	13,963,236	23,793,342	70.4%
Fort Lauderdale-Hollywood International (FLL)	9	7,968,172	13,505,162	69.5%
Fort Myers Southwest Florida Regional (RSW)	10	2,460,091	4,124,037	67.6%
Detroit Metropolitan Wayne County (DTW)	11	15,166,353	25,171,789	66.0%
Greater Cincinnati International (CVG)	12	10,039,090	16,339,419	62.8%
Philadelphia International (PHL)	13	11,649,324	18,768,263	61.1%
Spokane International (GEG)	14	1,337,035	2,135,353	59.7%
Long Island MacArthur/Islip (ISP)	15	945,290	1,509,429	59.7%
Birmingham (BHM)	16	1,384,082	2,204,629	59.3%
Denver International (DEN)	17	16,517,000	25,960,909	57.2%
Charleston AFB International (CHS)	18	757,759	1,179,320	55.6%
T.F. Green (PVD)	19	2,630,373	4,090,873	55.5%
Orlando International (MCO)	20	12,710,392	19,746,244	55.4%
Ronald Reagan National (DCA)	21	5,269,065	8,179,403	55.2%
Ontario International (ONT)	22	3,038,100	4,715,356	55.2%
Louisville International (SDF)	23	1,735,018	2,690,746	55.1%
George Bush Intercontinental (IAH)	24	15,888,306	24,578,670	54.7%
Las Vegas McCarran International (LAS)	25	15,987,081	24,705,736	54.5%
Austin-Bergstrom International (AUS)	26	3,173,554	4,894,979	54.2%
Guam International (GUM)	27	1,316,366	2,029,981	54.2%
Chicago O'Hare International (ORD)	28	31,036,583	47,720,148	53.8%
Baltimore-Washington International (BWI)	29	9,483,542	14,578,543	53.7%
Dallas/Fort Worth International (DFW)	30	24,415,967	37,493,680	53.6%
Newark Liberty International (EWR)	31	14,297,394	21,874,869	53.0%
Hartsfield Atlanta International (ATL)	32	36,377,381	55,457,929	52.5%
Boise Air Terminal (BOI)	33	1,360,629	2,069,395	52.1%
Grand Rapids Gerald R. Ford International (GRR)	34	917,852	1,383,906	50.8%
Memphis International (MEM)	35	5,040,988	7,587,171	50.5%
John Wayne-Orange County (SNA)	36	3,832,501	5,765,433	50.4%
Ted Stevens Anchorage International (ANC)	37	1,895,745	2,844,492	50.0%
Phoenix Sky Harbor International (PHX)	38	16,816,833	25,203,755	49.9%
Bradley International (BDL)	39	3,167,363	4,738,197	49.6%
Madison/Dane County Regional (MSN)	40	720,398	1,075,600	49.3%
Los Angeles International (LAX)	41	26,262,032	39,078,206	48.8%
San Francisco International (SFO)	42	14,722,632	21,903,514	48.8%
Raleigh-Durham International (RDU)	43	4,129,284	6,095,485	47.6%

Table A-3 continued

Airport (ID)	Rank	Changes in Enplanements (Fiscal Year) 2002	2014	Change from 2002
Burbank-Glendale-Pasadena (BUR)	44	2,245,609	3,313,024	47.5%
Norfolk International (ORF)	45	1,683,310	2,477,904	47.2%
Indianapolis International (IND)	46	3,393,298	4,992,531	47.1%
Charlotte-Douglas International (CLT)	47	11,591,516	16,897,699	45.8%
San Antonio International (SAT)	48	3,161,931	4,598,174	45.4%
Greensboro Piedmont Triad International (GSO)	49	1,228,483	1,785,800	45.4%
San Diego International Lindbergh Field (SAN)	50	7,257,285	10,471,602	44.3%
Sacramento International (SMF)	51	4,126,102	5,943,857	44.1%
Knoxville McGhee-Tyson (TYS)	52	673,787	968,176	43.7%
Jacksonville International (JAX)	53	2,408,114	3,454,427	43.4%
Boston Logan International (BOS)	54	10,731,523	15,391,079	43.4%
Nashville International (BNA)	55	3,980,505	5,648,933	41.9%
Albuquerque International (ABQ)	56	2,985,124	4,231,408	41.7%
Palm Beach International (PBI)	57	2,671,845	3,786,738	41.7%
Cleveland Hopkins International (CLE)	58	5,283,887	7,480,847	41.6%
Colorado Springs Municipal (COS)	59	1,020,729	1,442,198	41.3%
Orlando Sanford (SFB)	60	649,384	912,849	40.6%
Milwaukee General Mitchell International (MKE)	61	2,769,339	3,855,110	39.2%
San Juan Luis Muñoz Marín International (SJU)	62	5,169,232	7,159,876	38.5%
Louis Armstrong New Orleans International (MSY)	63	4,562,282	6,303,290	38.2%
Omaha Eppley Airfield (OMA)	64	1,735,032	2,396,222	38.1%
Salt Lake City International (SLC)	65	8,938,546	12,316,344	37.8%
Seattle-Tacoma International (SEA)	66	13,092,774	18,013,906	37.6%
Portland International (PDX)	67	5,901,867	8,056,238	36.5%
Tampa International (TPA)	68	7,563,253	10,267,492	35.8%
New York LaGuardia (LGA)	69	10,490,623	14,060,361	34.0%
Buffalo Niagara International (BUF)	70	2,006,761	2,681,895	33.6%
Greenville-Spartanburg (GSP)	71	663,502	884,135	33.3%
Miami International (MIA)	72	14,262,340	18,952,970	32.9%
Tucson International (TUS)	73	1,651,940	2,194,217	32.8%
Richmond International (RIC)	74	1,119,205	1,465,999	31.0%
Honolulu International (HNL)	75	9,108,574	11,928,946	31.0%
Kahului (OGG)	76	2,595,693	3,369,791	29.8%
Harrisburg International (MDT)	77	604,146	779,721	29.1%
Pensacola Regional (PNS)	78	635,090	818,476	28.9%
Savannah International (SAV)	79	820,319	1,056,174	28.8%
Portland International Jetport (PWM)	80	607,632	777,816	28.0%
Greater Rochester International (ROC)	81	1,115,324	1,409,886	26.4%
Kona International (KOA)	82	1,185,676	1,477,813	24.6%
Houston William B. Hobby (HOU)	83	3,829,712	4,739,445	23.8%
Des Moines International (DSM)	84	803,147	991,083	23.4%
Reno Tahoe International (RNO)	85	2,161,567	2,650,372	22.6%
El Paso International (ELP)	86	1,433,423	1,747,521	21.9%

Table A-3 continued

Airport (ID)	Rank	Changes in Enplanements (Fiscal Year) 2002	2014	Change from 2002
Oklahoma City Will Rogers World (OKC)	87	1,517,836	1,823,250	20.1%
Kansas City International (MCI)	88	5,288,917	6,313,736	19.4%
Albany County (ALB)	89	1,374,241	1,620,192	17.9%
Dallas-Love Field (DAL)	90	2,822,588	3,318,604	17.6%
Port Columbus International (CMH)	91	3,206,361	3,726,752	16.2%
Syracuse Hancock International (SYR)	92	913,980	1,041,163	13.9%
Dayton International (DAY)	93	1,076,444	1,225,193	13.8%
Little Rock Adams Field (LIT)	94	1,101,456	1,250,746	13.6%
Wichita Mid-Continent (ICT)	95	580,606	648,701	11.7%
Hilo International (ITO)	96	664,925	730,210	9.8%
Tulsa International (TUL)	97	1,429,770	1,504,152	5.2%
Pittsburgh International (PIT)	98	9,304,145	9,381,673	0.8%
Lihue (LIH)	99	1,236,398	1,202,800	-2.7%
Lambert St. Louis International (STL)	100	12,404,296	9,549,690	-23.0%
Total Top 100		**594,939,494**	**883,494,914**	**48.5%**

Table A-4 Aircraft Operations, 2002 and Forecast 2014

		Changes in Operations (Fiscal Year)		
Airport (ID)	Rank	2002	2014	Change from 2002
George Bush Intercontinental (IAH)	1	458,649	681,231	48.5%
Minneapolis-St. Paul International (MSP)	2	497,934	729,738	46.6%
Detroit Metropolitan Wayne County (DTW)	3	490,663	718,643	46.5%
Greater Cincinnati International (CVG)	4	473,084	690,813	46.0%
Ronald Reagan National (DCA)	5	180,743	263,451	45.8%
Hartsfield Atlanta International (ATL)	6	882,407	1,264,497	43.3%
New York John F. Kennedy International (JFK)	7	291,021	413,123	42.0%
Memphis International (MEM)	8	393,858	558,858	41.9%
Fort Myers Southwest Florida Regional (RSW)	9	73,496	103,328	40.6%
Norman Y. Mineta San José International (SJC)	10	228,447	319,678	39.9%
Washington Dulles International (IAD)	11	401,750	560,289	39.5%
Austin-Bergstrom International (AUS)	12	216,618	300,999	39.0%
Denver International (DEN)	13	495,104	687,822	38.9%
Ted Stevens Anchorage International (ANC)	14	304,608	422,979	38.9%
Kona International (KOA)	15	121,244	167,869	38.5%
Ontario International (ONT)	16	149,143	206,404	38.4%
Dallas/Fort Worth International (DFW)	17	762,371	1,047,699	37.4%
Burbank-Glendale-Pasadena (BUR)	18	160,688	220,022	36.9%
Salt Lake City International (SLC)	19	401,491	549,001	36.7%
Fort Lauderdale-Hollywood International (FLL)	20	275,473	371,521	34.9%
Orlando International (MCO)	21	303,328	408,812	34.8%
Las Vegas McCarran International (LAS)	22	491,205	656,773	33.7%
Newark Liberty International (EWR)	23	407,730	544,928	33.6%
Chicago O'Hare International (ORD)	24	901,703	1,201,248	33.2%
Chicago Midway (MDW)	25	293,076	388,508	32.6%
Phoenix Sky Harbor International (PHX)	26	577,820	760,122	31.5%
Sacramento International (SMF)	27	155,747	204,497	31.3%
Milwaukee General Mitchell International (MKE)	28	212,232	277,557	30.8%
San Antonio International (SAT)	29	236,189	308,094	30.4%
Seattle-Tacoma International (SEA)	30	361,814	471,704	30.4%
Manchester (MHT)	31	93,706	122,154	30.4%
San Francisco International (SFO)	32	350,133	455,575	30.1%
Kahului (OGG)	33	156,086	202,107	29.5%
San Diego International Lindbergh Field (SAN)	34	201,604	260,973	29.4%
Hilo International (ITO)	35	92,127	119,254	29.4%
Baltimore-Washington International (BWI)	36	310,281	400,301	29.0%
Los Angeles International (LAX)	37	637,588	818,565	28.4%
Louis Armstrong New Orleans International (MSY)	38	149,061	191,061	28.2%
Buffalo Niagara International (BUF)	39	136,785	174,406	27.5%
Portland International (PDX)	40	277,400	353,259	27.3%
Metropolitan Oakland International (OAK)	41	374,216	469,096	25.4%
Philadelphia International (PHL)	42	467,160	585,218	25.3%
Spokane International (GEG)	43	107,257	133,108	24.1%

Table A-4 continued

Airport (ID)	Rank	Changes in Operations (Fiscal Year) 2002	2014	Change from 2002
Albuquerque International (ABQ)	44	255,137	315,350	23.6%
Omaha Eppley Airfield (OMA)	45	142,910	176,276	23.3%
Palm Beach International (PBI)	46	187,159	230,698	23.3%
Bradley International (BDL)	47	147,117	180,506	22.7%
Raleigh-Durham International (RDU)	48	239,091	293,336	22.7%
Nashville International (BNA)	49	233,392	285,839	22.5%
Greensboro Piedmont Triad International (GSO)	50	122,809	149,273	21.5%
Indianapolis International (IND)	51	206,906	251,441	21.5%
Jacksonville International (JAX)	52	125,250	151,827	21.2%
Louisville International (SDF)	53	177,336	214,864	21.2%
Charlotte-Douglas International (CLT)	54	465,246	557,717	19.9%
Boise Air Terminal (BOI)	55	164,206	196,360	19.6%
Guam International (GUM)	56	52,858	62,994	19.2%
Honolulu International (HNL)	57	316,089	375,272	18.7%
T.F. Green (PVD)	58	144,655	171,626	18.6%
Birmingham (BHM)	59	145,877	171,141	17.3%
San Juan Luis Muñoz Marín International (SJU)	60	201,425	235,878	17.1%
Boston Logan International (BOS)	61	405,370	474,684	17.1%
Albany County (ALB)	62	146,827	171,856	17.0%
Greenville-Spartanburg (GSP)	63	65,389	76,486	17.0%
Cleveland Hopkins International (CLE)	64	264,075	307,185	16.3%
Long Beach/Daugherty Field (LGB)	65	350,974	403,310	14.9%
Tampa International (TPA)	66	245,225	281,502	14.8%
Charleston AFB International (CHS)	67	120,956	138,550	14.5%
New York LaGuardia (LGA)	68	354,218	405,537	14.5%
Pensacola Regional (PNS)	69	130,172	148,690	14.2%
Grand Rapids Gerald R. Ford International (GRR)	70	125,910	143,728	14.2%
Port Columbus International (CMH)	71	253,325	287,158	13.4%
Madison/Dane County Regional (MSN)	72	129,453	146,661	13.3%
Savannah International (SAV)	73	115,170	130,118	13.0%
John Wayne-Orange County (SNA)	74	377,073	424,317	12.5%
Tucson International (TUS)	75	265,733	295,068	11.0%
Kansas City International (MCI)	76	195,110	216,471	10.9%
Norfolk International (ORF)	77	127,883	141,386	10.6%
Pittsburgh International (PIT)	78	439,360	485,092	10.4%
Richmond International (RIC)	79	135,683	149,602	10.3%
Miami International (MIA)	80	442,358	487,423	10.2%
Dallas-Love Field (DAL)	81	239,732	260,400	8.6%
Dayton International (DAY)	82	124,637	135,314	8.6%
Harrisburg International (MDT)	83	74,220	80,578	8.6%
Lihue (LIH)	84	102,295	110,153	7.7%
Des Moines International (DSM)	85	118,456	127,302	7.5%
Syracuse Hancock International (SYR)	86	133,659	141,979	6.2%

Table A-4 continued

Airport (ID)	Rank	Changes in Operations (Fiscal Year) 2002	2014	Change from 2002
Reno Tahoe International (RNO)	87	144,585	153,149	5.9%
Little Rock Adams Field (LIT)	88	178,357	188,629	5.8%
Oklahoma City Will Rogers World (OKC)	89	172,089	179,912	4.5%
Houston William B. Hobby (HOU)	90	247,824	259,041	4.5%
Portland International Jetport (PWM)	91	105,781	110,416	4.4%
Greater Rochester International (ROC)	92	150,953	156,761	3.8%
Long Island MacArthur/Islip (ISP)	93	223,063	228,920	2.6%
El Paso International (ELP)	94	125,766	127,611	1.5%
Knoxville McGhee-Tyson (TYS)	95	151,670	153,129	1.0%
Colorado Springs Municipal (COS)	96	227,869	229,500	0.7%
Wichita Mid-Continent (ICT)	97	214,341	213,400	-0.4%
Orlando Sanford (SFB)	98	382,998	379,168	-1.0%
Tulsa International (TUL)	99	194,020	190,853	-1.6%
Lambert St. Louis International (STL)	100	453,302	370,942	-18.2%
Total Top 100		**26,336,384**	**32,917,664**	**25.0%**

Table A-5 Change in Enplanements from 2001 to 2002

Airport (ID)	Rank	Changes in Enplanements (Fiscal Year) 2001	2002	Change from 2002
Los Angeles International (LAX)	1	3,150,162	26,262,032	733.7%
Long Beach/Daugherty Field (LGB)	2	297,130	504,845	69.9%
Orlando Sanford (SFB)	3	454,579	649,384	42.9%
Pensacola Regional (PNS)	4	520,953	635,090	21.9%
Norfolk International (ORF)	5	1,485,273	1,683,310	13.3%
Greater Cincinnati International (CVG)	6	8,951,201	10,039,090	12.2%
Wichita Mid-Continent (ICT)	7	527,062	580,606	10.2%
Harrisburg International (MDT)	8	556,672	604,146	8.5%
San Juan Luis Muñoz Marín International (SJU)	9	4,943,132	5,169,232	4.6%
Chicago Midway (MDW)	10	7,236,415	7,551,934	4.4%
Madison/Dane County Regional (MSN)	11	693,911	720,398	3.8%
Metropolitan Oakland International (OAK)	12	5,623,479	5,802,641	3.2%
Manchester (MHT)	13	1,600,848	1,626,494	1.6%
John Wayne-Orange County (SNA)	14	3,787,262	3,832,501	1.2%
Sacramento International (SMF)	15	4,097,754	4,126,102	0.7%
Fort Lauderdale-Hollywood International (FLL)	16	8,147,642	7,968,172	-2.2%
Charlotte-Douglas International (CLT)	17	11,859,005	11,591,516	-2.3%
Des Moines International (DSM)	18	823,367	803,147	-2.5%
Grand Rapids Gerald R. Ford International (GRR)	19	943,620	917,852	-2.7%
Burbank-Glendale-Pasadena (BUR)	20	2,322,699	2,245,609	-3.3%
Salt Lake City International (SLC)	21	9,285,642	8,938,546	-3.7%
Seattle-Tacoma International (SEA)	22	13,604,468	13,092,774	-3.8%
Omaha Eppley Airfield (OMA)	23	1,802,980	1,735,032	-3.8%
George Bush Intercontinental (IAH)	24	16,576,594	15,888,306	-4.2%
Philadelphia International (PHL)	25	12,175,642	11,649,324	-4.3%
Knoxville McGhee-Tyson (TYS)	26	705,607	673,787	-4.5%
Dayton International (DAY)	27	1,128,856	1,076,444	-4.6%
T.F. Green (PVD)	28	2,767,789	2,630,373	-5.0%
Albuquerque International (ABQ)	29	3,149,546	2,985,124	-5.2%
Hartsfield Atlanta International (ATL)	30	38,403,184	36,377,381	-5.3%
Chicago O'Hare International (ORD)	31	32,861,464	31,036,583	-5.6%
Port Columbus International (CMH)	32	3,402,615	3,206,361	-5.8%
Savannah International (SAV)	33	875,158	820,319	-6.3%
Tampa International (TPA)	34	8,102,506	7,563,253	-6.7%
San Diego International Lindbergh Field (SAN)	35	7,780,769	7,257,285	-6.7%
Minneapolis-St. Paul International (MSP)	36	16,462,360	15,351,693	-6.7%
Ontario International (ONT)	37	3,259,334	3,038,100	-6.8%
Ted Stevens Anchorage International (ANC)	38	2,035,781	1,895,745	-6.9%
Phoenix Sky Harbor International (PHX)	39	18,064,086	16,816,833	-6.9%
Las Vegas McCarran International (LAS)	40	17,215,302	15,987,081	-7.1%
Milwaukee General Mitchell International (MKE)	41	2,983,348	2,769,339	-7.2%
Lihue (LIH)	42	1,335,368	1,236,398	-7.4%
Hilo International (ITO)	43	718,594	664,925	-7.5%

Table A-5 continued

Airport (ID)	Rank	Changes in Enplanements (Fiscal Year) 2001	2002	Change from 2002
Boise Air Terminal (BOI)	44	1,471,811	1,360,629	-7.6%
Greater Rochester International (ROC)	45	1,207,456	1,115,324	-7.6%
Jacksonville International (JAX)	46	2,610,899	2,408,114	-7.8%
Louis Armstrong New Orleans International (MSY)	47	4,947,243	4,562,282	-7.8%
Kona International (KOA)	48	1,286,032	1,185,676	-7.8%
Syracuse Hancock International (SYR)	49	992,105	913,980	-7.9%
San Antonio International (SAT)	50	3,434,758	3,161,931	-7.9%
Baltimore-Washington International (BWI)	51	10,302,083	9,483,542	-7.9%
Colorado Springs Municipal (COS)	52	1,110,323	1,020,729	-8.1%
Portland International (PDX)	53	6,438,633	5,901,867	-8.3%
Washington Dulles International (IAD)	54	8,360,991	7,651,157	-8.5%
Fort Myers Southwest Florida Regional (RSW)	55	2,688,420	2,460,091	-8.5%
Tucson International (TUS)	56	1,805,592	1,651,940	-8.5%
Charleston AFB International (CHS)	57	828,260	757,759	-8.5%
Denver International (DEN)	58	18,068,664	16,517,000	-8.6%
Pittsburgh International (PIT)	59	10,183,267	9,304,145	-8.6%
Portland International Jetport (PWM)	60	665,166	607,632	-8.6%
Nashville International (BNA)	61	4,358,463	3,980,505	-8.7%
Spokane International (GEG)	62	1,468,964	1,337,035	-9.0%
Albany County (ALB)	63	1,512,482	1,374,241	-9.1%
Long Island MacArthur/Islip (ISP)	64	1,040,475	945,290	-9.1%
Detroit Metropolitan Wayne County (DTW)	65	16,698,964	15,166,353	-9.2%
Dallas/Fort Worth International (DFW)	66	26,891,403	24,415,967	-9.2%
Miami International (MIA)	67	15,740,006	14,262,340	-9.4%
Indianapolis International (IND)	68	3,750,829	3,393,298	-9.5%
Kahului (OGG)	69	2,869,392	2,595,693	-9.5%
Kansas City International (MCI)	70	5,879,219	5,288,917	-10.0%
Houston William B. Hobby (HOU)	71	4,265,788	3,829,712	-10.2%
Honolulu International (HNL)	72	10,150,357	9,108,574	-10.3%
Palm Beach International (PBI)	73	2,979,195	2,671,845	-10.3%
San Francisco International (SFO)	74	16,475,611	14,722,632	-10.6%
Cleveland Hopkins International (CLE)	75	5,924,679	5,283,887	-10.8%
Louisville International (SDF)	76	1,950,543	1,735,018	-11.0%
New York John F. Kennedy International (JFK)	77	15,734,725	13,963,236	-11.3%
Birmingham (BHM)	78	1,559,770	1,384,082	-11.3%
Bradley International (BDL)	79	3,571,026	3,167,363	-11.3%
El Paso International (ELP)	80	1,616,621	1,433,423	-11.3%
Greenville-Spartanburg (GSP)	81	750,723	663,502	-11.6%
Austin-Bergstrom International (AUS)	82	3,591,420	3,173,554	-11.6%
Little Rock Adams Field (LIT)	83	1,253,209	1,101,456	-12.1%
Orlando International (MCO)	84	14,483,116	12,710,392	-12.2%
Oklahoma City Will Rogers World (OKC)	85	1,729,672	1,517,836	-12.2%
Lambert St. Louis International (STL)	86	14,139,923	12,404,296	-12.3%

Table A-5 continued

Airport (ID)	Rank	2001	2002	Change from 2002
		Changes in Enplanements (Fiscal Year)		
Greensboro Piedmont Triad International (GSO)	87	1,402,775	1,228,483	-12.4%
Richmond International (RIC)	88	1,285,536	1,119,205	-12.9%
Newark Liberty International (EWR)	89	16,521,266	14,297,394	-13.5%
Reno Tahoe International (RNO)	90	2,498,416	2,161,567	-13.5%
Buffalo Niagara International (BUF)	91	2,325,775	2,006,761	-13.7%
Memphis International (MEM)	92	5,876,534	5,040,988	-14.2%
Tulsa International (TUL)	93	1,668,810	1,429,770	-14.3%
New York LaGuardia (LGA)	94	12,342,023	10,490,623	-15.0%
Boston Logan International (BOS)	95	12,831,269	10,731,523	-16.4%
Raleigh-Durham International (RDU)	96	4,968,382	4,129,284	-16.9%
Norman Y. Mineta San José International (SJC)	97	6,309,826	5,196,525	-17.6%
Dallas-Love Field (DAL)	98	3,552,296	2,822,588	-20.5%
Guam International (GUM)	99	1,657,127	1,316,366	-20.6%
Ronald Reagan National (DCA)	100	7,374,029	5,269,065	-28.5%
Total Top 100		**620,121,501**	**594,939,494**	**-4.1%**

Table A-6 Change in Operations from 2001 to 2002

Airport (ID)	Rank	Changes in Operations (Fiscal Year) 2001	2002	Change from 2002
Greater Cincinnati International (CVG)	1	390,306	473,084	21.2%
Kona International (KOA)	2	105,510	121,244	14.9%
Colorado Springs Municipal (COS)	3	199,364	227,869	14.3%
Pensacola Regional (PNS)	4	117,058	130,172	11.2%
Salt Lake City International (SLC)	5	363,682	401,491	10.4%
Albuquerque International (ABQ)	6	238,200	255,137	7.1%
Norfolk International (ORF)	7	120,438	127,883	6.2%
Savannah International (SAV)	8	110,104	115,170	4.6%
Chicago Midway (MDW)	9	280,527	293,076	4.5%
Port Columbus International (CMH)	10	243,203	253,325	4.2%
Madison/Dane County Regional (MSN)	11	124,429	129,453	4.0%
Tucson International (TUS)	12	258,031	265,733	3.0%
Little Rock Adams Field (LIT)	13	173,476	178,357	2.8%
Sacramento International (SMF)	14	151,613	155,747	2.7%
Knoxville McGhee-Tyson (TYS)	15	147,689	151,670	2.7%
Reno Tahoe International (RNO)	16	142,119	144,585	1.7%
San Antonio International (SAT)	17	234,423	236,189	0.8%
Wichita Mid-Continent (ICT)	18	212,995	214,341	0.6%
Burbank-Glendale-Pasadena (BUR)	19	159,832	160,688	0.5%
Oklahoma City Will Rogers World (OKC)	20	172,241	172,089	-0.1%
Boise Air Terminal (BOI)	21	164,390	164,206	-0.1%
Houston William B. Hobby (HOU)	22	248,111	247,824	-0.1%
Ted Stevens Anchorage International (ANC)	23	304,988	304,608	-0.1%
Louisville International (SDF)	24	177,642	177,336	-0.2%
Tulsa International (TUL)	25	195,669	194,020	-0.8%
Albany County (ALB)	26	148,233	146,827	-0.9%
Milwaukee General Mitchell International (MKE)	27	214,549	212,232	-1.1%
Memphis International (MEM)	28	398,451	393,858	-1.2%
Charlotte-Douglas International (CLT)	29	471,731	465,246	-1.4%
Grand Rapids Gerald R. Ford International (GRR)	30	127,903	125,910	-1.6%
Philadelphia International (PHL)	31	475,577	467,160	-1.8%
Hartsfield Atlanta International (ATL)	32	898,899	882,407	-1.8%
John Wayne-Orange County (SNA)	33	385,742	377,073	-2.2%
Des Moines International (DSM)	34	121,469	118,456	-2.5%
Orlando Sanford (SFB)	35	393,027	382,998	-2.6%
Birmingham (BHM)	36	149,996	145,877	-2.7%
Minneapolis-St. Paul International (MSP)	37	512,102	497,934	-2.8%
T.F. Green (PVD)	38	148,800	144,655	-2.8%
Chicago O'Hare International (ORD)	39	927,896	901,703	-2.8%
El Paso International (ELP)	40	129,438	125,766	-2.8%
Omaha Eppley Airfield (OMA)	41	147,163	142,910	-2.9%
Pittsburgh International (PIT)	42	452,696	439,360	-2.9%
Long Beach/Daugherty Field (LGB)	43	362,014	350,974	-3.0%

Table A-6 continued

Airport (ID)	Rank	Changes in Operations (Fiscal Year) 2001	2002	Change from 2002
Nashville International (BNA)	44	241,280	233,392	-3.3%
Austin-Bergstrom International (AUS)	45	224,575	216,618	-3.5%
Spokane International (GEG)	46	111,739	107,257	-4.0%
Long Island MacArthur/Islip (ISP)	47	232,430	223,063	-4.0%
Dallas-Love Field (DAL)	48	249,823	239,732	-4.0%
San Juan Luis Muñoz Marín International (SJU)	49	210,050	201,425	-4.1%
Las Vegas McCarran International (LAS)	50	513,679	491,205	-4.4%
Ontario International (ONT)	51	157,448	149,143	-5.3%
Lihue (LIH)	52	108,013	102,295	-5.3%
Fort Myers Southwest Florida Regional (RSW)	53	77,616	73,496	-5.3%
San Diego International Lindbergh Field (SAN)	54	213,080	201,604	-5.4%
Baltimore-Washington International (BWI)	55	328,428	310,281	-5.5%
Portland International Jetport (PWM)	56	111,968	105,781	-5.5%
Kahului (OGG)	57	165,832	156,086	-5.9%
Denver International (DEN)	58	526,204	495,104	-5.9%
George Bush Intercontinental (IAH)	59	489,987	458,649	-6.4%
Washington Dulles International (IAD)	60	430,082	401,750	-6.6%
Greenville-Spartanburg (GSP)	61	70,092	65,389	-6.7%
Lambert St. Louis International (STL)	62	486,503	453,302	-6.8%
Honolulu International (HNL)	63	339,987	316,089	-7.0%
Metropolitan Oakland International (OAK)	64	403,399	374,216	-7.2%
Phoenix Sky Harbor International (PHX)	65	627,561	577,820	-7.9%
Fort Lauderdale-Hollywood International (FLL)	66	299,773	275,473	-8.1%
Charleston AFB International (CHS)	67	131,638	120,956	-8.1%
Louis Armstrong New Orleans International (MSY)	68	162,507	149,061	-8.3%
Dayton International (DAY)	69	135,992	124,637	-8.3%
Syracuse Hancock International (SYR)	70	146,047	133,659	-8.5%
Dallas/Fort Worth International (DFW)	71	835,748	762,371	-8.8%
Richmond International (RIC)	72	148,993	135,683	-8.9%
Portland International (PDX)	73	304,896	277,400	-9.0%
Tampa International (TPA)	74	269,948	245,225	-9.2%
Detroit Metropolitan Wayne County (DTW)	75	540,966	490,663	-9.3%
Miami International (MIA)	76	489,058	442,358	-9.5%
Kansas City International (MCI)	77	215,833	195,110	-9.6%
Hilo International (ITO)	78	103,169	92,127	-10.7%
Orlando International (MCO)	79	342,315	303,328	-11.4%
Greensboro Piedmont Triad International (GSO)	80	138,607	122,809	-11.4%
Newark Liberty International (EWR)	81	462,202	407,730	-11.8%
Jacksonville International (JAX)	82	142,561	125,250	-12.1%
New York LaGuardia (LGA)	83	404,206	354,218	-12.4%
Greater Rochester International (ROC)	84	173,371	150,953	-12.9%
Cleveland Hopkins International (CLE)	85	305,299	264,075	-13.5%
Bradley International (BDL)	86	170,322	147,117	-13.6%

Table A-6 continued

Airport (ID)	Rank	Changes in Operations (Fiscal Year) 2001	2002	Change from 2002
San Francisco International (SFO)	87	407,040	350,133	-14.0%
Manchester (MHT)	88	109,232	93,706	-14.2%
New York John F. Kennedy International (JFK)	89	340,459	291,021	-14.5%
Seattle-Tacoma International (SEA)	90	423,903	361,814	-14.6%
Palm Beach International (PBI)	91	223,406	187,159	-16.2%
Los Angeles International (LAX)	92	783,160	637,588	-18.6%
Raleigh-Durham International (RDU)	93	293,995	239,091	-18.7%
Boston Logan International (BOS)	94	499,474	405,370	-18.8%
Guam International (GUM)	95	65,467	52,858	-19.3%
Indianapolis International (IND)	96	257,295	206,906	-19.6%
Buffalo Niagara International (BUF)	97	172,294	136,785	-20.6%
Norman Y. Mineta San José International (SJC)	98	363,682	228,447	-37.2%
Harrisburg International (MDT)	99	121,469	74,220	-38.9%
Ronald Reagan National (DCA)	100	328,340	180,743	-45.0%
Total Top 100		**28,134,169**	**26,336,384**	**-6.4%**

APPENDIX B CAPACITY ENHANCEMENT PLAN UPDATE

Table B-1 Airport Capacity Recommendations – Airfield

R – Recommendations
C – Completed
N – No Longer in Consideration

Region	Airport (ID)	Capacity Enhancement Plan Year	New Runway	Construct 3rd Parallel Runway	Construct 4th Parallel Runway	Relocate Runway	New Taxiway	Runway Extension	Taxiway Extension	Angled Exits/Improved Staging	Holding Pads/Improved Staging	Terminal Expansion
AAL	Ted Stevens Anchorage International (ANC)	00										
ACE	Kansas City International (MCI)	90		R	N				C	R	R	R
	Lambert St. Louis International (STL)	88		R					C	R	R	
AEA	Greater Pittsburgh International (PIT)	91			R			C				C
	Newark Liberty International (EWR)	99	R	R				C				
	New York John F Kennedy International (JFK)	02										
	New York LaGuardia (LGA)	02										
	Norfolk International (ORF)	94	R					R				
	Philadelphia International (PHL)	91		R		N		N			R	R
	Richmond International (RIC)	94						R		R		
	Washington Dulles International (IAD)	90		R			C	C	C		C	R
AGL	Chicago Midway (MDW)	91					R	C			C	R
	Chicago O'Hare International (ORD)	91				R	N	R		C	C	
	Cleveland Hopkins International (CLE)	94	C	C		R	R	R	R	R	R	R
	Detroit Metropolitan Wayne County (DTW)	88			R		R			R	C	R
	Indianapolis International (IND)	93		R	R	C	R		C	R	C	
	Minneapolis-St. Paul International (MSP)	93		R			C	C		R	R	R
	Port Columbus International (CMH)	93		R	N	R	R	C		R	R	R
ANE	Boston Logan International (BOS)	92	R				R	N	N	R	C	
ANM	Boise Air Terminal (BOI)	01		R								
	Portland International (PDX)	96					C		R	C		
	Salt Lake City International (SLC)	91		C					C	C	R	R
	Seattle-Tacoma International (SEA)	91		R						C		
	Seattle-Tacoma International (SEA) – Update	95										
ASO	Charlotte-Douglas International (CLT)	91		R	R			C	R	C	R	
	Charlotte-Douglas International (CLT)	95										
	Fort Lauderdale-Hollywood International (FLL)	93					R	R		R	R	R
	Hartsfield Atlanta International (ATL) – Update	95			R					R	R	R
	Hartsfield Atlanta International (ATL)	87					C			C	C	C
	Memphis International (MEM)	88		C			C	N	C	R		
	Memphis International (MEM) – Update Study	97					R	N	R	R	R	
	Miami International (MIA)	89					C		N	C	C	
	Miami International (MIA) – Update Study	97		R								R
	Nashville International (BNA)	91			R	C	C	N	R		R	

Table B-1 continued

Region	Airport (ID)	Capacity Enhancement Plan Year	New Runway	Construct 3rd Parallel Runway	Construct 4th Parallel Runway	Relocate Runway	New Taxiway	Runway Extension	Taxiway Extension	Angled Exits/Improved Staging	Holding Pads/Improved Staging	Terminal Expansion
ASO	Orlando International (MCO)	90			C		R		C		R	
	Orlando-Sanford International (SFB)	99										
	Orlando-Sanford International (SFB)	00										
	Orlando-Sanford International (SFB)	01	R									
	Raleigh-Durham International (RDU)	91		R	N	N	R			R	R	
	San Juan Luis Muñoz Marín International (SJU)	91					R		R	C	R	C
	Tampa International (TPA)	00	R	R			R	R	R	R	R	R
ASW	Albuquerque International (ABQ)	93					C	C	C	C	R	R
	Dallas-Fort Worth International (DFW)	94					C	R		C		
	George Bush Intercontinental (IAH)	93		R	R		R	R	R	R	R	R
	New Orleans International (MSY)	92	R	R			R					
	San Antonio International (SAT)	92		R			R	R	R		C	
AWP	Honolulu International (HNL)	92		R				R		R	R	R
	Las Vegas McCarran International (LAS)	94					R	C	C		C	R
	Los Angeles International (LAX)	91					C	R	C	R	C	R
	Metropolitan Oakland International (OAK)	87					R			R	R	
	Phoenix Sky Harbor International (PHX)	89		R			R		C	R	C	C
	San Francisco International (SFO)	87		N	N			R	C	R	R	C
	Norman Y. Mineta San José International (SJC)	87						C		C	C	

Table B-2 Airport Capacity Recommendations – Facilities and Equipment Improvements

R – Recommendations
C – Completed
N – No Longer in Consideration

Region	Airport (ID)	Capacity Enhancement Plan Year	Install/Upgrade ILS	Install/Upgrade RVRs	Install/Upgrade Lighting	Install/Upgrade VOR	Upgrade Terminal Approach Radar	Install ASDE	Install/Upgrade PRM	New ATC	Wake Vortex Advisory System
AAL	Ted Stevens Anchorage International (ANC)	00	R								
ACE	Kansas City International (MCI)	90	R	R				C			
	Lambert St. Louis International (STL)	88	R		R			C			R
AEA	Greater Pittsburgh International (PIT)	91	C						R		
	Newark Liberty International (EWR)	99		R							
	New York John F Kennedy International (JFK)	02	R		C			R	R		
	New York LaGuardia (LGA)	02	R		R				R		R
	Norfolk International (ORF)	94	R	R	R						
	Philadelphia International (PHL)	91	R	R					R		
	Richmond International (RIC)	94	R	R	R						
	Washington Dulles International (IAD)	90		C	C						
AGL	Chicago Midway (MDW)	91									
	Chicago O'Hare International (ORD)	91	C	R							
	Cleveland Hopkins International (CLE)	94	R			R			R	R	
	Detroit Metropolitan Wayne County (DTW)	88	R	R							
	Indianapolis International (IND)	93	R	C	R			R			
	Minneapolis-St. Paul International (MSP)	93	R	C	R	C			C		
	Port Columbus International (CMH)	93	C		R			R	R	R	
ANE	Boston Logan International (BOS)	92	R								R
ANM	Boise Air Terminal (BOI)	01								R	
	Portland International (PDX)	96	C								
	Salt Lake City International (SLC)	91	C	C	C			C	R	C	
	Seattle-Tacoma International (SEA)	91	R								R
	Seattle-Tacoma International (SEA) – Update	95									
ASO	Charlotte-Douglas International (CLT)	91	R		R			R	R		
	Charlotte-Douglas International (CLT)	95									
	Fort Lauderdale-Hollywood International (FLL)	93	R			R	C		R		R
	Hartsfield Atlanta International (ATL) – Update	95	R						R		R
	Hartsfield Atlanta International (ATL)	87	C	C	C		C	C	R		R
	Memphis International (MEM)	88									R
	Memphis International (MEM) – Update Study	97	R						R		R
	Miami International (MIA)	89	C	C	C			C			
	Miami International (MIA) – Update Study	97	R								R
	Nashville International (BNA)	91	C								R

Table B-2 continued

Region	Airport (ID)	Capacity Enhancement Plan Year	Install/Upgrade ILS	Install/Upgrade RVRs	Install/Upgrade Lighting	Install/Upgrade VOR	Upgrade Terminal Approach Radar	Install ASDE	Install/Upgrade PRM	New ATC	Wake Vortex Advisory System
ASO	Orlando International (MCO)	90	R			R		C	R		
	Orlando-Sanford International (SFB)	99									
	Orlando-Sanford International (SFB)	00	C								
	Orlando-Sanford International (SFB)	01									
	Raleigh-Durham International (RDU)	91	R	R				R			R
	San Juan Luis Muñoz Marín International (SJU)	91			R	C				C	R
	Tampa International (TPA)	00	R	R	R		R	R			
ASW	Albuquerque International (ABQ)	93	C			R					
	Dallas-Fort Worth International (DFW)	94									
	George Bush Intercontinental (IAH)	93	R	R	R					C	
	New Orleans International (MSY)	92				R				C	
	San Antonio International (SAT)	92	C	C	R				R		R
AWP	Honolulu International (HNL)	92	R								
	Las Vegas McCarran International (LAS)	94	R								
	Los Angeles International (LAX)	91	C							C	
	Metropolitan Oakland International (OAK)	87									
	Phoenix Sky Harbor International (PHX)	89	C		R	C					
	San Francisco International (SFO)	87						C	R		
	Norman Y. Mineta San José International (SJC)	87									

Table B-3 Airport Capacity Recommendations – Operational Improvements

R – Recommendations
C – Completed
N – No Longer in Consideration

Region	Airport (ID)	Capacity Enhancement Plan Year	Airspace Restructure/Analysis	IFR Approach Procedures	Departure Sequencing	Reduced Separations BTW Arrivals	Intersecting Operations with Wet Runways	Expand TRACON/Establish TCA	Segregate Traffic	De-peak Airline Schedules	Enhance Reliever and GA Airport System
AAL	Ted Stevens Anchorage International (ANC)	00	R								
ACE	Kansas City International (MCI)	90	R		R					R	
	Lambert St. Louis International (STL)	88	C		C					N	
AEA	Greater Pittsburgh International (PIT)	91	R								
	Newark Liberty International (EWR)	99									
	New York John F Kennedy International (JFK)	02									
	New York LaGuardia (LGA)	02									
	Norfolk International (ORF)	94				C					
	Philadelphia International (PHL)	91	R	R	R		R				
	Richmond International (RIC)	94		R		R					
	Washington Dulles International (IAD)	90		C		C				N	N
AGL	Chicago Midway (MDW)	91		R		R					
	Chicago O'Hare International (ORD)	91					C				
	Cleveland Hopkins International (CLE)	94		R	R	R		R			R
	Detroit Metropolitan Wayne County (DTW)	88		R							
	Indianapolis International (IND)	93		C	R	R					R
	Minneapolis-St. Paul International (MSP)	93	C			C					R
	Port Columbus International (CMH)	93	R	R		R				R	R
ANE	Boston Logan International (BOS)	92		C			N				
ANM	Boise Air Terminal (BOI)	01									
	Portland International (PDX)	96		N	N	C			R		
	Salt Lake City International (SLC)	91		C		C					R
	Seattle-Tacoma International (SEA)	91		R		C				N	
	Seattle-Tacoma International (SEA) – Update	95									
ASO	Charlotte-Douglas International (CLT)	91				R	C				R
	Charlotte-Douglas International (CLT)	95									
	Fort Lauderdale-Hollywood International (FLL)	93	R	R		R				R	R
	Hartsfield Atlanta International (ATL) – Update	95				R					R
	Hartsfield Atlanta International (ATL)	87				R				N	
	Memphis International (MEM)	88		C		N				N	
	Memphis International (MEM) – Update Study	97		C		R					R
	Miami International (MIA)	89		C							C
	Miami International (MIA) – Update Study	97	R			R				C	
	Nashville International (BNA)	91	C	R				R		N	R

Table B-3 continued

Region	Airport (ID)	Capacity Enhancement Plan Year	Airspace Restructure/Analysis	IFR Approach Procedures	Departure Sequencing	Reduced Separations BTW Arrivals	Intersecting Operations with Wet Runways	Expand TRACON/Establish TCA	Segregate Traffic	De-peak Airline Schedules	Enhance Reliever and GA Airport System
ASO	Orlando International (MCO)	90	C	R					R		R
	Orlando-Sanford International (SFB)	99	C								
	Orlando-Sanford International (SFB)	00									
	Orlando-Sanford International (SFB)	01									
	Raleigh-Durham International (RDU)	91	R	R		R		R			
	San Juan Luis Muñoz Marín International (SJU)	91				R					R
	Tampa International (TPA)	00		R	R	R					C
ASW	Albuquerque International (ABQ)	93		R		N					R
	Dallas-Fort Worth International (DFW)	94		C	C	C					C
	George Bush Intercontinental (IAH)	93		R	R					R	R
	New Orleans International (MSY)	92	R	C		C					C
	San Antonio International (SAT)	92	R	R		N					R
AWP	Honolulu International (HNL)	92								R	C
	Las Vegas McCarran International (LAS)	94		R			N				C
	Los Angeles International (LAX)	91	R								
	Metropolitan Oakland International (OAK)	87									
	Phoenix Sky Harbor International (PHX)	89		R	R	R			R	R	C
	San Francisco International (SFO)	87			C		C		R	R	C
	Norman Y. Mineta San José International (SJC)	87			C						

APPENDIX C RUNWAY PROJECTS 2009 AND BEYOND

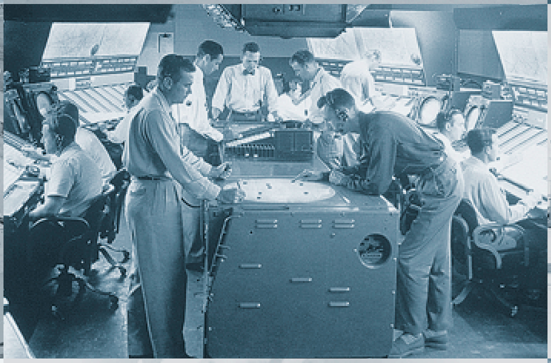
Table C-1 Runways Planned, Proposed, or Currently Under Construction at the 100 Busiest Airports for 2009 and Beyond

Airport (ID)	New	Extension	Runway Identifier	Estimated Cost ($M)	Planned Operational Year	In Progress
Omaha Eppley Airfield (OMA)		•	14L/32R	$10.8	2005	
Washington Dulles International (IAD)	•		1W/19W	$200.0	2008	
Wichita Mid-Continent (ICT)		•	1R/19L	$10.0	2009	
Jacksonville International (JAX)	•		7R/25L	$50.0	2009	
Greenville-Spartanburg (GSP)	•		3R/21L	$65.0	2010	
Hilo International (ITO)		•	8/26	$25.0	2010	
Oklahoma City Will Rogers World (OKC)		•	13/31	$11.2	2010	
Tulsa International (TUL)	•		18/36	$115.0	2010	
Baltimore-Washington International (BWI)	•		10R/28L	$600.0	2012	
Oklahoma City Will Rogers World (OKC)	•		17/35	$13.0	2012	
Tampa International (TPA)	•		17/35	$89.2	2012	
Oklahoma City Will Rogers World (OKC)		•	17R/35L	$8.0	2014	
Oklahoma City Will Rogers World (OKC)		•	17L/35R	$8.0	2014	
Boise Air Terminal (BOI)	•		10R/28L	TBD	2015	
Denver International (DEN)	•		8L/26R	$285.0	2015	
Louis Armstrong New Orleans International (MSY)	•		18/36	$452.0	2015	
Savannah International (SAV)	•		9L/27R	$20.0	2020	
Nashville International (BNA)	•		2E/20E	TBD	TBD	
Charlotte/Douglas International (CLT)		•	18W/36W	$187.0	TBD	
Port Columbus International (CMH)	•		10S/28S	TBD	TBD	
Dayton International (DAY)		•	6L/24R	TBD	TBD	
Grand Rapids Gerald R. Ford International (GRR)	•		8L/26R	TBD	TBD	
Washington Dulles International (IAD)	•		12R/30L	TBD	TBD	
George Bush Intercontinental (IAH)	•		9R/27L	TBD	TBD	
Indianapolis International (IND)	•		5R/23L	$125.0	TBD	
Kansas City International (MCI)		•	1L/19R	$12.0	TBD	
Orlando International (MCO)		•	17R/35L	TBD	TBD	
Milwaukee General Mitchell International (MKE)	•		7/25	TBD	TBD	
Raleigh-Durham International (RDU)		•	5R/23L	TBD	TBD	
Raleigh-Durham International (RDU)	•		5W/23W	TBD	TBD	
Richmond International (RIC)		•	16/34	$45.0	TBD	
San Antonio International (SAT)	•		12N/30N	$400.0	TBD	
Norman Y. Mineta San José International (SJC)		•	12L/30R	$54.3	TBD	
Sacramento International (SMF)		•	16R/34L	TBD	TBD	
Sacramento International (SMF)		•	16L/34R	TBD	TBD	
John Wayne-Orange County (SNA)		•	1L/19R	TBD	TBD	
Sarasota-Bradenton (SRQ)	•		14L/32R	$10.0	TBD	
Lambert St. Louis International (STL)		•	12R/30L	TBD	TBD	
Syracuse Hancock International (SYR)		•	10L/28R	$55.0	TBD	
Syracuse Hancock International (SYR)	•		10R/28L	TBD	TBD	
Tampa International (TPA)	•		17/35	$150.0	TBD	
Tampa International (TPA)		•	9/27	TBD	TBD	
Tampa International (TPA)		•	18L/36R	TBD	TBD	

Table C-1 continued

Airport (ID)	New	Extension	Runway Identifier	Estimated Cost ($M)	Planned Operational Year	In Progress
Tucson International (TUS)	•		11R/29L	$40.0	TBD	
Knoxville McGhee-Tyson (TYS)		•	5L/23R	TBD	TBD	
Knoxville McGhee-Tyson (TYS)		•	5R/23L	TBD	TBD	



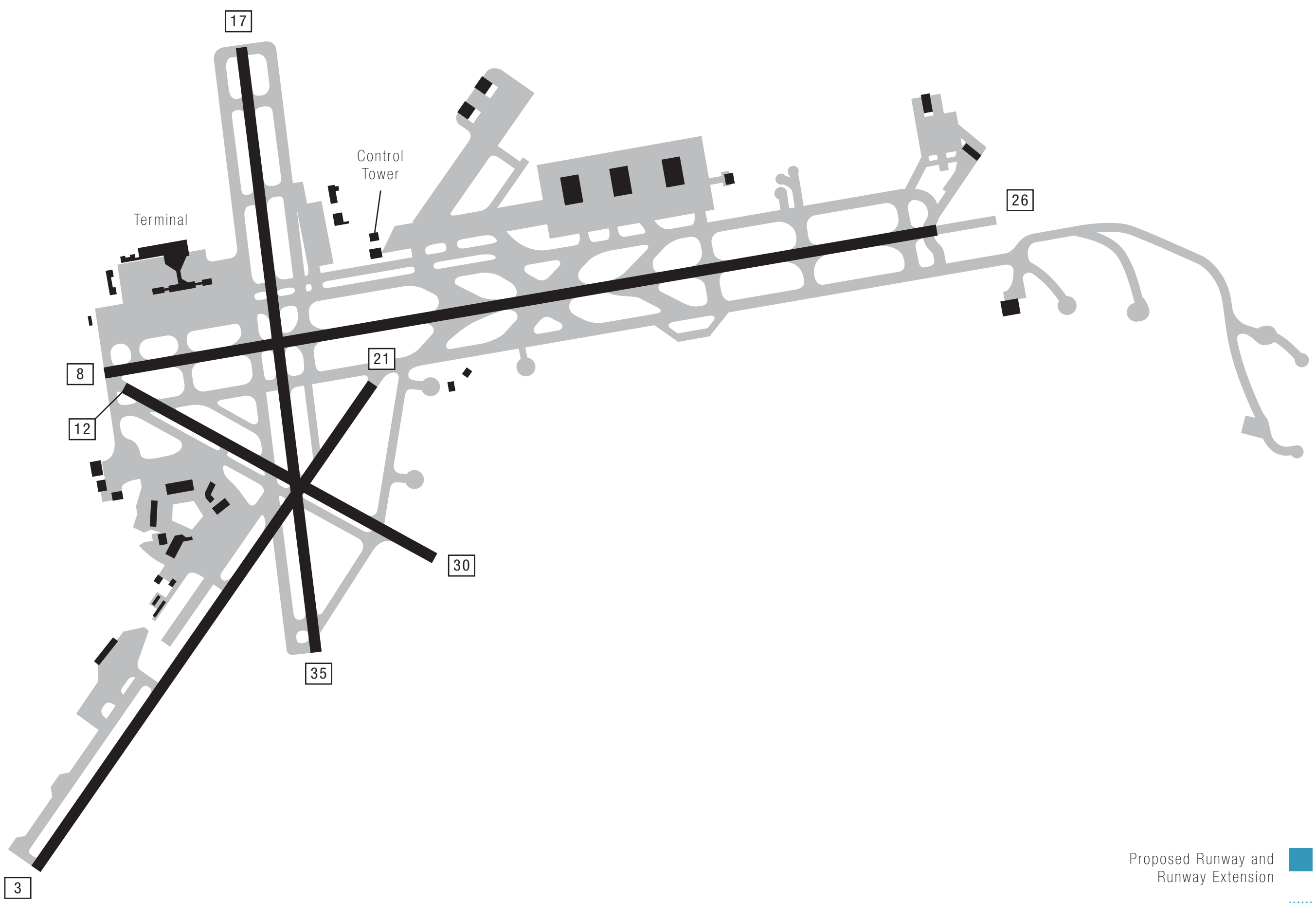



APPENDIX D AIRPORT LAYOUTS FOR THE TOP 100 AIRPORTS




ABQ – Albuquerque International Airport

There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.



Proposed Runway and Runway Extension

Proposed Construction

Proposed Building Construction

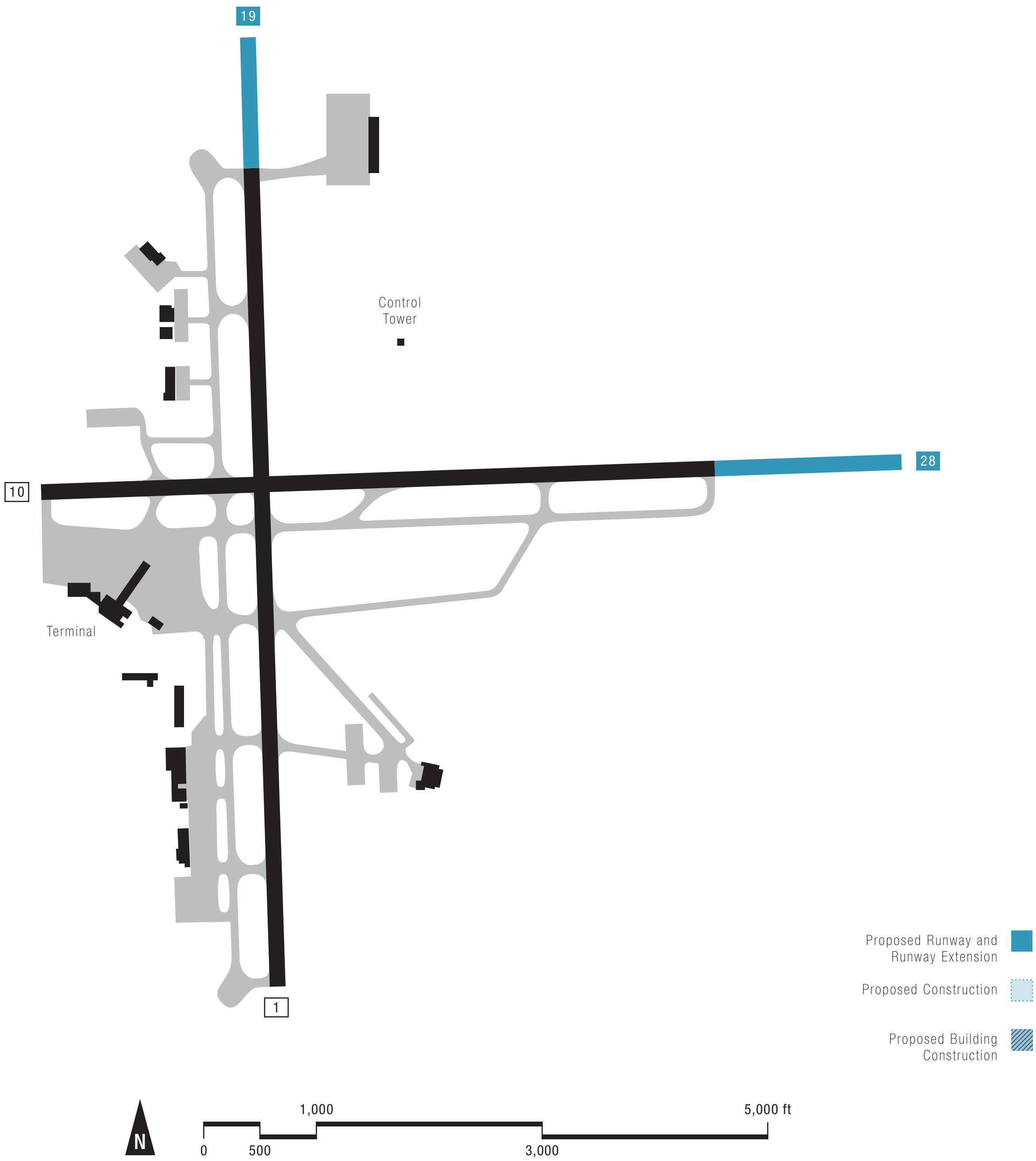
NM 52

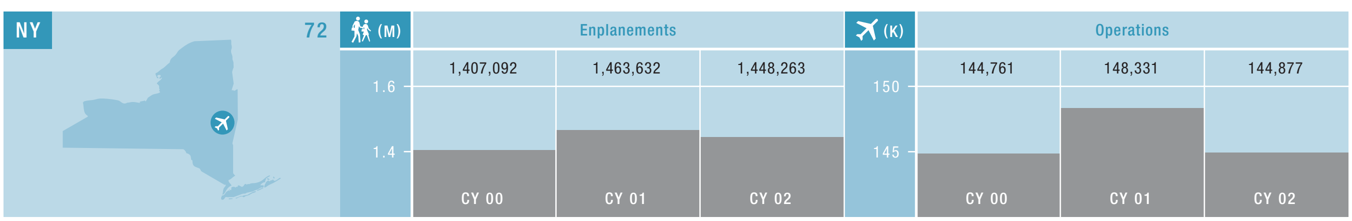
(M)	Enplanements		
	3,148,780	3,095,899	2,973,093
3.2 – 2.9	CY 00	CY 01	CY 02

(K)	Operations		
	233,173	241,673	254,568
260 – 230	CY 00	CY 01	CY 02

ALB – Albany County Airport

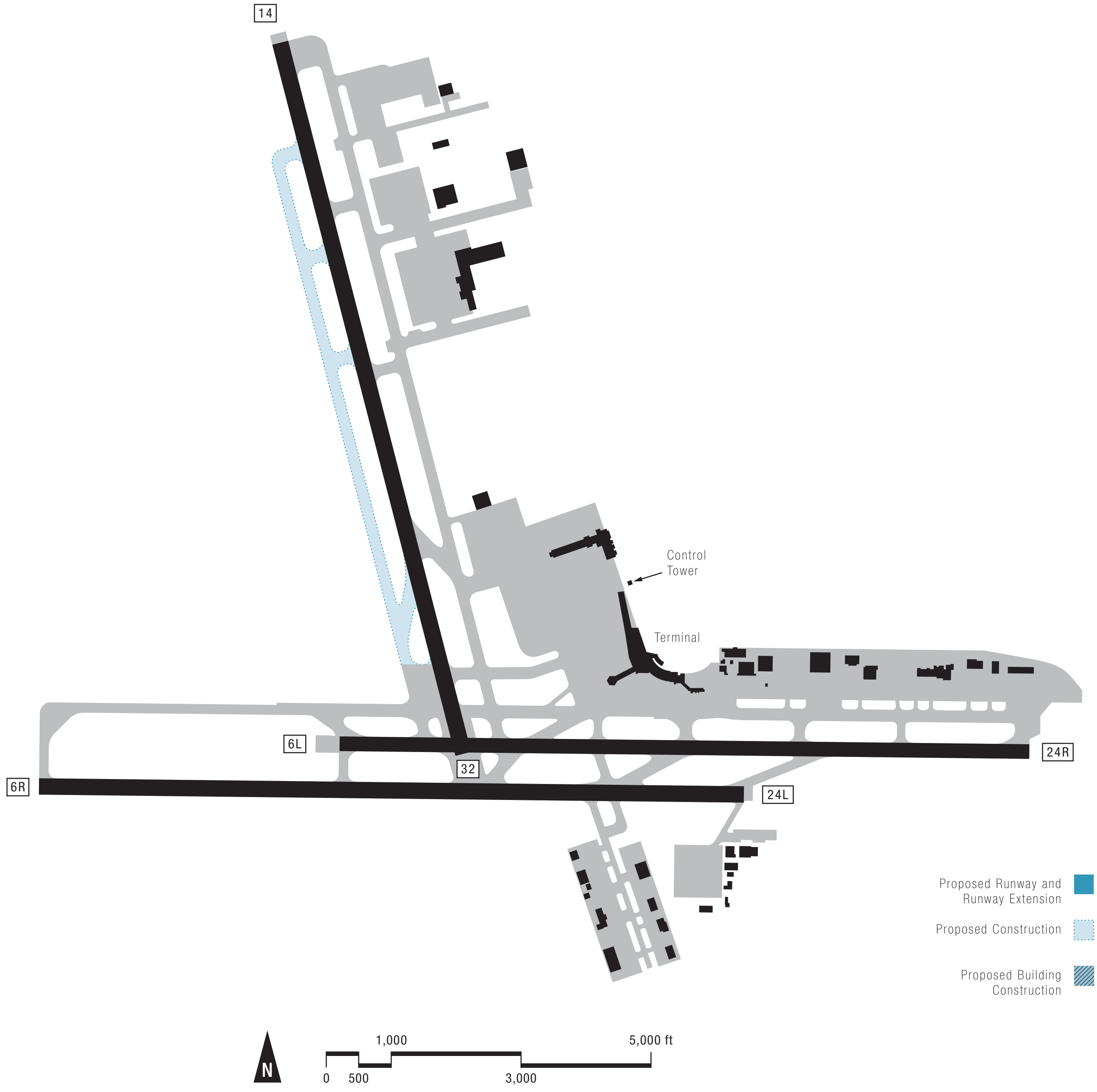
Construction of an extension to Runway 10/28 is planned. The estimated cost of construction is $5.8 million and is expected to be completed in 2002. An extension of Runway 1/19 is planned at an estimated cost of $7.5 million. Completion is expected in 2005.

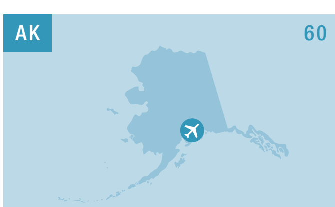


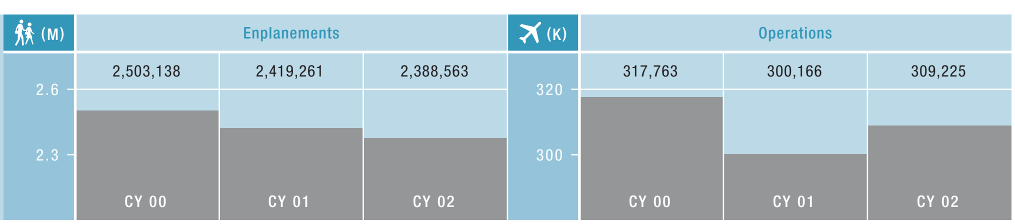


ANC – Ted Stevens Anchorage International Airport

A new runway, 32L/14R, is being proposed, at a cost of $16 million. No completion date is available at this time.

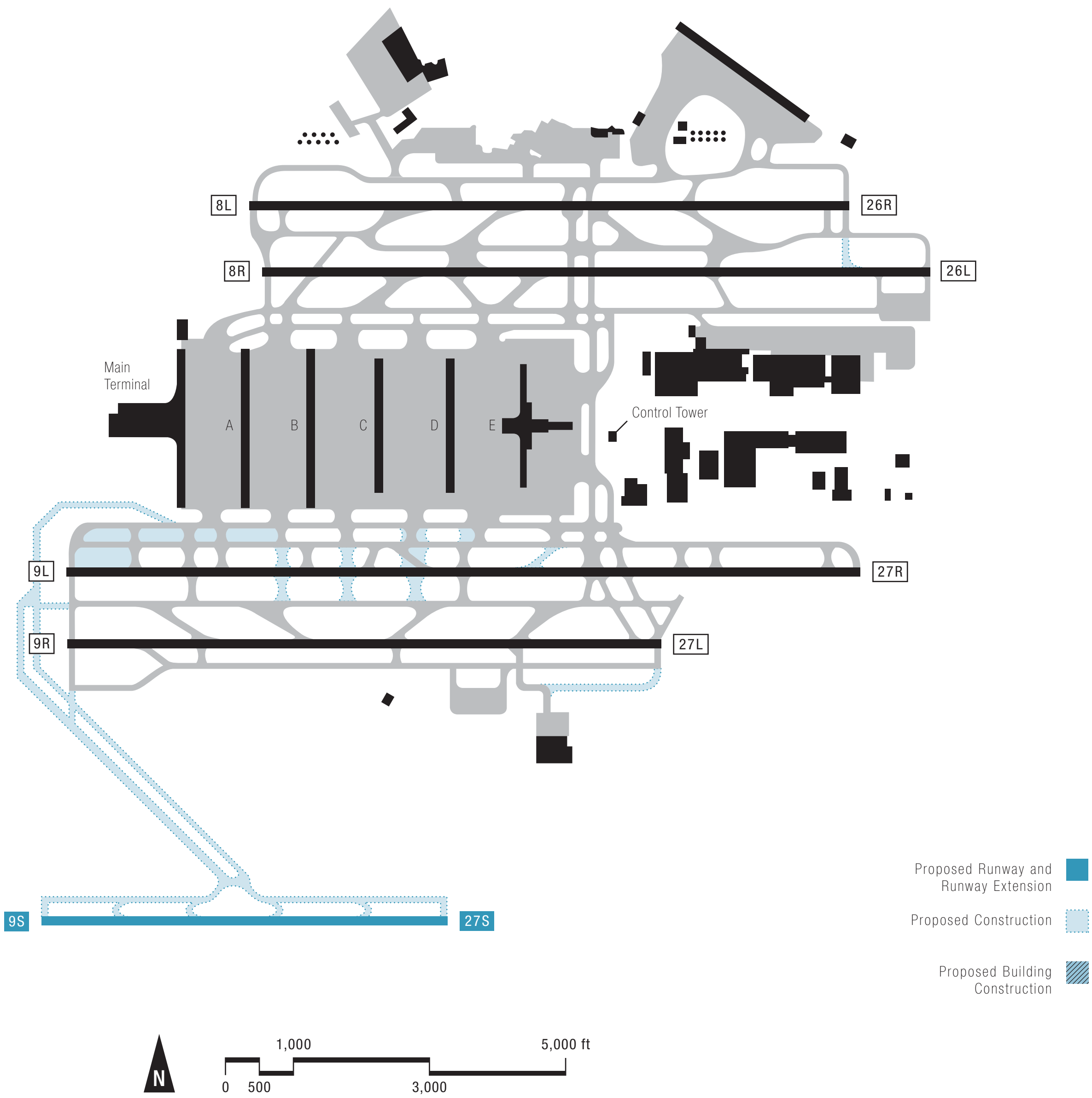






ATL – Hartsfield Atlanta International Airport

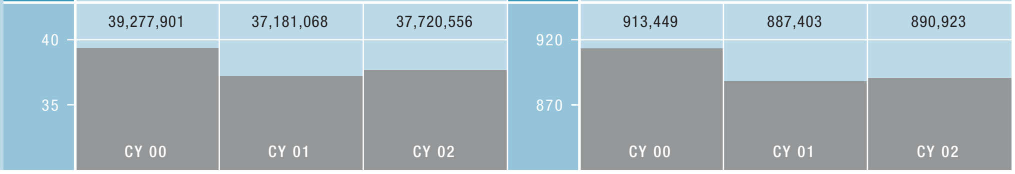
A fifth Runway 10/28, 9,000 ft. long and approximately 4,200 ft. south of Runway 9R/27L, is under design. Land acquisition is ongoing. The runway will permit triple independent IFR approaches using the PRM. The total estimated cost is $1.2 billion. Construction began in 2000. The estimated operational date is early 2005.



GA 1

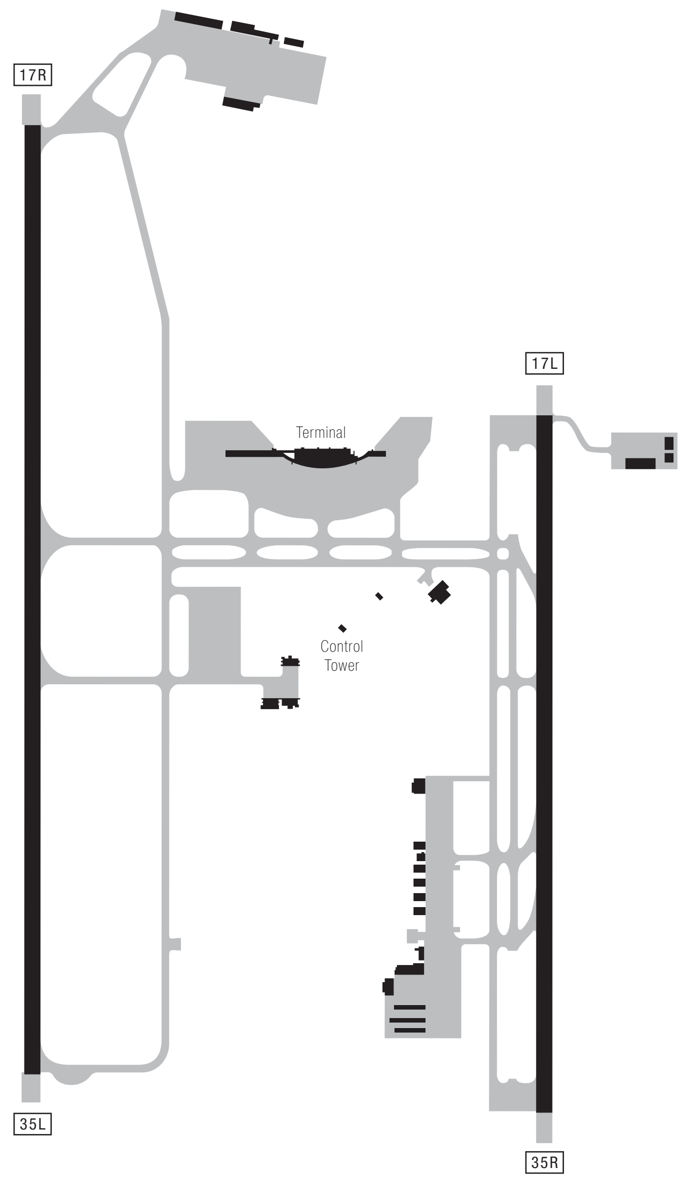
(M)	Enplanements CY 00	Enplanements CY 01	Enplanements CY 02
	39,277,901	37,181,068	37,720,556

(K)	Operations CY 00	Operations CY 01	Operations CY 02
	913,449	887,403	890,923



AUS – Austin-Bergstrom International Airport

There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.



Proposed Runway and Runway Extension

Proposed Construction

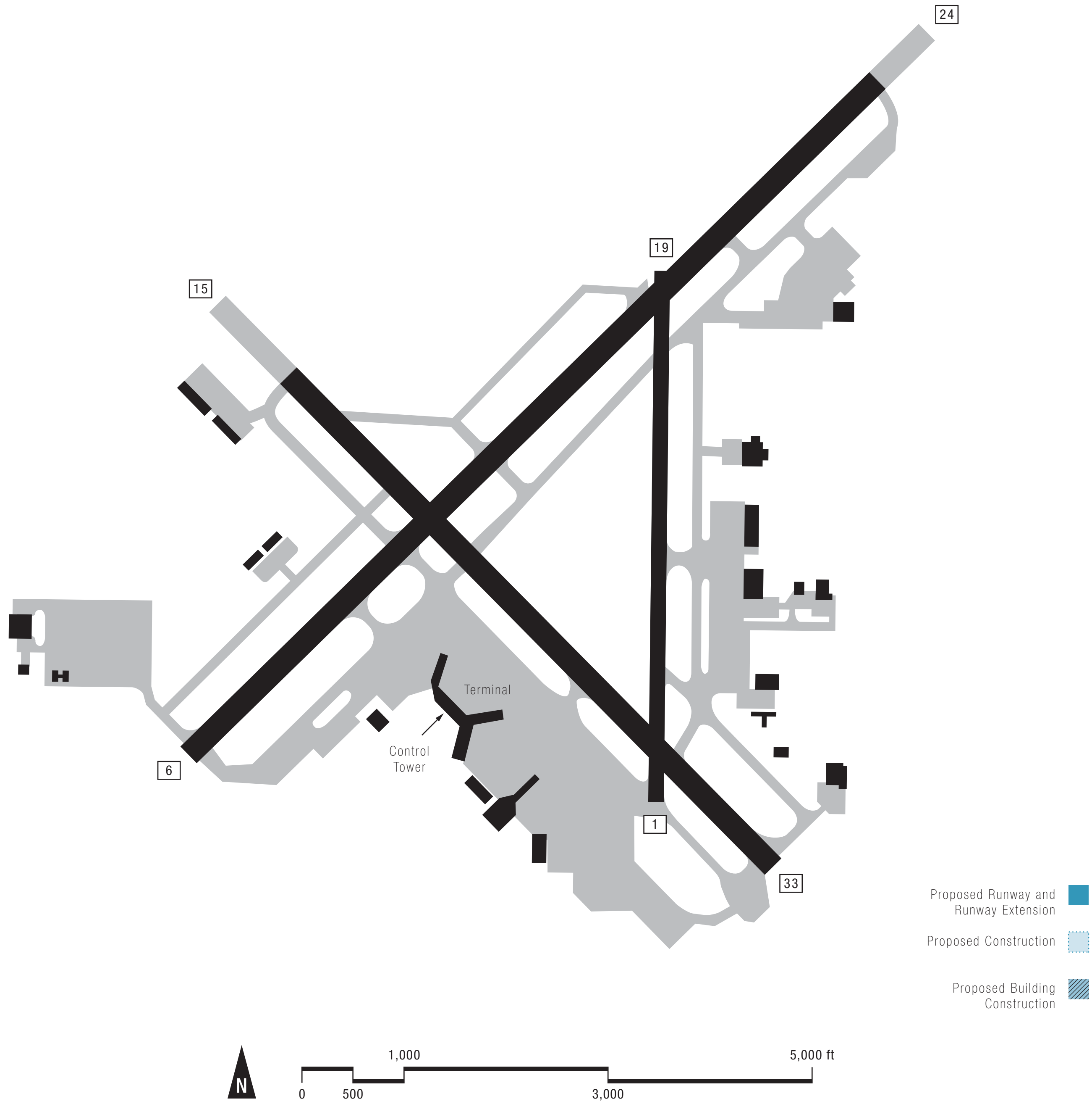
Proposed Building Construction

TX 50

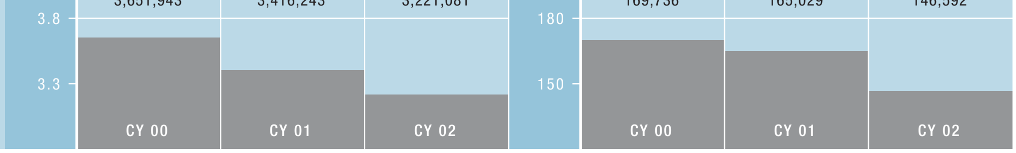
(M)	Enplanements			(K)	Operations		
3.8 / 3.3	3,648,600	3,428,202	3,186,381	240 / 200	212,635	220,439	217,359
	CY 00	CY 01	CY 02		CY 00	CY 01	CY 02

BDL – Bradley International Airport

There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.

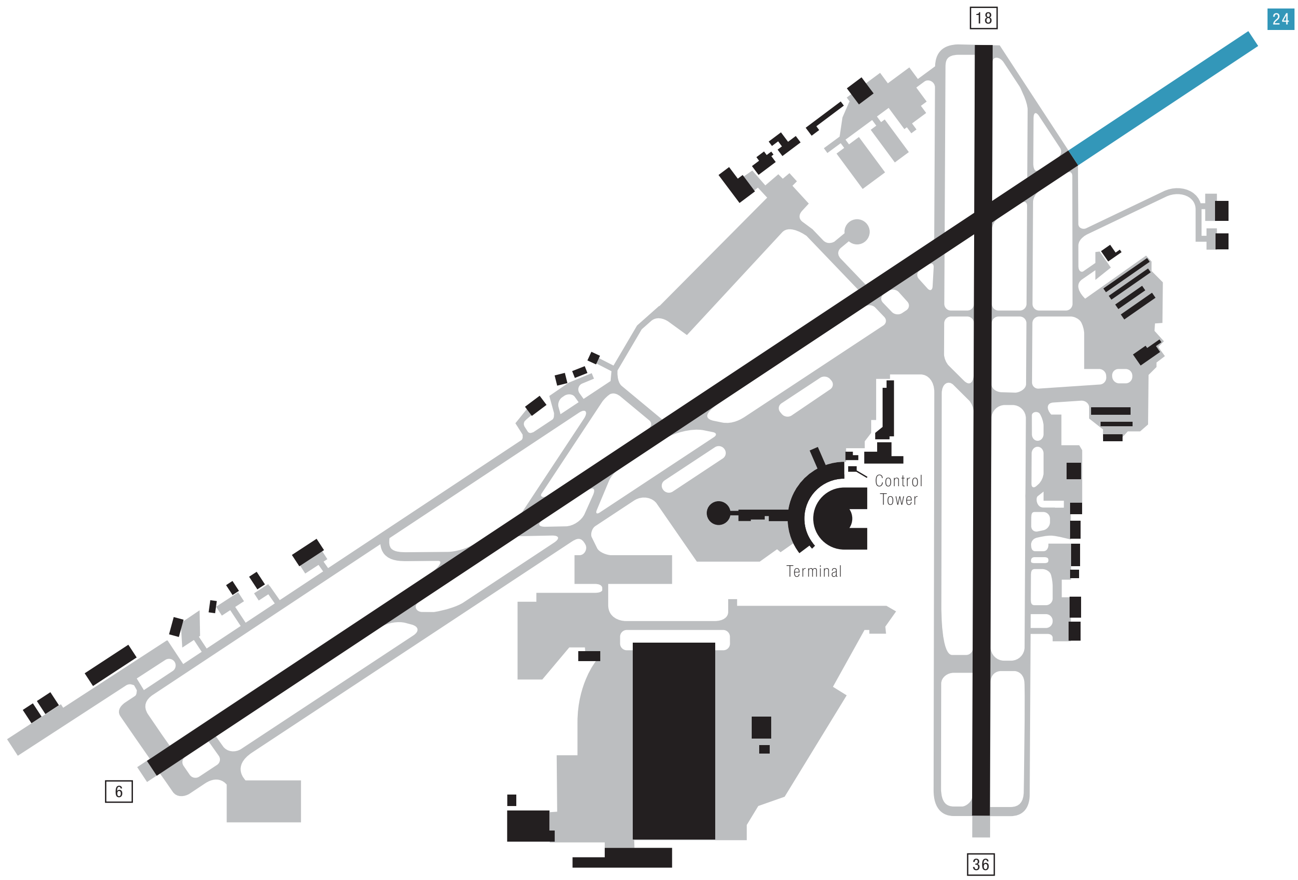


CT	49	(M)	Enplanements			(K)	Operations		
			3,651,943	3,416,243	3,221,081		169,736	165,029	146,592
			CY 00	CY 01	CY 02		CY 00	CY 01	CY 02



BHM – Birmingham Airport

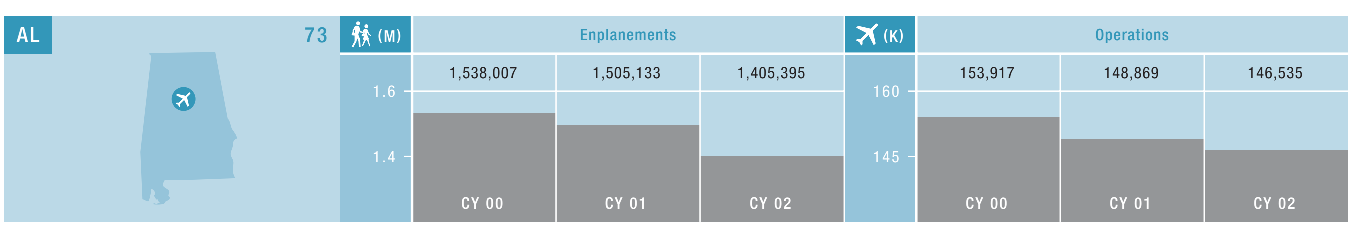
A 2,000-ft. extension of Runway 5/23 is currently proposed in the Airport's Master Plan. As proposed, the Runway 23 threshold would be displaced by 2,000 ft. Therefore, Runway 23's length available for departures and arrivals would be 12,000 ft. and 10,000 ft., respectively. Runway 5's available length for both arrivals and departures would increase to 12,000 ft. The increased length will allow increased aircraft payloads. An environmental assessment for the runway extension was completed in 1999. The runway extension was completed by 2002. The total estimated cost is $17 million.



Proposed Runway and Runway Extension

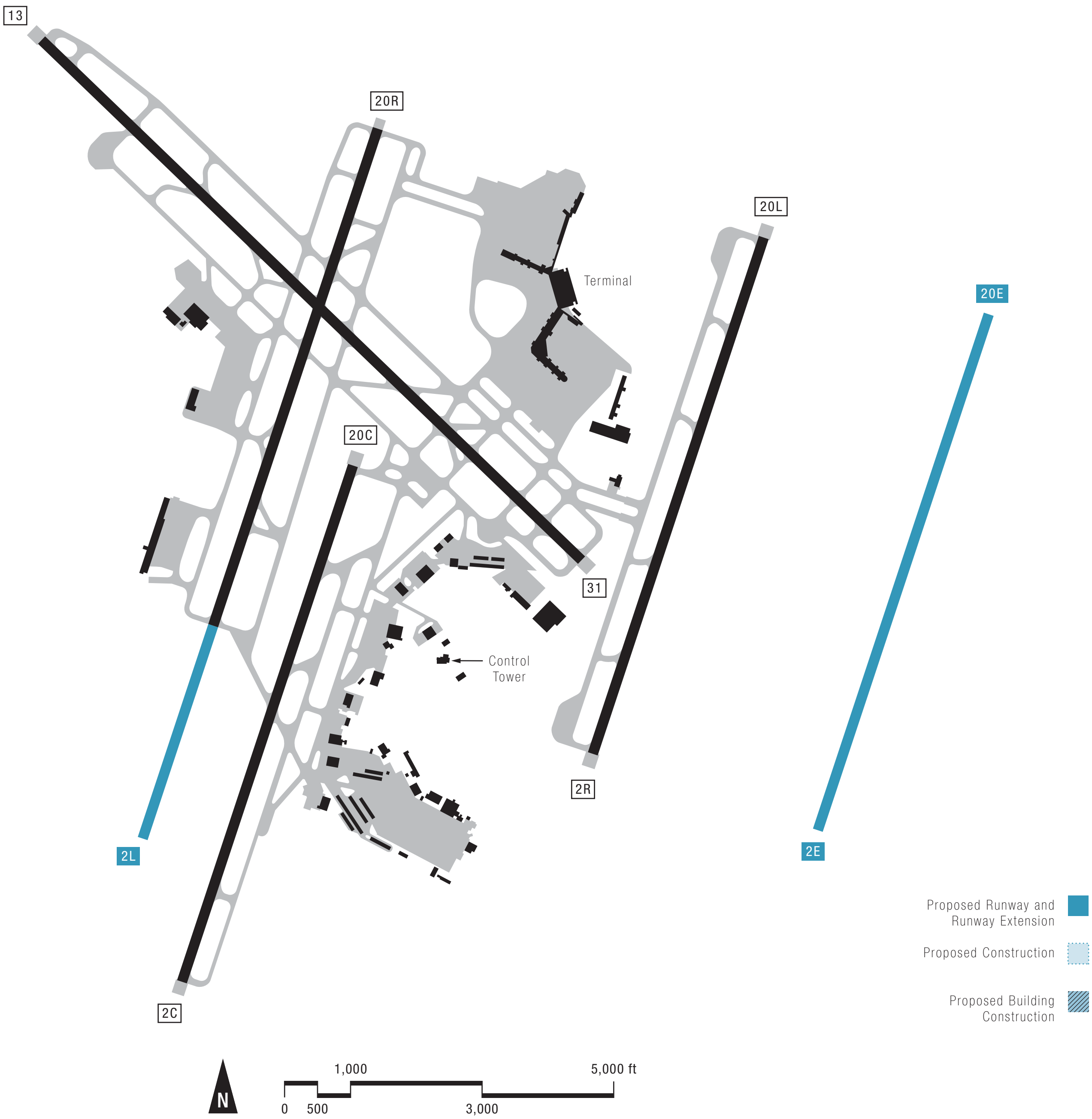
Proposed Construction

Proposed Building Construction



BNA – Nashville International Airport

A new Runway 2E/20E is planned for the future between 1,500 and 3,500 ft. from Runway 2R/20L. In addition, an extension to Runway 2R/20L is planned.

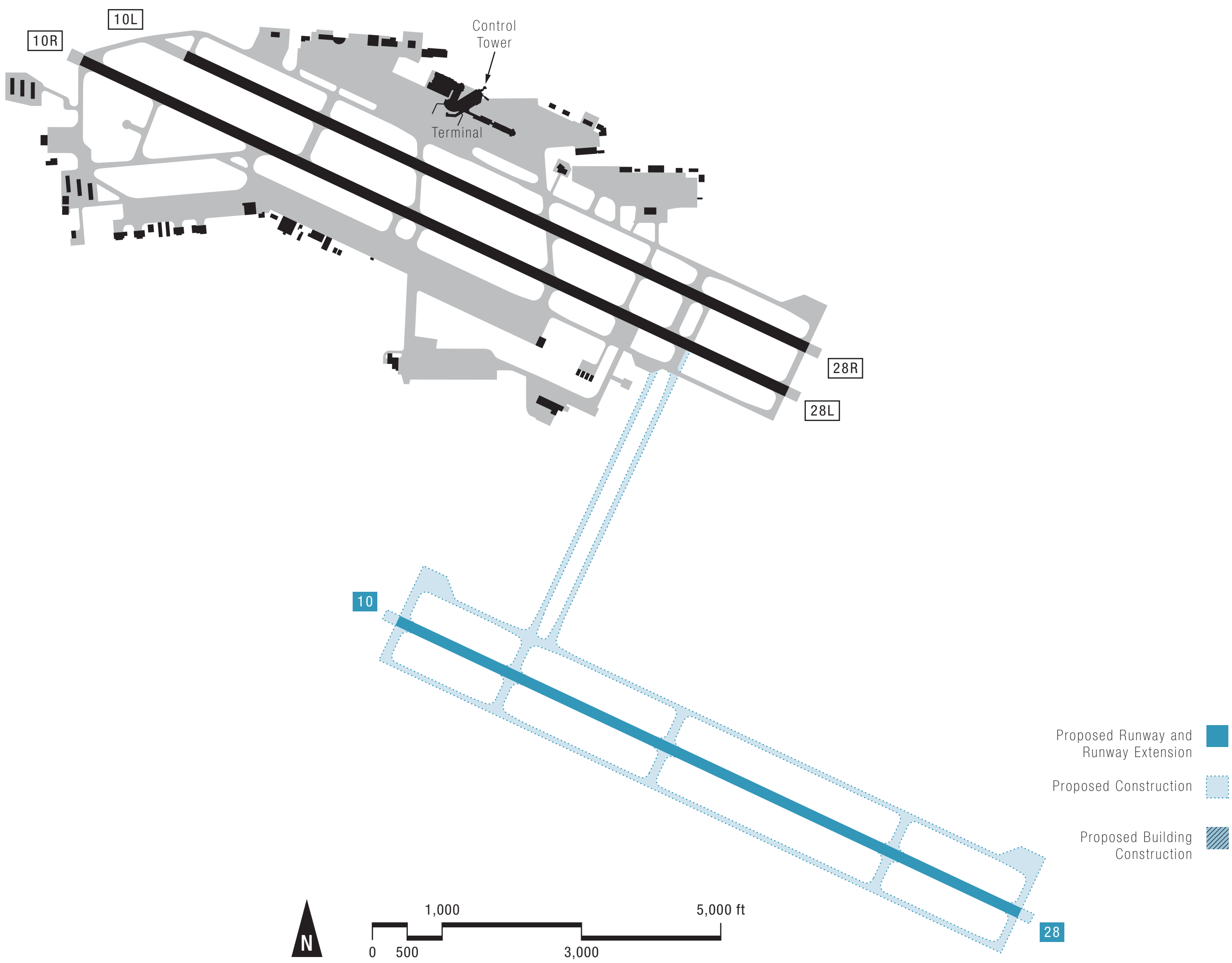


TN 43

(M)	Enplanements			(K)	Operations		
4.6 / 4.1	4,479,909	4,209,465	4,009,959	250 / 235	248,135	237,139	233,163
	CY 00	CY 01	CY 02		CY 00	CY 01	CY 02

BOI – Boise Air Terminal

The eastern 5,000 ft. of runway 9/27 was constructed and completed July 2002 for military training of short-field landings. Future long-term plans are for a total runway length of 13,000 ft. to the west. Runway 9/27 is located 5,400 ft. south of the existing runway 10R/28L.



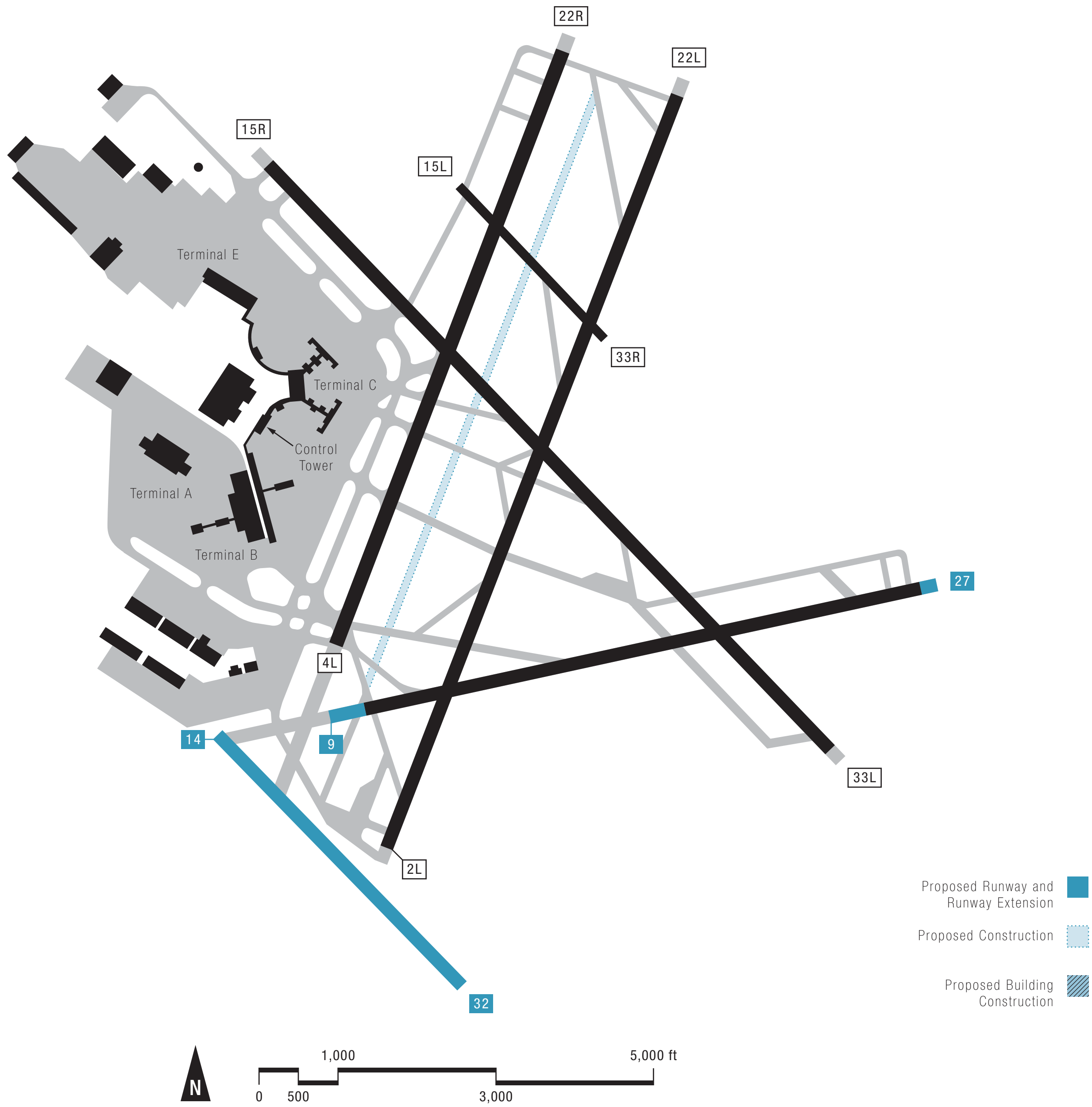
ID 74

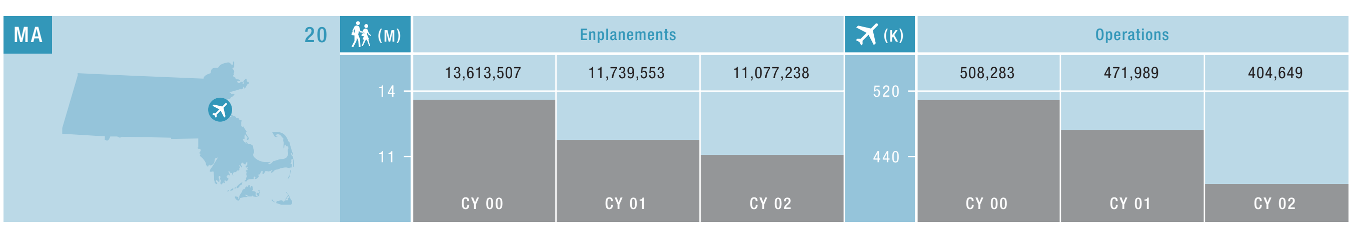
	Enplanements (M)			Operations (K)		
	CY 00	CY 01	CY 02	CY 00	CY 01	CY 02
Value	1,524,458	1,425,007	1,380,227	171,010	164,741	167,730

Axis: Enplanements 1.4 – 1.6; Operations 160 – 180

BOS – Boston Logan International Airport

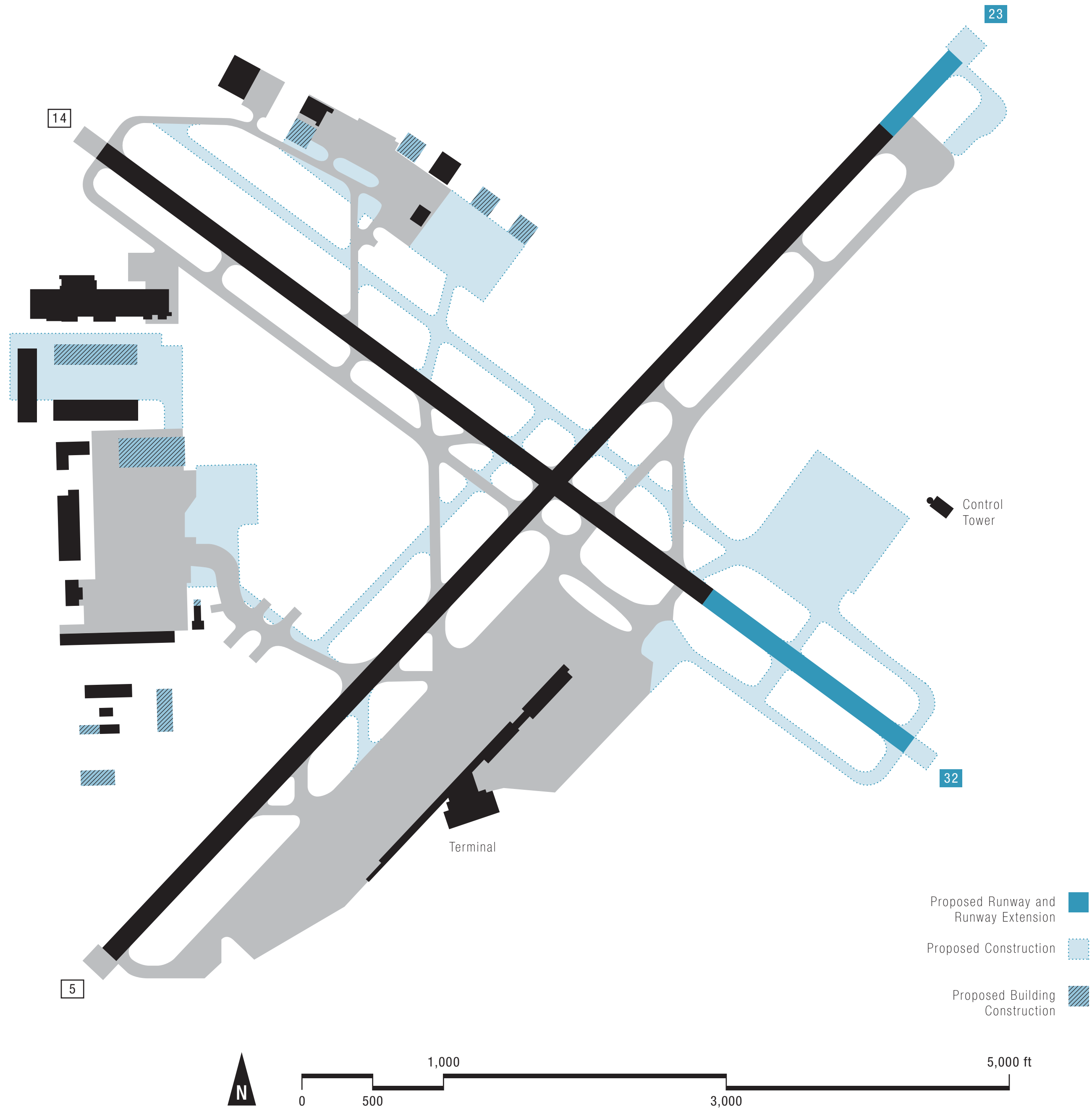
A new uni-directional 5,000 ft. Commuter Runway 14/32, and a new midfield taxiway, 9000 ft. in length, and other improvements are planned. An Environmental Impact Statement is nearing completion for the airfield project. The estimated cost for construction for the new runway is $100 million including mitigation. Massport's current plans reflect completion of the new Runway in 2005.

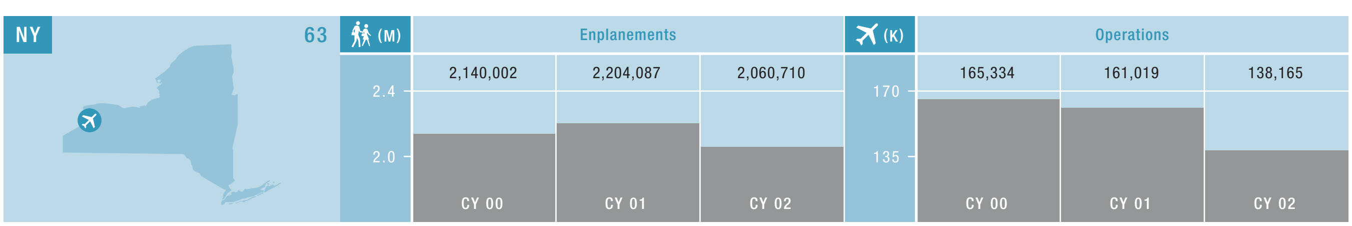




BUF – Buffalo Niagara International Airport

Construction of an extension to Runway 14/32 is planned. Estimated cost of construction is $4.9 million and it is expected to be completed in 2005.





BUR – Burbank-Glendale-Pasadena Airport

There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.

Proposed Runway and Runway Extension

Proposed Construction

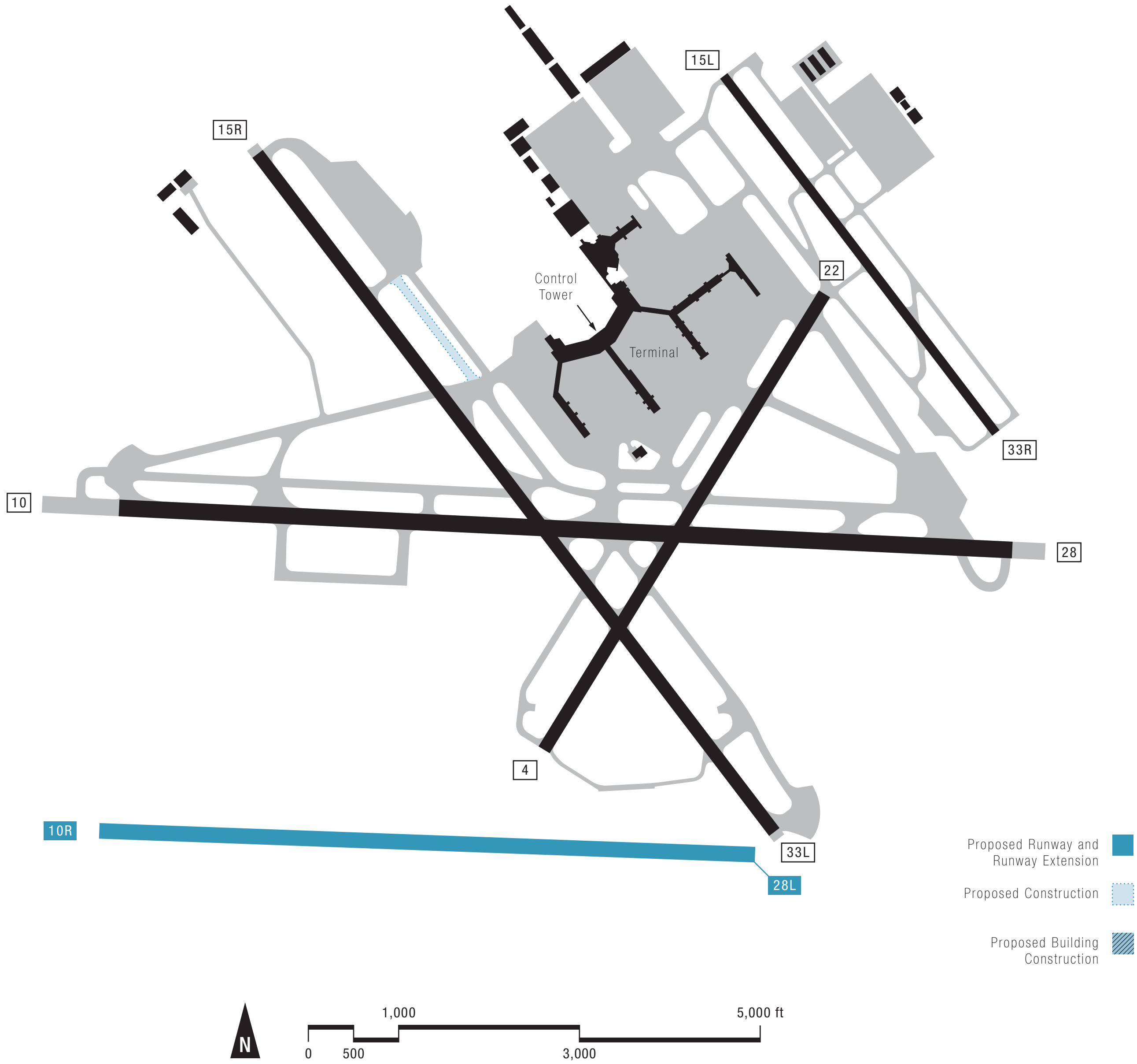
Proposed Building Construction

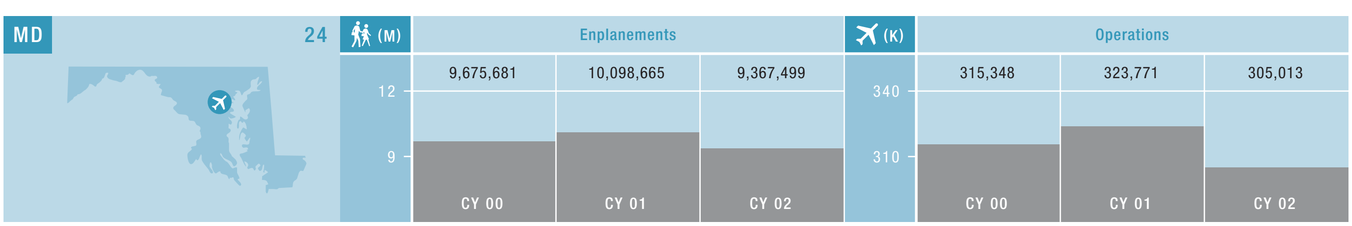
CA 61

(M)	Enplanements			(K)	Operations		
	2,380,531	2,250,685	2,305,747		160,730	159,705	161,912
2.4 / 2.2	CY 00	CY 01	CY 02	170 / 155	CY 00	CY 01	CY 02

BWI – Baltimore-Washington International Airport

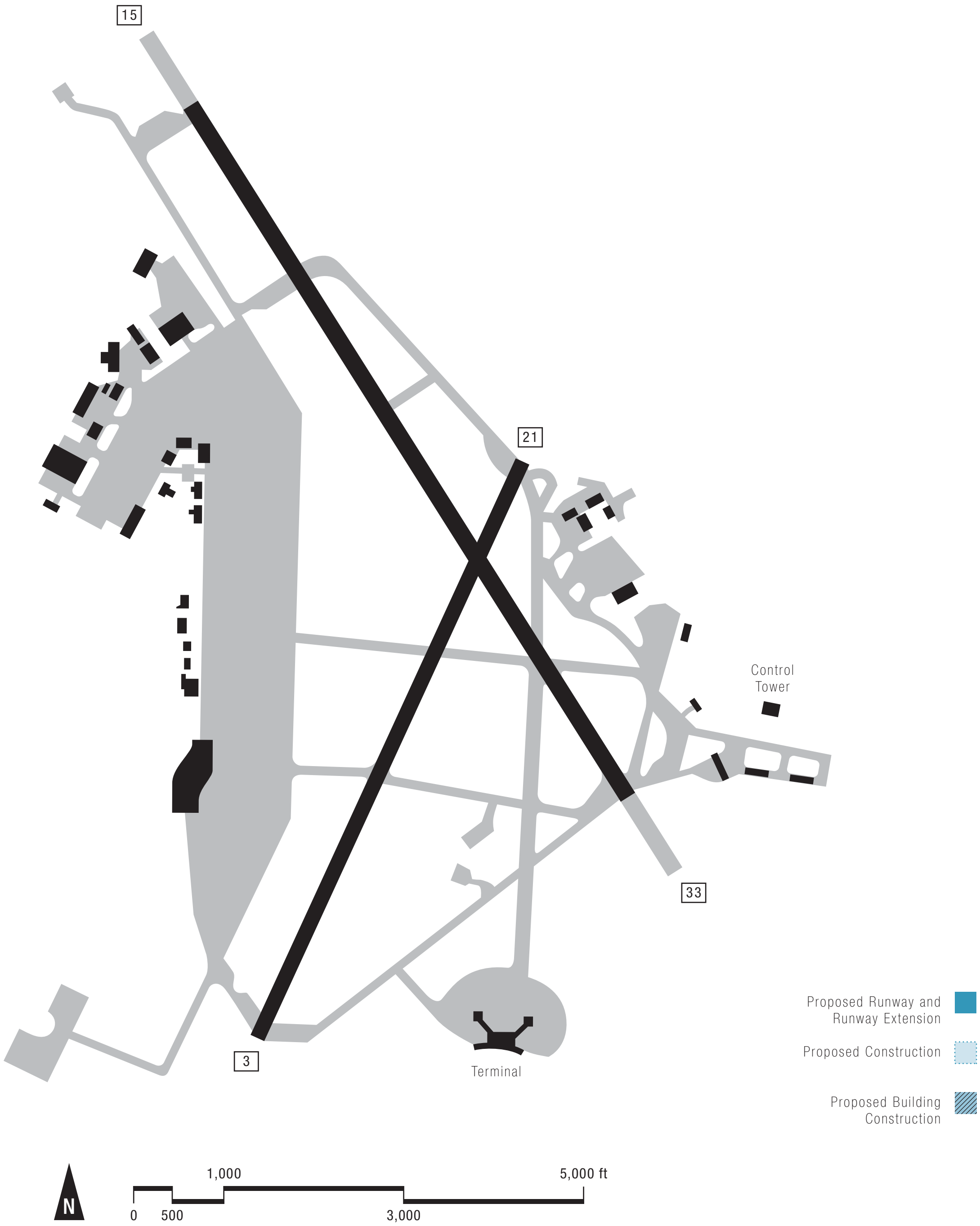
Various capacity improvements are currently under consideration by the Baltimore/Washington International Airport (BWI) Capacity Task Force. The BWI Capacity Enhancement Plan (CEP) is projected for release in 2003. The CEP will detail several viable proposed capacity improvements and runway alternatives, and identify the anticipated date of project(s) construction.

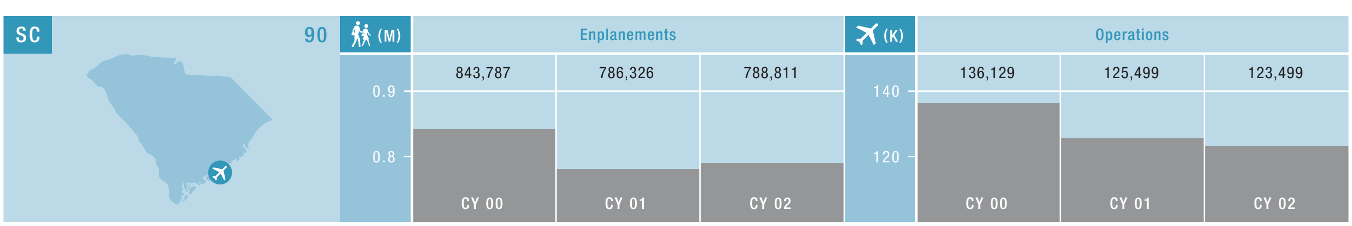




CHS – Charleston International Airport

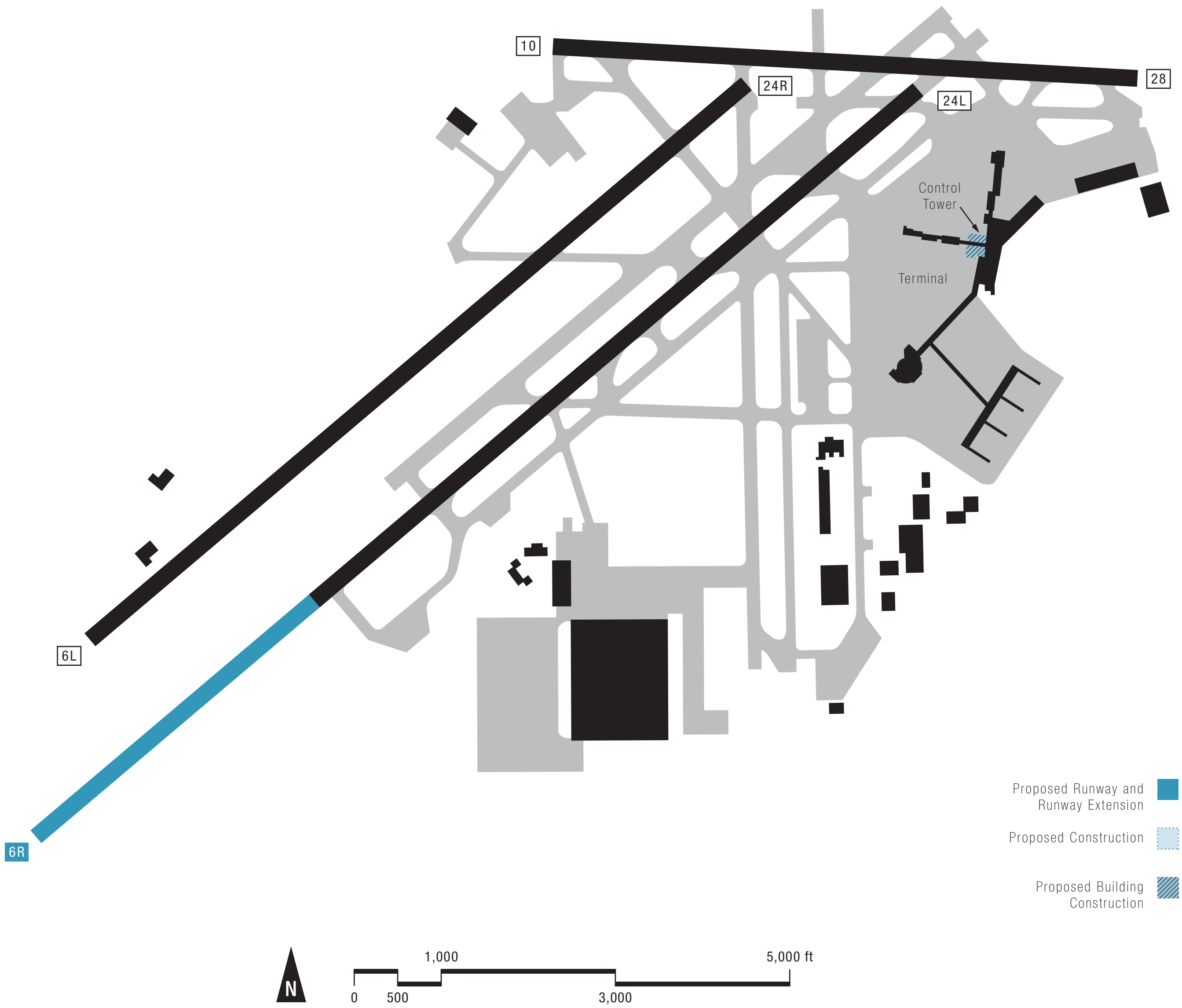
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.

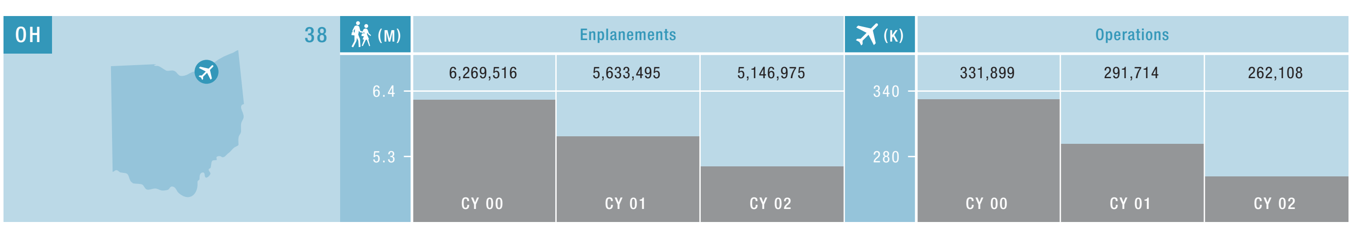




CLE – Cleveland Hopkins International Airport

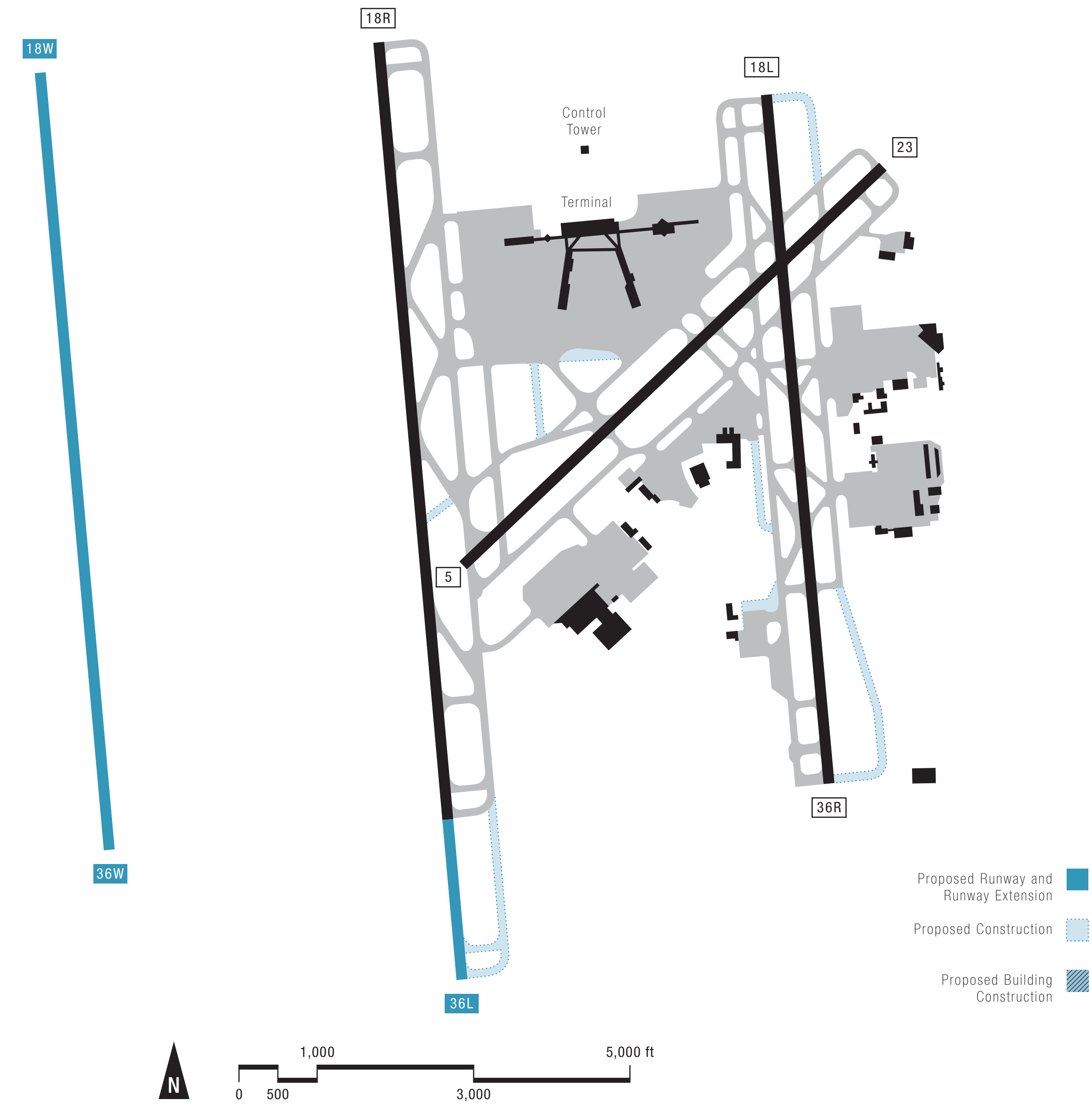
Phase II, completing construction to 9,000 ft., is awaiting relocation of existing NASA facilities now in progress and is scheduled to be operational in November 2004. The cost of Phase I and II is $129 million. Also planned is the conversion of existing 6L/24R into a parallel taxiway at a cost of $3 million, scheduled for completion 2005. Future projects include an extension of existing Runway 6R/24L from 9,000 ft. to 11,250 ft., at an estimated cost of $40 million. The schedule is pending, based upon available funding. Runway 18/36 has been decommissioned and construction on the North end of the terminal is complete.

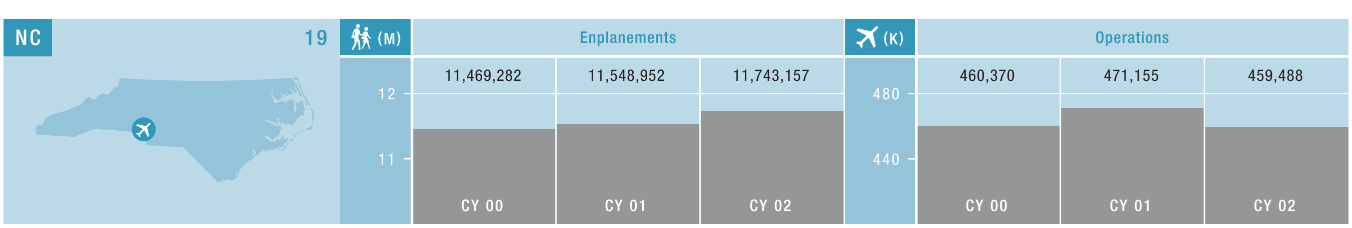




CLT – Charlotte/Douglas International Airport

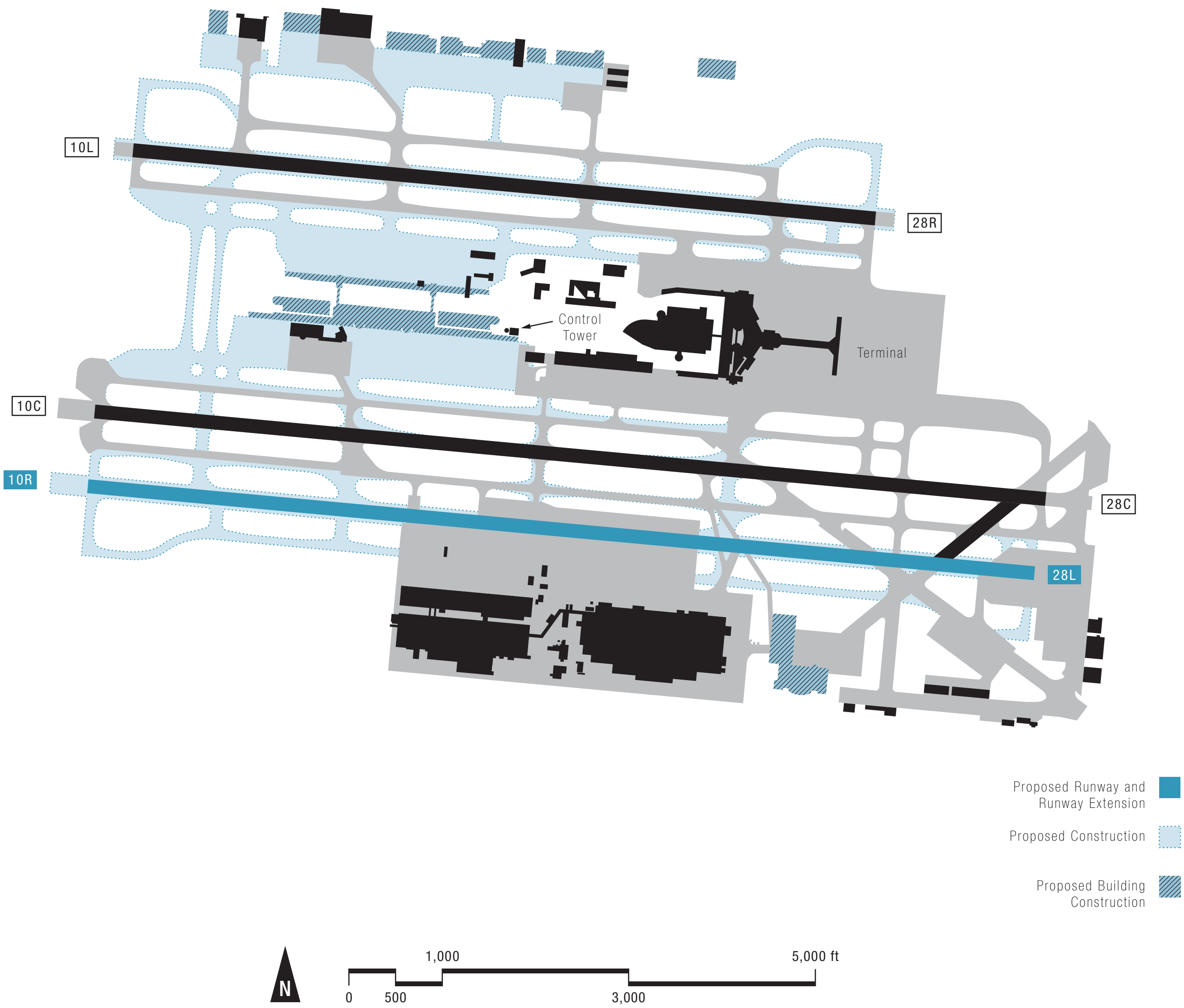
A third parallel 9,000-ft. Runway 18W/36W, 3,700 ft. west of Runway 18R/36L, is being planned. It would permit triple dependent IFR approaches. Land acquisition is ongoing. Construction is expected to start in mid-2002 and be completed by late-2005, at an estimated cost of $187 million. A 2,000-ft. extension of Runway 18R/36L is also planned. The estimated cost is $22 million, and it is expected to be operational beyond 2006. The extension is primarily for departures.

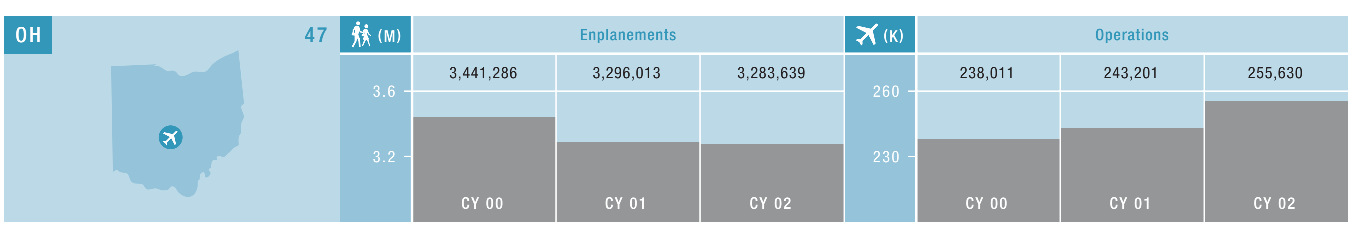




CMH – Port Columbus International Airport

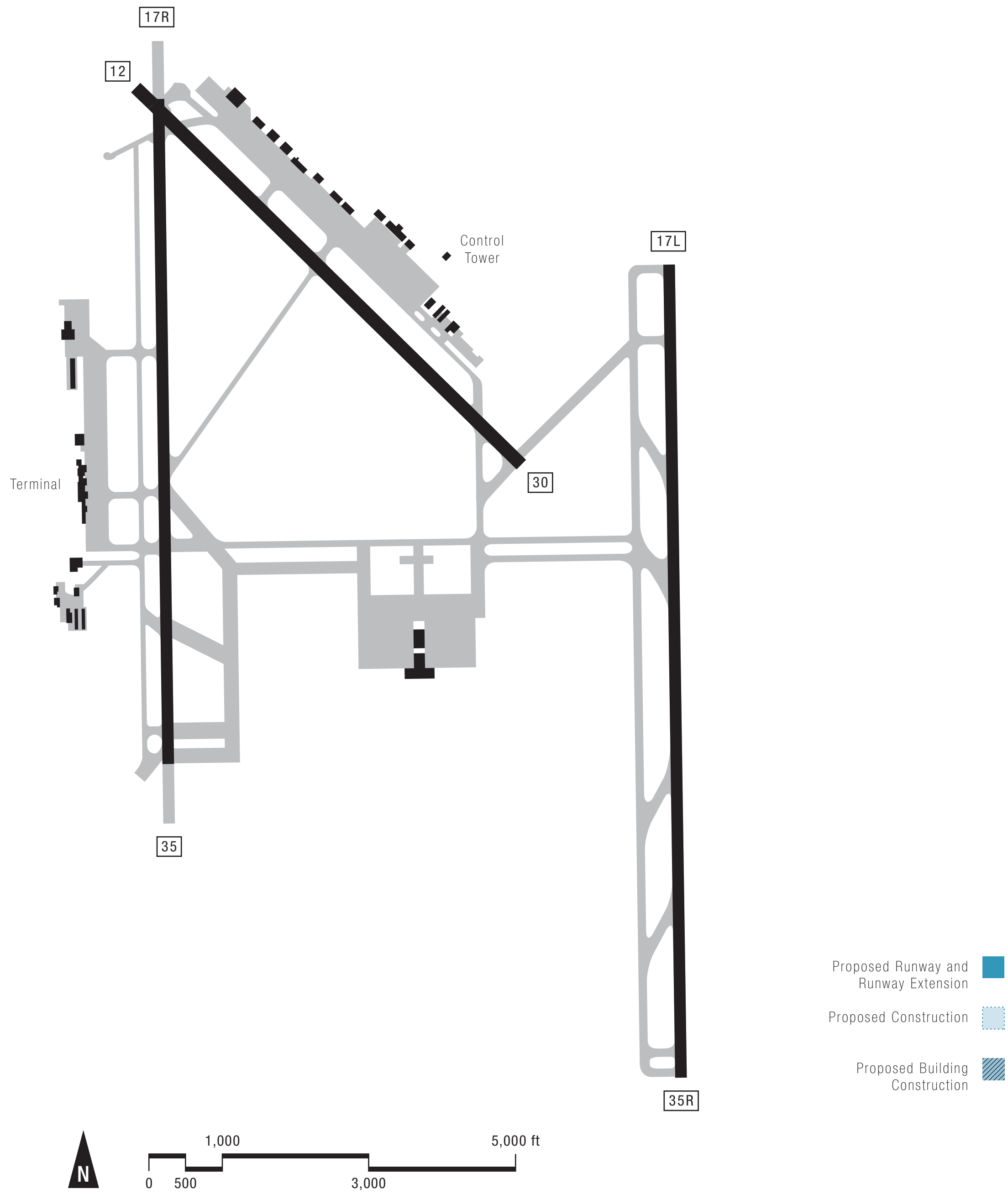
The Airport Layout Plan illustrates a third parallel Future Runway 10R/28L, constructed 800 ft. south of the existing Runway 10R/28L. (Existing Runway 10R/28L will become Runway 10C/28C upon completion of construction of the third parallel Future Runway 10R/28L.) The new runway will be 10,125 ft. in length and 150 ft. in width, with two high-speed exits, a 90-degree exit at the center and a 90-degree bypass taxiway at each end. This would provide a 3,600-ft. separation between the proposed Runway 10R/28L and the existing Runway 10L/28R. With the installation of the Precision Runway Monitor (PRM), the existing Runway 10L/28R and the proposed Runway 10R/28L could be used for arrival traffic. Runway 10C/28C would be used as the departure runway. The expected operational date is 2020, and no project cost estimates are available.





COS – Colorado Springs Municipal Airport

Runway 17R/35L began reconstruction March 2002 with completion scheduled for November 2002.

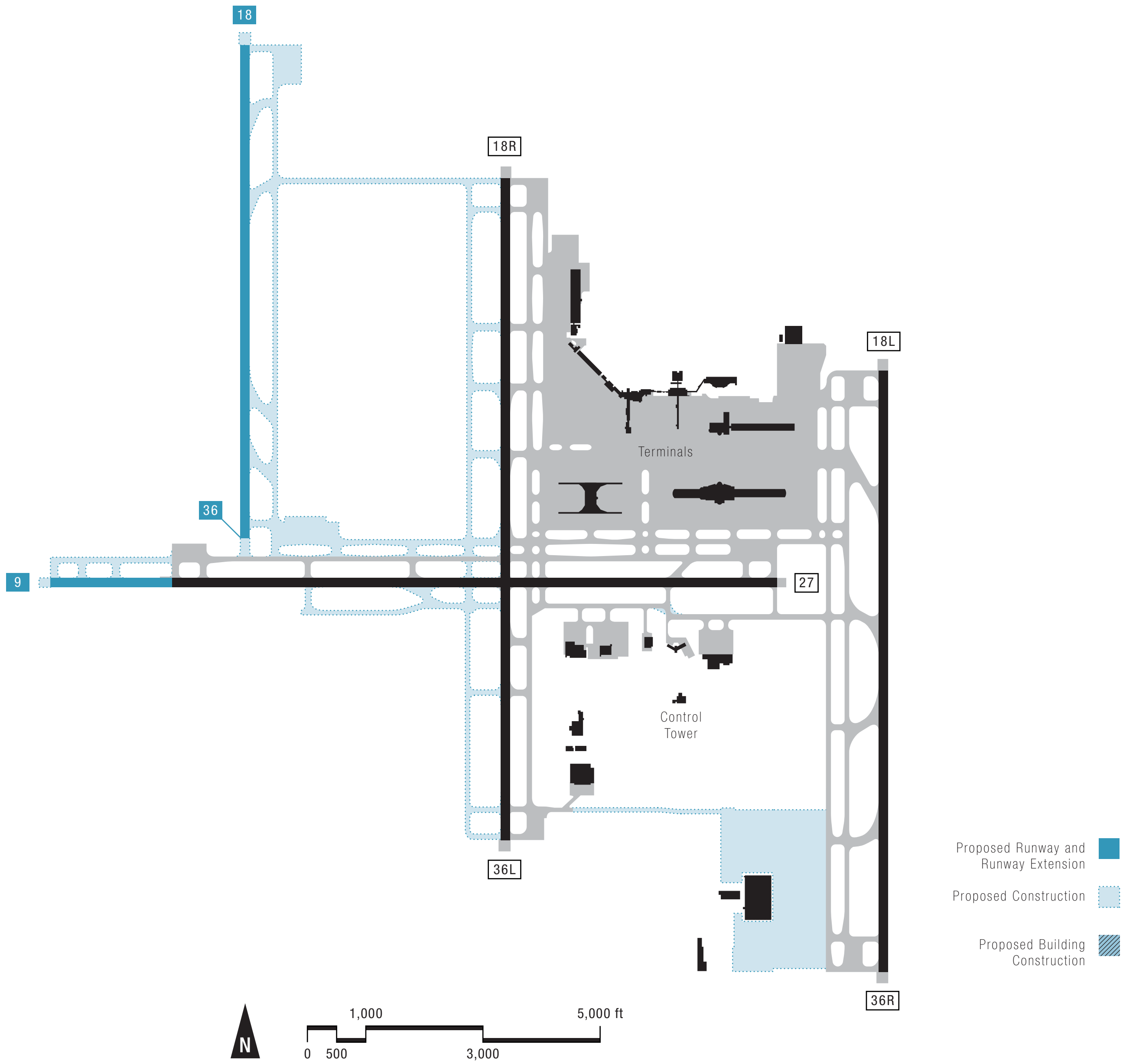


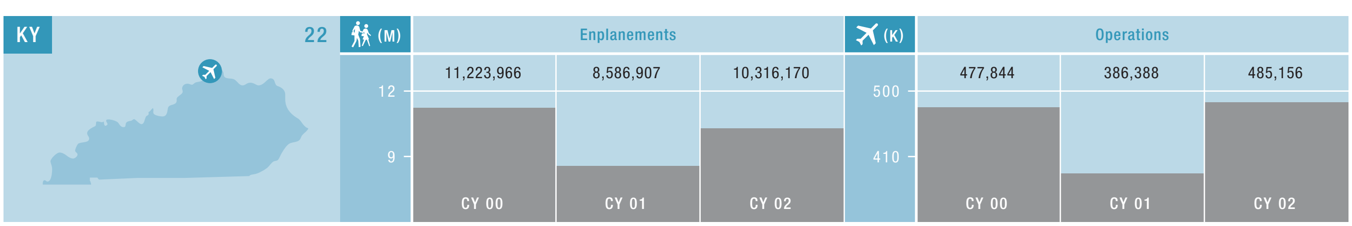
CO 84

(M)	Enplanements			(K)	Operations		
1.4 / 1.1	CY 00	CY 01	CY 02	240 / 210	CY 00	CY 01	CY 02
	1,205,552	1,050,344	1,038,027		220,739	206,221	218,166

CVG – Greater Cincinnati International Airport

A new 8,000 ft. third parallel Runway 18R/36L is planned to be located 4,300 ft. west of the existing Runway 18R/36L (to be renamed 17/35). The estimated cost is $233 million. The expected operational date is 2005. The new runway may allow triple independent IFR approaches. A 1,000 ft. extension to Runway 9 is required for the new runway to become operational. However, a 2,000 ft. extension is planned and is expected to be completed in 2005 at an estimated cost of $18.2 million. The extension would allow departures of aircraft with heavier payloads and/or longer haul-lengths. An EIS is currently underway for both projects.





DAL – Dallas-Love Field

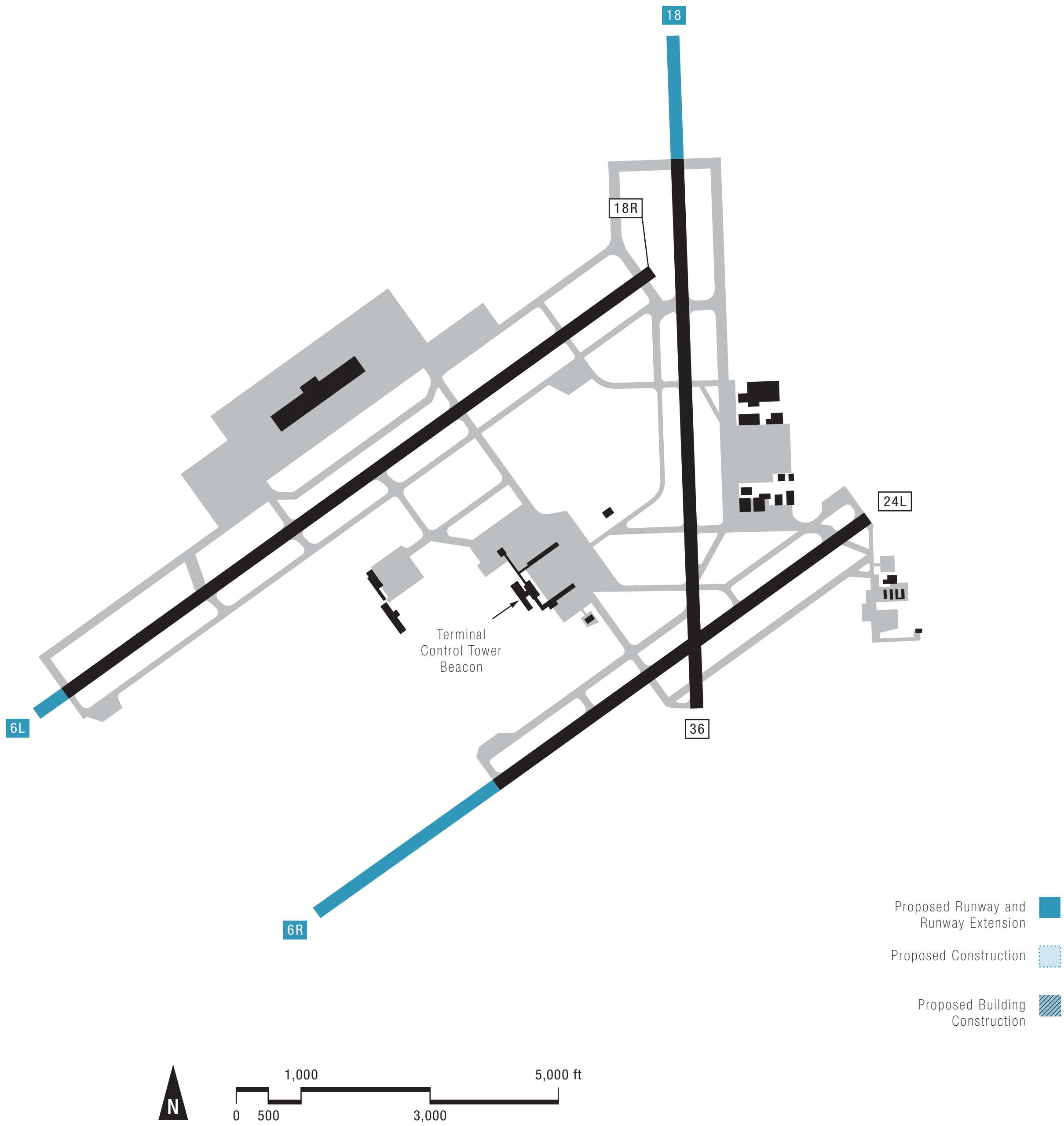
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.

(M)	Enplanements		
	3,596,052	3,352,083	2,815,907
3.8			
2.9			
	CY 00	CY 01	CY 02

(K)	Operations		
	256,787	243,849	243,910
260			
240			
	CY 00	CY 01	CY 02

DAY – Dayton International Airport

Future plan revisions under consideration are: a northerly shift of Runway 18/36 including an extension to Runway 18 end to provide a total length of 9,500 ft.; and an additional extension to Runway 6R end to provide a total length of 11,000 ft. Currently these projects are under Airspace review and an EIS study is underway.

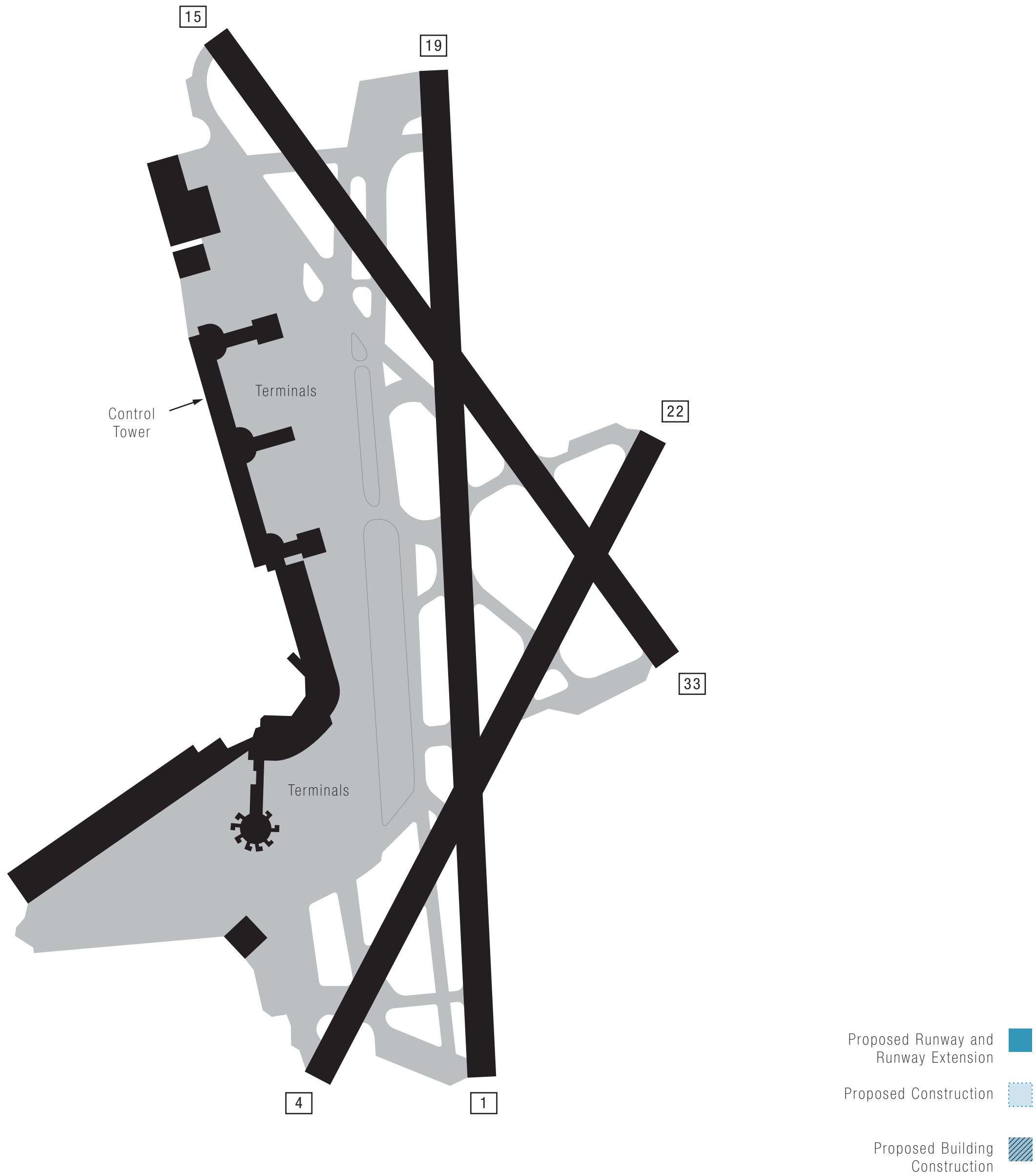


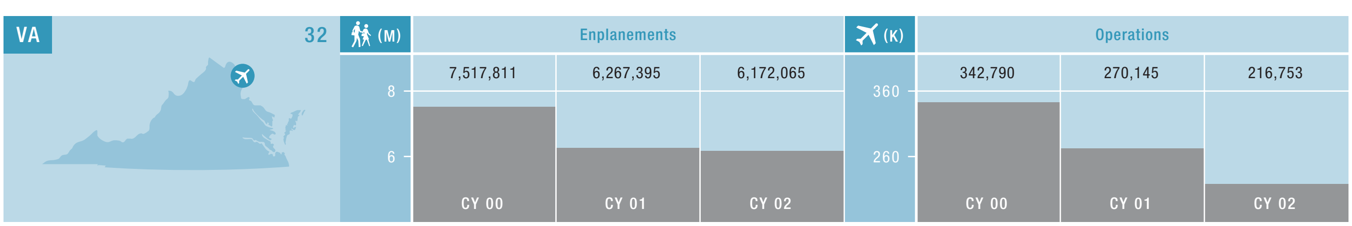
OH 82

	(M) Enplanements			(K) Operations		
	CY 00	CY 01	CY 02	CY 00	CY 01	CY 02
	1,164,032	1,070,456	1,144,295	145,123	131,651	124,892

DCA – Ronald Reagan National Airport

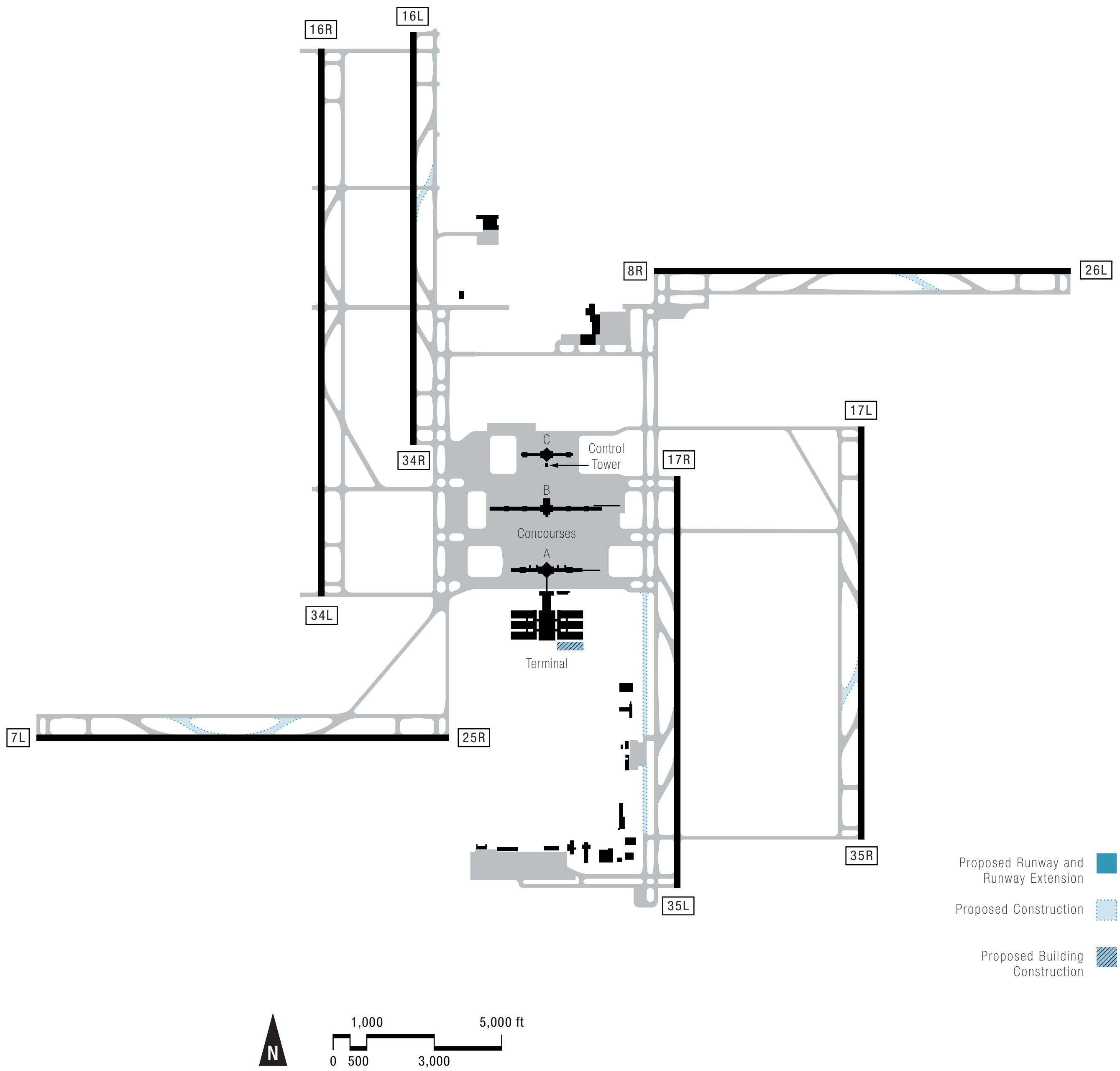
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.





DEN – Denver International Airport

Runway 16R/34L, which is 16,000 feet, was completed in fall of 2003 at a cost of $170.3 million. Other airfield improvements anticipated to be completed by 2008 include: parallel Taxiway L and high-speed exit Taxiways P5, B5, B6, R5, and F7.

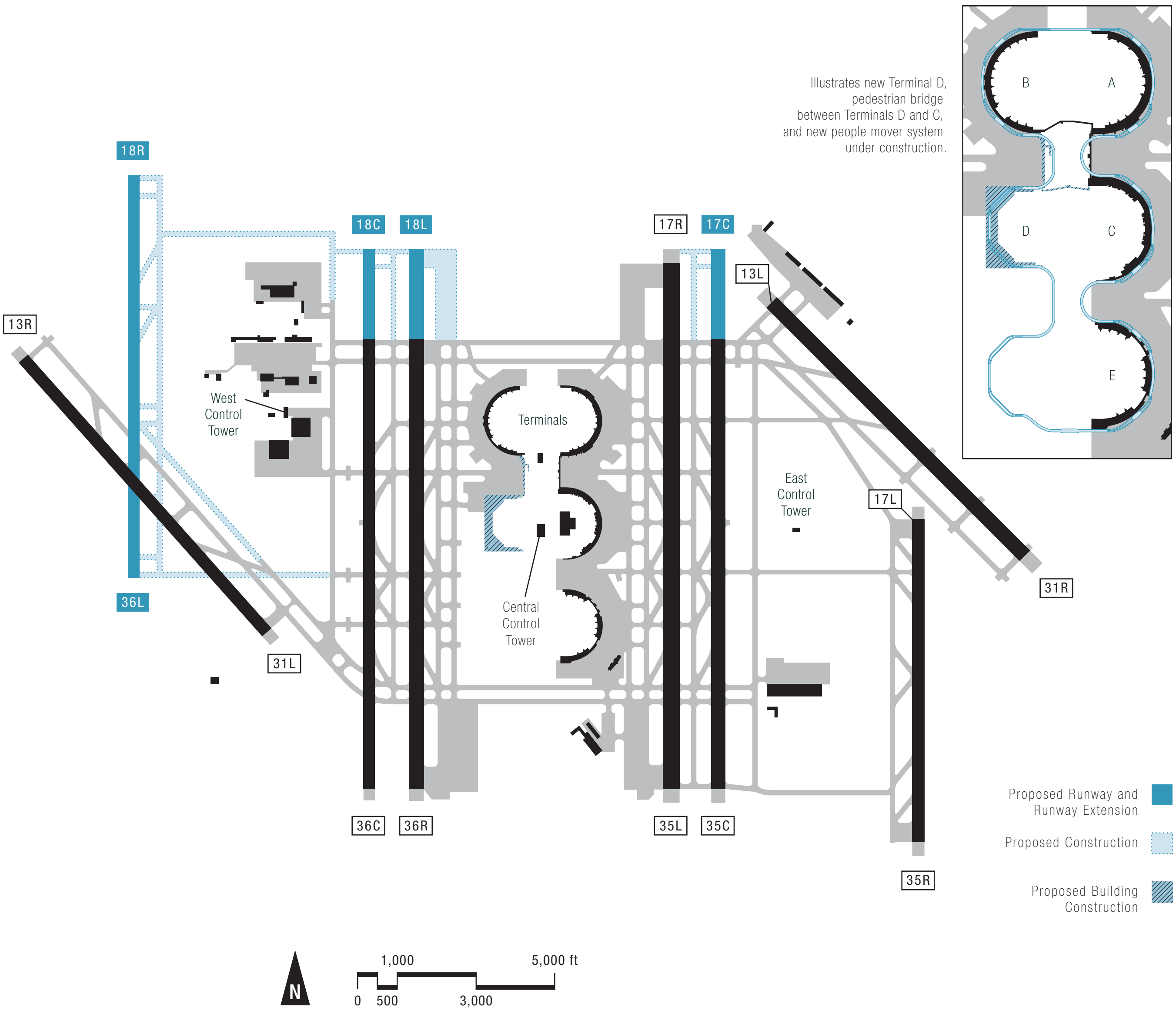


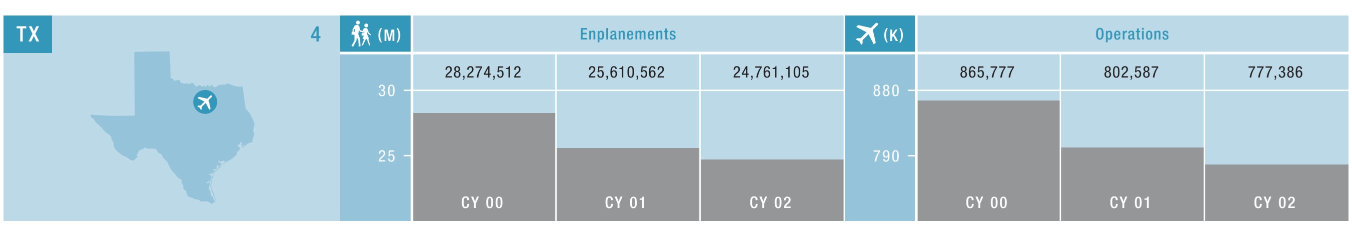
(M)	Enplanements		
	18,382,940	17,178,872	16,943,564
	CY 00	CY 01	CY 02

(K)	Operations		
	528,604	507,826	509,477
	CY 00	CY 01	CY 02

DFW – Dallas-Fort Worth International Airport

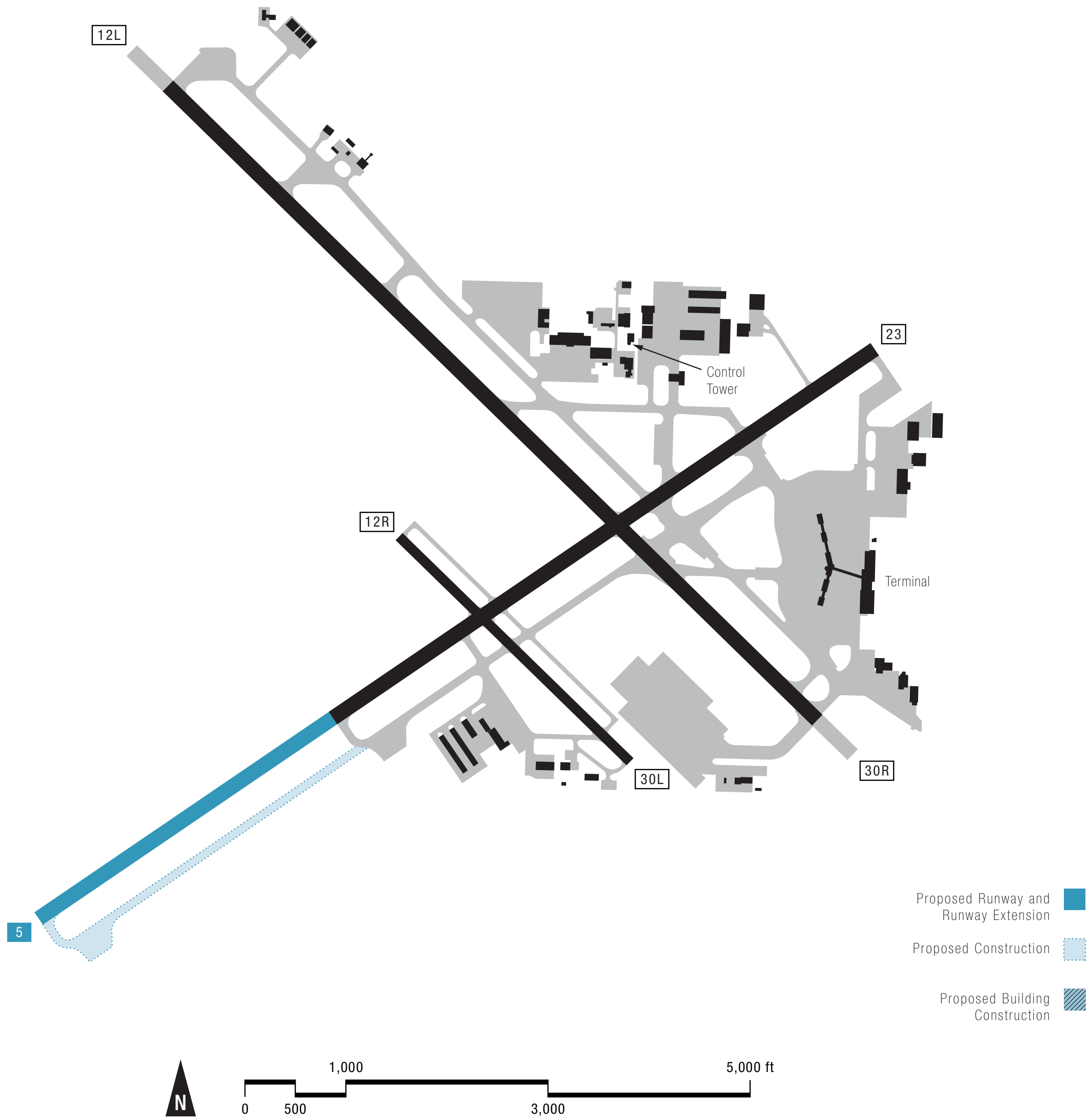
Proposed 2,000-ft. extensions to all of the north/south parallel runways will provide an overall length of 13,400 ft. for each. All extensions are expected to be completed by 2005. The estimated cost of the extensions is $95 million. A terminal expansion program has recently been completed that added five new jet departure gates to the south side of Terminal 2W; provided baggage and passenger connections to Terminal 2E; and renovated a portion of Terminal 2W. Construction on the new west runway, Runway 18R/36L, will begin when warranted by aviation demand. It could be available as early as 2005 and the estimated cost is $400 million. It will be located 5,800 ft. west of the existing Runway 18R/36L (to be renamed 18C/36C), and will be used primarily for arrivals. The addition of Runway 18R/36L will allow DFW to accommodate quadruple simultaneous precision instrument approaches.





DSM – Des Moines International Airport

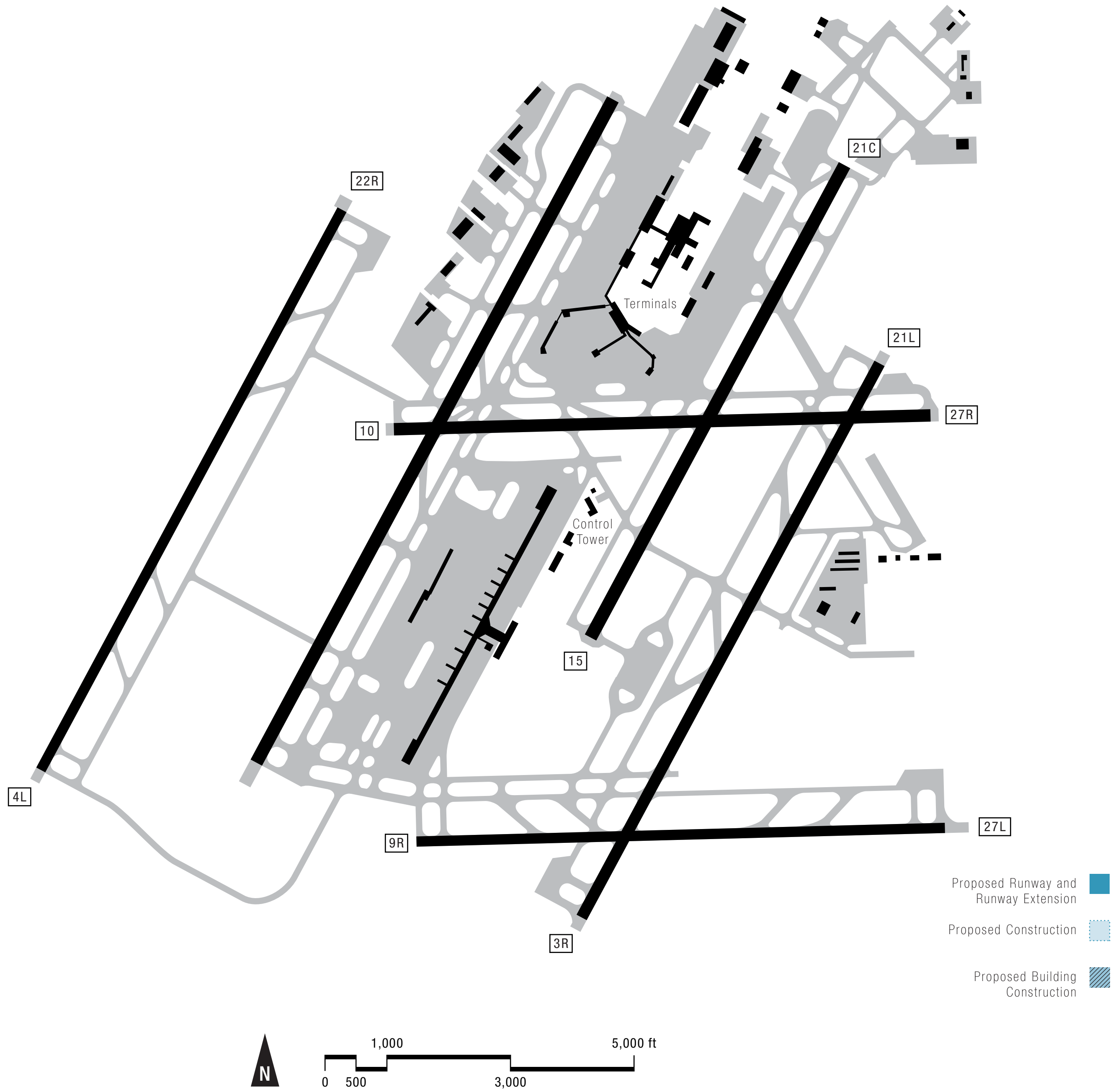
Construction began in 1997 for a southwest extension of Runway 5/23, and was completed in 2001. Cost for construction is estimated at $31 million, with an additional estimated $23 million for road relocation.



(M)	Enplanements			(K)	Operations		
	843,290	789,715	846,301		127,668	118,068	120,515
0.9 / 0.8	CY 00	CY 01	CY 02	140 / 120	CY 00	CY 01	CY 02

DTW – Detroit Metropolitan Wayne County Airport

A fourth north-south parallel, Runway 4/22 began in 1999 and was completed in 2001. The cost of construction was $116.5 million. This runway could potentially permit triple IFR arrivals with one dependent and one independent pairing.



Enplanements (M)	CY 00	CY 01	CY 02
	17,326,775	15,819,584	15,525,413

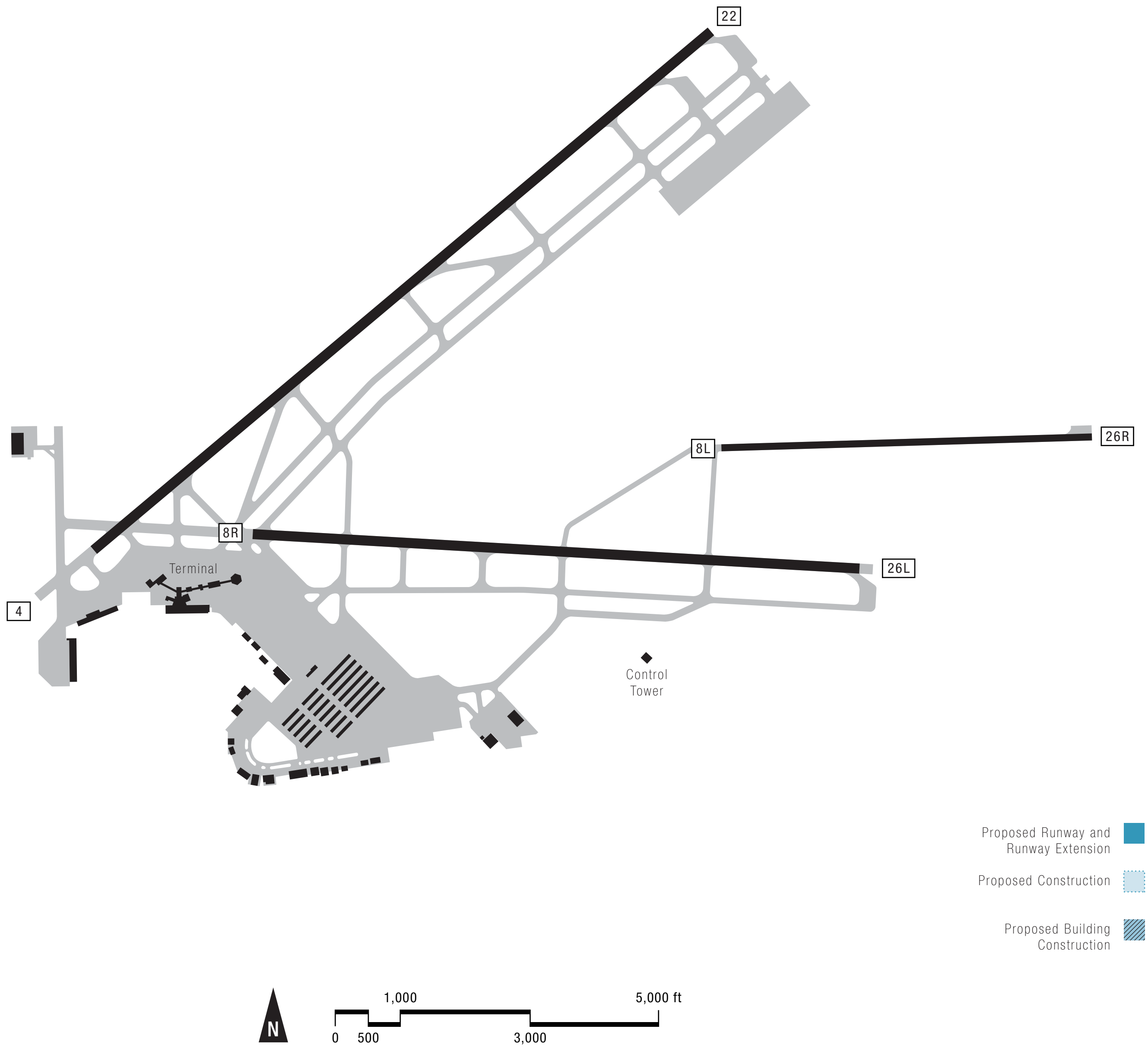
Axis: 18, 16

Operations (K)	CY 00	CY 01	CY 02
	554,580	523,039	497,564

Axis: 560, 510

ELP – El Paso International Airport

Passenger Facility Charge collection was completed for the 1,000-ft. extension of Runway 22. The estimated cost is $7 million.



(M)	Enplanements			(K)	Operations		
1.8 / 1.4	1,678,287	1,544,734	1,452,631	150 / 125	140,618	126,545	122,989
	CY 00	CY 01	CY 02		CY 00	CY 01	CY 02

EWR – Newark Liberty International Airport

A 2,800-foot extension to Runway 4L/22R (4L extension of 1,000 feet, 22R extension of 1,800 feet) has recently been completed.

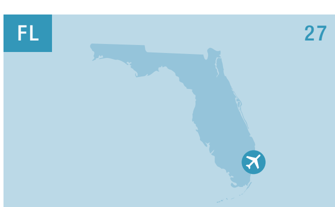
NJ 12

(M)	Enplanements		
	CY 00	CY 01	CY 02
	17,212,226	15,497,560	14,553,843

(K)	Operations		
	CY 00	CY 01	CY 02
	457,182	445,082	411,239

FLL – Fort Lauderdale-Hollywood International Airport

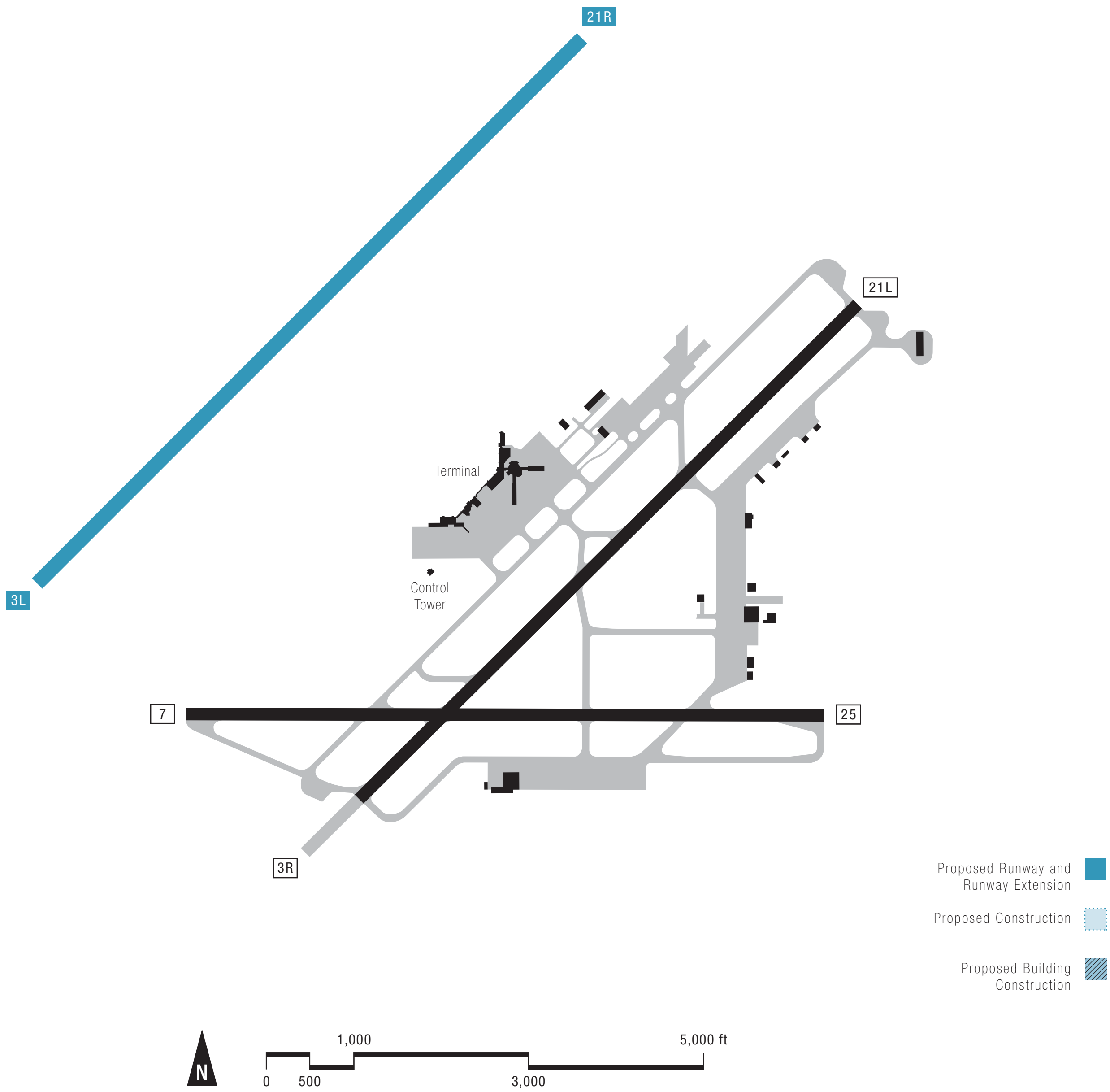
An extension of the short parallel Runway 9R/27L to 9,000 ft. is planned to provide the airport with a second parallel, air carrier runway. Construction is expected to begin in 2003. The estimated cost of construction is $300 million. The anticipated operational date is 2005. The extended runway would be used for arrivals and departures and would allow dual dependent IFR arrivals of all types of aircraft.

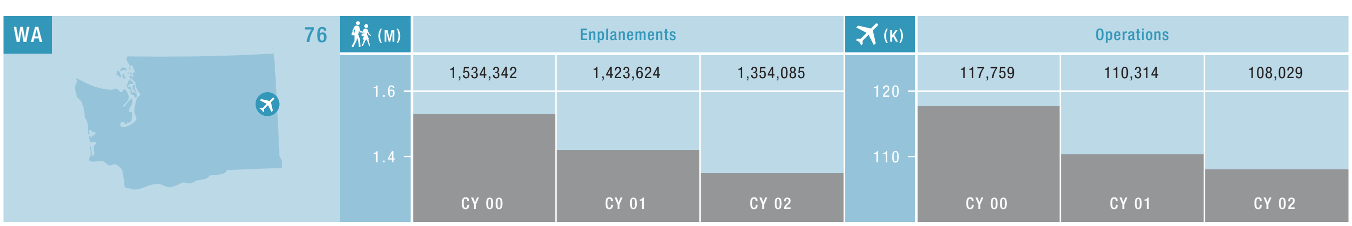


	CY 00	CY 01	CY 02
Enplanements (M)	7,817,173	8,015,055	8,266,788
Operations (K)	292,462	290,124	280,603

GEG – Spokane International Airport

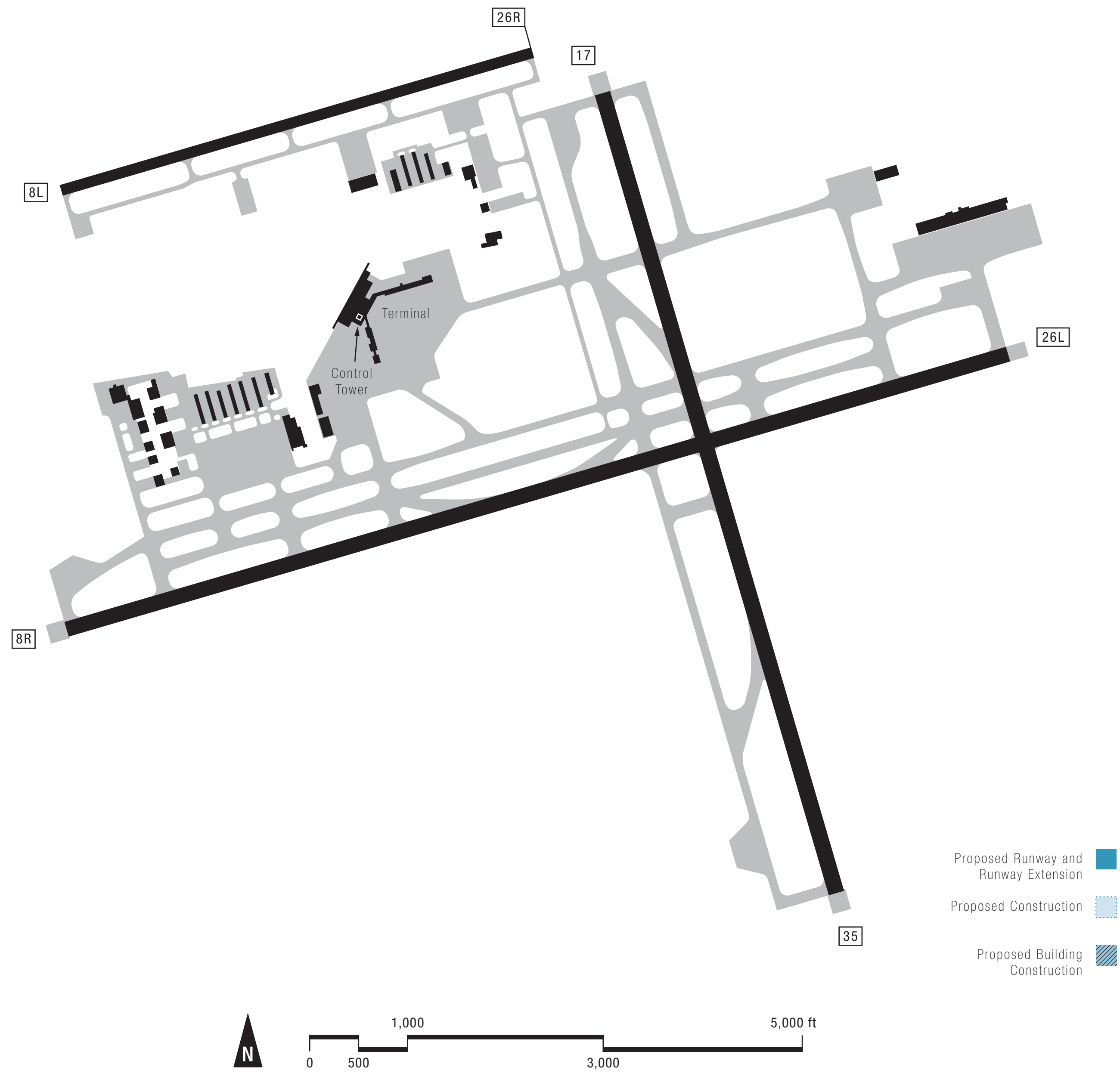
The long-term future plan is to construct a new parallel Runway 3L/21R, 8,800 ft. long and separated from Runway 3R/21L by 4,400 ft. This would enable independent parallel operations, doubling hourly IFR arrival capacity.





GRR – Grand Rapids Gerald R. Ford International

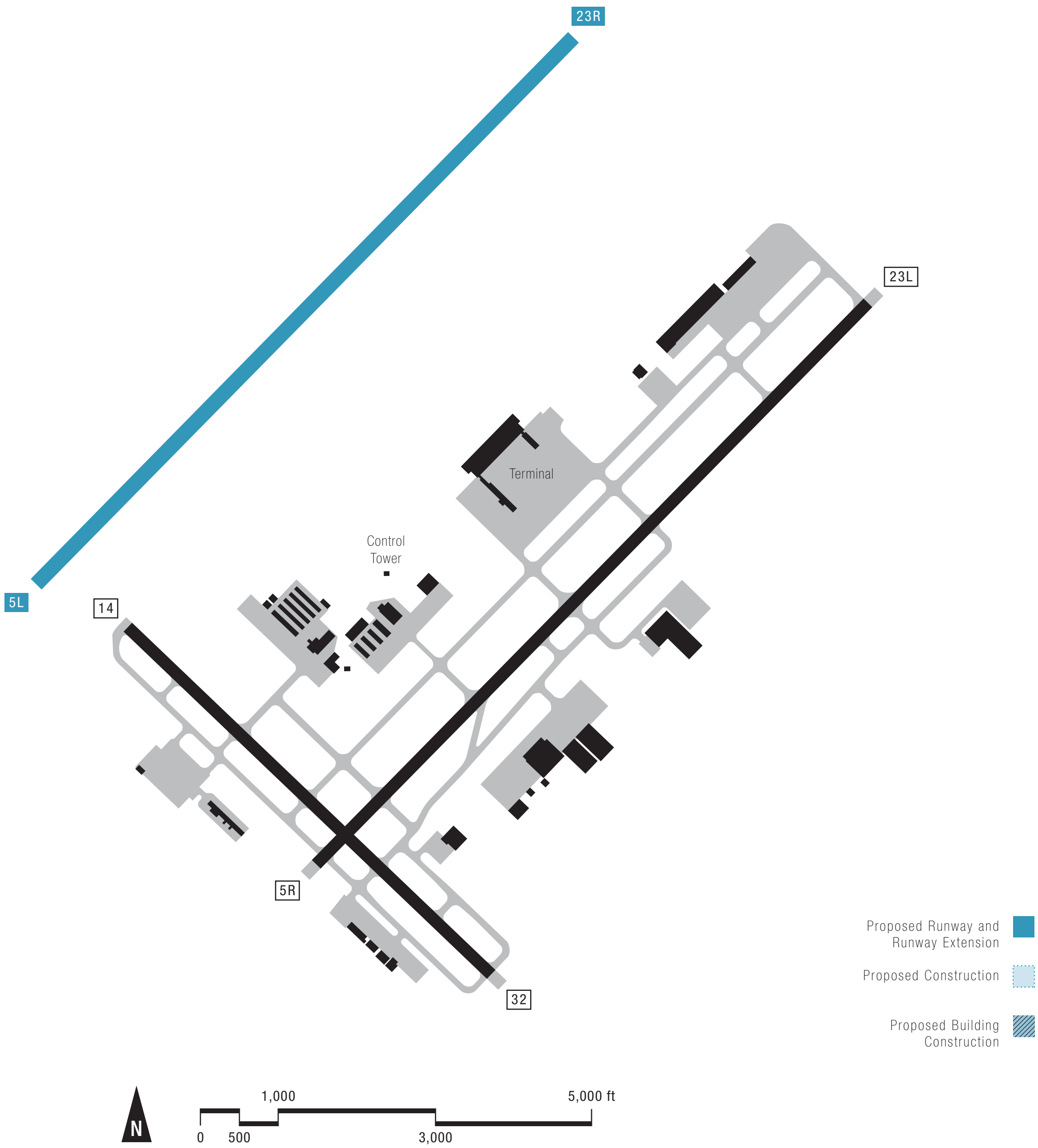
A new 7,000-ft. parallel Runway 8L/26R is planned for future development. The current 8L/26R would be converted into a taxiway at that time. There are no immediate plans to construct Runway 8L/26R. This is a long-term proposal beyond the 20-year planning period and no cost estimates are available.

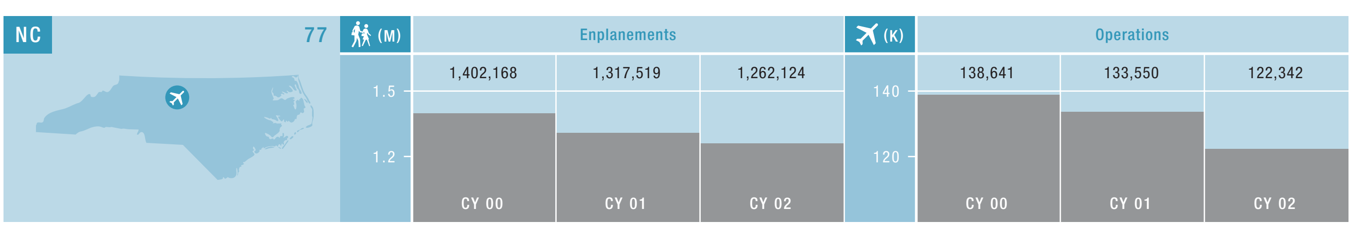


(M)	Enplanements			(K)	Operations		
	960,640	906,768	960,482		136,465	126,224	125,622
1.0 / 0.9	CY 00	CY 01	CY 02	140 / 125	CY 00	CY 01	CY 02

GSO – Greensboro Piedmont Triad International Airport

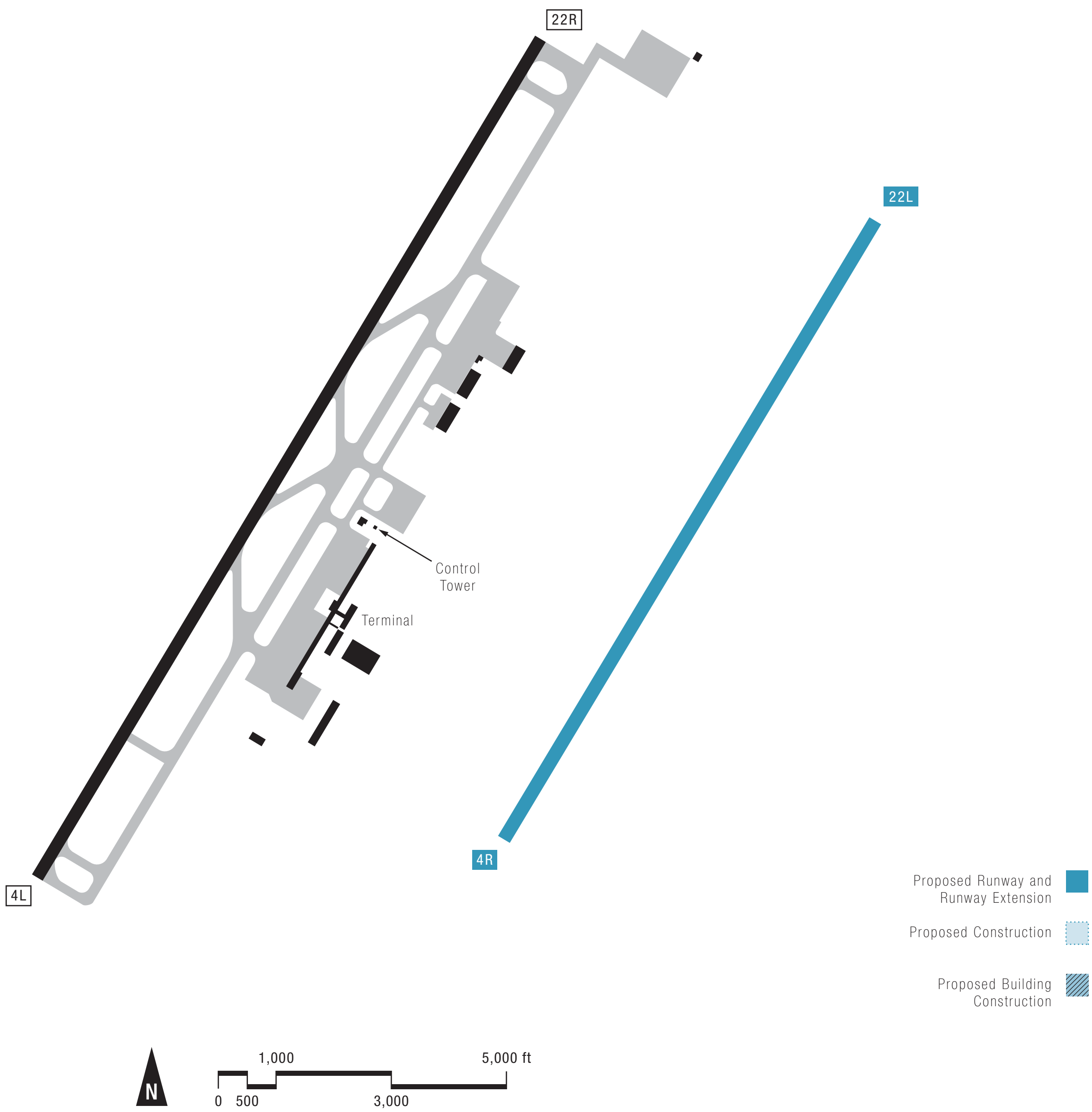
Construction of a new 10,000 ft. parallel Runway 5L/23R, 5,300 ft. north of Runway 5/23, is being planned. An EIS was completed in 2001. It is expected to be operational by 2004. The estimated cost is $96 million. The new runway would allow dual independent arrivals and departures in all weather conditions.

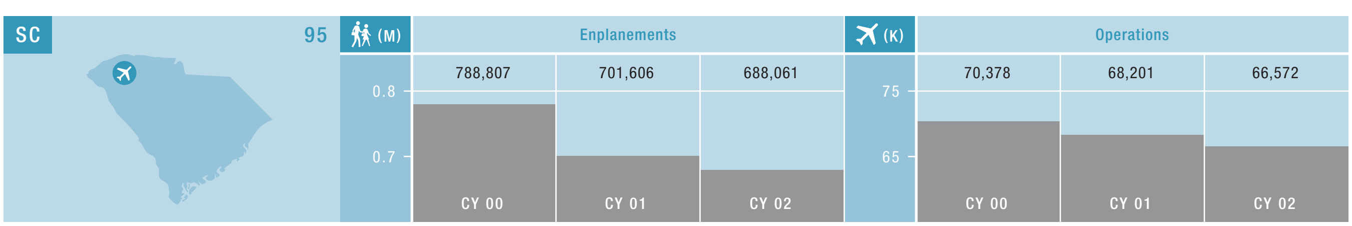




GSP – Greenville-Spartanburg International

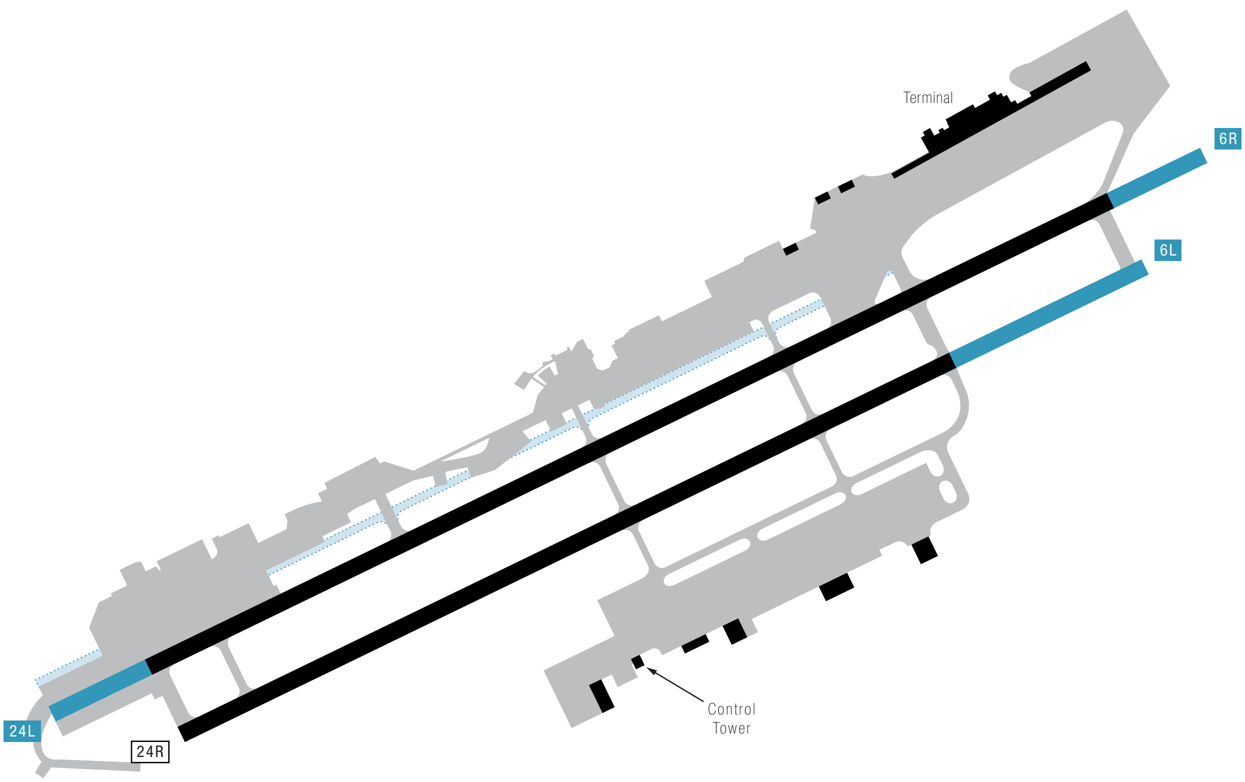
A new 8,200-ft. parallel Runway 3R/21L is anticipated in 2010 at an estimated cost of $65 million. Presently, it is planned to have a 4,300-ft. separation from Runway 3L/21R. This would allow dual independent IFR arrivals, potentially doubling hourly IFR arrival capacity. Also, an extension of Runway 3L/21R to 11,000 ft. was completed in 1999 at a cost of $57.6 million. The extension allows departures of aircraft with larger payloads and/or greater haul-lengths.





GUM – Guam International Airport

Extensions to both Runway 6L/24R and Runway 6R/24L are proposed. The 2,000 ft. extension to Runway 6L/24R has a proposed operational date of 2004. The 3,000 ft. extension to Runway 6R/24L has a proposed operational date of 2010. Both runway extensions are expected to cost $30 million each.



Proposed Runway and Runway Extension

Proposed Construction

Proposed Building Construction

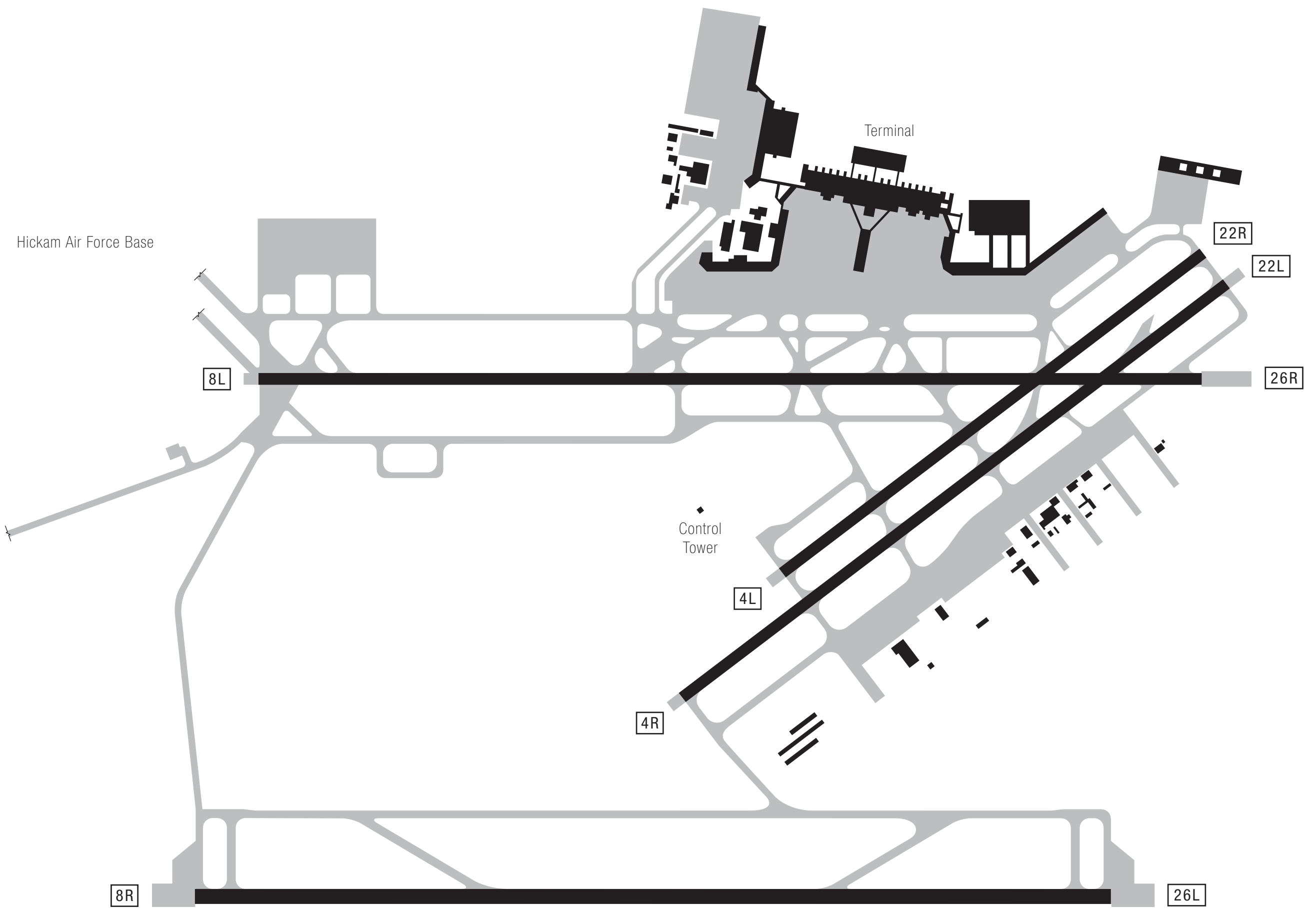
GUAM 75

	(M) Enplanements			(K) Operations		
	CY 00	CY 01	CY 02	CY 00	CY 01	CY 02
	1,665,676	1,489,164	1,375,996	63,389	58,405	54,396

Axis: Enplanements (M) 1.5, 1.8; Operations (K) 55, 70

HNL – Honolulu International Airport

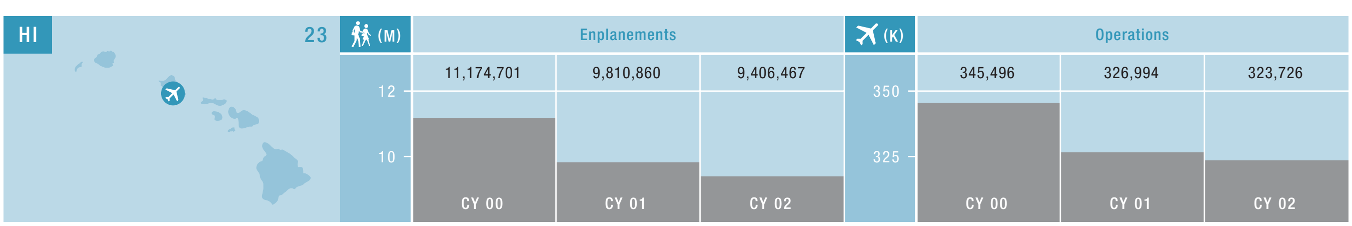
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.



Proposed Runway and Runway Extension

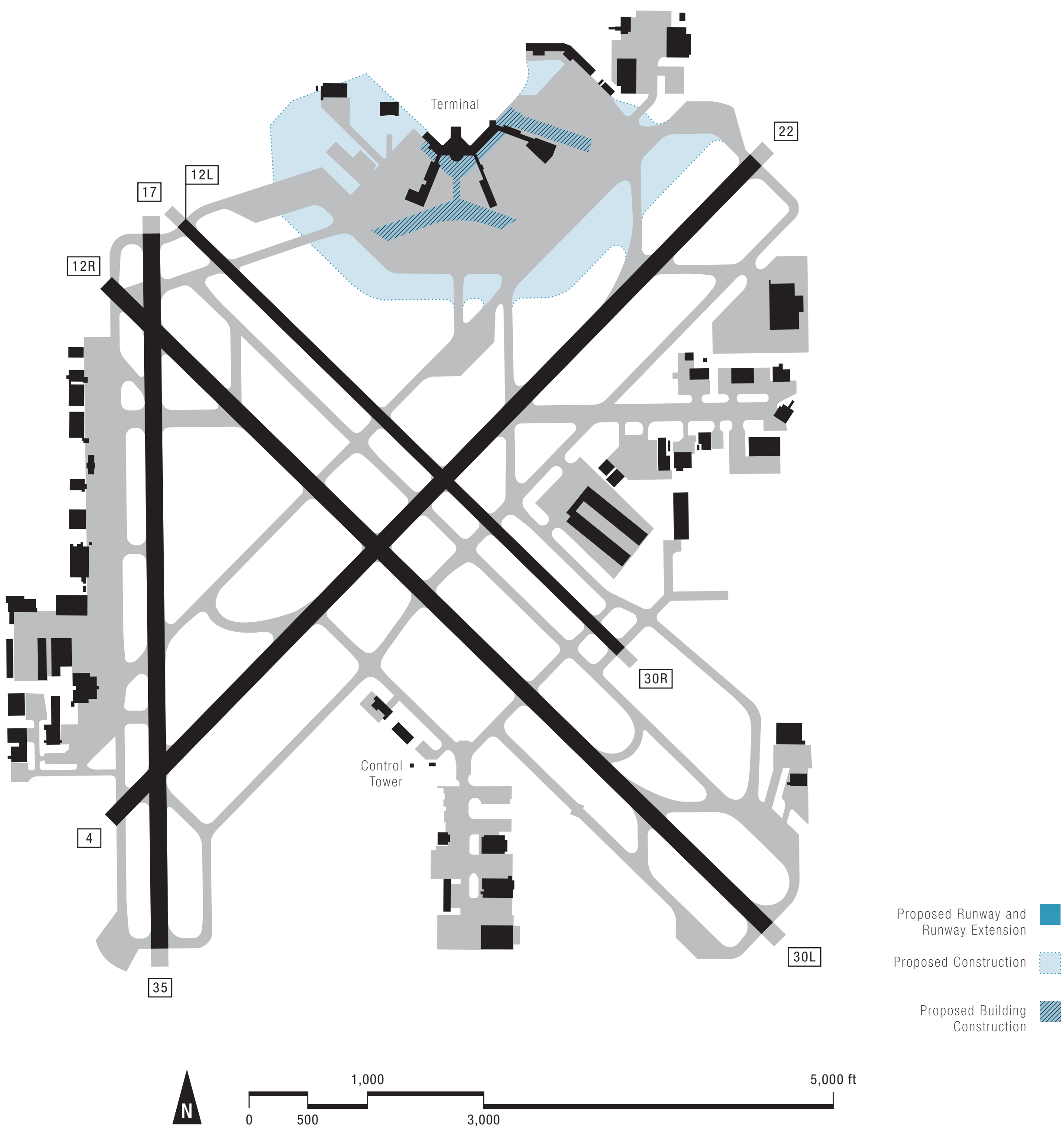
Proposed Construction

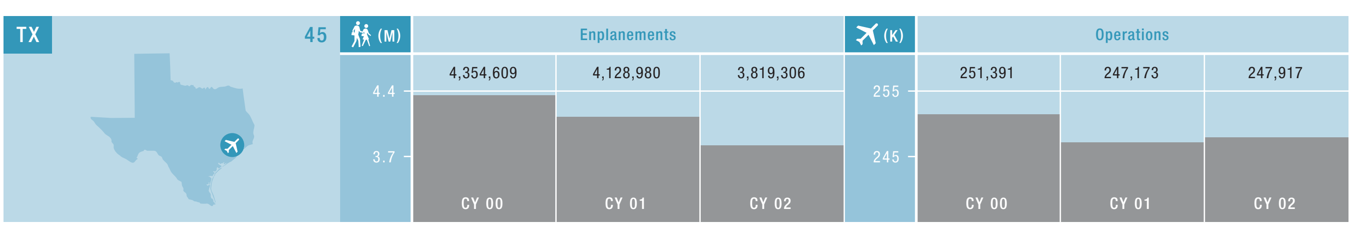
Proposed Building Construction



HOU – Houston William P. Hobby Airport

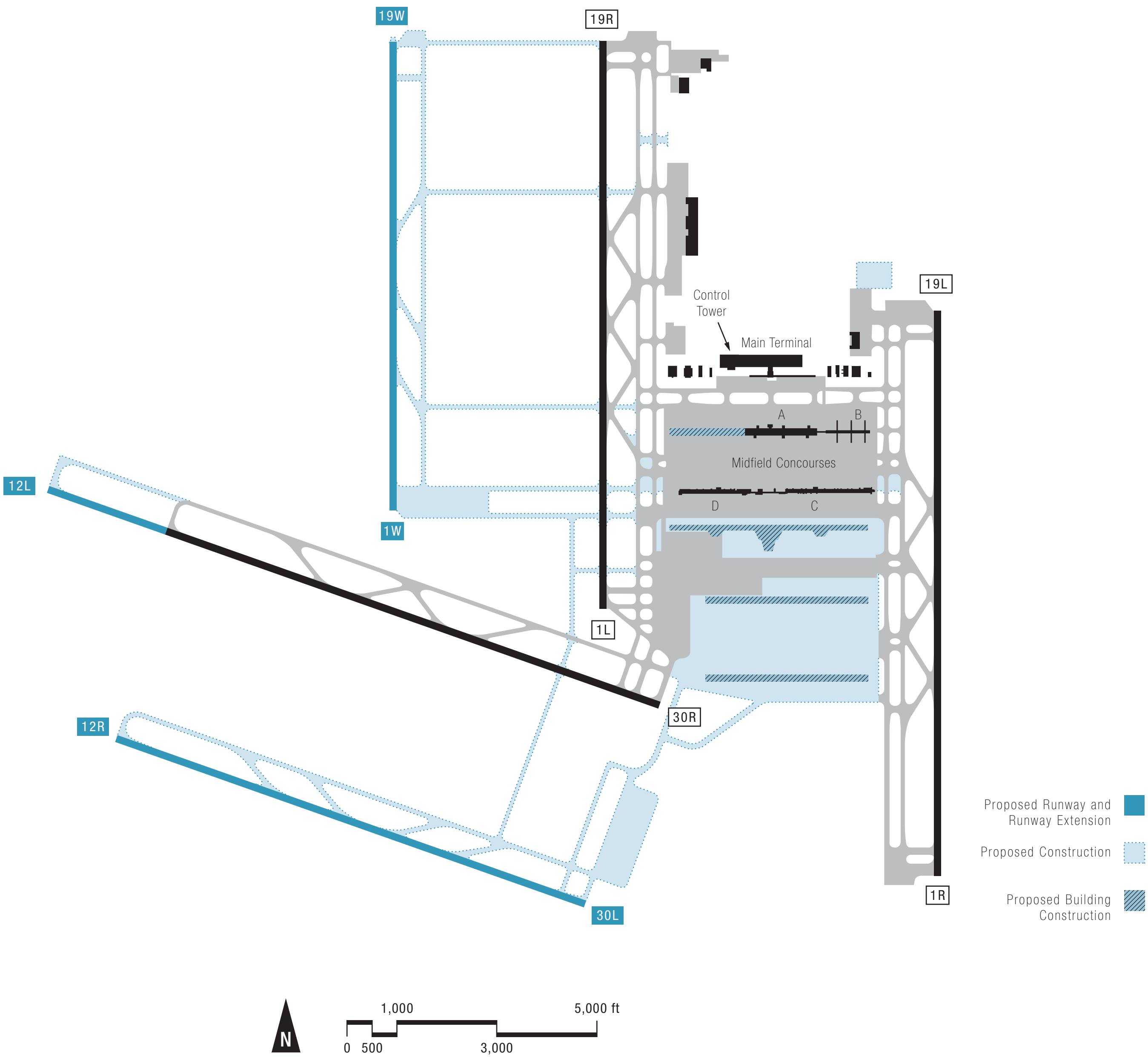
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.

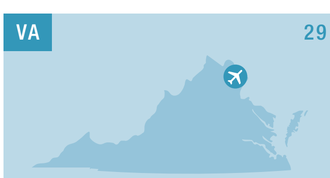




IAD – Washington Dulles International Airport

Two new parallel runways are under consideration. A north-south parallel Runway 1W/19W, would be located west of the existing parallels and north of Runway 12/30. This could provide triple independent parallel approaches, if they are approved. A second parallel Runway 12R/30L has been proposed for location southwest of Runway 12/30. The cost to build the two runways is estimated at $400 million.





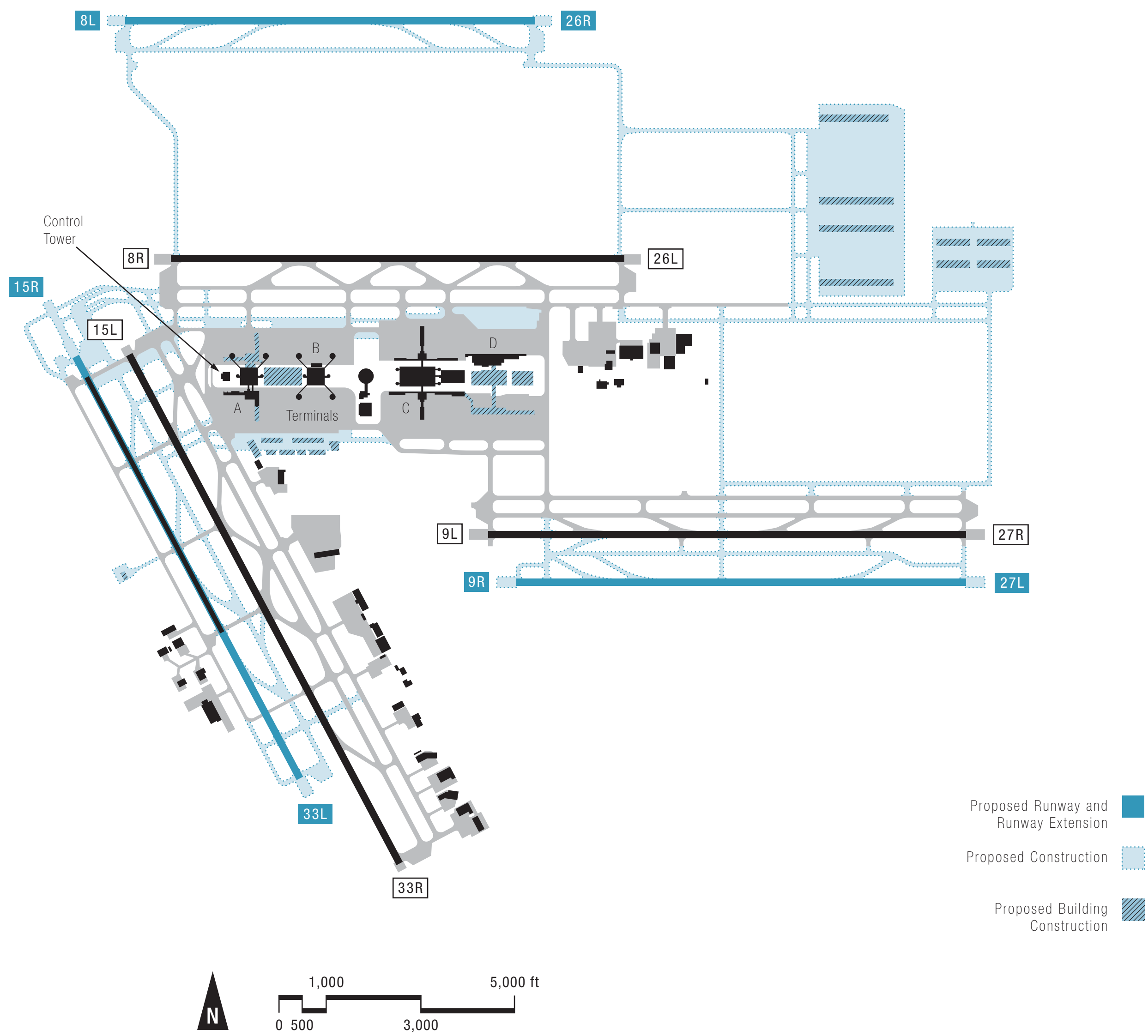
29

(M)	Enplanements		
	9,643,275	8,484,112	7,848,911
10			
8			

(K)	Operations		
	479,931	424,150	392,179
490			
410			

IAH – George Bush Intercontinental Airport

An $85 million, 4,000-ft. extension to Runway 15R/33L was completed in 2002. In 2003, a new Runway 8L/26R 9,000 ft parallel to, and north of, the existing Runway 8/26 was completed. Commissioning is tentatively scheduled for the year 2003. Runway 8L/26R, in conjunction with Runways 9L/27R and 8R/26L, has the potential to support triple IFR approaches, if approved. Another new runway, 9R/27L, parallel to and south of Runway 9/27, is also planned in the distant future. Construction is expected to cost $260 million for Runway 8L/26R.

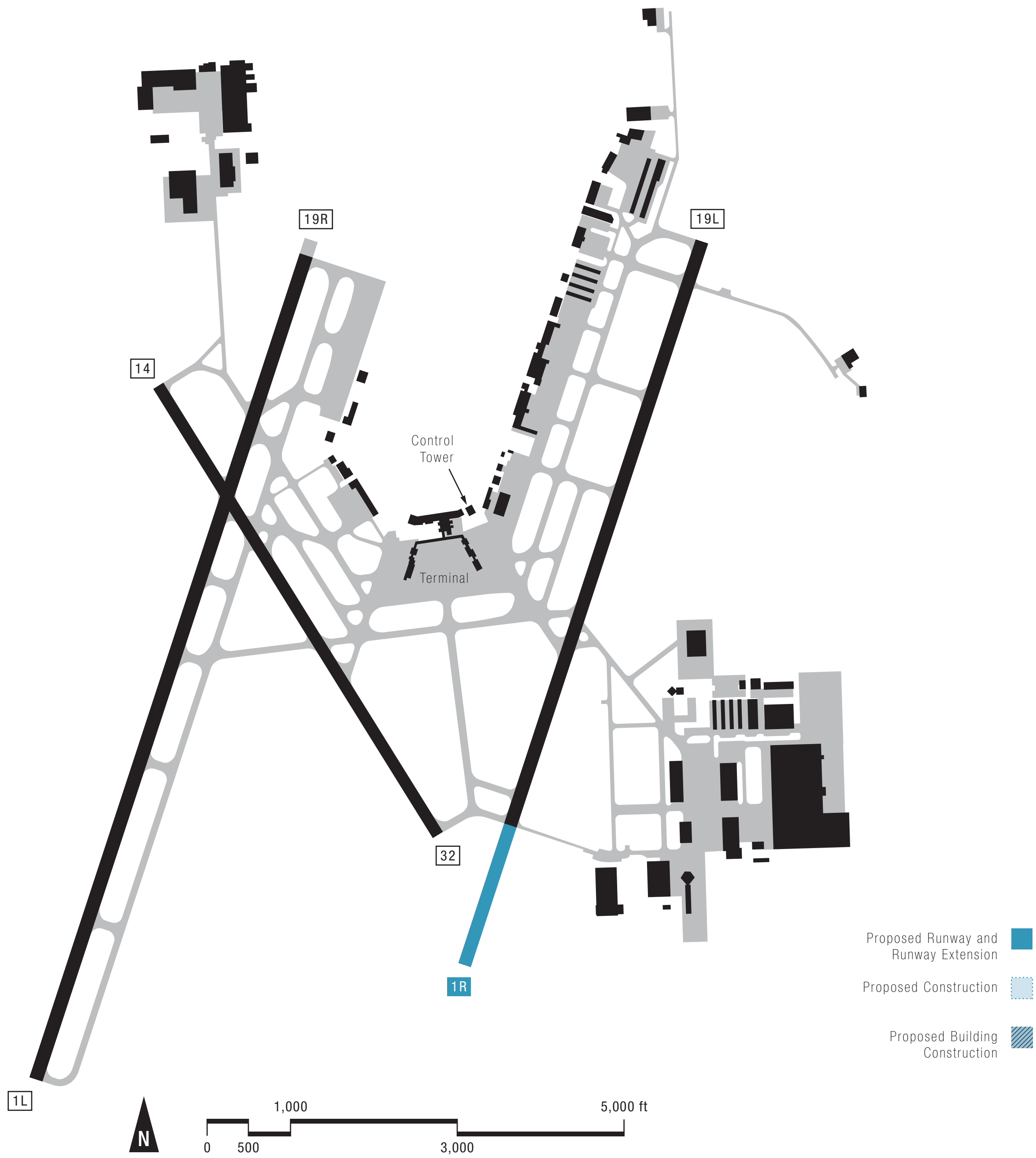


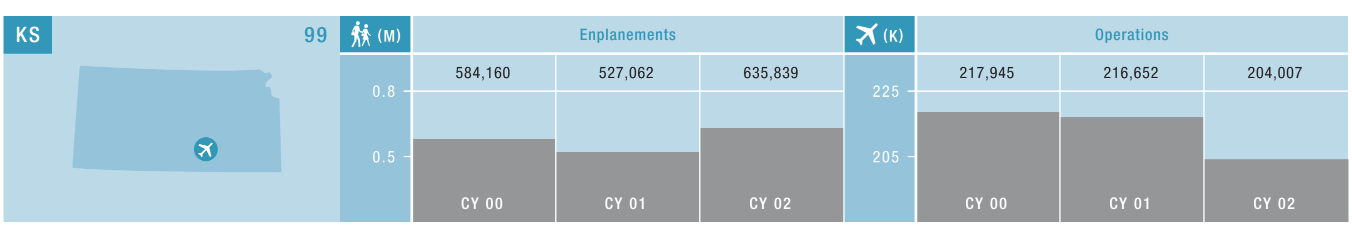
Enplanements (M)	CY 00	CY 01	CY 02
	16,358,035	16,173,551	15,865,479

Operations (K)	CY 00	CY 01	CY 02
	490,568	477,367	462,255

ICT – Wichita Mid-Continent Airport

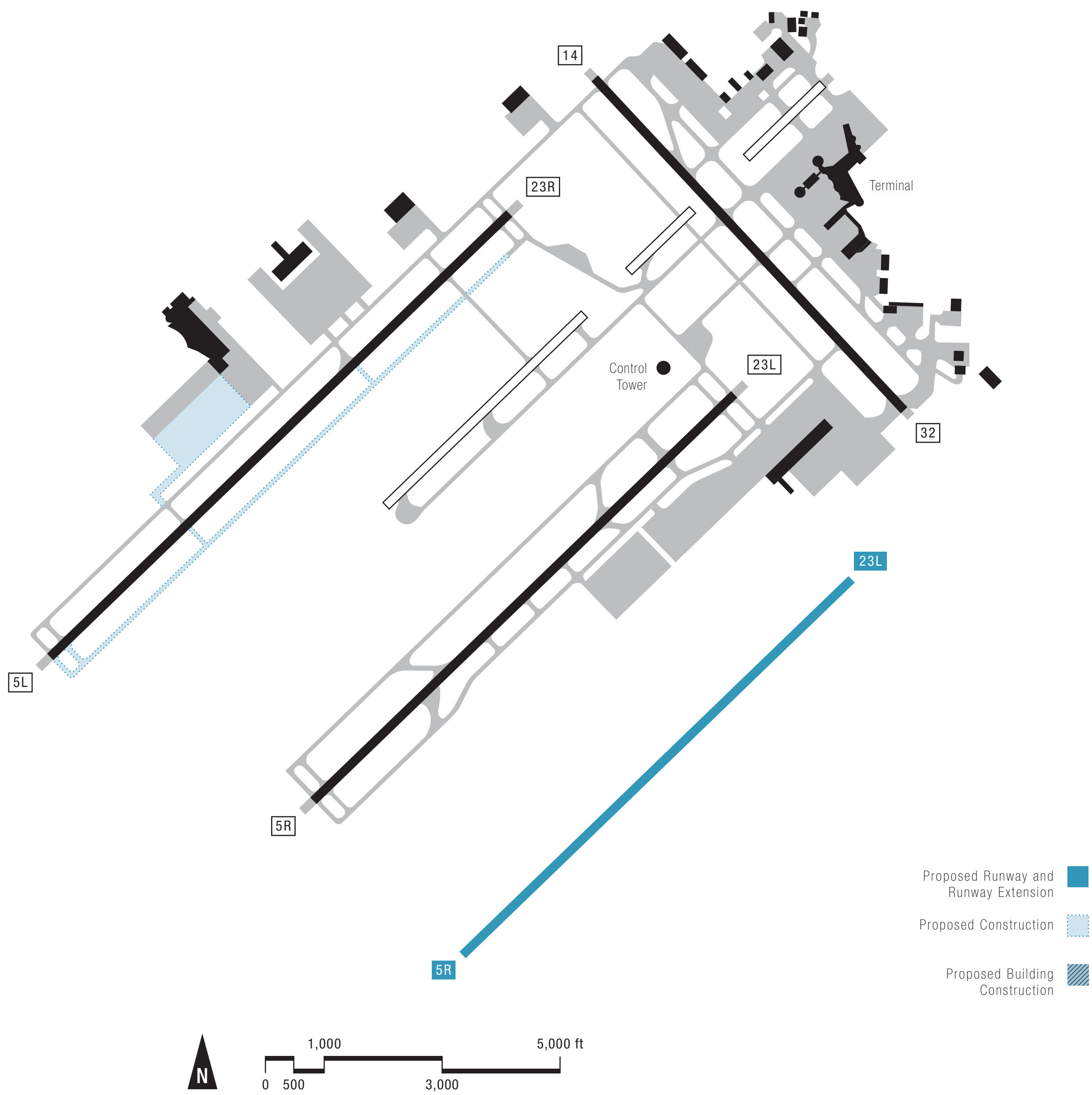
A 1,400-foot runway extension for Runway 1R is expected to be completed in 2009. The estimated cost is $10 million.

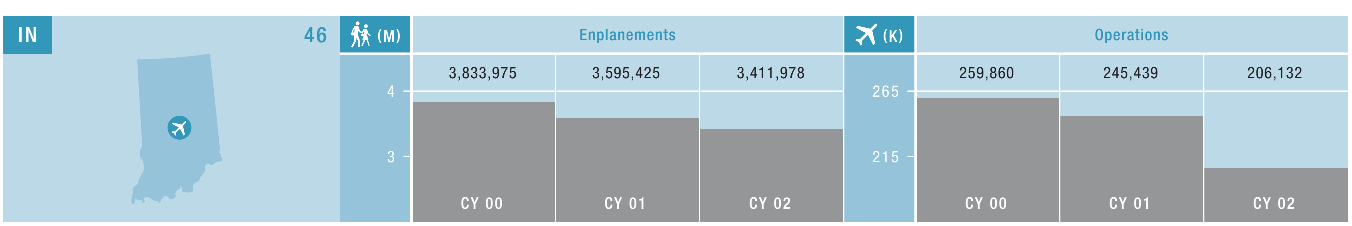




IND – Indianapolis International Airport

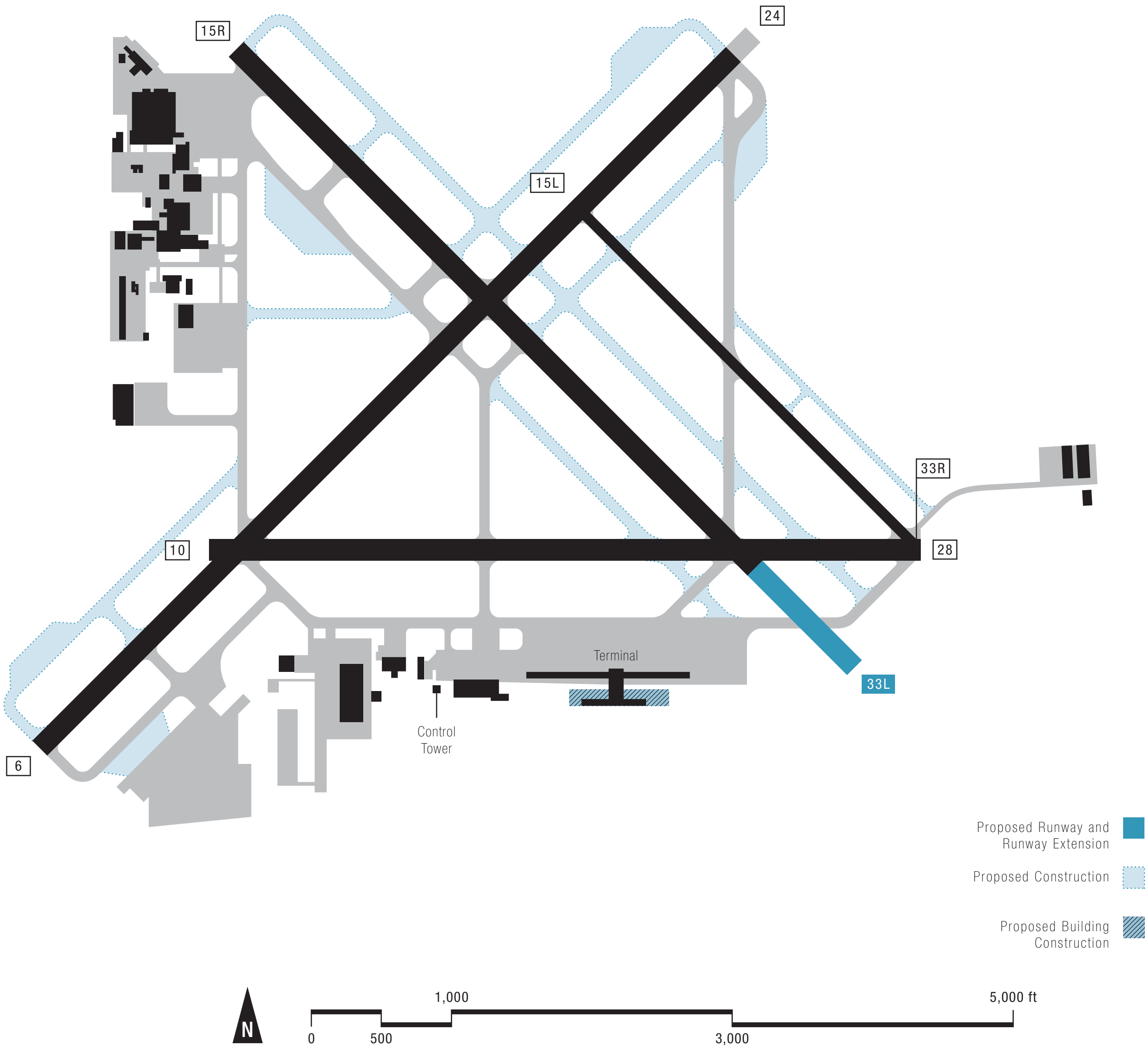
A third parallel Runway 5R/23L, is planned south of existing Runway 5R/23L (to be renamed 5C/23C). The estimated project cost is approximately $125 million, and the expected operational date is beyond 2015. Taxiway "N" was put into service in October 1999 at a total cost of $7.6 million.

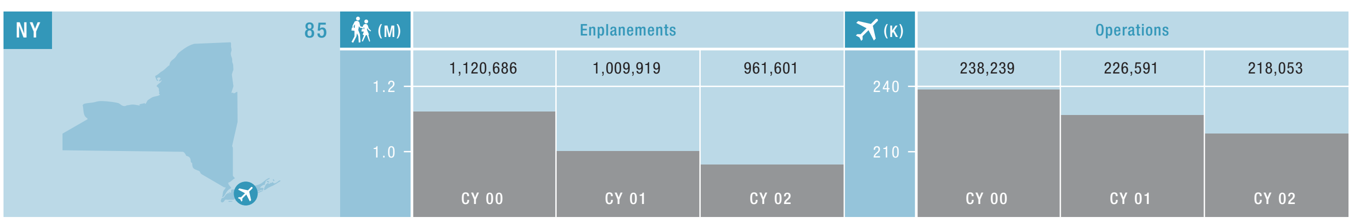




ISP – Islip Long Island MacArthur Airport

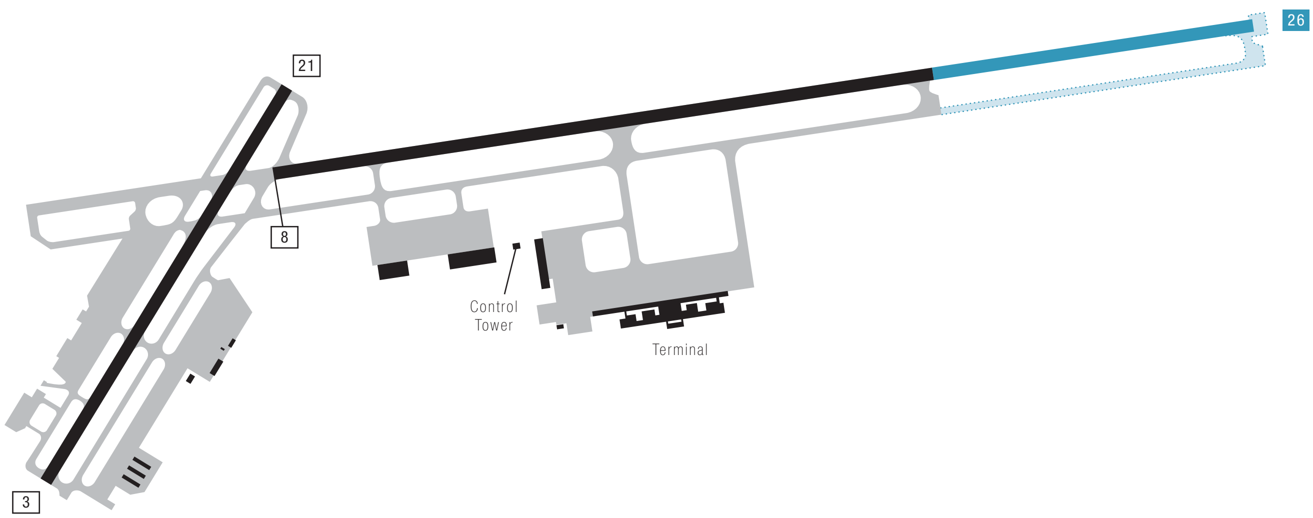
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.





ITO – Hilo International Airport

A 2,200 ft. east extension of Runway 8/26 is proposed for development by between 2011 and 2020.



Proposed Runway and Runway Extension

Proposed Construction

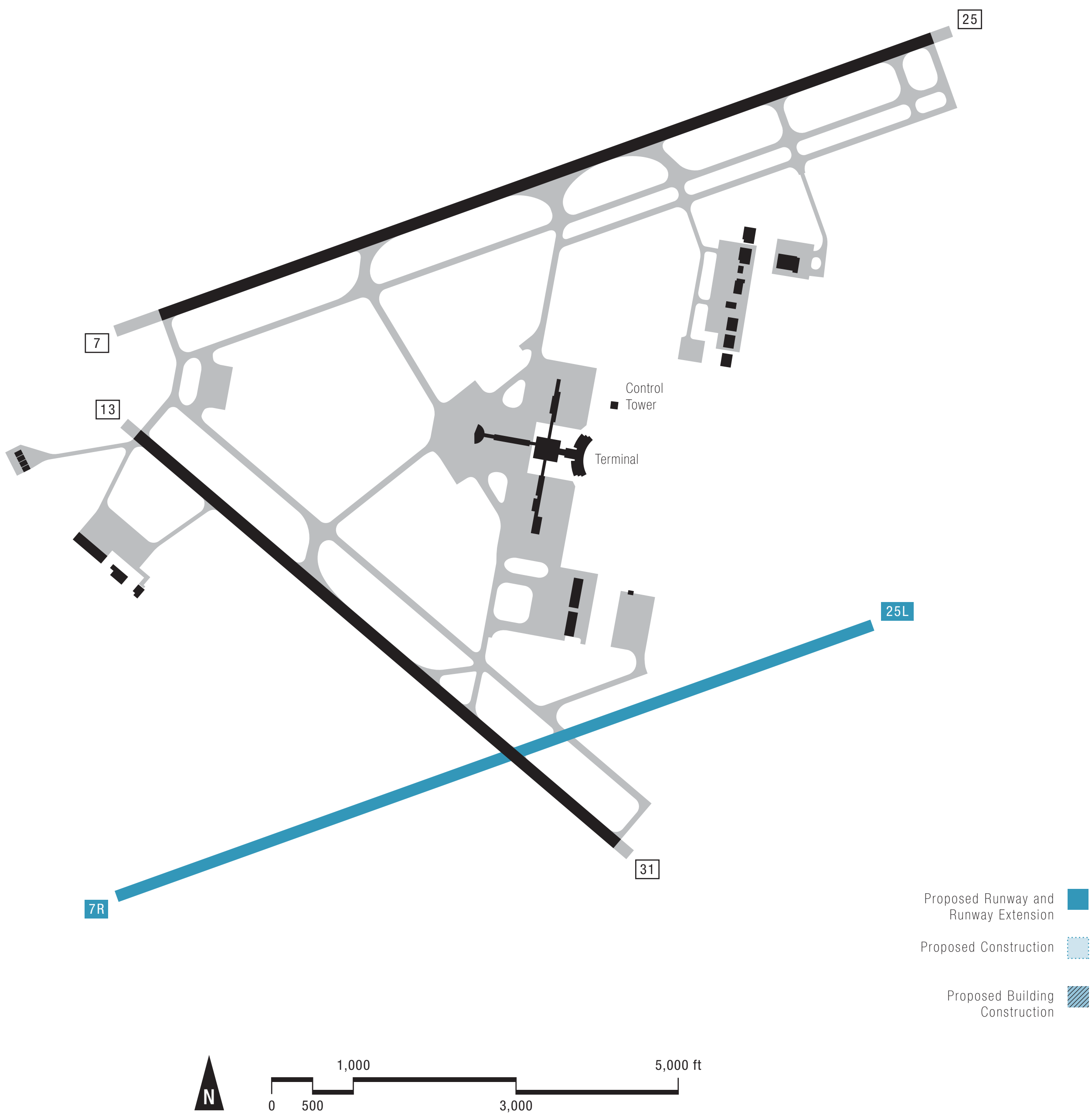
Proposed Building Construction

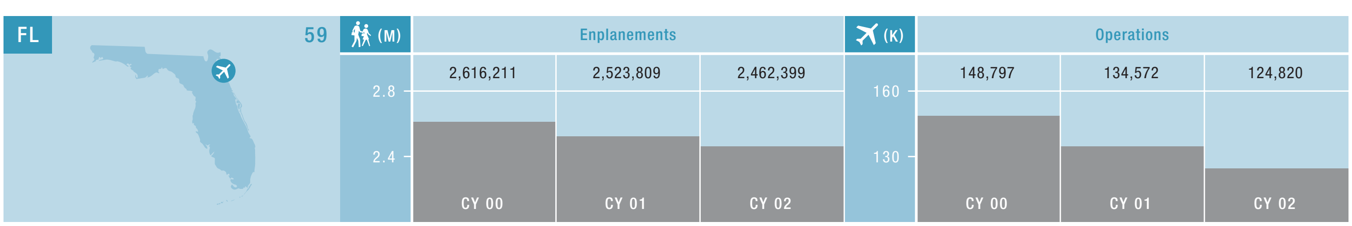
(M)	Enplanements		
	791,398	714,537	712,162
0.8 / 0.7	CY 00	CY 01	CY 02

(K)	Operations		
	115,536	96,238	97,540
120 / 100	CY 00	CY 01	CY 02

JAX – Jacksonville International Airport

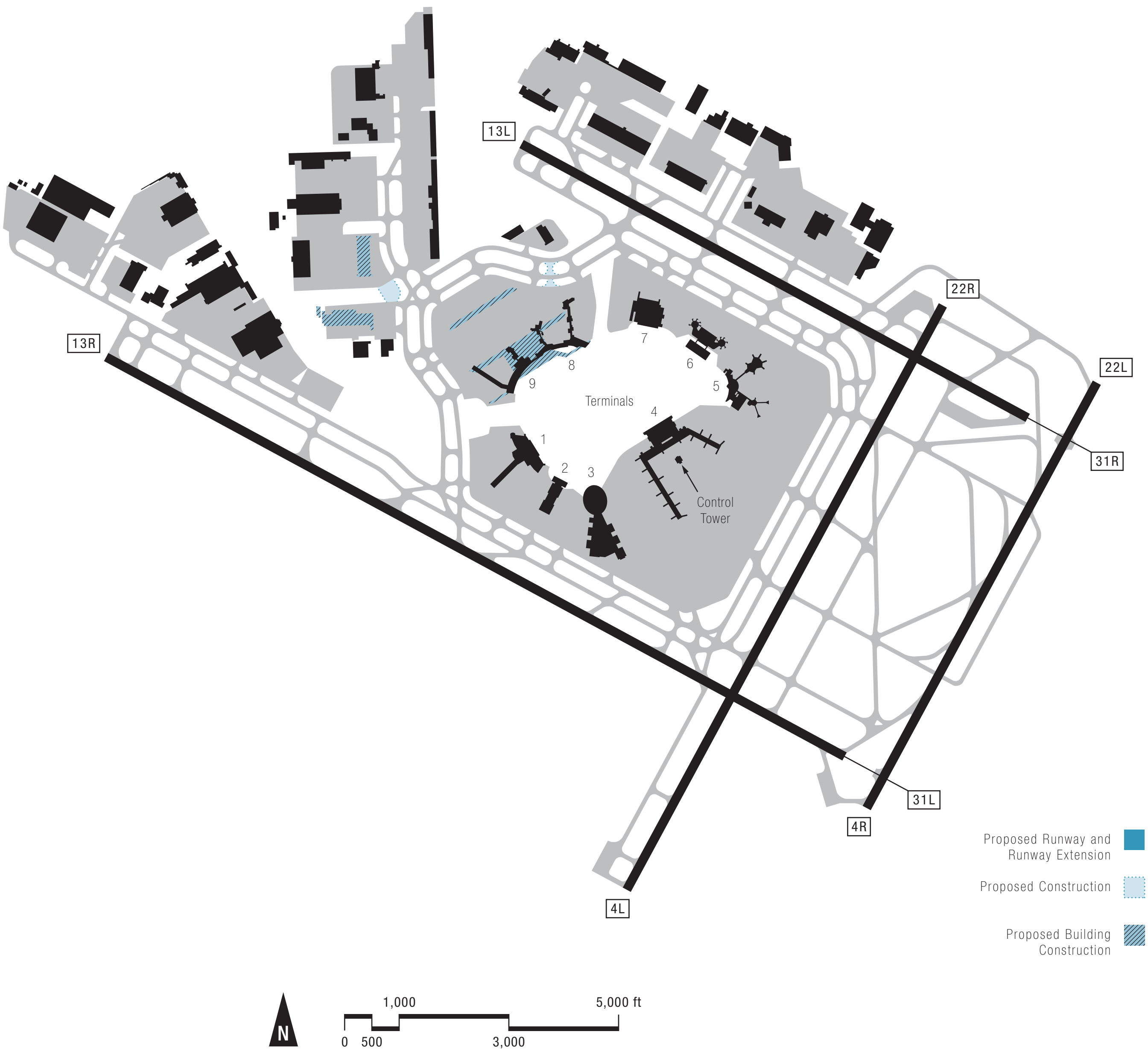
A new parallel Runway 7R/25L is being planned. It will be 6,500 ft. south of the existing Runway 7/25, permitting independent parallel IFR operations and potentially doubling Jacksonville's hourly IFR arrival capacity. An EIS study is scheduled for 2005. Construction is scheduled to begin in 2008, with completion expected in 2009. The estimated cost of construction is $50 million.

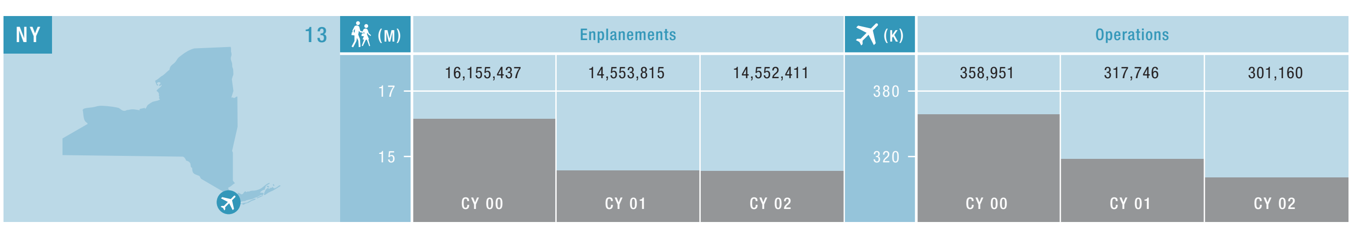




JFK – New York John F. Kennedy International Airport

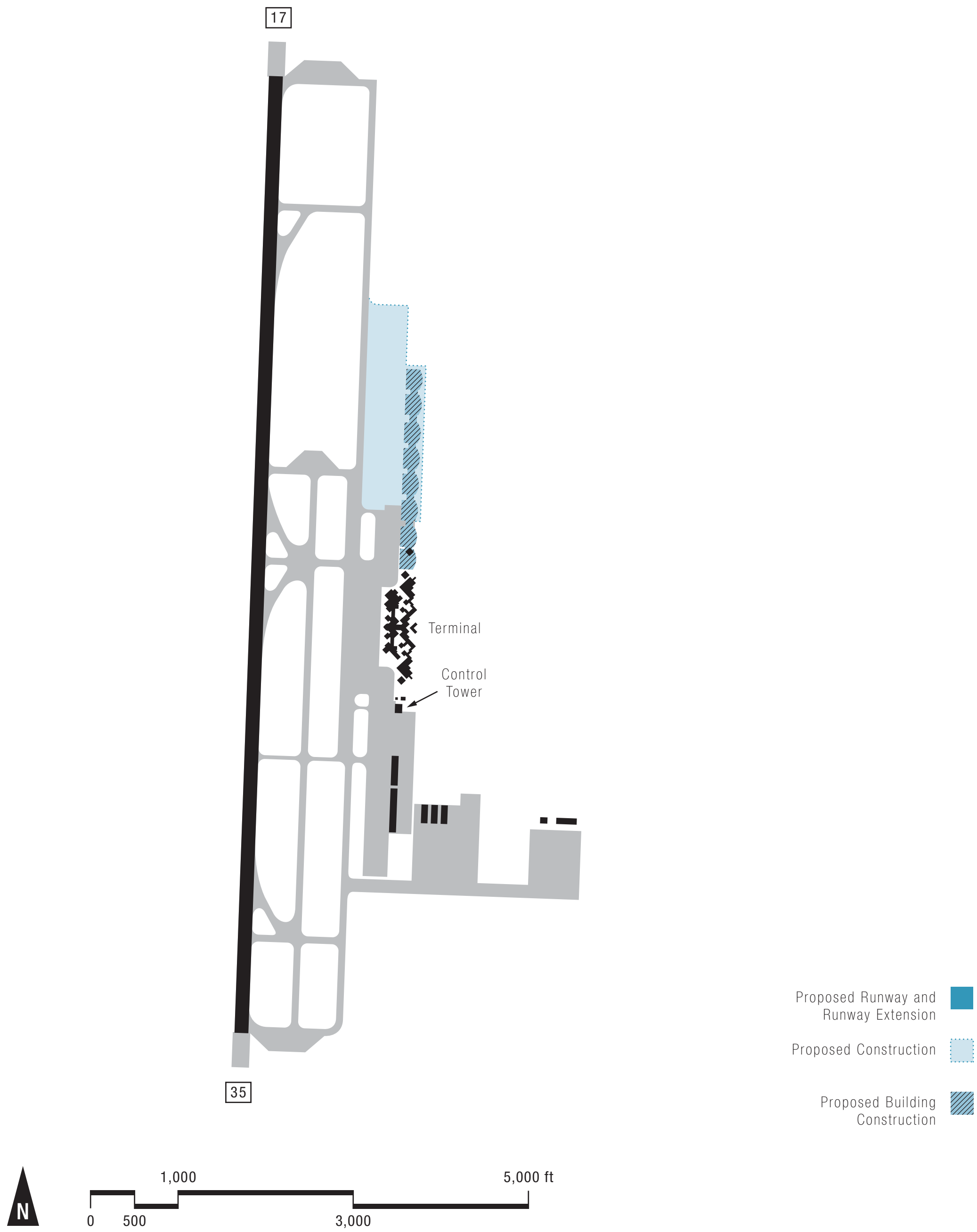
Construction to widen runway 4R/22L from 150 ft. to 200 ft. was completed in early November 2002. Reconstruction plans for Runway 13R/31L will start and be completed in 2005. No estimates of cost are available at this time.

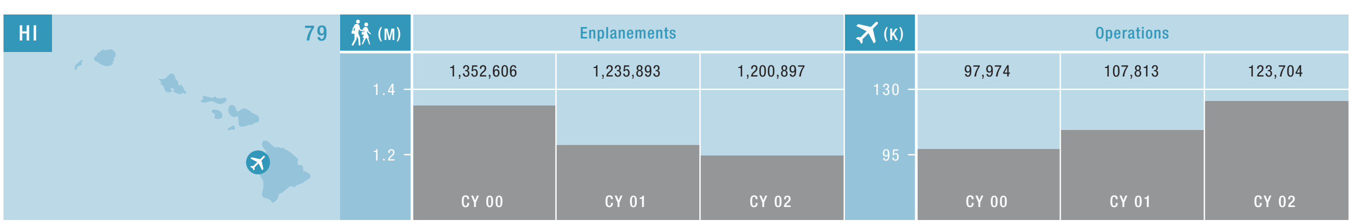




KOA – Kona International Airport at Keahole

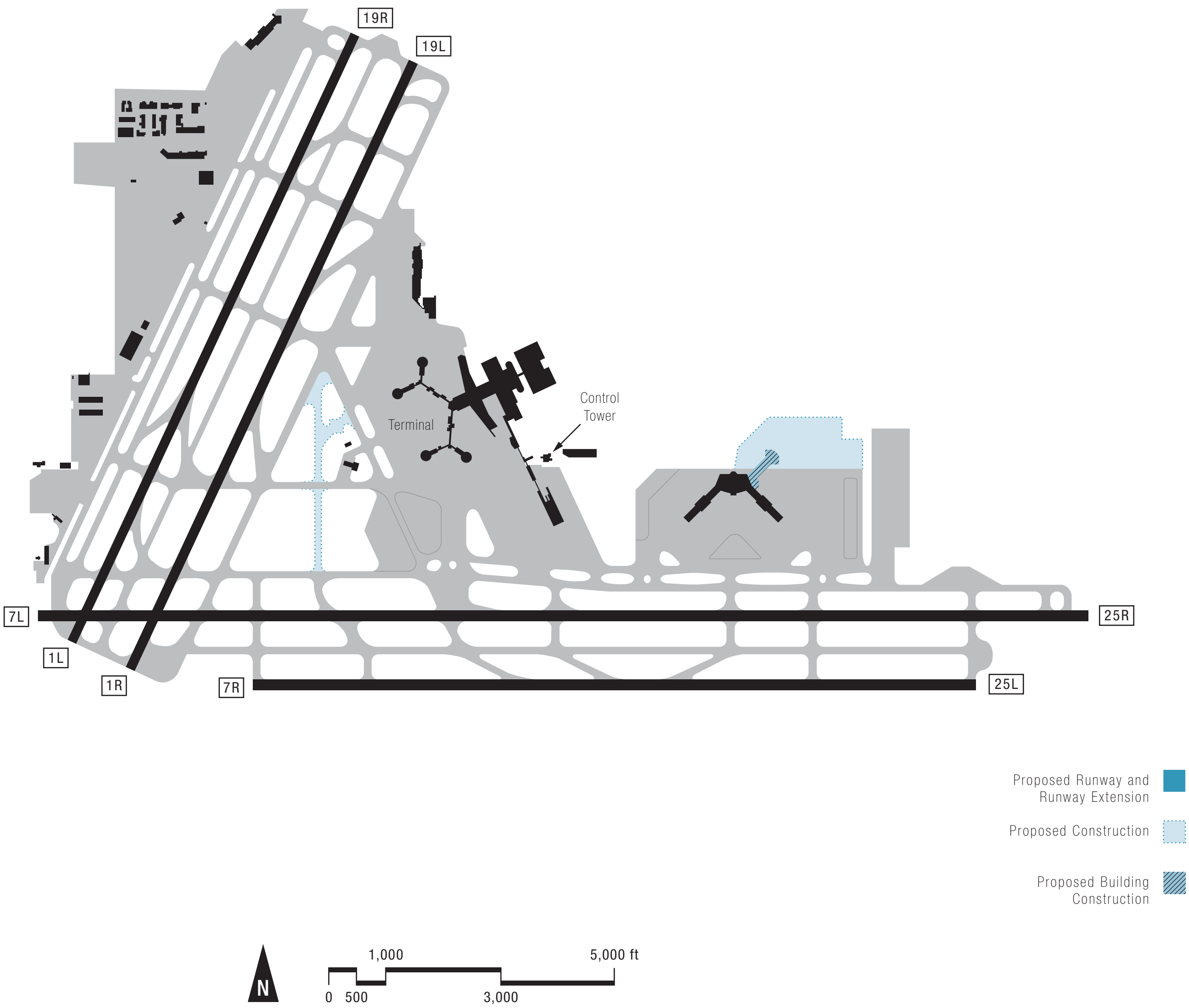
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.

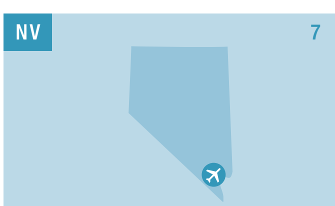




LAS – Las Vegas McCarran International Airport

Construction plans are underway to construct 3,000 feet of taxiway north of taxiway B, with connections to taxiways G and D. This project is estimated to cost $23.3 million. Plans for terminal development include construction of an apron and taxi lane to support a 12-gate expansion of the D concourse. The apron and taxi lane work is estimated to cost $20 million, and construction of the terminal building, estimated to cost $80 million, may not commence until after December 31, 2002.

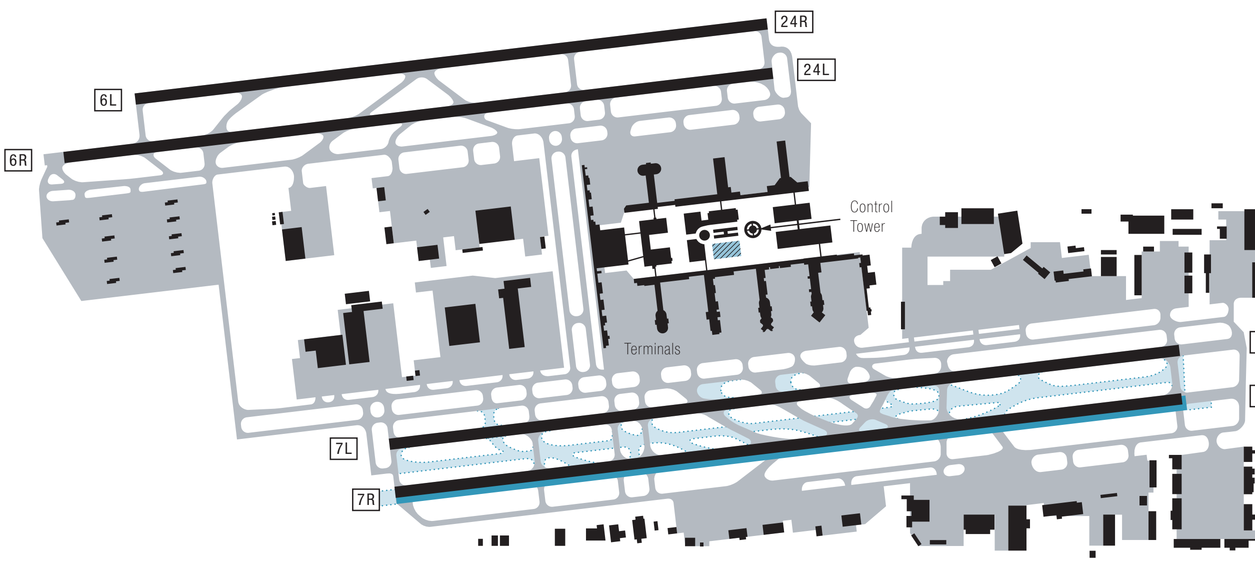




(M)	Enplanements			(K)	Operations		
	17,425,214	16,633,435	16,600,807		521,300	498,970	498,037
18				540			
16				490			
	CY 00	CY 01	CY 02		CY 00	CY 01	CY 02

LAX – Los Angeles International Airport

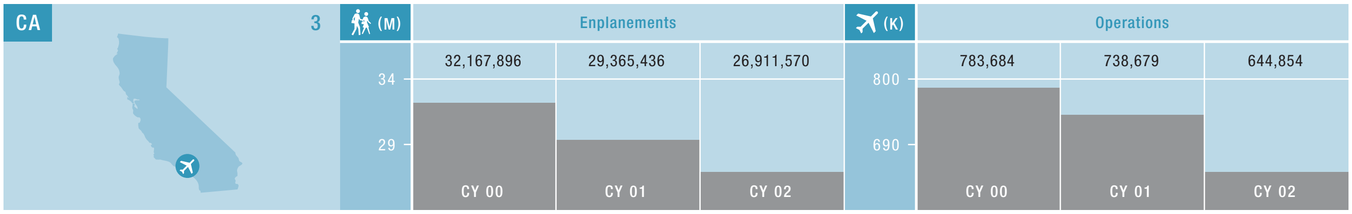
Taxiway exits and a new parking structure are planned at this airport.



Proposed Runway and Runway Extension

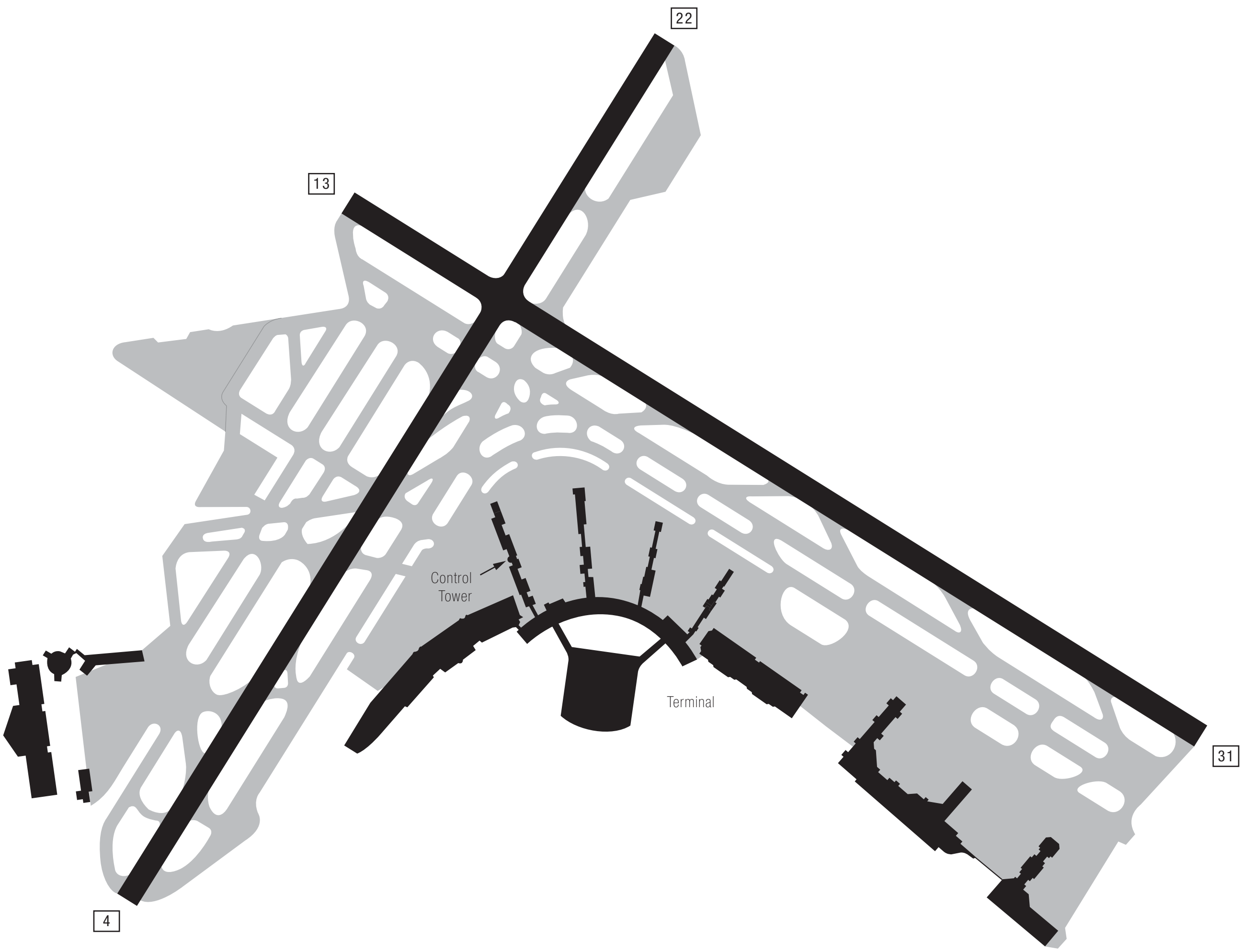
Proposed Construction

Proposed Building Construction



LGA – New York LaGuardia Airport

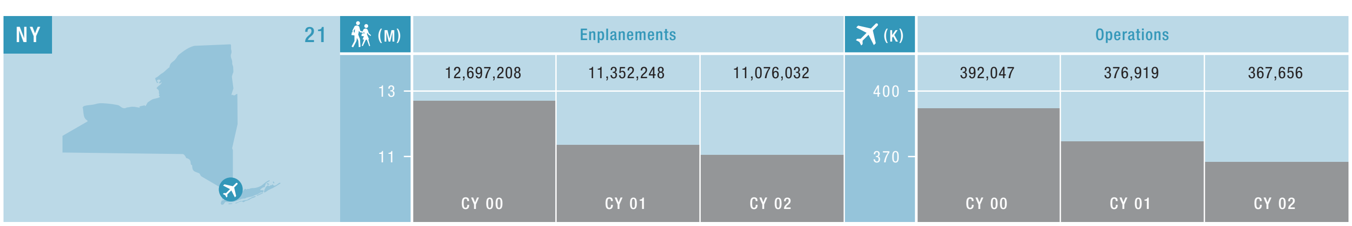
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.



Proposed Runway and Runway Extension

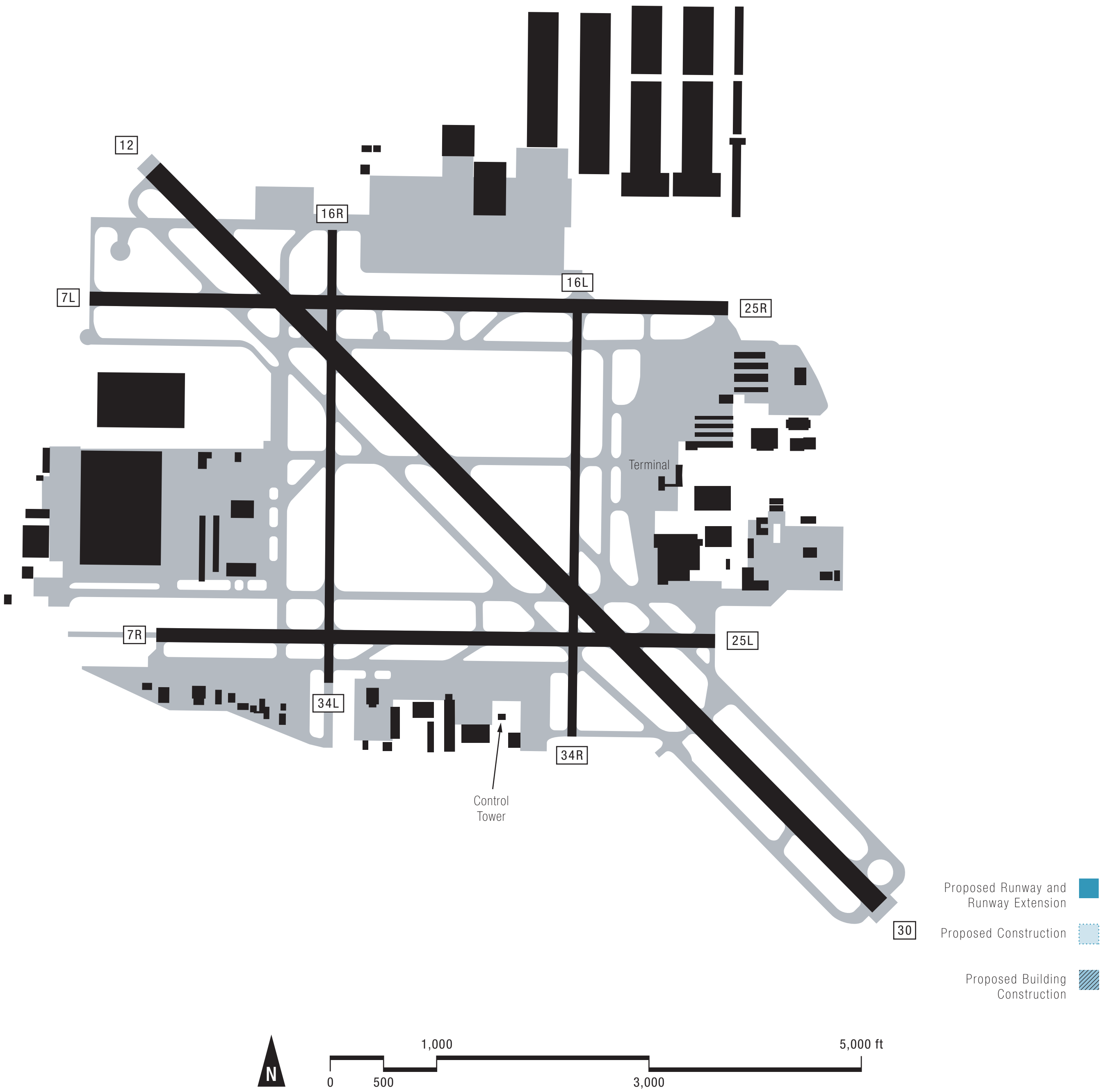
Proposed Construction

Proposed Building Construction



LGB – Long Beach Airport

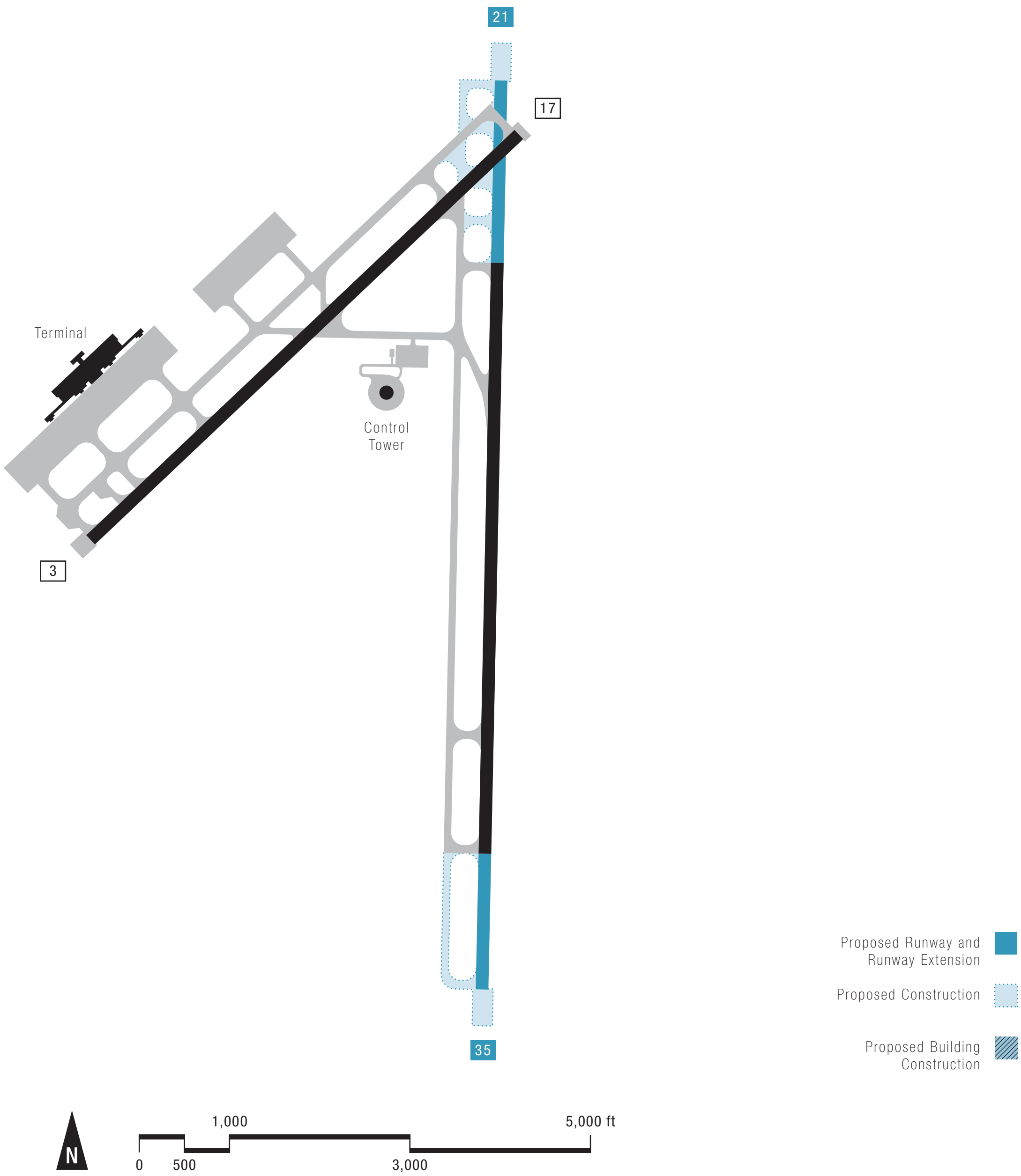
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.

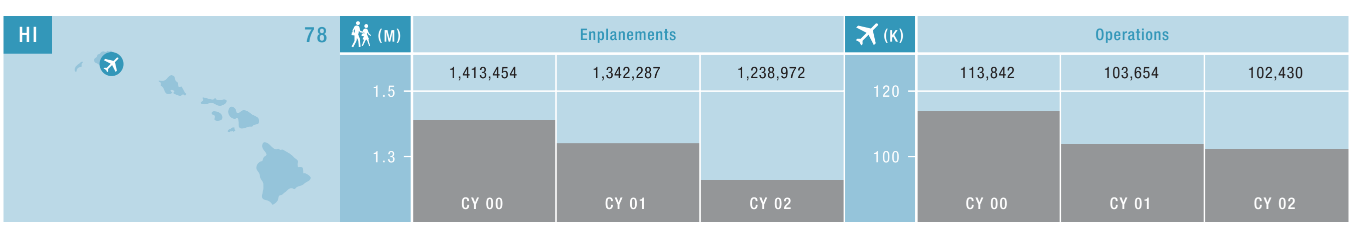


	Enplanements (M)			Operations (K)		
	CY 00	CY 01	CY 02	CY 00	CY 01	CY 02
Value	335,225	297,130	708,686	379,399	358,508	350,913

LIH – Lihue Airport

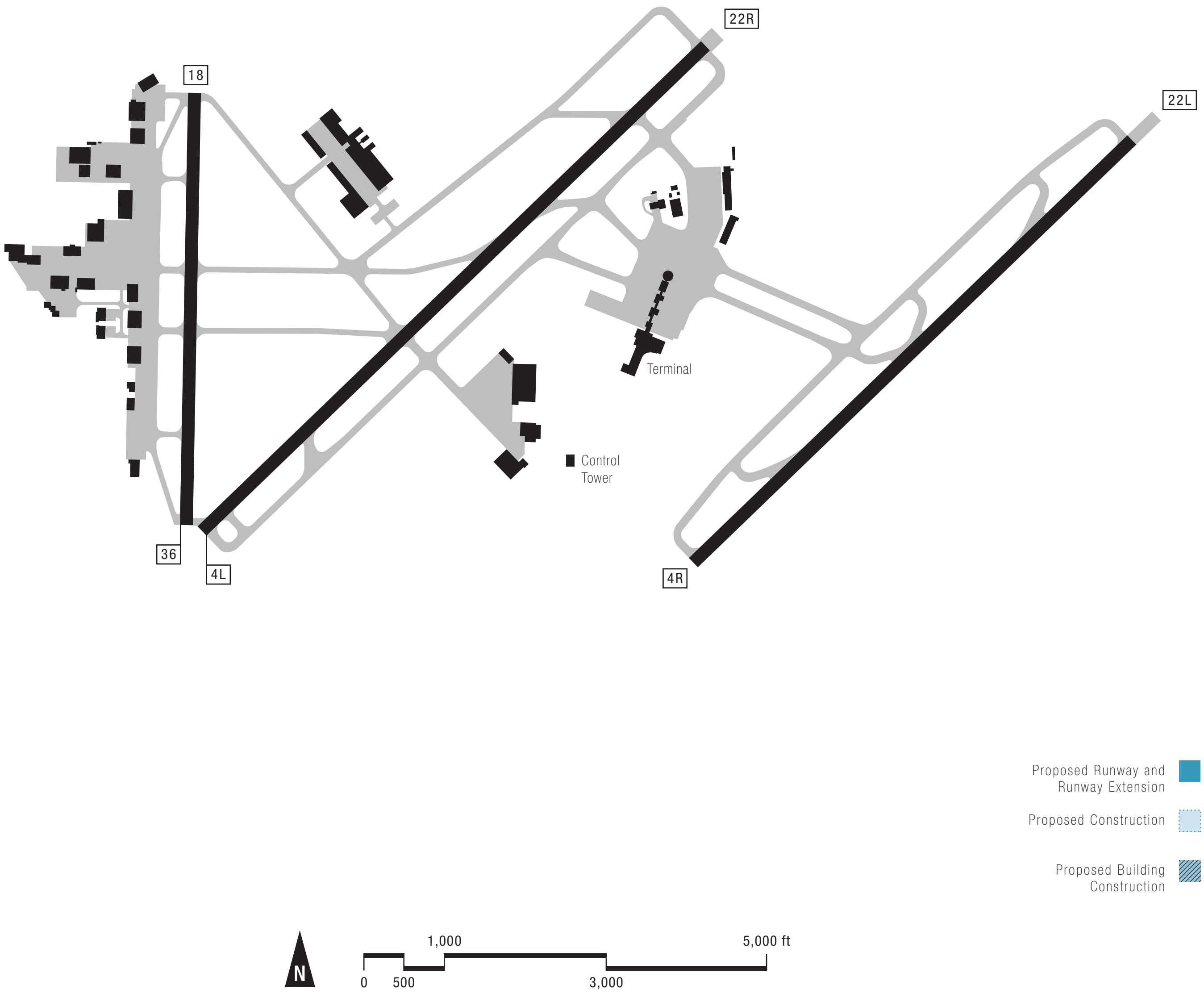
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.





LIT – Little Rock Adams Field

There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.



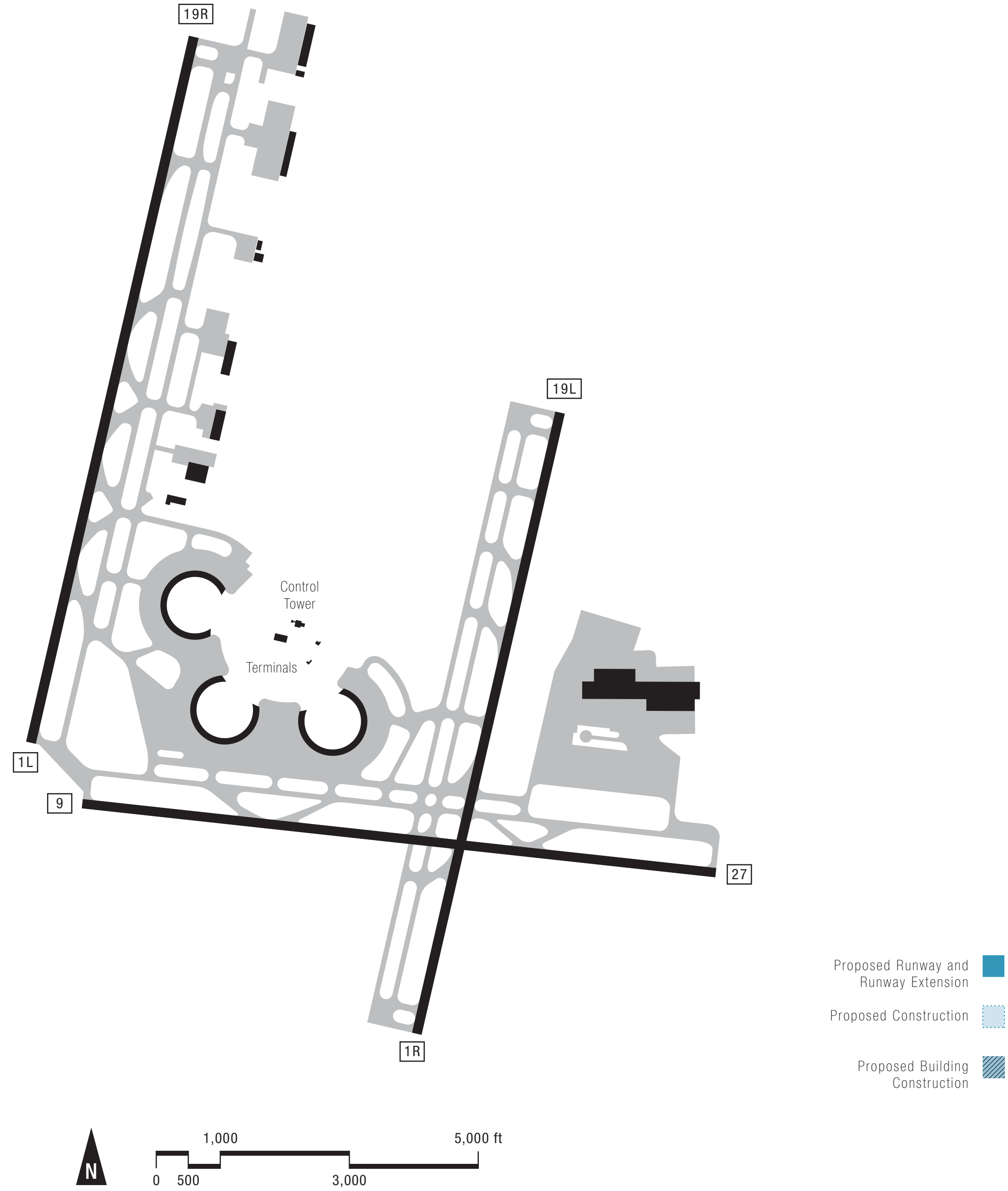
AR 83

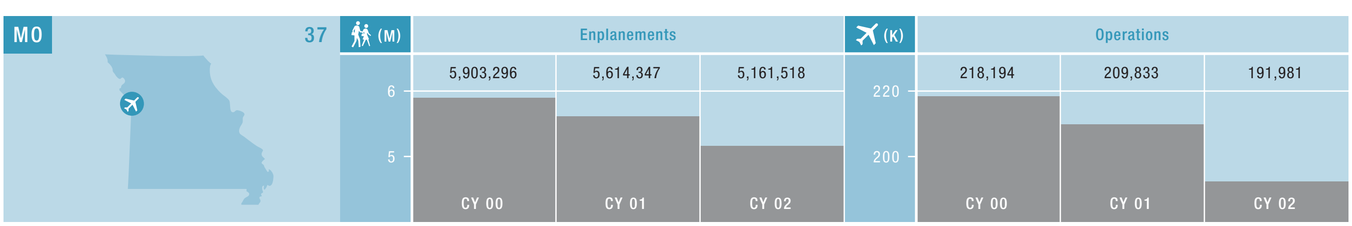
(M)	Enplanements		
	1,276,145	1,211,753	1,101,623
1.4 / 1.1	CY 00	CY 01	CY 02

(K)	Operations		
	174,802	176,067	177,203
180 / 170	CY 00	CY 01	CY 02

MCI – Kansas City International Airport

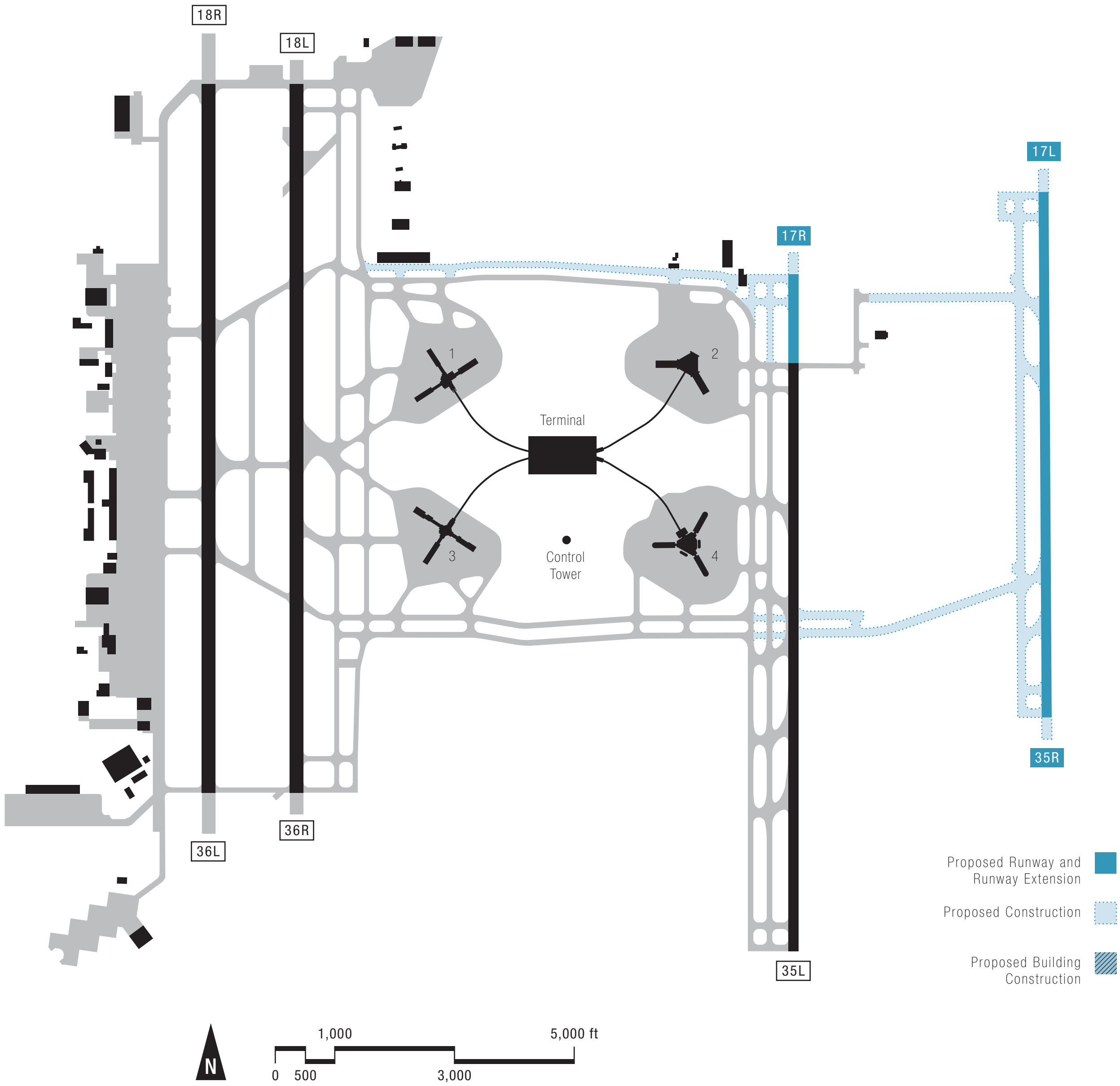
In accordance with the Airport Master Plan, an extension of Runway 12L/19R, estimated to cost $12.2 million, is not planned until after 2014.

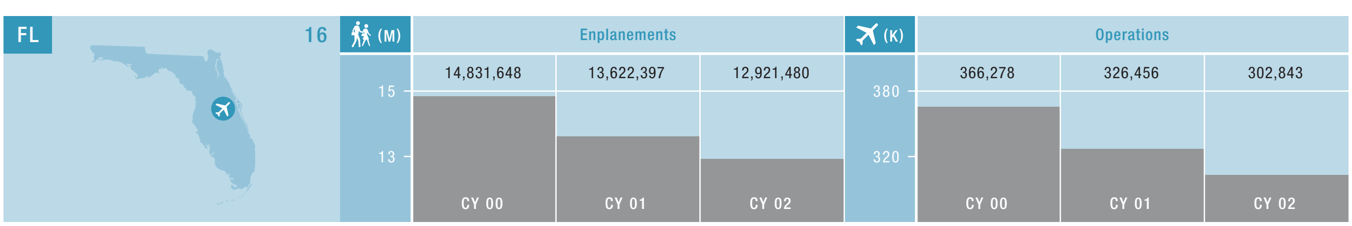




MCO – Orlando International Airport

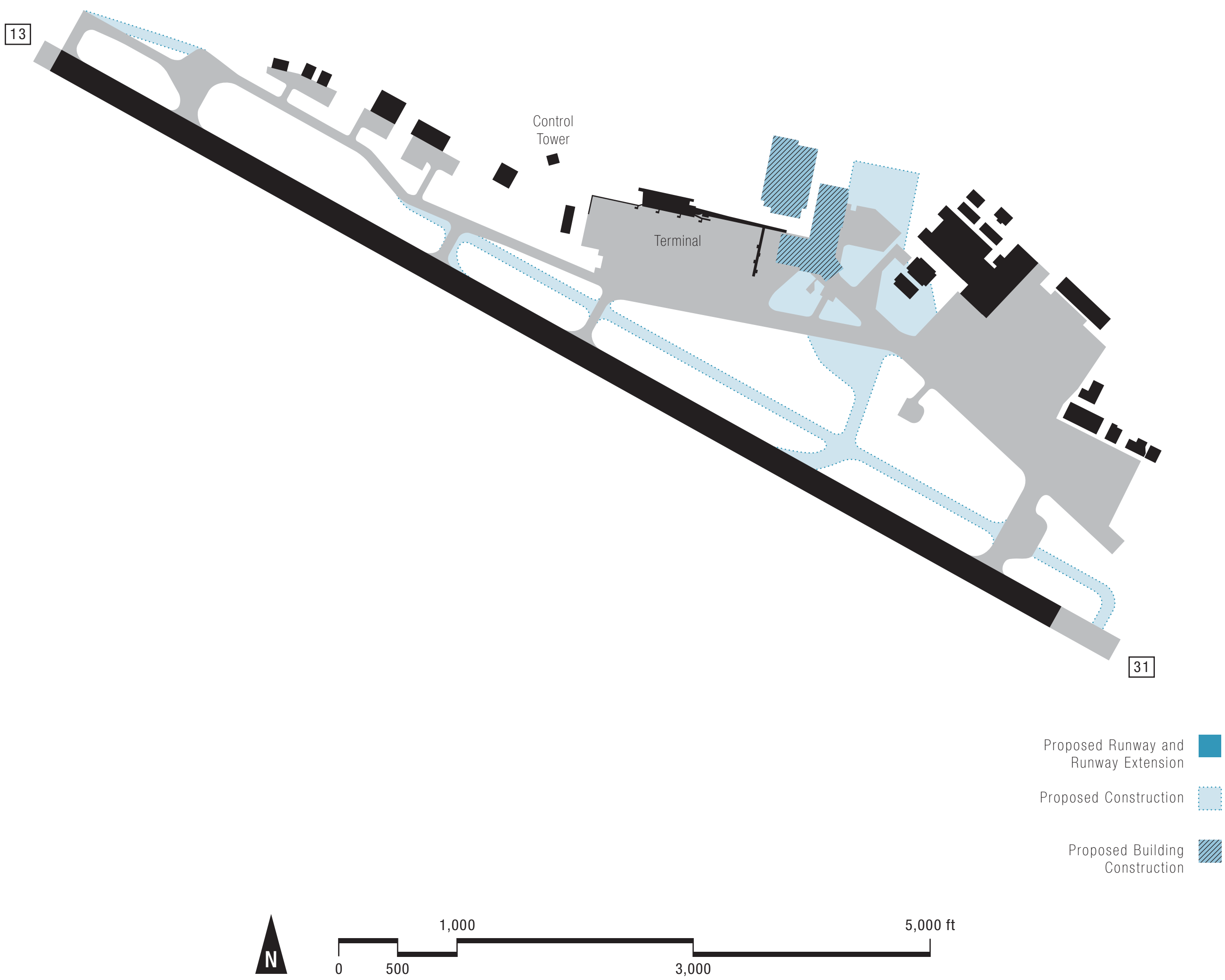
A new 9,000 ft. fourth parallel Runway 17L/35R that will allow simultaneous triple flow instrument approaches opened for operations in December 2003. The cost of the runway is $203 million. It will be located 4,300 feet east of existing Runway 17R/35L which has a 1,500-ft. extension planned to prevent aircraft from obstructing the Runway 17R approach. The new Air Traffic Control Tower has been recently commissioned and is one of the tallest towers in the nation. The first of two north crossfield taxiways and a forth airside passenger terminal located in the North Terminal Complex area were completed in 2000. The first phase of the South Terminal Complex is now in the design stage.

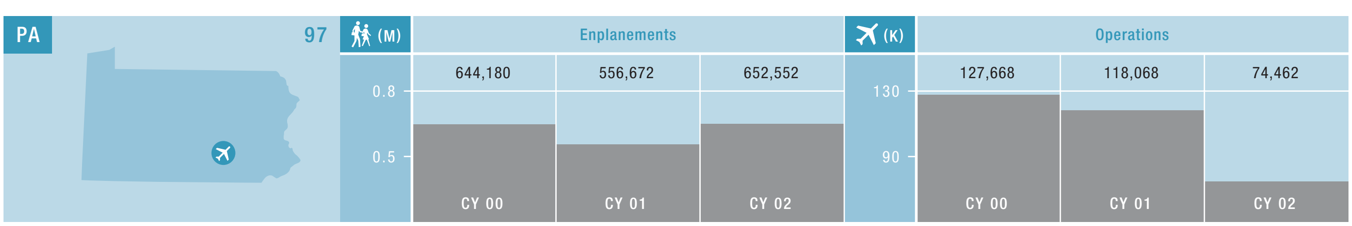




MDT – Harrisburg International Airport

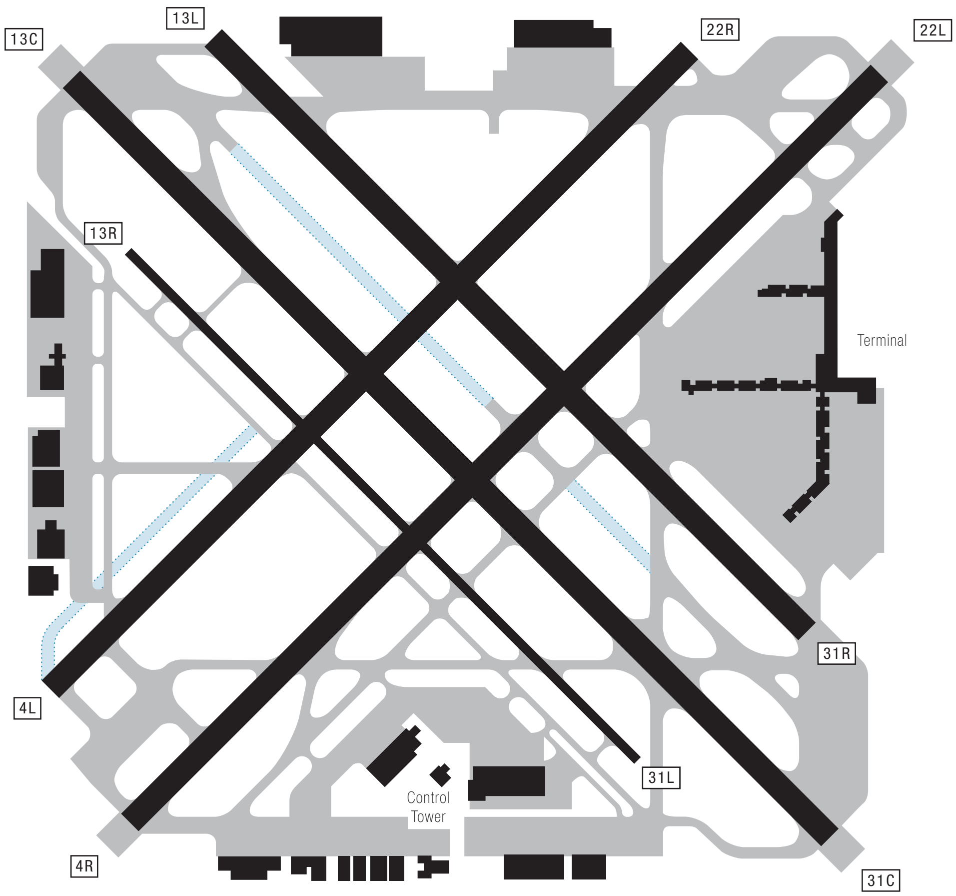
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport





MDW – Chicago Midway Airport

There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.



Proposed Runway and Runway Extension

Proposed Construction

Proposed Building Construction

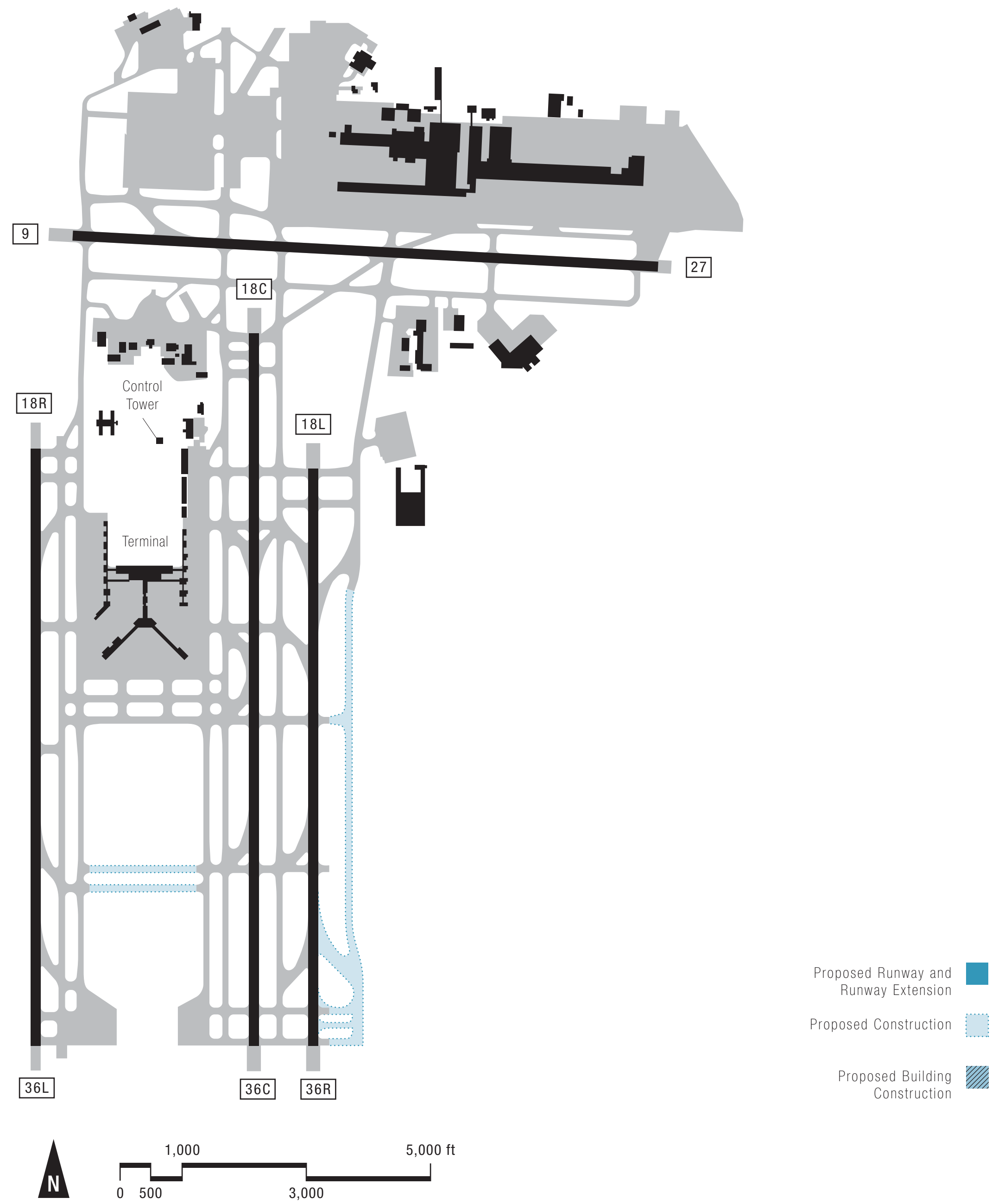
IL — 28

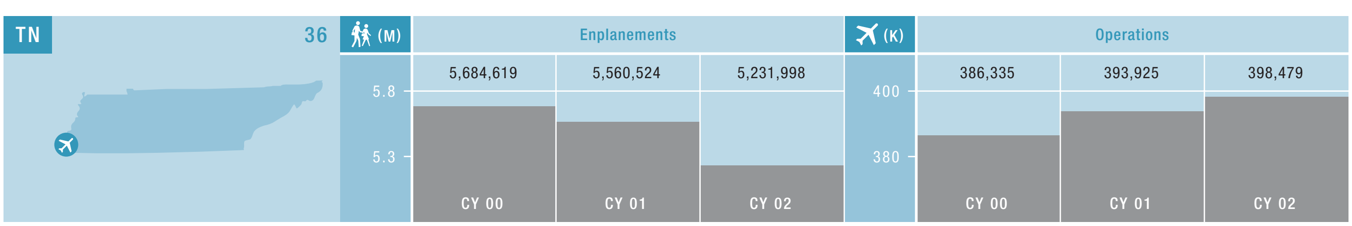
(M)	Enplanements		
	7,059,520	7,112,784	7,878,438
8, 7	CY 00	CY 01	CY 02

(K)	Operations		
	298,437	276,520	303,837
320, 270	CY 00	CY 01	CY 02

MEM – Memphis International Airport

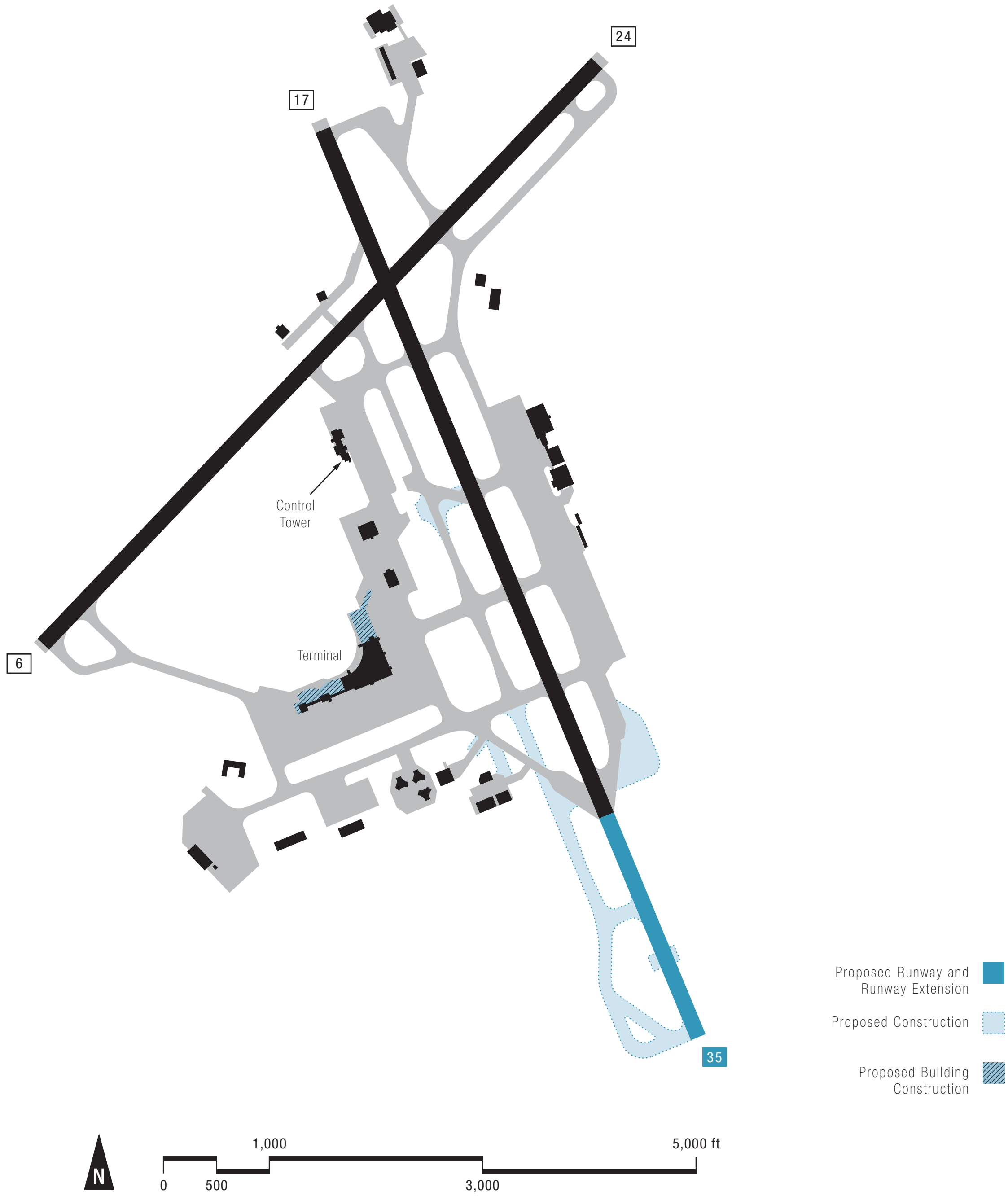
The reconstruction of Runway 18R/36L was completed in September 2002 at a cost of $43 million. All three (3) parallels have been built or reconstructed since 1997.





MHT – Manchester Airport

Current plans call for the reconstruction and extension of Runway 17/35 that includes a 2,250 extension of Runway 35 to the South. Taxiway "A" will also be extended.

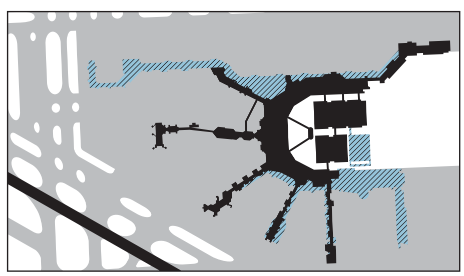


NH 68

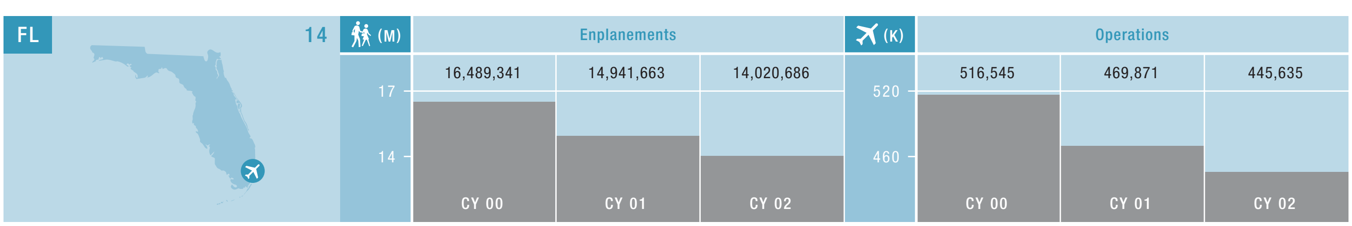
(M)	Enplanements			(K)	Operations		
1.7, 1.6	1,568,860	1,599,062	1,647,797	110, 95	106,086	106,633	92,271
	CY 00	CY 01	CY 02		CY 00	CY 01	CY 02

MIA – Miami International Airport

Construction of a new air carrier Runway 8/26, 8,600 ft. long and 800 ft. north of existing Runway 9L/27R, is estimated to be completed by 2003. The estimated cost of construction is $206 million. An EIS was completed in December 1998. The new Runway is planned for use primarily as an arrival runway in VFR and non-precision IFR conditions.

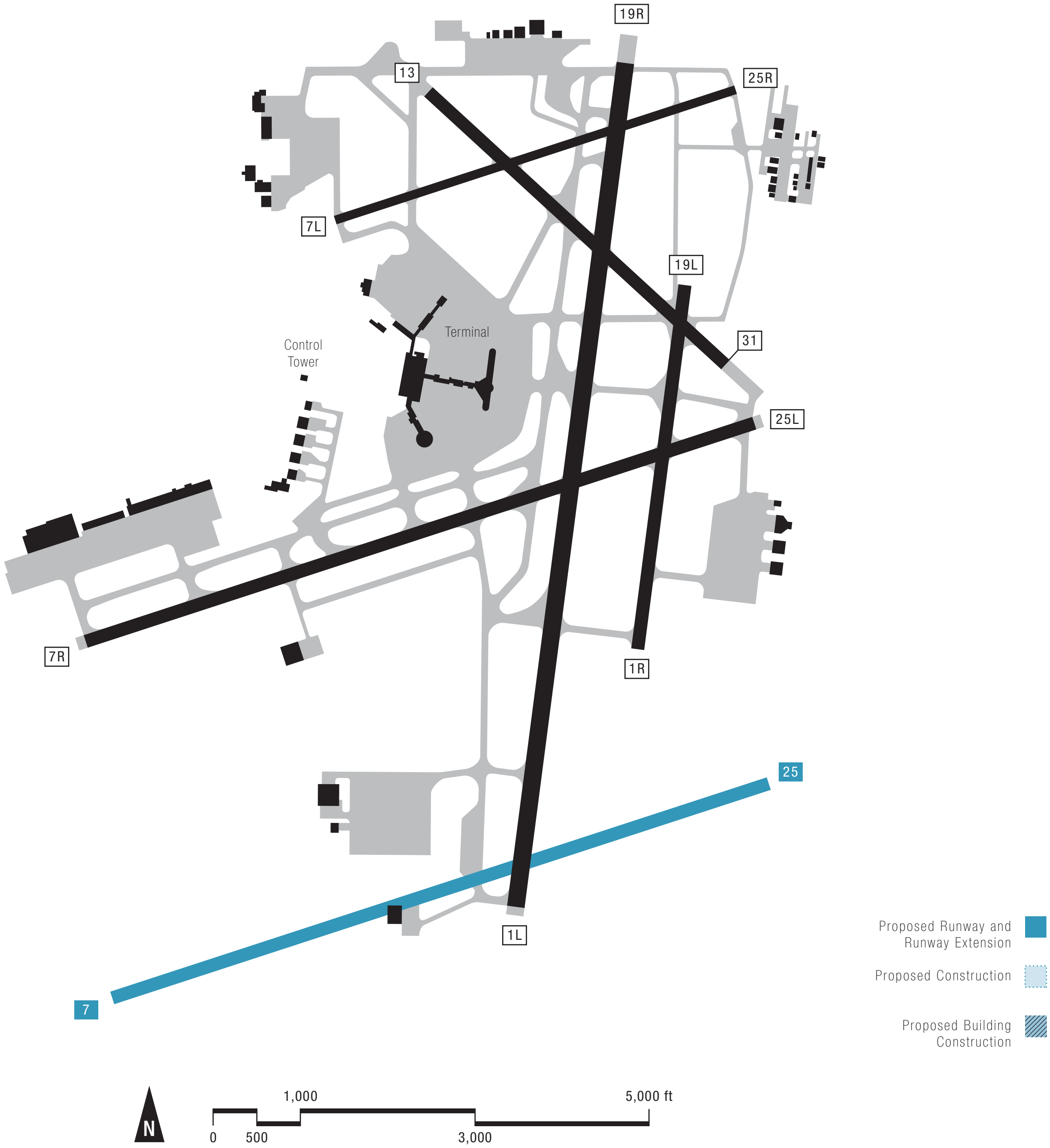


New Terminal Design and Mid-Field Hold Pad



MKE – Milwaukee General Mitchell International Airport

A 700-ft. extension to Runway 7L/25R was completed in the summer of 1998. Extension of this runway from 4,100 ft. to 4,800 ft. will accommodate commuter aircraft and delay the need for a third parallel runway until about the year 2015.

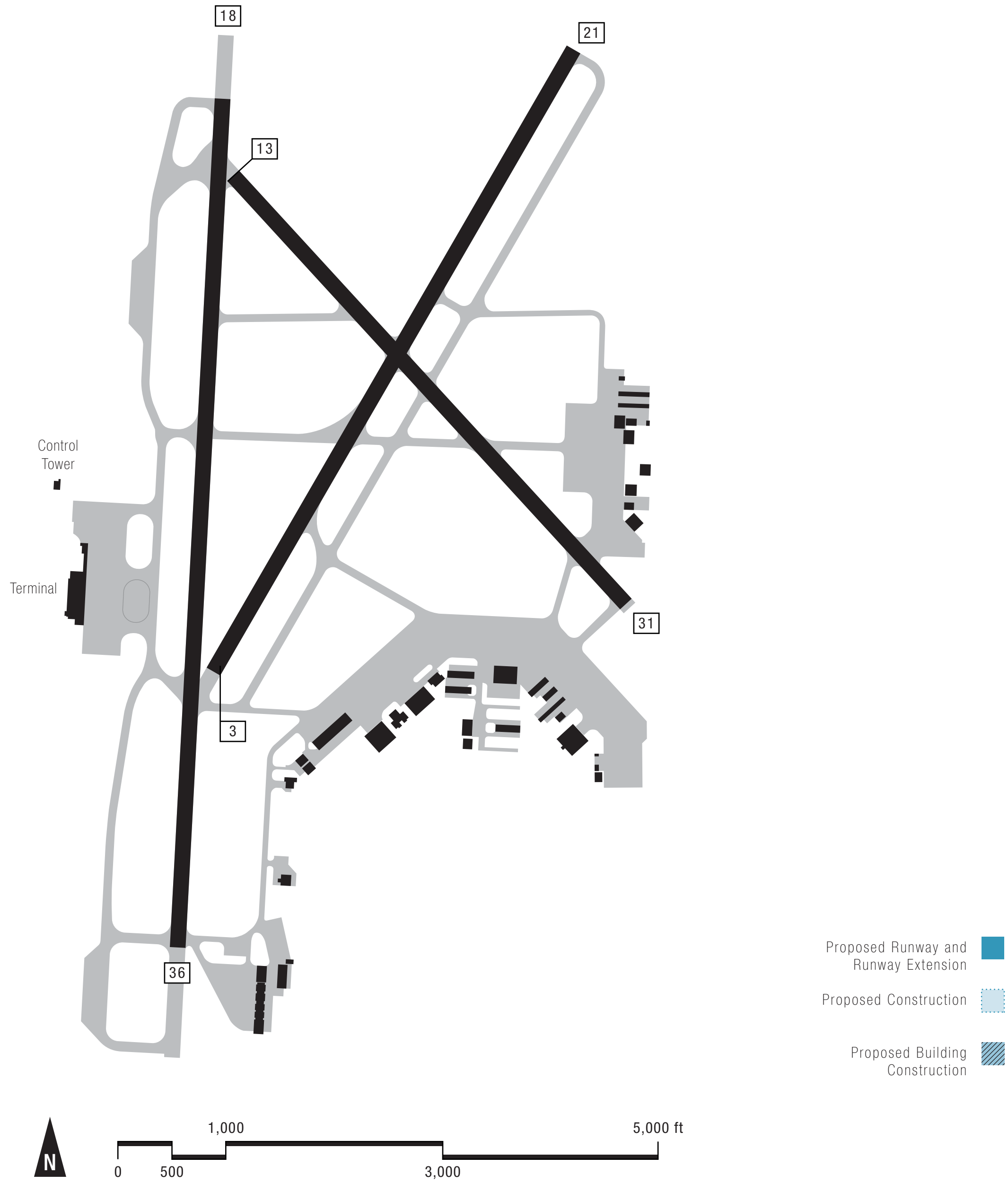


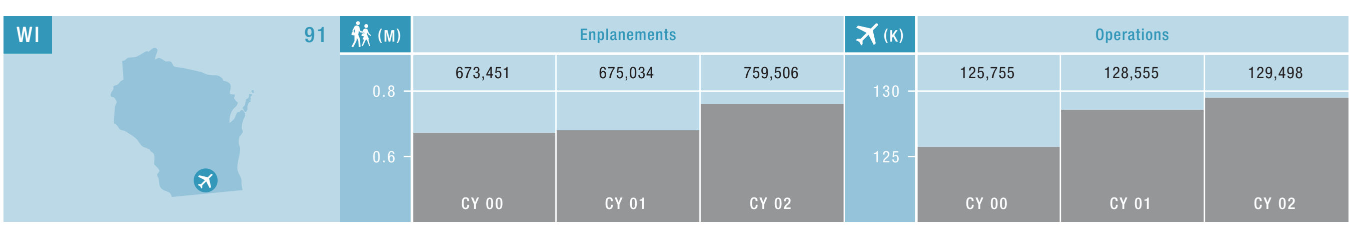
WI 54

(M)	Enplanements			(K)	Operations		
	3,089,592	2,825,473	2,779,197		221,855	211,512	216,050
3.2 – 2.7	CY 00	CY 01	CY 02	230 – 205	CY 00	CY 01	CY 02

MSN – Madison/Dane County Regional Airport

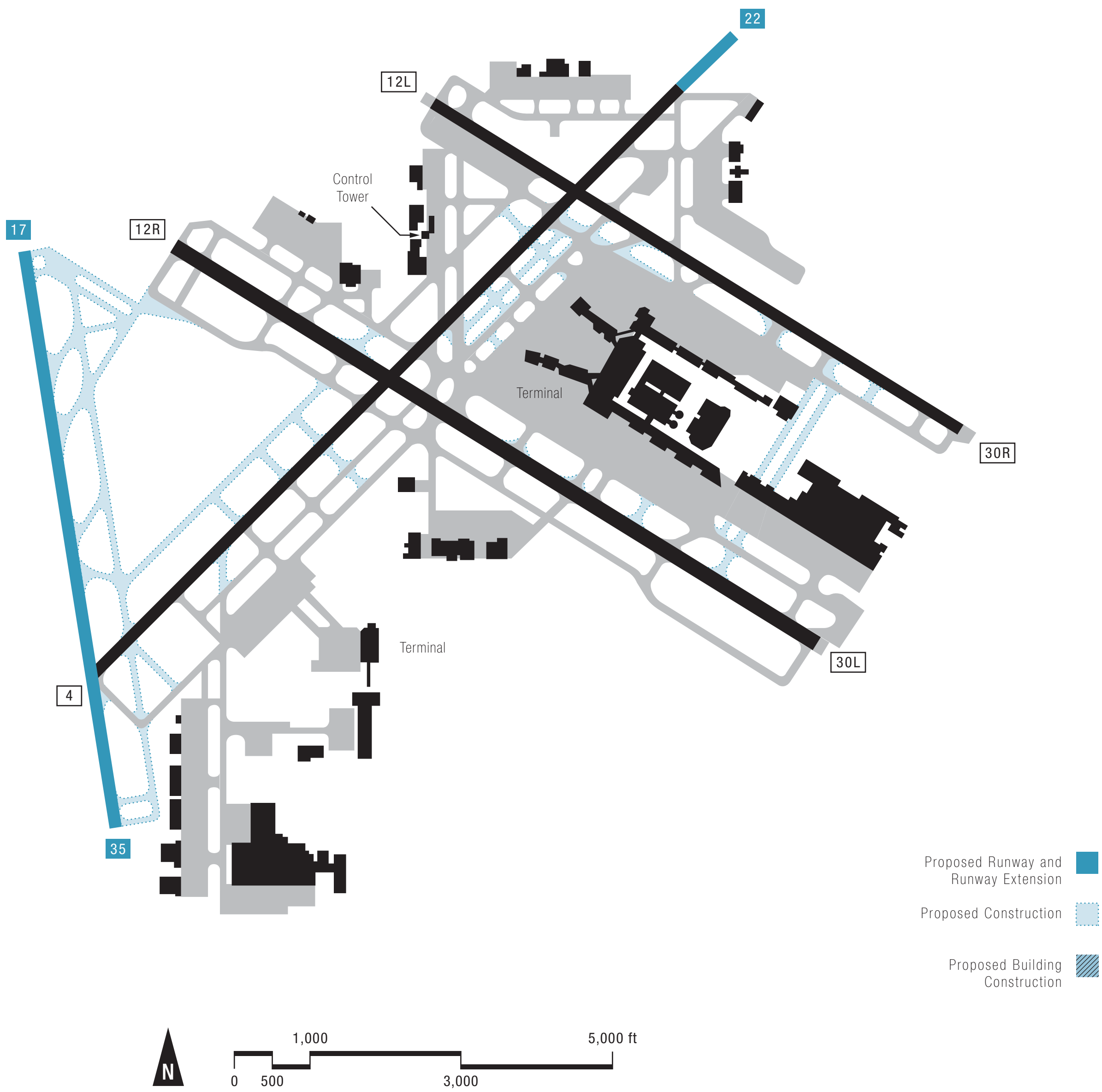
The airport is currently undertaking an Environmental Assessment (EA) for the Runway Safety Area of the Runway 13/Runway 18 Approaches. Presently Runway 13 does not meet FAA Runway Safety Area design criteria due to railway, waterway, and perimeter road intrusions. The actions proposed under the EA will correct design deficiencies of the Runway Safety Area, clear up pavement marking discrepancies on Runway 13, and provide for clear approaches to Runway 13 and 18.

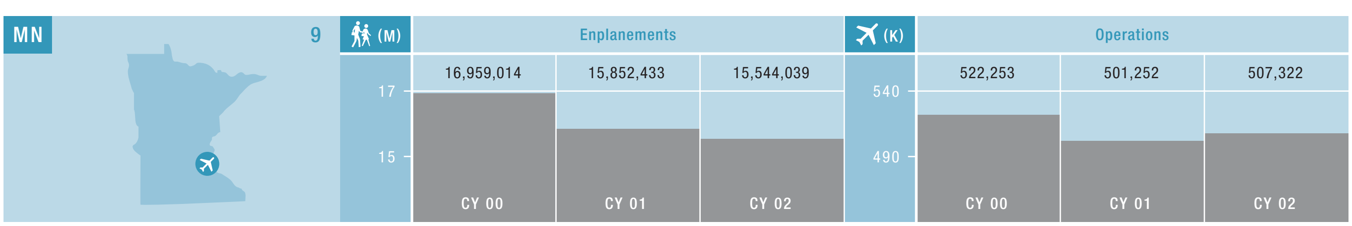




MSP – Minneapolis-St. Paul International Airport

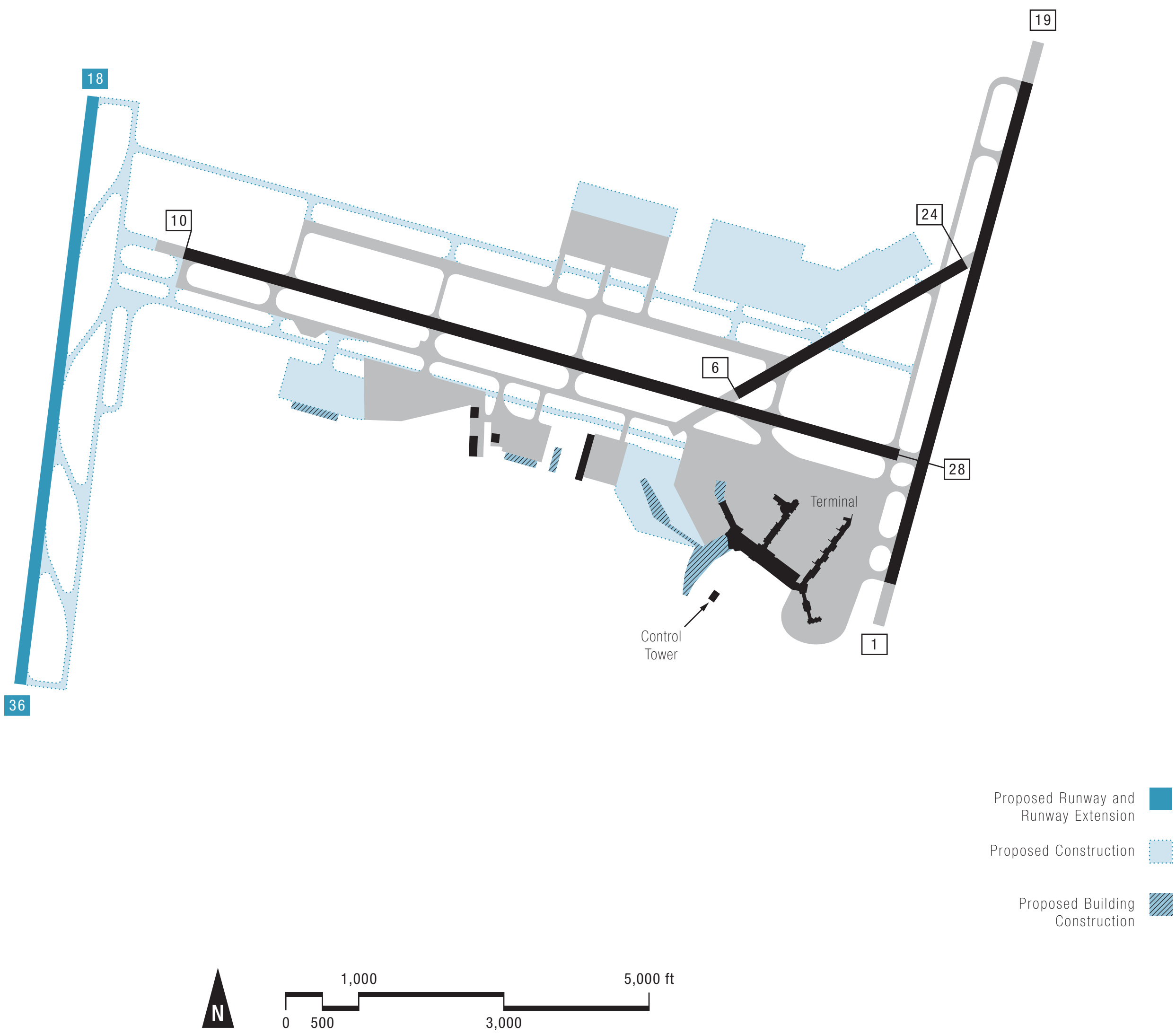
Construction of the proposed 8,000 ft. Runway 17/35, at a cost of $490 million, will reduce the projected 2020 annual delay cost from $66 million to $38 million. The runway is expected to be operational in 2004 and will be used primarily for departures to the south and arrivals from the north. Construction of a 1,000 ft. extension to the northeast end of Runway 4/22 is planned.

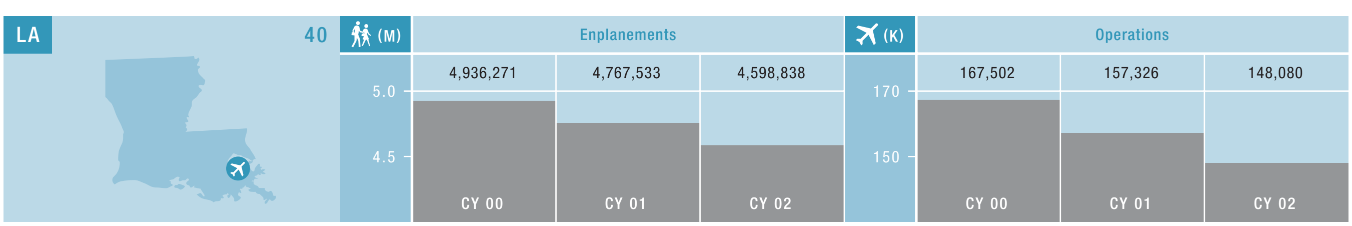




MSY – Louis Armstrong New Orleans International Airport

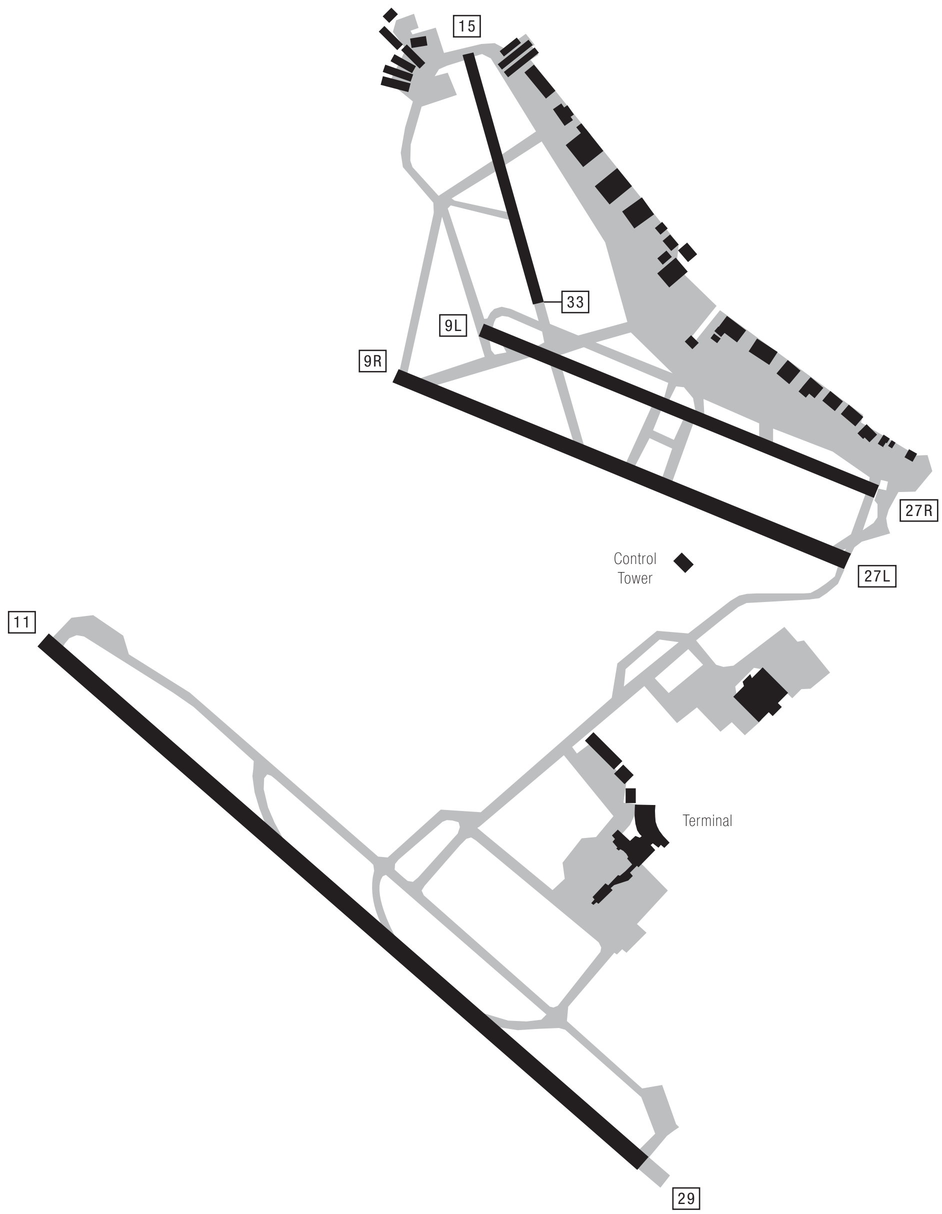
Commissioning of Runway 18/36 is proposed for early 2015. Taxiway G construction is complete. Once Runway 10L/28R is complete, Runway 6/24 will be decommissioned. Taxiway U and the aircraft holding apron should be completed in early 2004. Our ongoing planning efforts may change some terminal and apron elements shown on the Airport Diagram. However, the existing Airport Diagram should (with the changes reflecting Taxiway G, Taxiway U and the holding pad) continue to be used. Once these efforts are complete, we will amend the Airport Diagram accordingly.





OAK – Metropolitan Oakland International Airport

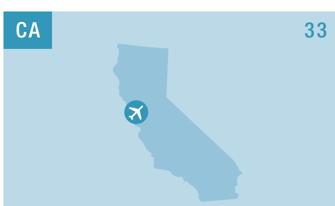
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.

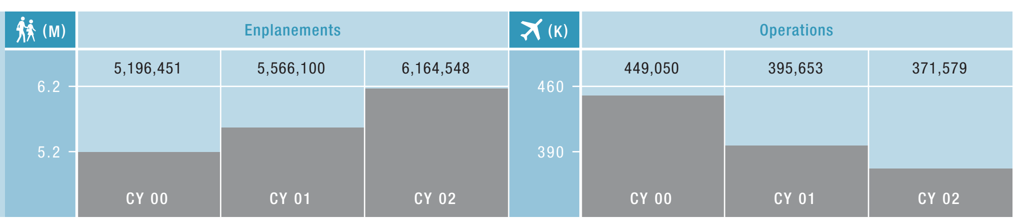


Proposed Runway and Runway Extension

Proposed Construction

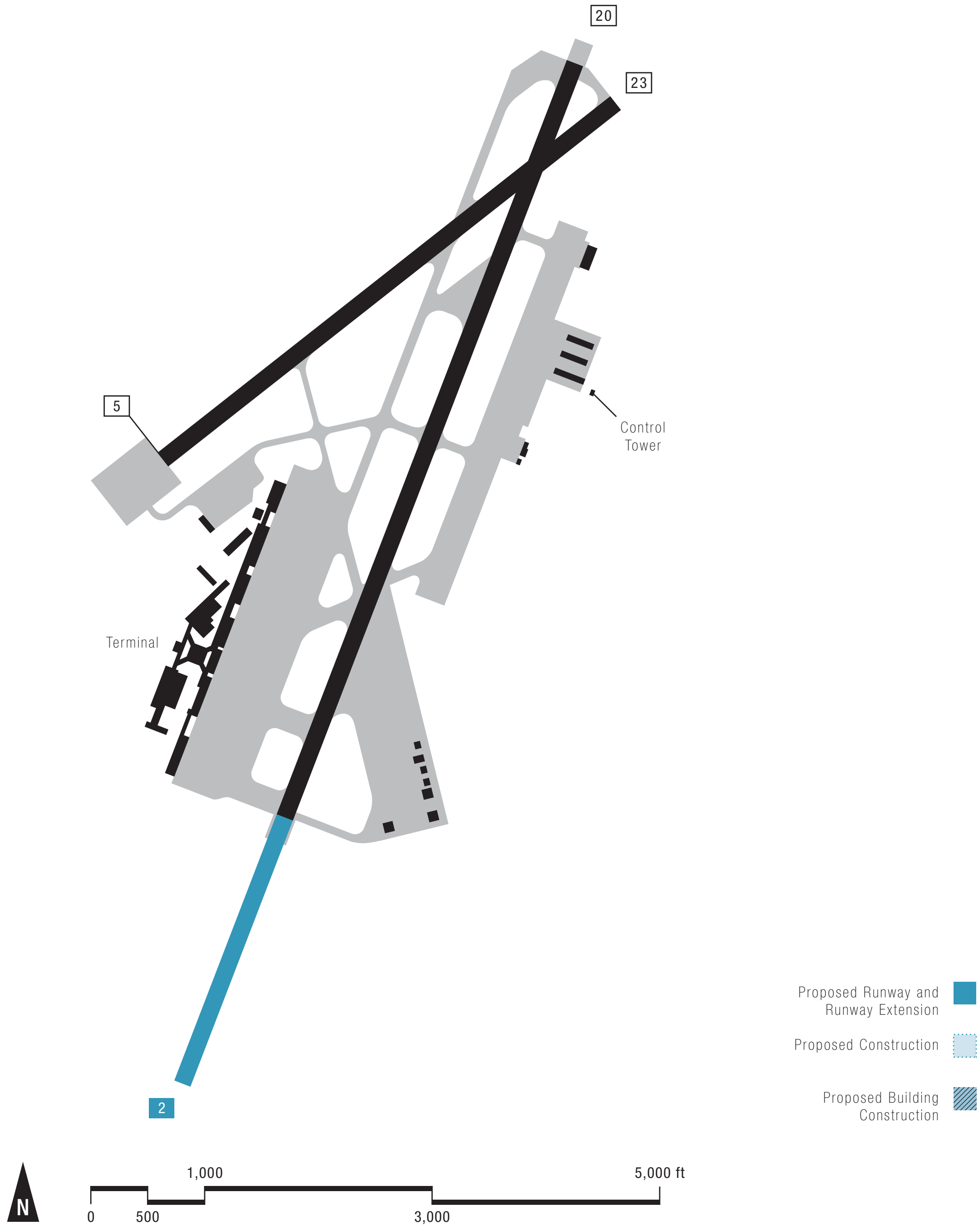
Proposed Building Construction





OGG – Kahului Airport

There are no new runway or runway extension projects proposed, or currently under construction at this airport.

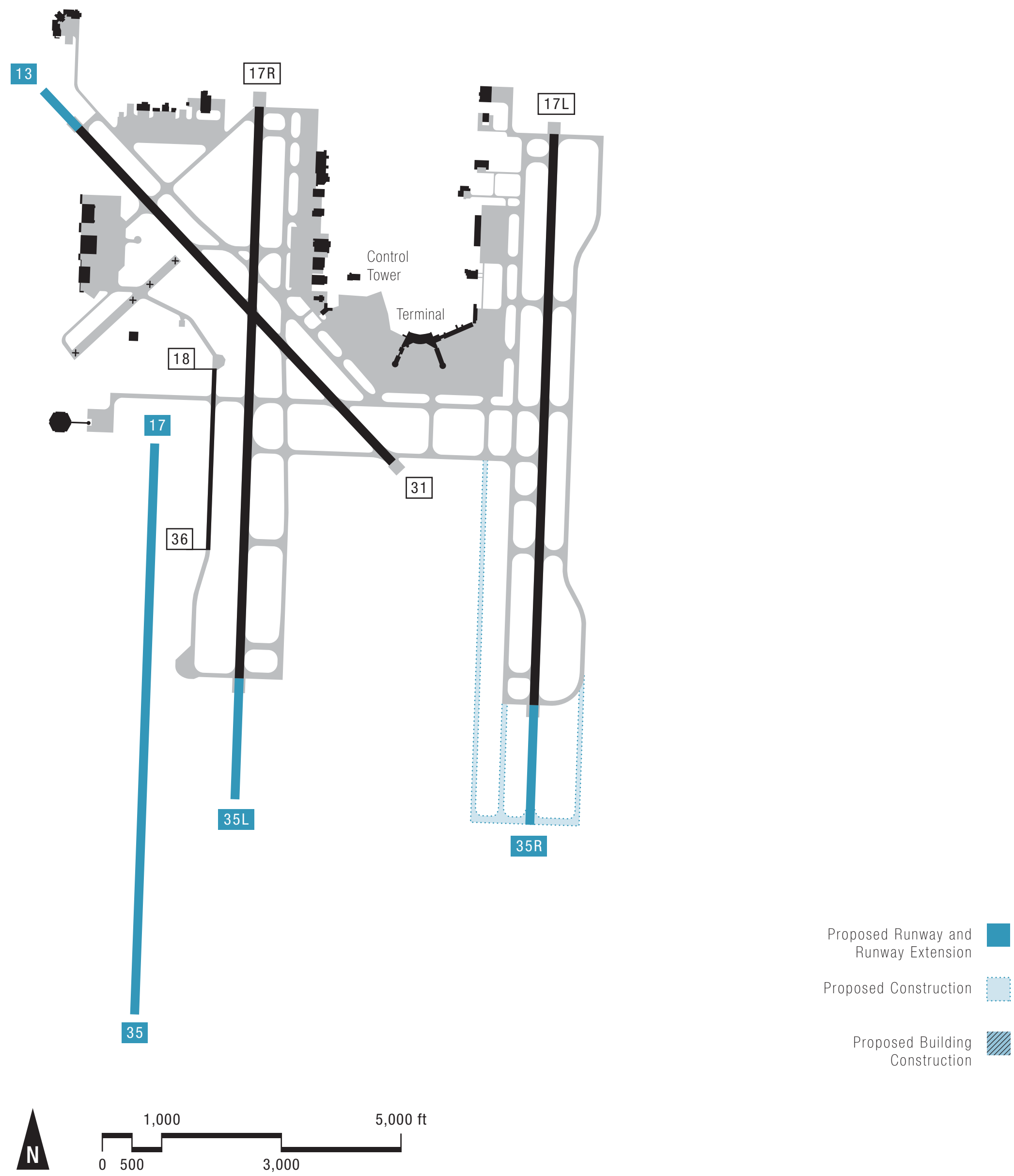


HI 56

	Enplanements (M)	Operations (K)
CY 00	2,999,863	174,855
CY 01	2,777,692	160,324
CY 02	2,663,824	157,868

OKC – Oklahoma City Will Rogers World Airport

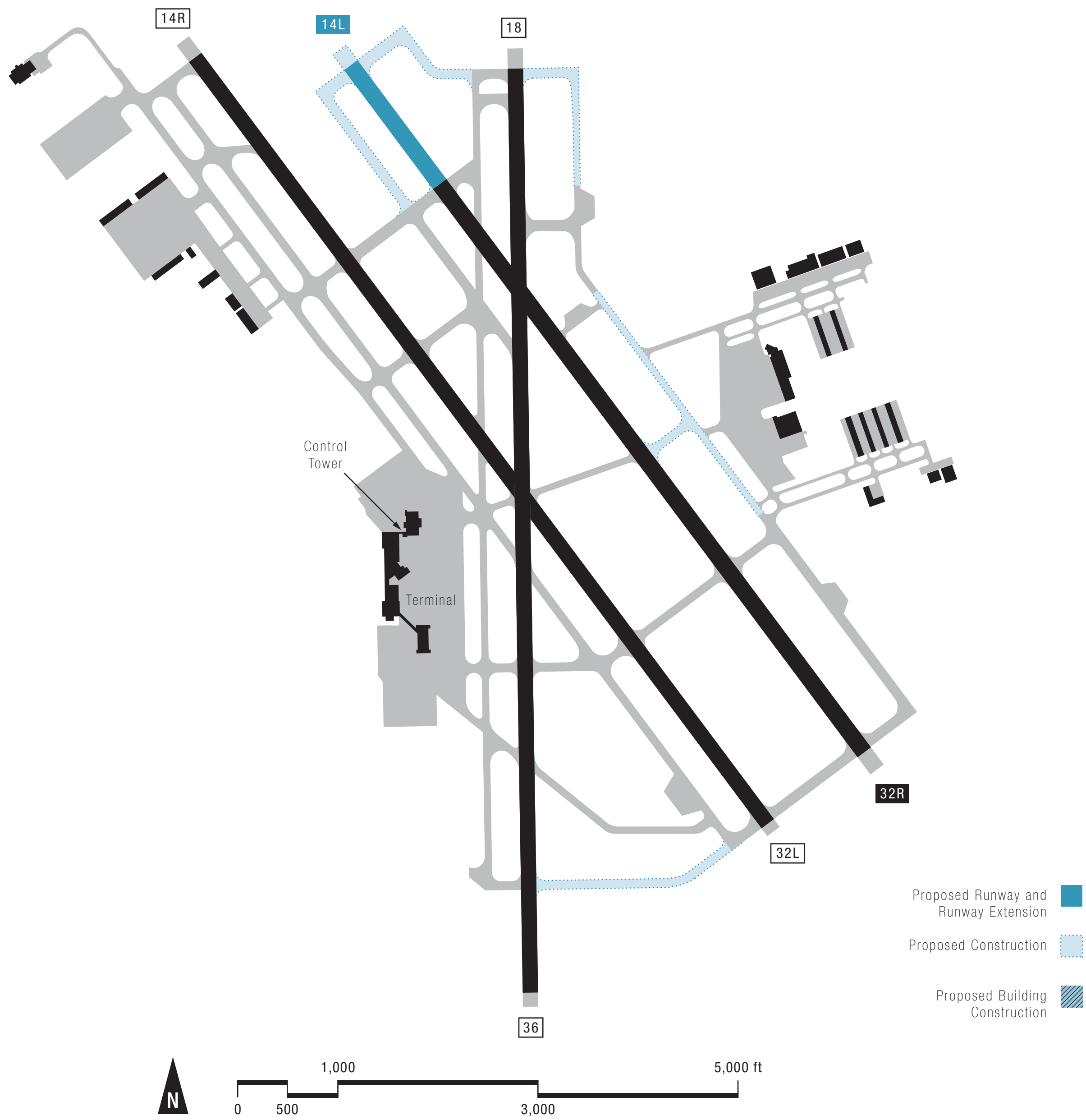
Construction of a new west parallel runway 1,600 ft. west of Runway 17/35 is reflected on the ALP. Estimated cost of construction is $13 million. Extensions to both north/south runways, Runways 17L/35R and 17R/35L, are also planned. The estimated cost of extending the runways is $8 million each. Construction of the extension to Runway 17R/35L is expected to start in 2010 and be completed by 2014. A 2,200 ft. extension to the northwest of Runway 13/31 is planned as well. Relocation of MacArthur Boulevard may begin in 2003, with runway completion in 2010. The cost is estimated at $11.6 million.

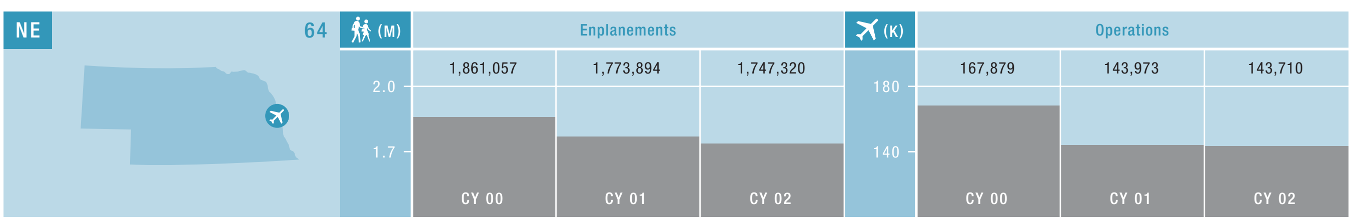


(M)	Enplanements CY 00	Enplanements CY 01	Enplanements CY 02	(K)	Operations CY 00	Operations CY 01	Operations CY 02
1.8 / 1.6	1,739,169	1,675,889	1,579,179	180 / 160	160,083	176,499	169,437

OMA – Omaha Eppley Airfield

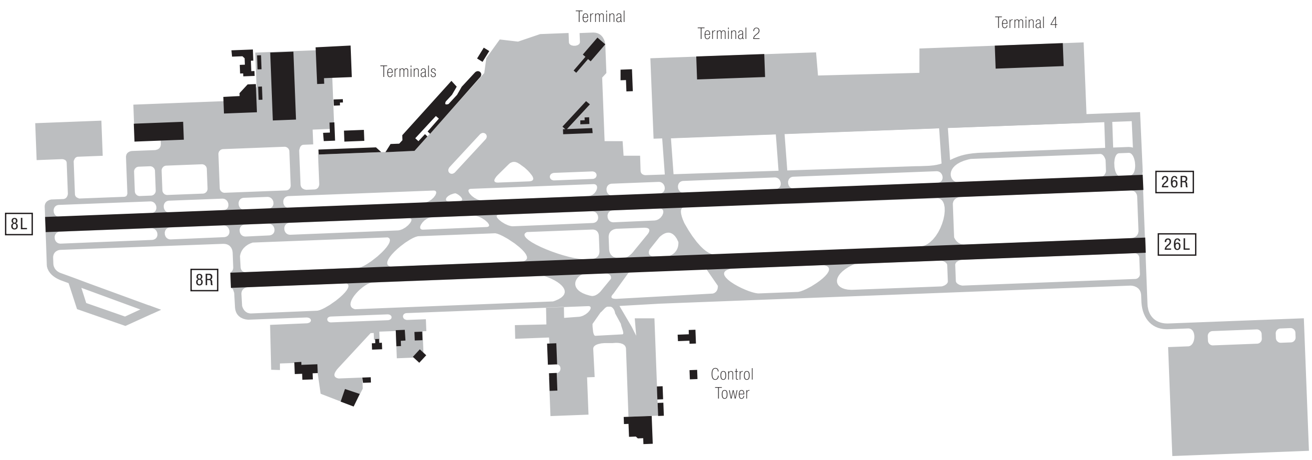
An extension of Runway 14L/32R to 7,000 feet at an estimated cost of $10.8 million, is expected to be completed in 2005.





ONT – Ontario International Airport

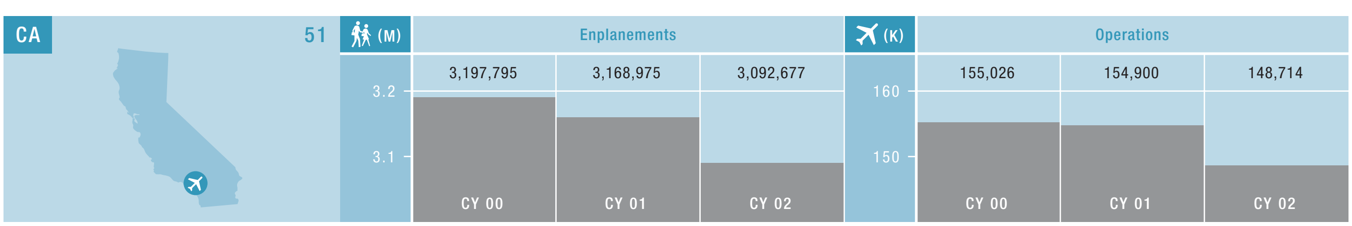
Plans are proposed for a runway reconstruction that will be operational in 2005, at an estimated cost of $34.2 million.



Proposed Runway and Runway Extension

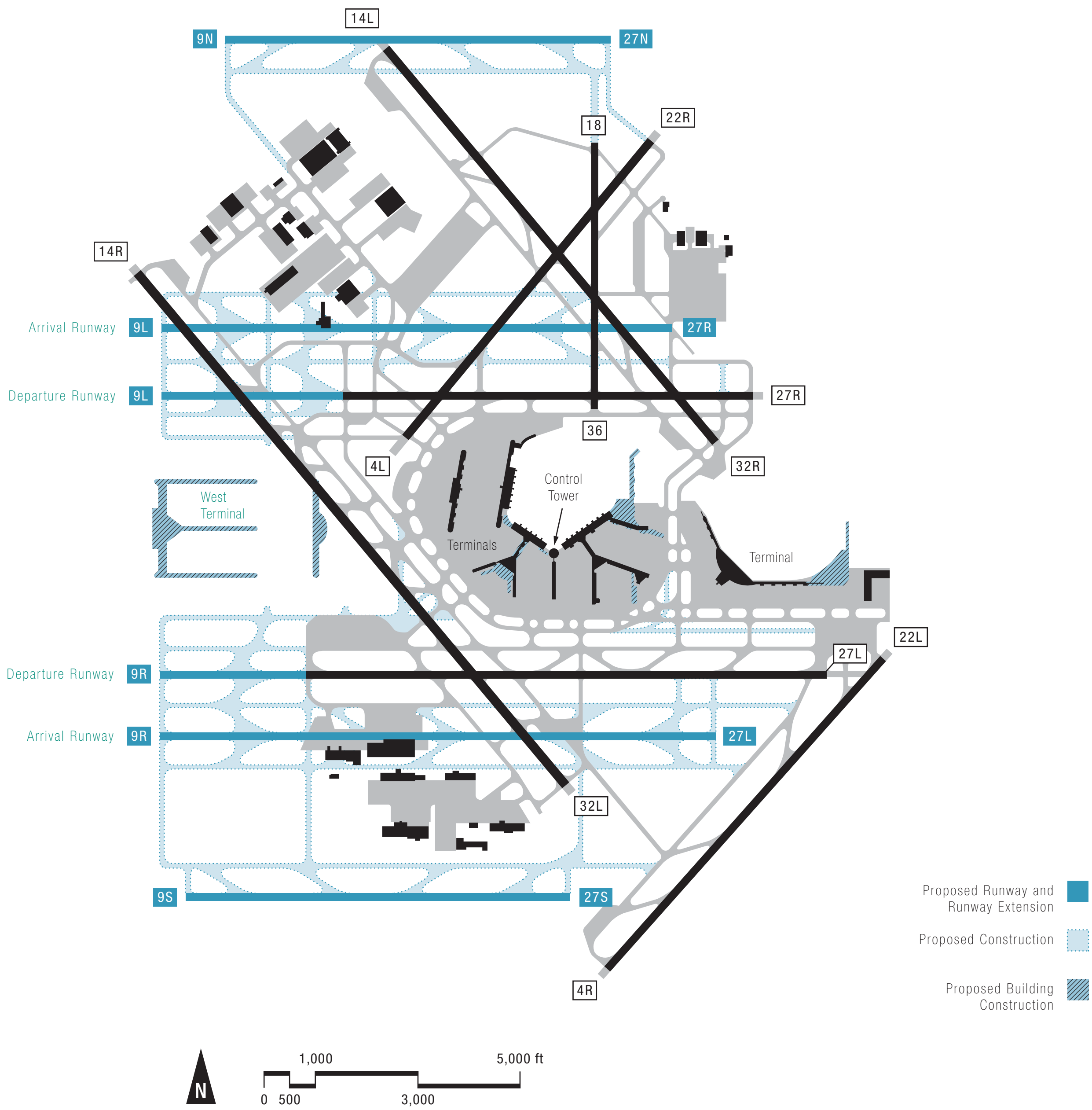
Proposed Construction

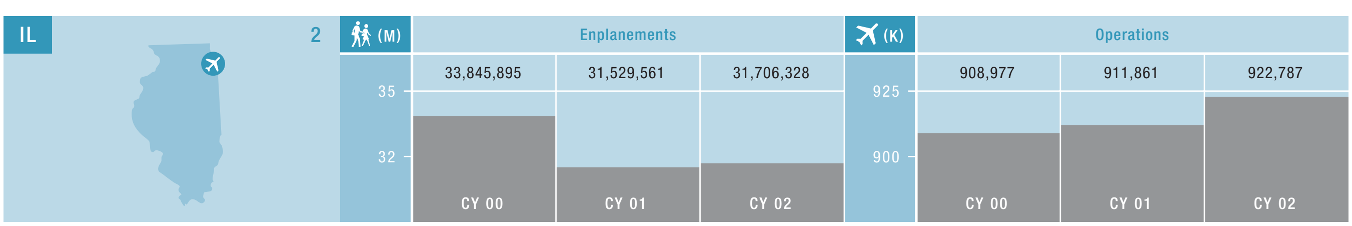
Proposed Building Construction



ORD – Chicago O'Hare International Airport

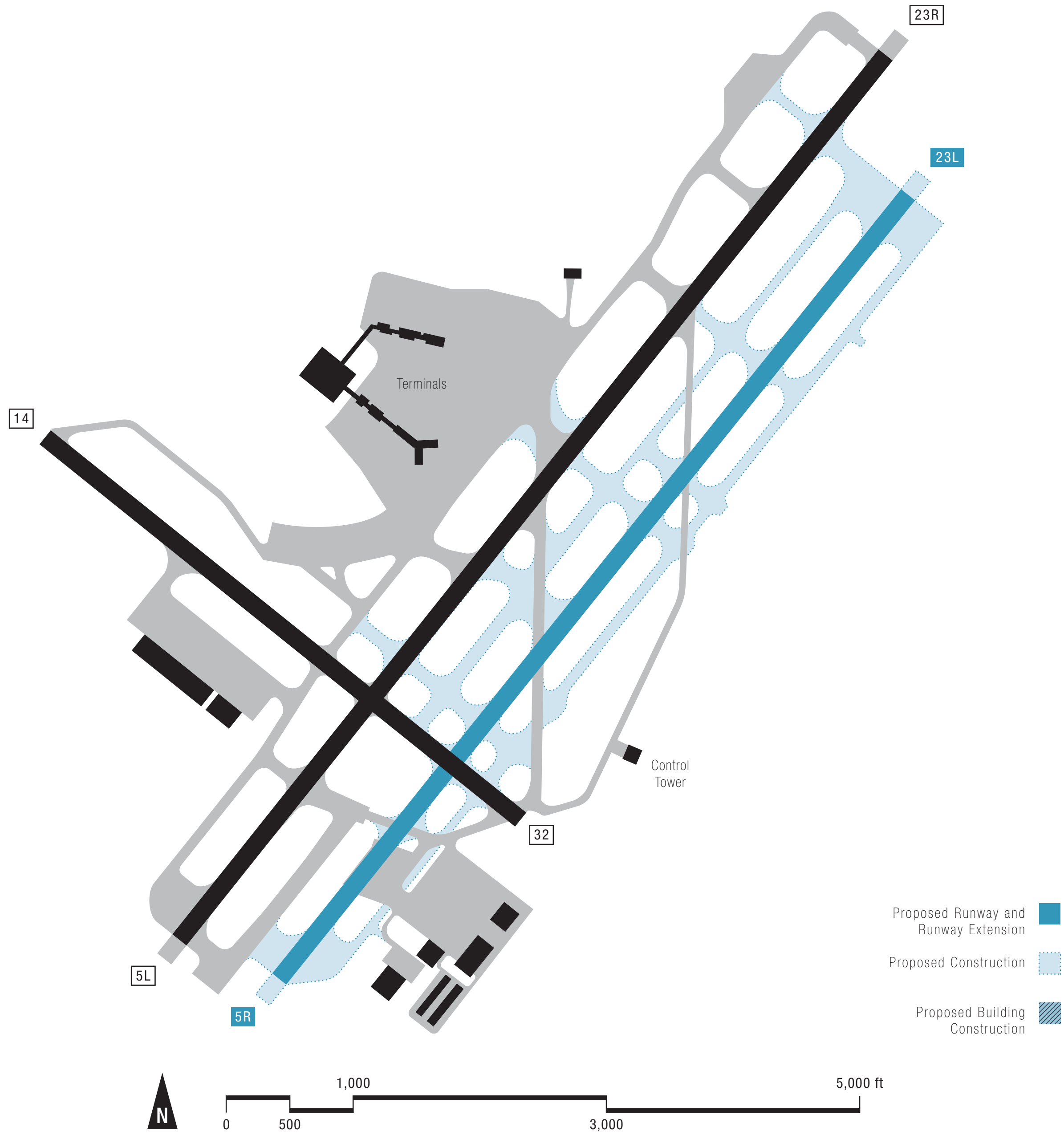
The O'Hare Modernization Plan currently consists of constructing one new runway and relocating three of the existing seven runways along with the required new taxiways to provide a new airfield configuration with six runways in the 9/27 direction and two in the 4/22 direction. Airfield construction, estimated at $2.5 billion, will be phased over several years with the construction of the first new runway beginning in 2004. This new configuration will reduce IFR delays by 95 percent and overall delays at O'Hare by 79 percent.

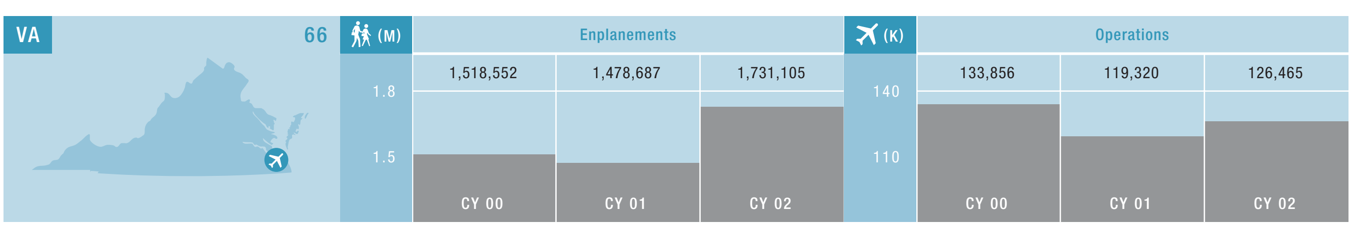




ORF – Norfolk International Airport

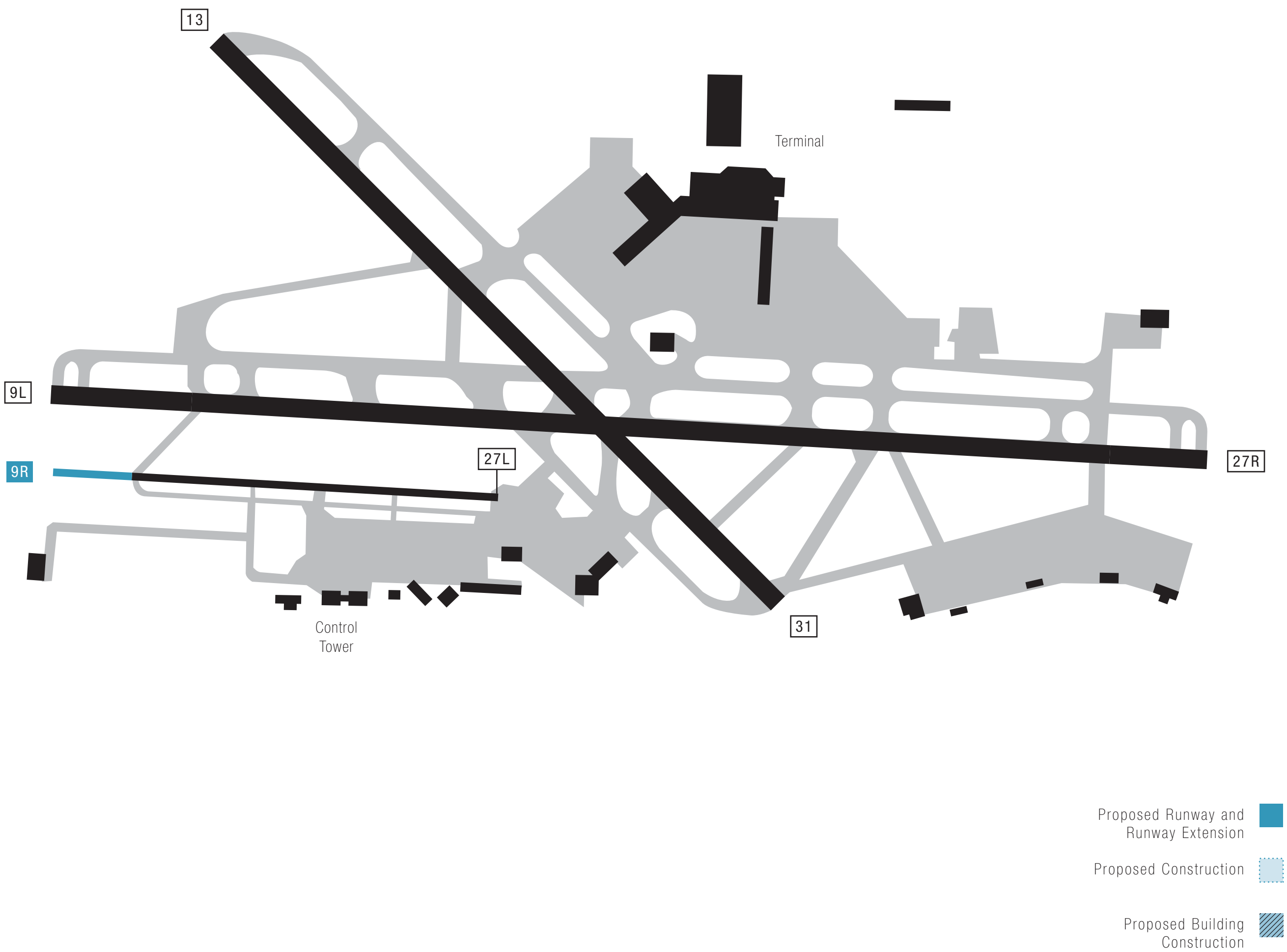
A new parallel Runway 5R/23L will be constructed between 2004 and 2006 at a cost of $120 million. An Environmental Review is currently underway.

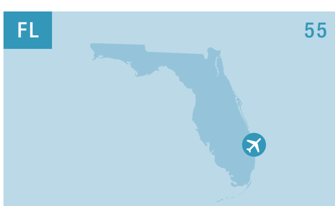


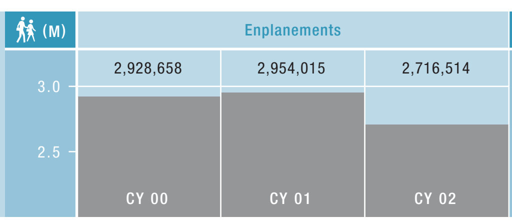


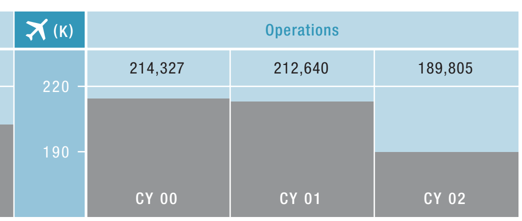
PBI – Palm Beach International Airport

Runway 9L/27R is planned to be extended 1,200 ft. to the west and 811 ft. to the east, for a total length of 10,000 ft. The total estimated project cost is $9 million. An Environmental Assessment was completed and a Finding of No Significant Impact (FONSI) was issued in April 1998. Construction was completed in 2000. The runway thresholds will remain in their present locations; therefore, the extended length will only be used for departures.



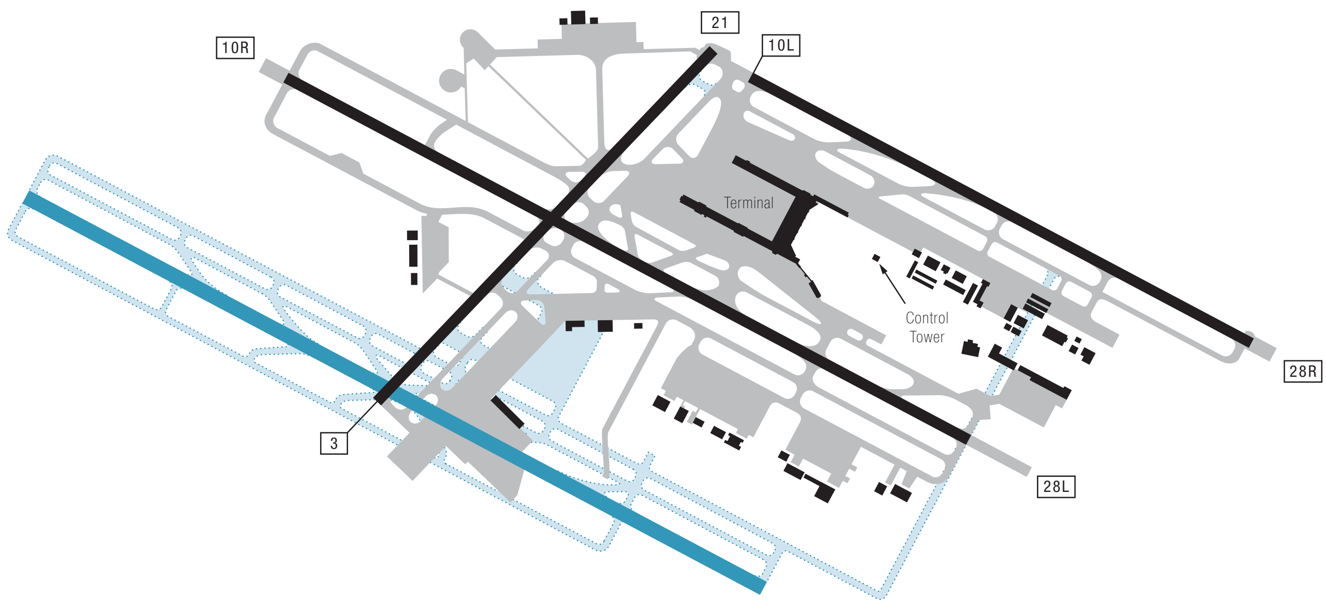






PDX – Portland International Airport

An update of the 1996 Capacity Enhancement Plan was completed in an initial phase in 2001, with the final phase to be completed in 2003. The update evaluated development of a third parallel runway south of the existing parallel runways with associated taxiways (not shown) under construction after 2020, and constructing an additional terminal or expanding the existing terminal. The update also evaluated the capacity benefit or impact of the new parallel runway under various operating scenarios. Two new connecting taxiways are proposed over the next five years to reduce runway occupancy times on Runway 10R/28L and congestion on the south parallel taxiway.



Proposed Runway and Runway Extension

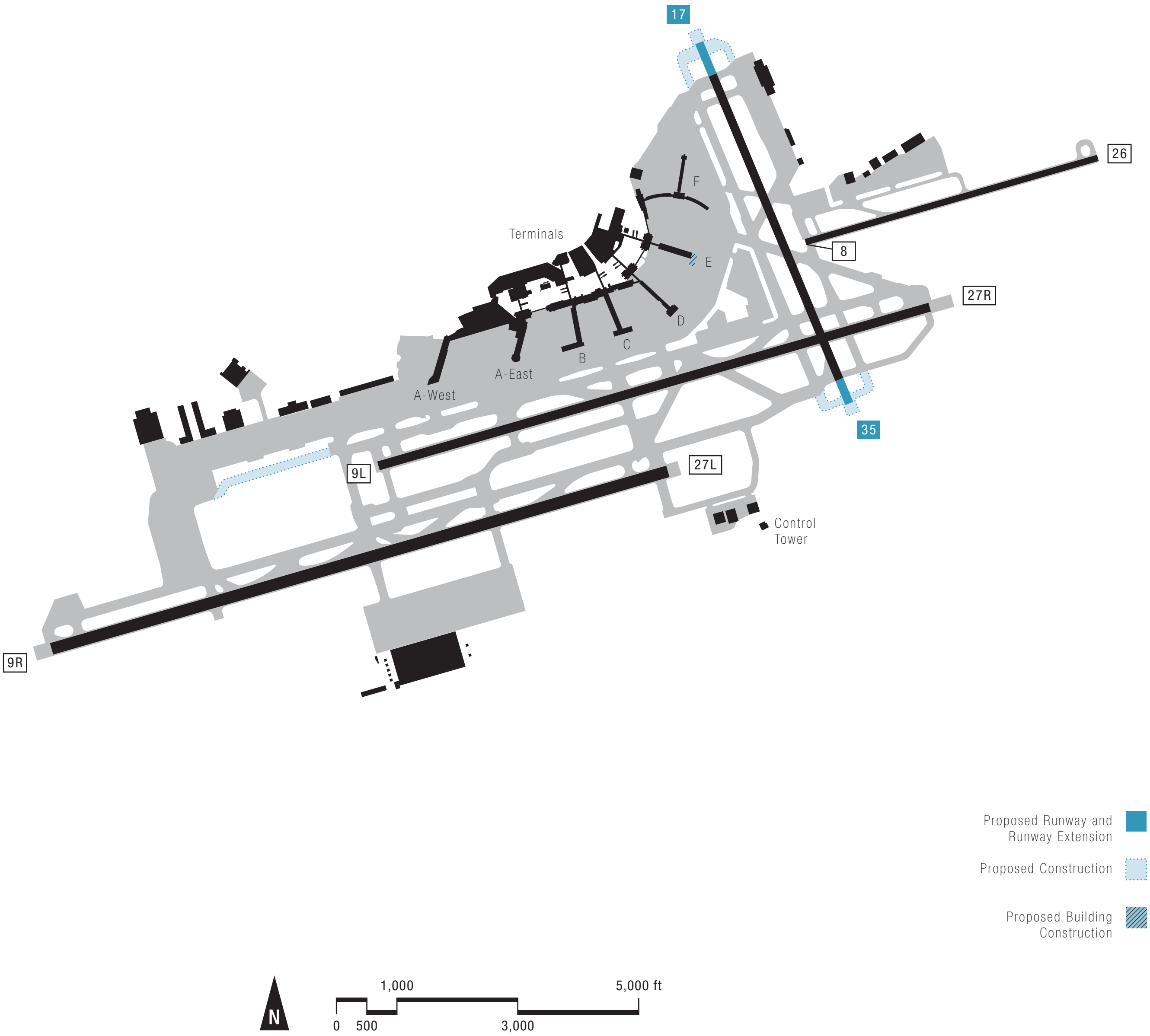
Proposed Construction

Proposed Building Construction

OR 34	(M)	Enplanements			(K)	Operations		
		6,754,514	6,168,103	5,978,025		317,477	293,902	278,406
	7				320			
	6				270			
		CY 00	CY 01	CY 02		CY 00	CY 01	CY 02

PHL – Philadelphia International Airport

A major terminal expansion project, including the 13 International Terminal A-West opened in May of 2003, at a cost of $687 million. An extension of approximately 1,040 feet is planned for Runway 17/35 (currently 5,460 feet), and an expansion to Concourse E is currently underway. Additionally, the ongoing master plan has identified a number of potential longer-term airfield development/expansion alternatives.

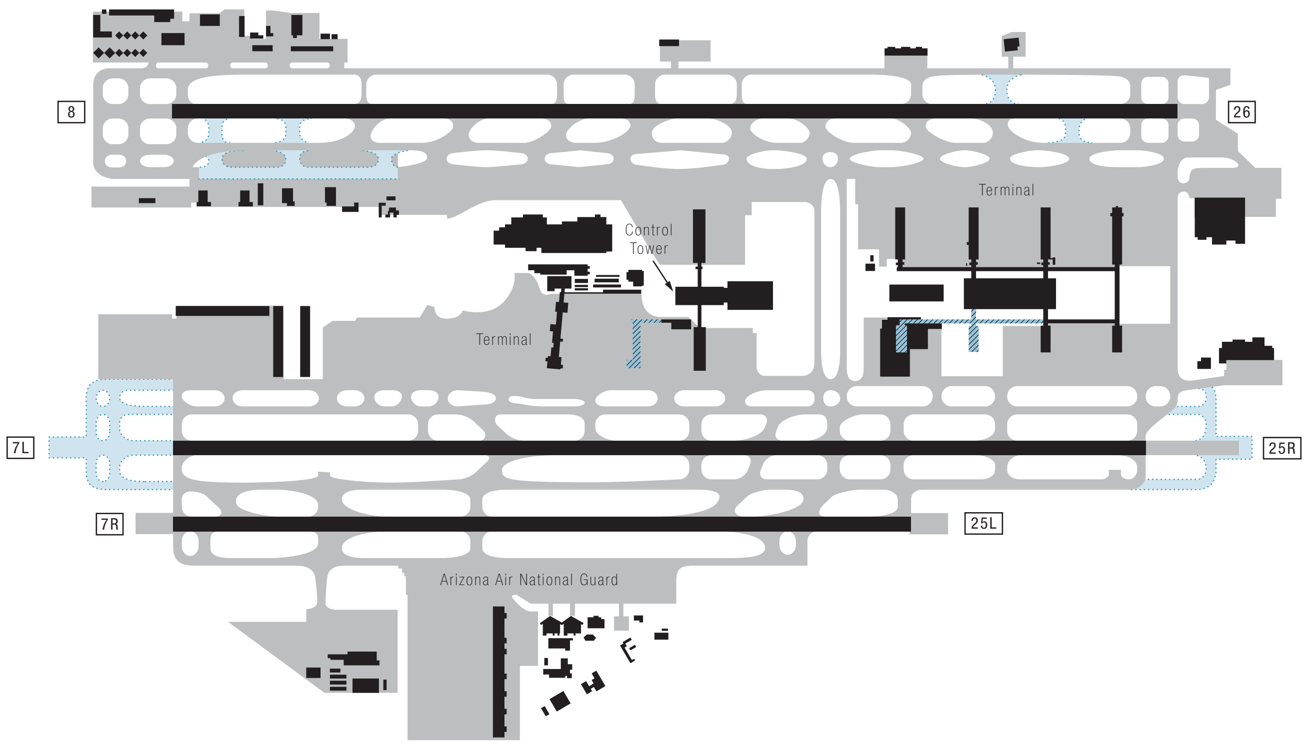


(M)	Enplanements		
	12,294,051	11,736,129	11,954,469
13.0 – 11.5	CY 00	CY 01	CY 02

(K)	Operations		
	483,567	467,183	467,717
500 – 470	CY 00	CY 01	CY 02

PHX – Phoenix Sky Harbor International Airport

Resurfacing of runway 7L/25R in concrete at a cost of $66 million scheduled to be completed in 2003. Terminal 4, N1 Concourse apron infill project completed in 2003, along with demolition of ARFF Station 19. Two new ARFF stations 19 and 26 construction completed fall 2002. New ATCT east of Terminal 3 groundbreaking fall 2003 with scheduled completion mid-2005 at a cost of $54 million. International pedestrian walkway project to be completed fall 2003 at a cost of $16.2 million. Consolidation rental car facility west of Airport is in design and development stages with on-site construction beginning end if 2003, completion in late 2005, at a cost of $252 million. Initial design stages of automated people mover $700 million project schedule for completion 2011. Proposed future reconstruction of Taxiway Sierra bridge.



Proposed Runway and Runway Extension

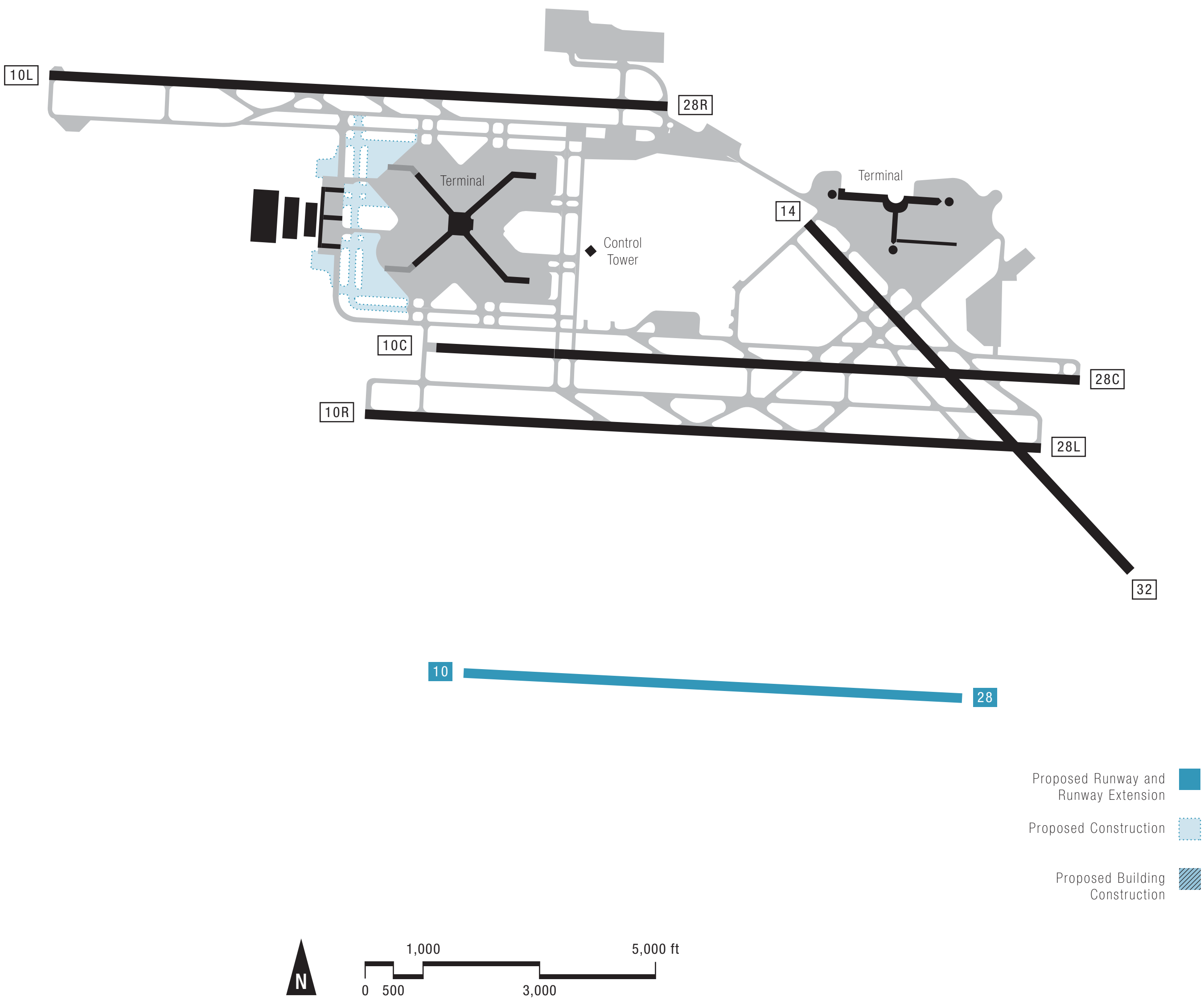
Proposed Construction

Proposed Building Construction

(M)	Enplanements			(K)	Operations		
19 / 17	18,094,251	17,478,622	17,271,519	660 / 560	638,757	606,666	590,329
	CY 00	CY 01	CY 02		CY 00	CY 01	CY 02

PIT – Greater Pittsburgh International Airport

The ongoing Master Plan has recommended that at least two new runways will be needed within a 20-year planning period to accommodate projected Baseline (normal growth) forecast demands and achieve acceptable aircraft delay times and associated delay costs. The southern parallel will be located approximately 4,300 ft. south of existing Runway 10R/28L and should be operational by the time the airport reaches 495,000 annual aircraft operations. The Master Plan was completed in 2001.

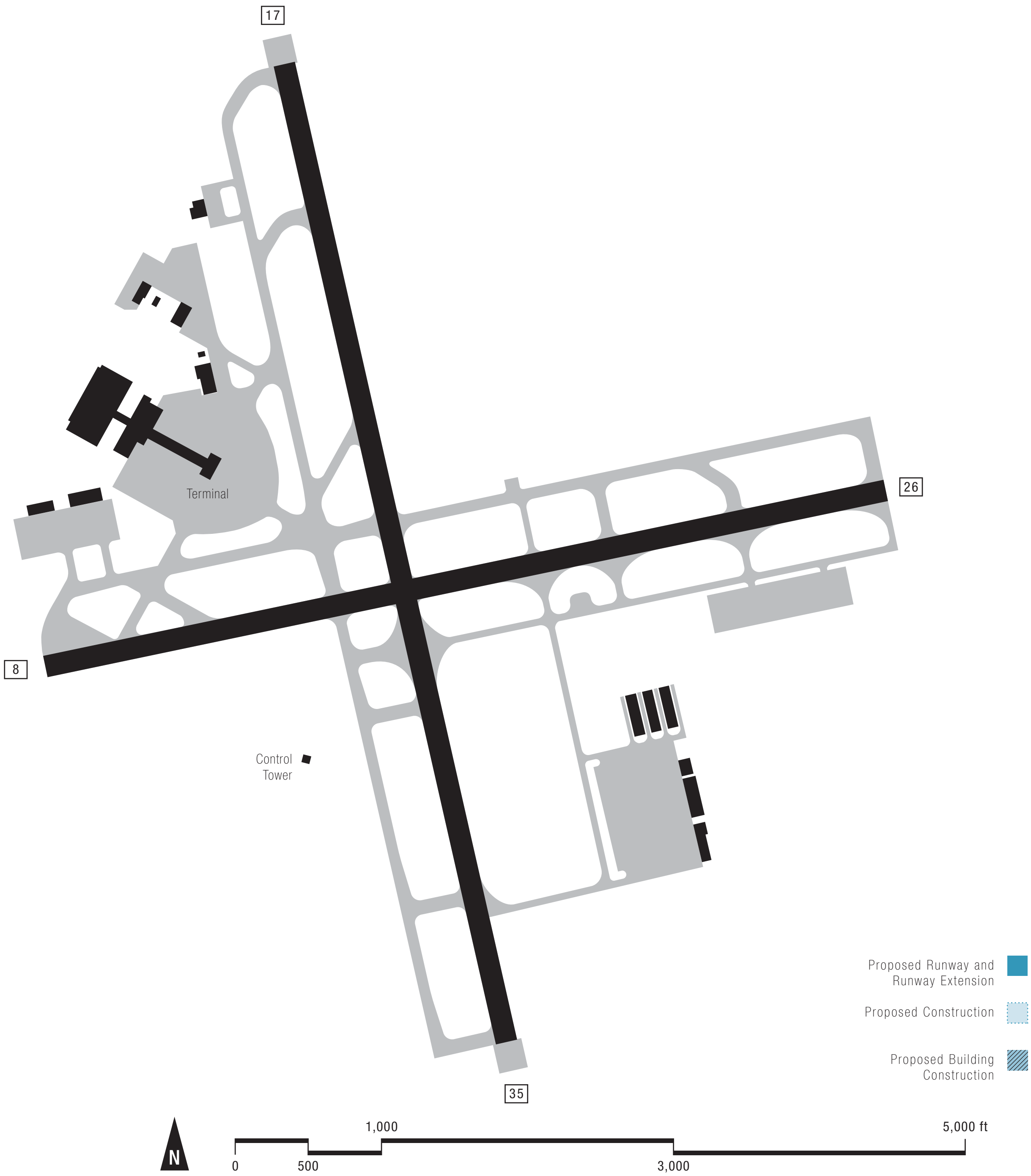


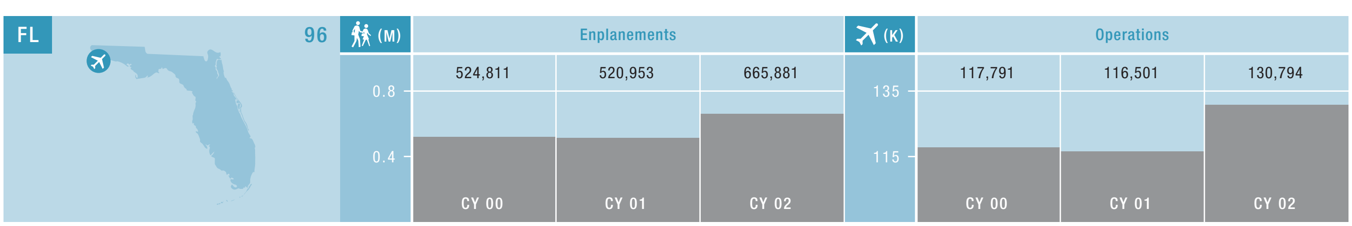
(M)	Enplanements		
	9,871,995	9,939,223	8,975,111
	CY 00	CY 01	CY 02

(K)	Operations		
	448,181	451,180	424,977
	CY 00	CY 01	CY 02

PNS – Pensacola Regional Airport

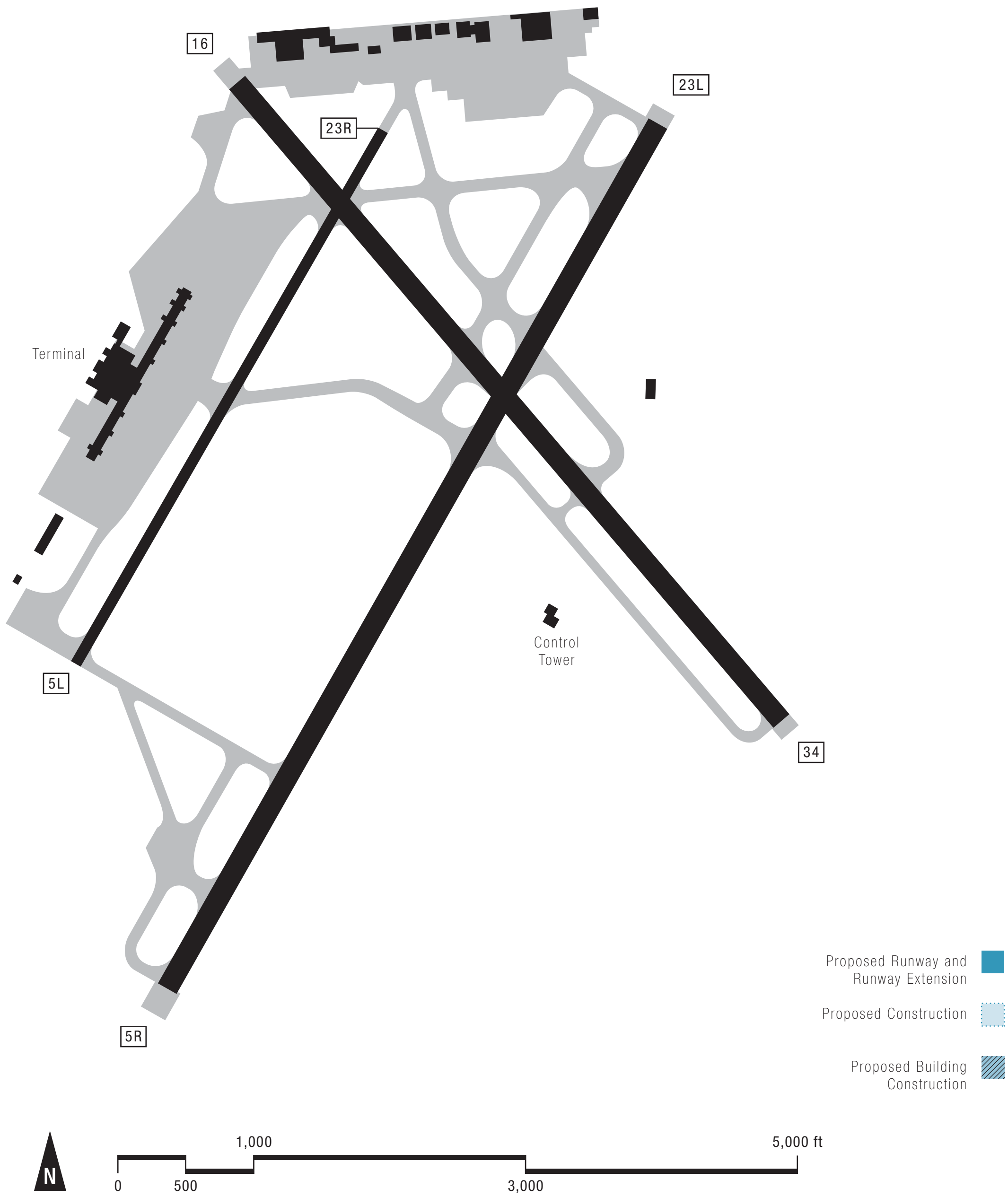
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.

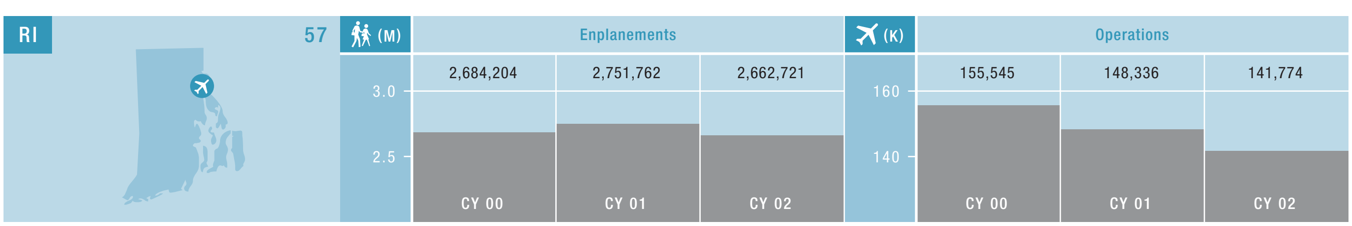




PVD – T.F. Green Airport

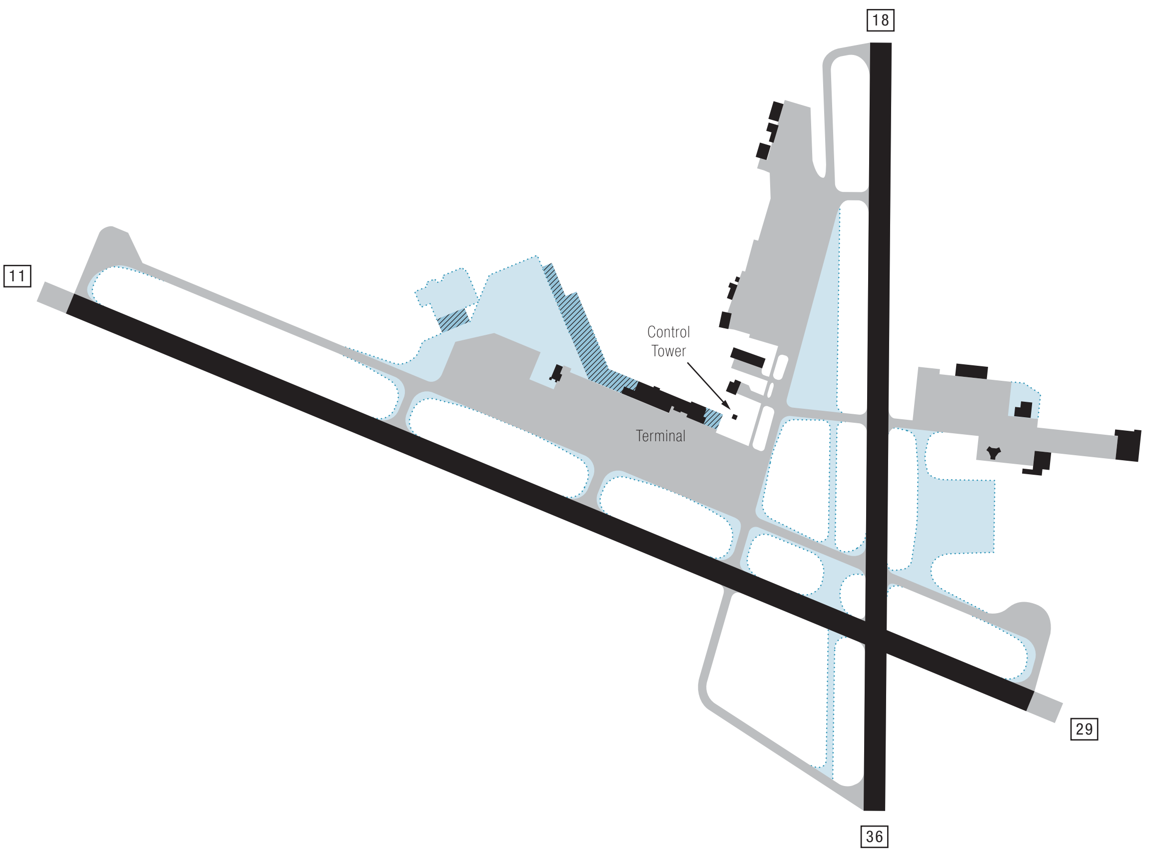
Runway 5L/23R is planned to be decommissioned during June of 2003. It will be utilized as full length taxiway. T.F. Green Airport is currently in the process of updating its airport master plan.





PWM – Portland International Jetport

The design is completed for a 400 ft. extension to the west end of runway 11/29, an upgrade to CAT III for runway 11/29, and complete rehabilitation of runway 11/29 and associated taxiways. Construction of the 11/29 runway extension will begin in 2002.



Proposed Runway and Runway Extension

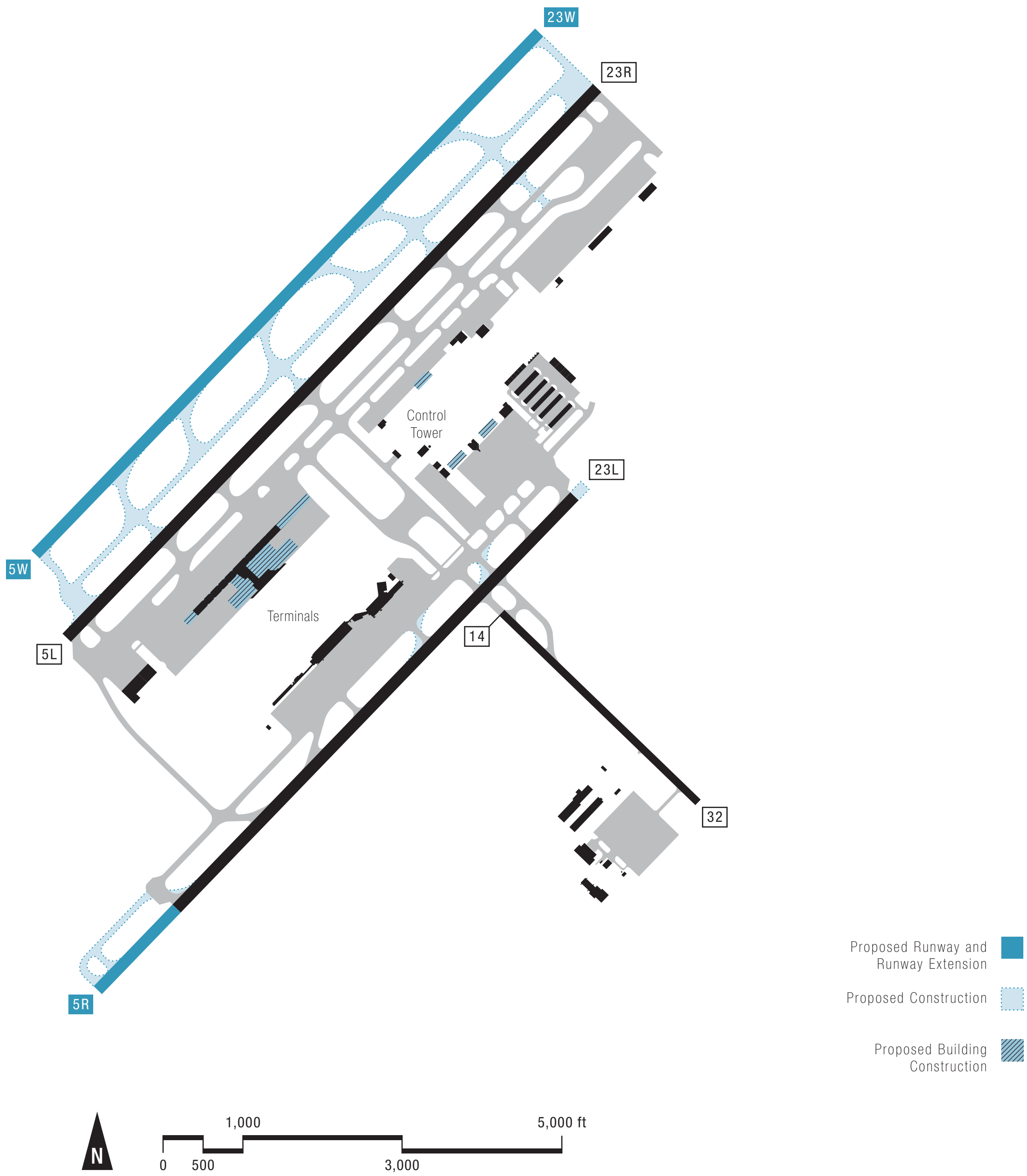
Proposed Construction

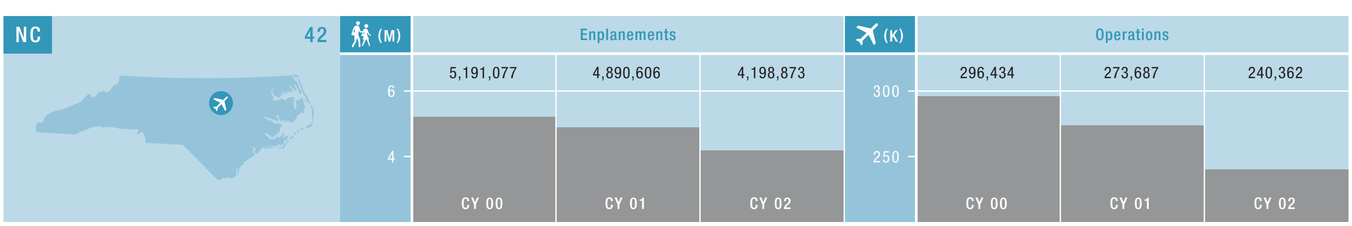
Proposed Building Construction

	Enplanements (M)			Operations (K)		
	CY 00	CY 01	CY 02	CY 00	CY 01	CY 02
Value	668,098	625,591	623,093	106,252	112,043	102,630

RDU – Raleigh-Durham International Airport

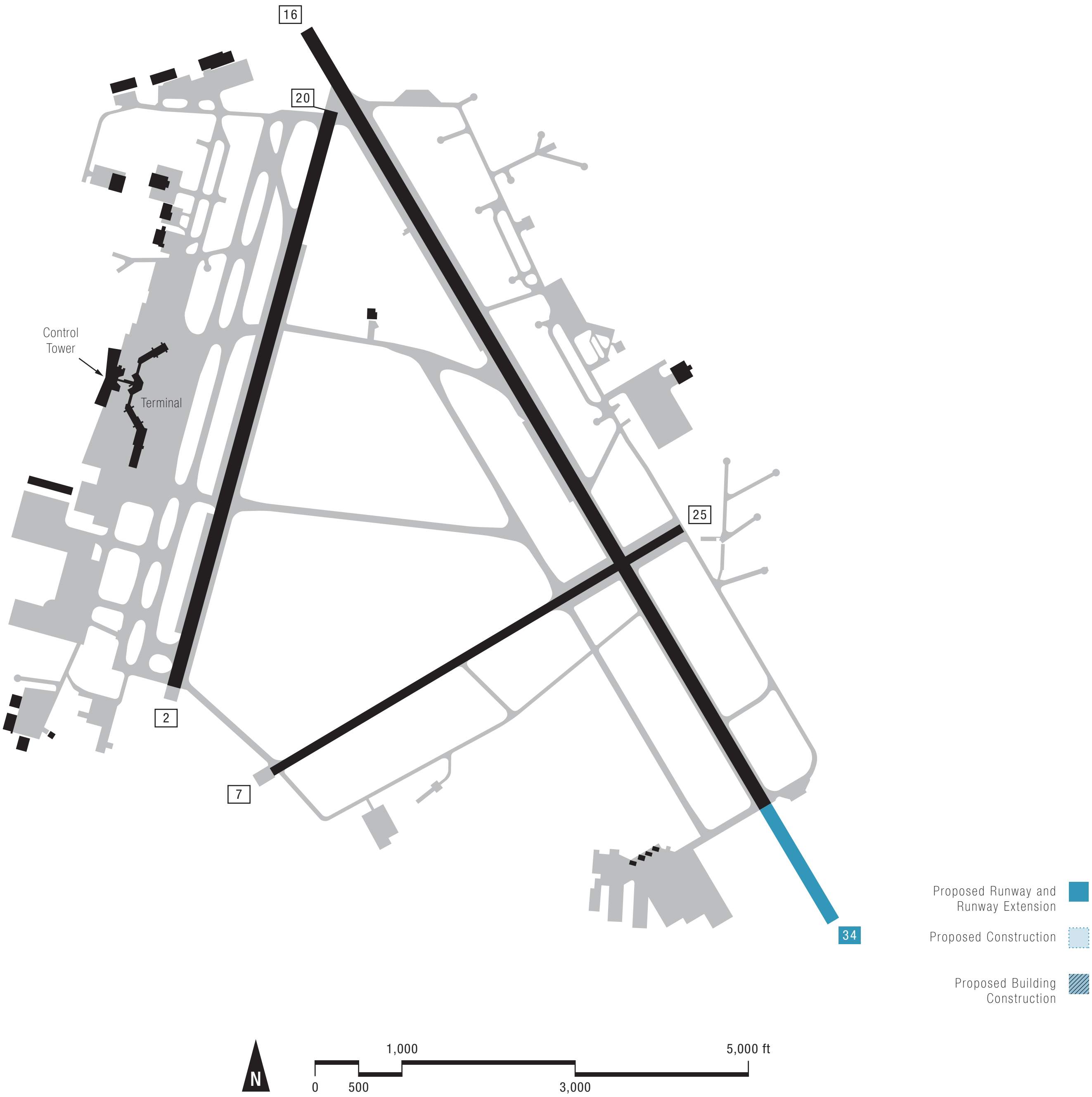
A new 8,000-ft. parallel Runway 5W/23W, located 3,000-4,300 ft. west of existing Runway 5L/23R, is planned for the future (beyond 2005). Also, a 1,500-ft. runway extension to the south end of existing Runway 5R/23L is planned following the construction of the new runway. This would bring the total useable length for landings and take-offs to 9,000 ft.

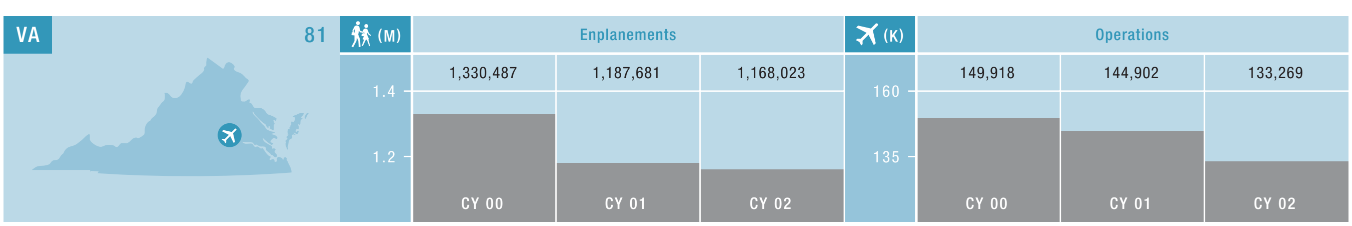




RIC – Richmond International Airport

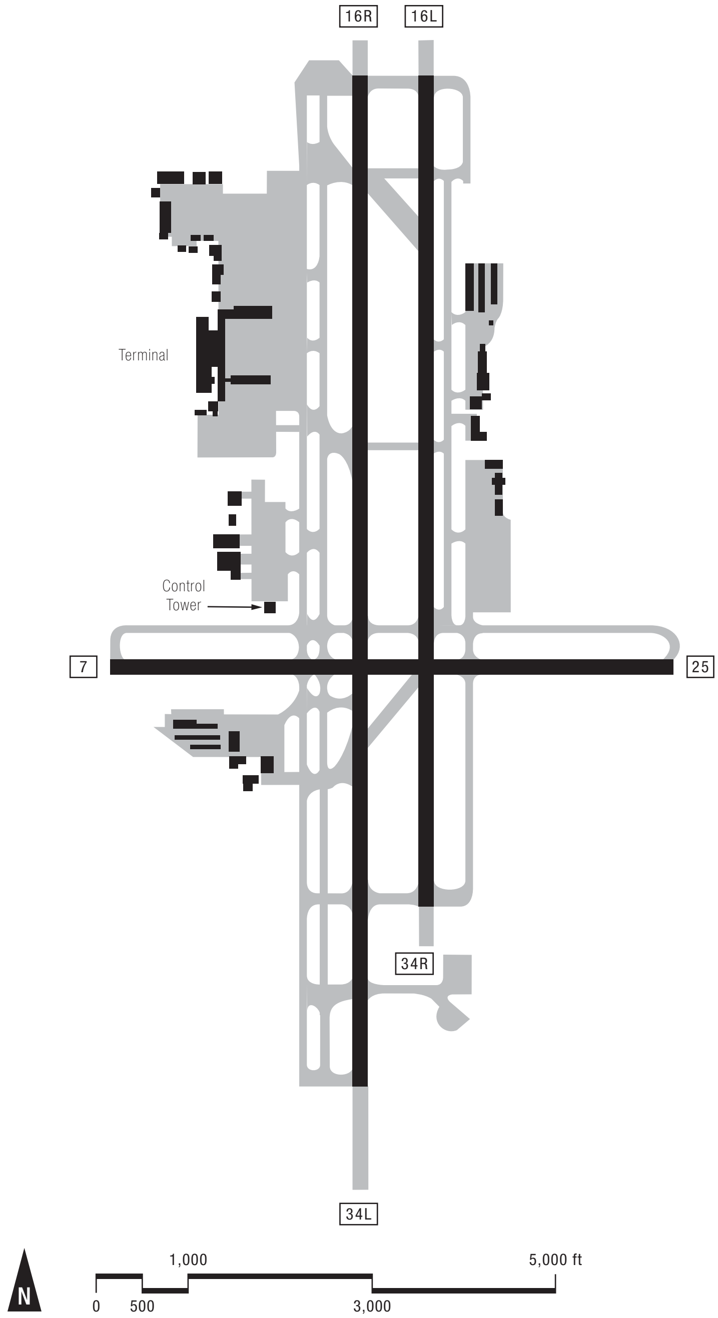
An extension of Runway 16/34 is under design. Construction has been delayed until after 2005.





RNO – Reno Tahoe International Airport

There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.



Proposed Runway and Runway Extension

Proposed Construction

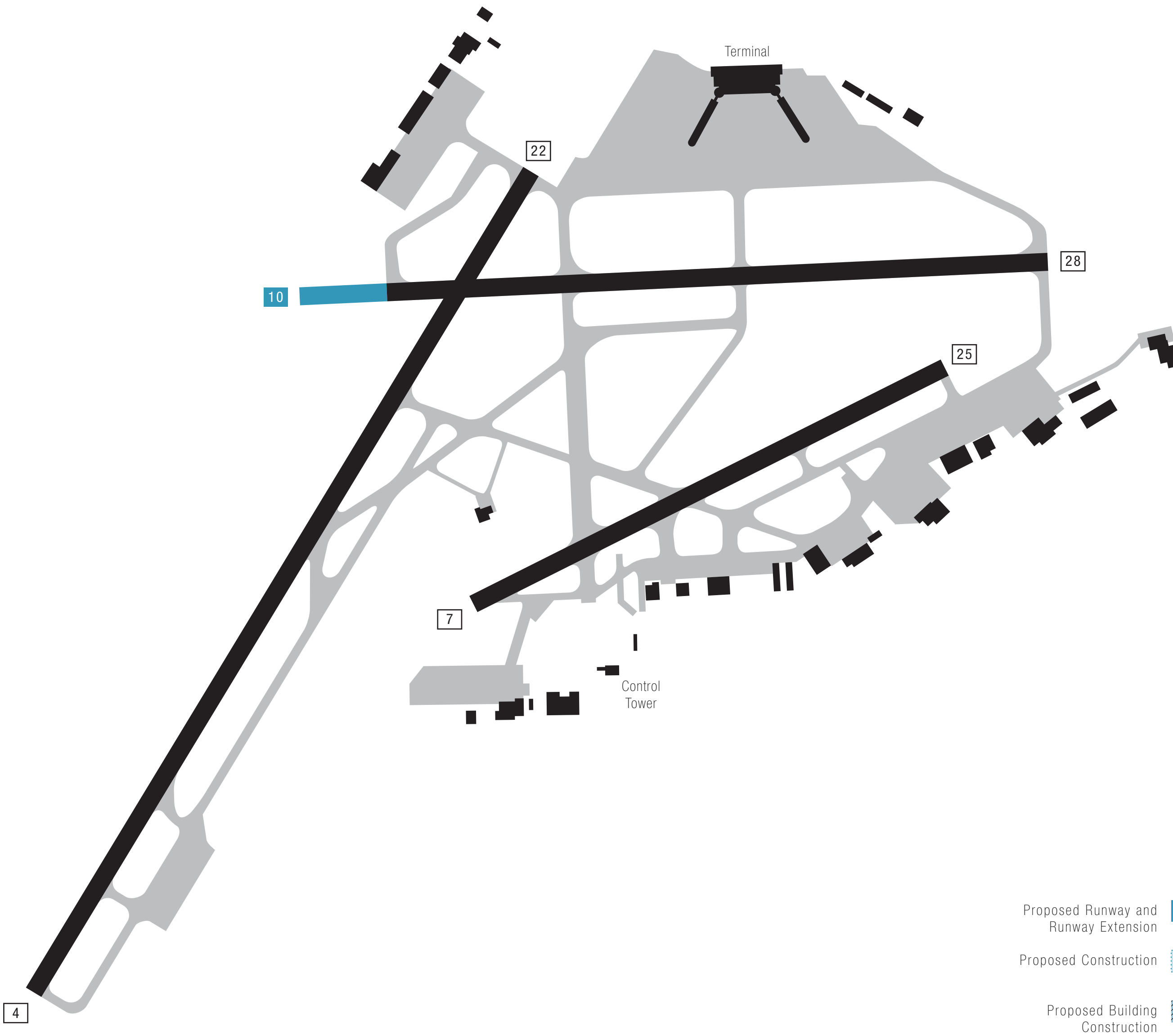
Proposed Building Construction

NV 62

	Enplanements (M)			Operations (K)		
	CY 00	CY 01	CY 02	CY 00	CY 01	CY 02
	2,732,837	2,388,923	2,170,828	149,873	139,663	145,036

ROC – Greater Rochester International Airport

There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.



Proposed Runway and Runway Extension

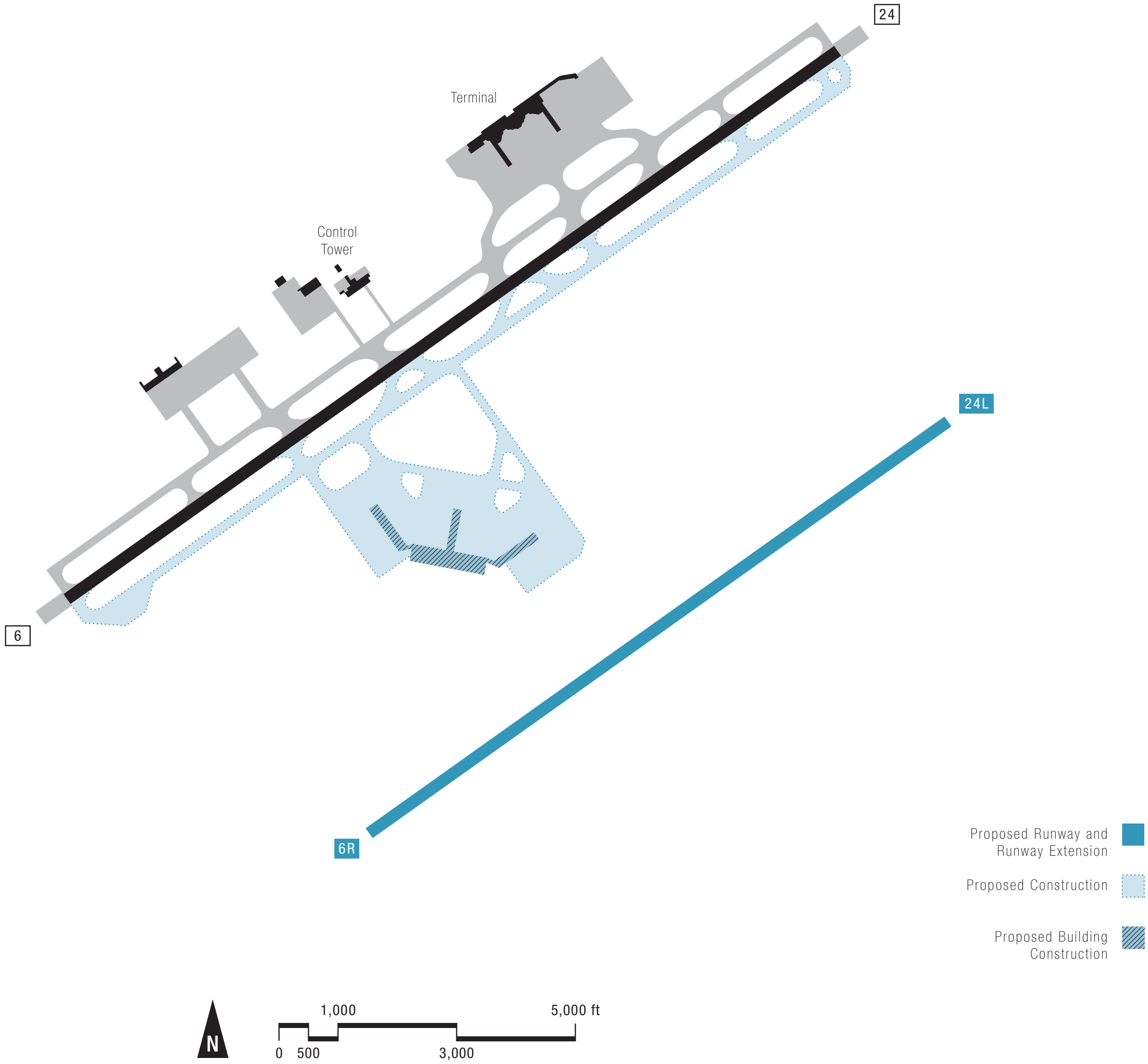
Proposed Construction

Proposed Building Construction

(M)	Enplanements			(K)	Operations		
	1,218,403	1,132,597	1,176,736		178,930	168,868	145,509
1.3				180			
1.1				150			
	CY 00	CY 01	CY 02		CY 00	CY 01	CY 02

RSW – Fort Myers Southwest Florida International Airport

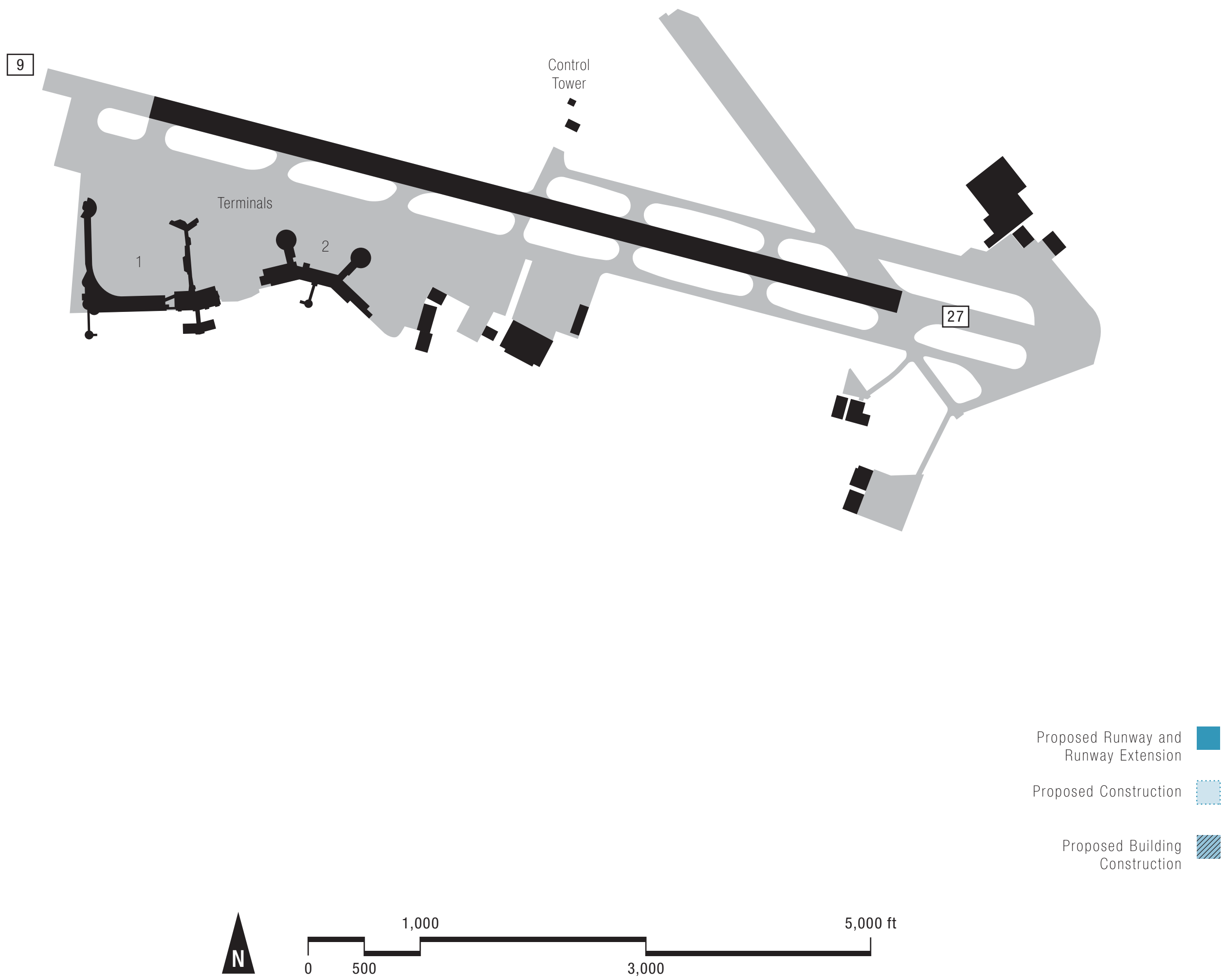
Planning is ongoing for a new 9,100 ft. parallel Runway 6R/24L, 5,385 ft. or more southeast of Runway 6/24. Construction is expected to begin in 2010. The new runway should be operational by 2012. The estimated cost of the project is $120 million.



FL	58	Enplanements (M)			Operations (K)		
		CY 00	CY 01	CY 02	CY 00	CY 01	CY 02
		2,574,322	2,596,005	2,551,187	77,376	75,779	74,152

SAN – San Diego International Lindbergh Field

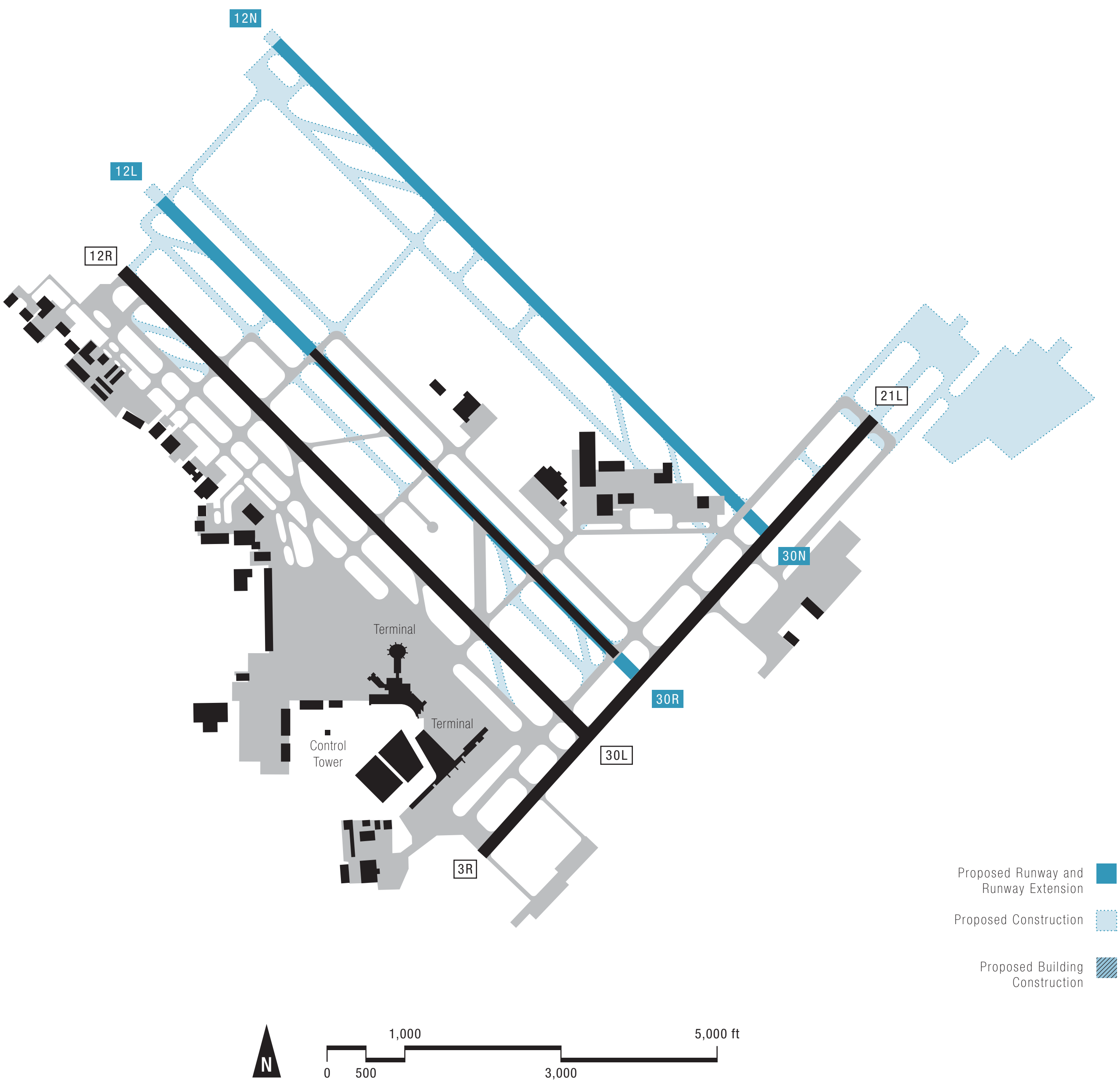
There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.



	Enplanements (M)			Operations (K)		
	CY 00	CY 01	CY 02	CY 00	CY 01	CY 02
	7,898,360	7,506,320	7,392,389	207,916	206,848	206,605

SAT – San Antonio International Airport

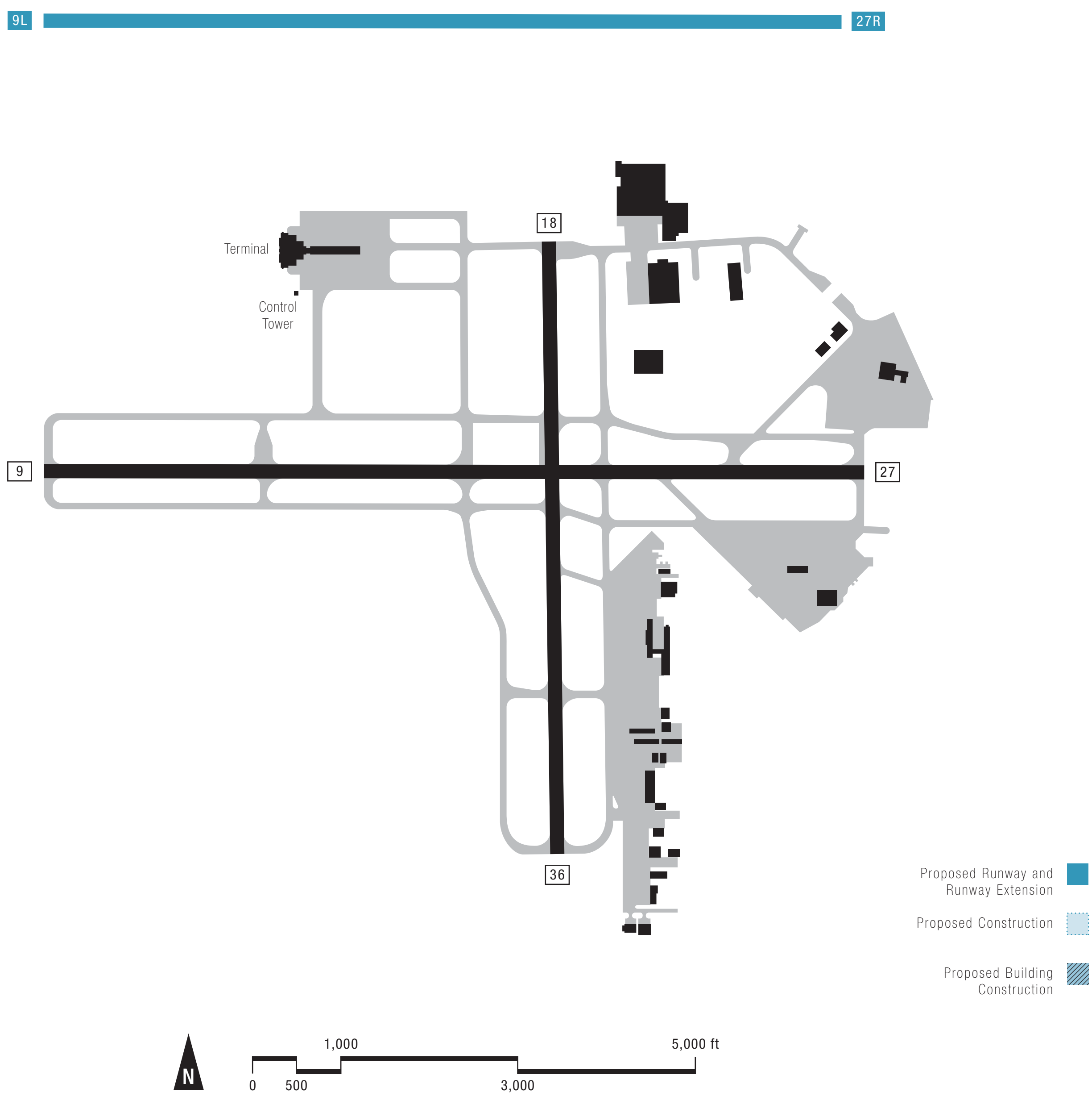
Reconstruction and extension of 12L/30R for air carrier operations is planned for completion by 2006. A third parallel runway, Runway 12N/30N, is in the long term planning, within 5-10 years. Taxiway and cargo ramp expansion were completed in 2000. Expansion of the terminal to 29 gates is planned for 2002.

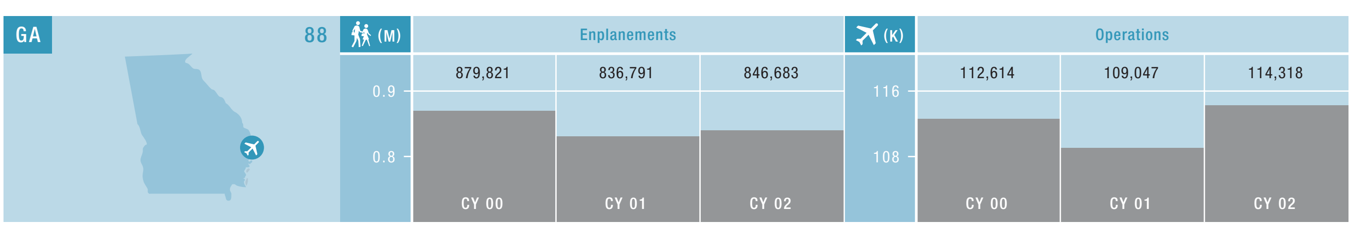


TX	48	(M)	Enplanements			(K)	Operations		
			3,528,955	3,313,545	3,224,764		246,200	236,102	234,261
		3.6 / 3.3	CY 00	CY 01	CY 02	260 / 230	CY 00	CY 01	CY 02

SAV – Savannah International Airport

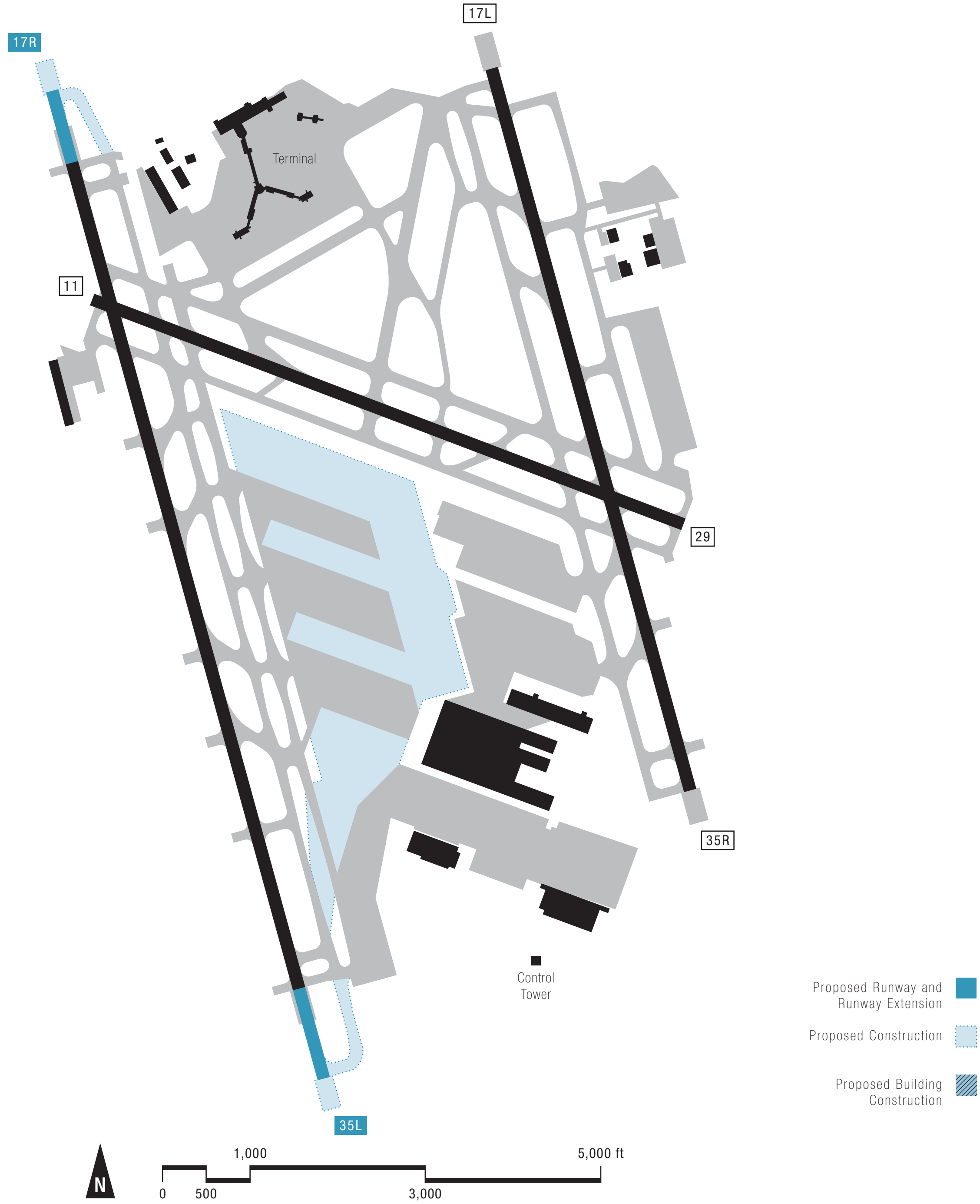
A new 9,000 ft. parallel Runway 9L/27R, approximately 5,000 ft. north of Runway 9/27, is expected to be constructed by 2020, with an estimated cost of $20 million. This runway would allow independent parallel operations, thereby potentially doubling hourly capacity.

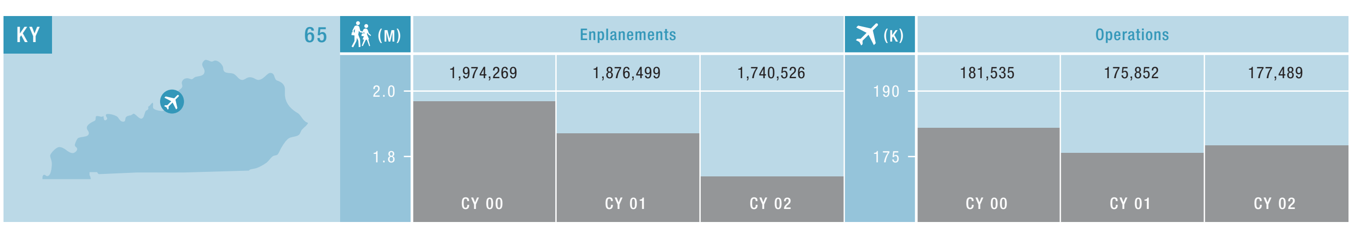




SDF – Louisville International Airport

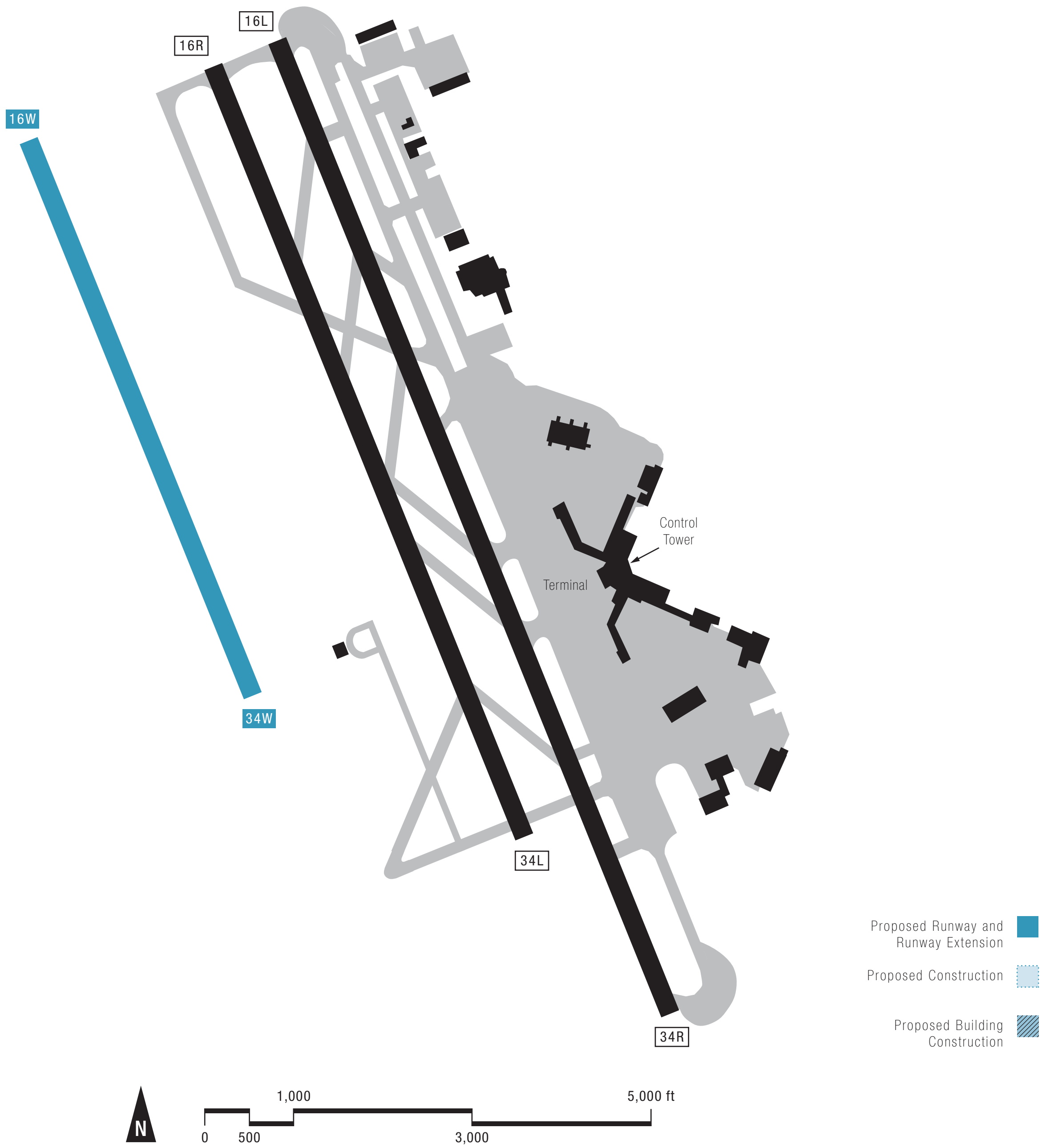
Runway 17R/35L will be extended on both ends for a total extension length of 1890 feet. The project will start in 2003 and be complete late 2004, at a cost of $18 million.





SEA – Seattle-Tacoma International Airport

Airport improvements include a new Runway 16W/34W, 8,500 ft. in length, which will be located 2,500 ft. from Runway 16L/34R. Construction began in 1999. The runway will be completed by 2006 at a cost of $773.0 million.

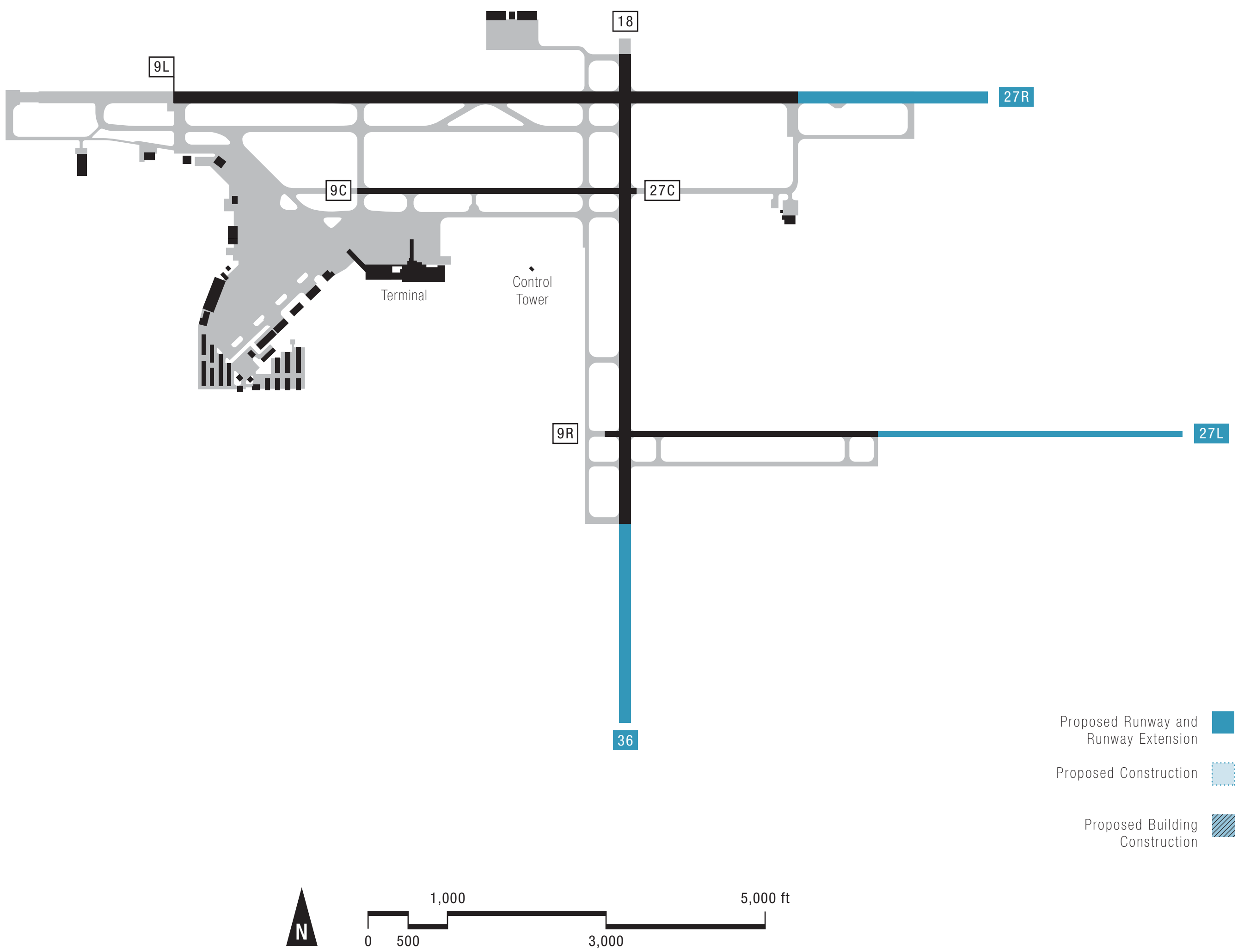


WA 15

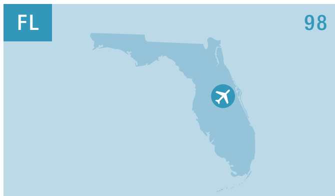
	Enplanements (M)	Operations (K)
CY 00	13,875,942	445,677
CY 01	13,184,630	400,670
CY 02	12,969,024	364,671

SFB – Orlando-Sanford Airport

Runway 9C/27C, completed in 1998 at a cost of $6.5 million, was approved for permanent use in 2001 by the FAA, following completion of an Environmental Assessment. Future plans include extending Runway 9R/27L to 7,400 ft. for completion by 2005 at an estimated cost of $14 million, and then reconstructing this runway by 2006 at an estimated cost of $4 million. Long term plans include extending Runway 18/36 to 8,500 ft., for completion by 2007 at an estimated cost of $6 million, and extending 9L/27R to 12,000 ft. beyond 2007.



FL 98

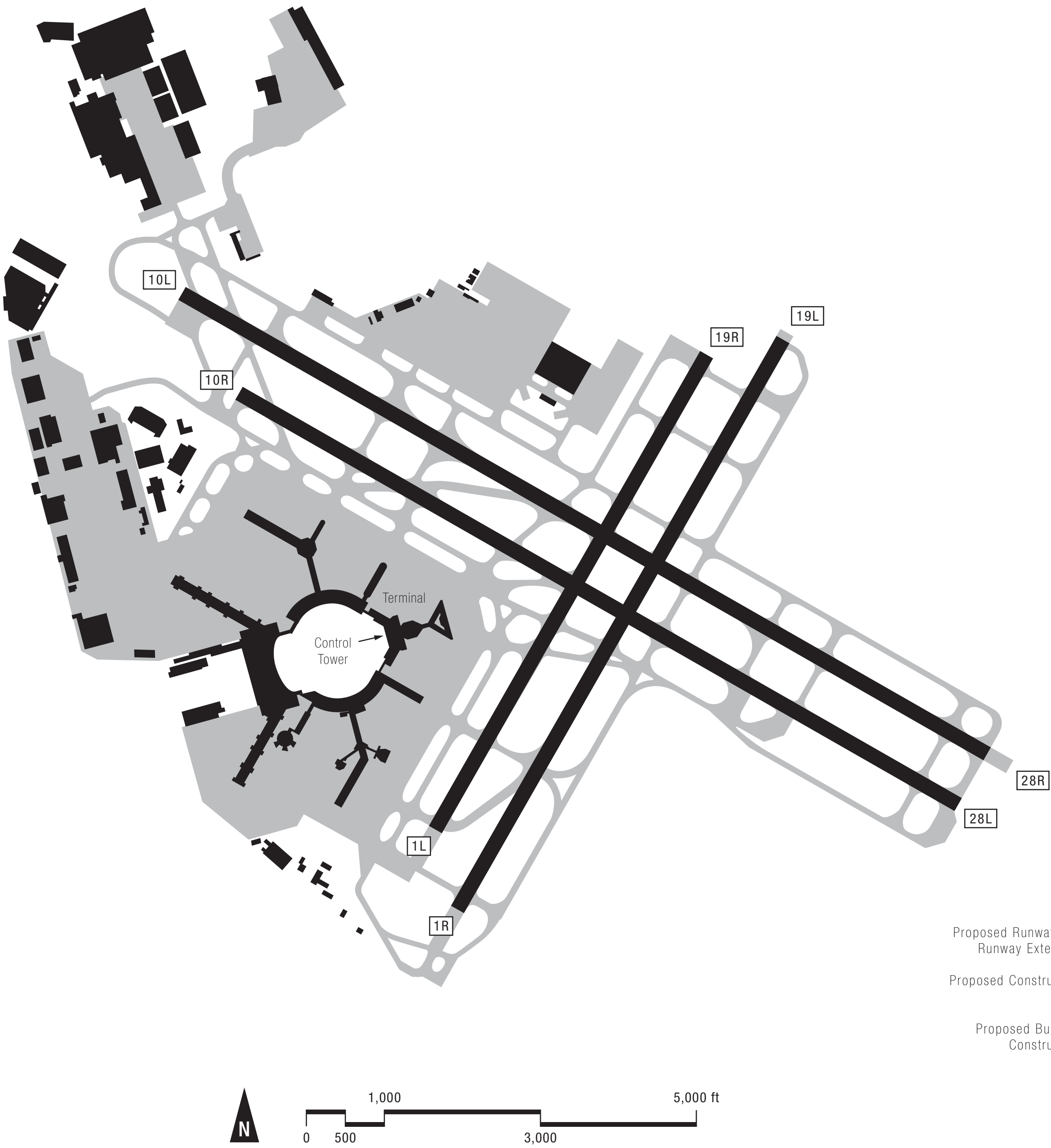


Enplanements (M)	CY 00	CY 01	CY 02
	508,092	645,944	648,144

Operations (K)	CY 00	CY 01	CY 02
	371,784	397,557	373,277

SFO – San Francisco International Airport

There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.



Proposed Runway and Runway Extension

Proposed Construction

Proposed Building Construction

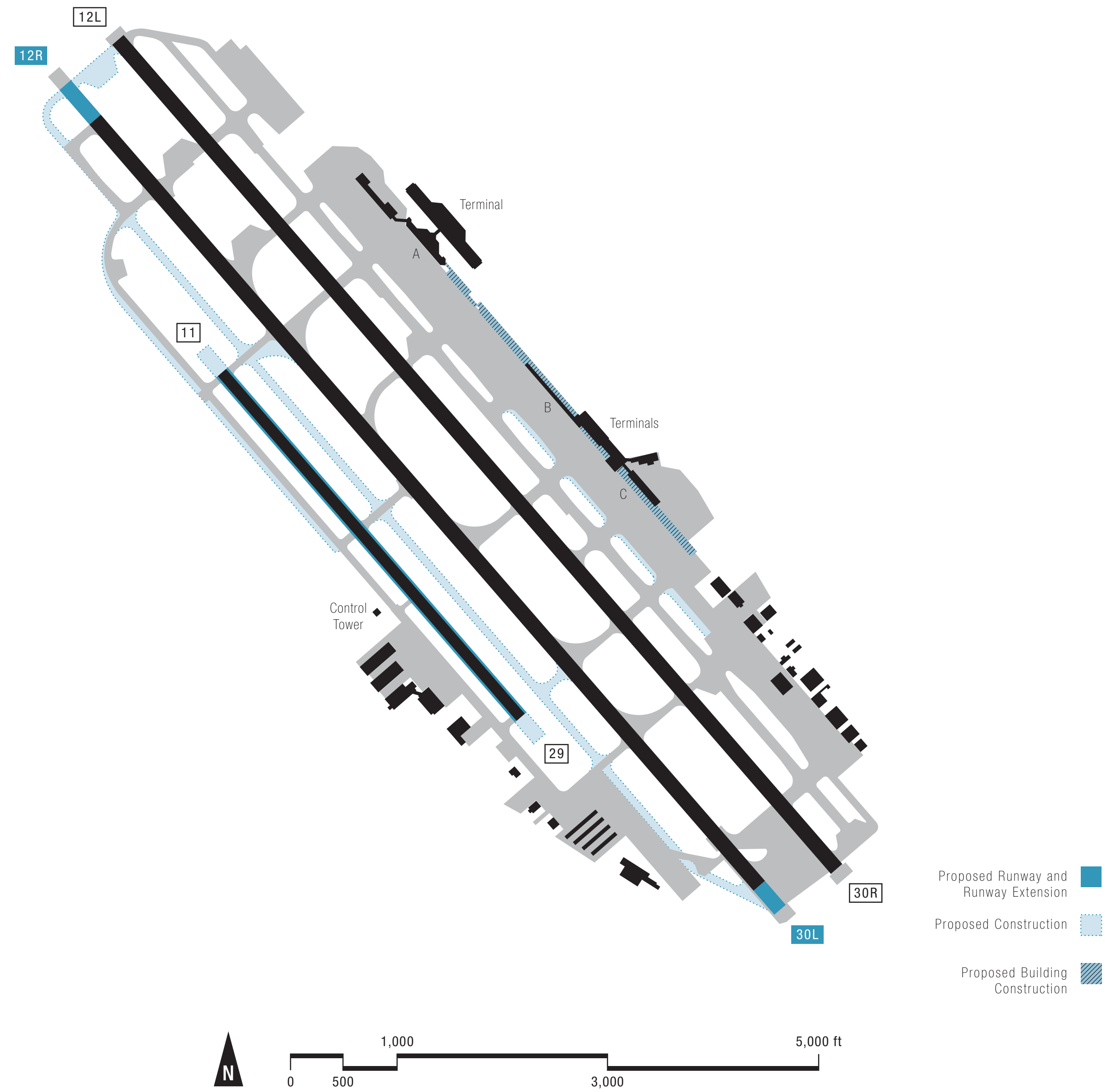
CA 11

(M)	Enplanements		
	19,556,795	16,475,611	14,736,137
20 – 16	CY 00	CY 01	CY 02

(K)	Operations		
	430,554	387,599	351,453
440 – 370	CY 00	CY 01	CY 02

SJC – Norman Y. Mineta San José International Airport

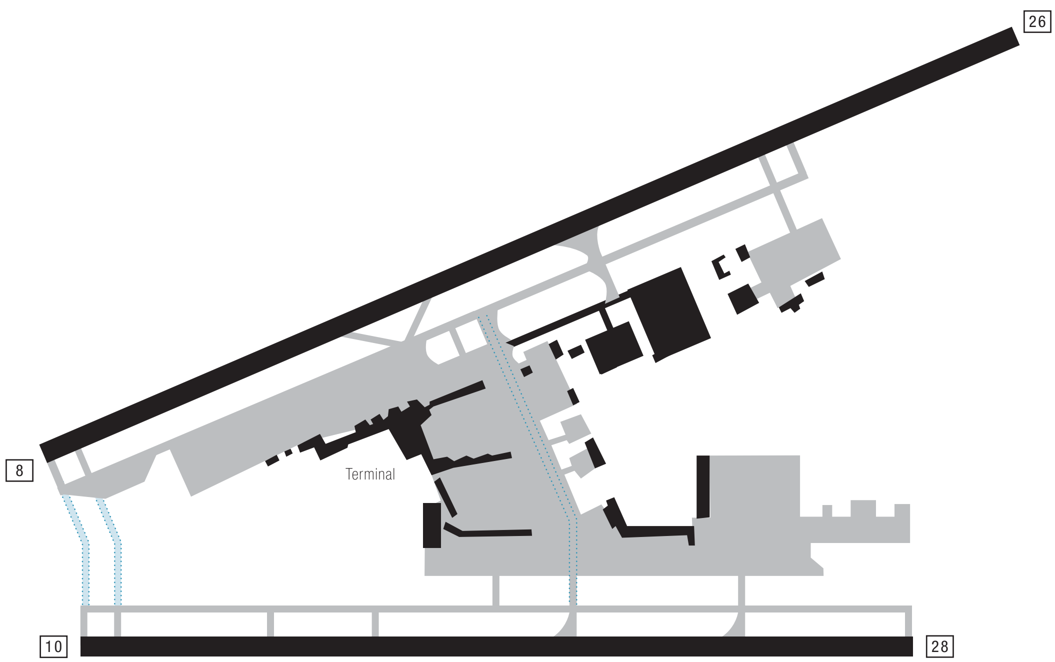
Extension, widening and strengthening of Runway 12L/30R was completed in August 2001 at a cost of $65 million. Reconstruction of Runway 12R/30L was completed in 2002, and the lengthening of the runway from 10,200 ft. to 11,000 ft. is planned for 2003. The estimated cost is $61.4 million.



	Enplanements (M)	Operations (K)
CY 00	6,170,384	299,844
CY 01	5,981,440	272,299
CY 02	5,248,193	223,199

SJU – San Juan Luis Muñoz Marín International Airport

There are no new runway or runway extension projects planned, proposed, or currently under construction at this airport.



Proposed Runway and Runway Extension

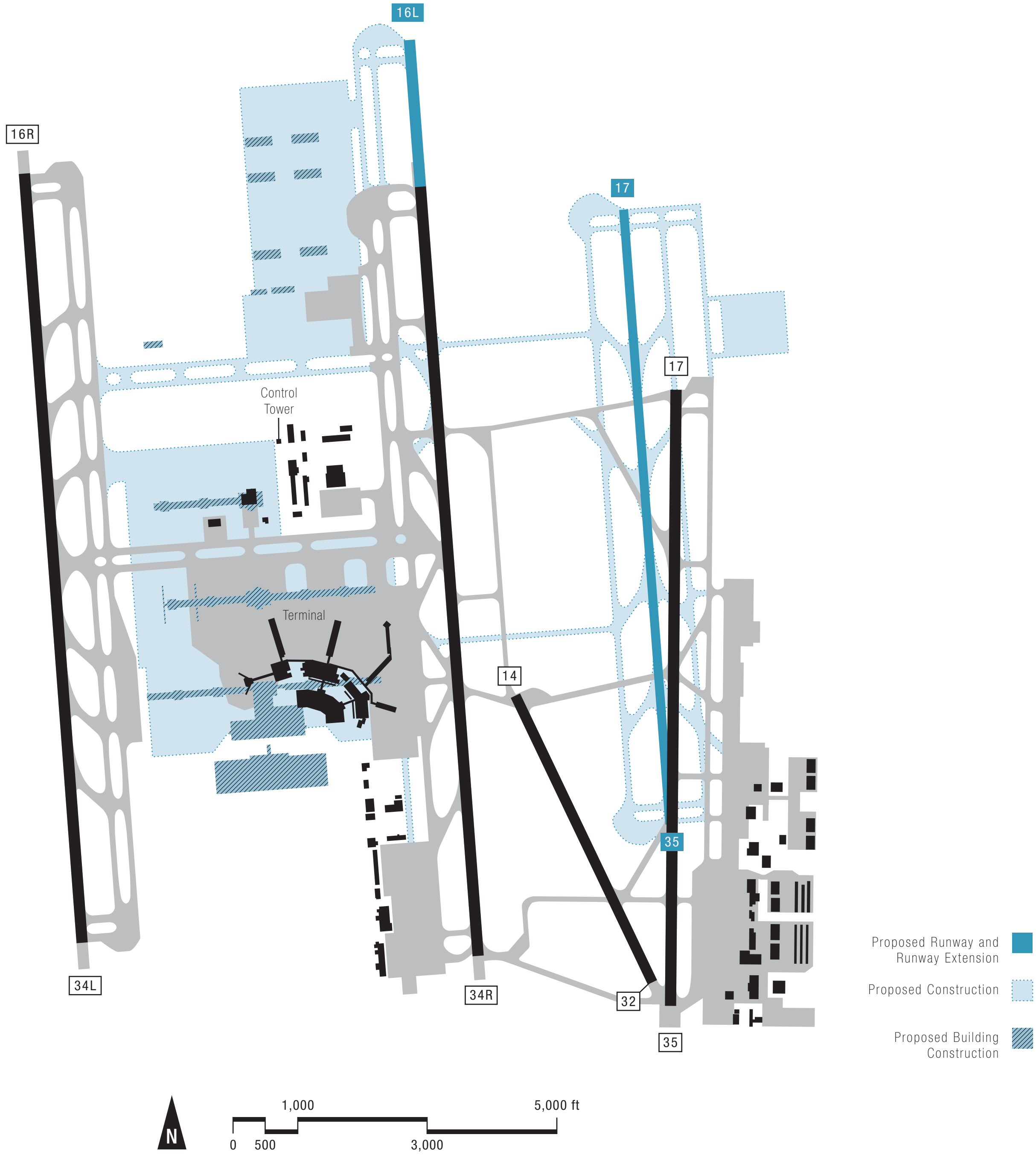
Proposed Construction

Proposed Building Construction

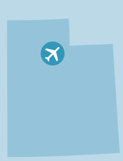
PR	39	(M)	Enplanements			(K)	Operations		
		5.2 / 4.7	5,135,591	4,706,307	4,607,290	240 / 190	236,903	205,976	203,137
			CY 00	CY 01	CY 02		CY 00	CY 01	CY 02

SLC – Salt Lake City International Airport

In the long-term Runway 17/35 is planned to be realigned parallel with the other two major runways. This project is identified in the 20-year master plan update.



UT 25

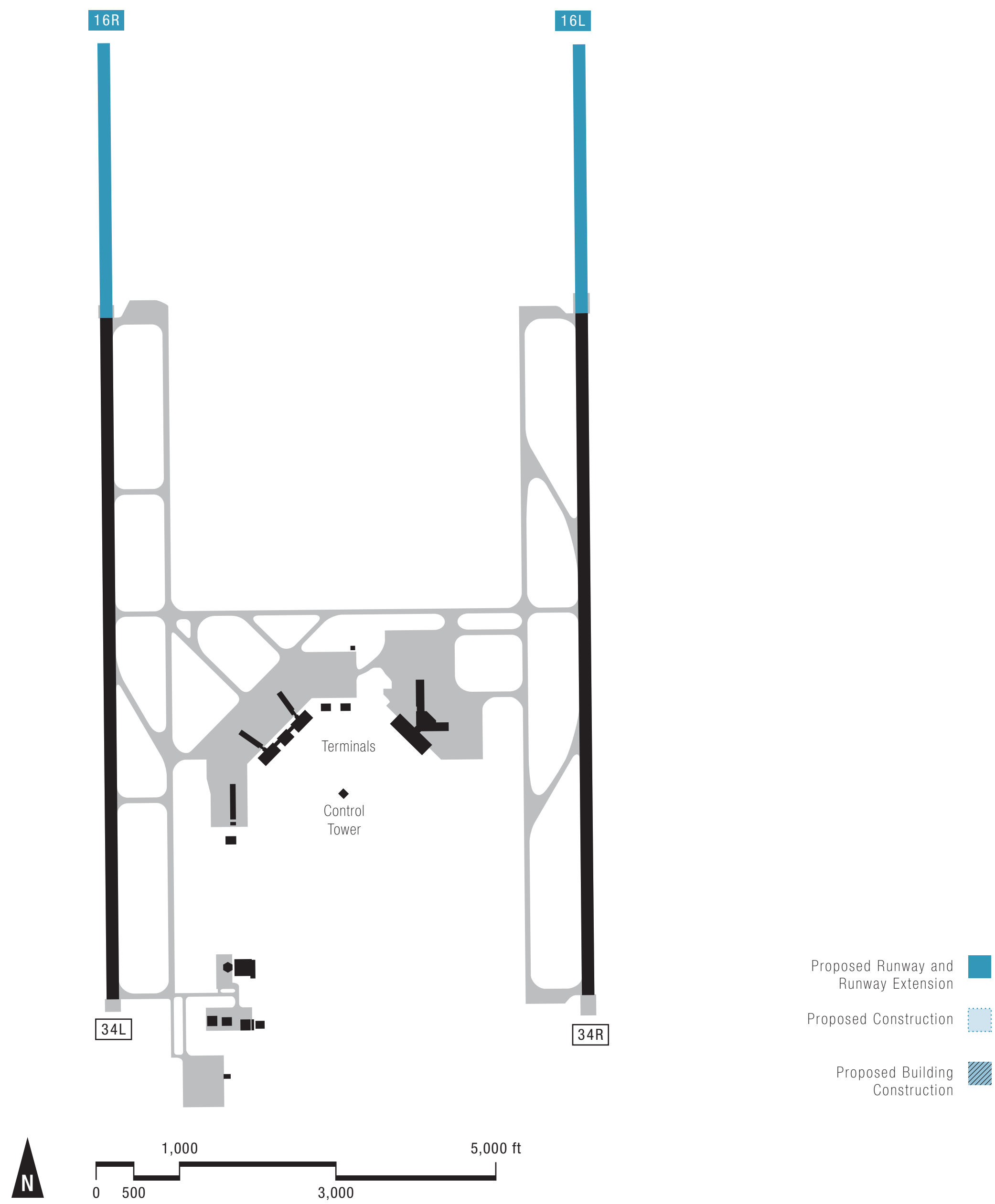


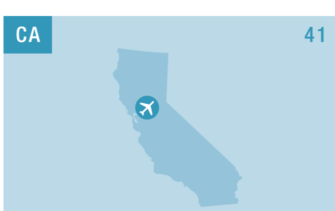
	(M) Enplanements			(K) Operations		
	CY 00	CY 01	CY 02	CY 00	CY 01	CY 02
Value	9,522,344	8,951,776	8,997,942	366,933	370,282	406,994

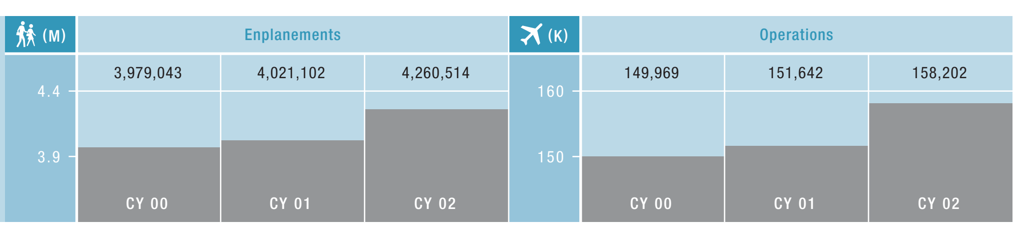
Axis: Enplanements 9–10 (M); Operations 370–420 (K)

SMF – Sacramento International Airport

A master plan update is currently in progress. A time frame for the proposed northerly extensions of Runway 16L/34R, to an ultimate length of 12,000 ft., has not yet been identified. Alternatives for the development of a third parallel runway are being considered. A third runway would not be required until beyond 2015.

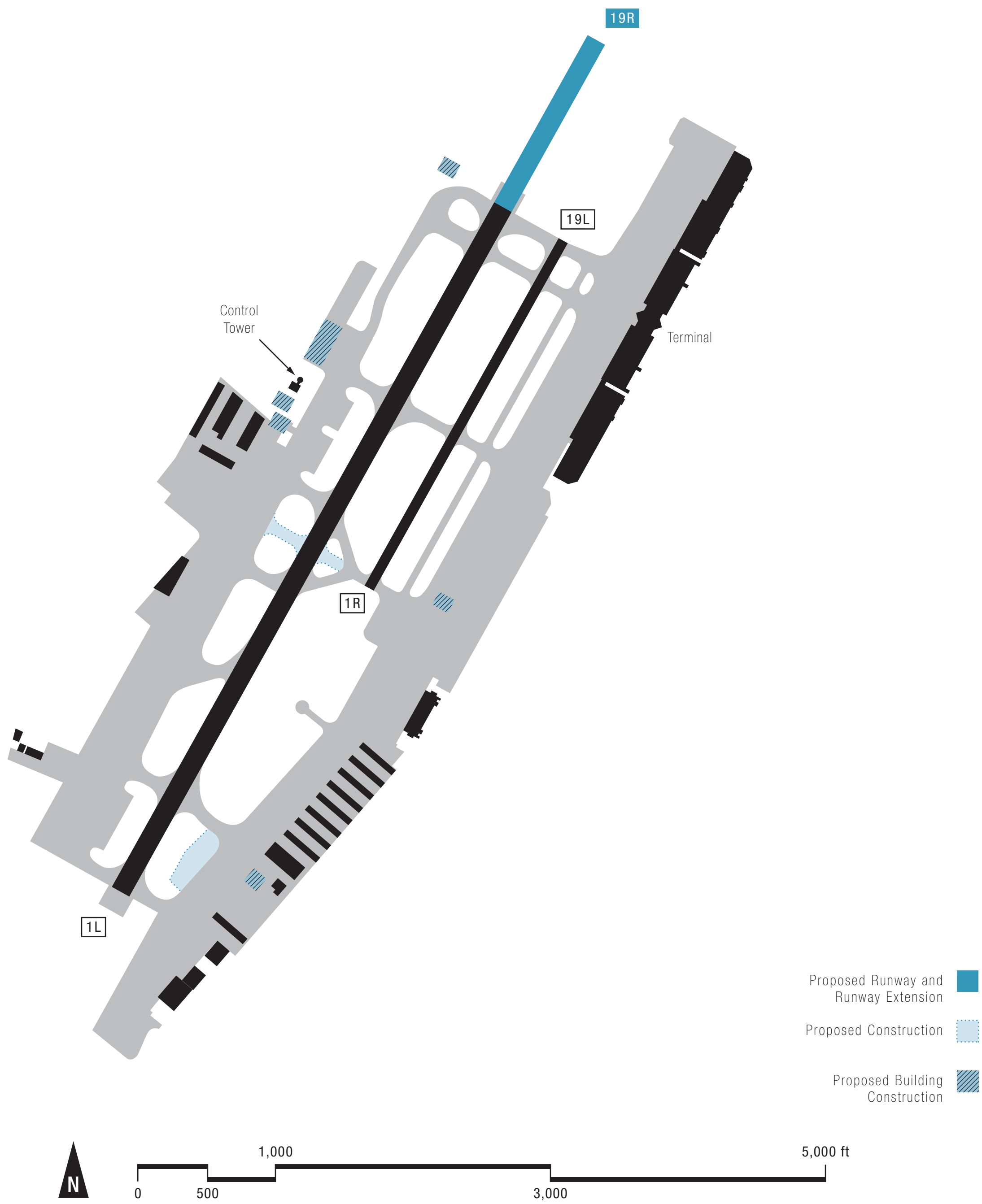






SNA – John Wayne Airport-Orange County

An extension of Runway 1L/19R has been considered, but is not included in Orange County's current airport development plans.

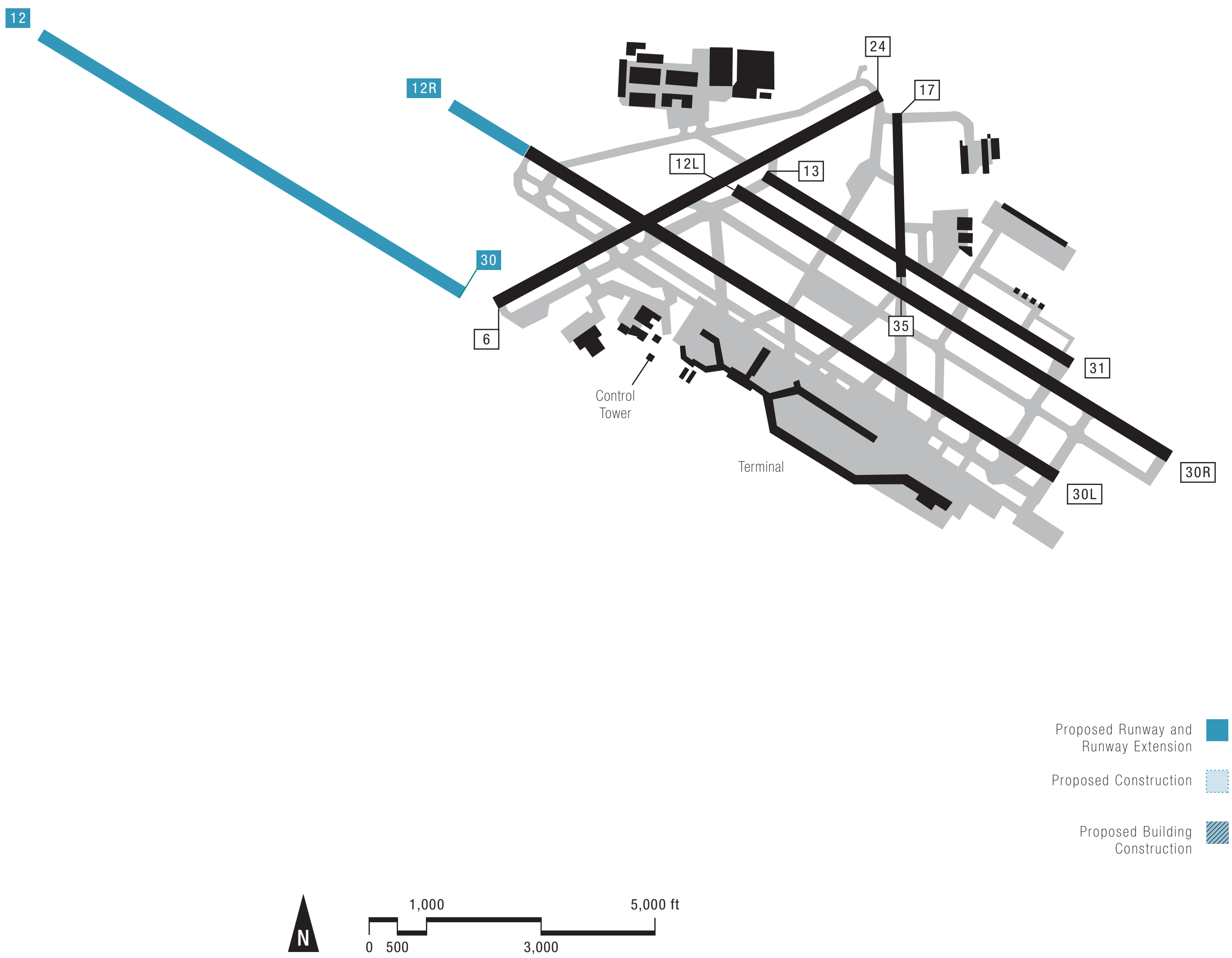


CA 44

(M)	Enplanements			(K)	Operations		
4.0 / 3.5	3,914,051	3,688,304	3,968,978	400 / 370	387,864	384,987	376,335
	CY 00	CY 01	CY 02		CY 00	CY 01	CY 02

STL – Lambert St. Louis International Airport

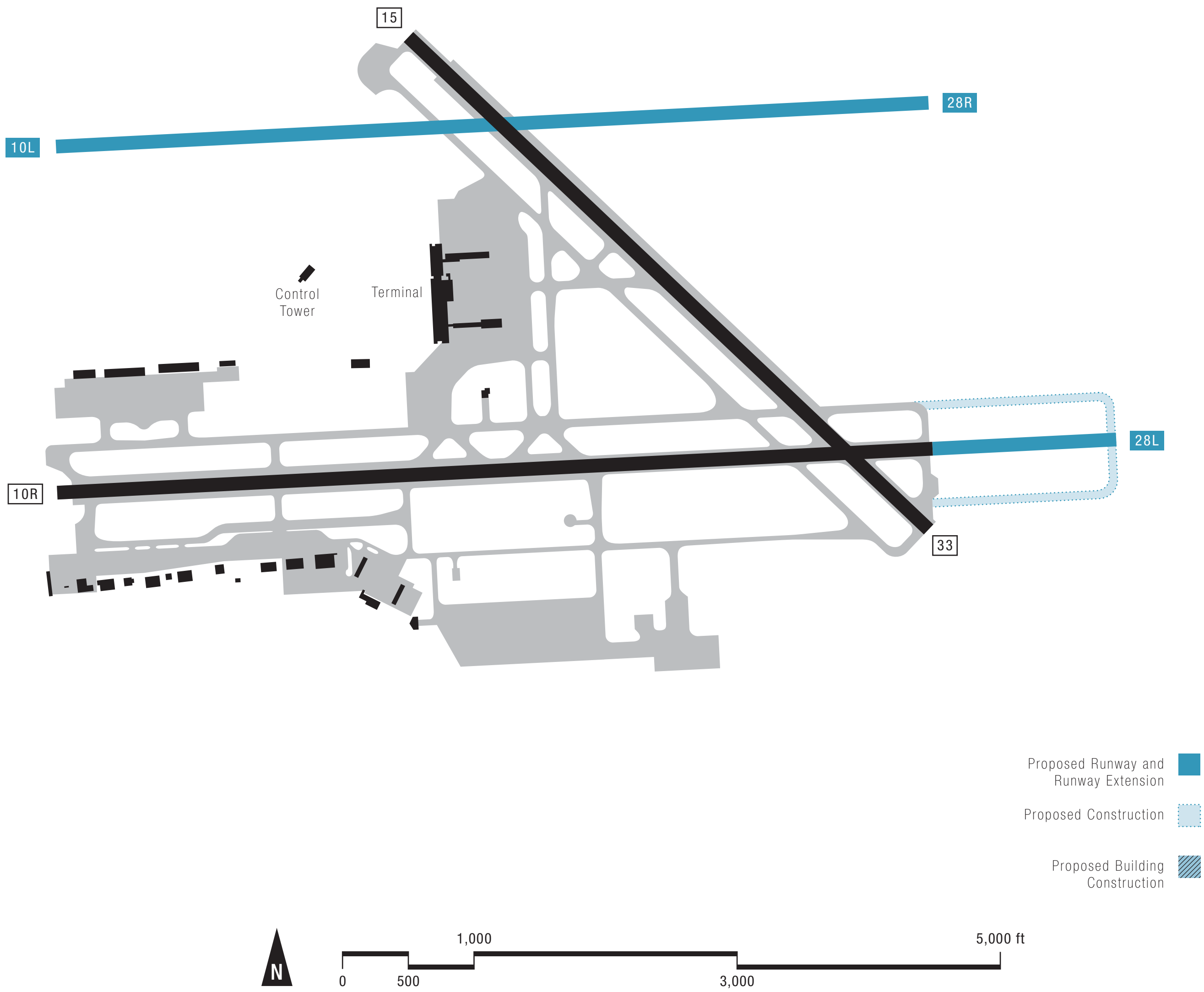
There are no new runway or runway extension projects planned, proposed, or currently under construction in this airport's Master Plan, which includes a planning period from 1995 to 2015.



(M)	Enplanements			(K)	Operations		
	15,288,493	13,264,751	12,474,566		484,224	478,947	451,804
16 / 13	CY 00	CY 01	CY 02	500 / 450	CY 00	CY 01	CY 02

SYR – Syracuse Hancock International Airport

An extension of Runway 10/28 is under consideration. Capacity analysis and needs studies are in process. If this project were undertaken, the runway would be extended 2,000 feet to an ultimate length of 11,000 ft. A parallel runway also remains under consideration. The new runway would be 9,000 ft. long, separated from existing Runway 10/28 by 3,400 ft. It would provide independent parallel IFR operations, doubling hourly IFR arrival capacity.

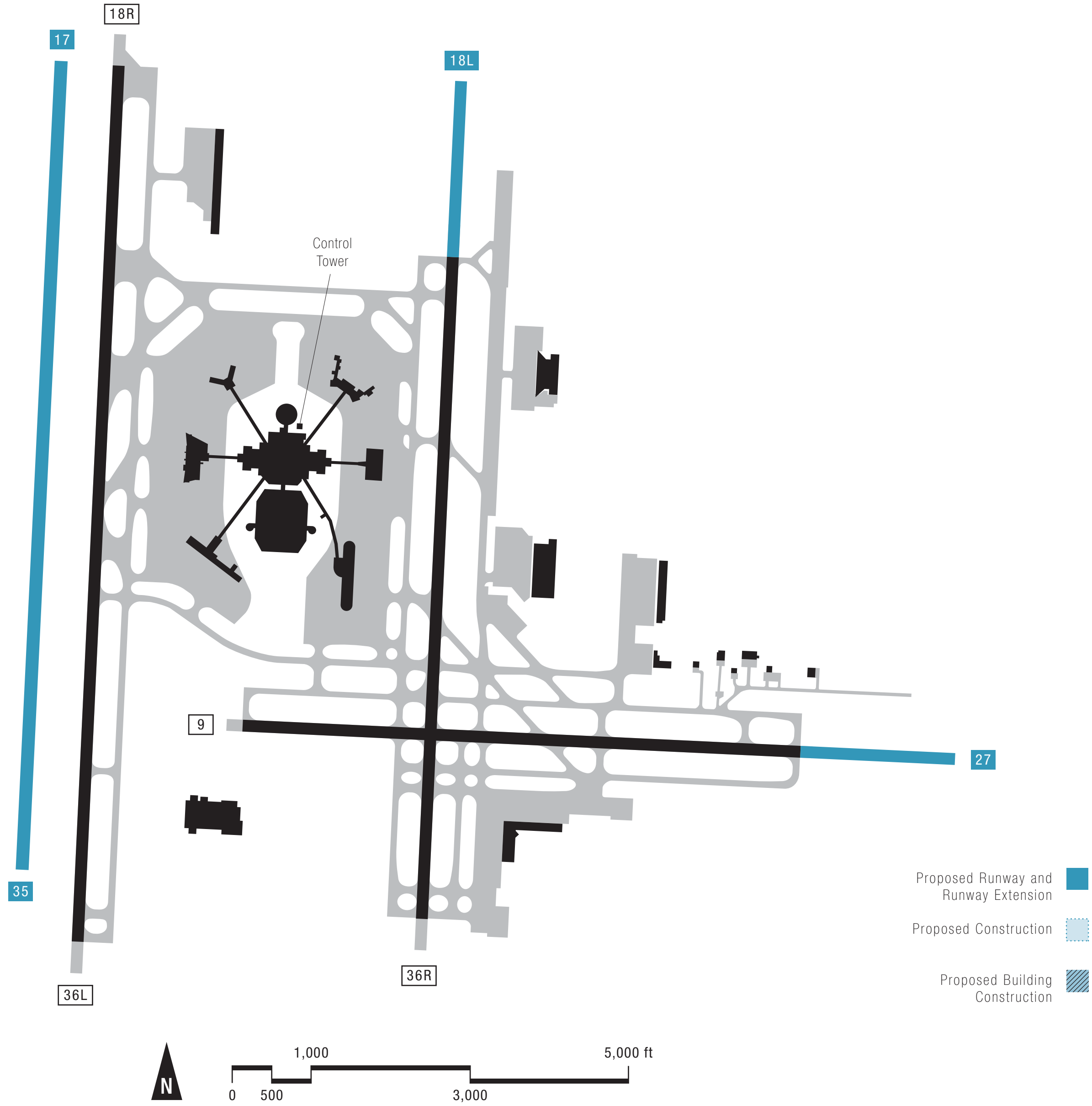


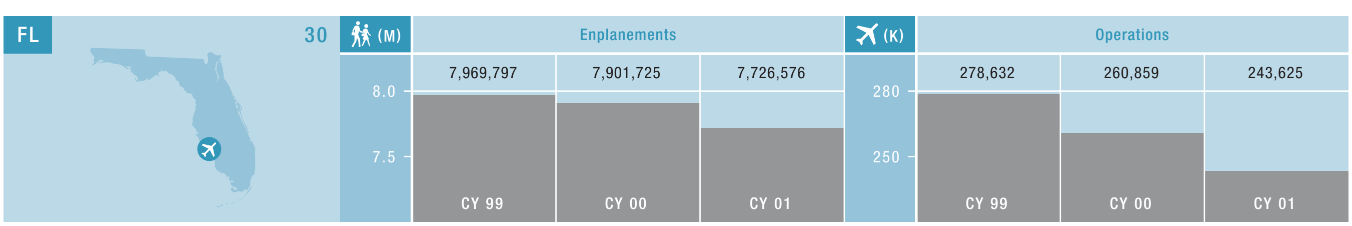
Enplanements (M)	CY 00	CY 01	CY 02
	1,060,746	936,450	945,066

Operations (K)	CY 00	CY 01	CY 02
	140,291	145,751	128,460

TPA – Tampa International Airport

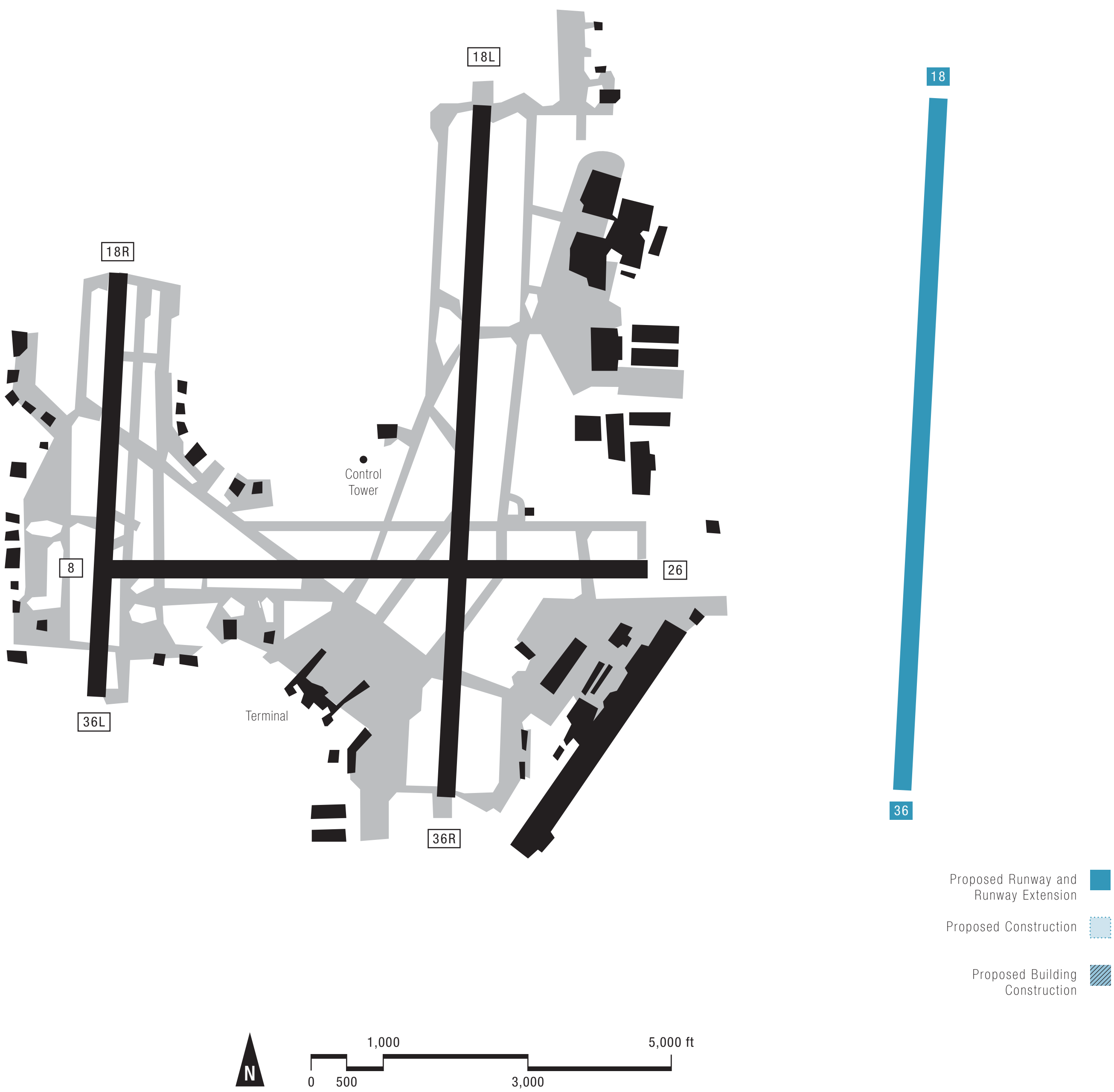
New Runway and associated Taxiway improvements $89.2 million (proposed; to be reviewed in 2004 master plan update). Runway 18L extension (proposed post 2020; to be reviewed in master plan update 2004). Runway 27 extension (proposed post 2020; to be reviewed in master plan update 2004). Runway 18R/36L angles exit at W5 and 36L holding pad $8.8 million (underway). Runway 18R CAT II ILS $3.4 million (underway).

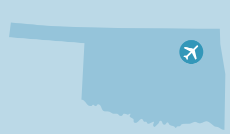




TUL – Tulsa International Airport

A new parallel Runway 18/36, located 6,400 ft. east of the present 18L/36R and 9,000 ft. long, is being considered. The new runway would permit IFR triple independent approaches, if approved, to Runways 18L, 18C, and 18R. It is estimated to cost $115 million and will be operational in 2010.



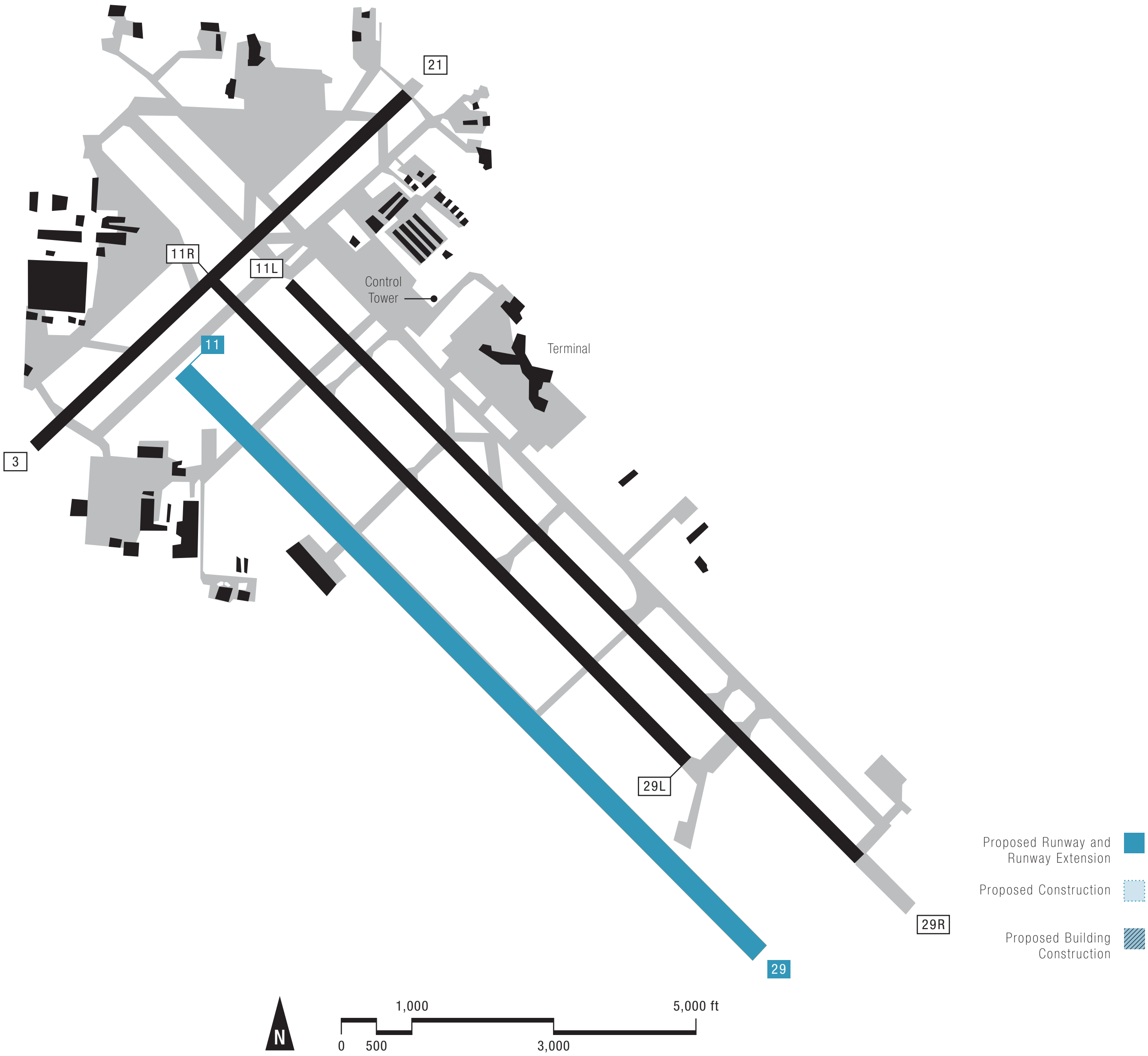


(M)	Enplanements		
	1,737,672	1,627,293	1,450,242
1.8			
1.5			
	CY 00	CY 01	CY 02

(K)	Operations		
	198,970	199,533	189,136
210			
190			
	CY 00	CY 01	CY 02

TUS – Tucson International Airport

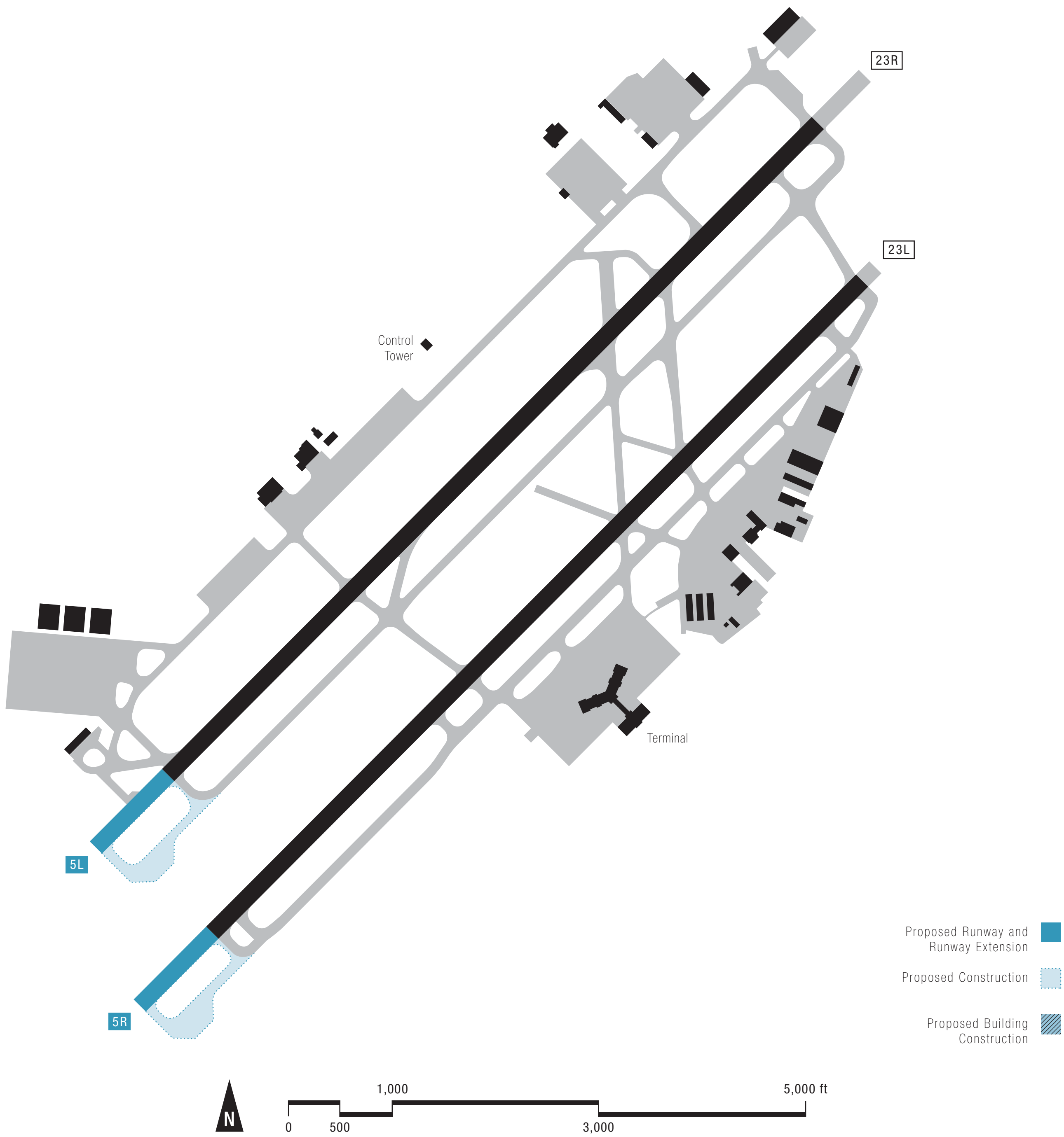
An additional parallel air carrier Runway 11R/29L has been proposed. Upon completion of the new runway, the current Runway 11R/29L, a general aviation runway, will revert to its original taxiway status. Current plans call for construction to start in 2008 to be operational in 2010. The estimated is $50 million.



AZ 67	(M)	Enplanements			(K)	Operations		
		1,804,086	1,749,560	1,677,341		250,943	261,800	272,568
	1.9 / 1.7	CY 00	CY 01	CY 02	275 / 250	CY 00	CY 01	CY 02

TYS – Knoxville McGhee-Tyson Airport

An extension of both runways, 5L/23R and 5R/23L, is being planned for the future.



TN 94

	CY 00	CY 01	CY 02
Enplanements (M)	863,539	705,607	693,351
Operations (K)	148,596	149,342	149,323

APPENDIX E ACRONYM LISTING

ACE	Aviation Capacity Enhancement
ACI	Airports Council International
ADS-B	Automatic Dependent Surveillance Broadcast
AIP	Airport Improvement Program
AIR-21	Wendell H. Ford Aviation Investment and Reform Act for the 21st Century
AOZ	Free Flight Program Office
ARS	Air Traffic Systems Requirement Services
ARTCCs	Air Route Traffic Control Centers
ARTS	Automated Radar Terminal Systems
ASC	Office of System Capacity
ASMs	Available Seat Miles
ASPM	Aviation System Performance Metrics
ATC	Air Traffic Control
ATO	Air Traffic Organization
ATOP	Advanced Technologies and Oceanic Procedures
ATS	Air Traffic Services
BTS	Bureau of Transportation Statistics
CAA	Cargo Airline Association
CARF	Central Altitude Reservation Function
CDM	Collaborative Decision Making
CEP	Capacity Enhancement Plan
CY	Calendar Year
DME	Distance Measuring Equipment
DOT	U.S. Department of Transportation
DPs	Departure Procedures
DRVSM	Domestic Reduced Vertical Separation Minima
EAS	Essential Air Service
EASE	Expedited Aviation System Enhancement
ERAM	En Route Automation Modernization
ETMS	Enhanced Traffic Management System
FAA	Federal Aviation Administration
FIR	Flight Information Region
FL	flight level
FMS	Flight Management System
FY	Fiscal Year
GA	General Aviation
GARBs	General Airport Revenue Bonds
GEO	Geostationary Earth Orbit
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GRADE	Graphical Airspace Design Environment
HITL	Human In The Loop
HOCSR	HOST and Oceanic Computer System Replacement
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rule

ILS	Instrument Landing System
LAAS	Local Area Augmentation System
LDA	Localizer Directional Aid
LAHSO	Land and Hold Short Operations
LNAV	Lateral Navigation
LPV	Lateral with Precise Verticals
MAP	Military Airport Program
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NLA	New Large Aircraft
PRM	Notice of Proposal Rulemaking
NRS	Navigation Reference System
NTSB	National Transportation Safety Board
NYICC	New York Integrated Control Complex
OEP	Operational Evolution Plan
OMB	Office of Management and Budgets
OOOI	Out, Off, On and In
OPSNET	FAA's Operations Network
PCT	Potomac Consolidated TRACON
PDARS	Performance Data Analysis and Reporting System
PFCs	Passenger Facility Charges
PRM	Precision Runway Monitor
RAT	Reroute Advisory Tool
RPAT	RNP Parallel Approach Transitions
RJs	Regional Jets
RNAV	Advanced Area Navigation
RNP	Required Navigational Performance
RTMs	Revenue Ton-Miles
RVSM	Reduced Vertical Separation Minima
SARS	Severe Acute Respiratory Syndrome
SCT	Southern California TRACON
SIAP	Standard Instrument Approach Procedure
SOIA	Simultaneous Offset Instrument Approaches
STARs	Standard Terminal Arrival Routes
SUA	Special Use Airspace
TMA	Traffic Management Advisor
TRACON	Terminal Radar Approach Control facility
URET	User Request Evaluation Tool
VFR	Visual Flight Rule
VMC	Visual Meteorological Conditions
VNAV	Vertical Navigation
WAAS	Wide Area Augmentation System
WAN	Wide Area Network
WATRS	West Atlantic Route System

APPENDIX F CREDITS

Special thanks to:

The many FAA employees at Headquarters and Regional Offices that contributed to this publication, providing technical insight, background materials and feedback.

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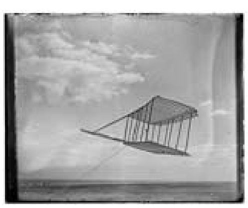
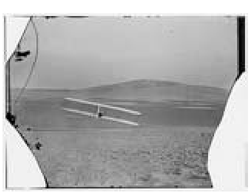


Left side view of the 1900 Wright glider before installation of forward horizontal control surface, flying as a kite, tipped forward; Kitty Hawk Lifesaving Station and Weather Bureau buildings in background to the left – 1900

Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-00556 (digital file from original) LC-W851-96 (b&w film copy negative)]



Rear view of Wilbur making a right turn in glide from No.2 Hill, right wing tipped close to the ground – 1902 October 24

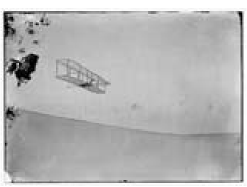
Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-00598 (digital file from original) LC-W861-7 (b&w film copy negative)]

Orville Wright, age 34, head and shoulders, with mustache – 1905

Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-00680 (digital file from original) LC-W861-89 (b&w film copy negative)]

Wilbur Wright, age 38, head and shoulders, about 1905; one of the earliest published photographs of him – 1905

Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-00683 (digital file from original) LC-W861-92 (b&w film copy negative)]



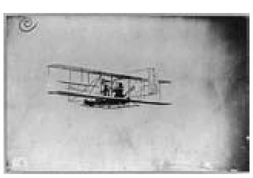
Wilbur gliding down steep slope of Big Kill Devil Hill; Kitty Hawk, North Carolina – 1902 Oct 10

Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-00602 (digital file from original) LC-W861-11 (b&w film copy negative)]

First flight, 120 feet in 12 seconds, 10:35am; Kitty Hawk, North Carolina – 1903 Dec 17

Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-00626 (digital file from original) LC-W861-35 (b&w film copy negative)]

Cover (flap)



Wilbur Wright in flight from Governor's Island – 1909 Sept 29

Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-3b25548 (digital file from original) LC-USZ62-78454 (b&w film copy negative)

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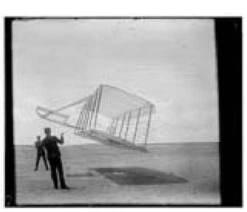

Side view of glider flying as a kite near the ground, Wilbur at left and Orville at right, glider turned forward to right and tipped downward – 1901

Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-00580 (digital file from original) LC-W851-121 (b&w film copy negative)

Page 2

Three-quarter left rear view of glider in flight at Kitty Hawk, North Carolina – 1911

Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-00699 (digital file from original) LC-W861-108 (b&w film copy negative)]

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Katharine Wright, wearing a leather jacket, cap, and goggles, aboard the Wright Model HS airplane with Orville – 1915

Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-00588 (digital file from original) LC-W851-129 (b&w film copy negative)]

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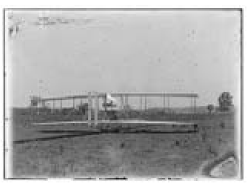

Close-up view of machine on launching track at Huffman Prairie, Dayton, Ohio – 1904 June or July

Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-00618 (digital file from original) LC-W861-27 (b&w film copy negative)]

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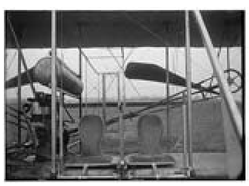

Close-up view of airplane, including the pilot and passenger seats – 1911

Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-00691 (digital file from original) LC-W861-100 (b&w film copy negative)]

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Wireless operator in conversation with plane in flight, conducting his conversation at the time and for the length of time permitted by the special synchronized clocks of United Airlines.

National Air and Space Museum (NASM Videodisc No. 2A-34452), Smithsonian Institution

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Right front view of glider in flight – 1911

Library of Congress, Prints and Photographs Division [LC-DIG-ppprs-00692 (digital file from original) LC-W861-101 (b&w film copy negative)]

Appendix D Divider – First Row (left to right)

Ted Stevens Anchorage International Airport

Austin Municipal Airport Terminal – 1938 October 26

Austin History Center (AF-Municipal Airport, M8600 (1) - PICA 03770), Austin Public Library

Port Columbus International Airport

Appendix D Divider – Second Row (left to right)

Dayton International Airport

Air traffic controllers tracking airplanes on a radarscope, Washington Air Route Traffic Control Center in Washington, D.C. – 1955

National Air and Space Museum, Smithsonian Institution

American Airlines DC-6 being marshalled on the L.C. Smith Terminal Ramp – late 1950s.

Detroit Metropolitan Wayne County Airport

Appendix D Divider – Third Row (left to right)

Las Vegas McCarran International Airport ticketing – Mid 1970s

Las Vegas McCarran International Airport

Kansas City International Terminal

Kansas City International Airport

Appendix D Divider – Third Row continued

Dedication ceremony for Wisconsin Central Airlines' first flight to Madison

Madison/Dane County Regional Airport, WHi(N48)4080

Appendix D Divider – Fourth Row (left to right)

Sky Harbor Airport – 1930

Phoenix Sky Harbor International Airport

Air traffic controller with light gun

T.F. Green Airport

Old United Airlines Airport at Reno, Nevada

Reno Tahoe International Airport

Appendix D Divider – Fifth Row (left to right)

Some of the old-time local barnstormers

John Wayne Airport - Orange County

Old terminal

Sarasota Bradenton Airport

Pilots deliver the mail

Syracuse Hancock International Airport

Back Cover (left to right)

Curtiss JN-4
The Curtiss JN-4 was the type of aircraft flown by pioneer aviator Bessie Coleman – 1920

Smithsonian Institution, Negative #86-6177

Bessie Coleman

Smithsonian Institution, Negative #80-12873

Charles A. Lindbergh with the "Spirit of St. Louis" prior to his transatlantic flight. New York. Circa May 17, 1927

Lindbergh Picture Collection (3143), Manuscripts and Archives, Yale University Library

Ryan NYP "Spirit of St. Louis" equipped with 220 HP Wright Whirlwind engine

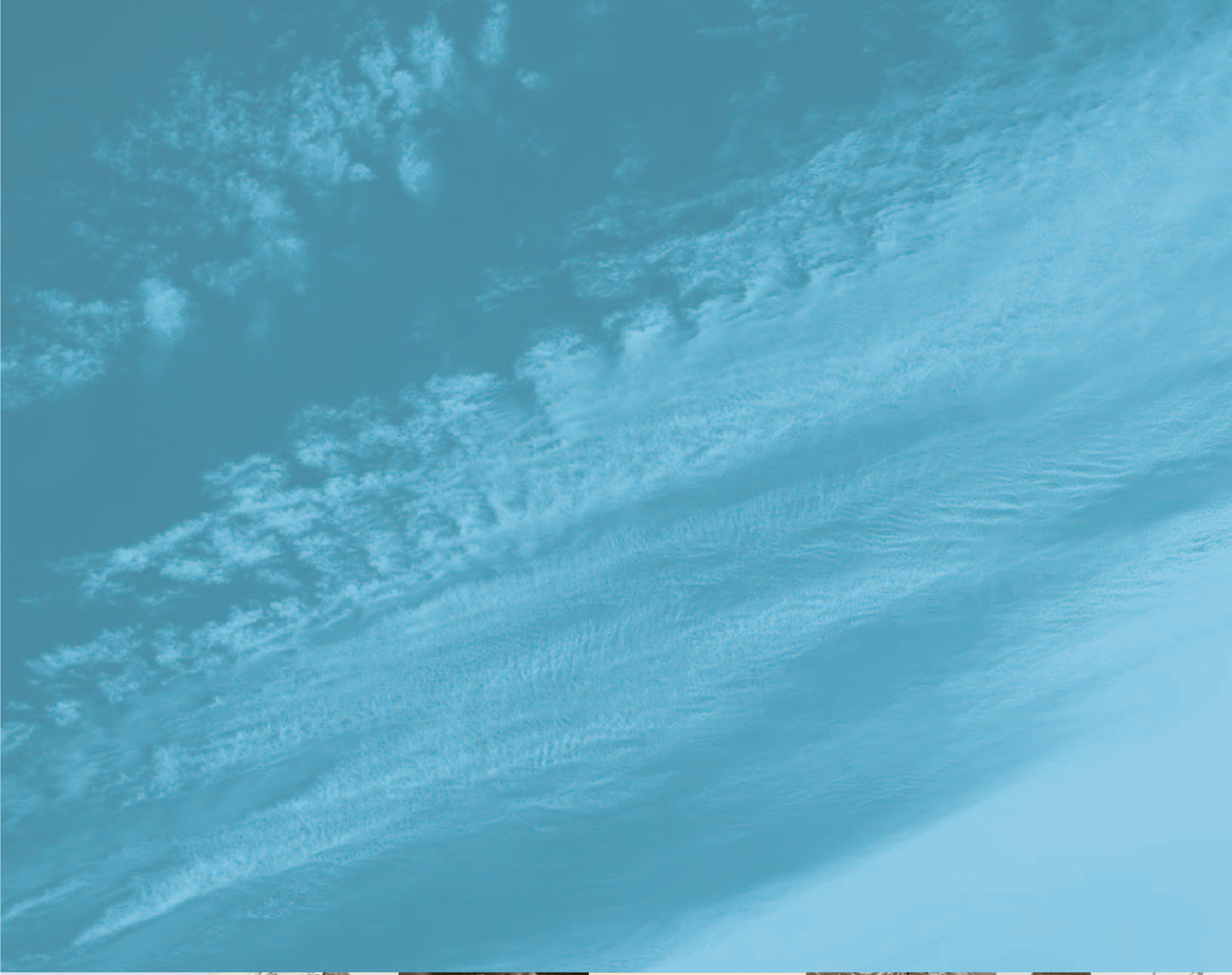
Loftin Collection (Spirit of St. Louis), NASA Langley Research Center, #EL-2001-00026

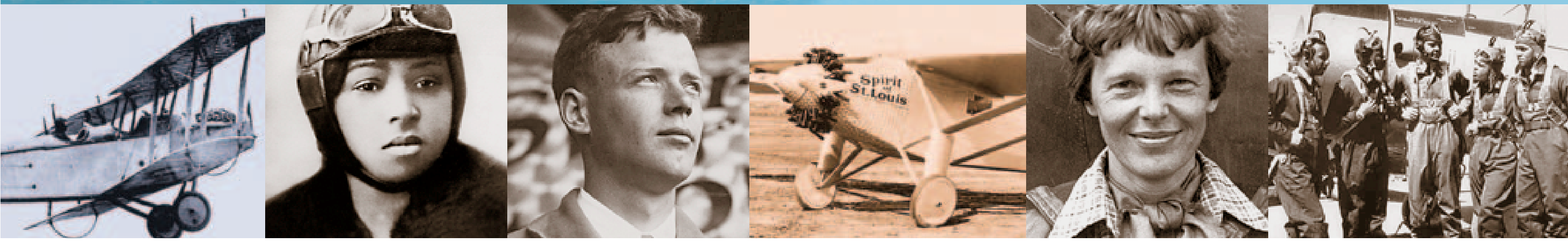
Amelia Earhart

Smithsonian Institution, Negative #2004-11247

First Cadets, Tuskegee
In 1941 the first group of black cadets to earn their wings at Tuskegee Army Air Field gather alongside a Vultee BT-13 trainer. Benjamin O. Davis Jr. (middle) became the first black general in the U.S. Air Force in 1954.

Smithsonian Institution, Negative #99-15437





Man is both determined and self-determining

~ Stein and Vidichon