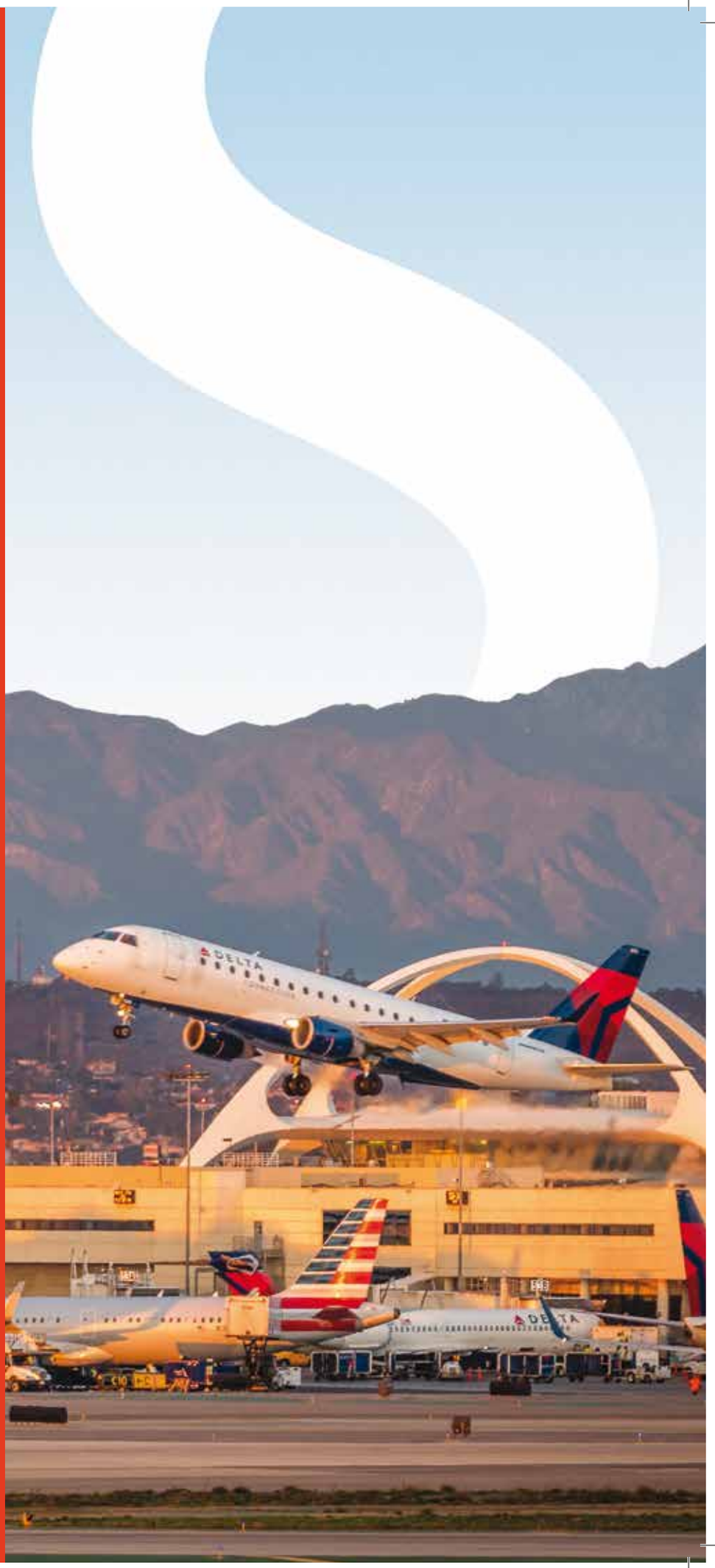
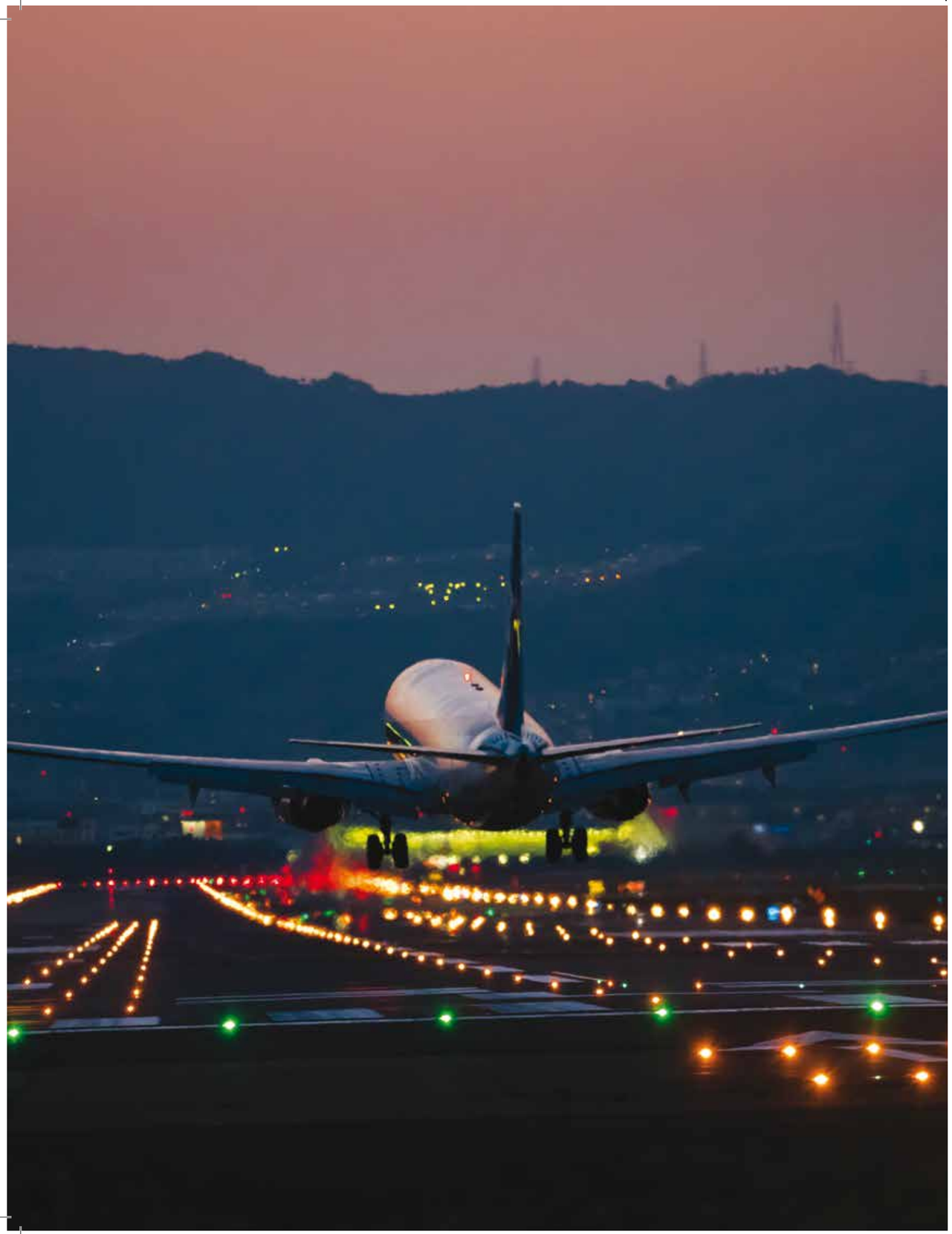
Aviation

Delivering strategic solutions





Aviation

People are taking to the skies in record numbers. It is projected that U.S. airports will reach one billion annual passengers in the next 10 years. Air cargo volumes continue to increase. Technology is changing how we get to the airport, how we get from curb to gate, and what we do while we are at the airport. How will the aviation industry adjust to these new realities?

Aviation continues to be one of the fastest growing markets in the transportation industry. Airports serve as economic engines for the locales they serve, attracting businesses, residents and visitors through increased connectivity to the global community. Many airports around the nation set records for passenger enplanements and cargo tonnage shipped in 2016, and forecasts indicate that this trend will continue upward. As airports look to the future, focusing on maintaining and increasing their share of the national aviation market, the challenge is to plan realistically to meet short-term needs while addressing longer-term customer expectations.

With this success comes challenges. Aging infrastructure, facilities operating over or near capacity, and demand for more modern amenities are pushing airport owners to jump-start aggressive capital improvement programs. These programs are aimed at enhancing the passenger experience while assuring operationally efficient facilities that are safe and resilient in today's unpredictable world. Technology advances will continue to affect how airports operate in the future, and airport owners are looking to integrate this new technology with legacy systems to make operations more efficient and profitable. As passenger and cargo volumes increase and airports expand, modernize or build new facilities to accommodate this demand, they must do so with little or no impact on existing operations. With funding for capital improvements becoming harder to obtain, airport owners are looking at new sources of financing and alternative delivery methods to bring their visions to fruition.

Integrated *approach*

WSP USA supports airport owners by developing and implementing practical, effective solutions to meet myriad challenges.

Our team of planners, designers, construction managers, financial analysts, systems engineers, architects and IT specialists work with airport owners throughout the project life cycle. Drawing on the latest technologies and innovations, we plan, design and manage the implementation of projects that provide modern, sustainable, state-of-the-art facilities. We deliver integrated services for the development, operation and maintenance of airport buildings and infrastructure, including roadways, bridges, tunnels, transit systems, terminals, parking garages, consolidated rental car facilities, and central utility plants and distributed energy systems. WSP professionals keep pace with industry trends and the needs of our clients, including airports, airlines, and federal, state and city agencies.

WSP provides services for airports of all sizes, from general aviation airports to large international hubs. No matter the size, we are committed to supporting airport owners in achieving their objectives. We draw upon the skills and expertise of staff across the globe to support airport owners in overcoming challenges and realizing opportunities as the aviation industry looks to the future of air travel.

Comprehensive *services*

Water & Environment

- Air Quality
- Environmental Studies & Compliance
- Hazardous Materials
- Mitigation
- Inspection Services
- Health and Safety
- Noise/Air Studies
- Storm Water & Ecosystem Management
- Water Supply & Reuse

Advisory Services

- Alternative Delivery
- Asset Management
- Business Improvement
- Due Diligence
- Financing
- Freight & Logistics
- Grant Applications
- Mobility Management
- Policy Research
- Public Private Partnerships
- Technology Solutions

Property & Buildings

- Acoustics
- Architectural Lighting
- Building Enclosures
- Building Technology Systems
- Commissioning
- Fire Protection
- High Performance Design
- MEP Engineering
- Special Systems
- Structural Engineering

Transportation & Infrastructure

- Civic Engagement
- Condition Surveys
- Construction Management
- Engineering Design
- Geospatial Services
- Lighting
- Operations & Maintenance
- Planning
- Strategic Consulting
- Technology Systems Planning
- Program Management
  - Commissioning & Start-Up Management
  - Constructability
  - Cost Management
  - Project Controls
  - Quality Assurance
  - Risk Management
  - Schedule Management
  - Stakeholder Coordination
  - Value Engineering

Energy

- Central Plant Design
- Cogeneration
- Combined Heat & Power
- Distributed Generation, Energy Master Planning & Audits
- Energy Renewal
- MEP Engineering
- Load, Demand & Capacity Analysis
- Power Generation
- System Optimization
- Underground Storage

Aviation *specialties*

- Terminals/Concourses
- Airside Infrastructure
- Runways/Taxiways/Aprons
- Airfield Pavements
- Airfield Lighting and Signage
- NAVAIDS
- Parking Garages
- CONRACs
- Master Planning
- Intermodal Facilities
- Security Checkpoints
- Air Traffic Control Towers
- APMs/Transit Connections
- Landside Access/Roadways
- Cargo Facilities/Hangars
- General Aviation Facilities
- Drainage/Stormwater Management Systems
- Central Heating and Refrigeration Plants
- Utilities
- Aviation Environmental Design
- Building Management Systems
- IT/Communications Systems

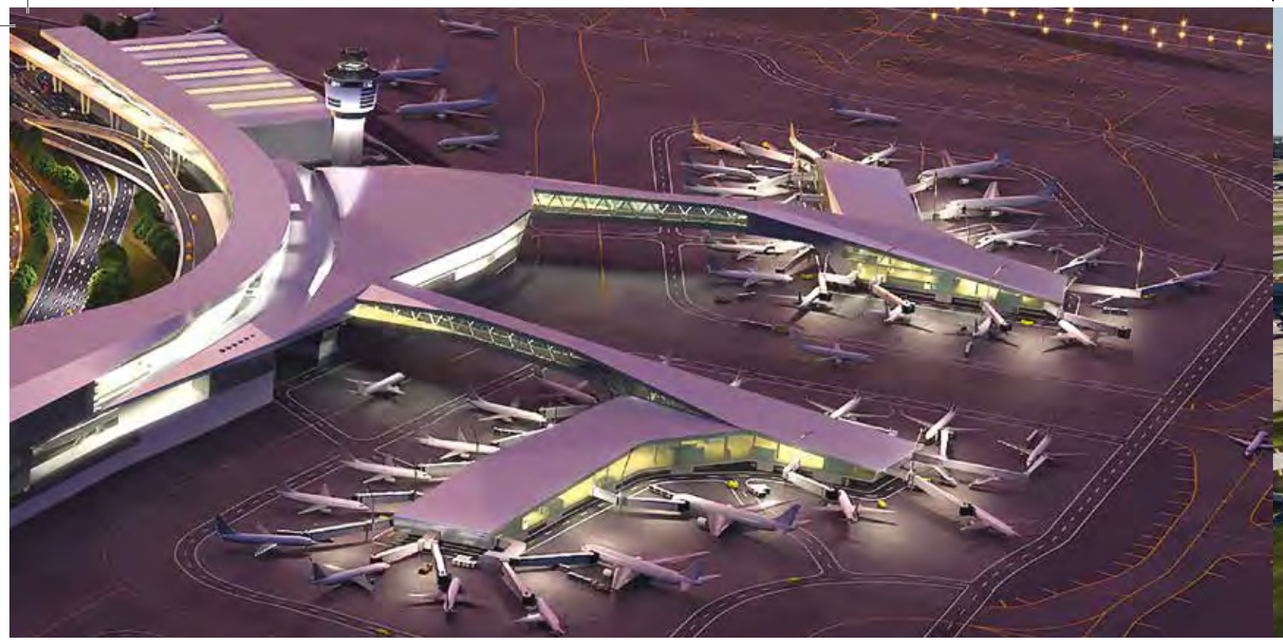


Photo courtesy of OMP LLC

Our *projects*

LAGUARDIA AIRPORT REDEVELOPMENT PROGRAM

Queens, New York
Services: Planning, Design, Project Management

The State of New York and the Port Authority of New York and New Jersey have embarked on a bold new vision to create a world-class experience for passengers and users of LaGuardia Airport. The challenge: how to renovate/replace existing facilities to meet increasing passenger volumes and provide modern facilities that air travelers demand given the airport's constrained footprint, while maintaining ongoing operations at this already congested airport. WSP is involved in several elements of the innovative solution being implemented to overcome this challenge.

WSP leads the design joint venture for the $4 billion Central Terminal redevelopment program being developed through a public-private partnership, which entails a new 35-gate terminal, two remote concourses connected to the main terminal via dramatic pedestrian bridges over active taxiways, a new central arrivals hall, a 3,100-space parking garage, a new central utility plant and reconfiguration of the landside roadway network. Our services include civil, structural, traffic, geotechnical, mechanical/electrical and utility design and environmental remediation.

The Port Authority also initiated a master plan for the redevelopment of the rest of LaGuardia, including Terminals C and D, the Marine Air Terminal and the west side of the airport. As a subconsultant to an architect-led master planning team, WSP provided airside and landside facility, roadway, access and transit planning service.

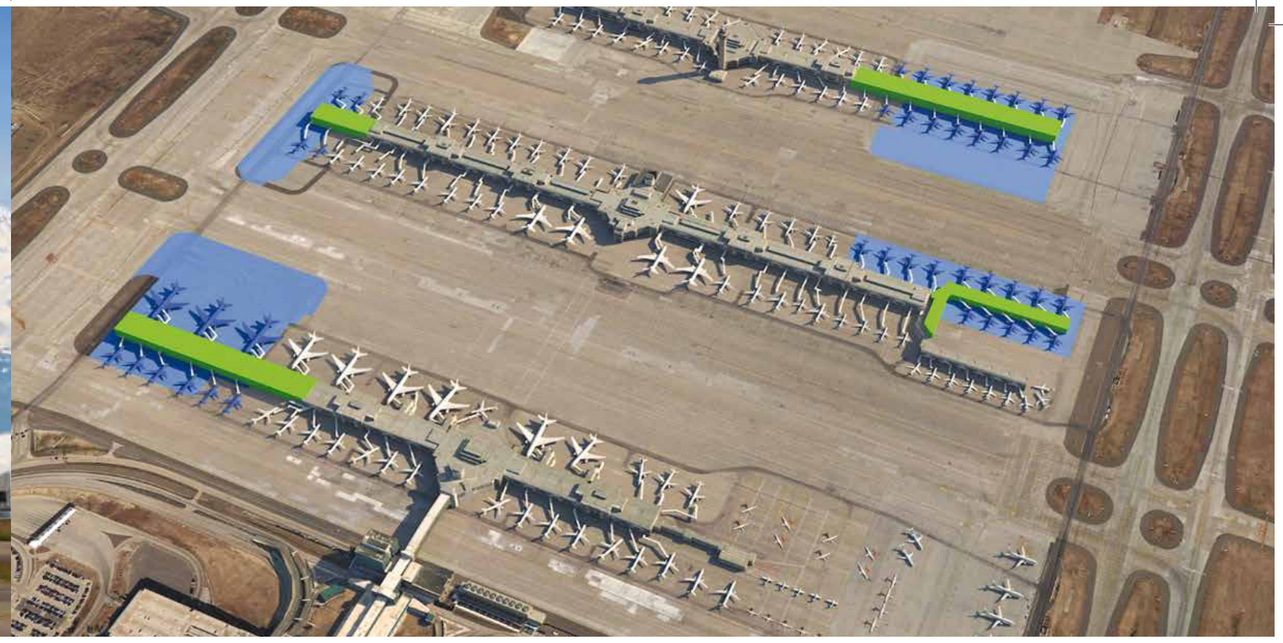
One element of the master plan was an automated people mover system to provide a transit connection to the New York City subway and commuter rail network as well as a connection between terminals. WSP is leading the team performing preliminary engineering for development of AirTrain, including the guideway, stations, alignment, systems, vehicle technology, maintenance facility and connection to off-airport facilities.

O'HARE INTERNATIONAL AIRPORT MODERNIZATION PROGRAM

Chicago, Illinois
Services: Construction Management

WSP is serving as construction manager for the O'Hare Modernization Program (OMP), a $4.5 billion project to reconfigure the airfield to reduce delays and increase capacity to meet future aviation needs at one of the nation's busiest airports. The OMP entails more than 20 miles of airfield construction/rehabilitation to create a more efficient runway/taxiway system, accommodate larger A380 aircraft and reduce impacts on communities surrounding the airport. The program includes the construction of four new runways, the extension of two existing runways, the construction of two LEED-certified air traffic control towers, the relocation of a state highway, the relocation (twice) of a Union Pacific rail line, the relocation of the FedEx cargo sorting facility (four buildings), the relocation of St. Johannes Cemetery and extensive airfield systems upgrades. WSP developed an intricate, comprehensive phasing plan and coordinated extensively with the Chicago Department of Aviation (CDA), the Federal Aviation Administration, airlines, air cargo carriers and all project stakeholders to maintain operations during construction on the active airfield.

WSP developed the program's safety management system and worked with CDA and a panel of stakeholders to identify risks and mitigation and update the airport's safety programs and protocols to meet FAA requirements. The program included green roofs on eight new structures, extensive reuse of waste materials, and an earthwork management plan that developed an economical and sustainable solution for reuse of 30 million cubic yards of soils. New Runway 10R-28L was named the 2016 project of the year by the Construction Management Association of America.



DALLAS/FORT WORTH INTERNATIONAL AIRPORT SOUTHWEST END-AROUND TAXIWAY

DFW Airport, Texas
Services: Civil, Geotechnical, Structural, Electrical, and Lighting Design; Construction-phase Services

To reduce the number of runway crossings during peak periods to allow for continuous takeoffs and landings, DFW Airport has initiated several airfield improvements including a new 7,400-foot-long end-around taxiway and a 4,850-foot extension of Taxiway E. The project also includes a high-speed exit taxiway, aircraft rescue and firefighting lanes, roadway bridge, replacement of the approach lighting systems and drainage improvements.

WSP's scope includes validating the 35 percent design and drainage design; developing and evaluating alternatives for the bridge carrying Taxiway C over a tributary to Big Bear Creek; preparing bridge designs for the vehicle service road extension and ALSF-2 catwalk; performing structural calculations for existing deep drainage structures; and coordinating with the Federal Aviation Administration and the airport to upgrade the approach lighting system for Runway 36L to ALSF-2. WSP will then advance the design to 100 percent and provide inspection and construction administration services.

SEATTLE-TACOMA INTERNATIONAL AIRPORT SUSTAINABILITY MASTER PLAN AND BIOFUELS STUDY

SeaTac, Washington
Services: Planning; Conceptual Design; Feasibility Study

WSP provided design guidance for a study that investigated energy and water strategies at the North Satellite terminal at Sea-Tac Airport. The goal of the study was to determine whether the plan could meet the Port of Seattle's sustainability objectives as the terminal expands to meet higher passenger volumes over the next 20 years. WSP considered an integrated systems approach, including heating, ventilation and air conditioning, lighting, renewable energy; and envelope system modifications and improvements – all overlaid on a potential phasing plan for expansion. The firm completed a life-cycle cost analysis, including energy modeling, to provide the Port of Seattle with a total cost of ownership under various scenarios relative to the current operational benchmark.

Under another contract, WSP conducted a study to determine the feasibility of developing a biofuels infrastructure to serve the main fuel supply system at the airport, with the goal of producing a blended fuel of 20 percent biofuel and 80 percent petroleum. The feasibility study identified the technical and engineering requirements for short-term and long-term options to deliver blended biofuel to aircraft at Sea-Tac.

DENVER INTERNATIONAL AIRPORT

Denver, Colorado
Services: Program Management

The sixth-busiest airport in the U.S. and the Gateway to the Rockies, Denver International Airport has undertaken a capital improvement program to ensure the airport continues to provide superior service to its patrons and users. WSP has provided program management services for the implementation of the multiple projects included in the capital program. Individual tasks included preparing project definition documents for more than 250 projects; supporting the creation of an asset management policy, strategy, procedural handbook and condition assessment methodology; and developing a new set of project delivery procedures and workflows. The firm has also managed a range of mechanical engineering projects including terminal air handling unit upgrades and rooftop HVAC unit replacement, as well as providing civil engineering services for landside projects such as roadway and parking lot improvements and bridge rehabilitation.

Currently, WSP is providing program management services for a $1.5 billion expansion that will add 39 gates across the airport's three concourses. WSP will act on behalf of the Denver Department of Aviation as part of the program management team on multiple concurrent concourse expansion projects, including hiring and managing designers and contractors. The firm will also be responsible for coordination with stakeholders, maintaining schedule and budget, and minimizing impact to ongoing airport operations.

Image courtesy of Los Angeles World Airports

LOS ANGELES INTERNATIONAL AIRPORT LANDSIDE ACCESS MODERNIZATION PROGRAM

Los Angeles, California
Services: Planning, Design, Advisory Services, Program Management

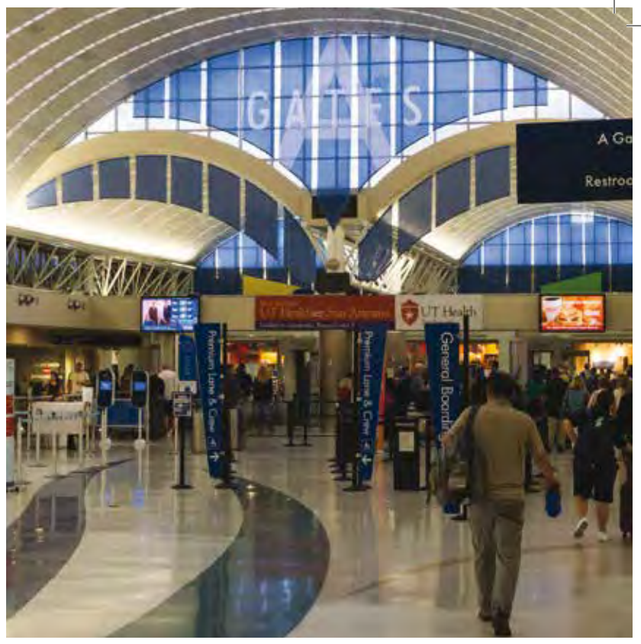
As the lead firm in the MapLAX joint venture, WSP was responsible for developing program-level analysis for improvements to the airport's Landside Access Modernization Program (LAMP), including conceptual engineering and phasing for proposed new facilities at LAX. Facilities included an intermodal transportation facility, a consolidated rental car facility (CONRAC), roadway and transit improvements, and an automated people mover (APM).

This effort also included analysis of future phasing of these projects, traffic analysis and operational logistics during LAMP construction in order to minimize congestion within the Central Terminal Area. WSP also performed an analysis of delivery options for all program elements and an evaluation of related operational and financial interests. Upon selection of a design-build-finance-operate-maintain delivery option for the APM and the CONRAC facility, WSP became the technical advisor for the $2 billion APM. The firm developed the first draft of the technical provisions and contract drawings, managed the procurement process through the RFQ phase, supported the operating system supplier eligibility determinations, and provided technical assistance with the evaluation of proposers. WSP also served as the engineer-of-record for the foundations of the APM guideway.

ST. LOUIS LAMBERT INTERNTIONAL AIRPORT TAXIWAY ECHO RECONSTRUCTION

St. Louis, Missouri
Services: Construction Management

St. Louis Lambert International Airport completed a large-scale program to reconstruct airfield pavements constructed in the 1970s and 1980s. WSP provided construction management services for the $9.3 million reconstruction of Taxiway Echo. The program included removal and replacement of the taxiway pavement, reconstruction of asphalt shoulders along the taxiway, installation of drainage structures, improvements to airfield electrical lighting and signage, and application of pavement markings. WSP's construction management, inspection and quality assurance services ensured compliance with Federal Aviation Administration (FAA) regulations and construction requirements as well as the FAA/AIP grant reimbursement program.



SAN ANTONIO INTERNATIONAL AIRPORT

San Antonio, Texas
Services: Master Planning and Engineering

WSP is updating the airport's master plan to create a road map for development to meet future demand, stimulate economic development and support the City of San Antonio's SA Tomorrow Comprehensive Plan. WSP will conduct airfield simulations (aircraft traffic/capacity studies) to understand the aviation requirements to meet long-term demand. The firm will create future development alternatives and phasing plans (including a potential site for a new airport) that will enhance the overall passenger experience. Airside considerations include reconfiguring the intersecting runways and pavement maintenance needs to improve operational excellence. The project team will analyze the complete airport experience, including landside access, terminal space programming, air space and air service analysis, and improved amenities to create an improved travel experience.

ORLANDO INTERNATIONAL AIRPORT

Orlando, Florida
Services: Owner's Reprensentative

Responding to passenger demand and dynamic growth in Central Florida, the Greater Orlando Airport Authority has embarked on a $3 billion capital improvement program (CIP) to upgrade facilities at Orlando International Airport. The CIP will enable the airport to maintain its role as an important economic driver for the region, while enhancing The Orlando Experience® for travelers who pass through its facilities. Serving as the Authority's authorized representative, WSP is providing construction management, program controls, quality management and design oversight services for airside, terminal, landside, ground transportation, rail/transit, and land development projects to support the CIP. Coordinating with the Authority, multiple design consultants and contractors, TSA, the airlines, and other stakeholders, WSP managed construction of more than 50 projects – several on active airfields – with no unscheduled operational impacts. The firm will continue to support the Authority over the next five years on tasks related to the South Terminal Complex Development project, expansion of the airport's automated people mover, development of an intermodal transportation facility, and other land development projects on airport property.

BOSTON LOGAN INTERNATIONAL AIRPORT

Boston, Massachusetts
Services: Planning, Design, Project Management

The consolidated rental car facility at Logan International Airport consolidates what were once separate facilities for eight rental car companies into a central 4,000-space garage and customer service center building. The facility, which was developed to help Massport achieve its sustainable design goals, achieved LEED Gold certification. WSP served as prime consultant for the project, with responsibility for planning, design and project management, as well as construction-phase services and oversight of subconsultants. The project continues WSP's two-plus decades of experience at the airport, which includes redevelopment of Terminal A (the first LEED-certified terminal in the U.S.), the Terminal C/E connector and ongoing airfield design work.

Other ongoing efforts include structural engineering services for consolidation of American Air Lines and US Airways facilities in Terminal B, development of an airport-wide VISSIM model to reduce ground transportation congestion, and design of a 400-foot-long taxiway to improve airfield operations. WSP was recently selected to provide design services for the new Terminal B/C Connector as well as a new 5,000-space garage.

Image courtesy of HNTB Architects

SAN DIEGO INTERNATIONAL AIRPORT TERMINAL 2 EXTENSION

San Diego, California
Services: Design

The $1 billion "Green Build" program, the largest expansion ever undertaken at San Diego International Airport, comprises 10 additional aircraft gates at Terminal 2 West; expanded dining and shopping options; and terminal, roadway, parking and airfield improvements. The program is intended to meet the airport's current and future demand for travel, while improving customer service and serving as an economic stimulus for the San Diego region. WSP provided electrical design and engineering services for the 470,000-square-foot expansion of Terminal 2, including passenger circulation, airline check-in/ticket lobby, security screening, baggage handling, waiting areas, seating areas, concessions food court space, a new USO facility, on-site project management office, public art, restrooms, office space, special technology systems, and other service and support areas.

The design-build project incorporated many sustainable design principles, such as solar energy, water and energy conservation, storm water pollution prevention and improved indoor air quality — all of which helped the project achieve LEED® Platinum certification, the first commercial airport terminal in the world to achieve this distinction. The project received numerous awards including a National Merit Award from the Design-Build Institute of America, and was selected as the best project in the airports/transit sector for Southern California by *Engineering News-Record*.

OAKLAND INTERNATIONAL AIRPORT TERMINAL 2 EXIT LANE

Oakland, California
Services: Design

As part of its continuing effort to increase security and enhance the passenger experience at Oakland International Airport, the Port of Oakland selected WSP as its airport technology consultant for design of security and communications system improvements to facilitate passenger circulation. Under this as-needed services agreement, the firm is providing design and implementation support services for architectural and technical systems improvements to increase the level of security at the Terminal 2 exit lane. The objective is to reconfigure and upgrade the technology and layout of the exit lane and enhance security with regard to reverse pedestrian traffic. Oakland International Airport, as a result, is embracing technology and transitioning to automated secure exit lanes. WSP is also providing planning, design and construction-phase services support for an expansion of the airport's video surveillance system at a variety of landside areas, including parking areas, frontage roadways and curbside of the terminal area.

BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT D/E CONNECTOR

Baltimore, Maryland
Services: Construction Management

Opened in November 2016 just in time to serve Thanksgiving travelers, the D/E Connector at BWI Airport features a larger upgraded security checkpoint, a new secure connection between Concourses D and E, more shops and restaurants, a children's play area, a gym, an art gallery and an outdoor observation deck. The new eight-lane security checkpoint allows passengers to circulate between concourses and is part of a long-term master plan to connect all five of the airport's concourses. Relocating two gates from Concourse D and one gate from Concourse E to serve as swing gates allows new opportunities for expanded international service. The updated terminal infrastructure (mechanical, electrical, plumbing, IT, security and fire protection systems) meets current Federal Aviation Administration and local building code requirements. Replacing the airport's oldest and slowest security line, adding more passenger amenities, moving walkways, and reconfiguring hold rooms are major upgrades to improve the travel experience for BWI passengers. WSP served as the construction manager for this award-winning project.

MIAMI INTERNATIONAL AIRPORT CENTRAL BASE APRON

Miami, Florida
Services: Design

The Miami-Dade Aviation Department (MDAD) has initiated the terminal optimization program at Miami International Airport to meet growing demand and accommodate larger, wide-body aircraft at the airport's North Terminal. While the program calls for a total rebuild of the North Terminal in the long term, improvements and upgrades are needed to meet current and short-term demand for American Airlines, the main airline housed in the North Terminal. The central base apron project is part of the first phase of this vital capital improvement program. The project consists of approximately 84 acres of aircraft-rated rigid and flexible apron pavement, taxiway and taxi lanes to add additional aircraft hard stands, utility lines, lighting, electric power distribution and storm water management facilities.

The scope of work entails development of construction phasing and maintenance of operation plans; pavement and aircraft hard-stand markings; pavement grading and drainage; gravity sewer lines; taxiway/taxi lane pavement lighting; and design of the overall site plan. Existing pavement and other miscellaneous facilities will be demolished. In addition, an existing open channel will be filled to accommodate a 10-foot-by-10-foot concrete box culvert that will make room for extension of the existing taxi lane. Other responsibilities include preparation of existing topography, utility plans and utility tie-in.

WSP is responsible for the grading, drainage and utilities relocation design, as well as coordination of the permitting process with the Federal Aviation Administration and MDAD to mitigate airside traffic and landside regulatory issues. The project team will also coordinate with an adjacent American Airlines maintenance hangar facility that must remain operational to at least 75 percent of its capacity throughout construction.

Image courtesy of San Francisco International Airport

SAN FRANCISCO INTERNATIONAL AIRPORT IMPROVEMENTS

San Francisco, California
Services: Project Management, Construction Management, Design

The Ascent 2020 program is creating the next generation of facilities to redefine the travel experience at San Francisco International Airport. WSP is providing project management support services for the redevelopment of Terminal 1 (Boarding Area B) that will elevate the passenger experience, accommodate larger aircraft, and provide facilities to meet increased passenger volume. Services include pre-programming support, stakeholder engagement coordination, assisting the airport and the design-build team with construction management support, design team peer review, project controls, activation and commissioning.

The project will provide 24 new gates, including six with direct access to the Federal Inspection Services area to accommodate international arrivals. In addition, the project entails a new centralized security checkpoint, a new consolidated baggage handling system, new dining and retail concessions, post-security connecting walkways, and improved connections to the AirTrain station and central parking garages. WSP was also commissioned to develop an integrated technology systems plan for the redeveloped Terminal 1 designed to LEED Gold standards.

Image courtesy of Hartsfield-Jackson Atlanta International Airport

HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

Atlanta, Georgia
Services: Program/Project Management

WSP leads the joint venture that is providing program management support services for the ATLNext program, an ambitious $6 billion program of improvements to enhance the passenger experience, increase service capacity, and optimize airport operations at the world's most traveled airport. The joint venture is responsible for program/project management support, quality management, safety oversight, project controls, contract administration, document control, invoice compliance, constructability reviews and supplier diversity outreach, monitoring and reporting.

The program entails landside, terminal and airside facility renewal, replacement and modernization projects to meet increasing demand. Key program elements include a five-gate addition to Terminal T, a new sixth runway, and an extension of the underground automated people mover, as well as improvements to the domestic terminal complex, parking decks, baggage handling systems and end around taxiways. Dramatic new curbside canopies, more open and brighter terminals, better parking options and other modern amenities will enhance the passenger experience. The improvements will expand airport capacity, including the ability to accommodate A380 aircraft with dual passenger boarding bridges.

NEWARK LIBERTY INTERNATIONAL AIRPORT TERMINAL A REDEVELOPMENT

Newark, New Jersey
Services: Construction Management

Terminal A at Newark Liberty International Airport, which opened in 1973, was designed to accommodate 9 million passengers annually. Passenger volume has exceeded that design capacity and is expected to grow. As a result, the Port Authority of New York and New Jersey has undertaken the Terminal A redevelopment program to provide a world-class, state-of-the-art terminal that will enhance the passenger experience and improve operations. WSP is serving as construction manager, providing construction engineering and inspection, construction administration, project controls, safety management and environmental mitigation services.

The Terminal A program comprises the new three-level terminal, airfield modifications, a new parking garage, and a completely redesigned landside and roadway network. The terminal will also include a two-story central head house featuring a mezzanine level between the departure and arrival levels.

The head house will include a weather-protected pedestrian bridge that will connect the terminal with a new parking garage, the existing parking lot and a future AirTrain station. The airside infrastructure includes new aprons adjacent to the planned terminal, dual north and south taxi lanes, service roads and staging areas. The reconfigured landside roadway network includes eight new bridges, ground transportation facilities, elevated roads and taxi zones.

National Footprint, Local Knowledge

WSP provides clients with the collective experience of our work at airports across the U.S., providing lessons learned and best practices to deliver the most challenging projects. With more than 7,000 people in 100 offices across the country, located in close proximity to our airport clients, we bring the best of both worlds—extensive aviation project expertise and local knowledge of the unique environments within which our clients operate. Our solutions are tailored to meet the objectives of our clients, creating a safe, efficient and memorable airport experience for patrons, employees and tenants alike.

WSP USA
One Penn Plaza
New York, NY 10119
main: 1-212-465-5000
email: USinfo@wsp.com

wsp.com

About WSP USA

WSP USA is the U.S. operating company of WSP, one of the world's leading engineering and professional services firms. Dedicated to serving local communities, we are engineers, planners, technical experts, strategic advisors and construction management professionals. WSP USA designs lasting solutions in the buildings, transportation, energy, water and environment sectors. With more than 7,000 people in 100 offices across the U.S., we partner with our clients to help communities prosper.

US-CC-BR-Y074-EN-2018.08-002