

Jacobs

Challenging today.
Reinventing tomorrow.

Jacobs Aviation





Aviation Business Development

Partner of Choice

Number		Americas Project	EMEA Project	APAC Project
001	Traffic Forecasting	Seattle-Tacoma Intl Airport	Zurich Airport	Noida Intl Airport
002	Airport Transaction Services (P3)	Luis Muñoz Marín Intl Airport	Aéroports de la Côte d'Azur	Clark Intl Airport
003	Strategic Business Consultancy	Massachusetts Port Authority	Gatwick Airport	Kualanamu Intl Airport
004	Environmental Services and Sustainability	Whidbey Island	Heathrow Airport	Melbourne Airport
005	Master and Facilities Planning	Guayaquil Airport	Heathrow Airport	Navi Mumbai Intl Airport
006	Project Definition	Dallas Fort Worth Intl Airport	Gatwick Airport	Chhatrapati Shivaji Intl Airport
007	Design	Denver Intl Airport	Manchester Airport	Brisbane Airport
008	Airport Operations and ORAT	Seattle-Tacoma Intl Airport	Heathrow Airport	Chhatrapati Shivaji Intl Airport
009	Asset Management	Los Angeles World Airports	Heathrow Airport	Melbourne Airport
010	PM / CM	LaGuardia Airport	Abu Dhabi Intl Airport	New Manila Intl Airport
011	Military	Hill Air Force Base	RAF Lakenheath	Kadena Air Base



Traffic forecasting is a key element underpinning all areas of airport planning - whether strategic, business, or operational.

Our traffic forecasts bring together a combination of econometric, "top down" techniques along with our extensive knowledge of market-driven, "bottom up" approaches. For each traffic forecast, we identify the appropriate key drivers and build our models around them.

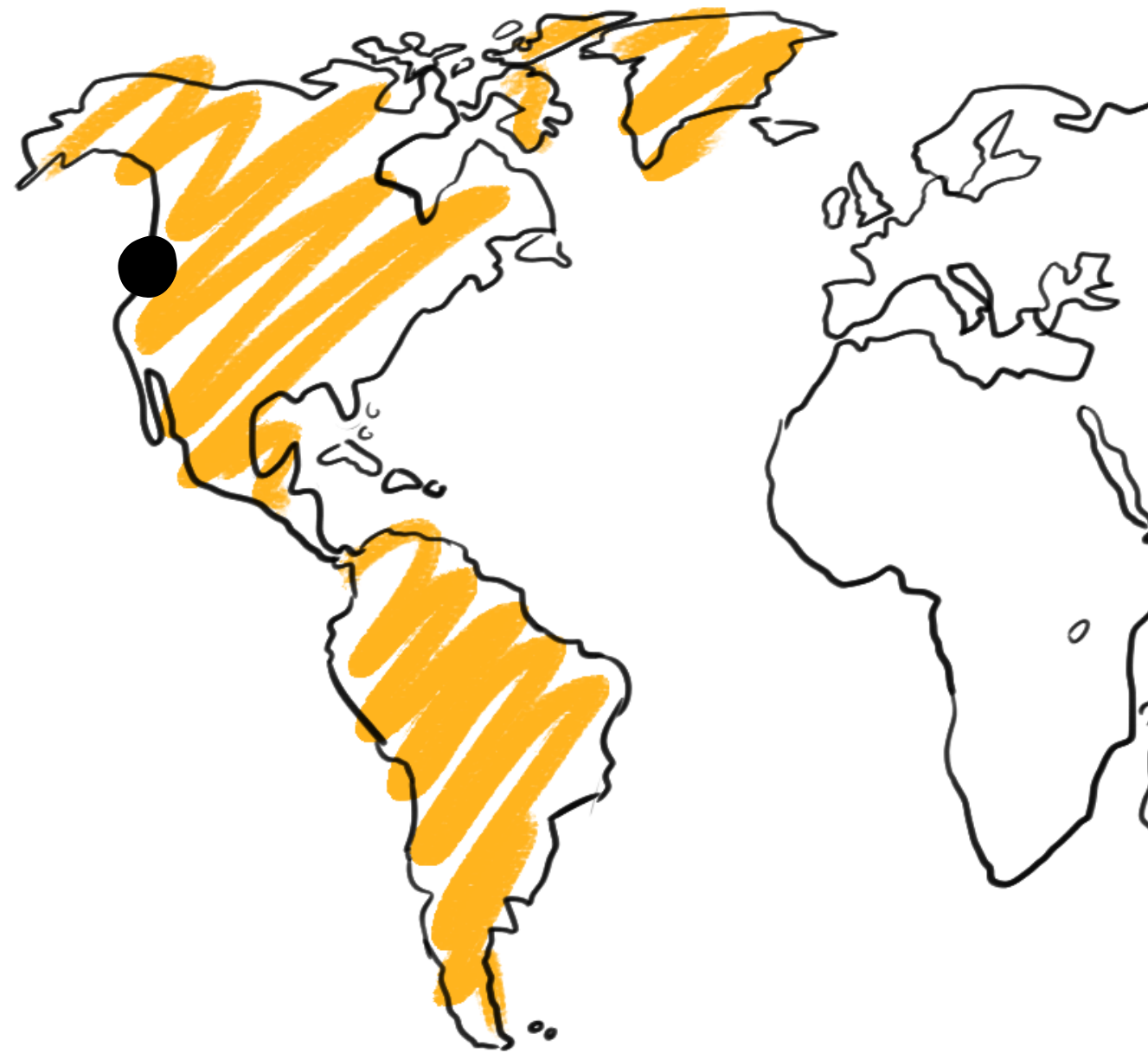
We produce traffic forecasts for airports, airlines, airport investors, shareholders, and governments. Our forecasts provide the basis for major master plans, investment decisions, regulatory submissions, policy development, route planning, and traffic marketing plans, among other uses. We have produced traffic forecasts throughout the world, ranging from the largest global international hubs to small regional airports and major greenfield developments.



- Example Projects**
- Seattle-Tacoma International Airport, Seattle, Washington, U.S.
 - Zurich Airport, Zurich, Switzerland
 - Noida International Airport, Delhi, India

- Additional Projects**
- London Heathrow Airport, United Kingdom
 - Sao Paulo Guarulhos Airport, Brazil
 - Medan Kuala Namu Airport, Indonesia
 - Bengaluru Airport, India
 - Istanbul Sabiha Gokcen Airport, Turkey

Americas



Jacobs prepared aviation demand forecasts and Design Day Flight Schedules (DDFSs) in support of the Sustainability Airport Master Plan - one of the first sustainability master plans conducted in the U.S.

Seattle-Tacoma International Airport - Seattle, Washington, U.S.

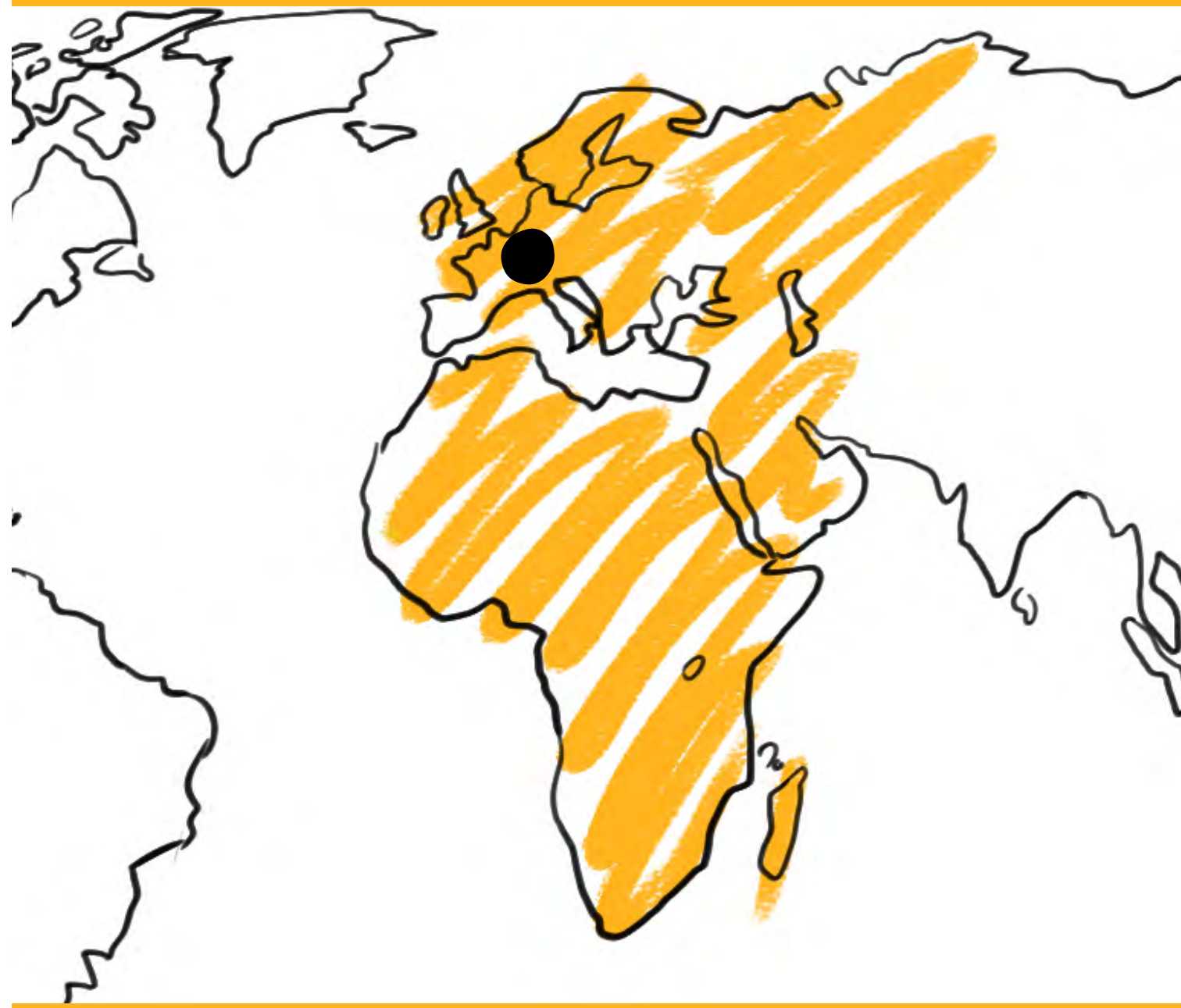


At that time, the airport was being developed as a West Coast connecting hub and international gateway in Delta Air Lines' system, in addition to its ongoing role as a primary connecting hub in Alaska Airlines' system.

To facilitate the development of annual forecasts and DDFSs, Jacobs:

- Met with the two airlines' representatives for their input on future activity at the airport
- Analyzed the hourly distribution of operations and connecting banks at Delta's other connecting hubs
- Reviewed the buildup in airline service that occurred at other airports that were developed as connecting hubs

EMEA



Jacobs developed demand forecasts to inform Zurich Airport's aeronautical charges negotiations.

Zurich Airport - Zurich, Switzerland



Jacobs prepared a thorough market analysis and airline review, developed a bottom-up demand forecast for a 5-year period, and conducted an independent review of airlines' forecasts to assess suitability for negotiations.

Jacobs provided our client with a market analysis to determine recent regional trends in aviation, an understanding of what the next 5 years could look like, and a thorough critique of the airline forecast submissions, and effectively supported our client with airline negotiations.

APAC



Noida International Airport - Delhi, India



Jacobs was involved in determining the demand and need for a secondary airport in Delhi, India, through a comprehensive traffic study that considered the wider benefits to Indira Gandhi International Airport (IGIA) and the enabling of future unconstrained growth in the national capital region.

The Jewar greenfield airport, proposed to be located to the southeast of Delhi, at Noida, is expected to handle 30-50 million passengers per year.

The traffic study:

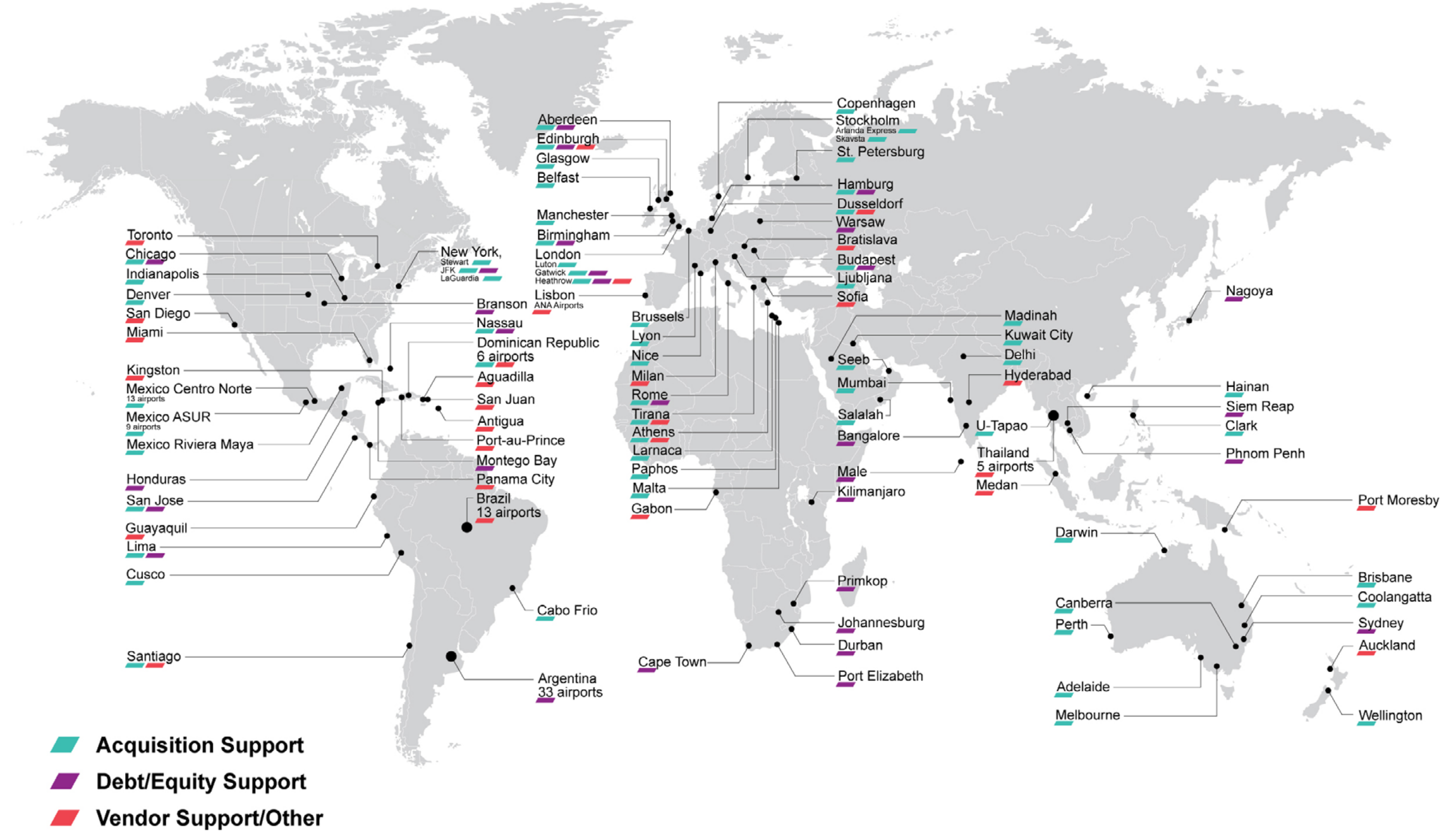
- reviewed current airport operations and historic trends;

- analyzed the Regional Connectivity Scheme, which aims to connect regions with currently limited transport options;
- forecasts passengers, air traffic movements (ATMs), cargo tonnage, and landed tonnage for the Delhi region; and

- provides insight into other cities with dual airport systems in order to establish reasonable assumptions for the Jewar airport traffic allocation and forecasts that were produced.

Increased aviation traffic has driven the need for additional capacity and placed substantial demands on aging airport infrastructure. This has led to a need for substantial and rapid investment in new airports in developing economies and improved and enlarged facilities at existing airports.

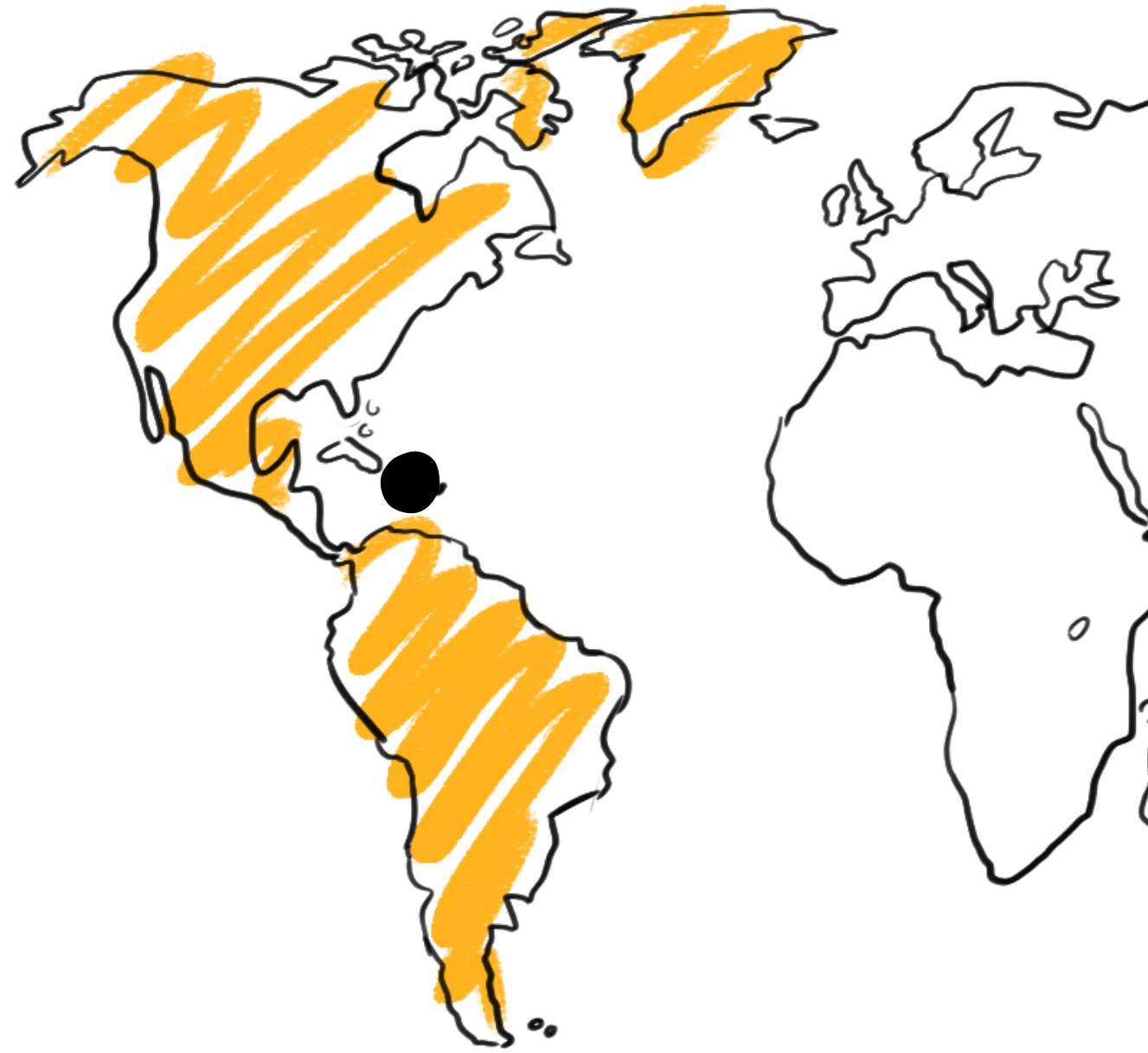
While, historically, airport capital improvements would be primarily government funded, the volume and urgency of these needs require new and fresh approaches to the investment challenge. A range of alternative public/private partnerships (P3s) have been created to fund airport developments across the globe, and Jacobs has been closely involved in many of them. We have worked successfully with government and private vendors, potential concessionaires, and financial lenders. Our services can be tailored to suit the needs of the client, from traffic and revenue forecasting through airport planning to project delivery and airport operations - leveraging our end-to-end understanding of airport financing, operations, and development.



- ### Example Projects
- Luis Muñoz Marín International Airport, San Juan, Puerto Rico, U.S.
 - Aéroports de la Côte d'Azur, France
 - Clark International Airport, Philippines

- ### Additional Projects
- Medan Kualanamu Airport, Indonesia
 - Milan, Naples & Turin Airports, Italy
 - Hobart Airport, Australia
 - Lima Airport, Peru
 - U-Tapao Airport, Thailand

Americas



Luis Muñoz Marín International Airport - San Juan, Puerto Rico, U.S.



Under the FAA's Airport Privatization Pilot Program, the Puerto Rico Ports Authority completed the first privatization of a large commercial airport in the United States in 2013.

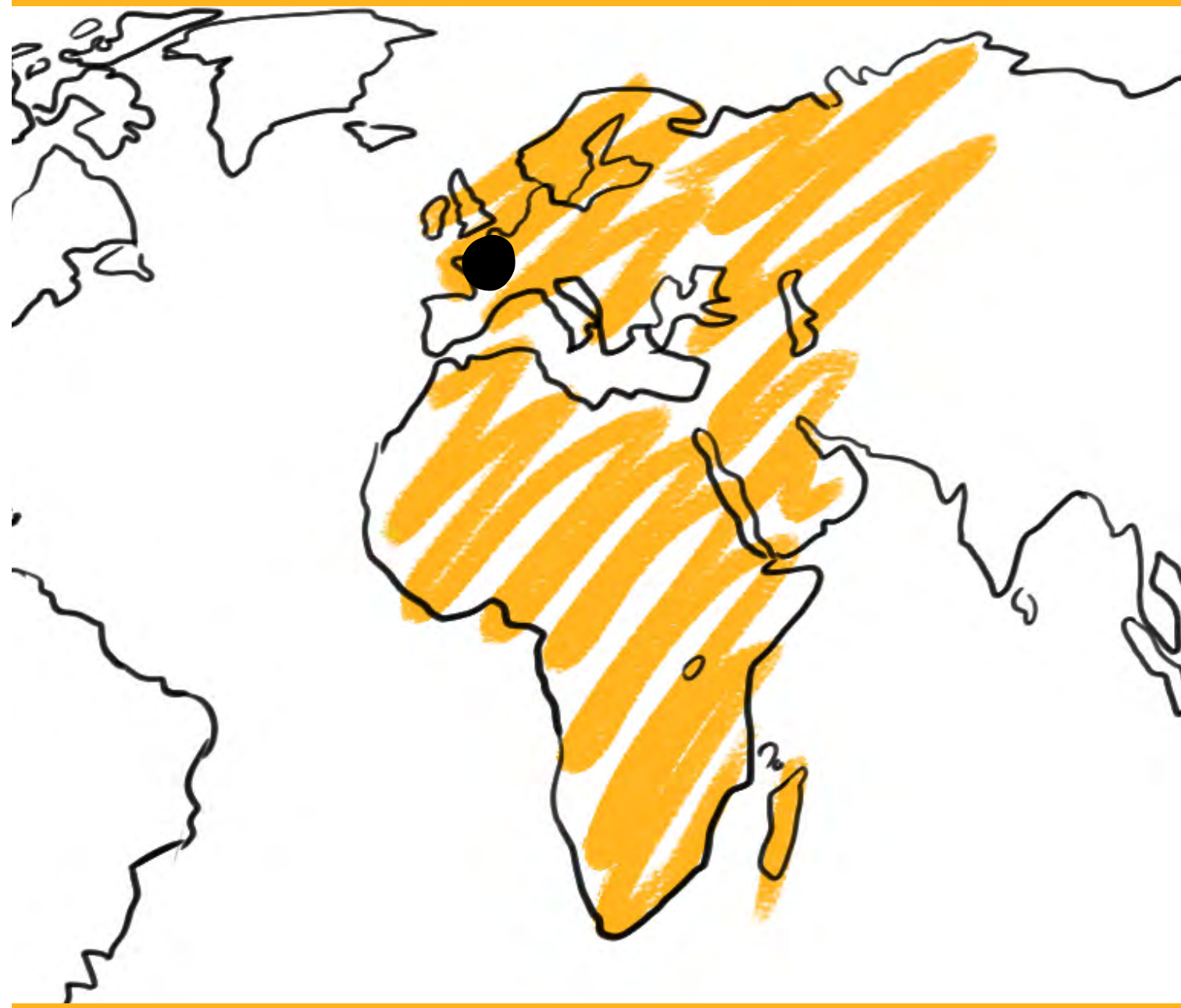
With Jacobs' assistance, the Authority entered into a 40-year lease with Aerostar Airport Holdings, a joint venture of Aeroportuario del Sureste and Highstar Capital, for the development and operation of the airport.

The Authority received an up-front payment of \$615 million and, over the next 40 years, is expected to receive revenue sharing along with a privately financed \$1.2 billion capital program. Jacobs' tasks included:

- Air traffic and revenue projections
- Airline negotiations - establishing airline payments and developing operating standards

- Assessing capital projects
- Passenger facility charge application preparation
- FAA coordination - ensuring FAA would grant the exemptions on use of proceeds and airport revenues

EMEA



Jacobs was engaged by Aeroporti di Roma (AdR) and Électricité de France (EDF) to develop independent traffic forecasts and undertake a due diligence review of Aéroports de la Côte d'Azur (ACA) covering the airports in Nice, Cannes, and St. Tropez.

Aéroports de la Côte d'Azur - France



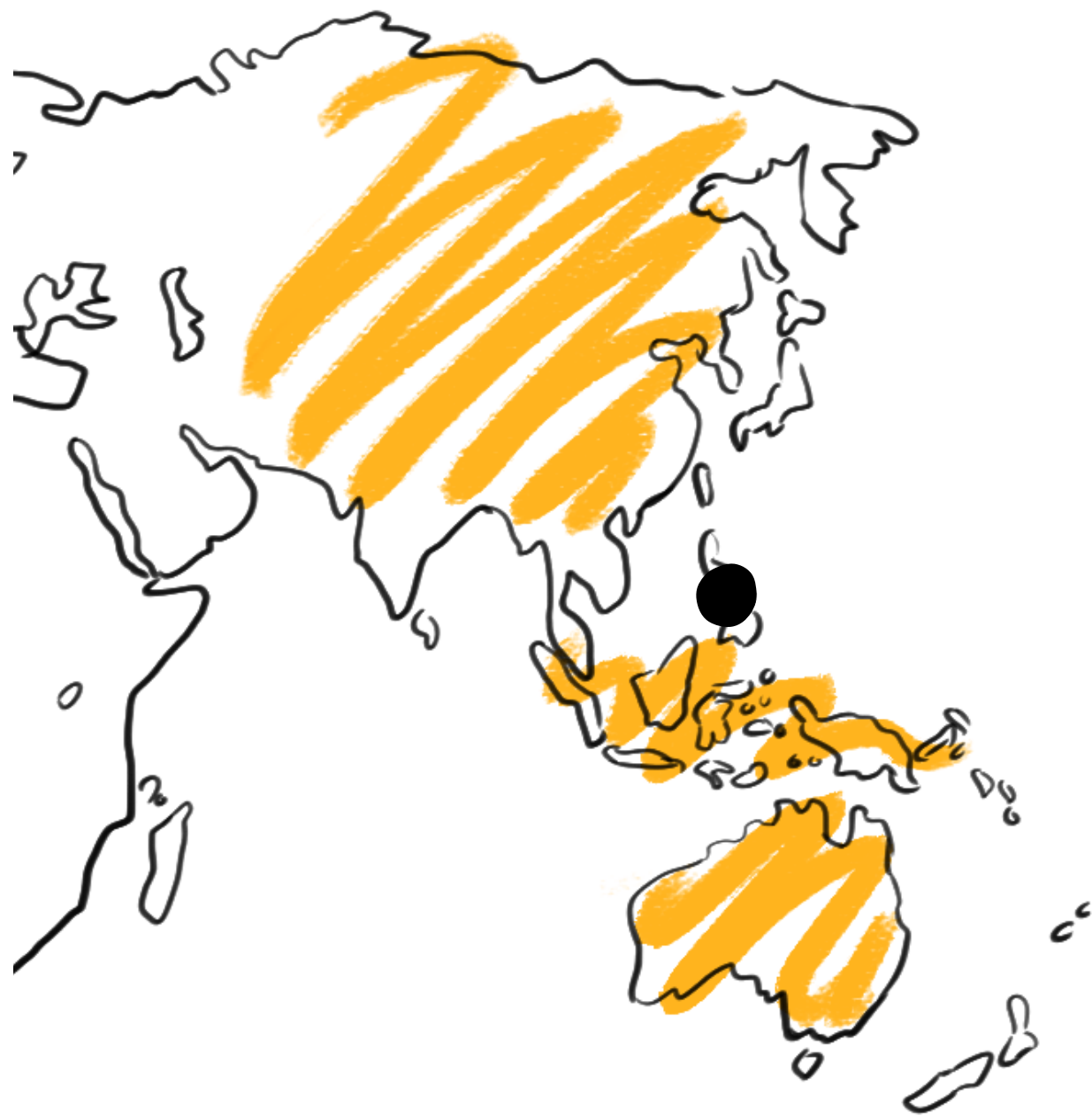
Jacobs undertook;

- an analysis of macroeconomic drivers;
- a strengths, weaknesses, opportunities, and threats (SWOT) analysis of the airports;
- prepared a fleet strategy and route plans of major carriers; and prepared forecasts for traffic, aeronautical and non-aeronautical revenue, and capital expenditures,

all of which considered the strong element of business and general aviation present at the airports.

As a result, and based on commercial and strategic advice, the client made a successful offer to purchase a 64% stake in ACA.

APAC



Jacobs was engaged by the Air Asia Consortium to provide business planning and technical support to their bid for the concession agreement for Operations and Management (O & M) at Clark International Airport.

Clark International Airport - Philippines



Under a new approach by the government of the Philippines, the EPC and the O&M contracts were to be awarded to separate parties. The O&M Concession is for the completion, commissioning and operation of the new terminal and the management, operations and maintenance of the existing passenger terminal.

Jacobs brought together extensive knowledge of business planning and technical expertise to deliver a Business Plan and Project Execution Plan to inform the decision making and pricing processes of the Consortium. Jacobs conducted a detailed review of the current operating environment including infrastructure, finances, passengers, emerging issues and opportunities.

Jacobs identified key technical risks relevant to the O&M Concession Agreement and its interface with the EPC contract. The resultant plan for the completed terminal facilities embodied operational efficiency, and the capability for continued expansion to meet demand through strategic asset management philosophies.

As an end-to-end solutions provider to our clients, Jacobs knows that infrastructure development is not always the appropriate solution to an airport's business needs. Frequently, opportunities exist to improve business performance through optimization of existing facilities and operational processes.

Our airport commercial and operational experts work with clients to collectively understand what the core business needs and objectives truly are and then analyze the existing financial and operational models to develop solutions. This can range from restructuring an airport's business model to adopting alternative operational practices to optimize process efficiencies, improve health and safety, or increase resilience.

Where infrastructure solutions are deemed appropriate, we work closely with clients to help them prioritize their capital expenditure in a robust and structured manner that will enable them to secure the support of airlines, regulators, and other stakeholders. Jacobs also can assess the state of a client's information technology (IT) environment and develop a strategic technology plan that best positions them to embrace emerging technologies.

Jacobs can assist with forecasting IT needs and providing the focus, experience, and vision to help the client fulfill them.



Example Projects

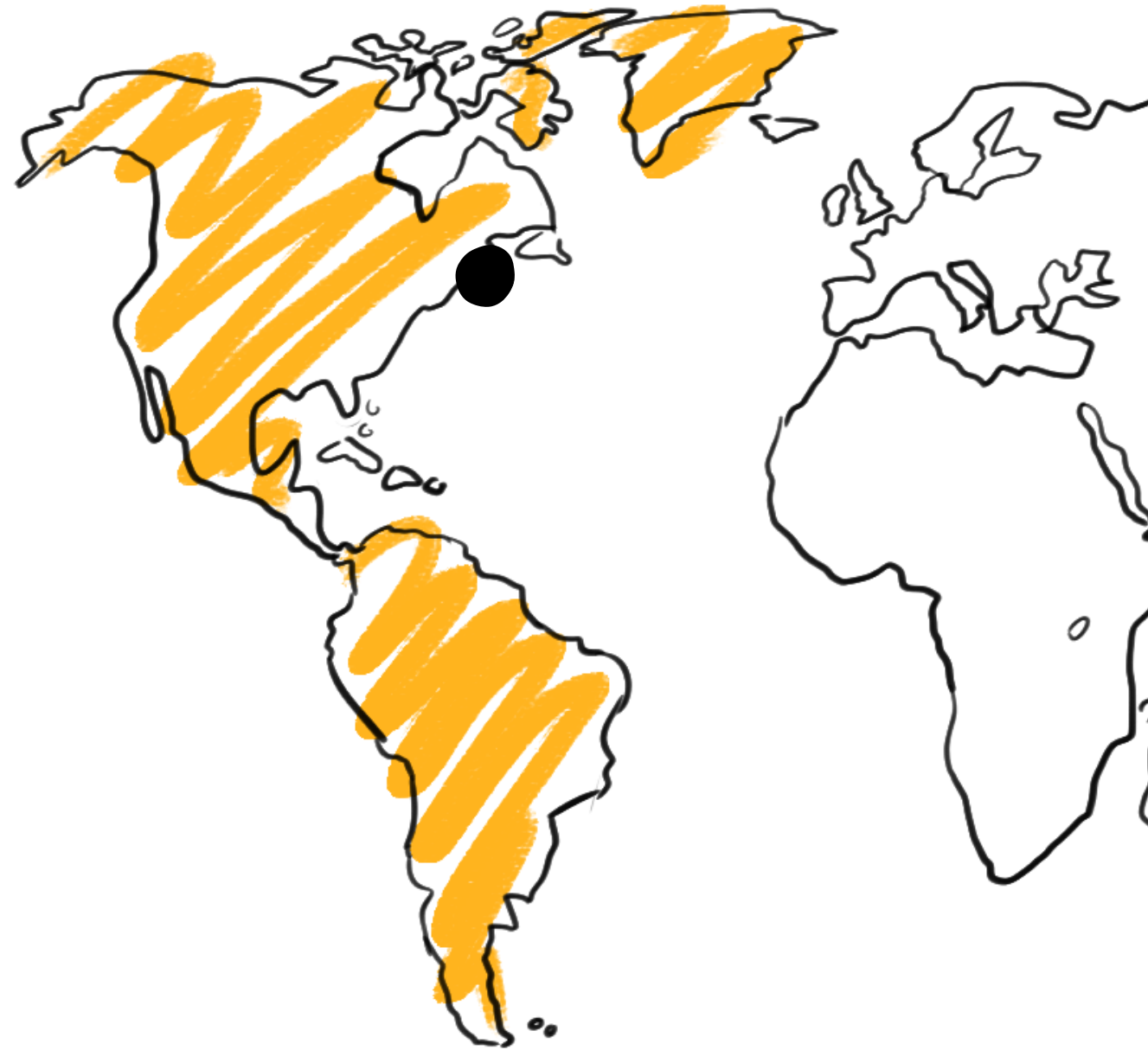
- Massachusetts Port Authority, Boston, Massachusetts, U.S.
- Airline Moves, Gatwick Airport, London, U.K.
- Kualanamu International Airport Medan, Indonesia

Additional Projects

- HSE Assessment, Ardian
- Dublin Stand Allocation Study
- Cargo Optimization Study, Heathrow
- Airside Roads Network Performance Analysis, Heathrow
- Pittsburgh International Airport



Americas



Massachusetts Port Authority - Boston, Massachusetts, U.S.



Jacobs has successfully provided Massport with operational management and technical consulting support for 20 years. Our long-term relationship has provided a unique understanding of Massport's critical network technologies, as well as the personnel, procedures, and processes of the entire enterprise.

Facilities

Jacobs personnel are co-located with Massport, supporting operations at the following facilities:

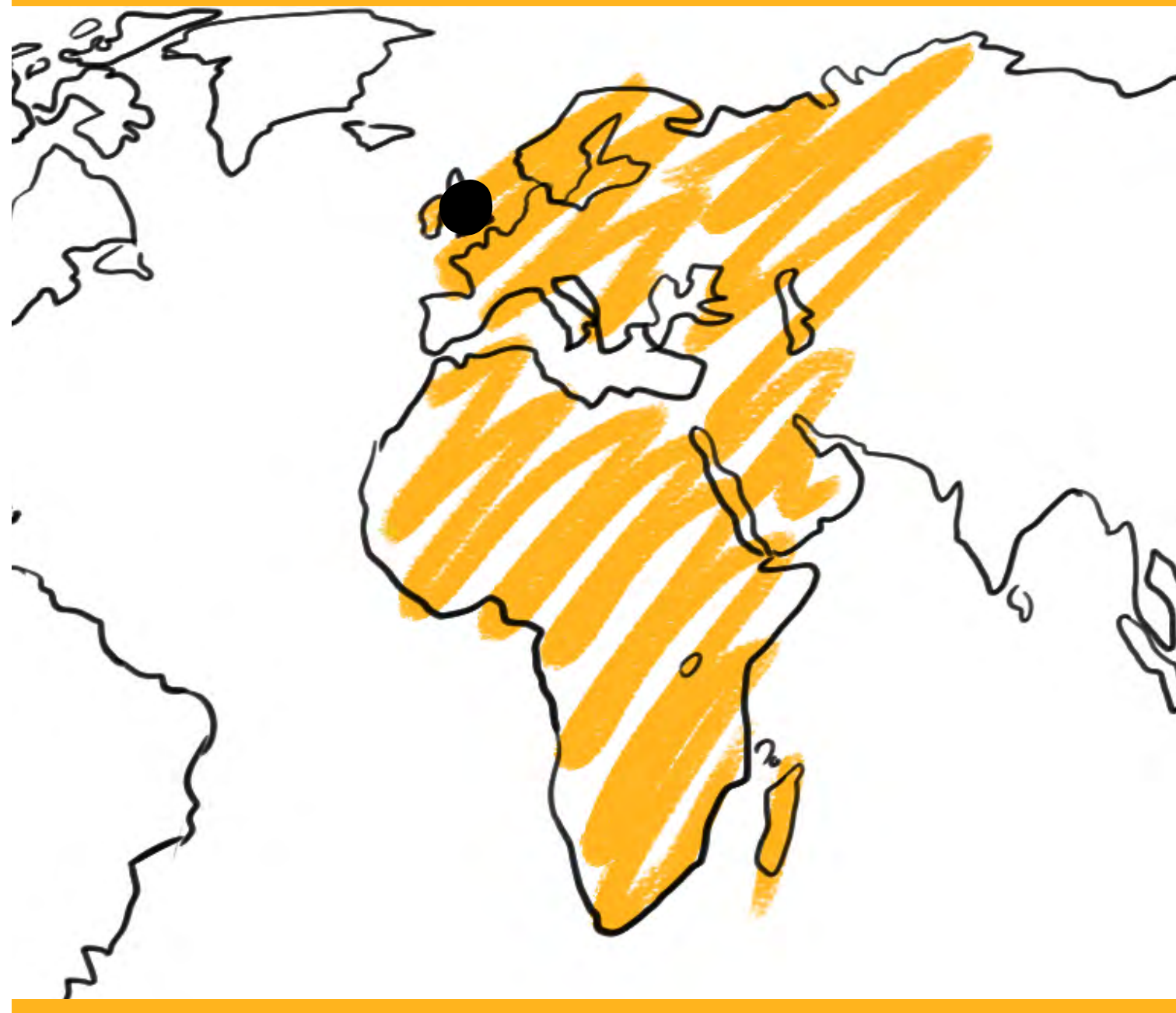
- Logan International Airport Facilities, East Boston
- Hanscom Field, Bedford
- Worcester Airport, Worcester
- Conley Terminal, South Boston
- Black Falcon Cruise Terminal, South Boston
- Fish Pier, South Boston

Staffing

Our staff of eight engineers support Massport in providing mission-critical IT consulting with a high level of technical expertise. Jacobs provides critical IT services for network infrastructure, systems, and security support.

Examples of our high performance include: maintaining system uptime at 99.9%; responding to 100% of service requests, meeting/exceeding Service Level Agreements (SLAs); and increasing overall IT server resource utilization by 400%.

EMEA



Airline Moves, Gatwick Airport - London, U.K.



In 2017, Gatwick Airport undertook a £2.5 billion (US\$3.3 billion) transformation in which three airlines were to be relocated over 3 nights.

The project would allow Gatwick to reconfigure and optimize the functionality of the airport's existing infrastructure and footprint, as well as achieve operational efficiencies in terminal areas such as check-in, immigration, and security. The relocation involved Virgin Atlantic moving from South Terminal to North Terminal, British Airways from North Terminal to South Terminal, and Easyjet consolidating operations in North Terminal.

Over 200,000 square feet of tenanted space was changing, necessitating more than 80 construction tasks and affecting over 10,000 airport-based workers. Jacobs was the primary design consultant engaged to provide multidisciplinary services for RIBA (Royal Institute of British Architects) Plan of Work, Stages 2-4, on various projects, as well as advisory services in Stage 5 and assisting in "as constructed" drawings for Stage 6.

In addition to providing operational readiness and airport transition (ORAT) services for the facilities, Jacobs provided architectural, structural, mechanical, electrical, and public health design services to deliver a business-critical program via a fast-tracked procurement schedule and by working closely with our client and stakeholders.

APAC



Jacobs is supporting PT Angkasa Pura II (AP II) in their search for an international strategic partner in the expansion of Kualanamu Airport in Medan. AP II is one of two Indonesian government companies responsible for the management and operations of 13 airports in Indonesia, including Kualanamu, the largest airport on the island of Sumatra and the fourth largest in Indonesia.

Kualanamu International Airport – Medan, Indonesia



Our responsibilities include:

- Traffic demand forecasts, including interviewing key airline representatives and other stakeholders, producing base, high and low case scenarios
- Aeronautical revenue forecasts, including a review of the current charges, benchmarking against peer airports
- Commercial revenue forecasts, including benchmarking against comparable airports, a review of the current situation and a review of the airport management outlook
- Opex forecasts and capex forecasts, including a review of the current facilities and an assessment as to new capacity may be provided
- Environmental, health and safety review and recommendations
- Recommendations on changes to national regulatory policy to accommodate the new investment and company structure
- Reviewing the RFP and Master Agreement, drafting technical annexes, and technical evaluation



Jacobs offers a diverse set of aviation environmental services covering the full range of our airport customers' needs and providing value-added solutions that place our customers' individual challenges at the forefront of our approaches.

We provide strategic approaches that are tailored to our client's environmental needs, whether it is developing compliance master plans, Environmental Impact Statements (EISs), sustainability resiliency approaches, carbon management plans, or per- and polyfluorinated substances (PFAS) risk management. Our service bundles include environmental permitting and planning, environmental stewardship and resiliency, waste management and planning, environmental assessments and remediation, and PFAS management and risk strategies.

Jacobs is at the forefront of airport sustainability and is a leader in applying Green and Sustainable Remediation to our projects, including the use of natural systems approaches and life-cycle cost analysis tools. We deliver best-in-class environmental approaches for airport clients worldwide, and we constantly seek opportunities to incorporate sustainable concepts within all of our projects, from development, through design, construction, and operation.

Our environmental services include:

- Environmental Stewardship, Sustainability, and Resiliency
- Environmental Assessment and Planning
- Waste Management and Planning
- Environmental Investigation, Remediation, and Beneficial Reuse



Example Projects

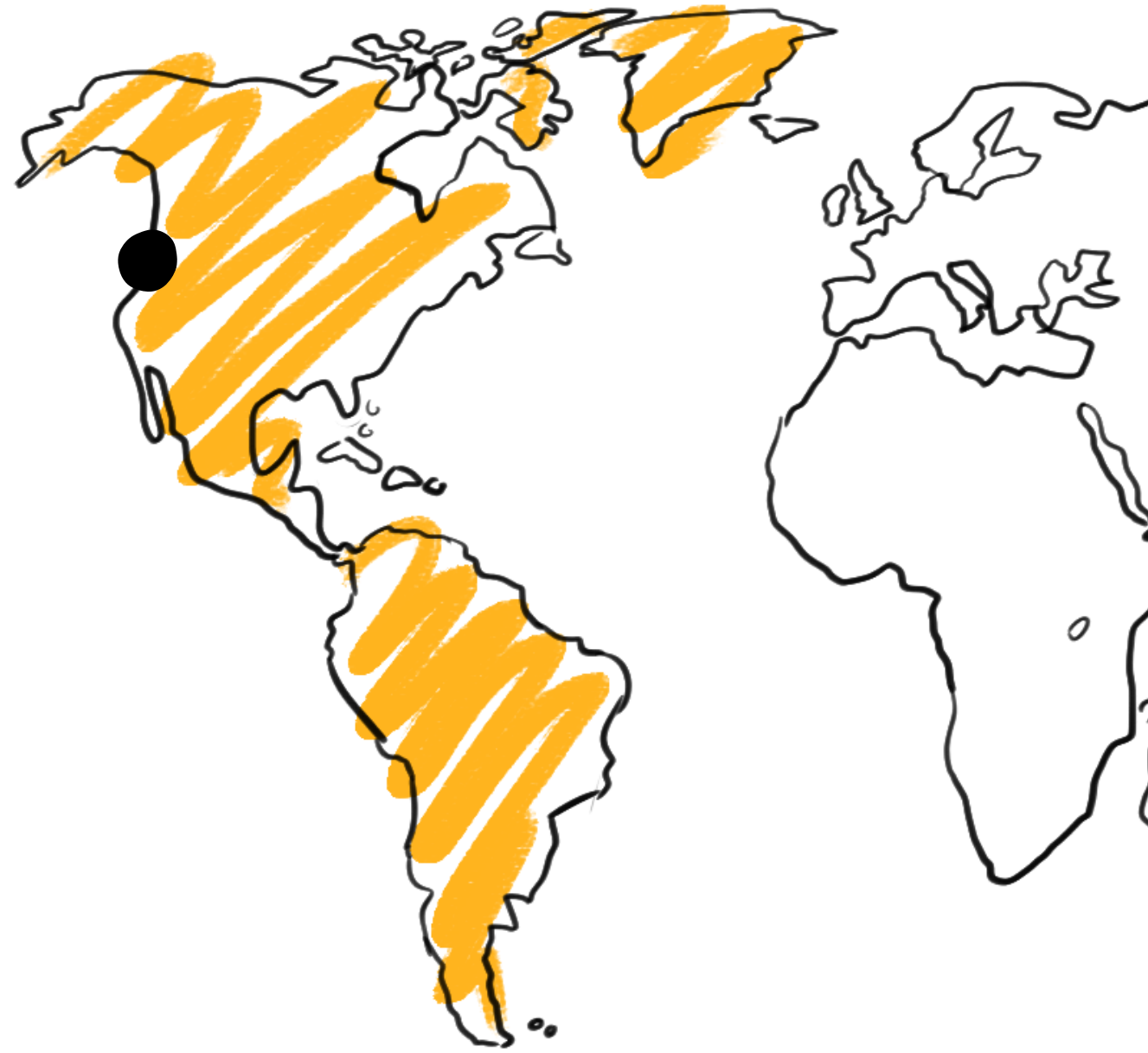
- PFAS Investigation / Treatment Design, Naval Air Station Whidbey Island, Washington, U.S.
- Carbon Footprint and Reporting, Heathrow Airport, London, U.K.
- Assessment and Management of PFAS-Impacted Construction Spoil, Melbourne Airport, Melbourne, Australia

Additional Projects

- Flood Resilience Review, London Gatwick Airport;
- Sustainability Assessment and Climate Change Resilience, Virtual Control Tower, London Heathrow Airport: tbc
- Melbourne Airport, Australia:



Americas



Naval Air Station Whidbey Island - Washington, U.S.

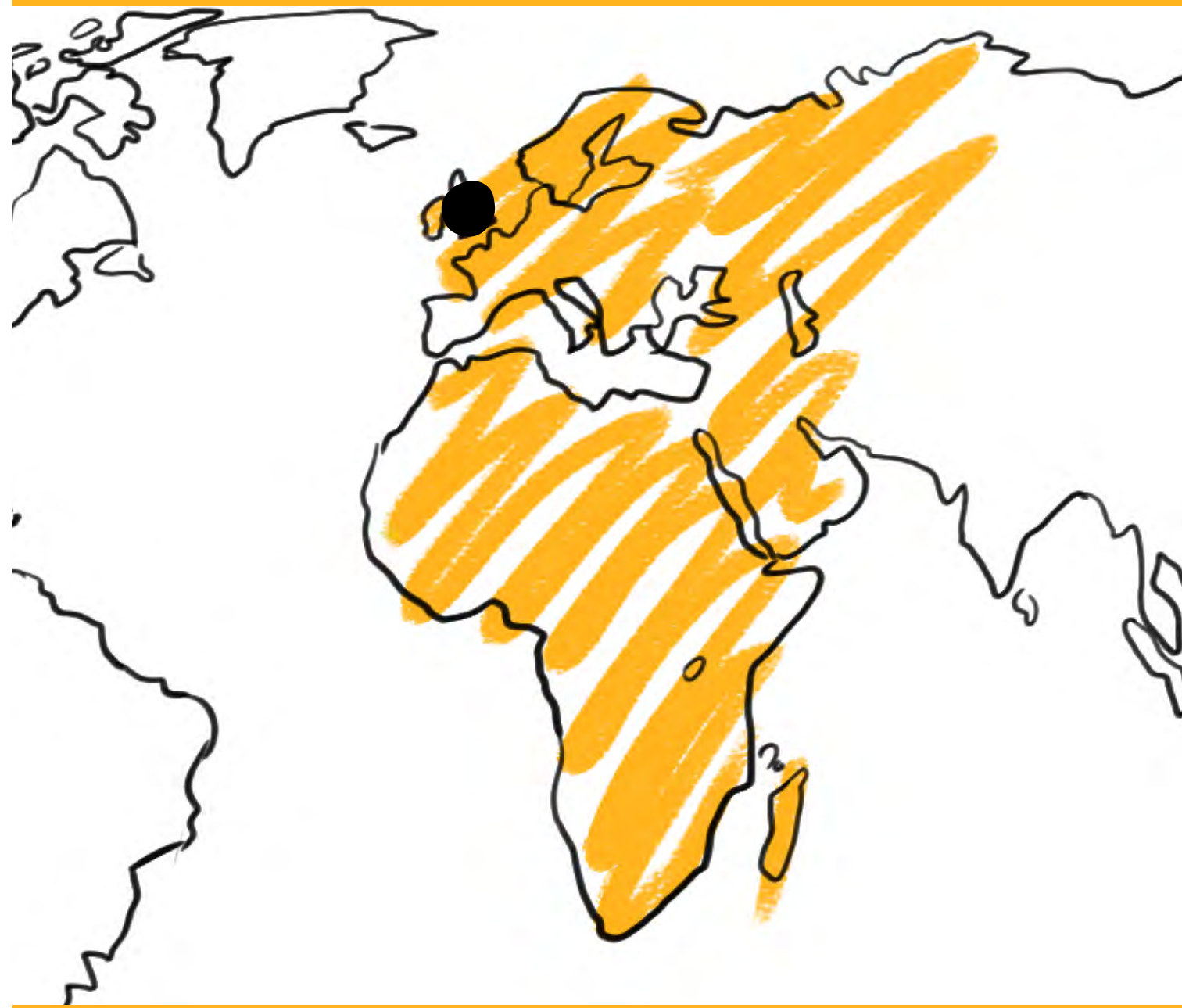


Jacobs performed Preliminary Assessments for PFAS at three base operational areas; on-base sampling of groundwater, soil, and drinking water; and aquifer testing for hydraulic containment at two base operational areas.

Jacobs has supported public outreach through off-base private drinking water sampling, fact sheets, results notifications, and organizing three public meetings and supporting two Restoration Advisory Board meetings. In support of treatment system design, we performed bench-scale pilot testing of various granular activated carbon (GAC) for ex situ treatment of drinking water.

We performed remedial design and installed a point-of-use treatment system at one privately owned property and prepared the Engineering Evaluation/ Cost Analysis and Action Memorandum to evaluate long-term removal actions for residents impacted by PFAS in seven drinking water wells near the base.

EMEA



Jacobs has calculated the carbon footprint for Heathrow Airport for Scope 1, 2, and 3 emissions from operations, in compliance with Airport Carbon Accreditation (ACA) standards, since 2014.

Heathrow Airport - London, U.K.



In 2019, Jacobs worked with Heathrow to expand their reporting to include further datasets outlined by ACA's newly introduced step and to expand the number of Scope 3 categories reported. This vast dataset includes information from over half a million aircraft movements and the surface access journeys of over 48 million passengers.

Once all this data has been checked and validated and the footprint has been calculated, Jacobs supports Heathrow through the verification process, answering any queries from auditors.

The carbon footprint work is part of a larger carbon scope and wider resilience program that Jacobs undertakes for the airport.

APAC



Melbourne Airport - Melbourne, Australia



Jacobs was engaged by Melbourne Airport (Australia Pacific Airports [APAM]) to conduct successive PFAS investigations associated with the Taxiway Zulu and Northern Access Route (NAR) design project being undertaken by the Jacobs civil design team.

Identification and further investigation of PFAS impacts within soils at the site, and as a requirement of the Environmental Protection and Biodiversity Conservation Act 1999 (EPBCA), led to a request to develop a PFAS Management Plan (PFAS MP). The purpose of the plan was to address potential environmental risks associated with the disturbance of PFAS-impacted material resulting from project activities.

The approved and finalized PFAS MP was incorporated into Melbourne Airport's estate-wide PFAS Management Strategy and used to develop and update PFAS Management Plans at airports across the country (Brisbane and Adelaide Airports) and the world (Heathrow Airport, London, U.K.).

Jacobs also conducted additional delineation sampling to minimize soil volumes for management, updated the Construction Environment Management Plan (CEMP) in light of the PFAS MP, and developed a detailed Surface Water Management Methodology for the site.



Jacobs provides airport facilities and master planning services for new and existing airports worldwide. Our airport master plans are focused on their deliverability – financially, physically, and politically. They are also designed to be developed flexibly, in phases, while safeguarding our clients' long-term development needs.

We are skilled in right-sizing facilities to reflect emerging technological innovations and changing industry requirements, and we create development plans using a range of simulation tools to optimize the use of facilities.

Sustainability is at the heart of all we do, and we create our master plans carefully, to minimize their impacts on the environment, be resilient to climate change, and address the industry challenge of reducing carbon emissions.

Because many airports are situated within an urban environment, our master plans embrace the concept of "airport cities" and seek to serve the neighboring businesses and residential communities as well as the airport users. For a master plan to be ultimately successful, we know the importance of securing support of all airport stakeholders.



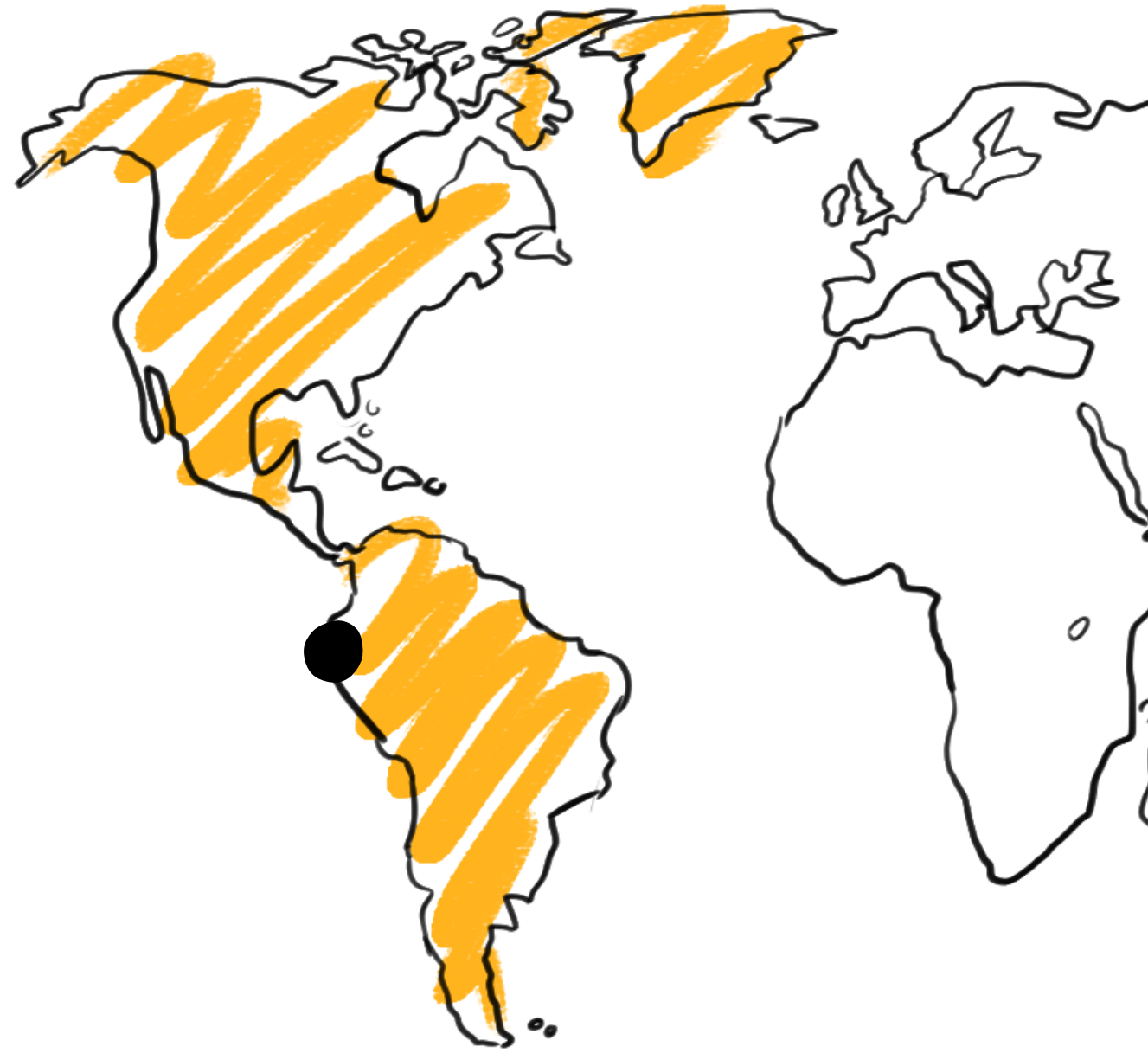
Example Projects

- Greenfield Airport Master Plan, Guayaquil, Ecuador
- Heathrow Expansion Program, Heathrow Airport, London, U.K.
- Navi Mumbai International Airport, Mumbai, India

Additional Projects

- Bangalore International Airport, T1 and T2, India
- Northern Runway, Gatwick Airport, U.K.
- San Diego International Airport, California
- Manchester Airport, U.K.

Americas



Guayaquil, the most populous city in Ecuador, anticipates exceptional growth in the region, with its airport reaching capacity around 2024.

Guayaquil Airport Master Plan - Guayaquil, Ecuador



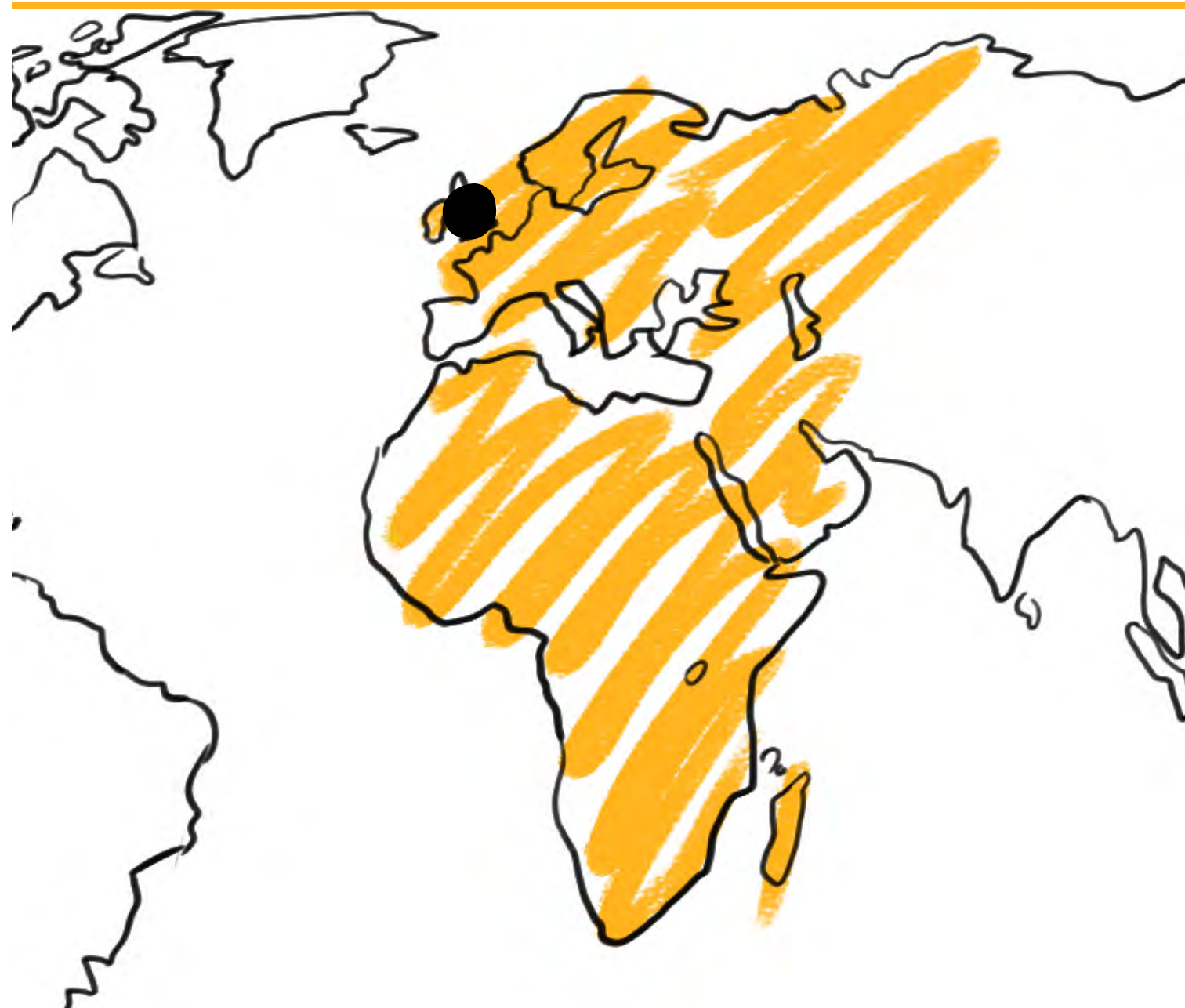
The existing airport site provides few opportunities to increase capacity, prompting the Airports Authority of Guayaquil to study the possibility of building a new greenfield airport.

Jacobs' strategic planners provided services to evaluate the development plan, including airfield and airspace planning, terminal facilities planning, ground transportation and parking, air cargo, forecasting and economics, commercial and concessions, and financial planning and advisory.

We are developing conceptual designs to support the advancement of the program.



EMEA



Heathrow Expansion Program - London, U.K.



As the Gateway to the United Kingdom, Heathrow Airport has faced increasing pressure to consider future expansion opportunities. Between 2017 and 2020, Jacobs has been the Programme Client Partner (PCP) and a leading a member of the Integrated Design Team (IDT) for Heathrow Expansion Programme (HEP).

Within the IDT, Jacobs has been leading the engineering for Highways (Motorways and Local Roads), Runways and Taxiways (including the bridge over the M25) and Earthworks which is the largest planned single site earthworks project ever in the U.K.

We were also central to the Surface Access Strategy where the team produced transport demand forecasts for air passengers and employees.

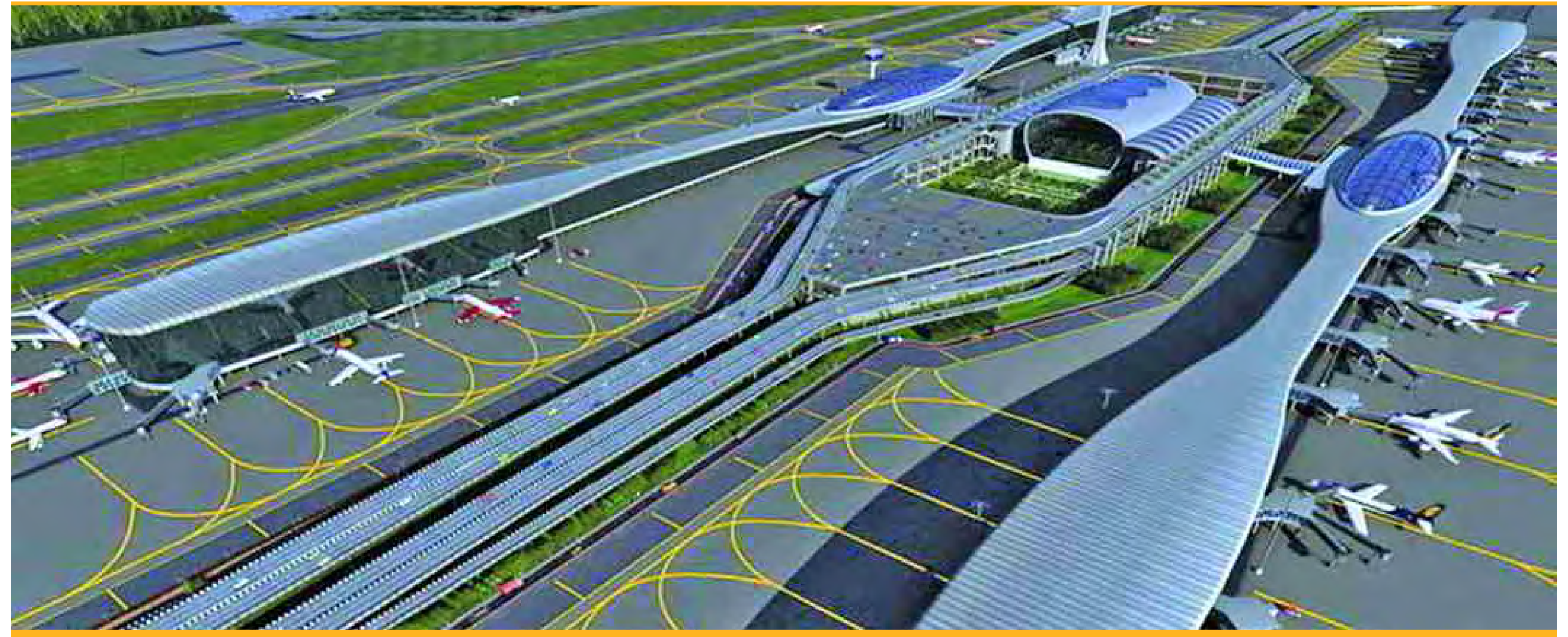
These provided critical inputs to businesses cases, highway modelling and air quality assessments to inform surface access strategies for Heathrow. Jacobs led the Masterplan Design and Guardianship Team which coordinated all the engineering and technical inputs into a single coherent Master Plan that aligned with the client brief and sought to respond to the needs of stakeholders and the consenting process.

Our team developed a strong collaborative relationship with Heathrow across all our delivery streams and has been integral in producing a robust master plan.

APAC



Navi Mumbai International Airport - Mumbai, India



To support the broader development of the Navi Mumbai International Airport (NMIA) Masterplan, Jacobs prepared a detailed terminal area and facilities model to define the size of the Terminals. To achieve the desired outcome for the client, the Jacobs team developed a custom planning tool that was aligned with the specific needs of the local market.

NMIA is a greenfield airport with an untested market, therefore assumptions included considerations of global standards and best practice that were then fine-tuned with the needs of the local airport operations through a series of collaborative stakeholder engagement workshops. In developing a custom planning tool the following factors were considered:

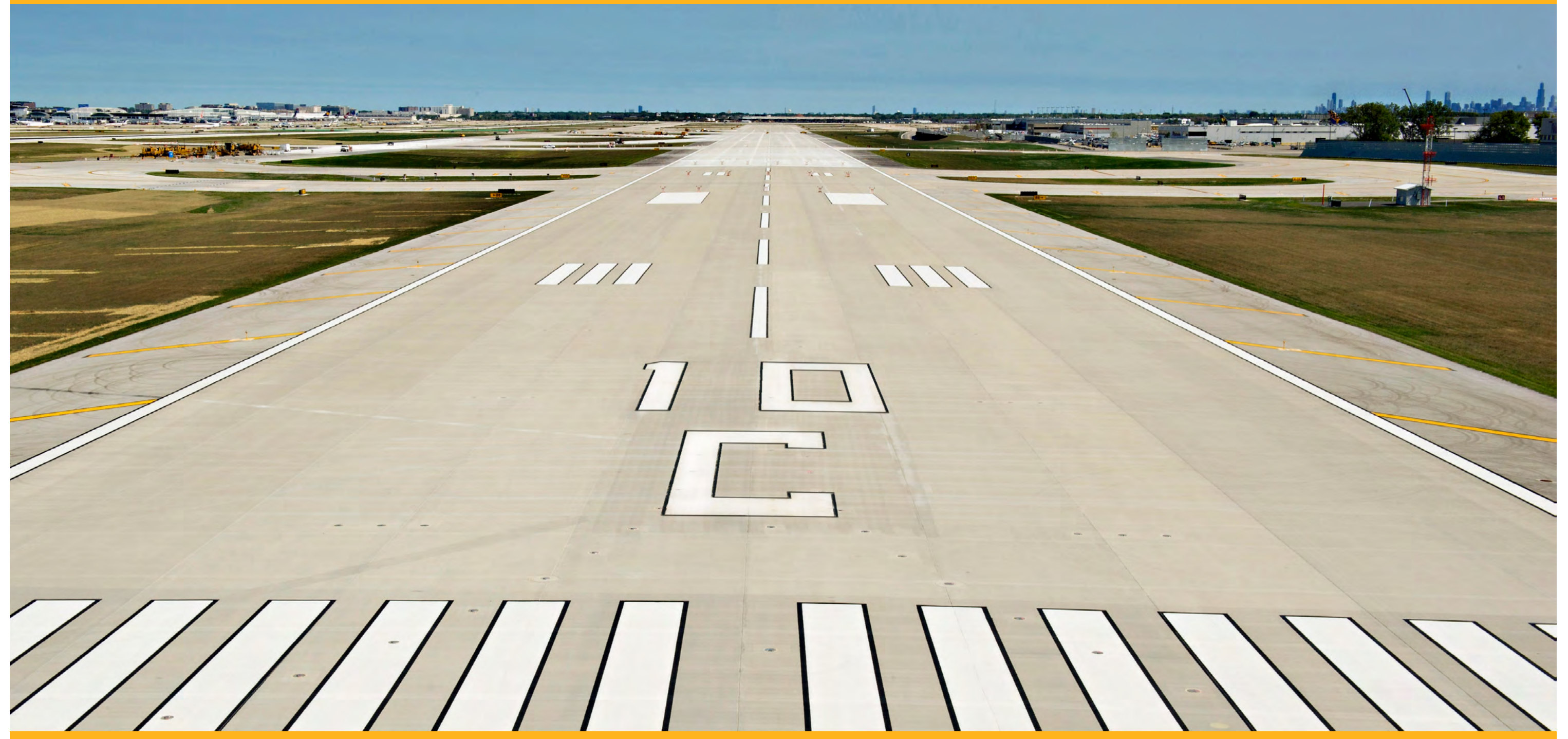
- Projected / synthetic airline schedules;
 - The split between domestic and international passengers;
 - Transfer percentages;
 - Premium service offerings;
 - Compatibility with efficient international and domestic swing facilities;
 - Passenger process flows;
 - Border agency requirements specific to India; and
 - Local 'meet and greet' behavior to inform the landside forecourt planning.
- In addition, the outputs were developed into a Terminal Brief for an architecture team to prepare a Concept Design. The outcome was a very detailed and site-specific blue print for a contemporary terminal in a high-growth market.

The initial stages of a project or program are critical, as it is there that strategic choices are made that have the greatest influence on the development process and the success of project outcomes.

Working closely with clients, we adopt a structured approach to identifying and recording not only a project's objectives, but its constraints, success criteria, schedule, risks, assumptions, and more. This provides a basis for guiding a project's development and, ultimately, measure its success. Typically, we then develop the design of the project or program elements to a 10-30% level of design maturity to inform the required level of cost certainty and support the selected procurement route.

The information produced through this process can be tailored to suit a range of internal and external audiences to support stakeholder alignment and communication. In increasingly congested airports, a critical aspect of development is that it must not unduly impact upon the safe, efficient, and economic operation of the airport. At an early stage, proposed design solutions need to be tested and potentially amended to ensure that they can be constructed cost effectively and without unacceptable impacts.

Our operational and program management experts adopt a range of analytical and simulation techniques to assess the level of impact on airport capacity and operations. Working with the designers and the airport operational teams, we seek to either optimize the construction phasing to obtain the optimal balance of operational impact with construction cost and schedule, or to amend the design or construction methodology to reduce the predicted impacts.



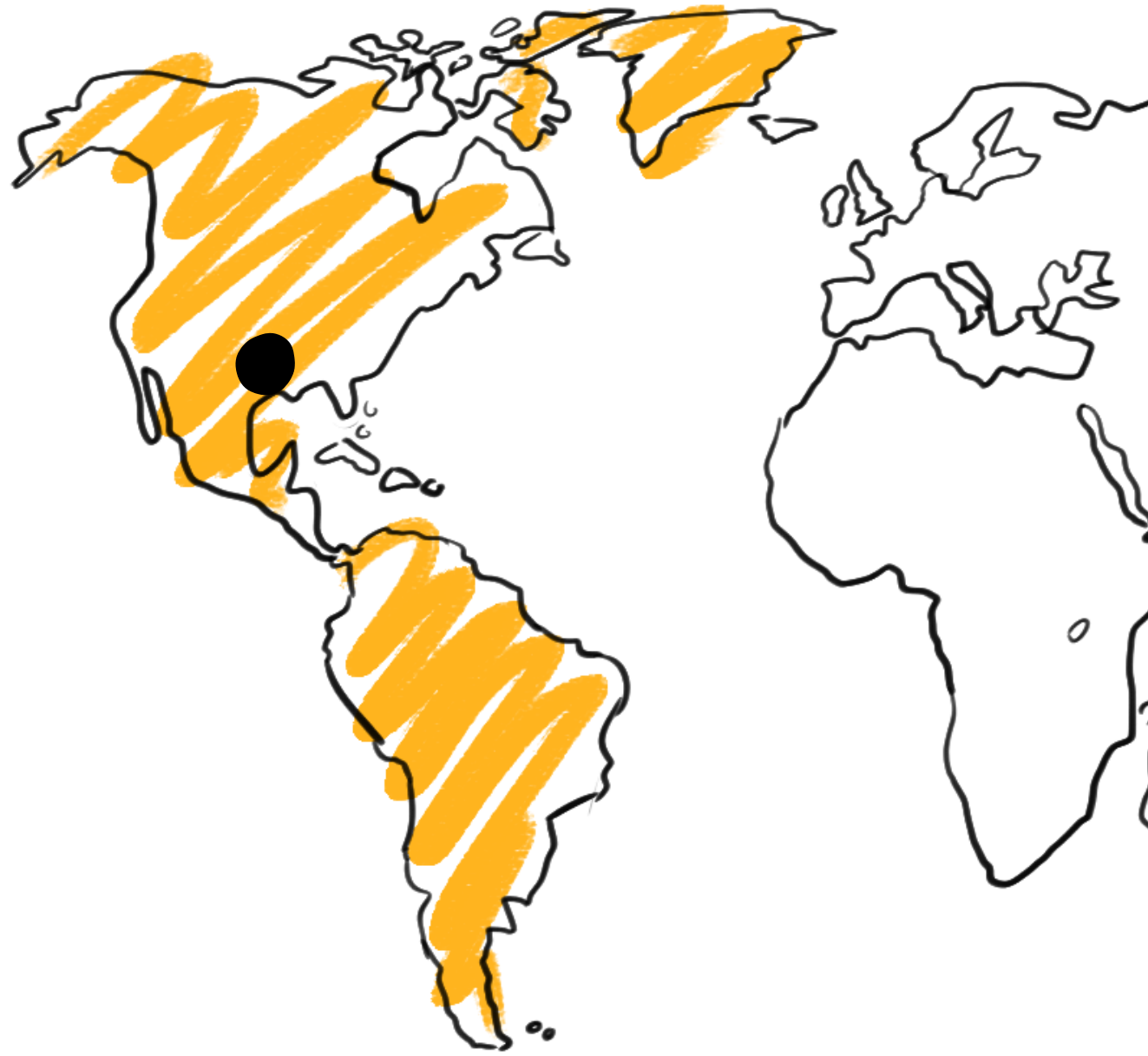
Example Projects

- Runway 17C/35C Reconstruction, Dallas Fort Worth International Airport, Dallas, Texas, U.S.
- Standard (Std) 3 Explosive Detection System (EDS), Gatwick Airport, London, U.K.
- Chhatrapati Shivaji Maharaj International Airport (CSIA) Modernization Program, Mumbai, India

Additional Projects

- Abu Dhabi International Airport, United Arab Emirates
- Melbourne Airport, Taxiway Zulu, Australia
- La Guardia Airport, New York
- Manchester Airport, U.K.

Americas



Dallas Fort Worth International Airport - Dallas, Texas, U.S.



Jacobs provides design and design management services of airfield civil engineering projects as part of the airport's Capital Improvement Program through an on-call contract.

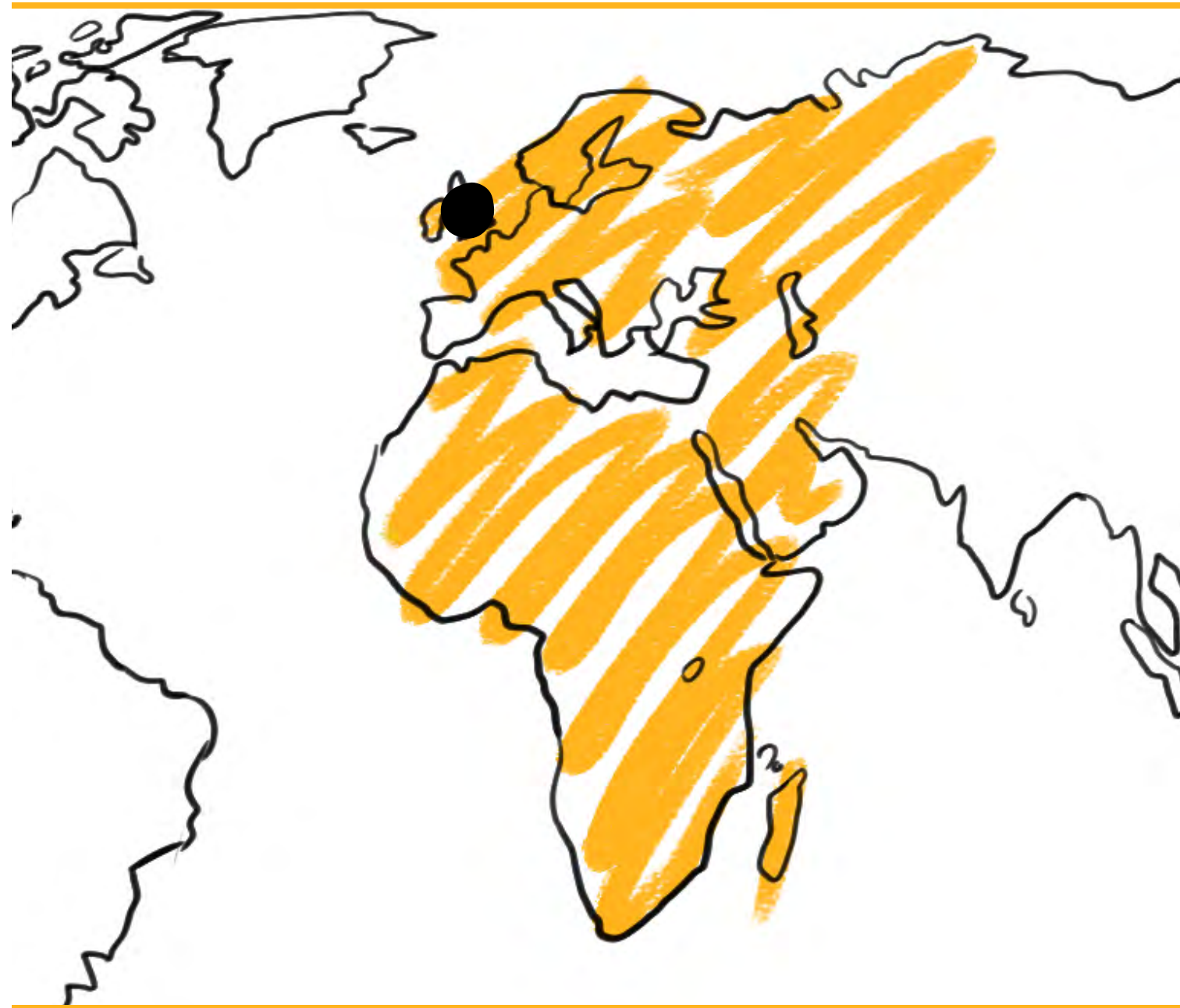
To address an increasing number of pavement surface and subsurface distresses in Runway 17C/35C, the client tasked Jacobs with;

- designing the reconstruction of the runway in "an expedited manner,

- utilizing proven cutting-edge engineering technologies and developing optimum construction phasing to minimize operational impacts, while
- providing the best return on investment for the longest facility service life possible."

Jacobs' scope included pavement condition assessment; airfield geometrics; earthwork and subsurface investigations; drainage analysis; pavement design; utilities; airfield lighting and signage; and NAVAIDs.

EMEA



Jacobs provided the preliminary design and design management services for the installation of Std 3 EDS as part of the airport's Capital Investment Plan through a competitive tender process.

Gatwick Airport - London, U.K.



The project required the installation of Std 3 EDS machines and upgrade/ amendment of the baggage system including the conveyor and controls across all the Gatwick Baggage Halls. The client tasked Jacobs to deliver this upgrade without impacting the airport or baggage hall operations.

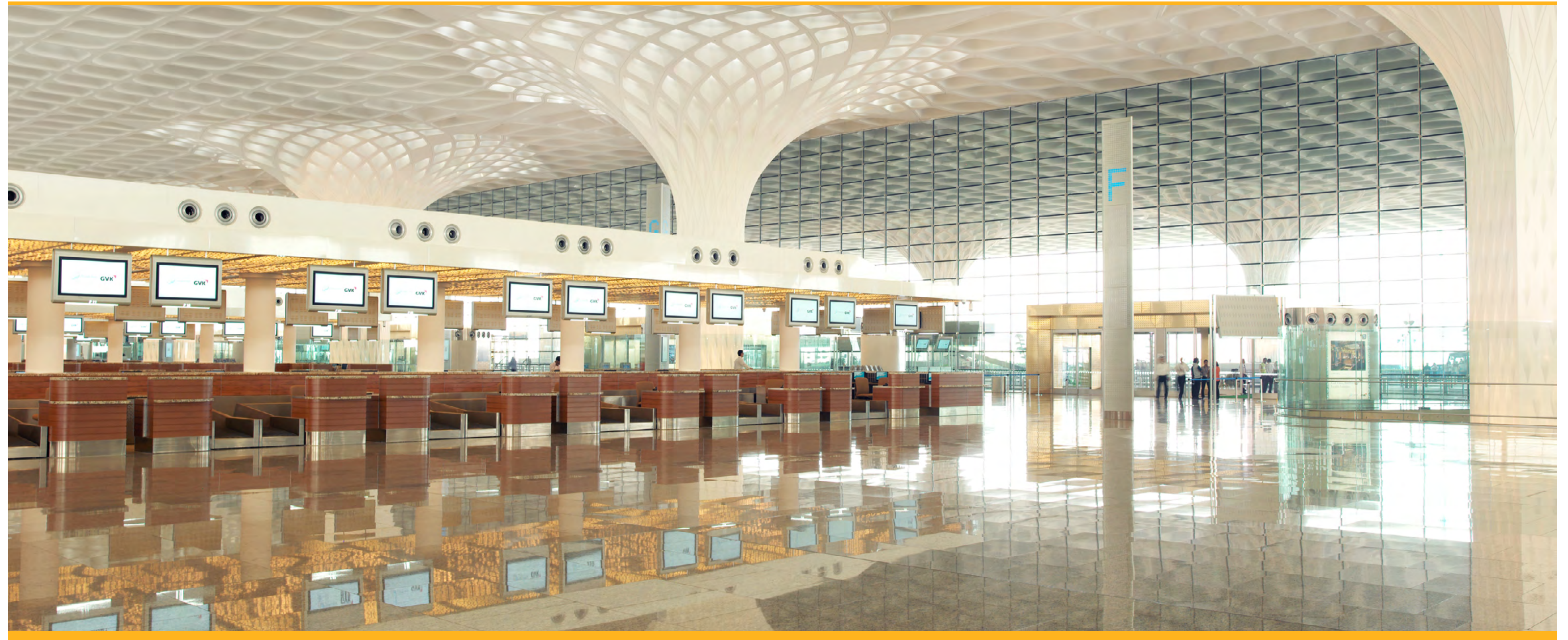
The works not only involved the installation of new Std3 EDS machines, changes to the baggage system but also upgrading the Mechanical, Electrical and Public Health (MEP) services within the live baggage halls and structural enhancements to the mezzanine floors upon which the Std 3 EDS machines would sit.

Utilizing BIM, Jacobs successfully developed a design solution that provided a phased the installation of the Std 3 EDS machines across the baggage halls without impacting the airport operations or baggage hall capacity.

APAC



Chhatrapati Shivaji International Airport - Mumbai, India



Jacobs provided program management consulting services for the US\$2 billion+ improvement program. The modernization program was complex—updating an operating airport while keeping it open for business. This was a large, complex airport redevelopment program which was delivered successfully on a constrained operational airport with numerous obstructions.

The Jacobs team developed project briefs for each of the key facilities identified in the high-level master plan, which enabled the contractors to engage in further design. Projects included

- upgrade of the cross-runway system to Code F,
- modernizing an existing domestic terminal,
- constructing a new 52-gate international and domestic terminal building including aircraft parking aprons and all stand services,

- constructing and rehabilitating all airfield pavements, and
- improving landside roadways and facilities.

In addition, support and ancillary facilities included a new air traffic control tower, aircraft hangars for Code E aircraft, navigational aid replacement and upgrade, airfield electrical vaults, fire station, a central vehicle maintenance facility, and ground service and handling support infrastructure, to name a few.

The development of project briefs by the extended Jacobs team and managed locally by a Jacobs member, required a careful balance of stakeholder needs, budget considerations, land constraints, and long-term airport vision.

Jacobs' aviation architectural and engineering specialists provide design of all aspects of airport facilities.

Airside

Our airside infrastructure team works with clients and operational stakeholders to identify opportunities to increase capacity, apply new technologies, future-proof infrastructure, maintain safety, and maximize airside operational outcomes while minimizing impacts to airport operations during construction. We are working closely with many clients to reduce both the embodied carbon and carbon emissions associated with airfield construction and operation.

Buildings

Airport terminals are highly complex buildings comprising large retail areas, sophisticated baggage handling facilities, and state-of-the-art IT and security functions. We provide both design and management to address all facets of terminal and building development. Our approach is to seek a balance of operations, revenue generation, and passenger experience, while retaining flexibility and resilience in the layout to respond to change.

Landside

Airports are more than a gateway to air travel — they are hubs for increasingly complex multimodal transportation combining new and emerging technologies. Efficient landside development is critical to moving passengers and cargo efficiently and cost effectively. Our specialized services in roadways, rail and transit, parking, and other landside facilities allow us to deliver integrated transportation solutions, based upon the latest analytical and transportation modeling techniques.

Airport Systems

As a full-service solutions provider, Jacobs is also a source of expertise concerning your key IT disciplines, including voice and data network, IT infrastructure, operations and maintenance, cybersecurity, data analytics, public and private cloud solutions, and agile software development. We routinely work with third-party airport vendors to expertly integrate their newest technologies seamlessly into our clients' existing production IT systems.

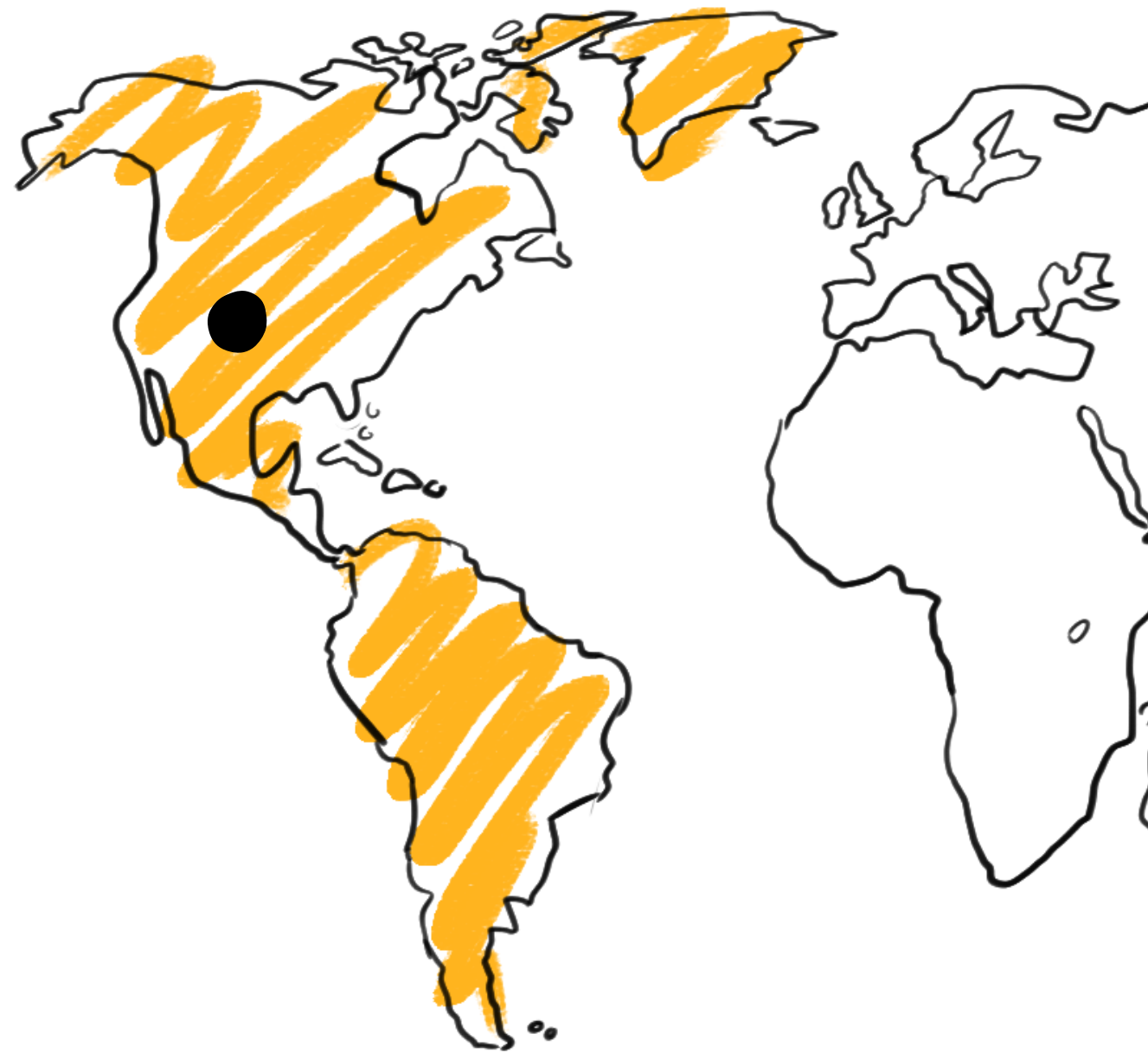


Example Projects

- Concourse Expansion Program, Concourse B and C East, Denver International Airport, Denver, Colorado, U.S.
- Manchester Airport Transformation Program, Manchester, U.K.
- Brisbane New Parallel Runway, Brisbane, Australia

Additional Projects

- Denver International Airport On-Call and GARDI Program, Colorado
- Offutt AFB Reconstruct Runway 12/30, Nebraska
- Gatwick Airport Standard 3 Baggage, U.K.
- Sharjah International Airport Runway, United Arab Emirates
- Navi Mumbai Airfield, India



Denver International Airport - Denver, Colorado, U.S.



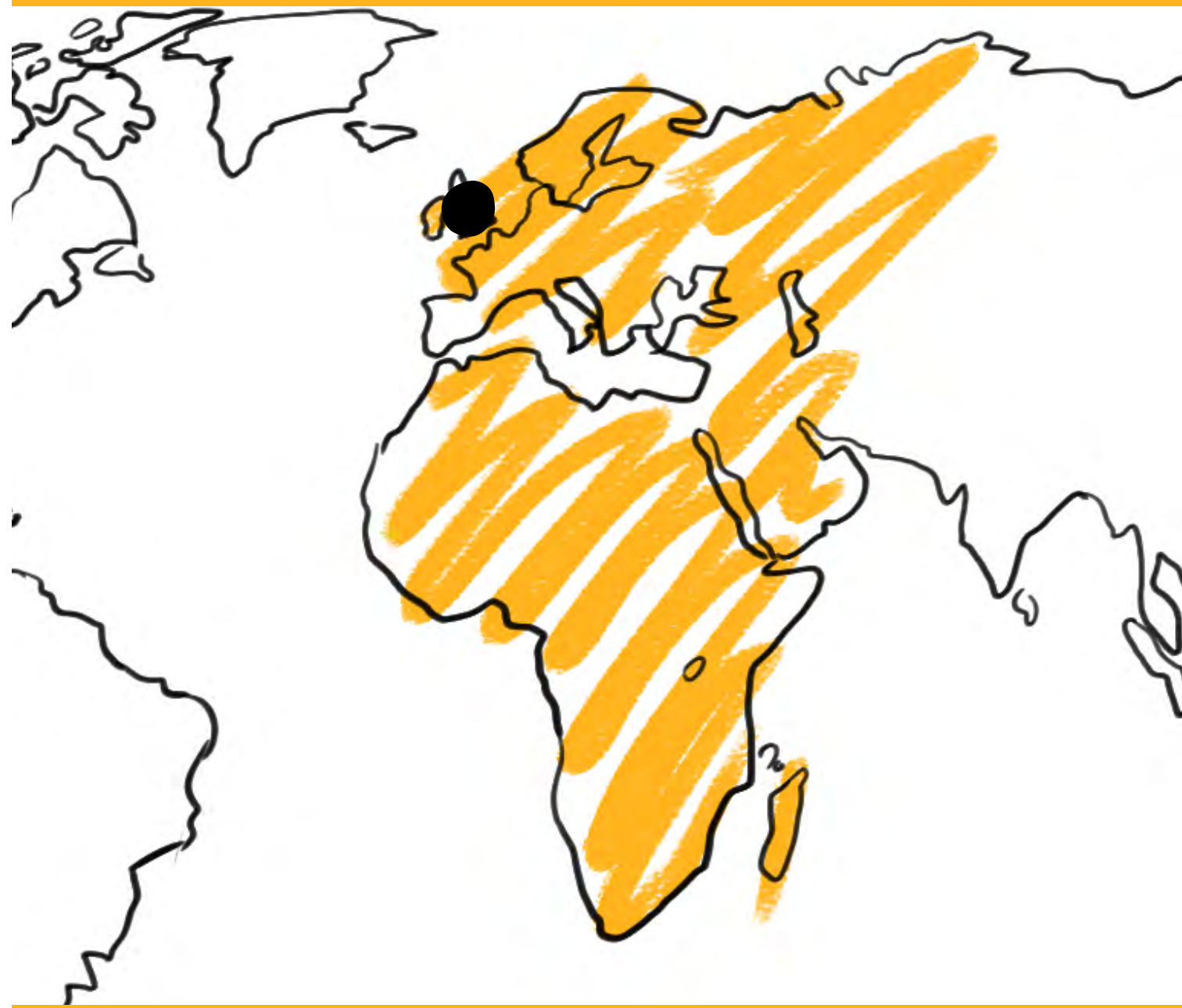
Jacobs is designing and providing construction administration services for the \$1.5 billion Concourse Expansion Program.

Jacobs is the A/E of record for the East expansions to existing Concourses B and C, which is composed of roughly 60851 square meters of new concourse, 28 new aircraft gates, and approximately 12,444 square yards of aircraft parking apron.

The program includes the addition of new hold rooms as well as “right-sizing” of four existing hold rooms. Efforts include constructability and value engineering reviews necessary for preparing guaranteed maximum prices (GMPs) for each component package developed during the construction documents phase of design.

Design packages are being delivered and refined to maximize the benefit of construction management at risk (CMAR) delivery in a highly sensitive operating aviation environment.

EMEA



Manchester Airport Transformation Program - Manchester, U.K.



Jacobs has been actively involved in the Manchester Airport Transformation Program (MAN-TP) since 2016, offering multidisciplinary services. The future landside design (including surface access, car parks, and curbside optimization) was derived from a multitude of modeling exercises performed by Jacobs in addition to the development of a passenger and vehicle wayfinding strategy.

Jacobs' modeling outputs ensured that our designs for highways, utilities, architecture, and IT of the landside road network were sufficient to meet the future demand determined and that improvements were able to increase capacity and mitigate passenger and vehicle congestion where appropriate.

The modeling outputs were also used by the client for commercial planning and as inputs into pricing strategies for landside products.

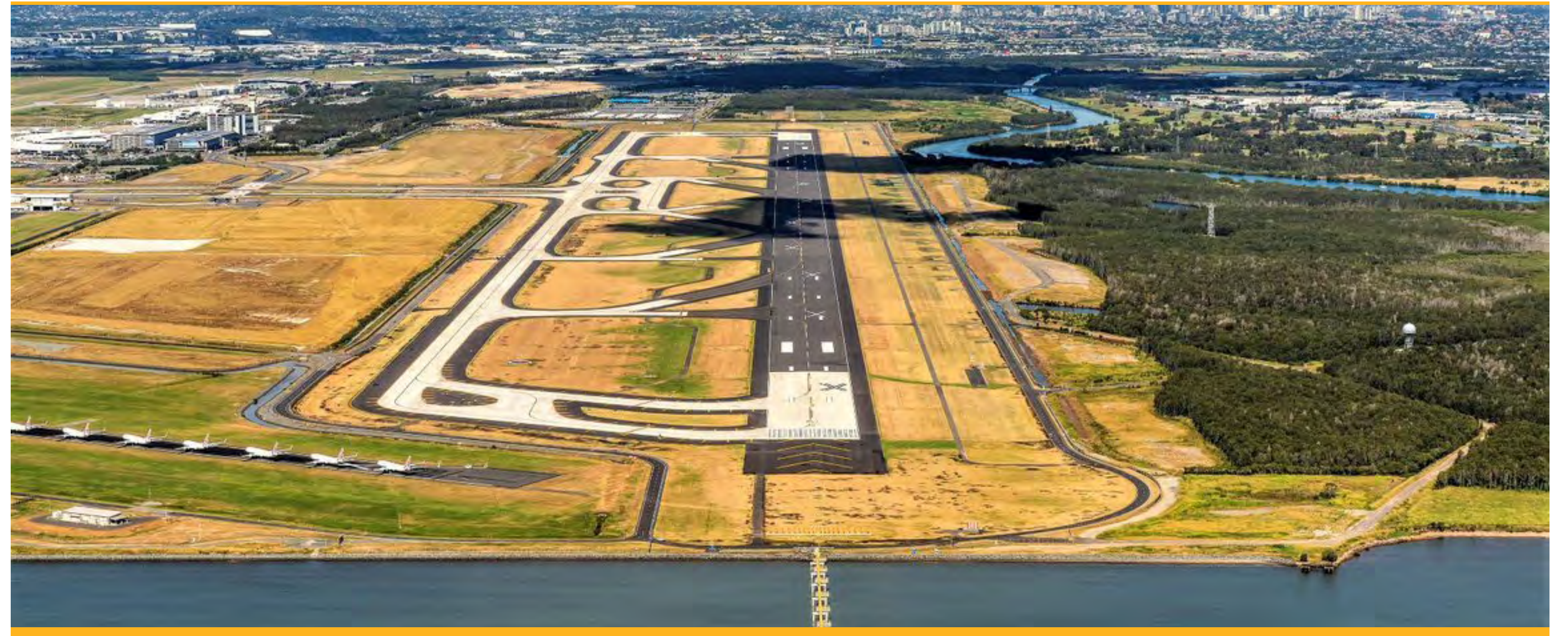
MAN-TP, a 10-year investment program worth over \$1.4 billion, will further cement Manchester Airport as the United Kingdom's gateway to the north.

Multiple Jacobs teams worked together effectively to achieve the best outcomes for our client.



In 2020, Brisbane Airport officially opened their new 3300m parallel runway.

Brisbane New Parallel Runway - Brisbane, Australia



Built on reclaimed marshland with challenging geotechnical conditions, Jacobs was engaged to provide the concept, preliminary and detailed design of the airfield infrastructure, including the airfield pavements, airside roads, a taxiway structure over Dryandra Road, aeronautical ground lighting and associated civil works.

Jacobs worked closely with Brisbane Airport Corporation (BAC) through scope confirmation all design stages and construction phase support.



Working globally at airports of various types and sizes, our team specializes in all aspects of airport operations and can review or provide solutions for airside and landside operations, passenger and employee processes, facility mothballing and reactivation, and construction impact assessments.

Jacobs' airport operations specialists can assist airport operators and stakeholders to better understand and optimize the use of new or existing infrastructure. Using our global experience and expertise, we can help develop the optimum solutions. Through early engagement, we can add the most value to your projects, such as development of a Concept of Operations for a new or modified facility, the use of simulation tools to analyze the performance of proposed new processes or infrastructure, or through providing Operational Readiness and Transition (ORAT) services to prepare for opening and inform the design.

ORAT is a collection of tools, techniques, and activities to start the "heartbeat" of a new airport facility. Our team of seasoned ORAT professionals are helping airports across the U.S. and globally to ensure that their diverse collections of equipment, systems, and operating procedures are tried, tested, and fully capable of smooth and efficient operation on Day One.

Jacobs partners with our clients using a multi-tiered approach to meet a full range of airport IT demands. We have expertise in short-term, on-call projects to assist clients in the design and implementation for immediate project needs. In addition, Jacobs offers long-term staff augmentation services that can be tailored to your needs and embedded with airport operations as a flexible, integrated extension of your IT staff.



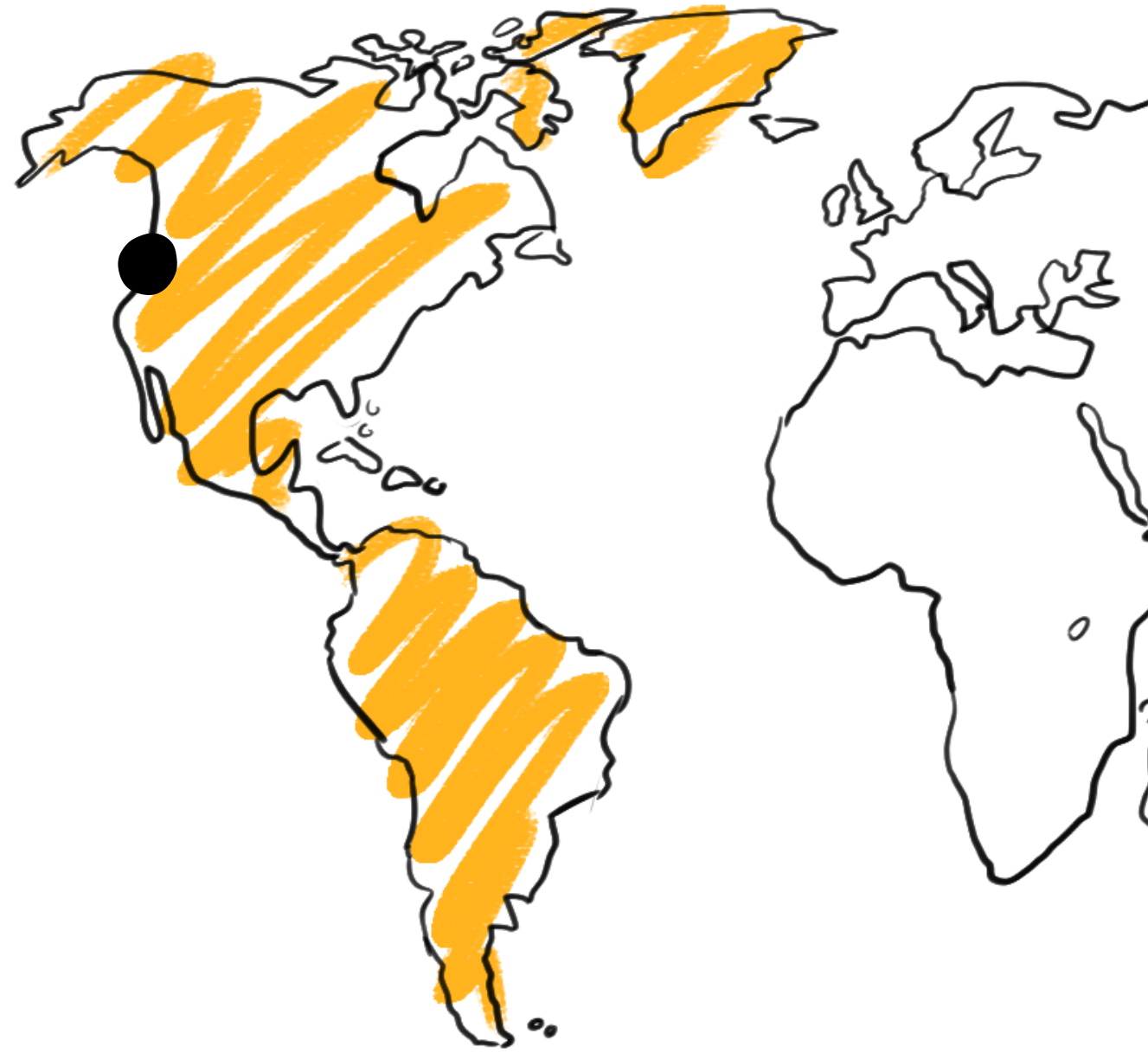
Example Projects

- Seattle-Tacoma International Airport, Seattle, Washington, U.S.
- Air to Air Cargo Trans-shipment, Heathrow Airport, London, U.K.
- Chhatrapati Shivaji International Airport, Mumbai, India

Additional Projects

- Mototok implementation, Heathrow Airport
- Tampa International Airport, Florida
- Chicago O'Hare International Airport, Chicago
- Amsterdam Airport Schiphol, Netherlands
- Los Angeles International Airport, California

Americas



The airport selected Jacobs to provide ORAT program management services for the North Sea-Tac Airport Renovation (NorthSTAR) program, due to our extensive experience implementing ORAT within a live environment.

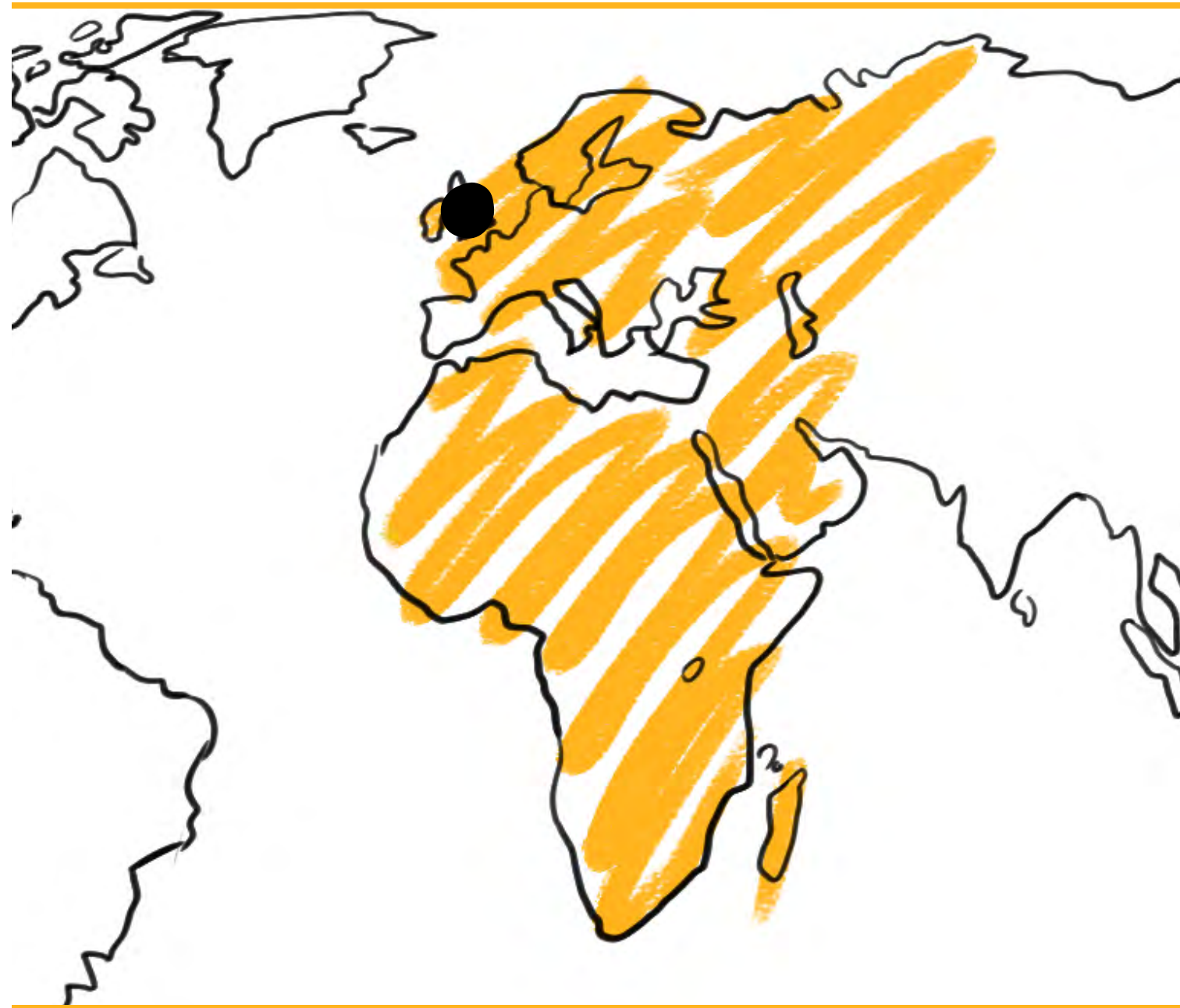
Seattle-Tacoma International Airport - Seattle, Washington, U.S.



We are providing

- staff augmentation;
- stakeholder engagement;
- gap analysis;
- risk and contingency planning;
- mobilization/move and relocation;
- standard operating procedures;
- familiarization induction and training;
- pre- and post-opening support;
- basic, advanced, and integrated trials; and
- design review.

EMEA



Air to Air Cargo Trans-shipment, Heathrow Airport - London, U.K.



Jacobs undertook the options study of a new Air to Air Transshipment Facility at Heathrow Airport.

Using a robust requirements capture process and close engagement with the U.K. Border Force and the airline community we helped to define the future operational practices the project was seeking to achieve and the benefits they would provide.

A detailed requirements capture process was founded on understanding the end to end transshipment process, including U.K. Border Force inspections and screening.

The provision of the facility removed the requirement for cargo to be transported landside, inspected and then transported airside again to continue its journey.

This provides benefits of reduced connection times, reduced loading on control posts and reduced demand for warehouse space.

APAC



Chhatrapati Shivaji International Airport - Mumbai, India



Jacobs conducted a study to assess the operational capacity of Chhatrapati Shivaji International Airport (CSIA) to accommodate its off-peak traffic growth by identifying opportunities to optimize the throughput of aircraft and passengers through the airport system, while maintaining a balance between the terminal and airside processes and infrastructure.

Our methodology included:

- Identifying capacity constraints, both terminal and airside, using CAST Terminal and CAST Stand Allocation, respectively, for the then-future traffic schedules.
- Analyzing both proactive and reactive approaches to infrastructure operation
- Implementing a dynamic check-in allocation within the model to help inform business decisions on airline allocations between terminals.
- Identifying a program of projects to meet the forecast demand by maximizing the capacity of existing facilities and maintaining a balance between airside and terminal while maintaining a safe operation.
- Reviewing and shortlisting phase-wise options for the future redevelopment of terminal and aircraft parking apron infrastructure, in line with the CSIA Master Plan development.

Our findings included recommendations for:

- Improving check-in processing rates through various measures, such as profiling in-line and implementing new technologies
- Adopting common check-in to increase efficiency
- Adopting new technologies for emigration and immigration facilities to minimize resourcing requirements.

The effective management and maintenance of the airport infrastructure and facilities portfolio is central to the success of any airport business.

Our asset-management services team can help airports manage costs and risk while realizing greater returns from vital capital and infrastructure investments. Our experts are well versed in all aspects of life-cycle asset management practices and principles and work with clients to determine their needs and objectives. Based on stakeholder input and our analysis, we can help craft a custom-tailored approach—from tackling a single improvement area to developing a comprehensive, full-scale asset-management program.

Our proven approaches and methods have been adopted by a wide range of industries and organizations, where we have successfully helped reduce costs and risks in areas such as tracking and executing maintenance and repair; achieving successful capital improvements; forecasting equipment life cycle accurately; and implementing timely and economical technology upgrades. We also utilize airport-specific tools such as PAVY, our cloud-based solution for managing aircraft pavement performance and investment optimization.

Our ultimate goal is to maximize the useful life and value of airport staff, equipment, utilities, and infrastructure assets.

- PAVY
- Predictive maintenance
- Project prioritization
- Other analytical tools
- Civil and military



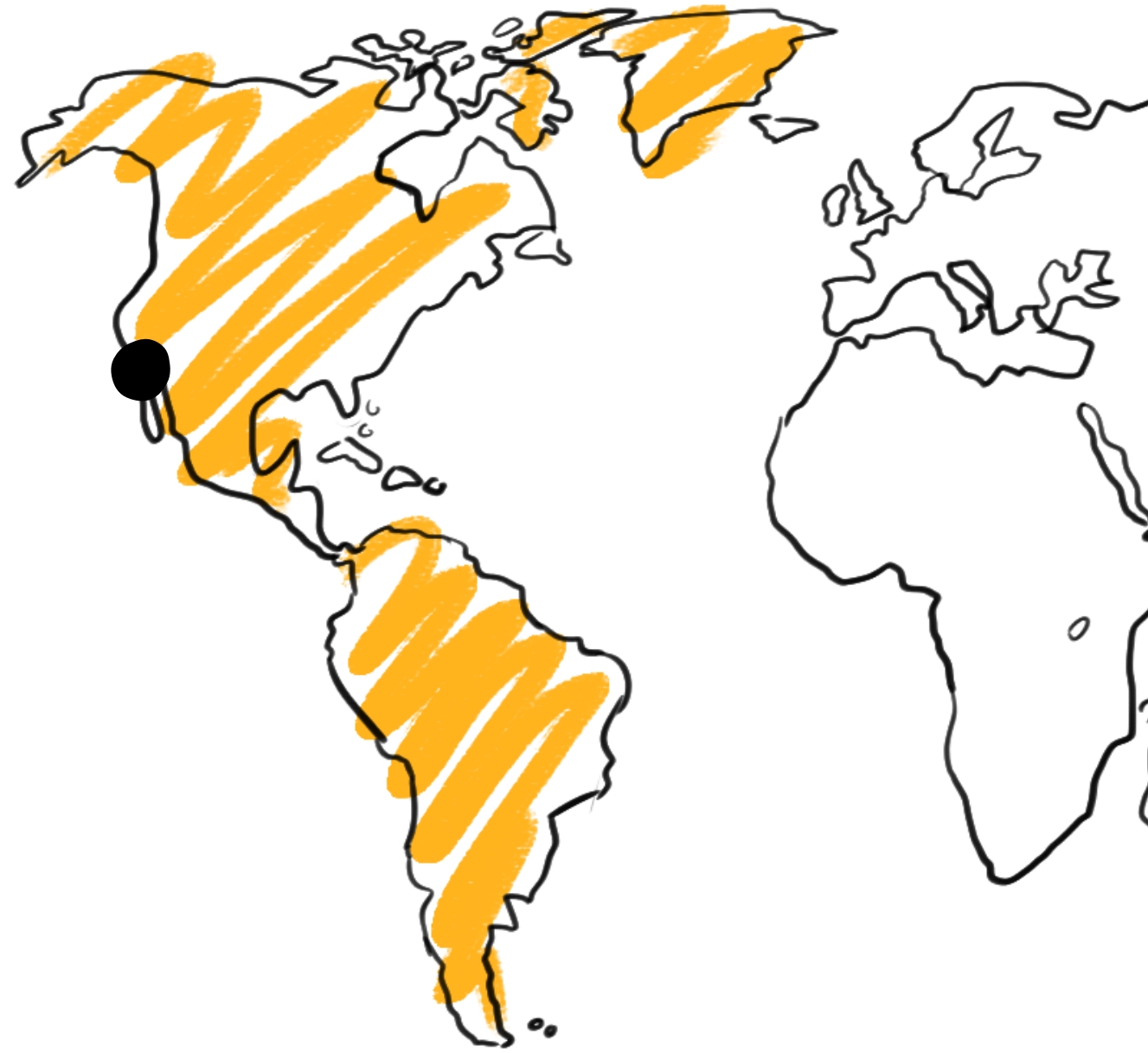
Example Projects

- Los Angeles World Airports (LAWA) Facilities Management (FM) Consulting Services, Los Angeles, California, U.S.
- Heathrow Airport, London, U.K.
- Capital Investment Planning and Development, Melbourne Airport, Melbourne, Australia

Additional Projects

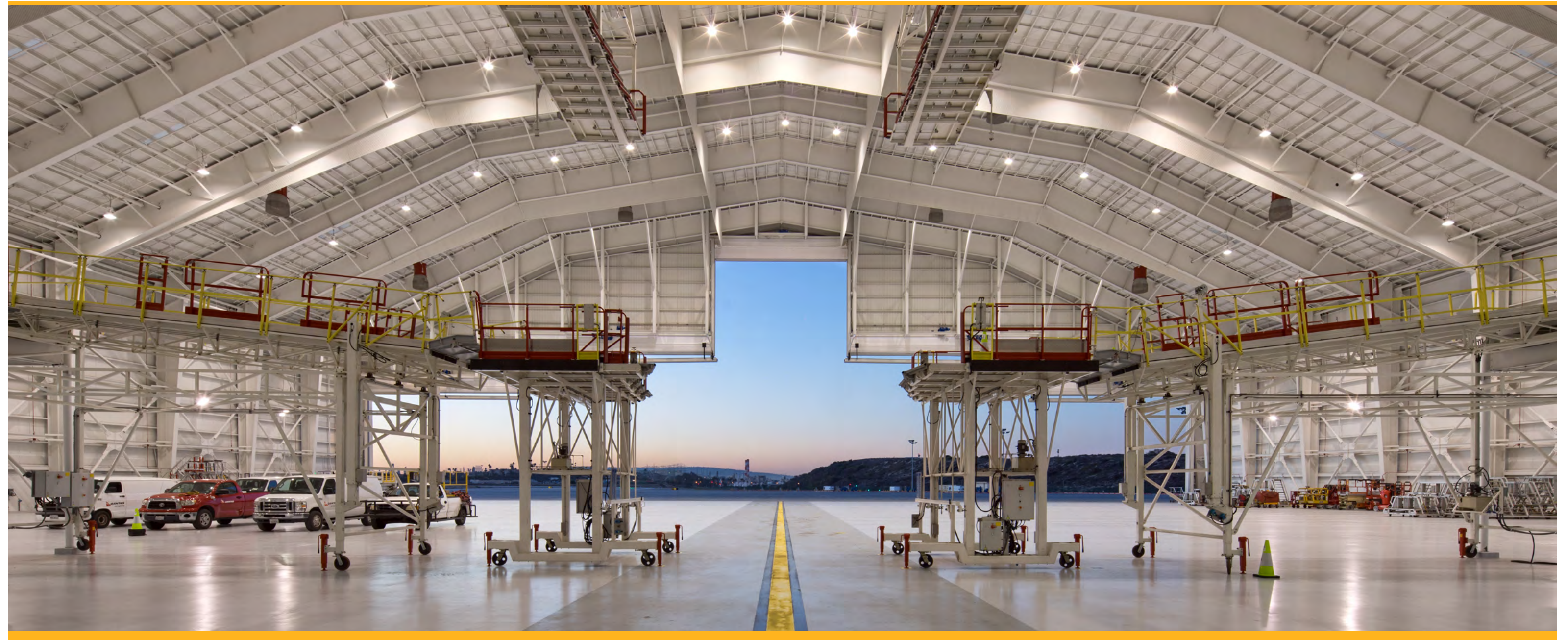
- Los Angeles International
- San Francisco International
- Newark International

Americas



Jacobs has worked with LAWA from 2010 to 2020 to implement a comprehensive asset management program called FM@LAWA.

Los Angeles World Airports - Los Angeles, California, U.S.

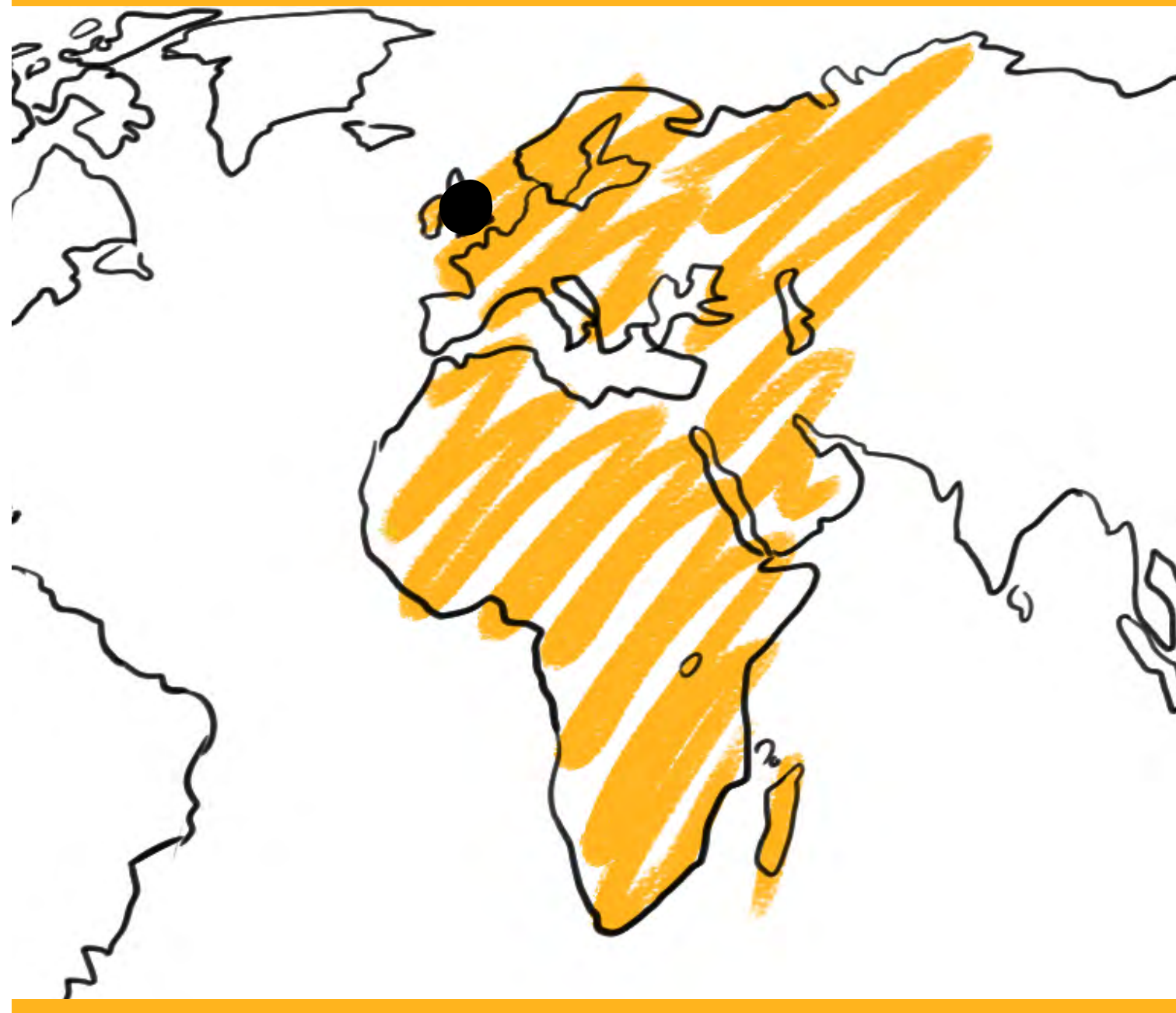


FM@LAWA is a strategic approach to how LAWA manages, assesses, maintains, and repairs facilities and assets. It focuses on improved capital planning, more reliable assets, and a more efficient facility and maintenance operation.

This was a multiyear effort that included business process improvement, alignment in depreciation between financial systems and computerized maintenance management system (CMMS), workflows, Facility Condition Assessment reporting, investment prioritization, training, and integration with the capital program.

During our 10-year support to LAWA, our team supported all aspects of the FM@LAWA program and the on-boarding and activation of over \$5 billion in renovation and new construction assets.

EMEA



Heathrow Airport - London, U.K.



Pavy 'by Jacobs' is a cloud-based asset management platform that helps airports plan investment into airfield pavements.

As a Software-as-a-Service offering, Pavy can be used by any airport around the world - enabling strategic, data-led decisions. After uploading PCI data into the platform, Pavy automatically generates CapEx plans, maps and visualizations within an intuitive and interactive dashboard.

The asset management principles behind Pavy were originally conceived by Heathrow Airport - a world-renowned airport that strives to excel in how it manages its airfield pavements.

Jacobs produced the models and developed PAVY to support the management of Heathrow's 4 million m² of airfield pavement.

This expertise was then translated into cloud-based software. On average, previous clients have identified an average of 30% deferred CapEx savings by using the asset management models embedded in the platform.

APAC



Capital Investment Planning and Development - Melbourne, Australia



Jacobs worked with Melbourne Airport to revamp their existing capital investment planning and development processes.

Together we designed, tested and implemented an upgraded capital planning and development framework that comprises:

- A 20 year capital portfolio analysis methodology that allows the Airport to test if future portfolio of investments will meet investment hurdles and corporate objectives and identify areas of key vulnerability.
- A weighted capital investment evaluation and prioritisation tool that allows every capital investment to be compared and contrasted to identify the optimal set of investments over the next 20 years.
- A five gate capital investment approval process where each gate has set of investment evaluation criteria that must be satisfied in order for the investment to be allocated further development funding.
- Set of standard business case templates that requires all major investments to consider different investment options (such as adding further supply, interventions to manage demand and/or optimise productivity and efficiency of existing infrastructure and services).



Exceptional program management and construction management (PM/CM) are fundamental to the successful completion of aviation projects if they are to be delivered safely, within budget, on time, and in line with the original client and stakeholder expectations.

Jacobs delivers a wide suite of PM/CM services, from project inception to operation and maintenance, encompassing program and project delivery, commercial and contract services, and business performance. We tailor our services to meet individual client needs - complementing their strengths and eliminating gaps in their own project team - from providing client augmentation to staffing an entire project management team.

Increasingly, clients are seeking our services as a strategic partner, working as their trusted advisor from business planning through to construction delivery, enhancing the core project team with a range of subject matter experts drawn from the breadth of our extensive resources.

Through years of experience, we have developed a range of project management tools that can either be used "out of the box" or tailored to individual client needs, enabling the team to hit the ground running.



Example Projects

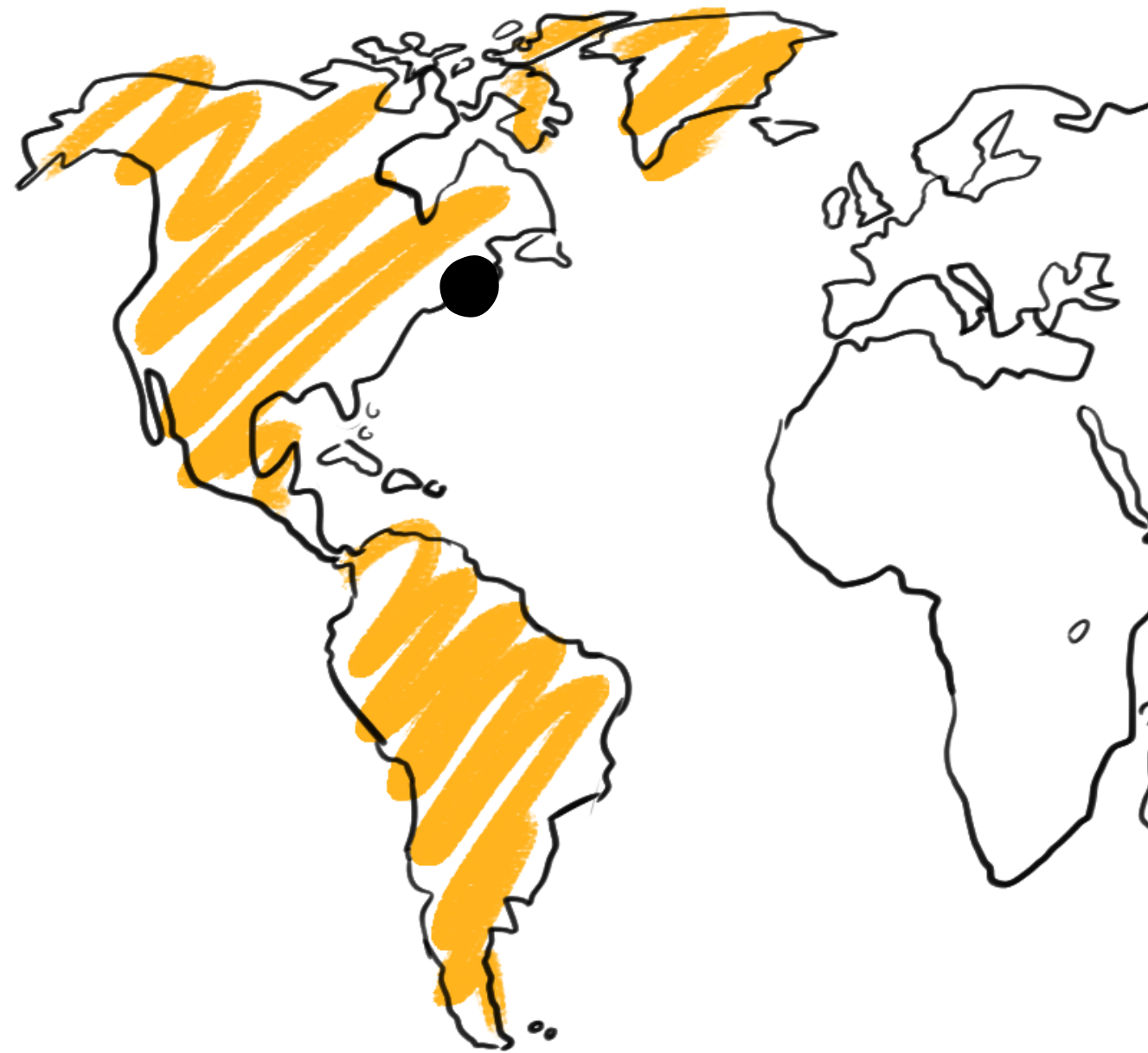
- LaGuardia Airport, New York, U.S.
- Abu Dhabi International Airport, Abu Dhabi, UAE
- New Manila International Airport, Manila, Philippines

Additional Projects

- Noida International Airport, India
- La Guardia Airport, New York
- Dublin Northern Runway, Ireland
- Philadelphia International Airport, Pennsylvania



Americas



LaGuardia Airport - New York, U.S.



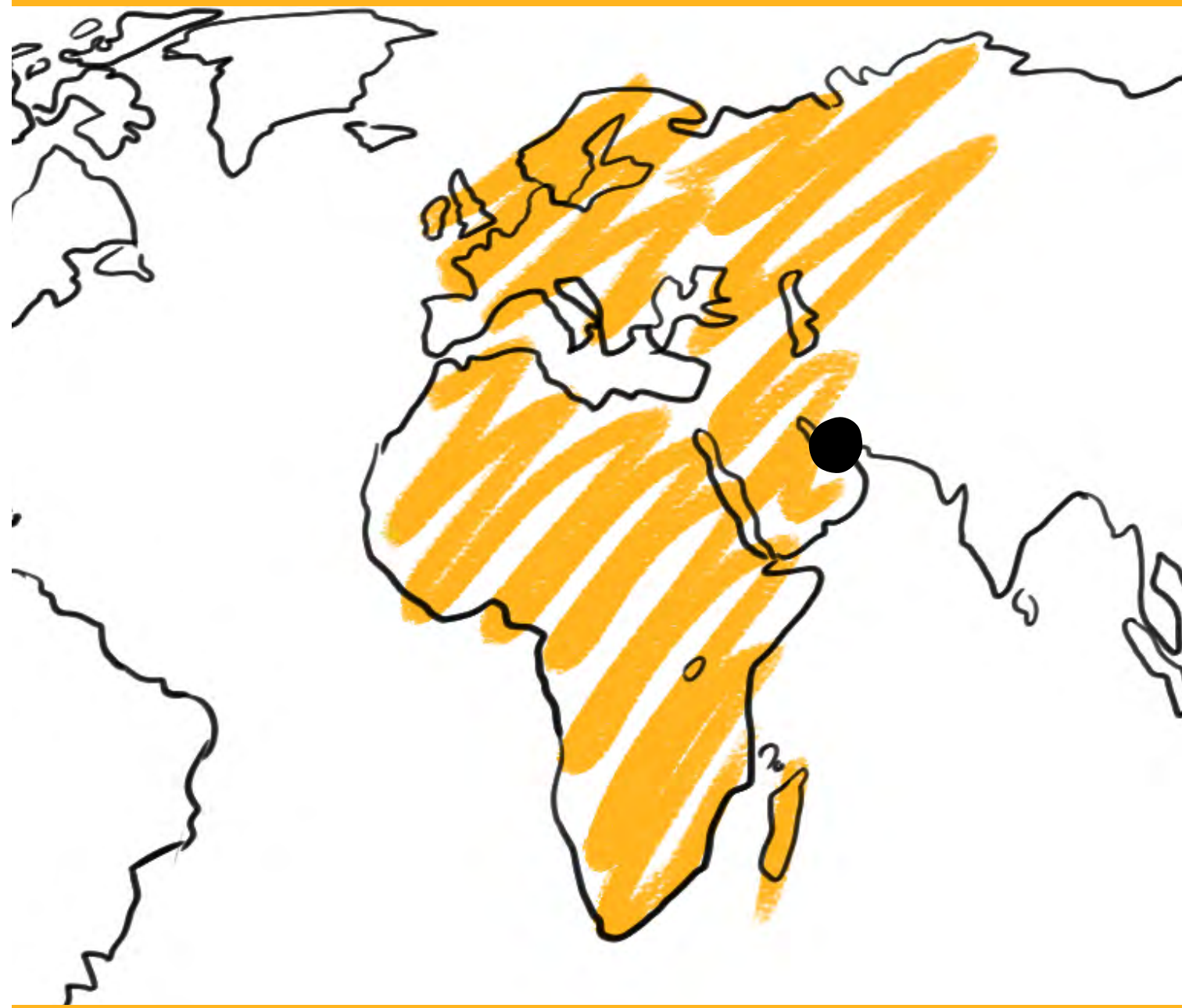
Jacobs is providing the Port Authority of New York & New Jersey (PANYNJ) program management services in support of the \$8 billion LaGuardia Airport Redevelopment Program.

This major redevelopment effort includes the demolition of the existing central terminal and construction of a new 1.3 million SF, 35 gate terminal building (Terminal B); a new aeronautical ramp; frontage roads; a new central heating and refrigeration plant; new Delta Airlines terminals; and an AirTrain connecting the NYC subway to LaGuardia.

Jacobs is also the Program Manager for the P3 development of the \$3.6 billion Terminal B facility, as well as airside and landside improvements.

This redevelopment will transform the airport, create a unified terminal, alleviate traffic congestion, and improve transportation access to the airport.

EMEA



Abu Dhabi International Airport - Abu Dhabi, UAE



Jacobs was engaged by Abu Dhabi Airports Company to provide the supervision and contracts management for the South Airfield Development and Rehabilitation project at Abu Dhabi International Airport. Jacobs was involved in two packages of work spanning from 2013 to 2019 with a construction value in excess of US\$1.2bn.

Jacobs was responsible for the construction program and management of all activities undertaken onsite while ensuring that the statutory, health and safety, and environmental requirements were maintained throughout the construction period. Jacobs also oversaw the quality and acceptability of the construction in accordance with contractual obligations

and client standards, which we achieved through regular reviews and site inspections to judge the acceptability of the work. When defects were discovered, Defects Notification Period services were managed to ensure rectification. Prior to completion, Jacobs oversaw the ORAT process for end users. Jacobs also oversaw the certification for contractor payment applications in accordance with

the contract conditions and provided recommendations to the employer for approval and payment. Jacobs provided claims and dispute analysis and made recommendations to the client.

APAC



New Manila International Airport - Manila, Philippines



In 2019, Jacobs was engaged by San Miguel Corporation (SCM) to deliver project management services for the first phase of the New Manila International Airport (NMIA).

Phase 1 is expected to accommodate 35 million passengers per annum (mppa) with two runways on a site that encompasses 1,635 hectares.

Jacobs will deliver project management services during planning, design, and construction phases, including;

- project scoping and management,
- contract development,
- strategic advisory,
- design management, and
- scheduling and financial planning services.

The development is anticipated to have a construction value of approximately \$8.8 billion, and the first phase is to be operational within 6 years.

Jacobs has supported the defense sector for more than 70 years, and we are known for our commitment to excellence and our outstanding achievements in quality, performance and safety.

With a focus on long-term and ongoing client relationships, Jacobs offers an extensive range of program support capabilities to defense agencies that include the United States Department of Defense, U.K. Ministry of Defence, and Australian Department of Defence, along with other government agencies, defense contractors and suppliers across the globe.



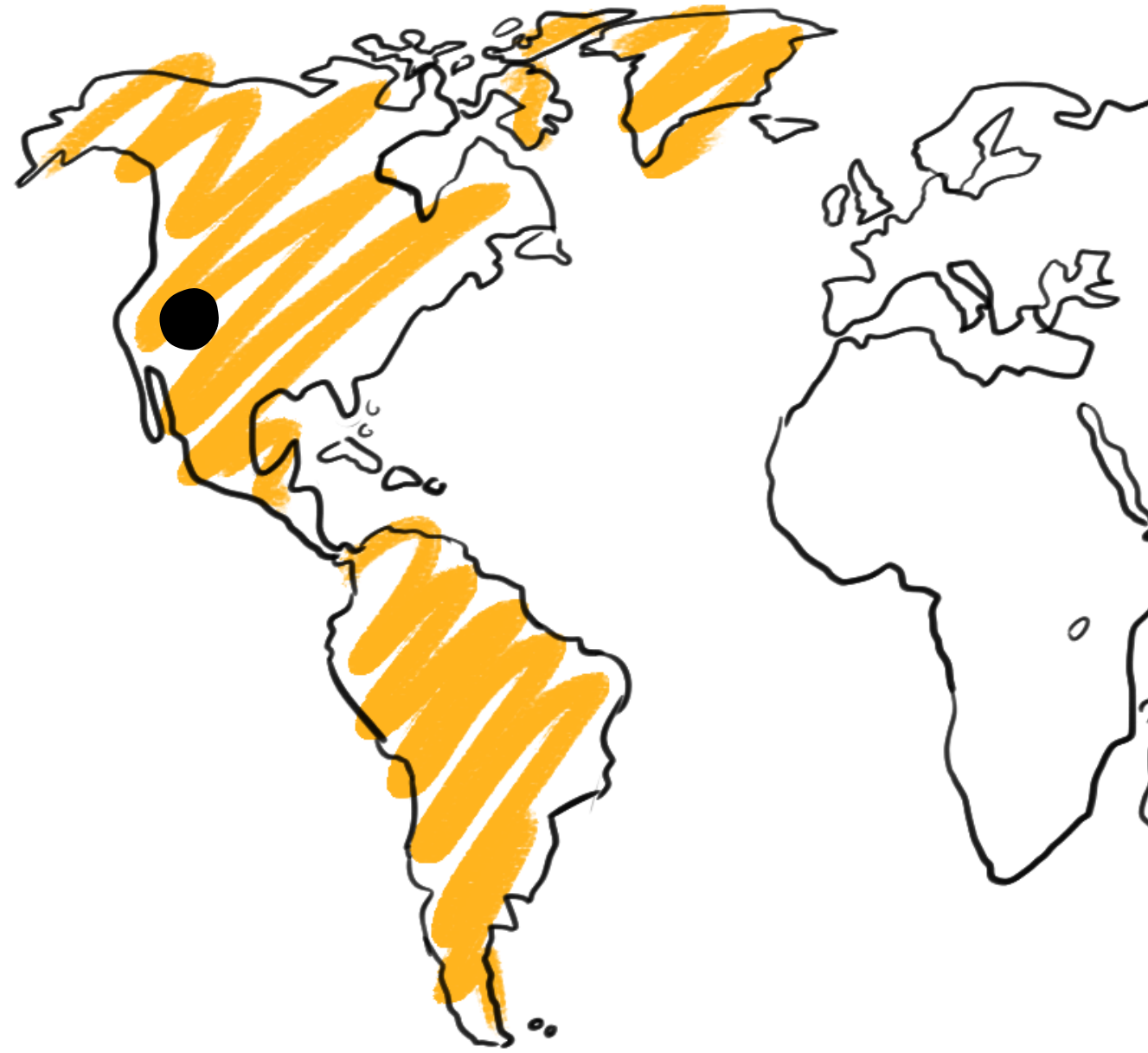
Example Projects

- Repair Runway, Shoulders, and Lighting, Hill Air Force Base (AFB), Utah, U.S.
- F-35 Beddown Program. RAF Lakenheath, Suffolk, U.K.
- Kadena Air Base Mission Infrastructure Modernization Program, Okinawa, Japan

Additional Projects

- Fairford Northrop Grumman
- Offutt AFB Reconstruct Runway 12/30, Nebraska
- RAF Akrotiri, Refurbishment of Airfield
- F-35 Maintenance Hangar Addition, NAS Lemoore, California
- Runway and Taxiway Extension, NAWS China Lake, California

Americas



Jacobs designed the rehabilitation of much of the existing runway pavement at Hill AFB, including milling and overlaying the asphalt portions of the runway, completing selective slab repairs, and completing other minor concrete pavement patches. In addition, this project also widened the runway shoulders, corrected the runway edge lighting, corrected the runway overruns and approach lighting, corrected runway cross slopes and drainage, recircuited the airfield, replaced all of the airfield guidance signage, and widened a connector taxiway at the south end of the runway.

Hill Air Force Base - Utah, U.S.

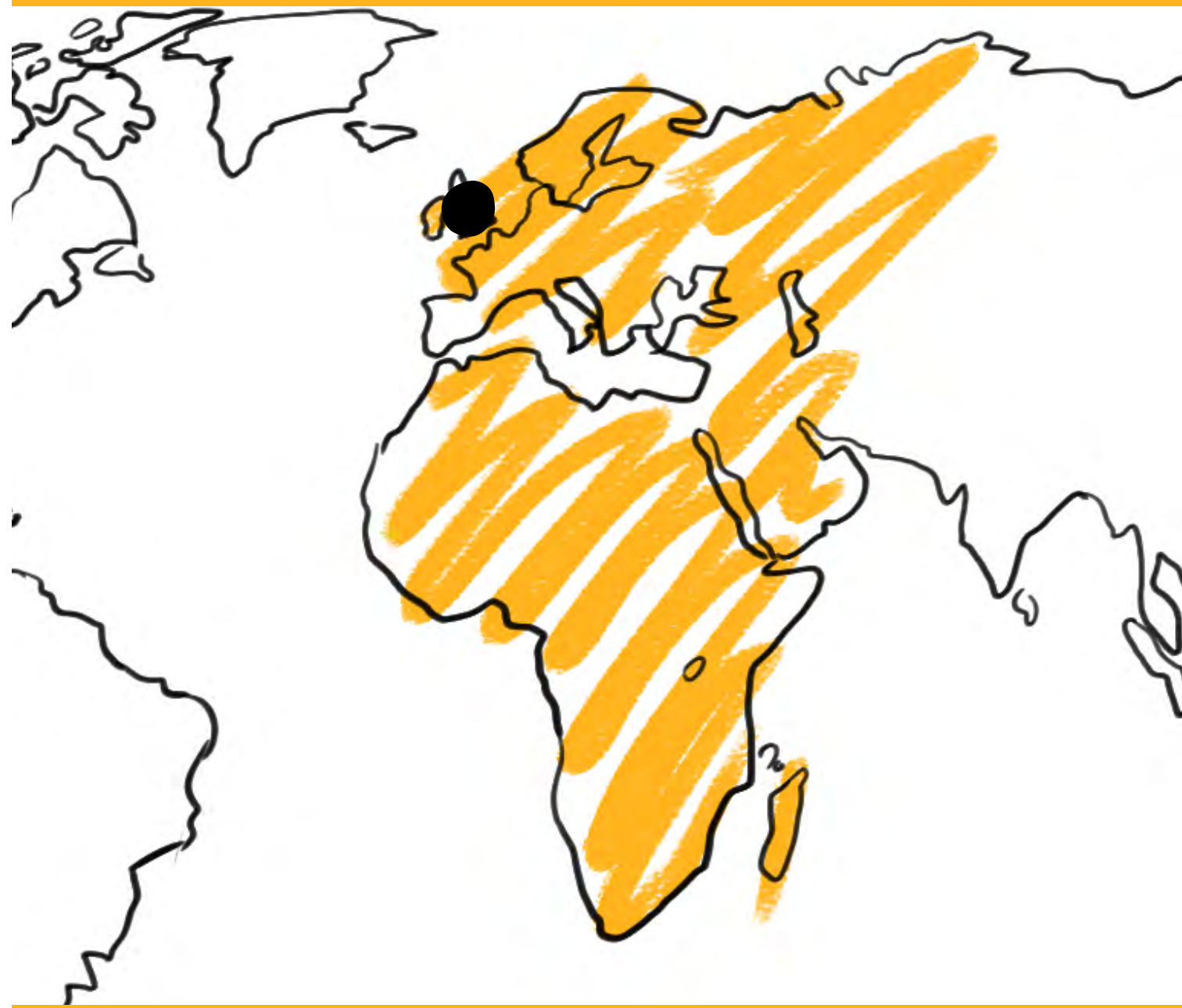


The project at this single runway airfield was completed in three primary phases and included displaced thresholds on the north end and south end and short-duration runway closure to minimize flying mission impacts.

Jacobs analyzed several repair alternatives, completed a cost-benefit analysis, and presented the findings to the U.S. Air Force to determine the final scope. Key details of the project included:

- During the full runway closure phase, creating a temporary runway out of a parallel taxiway to allow A-10, F-16, F-22, and C-130 depot maintenance functions serving the entire Air Force to continue.
- Mill and overlay of an approximately 8,850-foot-long by 200-foot-wide asphalt portion of the runway.
- Removal and replacement of over 12,000 feet of asphalt shoulders on each side of the runway and widening them from 20 feet wide to 25 feet wide to meet Unified Facilities Criteria.
- Full-depth removal and replacement of two 1,000-foot-long by 200-foot-wide runway overruns, including profile and approach light corrections.
- Removal and replacement of approximately 250 runway and taxiway concrete pavement panels.

EMEA



Jacobs is a member of the Delivery Partner team that is preparing RAF Lakenheath base for the deployment of two US Air Force squadrons of F-35A aircraft.

RAF Lakenheath - Suffolk, U.K.



Jacobs' client is the U.K. Defence Infrastructure Organisation (DIO), on behalf of the United States Air Force Installation and Mission Support Center, U.K. Ministry of Defence and the US Department of Defence.

Jacobs is responsible for:

- Providing overall project management services including specifications, design, cost control, commercial negotiation, construction management and risk control.
- Providing assurance for the architectural and engineering design, construction delivery and project management services for the F-35A Parking Apron and its associated aircraft shelters as part of a package of 5 projects.
- Providing assurance for the architectural and engineering design of the 6 Bay Maintenance Hangars and Flight Mission Simulator (FMS) building, inclusive of a Sensitive Compartmented Information Facility (SCIF)

APAC



Kadena Air Base - Okinawa, Japan



Jacobs serves as the lead for planning, design, and construction oversight of airfield infrastructure at Kadena Air Base. Kadena is the largest U.S. base in the Pacific and home to the largest combat wing and concentration of composite air assets of all U.S. Department of Defense services.

The base provides two 12,000-foot runways that serve all types of military and civil aircraft and worldwide deployment capability. The airfield is home to approximately 150 aircraft on permanent or rotational basis and has a need for capacity to support over 200 aircraft under various scenarios.

Our experience at Kadena and the entire Asia-Pacific region led to Jacobs being selected to partner with the 18th Wing and Pacific Air Forces (PACAF) to not only complete plans and designs for major facility repairs, modernization, and improvements, but also to develop the strategic vision for the base and airfield to meet mission requirements over the next 50 to 100 years.

Jacobs is engaged in the design and oversight of construction of aircraft hangars, aprons, support buildings, and infrastructure as part of the program to recapitalize and modernize the installation that comprises over \$8 billion in air base infrastructure.