

# Sustainable airports:

Benefiting from the UK's  
world-class expertise

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# Contents

- 01 UK expertise - Your world-class solution
- 02 Design
- 08 Engineer
- 14 Operate
- 17 Accessing the UK's expertise

# UK expertise

Your world-class solution

## London Heathrow Terminal 5

London Heathrow is the busiest international airport in the world. Terminal 5, designed by Rogers Stirk Harbour + Partners, is a world-class example of sustainable airport design and construction. For example, as noise and air pollution from aircraft make natural ventilation impractical, the design adopts an energy-efficient

strategy using a displacement air conditioning system and shading by means of canopies and low eaves to reduce solar gain on the long east and west elevations. UK companies involved in this project included Arup, Atkins, DSSR, Mott MacDonald, Pascall + Watson and TPS.

*UK companies are renowned internationally for their expertise in delivering the world's best sustainable airport solutions.*

This document showcases examples of the UK's impressive track record in tackling key environmental issues such as the reduction of CO<sub>2</sub>, noise management, air quality, biodiversity, surface and ground water pollution and the efficient management of resources such as energy, waste and water.

From award-winning design and engineering projects for new and existing airports, through to leading-edge initiatives in air traffic management and the movement of people, UK companies are maximising the environmental performance of the world's airports.

World-class airport designs integrating sustainable solutions

# Design

*UK companies are renowned globally for their excellence in the architectural design of airports that fully integrate the latest sustainable solutions.*

From innovative building designs that maximise light and solar panelling, noise reduction and air quality, through to landscape architecture that fully integrates local public transport systems to minimise carbon emissions, UK companies are at the leading-edge of sustainable airport design.

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### **Beijing Capital International Airport, China**

Designed by Foster + Partners, Beijing airport's international terminal is one of the world's most sustainable. The terminal incorporates a range of passive environmental design concepts, such as the south east orientated skylights which maximise heat gain from the early morning sun and an integrated environment control system that minimises energy consumption.

The technical detailed design optimised construction materials on the basis of local availability, functionality and low cost procurement. Public transport connections are fully integrated, whilst walking distances for passengers are short with few level changes, minimising transfer times. Other UK companies involved in the project were Arup, Vector Management and Davis Langdon.



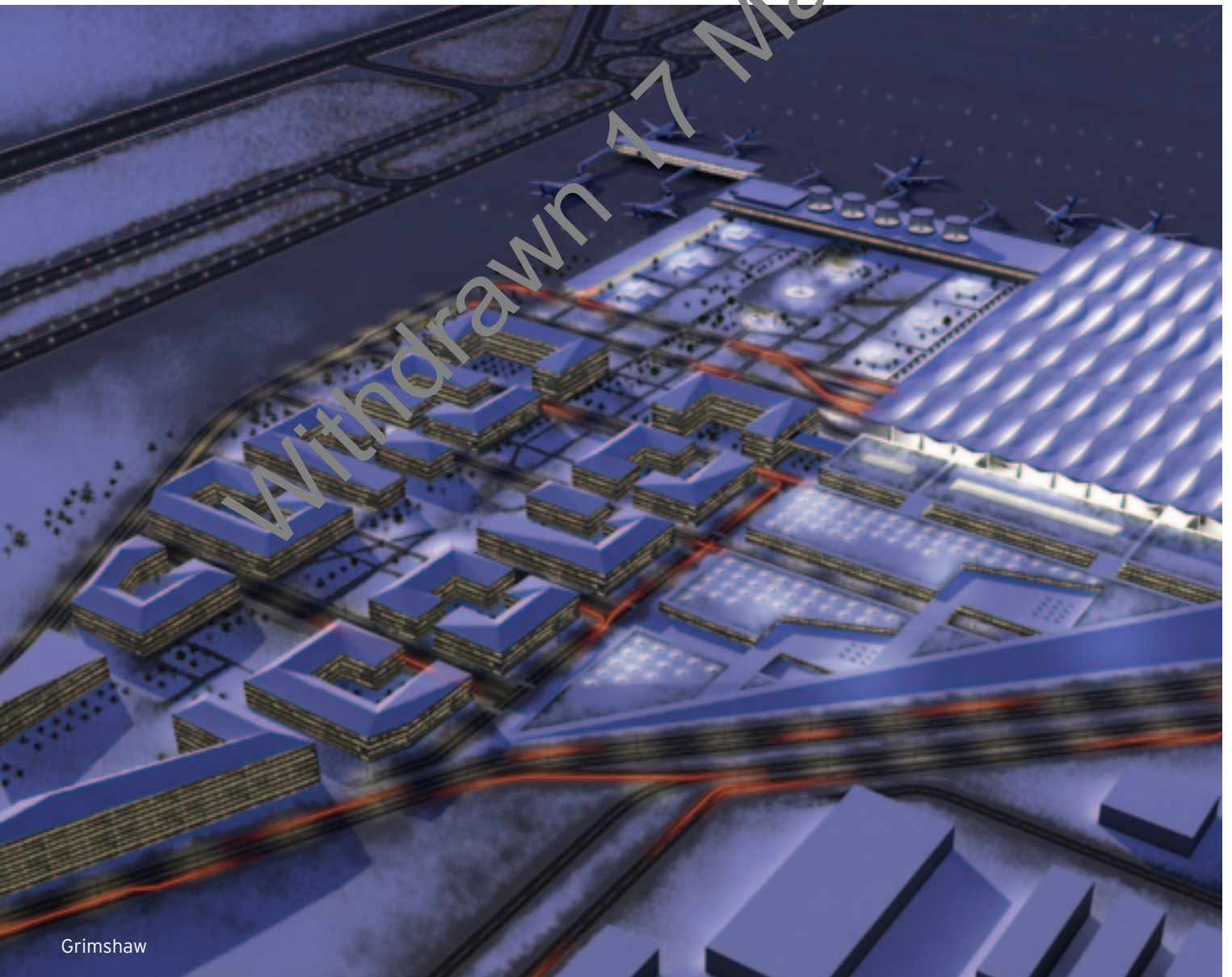
### **Pulkovo Airport, Saint Petersburg, Russia**

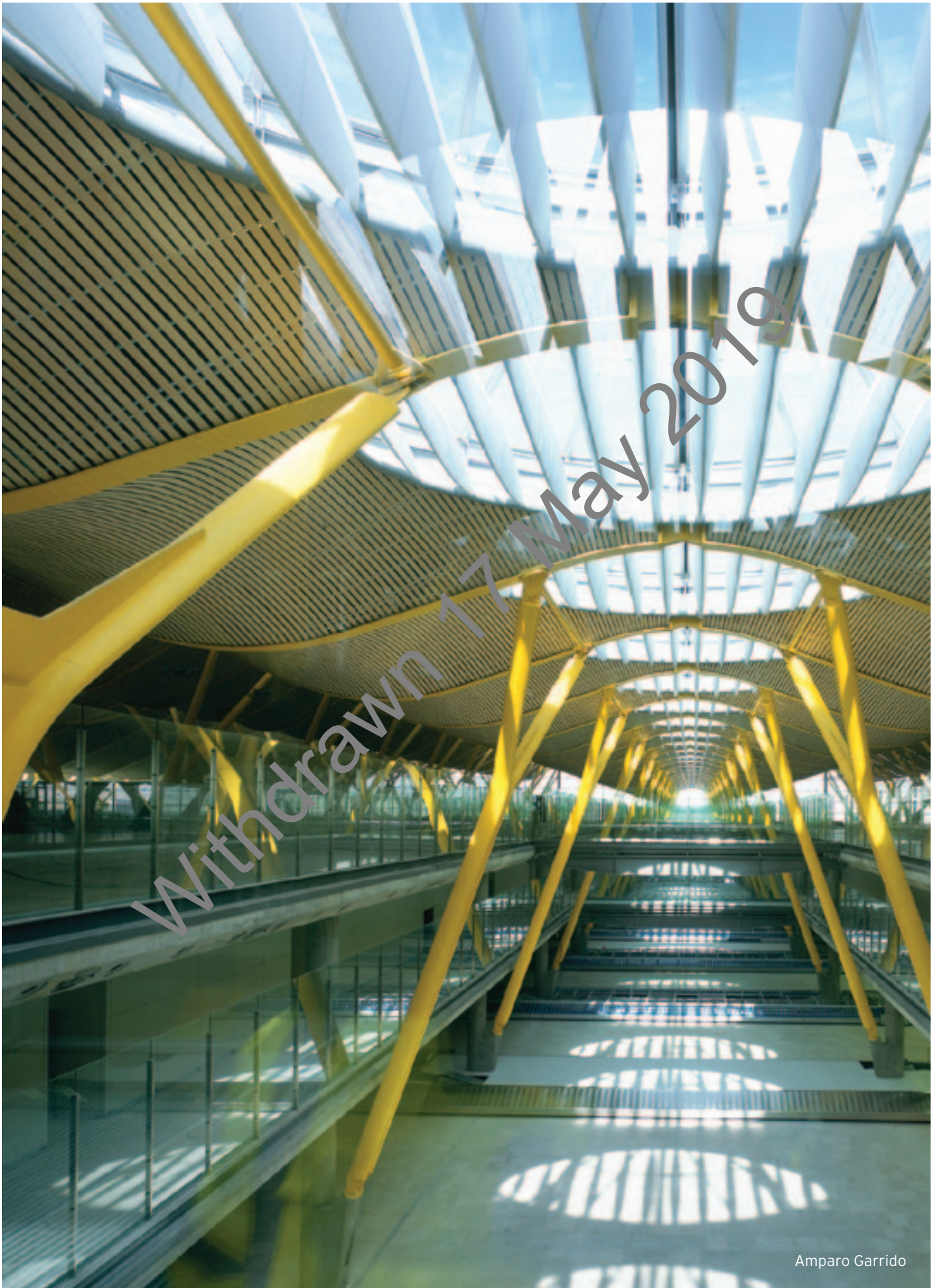
Grimshaw is part of an international team, including Pascall + Watson, that is designing a new terminal and 'airport city' for Pulkovo Airport. The striking new terminal roof and envelope were designed to accommodate the extremes of climate experienced by the city. The roof is created from a series of 18 metre bays which effectively act as large hoppers, shallow enough not to encourage gathering snow but deep enough to provide effective drainage.

The drains are located directly above the roof's supportive columns to ensure that the greatest snow load is concentrated on the area of maximum structural support. The roof lights are positioned above the datum line to give them the greatest protection from blanketing snow and to enable them to make optimal use of the low angle natural light. Other UK companies working on this project include Arup, Buro Happold, Mott McDonald and Halcrow.

### **Madrid Barajas Airport, Spain**

Rogers Stirk Harbour + Partners designed the new terminal and satellite at Madrid Barajas to handle up to 35 million passengers annually. The design team set out to maximise natural daylight to all passenger areas and reduce dependence on artificial light, whilst reducing solar gain through extensive external shading. Other UK companies involved in this project included TPS and Sandy Brown Associates.







### Dublin Airport, Republic of Ireland

Arup, working with Pascall + Watson and Mace, have designed a new 75,000 square metre terminal building at Dublin Airport. The designs for the terminal were optimised to ensure maximum environmental sustainability, reducing CO<sub>2</sub> emissions by up to 32 per cent and saving 6,000 tonnes of CO<sub>2</sub> per annum. The new terminal has a variety of energy-efficient initiatives including reduced numbers of fan systems through the use of natural air exhaust, the use of natural daylight, a building envelope that minimises air infiltration and heat loss, the reuse of warm air and effective automatic building control systems.







### **Queen Alia International Airport, Amman, Jordan**

The design by Foster + Partners at Queen Alia International Airport in Amman offers an approach towards ecologically sensitive architecture for the twenty-first century airport. The project incorporates a passive environmental strategy with maximum use being made of natural light through split beams at the column junctions in the roof that allow daylight to flood deep into the building. The concrete roof structure acts as a thermal store to heat and cool the building, whilst a black metal roof covers the domes and acts as a heat shield that incorporates a naturally ventilated cavity to release heat build up. The building draws on the vernacular tradition of outdoor areas and open-air gardens - these courtyards contain water pools that reflect natural light into the building and provide passive air-cooling to pre-condition air prior to mechanical ventilation. Other UK companies involved in the project included Davis Langdon, WSP and Buro Happold.



### **New Bugesera International Airport, Kigali, Rwanda**

Sustainability was a key consideration for TPS in the design of New Bugesera International Airport in Rwanda. Located on a greenfield site to the south east of the capital city Kigali, the new airport was designed to handle the most modern and quietest fuel-efficient aircraft. Sustainable solutions included the use of pre-conditioned air on all aircraft stands, forced natural ventilation in all buildings, together with the use of an underground cool air system within the passenger terminal. Rainwater harvesting and an on-site recycling and waste processing facility have added to the project's strong sustainability benefits.

Engineering sustainability  
into the world's airports

# Engineer

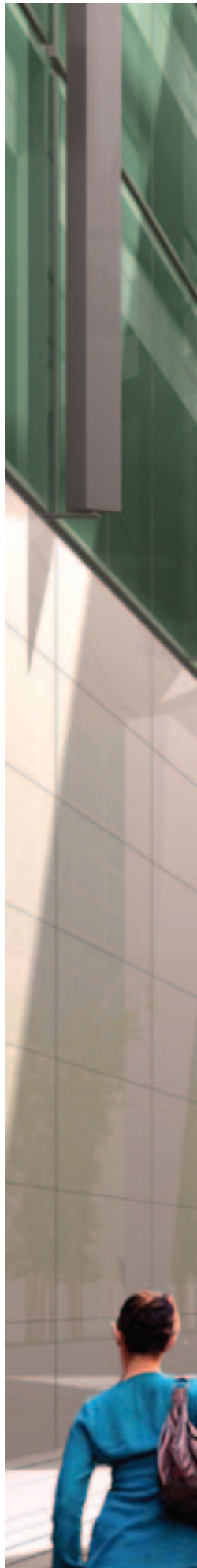
*Ranging from initial feasibility and master planning, through to the most sophisticated airport construction techniques, UK companies are at the forefront of environmental and sustainable airport engineering.*

Our world-renowned companies have provided engineering expertise for airport developments across Europe, Asia, Africa, the Middle East and the Americas.

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## **Indira Gandhi International Airport, New Delhi, India**

Mott MacDonald provided technical advice for the new international terminal at Indira Gandhi International Airport. The company produced master plans, environmental impact assessments and technical design for India's largest ever airport development (which has a capacity of up to 60 million passengers per annum). The key sustainable solutions implemented at the terminal included full aquifer recycling and displaced thresholds to minimise noise under approach.





### Abu Dhabi International Airport, UAE

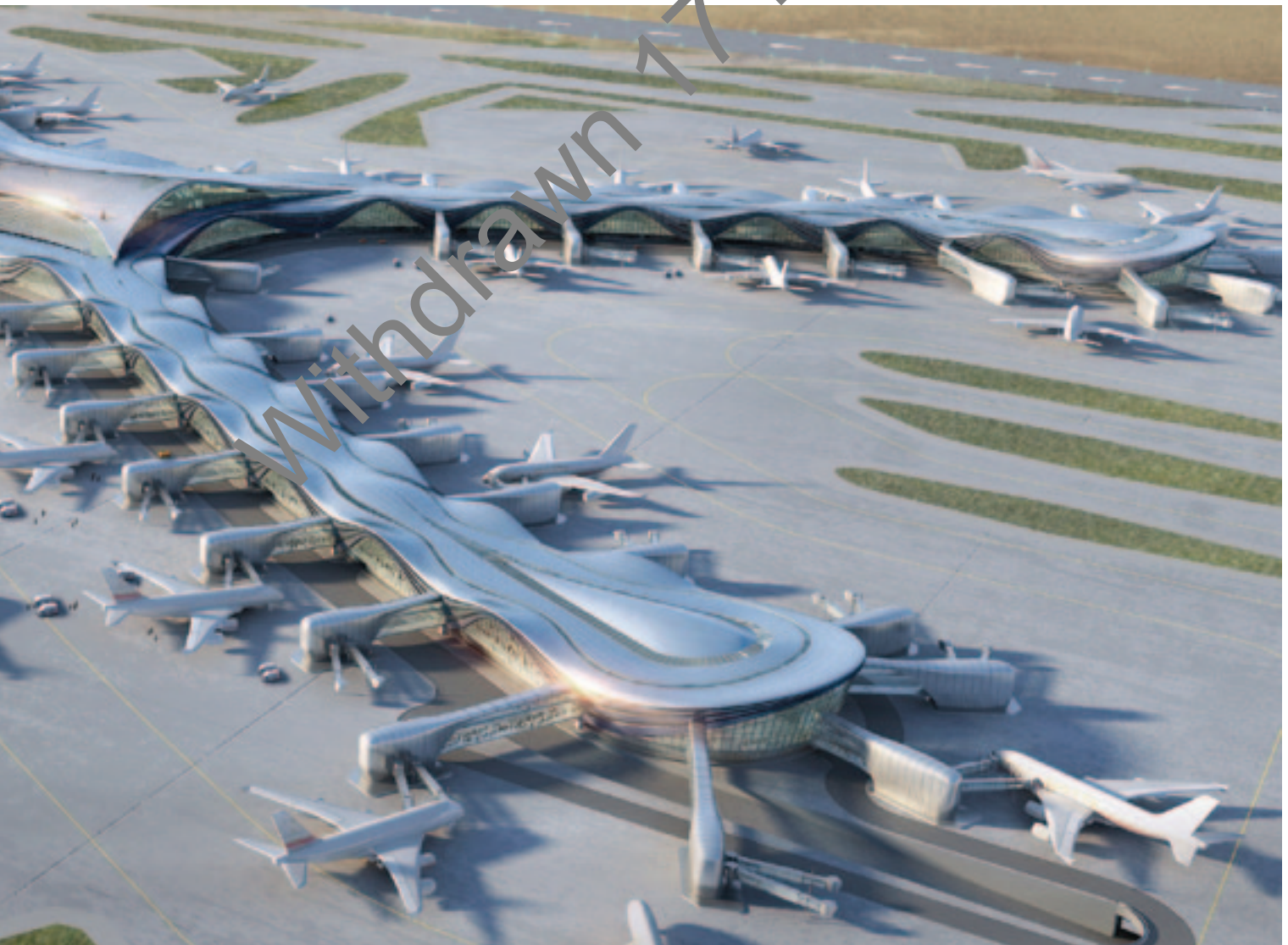
Arup has been involved in the development strategy of four terminals at Abu Dhabi International Airport with the overarching objective of handling an increase in passenger traffic from seven million passengers per year to forty million. The largest of these terminals (located in the mid-field) is being designed on sustainable principles.

Stratified air conditioning systems serve all large volume spaces whilst low energy lighting, facade shading and high efficiency perimeter glazing all contribute to optimal energy efficiency. Water conservation is a critical issue, with condensate from air conditioning equipment being re-circulated to grey water systems.



### **New Quito International Airport, Ecuador**

Mott MacDonald were key advisers for the development of a new airport at Quito. The development was awarded a United Nations Global Sustainability Award in 2009 on the basis of multiple criteria including minimising the impact on the environment; emissions and noise reduction; residual water treatment; flora and fauna protection; and a positive economic impact in the local community. Alexander Mejia from the United Nations said "the new Quito airport was selected as best practice on how to design and build a green mega-project, not only in the Americas but in the world, as we are aware that no other airport of this magnitude is being built with such a high environmental focus."





### Yinchuan Airport, China

Atkins developed a new airport complex in Yinchuan, Ningxia in a project that involved master planning and the construction of a new 30,000 square metre terminal building. The project, which had to overcome the extreme temperatures and harsh climate of the arid region, utilised arching steel columns and an efficient three-dimensional structural system to satisfy severe seismic building codes. The 53 metre clear span steel trusses projecting above the roof enabled natural light to flood in, whilst discreet skylights and insulated translucent cladding panels were used to create a bright and airy interior while filtering the harsh desert sunlight into the terminal building.





### **Toronto Pearson International Airport, Canada**

Halcrow and Arup worked together on the expansion of the airport to double in size from 25 million to 50 million passengers per annum. The key environmental solutions adopted included a large structural roof span-to-depth ratio and multiple floor openings that maximise natural light in the departures and arrivals halls.

UK excellence provides operational sustainability for the world's airports

# Operate

*The successful integration of sustainable and environmental initiatives, without impacting on operational effectiveness, is an increasingly important requirement for airport operators worldwide.*

From site management systems that monitor spillages, to air traffic control systems that reduce CO<sub>2</sub> emissions and minimise noise, and from the environmentally safe de-icing of aeroplanes through to the careful management of biodiversity at airports, UK companies are at the forefront of sustainable airport solutions.



## **UK expertise in research and knowledge transfer**

UK universities have a global reputation for leading-edge research into the strategic and operational environmental impacts of air transport. Students and industry practitioners from across the world come to the UK to take advantage of this expertise in courses provided by universities such as Cambridge, Cranfield, Leeds, Loughborough, Oxford, Reading, Sheffield and Southampton. Manchester Metropolitan University even offers a Masters degree in 'Aviation Sustainability'.



## **Smith Jumbotugs**

Airport authorities are increasingly demanding that ramp or apron vehicles should be low or zero emission - Smith Jumbotugs are recognised worldwide as a truly zero emission solution, without sacrificing performance. These reliable, efficient vehicles are ideal for servicing aircraft which require a quick turnaround.





ULTra PRT

### ULTra PRT

Consisting of 21 low-energy, battery-powered, driverless vehicles capable of carrying four passengers, this is the first such system in the world. BAA have chosen ULTra PRT in order to provide a major improvement in passenger experience combined with a useful benefit in reducing carbon emissions.



### NATS

NATS is one of the world's first air traffic control organisations to set firm targets for reducing emissions in its air traffic management system. The company has a suite of analytical tools that provide airport CO<sub>2</sub> assessments and baseline emissions on either a regional or airport basis. These can then be used to develop airport and airspace efficiencies and CO<sub>2</sub> reduction strategies, and deliver real savings in operational environments.



### QinetiQ

The QinetiQ Tarsier system automatically detects foreign object debris on airport runways, thereby increasing safety whilst minimising the cost of runway closures and aircraft damage. A substantial environmental benefit of the system is a dramatic reduction in CO<sub>2</sub> emissions achieved by reducing the need for aircraft to stack.



### Kilfrost

Thanks to continued investment in research and development, Kilfrost has pioneered de-icing fluids which exceed the industry's stringent environmental demands. Serving clients in over fifty countries and five continents, and with an extensive portfolio of environmentally-friendly fluids, Kilfrost is strongly committed to helping achieve greener and more sustainable winter operations.



### Douglas Equipment

Douglas Equipment is one of the world's leading suppliers of aviation towing tractors (conventional and towbarless), military aircraft movers and runway friction measuring equipment. The company produces the zero emission Remote Aircraft Mover and is developing a zero emission electrical drive system for its range of towbarless tractors.



### Metalite Aviation Lighting

Metalite's new 'Portable Aviation Lighting Systems' with LED technologies provide a range of environmental benefits, increased performance and reduced maintenance. LED lamps have a greater lifespan and improve efficiency by up to 75 per cent through reduced charging times and power consumption.

## And even planning for a sustainable future...

### **The Spaceport Authority Building, New Mexico**

Foster + Partners is part of a team that won an international competition to build the first private spaceport in the world - The New Mexico Spaceport Authority Building. Making a minimal impact on the environment, the scheme will be the first facility of its kind and a model for the future.

The Spaceport lies low within the desert-like landscape of the site, exploiting the thermal mass which buffers the building from the extremes of the New Mexico climate as well as catching the westerly winds for ventilation. Natural light enters via skylights, with a glazed facade reserved for the terminal building. Using local materials and regional construction techniques, the building is both sustainable and sensitive to its surroundings.

The scheme will have minimal embodied carbon and few additional energy requirements, and has been designed to achieve the prestigious 'Leadership in Energy and Environmental Design' platinum accreditation.

Withdrawn 17 May 2019



# Accessing the UK's expertise

*This brochure illustrates just some of the world-class expertise available from UK companies that provide sustainable airport solutions globally.*

If you require any further information, please do not hesitate to contact UK Trade & Investment ([www.ukti.gov.uk](http://www.ukti.gov.uk)), the British Aviation Group ([www.britishaviationgroup.co.uk](http://www.britishaviationgroup.co.uk)), the British Airport Services & Equipment Association ([www.basea.org.uk](http://www.basea.org.uk)), the UK Civil Aviation Authority ([www.caa.co.uk](http://www.caa.co.uk)) or any of the companies featured within this document:

Arup: [www.arup.com](http://www.arup.com)

Atkins: [www.atkinsglobal.com](http://www.atkinsglobal.com)

BAA: [www.baa.com](http://www.baa.com)

Buro Happold:  
[www.burohappold.com](http://www.burohappold.com)

Davis Langdon:  
[www.davislangdon.com](http://www.davislangdon.com)

Douglas Equipment:  
[www.douglas-equipment.com](http://www.douglas-equipment.com)

DSSR: [www.dssr.co.uk](http://www.dssr.co.uk)

Foster + Partners:  
[www.fosterandpartners.com](http://www.fosterandpartners.com)

Grimshaw:  
[www.grimshaw-architects.com](http://www.grimshaw-architects.com)

Halcrow: [www.halcrow.com](http://www.halcrow.com)

Kilfrosth: [www.kilfrosth.com](http://www.kilfrosth.com)

Mace: [www.macegroup.com](http://www.macegroup.com)

Metalite Aviation Lighting:  
[www.metaliteaviation.com](http://www.metaliteaviation.com)

Mott MacDonald:  
[www.mottmac.com](http://www.mottmac.com)

NATS: [www.nats.co.uk](http://www.nats.co.uk)

Pascall + Watson Architects:  
[www.pascalls.co.uk](http://www.pascalls.co.uk)

QinetiQ: [www.qinetiq.com](http://www.qinetiq.com)

Rogers Stirk Harbour + Partners:  
[www.richardrogers.co.uk](http://www.richardrogers.co.uk)

Sandy Brown Associates:  
[www.sandybrown.com](http://www.sandybrown.com)

Smith Jumbotugs:  
[www.jumbotugs.co.uk](http://www.jumbotugs.co.uk)

TPS: [www.tpsconsult.co.uk](http://www.tpsconsult.co.uk)

ULTra PRT: [www.ultraprt.com](http://www.ultraprt.com)

Vector Management:  
[www.vecman.com](http://www.vecman.com)

WSP Group: [www.wspgroup.com](http://www.wspgroup.com)

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## UKTI

UK Trade & Investment is the Government Department that helps UK-based companies succeed in the global economy. We also help overseas companies bring their high-quality investment to the UK's dynamic economy acknowledged as Europe's best place from which to succeed in global business.

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