AN OFFICIAL REPORT ON TERMINAL 2: THE QUEEN’S TERMINAL FOR THE AVIATION COMMUNITY

Heathrow
Making every journey better
Make your airport the most competitive and passenger friendly with innovative, efficient, reliable and flexible solutions. Our baggage handling, air cargo and airport IT solutions combined with our excellent customer services lead to an airport running efficiently, smoothly and creating a great passenger experience.

We have a proven track record with a global pedigree for the efficient operation and maintenance of baggage handling systems with the technical capability to integrate and improve systems and technology. For logistics expertise and operational support, we combine experience with reliability, foresight with innovation.

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Building on strength

The importance of developing the UK’s global hub

Heathrow has invested £11 billion in the transformation of its facilities in the past decade, as it strives to achieve its aim of ‘making every journey better’, and the latest phase is the £2.5 billion new Terminal 2. The emphasis is on further developing the airport as the UK’s hub, directly connecting the UK to the world and becoming Europe’s hub of choice. The ambitious investment programme – T2 is one of the UK’s largest private-sector investment projects – is making this a reality. Colin Matthews, Chief Executive, Heathrow Airport, outlined the strategy to Ross Falconer.

In Heathrow, the UK has one of the world’s most successful hub airports, and building from its existing strength can connect the UK to growth quicker and at less cost than the alternatives. The key to building these long-haul connections is an expanded hub airport. For the UK to succeed economically it needs direct air transport links with the global markets upon which future growth depends – places like China, India, Latin America and South East Asia. Those direct links are critical to trade and, therefore, to jobs and economic growth. Colin Matthews, Chief Executive, Heathrow Airport, explained that the UK needs a single hub with the size and scale to compete internationally. Indeed, Heathrow welcomed the interim report from the Airports Commission published in December 2013, which shortlists a Heathrow north-west runway as one of the options for solving the UK’s aviation capacity crisis. “Britain is better off when we’re connected,” Matthews emphasised. “The world economy is changing fast and Britain needs a world-class hub airport with the capacity to compete against Paris, Frankfurt and Amsterdam. A third runway is the quickest, cheapest and surest way of connecting the UK to growth. We have thought afresh about how a third runway can be delivered. Our new option is different from the previous proposal for a third runway and will deliver the flights
Britain needs while continuing to reduce the total number of people affected by aircraft noise.¹

Heathrow handled 72.5 million passengers in 2015 – an increase of +3.4% on 2012. BRIC (Brazil, Russia, India, China) passengers were up +6.9% overall, with China up +18.9% and India up +8.7%, and Matthews commented that the passenger figures reflect the growing demand for the long-haul destinations only a hub airport can support.

Transforming the entire airport

The £1 billion investment in upgrading, replacing and refreshing facilities within and around Heathrow is fundamental to ensuring its competitive position. Terminal 5 was the springboard for transforming the entire airport, reducing congestion and enabling airlines to be relocated with their alliance partners. Grouping the airlines by alliance, of course, increases efficiency and improves the transfer experience for passengers, and this will be further enhanced with the Star Alliance carriers grouped together in the new Terminal 2. Terminals 1 and 3 have been redeveloped with improved facilities and services, while Terminal 4 has also been completely refurbished – a new check-in area and forecourt have added an extra 6,000sqm of space. Once Terminal 2 opens, two-thirds of Heathrow’s passengers will be using effectively brand new facilities, with the remainder travelling through facilities that have been significantly upgraded.

“Our arguments, however strategic and however long-term, are always stronger when the airport is operating well,” commented Matthews. “Anything we do to improve the passenger experience today improves our argument – even if we’re talking about the need for capacity decades into the future. The opening of Terminal 5 and the forthcoming opening of the new Terminal 2 contribute to a more efficient airport. They allow us to make better use of available capacity.”

Heathrow creating jobs and growth

As the UK’s only hub airport, Heathrow plays a unique role in the variety of high quality jobs, training and career opportunities it creates locally and nationally. It is one of the UK’s largest single-site employers; more than 76,600 people are directly employed onsite, and the airport supports a total of 114,000 jobs in the surrounding area. The Terminal 2 development has created infrastructure, engineering and construction jobs across the country, and 35,000 people have worked onsite over the course of the project. It’s the people who bring Heathrow to life. More than 25,000...
people from around 200 organisations will work in Terminal 2, including airlines, handlers, retailers, security officers, cleaners and engineering. “When we talk about the T2 team, it’s certainly inclusive,” Matthews said. “The construction side, operations side and immigration are all a significant part of the terminal, so they were deeply involved in designing and are now deeply involved in commissioning the facilities.”

Heathrow is also developing responsibly and engaging constructively with the local community. “Of course, an airport brings jobs and economic activity to an area – that’s obviously the case around Heathrow,” added Matthews. “Equally, we need to ensure we minimise the impact of noise and also of congestion on the roads. The airport must become quieter over time and it can become quieter; new aircraft are quieter than those they are replacing, and over time there will be more effective means of mitigating noise on the ground. We are doing all of that with a productive conversation with people who live around the airport.”

Terminal 2 itself will be Heathrow’s most sustainable terminal yet. Over 99% of material from the demolished Terminal 2 has been recycled or reused for energy. The building’s CO₂ emissions will be 40.5% lower than required by building regulations, and the target is to recycle or compost 70% of airport waste by 2020.

With construction complete and operational readiness trials underway, Terminal 2 is on time and on budget. It will be a fantastic showcase for the UK and has been developed with a real sense of place – passengers will instantly recognise the best of London and of the country. “We’re confident we’re on track. Equally we are determined to ensure that we’ve thought through every eventuality – that we have Plan A and Plan B. Like all major infrastructure developments, Terminal 2 is a complex project and we’re determined that it goes as smoothly as it possibly can on Day 1 and Day 2, and subsequently every day and week thereafter,” concluded Matthews.
Heathrow has invested £11 billion in its transformation since 2003, including the iconic Terminal 5, the soon-to-open Terminal 2, new baggage systems and the refurbishment of Terminals 3 and 4.

Terminal 5 changed the way Heathrow serves its passengers, enhancing both operational performance and the passenger experience, and Terminal 2: The Queen’s Terminal will augment that further.

The old Terminal 2, opened by the Queen in 1955, was demolished after 54 years of service. It was Heathrow’s first terminal – originally called the Europa Building – and was designed to deal with 1.2 million passengers per year. By the time it closed in 2009, it was handling eight million passengers each year. Up to 20 million passengers a year will use the new Terminal 2. The rigorous planning and build schedule was completed in November 2013, allowing a six-month period of operational readiness and testing before the terminal opens, so staff can familiarise themselves with the building and how it operates. The phased opening will see the airlines – the 23 Star Alliance partners, as well as Aer Lingus, Germanwings and Virgin Little Red – move in over a six-month period. United Airlines will be the only carrier to move in on the first day, and it will account for around 10% of the terminal’s activity. The first flight – a United Airlines service from Chicago – is scheduled to land at 06:55 on 4 June.

Designed to delight passengers

The passenger experience is at the very heart of the Terminal 2 development, which has two parts: the main Terminal 2A building and the Terminal 2B satellite building – the two are connected by a passenger tunnel. The project also includes a 1,340-space car park and an energy centre and cooling station. “We started by thinking about what passengers really want,” commented John Holland-Kaye, Development Director, Heathrow Airport. “What they really want to do is get from their car, or bus, or train to their plane as quickly as possible, so we planned for the shortest possible walking distances between transportation and the gates, making the passenger journey as easy and intuitive as possible.”

Anyone who travels through the facility will be struck by the light, airy building, which creates a real feeling of space. A key feature is the 50,000sqm iconic three-wave roof, which maximises natural daylight and helps guide passengers through their journey.

Heathrow’s world-class transformation

When the new £2.5 billion Terminal 2 opens on 4 June it will be a real game-changer for Heathrow. The world-class facility has been designed around the needs of passengers and is one more step in the airport’s transformation, as John Holland-Kaye, Development Director, Heathrow Airport, explained to Ross Falconer.
daylight and helps guide passengers through their journey. Holland-Kaye explained that each of those waves reflects a different stage of the passenger journey. “The first wave of the roof is the check-in space, the second wave is the security zone, and then the third wave is the departures area,” he said. “So from a passenger’s point of view, they will quickly pick up that where the roof comes down to a lower point, that is the point at which you transition from one part of the journey to another, and it helps people naturally adjust to a slight change in pace. It also means that, as they come through one of those transitions, they come into a much lighter, brighter space.” While the journey is intuitive, those seeking a reassuring human touch will be assisted by friendly Passenger Ambassadors to help find their way faster. Utilising the latest technology, passengers will be offered greater choice as they travel through the airport. The check-in process in Terminal 2 is configured in three waves across four zones (A to D). This wave approach, supplemented by clear signage, provides passengers with choice, an intuitive route and a simplified process. Holland-Kaye outlined that Wave 1 consists of 66 self-service kiosks, at which passengers can check-in, print their boarding cards and bag tags and tag their own bags, before moving on to the fast bag drop at Wave 2. 56 traditional check-in desks can be found in Wave 3 – this wave features dedicated premium desks and full service economy check-in desks. “We also have automated ticket presentation, so travellers simply scan their boarding pass and that allows them into the Departure Lounge,” added Holland-Kaye. “We have the same technology at the gates and that allows us to board planes more quickly, so that passengers can get on their way quicker.” That automation extends to immigration, where there are 10 automated gates in Terminal 2.

‘Best of British’

Terminal 2: The Queen’s Terminal recognises the 60-year relationship that Heathrow has had with Her Majesty The Queen, and the creation of a unique sense of place really brings that to life. “When you’re in the terminal, you will get a sense that you could be nowhere other than in the UK, and nowhere other than in London,” commented Holland-Kaye. “One of the best opportunities to achieve that is in the retail environment, so we’ve tried to capture the best of the British High Street and the best of Bond Street, because London is one of the shopping capitals of the world.” Among the global selection of 82 shops and 17 bars and restaurants will be outlets that really reflect the ‘best of British’. Heathrow will use technology to bridge the gap between physical shopping and e-commerce, utilising the opportunity to connect with passengers through their mobile devices and tablets. Heathrow has challenged its retailers to raise their game with a more innovative offer following six retail directions: New luxury – personalised experiences; SoLoMo – social location mobile targeting customers on the go; Hybridisation – one space, many moods, inspired by innovative collaborations between different brands; Transient – customised experiences which respect the airport’s
international audiences; Customisation – bespoke products and services that embrace the needs of a global audience; and Multi channel – thinking digital to communicate with passengers on the move. For example passengers will be able to Tweet their order for YoSushi and their order will be waiting for them in the store.

Among the exciting retail firsts is John Lewis’ first ever airport store. The retailer is investing more than £1 million in a 3,600 sq ft shop, showcasing many of its own-brand products, designer collaborations and exclusives. “We also have Fuller’s, who brew their beer only eight miles from Heathrow,” added Holland-Kaye. “They will open their first airport pub at Heathrow, which will be called London’s Pride, and that will help them to promote their fabulous beer brands to international markets.”

Other iconic British brands present include Burberry and Paul Smith, and they will be joined by a range of exciting new and emerging brands. “It’s going to be a fantastic offer and one of our most prominent sites will be home to Heston Blumenthal’s first airport restaurant,” Holland-Kaye enthused. “It will give people who don’t normally have a chance to eat at one of his restaurants the opportunity to do so. That will be really exciting and will create a real buzz. It will be a mainstream offer, but with a very Heston touch to it.”

The new Terminal 2 has clearly been designed and built with passengers at its heart. As Holland-Kaye passionately espouses, it will mean another big improvement in the passenger experience, continuing the progress made in recent years with the opening of Terminal 5 and the refurbishment of Terminals 3 and 4. This next step in Heathrow’s transformation will deliver a better journey for passengers, more efficient and reliable infrastructure for airlines, and additional jobs, trade and economic growth for the UK.
Terminal 2: The Queen’s Terminal has been delivered on time, on budget and with an impeccable safety record. Stephen Livingstone, T2 Development Director, Heathrow Airport, outlined some of the key challenges and how the airport is ensuring a safety first culture.

Delivering the new Terminal 2

Constructing a new terminal at the heart of the world’s busiest international airport is, of course, an incredibly complex task, and the previous experience of T2 Development Director Stephen Livingstone in the challenging oil, gas and nuclear industries, has proven invaluable. It is also telling, therefore, that he refers to the centre of Heathrow as "the most complex place that you can deliver a major project". “You not only have the constraints of a full live operation around you, but below are the Heathrow Express and Piccadilly Line tunnels.”

Livingstone’s experience means that various techniques, not just from the airport industry, have been applied on the £2.5 billion Terminal 2 development. “We’ve initiated project controls, we’ve used modulisation strategies – in essence, the car park has been manufactured offsite and shipped in overnight and built as a huge Meccano kit,” he explained. “On T2B we’ve actually been able to come up with a strategy where we’ve excavated below ground and built above ground by adding the structure built in the middle of the facility and that’s saved us six months on the schedule. So we’ve brought all kinds of techniques into place.”

The phased opening is an important element in the airport’s risk management strategy. Certainly Terminal 2 presents a unique risk challenge, with 26 airlines moving in – 23 Star Alliance carriers, plus Aer Lingus, Germanwings and Virgin Atlantic Little Red – each with their own organisational requirements and culture. Livingstone added that the phased approach is sensible to ensure each individual airline is properly embedded before introducing the next.

Safety culture

Safety is at the heart of everything Heathrow does, and the airport’s construction partners have shared this approach, helping to make Terminal 2 one of the UK’s safest construction sites. This shared approach is reflected in the ‘We’re Heathrow Safe! And proud of it’ campaign, which uses workers’ stories to demonstrate why health and safety is important. The sharing of best practice is encouraged across all Terminal 2 sites to promote the best safety standards. “In fact, it’s gone beyond the campaign – it’s become part of the

Sustainable airport operations are central to Heathrow’s vision to become Europe’s hub of choice, and Terminal 2 is Heathrow’s most sustainable terminal yet.
culture,” Livingstone stated. “At times we’ve had five million man hours without a reportable incident – by any standards, that is the top end of achievement. And when there is an incident or accident, it is investigated thoroughly to ensure lessons are learned and it doesn’t happen again. We feed that back to the suppliers. It’s our job to make sure we manage risks to the highest professional standards, because we have a moral obligation to all of our workers that we go home safely each day.”

The new Terminal 2 is one of the largest privately funded construction projects in the UK, with 35,000 people having worked onsite over the course of the development. Significant investment has been made in staff welfare, protective equipment and a safe, pleasant work environment, and Livingstone reports excellent feedback from the workforce. “Across Heathrow we have an agenda whereby our safety record exceeds national standards and we’re very proud of that – that’s why we have the ‘We’re Heathrow Safe. And proud of it’ campaign,” he commented.

**Heathrow’s most sustainable terminal yet**

Sustainable airport operations are central to Heathrow’s vision to become Europe’s hub of choice, and Terminal 2 is Heathrow’s most sustainable terminal yet. The figures are impressive – more than 99% of material from the demolished old Terminal 2 has been recycled or reused for energy, the building’s CO₂ emissions will be 40.5% lower than required, and the aim is to recycle or compost 70% of airport waste by 2020. Terminal 2 will also be the world’s first BREEAM certified airport terminal – BREEAM being the world’s foremost environmental assessment method and rating system for buildings. Livingstone explained that around 20% of all energy in the building will come from renewable sources. The terminal has its own renewable energy centre providing combined heat and power fuelled by woodchip, highly efficient gas boilers and a cooling station. “The woodchip that we use comes from Richmond Park, which is only a few miles away from Heathrow,” Livingstone added. “We’ve also designed the building so that it needs less energy than might otherwise be the case. The iconic skylights in the roof are north-facing and that allows us to bring in a cool steady level of lighting, which doesn’t warm the building up too much. One of the biggest challenges we have in a building that is as heavily used as an airport terminal is to make sure it doesn’t overheat, so that’s a really good design feature, and it brings in a really beautiful clear level of light at all times of day.”

The new Terminal 2 will support a more sustainable Heathrow, with the airport operating more efficiently from a smaller number of larger terminals arranged.
Public transport connections – rail, tube and bus – feed directly into the terminal’s striking central courtyard. From 2019 Crossrail will give Heathrow passengers new routes into London, and connect business passengers directly to the City of London and Canary Wharf. When Crossrail opens, 11.7 million people will live within an hour of Heathrow. “Heathrow is fantastically well connected by road and by rail,” explained Livingstone. “By road we have the M4, M40 and M25 very close by, and we have the biggest coach station in the UK just outside Terminal 2, so that’s a great connection all across the UK. Of course, we also have rail; the Piccadilly Line goes straight to the door of Terminal 2, and we have Heathrow Connect and Heathrow Express, with a shuttle service into central London in only 15 minutes.” Today, around 40% of passengers travel to Heathrow using public transport. Once the new connections are in place that figure will rise to 60%, which is significant in the context of the airport’s carbon reduction efforts. Delivery of the new Terminal 2 is the latest phase in the transformation of Heathrow, providing a new vision and a new space designed around the needs of the passenger. Constructing a new terminal at the centre of the world’s busiest international airport is a huge challenge, and the scale and complexity of the task has meant a strong focus on collaboration and coordination at every stage of construction. The end result will be the best possible experience for every passenger travelling through the new Terminal 2.

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Stephen Livingstone, T2 Development Director, Heathrow Airport

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Offsite prefabrication has been used extensively, bringing a number of benefits, perhaps the most important of which is safety.

Major projects such as T2A are hugely important to the UK economy, not only locally to the airport but also nationally. Over 140 suppliers from across the UK have been involved, from Scotland down to the south coast, not to mention Spain and Germany. "Major projects also create a degree of stability and certainty for many organisations due to the size and duration of the works," said Duncan Pickard, HAL Project Director. "Additionally, let’s not forget the local economy and support services – accommodation for travelling operatives – who all benefit from the influx of people and the prosperity of the economy."

The construction of T2A has predominantly used tried and trusted techniques. As with all forms of construction, evolution takes place – for example, the installation of the glass wall linings has been developed to enable the easy handling of the large panels through the use of mechanical equipment, together with the simple screw mechanism on the brackets, to allow for the easy adjustment and alignment.

"Offsite prefabrication has been used extensively, bringing a number of benefits, perhaps the most important of which is safety. "Taking construction activities offsite and into a factory ensures a better controlled environment for the operatives and reduces the potential for the environment to change," explained Pickard. "Additionally, the manufacture of component parts reduces the need to work at height, which is inherently more dangerous. Finally, the installation of the elements into the site requires fewer people. Quality is also improved as the works are constructed in a factory environment."

One of the most challenging aspects has been the location of Terminal 2 at the heart of the world's busiest two-runway airport. It is situated 12m above the Piccadilly Line, which therefore needed to be continuously monitored to make sure that as the old buildings were demolished the ground did not heave too much before the new building...
was constructed. "Had this occurred the tunnel would have collapsed," said Pickard. "It is also in a direct sight line from the control tower to the southern runway threshold – this meant that construction lights and cranes and the sequence of build did not impact on these sight lines, as this would impact on the airport's capacity and cause flight delays. We have also brought into Heathrow – and taken away – millions of tonnes of plant, equipment and materials, not to mention the thousands of people, smoothly and efficiently. This has required the detailed planning of deliveries, such that materials are only delivered just in time for installation, as we have limited on-site storage space."

Safety part of the T2A DNA

From a passenger perspective, the terminal is very easy to navigate, with a strong emphasis placed on making the building intuitive to use. Key routes have been kept on a single level, which removes the need for vertical circulation – again making it easy for passengers to move through the building. The shape of the roof really aids the intuitive wayfinding; it accommodates the huge north-facing windows and with the fabric softfit creates a light, airy and calm environment that will reduce the stress of travelling. "The other item I am really proud of is the safety record," added Pickard. "We have employed over 25,000 people onsite and have reached five million RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations) free hours. This could not have been achieved without the support of the HAL Executive, the leadership of the senior management team onsite and most importantly the engagement and buy-in from the operatives. Safety has been the number one priority and the culture has been embedded and now forms part of the T2A DNA. Finally, I am proud that the terminal has been constructed without impacting on Heathrow's operations – not one flight or passenger has been affected by the construction, which when you consider the location is a massive feat of planning."

There are also a number of key environmentally friendly solutions. The huge north-facing windows located in the waves of the roof allow substantial amounts of natural light into the building, which reduces the amount of artificial light required. Also, as the windows are north-facing this means that there is very little heat gain. The use of Bore Hole water, instead of potable water, the fire fighting sprinkler main and also chilled water associated with the HVAC systems further reduces the carbon footprint. While the Energy Centre has two gas turbines, it also has two large biomass boilers that burn woodchips, which is a renewable resource.
There are still several months until the eagerly awaited opening of Heathrow’s new Terminal 2, but its design is a fervent topic of conversation, as it has been since the earliest artists’ renderings of the site. Passengers have yet to set foot inside the building, but already The Queen’s Terminal is being heralded as an emblem of aviation architecture, and understandably so: the six-floor, 200,000sqm Terminal 2A is a compact and compelling space of crisp, clean design, with 28 full-services stands that will provide capacity for 20 million passengers a year. Steve West of architect Pascall+Watson described T2 as iconic, “a true gateway to Britain”, from its state-of-the-art technologies to the unique fabric of the roof, evocative of early flying machines and reminiscent of the joy of flight. A renaissance of the romance of aviation is evident throughout the terminal’s many thoughtful architectural facets, each designed to deliver a passenger experience that far exceeds that which is considered typical of fast-paced modern travel. “In short,” explained Concept and Lead Architect Luis Vidal, “we created Terminal 2 as a welcoming airport with human scale.”

“Heathrow’s T2A will become one of the primary gateways of the UK (both arriving and departing), which is precisely why we have worked very hard to mark the difference, and leave a remarkable impression on the passengers,” he explained. “We have created the new Terminal 2A at Heathrow Airport inspired by the nostalgia of the early days of aviation, when flying was an extraordinary experience. Therefore, Terminal 2 gives a sense of delight and ease to passengers, which has been missing from air travel for too long.”

A new era of airport architecture

Terminal 2’s distinctively contoured roof, primarily natural lighting and pioneering, humanised design are among the countless architectural characteristics that contribute to an airport environment unlike any other. Concept and lead architect Luis Vidal + Architects, concept master plan architect during the initial project phase Foster + Partners and fit-out phase partner Pascall+Watson explained to Amy Hanna why Heathrow’s £2.5 billion new terminal will leave a lasting impression.

‘A welcoming airport with human scale’
Perspicacious use of daylight is at the heart of Vidal’s unprecedented passenger experience, contributing to an exceptional airport journey with a distinct sense of place, presenting passengers with an awareness of where they currently are and where they are heading to in an intuitive way. The rippling waves of T2’s billowing roof lean one over the other, housing north-facing skylights in their intersections allowing a consistent flow of sunlight. The underside of the roof, meanwhile, is covered with a material – almost like an artist’s canvas – which acts as a giant parasol, helping to ‘bounce’ natural light.
during the day and assisting the reflection of artificial light at night. The roof’s open transparency means passengers can identify time of day, helping to dispel the disorientation that comes with international travel, while its undulations create three giant vaults, guiding passengers through the three main stages of the departure process: check-in, security control and departure lounge. “The sequence of the roof, and the view of the final destination, will lead passengers through the terminal in a manner that is instinctive and natural as possible,” added Oscar Torrejón, Partner in Luis Vidal + Architects (LVA) and Project Director of Terminal 2 of London Heathrow Airport.

Terminal 2 is a demonstration of the feats of modern engineering that are possible in an aerospace environment, and the sum of its deftly designed parts is a unique passenger experience, free of stress. But it is not just the needs of the passenger that have been considered – when LVA developed its concept for T2 it was with everyone who would use the terminal in mind. “We have also thought of everyone running T2, providing them a pragmatic, proactive and flexible design that enhances the maximum level of operability and functionality of the terminal – taking into account its management, maintenance, as well as future growth and implementation of the facilities,” Vidal asserted. “And finally, for those who have funded the project, we have created an innovative terminal conceived to attract and maximise non-aeronautical revenue through architecture and ‘passenger experience’ with the right balance between retail and amenities, leisure and catering, friendly atmosphere and space.”

“The most important issue is that the Terminal 2A project has satisfied stringent requirements for timescale and budget,” Torrejón added. The construction works, which began in July 2010, were completed successfully and on time on 19 November 2013, and now proving trials are in progress to ready the terminal for passengers ahead of T2’s summer opening.

**Design concept masterplan**

The initial conception of the remarkable Heathrow Airport as it will appear when T2 is opened in June began in 2004, when illustrious British firm Foster + Partners worked with BAA to create a masterplan and vision for the airport’s future, in the era that would follow the opening of Terminals 1, 2 and 3, and with BAA’s operations moving almost completely to Terminal 5. Foster + Partners recognised an opportunity to ease congestion in the central terminal area and consolidate facilities. To bring greater clarity to the whole airport it redefined the site as two districts – ‘West’, comprising Terminal 5 and its subordinate piers, and ‘East’, including the new Terminal 2 and its piers.

Grant Brooker, Senior Partner in Foster + Partners, explained that the original airport was planned around various diagonal north-east/south-west and east-west runways for aircraft taking off in different weather conditions, but today’s more powerful aircraft mean that such measures are no longer necessary, meaning that Foster + Partners was able to develop a simple, orthogonal masterplan between the two parallel runways, bringing more coherence to the overall site and allowing for incremental expansion. “Our approach took advantage of the space freed up by passengers moving to the new Terminal 5, without compromising the airport’s operations during redevelopment. We proposed the demolition of the former Terminal 2 and the building of a large new

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**Terminal 2A comprises 200,000sqm distributed over six levels. Departing passengers will enjoy more than 20,000sqm of commercial facilities on the lower floors, and, for the first time in the UK, airport passengers will have immediate access to departure gates, which are located within sight of retail and concession facilities.**
rectilinear terminal to replace both it and, ultimately, Terminal 1 – maximising convenience for hub passengers by integrating these terminals within a single building,” he said.

**Building fit-out**

West, Project Director at Pascall+Watson, has been based on site with the T2A project for the last two and a half years, during which time Pascall+Watson has led the design of the building’s fit-out, developing the internal environments, and aligning the operational briefing requirements to create a world-class terminal facility, according to Vidal’s pioneering design.

West explained that Terminal 2A represents the next step in Heathrow’s transformation towards a leaner, far more efficient airport layout. One of Pascall+Watson’s key achievements on T2A is the creation of a series of internal spaces to reinforce intuitive passenger flows. The building layouts have been developed to follow clear, logical sequences that seamlessly merge together.

The firm, which is one of the most experienced aviation architects in the UK and beyond, developed a selection of bright, hard surfaces to take full advantage of the natural light that penetrates the building. Many of the architectural systems deployed in T2 are evolutions of those Pascall+Watson has introduced across the rest of Heathrow Airport, most notably Terminal 5. The aesthetically appealing ‘loose fit’ ceiling panels, durable opaque glass wall linings, floors that can withstand the rigours of 24-hour airport traffic, and informational elements such as Flight Information Displays, wayfinding beacons and signage posts, were all conceived elsewhere at the airport, and developed to ensure a perfect fit for Terminal 2A. “Quality finishes and products have been carefully considered and detailed to ensure passengers experience a contemporary interior suitable for a modern airport environment,” West said. “All products have been designed integrating both building and passenger requirements to avoid visual clutter, and all services elements fully co-ordinated into the architecture. Combined, all design considerations and developments have focused on passengers experiencing a stress-free and enjoyable journey.”

**Committed to sustainability**

Terminal 2 is also the most sustainable terminal at Heathrow. 99% of the materials from buildings demolished to make way for the new Terminal 2A were reused in its construction, and an almost futuristic level of innovation has been applied to the sophisticated system of measures to reduce its ecological footprint, which has resulted in a 40% reduction in CO₂. Its technological, modular systems, meanwhile, facilitate future growth according to further operational needs – part of LVA’s focus on producing designs that contribute to the dialogue and changes of modern cities. When the first passengers enter T2 later this year, they will experience an uplifting, easy to use building, awash with natural light and inherently environmentally efficient. “We have designed Terminal 2A to be much more than a building for taking off and landing, or just some place to pass through: it is a destination in itself,” Vidal said. “Airports are nowadays the main gateways to countries, becoming an extension of the identity that a city or country displays to the visitors and therefore the last image that passengers will carry with them. Our final goal is to attract passengers to Terminal 2 earlier than their departure time in order to spend time, enjoy the welcoming atmosphere and have experiences with the wide range of amenities, services and retail that T2 has to offer. Welcome to T2, welcome to your home in London!”
Safe operations and a great passenger experience

Brian Woodhead was appointed Terminal 2 Operations Director 18 months before the terminal opens on 4 June 2014. This early appointment helped ensure construction decisions were focused on the twin objectives of safe operations and a great passenger experience – a focus that has continued into the operational readiness phase. Woodhead offered his perspective on the new Terminal 2 to Ross Falconer.

The new Terminal 2 building was handed over to the operations team on 23 December 2013. As Terminal 2 Operations Director, Woodhead and his team, by definition, operate the building and ensure it works for passengers. “Our whole strategy centres on understanding what passengers are looking for and what we need to do to deliver those ambitions, which means that, by us being involved early, we could have those conversations with the construction and operational readiness teams,” he explained.

Woodhead has led a cross-functional leadership team for the past 18 months, encompassing the different disciplines needed to make the building operational, ensuring everyone is working towards the same objective of getting it right for the passenger.

Since taking over responsibility for the building, the operations team has followed the lead of the construction team in terms of its safety messages, and this culture is also embedded into the staff induction process. “We’ve instigated a system of what we call ‘near misses’ – so a member of the team can immediately report anything that might look dangerous or unsafe and we can take corrective action,” explained Woodhead.

**Familiarisation**

The development programme for T2 is now in the operational readiness and staff familiarisation phase. The six months between construction handover and terminal opening provides the time to plan, test, improve and test again before the new Terminal 2 opens for business. The methodology is to begin by trialling the different elements of the passenger process in small unit levels e.g. a kiosk within Check-in, before progressing to testing different elements – such as check-in and security – together.

“This culminates in an end-to-end trial, whereby we test and trial every single part of the passenger journey, so we are not leaving anything to chance,” commented Woodhead. “The trials serve a very important purpose – they give us the opportunity to take corrective action if we find anything wrong. The trials we have completed so far have proved very successful, there are no show-stopping things that we’ve found within the programme so far, but the trials provide some insights into what we could refine and do better.”

Staff are, of course, critical to the success of Terminal 2, and the familiarisation process for the 24,000 people from 160 companies who will work within the building is vital. They will participate in familiarisation, induction and training courses to ensure they know how the terminal works, and understand the new systems and processes, terminal health and safety, and their role in the smooth running of operations. Heathrow has adopted a show-me-you-know approach, so that it can ensure the training is thorough and that staff are comfortable with their new roles and responsibilities.

Safety is clearly the number one priority on the Terminal 2 development, and the operations team has worked with the health and safety team to impress the absolute primacy of the safety of staff and passengers. Heathrow’s goal is to make every journey better for its passengers and this latest step in its transformation brings together technology, architecture and human touches to provide a great travel experience for its customers.

Woodhead has led a cross-functional leadership team for the past 18 months, encompassing the different disciplines needed to make the building operational, ensuring everyone is working towards the same objective of getting it right for the passenger.
HETCo Joint Venture completes safe, sustainable T2A construction

HETCo is a Ferrovial Agroman and Laing O’Rourke Joint Venture Company established to complete the construction of the new Terminal 2A. Pablo Riesco, HETCo Project Director, outlined the strategy and techniques being used on the project.

"With an operational budget of approximately £1 billion, HETCo’s scope of works has included the demolition of the old Terminal 2 and Queen’s Building and the construction of the new main Terminal Building (T2A). This includes the aircraft stands, ancillary buildings and the Cooling Station. These works equate to an area of approximately 250,000sqm for the buildings and an additional 60,000sqm for the stands.

The JV Company consists of 250 staff fulfilling roles in engineering, planning, design, commercial, logistics, health and safety, environment, quality assurance, finance and administrative support. HETCo is also responsible for managing 76 subcontractors and 200+ suppliers with a peak workforce of approximately 4,000.

“As one of the UK’s largest privately funded infrastructure developments, we needed to undertake a process that used the latest concepts in digital engineering and construction,” explained Pablo Riesco, HETCo Project Director.

The two main benefits of offsite prefabrication, from my point of view, are the reduced health and safety risk to the workforce and the savings made to the programme.”

Pablo Riesco, HETCo Project Director
Project Director. "One specific example of this was our Design for Manufacture and Assembly strategy. This consisted of critical elements of the building being constructed offsite and delivered ready to be installed." Major structural elements, such as 12 key M&E cores of the building, were designed, built and installed ahead of the main structure, which then grew around them. These 12 cores represented the first modular elements of over 3,000 sections that were manufactured offsite and later assembled to become part of the fabric of the building. "The two main benefits of offsite prefabrication, from my point of view, are the reduced health and safety risk to the workforce and the savings made to the programme," Riesco commented. "The elements of the buildings are fabricated in a much more controlled environment than directly onsite. The savings made can then be modelled to include the installation process, which enables more effective planning and the identification of any potential risks in advance. This creates a heightened awareness in relation to the installation that helps reduce risk and the potential hazards to the workforce." This strategy has helped the JV deliver this project safely, saving time and cost while increasing the efficiency and quality of the finished terminal.

Maximising sustainability
Demolition of the old T2 and the Queen's Building formed part of HETCo’s scope of works, and it was able to ensure the most sustainable approach by utilising a network of established offsite waste management systems with a proven record to maximise diversion from landfill. The project reuse and recycling performance was reviewed by an external consultant, who confirmed that 99% of demolition material was diverted from landfill. Concrete, metal, plastic and timber were sent to specialist recycling centres across South East England and became available for other projects to utilise. “Runways, taxiways and the ramp use a special high quality concrete—a valuable resource,” said Riesco. “Where possible, the recycled materials were sent to a special offsite crushing facility, to produce a material that could be reused in the new surfaces at the terminal.” Meanwhile, one of the most striking elements of the terminal is its unique undulating wave form roof. Not only is it visually appealing, the shape includes 628,659m² of northern facing glazing and provides the terminal with one of its most sustainable features. The use of natural light plays a large role in the terminal. The roof design and natural light reduce the need for artificial lighting during the day. This not only provides a more comforting experience for the passenger, but also optimises the consumption of energy to condition the building. This in combination with other energy systems contributes to a reduction of 40% in CO₂ emissions in comparison with the buildings the new terminal has replaced. “Other buildings are designed to maximise the use of natural light, however you won’t find many where you can actually see the sky, not like at Terminal 2,” Riesco explained.

Award-winning safety
HETCo has had to overcome a number of challenging factors in its delivery of the project. The most prominent of these is the logistical challenge of working in a live operational environment. The Terminal 2 development is situated between two operational runways, with aircraft landing every 60 seconds. “We operate to a maximum lifting height restriction of 44m to not disrupt Control Tower visibility and have the Piccadilly Line running seven metres below the building,” stated Riesco. “Our surveyors identified over 100 live services running within our site boundary, striking one of these services could have resulted in the closure of the entire airport.” Site deliveries were also strictly managed to avoid disruption to airport operations and to reduce larger deliveries accessing the site through the narrow access tunnel. Where larger loads were unable to be delivered via the tunnel, HETCo coordinated with the client to have the material delivered via the runway overnight. Alongside these inherent airport challenges, HETCo also had to coordinate with four other Principal Contractors (T2B, Multi-Storey Car Park, Energy Centre, T1 Baggage) that were involved in the Terminal 2 redevelopment and manage the various project interfaces. "I am especially proud to be able to say that we have delivered this project on time and under budget. Most importantly, we have done this safely,” Riesco commented. "Our dedicated commitment to site safety has seen the project set, what we believe to be, a new national record in the United Kingdom – 5.5 million consecutive hours without a reportable accident. This accomplishment was not only delivered during the busiest period of construction, working 24/7, but with a peak workforce of over 4,000 workers.” The innovative approach to the project has been recognised by three independent organisations – HETCo won the National Constructing Excellence 2013 award for Health and Safety, it achieved a Gold rating from the Royal Society for the Prevention of Accidents (RoSPA), and received a Green Apple award for its sustainable approach. "Everything about T2A is unique, including HETCo itself – two companies from two different cultures that have found the right balance to create history at Heathrow," concluded Riesco.
In the six months between the construction handover and opening of Terminal 2, a robust and rigorous series of trials is taking place as part of a proving programme designed to optimise every aspect of the end-to-end airport journey. This will give us as realistic as possible an insight into how the terminal will operate when services go live. Approximately 180 operational readiness trials will take place ahead of the new Terminal 2’s opening, each designed to challenge the functionality of facilities, identify any issues in the processes and educate staff in the use of equipment. The aim is to ensure we iron out as many issues as we can to create a really great passenger experience once the terminal becomes operational.

“They help us to make sure that all our facilities, processes and systems are going to work as effectively as possible upon opening, and also give us an early insight into what sort of problems could come up. For example wayfinding, during the passenger journey through Terminal 2 has been an important part of our passengers’ experience and this is our opportunity to get early feedback so we can reflect these changes now way in advance of opening,” described Joan Buszewska, Terminal 2 Operational Process & Proving Leader at Heathrow Airport.

Ensuring the smooth opening of a terminal that will eventually serve 20 million passengers a year is no small undertaking. A broad spectrum of volunteers, including experienced airport operational staff, who will be working in the active site, Heathrow Passenger Ambassadors, and around 14,000 members of the public – representative of the airport’s passenger base – will serve as “fresh eyes and ears”, Buszewska explained, experiencing the airport’s processes and providing an unbiased perspective as T2 is put through its paces.

“We’re aiming to cover many aspects of the passenger and staff journey, from arrival at Heathrow to the departures process, through check-in, security, gate, the boarding process – and also for connecting passengers and the arrival process.”

With just months to go to the opening of Terminal 2, an all-encompassing series of operational readiness trials has been implemented to ensure that every element of airport operation runs efficiently from day one. More than 14,000 volunteers will participate in proving trials that will see facilities tested, staff fully prepared, and the passenger experience optimised before operations commence in one of the world’s most highly anticipated new terminals.
that a place on a trial was harder to get than a ticket to the Olympics. Over 70 trials, both large and small in scale, have already taken place, and number of issues have been identified and a resolution sought and implemented. As a result systems and processes have been strengthened. For example, in the baggage hall a readiness trial identified that the installation of mirrors would enable baggage handlers to safely reverse baggage tug equipment. The trials have also resulted in reworking of the paint markings on aircraft stands to suit the specific aircraft that will make use of them, while the employment of a mock-up set of aircraft doors highlight some important considerations, which will help to reduce the costs and logistical challenges presented by live aircraft. "We are also trialling our contingency processes, so it’s not just about business as usual operations on the day, it’s also about how do we react when things go wrong, and that was one of the key findings from Terminal 5, so we’re thoroughly testing our contingency," Buszewksa said.

A familiar environment
Lessons learned in the early stages of Terminal 5 have left Heathrow in a fortunate position, enabling it to take on the positive examples that were set, and having shone a light on areas in which more attention should be focused during the operational readiness procedure. "A huge amount of time and energy has been put into examining all the learning — the positive and not so positive — from Terminal 5 and terminal openings around the world that we need to put into Terminal 2," commented Buszewksa. The training of airport staff and stakeholders is one area to which a great deal of weight has been recorded, and the trialling process provides an opportunity for staff to familiarise themselves with the terminal environment, and highlight areas in which more awareness is needed. "Our early check-in trials, for example, raised issues regarding the economics of the check-in desks," Buszewksa said. "We needed to ensure our staff were briefed and trained on how to use the new desks in advance of Proving trials, to ensure they were able to focus on the trial and not on the new equipment." There is a specialised team dedicated to training the 24,000 staff who will work within the terminal, when all of its airlines have moved into the terminal by the end of this year. "We’ve also conducted a lot of peer reviews as we’ve gone through the Terminal 2 process, to gain external advice, and different people’s perspectives, and to make sure that we are taking on the learning from T5, and all the terminal openings across the world," she commented.

Once the terminal is active it will be home to 23 Star Alliance carriers, as well as Aer Lingus, Virgin Atlantic Little Red and germanwings, and the airport’s airlines, handlers and third party organisations have been key participants in both the design and the operation of the operational readiness process, with companies clamouring to be the ones to test aspects of their new base for the first time. "We’ve been really clear that this is a joint trial programme with all our stakeholders – Heathrow’s success is our airline partners’ success, and all our third parties that are operating have got to be successful, so it’s as much around our stakeholders and our partners being able to prove their readiness to move into the terminal as it is for Heathrow to prove to all our partners that we’re ready as well," Buszewksa said. "The airlines, and our other stakeholders, have been really quite positive about how they have been engaged and taken on the journey with us, and they’re obviously very much part of the preparation to make Terminal 2 a better place for everyone involved.”
Integrated airport solutions

Central to the streamlined, safe and stress-free passenger experience that Heathrow Terminal 2 will deliver upon its opening is a flexible and intelligent suite of building control solutions. Honeywell, a global leader in the manufacture of airport solutions, is behind the integrated systems that will accomplish the passenger comfort and energy savings at the heart of the terminal’s design.

Honeywell has been active at Heathrow for more than 15 years, and was awarded multiple contracts to supply Terminal 2’s control and safety systems following the successful completion of the largest integrated fire detection, voice alarm and public address system at Heathrow’s Terminal 5 – the most extensive ever installed in the world at the time. This specialist in the design, manufacture and installation of integrated airport solutions has implemented state-of-the-art integrated fire safety, public address and voice alarm systems in Terminal 2, along with advanced lighting controls and building management systems covering mechanical and electrical operations.

The systems incorporate over 180 fire alarm panels, 14,000 fire detection devices, 5,000 speakers, 25,000 building management system hardware points, 13 servers and six front-end workstations. “Despite the complexity and scale of the systems we’re deploying in Terminal 2, the ultimate objective is to ensure that travellers have a safe, secure and comfortable environment in which to start or to end their journey,” explained Graham Roberts, Honeywell’s Branch General Manager, Airports.

The Honeywell airport solution not only contributes towards fast and efficient services for passengers, but also ensures an energy efficient indoor environment. Passenger comfort and energy savings were built into the design of Terminal 2, which absorbs natural light through roof panels to save energy. Honeywell’s advanced lighting controls maintain comfortable light levels indoors, continuously adapting to changes in outside weather and lighting conditions. “The building management system is the cornerstone of the terminal’s building efficiency programme,” Roberts commented. “We look forward to working with Heathrow Airport Limited to ensure that energy saving and carbon reduction opportunities, identified as Terminal 2 becomes operational, are fully exploited.”

State-of-the-art fire detection technologies with an integrated public address and voice alarm system, meanwhile, ensure a safer facility for visitors and employees. The Epsilon integrated fire detection, public address and voice alarm system developed by Honeywell’s fire detection manufacturing branch Gbdentric was specifically for Heathrow Terminal 5 and has now been adopted for Terminal 2. It is a safety system that doesn’t compromise on security, and allows for “smart evacuation” procedures in the case of emergency. Minimising unwanted alarms also reduces the chances of flight delays and the consequent issues for passengers and airport staff.

Honeywell is also responsible for the integration of the systems across the different projects via its Enterprise Buildings Integrator (EBI) front end. EBI is an easy to use, fully scalable, intelligent single system that seamlessly integrates existing (and future) building management, life safety, security, business and communication systems from Honeywell and third parties, to provide a highly efficient and consistent data source for the efficient running of the facility.
A seamless Star Alliance hub

Terminal 2 will be the new Heathrow home of 23 Star Alliance member airlines, enhancing its seamless hub service. Star Alliance CEO Mark Schwab outlined the benefits of member carriers operating from the same terminal, and how it will streamline the passenger experience.

The Star Alliance airlines represent just over 20% of Heathrow’s airport traffic. Once they have moved into the new Terminal 2, they will, according to current schedules, operate 127 flights per day from Heathrow, serving 43 destinations worldwide.

Being located in the same terminal will allow member carriers to better cooperate in all aspects of airport operations. “Sharing airport real estate makes economic sense for the airlines and also helps the creation of a family feeling among the different member airline staff and ground handlers. This translates into a better and seamless customer experience,” said Mark Schwab, CEO, Star Alliance.

Working hand-in-hand with Heathrow Airport Limited from the outset of the project, Star Alliance was able to contribute its member airlines common understanding of the needs of its passengers, as well as its own technical know-how. “This flowed into the design from the beginning and has enabled us, for example, to offer a unique level of integration into check-in procedures, which will help speed passengers through the airport,” explained Schwab.

Indeed the single terminal operation will allow the airlines to provide customers with a new, faster and more automated check-in process. Right from the moment of check-in, the Terminal 2 experience puts the passenger in control. They may choose to check-in from home, take no checked luggage and proceed straight to security. Or they can use a range of automated check-in options, including 66 kiosks that allow passengers to print their bag tag, before proceeding to fast bag drop. Premium passengers can choose full service check-in with an agent. Closer proximity also means that passengers will walk shorter distances to the gate or to make their connections. “In fact, our minimum connection time within Terminal 2 will now be a standard 60 minutes, compared with 75 minutes for some intra-Alliance transfers previously,” added Schwab.

The seamless customer experience described by Schwab means that passengers arriving at the T2 satellite do not need to enter the main terminal building at all if their connection leaves from the satellite. “In short, the terminal is designed for today’s air traveller,” he said.

Moves into the new terminal will be in a coordinated sequence designed to ensure that one airline’s operations are embedded before
Sharing airport real estate makes economic sense for the airlines and also helps the creation of a family feeling among the different member airline staff and ground handlers. This translates into a better and seamless customer experience.

Mark Schwab, CEO, Star Alliance

Moves into the new terminal will be in a coordinated sequence. The first airline, United, will move into Terminal 2 on 4 June 2014 and all moves are expected to be completed by November.

The new Terminal 2 will increase speed, comfort and convenience for passengers, with all Star Alliance member airlines operating under one roof at Heathrow for the first time.

The next airline comes along. This will make it easier to iron out any issues encountered. “The first airline, United, will move into Terminal 2 on 4 June 2014 and we expect that all of our moves will be completed by November,” explained Schwab. “The schedule also ensures that no moves are planned during the busy summer holiday period. We are working with our airlines to ensure that passengers will be fully informed before they arrive at Heathrow, so that they will go straight to the correct terminal.”

Ground handlers, of course, also play an important part in the smooth running of services at Heathrow. As part of the move planning, the airlines have been working closely together to reduce the number of handlers operating in the terminal, allowing them also to share services more closely.

It is clear that the new Terminal 2 will increase speed, comfort and convenience for passengers, with all Star Alliance member airlines operating under one roof at Heathrow for the first time. This will let carriers share operational facilities more efficiently and make best use of space and services, making the new Terminal 2 a commercially attractive European hub.

The Star Alliance CEOs pictured last year counting down 365 days before the first flight at Terminal 2.
Bringing the infrastructure to life

Firstco provided Information & Communication Technology (ICT) engineering resources to a Design, Manage & Integrate (DMI) Framework led by Mott MacDonald and appointed by Heathrow Airport Ltd (HAL). Firstco was engaged to develop client requirements for over 70 systems into a full scheme design for delivery by specialist systems providers and complex building integrators. John Myers, Firstco Director, outlined the company’s involvement.

Firstco. “Stakeholder engagement was applied throughout the project life-cycle so that there were no surprises in the solutions developed.”

Many of the systems and products deployed in the new Terminal 2 are extensions to, or developments of, existing systems at Heathrow, so there were a certain amount of mandated products that come with good historical data with respect to reliability, availability and maintainability. New technologies that have been introduced include CCTV over IP, which was driven by client standards and requirements to use the latest technology. “In addition, there was a desire to maximise the use of the common network infrastructure to drive out efficiencies in cabling and containment,” Myers explained.

As Terminal 2 is a large infrastructure project being integrated into an existing airport environment there is a desire to design and implement a solution that provides the best technological practice at the time without introducing risk or additional operational costs. “The continual convergence of technology in the systems world will challenge any designer when considering the full life-cycle of a product in this environment,” added Myers. “Fortunately HAL is an informed client and generally determines the future of products and systems deployed on the airport in collaboration with ICS designers so as to meet their overall strategic plans for renewals and replacements, and this is done through market research and trials.”

The integration of airport systems is always complex, however it is made manageable by using clear and robust processes that lean on requirements, management, systems assurance and the ability to prove the integration path through extensive testing in an Integrated Test Facility. Additionally, HAL has well-established BIU (Bring Into Use) procedures that enable stakeholders and maintainers to ensure there are no inherent risks in introducing extended or new systems onto the wider airport campus.
Delivering 21st Century ICT

At the heart of Heathrow’s new Terminal 2 is a complex ICT system that meets stringent commercial and technical requirements. The ICT design delivers a future-proof, innovative solution in a multi-discipline environment.

Heathrow Airport needed an experienced team to specify the entire ICT system in the terminal, including data networks, wireless and cellular communications, radio, security and search, CCTV, access control, building management, lighting control and displays, as well as manage all procurement and construction.

The cornerstone of the project was the technical interface, with robust performance specifications. Mott MacDonald took a concept design originally prepared by Heathrow and developed this into a full ICT scheme design. This was a highly complex exercise requiring us to validate the system requirements for Heathrow and then prepare a full scheme design documentation, so as to allow Heathrow to achieve sign-off by all its stakeholders and in a suitable level of detail so that the scheme could be suitably packaged for the procurement process,” explained Bob Harthorne, Mott MacDonald’s Programme Manager for the Heathrow project. “Once package suppliers were onboard we provided Heathrow with all the ICT technical and programme management resources needed to ensure that the scheme design was progressed through detailed design development, installation and testing in readiness for ORAT, which is currently in progress.”

Mott MacDonald provided a design team with the right skills and experience to be able to develop the scheme design, paying particular attention to the high risk areas of the ICT project. These related to the need to integrate the new terminal’s ICT systems and applications into the wider airport ICT infrastructure and also manage the integration of ICT within a very large construction project.

The choice of systems for Terminal 2 had to align with the ICT and technology development route map for Heathrow as a whole. “One area where this became critical is the introduction of full IP based CCTV,” added Harthorne. “This had to be compatible with other systems operating at LHR and not constraining the accessibility to technology platforms. The choice of technology or solution was heavily driven by the operational requirements at the airport, the cost of ownership associated with the technology selection and supportability and maintainability. The innovation being measured by the benefits that can actually be realised from the technology.”

Integrating the Terminal 2 ICT systems with the infrastructure across the airport has proven less complex than might have been expected. Heathrow has a well-documented ICT infrastructure and the associated airport applications already had the concept of Terminal 2 embedded, so the changes needed at the ICT level were well understood from an operational and user perspective.
A resilient, reliable and efficient baggage system

The passenger experience has been at the heart of every aspect of Terminal 2’s design, and the implementation of its safe, resilient and reliable baggage system is central to the delivery of its efficient passenger processes and an exceptional airport journey. Crucial to the fluid and fail-safe function of the new terminal’s system is the baggage facility in Terminal 1, through which bags checked in by T2’s passengers depart.

Kevin Turner, Project Director, explained how lead contractor Mace breathed life into the old system to enable the operation of the new.

When Terminal 2 opens its doors in June, its extensive system will be in Phase 1 of its two-stage development. In which Terminal 1’s baggage facility will process Terminal 2’s departing and transfer baggage. Arriving baggage, meanwhile, will be processed in Terminal 2, in one of two spacious new baggage reclaim halls. The international hall has eight reclaim belts, each capable of handling A380-size aircraft, while the domestic hall has two reclaim belts and direct access to the arrivals hall without passengers having to go through customs.

In order to maximise efficiency of the system, and provide passengers with the reliability they expect, Terminal 1’s trusted baggage system has been strengthened, expanded and upgraded as part of the Terminal 2 Transitions project, so that it can handle baggage from Terminal 2 with ease and swiftness. The modernisation of Terminal 1’s system has been thoroughgoing, and principal contractor Mace led the comprehensive upgrade, working hand-in-hand with its key supplier Babcock to prolong the life of the terminal, and increase the capacity of the system to facilitate the connectivity between T2 into T1.

In the short-term, T1’s baggage system will have to deal with both Terminal 1 and Terminal 2 departing bags and, described Kevin Turner, Project Director at Mace, on completion of the migration of airlines into T2 by 2016, Terminal 1 will shut to passengers leaving the departing baggage system capability in place. Delivering a lot more long-haul flights than Terminal 1, Terminal 2 has a different profile of passenger with different baggage needs, so the baggage system needs to flex and morph, to react to the varying passenger load that it will receive.

“The worked in small working windows to relife and provide additional baggage capacity in Terminal 1. We have provided additional out of gauge, reflight and ITO (Inter Terminal Operation) capacity along with additional make-ups in the baggage hall. We have also provided up-to-date low and high-level baggage software controls, and we have also provided a number of different baggage manual handling devices,” he said.

The T2 Transitions project is the latest in Mace’s more than 15 years of working with Heathrow across its entire infrastructure, and has seen the project construction and consultancy company earn a contract to manage operations as Heathrow’s primary baggage contractor. The firm will now utilise its 20 years of experience in procurement and baggage activities in a new project at Heathrow’s Terminal 3, where it will be working alongside leading baggage handling systems provider Vanderlande.
Siemens was responsible for the design, supply, building and implementation of T2’s departing baggage system, which features large collectors and 5.2km of conveyors, and takes 15 minutes to transport a bag from check-in desk in Terminal 2 to the make up in Terminal 1. “No two baggage systems are ever the same, because largely they are defined by the space you’re putting them in,” explained Ciarán Creamer, Senior Project Manager, Siemens. “One of the requirements of Terminal 2A is that the passenger journey is the main focus, and there’s an emphasis on putting baggage systems back of house and making the passenger experience that bit more expansive.”

The facility itself is a state-of-the-art baggage system, with centralised controls, manual handling aids and highly resilient operational capabilities. When a passenger check-in their bag in Terminal 2, it will move down the Collection Levels in the T2 mezzanine and is ejected from Terminal 2 via a link bridge, which has four baggage lines that run into Terminal 1’s baggage system. It is then processed by the high-level baggage controls involved in Terminal 2’s baggage application software.

The common use, multi-check-in system is designed to enable each of the 23 Star Alliance carriers, who will soon begin their phased move into Terminal 2, to build passenger baggage handling to their unique requirements, thus giving them maximum flexibility for passenger baggage drop at any assigned desk.

The limited area in which Siemens was able to fit mechanical elements of Terminal 2’s baggage system installation means that passengers only see baggage operations taking place at the 116 check-in desks on T2’s Level 30 and at the 10 arrival carousels on Level 10. “The challenges for us were fitting the baggage systems into an ever decreasing space, because they do not build these fantastic buildings to show off conveyors, they build them to make it easier for passengers,” Creamer said. “It also means exacting engineering tolerances between ourselves and the builders; there’s an awful lot of considerations to take into account when you are designing a baggage system into the given space.”

Throughout the installation process, the system underwent independent trials to ensure that each of the one million bolts, 1,000 tonnes of steel, 1,500 conveyors and 180,000 metres of cable involved functioned as required, and now end-to-end testing is taking place, to scrutinise the baggage facility in a working environment. Siemens’ handover of the baggage system took place at the end of November last year, and it is now undergoing the final stages of testing and integration with T1.”
Terminal 2’s spectacular ‘wave’-shaped roof was developed with an unforgettable aesthetic and utmost functionality at the crux of its design. Brent Tyrrell, Business Development Manager at Lakesmere, explained the parts that state-of-the-art materials, cutting edge planning processes and complex geometric design play in the delivery of T2’s high performance roof.

Building envelope specialist Lakesmere used its unequalled expertise to breathe life into the vision of architect Foster + Partners, and fulfil the high performance requirements of Heathrow Airport Limited (HAL). “What we do at Lakesmere is develop the design that the architect aspires to achieve,” explained Brent Tyrrell, Lakesmere’s Business Development Manager. “They have in mind what they want the roof to do and how they want it to look, and Lakesmere’s responsibility then is to follow a design development process, to come up with a solution that can be
Tyrell: “T2’s roofing system is especially unique because of three main aspects: the geometry of the roof, combined with the location of the site on an operational airport with all the restrictions that that provides, and also the exacting performance requirements, in terms of heat and acoustic insulation and light transmission.”

did not provide as much daylight as was needed. Bringing into being the £25 million roofing system’s elaborate geometry did present challenges. Special tapering-type roof sheets were required for the absorption of light, meaning that a whole new manufacturing and installation process had to be undertaken on site, while every individual glass panel – of which there are more than 900 – had to be shaped to follow the curvature of the waves, requiring substantial design consideration. The 3D design process determined factors such as the necessary glass pane sizes and shapes, as well as aspects such as the guttering system and interfaces between different material parts of the 40,000m roofing structure, for which Lakesmere was also responsible. The contractor also utilised 3D modelling in the planning of the installation process. “Because of the complex nature of the job, its location on a live airport with very restricted areas around the footprint of the building, it meant that we had to be sure before we started any work that we had full understanding that the methods we were using and our access to the necessary areas, could be achieved without any interruption to the main airport activity,” Tyrrell explained. “We were able to simulate the whole thing in 3D images, and we didn’t even begin the design process until we were comfortable that we could build it within the constraints that the airport presented to us.” In terms of scale, the design of Terminal 2’s roof was one of the most immense that Lakesmere has developed, and has proved a pivotal project for the frontrunner in designing and installing complex geometrical roofs. “Thanks to the credibility and the experience that we gained on Terminal 2A at Heathrow Airport we have been able to secure the project on Jeddah Airport’s new terminal in Saudi Arabia. T2 was a very successful job for Lakesmere, and the challenge has furthered our position in the market place,” Tyrrell said.
Intelligent, inside and out

Ingeniousness has touched every element of Terminal 2’s infrastructure. The most advanced materials and first-of-their-kind innovations have furnished T2 with the facilities to be Heathrow’s safest and most efficient terminal, while the opening of the brand new building provided suppliers with the opportunity to create tailor-made, state-of-the-art solutions that meet the latest requirements and every operational need.

Heathrow’s new £2.5 billion Terminal 2 is an enduring icon of sleek and airy design. Instinctively traversable thanks to its undulating three-wave roof, and flooded with natural light on account of its uniquely absorbent glass, innovation is inherent to its makeup. The building’s intelligent, multi-functioning façades and uncompromisingly robust interior and building envelope are an integral part of the terminal’s ingenious constitution, securing the safety of all who use the terminal, its walls, for example, can endure a 15kg TNT blast.

More than £60 million has been invested in the cutting edge building interiors that swathe T2, in an enterprise executed by Lindner, one of Europe’s leading companies for interior fit-out, façade construction and insulation engineering. 38,000sqm of metal façades and 12,500sqm of glass façades encompass the new 20 million-passenger terminal, and Lindner was also behind the 22,000sqm of metal roofing systems for the exteriors of Terminal 2 and 68,000sqm of suspended metal ceilings, 20,000sqm of glass wall cladding, 10,000sqm of metal wall cladding and 30,000sqm of innovative hollow floor systems, that are pivotal to the terminal’s performance.

Interior innovation

The creation of a new and modern terminal, built from the ground up, provided Lindner with a window of opportunity in which to exercise its 45 years of expertise in the development, manufacture and implementation of individualized and integrated solutions. “One could say that Heathrow Airport’s concept to rely on high quality and innovative products has provided an ideal opportunity for Lindner to present its overall strength on the interiors, as well as exteriors, of the Terminal 2 facilities,” said Bernhard Staab, Sales Manager at Lindner Airports & Airlines, Railways & Tunnels Department. Safety has been at the crux of Terminal 2’s development, and one element central to its infrastructure is the trailblazing explosion-resistant interior building material, developed by Lindner in close collaboration with the airport to make the T2 journey the safest ever for passengers. Heathrow Airport was one of the first airports to identify the potential threat of interior claddings in the case of a booby-trap attack, and the terminal’s groundbreaking bomb blast-resistant glass wall cladding has been developed to meet the latest safety requirements, and is the first in the world to be tested and approved for
its purpose. In tests the uniquely crafted wall system proved capable of withstanding 15kg of highly explosive TNT detonated at a distance of 6m, and is designed to vastly enhance the terminal’s safety in the instance of an attack, reducing the risk of injury considerably. The high quality glazed and metal panels prevent the occurrence of the splinters or fragments that create a danger of injury due to the reflected pressure and impulse following an explosion. “What happens in the case of a bomb detonation? It is not only the explosion itself but also the highly underestimated hidden danger in the surrounding environment that imperils people,” said Stefan Heindl, Lindner’s Head of Airports & Airlines, Railways & Tunnels, Special-Purpose Constructions & Stadiums. “Flying splinters or particles released from surrounding glass, metal or even concrete structures represent a huge danger in the area surrounding an explosion as the released fragments act like bullets when it comes to the detonation of a bomb. Intelligently constructed, the Lindner wall system incorporates high-quality glazed, metal or synthetic panels that are engineered to withstand a blast impact.”

Lindner’s experience in the design, manufacture and installation of the façades, partitions and ceilings in Heathrow’s Terminal 5 inspired its vision of the pioneering solutions developed for Terminal 2. “It was not new to Lindner that LHR is an airport with a focus not only on high-quality interiors but also on passenger safety in case of terrorist attacks,” explained Stömer, “however, the requirement for bomb blast resistant glass claddings as being installed in Terminal 2 was nevertheless a new requirement Lindner was faced with.”

Lindner was responsible for both interior and exterior works on the terminal, and worked in conjunction with its subsidiaries Lindner Interiors Ltd., Lindner Façades Ltd. and Prater, on the ambitious, ultra-modern Terminal 2. The design, supply and installation of the roof and wall systems for the ancillary buildings around T2 was realised by Prater, a leading contractor specialising in design and installation services for the complete building envelope, including the cooling station, VCC buildings, VIP building, and the T1 Baggage Link as well as the T1 Passenger Link. Prater’s delivery of the external envelope packages was accomplished in coordination with industry-leading developers such as Sarnafil and Trimo, and the majority of materials are proprietary products, while the curtain wall, flashing trims, specialist pressings and fascias and copings were designed and manufactured by Prater in-house. Ray Bune, BAA Operations Manager, explained that Prater’s extensive and unique set of disciplines and pioneering of the latest construction methods such as off-site manufacture, made it ideally suited to delivering this large and complex airport project. “Prater’s longevity within the industry and previous experience with airport projects put it in good stead for projects such as these. Specialist knowledge of the regulations that come with working airside and the company’s ability to adapt to working at night to avoid interrupting the day-to-day running of the airport are also key factors in Prater’s continued success in this sector,” he said.
Hoare Lea lights Heathrow T2A

Heathrow’s new Terminal 2A will provide a spacious, airy and bright building for up to 20 million passengers each year under its initial phase. Hoare Lea Daylight worked with the architects on the design of the roof lights, while Hoare Lea Lighting designed the front-of-house artificial lighting scheme up to production design stage.

The design brief for the lighting was to provide visual comfort by avoiding high contrasts, avoid excessive solar heat gains; maximise energy efficiency; and achieve an average daylight factor of 2%.

The undulating roof with north-facing roof lights captures daylight while blocking direct sunlight. The three waves reflect the passenger journey, with the height of the roof and size of the roof lights increased in check-in, security, and departure lounge and reduced in transitional spaces.

Following an 18-metre grid, north-facing roof lights vary in height along the east-west section of the building. Various roof light configurations were considered, but daylight and thermal building simulations undertaken by Hoare Lea showed many options were likely to suffer from problems, including visual discomfort and excessive solar heat gains, because of the large areas of horizontal roof light glazing allowing too much summer sunlight to enter. Parametric studies by Hoare Lea helped define the optimum shape and opening of the roof lights, while visuals allowed for appraisals by the team. The result was a pleasing visual expression and a friendly, stimulating space. Even the most well designed daylighting system has to rely on artificial lighting at night. Hoare Lea Lighting’s scheme aims to ensure Heathrow T2A looks great under both natural and electric light.

The stretched ceiling membrane, which forms the largest continuous surface visible from the concourse, required special attention. Linear LED luminaires integrated into the lower lip of the roof section provide back lighting to the edge of the membrane. This mimics and supplements daylight and ensures a harmonious transition between areas of different brightness. At the same time, downlights at high-level provide general illumination to the concourse. The result is an integrated lighting solution, which works intuitively with the architecture, and accentuates the form of the ceiling.

ISS – using the ‘Power of The Human Touch’ to make every journey better

Heathrow Airport Limited’s (HAL) new Terminal 2 is designed with sustainability in mind, whilst making ‘Every Journey Better’ for its stakeholders. To support these goals, ISS Facility Services is providing T2’s ‘Soft+’ Facility Management – including cleaning, waste management and fabric maintenance for the prestigious facility.

Millions of passengers use busy transport hubs and the people they interact with can make the journey more enjoyable. To achieve service excellence, ISS promotes the ‘Power of The Human Touch’ which promotes a customer-focused culture.

ISS personnel attend a comprehensive training programme to ensure the teams have the skills and attitude required to provide clients and customers with the best support and service. Little things make a difference; ISS team members wear badges indicating the languages they speak, enabling them to better assist customers with limited English.

In line with T2’s ‘Green’ ambitions, the integrated cleaning and waste management solutions aim to achieve over 70% recycling throughout the terminal. ISS’s understanding of complex ‘live’ environments provides experience in achieving the optimum balance of sustainability, passenger experience, service quality and value. The ability to deliver value and quality is supported by ‘Lean’ business methodologies to continue to improve the speed of work and streamline work processes once introduced.

With a track-record of delivering excellence in the transport sector these are just a few ways ISS contributes to HAL’s vision to make ‘Every Journey Better’.
For over 50 years, Atkins has been on a journey with Heathrow...

From developing an innovative Passenger Authentication Scanning System that improves security and passenger processing, to designing new buildings and infrastructure which increase efficiency as well as destinations, we’ve been working with Heathrow to create a world class airport.

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- Facilities planning, design and delivery
- Baggage and radio systems design
- Identity assurance and holistic security
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