AIRCRAFT HANGARS AND THEIR DOORS

REIDsteel
JOHN REID & SONS (STRUCSTEEL) LTD

Reference	Version
G2	b

Structural Engineering is at the heart of our business, and aircraft hangars have been an important part of our portfolio since the very early days of aviation when we built our first bespoke hangar for Louis Bleriot in the 1920s.

Today our customers include major airlines, aircraft maintenance companies, airports, and various militaries across the globe.

Design • Our designers make it their goal to understand your needs fully, so as to provide you with a hangar you can be proud of. Innovative design and extensive experience combine to create excellent, clear span aircraft hangars for any type of aircraft.

Fabrication • We have a reputation for quality and cost effectiveness, which in part is due to our design practices which are both fabrication led and ensure project installation is completed safely, efficiently, and with no surprises.

Installation • We can install our hangars using our site team, or provide site advisors if you prefer to use your own installation team.

Worldwide shipping • We have excellent shipping knowledge and to date our structures have been shipped to over 140 countries.

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We are certified to fabricate steelwork to UKCA execution classes 1 to 4
For up-to-date details of our certifications & accreditations please visit our website.

AWARD WINNING

Award winning twin cantilever MRO hangar

Constructed at Biggin Hill Airport, UK and completed in early 2022. (See more overleaf).

> The **Structural Steel Design Awards** are a hallmark of excellence as the foremost awards in our industry in the UK, and act as a real showcase for the exceptional capabilities of British design, engineering, manufacturing and construction.
>
> **Simon Boyd**,
> REIDsteel Managing Director

Award winning twin cantilever MRO hangar (continued)

The cantilever design allows the roofs each side to safely span the hangar without support from any internal columns, creating a vast floor space capable of housing up to 14 business jets at any one time.

This was one of our most technically challenging hangars with the 165m long central core supporting two 45m deep cantilever roofs.

It has been designed to be incredibly robust against unforeseen events.

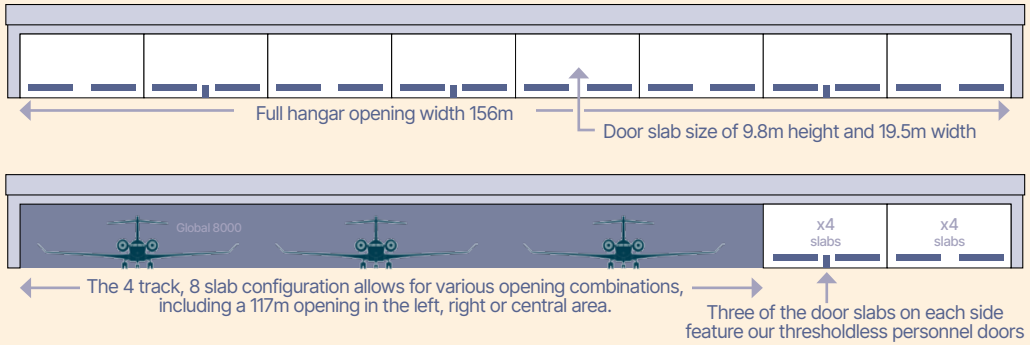
It has been thoroughly checked with codes of practise, against our own full-scale testing and computational fluid dynamics to ensure that even with the doors fully open the hangar will remain within tight deflection tolerances. The roof features an underslung crane, requiring even tighter deflection tolerances.

In addition to the hangar space, the project comprises of a reception area, workshop, and office space and 650,000 sq. ft of apron area and surrounds.

We worked closely with the main contractor and the client to keep costs down and shape the structure to be as efficient as possible for manufacturing, design and the end user.

Hangar door and door track configuration for this project

This hangar features identical hangar door configurations on both sides



REIDsteel provided conceptual and detailed design, fabrication and erection of both the steel frame and the full building envelope including cladding, windows, doors, decking and vents.

The project used 1600 tonnes of steel and 300,000 sq ft of cladding.

LOW CARBON EMBODIMENT

ENABLED BY INNOVATIVE THINKING

The project was praised for both it's design and it's low carbon embodiment by the Structural Steel Design Award committee.

Project Ref: 118773-G61

MRO hangar in Southeast Asia

The first in a series of three now completed hangars.

This 16,500m^2 facility has a span of 97m and is 165m long with an apex height of 25.5m and a height to the underside of the truss of 17.5m. REIDsteel designed, detailed and fabricated the hangar for a client in Southeast Asia, and it is unusual in having hangar doors at both ends.

In a traditional hangar, construction starts from the gable frame where it is most stable across its span.

However, as this structure has hangar doors at both ends, we had no braced bay to start from! In this situation, erecting a single frame would be too unstable and erecting two frames together would be too heavy for the cranes available.

We solved this issue by building part of the gable frame of a future, adjacent hangar, and then erecting a temporary tower at mid span (Construction photo A). Two half-frames could then be lifted together by the cranes and then the remaining steel lifted to create a self-stable box truss.

Careful calculations produced the result that once both frames were installed, they lifted themselves from the central temporary tower, which was then detached and dismantled. (Construction photo B).

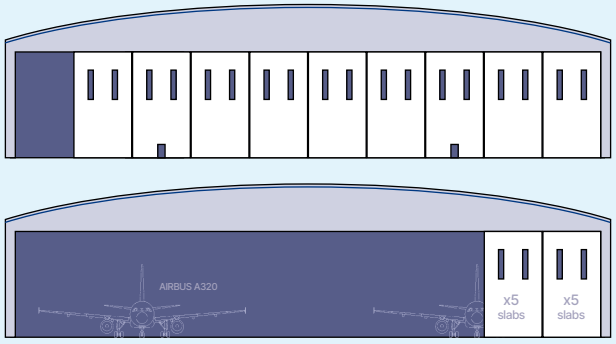
Installation of the remainder of the structure could then continue as for a traditional hangar with full frames lifted into position one at a time.

This was followed by adding the cladding, cat ladder, underslung crane and hangar doors.

Construction photo A

Construction photo B

Hangar door and door track configuration for this project
5 tracks with 10 independent leaves (identical configuration on each end).



This hangar features identical hangar door configurations on both sides.

Each side feature a full hangar opening of 97m covered by 10 independently powered leaves on 5 tracks. Each leaf is 17.5m high by 9.7m wide. This configuration allows for a maximum of 77.5m opening left, right or centre.

Project Ref: 118810-G64

100m span MRO hangar

The second for our client in SE Asia

Following the successful delivery of the first hangar, this 11,000m² facility represents the second in a planned series.

While maintaining the same impressive structural specifications - 100m clear span, 25.5m total height, and 17.5m clearance to the underside of the truss - this hangar is shorter in length at 110m and purpose-built to house four narrow-body aircraft maintenance bays.

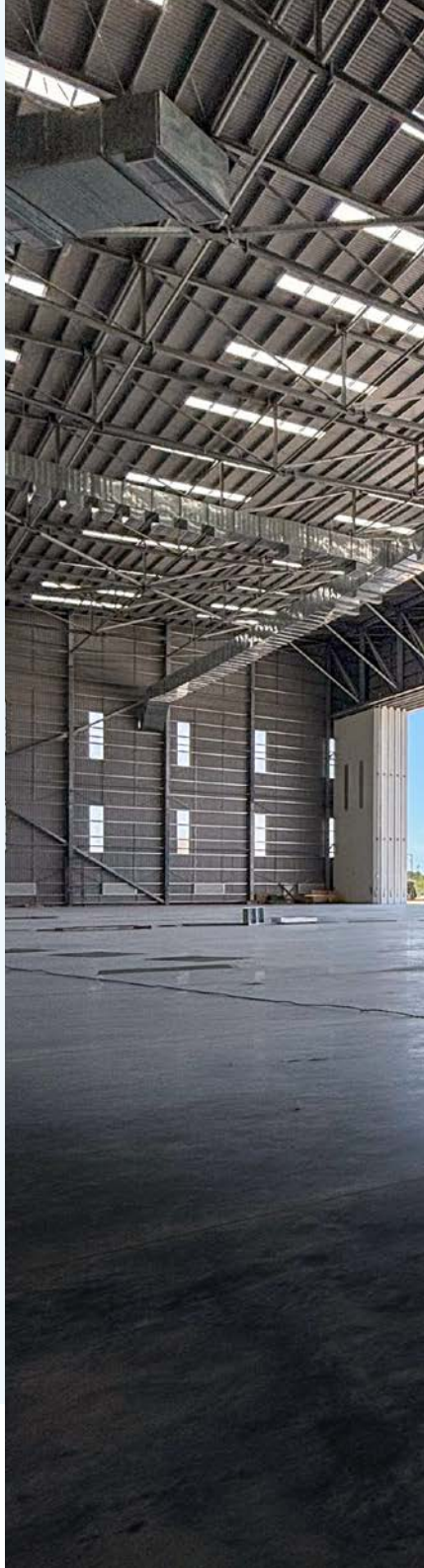
This expansion was strategically pre-planned during the design of the original hangar, allowing for a seamless and cost-effective installation. Both hangars share a common row of foundations, columns, drainage systems, and wall structures. Key elements such as columns, gutters, edge protection, roof, and wall cladding were detailed to streamline construction and reduce on-site work typically required for standalone facilities.

In anticipation of future growth, the new hangar has also been designed to support an additional extension.

Although an underslung crane was not immediately required, the structure was engineered to accommodate one with minimal disruption. Crane beams were integrated and levelled during installation to ensure readiness for future use.

As with the first hangar, REIDsteel supplied and installed custom louvres and a large ridge vent to ensure efficient natural ventilation throughout the facility.

REF: 118978



Paint/MRO hangar

Third in a series for our client in SE Asia

Following the completion of the two MRO hangars, our client identified the need for a paint facility for their wide-body aircraft. We collaborated closely with them to deliver a solution that met both functional requirements and aesthetic expectations.

The hangar was designed to fit within a 100m x 110m footprint, with provisions for future expansion. The structural concept allows for a seamless extension that would share part of the existing superstructure. Accordingly, the foundations were engineered to support both the current facility and any future additions.

The structural system incorporates two king trusses:

- The primary truss, located at the front, stands at 8.7m and is rotationally supported to efficiently transfer wind loads from the doors into the diaphragm bracing system.
- The secondary truss, positioned at the midpoint, reduces the span of the main frames, optimising structural efficiency and facilitating the packing and shipping of components within standard 40ft containers.

To achieve the client's desired mono-slope aesthetic, we employed inverted parabolic trusses. This approach not only delivered the visual outcome but also minimized structural forces, resulting in a highly efficient design.

This project exemplifies our team's adaptability and commitment to delivering resource-conscious solutions that support both immediate operational needs and long-term strategic goals.

This dual-purpose hangar can serve as both a paint and MRO facility. It features a clear door height of 20.8m and includes 10 door leaves operating on 5 tracks, allowing for a maximum opening width of 80% across the full 108m span.

Ref 119017

70m Multi-span Parking Hangars

For Oxford Airport, UK

We are proud to announce the successful delivery of our second aircraft parking hangar at Oxford Airport for a valued repeat client.

The first hangar, completed in 2021, was designed to meet growing demand for private aircraft parking. With continued expansion at the airport, a second hangar was commissioned with expedited delivery as a key requirement.

To streamline the process, the second hangar was designed as a near-identical replica of the original. Both structures feature a twin barrel vault roof and span 140m in total, divided into two 70-metre spans with central valley columns.

Each hangar measures 45m in depth and offers a clear internal height of 10m, accommodating multiple private aircraft simultaneously.

The hangar doors are configured as six individual units operating on three tracks, allowing up to 66% of the 136-metre frontage to be opened at any time. Each door is independently powered, providing maximum operational flexibility.

Natural light is optimised through the integration of rooflights and glazed door panels, significantly reducing the need for artificial lighting during daytime operations.

A distinctive feature of the hangars is the 15-metre king truss located in the valley, enabling vehicle and small aircraft movement within the hangar without the need to open the doors.

Each hangar includes an 80m² office and storage facility at the rear, constructed with composite cladding to meet building regulations for occupied spaces.

To meet the accelerated delivery timeline, the original design was reviewed and refined to enhance structural efficiency and incorporate modern fabrication and erection techniques.

Ref: 118841/119007

89m clear span hangar

■ With extensive office and maintenance facilities at Biggin Hill Airport, Kent UK

Originally built for Rizon Jet, this FBO and maintenance facility focuses on travel for senior executives, high-ranking government officials and professionals.

A striking visual feature is the natural light in the two storey office areas, made possible by curtain walling running the whole of one end of the building. REIDsteel also supplied and fitted the stylish departures & arrivals doors as well as the FBO entrance.

The 4300m^2 hangar has an 89m door width consisting of six 15m x 9.6m electrically powered doors, which can be operated independently.

This configuration permits the doors to create a clear opening of up to 59m to the left, right or centre. The clear height of 9.6m will guarantee the entry of aircraft up to Global Express and BAe 146 size.

Two of the hangar door leaves contain personnel doors which have no threshold and can therefore be used as escape doors in the event of a fire.

The hangar is also served by two 2T overhead travelling cranes, which run the whole length of the 90m building.

All the steelwork, hangar doors, cladding, glazing and curtain walling was designed, made and installed by REIDsteel.

Ref: 117237 • G73

120m wide hangar with a tailgate door

■ Biggin Hill Airport, UK

The brief for this hangar required a maximum structure height of 15m combined with a 120m wide span split into three areas, two of which had to be accessible simultaneously, and one span designed to house a Boeing Business Jet (BBJ).

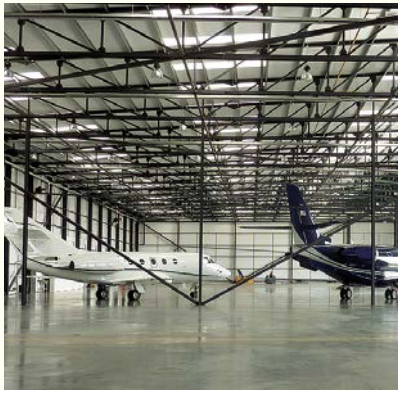
Our solution has nine slabs, three tracks and a tailgate door. The 9.2m high hangar doors allow the entry of most business jets, but the 3m wide and 4.3m tall tailgate takes the opening height in that section to 13.5m for the BBJ entry. Innovative engineering allows the slabs to 'jump' the tailgate opening gap.

The hangar door/track configuration allows for a maximum opening covering two thirds of the full hangar opening. Most of the weight of the doors is borne by the bottom rolling track, while the top track supplies stability and the power to the door motors and controls.

These hangar doors are sheeted in microrib profile composite panels and include glazing and our thresholdless personnel doors.

The hangar also features a service door at the rear for towing trucks or deliveries.

Ref: 117480



72m span hangar

Stansted Airport, UK

This hangar, with ancillary accommodation, was designed by REIDsteel. We fabricated and erected all structural steelwork, cladding, glazing, external doors and the hangar doors, which featured 6off 12m wide by 15.1m high leaves on three tracks giving a maximum opening of 48m.

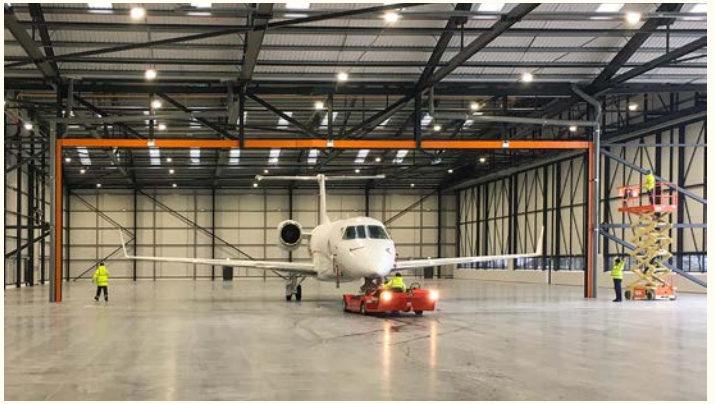
The hangar features insulated double skin cladding system on the roof and walls, with fire rated composite panels affording protection at the main partition walls between the hangar and the ancillary accommodation facility.

The walls of the ancillary accommodation are clad with horizontally laid composite panels in two stylish colours and with ventilation louvres colour matched to suit.

Excellent and safe on-site coordination with the client and the various other trades enabled a quick and efficient construction.

The level of commitment from all parties was paramount to the successful completion of the project and the end result demonstrates the degree of attention to detail that was administered in every aspect.

Ref: 118217



60,000 sq ft parking hangar

■ At Biggin Hill Airport, UK

This parking hangar is one of many buildings we have built at the Biggin Hill Airport on the outskirts of London. It is currently home to approximately 65 commercial and aviation activities, 55 business jets and more than 150 other private aircraft and helicopters.

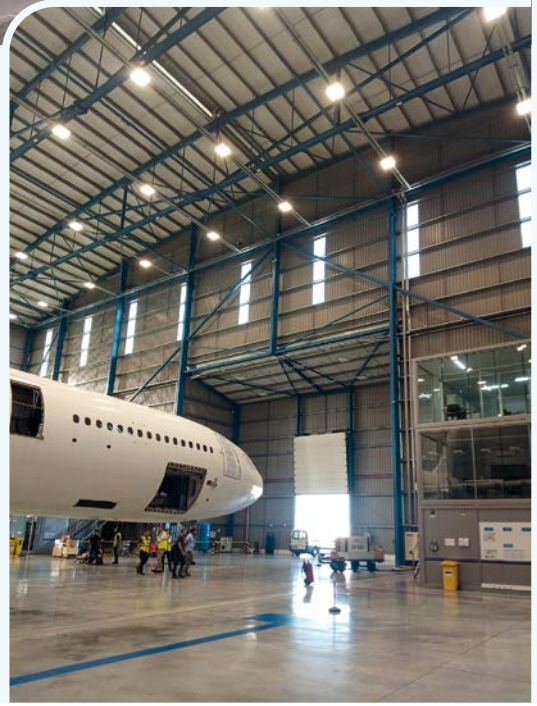
The hangar is 132m x 43m and has the capacity for up to six G650's or Global 7000's.

We designed, detailed, fabricated and erected the structural steel frame along with the roof and wall cladding, glazing system, and hangar doors.

The hangar door features twin span openings to enable the accommodation of executive class business jets. Our six slab, three track hangar door system means that two-thirds of the whole door can be opened to the left, right or centre at any one time.

As well as the 60,000 sq ft of hangar space it also features a 34m x 11m, three-storey integrated annex which gives 10,000 sq ft of internal office space.

Ref: 118403



68m span MRO hangar

Beja Airport, Portugal

Built for the maintenance of A340-500 aircraft, this hangar has a 68m clear span, a length of 70m and an internal height of 20m.

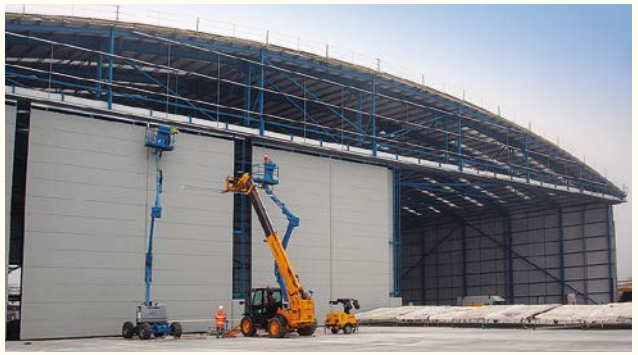
The roof is double skin with an external Aluzinc coat and a white enamel coated galv profile liner. Insulation is made of 120mm fibreglass blanket. The walls are single skin.

The hangar features cascading doors incorporating 6 leaves running on 3 tracks into outriggers on both sides to offer a clear opening of 68m.

Ref: 118453

90m span hangar

For Inflite Limited – Stansted Airport, UK



This maintenance hangar is 90m clear span, 48.8m long with a 13.7m clear height. Its six, 15m wide, door leaves are electrically operated giving a clear opening of 60m and are clad in horizontally laid composite panels complete with preformed corners.

The roof is fitted with permanent edge protection to protect workers during construction and for future maintenance. The rear elevation has a two storey lean-to ancillary building.

Ref: 117350

55m span military hangar

■ For the Royal Air Force, Valley Airport, Anglesey UK

This 155m long, 55m span, hangar houses the latest generation of Hawk trainers for use by the RAF, Royal Navy and Army Air Corps.

We also designed and constructed the Squadron Building containing two simulators, classrooms, gym and changing facilities. Including all the glazing.

Ref: 117211 / 117212 • G42

Military helicopter hangar

■ For the Royal Naval Air Station Culdrose, Helston, Cornwall UK

This 37m span, 2000m² hangar was built to house the Royal Navy's new Merlin search and rescue helicopter. It took only twenty five weeks to design, make and erect in spite of high winds and generally wet conditions.

The hangar has two sets of six leaf Cascade type rolling doors made by us, one set at each end, with outriggers to allow full width access.

The doors are each driven through a cable and gearbox mechanism turned by one large handle, so the slabs all operate together.

Ref: 117137

Three 42m span air force hangars

■ Two for the Chilean Air Force at Fuerza Aerea del Chile, Santiago and one for the Chilean Navy at Vina del Mar, Chile

2300m^2 hangars designed and made for the Chilean Air Force, incorporating two storey offices, workshops and stores on three sides.
At the rear, to accommodate the aircraft nose, there is a specially built extension complete with door to allow exit and entry of tow vehicles. The complete erection and cladding was undertaken by a local construction company under the supervision of our engineer.

The hangar for the Chilean Navy at Concon was specially constructed to house and maintain the Orion P-3 turbo-prop long range aircraft that patrol Chile's long Pacific coastline.

Ref: 116169

Malta Aircraft Museum

■ 32m clear span hangar

We built this beautiful little hangar for the Malta Aircraft Museum in 2005. The style had to reflect the era of the Second World War and houses a Supermarine Spitfire, a Hawker Hurricane and period anti aircraft guns as well as other WW2 memorabilia.

Malta, the George Cross Island, is rightly proud of its steadfast resistance to the fascist tyranny that swept across Europe during the 1930s and 40s.

Ref: 116691

280m wide Airbus & Boeing maintenance hangar

■ For Lufthansa Technik, Malta

Lufthansa Technik Malta specialises in the maintenance and repair of Airbus, Boeing and other large aircraft. This hangar is 280m wide in three clear spans of 91.5m.

We have since created an extension for the third bay (see opposite), but the original build was 90m deep with a clear height of 26m under all the steelwork.

The hangar is fronted with eighteen electrically operated door leaves, the largest of which are 26m high by 15m wide.

The facility can accommodate two Airbus A380s and many narrow body aircraft simultaneously as well as having a number of workshops within it.

In addition to Lufthansa and Air Malta aircraft, customers include: Spanair, AirOne, BMI, Germanwings, Fly Niki, Privat Air, Arik Air, Wizz Air, SunExpress and Livingston Energy Flight.

Ref: 117160 • G41

Hangar extension

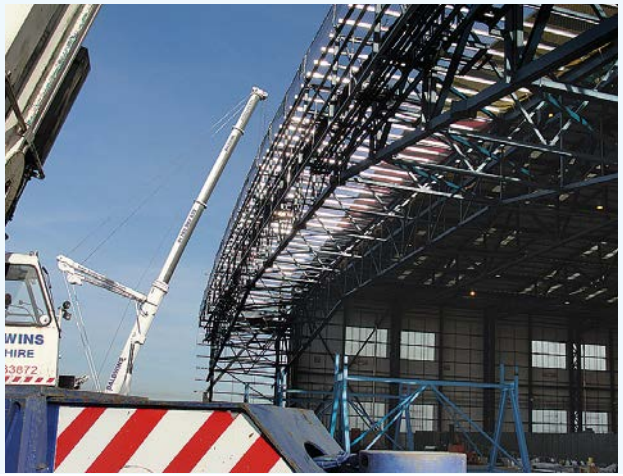
For Lufthansa Technik, Malta

In order to accommodate larger aircraft in the smallest of its three maintenance hangars, Lufthansa Technik asked REIDsteel to design a 20m deep extension with a height of 20m under the central door head of this 90m span hangar.

The REIDsteel design team worked under the constraint that this new extension was to be constructed on top of the existing apron which could only accept shallow excavations. This led REIDsteel to recommend that an electrically operated fabric curtain door from Megadoor be used - a five curtain design which, when raised, produced clear heights of 20m in the centre section, dropping to 18.5m and then 15m in the outer sections.

Steelwork and cladding was designed, supplied and erected by REIDsteel and the end result is a very neat and hugely accommodating extension that incorporates translucent door fabric to allow diffused daylight into the hangar. A wall mounted louvre/ridge-vent combination helps to provide a comfortable and productive working environment.

Ref: 117914



100m span hangar extension and door

At Bournemouth Airport, UK

This extension to the existing Hangar 12 at Bournemouth Airport has a clear span of 100m, is 12m deep and 22m high to the eaves.

Once the pre-assembly work had been carried out, the 140T truss was lifted into position, using a 500T and a 1000T crane in tandem. Taking advantage of a perfectly still day, and with the help of our crane suppliers, Civils and Bournemouth International Airport, we were given the green light to go ahead with the lift. Once all the steelwork and cladding was completed the Megadoor was installed.

Ref: 117899

New T2 hangar door & extension

■ To house two new aircraft, Biggin Hill Airport, UK

In order to house a BAe 146 with a 26.2m wing span and a Dassault Falcon 900 with a 19.3m wing span, new doors and an extension were required for the T2 hangar at Biggin Hill Airport.

The new doors have six slabs on three tracks, giving an entrance 30m wide by 9.25m high. These doors are all electrically operated with a fail-safe system which allows each door slab independent movement via a hand held control pendant. The system also allows manual operation when required.

The doors are insulated with horizontally laid microrib composite panel cladding complete with preformed corners. The door hood steel frame was erected independently from the existing hangar steel frame. We erected the steel, fitted the cladding and wired and commissioned the electrically operated doors whilst maintaining access into the hangar for plant etc.

Ref: 1176975

Hangar extension

■ For KLM, Norwich International Airport, UK

KLM UK Engineering who specialise in the maintenance, repair and overhaul of aircraft, have their main base at Norwich International Airport. Due to existing and new contracts KLM were in need of more space and decided to refurbish a disused hangar which included a 10m hangar extension supplied and erected by REIDsteel.

The electrically operated Megadoor is split into three leaves, separated by swing-up columns, which allows a full width of 45m. The outer leaves are 9m high; the centre 13m. For flexibility the door leaves can be individually opened and a row of vision panels allows daylight to illuminate the hangar interior. The hangar can now house a Boeing 737.

Ref: 1176975

50m span MRO hangar with fuselage sealing doors

■ For Eznis Airways, Ulaanbaatar, Mongolia

Designed for a fleet of two Avro RJ85 and four Saab 340B aircraft, this is a 50m clear span hangar with two storey office, stores and workshops on three sides.

REIDsteel fabricated, designed, and shipped all the steelwork which, with the cladding and essential insulation material, filled more than twenty shipping containers. We also supplied the large Eznis company logo which features on the front and back of the hangar, and supervised all the hangar erection and construction before the winter set in.

The centre two door leaves feature an inflatable fuselage sealing ring hidden behind two smaller outer doors. With these two smaller doors open the nose of an Avro RJ85 aircraft can be inserted so that it can be worked on from inside the hangar with the majority of the aircraft remaining outside.

The inflatable seals are a bespoke design for the aircraft to ensure a perfect seal against the weather . . . and what weather it is . . . Summer temperatures in Ulaanbaatar can go as high as +40°C, but during the Winter they can drop to as low as -40°C!

Ref: 117592

950m² helicopter hangar

With maintenance with built in office area

This UK hangar was designed & erected by REIDsteel and featured our hangar doors, cladding, windows and personnel doors.

Ref: 118136

80m wide helicopter hangar

For Scatsta Airport, Shetland Isles, UK

Shetland Leasing & Property Company (SLAP) called us in to design and build a hangar to house and maintain their helicopters servicing North Sea oil platforms and resist the howling winds blowing straight off the sea..

This facility has greatly enhanced the working conditions, allowing maintenance engineers to provide a much better service. The hangar is a two span propped portal frame building measuring 80m x 41m with a 7.5m clear height. Its manually operated doors are clad in vertically laid composite panels. The rear elevation has a full gable frame to permit future end extension.

Ref: 117159

25m span helicopter hangar

At Nouakchott in Mauritania, North West Africa

The hangar is 7m high with a lean-to on either side, together with cantilevered upper tracks on each side of the doorway so that the manual doors can be rolled back to give maximum clear entry of 25m. The hangar doors, cladding, windows and personnel doors were also designed and made by us and we supplied a 2 tonne EOT crane as well as incorporating crane beams and rails into the steelwork.

Ref: 117038

REIDsteel Hangar Doors

Hangar doors are the most important part of an aircraft hangar. We supply doors for own hangars, but we can also tailor the design to fit other hangars.

Our hangar doors are designed to be practical, efficient and most importantly as safe as possible. The doors are internally clad to above head height for a smooth, safe surface with less chance of snagging and they include a range of safety features.

Each leaf has a safe opening & closing system controlled by a handheld pendant. These allow the operator to be well clear of the moving door and gives them excellent visibility to spot obstructions or dangers. Electro-mechanical brakes stop the door quickly and efficiently, and should the operator drop or let go of the pendant, they are applied automatically.

In our standard bottom rolling design, each door leaf has its own motor(s)and reduction gearbox independently driving the ground wheels and powered from the overhead enclosed conductor rail.

In the event of an electrical failure the door leaves can be declutched and pushed manually or towed. Low friction sealed ball-bearing system in the ground-wheel hubs makes them easy to move.

1

2

Manually operated doors are designed to be pushed, towed or moved with a turning handle. Manual doors are strongly recommended where the electrical supply is unreliable. Our doors open and close so easily that power is a luxury rather than a necessity.

We also supply cascade (sheave) hangar doors, which are a set of doors cabled together with a master drive leaf. The set of doors open and close altogether in one smooth operation. These type of doors don't offer the same flexibility as individually powered leafs

***1** - The handheld control pendant is fitted with an anti-stretch tether and provides safe control when opening and closing powered doors.*

***2** - The galvanised ground tracks are laser levelled before being concreted into position. The door leaves have double flanged ground wheels which run on the steel tracks. The door track system also includes drainage to draw away rain water.*

Hangar door servicing and training

In addition to the design, fabrication and installation of hangars and hangar doors, we also offer a hangar door service option for our bottom rolling hangar doors (and similar hangar doors by others).

The service includes a thorough mechanical and electrical check at high and low level, to pick up any problems and minimise the risk of any breakdown or safety issues which could prevent the hangar from operating at its normal capacity.

We recommend a service check every 12 months, but also offer an emergency call out service.

We also offer hangar door training sessions for door operatives, so they fully understand how to operate the doors and recognise the need for all the safety protocols to keep everyone and everything safe during operation.

This also includes knowledge of all the door safety systems, interlocks, isolators and systems resets.

Fabric hangar doors

Fabric doors can be used if there is no space for outriggers and where the whole hangar width needs to be open at the same time.

The door slides up and down in weather-sealed vertical guides, which are attached to the hangar structure. The bottom section is lifted upwards and the fabric folds into pleats.

Once the fabric sections are fully raised the vertical guides swing up into the door head to leave clear access to the full width of the hangar.

Top hung doors

Ideal for small manually operated hangar doors. These are top hung with a simple ground track and hood.

Sliding folding doors

These are a useful alternative on smaller hangars. We can supply doors to your own individual specifications, including electric or manual operation, and/or bi-folding doors with glazing.

REIDsteel

JOHN REID & SONS (STRUCSTEEL) LTD

Structural engineering is at the heart of our business . . .

- Aircraft hangars, hangar doors and hangar extensions
- Bridges
- Car parks
- Church and community buildings
- Cranes
- Environmental structures
- Grandstands and stadia
- Housing, hospitals and schools
- Hurricane and earthquake resistant buildings
- Industrial and warehouse buildings
- Leisure and sports buildings
- Office buildings, commercial buildings and retail superstores
- Security gates, barriers and defensive structures

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