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The Listing and Conservation of the Farnborough Wind Tunnels

Judy Allen

Abstract

The Royal Aircraft Establishment factory site at Farnborough, UK, was used for most of the twentieth century to develop and test aircraft. The origins of the factory site are described together with the development of wind tunnel testing as the design of aircraft evolved. The significance of some of the factory buildings in use was recognized, and as the site was declared redundant and sold for redevelopment, attempts were made to safeguard the aeronautical heritage. During preparation of a Development Brief for the area around the listed wind tunnel buildings, the listings of the former factory buildings were reviewed. The brief and philosophy for the conservation of the listed wind tunnel buildings are described, and the current and potential uses of the retained historic buildings discussed.

Introduction

Farnborough IQ is a business park in Hampshire built on a brownfield site adjacent to Farnborough Airport. Formerly the site of the Royal Aircraft Establishment factory, the buildings and infrastructure had been decommissioned before the site was sold in 1999 by the Ministry of Defence (MoD) for commercial redevelopment to developer Segro. A group of listed factory buildings at one end of the site included early twentieth-century wind tunnel buildings and sheds constructed by reusing structure from a 1912 airship hangar. During redevelopment of the site, Segro and its architects established an approach to conserve the historic buildings and their settings at a time when the statutory status of the site and buildings of interest was under frequent review.

Origins of the Royal Aircraft Establishment factory site

The British Army established a Balloon Unit at Aldershot in 1889, relocating to Farnborough in 1905 where a Balloon Factory for the Royal Engineers was set up. In April 1911 the factory was renamed the Army Aircraft Factory, only to be changed to the Royal Aircraft Factory in April 1912. To avoid its initials being confused with those of the newly formed Royal Air Force (RAF), the factory became the Royal Aircraft Establishment (RAE) in 1918. The site along the north side of Farnborough Common was intended as a temporary factory site.

Balloon manufacture was developed for the construction of airships and early aeroplanes, all of which were of delicate lightweight construction covered with thin fabrics. Shelters for the ground aircraft were originally of canvas, but the comparatively large airships required vast sheds with supporting workshops and gasholders. Construction of the first airship shed to house the Army's first airship, *Nulli Secundus*, began in 1905. Later that year the main Balloon House, two gasholders and various smaller buildings were removed from Aldershot and re-erected at Farnborough. By 1912 three more airship sheds had been constructed including a portable airship shed, designed to be easily dismantled and re-erected. The individual canvas tents used for housing aircraft were replaced at Farnborough during 1912 and 1913 with 'Black Sheds' used as aircraft hangars by the Royal Flying Corps (forerunner of the RAF). These still exist adjacent to the airfield.

The earliest wind tunnels

Growth was rapid as the RAE factory site became important for the manufacture and development of aircraft. The site was expanded to the north and several more buildings were erected for testing and research with a shed built specifically for airship manufacture in 1915. The First World War showed the potential of the aeroplane for military purposes and aircraft technology developed rapidly for military use, particularly for bombers and fighter planes. Key to the development of the early small slow planes were the wind tunnels, which could test full-size planes or components at their actual speed of flight.

The principle of all wind tunnels is a power-driven fan used to draw a current of air through a test chamber where a scale model, a component or a complete aircraft is supported in such a way that its aerodynamic characteristics can be observed and measured by sensitive equipment. The air is usually circulated through a return air duct to save energy; then passes through a honeycomb grid and a contraction chamber to smooth and accelerate the air flow before it impinges on the test object. It is to minimize the turbulence that the fan sucks rather than blows air.¹



Figure 1 Before the restoration of Q121, taken from inside the wind tunnel, behind the mahogany fan, showing in the foreground the fan shaft supported by aerodynamic concrete blades, with the concrete air-turning veins in the distance. (The Downland Partnership)

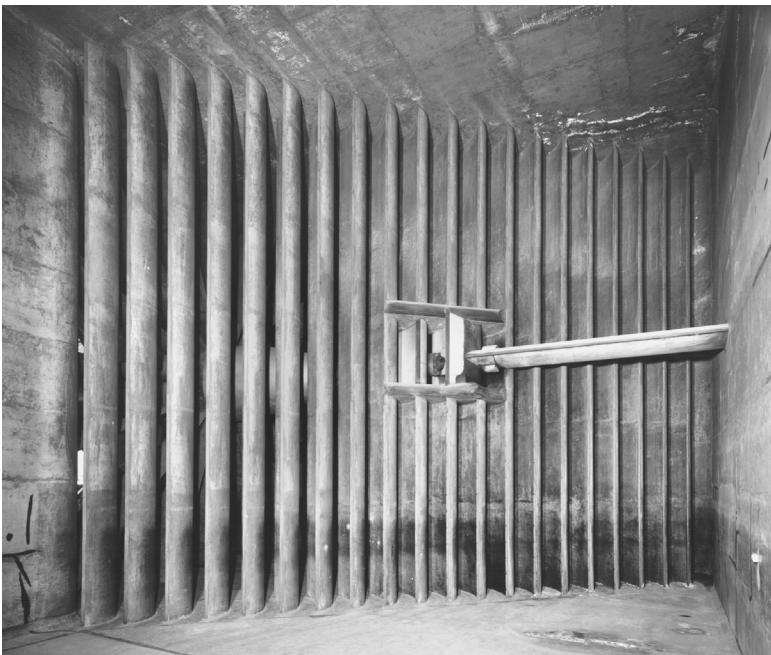


Figure 2 Before the restoration of Q121, showing the curved concrete turning-veins which turn the wind through 90 degrees. The ceiling, floor, walls and turning-veins are all smooth concrete to reduce friction for the air flow. Centrally, horizontally is the fan shaft connecting the fan (left) to the motor room (right). (The Downland Partnership)

R52, the first wind tunnel building

The first major RAE wind tunnels, built in 1916–17, were housed in the country's first purpose-built wind tunnel building. Later named R52, the building had three bays each housing an open-ended wind tunnel (then called a wind channel). Two of the tunnels had test areas 7 ft in diameter and produced a maximum wind speed of 130 ft per second (90 mph). These wind channels, which survived until 1944, tested Mitchell's Supermarine 'S' series of high-speed aircraft in the 1920s and new streamlined bomb shapes and their release characteristics in the 1920s and 1930s.

In the south bay of R52, the 7 ft wind tunnel was converted in 1938 to a square 11.5 ft × 8.5 ft low-speed closed circuit wind tunnel. An engine house was built against the west gable wall, and an extension to the south along the full length of the building accommodated the return air circuit. Two large openings were made into the original south brick wall to let the air flow into and out of the return air chamber. The wind tunnel was used extensively on many aircraft types and was sold to Southampton University in 1976.

The existing 4 ft × 3 ft low-speed, low-turbulence wind tunnel was built in the north bay of R52 in 1945, being constructed of finely jointed wood mounted on a steel frame. Models were suspended on wires or mounted on the sting (a projecting mount) in the test area. The tunnel was powered by the remounted, original 1916 200 horsepower (hp) motor and achieved a top speed of 280 ft per second (190 mph). Experiments on narrow delta winged aircraft culminated in the development of Concorde in the late 1950s and Malcolm Campbell's speedboat in the 1960s.

Site expansion

The factory site expanded with the construction of workshops, offices and laboratories. The RAE estate became so large that it was divided into zones identified alphabetically for ease of navigation. Each building was given a number prefixed with the zone letter. For example, the building designated 'P160' was located in zone P and was probably the 160th structure erected in this particular area of the site.

Q121, the low-speed wind tunnel

Wind tunnel building Q121, built in 1935, was extensively reported in *The Engineer* magazine at the time. Rather than housing an independent wind tunnel, Q121 is the wind tunnel, with the form of the building expressing every component part of it. The test area is large enough to contain a small aircraft or a working aero engine. At the time it was the largest open-jet facility in Europe capable of continuous running at atmospheric pressure.

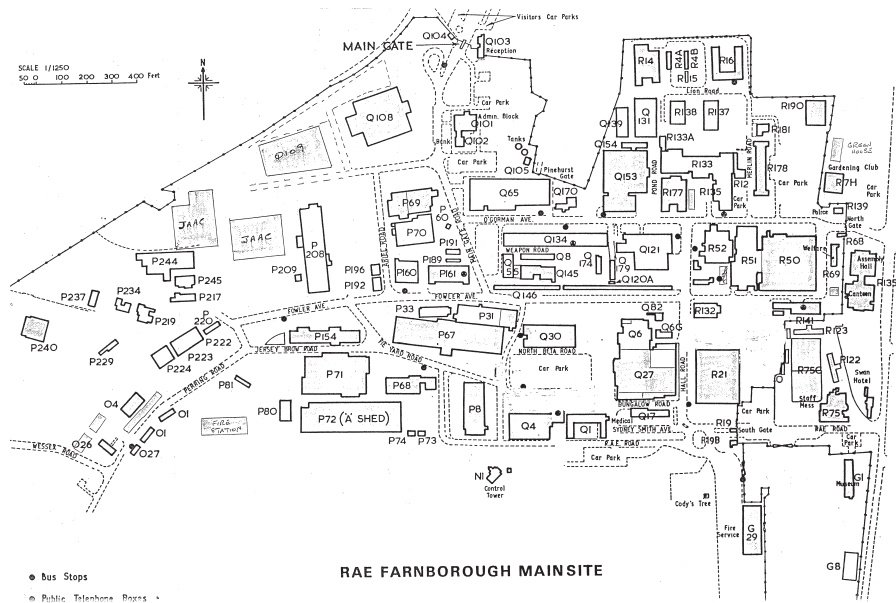


Figure 3 Archive plan of the RAE Farnborough factory site, July 1984. (Farnborough Air Sciences Trust)



Figure 4 Archive photo of testing in the Q121 wind tunnel. (Farnborough Air Sciences Trust)

Air speeds in Q121 were up to 130 mph. The wind tunnel was used in the development of Second World War aircraft including the Hurricane, the most widely used fighter in the Battle of Britain.

R133, the transonic wind tunnel

As the size and speed of aircraft increased, the actual conditions of flying could no longer be accurately reproduced in a wind tunnel. It was unrealistic to build a large enough test space or to produce air flow fast enough, so wind tunnels were developed to test accurate scale models of aircraft or aeroplane components.

The relationship between the conditions of each test in a wind tunnel (scale of the model to be tested, speed of the air and atmospheric pressure) was defined using the so-called Reynolds number. To predict the effect of wind speed and atmospheric pressure on a prototype aircraft accurately, the Reynolds number for the model test and for the full-size prototype in the air must be the same. This led to the construction of pressurized wind tunnels in which the small size of the model and the relatively slow air speed was compensated for by running the test at high pressure.

Wind tunnel building R133, with R136 attached, was built between 1939 and 1942 during the Second World War. R133 housed a closed-section,

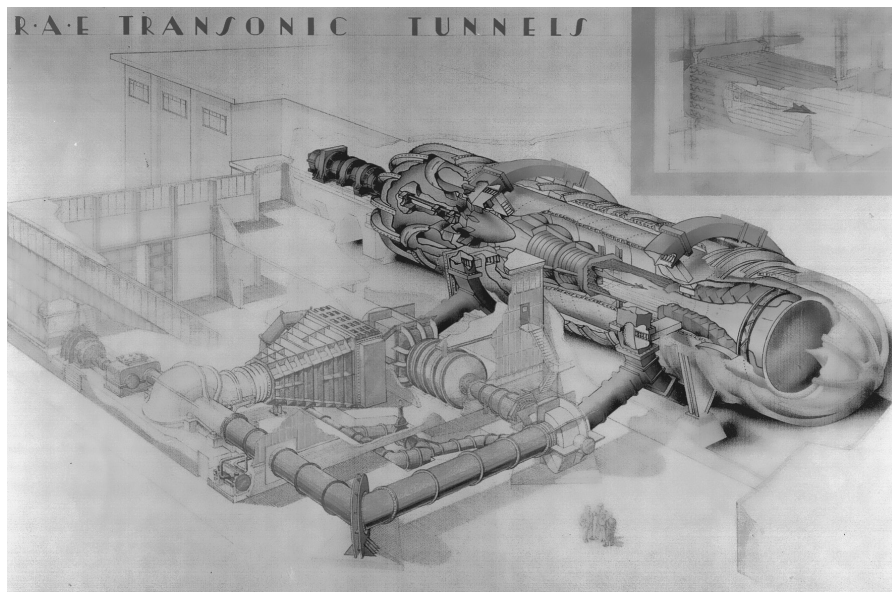


Figure 5 Artist's cutaway drawing showing a model aeroplane on the sting in the test chamber of the steel flask in the R133 transonic wind tunnel, with the 1956 axial blower compressor in the foreground. (Farnborough Air Sciences Trust)

high-speed wind tunnel; the 10 ft × 7 ft test area and return air duct were contained in a steel flask mounted on four concrete pads to allow for its expansion and contraction during the running of the tunnel. Air was sucked through the centre of the cylinder over the model test area by a fan powered by two 2,000 hp motors; it then circulated in a cavity between twin steel walls around the edge of the flask. Considerable heat was generated by air speeds of up to 600 mph, which could distort the measurements, showing the effect of pressure and wind speed on the scale model. 'Jackets', looking like central heating radiators, were fixed to the outside of the steel flask through which chilled potassium chloride brine was pumped to keep the tunnel air temperature at about 15°C. Air compressors were used to alter the pressure in the test area in the wind tunnel to either above or below atmospheric pressure as required. Vital research was undertaken in R133 during the Second World War, for example, to the Mustang, Spitfire, Canberra and V Bomber series.

During the Cold War in the 1950s, the R133 wind tunnel was modified to raise its specification from high-speed to transonic, enabling speeds of 1.2 Mach (approximately 800 mph). The wind tunnel test area was reduced in size to 8 ft × 6 ft and open slots were introduced into its sides to smooth the high-speed air flow. The air flow through the tunnel was speeded up by two measures: an 8,000 hp motor was added to the two existing motors to drive the fan and an axial compressor was installed in a new building extension adjoining the steel flask, taking the air which had come out of the test area open slots, compressing it and reintroducing it into the return air circuit.

The transonic tunnel contributed significantly to Britain's success in the race to break the sound barrier and lead in supersonic flight. In 1957, the Fairey Delta broke the world speed record reaching 1,132 mph. The Harrier and Tornado were developed using the transonic wind tunnel and one of its last projects was in connection with the Gulf War.

The first listing of RAE buildings

Four of the buildings owned by RAE were listed in 1979. Two of these buildings, Q65 and R51, were large sheds within the factory site and both were listed Grade II as they were built reusing the steel structure of the 1912 portable airship hangar. On the airfield, building G29, a large hangar of metal-framed construction clad in black-painted corrugated iron and built in 1912, was listed Grade II for historical reasons, being the earliest Royal Flying Corps hangar. Just east of the airfield is G1, Headquarters of No.1 (Airship) Company of the Air Battalion of the Royal Engineers, built in 1911, listed Grade II* for its importance in the development of military aviation in Britain.

Closure of the RAE at Farnborough

Early in 1991, the MoD declared its Farnborough facility surplus to requirements as military aviation research and development had become concentrated in Bedfordshire and at Boscombe Down. In conjunction with the Department of Trade & Industry and the Department of Transport, the MoD drew up a strategy for disposal of its landholdings at Farnborough.

In April 1991, RAE Farnborough became the Aerospace Division of the newly created Defence Research Agency (DRA). The Defence Evaluation and Research Agency (DERA) was formed in April 1995 as an amalgamation of several defence organizations, including DRA. In 2001, DERA separated into two organizations: a commercial company, Qinetiq, and the Defence Science and Technology Laboratory (DSTL).

Attempts to safeguard the aeronautical heritage

A group of local enthusiasts, many of whom had worked at Farnborough Factory site, established Farnborough Air Sciences Trust (FAST) in 1993 when it became apparent that the MoD was planning to sell the airbase. FAST's chief aim was to 'safeguard the priceless aeronautical heritage of Farnborough for the nation'.² It supported Hampshire County Council's recommendation to award conservation area status to the historic core of the site and prepared proposals for the regeneration of this four-hectare area.

FAST lobbied for the listing of important buildings on the factory site and, following a visit from the listings inspector, Q121 was recommended for listing at Grade I, R133 at Grade II* and Q27 (a large dirigible shed, balloon factory and balloon house mainly built in 1915) was recommended for listing at Grade II. Being keen to sell the site and concerned that listing the redundant industrial buildings would diminish its value, the MoD commissioned Clews Architects to review the inspector's recommendations. Clews' recommendations were either not to list the buildings recommended for listing by the inspector or to list them at lower grades.

The result of 'representations from the MoD and interference from the Cabinet'³ was that, in December 1996, Q121 was listed Grade II*, R133 at Grade II and Q27 was not listed at all. Rushmoor Borough Council declined to award the core area conservation area status.

In the mid-1990s, English Heritage had set up a long-term thematic survey of military aviation sites and structures, and in May 2000, Jeremy Lake (project leader) published a summary report with recommendations for buildings and structures to be listed. The listed buildings at Farnborough were noted but no further recommendations for listings were made.

Disposal of the RAE sites

The former RAE factory site was decommissioned by the MoD in 1998. When viewed in 1999, it did not appear that any buildings had been demolished in the decommissioning process, but machinery and plant had been disabled or removed from inside some of the buildings.

Outside the airfield, part of the former RAE site at Farnborough was retained by DERA (now Qinetiq) for a variety of research and development activities. Land held to the south of the airfield is now largely occupied by BAE Systems, a British defence, security and aerospace company. The government kept Farnborough airfield in aviation use as it was realized that the lack of space in the south-east for business aviation could have a serious impact on the regional economy. The small civil operation started by Farnborough Business Aviation under licence from the MoD is now operated by TAG Aviation.

Slough Estates Plc (now Segro) bought the factory site in 1999 with the intention of demolishing most of the factory buildings to develop the site as Farnborough Business Park to accommodate nearly two million square feet (371,600 m²) of office space. The site contained over 100 buildings, four of which were listed: three at Grade II and one at Grade II*. No part



Figure 6 View of the factory site and airfield from the east in 1999. (Farnborough Air Sciences Trust)

of the site had conservation area status. *The Times* reported the chairman of FAST as saying, 'Machinery that gave Britain its brilliant reputation in aviation development is everywhere to be seen and much of it still works'.⁴

A development brief for the historic core of the factory site

As part of the planning process for the new business park, a Section 106 Agreement required the developer to prepare a Development Brief for the historic core at the east end of the site to safeguard the settings and long-term future of the four listed buildings before any demolition or redevelopment could take place in this area. Rushmoor Borough Council commissioned a historic buildings adviser, Dean Clarke, to inspect all the buildings on the factory site and identify those of interest to inform the planning process. His report identified 29 unlisted buildings of interest in addition to the four listed buildings, but there was no legislation to protect them due to Rushmoor's earlier refusal to grant conservation area status.

Julian Harrap Architects began preparing the Development Brief in 2000. Consultations with amenity societies and statutory consultees, particularly FAST, SAVE Britain's Heritage (SAVE) and English Heritage, began with the establishment of the boundary of the Development Brief area around the listed wind tunnels. Outside this boundary, Segro set about demolishing all the factory buildings including workshops, laboratories, test facilities, offices and hangars. This prompted SAVE to publish a report⁵ in December 2001 highlighting the importance of the listed buildings of interest (as identified by Dean Clarke) within the Development Brief area.

The Development Brief described the overall historic character of the area and defined those elements that contributed to the character. Recommendations were made to retain certain unlisted buildings important to the settings of the wind tunnels. Reuse possibilities for the wind tunnel buildings and for any unlisted buildings to be retained were identified, together with a suitable provision for car parking according to the nature of the future anticipated use of each building. The road layout was defined and opportunities for new development identified, together with design criteria to ensure that any new development was in keeping with the historic character of the Development Brief area.

Demolition of listed sheds Q65 and R51 was proposed with salvage of the historic components of the former portable airship hangar in order to re-erect the hangar frame, thereby liberating two large sites for redevelopment. Julian Harrap Architects obtained listed building consent for the demolitions in 2002, linked to a Section 106 Agreement requiring the re-erection of the 1912 airship hangar in the central square of the business park.



Figure 7 CAD drawing of the re-erected 1912 airship hangar in the central square of the IQ business park. (Blink)

During the preparation of the Development Brief, English Heritage reviewed the listed status of the wind tunnel buildings in 2003 and redesignated both Q121 and R133 as Grade I, and listed R52 at Grade II. R136 had statutory protection by being physically attached to the listed building R133. Rushmoor Borough Council approved the Development Brief in 2003 and Segro proceeded with the demolition of all the buildings it was not legally obliged to retain.

As key to encouraging redevelopment and reuse of existing buildings, the Development Brief identified the need to preserve and repair the listed wind tunnels and their settings. The historic area appeared so derelict and unattractive that Segro feared it would deter commercial redevelopment of surrounding sites. During 2002, in a stagnant commercial property market, Segro instructed Julian Harrap Architects to draw up proposals to repair and enhance the wind tunnels and their settings. The intention was to undertake works while the market was flat with the hope of attracting new tenants when conditions improved.

Conservation of the windtunnel buildings: The brief and philosophy

The architects established a brief and philosophy for works to the wind tunnels with the client and authorities. The statutory duty was to fulfil the owner's obligations to ensure the buildings were wind- and weather-tight,

and to design repairs and alterations of high quality as appropriate for listed buildings. A conservation plan was prepared which identified a hierarchy of significance for each part of the listed buildings. Segro's priority was to repair and alter the buildings to encourage their reuse; the architects carefully edited later additions to the buildings and sought approval to demolish those of less interest in order to enhance presentation and reuse prospects of the wind tunnel buildings. This was contrary to an archaeological approach to conservation whereby every alteration is given a status equal to the original design and fabric, and retained as a record of the building's development.

The conservation principle of minimum intervention to the historic fabric was in each case weighed by the architects against the client's wish for repairs to be designed for a 25-year lifespan, with maintenance requirements kept to a minimum. Retention of the patina of age, original workmanship and materials was considered important, and new repairs were carefully designed to ensure they did not dominate or visually jar against the weathered historic fabric.

The established principle of honesty in conservation (i.e. of making no attempt to conceal a repair) was intentionally contradicted where an intervention would shout out its presence and detract from the historic composition. Honesty was, however, embraced with the use of twenty-first-century materials and technology where the original fabric of the building had failed due to poor design or inherent problems with the materials. This occurred in many instances as the wind tunnel buildings were erected by the factory's construction department, mostly in wartime conditions, unhindered by building regulations or statutory requirements, and most likely for a limited lifespan.

Both the architects and the local group of enthusiasts, FAST, were keen to interpret the original uses of the buildings to the public and to ensure that any alterations to the buildings should not restrict their future reuse as wind tunnels (should there be a demand). Pre-contract recording of the listed buildings consisted of a detailed measured survey of the wind tunnel buildings and professional record photos of the exteriors and interiors. No work to the interiors was to be undertaken at this stage: this would be the responsibility of future lessees. Listed building consent applications were prepared by Julian Harrap Architects for repairs and alterations to the buildings' exteriors and submitted for consent.

Restoration of R52, the earliest wind tunnel building

R52 was restored to its impressive original 1916 form to attract new uses for the building and development to the surrounding sites. This involved demolition of some archaeologically really quite interesting alterations



Figure 8a R52 in 1999 showing extensions to the original 1916 wind tunnel building. (Farnborough Air Sciences Trust)



Figure 8b R52 on completion of the repair contract. (Julian Harrap Architects)

reflecting the changes to the building in order to accommodate different wind tunnels over time.

The six structures added since 1916 had been assessed in the conservation plan as being less significant than the original structure. Their demolition involved a degree of loss in conservation terms, but the restoration of the original resulted in a very significant positive contribution towards the historic area of the business park.

To reflect the original roof finish of diamond patterned asbestos slates, the unbonded single membrane was replaced with a new diamond pattern

slate roof with aluminium-framed double-glazed rooflights on the north roof slopes. To support the increased weight of the new roof finishes, the lightweight steel trusses were reinforced with duplicated steel flats bolted to double up the existing steels. Extensive brickwork repairs were required to infill the large 1940s openings made in the external solid brick walls. To match the length of the calcium silicate imperial bricks, new bricks were 'extended' by sticking a slice of brick to one end of a standard brick to lengthen it. Single-glazed steel windows were reinstated into the original empty window openings using the universal range of galvanized hot rolled mild steel sections. Industrial doors and ironmongery were overhauled and repaired with duplicates made to match those that were missing.

Conservation and repair of Q121, the low speed wind tunnel building

Building Q121 appeared in 1999 to be substantially unaltered from its original 1935 form. The steel framing of the walls and the flat roof of the massive return air duct of the wind tunnel are encased in concrete, with cast in situ reinforced concrete panels in between. The structural framing projects externally in order to keep the internal concrete walls, ceiling and floor of the return air circuit completely smooth and unobstructed, and

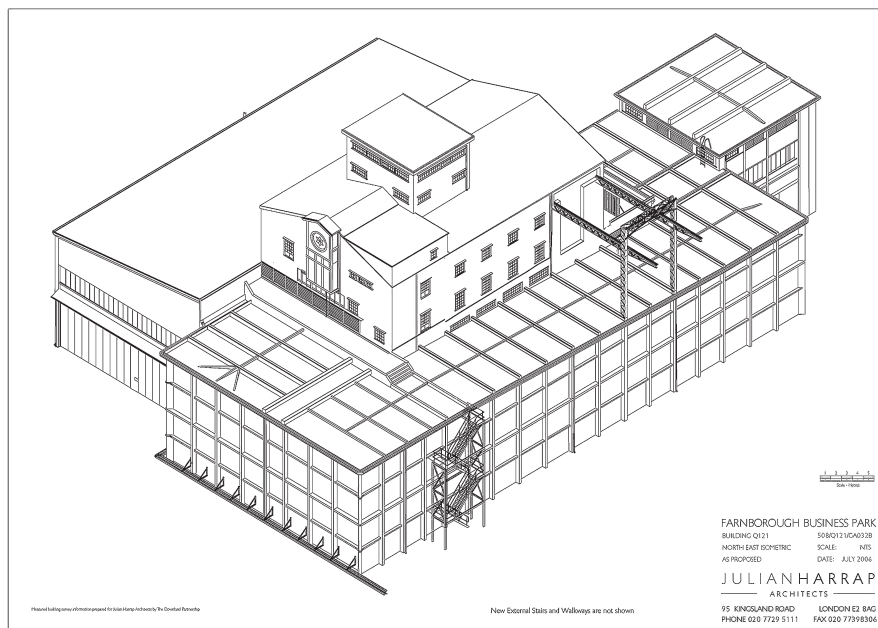


Figure 9 Isometric drawing of Q121 from the north east. (Julian Harrap Architects)

thus reduce friction of the air flow. Rising above the test area of the wind tunnel is the raised central portion to the building containing the first, second, third and fourth floors; the steel frame to these upper floors was clad with coated corrugated steel sheets. A hangar against the south side of the wind tunnel housed the aircraft and components to be tested. Huge timber folding doors at each end of the hangar allowed aircraft in and out; above the doors, rows of patent glazing were still painted black from the wartime blackouts. Inside the building, a 30-ft-diameter mahogany fan circulated air over the test area. An external gantry provided access for models to the building at high level, and these could be lowered to the test area via fixed lifting gear.

The asbestos-coated steel corrugated cladding to the upper steel frame was replaced in the repair contract with sheets of Rheinzink, corrugated to match the original profile. The felt and plywood finish of the hangar roof was replaced with a Rheinzink standing seam roof on insulated board. Felt and bitumen were removed from the concrete flat roofs of the return air duct and the concrete was tested for carbonation and chlorides. It was then repaired and coated with Belzona, a breathable liquid roofing membrane.



Figure 10 View from the scaffolding looking up to the fourth floor of Q121 during replacement of the original asbestos coated corrugated steel cladding with new corrugated Rheinzink cladding.

Concrete repairs to the encased steel columns and the reinforced concrete panels were undertaken using a combination of proprietary repair products with local aggregates in order to match the texture and colours of the 1930s concrete. Single-glazed steel casement windows were repaired and replaced where necessary and the massive hangar doors were overhauled and repaired. The wind tunnel building was redecorated externally with reference to the historic paint analysis which showed the return air duct to have been varnished concrete. Lightning protection was renewed, and external lighting and CCTV cameras installed. Electrical power was brought into the building to power the Farnborough Airfield navigation light on top of Q121 and the exterior clock, which was overhauled and upgraded.

Conservation and repair of R133, the transonic windtunnel building

The original 1940s structures of R133/R136 are made entirely of cast in situ reinforced concrete. Offices and workshops, the fan motor and cooling plant built around the central wind tunnel chamber are all of the same construction. External walls were painted titanium white and the roofs were covered by a woven glassfibre scrim bonded with bitumen.

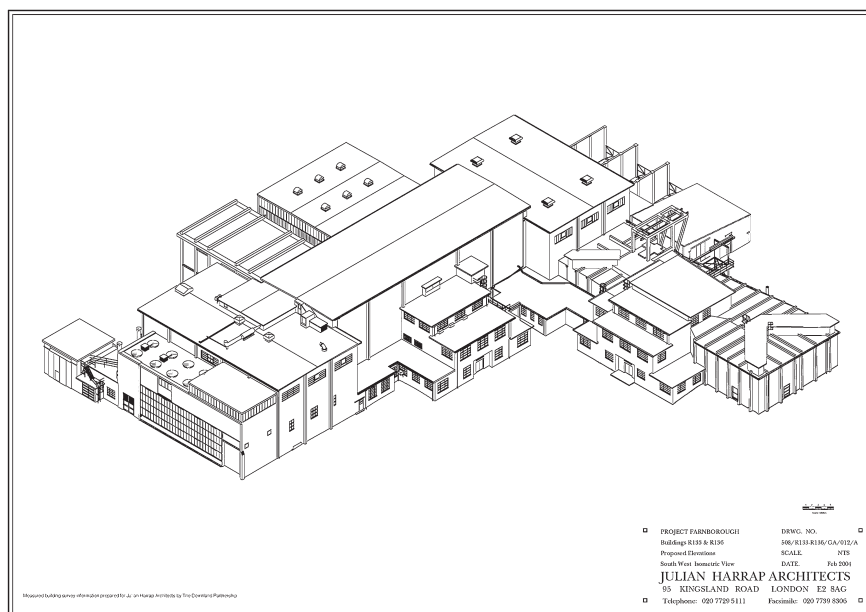


Figure 11 Isometric drawing of R133 and R136 from the south-west. (Julian Harrap Architects)



Figure 12
Photo of the entrance to R133 on completion, showing the camouflage-painted transonic chamber. (Julian Harrap Architects)

During the repair contract, the concrete walls were glass-blasted to remove the paint finishes and to reveal the extent of the damaged concrete. Spalling concrete was cut out around rusting reinforcement bars, the steel treated for corrosion, and the concrete reinstated using a proprietary product with aggregate mixed into the top layer to match the varying finishes of the weathered concrete adjacent. Concrete walls were then repainted using an anti-carbonation paint, the historic paint analysis informing some of the colours selected, including camouflage paint to the principal wind tunnel housing. Concrete roofs were again repaired and coated with Belzona (specially coloured).

The many items of exterior plant, extracts, vents and cowls, together with external ladders and access platforms were removed, repaired, redecorated and refixed. The 1930s universal steel casement windows were either repaired and redecorated in situ, or replaced where their condition was poor. Timber and steel external doors were repaired, together with their mechanisms. Early twentieth-century ironmongery was sourced to replace missing ironmongery, often from other buildings on the site due for demolition. Later, unsightly additions such as external roof walkways were removed and new fall restraint systems added to some roofs. New aluminium box gutters replaced the original rusty pressed metal, and cast iron rainwater pipes were overhauled and reused or replaced to match. A new design for an aluminium swan neck replaced the old connection between the downpipes and gutter on the projecting concrete soffits.

The historic buildings within the business park

The contract for works to the listed buildings and their settings started late in 2004, under contract management by Segro, and continued until 2008. The re-erected airship hangar, which was completed before the wind tunnels, was re-listed Grade II in 2006. On completion of the works, Julian Harrap Architects submitted the historic buildings for various awards with some success.⁶

The historic core is now a very interesting and attractive place and has, without doubt, attracted housing and commercial development to the surrounding sites. Segro uses images of the re-erected airship hangar on its promotional materials to attract new businesses to the site, and the hangar public square is well used and surrounded by new office buildings. The former factory buildings, retained due to their contribution to the listed wind tunnels, have all been successfully converted to new uses. Former weapons testing building Q134 is Segro's reception building at the heart of the business park. A housing developer was attracted to a large development site adjacent to R133 and has built several new apartment buildings overlooking the transonic wind tunnel building. Q153 (structural test building) and R178 (materials and chemistry department) have been converted to apartments. The former telephone exchange building, Q170, is now a nursery for children of people employed at the site. Segro has tried, without success to date, to market R136, Q121 and R52 for wind tunnel use, commissioning FAST to prepare detailed reports to facilitate their reuse and placing adverts in the technical press aimed at potential users in industry and the universities.

The exteriors of Q121 and R133 have been used for advertising photo shoots to raise some revenue, but the cost of their upkeep, security and maintenance greatly exceeds any income generated directly from the wind tunnel buildings. The greatest running cost is the massive building insurance premiums being paid for the wind tunnels owing to the cost of reinstating them if damaged or destroyed. It may be possible for Segro to agree with the authorities the level of reinstatement required if the buildings are damaged or destroyed, and use this information to reduce building insurance premiums.

At the beginning of 2010 a lease was being negotiated for use of listed building R52 for a restaurant and corporate functions in the empty bays, each with views of the timber wind tunnel. The same developer has shown interest in using the enormous hangar of Q121 for events, with an ambition to refurbish the interior ground floor for use during the Farnborough Airshow 2012. He has also shown interest in R133 for various uses (workshops, offices and archive storage) to suit the different areas of the building.

As architects for the wind tunnels' repairs, Julian Harrap Architects understand the enormous risk for a lessee taking on a full repairing lease for a Grade I-listed wind tunnel building, with massive building insurance premiums, un-refurbished interiors containing asbestos and other hazardous materials, and an enormous amount of machinery which is also Grade I listed as it is fixed to the building.

Segro may need to consider selling the buildings to attract new uses or establishing a trust to raise funds for their future use and to lease usable areas. A flexible approach is required, but meanwhile the conservation of the wind tunnels with their settings and re-erection of the airship hangar has enabled commercial development of all the surrounding sites at IQ Farnborough.

Biography

Judy Allen, Project Architect for the repair of the listed wind tunnels at Farnborough
Judy Allen is an Associate at Julian Harrap Architects, historic building specialists. She has been with the practice for 22 years, working as project architect for many Grade I-listed buildings including The Monument, Sir John Soane's Museum, Cliveden, St Clement Eastcheap and Headstone Manor.

Project details

Client, quantity surveyor, principal contractor: Segro

Architect: Julian Harrap Architects

Structural engineer: Hockley & Dawson

Notes

- 1 L. Peskett, Farnborough Air Science Trust.
- 2 Singmaster, D., 'Wings of change. AJ building study', *Architects Journal*, 15 November 2001, pp. 32–41.
- 3 SAVE, *Enough has been bulldozed! SAVE Farnborough, The Cradle of British Aviation*, SAVE Britain's Heritage, London (2001).
- 4 Binney, M., 'Down to earth with a bump', *The Times*, 10 July 1999.
- 5 SAVE, *op. cit.*
- 6 The re-erected airship hangar won an RIBA Award in 2007. The listed wind tunnels were given an RIBA Award in 2008 and were one of five projects short-listed for the RIBA Crown Conservation Award that year. The wind tunnels and hangar were Overall Winners of the RICS South East Awards 2009, Runner Up in the Conservation category and commended for Building Conservation in the RICS National Awards 2009. The Airship Hangar was awarded the prize for Best Environmental Improvement Scheme by Rushmoor Borough Council in its Design Awards 2009.