Case Name: Dunsfold: Engine running pens and V/STOL blast grids, Dunsfold airfield

Case Number: 1446285

Background

Historic England has been requested to assess the engine running pens and V/STOL blast grids at Dunsfold airfield, for listing.

Asset(s) under Assessment

Facts about the asset(s) can be found in the Annex(es) to this report.

Annex	List Entry Number	Name	Heritage Category	HE Recommendation
1	1446621	Engine running pens at Dunsfold airfield	Listing	Add to List
2	1447246	V/STOL blast grid at Dunsfold airfield	Listing	Add to List

Visits

Date	Visit Type
08 March 2017	Full inspection

Context

This case combines the assessment of the listing applications for the engine running pens (UDS 1442394) and the V/STOL (Vertical/Short Take Off and Landing) blast grids (UDS 1443224), both at Dunsfold airfield. These structures are linked in location and purpose and are therefore best addressed together.

Planning permission has been approved by Waverly Borough Council for approximately 1,800 houses at the airfield, which may result in the loss of some of the heritage assets. However this decision has been 'called in' by the Secretary of State for determination in 2017. Waverley Borough Council is also assessing the site for potential conservation area status. The engine running pens and V/STOL blast grids are under threat of demolition or re-location from the development plan.

A number of other buildings and structures at Dunsfold have recently been listed, including the 1942 airfield memorial (National Heritage List for England 1447316) and a Royal Observer Corps monitoring post (NHLE 1447588). Primemeads, a former farmhouse on the site, has recently been listed at Grade II (NHLE 1440373).

Assessment

CONSULTATION

The applicant, owners, leaseholders, local planning authority, and Surrey Historic Environment Record (HER) were all consulted. Cranleigh Freight Services, who occupy the engine testing pens, responded with a query relating to the impact of listing on operational usage of the structures to which a response was sent.

The owners of Dunsfold airfield maintain that the engine running pens were not used for engine research (this having taken place at the manufacturers site), but more for operational testing, and that facilities of this nature exist across many airfields in Britain. They do acknowledge that the eastern-most pen has been

modified for V/STOL, however they argue that both engine running pens do not have architectural, or historic special interest and therefore do not meet the criteria for listing. The owners also responded with further information on the V/STOL blast grids identifying that there are two structures to the western end of the runway (rather than one) and one to the eastern end. The example to the east and the larger example to the west are now thought to be c1970 additions and without a sub-structure. The smaller western example is probably the c1960 blast grid used for the original hover trials, but the owner does not know if any sub-structure remains. They argue that the larger grids do not have special historic interest, and that the lack of understanding of the extent of the historic fabric remaining in the smaller grid, means that there is doubt over whether it merits listing.
HISTORIC ENGLAND RESPONSE: the owner's comments are covered in the Discussion below, and the Details and History sections have been updated where appropriate.

Research colleagues at Historic England noted that the jet engine and V/STOL research facilities at Dunsfold are rare structural types and that research sites can be of national significance, particularly where there is a direct link between a test facility and a named aircraft. They therefore suggest that there is a very strong case for the facilities associated with the development of the Hawker Hunter, V/STOL and the Harrier, due to their appreciation as examples of world–class British technological achievement, and in the case of the Harrier, the only viable aviation development of V/STOL technology.

The HER stated they had nothing to add, and no other responses were received.

DISCUSSION

The engine running pens and blast grids are assessed against the Principles of Selection for Listing Buildings (DCMS March 2010) which set out how the Secretary of State determines whether a building is of special interest and therefore merits listing. The principles also identify that a building or structure may be of special interest as an illustration of an important aspect of the nation's military or industrial history. The Historic England Listing Selection Guide for Military Structures (April 2011) notes the significance of the Cold War and those structures that can help us understand this part of the nation's recent history. Factors for consideration when assessing military structures include: whether they are strongly representative of a phase or activity, how they contribute to understanding defence policy, if they are rare survivals of their type, and whether their structural integrity remains along with evidence of internal configuration, plant and fittings. Technological developments are also likely to be important, and the claims to special interest can often be greatly strengthened by group value factors. The Historic England Listing Selection Guide for Industrial Structures (April 2011) notes that the industrial heritage of the last 100 years is not as easy to evaluate as the periods that came before. With specific reference to technology it also identifies that where alterations of a structure provide evidence of technological change that alteration can have a positive value on architectural interest. With regard to historic interest, this can be association with notable achievements which may be sufficient to justify listing on this basis alone. The relevance of this factor depends on the force of the historical claims, and the significance of the persons or products involved at the site in question.

The two engine running pens and the V/STOL blast grids are tangible reminders of the golden age of British military jet-aviation in the second half of the C20. The pens were designed first to test and prepare the Hawker Hunter which went on to serve in operational squadrons across the world, and in the hands of Squadron Leader Neville Duke, broke the world speed record. The confidence of the jet-age and Britain's lead in this technology is reflected in their fabric, and despite some alteration they are still able to convey the investment made in the military jet-aircraft, and the awesome power produced by the combat jet engine. The western example through its conversion to a V/STOL testing facility tells the story of the new challenges involved in testing this technology. The enclosing of the test area, the addition of a subterranean diffuser pit, metal cladding and sound-proofed control rooms being necessary in order to test the aircraft engine in all vectors, and deal with the resultant exhaust gases and thrust. These structures represent the evolution of Hawker Siddeley technology and the airfield's significant place in the development of perhaps the most influential range of military aircraft ever produced. C Ashworth in his review of south-eastern military airfields reported in 1985 that 'Starting with the P.1127's first tentative hover on October 21 1960 up to the Sea Harrier, all British development, assembly and testing of this family of vertical take-off aircraft has been at Dunsfold'. The survival of the two pens in tandem is particularly instructive, and serves to show how the architecture of the buildings was adapted to meet the changing technological challenges of an evolving product line.

Responding to the commentary of the owner on the consultation report, it is acknowledged that other aircraft companies and perhaps operational stations would have had areas for testing engines after manufacture or servicing. However, no mid-C20 engine-in airframe testing facilities are known to exist or survive at Hatfield (De Haviland), Ansty (Gloucester) and Hucknall (Rolls-Royce). At operational stations, serviced jet-aircraft

were normally taken to remote areas of the taxi-way where the engines were run-up whilst the pilot or engineer held the aircraft on the brakes. If any pens were built on operational stations, then they would probably not have been on anything like the scale of the structures at Dunsfold. The Harrier test pen is particularly rare, if not unique. It is also acknowledged that the Pegasus engine of the Harrier would have been tested at its place of design and manufacture (Bristol), but crucially the combination of engine and airframe, along with all the technology to control both was developed, manufactured, and tested at Dunsfold.

With regard to the V/STOL blast grids, the owner, via the consultation process, identified that the two larger structures were later additions from c1970, and that their purpose and level of survival was unknown. They were probably designed in their present metal-sheeted form and may have been used for testing of Harriers in modes where there was a concern that the tarmac runway surface may be damaged. As their role is unclear and they appear to date from a period of mainstream manufacture rather than prototype development, they are not recommended for listing. However, the smaller western example has a bolted access hatch which strongly suggests that this was the site of the original V/STOL tests of 1960. Photographs of the grid under construction, and a P.1127 in a tethered hover over the grid, show that it was specially designed with a set of vanes held within a steel box grid. The structure was clearly designed for the specific task, and in this regard it needed to disperse the exhaust gases, whilst allowing the aircraft to create sufficient lift for a vertical take-off. It is probably unique, and displays the specialised architectural design required for the crucial first V/STOL tests. The presence of an access hatch within the centre of the steel plate cover, indicates that a void still exists below, which is likely to retain the box grid of vanes.

Comparable aviation testing and manufacturing sites are represented on the List. The earliest is the Ladywood works of Sir Frank Whittle (National Heritage List for England reference 1392641, listed at Grade II*), where he developed, built and brought to production the first viable jet aircraft engine. In terms of architectural quality, the interest in the buildings is limited, but it is what happened in the buildings, which helped to shape C20 aviation, that makes them of the utmost importance. This is also true of other listed Cold War research and development facilities. The engine pens and the smaller western V/STOL blast grid sit well in this company with their special architectural interest lying in their technological capability for testing advanced military equipment, and their special historic interest relating to their role in developing key British products. The use of Dunsfold airfield as a centre for the development of military aircraft by Hawker Siddeley including the Hunter (one of the RAF's front-line fighters during the Cold War), and the later Harrier (in service during the latter part of the conflict), also provides a clear claim to associative interest with the Cold War period.

The construction of the airfield that became the physical home of these structures is commemorated through a memorial by Stephen Trenka, which was constructed in 1942. There is also a Royal Observer Corps observation post on the site which also has associative value with the Cold War period. There is a case for group value with these structures, which have been recently listed at Grade II.

Taking all of the above into consideration it is clear that there is a strong case for the Dunsfold engine pens, and the smaller western blast grid having the necessary architectural and historic special interest for listing. In summary, both engine running pens are well preserved examples of buildings designed to accommodate the needs of firstly the golden age of the British military combat jet, and later the hugely significant development and manufacture of the Harrier jump jet. The V/STOL blast grid is also a crucial part of the story and, as it is able to demonstrate technology developed for hover testing, it has a strong claim to being the epicentre of the V/STOL story. It is assumed that the blast grid survives in a relatively unaltered form beneath the protective steel-sheeting. There are again clear associative links with the Cold War period, with the V/STOL concept being specifically designed to operate from dispersed sites rather than major airfields which would have been unlikely to survive the initial nuclear attack. In addition there is group value with other C20 structures on the airfield which are being recommended for listing. The engine running pens and blast grid are therefore, recommended for inclusion on the statutory List at Grade II.

In recommending the extent of designation we have considered whether powers of exclusion under s1 (5A) of the 1990 Act are appropriate and consider that they are not.

CONCLUSION

After examining all the records and other relevant information, and having carefully considered the architectural and historic interest of this case, the criteria for listing are fulfilled and the former engine running pens and the smaller western 1960s V/STOL blast grid are recommended for listing at Grade II.

REASONS FOR DESIGNATION DECISION

The engine running pens and the smaller western 1960s V/STOL blast grid at Dunsfold airfield, all designed to develop and test Hawker Siddeley jet aircraft including the Hunter and Harrier jump jet, are recommended for listing at Grade II for the following principal reasons:

ENGINE RUNNING PENS

Historic interest:

* For their essential role in the testing of Hawker Siddeley combat aircraft, including modification for the development and testing of the Harrier jump jet. Collectively they help to tell the story of testing the Hawker Siddeley product line;

* The pair at Dunsfold are especially rare as both were designed for engine-in airframe research, development, and pre-delivery testing;

* Associative value with the Cold War; the Hunter being at the forefront of Britain's fighter defence against airborne nuclear attack, the Harrier jump jet designed to operate from remote sites, rather than major airfields which were likely to be lost during a nuclear attack.

Architectural interest:

* The architectural interest of these buildings and structures is in their technological fabric and in their display of the jet-age confidence inherent in the British aviation industry of the mid to late C20;

* The western engine pen is of particular interest due to its modification for V/STOL testing, including a subterranean diffuser pit, control room, and fully enclosed metal-sheeted walls developed to test and develop the vectored thrust of V/STOL aircraft.

Group value:

* The engine running pens, and the smaller western V/STOL blast grid, form an important group of structures at Dunsfold, which are directly related to the creation, testing, and manufacture of the iconic Harrier jump jet;

* With the Grade II listed 1942 airfield memorial and the Royal Observer Corps observation post.

V/STOL BLAST GRID

Historic interest:

* For its essential role in the testing of the V/STOL prototype which was the precursor to the Harrier jump jet, which went on to arguably be the nation's most successful late-C20 military combat jet aircraft;

* The hover grid is probably unique and can be considered to be the epicentre of V/STOL development in England;

* Associative value with the preparation for the Cold War as V/STOL was designed to allow operation from remote sites, rather than major airfields which were likely to be lost during a nuclear attack.

Architectural interest:

* The V/STOL blast grid through its technological structure is able to show how facilities were designed for the specialised needs of leading-edge V/STOL aviation testing.

Group value:

* With the engine running pens, the V/STOL blast grid forms an important group of structures at Dunsfold, which are directly related to the creation, testing, and manufacture of the iconic Harrier jump jet.

* With the Grade II listed 1942 airfield memorial and the Royal Observer Corps observation post.

Countersigning comments:

Agreed. Dunsfold is a site of particular national importance in the story of the development of military jet aviation and this is expressed in the survival of two engine running pens and the V/STOL blast grid. The structures are exceptionally rare survivals and bare witness to Britain's place at the forefront of this leading-edge technology and therefore merit listing at Grade II. P Metz, 5 September 2017

Second Countersigning comments:

Agree also. The pens and blast grid at Dunsfold are very rare, possibly unique structures nationally relating to key technological developments in British aviation history with international reach and influence, and as such they should be listed at Grade II.
V Fiorato, 20 September 2017

Annex 1

List Entry

List Entry Summary
This building is listed under the Planning (Listed Buildings and Conservation Areas) Act 1990 as amended for its special architectural or historic interest.

Name: Engine running pens at Dunsfold airfield

List Entry Number: 1446621

Location
Dunsfold Airfield, Cranleigh, Surrey, GU6 8TB

The building may lie within the boundary of more than one authority.

County	District	District Type	Parish
Surrey	Waverley	District Authority	Dunsfold

National Park: Not applicable to this List entry.

Grade: II

Date first listed:
Date of most recent amendment:

Legacy System Information
This section only relates to older records, created before the introduction of the National Heritage List for England in 2011.

Legacy System: Not applicable to this List entry.
Legacy Number: Not applicable to this List entry.

Asset Groupings
This List entry does not comprise part of an Asset Grouping. Asset Groupings are not part of the official record but are added later for information.

List Entry Description

Summary of Building
Two brick built jet-engine running pens, c1950, with the eastern example modified c1960 for V/STOL engine testing.

Reasons for Designation
The engine running pens at Dunsfold airfield, designed to develop and test Hawker Siddeley jet aircraft including the Hunter and Harrier jump jet, are listed at Grade II for the following principal reasons:

Historic interest:

* For their essential role in the testing of Hawker Siddeley combat aircraft, including modification for the development and testing of the Harrier jump jet. Collectively they help to tell the story of testing the Hawker Siddeley product line;

* The pair at Dunsfold are especially rare as both were designed for engine-in airframe research, development, and pre-delivery testing;

* Associative value with the Cold War; the Hunter being at the forefront of Britain's fighter defence against airborne nuclear attack, the Harrier jump jet designed to operate from remote sites, rather than major airfields which were likely to be lost during a nuclear attack.

Architectural interest:

* The architectural interest of these buildings and structures is in their technological fabric and in their display of the jet-age confidence inherent in the British aviation industry of the mid to late C20;

* The western engine pen is of particular interest due to its modification for V/STOL testing, including a subterranean diffuser pit, control room, and fully enclosed metal-sheeted walls developed to test and develop the vectored thrust of V/STOL aircraft.

Group value:

* The engine running pens, and the smaller western V/STOL blast grid form an important group of structures at Dunsfold, which are directly related to the creation, testing, and manufacture of the iconic Harrier jump jet;

* With the Grade II listed 1942 airfield memorial and the Royal Observer Corps observation post.

History

The engine running pens were built to support the development and manufacture of jet aircraft from c1950 at Dunsfold airfield.

The airfield was constructed for the military in 1942 by Royal Canadian Engineers. Initially it was home to four squadrons of Tomahawks and Mustangs, tasked with training and reconnaissance. By August 1943 it had become a bomber base, supporting Mitchell bombers on European missions, and by 1944 the airfield had three runways and accommodation for over a 1,000 personnel.

In the early 1950s Hawker Siddeley were developing jet aircraft for which the short, grass landing strips then available to them were insufficient. Long hard-surfaced runways were required and Dunsfold was identified as a base which could work hand in hand with their existing factory in Kingston, Surrey. This was a period of consolidation for the many private British aircraft companies, and with the benefit of Britain’s lead in jet engine technology, these newly consolidated companies had the financial wherewithal and technical capability to lead the world in jet aviation. During the 1950s and 1960s, huge advances were made and for this brief period of time, Britain led the world in this area.

On taking over Dunsfold airfield, Hawker Siddeley developed a final assembly and experimental test facility including three engine running pens to test and develop the aircraft prior to delivery. The first aircraft to be developed and assembled at Dunsfold was the Hunter which at the time was at the cutting edge of military jet fighter development, and first took to the air in 1951. Flown by Squadron Leader Neville Duke, it later broke the world speed record achieving a speed of 727.6 mph on the 7 September 1953. Hunters were put into service by the Royal Air Force (RAF) in 1954, and after a number of teething problems, were in operational use until the 1990s.

By the start of the 1960s, the company was developing the concept of V/STOL (Vertical, Short Take Off and Landing) which involved the use of vectored thrust to lift a static or slow moving aircraft into the air. Once airborne, the engine thrust would be transitioned to the rear and the aircraft would achieve normal forward flight. Hawker Siddeley recognised a need for a fighter that could be operated away from large airfields, therefore reducing dependence on fixed airfields that were vulnerable to nuclear attack. In preparation, one of the engine running pens was redesigned to accommodate the need to test an engine that could create thrust in multiple directions. The existing diffuser (a device for dissipating jet engine thrust) and brick supporting

structure were removed, to enable a larger floor area within the pen. This area was then excavated to form a void which was fitted with a blast grid to diffuse vertical thrust. At the same time, a second control room was added and the inside of the pen was fitted out with metal covered insulation. A double-depth metal sliding door was also installed at the entrance so that when closed, noise and debris were suppressed. On 15 July 1960, the first P1127 Prototype V/STOL Strike Aircraft serial XP831, was delivered to Dunsfold airfield to commence static engine testing in the engine running pen. On 31 August 1960, the Pegasus engine was run for the first time while inside the aircraft. The first free hover of the prototype occurred on 19 November. In parallel, conventional taxi-trials were performed at speeds of up to 70 knots, and on 13 February 1962, the first conventional flight was achieved.

The P.1127 evolved into the Kestrel and then the Harrier. By 1969, the RAF was using Harriers operationally, and by 1980 the Sea Harrier variant was in use by the Royal Navy. Harriers saw action as part of the Falklands Task Force in 1982, operating from the carrier HMS Hermes some 8,000 miles from England. They flew 1,435 operational sorties, accounting for the destruction of 28 enemy aircraft, with no losses in the air. The Harrier went on to become probably the most successful British military aircraft to date, with 112 sold to the US Marine Corps. In total 879 Harrier aircraft were built at Dunsfold with an estimated sales value of £2.6 billion (2017 values), all of which were tested in the engine running pen, prior to delivery.

One of the three original engine running pens has now been demolished, and the north-western example has been modified to accommodate a truck-washing system.

Details

Two brick built jet-engine running pens, c1950, with the eastern example modified c1960 for V/STOL (Vertical/Short Take Off and Landing) testing.

PLAN: the north-western pen is U-shaped in plan, with the curve being to the north and housing an aperture for the former diffuser (a device for dissipating jet engine thrust). The eastern example is also U-shaped but has sliding doors to the south. The pens are accessed from the south, which is where the aircraft would have been reversed in and secured to the ground with its engine facing into the diffuser.

MATERIALS: mixed-stock brick, concrete, steel and steel sheet.

DETAILS:

WESTERN PEN

This pen is a largely open structure, built of brick in an English bond, with regular brick piers supporting the walls which are topped with concrete copping. The walls are approximately 2m deep and 5m high. The main elevation faces north and is semi-circular, with the central section marginally higher than the flanking walls. It has a large ovoid aperture where the diffuser would have been positioned. Above this area is an internal dome like structure faced in aluminium. Either side there are oversized pedestrian door apertures which give internal access to the former diffuser area. The walls either side of the central curved section, extend to the south, and have a number of irregular access doors or apertures. The working space contained by the walls has been adapted to house a late-C20 truck-wash system. The internal face of the brick walls has a regular pattern of inserted black bricks. The flanking walls have single storey brick control rooms, one of which is internal (western side) and the other projects from the wall to the east. They have small rectangular timber casement windows, and flat roofs. The interiors were converted to toilets or rest rooms in the late-C20.

EASTERN PEN

This pen is similar to the north-western example but has been modified to allow testing of V/STOL aircraft. The central section of the north-eastern face is largely open underneath a steel beam which replaced the original diffuser. The walls either side have brick buttresses interspersed along their length, which continue onto the flanking walls. The working space is larger, having been extended to the north-east end. The floor of the pen is largely concrete, but to the north-east end there is a subterranean diffuser pit, which is now covered in metal plate. The inside face of the pen is covered with brushed metal panels, including built-in control rooms to the north-west and south-east. The example to the south-east has a line of small rectangular top-hinged metal windows facing into the working area. There is also a pedestrian door to the control room, which is fitted out with a bench and seating. To the south-west, there is a large double-depth sliding aluminium door, which served as the aircraft entrance.

Selected Sources

Books and journals

Ashworth, C, Action Stations: 9. Military Airfields Of The Central South And South-East, (1985), .

Websites

Aviation website, accessed 10/4/2017 from http://www.flypast.com/view_article.asp?ID=6029

Friends of Dunsfold Aerodrome, accessed 10/4/2017 from https://dunsfoldairfield.org/

Harrier specific aviation website, accessed 10 May 2017 from http://www.harrier.org.uk/history/history3_4.htm

Map

National Grid Reference: TQ0214136459

The above map is for quick reference purposes only and may not be to scale. For a copy of the full scale map, please see the attached PDF - 1446621_1.pdf

Annex 2

List Entry

List Entry Summary

This building is listed under the Planning (Listed Buildings and Conservation Areas) Act 1990 as amended for its special architectural or historic interest.

Name: V/STOL blast grid at Dunsfold airfield

List Entry Number: 1447246

Location

Dunsfold Airfield, Cranleigh, Surrey, GU6 8TB

The building may lie within the boundary of more than one authority.

County	District	District Type	Parish
Surrey	Waverley	District Authority	Dunsfold

National Park: Not applicable to this List entry.

Grade: II

Date first listed:
Date of most recent amendment:

Legacy System Information
This section only relates to older records, created before the introduction of the National Heritage List for England in 2011.

Legacy System: Not applicable to this List entry.
Legacy Number: Not applicable to this List entry.

Asset Groupings
This List entry does not comprise part of an Asset Grouping. Asset Groupings are not part of the official record but are added later for information.

List Entry Description

Summary of Building
Steel V/STOL blast grid of 1960, located at the western end of the main runway at Dunsfold airfield.

Reasons for Designation
The western 1960s V/STOL blast grid at Dunsfold airfield, designed to test the V/STOL prototype in the hover, is listed at Grade II for the following principal reasons:

Historic interest:

* For its essential role in the testing of the V/STOL prototype which was the precursor to the Harrier jump jet, which went on to arguably be the nation's most successful late-C20 military combat jet aircraft;

* The hover grid is probably unique and can be considered to be the epicentre of V/STOL development in England;

* Associative value with the preparation for the Cold War as V/STOL was designed to allow operation from remote sites, rather than major airfields which were likely to be lost during a nuclear attack.

Architectural interest:

* The V/STOL blast grid through its technological structure is able to show how facilities were designed for the specialised needs of leading-edge V/STOL aviation testing.

Group value:

* With the engine running pens, the V/STOL blast grid forms an important group of structures at Dunsfold, which are directly related to the creation, testing, and manufacture of the iconic Harrier jump jet;

* With the Grade II listed 1942 airfield memorial and the Royal Observer Corps observation post.

History

The V/STOL (Vertical/Short Take Off and Landing) blast grids were built to support the development of a V/STOL fighter aircraft during the early 1960s at Dunsfold airfield.

The airfield was constructed for the military in 1942, by Royal Canadian Engineers. Initially it was home to four squadrons of Tomahawks and Mustangs, tasked with training and reconnaissance. By August 1943 it had become a bomber base, supporting Mitchell bombers on European missions, and by 1944 the airfield had three runways and accommodation for over a 1,000 personnel.

In the early 1950s Hawker Siddeley were developing jet aircraft for which the short, grass landing strips then available to them, were insufficient. Long hard-surfaced runways were required and Dunsfold was identified as a base which could work hand in hand with their existing factory in Kingston, Surrey. This was a period of consolidation for the many private British aircraft companies, and with the benefit of Britain's lead in jet engine technology, these newly consolidated companies had the financial wherewithal and technical capability to lead the world in jet aviation. During the 1950s and 1960s, huge advances were made and for this brief period of time, Britain led the world in this area.

On taking over Dunsfold airfield, Hawker Siddeley developed a final assembly and experimental test facility including engine running pens to test the jet engines in the aircraft prior to delivery. The first aircraft to be developed and assembled at Dunsfold was the Hunter which at the time was at the cutting edge of military jet fighter development, and first took to the air in 1951. Flown by Squadron Leader Neville Duke, it later broke the world speed record achieving a speed of 727.6 mph on the 7 September 1953. Hunters were put into service by the Royal Air Force (RAF) in 1954, and after a number of teething problems, were in operational use until the 1990s.

By the start of the 1960s, the company was developing the concept of V/STOL which involved the use of vectored thrust to lift a static or slow moving aircraft in to the air. Once airborne, the engine thrust would be transitioned to the rear and the aircraft would achieve normal forward flight. Hawker Siddeley recognised a need for a fighter that could be operated away from large airfields, therefore reducing dependence on fixed airfields that were vulnerable to nuclear attack. On 15 July 1960, the first P1127 Prototype V/STOL Strike Aircraft serial XP831, was delivered to Dunsfold airfield to commence static engine testing in the engine running pens. On 31 August 1960, the Pegasus engine was run for the first time while inside the aircraft.

Early testing of the concept was performed from the purpose-built V/STOL blast grid, which was located at the western end of the main runway. This was a new technology and the physics of vectored thrust were not fully understood. The grid was designed to deflect the hot exhaust gases away from the hovering aircraft, and protect the runway tarmac. It was also thought to be essential in eliminating the adverse effects of thrust losses due to re-ingestion of these hot gases, which was important as the thrust of the prototype engine was only adequate to lift the aircraft with a small fuel load, and all non-essential equipment removed. The designers were also concerned that the aircraft might depart controlled flight in the hover, so tethering points and lines were added to the grid, so that it could be held back in an emergency. Initially the tethers were set at a length of 1ft, and the first hover in this configuration was achieved by Bill Bedford on the 4 November 1961, with one of his legs still in plaster from an earlier car accident. Later, when the tethers were lengthened to 4ft the reaction controls of the aircraft were found to be inadequate. When the aircraft departed from the ground, it had a tendency to lift one wing ahead of the other, and there was too little roll-power within the controls to correct this. This lack of control caused the aircraft to 'cavort around like a drunken cow', until the controls were modified. The first free hover occurred on 19 November. In parallel, conventional taxi-trials were performed at speeds of up to 70 knots. Finally, on 13 February 1962, the first conventional flight was achieved.

The P.1127 evolved into the Kestrel and then the Harrier. By 1969, the RAF was using Harriers operationally, and by 1980 the Sea Harrier variant was in use by the Royal Navy. Harriers saw action as part of the Falklands Task Force in 1982, operating from the carrier HMS Hermes some 8,000 miles from England. They flew 1,435 operational sorties, accounting for the destruction of 28 enemy aircraft, with no losses in the air. The Harrier went on to become probably the most successful British military aircraft to date, with 112 sold to the US Marine Corps. In total 879 aircraft were built at Dunsfold with an estimated sales value of £2.6 billion (2017 values).

The V/STOL blast grid has been covered over with steel-plate but is believed to be otherwise intact. Two other larger steel-sheeted blast platforms (one to each end of the runway) were constructed in the 1970s, and were probably used for tests that would have otherwise harmed the runway tarmac.

Details

Steel V/STOL blast grid of 1960, located at the western end of the main runway at Dunsfold airfield.

MATERIALS: boxed-steel, brick, concrete and steel-plate.

PLAN: the grid is rectangular and measures approximately 10m by 20m. The longer edge faces broadly east-west along the main runway.

DESCRIPTION: for safety reasons, the grid is now completely covered with sections of steel-plate, but it is likely that the below ground structure survives. The following description is based on photographs taken during construction; the blast grid is sunk around 2m into the tarmac runway surface and is formed of multiple steel box-sections of approximately 0.5m by 1m, which are supported by steel uprights of circa 1.5m in height. Within each box-section there is a curved metal vane designed to disperse exhaust gases into the void below. The void is formed by brick walls and a concrete floor. To the centre of the grid there is an inset lifting door of finer box-section measuring approximately 2m by 3m, which probably provides access for maintenance to the underside of the grid.

Selected Sources

Books and journals

Ashworth, C, Action Stations: 9. Military Airfields Of The Central South And South-East, (1985), .

Websites

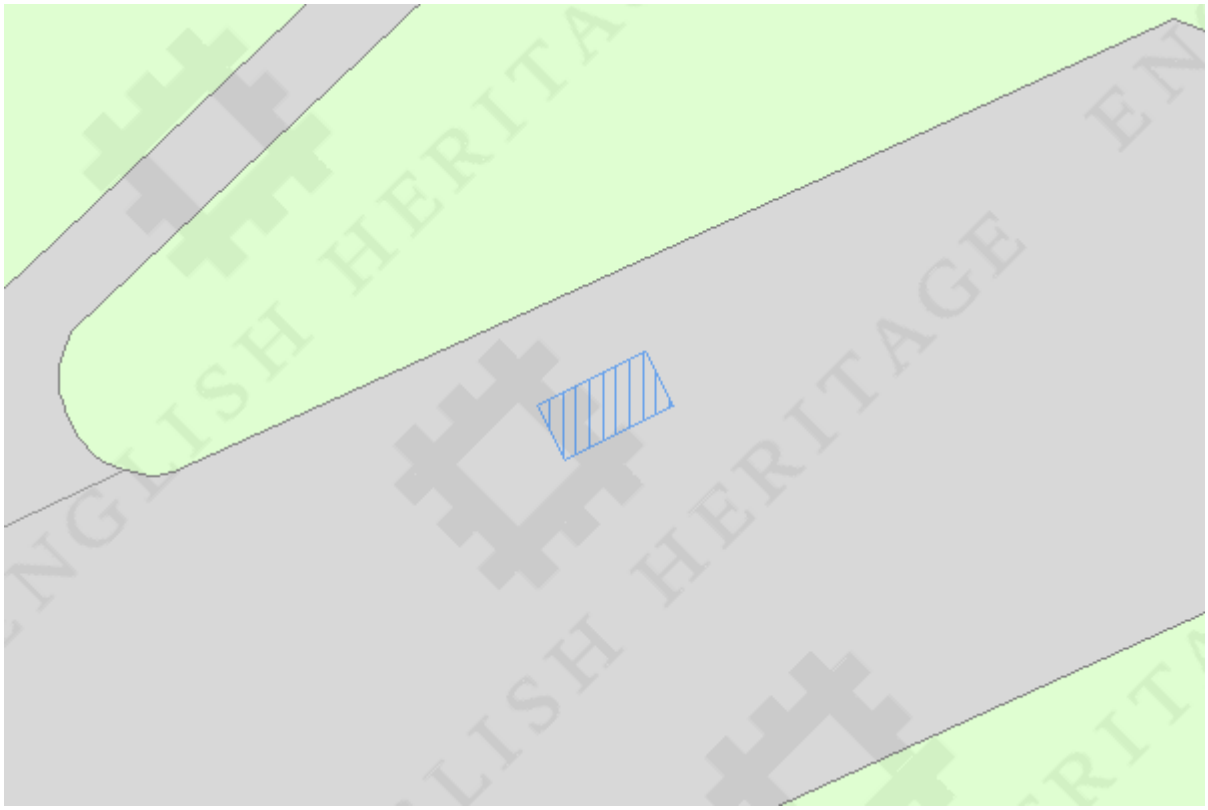
Aviation website, accessed viewed on 4/5/2017 from http://www.flypast.com/view_article.asp?ID=6029

Friends of Dunsfold Website, accessed viewed 5/5/2017 from https://dunsfoldairfield.org/

Harrier specific aviation site, accessed 10 May 2017 from http://www.harrier.org.uk/history/history3_4.htm

Map

National Grid Reference: TQ0182336060



The above map is for quick reference purposes only and may not be to scale. For a copy of the full scale map, please see the attached PDF - 1447246_1.pdf