

OLD SARUM AIRFIELD

HANGAR 3

CONDITION REPORT - 2023



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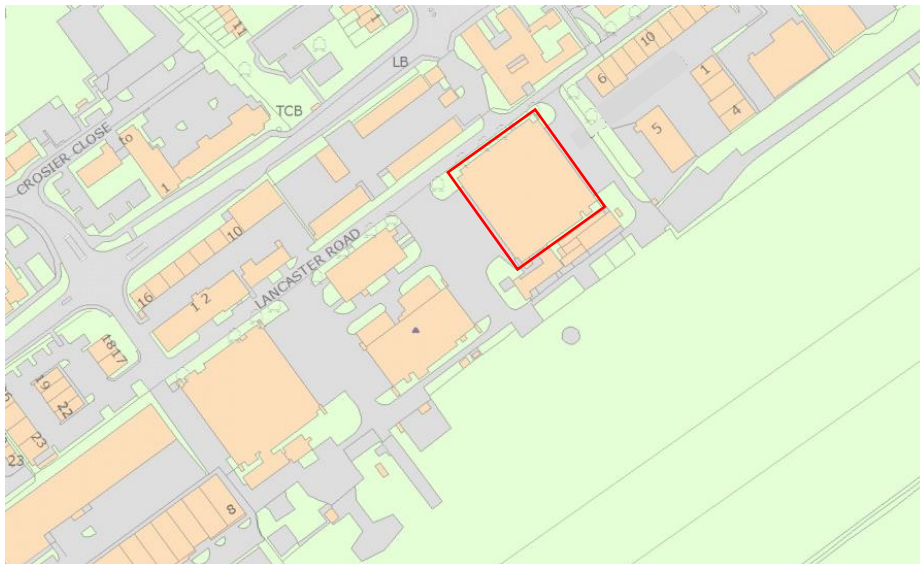
OLD SARUM AIRFIELD – HANGAR 3 CONDITION REPORT – 2023

1.0 INTRODUCTION

1.1 BRIEF DESCRIPTION & LOCATION

The Old Sarum Airfield is a Conservation Area with WW1 and WW2 buildings, several of which are now listed. These include three aircraft hangars, built towards the end of the First World War, which are listed grade II*. There were originally four hangars, but the westernmost one (Hangar 1) was destroyed in a fire a few years ago.

A gazetteer, produced in 2013, lists and describes all the relevant buildings remaining on the site. This is a useful record and reference, which helps understand the context of the various buildings. One significant feature of the site, unlike some other listed hangars, is that it retains its airfield.



Hangar 3 is the eastern of the three hangars. It and the western one (Hangar 2) are two-bays wide, whereas the middle one is one-bay wide.

These hangars are of historic interest because they are an early example of large structures built to accommodate aircraft. They are of particular significance because the large spans were achieved using timber lattice trusses (known as Belfast trusses), rather than steel. Their importance is reflected in their grade II* listing, as relatively unchanged examples of buildings of this type.

The site remained in use as an airfield after WW1 and the buildings were brought back into military use in WW2. Since the Second World War they have had a variety of uses, with some now used for commercial/light-industrial purposes. Key buildings still relate to their original use, such as Hangar 2, which houses the Boscombe Down Aviation Collection (aircraft museum), and Hangar 3, which is used as a base for a sky-diving venue & flying training centre (in ancillary buildings) and will house small aircraft once repaired.

1.2 REPORT

The three hangars were placed on Historic England's Heritage at Risk Register in November 2020. Hangar 3 is in poorest condition, with a lot of the roof having now collapsed.

This report records the observations of a condition survey of Hangar 3, carried out by Tim Ratcliffe (Conservation Architect with experience of repairing similar hangars at Hooton Park, Ellesmere Port) in April 2023.

The report was commissioned by Grenville Hodge, to help properly understand the condition of the hangar and ensure that proposed repairs are appropriate. It is intended to make the building wind and watertight, to bring it back into use and allow it to be removed from HE's Risk Register.

Accompanying this report is an Appendix, written by Tim Ratcliffe, outlining the repairs and interventions carried out at Hooton Park, for information.

The inspection was visual and did not involve any opening up of hidden voids and is based on findings made from the ground. Areas of concern requiring further investigation are referred to in the appropriate section of this report. Comments on the condition of timbers in the building are limited, as so many roof trusses have collapsed and most of the remaining ones are inaccessible.

1.3 ORIENTATION & DESCRIPTION

The site is orientated at about 30 degrees to compass points. In this report, the elevation facing the airfield is referred to as south and the elevation facing the access road is referred to as north.

The hangar is formed in 16 bays, with original low lean-to annexes along the north and south sides. Two rows of Belfast trusses span between the external brick piers and a central row of columns. Between the external piers are original painted steel casements, forming a high clerestory in 14 of the 16 bays, with infill walling above and below in brick.

At the west and east ends are full height doors designed to slide to external brick tower-gantries at the four corners. The doors are suspended on overhead rails, protected by a deep projecting weathering, and should slide on ground rails into their external brick tower-gantries. Between the doors is a brick pier with a recess carrying a large rainwater downpipe. Above the canopies over the door tracks are shallow curved gables, in line with the Belfast trusses, with a wide central ventilation louvre.

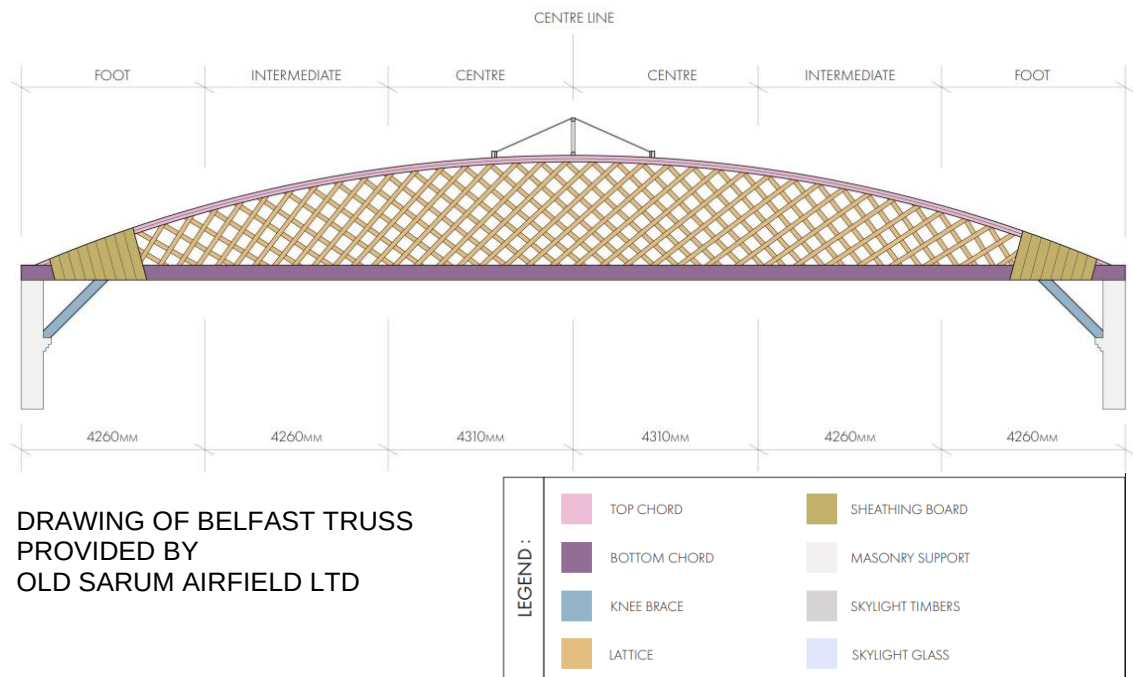
The 'Belfast' trusses are formed from small-section timbers, the top and bottom chords sandwiching a mesh of closely-spaced cross-bracing, with further shear strengthening in the form of diagonal boarded bracing. Trusses carry small purlins and closely-spaced rafters, with continuous sheathing in diagonal boarding. Both roofs have an original continuous gabled ridge rooflight.

Some ancillary structures have been added on the south side, over time, but were not included in this inspection. It is proposed, subject to approval, to remove these to reinstate the original views of the hangar from the south.

2.0 CONDITION REPORT

2.1 ROOF

Belfast trusses are designed to span considerable distances with relatively small section (easily obtainable) timbers. They are incredibly efficient and well-engineered but, as soon as one timber fails, their structural integrity is compromised, and they start to twist and bend. If more than a couple of timbers rot through in key locations, they collapse.



At the time of the inspection, of the 34 Belfast trusses supporting the hangar roof, 14 had collapsed to the ground (8 on the south side and 6 on the north side), and a lot of the remaining trusses were in poor condition.

2.1.1 In 2016 James Carroll Ltd, a building firm who carried out extensive repairs on Belfast trusses to aircraft hangars at Hooton Park, were invited to visit Old Sarum and advise on the propping and repair of the trusses to Hangar 3. They identified trusses that were most at risk of failure and recommended propping under the ends of these. This was done using scaffold and, in some cases, shipping containers.

2.1.2 Since then, general leakage through the roof coverings has caused a lot of the other trusses to rot and collapse. So, most of the 20 trusses remaining in-situ in April 2023 are only still there because one end, or both ends, were propped in 2016.

2.1.3 Of these 20 trusses, about 6-8 of them have failed, with key elements (such as the bottom chord, etc) having rotted through. These trusses are no longer repairable.



- 2.1.4 Another 6-8 trusses are in a relatively poor state. Although they could potentially be repaired, the extent of replacement timbers needed (about 75%) and the cost of in-situ repairs mean this is unlikely to be viable.
- 2.1.5 About 4-6 trusses looked, at the time of the inspection, as though they could be repaired in-situ. This would involve fully propping them and then removing sheathing boards, unpicking damaged chord and lattice timbers and reinstating with new timbers. This was a method used successfully on the Belfast trusses at Hooton Park. It is quite a laborious process, and the condition of the relevant trusses should be assessed in more detail before deciding how many can be reasonably repaired. This will be affected by any further degradation that occurs before repairs begin.
- 2.1.6 All the collapsed and badly damaged trusses should be replaced with new Belfast trusses. This was done at Hooton Park, where one roof had totally collapsed, using a large jig on the ground as a former, before using a crane to lift them into position.
- 2.1.7 The Belfast trusses support purlins, rafters and diagonal roof boarding. These timbers have collapsed in the areas where the trusses have fallen and are in very poor condition where they remain. They will need removing, in order to repair/replace the trusses, and appear too rotten to be salvaged or reused. The purlins & rafters will need to be reinstated in new timber, but the detailing of the boarding may need to be reviewed along with the possible addition of insulation (at Hooton Park, Historic England approved profiled metal instead of boards).
- 2.1.8 The ridge rooflights have collapsed where trusses have fallen and some of the remaining sections are twisted, but some lengths still seem sound. Examination of the fallen rooflights show they are formed in T-section metal bars, wrapped in lead. The remaining rooflights should be carefully dismantled, if/where possible, and salvaged for reuse, and the rest remade to the same details.
- 2.1.9 The original roof covering to the collapsed sections seems to be bitumen/tar applied directly to the boards. Over this are later layers of bitumen/tar reinforced with glass-fibre mesh (check for asbestos). Leaks through this covering, and around the edges have caused collapse of the roof structures. When replacing the covering, thought could be given to using other materials (at Hooton Park, modern profiled metal was used).



- 2.1.10 The central valley gutter, running the length of the roof, could not be accessed at the time of the inspection but appears to be formed in timber boards with a bitumen/tar lining. Localised leaks in this gutter have contributed to the rotting of the ends of some of the trusses. Replacement of the gutter lining may be best in a modern metal (at Hooton Park stainless steel was used, with rubber expansion joints at 20m intervals).

2.2 NORTH & SOUTH SIDE WALLS & WINDOWS

The slender brick hangar walls are supported by external brick buttresses with metal framed 'clerestory' windows between. The external face of brickwork is cement rendered. Profiled asbestos-cement cladding has been added on the south side.

- 2.2.1 The profiled asbestos-cement cladding should be tested. Its removal is desirable, unless it is shown to be completely stable and safe, and is of historical interest.



- 2.2.2 There is some cracking to the external render and there are patches where it is failing (particularly on the sloping faces of the buttresses). Some localised repairs and patching are required. Most of the visible brickwork seems sound, although eroded and damaged bricks to the buttresses need replacing, along with some other localised repairs and pointing.



- 2.2.3 The tops of the wall have been subjected to lateral forces where trusses, and end doors, have twisted or collapsed. This has caused minor localised cracking (particularly at the ends), visible internally, and allowance should be made for repairing areas of brickwork at high level, including corbelled kneelers. Apart from this, internal brickwork generally seems sound.

- 2.3.5 The metal framed windows need localised repair and repainting, and some re-glazing will be required, mainly where stones have been thrown through panes. The opportunity should be taken to overhaul the opening casements, to get them to open again, if possible.

If this hangar is to be used to store/exhibit vintage aircraft, thought should be given to adding uv-protection to the windows, when they are repaired.

2.3 CENTRAL SPINE WALL & COLUMNS

The central spine wall is formed by a line of paired brick columns with brick arches spanning between them.

- 2.3.1 One pair of columns has collapsed near the centre of the spine wall, along with the arches either side. This has also caused some localised movement cracks in adjoining arches. It should be possible to rebuild the collapsed pair of columns and arches, and then consolidate and point-up the cracks in the adjoining arches, without having to disturb or dismantle any more brickwork.



- 2.3.2 Further damage has been caused to columns and arches towards the east end of the hangar. The end arch has collapsed and a column has been twisted, causing cracking in the arches either side. A conservation structural engineer should be asked to advise, but it is likely two pairs of columns will have to be dismantled and rebuilt, along with the arches. The twisted column looks precarious, and advice should be sought on the need to prop it for now.



- 2.3.3 There is a lot of green algae-type staining on columns and arches towards the western end of the hangar, caused by the central valley leaking. Some minor hairline cracking was also noted and allowance should be made for localised brickwork repairs and pointing at high level.
- 2.3.4 There are modern concrete block walls running between the pairs of columns, with lightweight screens above some. Ideally, these modern dividers between the two halves of the hangar should be removed, to reinstate the original form and size of the interior. Similarly, removal of internal pods/boxes that have been used as offices, is desirable.

2.4 GABLES & DOORS TO EAST & WEST ENDS

The cladding to the shallow curved gables and the runner rails for the doors, plus the canopies over the rails, are supported by the end Belfast trusses, with timber braces tying back to further internal trusses.

- 2.4.1 The doors to the southern opening were lying on the ground at the time of the inspection; one had fallen but the rest were lowered to prevent further collapse. These should be inspected in more detail and repaired and reinstated where possible. Even in cases where they are beyond repair, it is worth keeping the running wheels and other fittings, plus metal cladding, for reuse.



- 2.4.2 The other three sets of doors remain in-situ, but cannot be opened, partly because of damage to the tracks and runners, at the bottom and top respectively, but also because the Belfast trusses supporting them are dropping and twisting. Retention and repair of these doors is desirable, but it is assumed they will need to be lifted out in order to repair the tracks and rails, plus canopies over. A structural engineer will need to be involved with decisions about moving and repairing them.



- 2.4.3 The canopies over the runner rails are beginning to fail and need replacing, in association with repairs to the rails. The cladding to the faces of the shallow carved gables will need taking down, along with the fascia capping, in order to replace the Belfast trusses behind, and should then be refixed. The central timber louvers also need to be dismantled and reinstated.
- 2.4.4 It is currently hoped to overhaul and reinstate all the sliding doors, but this will involve quite a lot of heavy-duty lifting and engineering. As an alternative, it may be worth just making doors at one end operational, with the doors at the other end retained but supported in-situ. This could be more economical and also allow retention of more original fabric.

2.5 CORNER TOWER - GANTRIES

The four corner towers provide structural buttressing to the ends of the walls and are designed to support the sliding doors when opened.

- 2.5.1 The four brick towers are generally in a reasonable condition, although there are quite a lot of damaged/eroded surfaces to bricks, as well as open joints. Some localised brick repairs and pointing are required. Replacement of all bricks that have lost their faces could be rather intrusive, and it may be better to just replace those that are worst damaged.

- 2.5.2 The metal door runner rails at the tops of the towers are rusting. Some may be coming loose and all need to be checked and repaired to ensure the doors can function again. The metal fixings are built into the brickwork and are rusting, causing a horizontal joint to open up. Hopefully it will be possible to simply replace the fixings but, if not, the top ten courses will need to be dismantled and rebuilt.



- 2.5.3 As well as some creeper growth at low level, there is plant growth visible in the top joints, particularly on the south-east corner tower, which needs removing a joints repointing. This, and the rust jacking noted above, suggest the flaunching cappings are cracked and failing in places, and allowance should be made for repairing all the cappings.
- 2.5.4 There are a few metal brackets and other fixings into the brickwork, some from old phone-wire fixings. Generally these should be removed, to avoid damage from rust-jacking, but it would be worth checking whether any have historic significance before doing so.

2.6 NORTH & SOUTH SIDE ANNEXES

The lean-to annexes are original, and have been extended or altered on both sides. Further ancillary structures (café, etc) added on the south side are to be removed, so were not included in this inspection.

- 2.6.1 The exact configuration of the lean-tos isn't completely clear, but could be established with a little more investigation. Two vertical joint lines towards the eastern end of the north annex (red lines on photo) indicate the section between them is a later infill.

Different internal door lintel details may help understand the original layout, and blocked arches suggest some annex rooms opened directly into the hangar.



2.6.2 The paint on the external walls of the annexes (original may be a cement-wash) is peeling in places. The brickwork, under the paint is mainly sound, but there are areas where localised repointing and repairs are desirable. This should be coordinated with any making-good required after the links to ancillary structures on the south side have been removed. Repainting may be desirable, once repairs and making-good have been completed.

2.6.3 Most of the original window openings are fitted with metal frames set within timber frames (photo shows one on the north side). It is thought, from records, these were fitted in 1928. As the metal frames were too small for the openings, timber frames were added with extra 'lights' above. The metalwork needs some minor repairs and redecoration, whereas, in some cases, rot in timber cills and frames require more extensive repair. Although it should be possible to repair most of the timber frames in-situ, it may be better to temporarily remove the metal frames to allow better access to the more damaged ones.



2.6.4 One original window opening on the north side has been fitted with a later timber frame. Replacing this with a frame to match the rest would be visually desirable.

2.6.5 Windows to the infill on the north side also need localised repair and redecoration, and the door needs attention or replacement (check for asbestos in the door panels). As an alternative, thought could be given to removing this infill section, to match the configuration on the south side (?).

2.6.6 The roofing felt covering wasn't accessed during this inspection, but there were no signs of major leaks. There are, however, places where debris falling from the roof eaves above has damaged the felt, and also sections around buttresses where the flashing is degrading. These defects will be slowly feeding water into the roof timbers, and replacement of the roofing felt is recommended in the next couple of years. Allowance should also be made for some replacement of roof sheets and supporting timbers.

2.6.4 There are modern ceilings in quite a few of the annex spaces. The voids and timbers above these should be inspected and allowance made for some repairs. The suspended-ceiling boards should be tested for asbestos before proceeding. Although reinstatement of original ceilings may be desirable, this is not essential to the weathertightness of the building.

2.6.5 Repairs and redecoration of walls is desirable, depending on proposed uses of the various rooms/spaces in the annexes.

2.6.6 The concrete floors have been carpeted and screeded in various annex spaces. These were not inspected in detail, but some repairs or recovering will be required to floors before the spaces can be used, but this is not essential to the well-being of the structure.

2.7 HANGAR INTERIOR

- 2.7.1 The floor in the main hangar spaces was generally covered in debris at the time of the inspection. In areas where it could be seen, there was localised cracking to the edges of concrete and some areas have been tarmacked. The condition of the floor does not affect the stability of the building, so is not included in the recommendations on the next page but repairs will be required before it can be brought back into use.
- 2.7.2 Peeling paint, damp and other staining on the walls is not a cause for immediate concern. Redecoration may be desirable, but everything should be allowed to dry out before this is considered.
- 2.7.3 There is an incoming 3-phase supply that terminates at a distribution board in the north-west corner. There are cables and pipes running around the building, attached to walls and some trusses, but it is understood these have all been disconnected. Removal of redundant services should be included in the refurbishment of the structure.

2.8 RAINWATER DISPOSAL

All the gutters have been replaced in plastic. Most are missing from the sides of the hangar and those on the annexes need attention.

- 2.8.1 The remaining guttering on the hangar is feeding water into the walls. New cast iron gutters and downpipes should be installed along both sides of the hangar, in association with reinstatement of the roof structures and coverings. Most of the eaves boxing is missing and/or damaged and needs rebuilding, to fix the gutters to.

Plastic rainwater goods to the annexes need overhauling, and thought should be given to replacing them in cast iron.



- 2.8.3 The large downpipes at either end of the hangar, which serve the central valley gutter, are in poor condition and need replacing.
- 2.8.4 The gullies to the below ground drains were partially covered by soil and plant growth at the time of the inspection. These need to be cleared and unblocked, and then included in a regular maintenance cycle. Some gulley pots may be damaged and allowance should be made for replacing cracked/broken ones.
- 2.8.5 The trench drains outside the sliding hangar doors need to be overhauled, and missing iron grilles replaced, in association with work to the drainage system.
- 2.8.6 There is evidence some of the rainwater drains below ground may have blocked and are ineffective. These should be investigated further, and allowance made for digging up and relaying some drain runs.

3.0 SUMMARY OF RECOMMENDATIONS

Accompanying this report is an Appendix, written by Tim Ratcliffe, outlining the repairs and interventions carried out at Hooton Park, on a similar group of Grade II* listed hangars, to illustrate how repairs and modern interventions allowed them to be brought back into use.

3.1 WORK RECOMMENDED WITHIN 6 MONTHS

- Carry out asbestos survey in the hangar & annexes
- Seek structural advice and prop central columns, etc, as required
- Remove all collapsed parts of roof & other debris inside the hangar
- Remove redundant cables and pipes, and office pods/boxes

3.2 WORK RECOMMENDED WITHIN 1 YEAR

- Access the remaining sections of roof and (if possible) remove the rooflights
- Prop or move the sliding doors and associated canopies and cladding above
- Remove profiled asbestos-cement cladding from south side
- Strip the remaining hangar roof coverings and timbers, plus failed roof trusses
- Repair brickwork to wall tops and central spine columns and arches
- Repair any salvageable Belfast trusses and replace the rest to match
- Reinstate roof timbers & install new coverings, including central valley
- Reinstate the rooflights
- Repair and rebuild eaves boxing on both sides, to fix guttering to
- Reinstate high-level gutters & downpipes to both sides of hangar, in cast iron
- Replace the large downpipes at both ends of the hangar, in cast iron
- Check and clear all drainage gullies and trench drains (instigate regularly)
- Replace broken/damaged drainage gullies and overhaul trench drains
- Survey and relay any blocked or failing rainwater drains

3.3 WORK RECOMMENDED WITHIN 2 YEARS

- Carry out brick & render repairs to hangar external walls and buttresses
- Overhaul, repair and redecorate clerestory windows to hangar
- Carry out localised brick repairs and pointing to all four corner towers
- Repair flaunching and remove redundant metal fixings to corner towers
- Repair or replace door runners and rails
- Repair and reinstate sliding doors, plus canopies above
- Reinstate cladding and louvers to gable ends
- Strip & relay roof coverings, & repair roof structures to annexes
- Reinstate gutters and downpipes to roofs of annexes, ideally in cast iron

3.4 WORK RECOMMENDED WITHIN 3 YEARS

- Carry out pointing and brick repairs to annexes
- Make good openings after removal of ancillary buildings on south side
- Repair & repaint metal and timber framed windows to both annexes
- Repair/replace external doors to annexes