

North Clyde Archaeological Society
Military Project 2015 >
On going report updated as work commences

Murrays (Geilston Farm) Military Installations
Tam Ward. August 2016



Frontispiece. Illustration from Mugdock Park HAA gun site.

Abstract

*The remains of Heavy Anti Aircraft gun batteries (HAA) along with control rooms and ancillary buildings, surviving in the area of operations of the NCAS are currently being researched, surveyed and recorded by photography as part of NCAS **Military Project**. This report deals with the site at Geilston Farm near Cardross.*

Introduction

The River Clyde Estuary contains the largest number of HAA and other military coastal defence sites in Scotland. The heavily defended site of Scapa Flo in Orkney comes second in numerical terms to that of the Clyde.

North Clyde Archaeological Society (NCAS) are engaged in a Military Project to record the surviving remains of all periods in their area of interest, and to compile research on such sites with a view to publishing the results more fully in due course. The sites consist principally of former gun installations with ancillary buildings, although hospitals, POW camps and other sites also existed in the area.

Methodology

The buildings and their layout are surveyed using the taped offset method and/or measured as an upstanding buildings survey. Drawings are completed at appropriate scales and the entire sites are recorded by digital photography.

This project comprises of a survey of visible remains only and therefore some interpretations of buildings etc may be compromised by lack of data at particular sites. Many buildings now survive merely as rectangular concrete slabs and vegetation probably covers some of those, therefore understanding their original layout and function is difficult, although comparanda with other places where survival is better, and from other available information, may help in due course. This survey uses metric measurements however the original construction sizes were probably imperial.

GEILSTON FARM SURVEY

Centred NS. 337 772

OS Explorer Map 1:25,000 Series. Loch Lomond South. No 347

Fig's 1&2

The site lies at the above NGR on the north coast of the Clyde Estuary and immediately SW of the village of Cardross. Located on the raised beach the entire site originally occupied several fields on the south side of Murrays Crossing, being a level crossing of the Helensburgh railway. The OS 1:25.000 map of 1958 shows three roofed buildings on the west side of the access road to the beach and five on the east side, also a single building at the level crossing, none of these buildings survive but apart from the one at the railway, they must all have been part of the camp of the gun emplacements. The OS sheet No 347 (given above) and on Fig 1 shows the site of the guns and two surviving buildings on the east side of the track, and also what may have been the military perimeter fence around the site. The OS 1:25,000 map [NS 37] 1958 (Fig 2) shows three building in the field where the guns remain, and six buildings on the east side of the access road, none of these buildings now exist although the ruinous remains of two lie adjacent the gun field boundary.

The neighbouring HAA gun site of Mollandhu Farm to the north is also shown on the Explorer map. That site will be the next survey in the series.

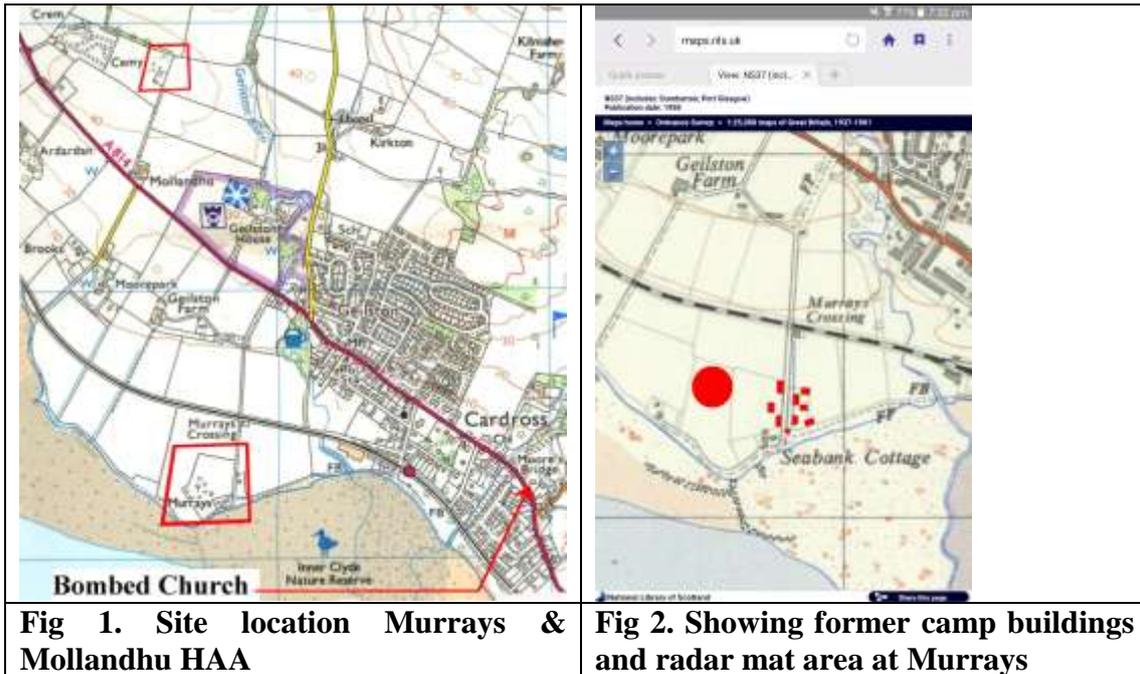


Fig 1. Site location Murrays & Mollandhu HAA

Fig 2. Showing former camp buildings and radar mat area at Murrays

Results

Principal buildings

The principal buildings which survive at Geilston Farm are the four main gun emplacements, the Command Centre, two further buildings which were guns, two circular structures which are also assumed to have been gun positions. The radar mat area which is known to have existed and the camp buildings are all absent, with the exception of a ruinous building to the east of the main site and at the field edge.

The fields wherein the extant structures lie is currently grazed and vague shapes are discernable on the ground which may indicate the former location of buildings, a few manhole positions are also evident (see below).

THE SURVEY

Gun Operations Room

The Gun Operations Rooms (GOR) or Command Post is the best preserved part of the installation at Geilston Farm and compares exceedingly well with the example at South Ailey Farm (Ward 2016). The plans of each are extremely similar differing only slightly in detail; both are partially built below ground level with the open air observation areas surrounded by concrete walls. At Geilston, brick and concrete are also used, the concrete having been shuttered with wooden planks as is seen in the matrix left on the walls and ceilings. Similar to South Ailey the roofed areas were heavily coated in bitumen as a water repellent.

The rectangular rooms all have concrete floors and are described as per the plan (Fig 3):

Room No 1. Pl's 2 & 3.

The southerly of the chambers and it is the only one leading directly to the observation areas via a stair way. The room measures 4m by 3.25m, the external door (opening inwards) has been a metal and was hung on two surviving pintle hinges. The internal door steps down 100mm to the floor of the next room (Room No 2), its height

is 2m and the step means that all other rooms are 2.1m high. One window measuring just less than 1m wide and flush with the ceiling (as are all three windows in the building) looks out over the external stairs. The concrete walls are covered in metal fixtures where former equipment was mounted; this may be the telephone or communications room.

Room No 2. Pl 4.

The room measures 3m square and has slightly thicker walls at 0.6m. Presumably it has been a store room with no windows and its doorway leads directly to the former ramp area and is adjacent the larger entrance to Room No 3.

Room No 3. Pl 4.

The room is 8.9m long by 3m wide, around the floor is a cable duct measuring 0.2m wide and which has once been covered. Two cable pipes lead through the wall to the Predictor area and a doorway gives access to the next room (No 4). It is likely that this room was the Plotting Room.

Room No 4.

The room measures 5.5m by just over 3m wide. It has been furnished with two windows identical to that in Room No 1, the external doorway leads to the area at the bottom of a flight of steps (now buried) and the entrance to a small room of 1.5m by 0.75m.



Pl 1. Showing part of the Command Post roof and instrument enclosure, with gun positions beyond.

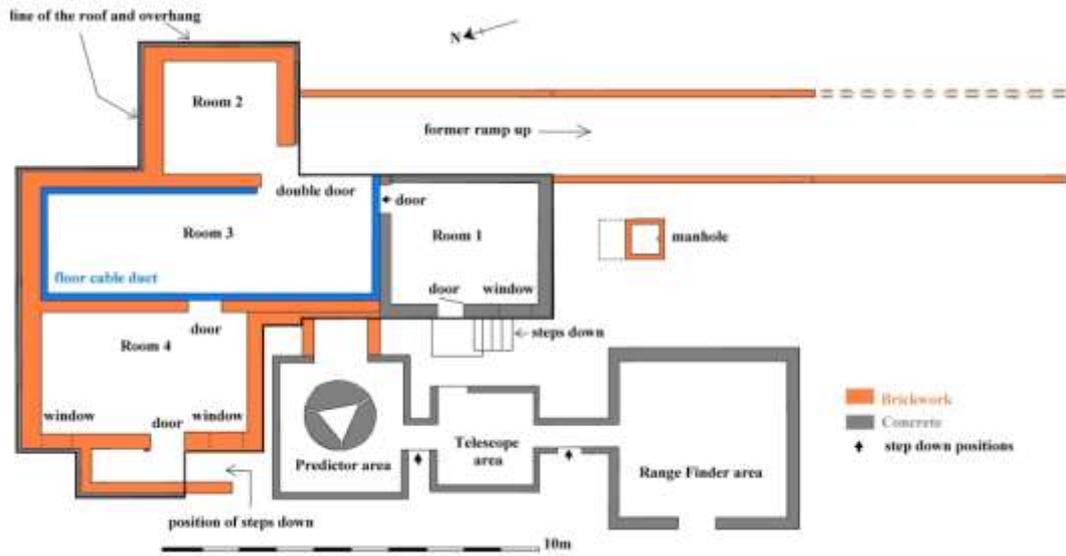


Fig 3. Command Post and instruments area.



Other features at the Command Post

On the east side of the complex was a 20m long ramp (now filled in), it is bounded on each side by a double brick wall the top of which steps down as the passage progresses up to ground level. The ramp was a very gradual gradient presumably to allow heavy or bulky equipment to be delivered to the wide access at Room No 3.

To the south of Room No 1 is a brick manhole of 0.7m square which was 1.8m deep but obviously partially infilled, the internal chamber widened to the north by a further 0.6m as its roof sloped downwards, three foot rungs were in place. This may have

been a drain manhole, the drain ensuring that water did not flood the sunken internal rooms of the Command Post.

The higher external areas where the detecting instruments are known to have been used by ATS personnel are perfectly preserved, each has a concrete floor.

The Predictor area is 4.75m by 3.25m and lying on its floor are three concrete slabs 100mm high and forming a circle of 2m in diameter but with an equilateral triangular space in the centre, it has sides measuring 1m long. The structure is presumably a mount for the Predictor instrument, probably to keep a tripod firmly in place when the Predictor was in use.

A short corridor leads to the Telescope Area which is 2.5m square and has an opening leading to the stair down to room No 1.

Finally the Range Finder area is reached via another passage which gives access to outside as does the last compartment itself which is 4.25m square. The Range Finder area walls are slightly thicker than the others being 0.4m while the others are only 0.25m thick.

Around the entire complex the ground is heaped up against the walls to varying degrees (not given on the plan), presumably this revetment was more uniform when the site was in use and would have protected the building to some degree.

The internal rooms have a few details of electric conduit saddles, high wall ventilators and shelf and equipment positions showing on the formerly white washed brick wall surfaces.

Gun Positions. 4 of. Fig 4, Pl's 6 & 7.

Four gun positions are located to the north and east of the GOR and arranged in a typical arc with each gun site building being open to the central area. Apart from their alignments and two of the small rooms being on a reverse side, they are identical in constructional details and comprise of the following components; four open cubicles diametrically opposed in pairs to one another and facing inwards, a room with a central pipe through the roof and a 'floor' scarcement, and enclosing double brick walls. Fig 4 shows Gun No 3.

The central floor is concrete overall, however, a circular patch measuring 4m in diameter appears to be a separate pouring of concrete, and the details of the gun mounts are arranged in a circular form on this and are identical in layout to those of the isolated gun positions to the north and south of the complex (No's 7 & 8). The cable duct runs from the centre of the gun position and towards the side of the entrance, it must have been installed before the walls were built as it runs below them. An identical arrangement may be seen in the gun positions at Mugdock Park in Glasgow, although the shell storage areas at Mugdock are slightly different in layout. See 'Isolated gun positions' below for description of metal work and mounts.

The four cubicles and the small room never had doors and are all covered by a shuttered concrete slabs which have been created over double brick built walls, all the walls are brick. The roofs are all 103mm thick and are flush with the walls. Each

cubicle is 1.5m square internally and 1.4m high, three channels can be observed in some of the concrete floors to indicate a possible sliding arrangement (of shell racks?), the semi circular grooves are 50mm wide and 25mm deep and are equidistantly spaced running from front to back.

The side room measures 4.5m by 2.5m and has a small aperture/window through the brick looking inwards to the gun position. The room is accessed by a 2m gap in the wall. The pipe leading through the roof may have been ventilation (or a heating stove?). Two short wall stumps are on each side of the gun area entrance. None of the cubicles or the small room indicates they have had doors hung on them, but electrical conduit saddles indicate that lighting bulkheads were probably installed around the inside of the enclosure.

Surrounding each gun position is an embankment of earth running out about 3m and coming to within 0.5m of the wall heads.

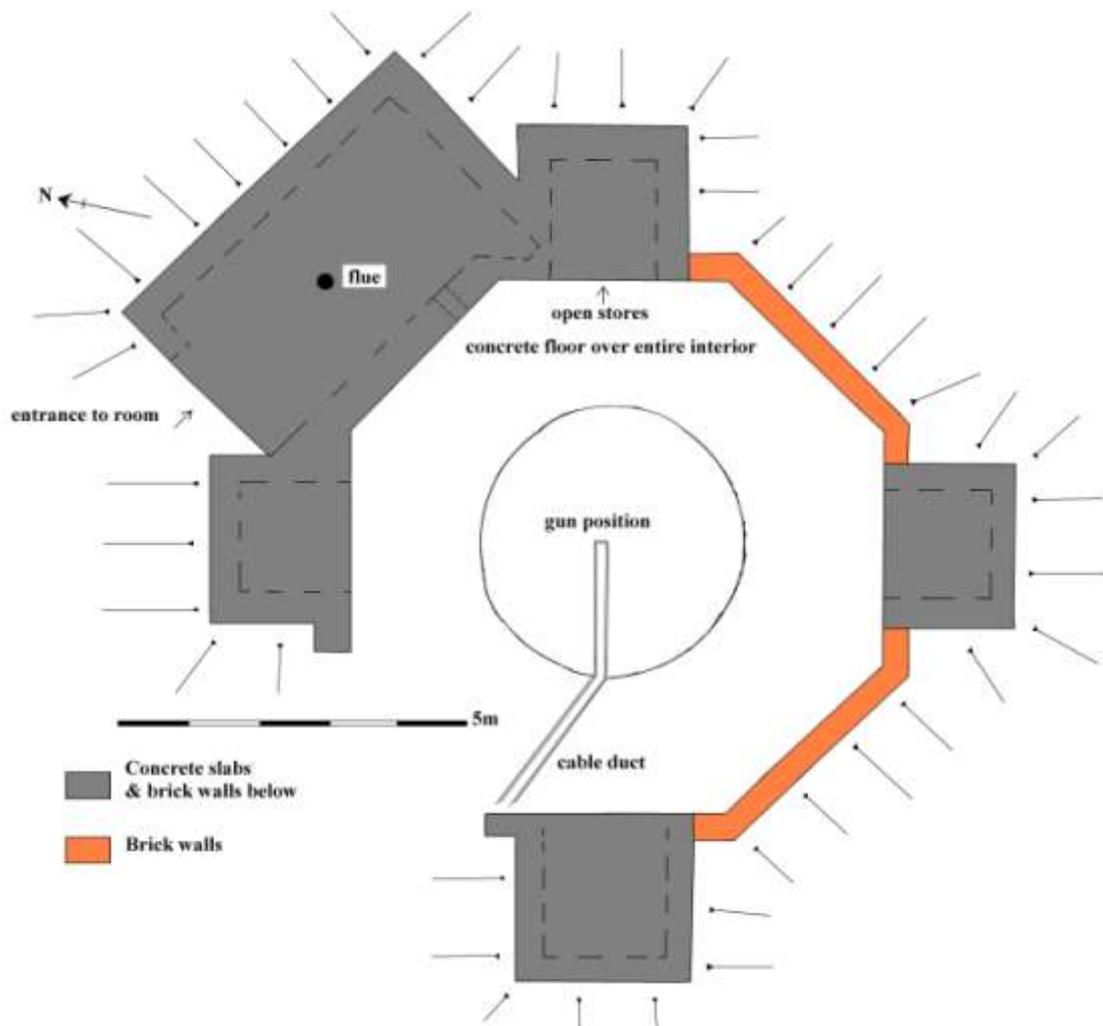


Fig 4. Showing typical layout of gun locations. This is Gun No 3.



Pl 6. Showing entrance to rest room.



Pl 7. Gun cubicle for ammunition with floor rails

Isolated gun positions

Two circular concrete bases each measuring 4m in diameter are located one to the north and the other to the south of the main complex. The southern example was cleared and surveyed (Fig 5 & Pl 8). Each 0.3m high structure was made with concrete including basalt chips as part of the aggregate. Eight circular steel ‘mounts’ were evenly spaced and located in a circle on the structure; they measured 180mm in diameter with a 100mm central flange within which there was a 70mm hole. Another large steel ‘mount’ measured 200mm in diameter and with a central hole of 100mm lay only slightly outwith the circle of the other ‘mounts’, directly opposing this was a concrete pillar of only 100mm high by 300mm square, it is known that this pillar covers one of the larger ‘mounts’. A cable duct runs from the centre to the edge of the structure, it measures 250mm wide and 450mm deep, it has been covered by a plate, in its base were fragments of field drain pipes, possibly used to contain cables. In the central slightly offset area an angle iron runs in line with two larger ‘mounts’ probably indicating they are fixed to it below the concrete, this plate has two 25mm holes in it, perhaps once used as bolt holes. Also crossing the cable duct at an angle but lining up with two of the smaller mounts is another angle iron plate, it has one of the smaller ‘mounts’ fixed to it suggesting that the plate runs round the structure as a support for all the ‘mounts’.

It is uncertain at this stage in the Project what these structures were used for, but gun positions are strongly suspected.

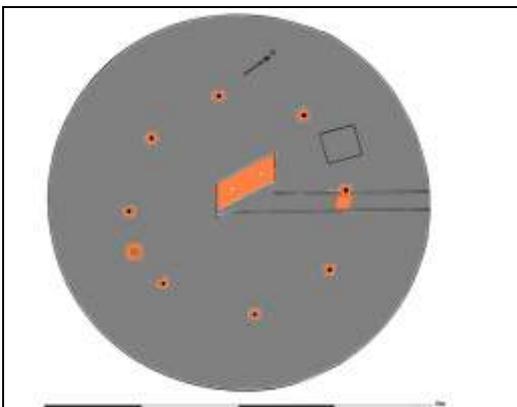


Fig 5. Gun? No 7 position. Showing steel ‘mounts’ and cable duct.



Pl 8. Gun? No 7 concrete base with ‘mounts’ and cable duct.

Other gun positions.

To the SE of the GOR are two buildings made almost entirely with concrete blocks and brick. One survives in reasonable condition while the other is very ruinous. They are both reckoned as being gun positions because of the arrangements of shelving cubicles (more below).

The plan of Gun No 5 shows it to be just over 15m square overall (Fig 6), the entrance walls which would have extended further to the north are missing. A central courtyard of c8m square has a centrally placed circular concrete foundation of 4m in diameter, exactly the same size as those in the other gun locations. However the arrangement of mounts is different from those in as much as a steel angle iron plate forms a 2m square set flush with the upper surface of the concrete (Fig 7, Pl's 9 & 11). The arrangement is identical to that recorded at Woodend HAA installation (Ward 2016), although in this example the concrete pillars over the bolts are all missing, however in the adjoining building (Gun No 6), which is clearly the same in function despite a differing plan and being much more ruinous, some of the concrete pillars survive. The cable duct leads under part of the main building and appears to run towards the GOR. Nearly all of the floor surrounding the concrete circle and within the storage cubicles is made with bricks as far as may be determined; however an area of concrete floor has been laid at the entrance (Fig 6 & Pl 9).

The perimeter walls are all made with 'double hollow' concrete blocks, occasionally with bricks built into the walls, Summerlee, Hurl and Broomhouse bricks were used on the building. On top of the concrete block walls a double line of brick was used to achieve the desired finished height. On top of these bricks four of five concrete roofs survive and which cover open ended chambers of which sixteen would originally have existed. Each chamber is 1.4m square and 1.6m high, there were no doors fitted to them. On each of the side walls of the cubicles are six cut outs which show the position and arrangement of timber shelves, possible 3" x 2" timbers were inserted to form three shelves each time, the lower one being just over 0.5m from the ground and each shelf having 0.25m space height. Thus there were 48 shelves in total in the cubicles of Gun No 5 (Fig 6 & Pl 10).

On the west side of the complex is a much ruinous small Nissen hut type building which measured circa 3m by 3.5m, the semi circular external gable is nearly all visible in the adjacent building (Gun No 6) and shows a small window on 0.6m square. The feature has a direct parallel with the similar structure recorded at Woodend HAA site.

A modern horse shelter (Pl 9) has been built over part of the west side of the building, incorporating the original structure there.

The entire building apart from the entrance is embanked in a similar fashion to the four central gun locations; steel rods tying the structural aspects of the complex to within the banks are visible at several locations.

The adjacent building (Gun No 6) is similar but not exactly the same in plan, its ruinous state prevents a decent survey being made. However the remains of the small Nissen hut already given and the concrete pillars which survive over the gun mounting bolts, and some collapsed cubicles all point to that interpretation being

realistic. A concrete cable duct (Fig 9) similar in size to those on the gun locations, runs from this building towards the GOR, however only a part of its apparently straight route is visible on the ground.

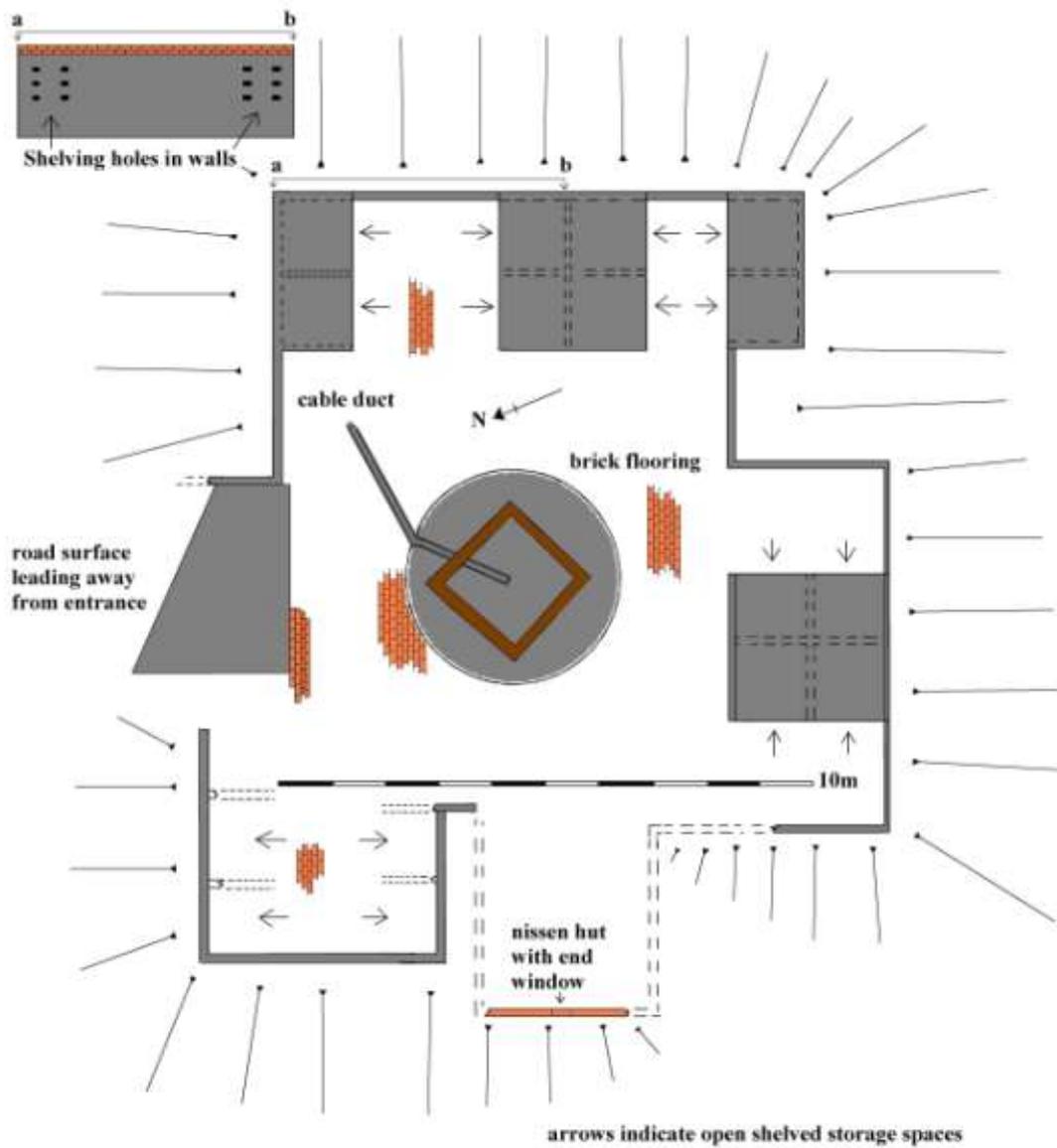


Fig 6. Gun position No 5.



PI 9. Gun No 5 showing partial mount, cable duct and brick flooring.



PI 10. Gun No 5 showing cubicles and shelf slots.

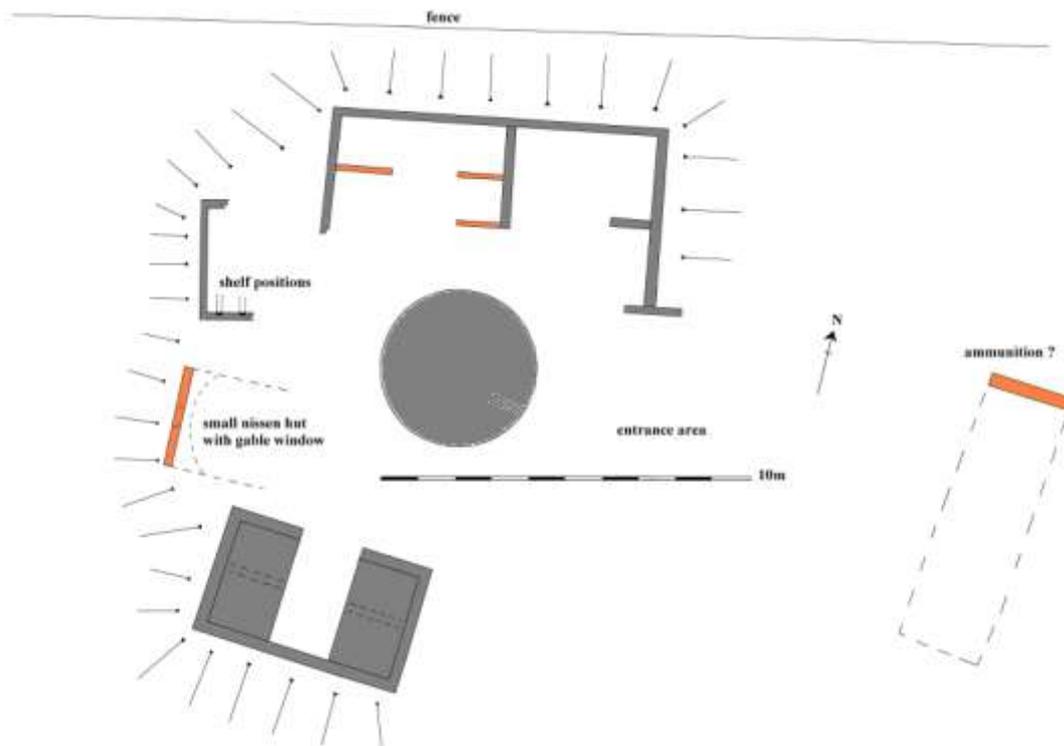
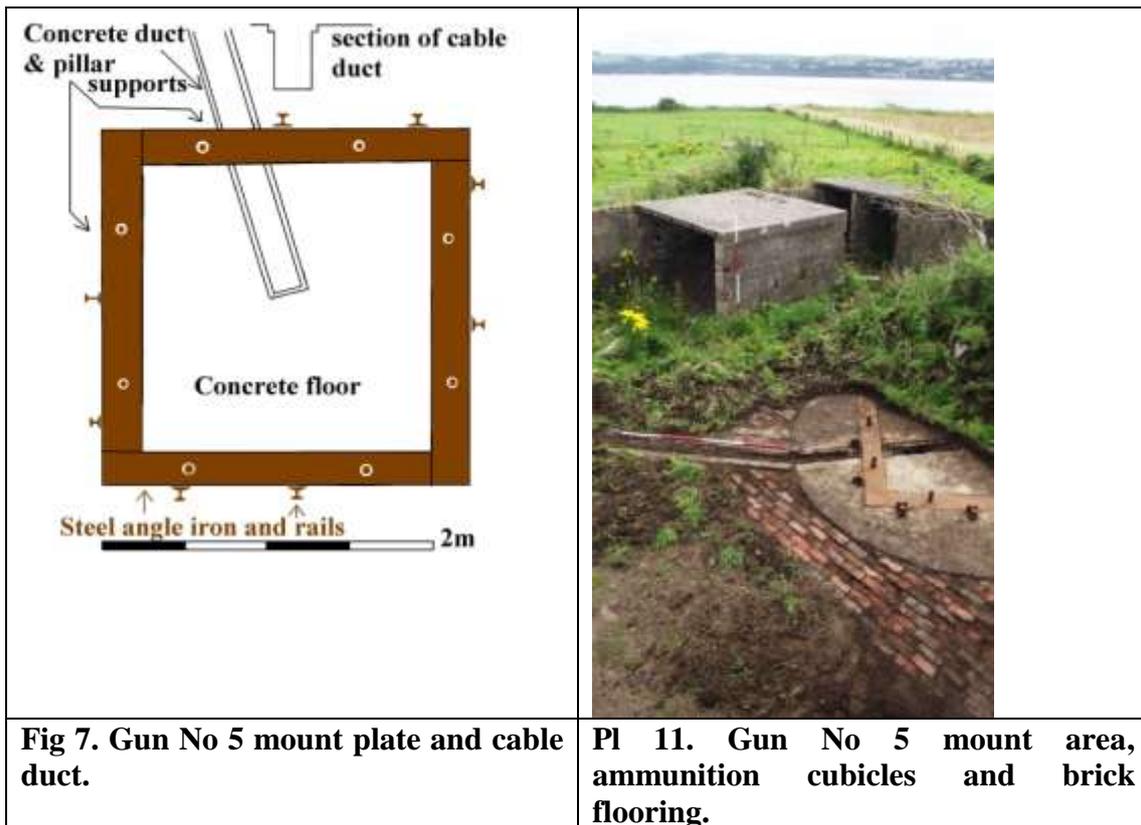


Fig 8. Gun position No 6. Much demolished but clearly having similarities to Gun position No 5.

Other features

Evidence for at least three brick built manholes (PL 12) can be seen in the vicinity, one still has a concrete cover over it. Drainage must have been provided for the sunken Command Post and the drains there must have been several metres deep, such manholes would have been necessary, perhaps also for sewage from latrines etc.

A brick channel runs away from between Guns 5 & 6 (PI 13) and towards the Command Post, this is a cable duct which has been covered with a plate, it is likely that similar ducts connect all the principal features of the site.



The ruinous remains of a building lie beside the fence at the access road but few details are available other than a brick building was originally roofed with concrete slabs. These buildings are however given on Fig 2 above.

Local history.

While much detail regarding the installations and operations of HAA guns in this part of Scotland is at present absent, current research by NCAS from a position of knowing nothing is making good progress.

It is known that on in March 13-14 1941 the well known Clydeside Blitz took place causing much damage and loss of life in Clydebank especially. On 6 May 1941 another raid on the Clyde saw what were probably stray bombs being dropped around Cardross and area which had no strategic targets, and may be testament to the effectiveness of HAA batteries while not actually bringing down aircraft, certainly disrupted their abilities to bomb accurately. It may be that Cardross paid the penalty for the actions of their own nearby defences.

Certainly the village suffered as both the church (PI 14) and the nearby Golf Clubhouse took direct hits. At least one person is reported to have been killed and two others died later. Several different types of bomb fell including incendiaries, and a land mine which fell of Peel St. Only the tower of the church survived and several gravestones (PI 15) show the effect of shrapnel scars. Two headstones (PI's 16 & 17) in the churchyard are testament to the reality of the time, both of young men of the Royal Artillery Regiment killed in action. The date on one is the same as the date of the bombing of Cardross. The man commemorated here was Gunner Graham (PI 16) who is recorded to have died with his wife in the same incident. Research into such stories will form major part of this project in due course.

Geilston camp was used up to 1950 as temporary housing, five years later AA Command was abolished as being useless for modern warfare.



Pl 14. Cardross church.



Pl 15. Damaged grave stones.



Pl 16. G W Graham (gunner) Aged 32, died on 6th May 1941



Pl 17. W McManus (gunner) Aged 19, died 27th September 1941

Discussion/Conclusion

The Geilston site (Fig 9) has supplied additional features not yet recorded in the overall Project, especially the circular concrete structures (Guns 7 & 8) and better details of the two other features given here as Gun No's 5 & 6, and which are obviously the same as the two similar but poorly preserved examples at Woodend HAA site (part of this Project). Aerial photographs of both Woodend and Geilston give valuable phasing evidence. The photographs of the site at Woodend show at least three phases of guns; some positions surrounded by earth banks, the typical gun emplacements seen everywhere e.g. Fig 4, and the types now recorded in more details at Geilston (Guns 5 & 6).

It is now believed that the structures recorded at Geilston are all associated with guns rather than searchlights as was previously thought (Woodend Report). Gun No's 5 & 6 clearly show that storage was involved using cubicles with heavy shelves and these have been for shells (see below). The four brick built gun structures (Guns No's 1 – 4) equate well with those at South Ailey, Woodend and those seen in Mugdock Park near Glasgow, they, like the Command Posts seem to form fairly standard designs as one may expect. Certainly the Command Post at Geilston is extremely well preserved and is on a par with South Ailey, while the Woodend one appears to be demolished but is clearly given on aerial photographs. The evidence is building up to show that the HAA gun sites were under constant review and re-configuration of buildings and equipment. It is possible that both Woodend and Geilston had 4.7" guns installed later in the war.

Unfortunately evidence of the camp at Geilston is nearly completely gone with only scant evidence of its former presence on the ground, similarly the radar mat area is totally devoid of any trace, however, both the radar mat and camp are shown on photographs of the site (Pl's 18 & 19). Furthermore it can be seen that Guns 5 & 6 were not built when the pic was taken of Geilston on the 6th June 1941. One wonders if these were the more powerful 4.7" guns installed later in the war?

Research on the subject has advanced considerably since the project began and the following may now be given as preliminary information, but it is certain that more meaningful and accurate data will eventually be gathered.

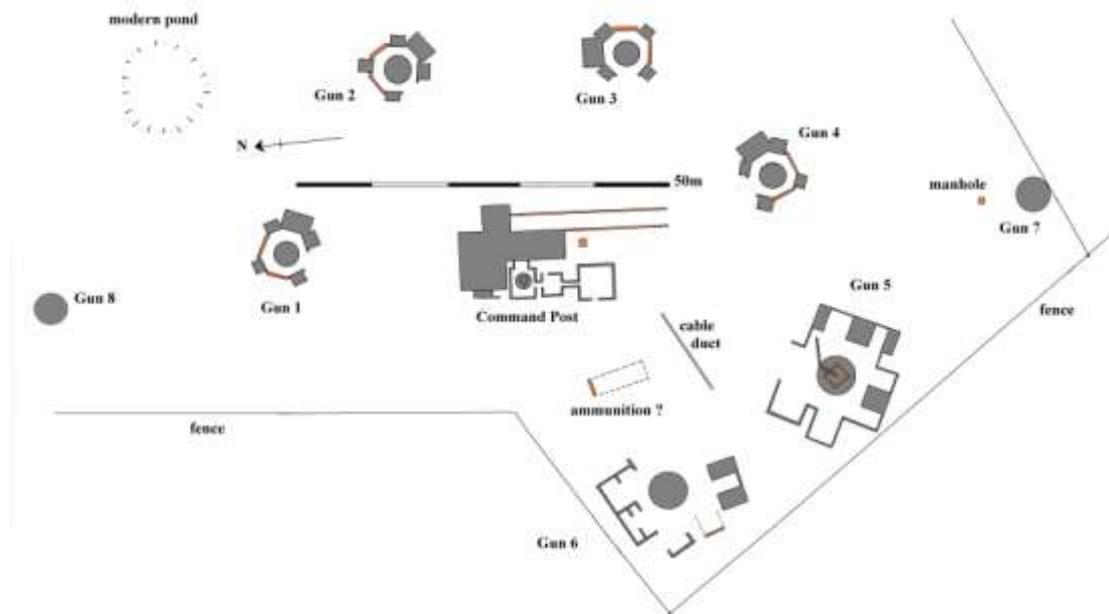
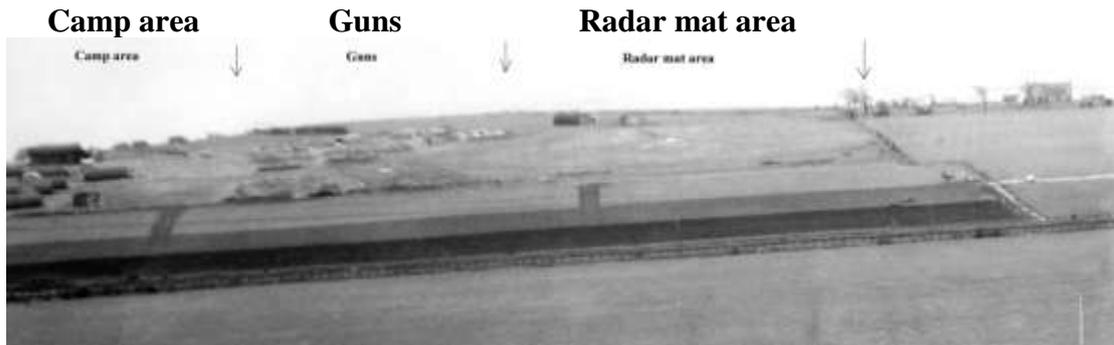


Fig 9. Principal visible structures at Geilston Farm, showing eight possible gun locations.



Pl 18. Part of the installation as seen on an unidentified oblique aerial photograph of Geilston, showing the radar mat and camp areas with guns between them. The railway is in the foreground.



Pl 19. Geilston 6th June 1941.

The above RAF photograph of Geilston is invaluable as it shows the site during the early years of the war. The complete caption for the pic on the web site is given in total here, and the points to make are that the hexagonal radar mat is clearly shown and that gun positions 5 & 6 are not yet built. Taken along with next image (Pl 20) the extent of bombing is clearly visible, showing how randomly the bombs fell and in some instances how close they came to hitting buildings, including Geilston HAA.

Description RAF WWII oblique aerial photograph of Cardross heavy anti-aircraft battery and a accommodation camp from the W. Also visible are several bomb craters from Luftwaffe raids. The octagonal feature to the left of the gun positions is the GI-mat (probably Mk.1) for the gun laying radar.

Date 6/6/1941

Collection RAF World War II (APs)

Catalogue Number SC 458748

Category On-line Digital Images

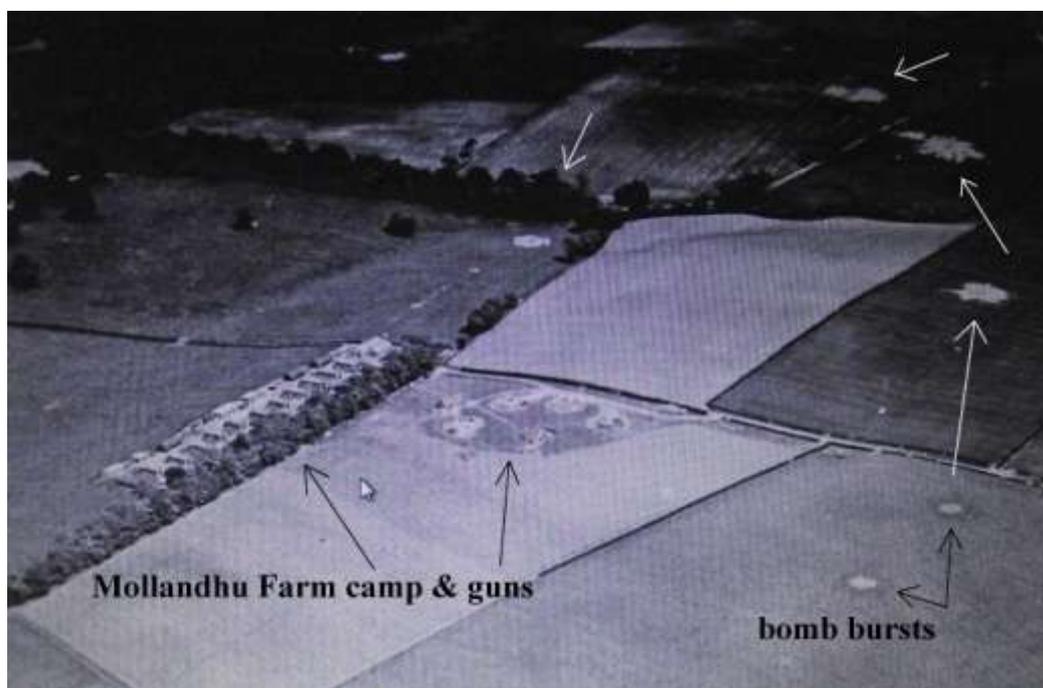
Copy of [D 97929 S](#)

Scope and Content Aerial view of heavy anti-aircraft battery at Cardross, Strathclyde
This oblique aerial photograph of the heavy anti-aircraft battery at Cardross was taken during World War II by the Royal Air Force. This heavy anti-aircraft battery was one of a series built following the heavy bombing raids on Glasgow in 1941. Built to provide protection against bombers, it would have been armed with 3.7-inch or 4.5-inch guns. Several bomb craters can also be seen. Oblique air photographs were taken by the RAF during photographic-reconnaissance training. These photographs were used to ascertain the accuracy of the pilot in photographing the target and to aid the skills of photographic interpretation. Source: RCAHMS contribution to SCRAN.

External Reference F309, 3655

Permalink <http://canmore.org.uk/collection/458748>

Related Site(s) 



PI 20. Screen shot from web showing Mollandhu HAA site.

Aerial photographs of the Mollandhu Farm gun site show bomb craters strewn around the fields in an east/west alignment. Four gun positions, Command Post and camp are all shown – but no radar mat area, was this site controlled from Geilston?

HAA gun sites. Current research notes and images are given here as a preamble to more thorough investigations.

HAA guns were located along the Clyde Estuary from Ayrshire to the Glasgow conurbation. There appear to have been 47 sites in total in this area and at the following locations:

Ayr	2
Cowal	2
Around Glasgow	21
South Clyde coast	12
North Clyde coast	3
Cardross area	2
Rhu	1
Rosneath peninsula	4

Clyde codes

AN1	Cardross above Geilston (Mollandhu)
AN2/N10	Woodend
AN3	Kilcreggan (South Ailey)
AN4	Geilston/Cardross (Murrays)
AN5	Rosneath given as two sites; WWII and Post War
AN6	Mamore NS 225 868 Peaton Road is Mamore
AN7	Whistlefield NS 194 702
AN8	
AN9	Strone (Glen Fruin) NS 261 702
AN9	Clyde Mugdock

Each site would fire in sequence as the aircraft came into range.

The guns

Data on guns and all other aspects of the HAA sites changed considerably as the war progressed, this was especially true of radar development and other technical innovation. At present it is uncertain exactly what period during the war that the various constituent parts of NCAS surveys fit. Some sites are shown to have phasing involved e.g. Woodend where two periods of guns and Command Posts are present.

The guns were generally 3.75” and were Britain’s answer to the German 88mm gun.

In 1928, 3.7” guns fired a 25lb (11kg) shell to reach 28,000 feet.

In 1930, 3.7” guns fired a 28lb (13kg) shell to reach 35,000 feet.

The units were mounted on a four wheel trailer and could be towed at 25mph, weighed between 8 to over 9 tons, and could be in action in 15 minutes. In 1942 automatic fuse setting increased the rate of fire to 20 rounds per minute! = 3 per second, the shells were hand loaded! Shell fuses changed over time and could be set for ‘burn’ time = altitude explosion.



Pl 21. 3.7" HAA gun shells came two in a box.



Pl 21. Showing a gun in action with a continuous movement of shells by hand to the gun

Developed in 1934 the guns were issued to the army in 1938 at which time we had 180 AA guns, by the time of the Munich crisis we had increased that to 341. In 1939 we had 540 guns thereafter they were manufactured at the rate of up to 228 guns per month. A fourteen man crew worked a gun.

There were two gun types: Travelling carriage
Travelling platform

Platform was fixed to a concrete or railway sleeper platform, but in all cases the wheels were removed when ready for action.



VICKERS 3.7-INCH ANTI-AIRCRAFT GUN
Fig. 13. The shell and cartridge of this gun weighs about half a hundredweight, yet eight rounds per minute can be fired. 1. Barrel. 2. Recoil spring. 3. Recoil spring. 4. Recoil cylinder. 5. Oil pump. 6. Breach post. 7. Breach block. 8. High explosive shell. 9. Loading tray. 10. Cord for sliding loading tray into breech. 11. Cradle. 12. Traverser. 13. Elevating screw and gears. 14. Screw case. 15. Screw for fine aim. 16. Bearing shell. 17. Slotted. 18. Elevating shell. 19. Wheel drum. 20. Elevating handle. 21. Wheel lowering hand wheel. 22. Draft indicator. 23. Scales. 24. Road wheel raised. 25. Trestle. 26. Collar from platform. 27. Gun legs. 28. Screw adjusters.

Pl 23. Gun ready for action, note the levelling outriggers and cable.



Pl 24. Gun ready for action, note the men ready with shells.

3.7" shell weighed half a hundredweight (28lbs) and could be fired at 8 rounds per minute, roughly every 7 seconds. The ceiling was 13,666 yards which is 7.75 miles.

In 1944 naval 4.5” guns firing 3.75” shells could fire faster and higher, reaching 45,000 feet, now with radar the guns had a potential 80% accuracy of hitting the target as opposed to 1% in 1939, when 20,000 shells could be fired to bring down a single enemy aircraft. The greater efficiency of accuracy also meant a huge economic cost saving on shells. Gun barrels wore out because of increased the rate of fire.

Shells

As stated above, all things changed during the course of the war and this was especially true of shells.

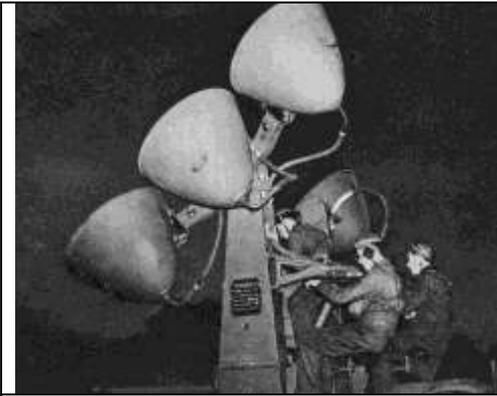
The shell had a curved trajectory which also had to be factored into the predictor calculations (below). Eventually it took 15 seconds for a shell to reach 30,000 feet, trying to hit an aeroplane travelling at c200mph. The primers were kept separate from shells, 10 rounds per minute were possible, and the gun had a 25foot flame. Very soon during the war the fuse of the shells were automatically set by pushing the nose of the shell into an instrument on the gun; it became a split second event, however the men still had to manually fetch and load the shells. A ready supply was kept beside the guns with larger ammunition stores nearby. Part of the routine maintenance of an HAA site was to inspect all gun ready shells on a daily basis for defects and problems such as condensation.

At the start of WW II the guns seldom appear to hit much; they were a psychological deterrent for enemy aircraft and psychological boost for locals. Powerful searchlights were often more of a nuisance to enemy pilots than guns; searchlights could actually blind the pilots temporarily. Thus the HAA guns, although perhaps seldom hitting their targets caused the enemy huge problems forcing them to alter height and direction to avoid flak and shrapnel, meaning their bomb aimers had a difficult time both in concentration and therefore aim accuracy. Also when bombers were scattered they became easier targets for fighter planes.

Instrumentation controlling the guns

Amazingly from the start of the war the HAA guns were controlled in semi or completely automatic ways.

To begin with, remote detection of enemy aircraft was attempted by heat and sound detectors, neither of which was satisfactory. Visual detection using binoculars or telescopes of course meant that the enemy was nearly over the observer before he or she saw it, nevertheless for the English Channel, forward observers could warn airfields and London in advance of the enemy appearance in the skies.



PI 25. Early sound detection.



PI 26. Guns in action with a 25 foot flame.



PI 27. ATS using the telescope.



PI 28. ATS using the predictor.



PI 29. ATS spotter.



PI 30. ATS using the Kline theodolite.

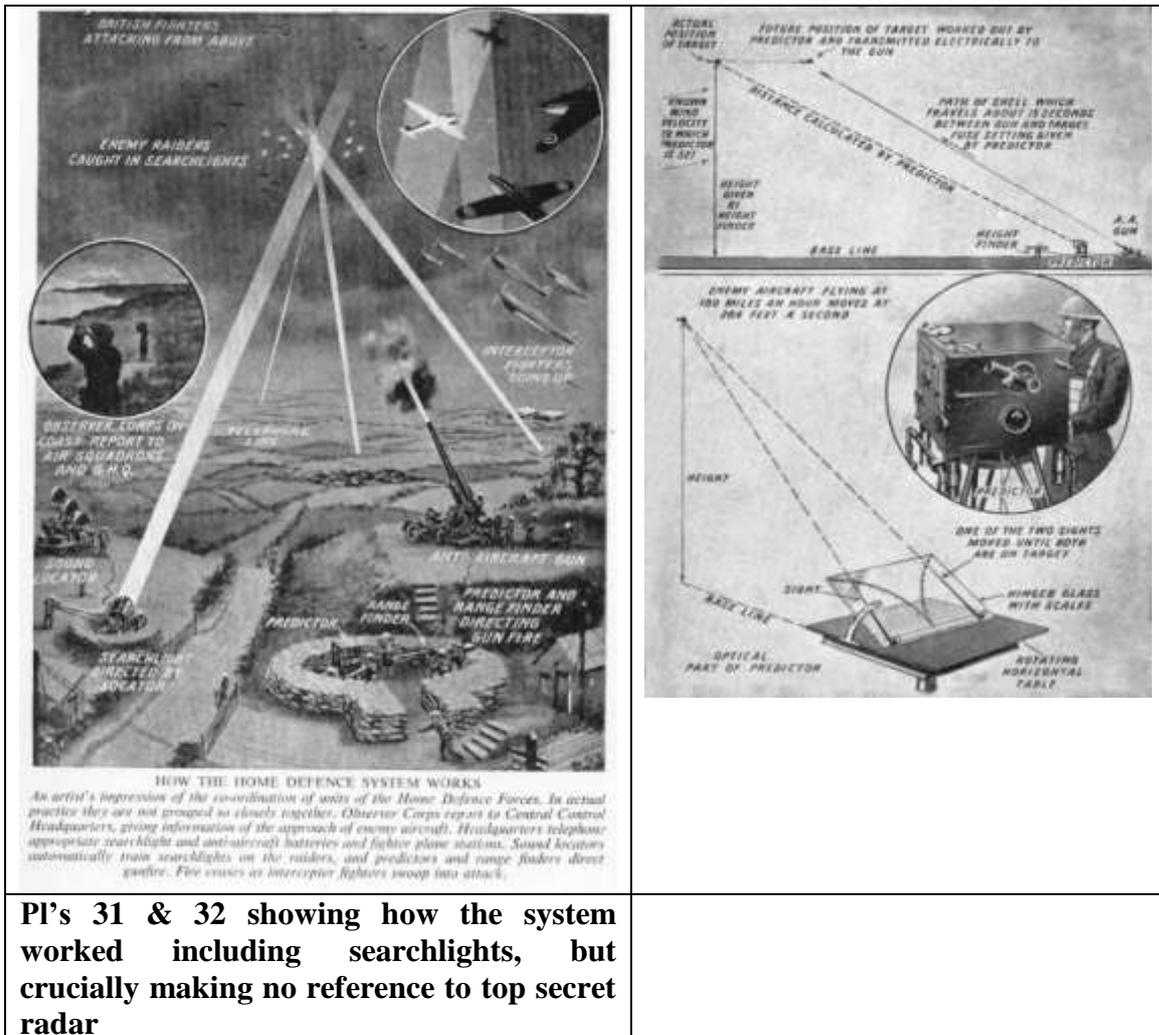
Sophisticated optical equipment had been developed enabling observers to supply accurate data on the height and speed of aircraft once seen. The Vickers Armstrong Company had created their Predictor in 1920. This was a device which could accurately calculate the height, range and speed of an aircraft in conjunction with data supplied by other 'spotters' who were using telescopes and range finding instruments.

The predictor also calculated the trajectory the gun would fire at and also gave the gun the timing for the shell automatic fuse setting, it took only seconds for the predictor to give results, and the predictor also had to calculate wind speed, in reality the Predictors were the forerunners of computers. All of this and more information was supplied via hard wiring to the guns, and spotlights if they were used, all of which worked in unison, furthermore the data could be relayed to other gun locations well in

advance of the enemy aircraft approaching them. The predictor equipment was often named 'Kerry' after its inventor. Another instrument known as a Kline Theodolite was used to photograph bomb bursts to check for accuracy.

The technology was incremental as time went on and was fine as long as aircraft could be seen; night time and overcast skies negated all of this technology until radar came into play.

How it all worked before radar.

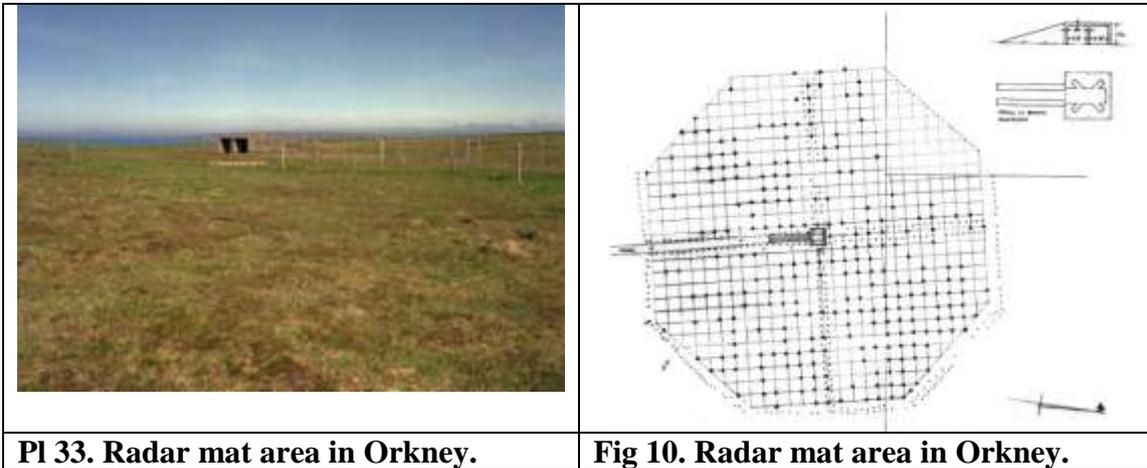


Radar

It was the development of radar which altered that position. Radio Direction Finding (RDF) meant that aircraft could now be detected under any circumstances and from remote distances. Radar was being developed long before the war but many people still say that it was radar which won the war. Without the advantage of radar, still in its infancy, it is unlikely that spitfire and hurricane planes would have won The Battle of Britain.

Eventually by 1940 the whole of the east coast of Britain to Orkney was covered by radar. The system is known as **Chain Home** and it was mostly by pylon tower type installations.

However for HAA sites the radar appears to have been mobile units pulled onto a ramp installed in the centre of a huge hexagonal area known as the radar mat. The entire area was covered in chicken mesh suspended on wooden stobs. The mesh was to counteract interference radio signals. Amazingly in Orkney, sites exist where the stobs are still in place, and on aerial photographs of the Rosneath Farm site (now totally demolished), the stobs arrangement on the radar mat and the radar unit is all visible.



At the time of writing NCAS do not have a great deal of data on radar and this will improve as research continues but it is appreciated that the technology was changing at a furious rate, unfortunately the same thing was happening in Germany!

Searchlights

Searchlight installations are similarly poorly understood by NCAS as nothing regarding them appears to survive on the present surveys.

Searchlights were 60” spotlights using the carbon arc method of illumination, they had 15KW generators, were very mobile and produced an astounding 800,000,000 candela and could beam for 28-35 miles. The searchlights were often cited by German pilots as being the worst effect of a night time barrage, as the beam of light could temporarily blind the pilots and bomb aimers. Could this also have been partially the reason for Cardross being bombed?



The HAA gun installations had cables connecting the predictor, Command Post, searchlights and guns and also could supply data to other nearby gun positions. The present survey shows cable ducts in Command Posts and also leading to gun positions. The degree of sophistication and automation during the war is quite surprising and led to various strands of technology being born as a result, and which has continued to the present.

The first plane to be shot down by HAA in Scotland was in Orkney.

As the war progressed men were needed more and more at the front, so unmarried women between the ages of 20 – 30 years were enlisted into the ATS (Auxiliary Territorial Service or Army Transport Service), and many were stationed on AA guns sites to operate detection equipment and as plotters. The guns were 3.7” guns and the women were assessed for ‘nerves’. The noise of a gun barrage continually firing and the flashes especially at night time would have been terrifying at first, but with most things, people become used to a situation and especially during WW II it is adequately recorded how people adapted themselves to quite extraordinary situations.

The ATS ladies lived in Nissen huts on site with fourteen women to a hut.

Generally married or older men were selected for gun locations because of the women present.

731 women of the ATS died on active duty, but not all on HAA gun sites.

The ATS worked as spotters, using the telescope, height finder, predictor and Kline theodolite, they also operated in the Command Post as plotters.

All aspects of the HAA installations operated 24 hours per day and shift work was obviously in practice.

After the war, some camps were used to house homeless people; this happened at Geilston and is recorded in other places in Britain e.g. Mumbles Hill near Swansea.

The following information is taken from an HMSO publication of 1943; *‘Roof Over Britain’ The Official Story of the AA Defences 1939 – 1942*. The booklet appears to have been as much about propaganda and moral boosting, it states it does not give information the Germans won’t already have. It also states numbers of enemy aircraft hits, which at this early stage in the War may be exaggerated, as current accounts on the web indicate that accuracy was very poor indeed. Whatever the advances in radar were at this point, no mention is made of its existence, probably being too sensitive a subject at that time.

Light Anti Aircraft (LAA) was the Bofors guns, firing 2lb shells at 120 per minute to 6000 feet. Shells burst on impact. They were only effective for low flying aircraft.

Heavy Anti Aircraft (HAA) installations could be for 2, 4, 6, or 8 guns, the normal was four.

The Gun Position Officer (GPO) was in charge of guns etc, he had an assistant (GPOA) who directed orders.

The Spotter telescope had two eyepieces and is the first indication at the gun site of a plane, which has to be identified as friend or foe. They may have been forewarned by coastal and other perimeter lookouts.

When the spotter has a target, the GPOA shouts out the height and bearing, which he reads from the base of the telescope.

The predictor and Height finder then report they are “on target”.

When the GPOA hears all that he informs the GPO “Section on target”, the battery is then ready.

The data from the Predictor is passed to the guns which have two dials; one for bearing and one for elevation. The gunners move the gun both ways as instructed by the pointers on the dials.

The GPO and GPOA have to shout verbal commands from the Command Post i.e. where the instruments are in the open air.

Ammunition comes as two shells in a box which are stored beside the guns on wooden shelves, the boxes must not touch one another and the shells are examined daily for any problems.

The gun crew (usually eleven men) have a small shelter to sit in while waiting for action, but they and the other teams on the site must be on station at all times, the installations are manned 24 hours every day.

When the command “Take post” is shouted the crews are at their guns in seconds.

For a ‘half battery’ (4 guns) there are 140 people.

6 – 8 working the Predictor.

3 – 4 working the Height finder.

3 – 4 working the telescope.

It would appear at this time few women were involved, later the ATS did much of the instrument, plotting and other less rigorous work.

Films are available on Pathe News reels (web).

Information from web site to web site can vary – caution is required!

NCAS Project

The Military Project by NCAS is making good progress and its importance is in garnering data and the layouts on the current state of these WW II installations. It is known that parts of these sites have been affected or removed in the last two decades and the NCAS survey and research will eventually provide a valuable source for

students of the local and wider story of HAA defences along the Clyde and further afield in Scotland.

The next survey will be at the neighbouring HAA site of Mollandhu Farm where gun positions and elements of the camp survive (Pl 18), however there does not appear to have been a radar mat and current speculation is that Mollandhu may have been controlled from Geilston. In aerial photographs of Mollandhu, bomb craters in surrounding fields are clearly evident.

Acknowledgements

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All aerial photographs and other images downloaded from web sites will be duly acknowledged in the final publication which will include all of the sites surveyed and research by NCAS.