

The German Radio Guidance Station *K11, Stp Mo 44c* at Saint-Fiacre (Lanmeur-FR)

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How to cite this paper: Tomezzoli, G. T. (2023). The German Radio Guidance Station *K11, Stp Mo 44c* at Saint-Fiacre (Lanmeur-FR). *Archaeological Discovery*, 11, 189-202.

<https://doi.org/10.4236/ad.2023.114009>

Received: August 13, 2023

Accepted: September 23, 2023

Published: September 26, 2023

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Abstract

It is common opinion that the Battle of Britain during the WWII was principally characterised by the role of the British radars and the RAF aircrafts in detecting and destroying incoming German bombers. This is partially true, because it ignores the role played by German installations of advanced technology for guiding German bombers during their missions over Great Britain and the British attempts to jam the German bomber guiding beacons. The German radio guidance station *K11, Stp Mo 44c* at Saint-Fiacre (Lanmeur) is one of the best examples of German radio guidance station in France. The visits on the site, permitted to identify some *K11, Stp Mo 44c* components and to determine their preservation state at about eighty years from the end of the WWII.

Keywords

Knickebein, *K11, Mo 44c*, Lanmeur, Saint-Fiacre, Battle of England, Luftwaffe, Wassermann, See-Elefant

1. Introduction

It is common opinion that the Battle of Britain during the WWII was principally characterised by the role of the British radars and the RAF aircrafts in detecting and destroying incoming German bombers. This is partially true, because it ignores the role played by German installations of advanced technology, in particular the Knickebein systems, for guiding the German bombers during their mission over Great Britain and the British attempts to jam the German bombers guiding beacons.

2. History

The information about the Knickebein (Bent Leg) system came to the British

scientific, military intelligence through a note on a paper saved a day of March 1940 from the shot down German *Heinkel* aircraft *IH + AC* belonging to the *Kampfgeschwader 26 Löwen*. Its translation was:” Navigational Aid: ... Radio Beacon Knickebein from 0600 hours on 315°”.

Radio beacons were normally used by navigators for figuring out the position of their aircrafts. The radio beacon 315° was unusual because it pointed north-west and appeared to have been pre-set before the beacon itself. Knickebein appeared as a beamed beacon set in that day for transmitting in a north-west direction.

The interrogation of one of the prisoners allowed to establish that Knickebein was something similar to the German radio-guidance *X-Apparatus*, developed at the same time and, because of the short wave used, the British experts estimated that the beacon was not wider than a km in diameter over London.

Further, a rumour arrived from France, according to which the Germans had set up a kind of radio beam station on their frontier (Kleve-Dutch border, Stollberg-Schleswig-Holstein, Lörrach-Baden, [Trenkle, 1979](#)) that the experts evaluated as having surprisingly narrow beacon. Such a narrow beam would have required very short wavelengths.

The German attack exercises against Great Britain of March 1940 were followed by other exercises in June/July 1940. The beacons, surprisingly were directed against England although there was enough exercise space over France. Consequently, from early June, the British had the possibility to investigate such directional beams by means of one aircraft equipped with a radio landing system developed in Germany, and to prepare quickly countermeasures by means of diathermy transmitters (high frequency electric current devices) in the hope to jam the beacons by sending noise on the Knickebein frequencies (coded Headache), but with little effect ([Jones, 2009](#)).

A secret weapon report update ([Jones, 2009](#)) for the new Prime Minister Churchill, who had taken over the same day as the German invasion of Holland and Belgium, warned: “It is possible that [the Germans] have developed a system of intersecting radio beams so that they can locate a target such as London sufficiently accurately for indiscriminate bombing. ..., but the accuracy expected by the Germans is something like a 1/2 mile over London from the western frontier of Germany. Efforts are still being made to determine the possible wavelengths so that counter measures can be employed”.

The British Y Service intercepted German radio signals and a message from the Chief Signal Officer of the *Flieger Korps IV* on 5th June at 1455, decoded at Bletchley which was successful in decoding some of the *Enigma* messages, which informed: “Cleves Knickebein is confirmed (or established) at position 53°24' north and 1° west”. It was now obvious that the Germans had an intersecting beam system for bombing England. The bombers of the *Flieger Korps IV* were *Heinkel 111* of *Kampf Geschwadern 4* and *27*, equipped with a receiver *E. Bl. I* (*Empfänger Blind I*—blind landing receiver type I), normally used for blind landing, improved for receiving Knickebein frequencies. Knowing the frequencies at which the receiver could be tuned allowed the identification of the Knick-

eben emission frequencies.

Another prisoner informed that Knickebein was a bomb-dropping device which involved two intersecting radio beams and which was developed in Germany at Rechling. He drew a sketch of what he thought to be a transmitting tower.

In a ministry high-level meeting, it was taken the decision to jam these emission frequencies. Five British radar stations were equipped with signal receivers on radar towers, a RAF unit received the duty of detecting the beams in the air and new receivers and jamming systems were investigated (Jones, 2009).

On 1940 a small Knickebein system version was developed by the German company *Telefunken*, comprising a rail ring of 45 m in diameter. Its antenna, on a turntable, was turned on the rail. In the middle, it comprised 2×4 half-wave dipoles each associated with a reflector. Because thick dipole tubes were used, a system, without changes to the antenna, was able to be tuned from 30.0 to 31.5 MHz and from 31.5 to 33.3 MHz. The systems were used against Great Britain from May to September 1940 but always disturbed and finally they could no longer be used. For recognizing the distance from the target each bomber was provided with a X-device. The system beacons served primarily to recognize the approach and return routes on the sea about 30 - 80 km parallel to the English coast outside the range of jammers. To indicate turning points, at the beginning, another Knickebein beacon was used and later other types of radio beacons. One system beacon was directed to the target indicating the pathway and it was crossed over the target by a second beacon used as signal for the bombing (Trenkle, 1979). The Knickebein beacon worked according to the Lorentz beam principle consisting in transmitting two fairly blunt beams, pointing in slightly different directions but overlapping one another in a relatively narrow region which was the beam along which the aircraft had to fly. The two overlapping beams were generated by two aerial systems pointing in slightly different directions and mounted together on a turntable. The radio transmitter was switched from one of these aerials to the other and back again in a repetitive sequence so that one aerial transmitted for a short time transmitting a dot beam, followed by a longer interval, while the other aerial transmitted for a longer time transmitting a dash beam followed by a short interval. On a receiver for the two aerial signals on an aircraft a dot signal was immediately followed by a dash signal giving rise to an equi-signal giving a continuous note. As the aircraft moved on one side toward the dot beam the dot signals became stronger above the continuous note and vice versa with the dash signals. This indicated to the pilots the direction to steer for bringing the aircraft back in the equi-signal beam. The turntable was turned so that the aerials were set in a direction such that the equi-signal beam crossed the target. In case of a bomber, a second system transmitted a beam crossing the equi-signal beam few kilometres before the target.

On 1940 nine small Knickebein systems were installed along the coasts of Norway, Germany, Holland, and France.

On 27th June 1940 another Knickebein information arrived through an *Enig-*

ma message “it is proposed to set up Knickebein and *Wotan* installations near Cherbourg and Brest” (Jones, 2009).

Correspondingly, on the other side of the English Channel, a company working for the German *Luftwaffe* on the aviation camp of Morlaix was the first German unit to reach Lanmeur. The *Luftwaffe* installed one of the small Knickebein system at Saint-Fiacre, near Lanmeur (Figures 1-3). The system was defended by the 3rd battery of the group *Flak 752* (Unit L32 999). The gunners were lodged at the ancient gendarmerie (Flock, 2012).

From 13th August 1940 (*Adler Tag*) began large-scale operations of German bombers using Knickebein systems. So, Liverpool, among other, was attacked from 28th to 30th August (Jones, 2009).



Figure 1. aerial oblique view of the radio guidance station *K11, Stp Mo 44c* of Saint-Fiacre around 1947. Distinguishable are: the access road, the reinforced, buried bunker, concrete barracks or exhaust vents near the bunker, *Flak* emplacements, the Knickebein ring with two nearby constructions, a ditch for one shack or cistern; the *Wasserman/See Elefant* antenna (Rapport Pinczon du Sel, 1947-1948a).

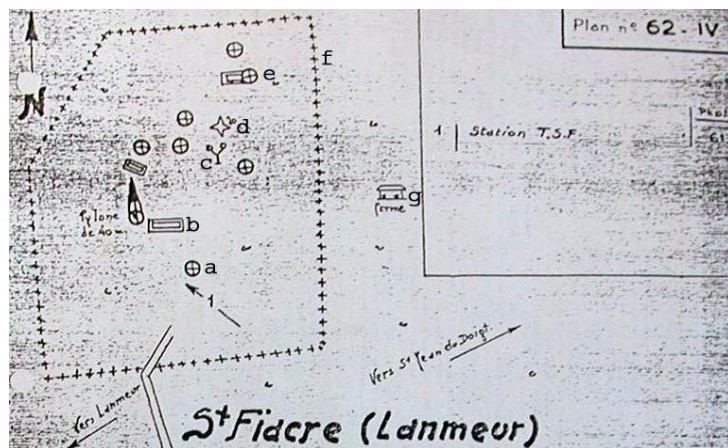


Figure 2. radio guidance station *K11, Stp Mo 44c* of Saint-Fiacre (Rapport Pinczon du Sel, 1947-1948b)—a, tobruck; b, unburied concrete bunker; c, listening post; d, concrete cover for *Flak* gun—small model—20 mm; e unburied thick concrete bunker *R622* (11), flanked by a tobruck for machine gun; f barbed wire and mines; g farm.



Figure 3. radio guidance station *K11, Stp Mo 44c* of Saint-Fiacre—1, tobruck; 2, reinforced, buried bunker; 3, concrete barracks or ventilation towers; 4, three concrete barracks or ventilation towers; 5, possible light *Flak* emplacement or tobruck; 6, *L409 Flak* emplacement; 7, Knickebein single rail ring; 8, possible light *Flak* emplacement or tobruck; 9, pit for shack or cistern; 10, possible *Flak* emplacement or tobruck; 11, *R622*. C0515-0021_1966_F0515-0915_0110, n° 110, ech. 1/23364, Argentine, 16/05/1966.

The German site of Saint-Fiacre was fortified assuming the code name *Stp Mo 44c* and became an important *Luftwaffe* radio guidance station (*Funk-Sende-Anlage*—FuSan) coded *Dora/Knickebein K 11*. It was built by the *Organisation Todt* (*O.T.*) dependent directly from the High *Kommandantur* and allowed the driving of the German bomber wings during night raids on Great Britain (Flock, 2012). It was equipped with: 1 × *FuSan 721* Knickebein; 1 × *FuMG 402 Wasermann*; 1 × *See-Elefant* and 1 × *FuSE* (*Funk-Sende-Empfänger*—emitter) *62 A* (Lécuillier, 2003).

Table 1 adds some more convergent information about the site.

Ameliorated, more powerful jam senders (*Aspirin*) were successfully used from 7th September. These transmitted dash signals like those emitted by the Knickebein systems so that the German bomber navigators flying along the equi-signal beams, hearing the dash signal would be confused depriving them of navigation accuracy. In October the jammers were so powerful that the Knickebein beacons on England were almost worthless for insufficiently trained bomber crews and could only be used for marking approach routes across the sea including turning points (Trenkle, 1979).

Apart from the accidental bombing night of 24th August, London was saved from attack up to the afternoon of 7th September, when London docks were touched and gone in fire visible from the British coast, facilitating the German night bombers. From 7th September to 13th November each night, except one, 160 bombers were sent against London (Jones, 2009).

Table 1. *Dora/Knickebein K11* (Lippmann, 2021).

ID F3	Type	Cover name	Location	Order/Duty Equipment
334	FuSAn	<i>Dora</i>	St. Fiacre/ Nw Lanmeur	1 × <i>FuSAn 721</i> Knickebein (1944 dismantled)
		<i>K11</i>		1 × <i>FuMG 402 Wassermann</i> 1 × <i>See-Elefant</i> 1 × <i>FuSE 62 A</i>

The Saint-Fiacre site was attacked several times by allied bombers, but only one bomb damaged the ring rail of the Knickebein system.

The *FuMG 402* was formed by a square frame of ten meters length mounted on a pivot at the extremities and a roll ring. On 1944, this emitter was replaced by a device *See-Elefant* linked to a pylon forty-meter high supporting the antennae.

A reinforced, buried bunker (Figures 3-5) was built, comprising a three meters thick coverage, four garage cells for special tracking trucks, one electrical power plant, one data exploitation and transmission room to the wings in flight and rooms and depots for the troop.

Four bunkers two of which provided with a machine gun tobruck and two other *tobrucks* (one nowadays destroyed) were located on the site. The anti-air defence was composed by three emplacements each provided with a 20 mm *Flak 30* gun. The station was protected by a large net of barbed wires and mine fields (Lécueillier, 2003).

Lanmeur was liberated on 9th August 1944 (Flock, 2012).

After the Liberation, the site, favourable for radar installations, was preserved by the French *Armée* and *Marine Nationale*. The reinforced, buried bunker, judged practically indestructible, was used as garage and agricultural depots by the field proprietors.

Recently, the site has been transformed in a “stand de tir”—shooting range—and the large garages cells still preserve their original orange camouflage (Lécueillier, 2003).

3. The Visits

The visits took place on 20 July 2023 and 22 July 2023. The *K11*, *Stp Mo 44c* (48°39'58.31"N, 3°43'48.7"W, height 120.69 m) identified structures (Figure 3) were the following.

A *tobruck* (1) (48°39'54.36"N, 3°43'46.44"W, h. 115.58 m) (Figure 6) disposed as defence of the site entrance road, buried in the terrain. The exposed external concrete structure was well-preserved, without damages due to combats or bombardments. It presented green painted entrance walls due to a restauration attempt. The entrance gave access to a clean combat room preserving formwork board traces. The combat room aperture was obstructed by a blue metallic plate.



Figure 4. Reinforced, buried bunker—(a) Coverage three meters thick; (b) Entrances of the electrical power plant; (c) Entrance square and four garage cells for special vehicles with orange camouflage; (d) Entrance of the rooms and depots for the troop; (f) Internal telephone; (g) Watertight insulation.

A reinforced, buried bunker (2) ($48^{\circ}39'54.62''\text{N}$, $3^{\circ}43'47.6''\text{W}$, h. 114.45 m), 14×9 m, *Sonderkonstruktion*, facing three sides of an entrance square (Figure 5). On its coverage were several meters of terrain and vegetation. The entrances of the electric generator room and the fuel depot faced the square left side. The four entrances of the garage cells faced the middle, larger square side. The entrance of the troop rooms and depots faced the square right side. All the entrances were obstructed by recent metallic, bleu painted doors, so that the interior remained inaccessible. The bunker external concrete structure appeared well-preserved without damages due to combats or bombardments. It preserved the traces of the formwork boards typical of the German masonry and the original orange camouflage on the garage cells entrances.

A group of concrete barracks or ventilation towers (3) ($48^{\circ}39'54.69''\text{N}$,

3°43'48.24"W, h. 121.56 m) for the generator room and the garage cells, near the bunker coverage, disappeared or buried in the terrain.

A three concrete barracks or ventilation towers (4) (48°39'55.43"N, 3°43'47.52"W, h. 121.26 m) for the garage cells and the troop rooms and depots, inaccessible (Figure 6). The visible coverages appear in good preservation state without damages due to combats or bombardments. A television antenna on the coverage of the larger one indicated a possible squat.

A possible light *Flak* emplacement or *tobruck* (5) (48°39'56.82"N, 3°43'47.86"W, h. 117.31 m) disappeared or buried in the terrain.

A *FuMG 402 Wassermann* (48°40'54.49"N, 3°43'51.52"W, h. 116.23 m) disappeared. Its basement was not identified because it was probably demolished or buried in the terrain. No concrete anchor blocks for the antenna on the terrain were identified.

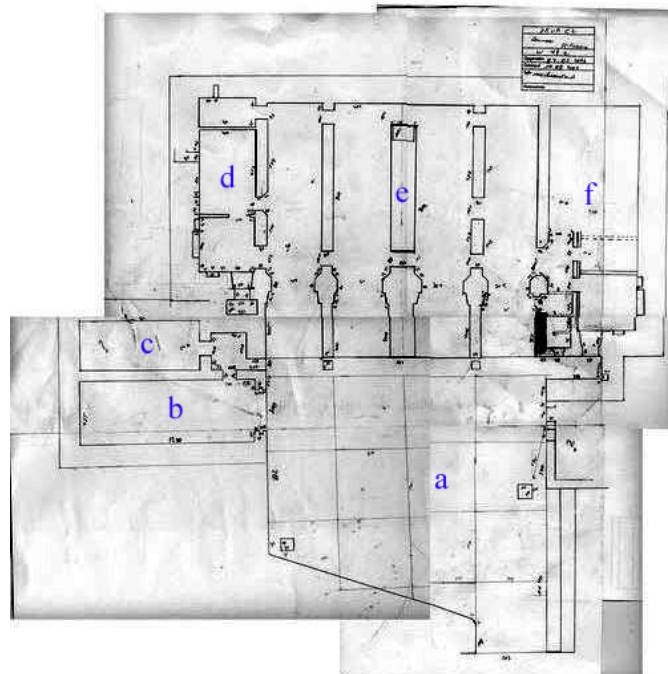


Figure 5. reinforced, buried bunker plan—(a) Entrance square; (b) Electric generator room; (c) Fuel depot; (d) Workshop; (e) Garage cells; (f) Troop rooms and depots (Lécuyer, 2003; Peeters, 2003).

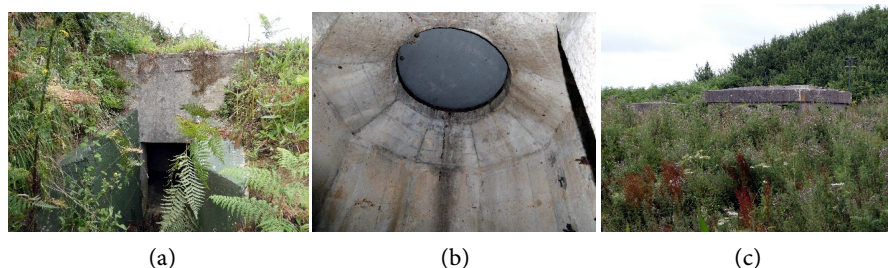


Figure 6. (a) *Tobruck* (1) entrance; (b) Aperture of the combat room; (c) Concrete barracks or ventilation towers (4).

A *See-Elefant* (unknown position) disappeared. Its basement was not identified probably because it was demolished or buried in the terrain. No concrete anchor blocks for the antenna were identified on the terrain.

A *FuSE 62 A* radar (unknown position) disappeared. Its possible concrete platform was not identified because it was probably dismantled or buried in the terrain.

An *L409* (6) ($48^{\circ}39'57.25''\text{N}$, $3^{\circ}43'50.08''\text{W}$, h. 120.05 m), with one possible nearby other *Flak* emplacement, disappeared or buried in the terrain.

A *FuSAn 721* Knickebein (7) ($48^{\circ}39'58.39''\text{N}$, $3^{\circ}43'49.4''\text{W}$, h. 120.76 m) disappeared.

A possible light *Flak* emplacement or *tobruck* (8) ($48^{\circ}39'58.98''\text{N}$, $3^{\circ}43'50.13''\text{W}$, h. 120 m) disappeared or buried in the terrain.

A 7×10 m pit for shack or cistern (9) ($48^{\circ}39'58.33''\text{N}$, $3^{\circ}43'48.14''\text{W}$, h. 120.45 m) disappeared.

A possible *Flak* emplacement or *tobruck* (10) ($48^{\circ}39'58.17''\text{N}$, $3^{\circ}43'46.57''\text{W}$, h. 117.6 m) disappeared or buried in the terrain.

An *R622* (11) ($48^{\circ}40'1.38''\text{N}$, $3^{\circ}43'46.97''\text{W}$, h. 117.22 m) buried in the terrain and covered by vegetation (**Figure 7**) (**Appendix**). The visible portion did not let possible to estimate its preservation state.

Two elements of the electrified protection barrier ($48^{\circ}39'57.05''\text{N}$, $3^{\circ}43'48.11''\text{W}$, h. 117.32 m) (**Figure 8**) each comprising an original, concrete support and five insulation glass elements some of them still in place.



Figure 7. *R622* (11) ruins.



Figure 8. electrified protection barrier—(a) Remains of two concrete supports; (b) Glass insulation element, details.

4. Discussion

K11 is sometime erroneously indicated in literature as located at Plestin-les-Grèves (N/O Morlaix) (Trenkle, 1979). The listening post (c) in **Figure 2** might correspond to the Knickebein system.

Two theories concern the vehicles parked in the reinforced, buried bunker cells. The first assumes that they were four trucks (*Meßfahrzeugen*) each provided with a shelter containing sensor devices for measuring the strength (Tomezzoli, 2019) of the Knickebein signals at different distances (Lécuillier, 2003). The second assumes that they were three trailers each provided with shelter containing radar instrumentation and a tractor. The tractor moved the trailers on the entrance square site to allow the cooling down of the instrumentation in the shelters. In case of attack the tractor would have pushed the trailers inside the garage cells. The same type of bunker, including the camouflage painting was constructed at *K9* (Beaumont-Hague-West Cherbourg).

The Knickebein operators were probably lodged in the rooms and depots for the troop (f) of the bunker so as to have easy access to the data exploitation and transmission room. The location of this room inside the bunker is unknown. It is also possible that operators were lodged in the constructions near the Knickebein ring or in the nearby *R622* originally intended for two groups of soldiers.

The internal telephone (**Figure 4(e)**) bearing the inscription: ACHTUNG! FEIND HORT MIT!—Danger! Enemy hears with!—has been indicated as a false one.

The bombing missions managed by *K11* are unknown.

The electric generator was similar to a Diesel motor of a ship. It supplied electricity not only to the Knickebein and the radar systems but also to the electrified protection barrier (**Figure 7**).

The *K11* rail ring was demolished on 1975 after some people had accidents on it. The aerial systems were already dismantled on 1944.

The pit might have hosted and protected a shack for personnel lodgement as those at Cap Fréhel (Tomezzoli, 2021), *Qu 500* and *Qu 13* at the Pointe du Raz (Tomezzoli, 2021), on the Menez Hom (Tomezzoli, 2017) and at Flescou (Tomezzoli, 2022) or was a cistern/pool as those at Murs Érigné (Tomezzoli, 2016) and the Domaine de Pignerolle (Tomezzoli, 2019) for providing relax to the personnel in service and water in case of fire to the components on the site.

The commissioning of *FuMG 402 Wassermann* started about on 1942, therefore that of *K11* did not participate to the Battle of Britain as possible ranging system for detecting the German bombers positions on the equi-signal beam so as to allow the transmission of the second beam indicating the target. The *FuMG 402* and the *See-Elefant* were long-range, early warning radars (range of about 300 km) intended for detecting incoming enemy aircrafts and alert the *Flak* emplacements not only those of the site but also those around Brest (Tomezzoli & Dupont, 2009). The *FuSE 62 A* was a movable, short-range radar (range of about 30 km) able to detect azimuth and height of incoming enemy aircrafts so as to

direct the fire of the gun batteries of the site and possible nearby other batteries. It is still recognizable here the coupling on the same site of long-range, early warning and short-range radars remarked also at the radar stations at Cap Fréhel (Tomezzoli & Moser, 2021), Pointe du Raz (Tomezzoli, 2021), Saint-Pabu (Tomezzoli & Colliou, 2017), Monterfil (Dupont et al., 2007) and Les Mées (Tomezzoli & Pottier, 2015).

The mast actually claimed as 40 m height of the *See-Elefant* radar-system (Figure 2) was added on the site on 1944. The site included a *FuSE 62A Würzburg* with a circular antenna and a *Wassermann* radar at different times—though not necessarily at the same time.

A photogrammetric analysis of Figure 1 revealed that the mast was actually 60 m height and was not pointed at the bottom. Based on this, it appears to be the mast of a *Wassermann S* (Schwehr—heavy) without the antenna elements. The *See-Elefant* was not a complete radar system. It was only the half of a bi-static radar system: the radar transmitter (*See-Elefant*, with a twin mast (!) antenna) was not collocated with the associated radar receiver (“*Russel*”). They had large antennas separated by about one km. No antenna system had a mast that looked like the one in Figure 1.

A decoy-Knickebein (“*Schein Knickebein*” typically a wooden contraption) was located 3.5 km North of *K11*, at Saint-Jean-du-Doit (Döremberg, 2004-2016). A search on satellite images for such a decoy actually permitted to identify a circular structure of about 30 m in diameter at Guernevez (48°42'14.02"N, 3°46'19.22"W) in the municipality of Saint-Jean du Doigt, but the visit on the site on 8th August 2023 and the information of the owner allowed to ascertain that it was a waste water dump built on free terrain in the 1950s. The owner also declared that no structure of the WWII was located at Guernevez.

The choice to place the *Wassermann* and after of the *See-Elefant* at the site was rather obvious. In fact, the site already offered an elevated position (121 m), a reinforced, buried bunker, an electric generator, a data exploitation room and personnel lodgements.

The *K11* Site map, based on RAF Photographic Reconnaissance Unit (P.R.U.) sorties in July 1940-Sept. 1941 (Döremberg, 2004-2016), identifies six more guns light batteries around the site.

5. Conclusion

The development of the shooting range preserved the *K11* reinforced, buried bunker, one cell of it is actually used as shooting training room and the troop rooms and depots (f) used as administration rooms. But it imposed also a deep alteration of the site by the erection, because of the neighbouring inhabitants protestations (Baudier, 2021), of terrain barriers to muffle the gunfire shots, which caused the covering or destruction of site structures like *tobrucks* (Figure 2) and concrete barracks or ventilation towers (3). The utilisation of the reinforced, buried bunker, at the moment, ensures its preservation and its survival in

the near future. However, no classification as monument or architectural heritage of the site is foreseen. Moreover, no tourist board gives information about its existence, history and structures. In any case, the hope is that this article will attract the attention of archaeologists, scholars and a large public about the study and preservation of German installations of advanced technology operating in France during the WWII.

Acknowledgements

I am grateful Mr Döremberg for his explanations about the *Knickebein* system, the first parked vehicle theory and his kind permission of using information about K11 coming from his internet site, to Mr. Denis for his explanations during a visit of the K11 site and about the second parked vehicle theory, to Mr. Peeters for his kind permission to insert in the article the reinforced, buried bunker plan and to Mr Fleuridas for his kind permission to insert in the Appendix the plans of the R622 bunker.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Appendix

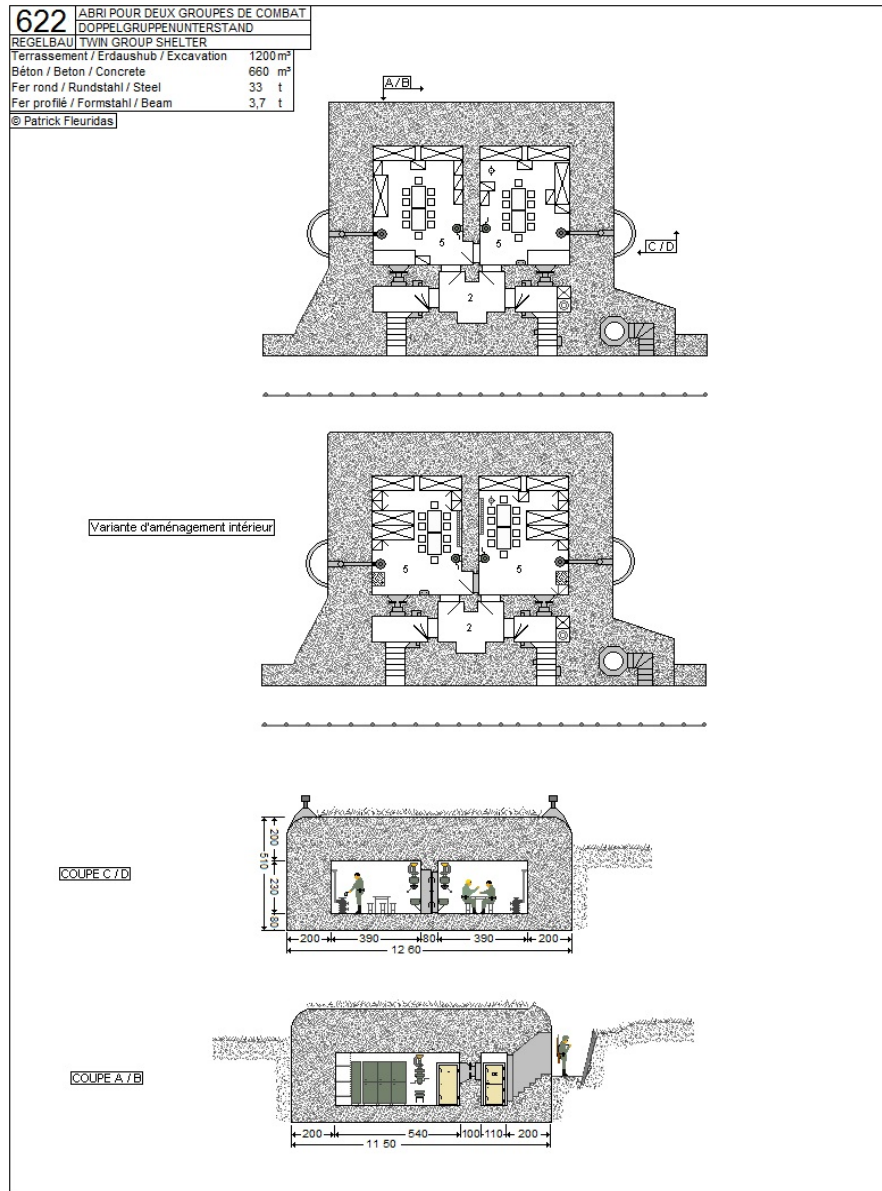


Figure A1. R 622 twin group shelter—plan: 2 gas lock, 5 - 6 crew rooms (Courtesy Fleuridas P.).