

RADIO AIR NAV | FUSAN 724/725 "BERNHARD" GROUND STATION - BE-9



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Latest page update: March 2024 (added ref. 231B, added Fig. 7)

Previous updates: November 2022 (added Fig. 152A); September 2022 (updated Fig. 151); February 2020 (added refs. 210Y-210AE and 244M-244Q); October-November 2019 (uploaded complete map for ref. 210A, added maps ref. 210E-210W, added Fig. 150B).

BERNHARD INSTALLATION BE-9 AT BREDSTEDT (Germany)



Bernhard station Be-9 was located on the "Stollberg" hill, 4 km north-west of **Bredstedt** in the far north of Germany, next to the B5 *Bundesstraße* highway (*Reichsstraße* R5 at that time). This is ca. 32 km (20 miles) southwest of Flensburg, and half-way between Leck and Husum. With 44 m above sea level, it is one of the highest points in the area (see [this interactive topographic map](#) with Be-9 marker). According to ref. 99, this Bernhard station had the "Kennbuchstabe" identifier "K", transmitted as part of the compass rose information. However, per §21 in ref. 6C, it was the letter "X".

The aerodrome of Leck is about 16 km north of the Bernhard station, and was a Luftwaffe *Fliegerhorst* built in 1939/40. It became a fighter base

mid-1944. Husum, some 11 km south of Be-9, had a small civil aerodrome, Narrenthal, that was built in 1931. In September of 1939, it was expanded into a Luftwaffe *Einsatzflugplatz* (main operating base): Husum-Schauendahl. Luftwaffe fighters were stationed here full-time, starting May 1942. Nearby Husum-Schwesing was a decoy airfield ("Scheinflugplatz", ref. 119). Fliegerhorst Schleswig (a.k.a. Schleswig-Jagel) lies 44 km to the southeast of Be-9, and became operational in 1937. Flensburg-Weiche airfield (a.k.a. Flensburg-Schäferhaus) lies 30 km to the northeast of Be-9, and Westerland/Sylt about 50 km to the northwest. All of these airfields were home to Luftwaffe fighter and/or night-fighter units.

All "Bernhard" stations normally only transmitted compass rose information. At the end of the war, a few stations also had the [capability to send "running commentary" command messages](#) to fighter aircraft in Hellschreiber-format. Be-9 was one of them. Ref. 6G.



Fig. 1: Be-9 is marked on a Luftwaffe night-fighter navigation chart
(source: ref. 244L)



Fig. 2: Be-9 is marked on a Luftnachrichten map of July 1944
(source: ref. 210B; note the "t" missing after "Bredstedt")

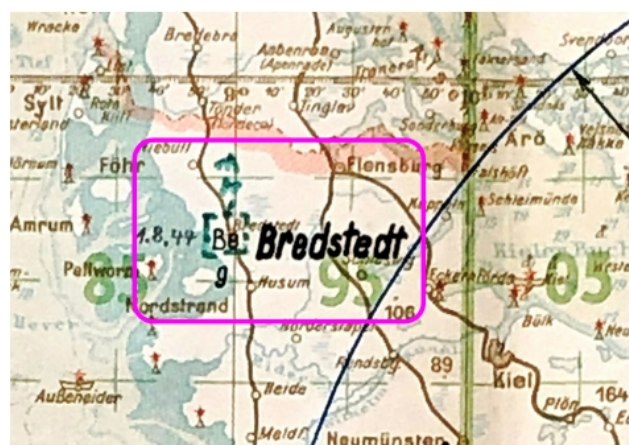


Fig. 3: Be-9 is marked on Luftwaffe Signal Corps maps dated 15 June 1944
(source: ref. 210E (left) and 210A; dashed box around "Be" means "planned or under construction" - here with est'd completion date 1-Aug-44)

Before the Bernhard station was built at this location, it was the site of FuSAn 721 "Knickebein" station number [Kn-2](#). It was built in 1939 and operational in 1940. "Knickebein" was also a radio-navigation beacon. The "Knickebein" stations in Germany ([Kn-2](#) at Bredstedt, [Kn-4](#) at Kleve, [Kn-12](#) at Maulburg/Lörrach) were all the large version of the system. It had an enormous antenna system: 29 m tall (≈95 ft) and 99 m wide (≈325 ft), and could be rotated on a track with a diameter of 93 m (≈305 ft). The small version ("kleine Bauform") of "Knickebein" only stood half as tall and wide as the large version, and had a circular track with a diameter of 31 m. It had a smaller range. Hence, it was used at locations in occupied countries, closer to targets in England. The "Knickebein" antenna could be rotated, so as to point its beam in the direction of the target that was to be bombed. Like the "Bernhard" system, the "Knickebein" antenna system

had a central support, and a circular track on a concrete base (though a single track and no locomotives). Both "Knickebein" and "Bernhard" operated in the same frequency range (30-33.3 MHz).

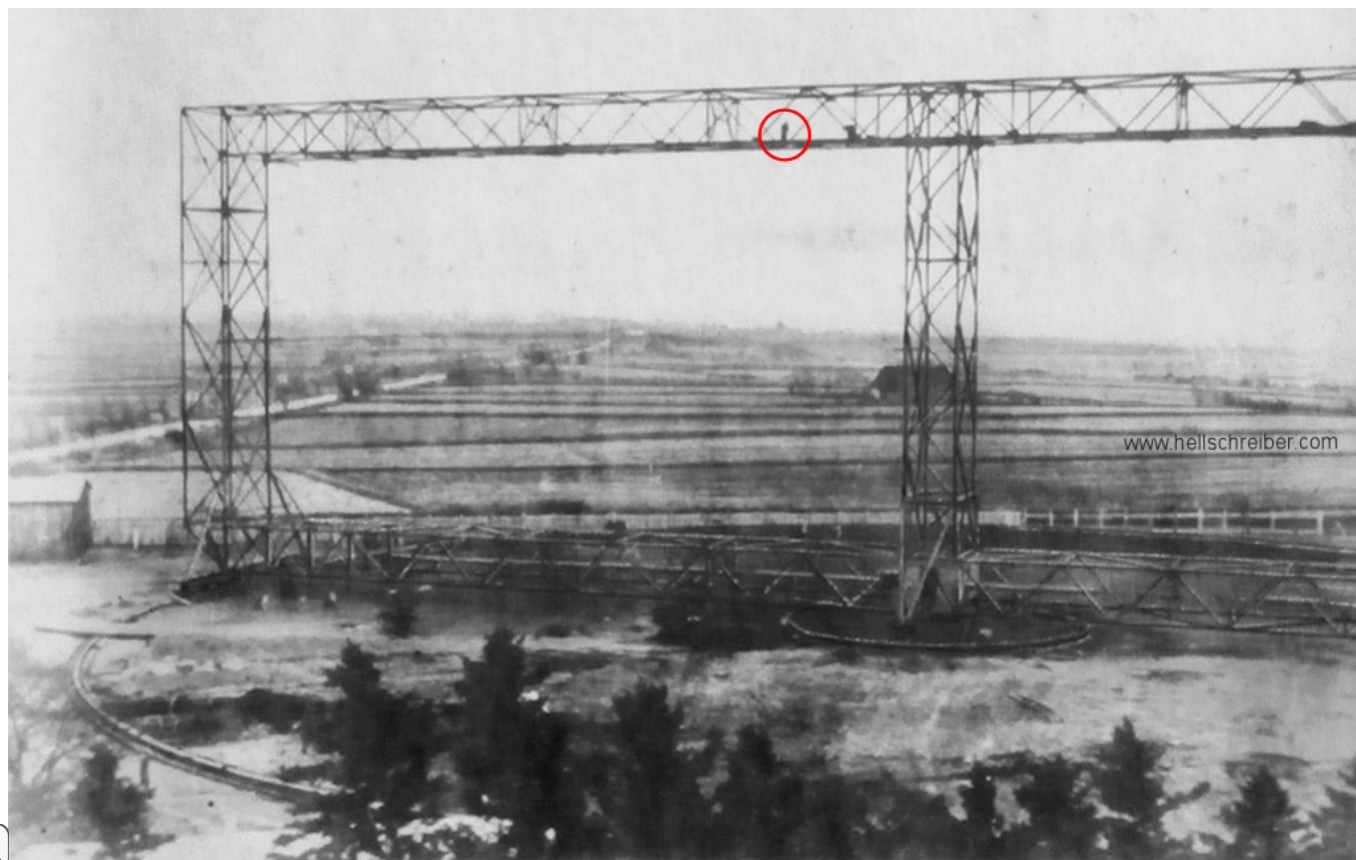


Fig. 4: "Knickebein" K2 under construction at Bredstedt (circular track diameter ca. 90 meters)

(source: Fig. 36 in ref. 181; note the relative size of the man inside the upper left truss)

This "Knickebein" station was only active for about a year, until British jamming and spoofing became too effective. It was abandoned before mid-1941, at which time the site was guarded by civilians. Mid-1944, the Knickebein installation was still there (ref. 120), though not operational. This suggests that the Bernhard station at Bredstedt was constructed *after* the summer of 1944. This is consistent with the estimated completion date of 1 August 1944, as marked on the maps in Fig. 3 above. The concrete ring of the Bernhard beacon was built inside the defunct "Knickebein" circle, off-center. The barracks outside the "Knickebein" circle were all put in place for the "Knickebein". Two brick buildings were added inside that circle, to support the operation of the "Bernhard" station. After the war, the barracks were used for German refugees from eastern Europe (ref. 120).

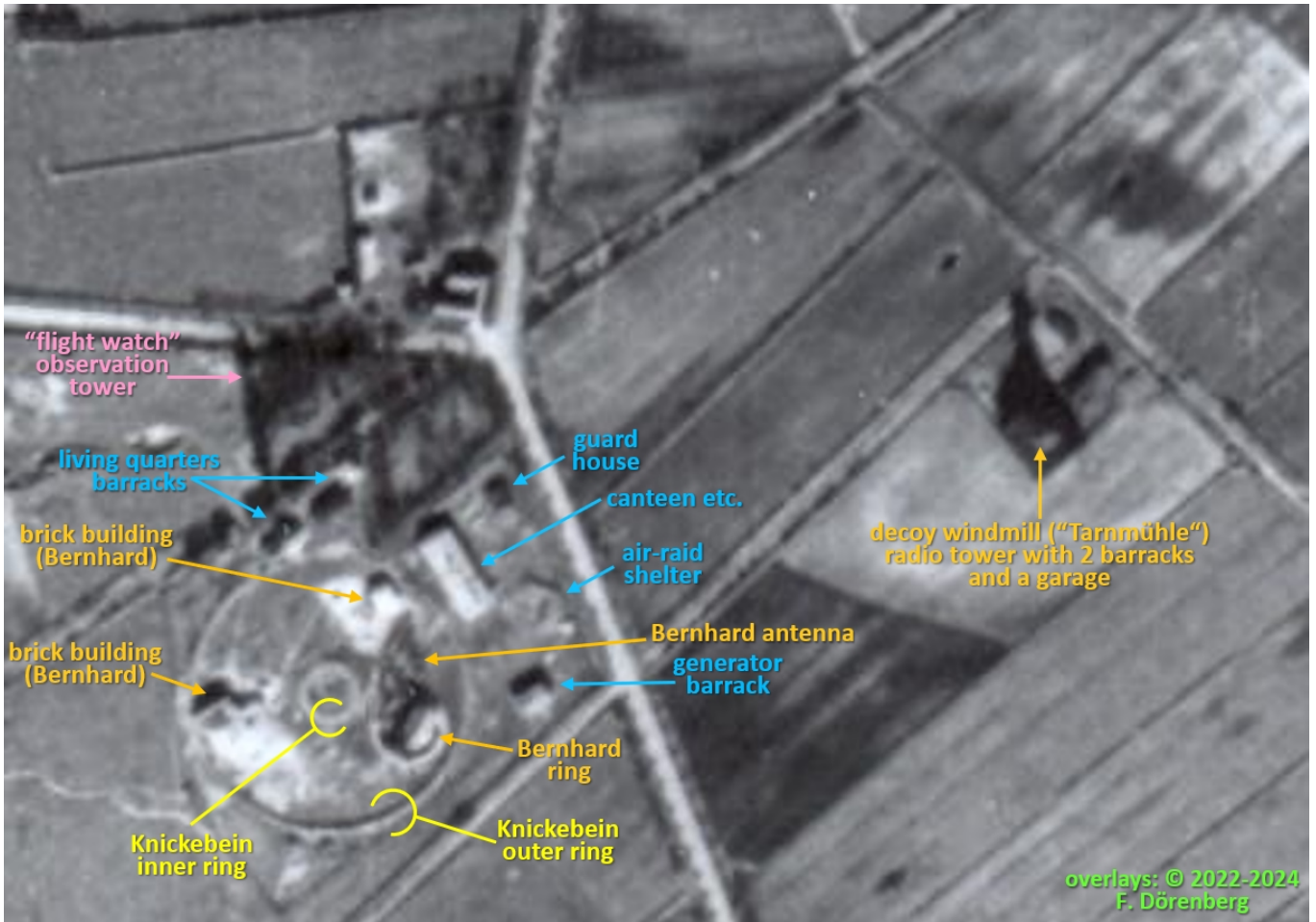


Fig. 5: Aerial photo of the Stollberg/Bredstedt site - March 1945
(source: unknown)

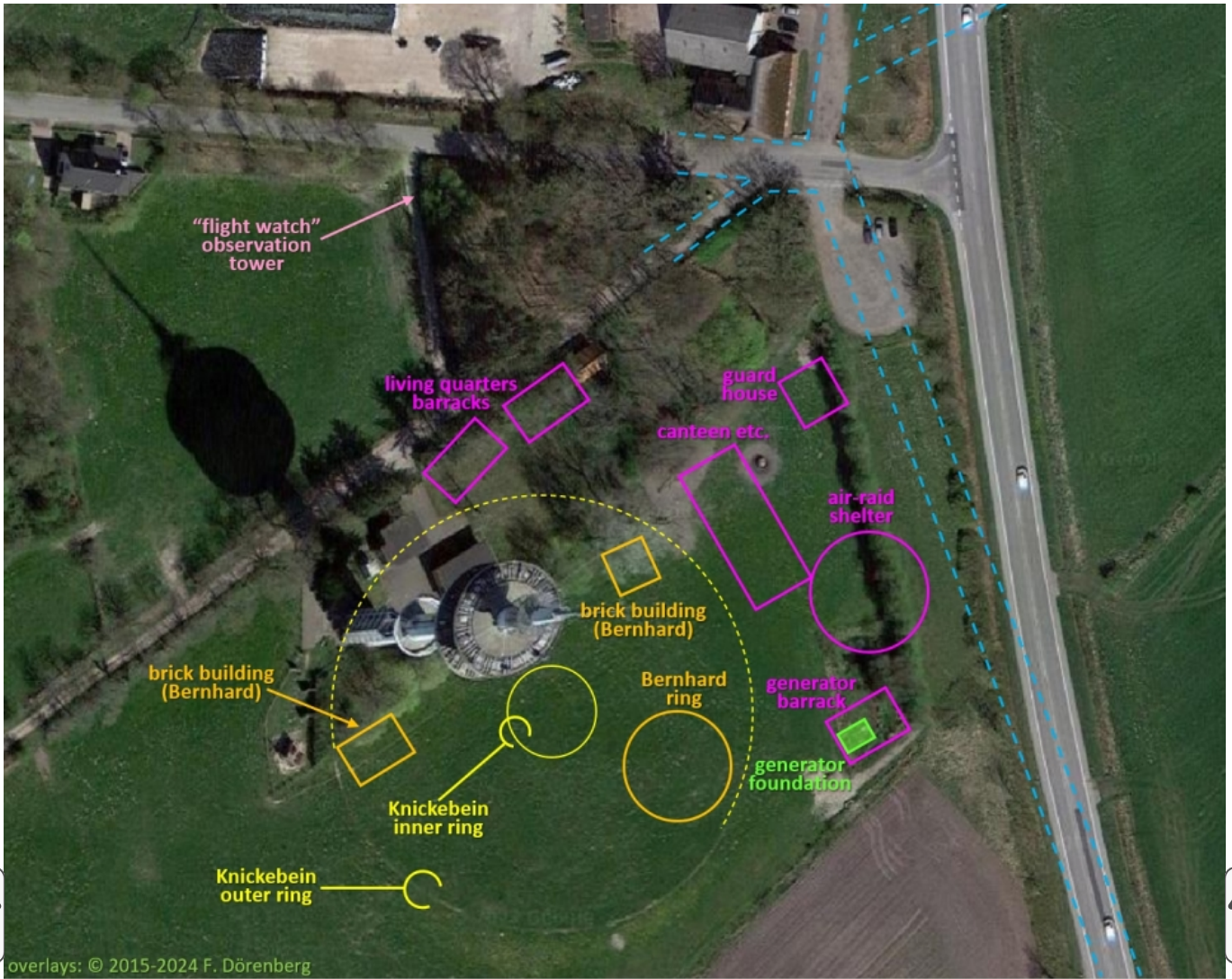


Fig. 6: Annotated satellite image (ca. 2011) of the Stollberg site
 (at the 10 o'clock position of the circle: modern transmitter tower (TV, FM radio, telecom, cell phone);
 the dashed blue lines show where the road used to be)



Fig. 7: The Be-9/Kn-2 site on a 1954 British reprint of a German war-time map
 (source: adapted from ref. 231B)

There were living quarters on the north side of the "Knickebein" circle (officers may have been quartered in town). There was also a guard house and a "Wirtschaftsbaracke" (canteen, possibly laundry and washroom facilities) to the northeast. There was an electric power barrack ("Generatorbaracke") about 25 meters to the east of the Knickebein ring. The concrete foundation for the generator is still visible in recent (2022) satellite images - as is the large "Knickebein" ring (see just inside the bottom part of the large yellow circle). Between the "Wirtschaftsbaracke" and the "Generatorbaracke", there was a light air-raid shelter ("Luftschutzunterstand"), dug out into the ground, and reinforced with a wall made of wooden poles.

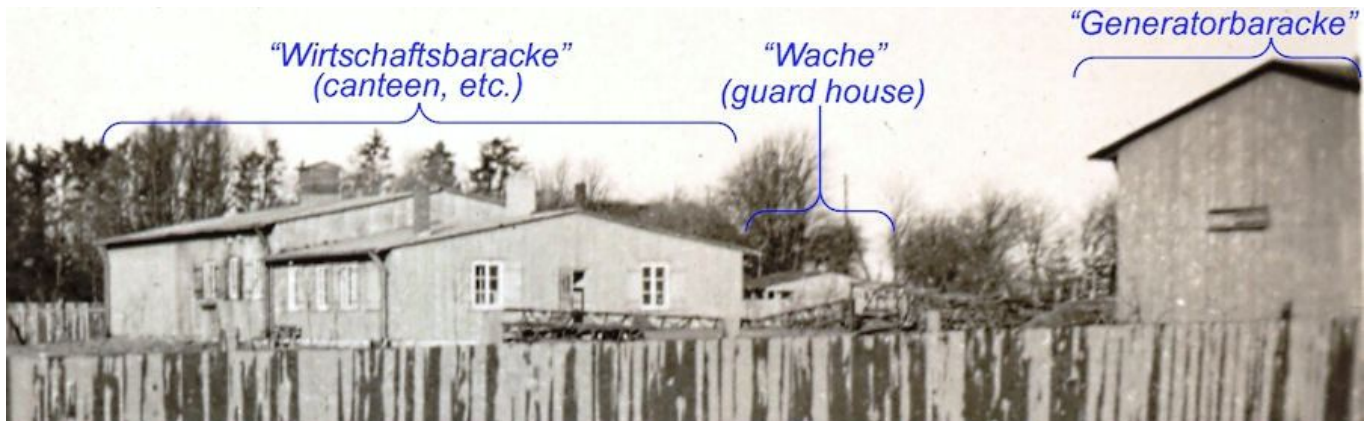


Fig. 8: Wooden barracks on the east side of the Knickebein & Bernhard rings, behind wooden fence

(source: R. Grzywatz, used with permission)

The concrete foundation slab for the generator is still visible today:





Fig. 9: The rectangular concrete foundation of the power generator is still still there
(source: ©2008 R. Grzywatz, used with permission)

The standard antenna mast for monitoring of the "Bernhard" transmissions was located in a field, over 500 meters southeast of the Bernhard ring:



Fig. 10: The antenna mast for transmission-monitoring was located over 500 meters southeast of the Bernhard ring

The concrete foundation measured 3 x 3 meters (10x10 ft), the same size as at other Bernhard sites. The concrete foundation was removed in 2013. After the war, the mast was dismantled and divided among the locals. A section of the mast was used as a lookout tower at a fox breeding farm in nearby Ost-Bordelumfeld (less than a km southeast of the Bernhard site). The tower was dismantled when the farm ended its breeding activities.



Fig. 11: Concrete foundation of the monitoring-antenna mast (right-hand photo: the mast was partly re-used later)

(source: R. Grzywatz, used with permission)

Each leg of the mast had a triangular base plate of 30.5x30.5 cm (1x1 ft). Each plate was secured to the foundation with two bolts (threaded rebar) of 20mm diameter.



Fig. 12: Mounting bolts for one of the legs of the mast (left), and embedded ground

straps (right)

(source: ©2008 R. Grzywatz, used with permission)

A radio mast and associated barracks were located some 250 meters to the northeast of the Knickebein and Bernhard circles (see the satellite image in Fig. 10 above). The mast sticks up through the roof of a large barn, and was disguised as a windmill ("Tarnwindmühle"). See Fig. 13. This was a directional-radio relay station, built after the Knickebein was decommissioned. Basically, it was a range-extender repeater for the voice-broadcast of running commentary of a Y-station of the regional *Jägerleitstelle*, for vector-guiding fighter aircraft to their target. The tower also carried an antenna for radio communication with that *Leitstelle*. There were two barracks and a garage barn at the base of the tower. One of the barracks housed the radio equipment racks. A mobile back-up power generator was kept in the garage. The 4-wire power lines going to the tower connected to the local or regional electrical power grid.

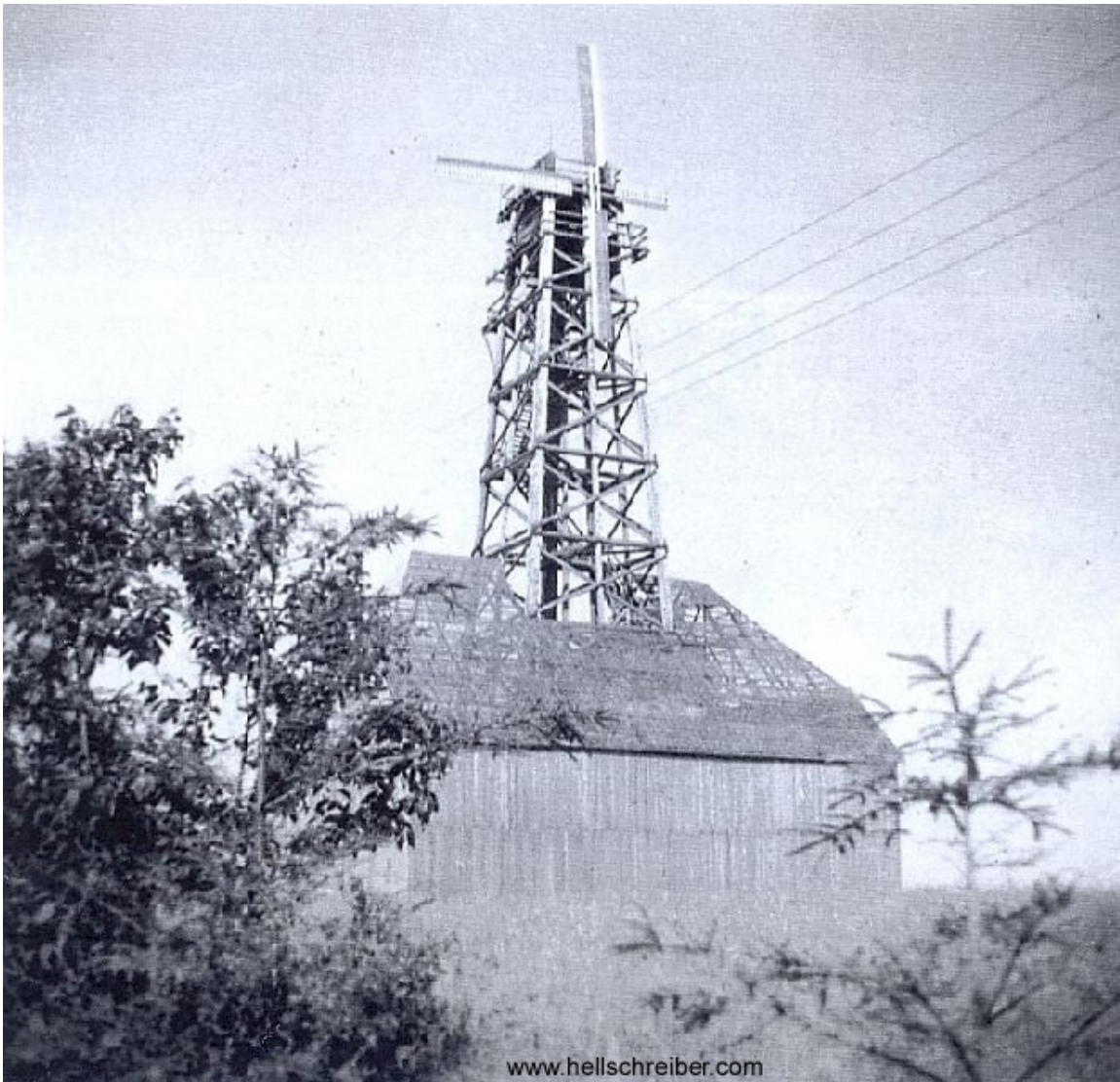


Fig. 13 The "windmill" radio mast

(source: collection R. Grzywatz, used with permission)

The British "Air Disarmament Wing" (ADW) moved in, as soon as a Luftwaffe airfield or other installation was captured. Besides disarming and disbanding the Luftwaffe units, their task was to get classified documents (and other items of interest), translate and interpret them, and send them to ADW headquarters or to the Air Ministry in London. The ADW employed Luftwaffe

personnel. In the photos below, taken ca. August of 1945, they wear a white "ADW" arm band on their left arm.

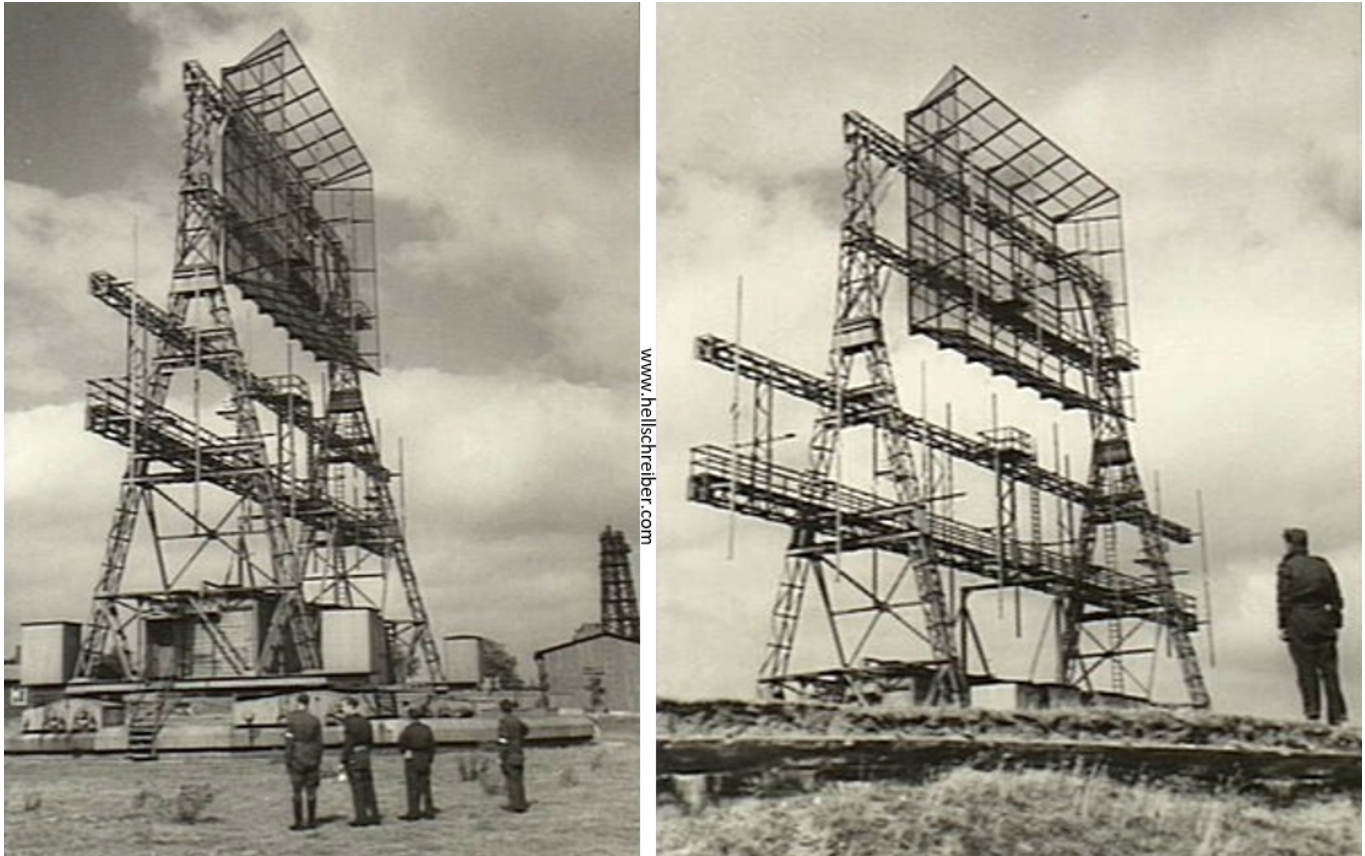


Fig. 14: "Wirtschaftsbaracke" (canteen etc.) at far left, electrical power barn at far right, with fake windmill radio tower behind it

(source: Australian War Memorial photo SUK14634 (left; also 5th photo page in ref. 5) & 14632, public domain; ca. August 1945)

In the background of the left-hand photo above: the "Wirtschaftsbaracke" (canteen etc.) at the far left, electrical power barn at the far right, with the fake windmill radio tower behind it. Across the foreground of the right-hand photo is the track of the *Knickebein* that preceded the *Bernhard* at this site.

The next three photos were taken by RAF Flight Lieutenant Herbert Ernest "Benny" Bennett. At the time, he was with RAF Mobile Signals Units (Countermeasures) of No. 72 Wing RAF. Initially, 72 Wing was a Radio Service Wing formed in July of 1940. May 1944, it became a Signals Wing whose main task was mobile Radio Navigational Aids (RNA) on the Continent, upon the Invasion. Initially it was part of No. 60 (Signals) Group, which controlled the air defence radar network across Britain. Some time after the Invasion under control of No. 85 Group RAF. The latter was formed in December of 1943, within the 2nd Tactical Air Force (2TAF). 72 Wing's RJ ("radar/radio jamming"?) units 5369, 5370, and 5371 were formed in August of 1944 and crossed the Channel to Belgium in November of 1944. Flt. Ltn. Bennet's units followed the advancing front line through Belgium, The Netherlands, Germany, and Denmark.

www.hellschreiber.com
photographer: Flt. Lt. Herbert Bennet
© David Bennet

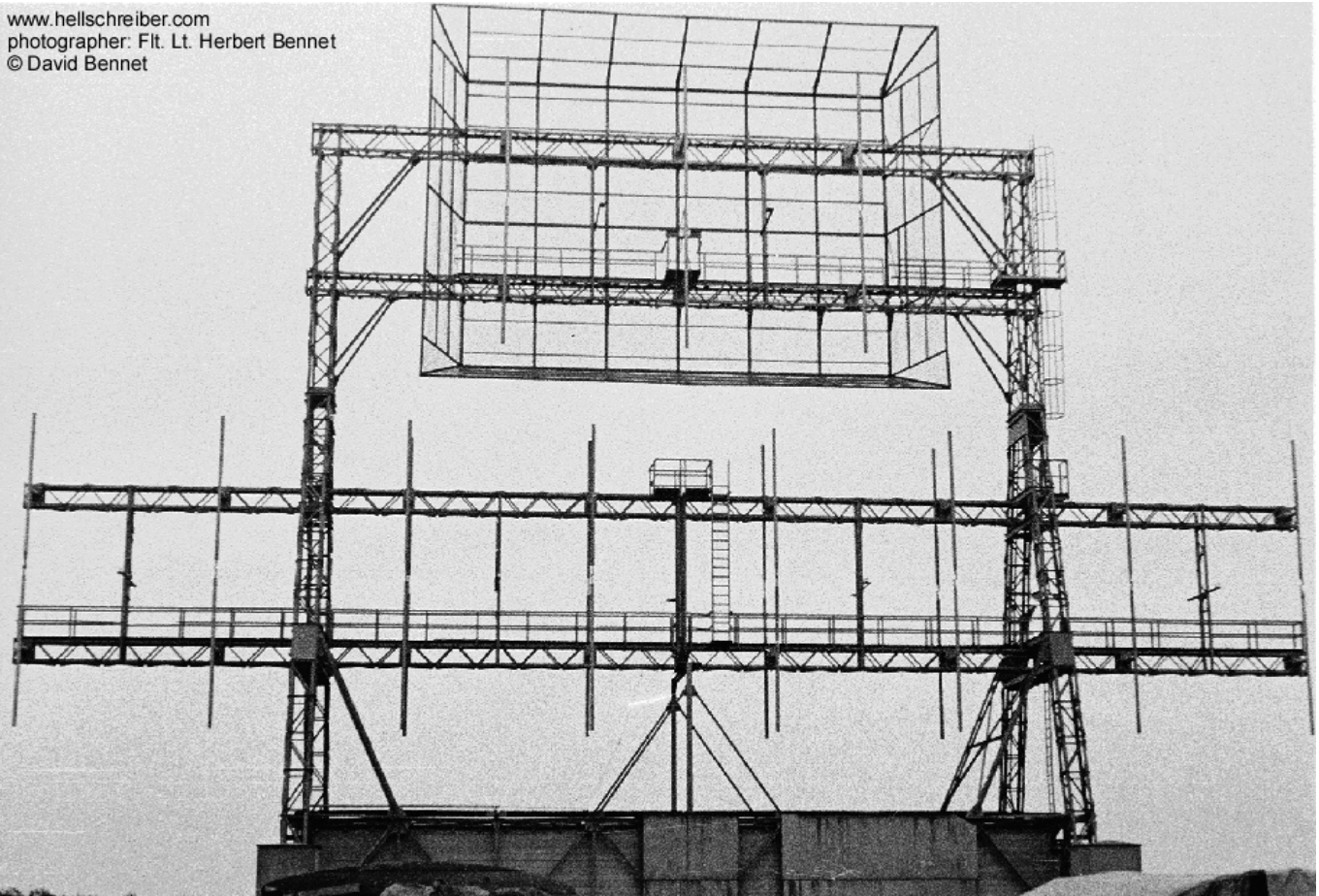


Fig. 15: The "Bernhard" station at Bredstedt - 23 May 1945
(photo taken by Flt. Lt. Herbert Bennet, © David Bennet; used with permission)



www.hellschreiber.com
photographer: Flt. Lt. Herbert Bennet
© David Bennet

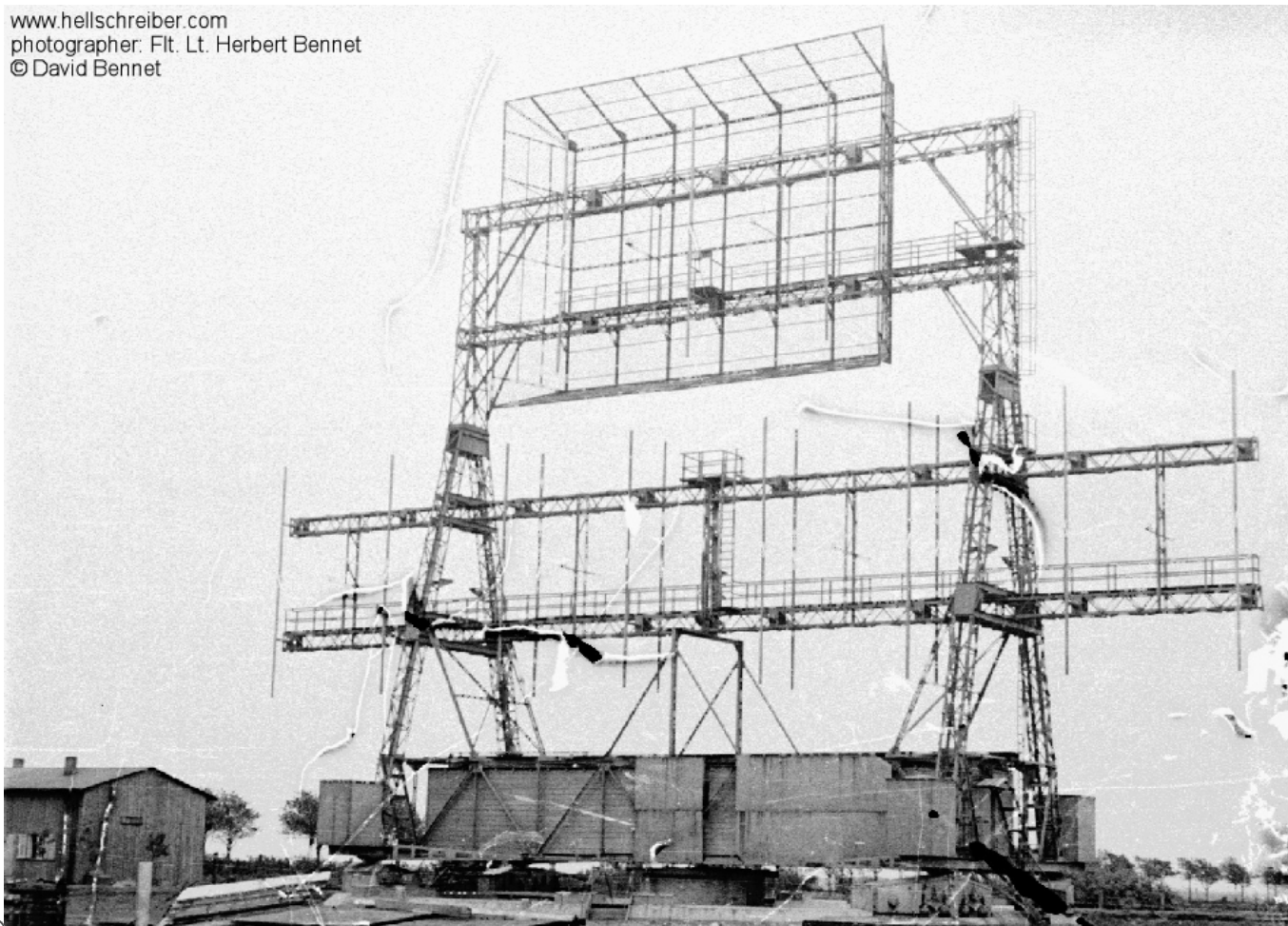
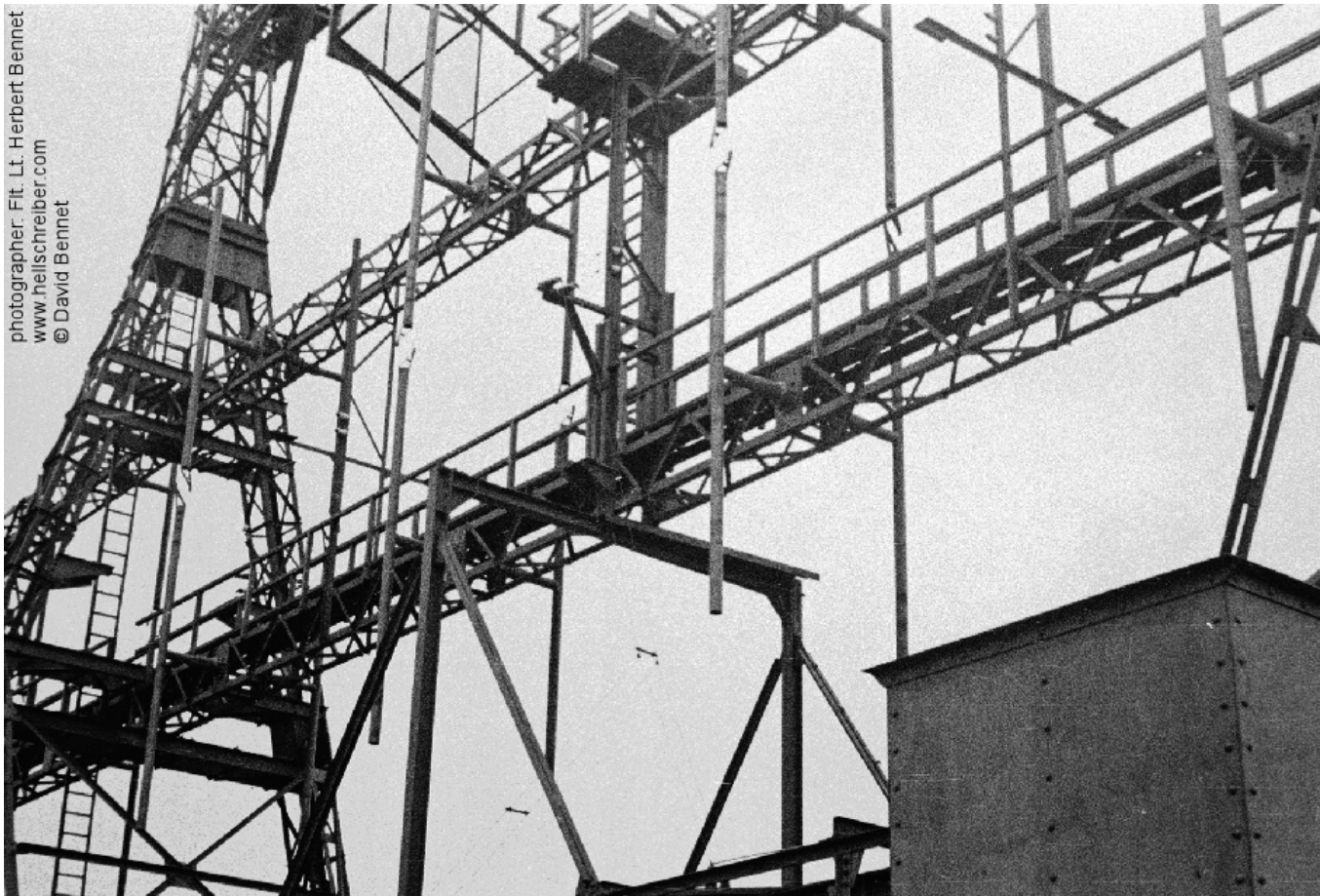


Fig. 16: Close-up of the "Bernhard" station at Bredstedt - probably 23 May 1945
(photo taken by Flt. Lt. Herbert Bennet; © David Bennet; used with permission)



photographer: Flt. Lt. Herbert Bennet
www.hellschreiber.com
© David Bennet

Fig. 17: Close-up of the "Bernhard" station at Bredstedt - 23 May 1945
(photo taken by Flt. Lt. Herbert Bennet; © David Bennet; used with permission)



Fig. 18: The German chief engineer (with white ADW armband) of the station explains details of the system to RAF ADW men

(source: Australian War Memorial photo SUK14633, public domain; ca. August 1945)



Fig. 19: A German engineer describing controls in the cabin of Be-9 to a member of the RAF-ADW

(source: Australian War Memorial photo SUK14636, public domain; ca. August 1945)

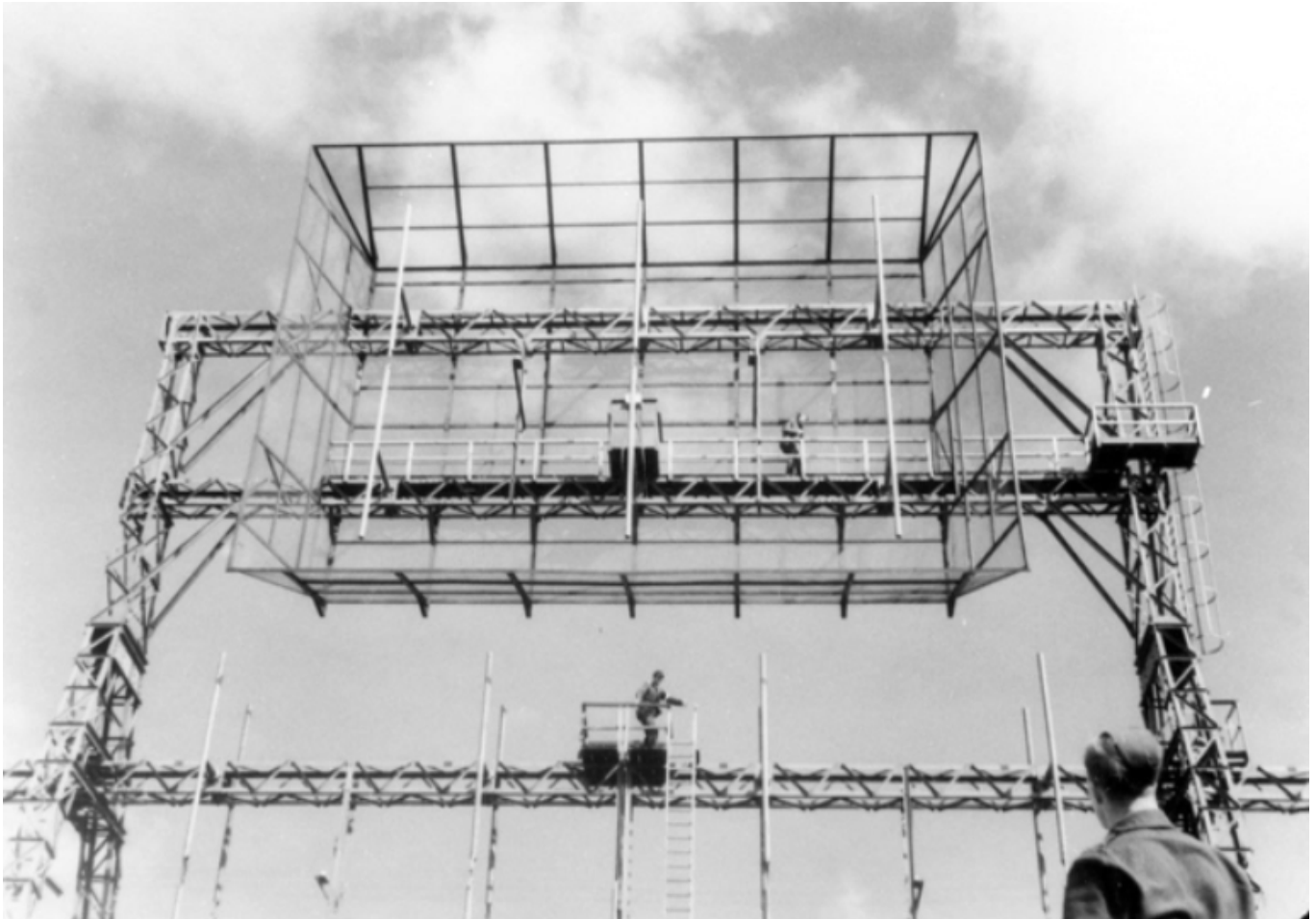


Fig. 20: Upper framework of the "Bernhard" antenna system
 (source: Australian War Memorial photo SUK14635, public domain; ca. August 1945)

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Ref. 2A1: [p. 149](#) (X-Uhr / X-system clock).

Ref. 2A2: [pp. 76-110, 224](#).

Ref. 2B: "Die deutschen Funk-Navigations- und Funk-Führungsverfahren bis 1945" ["The German radio navigation & guidance procedures through 1945"], Fritz Trenkle, Motorbuch Verlag, 1995, 208 pp., ISBN-10: 3879436150.

[pp. 62, 94-102](#).

Ref. 2C: "Bordfunkgeräte - vom Funkensender zum Bordradar" ["On board radio equipment - from spark transmitter to radar"], Fritz Trenkle, Bernard und Graefe Verlag (publ.), 1986, 283 pp., ISBN 3-7637-5289-7. [[table of contents](#)]

Ref. 2C1: [p. 61-63](#) - "Kommandoübertragungszusätze" ["Command uplink accessories"].

Ref. 2C2: [p. 83-95](#) - "Eigenpeil- und Zielflug-Verfahren - LW-MW-Peil und Zielfluggeräte" ["RDF and reverse-RDF systems - LW/MW RDF &

approach equipment"]

Ref. 2C3: [pp. 97-118](#) - "Leitstrahl-Verfahren" ["Guidance-beam systems"].

Ref. 2C4: [p. 108](#) - photo "Große Knickebein Anlage bei Kleve", ["Large Knickebein installation near Cleves"]; note: incorrectly identified by Trenkle as station K4 at Kleve, instead of K2 at Bredstedt].

Ref. 2C5: [pp. 119-133](#) - "Drehfunkfeuer-Verfahren - LW, KW, UKW, DMW, bis 1945" ["Rotating-beam beacon systems, Longwave"].

Ref. 2C6: [pp. 134-140](#) - "Hyperbel-Navigations-Verfahren" ["Hyperbolic navigation systems"]

Ref. 2C7: [pp. 141-150](#) - "Entfernungsmeß-Verfahren" ["Distance measuring systems"]

Ref. 2C8: [pp. 198-200](#) - "Kenngeräte (Bord-Transponder)" [FuG 25 "Zwilling", FuG25a "Erstling"]

Ref. 2D: "[Versuch einer Zusammenstellung deutscher Funkgeräte 1939 ... 1945 LUFTWAFFE / HEER / MARINE \(ca. 1200 Geräte\)](#)" ["Attempt at a compilation of German radio equipment 1939 ... 1945 Air Force / Army / Navy (ca. 1200 equipment items)"], Wolfgang "Fritz" Trenkle, Issue VI.60 (1960), 100 pp. [file size: **38 MB**]. Source: Bundesarchiv-Militärarchiv (BArch-MA, BAMA) Freiburg/Germany, Signatur/file nr. [RL 2-V/211](#), used in accordance with "[Erstinformation für Ihren Besuch im Bundesarchiv in Freiburg, Stand Juni 2016](#)".

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Ref. 6K: "[German knowledge of 'OBOE'](#)", [transcript], S.D. Felkin, A.D.I. (K) Report No. 318/1944, 29 Juni 1944, 11 pp.

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Ref. 6M: "[A G.A.F. Pathfinder Unit - Further report on Ju.88 S-1, Z6+IN, of 5/ K.G.66, brought down in the sea off Brighton on 25th March 1944](#)", Samuel Denys Felkin, A.D.I.(K) Report No. 160/1944 (prev. No. 141/1944).

Ref. 99 "[Völlig in Vergessenheit geraten: Funkanlage bei Buke](#)", Hans-Walter Wichert, in "Die Warte - Heimatzeitschrift für die Kreise Paderborn und Höxter", Nr. 24, December 1979, pp. 14-15, ISSN 0939-8686 (courtesy Mr. R. Gellhaus and H.-W. Wichert)

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Ref. 120: personal correspondence with R. Grzywatz, February 2014.

Ref. 136: "Nachtjagdnavigationskarte - herausgegeben von NJG.3.-NO" [night-fighter navigation chart issued by "Nachtjagdgruppe" 3-NO, the no. 3-NO Night Fighter Group

Ref. 181: "[Drehfunkfeuer System Telefunken - Teil 1: Verfahrensbeschreibung EC1-4262](#)" [Telefunken rotating radio beacon, part 1: description of the method], Adalbert Lohmann, Berlin, October 1942, 129 pp., copy nr. 29, personal copy of Albrecht Leyn [note: this document was never printed, other than a very limited number of personal copies, individually approved by Dept. LC-4 (Technisches Amt) of the RLM; ref. 183]; source: corporate archives of DTM Berlin, part of [file nr. I.2.060C-06172](#). [file size: [62 MB](#)]

Ref. 210: Maps (charts) with Luftnachrichten Anlagen (Luftwaffe Signal Corps installations) from the Bundesarchiv-Militärarchiv (BArch-MA, BAMA) Freiburg/ Germany, used in accordance with "[Erstinformation für Ihren Besuch im Bundesarchiv](#)

[in Freiburg, Stand Juni 2016](#)". Note: at the Archive, only free-hand photography is allowed (no tripod, etc.), under sub-optimal lighting conditions. Also, most of the maps are large, are folded into A4-size (ca. 21x30 cm, ≈8x12 inch), and are not flat when unfolded...

Ref. 210A: "[Funk-Navigationsanlagen im Reichsgebiet](#)" (radio-navigation stations in the *Reich*), Oberkommando der Luftwaffe [OKL] - Generalnachrichtenführer 1- II. Map is dated 15 June 1944. [file size: **65 MB**; good-but-lower-resolution file is [here](#) **12 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/8](#) "Ln. Anlagen (Karten)", Bandnr. 2, Teil 2 of "Anlage B, Teil 2: Ln. Anlagen verschiedener Art, Juni - Aug. 1944".

Bernhard stations Be-0, Be-9, B-10, Be-11, and Be-12 are marked on this map. Map size 4x5 A4-size panels.

Ref. 210B: "[Bernhard"-Anlagen im Reichsgebiet](#)"(radio-navigation stations in the *Reich*), OKL - Generalnachrichtenführer Abt. 1/ II. Map is dated 1 July 1944. [file size: **24 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/8](#).

Bernhard stations Be-0, Be-6, Be-8 through Be-12, and Be-14 through Be-16 are marked on this map. Map size 5x2½ A4-size panels.

Ref. 210C: "[Ln.-Anlagen Westfront](#)" (Luftwaffe Signal Corps installations on the western front). Map is dated 30 August 1944. [file size: **22 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/8](#)

Bernhard station Be-6 is marked on this map. Map size 4x3 A4-size panels.

Ref. 210D: "[Funk-Navigationsanlagen Ost-Raum](#)" (radio-navigation installations, eastern area), OKL Generalnachrichtenführer 1. Abt.II. Map is dated 15 June 1944. [file size: **44 MB**; good-but-lower-resolution file is [here](#), **26 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/8](#).

Map is marked with locations of Sonne, Komet, Zyklop, Egon, and Truhe stations. Map size 5x5 A4-size panels.

Ref. 210E: "[Funk-Navigationsanlagen Westraum](#)" (radio-navigation installations, western area), OKL - Generalnachrichtenführer 1. Abt. II. Map is dated 15 June 1944. [file size: **83 MB**; good-but-lower-resolution file is [here](#), **10 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/8](#).

Bernhard stations Be-2, Be-6, Be-8, and Be-10 are marked on this map. Map is marked with locations of Sonne, Knickebein, Komet, Zyklop, Bernhard, Truhe, Erika, Y-(Kampf), Egon (Kampf), Baldur, Peildörfer, Flugsicherungshauptstellen, and Flugsicherungszentralen.

Map size 6x5 A4-sheets (WxH). Map scale is 1:2000000.

Ref. 210F: "[Funknavigationsanlagen](#)" (radio-navigation installations), OKL - Generalnachrichtenführer 1. Abt.II Map is dated 1 October 1944. [file size: **107 MB**; good-but-lower-resolution file is [here](#), **13 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/13](#).

Map covers Europe, from mid-Scandinavia down to mid-Italy. Map is marked with locations of Sonne, Zyklop, Egon, Truhe, Bernhard, Y-Kampf, Hermine, Knickebein, Komet, Erika, Flugsicherungs-Zentralen, Flugsicherungshauptstellen. Map size 7x4 A4-sheets (WxH). Map scale 1:200000.

Ref. 210G: "[Flughafen-Bereichskommando \(Koflug\) 10/XII](#)". Map is not dated. Source: BArch-MA/BAMA file nr. (Signatur) [RL 20/310](#).

Koflug 10/XII moved to Morlaix/Bretagne in July of 1940; it was dissolved in October of 1944.

Bernhard station Be-2 is marked on this map. Map is marked up with Korps- & Divisions-boundaries, Ln.-Anlagen, Flugwachen, Fliegerhorste, Unterstellungen, Armeekorps LXXIV & XXV; map scale 1:500000.

Ref. 210H: "[Kommando des Flughafensbereiches 8/XII \(Morlaix\)](#)" (Kdo FHB 8-XII). Map is dated 6 July 1944. [file size: **91 MB**; good-but-lower-resolution file is [here](#), **31 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 20/310](#).

Bernhard station Be-2 is marked on this map. Map covers the western half of Brittany (Bretagne). Map is marked with boundaries at Ln. Korps & Division level; Map scale 1:200000.

The original large single-sheet map (ca. 120x105 cm overall size) was divided into 4x5 separate map panels of ca. A4 size, that were glued onto a large sheet of thin gray canvas, and folded.

Ref. 210J: [Map of FuMG Stellungen in Litauen](#) [Luftwaffe radar sites in Lithuania], Oberkommando der Luftwaffe - Generalnachrichtenführer (O.K.L. Gen.Nafü), 1. Abt. (III). Map is dated 21 July 1944. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/6](#).

Flugwachkommandos, Flugmeldezentralen, Luftflottengrenzen also marked on the map. Map scale 1:2500000, Zchs.Nr. 44/46.

Ref. 210K: Map "[Ln. Anlagen im Raume Rumänien](#)" (Luftwaffe Signal Corps installations in Rumania)]. Map is dated 25 August 1944. [file size: **25 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/8](#).

Map is marked with locations of FuMG, Funknav. Anlagen, LVerm., Jägerleistungen. Map size 5x2 A4-sheets (WxH).

Ref. 210L: Map "[Ln. Anlagen im Raume Bulgarien](#)" (Luftwaffe Signal Corps installations in Bulgaria). Map is dated 25 August 1944. [file size: **21 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/8](#).

Map is marked with locations of FuMG, Funknav. Anlagen, LVerm., Flugsicherungshauptstellen, Jägerleistungen. Also, 1 map panel has listing of Luftnachrichtentruppe units present in Bulgaria at that time. Map size 5x2 A4-sheets (WxH).

Ref. 210M: "[Ln.-Anlagen im Raume Finnland - Übersichtskarte von Nord-Finnland](#)" (Luftwaffe Signal Corps installations in Finland). [file size: **34 MB**; good-but-lower-resolution file is [here](#), **4 MB**]. Map is dated 14 October 1944. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/13](#).

Map is marked with locations of FuMG, Funknav. Anlagen Sonne, Kzw-Adcock, Luftparke, FMZ, S.u.J.-Stellen, Frontrep. Betriebe, LVerm., Flugsicherungshauptstellen, and Jägerdienste. Map markings include dates of explosive destruction or disassembly ("Sprengung", "Abbau"). Map size 3x2½ A4-sheets (WxH).

Ref. 210N: "[Untitled map of northernmost Scandinavia](#)". Map is not dated. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/13](#).

Map is marked with location of "Sonne" beacons S-20 at Andö and S-17 at Svanvik, Flugsicherungszentralen "Lofoten", "Polarmeer", nr. 11 at Kemi/Finland. Map scale 1:4000000. Map size 2x1 A4-sheets (WxH).

Ref. 210P: "[Ln.-Anlagen Baltikum](#)" (Luftwaffe Signal Corps installations in the Baltic area). Map is dated 18 September 1944. [file size: **24 MB**; good-but-lower-resolution file is [here](#), **3 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/13/K3](#).

Map is marked with locations of FuM, LV, and RV-Netz. Map size 2x2 A4-sheets (WxH).

Ref. 210Q: "[Ln. Anlagen im Raume Griechenland](#)" (Luftwaffe Signal Corps installations in Greece). Map is dated 30 August 1944 - 5 November 1944 [file size: **26 MB**; good-but-lower-resolution file is [here](#), **4 MB**].

Map is marked with locations of FuMG, Flugsicherungszentralen, L. Verm., Luftparke, Ln. Gast., Frontrep. Betr., Rep. & Sammelstellen f. Bordfunk Geräte. Map size 4x2 (WxH) A4-sheets. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/13](#).

Ref. 210R: Map "[Drahtlage Ost](#)" (wired communication links, eastern area). Map is not dated. [file size: **21 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/8](#).

Map is marked with line types (DK, Zuspaltung, Heereslinie, Fernkabel, I-Kabel, LF-Kabel), LV, Schaltstellen. Scale 1:2500000.

Ref. 210S: "[I. Flugsicherungsbezirke](#)" (air traffic control districts), OKL. Gen.-Nafü, 1. Abt. II. Map is dated 1 October 1944. [file size: **91 MB**; good-but-lower-resolution file is [here](#), **11 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/13](#).

Colored map covers area of the southern half of Scandinavia through Greece. A separate small map of entire Scandinavia is attached to the back of the map (included). Map is marked with locations of Flugsicherungszentralen, Flugsicherungshauptstellen. Map scale 1:2000000. Map size 5x4 (WxH) A4-sheets.

Ref. 210T: "[I. Flugsicherungsbezirke](#)" (air traffic control districts). Map is dated 1 October 1944. [file size: **17 MB**; good-but-lower-resolution file is [here](#), **2 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/13](#).

Black & white map covers area of the southern half of Scandinavia through Greece. Map is marked with locations of Flugsicherungshauptstellen and Flugsicherungszentralen. Map size: 3x2 (WxH) A4-sheets.

Ref. 210U: "[Wassermann-Einsatz und -Planung](#)" (operational and planned Wassermann sites), Zeichgs-Nr. 44/18-1-A, GKdos, OKL. Gen.-Nafü, 1. Abt. III. Map is dated 20 June 1944. [file size: **76 MB**; good-but-lower-resolution file is [here](#), **8 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/9](#).

Map covers area of northern Britain to northwestern Egypt. Map is marked with locations of Wassermann (L/M/S; operational/under construction/planned by Luftflotten, proposed by O.K.L. Gen.Nafü.), Fu.MG (nachtjagdfähig), Jagdschloß, Mammut, Freya (+ An , + An & Kuh, + Kuh & Gemse, + Fahrstuhl), Würzburg (A-D, Riese, Riese + Gema Zusatz).

Map size: 6x5 (WxH) A4-sheets. Map scale 1:2500000.

Ref. 210V: "[Jägermeßstellungen](#)" (radar sites for fighter intercept guidance), Zeichgs-Nr. 44/17-2-A, GKdos, OKL. Gen.-Nafü, 1. Abt. III. Map is dated 20 June 1944. [file size: **61 MB**; good-but-lower-resolution file is [here](#), **25 MB**]. Note: this map was rather poorly folded (6x5 layers) and not flat at all, which made it hard to stitch the individual partial images back together. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/9](#).

Map covers area of northern Britain to northwestern Egypt. Map is marked with locations of Egon (Gerät, Gerät + AN, Gerät + A/K), Y-Stellung, Y-Gerät (operational, under construction, planned), Tagjagdgenauigkeit, Nachtjagdgenauigkeit, and also boundaries of Zusatzzahlgebiete, Jagdtrapezbegrenzung.

Map size: 6x5 (WxH) A4-sheets. Map scale 1:2500000.

Ref. 210W: "[Flugmeldeeeinsatz- und Organisationsplanung](#)", Zeichgs-Nr. 44/20-1-A, GKdos, OKL. Gen.-Nafü, 1. Abt. III. Map is dated 20 June 1944. [file size: **63 MB**; good-but-lower-resolution file is [here](#), **26 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/9](#).

Note: this map has the same background map as ref. 210V, but with some different mark-ups. Map covers area of northern Britain to northwestern Egypt. Map is marked with locations of Wassermann (L/M/S), Fu.MG (nachtjagdfähig), Mammut, Freya (+ An , + An & Gemse, + An & Kuh, + Kuh & Gemse, + Fahrstuhl), Würzburg (A-D, Riese, Riese + Gema Zusatz), and also boundaries of Zusatzzahlgebiete, Jagdtrapezbegrenzung.

Map size: 6x5 (WxH) A4-sheets. Map scale 1:2500000.

Ref. 210X: "[Ln-Gerätstellungen im Landekopfraum](#)" [Luftwaffe Signal Corps installations/sites]. Map is dated 24-June-1944. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/235](#) (frmr. [RL 2-V/5](#)).

Map is centered on Allied invasion beachheads in Normandie. Map is marked with location of LV, Fu.M.B., H-Peiler, Fu.M.G. Fu.Nav. (Y, Kn, E, Be), H.-Zug, Jägermeßstellungen, and s. & l. Funkfeuer sites. "Bernhard" stations Be-1 (Favières) and Be-4 (La Pernelle) are marked on this map.

Map size: ca. 4x3½ (WxH) A4-sheets. Map scale 1:500000.

[Cover letter for the above map](#). Letter without subject, dated 24 June 1944, addressed to Chef Luftwaffe Führungsstab. Letter reference "Gen.Nafü. 1. Abt (I), Nr. 11 004/44 g. Kdos". Letter mentions scuttling/destruction of installations, transfer of forces from the Cotentin peninsula to Cherbourg, and numbers of German forces killed or taken prisoner.

Ref. 210Y: "[Ln.-Anlagen im Bereich der Ostfront](#)" [Luftwaffe Signal Corps installations on the eastern front]. Map is dated 9 February 1945. [file size: **103 MB**; good-but-lower-resolution file is [here](#), **21 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL-2-V-19](#).

Map covers area from Denmark to Hungary. Map is marked with locations of Fu.MG (1. Ordnung, Eisenbahn, mot.), Funknav.-Anlagen (Egon, Zyklop, Sonne, Truhe), L Vermittlung, Jägerleitstellungen, and Flugsicherungszentralen (Nachtjagd) sites. Map markings include "Bernhard" stations Be-0, Be-12, and Be-15. [On the back of the map's legend panel](#), the map title is repeated, but changed by hand to "Ln.-Anlagen im Bereich der Front" and "Bereich Reichsgebiet 9.2.45".

Map size: ca. 6x3½ (WxH) A4-sheets. Map scale is not marked.

Ref. 210Z: "[Flugsicherungseinheiten mit Nebenkarte Norwegen](#)". Map is dated 1-Jan-1945, Gen.-Nafü 1/II. [file size: **61 MB**; good-but-lower-resolution file is [here](#), **11 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL-2-V-19](#).

Map covers area from Scandinavia to Romania. Map is marked with location of Flugsicherungshauptstellen, abgesetzte UKW Arbeitsplätze, Flugsicherungszentralen (Fluz), and Rgt. / Abt. / Komp. sites.

Map size: ca. 4x3½ (WxH) A4-sheets. Map scale is 1:2000000.

Ref. 210AA: "[Flugsicherungszentralen Flugsicherungs-Hauptstellen](#)", map covers area from The Netherlands to Hungary. Map is dated 1-January-1945, Gen.-Nafü 1/II. Source: BArch-MA/BAMA file nr. (Signatur) [RL-2-V-19](#).

Map is marked with location of Flugsicherungszentralen (Fluz; Kampf & Nachtjagd), Flugsicherungs-Hauptstellen, abgesetzte UKW-Arbeitsplätze.

Map size: ca. 4x2 (WxH) A4-sheets. Map scale 1:2000000.

Ref. 210AB: "[Drehkreuzachsen im Reichsgebiet](#)". Map is dated 1-March-1945 with update on 22-March-1945, Gen.-Nafü. [file size: **88 MB**; good-but-lower-resolution file is [here](#), **26 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL-2-V-19](#).

Map covers area from Denmark to Hungary. Map is marked with location of "Drehkreuzachsen" lines (permanent phone lines, with wire-pairs twisted between masts), LV, LSZ, Jägermeßstellungen, Schaltstellen, TF-Verstärker.

Map size: ca. 5x3½ (WxH) A4-sheets. Map scale 1:1000000.

Ref. 210AC: "[Gesamt-Drahtlage](#)" [Complete com wire/cable map]. Map is dated 1-January-1945. [file size: **41 MB**; good-but-lower-resolution file is [here](#), **23 MB**]. Source: BArch-MA/BAMA file nr. (Signatur) [RL-2-V-19](#).

Map covers area from Denmark to Hungary. Map is marked with location of Drehkreuzachsen, Heereslinien, Fernkabel, Breitbandkabel, U-Kabel, LF-Kabel, LV, Schaltstellen, LSZ, Verstärkerämter, Betriebsstellen.

Map size: ca. 4x2 (WxH) A4-sheets. Map scale 1:2000000.

Ref. 210AD: "[Begriffsbestimmungen](#)" [definitions/terminology], Anlage (appendix) to "Der Reichsmarschall d. Großdeutschen Reiches und Oberbefehlshaber der Luftwaffe Lw.Fü.St./Chef NVW Nr. 10 222/44 g.Kdos.(I/I) vom 28.2.44". Dated 28 february 1944. Page 6 missing from file. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/5](#).

Brief definition/clarifaction of the terms "Flugmeldedienst", "Flugwache" (Vollflugwache / Tagflugwache / Behelfsflugwache), "Fu.M.G.Stellung" (1. Ordnung, 2. Ordnung, 3.Ordnung), Flugmeldezentrale (Stellungs-, Abschnitts-, Divisions-, Korps-, Flotten-), "Flugmelde-Bereiche" (Stellungs-, Abschnitts- (Flugmeldeabschnitt), Divisions-), "Einheiten des Flugmeldedienstes" (-Kompanie, -Abteilung-, -Regiment), "Flugmeldeauswertestelle eines Fliegerhorstes", "Florian-Netz", "Reportageverfahren", "Jägermeßdienst", "Jägermeßstellung", "Warnwache", "L.S.Warnkommando (L.S.Wako)", "L.S.Warnzentrale", "Eisenbahnflugwarnzentrale (Eflu-Wz.)", "Flugmeldposten der Flakartillerie".

Ref. 210AE: "[Taktische Zeichen für die Neuorganization des Flugmeldedienstes, Eintragung der Geräteausstattung der Fu.M.G.-Stellung, Darstellung des Ausbauzustandes, Taktische Zeichen für die Neuorganization des Jägerleitdienstes](#)" [map & org-chart symbology for the Luftwaffe Aircraft Reporting Service, standard equipment configuratins for radar sites, map & org-chart symbology for the reorganized Fighter Guidance Service], 1944, 6 pp. Source: BArch-MA/BAMA file nr. (Signatur) [RL 2-V/5](#).

Ref. 210AF: "[Flughafenbereich 10/XII \(Morlaix\) - Flugplätze und Ln Anlagen](#)" ["Airport zone Morlaix (Brittany/France), airfields and Signal Corps installations"], drawn 16 September 1942, mark-ups September 1943.

Ref. 231: documents covering the Bernhard-9/Knickebein-2 site at Stollberg/Bredstedt:

Ref. 231A: "[Flugwache Turm auf dem Stollberg / Bredstedt](#)", R. Grzywatz, 22 April 2019, 1 p.

Ref. 231B: "[Bredstedt](#)", topographic map made by the *Reichsamt für Landesaufnahme* (Land Survey Office of the German Reich), date unknown, confiscated by the British military after the war, reprinted by the Geographical Section, General Staff (G.S.G.S.), Map No. 4414 (AMS M (41), Sheet 1319, War Office (publ.), Edition 4, 1954. Source: public domain, courtesy [Harold B. Lee](#)

[Library, Brigham Young University](#), accessed March 2024.

Ref. 244: Luftwaffe & Royal Air Force fighter intercept & control methods ("Jagdverfahren"), maps, and related topics

Ref. 244A: "[Nachtjagd](#)" [intro, descriptions, and evaluations], Luftwaffe document, date unknown, 18 pp. Source: [German Russian Project for digitization of archives in the Russian Federation](#). Retrieved 29 August 2019.

Ref. 244B: "[Bestimmungen über Nachtjagd](#)" [descriptions of methods, and instructions to Flak organisation regarding night fighting], 1st Flakdivision, Berlin, 19 November 1943, 12 pp. Source: [German Russian Project for digitization of archives in the Russian Federation](#). Retrieved 29 August 2019.

Ref. 244C: "[Mosquito Nachtjagd](#)", [specific fighter and flak tactics against incoming British "Mosquito" fighter-bombers] 1st Flakdivision, Berlin, 7 March 1944, 5 pp. Source: [German Russian Project for digitization of archives in the Russian Federation](#). Retrieved 29 August 2019.

Ref. 244D: "[Das Y-verfahren für Tag- und Nachtjagd](#)" ["The Y-Procedure for day and night fighter control (navigation method)"], document without reference number, author unknown, without date (but before May 1945), without place, 114 pp. The 1960s file coversheet of the Militärgeschichtliches Forschungsamt (Research Office for Military History) suggests that it dates to 1940/41, 114 pp. [file size: **82 MB !!!!** - with reduced resolution [file size: **84 MB**; good-but-lower-resolution file is [here 27 MB](#)]. Source: Bundesarchiv-Militärarchiv (BArch-MA, BAMA), Signatur/file nr. [RL 2-V/38](#), used in accordance with "[Erstinformation für Ihren Besuch im Bundesarchiv in Freiburg, Stand Juni 2016](#)".

Complete description of the "Y" procedure for day & night fighter control from ground plotting stations with short wave equipment. Keywords: Y-Verfahren, Y-Führung, Y-Stelle, Y-Stellung, Y-Anlage, Y-Station, Y-Einrichtung, E 16, FuG 16, Graetz-E-Mess-Gestell, Siemens-E-Mess-Gestell, Heinrich Peiler, ZVG 16, ZE ZY Zeiger, Schildkröte, PQK, S 16.

Ref. 244E: "[Anlage 1 zu Luftflottenführungsabteilung Ia op2 Nr. 500/41 geh.](#)" [file size: **28 MB**; good-but-lower-resolution file is [here, 4 MB](#)]. Map is not dated. Source: Bundesarchiv-Militärarchiv (BArch-MA, BAMA), Signatur/file nr. [RL 20/186/K](#), used in accordance with "[Erstinformation für Ihren Besuch im Bundesarchiv in Freiburg, Stand Juni 2016](#)".

Map covers area of Belgium, The Netherlands, Denmark, northern Germany incl. Berlin. Map is marked with locations of militärische Sperrgebiete, Nachtsperregebiete, Nachtjagdgebiete, Dunkle Nachtjagdräume.

Map size: 4x2 (WxH) A4-sheets. Map is low-quality blueprint copy.

Ref. 244F: "[Einsatzbeispiel für einen Feindeinflug](#)" (example of response to intruding enemy aircraft). Map is not dated. [file size: **84 MB**; good-but-lower-resolution file is [here, 10 MB](#)]. Source: Bundesarchiv-Militärarchiv (BArch-MA, BAMA), Signatur/file nr. [RL 36/443](#).

Map shows ground track of enemy bomber stream arriving from Britain with target Frankfurt, intercepting fighters, timing, etc. Map includes large & detailed table of the entire nightfighter intercept process, from long-range radar detection to "kill", with step-by-step status/activity/communication at the level of Flugmeldekompanie, Nachtjagdraum, Fühlungshalter, Jagdgruppe, Flugmeldungszentrale, Fluko, and Flak; the entire sequence covers 1 hr 40 min. Map size: 4x5 (WxH) A4-sheets.

Ref. 244G: "[Luft-Navigationskarte in Merkatorprojektion - Erweitertertest Blatt Deutschland mit Jägernetz](#)", Bodenorganisation Großraum-Nachtjagd Luftflotte Reich, July 1944. Source: [Bestand/File 500, Findbuch/Index 12452, Akte/record 286](#) of the German-Russian Project for the Digitization of German Documents in Archives of the Russian Federation. Retrieved 28 August 2019.

Ref. 244H: "[Nederland en de Duitse Nachtjacht - Van jager tot prooi](#)" (The Netherlands and German night fighting - from hunter to prey), W.H. Lutgert, R. de Winter, pp. 536- 545 in "Militaire Spectator", vol. 183, nr. 12, December 1994. Accessed September 2019. [[pdf](#)]

Ref. 244J: "[Nederland en de Duitse Nachtjacht - Van jager tot prooi \(Deel 2\)](#)" (The Netherlands and German night fighting - from hunter to prey - part 2), W.H. Lutgert, R. de Winter, pp. 5-17 in "Militaire Spectator", vol. 184, nr. 1, January 1995. Accessed September 2019. [[pdf](#)]

Ref. 244K: "[De Luftwaffe en Nederland - Balans van een oorlogserfenis](#)" (The Luftwaffe and The Netherlands - legacy of a war), W.H. Lutgert, R. de Winter, pp. 450- 459 in "Militaire Spectator", vol. 184, nr. 10, October 1995. Accessed September 2019. [[pdf](#)]

Ref. 244L: "[Nachtjagd-Navigationskarte - Groborientierung der Nachtjäger](#)" [["Night-fighting navigation charts - Coarse orientation of the night-fighters"](#)] and "[Nachtjagd - Taktiken und Technik der Nachtjäger](#)" [["Night-fighting - tactics and techniques of the night fighters"](#)], Heiko Müller, in "Klassiker der Luftfahrt", No. 5, 2013, pp. 41-43 and 44-48, respectively. Source: [archive.org](#), open source, accessed April 2024.

Includes "Nachtjagdnavigationskarte - herausgegeben von NJG.3.-NO" [night-fighter navigation chart issued by the Nachrichten-Offizier of the No. 3 night fighter-wing, Nachtjagdgeschwader 3]. Map is not dated. Bernhard-stations Be-0, Be-6, Be-8 through Be-12 are also marked on this map.

Ref. 244M: "[Tag- und Nachtjagd, 3. Jagddivision \(als beispiel\)](#)". Map is dated 29 July 1944. [file size: **24 MB**; good-but-lower-resolution file is [here](#), **9 MB**]. Source: Bundesarchiv-Militärarchiv (BArch-MA, BAMA), Signatur/file nr. [RL-3-1527](#).

Map covers area of The Netherlands to Heilbronn/Germany. Map is marked with location of Tagjagdstellungen and Fu.M.G. sites (1., 2., and 3. Ordnung; dunajafähig vs. nicht dunajafähig).

Map size ca 3x2 (WxH) sheets of size A4. Map scale 1:1.000.000

Ref. 244N: "[Jagd-Einsatz im November 1943](#)", Anlage 3 (appendix 3) to "Lfl.Kdo3, Führ.Abt(1)/1c No. 15684/43 Kdos". Source: Bundesarchiv-Militärarchiv (BArch-MA, BAMA), Signatur/file nr. [RL-3-1527](#). [file size: **19 MB**].

Large bar graph for each day of November 1943, with total number of fighter sorties for each day, split into "day" and "night" fighter. Also: table with statistics for each day: number (with type(s) of aircraft) for each type of sortie/mission: "Alarmstart" / "Überwachung und Sperre" / "Geleitschutz" / "Begleitschutz u. Ausnahme"; / "Nachtjagd" (night fighter) / "Fernjagd" (long range intercept); also: total number of sorties/missions, number of enemy kills (incl. type of enemy aircraft), own losses.

Size: size: ca. 3x3½ (WxH) A4-sheets.

Ref. 244P: "[Abschüsse der Nachtjagd im Bereich Luftwaffenbefehlshaber Mitte](#)", Anlage 2 (appendix 2). Source: Bundesarchiv-Militärarchiv (BArch-MA, BAMA Freiburg/Germany, Signatur/file nr. [RL-3-1527](#)

Graph with three lines: "hell" (helle Nachtjagd), "dunkel" (dunkle Nachtjagd), "kombiniert" (kombinierte Nachtjagd). Graph covers monthly statistics regarding enemy kills for the period April 1941 - March 1942.

Ref. 244Q: "[Anzahl der voll u. bedingt \(ab Juli 1941\) bzw. eingeschränkt \(ab Mai 1943\) einsatzfähigen Besatzungen](#)" and "[Anzahl der einsatzbereiten Kampf-Flugzeuge](#)". Source: Bundesarchiv-Militärarchiv (BArch-MA, BAMA), Signatur/file nr. [RL-3-1527](#). [file size: **17 MB**].

Graph with monthly statistics for the period mid-1939 - mid-1939: number of available flight crews and number of operational fighter planes, separate curves for "Tagjäger" (day fighters) and "Nachtjäger" (night fighters; from late 1940 onward).

Also: interesting large table with 53 key dates of the WW2, from 1 September 1939 (German invasion of Poland) through 15 August 1944 (anglo-american landing in southern France).

Size: ca. 1½ x3 (WxH) A4-sheets.

Ref. 244R: "[Fighter defence of Germany - Control of fighters by the "Y" Procedure](#)", Samuel Denys Felkin (Chief Interrogator at Bletchley), transcribed report from the British Air Ministry, Assistant Director of Intelligence (Prisoner Interrogation), A.D.I. (K) Report No. 525/1944, 14 pp. Source: The National Archives of the UK, ref. AIR40/2875 and 2876. Retrieved from www.cdvandt.org.

Ref. 244S: "[Die Deutschen Nachtjagdverfahren](#)" ["The German night fighter procedures"], Walter Grabmann, Generalmajor a.D., date unknown, 22 pp. [Helle Objektjagd, helle Gebietsjagd, Himmelbett, Verfolgungsnachtjagd [pursuit night], Objektjagd "Leichentuch" / "Milchglas", 1-mot Objektjagd "Wilde Sau", Fernnachtjagd [long-range night], Zusammenarbeit mit Jäger-Flak, 13 maps]. Source: Bundesarchiv-Militärarchiv (BArch-MA, BAMA Freiburg/Germany, Signatur/file nr. [ZA 3/402a](#)

Ref. 244T: "[Besprechung bei General Galland am 21.1.43](#)" ["Meeting with Gen. Galland on 21 Jan 1943"], signed by Major Eisermann, 22 January 1943, 3 pp. [Keywords: possibility of fighter control from an aircraft carrier ("Flugzeugträger"), limitations of Freya FuMG radar for that application, proposal from Plendl to install Y-RDF system (Y-Boden-Anlage), aircraft carrier to have landing beam system for fighters; the Y fighter control system (Y-Verfahren) meets its requirements but has serious practical problems due to frequency changes and exposure of the equipped lead aircraft]. Source: Bundesarchiv (BArch) Freiburg/Germany, Signatur/file nr. [RL 16-3/12](#).

Ref. 244U: "[Funkübermittlung der feindliche Luftlage](#)" ["Transmission of enemy aircraft situation via radio" (reportage, running commentary)], excerpt of a report dated 22 March 1945 by Morgenstern, chef to the Generalnachrichtenführer (Chief Signal Officer), 14 June 1956, 9 pp. Source: Bundesarchiv (BArch) Freiburg/Germany, Signatur/file nr. [ZA 3/402b](#), used in accordance with "[Erstinformation für Ihren Besuch im Bundesarchiv in Freiburg, Stand Juni 2016](#)".

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Keywords: Verfolgungsnachtjagd, Führungswellen,

Gruppenbefehlswellen, Geschwaderbefehlswellen UKW (Tast) Bord-Bord, Divisionsführungswellen Lgw, Kzw, UKW der 1.J.Div., Divisionsklärungswellen (Tast), Y-Linienverteilung für Aufklärer, Y-Linien für 1-mot. Nachtjagd, Mosquito-Jagd (Silber), Feindreportagen, Kennung für Fu. G 25, Rufzeichen und Rufnamen, Optische Gruppenkennung und Wellen für flg. Funkfeuer, Verschlüsselung eigener Standort- und Flughöhenangaben, Gebietsnachtjagd, Flugsicherung.

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