II. THE OCCUPATION OF NORWAY AND DENMARK; GERMAN INTERCEPT OPERATIONS IN NORWAY AND FINLAND UNDER SECOND AIR FLEET

1. 1940: Preparatory Intercept Activities in Norway Immediately after Occupation of that Country by German Troops.

a. ~~The situation prior to German Conquest~~. Communications intercept operations covering Norway and Denmark by Station W-22, Husum-Milstedt, produced no information of real military significance, but intercepted British radio communications and the deductions drawn from other events revealed timeously the intended and imminent occupation of Norway by Britain.

b. German Air Force Operations During the Early Stages of the Occupation of Norway.

(1) ~~Higher Levels of~~ German Air Force ~~Command~~.

With the German occupation of Norway, Headquarters, X Air Corps in May 1940 displaced from Hamburg to Stavanger with a small fighter ~~xxxx~~ force and the 1st Strategic Reconnaissance Squadron, 120th Strategic Reconnaissance Group, stationed at Stavanger. After the British Air Force had changed over from shortwave to ultrashortwave radio communications, the units of the German reconnaissance squadron each took along an interpreter-radio operator to protect themselves against attack by British fighters when on reconnaissance missions against Britain. In March-April 1941 Air Command North was established with headq arters at Trondheim.

The CO, Air Command North was at the same time Commodore of the 26th Bomber Wing, stationed at Trondheim, and the 26th Twin-Engine Fighter Wing was also assigned under him.

In June 1941 Air Command Kirkenes (under Colonel Nielsen, later Chief of Staff, Fifth Air Fleet) was established. Some time before this Air Force Command Arctic (General der Luftwaffe-Nordmeer) had been organized, but after Air Command Kirkenes became a regular Table of Organization unit, the former establishment was redesignated Air Command North (East) with headquarters at Kirkenes. Beginning with the advent of the PQ convoys, and starting in November 1941, Air Command Lofoten was created, under General Roth, which controlled torpedo bomber units and a Fighter Command. Whenever units of the intercept services were employed in any form for tactical or battle reconnaissance they were attached directly to the combat units concerned and at no time to the headquarters of the individual Air Commands. They also at no time came under administrative control by these Air Command Headquarters.

(2) Operations of the 9th Intercept Company, 2d Air Signal Regiment (later redesignated 2d Company, 5th Air Signal Regiment) at Naerland, near Stavanger.

Until then at Schwabstedt, near Husum, under the Second Air Fleet, this company transferred under the same commanding officer, Captain Windels, together with the X Air Corps to

4 to Naerland, 24 miles south of Stavanger in southwestern Norway. Here, the company was stationed at the coast in a former British radio station constructed there for mercantile purposes. In December 1940 Captain Windels split his unit to form two new companies. One of the new companies remained at Naerland under the old designation until it became the 9th Company, [illegible] of the newly activated III Battalion, Air Signal Regiment 5. The other new company, under Captain Windels, became the corps headquarters intercept company of the X Air Corps as the 9th Company, Air Signal Regiment 40. In January 1941 X Air Corps transferred to Sicily together with Air Signal Regiment 40, including its new 9th Intercept Company.

The 9th Company, XI Air Signal Regiment 2 was employed against Britain and to extend the DF operating base line ~~extend the direction finding base~~ of Husum. Under its new designation as the 9th Company, Air Signal Regiment 5, the unit was commanded by 1st Lieutenant Meyer, an Austrian, who succeeded Captain Windels in the command. Previously, Lieutenant Meyer had commanded the 9th Company, Air Signal Regiment 32 of the Second Air Fleet, and he is said to have been killed later while defending an airfield at Kazimirovka in Russia. He was followed as commander of the 9th Company in Norway by 1st Lieutenant Lacher, who in turn was followed by 2d Lieutenant Isselhorst. The first

5 interpreter-radio operator to fly with the reconnaissance units was 2d Lieutenant Hartwich,+ followed by Lieutenants Lemberg, Hans Homberg, Isselhorst, and Fuchs, who later took over Weather Research Station (Special Purposes) Svanik. At that time, however, these officers were still ranked as privates first class and corporals. On these reconnaissance missions they flew as far as northern England, Scotland, Scapa Flow, the waters around the Farö and Shetland Islands, Iceland, and when conditions were favorable even as far as the east coast of Greenland. Later, these reconnaissance missions were flown by units

6 of the FW-200 wing from Trondheim. The 9th Company, Air Signal Regiment 5 also had an Adcock DF instrument with which it could in cases of emergency cooperate with the Stavanger air traffic control center.

(3) Intercept Sub-Station Wo-III or Special Purposes Weather Research Station at ~~KIRKENES~~ Svanik near Kirkenes.

This sub-station was installed by Weather Reporting Control Station, Bernau, and was situated at a lake some twelve miles east of Kirkenes. Kirkeses is situated on the shore of the Varanger Fjord in Lapland or County Finmark, a little south of the point of intersection of 70° latitude and 30° longitude at the northeastern border of Norway. In the summer

+ See under Lieutenant Hartwich, Station W-22, Husum, B IV (West), 1,(2), (b).

6 of 1940 the III Radio Intercept Battalion, Air Signal Regiment 1, Bernau, had, as an advance detachment, sent a "handful" of men to Kirkenes to establish a DF operating base line Kirkenes-Bernau for operations against Russia and Britain. In December a new detachment under 2d Lieutenant Bauer from Control Station W-1 arrived with Officer Candidate Sergeant Kretschmer and ten men to relieve the first detachment. A transport ship carrying equipment for this station struck a mine and sank; three survivors from the detachment accompanying the equipment returned to Bernau by way of Oslo. As a field or sub-station of the III Battalion, Air Signal Regiment 1, the intercept station

7 at Stanvik was designated Weather Research Station Wo-111. It was intended as the most northerly point of a DF base line which was completed in 1941 providing for DF communications from Svanvik to Kobbelbude, near Koenigsberg (10th Company, Air Signal Regiment 1). To serve this purpose there was an Adcock installation approximately 2 miles (3 kilometers) from Svanvik with a Diesel power unit servicing the whole station. In 1941 Lieutenant Bauer was recalled. He was replaced by Lieutenant Schmidt of the III Battalion, Air Signal Regiment 5, Naerland, under which battalion Svanvik was then assigned. In September-October 1942 Lieutenant Fuchs ~~replaced~~ coming from the 9th Company, Air Signal Regiment 5, replaced Lieutenant schmidt, who was promoted 1st Lieutenant and as company commander took over ~~station~~

7 Control Station W-Leit-5. At that time the control station had only "radio officers for guard duties (Funke-Wachoffiziere)" and the senior of these was Lieutenant Lacher, whose functions on his transfer to Naerland in 1942 were taken over by Lieutenand Kretschmer. Later, 1st Lieutenant Schmidt took over Control Station W-Leit-5 when Lieutenant Kretschmer was transferred as Intercept Liaison Officer to Fifth Air Fleet Headquarters, where he was a member of the signal battalion headquarters staff. With the departure of Lieutenant Bauer, the III Battalion, Air Signal Regiment 5 took over the station because it was so far distant from the station of the III Battalion, Air Signal Regiment 1, and from then on it was designated Special Purposes Weather Research Station. In addition to DF functions, the stations also operated receivers. Initially all data gathered was forwarded as Top Secret material to Control Station W-Leit-1 and to the Cryptographic Center at headquarters of the AF CINC in Potsdam. Later, all reports were transmitted by Secret Teletype line to Control Station W-Leit-5. Reception suffered from the effects of the aurora borealis. For

8 supplies the station depended on a road 27 miles long and with 280 suicidally dangerous bends linking it with the Kirkenes air base. The premises were in a prefabricated type building situated beside the beautiful lake with its plentiful fish

on the northern outskirts of Svavnik. In 1941 the station's mission was expanded to include support for the Air Force tactical staffs through interception of Russian fighter voice radio communications. For this purpose a forward ultrashort-wave voice-radio intercept post was established near the Petsamo airfield to support a fighter group from the 5th Fighter Wing; the site of this new post was 12 miles east of Stanvik, in Petsamo on what was called the Redeemer Hill. The CO of this fighter group was at the same time in command of the Fighter Command under Air Command North (East), Kirkenes.

2. 1940-45: Activation of the III Radio Intercept Battalion, Air Signal Regiment 5 and Further Extension of Intercept Operations under the Fifth Air Fleet in Norway.

a. The III Battalion within Air Signal Regiment 5.

After the stabilization of conditions in Norway, Headquarters of the Fifth Air Fleet was organized together with the Air Signal Regiment 5. The regiment was under the command of General Kuehne, followed successively by Lieutenant Colonel Blasius and Colonel Reif, an Austrian. The regiment's III Battalion, together with Control Station W-Leit-5, was commanded successively by Captain Freudenfeld (1940-end of May 1941), Captain, later Major Weimann (Acting CO, May-15 June 1941), Lieutenant Colonel Dr. Ulrich from then on. Among others, 2d Lieutenant Wasmer, who on 4 August took over Stati

9 Station W-22, Husum-Milstedt, in place of Captain Schwintzer, for some time served as battalion adjutant. Other staff members were: Senior Technical Signal Inspectors Blazey and Groenewald; data processing personnel and translator personnel for the Norwegian, Swedish, and Danish languages; Sergeant Rothaermel as English translator; Sergeant Goetsche as data processor, an inspector from the Cryptographic Center to handle decoding and data interpretation, and Sergeant Forster.+

Regimental headquarters was initially in Oslo in the Drammensveien not far from the former Portuguese Embassy, in which Station W-Leit-5 and its Casino were initially situated. Offices of the III Battalion and of Control Station W-Leit-5 were also in Oslo on the sixth floor of the "Samfundshuset," a tall building in the Youngsgade, in which the Signal Staff Officer of the Fifth Air Fleet also had his premises. The Fifth Air Fleet had its headquarters at the Holmen Kollen near Oslo, a villa suburb 20 minutes distant by the suburban railway. Later, battalion headquarters and Control Station W-Leit-5 moved to premises at the North Beach, Oslo, because of the better conditions there for radio reception. The new premises were 6 miles from the center of Oslo at the foot of a

+ Administrative Inspectors: successively Korn, Karl and Haubold, who was still on the staff when Lieutenant Colonel Ulrich was transferred. See also B, II, 3.

9 steep cliff at the end of Oslo Fjord. The whole premises consisted of one building for the Control Station itself, a headquarters building; a building in which the officers had their recreation center; billets for the Women Signal Auxiliaries, and billets for the officers and enlisted personnel were also in this latter building, a Home for Aged Persons with a view of Oslo and the fjord; and a motor cehicle shelter newly built into the cliff. All of these premises were in country houses surrounded by gardens. A large receiver installation was also installed at North Beach. The following Emper type instruments were installed: Pack E.b. up to 7050 kiloherz= 39 meter; H.E.c = shortwave and H.E.e. ultrashortwave, Telefunken "Kohinor" broadcast receiver for telephony reception down to 15 meter; and "Sadir" ultrashortwave Emper. DF instruments were not installed because of the steep cliff wall.at the coast. When direction finding operations were necessary they were carried out by the companies equipped with DF instruments.

b. 1942-43: Operations of the Halcstrants and Alta Companies. After the 9th Company, 2nd Regiment had become the 9th Company, 5th Regiment in Naerland in 1942, as previously described above, an additional company was assigned in 1942 and another in the spring of 1943, both of them intercept units, as follows:

(1) 8th Company, Air Signal Regiment 5, Halostranta 1942. This company was committed under 1st Lieutenant Tutschek at the Russo-Finnish border in 1942 to intercept Russian communications. Halostranta is approximately 120 miles east of Rovaniemi. A start was made at establishing a sub-station with DF installations to support the units based on the Lieska airfield.++

(2) ~~10th Company, Air Signal Regiment 5, Alta, 1943~~

Alta is west of Kirkenes, about half way to the northwest coast of Norway. The new company was assigned the Special Purposes Weather Station Stavnik and its Sub-Station Petsamo. With these two sub-stations, the new company had the mission of intercepting British and Russian communications and in particular of keeping track of PQ convoys between Reykjavik (Iceland) and Murmansk. The company commander was a 1st Lieutenant, presumably named Mueller, who had formerly been a Chief Technical Signal Inspector, and was soon promoted to captain rank. As previously mentioned, the main mission of this company was to track the PQ convoys, in addition to which it was presumed that the Allies had a radio beacon system between Reykjavik and Murmansk. From the intercepted messages it was sometimes possible to determine by the number designations of the convoys (even or uneven numbers) whether they were westward or eastward bound.

11 c. Intercept Sub-Station Mikeli. Within the command zone of the Fifth Air Fleet was Intercept Sub-Station Mikeli, a post with advanced DF posts at Lake Ladoga. It had been established by the III Battalion, Air Signal Regiment 1, Riga, in 1941 under 2d Lieutenant Vaatz to cooperate with Station W-11, Kobbelbude, against Russia (see B, V, 2a (a 1 and a 2)). Being coupled with Station W-11 it was probably designated Wo-111, as the Svavnik sub-station had formerly been designated. Since the III Battalion, Air Signal Regiment 1 had no possibility to supervise operations at Mikeli, the Signal Staff Officer, Fifth Air Fleet placed it under Lieutenant Colonel Ulrich, CO, III Battalion, Air Signal Regiment 5. Due to the distance and the poor conditions of travel, duty trips by Lieutenant Colonel Ulrich to the sub-station took almost eight days.

3. Disposition of the III Battalion (Radio Intercept), Air Signal Regiment, in the Summer of 1943.

(1) Battalion Headquarters, North Beach, Oslo.

CO : Lieutenant Colonel Ulrich

Adjutant : 2d Lieutenant Wasmar, from 4 August on ~~XXXXXXXXXXXX~~ Chief of Station W-22, Husum,+

Admin Inspector: Karl.++

+ Succeeded as Battalion Adjutant by 2d Lieutenant Schubert.
++ Preceded by Inspector Korn and followed by Chief Inspector Haubold.

Footnote ++, p. 152: The Finnish Headquarters was at Mikeli, 61.8° Latitude North, approximately 27° Longitude east.

12 (2) 7th Company (Control Station W-Leit-5), North Beach.

Commander : 1st Lieutenant Schmidt.+

Chief Tec Air Inspector: Balzey, Groenewald

(3) 9th Company, Stavanger

Commander: from 1942 1st Lieutenant Lacher
Adcock DF installation.

(4) 8th Company, Halosranta

Commander: 1st Lieutenant Tutschek

Sub-Station Lieska with DF installation

(5) 10th Company, Alta

Commander: 1st Lieutenant Mueller (?)

Intercept Sub-Stations

(a) Svavnik, near Kirkenes, CO: 2d Lieutenant Fuchs (air-carried ~~xxxix~~ interpreter-radio operator), previously 9th Company at Naerland, Adcock DF installation.

(b) Petsamo, 12 miles east of Svavnik.

(6) Fifthe Air Fleet

Headquarters: Holmen Kollen, near Oslo

Commanding General: Generaloberst (General) Stumpf

Signal Staff Officer: 1941 General Kuehne; 1942 General Haenschke; 1943 Colonel Gosewisch

(7) Intercept Liaison Officers at Fifth Air Fleet Headquarters and Their Missions. The first Liaison Officer was Lieutenant Kretschmer, formerly at Station Wo-111, Svavnik, followed by Lieutenant Homberg, of the 9th Company, when Lieutenant Kretschmer was transferred to the night fighte

Footnote ++, p. 153: Lt.Schmidt was Chief of Station Wo-111 until after summer 1942, at Svavnik. Lt. Bahr was also on the staff of Control Station W-Leit-5 in addition to those mentioned here.

13 fighter arm as a night fighter.

The missions of the Intercept Liaison Officers were as follows:

To keep the Intelligence Officer, the Operations Officer and the Admiralty Liaison Officer posted on the possible interrelations between the communications intercepted and German and/or enemy operations; the latter at the time was Naval Captain Boehme who, if he was convinced on the basis of the official intercept reports received from the Intercept Liaison Officer that German forces were exposed to a serious threat, was required to order those forces to change their course.

As intelligence aide, the Intercept Liaison Officer was responsible for the maintenance of statistics, showing for example the disposition of British air forces within Britain and in overseas areas, the ground situation, a reconstruction of air routes, German lossesinsofar as these were clearly visible from records of lower level commands, and was required to report on the current situation, together with the other two Intelligence Aides, to the Commanding General in person. Another of his duties was the preliminary interrogation of prisoners for the transient camps at Oberursel. The information obtained in these interrogations frequently were a valuable supplementation to the intercepted information

14 The most important item here was the interrogation of crews from Beaufighter and Blenheim units, which attacked our ships with torpedo bombs along the west coast of Norway. The interrogating was done at the Fornebu air base. The officers assigned as Fifth Air Fleet Intelligence Officer were, in the period November 1942 to November 1943, Major Domnik, GSC, followed by Lieutenant Colonel Lilienskjoeld. Chief of Staff was General Nielsen, previously at the head of Air Command Kirkenes.

4. Final Organization and the Capitulation. On 3 August 1943 Lieutenant Colonel Dr. Ulrich, CO, III Battalion, Air Signal Regiment 5, was transferred as Radio Officer to the Signal Staff Officer, Special Air District Command XXVI, Riga. He was replaced by Captain Schwintzer, until then at the head of Station W-22, Husum-Milstedt, who in turn was replaced towards the end of 1944 by Major Camerlaender who had previously commanded the III Battalion, Air Signal Regiment 1, Kreuzburg, Eastern Prussia, and who remained in command until capitulation. In the course of the final reorganization of the entire Intercept Service, the III Battalion, Air Signal Regiment 5 became Air Signal (Radio Intercept) Battalion 355, and is said to have had the five companies, the 8th, 9th, 10th, 14th, and 15th.

15 According to information from Colonel Forster, Chief of Radio Intelligence (Home Command), the units of Air Signal Battalion 355 were committed as follows up to the end of war:

(1) Battalion Headquarters, Oslo (presumably in the same premises as before at North each

(2) 1st Company, Data Interpretation (presumably as above

(3) 2d Company, Shortwave Receiving Halden (approximately 15 miles east of Frederiksstadt, 59.2° latitude north, 11.4° longitude east)

(4) 3d Company, Short- and Ultrashortwave Receiving, Stavanger (presumably at Naerland near Stavanger)

(5) 4th Company, Short- and Ultrashortwave Receiving, Krikenes

(6) 5th Company, DF, Oslo

The Battalion reported to:

Commanding General, German Air Forces, Norway;

Air Command 5;

Torpedo Bomber Wing, Norway;

Commanding Officer, Patrol Forces, North;

Naval DF Branch Norway;

Reporting Center 1, ~~XXXXXX~~ Air Signal Battalion 357, Heiligenstadt/Eichsfeld (responsible for early warning, reports on enemy air penetrations, security in the early warning zone and the zone of interior).

After the capitulation the commanding officer and all personnel of the battalion were placed in an internment camp under British control at the former German Air Force airfield

Footnote 7, p. 156: On 1 October 1944 Captain Schwintzer was reassigned in command of the I Battalion, Air Signal Regiment 352 (Radio Intercept). See B, VI.

from where they were later released, Major Camerlaender before the rest of the battalion because of his Austrian citizenship.

5. ~~Results achieved by Intercept Operations~~; ~~Experience~~, with Examples of Results Obtained; Difficulties Encountered in Fifth Air Fleet Command Zone. The intercept forces operating within the zone of the Fifth Air Fleet were required to cover both Britain and Russia. It was in this zone that the battle was waged far in the North against the Allied PQ convoys on their way to the Russian supply port Arkhangelsk by way of Reykjavik and Iceland. Together with the Naval units the sub-station at Svavnik, near Kirkenes (the Special Purposes Weather Research Station of Intercept Company Alta) produced notable results in this field, as it did also in cooperation with the Army Intercept Service, which maintained an intercept post located between Hallostranta and Kirkenes. Cooperation between Intercept Company Maerland and the Navy in Stavanger was also excellent. The company at Maerland also concentrated on the interception of voice-radio communications of British fighter units on ultrashortwave frequencies. Receivers were installed in the German Ju-52 and later also in the Do-17 aircraft for ultrashortwave reception, and interpreter-radio operators were placed on board these units during missions flown against Britain.

16 Lieutenant Lacher, promoted to 1st Lieutenant and placed in command of the 9th Company, Naerland, in 1942, was seriously wounded when his plane came under British fighter attack during one of these missions.

In the summer or autumn of 1941 or 1942 efforts were made to extend the service with ultrashortwave receivers from Naerland into the western mountain range of Norway. Under great difficulties and at a great expenditure in personnel and material an ultrashortwave voice-radio intercept station was established there at an altitude of between 6,000 and 6,600 feet in a ski hut roughly 60 miles from the coast of western Norway. The ascent was made from either from Finse or Myrdal, and the point in question may have been Fjell (Joekul) at an altitude of approximately 1961 meters.

The antenna was rigidly set, could be heated, and consisted of eight Dipol elements placed parallel one above the other to increase the area covered. However, this project was frustrated by the difficult terrain and climatic conditions (icing). Owing to the great distance from England, roughly 360 miles, and the inadequate altitude reception was practically nil.

The forward intercept post at Petsamo in particular concentrated on the interception of Russian fighter radio communications to support the operations of the German fighters

17 stationed there.

Data interpretation at Constrol Station W-Leit-5 produced only few successful results because of the small amount of data received. The production of appreciable results in this field had to be left to the main agency for such activities, the AF CINC Cryptographic Center. However, useful results were obtained daily in cracking the codes for the coding instruments installed in the British aircraft.

Good results were also achieved in what was a new departure, the employment of 20 women signal auxiliaries as radio intercept operators. They worked very well and were keenly interested. One of these auxiliaries even received the War Service Medal (Kriegsverdienstkreuz), Second Class with Swords, from the Fifth Air Fleet for intercepting an exceedingly important message.

All intercept companies and their stations and substations had DF installations and from 1943 on had special direct lines for telephone and Secret teletype communication with Control Station W-Leit-5 at North Beach, Oslo. This removed one of the most serious difficulties encountered in Norway, so far as intercept operations were concerned. The Northern Lights also had a hampering effect and sometimes even precluded reception in the extreme North.

Owing to the immense distances involved in the zone

of the Fifth Air Fleet, which covered Norway and Finland, and owing to the exceptionally difficult terrain conditions in this region of lakes and mountains, which is so thinly populated and so ~~difficult~~ little developed as far as roads are concerned, the maintenance of personal contact between the control station at Oslo and its intercept units stationed at the frontiers was a time-consuming and complicated matter, except when the telephone or radio were used for the purpose. In most cases travel had to be by air, because it was only possible in sections by rail, and because there were no rail connections whatever with the far northern parts of Norway and with Finland. By sea the trip would have taken too long, and would hardly have been possible at all to the extreme north. Under these circumstances a tour of inspection always took up a number of days. For a trip to Finland, for example, on which the commander of the III Battalion, Air Signal Regiment 5, Lieutenant Colonel Ulrich had to cover 2,700 miles because of the necessity to avoid crossing neutral Swedish territory, he required almost eight days.

In regard to the radio reception difficulties caused by the Northern Lights it is necessary to point out that these were encountered not only in Norway but also in adjacent territories. Official warning was given when the occurrence

of Northern Lights conditions were predicted. During the initial stages, however, these warnings were given in writing and usually arrived too late, so that the intercept operators only discovered the cause of their reception dofficulties when these continued for a number of days, or when reception became altogether impossible. Later in the war, these predictions were dispatched by teletype and thus arrived in good time.

The Northern Lights, known as Aurora borealis in the North and as Aurora australis in the south, are lights which appear above the two poles at altitudes between 42 and 360 miles (most commonly between 60 and 65 miles). In their physical nature they correspond theoretically to cathode rays, which one must consider as consisting of minute electrically charged particles (atom rays) emanating constantly from the Cathode and progressing outward through the area of vacuum or strongly rarified air. In the case of the Polar Lights the sun represents the source of power from which these rays emanate. If drawn by gravitation into the magnetic field of the earth they are absorbed by the atmosphere in high strata and the air glows like a cathode tube. In these strata of very rarified air bands of cathode rays develop, which in turn emit secondary cathode rays. It is these latter which, through friction-ionization produce the illuminations seen

21 in the progressively denser atmospheric strata closer to the earth which are commonly known as the Northern Lights. The sequence of the rays is in accordance with the position of the magnetic fields. Within any one day the frequency of the phenomenon of the Northern Lights is in the first hours of the night, between 19 and 24 hours , because the ~~xxxxxxx~~ electric rays of the sun are so deflected from the magnetic field of the earth that they penetrate to the earth on the shadow side. During the rest of the night the intensity of these electric rays decreases, and this source of energgy requires replenishment on the following day.

The electron rays causing the Northern Lights, or the ions produced by themgive off particles responsible for the condensation of air, and the result is the frequent appearance of cirrus clouds in the area over which the Northern Lights appeared on the night before. The appearance of the Polar Lights always coincides with magnetic distrubances, which is due to the increased electric intensity of the sun rays. These electro-magnetic phenomena, which occur over the Polar areas, are the cause of the distrubance and occlusion of radio waves†

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† On the subject of Northern Lights see also Chapter 12, B, II, (Fading) and V (Northern Lights).

Wilhelm Haenschke
Major General (Ret.) Bonn, 15 January 1958

THE AIR SIGNAL CORPS AND THE RADIO INTERCEPT SERVICES IN AUSTRIA AFTER GERMAN ANNEXATION. MOBILIZATION AND THE CAMPAIGN IN POLAND

1. Survey of the Radio Intercept Service in the zone of the Fourth Air Fleet, 13 March 1938 to the End of the War in 1945.

(1) ~~1938~~.

a. ~~Command Headquarters and Air Signal Troops~~. At the time of the annexation of Austria by Germany there existed in Austria an Air Forces Command under Generalmajor (~~Brigadier~~ General) Loehr (seniority 25 September 1934), with headquarters in the Elizabethstrasse, Vienna. This command controlled seven airfields: Aspern, Wiener-Neustadt, Klagenfurt, Graz, Zeltweg, Wels, and Aigen.

The Command Headquarters had a Telegraphy Staff Section, under Major Jenny.

The Austrian Air Forces Command had signal forces totalling three companies, not yet fully organized, namely,

1. a wire telegraph company and
2. a wireless telegraph company, both in the antiaircraft artillery caserne at Kagran, near Vienna;
3. an air-carried radio company employed at training air-carried radio operators and stationed with the fighter wing in Wiener-Neustadt.

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After the annexation in March 1938 the existing Air Forces Command became Headquarters, Commanding General, German Air Force in Austria. General Loehr remained in command and was promoted to the rank of Generalleutnant (Major General), and Lieutenant Colonel Korten, GSC, was assigned as Chief of Staff. Headquarters remained in the old premises in the Elisabethstrasse, Vienna.

The headquarters in Vienna was assigned a signal staff officer, the first time such an assignment was made in the German military establishment. In contrast with the Signal Sections in other headquarters staffs, which had only an advisory function, the newly assigned Signal Staff Officer at the same time had direct command control over the air signal units directly assigned to the headquarters and the senior officer of all air signal units within the command zone. In the case of other high level German Air Force command headquarters, a signal staff officer was only assigned later, generally speaking, at mobilization. The signal staff officer assigned to the Vienna Headquarters was Lieutenant Colonel Haenschke.

In addition to the seven air signal posts in existence at the airfields, the following air signal units were created within the command zone:

3 Headquarters, Air Signal Battalion 18

Battalion Commander: Lieutenant Colonel Haenschke

Battalion Adjutant : 2d Lieutenant Koerner

1st (Telephone and Teletype) Company

Captain von Goebel-Hentscholek

2d Lieutenant Berlin

2d Lieutenant Grabner

2d (Radio Operating and Radio Intercept) Company

Captain Freiherr von Camerlaender

2d Lieutenant Meyer

2d Lieutenant Frenzel

3d(Air Traffic Control)Company

1st Lieutenant Markussen

2d Lieutenant Hanisch

2d Lieutenant Biza

Air District Command Headquarters Air Signal Battalion 17

Battalion Commander: Major Schleich

Battalion Adjutant : 2d Lieutenant Jochmann

1st (Telephone) Company

Major Schubert

2d Lieutenant Krause

2d (Aircraft Reporting) Company

Captain Ahrens

3d (Replacement) Company

Captain Vespermann

2d Lieutenant Franz

Training Company (for Air-Carried Radio Operators)

2d Lieutenant Holdt

4 Both of the above air signal battalions were activated at the Meidlinger Caserne in Vienna. Besides the three signal companies available under the former Austrian Air Forces

4 Command, the following units of the former Austrian Federal Army were used for the activation:

(1) The Army Telegraph Battalion, Meidlinger Caserne

(2) Telegraph Battalion 1, Klosterneuburg.

In the autumn of 1938 Headquarters, Air Signal Battalion 18 with one of its companies moved to a newly established camp of prefabricated barracks on the St. Georgenberg mountain in Mauer, wouthwest of Vienna, two companies moving to a caserne newly constructed by the former Austrian Army in Gross-Enzersdorf, east of Vienna.

Air District Command Headquarters Air Signal Battalion 17 headquarters and one company moved to a barracks camp in Auhof, west of Vienna; one of this battalion's other companies moved to Klosterneuburg and the other to the Trost caserne, both within Vienna.

A start was made at constructing new Air Force casernes at both Auhof and Mauer.

The air-carried radio operator training company in Wiener-Neustadt was administratively assigned under the AF Command Signal Staff Officer. Besides radio operators it also trained personnel for DF operations. Later, it provided the cadre for the activation of the Air Signal School of the Fourth Air Fleet in Budweis.

In July 1938 Air Force Command Austria moved to new

headquarters premises at 13 Schwarzenbergerstrasse, Vienna, commonly known as the Guttmann Palace, and was redesignated German Air Force Command Ostmark.

Around the same time Air District Command XVII was activated, which was assigned under AF Command Ostmark and took up that command's former premises in the Elisabethstrasse, Vienna, under Generalleutnant (Major General) Hirschauer, with Signal Staff Officer Major Schroeder. The new Air District Command was assigned the already activated Air District Command Headquarters Signal Battalion 17, until then assigned under the AF Command Ostmark Signal Staff Officer.

b. The Intercept Service. The former Austrian Air Forces Command had not carried out intercept activities. As a rule such activities were carried out by the Army for both the Army and the Air Force. A Decoding and Interpreting Center existed since 1 June 1936 for this purpose, under Generalmajor (retired on recall status) Johann Adametz. It was in premises in the Heidlinger caserne in Vienna and came directly under Branch 5 (Signal Branch) of the Austrian Federal Ministry of National Defense. This branch was headed by Generalmajor Boehme.

The Decoding and Data Interpreting Center maintained two field stations as reception points, one in Klosterneuburg and one in Graz, each occupied by the personnel of one

6 telegraph company in Vienna and Graz, respectively. These units covered Italy, Yugoslavia, and Czechoslovakia. None of the staffs included data interpreting personnel. All messages intercepted were processed exclusively at the Decoding and Data Interpreting Center in the Meidlingerstrasse, Vienna. From there the screened material was transmitted to Branch 5 of the Ministry of Defense. In relation to the small number of personnel employed in the whole intercept service and the simplicity of the receiver instruments used the results obtained were astonishingly good. This was certainly due in a large measure to the general multi-language capabilities in Austria and, particularly in the case of the older personnel, to personal knowledge of the areas covered from the old days of the Habsburg Monarchy. Friendly relations existed with the appropriate agencies in Hungary, due to personal contacts of General Adametz based on friendships of long standing from the days of the Austro-Hungarian Imperial-Royal Army. These friendly relations led to a mutual exchange of the results obtained in intercept operations.

In the subdivision of the existing ~~of~~ signal units and installations, after the annexation of Austria, the Army renounced any claim to the entire Austrian Intercept Service in favor of the German Air Force,

7 so that the entire service was transferred to the Air Force.

7 The Air Force, in turn, left this well-intergrated Austrian Intercept Service largely unchanged in its basic features for the time being. This is why the pattern of the whole Intercept Service under German Air Force Command Ostmark for a long time differed from the pattern in Germany proper and this is also why it was adapted with great caution and only very gradually to the German pattern.

Retaining the missions it had had in the past, the Decoding and Data Interpreting Center under General Adametz became a section of the staff of the Air Command's Signal Staff Officer, ~~XXIXXXXXXXXXXX~~d and moved from the Weidlinger-~~XXXXXXXXX~~ caserne to Schwarzenbergerplatz, also in Vienna. Instead of to Branch 5 of the Ministry of Defense, it now reported to the Air Force Command Headquarters. At the same time all data gathered was transmitted also to the Cryptographic Center of the German Air Ministry, as was the case with all Weather Reporting Control Stations within Germany proper. The designation of Decoding and Data Interpreting Center was changed after a while for the sake of uniformity to "Weather Reporting Control Station (Wetterleitstelle), but without any designation number and with the suffix "AF Command Ostmark." In contrast with the pattern in Germany, however, it remained a staff section under the Signal Staff Officer and was still not an independently operating unit. Its integration with the Headquarters Signal Staff from the

8 start insured smooth cooperation of the Control Station with the Intelligence Division of the AF Command and later with the Air Fleet Headquarters, a feature completely absent in the case of the Control Stations in Germany and which was only developed under the stress of circumstances during the war.

The existing very small Telegraph (Radio) Companies operating the reception posts at Klosterneuburg and Graz provided a cadre in the activation of the 2d (Radio Operating and Radio Intercept) Company, Air Signal Battalion 18, Meidlingerstrasse, Vienna. Commander of the new company was Captain Freiherr von Camerlaender, until then in command of the Telegraph (Radio) Company in Graz. Company officer was 2d Lieutenant Meyer, also from the company at Graz. This new company moved in the summer of 1938 to Gross Enzersdorf.

Since the radio receiver station in Klosterneuburg, which covered Czechoslovakia, was in a caserne allocated to the Army, new premises had to be found for it. Suitable premises were found in Hirschstetten, northeast of Vienna. Initially, Hirschstetten served only as an intercept receiving operation point of the 2d Company, Air Signal Battalion 18.

The receiver post in Graz was soon closed, since coverage of Italy was no longer considered an urgent requirement, and be-

9 cause conditions there were not unfavorable for intercept operations against Yugoslavia. The personnel from the post at

Captain Morgenstern established Special Purposes Weather Station Budapest at the Budapest-Mátyasfoeld airfieldwhich he commanded until November 1938, and substations at Szeged and Debrezin. Weather Station Hirschstetten received instructions to furnish the necessary personnel for Budapest and released some of its newly trained staff for the purpose. Later, in November 1938, Major Immisch, temporarily assigned at Hirschstetten,was assigned to command the Budapest station.

(2) 1939.

a. On 16 March 1938, the day after German troops entered Czech territories, Air Force Command Ostmark was redesignated Fourth Air Fleet. The staff remained unchanged and General Loehr, in command, was promoted to the rank of General der Flieger (Lieutenant General).

In addition to its Air district Command XVII, Vienna, the Fourth Air Fleet was assigned Air District Command VIII, Breslau, which transferred the western parts of its district to Air District Command IV, Dresden,and instead took over
11 the entire area of Bohemia. Generalmajor Wawer was assigned to command Air District Command VIII with Captain Sonntag assigned as chief of the headquarters Signal Section.

At the same time Air Signal Battalion 18, Vienna, was redesignated I Battalion, Air Signal Regiment 4. (CO: Major Schroeder 1 April-30 April 1939; Captain von Goebel-Hertscholek

11 Orders had been given previously to activate a 4th (Headquarters Signal)Company for the new Air Signal Regiment 4, and this activation was completed at Wien-Mauer on 1 April 1939 (Company Commander 1st Lieutenant Kirner; company officers 2d. Lieutenants Pfeiffer and Schmidt).

Simultaneously with the establishment of the Fourth Air Fleet, orders were given to activate Air Signal Regiment 4 on 1 June 1939. By that date the following activations were completed:

Headquarters, Air Signal Regiment 4, Wien-Mauer

Commanding Officer: Major Loewe

Adjutant : 1st Lieutenant Berlin

II Battalion, Air Signal-Regiment 4, Reichenbach/Silesia

Battalion Commander: Major Bauerschaefer

This battalion had three companies.

Air Fleet Signal School 4, at Budweis, was also established for the new Fourth Air Fleet. The air company attached to this school was stationed initially at Deutsch Brod under Major Krumm.

Air District Command VIII, newly assigned under the Fourth Air Fleet, brought with it its Air District Command Air Signal Battalion 8, with headquarters in Breslau Schoengarten under the command of Major Saul and with its Replacement Company at Oppeln.

b. Intercept Services. Weather Reporting Control

9

Graz were integrated with the staff at Hirschstetten, and the receiver station at Hirschstetten was then designated "Weather Station Hirschstetten." Chief of the station was Captain Freiherr von Camerlaender, Commander of the 2d Company, Air Signal Battalion 18.

In July 1938 the Cryptographic Center, Air Ministry, detached Major Immich to command the new station and to organize it in adaptation to conditions in Germany. From the control station, the station at Hirschstetten also received civilian personnel until then employed at the decoding and processing station; other civilians were also engaged.

In 19vember 1938 Lieutenant Meyer took command of Station Hirschstetten, coming from the 2d Company, Air Signal Battalion 18. Technical Signal Inspectors assigned were Oettelbauer and later Querfurt.

Plans for Operation Stephan in September 1938 provided for closer cooperation between the Hungarian air forces and German Air Force Command Ostmark (Austria), for adaptation of the Hungarian aircraft reporting system to the German, and for the assignment of German Air Force Radio intercept personnel in Hungary. Under the agreements reached, Captain Morgenstern was dispatched to Budapest and attached to the staff of Air Attaché Lieutenant Colonel Futterer to handle air signal matters.

12 Section, Air Force Command Ostmark was redesignated Air Fleet Weather Reporting Control Section 4 in March 1939. For the time being it remained a staff section under Colonel Haenschke Signal Staff Officer of the Fourth Air Fleet.

It was only with activation of Air Signal Regiment 4 that the Control Section was organized as an independently operating unit. It remained in its old premises in the Schwarzenbergerplatz Vienna, under Generalmajor Adametz and Technical Inspector Querfurth.

Weather Station Hirschstetten retained its unit designation number of 14.

An agreement had been reached with Slovakia in March 1939 regulating cooperation between the Fourth Air Fleet and the authorities in Slovakia in the development of the ground organization of the Air Force. As far as the air signal troops were concerned this agreement, similarly to the September 1938 agreement with Hungary, provided for the coordination of the aircraft reporting services and for the assignment of German air traffic control and radio intercept personnel in Slovakian territory. For this purpose Colonel Schwarz, together with a few officers and other staff personnel, was attached to the German Air Force Attaché in Pressburg to handle air signal matters.

The Officer of the Commander in Chief of the Air Force made Intercept Platoon Herold available for intercept

13 operations in Slovakia. Originally intended for an assignment in Esthonia, the platoon was transferred instead to Vienna and brought up to strength with personnel from the system under Control Station W-Leit 4, particularly from Station 14. Measures to readapt the platoon for operations in Slovakia instead of in Esthonia, and negotiations with the Slovakian Government delayed the commencement of operations, the first elements of the Platoon (named Herold after its commanding officer, 2d Lieutenant Herold) only arrived in Slovakia in July 1939, the bulk following a month later, where they established their station at Zipser-Neudorf.

2. Mobilization and the Campaign in Poland.

a. Command Headquarters and Air Signal Troops. On 24 August 1939 the staff of Fourth Air Fleet Headquarters moved to its prepared command post in Peichenbach, Silesia, in the permanent-type barracks constructed there for the II Battalion, Air Signal Regiment 4.

At mobilization the Fourth Air Fleet was assigned the 2d Air Division, under General Loerzer, Special Purposes Air Command, under Generalmajor von Richthofen, and Special Air District Commands 8, 13, and 17. These special air district commands were units organized for operations outside of Germany in the event of war.

In all air fleets the chiefs of the staff signal sections

14 became Air Fleet Signal Staff Officers with the command authority and status of divisional commanders, a post which Colonel Haenschke assumed in the case of the Fourth Air Fleet.

In each air district command the chief of the Air Signal Staff Section was replaced by a Signal Staff Officer with the command authority and status of a brigadier commander.+ In the case of these posts were held

in Air District Command VIII, Breslau, by Major Thoenissen
" " " " XVII, Vienna, by Lieutenant Colonel Ahlfeldt.

Each special air district command was also assigned a signal staff officer, namely,

Special Air District Command 8, Colonel Aschenbrenner
" " " " 13, Lieutenant Colonel Klemme
" " " " 17, " " Saul(replaced during the campaign in Poland by Major Arlt).

After mobilization the organization of Air Fleet Signal Regiment 4 was as follows:

~~Regimental Headquarters~~ with
1 Equipment Company

~~I (Operating) Battalion~~
1st (operating) (Mtz) Company
2d (Operating) (Mtz) Company
3d (Headquarter Signal) (Mtz) Company
6th (Radio) (Mtz) Company

~~II (Construction) Battalion~~
4th(Field Cable Construction) (Mtz) Company
5th " " " " "

+ For difference between status of a Signal Staff Officer and the chief of a headquarters signal section see 1938, a. Command Headquarters and Signal Troops.

III (Radio Intercept) Battalion

7th Radio Intercept) (Mtz) Company

Weather Reporting Control Station W-Leit-4

Weather Station 14

Special Purposes Weather Station

Intercept Platoon Herold

IV (Air Traffic Control) Battalion

9th (Air Traffic Control) (semi-Mtz) Company

10th " " " " "

11th " " " " "

12th " " " (Mtz) "

The air district command headquarters battalions at mobilization were expanded to form air district command signal regiments. However, at mobilization the regimental commanders were still identical with the air district command signal staff officers, a circumstance which was only changed later.

Each air district command signal regiment had three battalions:

I Air District Command Signal Battalion
II " " " Aircraft Reporting Battalion
III " " " Signal Replacement Battalion.

However, this organization, provided for in the mobilization plans for each air fleet and air district command signal regiment, was disrupted right at the beginning of the campaign in Poland when company and battalion staffs were assigned to the air divisions and special air district commands.

b. Intercept Services.

(1) Motorized Units. At mobilization headquarters

16 of the III (Mtz) Battalion, Air Signal Regiment 4 was activated under Generalmajor Adametz, with Staff Officer Major Klitzsch and Battalion Adjutant 1st Lieutenant Berger.

The battalion had its headquarters in Wien-Mauer but during the campaign in Poland was at a forward command post in Reichenbach.

General Adametz remained in command of this battalion until 1 April 1940, when he was replaced by Major Eick.

Since Air Signal Regiment 4 Headquarters was moved to
17 the West immediately after the Polish campaign and used there to activate a new Air Signal Construction Regiment, its III Battalion was placed directly under the Fourth Air Fleet Signal Staff Officer.

On 1 April 1940 a new Headquarters for Air Signal Regiment 4 was organized under General Adametz, with Staff Officer Major Janowski, Battalion Adjutant 1st Lieutenant Bergentun; the latter was succeeded very soon by 2d Lieutenant Froben.

At this juncture the III (Radio Intercept) battalion was returned to command by the regimental headquarters.

The former 2d (Radio Operating and Radio Intercept) Company of the regiment was divided at mobilization to form a 6th (Radio Operating) and a 7th (Radio Intercept) Company, both of them motorized. Captain Freiherr con Camerlaender was assigned to command this 7th Company,which after the Polish campaign

was again re-numbered, this time as the 10th (Radio Intercept) (Mtz) Company, Air Signal Regiment 4.

At the same time the regiments 9th (Radio Intercept) (Mtz) Company was activated under Captain Freiherr von Camerlaender.

On 6 November 1939 Captain Freiherr von Camerlaender handed over his command to 1st Lieutenant Oeljeschlaeger and from

18 him took over Station W-14 in Wien-Hirschstetten.

On 11 May 1940 the 10th (formerly the 7th) Company moved from Czyżyny, near Krakau, to Vienna, to premises in the Conrad caserne in Gross Enzersdorf, where it continued to operate against Russia. At the same time it was reorganized as a motorized intercept company with two motorized intercept platoons and redesignated as the 10th (Mtz) Company, Air Signal Regiment 4. Station W-24, Breslau, until then part of the 10th (previously 7th) Company as a static platoon, was taken out of the company and again became an independently operating weather station.

From 9 July 1940 on the 10th Company was stationed at Leibnitz in Styria, with main emphasis in its operations being on the southeastern areas. On 19 July it was transferred back to Vienna and on 23 July to Belgium.

Command of the 9th Company, activated in the spring of 1940, was given to Captain Freiherr von Camerlaender from Station W-14, Wien Hirschstetten. For the time being the

18 company continued to operate in these premises and in premises in the Conrad caserne in Gross Enzersdorf, but later moved to the caserne of Air Signal Regiment 4 in Wien-Mauer. Main emphasis in its operations was on the interception of communications in the southeastern areas.

With these changes Station W-14 was moved to Premstetten, near Graz in Styria, where, under 1st Lieutenant Scheidl, it became the Intercept School of the III Battalion Air Signal Regiment 4.

In the Balkan campaign the 9th Company, Air Signal Regiment 4 was committed in Bulgaria and Greece under 1st Lieuten-

19 ant Herold.

Intercept Platoon Herold, which had commenced operations in Slovakia one month prior to the war, moved back to Vienna after the Polish campaign, during which it had been committed in Humenée and Krakau. In Vienna it returned the supplementary military personnel it had received from the Fourth Air Fleet and its civilian data processors and translators to Control Station W-Leit-4. The rest of the platoon returned to Headquarters of the Commander in Chief of the Air Forcewhere it was used as a cadre for a new intercept company, which was assigned to the VIII Air Corps.

(2) ~~Static Units~~.

Station W

19 (2) ~~Static Units~~.

Control Station W-Leit-4

Commanding ~~Officer~~: Generalmajor Adametz who, in addition to his duties as commander of the III Battalion, Air Signal Regiment 4, and from 1 April 1940 on as regimental commander, retained his responsibilities as chief of Station W-Leit 4 until 2 January 1941.

Officers on the staff of Control Station W-Leit-4:

Major (recalled to service) Janowski
Captain (Reserve) Richter
Captain) " Partilla
Technival Officials: Wuerfurt, Wirth, Marchl.

3. ~~1940~~.
Weather Station Premstetten. After the campaign in Poland, main emphasis in intercept activities again shifted southwards. For this reason receiving conditions were no longer favorable at Weather Station Hirschstetten. Therefore, ~~xxxxxxx~~ ~~xxxxxx~~ a new site was sought in the southern areas of Austria, for a new receiving station. Suitable premises were found for the purpose in the Barock Castle of Premstetten close to Graz. Initially the 10th Company, Air Signal Regiment 4 was assigned in these premises to operate from there and at the same time to train replacements for the regiment's III Battalion.+ Station W-14 only moved from Hirschstetten to Premstetten at a later date.

+ The 10th Company did not actually operate from Premstetten but from Leibnitz/southeastern Styria. It remained there only from 9-19 July 1940and then transferred to Belgium. See p. 180, above.

III. CAMPAIGN IN THE BALKANS AGAINST YUGOSLAVIA AND GREECE IN THE ZONE OF THE FOURTH AIR FLEET.

1. Campaign in the Balkans

a. ~~Operations of the III Battalion, Air Signal Regiment 4~~.

(1) ~~Battalion Headquarters~~ and ~~Control Station W-Leit-4~~ remained in Vienna, from where the battalion commander, Captain Camerlaender directed the operations of the battalion's units.

(2) ~~The 9th Company~~, in the past commanded by Captain Camerlaender in Vienna, was assigned a new commander, 1st Lieutenant Schmidt, until then in the III Battalion, AF CINC Headquarters Signal Regiment. Committed initially in Sofia and Plovdiv, Bulgaria, the company succeeded in cracking the Yugoslav code. In the campaign against Greece, elements of the company followed the German advance as far forward as Athens. It was the only German motorized intereept operating unit within the Balkans at the time of the campaign in Greece.

(3) ~~Weather Station Athens~~.+ Established by the III Battalion, Air Signal Regiment 4, this unit later became Station W-3, AF CINC Headquarters, and it is said that Chief Decoder Voegele served on its staff during its initial stages. Still later the unit became Control Station W-Leit Southeast in Athens under Radio Intercep. Battalion Southeast.

(4) The 10th Company was detached, under 1st Lieutenant Oeljeschlaeger, to the Second Air Fleet in Belgium and therefore did not participate in the campaign in the Balkans (see under 10th Company).

(5) Station W-24, Breslau and the Intercept School Premstetten continued with their special missions (see under Russia).

(6) Special Purposes Weather Station Budapest, under Captain Ristow, had already expanded its operating areas in 1940 by establishing a sub-station, with DF posts, in Mamaia on the Black Sea. Because of its favorable geographical position this station with its radio intercept and DF posts in Budapest/Mátyasfoeld and Mamaia produced the best results in respect to Yugoslavia and Greece, and later Russia. One mission of the station was to cooperate in the organization and training of the Hungarian Intercept Service, from which one radio intercept and DF team participated in the campaign in Serbia. Together with the intercept units committed from Vienna the Station contributed very largely to the speedy end of the campaign in the Balkans. The operational orders of the Yugoslav Air Command were intercepted and decoded so quickly that German countermeasures could always be taken in good time.

b.

3 b. Transfer of the Special Purposes Weather Station Constanza and Its further Development; Officer and Civil Service Members of the Staff.

(1) The Transfer and further Development. On 25 October 1940 an advance part was transferred from Debrecen, under 2d Lieutenant Lampson, in charge at Debrecen since mid-1940, to Rumania to establish a Weather Research Station in Mamaia, near Constanza, with two advance posts in Romau and Craiova, which remained in existence until the end of 1940. The station at Debrecen itself was deactivated at the end of the year after operations had commenced at Mamaia in November or December. In the summer of 1941 a camp of prefabricated buildings was erected on the road to Mangolia about 30 minutes south of Constanza and in late autumn of the same year units moved into it. Early in November the bulk of Special Purposes Weather Station Budapest moved to Constanza, where 1st Lieutenant Kohlwalt assumed command, who later took over the 10th Company from Captain Oeljeschlaeger in August 1942. The commander of the Special Purposes Weather Station, Captain Ristow and his deputy, Captain Richter, remained in Budapest. When Captain Ristow, promoted to Major rank, was transferred to the III Battalion, Air Signal Regiment 4, Captain Richter assumed command. When he in turn was promoted Major and transferred to the III Battalion in the autumn of 1942 he was

4 was succeeded by Captain Winter. Early in 1943 the station was taken over by Captain Schnabel of the 16th Company, Air Signal Regiment 4. Captains Winter, Richter and Schnabel were all three Austrians. Constanza had meanwhile become headquarters of the Special Purposes Weather Station, with Budapest serving as Liaison Post U, still under Captain Winter. However, the DF posts in Mátyasfoeld remained in operation. From November 1940 to the end of 1942 Liaison Post R in Bukharest served as the message center to Vienna, Budapest, Constanza and from the autumn of 1944 on to the III Battalion, Air Signal Regiment 4 at Nikolaiev. In the early summer of 1942 the Special Purposes Weather Station was redesignated as the 16th Company, Air Signal Regiment 4. While the III Battalion was committed in the Caucasus (October 1942 to early January 1943) the 16th Company was assigned under Intercept Battalion Southeast and remained under that battalion although it operated in naval air intelligence and with its DF installations at the same time for the III Battalion, Air Signal Regiment 4. It also retained its designation as the 16th Company of that battalion. Captain Schnabel's deputy was 2d Lieutenant Poelzl. Captain Schnabel was succeeded at the end of 1943 by 1st Lieutenant Rosskoth, until then chief of Constrol Station W-Leit-2 in Italy and who was promoted on 1 July 1944 to the rank of captain. The 16th Company also covered Turkey, for which purpose it had

a platoon of 40 men, called the Turk Platoon. It remained a static weather station throughout. In July 1944 those elements of the 16th Company which were still operating for the III Battalion, Air Signal Regiment 4 were separated from the rest of the company and returned to that battalion, so that from then on the 16th Company, with the exception of its DF elements, executed missions only for Intercept Battalion Southeast. In the summer of 1944, after the collapse of Rumania, the bulk of the company retired to Battalion Southeast, towards Germany. Elements left behind for the purpose destroyed all installations at Constanza and then followed on 25-26 August. During the last few days of April 1945 the company was committed under Captain Rosskoth in the region of Lake Kammer-(Atter-) see, Salzkammergut.+

(2) Missions and Results Achieved. The primary mission of the station at Constanza, besides intercepting all communications in the southeastern areas, was to keep track of the Russian Black Sea air forces, a special air command besides the air armies of the Russian Army Group South and comprising 2 bomber, 1 mine-torpedo bomber, and 2 ground-attack regiments stationed in Skadovsk, besides other elements, particularly fighter units, along the Caucasus coast in the Poti (Oil port) Batum) region, and a division headquarters in Novorossisk, which later displaced forward to Skadovsk, west of the Perekop

6 Isthmus.

Russian communications were transmitted by telegraphy or voice radio on daily changing frequencies, with certain frequencies recurring constantly. The call signal system and coding procedures were no different from those of other Russian air forces. The dispatch of Russian reconnaissance units was detected timeously through interception of coordinating communications between the various ground stations. The area of Russian air operations was towards the Crimea and Constanz, and was a logical conclusion. By taking cross bearings it was possible to determine the current station of a reconnaissance plane the moment it transmitted a report, so that German fighters could be dispatched in time to protect the convoy detected by the Russian reconnaissance plane. This made it possible for the German fighters to shoot down large numbers of Russian planes on their way to attack German convoys, particularly during the German evacuation of the Crimea. Furthermore, it was found that the Russians concentrated their reconnaissance activities within certain areas, and paid no attention whatever to areas south of 44° lattitude. In possession of this knowledge German convoys for a whole month were able to travel between Constanza and Sevastopol without encountering enemy aircraft. Continuous consultation was maintained with the German 10th Naval Security

7 Division, which directed convoy movements between Constanza, Odessa, and Sevastopol. During its period of operations the intercept station received numerous letters from naval and fighter units confirming their successful action and thanking the station for its support.

(3) Officer and Civil Service Staff Members.

Special Purpose Weather Station Budapest:

Commanding Officers: In succession, Major Immisch, Major Eick, Captain Ristow, Captain Richter, and Captain Winter (the latter simultaneously in charge of Liaison Post U in Budapest).

Weather Research Station Constanza:

Commanding Officers: In succession, 2d Lieutenant Lampson, 1st Lieutenant Kowalt.

Special Purpose Weather Station/16th Company, Air Signal Regiment 4.

Commanding Officers: in succession, Captain Winter, Captain Dr. Schnabel,(Acting Commander) 2d Lieutenant Poelzl, Captain Rosskoth.

Other Officer Personnel:

Officer Candidate Sergeant, later 2d Lieutenant Herold, Officer Candidate Sergeant Hundacker, 2d Lieutenant Kowalt, 2d Lieutenant Sedlak (the latter at Liaison Post R in Bukharest).

Civil Service Officials: Technical Inspector Luetge; Technical Chief Inspectors Besser, Grubert; Administrative Inspector (Cryptographic) Serfoezoe.

Footnote +, p. 186: See also Chapter 11, B, VI, 9a (6) and b; B, V, 4c, 2 (6) and c3 (7).

CHAPTER 11

POINTS TO BE OBSERVED IN THE RE-ESTABLISHMENT OF A GERMAN AIR FORCE RADIO INTERCEPT SERVICE

A radio intercept, or radio intelligence, service cannot be stamped out of the ground, as was Prussia's national army in 1813. Its establishment requires the existence of very specific conditions.

I. THE PERSONNEL REQUIRED.

1. In considering the organization of the Radio Intercept Service of the former German Air Force, as described in Chapter 8, above, it immediately becomes obvious what difficulties the selection of personnel encountered, as well as the training which had to be given to them, and how much time passed before the units were established and achieved full performance capabilities, and that in spite of the fact that ideal conditions for the task existed. Nowadays circumstances are completely different. There is no Reichswehr Army in existence with its excellent Signal Corps, as was then the case, to provide training for an Air Signal Corps and an Air Radio Intercept Service.

Should the necessity arise to establish a new radio intercept service, it will not be possible to wait until a new Signal Corps has been formed in order to then take the neces-

necessary radio intercept personnel from it. Furthermore, such personnel would only have training in normal radio services and the question would remain of where to provide training in the specific peculiarities of readio intercept activities. A shorter way must be found and other personnel must be sought out.

2. Only one possibility exists, and that is to rely on the old body of tried and tested personnel of the former service and use these immediately to develop a new service. It is hardly likely that many of the old personnel would return to the service at the start, but those who returned would at least provide a cadre of trained and experienced men ready to start immediately with the training of the younger generation of radio intercept personnel. In calling on the former personnel to rejoin, age and possible slight physical disabilities whould be no deterrent; the only standard for acceptance should be mental capability. What makes it all the more necessary to rely on trained and tested personnel is the fact that the very special niceties of the radio intercept activities, as apart from normal radio activities, can not be formulated in training or other manuals, but can only be passed on in detail work from man to man personally. That was the method adopted in the old service to furnish the intellectual training which made the high standard of performances obtainable.

3. The old personnel should be offered favorable conditions of employment. Although many are no longer alive, a considerable number of the former cadre are still available and would answer the call readily, but only if the conditions and prospects are at least equivalent to the conditions and prospects of their present employment. They would do their duty and, commensurate with the recognition shown by the highest levels of command would soon make their creative presence felt.

4. It would be useless to place the burden of training on already existing organizations of some type or other in the foreign service, in the Federal Postal Services, or the Federal Railways or Border or Frontier Guard. Their targets of training and their missions are entirely different from what is required. It is naturally advisable to establish contact with these organizations and exploit them and their facilities for the end in view, just as was done by the former Radio Intercept Service.

5. In the matter of the selection and training of younger personnel, attention is drawn to Chapter 8, I and II, of this present study. In order to accelerate the build-up it is recommended here that as radio operators only such persons should be accepted who already have appropriate technical training, including practical experience as telegraphists with a minimum speed of 80-100. Combined with professional radio

operators, amateur operators should provide a wide enough field for personnel selection.

II. PREMISES; EQUIPMENT; ORGANIZATION.

1. The choice of areas for the establishment of new static radio intercept stations would be governed primarily by the areas to be monitored, but in view of the existing political constellation and the small size of Western Germany the selection should present no difficulties.

It is almost certain that a number of the old permanent type radio intercept premises of the former German Air Force are still in existence, and use should be made primarily of these, since they are in carefully selected and tested areas. Arrangements should be made for an early evacuation by the present occupants.

If difficulties are encountered in the procurement of masonry buildings, efforts should be made to house the stations as soon as possible in solidly constructed timber buildings, but this should not lead to a renunciation of the demand for masonry buildings. These are an essential requirement, but only to replace the temporary premises by permanent and more stable premises which alone provide the possibility for intensive and uninterrupted work, such as is required in permanent operations.

2. As the first step it is essential to instal the central station of the whole Radio Intercept Service, corresponding to

the former Cryptographic Center. There is no need to discuss its location, since that is a predetermined matter. It would be the first radio receiving and ~~XXXXXXXXX~~ data interpreting agency and at the same time the radio intercept training center, and its first mission would be to build up the necessary network of static radio intercept stations. Concurrently forward radio intercept and DF stations will be established as frontier operating posts, which in the past rendered very valuable services.

3. The build up of a separate Radio Intercept Service presupposes in an even greater measure than in former times the availability of separate Radio Intercept Service communication channels. In this respect the arrangements during peace under the old organization were unsatisfactory. The authorized priority use of the existing Air Force and/or Postal communication lines proved inadequate. At the outbreak of war all the disadvantages accruing from this omission became painfully apparent in the delayed transmission of urgently important radio intercept reports owing to the excessive overload on the existing wire lines for other purposes. From the very outset care must be taken to provide absolutely secure and modern communication facilities.

The situation must not be allowed to arise again in which the Radio Intercept Service must take second place to other

users.

4. Equipment will have to be in accordance with the present progress in the fields of technology. The demand must be for instruments which guarantee maximum freed m from interferences. Proper radio intercept operations can only commence after the necessary instruments have been installed, but it will no doubt be possible to make a start with provisionally installed equipment similar, for example, to the old types of pack radio receivers and DF instruments in order to make the initial observations and preparatory radio intercept training possible.

5. Besides the build-up of the static radio intercept stations and their central control organ, it will also be necessary,as soon as the development of an Air Signal Corps has progressed far enough, to create a mobile branch of the Radio Intercept Service supplementing the static branch by the activation of radio intercept and DF platoons, a development which will culminate in the consolidation of these platoons in radio intercept companies.

It is necessary at this point to stress that in this process of development, the entire Radio Intercept and DF Service must be developed as one integrated whole. An irreparable flaw in the organization of the former service was the inclusion of the radio intercept companies and platoons in

the tables of organization of the air signal battalions and regiments. This arrangement firmly established the training and other command authority of non-experts in this very special organization. The standards of radio intercept training of these radio intercept platoons under peace conditions were not always satisfactory, and the defects noticable during peace also became apparent in actual operations. What was lacking was a firm bond tying them to the static branch of the service.

The recommendation here is that when the creation of radio intercept platoons and, at an advanced stage, companies becomes necessary, a static station and a n mber of platoons in each case should form a radio intercept company. These companies should be under the command of service specialists serving simultaneously as chiefs of the static radio intercept stations. These companies should be consolidated already during peace to form radio intercept battalions, the commanders of which should serve simultaneously as chiefs of the radio intercept control stations. In operations they would serve to cover specific radio intercept frontages, for example, East, West, North, South.

The radio intercept companies should be staffed with personnel serving appreciably long assignments, which is the only possible way to insure their thorough radio intercept

training. Highly qualified personnel must be assigned, also in the companies, for particularly difficulties duties, such as those requiring a knowledge of foreign languages or decoding, and these personnel will have to be civilians.

For reasons of training requirements, performance standards, and the maintenance of secrecy it is essential that the entire radio intercept service should be a homogeneous whole.

6. In all radio intercept matters this special Air Signal Corps Radio Intercept Service will be assigned under the central radio intercept authority in the Ministry; operationally the units will also be under that authority and at the same time under some other high level headquarters represented by that headquarters' staff signal officer, who will have exclusive administrative and disciplinary authority over them. For supply and housekeeping purposes they will be attached to the nearest Air Signal Corps unit.

The contents of this present Chapter 11 represent the essence of a memorandum which the present author prepared prior to the war for the Air Force Chief Signal Officer on the creation of Air Signal Corps Radio Intercept battalions at mobilization. What has been said here corresponds to the requirements previously stated. In particular, it provides a graphic picture of cooperation between the static radio intercept stations and the radio intercept

companies and/or platoons in actual operations.

It was not possible at mobilization to effectuate the ideas propounded, since the necessary conditions had not yet been created by that time in the organization.

III. CONSOLIDATED RECOMMENDATIONS FOR A FUTURE RADIO INTERCEPT ORGANIZATION.

A. Radio Intercept Units (at an advanced stage).

1. Central Radio Intercept Authority (Cryptographic Center in the Ministry.
   Composition and personnel strength according to the size of the existing Radio Intercept Service.

2. Static Radio Intercept Control and Radio Intercept Stations.

   a. Premises: in the former premises of radio intercept stations or in solidly constructed masonry buildings or special type timber structures

   b. Personnel: as in the former service

   c. Equipment: commensurate with the present advance in technological developments; in particular reliably functioning DF installations on the same scope as in former time

   d. Signal Communications: fundamentally better than in the former service.

      (1) own separate service wire communications network (G-teletype)
      (2) own separate radio and microwave networks
      (3) own voice radio traffic circuits

) separate radio intercept service system

   e. Motor vehicles and Materiel: commensurate with modern requirements.

3. Forward DF and Radio Receiving Posts (Frontier operating Posts).

a. Personnel as formerly; interchangable with personnel of the static radio intercept stations.

b. Receivong and mobile DF equipment, Control Transmitters, Voice-Radio Communications.

c. Connected with special Radio Intercept Service communications system (G-teletype).

4. Radio Intercept Platoons (Motorized) and at a later stage Motorized Companies.

a. Personnel: approximately former personnel strength; military personnel to serve longest possible assignments; radio intercept training by the static radio intercept stations.

b. Equipment, Motor Vehicles, and Materiel commensurate with modern requirements.

e. Communications: adequate connections with the special signal communications networks of the Radio Intercept Service.

B. Organization and Chains of Command.(Advanced Stage)

1. Establishment of a Radio Intercept Service as a separate division of the Air Signal Corps, and consisting of

a. Radio Intercept Companies, each comprising one static radio intercept station and 1 or 2 (mtz) radio intercept platoons.

Company Commander: Chief of the static radio intercept station.

b. Radio Intercept Battalions, East, West, South, North, each comprising 1 Radio Intercept

control stationand 2 or 3 radio intercept companies

Battalion Commander: Chief of the radio intercept control station.

2. Chains of Command.

a. In Radio Intercept Matters under the central authroity in the Ministry (Chief AF Signal Officer

b. Operationally under the central authority, as above or some other high level headquarters (there controlled by the Staff Signal Officer)

c. Administratively and in matters of military discipline under direct command authority of the the Staff Signal Officer of the Headquarters concerned,

d. For Housekeeping and Supplies attached to the nearest Air Signal Corps battalion.

IV. Apart from what has just been said above, all details for the organization of a new radio intercept service can be gathered from the previous chapters of this present study, particularly Chapters 5-7 and 8-11 and the appendix. The events of World War II did little to modify the principles established and the experience gathered prior to its outbreak in the process of the development of the service. A radio intercept service will always remain just what its name implies, although it is nowadays often referred to as a radio intelligence service, and this exploitation of the experience of the old Radio Intercept Service of the former German Air Force will be unavoidable in the establishment of a new

service. Any such reestablishment would necessarily have to be initially on a very modest scale. However, this changes nothing of the fact that also under present conditions a military power cannot exist without an extremely well organized and thoroughly trained radio intercept or intelligence serviceand will need to pay very close attention to its development and insure that it is adapted to present-day requirements.

The increasing speed of aircraft, their increasing altitudes at which they can operate and the steadily growing striking range of fighter and bomber forces, plus such factors as the use of guided missiles, ABC warfare agents, the use of radio, radar, and deceptive and harassing means of warfare, air warfare in the future will create for the defenders problems of ever mounting difficulty and almost beyond the possibility of solution. In view of the possibilities of future inter-continental air warfarethe responsible military and civil authorities will have to rely heavily on and demand much from large-area and long-range intelligence as an indispensable condition for an effective air defense, which needs a service restricted exclusively to radar and the aircraft reporting and visual observer programs can no longer fulfill. This fact has been proved conclusively in two world wars. In the meanwhile the Americans have also realized that even

their present improved radar network will probably not provide adequate security against the rapid approach of the modern supersonic jet-propelled aircraft and can not give adequately timely warning for timeous measures to defend the interior of their homeland. They already consider their radar network, established at stupendous cost along the north coast of Alaska, outdated as a means of defense, even for the interior of the United States proper, against Russian aircraft approaching from the direction of Siberia, and it appears questionable whether the radar system can be rendered more effective and effective at longer ranges than is presently the case.

In view of these circumstances it is quite possible that even greater and more copious demands might be made in the special field of radio intelligence, namely, in the tracking of aircraft, than was the case in World War II. Two recent events already indicate some such realization. One of these is the fact that the US Secretary of State indicated that Nato lacked a comprehensive warning system which could alert Western Europe in the event of an imminent Soviet air attack; the other indication is the demand which has been stated that the German Federal Republic, within the scope of land defense, should concern itself with the problemsof the establishment of a far-reaching early warning system.

With our experience from World War II the establishment of such a system should not prove all to difficult. For the principles involved the reader is referred to Chapter 10, B, IV, Par. 6 and A, Par. 9.

CHAPTER 12

SHADOW REGIONS AND FADING; EFFECTS OF STRATA SURROUNDING THE EARTH ON RADIO WAVES; RAYS FROM OUTER SPACE; RADIO-ASTRONOMY--THE EAR TO THE STARS; RADIATION POSSIBILITIES OF ELECTROMAGNETIC WAVES; A VADE MECUM FOR THE RADIO INTELLIGENCE PERSONNEL. See also Appendix

A. PREFACE.

Every person active in the fields of radio intelligence, whether he be an intercept, a radio beam or DF operator, a data analyst, translator or decoder, must not only have a mastery of his specific radio intercept subject and a good fund of knowledge on the general electronic principles involved. He must also endeavor to to inform himself fully on what is happening around him in Nature and in outer space, on phenomena which can have a profound influence on the field in which he is working. The electro-magnetic phenomena with which he will thus become acquainted will open up to him ever new vistas in his own specific field , since that field will expand continuously concurrently with technological progress and new discoveries, so that he will be faced constantly by new tasks inseparably bound up with the phenomena in outer space.

These circumstances hav not been dealt with in the previous chapters of this study, and in an effort to close that gap they are presented in this chapter in the form of a

concise and easily intelligible compilation preceded by an Introduction.

B. ORGANIZATION OF THE PRESENT CHAPTER.

I. INTRODUCTION.

II. SHADOW REGIONS OR DEAD SPACES IN SHORT WAVE RADIO.

III. FADING.

1. Essential Conditions for Fading

2. The Phenomenon of Fading in Shortwave Radio Reception

3. The causes of Fading in Short Wave Radio Reception

4. Graphic Presentation of Shadow Regions or Fading

5. The Space Wave and Phenomena Similar to Fading in Mediumwave Radio Reception; Reflected Rays in Longwave Radio Operations.

IV. THE STRATA ENVELOPING THE EARTH; THEIR REACTION TO RADIO WAVES AND TO RAYS FROM OUTER SPACE. RADIO-ASTRONOMY: THE EAR TO THE STARS. THE RADIATING POSSIBILITIES OF ELECTRO-MAGNETIC WAVES.

1. Arrangement of the Spherical Strata; Altitudes; Atmospheric Pressures; Temperatures.

a. general background

b. The Atmosphere

c. The Troposphere

d. The Tropopause

e. The Stratosphere and Mesosphere

f. The Ionosphere

g. The Exosphere

2. The ionosphere and Radio-Astronomy.

a. Pattern of the Ionosphere; Its Reaction to Electromagnetic Waves and Its study

b. The Concept of Radio-Astronomy

b. Wavebands of Radio-Astronomy

(1) Ultrashortwaves

(2) Micro (Decimeter) Waves

(3) Centimeter Waves

d. Radio-Astronomy and Radio Transmission to the Stars

3. The Exosphere and its Rays

4. The Radiating Possibilities of Electro-Magnetic Waves Transmitted by Human Agency and of Outer Space Solar and Cosmic Radio Waves

a. Long-and Medium waves

b. Shortwaves

c. Ultrashortwaves

d. Micro- and Centimeterwaves

e. The effects of Combined Ultrashort- Micro- and Centimeter Waves on the Ionosphere. What Happens Ultimately to the Solar and Cosmic Rays

V. THE NORTHERN OR POLAR LIGHTS

VI. INSTRUCTION MATERIAL ON LATEST RESEARCH IN THE FIELDS OF SHORTWAVE RADIO, AND SOLAR AND COSMIC RADIO WAVES!

I. INTRODUCTION.

It appears advisable to enter immediately at the outset of this treatment of the subjects to be dealt with here to enter into two processes which impair the reception of electromagnetic waves with exceptional frequency and to explain the fundamental causes.

These processes are closely bound up with the Ionosphere, one of the strata enveloping our Earth and the way in which is influenced by the impact of radiation from outer space.

The processes involved are known as "Shadow Regions" or "Dead Zones" and "Fading."

Treatment of these subjects at this point will at the same time serve to arouse the reader to a realization of how highly important the whole complex of subject matter dealt with in this chapter is in its bearing on radio intelligence activities.

II. SHADOW REGIONS OR DEAD ZONES.

The phenomenon of Shadow Regions or Dead Zones, which occurs in shortwave radio operations (100 meter-10 meter = 3,000 kHz [3 mHz]-30,000 kHz [30 MHz]) as a result of these waves radiating as reflected waves can under certain conditions seriously impair reception. In other respects, however, the advantages of shortwave transmission in radio communications are so great that their use has been generally

adopted, the attendant disadvantages being accepted as an unavoidable evil, since they usually only occur in transmissions over short distances. These disadvantages are to a large extent avoided by restricting shortwave transmission to communications over long distances.

The radio intelligence operator, however, is practically helpless in the face of these disadvantages. Where a dead zone exists, he simply cannot receive, and this can easily happen in radio interception or receiving operations in the front areas. In such cases it will be advisable to place a few radio receiver teams in posts approximately 30 to 42 miles in the rear so as to be absolutely certain that the shortwave communications from the enemy transmitters stationen along the front lines, which stations usually communicate with headquarters farther in the enemy rear, will be intercepted and made available for own command and service headquarters and agencies situated in the dead zone.

The principal receiver stations of the Radio Intelligence Service, namely those with the Radio Intercept Control and other stations farther in the rear, will be out of the dead zone of the shortwave transmitters operating in the close enemy rear.

A different situation can occur, however, when the dead zones are caused by atmospheric interferences. In such

cases the only thing the Radio Intelligence operator can do, and which it is his duty to do, is to be always prepared by constantly observing the radio weather reports. Reports on periodical sun spots and the occurrence of Northern Lights will provide the necessary indications in this field.

III. FADING OR DISAPPEARANCE.(Das Fading oder der Schwund).

1. Essential Conditions for the Occurrence of Fadings.

What is called the Fading or Disappearance of is a phenomenon peculiar to electro-magnetic waves which occurs in the reception of shortwave transmissions (100 meter-10 meter=3 MHZ-30 MHZ), but occasionally also in the mediumwave range (1,000 meters-100 meters = 300 MHZ-3,000 kHz /3 MHZ/)

2. Types of Fading in Shortwave Radio Receiving. There are two types of fading which can occur if two/equal wave sequences or waves -- meaning wave formations of equal frequencies -- emanate from the same transmitter at the receiving post: in other respects

a. one wave low simultaneously with one wave crest . In such case the wave low deletes the wave crest or vice versa. This leads to a reduced sound volume of reception which can sink to complete cessation of reception, causing the occurrence of what is called "Disappearing(Schwund)"

Thus, if one wave reaches its positive crest at the same time as another wave is at its highest negative value,

each subtracts from the volume of the other leaving a residue smaller than the original volume or value of either of the two. Through reflection (see Causes of Fading under Par. 3, below) this results in reduced receiving performances.

b. in opposite sequence, if by chance one wave crest coincides with another wavecrest at the receiving point. Then the opposite to what is described in ~~Paxx~~ (a), above, happens. The sound volume swells and increases in some circumstances extraordinarily.

In this case two separate waves at one and the same specific time reach their maximum value. If they are what is called "in phase," their separate effects will thus be added and reception is thereby proportionately stronger.

3. The Causes of Fading in Shortwave Transmission (See also graph at end of chapter supplementing III, 3 and 5).

a. These phenomena can only occur as the result of one part of the wave series, the reflected (or indirect or sky waves) in their reflection (wave refraction) in the ionosphere (Kenely or Heaviside layer) are retarded or speeded by exceptional current conditions there or by other causes.

Such causes include:

Shifts in the border layers of the Ionosphere due to ionic irradiation (the effect of ioneprotuberances) due to eruptions in the fringe areas of the sun's surface, to sun

spots, or to gas-like eruptions from the sun's surface; to ionosphere storms caused by the ejection of H. and Ca.ions as well as free electrons from the sun which, similarly to the waterrays of a lawn sprayer are ejected into outer space; to meteoric iron; corpuscular radiation,; Moegel-Dellinger effect; Earth-magnetic storms, producing interferences which can last from one to three days. The position of the sun here also plays an important role, because long-range effects are only possible if the area between the transmitting and the receiving stations is dark, and hence only at night. This all leads to impaired reception or to complete ~~XXXXXX~~ ~~XXXX~~ occlusion.of the shortwave lines. What is needed is early predictions concerning the expansion of short waves: predictions concerning the day to day radio weather conditions. The ionosphere is an electric mirror.

The occurrences on the sun referred to above call for further research into their causes and effects. Sun spots, long since a known phenomenon, always occur at regular intervals . They sometimes reach a size larger than the surface area of the entire earth and must be considered as "zones of cold" since the temperature in them is only approximately 4,500° Centigarde while the temperature on the rest of the sun registers approximately 6,000°.

Where the hot and cold areas on the sun's surface

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close of present chapter).

a. General Background. The "celestial ocean" enveloping our globe is described in its lower parts as the "atmosphere," in its upper parts as the "exosphere." What is beyond the atmosphere is the real region of "outer space(Weltraum)."

So far we are only reasonably well informed concerning what one might call the "coastal regions" of the mighty "celestial ocean." Up to an altitude of 60 miles we have relatively precise knowledge on the atmospheric pressure, irradiation, darkness and light, heat and cold. Concerning the zone between 60 and 150 miles above the surface of our earth the information available is extremely incomplete, and usually conjecture displaces certainty. Nonetheless, modern research, with the aid of the rocket, has penetrated as far as the "upper atmosphere" to as high as 300 miles, concerning which at least some data, although defective, is available.

To what extent the two Russian rockets, of which Sputnik allegedly reached an altitude of approximately 600 miles and Sputnik II an altitude of approximately 900 miles, will produce information concerning the space beyond the atmosphere is a matter of conjecture. Furthermore, an American rocket launched from the Eniwetok Atoll is said to have reached an altitude of 3,900 miles, four times that of Sputnik II.

It is in this region above the atmosphere that the real

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abut or intersect very highly significant results must occur. Even within the relatively confined area of the earth around us we experience the collision of hot and cold areas. At the point of intersection of these areas thunderstorm or/ and tornados develop simultaneously with electric rays which produce diversified effects on the surface of the earth. At the fringes of the sun spots, however, currents collide registering a difference in temperature of almost 1.500° Celsius. The magnitude and the force of the tornados which result and rage across the sun are humanly inconceivable in their power. Gigantic magnetic fields develop with rays of commensurate dimensions, which can also be aggravated by eruptions from the sun's interior. Ejected into outer space these rays also influence the ionosphere of the earth and it is already possible from earth to detect and measure them. The following is a quotation from a newspaper on this subject:

Gigantic Sun Eruption, Munich (Courier Service). The Observatory on the Wendelstein Mountain in Upper Bavaria on Sunday (26 November 1957) observed the greatest sun eruption observed in the past decade:

At 1011, Central European time, the eruption reached its peak. The glowing surface area extended approximately 26 square degrees (Quadratgrad), corresponding approxi-

approximately to a surface area thirty time as large as the disc of the earth. The last eruptions of such magnitude were observed during the sun-spot maximum of 1947-48. The effects of the eruption were reflected in strong particle radiation, magnetic storms in the ionosphere and a disruption of radio communications.

b. Changing sound volume, extending from complete occulsion to very strong reception, merges constantly or the one succeeds the other incessantly. Oscillations of the receiving volume thus occur, frequently during changing weather, and during morning or evening twilight. Briefly stated, we have here an interference, the case of two waves influencing each other.

4. Graphic Description of Fading.

a. Normal reception free of interference

b. Fading (supplementary to III, 2 a, above): Wave low meets wave low, deleting each other. Results: Sound volume decreases to very low or no reception at all.

c. Fading (supplementary to III,2, b, above): Wave crest meets wave crest, wave low meets wave low producing mutual amplification. Result: Sound volume increases, possible to very loud reception.

5. Wave Reflection and Phenomena Similar to Fading in Medium Wave Radio Transmissions.

a. In the case of mediumwave transmissions, wave reflection also occurs far beyond the range of their ground waves. Possible causes for the inception of these reflected waves are that a certain part of the mediumwave series emanates not as a ground wave but as a sky wave; that parts of the energy emitted is so deflected by the sun's rays, for example by tze conditions of sunrise or sunset, or by other electromagnetic causes that they do not continue their course as ground waves but instead become sky waves. That these waves, just as is the case with short waves, can then by reason of certain modifications in the ionosphere, or produced by other causes, can produce the features of Fading is due to their nature as sky waves. In accordance with the nature of sky waves, the appearance of this type of sky wave must have occurred Bar beyond the normal expansion range of the ground wave but due to specific circumstance it has become possible for it to become effective within that expansion range. This would produce the possibility of Fading within the range of the ground wave.

b. Another feature noticed at receiving stations and within the range of ground waves were phenomena similar to Fading when bearings were being taken on constantly operating medium-wave transmitters . These Fading effects were caused by medium waves from far distant radio broadcasting

stations. In the case of such DF operations the minimum of the receiving instrument commenced fluctuating and became completely indistinct; at times this was combined with a considerable decrease in the receiving volume. If this is not due to the effects of sky waves, as discussed above, the cause can be assumed to be that the ground wave is being defelected by bad weather fronts, fog banks, snow zones, or mountain ranges between the transmitting and the receiving stations. The DF results obtained under these conditions are naturally useless, but the phenomena as such should probably not be described as Fading but instead as deflection.

c. Insofar as sky waves might also appear in longwave transmissions, these are also subject to reflection. This takes place at a level below the reflection level of medium and short waves. The average altitudes at which wave reflection takes place can be assumed roughly as follows: longwave reflection 30 miles; mediumwave reflection 60 miles; shortwave reflection 150 miles.

IV. THE ENVELOPING STRATA OF THE EARTH; THEIR REACTION TO RADIO WAVES AND TO RAYS FROM OUTER SPACE. THE EAR TO THE STARS: RADIO-ASTRONOMY. THE EXPANSION CAPACITY OF ELECTROMAGNETIC WAVES.

1. Arrangement of the Spherical Spherical Strata; Altitudes; Atmospheric Pressure; Temperatures. (See also graph at close of present chapter.

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region of outer space only begins. Above it, in the region hitherto conceived as a vacuum filled with "World ether" research results based on "indirect methods" have produced entirely new concepts. The weight of a large expanse of space was measured, together with the stars and all it contained by computing the centrifugal force this expanse ex r-cised on the movements of the stars. Here, it was found that the mass force of gravitation of the region in question could not be ascribed to the weight of the stars alone; the region must also contain matter. Then it was discovered that"enormous quantities of gas" in various stages of composition constitute"ice particles", hitherto stated to have been dust, in outer space. They have the appearance of being "egg-shaped, disc-shaped, and occasionally needle-shaped."

Attempts are also being made to explore the secrets of the universe with the aid of radio-astronomy.

b. The Atmosphere. The "ocean of air" called the "atmosphere" enveloping the earth is at sea level under a pressure of what is called one atmosphere (14 pounds per sq. inch), at an altitude of 300 miles the pressure is zero. At an altitude of 33,000 feet human life is possible with oxygen-breathing, for a limited period.

Dave Simons, balloonist and student of space medicine,

in August 1957 during a space voyage undertaken alone and lasting 32 hours, spent 26 hours in his pressure cabin at an altitude of 27 000 meters. During this time he was in a region where the atmospheric pressure was only 1.5 to 2 percent of the normal pressure immediately over the surface of the earth.

According to a report from Moscow, at the end of November 1957 a test balloon of t the Soviets released unmanned from a Polar station even reached an altitude of 35 000 meters. Reportedly, automatic signals from the balloon provided remarkable indications concerning the lower strata of the atmosphere.

In September 1956 Air Officer Kinchloe in a rocket propelled aircraft of the Bell Aircraft Corporation reached the record height of netween 37 and 38 kilometers. This whole flight lasted only 15 minutes so that the pilot may have spent two or three minutes above the 30,000 meter line. Before the whole complex of environment could begin to take effect the pilot was already back in the denser layers of earth atmosphere. He was in a pressure cabin and against all eventualities was protected by an inflated suit of clothing when at his peak of 37,000 meters, where atmospheric pressure is less than one-half of that at the earth's surface. The inflated suit is a safety provision against the eventuality of the pressure cabin developing leaks,

since already at an altitude of 18,000 meters human blood would reach boiling point outside of the pressure cabin;at greater heights the human body would, one might say, burst because of the sudden absence of external pressure, the air streaming out of the lungs very much like the air out of a punctured car tyre. For the altitudes hitherto reached by humans, these protective suits appear to be adequate. Pressure suits for greater heights, in outer space proper, are being tested, but are as yet by no means adequate. Preparations are also being made for the launching of an American rocket-propelled aircraft to an altitude of 100 000 meters.

At an altitude of 65,000 meters, transition into the "ozon layer" commences. It is presumed that this layer in particular provides protection for the earth against the ultra-violet rays of the sun and other rays. However, it is probably safe to assume that the whole atmospheric mantle enveloping the earth, from the ionosphere downwards, and the magnetic field of the earth itself provide protection against this irradiation, of which only a small percentage reaches the earth's surface. The radiation penetrating to the earth is at an intensity not yet considered harmful. During eruptions on the sun, however, this intensity increases considerably, and on 23 February 1936

was at 30 times normal intensity for a period of 36 hours. The crew of a space ship would thus within one day be exposed to radiation equivalent to between 150 and 200 Roentgen, which would correspond to the radiation of the radioactive fallout in which the Japanese fishermen some time back became involved on the occasion of the explosion of the American hydrogen bomb.

In point of its composition the space above the surface of the earth is divided into strate, as far as it has been possible to determine up to date. These strata have been given names , which are being enumerated below. Their delimitations fluctuate, but the opinion has been arrived at that at the outer limits of the ionosphere, approximately 500,000 meters above the surface of the earth, the power of earth gravitation on the air atoms practically ceases, so that at this altitude they escape the earth's force of attraction. But even at an altitude of only 170,000 meters the atmosphere is so rare that meteorites or particles of matter do not ignite from air friction.

c. The Troposphere. The layer or mantle of air immediately above the earth to an altitude of between 8,000 and 17,000 meters is called the troposphere. Within this layer temperatures decrease with increasing altitude.

d. The Tropopause. This is the intermediate layer

between the troposphere and the next higher Stratosphere strata.

e. The Stratosphere and the Next Higher Mesosphere. Here, temperatures initially remain constant and reach a maximum at an altitude of 60,000 meters.

The sub-division of the "coastal regions" of our atmosphere into a troposphere and a stratosphere was introduced by the Frenchman Teisserenc de Bort.

f. The Ionosphere. This strate follows the mesosphere (ozon strata) at a height of approximately 70,000 meters. It is the strata which, broadly speaking, is the extreme limit of the atmosphere. It is of particular significance in regard to the electromagnetic waves and in this respect will be dealt with in more detail later.

In the ionosphere the temperature again drops , sinking at the altitude of night-illuminated clouds, a height of about 90,000 to 100,000 meters, to freezing point. In the light of recent research it appears that at still greater altitudes the temperature again rises .

g. The Exosphere. Here the temperature can rise to as high as +2,000° Centigrade. Assuming that there is no conducting medium in those regions, this space temperature is not effective as body heat, so that it is practically without significance. "The exosphere is Outer Space, Eternity."

2. The Ionosphere and Radio-Astronomy.

a. Composition of the Ionosphere; Its reaction to Electromagnetic Waves; Its Study. The characteristic feature of the ionosphere, formerly called the Heaviside Strata, is that it reflects in particular the radio shortwaves (see also III, 3 and 5, above). This specific characteristic is due to the "ionized layers" of which it consists and provides the reason for its naming. Its structure has been examined by means of the reflection or refractory measurements of electromagnetic waves, and by means of the measurement of their decrease and the time involved. Four separate ionized layers are identifiable, namely, the D, E, F, anf F2 Layers, each of a differing height and density, thus the D Layer at an altitude of approximately 70,000-100,000 meters, the E-Layer at 120,000 to 200,000 and the F-Layer at 200,000 to 400,000 meters. The ionization of these layers is the determining factor in the reflection of the waves. The ionosphere can therefore be compared with an electric mirror.

The ionization in the higher strata of the atmosphere is caused by the ultraviolet light rays of the sun. Ultraviolet light with a 1,000 X wavelength or shorter (1X /Angstroem/ = 10 - 8 centimeter), provides energy enough to attract one electron from the atmospheric gases. This process is called ionozation. The atom nucleus continues with its residual

electron as a positively charged ion, while the free electron after a short while unites with another.partner. It attaches itself either to a neutral atom or molecule (a molecule consists of a number of atoms), producing a negative ion, or it unites again with a positive ion to form a neutral atom. The latter process is called recombination. The number of free electrons present per unit of volume at a specific time depends on the one hand on the intensity of the ionizing radiation, on the other hand on the speed with which the free electrons find a new partner through recombination or by adherence.

Ionization sets in already at a high altitude, but the electron count produced there is still very low because only few molecules exist there. As the altitude decreases the electron count produced increases because the gas pressure and consequently also the number of molecules present mounts. With the mounting ionization (electron production) in descending altitude, however, the radiation absorbed increases, so that only few electrons are created in low altitudes in spite of the high gas XXXXXXXXX density there. A specific altitude thus evolves for the optimum production of electrons.

Such a maximum of electron concentration is at a height of about 200,000 to 400,000 meters, and this region is called the "F-Layer." It is created by the ionization of atomic oxygen through light rays of approximately 910-740 X. Whereas

oxygen occurs exclusively in the molecular form in the air close to the surface of the earth, it occurs only in the atomic form at high altitudes.

A second maximum of electron concentration occurs at an altitude of approximately 120,000 meters; this layer is called the "E-Layer." As previously stated, the ionosphere commences with the D-Layer at an altitude of 70,000 meters.

On behalf of German science, the Max Planck Institute for Ion Research at Lindau has played an outstanding role. It produced precise proof that the ionosphere commences not at an altitude of 100,000 meters, as previously assumed, but already at 70,000 meters. Lindau, 6 miles from Northeim in the Western Harz region offers surprisingly favorable conditions for a research institute of this kind: a large area of level terrain for the antennae of the transmitting and receiving installations, a low incidence of electrical interferences, and a regular sub-surface water table. Within a radius of 3,000 meters around the Institute there are 13 antennae masts. Day by dayshort wave impulses are directed from here every two minutes into the ionosphere between 70,000 and 1,000,000 meters up , into that layer thus, which curves over the earth atmosphere and not too far above which commences outer space, Eternity. The ionosphere provides a protective cover for the earth, helping to keep from the earth the life-destroying

radiation coming from outer space or from the sun, such as the cosmic and ultraviolet rays, etc.

During preparations for the international Geophysical Year, which was to last from 1 July 1957 to 31 December 1958 , it was found that in the planned observation network of 200 stations to cover the entire face of the world, there was a gap of roughly 1,800 miles between Cape Town, South Africa, and Leopoldville in the Congo, and Germany immediately took this opportunity to participate with the Institute at Lindau. The Institute was fortunate enough to receive support from an American mining company in the former German colony, South West Africa, which made the necessary groun available in an extent of 23,920 sq yards and provided the required water and electricity supplies and telephone connections, all free of charge. The observation station was established at Tsumek [undoubtedly should read Tsumeb--Translator] 180 miles north of Windhoek, the capital of the territory, as a field station of the Max Planck Institute for Ion Research. These two stations had the mission not only of transmitting wave impulses vertically into space, but also diagonally upwards and towards each other, the latter direction in order to determine the precise direction of the waves. It was hoped that this would make it possible to solve the problem by 1958 in spite of its extreme

difficulty.

Besides the Max Planck Institute, a second Institute has commenced work recently in this field of research. It completed its installations around August 1957 in the Rhine lowlands north of Breisach just in time for the opening of the International Geophysical Year. Together with the roughly 150 institutes conducting ion reserach throughout the world at the time it participated in the program of the Geophysical Year by collecting material on the layers of the ionosphere, which are so important for radio communications. It was established with German Federal funds and initially was placed under the German Federal Postal Services.

Concerning the mission of this latter station, the following information is offered:

The layers of the ionosphere, formerly named the "Heaviside Layers" after their discoverer and now called briefly the H. and E. Layers , and which as peviously stated commence at an altitude of approximately 70,000 meters and extend to an altitude of approximately 400,000 metersabove the surface of the earth are characterized by the known fact that they reflect electric waves of a certain wavelength in such a manner that these waves in some cases return to earth several thousand miles from their point of origin. Shortwave radio communications, which play such an important

role in radio traffic are based primarily on this property of wave reflection. The interferences which so frequently occur in these communications are caused by changes occurring in the layers of the ionosphere. The condition of the ionosphere depends on the time of the day, the seasons of the year and current position and state of the sun. Furthermore, small intermediate layers frequently form between the principal layers of the ionosphere, and these can impair wave reflection.

Regular probes not only provide precise information on the current status of the ionosphere but also make predictions for specific times of the day and seasons of the year possible. The data thus obtained is made available to the various radio stations in the form of graphs. Measurements of the ionosphere layers are taken by means of the sonic-ranging altimeter. An electrical impuls is directed upwards and is reflected by the ionosphere. The whole process taken only a fraction of a second but the time between transmission of the impulse and the return of the "echo" makes it possible to calculate the altitude of the layer, while the degree of "damping" the original impulse has undergone can be determined from the amplitude values.

In addition to the above activities, the Breisach Institute conducts several programs of basic data research.

28 Thus, it has been discovered recently that there is a kind of wind movement, which has been called a "drift" within the ionosphere. The E-Layer, at an altitude of roughly 100,000 meters shows an eastward drift in summer and a westward drift in winter. The average speed of the movement is between 50 and 100 meters per second. There is another, clockwise, movement, which completes the whole circle in twelve hours. How these movements arise, whether they have any influence on weather conditions, and whether the movements are of the same nature as the movement of winds we experience on earth, these are all problems which must still be investigated; with the instruments presently available it is only possible to register the movement of electrical particles. Another point to be investigated is whether other, electrically neutral particles, are included in the movements within the ionosphere. Signs seem to indicate, however, that there is within the ionosphere "a wind movement of all types of particles." The Breisach Institute is expanding this most recent branch of ionosphere research, the branch of "drift" research with particular emphasis.

2 b. The Concept of Radio Astronomy. Whereas in particular radio short waves (and certain medium waves) are reflected by the ionosphere back to earth, the ultrashort waves and still shorter waves are able to penetrate

the various layers. These waves are the research media used in radio astronomy, by means of which one is able to "peer" or take measurements electrically in outer space between the ultraviolet and ultrared rays. It is thus possible, one might say as through a window, to peer into outer space, not optically but electronically, with the aid of radio telescopes, interferometers and other instruments. In other words rays or impulses are received from,or sent out into, outer space. To sent such impulses out the transmissions must use very tightly concentrated waves by means of antennae similar to radar antennae. The Federal Government of Western Germany has installed a radio telescope using this system on Stockert Mountain, at an altitude of 435 meters, in the eastern Eifel Mountains. The installation has a lattice-plane parabolic reflector with a diameter of 25 meters and a weight of 20 tons movably mounted on a pagoda-shaped platform. "It is an ultrashortwave catapult transmitting rays after the sonic altimeter principle, which are reflected by the stars in outer space. " The usefulness of this radiotelescope also as a super radar instrument for purposes of national defence is unmistakable. During World War II a battery of 88-mm antiaircraft guns was in position on the same spot, which fired at approaching enemy aircraft

with its fire directed by radar instruments of the Wuerzburg type.

c. Wavebands Used in Radio Astronomy. The following wave bands can be used in radio astronomy for receiving and transmitting:

(1) Ultrashortwaves, with the range of from 10 meters to 1 meter. This range includes: the wavelengths initially used in the first stages of radar technology, from 7.5 meters to 2 meters (in Germany) and 13 meters to 1.5 meters (in England); the 7 meter to 3 meter band used for the Berlin-Western Germany radio beam, which can be used to maintain contact outside the line of optical vision by a process of computing and deflecting the ultrashortwaves in the lowere strata of air; the wavebands used in television on the principle of "optical line of vision."

Germany uses for these purposes wavelengths of about from 6 meters to 1 meter:

Channel I : Television = 45.25-62.26 MHZ
XXXXXXXXXX Sound = 53.75 -67.75 MHZ

Channel III: Television = 175.25-217.25 MHZ
Sound = 180.75-222.75 MHZ

b. The Micro- or Decimeterwaves of from 1 meter to 10 meters. These were also used in German radio DF instruments and military radio line-of-vision beam communications (6 dm-4dm). These functioned only on the line-

of-vision principle, bu since more recent times microwaves can be used also for beam communications beyond the horizen. The waves concentrated by large parabolic reflectors in accordance with the Scatter method in the decimeter wave range produce a far lagger number of channels than the meterwaves hitherto in use.

The Federal Postal Service of Western Germany operates a microwave or decimeterwave network with an operating range of "optical sight" to supplement the internal network of long-distance telephone cables as well as to transmit television programs from studios to the television transmitting stations using 2,000 MHZ 3 15 centimeter waves for the purpose.

c. The Centermeter Waves from 10 centimeter to 1 Centimeter, Presently Used in Radar. Britain adopted these bands for this purpose already during the war and Germany followed suit before the war was over.

In radar,or direction finding through wave reflection, we differentiate between methods for navigation and methods for aircraft flight control or "active" and "passive" methods. Blind landing operations can be guided by either the active or passive wave-reflection method.

4. Radio Astronomy and Radio Transmissions to the Stars

The nature of these waves, as described above, thus makes it possible to penetrate through the atmosphere into outer space and measure distances to the stars, register sounds, and determine the position of sun spots. On 8 November 1951, for example, complete messages were transmitted to the moon for the first time and the reflected waves were received on earth. The transmitting station, of the Collins Radio Corporation, was at Cedar Rapids (Iowa, USA), the station receiving the reflected waves was 744 miles distant, at Stirling, in Virginia. The experiment was conducted by the National Bureau of Standards, USA. The transmitting frequency used was 418 MHZ and thus approximately 72 centimeters. The transmitting power was 20 KW. The transmitting antenna was hornshaped and its length was 23 meters. The parabolic receiving antenna had a diameter of 10 meters, and the beam antenna was movable. It was thus possible to observe how the moon moved into the beam and left it after 30 minutes. Maximum receiving volume was reached within ten minutes and continued for ten minutes. A comparison of the time lag between transmission and reception with the known distance of the moon from the earth showed a properly corresponding value of 2.5 seconds.

The establishment of contact with the moon can not be described as pure radio astronomy. The object here

is to observe and measure self-radiating bodies, and thus heavenly bodies or cosmic objects which do not first have to be irradiated, as the contact established with the moon shows, by using the wave bands of 10 meters to 1 meter, which can penetrate through the ionosphere in contrast with longer radio waves. In radio astronomy one does not"see " but"listens" in to outer space, but speaks nevertheless of a"radio telescope" because the arriving rays can be depicted on a screen.

3. The Exosphere and Its Rays. Besides the waves or rays which can be received, the exosphere, or outer space, or eternity or infinity, emits other waves or rays of even smaller wavelengths. Thus, from the the sun as the pivot point of our planetary system come the heat and light waves with their infra and ultrared rays and their invisible light and ultraviolet rays having a wavelength of from 1 millimeter to 1/100,000th millimeter, and the Roentgen and Gamma rays with wave lengths of from 1 millionth to 1 billionth of a millimeter.

As beneficial as the pure rays of light and warmth are for all life on earth, just as harmful would those other rays be for that selfsame life if they could reach the earth unhampered. Even more dangerous, however, would

be the energy-laden cosmic rays, with wavelengths of a billionth of a millimetercoming from still greater and mysterious depths of infinite space. However, all of these micro rays are radically reduced on impact with the gaseous atmosphere enveloping the earth and on their way through that atmosphere, are subjected to secondary effects, and are thus rendered innocuous and absorbed, as is the case with the ultraviolet rays, which are rendered harmless in the ozon layer at an altitude of 65,000 meters. For the above reasons no precise knowledge is available on what harm these microwaves could in inflict on earth-bound life.

4. The Expanding Possi ilities of Electromagnetic Waves Transmitted by Human Agencies and of Solar and Cosmic Radio Waves emanating from Space (Excluding Technical Alternating Currents and Sound Frequencies fro 10,000,000 kilometers to 10 meters).

a. Long and Medium Waves.

Long Waves 10,000-1,000 meters = 30 kHz-300 kHz

medium Waves 1,000-100 meters = 300kHz-3,000 kHz (3 MHZ).

These waves travel and expand along the curve of the earth, their expansion varying with the varying ground or terrain conditions, and extending farthest over surfaces of water. In the medium wave bands sky waves occur far beyond the range of the ground wave.

b. Short Waves: 100 meters to 10 meters = 3 MHZ to 30 MHZ. These travel primarily into the atmosphere and are reflected back to earth by the ionosphere, a phenomenon which is exploited for long distance transmissions. Short-wave transmissions with even the smallest power can be received at certain intervals at great and very great distances.

c. Ultrashort Waves: 10 meters to 1 meter = 30 MHZ to 300 MHZ. These can occur on a horizontal line-of-sight level and thus can appear outside of receiving range, which is restricted by the curve of the earth. Owing to their refraction and reflection by the lower layers of the atmosphere, the impulses of the waves can also be heard, although at greatly reduced volume, beyond the line-of-sight horizon. Thus, if there is no line of sight between the transmitting and the receiving stations owing to earth curvature, the characteristics of the ultrashort waves just mentioned nevertheless make communications on these wavelengths possible if the loss of intensity is compensated by a tight concentration of the wave rays of the transmitting antennae, the concentrated waves being directed, much as is the case with the rays of a searchlight, precisely at the receiving station. In this way a radio beam contact can be established with ultrashort waves extending beyond the line-of-sight

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horizon . The concentration of the wave rays apparently effects a performance increase. For example, if the actual transmitting power is one kiloratt, an appropriate concentration of the wave rays at the transmitting and receiving antennae produces transmitting and receiving conditions as though a 50-100 kilowatt transmitter were being used. If the plans and the layout of the stations are appropriate, this provides a safely operable channel of communication even if, as is the case in beam communications between Western Europe and Berlin, the communicating beam line, which must be imagined as being absolutely horizontal, and extends over 150 and in some cases 200 kilometers (90 and 120 miles, respectively) between the transmitting and receiving stations, in the middle of this intervening space passes below the surface of the earth by a few hundred meters or, as is commonly said, passes below the line-of sight horizon.

Radio Beam communications to Berlin are conducted on the 7-3 meter wavebands. In Berlin-Dahlem is one antennae mast providing 30 channels, and other receiving stations are at Wannsee, Nikolassee (a portal or gantry mast), and at the Olympic Games Stadion. These masts are between 100 and 150 meters high. The opposite stations of these installations, which are operated by the postal services, are on the Harz

Mountain range (Brocken/Torfhaus) and on the Elm Mountain near Braunschweig. Communication traffic proceeds over 200 telephone and teletype channels.

Short waves of this range are also the only ones suitable for television transmissions. This is the reason why television broadcasts by the radio broadcasting stations, most of which operate on long, medium, and short waves, cannot be transmitted over any considerable distances. The fact that the expansion radius or spread radius of ultrashort waves is restricted to the line-of-vision level makes this impossible. A concentration of the wave rays to secure effectiveness beyond the line-of-sight horizon, as in the case of the Berlin-Harz radio beam (7-3 meter band), is not possible for broadcasting stations because they have to broadcast in all directions. Such transmissions as a rule, however, can only be heard a short distance beyond the line-of sight horizon, and then only very faintly, and at varying times.

For the above reasons, the omnidirectional transmissions of television broadcasts insure practically useful reception only at distances visible from the antennae towers. As a rule this will be at a distance of approximately 18 to 20 miles in level terrain within which the installation of television receivers is permissible.

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Even at these distances the precise site for the receiving antenna must be very carefully selected. The ultrashort waves also have, namely, the very disturbing peculiarity that their penetration is seriously impeded by any elevations in the terrain, such as hills, houses, trees, etc. Furthermore, it can happen at times that certain elements of a picture will appear repeatedly at the receiving site, confusing the picture; in other cases, some elements may appear on the screen more pronouncedly than others, or, what is even worse, some might be deleted altogether.

Apart from the selection of a good site for the receiving antennae from the above points of view, an adequately strong receiving signal is also essential for good television reception. For this purpose the transmitting station must have adequately powerful transmitting installations and should have a transmitting antenna so installed that it will intensify the impulses coming from the transmitter.

Television transmissions in the future will also play a role for military purposes. Television will be the eye penetrating into the rear areas of the enemy.

The difficulties and the small wave-ray spread of ultrashortwave television broadcasts are also a characteristic feature of radio sound broadcasting stations operating on ultrashort waves. In this case, however, the disadvantage

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of the small penetration range is accompanied by the advantage of avoidance of interference by other naerby ultrashortwave transmitters.

d. Microwaves or Decimeterwaves (100 centimeter to 10 centimeter ≒ 300 MHZ to 3,000 MHZ) and Centimeter Waves (10 centimeter to 1 centimeter = 3,000 MHZ to 30,000 MHZ). These wavebands, similarly to the ultrashortwave bands, are also limited in their wave-ray spread to line-of sight, and can therefore also occur beyond normal range and systematically exploited by other stations if directional beams are used.

Thus, these transmissions, which on the ground can not be received beyond the line-of-sight horizon or can there be received only by chance or over particularly suitable areas, such as across a body of water, by means of specific computations and due to specific refractions, can be received by balloons or aircraft far beyond the line-of-sight horizon and with the appropriate instruments the position of the transmitting station can be determined. The concentration of the ~~xxxxxxxxxxx~~ wave-rays in radio beam communications (on ultrashort-, micro- and centimeterwavebands) makes reception possible only in a certain direction, but with increasing distance the beam becomes wider and thus more easily intercepted.

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Radio beam communications on micro- and centimeterwave bands are more secure against interception than those on ultrashortwaves, since their penetration resembles the direct exploitation of light more closely than does that of the untrashort waves and therefore can be more easily concentrated. In contrast with ultrashort waves, it has not yet been possible in the past to use these wavebands for communications beyond the line-of-sight horizon. Now, however, the system under construction for the Berlin-Harz radio communication beam , which will be based on the American Scatter method, will make it possible by means of large parabolic reflectors to also use the micro-waves to bridge this distance beyond the line-of-sight horizon and that with such a large number of channels that self-dialling telephonic communications will be possible. As the name of this type of directional beam communications implies, the distance covered is based on the scatter or refraction, and on the concentration effect.

Whereas this new system of communications represents a highly important step forwards insofar as public telephonic communications are concerned, it is even less suitable for national defense purposes that the directional beam communications systems of the past. In microwave and centimeterwave communications it must be borne in mind, namely, that besides the possibility of interception by high altitude aircraft

and balloons, the receiving possibility far beyond the line-of-sight horizon because of the Scattering effect, will also make interception by enemy ground receiving stations possible. Even in the case of the old German microwave beam communications system peculiar phenomena became evident which can only have been caused by very large-scale reflection. Thus, German microwave communications were intercepted in Japan, and the British also claim to have intercepted such communications. These facts were known on the German side during the war and resulted in orders prohibiting the use of this system of communications for the discussion of secret material or for the transmission of encoded teletype messages.

e. The Effect of Concentrated Ultrashort, micro or decimeter, and Centimeter Waves on the Ionosphere. What Happens ultimately to the Solar and Cosmic Rays. As explained in Par. 2, above, it is possible with tightly concentrated beams of ultrashort, decimeter, and centimeter waves to penetrate through the ionosphere and into outer space. The solar and cosmic radio waves, with their far shorter wavelengths are absorbed or rendered harmless by the gaseous envelope of the earth. Only the pure light and heat waves reach the earth, besides, for example, the ultraviolet rays, but only after they have been deprived of their harmful properties. (see also Par. 3, above).

V. THE NORTHERN OR POLAR LIGHTS(AURORA BOREALIS).

This is also a subject which merits mention here. However, it has been treated previously in Chapter 10, B, II (Norway), and only the following need be added here:

Pprograms of more precise study of the phenomena of the Northern Lughts have not yet been concluded. In present research on this subject use is being made of high-altitude rockets equipped with the appropriate instruments. Thus, a rocket was to be fired on 23 October 1956 from the Canadian-USA air base of Fort Churchill. A missile ten meters in length and with highly sensitized cameras and other scientiifc equipment built into its nose was held ready for firing on that date, on which on which a very pronounced appearance of the Northern Lights was anticipated, and was to reach an altitude of 114 miles. The Northern Lights usually occur at an altitude between 60 and 65 miles, but at times still higher up. The experiment was designed to determine why the Northern Lights are so much more powerful than the Southern Lights (Aurora Australis). Studies on the subject are not yet completed.

VI. INSTRUCTION MATERIAL ON LATEST RESEARCH IN THE FIELDS OF SHORTWAVE RADIO AND SOLAR AND COSMIC RADIO WAVES.

1. Zeitschrift fuer Kurzwellen-Amateure (Journal for Shortwave Amateurs), Deutscher Amateur Radio Klub, 1959

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Vol. 9-12, and 1956, Vol. 1-3.

Article: ~~The Ionosphere~~ Die Ionosphaere, Ihr Einfluss auf die Ausbreitung kurzer Wellen (The Ionosphere; Its Influence on the Spread of Shortwaves), Dr. G. Lange-Hesse.

2. Der Fernmeldeingenieur (The Telecommunications Engineer), Training and Advanced Training Journal published by Dr. Karl Hertz, President of the Central Telecommunications Office of the German Federal Postal Services; Verlag fuer Wissenschaft und Leben, Georg Heidecker, Windheim/M. Fr.

1954, Vol. ~~1~~ January: Zur Praxis des Funkwetterdienstes, II. Langfristige Vorhersage der Ausstrahlungsbedingungen von Kurzwellen (Practical Problems in the Long-Term Prediction on Spread Conditions for Shortwaves), by W. Menzel.

1954, October, Vol. 10: Funkwetterdienst III, Oertliche und zeitliche Einfluesse auf die Ionosphaere (Radio Weather Service III, The Influence of Local and Time Factors on the Ionosphere), by W. Menzel.

1954, November, Vol. 11: Kosmische und Solare Radio wellen, Radio-Astronomie (Cosmic and Solar Radio Waves, Radio Astronomy) by H.M. Klinger.

1955, March, Vol. 3: Radiowetterdienst IV., Kennzeichen und Vorhersagen des Funkwetters (Radio Weather Service IV, Features and Prediction of Radio Weather), by B.Bechmann.

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1955, May, Vol. 5 : Funkwetterdienst V., Kennzeichen und Vorhersagen des Funkwetters (Features and Prediction of Radio Weather), by B. Beckmann.

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Anlage GRAPH

Legend.

Entfernung Erde-Mond 385,000 KM	Distance Earth to Moon 385,000 Kilometers
Ionosphäre, Exosphäre	Ionosphere, Exosphere
Sph.	Sphere
Polarlichter	Northern Lights (Aurora borealis)
Heavisideschicht	Heaviside Strata or Layer
Kurzwellenreflexion	Shortwave Reflection
Dunkelheit des Raumes	Darkness in Area
Krakatau-Wolke	Krakatau Cloud
Mittelwellen Reflexion	Mediumwave Reflection
Meteore	Meteors
Raketen-Flugzeug	Rocket-Propelled Aircraft
Langwellen-Reflexion	Longwave Reflection
Bemannter Ballon	Manned Balloon

APPENDIX

PRINCIPLES GOVERNING THE OPERATIONS OF AN AIR SIGNAL CORPS RADIO INTERCEPT BATTALION (Motorized)

Note by Translator: The Air Force Groups (LW Gruppe) referred to in the German text were the headquarters which later became the Air Fleet Headquarters. In order to avoid confusion with the unit known as a Group (Kampfgruppe, Jagdgruppe = Bomber Group, Fighter Group, etc.), a headquarters controlling a number of wings under a corps or air fleet, the term Lw Gruppe where it refers to what was later an air fleet headquarters will therefore be rendered as "Air Fleet" in the English text.

Copy

Gottschling, Lt.Col.(Reserve)
Aignal Battalion, Reich Air Ministry

Berlin, 3 September 1938

To: Bistributio n Center.

Pursuant to orders I am sending herewith the draft prepared by me:

Principles Governing the Operations of an Air Signal Radio Intercept Battalion (Motorized).

S/Gottschling
Obstlt. (E)

~~Distribution~~:

Chief, Air Signal Division (Generalmajor Martini) 1 Copy
Chief, Radio Branch (Major Gosewisch) 1 Copy
Central Branch, Operations Officer) (Captain Ruepke) 1 Copy

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PRINCIPLES GOVERNING THE OPERATIONS OF AN AIR SIGNAL RADIO INTERCEPT BATTALION (MOTORIZED) ORGANIC TO AN AIR SIGNAL REGIMENT

CONTENTS

Annex 4: Operations Graph for a Motorized Air Signal Radio Intercept Company (Only as Indication, not as "Blueprint").

PRINCIPLES GOVERNING THE OPERATIONS OF A MOTORIZED AIR SIGNAL RADIO INTERCEPT BATTALION ORGANIC TO AN AIR SIGNAL REGIMENT

I. MISCELLANEOUS.

1. An Air Signal Radio Intercept Battalion (Motorized) consists of:

a. Battalion Headquarters
(Large) Air Report Collecting Center

b. Air Signal Motorized Headquarters Company

c. Motorized Air Signal Radio Intercept Companies (under mobilization conditions intercept companies will be activated in a number equivalent to that of the static radio intercept stations within the Air Fleet zone. Each Air Signal Radio Intercept Company consists of one motorized radio intercept platoon, being its 1st Platoon (at present this platoon under peace conditions organic to the Air Signal Radio ~~XXXXXXX~~ Operating and Radio Intercept Company (motorized) in each Air Signal Regiment), and one Air Signal Radio Intercept Operating Station, being its 2d Platoon. (The AF CINC HQ Radio Intercept Operating Station is excluded from this pattern).

c. One Air Signal Radio Intercept Control Station.

2. An Air Signal Motorized Radio Intercept Battalion is a unit organic to the Air Signal Regiment of the Air Fleet Headquarters concerned. Tactically, it is assigned under the Air Fleet Signal Staff Officer, whom the Commanding Officer of the Motorized Air Signal Radio Intercept Battalion

will serve as an adviser on all radio intercept matters.

Pursuant to orders from the Commanding General of the Air Fleet and in line with directives received directly from Headquarters of the Commander in Chief of the Air Force (AF Chief Signal Officer) governing radio intercept activities, the Air Fleet Signal Staff Officer will assign missions to the Air Signal Radio Intercept Battalion (Motorized).

Continuous radio intercept missions the Chief Signal Officer (through the Cryptographic Center) at Headquarters of the Commander in Chief of the Air Force will as a rule assign directly to the Air Signal Radio Intercept Control Station, at the same time forwarding an information copy of any such orders to the Signal Staff Officer of the Air Fleet concerned(see also Paragraph 30, third sentence).

Pursuant to instructions received from the Air Force Chief Signal Officer (at Air Force CINC Headquarters) the Air Fleet Signal Staff Officer will instruct his Air Signal Radio Intercept Battalion (Motorized) to cooperate with the communications intercept units of the Army and/or Navy committed within the Air Fleet zone and will take steps to insure the timeous availability of the necessary wire communication lines for the radio intercept services within his zone of authority. In this respect it must at all times be borne in mind that in view of the speed of present-day

aircraft, an Air Force radio intercept service lacking adequate and reliably functioning direct wire communications channels can accomplish its missions only to a very limited extent.

To supplement the wire communication channels, efforts will also be made to establish microwave radio communication channels (see annex 5).

What has been said above applies equally to the necessity for smooth and swiftly functioning operations at the air report collecting center (See Par. 47).

3. The Air Signal Motorized Radio Intercept Battalion thus has missions in the fields of operational, general tactical, and battle radio intelligence to perform both for the Commander in Chief of the Air Force and for the Commanding General of the Air Fleet concerned. Acting on behalf of and under instructions from the Commander in Chief of the Air Force (Air Force Chief Signal Officer) and also on its own initiative, each Air Fleet Headquarters thus has authority to employ its static radio intercept stations and the motorized Air Signal Radio Intercept Platoons of its motorized Air Signal Radio Intercept Battalion. The Commanding General of the Air Fleet Concerned is thus authorized to also issue orders assigning his own missions directly to

the radio intercept units under his command.

4. The concept of a Radio Intercept Service also includes measures of radio jamming, radio ~~jamming~~ deception and/or radio camouflage. (see Par. 22-25 and 42-45).

Concerning the operations of the Air Report Collecting Center see Par. 47. At Air Fleet Headquarters the Intelligence Staff Officer will be responsible for the assignment of the missions for the motorized Air Signal Radio Intercept Battalion.

5. The Commanding Officer of an Air Signal Motorized Radio Intercept Battalion is the responsible adviser to the Signal Staff Officer of the Air Fleet Headquarters concerned in all matters of intelligence data procurement connected with the radio intercept and communications listening services, the results obtained by air reconnaissance , by the Aircraft Reporting Service and by the forward weather reporting units within that air fleet's zone as well as in the zones of the adjacent commands.

6. The missions he assigns to the units under his command must be in accordance with the orders he receives,with the proviso, however, that he is authorized to act on his own initiative to meet changing situations if he considers such action necessary. In such case he will rely largely on consultation with the Chief of the Air Signal Radio

Intercept Control Station, who will be assigned responsibility for direction of the radio intercept operations.

7. The Commanding Officer of an Air Signal Motorized Radio Intercept Battalion will only be able to fulfill the missions enumerated under Par. 5 and 6, above, in full measure if, besides executing the orders he receives, he at all times on his own initiative endeavors to devise, develop, and test new approaches to all fields of activity within the province of his Battalion.

8. The missions assigned to static radio intercept stations under peace conditions will expand at the commencement of a time of crisis. The battalion commander will employ the radio intercept units assigned under him in terms of Par. 6 to perform the missions arising during transition from conditions of crisis to the conditions of mobilization and also later during actual war, which missions will be stated by the Chief of the AF CINC HQ(Cryptographic) Staff Section and/or by the Intelligence Officer of the Air Fleet Headquarters concerned.

9. Under conditions of peace ~~there will~~ for the time being ~~XX~~ one communications intercept operating station within the command zone of each Air Fleet command zone will be the Radio Intercept Control Station for that zone. At mobilization, this station will again become a normal operating station and the Air Fleet Radio Intercept Control

6 Station will be formed from elements released+ by the various radio intercept operating stations of the Air Fleet command zone. The Air Force CINC Headquarters Radio Intercept Station is exempted from this provision.

10. Operational orders for the Air Signal Motorized Radio Intercept Battalion will be issued by the parent Air Signal Regiment in the form of separate "Intercept Orders" (see also Par.21, below), which will only be referred to or quoted in general detailed ordersand which the Battalion will use as the basis for its own orders to its units (for specimen of an order see Annex 2). The issue of written and oral orders in the Radio Intercept Service presuppōses a comprehensive knowledge ~~[illegible]~~ and corresponding understanding of that service in order to be able to judge what can be demanded of it.

II. MISSIONS OF AN AIR SIGNAL MOTORIZED RADIO INTERCEPT BATTALION:

11. The missions of an Air Signal Radio Intercept Battalion (Motorized) are, in general outline, as follows:

a. to control and conduct

aa. Radio Intercept Service activities, including radio interference and deceptive and camouflage operations;

bb. the activities of the Air Report Collecting Center.

+ ~~[illegible]~~ "Angaben (Information)" in the German text is obviously an error and should read "Abgaben (releases)" Note by Tr.

7 b. to plan for and requisition in time the wire and/or microwave communication networks required for the radio interceot units, the air report collecting center, etc., from case to case (for alternate positions, in case of displacements etc.).

c. to regulate the radio transmissions services of the radio intercept units within the scope of existing regulations.

d. to handle the basic and advanced training of replacements for the Radio Intercept Service (radio operators, data interpreters, translators, decoders).

The missions of Air Signal Motorized Radio Intercept Battalions are explained in more detail in Section III, below.

III. MISSIONS AND OPERATIONS OF UNITS OF THE AIR SIGNAL RADIO INTERCEPT BATTALIONS (MOTORIZED).

A. RADIO INTERCEPT SERVICE

a. Definition of the Concept of a Radio Intercept Service.

12. The Radio Intercept Service comprises "Intelligence Data Gathering through Communications Media," and in addition "Deception and Camouflage through Communications Media."

aa. Intelligence Data Gathering through Communications Media.

13."Intelligence Data Gathering through Communications

7 Media" is one of the intelligence media serving the higher levels of command. This involves the interception of enemy communications by ~~xxxxxxxx~~ all technical means of communication insofar as these can possibly be intercepted and the analysis and interpretation of the results obtained for use by the command. This includes both radio and wire communications, by Morse telegraphy, telephony and television.

14. To accomplish the mission of procuring intelligence data through communications media, it is essential to process the information thus procured. From that information conclusions must be drawn concerning the organization, relationship, and strengths of the enemy forces. Detection of the whereabout of enemy radio stations must be done by means of direction finding in order to determine the concentration and local disposition of enemy troops. From the whole complex of information thus becoming available by the overall processing of the material secured, the essential intelligence data must then be drawn.

15. In detail the mission of "Intelligence Data Gathering through Communications Media"is sub-divided into the following fields:

a. Radio Intelligence, being the interception of ~~xxxx~~ ~~xxx~~ military and other official communications and the monitoring of radio broadcasts.

B b. Direction Finding.

c. Data analysis and interpretation (to include decoding).

d. Wire communications listening service (called the Arendt Service).

e. Wire communications intelligence, particularly by coupling up with or tapping wire communication lines of the enemy.

In accordance with the nature of air power, the procurement of intelligence date through communications media for an air force is restricted to radio intelligence in contrast with the communications intercept services of an army. For an air force the communications intelligence mission is restricted to the gathering of intelligence data on foreign air forces, unless specific orders are received to cover other areas. The interception and monitoring of official civilian communications and of radio broadcasts is ordered from case to case by the Air Force Commander in Chief through the Radio (Cryptographic) Branch, at Air Force High Command.

16. To expand upon what has just been said: the broad mission of "Intelligence Data Gathering through Communications Media" is to furnish the command a picture of the overall situation of the enemy and to serve as a basis for decisions in the fields of politics, strategy, operations, and tactics. Besides the other intelligence media of air reconnaissance,

9 ground reconnaissance, counterintelligence, prisoner-of-war interrogation, Press analysis, it is a highly important branch of intelligence and can only accomplish its mission to the full in cooperation with these other media.

17. The field of military-political intelligence includes such items as war objectives, propaganda, inter-State relationships, public morale and troops morale, and the industrial situation, on the enemy side. It serves primarily to orient the own highest level of the National Defense Council. Strategic intelligence should provide an intelligible picture of the enemy processes of mobilization, strategic concentration, Army-Navy-Air Force cooperation, and reinforcement and supply movements. It serves primarily as an intelligence source for the highest levels of military command.

For the above reasons the missions of political and strategic intelligence must be assigned uniformly to the three military branches and the results must be uniformly analyzed and interpreted.

18. In the case of the Air Force Radio Intercept Service, the interception of communications for political and strategic intelligence is handled by the static radio intercept stations and only in response to specific orders from the Commander in Chief of the Air Force pursuant to

directives he receives from the Supreme Military Command. The analysis and interpretation of such data is handled by the XXXXXX Radio (Cryptographic) Section at headquarters of the Commander in Chief of the Air Force, which passes on the results to the Cryptographic Section of the Supreme Military Command.

19. Operational intelligence for the Army is to provide an insight into the enemy conduct of operations and the plans of the enemy command, and should not extend far into the enemy rear. For the Air Force the purpose in operational intelligence is primarily to provide a picture of the composition of the enemy XXXXXXXXXX operational air forces, their stations or operating areas, and their plans.

20. The purpose of tactical intelligence for the Air Force iss to clarify all important details concerning the enemy air forces, particularly unit transfers, the take-off of units on combat missions, etc. General tactical reconnaissance includes battle reconnaissance.

Commensurate with the great mobility and flexibility of air power, tactical intelligence requires on the part of the radio intercept units committed for the purpose extraordinarily high standards of speed in the actual interception, analysis and interpreting, and reporting of the data, besides high precision in DF operations.

21. In the mission assignment order the commanding officer of the radio intercept unit must be informed concerning the area to be covered, main point of effort, and the particular objectives of his mission. Furthermore, he must be informed on the enemy situation and the own situation, including information on friendly call signals and frequency allocations, and the use of own military and civilian transmitters. (for specimen of a radio intercept mission order see Annex 2).

bb. Deception and Camouflage through Communications Media.

22. "Deception and Camouflage through Communications Media" includes "The Protection of Own Communications Traffi against the Enemy Intelligence Services," "Deception through Communications Media," and jamming and other interference measures. The execution of protective, interference, and deceptive missions at all times requires support from the Radio Intercept Service and exploitation of the experience gathered by that service.

23."Protection of Own Communications Traffic against Enemy Intelligence Services," includes all measures designed to prevent or complicate the interception and interpretation of own communications by the enemy radio intercept services. Communications protection thus amounts to a "camouflaging"

10-11 of own communications traffic in order to deny the enemy any information on the actual own circumstances and plans.

The Air Signal Corps contributes towards the protection of own communications by exploiting the experience gathered by the Radio Intercept Service and organizing its own communication procedures accordingly, by camouflaging its transmissions, by strict adherence to radio discipline, and by all other security measures designed for the purpose.

24. "Deception through Communications Media" is an operational measure. The desired effect can be achieved by a continuation of normal radio traffic (instead of ordering radio silence), or by means of specially planned deceptive communications traffic simulating the presence, transfer, or other movement of forces. Deception by means of deceptive communications traffic should always be coordinated with and in support of other deceptive measures, for example to support simulated regrouping movements, false reports by agents, or concealment of plans to attack in some other segment of the front, and so forth. If deceptive measures are carried out in cooperation with the Army, the Navy, the propaganda agencies and all means available to the State, one can no longer speak of operational measures, but should refer to them as political action.

25. Interference, similarly to deception, is a measure

of active camouflage. The purpose is, by means of jamming or other interference operations, to disrupt or at least seriously complicate and slow down enemy communications. Every interference measure taken at the same time introduces the hazard of interference in own communications.

b.

b. MISSIONS AND OPERATIONS OF THE RADIO INTERCEPT SERVICE.

aa. Air Signal Radio Intercept Control Station.

26. The Air Signal Radio Intercept Control Station is responsible for the radio-intercept-technical direction of radio intercept operations within its intercept zone. Pursuant to orders from the Air Signal Motorized Radio Intercept Battalionit assigns radio intercept missions to the radio intercept units. The data thus procured is reported to and analyzed and interpreted by it. The results of the data interpretation are reported by the radio intercept control station through the Air Report Collecting Center of the Air Signal Motorized Radio Intercept Battalion to the Intelligence Officer of the appropriate Air Fleet Command and, so far as necessary, to the Radio (Cryptographic) Section at Headquarters of the Commander in Chief of the Air Force. Reports of other types to the Radio (Cryptographic) Section are called for in special instructions.

13-14 27. Depending on the allocation of the intercept areas among the several air fleet or other Air Force headquarters, it might happen that a motorized radio intercept company receives intercept instructions for an outside air intercept control station. This will change nothing in its assignment under the radio intercept control station of its own air fleet zone.

28. The radio intercept control station is a small cryptographic center serving as the radio intercept data interpreting section of the air fleet headquarters to which it is assigned and at the same time serving to relieve the burden on the Radio (Cryptographic) Section at Headquarters of the Commander in Chief of the Air Force. Its staff and equipment are commensurate with these purposes. Whereas the Air Signal Radio Intercept Companies concentrate primarily on the mission of radio intercept and DF operations and the preliminary analysis of the data procured, and thus have primarily radio operating personnel and the appropriate equipment, the Air Signal Radio Intercept Control Stations have the primary mission of final interpretation of the data reported to them by the Air Signal Radio Intercept Companies (Motorized) assigned under them.

29. The necessity for very close cooperation with the Air Fleet Headquarters concerned, or with that Air Fleet's

14-15 air report collecting center requires that the Radio Intercept Control Station should be located in very close proximity to the Air Fleet command post. A very important requirement in preparations for mobilization is therefore to provide definitely for working premises, antennae installations and contacts, high-tension electricity supplies, and wire communications (telephone, teletype, and secret teletype) ahead of time for the Air Signal Radio Intercept Control Station to be established at each air fleet at mobilization. Normal mobilization plans and preparations would not meet these requirements. Instead the demand must be that the Air Signal Radio Intercept Control Stations to be created at mobilization should be organized, both in respect of personnel and equipment (through personnel and equipment released from the radio intercept stations under it during peace), so far ahead of time that each will be able to commence operations already during a period of crisis at its station in close proximity to the command post of the Air Fleet Headquarters concerned and familiarize itself with conditions.

An alternate position for each Air Signal Radio Intercept Control Station must be provided, due regard being given to the available wire communications network.

30. The Air Force CINC HQ Cryptographic Center is connected already during peace with its static radio intercept

15-16 stations by a special wire communications network (normal and secret teletype). The same network connects the static radio intercept stations designated as control stations during peace with the stations assigned under them. The peacetime forward operating posts (designated as weather research posts) of the control and other static radio intercept stations are also connected by special networks with their parent stations. Since the forward operating posts are advanced very close to the borders, these communication networks have only normal telephone or teletype lines and no secret teletype lines.

The Air Signal Radio Intercept Stations nominated as control stations temporarily during peace, revert to the status of normal statich radio intercept stations at mobilization. In their place XXX an Air Signal Radio Intercept Control Station will be newly activated at each Air Fleet headquarters. It is a responsibility of the individual air fleets (Intelligence Staff Officer) to insure that the wartime Air Signal Radio Intercept Control Stations have the necessary communication lines to their intercept stations, air report collecting centers and to the Air Force CINC Cryptographic Center in the form of normal and secret teletype lines, and are linked up already during times of crisis with the already existing special wire communications network of the Radio Intercept Service (see also Par. 2, above).

16-17 The Air Signal Radio Intercept Control Stations and their operating stations by reason of their special wire communicatie tions network and by reason of their highly qualified staffs of radio operators, data analysts and interpreters, and decoders, provide the framework of the whole Radio Intercept Service. The Commander in Chief of the Air Force asa rule will therefore use his special wire communications network to issue his communications intercept instructions directly to the Air Signal Radio Intercept Stations (see Par. 2), which in turn will pass them on, using wire communications whenever possible, to the Air Signal Motorized Radio Intercept Companies assigned under them. (The operational orders, etc., from the Air Fleet Intelligence Officer and from the Commander of the Radio Intercept Battalion concerned remained unaffected--see Par.10).

Literally speaking, it is this special wire communications network which makes it technically possible for the commander or chief of an Air Signal XXXXX Radio Intercept Control Station to direct the XXXXXXXXXXXX radio intercept operations of an Air Signal Motorized Radio Intercept Battalion, according to the instructions he receives, with any prospects of success (see Par. 6, above).

For details on the wire communications network required by an Air Signal Radio Intercept Control Station see Annex 3: Graph of Operations of an Air Signal Radio Intercept Control

17 31. The Air Signal Radio Intercept Control Station will report the results of all radio intercept units operating under it to the Air Report Collecting Center (Radio Intercept Section) of its Air Signal Motorized Radio Intercept Battalion, which serves to maintain contact between it and the Air Fleet Intelligence Officer, to whom the Center will pass on all data thus received. Direct reporting to the Radio (Cryptographic) Section under the Air Force Chief Signal Officer at Air Force CINC Headquarters will not be affected by this requirement. The Chief of the Control Station, consonant with his position as responsible head of all radio intercept operations within the zone of the Air Fleet and adviser to the Commanding [illegible] Officer of the Radio Intercept Battalion in all radio intercept matters, will have the right of directoral report, as representative of the battalion commander or under his instructions, to the Air Fleet Intelligence Officer concerning the radio intercept data obtained and the conclusions to be drawn therefrom.

32. The areas to be covered by the several radio intercept control stations and their operating stations will be defined already during peace. Changes in the allocation of areas at the outbreak of a war or during that war will only be possible as an exception and only on a restricted scale.

18 The mission scope of the Radio Intercept Control and Operating Stations (broadly speaking also of the Radio Intercept Companies) see Par. 36, ff, below)is as follows:

33. a. Peacetime Missions.

1. To monitor the general communications traffic of the air forces in adjacent countries, with particular emphasis on the traffic of flying units. Particular attention will be paid to sizable field exercises and maneuvers of the armies and air forces, and of the air raid protection services.

2. To analyze and interpret the data thus obtained in order to become familiar with and be able to continuously keep under observation the characteristic features of foreign air organizations (including the ground installations), air tactics, command and reporting systems, navigation, frequencies used in communications, camouflage action and methods, etc.

3. To exploit the results obtained in monitoring foreign radio traffic for use by own bomber forces for navigation by tuning their navigational D/F instruments in to fureign transmitters which are suitable as radio beacons; and to maintain a watch over the frequencies and operating procedures of such transmitters in order to be prepared for any changes introduced in the event of war.

19 4. To test the efficacy of the existing Radio Intercept Service with support from the Aircraft Reporting Service.

b. Missions during Times of Crisis.

1. On the basis of experience and information accumulated during peace to recognize timeously measures of mobilization and the operational plans of a possible enemy.

2. The above can be recognized from:

a. any sudden and significant increase in the volume of radio communications traffic; from sudden radio silence; or from any deviations from the normal.

b. from the appearance of new radio traffic;

c. from radio communications which can be inferred to indicate a greater ~~xxx~~ frequency than otherwise of take-off and landing reports, or a transfer of air units.

d. from transmitter coordinating meausees.

e. from an increased exchange of e traordinary weather reports for air routes other than those normally used for military purposes.

f. from the appearance of encoded radio messages in traffic normally conducted in clear text.

35 c. WARTIME MISSIONS

1. To recognize the operational and tactical plans of the enemy through timeous detection of the strategic

concentration areas of the enemy air forces. Timeous detection of the types and numbers of aircraft in enemy air bases.

In this field the Radio Intercept Service must operate as supplementary to long-range reconnaissance by aircraft.

2. To carefully monitor all enemy radio traffic while own bomber forces are flying missions over enemy territory. Such bomber forces will carefully avoid the use of radio while over enemy territories in order not to betray their position. From the enemy radio traffic the Radio Intercept Service will endeavor to ascertain whether the bomber forces have succeeded in their missions, whether they have suffered losses, and when their presence was discovered by the enemy. This will often be possible from intercepted enemy broadcasts and enemy Army radio traffic.

3. To report immediately and continuously for the Aircraft Reporting Service all enemy bomber or other air forces whose take-off or approach is recognizable from enemy radio traffic. These reports to go directly to the several air district command headquarters and to the nearest local offices of the Aircraft Reporting Service. This observation of the movements of enemy air forces is particularly important during that part of their approach flight which is beyond range of the visual observer posts.

4. To determine, for navigational purposes, which of

21 the foreign radio transmitting stations recorded and tested during peace as navigational aids for own air forces remain in operation after the outbreak of war, whether they continue to transmit at the times previously recorded or what changes have occurred in transmitting times, what call signals and frequencies they are using under the changed conditions. To endeavor also to discover new radio transmitting stations which can serve own air forces as navigational aids. The radio beacons and other radio transmitting stations thus detected and recorded will be kept under constant observation even while units in flight are making use of them for their own navigation.

5. In connection with ewhat has been said under Par. 4, above, the Radio Intercept Service will/sometimes be able during enemy air operations destined to penetrate into friendly territory to determine the point of enemy air concentration, the times of transmissions and the frequencies and call signals used by the radio beacons by which the enemy air wings orient themselves. This will not only enable own air forces to make use of these radio beacons for an immediate strike against targets in enemy territories, but can also provide opportunities to systematically disrupt or mislead the enemy navigation.

22 6. To intercept and interpret enemy and neutral radio weather service reports and to make the information thus obtained available for own navigation.

7. To observe enemy measures taken in reaction to own deceptive radio traffic.

bb. THE AIR SIGNAL RADIO INTERCEPT COMPANY.

36. Whereas the Air Signal Radio Intercept Operating Station (the company's 2d Platoon) represents the company's stationary, rearward, and continuously operating element, whose locally fixed and highly sensitive radio receiving and D/F installations can produce results even over very long distances, the mobile part of the company, namely, the Air Signal Radio Intercept Platoon (Motorized) can be likened with the company's assault element which, according to the current general military and local combat situation, will be committed wherever the command assumes that the most useful intercept results can be obtained for operational and tactical (battle intelligence) use.

Because of their integration in the Air Signal Motorized Radio Intercept Companies, the Air Signal Radio Intercept Operating Platoons thus resemble fortresses, from which the motorized radio intercept platoons launch their (radio intercept) sorties against the enemy, and behind the protecting walls of which they can retire when battle-

22-23 worn or from where they can receive new replacements.

37. The activities of a radio intercept company of the Air Force can not, as is the case with the Army ~~XXXXX~~ radio intercept companies, be restricted to commitments close behind the front lines on the ground and to the interception of communications at a moderate distance in the enemy rear extending at farthest to field army level headquarters all usually without any contact with static radio intercept stations.

On the one hand the radio intercept companies of the Air Force must be committed close to the front in order to be able to fully cover the assembly and concentration areas of enemy air forces farther in the enemy rear and thereby provide the necessary data for the own command to decide on the objactives and directions of its own operations; on the otherhand the company's units must also be able to track the approach of enemy air forces and their course within friendly territory, such as the zone of interior, and must have contact with the higher levels of Air Force command in the interior, for whom they operate and from whom they receive their orders, so that these elements must be distributed throughout the rear areas and in the zone of interior in a manner appropriate to the disposition of the various Air Force commands.

23-24 Integration of the mobile elements of the Air Force Radio Intercept Service with the static radio intercept stations thus evolves from the overlapping of their fields of activities in accordance with the characteristics of air warfare and the conduct of air operations and the Air Force Command system resulting therefrom.

The threat to the static radio intercept operating elements in the event of war on the one hand, and on the other hand the necessity for them to cooperate with the Air Signal Radio Intercept Control Stations precludes the possibility of establishing them along the borders in order thereby to insure them an adequate penetration depth for radio reception and D/F operations within the allocated communications intercept areas. The Radio Intercept Operating Stations were thus compelled even during peace already to establish their own forward operating posts in the vicinity of the borders and to install and man them with support in the form of military personnel from the radio intercept platoons of the Air Signal Regiments.

These forward operating posts will also remain occupied by personnel of the 2d Platoons (or Air Signal Radio Intercept Operating Posts) of the Air Signal(Motorized) Radio Intercept Companies, since they are already under peacetime

24-25 conditions linked by permanent wire communication lines with those platoons(see also Paragraph 30, above).

38. Concerning the radio intercept missions of the Air Signal (Motorized) Radio Intercept Companies in general, the reader is referred to Paragraphs 32-35, above. In Particular, each company and its units will maintain a constant watch over the radio communications traffic of the flying forces of the enemy and their ground organization--within its allocated intelligence areas and in line with the stated purposes and thereby make an important contribution towards intelligence data gathering and towards a correct appreciation of the air situation. Its attention will be directed in particular at the organization and types of the flying units of the hostile air forces, their movements, and their distribution within the enemy ground organization.

Apart from the systematic interception and analysis and interpretation of the radio communications traffic of the enemy units and their ground installations, particular emphasis will be placed on intercepting the communications and signals attendant upon unit take-off and landing operations. By means of D/F action every effort will also be made to identify the routes of approach and departure of the units involved. The data thus secured will be

25-26 analyzed and interpreted immediately and the results reported to the Air Report Collecting Center by the shortest route. The execution of thèsemissions, which are of the utmost importance for the command, call for meticulously careful work and for the assignment of appropriately qualified personnel to the company.

39. Intercept data will be reported continuously and currently to the Radio Intercept Control Station and, according to orders received, directly to the Radio(Crypro-graphis) section at Headquarters of the Commander in Chief of the Air Force (using the wire communication lines necessary for the purpose, see Par. 41, below). In addition, the Commander of the Air Signal (Motorized) Radio Intercept company will establish contact and cooperate with adjacent radio intercept units of the Air Force, the Army, and the Navy insofar as it is possible to do so by personal visits or by wire communications.

40. The company's 1st Platoon will be committed in technically positions favorable for radio intercept and D/F operations. These positions must be timeously reconnoitered and the necessary wire communications must be insured from the platoon to the company command post (for final data interpretation) and to the superior headquarters concerned. Wire communication channels are particularly important for the D/F teams

26 to avoid their use of radio communications providing the enemy radio intercept services indications for their operations.

The commitment of the platoon will be well ahead of time in the positions reconnoitered, in oder to permit it to familiarize itself with local conditions in time.

If the radio intercept platoon is committed in the front areas, it should be in position as far forward as possible; this applies both to the radio receiving and the D/F teams. In view of the depth of the operational zones and the nature of the instruments used, the D/F teams in particular must be as far forward as possible in order to enable them to penetrate far enough into the enemy rear areas. If the D/F teams are spaced approximately 36 miles apart, giving a total frontage of approximately 60 miles for the entire platoon, this can be considered as providing generally good angle intersections in the far enemy rear.

The length of the operating base line will as a rule be determined by the sound volume of the enemy airborne transmitters.

In special cases the operating base line of a radio intercept platoon will remain within the limits of

Maximum 72 miles, Minimum 36 miles.

27 The reasons for this limitation of the maximum width of the operating base line are as follows:

Withthe increasing distance in the enemy rear the receiving sound volume of low-power airborne radio transmitters at the front decreases, and the possibility of taking bearings on them decreases commensurately.

Reasons for the establishment of a minimum width for the operating base line:

If the base line is too short, the bearings taken will not be accurate enough since the angle intersections will be too acute, so that no good results can be obtained in the far enemy rear.

The company command post of an Air Signal (Motorized) Radio Intercept Company for practical purposes should be with the company's 2d Platoon, and the radio intercept platoon committed farther forward should only be assigned the elements necessary for a preliminary data analysis. Alternate positions for both platoons will be provided, the important factor here being the availability of wire communication lines.

41. The availability of speedily and securely functioning communication channels within the Air Signal (Motorized) Radio Intercept Company and to its superior headquarters is a responsibility of the company commander. If he is

27-28 not assigned Air Force communication channels, he will well ahead of time request the construction of such lines by the parent Air Signal (Motorized) Radio Intercept Battalion. If his unit operating positions are within the zone of operations in the vicinity of the front on the ground, he will request the Signal Staff Officers of the appropriate Air Force Commands and field Army headquarters to establish the necessary communication channels if this cannot be done by his own direct superior headquarters.

For details on the communication channels required for an Air Signal (Motorized) Radio Intercept Company see Annex 4: Operational Graph of an Air Signal (Motorized) Radio Intercept Company.

cc. AIR SIGNAL (MOTORIZED) HEADQUARTERS COMPANY

42. The Air Signal (Motorized) Headquarters Company has the mission of conducting the deceptive communications traffic and the interference operations mentioned previously in Par- 15-19, above, under the title "Deception and Camouflage through Communications Media."

43. Radio interference operations will disturb not only enemy communications but also the radio communications of the own side on the frequencies being interefered with and on adjacent wavebands. Deceptive radio communications can only achieve their purpose if carefully coordinated with

28-29 other deceptive measures. The slightest discrepancies here could jeopardize the entire plan of deception and betray it as such to the enemy.

Interference and deceptive measures thus require careful planning and preparation.

44. The use of interference radio transmitters must be permissible only under orders from a headquarters at the level of an air fleet or higher, and only in agreement with the next higher command level of the Army and/or Navy. The jamming or other interference ordxr must be given in writing. Cooperation by the Radio Intercept Service is indispensable in deciding the purpose as well as in the execution of the interference tranmissions. The interference transmitting station must have wire connections with the nearest radio intercept receiving station, (this will probably usually be a radio intercept control station), which will tune in to the enemy radio communication channels to be jammed and observe the effectiveness or otherwise of the interference transmissions and at the appropriate time will request the chief of the interference transmitting station to cease the interference transmissions.

Under no circumstances should interference transmissions continue longer than is essential for the intended purpose. The Commander in Chief of the Air Force will be informed

29-30 through the appropriate Air Fleet Headquarters on the execution of interference missions.

45. The use of the Air Signal (Motorized) Headquarters Company for purposes of deceptive communications traffic also is permissible only on orders from headquarters at the level of air fleet or higher. It might be desirable to inform the next higher Army or Navy command level. The order must be in writing. If support by aircraft is necessary, these will be placed under control by the Air Signal (Motorized) Radio Intercept Battalion for the duration of the deceptive operation.

46. When not employed in interference or deceptive missions, the interference and deceptive platoons of the Air Signal Headquarters Company can be employed at establishing and maintaining radio communication channels.

B. (LARGE) AIR REPORT COLLECTING CENTER.

47. See separate study on this subject: Principles Governing the Operations of an Air Report Collecting Center.

ORGANIZATION OF AN

AIR SIGNAL (MOTORIZED) RADIO INTERCEPT BATTALION

1. Battalion Headquarters Staff, T/O & E (Air) St.N. 3110 (L), 1 July 1938

Air Report Collecting Center, T/O & E (Air) St.N. 3410 (L), 1 July 1938

Information Reporting Element

Radio Intercept Data Interpretation

Aircraft Reporting Service Information Analysis

Radio Monitoring Service Reports Analysis

2. Air Signal (Motorized) Headquarters Company, T/O & E. (Air) St.N. 3151 (L), 1 July 1938

1st Platoon [Radio Receiver] (Mtz)

Platoon Leader and Staff

4 (Motorized) Radio Receiver Teams, T/O& E. St.N. 3755 (L).

2d Platoon [Battalion HQ Platoon] (Ltz)

Platoon Leader and Staff

3 Signal Teams:

1 heavy (longwave) Radio Operating Team (Motorized), T/O & E (Air) St.N. 3748 (L)

1 heavy (shortwave) Radio Operating Team (Motorized), T/O & E (Air) St.N. 3749 (L)

1 light (Short- & Longwave) Radio Operating Team (Motorized), T/O&E (Air) St.N. 3753 (L)

3d Platoon (Battalion HQ Platoon) (Motorized)

Same as 3d Platoon, above

Effective 1 January 1939 company strength will be augmented by assignment of two heavy Ultrashortwave Radio Operating Teams (Motorized).

3. Air Signal (Motorized) Radio Intercept Company, T/O & E (Air) St.N. 3149, 1 July 1938

Headquarters Echelon

1st (Radio Intercept) Platoon (Motorized)

Platoon Leader and Staff

Data Procuring and Analysis Elements:

1 Officer as Chief of Intercept Elements

3 NCOs (Radio) for Intercept Operations

5 NCOs (Radio):

1 D/F Data Interpreter

1 Controlled D/F Operations Chief

1 Radio Operations Data Analyst

1 Final Data Interpreter

1 Radio Traffic Data Interpreter

16 Men:

2 D/F Data Analysts

2 Control D/F Operators

3 Signals Analysts

2 Radio Operatons Data Analysts

3 Translators

1 Fibal Data Interpreter

1 Cartographer

2 File Clerks

1 Motor Vehicle Driver

33 1 Medium Motor Omnibus with Trailer as Data Interpreting Element (still under development; to be replaced by two personnel carriers)

1 (single-axle) Trailer for Heavy Power Unit A (Sd. AH 24)

11 Signal Teams:

1 Telephone Switchboard Team (Motorized)

2 Radio Intercept Teams (Longwave) (Motorized)

2 " " " (Shortwave) "

3 Intercept D/F Teams (Motorized)

3 Light Radio Operating Teams (Short- and Longwave) (Motorized)

2d Platoon (Air Signal Radio Intercept Operating Station), T/O & E ST.N. 3408 (L) (Air), 1 July 1938

1 Officer

5 Signal Officials (Radio Technology)

1 Scientific Assistant (Salaried)

1 Equipment Administrator (Air Signal Master Sergean

1 Radio Signal NCO

1 NCO)
) Secret Teletype Operators
2 Men)

1 NCO)
)Telephone Switchboard Operators
3 Men)

68 Civilian Employees:

8 Data Interpreters

5 Tranalators

34

68 Civilian Employees--Continued

50 Radio Intercept Operators

1 Cartographer

1 Radio Instrument Expert

3 Clerks (can also be female)

5 Motor Vehicle Drivers

2 Motorcyclists

1 Passenger Car Driver

2 Truck Drivers

Motor Vehicles

2 Heavy-Type Motorcycles with Sidecar (o)

1 Medium Passenger Car (Closed) (o)

1 Light Truck (Open) (o)

1 Medium Truck (Open) (o), to serve simultaneously as personnel carrier

Trailers

2 Navigation Radio D/F Trailers (two-axle) (Sd.Ah. 447)

4. Air Signal Radio Intercept Control Station

Chief (Officer), T/O & E (Air) St.N. 3406 (L), 1 July 1938

5 Signal Technical Officials

1 Air Signal Corps Equipment Administrator

1 Radio NCO

3 Teletype Operators (including 1 NCO)

4 Telephone Operators (including 1 NCO)

2 Scientific Assistants.

35 12 Data Interpreters

8 Translators

30 Radio Intercept Receiver Operators

1 Cartographer

1 Radio Instrument Expert

3 Clerks

5 Motor Vehicle Drivers:

2 Motor Cyclists

1 Passenger Car Driver

2 Truck Drivers

Motor Vehicles

2 Heavy Type Motorcycles with Sidecar (o)

1 Medium Passenger Car (closed) (o)

1 Medium Truck (open) (o)

1 Medium Omnibus (o) (until procurable to be replaced by 1 Personnel Carrier).

36 OPERATIONAL RADIO INTERCEPT ORDER

Among other items the order assigning a radio intercept mission must contain the following information:

1. Enemy situation } Ground and Air
2. Own situation }

3. Intelligence gathering area to be covered

   Type of communications on which main emphasis is to be placed

   Purpose of the intelligence gathering mission

4. Characteristic features of enemy radio communications traffic.

5. Own call signals and frequency allocations } Radio Situation
   Own military and other official agencies operating radio transmitters }

OPERATING PATTERN OF AN

AIR SIGNAL RADIO INTERCEPT CONTROL STATION

(to serve as a guid, not as a blueprint)

Legend.

———	Telephone lines
— — —	Teletype lines
—·—·—	Secret teletype lines simultaneously normal teletype lines
●—●—●—	Micro- or Decimeter communication lines
Ln.Funkhorchkomp.(Mot)	Air Signal Radio Intercept Company (Motorized)
L.W.Gruppen Kdo (Ic)	Air Force Group Command (Rendered in Manuscript as Air Fleet Command) (Intelligence Officer)
Grosse Luftmeldeng Sammelstelle	(Large) Air Report Collecting Center
Ln.Horchleitstelle Gef.Stand Fu.G.III	Air Signal Radio Intercept Control Station Command Post Radio Report Receiving Section
Ln.Funkhorch-Abt (mot.) Stab	Air Signal Radio Intercept Battalion (Motorized). Headquarters
Ln.Stabskompan(mot.)	Air Signal Headquarters Company (Motorized)
Ob.d.L. (Chi) Stelle	Air Force CINC/Cryptographic Section

OPERATING PATTERN OF AN

AIR SIGNAL (MOTORIZED) RADIO INTERCEPT COMPANY

(to serve as a guide, not as a blueprint)

Legend:

Funkpeiltrupp	Radio D/F Team
1. Funktrupp	Light Radio Operating Team
Kdo Sender	D/F Control Transmitter
Empfangszentrale	Receiving Center
Vorauswertung	Preliminary Analysis
1 Zug	1 Platoon
Funkhorchzug (mot.)	Motorized Radio Intercept Platoon
Wo-Stelle	Weather Research Post (Code Designation for Forward Radio Intercept Post)
Grenzeinsatzpunkt	Frontier Operating Post
Peildorf	D/F Center
Ln.H.Betr.Stelle	Air Signal Radio Intercept Operations Center
Peil Auswertung	D/F Data Interpretation
Endauswertung	Final Data Interpreting
Komp.Gef.Stand	Company Command Post
Fu G. III	Radio Operating (Transmitter) Section
Ob.d.L.,Fu.Chi.Stelle	Air Force CINC/Radio (Cryptographic Section
Ln. H.,Leitstelle	Air Signal Radio Intercept Control Station
————	Telephone Line
— — — —	Teletype line
—·—·—·—	Secret,simultaneously normal Teletype Line
●-●-●-●-●-	Micro- or Centimeterwave communications Line
→ → → → →	Radio Communication Channels