ITEM No. 1
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C. LORENZ A.G.

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COMBINED INTELLIGENCE OBJECTIVES

SUB-COMMITTEE

LONDON—H.M. STATIONERY OFFICE

REPORT ON C. LORENZ A.G.

Survey 20th - 31st May 1945

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G-2 Division, SHAEF (Rear) APO 413

Detailed reports on the technical features discussed are in preparation and will be circulated as Appendixes to this report.

I. Introduction.

In accordance with SHAEF directives, the officers listed below proceeded to Germany for the purpose of investigating the activities of C.Lorenz A.G. of Berlin, Tempelhof, as far as dispersed factories and laboratories could be reached and leading experts and engineers could be interrogated. The survey was carried out between 20th - 31st May.

Investigating Personnel.

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II Description of History and Activities of C.Lorenz A.G.

C.Lorenz A.G. was incorporated in 1906 as a telephone and telegraph factory. It soon acquired contracts from the German Reischspost and participated in the automatisation of a great number of German Telephone Exchanges. The company was granted a quota of manufacturing all automatic telephone exchanges and subscribers sets, and thereby established for itself a steady production and turnover. Lorenz acquired its international reputation, however, after it had bought the Poulsen patents for wireless machine transmitters before the first World War, thereby entering the field of wireless communications as a pioneer in manufacture. Lorenze not only shared the German market exclusively with Telefunken but after having largely extended its wireless activities through armament work in the first World War, it acquired some importance in the export market as well.

The firm also began the manufacture of wireless transmitting and receiving valves. Following the general and international trend for patent and cartel agreements to control the wireless business, Lorenz made a general agreement regarding this field of activities with Telefunken. An exchange of patents was arranged whereby Lorenz acquired, for use on the transmitting and the receiving side, all patents which Telefunken owned or had acquired through the Telefunken agreement with Marconi, R.C.S. and C.F.R. for use in Germany. After this agreement, Lorenz gave up the manufacture, but not the research of valves, against an obligation by Telefunken to supply Lorenz with all valves needed by them at cost plus 5-10%. After the majority of the shares of Lorenz had been bought up by the Philips Co., of Eindhoven, differences between Philips, Lorenz and Telefunken arose which, however, were settled after the Philips' owned shares had been acquired by the International Telephone and Telegraph Corporation of New York. An agreement was later reached

RCA

whereby first Philips and Telefunken made a cartel agreement with regard to their broadcasting activities and then the International Standard Electric Corporation, a subsidiary of I.T. & T.C. and Lorenz joined the Telefunken/Philips agreement.

Lorenz furthermore acquired the Morcrum rights on teleprinters, and their activities in this field became quite important. Here too an agreement with regard to sharing certain business activities was reached with Siemens and Halske.

Railway Signalling equipment, stabilisator valves and various other components formed part of further activities of Lorenz.

III. Location of Factories.

The expansion of production activities during and after the last war necessitated the building of some new factories which, however, were all concentrated in Berlin up to 1938, when the increased work given to Lorenz by the Nazi authorities and their wish to dispersal of factories, compelled Lorenz to acquire factories at Muhlhausen (Thuringia), where a valve factory and communications apparatus plants were established. Further dispersals were carried through during the war, and the exact description of these are included in Appendix I, Furthermore, three similar factories had been rented in the province of Posen and Silesia which, however, had been evacuated before the Russian occupation. In one of them at Kustrin, the machine tools for the manufacture of teleprinters remained.

IV. Organisation.

Interrogation of various members disclosed the following details on the organisation of C.Lorenz.

Management:-

General Manager	-	Maj. K. Schmid (remained in Berlin)
Organising Secretary	-	Mr. A. Rothe (Muhlhausen)
Works Manager	-	Mr. E. Brinkmann (Berlin)
Chief of Laboratories	-	Mr. Herzog (Berlin)
Sales & Purchases	-	Major Schmid (Berlin)
Controller	-	Mr. Branner (now at Fussen)
Radio Broadcast Sales	-	Mr. Roessing (Berlin. Now said to be in Hamburg).

Organisation of Laboratories.

Laboratory Chief	-	Mr. Herzog (Berlin)

First Technical Chief - Dr. Gerth (Berlin)

(a) Valves.

Research - Dr. Herriger (Auerbach)
Production - Mr. Loepp at valve works Hohenelbe (Czech)
- Mr. Hidde, Valves Works, Muhlhausen.

(b) Machines - Generators and High Frequency Machines
- Mr. Blatt (Landshut)

(c) Television and PPI.
- Dr. Messner, Berlin.
High discrimination work was carried through at Brunswick, Technical High School Laboratories and at Auerbach.

(d) Aerials, Pulse Modulation.
- Dr. Wandt (Berlin)

Second Technical Chief - Dr. Roshow (Berlin)

(a) High Power Transmitters.
- Mr. Gutzmann (Berlin)

(b) Medium Power Transmitters (1/20 Kilowatts)
- Mr. Schuhmacher (Auerbach)

(c) Low Power Transmitters (less than _Kw at wavelengths of more than one metre)
- Mr. Kloepfer (Auerbach)

(d) At Wavelengths less than 1 metre.
- Dr. Gossl (Muhlhausen).
Transmitters - Dr. Puhlmann (Falkenstein)

(e) All types of Receivers lower than 1 metre
- Mr. Viehweger - (Falkenstein)

(f) Small Army Equipment.
- Mr. Schmidt - (Falkenstein)

(g) High Frequency Iron Dust Cores and Components
- Mr. Keiser - (Mittweida)

(h) Crystals - Dr. Jacobs (Berlin)

Third Technical Chief - Dr. Kramar (Landshut, Bavaria).

Navigation and Radar

(a) Receivers for navigation and attachment to existing Receivers for communication and homing purposes.
- Dr. Johannson (now in Slesvig near Kiel)

(b) Ground Equipment - Dr. Goldmann (Landshut)

(c) Radar Airborne and Jamming
- Dr. Christ (Auerbach)

Radar, Navy - Dr. Müller (Berlin)

Fourth Technical Chief - Mr. Wiessner (Berlin)

Carrier Frequency
- Laboratories in Chrast, Czechoslavakia.

Fifth Technical Chief - Dr. Seydelbach (Berlin)
Modulation equipment and low frequency amplifiers for high power transmitters.
Equipment for detection and decoding of wireless messages with aid of magnetised wire or films with iron dust covering.

Sixth Technical Chief - Dr. Grimson (Mühlhausen)
Teleprinters
Research with regard to use of teletype with cables radio links.
Laboratories in Berlin.

Seventh Technical Chief - Dr. Jung (Berlin) - Patents.

V. Technique and Development.

The officers carrying out the investigation came to the general conclusion that the technique and development of Lorenz with regard to radar and wireless communications in general was on a high scientific level, but that outstanding developments were not achieved in this field. Lorenz engineers claimed to be well aware of this fact, and said that they had been prevented from carrying on long term developments by Mr. Herzog who, as an ardent Nazi, followed

the policy to concentrate exclusively on war work and the development orders given by the government and the respective Rings. They said that they were furthermore handicapped by the demands of the German Services to construct all equipment for very simple servicing, this being necessitated by the short training periods allotted to the servicing personnel. They know that thereby they could not get the highest performance out of their sets and were aware of better performances by the corresponding Allied equipments. For detailed information, I would refer to the technical reports in Appendixes 2,3, and 4.

Following however, a development by Dr.Kramar of the Lorenz Blind Landing Approach system, developments and research of wireless navigation were carried through with great energy and success. In particular, the various Sonne systems seem to be of considerable importance.

VI Production.

An investigation into production methods has not yet been carried through, but it will probably render some valuable information mainly on the use of Ceramics, high frequency iron and light metal alloys. The Lorenz plants, chiefly those at Muhlhausen and Oberhohenelbe can be used for the manufacture of transmitting and receiving valves of all types, broadcast receiving sets, small electrical equipment of various types, electrical heaters and household goods and electrical machines, generators etc.,

VII. Economics.

The Controller of Lorenz Mr. Brenner, who was interrogated at Füssen, gave the following story on the financial situation at Lorenz.

Estimated Statement of Balance Accounts - C.Lorenz.

		in RM.1000
	Buildings(nett)and permanent fixtures	18,000
	Machinery etc.	1
x	Investments	4,500
	Cash at Banks	15,000
	Stocks	80,000
	Receivables	60,000
	" (Interhouse)	10,000
	Prepayments and others	20,000
	Receivables for War Damage	15,000
		222,500
	Capital stock	15,200
	Free reserves	10,000

IX.

APPENDIX 1. (Contd.)

Location	Floor space sq. metres.	Employees
Muhlhausen (Thuringia)		
Owned by company		
Radio transmitters & Receivers	9,000	800
Tube factory (factory	4,000	700
Rented by company		
Teleprinter Laboratory	1,000	-
Plauen Area		
All rented premises used as laboratories:		
Falkenstein (transmitters & Receivers)	1,200	700
Auerbach (transmitters & Receivers)		
Auerbach (tubes)		150
Hanover Area		
Holzen near Eschershaused, Kreis Holzminden.		
Rented for piece parts manufacture located in caves.	10,000	700
Approx.500 valuable machines stored there.		
Bavaria.		
Landshut.		
Laboratory for special machines (rented)	1,500	120

Studiengellschaft Deutscher Bergbau, Muhlbach am Hochkonig bei Bischofshofen.

C.Lorenz A.G. Lager Mistelfeld bei Lichtenfels.

G.Sheub, Apparatebauges., m.b.H. Pfortzheim.

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APPENDIX 2.

Excerpt from Target Report.

"A summary of the items of technical interest encountered in the establishments visited are given below.

(a) Muhlhausen - Mackensen - Strasse 75. date 21/5/45

Spoke to Mr. Rothe (Secretary to general management of Lorenz in Berlin and Mr. Crohmann (Works Manager at above address).

At this plant five types of small communications sets were made (the ranges quoted are under average conditions)

Gerat type a39b1) - Transmitter and receiver 3 to 5 M/cs. Power 0.6 Watt range 12Km.

Gerat type a4(f) - Transmitter and receiver 3 to 6.7 M/cs.

Gerat type k - Variation of above two - range 15km

Gerat type 20 watt- Sender 3.95 to 4.5 M/cs- uses give tubes type RL.T15

Gerat type i - Transmitter-receiver 1.87 to 3.00 m/cs. Power 3.5 Watt Range 25 km

Dr. Grimsen, the Lorenze expert on Teleprinters was interrogated and an account obtained of the use of teleprinters in the radio link point to point communication system called "Stuttgart' (see later under Dr. Gossl)

(b) Mühlhausen - 40 Eisenacher Strasse. Date 21st May 1945.

Valve factory producing following types:-

R.V.2P.800
Vacuum relay FuGX - used to switch aerial to transmit or receive (R/T use - 300 kcs)
D.S.310 Decimetre triode (60 cm) 2 watts anode dissipation.
D.S.311 Similar
R.L.2 4T1, RL 2.4P2, RL 1P2, LG 10. High voltage full wave rectifier.
R.S.12 Tf Decimetre transmitter triode. Lower wavelength limit 40 cms. C.W power 20 to 30 watts. Peak power on pulse 25Kw. (used on FuG 200).

Dr. Gossl was also at Mühlhausen. He was from one of the Berlin laboratories (Rangstorf) and had been responsible for the development of and testing of prototypes of systems.

He gave us a general description of the "Stuttgart" high frequency radio link system. The name "Stuttgart" covers the FuG Os and FuG 03a. The FuG 03 works on a wavelength of 50-54 cms and is a mobile transmitting and receiving station. A large

number of these had been produced.

Further sets had been produced on 20-24 cms, using magnetrons, and two experimental prototypes using Klystons (RD 12[illegible] these RD 12 L ... last two were said to have been captured near Magdeburg.

Each set had 10 channels for telephony and it would be possible to use 10 teleprinters on each of these channels.

(c) Target at Auerbach, Carl Knoll Strasse. Date visited 23/5/45. Herr Lemske in charge.

The Director of the Valve Works, Dr. Herringer, had gone to Muhlhausen, so Dr. Schulze-Herringer spoke for him. Dr. Erben of the Valve Lab. Dr.Christ and Dr.Carl and Mr.Grack were also present.

Models of the RD 12 La Klystron, 20 watts at 20-24 cms for the Stuttgart communication system were seen, as well as the first attempt at a double cavity klystron on 5cms which was the first step towards an E-Band jammer. The model of the Siemens ranging unit EGC218 for attachment to the FuG200 for relatively short wave ranging, was seen and circuit diagrams obtained; nothing was known of how this worked.

Two transmitters for jamming Oboe were seen; "Feuerzauber" on 1.2-1.0, using two Siemens RS80 triodes giving 5kw pulses and "Feuermolch" on 8.5-9.7 cms., 4kw pulses using a Telefunken L57 planar triode (Scheiberohre) in a normal concentric line circuit.

The ceramic-metal construction of the valve was of interest and a sample valve was obtained. The latter transmitter was also for jamming H2S. A small amount of work on PPI with FuG 200 was being done; work was mostly in Berlin.

A receiver used in the 9cm jamming system and made by Blaupunkt (Korpn) Berlin, was seen; a Telefunken RD2Md2 split anode magnetron is used as local oscillator with a crystal mixer. This did not have a performance high enough to warrant removal, but Lt. Redgment (ASE) of another party, wishes this to be done. Another version of the receiver using harmonic mixing works at 2.7 - 4 cms.

(d) Target at Falkenstein. Date visited 23rd and 24th May 1945. Drs. Schmidt, Fullman, Kloepfer and Viehweger.

A 10cm model of the FuG 200 was envisaged best on the jamming transmitter using the Telefunken Lo7 type of Planar triode. Aerial work for this was being done by Herr Bosse in Berlin - Badendorf, but the aerial of the Telefunken "Berlin" was actually to be used; work was being done on a search receiver for 16 - 30 cms in one range using the Telefunken LD11 Planar triode.

Badendorf

Puhlmann

Dr. Pullman showed the Klystron transmitter - oscillator and the receiver for the 20cm Stuttgard - FuG 03a a development of the FuG 03 which uses magnetron, transmitter. A report on the former and a handbook on the latter were obtained.

The Neuling IFF system (FuG 226) was explained by Dr.Kloepfer, and the means by which the transponder is converted into an interrogator-responser ("Abfrage"). The method of combining Neuling with high discrimination radars by addition of a centimetre receiver with the IFF (Frischling) so that the IFF response only occurs over the narrow arc of the radar was described. Examples of the apparatus were seen. The firm of GEMA were mentioned as specialists on IFF, chiefly for the Navy; numbers of the staff had moved from Köpenik in Berlin. Herr Schwarzer was at Pohland AG, Falkenstein, others were at Waldsassen east of Nuremberg. They altered 'Berlin' for the navy.

New transmitters and receivers on 11-12m for sound ranging equipments using FM were seen. It.Col. J. French 41109 20WTSFF 21 AG arrived at Falkenstein when we were there and took away as much as possible of the complete sound ranging equipment. A Transceiver for 20-25 M/cs T.FuGD3 was seen, giving 1 watt H.F. AM or FM. A very small transceiver for 20-40 M/cs 'Kleinfunksprecher K' was under development.

(e) Target at Landshut, Bauhof Strasse 5. date 29/5/45

A Dr. Blatt was in charge of a laboratory, working on electrical machines and generators and complete power supplies (500 c.p.s.) This target was visited because Dr. Kramar, the Department chief on navigation and Radar was here. Another C.I.C.S. party was here (Farvis of TRE and Redgmann of AST).

Farvis & Co., dealt with the details of the generators and also with many details on navigation systems. Dr. Kramar was able to give a fuller overall picture of the Lorenz effort on Radar and Jamming than had been obtained from the more junior people at Falkenstein and Auerbach.

He also gave us an overall description of work on navigation and homing together with recent thoughts and plans. These latter included a system of modulation using a variation in the spacing of pulses. He described a possible system whereby as many as five different messages might be sent out simultaneously on one carrier. These ideas are of great interest and value for transmission of information in connection with navigational side.

ELEKTRA The navigation and homing system discussed were:-

~~Elektra~~ - Early magnetron system

Sonne - Navigation system - details obtained of location of latest phasing control units (in Berlin)

Goldtsonne - (an extension of Sonne under Dr. Goldtmann who is also at Landshut).

Esseker - Uses principle of Sonne, but gives much quicker indication of position. It requires more elaborate equipment in A/C than Sonne.

Hermine - Simple navigational aid using a rotating minimum. Used even short ranges for fighters.

Blind Landing (Orginial Lorenz system). Further developments during the war have been restricted to indication of an automatic control in azimuth only - methods of control in height (glide path) were considered too elaborate for military purposes.

Homing systems for Luftwaffe (Ziel flug); attachments to standard FuG 16 R/T receiver. FuG ~~Pail~~ PEIL 6 (Receiver of this is EZ6).

Note. Pulse spacing method of modulation was in early development stages. A number of groups were co-operating. These included Dr. Wundt (of Lorenz in Berlin) Dr. Kimmel (Olchning lan. in Munich) and L.M.T. of Lyons.