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GERMAN TECHNICAL AID TO JAPAN

A Survey

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GERMAN TECHNICAL AID TO JAPAN

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INTRODUCTION

The following survey of German technical aid to Japan is a selected abstract of a vast amount of material available on the subject. The entire study is pointed to depict those German techniques, devices, and weapons whose use by the Japanese would have a bearing on the war in the Pacific. Logistic shipments of raw materials and ordinary commercial products and the inferences therefrom are not treated, except insofar as they affect the probable production of a particular type of weapon or equipment.

Where there is positive evidence that a particular item or its description reached Japan it is so stated. Otherwise, it must be assumed that the transfer was dependant on its bulk, difficulties of transportation and the perils of the sea.

As the intelligence exploitation of Germany proceeds, more and more material on transfers to Japan is uncovered. Although it is not believed that this evidence will change the basic implications contained herein, new details will undoubtedly be developed. These will be issued as corrections and additions as they become available.

This survey has been arranged along the lines of the Combined Intelligence Objectives Sub-Committee index of technical subjects as technical intelligence on German materiel is so maintained. Further, for the use of those who are not familiar with German equipment, a short description is given. Where possible, the probability and date of production by the Japanese are given, with any conclusions which may be drawn from the transfer.

However it must be realized that the setting forth of the details of the exchange is only part of the picture, and that the meat of the problem, viz, the use which the Japanese are making or intend to make of German plans and prototypes, can only be answered by identification of the German origin and complete technical intelligence reports by those of our Pacific forces who encounter the Japanese version in action.

It is therefore requested that all Commands who receive this survey and who discover information which will cast light on Japanese use of German weapons and techniques send full details via regular channels to the Office of Naval Intelligence, Technical Intelligence Center, so that their implications may be assessed and those charged with countermeasures given timely warning.

A reliable P/W provides from memory an imposing list of Japanese technical liaison personnel stationed in Berlin since 1941. This is admittedly an incomplete list and not sufficiently checked for intelligence purposes. It is given here merely to indicate the level on which negotiations were carried on, and the diversified specialties represented.

JAPANESE NAVAL ATTACHES AND AIDES IN BERLIN

Rank	Name	First Name	Note
Rear Admiral, Naval Attache	YOKOI	Tadao	Member of Japanese Air Mission. Returned to Japan spring of 1943.
Rear Admiral*	KOJIMA		Remained in Berlin.
Captain*	TANIGUTT	Yasumaru	Member of Japanese Air Mission. Whereabouts unknown.
Captain*	FUJIMURA	Yosikazu	Member of Japanese Air Mission. Remained in Germany until the end.
Secretary*	SAKATO	Tikai	Member of Japanese Air Mission. Remained in Germany until the end.
Secretary*	SAKAI	Naoe	Member of Japanese Air Mission. Remained in Germany until the end.
Secretary*	YAMAMOTO	Yosi	Member of Japanese Air Mission. Remained in Germany until the end.
Commander**	FOYA	Kumao	Aide of Naval Attache. Returned spring of 1943.

* Probably among the staff of the Japanese Ambassador OSHIMA, Hiroshi, captured in Germany by the U. S. 7th Army.

**Returned to Japan in spring of 1943 but probably were casualties.

Vice Admiral	NOMURA	Naokuni	Head of Naval Mission. Returned to Japan in 1943. Also belonged to Air Mission.
Rear Admiral	ABE	Katuo	Deputy; remained in Germany.
Rear Admiral	MITO	Yoshiko	Engineer construction; returned 1943.
Rear Admiral	IRIFUNE	Nosaburo	Artillery; returned 1943.

Rear Admiral	SAKAMAKI	Munetaka	Aviation specialist; remained in Germany.
Captain	SATO	Namizo	Mines; also specialist for aviation; returned 1943.
Captain	NISHINA	[illegible]	Submarines, training and command; returned 1943.
Captain	[illegible]	Minozu	Artillery; returned 1943.
Captain	RAI	Zyungo	Weapon construction (mines and torpedoes); returned 1943.
Commander	AKU	Akira	Weapon construction (torpedoes and mines); returned 1943.
Commander	NAGAI	Taro	Navigation; also aviation; returned 1943.
Commander	ITO	Yuzi	Communications; returned 1943.
Commander	TUKUDA	Osamu	Artillery, explosives, gas; returned 1943.
Commander	NAITO	Takesi	Aviation; returned 1943.
Commander	YAMADA	Seizi	Engines, steam propulsion; active with Swiss companies. Did not arrive in Japan.
Commander	KIYASU	Sadao	Engines and motor propulsion; returned 1943.
Commander	[illegible]	Yuitiro	Ship construction. Did not arrive in Japan.
Commander	TOMONAGA	Hideo	Submarine construction. Did not arrive in Japan.
Commander	EMI		Submarine command. Did not arrive in Japan.
Commander	KASAI	Seiti	Aviation, fuels; returned 1943.
Commander	SHOZI		Aviation; was active for a long time in Italy and Switzerland. Did not arrive, however, in Japan.

MEMBERS OF THE JAPANESE NAVAL MISSION STILL IN GERMANY TODAY

Commander (Ing.)	MATUI	Tohei	Electrical devices.

Lt. Commander	IKI	Tuneyo	Armor and weapons, as well as materials and substitutes.
Naval Chief Eng.	URIO	[illegible]nozio	Tool engines; specialist.
Naval Chief Eng.	NISI	Ta[illegible]o	Materials, casting engines, and work engineer.
Naval Engineer	[illegible]	T[illegible]niziro	Navigational devices.
Naval Engineer	ITO	Sigeru	Weapon construction, artillery.
Naval Engineer	KANAGAWA	Zen	Weapon construction, artillery.
[illegible] Engineer	SHIMOSATO	Kazuro	Engine construction.
Naval Engineer	YAMATO	Tadao	Electrical engineering.

OTHER SPECIALISTS OF THE JAPANESE NAVAL OFFICE STILL IN GERMANY TODAY

Captain	YOKOTA	Tosio	Aviation, fuels, lubricating oils.
Naval Engineer	OTANI	Buntaro	Aviation specialist.
Commander	IMASATO		Torpedo production.
Commander	NISHIKARA		Engine construction, motors.
Commander	YSHIKAWA		Engine construction.
Naval Chief Eng.	[illegible]AKUT[illegible]		Motor construction.
Naval Engineer	NA[illegible]AMOTO		Engine construction.

1. RADIO and RADAR

GENERAL

The Japanese were seriously handicapped at the start of the war by the primitive state of all their electronic equipment. Aside from some knowledge of Allied equipment, gained through capture or through non-German sources, most of the Japanese progress in radar appears to be due to German information and equipment. The most important contribution of German liaison in the electronics field is the Wurzburg. Its use both in gunlaying (anti-aircraft fire control) and in ground control of interception, at a time when the B-29 has made both of these radar measures imperative, would greatly strengthen the Empire's home defense. The termination of assistance from Germany may freeze the state of the art in Japan, which in its present condition of advancement includes micro-wave radar for surface search and fire control and air warning radars which may be said to be approaching the range of Allied radars.

The principal bottlenecks in the Japanese radar program, according to a combined U.S.-British report issued by the Military Intelligence Service, are believed to be the development of effective new types of radar and the manufacture of sufficient quantities of high quality vacuum tubes. Radar units can be built by most of the leading producers of radio apparatus. Facilities for the development of new equipment are scattered among many laboratories and research centers. The manufacture of tubes, however, is not only the most critical but also the most concentrated point in the entire industry. Tube production requires many skills and very specialized apparatus. One firm, Tokyo Shibaura Denki K.K., produced 58.3 percent of the recovered tubes made solely for radar, 68.3 percent of those used both in radio and radar, and 74.4 percent of those made only for radio use. That firm's tube facilities are believed to be concentrated in three factories located within an area of one square mile in Kawasaki. The tube factory of Sumitomo Tsushin Kogyo K.K., the only known maker of some of the most specialized tubes used in radar, is also in Kawasaki.

The Navy Technical Laboratory (Kaigun Gijutsu Kenkyusho), which is believed to be in the Tokyo area, directs the manufacture of Navy radar and is a large producer of units, but is not known to make any tubes. Until 1942 the Navy directed the development and production of all Japanese radar, and most models now in production and use are still known as Navy radar.

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1. RADIO and RADAR

ITEM: SMALL WURZBURG (D)

INTELLIGENCE: Transfer of this equipment is known to have taken place. The earliest date of transfer is stated by a reliable P/W as 1942. Equipment for manufacture in Japan was also shipped. 100 sets were in Germany for Japan in 1943. RCM reports have disclosed interception of radar signals similar in pulse and frequency of those characteristics of the Wurzburg. Captured document confirms delivery of 3 sets in Jan/Feb. 1943.

IDENTIFICATION: The small Wurzburg appeared first in 1942, and was used to obtain range elevation and azimuth. It is equipped with IFF and an additional CRT for precision range finding. Its effective beam width is [illegible]° and so the 2 targets must differ in slant roughly 1000' to be seen as separate targets. This type used for detecting surface vessels, flak fire control, gun-laying, searchlight control, height finding for aircraft-reporting and as stand-by in ground control of interception.

Range (miles)	1-25
Frequency Range (mc)	"A" Band 550-8[illegible]0 "B" Band 470-49[illegible] Intermediate band 54[illegible]-555 also reported 520-[illegible]0
Pulse Recurrence Frequency (cps)	3750 (increased to [illegible]00 when used in IFF)
Pulse Length	[illegible] 2 microseconds
Tubes	75 tubes in transmitter-receiver unit FuSE 62 1 - [illegible]S 80; 12 LS 50; 12 LS 30; [illegible] 2; 34 RV 12; 1 LV 1; 2 LG 1; [illegible] LG 2; 1 LB 13/40; 1 LB 7/15/ 4 neon lights - TL4; 1 quartz crystal CEK 1; 1 stabilizer STV 150/15.
Accuracy	Range accuracy approx. 11 yds. D/F accuracy ranges 0.2° Precision ranging by phase-shifter operating on sinusoidal (30 kcps crystal-controlled) deflector - voltage of the range strobe tube.

CONCLUSIONS: Photographic interpretation tentatively identifies Small Wurzburg in Japan, but conclusive evidence of its production is lacking.

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ITEM: GIANT WURZBURG

INTELLIGENCE: Transfer of this equipment is known to have been made. Special equipment for manufacture in Japan was also shipped along with

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Igel which checks all parts for proper operation.

IDENTIFICATION: The Giant "Basket" Wurzburg was used to obtain data on range, elevation and azimuth. It has a large (14 times the wave length) parabolic reflector of wire mesh which is capable of giving accurate height measurements because of its narrow (7°) beam. One of its earliest functions was in fighter control stations, with crews of 120 - 150 men. It is useful as early warning against low flyers, with performance governed by elevation of site. IFF has been installed on a limited number of FuSE65.

Range (miles)	37½ to 50
Frequency Range (mc)	3 bands A,B,C between 500 & 600mc.
Pulse Recurrence Frequency (cps)	1750
Pulse Length	1 microsecond
Tubes	75 tubes in transmitter-receiver unit FuSE 62: 1 LS-80; 1 LS-50; 12 LS-30; 4-LP-2; 34 LP-12; 1 LV-1; 2 LG-1; 1 LG-2; 1 LB 13/40; 1 LB 7/1; 4 neon lights TE 4; 1 quartz crystal QEK 1; 1 stabilizer STV 150/15
Accuracy	Height down to 2.5° elevation. This limit corresponds approx. to 5000' at 20 miles, 10,000 ft. at 40 miles and 12,000 ft. at 50 miles.

ITEM: FREYA, (GCI AND A/C REPORTING)

INTELLIGENCE: Reliable evidence of transfer on hand. (A-2). Captured document indicates that two sets were ready for delivery June 1943; Japs were to transport.

IDENTIFICATION: This is a mobile equipment which measures range and bearing, but not height of aircraft. The whole apparatus can be rotated manually or mechanically in azimuth.

Range: Maximum - 150 km. on high flying aircraft (in older 1000 pps model) in both models limited by display gear to 200 km. Minimum - 1 km. Accuracy: range better than 1 km. probably 100 meters bearing better than 1°, relative bearing better than 0.2°.
Frequency: 116 - 146 (mcs) nominal wavelength 2.1 to 2.6 meters)
Pulse recurrence rate: 300 pps (allowing theoretical maximum range of 300 km.)

IFF Receiver Frequency: 155 (mcs) (nominal wavelength 1.94 meters)
Transmitter peak power: 15-20 Kw.
Split: When fitted, is on receiver and/or IFF aerials only.
Beam Widths: Transmitter 40° zero to zero without split (about 20° e.f.), 9° with split.
Aerial Arrays (Limber type) Separate arrays for Transmitter and receiver - more recently 3rd. small array for IFF.
(Pole type) lowest and middle banks for Transmitter and receiver respectively. Top bank for IFF (occasionally omitted)

The Pole type Freya is a newer design than the original Limber type Freya. Its functions, radio characteristics, and performance are much the same, but its form and mechanical design are entirely new. It is assembled from a larger number of smaller components, which renders it more suitable for air transport; it is not fitted with limbers for road transport.

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ITEM: LORENZ Fu[illegible] (HOHENTWIEL) FOR U-BOATS

INTELLIGENCE: Drawings for this set are reliably reported to have been received in Japan in February and August 1944. (A-2)

IDENTIFICATION: This is an electro-magnetic, location-finding equipment operating on reflected [illegible] principle for use against sea surface targets with range determination. It consists of transmitter with modulator stage, receiver with artificial target device, viewing device with brilliancy-control equipment, reflector, convertor and power supply and switch box for antenna switch. The array is rotatable mattress 4 ft. sq.

Wave length	54 cm with "stray waves"
Pulse Recurrence Frequency	50 cps
Range	15 and 150 km. depending on position of range switch.
Power (peak)	30 to 40 kw.
Voltage Pulse	10,000 volts
Antenna	Consists of rotary reflector (which can be rotated 190° with side of zero.) 2 dipole groups of [illegible], 2 FuMB wide and dipole
Accuracy of D/F	1 to 2°

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ITEM: Fu[illegible]a (TRANSMITTER-RECEIVER)

INTELLIGENCE: Components were found at Bordeaux awaiting shipment to

1. RADIO and RADAR

Japan, October 1944.

IDENTIFICATION: This was standard equipment in single seater aircraft Me109, Me109F, FW190, until 19[illegible] when it was replaced by the FuG 16Z. Since 1943 it has been used in [illegible] seater aircraft. (JU87 and Hs129). For communication with ground stations and other aircraft. Type of signal: Transmitted, CW and voice. Received tone and voice.

Range (miles) [illegible] or less
Frequency range (mc) - 2.5 - 3.75 for trans. & receiver
Preset frequencies - Preset on one frequency on ground fighters, [illegible] in dive bombers set accessible during flight.
Tuning - (MO or crystal) - MO
Tubes - Transmitter, 2 Ren 904 and 2 Rens 1664;
Receiver, 5 Rens 1264.
Principal Components:
Transmitter (S-6b) 8" high, 14" wide, 9" deep, wt. 20 lbs.
Receiver (E-5a) 8" high, 14" wide, [illegible]" deep, wt. [illegible] lbs.
Junctionbox (VK-5a) 8" high, 8" wide, 9" deep, wt. 5 lbs.
Dynamotor (u-1b/24) 8½" high, 9½" wide, [illegible]" deep

CONCLUSIONS: Inasmuch as spare parts were crated for shipment in October 1944, it is assumed that the basic FuG 16a had been sent to Japan before that date.

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ITEM: FuG10 (TRANSMITTER - RECEIVER)

INTELLIGENCE: Components found at Bordeaux awaiting shipment to Japan, October 1944.

IDENTIFICATION: This is a widely used transmitting and receiving set installed in multiple engined aircraft by the Germans. Not crystal controlled, relying on capacitance compensation for frequency stability. Can be turned in flight. Each transmitter-receiver unit is constructed so that 4 channels may be quickly selected.

Range (miles) - 350 to 500
Frequency range - (mc) Transmitters: long wave (S-10L) 0.3-0.6, short wave (S-10K) 3.0-6.0
Receivers: long wave (E-10L) 0.3-0.6, short wave (E-10K) 3.0-6.0.
Preset frequencies - four click stops on tuning knobs.
Tuning - (MO or crystal) MO. Manual with 4 click stops on each transmitter and receiver. Antenna matching units tuned remotely by servo system.

Tubes - 31 - 6 RL 12 P 35 and 25 RV 12 P 2000. These tubes perform well over a frequency range of 200 kc to 400000 kc. The receiver tubes function as R-F amplifier, detector and audio amplifier for both pentode and triode operation.

Use - Current equipment for all first line multiple-engine aircraft. It has been found in all bombers, twin engine fighters and certain flying boats.

Type of signal - Transmitter, CW on both long and short wave; received CW, on both long and short wave; tone and voice also received on short wave.

To communicate with: Aircraft and ground stations.

Principal components: Transmitters S10K and S10L, each 9" high, 8-3/4" wide, 8" deep, wt. 16 lbs.
Receivers E10K and E10L, each 7-½" high 8-3/4" 8" deep, wt. 16½ lbs.
Dynamotor U10/S, 9" high, 13¼" wide, 6½" deep, 28½ lbs. wt.
Dynamotor U10/E 6½" high, 10¼" wide, 4½" deep

CONCLUSIONS: Basic model would have been received in Japan before date of shipment of spare parts.

ITEM: FuG 15 (TRANSMITTER - RECEIVER)

INTELLIGENCE: The Joint Communications Board Counter-measures Committee, reports definite knowledge of this transmitter, December 1943. Eval. A-1.

IDENTIFICATION: This apparatus replaced the FuG 16 on bomber aircraft, being designed for air-to-air and air-to-ground telephony. It differs considerably from the FuG 16 and FuG 17, and is considered an ingenious electrical design. The main points are as follows:

(a) Use of frequency modulation.
(b) Wider frequency band covering 37,8 to 47,7 Mc/s.
(c) Remote control.
(d) Many of the circuits are shared between the transmitter and receiver. For instance, the master oscillator of the transmitter is also the beat frequency oscillator of the receiver, the I. F. stages of the receiver are also the modulator stages of the transmitter.

It is stated that the FuG 15 had been evolved as far as the prototype stage, and that series production was just beginning at the time of the visit to Berlin in the Winter of 1942. The following characteristics have been given:

Transmitter
Frequency range 37,8 to 47,7 Mc/S (can therefore be operated with existing FuG 16 and FuG 17 ground equipment)