

THE FOLLOWING INFORMATION HAS BEEN OBTAINED FROM P/W AS THE STATEMENTS HAVE NOT AS YET BEEN VERIFIED, NO MENTION OF THEM SHOULD BE MADE IN INTELLIGENCE SUMMARIES OF COMMANDS OR LOWER FORMATIONS, NOR SHOULD THEY BE ACCEPTED UNTIL COMMENTED ON AIR MINISTRY INTELLIGENCE SUMMARIES OR SPECIAL COMMUNICATIONS.

THE GAF SIGNALS ORGANISATION IN THE WAR.

1. This report results from the interrogation in England of General der Nachrichtenfürher MARTINI, the Director General of G.A.F. signals from the time of the formation of the Luftwaffe until the end of the war. A feature of this interrogation was General MARTINI's rather surprising lack of detailed knowledge of signals and radar equipment in use in the Luftwaffe, but his knowledge on matters of broader policy of the signals organisation was naturally considerable.

2. The gap in his detailed knowledge has to some extent been filled by the chiefs of his subordinate formations, and it is intended in due course to issue a further report dealing with employment of radio and radar equipment. The present report confines itself to the main events during the war as they concerned the signals organisation, and shows that General MARTINI himself was not free from the intrigues which beset the whole of the General Staff.

3. The information has been divided into five parts, each of which is, as far as possible, dealt with in historical sequence; the parts are:-

1. Expansion of the G.A.F. Signals Organisation.
2. Navigational aids for G.A.F. bombers.
3. Defensive radar.
4. The success of Window.
5. Wireless intelligence and Signals developments.

I - EXPANSION OF G.A.F. SIGNALS ORGANISATION.

4. To meet the growing needs of the G.A.F., General MARTINI developed the Signals Organisation from a small force with about 300 active officers at the outset of the war, to an army of about 350,000 of which 10,000 were officers and 100,000 women.

5. In the early autumn of 1940, GOERING, appreciating the part played by G.A.F. signals, ordered the force to be doubled. As Germany conquered fresh territories the Signals Organisation had to be constantly expanded.

Early Campaigns.

6. General MARTINI was of the opinion that all the early German campaigns were prepared with great speed. When the German marched into Austria, he and General Feldmarschall von REICHEMACH were at a radio conference in Cairo. Neither of them had the slightest idea that Austria was to be invaded. They were both informed at Cairo that German troops had marched into Austria. Similarly, General MARTINI heard only at the last minute that German troops were to invade Czechoslovakia.

7. Some days before the Polish Campaign was opened, German land-air exercises were being carried out on a large scale, and the G.A.F., signals organisation was assuring inter-service communications, in particular between RICHTHOFEN's Stukas and the Army. On the outbreak of war considerable strain was put on G.A.F. Experimental Regiment KOETHEN at the last minute, so as to ensure satisfactory communications for the Stukas in Poland. The British declaration of war came as a general surprise and created great uneasiness.

8. General MARTINI was emphatic in maintaining that he was informed of the intention to invade Norway only six to eight days in advance. He doubted whether HITLER had told more than a very few people of his intentions beforehand and he asserted that everybody appeared to be taken by surprise as arrangements were kept "terribly secret".

9. As soon as General MARTINI was informed of the intended campaign, he flew to his headquarters in Hamburg and selected his best officers for organising communications. They worked at high speed day and night for six days. The organisation proved exceptionally difficult because all the details of the plan had to be kept secret. It was decided that the Army Navy and Luftwaffe would all work on the same frequency at the half dozen points where landings were to be effected.

10. Every Ju.52 which the G.A.F. signals organisation could lay its hands on was transformed into a signals aircraft, and communications Trupps were also sent out on all the transport ships. The success of the G.A.F. communications, the General considered was largely due to the Ju.52 signals aircraft.

Invasion of Britain.

11. General MARTINI would not commit himself about the time at which preparations were first made to invade England. Once

the Germans held the Channel ports a plan was evolved under the cover-word "Seelöwe" by which barges were assembled in the Channel Ports. The whole plan was so decentralised, however, that the various departments knew only what directly concerned them. For a long time General MARTINI had the impression that the whole plan was a feint. He estimates that the General Staff worked seriously on the invasion plan for two to three months.

12. The plan comprised landings in two different places, but he maintains that he was never told what these places were, and he is not aware that any date was fixed for the invasion. He is certain that if the date for the invasion was fixed and the plan called off, then the High Command deliberately kept up the fiction that it intended to invade England for months after the whole thing had been shelved.

Russian Campaign.

13. Support was given to the above contention by the General when he stated that he was informed at least six months ahead of the High Command's plan to invade Russia. Since the Germans wished to avoid fighting on two fronts, the plan to invade England must have been postponed indefinitely at any rate before 1941. When he was informed of the Russian invasion plan, General MARTINI discussed his requirements at a conference with HITLER.

14. This was one of the two or three occasions on which he had personally to report to HITLER. He worked out a plan to build six lines of communication advancing into Russia, each manned by one signals regiment. This required a considerable amount of material and transport. Generaloberst JESCHONNEK appreciated that General MARTINI's requirements were justified, but the Army put up objections.

15. At the inter-service conference with HITLER which ensued, General MARTINI stated his case. "How quickly will you be able to construct your lines of communication?" HITLER asked him. MARTINI replied "30 kilometres a day". HITLER interposed; "That is far too little. Forty kilometres of railway will be built per day!".

16. MARTINI said that by putting down one telegraph line instead of two, he could assure the construction of more than 40 kilometres a day. HITLER then sanctioned all his requirements, telling the other services not to under-estimate the value of signals communications.

17. A unified method was adopted for signals construction in the Russian advance; field cables were first laid, then ordinary telegraph wires. Inter-service and fast communication such as Met. reports were sent by wireless. The system of

G.A.F. Army Liaison officers used in Russia was modelled on that worked out by the Germans in the Spanish war.

18. Telegraphic communications were as a rule reserved for communications between O.K.L. and the Luftflotten, between the Luftflotten and the Fliegerkorps, and between the Fliegerkorps and Army Staff.

19. The German land lines were tapped by the Russians. General MARTINI regretted that the Germans had never succeeded in making a secure telephone scrambler. He said that towards the end of the war a satisfactory apparatus was found in a British or American aircraft. He had it tested and found it good.

20. Land lines in Russia also suffered considerably from partisan action. They were guarded every 30 to 50 kilometres by posts of 8 to 12 men, but guard duties were particularly difficult in forested country. When one line was cut, communications were switched onto one of the other lines or put over wireless links. Despite these difficulties, regular communications were maintained throughout the campaign.

II - NAVIGATIONAL AIDS FOR BOMBERS.

Development of Bombing Beams.

21. At the beginning of the war the G.A.F. tended to neglect its defensive organisation and concentrated on the offensive, General MARTINI was not responsible for navigation as such, but for high frequency radio as an aid to navigation. In 1933 he had calculated that with the navigational aids at his disposal, mainly D/F and compass, he could obtain an accuracy of only about 50 kilometres at a distance of 500 kilometres.

22. At the end of 1933, Dr. PLENDL, who had been introduced to him by the Technisches Amt, told him that if the funds were placed at his disposal he could in some years' time produce, a navigational aid with an accuracy of 500 metres at a distance of 500 kilometres, Feldmarschall MILCH placed the means at his disposal. After several years PLENDL completed his apparatus, and experiments were conducted on the X-System by Versuchs Regiment KOETHEN with the bomber Gruppe which later became K.G. 100.

23. The first operations of the war with mobile X-Stations were on two bombing missions against a munitions factory in Poland. The factory was foolishly bombed at the same time by ordinary bombers, so that the experts were unable to determine whether or not the X-System was a success.

24. The campaign was over so quickly that no other operational trials with X-beams on Poland could be made.

Knickebein Beams.

25. After the Polish campaign, Knickebein and X Stations were constructed opposite the German-French frontier in preparation for the Western offensive. Kampfgruppe 100 was by that time thoroughly trained in the beam procedure, and many highly specialised Signals officers had been incorporated in the Gruppe as navigators.

26. The Norwegian campaign then took place, and Kampfgruppe 100 was thrown into it as an ordinary bomber unit. Most of the crews were killed, and the Gruppe was wasted. The specialists were scarcely required for the French campaign, but the Gruppe had to be re-formed completely with lesser trained crews for the attack on England.

27. The Knickebein system was used at the outset of the attack on England. The apparatus on the Channel coast had been hurriedly set up, however, and there were neither sufficient technicians nor material to make conclusive tests. Dr. MODEL, a former Reichspost official who died during the war, was taken over by the wireless department of the signals organisation and was chiefly responsible for developing Knickebein in collaboration with the Technisches Amt and Telefunken.

28. The crews using Knickebein soon reported that the beam was being diverted, and that British fighters were being vectored on to it. Several weeks were required to prove that the beam was really being diverted. After some weeks, experienced signals officers were sent out with the bombers and reported that countermeasures had in effect been taken by the British.

"X" and Benito Bomber Beams.

29. Dr. PLENDL invented both the "X" and "Y" (Benito) systems. The "X" beams were developed under the signals organisation at Köthen by Dr. KÜNHOLD with K.G.100 and General - then Oberst - ASCHENBRENNER, an old and experienced pilot. The Benito system, on the other hand, was perfected by Dr. PLENDL at the Technisches Amt under Feldmarschall MILCH, and General MARTINI had nothing to do with it.

30. It was intended to train a whole Geschwader to navigate on the "X" system. After Kampfgruppe 100, acting as pathfinders for large bomber forces, had been attacking towns in Great Britain on the "X" system for a short time, however, Dr. PLENDL wanted to try out Benito in practice, which he regarded as the better system.

31. At that time Oberst ASCHENBRENNER's younger brother, who was the Kommandeur of Kampfgruppe 100, was ordered to take over III/K.G.26 which had been intended to fly also on "X". Dr. KÜNHOLD always considered the "X" system better than the Benito, and was annoyed with Dr. PLENDL for introducing and pushing the Benito system.

32. P/W from III/K.G.26 stated in 1940 that the Benito system was introduced prematurely because of the countermeasures which the British had been taking against the "X" beam. General MARTINI, however, maintains that the causes for the early introduction of Benito were more complex. He said that he had been responsible for putting into practice the use of beams as navigational aids for bombers, and that he had considerable difficulty in overcoming the objections of the pilots and their commanders.

33. The pilots maintained that they could obtain better results by finding the targets themselves, and those who were obliged to follow the pathfinders felt that they were being relegated to subsidiary tasks. They reported that K.G.100 had bombed in the wrong place, and that they had found the right target by themselves. Despite the good results obtained with "X", anger against the system remained unabated.

34. The aim of operating two whole Geschwader on beams against England was not achieved because of initial distrust and British countermeasures and later because the bombers were earmarked for the Russian campaign. The Benito system suffered chiefly from British interference of the R/T.

35. General MARTINI himself realised from the outset that the beams could be interfered with from Britain, and favoured the introduction of several systems to make countermeasures more difficult.

36. Thus, in the light of later experience, the Benito system was introduced prematurely. The General points out that this was only the beginning of the high frequency war, and they lacked experience about the best measures for forestalling countermeasures.

37. When KG.100 was achieving its successes, GOERING enquired as to who was responsible for the "X" system. On hearing from MARTINI during a long talk on navigational aids that PLENDL had invented it, he said: "Then I shall promote him to Staatsrat!" (State Councillor). GOERING could not understand how the system had been jammed. MARTINI spent two hours trying to explain the procedure of jamming and countermeasures. GOERING asked a number of questions, but was afterwards clearly none the wiser. He grew very angry, and accused MARTINI of fiddling about with patchwork measures.

38. In reading the above statement it must be emphasised that General MARTINI was sometimes confused in his memory between the "X" and "Y" systems.

Mobile "X" Stations in Russia.

39. Kampfgruppe 100 later flew in Russia with mobile "X" stations, which were set up with great speed.

Cyklop System.

40. Towards the end of 1943, the Knickebein system was developed on a new basis with mobile stations under the cover name CYKLOP. This system was used extensively by Fliegerkorps IV, in Russia and was to have been set up on the Channel coast for attacks on England, but the General was not sure whether it was actually used.

41. Cyklop had a range of 300 to 350 kilometres as against the 450 kilometres of Knickebein. It was developed by Dr. KÜNHOLD at Köthen.

Hitler Demands a Demonstration of the "X" Beam.

42. About the summer of 1942, when General MARTINI was at his headquarters in South Russia, he was suddenly ordered to fly over to Hitler's general headquarters near Kalinovka some 12 miles away. HITLER had heard that the Krupps works had been hit in an attack at night through ten-tenths cloud by R.A.F. bombers flying with navigational aids. He could not believe it, and said that there must have been a gap in the clouds; GOERING was troubled, and General JESCHONNEK - his Chief of Staff, who also had no faith in high frequency aids, was also sceptical. So HITLER ordered them to call in MARTINI.

43. Asked by HITLER whether such accurate bombing was possible on beams, MARTINI said it was. GOERING, who saw trouble ahead for himself, interposed saying: "Yes, my Führer, but we also have such systems."

44. HITLER asked MARTINI how the "X" system worked. In an attempt to simplify the explanation, MARTINI spoke about impulses and echoes. HITLER asked for more and more details, calculating for himself everything that MARTINI explained. The General thus found himself thoroughly involved and confused.

45. "Now I want to know", HITLER said with some impatience, "if you were to attack Munich main railway station from Leipzig on your system, whether you could hit it?" MARTINI, taking good care not to commit himself too deeply, said; "I should estimate that Munich is about 400 kilometres from Leipzig. If that is correct, and if the station is 1,000 metres long by 300 wide, then I believe that some of the bombs would hit the target."

46. HITLER replied: "I hope this is correct. I don't trust high frequency. I went on a flight in South Germany, and ended up in North Germany by mistake with your high frequency." He reflected for a moment and said: "I order a demonstration to be carried out with the "X" System in Germany, just as if it were an operation, to show me whether these things really can be done.

47. This was the last that MARTINI heard on the subject from HITLER himself, but a long time afterwards he was rebuked by GOERING for taking so long to prepare the demonstration; preparations actually took about nine months.

48. At the time the "X" apparatus was undergoing trials for improvements, and the aircrew who had used airborne apparatus had to be replaced in the aircraft, the "X" stations set up in the neighbourhood of Vienna, and new pilots trained. General MARTINI did not know all details of the trials, since they were put into the hands of Dr. PLENDL and the Air Officer for Bombers who was also Inspector for Navigation.

49. The actual bombing demonstration flight was from Austria to an unpopulated spot near Grafenwöhr in the neighbourhood of Bayreuth, and was a success, but it cost enormous effort.

Disappointment over Erika.

50. Explaining why "Erika" stations had been built on the Channel coast but had not been used, General MARTINI said that the system proved far more difficult to perfect than had been supposed.

51. Moreover it necessitated a large airborne apparatus, and a very large ground installation, and this took years and years. In the final stages an inaccuracy was observed which had been previously overlooked.

52. There was besides the continual danger that it could be easily jammed. "I worried a great deal over it", the General said.

53. Professor von HANDEL, whose great passion it was, had claimed that it would be more accurate than the "X" system. He worked at it as feverishly as PLENDL worked on his "X" system.

54. The two men fell out and MARTINI went to great pains to get them to work together, and finally succeeded. He hoped that they would combine the "X" and "Erika" systems, but this never happened.

Sonne Beacons in Spain.

55. Talking of other air navigation systems, General MARTINI said that besides using Sonne beacons themselves in Spain, the Germans made over some Sonne apparatus to the Spaniards.

III - DEFENSIVE RADAR.

First Information on British Radar.

56. Discussing British and German ground radar, General MARTINI said he was aware before the beginning of the war that great radar stations had been put up on the coast of England, and that they had very long range. It was known that the impulses were 25, 50 and 1000, and that height measurements could be obtained. It was not known whether the radar could really determine the number of aircraft approaching.

57. Just before the war the Graf Zeppelin flew along the coast of England during an experimental flight. The main object of that flight was to test ultra-short wave receivers. Incidentally it was thought that British radar stations might be D/F'd. General MARTINI said he did not know exactly what experiments were made during the flight, but he had heard that the high frequency receivers were not satisfactory, and results were uncertain.

First German Radar.

58. In General MARTINI's opinion, the two men chiefly responsible for the invention of radar in Germany were Dr. RUNGE, of Telefunken, who worked on a 50 to 60 centimetre wavelength, and Dr. SCHULTES, of GEMA, who worked chiefly with 80 centimetre and 2.4 metre waves.

59. Radar apparatus was first developed in Germany by the Naval Experimental Institut and GEMA in 1936 or earlier. General MARTINI was shown a Freya by the Navy, and saw that it could achieve results over the sea. He hoped that the G.A.F. would be successful with it over land and foresaw that it could have a great feature in aircraft reporting, blind landing and other spheres.

60. Just before the invasion of Czechoslovakia he had a Freya placed in the Sudeten mountains. "I hoped", he said "that with our Freya in the mountains we would be able to pick up aircraft taking off in Czechoslovakia, but we failed to obtain any results".

61. At about the same time the firm of Telefunken began trials with Würzburg apparatus. They claimed that it could pick up aircraft, but their demonstration failed.

62. The General said that he had ordered about 200 Freyas and 800 Würzburgs for the G.A.F. before the war, but he had obtained only a small number by the time hostilities had begun. A very few Freyas were set up on the North Sea coast and these worked satisfactorily, being instrumental in causing heavy R.A.F. losses over Heligoland in the bombing attacks in 1939.

63. Freyas were not used during the Norwegian campaign, but were set up after the Luftwaffe had established itself on the Norwegian coast. The signals organisation was obliged to hand over all the Würzburgs intended for the aircraft reporting system to the Flak arm, because the radar apparatus brought out by Lorenz which was used for Flak aiming had proved a failure.

Fighter Control.

64. From the reports of his Signals Intelligence Service, the General concluded that the R.A.F. aircraft reporting system and radar were used principally to aid the ground control of fighters. For a long time the Luftwaffe was unable to organise ground control of day fighters, because of the opposition of most of the pilots, who insisted on free-lance fighting.

65. The change was introduced very slowly and was influenced by the discovery by the German Signals Intelligence Service that the R.A.F. was using Pip-Squeak. The Pip-Squeak aircraft apparatus was later captured. The procedure seemed a good idea to the German pilots, who wanted a Pip-Squeak of their own, and began to realise the advantages of fighter control.

66. Actually, German industry had for a long time been working on a similar apparatus, but failed to bring out a satisfactory one. Later the Pip-Squeak apparatus was copied by the Germans, but it was never used operationally.

67. The organisation of radar for fighter defence suffered both before and during the war from inter-departmental difficulties and intrigue.

68. The main reason why radar was not developed earlier for ground control of fighters, General MARTINI said, was that until the summer of 1941 the Luftwaffe concentrated on offensive tactics to the neglect of fighter defence. The decision to subordinate aircraft reporting and radar to fighter ground control was reached at a stormy conference in Russia in the early stages of the campaign. MOELDERS and GALLAND insisted that the only way to improve fighter interception and cut down losses was to introduce satisfactory ground control.

Research, Industry and Intrigue.

69. General MARTINI had a constant struggle to obtain the technical improvements necessary for carrying on the high frequency war. Except for a period of less than a year, during which he was given special responsibilities by GOERING, General MARTINI had no authority to make demands either from the scientists or from the industrialists.

70. Until 1937 he and his subordinates had been allowed to keep in close contact with the wireless industry, and to state their requirements, but merely for information. After that time Feldmarschall MILCH strictly forbade these contacts, and ordered that requests and enquiries should be made by the signals organisation through the Technisches Amt, of which he was head. Feldmarschall MILCH knew just as little about high frequency matters as GOERING.

71. MILCH issued his veto during a scandal in 1937 over the sale of the FUGe.7 to Switzerland, in connection with which a number of prominent scientists at Telefunken were arrested. P/W had the feeling that the scandal was worked up to prevent free collaboration between industry and the services, and to place the big firms under the supervision of the Technisches Amt.

72. Relations between MARTINI and MILCH were strained for years, even if the two men were outwardly polite to each other. MILCH was a great opponent of the General Staff, and particularly of the Tactical Führungsstab. He attempted to have the whole signals organisation placed under his command, but MARTINI resisted this strongly.

73. Thwarted in his empire-building, MILCH carried on an underground war against the signals organisation. On one occasion, in the presence of MARTINI, he said to GOERING: "It is a great crime that this signals organisation has been set up!" MILCH tried to prevent Luftwaffe officers from working in the Technisches Amt, and made liaison with MARTINI extremely difficult. For a time MARTINI had a representative at the Technisches Amt but he requested to be posted back to the signals organisation, saying that it had room only for engineers and not for officers.

74. MARTINI had engineers in his Experimental Regiment, the L.N. Versuchsregiment at Koethen, working together with the officers, but the engineers in the Technisches Amt refused to co-operate with them. When the Versuchsregiment brought out something new and stated its requirements, the Technisches Amt engineers said that their work was all wrong.

75. Even during the time that UDET was head of the Technisches Amt, MILCH in P/W's opinion, really held the reins because of his position as GOERING's representative.

76. Feldmarschall MILCH made a point of co-operating with the signals organisation from the summer of 1941 for about nine months, during which MARTINI had GOERING's backing. Because of MILCH's opposition, MARTINI was still given no authority over the scientists or the industrialists, but he was given special powers to hold conferences with them, and with representatives of the Technisches Amt.

77. He had GOERING's authority to discuss his requirements in the utmost detail. When agreement had been reached on which developments could be carried out by the industry, the General had to make written requests to the Technisches Amt to put through the required orders. Thanks to GOERING's backing, MARTINI was able to force the Technisches Amt to place these orders.

Role of the Versuchsregiment.

78. The Versuchsregiment had the task of conducting experiments with signals apparatus, and stating the technical or tactical requirements of the Luftwaffe with regard to it. Their reports went to the Technisches Amt. When the apparatus was delivered to the signals organisations the Versuchsregiment carried out operational tests with it and often made improvements.

79. The Versuchsregiment Koethen acted as a fillip to the wireless industry, sometimes producing new apparatus which the industrialists were unable to manufacture.

80. For example, the height measuring attachments on the Freya were built and produced by Koethen. Whenever work of this nature was handed over to Koethen, MARTINI had to obtain the sanction of the Technisches Amt. Despite the rivalry with the Versuchsregiment, this sanction would be given. Feldmarschall MILCH once or twice indicated that Koethen should be directly subordinated to him, but never pursued the matter.

81. General MARTINI described Dr. KÜNHOLD, the Technical Chief of the Versuchsregiment, as exceptionally able and at the same time very modest scientist. He was responsible for all the technical work done at Koethen. Oberst LÖWE, Kommandeur of the Regiment, was responsible for administration and discipline. He was also a good technician. He had formerly been a Captain in the Signals section of the Landes Polizei and had been taken into the Luftwaffe signals organisation in 1934.

82. The work of the Versuchsregiment at Koethen embraced all branches of the signals organisation; its work on radar was in practice restricted to ground apparatus.

83. The experimental station at Werneuchen restricted its research to radar and concentrated on airborne apparatus. Whereas Koethen, under the signals organisation, trained the experimental detachments which were incorporated in the signals regiments, Werneuchen was restricted to engineers and was subordinated to the Technisches Amt.

84. Oberstleutnant HENTZ, at the end of the war head of General MARTINI's Radar Section, the VI Abteilung, was formerly Kommandeur of Werneuchen responsible for its growth.

85. Co-operation between Werneuchen and the signals organisation was always better than that of the Technisches Amt itself with the signals organisation.

Industry's need of Technicians.

86. At the end of 1941, it became obvious that the wireless industry did not have a sufficient number of technicians to carry out the requirements of the signals organisation.

87. Realising the danger of defeat in the high frequency war, MARTINI offered the industry up to 15,000 technicians from his Signals Regiment. He started by having 7000 to 8000 men transferred to industry, and then persuaded GOERING to transfer back to the industry and research organisations about 15,000 technicians from both the Army and Luftwaffe.

88. While the transfers were being carried out, the manpower crisis occurred on the Russian front and the process was reversed. Thus the best experienced technicians were being sent from industry to the Russian front, while less capable men were coming home and required at least a year to be trained.

Countering of Allied Countermeasures.

89. The very nature of the high frequency war with countermeasures, measures to overcome countermeasures and constant changes in the apparatus, led to demands from the wireless industry which it could not meet. Thus the Versuchsregiment was frequently called upon by MARTINI to make the alterations itself.

90. For instance, when Freyas were manufactured with only one wavelength, MARTINI told the industrialists that it would be useless without a wave band. The industrialists replied that such a change would be colossal work which would require a very long time. "At any rate", MARTINI interposed, "bring out the next series of Freyas with two wavelengths, the one after with three, and gradually get a reasonable frequency band". The industrialists made objections, saying that the work was too fiddling.

91. MARTINI then ordered the Versuchsregiment to make the required modifications in the Freyas. Thus, despite British jamming from high-powered transmitters, the Versuchsregiment modified a sufficient number of Freyas for some to operate without being jammed.

92. Gradually all the Freyas were modified at Koethen under the covername "Voll-Wismar" and the wireless industry finally produced Freyas with an adequate frequency band.

93. Similar difficulties were experienced with FuG.16. The signals organisation asked the Technisches Amt for the apparatus to be constructed with 100 two-way channels, but through a misunderstanding it was produced with 100 one-way channels.

94. In the ensuing discussions, the industrialists considered that they would not be able to produce the apparatus with the required frequency band for about two years.

FuG.25 and 25A.

95. The failure to organise the mass production of the German I.F.F., the FuG.25A, at an early date was attributed by the General to the weakness of his position in relation to the Technisches Amt. He was first shown the apparatus, which had been constructed by Dr. SCHULTHES, in September or October 1939. He was delighted with it and requested the production of two or three thousand.

96. These unfortunately were not produced, the General said, because too many people had a say in the matter. "Shortly afterwards a high official at the Technisches Amt told me quite by chance that 30,000 FuG.25 were already in production. That was terrible; it was my greatest worry. But Reichsmarschall GOERING said to me "It is the easiest problem of all and you haven't even solved that for me!"

Switching on of I.F.F.

97. The General had heard the explanation from British bomber pilots that they kept their I.F.F. switched on to dowse searchlights, but he did not believe it.

98. He thought that there must have been some important reason this procedure which allowed the Germans to pick up the approach of R.A.F. bombers. He asked whether it was maintained with the object of eventually being of use to night fighter escort aircraft. He pointed out that it was of exceedingly great value to the Germans.

The Panorama Apparatus.

99. About September 1942, somebody, whose name MARTINI never discovered, told GOERING that the signals organisation had neglected to develop the Panorama search apparatus. GOERING in a fit of temper told MARTINI that he had sabotaged the Panorama apparatus and MARTINI retorted sharply. That same day GOERING appointed Oberst KNEEMEYER as his Wireless and Navigation Officer, and put an end to MARTINI's special functions in high frequency developments.

100. MARTINI continued to hold conferences with the scientists and industrialists on behalf of the Chief of the General Staff, but without GOERING's authority he laboured under great difficulties.

101. The production of a German Panorama apparatus was delayed largely because at the beginning of the war tests were unsuccessful, and afterwards the wireless industry neglected it to try and satisfy other demands regarded as more urgent. The first Panorama, which was put up to the West of Berlin, could not be made to work and its development was shelved.

102. At the beginning of 1943, General MARTINI insisted that he should be shown what the apparatus was worth. He was told that the apparatus, which worked on one of the Freya frequencies, had not yet been perfected. He sent two members of his staff to try and overcome the technical difficulties and three months later he was asked to inspect the apparatus as it was at last working. He spent two hours looking at it, but the demonstration failed.

103. A second prototype, which worked on decimetre waves, was burnt out just after being completed.

Centimetre Wave Research.

104. The failure to develop radar on centimetre waves was due, General MARTINI said, partly to Feldmarschall MILCH's lack of understanding of the problem, and partly because the wireless industry could not cope. He himself had demanded in 1937 that research should be carried out on centimetre waves.

105. Staatsrat ESAU made experiments with ultra-short waves at first with a milliwatt, which he later increased to a watt. The scientist said that it was not his business, but that of the industrialists to continue the work with higher power. The industry, however, had too many other orders on hand, and Feldmarschall MILCH, who could have put the research in the hands of the Technische Amt, did not realise the implications of the high frequency war.

106. In the summer of 1942, GOERING suddenly decided to replace Dr. ESAU by Dr. PLENDL, whom he promoted to the rank of Oberst Ingenieur, saying: "I appoint you chief of all high

frequency research in Germany". Dr. ESAU complained to General MARTINI of being cold shouldered, but the General had not even been informed of GOERING's decision beforehand.

107. General MARTINI made about 60 closely inter-connected requests for research on high frequency matters to Dr. PLENDL. He said that PLENDL's work as Chief of high frequency investigations was somewhat disappointing, and criticised him for spending too much time on organising, to the neglect of research. He did not put the same energy into this work as he had done in the development of the "X" and "Y" systems. However, the General did not agree with those critics who accused Dr. PLENDL of combatting the protagonists of the Egon system.

108. In 1944 GOERING became dissatisfied with PLENDL, and reinstated ESAU in his place. The old collaboration between ESAU and MARTINI was then resumed.

The Egon System.

109. Dr. SCHULTHES, who first worked with GEMA for the Navy and later with Siemens, had reported early on that the Egon system promised great possibilities. At one of the General's conferences in 1941, he said that exact location up to 350 kilometres could be attained with Egon, but could not give a date for the perfection of the system. Nevertheless those scientists who were opposed to Dr. PLENDL advocated the immediate scrapping of the Benito fighter control system and the introduction of Egon.

110. MARTINI intervened, stating: "The problem is not so simple. We have built up the whole organisation for the Benito system which has definite advantages; it can be used not only for bombers but for fighters with very good results. We must develop Egon with all possible speed, but before it is ready to be used operationally it would be madness to do away with Benito. We must have both systems operating at the same time".

111. In General MARTINI's view, time has justified his point of view. The Benito system had proved itself thoroughly efficient for fighter control, and in the later stages of the war those controllers who used both systems were glad to check up one on the other. With the small fighter force to which the Luftwaffe was reduced, a small error in ground control was fatal.

Capture of the British "Gee" Apparatus.

112. GOERING, who was in the habit of cursing the signals organisation, was particularly vehement when he heard that a British bomber had been captured with a fine apparatus on board which was an improvement on anything brought out in

Germany. This was the "Gee" apparatus which the Germans named Hyperbel.

113. General MARTINI said that he learned a long time afterwards that the firm of Telefunken had actually worked out a similar system to "Gee" on long waves in 1939. Telefunken which had given the apparatus the cover name "Ingolstadt", had proposed developing it, but the Technisches Amt had turned it down because of an order previously issued forbidding work on any developments which could not be completed by the end of 1940.

114. The "Gee" apparatus was handed over to Koethen for examination and copies. The reason why "Gee" was not jammed earlier, the General thought, was because of the German lack of ultra-short wave transmitters. It required a good nine months to construct apparatus, once the prototype had been completed. For a time, he said, the Germans considered that they were successful in jamming both "Gee" and "Oboe", but when these systems were used by the Allies with many wavelengths, the only answer was to build up a great system of jamming throughout Germany. This system was never completed.

Jamming - The Feldberg Project.

115. The General recalled an attempt in 1945 to jam Allied airborne radar which ended in disaster. The first new high-powered German ground jamming plant, which was manufactured with great difficulty because of Allied bombing attacks, was finally all assembled inside a tower on the Feldberg with the object of jamming all wavelengths from the one place.

116. The work was carried out by the Reichspost "just as it were peacetime" without a thought to possible consequences of bombing. No sooner had all the apparatus been completed than the tower was destroyed by a fighter bomber attack. The case was brought before a court-martial.

H2S Countermeasures.

117. The Germans were not successful in their ground countermeasures against H2S, because they were unable to get such apparatus as they had captured intact to work properly. The apparatus was technically in order, but despite repeated trials the navigators were unable to achieve results with it. Results were finally with a F.W.200 which was fitted with both the H2S and the "Berlin". When flying over the Mark Brandenburg in the spring of 1944, the aircraft crashed for some unknown reason.

"Berlin" for Night Fighting.

118. It would have taken a long time, the General said, before "Berlin" could have been put into operational use for bombing on the same lines as H2S for which it was originally constructed. As the Germans were not carrying out bombing raids it was no longer important. It was therefor proposed to adapt the "Berlin" for night fighting, and as such it would have been used operationally within a comparatively short while.

119. The Germans had great difficulty towards the end of the war in constructing airborne apparatus such as "Berlin" small enough to fit into their aircraft. They had scarcely any four-engined aircraft, and the Ju.88 was not roomy enough. In the final stages the wireless industry had to concentrate on apparatus sufficiently small to fit into the Me.262.

Me.262 Radar.

120. No Me.262 had flown operationally with radar, but a few successful trial flights had been carried out, using Neptun apparatus which was small to go into the aircraft without being unwieldy.

121. The type used was the forward-looking Neptun. The test aircraft crashed and the observer was killed, but the pilot reported that good blips had been obtained.

Me.163.

122. No attempt had been made to operate the Me.163 with ground control.

Kammhuber's Night Fighter Belt.

123. Speaking of the development of German night fighter defences, General MARTINI said that General KAMMHUBER did not at first appreciate the value of radar. Before the latter had taken over the night fighter defences, he had distinguished himself as a good blind flying pilot, but he had no technical knowledge of radar. For that reason he organised the well-known searchlight belt defending the western approaches to the Reich.

124. About two and a half months after KAMMHUBER had begun to work on the night fighter belt, MARTINI sent him six reporting companies which were then equipped with Würzburgs, because MARTINI considered that this would be the best way of organising night fighter defences.

125. The reason why the night fighter defence sectors were worked out in a perfect pattern was that KAMMHUBER, being a keen organiser, considered that he would benefit by their being all exactly alike.

126. Asked why KAMMHUBER did not organise his night fighter belt to rely on Würzburgs from the outset, General MARTINI said that he himself had not been consulted when the work began. GOERING had ordered KAMMHUBER to organise night fighting, without referring him to MARTINI. KAMMHUBER did not even know what to do with the aircraft reporting companies which MARTINI sent him; however, he studied the whole question of high frequency with much vigour, and soon reorganised the night fighter defences to depend on ground radar.

127. The reason why so many radars were put up on the Kammhuber belt was that the Germans at that time were using the old Würzburgs which could obtain satisfactory results only up to a radius of 35 kilometres. When the Würzburg Riesen were introduced, General KAMMHUBER kept the other Würzburgs for a time so as to maintain the pattern of his organisation throughout the night fighter belt.

128. KAMMHUBER preferred the Seeburg Tisch method of plotting to the Freya-AN system, because he said that the former method of control could be understood by all but the latter could be managed successfully only by special gifted officers. MARTINI was disappointed because he considered that there were enough capable young officers in his organisation to have worked with the Freya-AN.

The Removal of Kammhuber.

129. The General said that he did not know exactly why KAMMHUBER was removed to Luftflotte 5. In his own words, taken from shorthand notes during interrogation: "It was a sudden decision of the Reichsmarschall and I imagine that he must have reached it after one of the officers had told him something or other. It happened during a big conference at Deelen during which the Reichsmarschall attacked me sharply because he was determined not to understand why I wanted to maintain the visual and oral aircraft reporting system as well as the radar organisation. I explained that it was important to know what types of aircraft were approaching when there were low-flying attacks. He would have nothing of it and was in a very bad temper.

130. "The next day he took General KAMMHUBER aside, and then came back saying that he was to be A.O.C.-in-C. of the Luftflotte in Norway. Possibly the reason for this was that the night fighters were not gaining so many victories. Outwardly the new post meant a great promotion, for he was a young officer, and as A.O.C.-in-C. he attained the rank of a General-Feldmarschall.

131. "I did not ask him what he personally thought about it. Perhaps he had expected to control all the fighter forces in Germany, and to have become an A.O.C.-in-C. like that.

132. "The change took place at the time of the appointment of a new General Staff. I was to have been thrown out also. They wanted to divide up my work, and I had made it a hard and fast rule that my organisation must not be split up, whatever happened. I had to insist on this several times, and each time said that if the organisation were split up, I should ask for another post. Finally on that occasion too, it was decided that I should.....

133. The Reichsmarschall did not understand the principles of night fighting, but discussed them a great deal with General KAMMHUBER just as he did with me. When I held a different opinion, I told him so quite openly. For a long time he listened to me, and then one day he refused to listen to me at all. It was roughly the same with General KAMMHUBER. He too used to state his opinion openly".

IV - SUCCESS OF WINDOW.

Not a Surprise.

134. The dropping of Window by Bomber Command over Hamburg in the summer of 1943 did not come as a complete surprise to the German signals organisation. For about a year engineers at the Technisches Amt had studied the question. The scientists had a suspicion of the danger to German defensive radar but said nothing because they did not wish to bring them-selves into disrepute.

135. Six months before the Hamburg raid their experiments had proved conclusively what a menace the metal strips represented. The information was passed to MARTINI, who handed GOERING a two-page report on the subject, pointing out what a terrible danger they might be. GOERING was so upset that he ordered MARTINI to destroy the document at once, and take the utmost precautions to prevent the enemy from learning of the discovery.

136. "It was thus extremely difficult", the General said, "to work out countermeasures because we dared not experiment with the little beasts for fear of their being discovered. Had the wind blown when we dropped the metal strips, people would have picked them up, talked about them, and the secret would have been betrayed".

137. When the Hamburg raid came there was great excitement because the signals organisation had not discovered any countermeasures. GOERING blamed MARTINI again, saying: "The

British have now gone and used the metal strips, so they have surely got countermeasures against them and you haven't!"

Window Countermeasures.

138. A few days after the Hamburg raid, two scientists independently worked out countermeasures to Window and the result was the Würzlaus attachment to the Würzburg and the Freyalaus attachment to the Freya. When considerable quantities of Window were dropped, the Würzlaus was swamped, however, but the Freyalaus still gave results. Finally a combination of the two, the "K-Laus", was tried out but was found difficult to handle.

139. The General admitted that no really satisfactory answer to Window had been found, and doubted whether there could be one if the strips were dropped in sufficient quantities and places. The Flak batteries never succeeded in using their own radar instruments when the Allied air force used sufficient Window or Chaff, but the aircraft reporting system was at least able to provide them with rough data on height and direction.

140. With Koethen Grau apparatus they managed for some months to get a rough picture despite Window. German night fighters were on the whole not too much affected by Window and at first it frequently even gave them a rough idea of where to find the bomber stream. Their task was then complicated by the countermeasures of 100 Group, R.A.F. Bomber Command, which General MARTINI described as outstandingly good.

141. Explaining the lines on which the Germans developed their radar defences, General MARTINI said that in order to obtain as early a warning as possible. They built bigger and bigger apparatus, as the range of the Allied bombers increased. The Germans thus gradually increased their warning range from 100 kilometres with the Freya to 300 kilometres with the Wassermann, the Mammut and the Elefant. The danger of jamming and bombing was fully realised but the Germans were glad to have the latter types of apparatus when the British introduced Window and airborne jamming,

142. Elefant proved particularly useful as it was not jammed for a long time. Results with Klein-Heidelberg were also good. General MARTINI believed that the apparatus had been invented by Oberpostrat SCHOLZ, who had the chief merit for jamming British radar when the Scharnhorst and Gneisenau passed through the Channel. The General attributed the success of this operation to the fact that it was started with very slight jamming which was gradually and almost imperceptibly increased until it became effective.

Wilde Sau Night-Fighting.

143. The fact that the Germans began to develop Wilde Sau free-lance night fighting at the very time that the R.A.F. introduced Window was largely fortuitous. Oberst HERRMANN was mainly responsible. He said that the night fighter had to take risks in German Flak areas and shoot down bombers caught by the searchlights or in the glow of the blazing target. He said he was quite prepared to do free-lance night fighting of this nature himself, and did so.

144. GOERING, seeing that far fewer bombers were being shot down because of Window, encouraged the younger night fighters to go up over the targets and fight.

V - SIGNALS INTELLIGENCE AND SIGNALS DEVELOPMENTS.

SIGNALS INTELLIGENCE.

Work of the Intercept Service.

145. The German Signals Intelligence Service (Luft Aufklärungs Dienst) was under the operational command of Oberstleutnant FRIEDRICH, who was subordinate to MARTINI through Oberst MORGENSTERN; the officer responsible for discipline and administration of the service was Generalmajor KLEMME. Coverage of Allied signals was determined by the Intelligence of the Luftflotten in which the signals units operated.

146. GOERING himself was interested in the service and occasionally gave personal orders for some particular activity to be covered.

147. Results from the German Signals Intelligence had, according to General MARTINI, given high satisfaction to everyone until the last phase of the war, when the service, no longer able to cope with the enormous number of Allied raids or to keep track of the continually changing basings of Allied aircraft, also came in for its share of GOERING's displeasure.

148. Up to this point it had never failed to provide, from the Battle of Britain onwards, a current and exact Order of Battle of the British and later of U.S.A.A.F. formations, including subordinations, the number of squadrons operating in each sector, and their dispositions and strength.

149. Valuable information on Allied fighters was given by the interpreters, who were sent up with reconnaissance crews operating from Norwegian and Mediterranean bases. They were briefed beforehand in the locations of Allied fighter units in the operational area, and the frequencies on which the latter were likely to work. The low number of suitable men available, however, had confined their employment to reconnaissance

aircraft. The General thought they would have continued to be valuable as long as air to air and ground communication remained insecure.

150. The Germans were able to recognise Allied preparations for taking off, not so much through the pilots' talk as by observation of small details in point to point traffic. The slightest carelessness in procedure between two ground stations, for instance, might suffice to reveal which networks were active. Then, even though the traffic itself remained unbroken, time and time again it became possible to draw definite conclusions concerning the operations involved by the comparison of traffics occurring in similar form.

151. The General admitted that sometimes the German intercept service was tricked by British spoof traffic.

152. The very high standard of R/T discipline shown by British pilots was held up by General MARTINI as a model for German pilots, who, as a result of the example began to show marked improvement in the later stages. He considered American pilots to be about the equal of the German pilots in this respect.

Employment of Signal Aircraft.

153. General MARTINI thought that experiments with Signals Ju.52's had begun in the Spanish war, but in any case exercises with them shortly afterwards had proved their worth, and they were used with success in considerable numbers in the Polish Campaign.

154. Later on, with fighter units being constantly switched from one area to another out of range of their home stations, the signals Ju.52's were used to pass information from Aircraft Reporting Station and ground radar to airborne fighter formations.

155. As the scale of Allied attacks increased, it became impossible to protect these signals aircraft on the airfields. Their signals equipment was therefor made portable, taken out on arrival at the airfield at which it was desired to operate, and set up some distance away.

156. Allied bombing was thus responsible for the abolishing of the signals aircraft, which was used in the later stages of the war as a transport aircraft.

Liaison with German Navy.

158. All intercepted signals that concerned shipping were passed immediately to the German Navy, who controlled the costal observation posts. In general, liaison with the German Navy in signals matters was very close indeed, key personnel

of both services and the Army often working together on the same problems.

High Grade Cyphers.

159. The General did not think that Allied high grad Cyphers had ever been broken, although since he was only concerned with what came out he could not speak with certainty. Allied Cyphers in general were very secure.

160. Prior to the North African Campaign the Germans themselves introduced the "Sägefisch" for communication over great distances in the event of cable being rendered unserviceable.

161. "Sägefisch" comprised a short-wave transmitter operating in conjunction with an automatic cyphering Machine; it was efficient only over distances of 250 miles or more. Messages were typed into the machine in clear, automatically encyphered and then transmitted. At the other end they were automatically received, decyphered and typed out by the machine also in clear, the entire operation taking only a few minutes.

162. Continual watch had been kept by the Germans on their Sägefisch traffic, and whenever possibilities of the Allies breaking down the cypher were observed, countermeasures were immediately taken to render it more secure.

Defensive Measures.

163. Towards the end of the war, with the overwhelming superiority of the Allied air forces, special efforts were made to obtain the maximum efficiency from the German Intercept Service, which was accordingly brought into much closer co-operation with the Aircraft Reporting Service, employing visual and radar means for aircraft detection.

164. Radar stations and intercept stations finally worked together, both at Divisional and Sector Battle H.Q.'s. By comparison of the intelligence produced by both services, it was possible to obtain a more accurate picture of the air situation. In this connection, the General said that Allied bomber formations could be D/F's to within 1° of accuracy.

165. To ensure that German signals traffic could not help an eventual enemy to D/F German airfields, General MARTINI laid it down from the outset that transmitters must not be situated in their vicinity. Throughout Germany, therefore, the wireless transmitters were built at least 10 kilometres away from the airfields. One transmitter station was usually built to serve several airfields. To maintain land communications during bombing attacks the decimetre wave point-to-point system,

Richtverbindung, for telephonic and/or telegraphic communications was extensively developed.

166. In Italy, Allied bombing frequently made it impossible for the Germans to move along the roads, and telegraphic communications were wrecked. The Luftwaffe, however, was able to help the Army out with its Richtverbindungen.

Point-to-Point Communication.

167. The General said that a number of conversations on Richtverbindungen were held which should not have taken place, since this method of communications was not secure.

168. Another difficulty with the Richtverbindung system was that it could be seriously jammed. He believed that the jamming which actually took place was by chance, and that it came from airborne transmitters intended to jam the German ground radars. He even considered organising a raid warning system on the basis of this jamming.

Spoof before D-Day.

169. Before D-Day the Germans were tricked by a spoof operation which gave them the impression that a big force was making for Fécamp.

170. Although many aircraft reporting radars along the coast had been put out of action by Allied bombing, the General claimed that there were still sufficient left to maintain the service. (He said that he was not responsible for the Naval Radar Service). •

171. During the last few days before the invasion, the radar operators were often misled to report that something was coming when nothing was there at all. This was partly due to the atmosphere, and the radar operators were accordingly warned to caution when reporting.

172. As a considerable number of jamming transmitters on the French coast had been destroyed by Allied attacks, the Germans had to achieve results with mobile ones which were to jam ground-to-air R/T. They were never used, having possibly been destroyed on the way to the coast or on their arrival.

SIGNALS DEVELOPMENT.

Allied Bombing.

173. The signals organisation suffered most through the Allied bombing of wireless valve factories; on the other hand the General did not think that decisive results could have been achieved, had the Allies made a concerted campaign exclusively against the valve industry.

174. The Germans started dispersing stocks after Telefunken and Lorenz had been severely damaged. A marked shortage of valves resulted, but according to the General the situation was never critical. The General admitted, however, that during the Mediterranean campaign, for a time fighter aircraft were delivered to Sicily without wireless apparatus.

Low Quality of Radar Operators.

175. It was mentioned to General MARTINI that earlier in the war, when the Würzburg was captured on the French coast at Bruneval, the prisoners who were taken with the apparatus were found to have remarkably little technical knowledge.

176. The General ascribed this to the crisis in manpower among wireless technicians, which forced him to use unskilled men and later women as radar assistants.

177. Wireless technicians had to be trained within the signals organisation, because before the war there were no radio amateurs as in Britain and the United States. The activities of all amateurs had been suppressed in Germany "at the time of the Communist danger".

Failure of HS.293.

176. Lack of success with the Hs.293 radio-controlled glider bomb was attributed by the General largely to two factors. Firstly, the Technisches Amt, which was responsible for its development and production, kept the weapon entirely for itself. Only when it was realised that there were not enough frequencies on the radio control of the bomb to make it immune from jamming, did the Technisches Amt feel obliged to bring the signals organisation into the picture. General MARTINI insisted on a number of alterations, but the Hs.293 was brought out before the radio control had been perfected to make it free from jamming.

179. Secondly, the Germans had not sufficient numbers of suitable aircraft from which the bomb could be operated. The Do.217 with which it was mainly employed was, moreover, extremely limited in range.

180. The high vulnerability of the Hs.293 to jamming was accepted by the Germans, who decided that it had best be used in a heavy surprise attack in an area where immediate observation by the Allies would be difficult. Norway was considered to offer best chances of success, and it was therefore a very unpleasant surprise to the General to learn that the bomb had been used in the Mediterranean theatre shortly afterwards.

181. Nevertheless, to render Allied countermeasures as difficult as possible and in order to camouflage tuning, radio stations were set up whenever the bombs were being used, and aircraft were employed with the bombers to transmit on other wavelengths while the bombs were being armed.

182. In spite of these precautions the General thought that the Allies might have succeeded in jamming the bomb, owing to the extreme simplicity of the wireless control.

183. Radio-controlled bombs had been conceived solely as an anti-shipping weapon, the HS.293 against large transport, the FX against battleships and armoured vessels of all sorts. They were afterwards relegated to uses for which they were never intended - against bridges and other land targets.

Collaboration with Japan.

184. The extent to which the Germans gave their secrets to the Japanese was not known by the General. He said that early in 1945 HITLER ordered that all German technical secrets of short and medium term value should be given to the Japanese.

185. He said that no members of the signals organisation had left for Japan apart from those who were presumably in the U-boat which was intercepted by the U.S. Navy in the Atlantic.

186. From a visit to Germany paid by a delegation of Japanese officers. General MARTINI gained the impression that they were behind-hand in radar. A Japanese told him that they had apparatus with centimetre waves, but he could not remember the details. He regarded the Jagi aerial as very good, but did not know whether or not the Technisches Amt had received it from Japan. He was sure that the Japanese had received at least documents and photographs of German ground radar.

A.D.I.(K)&

U.S. Air Interrogation.

21st June 1945.

S.D. Felkin

Group Captain