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.

EQUIPMENT OF A Y-SITE.

1. The operational procedure in the control of fighters by the "Y" procedure was described in A.D.I.(K) 525/1944. The interrogation of the two G.A.F. signals officers, who supplied the information for that report, has produced a large amount of information on Y-site and airborne equipment which is of rather more limited interest. The present report, which contains that information, is therefore being given a limited circulation.

2. Captured documents on the "Y" procedure have helped to add further information, and have provided a further basis for interrogation; these documents have been forwarded to A.I.4.(b).

TRANSMITTER HUT.

3. Four types of "Y" ground transmitter are believed to be in use. Y-Stations in Germany are said to be equipped with a four-stage transmitter known as Berta I or Berta II, with an output of 80/100 watts and a range of 400/500 kilometres, when controlling aircraft at heights of 5,000/7,000 metres.

4. Another transmitter used in Germany is the S16B (Sender 16 Boden), which is a modification of the FuGe 16, and which has a maximum range of 250 km. when used in conjunction with a Rechlin range-measuring unit, or a range of 250/350 km. when used with the more accurate Siemens range-measuring unit.

5. Y-Stations installed in France employed a Sadir 80/100 watt transmitter, usually also in conjunction with a Siemens range-measuring unit; the ranges achieved by this combination were of the order of 400/500 kilometres for aircraft operating at heights of 5,000/7,000 metres.

6. The transmitter S16B (Sketch I) is operated in the following sequence of steps:-

(i) Main switch (1) first to stop Hzg (Heizung = heating) then after two minutes to stop "Ein" (on). Lamps (2) and (3) light up.

(ii) Select frequency to be used. Switch (4). Frequency indicated in Window (5).

(iii) Switch (6) to stop Test.

(iv) Knob (7) (blip intensity) turned until vertical line appears on Cathode Ray tube (8).

(v) Definition of line re-adjusted by means of Knob (9).

(vi) In the meantime operator of range-measuring unit has switched on "Geber" for production of "Messton" (Modulation tone).

(vii) Knob (10) turned to right until the luminous area produced in (3) corresponds to 80% modulation.

(viii) Transmitter now ready tuned for transmission to commence. Switch (6) to right (Load).

(ix) Transmission is automatic when the switch for the modulation note is depressed by the operator of the range-measuring unit; or for R/T instruction when key for R/T circuit is depressed by the plotter.

7. When taking over a "Y" controlled aircraft from one station to the next, the following procedure for tuning the receiver and transmitter is carried out by the station taking over when using a S16B transmitter.

8. As a first step the receiver of the range-measuring unit is set to the transmitter frequency given for the aircraft. The range measurer then tunes his receiver to maximum audible strength of the modulation tone received ("Hörmaximum").

9. The 80% modulation image on Cathode ray tube (8) then shows an additional bright vertical line within the area of the image. By turning frequency stop (4) this vertical line is displaced to the right.

10. The operator of the transmitter turns the frequency stop (4) until the line reaches a limiting position, and on further movement of stop (4) tends to re-trace its path to move again to the left. This turning point ("Umkehrpunkt") corresponds to the accurate setting of frequency stop (4), and provides a

visual method of tuning the transmitter accurately to the receiver frequency of the "Y" aircraft.

D/F'ING CABIN.

11. The D/F'ing cabin consists of an octagonal wooden hut erected on the platform of the receiver pylon; the latter are of wooden construction and according to P/W, are either 15 m. or 25 m. heigh, depending on the location of the site.

12. The present P/W were acquainted with two types of D/F equipment, known respectively as "Heinrich I" and "Heinrich III". The latter equipment is of recent origin, and was only introduced to Y-Stations in France early in 1944.

"Heinrich I" D/F Equipment.

13. The aerial array of this equipment, illustrated in Sketch II, consists of four quarter-wave vertical dipoles arranged in pairs at the corners of one side of a horizontal frame about four metres long. In each pair one dipole is mounted above and one below the frame. Two half-wave reflectors are mounted on the opposite corners of the frame. A single quarter-wave dipole is mounted centrally, and is connected to the range-measuring unit situated at the base of the receiver pylon.

14. The vertical axis of the aerial system can be rotated about the control axis of the pylon by means of a hand-wheeled drive operated from the interior of the cabin. The vertical axis of the aerial is geared to a graduated disc, marked from 0° to 360° in a box placed centrally on the table of the D/F cabin. Readings are made through a small window carrying a hair line at the back.

15. To the left of the central box is a receiver E16P; this is the normal receiver unit of the FuGe.16, from which the A.V.C. (Regler) has been removed. To the right of the box is a voltmeter.

16. The D/F operator, who is equipped with headphones, sits in front of the box. The modulated note or "Messton" reaching the receiver is audible in these headphones, and having established the minimum position, the operator checks the direction as follows.

17. The aerial is turned out of the minimum position by about 30°, and the reading of the output meter is noted. If, on pressing a switch attached to the output meter, the voltage falls, the direction in which the bearing has been taken is correct. If, on pressing the button the voltage increases,

this indicates that the aerial has to be swung by 180° to get the correct direction.

18. The readings should on the average be correct to within 0.5°, and for distances of under 100 km. to within 0.3°. This reading is spoken aloud by the D/F operator, and is recorded by a logbook-keeper (Betriebsbuchführer), who also repeats the reading on a telephone connected to the range-measuring unit and from there to the plotting room.

"Heinrich III" D/F Equipment.

19. The Heinrich III, also known as the "Umtastpeiler", is referred to in documents issued by "Hochfrequenzforschung Einsatzstab Holland" as having been developed at the "Flug Funk Forschungsinstitut Oberpfaffenhofen".

20. The Heinrich III differs from the "Heinrich I" in several respects. The aerial system consists of six quarter-wave vertical dipoles, four of which are arranged in pairs at the end of a single horizontal support about 4 metres in length. The fifth dipole is mounted centrally above the D/F cabin, but also forms part of the D/F aerial system.

21. The sixth quarter-wave dipole is placed vertically within the structure of the receiver pylon midway between the D/F'ing cabin at the top and the range-measuring room at the base, and is connected to the range-measuring unit.

22. The aerial system rotates horizontally about the central axis of the pylon, and the vertical axis of the aerial is geared to the central box in the D/F'ing cabin as with the Heinrich I.

23. The D/F receiver used is the El6EP, and this operates in conjunction with an automatic device known to P/W as PUG (Peilumtastgerät), also referred to in documents an ZVG 16 P (Zielflugvorsatzgerät 16 P), and finally with a visual indicator termed AFN 2 (Probably = Anzeiger Frequenzniedrig 2).

24. The PUG is connected to E16EP as well as to a plug connection on the central box. The AFN 2 device has the appearance of a mall box, measuring approximately 20 x 10 x 10 cms., connects to the same plug.

25. The dial on the side of the AFN 2 has a pointer which is directed vertically downwards when the aerial is in the minimum position. The correct direction is now established by turning the aerial a few degrees out of the minimum position.

If the pointer deflects in the same direction in which the degree graduations in the small window have moved, the bearing has been taken in the correct direction. If the pointer moves in the opposite direction to the movement of the degree graduations, then the aerial must be swung by 180°.

26. According to P/W, this device allows the D/F operator to fix the minimum position by visual means only, eliminating errors duo to the human factor when aural methods are used. Secondly, the device is automatic and does not require to be switched on each time by the D/F operator.

"Heinrich II M" and "Heinrich II U" D/F Equipment.

27. Captured documents make mention of the Heinrich II M. and II U; these versions were unknown to the present P/W, but the II M is shown in a document, issued at Arnheim in May 1943 by Staaatsrat Dr. PLENDL, to utilise an aerial array with three sets of quarter-wave dipoles and reflectors.

28. The II U, mentioned in another document from the same source, and dated July 1943, is shown to be the forerunner of the Heinrich III described above, and to embody the same aerial array as the letter.

RANGE MEASURING CABIN.

29. The range-measuring cabin is situated at the base of the receiver pylon, and houses a range-measuring unit. Two types of units are in use, known as Rechlin and Siemens range-measuring units respectively.

"Rechlin" Range-Measuring Unit.

30. The "Rechlin" unit (Sketch III) was designed by Dr. BECKER of Rechlin, and constructed by a firm named Graetz. It is thus sometimes referred to as the "Becker Gestell" or the "Graetz Gestell".

31. The Rechlin, which is used principally on day fighter "Y" control stations, gives reading accurate to 1 km.; it measures the time required by the transmitted impulse to reach the aircraft and return again to the receiver of the range-measuring unit. This time is determined by means of an invisible point which travels along the graduations of the Cathode ray tube, and becomes visible at the moment when the returning impulse reaches the range measuring unit.

32. The tuning and operation of the Rechlin range-measuring unit are carried out ne follows:-

(i) Main switch (1) to ON. Dial lamp (2): lights up.

(ii) Knob (3) turned to left (Bright), an illuminated area appears on the face of Cathode tube (4). This area is usually off-centre and of irregular shape.

(iii) By adjustment of trimmer screws (5) the illuminated area is moved to the centre of the tube and made uniformly circular in outline.

(iv) By turning controls (6) the circular area is enlarged until its circumference coincides with the scale graduations on the edge of the Cathode ray tube face.

(v) Knob (3) is turned to the right (Dim). The illumination of the Cathode ray tube is now extinguished.

(vi) By means of knob (7) the receiver in now set to the transmitter frequency of the aircraft which is to be controlled (that is at 1.9 Mc/s. less than ground transmitter frequency). The frequency is given by the plotter.

(vii) Switch (8) is now moved to down position for transmission of the Modulation Note ("Messton").

(viii) Switch (9) controlling test transmitter is then moved to the "On" position. This initiates transmissions from the station transmitter on a frequency automatically reduced by 1.9 Mc/s. The modulation note ("Messton") is audible in the operators' headphones. At the same time a point of light appears on the graduations of the Cathode ray tube (4) near the 13.7 km. graduation.

(ix) Fine tubing knob (10) is now turned until the sound heard in the headphones is at maximum. Simultaneously with this adjustment the light point is seen to travel in a clockwise direction, reaching a turning point from which it retraces its path. This turning point coincides with the point of maximum sound reception and provides a visual method of tuning.

(x) Phase switch (11) is now moved until the light point accurately coincides with graduation 13.7 km.

(xi) Finally knob (12) (Amplitude width) is used to adjust the definition and intensity of the light point.

(xii) The range measuring operator can now either switch on to the transmitter for continuous transmission by means of switch (13) or select either an automatic five or ten second transmission by means of switch (14). The latter system has recently been discontinued and on some Rechlin measuring units, switch (14) and the clock above it are not fitted.

(xiii) To test R/T circuit the range-measuring operator depresses knob (15). Dial lamp (16) lights up. The operator must now hear his own conversation in his headphones. Turn knob (17) to adjust for correct audible strength. The R.M. unit is now tuned ready for use.

(xiv) To go over to aircraft control, switch (9) (Test transmitter) moved to OFF position.

(xv) If "Y" aircraft is being controlled then a light point will appear on the graduation of the Cathode ray tube. This gives the correct reading for the last digit. If, for example, the light point appeared on the 12 km. graduation, the digit "2" only is noted. When coarse-control knob (18) is pressed, the light point will spring forward by 10% of the real distance of the "Y" aircraft. That is, if the point advanced by 6.2 km., the correct distance of the "Y" aircraft could be 62 km.

(xvi) The tuning transmitter referred to in (viii) forms part of the range-measuring apparatus, and superimposes its own transmission of 1.9 Mc/s. on to that of the station transmitter. This results automatically in a reduction of 1.9 Mc/s in the frequency of the station transmitter.

"Siemens" Range-Measuring Unit.

33. The "Siemens" unit (Sketch IV) is found on "Y" control stations controlling night fighters. It is said to permit readings to an accuracy of 200/250 metres, allowing night fighter aircraft lacking search gear to be directed close enough to their target to obtain visuals.

34. The tuning and operation of this unit is effected as follows:-

(i) Main switch (1) to "On" position. Dial lamp (2) lights up.

(ii) Select frequency by means of knob (3). Instruct operator of station transmitter to transmit (a tuning transmitter is not incorporated in the Siemens unit).

(iii) Switch (4) moved to "On" position.

(iv) Switch (5) to "On" position, modulation note now being transmitted. Green dial lamp (6) lights up.

(v) Tune for maximum audible signal strength by means of fine control knob (7).

(vi) Turn knobs (8) and (9) until an image appears in the Cathode ray tube (10). Knob (8) controls light intensity and knob (9) controls definition of image.

(vii) Control (11) now turned until the shape of the illuminated area in the Cathode ray tube is approximately circular.

(viii) Using switch (12) (Wechselspannungs Diode) and switch (13) (Wechselspannung Empfänger) the approximately circular area now made fully circular and adjusted to a diameter of 3/4 cm.

(ix) Control (11) now turned until the accurate reading pointer (14) records 13.7 km. The circle on Cathode ray tube (10) should now have become a line approximately at an angle of 45° from left bottom to right top of the face of the tube. If the circle shrinks only to an ellipse, trimmer knob (15) is used to reduce the ellipse to a line.

(x) Switch (17) now moved down to coarse reading position. Turn knobs (18) (Intensity) and (19) (Definition) until a sharp image appears in Cathode ray tube (20).

(xi) The coarse reading pointer (22) is then moved to the 413 km. position by turning control (11). The image in tube (20) should now be a line. If not, adjust by means of trimmer screw (21).

(xii) This completes the tuning of the Siemens unit. "Y" control can commence as soon as the receiver frequency is lowered by 1.9 Mc/s. to bring the receiver frequency in line with aircraft transmission.

(xiii) To take over control of an aircraft the following procedure is carried out:-

Switch (17) moved to bottom coarse setting position. Control (11) turned until blip appearing in left tube (20) forms a diagonal line. If switch (17) now moved up into up (fine setting) position the line disappears in left tube and reappears as a flat ellipse in the right tube (10). On slightly turning control (11) the ellipse is converted into a line.

(xiv) Distances can now be read off. The coarse reading scale is calibrated to read from 0 to 500 km. in 5 km. intervals. The fine reading scale has calibration readings from 0 to 100 km., which are divided, according to P/W, in 250 metre graduations. A very skilled operator is said to be able to estimate fairly accurately to 100/200 metres.

(xv) As the distance of the aircraft varies, control (11) has to be used to maintain the blip in the form of a thin line. After the first setting, the coarse reading is only taken again at intervals.

(xvi) Adjustment of the fine control knob (7) of the receiver unit as described under (v) also controls the "steepness" of the line image in the Cathode ray tube. The position of maximum steepness coincides with maximum audible signal strength and represents the turning point of the line image. This provides a visual check for tuning correctly.

(xvii) The controls shown at the bottom of a Siemens unit are not touched by the operator. They are set by the makers of the instrument initially, using Deutschlandsender transmissions. (According to one captured document, a special transmission at 1040 hours daily by Deutschlandsender can be used for this purpose). The controls are subsequently reset by special test personnel.

AIRBORNE R/T EQUIPMENT.

35. The R/T set used in Y-controlled aircraft is a modification of the FuGe 16-Z, in which the receiver unit of the set is linked to the transmitter unit in such a way that all signals received on the carrier frequency ("Gemeinschafts-

welle") are automatically re-transmitted on another lower frequency ("Messwelle"), which is usually 1.9 Mc/s. below the first.

36. The automatic re-transmission of all signals received enables the aircraft to be plotted by bearing and range measurement without any reference to the personnel of the aircraft.

37. Two modifications of airborne FuGe 16-Z R/T sets are used in the "Y" procedure.

FuGe 16-ZE.

38. The original modification of the FuGe 16-Z used for Y-control was the FuGe 16-ZE, which incorporated the "Zielfluggerät" (Z).

39. This set had the disadvantage that it caused a phase displacement ("Eigenphasenverschiebung") equal to a reading of 13.7 km., which had to be allowed for in the calibration of Siemen or Rechlin range-measuring units working in conjunction with it.

FuGe 16-ZY.

40. In this modification of the FuGe 16-Z, the phase displacement of the apparatus is eliminated. Hence, when using Rechlin range-measuring unit, an attachment to this equipment is used which has the effect of cancelling the calibration allowance of 13.7 km., and causes the light point on the Cathode ray tube to start all readings from the zero graduation on the tube.

41. When the Siemens range-measuring unit is used in conjunction with FuGe 16-ZY, a second pointer marked "Y" is fitted in the former apparatus on the fine and coarse reading dials, in addition to the existing pointer marked "E" on both dials. The pointer marked "Y" added to the accurate reading scale is set back (to the left) of the pointer marked "E" by a number of scale graduations corresponding to the reading of 13.7 km. Therefore, when pointer "E" of the Siemens unit is on the 13.7 km. mark, the pointer "Y" is opposite the zero graduation. The additional coarse-reading pointer is similarly set back to approximately the 413 km. graduation, so far as P/W can remember.

A.D.I.(K)
25 Sept. 1944.

S. D. Felkin.
Wing Commander.

SKETCH I S16B TRANSMITTER UNIT.

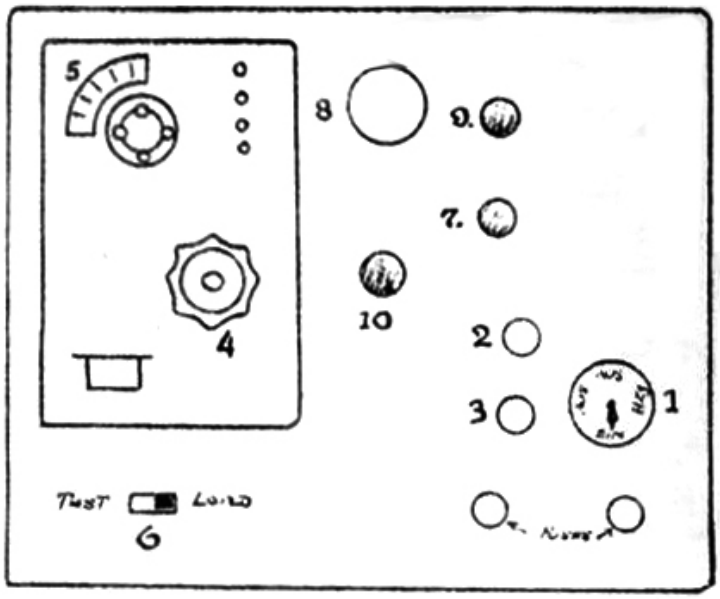
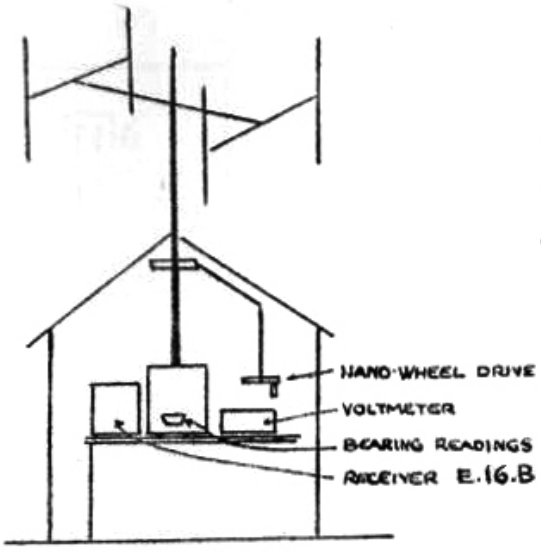


IMAGE IN CATHODE RAY TUBE(8) WHEN MODULATION IS 80%

SECRET

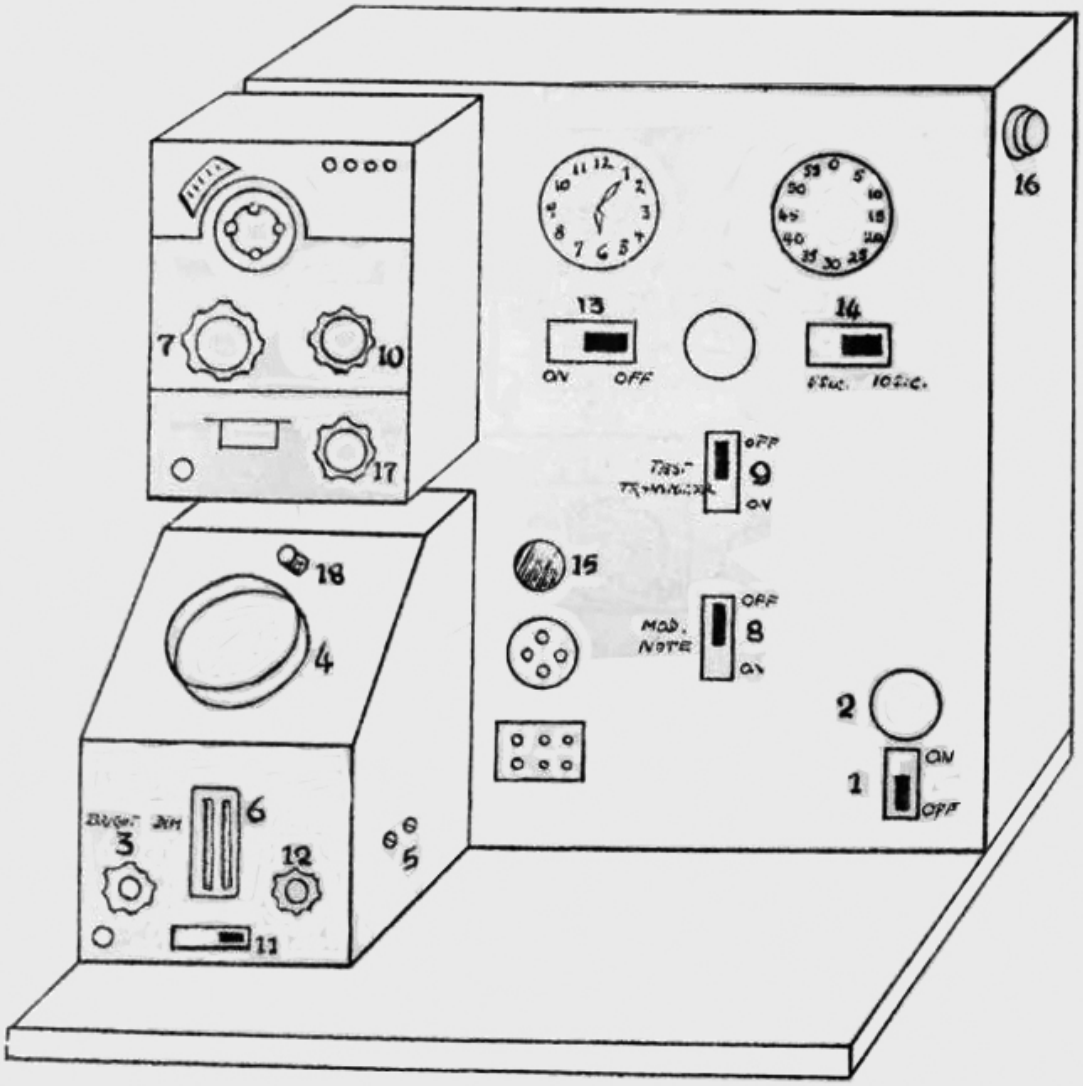


SKETCH II.

D'F. HUT AND HEINRICH I AERIAL ARRAY

SECRET

SKETCH III RECHLIN RANGE MEASURING UNIT.



SKETCH IV

SIEMENS' RANGE MEASURING UNIT.