PART 3 : SECTION 2

CHAPTER 2

RADIO COMPASSES

RADIO COMPASS (A.R.I. 5428)

Function

1. The radio compass is a radio receiver that can identify the direction from which a signal is being received by means of a rotatable loop aerial. An aircraft equipped with a radio compass can home to the transmitter generating the signal, or use the bearing indicated by the radio compass as an aid to navigation.

Principle of Operation

2. The radio compass uses the directional properties of a loop aerial, *e.g.* when the plane of the loop is at right angles to the direction of the transmitter, signal reception is at a minimum.

3. By using a directional loop and a non-directional aerial, the signals received are phased to control an electric motor which rotates the loop so as to keep it at right angles to the transmitting station.

4. The phasing system solves the normal 180° ambiguity of the loop and the correct direction of the transmitter is indicated automatically and continuously.

5. Bearing indicators are provided to indicate the position of the loop aerial to the pilot and navigator. On the navigator's indicator the compass rose may be rotated manually to bring the true or magnetic heading of the aircraft under an index at the top of the indicator so that true or magnetic bearings may be read directly from the pointer.

Fig. 1. Radio Compass (A.R.I. 5428) Control Unit.

Airborne Equipment

6. Apart from the receiver and aerials the aircraft is fitted with either one or two remote control units and two bearing indicators, one for the pilot and one for the navigator.

7. **Control Unit.** Either one or two control units may be installed in the aircraft according to requirements. As can be seen in Fig. 1, each unit has the following controls :—

(*a*) *Wave Change Switch.* This switch is for selecting the required frequency range.

(*b*) *Tuning Dial.* The tuning dial has three concentric scales covering the frequency bands 150 to 325 kc/s, 325 to 700 kc/s, and 700 to 1,500 kc/s. The scale in use corresponds with the band selected by the wave change switch.

(c) *Tuning Meter.* The tuning meter is located under the tuning dial and is used to tune the receiver so that a maximum deflection of the pointer is obtained.

(d) *Function Switch.* The function switch has five positions :—

(i) OFF. In this position the equipment is inoperative.

(ii) TUNE RT. In this position the radio compass receiver operates as a conventional receiver using the fixed whip aerial, and it is intended that this position will be used to tune in and identify the station to be used.

(iii) NAV.CW. This position is for use with navigation aids such as Consol and Radio Range.

(iv) ADF. In this position the radio compass gives a continuous indication of the bearing of the station to which the receiver is tuned relative to the fore and aft axis of the aircraft.

(v) LOOP. In this position the equipment may be used as a normal D/F loop and the loop turned until an aural null (no signal) is found.

(e) *Volume Control.* This knob is used for controlling the volume of the signal received in the headphones.

(f) *CW/RT Switch.* This switch allows the equipment to be used for voice or CW reception. When used in the CW position a heterodyne note is introduced into the signal.

(g) *Filter Control.* When this switch is in the FILTER position a filter is introduced into the circuit and reduces the amount of background noise.

(h) *Loop Left/Right Control.* This switch is used to rotate the loop when aural D/F bearings are taken.

(j) *Frequency Dec/Inc Control.* This switch changes the frequency of the receiver.

(k) *Sense Button.* When depressed, the sense button introduces a sensing circuit in the receiver and is used to determine the true null position.

(l) *Take-Over Button.* The take-over button connects the control unit to the receiver, and until the button is depressed the equipment is not switched on. When two control units are fitted, the take-over button should be pressed by the pilot or navigator when they wish to use the equipment.

8. *Pilot's Bearing Indicator.* The pilot's bearing indicator (Fig. 2) is a direct-reading instrument which indicates the position of the loop relative to the aircraft's fore and aft axis. A neon signal lamp, fitted behind a hole in the indicator, is normally obscured by an opaque shutter linked to the TEST switch. Rotation of this switch moves the shutter aside and the neon lamp gives an indication whenever the receiver is tuned to an incoming signal.

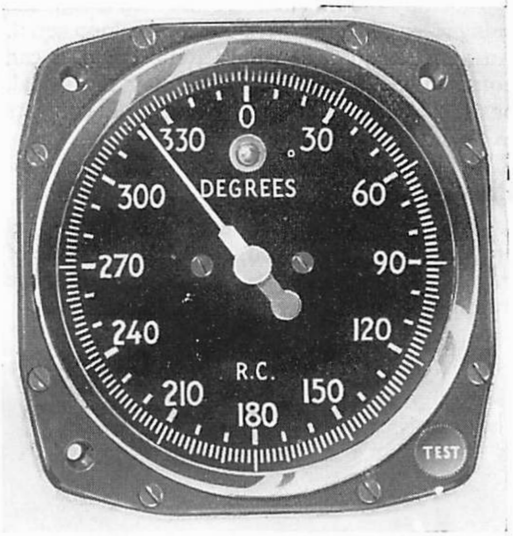


Fig. 2.

Radio Compass (A.R.I. 5428) Pilot's Bearing Indicator.

9. **Master Bearing Indicator.** The graduated dial of this instrument (Fig. 3) is the repeated

Fig. 3.

Radio Compass (A.R.I. 5428) Master Bearing Indicator.

scale of a remote indicating compass. If variation is applied at the variation setting corrector (V.S.C.) of the remote indicating compass the bearing of the transmitter relative to true north can be obtained directly from the indicator.

Operational Limitations

10. **Range.** With low-powered M/F beacons, the range of the equipment is about 60 nautical miles. This range increases with the power output of the transmitter. Ranges of over 200 nautical miles can be obtained by high-power broadcast stations.

11. **Accuracy.** On powerful broadcast stations the probable accuracy of the equipment is $\pm 1°$ by day or $\pm 2°$ by night up to a range of 150 nautical miles. With low-powered M/F beacons the accuracy is about $\pm 2\frac{1}{2}°$.

12. **Jamming.** Signals received from two different sources on the same frequency will cause the radio compass to indicate a mean direction between the two, proportional to their relative strengths. The radio compass can thus be made unreliable by enemy jamming.

Operating Procedure

13. The following operating procedure applies whether a single or double control unit system is used. *Particular care must be taken, when using the two control unit system, to ensure that the take-over button is depressed momentarily before attempting to use the equipment.*

14. **Switching On.** To switch on, the function switch is placed in any of the four operating positions and the take-over button is depressed. The equipment takes about 30 seconds to warm up. It should be noted that there is no positive indication of which control unit is in use; consequently, the take-over button must always be depressed, even though the equipment has previously been switched on.

15. **Tuning.** To tune the equipment the following action should be taken :—

(*a*) Place the function switch in the TUNE RT position.

(*b*) Select the required frequency band, using the wave change switch.

(*c*) Tune the receiver on the tuning dial by operating the FREQUENCY INC/DEC control until the pointer indicates the desired frequency. Carry out final tuning until a maximum deflection of the tuning meter needle is obtained and then positively identify the station. To tune CW signals, tune the signal until maximum deflection of the needle of the tnuing meter is obtained, then switch in the heterodyne (CW) and filter switches. Final tuning is accomplished by adjusting the frequency control unit until the audio output in the headphones reaches a maximum. At this point the receiver is accurately tuned.

16. **Consol, Radio Ranges, etc.** The following procedure should be adopted when using the equipment in conjunction with consol, radio ranges, etc :—

(*a*) Tune in as described in para. 15.

(*b*) Turn the function switch to NAV.CW and use the equipment as an ordinary receiver. It is important to note that in this position the automatic gain control system is inoperative and consequently the volume control must not be advanced too far, otherwise the signal in the earphones will be distorted.

17. **Homing.** The following procedure should be followed during homing :—

(*a*) Tune as described in para. 15.

(*b*) Turn the function switch to ADF.

(*c*) Turn the aircraft until the pilot's bearing indicator indicates zero. Drift may be allowed for by off-setting the pilot's bearing indicator pointer from zero by the required amount. As the aircraft flies over the transmitting station the indicator pointer will fluctuate widely to either side of the 0° position and subsequently rotate close to the 180° position.

18. **Automatic Determination of Bearings from the Radio Transmitter.** For automatic determination of bearings from the radio transmitter, carry out the following drill :—

(*a*) Tune as described in para. 15.

(*b*) Note the position of the master indicator pointer. If variation has been set on the V.S.C. of the remote indicating compass a true bearing can be read directly from the instrument. Note that if the pilot's indicator is used to obtain bearings, the true heading of the aircraft must be added to the bearing before it can be plotted and used for navigation.

19. **Manual Determination of Bearings from the Radio Transmitter.** For manual determination of bearings from the radio transmitter :—

(*a*) Tune as described in para. 15.

(*b*) Turn the function switch to LOOP.

(*c*) Rotate the loop, using the Left/Right control until a minimum signal is found.

(*d*) Having determined the minimum, press the sense button and *increase* the bearing by *rotating the loop to the left* until a change in signal strength is observed. If the signal strength *decreases* the bearing is correct ; but if the signal strength increases the bearing is the reciprocal and the loop must be rotated through 180° and the correct null determined. It is important to note that in the LOOP position the automatic gain control is inoperative and the volume control should not be advanced too far, otherwise the signal in the headphones will be distorted.

RADIO COMPASS (S.C.R. 269G)

20. This equipment is similar in many respects to the British radio compass (A.R.I. 5428) already described, differing mainly in presentation.

Airborne Equipment

21. **Remote Control Boxes.** Two radio control boxes are provided for each radio compass installation where dual remote control is required. The controls provided on each remote control box (Fig. 4) are :—

(*a*) *Function Switch.* This switch has four positions :—

(i) OFF. In this position the equipment is inoperative.

(ii) COMP. In this position the loop aerial is rotated under the control of the phasing system, and bearing indications are automatic and continuous.

(iii) ANT. In this position the non-directional aerial only is used. All tuning is done with ANT selected.

(iv) LOOP. In this position the loop aerial only is in use and direction finding is carried out by aural null procedures. The loop is rotated manually by means of the loop LEFT/RIGHT SWITCH.

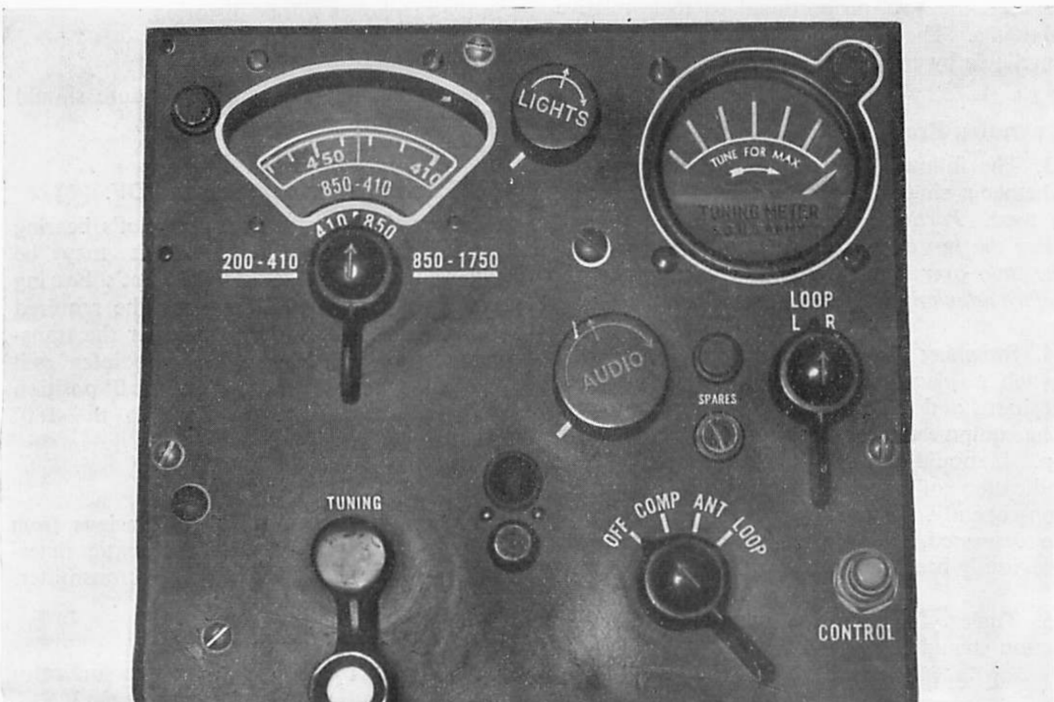


Fig. 4. Radio Compass (S.C.R. 269G) Control Box.

(*b*) *Band Selector Switch.* This switch divides the frequency range of the receiver into tuning bands. These are :—

(i) 200 to 410 kc/s.

(ii) 410 to 850 kc/s.

(iii) 850 to 1,750 kc/s.

(*c*) *Tuning Crank.* This rotates the dial in the tuning window (Fig. 4) to bring the required frequency under the reference line.

(*d*) *Tuning Meter.* This is an aid to tuning during manual operation of the loop.

(*e*) *Audio Switch.* This controls the volume of signals heard.

(*f*) *Loop LEFT/RIGHT Switch.* This switch controls loop rotation when the function switch is in the loop position. There are two speeds of loop rotation : turning the switch to the left or right will give a slow rotation, but if the switch is pushed in and turned the speed of rotation is much faster.

(*g*) *CW/VOICE Switch.* This switch is located either on the lower edge of the remote control box or installed (Fig. 5) on the receiver itself. In the CW position, modulated carrier waves are heard with a background hum.

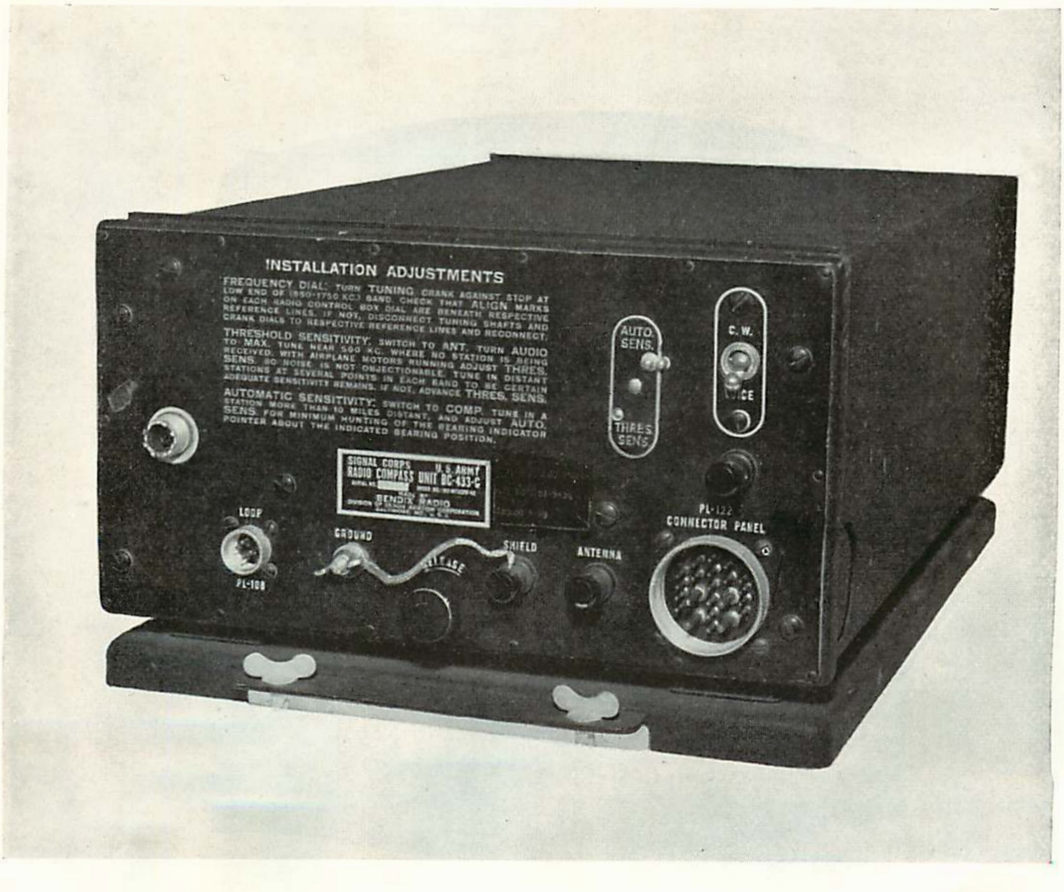


Fig. 5. Radio Compass (S.C.R. 269G) Radio Receiver.

22. **Bearing Indicators.** The pilot's bearing indicator (Fig. 6) is a direct-reading instrument, but variation may be set on the navigator's bearing indicator (Fig. 7) in order to read true bearings.

Operational Limitations

23. The operational limitations are similar to those described for the A.R.I. 5428.

Operating Procedure

24. **General Operation.**

(*a*) Set the function switch to either COMP or ANT.

(*b*) Push the CONTROL switch to operate the green light. The green light identifies whichever radio control box is in control.

(*c*) Rotate the band switch to the frequency band required.

(*d*) Turn the tuning crank to the desired station frequency in kilocycles, and rotate the crank back and forth for maximum clockwise deflection of the tuning meter to determine the exact setting of the dial. Listen for station identification to ensure that the correct station is being received.

(*e*) The equipment provides for aural identification of keyed CW stations by means of internal modulation controlled by the CW/VOICE switch on the front panel of the receiver. Switch to CW when this type of operation is desired.

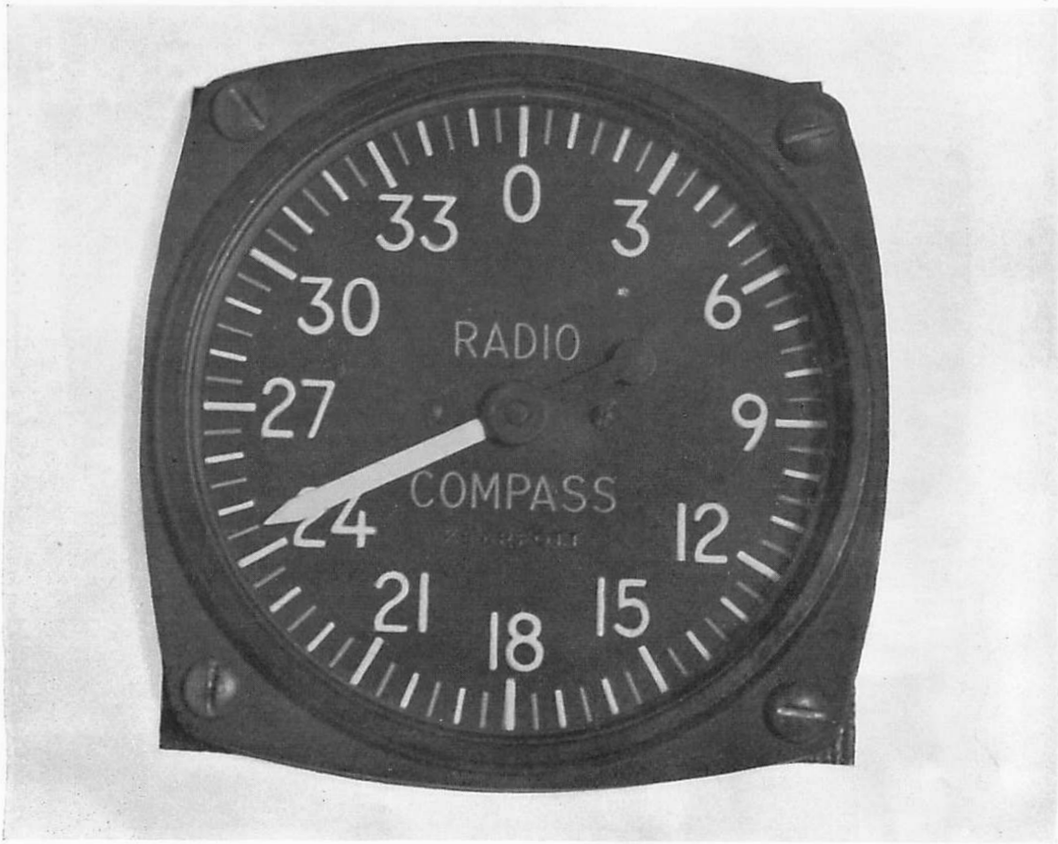


Fig. 6. Radio Compass (S.C.R. 269G) Pilot's Indicator.

25. **Homing.** The following procedure should be followed for homing :—

(*a*) Turn the VAR knob on the navigator's bearing indicator until the azimuth zero is at the index. The pilot's indicator is effectively in this position at all times.

(*b*) Switch to COMP.

(*c*) Turn the aircraft until the indicator pointer reaches zero, when the aircraft will be heading towards the homer.

(*d*) Adjust the AUDIO control for satisfactory volume. If desired, the volume may be turned fully down.

(*e*) Since, with the function switch in the COMP position, the automatic volume control (A.V.C.) circuits are switched in, it is not practicable to make a "needle" homing to a radio range beacon and fly aurally at the same time.

(*f*) To correct for drift, off-set the aircraft heading by the amount of drift. As the aircraft passes over the transmitting station, the indicator pointer fluctuates widely to either side of the 0° position then rotates close to the 180° position.

26. **Position Line Determination.**

(*a*) Turn the VAR knob on the navigator's indicator until the azimuth zero is at the index.

(*b*) Switch to COMP.

(*c*) Note the relative bearing of the station by taking the mean value of hunt of the pointer, applying correction for residual quadrantal error if necessary.

Or alternatively :—

(*d*) Switch to LOOP.

(*e*) Adjust the AUDIO control for satisfactory volume.

Fig. 7. Radio Compass (S.C.R. 269G) Navigator's Indicator.

(*f*) Use the LOOP L-R switch to rotate the loop for minimum volume and read off the relative bearing of the station from the bearing indicator, applying correction for residual quadrantal error if necessary.

Note: If the signal null exists over too wide an angle, greater accuracy may be obtained by rotating the AUDIO knob fully clockwise and locating the null either by listening for the disappearance of the audio signal, or by noting the dip in the tuning meter deflection. The use of CW operation also decreases the width of the null indication.

(*g*) Bearings taken by this method are subject to 180° ambiguity, which should be resolved by reference to D.R. position.

27. **Radio Range, Consol, etc.**

(*a*) Switch to ANT.

(*b*) Adjust volume by using the AUDIO control.

Or alternatively :—

(*c*) Switch to LOOP.

(*d*) Adjust the volume by using the AUDIO control and using the LOOP L-R control to rotate the loop so as to give maximum signal strength.

Precautions During Operation

28. The following precautions must be taken during operation of the equipment :—

(*a*) For aural reception of A-N signals, *i.e.* when using radio range, operate the equipment on ANT or LOOP instead of COMP, since the action of the automatic compass control when in the COMP position causes broad course indications.

(*b*) During periods of precipitation static, operate on LOOP and, for best reception, rotate the loop until a maximum signal is obtained.

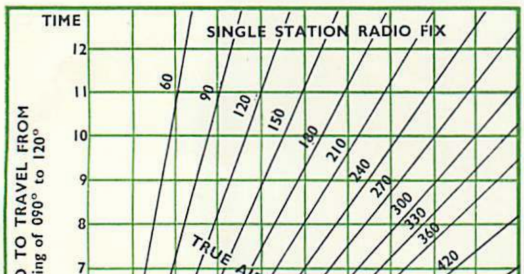
PROCEDURES—GENERAL

Cross-Checking

29. The radio compass is *not a means of navigation* but is a radio aid. Used correctly as such, and with proper attention to the selection of transmitting stations and operation of the equipment, the radio compass generally produces satisfactory results. Because the radio compass is subject to many outside influences which may affect its accuracy, however, it is evident that the only way to ensure that the information derived from the compass is dependable, is to cross-check the indications by some other means, *e.g.* D.R., Loran, etc.

Single Station Fix

30. With high-speed, high-altitude aircraft, a speedy and efficient method of fixing position by radio bearings is necessary. The following graphic solution (Fig. 8) of the single station fix illustrates how this problem is solved.



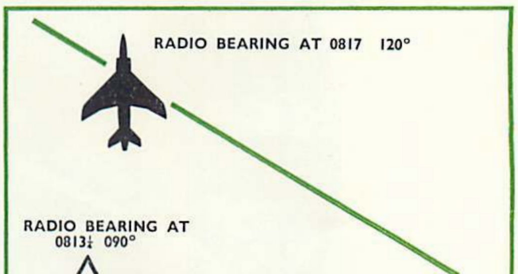


Fig. 8. Single Station Fix.

31. The operating procedure is as follows :—

(*a*) Tune in a radio compass station ahead of the aircraft, turn the selector switch to COMP (S.C.R. 269G) or ADF (A.R.I. 5428), and hold a constant heading. Note the exact times when the indicator reads 060°, 090°, and 120° or 300°, 270°, and 240°, depending on the location of the station in relation to the aircraft heading.

(*b*) Find the point on the time ordinate of the graph that represents the average of the two intervals (060° to 090° and 090° to 120°, or 300° to 270° and 270° to 240°). Extend this point horizontally until it intersects the slanting true airspeed line nearest to the true airspeed of the aircraft. Read down vertically from this intersection to the abscissa labelled "NAUTICAL MILES ABEAM OF STATION". This gives the distance from the station at the 090° or 270° point.

(*c*) Draw a position line through the station perpendicular to the true heading of the aircraft. A point on this position line at the number of nautical miles abeam of the station is the position of the aircraft at the time of taking the 090° or 270° bearing.

32. The graphic method is an accurate means of fixing position. An approximation of position may be made by using the following formula :—

$$\frac{\text{Ground speed (or true airspeed)} \times \text{minutes flown}}{\text{Degree of bearing change}}$$

= Distance from station.

Approach and Let-Down

33. As the foregoing procedures make it possible to fly towards or away from a transmitting station along a specific track, the radio compass may be used as a means of aerodrome approach in poor weather. The location of the transmitter in relation to the airfield establishes the approach bearing, depending, of course, upon terrain features.

34. If the transmitter is situated on the aerodrome, or in line with the landing runway, a procedure may be adapted to permit a reasonably accurate approach to the landing runway. Fig. 9 illustrates a typical airfield and runway approach pattern which can be flown by means of the radio compass.

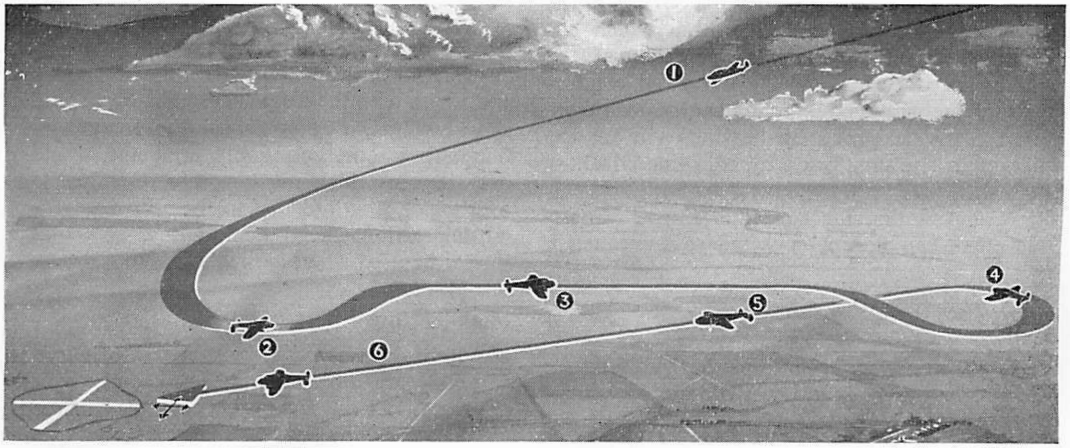


Fig. 9. Airfield and Runway Approach Procedure, Using the Radio Compass.

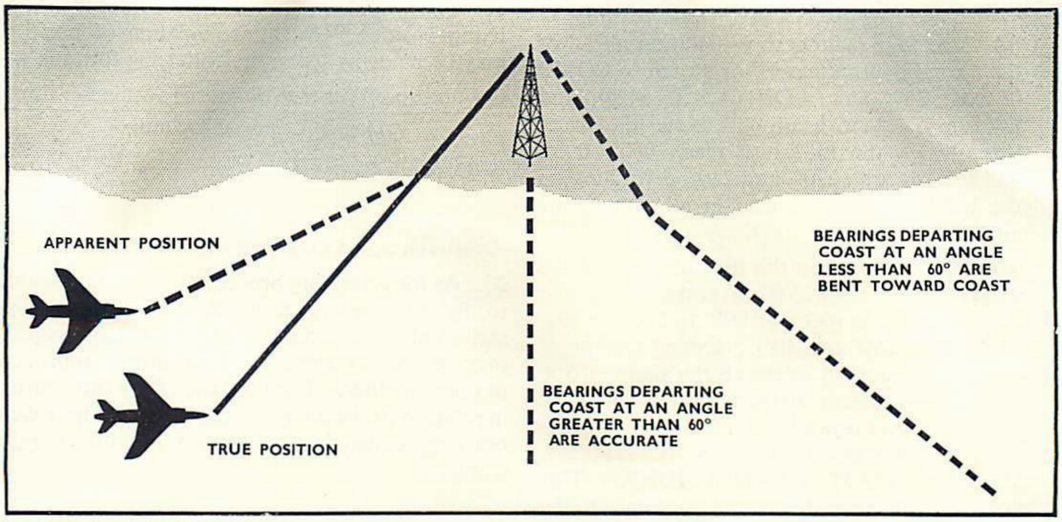


Fig. 10. Coastline Effect.

FACTORS AFFECTING R.C. ACCURACY

Coastline Effect

35. Coastline effect is caused by the passage of radio waves from a medium of one conductivity to that of another conductivity. The land is a relatively poor conductor and the water a good one. Therefore when a radio beam leaves the coast at an acute angle, there is an appreciable bending towards the land because the poor conductivity of the land holds up a portion of the beam while that part of the beam which has already reached the water is proceeding at a greater speed because of the improved conductivity of the new medium. As can be seen from Fig. 10, the accuracy of bearings cutting the coast at 90° is unaffected by coastline effect.

36. **Compensation for Coastline Effect.** Coastline effect can be compensated to some extent by :—

(*a*) Increasing the altitude, which decreases the refraction.

(*b*) Always selecting stations that stand on the shore or on an island just off the coastline.

(*c*) Using only those bearings that leave the coast at an angle greater than 30°, if stations lying inland have to be used.

Quadrantal Error

37. When the incoming radio waves strike an aircraft, a number of magnetic fields are created around the metallic portions of the aircraft. These fields bend the radio waves before they are received by the loop antenna. Thus all bearings are in error by the amount of this deflection. This error is known as *quadrantal error*.

38. The extent of quadrantal error can be determined by swinging the compass and drawing a curve showing the actual amount of error present in signals being received. The error is usually at the maximum when the relative bearing is 045°, 135°, 225°, or 315°.

39. Swinging the compass is not the whole answer, however, as this error is not constant and varies with the frequency. The best solution is to swing the compass on the frequency or frequencies most commonly used and to do it over terrain which most closely resembles that over which it is intended to fly. Even so, transmitting stations ahead, behind, or directly abeam should be used where possible.

High Terrain Effect

40. Radio waves striking mountainous terrain (Fig. 11) are diffracted, reflected, and partially absorbed. Consequently, bearings obtained from stations lying across ranges of high terrain should be used cautiously. Height is of great importance in assessing bearings of this type, as an aircraft with sufficient height receives that portion of the ground wave which has not been affected by the terrain. The proximity of the transmitter to the obstructing high terrain must also be considered.

Night or Twilight Effect

41. Night effect is due to the interference of sky waves (Fig. 12) with normal ground-wave reception.

42. Whenever sky waves are present, the determination of a sharp minimum is not easy. The distance at which sky-wave reception is experienced on any given frequency varies with the time of day and year. However, normal sky-wave reception can be expected to begin on the medium frequency band at distances of about 100 miles by day and about 30 miles by night.

43. During sky-wave interference the following points should be borne in mind :—

(*a*) Better results can be obtained by using low-frequency stations. This decreases the reflection experienced from the ionosphere, and lower frequencies cover greater ground distances.

(*b*) Best loop results are obtained when using transmitters within the direct ground-wave distance. At extreme ground-wave range an increase in altitude generally produces better results. In estimating the effective range it should be remembered that, in the case of a ground wave having an effective range of 1,000 miles over a perfect conducting surface, the effective distance over the sea would be about 900 miles, falling to as little as 100 miles over poorly conductive soil. As this example clearly illustrates, greatest attenuation (strength reduction) of signals occurs when the track of the ground wave is over land.

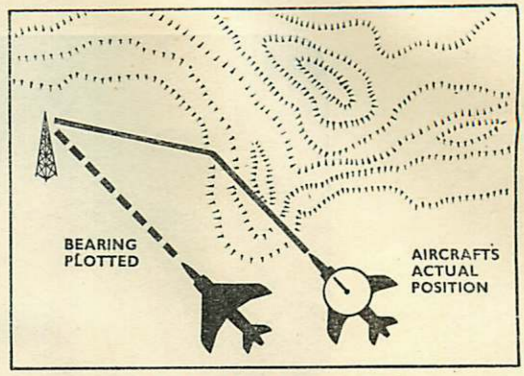


Fig. 11. High Terrain Effect.

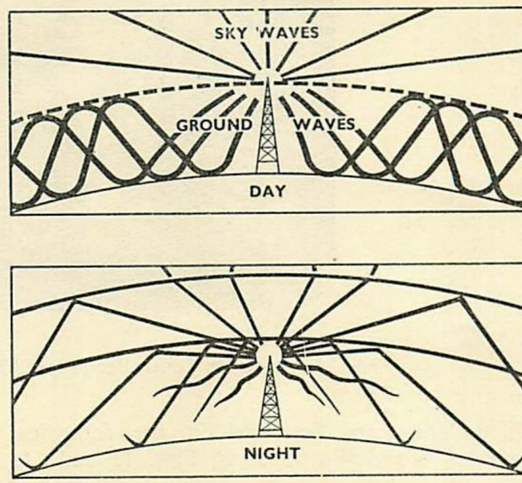


Fig. 12. Night Sky-Wave Reflection.

RADIO COMPASS (Type AD7092D)

Introduction

44. The radio compass Type AD7092D is of Marconi design and can be used for the following purposes :—

(*a*) Homing to a selected ground transmitter.
(*b*) Position fixing.
(*c*) Radio reception, including radio range signals.

The operating principles are the same as for other radio compasses and the equipment differs only in the method of instrument presentation and the operation of the controlling switches.

Control Units

45. The three separate units which make up the complete installation are :—

(*a*) Bearing indicator.
(*b*) Receiver controller.
(*c*) Loop controller.

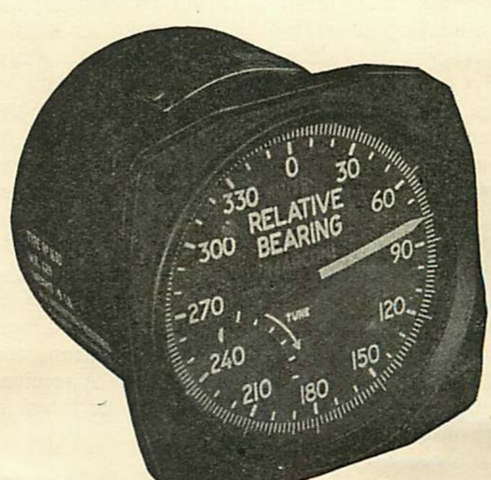


Fig. 13. The Bearing Indicator for Radio Compass Type AD7092D.

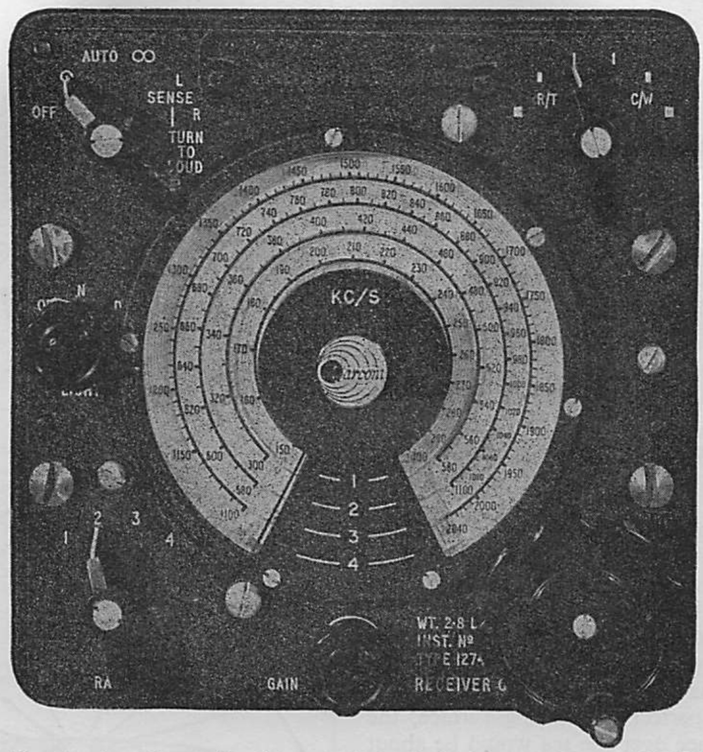


Fig. 14. Receiver Controller (Type 1274) for Radio Compass Type AD7092D.

These units are described in the following paragraphs and illustrated in Figs. 13 and 14.

46. **Bearing Indicator.** Fig. 13 shows the bearing indicator. The needle shows the bearing of the aircraft relative to the transmitter, *i.e.* the needle points towards the transmitter and the bearing is read directly from the circular scale. The tuning indicator on the lower left face of the instrument aids in accurate tuning of the receiver to the selected transmitter ; tune for maximum clockwise deflection of the pointer using the tuning knob on the receiver controller.

47. **Receiver Controller (Type 1274).** This controller is an electrical remote-control for the receiver itself. Fig. 14 shows the disposition of the various switches and the control markings. For the reception of keyed C.W. stations the R.T.-C.W. switch should be at C.W. A receiver master controller (Type 1276) may be fitted in the navigator's position.

48. **Loop Controller.** The loop controller is used for the remote manual operation of the loop aerial when taking aural bearings. Before manual operation the system selector switch at the top left-hand corner of the receiver controller must first be set to the position marked ∞. Manual loop operation serves also as a standby for direction finding if the automatic facility fails.

Switching On

49. The recommended procedure for switching on is as follows :—

(*a*) The equipment master switch or circuit breaker, usually fitted on the radio control panel, must be on for two minutes before using the radio compass.

(*b*) Set the system selector switch to O (omni).

(*c*) Set the frequency range selector (lower left side of receiver controller) to the band required.

(*d*) Tune to the desired frequency, adjusting the tuning control for maximum deflection of the tuning indicator.

(*e*) Adjust the gain control for satisfactory headset volume.

Note : If the navigator has a receiver master controller (Type 1276) the switch marked LOCAL-REMOTE must be in the REMOTE position if the pilot wishes to take control of the equipment.

Homing

50. Tune to the desired transmitter as detailed in para. 49 then :—

(*a*) Set the system selector switch to AUTO.

(*b*) Turn the aircraft in the direction shown by the bearing indicator needle until the indicator is at zero on the scale. The aircraft will then be heading towards the radio station.

(*c*) Adjust the gain control for volume.

To allow for a cross-wind, fly the aircraft so that the bearing indicator needle is off zero by the number of degrees of drift in the direction required, *i.e.* to counteract 10° port drift, the needle should be at 350° (port of zero).

Automatic Direction Finding and Position Fixing

51. **Direction Finding.** To determine the true bearing of a transmitter from the aircraft, the procedure is as follows :—

(*a*) Tune to the required transmitter.

(*b*) Set the system selector to AUTO.

(*c*) Adjust the gain control for volume.

(*d*) Read the bearing shown by the indicator needle.

(*e*) Add the indicated bearing to the TRUE heading of the aircraft (if the total is more than 360°, subtract 360° from the total). The result is the true bearing of the transmitter from the aircraft.

52. To determine the true bearing of the aircraft from the transmitter add 180° to bearings (obtained as in para. 51) less than 180°, and subtract 180° from bearings greater than 180°.

53. **Fixing Positions.** To obtain a fix use either the method of para. 30 or take bearings on at least three known transmitters in quick succession; chosen stations should subtend angles of more than 30°, measured from the aircraft. Position lines from the transmitters are then plotted, the intersection being the position of the aircraft at the time of observation. The aircraft should be held on a steady heading while the bearings are being taken.

Loop Direction Finding

54. To determine the true bearing of a transmitter proceed as for automatic D.F. except that the loop must be rotated by the hand control on the loop controller then :—

(*a*) *Set the system selector to* ∞.

(*b*) Rotate the loop to the null (minimum headset volume) position and read the indicated bearing.

(*c*) Repeat the above procedure for each reference transmitter.

(*d*) The sense of the bearings must be determined, either by reference to the magnetic compass or by the following aural method, in order to resolve the ambiguity of the two possible aural nulls, which are 180° apart.

(*e*) Turn the aircraft or the loop to port. Set the system selector to the " L " sense position and then to " R " sense position and check which gives the louder signal. The sense is correct if the louder signal is obtained in the " R " position. If the initial turn had been to starboard, the louder signal would be obtained in the " L " position, for correct sense.

Use with a Radio Range

55. The installation is used as an ordinary receiver with manual gain control. After setting the system selector switch to " O " (omni) the required station is tuned in and identified and the volume control on the intercom mixing box is set to maximum volume. The gain control on the pilot's receiver controller is then adjusted until the volume is at a minimum consistent with reasonable signal discrimination. This level should be maintained by repeated adjustment of the gain control as the aircraft approaches the beacon. With the gain control too high, the beam appears to become wider.

Note :— When flying by radio range the receiver must not be operated on the narrow bandwidth (400 c/s) as the range signal is produced by the beat of the two transmissions 1020 c/s apart.

Precautions During Operation

56. When taking aural bearings the width of the null obtained depends upon the strength of the signals. The gain control should be used to adjust the null to a convenient width.

57. The equipment should not be operated with the system selector switch at AUTO when flying on a radio range course, or fading of signals may be mistaken for the cone of silence. On loop type radio range stations, operation of the receiver on ∞ only is not advised as signals may increase instead of indicating a cone of silence when passing over the station.

58. Care should be taken to tune the receiver very accurately when receiving strong signals otherwise bearing errors may occur. Always tune the receiver with the system switch at " O " using the tuning meter. The gain control should be adjusted if necessary to keep the meter pointer near the centre of the scale.

59. Noisy reception may occur under some weather conditions owing to charged particles of rain or snow striking the external sense aerial. Better reception is then obtained by operation on the *loop aerial* only ; the system selector switch should be set to the ∞ position, and the loop rotated by means of the hand control on the loop controller until maximum signal strength is obtained.

60. Night effect is noticeable and is especially bad at sunrise and sunset. It may be detected by unsteadiness of bearings. The operator should average the fluctuations to obtain the correct reading. Sometimes an increased altitude improves the bearings. Stations operating on the lower frequencies are least liable to this effect.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