Navigation Definitions

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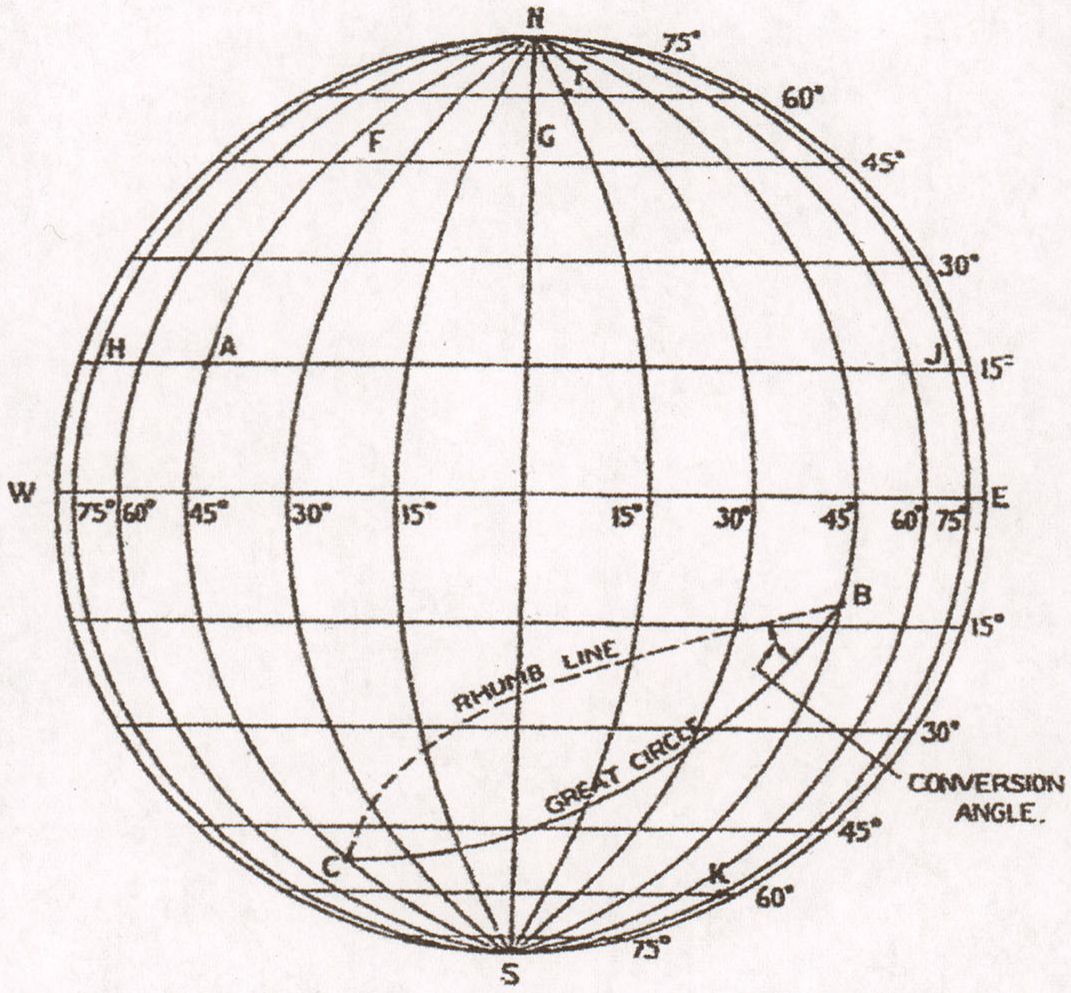

FIG. 4.—The Earth, showing latitude, longitude, great circle and rhumb line. etc.

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DEFINITIONS

1. *Air navigation* is the art of conducting an aircraft from place to place by dead reckoning and fixing position by observations of terrestrial objects and celestial bodies. It includes the ability to maintain a given direction in or above clouds and mist, and by night.

2. *Air speed* is the speed of an aircraft relative to the air.

3. *Axis of the Earth* is that diameter about which it revolves.

4. *Azimuth.—See "Bearing".*

5. *Bearing.*—(i) The *great circle bearing* of an object is the angle at the observer between the meridian passing through the observer and the great circle joining his position to the object. This may also be called the *azimuth*. The angle is measured clockwise from the meridian from 0° to 360°. (Fig. 1.)

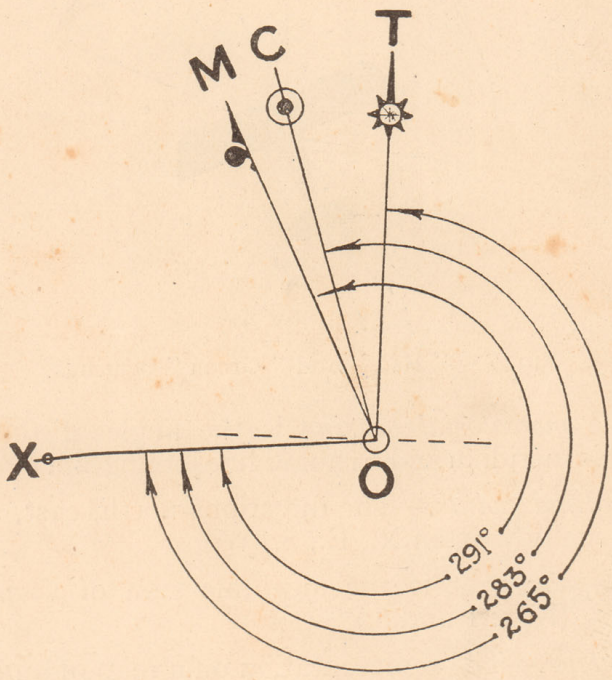

FIG. 1.—True Bearing = Angle T.O.X. = 265°.
Magnetic Bearing = Angle M.O.X. = 291°.
Compass Bearing = Angle C.O.X. = 283°.
Variation = Angle T.O.M. = 26° W.
Deviation = Angle M.O.C. = 8° E.
Compass Error = Angle T.O.C. = 18° W.

(ii) Bearings are called *true* or *magnetic*, according to whether the angles are measured from the true meridian or the magnetic meridian.

(iii) In a *compass bearing* the angle is measured from the direction of a particular compass needle.

(iv) Bearings may be referred to the course of an aircraft, and are then measured from ahead through 180° to port and starboard, being termed respectively *red* and *green*. In Fig. 2 the bearing of A is Green 45°, and of B Red 120°.

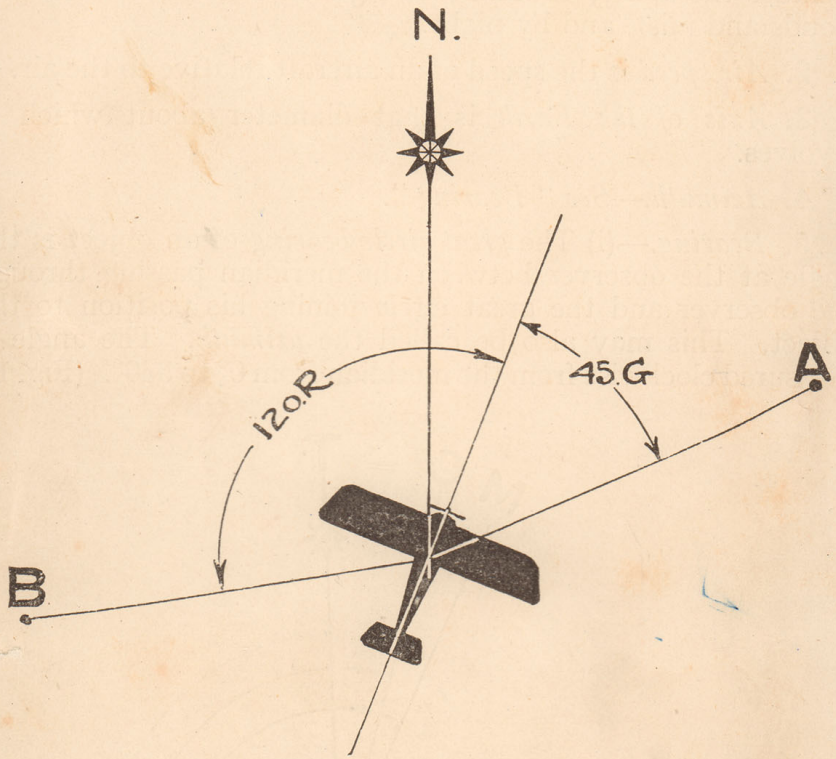

FIG. 2.—" Red " and " Green " bearings.

(v) The *mercatorial bearing* is the angle at the observer between his meridian and a rhumb line joining him to the object.

6. *Cardinal points.*—The directions north, east, south and west. (Usually written N., E., S., W.)

7. *Compass error* is the algebraic sum of variation and deviation. (Figs. 1 and 3.)

8. *Contour.*—The representation on a map of an imaginary line running along the surface of the ground at the same height above sea level throughout its length. A *form line* is an approximate contour.

9. *Conversion angle.*—The angle between the great circle and mercatorial bearings. (Fig. 4.)

10. *Couple.*—When two equal forces act on a body in opposite directions, they constitute a *couple.* The couple is the product of one of the forces and the perpendicular distance between them.

11. *Course.*—(i) The *true course* is the angle between the longitudinal axis of an aircraft and the true meridian. (Fig. 3.)

(ii) The *magnetic course* is the angle between the longitudinal axis of an aircraft and the magnetic meridian.

(iii) The *compass course* is the angle between the longitudinal axis of an aircraft and the direction of a particular compass needle.

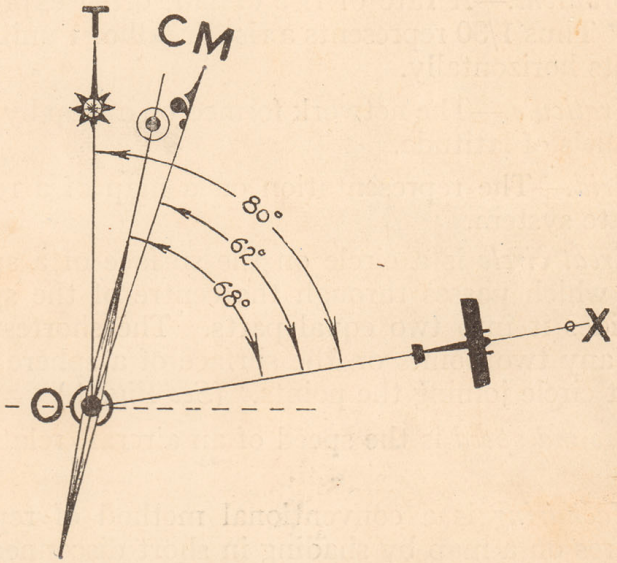

FIG. 3.—True Course = Angle T.O.X. = 80°.
Magnetic Course = Angle M.O.X. = 62°.
Compass Course = Angle C.O.X. = 68°.
Variation = Angle T.O.M. = 18° E.
Deviation = Angle M.O.C. = 6° W.
Compass Error = Angle T.O.C. = 12° E.

12. *Dead reckoning* consists of calculating the track and ground speed of an aircraft. The *D.R. position* is the position arrived at by dead reckoning.

13. *Deviation* is the angle, measured in the horizontal plane, between the magnetic meridian and the direction of a particular compass needle influenced by a magnetic field not coincident with the earth's magnetic field. It is named E. (+) or W. (—), according to whether the north-seeking pole lies to the east or west of the magnetic meridian. (Figs. 1 and 3.)

14. *Dip* of a magnetic needle is the angle in the vertical plane between the horizontal and the direction of the earth's line of total magnetic force. Sometimes called *magnetic inclination.*

15. *Drift* is the angle between the longitudinal axis of an aircraft and the track : it is measured to port or starboard relative to the aircraft's head.

16. *Equator* of the Earth is the great circle of which the plane is at right angles to the axis. (W.E. in Fig. 4.)

17. *Fix.*—The position of an aircraft as determined on a map or chart, generally by the intersection of two or more position lines.

18. *Force.*—Any cause which tends to alter a body's state of rest or uniform motion in a straight line.

19. *Gradient.*—A rate of rise or fall, often expressed as a fraction. Thus 1/30 represents a rise or fall of 1 unit vertically in 30 units horizontally.

20. *Graticule.*—The network formed on a map by meridians and parallels of latitude.

21. *Grid.*—The representation on a map of a rectangular co-ordinate system.

22. *Great circle* is a circle on the surface of a sphere, the plane of which passes through the centre of the sphere and thus divides it into two equal parts. The shortest distance between any two points on the surface of a sphere is the arc of a great circle joining the points. (*See* Fig. 4.)

23. *Ground speed* is the speed of an aircraft relative to the ground.

24. *Hachuring* is a conventional method of representing hill features on a map by shading in short disconnected lines, which are drawn in the direction of the steepest slopes.

25. *Horizontal equivalent.*—The distance in plan between two adjacent contours. (Written H.E.)

26. *Inertia.*—The tendency of a body to resist a change of motion.

27. *Isobar.*—A line drawn on a weather map, at all points on which the atmospheric pressure has the same value.

28. *Isoclinal.*—A line drawn on a map or chart, at all points on which the magnetic dip has the same value.

29. *Isogonal.*—A line drawn on a map or chart, at all points on which the magnetic variation has the same value. The *agonic line* is the line of no variation.

30. *Knot* is a unit of speed : it is a speed of one nautical mile an hour.

31. *Latitude* of a place is the arc of the meridian between the equator and the place and is named N. or S. according to whether the place is north or south of the equator. (In Fig. 4, Lat. of A = 15° N. ; Lat. of K = 60° S.)

A *parallel of latitude* is a small circle parallel to the equator. (HAJ in Fig. 4.)

Difference of latitude between two places is the arc of a meridian intercepted between the parallels of the places (written d. Lat.); d. Lat. from A to K = 75° S. (Fig. 4.)

32. *Layer tinting.*—A system of representing relief on maps by colouring the map between adjacent contours in a uniform shade, the shade chosen depending on the height.

33. *Longitude* of a place is the smaller arc of the equator intercepted between the prime meridian and the meridian of the place, and is named E. or W. according to whether the place is east or west of the prime meridian. (In Fig. 4, Long. of A = 45° W.; Long. of K = 75° E.)

Difference of longitude between two places is the smaller arc of the equator intercepted between the meridians of the places (written d. Long.); d. Long. from K to A = 120° W. (Fig. 4.)

34. *Magnetic equator.*—An imaginary line on the surface of the earth joining all points where the earth's line of total magnetic force is horizontal, i.e. where the angle of dip is zero.

35. *Magnetic field.*—The region round a magnet in which its magnetism has effect.

36. *Magnetic meridian.*—The great circle on the earth at any place in the plane of which a magnetic needle would be, if freely suspended and influenced only by the earth's magnetic field.

37. *Magnetic poles* of the earth are the two positions on the earth's surface where the earth's line of total magnetic force is vertical, i.e. where the angle of dip is 90°.

38. *Meridian* is a semi-great circle passing through the poles of the earth (NAS, NKS, etc., in Fig. 4).

39. *Natural scale.—See " Representative fraction ".*

40. *Nautical mile* is the average length of a minute of latitude measured on any meridian. Its length is generally taken as 6,080 ft. (Symbol ′.)

41. *Orienting* a map is the process of setting it so that the meridians on the map lie North and South.

42. *Poles* of the earth are the extremities of its axis of revolution. (N. and S. in Fig. 4.)

43. *Position error* is the error in the reading given by an air speed indicator due to the positioning of the pressure head.

44. *Position line* is a line obtained from observation of a terrestrial object or a celestial body, at some point on which line it is known that the aircraft must be.

45. *Projection* of a map or chart is any orderly system of representing meridians and parallels and the earth's surface on a plane.

46. *Quadrantal points.*—The directions north-east, south-east, south-west and north-west. (Usually written NE., SE., SW., NW.)

47. *Representative fraction* (written R.F.).—The ratio which the distance between two points on a map bears to the distance between the same two points on the ground. The ratio is always expressed as a fraction, of which the numerator is unity. It may also be called the *natural scale.*

48. *Rhumb line* is that curve on the earth's surface which cuts all the meridians it meets at the same angle. (*See* Fig. 4.)

49. *Run* is the direction and distance over the ground which an aircraft travels between two given instants.

50. *Small circle* is a circle on the surface of the sphere, the plane of which does not pass through the centre of the sphere.

51. *Spot height.*—The record on a map of the exact height above sea level of a particular point.

52. *Synoptic chart.—See "Weather map".*

53. *Track* is the angle between a meridian and a line representing the actual path of an aircraft relative to the ground. It is measured from 0° to 360° clockwise from the meridian.

54. *Variation* (sometimes called *declination*) is the angle, measured in the horizontal plane, between the true meridian and the direction of a freely suspended magnetic needle influenced only by the earth's magnetic field. It is named E. (+) or W. (−) according to whether the north-seeking end of the needle lies to the east or west of the true meridian. (*See* Figs. 1 and 3.)

55. *Vector* is a straight line which, in both length and direction, represents a quantity such as a force or velocity.

56. *Velocity.*—The rate of change of position of a body in a given direction. Velocity therefore involves both speed and direction.

57. *Vertical interval.*—The difference in level between two adjacent contours. (Written V.I.)

58. *Weather map.*—An outline map on which are recorded meteorological observations made simultaneously at observing stations over a large area. The weather map is the basis of weather forecasting. (Also known as a *synoptic chart.*)