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NAVIGATION AID TERMS

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IEEE Standard Definitions: **NAVIGATION AID TERMS**

FOREWORD

This document represents a revision of material contained in the previous edition of IEEE Standard No. 172 (54 IRE 12.S1) and IEEE Standard No. 174. In addition, there has been consolidated into this document selected applicable terms from 49 IRE 12.S1, 59 IRE 12.S1, former IEEE Standard No. 173, and the IRE Dictionary which was published in 1961.

The committee reviewed all of the terms, selected those which it considered appropriate, and deleted others. This resulted in a document with about 650 terms, which include additions.

The IEEE Navigation Aids Committee consists of the following personnel, all of whom have contributed to this document.

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IEEE STANDARD DEFINITIONS: NAVIGATION AID TERMS

A and R Display. An A display, any portion of which may be expanded.

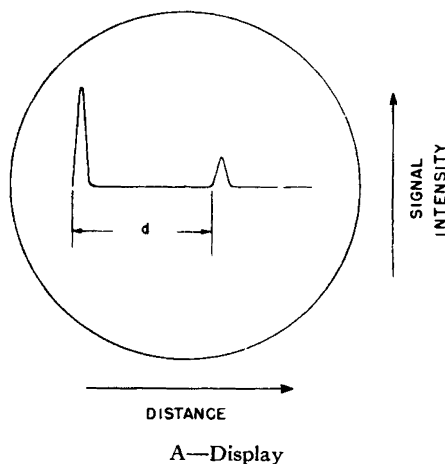
Absolute Altimeter. A device that measures altitude above local terrain.

Absolute Delay (in loran). The interval of time between the transmission of a signal from the master station and transmission of the next signal from the slave station.

Accelerometer. A device that senses inertial reaction to measure linear or angular acceleration. Note: In its simplest form, an accelerometer consists of a case mounted spring and mass arrangement, where displacement of the mass from its rest position relative to the case is proportional to the total non-gravitational acceleration experienced along the instrument's sensitive axes.

ADF. See Automatic Direction Finder.

A-Display (in radar). A display in which targets appear as vertical deflections from a line representing a time base. Target distance is indicated by the horizontal position of the deflection from one end of the time base. The amplitude of the vertical deflection is a function of the signal intensity.



Aerophare (in air operations). A name for Radio Beacon.

Aided Tracking. A tracking system in which the manual correction of the tracking error automatically corrects the rate of motion of the tracking mechanism.

AI Radar (Airborne Intercept Radar). See Fire Control Radar.

Air-Derived Navigation Data. Data obtained from measurements made at an airborne vehicle.

Airport Surface Detection Equipment (ASDE). A radar for observation of the positions of aircraft on the surface of an airport.

Airport Surveillance Radar (ASR). See Surveillance Radar.

Air-Position Indicator (API). An airborne computing system which presents a continuous indication of the aircraft position on the basis of aircraft heading, airspeed and elapsed time.

Air-Route Surveillance Radar (ARSR). See Surveillance Radar.

Air Speed. The rate of motion of a vehicle relative to the air mass.

Alford Loop. A multi-element antenna, having approximately equal amplitude currents which are in phase and uniformly distributed along each of its peripheral elements, producing a substantially circular radiation pattern in the plane of polarization; (originally developed as a four-element horizontally polarized VHF loop antenna).

Alignment (in inertial navigation equipment). The orientation of the measuring axes of the inertial components with respect to the coordinate system in which the equipment is used. Note: Initial alignment refers to the result of the process of bringing the measuring axes into a desired orientation with respect to the coordinate system in which the equipment is used, prior to departure. The initial alignment can be refined by the use of non-inertial sensors while in operational use.

Ambiguity (in navigation). The condition obtaining when navigation coordinates define more than one point, direction, line of position or surface of position.

Amplitude Balance Control (in navigation). That portion of a circuit which may be varied to adjust the relative output levels of two related signals. Originally used in ILS and later in loran.

Amplitude Discriminator. A circuit whose output is a function of the relative magnitudes of two signals.

Amplitude Noise (in radar). The noise-like variation of the amplitude of the received echo from a target caused by change of target aspect; a component of scintillation.

Analytic Inertial Navigation Equipment. That class of inertial navigation equipment in which geographic navigational quantities are obtained by means of computations (generally automatic) based upon the outputs of accelerometers whose orientations are maintained fixed with respect to inertial space.

Angle Noise (in radar). The noise-like variation in the apparent angle of arrival of an echo received from a target, because of change in target aspect; a component of scintillation.

Angle of Cut (in navigation). The angle at which two lines of position intersect.

Angular Deviation Sensitivity. The ratio of change of course indication to the change of angular displacement from the course line.

Angular Resolution (in radar). The ability to distinguish between two targets solely by the measurement of angles; generally expressed in terms of the minimum angle by which two targets must be spaced to be separately distinguishable.

Angular Width. See Course Width.

A-N Radio Range. A radio range providing four radial lines of position identified aurally as a continuous tone resulting from the interleaving of equal amplitude "A" and "N" International Morse Code letters. The sense of deviation from these lines is indicated by deterioration of the steady tone into audible A or N code signals.

Antenna Effect (in radio direction finding). The presence of output signals having no directional information and caused by the directional array acting as a simple non-directional antenna; the effect is manifested by angular displacement of the nulls, or a broadening of the nulls.

Anti-Clutter Circuits (in radar). Circuits which attenuate undesired reflections to permit detection of targets otherwise obscured by such reflections.

Anti-TR Box. See Anti-TR Switch.

Anti-TR Switch (in radar). An electronic switch which automatically decouples the transmitter from the antenna during the receiving period; it is employed when a common transmitting and receiving antenna is used.

Apparent Bearing (in direction finding). A bearing from a direction finder site to a target transmitter determined by averaging the readings made on a calibrated direction finder test standard; the apparent bearing is then used in the calibration and adjustment of other direction finders at the same site.

Apparent Vertical. The direction of the vector sum of the gravitational and all other accelerations.

Approach Navigation. Navigation during the time that the approach to a dock, runway, or other terminal facility is of immediate importance.

Approach Path. That portion of the flight path between the point at which the descent for landing is normally started and the point at which the aircraft touches down on the runway.

Area MTI. A Moving Target Indicator (MTI) system in which the moving target is selected on the basis of its change in position between looks, rather than its doppler frequency.

ARSR (Air Route Surveillance Radar). See Surveillance Radar.

A-Scan. See A-Display.

A-Scope. See A-Display.

ASDE. See Airport Surface Detection Equipment.

ASR (Airport Surveillance Radar). See Surveillance Radar.

Astro-Inertial Navigation Equipment. See Celestial Inertial Navigation Equipment.

A-Trace (in loran). The first (upper) trace on the scope display.

Attitude Effect Error (in navigation). A manifestation of polarization error; an error in indicated bearing that is dependent upon the attitude of the vehicle with respect to the direction of signal propagation. Note: See Heading Effect Error.

Aural Radio Range. See A-N Radio Range.

Automatic Chart-Line Follower. A device which automatically derives error signals proportional to the deviation of the position of a vehicle from a predetermined course line drawn on a chart.

Automatic Direction Finder. A direction finder which automatically and continuously provides a measure of the direction of arrival of the received signal. Data are usually displayed visually.

Automatic Pilot. Equipment which automatically controls the attitude of a vehicle about one or more of its rotational axes (pitch, roll and yaw), and may be used to respond to manual or electronic commands.

Automatic Track-Follower. See Automatic Chart-Line Follower.

Automatic Tracking. Tracking in which a servomechanism automatically follows some characteristic of the signal.

Autonavigator. Navigation equipment which includes means for coupling the output navigational data derived from the navigation sensors to the control system of the vehicle.

Autopilot. See Automatic Pilot.

Autopilot Coupler (in navigation). The means used to link the navigation system receiver output to the automatic pilot.

Autoradar Plot. A particular chart comparison unit using a radar presentation of position.

Azimuth. (1) The direction of a celestial point from a terrestrial point, expressed as the angle in the horizontal plane between a reference line and the horizontal projection of the line joining the two points. Note: True North is usually but not always implied where no reference direction is stated. (2) (in directional antenna systems). The pointing direction of an antenna, expressed as the angle in the horizontal plane between a reference direction and the horizontal component of the pointing direction of the boresight of the antenna. (3). Bearing.

Azimuth Discrimination. Deprecated, see Angular Resolution.

Azimuth Markers. See Calibration Markers.

Azimuth-Stabilized PPI. A Plan Position Indicator (PPI) on which the reference direction remains fixed with respect to the indicator, regardless of the vehicle orientation.

Back Course (in ILS). The course which is located on the opposite side of the localizer from the runway.

Background Returns. See Clutter.

Backscatter (in primary radar). Energy reflected with a direction component toward the transmitter.

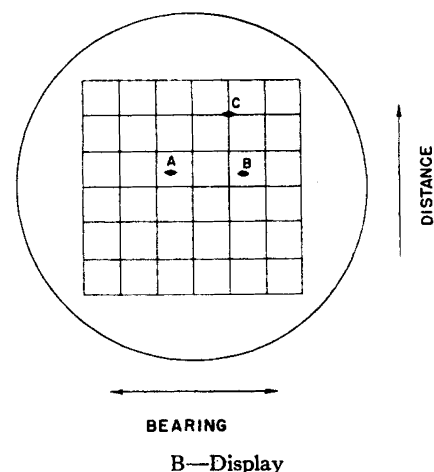
Baseline (in navigation). The line joining the two points between which electrical phase or time is compared in determining navigation coordinates; for two ground stations, this is the great circle joining the two stations, and, in the case of a rotating collector system, it is the line joining the two sides of the collector.

Baseline Delay. The time interval needed for a signal from a loran master station to travel to the slave station.

Basic Repetition Frequency (in loran). The lowest pulse repetition frequency of each of the several sets of closely-spaced repetition frequencies employed.

Basic Repetition Rate. See Basic Repetition Frequency.

B-Display (in radar). A rectangular display in which each target appears as a blip, with bearing indicated by the horizontal coordinate and distance by the vertical coordinate.



Beam Error (in navigational systems using directionally propagated signals). The lateral or angular difference between the mean direction of the actual course and the desired course direction. Note: Sometimes called course error.

Beam Noise (in navigational systems using directionally propagated signals). Extraneous disturbances tending to interfere with ideal system performance. Note: Beam noise is the aggregate effect of bends, scalloping, roughness, etc.

Bearing. (1) The horizontal direction of one terrestrial point from another, expressed as the angle in the horizontal plane between a reference line and the horizontal projection of the line joining the two points. (2) Azimuth.

Bearing Error Curve. (1) (in DF equipment). A plot of the instrumental bearing errors vs. either indicated or correct bearings. (2) (in DF installations). A plot of the combined instrumental bearing error (of the equipment) and site error vs. indicated bearings.

Bearing Offset, Indicated (in DF installations). The mean difference between the indicated and apparent bearings of a number of signal sources, the sources being substantially uniformly distributed in azimuth.

Bearing Reciprocal. See Reciprocal Bearing.

Bearing Sensitivity, DF. The minimum field strength input to a direction finder system to obtain repeatable bearings within the bearing accuracy of the system.

Bend. A departure of the course line from the desired direction at such a rate that it can be followed by the vehicle.

Bend Amplitude (in navigation). The measured maximum amount of course deviation due to bend; measurement is made from the nominal or bend-free position of the course.

Bend Frequency (in navigation). The frequency at which the course indicator oscillates when the vehicle track is straight and the course contains bends; bend frequency is a function of vehicle velocity.

Bend Reduction Factor (in navigation). The ratio of bend amplitude existing before the introduction of bend-reducing features to that existing afterward.

Blind Speed (in radar systems using MTI). The radial velocity of a target with respect to the radar for which the response is approximately zero; in a Coherent MTI system using a uniform repetition rate, the blind speed is the radial velocity at which the moving target changes distance by one-half wavelength (or multiples thereof) during each pulse period.

Blinking (in pulse systems). A method of providing information by modifying the signal at its source so that the signal presentation on the display at the receiver alternately appears and disappears; e.g., in loran, blinking is used to indicate that a station is malfunctioning.

Blip (in radar display). A deflection, or a spot of contrasting luminescence, caused by the presence of a target.

Blooming (in radar). An increase in the blip size on the display as a result of an increase in signal intensity or its duration; may be employed in navigational systems with intensity modulation displays for the purpose of conveying information.

Blur (in null-type DF systems). The output (including noise) at the bearing of minimum response expressed as a percentage of the output at the bearing of maximum response.

Boresighting. The process of aligning the axis of a directional antenna system, usually by an optical procedure.

Boundary Marker (in ILS). A radio transmitting station near the approach end of the landing runway, which provides a fix on the localizer course.

B-Scan. See B-Display.

B-Scope. See B-Display.

B-Station. Deprecated, see B-Trace.

B-Trace (in loran). The second (lower) trace on the scope display.

CADF. See Commutated-Antenna Direction Finder.

Calibration Marks. Indications superimposed on a display to provide a numerical scale of the parameters displayed.

Cancellation Ratio (in radar MTI). The ratio of canceller voltage amplification for fixed-target echoes received with a fixed antenna, to the gain for a single pulse passing through the undelayed channel of the canceller.

Cancelled Video (in radar MTI). The video output remaining after the cancellation process.

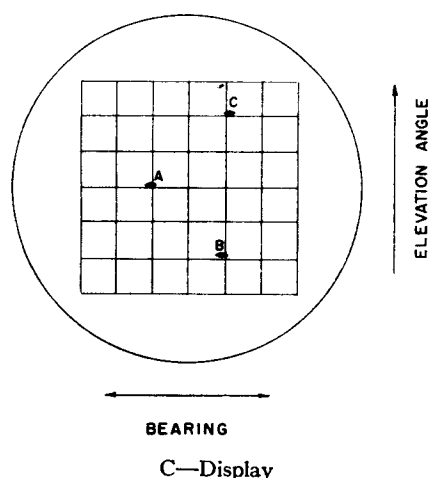
Canceller (in radar MTI). That portion of the system in which cancellation of the fixed target signals is accomplished.

Capture Effect. The tendency of a detector of a receiver to suppress the weaker of two signals whose frequencies lie within the pass band of the receiver.

Carrier-Controlled Approach System (CCA). An aircraft carrier radar system providing information by which aircraft approaches may be directed via radio communication.

CCA. See Carrier-Controlled Approach system.

C-Display (in radar). A rectangular display in which each target appears as a blip with bearing indicated by the horizontal coordinate and angle of elevation by the vertical coordinate.



Celestial-Inertial Navigation Equipment. An equipment employing both celestial and inertial sensors.

CEP. See Circular Probable Error.

Chain. A network of similar stations operating as a group for determination of position or for furnishing navigational information.

Challenge. See Interrogation.

Challenger. See Interrogator.

Chart Comparison Unit. A device for the simultaneous viewing of a navigational position presentation and a navigational chart in such a manner that one appears superimposed upon the other.

Check Point. See Way Point.

Circular Probable Error (CPE or CEP). In a two-dimensional error distribution, the radius of a circle encompassing half of all errors.

Clearance (1) (in ILS). The DDM in excess of that required to produce full-scale deflection of the course deviation indicator in flight areas outside the on-course sector; when the DDM is too low the indicator falls below full scale deflection and the condition of "low clearance" exists. (2) (in air traffic control). Permission by a control facility to the pilot to proceed in a mutually understood manner.

Clearance Antenna Array (in a directional localizer). The antenna array that radiates a localizer signal on a separate frequency within the pass band of the receiver, and provides the required signals in the clearance sectors as well as a back course.

Clearance Sector (in ILS). The sector extending around either side of the localizer from the course sector to the back course sector, and within which the deviation indicator provides the required offcourse indication.

Clutter (in radar). Unwanted echoes.

Clutter Attenuation (in radar MTI). The ratio of clutter power at the canceller input to clutter residue at the output, normalized to the attenuation for a single pulse passing through the undelayed channel of the canceller.

Clutter Reflectivity (in radar). The back-scattering coefficient of a unit volume, or of a unit area, containing clutter sources.

Clutter Residue (in radar MTI). The clutter power remaining at the output of an MTI system; it is the sum of several (generally uncorrelated) components resulting from radar instabilities, antenna scanning, relative motion of the radar with respect to the sources of clutter and fluctuations of the clutter reflectivity.

Clutter Visibility Factor (in radar). The signal-to-clutter ratio at the receiver output that provides stated probabilities of detection and false alarm on a display; in MTI systems, it is the ratio after cancellation or doppler filtering. When the clutter residue has the spectrum of thermal noise, this factor is the same as the Visibility Factor.

Coding Delay (in loran). An arbitrary time delay in the transmission of pulse signals from the slave station to permit the resolution of ambiguities; the term Suppressed Time Delay more accurately represents what is being accomplished and should be used instead of Coding Delay.

Cohered Video (in radar MTI). Video signal output employed in a coherent system.

Coherent MTI (in radar MTI). A system in which the target echo is selected on the basis of its doppler frequency when compared to a local reference frequency maintained by a coherent oscillator.

Coherent Oscillator (Coho) (in radar MTI). An oscillator that provides a reference phase by which changes in the radio frequency phase of successively received pulses may be recognized.

Coho. Coherent oscillator.

Commuted Antenna Direction Finder (CADF). A system using a multiplicity of antennas in a circular array and a receiver which is connected to the antennas in sequence through a commutating device for finding the direction of arrival of radio waves; the directional sensing is related to phase shift which occurs as a result of the commutation.

Compass Bearing. Bearing relative to compass north.

Compass Course. Course relative to compass north.

Compass Deviation. See Magnetic Deviation.

Compass Heading. Heading relative to compass north.

Compass Locator. See Nondirectional Beacon.

Complex Target (in radar). A target composed of a number of reflecting surfaces, such as an aircraft, which surfaces in aggregate are smaller in any dimension than the resolution capabilities of the radar.

Composite Pulse (in pulse navigation systems). A pulse composed of a series of overlapping pulses received from the same signal source but via different paths.

Compound Target (in radar). A target composed of a number of reflecting surfaces, such as an aircraft at short distance, which surfaces in aggregate are larger in dimension than the resolution capabilities of the radar.

Cone of Ambiguity. A generally conical volume of airspace above a navigation aid within which navigational information from that facility is unreliable.

Cone of Silence. A conically shaped region above an antenna where the field strength is relatively weak because of the configuration of the antenna system.

Conical Scanning. A form of sequential lobing in which the direction of maximum radiation generates a cone whose vertex angle is of the order of the beamwidth; such scanning may be either rotating or nutating, according to whether the direction of polarization rotates or remains unchanged.

Consol. A keyed C-W short baseline radio navigation system operating in the L/MF frequency band, generally useful to about 1500 nautical miles (2800 kilometers), and using three radiators to provide a multiplicity of overlapping lobes of dot-and-dash patterns which form equisignal hyperbolic lines of position. These lines of position are moved slowly in azimuth by changing r-f phase, thus allowing a simple listening and counting or timing operation to be used to determine a line of position within the sector bounded by any pair of equisignal lines.

Consolan. A form of consol using two radiators instead of three.

Constant-Delay Discriminator. See Pulse Decoder.

Coriolis Correction (in navigation). A correction which must be applied to measurements made with respect to a coordinate system in translation to compensate for the effect of any angular motion of the coordinate system relative to inertial space.

Corner Reflector (in radar). Three conducting surfaces, mutually intersecting at right angles, designed to return electromagnetic radiations toward their sources and used to render a target more conspicuous to radar observations.

Corrected Compass Course. See Magnetic Course.

Corrected Compass Heading. See Magnetic Heading.

Cosecant-Squared Pattern. An antenna field in which the signal-power pattern in the vertical plane varies as the square of the cosecant of the elevation angle. Note: Similar objects at the same altitude give equal response regardless of distance.

Count-Down (in a transponder). The ratio of the number of interrogation pulses not answered to the total number of interrogation pulses received.

Coupler. That portion of a navigational system which receives signals of one type from a sensor and transmits signals of a different type to an actuator. See Autopilot Coupler.

Course. (1) The intended direction of travel, expressed as an angle in the horizontal plane between a reference line and the course line, usually measured clockwise from the reference line. (2) The intended direction of travel as defined by a navigational facility. (3) Common usage for Course Line.

Course Line. The projection in the horizontal plane of a path (proposed path of travel).

Course Linearity (in ILS). A term used to describe the change in DDM of the two modulation signals with respect to displacement of the measuring position from the course line but within the course sector.

Course-line Computer. A device, usually carried aboard a vehicle, to convert navigational signals such as VOR/DME into courses extending between any desired points regardless of their orientation with respect to the source of the signals.

Course-line Deviation. The amount by which the track of a vehicle differs from its course line, expressed in terms of either an angular or linear measurement.

Course-line Deviation Indicator. (Course-deviation Indicator). A device providing a visual display of the direction and amount of deviation from the course. Also called Flight Path Deviation Indicator.

Course Made Good. The direction from the point of departure to the position of the vehicle.

Course Push (or Pull). An erroneous deflection of the indicator of a navigational aid, produced by altering the attitude of the receiving antenna. Note: This effect is a manifestation of polarization error and results in an apparent displacement of the course line.

Course Roughness. A term used to describe the imperfections in a visually indicated course when such imperfections cause the course indicator to make rapid erratic movements. See Scalloping.

Course Scalloping. See Scalloping.

Course Sector (in ILS). A wedge-shaped section of airspace containing the course line and spreading with distance from the ground station; it is bounded on both sides by the loci of points at which the DDM is a specified amount, usually the DDM giving full-scale deflection of the course deviation indicator.

Course Sector Width (in ILS). The transverse dimension at a specified distance, or the angle in degrees, between the sides of the course sector.

Course Sensitivity (in navigation systems). The relative response of a course-line deviation indicator to the actual or simulated departure of the vehicle from the course line. In VOR, Tacan, or similar omnirange systems, course sensitivity is often taken as the number of degrees through which the omnibearing selector must be moved to change the deflection of the course-line deviation indicator from full scale on one side to full scale on the other, while the receiver omnibearing input signal is held constant.