

# GLOSSARY OF MARINE NAVIGATION

## A

**abaft**, *adv.* In a direction farther aft in a ship than a specified reference position, such as abaft the mast. See also ABAFT THE BEAM, AFT, ASTERN.

**abaft the beam**. Any direction between broad on the beam and astern. See also FORWARD OF THE BEAM.

**abampere**, *n.* The unit of current in the centimeter gram-second electromagnetic system. The abampere is 10 amperes.

**abeam**, *adv.* In a line approximately at right angle to the ship's keel-opposite the waist or middle part of a ship. See also BROAD ON THE BEAM.

**aberration**, *n.* 1. The apparent displacement of a celestial body in the direction of motion of the earth in its orbit caused by the motion of the earth combined with the finite velocity of light. When, in addition to the combined effect of the velocity of light and the motion of the earth, account is taken of the motion of the celestial body in space during the interval that the light is traveling to the earth from the luminous body, as in the case of planets, the phenomenon is termed planetary aberration. The aberration due to the rotation of the earth on its axis is termed diurnal aberration or daily aberration. The aberration due to the revolution of the earth about the sun is termed annual aberration. The aberration due to the motion of the center of mass of the solar system in space is termed secular aberration but is not taken into account in practical astronomy. See also CONSTANT OF ABERRATION. 2. The convergence to different foci, by a lens or mirror, of parallel rays of light. In a single lens having spherical surfaces, aberration may be caused by differences in the focal lengths of the various parts of the lens: rays passing through the outer part of the lens come to a focus nearer the lens than do rays passing through its central part. This is termed spherical aberration and, being due to the faulty figure of the lens, is eliminated by correcting that figure. A lens so corrected is called an aplanatic lens. Aberration may also result from differences in the wavelengths of light of different colors: light of the shorter wavelengths (violet end of the spectrum) comes to a focus nearer the lens than light of the longer wavelengths (red end of the spectrum). This is termed chromatic aberration, and is practically eliminated over a moderate range of wavelengths by using a composite lens, called an achromatic lens, composed of parts having different dispersive powers.

**aberration constant**. See CONSTANT OF ABERRATION.

**ablation**, *n.* Wasting of snow or ice by melting or evaporation.

**abnormal**, *adj.* Deviating from normal.

**abrasion**, *n.* Rubbing or wearing away, or the result of such action.

**abroholos**, *n.* A squall frequent from May through August between Cabo de Sao Tome and Cabo Frio on the coast of Brazil.

**abrupt**, *adv.* Steep, precipitous. See also BOLD.

**abscissa**, *n.* The horizontal coordinate of a set of rectangular coordinates. Also used in a similar sense in connection with oblique coordinates.

**absolute**. Pertaining to measurement relative to a universal constant or natural datum.

**absolute accuracy**. The ability of a navigation or positioning system to define an exact location in relation to a coordinate system.

**absolute gain**. See ISOTROPIC GAIN (of an antenna).

**absolute humidity**. The mass of water vapor per unit volume of air.

**absolute motion**. Motion relative to a fixed point. If the earth were stationary in space, any change in the position of another body, relative to the earth, would be due only to the motion of that body. This would be absolute motion, or motion relative to a fixed point. Actual motion is motion of an object relative to the earth.

**absolute temperature**. Temperature measured from absolute zero which is zero on the Kelvin scale, 273.16°C on the Celsius scale, and 459.69°F on the Fahrenheit scale. The sizes of the Kelvin and Celsius degree are equal. The size of a degree on the Fahrenheit scale equals that on the Rankine scale.

**absolute value**. The value of a real number without regard to sign. Thus, the absolute value of +8 or -8 is |8|. Vertical lines on each side of a number indicate that its absolute value is intended.

**absorption**. The process by which radiant energy is absorbed and converted to other forms of energy. See ATTENUATION.

**absolute zero**. The theoretical temperature at which molecular motion ceases, 459.69°F or -273.16°C.

**abyss**, *n.* A very deep area of the ocean. The term is used to refer to a particular deep part of the ocean, or to any part below 300 fathoms.

**abyssal plain**. See under PLAIN.

**accelerate**, *v., t.* To move or cause to move with increasing velocity.

**acceleration**, *n.* 1. The rate of change of velocity. 2. The act or process of accelerating, or the state of being accelerated. Negative acceleration is called DECELERATION.

**acceleration error**. The error resulting from change in velocity (either speed or direction); specifically, deflection of the apparent vertical, as indicated by an artificial horizon, due to acceleration. Also called BUBBLE ACCELERATION ERROR when applied to an instrument using a bubble as an artificial horizon.

**accelerometer**, *n.* A device used to measure the accelerations of a craft, resulting from the craft's acceleration with respect to the earth, acceleration of gravity, and Coriolis acceleration.

**accidental error**. See RANDOM ERROR. An error of accidental nature. (Not to be confused with MISTAKE.)

**accretion**, *n.* Accumulation of material on the surface of an object.

**accuracy**, *n.* 1. In navigation, a measure of the difference between the position indicated by measurement and the true position. Some expressions of accuracy are defined in terms of probability. 2. A measure of how close the outcome of a series of observations or measurements approaches the true value of a desired quantity. The degree of exactness with which the true value of the quantity is determined from observations is limited by the presence of both systematic and random errors. Accuracy should not be confused with PRECISION, which is a measure of the repeatability of the observations. Observations may be of high precision due to the quality of the observing instrument, the skill of the observer and the resulting small random errors, but inaccurate due to the presence of large systematic errors. Accuracy implies precision, but precision does not imply accuracy. See also ERROR, RADIAL ERROR, ABSOLUTE ACCURACY, PREDICTABLE ACCURACY, RELATIVE ACCURACY, REPEATABLE ACCURACY.

**achromatic lens**. See under ABERRATION, definition 2.

**acinal**, *adj.* Without dip; horizontal.

**acclinic**, *adj.* Without magnetic dip.

**acclinic line**. The magnetic equator; the line on the surface of the earth connecting all points of zero magnetic dip.

**acoustic depth finder**. See ECHO SOUNDER.

**acoustic navigation**. See SONIC NAVIGATION.

**acoustics**, *n.* 1. That branch of physics dealing with sound. 2. The sound characteristics of a room, auditorium, etc., which determine its quality with respect to distinct hearing.

**acoustic sounding**. See ECHO SOUNDING.

**acquisition**, *n.* The selection of those targets or satellites requiring a tracking procedure and the initiation of their tracking.

**acre**, *n.* A unit of area equal to 43,560 square feet.

- across-the-scope echo.** See CLASSIFICATION OF RADAR ECHOES.
- active satellite.** 1. An artificial satellite which transmits an electromagnetic signal. A satellite with the capability to transmit, repeat, or retransmit electromagnetic information, as contrasted with PASSIVE SATELLITE. 2. As defined by International Telecommunications Union (ITU), an earth satellite carrying a station intended to transmit or retransmit radio communication signals.
- active tracking system.** A satellite tracking system which operates by transmission of signals to and receipt of responses from the satellite.
- actual motion.** Motion of an object relative to the earth. See also MOTION.
- acute angle.** An angle less than 90°.
- additional secondary phase factor correction.** A correction in addition to the secondary phase factor correction for the additional time (or phase delay) for transmission of a low frequency signal over a composite land-water path when the signal transit time is based on the free-space velocity.
- ADF reversal.** The swinging of the needle on the direction indicator of an automatic direction finder through 180°, indicating that the station to which the direction finder is tuned has been passed.
- adiabatic, *adj.*** Referring to a thermodynamic change of state of a system in which there is no transfer of heat or mass across the boundaries of the system. In an adiabatic process, compression causes warming, expansion causes cooling.
- adjacent angles.** Two angles having a common vertex and lying at opposite ends of a common side.
- adjustment, *n.*** The determination and application of corrections to observations, for the purpose of reducing errors or removing internal inconsistencies in derived results.
- admiralty.** Pertaining to the body of law that governs maritime affairs.
- adrift, *adj. & adv.*** Afloat and unattached to the shore or the sea bottom, and without propulsive power. See also UNDERWAY.
- advance, *n.*** 1. The distance a vessel moves in its initial direction from the point where the rudder is started over until the heading has changed 90°. 2. The distance a vessel moves in the initial direction for heading changes of less than 90°. See also TRANSFER.
- advance, *v., t. & i.*** To move forward, as to move a line of position forward, parallel to itself, along a course line to obtain a line of position at a later time. The opposite is RETIRE.
- advanced line of position.** A line of position which has been moved forward along the course line to allow for the run since the line was established. The opposite is RETIRED LINE OF POSITION.
- advection, *n.*** Transport of atmospheric properties solely by mass motion of the atmosphere. WIND refers to air motion, while ADVECTION refers more specifically to the transfer of any property of the atmosphere (temperature, humidity, etc.) from one area to another.
- advection fog.** A type of fog caused by the advection of moist air over a cold surface, and the consequent cooling of that air to below its dew point. SEA FOG is a very common advection fog that is caused by moist air in transport over a cold body of water.
- aero light.** Short for AERONAUTICAL LIGHT.
- aeromarine light.** A marine light having part of its beam deflected to an angle of 10° to 15° above the horizon for use by aircraft.
- aeromarine radiobeacon.** A radiobeacon established for use by both mariners and airmen.
- aeronautical, *adj.*** Of or pertaining to the operation or navigation of aircraft.
- aeronautical beacon.** A visual aid to navigation, displaying flashes of white or colored light or both, used to indicate the location of airports, landmarks, and certain points of the Federal airways in mountainous terrain and to mark hazards.
- aeronautical chart.** See under CHART.
- aeronautical light.** A luminous or lighted aid to navigation intended primarily for air navigation. Often shortened to AERO LIGHT.
- aeronautical radiobeacon.** A radiobeacon whose service is intended primarily for aircraft.
- aestival, *adj.*** Pertaining to summer. The corresponding adjectives for fall, winter, and spring are autumnal, hibernal and vernal.
- affluent, *n.*** A stream flowing into a larger stream or lake; a tributary.
- afloat, *adj. & adv.*** Floating on the water; water-borne. See also SURFACED, UNCOVERED, AGROUND, ASHORE.
- aft, *adv.*** Near, toward, or at the stern of a craft. See also ABAFT, ASTERN.
- afterglow, *n.*** 1. The slowly decaying luminescence of the screen of the cathode-ray tube after excitation by an electron beam has ceased. See also PERSISTENCE. 2. A broad, high arch of radiance or glow seen occasionally in the western sky above the highest clouds in deepening twilight, caused by the scattering effect of very fine particles of dust suspended in the upper atmosphere.
- aged ridge.** A ridge of ice forced up by pressure which has undergone considerable weathering.
- age of diurnal inequality.** The time interval between the maximum semi-monthly north or south declination of the moon and the maximum effect of the declination upon the range of tide or the speed of the tidal current; this effect is manifested chiefly by an increase in the height or speed difference between the two high (low) waters or flood (ebb) currents during the day. The tides occurring at this time are called TROPIC TIDES. Also called DIURNAL AGE.
- age of parallax inequality.** The time interval between perigee of the moon and the maximum effect of parallax upon the range of tide or the speed of the tidal current. See also PARALLAX INEQUALITY.
- age of phase inequality.** The time interval between new or full moon and the maximum effect of these phases upon the range of tide or the speed of the tidal current. Also called AGE OF TIDE.
- age of the moon.** The elapsed time, usually expressed in days, since the last new moon. See also PHASES OF THE MOON.
- age of tide.** See AGE OF PHASE INEQUALITY.
- Ageton, *n.*** 1. A divided triangle method of sight reduction in which a perpendicular is dropped from the GP of the body to the meridian of the observer. 2. Rear Admiral Arthur A. Ageton, USN, inventor of the Ageton method.
- agger, *n.*** See DOUBLE TIDE.
- agonic line.** A line joining points of no magnetic variation, a special case of an isogonic line.
- agravic, *adj.*** Of or pertaining to a condition of no gravitation.
- aground, *adj. & adv.*** Resting or lodged on the bottom.
- Agulhas Current.** A generally southwestward flowing ocean current of the Indian Ocean, one of the swiftest ocean currents. To the south of latitude 30°S the Agulhas Current is a well-defined and narrow current that extends less than 100 km from the coast of South Africa. To the south of South Africa the greatest volume of its water bends sharply to the south and then toward the east, thus returning to the Indian Ocean.
- ahead, *adv.*** Bearing approximately 000° relative. The term is often used loosely for DEAD AHEAD or bearing exactly 000° relative. The opposite is ASTERN.
- ahead reach.** The distance traveled by a vessel proceeding ahead at full power from the time the engines are reversed until she is at full stop.
- ahull.** The condition of a vessel making no way in a storm, allowing wind and sea to determine the position of the ship. Sailing vessels lying ahull lash the helm alee, and may carry storm sails.
- aid, *n.*** Short for AID TO NAVIGATION.
- aid to navigation.** A device or structure external to a craft, designed to assist in determination of position, to define a safe course, or to warn of dangers or obstructions. If the information is transmitted by light waves, the device is called a visual aid to navigation; if by sound waves, an audible aid to navigation; if by radio waves, a radio aid to navigation. Any aid to navigation using electronic equipment, whether or not radio waves are involved, may be called an electronic aid to navigation. Compare with NAVIGATIONAL AID, meaning an instrument, device, chart, method, etc., intended to assist in the navigation of a craft.
- air, *n.*** 1. The mixture of gases comprising the earth's atmosphere. It is composed of about 78% nitrogen, 21% oxygen, 1% other gases, and a variable amount of impurities such as water vapor, suspended dust particles, smoke, etc. See also ATMOSPHERE. 2. Wind of force 1 (1-3 knots or 1-3 miles per hour) on the Beaufort wind scale, called LIGHT AIR.
- air almanac.** 1. A periodical publication of astronomical data designed primarily for air navigation, but often used in marine navigation. See also ALMANAC FOR COMPUTERS. 2. *Air Almanac*, a joint publication of the U.S. Naval Observatory and H. M. Nautical Almanac Office, Royal Greenwich Observatory, designed primarily for air navigation. In general the information is similar to that of the *Nautical Almanac*, but is given to a precision of 1' of arc and 1s of time, at intervals of 10m (values for the sun and Aries are given to a precision of 0.1').

- air defense identification zone (ADIZ).** Airspace of defined dimensions within which the ready identification location, and control of aircraft are required.
- air mass.** An extensive body of air with fairly uniform (horizontal) physical properties, especially temperature and humidity. In its incipient stage the properties of the air mass are determined by the characteristics of the region in which it forms. It is a cold or warm air mass if it is colder or warmer than the surrounding air.
- air-mass classification.** Air masses are classified according to their source regions. Four such regions are generally recognized- (1) equatorial (E), the doldrum area between the north and south trades; (2) tropical (T), the trade wind and lower temperate regions, (3) polar (P), the higher temperate latitudes; and (4) Arctic or Antarctic (A), the north or south polar regions of ice and snow. This classification is a general indication of relative temperature, as well as latitude of origin. Air masses are further classified as maritime (m) or continental (c), depending upon whether they form over water or land. This classification is an indication of the relative moisture content of the air mass. A third classification sometimes applied to tropical and polar air masses indicates whether the air mass is warm (w) or cold (k) relative to the underlying surface. The w and k classifications are primarily indications of stability, cold air being more stable.
- air temperature correction.** A correction due to nonstandard air temperature, particularly the sextant altitude correction due to changes in refraction caused by difference between the actual temperature and the standard temperature used in the computation of the refraction table. The *Nautical Almanac* refraction table is based upon an air temperature of 50°F (10°C) at the surface of the earth. Refraction is greater at lower temperatures, and less at higher temperatures. The correction for air temperature varies with the temperature of the air and the altitude of the celestial body, and applies to all celestial bodies, regardless of the method of observation. It is not applied in normal navigation.
- Alaska Current.** A North Pacific Ocean current flowing counterclockwise in the Gulf of Alaska. It is the northward flowing division of the Aleutian Current.
- Alaska-Hawaii standard time.** See STANDARD TIME.
- albedo, n.** The ratio of radiant energy reflected to that received by a surface, usually expressed as a percentage; reflectivity. The term generally refers to energy within a specific frequency range, as the visible spectrum. Its most frequent application in navigation is to the light reflected by a celestial body.
- alert, n.** See ALERT TIME CALCULATIONS.
- alert time calculations.** Computations of times and altitudes of available satellite passes in a given period of time at a given location, based on orbital data transmitted from satellite memory. Sometimes called ALERT.
- Aleutian Current.** An eastward flowing North Pacific Ocean current which lies north of the North Pacific Current. As it approaches the coast of North America it divides to form the northward-flowing ALASKA CURRENT, and the southward-flowing CALIFORNIA CURRENT. Also called SUBARCTIC CURRENT.
- alga (pl. algae), n.** A plant of simple structure which grows chiefly in water, such as the various forms of seaweed. It ranges in size from a microscopic plant, large numbers of which sometimes cause discoloration of water, to the giant kelp which may extend for more than 600 feet in length. The Red Sea owes its name to red algae, as does the "red tide."
- algorithm.** A defined procedure or routine used for solving a specific mathematical problem.
- alidade, n.** The part of an optical measuring instrument comprising the optical system, indicator, vernier, etc. In modern practice the term is used principally in connection with a bearing circle fitted with a telescope to facilitate observation of bearings. Also called TELESCOPIC ALIDADE.
- align, v., t.** To place objects in line.
- alignment, n.** 1. The placing of objects in a line. 2. The process of orienting the measuring axes of the inertial components of inertial navigation equipment with respect to the coordinate system in which the equipment is to be used.
- Allard's law.** A formula relating the illuminance produced on a normal surface at a given distance from a point source of light, the intensity of the light, and the degree of transparency of the atmosphere, assumed to be uniform. See OMNIDIRECTIONAL LIGHT.
- all-weather, adj.** Designed or equipped to perform by day or night under any weather conditions.
- almanac, n.** A periodical publication of ephemeral astronomical data. If information is given in a form and to a precision suitable for marine navigation, it is called a nautical almanac. See also NAUTICAL ALMANAC; if designed primarily for air navigation, it is called an air almanac. See also EPHEMERIS, ASTRONOMICAL ALMANAC.
- almucantar, n.** A small circle on the celestial sphere paralleled to the horizon. Also called CIRCLE OF EQUAL ALTITUDE, PARALLEL OF ALTITUDE.
- almucantar staff.** An ancient instrument formerly used for amplitude observations.
- alnico, n.** An alloy composed principally of aluminum, nickel, cobalt, and iron; used for permanent magnets.
- aloft.** Up in the rigging of a ship.
- alongshore current.** See LONGSHORE CURRENT.
- alphanumeric.** Referring to a set of computer characters consisting of alphabetic and numeric symbols.
- alphanumeric grid.** See ATLAS GRID.
- alternate blanking.** See under DUAL-RATE BLANKING.
- alternating current.** An electric current that continually changes in magnitude and periodically reverses polarity.
- alternating.** Referring to periodic changes in color of a lighted aid to navigation.
- alternating fixed and flashing light.** A fixed light varied at regular intervals by a single flash of greater luminous intensity, with color variations in either the fixed light or flash, or both. See ALTERNATING LIGHT.
- alternating fixed and group flashing light.** A fixed light varied at regular intervals by a group of two or more flashes of greater luminous intensity, with color variations in either the fixed light or flashes or both.
- alternating flashing light.** A light showing a single flash with color variations at regular intervals, the duration of light being shorter than that of darkness. See also FLASHING LIGHT.
- alternating group flashing light.** A group flashing light which shows periodic color change.
- alternating group occulting light.** A group occulting light which shows periodic color change.
- alternating occulting light.** A light totally eclipsed at regular intervals, the duration of light always being longer than the duration of darkness, which shows periodic color change. See also ALTERNATING LIGHT.
- alternating light.** A light showing different colors alternately.
- altitude, n.** Angular distance above the horizon; the arc of a vertical circle between the horizon and a point on the celestial sphere, measured upward from the horizon. Angular distance below the horizon is called negative altitude or depression. Altitude indicated by a sextant is called sextant altitude. Sextant altitude corrected only for inaccuracies in the reading (instrument, index, and personal errors, as applicable) and inaccuracies in the reference level (principally dip) is called apparent or rectified altitude. After all corrections are applied, it is called corrected sextant altitude or observed altitude. An altitude taken directly from a table, before interpolation, is called tabulated altitude. After interpolation, or if determined by calculation, mechanical device, or graphics, it is called computed altitude. If the altitude of a celestial body is computed before observation, and sextant altitude corrections are applied with reversed sign, the result is called precomputed altitude. The difference between computed and observed altitudes (corrected sextant altitudes), or between precomputed and sextant altitudes, is called altitude intercept or altitude difference. An altitude determined by inexact means, as by estimation or star finder, is called an approximate altitude. The altitude of a celestial body on the celestial meridian is called meridian altitude. The expression ex-meridian altitude is applied to the altitude of a celestial body near the celestial meridian, to which a correction is to be applied to determine the meridian altitude. A parallel of altitude is a circle of the celestial sphere parallel to the horizon, connecting all points of equal altitude. See also EQUAL ALTITUDES.

- altitude azimuth.** An azimuth determined by solution of the navigational triangle with altitude, declination, and latitude given. A time azimuth is computed with meridian angle, declination, and latitude given. A time and altitude azimuth is computed with meridian angle, declination, and altitude given.
- altitude circle.** See PARALLEL OF ALTITUDE.
- altitude difference.** 1. See ALTITUDE INTERCEPT. 2. The change in the altitude of a celestial body occurring with change in declination, latitude, or hour angle, for example the *first difference* between successive tabulations of altitude in a latitude column of *Pub. No. 229*, Sight Reduction Tables for Marine Navigation.
- altitude intercept.** The difference in minutes of arc between the computed and the observed altitude (corrected sextant altitude), or between precomputed and sextant altitudes. It is labeled T (toward) or A (away) as the observed (or sextant) altitude is greater or smaller than the computed (or precomputed) altitude. Also called ALTI-TUDE DIFFERENCE, INTERCEPT.
- altitude intercept method.** See ST. HILAIRE METHOD.
- altitude of the apogee.** As defined by the International Telecommunication Union (ITU), the altitude of the apogee above a specified reference surface serving to represent the surface of the earth.
- altitude of the perigee.** As defined by the International Telecommunication Union (ITU), the altitude of the perigee above a specified reference surface serving to represent the surface of the earth.
- altitude tints.** See HYSOMETRIC TINTING.
- alto-** A prefix used in cloud classification to indicate the middle level. See also CIRRO-.
- altocumulus, n.** Clouds within the middle level (mean height 6,500-20,000 ft.) composed of flattened globular masses, the smallest elements of the regularly arranged layers being fairly thin, with or without shading. These elements are arranged in groups, in lines, or waves, following one or two directions, and are sometimes so close together that their edges join. See also CLOUD CLASSIFICATION.
- altostratus, n.** A sheet of gray or bluish cloud within the middle level (mean height 6,500-20,000 ft.). Sometimes the sheet is composed of a compact mass of dark, thick, gray clouds of fibrous structure; at other times the sheet is thin and through it the sun or moon can be seen dimly. See also CLOUD CLASSIFICATION.
- A.M.** Abbreviation for *Ante Meridian*; before noon in zone time.
- ambient temperature.** The temperature of the air or other medium surrounding an object. See also FREE-AIR TEMPERATURE.
- ambiguity, n.** In navigation, the condition obtained when a given set of observations defines more than one point, direction, line of position, or surface of position.
- ambiguous, adj.** Having two or more possible meanings or values.
- American Ephemeris and Nautical Almanac.** See ASTRONOMICAL ALMANAC.
- American Practical Navigator, The.** A navigational text and reference book published by the Defense Mapping Agency Hydrographic/Topographic Center; originally by Nathaniel Bowditch. Popularly called BOWDITCH.
- amidships, adv.** At, near, or toward the middle of a ship.
- ampere, n.** The base unit of electric current in the International System of Units; it is that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross section, and placed 1 meter apart in vacuum, would produce between these conductors a force equal to  $2 \times 10^{-7}$  newton per meter of length.
- ampere per meter.** The derived unit of magnetic field strength in the International System of Units.
- amphidromic point.** Point on a tidal chart where the cotidal lines meet.
- amphidromic region.** An area surrounding a no-tide point from which the radiating cotidal lines progress through all hours of the tidal cycle.
- amplification, n.** 1. An increase in signal magnitude from one point to another, or the process causing this increase. 2. Of a transducer, the scalar ratio of the signal output to the signal input.
- amplifier, n.** A device which enables an input signal to control power from a source independent of the signal and thus be capable of delivering an output which is greater than the input signal.
- amplitude, n.** 1. Angular distance of a celestial body north or south of the prime vertical circle; the arc of the horizon or the angle at the zenith between the prime vertical circle and a vertical circle through the celestial body measured north or south from the prime vertical to the vertical circle. The term is customarily used only with reference to bodies whose centers are on the celestial horizon, and is prefixed E or W, as the body is rising or setting, respectively; and suffixed N or S to agree with the declination. The prefix indicates the origin and the suffix the direction of measurement. Amplitude is designated as true, magnetic, compass, or grid as the reference direction is true, magnetic, compass, or grid east or west, respectively. 2. The maximum value of the displacement of a wave, or other periodic phenomenon, from the zero position. 3. One-half the range of a constituent tide. By analogy, it may be applied also to the maximum speed of a constituent current.
- amplitude compass.** A compass intended primarily for measuring amplitude. It is graduated from 0° at east and west to 90° at north and south. Seldom used on modern vessels.
- amplitude distortion.** Distortion occurring in an amplifier or other device when the output amplitude is not a linear function of the input amplitude.
- amplitude modulation.** The process of changing the amplitude of a carrier wave in accordance with the variations of a modulating wave. See also MODULATION.
- AMVER System.** See AUTOMATED MUTUAL-ASSISTANCE VESSEL RESCUE SYSTEM.
- anabatic wind.** Any wind blowing up an incline. A KATABATIC WIND blows down an incline.
- analemma, n.** A graduated scale of the declination of the sun and the equation of time for each day of the year located in the Torrid Zone on the terrestrial globe.
- analog computer.** A computer in which quantities are represented by physical variables. Problem parameters are translated into equivalent mechanical or electrical circuits as an analog for the physical phenomenon being investigated without the use of a machine language. An analog computer measures continuously; a digital computer counts discretely. See DIGITAL.
- anchorage, n.** An area where vessels may anchor, either because of suitability or designation.
- anchorage buoy.** A buoy which marks the limits of an anchorage, not to be confused with a MOORING BUOY.
- anchorage chart.** A nautical chart showing prescribed or recommended anchorages.
- anchorage mark.** A navigation mark which indicates an anchorage area or defines its limits.
- anchor, n.** A device used to secure a ship to the sea floor.
- anchor, v.t.** To use the anchor to secure a ship to the sea floor. If more than one anchor is used the ship is moored.
- anchor buoy.** A buoy marking the position of an anchor on the bottom, usually painted green for the starboard anchor and red for the port anchor, and secured to the crown of the anchor by a buoy rope.
- anchor ice.** Submerged ice attached or anchored to the bottom, irrespective of the nature of its formation.
- anchor light.** A light shown from a vessel or aircraft to indicate its position when riding at anchor. Also called RIDING LIGHT.
- anemometer, n.** An instrument for measuring the speed of the wind. Some instruments also indicate the direction from which it is blowing. See also VANE, definition 1; WIND INDICATOR.
- aneroid barometer.** An instrument which determines atmospheric pressure by the effect of such pressure on a thin-metal cylinder from which the air has been partly exhausted. See also MERCURIAL BAROMETER.
- angel.** A radar echo caused by a physical phenomenon which cannot be seen.
- angle, n.** The inclination to each other of two intersecting lines, measured by the arc of a circle intercepted between the two lines forming the angle, the center of the circle being the point of intersection. An acute angle is less than 90°; a right angle, 90° an obtuse angle, more than 90° but less than 180° - a straight angle 180°; a reflex angle, more than 180° but less than 360°; a perigon, 360°. Any angle not a multiple of 90 is an oblique angle. If the sum of two angles is 90°, they are complementary angles; if 180°, supplementary angles; if 360°, complementary angles. Two adjacent angles have a common

- vertex and lie on opposite sides of a common side. A dihedral angle is the angle between two intersecting planes. A spherical angle is the angle between two intersecting great circles.
- angle of cut.** The smaller angular difference of two bearings or lines of position.
- angle of depression.** The angle in a vertical plane between the horizontal and a descending line. Also called DEPRESSION ANGLE. See ANGLE OF ELEVATION.
- angle of deviation.** The angle through which a ray is bent by refraction.
- angle of elevation.** The angle in a vertical plane between the horizontal and an ascending line, as from an observer to an object. A negative angle of elevation is usually called an ANGLE OF DEPRESSION. Also called ELEVATION ANGLE.
- angle of incidence.** The angle between the line of motion of a ray of radiant energy and the perpendicular to a surface, at the point of impingement. This angle is numerically equal to the ANGLE OF REFLECTION.
- angle of reflection.** The angle between the line of motion of a ray of reflected radiant energy and the perpendicular to a surface, at the point of reflection. This angle is numerically equal to the ANGLE OF INCIDENCE.
- angle of refraction.** The angle between a refracted ray and the perpendicular to the refracting surface.
- angle of roll.** The angle between the transverse axis of a craft and the horizontal. Also called ROLL ANGLE.
- angle of uncertainty.** The horizontal angle of the region of indefinite characteristic near the boundaries of a sector of a sector light. Also called ARC OF UNCERTAINTY.
- angstrom, n.** A unit of length, used especially in expressing the length of light waves, equal to one ten-thousandth of a micron or one hundred millionth of a centimeter.
- angular, adj.** Of or pertaining to an angle or angles.
- angular distance.** 1. The angular difference between two directions, numerically equal to the angle between two lines extending in the given directions. 2. The arc of the great circle joining two points, expressed in angular units. 3. Distance between two points, expressed in angular units of a specified frequency. It is equal to the number of waves between the points multiplied by  $2\pi$  if expressed in radians, or multiplied by  $360^\circ$  if measured in degrees.
- angular distortion.** Distortion in a map projection because of non-conformity.
- angular momentum.** The quantity obtained by multiplying the moment of inertia of a body by its angular speed.
- angular rate.** See ANGULAR SPEED.
- angular rate of the earth's rotation.** Time rate of change of angular displacement of the earth relative to the fixed stars equal to  $0.729211 \times 10^{-4}$  radian per second.
- angular resolution.** See BEARING RESOLUTION.
- angular speed.** Change of direction per unit time. Also called ANGULAR RATE. See also LINEAR SPEED.
- anneal, v., t.** To heat to a high temperature and then allow to cool slowly, for the purpose of softening, making less brittle, or removing permanent magnetism. When Flinders bars or quadrantal correctors acquire permanent magnetism which decreases their effectiveness as compass correctors, they are annealed.
- annotation, n.** Any marking on illustrative material for the purpose of clarification such as numbers, letters, symbols, and signs.
- annual, adj.** Of or pertaining to a year; yearly.
- annual aberration.** See under ABERRATION, definition 1.
- annual inequality.** Seasonal variation in water level or tidal current speed, more or less periodic due chiefly to meteorological causes.
- annual parallax.** See HELIOCENTRIC PARALLAX.
- annular, adj.** Ring-shaped.
- annular eclipse.** An eclipse in which a thin ring of the source of light appears around the obscuring body. Annular solar eclipses occur, but never annular lunar eclipses.
- annulus, n.** A ring-shaped band.
- anode, n.** 1. A positive electrode; the plate of a vacuum tube; the electrode of an electron tube through which a principal stream of electrons leaves the inter-electrode space. 2. The positive electrode of an electrochemical device, such as a primary or secondary cell, toward which the negative ions are drawn. See also CATHODE.
- anomalous, adj.** Pertaining to the periodic return of the moon to its perigee, or of the earth to its perihelion.
- anomalous month.** The average period of revolution of the moon from perigee to perigee, a period of 27 days, 13 hours, 18 minutes, and 33.2 seconds in 1900. The secular variation does not exceed a few hundredths of a second per century. anomalous period. The interval between two successive passes of a satellite through perigee. Also called PERIGEE-TO-PERIGEE PERIOD RADIAL PERIOD. See also ORBITAL PERIOD.
- anomalous year.** The period of one revolution of the earth around the sun, from perihelion to perihelion, averaging 365 days, 6 hours, 13 minutes, 53.0 seconds in 1900, and increasing at the rate of 0.26 second per century.
- anomaly, n.** 1. Departure from the strict characteristics of the type, pattern, scheme, etc. 2. An angle used in the mathematical description of the orbit of one body about another. It is the angle between the radius vector of the body and the line of apsides and is measured from pericenter in the direction of motion. When the radius vector is from the center of the primary to the orbiting body, the angle is called true anomaly. When the radius vector is from the center of the primary to a fictitious body moving with a uniform angular velocity in such a way that its period is equal to that of the actual body, the angle is called mean anomaly. When the radius vector is from the center of the elliptical orbit to the point of intersection of the circle defined by the semimajor axis with the line perpendicular to the semimajor axis and passing through the orbiting body, the angle is called eccentric anomaly or eccentric angle. 3. Departure of the local mean value of a meteorological element from the mean value for the latitude. See also MAGNETIC ANOMALY.
- antarctic, adj.** referring to the Antarctic region.
- Antarctic, n.** The region within the Antarctic Circle, or, loosely, the extreme southern regions of the earth.
- antarctic air.** A type of air whose characteristics are developed in an Antarctic region. Antarctic air appears to be colder at the surface in all seasons, and at all levels in fall and winter, than ARCTIC AIR.
- Antarctic Circle.** The parallel of latitude at about  $66^\circ 33'S$ , marking the northern limit of the south Frigid Zone. This latitude is the complement of the sun's greatest southerly declination, and marks the approximate northern limit at which the sun becomes circumpolar. The actual limit is extended somewhat by the combined effect of refraction, semidiameter of the sun, parallax, and the height of the observer's eye above the surface of the earth. A similar circle marking the southern limit of the north Frigid Zone is called ARCTIC or NORTH POLAR CIRCLE. Also called SOUTH POLAR CIRCLE.
- Antarctic Circumpolar Current.** See WEST WIND DRIFT.
- antarctic front.** The semi-permanent, semi-continuous front between the Antarctic air of the Antarctic Continent and the polar air of the southern oceans; generally comparable to the **arctic front** of the Northern Hemisphere.
- antarctic whiteout.** The obliteration of contrast between surface features in the Antarctic when a covering of snow obscuring all landmarks is accompanied by an overcast sky, resulting in an absence of shadows and an unrelieved expanse of white, the earth and sky blending so that the horizon is not distinguishable. A similar occurrence in the Arctic is called ARCTIC WHITEOUT.
- ante meridian (AM).** Before noon, or the period of time between midnight (0000) and noon (1200). The period between noon and midnight is called POST MERIDIAN.
- antenna, n.** A structure or device used to collect or radiate electromagnetic waves.
- antenna array.** A combination of antennas with suitable spacing and with all elements excited to make the radiated fields from the individual elements add in the desired direction, i.e., to obtain directional characteristics.
- antenna assembly.** The complete equipment associated with an antenna, including, in addition to the antenna, the base, switches, lead-in wires, revolving mechanism, etc.

- antenna bearing.** The generated bearing of the antenna of a radar set, as delivered to the indicator.
- antenna coupler.** 1. A radio-frequency transformer used to connect an antenna to a transmission line or to connect a transmission line to a radio receiver. 2. A radio-frequency transformer, link circuit, or tuned line used to transfer radio-frequency energy from the final plate-tank circuit of a transmitter to the transmission line feeding the antenna.
- antenna directivity diagram.** See DIRECTIVITY DIAGRAM.
- antenna effect.** A spurious effect, in a loop antenna, resulting from the capacitance of the loop to ground.
- antenna feed.** The component of an antenna of mirror or lens type that irradiates, or receives energy from, the mirror or lens. See also HORN ANTENNA.
- antenna radiation pattern.** See RADIATION PATTERN.
- antheion, n.** A rare kind of halo, which appears as a bright spot at the same altitude as the sun and 180° from it in azimuth. See also PARHELION.
- anti-clutter gain control.** See SENSITIVITY TIME CONTROL.
- anti-clutter rain.** See FAST TIME CONSTANT CIRCUIT.
- anti-clutter sea.** See SENSITIVITY TIME CONTROL.
- anticorona, n.** A diffraction phenomenon very similar to but complementary to the corona, appearing at a point directly opposite to the sun or moon from the observer. Also called BROKEN BOW, GLORY.
- anticrepuscular arch.** See ANTIWILIGHT.
- anti-crepuscular rays.** Extensions of crepuscular rays, converging toward a point 180° from the sun.
- anticyclone, n.** An approximately circular portion of the atmosphere, having relatively high atmospheric pressure and winds which blow clockwise around the center in the Northern Hemisphere and counterclockwise in the Southern Hemisphere. An anticyclone is characterized by good weather. Also called HIGH. See also CYCLONE.
- anticyclonic winds.** The winds associated with a high pressure area and constituting part of an anticyclone.
- Antilles Current.** This current originates in the vicinity of the Leeward Islands as part of the Atlantic North Equatorial Current. It flows along the northern side of the Greater Antilles. The Antilles Current eventually joins the Florida Current (north of Grand Bahama Island) to form the Gulf Stream.
- antilogarithm, n.** The number corresponding to a given logarithm. Also called INVERSE LOGARITHM.
- antinode, n.** Either of the two points on an orbit where a line in the orbit plane, perpendicular to the line of nodes, and passing through the focus, intersects the orbit.
- antipodal effects.** See as LONG PATH INTERFERENCE under MULTIPATH ERROR.
- antipode, n.** Anything exactly opposite to something else. Particularly, that point on the earth 180° from a given place.
- antisolar point.** The point on the celestial sphere 180° from the sun.
- antitrades, n., pl.** The prevailing western winds which blow over and in the opposite direction to the trade winds. Also called COUNTERTRADES.
- anti-TR tube.** See TR TUBE.
- antitwilight, n.** The pink or purplish zone of illumination bordering the shadow of the earth in the dark part of the sky opposite the sun after sunset or before sunrise. Also called ANTI CREPUSCULAR ARCH.
- anvil cloud.** Heavy cumulus or cumulonimbus having an anvil-like upper part.
- apastron, n.** The point of the orbit of one member of a double star system at which the stars are farthest apart. That point at which they are nearest together is called PERIASTRON.
- aperiodic, adj.** Without a period; of irregular occurrence.
- aperiodic compass.** Literally "a compass without a period," or a compass that, after being deflected, returns by one direct movement to its proper reading without oscillation. Also called DEADBEAT COMPASS.
- aperture, n.** 1. An opening; particularly, the opening in the front of a camera through which light rays pass when a picture is taken. 2. The diameter of the objective of a telescope or other optical instrument, usually expressed in inches, but sometimes as the angle between lines from the principal focus to opposite ends of a diameter of the objective. 3. Of a directional antenna, that portion of nearby plane surface that is perpendicular to the direction of maximum radiation and through which the major part of the radiation passes.
- aperture antenna.** An antenna in which the beam width is determined by the dimensions of a horn, lens, or reflector.
- aperture ratio.** The ratio of the diameter of the objective to the focal length of an optical instrument.
- apex, n.** The highest point of something, as of a cone or triangle, or the maximum latitude (vertex) of a great circle.
- aphelion, n.** That point in the elliptical orbit of a body about the sun farthest from the sun. That point nearest the sun is called PERIHELION.
- aphylactic map projection.** A map projection which is neither conformal nor equal area. Also called ARBITRARY MAP PROJECTION.
- aplanatic lens.** See under ABERRATION, definition 2.
- apoapsis, n.** See APOCENTER.
- apocenter, n.** In an elliptical orbit, the point in the orbit which is the farthest distance from the focus, where the attracting mass is located. The apocenter is at one end of the major axis of the orbital ellipse. The opposite is PERICENTER, PERIFOCUS, PERIAPSIS. Also called APOAPSIS, APOFOCUS.
- apofocus, n.** See APOCENTER.
- apogean range.** The average semidiurnal range of the tide occurring at the time of apogean tides. It is smaller than the mean range, where the type of tide is either semidiurnal or mixed, and is of no practical significance where the type of tide is diurnal.
- apogean tidal currents.** Tidal currents of decreased speed occurring monthly as the result of the moon being at apogee (farthest from the earth).
- apogean tides.** Tides of decreased range occurring monthly as the result of the moon being at apogee (farthest from the earth).
- apogee, n.** That orbital point of a non-circular orbit farthest from the center of attraction. Opposite is PERIGEE. See APOCENTER, PERICENTER.
- apparent altitude.** Sextant altitude corrected for inaccuracies in the reading (instrument, index, and personal errors) and inaccuracies in the reference level (principally dip or Coriolis/acceleration), but not for other errors. Apparent altitude is used in obtaining a more accurate refraction correction than would be obtained with an uncorrected sextant altitude. Also called RECTIFIED ALTITUDE. See also OBSERVED ALTITUDE, SEXTANT ALTITUDE.
- apparent horizon.** See VISIBLE HORIZON.
- apparent motion.** Motion relative to a specified or implied reference point which may itself be in motion. The expression usually refers to movement of celestial bodies as observed from the earth. Usually called RELATIVE MOVEMENT when applied to the motion of one vessel relative to that of another. Also called RELATIVE MOTION.
- apparent noon.** Twelve o'clock apparent time, or the instant the apparent sun is over the upper branch of the meridian. Apparent noon may be either local or Greenwich depending upon the reference meridian. High noon is local apparent noon.
- apparent place.** The position on the celestial sphere at which a celestial body would be seen if the effects of refraction, diurnal aberration, and geocentric parallax were removed; the position at which the object would actually be seen from the center of the earth. Also called APPARENT POSITION.
- apparent position.** See APPARENT PLACE.
- apparent precession.** Apparent change in the direction of the axis of rotation of a spinning body, such as a gyroscope, due to rotation of the earth. As a result of gyroscopic inertia or rigidity in space, to an observer on the rotating earth a gyroscope appears to turn or precess.
- apparent secular trend.** The non-periodic tendency of sea level to rise, fall and/or remain stationary with time. Technically, it is frequently defined as the slope of a least-squares line of regression through a relatively long series of yearly mean sea level values. The word apparent is used since it is often not possible to know whether a trend is truly non periodic or merely a segment of a very long oscillation.
- apparent shoreline.** A line drawn on the chart in lieu of the mean high water line or the mean water level line in areas where either may be obscured by marsh, mangrove, cypress, or other marine vegetation. This line represents the intersection of the appropriate datum with the outer limits of vegetation and appears to the navigator as the shoreline.

- apparent sidereal time.** See under SIDEREAL TIME.
- apparent solar day.** The duration of one rotation of the earth on its axis, with respect to the apparent sun. It is measured by successive transits of the apparent sun over the lower branch of a meridian. The length of the apparent solar day is 24 hours of apparent time and averages the length of the mean solar day, but varies somewhat from day to day.
- apparent sun.** The actual sun as it appears in the sky. Also called TRUE SUN. See also MEAN SUN, DYNAMICAL MEAN SUN.
- apparent time.** Time based upon the rotation of the earth relative to the apparent or true sun. This is the time shown by a sun dial. Apparent time may be designated as either **local** or **Greenwich**, as the local or Greenwich meridian is used as the reference. Also called TRUE SOLAR TIME. See also EQUATION OF TIME.
- apparent wind.** The speed and true direction from which the wind appears to blow with reference to a moving point. Sometimes called RELATIVE WIND. See also TRUE WIND.
- application program.** A computer program designed to do a specific task or group of tasks.
- approach chart.** A chart used to approach a harbor. See CHART CLASSIFICATION BY SCALE.
- approximate altitude.** An altitude determined by inexact means, as by estimation or by a star finder or star chart.
- approximate coefficients.** The six coefficients used in the analysis of the magnetic properties of a vessel in the course of magnetic compass adjustment. The values of these coefficients are determined from deviations of an unadjusted compass. See also COEFFICIENT A, COEFFICIENT B, COEFFICIENT C, COEFFICIENT D, COEFFICIENT E, COEFFICIENT J.
- appulse, n.** 1. The near approach of one celestial body to another on the celestial sphere, as in occultation, conjunction, etc. 2. The penumbral eclipse of the moon.
- apron, n.** 1. On the sea floor a gentle slope, with a generally smooth surface, particularly as found around groups of islands or sea mounts. Sometimes called ARCHIPELAGIC APRON. 2. The area of wharf or quay for handling cargo. 3. A sloping underwater extension of an iceberg. 4. An outwash plain along the front of a glacier.
- apse line.** See LINE OF APSIDES.
- apsis (pl. apsides), n.** Either of the two orbital points nearest or farthest from the center of attraction, the perihelion and aphelion in the case of an orbit about the sun, and the perigee and apogee in the case of an orbit about the earth. The line connecting these two points is called LINE OF APSIDES.
- aqueduct, n.** A conduit or artificial channel for the conveyance of water, often elevated, especially one for the conveyance of a large quantity of water that flows by gravitation.
- arbitrary map projection.** See APHYLACTIC MAP PROJECTION.
- arc, n.** 1. A part of a curved line, as of a circle. See also ANGULAR DISTANCE. 2. The semi-circular graduated scale of an instrument for measuring angles. See also EXCESS OF ARC.
- arched squall.** A squall which is relatively high in the center, tapering off on both sides.
- archipelagic apron.** See APRON, definition 1.
- archipelago, n.** 1. A sea or broad expanse of water containing many islands or groups of islands. 2. A group of such islands.
- arc of uncertainty.** See ANGLE OF UNCERTAINTY.
- arc of visibility.** The arc of a light sector, designated by its limiting bearings as observed from seaward.
- Arcs of Lowitz.** Oblique, rare, downward extensions of the parhelia of 22°, concave toward the sun, and with red inner borders. They are formed by refraction by ice crystals oscillating about the vertical, such as with snowflakes.
- arctic, adj.** Of or pertaining to the arctic, or intense cold.
- Arctic, n.** The region within the Arctic Circle, or, loosely, northern regions in general, characterized by very low temperatures.
- arctic air.** A type of air which develops mostly in winter over the arctic. Arctic air is cold aloft and extends to great heights, but the surface temperatures are often higher than those of POLAR AIR. For 2 or 3 months in summer arctic air masses are shallow and rapidly lose the characteristics as they move southward. See also ANTARCTIC AIR.
- Arctic Circle.** The parallel of latitude at about 66° 33'N, marking the southern limit of the north Frigid Zone. This latitude is the complement of the sun's greatest northerly declination and marks the approximate southern limit at which the sun becomes circumpolar. The actual limit is extended somewhat by the combined effect of refraction, semidiameter of the sun, parallax, and the height of the observer's eye above the surface of the earth. A similar circle marking the northern limit of the south Frigid Zone is called ANTARCTIC or SOUTH POLAR CIRCLE. Also called NORTH POLAR CIRCLE.
- arctic front.** The semi-permanent, semi-continuous front between the deep, cold arctic air and the shallower, generally less cold polar air of northern latitudes; generally comparable to the ANTARCTIC FRONT of the Southern Hemisphere.
- arctic sea smoke.** Steam fog, but often specifically applied to steam fog rising from small areas of open water within sea ice. See also FROST SMOKE.
- arctic smoke.** See STEAM FOG.
- arctic whiteout.** The obliteration of contrast between surface features in the Arctic when a covering of snow obscuring all landmarks is accompanied by an overcast sky, resulting in an absence of shadows and an unrelieved expanse of white, the earth and sky blending so that the horizon is not distinguishable. A similar occurrence in the Antarctic is called ANTARCTIC WHITEOUT.
- arc to chord correction.** See CONVERSION ANGLE.
- areal feature.** A topographic feature, such as sand, swamp, vegetation, etc., which extends over an area. It is represented on the published map or chart by a solid or screened color, by a prepared pattern of symbols, or by a delimiting line.
- area to be avoided.** A ship routing measure comprising an area with defined limits which should be avoided by all ships, or certain classes of ships; instituted to protect natural features or to define a particularly hazardous area for navigation. See also PRECAUTIONARY AREA, ROUTING SYSTEM.
- argument, n.** One of the values used for entering a table or diagram.
- argument of latitude.** The angular distance measured in the orbital plane from the ascending node to the orbiting body; the sum of the argument of pericenter and the true anomaly.
- argument of pericenter.** The angle at the center of attraction from the ascending node to the pericenter point, measured in the direction of motion of the orbiting body. Also called ARGUMENT OF PERIFOCUS.
- argument of perifocus.** See ARGUMENT OF PERICENTER.
- argument of perigee.** The angle at the center of attraction from the ascending node to the perigee point, measured in the direction of motion of the orbiting body.
- Aries, n.** 1. Vernal equinox. Also called FIRST POINT OF ARIES. 2. The first sign of the zodiac.
- arithmetic mean.** See MEAN.
- arm, v., t.** To place tallow or other substance in the recess at the lower end of a sounding lead for obtaining a sample of the bottom.
- Armco, n.** The registered trade name for a high purity, low carbon iron, used for Flinders bars, quadrantal correctors, etc., to correct magnetic compass errors resulting from induced magnetism.
- arming, n.** Tallow or other substance placed in the recess at the lower end of a sounding lead, for obtaining a sample of the bottom.
- array, n.** See as ANTENNA ARRAY.
- articulated light.** An offshore aid to navigation consisting of a pipe attached to a mooring by a pivoting or universal joint; more accurate in position than a buoy but less than a fixed light.
- artificial antenna.** See DUMMY ANTENNA.
- artificial asteroid.** A manmade object placed in orbit about the sun.
- artificial earth satellite.** A man-made earth satellite, as distinguished from the moon. Often shortened to ARTIFICIAL SATELLITE.
- artificial harbor.** A harbor where the desired protection from wind and sea is obtained from breakwaters, moles, jetties, or other man-made works. See also NATURAL HARBOR.
- artificial horizon.** A device for indicating the horizontal, such as a bubble, gyroscope, pendulum, or the surface of a liquid.

- artificial magnet.** A magnet produced by artificial means, either by placing magnetic material in the field of another magnet or by means of an electric current, as contrasted with a NATURAL MAGNET occurring in nature.
- artificial range.** A range formed by two objects such as buildings, towers, etc., not designed as aids to navigation. See also NATURAL RANGE.
- artificial satellite.** See ARTIFICIAL EARTH SATELLITE.
- ascending node.** That point at which a planet, planetoid, or comet crosses the ecliptic from south to north, or a satellite crosses the plane of the equator of its primary from south to north. Also called NORTH-BOUND NODE. The opposite is called DESCENDING NODE.
- ASCII.** Acronym for American Standard Code for Information Interchange, a standard method of representing alphanumeric characters with numbers in a computer.
- ash breeze.** Expression referring to rowing a sailing vessel in a calm, usually from ship's boats which tow the ship. (Oars are commonly made of ash wood.)
- ashore.** *adj.* & *adv.* On the shore; on land; aground. See also AFLOAT.
- aspect, n.** The relative bearing of own ship from the target ship, measured 0° to 180° port (red) or starboard (green). See also TARGET ANGLE.
- aspects, n., pl.** The apparent positions of celestial bodies relative to one another; particularly the apparent positions of the moon or a planet relative to the sun.
- assigned frequency.** The center of the frequency band assigned to a radio station. Sometimes called CHANNEL FREQUENCY, CENTER FREQUENCY.
- assigned frequency band.** The frequency band whose center coincides with the frequency assigned to the station and whose width equals the necessary bandwidth plus twice the absolute value of the frequency tolerance.
- assumed latitude.** The latitude at which an observer is assumed to be located for an observation or computation, as the latitude of an assumed position or the latitude used for determining the longitude of time sight. Also called CHOSEN LATITUDE.
- assumed longitude.** The longitude at which an observer is assumed to be located for an observation or computation, as the longitude of an assumed position or the longitude used for determining the latitude by meridian altitude. Also called CHOSEN LONGITUDE.
- assumed position.** A point at which a craft is assumed to be located, particularly one used as a preliminary to establishing certain navigational data, as that point on the surface of the earth for which the computed altitude is determined in the solution of a celestial observation, also called CHOSEN POSITION.
- astern, adv.** Bearing approximately 180° relative. The term is often used loosely for DEAD ASTERN, or bearing exactly 180° relative. The opposite is AHEAD.
- asteroid, n.** A minor planet, one of the many small celestial bodies revolving around the sun, most of the orbits being between those of Mars and Jupiter. Also called PLANETOID, MINOR PLANET. See under PLANET.
- astigmatism, n.** A defect of a lens which causes the image of a point to appear as a line, rather than a point.
- astigmatizer, n.** A lens which introduces astigmatism into an optical system. Such a lens is so arranged that it can be placed in or removed from the optical path at will. In a sextant, an astigmatizer may be used to elongate the image of a celestial body into a horizontal line.
- astre fictif.** Any of several fictitious stars which are assumed to move along the celestial equator at uniform rates corresponding to the speeds of the several harmonic constituents of the tide producing force. Each astre fictif crosses the meridian at a time corresponding to the maximum of the constituent that it represents.
- astro.** A prefix meaning *star* or *stars* and, by extension, sometimes used as the equivalent of *celestial*.
- astrodynamics, n.** The practical application of celestial mechanics, astrobballistics, propulsion theory, and allied fields to the problem of planning and directing the trajectories of space vehicles.
- astrograph, n.** A device for projecting a set of precomputed altitude curves onto a chart or plotting sheet, the curves moving with time such that if they are properly adjusted, they will remain in the correct position on the chart or plotting sheet.
- astrolabe, n.** An instrument which measures altitudes of celestial bodies, used for determining an accurate astronomical position, usually while ashore in survey work. Originally, the astrolabe consisted of a disk with an arm pivoted at the center, the whole instrument being hung by a ring at the top to establish the vertical.
- astrometry, n.** The branch of astronomy dealing with the geometrical relations of the celestial bodies and their real and apparent motions.
- astronomical, adj.** Of or pertaining to astronomy.
- Astronomical Almanac, The.** An annual publication prepared jointly by the Nautical Almanac Office, U.S. Naval Observatory, and H.M. Nautical Almanac Office, Royal Greenwich Observatory. With the exception of certain introductory pages, the publication as printed in the United Kingdom is identical to that printed in the United States. This ephemeris gives high precision, detailed information on a large number of celestial bodies. It is arranged to suit the convenience of the astronomer for whom it is primarily intended and is not intended for ordinary purposes of navigation. But it does contain some information of general interest to the navigator, such as various astronomical constants, details of eclipses, information on planetary configurations, and miscellaneous phenomena. Prior to 1981 this publication was entitled *American Ephemeris and Nautical Almanac*. See also NAUTICAL ALMANAC.
- astronomical day.** Prior to January 1, 1925, a mean solar day which began at mean noon, 12 hours later than the beginning of the calendar day of the same date. Since 1925 the astronomical day agrees with the civil day.
- astronomical equator.** A line connecting points having 0° astronomical latitude. Because the deflection of the vertical varies from point to point, the astronomical equator is not a plane curve. But since the verticals through all points on it are parallel, the zenith at any point on the astronomical equator lies in the plane of the celestial equator. When the astronomical equator is corrected for station error, it becomes the GEODETIC EQUATOR. Sometimes called TERRESTRIAL EQUATOR.
- astronomical latitude.** Angular distance between the plumb line at a station and the plane of the celestial equator. It is the latitude which results directly from observations of celestial bodies, uncorrected for deflection of the vertical which, in the United States, may amount to as much as 25". Astronomical latitude applies only to positions on the earth, and is reckoned from the astronomical equator (0°), north and south through 90°. Also called ASTRONOMIC LATITUDE and sometimes GEOGRAPHIC LATITUDE. See also GEODETIC LATITUDE.
- astronomical longitude.** Angular distance between the plane of the celestial meridian at a station and the plane of the celestial meridian at Greenwich. It is the longitude which results directly from observations of celestial bodies, uncorrected for deflection of the vertical, the prime vertical component of which, in the United States, may amount to more than 18". Astronomical longitude applies only to positions on the earth, and is reckoned from the Greenwich meridian (0°) east and west through 180°. Also called ASTRONOMIC LONGITUDE and sometimes GEOGRAPHIC LONGITUDE. See also GEODETIC LONGITUDE.
- astronomical mean sun.** See MEAN SUN.
- astronomical meridian.** A line connecting points having the same astronomical longitude. Because the deflection of the vertical (station error) varies from point to point, the astronomical meridian is not a plane curve. When the astronomical meridian is corrected for station error, it becomes the GEODETIC MERIDIAN. Also called TERRESTRIAL MERIDIAN and sometimes called GEOGRAPHIC MERIDIAN.
- astronomical parallel.** A line connecting points having the same astronomical latitude. Because the deflection of the vertical varies from point to point, the astronomical parallel is an irregular line not lying in a single plane. When the astronomical parallel is corrected for station error, it becomes the GEODETIC PARALLEL. Sometimes called GEOGRAPHIC PARALLEL.
- astronomical position.** 1. A point on the earth whose coordinates have been determined as a result of observation of celestial bodies. The expression is usually used in connection with positions on land determined with great accuracy for survey purposes. 2. A point on the earth, defined in terms of astronomical latitude and longitude.



- astronomical refraction.** Atmospheric refraction of a ray of radiant energy passing through the atmosphere from outer space, as contrasted with TERRESTRIAL REFRACTION of a ray emanating from a point on or near the surface of the earth. See also REFRACTION.
- astronomical tide.** The tide without constituents having their origin in the daily or seasonal variations in weather conditions which may occur with some degree of periodicity. See also METEOROLOGICAL TIDES.
- astronomical time.** Time used with the astronomical day which prior to 1926 began at noon of the civil day of same date. The hours of the day were numbered consecutively from 0 (noon) to 23 (11 AM of the following morning).
- astronomical triangle.** The navigational triangle either terrestrial or celestial, used in the solution of celestial observations.
- astronomical twilight.** The period of incomplete darkness when the center of the sun is more than 12° but not more than 18° below the celestial horizon. See also CIVIL TWILIGHT, NAUTICAL TWILIGHT.
- astronomical unit.** 1. The mean distance between the earth and the sun, approximately 92,960,000 miles. 2. The astronomical unit is often used as a unit of measurement for distances within the solar system. In the system of astronomical constants of the International Astronomical Union the adopted value for it is 1 AU = 149,600 × 106 meters.
- astronomical year.** See TROPICAL YEAR.
- astronomic latitude.** See ASTRONOMICAL LATITUDE.
- astronomic longitude.** See ASTRONOMICAL LONGITUDE.
- astronomy, n.** The science which deals with the size, constitution, motions, relative position, etc. of celestial bodies, including the earth. That part of astronomy of direct use to a navigator, comprising principally celestial coordinates, time, and the apparent motions of celestial bodies is called navigational or nautical astronomy.
- astro-tracker.** A navigation equipment which automatically acquires and continuously tracks a celestial body in azimuth and altitude.
- asymmetrical, adj.** Not symmetrical.
- asymptote, n.** A straight line or curve which a curve of infinite length approaches but never quite reaches.
- Atlantic Equatorial Counter Current.** An ocean current that flows eastward between the westward flowing Atlantic North and South Equatorial Currents. The counter current is most prominent during August and September, when it extends from about 52° W to 10° W and joins the GUINEA CURRENT. In October it narrows and separates into two parts at about latitude 7° N, longitude 35° W. The western part, which appears to be a region where the counter current probably sinks and flows eastward beneath the equatorial currents, gradually diminishes in size to the west-northwest, while the eastern part diminishes to the east-southeast. The greatest separation occurs during March; during April the western part of the counter current disappears, but in May it reappears in the vicinity of latitude 0°, longitude 40° W. The two segments progress west-northwestward without much change in size. They merge at about latitude 6°N, longitude 43°W during August and continue their flow eastward uninterrupted through September.
- Atlantic North Equatorial Current.** A broad, slow, westward flowing ocean current generated mainly by the northeast trade winds. The current originates near longitude 26° W between about latitude 15° N and 30° N and flows across the ocean past longitude 60° W. It forms the ANTILLES CURRENT in the vicinity of the Leeward Islands. The part of the current between 12° N and 15° N joins the Guiana Current and forms the CARIBBEAN CURRENT.
- Atlantic South Equatorial Current.** The major part of this westward flowing ocean current is located south of the equator, the central portion extending to about latitude 20° S. The northern part expands northward during January, February, and March when the Atlantic Equatorial Counter current dissipates and is least evident. On approaching the coast of South America one part turns northwestward as the GUIANA CURRENT; the other part turns below Natal and flows southwestward along the coast of Brazil as the BRAZIL CURRENT. Of the two equatorial currents in the Atlantic, the Atlantic South Equatorial Current is the stronger and more extensive.
- Atlantic standard time.** See STANDARD TIME.
- atlas, n.** A collection of charts or maps kept loose or bound in a volume.
- atlas grid.** A reference system that permits the designation of the location of a point or an area on a map, photograph, or other graphic in terms of numbers and letters. Also called ALPHANUMERIC GRID.
- atmosphere, n.** 1. The envelope of air surrounding the earth and bound to it more or less permanently by gravity. The earth's atmosphere extends from the surface of the earth to an indefinite height, its density asymptotically approaching that of interplanetary space. At heights of the order of 80 kilometers (50 miles) the atmosphere is barely dense enough to scatter sunlight to a visible degree. The atmosphere may be subdivided vertically into a number of atmospheric layers, but the most common basic subdivision is that which recognizes a troposphere from the surface to about 10 kilometers, a stratosphere from about 10 kilometers to about 80 kilometers, and an ionosphere above 80 kilometers. See also STANDARD ATMOSPHERE. 2. The gaseous envelope surrounding any celestial body, including the Earth.
- atmospheric absorption.** The loss of power in transmission of radiant energy by dissipation in the atmosphere.
- atmospheric drag.** A major cause of perturbations of close artificial satellite orbits caused by the resistance of the atmosphere. The secular effects are decreasing magnitudes of eccentricity, major axis, and period. Sometimes shortened to DRAG.
- atmospheric noise.** See ATMOSPHERIC RADIO NOISE.
- atmospheric pressure.** The pressure exerted by the weight of the earth's atmosphere, about 14.7 pounds per square inch. See also STANDARD ATMOSPHERE, definition 1; BAROMETRIC PRESSURE.
- atmospheric radio noise.** In radio reception noise or static due to natural causes such as thunderstorm activity. Sometimes shortened to ATMOSPHERIC NOISE. See also MAN-MADE NOISE, RADIO INTERFERENCE.
- atmospheric refraction.** Refraction resulting when a ray of radiant energy passes obliquely through the atmosphere. It may be called astronomical refraction if the ray enters the atmosphere from outer space, or terrestrial refraction if it emanates from a point on or near the surface of the earth.
- atoll, n.** A ring-shaped coral reef which has closely spaced islands or islets on it enclosing a central area or lagoon. The diameter may vary from less than a mile to 80 or more.
- atollon, n.** A large reef ring in the Maldives Islands consisting of many smaller reef rings. The word ATOLL was derived from this name.
- atomic clock.** A precision clock that depends for its operation upon an electrical oscillator regulated by an atomic system. The basic principle of the clock is that electromagnetic waves of a particular frequency are emitted when an atomic transition occurs.
- atomic second.** See SECOND, definition 1.
- Atomic Time.** A fundamental kind of time based on transitions in the atom. International Atomic Time (TAI) is the time reference coordinate established by the Bureau International de l'Heure (BIH) on the basis of the readings of atomic clocks functioning in various establishments in accordance with the definition of the atomic second, the unit of time in the International System of Units (SI). The Atomic Time scales maintained in the United States by the National Institute of Standards and Technology and the U.S. Naval Observatory constitute approximately 37 1/2 percent of the stable reference information used in maintaining a stable TAI scale by the BIH.
- A-trace.** The first trace of an oscilloscope having more than one displayed.
- ATR tube.** See ANTI-TR TUBE.
- attenuation, n.** 1. A lessening in amount, particularly the reduction of the amplitude of a wave with distance from the origin. 2. The decrease in the strength of a radar wave resulting from absorption, scattering, and reflection by the medium through which it passes (wave guide, atmosphere) and by obstructions in its path. Also attenuation of the wave may be the result of artificial means, such as the inclusion of an attenuator in the circuitry or by placing an absorbing device in the path of the wave.
- attitude, n.** The position of a body as determined by the inclination of the axes to some other frame of reference. If not otherwise specified, this frame of reference is fixed to the earth.

**atto-**. A prefix meaning one-quintillionth ( $10^{-18}$ ).

**audible**, *adj.* Capable of being translated into sound by the human ear.

**audible aid to navigation**. An aid to navigation which uses sound waves.

**audio frequency**. A frequency within the audible range, about 20 to 20,000 hertz. Also called SONIC FREQUENCY.

**augmentation**, *n.* The apparent increase in the semidiameter of a celestial body as its altitude increases, due to the reduced distance from the observer. The term is used principally in reference to the moon.

**augmentation correction**. A correction due to augmentation, particularly that sextant altitude correction due to the apparent increase in the semidiameter of a celestial body as its altitude increases.

**augmenting factor**. A factor used in connection with the harmonic analysis of tides or tidal currents to allow for the difference between the times of hourly tabulation and the corresponding constituent hours.

**aural**, *adj.* Of or pertaining to the ear or sense of hearing.

**aural null**. A null detected by listening for the minimum or the absence of an audible signal.

**aureole**, *n.* A poorly developed corona, characterized by a bluish-white disk immediately around the luminary and a reddish-brown outer edge. An aureole, rather than a corona, is produced when the cloud responsible for this diffraction effect is composed of droplets distributed over a wide size-range. The diffracted rays approach the observer from a wide variety of angles, in contrast to the relative uniform diffraction produced by a cloud of more limited drop-size range. In as much as most clouds exhibit rather broad drop-size distributions, aureoles are observed much more frequently than coronas.

**aurora**, *n.* A luminous phenomenon due to electrical discharges in the atmosphere, probably confined to the thin air high above the surface of the earth. It is most commonly seen in high latitudes where it is most frequent during periods of greatest sunspot activity. If it occurs in the Northern Hemisphere, it is called aurora borealis or northern lights; and if in the Southern, aurora Australis.

**aurora Australis**. The aurora in the Southern Hemisphere.

**aurora borealis**. The aurora in the Northern Hemisphere. Also called NORTHERN LIGHTS.

**auroral zone**. The area of maximum auroral activity. Two such areas exist, each being a  $10^\circ$  wide annulus centered at an average distance of  $23^\circ$  from a geomagnetic pole.

**aurora polaris**. A high latitude aurora borealis.

**austral**, *adj.* Of or pertaining to south.

**authalic map projection**. See EQUAL-AREA MAP PROJECTION.

**Automated Mutual-assistance Vessel Rescue System**. Operated by the United States Coast Guard, the AMVER System is a maritime mutual assistance program that aids coordination of search and rescue efforts in the oceans of the world, by maintaining a computerized worldwide merchant vessel plot.

**automatic direction finder**. A radio direction finder in which the bearing to the transmitter is indicated automatically and continuously, in contrast with a MANUAL RADIO DIRECTION FINDER which requires manual operation. Also called AUTOMATIC RADIO DIRECTION FINDER (ADF).

**automatic frequency control**. The technique of automatically maintaining, or a circuit or device which automatically maintains, the frequency of a receiver within specified limits.

**automatic gain control**. A feature involving special circuitry designed to maintain the output of a radio, radar, or television receiver essentially constant, or to prevent its exceeding certain limits, regardless of variations in the strength of the incoming signal.

**automatic radar plotting aid**. A computer-assisted radar data processing system which generates predicted ship vectors based on the recent plotted positions. For such a system to meet the specifications of the Inter Governmental Maritime Consultative Organization (IMCO), it must satisfy requirements with respect to detection, acquisition, tracking, display, warnings, data display, and trial maneuvers.

**automatic radio direction finder**. See AUTOMATIC DIRECTION FINDER.

**automatic tide gage**. An instrument that automatically registers the rise and fall of the tide. In some instruments, the registration is accomplished by recording the heights at regular intervals in digital format, in others by a continuous graph in which the height versus corresponding time is recorded.

**auto pilot**, *n.* A device which steers a vessel unattended along a given bearing. See GYRO PILOT.

**autumn**, *n.* The season between summer and winter. In the Northern Hemisphere autumn begins astronomically at the autumnal equinox and ends at the winter solstice. In the Southern Hemisphere the limits are the vernal equinox and the summer solstice. The meteorological limits vary with the locality and the year. Also called FALL.

**autumnal**, *adj.* Pertaining to fall (autumn). The corresponding adjectives for winter, spring, and summer are *hibernal*, *vernal*, and *aestival*.

**autumnal equinox**. 1. That point of intersection of the ecliptic and the celestial equator occupied by the sun as it changes from north to south declination, on or about September 23. Also called SEPTEMBER EQUINOX, FIRST POINT OF LIBRA. 2. The instant the sun reaches the point of zero declination when crossing the celestial equator from north to south.

**auxiliary lights**. See under VERTICAL LIGHTS.

**average**, *adj.* Equaling or approximating a mean.

**average**, *n.* See MEAN.

**average**, *v., t.* To determine a mean.

**avoirdupois pound**. See POUND.

**avulsion**, *n.* The rapid erosion of shore land by waves during a storm.

**awash**, *adj. & adv.* Situated so that the top is intermittently washed by waves or tidal action. The term applies both to fixed objects such as rocks, and to floating objects with their tops flush with or slightly above the surface of the water. See also ROCK AWASH, SUBMERGED, UNCOVERED.

**axial**, *adj.* Of or pertaining to an axis.

**axis**, *n. (pl. axes)*. 1. A straight line about which a body rotates, or around which a plane figure may rotate to produce a solid; a line of symmetry. A polar axis is the straight line connecting the poles of a body. The major axis of an ellipse or ellipsoid is its longest diameter; the minor axis, its shortest diameter. 2. One of a set of reference lines for certain systems of coordinates. 3. The principal line about which anything may extend, as the axis of a channel or compass card axis. 4. A straight line connecting two related points.

**axis of freedom**. An axis about which the gimbal of a gyro provides a degree-of-freedom of movement.

**azimuth**, *n.* The horizontal direction or bearing of a celestial point from a terrestrial point, expressed as the angular distance from a reference direction. It is usually measured from  $000^\circ$  at the reference direction clockwise through  $360^\circ$ . An azimuth is often designated as true, magnetic, compass grid, or relative as the reference direction is true, magnetic, compass, or grid north, or heading, respectively. Unless otherwise specified, the term is generally understood to apply to true azimuth, which may be further defined as the arc of the horizon, or the angle at the zenith, between the north part of the celestial meridian or principal vertical circle and a vertical circle, measured from  $000^\circ$  at the north part of the principal vertical circle clockwise through  $360^\circ$ . Azimuth taken directly from a table, before interpolation, is called tabulated azimuth. After interpolation, or, if determined by calculation, mechanical device, or graphics, it is called computed azimuth. When the angle is measured in either direction from north or south, and labeled accordingly, it is properly called azimuth angle; when measured either direction from east or west, and labeled accordingly, it is called amplitude. An azimuth determined by solution of the navigational triangle with altitude, declination, and latitude then is called an altitude azimuth; if meridian angle, declination, and latitude are given, it is called a time azimuth; if meridian angle, declination and altitude are given, it is called a time and altitude azimuth. See also BACK AZIMUTH, BEARING.

**azimuthal**, *adj.* Of or pertaining to azimuth.

**azimuthal chart**. A chart on an azimuthal map projection. Also called ZENITHAL CHART.

**azimuthal equidistant chart**. A chart on the azimuthal equidistant map projection.

**azimuthal equidistant map projection**. An azimuthal map projection on which straight lines radiating from the center or pole of projection represent great circles in their true azimuths from that center, and lengths along those lines are of exact scale. This projection is neither equal-area nor conformal. If a geographic pole is the pole of projection, meridians appear as radial straight lines and parallels of latitude as equally spaced concentric circles.

**azimuthal map projection.** A map projection on which the azimuths or directions of all lines radiating from a central point or pole are the same as the azimuths or directions of the corresponding lines on the ellipsoid. This classification includes the gnomonic, stereographic, orthographic, and the azimuthal equidistant map projections. Also called ZENITHAL MAP PROJECTION.

**azimuthal orthomorphic projection.** See STEREOGRAPHIC MAP PROJECTION.

**azimuth angle.** Azimuth measured from 0° at the north or south reference direction clockwise or counterclockwise through 90° or 180°. It is labeled with the reference direction as a prefix and the direction of measurement from the reference direction as a suffix. When azimuth angle is measured through 180°, it is labeled N or S to agree with the latitude and E or W to agree with the meridian angle.

**azimuth bar.** An instrument for measuring azimuths, particularly a device consisting of a slender bar with a vane at each end, and designed to fit over a central pivot in the glass cover of a magnetic compass. See also BEARING BAR.

**azimuth circle.** A ring designed to fit snugly over a compass or compass repeater, and provided with means for observing compass bearings and azimuths. A similar ring without the means for observing azimuths of the sun is called a BEARING CIRCLE.

**azimuth instrument.** An instrument for measuring azimuths, particularly a device which fits over a central pivot in the glass cover of a magnetic compass.

**azimuth stabilized display.** See as STABILIZED IN AZIMUTH under STABILIZATION OF RADARSCOPE DISPLAY.

**azimuth tables.** Publications providing tabulated azimuths or azimuth angles of celestial bodies for various combinations of declination, latitude and hour angle. Great circle course angles can also be obtained by substitution of values.

**Azores Current.** A slow but fairly constant southeast branch of the North Atlantic Current and part of the Gulf Stream System. Its mean speed is only 0.4 knot, and the mean maximum speed computed from all observations above 1 knot in the prevailing direction is 1.3 knots. There is no discernible seasonal fluctuation. The speed and direction of the current is easily influenced for short periods by changing winds. The Azores Current is an inner part of the general clockwise oceanic circulation of the North Atlantic Ocean. Also called SOUTHEAST DRIFT CURRENT.