Q

Q-band. A radio-frequency band 36 to 46 gigahertz. See also FREQUENCY, FREQUENCY BAND.

Q-correction. The Polaris correction as tabulated in the *Air Almanac*.

Q signals. Conventional code signals used in radiotelegraphy, each signal of three letters beginning with Q and representing a complete sentence.

quadrant, *n*. 1. A quarter of a circle; either an arc of 90° or the area bounded by such an arc and two radii. 2. A double-reflecting instrument for measuring angles used primarily for measuring altitudes of celestial bodies.

quadrantal correctors. Masses of soft iron placed near a magnetic compass to correct for quadrantal deviation. Spherical quadrantal correctors are called quadrantal spheres.

quadrantal deviation. Deviation which changes its sign (E or W) approximately each 90° change of heading. It is caused by induced magnetism in horizontal soft iron.

quadrantal error. An error which changes sign (plus or minus) each 90°. Also called INTERCARDINAL ROLLING ERROR when related to a gyrocompass.

quadrantal point. See INTERCARDINAL POINT.

quadrantal spheres. Two hollow spheres of soft iron placed near a magnetic compass to correct for quadrantal deviation. See also QUADRANTAL CORRECTORS.

quadrant with two arcs. See BACKSTAFF.

quadrature, *n*. An elongation of 90° usually specified as east or west in accordance with the direction of the body from the sun. The moon is at quadrature at first and last quarters.

quadrilateral, *adj*. Having four sides.

quadrilateral, *n*. A closed plane figure having four sides. See also PARALLELOGRAM, TRAPEZOID.

quarantine anchorage. An area where a vessel anchors while satisfying quarantine regulations.

quarantine buoy. A buoy marking the location of a quarantine anchorage. In U.S. waters a quarantine buoy is yellow.

quarantine mark. A navigation mark indicating a quarantine anchorage area for shipping, or defining its limits.

quartering sea. Waves striking the vessel on the quarter, or relative bearings approximately 045°, 135°, 225°, and 315°.

quarter-power points. See under HALF-POWER POINTS.

quartz, *n*. Crystalline form of silica. In its most common form it is colorless and transparent, but it takes a large variety of forms of varying degrees of opaqueness and color. It is the most common solid mineral.

quartz clock. See QUARTZ CRYSTAL CLOCK.

quartz crystal clock. A precision timepiece, consisting of a current generator of constant frequency controlled by a resonator made of quartz crystal with suitable methods for producing continuous rotation to operate time-indicating and related mechanisms. See also QUARTZ CRYSTAL MARINE CHRONOMETER.

quartz crystal marine chronometer. A quartz crystal clock intended for marine use. The degree of accuracy is such that it requires no chronometer rate, but can be reset electrically if necessary.

quasi-stationary front. See STATIONARY FRONT.

quay, *n*. A structure of solid construction along a shore or bank which provides berthing for ships and which usually provides cargo handling facilities. A similar facility of open construction is called WHARF. See also MOLE, definition 1.

quick flashing light. A light flashing 50-80 flashes per minute. See also CONTINUOUS QUICK LIGHT, GROUP QUICK LIGHT, INTERRUPTED QUICK LIGHT.

quick light. See QUICK FLASHING LIGHT.

quicksand, *n*. A loose mixture of sand and water that yields to the pressure of heavy objects. Such objects are difficult to extract once they begin sinking.

quiet sun. The sun when it is free from unusual radio wave or thermal radiation such as that associated with sun spots.

quintant, *n*. A double-reflecting instrument for measuring angles, used primarily for measuring altitudes of celestial bodies, having an arc of 72°.

R

race, *n*. A rapid current or a constricted channel in which such a current flows. The term is usually used only in connection with a tidal current, when it may be called a TIDE RACE.

racon, *n*. As defined by the International Telecommunication Union (ITU), in the maritime radionavigation service, a receiver-transmitter device which, when triggered by a surface search radar, automatically returns a distinctive signal which can appear on the display of the triggering radar, providing range, bearing and identification information. See also IN-BAND RACON, CROSS BAND RACON, SWEPT-FREQUENCY RACON, RAMARK. Also called RADAR TRANSPONDER BEACON.

radar, *n*. 1. (from radio detection and ranging) A radio system which measures distance and usually direction by a comparison of reference signals with the radio signals reflected or retransmitted from the target whose position is to be determined. Pulse-modulated radar is used for shipboard navigational applications. In this type of radar the distance to the target is determined by measuring the time required for an extremely short burst or pulse of radio-frequency energy to travel to the target and return to its source as a reflected echo. Directional antennas allow determination of the direction of the target echo from the source. 2. As defined by the International Telecommunication Union (ITU) a radiodetermination system based on the comparison of reference signals with radio signals reflected, or re-transmitted, from the position to be determined.

radar beacon. A radar transmitter whose emissions enable a ship to determine its direction and frequently position relative to the transmitter using the ship's radar equipment. There are two general types of radar beacons: one type, the RACON, must be triggered by the ship's radar emissions; the other type, the RAMARK transmits continuously and provides bearings only. See also TRANSPONDER.

radar bearing. A bearing obtained by radar.

radar buoy. A buoy having corner reflectors designed into the superstructure, the characteristic shape of the buoy being maintained. This is to differentiate from a buoy on which a corner reflector is mounted.

radar conspicuous object. An object which return a strong radar echo which can be identified with a high degree of certainty.

radar cross section. The area of a plane element situated at the position of an object and normal to the direction of the radar transmitter, which would be traversed by a power such that, if the power were re-radiated equally in all directions with suitable polarization, it would give an echo of the same power as that given by the object itself. Also called EQUIVALENT ECHOING AREA.

radar echo. See ECHO, definition 3.

radar fix. A fix established by means of radar.

radar horizon. The sensible horizon of a radar antenna.

radar indicator. A unit of a radar set which provides a visual indication of radar echoes received using a cathode-ray tube or video monitor. Besides the cathode-ray tube, the radar indicator is comprised of sweep and calibration circuit; and associated power supplies. Often shortened to INDICATOR.

radar link. A means by which the information from a radar set is reproduced at a distance by use of a radio link or cable. Also called RADAR RELAY SYSTEM.

radar nautical mile. The time interval required for the electromagnetic energy of a radar pulse to travel 1 nautical mile and the echo to return; approximately 12.4 microseconds.

radar picture. See DISPLAY, definition 1.

radar range. 1. The distance of a target as measured by radar. 2. The maximum distance at which a radar is effective in detecting targets. Radar range depends upon variables such as the weather, transmitted power, antenna height, pulse duration, receiver sensitivity, target size, target shape, etc.

radar receiver. A unit of a radar set which demodulates received radar echoes, amplifies the echoes and delivers them to the radar indicator. A radar receiver differs from the usual superheterodyne com-

munications receiver in that its sensitivity is much greater; it has a better signal noise ratio, and it is designed to pass a pulse-type signal.

radar reference line. A mid-channel line on a chart which corresponds to a line incorporated in harbor radar display for the purpose of providing a reference for informing a vessel of its position. In some cases the line may be coincident with the recommended track. The line may be broken into sections of specified length having assigned names or numbers.

radar reflector. A device arranged so that incident electromagnetic energy reflects back to its source. See also CORNER REFLECTOR, PENTAGONAL CLUSTER, OCTAHEDRAL CLUSTER, DIHEDRAL REFLECTOR, DIELECTRIC REFLECTOR, REFLECTOR.

radar relay system. See RADAR LINK.

radar repeater. A unit which duplicates the radar display at a location remote from the main radar indicator installation. Also called PPI REPEATER, REMOTE PPI.

radar return. See ECHO, definition 2.

radar scan. The motion of a radar beam through space in searching for an echo.

radar scanning. The process or action of directing a radar beam through a search pattern.

radarscope, *n*. The cathode-ray tube or video monitor in the indicator of a radar set which displays the received echo to indicate range and bearing. Often shortened to SCOPE. See also PLAN POSITION INDICATOR.

radar set. An electronic apparatus consisting of a transmitter, antenna, receiver, and indicator for sending out radio-frequency energy and receiving and displaying reflected energy so as to indicate the range and bearing of the reflecting object. See also RADAR.

radar shadow. The area shielded from radar signals because of an intervening obstruction or absorbing medium. The shadow region appears as an area void of targets.

radar target. See as TARGET.

radar transponder beacon. See RACON.

radial, *adj*. Of or pertaining to a ray or radius; extending in a straight line outward from a center.

radial, *n*. A straight line extending outward from a center.

radial error. In a two-dimensional or elliptical error distribution, the measure of error as the radius of a circle of equivalent probability derived from the error ellipse. The error, expressed as l d_{rms}, is the square root of the sum of the error components along the major and minor axes of the probability ellipse. The use of radial error or d_{rms} error as a measure of error is somewhat confusing because the term does not correspond to a fixed value of probability for a given value of the error measure.

radial motion. Motion along a radius, or a component in such a direction, particularly the component of space motion of a celestial body in the direction of the line of sight.

radial period. See ANOMALISTIC PERIOD.

radian, *n*. The supplementary unit of plane angle in the International System of Units; it is the plane angle subtended at the center of a circle by an arc equal in length to the radius of the circle. It is equal to 360 Ö 2π, or approximately 57°17'48.8".

radian per second. The derived unit of angular velocity in the International System of Units.

radian per second squared. The derived unit of angular acceleration in the International System of Units.

radiant, *adj*. Of, pertaining to, or transmitted by radiation.

radiant energy. Energy consisting of electromagnetic waves.

radiate, *v., t.* & *i.* To send out in rays or straight lines from a center.

radiation, *n*. 1. The process of emitting energy in the form of electromagnetic waves. 2. The energy radiated in definition 1 above.

radiational cooling. The cooling of the earth's surface and adjacent air, occurring mainly at night whenever the earth's surface suffers a net loss of heat due to terrestrial radiation.

radiational tides. Periodic variations in sea level primarily related to meteorological changes such as the semi-daily (solar) cycle in barometric pressure, daily (solar) land and sea breezes, and seasonal (annual) changes in temperature. Only changes in sea level due to meteorological changes that are random in phase are not considered radiational tides.

radiation fog. A major type of fog, produced over land when radiational cooling reduces the temperature to or below its dew point. Radiation fog is a nighttime occurrence although it may begin to form by evening twilight and often does not dissipate until aft sunrise.

radiation pattern. A curve representing, in polar or Cartesian coordinates, the relative amounts of energy radiated in various directions. Also called DIRECTIVITY DIAGRAM.

radiatus, *adj*. Radial. A term used to refer to clouds in parallel bands which, owing to perspective, appear to converge toward a point on the horizon, or two opposite points if the bands cross the sky.

radio, *n.* A general term applied to the use of radio waves.

radio acoustic ranging. Determining distance by a combination of radio and sound, the radio being used to determine the instant of transmission or reception of the sound, and distance being determined by the time of transit of sound usually in water. See also ECHO RANGING.

radio aid to navigation. An aid to navigation transmitting information by radio waves. See also ELECTRONIC AID TO NAVIGATION.

radio altimeter. As defined by the International Telecommunications Union (ITU), a radionavigation device for aircraft, which uses reflected radio waves from the ground to determine the height of the aircraft above the ground.

radiobeacon, *n.* A radio transmitting station which emits a distinctive or characteristic signal so a navigator can determine the direction of the source using a radio direction finder, providing a line of position. The most common type of marine radiobeacon transmits radio waves of approximately uniform strength in all directions. These omnidirectional beacons are called circular radiobeacons. A radiobeacon some or all of the emissions of which are directional so that the signal characteristic changes according to the vessel's bearing from the beacon is called a directional radiobeacon. A radiobeacon all or part of the emissions of which is concentrated in a beam which rotates is called a rotating radiobeacon. See also CONTINUOUS CARRIER RADIOBEACON, DUAL-CARRIER RADIOBEACON, SEQUENCED RADIOBEACON, ROTATING PATTERN RADIOBEACON, COURSE BEACON.

radiobeacon characteristic. The description of the complete cycle of transmission of a radiobeacon in a given period of time, inclusive of any silent period.

radiobeacon station. As defined by the International Telecommunications Union (ITU), a station in the radionavigation service the emissions of which are intended to enable a mobile station to determine its bearing or direction from the radiobeacon station.

radio bearing. The bearing of a radio transmitter from a receiver, as determined by a radio direction finder.

radio compass. The name by which the radio direction finder was formerly known.

radiodetermination, *n.* As defined by the International Telecommunication Union (ITU), the determination of position using propagation properties of radio waves.

radiodetermination-satellite service. As defined by the International Telecommunication Union (ITU), a radiocommunication service involving the use of radiodetermination and the use of one or more space stations.

radio direction finder. A radio receiver system used for radio direction finding. Also called DIRECTION FINDER. Formerly called RADIO COMPASS. See also AUTOMATIC DIRECTION FINDER.

radio direction finder station. A radio station equipped with special apparatus for determining the direction of radio signals transmitted by ships and other stations. The bearing taken by a radio direction finder station, and reported to a ship, is corrected for all determinable errors except conversion angle. Also called DIRECTION FINDER STATION.

radio direction finding. As defined by the International Telecommunication Union (ITU), radiodetermination using the reception of radio waves to determine the direction of a station or object.

radio direction-finding station. As defined by the International Telecommunication Union (ITU), a radiodetermination station using radio direction finding.

radio fix. A navigational position determined by radio direction finder.

radio frequency. Any electromagnetic wave occurring within that segment of the spectrum normally associated with some form of radio propagation.

radio guard. A ship, aircraft, or radio station designated to listen for and record transmissions, and to handle traffic on a designated frequency for a certain unit or units.

radio horizon. The locus of points at which direct rays from a transmitting antenna become tangent to the earth's surface, taking into account the curvature due to refraction. Its distance from the transmitting antenna is greater than that of the visible horizon, and increases with decreasing frequency.

radio interference. Interference due to unwanted signals from other radio transmitting stations operating on the same or adjacent frequencies.

radio interferometer. An interferometer operating at radio frequencies; used in radio astronomy and in satellite tracking.

radiolarian *(pl. radiolaria), n*. A minute sea animal with a siliceous outer shell. The skeletons of such animals are very numerous, covering the ocean bottom in certain areas, principally in the tropics.

radiolocation, *n*. As defined by the International Telecommunication Union (ITU), radiodetermination used for purposes other than navigation.

radio mast. A label on a nautical chart which indicates a pole or structure for elevating radio antennas, usually found in groups.

radionavigation, *n*. 1. The determination of position, or the obtaining of information relating to position, for the purposes of navigation by means of the propagation properties of radio waves. 2. As defined by the International Telecommunication Union (ITU), radiodetermination used for the purposes of navigation, including obstruction warning. See also RADIODETERMINATION, RADIOLOCATION.

Radio Navigational Aids. See *PUB. 117*.

radio navigational warning. A radio-transmitted message affecting the safe navigation of vessels or aircraft. See also HYDROLANT, HYDROPAC, NAVAREA WARNINGS, WORLD WIDE NAVIGATIONAL WARNING SERVICE.

radionavigation-satellite service. As defined by the International Telecommunication Union (ITU) a radiodetermination-satellite service used for the same purposes as the radionavigation service; in certain cases this service includes transmission or retransmission of supplementary information necessary for the operation of radionavigation systems.

radio receiver. An electronic device connected to an antenna or other receptor of radio signals which receives and processes the signals for use.

radio silence. A period during which all or certain radio equipment capable of radiation is kept inoperative.

radio spectrum. The range of electromagnetic radiation useful for communication by radio (approximately 10 kilohertz to 300,000 megahertz).

radio station. A place equipped with one or more transmitters or receivers and accessory equipment for carrying on a radiocommunication service.

radio tower. A label on a nautical chart which indicates a tall pole or structure for elevating radio antennas.

radio transmitter. Equipment for generation and modulation of radio-frequency energy for the purpose of radiocommunication.

radio wave propagation. The transfer of energy by electromagnetic radiation at radio frequencies.

radio waves. Electromagnetic waves of frequencies lower than 3,000 GHz propagated in space without artificial guide. The practicable limits of radio frequency are approximately 10 kHz to 100 GHz. Also called HERTZIAN WAVES.

radius, *n*. A straight line from the center of a circle, arc, or sphere to its circumference, or the length of such a line. Also called SEMIDIAMETER for a circle or sphere. See also DIAMETER.

radius of action. The maximum distance a ship, aircraft, or vehicle can travel away from its base along a given course with normal combat load and return without refueling, allowing for all safety and operating factors.

radius vector. A straight line connecting a fixed reference point or center with a second point, which may be moving. In astronomy the expression is usually used to refer to the straight line connecting a celestial body with another which revolves around it. See also POLAR COORDINATES, SPHERICAL COORDINATES.

radome, *n*. A dome-shaped structure used to enclose radar apparatus.

rafted ice. A type of deformed ice formed by one piece of ice overriding another. See also FINGER RAFTING.

rain, *n*. Liquid precipitation consisting of drops of water larger than those which comprise DRIZZLE. Orographic rain results when moist air is forced upward by a mountain range. See also FREEZING RAIN.

rainbow, *n*. A circular arc of concentric spectrally colored bands formed by the refraction of light in drops of water. One seen in ocean spray is called a marine or sea rainbow. See also FOGBOW, MOONBOW.

rain clutter. Clutter on the radarscope which is the result of the radar signal being reflected by rain or other forms of precipitation.

rain gush. See CLOUDBURST.

rain gust. See CLOUDBURST.

rain shadow. The condition of diminished rainfall on the lee side of a mountain or mountain range, where the rainfall is noticeably less than on the windward side.

rain storm. See under STORM, definition 2.

raise. To cause to appear over the horizon or higher above the horizon by approaching closer.

ram, *n*. An underwater ice projection from an ice wall, ice front, iceberg, or floe. Its formation is usually due to a more intensive melting and erosion of the unsubmerged part.

ramark, *(from radar marker) n*. A radar beacon which continuously transmits a signal appearing as a radial line on the radar display, indicating the direction of the beacon from the ship. For identification purposes, the radial line may be formed by a series of dots or dashes. The radial line appears even if the beacon is outside the range for which the radar is set, as long as the radar receiver is within the power range of the beacon. Unlike the RACON, the ramark does not provide the range to the beacon.

ramming, *n*. In ice navigation, the act of an icebreaker at full power striking ice to break a track through it.

ramp, *n*. On the sea floor, a gentle slope connecting areas of different elevations.

random access memory (RAM). Type of computer memory used for temporary storage and processing of data, as opposed to permanent storage of data. RAM is volatile, meaning it is unable to store data without a constant source of power. See READ ONLY MEMORY(ROM).

random error. One of the two categories of errors of observation and measurement, the other category being systematic error. Random errors are the errors which occur when irregular, randomly occurring conditions affect the observing instrument, the observer and the environment, and the quantity being observed so that observations of the same quantity made with the same equipment and observer under the same observing conditions result in different values of the observed quantity. Random errors depend upon (1) the quality of the observing instrument. (2) the skill of the observer, particularly, the ability to estimate the fraction of the smallest division or graduation on the observing instrument, and (3) randomly fluctuating conditions such as temperature, pressure, refraction, etc. For many types of observations, random errors are characterized by the following properties: (1) positive and negative errors of the same magnitude are about equal in number, (2) small errors occur more frequently than large errors. and (3) extremely large errors rarely occur. These properties of random errors permit the use of a mathematical law called the Gaussian or normal distribution of errors to calculate the probability that the random error of any given observation of a series of observations will lie within certain limits. Random error might more properly be called deviation since mathematically, the random error of an individual observation is calculated as the difference or deviation between the actual observation and an improved or adjusted value of the observation obtained by some mathematical technique such as averaging all the observations. Also called ACCIDENTAL ERROR, CHANCE ERROR, IRREGULAR ERROR, STATISTICAL ERROR. See also ERROR, PRECISION, PRECISION INDEX, STANDARD DEVIATION.

range, *n*. 1. Two or more objects in line. Such objects are said to be in range. An observer having them in range is said to be on the range. Two beacons are frequently located for the specific purpose of forming a range to indicate a safe route or the centerline of a channel. See also BACK RANGE, LEADING LINE, MAGNETIC RANGE, MULTIPLE RANGES. 2. Distance in a single direction or along a great circle. 3. The extreme distance at which an object or light can be seen is called VISUAL RANGE. When the extreme distance is limited by the curvature of the earth and the heights of

the object and the observer, this is called geographic range; when the range of a light is limited only by its intensity, clearness of the atmosphere, and sensitiveness of the observer's eyes, it is called luminous range. 4. The extreme distance at which a signal can be detected or used. The maximum distance at which reliable service is provided is called operating range. The spread of ranges in which there is an element of uncertainty of interpretation is called critical range. 5. The distance a vessel can travel at cruising speed without refueling is called CRUISING RADIUS. 6. The difference in extreme values of a variable quantity. See also RANGE OF TIDE. 7. A series of mountains or mountain ridges is called MOUNTAIN RANGE. 8. A predetermined line along which a craft moves while certain data are recorded by instruments usually placed below the line, or the entire station at which such information is determined. See also DEGAUSSING RANGE. 9. An area where practice firing of ordnance equipment is authorized is a firing range. See also BOMBING RANGE. 10. On the sea floor, a series of ridges or seamounts.

range, *v.*, *t.* 1. To place in line. 2 To determine the distance to an object. 3 To move along or approximately parallel to something, as to range along coast.

range daymark. 1. One of a pair of unlighted structures used to mark a definite line of bearing. See also RANGE, definition 1. 2. A daymark on a range light.

range finder. An optical instrument for measuring the distance to an object. See also STADIMETER.

range lights. Two or more lights at different elevations so situated to form a range (leading line) when brought into transit. The one nearest the observer is the front light and the one farthest from the observer is the rear light. The front light is at a lower elevation than the rear light.

range marker. A visual presentation on a radar display for measuring the range or for calibrating the time base. See also VARIABLE RANGE MARKER, RANGE RING.

range (of a light). See VISUAL RANGE (OF A LIGHT).

range of tide. The difference in height between consecutive high and low waters. The mean range is the difference in height between mean high water and mean low water. The great diurnal range or diurnal range is the difference in height between mean higher high water and mean lower low water. Where the type of tide is diurnal the mean range is the same as the diurnal range. For other ranges see APOGEAN TIDES, NEAP TIDES, PERIGEAN TIDES, SPRING TIDES, TROPIC TIDES.

range-range mode. See RANGING MODE.

range resolution. See as RESOLUTION IN RANGE under RESOLUTION, definition 2. Also called DISTANCE RESOLUTION.

range ring. One of a set of equally spaced concentric rings, centered on own ship's position, providing a visual presentation of range on a radar display. See also VARIABLE RANGE MARKER.

ranging mode. A mode of operation of a radionavigation system in which the times for the radio signals to travel from each transmitting station to the receiver are measured rather than their *differences* as in the HYPERBOLIC MODE. Also called RHO-RHO MODE, RANGE-RANGE MODE.

Rankine temperature. Temperature based upon a scale starting at absolute zero (–459.69°F) and using Fahrenheit degrees.

rapids, *n.* A portion of a stream in swift, disturbed motion, but without cascade or waterfall.

raster. A type of computerized display which consists of a single undifferentiated data file, analogous to a picture. See BIT-MAP, VECTOR.

ratan, *n.* An experimental short-range aid to navigation, not operational, in which radar harbor surveillance information is transmitted to the user by television.

rate, *n.* 1. Quantity or amount per unit of something else, usually time. See also ANGULAR RATE, CHRONOMETER RATE, PULSE REPETITION RATE, REPETITION RATE, WATCH RATE. 2. With respect to Loran C, the term rate, implying the number of pulses per unit time, is used for the character designation, and also the station pair, their signals, and the resulting hyperbolic lines of position and the tables and curves by which they are represented.

rate gyro. A single-degree-of-freedom gyro having primarily elastic restraint of its spin axis about the output axis. In this gyro, an output signal is produced by gimbal angular displacement, relative to the base, which is proportional to the angular rate of the base about the input axis. See also RATE INTEGRATING GYRO.

rate integrating gyro. A single-degree-of-freedom gyro having restraint of its spin axis about the output axis. In this gyro an output signal is produced by gimbal angular displacement, relative to the base, which is proportional to the integral of the angular rate of the base about the input axis. See also RATE GYRO.

ratio, *n.* The relation of one magnitude to another of the same kind, the quotient obtained by dividing one magnitude by another of the same kind. See also MAGNITUDE RATIO.

rational horizon. See CELESTIAL HORIZON.

ratio of ranges. The ratio of the ranges of tide at two places. It is used in the tide tables where the times and heights of all high and low tides are given for a relatively few places, called REFERENCE STATIONS. The tides at other places called SUBORDINATE TIDE STATIONS, are found by applying corrections to the values given for the reference stations. One of these corrections is the ratio of ranges, or the ratio between the height of the tide at the subordinate station and its reference station.

ratio of rise. The ratio of the height of tide at two places.

ravine, *n.* 1. A gulch; a small canyon or gorge, the sides of which have comparatively uniform slopes. 2. On the sea floor, a small canyon.

read only memory (ROM). Computer memory used for permanent storage of data. It retains the data without a source of power. See RANDOM ACCESS MEMORY (RAM).

reach, *n.* A comparatively straight segment of a river or channel between two bends.

reach ahead. The distance traveled from the time a new speed is ordered to the time the new speed is being made.

real image. An image actually produced and capable of being shown on a surface, as in a camera.

real precession. Precession of a gyroscope resulting from an applied torque such as that resulting from friction and dynamic unbalance as opposed to APPARENT PRECESSION. Also called INDUCED PRECESSION, PRECESSION.

rear-light. The range light which is farthest from the observer. It is the highest of the lights of an established range. Also called HIGH LIGHT.

receiver, *n.* A person who or a device which receives anything, particularly a radio receiver.

receiver gain control. An operating control on a radar indicator used to increase or decrease the sensitivity of the receiver. The control regulates the intensity of the echoes displayed on the radarscope.

receiver monitor. See under PERFORMANCE MONITOR.

reciprocal, *adj*. In a direction 180° from a given direction. Also called BACK.

reciprocal, *n.* 1. A direction 180° from a given direction 2. The quotient of 1 divided by a given number.

reciprocal bearing. A bearing differing by 180° or one measured in the opposite direction, from a given bearing.

recommended direction of traffic flow. A traffic flow pattern indicating a recommended directional movement of traffic in a routing system within which it is impractical or unnecessary to adopt an established direction of traffic flow.

recommended track. A route which has been examined to ensure that it is free of dangers and along which vessels are advised to navigate. See also ROUTING SYSTEM.

rectangle, *n.* A four-sided figure with its opposite sides parallel and its angles 90°, a -right-angle parallelogram.

rectangular chart. A chart on the rectangular projection.

rectangular coordinates. Magnitudes defining a point relative to two perpendicular lines, called AXES. The magnitudes indicate the perpendicular distance from each axis. The vertical distance is called the ordinate and the horizontal distance the abscissa. This is a form of CARTESIAN COORDINATES.

rectangular error. An error which results from rounding off values prior to their inclusion in table or which results from the fact that an instrument cannot be read closer than a certain value The error is so called because of the shape of its plot. For example: if the altitudes tabulated in a sight reduction table are stated to the nearest 01', the error in the altitude as extracted from the table might have any value from (+) 0.05' to (-) 0.05', and any value within these limits is as likely to occur as another value having similar decimals. See also SIMILAR DECIMALS.

rectangular projection. A cylindrical map projection with uniform spacing of the parallels. This projection is used for the star chart in the *Air Almanac.*

rectified altitude. See APPARENT ALTITUDE.
rectilinear, *adj*. Moving in or characterized by straight line.
rectilinear current. See REVERSING CURRENT.
recurring decimal. See REPEATING DECIMAL.
recurring polynya. See under POLYNYA.
recurved spit. A hook developed when the end or spit is turned toward the shore by current deflection or by opposing action of two or more currents. Also called HOOK, HOOKED SPIT.
red magnetism. The magnetism of the northseeking end of a freely suspended magnet. This is the magnetism of the earth's south magnetic pole.
red sector. A sector of the circle of visibility of a navigational light in which a red light is exhibited. Such sectors are designated by their limiting bearings, as observed from a vessel. Red sectors are often located to warn of dangers.
red shift. In astronomy, the displacement of observed spectral lines toward the longer wavelengths of the red end of the spectrum. The red shift in the spectrum of distant galaxies has been interpreted as evidence that the universe is expanding.
red snow. Snow colored red by the presence in it either of minute algae or of red dust particles.
reduction, *n*. The process of substituting for an observed value one derived from it; often referring specifically to the adjustment of soundings to the selected chart datum. Usually the term reduction of soundings does not pertain to corrections other than those for height of tide. See also CORRECTION OF SOUNDINGS.
reduction of tidal current. The processing of observed tidal current data to obtain mean values of tidal current constants. See also REDUCTION OF TIDES.
reduction of tides. The processing of observed tidal data to obtain mean values of tidal constants. See also REDUCTION OF TIDAL CURRENTS.
reduction tables. See SIGHT REDUCTION TABLES.
reduction to the meridian. The process of applying a correction to an altitude observed when a body is near the celestial meridian of the observer, to find the altitude at meridian transit. The altitude at the time of such an observation is called an EX-MERIDIAN ALTITUDE.
reed, *n*. A steel tongue which is designed to vibrate when air is passed across its unsupported end.
reed horn. A sound signal emitter comprising a resonant horn excited by a jet of air which is modulated by a vibrating reed. The signal is a high-pitched note. See also REED, HORN.
reef, *n*. 1. An offshore consolidated rock hazard to navigation with a depth of 16 fathoms (or 30 meters) or less over it. See also SHOAL. 2. Sometimes used as a term for a low rocky or coral area some of which is above water. See BARRIER REEF, CORAL REEF, FRINGING REEF.
reef flat. A flat expanse of dead reef rock which is partly or entirely dry at low tide. Shallow pools, potholes, gullies, and patches of coral debris and sand are features of the reef flat.
reference datum. A general term applied to any datum, plane, or surface used as a reference or base from which other quantities can be measured.
reference ellipsoid. A theoretical figure whose dimensions closely approach the dimensions of the geoid; the exact dimensions of the ellipsoid are determined by various considerations of the section of the earth's surface of concern. Also called REFERENCE SPHEROID, SPHEROID OF REFERENCE, ELLIPSOID OF REFERENCE.
reference frequency. A frequency having a fixed and specified position with respect to the assigned frequency. The displacement of this frequency, with respect to the assigned frequency, has the same absolute value and sign that the displacement of the characteristic frequency has with respect to the center of the frequency band occupied by the emission.
reference grid. See GRID, definition 2.
reference orbit. An orbit, usually but not exclusively, the best two-body orbit available, on the basis of which the perturbations are computed.
reference ship. The ship to which the movement of other ships is referred.
reference spheroid. See REFERENCE ELLIPSOID.
reference station. A tide or current station for which independent daily predictions are given in the Tide Tables and Tidal Current Tables, and from which corresponding predictions obtained for subordinate stations by means differences and ratios. Also called STANDARD STATION. See also SUBORDINATE CURRENT STATION, SUBORDINATE TIDE STATION.
reflecting prism. A prism that deviates a light beam by internal reflection.
reflecting telescope. A telescope which collects light by means of a concave mirror. All telescopes more than 40 inches in diameter arc of this type. See also CASSEGRAINIAN TELESCOPE, NEWTONIAN TELESCOPE.
reflection, *n*. The return or the change in direction of travel of radiation by a surface without change of frequency of the monochromal components of which the radiation is composed. The radiation does not enter the substance providing the reflecting surface. If reflecting surface is smooth, specular reflection occurs; if the reflecting surface is rough with small irregularities, diffuse reflection occurs.
reflection plotter. An attachment fitted to a radar display which provides a plotting surface permitting plotting without parallax errors. Marks made on the plotting surface are reflected on the radarscope directly below. Also called PLOTTING HEAD.
reflectivity, *n*. The ratio of the radiant energy reflected by a surface to that incident upon it.
reflector, *n*. A reflecting surface situated behind the primary radiator, an array of primary radiators or a feed for the purpose of increasing forward and reducing backward radiation from antenna. See also RADAR REFLECTOR.
reflector compass. A magnetic compass in which the image of the compass card is viewed by direct reflection in a mirror adjacent to helmsman's position. See also PROJECTOR COMPASS.
reflex angle. An angle greater than 180° and less than 360°.
reflex reflection. See RETRO-REFLECTION.
reflex-reflector, *n.* See RETRO-REFLECTOR.
refracted ray. A ray extending onward from point of refraction.
refracting prism. A prism that deviates a beam light by refraction. The angular deviation is function of the wavelength of light; therefore if the beam is composed of white light, the prism will spread the beam into a spectrum.
refracting telescope. A telescope which collects light by means of a lens or system of lenses.
refraction, *n*. The change in direction of motion of a ray of radiant energy as it passes obliquely from one medium into another in which the speed of propagation is different. Atmospheric refraction is caused by the atmosphere and may be further designated astronomical refraction if the ray enters from outside the atmosphere or terrestrial refraction if it emanates from a point on or near the surface of the earth. Super-refraction is greater than normal and sub-refraction is less than normal. See also DIFFRACTION, REFLECTION.
refraction correction. 1. A correction due to refraction, particularly such a correction to a sextant altitude, due to atmospheric refraction. 2. See IONOSPHERIC CORRECTION.
refractive index. The ratio of the velocity of light in vacuum to the velocity of light in a medium. This index is equal to the ratio of the sines of the angles of incidence and refraction when a ray crosses the surface separating vacuum and medium.
refractive modulus. One million times the amount by which the modified refractive index exceeds unity.
refrangible, *adj*. Capable of being refracted.
regelation, *n*. The melting of ice under pressure and the subsequent refreezing when the pressure is reduced or removed.
region. One of the major subdivisions of the earth based on the DMAHTC chart numbering system.
regression of the nodes. Precessional motion of a set of nodes. The expression is used principally with respect to the moon, the nodes of which make a complete westerly revolution in approximately 18.6 years.
regular error. See SYSTEMATIC ERROR.
regular reflection. See SPECULAR REFLECTION.
relative, *adj*. Having relationship. In navigation the term has several specific applications: a. related to a moving point; apparent, as relative wind, relative movement; b. related to or measured from the heading, as relative bearing; c. related or proportional to a variable, as relative humidity. See also TRUE.
relative accuracy. The accuracy with which a user can measure current position relative to that of another user of the same navigation system at the same time. Hence, a system with high relative accuracy provides good rendezvous capability for the users of the system.

The correlation between the geographical coordinates and the system coordinates is not relevant. See also PREDICTABLE ACCURACY, REPEATABLE ACCURACY.

relative azimuth. Azimuth relative to heading.

relative bearing. Bearing relative to heading of a vessel, expressed as the angular difference between the heading and the direction. It is usually measured from 000° at the heading clockwise through 360°, but is sometimes measured from 0° at the heading either clockwise or counterclockwise through 180°, when it is designated right or left.

relative course. Misnomer for DIRECTION OF RELATIVE MOVEMENT.

relative direction. Horizontal direction expressed as angular distance from heading.

relative distance. Distance relative to a specified reference point, usually one in motion.

relative gain of an antenna. The gain of an antenna in a given direction when the reference antenna is a half-wave loss-free dipole isolated in space, the equatorial plane of which contains the given direction.

relative humidity. See under HUMIDITY.

relative motion. See RELATIVE MOVEMENT.

relative motion display. A type of radarscope display in which the position of own ship is fixed, usually at the center of the display, and all detected targets move relative own ship. See also TRUE MOTION DISPLAY.

relative movement. Motion of one object relative to another. The expression is usually used in connection with problems involving motion of one vessel to another, the direction such motion being called DIRECTION RELATIVE MOVEMENT and the speed of the motion being called SPEED OF RELATIVE MOVEMENT or RELATIVE SPEED. Distance relative to a specified reference point, usually one in motion, is called RELATIVE DISTANCE. Usually called APPARENT MOTION applied to the change of position of a celestial body as observed from the earth. Also called RELATIVE MOTION.

relative plot. A plot of the successive positions of a craft relative to a reference point, which is usually in motion. A line connecting successive relative positions of a maneuvering ship relative to a reference ship is called a RELATIVE MOVEMENT LINE. A relative plot includes relative movement lines and the position of the reference ship.

relative position. A point defined with reference to another position, either fixed or moving coordinates of such a point are usually between true or relative, and distance from an identified reference point.

relative speed. See SPEED OF RELATIVE MOVEMENT.

relative wind. The wind with reference to a moving point. Sometimes called APPARENT WIND. See also APPARENT WIND, TRUE WIND.

release, *n.* A device for holding or releasing a mechanism, particularly the device by which the tangent screw of a sextant is engaged or disengaged from the limb.

reliability diagram. See LORAN C RELIABILITY DIAGRAM.

relief, *n.* 1. The elevations of a land surface; represented graphics by contours, hypsometric tints, spot elevations, hachures, etc. Similar representation of the ocean floor is called SUBMARINE RELIEF. 2. The removal of a buoy (formerly also referred to lightships) from station and provision of another buoy having the operating characteristics authorized for that station.

relief map. See HYPSOGRAPHIC MAP.

relief model. Any three-dimensional representation of an object or geographic area, modeled in any size or medium. See also PLASTIC RELIEF MAP.

relieved, *adj*. Said of a buoy that has been removed from a station and replaced by another having the proper operating characteristics.

relighted, *adj*. Said of an extinguished aid to navigation returned to its advertised light characteristic.

relocated, *adj*. Said of aid to navigation that has been permanently moved from one position to another.

reluctance, *n.* Magnetic resistance.

remanence, *n.* Ability to retain magnetism after removal of the magnetizing force. Also See RETENTIVITY.

remote-indicating compass. A compass equipped with one or more indicators to repeat at a distance the readings of the master compass. The directive element and controls are called a master compass to distinguish this part of the system from the repeaters, or remote indicators. Most marine gyrocompass installations are of this type. Also called REMOTE-READING COMPASS.

remotely controlled light. A light which is operated by personnel at a considerable distance from the light, through electrical or radio links.

remote PPI. See RADAR REPEATER.

remote-reading compass. See REMOTE-INDICATING COMPASS.

repaired, *adj*. Said of a sound signal or radionavigation aid previously INOPERATIVE, placed back in operation, or of a structure previously DAMAGED, that has been restored as an effective aid to navigation.

repeatability, *n.* 1. A measure of the variation in the accuracy of an instrument when identical tests are made under fixed conditions. 2. In a navigation system, the measure of the accuracy with which the system permits the user to return to a specified point as defined only in terms of the coordinates peculiar to that system. See also PREDICTABILITY.

repeatable accuracy. In a navigation system, the measure of the accuracy with which the system permits the user to return to a position as defined only in terms of the coordinates peculiar to that system. For example, the distance specified for the repeatable accuracy of a system such as Loran C is the distance between two Loran C positions established using the same stations and time-difference readings at different times. The correlation between the geographical coordinates and the system coordinates may or may not be known. See also PREDICTABLE ACCURACY, RELATIVE ACCURACY.

repeater, *n.* A device for repeating at a distance the indications of an instrument or device. See also COMPASS REPEATER, GYRO REPEATER, RADAR REPEATER, STEERING REPEATER.

repeating decimal. A decimal in which all the digits after a certain digit consist of a set of one or more digits repeated and infinitum. Also called RECURRING DECIMAL.

replaced, *adj*. Said of an aid to navigation previously OFF STATION, ADRIFT or MISSING that has been restored by another aid of the same type and characteristic.

representative fraction. The scale of a map or chart expressed as a fraction or ratio that relates unit distance on the map to distance measured in the same unit on the ground. Also called NATURAL SCALE, FRACTIONAL SCALE. See also NUMERICAL SCALE.

reradiation, *n.* 1. The scattering of incident radiation. Reradiation from metallic objects in proximity to either the transmitting or receiving antennas can introduce unwanted effects. This is particularly true on a vessel having a number of metallic structures or wires in the vicinity of an antenna. Where such structures are permanent, the effects can sometimes be allowed for by calibration. Also called SECONDARY RADIATION. 2. Radiation from a radio receiver due to poor isolation between the antenna circuit and the local oscillator within the receiver, causing unwanted interference in other receivers.

research sanctuary. A marine sanctuary established for scientific research in support of management programs, and to establish ecological baselines. See also MARINE SANCTUARY.

reset, *adj*. Said of a floating aid to navigation previously OFF STATION, ADRIFT, or MISSING that has been returned to its station.

residual deviation. Deviation of a magnetic compass after adjustment or compensation. The values on various headings are called RESIDUALS.

residual magnetism. Magnetism which remains after removal of the magnetizing force.

residuals, *n., pl.* The remaining deviation of a magnetic compass on various headings after adjustment or compensation. See also DEVIATION TABLE.

resistance, *n.* Opposition, particularly to the flow of electric current.

resistivity, *n.* The amount of resistance in a system. Resistivity is the reciprocal of CONDUCTIVITY.

resolution, *n.* 1. The ability of an optical system to distinguish between individual objects; the degree of ability to make such a separation, called RESOLVING POWER, is expressed as the minimum distance between two objects that can be separated. 2. The degree of ability of a radar set to indicate separately the echoes of two targets in range, bearing, and elevation. Resolution in range is the minimum range difference between separate targets at the same bearing which will allow both to appear separately; Resolution in bearing is the minimum horizontal angular separation between two targets at

the same range which will allow both to appear separately. Resolution in elevation is the minimum separation in the vertical plane between two contacts at the same range and bearing which will allow both to appear as distinct echoes.

resolution of vectors. The resolving of a vector into two or more components. The opposite is called VECTOR ADDITION.

resolving power. The degree of ability of an optical system to distinguish between objects close together. See also RESOLUTION.

resolving time. 1. The minimum time interval between two events which permits one event to be distinguishable from the other. 2. In computers, the shortest permissible period between trigger pulses for reliable operation of a binary cell.

resonance, *n*. Re-enforcement or prolongation any wave motion, such as sound, radio waves etc., resulting when the natural frequency of a body or system in vibration is equal to that of an impressed vibration.

resonant frequency. Any frequency at which a body or system vibrates most readily. The lowest resonant frequency is the natural frequency of the body or system.

responsor, *n*. A unit which receives the response emitted by a transponder.

restricted area. 1. An area (land, sea, or air) in which there are special restrictive measures employed to prevent or minimize interference between friendly forces. 2. An area under military jurisdiction in which special security measures are employed to prevent unauthorized entry. See also DANGER AREA, PROHIBITED AREA.

restricted waters. Areas which for navigational reasons such as the presence of shoals or other dangers confine the movements of shipping within narrow limits.

resultant, *n*. The sum of two or more vectors.

retard, *v., t & i.* To delay. This term is sometimes used as the equivalent of RETIRE (meaning "to move back"), but this usage is not appropriate.

retarded line of position. See RETIRED LINE OF POSITION.

retentive error. Deviation of a magnetic compass due to the tendency of a vessel's structure to retain some of the induced magnetic effects for short periods of time. For example, a vessel on a northerly course for several days, especially if pounding in heavy seas, will tend to retain some fore-and-aft magnetism gained through induction. Although this effect is not large and generally decays within a few hours, it may cause incorrect observations or adjustments, if neglected. This error should not be confused with GAUSSIN ERROR.

retentivity, *n*. See REMANENCE.

reticle, *n*. A system of lines, wires, etc., placed in the focal plane of an optical instrument to serve as a reference. A cross hair is a hair, thread, or wire constituting part of a reticle. See also GRATICULE, definition 2.

retire, *v., t. & i.* To move back, as to move a line of position back, parallel to itself, along a course line to obtain a line of position at an earlier time. The term RETARD (meaning "to delay") is sometimes used as an equivalent, but the term RETIRE (meaning "to move back") is more appropriate. The opposite is ADVANCE.

retired line of position. A line of position which has been moved backward along the course line to correspond with a time previous to that at which the line was established. The opposite is ADVANCED LINE OF POSITION.

retrace, *n*. The path of the visible dot from the end of one sweep to the start of the next sweep across the face of a cathode-ray tube.

retract, *v., t. & i.* The opposite of BEACH, *v., t & i*.

retrograde motion. The apparent motion of a planet westward among the stars. Apparent motion eastward, called DIRECT MOTION, is more common. Also called RETROGRESSION.

retrogression, *n*. See RETROGRADE MOTION.

retro-reflecting material. A material which produces retro-reflection over a wide range of angles of incidence of a light beam, by use of a large number of very small reflecting and refracting elements, usually very small beads.

retro-reflection, *n*. Reflection in which light is returned in directions close to the direction from which it came over wide variations of the direction of the incident light. Also called REFLEX REFLECTION.

retro-reflector, *n*. A device intended to produce retro-reflection. It may comprise one or more retro-reflecting optical units, for example, comer reflectors or special lens units of glass or plastic. Such devices may be installed generally on unlighted buoys or other aids to navigation to increase the range at which they may be seen at night. Also called REFLEX REFLECTOR.

return, *n*. See BLIP; ECHO, definition 2.

reverberation, *n*. Continuation of radiant energy, particularly sound, by multiple reflection.

reversing current. A tidal current which flows alternately in approximately opposite directions with a slack water at each reversal of direction. Currents of this type usually occur in rivers and straits where the direction of flow is somewhat restricted to certain channels. When the movement is towards the shore or up a stream the current is said to be flooding, and when in the opposite direction it is said to be ebbing. The combined flood and ebb movement including the slack water covers, on an average, 12.4. hours for the semidiurnal current. If unaffected by a nontidal flow, the flood and ebb movements will each last about 6 hours, but when combined with such a flow, the durations of flood and ebb may be quite unequal. During the low in each direction the speed of the current will vary from zero at the time of slack water to a maximum about midway between the slacks. Also called RECTILINEAR CURRENT.

reversing falls. Falls which flow alternately in opposite directions in a narrow channel in the St. John River, New Brunswick, Canada, due to the large range of tide and a constriction in the river. The direction of flow is upstream or downstream according to whether it is high or low water on the outside, the falls disappearing at the half-tide level.

revolution, *n*. Circular motion about an axis usually external to the body. The terms REVOLUTION and ROTATION are often used interchangeably but, with reference to the motions of a celestial body, REVOLUTION refers to the motion in an orbit or about an axis external to the body while ROTATION refers to motion about axis within the body. Thus, the earth revolves about the sun annually and rotates about its axis daily.

revolution counter, revolution indicator. An instrument for registering the number of revolutions of a shaft, particularly a propeller shaft of a vessel (when it may be called ENGINE REVOLUTION COUNTER). This information is useful in estimating a vessel's speed through the water.

revolution table. A table listing the number of shaft revolutions corresponding to various speeds of a vessel.

revolver, *n*. The pair of horizontal angles between three points, as observed at any place on the circle defined by the three points. This is the only situation in which such angles do not establish a fix. Also called SWINGER.

revolving light. See ROTATING LIGHT.

revolving storm. A cyclonic storm, or one in which the wind revolves about a central low pressure area.

rheostat, *n*. A variable resistor for changing the amount of current in an electrical circuit.

rhomboid, *n*. A parallelogram with oblique angles. A rhomboid with sides of equal length is rhombus.

rhombus, *n*. A rhomboid with sides of equal length.

Rho-Rho mode. See RANGING MODE.

rho-theta navigation. Navigation by means measuring ranges and bearings of a known position.

rhumb, *n*. Short for RHUMB LINE.

rhumb bearing. The direction of a rhumb line through two terrestrial points, expressed angular distance from a reference direction. It is usually measured from 000° at the reference direction clockwise through 360°. Also called MERCATOR BEARING.

rhumb direction. See MERCATOR DIRECTION.

rhumb line. A line on the surface of the earth making the same oblique angle with all meridians; a loxodrome or loxodromic curve spirals toward the poles in a constant true direction. Parallels and meridians, which also maintain constant true directions, may be considered special cases of the rhumb line. A rhumb line is a straight line on a Mercator projection. Sometimes shortened to RHUMB. See also FICTITIOUS RHUMB LINE.

rhumb-line course. The direction of the rhumb line from the point of departure to the destination, expressed as the angular distance from a reference direction, usually north. Also called MERCATOR COURSE.

rhumb-line distance. Distance point to point along a rhumb line, usually expressed in nautical miles.

rhumb-line sailing. Any method of solving the various problems involving course, distance, difference of latitude, difference of longitude, and departure as they are related to a rhumb line.

rhythmic light. A light showing intermittently with a regular periodicity.

ria, *n.* A long, narrow inlet with gradually decreasing depth inward.

ridge, *n.* 1. On the sea floor, a long, narrow elevation with steep sides. 2. A line or wall of broken ice forced up by pressure. The ridge may be fresh or weathered. See also AGED RIDGE. 3. In meteorology, an elongated area of relatively high atmospheric pressure, almost always associated with and most clearly identified as an area of maximum anticyclonic curvature of wind flow. The opposite of a ridge is called TROUGH. Sometimes called WEDGE.

ridged ice. Ice piled haphazardly one piece over another in the form of ridges or walls; usually found in first-year ice.

ridged-ice zone. An area in which much ridged ice with similar characteristics has formed.

ridging, *n.* The pressure process by which sea ice is forced into ridges.

riding light. See ANCHOR LIGHT.

rift, *n.* An opening made by splitting; a crevasse; usually in the earth.

right angle. An angle of 90°.

right angle reflector. See DIHEDRAL REFLECTOR.

right ascension. Angular distance east of the vernal equinox; the arc of the celestial equator, or the angle at the celestial pole, between the hour circle of the vernal equinox and the hour circle of a point on the celestial sphere, measured eastward from the hour circle of the vernal equinox through 24 hours. Angular distance west of the vernal equinox, through 360°, is SIDEREAL HOUR ANGLE.

right astern. See DEAD ASTERN.

right bank. The bank of a stream or river on the right of the observer when he is facing in the direction of flow, or downstream. See also LEFT BANK.

right circular cone. A cone having a circular base perpendicular to the axis of the cone. Often shortened to RIGHT CONE.

right cone. Short for RIGHT CIRCULAR CONE.

right sphere. The celestial sphere as it appears to an observer at the equator, where celestial bodies appear to rise vertically above the horizon.

right triangle. A triangle one angle of which is 90°.

rigidity in space. See GYROSCOPIC INERTIA.

rime, *n.* A white or milky and opaque granular deposit of ice formed by the rapid freezing of supercooled water drops as they impinge on an exposed object. It is denser and harder than frost, but lighter, softer, and less transparent than glaze.

rime fog. See ICE FOG.

ring time. The time, reckoned from the end of pulse transmitted by a radar set, during which the output of an echo box produces a visible signal on the display.

rip current. A narrow intense current setting seaward through the surf zone. It removes excess water brought to the zone by the small net mass transport of waves, and is fed by longshore currents. Rip currents usually occur at points groins, jetties, etc., of irregular beaches, and at regular intervals along straight, uninterrupted beaches. See also RIPS.

riprap, *n.* Stones or broken rock thrown together without order to provide a revetment.

riprap mounds. Mounds of riprap maintained at certain light structures to protect the structures against ice damage and scouring action. Submerged portions present a hazard to vessels attempting to pass very close aboard.

rips, *n. pl.* Agitation of water caused by the meeting of currents or by a rapid current setting over an irregular bottom. Called TIDE RIPS when the tidal current is involved. See also OVERFALLS, RIP CURRENT.

rise, *n.* A broad elevation that rises gently and generally smoothly from the sea floor. See also CONTINENTAL RISE.

rise, *v., i.* To ascend past the visible horizon. The opposite is SET.

rise of tide. Vertical distance from the chart sounding datum to a higher water datum. Mean rise of tide is the height of mean high water above the chart sounding datum. Spring rise and neap rise are the heights of spring high water and neap high water, respectively, above the chart sounding datum; while mean spring rise and mean neap rise are the heights of mean high water springs and mean high water neaps, respectively above the chart sounding datum. Also called TIDAL RISE. See also HEIGHT OF TIDE.

rising tide. A tide in which the depth of water is increasing. Sometimes the term FLOOD is used as an equivalent, but since flood refers primarily to horizontal rather than vertical movement RISING TIDE is more appropriate. The opposite is FALLING TIDE.

river, *n.* A natural stream of water, of greater volume than a creek or rivulet, flowing in a more or less permanent bed or channel, between defined banks or walls, with a current which may either be continuous in one direction or affected by the ebb and flow of the tidal current.

river buoy. A lightweight nun or can buoy especially designed to withstand strong currents.

river estuary. See ESTUARY, definition 2.

river ice. Ice formed on a river, regardless of observed location.

river radar. A marine radar set especially designated for river pilotage, generally characterized by high degree of resolution and a wide selection of range scales.

rivulet, *n.* A small stream; a brook.

road, *n.* An open anchorage affording less protection than a harbor. Some protection may be afforded by reefs, shoals, etc. Often used in the plural. Also called ROADSTEAD.

roadstead, *n.* See ROAD.

roaring forties. The area of the oceans between 40° and 50° south latitude, where strong westerly winds prevail. See also BRAVE WEST WIND.

roche moutonnée. A rock worn into a rounded shape by a glacier.

rock, *n.* 1. An isolated rocky formation or single large stone, usually one constituting a danger navigation. It may be always submerged, always uncovered, or alternately covered and uncovered by the tide. A pinnacle is a sharp-pointed rock rising from the bottom. 2. The naturally occurring material that forms the firm, hard, and solid masses of the ocean floor. Also, rock is a collective term for hard material generally not smaller than 256 millimeters.

rock awash. A rock that becomes exposed, or nearly so, between chart sounding datum and mean high water. In the Great Lakes, the rock awash symbol is used on charts for rocks that are awash, or nearly so, at low water datum. See also BARE ROCK, SUBMERGED ROCK.

rocking the sextant. See SWINGING THE ARC.

rod, *n.* 1. A unit of length equal to 5.5 yards or 16.5 feet. Also called POLE, PERCH. 2. One of the imaginary slender soft iron bars which are assumed to be components or parameters of a craft's magnetic field caused by magnetism induced in soft iron.

roll, *n.* Oscillation of a craft about its longitudinal axis. Also called ROLLING. See also LIST, *n.*; SHIP MOTIONS.

roll, *v., t.* & *i.* To oscillate or be oscillated about the longitudinal axis.

roll angle. See ANGLE OF ROLL.

rollers, *n.* Amongst the islands of the West Indies, the South Atlantic and the South Indian Ocean, swell waves which after moving into shallow water have grown to such height as to be destructive. See also COMBER.

rolling, *n.* See ROLL, *n.*

root mean square. The square root of the arithmetical mean of the squares of a group of numbers.

root mean square error. For the one-dimensional error distribution, this term has the same meaning as STANDARD DEVIATION or STANDARD ERROR. For the two-dimensional error distribution, this term has the same meaning as RADIAL (d_{rms}) ERROR. However, such use of the term is deprecated. Root mean square error is commonly called RMS ERROR.

rotary current. A tidal current that flows continually, with the direction of flow changing through 360° during the tidal period. Rotary currents are usually found offshore where the direction of flow is not restricted by any barriers. The tendency for rotation is due to the Coriolis force and, unless modified by local conditions, is clockwise in the Northern Hemisphere and counterclockwise in the Southern Hemisphere. The speed of the current usually varies throughout the tidal cycle, passing through the two maxima in approximately opposite directions and the two minima with the direction of the current at approximately 90° from the direction at time of maximum speed.

rotating light. A light with one or more beams that rotate. Sometimes called REVOLVING LIGHT.

rotation, *n.* Turning of a body about an axis within the body, such as the daily rotation of the earth. See also REVOLUTION.

rotten ice. Sea ice which has become honeycombed and is in an advanced state of disintegration.

round, *v., t.* To pass and alter direction of travel, as a vessel ROUNDS A CAPE. If the course is nearly reversed, the term DOUBLE may be used.

roundabout, *n*. A routing measure comprising a separation point or circular separation zone and a circular traffic lane within defined limits. Traffic within the roundabout moves in a counterclockwise direction around the separation point or zone. See also ROUTING SYSTEM, TRAFFIC SEPARATION SCHEME.

round of bearings. A group of bearings observed together for plotting as a fix.

round of sights. A group of celestial observations made together for plotting a fix.

round wind. A wind that gradually changes direction through approximately 180° during the daylight hours. See also LAND BREEZE.

route chart. A chart showing routes between various places, usually with distances indicated.

routing system. Any system of one or more defined tracks and/or traffic control measures for reducing the risk of casualties; it includes traffic separation schemes, two-way routes, recommended tracks, areas to be avoided, inshore traffic zones, roundabouts, precautionary areas, and deep water routes.

rubble, *n*. 1. Fragments of hard sea ice, roughly spherical and up to 5 feet in diameter, resulting from the disintegration of larger ice formations. When afloat, commonly called BRASH ICE. 2. Loose angular rock fragments.

Rude Star Finder. A star finder previously published by the U.S. Navy Hydrographic Office, and named for Captain Gilbert T. Rude, U.S. Coast and Geodetic Survey. This star finder preceded No. 2102-D Star Finder and Identifier.

rugged, *adj*. Rock-bound; craggy.

rules of navigation. Rules of the road.

rules of the road. The *International Regulations for Prevention of Collisions at Sea*, commonly called *International Rules of the Road*, and the *Inland Navigation Rules*, to be followed by all vessels while navigating upon certain inland waters of the United States. Also called RULES OF NAVIGATION.

run, *n*. 1. A brook, or small creek. 2. A small, swift watercourse. 3. The distance traveled by a craft during any given time interval, or since leaving a designated place. See also DAY'S RUN.

run a line of soundings. To obtain soundings along a course line, for use in making or improving a chart.

run before the wind. To steer a course downwind, especially under sail.

run down a coast. To sail approximately parallel with the coast.

runnel, *n*. The smallest of natural streams; a brook or run.

running fix. A position determined by crossing lines of position obtained at different times and advanced or retired to a common time. However in celestial navigation or when using long-range electronic aids, a position determined by crossing lines of position obtained within a few minutes is considered a FIX; the expression RUNNING FIX is applied to a position determined by advancing or retiring a line over a considerable period of time. There is no sharp dividing line between a fix and a running fix in this case.

running light. See NAVIGATION LIGHTS.

run-off, *n*. That portion of precipitation which is discharged from the area of fall as surface water in streams.

run of the coast. The directional trend of a coast.

run-up. The rush of water up a structure on the breaking of a wave. The amount of run-up is the vertical height above the still water level that the rush of water reaches. Also called UPRUSH.