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SOCIETY FOR PHOTOGRAMMETRY

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COMMISSION VI

Report of Working Group-3

TRI-LINGUAL GLOSSARY OF PHOTOGRAMMETRY TERMS

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The activities of Working Group-3 of Commission VI during the four year period from 1976 to 1980 are summarized. A draft version of definitions of common photogrammetry terms which are the result of this work is attached. This draft is intended to serve as the basis for developing the final version of the Photogrammetry part of the ISP Tri-Lingual Glossary of Terms. Recommendations are made for the inclusion of Remote Sensing terms in the final Glossary.

I. Introduction

At the XIII Congress of the International Society for Photogrammetry at Helsinki, Finland in 1976, the following resolution was recommended by Commission VI, and was adopted by the General Assembly:

"Commission VI has noted that the continuously increasing fields of application of Photogrammetry and Remote Sensing would involve them in more diverse activities among fellow photogrammetrists and with colleagues in other associated branches of science and engineering. This demands continuous exchange of ideas with regard to "Notations and Terminology.

It is, therefore, recommended that such activities be pursued with more vigor by continuing the efforts in one working group and that an appropriate multi-lingual glossary be developed for submission to the XIV Congress in 1980."

Working Group-3 was organized for the purpose of carrying out the objectives of this resolution. A committee for Working Group-3 was appointed and consisted of Dr. Paul R. Wolf, Chairman, (USA); Dr. M.J. Pietschner (GDR); Dr. M. Serge Paul, (France); Prof. J.A. Szorenyi (Australia); and Prof. Paul Louis Baetsle (Belgium).

I agreed to Chair this Working Group and to take an active part in the project because I was concurrently chairing the Nomenclature Committee of the American Society of Photogrammetry (ASP). Within ASP one major task of the Nomenclature Committee was to prepare a Glossary of Photogrammetry Terms for inclusion within their proposed 4th Edition of the Manual of Photogrammetry.

II. PROPOSED SCHEDULE OF ACTIVITIES

Soon after the Helsinki meeting Working Group-3 proposed the following schedule of activities in order to achieve the objective of producing a tri-lingual (English-German-French) Glossary of Photogrammetric Terms:

1. That in attaining the goal of the presentation of a Tri-lingual Glossary of Photogrammetry Terms to the XIV Congress, it is proposed that the English Glossary of Photogrammetry Terms being prepared by the American Society of Photogrammetry, for inclusion in the 4th Edition of the Manual of Photogrammetry, become the substance of the "working document" for ISP Working Group-3.
2. That the American Society of Photogrammetry's Board of Direction be petitioned to give its approval for such use of these materials.
3. That upon completion of the draft of ASP terms, a copy of these drafts be sent to each of the members of Working Group-3.

4. That these committee members each carefully review this draft, making necessary changes, additions and corrections.
5. That the reviews be consolidated into an English compilation.
6. That the compiled English Version of the Glossary of Terms be presented at the 1978 Commission VI Symposium in Krakow, Poland.
7. That input and suggestions resulting from the Symposium be incorporated into the English Version to create a final draft.
8. That thereafter, Dr. Paul head a subcommittee for the purpose of preparing a French translation of the final draft, and that Dr. Pietschner head a subcommittee to prepare a German translation.
9. That the final drafts in the three official languages of ISP be printed for the XIV ISP Congress in Hamburg, and the substance of the document be discussed at one of the Commission VI sessions held at that Congress.

III. CURRENT STATUS

The important work of preparing the Tri-lingual Glossary of Photogrammetry Terms has been found to be a monumental task. Although this was recognized at the outset, it was only after becoming involved in the work that the true magnitude of the project could be appreciated. In attempting to attain any major goals it is important to aim high by setting ambitious objectives. In preparing the foregoing proposed schedule of activities, we did aim high. We achieved many of the goals but we failed to reach all of them. Nevertheless, a great deal of work has been accomplished.

Objective No. 1 was reached early in 1978, and The Board of Direction of the American Society of Photogrammetry gave its approval for Objective No. 2 at its Annual Meeting in March of 1978. The Draft of the Glossary was distributed to Committee members thereafter in keeping with Objective No. 3. There was only a short amount of time available, however, prior to the submittal deadline for the English Version of the Draft for the Krakow Symposium. Two committee members did respond in time to have their suggestions incorporated into the Krakow paper, and thus Objectives No. 4 and No. 5 were partially met. Objective No. 6 was met, as the paper was presented at Krakow.

Objective No. 7 has been ongoing by various photogrammetrists since the Krakow Symposium, however to date only a few reviews have been received. Therefore, Objectives No. 8 and No. 9 could not be totally achieved. At this meeting then, what is presented is basically an English Draft of the Glossary with a modest amount of revision to the Glossary as presented in Krakow.

This Glossary in its present form must be viewed as a draft and nothing more. It is intended only to serve as a basis for future work. Working Group-3 recognizes that it will require substantial input from photogrammetrists of wide international distribution to produce a final product of the quality desired by this Society.

IV. REMOTE SENSING

During the course of the past four years a number of people have indicated their desire to have Remote Sensing terms included within the Tri-Lingual Glossary. In fact one of those making that suggestion was our President Jean Cruset. To paraphrase his words, this would illustrate the will of Photogrammetrists to cooperate with Remote Sensing people and reaffirm once more an ISP Resolution that gives Remote Sensing its full place in ISP activities.

The task of adding Remote Sensing terms was considered by Working Group-3 but it was realized that to add this would be far too huge an undertaking for the four-year period 1976-1980. Adding these terms into the Glossary will probably approximately double the amount of work required to prepare the final draft, and also probably double its size. Accordingly it will require a significant expansion of the Committee to include people from the several areas of Remote Sensing. Nevertheless this is an addition that appears desirable in order that ISP compile a truly complete Glossary.

V. PROPOSALS FOR 1980-1984

The following activities are proposed for Working Group-3 to undertake during the four year period 1980-1984:

1. A Working Group comprised of International Photogrammetry and Remote Sensing people should be organized immediately. This should be done during the 2-weeks of this Congress, because to do otherwise will create severe difficulties with long distance communication. The Working Group should be composed of people representing all of the broad aspects covered within Photogrammetry and Remote Sensing. Of course, the group must contain people having fluency in the three official languages of ISP, and the people appointed must also be enthusiastic to the task if the goals are to be achieved.
2. Work should begin immediately in the compilation of the Remote Sensing Addendum. A Draft should be ready for presentation at a 1982 Symposium of Commission VI. It is recommended that the initial draft be prepared in only one language, and English is suggested.
3. Work should begin immediately on the revision of the attached Draft of Photogrammetry Terms. Efforts should be made to modify the current definitions where appropriate to make them truly international. Reference to existing Dictionaries and Glossaries of "Sister Organizations" should be made at every

opportunity so as to make our Glossary as consistent with them as possible. This revised Draft should also be presented at a 1982 Symposium of Commission VI.

4. Following The 1982 Symposium, Translation of the English versions of the Photogrammetry and Remote Sensing terms should be made into French and German. These should then be published in book form for distribution at the 1984 Congress.

Admittedly the above proposed schedule is ambitious. But as stated earlier, to achieve any major goal it is important to aim high!

VI. DEFINITIONS OF COMMON PHOTOGRAMMETRY TERMS

The following pages contain definitions, in alphabetical order, of common Photogrammetric Terms. The terms that are defined are typed in capital letters. If a term is used within any definition, and that term is defined elsewhere as a part of the alphabetical definitions, the term will be capitalized. Other sub-terms used within definitions are underscored. These terms will usually be defined as a part of the major definition within which they appear. In some cases sub-terms which are underscored may not be defined at all. In general terms which are placed within parentheses give the broad category within which the definition pertains.

ABERRATION (optics) - Failure of an optical system to bring all light rays received from a point object to a single image point or to a single image point or to a prescribed geometric position. Astigmatism - An aberration affecting the sharpness of images for objects off the axis in which the rays passing through different meridians of the lens come to a focus in different planes. Thus, an extra-axial point object is imaged as two mutually perpendicular short lines located at different distances from the lens. Lateral Chromatic Aberration - An aberration which affects the sharpness of images off the axis because different colors undergo different magnifications. Longitudinal Chromatic Aberration - An aberration which affects the sharpness of all parts of an image because different colors come to a focus at different distances from the lens. Spherical Aberration - An aberration caused by rays through various zones of a lens coming to focus at different places along the axis. This results in a point object being imaged as a circle. (See also CIRCLE OF CONFUSION.) Coma - An aberration affecting the sharpness of images off the axis in which rays from a point object off the axis passing through a given circular zone of the lens come to a focus in a circle rather than a point, and the circles formed by rays through different zones are of different sizes and are located at different distances from the axis. Therefore, the image of a point object is comet-shaped. Curvature of Field - An aberration affecting the longitudinal position of images off the axes in such a manner that objects in a plane perpendicular to the axis are imaged in a curved or dish-shaped surface. Distortion - An aberration affecting the position of images off the axis in which objects at different angular distances from the axis undergo different magnifications. Frequently referred to as lens distortion. (See also DISTORTION CURVE.)

ABSOLUTE ALTITUDE - See FLIGHT ALTITUDE.

ABSOLUTE ERROR - See ERROR.

ABSOLUTE HUMIDITY - See HUMIDITY.

ABSOLUTE ORIENTATION - See ORIENTATION.

ABSOLUTE PARALLAX - See ABSOLUTE STEREOSCOPIC PARALLAX under PARALLAX.

ABSOLUTE STEREOSCOPIC PARALLAX - See PARALLAX.

ACCIDENTAL ERRORS - See ERROR.

ACCOMMODATION - The faculty of the human eye to adjust itself to give sharp images for different object distances. (STEREOSCOPY)--The ability of the eyes to bring two images into superimposition for stereoscopic viewing.

ACCUMULATIVE ERROR - See CONSTANT ERROR under ERROR.

- ACCURACY - The degree of conformity with a standard, or the degree of perfection attained in a measurement. Accuracy relates to the quality of a result, and is distinguished from PRECISION which relates to the quality of the operation by which the result is obtained.
- ACCURATE CONTOUR - See CONTOUR LINE.
- ACETATE - A nonflammable plastic sheeting used as a base for photographic films or as a drafting base for overlays where critical registration is not required.
- ACHROMATIC LENS - A lens that has been partly corrected for CHROMATIC ABERRATION. Such a lens is customarily made to bring green and red light rays to approximately the same point focus. Also called achromat.
- ACTINIC LIGHT - A part of the spectrum that causes chemical changes to take place in light sensitive photographic emulsions. The light that creates images on light sensitive material. The blue or violet portion of the spectrum is considered the most actinic band of light. The actinic value also depends on the sensitiveness of the emulsions.
- ACTIVE SYSTEM - A system which transmits an electromagnetic signal. A system with the capability to transmit, repeat, or re-transmit electromagnetic information. Contrasted with PASSIVE SYSTEM.
- ACTIVE TRACKING SYSTEM - A satellite tracking system which operates by transmission of signals to and receipt of responses from the satellite.
- ACUITY, VISUAL - A measure of the human eye's ability to separate details in viewing an object. The reciprocal of the minimum angular separation, in minutes of arc, of two lines of detail which can be seen separately.
- ACUTANCE - An objective measure of the ability of a photographic system to show a sharp edge between contiguous areas of low and high illuminance.
- ADAPTATION (ophthalmology) - The faculty of the human eye to adjust its sensitivity to varying intensities of illumination.
- ADDITIVE COLOR PROCESS - A method for creating essentially all colors through the addition of light of the 3 additive color primaries (blue, green, and red) in various proportions through the use of 3 separate projectors. In this type of process each primary filter absorbs the other 2 primary colors and transmits only about one-third of the luminous energy of the source. It also precludes the possibility of mixing colors with a single light source because the addition of a second primary color results in total absorption of the only light transmitted by the first color.

ADDITIVE COLOR VIEWER - Projector for positive transparencies secured in multiband photography, with each image superimposed on the other and illuminated with a different colored light.

ADJUSTED ANGLE - See ANGLE.

ADJUSTED ELEVATION - See ELEVATION.

ADJUSTED POSITION - See POSITION.

ADJUSTMENT - The determination and application of corrections to observations, for the purpose of reducing ERRORS or removing internal inconsistencies in derived results. The term may refer either to mathematical procedures or to corrections applied to instruments used in making observations.

ADJUSTMENT OF OBSERVATIONS - The determination and application of corrections corresponding to ERRORS affecting the observations, making the observations consistent among themselves, and coordinating and correlating the derived data.

AERIAL CAMERA - See CAMERA.

AERIAL EXPOSURE INDEX (A.E.I.) - The reciprocal of twice the Exposure, expressed in meter candle seconds, at the point on the toe of the characteristics curve where the slope equals 0.6 gamma when recommended processing conditions are used.

AERIAL FILM - Specially designed roll-film supplied in many lengths and widths, with various Emulsion types for use in aerial cameras.

AERIAL MOSAIC - See MOSAIC.

AERIAL PHOTOGRAMMETRY - See PHOTOGRAMMETRY.

AERIAL PHOTOGRAPH - Any photograph taken from the air. Sometimes called aerial photo or air photograph.

AERIAL PHOTOGRAPHIC INTERPRETATION - See PHOTOINTERPRETATION.

AERIAL PHOTOGRAPHY - The art, science, or process of taking aerial photographs. (See also PHOTOGRAPHY.)

AERIAL RECONNAISSANCE - The collection of information by visual, electronic, or photographic means from the air.

AERIAL SURVEY - See SURVEY.

AEROLEVELING - As applied to model orientation during phototriangulation, barometric height measurements of the camera air stations which have been recorded during the photographic mission are used to represent the bz values during the orientation of the successive models on the stereoplotting instruments. Only differences in flight height are required and these are provided by the Statoscope.

- AEROMETEOROGRAPH - An instrument that records the pressure and temperature of the air, the amount of moisture in the air, and the rate of motion of the wind.
- AERONAUTICAL CHART (or AIR NAVIGATION CHART) - A chart especially designed for air navigation use, on which--in addition to essential topography--are shown obstructions and aids to navigation and other pertinent information. They are sometimes referred to as Airway Maps, and are published at scales ranging from 1:1,000,000 to 1:250,000 and larger.
- AERONAUTICAL DATA - Aids to air navigation, such as isogonic lines, compass rosettes, hour angles, airports, beacons and direction finders, major radio stations, airports, emergency landing fields, etc. Customarily applied to Aeronautical Charts and occasionally to other type Maps.
- AERONAUTICAL MILE - See AIR MILE.
- AEROTRIANGULATION - See PHOTOTRIANGULATION.
- AFFINE - A geometrical condition in which the scale along one axis or reference plane is different from the scale along the other axis or plane. Affine Deformation - a deformation in which the scale along one axis or reference plane is different from the scale along the other axis or plane. Affine Transformation - a Transformation in which straight lines remain straight and parallel lines parallel. Angles, however, may undergo changes and differential scale changes may be introduced.
- AIR BASE (photogrammetry) - The line joining two AIR STATIONS, or the length of this line; also, the distance (at the scale of the Stereoscopic Model) between adjacent perspective centers as reconstructed in the plotting instrument. Photobase - the length of the air base as represented on a photograph. The distance between the principal points of two adjacent prints of a series of vertical aerial photographs. It is usually measured on one print after transferring the principal point of the other print. (See CAMERA STATION.)
- AIR NAVIGATION CHART - see AERONAUTICAL CHART.
- AIR PHOTO INTERPRETATION - See PHOTOINTERPRETATION.
- AIRBORNE CONTROL (ABC) SYSTEM - A survey system for horizontal and vertical Control Surveys involving electromagnetic distance measurements and horizontal and vertical angle measurements from two or more known positions to a helicopter hovering over the unknown position. The elevation of the unknown position is determined by the use of a special plumbline cable.
- AIRBORNE ELECTRONIC SURVEY CONTROL - Control Surveys accomplished by electronic means from an airborne vehicle or platform, such as by hiran and shoran.

AIR SPEED - The speed of an aircraft, along its longitudinal axis, relative to the surrounding atmosphere.

AIR STATION - See CAMERA STATION.

ALBEDO - The ratio of radiant energy reflected to that received by a surface, usually expressed as a percentage. The term generally refers to energy within a specific frequency range, as the visible spectrum. Its most frequent application is to the light reflected by a celestial body.

ALMANAC - A periodical publication of astronomical coordinates useful to a navigator. It contains less information than an ephemeris and values are generally given to less precision.

ALTIMETER - (1) An instrument that indicates directly the height above a reference surface. (See BAROMETER.) (2) air navigation: An aneroid barometer used for determining the altitude of an airplane above a specified datum. (3) surveying: An aneroid barometer specially constructed and calibrated for the purpose of determining differences of elevation within the ranges usually encountered in ground surveys. (4) radar: An instrument, called a Radar Altimeter, used for determining an aircraft's flight height above terrain by the measurement of time intervals between the emission and return of electromagnetic pulses. (See also APR.) Statoscope - A sensitive barometer used in aerial photography for measuring small differences in altitude between successive air stations. Recording Statoscope - a statoscope equipped with a recording camera whose shutter is synchronized with that of the aerial camera and the image of the statoscope is recorded on each individual frame.

ALTIMETRY - The art and science of measuring altitudes and interpreting the results.

ALTITUDE (aerial photography) - Vertical distance above the datum, usually mean sea level, of an object or point in space above the earth's surface. (See also ELEVATION and ANGULAR ALTITUDE.)

ALTITUDE-CONTOUR RATIO - See C-FACTOR.

AMICI PRISM - A prism that deviates the rays of light through 90 degrees and, because of its shape, inverts the image. An amici prism is a type of roof prism.

ANAGLYPH - A stereogram in which the two views are printed or projected superimposed in complementary colors, usually red and green. By viewing through filter spectacles of corresponding complementary colors, a stereoscopic image is formed.

ANALOG INSTRUMENTS - devices that represent numerical quantities by means of physical variables; for example, by translation; by rotation, as in a mechanical gear system; and by voltage or

ANALYTICAL AEROTRIANGULATION - See ANALYTICAL PHOTOTRIANGULATION.

ANALYTICAL NADIR-POINT TRIANGULATION - See RADIAL TRIANGULATION.

ANALYTICAL ORIENTATION - Those computational steps required to determine tilt, direction of principal line, flight height, preparation of control templets at Rectification scale, angular elements, and linear elements in preparing aerial photographs for rectification. Developed data are converted to values to be set on circles and scales of rectifier or transforming printer.

ANALYTICAL PHOTOGRAMMETRY - Photogrammetry in which solutions are obtained by mathematical methods.

ANALYTICAL PHOTOTRIANGULATION - A phototriangulation procedure in which the spatial solution is obtained by computational routines. When performed with aerial photographs, the procedure is referred to as Analytical Aerotriangulation.

ANALYTICAL RADIAL TRIANGULATION - See RADIAL TRIANGULATION.

ANASTIGMATIC LENS - A lens that has been corrected for Astigmatism and Curvature of Field. (See also ABERRATION.)

ANEROID BAROMETER - See BAROMETER.

ANGLE - 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. ADJUSTED ANGLE - an adjusted value of an angle which may be derived either from an observed angle or from a deduced angle.

ANGLE OF CONVERGENCE - See ANGULAR PARALLAX under PARALLAX.

ANGLE OF COVERAGE - See LENS.

ANGLE OF DEPRESSION - The complement of Tilt. The angle in a vertical plane between the horizontal and a descending line. Also called Depression Angle; Minus Angle; Descending Vertical Angle. Contrasted with ANGLE OF ELEVATION.

ANGLE OF INCIDENCE (optics) - As measured from the normal, the angle at which a ray of light strikes a surface.

ANGLE OF INCLINATION - An angle of Elevation or angle of Depression.

ANGLE OF REFLECTION (optics) - As measured from the normal, the angle at which a reflected ray of light leaves a surface.

ANGLE OF REFRACTION - See REFRACTION.

ANGLE OF TILT - See TILT.

- ANGLE OF VIEW - 1. When the format is square--the angle between two rays passing through the perspective center (rear nodal point) to two opposite sides of the format. 2. When the image format is rectangular--it is necessary to define the sides of the format to which the angle refers. 3. Photogrammetrically, it is twice the angle whose tangent is one-half the length of the diagonal of the format divided by the calibrated focal length. Also called Covering Power; FIELD OF VIEW.
- ANGLE OF YAW - The angle between a line in the direction of flight and a plane through the longitudinal and vertical axes of an aircraft. It is considered positive if the nose is displaced to the right. Also called Yaw Angle.
- ANGSTROM UNIT (A) - A unit of measure for the wavelengths of light, equal to one ten-millionth of a millimeter; for example, the visible spectrum extends from about 4,000A to 7,000A (400 to 700 nm, 0.4 to 0.7 μ , or 0.0004 to 0.0007 mm).
- ANGULAR ALTITUDE - A measure in degrees of a given object above the horizon, taken from a given or assumed point of observation, and expressed by the angle between the horizontal and the observer's line of sight. Sometimes shortened to Altitude (see also COALTITUDE).
- ANGULAR CALIBRATION CONSTANTS - In a Multiple-Lens Camera, or Multiple-Camera Assembly, the values of angular orientation of the lens axes of the several lens-camera units to a common reference line. For example, in a Trimetrogon Camera, the angular relationships of the wing-camera axes with respect to the axis of the central (vertical) camera.
- ANGULAR COVERAGE - The angle made by the camera lens with the borders of the field of a vertical photo. See also FIELD OF VIEW.
- 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 2π if expressed in radians, or multiplied by 360 degrees if expressed in degrees.
- ANGULAR DISTORTION - See DISTORTION CURVE.
- ANGULAR MAGNIFICATION - See MAGNIFICATION.
- ANGULAR PARALLAX - See PARALLAX.
- ANGULATOR - An instrument for converting angles measured on an oblique plane to their corresponding projections on a horizontal plane.

ANNEX POINT - A point used to assist in the relative orientation of vertical and oblique photographs, selected in the overlap area between the vertical and its corresponding oblique about midway between the pass points. Alternate sets of photographs only will contain annex points.

ANNOTATED PHOTOGRAPH - A photograph on which planimetric, hypsographic, geologic, cultural, hydrographic, or vegetation information has been added to identify, classify, outline, clarify, or describe features that would not otherwise be apparent in examination of an unmarked photograph. The term generally does not apply to photographs marked only with geodetic control or pass points. (Contrast with CARTOGRAPHIC ANNOTATION.)

ANTI-CURL BACKING - An unsensitized layer of gelation coated to the base side of the Film to counter the "pull" of the Emulsion side of the film during the drying process.

ANTIHALATION COATING (photography) - See HALATION.

APERTURE - See RELATIVE APERTURE and APERTURE STOP.

APERTURE STOP (optics) - The physical element (such as a Stop, Diaphragm, or lens periphery) of an optical system which limits the size of the pencil of rays traversing the system. The adjustment of the size of the aperture stop of a given system regulates the brightness of the image without necessarily affecting the size of the area covered. Field Stop - The physical element (such as a stop, diaphragm, or lens periphery) of an optical system which limits the field of view covered by the system. Entrance Pupil - The image of the aperture stop. Exit Pupil - The image of the aperture stop formed by all the lens elements on the image side of the aperture stop. Entrance Window - The image of the field stop formed by all the lens elements on the object side of the field stop. Exit Window - The image of the field stop formed by all the lens elements on the image side of the field stop.

APOCHROMATIC LENS - A lens that has been corrected for Chromatic Aberration for three colors.

APOGEE - See APSIDES.

APPARENT HORIZON - See HORIZON.

APPARENT POSITION - An astronomical term applied to the observable position of a star, planet, or the Sun. The position on the celestial sphere at which a heavenly body (or a space vehicle) would be seen from the center of the Earth at a particular time. Compare with Astronomic Position. Also called Apparent Place.

APPROXIMATE CONTOUR - See CONTOUR and CONTOUR LINE.

APR - An abbreviation for "Airborne Profile Recorder"; also called "Terrain Profile Recorder" (TPR). An electronic instrument that emits a pulsed-type radar signal from an aircraft to measure vertical distances between the aircraft and the earth's surface.

APSIDES - The points in the orbit of one celestial body about another at which the distance between the two bodies is greatest or smallest. For a body moving round the earth, Apogee is the point farthest from the earth and Perigee the nearest point. Referring to the sun, the two corresponding points are Aphelion & Perihelion. For a starling revolving about the centre of the galaxy we have Apogalacticum and Perigalacticum, and for a component of a double star system we have apastron and periastron. The straight line connecting the apsides is called the Line of Apsides, and if the orbit is elliptical half the line of apsides is identical with the semi-major axis of the orbit and is thus one of the orbital elements.

ARCHITECTURAL PHOTOGRAMMETRY - Encompasses the application of photogrammetry in documenting and preserving information on the sizes and shapes of historic buildings and monuments. (See also CLOSE RANGE PHOTOGRAMMETRY.)

ARC MEASUREMENT - A survey method used to determine the size of the earth. A long arc is measured on the Earth's surface and the angle which subtends this measured arc is determined. By assumptions and mathematical formula the size and shape of the earth can then be determined.

ARC NAVIGATION - A navigation system in which the position of an airplane or ship is maintained along an arc measured from a control station by means of electronic distance-measuring equipment, such as Shoran. (See also HIRAN and LORAN.)

ARC TRIANGULATION - See TRIANGULATION.

AREA WEIGHTED AVERAGE RESOLUTION (AWAR) - See RESOLUTION.

ASCENDING NODE - That point at which a planet, planetoid, or comet crosses the ecliptic from south to north, or a satellite crosses the equator of its primary from south to north. Opposite of Descending Node.

ASPHERICAL LENS - A lens in which one or more surfaces depart from a true spherical shape. For instance, Condenser lenses are sometimes ground with a parabolic surface, thus making possible a practical elimination of spherical aberration near the outer zones. With such a condenser, it is possible to concentrate the light within a very small aperture. One type of Multiplex projector is equipped with a condenser system of this nature.

ASSUMED GROUND ELEVATION - See ELEVATION.

ASSUMED PLANE COORDINATES - See COORDINATES.

ASTIGMATISM - See ABERRATION.

ASTROMETRIC POSITION - The position of a heavenly body (or space vehicle) on the celestial sphere corrected for aberration but not for planetary aberration. Astrometric positions are used in photographic observation where the position of the observed body can be measured in reference to the positions of comparison stars in the field of the photograph. Also called Astrographic Position. Compare with Apparent Position.

ASTRONOMIC CONTROL - See CONTROL.

ASTRONOMIC STATION - A point on the earth whose position has been determined by observations on celestial bodies.

ASTRONOMICAL AZIMUTH - See AZIMUTH ANGLE.

ASTRONOMICAL LATITUDE - The angle between the plumb line and the plane of celestial equator. Also defined as the angle between the plane of the horizon and the axis of rotation of the Earth. Astronomical latitude applies only to positions on the Earth and is reckoned from the astronomical equator (0°), north and south through 90° . Astronomical latitude is the latitude which results directly from observations of celestial bodies, uncorrected for Deflection of the Vertical.

ASTRONOMICAL LONGITUDE - The angle between the plane of the celestial meridian and the plane of an initial meridian, arbitrarily chosen. Astronomical longitude is the longitude which results directly from observations on celestial bodies, uncorrected for Deflection of the Vertical.

ASTRONOMICAL REFRACTION - The apparent displacement of an object that results from light rays from a source outside the atmosphere being bent in passing through the atmosphere. This results in all objects appearing to be higher above the horizon than they actually are. The magnitude of this displacement is greater when the object is near the horizon and decreases to a minimum assumed to be zero when the object is at the zenith. Sometimes shortened to refraction. Also called Astronomical Refraction Error; celestial refraction.

ASTRONOMICAL TRIANGLE - The triangle on the Celestial Sphere formed by arcs of great circles connecting the celestial pole, the zenith, and a celestial body. The angles of the astronomical triangle are: at the pole, the Hour Angle; at the celestial body, the Parallactic Angle; at the zenith, the Azimuth Angle. The sides are: pole to zenith, the Co-Latitude; zenith to celestial body, the Zenith Distance; and celestial body to pole, the Polar Distance. Also called PZS Triangle. (See also POLAR COORDINATES and SPHERICAL COORDINATES under COORDINATES.)

ASYMMETRICAL - Not symmetrical.

ATMOSPHERIC DRAG - A major perturbation of close artificial satellite orbits caused by the resistance of the atmosphere. The secular effects are decreasing eccentricity, major axis, and period. Sometimes shortened to drag.

ATMOSPHERIC REFRACTION - The refraction of light passing through the Earth's atmosphere. Atmospheric refraction includes both astronomical refraction and terrestrial refraction.

ATRAN - Acronym for "automatic terrain recognition and navigation." A navigational system which depends upon the correction of terrain images appearing on a radar cathode-ray tube with previously prepared maps or simulated radar images of the terrain.

ATTENUATION - The reduction in the strength of magnitude of a signal or action.

ATTITUDE (photogrammetry) - The angular orientation of a camera, or of the photograph taken with that camera, with respect to some external reference system. Usually expressed as omega (x-tilt), phi (y-tilt) and Kappa (z-rotation); tilt, swing and azimuth; or roll, pitch, and yaw.

AUTOCOLLIMATOR - See COLLIMATOR.

AUTOFOCUS RECTIFIER - A precise, vertical photoenlarger which permits the correction of distortion in an aerial negative caused by tilt. The instrument's operations are motor driven and are interconnected by mechanical linkages to insure automatically maintained sharp focus.

AUTOGRAPH - A first-order stereoplotting instrument manufactured by Wild. Negative or glass positives (diapositives) may be used.

AUTOPOSITIVE FILM and PAPER - A material which gives a positive copy from a positive transparency (or a negative from a negative) by direct processing. Also called direct copy or direct positive.

AUTOSCREEN FILM - A photographic film embodying a halftone screen which automatically produces a halftone negative from continuous-tone copy.

AUXILIARY CONTOUR - See SUPPLEMENTARY CONTOUR.

AVERAGE DEVIATION - In statistics, the average or arithmetic mean of the deviations, taken without regard to sign, from some fixed value, usually the arithmetic mean of the data. Also called mean deviation.

AVERAGE ERROR - See ERROR.

AXIS - See OPTICAL AXIS; CAMERA AXIS; FIDUCAL AXES.

AXIS OF HOMOLOGY - 1. Projective geometry: the intersection of two projectively related planes. 2. Photogrammetry: the intersection of the plane of the photograph with the horizontal plane of the map or the plane of reference of the ground. Corresponding lines in the photograph and map planes intersect on the axis of homology. Also called the Axis of Perspective.

AXIS OF LENS - See OPTICAL AXIS.

AXIS OF PERSPECTIVE - See AXIS OF HOMOLOGY.

AXIS OF TILT - See under PRINCIPAL PLANE.

AZIMUTH -1. Surveying: the horizontal direction of a line measured clockwise from a reference plane, usually the Meridian. Contrast with Bearing. 2. Photogrammetry: azimuth of the principal plane. The clockwise angle from north (or south) to the principal plane of a tilted photograph.

AZIMUTH ANGLE - (Astronomy) The angle 180° or less between the plane of the celestial meridian and the vertical plane containing the observed object, reckoned from the direction of the elevated pole. In astronomic work, the azimuth angle is the spherical angle at the zenith in the astronomical triangle which is composed of the pole, the zenith, and the star. In geodetic work, it is the horizontal angle between the celestial pole and the observed terrestrial object. Also called Astronomical Azimuth. (Surveying) An angle in triangulation or in a traverse through which the computation of azimuth is carried. In a simple traverse, every angle may be an azimuth angle. Sometimes, in a traverse, to avoid carrying azimuths over very short lines, supplementary observations are made over comparatively long lines, the angles between which form azimuth angles. In triangulation, certain angles, because of their size and position in the figure, are selected for use as azimuth angles, and enter into the formation of the azimuth condition equation (azimuth equation).

BACK AZIMUTH - If the azimuth of point B from point A is given, the back azimuth is the azimuth of point A from point B. Because of the Convergence of the Meridians, the forward and backward azimuths of a line do not differ by exactly 180 degrees, except where A and B have the same geodetic longitude or where the geodetic latitudes of A and B are 0° .

BACK FOCAL LENGTH - or back focal distance - See under FOCAL LENGTH.

BACKING (photographic) - See ANTIHALATION COATING.

BACKUP - An image printed on the reverse side of a map sheet already printed on one side. Also the printing of such images.

BAND - A set of adjacent wavelengths in the electro-magnetic spectrum with a common characteristic, such as the visible band.

BAROMETRIC ELEVATION - An elevation determined with a barometer. (See also ELEVATION.)

BARREL DISTORTION - A type of geometric distortion found in scanning imagery (see SCANNER) in which elements crossing the flight direction are distorted by a combination of scanner-mirror rotation.

BASAL COPLANE - See COPLANAR.

BASAL ORIENTATION - The establishment of the position of both ends of an air base with respect to a ground system of coordinates. In all, six elements are required. These are essentially the three-dimensional coordinates of each end of the base. In practice, however, it is also convenient to express these elements in one of two alternative ways: 1. The ground rectangular coordinates of one end of the base and the difference between these and the ground rectangular coordinates of the other end of the base. 2. The ground rectangular coordinates of one end of the base, the length of the base, and two elements of direction (such as Base Direction and Base Tilt). Base Direction - the direction of the vertical plane containing the air base, which might be expressed as a Bearing or an Azimuth. Base Tilt - The inclination of the air base with respect to the horizontal.

BASAL PLANE - See EPIPOLAR PLANE under EPIPOTES.

BASE-ALTITUDE RATIO - See BASE-HEIGHT RATIO.

BASE COLOR - The first color printed of a polychrome map to which succeeding colors are registered.

BASE DIRECTION - See BASAL ORIENTATION.

BASE-HEIGHT RATIO - The ratio (B:H) of the air base and the flight height of a stereoscopic pair of photographs. Also referred to as BASE-ALTITUDE RATIO: K-factor.

BASE LINE - (Surveying) A surveyed line established with more than usual care, to which surveys are referred for coordination and correlation. (Photogrammetry) See AIR BASE: PHOTO BASE. (Navigation) The line between two radio transmitting stations operating in conjunction for the determination of a line of position, as the two stations of a Loran.

BASE MANUSCRIPT - See COMPILATION MANUSCRIPT.

BASE MAP - See MAP.

BASE, PHOTO - See PHOTOBASE under AIRBASE.

BASE SHEET - A sheet of dimensionally stable material upon which the MAP PROJECTION and GROUND CONTROL are plotted, and upon which STEREOTRIANGULATION or STEREOCOMPILATION is performed.

BASE TILT - See BASAL ORIENTATION.

BASIC CONTROL - See CONTROL.

BATHYMETRIC CHART - A Topographic Map of the floor of the ocean.
See also CHART.

BATHYMETRIC CONTOUR - See DEPTH CURVE.

BEAM OF LIGHT - See RAY OF LIGHT.

BEAM SPLITTER - An optical device, such as a semi-reflecting mirror or a prism arranged so as to transmit different spectral bands along separate axes to various films, detectors, or other analyzing/recording devices.

BEARING - Direction of a line measured as the acute angle from a reference Meridian; usually expressed in the form "N 30° W" or "S 87° E." Contrast with Azimuth.

BELLOWS - A folding cloth or leather tube, generally square or pyramidal in shape, providing flexible, light-tight enclosure between camera lens and film.

BENCH MARK (BM) - A marked Vertical Control point which has been located on a relatively permanent material object, natural or artificial, and whose Elevation above or below an adopted Datum has been established. It is usually monumented to include bench mark name or number, its elevation, and the name of the responsible agency.

BETWEEN-THE-LENS SHUTTER - See SHUTTER.

BINOCULAR VISION - See also STEREOSCOPY.

BIOSTEROMETRICS - The spatial and spatio-temporal analysis of biological form and function based on principles of analytic geometry. (Also referred to as Biomedical and Bioengineering Photogrammetry.)

BLOCK ADJUSTMENT - The adjustment of Strip Coordinates or Photograph Coordinates for two or more contiguous strips of photographs. (See also STRIP ADJUSTMENT.)

BLOCK OF PHOTOGRAPHS - Two or more contiguous strips of photographs.

BLUELINE - A nonreproducible blue image or outline usually printed photographically on paper or plastic sheeting, and used as a guide for drafting, stripping, or layout. Sometimes called blind image.

BLUNDER - See under ERROR.

BRIDGING - Synonym for Stereotriangulation.

- BRIGHTNESS SCALE (Photography) - The ratio of the brightness or Luminance of highlights to the deepest shadow in the actual terrain (as measured from the camera station) for the field of view under consideration.
- Bx CURVE - Similar to Bz curve, except errors in the x-direction on horizontal control points are plotted as ordinates versus x-coordinates of these points. See Bz CURVE.
- By CURVE - Similar to Bz curve, except errors in the y-direction on horizontal control points are plotted as ordinates versus x-coordinates of these points. See Bz CURVE.
- Bz CURVE (Photogrammetry) - A graphical representation of the vertical errors in a stereotriangulated strip. In a Bz curve, the x-coordinates of the vertical control points, referred to the initial nadir point as origin, are plotted as abscissas, and the differences between the known elevations of the control points and their elevations as read in the stereotriangulated strip are plotted as ordinates; a smooth curve drawn through the plotted points is the Bz curve. The elevation read on any pass point in the strip is adjusted by the amount of the ordinate of the Bz curve for an abscissa corresponding to the x-coordinate of the point.
- C-FACTOR - An empirical value which expresses the vertical measuring capability of a given stereoscopic system; generally defined as the ratio of the Flight Height to the smallest Contour Interval accurately plottable. The C-factor is not a fixed constant, but varies over a considerable range, according to the elements and conditions of the photogrammetric system. In planning for aerial photography, the C-factor is used to determine the flight height required for a specified contour interval, camera, and instrument system. Also called Altitude-Contour Ratio.
- CADASTRAL MAP - See MAP.
- CADASTRAL SURVEY - A survey relating to land boundaries and subdivisions, made to create units suitable for transfer or to define the limitations of title. Derived from Cadastre (meaning register of the real property of a political subdivision with details of area, ownership, and value), the term is now used to designate the surveys of the public lands of the United States, including retracement surveys for the identification, and resurveys for the restoration, of property lines; it may also be applied properly to corresponding surveys outside the public lands, although such surveys usually are termed Land Surveys or Property Surveys through preference.
- CALIBRATED FOCAL LENGTH - See FOCAL LENGTH.
- CALIBRATION - The act or process of determining certain specific measurements in a camera or other instrument or device by comparison with a standard, for use in correcting or compensating errors or for purposes of record. FIELD CALIBRATION -

A term generally applied where only a combination of field and office computer techniques are available to check instrument accuracy. Adjustments, other than normal operator adjustments, cannot be made during field calibration. Camera Calibration (Photogrammetry) - The determination of the Calibrated Focal Length, the location of the Principal Point with respect to the fiducial marks, the Point of Symmetry, the resolution of the lens, the degree of flatness of the focal plane, and the lens distortion effective in the focal plane of the camera and referred to the particular calibrated focal length. In a multiple-lens camera, the calibration also includes the determination of the angles between the component perspective units. The setting of the fiducial marks and the positioning of the lens are ordinarily considered as adjustments, although they are sometimes performed during the calibration process. Unless a camera is specifically referred to, distortion and other optical characteristics of a lens are determined in a focal plane located at the Equivalent Focal Length and the process is termed Lens Calibration. In close-range photogrammetry, calibration may be performed directly or indirectly on the camera, the individual photograph (particularly in case of non-metric cameras) or on the total system. Camera calibration may be done in one of three forms: laboratory; on-the-job, and self-calibration. Laboratory calibration of a camera is performed separately from the photography phase and is undertaken with goniometers or test areas of various sophistication. On-the-job calibration of a camera or a photograph utilizes object photography and object-space control points. Self-calibration of a camera or a photograph utilizes object photography and well-defined object points. Calibration of a system may be accomplished by including parameters such as affinity and non-perpendicularity of comparator axes. (See also ANGULAR CALIBRATION CONSTANTS and COLLIMATE.)

CALIBRATION CONSTANTS (Photogrammetry) - The results obtained by calibration, which give the calibrated focal length of the lens-camera unit and the relationship of the principal point to the fiducial marks of a camera.

CALIBRATION CORRECTION - The value to be added to or subtracted from the reading of an instrument to obtain the correct reading.

CALIBRATION ERROR - See INSTRUMENTAL ERROR under ERROR.

CALIBRATION PLATE - A glass negative exposed with its emulsion side in the same position as is occupied by the service emulsion (on film or glass) at the time of exposure. This plate provides a record of the distance between the fiducial marks of the camera; it is sometimes called a master glass negative or flash plate.

CALIBRATION TABLE - A list of calibration corrections or calibrated values.

CALIBRATION TEMPLET (Photogrammetry) - A templet of glass, plastic, or metal made in accordance with the calibration constants to show the relationship of the principal point of a camera to the fiducial marks; used for the rapid and accurate marking of principal points on a series of photographs. Also, for a multiple-lens camera, a templet prepared from the calibration data and used in assembling the individual photographs into one composite photograph.

CAMERA - A lightproof chamber or box in which the image of an exterior object is projected upon a sensitized plate or film, through an opening usually equipped with a lens or lenses, shutter, and variable aperture. Aerial Camera - A camera specially designed for use in aircraft. The prefix Aerial is not essential where the context clearly indicates an aerial camera rather than a terrestrial camera. Ballistic Camera - See under CAMERA. A precision terrestrial camera, usually employing glass plates, used at night to photograph such objects as rockets or satellites against a star background. If the camera is mounted so that it tracks the stars (as with a sidereal mount) or the object, it may be called a Tracking Camera. Continuous-Strip Camera - A camera in which a continuous strip exposure is made by rolling the film continuously past a narrow slit opening at a speed proportional to the ground speed of the aircraft. Copy Camera or Process Camera - A precision camera used in the laboratory for copying purposes. Also called process camera. Frame Camera - A camera in which an entire frame or format is exposed simultaneously through a lens that is fixed relative to the focal distance. Horizon Camera (Aerial Photography) - A camera used in conjunction with an aerial surveying camera in vertical photography to photograph the horizon simultaneously with the vertical photographs. The horizon photographs indicate the Tilts of the vertical photographs. Mapping Camera or Surveying Camera - A camera specially designed for the production of photographs to be used in surveying. The prefixes Mapping and Surveying indicate that a camera is equipped with means for maintaining and indicating the interior orientation for the photographs with sufficient accuracy for surveying purposes. A mapping camera may be either an aerial mapping camera or a terrestrial camera. Multiband Camera - A camera that exposes different areas of one film, or more than one film, through one lens and a beam splitter, or two or more lenses equipped with different filters, to provide two or more photographs of the same scene in different special bands. Multiple-Lens Camera - A camera with two or more lenses, with the axes of the lenses systematically arranged at fixed angles in order to cover a wide field of simultaneous exposures in all chambers. Precision Camera - An indefinite term sometimes applied to any camera used for photogrammetric purposes. May be construed as meaning a metric camera. Metric Camera - A camera whose Interior Orientation is known, stable, and reproducible. Multiple-Camera Assembly - An assembly of two or more cameras mounted so as to maintain a fixed angle between their respective optical axes. Convergent

Camera - An assembly of two cameras which take simultaneous photographs and are mounted so as to maintain a fixed angle between their optical axes. The effect is to increase the angular coverage in one direction, usually along the longitudinal axis of the aircraft. Fan Camera - An assembly of three or more cameras systematically disposed at fixed angles relative to each other so as to provide wide lateral coverage with overlapping images. Panoramic Camera - A camera which takes a partial or complete panorama of the terrain. Some designs utilize a lens which revolves about a vertical axis; in other designs, the camera itself is revolved by clockwork to obtain a panoramic field of view. Photogrammetric Camera - A general term applicable to cameras used in any of the several branches of photogrammetry. Stellar Camera - A camera for photographing the stars. If it is used for photographing the sun, it may be called a Solar Camera. If the stellar camera has been rigidly mounted and calibrated with respect to one or more mapping cameras in an airborne vehicle, the absolute attitude of a photograph taken with the mapping camera can be computed from the attitude of the stellar-camera photograph taken at that same instant. (See ZENITH CAMERA.) Stereometric Camera - A combination of two cameras mounted with parallel optical axes on a short rigid base; used in terrestrial photogrammetry for taking photographs in stereoscopic pairs. Terrestrial Camera - A camera designed for use on the ground. (See PHOTOTHEODOLITE.) Trimetrogon Camera - An assembly of three cameras equipped with wide angle Metrogon lenses, in which one of the cameras is vertical and the other two are 60-degree obliques. Zenith Camera - A special camera so designed that its optical axis may be pointed accurately toward the zenith. It is used for the determination of astronomical positions by photographing the position of the stars.

CAMERA AXIS - A line perpendicular to the focal plane of the camera and passing through the Interior Perspective Center or Emergent Nodal Point of the lens system.

CAMERA BASE - See AIR BASE.

CAMERA CALIBRATION - See CALIBRATION.

CAMERA, HORIZON - See HORIZON CAMERA under CAMERA.

CAMERA LUCIDA - A monocular instrument using a half-silvered mirror, or the optical equivalent, to permit superimposition of a virtual image of an object upon a plane. The Sketchmaster is such an instrument used for superimposing the image of a photograph upon a map or map manuscript. In the process, the image may be rectified.

CAMERA, MULTIBAND - See MULTIBAND CAMERA under CAMERA.

CAMERA OBSCURA - See CAMERA LUCIDA.

CAMERA, PANORAMIC - See PANORAMIC CAMERA under CAMERA.

CAMERA STATION (Photogrammetry) - The point in space occupied by the camera lens at the moment of exposure; also called Air Station or Exposure Station.

CANADIAN GRID - See PERSPECTIVE GRID.

CANDELA (formerly Candle) - The international unit of luminous Intensity; the Luminance of a blackbody radiator at the temperature of solidification of molten platinum is 60 candelas per sq. cm. The candela corresponds to one Lumen per Steradian.

CANDLE POWER - Luminous intensity expressed in terms of the Candela.

CANTILEVERED EXTENSION - Phototriangulation from a controlled area to an area of no control. Also, the connection by Relative Orientation and Scaling of a series of photographs in a strip to obtain strip coordinates.

CARDAN LINK - A universal joint. An optical cardan link is a device for universal scanning about a point.

CARDINAL POINTS - 1. Any of the four principal astronomical directions on the surface of the Earth: north, east, south, west. 2. (Optics) Those points of a lens used as reference for determining object and image distances. They include principal planes and points, nodal points, and focal points.

CARPENTIER INVERTOR - See INVERTORS.

CARRYING CONTOUR - See CONTOUR LINE.

CARTESIAN COORDINATES - See COORDINATES.

CARTOGRAPHIC ANNOTATION - The delineation of additional data, new features, or deletion of destroyed or dismantled features on a Mosaic to portray current details. Cartographic annotations may include elevation values for airfields, cities, and large bodies of water; new construction and destroyed or dismantled roads, railroads, bridges, dams, target installations, and cultural features of landmark significance. (Compare with Annotated Photograph.)

CARTOGRAPHIC COMPILATION - See COMPILATION.

CARTOGRAPHIC FILM - Film with a dimensionally stable base, used for map negatives and/or positives. Usually referred to by trade name.

CARTOGRAPHIC LICENSE - The freedom to adjust, add, or omit map features within allowable limits to attain the best cartographic expression. License must not be construed as permitting the cartographer to deviate from specifications.

CARTOGRAPHIC PHOTOGRAPHY - See MAPPING PHOTOGRAPH.

- CARTOGRAPHY - The art and science of expressing graphically, by maps and charts, the known physical features of the earth, or of another celestial body, often includes the work of man and his varied activities.
- CARTOMETRIC SCALING - The accurate measurement of geographic or grid coordinates on a map or chart by means of a scale. This method may be used for plotting the positions of points, or determining the location of points.
- CATADIOPTRIC SYSTEM (Optics) - An optical system containing both refractive and reflective elements.
- CATOPTRIC SYSTEM (Optics) - An optical system in which all elements are reflective (mirrors).
- CELESTIAL COORDINATES - Any set of coordinates used to define a point on the Celestial Sphere.
- CELESTIAL NAVIGATION - A means of navigation by which a geographical location is determined by reference to celestial bodies.
- CELESTIAL SPHERE - An imaginary sphere of infinite radius, described about an assumed center, and upon which imagined positions of celestial bodies are projected along radii passing through the bodies. For observations on bodies within the limits of the solar system, the assumed center is the center of the Earth. For bodies where the parallax is negligible, the assumed center may be the point of observation. (See also POLAR COORDINATES and SPHERICAL COORDINATES under COORDINATES.)
- CENTER OF PROJECTION - See PERSPECTIVE CENTER.
- CENTER TO CENTER METHOD - See MOSAICKING.
- CHARACTERISTIC CURVE (Photography) - A curve showing the relationship between exposure and resulting density in a photographic image, usually plotted as the density (D) against the logarithm of the exposure (log E) in candle-meter-seconds. It is also called the H and D Curve, the Sensitometric Curve, and the D log E Curve.
Density - A measure of the degree of blackening of an exposed film, plate, or paper after development, or of the direct image (in the case of a printout material). It is defined strictly as the logarithm of the optical opacity, where the opacity is the ratio of the incident to the transmitted (or reflected) light. It varies with the use of scattered or specular light.
Gamma - The tangent of the angle which the straight-line portion of the characteristic curve makes with the log-exposure axis. It indicates the slope of the straight-line portion of the curve and is a measure of the extent of development and the contrast of the photographic material.
Speed (film, plate, or paper) - The response or sensitivity of the material to light, often expressed numerically according to one of several systems (e.g., H and D, DIN, Scheiner, and ASA exposure index).

(See RELATIVE APERTURE.) Gradient - The slope of the characteristic curve at any point. Gradient Speed - The speed of a photographic material determined on the basis of the exposure corresponding to a particular gradient of the characteristics curve. (See also CONTRAST, EXPOSURE, and BRIGHTNESS SCALE.)

CHART (Mapping) - A special-purpose map, generally designed for navigation or other particular purposes, in which essential map information is combined with various other data critical to the intended use. (See also MAP and AERONAUTICAL CHART.)

CHECK PROFILE - A profile plotted from a field survey and used to check a profile prepared from a topographic map. The comparison of the two profiles serves as a check on the accuracy of the contours on the topographic map.

CHOPPING (Star or Satellite Trails) - Interrupting the photographic image of a star or satellite trail by a shutter or other device to provide precise timing and orientation data for geodetic observations of aerospace vehicles against a stellar background. (See also BALLISTIC CAMERA.)

CHRONOGRAPH - An instrument for producing a graphical record of time as shown by a clock or other device. In use, a chronograph produces a double record: the first is made by the associated clock and forms a continuous time scale with significant marks indicating periodic beats of the timekeeper; the second is made by some external agency, human or mechanical, and records the occurrence of an event or of a series of events.

CHRONOMETER - A portable timekeeper with compensated balance, capable of showing time with extreme precision and accuracy.

CHROMATIC ABERRATION - See LATERAL and LONGITUDINAL CHROMATIC ABERRATION under ABERRATION.

CHROMOSTEREOPSIS - The phenomenon in which a set of different colored objects are perceived at different heights dependent on their color, even though no height difference, or parallax, is actually present. (Contrast with STEREOSCOPY.)

CINE-THEODOLITE - A photographic tracking instrument which records on each film frame the target and the azimuth and elevation angles of the optical axis of the instrument.

CIRCLE OF CONFUSION (Optics) - The circular image of a distant point object as formed in a focal plane by a lens. A distant point object (e.g., a star) is imaged in a focal plane of a lens as a circle of finite size, because of such conditions as 1. The focal plane's not being placed at the point of sharpest focus, 2. The effect of certain aberrations, 3. Diffraction at the lens, 4. Grain in a photographic emulsion, and/or 5. Poor workmanship in the manufacture of the lens.

CLARKE SPHEROID (Ellipsoid) of 1866 - A reference ellipsoid having the following approximate dimensions: semi-major axis - 6,378,206.4 meters; semi-minor axis - 6,356,583.8 meters; and the flattening or ellipticity - $1/294.97$.

CLOSE-RANGE PHOTOGRAMMETRY - A branch of photogrammetry where in object-to-camera distances are not more than 300 meters. The field of Close-Range Photogrammetry encompasses the following three major areas of applications: Architectural Photogrammetry, Biostereometrics (Biomedical and Bioengineering Photogrammetry) and Industrial Photogrammetry.

CLINOMETER - A simple instrument used for measuring the degree of slope, in percentage or in angular measure.

CLOSURE or CLOSING ERROR - See ERROR.

COALTITUDE - The Coaltitude - The complement of altitude, or ninety degrees minus the altitude. The term has significance only when used in connection with altitude measured from the celestial horizon, when it is synonymous with Zenith Distance. (See also ANGULAR ALTITUDE and ASTRONOMICAL TRIANGLE.)

COATED LENS - A lens whose air-glass surfaces have been coated with a transparent film of such thickness and index of refraction as to minimize the light loss due to reflection. The reflection loss of uncoated lenses amounts to about 4 percent per air-glass surface.

COHERENT OPTICS - That branch of optics utilizing coherent radiation, produced from sources such as Lasers. In photogrammetry coherent radiation is used to produce Holograms which are used to obtain three-dimensional images of objects.

COLATITUDE - The complement of the latitude, or 90 degrees minus the latitude. Colatitude forms one side, zenith to pole, of the Astronomical Triangle. It is the side opposite the celestial body.

COLLIMATE - (Physics and Astronomy) To render parallel to a certain line or direction; to render parallel, as rays of light; to adjust the line of sight or lens axis of an optical instrument so that it is in its proper position relative to the other parts of the instrument. (Photogrammetry) To adjust the fiducial marks of a camera so that they define the principal point. (See also Calibration.)

COLLIMATING MARKS - Marks on the stage of a reduction printer or projection equipment, to which a negative or diapositive is oriented. (See Fiducial Marks.)

COLLIMATION ADJUSTMENT - See COLLIMATE.

- COLLIMATION AXIS - In an optical instrument, the line through the rear nodal point of the objective lens that is precisely parallel with the center line of the instrument. See also LINE OF COLLIMATION.
- COLLIMATION ERROR - The angle by which the line of sight of an optical instrument differs from its Collimation Axis. Also called error of collimation.
- COLLIMATION PLANE - The plane described by the Collimation Axis of a telescope of a transit when rotated around its horizontal axis.
- COLLIMATOR - An optical device for artificially creating a target at infinite distance (a beam of parallel rays of light); used in testing and adjusting certain optical instruments. It usually consists of a converging lens and a target (a system or arrangement of crosshairs) placed at the principal focus of the lens. Autocollimator - A collimator provided with a means of illuminating its crosshairs so that, when a reflecting plane is placed normal to the emergent light beam, the reflected image of the cross hairs appears to be coincident with the crosshairs themselves. This device is used in calibrating optical and mechanical instruments.
- COLOR COMPOSITE - A composite in which the component images are shown in different colors. See also composite photograph.
- COLOR PHOTOGRAPHY - Photography in which either the direct-positive or the negative-positive color process is used.
- COLOR PLATE - A general term for the pressplate from which any given color is printed. Normally, the term is modified to reflect a special color or type of plate, such as brown plate or contour plate. (See also COMBINATION PLATE.)
- COLOR SEPARATION - The process of preparing a separate drawing, engraving or negative for each color required in the production of a lithographed map or chart. A photographic process or electronic scanning procedure using color filters to separate multicolored copy into separate images of each of the three primary colors. Color-Separation Drawing - One of a set of drawings which contains similar or related features, such as drainage or culture. There are as many drawings as there are colors to be shown on lithographed copy.
- COLOR-PROOF PROCESS - A photomechanical printing process which makes possible the combining of negative separations by successive exposures to produce a composite color proof on a vinylite sheet. The method is usually referred to by the manufacturer's trade name of the materials used.
- COMA - See ABERRATION.
- COMBINATION PLATE - Halftone and line work on one plate. Also, two or more subjects combined on the same plate. (See also COLOR PLATE.)

- COMPARATOR - An optical instrument, usually precise, for measuring rectangular or polar coordinates of points on any plane surface, such as a photographic plate. Monocomparator - A precision instrument, consisting of a measuring system, a viewing system, and a readout system designed for the measurement of image coordinates on a single photograph. Stereocomparator (Photogrammetry) - A stereoscopic instrument for measuring parallax; usually includes a means of measuring photograph coordinates of image points.
- COMPASS - An instrument for indicating a horizontal reference direction relative to the Earth. (See also MAGNETIC NORTH.)
- COMPENSATING LENS (Photogrammetry) - A lens introduced into an optical system to correct for Radial Distortion.
- COMPENSATION PLATE (Photogrammetry) - A glass plate having a surface ground to a predetermined shape, for insertion in the optical system of a diapositive printer or plotting instrument, to compensate for Radial Distortion introduced by the camera lens.
- COMPILATION - (Cartography) The production of a new or revised map or chart, or portion thereof, from existing maps, aerial photographs, surveys, new data, and other sources. (See also DELINEATION.) (Photogrammetry) The production of a map or chart, or portion thereof, from aerial photographs and geodetic control data, by means of photogrammetric instruments. Also called Stereocompilation.
- COMPILATION MANUSCRIPT - The original drawing, or groups of drawings, of a map or chart as compiled or constructed from various data on which cartographic and related detail is delineated in colors on a stable-base medium. A compilation manuscript may consist of a single drawing called a Base Manuscript, or because of congestion, several overlays may be prepared showing vegetation, relief, names, and other information. Since the latter is usually the case, the base together with its appropriate overlays are collectively termed the compilation manuscript. The general term "manuscript" is not recommended without adequate qualification.
- COMPILATION SCALE - The scale at which a map or chart is delineated on the original manuscript. This scale may be larger than reproduction scale.
- COMPLEMENTARY COLORS (Optics) - Two colors are complementary if, when added together (as by projection), they produce neutral-hue light.
- COMPOSITE MAP - A map which portrays information of two or more general types. Usually a compiled map, bringing together on one map, for purposes of comparison, data which were originally portrayed on separate maps.

- COMPOSITE PHOTOGRAPH (Aerial Photography) - A photograph made by assembling the separate photographs, made by the several lenses of a multiple-lens camera in simultaneous exposure, into the equivalent of a photograph taken with a single wide-angle lens. (See also MULTIPLE-LENS CAMERA under CAMERA.)
- COMPUTER, ANALOG COMPUTER - A physical device or system which behaves in a manner analogous to some system under study, simulating the processes and producing results which are measured in terms of physical quantities. Often, an electrical system.
- DIGITAL COMPUTER - A machine for carrying out mathematical processes by operations based on counting, as distinct from an analog computer.
- CONDENSER (Optics) - A lens or lens system designed to concentrate the illumination from a light source on a limited area. A reflector of ellipsoidal shape having the light source concentrated at one of its foci is optically equivalent to a condenser-lens system. (See also ASPHERICAL LENS.)
- CONDITION EQUATION - An equal which expresses exactly certain relationships that must exist among related quantities, which are not independent of one another, exist a priori, and are separated from relationships demanded by observation. Condition - A term used in setting up equations for computation and adjustment of triangulation, trilateration, or traverse and analytical photogrammetry.
- CONFORMAL MAP PROJECTION - See MAP PROJECTION.
- CONIC MAP PROJECTION - See MAP PROJECTION.
- CONJUGATE DISTANCE - The corresponding distances of objects and image from the Nodal Points of the lens. The conjugate distances O and I and the focal length f of the lens are related by the equation
- $$\frac{1}{f} = \frac{1}{I} + \frac{1}{O} .$$
- This relation may also be expressed in Newton's form as
- $$XX' = f^2$$
- where $X = I - f$ and $X' = O - f$. The total distance from object to image equals the sum of the two conjugate distances plus or minus (depending on lens design) a small distance called the Nodal-Point Separation.
- CONJUGATE IMAGE POINTS - A term formerly used to denote the images of a single object point on two (or more) overlapping photographs. Use of this term is not recommended as it may lead to confusion with accepted usage in optics, wherein Conjugate Points (object and image) apply to one lens or lens system and are physically related according to the equations given under

the definition of Conjugate Distance. The preferred term is Corresponding Image Points. (See CORRESPONDING IMAGES.)

CONJUGATE IMAGE RAYS - The preferred term is Corresponding Image Rays. (See discussion under CONJUGATE IMAGE POINTS.)

CONJUGATE PRINCIPAL POINT - See CORRESPONDING PRINCIPAL POINT.

CONTACT GLASS - See FOCAL-PLANE PLATE under FOCAL PLANE.

CONTACT PLATE - See FOCAL-PLANE PLATE under FOCAL PLANE.

CONTACT PRINT - See PRINT.

CONTACT PRINTING FRAME - In photography and platemaking, a device for holding the negative and the sensitive material in contact during exposure. The light source may or may not be a separate element. If the frame contains a vacuum pump to exhaust all air within the frame to insure perfect contact between the negative and the sensitive material, it is known as a contact vacuum printing frame.

CONTACT SCREEN - 1. A halftone screen made on a film base and used in direct contact with the film to obtain a halftone image from a continuous-tone original. 2. A pattern image on a film base used in contact with the film or plate to obtain a pattern image from an open window negative.

CONTESIMAL SYSTEM - The division of the circle into 400 grades. Thus a grade equals .9 of a degree. Grades are divided into 100 minutes, and each minute into 100 seconds; written as 50^g 17' 98.8" or 50^g 1798"8 or 50,17988.

CONTINUOUS-STRIP CAMERA - See CAMERA.

CONTINUOUS-STRIP PHOTOGRAPHY - Photography of a strip of terrain in which the image remains unbroken throughout its length along the line of flight. (See also CONTINUOUS-STRIP CAMERA under CAMERA.)

CONTINUOUS TONE - An image which has not been screened and contains unbroken, gradient tones from black to white, and may be either in negative or positive form. Aerial photographs are examples of continuous-tone prints. Contrasted with Halftone; line copy.

CONTINUOUS TONE GRAY SCALE - A scale of tones from white to black or from transparent to opaque, each tone of which blends imperceptibly into the next without visible texture or dot formation. Also called continuous Wedge. Contrasted with Step Wedge.

CONTINUOUS WEDGE - See CONTINUOUS TONE GRAY SCALE.

CONTOUR (Surveying and Cartography) - An imaginary line on a land surface connecting points of equal elevation; also, the line representing this feature on a map or chart (properly called a Contour Line). Depression Contour - A closed contour inside of which the ground is at a lower elevation than outside. (See also FORM LINES.)

CONTOUR INTERVAL - The difference in elevation between adjacent Contours.

CONTOUR LINE - A line on a map or chart connecting points of equal elevation. Accurate Contour - A contour line which is accurate within one-half of the basic Contour Interval; also called Normal Contour. Approximate Contour - A contour line substituted for a normal contour whenever its accuracy is questionable. Carrying Contour - A single contour line representing two or more contours, used to show vertical or near-vertical topographic features, such as steep slopes and cliffs. (See also CHECK PROFILE.)

CONTOUR MAP - See MAP.

CONTOUR VALUE - A numerical value placed upon a contour line to denote its Elevation relative to a given datum, usually mean sea level.

CONTRAST (Photography) - The actual difference in density between the highlights and the shadows on a negative or positive. Contrast is not concerned with the magnitude of density, but only with the difference in densities. Also, the rating of a photographic material corresponding to the relative density difference which it exhibits. (See also DENSITY under CHARACTERISTIC CURVE.)

CONTROL (Mapping) - A system of points with established positions or elevations, or both, which are used as fixed references in positioning and correlating map features. Control is generally classified in four orders (with first order denoting highest quality) according to the precision of the methods and instruments used in establishing it, and the accuracy of the resultant positions and elevations. Basic Control - Horizontal and vertical control of third - or higher - order accuracy, determined in the field and permanently marked or monumented, that is required to control subordinate surveys. Horizontal Control - Control with horizontal positions only. The positions may be referred to the geographic parallels and meridians or to other lines of reference, such as plane coordinate axes. Vertical Control - Control with elevations only; usually referred to mean sea level. Astronomic Control - Control determined from astronomic observations. Geodetic Control - Control which takes into account the size and shape of the earth; implies a reference spheroid representing the Geoid and horizontal- and vertical-control Datums. Ground Control - Control established by ground surveys, as distinguished from control established

by photogrammetric methods. The term usually implies Geodetic Control or Basic Control. Supplemental Control - Points established by subordinate surveys, to relate aerial photographs used in mapping with the system of geodetic control. The points must be positively Photoidentified, that is, the points on the ground must be positively correlated with their images on the photographs. Photogrammetric Control - See CONTROL, PHOTOGRAMMETRIC.

CONTROL, PHOTOGRAMMETRIC - Control established by photogrammetric methods as distinguished from control established by ground methods. Also called Minor Control.

CONTROLLED MOSAIC - See MOSAIC.

CONTROL POINT (Photogrammetry) - Any Control Station (in a horizontal- and/or vertical-control system) that is identified on a photograph and used to aid in fixing the attitude and/or position of a photograph or group of photographs. More specific terms are Supplemental Control Point, Photocontrol Point, Picture Control Point, and Ground Control Point.

CONTROL STATION - An object or mark on the ground of known, or accurately determined horizontal position (Horizontal Control Station with x- and y- grid coordinates or latitude and longitude) or elevation (Vertical Control Station or Benchmark), or both, in a network of ground control. Control stations constitute the framework by which map details are fixed in their correct position, azimuth, elevation, and scale with respect to the Earth's surface. Also called Control Point; Ground Control Point.

CONTROL STRIP (Aerial Photography) - A strip of aerial photographs taken to aid in planning and accomplishing later aerial photography, or to serve as control in assembling other strips. Also called control flight; tie flight; tie strip. (See also CROSS-FLIGHT PHOTOGRAPHY.)

CONTROL SURVEY - A survey which provides positions, horizontal and/or vertical, of points to which supplementary surveys are adjusted. The fundamental control survey of the United States provides the geographic positions and plane coordinates of triangulation and traverse stations and the elevations of bench marks which are used as the base for subordinate surveys.

CONVERGENCE - See ANGULAR PARALLAX under PARALLAX.

CONVERGENCE OF MERIDIANS - The angular drawing together of the geographic meridians in passing from the equator to the poles. At the equator, all meridians are mutually parallel; passing from the equator, they converge until they meet at the poles, intersecting at angles that are equal to their differences of longitude. The term convergence of meridians is used to designate also the relative difference of direction of meridians at specific

points on the meridians. Thus, for a geodetic line, the azimuth at one end differs from the azimuth at the other end by 180 degrees plus or minus the amount of the convergence of the meridians at the end points.

CONVERGENT PHOTOGRAPHY - Aerial Photography using a Convergent-Camera. (See also CAMERA.)

CONVERGENT POSITION - A split camera installation so positioned that the plane containing the camera axis is parallel to the line of flight. See also CONVERGENT CAMERA under CAMERA.

CONVERGING LENS - See POSITIVE LENS.

COORDINATE AXES - See CARTESIAN COORDINATES under COORDINATES.

COORDINATE TRANSFORMATION - A mathematical or graphic process of obtaining a modified set of coordinates by scaling, rotating, and translating.

COORDINATES - Linear or angular quantities which designate the position that a point occupies in a given reference frame or system. Also used as a general term to designate the particular kind of reference frame or system, such as Plane Rectangular Coordinates or Spherical Coordinates. Cartesian Coordinates - Values representing the location of a point in a plane in relation to two perpendicular intersecting straight lines, called coordinate axes. The point is located by measuring its distance from each axis along a parallel to the other axes. This system is extended to represent the location of points in three-dimensional space by referencing to three mutually perpendicular coordinate axes which intersect at a common point of origin. Plane Rectangular Coordinates (also called simply Plane Coordinates) - A system of coordinates in a horizontal plane used to describe the positions of points with respect to an arbitrary origin by means of two distances perpendicular to each other. The two reference lines at right angles to each other and passing through the origin are called the Coordinate Axes. The y-axis may be in the direction of astronomic (true) north, magnetic north, or an assumed (arbitrarily assigned) north and is also called the Easting Line. The distances from the origin and parallel to the north-south axis are called the Ordinates, the y-Coordinates, the Total Latitudes or the Northings. The distances from the origin and parallel to the true (or arbitrarily assigned) east-west axis (or x-axis) are called the Abcissas, the x Coordinates, the Total Departures or Eastings. A plane rectangular coordinate system is used in areas of such limited extent that the errors introduced by substituting a plane for the curved surface of the earth are within the required limits of accuracy. The north and east directions are usually taken as positive, and the south and west directions are usually taken as negative. To avoid the use of negative coordinates, the origin of the system may be established at a point to the southwest of the area, or the

coordinates of the origin may be assigned large positive values instead of zero; these large positive coordinate values are sometimes called False Northings and False Eastings. The merit of a rectangular coordinate system is that positions of points, distances, and directions on it can be computed by the use of plane trigonometry. Plane rectangular coordinates may or may not be adjusted to a map projection. Assumed Plane Coordinates - A local plane coordinate system set up at the convenience of the surveyor. The reference axes are usually assumed so that all coordinates are in the first quadrant. The y-axis may be in the direction of astronomic (true) north, magnetic north, or an assumed north. A plane rectangular coordinate system based on, and mathematically adjusted to, a map projection so that geographic positions in terms of latitude and longitude can be readily transformed into plane coordinates, and the computations relating to them made by the ordinary methods of plane surveying. State Plane Coordinate Systems - A series of grid coordinate systems prepared by the U.S. Coast and Geodetic Survey for the entire United States, with a separate system for each State. Each State system consists of one or more zones. The grid coordinates for each zone are based on, and mathematically adjusted to, a Map Projection. The Lambert Conformal Conic Projection with two standard parallels is used for zones of predominant east-west extent and limited north-south extent. The transverse Mercator projection is used for zones of predominant north-south extent and limited east-west extent. (See also MAP PROJECTION.) Polar Coordinates - A system of coordinates used to define the position of a point in space with respect to an arbitrarily chosen origin by means of two directions, and one distance (i.e., the vectorial angles and radius vector). The primary axis of direction is the Polar Axis. Polar Coordinates - A system of coordinates used to define the position of a point in space with respect to an arbitrarily chosen origin by means of two directions and one distance (i.e., the vectorial angles and radius vector). Any plane containing the polar axis may be called a meridional plane, and the plane perpendicular to the polar axis containing the origin is called the Equatorial Plane or Equator. As any point must lie on a Meridional Plane, one coordinate of a point in this system is the angle formed by the intersection of its meridional plane with the reference meridional plane. This is called the Polar Angle or Polar Bearing. The second coordinate of a point is the angle in its meridional plane subtended at the origin between the line to the point and the polar axis. Also, the arc of the great circle between the point and the pole. This angle is called the Polar Distance, and its complement, the angle between the line to the point and the equator, is the Declination. The third coordinate is the distance between the origin and the point. Plane Polar Coordinates - A system of polar coordinates in which the points all lie on one plane. In the terminology of analytical geometry, the distance from the origin to the point is the Radius Vector and the polar distance is the Vectorial Angle.

Spherical Coordinates - A system of Polar Coordinates in which the origin is the center of a sphere and the points all lie on the surface of the sphere. The polar axis of such a system cuts the sphere at its two poles. In photogrammetry, spherical coordinates are useful in defining the relative orientation of perspective rays or axes and make it possible to state and solve, in simple forms, many related problems. For example, as used in determining the exterior orientation of a single photograph, the origin is the camera station and the polar axis is the vertical. The polar bearing is the horizontal bearing (azimuth) of the principal plane, and the polar distance is the tilt. In the determination of the relative orientation between pairs of photographs by the method originated by Fourcade, the polar axis of the coordinate system is the air base, and the origin is one of the camera stations. A meridional plane in this case is called a Basal or Epipolar Plane, and the reference meridional plane may be arbitrarily chosen but is usually the vertical. (See also CELESTIAL SPHERE.) Geographic Coordinates - A system of Spherical Coordinates for defining the positions of points on the earth. The Declinations and Polar Bearings in this system are the Geographic Latitudes and Longitudes respectively. Astronomical Coordinates (Earth) - Astronomical Latitude - The angle between the plumb line and the plane of celestial equator. Also defined as the angle between the plane of celestial equator. Also defined as the angle between the plane of the horizon and the axis of rotation of the Earth. Astronomical latitude applies only to positions on the Earth and is reckoned from the astronomical equator (0 degrees), north and south through 90 degrees. Astronomical latitude is the latitude which results directly from observations of celestial bodies, uncorrected for Deflection of the Vertical. Astronomical Longitude - The angle between the plane of the celestial meridian and the plane of an initial meridian, arbitrarily chosen. Astronomical longitude is the longitude which results directly from observations on celestial bodies, uncorrected for Deflection of the Vertical. Geodetic Coordinates - The quantities of Geodetic Latitude, and Longitude, which define the position of a point on the surface of the Earth with respect to the reference spheroid. Geocentric Coordinates (Terrestrial) - Coordinates that define the position of a point with respect to the center of Earth. Geocentric coordinates can be either Cartesian (x,y,z) or Spherical (geocentric latitude and longitude, and radial distance). Also called coordinate system; geocentric position. Photograph Coordinates (Photogrammetry) - A system of coordinates (either Rectangular or Polar) to define the positions of points on a photograph. If a two-dimensional system is used, the origin is usually the principal point, but it may be the nadir point, isocenter, one of the fiducial marks, or (on a high-oblique photograph) the intersection of the horizon and principal line. The coordinate axes are usually either the fiducial axes, or the principal line and photograph parallel. If a three-dimensional system is used, the origin is either the principal point or the perspective center. Space

Coordinates (Photogrammetry) - May refer to any general three-dimensional coordinate system used to define the position of a point in the object space, as distinguished from the image of the point on the photograph. Model Coordinates (Photogrammetry) - The Space Coordinates of any point imaged on an overlapping pair of photographs, which define its position with reference to the air base. They correspond, in respect to the position of origin and direction of axes, to a system of spherical coordinates in which an air base is the polar axis. Consequently, one such system (as suggested by Fourcade) can be defined as follows: Origin - The left-hand air station X Axis - The line of the air base to the right. Z Axis - The line perpendicular to the X axis, in the basal plane containing the principal point of the lefthand photograph. (The ground is considered as being in the negative direction.) Y Axis - The line perpendicular to the X and Z axes. The positive direction is toward the top side of the strip when viewed as running from left to right. Strip Coordinates - The coordinates of any point in a strip, whether on the ground or actually an air station, referred to the origin and axes of the coordinate system of the first overlap.

COORDINATOGRAPH - An instrument used to plot in terms of plane coordinates. It may be an integral part of a stereoscopic plotting instrument whereby the planimetric motions (x and y) of the floating mark are plotted directly.

COPLANAR - Lying in the same plane. Basal Coplane (Photogrammetry) - The condition of exposure of a pair of photographs in which the two photographs lie in a common plane parallel to the air base. If the air base is horizontal, the photographs are said to be exposed in Horizontal Coplane.

COPY (Copying) CAMERA - See CAMERA.

CORRESPONDING PRINCIPAL POINT - The principal point of one aerial photograph where it appears on the adjacent overlapping area of a stereo pair of photos (assuming more than 50% endlap). The use of the term conjugate principal point is not recommended (see discussion under CONJUGATE IMAGE POINTS).

CORRELATION - (General) The statistical interdependence between two quantities (e.g., in geodesy, gravity anomalies are correlated with other gravity anomalies, with elevation, with elevation differences, with geology, and so forth). (Surveying) The removal of discrepancies that exist among survey data so that all parts are interrelated without apparent error. The terms coordination and correlation are usually applied to the harmonizing of surveys of adjacent areas or of different surveys over the same area. Two or more such surveys are coordinated when they are computed on the same datum; they are correlated when they are adjusted together.

- CORRESPONDENCE (Stereoscopy) - The condition that exists when corresponding images on a pair of photographs lie in the same epipolar plane; the absence of y parallax. (See also Y PARALLAX under PARALLAX.)
- CORRESPONDING IMAGES - A point or line in one system of points or lines homologous to a point or line in another system. Corresponding Image Points (the use of the term conjugate points is not recommended; see discussion under CONJUGATE IMAGE) are the images of the same object point on two or more photographs. See also HOMOLOGOUS IMAGES.
- CORRESPONDING IMAGE RAYS - Rays connecting each of a set of corresponding image points with its particular perspective center.
- COURSE (Air Navigation) - The direction in which a pilot attempts to fly an aircraft; the line drawn on a chart or map as the intended Track. The direction of a course is always measured in degrees from the true meridian, and the true course is always meant unless it is otherwise qualified (e.g., as a magnetic or compass course). (See also TRACK and FLIGHT LINE.)
- COVARIANCE - The arithmetic mean or expected value of the product of the deviations from their respective mean values of corresponding values of two variables.
- COVERAGE - The ground area represented on aerial photographs, photomaps, mosaics, maps, and other graphics.
- CRAB (Aerial Photography) - The condition caused by failure to orient a camera with respect to the track of the airplane. In vertical photography, crab is indicated by the edges of the photographs not being parallel to the air-base lines. (See also YAW.)
- CRITICAL ANGLE (Optics) - The angle beyond which total internal reflection of a ray takes place when passing from a medium of higher refractive index to a medium of lower index. The angle is expressed by the equation $\sin A = N'/N$, in which A is the critical angle, N is the higher index of refraction, and N' is the lower index of refraction. See SNELL'S LAW OF REFRACTION.
- CROP - To trim or cut off parts of a photograph in order to eliminate superfluous portions and thus improve balance or composition. Usually accomplished by masking the image area during printing.
- CRISS-FLIGHT PHOTOGRAPHY - Single photographic strips having stereoscopic overlap between exposures and having a flight direction at right angles to that of coexistent area-coverage photography. When applied to shoran, the term implies that each of the cross-flight exposures is accompanied by recorded shoran distances. See also CONTROL STRIP.
- CROSSHAIRS - A set of wires or etched lines placed on a Reticle held in the focal plane of a telescope. They are used as index marks

for pointings of the telescope such as in a transit or level when points and readings must be made on a rod.

CROSS SECTION - A profile of the ground taken transverse to a centerline. It consists of recording elevations and corresponding distances, both left and right, from the centerline. Cross sections may be measured by field methods using an engineers level and tape, but they are often more rapidly and conveniently taken using a stereoplotter equipped with a digitized coordinate-graph. (See also PROFILE.)

CROSS TILT - An error introduced into stereotriangulation due to the inability to recover the exact camera stations for successive pairs. This condition is generally due to variations in equipment, materials, or to imperfect relative orientation.

CULTURE (Mapping) - Features of the terrain that have been constructed by man. Included are such items as roads, buildings, and canals; boundary lines; and, in a broad sense, all names and legends on a map. (See also DETAILS.)

CURVATURE OF EARTH - The offset from the tangent to the curve, as a result of the curvature of the earth.

CURVATURE OF FIELD - See ABERRATION.

DARK SLIDE - A thin plate (usually metal or fiber, rigid or flexible) which, after insertion in a camera magazine, renders it light-tight. The employment of dark slides makes it possible to interchange camera magazines in daylight.

DATUM: HORIZONTAL-CONTROL DATUM - The position of the spheroid of reference assigned to the horizontal control of an area and defined by 1. The position (latitude and longitude) of one selected station in the area, and 2. The azimuth from the selected station to an adjoining station. The horizontal-control datum may extend over a continent or be limited to a small area. A datum for a small area is usually called a Local Datum and is given a proper name. The horizontal-control datum for the North American continent is known as the North American Datum of 1927, the initial station for which is Meades Ranch and the azimuth to Waldo. Vertical-Control Datum-Any Level Surface (usually Mean Sea Level) taken as a surface of reference from which to reckon elevations; also called the Datum Level. (See also BENCHMARK.) Although a level surface is not a plane, the vertical-control datum is frequently referred to as the datum plane. (See GEOID.) HORIZONTAL PLANE - a plane perpendicular to the direction of gravity; any plane tangent to the geoid or parallel to such a plane. (See also GROUND PLANE.) MEAN DATUM PLANE - A hypothetical reference plane at the average elevation of an area.

DATUM LEVEL - See GEOID, and VERTICAL-CONTROL DATUM under DATUM.

DATUM PLANE - See DATUM.

DECLINATION (Geometry) - See POLAR and SPHERICAL COORDINATES under COORDINATES. (See also MAGNETIC DECLINATION.)

DEFINITION (Photography) - Degree of clarity and sharpness of an image.

DEFLECTION OF THE VERTICAL - The angular difference, at any place, between the upward direction of a plumb line (the vertical) and the perpendicular (the normal) to the Reference Spheroid. This difference seldom exceeds 30 seconds. Often expressed in two components, meridian and prime vertical. Also called Deflection of the Plumb Line; Station Error.

DELINEATION (Cartography) - The visual selection and distinguishing of mapworthy features on various possible source materials by outlining the features on the source material, or on a map manuscript (as when operating a stereoscopic plotting instrument); also, a preliminary step in compilation. Photo-delineation - The delineation of features on a photograph. (See also Compilation.)

DENSITOMETER - Instrument for measuring the density of a photo image.

DENSITY - See CHARACTERISTICS CURVE.

DENSITY EXPOSURE CURVE - See CHARACTERISTIC CURVE.

DEPRESSION ANGLE - The complement of the angle of TILT. (See ANGLE OF DEPRESSION.)

DEPRESSION CONTOUR - See CONTOUR.

DEPTH CURVE - A line on a map or chart connecting points of equal depth below the hydrographic datum. Also called Isobath or Bathymetric Contour.

DEPTH OF FIELD - The distance between the points nearest and farthest from the camera which are imaged with acceptable sharpness.

DEPTH OF FOCUS - The distance that the focal plane can be moved forward or backward from the point of exact focus, and still give an image of acceptable sharpness. Also called Focal Range.

DESCENDING NODE - The point at which a planet, planetoid, or comet crosses the ecliptic from north to south, or a satellite crosses the equator of its primary from north to south. Opposite of ASCENDING NODE. Also called Southbound Node.

- DETAILS (Mapping) - The small items or particulars of information (shown on a map by lines, symbols, and lettering) which, when considered as a whole, furnish the comprehensive representation of the physical and cultural features of the earth's surface. The greater the omission of details, the more generalized the map.
- DETECTION - An awareness that a pattern or object exists on the photo or remote sensing imagery. The first step in the process of Photo Interpretation.
- DEVELOP or DEVELOPMENT (Photography) - To subject to the action of chemical agents for the purpose of bringing to view the invisible or Latent Image produced by the action of light on a sensitized surface; also, to produce or render visible in this way.
- DEVELOPER (Photography) - The solution used to make visible the Latent Image in an exposed emulsion. In black and white photography the process is one in which the silver halide grains which were exposed to light are reduced to metallic silver. (See also DEVELOP.)
- DIAGONAL CHECK - Measurements made across the opposite corners of the basic frame of a Map Projection to insure the accuracy of its construction, or to establish and/or check the scale of Reproduction.
- DIAPHRAGM - The physical element of an optical system which regulates the quantity of light traversing the system. The quantity of light determines the brightness of the image without affecting the size of the image. (See also APERTURE STOP and RELATIVE APERTURE.)
- DIAPOSITIVE (Photogrammetry) - A positive photograph on a transparent medium, usually polyester or glass. The term is generally used to refer to a transparency used in a plotting instrument, a projector, or a comparator.
- DIAPOSITIVE PRINTER - A photographic device for producing diapositives from aerial negatives.
- DIFFERENTIAL DISTORTION - The resultant dimensional changes in length and width in any medium. See also DIFFERENTIAL SHRINKAGE.
- DIFFERENTIAL LEVELING - See LEVELING.
- DIFFERENTIAL SHRINKAGE (Mapping) - The difference in unit contraction along the grain structure of the material as compared to the unit contraction across the grain structure; frequently refers to photographic film and papers and to map materials in general. (See also DIFFERENTIAL DISTORTION.)

- DIFFRACTION (Optics) - The bending of light rays around the edges of opaque objects. Due to diffraction, a point of light seen or projected through a circular aperture will always be imaged as a bright center surrounded by light rings of gradually diminishing intensity. Such a pattern is called a Diffraction Disk, Airy Disk, or Centric.
- DIFFUSE REFLECTION - The type of reflection obtained from a relatively rough surface (such as a Matte Photographic Print), in which the reflected rays are scattered in all directions.
- DIGITAL - Pertaining to data in the form of digits.
- DIGITAL COMPUTER - See COMPUTER.
- DIGITIZE - To use numeric characters to express, or represent data, e.g., to obtain from an Analog representation of a physical quantity, a digital representation of the same quantity.
- DIHEDRAL ANGLE - The angle between two intersecting planes.
- DIMENSIONAL STABILITY - Ability to maintain size; resistance to dimensional changes caused by changes in moisture content and temperature. (See also DIFFERENTIAL DISTORTION, DIFFERENTIAL SHRINKAGE and FILM DISTORTION.)
- DIOPTER - A unit of measurement of the Power of a lens, especially a spectactyletype lens. The power in diopters equals the reciprocal of the focal length in meters; thus, a lens whose focal length is 20 cm has a power of 5 diopters.
- DIP ANGLE - The vertical angle, at the air station, between the True and the Apparent Horizon, which is due to flight height, earth curvature, and refraction.
- DIRECTION - The position of one point relative to another without reference to the distance between them. Direction may be either three-dimensional or two-dimensional, the horizontal being the usual plane of the latter. Direction is usually indicated in terms of its angular distance from a reference direction. (See also AZIMUTH and BEARING.)
- DIRECTION INSTRUMENT THEODOLITE - A theodolite in which the graduated horizontal circle remains fixed during a series of observations, the telescope being pointed on a number of signals or objects in succession, and the direction of each read on the circle, usually by means of micrometer microscopes. Direction instrument theodolites are used almost exclusively in first- and

second-order triangulation. Also called direction theodolite. (See also TRANSIT.)

DIRECTION OF FLIGHT - The heading of an aircraft, or the direction in which it is flying.

DIRECTION METHOD OF OBSERVATION - A method of observing angular relationships wherein the graduated circle is held in a fixed position, and the directions of the various signals are observed around the horizon. Thus, directions are pointings whereby angles are found by the differences in directions. Also called direction method of measuring horizontal angles.

DIRECT LINEAR TRANSFORMATION (DLT) - An analytical procedure through which the Comparator Coordinates of image points are transformed directly into Object-Space Coordinates without the need for fiducial marks or initial approximations for the inner and outer orientation parameters of the photograph.

DIRECT POSITIVE - A positive image obtained directly without the use of a negative.

DIRECTION OF TILT - The direction (azimuth) of the Principal Point of a photograph. Also, the direction of the Principal Line on a photograph.

DIRECT RADIAL PLOT - See RADIAL TRIANGULATION.

DISCREPANCY - A difference between results of duplicate or comparable measures of a quantity. The difference in computed values of a quantity obtained by different processes using data from the same survey.

DISPERSION - The separation of light into its component colors by its passage through a Diffraction Grating or by Refraction such as that provided by a prism.

DISPLACEMENT - Any shift in the position of an image on a photograph which does not alter the perspective characteristics of the photograph (i.e., shift due to tilt of the photograph, scale change in the photograph, and relief of the objects photographed). Contrast with Distortion. Relief Displacement - Displacement of images radially Inward or Outward with respect to the Photograph Nadir, according as the ground objects are, respectively, Below or Above the elevation of the Ground Nadir. Tilt Displacement - Displacement of images, on a tilted photograph, radially Outward or Inward with respect to the Isocenter, according as the images are, respectively, on the Low or High side of the Isometric Parallel (the Low side is the one tilted closer to the earth, or object plane). Refraction Displacement - Displacement of images radially Outward from the Photograph Nadir because of atmospheric refraction. It is assumed that the refraction is symmetrical about the nadir direction.

DISTANCE, PRINCIPAL - See FOCAL LENGTH.

DISTORTION - Any shift in the position of an image on a photograph which alters the perspective characteristics of the photograph. Causes of image distortion include lens aberration, differential shrinkage of film or paper, and motion of the film or camera. Contrast with Displacement.

DISTORTION COMPENSATION - That correction applied to offset the effect of distortion.

DISTORTION CURVE - A curve representing the linear distortion characteristics of a lens. It is plotted with image radial distances from the lens axis as abscissas and image radial displacements as ordinates. The distortion curve is based on the existence of Angular Distortion, which is defined as the difference between the object-space and image-space values of the angle between a ray and the lens axis. If the image-space value of this angle is greater than the object-space value, the angular distortion is positive; if less, it is negative. Geometrically, the radial distance of a ray trace in the focal plane is computed from the formula $r = f \tan \alpha$, in which f is the focal length and α is the object-space value of the ray angle. The actual radial distance will differ from the geometric value because of angular distortion. This difference, which may be considered a radial displacement of the ray trace, is termed Linear Distortion. It is considered positive when outward, and negative when inward. By varying the value of f , it is possible to make this difference equal to zero at any given radial distance. The value of f used in lens calibration for the purpose of determining linear distortion is called the Equivalent Focal Length. For a wide-angle lens, it is computed from the above formula by measuring, in the plane of best average definition, the radial distance to the image at about 10 degrees from the lens axis.

DIURNAL - Having a period of, occurring in, or related to a day.

DIVERGING LENS - See NEGATIVE LENS.

D LOG E - See CHARACTERISTIC CURVE.

DODGING - A process used while enlarging photographs by projection. Light which passes through certain parts of the negative is held back, and prevented from striking the sensitized paper. Manual dodging is done by holding a piece of opaque material between the enlarger lens and the easel. Electronic dodging is produced by feedback of signal voltage through the negative or positive to be printed to minimize density variations of produced materials.

DOPPLER EFFECT - The alteration in frequency of a wave radiation caused by a relative motion between the observer and the source of radiation. Acoustic Doppler effect applies to the propagation

of source waves, Optical Doppler effect depends on the relative velocity of the light source and the observer, Thermal Doppler effect causes a widening of the spectral lines.

- DOPPLER NAVIGATION - A system which measures ground speed and drift by means of electronically generated signals emitted from aircraft and reflected from the terrain. The system depends on the difference in frequencies between emitted and reflected signals caused by aircraft movement.
- DOPPLER SATELLITE POSITIONING - The determination of geodetic positions through the measurement of Doppler shifts of radio signals emitted from passing satellites.
- DOT GRID - Film positive with regularly spaced dots used in determining areas.
- DOUBLE WEIGHT PAPER - Heavy duty photographic paper. More durable and dimensionally stable than single-weight paper. (See also DIMENSIONAL STABILITY.)
- DOUBLE BURN - The intentional exposure of two or more line and/or halftone negatives in succession and register on the same sensitized surface. Not to be confused with double exposure, which is usually unintentional. Also called double shooting.
- DOUBLE-MODEL STEREOTEMPLET - See TEMPLET.
- DOUBLE-OPTICAL PROJECTION STEREOPLOTTER - See DOUBLE-PROJECTION DIRECT-VIEWING STEREOPLOTTER.
- DOUBLE-PROJECTION DIRECT-VIEWING STEREOPLOTTER - A close of stereoplotters employing the principal of projecting the images of two correctly oriented overlapping aerial photographs onto a reference datum so the resultant images may be viewed directly without additional optical system support. Also called Double-Optical Projection Stereoplotter.
- DOVE PRISM - A prism which reverts the image but does not deviate or displace the beam. A given angular rotation of the prism about its longitudinal axis causes the image to rotate through twice the angle. Also called a Rotating Prism.
- DRIFT (Air Navigation) - The lateral shift or displacement of an aircraft from its Course, due to the action of wind or other causes.
- DUPLICATE NEGATIVE - A negative made from an original negative or from a positive. The duplicate negative may be true reproduction of the original or a reproduction possessing greater or less contrast. With direct positive materials, chemical reversal process, and duplicating film, it is not always necessary to make a positive to obtain a duplicate negative.

EASTING - See PLANE RECTANGULAR COORDINATES under COORDINATES.

EARTH-FIXED COORDINATE SYSTEM - Any coordinate system in which the axes are stationary with respect to the Earth.

EDGE FOG - See FOG.

EDITING (Cartography) - The process of checking a map or chart in its various stages of preparation to insure accuracy, completeness, and correct preparation from and interpretation of the sources used, and to assure legible and precise reproduction. Edits are usually referred to by a particular production phase, such as compilation edit, scribing edit, etc.

EFFICIENCY OF A SHUTTER - The relationship between the total time a shutter remains open (counting from half-open to half-closed position) and the time required for the shutter to reach the half-open and the half-closed positions.

EFFECTIVE AREA OF AERIAL PHOTOGRAPH - That central part of the photograph delimited by the bisectors of overlaps with adjacent photographs. On a vertical photograph, all images within the effective area have less displacement than their corresponding images on adjacent photographs.

EFFECTIVE FOCAL LENGTH (EFL) - See PRINCIPAL DISTANCE under FOCAL LENGTH.

ELECTROMAGNETIC RADIATION (EMR) - Energy propagated through space or through material media in the form of an advancing disturbance in electric and magnetic fields existing in space or in the media. The term Radiation, alone, is used commonly for this type of energy, although it actually has a broader meaning. Also called Electromagnetic Energy. See also SPECTRUM and RADIATION.

ELECTRONIC DISTANCE-MEASURING EQUIPMENT (EDM) - Devices that measure the phase difference between transmitted and returned (i.e., reflected or retransmitted) electromagnetic waves, of known frequency and speed, or the round-trip transit time of a pulsed signal, from which distance is computed. A wide range of such equipment is available for surveying and navigational use (e.g., Geodimeter, Tellurometer, and Hiran).

ELECTROMAGNETIC SPECTRUM - See SPECTRUM.

ELEVATION - Vertical distance from the datum (usually mean sea level) to a point or object on the earth's surface. Sometimes used synonymously with altitude, which in modern usage refers particularly to the distance of points or objects above the earth's surface. Field Elevation - An elevation taken from the field computation of a line of levels. Adjusted Elevation - The elevation resulting from the application of an adjustment

correction to an orthometric elevation. Also, the elevation resulting from the application of both an orthometric correction and an adjustment correction to a preliminary elevation. Assumed Ground Elevation - The elevation assumed to prevail in the local area covered by a particular photography or group of photographs. Used especially to denote the elevation assumed to prevail in the vicinity of a critical point, such as a peak or other feature having abrupt local relief.

ELECTRON MICROSCOPE - A microscope of extremely high power that uses beams of electrons instead of rays of light; the magnified image being formed on a screen or recorded on a photographic plate.

ELECTRONIC SURVEYING - Any survey utilizing electronic equipment.

ELEVATION METER - A mechanical or electromechanical device on wheels that measures slope and distance, and automatically and continuously integrates their product into difference of elevation.

ELLIPSOID - A surface whose plane sections (cross sections) are all ellipses or circles, or the solid enclosed by such a surface. See also GEOID.

EMERGENT NODAL POINT - See NODAL POINT.

EMPIRICAL ORIENTATION (RECTIFICATION) - See TRANSFORMATION.

EMULSION (Photography) - A suspension of a light-sensitive silver salt (especially silver chloride or silver bromide) in a colloidal medium (usually gelatin), which is used for coating photographic films, plates, and papers.

EMULSION SPEED - A property of photographic emulsions which determines how long they must be exposed to a given light source to secure equal density when developed. This speed may be given in USASI, DIN, Weston, Scheiner, or AEL scales.

EMULSION-TO-BASE - A contact exposure in which the emulsion of the copying film is on the side of the film opposite to that in contact with the sheet being copied. See also PRINT.

EMULSION-TO-EMULSION - A contact exposure in which the emulsion of the copying film is in contact with the emulsion of the sheet being copied. See also PRINT.

ENDLAP - See OVERLAP.

ENLARGEMENT - The production of a negative, diapositive or print at a Scale larger than the original.

ENLARGING - The process of making a print or negative larger than the original by projection printing. See also TRANSFORMATION.

ENLARGING LENS - See PROCESS LENS.

ENTRANCE PUPIL - See APERTURE STOP.

ENTRANCE WINDOW - See APERTURE STOP.

EPIPOLAR PLANE - See EPIPOLES.

EPIPOLAR RAY - See EPIPOLES.

EPIPOLES - In the perspective setup of two photographs (two perspective projections), the points on the planes of the photographs where they are cut by the Air Base (extended line joining the two perspective centers). In the case of a pair of truly vertical photographs, the epipoles are infinitely distant from the principal points. Epipolar Plane - Any plane which contains the epipoles; therefore, any plane containing the air base. Also called Basal Plane. Epipolar Ray - the line on the plane of a photograph joining the epipole and the image of an object. Also expressed as the trace of an epipolar plane on a photograph.

EQUATION, NORMAL - See NORMAL EQUATION.

EQUATOR (Geometry) - In a system of polar or spherical coordinates, the great circle of a sphere which is perpendicular to the polar axis.

EQUIVALENT FOCAL LENGTH - See FOCAL LENGTH.

EQUIVALENT VERTICAL PHOTOGRAPH - A theoretically, truly-vertical photograph taken at the same camera station with a camera whose focal length is equal to that of a camera taking a corresponding tilted photograph.

ERROR (Statistics) - The difference between an observed or computed value of a quantity and the ideal or true value of that quantity. Errors are defined by types or by causes. Absolute Error - Absolute deviation (the value taken without regard to sign) from the corresponding true value. Accidental (Irregular or Random) Errors - Those whose occurrence depends on the law of chance only; they are unpredictable in regard to both magnitude and algebraic sign. In formulating adjustments for these errors, it is assumed that the relation between the magnitude and the frequency of the individual errors are regulated by some law, usually the Normal Frequency Function (or Gauss Law). Such errors tend to be Compensating in their effect. The theory of errors and the method of least squares are based on the behavior of accidental errors. Systematic Error - An error which, for known changes in field conditions, undergoes proportional changes in magnitude and which, for unchanging conditions, remains unchanged, both in sign and magnitude. A systematic error always follows some definite mathematical or physical law, and a correlation may be

determined and applied. Also called Regular Error. Constant Error - The result of the observational conditions remaining unchanged, so that there is no change in either the sign or the magnitude of the error. A number of readings under these conditions produce an Accumulative Error equal to the number of readings multiplied by the error in one reading. Gross Error (or Blunder) - The result of carelessness or a mistake; may be detected through repetition of the measurements. Personal Error - The result of the inability of an observer to perceive or measure dimensional values exactly. Personal errors may be either random or systematic in behavior. Instrumental Error - Generally systematic in nature; the result of an imperfect condition of an instrument. However, such an error may be accidental or random in nature and result from the failure of an instrument to give the same indication when subjected to the same input signal. Index Error - An instrumental error caused by the displacement of the zero or index mark or vernier; constant in behavior. Closure or Closing Error - The amount by which a quantity obtained by a series of related measurements differs from the true or fixed value of the same quantity. Hence, it is a cumulative measure of the various individual errors and blunders in the measurements. Average Error - The arithmetic mean, taken without regard to sign, of all the errors of a set. Mean Error - In American usage, synonymous with Average Error; in European usage, especially German, synonymous with Root Mean Square Error. Root Mean Square Error (RMSE) - The expression for the accuracy of a single observation; defined as the square root of the quantity: the sum of the squares of the errors divided by the number of errors. The square of this term is the Mean Square Error. Standard Error or Standard Deviation - The root mean square value based on errors corrected by subtracting the average error (assumed to be a constant) from all the errors of a set. It is generally denoted by the Greek letter Sigma (σ) and is a measure of precision (or accuracy) of a single observation. Its square is termed Variance. Probable Error - An error (or deviation from the mean) of such magnitude that the likelihood of its being exceeded in a set of observations is equal to the likelihood of its not being exceeded; its value is that of the Standard Error multiplied by 0.6745. The use of Standard Error is sometimes preferred in statistical studies. Residual (or Residual Error) - The difference between any value of a quantity in a series of observations, corrected for known systematic errors, and the value of the quantity obtained from the combination or adjustment of that series. Also called Errors;Residuals. The latter term is generally used in referring to actual values in a specific computation. When a measurement is referenced to some arbitrary or estimated value, the difference generally is denoted as Deviation instead of Error. An error thus constitutes a deviation from a particular reference.

ERROR, PROPAGATED - An error that occurs in one operation and spreads through later operations.

- EULERIAN ANGLES - A system of three angles which uniquely define, with reference to one coordinate system (e.g., earth axes), the orientation of a second coordinate system (e.g., body axes). Any orientation of the second system is obtainable from that of the first by rotation through each of the three angles in turn, the sequence of which is important.
- EXAGGERATION, VERTICAL - See VERTICAL EXAGGERATION.
- EXAGGERATED STEREO - See HYPERSTEROSCOPY.
- EXCHANGE AGREEMENT - An approved agreement between two or more organizations to furnish each other specified mapping, charting, and geodetic data as published, or on a request basis.
- EXIT PUPIL - See APERTURE STOP.
- EXIT WINDOW - See APERTURE STOP.
- EXPOSURE - The total quantity of light received per unit area on a sensitized plate or film; may be expressed as the product of the light intensity and the exposure time, in units of (for example) meter-candle-seconds or watts per square meter. The act of exposing a light-sensitive material to a light source. (See also CHARACTERISTIC CURVE.)
- EXPOSURE FACTORS - A large number of factors which must be taken into consideration in arriving at correct exposure time. Following is a list of some of the important factors: (1) relative aperture of lens; (2) type of film used; (3) reflecting power of the subject; (4) season of the year; (5) time of day; (6) color of the light; (7) geographical location; (8) flight altitude; (9) atmospheric condition.
- EXPOSURE INTERVAL - The time interval between the taking of successive photographs. See also INTERVALOMETER.
- EXPOSURE METER - An instrument used to measure the intensity of light and thus determine correct exposure.
- EXPOSURE STATION - See CAMERA STATION.
- EXPOSURE TIME - The time during which a light-sensitive material is subjected to the action of light.
- EXTENSION OF CONTROL - See PHOTOTRIANGULATION.
- EXTERIOR ORIENTATION - See ORIENTATION.
- EXTERIOR PERSPECTIVE CENTER - See PERSPECTIVE CENTER.
- EYE BASE - Synonymous with INTERPUPILLARY DISTANCE and Interocular Distance.

EYEPIECE - In an optical device, the lens group which is nearest the eye and with which the image formed by the preceding elements is viewed.

FAN CAMERA - See CAMERA.

FEATHEREDGING - See MOSAIC.

FIBER OPTICS - A device for relaying an image by means of a large number of transparent fibers (filaments) by multiple total internal reflection. The fibers are most commonly glass and less often a highly transparent plastic. Each fiber carries only one element of the image, so that the image is a mosaic in which the cell size is the fiber cross section rather than a continuous picture.

F NUMBER - See RELATIVE APERTURE.

FIDUCIAL AXES (Photogrammetry) - The lines joining opposite Fiducial Marks on a photograph. (See also PHOTOGRAPH COORDINATES under COORDINATES.)

FIDUCIAL MARKS (Photogrammetry) - Index marks, usually four, which are rigidly connected with the camera lens through the camera body and which form images on the negative and usually define the Principal Point of the photograph. Also marks, usually four in number, in any instrument which define the axes whose intersection fixes the principal point of a photograph and fulfills the requirements of interior orientation.

FIELD CALIBRATION - See CALIBRATION.

FIELD CHECK - The operation of checking a map Compilation Manuscript on the ground. Compare with Field Classification. See also CHECK PROFILE.

FIELD CLASSIFICATION - Field inspection and identification of features which a map compiler is unable to delineate; identification and delineation of political boundary lines, place names, road classifications, buildings hidden by trees, and so forth. Field classification may be included as part of the control survey effort and normally is completed prior to the actual Stereo-Compilation phase. See also FIELD INSPECTION and FIELD COMPLETION.

FIELD COMPLETION - A combination of field inspections or surveys, either before or after compilation, to classify and complete the map content, correct erroneous data, and add information such as names, civil boundaries, and similar classification data. Its purpose is to fill in or confirm that portion of a map manuscript prepared by Stereocompilation.

- FIELD CONTOURING - Contouring a topographic map by field methods accomplished by planetable surveys on a prepared base. Generally, this operation is applied to terrain unsuitable for contouring by photogrammetric methods.
- FIELD CORRECTION COPY - A map or tracing prepared in the field, delineating corrections for subsequent reproduction of a map. See also FIELD CHECK and FIELD COMPLETION.
- FIELD ELEVATION - See ELEVATION.
- FIELD INSPECTION (Photogrammetry) - The process of comparing aerial photographs with conditions as they exist on the ground, and of obtaining information to supplement or clarify that not readily discernible on the photographs themselves. See also FIELD CLASSIFICATION and FIELD COMPLETION.
- FIELD STOP - See APERTURE STOP.
- FILM - A plastic base which is coated with a light sensitive emulsion for use in a camera or printing frame.
- FILM BASE (Photography) - A thin, flexible, transparent sheet of stable plastic material.
- FILM DISTORTION - The dimensional changes which occur in photographic film with changes in humidity or temperature, or from aging, handling, or other causes. See also DIFFERENTIAL SHRINKAGE.
- FILM SPEED - That property of film which determines how much Exposure must be allowed for a given light source in order to secure a negative of correct Density and Contrast. Speed is measured on the H. & D., Scheiner, DIN, Weston, USAIS, or AEL scales.
- FILTER - Any transparent material which by absorption, selectively modifies the light transmitted through an optical system.
- FILTER FACTOR - A number indicating the exposure increase necessary when using a filter, as compared to the exposure necessary under the same conditions without the filter.
- FILTER RATIO - The ratio between the filter factors of two or more filters with same film.
- FIX - (Photography) To render a developed photographic image permanent by removing the unaffected light-sensitive material.
(Surveying) To establish the position of a point of observation by a surveying procedure, usually Resection. Also, the point thus established.
- FIXED-RATIO PANTOGRAPH - See PANTOGRAPH.
- FLASH PLATE - See CALIBRATION PLATE.

FLAT - See OPTICAL FLAT.

FLICKER METHOD - The alternate projection of corresponding photographic images onto a tracing-table platen or projection screen, or into the optical train of a photogrammetric instrument.

FLIGHT ALTITUDE - The vertical distance above a given datum, usually mean sea level, of an aircraft in flight or during a specified portion of a flight. In aerial photography, when the datum is mean ground level of the area being photographed, this distance is called Flight Height, Flying Height, or sometimes Absolute Altitude.

FLIGHT HEIGHT - See FLIGHT ALTITUDE.

FLIGHT LINE - A line drawn on a map or chart to represent the track of an aircraft. See also COURSE.

FLIGHT MAP - The map on which are indicated the desired lines of flight and/or the positions of exposure stations previous to the taking of air photographs, or the map on which are plotted, after photography, selected air stations and the tracks between them.

FLIGHT PLAN - A plan, prepared before aerial photography is executed, to provide photographs suitable for subsequent photogrammetric processes or operations.

FLIGHT STRIP - A succession of overlapping aerial photographs taken along a single Course.

FLOATING DOT - See FLOATING MARK.

FLOATING MARK (Photogrammetry) - A mark seen as occupying a position in the three-dimensional space formed by the stereoscopic fusion of a pair of photographs and used as a reference mark in examining or measuring the stereoscopic model. The mark may be formed 1. by one real mark lying in the projected object space; 2. by two real marks lying in the projected or virtually projected object spaces of the two photographs; 3. by two real marks lying in the planes of the photographs themselves; 4. by two virtual marks lying in the image planes of the binocular viewing apparatus. Index Mark (Photogrammetry) - A real mark (such as a cross or dot) lying in the plane or the object space of a photograph and used singly as a reference mark in certain types of monocular instruments, or as one of a pair to form a floating mark (as in certain types of stereoscopes).

FOCAL LENGTH - The distance measured along the optical axis from the rear nodal point the lens to the plane of critical focus of a very distant object. See also BACK FOCAL LENGTH and FRONT FOCAL LENGTH. NOMINAL FOCAL LENGTH - An approximate value of the focal length, rounded off to some standard figure, used for the classification of lenses, mirrors, or cameras. Equivalent Focal

Length - The distance measured along the lens axis from the rear nodal point to the plane of best average definition over the entire field used in an aerial camera. In general usage, the term also applies to the distance from the rear nodal point to the plane of best axial definition; in photogrammetry, however, this meaning is rarely used and will not be understood unless the term is accompanied by a qualifying phrase. Back Focal Length - The distance measured along the lens axis from the rear vertex of the lens to the plane of best average definition. This value is used in setting the lens in an aerial camera. Front Focal Length or Front Focal Distance - The distance measured from the vertex of the front surface of lens to the front focal point. Also called front focal distance. Calibrated Focal Length - An adjusted value of the Equivalent Focal Length computed to distribute the effects of lens distortion over the entire field used in an aerial camera. This value also is stated as the distance along the lens axis from the interior perspective center to the image plane, with the interior center of perspective selected to distribute the effect of lens distortion over the entire field. The calibrated focal length is used in the determination of the setting of diapositives in plotting instruments and in photogrammetric computations based on linear measurements on the negative (such as those made with a precision comparator). Principal Distance - The perpendicular distance from the internal perspective center to the plane of a particular finished negative or print. This distance is equal to the calibrated focal length corrected for both the enlargement or reduction ratio and the film or paper shrinkage or expansion. The same perspective angles to points on the finished negative or print as existed in the taking camera at the moment of exposure are maintained at the internal perspective center. This is a geometrical property of each particular finished negative or print.

FOCAL PLANE (Photography) - The plane (perpendicular to the axis of the lens) in which images of points in the object field of the lens are focused. Focal-Plane Plate - A glass plate set in the camera so that the surface away from the lens coincides with the focal plane. Its purpose is to position the emulsion of the film in the focal plane when the film is physically pressed into contact with the glass plate. Also known as Contact Glass or Contact Plate.

FOCAL-PLANE PLATE - See FOCAL PLANE.

FOCAL-PLANE SHUTTER - See SHUTTER.

FOCAL SPOT - The point of an X-ray tube through which X-rays emanate.

FOCUS - The point toward which rays of light converge to form an image after passing through a lens. Also defined as the condition of sharpest imagery.

- FOG - A darkening of negatives or prints by a deposit of silver which does not form a part of the image. Fog tends to increase density and decrease contrast. It may be caused by exposure to unwanted light, exposure to air during development, forced development, or impure chemicals. Edge Fog - fog on film caused by leakage of light between the flanges of the spool on which it is wound.
- FOOT-CANDLE - A unit of illumination equivalent to one Lumen of incident light per square foot.
- FOOT-LAMBERT - A unit of photometric luminance equivalent to $1/\pi$ candle per square foot. It is also the luminance of a perfectly plane diffuse surface radiating one lumen per square foot.
- FORM LINES - Lines drawn to represent the shape of terrain; unlike contour lines, they are drawn without regard to a true vertical datum or regular vertical interval.
- FORWARD LAP - See OVERLAP.
- FRAME - Any individual member of a continuous sequence of photographs.
- FRAME CAMERA - See CAMERA.
- FRONT FOCAL LENGTH - See FOCAL LENGTH.
- FRONT NODAL POINT - See NODAL POINT.
- FRONT SURFACE MIRROR - An optical mirror on which the reflecting surface is applied to the front surface of the mirror instead of to the back; i.e., to the first surface of incidence.
- FUNCTION, TRANSFER - A mathematical expression that relates the input signals or variables to the output signals or variables, usually showing the operations performed on the variables by the process or the control element.
- FUSION - See STEREOSCOPIC FUSION under STEREOSCOPY.
- GAMMA - See CHARACTERISTIC CURVE.
- GAP (Aerial Photography) - Any space where aerial photographs fail to meet minimum coverage requirements. This may be a space not covered by any photograph or a space where the minimum specified overlap was not obtained.
- GELATIN (Photography) - A natural or artificial protein or protein like substance used as a binding medium for the silver halide crystals in the common type of photographic emulsion.
- GEOCENTRIC - Relative to the Earth as a center; measured from the center of the Earth.

GEOCENTRIC COORDINATES - See COORDINATES.

GEOCENTRIC LATITUDE - The angle at the center of the Earth between the plane of the celestial equator and a line to a point on the surface of the Earth. Geocentric latitude is used as an auxiliary latitude in some computations in astronomy, geodesy, and cartography, in which connection it is defined as the angle formed with the major axis of the ellipse (in a meridional section of the spheroid) by the radius vector from the center of the ellipse to the given points. In astronomic work, geocentric latitude is also called Reduced Latitude, a term that is sometimes applied to parametric latitude in geodesy and cartography. The geocentric and isometric latitudes are approximately equal.

GEODESIC - See GEODESIC LINE.

GEODESIC LINE - A line of shortest distance between any two points on any mathematically defined surface. On a spheroid, a geodesic line is a line of double curvature, and usually lies between the two normal section lines which the two points determine. If the two terminal points are in nearly the same latitude, the geodesic line may cross one of the normal section lines. It should be noted that, except along the equator and along the meridians, the geodesic line is not a plane curve and cannot be sighted over directly. However, for conventional triangulation the lengths and directions of geodesic lines differ inappreciably from corresponding pairs of normal section lines. Also called Geodesic; Geodetic Line.

GEODESY - The science which treats of the determination of the size and figure of the earth (Geoid) by such direct measurements as triangulation, precise traverse, trilateration, leveling, gravimetric observations, satellite triangulation and doppler methods. The applied science of geodesy is called geodetic surveying (i.e., surveying which takes account of the figure and size of the earth).

GEODETTIC CONTROL - See CONTROL.

GEODETTIC COORDINATES - See COORDINATES.

GEODETTIC DATUM - See DATUM.

GEODETTIC LATITUDE - is the angle which the normal at a point on the reference spheroid makes with the plane of the geodetic equator. Geodetic latitudes are reckoned from the equator, but in the horizontal control survey of the United States they are computed from the latitude of station Meades Ranch as prescribed in the North American Datum of 1927.

GEODETTIC LONGITUDE - is the angle between the plane of the geodetic meridian and the plane of an initial meridian, arbitrarily chosen. A geodetic longitude can be measured by the angle at the pole of rotation of the reference spheroid between the

local and initial meridians, or by the arc of the geodetic equator intercepted by those meridians. In the United States, geodetic longitudes are numbered from the meridian of Greenwich, but are computed from the meridian of station Meades Ranch as prescribed in the North American Datum of 1927. A geodetic longitude differs from the corresponding astronomical longitude by the amount of the prime vertical component of the local deflection of the vertical divided by the cosine of the latitude.

GEODETTIC POSITION - A position of a point on the surface of the Earth expressed in terms of Geodetic Latitude and Geodetic Longitude. A geodetic Position implies an adopted geodetic Datum.

GEODETTIC SURVEYING - See GEODESY.

GEOGRAPHIC COORDINATES - See COORDINATES.

GEOGRAPHIC LATITUDE - A general term, applying alike to Astronomic Latitudes and Geodetic Latitudes.

GEOGRAPHIC LONGITUDE - A general term, applying alike to Astronomical and to Geodetic Longitudes.

GEOID - The figure of the earth considered as a sea-level surface extended continuously through the continents. The actual geoid is an equipotential surface to which, at every point, the plumb-line (direction in which gravity acts) is perpendicular. It is the geoid which is obtained from observed Deflections of the Vertical and is the surface of reference for astronomical observations and for geodetic leveling. Reference Spheroid or Ellipsoid. A spheroid determined by revolving an ellipse about its shorter (polar) axis and used as a base for geodetic surveys of a large section of the earth (such as the Clarke Spheroid of 1866, which is used for geodetic surveys in the United States). The spheroid of reference is a theoretical figure whose dimensions closely approach the dimensions of the Geoid; the exact dimensions are determined by various considerations of the section of the earth's surface concerned. Level Surface - A surface which, at every point, is perpendicular to the direction of gravity; the Geoid, or, in general, any surface parallel to it. If changes in elevation due to tides, winds, etc. are neglected, the surface of the sea is a level surface. A level surface is not a plane surface, but it is sometimes so regarded in surveys of limited areas. (See also VERTICAL CONTROL DATUM under DATUM.)

GONIOMETER - An instrument for measuring angles. Photogoniometer - An instrument for measuring angles from the true Perspective Center to points on a photograph.

GRADIENT - See CHARACTERISTIC CURVE.

GRADIENT SPEED - See CHARACTERISTIC CURVE.

- GRAIN (Photography) - One of the discrete silver particles resulting from the development of an exposed light sensitive material.
Granularity - The graininess of a developed photographic image, evident particularly on enlargement, that is due either to agglomerations of developed grains or to an overlapping pattern of grains.
- GRATICULE - 1. A network of lines representing the Earth's parallels of latitude and meridians of longitude. See also MAP PROJECTION.
2. A scale at the focal plane of an optical instrument to aid in the measurement of objects. See also RETICLE.
- GRAVIMETER (GRAVITY METER) - An instrument designed to measure relative differences in the acceleration due to gravity at different locations.
- GRAY SCALE - See STEP WEDGE.
- GREAT CIRCLE - A circle on the surface of a sphere, the plane of which passes through the center of the sphere. Also called Orthodrome.
- GREENWICH CIVIL TIME (GCT) or GREENWICH MEAN TIME (GMT) - Mean solar time of the meridian of Greenwich, adopted as the prime basis of standard time throughout the world. Also called Universal Time.
- GREENWICH SIDERIAL TIME (GST) - Local sidereal time at the Greenwich meridian. The arc of the celestial equator, or the angle at the celestial pole, between the upper branch of the Greenwich celestial meridian and the hour circle of the Vernal Equinox, measured westward from the upper branch of the Greenwich celestial meridian through 24 hours; Greenwich Hour Angle of the vernal equinox, expressed in time units.
- GROUND DISTANCE - The great-circle distance between two ground positions, as contrasted with slant range, the straight-line distance between two points. Also called Ground Range.
- GRID - A uniform system for rectilinear lines superimposed on aerial photographs, mosaics, maps, charts, and other representations of the earth's surface; used in defining the coordinate positions of points.
- GRID COORDINATES - See COORDINATES.
- GRID METHOD (Photogrammetry) - A method of plotting detail from oblique photographs by superimposing a perspective of a map grid on a photograph and transferring the detail by eye, that is, by using the corresponding lines of the map grid and its perspective as placement guides. (See also PERSPECTIVE GRID.)

- GRID PLATE - A glass plate on which is etched an accurately ruled grid. Sometimes used as a Focal-Plane Plate to provide a means of calibrating film distortion; used also for calibration of plotting instruments. Sometimes called a Reseau.
- GROUND CAMERA - The preferred term is Terrestrial Camera. See CAMERA.
- GROUND CONTROL - See CONTROL.
- GROUND CONTROL POINT - See CONTROL POINT and CONTROL STATION.
- GROUND PHOTOGRAMMETRY - See TERRESTRIAL PHOTOGRAMMETRY.
- GROUND PHOTOGRAPH - The preferred term is Terrestrial Photograph.
- GROUND PLANE (Photogrammetry) - The horizontal plane passing through the ground nadir of a camera station.
- GROUND PLUMB POINT - The preferred term is Ground Nadir. (See under NADIR.)
- GROUND RESOLUTION - See RESOLUTION.
- GROUND SPEED (Air Navigation) - The rate of motion of an aircraft along its Track with relation to the ground; the resultant of the Heading and Air Speed of an aircraft and the direction and velocity of the wind. (See also AIR SPEED.)
- GROUND SURVEY - See SURVEY.
- GROUND TRACE - The preferred term is Ground Parallel (See under PRINCIPAL PLANE.)
- GROUND TRUTH - Data and observations of the earth's surface normally to quantify simultaneously recorded remote sensing imagery.
- GYROCOMPASS - A compass which functions virtually of the couples generated in a rotor when the latter's axis is displaced from parallelism with that of the Earth. A gyrocompass is independent of magnetism and will automatically align itself in the celestial meridian. However, it requires a steady source of motive power and is subject to dynamic error under certain conditions. Certain aircraft compasses also use gyroscopes to gain stability, while relying basically on the magnetic meridian; these are to be distinguished from the true gyrocompass.
- GYROSCOPIC STABILIZATION - Equilibrium in the attitude and/or course of a ship or airborne vehicle maintained by the use of gyroscopes. Also, the maintenance (by the use of gyroscopes) of a camera in a desired attitude within an airborne vehicle.
- H AND D CURVE - See CHARACTERISTIC CURVE.

HALATION (Photography) - A spreading of a photographic image beyond its proper boundaries, due especially to reflection from the side of the film or plate support opposite to that on which the emulsion is coated. Particularly noticeable in photographs of bright objects against a darker background. Antihalation Coating (Photography) - A light absorbing coating applied to the back side of the support of a film or plate (or between the emulsion and the support) to suppress halation.

HALFTONE - Any photomechanical printing surface or the impression therefrom in which detail and tone values are represented by a series of evenly spaced dots of varying size and shape, varying in direct proportion to the intensity of the tones they represent. Contrast with Continuous Tone.

HALFTONE SCREEN - A grating of opaque lines on glass, crossing at right angles, producing transparent apertures between inter-sections. Used in a process camera to break up a solid or Continuous Tone image into a pattern of small dots. Also called Crossline Glass Screen. See also CONTACT SCREEN.

HAND TEMPLET - See TEMPLET.

HAND-TEMPLET METHOD - See TEMPLET and RADIAL TRIANGULATION.

HAND-TEMPLET PLOT - See RADIAL TRIANGULATION.

HAND-TEMPLET TRIANGULATION - See TEMPLET and RADIAL TRIANGULATION.

HAZE - A lack of transparency of the atmosphere, caused by the presence of foreign matter, such as dust or smoke.

HEADING (Air Navigation) - Azimuth of the longitudinal axis of an aircraft.

HEIGHT DISPLACEMENT - See RELIEF DISPLACEMENT under DISPLACEMENT.

HEIGHT FINDER - A stereoscopic range finder so constructed as to indicate vertical heights rather than slant range. See also STEREOMETER.

HIGH-OBLIQUE PHOTOGRAPH - See OBLIQUE PHOTOGRAPH.

HIRAN - An electronic distance-measuring system similar to Shoran, but with improved accuracy, for measuring distances from an airborne station to each of two ground stations. The term Hiran is a contraction of "high-precision shoran." See also SHORAN.

HOLOGRAM - A negative produced by exposing a high-resolution photographic plate without camera or lens, near a subject illuminated by monochromatic, coherent radiation as from a laser; when placed in a beam of coherent light a true 3-D image of the subject is formed.

HOMOLOGOUS IMAGES - The images of a single object point that appears on each of the two or more overlapping photographs having different perspective centers. See also CORRESPONDING IMAGES.

HOMOLOGOUS PHOTOGRAPHS - are two or more overlapping photographs having different camera stations.

HORIZON - In general, the apparent or visible line of demarcation between land/sea and sky, as seen from any specific position. Also called the Apparent Horizon, Local Horizon, Topocentric Horizon, or Visible Horizon. True Horizon - A horizontal plane passing through a point of vision or a perspective center. The Apparent or Visible horizon approximates the True horizon only when the point of vision is very close to sea level.

HORIZON CAMERA - See CAMERA.

HORIZON, DIP OF - See DIP ANGLE.

HORIZON PHOTOGRAPH (Aerial Photography) - A photograph of the horizon taken simultaneously with another photograph for the purpose of obtaining an indication of the orientation of the other photograph at the instant of exposure. (See also HORIZON CAMERA under CAMERA.)

HORIZON TRACE - See PRINCIPAL PLANE.

HORIZONTAL CONTROL - See CONTROL.

HORIZONTAL-CONTROL DATUM - See DATUM.

HORIZONTAL CONTROL STATION or HORIZONTAL CONTROL POINT - See CONTROL STATION.

HORIZONTAL COPLANE - See COPLANAR.

HORIZONTAL PASS POINT - See PASS POINT.

HORIZONTAL PARALLAX - See ABSOLUTE STEREOSCOPIIC PARALLAX under PARALLAX.

HORIZONTAL PHOTOGRAPH - A photograph taken with the axis of the camera horizontal.

HORIZONTAL PLANE - See DATUM.

HOUR ANGLE - Angular distance west of a celestial meridian or hour circle; the arc of the celestial equator, or the angle at the celestial pole, between the upper branch of a celestial meridian or hour circle and the hour circle of a celestial body or the vernal equinox, measured westward through 360 degrees.

HUMIDITY - Degree of wetness, especially of the atmosphere. Relative Humidity - Ratio of water vapor present, at a given temperature, to the greatest amount possible at that temperature. Absolute Humidity - The weight of water vapor contained in a given volume of air, in grains per cubic foot or grams per cubic meter. Specific Humidity - The weight of water vapor per unit weight of the moist air.

HYDROGRAPHIC MAP - see MAP.

HYPSONOGRAPH - An instrument of the sliderule type used to compute elevations from vertical angles and horizontal distances.

HYPSONOGRAPHY - See TOPOGRAPHY.

HYPSONOMETRY - The determination of elevations above sea level. Generally applied to the determination of elevations through the measurement of air pressure by observing the boiling point of a liquid.

HYPERSTEROSCOPY - Stereoscopic viewing in which the scale (usually vertical) along the line of sight is exaggerated in comparison with the scale perpendicular to the line of sight. Also called Appearance Ratio; Exaggerated Stereo; Relief Stretching; Stereoscopic Exaggeration.

IMAGE - The permanent record of the likeness of any natural or manmade features, objects and activities. Images can be acquired directly on photographic materials using cameras, or indirectly if non-imaging types of sensors have been used in data collection.

IMAGE, LATENT - See LATENT IMAGE.

IMAGE MOTION - The smearing or blurring of imagery on an aerial photograph because of the relative movement of the camera with respect to the ground during exposure.

IMAGE-MOTION COMPENSATOR - A device installed with certain aerial cameras to compensate for the forward motion of an aircraft while photographing ground objects. True image-motion compensation must be introduced after the camera is oriented to the flight track of the aircraft and the camera is fully stabilized.

IMAGE MOTION FACTORS - Those factors wherein the image motion varies directly with the aircraft ground speed and lens focal length and inversely with the altitude.

IMAGE PLANE - The plane in the camera in which the plate or film is held. It is not exactly the primary focal plane of the lens, but is a plane placed so as to secure the best balance of sharp focus on all parts of the plate or film. Also called Photograph Plane.

- IMAGE POINT - Image on a photograph corresponding to a definite object point.
- IMAGERY - The visual representation of energy recorded by cameras and other remote sensing instruments.
- INDEPENDENT MODEL TRIANGULATION - See SEMI-ANALYTICAL AEROTRIANGULATION.
- INCIDENT NODAL POINT - See NODAL POINT.
- INDEX CORRECTION - 1. A correction applied to the reading from any graduated measuring device to compensate for a Constant Error such as would be caused by misplacement of the scale; the reverse of the Index Error. 2. (Leveling) That correction which must be applied to an observed difference of elevation to eliminate the error introduced into the observations when the zero of the graduations on one or both leveling rods does not coincide exactly with the actual bottom surface of the rod.
- INDEX ERROR - The Instrumental Error which is constant and attributable to displacement of a vernier or some analogous effect.
- INDEX MAP - 1. A map of smaller scale on which are depicted the locations (with accompanying designations) of specific data, such as larger-scale topographic quadrangles or geodetic control. 2.(Photography) A map showing the location and numbers of flight strips and photographs. Photoindex - A Mosaic (not an Index Map) made by assembling individual photographs, with accompanying designations, into their proper relative positions and copying the assembly photographically at a reduced scale.
- INDEX MARK - See FLOATING MARK. Also called INDEX MOSAIC.
- INDEX MOSAIC - See PHOTOINDEX under INDEX MAP.
- INDEX OF REFRACTION - See SNELL'S LAW OF REFRACTION.
- INDEX OF PHOTOGRAPHY - Photography in which the camera records an Image cast upon a screen or similar display surface by electronic (television, radar, etc.) or other means.
- INDUSTRIAL PHOTOGRAMMETRY - Encompasses the application of photogrammetry in building construction, civil engineering, mining, vehicle and machine construction, metallurgy, ship-building and traffic, with their fundamental and border subjects, including phases of research, planning, production engineering, manufacturing, testing, monitoring, repair and reconstruction. (See also CLOSE-RANGE PHOTOGRAMMETRY.)
- INERTIAL SURVEYING - The determination of geodetic positions through the use of gyroscopically oriented accelerometers which measure the three-dimensional components of changes in position as they are moved from point to point.

INFRACHROMATIC - A term used to describe Emulsions sensitive to Infra-red radiations as used for infra-red photography.

INFRARED (Photography) - Pertaining to or designating the portion of the electromagnetic Spectrum with wavelengths just beyond the red end of the visible spectrum, such as radiation emitted by a hot body. Invisible to the eye, infrared rays are detected by their thermal and photographic effects. Their wavelengths are longer than those of visible light and shorter than those of radio waves.

INFRARED FILM - Film containing an Emulsion especially sensitive to infrared and blue light.

INSTRUMENT PHOTOTRIANGULATION - See STEREOTRIANGULATION.

INTERFERENCE FRINGES - See TEST GLASS.

INTERIOR ORIENTATION - See ORIENTATION.

INTERIOR PERSPECTIVE CENTER - See PERSPECTIVE CENTER.

INTEROCULAR DISTANCE - Synonymous with Interpupillary Distance and Eye Base.

INTERPRETATION OF PHOTOGRAPHS - See PHOTOINTERPRETATION.

INTERPRETER - A Computer program that translates and executes each source language statement before translating and executing the next one.

INTERPUPILLARY - The distance between the pupils of the eyes of an individual. Also called Eye Base and Interocular Distance.

INTERSECTION - The procedure of determining the position of an object point by intersecting lines of direction obtained photogrammetrically. The lines of direction may be obtained analogically by stereoplotter restitution or by graphic or mathematical means.

INTERVALOMETER - A timing device for automatically operating the shutter of a camera at selected intervals. See EXPOSURE INTERVAL.

INVERSORS (Photography) - Mechanical devices used to maintain correct Conjugate Distances and collinearity of negative, lens, and easel planes in autofocusing optical instruments, such as copy cameras and rectifiers. Carpentier Inversor - One of the inversors which corrects for the Scheimpflug condition in a rectifier if the negative, lens, or easel planes are tilted and not parallel.

IRIS DIAPHRAGM - A continuously variable circular aperture in a lens which makes it possible to control the amount of light passing through the lens. Also called a Stop. (See APERTURE STOP.)

ISOCENTER - 1. The unique point common to the plane of a photograph, its Principal Plane, and the plane of an Equivalent Vertical Photograph taken from the same camera station and having an equal principal distance. 2. The point of intersection on a photograph of the Principal Line and the Isometric Parallel. 3. The point on a photograph intersected by the bisector of the angle between the plumbline and the photograph perpendicular. The isocenter is significant because it is the center of radiation for displacements of images due to tilt.

ISOCENTER PLOT - See RADIAL TRIANGULATION.

ISOCENTER TRIANGULATION - See RADIAL TRIANGULATION.

ISOLINE - A line representing the intersection of the plane of a vertical photograph with the plane of an overlapping oblique photograph. If the vertical photograph were tilt-free, the isoline would be the Isometric Parallel of the oblique photograph.

ISOMETRIC PARALLEL - See PHOTOGRAPH PARALLEL under PRINCIPAL PLANE.

ISORADIAL - See RADIAL.

LAMBERT - A photometric unit of surface brightness or Luminance which is defined as the brightness of a perfectly diffuse plane surface radiating One Lumen Per Square Centimeter; also equivalent to $1/\pi$ Candela Per Square Centimeter.

LAMBERT CONFORMAL CONIC MAP PROJECTION - See MAP PROJECTION.

LASER TERRAIN PROFILE RECORDER - An electronic instrument that emits a continuous wave laser beam from an aircraft to measure vertical distances between the aircraft and the Earth's surface.

LASER - An acronym for "Light Amplification by Stimulated Emission of Radiation." A device producing coherent-energy beams in the spectrum of light-or-near-light frequencies.

LATENT IMAGE (Photography) - An invisible image produced by the physical or chemical effect of light upon matter (usually silver halide or halides), which can be rendered visible by the subsequent chemical process of photographic Development.

LATERAL CHROMATIC ABERRATION (Lens) - See ABERRATION.

LATERAL MAGNIFICATION - See MAGNIFICATION.

LATERAL-OBLIQUE PHOTOGRAPH - See OBLIQUE PHOTOGRAPH.

LATERAL REFRACTION - The horizontal component of the refraction of light through the atmosphere.

LATERAL TILT - See ROLL.

LATITUDE - The range of photographic Exposure which will result in a satisfactory negative. It is measured by the ratio of the maximum exposure which will yield a satisfactory negative to the minimum exposure. The latitude of a film is greatest when applied to photograph a subject with low Contrast. The term is also applied to printing papers. See also CHARACTERISTIC CURVE.

LAYDOWN - See MOSAIC.

LEAST COUNT - Micrometer or Vernier - The finest reading that can be made directly (without estimation) from a vernier or micrometer.

LEAST SQUARES - A method of adjusting observations in which the sum of the squares of all the Deviations or Residuals derived in fitting the observations to a mathematical model is made a minimum.

LEGEND - A description, explanation, table of symbols, and other information, printed on a Map or Chart to provide a better understanding and interpretation of it. The title of a map or chart formerly was considered part of the legend, but this usage is obsolete.

LENS (Optics) - A piece, or combination of pieces of glass or other transparent material shaped to form an image by means of Refraction. Angle of Coverage - The apex angle of the cone of rays passing through the front nodal point of a lens. Lenses generally are classified according to their angles of coverage, as follows: Narrow-Angle - less than 60 degrees, Normal-Angle - 60 degrees to 75 degrees, Wide-Angle - 75 degrees to 100 degrees, Super-Wide-Angle or Ultra-Wide-Angle - greater than 100 degrees. (See also APERTURE STOP). Positive Lens - A lens that converges a beam of parallel light rays to a point focus. Also called Converging Lens. Negative Lens - A lens diverging a beam of parallel light rays, with no real focus being obtained. Also called Diverging Lens.

LENS CALIBRATION - See CAMERA CALIBRATION under CALIBRATION.

LENS COMPONENT - See LENS ELEMENT.

LENS DISTORTION - See DISTORTION under ABERRATION.

LENS ELEMENT - One lens of a complex lens system. In a photographic lens, the terms Front Element and Rear Element are often used.

LENS PAPER - A fine soft tissue paper used to clean or polish lenses.

LENS SPEED - See RELATIVE APERTURE.

LENS STEREOSCOPE - See STEREOSCOPE.

LEVEL SURFACE - See GEOID.

- LEVELING (Photogrammetry) - In Absolute Orientation, the operation of bringing the modal datum parallel to a reference plane, usually the tabletop of the stereoplottting instrument. Also called Horizontalizing the Model; Leveling the Model. See ABSOLUTE ORIENTATION under ORIENTATION.
- LIGHT RAY - See RAY OF LIGHT.
- LINEAR DISTORTION - See DISTORTION CURVE.
- LINEAR MAGNIFICATION - See MAGNIFICATION.
- LINEAR PARALLAX - See ABSOLUTE STEREOSCOPIC PARALLAX under PARALLAX.
- LINE OF COLLIMATION (Optics) - The line through the second nodal point of the objective lens of a telescope and the center of the reticle. Also called Line of Sight; Sight Line; Pointing Line; Aiming Line of the Instrument. See also COLLIMATION AXIS and COLLIMATION ERROR.
- LINE OF CONSTANT SCALE - Any line on a photograph which is parallel to the True Horizon or to the Isometric Parallel. Also called Line of Equal Scale.
- LIST - The preferred term is x Tilt. See TILT, and OMEGA (ω) under ROLL.
- LOCAL HORIZON - See HORIZON.
- LOCATING BACK (Aerial Photography) - A plane surface in an aerial camera parallel to but out of the focal plane by an amount equal to the thickness of the film. The film is held against the locating back by vacuum or by air pressure so that the emulsion surface lies in the focal plane at the instant of exposure. Locating backs are usually of metal; they are perforated or slotted to allow for the building up of a differential pressure or for the removal of air in the formation of a vacuum. A locating back which uses a vacuum is known as a Vacuum Back, and one which uses pressure is known as a Pressure Back.
- LONGITUDINAL CHROMATIC ABERRATION - See ABERRATION.
- LONGITUDE - A linear or angular distance measured east or west from a reference meridian (usually Greenwich) on a sphere or spheroid.
- LONGITUDINAL CHROMATIC ABERRATION - See ABERRATION.
- LONGITUDINAL TILT - See TILT, and PHI (ϕ) under PITCH.
- LORAN - A method of applying pulse techniques to navigation; an acronym of the phrase "Long-Range Navigation." A pulsed transmitter (known as the master station) triggers one or more other pulsed

transmitters (known as slave stations) which may be as far as several hundred miles away. A mobile receiver is provided to measure the difference in time of arrival of the coded signals or pulses from the master and slave stations. If a receiver is moved in a manner to keep a constant time difference, it follows a hyperbolic path. A number of such paths may be drawn on a chart for each set or pair of the high-power, permanent, land-based stations used. Several sets of stations make it possible to prepare a chart containing many intersecting families of such hyperbolas. By noting where these hyperbolas intersect on the charts, the navigator can obtain a position fix. (See also Hiran and Shoran.)

LOWER SHUTTER - See SHUTTER.

LOW-OBLIQUE PHOTOGRAPH - See OBLIQUE PHOTOGRAPH.

LOXODROMIC CURVE - Synonymous with RHUMBLINE.

LUMEN - The unit of luminous flux, equal to the flux through a solid angle (steradian) from a uniform point source of one candela, or to the flux on a unit surface all points of which are at unit distance from a uniform point source of one candela.

LUMINANCE - In photometry, a measure of the intrinsic luminous intensity emitted by a source in a given direction; the illuminance produced by light from the source upon a unit surface area oriented normal to the line of sight at any distance from the source, divided by the solid angle subtended by the source at the receiving surface. Also called Brightness (luminance is preferred). See LAMBERT. It is assumed that the medium between source and receiver is perfectly transparent; therefore luminance is independent of extinction between the source and receiver. The source may or may not be self-luminous. Luminance is a measure only of light; the comparable term for Electromagnetic Radiation in general is radiance.

LUX - A unit of illumination equivalent to one Lumen of incident light per square meter.

MAGAZINE (Photography) - A container for rolled film or photographic plates, attached to the camera body and usually equipped with automatic mechanisms that advance and position the photographic material for exposure.

MAGNETIC DECLINATION - The angle between True (geographic) north and Magnetic north (direction of the compass needle). The magnetic declination varies for different places and changes continuously with respect to time.

MAGNETIC NORTH - The uncorrected direction indicated by the north seeking end of a compass needle. Also called Compass North. Also see MAGNETIC DECLINATION.

MAGNIFICATION (Optics) - The ratio of the size of an image to the size of the object. Linear Magnification - The ratio of a linear quantity in the image to a corresponding linear quantity in the object. It may be Lateral Magnification or Longitudinal Magnification - The ratio of a length in the image, perpendicular to the lens axis, to a corresponding length in the object. Longitudinal Magnification - The ratio of a length in the image, parallel to the axis, to a corresponding length in the object. Angular Magnification - The ratio of the angle subtended at the eye by the image formed by an optical device, to the angle subtended at the eye by the object itself without the optical device. This is convenient where a distance in the object cannot be measured for expressing a Linear Magnification, as in using a telescope.

MANUSCRIPT MAP - See MAP.

MAP - A representation (usually on a flat medium) of all or a portion of the earth or other celestial body, showing the relative size and position of features to some given scale or projection; also, a representation of all or part of the celestial sphere. A map may emphasize, generalize, or omit the representation of certain features to satisfy specific requirements. Maps are frequently categorized and referred to according to the type of information which they are designed primarily to convey, to distinguish them from maps of other types. Topographic Map - A map which represents the horizontal and vertical positions of the features represented; distinguished from a Planimetric Map by the addition of relief in measurable form. A topographic map show mountains, valleys, and plains; and, in the case of hydrographic charts, symbols and numbers to show depths in bodies of water. Contour Map - A topographic map which portrays relief by means of Contour Lines. Planimetric Map - A map which presents only the horizontal positions for the features represented; distinguished from a topographic map by the omission of relief in measurable form. Base Map - A map showing certain fundamental information, used as a base upon which additional data of specialized nature are compiled. Also, a map containing all the information from which maps showing specialized information can be prepared; a source map. Cadastral Map - A map showing the boundaries of subdivisions of land, usually with the bearings and lengths thereof and the areas of individual tracts, for purposes of describing and recording ownership. A cadastral map may also show culture, drainage, and other features relating to the value and use of land. Hydrographic Map - A map showing a portion of the waters of the earth, including shorelines, the topography along the shores and of the submerged portions, and as much of the topography of the surrounding country as is necessary for the purpose intended. (See also NAUTICAL CHART.) Manuscript Map - The original drawing of a map as compiled or constructed from various data (such as ground surveys or photographs). See also COMPILATION MANUSCRIPT. Special-Purpose Map - Any map designed primarily to meet specific requirements. Usually the map information portrayed on a special-purpose map is emphasized by omitting or subordinating nonessential or less important

nformation. A word or phrase is usually employed to describe the type of information which a special-purpose map is designed to present - for example, Route, Tax, or Index map. See also COMPOSITE MAP.

MAP COMPILATION - See COMPILATION.

MAP NADIR - See NADIR

MAP PARALLEL - The intersection of the plane of a photograph with the plane of the map. (See also AXIS OF HOMOLOGY.) Ground Parallel - The intersection of the plane of the photograph with the plane of reference of the ground (See also AXIS OF HOMOLOGY).

MAP PROJECTION - A systematic drawing of lines on a plane surface to represent the parallels of altitude and the meridians of longitude of the earth or a section of the earth. Conformal Map Projection - A map projection on which the shape of any small area of the surface mapped is preserved unchanged, and all angles around any point are correctly represented. Also called Orthomorphic Map Projection. Conic Map Projection - A map projection produced by projecting the geographic meridians and parallels onto a cone which is tangent to (or intersects) the surface of a sphere, and then developing the cone into a plane. Conic map projections may be considered as including cylindrical map projections when the apex of the cone is at an infinite distance from the sphere, and projections on a tangent plane when that distance is zero. Conic Map Projection with Two Standard Parallels - A conic map projection in which the surface of a sphere or spheroid, such as the earth, is conceived as developed on a cone which intersects the sphere or spheroid along two standard parallels. The Lambert Conformal Projection is an example. Also called Secant Conic Map Projection. Orthographic Map Projection - A perspective azimuthal projection in which the projecting lines, emanating from a point at infinity, are perpendicular to a tangent plane. This project is used chiefly in navigational astronomy for inter-converting coordinates of the celestial equator and horizon systems. Also called Orthogonal. Lambert Conformal Conic Map Projection - A conformal map projection of the conical type, on which all geographic meridians are represented by straight lines which meet in a common point outside the limits of the map, and the geographic parallels are represented by a series of arcs of circles having this common point for a center. Meridians and parallels intersect at right angles, and angles of the Earth are correctly represented on the projection. This projection may have one standard parallel along which the scale is held exact; or there may be two such standard parallels, both maintaining exact scale. At any point on the map, the scale is the same in every direction. It changes along each meridian. Where there are two standard parallels, the scale between those parallels is too small; beyond them, too large. Also called

Lambert Conformal Map Projection. One of the common projections used in the State Plane Coordinate Systems.

MAPPING CAMERA - See CAMERA.

MAPPING PHOTOGRAPHY - Aerial photography obtained by precisely calibrated Mapping Cameras and conforming to mapping specifications, as distinguished from aerial photography for other purposes. Also called Aerial Cartographic Photography, Cartographic Photography; Charting Photography; Survey Photography.

MAP SUBSTITUTE - A hasty reproduction of wide-coverage aerial photographs, photomaps, or mosaics, or of provisional maps, or any document used in place of a map, when the precise requirements of a map cannot be met.

MARK, FLOATING - See FLOATING MARK.

MATCHING - The act by which detail or information on the edge, or overlap area, of a Map or Chart is compared, adjusted, and corrected to agree with the existing overlapping map or chart. See also COMPILATION and REVISION.

MATRIX - A rectangular array of numbers or functions called Elements, arranged in rows and columns and used to facilitate the study or solution of simultaneous linear equations. Matrix Algebra - The science of the treatment of the fundamental mathematical operations involving matrices.

MATTE PRINT - Print made on photographic paper with a dull finish; more suitable for pencil or ink annotations than a glossy print but less suitable for interpretation than a semi-matte print.

MEAN DATUM PLANE - See VERTICAL-CONTROL DATUM under DATUM.

MEAN SEA LEVEL - (MSL) The average height of the surface of the sea for all stages of the tide, usually determined by averaging height readings observed hourly over a minimum period of 19 years. (See also VERTICAL-CONTROL DATUM under DATUM.)

MECHANICAL TEMPLET - See SPIDER TEMPLET under TEMPLET.

MECHANICAL-TEMPLET PLOT - See RADIAL TRIANGULATION.

MECHANICAL-TEMPLET TRIANGULATION - See RADIAL TRIANGULATION.

MENSURATION - The act, process, or art of measuring.

MERCURY BAROMETER - See BAROMETER.

MERIDIAN - A north-south reference line, particularly a great circle through the geographical poles of the earth, from which longitudes and azimuths are determined; or a plane, normal to the geoid or spheroid, defining such a line.

MERIDIONAL PLANE - Any plane containing the Polar Axis of the earth. (See also MERIDIAN and POLAR BEARING.)

METAL TEMPLET - See SPIDER TEMPLET under TEMPLET.

METRE - (abbr. m) - The basic unit of length of the metric system, defined as 1,650,763.73 wavelengths in vacuo of the unperturbed transition 2_{p10}^{-5d} in krypton μ . Effective 1 July 1959 in the U.S. customary system of measures, 1 yard = 0.9144 metre, exactly, or 1 metre = 1.094 yards = 39.37 inches. The standard inch is exactly 25.4 millimetre.

METRE-CANDLE-SECOND - A unit of exposure in sensitometry; one second of exposure at a distance of one metre from a light source of one candle-power.

METRIC CAMERA - See CAMERA.

METRIC PHOTOGRAPH - A photograph taken by a Metric Camera.

METRIC PHOTOGRAPHY - The recording of events by means of photographs, either singly or sequentially, together with appropriate coordinates, to form the basis for accurate measurements.

MICRODENSITOMETER - A special form of densitometer for reading densities in very small areas; used for studying astronomical images, spectroscopic records, and for measuring image edge gradients and graininess in films.

MICROMETER - An auxiliary device to provide measurement of very small angles or dimensions by an instrument.

MICRO-METRE - A unit of length equal to 1 millionth of a metre.

MICRON - An abbreviated term equivalent to Micro-Metre. The preferred term is micro metre.

MIL - A unit of length equal to 1/1,000 of an inch.

MILLIMETRE - A unit of length; 1/1,000 of a metre; mm. Standard abbreviation for millimeter.

MILLIMICRO-METRE - A unit of length in the metric system; the thousandth part of a micrometre, 10 Angstrom units (m μ). Standard abbreviation for Millimicron.

MINOR CONTROL - See PHOTOGRAMMETRIC CONTROL under CONTROL.

MINOR-CONTROL PLOT - See RADIAL TRIANGULATION.

MINUS COLOR - A Complementary Color. For example, minus blue is Complementary to blue.

MIRROR STEREOSCOPE - See STEREOSCOPE.

MISTAKE - See BLUNDER under ERROR.

MODEL COORDINATES - The space coordinates of any point in a stereoscopic model which define its position with reference to the air base or to the instrument axes.

MODEL DATUM - That surface in a stereoscopic model conceived as having been reconstructed as part of the model representing the sea-level datum of nature.

MODEL, MATHEMATICAL - A mathematical representation, usually of a process, device, or concept, which permits mathematical manipulation of variables as a means of determining how the process, device, or concept would behave in various situations, such as under the application of a specific stimulation.

MODEL SCALE - The relationship which exists between a distance measured in a stereoscopic model and the corresponding object distance.

MODULATION TRANSFER FUNCTION (MTF) - An optical analogue to general systems theory whereby the total resolution of the components of an optical system can be measured in terms of brightness as a linear function.

MOIRE EFFECT - A pattern which is produced when two or more screens of similar pattern are placed one over the other, but slightly out of register.

MONOCHROMATIC - Containing light or wavelength of one color.

MONOCOMPARATOR - See COMPARATOR.

MONOCULAR VISION - Vision related to or adapted to the use of one eye.

MOSAIC (Photogrammetry) - An assembly of aerial photographs whose edges usually have been torn, or cut, and matched to form a continuous photographic representation of a portion of the earth's surface. Often Called Aerial Mosaic. Featheredging - The thinning of overlapping edges of photographs before assembling into a Mosaic in order to make match lines less noticeable. When overlapping edges are feathered, shadows and sharp changes in contrast are reduced or eliminated. Also called Feathering. Laydown - Often used to designate a mosaic temporarily assembled from uncropped prints. Controlled Mosaic - A mosaic oriented and scaled to horizontal ground control; usually assembled from rectified photographs. Semi-Controlled Mosaic - A mosaic composed of corrected or uncorrected prints laid to a common basis of orientation other than ground control. Uncontrolled Mosaic - A mosaic composed of uncorrected prints, the detail of which has been matched from print to print without ground control or other orientation. Strip Mosaic - A mosaic consisting

of one strip of photographs or images taken on a single flight.
Orthophotomosaic - An assembly of orthophotographs forming a uniform scale mosaic.

MOSAICKING - The assembling of photographs or other images, the edges of which are cut and matched to form a continuous photographic representation of a portion of the Earth's surface. Center to Center Method - A method of assembling a strip mosaic from aerial photographs with a more than 50% overlap by matching a point near the center with corresponding points in the overlap area of adjacent pictures.

MOST PROBABLE VALUE - That value of a quantity which is mathematically determined from a series of observations and is more nearly free from the effects of blunders and errors than any other value that might be derived from the same series of observations.

MULTIBAND CAMERA - See CAMERA.

MULTIBAND PHOTOGRAPHY (or) MULTIBAND COLOR PHOTOGRAPH (or) MULTI-SPECTRAL PHOTOGRAPH - Photography using a camera or other device that gives simultaneous imagery in each of several portions of the spectrum (e.g., blue, 400-500 millimicrometres; green 500-600, red 600-700, infrared 700+).

MULTIPLE-CAMERA ASSEMBLY - See CAMERA.

MULTIPLE-LENS CAMERA - See CAMERA.

MULTIPLE-LENS PHOTOGRAPH - A photograph made with a multiple-lens camera. (See also MULTIPLE-LENS CAMERA under CAMERA.)

MULTIPLEX - A name applied to anaglyphic double-projection Stereo-plotters with the following characteristics: 1. The stereomodel is projected from diapositives reduced from an aerial negative according to a fixed ratio; 2. The projection system illuminates the entire diapositives formed area; and 3. The stereomodel is measured and drawn by observation of a floating mark.

MULTIPLEX TRIANGULATION - See STEREOTRIANGULATION.

MULTISPECTRAL PHOTOGRAPHY - See MULTIBAND PHOTOGRAPHY.

NADIR - The point on the Celestial Sphere directly beneath the observer and directly opposite to the Zenith. Photograph Nadir - (Photogrammetry) - The point at which a vertical line through the perspective center of the camera lens pierces the plane of the photograph. Also referred to as the Nadir Point. Ground Nadir - The point on the ground vertically beneath the perspective center of the camera lens. Map Nadir - The map position for the Ground Nadir.

NADIR-POINT PLOT - See RADIAL TRIANGULATION.

NADIR-POINT SLOTTED-TEMPLET PLOT - See RADIAL TRIANGULATION.

NADIR RADIAL - See RADIAL.

NARROW RADIAL - See RADIAL.

NARROW-ANGLE LENS - See ANGLE OF CONVERGENCE under LENS.

NAUTICAL CHART - A map especially designed for the mariner, on which are shown navigable waters and the adjacent or included land, if any, and on which are indicated depths of water, marine obstructions, aids to navigation, and other pertinent information. Also called Hydrographic Chart.

NEAR INFRARED - The preferred term for the shorter wavelengths in the infrared region extending from about 0.7 micrometers (visible red), to around 2 or 3 micrometers. The longer wavelength end grades into the middle infrared. The term really emphasizes the radiation reflected from plant materials, which peaks around 0.85 micrometers. It is also called solar infrared, as it is only available for use during the daylight hours.

NEAT MODEL - The portion of the gross overlap of a pair of photographs that is actually utilized in photogrammetric procedures. Generally, the neat model approximates a rectangle whose width equals the air base and whose length equals the width between flights.

NEGATIVE - A photographic image on film, plate, or paper, in which the subject tones to which the emulsion is sensitive are reversed or complementary.

NEGATIVE ALTITUDE - Angular distance below the horizon.

NEGATIVE LENS - See LENS.

NEUTRAL DENSITY FILTER - A gray filter used to reduce exposure when a lens cannot be stopped down sufficiently.

NEWTON RING (Photography) - Concentric bands of colored light sometimes seen around the areas where two transparent surfaces are not quite in contact. The rings are the result of interference and occur when the separation between the surfaces are of the same order as the wave length of light. These concentric bands appear as dark and light rings on photographic film and paper.

NODAL POINT (Optics) - One of two points on the optical axis of a lens (or a system of lenses) such that, when all object distances are measured from one point and all image distances are measured from the other, they satisfy the simple lens relation (conjugate-foci formula): $1/f = 1/I + 1/O$. A ray emergent from the second point is parallel to the ray incident at the first. The first nodal point is referred to also as the Front Nodal Point or Incident Nodal Point, and the second point as the

Rear Nodal Point or Emergent Nodal Point. Also called simply Node, as Front Node. (See also CONJUGATE DISTANCE.) Nodal Plane - A plane perpendicular to the optical axis at a nodal point. Principal Points - When the initial and final media have different indexes of refraction, another set of points is introduced, known as Principal Points. These points possess the following property: When a small object is placed at right angles to the camera axis at one of these points, the size of the image formed at the other point equals the size of the object. When the two media have the same index of refraction, the principal points and the nodal points coincide.

NODE - See NODAL POINT.

NOMINAL FOCAL LENGTH - See FOCAL LENGTH.

NON-METRIC CAMERA - A camera whose Interior Orientation is completely or partially unknown and frequently unstable.

NON-METRIC PHOTOGRAPH - A photograph taken by a Non-Metric Camera.

NON-SHRINK PAPER - Photographic paper treated to be dimensionally stable under a wide variety of humidity and temperature conditions. Most expensive of all photographic paper. See also DIMENSIONAL STABILITY.

NONTILTING LENS RECTIFIER - A class of rectifier wherein the lens is constrained to move in the direction of its fixed axis.

NON-TOPOGRAPHIC PHOTOGRAMMETRY - Photogrammetry applied outside the realm of topographic mapping.

NORMAL-ANGLE LENS - See ANGLE OF COVERAGE under LENS.

NORMAL CONTOUR - See ACCURATE CONTOUR under CONTOUR LINE.

NORMAL EQUATION - One of a set of simultaneous equations derived from Observation, Condition, or Correlate Equations, and expressing a condition for a Least Squares adjustment. In a least squares adjustment, values obtained from the solution of normal equations (either directly or through the correlate equations) are applied to the observation or condition equations to obtain the desired corrections.

NORMAL-ANGLE LENS - See ANGLE OF COVERAGE under LENS.

NORTH AMERICAN DATUM OF 1927 - See DATUM.

OBJECTIVE LENS - In telescopes and microscopes, the optical component which receives light from the object and forms the first or primary image. In a camera, the image formed by the objective lens is the final image. In a telescope or microscope used visually, the image formed by the objective lens is magnified by the eyepiece.

OBLIQUE PHOTOGRAPH - A photograph taken with the camera axis intentionally directed between the horizontal and the vertical. High-Oblique Photograph - An oblique photograph in which the apparent horizon is included within the field of view. Low-Oblique Photograph - An oblique photograph in which the apparent horizon is not included within the field of view. Lateral-Oblique Photograph - An oblique aerial photograph taken with the camera axis as nearly as possible normal to the flight line. Also called Lateral Oblique.

OBLIQUE PLOTTING INSTRUMENT - An instrument (usually monocular) for plotting from oblique photographs. An oblique sketchmaster is such an instrument.

OBSERVATION EQUATION - A condition equation which connects inter-related unknowns by means of an observed function, or a condition equation connecting the function observed and the unknown quantity whose value is sought.

OCCUPY (Surveying) - To observe with a surveying instrument at a Station.

OPACITY - See CHARACTERISTIC CURVE.

OPERATOR, MACHINE - The person who actually manipulates the computer controls. Places data media into the input devices, removes output, mounts reels of tape, pushes initiate buttons, and performs othersimilar duties.

OPTICAL AXIS - In a lens element, the straight line which passes through the centers of curvature of the lens surfaces. Also called Principal Axis. In an optical system, the line formed by the coinciding principal axes of the series of optical elements.

OPTICAL CENTER - The point within a simple thin lens at which the light rays are assumed to cross.

OPTICAL FLAT - A surface, usually of glass, ground and polished plane within a fraction of a wavelength of light. An optical element or glass blank with an optical flat is used to test the flatness of other surfaces. Parallel Plate - An optical disk with optically flat, parallel surfaces; used especially in optical micrometers.

OPTICAL RECTIFICATION - The process of projecting the image of a tilted aerial photograph onto a horizontal reference plane to eliminate the image displacements caused by tilt of the aerial camera at the time of exposure. See also TRANSFORMATION.

OPTICAL SYSTEM - All the parts of a compound lens and accessory optical parts which are designed to contribute to the formation of an image on a photographic emulsion, or of a visual image, or of an image on a projection screen.

OPTICAL-PROJECTION INSTRUMENTS - A class of instruments which provide projected images of photographic prints or other opaque material superimposed on a map or map manuscript. Often used for transferring detail from near-vertical photographs or other source material. See also CAMERA LENGTH.

ORIENTATION (Photogrammetry) - Absolute Orientation - The scaling, leveling, and orientation to ground control (in a photogrammetric instrument) of a relatively oriented stereoscopic model or group of models. Exterior Orientation - The determining (analytically or in a photogrammetric instrument) of the position of the camera station and the attitude of the taking camera at the instant of exposure. In stereoscopic instrument practice, exterior orientation is divided into two parts, Relative and Absolute Orientation. Also called Outer Orientation. (See RESECTION.) Interior Orientation - The determining (analytically or in a photogrammetric instrument) of the interior perspective of the photograph as it was at the instant of exposure. Elements of interior orientation are the calibrated focal length, location of the calibrated principal point, and the calibrated lens distortion. Also called Inner Orientation. Relative Orientation - The determining (analytically or in a photogrammetric instrument) of the position and attitude of one of a pair of overlapping photographs.

ORIGIN (Surveying) - The reference position from which angles or distances are reckoned. (See also COORDINATES.)

ORTHOCHROMATIC (Photography) - 1. Of, or pertaining to, or producing tone values (of light or shade) in a photograph, corresponding to the tones of nature, 2. Designating an emulsion sensitive to blue and green light, but not to red.

ORTHOGONAL - At right angles; rectangularly; meeting, crossing, or lying at right angles.

ORTHOGRAPHIC MAP PROJECTION - See MAP PROJECTION.

ORTHOGRAPHIC PROJECTION - See PROJECTION.

ORTHOPHOTOGRAPH - A photograph having the properties of an Orthographic Projection. It is derived from a conventional perspective photograph by simple or differential rectification so that image displacements caused by camera tilt and relief of terrain are removed.

ORTHOPHOTOGRAPHIC MAP - A map produced by assembling orthophotographs at a specified uniform scale in a map format.

ORTHOPHOTOMAP - An orthophotographic map with contours and color-enhanced cartographic treatment, presented in a standard quadrangle format and related to standard reference systems.

ORTHOPHOTOMOSAIC - See MOSAIC.

ORTHOPHOTOSCOPE - A photomechanical device, used in conjunction with a double-projection anaglyphic instrument, for producing orthophotographs.

ORTHOSTEREOSCOPY - A condition wherein the horizontal and vertical distances in a stereoscopic model appear to be at the same scale.

OUTER ORIENTATION - See EXTERIOR ORIENTATION under ORIENTATION.

OVERLAP (Photography) - The amount by which one photograph covers the same area as covered by another, customarily expressed as a percentage. The overlap between aerial or space photographs in the same flight is called the End Lap, and the overlap between photographs in adjacent parallel flights is called the Side Lap.

OVERLAPPING PAIR (Photogrammetry) - Two photographs taken at Different exposure stations in such a manner that a portion of one photograph shows the same terrain as shown on a portion of the other photograph. This term covers the general case and does not imply that the photographs were taken for stereoscopic examination. (See also STEREOSCOPIIC PAIR under STEREO-SCOPY.)

OVERLAY (Mapping) - A record on a transparent medium to be superimposed on another record; for example, maps showing original land grants (or patents) prepared as tracing-cloth overlays so that they can be correlated with the maps showing present ownership. Also, any of the several overlays that may be prepared in compiling a manuscript map; usually described by name - for example, Lettering Overlay.

ORTHOPHOTQUAD - A monochrome orthophotographic map presented in a standard quadrangle format and related to standard reference systems. It has no contour lines and little or no cartographic treatment.

PANCHROMATIC (Photography) - Sensitive to light of all colors, as a film or plate emulsion.

PANCRATIC SYSTEM - A variable-power optical system. Also called Zoom System.

PANEL - An element of a target used for control-station identification on aerial photography. Panels are made of cloth, plastics, plywood, or masonite, and are positioned in a symmetrical pattern centered on the station. See also TARGET.

- PANEL BASE (Cartography) - The completed assembly of pieces of film positives onto a grid or projection which is used as a base for Compilation. Also called Film Mosaic; Panel.
- PANELING - The placement of panels on a control station to facilitate station identification on aerial photography.
- PANORAMIC CAMERA - See CAMERA.
- PANORAMIC DISTORTION - The displacement of ground points from their expected perspective positions, caused by the cylindrical shape of the negative film surface and the scanning action of the lens in a Panoramic Camera system.
- PANORAMIC PHOTOGRAPH - Photography obtained from a Panoramic Camera.
- PANTOGRAPH - An instrument for copying maps, drawings, or other graphics at a predetermined scale. Pantographs capable of adjustment for several scales are known as Fixed-Ratio Pantographs.
- PAPER-STRIP METHOD (Rectification) - A graphical method of making a point-by-point rectification based on the invariance of the cross ratio. A modification of this technique permits map detail to be revised from an oblique aerial photograph based on the projectivity of straight lines. See also TRANSFORMATION.
- PARALLACTIC ANGLE - (Astronomy) The angle between a body's hour circle and its vertical circle. Also called Position Angle.
(Photogrammetry) The angle subtended by the eye base of the observer at the object viewed. Also called Angle of Convergence; Angular Parallax.
- PARALLACTIC GRID (Photogrammetry) - A uniform pattern of rectangular lines drawn or engraved on some transparent material, usually glass, and placed either over the photographs of a stereoscopic pair or in the optical system of a stereoscope, in order to provide a continuous floating-mark system.
- PARALLAX - The apparent displacement of the position of a body, with respect to a reference point or system, caused by a shift in the point of observation. Absolute Stereoscopic Parallax - Considering a pair of aerial photographs of equal principal distance, the absolute stereoscopic parallax of a point is the algebraic difference of the distances of the two images from their respective photograph nadirs, measured in a horizontal plane and parallel to the air base. Generally shortened to Parallax; also called Absolute Parallax, Horizontal Parallax, Linear Parallax, Stereoscopic Parallax, and X Parallax; parallax also is used to denote such measurements, as above, in the plane of a photograph and in the direction of flight. Parallax Difference - The difference in the absolute stereoscopic parallaxes of two points imaged on a pair of photographs. Customarily used in the determination of the difference in elevations of objects.

Y Parallax (Photogrammetry) - The difference between the perpendicular distances of the two images of a point from the vertical plane containing the air base. The existence of y parallax is an indication of tilt in either or both photographs and/or a difference in flight height and interferes with stereoscopic examination of the pair. Also called Want of Correspondence and Vertical Parallax, though the latter term is not preferred. Angular Parallax - The angle subtended by the eye base of the observer at the object viewed. Also called Parallactic Angle or Angle of Convergence.

PARALLAX BAR - See STEREOMETER.

PARALLAX DIFFERENCE - See PARALLAX.

PARAXIAL RAY - A ray whose path lies very near the axis of a lens and which intersects the lens surface at a point very close to its vertex and at nearly normal incidence.

PARALLAX WEDGE - A simplified Stereometer for measuring object heights on stereoscopic pairs of photographs. It consists of two slightly converging rows of dots or graduated lines printed on a transparent templet which can be stereoscopically fused into a single row or line for making parallax measurements.

PARALLAX, X - See ABSOLUTE STEREOSCOPIC PARALLAX under PARALLAX.

PARALLAX, Y - See Y PARALLAX under PARALLAX.

PASS POINT - A point whose horizontal and/or vertical position is determined from photographs by photogrammetric methods and which is intended for use (as in the manner of a Supplemental Control Point) in the orientation of other photographs.

PASSIVE SYSTEM - A system which records energy emitted or reflected but which does not produce or transmit energy of its own. Contrast with Active System.

PATTERN - In a photo image, the regularity and characteristic placement of tones or textures. The arrangement of objects or areas in a systematic fashion. See also PHOTOINTERPRETATION.

PATTERN RECOGNITION - The identification of patterns forms, or configurations by automatic means.

PENCIL OF LIGHT - See RAY OF LIGHT.

PERIGEE - See APSIDES.

PERSONAL ERROR - See ERROR.

PERSONAL EQUATION - The time interval between the sensor perception of a phenomenon and the motor reaction thereto. A personal equation may be either positive or negative, as an observer

may anticipate the occurrence of an event, or wait until he actually sees it occur before making a record. This is a Systematic Error, treated as the constant type. See also PERSONAL ERROR under ERROR.

PERSPECTIVE AXIS - See AXIS OF HOMOLOGY.

PERSPECTIVE CENTER - The point of origin or termination of bundles of perspective rays. The two such points usually associated with a survey photograph are the Interior Perspective Center and the Exterior Perspective Center. In a perfect lens-camera system, perspective rays from the interior perspective center to the photographic images enclose the same angles as do the corresponding rays from the exterior perspective center to the objects photographed. In a lens having distortion, this is true only for a particular zone of the photograph. In a perfectly adjusted lens-camera system, the exterior and interior perspective centers correspond, respectively, to the front and rear Nodal Point of the camera lens.

PERSPECTIVE GRID (Photogrammetry) - A network of lines, drawn or superimposed on a photograph, to represent the perspective of a systematic network of lines on the ground or datum plane. (See also GRID METHOD.)

PERSPECTIVE PLANE - Any plane containing the perspective center. The intersection of a perspective plane and the ground will always appear as a straight line on an aerial photograph.

PERSPECTIVE PROJECTION - See PROJECTION.

PERSPECTIVE RAY - A line joining a Perspective Center and a point object.

PHOTOALIDADE - A photogrammetric instrument having a telescopic alidade, a plate holder, and a hinged ruling arm mounted on a tripod frame. It is used for plotting lines of direction and measuring vertical angles to selected features appearing on oblique and terrestrial photographs.

PHOTOANGULATOR - See TRANSFORMATION.

PHOTOBASE - See AIR BASE.

PHOTOCONTROL INDEX MAP - Any selected Base Map or Photoindex on which ground control and photos identified ground points (pass points and photogrammetric points) are depicted and identified.

PHOTOCONTROL POINT - See CONTROL POINT.

PHOTOGONIOMETER - See GONIOMETER.

PHOTOGRAMMETRIC CAMERA - See CAMERA.

PHOTOGRAMMETRIC CONTROL - See CONTROL, PHOTOGRAMMETRIC.

PHOTOGRAMMETRIC SURVEY - See SURVEY.

PHOTOGRAMMETRY - The art, science and technology of obtaining reliable information about physical objects and the environment, through processes of recording, measuring, and interpreting images and patterns of electromagnetic radiant energy and other phenomena. (For specific branches of photogrammetry, see under the proper name, as: ANALYTICAL PHOTOGRAMMETRY, CLOSE-RANGE PHOTOGRAMMETRY, etc.).

PHOTOGRAPH - A general term for a positive or negative picture made with a camera on sensitized material, or prints from such a camera original. (For specific types of photographs, see under the proper name, as: AERIAL PHOTOGRAPH, MULTIPLE-LENS PHOTOGRAPH, etc.).

PHOTOGRAPH AXES - The preferred term is Fiducial Axes.

PHOTOGRAPH CENTER - The center of a photograph as indicated by the images of the Fiducial Mark or Marks of the camera. In a perfectly adjusted camera, the photograph center and the Principal Point are identical.

PHOTOGRAPH COORDINATES - See COORDINATES.

PHOTOGRAPH, HORIZON - See HORIZON PHOTOGRAPH.

PHOTOGRAPH MERIDIAN - See PRINCIPAL PLANE.

PHOTOGRAPH NADIR - See NADIR.

PHOTOGRAPH PARALLEL - See PRINCIPAL PLANE.

PHOTOGRAPH PERPENDICULAR - The perpendicular from the Interior Perspective Center to the plane of the photograph. (See also PRINCIPAL DISTANCE under FOCAL LENGTH.)

PHOTOGRAPH PLUMB POINT - The preferred term is Photograph Nadir. See under NADIR.

PHOTOGRAPH PYRAMID - A pyramid whose base is a triangle formed by three point images on a photograph, and whose apex is the Perspective Center of the photograph.

PHOTOGRAPHIC INTERPRETATION - See PHOTOINTERPRETATION.

PHOTOGRAPHY - The art, science, and process of producing images on sensitized material through the action of light. The term Photography is sometimes incorrectly used in place of Photographs; however, the distinction between the Process and the Product is a valuable one and should be observed.

- PHOTOGRAPHY, TRICAMERA - Photography consisting of the simultaneous exposure of three cameras systematically arranged at fixed angles to each other in such a way that overlap is provided between adjacent photographs. Generally, the cameras are arranged so that a center vertical photograph and two high-oblique photographs are obtained. This assembly is often referred to as a Trimetrogon Camera assembly because of the wide use of Metrogon lenses in early tricamera photography.
- PHOTOINDEX (Photointerpretation) - See INDEX MAP.
- PHOTOINTERPRETATION or PHOTOGRAPHIC INTERPRETATION - The detection, identification, description, and assessment of significance of objects and patterns imaged on a photograph. Air Photo Interpretation or Aerial Photographic Interpretation - Photo-interpretation applied to images on aerial photographs or to other aerial remote sensing imagery.
- PHOTOMAP - A photomosaic of a specified land area, which also contains marginal information, descriptive data, and a reference grid and/or projection. (See also MOSAIC.)
- PHOTOMOSAIC - See MOSAIC.
- PHOTOMETRY - The study of the measurement of the intensity of light. At one time photometry referred only to the measurement of luminous intensity, intensity of light in the wavelengths to which the eye is sensitive. This restriction has proved difficult to maintain in practice.
- PHOTOSENSITIVE - A term used to describe substances whose chemical composition is altered by exposure to light. See also EMULSION.
- PHOTO-REVISED MAP - A topographic or planimetric map which has been revised by photo-planimetric methods.
- PHOTOTHEODOLITE - A ground-survey instrument combining a theodolite and a surveying camera, in which the relationship between the camera axis and the Line of Collimation of the theodolite can be measured.
- PHOTOTOPOGRAPHY - The science of surveying in which the detail is plotted entirely from photographs taken at suitable ground stations. (See also TERRESTRIAL PHOTOGRAMMETRY.)
- PHOTOTRIANGULATION - The process for the extension of horizontal and/or vertical control whereby the measurements of angles and/or distances on overlapping photographs are related into a spatial solution using the perspective principles of the photographs. Generally, this process involves using aerial photographs and is called Aerotriangulation or Aerial Triangulation. (See also ANALYTICAL PHOTOTRIANGULATION, RADIAL TRIANGULATION, and STEREOTRIANGULATION.)

PICTOMAP - A color reproduction of a standard Photomosaic on which the photographic imagery has been converted into interpretable colors and symbols by means of tonal masking techniques.

PICTURE CONTROL POINT - See CONTROL POINT.

PICTURE PLANE - A plane upon which can be projected a system of lines or rays from an object to form an image or picture. In perspective drawing, the system of rays is understood to converge to a single point. In photogrammetry, the photograph is the picture plane.

PITCH - (Air Navigation) A rotation of an aircraft about the horizontal axis normal to its longitudinal axis so as to cause a nose-up or nose-down attitude. (Photogrammetry) A rotation of the camera, or of the photograph-coordinate system, about either the photograph y axis or the exterior Y axis; Tip or Longitudinal Tilt. In some photogrammetric instruments and in analytical applications, the symbol Phi (ϕ) may be used.

PLAN-POSITION-INDICATOR (PPI) RADAR - A radar system employing a rotating antenna to scan all or part of a complete circle, in which blips produced by signals from reflecting objects are shown in plan position, thus forming a maplike display.

PLANE (Photogrammetry) - See PRINCIPAL POINT.

PLANE COORDINATES - See COORDINATES.

PLANE POLAR COORDINATES - See COORDINATES.

PLANE, PRINCIPAL - See PRINCIPAL PLANE.

PLANE RECTANGULAR COORDINATES - See COORDINATES.

PLANIMETER - An instrument used to measure the area of any figure by passing a tracer around its boundaries and recording the area encompassed.

PLANIMETRIC MAP - See MAP.

PLAT - A cadastral map. (See CADASTRAL MAP under MAP.)

PLATFORM (Remote Sensing) - The objects, structure, vehicle, or base upon which a remote sensor is mounted.

PLUMB LINE - See VERTICAL LINE.

PLUMB POINT - See the preferred term NADIR POINT under NADIR.

POCKET STEREOSCOPE - See LENS STEREOSCOPE under STEREOSCOPE.

- POINTING - (Mensuration) Placing the reticle or index mark of a precision measuring instrument, such as a comparator, within the symmetrical center or center of gravity of a point being measured to determine its position relative to the position of other points in some system of coordinates. (Stereocompilation) A general term applied to the movement of the tracing table of a stereoplottting instrument to specific control and/or picture points on the datum during orientation of a stereomodel. See LINE OF COLLIMATION.
- POINTING ACCURACY - The exactness, in surveying or photogrammetry, with which the line of sight or floating mark can be directed toward a target or image point.
- POINTING ERRORS - Errors which reflect the accuracy with which the floating mark of a stereoplottting system can be located on a sharp model point. These errors generally follow a more or less random distribution but show a systematic trend with progressive working time on the instrument due to eye fatigue and its effect on stereoscopic perception.
- POINT MARKER - A device used for identifying points on diapositives by either marking a small hole in the emulsion or marking a small ring around the detail point itself.
- POINT OF SYMMETRY - The point in the focal plane of a camera about which all lens distortions are symmetrical. If the lens were perfectly mounted, the point of symmetry would coincide with the Principal Point.
- POINT-TRANSFER DEVICE - A stereoscopic instrument used to mark corresponding image points on overlapping photographs.
- POINT, VANISHING - See VANISHING POINT under PRINCIPAL PLANE.
- POLAR AXIS - See POLAR and SPHERICAL COORDINATES under COORDINATES.
- POLAR BEARING - See POLAR COORDINATES under COORDINATES: MERIDIONAL PLANE.
- POLAR COORDINATES - See COORDINATES.
- POLAR DISTANCE - See POLAR COORDINATES under COORDINATES.
- POLARIZATION (Optics) - The act or process of modifying light in such a way that the vibrations are restricted to a single plane. According to the wave theory, ordinary (unpolarized) light vibrates in all planes perpendicular to the direction of propagation. On passing through or contacting a polarizing medium (such as Polaroid or a Kerr Cell) ordinary light becomes Plane-Polarized, that is, its vibrations are limited to a single plane.

- POLARIZING FILTER - A filter which passes light waves vibrating in one polarization direction only. Used over camera lenses to cut down or remove, (plane) rays of any or all other polarization direction(s) when they may constitute objectionable reflections from glass, water, or other highly reflecting surfaces.
- POLAROID - A manufactured, plastic polarizing filter; on passing through it, ordinary light becomes plane-polarized.
- PORRO-KOPPE PRINCIPLE - The principal applied in some photogrammetric instruments to eliminate the effect of camera-Lens Distortion. The photographic positive or negative is observed through a lens or optical system identical in distortion characteristics to the camera objective which made the original exposure. In effect, this method of observation is a reverse use of the camera, with the focal plane becoming the object which is imaged at infinity by parallel bundles of rays emerging from the lens. The chief ray of each bundle assumes its correct direction, and the cone of rays is identical to that whose vertex was the incident node of the camera lens at the instant of exposure. The parallel bundles may be observed by means of a telescopic system focused at infinity and made rotatable about the incident node of the lens. This method of eliminating lens distortion is utilized in photogrammetric instruments of both the monoscopic type, such as the photogoniometer, and the stereoscopic type used for map plotting.
- PORRO PRISM - A prism that deviates the axis 180 degrees and inverts the image in the plane in which the reflection takes place. It may be described as two right angle prisms cemented together.
- POSITION - The location of a point with respect to a reference system, such as a Geodetic Datum. (See also GEODETIC POSITION.) The coordinates which define such a location. The place occupied by a point on the surface of the earth. Often construed as Horizontal Position with Elevations are considered separately. Adjusted Position - An adjusted value of the coordinate position of a point.
- POSITIVE LENS - See LENS.
- POWER OF A LENS - See DIOPTRER and MAGNIFICATION.
- PRECISION - A quality associated with the refinement of instruments and measurements, indicated by the degree of uniformity or identity of repeated measurements. In a somewhat narrower sense, the term refers to the Spread of the observations, or some measure of it, whether or not the mean value around which the spread is measured approximates the True value. Contrast with Accuracy.
- PRECISION CAMERA - See CAMERA.

PRESSURE BACK - See LOCATING BACK.

PRESSURE PLATE (Photography) - A flat plate (usually of metal but frequently of glass or other substance) which, by means of mechanical force, presses film into contact with the focal-plane plate of a camera.

PRINCIPAL AXIS - See OPTICAL AXIS.

PRINCIPAL DISTANCE - See FOCAL LENGTH.

PRINCIPAL-DISTANCE ERROR - In a stereoplotting system, an instrument error resulting from improper calibration of the aerial camera, diapositive printer, or projector. The error is of little importance in a flat surface model but the effects are increased in proportion to the relief in the model.

PRINCIPAL LINE - See PRINCIPAL PLANE (Photogrammetry).

PRINCIPAL MERIDIAN - See PRINCIPLE PLANE (Photogrammetry).

PRINCIPAL PARALLEL - See PRINCIPAL PLANE (Photogrammetry).

PRINCIPAL PLANE (Optics) - A plane through a Principal Point and perpendicular to the optical axis.

PRINCIPAL PLANE (Photogrammetry) - The vertical plane through the internal perspective center containing the photograph perpendicular of a tilted photograph. In the case of a truly vertical photograph, the principal plane and the other planes and lines discussed below lose their significance. Principal Line - The trace of the principal plane upon a photograph (e.g., the line through the principal point and the nadir point). Horizon Trace - An imaginary line, in the plane of a photograph, which represents the image of the true horizon; it corresponds to the intersection of the plane of a photograph and the horizontal plane containing the Internal Perspective Center or Rear Nodal Point of the lens. Point, Vanishing - The point in the plane of the photograph at which a system of parallel lines in the object space converge. Since any system of parallel lines in the object space will meet at infinity, the image of the meeting point will be formed by the ray through the perspective center parallel to the system. The vanishing points of all systems of parallel lines parallel to one plane will lie on a straight line on the photograph called a "Vanishing Line". The vanishing line for all systems of horizontal parallel lines in the object space is the horizon trace. Photograph Meridian - The image on a photograph of any horizontal line in the object space which is parallel to the principal plane. Since all such lines meet at infinity, the image of the meeting point is at the intersection of the principal line and the horizon trace and all photograph meridians pass through that point. The

Principal Line, sometimes called the Principal Meridian, is the only photograph meridian perpendicular to the photograph parallels, or lines of constant scale. Photograph Parallel - The image on a photograph of any horizontal line in the object space which is perpendicular to the principal plane. All photograph parallels are perpendicular to the principal line. The photograph parallel passing through the principal point is the Principal Parallel, and that passing through the isocenter is the Isometric Parallel. Thus, the isometric parallel is the intersecting line between the plane of a photograph and a horizontal plane having an equal perpendicular distance from the same perspective center. Axis of Tilt - A line through the perspective center perpendicular to the principal plane. (The term is usually restricted to this definition.) The axis of tilt could be any of several lines in space (e.g., the Isometric Parallel or the Ground Line), but the present definition is the only one which permits the concept of tilting a photograph without upsetting the positional elements of exterior orientation. Map Parallel - The intersection of the plane of a photograph with the plane of the map. (See also AXIS OF HOMOLOGY.) Ground Parallel - The intersection of the plane of the photograph with the plane of reference of the ground. (See also AXIS OF HOMOLOGY.)

PRINCIPAL POINT (Optics) - See NODAL POINT.

PRINCIPAL POINT (Photogrammetry) - The foot of the perpendicular from the interior perspective center to the plane of a photograph.

PRINCIPAL POINT ASSUMPTION - See RADIAL TRIANGULATION.

PRINCIPAL-POINT ERROR - A personal error in which the principal points in a stereoplotting system are displaced in such a manner that they have unequal x-components with a resultant error in vertical scale. Such errors are usually introduced into the system by either improper orientation of the diapositive plate in the printer, in the projector, or both.

PRINCIPAL-POINT RADIAL - See RADIAL.

PRINCIPAL-POINT TRIANGULATION - See RADIAL TRIANGULATION.

PRINT (Photography) - A copy made from a transparency by photographic means. Contact Print - A print made with a transparency in contact with a sensitized surface. Ratio Print - A print in which the scale has been changed from that of the transparency by projection printing. (See also POSITIVE.)

PRINTER, LINE - A device that prints all characters of a line as a unit.

PROCESS CAMERA - See CAMERA.

PROCESS LENS - A type of lens used in large Copy Cameras (e.g., those used in map reproduction); usually of low aperture (f/10, approximately), narrow angle, long focal length, symmetrical construction, and limited range of magnification (0.5Xto2X).

PROFILE - Elevations of the terrain along some definite line such as a project centerline. Positions along the line are given in terms of stationing, or distances from a starting point. Elevations are measured at a sufficient number of points to enable defining the configuration of the ground surface. This includes high points, low points, and points of slope changes.

PROJECTION - In geometry, the extension of lines or planes to intersect a given surface; the transfer of a point from any surface to a corresponding position on another surface, by graphical or analytical methods. Perspective Projection - The projection of points by straight lines drawn through them from some given point to an intersection with the plane of projection. Unless otherwise indicated, the point of projection is understood to be within a finite distance of the plane of projection. For example, a photograph is formed by a perspective projection of light rays from the rear node of the lens (the point of projection) to the emulsion (the plane of projection). As applied to the geometry of a photograph, the term Perspective Projection is preferable to the term Conic Projection. Orthographic Projection - A perspective projection of points by straight lines from a point of projection at an infinite distance from the plane of the drawing. It is regularly used in mechanical drawing and, when so used, the two vertical planes are revolved about their respective lines of intersection with the horizontal plane so as to show all three views of the plane of the paper. (See also MAP PROJECTION.)

PSEUDOSCOPIC IMAGE - One in which the normal impression of relief is reversed. See STEREOSCOPY.

QUADRANGLE - A rectangular, or nearly so, area covered by a map or plat, usually bounded by given meridians of longitude and parallels of latitude. Sometimes shortened to quad; also called quadrangle map.

RADAR - 1. The principle of locating targets or objects by the measurement of reflections of radio-frequency energy from them. 2. A term applied to devices and systems which make use of this principle. Acronym for "Radio Detection and Ranging."

RADAR ALTIMETER - See under ALTIMETER.

RADARGRAMMETRY - The science of obtaining reliable measurements by means of Radar.

RADAR PHOTOGRAPHY - A combination of the photographic process and radar techniques. Electrical impulses are sent out in pre-determined directions and the reflected or returned rays are

utilized to present images on cathode-ray tubes. Photography is then taken of the information displayed on the tubes.

RADAR SHADOW - A condition in which radar signals do not reach a region because of an intervening obstruction.

RADIAL (Photogrammetry) - A line or direction from the radial center to any point on a photograph. The radial center is assumed to be the principal point, unless otherwise designated (e.g., Nadir Radial). Nadir Radial - A radial from the nadir point, or Isoradial from the isocenter. Radial Center - The selected point on a photograph from which radials (directions) to various image points are drawn or measured (i.e., the origin of radials). The radial center is either the principal point, the nadir point, the isocenter, or a substitute center. Radial Plot - See RADIAL TRIANGULATION.

RADIAL DISTORTION - Linear displacement of image points radially to or from the center of the image field, caused by the fact that objects at different angular distances from the lens axis undergo different magnifications. (See also DISTORTION under ABERRATION.)

RADIAL LINE - A line drawn radially from the center point of a vertical photo.

RADIAL LINE PLOT - See RADIAL TRIANGULATION.

RADIAL PLOTTER - A device whereby two overlapping photographs are viewed stereoscopically, and the Planimetric details in their common area can then be transferred to a map or base sheet through a mechanical linkage utilizing the radial line principle. Also called Radial-Line Plotter.

RADIAL TRIANGULATION - The aerotriangulation procedure, either graphical or analytical, in which directions from the radial center, or approximate radial center, of each overlapping photograph are used for horizontal control extension by the successive intersection and resection of these direction lines. A radial triangulation also is correctly called a Radial Plot or a Minor-Control Plot. If made by analytical methods, it is called an Analytical Radial Triangulation. A radial triangulation is assumed to be graphical unless prefixed by the word Analytical. A Graphical Radial Triangulation is usually laid out directly onto ground control plotted on a map, map projection, or map grid; but it may be first laid out independently of such control and later adjusted to it as a unit. In the latter case, the scale and azimuth of the radial triangulation unit are not known until it is adjusted to the ground control. The radial center for near-vertical photographs may be the Principal Point, the Nadir Point, or the Isocenter. A radial triangulation is assumed to be made with principal points as radial centers unless the definitive term designates otherwise (as, for example, Nadir-Point

Triangulation or Nadir-Point Plot, and Isocenter Triangulation or Isocenter Plot. The adjective Radial is not necessary in these four terms). The adjective Analytical is required to designate that the triangulation is by analytical and not graphical methods (e.g., Analytical Nadir-Point Triangulation). A Graphical Radial Triangulation may be made by several methods, as follows: Slotted-Templet Triangulation or Slotted-Templet Plot - A graphical radial triangulation using slotted templates. Spider-Templet Triangulation, Spider-Templet Plot, Mechanical-Templet Triangulation, or Mechanical-Templet Plot - A graphical radial triangulation using spider (mechanical) templates. Hand-Templet Triangulation or Hand-Templet Plot - A graphical radial triangulation using any form of hand templates. In the preceding eight terms, it is assumed that the radial center is the principal point, unless the term includes the words Nadir Point or Isocenter (e.g., Nadir-Point Slotted-Templet Plot) or unless the context states that a radial center other than the principal point was used. (For definitions of various templates, see TEMPLET.) Direct Radial Triangulation or Direct Radial Plot - A graphical radial triangulation made by tracing the directions from successive radial centers directly onto a transparent plotting sheet rather than by laying the triangulation by the template method. Strip Radial Triangulation or Strip Radial Plot - A direct radial triangulation in which the photographs are plotted in flight strips without reference to ground control and the strips are later adjusted to gether to the ground control. Principal-Point Assumption - The assumption that, on near-vertical photographs, radial directions are correct if measured from the Principal Point.

RADIANCE - The accepted term for radiant flux in power units (e.g., 2 watts) and not for flux density per solid angle (e.g., watts/cm² sr) as often found in recent publications.

RADIATION - The emission and propagation of energy through space or through a material medium in the form of waves; e.g., the emission and propagation of electromagnetic waves, or of sound and elastic waves. The process of emitting radiant energy.

RADIOGRAPH - An image produced from X-rays. (See also X-RAYS and X-RAY PHOTOGRAMMETRY.)

RADIOMETER - Instrument for measuring radiant energy.

RANDOM ERROR - See ERROR.

RATE OF CLIMB - The rate of ascent from the earth's surface; the vertical component of the velocity of the center of gravity of an aircraft, usually expressed in feet per minute.

RATIOMETER - An instrument used to help solve the mathematical relationship of a photograph to a mosaic. It determines scale ratios from which, through mathematical formulas, a rectified print can be made on a properly calibrated rectifying printer.

RATIO PRINT - See PRINT.

RAY OF LIGHT - The geometrical concept of a single element of light propagated in a straight line and of infinitesimal cross-section; used in analytically tracing the path of light through an optical system. Pencil of Light - A bundle of rays originating at, or directed to, a single point. Beam of Light - A group of pencils of light, as those originating at the many points of an illuminated surface. A beam of parallel light rays is a special case in which each pencil is of such small cross section that it may be regarded as a ray.

RAY TRACING (Optics) - A trigonometric calculation of the path of a light ray through an optical system.

REAL TIME - Generally associated with data transmission at the time of occurrence with no delay.

REAR NODAL POINT - See NODAL POINT.

RECONNAISSANCE - A general examination or survey of the main features, or certain specific features, of a region, usually as a preliminary to a more detailed survey.

RECONNAISSANCE SURVEY - A preliminary survey, usually executed rapidly and at relatively low cost. The information obtained is recorded, to some extent, in the form of a reconnaissance map or sketch.

RECORDING STATOSCOPE - See ALTIMETER.

RECTIFICATION - See TRANSFORMATION.

RECTIFIED PRINT - A photograph in which tilt displacement has been minimized from the original negative, and which has been brought to a desired scale. See also TRANSFORMATION.

RECTOBLIQUE PLOTTER - See TRANSFORMATION.

REDUCTION - The production of a negative, diapositive or print at a smaller scale than the original. See also RATIO PRINT under PRINT.

REDUCTION PRINTER - See DIAPOSITIVE PRINTER.

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 LINE - Any line which can serve as a reference or base for the measurement of other quantities. Also called Datum Line.

REFERENCE SPHEROID - See GEOID.

REFLECTANCE - The ratio of the radiant energy reflected by a body to that incident upon it. The suffix (-ance) implies a property of that particular specimen surface.

REFLECTING PRISM - A prism that deviates a light beam by internal reflection. (Practically all prisms used in photogrammetric instruments are of this type.)

REFLECTING PROJECTOR - An instrument which is used to project the image of photographs, maps, or other graphics onto a copying table. The scale of the projected image can be varied by raising or lowering the projector or, in some models, the copy board. These latter models also allow the tilting of the copy board in x- and y- directions in order to compensate for tip and tilt distortion in aerial photographs.

REFRACTING PRISM - A prism that deviates a beam of light by refraction. The angular deviation is a 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 prisms can be used in optical instruments only for small deviations. (See also WEDGE.)

REFRACTION - The bending of light rays in passing from one transparent medium into another which has a different index of refraction. The Angle of Refraction is the angle which the refracted ray makes with the normal to the surface separating the two media. (See also SNELL'S LAW OF REFRACTION.)

REFRACTION DISPLACEMENT - See DISPLACEMENT.

RELATIVE ACCURACY - (General) An evaluation of the random errors in determining the positional orientation (e.g., distance, azimuth) of one point or feature with respect to another.
(Chart, feature to graticule) - An evaluation of the random errors in chart features with respect to the graticule or the datum defined by the graticule. (Chart, feature to feature)-
An evaluation of the random errors in determining the positional orientation of one chart feature to another feature on the same chart.

RELATIVE APERTURE - For a photographic or telescopic lens, the ratio of the Equivalent Focal Length to the diameter of the Entrance Pupil. Expressed as $f/4.5$ or $f: 4.5$; also called F Number or Speed of Lens.

RELATIVE HUMIDITY - See HUMIDITY.

RELATIVE ORIENTATION - See ORIENTATION.

RELATIVE POSITION - The location of a point or feature with respect to other points or features, either fixed or moving.

RELATIVE TILT - The tilt of a photograph with reference to an arbitrary plane, not necessarily a horizontal plane, such as that of the preceding or subsequent photograph in a strip. Also defined as the angle between the photograph perpendicular and a reference direction, such as the photograph perpendicular of the preceding or subsequent photograph in a strip.

RELIEF - The elevations or the inequalities, collectively, of a land surface; represented on graphics by contours, hypsometric tints, shading, spot elevations, hachures, etc.

RELIEF DISPLACEMENT - See DISPLACEMENT.

RELIEF MODEL - A three-dimensional representation of a portion of the earth's surface at a reduced scale. Normally some vertical exaggeration is used to accentuate relief features.

REMOTE SENSING - In the broadest sense, the measurement or acquisition of information of some property of an object or phenomenon, by a recording device that is not in physical or intimate contact with the object or phenomenon under study; e.g., the utilization at a distance (as from aircraft, spacecraft, or ship) of any device and its attendant display for gathering information pertinent to the environment, such as measurements of force fields, electromagnetic radiation, or acoustic energy. The technique employs such devices as the camera, lasers, and radio frequency receivers, radar systems, sonar, seismographs, gravimeters, magnetometers, and scintillation counters. 2. The practice of data collection in the wavelengths from ultraviolet to radio regions. This restricted sense is the practical outgrowth from airborne photography. Sense 1 is preferred and thus includes regions of the EM spectrum as well as techniques traditionally considered as belonging to conventional geophysics. Also called rapid reconnaissance. French: teledetection; German: Fernerkundung; Portuguese: sensoriamento remoto; Russian: Distantcionnaya; Spanish: perception remota.

REMOTE SENSING IMAGERY - The photographic and electronic image secured from platforms such as aircraft and satellites. The common types include panchromatic, infrared black and white, color and infrared color photos; thermal infrared, radar and microwave imagery.

REPRODUCTION (Mapping) - The processes involved in printing copies from an original drawing. The principal processes are photography, lithography (or engraving), and printing. Also, a printed copy of an original drawing, made by any of the processes of reproduction.

RESEAU - See GRID PLATE.

RESECTION - 1. The graphical or analytical determination of a position as the intersection of at least three lines of known direction

to corresponding points of known position. 2. Photogrammetry: The determination of the position and attitude of a camera, or the photograph taken with that camera, with respect to the exterior coordinate system.

RESIDUAL or RESIDUAL ERROR - See ERROR.

RESIDUAL PARALLAX - Small amounts of y-parallax which may remain in a model after relative orientation is accomplished.

RESOLUTION - The minimum distance between two adjacent features, or the minimum two adjacent features, or the minimum size of a feature, which can be detected by a remote sensing system. For photography, this distance is usually expressed in lines per millimeter recorded on a particular film under specified conditions; as displayed by radar, in lines per millimeter. If expressed in size of objects or distances on the ground, the distance is termed Ground Resolution. Area Weighted Average Resolution (AWAR) - A single average value for the resolution over the picture format for any given focal plane.

RESOLVING POWER - An expression of lens definition, usually stated as the maximum number of lines per millimeter that can be resolved (i.e., seen as separate lines) in the image. The resolving power of the lens varies with the contrast of the Test Chart and normally varies also with the orientation and position of the chart within the field.

RESOLVING POWER TARGET - A test chart used for the evaluation of photographic, optical, and electro-optical systems. The design usually consists of ruled lines, squares, or circles varying in size according to a specified geometric progression. (See also TEST CHART.)

RESTITUTION - The determination of the true (map) position of objects or points; the image of which appears distorted or displaced on aerial photographs. Restitution corrects for distortion resulting from both tilt and relief displacement. Restitution in photogrammetry is commonly achieved by analytical methods or through the use of stereoscopic plotting instruments.

RETICLE - A mark, such as a cross or system of lines, lying in the image plane of a viewing apparatus and used singly as a reference mark in certain types of monocular instruments or as one of a pair to form a floating mark, as in certain types of stereoscopic instruments. (See also PARALLACTIC GRID and FLOATING MARK.)

REVERT (Optics) - To interchange the right and left sides of an image without altering the relative positions of the top and bottom, as occurs in certain prisms and mirrors.

- RHOMBOIDAL PRISM - A prism that displaces the axis of the beam of light only laterally.
- RHUMB LINE - A line (curved) on the surface of the earth, crossing all meridians at a constant angle. Also called a Loxodromic Curve. On a Mercator Projection, the Rhumb Line is represented by a straight line.
- RIGHT-ANGLE PRISM - A prism that turns a beam of light through a right angle. It inverts (turns upside down) or reverts (turns right for left) according to the orientation of the prism.
- RIGHT ASCENSION - The angular distance measured eastward on the equator from the Vernal Equinox to the hour circle through the celestial body, from 0 to 24 hours.
- ROLL - (Air Navigation) A rotation of an aircraft about its longitudinal axis so as to cause a wing-up or wing-down attitude. (Photogrammetry) A rotation of a camera or a photograph-coordinate system about either the photograph x axis or the exterior X axis. In some photogrammetric instruments and in analytical applications, the symbol Omega (ω) may be used.
- ROOF PRISM - A type of prism in which the image is reverted by a roof - that is, two surfaces included at 90 degrees to each other.
- ROTATING PRISM - See DOVE PRISM.
- SAFELIGHT - A lamp, for use in the darkroom, which supplies light of a color which will not affect the photographic material within a reasonable time. Different photographic materials require different safelight filters.
- SATELLITE TRIANGULATION - The determination of the angular relationships between two or more stations by the simultaneous observation of an Earth satellite from these stations. Observational techniques have included the use of precise Ballistic Cameras.
- SCALE - The ratio of a distance on a photograph or map to its corresponding distance on the ground. The scale of a photograph varies from point to point due to displacements caused by tilt and relief, but is usually taken as f/H where f is the principal distance of the camera and H is the height of the camera above mean ground elevation. Scale may be expressed as a ratio, 1:24,000; a representative fraction, $1/24,000$; or an equivalence, 1 in. = 2,000 ft.
- SCANNER - 1. Any device that scans, and by this means produces an image. 2. A radar set incorporating a rotatable antenna, or

radiator element, motor drives, mounting, etc. for directing a searching radar beam through space and imparting target information to an indicator.

SCHEIMPFLUG CONDITION - The requirement that object, lens, and image planes be collinear for sharp focus in any direct-projection system. Sharp focus is achieved in a rectifier when the Scheimpflug condition is fulfilled and when the negative-to-lens and lens-to-easel distances satisfy the conjugate-distance formula. (See also Conjugate Distance.) These conditions may be fulfilled automatically by the use of inversors. (See **INVERSOR**.)

SCRIBING - The process of preparing a negative which can be reproduced by contact exposure. Portions of a photographically opaque coating are removed from a transparent base by scraping with specially designed tools.

SECOR - A phase comparison electronic long range distance measuring system used to determine positions and orbits of satellites or flight vehicles that contain the necessary transponders. This term is an acronym for "SEquential COLLation of Range."

SEMI-ANALYTICAL AEROTRIANGULATION - Aerotriangulation in which a stereoplotting instrument is used to read x, y and z model coordinates of each stereopair in a strip or block; each model in its own unique coordinate system. This is followed by numerical formation of strips and blocks and adjustments to ground control utilizing a digital computer.

SEMI-CONTROLLED MOSAIC - See **MOSAIC**.

SEMI-MAJOR AXIS - One-half the longest diameter of an ellipse. Also called Mean Distance.

SEMI-MINOR AXIS - One-half the shortest diameter of an ellipse.

SEMI-MICROGRAPH - Imagery produced by a scanning electron microscope.

SENSITOMETER - An instrument which exposes a photographic film in a known manner to that its light-sensitive properties may be measured. (See also **CHARACTERISTIC CURVE**.)

SENSOR - An instrument used to detect and/or record electromagnetic energy.

SHIRAN - An electronic distance-measuring system for measuring distances with geodetic accuracy from an airborne station to each of four ground stations. This term is an acronym for "S-band high precision short-range electronic navigation." See also **HIRAN**.

SHORAN - An electronic measuring system for indicating distance from an airborne station to each of two ground stations. The

terms is an acronym for the phrase "SHORt-Range Navigation." See also HIRAN and LORAN. Shoran Straight-Line Indicator - A shoran device for assisting the pilot to fly a straight flight line. Shoran Control - The control of aerial photographs by registration of the distance of the exposure station from two ground stations. Shoran Line Crossing - A method of determining distance between two points by flying across the joining line.

SHUTTER (Photography) - The mechanism of a camera which controls the length of time the emulsion is exposed. Focal-Plane Shutter - A shutter located near the focal plane; usually consisting of a curtain with a slot which is pulled across the focal plane to make the exposure. Between-the-Lens Shutter - A shutter located between the lens elements of a camera; usually consisting of thin metal leaves which open and close or revolve to make the exposure. Louver Shutter - A shutter consisting of a number of thin metal strips or louvers which operate like a venetian blind to make the exposure; usually located just in front of or just behind the lens.

SIDE LAP - See OVERLAP.

SIDEREAL TIME - Time based upon the rotation of the Earth relative to the Vernal Equinox.

SIDE-LOOKING AIRBORNE RADAR (SLAR) - A radar system using a stabilized antenna oriented at right angles to the aircraft's flight path. The acronym Slar is derived from "Side-Looking Airborne Radar."

SKETCHMASTER - See CAMERA LUCIDA.

SLOTTED TEMPLET - See TEMPLET.

SLOTTED-TEMPLET METHOD - See TEMPLET and RADIAL TRIANGULATION.

SLOTTED-TEMPLET PLOT - See RADIAL TRIANGULATION.

SLOTTED-TEMPLET TRIANGULATION - See RADIAL TRIANGULATION.

SNELL'S LAW OF REFRACTION - This law states that, for a ray of light passing from one medium to another, the sine of the angle of incidence divided by the sine of the angle of refraction equals a constant. This constant is called the Index of Refraction when the medium containing the incident ray is air or a vacuum. The index of refraction can also be defined as the ratio of the velocity of light in one medium to that in another medium. The indexes of glass range from 1.46 to 1.80. (See also REFRACTION and CRITICAL ANGLE.)

SOFTWARE - A set of Computer programs, procedures, and possibly associated documentation concerned with the operation of a data processing system.

- SOLARIZATION (Photography) - A reversal of the gradation sequence in the (usually very dense) image obtained on the normal development of films, plates, and papers after a very intense or long-continued exposure. A still greater exposure appears to restore the original sequence of gradation.
- SORTIE - An operation flight by one aircraft; also, photography obtained on a flight.
- SPACE COORDINATES - See COORDINATES.
- SPECIAL-PURPOSE MAP - See MAP.
- SPECIFIC HUMIDITY - See HUMIDITY.
- SPECTRUM - An array of waves ordered in accordance with the magnitude of wave length. The electromagnetic spectrum extends from the shortest cosmic rays, through gamma rays, X-rays, ultraviolet radiation, visible radiation, infrared radiation, and including microwave and all other wavelengths of radio energy.
- SPECULAR REFLECTION (Optics or Microwave Theory) - The type of reflection characteristic of a highly polished plane surface from which all rays are reflected at an angle equal to the angle of incidence.
- SPEED (Photography) - See CHARACTERISTIC CURVE.
- SPEED OF LENS - See RELATIVE APERTURE.
- SPHERICAL ABERRATION - See ABERRATION.
- SPHERICAL COORDINATES - See COORDINATES.
- SPHERICAL LENS - A lens in which all surfaces are segments of spheres. Most photographic lenses belong in this class. (See also ASPHERICAL LENS.)
- SPHEROID OF REFERENCE - See REFERENCE SPHEROID or ELLIPSOID under GEOID.
- SPIDER TEMPLET - See TEMPLET.
- SPIDER-TEMPLET PLOT - See RADIAL TRIANGULATION.
- SPIDER -TEMPLET TRIANGULATION - See RADIAL TRIANGULATION.
- SPIRIT LEVEL - A closed glass tube (vial) of circular cross section, its center line also forming a circular arc, its interior surface being ground to precise form; it is filled with ether or liquid of low viscosity with enough free space being left for the formation of a bubble of air and gas at the topmost point of the circular arc.

SPIRIT LEVELING - See LEVELING.

SPLIT CAMERA - An assembly of two cameras disposed at a fixed overlapping angle relative to each other. Also called split-vertical camera.

SPLIT PHOTOGRAPHY - Aerial photography taken using a split camera installation. Also called convergent photography; split-vertical photography.

SPLIT-VERTICAL CAMERA - See SPLIT CAMERA.

SPLIT-VERTICAL PHOTOGRAPHY - See SPLIT PHOTOGRAPHY.

SPOT ELEVATION - A point on a map or chart whose height above a specified reference datum is noted, usually by a dot or a small sawbuck and elevation value. Elevations are shown, wherever practicable, for road forks and intersections, grade crossings, summits of hills, mountains, and mountain passes, water surfaces of lakes and ponds, stream forks, bottom elevations in depressions, and large flat areas. Also called spot height.

STANDARD - An exact value (a physical entity or an abstract concept) established and defined by authority, custom, or common consent to serve as a reference, model, or rule in measuring quantities or qualities, establishing practices or procedures, or evaluating results. A fixed quantity or quality.

STANDARD DEVIATION - See ERROR.

STATE PLANE COORDINATE SYSTEMS - See COORDINATES.

STATION (Surveying) - 1. A point whose position has been (or is to be) determined. A station may be a marked station (i.e., a point more or less permanently marked for recovery) or an unmarked station, one which is not recoverable. 2. A length of 100 ft., measured along a given line, which may be straight or curved. 3. Any point on a straight (or curved) line, whose position is indicated by its total distance from a starting point, or zero point (e.g., station 4+47.2, meaning 447.2 ft. from zero). (See also CAMERA STATION.)

STATOSCOPE - See ALTIMETER.

STELLAR CAMERA - See under CAMERA.

STEP WEDGE - A strip of film or a glass plate whose transparency diminishes in graduated steps from one end to the other; often used to determine the density of a photograph. Also called Gray Scale or Step Tablet. Contrast with Continuous Tone Gray Scale.

STEREO - 1. Contracted or short form of stereoscopic. 2. The orientation of photographs when properly positioned for stereoscopic viewing. Photographs so oriented are said to be "in stereo."

STEREOCOMPARAGRAPH - A relatively simple and mobile stereoscopic instrument used for the preparation of topographic maps from photography. Differences in elevation are determined by measuring parallax difference on a stereoscopic pair.

STEREOCOMPARATOR (Photogrammetry) - See COMPARATOR.

STEREOCOMPILATION - See COMPILATION, Definition 2.

STEREOGRAM - See STEREOSCOPY.

STEREOMETER - A measuring device containing a micrometer movement by means of which the separation of two Index Marks can be changed to measure parallax difference on a stereoscopic pair of photographs. Also called Parallax Bar.

STEREOMETRIC CAMERA - See CAMERA.

STEREOMODEL - The three-dimensional model formed by the intersecting homologous rays of an overlapping pair of photographs.

STEREOPLANIGRAPH - A precise stereoscopic plotting instrument, especially valuable for extension of control, and capable of handling most types of stereoscopic photography, including terrestrial.

STEREOPLOTTER - See STEREOSCOPIC PLOTTING INSTRUMENT.

STEREOSCOPE - A binocular optical instrument for assisting the observer to view two properly oriented photographs or diagrams to obtain the mental impression of a three-dimensional model. Lens Stereoscope - An instrument consisting of two semi-convex simple lenses mounted in a frame a few inches above a pair of overlapping aerial photographs. Common magnifications are 2, 4, or 6 times. Only a small section of a stereopair of photographs may be viewed at any one time. Mirror Stereoscope - An instrument for viewing a stereopair of photographs that uses mirrors in addition to simple lenses, so that a relatively large area of each pair of photographs is viewed. This avoids frequent moving of photos and flipping up the sides of photos required when using a lens stereoscope since all the stereo overlap can be seen.

STEREOSCOPIC BASE - See PHOTOBASE under AIR BASE.

STEREOSCOPIC COVERAGE - Aerial photographs taken with sufficient overlap to permit complete stereoscopic observation.

STEREOSCOPIC EXAGGERATION - See HYPERSTEREOSCOPY.

STEREOSCOPIC FUSION - See STEREOSCOPY.

STEREOSCOPIC IMAGE - See STEREOSCOPY.

STEREOSCOPIC MODEL - See STEREMODEL.

STEREOSCOPIC PAIR - See STEREOSCOPY.

STEREOSCOPIC PARALLAX - See PARALLAX.

STEREOSCOPIC PERCEPTION - Ability to perceive a three-dimensional stereoscopic image.

STEREOSCOPIC PLOTTING INSTRUMENT or STEREOSCOPIC PLOTTER - An instrument for plotting a map or obtaining spatial solutions by observation of stereoscopic models formed by stereopairs of photographs.

STEREOSCOPIC VISION - See STEREOSCOPY.

STEREOSCOPY - The science and art that deals with the use of Binocular Vision for observation of a pair of overlapping photographs or other perspective views, and with the methods by which such viewing is produced. Stereoscopic Pair (Photogrammetry) - Two photographs of the same area taken from different camera stations so as to afford stereoscopic vision; frequently called a Stereopair. Stereogram - A stereoscopic pair of photographs or drawings correctly oriented and mounted or projected for stereoscopic viewing. Binocular Vision - Simultaneous vision with both eyes. Stereoscopic Vision - The particular application of binocular vision which enables the observer to obtain the impression of depth, usually by means of two different perspectives of an object (as two photographs taken from different camera stations). (Contrast with Chromo-Stereopsis.) Stereoscope - An optical instrument for helping an observer to view photographs, or diagrams, to obtain the mental impression of a three-dimensional model. Stereoscopic Fusion - The mental process which combines two perspective views to give an impression of a three-dimensional model. Stereoscopic Image - The mental impression of a three-dimensional model which results from viewing two overlapping perspective views. Also called Stereoscopic Model or Steremodel.

STEREOTEMPLET - See TEMPLET.

STEREOTEMPLET TRIANGULATION - See TEMPLET.

STEREOTRIANGULATION - A triangulation procedure that uses a stereoscopic plotting instrument to obtain the successive orientations of the stereoscopic pairs of photographs into a continuous strip. The spatial solution for the extension of horizontal and/or vertical control using these strip (or flight) coordinates may

be made by either graphical or computational procedures. Often called Bridging.

STEREOTRIPLET - Three photographs, the center photo having a common field of view with the two adjacent photos, to permit complete stereoscopic viewing of the center photograph.

STOP - See APERTURE STOP.

STRENGTH OF FIGURE (Triangulation) - The comparative precision of computed lengths in a triangulation net as determined by the size of the angles, the number of conditions to be satisfied, and the distribution of base lines and points of fixed position. Strength of figure in triangulation is not based on an absolute scale but rather is an expression of relative strength. Also applicable to the individual geometric figures within a given net.

STRIAE (Optics) - Threadlike filaments within a piece of glass caused by improper mixing of the molten glass during manufacture. These filaments are composed of glass having a slightly different index of refraction from that of the surrounding glass. The extreme fineness of striae often makes their detection difficult.

STRIP - See FLIGHT STRIP.

STRIP ADJUSTMENT - Similar to a Block Adjustment, but limited to a single strip of photographs.

STRIP MOSAIC - See MOSAIC.

STRIP COORDINATES - See COORDINATES.

STRIP RADIAL PLOT - See RADIAL TRIANGULATION.

STRIP RADIAL TRIANGULATION - See RADIAL TRIANGULATION.

SUBSTITUTE CENTER - A point which, because of its ease of identification on overlapping photographs, is used instead of the principal point as a Radial Center.

SUN ANGLE - Elevation of the sun above the apparent horizon, usually measured in degrees. It is a critical parameter in aerial photography since sun angle affects shadows.

SUPER-WIDE-ANGLE LENS - See ANGLE OF COVERAGE under LENS.

SUPPLEMENTAL CONTROL - See CONTROL.

SURVEY - The act or operation of making measurements for determining the relative positions of points on, above, or beneath the Earth's surface; also, the results of such operations; also,

an organization for making surveys. Photogrammetric Survey - A method of surveying that uses either ground photographs or aerial photographs. Aerial Survey - A survey using aerial photographs as part of the surveying operation; also, the taking of aerial photographs for surveying purposes. Ground Survey - A survey made by ground methods, as distinguished from an Aerial Survey. A ground survey may or may not include the use of photographs.

SURVEYING - Surveying may be defined as the science and art of determining relative positions of points above, on, or beneath the surface of the earth, or establishing such points. In a more general sense, however, surveying can be regarded as that discipline which encompasses all methods for gathering and processing information about the physical earth and the environment. Conventional ground systems are most frequently used, but aerial and satellite surveying methods are also common.

SURVEYING CAMERA - See CAMERA.

SWING - A rotation of a photograph in its own plane around the photograph perpendicular from some reference direction (such as the direction of flight). May be designated by the symbol Kappa (κ). Also, the angle at the Principal Point of a photograph which is measured clockwise from the positive y axis to the Principal Line at the Nadir Point. (See also YAW.)

SYMBOL - A diagram, design, letter, or abbreviation, placed on maps and charts, which (by convention, usage, or reference to a legend) is understood to stand for or represent a specific characteristic or object.

SYSTEMATIC ERROR - See ERROR.

TANGENTIAL DISTORTION - Linear displacement of image points in a direction normal to radial lines from the center of the field. See also DISTORTION under ABERRATION.

TARGET - The distinctive marking or instrumentation of a ground point to aid in its identification on a photograph. In photogrammetry, Target designates a material marking so arranged and placed on the ground as to form a distinctive pattern over a geodetic or other control-point marker, on a property corner or line, or at the position of an identifying point above an underground facility or feature. A target is also the image pattern on aerial photographs of the actual mark placed on the ground prior to photography. (See also TEST CHART and PANEL.)

TELEMETER (Surveying) - An instrument for determining the distance from one point (position) to another. Some such instruments employ a telescope and measure the angle subtended by a short base of known length. An Electronic Telemeter measures the phase difference or transit time between a transmitted electromagnetic impulse of known frequency and speed and its return.

TELEMETRY - The science of distance measurement by use of a tele-meter. Also, the transmission of recorded data by means of radio, telephone, or telegraph.

TELEPHOTO LENS (Optics) - A lens comprising a Positive Front Element and a Negative Rear Element; the focal length of the combination is greater than the distance from the front lens surface to the focal plane. This construction is used to make relatively compact long-focus cameras.

TEMPLET (Photogrammetry) - A graphical representation of a photograph; a templet records the directions, or Radials, taken from the photograph. Hand Templet - A templet made by tracing the radials from a photograph onto a transparent medium, as on sheet plastic; hand templets are laid out and adjusted by hand to form the Radial Triangulation. Slotted Templet - A templet on which the radials are represented as slots cut in a sheet of cardboard, metal, or other material. Spider Templet - A mechanical templet fabricated by attaching slotted steel arms, representing radials, to a center hub. The spider templet can be disassembled and the parts used again. Stereotemplet - A composite slotted templet adjustable in scale and representative of the horizontal plot of a stereoscopic model. Double-Model Stereotemplet - A templet representative of the horizontal plot of two adjacent stereoscopic models that have been adjusted to a common, though random scale. Stereotemplet Triangulation - Aerotriangulation by means of an assembly of stereotemplets which allows horizontal positions to be obtained with a stereoscopic plotting instrument not designed for Bridging. The method permits scale solutions by area and is not restricted to solutions along flight strips.

TEMPLET METHOD - See general description under RADIAL TRIANGULATION; see also TEMPLET.

TERRAIN - An area of ground considered as to its extent and topography.

TERRESTRIAL CAMERA - See CAMERA.

TERRESTRIAL PHOTOGRAMMETRY - Photogrammetry utilizing Terrestrial Photographs.

TERRESTRIAL PHOTOGRAPH - A photograph taken by a camera located on the ground. Sometimes called a Ground Photograph, although this is not a preferred term.

TEST CHART - A chart for testing the performance of optical systems. The design usually consists of ruled lines, squares, or circles of various sizes so arranged that the quality of a lens can be determined by examining the image of the chart. (See also TARGET, RESOLVING POWER and RESOLVING POWER TARGET.)

TEST GLASS - An optical element used for checking the curvature of lens surfaces during final polishing. The test glass has a

curvature equal to and opposite that of the desired lens. When the two surfaces are placed in contact and viewed in monochromatic light, Interference Fringes are formed. The fringe pattern (also called Newton's Rings) is really a contour map of the air film between the two glasses, the contour interval being one-half a wavelength of light (about 2500A or 0.00001 in.).

THICK LENS - A term used in geometrical optics to indicate that the thickness of a lens is considered and that all distances are being measured from the Nodal Points instead of the lens center.

THIN LENS - A term used in geometrical optics to indicate that the thickness of a lens is ignored and that all distances are measured from the lens center; used for approximate computations.

THREE-POINT RESECTION - Three-point resection Radial Triangulation - A method of computing the coordinates of the principal points of overlapping aerial photographs by resecting on three horizontal control points appearing in the overlap area.

TIE - A survey connection from a point of known position to a point whose position is desired. A tie is made to determine the position of a supplementary point whose point is desired for mapping or reference purposes, or to close a survey on a previously determined point. To "tie-in" is to make such a connection.

TIE POINT - Image points identified on photographs in the sidelap area between two or more adjacent strips of photography. They serve to tie the individual sets of photographs into a single flight unit and to tie adjacent flights into a common network.

TILT - The angle at the perspective center between the photograph perpendicular and the plumbline (or other exterior reference direction); also, the dihedral angle between the plane of the photograph and the horizontal plane. The direction of Tilt is expressed by Swing (when referred to the axes of the photograph) or Azimuth (when referred to the exterior coordinate system). In aerial photography, tilt may be separated into its component angles, referred to the fiducial axes, with the x axis being the one more nearly in the direction of flight. In aerial-camera orientation, a positive x tilt results from the left wing of the aircraft being lowered, displacing the nadir point in the positive y direction. Similarly, a positive y tilt results from the nose of the aircraft being lowered, displacing the nadir point in the positive x direction. (See ROLL, PITCH, YAW, and RELATIVE TILT.)

TILT DISPLACEMENT - See DISPLACEMENT.

TIP - Another term for y Tilt. See TILT.

- T-NUMBER, T-STOP - A system of marking lens apertures in accordance with their actual light transmission, rather than by their geometrical dimensions as in the f-stop system.
- TOE - The portion of the Characteristics Curve below the straight-line section of the curve. It represents the area of minimum useful exposure.
- TONE - For imagery, each distinguishable shade variation from black to white.
- TOLERANCE - The allowable variation from a standard or from specified conditions.
- TOPOANGULATOR - An instrument used to measure vertical angles in the principal plane of an oblique photograph.
- TOPOGRAPHIC FEATURE - See TOPOGRAPHY.
- TOPOGRAPHIC MAP - See MAP.
- TOPOGRAPHY - Features of the surface of the earth considered collectively as to form. A single feature (such as a mountain or valley) is called a Topographic Feature. Topography is subdivided into Hypsography (relief features), Hydrography (water and drainage features), and Culture (manmade features).
- TRACK (Air Navigation) - The actual path of an aircraft over the surface of the earth. The azimuth of this path generally is referred to the true meridian. (See also COURSE.)
- TRANSFER FUNCTION - See FUNCTION, TRANSFER.
- TRANSFORMATION - The process of projecting a photograph (mathematically, graphically, or photographically) from its plane onto another plane by translation, rotation, and/or scale change. (See also COORDINATE TRANSFORMATION.) When a photograph is transformed to a horizontal plane, so as to remove displacement due to tilt, the process is termed Rectification; however, relief displacement cannot be removed by this process. Empirical Orientation - The composited rectified adjustments of magnification, swing, easel tilt, y-displacement, and x-displacement used to correctly recreate the exact conditions in the projected image that existed in the negative at the instant of exposure. Transforming Printer - A projection printer, designed especially for use in transforming photographs according to fixed parameters. A rectified virtual image can be produced by a monocular instrument, such as a Sketchmaster or Camera Lucida. Rectification of individual rays on tilted or oblique photograph may be made by analytical or graphical methods (see also Paper-Strip-Method) or by mechanical devices, such as the Rectoblique Plotter and the Photoangulator.

- TRANSFORMED PRINT - A photographic print made by projection in a transforming printer. (See also MULTIPLE-LENS CAMERA under CAMERA, and TRANSFORMING PRINTER under TRANSFORMATION.)
- TRANSFORMING PRINTER - See TRANSFORMATION.
- TRANSIT - A surveying device which consists of a telescope and graduated circles and is used primarily to measure horizontal and vertical angles.
- TRANSLATION - Movement in a straight line without rotation. The systematic movement of projector assemblies in line-of-flight directions in a stereoplottting instrument.
- TRANSMISSION (Optics) - The ratio of transmitted light to the incident light. If 100 units of light fall upon a translucent material and 10 of them succeed in passing through, then it can be said that the material has 1/10 or 10 percent transmission.
- TRANSPARENCY - A photographic print on a clear base, especially adaptable for viewing by transmitted light. Also, the light-transmitting capability of a material.
- TRANSVERSE MERCATOR MAP PROJECTION - See MAP PROJECTION.
- TRAVERSE - A method of surveying in which the lengths and directions of lines connecting a series of stations are measured. A traverse may be closed or open, according as it does or does not end on a known position or return to the starting point. Traverses may be of many kinds, such as Stadia, Compass, or Transit Traverse.
- TRIANGULATION - A method of surveying in which the stations are points on the ground at the vertices of a chain or network of triangles whose angles are observed instrumentally and whose sides are derived by computation from selected triangle sides called base lines, whose lengths are obtained from direct measurement on the ground. ACR Triangulation - A system of limited width designed to progress in a single general direction. Arc triangulation is executed for the purpose of connecting independent and widely separated surveys, coordinating, and correlating local surveys along the arc, furnishing data for the determination of a geodetic datum, providing a network of control points for a country-wide survey, etc.
- TRIANGULATION STATION - A point on the Earth whose position is determined by triangulation. Sometimes shortened to trig point.
- TRICAMERA PHOTOGRAPHY - See PHOTOGRAPHY, TRICAMERA.
- TRIGONOMETRIC LEVELING - The determination of differences of elevations from observed vertical angles combined with lengths of lines. A type of indirect leveling.

TRILATERATION - A method of determining horizontal ground positions by measuring the sides of triangles in lieu of angles. Generally, electronic distance instruments are employed for this purpose.

TRIMETROGON - See TRIMETROGON CAMERA under CAMERA; also PHOTOGRAPHY, TRICAMERA.

TRIMMING AND MOUNTING DIAGRAM (Photography) - A sketch which indicates how the print of a transformed multiple-lens photograph should be corrected to obtain, in effect, a photograph made by a single lens. The information is given in the form of distances referred to the fiducial marks on the photograph, and it is the result of a calibration for the particular camera used.

TRUE HORIZON - See HORIZON.

ULTRA-WIDE-ANGLE LENS - See ANGLE OF COVERAGE under LENS.

UNCONTROLLED MOSAIC - See MOSAIC.

UNIVERSAL TRANSVERSE MERCATOR (UTM) GRID - A Transverse Mercator Projection, applied to maps of the Earth's surface extending to 80 degrees N and 80 degrees S latitudes.

VACUUM BACK - See LOCATING BACK.

VANISHING LINE - The straight line on a photograph upon which lie all the Vanishing Points of all systems of parallel lines parallel to one plane. The vanishing line for all systems of horizontal parallel lines in the object space is the horizon trace.

VANISHING POINT - See VANISHING POINT under PRINCIPAL PLANE.

VARIANCE - See under STANDARD ERROR at ERROR.

VARIATE - In contradistinction to a Variable, a variate is a quantity that may take on any of the values of a specified set with a specified relative frequency or probability; often known as a Random Variable. It is to be regarded as defined not merely by a set of permissible values like an ordinary mathematical variable, but by an associated frequency (probability) function expressing how often those values appear in a given situation.

VARIATION OF COORDINATE METHOD - A method of adjusting measurements in which the coordinates of geodetic points are varied so as to best fit the observations and retain mathematical homogeneity.

VECTOGRAPH - A stereoscopic photograph composed of two superimposed images that polarize light in planes 90 degrees apart. When

these images are viewed through Polaroid spectacles with the polarization axes at right angles, an impression of depth is obtained.

VERNIER - A device which enables readings of a scale to be made to smaller units than the smallest division of the scale.

VERNIER ACUITY - A measure of the ability to perceive when one segment of a straight line has been displaced laterally with respect to the rest of the line. It is equal to the reciprocal of the angle subtended at the eye by a lateral displacement that can barely be discriminated by the observer.

VERTICAL ANGLE - An angle measured in a vertical plane which is referenced to horizontal. Vertical angles above horizontal are called Elevation Angles; those below horizontal area called Depression Angles.

VERTICAL CONTROL - See CONTROL.

VERTICAL-CONTROL DATUM - See DATUM.

VERTICAL CONTROL POINT or VERTICAL CONTROL STATION - See CONTROL POINT, CONTROL STATION, BENCH MARK.

VERTICAL COORDINATES - The vertical distance of a point above or below a reference datum. Points may be plus or minus according to whether the point is above or below the datum.

VERTICAL DATUM - See DATUM.

VERTICAL DEFORMATION - In relative orientation, the cumulative model warpage affecting the vertical datum from x-tilt error and y-tilt error.

VERTICAL EXAGGERATION - An increase or decrease in the vertical dimension of the perceived stereo model when compared to its horizontal dimension. Equal to the perceived ratio of a height to horizontal dimension ratio of the actual object.

VERTICAL LINE or PLUMB LINE - A line which coincides with the direction of gravity.

VERTICAL PARALLAX - See Y PARALLAX under PARALLAX.

VERTICAL PASS POINT - See PASS POINT.

VERTICAL PHOTOGRAPH (Aerial Photography) - An aerial photograph made with the camera axis vertical (or as nearly vertical as practicable) in an aircraft.

VIEWFINDER - An auxiliary device which shows the field of view of a camera.

- VIGNETTING (Photography) - A gradual reduction in density of parts of a photographic image due to the stopping of some of the rays entering the lens. Thus, a lens mounting may interfere with the extreme oblique rays. An antivignetting filter is one that gradually decreases in density from the center toward the edges; it is used with many wide-angle-lenses to produce a photograph of uniform density by cutting down the over-exposure of the center of the photograph.
- VISIBLE SPECTRUM - The part of the electromagnetic spectrum designated as "light": 4,000-7,000 angstroms (400-700 millimicrons 0.4 - 0.7 microns, 0.0-04 to 0.0007 millimeters, 40-70 nanometers.)
- WANT OF CORRESPONDENCE - See PARALLAX.
- WEDGE (Optics) - A refracting prism of very small deviation, such as those used in the eyepieces of some stereoscopes. (See also STEP WEDGE.)
- WEIGHT (Statistics) - The measure of relative reliability (or worth) of a quantity as compared with other values of the same quantity or with comparable quantities.
- WEIGHTED MEAN - A value obtained by multiplying each of a series of values by its assigned weight and dividing the sum of those products by the sum of the weights.
- WIDE-ANGLE LENS - See ANGLE OF COVERAGE under LENS.
- WING PHOTOGRAPH - A photograph taken by one of the side or wing lenses of a multiple-lens camera. (See also MULTIPLE-LENS CAMERA under CAMERA.)
- X AXIS - See FIDUCIAL AXES and TILT.
- X-MOTION - In a stereoplottting instrument, the line adjustment approximately parallel to a line connecting two projector stations; the path of this adjustment is, in effect, coincident with the flight line between the two relevant exposure stations.
- X PARALLAX - See PARALLAX.
- X TILT - See TILT.
- X-RAYS - That radiation within the electromagnetic spectrum having very short wavelengths (between 0.1 and 100 angstroms) and which is capable of penetrating solids.
- X-RAY PHOTOGRAMMETRY - That branch of photogrammetry that deals with analysis and measurements from radiographs derived from X-rays.
- Y AXIS - See FIDUCIAL AXES and TILT.

Y-MOTION - In a stereoplottting instrument, that linear adjustment approximately perpendicular to a line connecting two projectors.

Y PARALLAX - See PARALLAX.

Y TILT - See TILT.

YAW - 1. Air Navigation: The rotation of an aircraft about its vertical axis so as to cause the aircraft's longitudinal axis to deviate from the flight line. Sometimes called Crab.
2. Photogrammetry: The rotation of a camera or a photograph coordinate system about either the photograph z axis or the exterior Z axis. In some photogrammetric instruments and in analytical applications, the symbol Kappa (κ) may be used.

ZENITH CAMERA - See CAMERA.

ZENITH DISTANCE - See COALTITUDE and ASTRONOMICAL TRIANGLE.

Z-MOTION - Movement of a stereoplottting projector in a vertical direction.

ZOOM SYSTEM - See PANCRATIC SYSTEM.