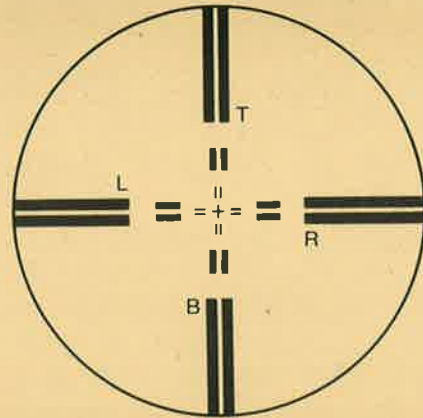


Glossary of Optical Alignment Terms.



CUBIC PRECISION

A member of the Cubic Corporation family of companies

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GLOSSARY

ABERRATION: Any errors that result in imperfection of an image. Such errors can result from design or fabrication, or both as in astigmatism, chromatic aberration, coma, curvature of field, distortion (image) and spherical aberration.

ALIGNMENT BRACKET: A clamping and/or adjusting device which holds an optical instrument and permits alignment of this instrument with the predetermined line of sight.

ALIGNMENT LASER: A specially manufactured laser instrument which can employ a gas or solid state laser as a power source. The laser barrel is machined to NAS specifications. The optical axis is aligned parallel and centered to the mechanical axis.

AUTO-COLLIMATING LASER: The auto-collimating laser is similar to the alignment laser and it can be used for both alignment and auto-collimation. The internal auto-collimating sensing unit lies wholly within the instrument at the focal plane of the objective lens.

ALIGNMENT TELESCOPE: A precision refracting telescope containing cross hairs where the optical and mechanical axis are made coincident. The instrument is used primarily with a target to establish a fixed line of sight.

ANGSTROM UNIT: A unit of measurement of wavelength of light. One angstrom unit (\AA) equals one hundred millionth of a centimeter or 10^{-10} meters. Helium-neon laser light has a wavelength of 6328 angstrom units.

AUTO-COLLIMATION: The process of establishing squareness by means of a mirror which reflects the light projected through the telescope reticle. The displacement of the reflected reticle image against the reticle represents an angular deviation.

AUTO-COLLIMATOR: An instrument which permits the measurement of small angular deviations of a mirror from a line of sight by means of its own collimated light.

AUTO-REFLECTION: The process of checking squareness to the line of sight by using a mirror to reflect the image of a target placed at/or on the objective lens of the telescope. The image is observed through the telescope.

AZIMUTH: Angular rotation of an optical instrument in a horizontal plane, around a vertical axis.

BASE PLANE: A plane, established by three or more points, used as a primary reference.

BUCKING IN: The process of aligning an optical instrument parallel to and at a predetermined distance in relation to two reference points.

BUTTOCK LINE (BL) (Sometimes called body line.): Buttock lines are parallel to the vertical center line of the fuselage, and are used to establish dimensions or locations from the center of the airplane, either left or right.

CLAMP, SPHERICAL MOUNT: A clamping device which holds a spherical mount on the mounting base.

COINCIDENCE: The intersection of two lines of superposition of a target with a telescope reticle.

COLLIMATE: To mutually aim two optical instruments so that their lines of sight are parallel.

COLLIMATOR: An optical device consisting of a lens of parabolic concave mirror with an illuminated slit or reticle at its focal plane.

COLLINEATION: Simultaneous linear and angular alignment.

COLLINEATOR: An instrument used for determining linear and angular deviations from the line of sight. Example: K&E Alignment Scope with K&E 71 2302 Angular Reading Attachment.

CONVERGENCE: The bending of light rays toward each other, as by a convex or positive lens.

CROSS PATTERN: A line pattern on a reticle centered on the optical axis within a telescope.

DIFFRACTION: The bending of rays through limiting apertures.

DISPLACEMENT: A parallel offset of a line of sight from its original position. Note; if one refers to a point, then displacement is an offset of the point from the line of sight.

DISPLACEMENT TARGET: The graduated pattern of an optical target, which is used to detect or measure horizontal and vertical displacement.

DIVERGENCE: The bending of light rays away from each other commonly accomplished with a concave lens or by a convex mirror.

DUMPING: Movement of the telescope about its horizontal axis and rotation around the vertical axis both rotation 180°. Same as plunging.

ERECTED IMAGE: An image in the same position as the sighted object, with the top side up and the right side on the right.

ERECTION LENS: A lens between the eyepiece and the reticle of a telescope to give normal appearance of the object viewed.

FRONT-SURFACE MIRROR: A mirror that has the reflective surface focusing the line of sight without the optical path going through the glass.

FOCAL LENGTH:

Effective Focal Length (EFL) — Distance from the second nodal point of lens to the collimated object.

Back Focal Length (BFL) — Distance from the vertex of the lens focusing the image side to the same focal point as the EFL.

Front Focal Length (FFL) — Distance from the vertex of the lens focusing the objective to the first focal point.

FOCAL PLANE: A plane perpendicular to the optical axis of a lens intersecting with the focus of a collimated object. (Second focal Point.)

FOCAL POINT: The focal point is the focus of a collimated object. It is normally measured at 5876 angstroms or the d line.

FOCUS: The adjustment to bring the focal point of the objective lens into coincidence with the reticle.

FOCUSING RANGE: The focusing range of an instrument is the linear distance between the closest point of focus and infinity.

INCIDENCE, ANGLE OF: The angle formed between a ray of light striking a surface and the normal to that surface at the point of incidence.

INFINITY: In the strict technical sense, infinity means a number or a distance which has no limits. When the term is applied to optical instruments, however, infinity means a point from which the light reaching the telescope is traveling in parallel rays.

INTERFEROMETER: An instrument that employs the interference of light waves, used primarily for measuring the accuracy of optical surfaces and components.

LASER: The word "laser" originated from the process used to create the extremely bright light, i.e., Light Amplification by Stimulated Emission of Radiation.

LEVEL:

Coincidence — A spirit level with a prism and mirror device, which gives the bubble viewed the appearance of two half-bubbles; when these half-bubbles are brought into coincidence, the desired level position has been obtained.

Electronic — A form of level in which a transducer is used to electronically indicate on a meter the angular displacement of the sensor to the local gravity vector.

Telescope Tilting Level — A telescope with spirit level that defines the telescope optical line of sight with respect to gravity.

Striding Level — A level mounted on vee-shaped legs, used for leveling tubular objects.

LINE OF SIGHT: The extended path of the optical axis of a telescope.

Basic — The line of sight from which secondary or auxiliary lines of sight are determined.

Auxiliary — Additional lines of sight related to the basic line of sight.

MECHANICAL AXIS: The mechanical axis is a term used in optical work to define the center line of a cylindrical housing.

MODULATION: A means of putting information on some type of carrier regardless if it is a laser, radio, etc. Modulation may be in frequency, amplitude or phase.

MONOCHROMATIC LIGHT: A single, colored light with all its rays being of the same wavelength.

MOUNTING BASE — ADJUSTABLE: A pedestal type base with a female cone for supporting spherical mounts. This base is adjustable and is normally mounted permanently to the tool being set optically.

MOUNTING BASE — FIXED: A non-adjustable pedestal type base with a female cone for supporting spherical mounts. It is normally mounted permanently to the tool being set optically.

OBJECTIVE LENS: The telescope lens nearest the objective viewed; it receives the light from the object, forming a small, inverted and reverted image inside the telescope.

OPTICAL AXIS: A line passing through both nodal points of a lens element or optical telescope system.

OPTICAL FLAT: A piece of glass having on one or both surfaces a carefully ground and polished plane, generally flat to within close tolerances.

OPTICAL MICROMETER: A device containing an optical element, calibrated to measure horizontal or vertical displacement.

OPTICAL REFERENCE PLANE: A plane determined by two intersecting lines of sight.

OPTICAL SQUARE: Any optical instrument which will turn the line of sight 90 degrees from its original path.

OPTICAL TOOLING: A tooling system using precision optical instruments to establish and maintain basic and auxiliary lines of sight.

PARALLAX: The optical illusion that causes a viewed object to appear to change position due to the observer's actual change of position.

PENTA-PRISM: A five-sided prism containing two reflecting surfaces at 45° to each other, and two refracting faces perpendicular to the entering and emerging beams. The deviation angle of 90° is independent of any rotation of the prism about an axis parallel to the line of intersection of the two reflecting faces.

PLUNGING: See dumping.

PHOTO CELL: The photo cell is an electronic transducer which converts light to electrical energy.

PLANIZE: To generate an optical plane with perpendicular to or containing a line of sight.

PLUMB LINE: A gravity reference device. It can be mechanical or optical.

PRISM: A transparent body bounded in part by two plane surfaces which are not parallel.

REFLECTION: The process by which the light path striking a surface is reversed.

REFLECTION, ANGLE OF: The angle found between the normal to surface and the reflected ray.

REFRACTION: The bending of light rays passing obliquely through materials of different optical densities.

RESOLUTION: The ability of a lens or an optical system to distinguish between two adjacent points. It is often expressed in terms of the minimum angle between two points that can definitely be resolved or separated.

RETICLE: Patterns placed in the focal plane of an optical instrument for the purpose of providing a reference.

SPHERICAL MOUNT: A steel sphere used to mount an alignment telescope, alignment laser, or target on a mounting base.

TARGET-OPTICAL TOOLING: A mounted reticle, pattern, or other device for determining accurate positions when viewed by a telescope or other optical instrument.

THEODOLITE:

Optical— An instrument used to determine vertical and horizontal angles.

Electronic— An instrument similar in function to an optical theodolite, with electronic angular readouts.

TILT TARGET: The graduated pattern of an optical target, which is used to detect and measure angular deviation.

TOOLING BAR: A mobile or fixed structure utilized to support optical instruments with a special index bar and scale to permit accurate linear measurements throughout the length of the bar.

TOOLING DOCK: A rigidly fixed structure utilized to support optical instruments with a special index bar and scale to permit accurate linear measurements throughout the length of the index bar.

TOOLING LASER: See Alignment Laser.

TRANSIT, JIG: An optical instrument with a telescope mounted so that it can be rotated about a vertical and horizontal axis. Its primary use in optical tooling is to establish vertical reference planes. It usually includes an optical micrometer to measure linear displacements from the vertical reference plane established by the jig transit.

Transit Square: A transit equipped with a mirror or other device to allow establishment of one line of sight perpendicular to another.

