20 SEPTEMBER 1949

GLOSSARY OF GUIDED MISSILE TERMS

PREPARED BY THE COMMITTEE ON GUIDED MISSILES

DEPARTMENT OF DEFENSE
RESEARCH AND DEVELOPMENT BOARD
WASHINGTON 25, D. C.

Approved _____

F. A. Darwin
Executive Director

FOREWORD

PURPOSE

The definitions in the Glossary of Guided Missile Terms (GM 51/3, 15 September 1948), and in this first revision, have been carefully selected to provide an easily accessible reference for the meanings of technical terms which are in daily usage in the guided missile and associated technical fields. This compilation of definitions reflects current usage; however, since new terms and meanings are evolving constantly, the definitions in the Glossary should be considered as advisory rather than obligatory.

The Glossary makes no attempt to replace general or scientific dictionaries for words or phrases of general meaning. Rather, the aim has been to define—

(1) New words coined for the guided missile art.
(2) Words currently in general usage but with different meanings when applied to the guided missile field.
(3) Certain general technical terms for which a convenient reference might be useful to those engaged in the guided missile field. Cross reference has been used only where no clear preference or obvious relationship in terms exists.

ABBREVIATIONS.—The use of abbreviations and letter symbols for terms has been held to a minimum

in the Glossary consistent with a clear and understandable word definition. The study, evaluation, and selection of letter symbols for terms is a major field of endeavor in itself and currently is being undertaken for the various fields of science by the American Standards Association.

SOURCE MATERIAL

The Glossary of Guided Missile Terms is an outgrowth of a smaller, classified monograph of the same title compiled by Lieutenant Colonel John A. White in September 1947, while he was stationed at the Applied Physics Laboratory, Johns Hopkins University, as Army Liaison Officer. The general interest in and recognized need for an expanded vocabulary of accurate terminology in the guided missile field led to the appointment of an Ad Hoc Subcommittee on Glossary by the Committee on Guided Missiles, Research and Development Board, the Department of Defense, which prepared the Glossary, and this revision thereto.

Material, where available, has been consolidated and re-edited from reports and documents issued by Government laboratories or civilian concerns engaged in guided missile work under military department contracts.

ACKNOWLEDGMENTS

Acknowledgment is made of the hearty cooperation of the numerous persons and activities that have contributed suggestions and advice on the contents and formation of the Glossary (GM 51/3, 15 September 1948) and on this revision. The large number of contributors precludes individual acknowledgments.

ADDITIONS OR CHANGES

Future revisions may be made in the Glossary if warranted by the number or extent of changes in or additions to guided missile terminology. To that end, recommendations for such changes are encouraged. All such recommendations received by the Committee on Guided Missiles, RDB, will be held until such time as a revision of the Glossary may be appropriate. It is requested that recommended changes show the term and definition, with the words to be deleted included but lined through, and the words to be added underscored, as shown in the sample following.

Ad Hoc Subcommittee on Glossary
C. M. Hudson, Chairman
T. W. Hopkins
V. S. Roddy
J. A. White, Secretary

MEMORANDUM FOR
THE RESEARCH AND DEVELOPMENT BOARD
The Department of Defense
Washington 25, D. C.

Attention: Committee on Guided Missiles

SUBJECT: Recommendation for Change in Glossary of Guided Missile Terms

It is recommended that the Glossary of Guided Missile Terms be changed as follows:

(1) AIRFOIL ~~Any~~ *A* ~~surface~~ thin body such as ~~an~~ a ~~aircraft~~ wing, aileron, or rudder, designed to obtain reaction from the air through which it moves.

COMMENT: (State briefly reasons for the recommendation.)

(2) ALIGN In radio or electronics, ~~the process of lining up or adjusting of~~ adjustment of circuit values in two or more resonant circuits, ~~so they will give satisfactory response to the given frequency~~ or circuit functions, so as to obtain optimum design performance.

COMMENT: (State briefly reasons for the recommendation.)

_____
(Name)

_____
(Title)

_____
(Office)

SAMPLE

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GLOSSARY OF GUIDED MISSILE TERMS

A

ACCELERATION, LATERAL

The component of the linear acceleration of an aircraft along its "lateral" or "Y" axis.

ACCELERATION, LONGITUDINAL

The component of linear acceleration of an aircraft parallel to its "longitudinal" or "X" axis.

ACCELERATION, NORMAL

1. The component of the linear acceleration of an aircraft along its "normal" or "Z" axis.
2. The usual or typical acceleration.

ACCELERATION, PITCH

The angular acceleration of an aircraft about its "lateral" or "Y" axis.

ACCELERATION, ROLL

The angular acceleration of an aircraft about its "longitudinal" or "X" axis.

ACCELERATION, YAW

The angular acceleration of an aircraft about its "normal" or "Z" axis.

ACCELEROMETER

An instrument that measures one or more components of the accelerations of a vehicle.

ACCUMULATOR, PRESSURE

An apparatus for storing fluid under pressure, usually consisting of a chamber separated into a gas compartment and a fluid compartment by a diaphragm. Fluid stored in accumulators is used to actuate pressure-operated devices, such as flaps, wings, etc.

ACOUSTIC VELOCITY

The speed of sound, or similar pressure waves.

ADIABATIC

Occurring without gain or loss of heat; a change of the properties, such as volume and pressure of the contents of an enclosure, without exchange of heat between the enclosure and its surroundings.

AERODYNAMIC CENTER, WING SECTION

A point about which the moment coefficient is practically constant.

AERODYNAMICS

That field of dynamics which treats of the motion of air and other gaseous fluids and of the forces acting on solids in motion relative to such fluids.

AEROPULSE

A pulse jet; a device producing thrust intermittently, from intake of air, as distinct from hydropulse. See PULSE JET.

AEROSTATICS

The science that treats of the equilibrium of gaseous fluids and of bodies immersed in them.

AFTERBURNING

(1) The characteristic of certain rocket motors to burn irregularly for some time after the main burning and thrust have ceased.

(2) The process of fuel injection and combustion in the exhaust jet of a turbojet engine (after the turbine).

AGC

Abbreviation for automatic gain control.

AILERON

A hinged or movable surface on an airframe, the primary function of which is to induce a rolling moment on the airframe. It usually is part of the trailing edge of a wing.

AIRCRAFT

Any weight-carrying structure for navigation of the air, designed to be supported by buoyancy of the structure, or by the dynamic action of the air against its surfaces.

AIRFOIL

A thin body, such as a wing, aileron, or rudder, designed to obtain reaction from the air through which it moves.

AIRFOIL SECTION

A cross section of an airfoil parallel to the plane of symmetry or to a specified reference plane.

AIRFRAME

Concerning guided missiles, the assembled principal structural components, less propulsion system, control and electronic equipments, and payload.

AIRPLANE

A mechanically driven fixed-wing aircraft, heavier than air, which is supported by the dynamic reaction of the air.

AIR SCOOP

A scoop or hood designed to catch the air and maintain the air pressure in ballonets, internal-combustion engines, ventilators, etc.

AIR SPEED, CALIBRATED

The air speed as read from a differential-pressure air-speed indicator which has been corrected for instrument and installation errors. Equal to true air speed for standard sea level conditions.

AIR SPEED, EQUIVALENT

The product of the true air speed and the square root of the density ratio ρ/ρ_0. Used in structural design work to designate various design conditions.

AIR-SPEED HEAD

An instrument which, in combination with a gage, is used to measure the speed of an aircraft relative to the air. It usually consists of a pitot-static tube or a pitot-venturi tube.

AIR SPEED, INDICATED

The air speed as indicated by a differential-pressure air-speed indicator, uncorrected for instrument and installation errors.

AIR SPEED, TRUE

Calibrated air speed corrected for altitude effects, i. e., pressure and temperature, and for compressi-

bility effects where high speeds are concerned. Not to be confused with ground speed.

ALIGN

In radio or electronics, the adjustment of circuit values in two or more resonant circuits or circuit functions, so as to obtain optimum design performance.

ALTIGRAPH

A recording altimeter.

ALTIMETER

An instrument that measures the elevation above a given datum plane.

ALTITUDE, ABSOLUTE

Altitude with respect to the surface of the earth as differentiated from altitude with respect to sea level. Sometimes referred to as radar or radio altitude.

ALTITUDE, CRITICAL

(1) In aircraft terminology, the maximum altitude at which a supercharger can maintain a pressure in the intake manifold of an engine equal to that existing during normal operation at rated power and speed at sea level without the supercharger.

(2) In guided missile practice, the maximum altitude at which the propulsion system performs satisfactorily.

ALTITUDE SIGNAL

The radio signals returned to an airborne electronics device by the ground or sea surface directly beneath the aircraft.

AMBIENT

Environmental conditions; may pertain to pressure, temperature, etc.

AMPLIFIER

A device for increasing the magnitude of a quantity. Used in radio, electrical, pneumatic, audio, and hydraulic systems.

ANGLE, AILERON

The angular displacement of an aileron from its neutral position. It is positive when the trailing edge of the right aileron is below the neutral position.

ANGLE, CRAB

The angle between the direction in which an aircraft is heading and its true course.

ANGLE, DEPRESSION

The angle measured downward from the horizontal to the axis of an airborne radar beam directed at a target. This is the complement of the incidence angle of the beam at the target plane.

ANGLE, DIHEDRAL

A dihedral angle is formed by two intersecting planes. In aeronautical usage one of these is the perpendicular to the plane of symmetry and parallel to the longitudinal axis of the airframe, and the other is a plane containing the wing axis and the longitudinal axis of the airframe.

ANGLE, DRIFT

The horizontal angle between the longitudinal axis of an aircraft and its path relative to the ground.

ANGLE, ELEVATOR

The angular displacement of the elevator from its neutral position. It is positive when the trailing edge of the elevator is below the neutral position.

ANGLE, FLIGHT PATH

The angle between the flight path of an aircraft and the horizontal. Sometimes called flight path slope.

ANGLE, GLIDING

The angle between the flight path during a glide and a horizontal axis fixed relative to the earth.

ANGLE OF ATTACK

The angle between a reference line fixed with respect to an airframe and the apparent relative flow line of the air.

ANGLE OF ATTACK, ABSOLUTE

The angle of attack of an airfoil, measured from the attitude of zero lift.

ANGLE OF ATTACK, CRITICAL

The angle of attack at which the flow about an airfoil changes abruptly, as evidenced by abrupt changes in the lift and drag.

ANGLE OF ATTACK FOR INFINITE ASPECT RATIO

The angle of attack at which an airfoil produces a given lift coefficient in a two-dimensional flow. Also called "effective angle of attack."

ANGLE OF ATTACK, INDUCED

The difference between the actual angle of attack and the angle of attack for infinite aspect ratio of an airfoil for the same lift coefficient.

ANGLE OF CANT

In a spin-stabilized rocket, the angle formed by the axis of a venturi and a line parallel to the longitudinal axis of the rocket.

ANGLE OF FLAP (and FLAPERONS)

The acute angle between two planes defined as follows: One plane including the spanwise and chordwise reference lines of the flap or flaperon; the other plane including the spanwise and chordwise reference lines of the supporting wing.

ANGLE OF INCIDENCE

Same as angle of wing setting. In British terminology the angle of incidence is equivalent to the American term "angle of attack."

ANGLE OF PITCH (AIRCRAFT)

(1) The acute angle between two planes defined as follows: One plane including the lateral axis of the aircraft and the direction of the relative wind, the other plane including the lateral axis and the longitudinal axis. The angle is positive when the nose of the aircraft is above the direction of the relative wind. (In normal flight, the angle of pitch is the angle between the longitudinal axis and the direction of the relative wind.)

(2) In the perturbation theory of longitudinal stability of conventional aircraft in unyawed flight—the temporary angular departure of the altitude of the longitudinal axis from an initial average direction in space in the median plane of symmetry. Sometimes called Geometric Angle of Pitch as contrasted to Aerodynamic Angle of Pitch.

ANGLE OF ROLL

The angle through which an aircraft must be rotated about its longitudinal axis in order to bring its lateral axis into the horizontal plane. The angle is positive when the left side is higher than the right, when viewed from rear to front of aircraft. Sometimes called angle of bank.

ANGLE OF STABILIZER SETTING

The acute angle between the longitudinal axis of an airplane and the chord of the stabilizer. The angle is positive when the leading edge is higher than the trailing edge.

ANGLE OF WING SETTING

The acute angle between the plane of the wing chord and the longitudinal axis of the airplane. The angle is positive when the leading edge is higher than, or to the right of, the trailing edge.

ANGLE OF YAW

(1) The acute angle between the direction of the relative wind and the plane of symmetry of an aircraft. The angle is positive when the nose of the aircraft is to the right of the relative wind.

(2) In the perturbation theory of lateral stability of conventional aircraft—the temporary lateral departure of the heading of the longitudinal axis from an initial or average direction in space. Sometimes referred to as Geometric Angle of Yaw as contrasted to Aerodynamic Angle of Yaw.

ANGLE, ZERO-LIFT

The angle of attack of an airfoil when its lift is zero.

ANGSTROM UNIT

A unit of length equal to one ten-thousandth of a micron, or one hundred-millionth of a centimeter. Used to express lengths of extremely short waves.

ANTENNA

A device, i. e., conductor, horn, dipole, etc., for transmitting or receiving radio waves, exclusive of the means of connecting its main portion with the transmitting or receiving apparatus.

ANTENNA ARRAY

Designates two or more antennas coupled together in a single mounting, such as to give desired directional characteristics.

ANTENNA, DIPOLE

A center-fed antenna, which is constructed to be approximately one-half as long as the wave length it is designed to transmit or receive.

ANTENNA, DISH

See DISH, RADAR.

ANTENNA, HORN

The flared end of radar wave guide, which has been matched to the surrounding space for efficient radiation of energy from within the guide to space.

AREA DRAG

(1) The quotient of drag over incompressible dynamic pressure or over dynamic head.

(2) The area of a flat plate producing an equivalent drag at a drag coefficient of 1.

AREA, EFFECTIVE

In aerodynamics, the area of the wing (or tail) of an aircraft plus that portion of the area of the fuselage which is effective in producing lift.

AREA, EQUIVALENT FLAT PLATE

Obsolescent. See AREA, DRAG.

AREA EXPOSED

The area of the wing (or tail) outside the fuselage.

ARMING

As applied to fuzes, the changing from a safe condition to a state of readiness for initiation. Generally a fuze is caused to arm by acceleration, rotation, clock mechanism, or air travel, or by combinations of these.

ARTIFICIAL HORIZON

(1) A device that indicates the attitude of an aircraft with respect to the true horizon.

(2) A substitute for a natural horizon, such as a liquid level, pendulum, or gyroscope, incorporated in a navigating instrument.

ASKANIA

The name of a German company which manufactured theodolites and other precision instruments.

ASPECT RATIO

(1) The ratio of the square of the span to the total area of an airfoil. In wingless missiles such as the Azon or Razon, the ratio of bomb diameter to its mean length.

(2) In television, the numerical ratio of frame width to frame height nominally standardized as four units horizontally to three units vertically.

ASPECT RATIO, CHAMBER

The ratio between the length of a combustion chamber and its diameter.

ATHODYD

A ramjet. An abbreviation for Aero THermODYnamic Duct.

ATMOSPHERE, STANDARD INTERNATIONAL

The atmosphere used as an international standard presumes for mean sea level and a temperature of 15° C., a pressure of 1,013.2 millibars, lapse rate of 6.5° C. per kilometer from sea level to 11 kilometers, and thereafter a constant temperature −56.5° C.

ATMOSPHERE, STANDARD U. S.

An arbitrary atmosphere which is used for numerous aeronautical purposes, but chiefly for comparing performance. The Standard Atmosphere recommended by NACA, and adopted in 1925 by all interested U. S. Government departments for official use, is based on the following assumptions:

The air is a dry perfect gas.

Ground temperature: 15° C=59° F.

Temperature gradient in the troposphere (Sea level to 10.769 Km): 0.0065° C/m=0.003566° F/ft.

Stratosphere temperature (10.769 Km to 32 Km): −55° C.=−76° F.

ATTENUATOR

A device designed to cause a loss in energy in a system without introducing appreciable distortion in the desired frequencies.

ATTITUDE

The position of an aircraft as determined by the inclination of its axes to some frame of reference. If not otherwise specified, this frame of reference is fixed to the earth.

ATTITUDE CONTROL SYSTEM

See AUTOMATIC PILOT.

AUDIO

Pertaining to frequencies of audible sound waves between about 20 and 20,000 cycles per second.

AUGMENTOR

A duct usually enclosing the exhaust jet behind the nozzle exit section to provide increased thrust.

AUTOMATIC GAIN CONTROL

A circuit, also called the Automatic Volume Control, which automatically varies the over-all amplification, inversely proportional to input signal strength changes, such that the output volume of the receiver remains constant. Commonly abbreviated as AGC.

AUTOMATIC PILOT

An automatic control mechanism for keeping an aircraft in level flight and on a set course or for executing desired maneuvers. Sometimes called gyropilot, mechanical pilot, robot pilot, or auto pilot.

AUTOSYN

A Bendix-Marine trade name for a synchro, derived from the words.—AUTOmatically SYNchronous. See SYNCHRO.

AXES OF AN AIRCRAFT

Three fixed lines of reference, usually centroidal and mutually perpendicular. The horizontal axis in the plane of symmetry, usually parallel to the axis of the propeller shaft or the thrust line of the jet motor, is called the longitudinal axis; the axis perpendicular to this, in the plane of symmetry, is called the normal or yaw axis; and the third axis perpendicular to the other two is called the lateral or pitch axis. In mathematical discussion, the first of these axes, drawn from rear to front, is generally designated the "X" axis; the second, drawn downward, the "Z" axis; and the third, running from left to right, the "Y" axis.

AXIS, ELASTIC (STRESS ANALYSIS)

The locus of all points through which a force may be applied to a structure without causing torsional deflection.

AXIS, WING

The locus of the aerodynamic centers of all the wing sections.

AZIMUTH

A direction expressed as a horizontal angle usually in degrees or mils and measured clockwise from north. Thus azimuth will be true azimuth, grid azimuth, or magnetic azimuth depending upon which north is used.

B

BABBLE

The resultant interference, or cross-talk, from a large number of interfering channels.

BACKGROUND, RADAR

See CLUTTER, RADAR.

BACK-SCATTERING

Refers to the scattering of energy of the radar reflected signal.

BALANCED SURFACE, AERODYNAMIC

A control surface that extends on both sides of the axis of the hinge or pivot, or that has auxiliary devices or extensions connected with it in such a manner as to effect a small or zero resultant moment of the air forces about the hinge axis.

BALANCED SURFACE, STATIC

A control surface whose center of mass is in the hinge axis.

BAND, FREQUENCY

In communications and electronics, a continuous range of frequencies extending between two limiting frequencies.

BANDWIDTH

The difference in frequencies between the lowest and highest effective frequencies; may refer to a tuned circuit, modulated radio signal, servo-mechanism, or radio station channel assignment, etc.

BANDWIDTH, ATTAINED

That portion of the band covered by the total frequency deviation of a subcarrier oscillator or pick-up with full range applied stimulus.

BANDWIDTH, DESIGN

The frequency deviation any device is intended to achieve with full range stimulus.

BANG-BANG

See CONTROL, BANG-BANG.

BANK

To incline an aircraft laterally; i. e., to rotate it about its longitudinal axis.

BEACON, RADAR

Generally, a nondirectional radiating device, containing an automatic radar receiver and transmitter, that receives pulses ("interrogation") from a radar, and returns a similar pulse or set of pulses ("response"). The beacon response may be on the same frequency as the radar, or may be on a different frequency.

BEAM DIRECTION

In stress analysis, the direction parallel to the plane of the spar web and the plane of symmetry of an airplane. (See CHORD, DRAG, LIFT, and SIDE FORCE.)

BEAM JITTER

The small oscillatory, angular movement induced into the radar antenna array, and consequently into the radar beam. This movement is caused by—

(1) The necessity of having to develop an error signal, when in automatic tracking, before the antenna will change its position.

(2) The circuitry intentionally made "tight" to obtain plus and minus tracking errors rather than only lagging errors and

(3) Gear play in the radar tracking head.

BEAM RIDER

See GUIDANCE, BEAM RIDER.

BEAMWIDTH

The angular separation in azimuth between the two directions to the right and left of the nose of the beam, at which the gain is one-half that at the nose. Beamwidth may be measured also in elevation, in the vertical plane, or in an inclined plane.

BEATS

Periodic variations in amplitude, which may be described as a superposition of disturbances having different frequencies.

BEEPER

An individual who flies a pilotless aircraft by remote control.

BIAS

The value of D-C voltage applied between the control grid of a vacuum tube and its cathode to provide the desired tube operating point.

BLACK BODY

A perfect absorber of all radiant energy that falls upon it; does not reflect radiant energy but radiates energy solely as a function of its temperature.

BLANKETING

The process of having a desired signal blanketed, or eliminated from reception, by the presence of an overriding, stronger undesired signal.

BLIP

See PIP.

BLOW-OUT DISC

A mechanism, consisting generally of a thin metal diaphragm, sometimes installed in a jato as a safety measure against excess gas pressure.

BOLOMETER

(1) A very sensitive type of metallic resistance thermometer, used for measurements of thermal radiation. See DETECTOR, INFRARED.

(2) In electronics a small resistive element capable of dissipating microwave power, using the heat so developed to effect a change in its resistance, thus serving as an indicator; commonly used as a detector in low- and medium-level power measurement.

BOOSTER

(1) A high-explosive element sufficiently sensitive to be actuated by small explosive elements in a fuze and powerful enough to cause detonation of the main explosive filling. (British—GAINE.)

(2) An auxiliary propulsion system which travels with the missile and which may or may not separate from the missile when its impulse has been delivered. A booster system may contain or consist of one or more jatos. See JATO.

BORE SIGHTING

The process by which the axis of a gun bore and the line of sight of a gun sight are made parallel or are made to converge on a point.

BOUNDARY LAYER

A layer of fluid, close to the surface of a body placed in a moving stream, in which the impact pressure is reduced as a result of the viscosity of the fluid, and through which a velocity gradient exists ranging from the velocity of the body to the velocity of the free stream.

BREAK

See PIP.

BRENNSCHLUSS

In rockets, the time at which burning ceases. (German.)

BUFFETING

The repeated aerodynamic forces experienced by any part of an aircraft, caused and maintained by unsteady flow arising from a disturbance set up by any other part of the airframe or accessories. See FLUTTER.

BUMP

A sudden vertical acceleration of an aircraft caused by a region of unstable atmosphere characterized by marked local vertical components in the air currents.

BUNCHING

In electronics, any process which introduces an rf convection current component into a velocity modulated electron stream as a direct result of the variation in electron transit time which the velocity modulation produces.

BURBLE

A term designating the breakdown of the streamline flow about a body; the change of laminar flow conditions to turbulent flow conditions, or flow separation.

BURN OUT

(1) To overheat a combustion chamber or nozzle to such an extent that the walls weaken and rupture.

(2) The time at which a jet motor ceases to burn. See BRENNSCHLUSS.

BURNER DRAG

Total drag due to the presence of a combustion system; usually includes the drag forces on the igniter, flame holders, combustion chamber wall, etc.

BURNT VELOCITY

The velocity of a rocket projectile at the moment when the burning of the propellant ceases.

C

CAMBER

The rise of the curve of an airfoil section, usually expressed as the ratio of the departure of the curve from a straight line joining the extremities of the curve to the length of this straight line. "Upper camber" refers to the upper surface; "lower camber" to the lower surface; and "mean camber" to the mean line of the section. Camber is positive when the departure is upward and negative when it is downward.

CANARD

A type of airframe having the stabilizing and control surfaces forward of the main supporting surfaces.

CAPACITANCE

Is measured by the electrical charge which must be communicated to a body to raise its potential one unit. Thus a capacity of one farad requires one coulomb of charge to change its potential one volt. Synonym—capacity.

CAPACITOR

In electricity, a device consisting essentially of two conducting surfaces separated by an insulating

material or dielectric. The electrical size is generally specified in some fraction of a farad. Commonly called condenser.

CARDAN-MOUNTED

Gimbal mounted.

CASSEGRAINIAN MIRROR

A mirror mounted between the surface of a spherical (or parabolic) mirror and its focus. The purpose is to project the image formed by the outer portion of the incident rays. Named after Cassegrain, the astronomer, who invented it.

CATAPULT

A fixed structure which provides an auxiliary source of thrust to a missile or aircraft; must combine the function of directing and accelerating the missile during its travel on the catapult; serves the same function for a missile as does a gun tube for a shell. See LAUNCHER.

CATHODE RAY TUBE

A rather long, funnel-shaped vacuum tube having in its neck an electron gun that directs a beam of electrons onto a screen at the opposite end of the tube. The screen is coated with a fluorescent material called a phosphor, which glows when struck by the electrons. Electrostatic deflecting plates or electromagnetic deflecting coils are placed around the path of the electron beam and serve to sweep the beam over the screen, thereby causing the beam to trace on the screen a visible waveform of a voltage, or current, or produce a pattern, or complete image.

CAVITATION

The formation and collapse of vapor pressure bubbles owing to the movement of a body, or the effects of this action.

CAVITY RESONATOR

A space enclosed by a metallic conductor in which electromagnetic oscillations will persist if properly excited. The size and shape of the enclosure determine the resonant frequency. Cavity resonators have a Q-factor as great as 50,000. They are used in ultra-high-frequency systems in place of conventional resonant circuits.

CEILING, ABSOLUTE

The maximum height above sea level at which a given airplane would be able to maintain horizontal flight under standard air conditions.

CENTER. ELASTIC

In stress analysis, a point within the wing section at which the application of a single, concentrated load will cause the wing to deflect without rotation and, conversely, a point within the wing section about which rotation occurs when the wing is subjected to pure torque.

CENTER OF GRAVITY

See CENTER OF MASS.

CENTER OF MASS

The point at which all the mass of a body may be regarded as being concentrated, so far as motion of translation is concerned. Commonly called center of gravity.

CENTER OF PRESSURE COEFFICIENT

The ratio of the distance of the center of pressure from the leading edge to the chord length.

CENTER OF PRESSURE OF AN AIRFOIL

The point on the chord of an airfoil, prolonged if necessary, which is at the intersection of the chord and the line of action of the resultant air force.

CHANNEL

In radio communications, the band of frequencies within which a radio transmitter must maintain its modulated carrier signal.

CHANNEL, TELEMETER

Designates the complete route for transmission of a telemetered function, including pick-up, commutator, modulator, transmitter, receiver, demodulator, decoder, and recorder.

CHARACTERISTIC LENGTH

In propulsion, the ratio of the chamber volume to its nozzle throat area. A measure of the length of travel available for the combustion of the propellants.

CHOKE COIL

An inductor inserted in circuit to offer relatively large impedance to alternating current.

CHOKING

The condition which prevails in compressible fluid flow when the upper limit of mass flow is reached, or when M=1 is reached in a duct.

CHORD

An arbitrary datum line from which the ordinates and angles of an airfoil are measured. It is usually the straight line tangent to the lower surface at two points, the straight line joining the ends of the mean line, or the straight line between the leading and trailing edges.

CHORD DIRECTION

In stress analysis, the direction parallel to the intersection of the plane of the internal wing truss with the plane of symmetry of the aircraft. When a wing has two internal trusses in nonparallel planes, the plane bisecting the dihedral angle between those two planes should be used. (See DRAG, LIFT DIRECTION, and SIDE DIRECTION.)

CHORD FORCE, or COMPONENT

In stress analysis, a force, or component, in the chord direction.

CHORD LENGTH

The length of the projection of the airfoil profile on its chord.

CHORD, MEAN AERODYNAMIC

The chord of an imaginary airfoil which would have force vectors throughout the flight range identical with those of the actual wing or wings.

CHORD, MEAN, OF A WING

The quotient obtained by dividing the wing area by the span.

CHUFFING

The characteristic of certain rockets to burn intermittently and with an irregular puffing noise. Sometimes called "chugging."

CIRCLE OF CONFUSION

The circular image of a distant point object as formed in a focal plane by a lens.

CLAMPING CIRCUIT

A circuit which maintains either amplitude extremity of a wave form at a certain level of potential.

CLIPPING CIRCUIT

In electronics, a pulse-shaping network which removes that part of a wave form which tends to extend above (or below) a chosen voltage level.

CLUTTER, RADAR

The visual evidence on the radar indicator screen of sea-return or ground return which, if not of particular interest, tends to obscure the target indication.

COAXIAL LINE

A cable having concentric conductors. Used as a transmission line for audio, radio, radar, and television signals.

COEFFICIENT OF DRAG

A dimensionless coefficient, equal to the total drag divided by the dynamic pressure and the reference area. ($C_D = D/qS$).

COEFFICIENT OF LIFT

A dimensionless coefficient, equal to the total lift divided by the dynamic pressure and the reference area. ($C_L = L/qS$).

COEFFICIENT OF MOMENT

The coefficients used for moment are similar to coefficients of lift, drag, and thrust, and are likewise dimensionless. However, these must include a characteristic length, in addition to the area. The span is used for rolling or yawing moment, and the chord is used for pitching moment.

COEFFICIENT OF THRUST

A dimensionless coefficient equal to the thrust divided by the product of dynamic pressure and reference area. ($C_T=T/qS$).

COMBUSTOR

A name generally assigned to the combination of flame holder, igniter, combustion chamber, and injection system of a ramjet.

COMPRESSIBILITY, MODULUS OF

The modulus of compressibility is the fractional change in volume per unit change of pressure.

COMPUTER

A mechanism which performs mathematical operations.

COMPUTER, ANALOGUE

A computer in which quantities and relationships are represented by continuously variable physical quantities such that approximate solutions can be obtained readily.

COMPUTER, DIGITAL

A computer in which quantities are represented in numerical form and which generally is made to solve complex mathematical problems by iterative

use of the fundamental processes of addition, subtraction, multiplication, and division.

CONCENTRATION

Relative amount of a particular constituent in a mixture.

CONDENSATION TRAIL

A visible trail of small water droplets or ice crystals formed under certain conditions in the wake of an aircraft. Also known as contrails.

CONDENSER

See CAPACITOR.

CONFIGURATION

The relative distribution or arrangement of parts in a structure.

CONICAL SCANNING

Defines a radar scanning system wherein a point on the radar beam describes a circle at the base of a cone, and the axis is the generatrix of the cone.

CONSTRICTOR

The exit portion of the combustion chamber in some designs of ramjets, where there is a narrowing down of the tube at the exhaust.

CONTRA-INJECTION

The injection of fuel into the air stream in a direction opposite to the flow of air.

CONTRAILS

See CONDENSATION TRAIL.

CONTRAST

The degree of difference in tone between the darkest and lightest areas of a visual reproduction.

CONTROL

(1) Concerning missiles in general, the entire processes of intelligence and maneuver intended for reaching a specified destination, with special connotation on changes in course owing to data which may be observed and computed either in the missile or externally.

(2) Concerning an airframe, a device for effecting a change in motion.

CONTROL, BANG-BANG

A control system used in guidance, wherein the corrective control applied to the missile is always applied to the full extent of servo motion.

CONTROL-PLANE

The qualifying term which describes the transmitting antenna on an aircraft which radiates the control signal by which a guided bomb is steered.

CONTROL, PROPORTIONAL

Control in which the action to correct an error is made proportional to that error.

CONTROL SURFACE

A movable airfoil designed to be rotated or otherwise moved by control servomechanism in order to change the attitude of the aircraft.

CONTROLLABILITY

The quality of an aircraft that determines the ease of operating its control and/or the effectiveness

of displacement of the controls in producing change in its attitude in flight.

CONVECTION

Motions resulting within a fluid owing to differences in temperature and density.

COUPLING

In electrical circuits, a mutual relationship between two circuits such that a transfer of energy between them is permitted.

CRAB-ANGLE

See ANGLE, CRAB.

CRITICAL PRESSURE RATIO

In nozzle flow, that outlet-to-chamber pressure ratio which just produces M=1 at the throat.

CROSS TALK

The interference between nearby circuits, wherein signals in one circuit are undesirably reproduced in another, or other circuits.

CRUCIFORM

A configuration in form of a cross with equal legs, 90° apart.

CRYSTAL, PIEZOELECTRIC

A crystal which, when strained, produces on its surface an electric charge; or will deform or bend when a voltage is applied properly. When driven by an alternating voltage at proper frequency, as determined by the dimensions, material, and axes of crystal, it will resonate and stabilize the applied frequency.

D

DAMPING

The effect of friction or its equivalent in reducing oscillation of a system.

DECCA NAVIGATION

See HYPERBOLIC NAVIGATION.

DECIBEL

A unit for expressing the magnitude of a change in sound or electrical power level. One "db" is approximately the amount that the power of a pure sine wave sound must be changed in order for the change to be just barely detectable by the average human ear. Precisely, the difference in decibels between two signals is 10 times the common logarithm of the ratio of their powers or 20 times the logarithm of the ratio of the voltages. Unless the reference is specified, decibles represent merely a logarithmic ratio. A common reference level is zero "db" with one milliwatt into a 600 ohm load.

DEFINITION

Refers to the fidelity with which a visual recording device forms an image. Definition is good when the image is sharp and clear.

DEFLAGRATION

See DETONATION.

DELTA WING

A triangular-shaped, low-aspect-ratio airfoil with tapered leading edge and straight trailing edge.

DEPRESSION ANGLE

See ANGLE, DEPRESSION.

DERIVATIVES, LATERAL RESISTANCE

Resistance derivatives expressing the variation of moments and forces owing to small changes in the lateral, yawing, and rolling velocities.

DERIVATIVES, LONGITUDINAL RESISTANCE

Resistance derivatives expressing the variation of moments and forces owing to small changes in the longitudinal, normal, and pitching velocities.

DERIVATIVES, ROTARY RESISTANCE

Resistance derivatives expressing the variation of moments and forces owing to small changes in the rotational velocities of the aircraft.

DERIVATIVES, STABILITY

Quantities expressing the variation of the forces and moments on aircraft owing to disturbance of steady motion. They form the experimental basis of the theory of stability, and from them the periods and damping factors of aircraft can be calculated. In the general case there are 18 translatory and 18 rotary derivatives.

DERIVATIVES, TRANSLATORY RESISTANCE

Resistance derivatives expressing the variation of moments and forces owing to small changes in the translational velocities of the aircraft.

DESTRUCTOR

An explosive or other device for intentionally destroying a missile on aircraft, or a component thereof.

DETAIL

In video and photographic usage, the distinction between slight differences in tone of the visual reproduction of an image. To some extent the opposite of "contrast." Good detail implies poor "contrast." See CONTRAST.

DETECTOR

In radio, the receiver stage at which demodulation takes place.

DETECTOR, INFRARED

Thermal devices for observing and measuring infrared radiation, such as the bolometer, radiomicrometer, thermopile, pneumatic cell, photocell, photographic plate, and photoconductive cell.

DETONATION

A sudden and violent explosion. Detonation is practically instantaneous. The slower burning of some explosives is called deflagration.

DETONATION, LOW ORDER

A partial or slow explosion. As applied to military explosives, generally caused by accidental or inadequate initiation.

DETONATOR

An explosive device, sensitive to electrical or mechanical impulse. Generally used to set off a larger quantity of explosive.

DEVELOPMENT

(1) The application of known scientific facts, techniques, materials, and physical laws to the

creation of new or improved matériel or methods of military use.

(2) In photography, the bringing to view of a latent image on a photosensitive surface.

DIELECTRIC

A substance capable of sustaining an electric field and of undergoing electric polarization. All electric insulators are dielectrics.

DIFFERENTIATING CIRCUIT

A circuit which produces an output voltage substantially in proportion to the rate of change of the input voltage or current.

DIFFUSER

A duct of varying cross section designed to convert a high-speed gas flow into low-speed flow at an increased pressure.

DIFFUSER EFFICIENCY

(1) The ratio of the actual pressure increase realized by the diffuser to the theoretical pressure increase realized in an isentropic process, or

(2) The ratio of the stagnation pressures after and before the diffuser.

(3) The ratio of actual change in enthalpy to the ideal change in enthalpy for passage from ambient to diffuser pressure.

DIFFUSER, AREA RATIO OF

The ratio of the outlet cross-sectional area of a ramjet diffuser to the inlet cross-sectional area, commonly expressed as 2/1, 2.5/1, 3/1, etc.

DIFFUSER, KANTROWITZ-DONALDSON

A type of supersonic diffuser, which first contracts to a throat and then expands. Under proper operating conditions a normal shock occurs near the throat at decreased gas stream velocity, thereby decreasing the shock-wave strength and the pressure losses which would occur if the normal shock had occurred at the lip of the diffuser.

DIFFUSER, OSWATITSCH OR FERRI

A type of supersonic diffuser for ramjet, with an inner body projecting forward of the diffuser lip, designed to permit pressures to be raised gradually through a series of conical shocks. The pressure recovery possible to this type of diffuser operating at high Machr numbers is considerably greater than could be obtained by a diffuser designed for single normal shock.

DIGITAL COMPUTER

See COMPUTER, DIGITAL.

DIHEDRAL

See ANGLE, DIHEDRAL.

DISCRIMINATOR

A device used to convert input frequency changes to proportional output voltages. For example, in a radio receiver, that stage which converts the frequency-modulated signals directly to audio-frequency signals.

DISH, RADAR

The parabolic reflector which is part of certain radar antennas.

DITCHING DEVICE

A device designed to effect an automatic landing or deliberate crash landing of a pilotless aircraft should remote control be lost.

DITHER

A signal of controlled amplitude and frequency applied to the servo motor operating a transfer valve, such that the transfer valve is constantly being "quivered" and cannot stick at its null position.

DIVE

(1) A steep descent, with or without power, in which the air speed is greater than the maximum speed in horizontal flight.

(2) In stress analysis, a design condition for the wings representing a steady state of flight characterized by high speed and an angle of attack approximately that of zero lift. See PULL-UP.

DOPPLER EFFECT

The apparent change in frequency of a sound or radio wave, reaching an observer or a radio receiver, caused by a change in distance or range, between the source and the observer or the receiver during the interval of reception.

DOUBLE-BASE POWDER

Propellant containing nitrocellulose and another principal explosive ingredient.

DOUBLE-TAPER

Taper of an airfoil in planform and in cross-section thickness from root to tip.

DOUBLE WEDGE

A diamond-shaped cross section.

DOUBLE WEDGE, MODIFIED

Diamond-shaped cross section with flat parallel upper and lower surfaces making a six-sided shape.

DOUBLER

In electronics, a circuit for doubling the input frequency. This may be done by tuning the plate circuit to twice the grid frequency or in several other ways.

DOWNWASH

The vertical downward component of an airflow induced by an airfoil.

DRAG

That component of the total air forces on a body, in excess of the forces owing to ambient atmosphere, and parallel to the relative gas stream but opposing the direction of motion. It is composed of skin-friction-, profile-, induced-, interference-, parasite-, and base-drag components.

DRAG AREA

See AREA, DRAG.

DRAG, BASE

Drag component caused by the reduction of pressure across the base of a missile or projectile to below the ambient pressure.

DRAG DIRECTION

In stress analysis, the direction of the relative wind. See CHORD, LIFT, and SIDE DIRECTION.

DRAG FORCE OR COMPONENT

In stress analysis, a force or component, in the drag direction, i. e., parallel to the relative wind. See BEAM, CHORD, LIFT and SIDE FORCE.

DRAG, INDUCED

The part of the total drag induced by the lift.

DRAG, NOSE

Drag due to the pressure on the nose of the body.

DRAG, PARASITE

The portion of the total drag of an aircraft exclusive of the induced drag of the wings.

DRAG, PROFILE

The difference between the total wing drag and the induced drag.

DRAG, PROFILE, EFFECTIVE

The difference between the total wing drag and the induced drag of a wing with the same geometric aspect ratio but elliptically loaded.

DRAG, SKIN FRICTION

That component of drag tangent to the surface of a body and owing to the friction between the air particles. It is a function of the total wetted surface and varies with the smoothness of the surface.

DRAG-WEIGHT RATIO

The ratio of the drag of a missile to its total weight.

DRONE

A remotely controlled aircraft.

DUTY CYCLE

In electronics, the ratio of the pulse duration time to the pulse repetition time.

DYNAMIC FACTOR

The ratio between the load carried by any part of an aircraft when accelerating and the corresponding basic load.

DYNAMIC PRESSURE

See PRESSURE, DYNAMIC.

DYNAMIC STABILITY

See STABILITY, DYNAMIC.

DYNAMOTOR

A combination electric motor and d-c generator having two or more separate armature windings and a common set of field poles. One armature winding, receiving direct current, operates as a motor producing rotation, while the others operate as a dynamo or generator, generating voltage.

E

ELECTROMAGNETIC

Pertaining to the combined electric and magnetic fields associated with radiation or with movements of charged particles.

ELECTRON GUN

A group of electrodes which produces and focuses an electron beam of controllable intensity.

ELECTRONICS

The broad field pertaining to the conduction of electricity through a vacuum or through gases, and circuits associated therewith.

ELECTROSTATIC

Pertains to stationary electrical charge, such as exists on the plates of a charged condenser.

ELEVATOR

A movable auxiliary airfoil, the function of which is to impress a pitching moment on the aircraft. It is usually hinged to the stabilizer.

ELEVONS

Wings flaps combining the functions of ELEVators and ailerONS.

EMMISIVITY

The rate at which the surface of a solid or a liquid emits electrons when additional energy is imparted to the free electrons in the material by the action of heat, light, or other radiant energy or by the impact of other electrons on the surface.

EMPENNAGE

See TAIL, AIRPLANE.

END INSTRUMENT

See PICK-UP.

ENERGY

Work, or its equivalent, in any form.

ENERGY, CHEMICAL

Energy obtainable from oxidation or other chemical reaction.

ENERGY, INTERNAL

The total quantity of energy in a material, i. e., the chemical and thermal energy, which may be considered as in the material itself, but not the potential and kinetic energies, which must be referred to conditions outside the material.

ENERGY, KINETIC

The capacity of a body for doing work by virtue of its motion. Quantitatively, it is one-half the mass times the velocity squared.

ENERGY, MECHANICAL

The composite of kinetic and potential energy and of energy expended by moving forces.

ENERGY, POTENTIAL

The capacity of a body for doing work by virtue of its position or distortion.

ENERGY, RADIANT

Energy consisting of electromagnetic waves, such as light, infrared, radio, and radar.

ENTHALPY

The sum of the internal and pressure energies of a substance or system; often called the total heat. Change in enthalpy is the amount of heat added to or subtracted from a substance or system in going from one state to another under constant pressure.

ENTROPY

A thermodynamic index of the relative amount of unavailable energy in a physio-chemical system. This is based on the physical conception that, if a

substance undergoing a reversible change takes on a quantity of heat dQ (in Btu/lb) at temperature T (in ° F. absolute), its entropy is increased by dQ/T.

The actual entropy of a system depends only on the state of that system and is not easily defined directly. The change in entropy, generally expressed in calories per degree, is equal to the heat taken up isothermally and reversibly divided by the temperature at which it is absorbed.

In thermodynamic discussions, entropy is commonly classed, along with temperature, pressure, and volume, as one of the variables defining the state of a body or substance.

ENVELOPE

In electronics—

(1) The glass or metal housing of a vacuum tube.

(2) A curve drawn to pass through the peaks of a graph showing the wave form of a modulated radio-frequency carrier signal.

EQUIVALENCE RATIO

The ratio of the stoichiometric air-to-fuel ratio to the experimental air-to-fuel ratio.

ERROR SIGNAL

(1) In servomechanisms, the signal, frequently a voltage, applied to the control circuit that indicates the misalignment between the controlling and the controlled members.

(2) In tracking systems, a voltage, depending upon the signal received from the target, whose sign and magnitude depends on the angle between the target and the center of the scanning beam.

ESTABLISHMENT, RESEARCH AND DEVELOPMENT

All research and development facilities that occupy one geographical location, with their attendant administrative, logistic, maintenance, land, supporting utilities, and community activities, i. e., White Sands Proving Ground, Squier Signal Laboratory, Naval Research Laboratory, etc.

E-VECTOR

The vector representing the electric field of an electromagnetic wave. In free space it is perpendicular to the direction of propagation.

EXPANSION RATIO

The ratio of the nozzle exit section area to the nozzle throat area.

EXPLOSIVE TRAIN

That portion of a fuze or fuze system consisting of explosive components, such as primer, detonator, booster, etc., necessary to cause functioning of a warhead or destructor.

F

FACILITY, RESEARCH AND DEVELOPMENT

That component part of an establishment which may include land, structures, equipment, or combinations thereof, used operationally in the pursuit of research, development, or tests and evaluations thereto, and which physically occupies a single geographical location, i. e., wind tunnels, test stands, ballistic laboratories, climatic laboratories, etc.

FACILITY, SUPPORTING

Any land, structure, apparatus, utility or combination thereof that contributes primarily to the operation of a research and development establishment or primary facility but that, in itself, is not used operationally in the pursuit of research, development, or tests and evaluations incidental thereto, i. e., housing and administrative buildings, firehouses, roads, security installations, or distributive systems for water, fuel, electricity, air, steam, etc.

FACTOR OF SAFETY

In stress analysis, the ratio of the ultimate load to any applied load. This term usually refers to the probable minimum factor of safety, which is the ratio of the ultimate load to the probable maximum applied load.

FADE, IN (OUT)

To vary gradually, increase or decrease, in signal strength in a sound or television channel.

FAIRING

An auxiliary member or structure whose primary function is to reduce the drag of the part to which it is fitted.

FEEDBACK

The electrical or acoustical return of a portion of the amplifier stage output to the input of that stage, or a preceding stage, such that there is either increase or reduction in amplification depending upon the relative phase of the return with the input signal.

FILTER

In electricity, a device or selective circuit network designed to pass signals within a specified frequency range while greatly reducing the amplitudes of signals at undesired frequencies.

FIN

A fixed or adjustable airfoil attached to a missile or an aircraft approximately parallel to the plane of symmetry to afford directional stability.

FINENESS RATIO

The ratio of the length to the maximum diameter of a streamlined body.

FISSURING

An undesired cracking or splitting of solid propellants; results in increased burning areas and increased rate of gas evolution.

FLAME HOLDER

A device inserted in a moving fuel-air mixture which is designed to stabilize a flame.

FLAP

A hinged or pivoted airfoil forming the rear portion of an airfoil used to vary the effective camber.

FLAP, SPLIT

A hinged plate forming the rear upper or lower portion of an airfoil. The lower portion may be deflected downward to give increased life and drag; the upper portion may be raised over a portion of the wing for the purpose of lateral control.

FLAPERONS

Control surfaces, integrally or differentially operated in certain missiles, which combine the braking effect and increased lift from the flaps with the roll control of ailerons.

FLIGHT PATH

The path of the center of gravity of an aircraft with reference to the earth or with reference to a coordinate frame fixed relative to the aircraft.

FLOW, LAMINAR

A particular type of streamline flow in which fluid in thin parallel layers tends to maintain uniform velocity. The term usually is applied to the flow of a viscous fluid near solid boundaries, when the flow is not turbulent.

FLOW, STREAMLINE

A fluid flow in which the streamlines, except those very near a body and in a narrow wake, do not change with time.

FLOW, TURBULENT

Any part of a fluid flow in which the velocity at a given point varies more or less rapidly in magnitude and direction with time.

FLUTTER

In aerodynamics, an oscillation of definite period set up in any part of an aerodynamically active component by a momentary disturbance, and maintained in a steady airstream by a combination of the aerodynamic inertial and elastic characteristics of the member itself.

FREQUENCY, CARRIER

The frequency of the unmodulated radio wave emanated from a radio, radar, or other type transmitter.

FREQUENCY, ELECTRONIC

The number of recurrences of a periodic phenomenon in a unit of time. In specifying electrical frequency, the customary unit of time is the second, for example—15 kc per second.

Frequency Designation Table

Designation of frequency	*Authorized abbreviation*	*Frequency in kc per second*
Very low	VLF	Below 30
Low	LF	30 to 300
Medium	MF	300 to 3000
High	HF	3000 to 30,000
Very High	VHF	30,000 to 300,000
Ultra High	UHF	300,000 to 3,000,000
Super High	SHF	3,000,000 to 30,000,000
Extremely High	EHF	30,000,000 to 300,000,000

FREQUENCY, INFRARED

The range of invisible radiation frequencies which adjoins the visible red spectrum and extends to microwave radio frequencies.

FREQUENCY, INTERMEDIATE

In superhetrodyne reception, the intermediate frequency is one resulting from the combination of the received frequency with a locally generated frequency, and is usually equal to their difference.

FREQUENCY, PULLING

The tendency of any load to change the frequency of an oscillator.

FREQUENCY, RADIO

The frequencies of electromagnetic radiation used for the transmission of radio signals through space, generally ranging from between 90,000 cycles per second, in long-wave transmission, to 400,000,000 or more cycles per second in short-wave transmission.

FREQUENCY, SUBCARRIER

In telemetering, an intermediate frequency that is modulated by intelligence signals and, in turn, is used to modulate the radio carrier either alone or in conjunction with subcarriers on other channels.

FUSELAGE

The body of approximately streamline form, to which the wings and tail unit of an aircraft are attached.

FUZE

A device designed to initiate a detonation under the conditions desired, such as by impact, elapsed time, proximity, or command.

G

GANTRY

A large crane-type structure, traveling on rails, which may be used for erecting and servicing large bombardment-type missiles. Can be positioned directly over the launching site and rolled away just prior to firing.

GATE

(1) In radar or control terminology, an arrangement to receive signals only in a small, selected fraction of the principal time interval.

(2) Range of air-fuel ratios in which combustion can be initiated.

GEE NAVIGATION

See NAVIGATION, HYPERBOLIC.

GIMBAL

A mechanical frame containing two mutually perpendicular intersecting axes of rotation (bearings and/or shafts).

GLIDE

To descend at a normal angle of attack with little or no thrust.

GLIDE BOMB

A winged missile powered by gravity. The wing loading is so high that it is incapable of flight at the speeds of conventional bombardment aircraft. Such a missile therefore must be carried rather than towed.

GLINT

The pulse-to-pulse variation in amplitude of reflected radar signal, owing to the reflection of the radar beam from a body which is changing its reflecting surface in an extremely rapid manner, such as would exist in pulses reflected from a rapidly spinning airplane propeller.

GRAIN

As applied to solid propellant, means one piece, which may be used separately, cemented to other grains, or collectively with other grains.

GRAY BODY

An imperfect "black body." See BLACK BODY.

GROUND

An electrically conducting connection, accidental or intentional, to the earth, or to some other conducting body at zero potential with respect to the earth.

GROUND RETURN

See CLUTTER, RADAR.

GROUND SPEED

The horizontal component of the velocity of an aircraft relative to the ground.

GROUND WAVE

A radio wave propagated over the surface of the earth.

GROUP

In telemetering, designates a number of subcarrier oscillators.

GUIDANCE

Concerning missiles, the entire processes of intelligence and of maneuver intended for reaching a specified destination, with special connotation on the flight path and on the information for determining the proper course.

GUIDANCE, BEAM RIDER

A system for guiding missiles which utilizes a beam directed into space, such that the center of the beam axis forms a line along which it is desired to direct a missile. The beam, which may be either fixed in elevation and azimuth or moving, may be basically a radar beam, a light beam, or a beam of some other type. Equipment is built into the missile,

such that the missile can determine when it is in the center of the beam or can determine the direction and magnitude of the error when it has deviated from the center of the beam. Also built into the missile are suitable electronic circuits, servo motors, aerodynamic surfaces, and/or other equipment, such that the missile by its own initiative, will return toward the center of the beam when it has deviated therefrom for any reason.

GUIDANCE, COMMAND

A guidance system wherein intelligence transmitted to the missile from an outside source causes the missile to traverse a directed path in space.

GUIDANCE, HOMING

A system by which a missile steers itself towards a target by means of a self-contained mechanism which is activated by some distinguishing characteristic of the target.

GUIDANCE, HOMING, ACTIVE

A system of homing guidance wherein both the source for illuminating the target and the receiver are carried within the missile.

GUIDANCE, HOMING, PASSIVE

A system of homing guidance wherein the receiver in the missile utilizes natural radiations from the target.

GUIDANCE, HOMING, SEMIACTIVE

A system of homing guidance wherein the receiver in the missile utilizes radiations from the target which has been illuminated from a source other than in the missile.

GUIDANCE, INERTIAL

A system independent of information obtained from outside the missile, the sensitive elements of which system make use of the principle of Newton's second law of motion.

GUIDANCE, MIDCOURSE

The guidance applied to a missile between the termination of the launching phase and the start of the terminal phase of guidance.

GUIDANCE, PRESET

A technique of missile control wherein a predetermined path is set into the control mechanism of the vehicle and cannot be adjusted after launching.

GUIDANCE, STELLAR

See NAVIGATION, CELESTIAL.

GUIDANCE, TERMINAL

The guidance applied to a missile between the termination of the midcourse guidance and impact with or detonation in close proximity of the target.

GUIDANCE, TERRESTRIAL REFERENCE

A technique of missile control wherein the predetermined path set into the control system of a missile can be followed by a device in the missile which reacts to some property of the earth, such as magnetic or gravitational effects.

GUIDED MISSILE

An unmanned vehicle moving above the earth s surface, whose trajectory or flight path is capable of being altered by a mechanism within the vehicle.

GUTTER

Portion of a flame holder which is grooved for better operation.

GYROSCOPE

A wheel or disc, mounted to spin rapidly about an axis and also free to rotate about one or both of two axes perpendicular to each other and to the axis of spin. The spinning gyroscope either offers considerable resistance, depending upon its angular momentum to any torque, which would tend to change the direction of the spin axis or, if free, changes its spin axis in a direction perpendicular both to the torque and to the original spin axis.

GYROSCOPE, DIRECTIONAL

A gyroscopic instrument for indicating direction, containing a free gyroscope which holds its position in azimuth and thus indicates angular deviation from the course.

GYROSCOPE, FREE

A gyroscope mounted in two or more gimbal rings so that its spin axis is free to maintain a fixed orientation in space.

GYROSCOPE, RATE

A gyroscope with a single gimbal mounting, such that rotation about an axis perpendicular to the axis of the gimbal and to the axis of the gyro produces a precessional torque proportional to the rate of rotation.

GYROSCOPIC HORIZON

A gyroscopic instrument that indicates the lateral and longitudinal attitude of the airplane by simulating the natural horizon.

H

HANGFIRE

The delayed ignition of the propellant or the igniter.

HARMONIC

A component having a frequency which is an integral multiple of the fundamental frequency. For example, a component, the frequency of which is three times the fundamental frequency, is called the third harmonic.

HINGE MOMENT

The moment tending to restore a control surface which has been displaced from a position of equilibrium.

HOMER

See SEEKER, TARGET.

HOMING

See GUIDANCE, HOMING.

HUNTING

A condition of instability resulting from overcorrection by a control device and resultant fluctuations in the quantity intended to be kept constant.

H-VECTOR

The vector representing the magnetic field of an electromagnetic wave. In free space it is perpendicular to the E-Vector and to the direction of propagation.

HYGROSCOPIC

Descriptive of a material which readily absorbs and retains moisture.

HYPERGOLIC

Capable of igniting spontaneously upon contact.

HYPERSONIC

See SONIC, HYPER-.

I

IGNITER

A device used to initiate burning of a fuel mixture or a propellant in a ramjet or rocket combustion chamber. A pilot-burner in a ramjet may serve the same purpose.

IGNITION, MULTISTAGE

An ignition system in a ramjet in which a portion of the fuel is ignited and these products are used to ignite the remainder of the mixture.

IMPACT PRESSURE.

See PRESSURE, IMPACT.

IMPEDANCE

The total opposition offered by a circuit to the flow of a varying current at a particular frequency. Impedance in ohms is equal to the square root of the sum of the resistance of the circuit squared plus the reactance of the circuit squared.

IMPULSE, SPECIFIC

See SPECIFIC IMPULSE.

IMPULSE, TOTAL

In jet propulsion usage, the product of the average thrust (in pounds), developed by the motor, times the burning time (in seconds).

INCLINOMETER

An instrument that measures the attitude of an aircraft with respect to the horizontal.

INDUCTANCE

The property of an electrical circuit which tends to oppose a change of any current in the circuit. The symbol is "L" and the unit of measure is the "henry."

INERTIA

The property of any material to resist change in its state of motion. Also, see MOMENT OF INERTIA.

INJECTION PRESSURE

The pressure difference between the total pressure at the fuel outlet orifice and the pressure in the combustion chamber.

INJECTOR

A device designed to introduce fuel into the combustion chamber.

INNER BODY

Any closed body located in the ramjet duct, around which the air taken into the diffuser must flow.

INTEGRATING CIRCUIT

A circuit whose output voltage is proportional to the product of the instantaneous applied input voltages and their duration. Some such circuits are made to give output proportional to input frequency and amplitude.

INTERFERENCE

(1) The aerodynamic influence of two or more bodies on one another.

(2) In physics, the effect of superimposing two or more trains of waves. The resulting amplitude is the algebraic sum of the amplitudes of the interfering trains. When two sets of spherical waves interfere, a system of stationary nodes and anti-nodes is formed, which in optics is known as interference fringes. See INTERFEROMETER.

(3) In radio communication, the disturbance of reception owing to strays or undesired signals.

(4) In radar, confusing signals accidentally produced on the indicator by the effects of either friendly or enemy electrical apparatus or machinery or by atmospheric phenomena.

INTERFEROMETER

An apparatus used to produce and show interference between two or more wave trains coming from the same luminous area, and also to compare wave lengths with observable displacements of reflectors, or other parts, by means of interference fringes. An interferometer is frequently used to obtain quantitative information on flow around bodies in wind tunnels. See INTERFERENCE.

INTERLACING

A technique in television scanning wherein, if the lines are sequentially numbered, all the odd-numbered lines are scanned first, following which all the even-numbered lines are scanned.

INTERMITTENT JET

See PULSE JET.

INVESTIGATION

The preliminary work leading to the initiation of development of new or improved matériel or methods.

ION

An electrically charged particle formed when one or more electrons are gained or lost by either a neutral atom or a group of atoms. An ion is positive when it has lost electrons, and negative when it has gained more electrons than it normally has.

IONOSPHERE

That portion of the earth's atmosphere, beginning about 30 miles above the earth's surface, which consists of layers of highly ionized air capable of bending or reflecting certain radio waves back to the earth.

ISENTROPIC

Without any change in the entropy.

ISOBAR

(1) A line on a chart or diagram drawn through places or points having the same barometric pressure.

(2) Curve of constant acceleration loading of a pursuing aircraft flying a true pursuit course.

ISOTHERMAL

Indicating changes of volume, pressure, or other property at constant temperature.

J

JAMMING

Intentional transmission of r-f energy, in such a way as to interfere with reception of signals by another station.

JATO

An auxiliary rocket device for applying thrust to some structure or apparatus.

JET

The exhaust stream or rapid flow of fluid from a small opening or nozzle.

JET HORSEPOWER

The power of the exhaust jet equal to the product of thrust and effective jet velocity.

JET MOTOR

A motor which provides a forward propulsive force by producing a rearward jet of matter.

JET STREAM

The steam of combustion products expelled from jet motor.

JET VANE

A vane made of some highly heat-resisting material placed in the jet stream for use in guidance of a missile.

JITTER, BEAM

See BEAM JITTER.

JOULE'S CONSTANT

The mechanical equivalent of heat, 778.26 ft-lb per Btu or 4.18 joules per calorie.

K

K

The ratio of propellant surface to nozzle throat area.

K-BAND

A radio-frequency band of 11,000 to 33,000 megacycles with wave lengths of from 2.73 to 0.91 centimeters, respectively. (Obsolescent.) See FREQUENCY, ELECTRONIC.

K, INTERNAL

The ratio of propellant surface which must discharge past any constricted region to the area at that region, at the most constricted portion of a rocket motor.

KLYSTRON

A vacuum tube for converting direct-current energy into radio-frequency energy by alternately slowing down and speeding up an electron beam, utilizing the transit time between two points to produce a velocity-modulated electron stream to deliver radio-frequency power to a cavity resonator. The term is applicable to an ultra-high-frequency amplifier, or generator, that combines the velocity-modulation principle with one or more cavity resonators to produce and/or utilize a velocity-modulated beam of electrons.

L

L-BAND

A radio-frequency band of 390 to 1,550 megacycles with wave lengths of from 77 to 19.35 centimeters, respectively. (Obsolescent.) See FREQUENCY, ELECTRONIC.

LATITUDE

The range in brightness of a scene over which fidelity of response of a television pick-up tube (or photographic emulsion) is maintained.

LAUNCHER

A mechanical structure which constrains a missile to move in the desired direction of flight during initial motion but does not itself propel the missile. See CATAPULT.

LAUNCHER, ZERO LENGTH

A launcher which supports the missile in the desired attitude prior to ignition, but which exercises negligible control on the direction of the missile's travel after ignition.

LEAD PREDICTION

The act of directing a missile (or projectile) ahead of a moving target—leading in aim—to a predicted collision point.

LEADING EDGE

The foremost edge of an airfoil.

LEAKANCE

A reciprocal of insulation resistance.

LENGTH/DIAMETER RATIO

See FINENESS RATIO.

LEVELING CIRCUIT

An r-c filter circuit used to level out fluctuations of a bias voltage.

LIFT DIRECTION (STRESS ANALYSIS)

The direction in the plane of symmetry perpendicular to the relative wind. (See CHORD, DRAG, and SIDE DIRECTION.)

LIFT/DRAG RATIO

The ratio of the lift to the drag of any body.

LIFT, AERODYNAMIC

The component of the total aerodynamic force of a body perpendicular to the relative wind.

LIFT FORCE OR COMPONENT

In stress analysis, a force or component, in the lift direction. (See CHORD, DRAG, and SIDE FORCE.)

LIMITER

In electronics, a circuit which limits the maximum positive or negative values of a wave form to some predetermined amount. It is used in frequency modulation systems to eliminate unwanted variations of amplitude in received waves.

LINEAR

A linear relationship exists between two quantities when the change in one quantity is exactly proportional to the change in the other quantity.

LOAD, BASIC

In stress analysis, the load on a structural member or part in any condition of static equilibrium of an airplane. When a specific basic load is meant, the particular condition of equilibrium must be indicated in the context.

LOAD, DESIGN

In stress analysis, a specified load below which a structural member or part should not fail. It is the probable maximum applied load multiplied by the factor of safety. Also, in many cases, an appropriate basic load multiplied by a design-load factor.

LOAD, ELECTRICAL

A device or circuit component into which power is intended to be delivered by an amplifier, genera-

tor, etc.; comprises resistive and/or reactive components.

LOAD FACTOR

In stress analysis, the ratio of two loads (the second being a basic load) that have the same relative distribution. The first load may be the load applied during some special maneuver, the maximum probable load on the airplane or part, the design load, or the ultimate load. Whenever a load factor is mentioned, the context should indicate clearly what load is being compared with the basic load. If the context does not so indicate, the load factor is usually the ratio of the design load to the weight of the airplane.

LOAD, FULL

Weight empty plus useful load; also called gross weight.

LOAD, SPAN

The ratio of the weight of an airplane to its equivatent monoplane span.

LOAD, ULTIMATE

In stress analysis, the load that causes destructive failure in a member during a strength test, or the load that, according to computations, should cause destructive failure in the member.

LOADING, POWER

The gross weight of an airplane divided by the rated horsepower of the engine computed for air of standard density, unless otherwise stated.

LOADING, UNSYMMETRICAL

In stress analysis, a design loading condition for the wings and connecting members representing the conditions as in a roll.

LOADING, WING

The gross weight of an airplane divided by the wing area.

LOBE

One of the three-dimensional portions of the radiation pattern of a directional antenna.

LOBE, SIDE

A portion of the radiation from an antenna outside the main beam and usually of much smaller intensity. A side lobe is a region between two minima in the pattern.

LOCAL SPEED OF SOUND

The velocity of propagation of acoustic waves over a small region as determined by the conditions there.

LONGERON

A principal longitudinal member of the framing of an airplane fuselage or nacelle, usually continuous across a number of points of support.

LORAN

An electronic navigation system in which two or more fixed transmitting stations utilize a pulse transmission technique. Aircraft and surface vessels, receiving the transmitted signals, may determine ranges to the stations, and thereby establish the location of the receiver. Derived from LOng RAnge Navigation. See NAVIGATION, HYPERBOLIC.

LUBBER MARK

A mark on the casing of a compass which gives the heading of an aircraft or vessel carrying the compass.

M

MACH ANGLE

The angle between a Mach line and the path of a body moving with supersonic speed. The sine of this angle is the ratio of the speed of sound to the projectile velocity.

MACH LINE

An imaginary line drawn at an angle to the path of a rapidly moving body. It represents theoretically the shock wave which would be produced by a microscopic point moving with the speed of the body. The angles of very weak shock waves closely approximate the angle of the Mach line.

MACH NUMBER

The ratio of the velocity of a body to that of sound in the medium being considered. Thus, at sea level, in air at the Standard U. S. Atmosphere, a body moving at a Mach number of one (M=1) would have a velocity of approximately 1116.2 ft/sec (the speed of sound in air under those conditions).

MACH NUMBER, CRITICAL

The Mach number at which sonic velocity is attained at some point on the airframe.

MAGIC TEE

A particular radar wave-guide configuration, so-called because its physical aspect resembles a

double letter "T." The use of this configuration permits the coupling of a radar transmitter and receiver to a common antenna without the use of an "anti-t-r" box.

MAGNETOMETER

An instrument for measuring the magnitude and direction of the earth's magnetic field or other types of magnetic fields.

MAGNETOSTRICTION

The change in the dimensions of a ferromagnetic object when placed in a magnetic field.

MAGNETRON

A high-vacuum thermionic tube capable of producing high output power in the microwave region of the frequency spectrum. This tube consists of a heater, cathode, usually a multisegment anode, and an external magnet (electro or permanent) for controlling the unidirectional current flow in the tube.

MANEUVERABILITY

That structural or aerodynamic quality in an aircraft which determines the rate at which its attitude and direction of flight can be changed. Commonly expressed in "g's."

MANOMETER

A gage for measuring pressure by fluid level.

MARGIN OF SAFETY

In stress analysis, the difference between the ultimate load and applied load.

MASS FLOW

The mass of fluid flowing past or through a particular reference plane, per unit of time.

MASS RATIO

As applied to rockets, the ratio of the total propellent weight to the gross rocket weight.

MATCHING

In electrical circuitry, the connecting of two circuits in such way that correct impedance to insure maximum transfer of energy exists in each circuit.

MEADOW

Ranges of air-fuel ratio within which smooth combustion may be had.

MEAN LINE

Concerning an airfoil profile, an intermediate line between the upper and lower contours of the profile.

MICROWAVES

Extremely short radio waves, which are not more than a few centimeters in wave length.

MIL

(1) A unit of angular measurement. In artillery and guided missile usage, a mil is equal to 1/6400 of a circle. In infantry usage, a mil is the angle subtended by 1 yard at 1000 yards distance. 100 artillery mils equals 98.2 infantry mils.

(2) A unit of linear measurement equal to 0.001 inch.

MIXTURE RATIO

The ratio of the weight of oxidizer used per unit of time to the weight of fuel used per unit of time.

MODE, TE-

Any mode of propagation in a wave guide or between parallel plates, in which the electric field is wholly transverse to the direction of propagation. The $TE_{1,0}$ mode is commonly used in rectangular wave-guide transmission lines.

MODE, TEM-

A mode of propagation of electromagnetic energy between parallel plates (or in a coaxial transmission line), in which the electric field is everywhere perpendicular to the conductors and the wave length is independent of the spacing between them.

MODE, $TEM_{0,1}$-

A mode of propagation of electromagnetic energy which has axial symmetry if excited in a circular wave guide.

MODIFICATION

A major or minor change in the design of an adopted item of matériel which is effected in order to correct a deficiency, facilitate production, or to improve operational effectiveness.

MODULATION

The process of varying the amplitude, frequency, or phase of a carrier wave with time, to transmit information.

MODULATION, AMPLITUDE

A method of modulating a radio-frequency carrier by causing the amplitude of the carrier to vary above and below its normal value in accordance with the audio or other signal to be transmitted.

The frequency of the carrier remains constant. Commonly abbreviated as AM.

MODULATION, FREQUENCY

A method of modulating a radio-frequency carrier by causing the frequency of this carrier to vary above and below the no-modulated value, at a rate determined by the audio or other modulating signal to be transmitted. The amplitude of the carrier remains constant. Commonly abbreviated as FM.

MODULATION, VELOCITY

A form of modulation in which the electrons of a stream are speeded up and slowed down so as to produce bunches or groups.

MODULATOR, BALANCED

In electronics, a circuit arrangement in which a carrier frequency is controlled by a signal wave in a manner to generate the sideband frequencies but suppress the carrier in the output.

MODULUS OF ELASTICITY

The force per unit area which would be required to stretch a substance to double its normal length on an assumption that the body would remain perfectly elastic; the ratio of stress to strain within the perfectly elastic range.

MOMENT, HINGE

See HINGE MOMENT.

MOMENT OF FORCE

The effectiveness of a force to produce rotation about an axis. It is measured by the product of the force and the perpendicular distance from the line of action of the force to the axis of rotation. Also known as torque.

MOMENT OF INERTIA

A measure of the resistance offered by a body to angular acceleration; the products of mass and the distance squared from the axis of reference, summed over all particles in the system or body.

MOMENTUM

The product of the mass of body and its linear velocity.

MOMENTUM, ANGULAR

The product of the angular velocity and the moment of inertia of a body. Also called MOMENT OF MOMENTUM.

MONOCOQUE

A type of fuselage relying for its rigidity upon the surface or skin which may be of sheet metal or of layers of veneer.

MOTORBOATING

An audio system is said to be "motorboating" when it emits pulsating audio sounds resembling those made by a motorboat These pulsating sounds are caused by feed-back at audio-frequency in the amplifier or receiver.

MULTIPATHS

The several paths by which, owing to reflections, a radiated signal may reach the receiving antenna from the transmitter.

MULTIPERFORATED

A term used in connection with solid propellants indicating that the propellant grain has more than one longitudinal perforation.

MULTIPLEX

Denotes the simultaneous transmission of several functions over one link without loss of detail of each function, such as amplitude, frequency, phase, or wave shape. Very high-speed commutation that would satisfy these conditions could, in special instances, be correctly classified as multiplexing. However, to prevent confusion the term "commutation" is still to be preferred whenever a switch is used.

MULTIPLEXER

A device by which simultaneous transmission of two or more signals may be made using the same common carrier wave.

MULTIVIBRATOR

An electronic circuit arrangement usually including two resistance-coupled oscillators, so connected that the output of each contributes to the control of the input of the other. The output may be made an essentially square wave (with many strong harmonics of the fundamental frequency). The frequency of the output is determined by the combined effect of the circuit constants and the characteristics of whatever externally-imposed control signals are used.

N

NAVIGATION, CELESTIAL

Navigation by means of observations of celestial bodies. A system wherein a missile, suitably instrumented and containing all necessary guidance equipment, may follow a predetermined course in

space with reference primarily to the relative positions of the missile and certain preselected celestial bodies. Determination of the vertical to the earth's surface may be necessary in addition.

NAVIGATION, HYPERBOLIC

A general method for determining lines of position by measuring the difference in distance of the navigator or navigating apparatus from two or more stations of known position. The difference in distance is determined by measuring the difference in time of arrival of signals transmitted from two or more stations. Although a great variety of signaling methods are theoretically possible, only radio waves are now commonly used in hyperbolic navigation. One system, using continuous wave signals, is known as DECCA. LORAN and GEE are systems using signals transmitted as pulses. One transmitting station is the master station, with the other station or stations, separated from 75 miles to 1200 miles, being slave stations. The cycle of transmission always begins at the master station and the signal travels out in all directions. The arrival of the master signal at the slave station "triggers off" the slave which, in turn, transmits a signal. Points of constant difference in time of arrival of the two or more signals will fall on hyperbolas, with the transmitters at the foci. The accuracy of the line of position which can be established by the navigator or the navigating apparatus varies from 200 yds to 2 miles depending upon the distance of the observer or the receiver from the base line between stations and upon the type of system and equipment used. Although the navigator's equipment differs in details

for GEE, DECCA and LORAN; nevertheless, the fundamental characteristics are all the same. In the DECCA and GEE systems, the master station operates in conjunction with two or more slave stations. In the LORAN system, the master station operates with one slave station. SHORAN is a short-range system.

NOISE LEVEL

The strength of noise signals at a particular point in the electrical or electronic circuit; usually expressed in microvolts or in decibels with respect to some arbitrary level such as signal voltage or power.

NOLO FLIGHT

The flight of a drone without a human (safety) pilot aboard. See SAFETY PILOT.

NOSE-DOWN

To depress the nose of an airframe in flight.

NOSE-HEAVY

The condition of an airframe in which the nose tends to sink when the longitudinal control is released in any given attitude of normal flight.

NOSE-UP

To elevate the nose of an airframe in flight.

NOZZLE

A duct of changing cross section in which the fluid velocity is increased. Nozzles are usually converging-diverging, but may be uniformly diverging or converging. Also called venturi.

NULL

Used in the electrical and electronics fields to mean zero.

NUTATION

The oscillation of the axis of a rotating body. In radar, the familiar situation where, with the radar reflector stationary, the center of the dipole, which has its longitudinal axis fixed, is caused to describe a circle centered at the focus of the paraboloid and lying in a plane perpendicular to the axis of the paraboloid.

O

OGIVE

A shape familiar on the nose of projectiles; the surface of revolution generated by rotating a line segment and the arc of a circle about an axis parallel to the line.

OGIVE, CONICAL

A cone plus cylinder; an ogive generated by a line segment plus an arc of infinite radius.

OGIVE, SECANT

An ogive generated by an arc not tangent, but intersecting at a small angle a segment which forms the cylindrical surface. A secant ogive may have any radius of curvature greater than that of the tangent ogive on up to an infinite radius of curvature (i. e., a straight, conical ogive) but, unless otherwise specified, a secant ogive has approximately twice the radius of curvature of a tangent ogive. (British—FRACTIONAL OGIVE.)

OGIVE, TANGENT

Generated by arc, tangent to segment forming the cylindrical surface. See OGIVE. (British—TRUE OGIVE.)

OPERATIONAL RESEARCH

See RESEARCH, OPERATIONS.

OPERATIONS ANALYSIS

See RESEARCH, OPERATIONS.

OPERATIONS EVALUATION

See RESEARCH, OPERATIONS.

OPERATIONS RESEARCH

See RESEARCH, OPERATIONS.

ONE-DIMENSIONAL FLOW

Flow in which it is assumed that static pressure, Mach number and other characteristics are uniform over any cross section perpendicular to the direction of fluid flow. Interpretations based on this assumption, although not exact, work out remarkably well in problems of duct flow.

ORTHOGONAL

The property of being at right angles or, more generally, independent. EXAMPLES: The X, Y, & Z directions, or the R, ϕ & θ directions in polar coordinates are orthogonal. Functions represented by the electric intensities of two radio signals, the ratio of whose frequencies is irrational, are orthogonal.

OSCILLATION, PHUGOID

A long-period oscillation characteristic of the disturbed longitudinal motion of an aircraft.

OSCILLATION, STABLE

An oscillation of constant amplitude or frequency.

OSCILLATION, UNSTABLE

In aerodynamics, an oscillation whose amplitude increases continuously until an attitude is reached

from which there is no tendency to return towards the original attitude, the motion becoming a steady divergence.

OSCILLATOR

Any nonrotating device designed to set up and maintain oscillations of a frequency determined by the physical constants of the system.

OSCILLATOR, MAGNETOSTRICTION

An oscillator whose frequency is controlled by a magnetostrictive resonator.

OSCILLOGRAPH

A device for making a graphic record of the instantaneous values of a rapidly varying electric quantity as a function of time or some other quantity.

OSCILLOSCOPE

An apparatus for showing visually on the screen of a cathode-ray tube the wave form of a rapidly varying quantity, such as an alternating current or a changing electric potential.

P

P-BAND

A radio frequency band of 225 to 390 megacycles with wave lengths of 133 to 77 centimeters, respectively. (Obsolescent.) See FREQUENCY, ELECTRONIC.

PAD

(1) A nonadjustable attenuator. See ATTENUATOR.

(2) A permanent or semipermanent base constructed to support a missile-launching device.

PARAMETER

A quantity which may have various values each fixed within the limits of a stated case or discussion.

PAYLOAD

Warhead, fuze, and container. In the case of research and test vehicles, this includes equipment for taking data and transmitting or recovering it.

PHASE

A quantity that specifies a particular stage of progress in any recurring operation, such as a vibration or an alternating current. Phase is often expressed as an angle or a part of a circle in which case the complete cycle of operation is equal to 360° (one complete rotation). When two alternating quantities pass through corresponding zero values at the same time, they are said to be in phase.

PHOSPHORS

Materials used in coating the viewing screen in radar, or other cathode-ray, indicator tubes, to transform the energy of the electron beam into visible light. In use are two types—

(1) The single-layer (short-persistence) phosphor producing visible green light of rapid decay (to about 1% of initial value in about 0.05 sec).

(2) The double-layer cascade (long-persistence) phosphor producing visible yellow light with a decaying time of several seconds.

PHOTOGRAPHY, SHADOW

An optical system for recording shadows, generally utilizing a short, high-intensity light source. When used in supersonic wind tunnel work, photographs

secured by this method reveal the locations and relative intensities of shock waves. Shadowgraphs are primarily sensitive to the second derivative of the densities existing in a supersonic stream over a model, and thereby reveal sharp changes in density as in shock waves. See SCHLIEREN.

PHOTOGRAPHY, SPARK

Photographs by the use of a high-intensity electric spark as a light source. Frequently used as a "loose" synonym for shadow photography.

PHUGOID

In aeronautics, pertaining to or representing variations in the longitudinal motion or course of the center of mass of an aircraft.

PICK-UP

In telemetering, a sensing instrument to measure a varying quantity, such as a pressure gage, strain-gage element, position indicator, etc.; also called end instrument.

PIEZOELECTRIC

The property of certain crystals in developing electrical charge or potential difference across certain crystal faces when subjected to a strain by mechanical forces or, conversely, to produce a mechanical force when a voltage is applied across the material. Examples—quartz, tourmaline, and Rochelle salts.

PILOTING, SELF

Concerning ramjets, an ignition system which utilizes a portion of the fuel and air as a pilot flame, which pilot, in turn, serves to ignite the remainder of the air-fuel flow.

PILOTLESS AIRCRAFT

An aircraft which is equipped to function without a human pilot aboard.

PIP

The figure presented on the oscilloscope of a radar caused by the echo from an aircraft or other reflective object. Also called blip.

PITCH

An angular displacement about an axis parallel to the lateral axis of an airframe.

PITCH INDICATOR

An instrument for indicating the existence and approximate magnitude of the angular velocity about the lateral axis of an airframe.

PITOT-STATIC TUBE

A parallel or coaxial combination of a pitot and a static tube. The ratio of the impact pressure to the static pressure is a function of the velocity of flow past the tube.

PITOT TUBE

A cylindrical tube with an open end pointed upstream, used in measuring impact pressure.

PITOT-VENTURI TUBE

A combination of a pitot and a venturi tube.

PLAN FORM, DEVELOPED

The plan of an airfoil as drawn with the chord lines at each section rotated about the airfoil axis into plane parallel to the plane of projection and with the airfoil axis rotated or developed and projected into the plane of projection.

PLAN FORM, PROJECTED

The contour of the plan form as viewed from above.

PLANE OF SYMMETRY

As applied to aircraft, a plane containing both the longitudinal or roll axis and the normal or yaw axis; a plane separating the right side from a symmetric left side.

PLUMBING

(1) Concerning missiles—the wave-guide construction used in microwave systems, such as radars.

(2) In power plant systems—the complex system of pipe-lines, fittings, and valves.

POLARIZATION

(1) In optics, the act or process of making light or other radiation vibrate in a definite form so that the paths of the vibrations, in a plane perpendicular to the ray, are straight lines, circles, or ellipses, giving, respectively, plane polarization, circular polarization, or elliptical polarization.

(2) In radio, a term used in specifying the direction of the electric vector in a linearly polarized radio wave as radiated from a transmitting antenna.

PRANDTL NUMBER

An expression of the temperature distribution in a fluid, equal to the product of the specific heat at constant pressure and the kinematic viscosity divided by the thermal conductivity.

PRECESSION

A change in the orientation of the axis of a rotating body, such as a spinning projectile or gyroscope,

the effect of which is to rotate this axis (axis of spin) about a line (axis of precession) perpendicular to its original direction and to the axis (axis of torque) of the moment producing that change.

PRESSURE

Force per unit area.

PRESSURE, BASE

The aerodynamic pressure exerted on the base or rear end of a missile in flight.

PRESSURE, DYNAMIC

The product $\frac{1}{2}\rho V^2$, where ρ is the density of the ambient air and V is the relative speed of the air. Commonly called dynamic head and designated by the letter "q"

PRESSURE, IMPACT

The pressure existing when a moving stream of gas strikes a surface which brings part of the gas abruptly to rest. This recovered pressure is roughly equivalent to the stagnation pressure, for subsonic flow.

PRESSURE, RECOVERED

The pressure actually obtained when the static pressure is increased by the conversion of a portion of the kinetic energy in the stream of gas to pressure energy. The maximum recovered pressure would be stagnation pressure were it not for losses in the conversion process.

PRESSURE, STAGNATION

Stagnation or total pressure is the static pressure that could be realized if the flow could isentropically

be brought to rest. It depends upon the static pressure, the Mach number, and kind of gas. At low Mach numbers, it approaches the sum of the static pressure and the incompressible velocity head but is increasingly greater than this sum at higher Mach numbers.

PRESSURE, STATIC

The pressure exerted by a gas at rest, or which would be indicated by a gage placed in the stream and moving with the same speed as the stream. The static pressure for a given gas is determined by the density and the temperature.

PRIMARY STRUCTURE

The main framework, including fittings and attachments. Any structural member, the failure of which would seriously impair the safety of the aircraft, is a part of the primary structure.

PROFILE THICKNESS

The maximum distance between the upper and lower contours of an airfoil, measured perpendicularly to the mean line of the profile.

PROPAGATION

Extending the action of; transmitting, carrying forward as in space or time or through a medium as the propagation of sound or light waves.

PROPAGATION, VELOCITY OF, RADIO

The velocity of radio propagation, within the accuracy demanded of radar equipment, is usually taken as the velocity of light, 2.998×10^8 m/sec, or 299.8 m/micro-sec. The following table gives the unit propagation velocities:

Velocity (travel/unit time)	*Reciprocal (time/unit travel)*
299.8 m/micro-sec	0.003336 micro-sec/m
983.6 ft/micro-sec	0.001017 micro-sec/ft
327.9 yd/micro-sec	0.003050 micro-sec/yd
0.1863 statute mi/micro-sec	5.368 micro-sec/statute mile
0.1618 nautical mi/micro-sec	6.180 micro-sec/nautical mile

PROPELLANT

Material, consisting of fuel and oxidizer, either separate or together in a mixture or compound, which, if suitably ignited, changes into a large volume of hot gases, capable of propelling a rocket or other projectile.

PULL-OUT

The act of changing from a power dive to level (or climbing) flight.

PULL-UP

A maneuver in the vertical plane in which the aircraft is forced into a short climb, usually from approximately level flight. See ZOOM.

PULL-UP, SUDDEN

In stress analysis, a loading condition resulting from a sudden application of up-elevator. Also called Sudden Pull-out.

PULSE

A single disturbance of definite amplitude and time length, propagated as a wave or electric current.

PULSE JET

A compressorless jet-propulsion device which produces thrust intermittently, with an operating frequency determined by the acoustic resonance of the

engine. Consists of a pulsating or intermittent inlet-valve system, a combustion chamber, and a discharge nozzle. Owing to the partial vacuum created for a short time in each cycle by the pulsating nature of the combustion and exhaust, this device can take in air and produce thrust even under static conditions.

PULSE LENGTH

The time duration of the transmission of a pulse of energy, usually measured in microseconds or in the equivalent distance in yards, miles, etc., represented by the pulse signal on a radar-scope.

q Q

See PRESSURE, DYNAMIC.

Q-FACTOR

(1) A rating applied to coils, capacitors, and resonant circuits, equal to reactance divided by resistance.

(2) The ratio of energy stored to energy dissipated per cycle in mechanical or electrical systems.

R

RADAR

(1) The principle of locating reflecting targets or objects by the measurement of reflections of radio-frequency energy from the targets.

(2) A term applied to devices which make use of the radar principle. The word was derived from a contraction of the phrase RAdio Detection And Ranging.

RADAR, BEACON

See BEACON, RADAR.

RADAR, CONTINUOUS-WAVE

System in which a transmitter sends out a continuous flow of radio energy to the target which reradiates (scatters) the energy intercepted and returns a small fraction to a receiving antenna. Since both the transmitter and receiver are operating simultaneously and continuously, it is impractical to employ a common antenna and usually two similar structures are employed side-by-side and so oriented that only a small fraction of the transmitted power leaks directly into the receiver. The reflected wave is distinguished from the transmitted signal by a slight change in radio frequency. The c-w method while not so adaptable to military needs has many interesting properties—

(1) Its ability to distinguish moving targets against a stationary reflecting background.

(2) More conservative of bandwidth than pulse radar.

RADAR, GPI

Ground position indicator.

RADAR, MTI

Moving target indicator.

RADAR, PULSE

Radar in which sharp bursts of radio energy, somewhat like the bursts of acoustic energy from the barrel of a machine gun, are sent out from the transmitter. When these bursts or "pulses" encounter a reflecting object, they are reflected as

discrete echoes which are detected by the radar receiver during the interval between the transmitted pulses. The pulse method has the ability to measure distances and engage several targets simultaneously.

RADAR, RANGE OF

The maximum usable distance to target of a radar system; under free-space conditions, varies as the fourth power of—

(1) The transmitted power.
(2) The receiver power sensitivity.
(3) The target echo area.
(4) The square of the antenna gain.

RADOME

A contraction of the words RAdar DOME. The housing for a radar antenna, transparent to radio frequency radiation. It may include some nontransparent areas, however.

RAMJET

A compressorless jet-propulsion device which depends for its operation on the air compression accomplished by the forward motion of the unit.

RANGE, SLANT

The distance, in a straight line, from a gun, a point of observation, or a radar set to a target, especially an aerial target.

RANGE-TRACKING ELEMENT

An element in a radar set which measures range and its time derivative. By means of the latter, a range gate is actuated slightly before the predicted instant of signal reception.

RASTER

A system of luminescent lines traced on the phosphor of a cathode-ray tube by motion of the cathode-ray beam. The changes of brightness in the lines produce a picture as a television picture or a radar map. This word is of German origin and is used in particular in television.

RATE-OF-CLIMB INDICATOR

An instrument that indicates the rate of ascent or descent of an aircraft.

RATIO, EFFECTIVE ASPECT

The aspect ratio of an airfoil of elliptical plan form that, for the same lift coefficient, has the same induced-drag coefficient as the airfoil or the combination of airfoils in question.

RATIO OF SPECIFIC HEATS

The ratio of specific heat at constant pressure to specific heat at constant volume.

RATRACE

A particular type of radar wave-guide configuration which serves the same purpose as the "Magic Tee" but allows the handling of greater power.

REACTANCE

That component of the impedance of an electrical circuit, not owing to resistance, which opposes the flow of alternating current. The reactance is the algebraic sum of—

(1) That owing to inductance in the circuit with a value in ohms equal to the product of 2π, the frequency in cycles, and the inductance in henries.

(2) That owing to capacitance in the circuit with a value in ohms equal to the reciprocal of the product of 2π, the frequency in cycles, and the capacitance in farads.

REACTANT RATIO

The ratio of the weight flow of oxidizer to fuel in a rocket.

REACTOR

A device that introduces either inductive or capacitive reactance into a circuit.

REDUNDANCE

The property of an equation which permits a plurality of solutions; therefore, in a mechanical or electrical system describable by such an equation, the property which permits a plurality of modes of action.

REFLECTION INTERVAL, RADAR

The length of time required for a radar pulse to travel from the source to the target and return to the source, taking the velocity of radio propagation to be equal to the velocity of light, 2.998×10^8 m/sec, or 299.8 m/micro-sec. Since the pulse must travel, in all, twice the distance to the target (out and back), the apparent velocities obtained are only one-half of the true velocity of the pulse. Likewise, the reflection intervals are just twice as great when target ranges are considered. The following table, as calculated, takes into consideration both travel to the target and return:

Apparent velocity (travel/unit time) Radar Ranges	*Reflection intervals*
149.9 m/micro-sec	0.006671 micro-sec/m
491.8 ft/micro-sec	0.002033 micro-sec/ft
163.9 yd/micro-sec	0.006101 micro-sec/yd
0.0932 statute mi/micro-sec	10.735 micro-sec/statute mile
0.0809 nautical mi/micro-sec	12.361 micro-sec/nautical mile

REFRACTIVE INDEX OF AIR

The ratio of propagation velocity in a vacuum to the velocity in the atmosphere for electromagnetic radiation. At sea level, the refractive index is approximately 1.0003, decreasing at the rate of approximately -1.2×10^{-8} per foot with gain in altitude.

REGENERATIVE

Feeding back. A regeneratively-cooled rocket motor is one in which one of the propellants is used to cool the motor by passing through a jacket prior to combustion.

RELATIVE HUMIDITY

The ratio of an actual partial pressure of water vapor in air to the partial pressure at saturation.

RELATIVE WIND

The velocity of the air with reference to a body in it. Usually determined from measurements made at such a distance from the body that the disturbing effect of the body upon the air is negligible.

RELAY

A device, usually electromechanical in operation, generally operated by a change in one low-powered electrical circuit, thereby controlling one or more other electrical circuits.

RESEARCH

A continued process of scientific investigation prior to and during development. It has for its aim the discovery of new scientific facts, techniques, and natural laws.

RESEARCH, APPLIED

Research aimed at specific application of scientific laws, principles, and phenomena. In contrast to basic research, the prospect of practical application of the results is a primary motive for applied research. Frequently even the methods to be used are clear before work is begun.

RESEARCH, BASIC

The theoretical or experimental study directed toward the increase of knowledge. It may result in the discovery of new scientific phenomena, principles, techniques, or significant data which add to the store of scientific knowledge. Immediate practical application is not necessarily a direct objective.

RESEARCH, NONMATERIEL

Concerns research directed toward development or improvement of techniques, rather than toward the development of matériel. It includes such subjects as the application of psychology or of analytical and statistical methods to the study of military problems.

RESEARCH, OPERATIONS

The scientific, qualitative, and quantitative study of warfare by military agencies with the objective of improving the weapons, tactics, and strategy of future operations through analysis and evaluation

of past operations and maneuvers and operations trials. Also known as Operational Research, Operations Analysis, and Operations Evaluation.

RESISTOR

A device which conducts electricity but converts part of the electrical energy into heat. Resistors are used in an electric circuit for protection, operation, or control.

RESOJET

See PULSE JET.

RESOLUTION

In radar, the minimum separation in angle or in range between two targets which the equipment is capable of distinguishing.

RESONANCE

A condition in which an actual oscillation occurs at approximately the natural frequency of a system. at resonance a small input of energy produces a large amplitude of oscillation, which is limited primarily by the amount of damping present.

RESONATOR, MAGNETOSTRICTIVE

A ferromagnetic rod so designed and arranged that it can be excited magnetically into resonant vibration at one or more definite frequencies.

RETURN, SEA OR GROUND

See CLUTTER, RADAR.

REYNOLDS NUMBER

A nondimensional coefficient used as a measure of the dynamic scale of a flow. Its usual form is

expressed by the fraction $\rho \frac{VL}{\mu}$ in which ρ is the density of the fluid, V is the velocity of the fluid, L is a linear dimension of a body in the fluid, and μ is the coefficient of viscosity of the fluid. (See SCALE EFFECT.)

RIPPLE

Any alternating-current component superimposed upon, or present in, a direct-current supply.

RISE TIME

In electronics, the time required for a pulse to rise to an arbitrary fraction (usually 90%) of its amplitude.

ROCKET

A thrust-producing system or a complete missile which derives its thrust from ejection of hot gases generated from material carried in the system, not requiring intake of air or water.

ROLL

An angular displacement about an axis parallel to the longitudinal axis of an airframe.

ROUGH BURNING

Pressure fluctuations frequently observed at the onset of burning and at the combustion limits of a ramjet or rocket.

RUDDER

A hinged or movable auxiliary airfoil on an aircraft, the function of which is to impress a yawing moment on the aircraft.

S

S-BAND

A radio-frequency band of 1,550 to 5,200 megacycles with wave lengths of 19.35 to 5.77 centimeters respectively. (Obsolescent.) See FREQUENCY, ELECTRONIC.

SABOT

A thrust-transmitting attachment which positions a projectile in the bore of a firearm.

SAFETY PILOT

A human pilot who rides in a remotely controlled aircraft for safety purposes during testing and checkout of the remote control and/or automatic equipment.

SCALAR QUANTITY

Any quantity that can be described by magnitude alone, such as temperature. See VECTOR QUANTITY.

SCALE EFFECT

The change in any force coefficient, such as the drag coefficient, owing to a change in the value of Reynolds number.

SCAN, AXIS OF

In a scanning system, the axis about which information as to the target location is collected and with reference to which target displacement is measured.

SCAN, RADAR

Denotes the motion of a radio-frequency beam through space in searching for a target. There are

many types of scanning used which are denoted by the path described in space by a point on the radar beam, such as circular, conical, spiral, and helical.

SCANNING, ELECTRICAL

A type of scanning which is accomplished electrically and without motion of the antenna.

SCAVENGER SYSTEM

The evacuation system in a wind tunnel for disposing of the products of combustion liberated from a burning model in the tunnel.

SCHLIEREN

Gradients or variations in gas density, or striae, from the German word. Schlieren are made visible by an optical system, bearing the same name, which either cuts off or passes a large change in light intensity owing to the slight refraction of the light passing through the gas. This system is often used in wind tunnels making visible turbulence and weak shock waves by showing the first derivatives of gas density directly.

SEEKER, TARGET

A homing guidance device. See GUIDANCE, HOMING.

SELF-DESTRUCTION EQUIPMENT

Primacord, or some other type of explosive, in a circuit such that it may be exploded by (a) a time-delay mechanism, (b) a radio-command link, (c) an automatic trip mechanism on the roll-stabilization gyro, or other signal.

SELF-PILOTING

See PILOTING, SELF.

SELSYN

A General Electric Company trade name for a synchro; derived from SELf-SYNchronous. See SYNCHRO.

SENSITIVITY

In radio-receiver usage, that minimum strength of a signal input capable of causing a desired value of signal output.

SEPARATION

(1) The phenomenon in which the boundary layer of the flow over a body placed in a moving stream of fluid separates from the surface of the body.

(2) Regarding multistage missiles, the time or place at which a burnt-out stage is discarded and the remaining missile continues on its way.

SEPARATION POINT

The point at which the separation of the boundary layer begins.

SERVO-LINK

A power amplifier, usually mechanical, by which signals at a low power level are made to operate control surfaces requiring relatively large power inputs; e. g., a relay and motor driven actuator.

SERVO-SYSTEM

A closed-cycle automatic-control system so designed that the output element or output quantity follows as closely as desired the input to the system. The output is caused to follow the input by the action of the servo-controller upon the output element in such a way as to cause the instantaneous error, or

difference, between output and input to approach zero. All servo-systems are dynamic systems containing at least one feed-back loop which provides an input signal proportional to the deviation of the actual output from the desired output; this property distinguishes servo-systems from ordinary automatic-control systems. In general, servo-mechanisms exhibit the following properties:

(1) Include power amplification.

(2) Are "Error Sensitive" in operation.

(3) Are capable of following rapid variations of input.

SHADING

The appearance of dark areas in a received television picture which sometimes covers the entire screen.

SHOCK WAVE

An extremely thin wave, or layer of gas, generated by the relative supersonic movement of the gas stream and a body, or generated by an explosion. Free stream gas, upon passing through this wave, experiences abrupt and discontinuous changes in pressure, density, velocity, temperature, and entropy. These changes are irreversible owing to some of the pressure energy being lost to heat. Shock waves are commonly called compressive waves, and may be either normal or oblique to the gas-stream direction. The stream upon passing through a normal shock always has its velocity reduced from supersonic to subsonic. In passing through an oblique wave, the velocity is reduced but is still supersonic. In both cases the total stagnation pressure is reduced, while the density, static

pressure, and free-stream temperature are increased in the gas stream.

SHOCK WAVE, LIP

The shock wave obtained from the lip of a free jet nozzle owing to the failure in matching of the stream pressure and the ambient exhaust pressure.

SHORAN

(1) Abbreviated name for SHOrt Range Navigation.

(2) A precision position-fixing system using a pulse transmitter and receiver and two transponder beacons at fixed points.

See NAVIGATION, HYPERBOLIC.

SIDE DIRECTION (STRESS ANALYSIS)

The direction perpendicular to the plane of symmetry.

SIDE FORCE OR COMPONENT (STRESS ANALYSIS)

A force, or component, perpendicular to the plane of symmetry.

SIEMENS

A Siemens and Halske trade name for synchronous device. See SYNCHRO.

SIGNAL

Any wave form or variation thereof with time serving to convey the desired intelligence in communication.

SIMULATOR

Concerning missiles, a device which solves a problem by use of components which obey the same

equations as the system being studied. Frequently, an electrical analogue or rotation instead of translation is used for mechanical problems. In general, a simulator is an alternative means of determining the effects of changing each of several design parameters at much less expense than building and testing complete missiles or systems.

SIMULATOR, YAW (PITCH)

A test instrument used to derive and thereby permit study of probable aerodynamic behavior in controlled flight under specific initial conditions. Certain components of the missile guidance system, such as the receiver, servo-loop, etc., are connected into the simulator circuitry. Also certain aerodynamic parameters of the specific missile must be known and set into the simulator. Most simulators are applicable to a single plane, which in case of the yaw simulator is the yaw plane. The missile is assumed to be completely roll stabilized.

SINK

A point or element in a system where energy is dissipated or otherwise removed from the system.

SINUSOIDAL

Varying proportionally to the sine of an angle or time function. Sometimes written "sinoidal."

SKIDDING

Sliding sidewise away from the center of curvature when turning. It is caused by banking insufficiently and is the opposite of sideslipping.

SKID FIN

A longitudinal vertical surface, usually placed above the upper wing to increase the lateral stability.

SKIN FRICTION

The tangential component of the fluid force on a surface.

SKY WAVE

A radio wave propagated by reflection from the ionosphere.

SLAT

A movable auxiliary airfoil attached to the leading edge of a wing which when closed falls within the original contour of the main wing and which when opened forms a slot. See SLOT.

SLOT

The nozzle-shaped passage through a wing whose primary object is to improve the flow conditions at high angles of attack. It is usually near the leading edge and formed by a main and an auxiliary airfoil or slat. See SLAT.

SONDE

In telemetering, the complete airborne telemetering system in the vehicle.

SONIC, HYPER- (HYPERSONIC)

(1) High supersonic velocities, of the order of M=5 or greater.

(2) Velocities at which time of missile passage is of the order of the relaxation time; that is, the time for gas molecules to reach equilibrium after sudden

change in conditions. In such a domain, gases must be treated as discrete particles rather than continuum. Measurements of relaxation times of gases are incomplete, but there are indications that Mach numbers of the order of ten must be regarded as hypersonic. Velocities that are not hypersonic at sea level may become so at high altitude, as relaxation times will be longest where densities are relatively low.

SONIC SPEED

The speed of sound. In ambient air, with ratio of specific heats assumed 1.4 and the air following the gas law with temperature in degrees Rankine, the speed of sound is $33.42\sqrt{T}$ miles per hour, or $29.02\sqrt{T}$ knots; with temperature in degrees Kelvin, the speed of sound is $44.84\sqrt{T}$ miles per hour, or $38.94\sqrt{T}$ knots.

SONIC, SUB- (SUBSONIC)

Less than the speed of sound or less than a Mach number of one.

SONIC, SUPER- (SUPERSONIC)

Faster than the speed of sound. When supersonic speed is attained by a moving object, no advance information in the form of advance pressure waves can be given to the advancing air, as the body is moving faster than the pressure waves emanating from the body can propagate themselves forward. As a result, shock waves are formed which move with the body, attached or unattached depending on the conditions.

SONIC, TRAN- (TRANSONIC)

The intermediate speed in which the flow patterns change from subsonic flow to supersonic, i. e., from Mach numbers of about .8 to 1.2, or vice versa.

SPAN

The maximum distance, measured parallel to the lateral axis from tip to tip of an airfoil, of an airplane wing inclusive of ailerons or of a stabilizer inclusive of elevator.

SPECIFIC FUEL CONSUMPTION

Mass of fuel used relative to an appropriate unit of output; jet engines usually are rated in pound (fuel) per pound (thrust) per hour, while reciprocating engines are rated in pound (fuel) per horsepower-hour.

SPECIFIC GRAVITY

The ratio of the weight of any volume of a substance to the weight of an equal volume of water at 4° C.

SPECIFIC HEAT

The heat capacity of a substance as compared with the heat capacity of an equal weight of water; the number of calories required to raise the temperature of one gram of a substance 1° C.

SPECIFIC IMPULSE

Pounds of thrust developed per pound of propellants consumed (fuel plus oxidizer) per second, or the ratio of thrust to propellent mass flow.

SPECIFIC IMPULSE, AIR

The ratio of the critical stream thrust (at M=1) to the air mass flow.

SPECIFIC IMPULSE, AIR-FUEL

The ratio of the stream thrust to the mass of air plus fuel flowing per unit time.

SPECIFIC IMPULSE, FUEL

The thrust developed by burning one pound of fuel in one second, or the ratio of the thrust to the fuel mass flow.

SPECIFIC IMPULSE, OVER-ALL

Impulse per unit total weight of system.

SPECIFIC THRUST

The ratio between the thrust of a jet reaction motor and the total propellent flow rate producing the thrust.

SPECTROPHOTOMETER

An instrument for measuring transmission or apparent reflectance of light as a function of wave length, permitting accurate color analysis or accurate comparison of luminous intensity of two sources at specific wave lengths.

SPECTRUM

The entire range of electromagnetic radiations from the longest radio waves to the shortest cosmic rays and including the spectrum of visible light.

SPIKE

In electronics, a spike is a transient of short duration during which the amplitude considerably exceeds the average amplitude of the pulse.

SPILLOVER

That portion of the air in the stream-tube which flows to the side of a ramjet intake rather than through

the intake. This takes place under conditions of detached shock. Under conditions of attached or swallowed shock, there is no spillover.

SPIRAL

A maneuver in which an aircraft descends in a helix of small pitch and large radius, the angle of attack being within the normal range of flight angles.

SPOILER

A surface which, being projected into the wind stream surrounding an airfoil, disturbs the airflow with consequent loss of lift and increase of drag.

SQUIB

A small pyrotechnic device which may be used to fire the igniter in a rocket or for some similar purpose. Not to be confused with a detonator which explodes.

STABILITY

That property of a system which causes it, when its equilibrium is disturbed, to develop forces or moments tending to restore the original condition.

STABILITY, ARROW

The partial derivatives of yawing and pitching moments with respect to angles of attack in yaw and pitch.

STABILITY, DIRECTIONAL

Stability with reference to disturbances about the normal axis of an aircraft, i. e., disturbances which tend to cause yawing.

STABILITY, DYNAMIC

That property of an aircraft which causes it, when its state of steady flight is disturbed, to damp the oscillations set up by the restoring forces and moments and gradually return to its original state.

STABILITY, INHERENT

Stability of an aircraft owing solely to the disposition and arrangement of its fixed parts; i. e., that property which causes it, when disturbed, to return to its normal attitude of flight without the use of the control or the interposition of any mechanical device.

STABILITY, LATERAL

Stability with reference to disturbances about the longitudinal axis; i. e., disturbances involving rolling or sideslipping. The term "lateral stability" is sometimes used to include directional and lateral stability, since these cannot be entirely separated in flight.

STABILITY, LONGITUDINAL

Stability with reference to disturbances in the plane of symmetry, i. e., disturbances involving pitching and variation of the longitudinal and normal velocities.

STABILITY, STATIC

That property of an aircraft which causes it, when its state of steady flight is disturbed, to develop forces and moments tending to restore its original condition.

STABILIZER

Concerning aircraft, any airfoil whose primary function is to increase the stability of an aircraft. It usually refers to the fixed horizontal tail surface

of an aircraft, as distinguished from the fixed vertical surface.

STAGE

In electronics, that portion of a circuit contoined between the control grid of one tube and the control grid of the next adjacent tube.

STAGNATION POINT

A point at which moving fluid comes entirely to rest.

STALL

The condition of an airfoil or airplane in which it is operating at an angle of attack greater than the angle of attack of maximum lift.

STANDING WAVES

Also called stationary waves. The wave-like distribution of potential along a conductor, when electric waves are reflected from the end of the conductor to form stationary nodes and loops; a condition of equilibrium, or zero motion, at certain lines, points, or surfaces, called nodes, with regions of vibration between, produced by interference between similar wave trains traveling in opposite directions.

STATIC GEARING RATIO

The ratio of the control-surface deflection in degrees to angular displacement of the missile which caused the deflection of the control surface.

STEADY STATE

The condition of a system which is essentially constant, after damping out of initial transients or fluctuations.

STING

A rod or type of mounting attached to, and extending backward from, a model, for convenience of mounting when testing in a wind tunnel.

STOICHIOMETRIC

Means that the components involved in a burning process are present in exactly the quantities needed for reaction without an excess of any component.

STRAIN GAGE

A strain-sensitive element, which permits recording, via a bridge circuit, of displacements between selected places.

STRATOSPHERE

The region of the upper atmosphere characterized by little or no temperature change with a change in altitude. The stratosphere is separated from the lower atmosphere, or troposphere, by the tropopause. An important constituent of the stratosphere is ozone, which plays an important role in the phenomenon of selective absorption and seems to have a significant correlation with surface weather conditions. The stratosphere is free from the clouds and connective currents of the troposphere. See TROPOPAUSE and TROPOSPHERE.

STREAM THRUST

The sum of the pressure force transmitted across a specified cross section and the time rate of momentum flow across the same cross section. Defined by $F=PA+\rho AV^2$, where F is the stream thrust, P is pressure, A is cross-sectional area, ρ is the density of the fluid, and V is the fluid velocity.

STREAM TUBE

In fluid flow, an imaginary tube whose wall is generated by streamlines passing through a closed curve.

STREAMLINE

The path of a particle of a fluid, supposedly continuous, commonly taken relative to a solid body past which the fluid is moving; generally descriptive of only such flows as are not eddying.

STREAMLINE FORM

The form of a body so shaped that the flow about it tends to be a streamline flow.

SUBCARRIER

See FREQUENCY, SUBCARRIER.

SUBSONIC

See SONIC, SUB-.

SUPERSONIC

See SONIC, SUPER-.

SUSTAINER

A propulsion system, which travels with, and does not separate from, the missile. Usually applied to solid propellent rocket motors when used as the principal propulsion systems as distinguished from an auxiliary motor, or booster.

SWEEPBACK

The acute angle between a line perpendicular to the plane of symmetry and the plan projection of a reference line in the wing.

SYNCHRO

The universal term applied to any of the various synchronous devices as the Selsyn, Autosyn, motor torque generator, mag-slip, and Siemans. Theoretically a synchro device is treated as a salient-pole, bipolar, alternating-current excited synchronous machine. The standard signal and control synchro has a two-pole, single-phase, rotor field and a Y-wound, single-phase, variable-voltage stator. The transmitter of the synchro, whose rotor is geared to, or otherwise linked with, mechanical equipment, is also called a generator, synchro-generator, or Selsyn-generator. The indicator, also called a motor, synchro-motor, or Selsyn-motor, has a motor that is free to rotate, and is damped to prevent excessive oscillation before coming into correspondence with the rotor of the transmitter.

T

TAB

An auxiliary airfoil attached to a control surface for the purpose of reducing the control force or trimming the aircraft.

TAIL, AIRPLANE

The rear part of an airplane, usually consisting of a group of stabilizing planes, or fins, to which are attached certain controlling surfaces, such as elevators and rudders; also called empennage.

TAIL SURFACE

A stabilizing or control surface in the tail of an aircraft.

TANK CIRCUIT

A resonant circuit consisting of an inductor and a capacitor in parallel.

TAPER IN THICKNESS RATIO

A gradual change in the thickness ratio along the wing span with the chord remaining constant.

TARE EFFECT

In wind tunnel testing, the forces and moments owing to support assembly and mutual interference between support assembly and model.

TARGET, RADAR

Any reflecting object of particular interest in the path of a radar beam.

TELEMETERING SYSTEM

The complete measuring, transmitting, and receiving apparatus for remotely indicating, recording, and/or integrating information.

TEMPERATURE

A measure of the level at which thermal energy may be added to substance or taken from it.

TEMPERATURE, ABSOLUTE

Scales based upon zero degrees as the lowest temperature attainable even theoretically. Absolute zero is approximately −273.18° C or −459.7° F.

TEMPERATURE, CENTIGRADE (C)

A temperature scale divided into 100 degrees, in which the freezing point of water is regarded as 0° and the boiling point as 100°.

TEMPERATURE COEFFICIENT OF PRESSURE AT CONSTANT K

The relative change in pressure per degree (C or F as stated) change in ambient temperature at a constant ratio (K) of propellent surface to throat area.

TEMPERATURE, FAHRENHEIT (F)

A temperature scale in which the freezing point of water is 32° and the boiling point 212°.

TEMPERATURE, IMPACT

The temperature in a gas after impact, which impact had caused the conversion of a portion of the kinetic energy into heat energy, with a resultant rise in temperature from the ambient.

TEMPERATURE, KELVIN (K)

An absolute temperature scale, assumed to be a measure of kinetic energy, in which (°K)=(°C) and the freezing and boiling points of water are separated by 100°. In this scale the freezing point of water is approximately 273.18° K.

TEMPERATURE, RANKINE (R)

A thermometer scale based on absolute zero of the Fahrenheit scale, in which the freezing and boiling points of water are separated by 180°. The freezing point of water is approximately 492° R.

TEMPERATURE, STAGNATION

The temperature of the stream which would be realized by conversion of all the kinetic energy of the stream into heat energy.

TEMPERATURE, STATIC

The temperature that would be measured by a thermometer moving with the gas at the gas velocity, and having no radiation losses.

TEST, ENGINEERING

Tests conducted by a developing agency comprising examinations, investigations, or other observations necessary to determine the technical adequacy of the matériel undergoing test. Pilot or experimental models are subjected to those tests at the various laboratories and proving grounds prior to initiation of procurement of a production model.

TEST, SERVICE

Tests of development matériel to determine suitability of the matériel for military use. Such tests are normally conducted by a using agency, following completion of engineering tests.

THEODOLITE

An optical instrument for measuring horizontal and vertical angles with precision.

THERMAL CONDUCTIVITY

Heat flow per unit of area per unit temperature gradient.

THERMISTOR

A contraction of THERMal resISTOR. A resistor whose value varies with temperature in a definite desired manner. Used in circuits to compensate for temperature variations in other parts, or to measure temperatures, or as a nonlinear circuit element.

THERMOCOUPLE

A pair of dissimilar conductors in contact, forming a thermojunction which when heated develops a potential difference between the parts; used for measuring temperature differences.

THERMOJET

Air-duct type engine in which air is scooped up from surrounding atmosphere, compressed, heated by combustion, and then expanded and discharged at high velocity.

THERMOPILE

An instrument consisting of several thermocouples so arranged as to give, when heated, a multiplied thermolectric current; often used for detecting very slight variations in temperature. See DETECTOR, INFRARED.

THICKNESS RATIO

The ratio of the maximum thickness of an airfoil section to the length of its chord.

THREE-DIMENSIONAL FLOW

A flow in which three Cartesian coordinates are necessary to specify conditions. Examples are—flow around a finite wing or around an inclined body of revolution. See TWO-DIMENSIONAL FLOW.

THROAT

In rocket and jet engines, the most restricted part of an exhaust nozzle.

THRUST

The resultant force in the direction of motion, owing to the components of the pressure forces in excess of

ambient atmospheric pressure, acting on all inner surfaces of the vehicle parallel to the direction of motion. Thrust less drag equals accelerating force.

TIME CONSTANT

In electronics, the time required for a varying quantity to reach within 1/e th of its total change (approximately 63.2 per cent of its total change); i. e., in a capacitor-resistor circuit, the time in seconds for the capacitor to reach approximately 63.2 per cent of its full charge after a steady voltage is applied; in an inductor-resistor circuit, the time in seconds required for the current to reach approximately 63.2 per cent of its final value, after a steady voltage is applied.

TRACK IN RANGE

To adjust the gate of a radar set so that it opens at the correct instant to accept the signal from a target of changing range from the radar.

TRACKING, AUTOMATIC

The process of utilizing range data and/or angular data in such a manner as to obtain error signals which are then used to drive devices that keep the tracking system locked on a target.

TRAILING EDGE

The rearmost edge of an airfoil.

TRANSCEIVER

A combination radio transmitter and receiver in a single housing with some of the electronic circuit components being used dually for transmitting and receiving.

TRANSDUCER

A device which converts the energy of one transmission system into the energy of another transmission system. A loudspeaker and a phonograph pick up are two examples of transducers, the former changes electrical energy into acoustical energy, and the latter changes mechanical into electrical energy.

TRANSFER FUNCTION

The function relating the output of a closed-cycle servo-system to its input.

TRANSISTOR

A common designation for Germanium triode, consisting of two fine wires imbedded at the proper spacing into a matrix of germanium, the whole exhibiting many properties of a three-element vacuum tube.

TRANSMISSION LINE

A system of material boundaries forming a continuous path from one place to another and capable of directing the transmission of electromagnetic energy along this path.

TRANSMISSION LINE, MATCHED

A transmission line is said to be matched at any plane if there is no reflected wave at that plane.

TRANSONIC

See SONIC, TRAN-.

TRAP

Part of a jato or other solid-propellent rocket motor which functions to prevent loss of propellant.

T-R BOX

Common abbreviation for transmit-receive switch or tube. This switch, or tube, permits the use of a single antenna on a radar for transmission and reception. The t-r box prevents the absorption of the transmitted pulse into the receiver system, thereby protecting the receiver circuit from damage, and also prevents the transmitter circuits from absorbing any appreciable fraction of the reflected echo signal. There are various types of t-r boxes, or tubes, graduating to fairly complex devices in microwave systems.

T-R BOX, ANTI

A second t-r switch used in the antenna system of a radar system to minimize absorption of the returned echo signal in the transmitter circuit during the quiescent period between transmitted pulses.

TRIM

(1) In electronics, denotes a small change or necessary adjustment of the tuning capacity.

(2) Concerning aircraft, the attitude with respect to wind axes at which balance occurs in rectilinear flight with free controls.

TROPOPAUSE

The boundary or zone of transition between the troposphere and the stratosphere. Its height is variable, it is highest, about 17–18 Km over the Equator, and lowest, about 6–8 Km, over the Poles. Its height also changes with the seasons and with the passage of cyclones and anticyclones. The temperature at the tropopause ranges from approxi-

mately −55° C. above the Poles to about −75° C. over the Equator.

TROPOSPHERE

The region of the atmosphere extending from the surface of the earth up to the tropopause; characterized by convective air movements and a pronounced vertical temperature gradient, in contrast to the convectionless and almost vertically isothermal stratosphere above the tropopause.

TUMBLING

(1) The act performed by a two-frame free gyroscope when both frames become co-planar. Under these circumstances, the gyro wheel rotates about a diameter as well as about its polar axis, resulting in loss of control.

(2) Concerning missles and projectiles in flight, turning end-over-end about the transverse missile axis.

TURBOJET

A jet motor whose air is supplied by a turbine-driven compressor; the turbine being activated by exhaust gases from the motor.

TURBULENCE

Irregular fluctuation in speed or direction of air-flow, the intensity of which may be measured by the root-mean-square speed fluctuations relative to the mean speed.

TURN AND BANK INDICATOR

An instrument combining in one case a turn indicator and a lateral inclinometer.

TWO-DIMENSIONAL FLOW

A flow in which two Cartesian coordinates are sufficient to specify conditions. The fluid undergoes a change of direction in one plane only, at right angles to the direction of the flow, such as in the case of flow over a wing of infinite span, and wind tunnel tests are facilitated by observations with uniform conditions along any line perpendicular to the windows of the tunnel.

U

ULTRASONICS

The technical field pertaining to waves in a material medium, such as audible sound but of higher frequency.

ULTRAVIOLET

Electromagnetic radiation extending from the visible spectrum at the violet end up to the region of low-frequency X rays, with wave lengths from about 136 to 4000 Angstrom units.

UMBILICAL CORD

A cable fitted with a quick disconnect plug at the missile end, through which missile equipment is controlled and tested while missile is still attached to launching equipment or parent plane.

UTILITY, SUPPORTING

See FACILITY, SUPPORTING.

V

VAPORIZATION, HEAT OF

The enthalpy difference between vapor and liquid at saturation; the amount of heat required to vaporize

a unit mass under normal pressure without changing its temperature.

VARISTOR

A special type of resistor which varies considerably with temperature; useful in making temperature measurements or in compensating circuits for other temperature effects.

VECTOR QUANTITY

A quantity which requires for description both magnitude and direction, such as displacement or velocity of a particle. See SCALAR QUANTITY.

VELOCITY, CHARACTERISTIC

The velocity attained by exhaust gases in the throat of a rocket motor. The ratio of the product of the chamber pressure and the throat area to the mass rate of gas exhaust.

VELOCITY, EFFECTIVE JET

A calculated average velocity of the exhaust gases as they leave the motor nozzle.

VELOCITY, FLAME

Flame velocity is the velocity of the flame front perpendicular to its surface, relative to the unburnt gas where it is at initial conditions; under stationary conditions of one-dimensional flow, the flame velocity is equal to the mass flow of unburnt gas through a unit area of the flame front divided by the initial density.

VELOCITY HEAD

See PRESSURE, DYNAMIC.

VELOCITY, TERMINAL

The hypothetical maximum speed that a body could attain along a specified straight flight path under given conditions of weight and thrust if diving an unlimited distance in air of specified uniform density. If the term is not qualified, a vertical path angle, normal gross weight, zero thrust, and standard sea-level air density are assumed.

VENTURI-TUBE

A short tube of varying cross section. The flow through the venturi causes a pressure drop in the smallest section, the amount of the drop being a function of the velocity of flow.

VIDEO

The term "video" is applied to the frequency band or circuits by which visual signals are transmitted.

VISCOSITY

The resistance to shear in a fluid.

W

WARHEAD

The portion of a missile intended to be lethal or incapacitating; normally the warhead casing, explosive, and/or chemical or incendiary agents, etc.

WAVE, EXPANSIVE

Such an oblique wave or zone is set up in supersonic flow, when the change in direction of the air flow is such that the air tends to leave the new surface, such as flow around the juncture of a cone and a cylinder. This condition is called flow around a

corner. The air on passing through an expansive wave or zone has lower density, static pressure, and free stream temperature and has higher velocity and Mach number.

WAVE GUIDE

A guide, consisting either of a metal tube or dielectric cylinder, capable of propagating electromagnetic waves through their interiors. The widths or diameters of such guides are determined by the frequency to be propagated. The metal guides may be evacuated, air filled, or gas filled, and are generally rectangular or circular in cross section. The dielectric guides consist of solid dielectric cylinders surrounded by air.

WAVE LENGTH

The distance traveled in one period or cycle by a periodic disturbance. It is the distance between corresponding phases of two consecutive waves of a wave train. A wave length is the quotient of velocity divided by frequency.

WEATHERCOCK STABILITY

See STABILITY, ARROW.

WETTED SURFACE

In aerodynamics, that surface of a body which comes into contact with the fluid through which the body is moving.

WIND, RELATIVE

The velocity of the air with reference to a body in it. It is usually determined from measurements made at such a distance from the body that the disturbing effect of the body upon the air is negligible.

WIND TUNNEL

An apparatus producing a controlled wind or air stream, in which objects can be placed for investigating the air flow about them and the aerodynamic forces exerted on them.

WING

A general term applied to a major airfoil.

WING, EQUIVALENT

In stress analysis, a wing of the same span as the actual wing, but with the chord at each section reduced in proportion to the ratio of the average beam load at that section to the average beam load at the section taken as the standard.

WING PROFILE

The outline of a wing section.

WING RIB

A chordwise member of the wing structure of an airplane, used to give the wing section its form and to transmit the load from the fabric to the spars.

WING SECTION

A cross section of a wing parallel to the plane of symmetry or to a specified reference plane.

WING TIP

The outer end of an airplane wing.

WING-TIP RAKE

A term referring to the shape of the wing when the tip edge is sensibly straight in plan but is not parallel to the plane of symmetry. The amount of rake is measured by the acute angle between the straight

portion of the wing tip and the plane of symmetry. The rake is positive when the trailing edge is longer than the leading edge.

WINTERIZATION

Preparation of material to permit storage and operation in frigid regions by such means as insulation against cold, addition of heating elements, changes in lubricants, and changes in dimensional clearances of parts to a point where operation at extremely low temperature is reasonably efficient.

X

X-BAND

A radio frequency band of 5,200 to 11,000 megacycles with wave lengths of 5.77 to 2.73 centimeters respectively. (Obsolescent.) See FREQUENCY, ELECTRONIC.

Y

YAW

An angular displacement about an axis parallel to the normal axis of an aircraft.

Z

ZOOM

To climb for a short time at an angle greater than the normal climbing angle, the airplane being carried upward at the expense of kinetic energy.

SYSTEM OF DESIGNATION OF GUIDED MISSILES

The following system of designating guided missiles was approved by the Aeronautical Board on 25 February 1948 and promulgated for joint Army, Navy, and Air Force use. This system was approved in principle by the Committee on Guided Missiles, RDB, at its 11th meeting on 7 April 1948.

1. TACTICAL MISSILES.

1.1 **Basic Designation.**—The basic designation will be a two-letter combination of the three letters A (Air), S (Surface), U (Underwater) in which the first letter designates the origin of the missile and the second letter designates the objective. This combination of two letters will be followed by the letter "M" indicating "missile." Examples—

AAM—Air-to-Air Missile
ASM—Air-to-Surface Missile
AUM—Air-to-Underwater Missile
SAM—Surface-to-Air Missile
SSM—Surface-to-Surface Missile
SUM—Surface-to-Underwater Missile
UAM--Underwater-to-Air Missile
USM—Underwater-to-Surface Missile

1.2 **Service Letter, Model Number, and Modification Letter.**—Each basic designation will be followed by a service letter, "A" Air Force, "G" Army, "N" Navy and a model number which, in

turn, will be followed by a modification letter, "a" to represent the first modification, "b" to represent the second modification, etc. For example, in the Air Force—

SSM-A-3b is Surface-to-Surface Missile, Air Force, Third Model, Second Modification.

After approval for joint use, the service letter will be dropped and the designation preceded by ANG.

1.3 **Prefix Letters.**—To designate the status of development of a missile, the following prefix letters will be used:

X—Experimental
Y—Service Test
Z—Obsolete

2. **Conventional Aircraft as Missiles.**

When conventional aircraft are employed as missiles, the standard or basic aircraft designation will be prefixed by the letter "M" to indicate "missile aircraft."

3. **Conventional Aircraft Modified with Control Equipment.**

When conventional aircraft are modified to serve as controlling or directing aircraft for guided missiles or missile aircraft, the standard or basic aircraft designation will be prefixed by the letter "D" to indicate "director-aircraft."

4. **Test Vehicles.**

When a guided missile is used as a test vehicle, it will be designated by "TV," followed by service letter, model, and modification letter with the following prefix letters indicating the type of testing:

C—Control
P—Propulsion

L—Launching
R—Research (includes high-altitude sounding rockets).

For example—CTV-A-1a is Control Test Vehicle, Air Force, First Model, First Modification.

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