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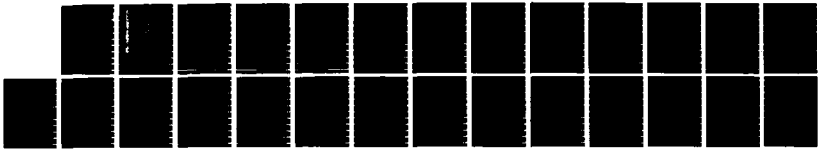

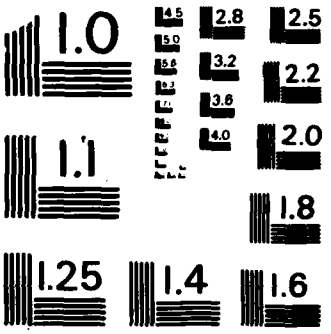

DOCUMENT 501-79
(REVISED JUNE 1979)

UNIVERSAL DOCUMENTATION SYSTEM HANDBOOK

[1979]

SUPPLEMENT 1

UNIFORM TEST DATA

AND

DATA PRODUCT NOMENCLATURE

DOCUMENTATION GROUP
RANGE COMMANDERS COUNCIL

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Glossary of definition of terms used for test data and data product nomenclature. A common reference and description of test data between users and ranges, and between ranges.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

FOREWORD

The explanations and definitions of terms used for test data and data product nomenclature contained herein have been compiled by the DG of the RCC. They are intended as a common reference for the discussion and description of test data between users and ranges, and between ranges.

The DG recognizes that it may take some time for these terms to be completely accepted and that there will continue to be minor variances between people and ranges. When known to be applicable, such variances have been pointed out in

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Block 20 (continued):

the text. It is hoped, however, that the universal acceptance of these terms and further improvements in standardization of terminilogy will significantly improve range interactions.

This is the first edition of this supplement. Recommendations for improving it are solicited. Please address your comments or questions to:

Chairman, Documentation Group
c/o Secretariat
Range Commanders Council
ATTN: STEWS-SA-R
White Sands Missile Range, NM 88002

DOCUMENT 501-79
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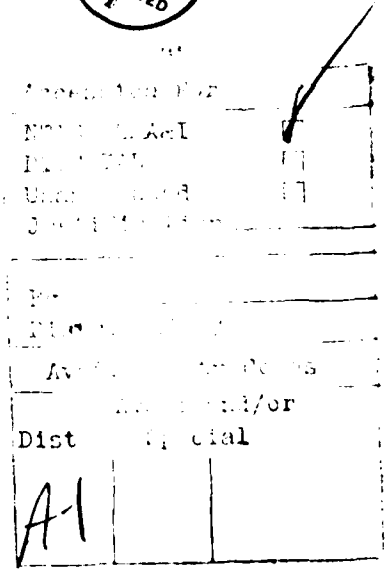
UNIVERSAL DOCUMENTATION SYSTEM

HANDBOOK

SUPPLEMENT 1

UNIFORM TEST DATA
AND
DATA PRODUCT NOMENCLATURE



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I. DEFINITIONS

-A-

ACCURACY - The residual statistical difference between a measured or computed value and the "true" value. High accuracy requires high precision. This term applies to the system(s) for acquiring and processing the information, not the media on which it is displayed (such as film or paper). See also: DATA QUALITY, PRECISION, RESOLUTION.

ANALOG TAPE - See MAGNETIC TAPE.

ASTRONOMIC COORDINATES - The two values which define a point on the surface of the earth or of the geoid on which the local direction of gravity is used as a reference. One such coordinate, the astronomic latitude, is the angle between the gravity vertical or plumb line and the plane of the celestial meridian and the plane of an initial meridian, arbitrarily chosen. The reference surface for astronomical observations and geodetic leveling is called the geoid. The geoid is the equipotential surface of the earth's gravitation and rotation which, on the average, coincides with mean sea level (MSL) in the open ocean. The direction of gravity is perpendicular to the geoid at every point. The following relationship (deflection of the vertical) is used to equate astronomic coordinates with geodetic coordinates. Deflection of the vertical values are the angles between the normals to the geoid and reference ellipsoid at a point on the geoid. The deflection angle is usually resolved into two prime components: deflection in the meridian and deflection in the prime vertical. See also: COORDINATE SYSTEM.

-C-

CARD DECK - Any series of punched cards used by a data processing system. Formats are variable. Users must specify the complete product required. See also: MEDIA.

CARTESIAN COORDINATES - Values representing the location of a point in a plane in relation to "at least" two intersecting straight lines called axes. If the axes are perpendicular to each other, the coordinates are rectangular. In order to specify a particular rectangular coordinate system, the location of the origin must be specified in some known system and the directions of two of the axes must be specified. A right-handed system is one in which an ordinary right-handed screw will advance in a positive direction along the third axis. Examples of rectangular coordinate systems are local or central (tangent plane) coordinate systems. See also: COORDINATE SYSTEM.

CHART - Any graphical display of data (e.g. oscillographs, line plots, bar graphs). Users may be required to specify:

- Nature of chart, size, axes orientation, paper speed.
- Intervals, sequence or segments.
- Axes labels and identification of axes by parameter (specify if special groupings are required).
- Frequency response (peculiar to strip charts/to determine the type of recording).
- Calibration and timing required.
- Number of traces, trace deflection and reference lines.

See also: MEDIA.

COMPUTER LISTING - See TABULATION.

COORDINATE SYSTEM - An improved World Geodetic System (WGS) has been developed to satisfy the mapping, charting and geodetic needs of the Department of Defense (DOD). The system, designated WGS 72, represents the culmination of approximately five years of data collection within DOD and the scientific community. The Defense Mapping Agency (DMA) validated WGS 72 in March 1974 for use within the DOD. The WGS 72 geodetic ellipsoid parameters and their associated accuracies are unclassified as are the geodetic coordinates and datum shift values for converting regional datums, such as the North American Datum of 1927 (NAD 27), to the WGS 72. Ranges involved in the development and testing of intercontinental ballistic missiles have converted to WGS 72. Since most of the other coordinate systems in use tend to be range-peculiar, no attempt is made here to describe each. Rather, the types of coordinate systems normally available are discussed very briefly. Any user desiring detailed information on systems at a particular range should direct questions to that range. See also: ASTRONOMICS: COORDINATES, CARTESIAN COORDINATES, GEOCENTRIC COORDINATES, GEODETIC COORDINATES, INERTIAL COORDINATE SYSTEM, LOCAL COORDINATE SYSTEM, MAP PROJECTION.

-D-

DATA - A collection of facts, numbers, letters, symbols, etc., from which a conclusion can be drawn, i.e., a representation of information. See also: DATA PARAMETER DESCRIPTION, DATA PRIORITY, DATA QUALITY, DATA REPORT, ENGINEERING UNITS DATA, FINAL DATA, IN-TEST DATA, ON-LINE DATA, QUICK-LOOK DATA, PRELIMINARY DATA, PRE-TEST DATA, RAW DATA, REAL-TIME DATA, SENSOR DATA, SUMMARY DATA, TEST DATA.

DATA PARAMETER - A list of data parameters is arranged in alphabetical order in section II of this document.

DATA PRIORITY - Each range determines data priorities in consideration of project/program agency assignments and current workload characteristics. In general, each range has a system of establishing priorities for range use and data production in terms of DOD priorities, local management agreements and the current and planned workload. Although priorities are guidelines, current circumstances actually determine priorities. The user is advised to request that each range explain its application of priorities in terms of the user's specific project/program.

DATA QUALITY - Test data quality requirements and commitments vary with the type of data, system and range involved. Quality is described in various terms. See also: ACCURACY, PRECISION, RANDOM ERRORS, RESOLUTION, SYSTEMATIC ERRORS.

DATA REPORT - Any test data records delivered to a user which include the integration of information necessary for analysis of object(s) performance or necessary to relate object(s) performance to other phenomena. See also: PRELIMINARY REPORT and FINAL REPORT.

DIGITAL TAPE - See MAGNETIC TAPE.

DOCUMENTARY PHOTOGRAPHY - Photography which provides a qualitative history of an event(s). Examples:

- Fixed: Photographic data from a camera whose optical axes remain stationary.
- Tracking: Photographic data from a camera which follows an object as it moves.
- Still: A single exposure of an event or object.

-E-

END OF TEST - Time at which a predetermined sequence of events, that is established for the purpose of obtaining test data, is terminated.

ENGINEERING PHOTOGRAPHY - Photography which provides a quantitative history of an event(s). Engineering photography may be fixed, tracking or still (see DOCUMENTARY PHOTOGRAPHY), but is normally distinguished from documentary photography by some type of timing mark, position reference, angle readout, etc. (Sometimes referred to as "metric" when position or angle information is included.) See also: MEDIA.

ENGINEERING UNITS DATA - Data which has been converted to the units needed by the user (knots, kilograms per second, etc.) rather than the units in which the data was measured at its source (counts, volts, percent of bandwidth, etc.)

-F-

FILM (PHOTOGRAPHY) - Any data presented by means of an image upon a light-sensitive surface. Although capabilites of individual ranges vary, photographic support is divided generally into DOCUMENTARY PHOTOGRAPHY and ENGINEERING PHOTOGRAPHY. See also: MEDIA, DOCUMENTARY PHOTOGRAPHY, ENGINEERING PHOTOGRAPHY.

FINAL DATA - Test data to which all known or user-requested corrections have been applied and no further processing is anticipat

FINAL REPORT - A data report which meets commitments as to quality of test data reported and commitments as to content, format and number of copies or, while not meeting quality commitments, is the best data obtainable from a given test. Final data reports may or may not include final data, depending on user requirements On-line and preliminary data may form a major part or all of a final data report if user requirements are met. The makeup and contents of final data reports vary widely and must be defined for each report.

-G-

GEOCENTRIC COORDINATES - Quantities that define the position of a point with respect to the center of the ellipsoid. Geocentric coordinates can be either Cartesian (x, y, z) or spherical (latitude, longitude and radial distance). See also: COORDINATE SYSTEM.

GEODETIC COORDINATES - Quantities of latitude, longitude and height which define the position of a point on the surface of the earth with respect to the reference ellipsoid. The geodetic latitude is the angle which the normal at a point on the reference ellipsoid makes with the plane of the geodetic equator. Geodetic longitude is the angle between the plane of the geodetic meridian and the plane of an initial meridian, arbitrarily chosen. In the United States, geodetic longitudes are numbered from the meridian of Greenwich, but are computed from the meridian of station Meades Ranch as prescribed in the North American Datum of 1927. The ellipsoidal height or geodetic height is the height above the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question. See also: COORDINATE SYSTEM.

-H-

HARD COPY - See TABULATION.

-I-

INERTIAL COORDINATE SYSTEM - One in which the axes remain fixed with respect to the celestial pole and the vernal equinox. See also: COORDINATE SYSTEM.

IN-TEST DATA - Test data acquired and processed during the conduct of a test.

-L-

LISTINGS - See TABULATION.

LOCAL COORDINATE SYSTEM - A right-handed rectangular coordinate system of which the Z-axis coincides with the plumb line through the origin. See also: COORDINATE SYSTEM.

-M-

MAGNETIC TAPE - A tape impregnated with a magnetic material on which polarized patterns representing information can be stored. Magnetic tape may be produced in digital or analog form.

Analog - A tape presentation of continuous-data information.
User specifications may include:

- Number of tracks, tape size and tape length (if necessary).
- Center frequency, start and stop times (or time interval), sequence, track assignment, recorder response bands and tape speed.
- Parameters to be recorded and engineering-unit conversion.
- Type of recording (pre-D, post-D, audio).
- Type of timing (IRIG).
- Facility calibrations and engineering-unit conversion (if required).
- Mixer track data assignments.

Digital - A digitized presentation of information with user specification of:

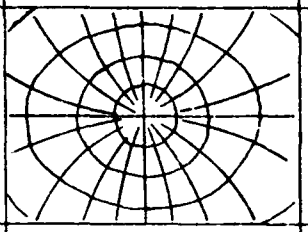
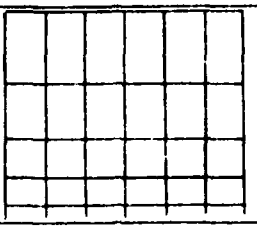
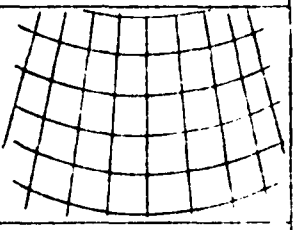
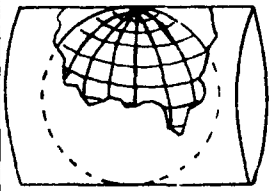
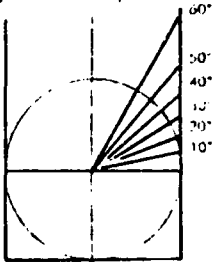
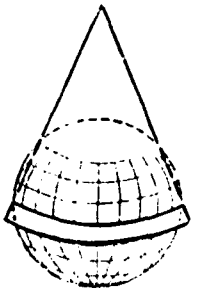
- Type of coding (BCD, binary).
- Physical size, number of tracks, word and record size and tape length (if necessary).
- Bit density (556, 800, etc., BPI) and parity.
- Parameters and sample rate.
- Time intervals, sequence, segments or T-time(s).
- Special requirements (e.g., tape compatibility, type of equipment used to write the tape).

See also: MEDIA.

MAP PROJECTION - A systematic drawing of lines on a plane surface to represent the parallels of latitude and meridians of longitude of the earth or a section of the earth. A map projection may be established by analytical computation or may be constructed geometrically. Some of the more commonly used projections are described below and illustrated in Table 1.

Lambert Conformal Map Projection - A conformal map projection of the so-called conical type on which all geographic meridians are represented by straight lines which meet in a common point outside the limits of the map and the geographic parallels are represented by a series of arcs of circles having this common point for a center.
Meridians and parallels intersect at right angles. Angles in the earth are correctly represented on the projection.

PROJECTIONS

CHARACTERISTICS	TRANSVERSE MERCATOR	MERCATOR	LAMBERT CONFORMAL
PARALLELS	Curves concave toward nearest pole	Parallel straight lines, unequally spaced	Arcs of concentric circles, nearly equally spaced
MERIDIANS	Complex curves concave toward central meridian	Parallel straight lines, equally spaced	Straight lines, converging at the pole
APPEARANCE OF GRID			
ANGLE BETWEEN PARALLELS & MERIDIANS	90°	90°	90°
STRAIGHT LINE CROSSES MERIDIANS	Variable angle	Constant angle (rhumb line)	Variable angle (approximates great circle)
GREAT CIRCLE	Curved line	Straight line	Approximated by straight line
RHUMB LINE	Curved line	Straight line	Curved line
DISTANCE SCALE		Mid-latitude	Nearly constant
GRAPHIC ILLUSTRATION		Cylinder tangent at equator 	Secant Cone 
ORIGIN OF PROJECTORS	Center of sphere (for illustration only)	Center of sphere (for illustration only)	Center of sphere (for illustration only)
DISTORTION OF SHAPES AND AREAS	Increases away from meridian of true scale	Increases away from equator	Very little
METHOD OF PRODUCTION	Mathematical	Mathematical	Mathematical
NAVIGATIONAL USES	Grid navigation in polar areas	Dead reckoning and celestial (suitable for all types)	Pilotage and radio (suitable for all types)
CONFORMALITY	Yes	Conformal	Conformal

MAP PROJECTION, Lambert Conformal Map Projection (Continued)

This projection may have one standard parallel along which the scale is held exact or there may be two such standard parallels, both maintaining exact scale. The scale is approximately the same in every direction unless the measurement is taken very far in the N-S direction or in any direction where the N-S component of a vector is large.

Mercator Map Projection - A conformal map projection of the cylindrical type. The equator is represented by a straight line true to scale. The geographic meridians are represented by parallel straight lines perpendicular to the line representing the equator and are spaced according to their distance apart at the equator. The geographic parallels are represented by a second system of straight lines perpendicular to the family of lines representing the meridians and, therefore, parallel with the equator. Conformality is achieved by mathematical analysis; the spacing of the parallels being increased with increasing distance from the equator to conform with the expanding scale along the parallels resulting from the meridians being represented by parallel lines.

Traverse Mercator Map Projection - A conformal cylindrical map projection in principle equivalent to the regular Mercator Map Projection turned (tranversed) 90° in azimuth. In this projection the central meridian is represented by a straight line corresponding to the line which represents the equator on the regular Mercator Map Projection. Neither the geographic meridians (except the central meridian) nor the geodetic parallels (except the equator) are represented by straight lines.

MEDIA - The type of information presentation available at each range; varies with the computer system employed and the type of tests conducted. However, a general grouping of media is normally available. Each is described briefly herein with examples of the type of user-provided information necessary for the range to supply a product on that medium. See also: CARD DECK, CHART, FILM, DOCUMENTARY PHOTOGRAPHY, ENGINEERING PHOTOGRAPHY, MAGNETIC TAPE, MICROFORM, PAPER TAPE, REMOTE TERMINAL, TABULATION.

MICROFORM - Information presented by means of photographic reduction (includes microfilm and microfiche). NOTE: Microforms may or may not be available at a particular range. See also: MEDIA.

-O-

ON-LINE DATA - In-test data delivered immediately after the test.

-P-

PAPER TAPE - Consists of printed and/or punched information on paper strips; normally by typed means (e.g., teletype). User must specify information content for each tape. See also: MEDIA.

PRECISION - A measure of the repeatability with which instrumentation can reproduce repeated measurements of the same quantity. Precision can be expressed in terms of the variation of instrument measurement errors; a large variation signifying lack of precision and a small variation signifying high precision. High precision does not necessarily imply accuracy. This term applies to the system(s) for acquiring and processing the information, not the media on which it is displayed (such as film or paper). See also: ACCURACY, DATA QUALITY, RESOLUTION.

PRELIMINARY DATA - Test data which normally has been partially corrected and is subject to additional correction. See also: TEST DATA.

PRELIMINARY REPORT - A data report produced for the purpose of expediting delivery of certain test data which is a part of the whole or may be below the quality level commited for the program's final data report. Preliminary data reports may include on-line or preliminary data. The makeup and contents of preliminary data reports vary widely and must be defined (if required) for each report. See also: DATA REPORT, FINAL REPORT.

PRE-TEST DATA - Any data acquired and/or processed prior to start of test. See also: START OF TEST.

PRINTOUT - See TABULATION.

-Q-

QUICK-LOOK DATA - Test data which normally requires additional effort after the test to produce. See also: TEST DATA.

-R-

RANDOM ERRORS- The inherent imprecision of a given process of measurement; the unpredictable components of repeated independent measurements on the same object under sensibly uniform conditions. Random errors are usually of an approximately normal frequency distribution; other than systematic or erratic errors and mistakes. Sometimes called short-period errors. In analysis it is convenient to treat long-period errors discretely as correctable bias and short-period errors collectively as random errors. After correcting for the more obvious bias, it is customary to treat all remaining deviations from the mean or mean trend as random, This term applies to the system(s) for acquiring and processing the information, not the media on which it is displayed (such as film or paper). See also: DATA QUALITY.

RAW DATA - The direct output of a sensor prior to the application of any corrections or qualifications.

REAL-TIME DATA - In-test data available in usable form in time for its application to effect the conduct of the test or to monitor the test in progress. See also: IN-TEST DATA.

REMOTE TERMINAL - A user's output device (e.g., Cathode Ray Tube, teletype, television). Users must normally provide electronic characteristics of their system for the range to plan a compatible output. Considerations necessary when requesting data of this nature include:

- Communication linkage(s) available (microwave, phone, teletype) and security classification.
- Interface equipment available/needed.
- Information rate, identification codes, category of data (metric, TM, etc.) and parameters required.
- Time intervals and constraints.

See also MEDIA.

RESOLUTION - (1) The degree to which small increments of the physical or electrical quantity, property or condition which is measured can be discriminated in terms of instrument output. (2) A measure of the resolving power of a measuring instrument. The measure of resolution is the smallest change in the observed phenomenon that the instrument can measure, not necessarily the smallest change that can be detected. This measure usually is the least count of the data output device. Resolutions cannot be smaller than the least count, but the least count can be smaller than the resolution. This term applies to the system(s) for acquiring and processing the information, not the media on which it is displayed (such as film or paper). See also: ACCURACY, DATA QUALITY, PRECISION.

-S-

SENSOR DATA - Any data collected by an instrumentation source. It may or may not have instrumentation corrections applied and has not been further processed.

START OF TEST - Time at which a predetermined sequence of events that is established for the purpose of obtaining test data is initiated.

STRIP CHART - See also: CHART.

SUMMARY DATA - A set of data derived from an original larger set which is used to characterize the results of a test. Examples: mean; standard deviation; frequency; maximum; minimum; etc.

SYSTEMATIC ERROR - An error that is always a function of the magnitude of the phenomenon observed. When the error is constant or consistently in the same direction, it is called a bias. These errors can be modeled and predicted. This term applies to the system(s) for acquiring and processing the information, not the media on which it is displayed (such as film or paper). See also: DATA QUALITY.

-T-

TABULATION - The output of a printer associated with a computer or accounting machine. NOTE: Computer tabulations may also be referred to as listings, printouts or hardcopies. Tabulations are highly variable with restrictions on the number of lines and columns per page dependent on the type of machine used and the security classification, if applicable. Users should contact the individual range to ascertain if standard formats are used or if the user can specify formats. See also: MEDIA.

TEST DATA - Any information acquiried and/or processed in support of a test. Test data includes that information provided by a user to a range, as required (e.g., theoretical flight trajectory). See also: DATA.

-U-

UNITS - There is no standard system of units common to all ranges. The foremost document available for user reference is RCC Document 156-73, Physical Constants and Conversion Factors. Although this document is not directly related to systems of units, it assists a user in determining those units most commonly used. The current trend is in the direction of metric standard and it is anticipated that in the near future all ranges will operate in metric units in response to the industry change. Specific systems for each range can be obtained by contacting the individual range.

II. DATA PARAMETERS

The following list of data parameters is arranged in alphabetical order. The data parameter nomenclature is followed by one or more symbols contained in parentheses and one or more of the following contained in brackets: Instrument Measurement [IM]; Trajectory Parameters [TM] and Aerodynamic and System Parameters [A&SP].

Acceleration Components (AX, AY, AZ) [TP] - Second derivative of the X, Y, Z position data in the selected Cartesian coordinate system. If the coordinate system is inertial, the accelerations are absolute. If the coordinate system is noninertial, the accelerations are relative.

Acceleration, Longitudinal and Normal (AX_W, AZ_W - Wind axes) [A&SP] - Components of all forces summed in the direction of, and perpendicular to, the velocity vector divided by an assumed constant mass. (See Figure 1)

$$AX_W = \frac{T}{M} \cos(\alpha + i_t) - \frac{D}{M} - g \sin \gamma$$

$$AZ_W = \frac{T}{M} \sin(\alpha + i_t) + \frac{L}{M} - g \cos \gamma$$

Where:

- T is net thrust
- α is the angle of attack
- i_t is the thrust incidence angle
- D is drag
- L is lift
- γ is the flight path angle
- M is mass
- g is acceleration due to gravity

Acceleration, Normal (A_n) [TP,A&SP] - Acceleration component normal to the tangential acceleration at the point of tangency and positive toward the center of curvature of the position path.

Acceleration, Tangential (A_t) [TP,A&SP] - Component of the acceleration vector in the direction of the tangent to the trajectory at a point; positive in the direction of the velocity vector.

Acceleration, Total (A_s) [TP] - The time rate of change of the total velocity vector; the resultant of the component accelerations.

Airspeed, Indicated (IAS) [A&SP] - Airspeed read from an instrument; unadjusted for air temperature, pressure or position errors.

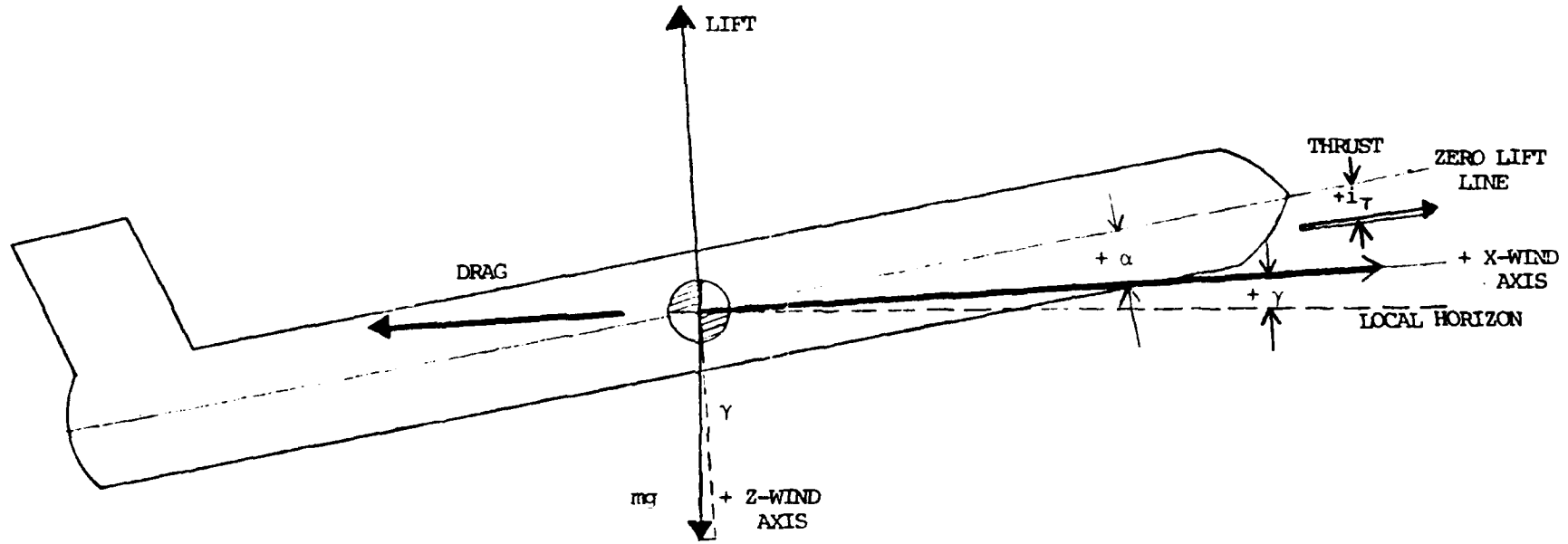


FIGURE 1

AERODYNAMIC FORCES & ANGLES

Airspeed, True (TAS) [A&SP] - Total velocity of an object with respect to the air mass in which it is traveling.

Altitude, Density (h_d) [A&SP] - The equivalent standard day atmosphere above mean sea level (MSL) at test day density. (At AFFTC: altitude in a standard atmosphere corresponding to the test day density.)

Altitude, Pressure (H_p) [A&SP] - The equivalent standard day atmosphere height above MSL at test day ambient pressure. (Not the same as aerodetic altitude.) (At AFFTC: altitude in a standard atmosphere corresponding to the test day ambient pressure.)

Angle of Attack (α) [TP,A&SP] - The angle between the longitudinal axis or zero lift line of the object and the velocity vector. Under singular circumstances, the zero lift line and the longitudinal reference axis of the object may be coincident.

Angular Rotation Rates, Trajectory ($\dot{\psi}_t$ $\dot{\gamma}$) [TP,A&SP] - Time rate of change of the trajectory angles; first derivative of the respective trajectory angles.

Angles, Trajectory (ψ_t γ) [TP,A&SP] - The trajectory angles are azimuth (ψ_t) and flight path angle (γ), and angles of the tangential velocity vector for a point on the trajectory, referenced to the coordinate system.

Aspect Angle (AA) [TP,A&SP] - The angle between the longitudinal axis of an object and the line of sight from a reference point on that object to one at another object.

Attitude Rate ($\dot{\psi}, \dot{\theta}, \dot{\phi}$) [TP,A&SP] - Time rate of change of the attitude angles (yaw, pitch and roll, respectively).

Azimuth (A_z) [IM&TP] - The angle in the reference horizontal plane measured clockwise from reference zero (usually true north) to the projection of the geometric line of sight from the instrument to the target.

Ballistic Coefficient (β_c) [TP,A&SP] - The relative efficiency of an object in overcoming air resistance.

$$\beta_c = \frac{W}{C_D A}$$

Where:

W is weight
C_D is coefficient of drag
A is reference area of reentry body

Closing Speed (V_c) [TP,A&SP] - Rate of change of miss distance (scalar). (Refer to definition for miss distance.)

Drag (D) [TP,A&SP] - Aerodynamic force component exerted on an object along the X-wind axis . Combination of drag due to shape and drag due to lift (aligned with velocity).

$$D = \bar{q} S C_D$$

Where:

$\bar{q}$ is dynamic pressure = $\frac{\rho V^2}{2}$

S is reference area

C_D is drag coefficient = C_{D_0} (shape) + C_{D_i} (lift)

Note: The term for induced drag (drag due to lift) is also written as

$$\frac{C_L^2}{\pi \cdot AR \cdot e}$$

C_L is lift coefficient

ρ is air density

AR is aspect ratio

e is Oswald efficiency factor

For unpowered flight, drag can be determined from longitudinal acceleration in X_W direction. Thrust would have to be known for powered flight.

Drag Coefficient (C_D) [TP,A&SP] - Dimensionless parameter normalizing the drag forces on a body with respect to the dynamic forces.

$$C_D = \frac{D}{\bar{q} S}$$

and may be determined from

$$C_D = \frac{T \cos(\alpha + i_t) - M g \sin\gamma - M AX_W}{\bar{q} S}$$

Where:

S is reference area

T is net thrust

α is angle of attack

i_t is thrust incidence angle

M is mass

$\bar{q}$ is dynamic pressure

g is acceleration due to gravity

γ is flight path angle

AX_W is acceleration along with X-wind axis

Elevation (El) [IM,TP] - The vertical angle measured from the reference horizontal plane to the line of sight (from the instrument to the target).

Elevation (E) [TP] - The height above MSL of some particular point of terrain.

Flight Path Angle (γ) [TP,A&SP] - The angle between the local horizontal and the velocity vector.

Heading [IM,A&SP] - Direction in which aircraft is pointed. This direction may be expressed as True Heading (TH) (referenced to true north) or Magnetic Heading (MH) (referenced to magnetic north). See also: YAW.

Height Above Terrain (Above Ground Level-AGL) [TP,A&SP] - Vertical difference between MSL altitude of an object and the geodetic elevation of the point of terrain intersected by a normal to the spheroid through the object.

Lift (L) [TP,A&SP] - Aerodynamic force component exerted on an object perpendicular to the X-wind axis (aligned with the Z-wind axis); due to angle of attack.

$$L = \bar{q}SC_L$$

Where:

$\bar{q}$ is dynamic pressure $= \frac{\rho V^2}{2}$

S is reference area

C_L is lift coefficient

ρ is air density

Lift Coefficient (C_L) [TP,A&SP] - Dimensionless parameter normalizing the lift forces on a body with respect to the dynamic forces.

$$C_L = \frac{L}{\bar{q}S}$$

and may be obtained from

$$C_L = \frac{M\ g \cos\gamma + M\ AZ_W - T \sin(\alpha + i_t)}{\bar{q}\ S}$$

Where:

T is net thrust

α is angle of attack

i_t is thrust incidence angle

M is mass

$\bar{q}$ is dynamic pressure $= \frac{\rho V^2}{2}$

γ is flight path angle

AZ_W is acceleration along the Z-wind axis

Look Angles (LA) [TP,A&SP] - Geometric elevation and azimuth at which a particular object is predicted to be found at a specified time (referenced to a specific location).

Mach Number (M) [A&SP] - The ratio of the true airspeed to the speed of sound in the surrounding medium.

Miss Distance, Scaler (MD) [TP,A&SP] - A measurement (or series of measurements) giving relative separation from one test object to another.

Miss Distance, Vector (Δx, Δy, Δz) [TP,A&SP] - The difference between the position coordinates from one test object to another.

Pitch (θ) [TP,A&SP] - The angle between the longitudinal axis or zero lift line of the object and the horizontal plane of the reference system (positive upward from the horizontal).

Position, Geographic (ϕ, λ, H) [TP] - Composite position in angular latitude (ϕ), longitude (λ), and height (H) above MSL.

Position (X, Y, Z) [TP] - Position data of a Cartesian coordinate system with the origin at a point with known coordinates. See definition of Coordinate System for more detailed information on the various systems.

Pressure, Dynamic ($\bar{q}$) [A&SP] - Pressure created by atmospheric pressure and fluid friction acting on the shell of an object in flight.

Computed from:

$$\bar{q} = 1/2 \ (Rho) \ (TAS)^2 = \frac{\rho V^2}{2}$$

Radar Cross Section (RCS) [TP] - The radar cross section of a target is a quantitative measure of the ratio of power density in the vector signal scattered in the direction of the receiver to the power density of the radar wave incident upon the target.

Radius of Curvature (R_C) [TP,A&SP] - Distance measured along the normal on the concave side of the curve to the center of curvature.

Range, Ground (Rg) [TP] - Projection of slant range onto the spheroid (earth surface).

Range (R) or Slant Range [IM,TP] - Geometric line-of-sight distance from a given position or measurement instrument to the target. It is equivalent to: $\sqrt{X^2 + Y^2 + Z^2}$

Range Rate (Ṙ or RDOT) [IM] - Time rate of change of range as measured by a system equipped to measure rate of change or as computed from the first derivative with respect to time.

Rate of Turn ( ) [TP,A&SP] - Time rate of change of the arc length divided by the instantaneous radius of curvature.

Roll ( ) [TP,A&SP] - Angle which an object has rotated about its longitudinal axis as measured from some reference point (clockwise is positive).

Signal Strength [IM] - Measure of the power level at the receiver above or below the [illegible].

Speed, Ground (Sg) [TP,A&SP] - The magnitude of the horizontal component of the velocity of an object relative to the earth's surface beneath it; time rate of change of Ground Range (Rg).

Standard Atmosphere [A&SP] - A reference atmosphere obtained by averaging or by arbitrary simplification. Dry standard atmospheres such as the NACA or ICAO are useful for optical refraction calculation, but not for radio frequencies. For radio frequencies up to 20 GHz, a gradient of 12 N-units per 1000 feet of altitude is typical of long term averages for coastal climates. Refraction under this condition is commonly called standard refraction.

Telemetry/Measurements [IM] - In most cases, the telemetry package for a test object is designed by the user; the range only participates as a collector and reducer of the data. For this reason, no attempt is made to define telemetry data terms. Users requiring information on telemetry systems should consult the information published by the RCC Telemetry Group (TG). The two publications currently in print are:

- RCC Document 106-86, Telemetry Standards
- RCC Document 118-79, Test Methods for Telemetry Systems and Subsystems (Revised [redacted] 1979)

Since the type of test objective determines the scientific parameters to be measured, a list of typical measurements for all test objects is impractical. However, for a specific object, they might include:

Booster Vehicle
- Pressure
- Temperature
- Vibration
- Acceleration
- Attitude
- Flow Rates
- Liquid Levels
- Current
- Voltage
- Guidance and Control
- Stress or Strain

Spacecraft Payload
- Corpuscular Radiation
- Electromagnetic Radiation
- Aspect
- Attitude
- Temperatures
- Power Supply
- Gas Density

Other types of measurements for a test object would include: acoustical; angular velocity; frequency; displacement; position; signal levels and rpm.
(None of the above should be construed as being directive in nature.)

Thrust (T) [TP,A&SP] - Propelling force developed by a jet or rocket engine. It is generally equivalent to (1) the difference between the product of the mass flow and exit velocity and the mass flow and inlet velocity for the jet engine or (2) the propellent mass flow rate and exhaust velocity relative to the vehicle for the rocket.

Time, Elapsed (t) [IM] - The time period between two occurrences.

Time, (Event) (T) [IM] - The instant at which something occurs.

Velocity Components (VX, VY, VZ; or $\dot{X}$, $\dot{Y}$, $\dot{Z}$) [TP] - First derivative of the X, Y, Z position data in the selected Cartesian coordinate system. If the coordinate system is inertial, the velocities are absolute. If the coordinate system is noninertial the velocities are relative. Similar relationships exist in other coordinate systems such as cylindrical, spherical, etc.

Velocity, Total (Vs) [TP] - The time rate of change of the position vector; the resultant of the component velocities.

Yaw, ( ) [TP,A&SP] - The azimuth of the longitudinal axis of the object, positioned clockwise from the reference direction.

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