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AEROSPACE LANDING GEAR SYSTEMS TERMINOLOGY

FOREWORD

Changes in the revision are format/editorial only.

1. SCOPE:

   This report has been compiled by the Landing Gear Systems Terminology panel of SAE Committee A-5 (Aerospace Landing Gear Systems). It represents an effort to gather together those terms commonly used within the discipline.

2. REFERENCES:

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   Ladd, D. M., Ground Flotation Requirements for Aircraft Landing Gears, Miscellaneous Paper No. 4-459, U.S. Army Waterways Experiment Station, Corps of Engineers, Vicksburg, Miss., July 1965.

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3. INTRODUCTION:

Some terms in this document are of course common to other disciplines. Others however are unique in form and/or meaning to the Landing Gear discipline. The need has been noted to set these terms down and provide a standard definition in order that communication within the discipline may be conducted with a common understanding. Full use has been made of available published information, and a list of references is provided.

Terms listed are usually applicable to a general functional area of Landing Gear disciplines. These general functional areas include: landing impact, directional ground control, velocity control (retardation and arrestment), structural support, ground flotation, and ground maintenance. In the listing of terms and definitions, each term is followed by a code in parenthesis which indicates which basic functional area or major component to which the term is most applicable.

Codes indicating basic functional area or major component are as follows:

Air Vehicle/Aircraft (A/V)
Landing Gear (General) (L/G)
Tire (Tire)
Wheel (Whl)
Brake (Brk)
Arresting Gear (A/G)
Operating Base & Equipment (Base)
Nose Wheel Steering (Steer)
Catapult (Cat)
Shock Absorber (S/A)
Skid Control (S/C)

ABORT (A/V): (1) To cut short or break off an action, operation, or procedure with an aircraft, space vehicle or the like, especially because of equipment failure, as to abort a takeoff, abort a mission, or abort a launch. (2) An aircraft, space vehicle, or the like that aborts. (3) An act or instance of aborting. (4) During catapulting, the act of suspending a launch and removing the airplane from the catapult.

ACCELERATE - STOP DISTANCE (Base, A/V): A measure of the field length requirement for aircraft operation. The accelerate-stop distance is the sum of (1) the distance required to accelerate the aircraft from a standing start to the critical engine failure speed and (2) assuming the critical engine to fail at this speed, the distance required to bring the aircraft to a full stop.

ACCELERATION (Whl, Brk, S/C, etc.): (1) The rate of change of velocity with respect to time (as in speed or direction). (2) The act or process of accelerating, or the state of being accelerated. Negative acceleration is called deceleration.

ACCUMULATOR (L/G, A/G, Brk, S/C, etc.): A device or apparatus that accumulates or stores up, as: a contrivance in a hydraulic system that stores fluid under pressure (energy). Also an electric storage battery (British).

3. (Continued):

ACTUATING SYSTEM (A/V, etc.): A system (mechanical, gas, or otherwise) that supplies and transmits energy for the operation of other mechanisms or systems.

ACTUATOR (L/G, A/G, Brk, etc.): A device that transmits energy and supplies force for the operation of other mechanisms or systems. It may utilize hydraulic, electrical, gaseous, or other sources of energy.

ACTUATOR-LOCKING (L/G, etc.): An actuator with integral provisions for locking the output rod or shaft in a given position or positions.

ADAPTIVE CONTROL SYSTEM (S/C): A control system which continuously monitors the dynamic response of the controlled system and automatically adjusts critical system parameters to satisfy the preassigned response criteria, thus producing the same response over a wide range of environmental conditions.

AERODYNAMIC COEFFICIENT (A/V): Any nondimensional coefficient relating to aerodynamic forces or moments, such as a coefficient of drag, a coefficient of lift, etc.

AERODYNAMIC FORCE (A/V, etc.): The force exerted by a moving gaseous fluid upon a body completely immersed in it.

AIRFIELD, EXPEDITIONARY (Base): An extension of SATS that provides a surfaced runway 4000 feet long and 96 feet wide, and parking/maintenance areas for up to four squadrons of aircraft. The field includes catapults and primary recovery systems identical to SATS, as well as three Fresnel Lens Optical Landing Systems (FLOLS), two M-21 Emergency Recovery Systems, and expanded field lighting and communications systems compatible with the expanded capability. See "SATS".

AIRFIELD, FORWARD-AREA (TO) (Base): Airfields that must support the operation of liaison, observation, and light transport type aircraft, including heavy cargo helicopters, for a period ranging from a few days to three weeks. Airfields of this class will be constructed by engineer combat and airborne battalions, and usually will be located in the Division area of a combat zone. The strength characteristics of the forward-area airfield will normally govern the landing gear flotation design for any fixed-wing aircraft or heavy cargo helicopter with a mission requirement to operate in a near-frontline unit (for example, the retail delivery mission is an Air Line of Communications). The controlling forward area airfield is characterized as a field having a 4-CBR subgrade with no structural surfacing. It should be noted that an aircraft having sufficient flotation to operate on a 4-CBR subgrade for the number of design operations will have the capability of operating a lesser number of times on subgrade strengths substantially below 4 CBR. (TO - Theater of Operations)

AIRFIELD, HEAVY-LOAD (ZI) (Base): An airfield that must support heavy bomber type aircraft. The load-carrying capacity of pavements for this type of airfield is equivalent to a main gear load of 265,000 lb on a four-wheel, dual-twin configuration having tire contact areas of 267 square inches for each wheel, twin spacing of 37 inches c-c, and inside wheels of twins spaced 62 inches c-c. (ZI - Zone of the Interior)

3. (Continued):

AIRFIELD, LIGHT-LOAD (ZI) (Base): An airfield that must support fighter and medium cargo type aircraft. The load-carrying capacity of pavements for this type of airfield is equivalent to a main gear load of 25,000 lb on a single wheel having a tire contact of 100 square inches.

AIRFIELD, MEDIUM LOAD (ZI) (Base): An airfield that must support heavy cargo, tanker, and medium bomber type aircraft. The load-carrying capacity of pavements for this type of airfield is equivalent to a main gear load of 100,000 lb on a two-wheel, twin configuration having tire contact areas of 267 square inches for each wheel and wheel spacing of 37 inches center to center.

AIRFIELD, REAR-AREA (TO) (Base): Airfields that normally must support the operation of heavy cargo aircraft, medium cargo aircraft, and fighter-bomber aircraft for a period of four to six months. Airfields of this class will be constructed, rehabilitated, extended, and maintained by engineer construction battalions and will usually be located in the Zone of Communications or in the Army rear area. The strength characteristics of the rear-area airfield will normally govern the landing gear flotation design for heavy cargo and fighter-bomber aircraft. The controlling rear-area airfield is characterized as a field having the equivalent of a T11 landing mat surface lying directly on a 4-CBR subgrade.

AIRFIELD, SUPPORT-AREA (TO) (Base): Airfields that normally must support the operation of medium cargo aircraft (and conceivably certain fighter-bomber aircraft designed for close tactical support) for a period of from two weeks to one month. Airfields of this class may be constructed by several types of engineer units including engineer construction battalions, engineer combat battalions, and engineer airborne battalions and light equipment companies, and will usually be located in the Corps forward or Division rear area. The strength characteristics of the support-area airfield will normally govern the landing gear flotation design for medium cargo aircraft with such typical missions as the bulk delivery of supplies to Corps and Division forces in an intratheater Air Line of Communications. The controlling support area airfield is characterized as a field having the equivalent of an M8 landing mat surface lying directly on a 4-CBR subgrade.

AIRFIELD, THEATER OF OPERATIONS (TO) (Base): Theater-of-Operations airfields (more specifically TO airfield types) are limited-life facilities which represent the maximum construction capability of engineer troop units in the field, considering time limitations imposed by the tactical situation and available construction equipment and surfacing materials. The TO airfield classes are defined as rear-area, support-area, and forward-area airfields, and light VTOL landing areas.

AIRFIELD, ZONE OF INTERIOR (ZI) (Base): Zone-of-Interior airfields are permanent facilities constructed in accordance with the criteria given in Air Force Manual 88-6. Pavements may be either rigid (concrete); flexible (bituminous), or a combination thereof. The ZI airfield classes, as defined for Air Force construction, not only represent a range of flotation capabilities but also directly represent the designs on which most existing military airfields are based. Thus, the relations presented have a direct application to existing airfields in addition to providing a basis for comparison of proposed new aircraft landing gear designs with those of existing aircraft. The ZI airfield classes are defined as heavy-load, medium-load, or light-load airfields.

3. (Continued):

ALIGHTING GEAR (L/G): A general term which includes all equipment or components concerned with alighting on or landing on water, land, shipboard or else, i.e., wheels, shock struts, floats, skis, etc. (see Landing Gear).

ALIGNING TORQUE (Tires) OR SELF ALIGNING TORQUE: The footprint torque which in a rolling tire resists rolling in a curvilinear path, i.e., tends to align the roll into a straight path.

ANGULAR VELOCITY (Whl, etc.): The change of angle per unit time; specifically the change in angle of the radius vector per unit time.

ANGLE OF CORD (Tires): The angle at which the cords in adjacent layers of fabric are set in the body or carcass of a tire.

AQUAPLANE (Tire, A/C): See Hydroplane.

AREA, LIGHT VTOL LANDING (THEATER OF OPERATIONS) (Base): This is a special category landing area which will normally require no construction effort other than the clearing of vegetation. It will be characterized as an area having a non-surfaced, 1-1/2 CBR subgrade and will permit one to three operations of aircraft, such as personnel transport helicopters, on ground which, while having the minimum strength required for operation of most common military types of wheeled ground vehicles, can support these vehicles without significant danger of immobilization. It should be noted that the type of aircraft using this landing area will be capable of repeated operation from areas having greater than 1-1/2 CBR strength.

ARMING (S/C): Provision of pre-setting a skid control function such as touchdown protection by some specific operating sequence of the aircraft (i.e. gear retraction/extension, squat switch activation, etc.). (Term may also be applied to systems other than skid control.)

ARRESTING CABLE (Base): A wire rope which is stretched across a deck or runway, and which is engaged by the aircraft arresting hook to decelerate the aircraft. See Arresting Gear.

ARRESTING GEAR (SHIPBOARD AND FIELD) (Base): Any gear or apparatus designed to arrest something in its motion either all or part of such gear being external to the object being arrested; specifically, any such apparatus used (i.e., in carrier landings) to arrest airplanes in the landing roll. "Arresting gear in its commonest form comprises a wire rope (arresting wire, arresting cable, cross deck pendant), or the like, stretched across the deck or runway in the path of the airplane and which engages the airplane arresting hook; and energy absorbing devices (arresting engine). In lieu of the wire rope/arresting hook system, a webbing assembly is sometimes used to engage the airframe and/or the landing gear, usually in emergency circumstances."

3. (Continued):

ARRESTING HOOK (A/C): The hook assembly, usually mounted on the aircraft for the purpose of engaging arresting gear mounted on the deck or runway for deceleration (arrestment) of the aircraft. "The hook assembly consists of the shank (usually a V, Y or single "stinger" arrangement) and a hook point, usually detachable. The arresting hook installation in the airplane usually consists of the hook assembly, the holddown (dashpot, snubber), the holddown accumulator and pressure gauge(s), the extend/retract actuator (sometimes combined with the dashpot), the centering spring or similar device, the unplatch mechanism, the cockpit controls, and any related linkages, mechanisms, and fairings. Also see Tail Hook."

ARRESTING WIRE (Base): See "Arresting Cable".

ARTICULATED (L/G): On a landing gear, an arrangement where the gear is hinged to permit folding as desired for retraction or operation, i.e., articulated axle.

ASPECT RATIO (Tires): Ratio of tire section height to section width. General category: Low aspect ratio equal to or less than 0.77.

ASSEMBLY LOAD (L/G): The total load imposed upon one gear assembly, i.e., one main gear assembly.

ATO (ABORTED TAKEOFF) (A/C): See "Abort" and "Rejected Takeoff".

ATO (ASSISTED TAKEOFF) (A/C): A procedure in which an assist is utilized for takeoff operation such as rocket assist (RATO) or jet assist (JATO). A catapult (shipboard and shorebased) is a launching device which can be reused repeatedly and rapidly to provide takeoff assistance.

AXLE (L/G): A supporting shaft upon which a wheel turns or which provides support for a rotating member.

AXLE BASE (L/G): The dimension between axle centerlines on a multiple axle landing gear.

AXLE BEAM (L/G): The structural member which connects and supports axles on a multiple axle gear arrangement.

AXLE SLEEVE (L/G): A tubular sleeve which fits over the axle and supports the wheel bearings. Function includes: (a) protection of the axle from galling or damage from bearing races, and (b) permits wheel tire assembly buildup and torquing adjustment in the shop and therefore protects against sand, dust, and foreign object damage in installation on the aircraft.

BACKLASH (L/G, etc.): In an aircraft control system, a looseness or freeplay in the linkage between crew station controls (input) and the device being controlled (output). In a landing gear system similarly, any looseness, freeplay or slop in the system, i.e., nose wheel steering backlash/freeplay.

3. (Continued):

BACKPRESSURE (Brk, etc.): Pressure exerted backward; in a field of fluid flow, a pressure exerted contrary to the pressure producing the main flow, i.e., brake back pressure, net operating pressure is equivalent to gross system pressure less back pressure and other mechanical losses.

BACKUP (L/G, etc.): An item or system kept available to replace an item or system, i.e., a backup gear extension system.

BALANCED FIELD LENGTH (Base): When the actual field length is equal to the critical field length, then it is designated a Balanced Field Length. See Critical Field Length.

BARRIER, MID-FIELD (Base): A type of arresting gear located at the mid-point of the runway to decelerate and stop an aircraft. May be utilized as the aircraft lands in either direction on the runway.

BARRIER, OVERRUN (Base): A type of arresting gear located near the end of a runway to decelerate and stop an aircraft in case of brake system or other failure. Generally an overrun area is provided off the end of the runway for runout.

BARRIER, POP-UP (Base): A type of arresting gear designed such that for normal operations, the aircraft rolls over the barrier. As an emergency requires and a command signal is given, the barrier pops up into a position for engagement as the aircraft passes.

BARRICADE (Base): Similar to barrier; for deceleration and recovery of an airplane with a known landing emergency. Generally a strap or webbing arrangement connected to an energy absorbing system. Whereas a barrier often is designed to engage an airplane landing gear, a barricade primarily is designed to engage the wings and other airframe structure, but may also engage the landing gear.

BEACHING GEAR (A/C, Base): Any wheeled device attached to a seaplane or flying boat to permit moving it onto the beach or shore and to move the aircraft about ashore. May also be gear separate from the aircraft normally but attached temporarily for the same purpose.

BEAD (Tire): Layers of steel (usually) wire imbedded in rubber and wrapped with fabric. They give a base around which the plies are anchored and provide a firm fit on the wheel. To provide increased stiffness in this area, "flippers" are then sometimes wrapped around the enclosed beads. Beads restrict air pressure expansion of the tire and jumping off the bead seat of the wheel. (See Figure 1.)

BEAD BUNDLE (Tire): The bead wires wrapped together to form the tire bead.

BEAD HEEL (Tire): The outer bead edge which fits against the wheel flange.

BEAD TOE (Tire): The inner bead edge closest to the tire centerline.

BEAD WIRE (Tire): The steel wire from which the tire beads are wound.

AIRCRAFT TIRE CONSTRUCTION

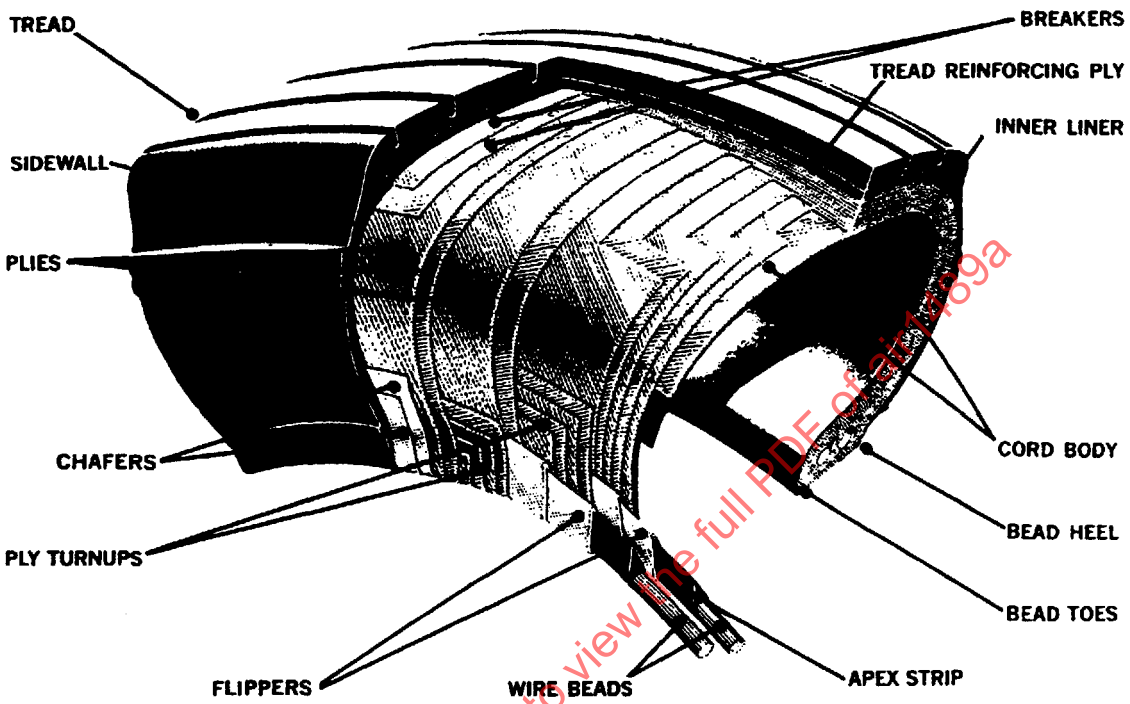

FIGURE 1

3. (Continued):

BEARING CAN (Wheel): See Axle Sleeve.

BOGIE (L/G): A low, strongly built cart. In landing gear usage, two or more wheels or sets of wheels on axles connected by means of an axle beam (or bogie beam) and pivoted at the lower end of a shock strut assembly or structure to permit pitching motion as it rides over the runway or other supporting surface.

BOGIE BEAM (L/G): See Axle Beam.

BOGIE GEAR (L/G): A type of landing gear configuration utilizing a shock strut or structural support assembly and at the lower end, a pivoted bogie assembly.

BOLTER (A/C): An attempted arrested landing wherein (1) the arresting hook fails to engage the arresting wire due to hook skip, (2) the aircraft touches down beyond the wire area, (3) the arresting hook fails to retain the wire, (4) the arresting hook or wire fails after engagement. The aircraft then becomes airborne and resumes normal flight.

BRACE (L/G): See Drag Brace, Jury Brace, Side Brace, etc.

BRAKE, ANNULAR PISTON (Brk): A type of brake utilizing for operation an annular or ring shaped piston/cylinder arrangement and powered by hydraulic or air pressure to apply force for squeezing a set of alternate rotating/stationary discs together and produce torque and a decelerating force.

BRAKE BACK PLATE (Brk): The structural end plate on a multiple disc brake opposite the actuators. Its purpose is to restrain the discs and resist the force exerted by the actuators.

BRAKE CARRIER (Brk): See Brake Housing.

BRAKE CHATTER (Brk): A self induced brake vibration of less than 100 cycles per second, excited by the friction characteristics of the rubbing surfaces.

BRAKE CONTROL SYSTEM (A/V): The total system for control of a brake or brakes. May be a mechanical system, hydraulic system, electrical/electronic system, etc., but generally includes a combination of types, i.e., mechanical pilot input to brake pedals, cable system to a metering valve and to the brakes actuators via an electronically/mechanically controlled antiskid system.

BRAKE DISC (Brk): A single disc of a brake. May be a rotating disc (rotor) in a single or multiple disc brake or stationary disc (stator) in a multiple disc brake. Functions in a heat absorbing capacity and to produce a frictional retarding force. May be a solid disc or an assembly of segments.

BRAKE, DISC (Brk): A type of brake utilizing one or more rotating discs with a clamping force applied to produce a frictional retarding force.

3. (Continued):

BRAKE DISPLACEMENT (Brk): The volumetric displacement required in a brake actuation system to actuate from full off to full on.

BRAKE DRAG (Brk): Any residual resistance to motion produced by a brake assembly when in the full off condition.

BRAKE DRAG FORCE (Brk): Any resistance to motion produced by a brake assembly. May apply to an on or off condition but generally considered as the decelerating force produced by the brake when powered to on condition.

BRAKE DRUM (Brk): Cylindrical, rotating part fastened to the wheel. Acts as a friction surface, heat sink, and transmits torque.

BRAKE, DRUM (Brk): A type of brake utilizing a brake drum and brake shoe or expander tube arrangement.

BRAKE ENERGY (KINETIC ENERGY) (Brk): The energy due to the motion of the vehicle mass which must be converted by the brake assembly to some other form of energy and either dissipated or absorbed.

BRAKE, EXPANDER TUBE (Brk): A drum type brake using a rubber like tube to expand and press the brake lining segments against the friction surface of the drum.

BRAKE HORSEPOWER (Brk): The horsepower (time rate of doing work) delivered to the brake.

BRAKE HOUSING (Brk): Also brake carrier, power plate, actuator housing. The brake part, fixed to the axle and used to contain hydraulic or pneumatic fluid passages and the actuating pistons and cylinders.

BRAKE LINING (Brk): Specially compounded materials applied to rotor and/or stator to create a predictable coefficient of friction and act as a wear surface.

BRAKE LINKAGE (A/V): Links or levers, or structural members used to connect an axle mounted, free rotating brake assembly to the fixed structure of the gear. Also a linkage system for the purpose of actuating a brake assembly.

BRAKE MASTER CYLINDER (A/V): In a fluid operated brake system, the cylinder assembly which receives an input command force and in turn transmits a fluid (Hydraulic/pneumatic) force to one or more actuating cylinders, usually located at or on the individual brake assemblies.

BRAKE PRESSURE METERING VALVE (A/V): A fluid metering valve in the brake control system. Upon receiving an input command (i.e., mechanical/electrical) the valve meters fluid pressure and flow (in proportion to the input command) to the brakes.

3. (Continued):

BRAKE, MULTIPLE DISC (Brk): A brake assembly utilizing a multiplicity of alternate rotating and stationary discs (rotors and stators).

BRAKE, MULTIPLE PISTON (Brk): A brake configuration utilizing two or more actuating cylinders and pistons, interconnected and circumferentially spaced around the brake housing.

BRAKE OVERHEAT INDICATOR (A/V): A device or system for the purpose of detecting and indicating to the pilot that an overheat condition exists in the brakes, i.e., caution and/or warning.

BRAKE PRESSURE PLATE (Brk): Also primary disc, retractor plate. A stationary disc with a prescribed cross-section used to distribute the applied piston actuating loads or forces to the brake discs.

BRAKE ROTOR (Brk): Rotating disc. A part normally keyed to the wheel and rotating with it relative to the fixed axle.

BRAKE SHOE (Brk): A structural part of the brake assembly which is actuated by the system force input and which presses the brake lining against the rotating brake drum.

BRAKE, SINGLE DISC (Brk): A brake configuration utilizing a single rotating disc.

BRAKE STATOR (Brk): Stationary disc. A part normally keyed to a stationary part of the brake assembly.

BRAKE, SPOT TYPE (Brk): A brake configuration utilizing a single cylinder and piston arrangement with a "spot" type lining carrier to rub against the rotating disc.

BRAKE SQUEAL (Brk): A self-induced brake vibration mode with a frequency greater than 100 cycles per second.

BRAKE TORQUE (Brk): The torque developed by the friction elements of the brake assembly. This torque is transmitted through the wheel and tire where it is reacted by a drag force at the tire/runway interface. Other resultant forces are reacted by the air vehicle structure (see Brake Torque Compensating Linkage).

BRAKE TORQUE COMPENSATING LINKAGE (Brk): Also Brake Torque Reaction Linkage. A mechanical linkage for the purpose of transmitting brake torque reaction loads to the fixed structure of a landing gear structure. Especially in a bogie type landing gear configuration where brake drag loads reacted at the tire/runway interface would cause excessive pitching of the bogie assembly if uncompensated with the linkage to fixed gear structure. The linkage system may also contain hydromechanical and/or automatic electronic control elements.

BRAKE TORQUE TUBE (Brk): A tubular shaped part of the brake assembly which fits around the axle and to which the stators (stationary discs) are keyed. The torque tube transmits the stator torque to the brake housing and/or other fixed brake structure and to the axle, compensating linkage, or gear structure.

3. (Continued):

BRAKED ROLL (A/V): The portion of an air vehicle landing roll during which the brakes are applied for deceleration of the vehicle.

BRAKING, ANTISKID (A/V): The process of braking an air vehicle and utilizing an antiskid system as an integral part of the brake control system.

BRAKING, AUTOMATIC (A/V): Control of air vehicle braking with an automatic system and the pilot out of the control loop. An input of the desired rate of deceleration is made prior to landing. The system generally includes an antiskid system and manual selection of a deceleration rate. Eliminates pilot technique during the braked roll.

BRIDLE, CATAPULT (Base): A wire rope or synthetic fiber assembly designed to connect an aircraft to a catapult for the purpose of accelerating the aircraft for takeoff. The bridle connects to two catapult hooks on the aircraft and passes around the catapult shuttle spreader. The bridle falls off the aircraft (sheds) as it overtakes the shuttle and is generally restrained by a bridle arrester system on the deck. See also Pendant, Catapult.

BRUISE RESISTANCE (Tires): The capability of a tire to resist bruise damage, i.e., from rocks and foreign objects.

BUFFER, CATAPULT (Base): In nose gear catapulting, a device or system for decelerating the aircraft to zero velocity at hookup condition, by the engagement of the holdback bar with the slider of the catapult deck hardware.

BUNGEE (L/G): A spring, elastic cord, or other tension (or compression) device used in a system to balance an opposing force or in a landing gear system to assist in retracting or extending the gear or to absorb shock, etc., i.e., downlock bungee, uplock bungee, overcenter bungee, etc.

BURST PRESSURE (Tire, Whl, Brk, etc.): The pressure required to rupture or burst. Generally a design includes allowance for maximum expected pressure in service times a reasonable safety factor.

CBR (CALIFORNIA BEARING RATIO) (Base): A measure of the bearing capacity of soil. The CBR of a soil is expressed in terms of a percentage of the bearing capacity of a standard crushed limestone surface (100).

CALIPER, BRAKE (Brk): A "C" shaped structural part of a brake assembly which fits around the edge and adjacent to both sides of the rotating disc. The caliper usually contains an actuator(s) on both sides to provide opposing forces against the rotating disc to produce the decelerating force.

CAMBER (Whl, Tire): The angle which the plane of a wheel or tire makes with a plane normal to the ground. Usually considered positive when the angle vector moves up and outboard relative to the centerline of the vehicle.

3. (Continued):

CARCASS (Tire): The structural body of a tire. Generally would include all tire components except the tread.

CASTER (Whl, Tire): Also castor. See also Trail. To swivel about an eccentric vertical axis. Also the dimension which defines this characteristic, i.e., distance from the point where the swivel axis intersects the ground and the centroid of the tire contact area. Generally considered positive when the tire centroid point falls aft of the swivel axis intersect point.

CASTERING GEAR (L/G): A gear configuration which has a designed-in capability to caster such as a nose gear or tail gear. See also "Cross Wind Gear."

CATAPULT (Base): A device or machine used to accelerate an airplane to takeoff speed. The capability for rapid and repeated re-use distinguishes it from rocket or JATO assisted takeoff devices. Also, a device (usually explosive) for ejecting a person from an aircraft.

CATAPULT BRIDLE (Base): See Bridle.

CATAPULT HOOK (A/C): A hook or hooks built into an aircraft for the purpose of engaging the catapult, pendant, or bridle for the purpose of catapulting the aircraft.

CATAPULT SHUTTLE (Base): The deck-mounted or field-mounted arrangement or device for the purpose of towing the aircraft for catapulting. Usually includes an inverted hook (spreader) for engagement with the catapult launching bridle or pendant.

CENTRIFUGAL FORCE (Whl, Tire, etc.): The apparent force in a rotating system, deflecting masses radially outward from the axis of rotation, with magnitude per unit mass $\omega^2 R$ where ω is the angular speed of rotation; and R is the radius of curvature of the path. This magnitude may also be written V^2/R, in terms of the linear speed V. This force (per unit mass) is equal and opposite to the centripetal acceleration.

CENTRIFUGAL GROWTH (Tires): The growth in diameter of a rotating tire due to centrifugal force.

CHAFER STRIP (Tire): The strips of rubber coated fabric which reinforce the bead area and protect the carcass plies against wheel chafing and against damage when mounting or demounting the tire.

CHUTE, DECELERATION (A/V): See Chute, Drag.

CHUTE, DRAG (A/V): A parachute attached to an air vehicle and deployed usually after touchdown for the purpose of decelerating the air vehicle by means of aerodynamic drag.

CHUTE, DROGUE (A/V): A parachute, deployed for the purpose of providing the necessary force for extracting and deploying a main drag chute or chutes.

3. (Continued):

CHUTE, PILOT (A/V): A parachute deployed to initiate a sequence of events in a drag chute system; i.e., the pilot chute is mechanically (or otherwise) ejected into the airstream. The pilot chute provides enough drag to pull the drogue chute which in turn provides adequate power to extract and deploy the main chute(s).

CLEARANCE, BRAKE RUNNING (Brk): The clearance provided in a brake assembly in the "full off" condition between the actuators and the pressure plate, i.e., the actuator travel required from "full off" to initial application of force to the friction surfaces.

CLEARANCE, LATERAL (Whl Tire, etc.): The clearance provided at the side of a wheel or tire to insure against interference during rotation and/or variations in a predetermined location, i.e., lateral runout, looseness in the system, etc.

CLEARANCE, RADIAL (Tire, Whl, etc.): The clearance provided radially to insure against interference during rotation and/or variations in a predetermined location. Tire radial clearance should include allowances for new tire growth due to pressure, service relaxation, and centrifugal growth.

CLOSED LOOP SYSTEM (S/C, etc.): A system in which the output is used to control the input. See Feedback Control Loop.

COD (CARRIER ONBOARD DELIVERY) (Base): Operation involving aircraft delivery of personnel or material on board an aircraft carrier.

COEFFICIENT OF FRICTION (Tire, etc.): A number indicating the amount of some change under certain specified conditions, often expressed as a ratio. Specifically, coefficient of friction is the ratio of the tangential force at a common boundary of two bodies (i.e., tire and runway) in contact that resists the motion or tendency to motion of one relative to the other to the normal force acting on the two bodies at that boundary.

COEFFICIENT OF FRICTION, EFFECTIVE (Tire, etc.): The net effective value for coefficient of friction within a specified operating range (i.e., of velocity, temperature, etc.).

COEFFICIENT, SIDE FRICTION (Tire): Coefficient of friction in a lateral direction for a tire. (May be affected by tread pattern.)

COEFFICIENT OF FRICTION, MAXIMUM INSTANTANEOUS (Tire): A peak value for coefficient of friction which usually could not be sustained over a period of time.

COMMAND (S/C, etc.): A signal or input whereby functions are performed as the result of a transmitted signal.

COMMAND CONTROL (S/C, etc.): A system whereby functions are performed as a result of a transmitted signal.

3. (Continued):

COMPENSATOR (L/G, Brakes, etc.): A device which compensates, makes up for, or offsets. For example a hydraulic pressure compensator (nose wheel steering system, etc.) which would maintain a positive pressure on the unit in case of loss of system pressure. Device may also be of mechanical or electrical design.

CONTACT AREA (Tire): The area of a loaded tire which is actually in contact with the supporting surface. Generally elliptical in shape.

CORD BODY (Tire): The main body of the tire which includes layer(s) of cord fabric (plies).

CORD FABRIC (Tire): The fabric from which the plies, breakers, and chafer strips are made. May be rayon, nylon, fibreglass, etc.

CORNERING FORCE (Tire): Lateral or cornering force of a tire (perpendicular to the direction of motion).

CO-ROTATING (Whl): See Wheels, Co-rotating.

COULOMB DAMPING (L/G, etc.): The dissipation of energy that occurs when a particle in a vibrating system is resisted by a force whose magnitude is a constant independent of displacement and velocity, and whose direction is opposite to the direction of the velocity of the particle. Also called dry friction damping.

COUPLED (Whl): See Wheels.

COUPLING (S/C, Whl, etc.): (1) A device or contrivance for joining adjacent ends or parts of anything. (2) A device permitting transfer of energy from one electrical circuit to another, or from one mechanical device to another.

COVERAGE (Base): Also Load Repetition Factor. The number of passes of loaded tires of an air vehicle in adjacent tire paths sufficient to just cover a given width of pavement one time. Determining factors are: width of traffic lane, number of wheels, width of tire contact area, and the traffic distribution.

CRITICAL DAMPING (L/G, etc.): The minimum damping that will allow a displaced system to return to its initial position without oscillation.

CRITICAL ENGINE FAILURE SPEED (A/V): A minimum speed at which it is considered safe to attempt to complete the takeoff with one engine inoperative.

CRITICAL FIELD LENGTH (Base): Critical Field Length is the length of field (runway) required to accelerate a multiengined aircraft to the critical engine failure speed, experience failure of the critical engine, and either (1) Continue takeoff and have just enough runway left to execute a safe takeoff, or (2) Elect to reject the takeoff and be able to stop the aircraft exactly at the end of the runway.

3. (Continued):

CRITICAL SPEED (Whl, etc.): A speed of a rotating system that corresponds to a resonance frequency of the system.

CROSS WIND GEAR (L/G): A landing gear configuration which permits alignment of the wheels to compensate for crab angle of the air vehicle (due to crosswinds) at touchdown and for rollout. A fixed angle may be set in to the gear or freedom to caster and align with the direction of aircraft travel may be utilized.

CURED ANGLE (Tire): The angle at which the cords are set in the tire after cure. In practice it may be measured from centerline of axle or from the plane of symmetry.

CURED END COUNT (Tire): Cords per inch in the tire ply fabric after cure.

CYCLE, GEAR EXTENSION (L/G): In a retractable landing gear system, the transition cycle form the up and locked (stowed) position to the down and locked (extended) position.

CYCLE, GEAR RETRACTION (L/G): In a retractable landing gear system, the transition cycle from the gear down and locked (extended) position to the up and locked (stowed) position.

CYLINDER, LANDING GEAR (L/G): A tubular structural member which houses the piston, orifice, oil, gas, and other elements of an air-oil shock absorber or the mechanical elements of a mechanical system. Carries lugs and/or provisions for various attachments on the exterior.

DAMP (L/G, etc.): To suppress oscillations or disturbances.

DAMPER (L/G, etc.): A device or system for the purpose of suppressing oscillations or disturbances. May be hydraulic or mechanical.

DAMPER, DRAG (L/G): A damper for the purpose of damping drag forces. Sometimes built into a landing gear drag strut.

DAMPER, HOP (L/G): A damper designed into a landing gear system for the purpose of suppressing pitching oscillations of the bogie assembly in a bogie type gear.

DAMPER, SHIMMY (L/G): A damper designed into a landing gear system for the purpose of suppressing shimmy or oscillation of the wheel system. Especially on gear configuration with castering provisions such as nose or tail wheel.

DAMPING BEHAVIOR (Tire): The characteristic of a tire which tends to damp out periodically applied forces.

DAMPING, FRICTION (L/G): See Coulomb Damping.

3. (Continued):

DAMPING, HYDRAULIC (L/G): A damping system in which a hydraulic fluid is utilized. External applied forces cause the oil to be moved through an orifice or restriction. Resisting force is proportional to the square of the velocity.

DAMPING RATIO: The ratio of actual damping to critical damping. It may be expressed as the ratio of output under static conditions to twice the output at the lowest frequency where a 90° phase shift is observed.

DAMPING, STRUCTURAL (A/V, L/G, etc.): Also Solid Damping. Damping due to internal friction within the material itself. It is independent of frequency and proportional to the maximum stress of the vibration cycle.

DAMPING, VISCOUS (L/G, etc.): This is damping encountered by bodies moving at moderate speed through a fluid. The resisting force is proportional to the velocity.

DASHPOT (L/G, S/A): A type of shock absorber which utilizes resistance of oil being forced through an orifice or restriction to oppose an impact load. Differs from an air-oil shock absorber in that no air charge system is utilized.

DEAD BAND (Steer, etc.): Free motion at the wheel(s) under control (output) over which the controlling system (input) has no authority. See also Backlash. May also apply to other mechanical systems. May also be defined as movement of the input control which produces no response in the output.

DEAD LENGTH, ACTUATOR (L/G, etc.): Nominal length between attach points of an actuator when in the fully retracted condition less the available stroke.

DECELERATION (Whl, etc.): The act or process of moving, or of causing to move, with decreasing speed. Sometimes called negative acceleration.

DECK RUN, CATAPULT (Base): The distance from the end of the catapult power stroke to the end of the deck.

DEFLECTION (Tire): The radial compression or deflection of a tire under load. This may be expressed by a finite value or as a ratio (percentage) of the actual deflection measurement to the total available [(undeflected outside diameter less the wheel rim flange diameter) divided by two].

DETECTOR (S/C, etc.): Sensor, also an instrument employing a sensor to detect the presence of something in the surrounding environment, i.e., wheel speed sensor, proximity sensor, etc.

DIFFERENTIATOR (S/C, etc.): In computer operations, a device whose output is proportional to the derivative of an input signal. In electronics, a transducer whose output wave form is the time derivative of its input waveform.

3. (Continued):

DIRECTIONAL STABILITY (A/V, Tire, etc.): The properties of an aircraft, rocket, tire, etc. enabling it to restore itself from a yawing or sideslipping condition. Also called weathercock stability.

DISPLAY (L/G, S/C, etc.): The cockpit or crew station presentation of information regarding condition of a component or system such as landing gear position (up and locked, down and locked, in transit), brake overheat warning, etc.

DOCKING (A/V, etc.): The act of coupling two or more orbiting objects. The operation of mechanically connecting together, or in some manner bringing together orbital payloads.

DOLLY, CATAPULT (Base): A low mobile platform that rolls on casters. A wheeled apparatus used to support an aircraft for lunching from a catapult. A low wheeled platform used to support the nose wheel of an airplane for lunching from a SATS catapult, and to which the aircraft is connected for lunching. The airplane lifts off from the dolly at the end of the power stroke, and the dolly remains on the ground and is braked to a halt.

DOOR, WHEEL FAIRING (A/V): A door in the Landing Gear installation for the purpose of fairing the wheel well to the contours of the air vehicle after the wheels are retracted inside the vehicle.

DOOR, STRUT FAIRING (A/V): A door in the landing gear installation for the purpose of fairing the gear (strut) well to the contours of the air vehicle after the strut is retracted into the air vehicle.

DOWNLOCK (L/G): The downlock is a mechanism or device for locking the landing gear in the down or extended position preparatory to landing. It locks the structure in the proper position for taking loads imposed by ground operations. Some types used are: (a) "on center" or "past center" side or drag brace held in position hydraulically and/or mechanically, (b) Secondary "Jury brace" held on or past center hydraulically and/or mechanically, (c) Lock pin engagement, (d) Hook and roller engagement, etc.

DRAG BRACE (L/G): A structural brace of a landing gear system whose primary function is to react drag loads imposed on the system. This member may be a folding member and often serves a secondary function of locking the gear system in the extended and/or retracted position.

DRAG BRAKE (A/V): A device for the purpose of providing a retarding force upon a body in motion through a fluid, parallel to the direction of motion of the body. See also Ground Spoilers, Speed Brake.

DRAG CHUTE (A/V): Any of various types of parachutes attached to high performance aircraft that can be deployed, usually during landings, to decrease speed and also, under certain flight conditions to control and stabilize the aircraft.

DRAG EFFICIENCY (S/C): The measure of efficiency of a skid control system expressed as a ratio (percentage) of the actual drag performance produced over a given period of time (or distance) relative to the maximum (100%) drag performance obtainable for the given set of conditions (i.e., coefficient tire to runway, wet, dry, temp., etc.).

3. (Continued):

DRAG STAY (L/G): See Drag Brace.

DRIVE COUPLING (S/C): See Coupling.

DROP TEST (L/G, A/V): A type of test to determine the dynamic capabilities of a landing gear shock absorber system to accept the loads and kinetic energies specified and imposed upon it. The shock absorber system may be mounted in a test rig and dropped at specified loads and velocities, or a complete air vehicle may be free dropped. The test is for the purpose of verifying the energy absorption capability and for optimization of the energy control system (hyd., pneumatic, mech., etc.).

DYNAMIC LOAD (L/G, Tire, etc.): A load imposed by dynamic action, as distinguished from a static load. Specifically, with respect to aircraft, rockets, or spacecraft, a load due to an acceleration, as imposed by gusts, by maneuvering, by landing, by firing rockets, by braking, etc.

DYNAMIC STABILITY: The characteristics of a body, such as an aircraft, that causes it, when disturbed from an original state of steady flight or motion, to damp the oscillations set up by restoring moments and gradually return to its original state; specifically, the aerodynamic characteristics.

DYNAMIC TORQUE (Brk): The torque which a brake will produce for deceleration dynamically as opposed to static torque. Dynamic torque is effected by velocity, temperature, lining coefficient, and other factors.

DYNAMOMETER, BRAKE TEST: A device for measuring (testing) forces and power or capability of brakes. Generally the system includes a large rotating steel wheel (mass) which is brought up to speed by external power and represents an inertia equivalent to which the brake is to be tested. The test brake/wheel/tire assembly is loaded against the dynamometer wheel and the power of the brake is utilized to stop the rotating mass.

DYNAMOMETER, TIRE TEST: See also Dynamometer, Brake Test. A device for measuring (testing) capabilities of tires. Differs from a Brake Test Dynamometer in that an Inertia Equivalent is generally not required. The dynamometer wheel is powered to rotate and the tire is loaded radially against it. Tire test parameters of interest are usually load, speed, time, and distance.

EFFICIENCY, RETRACTION (L/G): A measure of efficiency for retraction of a landing gear system represented by a ratio (percentage) i.e., area under the load/stroke curve for the actuator compared to the maximum attainable load/stroke curve area for the actuator.

EFFICIENCY, SHOCK ABSORBER (L/G, S/A): A measure of efficiency for a shock absorber represented by a ratio (percentage) i.e., area under the load stroke curve for the shock absorber compared to a theoretical straight line (horizontal) load/stroke curve representing maximum attainable output.

ENERGY, BRAKE (A/V): The portion of total energy of an air vehicle which in deceleration process goes to the brake. (Other portions go to aerodynamic drag, rolling resistance, etc.)

3. (Continued):

ENERGY, DRAG CHUTE (A/V): The portion of total energy of an air vehicle which in the deceleration process goes into the drag chute in the form or aerodynamic drag.

ENERGY LOSSES: Tire loss of energy due to rolling resistance of the tire which includes consideration of forces required to compress the tire as it rolls, as well as the work required to flex the tire carcass.

ENERGY, SHOCK ABSORBER (A/V): The portion of the total air vehicle energy which in the landing process goes into the shock absorber(s). Generally, it is the part due to the vertical sink speed of the vehicle at touchdown although some of this energy is damped out in the air vehicle structure, and tires.

ENERGY, TIRE (A/V): The portion of the total air vehicle energy which in the landing process goes into the tires. The tires also absorb energy during the braking process.

EQUIVALENT SINGLE WHEEL LOAD (A/V, Base): A theoretical calculated load which, if applied to a single tire, with a contact area equal to that of one tire of the assembly, would produce the same effect on the airfield as does a multiple wheel assembly.

EQUIVALENT STATIC WHEEL LOAD (Tire, Whl): A static wheel or tire load rating based on a dynamic load reduced by a specified factor. May be higher than the actual required static load rating for a specific application, in which case the tire/wheel static rating is dictated by this consideration rather than the actual static rating requirement.

EXPANDABLE TIRE (Tire): A tire which in the free, uninflated state assumes a shape which is smaller in diameter and cross section than when in the inflated state. For the purpose of conserving stowage volume in the air vehicle. Requires deflation after takeoff and prior to retraction, and reinflation after gear extension and prior to landing.

EXTENDED POSITION (L/G, S/A): The configuration of a retractable landing gear when it is down and locked and ready for landing and supporting the air vehicle. Also used in describing the state of a shock absorber when it is in the unloaded or uncompressed position.

FAIL SAFE (L/G, S/C, Steer., etc.): A design or systems used to minimize risk in case of a malfunction. For example, a steering control system designed to fail in a free caster mode rather than a wheel hard over condition.

FALSE AXLE: See Axle Sleeve.

FEEDBACK: (1) The return of a portion of the output of a device to the input; positive feedback adds to the input, negative feedback subtracts from the input. (2) Information, as to progress, results, etc., returned to an originating source.

3. (Continued):

FEEDBACK CONTROL LOOP (S/C, etc.): A closed transmission path (loop), which includes an active transducer and which consists of a forward path, a feedback path, and one or more mixing points arranged to maintain a prescribed relationship between the loop input signal and the loop output signal.

FEEDBACK CONTROL SYSTEM (S/C, etc.): A control system, comprising one or more feedback control loops, which combines functions of the controlled signals with functions of the commands to tend to maintain prescribed relationships between the commands and the controlled signals.

FLATSPOTTING (Tire): The wearing of a flat spot on a tire by means of skidding due to overbraking or faulty skidding due to overbraking or faulty skid control.

FLEXIBLE PAVEMENT (Base): See Pavement, Flexible.

FLOAT (A/V): A device or component part of an air vehicle which permits it to remain suspended upon the surface of a body of water without sinking: also to maneuver upon, takeoff, and land upon a body of water.

FLOLS (Base): Fresnel Lens Optical Landing System.

FLOTATION, GROUND (A/V, etc.): The process of supporting an air vehicle on the surface of the ground without sinking into the ground. Also used to describe capability of pavement and other surfaces on the surface of the ground to support a vehicle or object.

FOOTPRINT AREA (Tire): See Tire Footprint.

FORK (L/G): The structural member of a shock strut assembly which supports the axle and extends alongside the wheel and tire and connects to the basic shock strut.

FORK, FULL (L/G): A configuration of landing gear fork which supports the axle on both ends, extends adjacent to the wheel on both sides, and joins around the tire to attach to the basic shock strut.

FORK, HALF (L/G): A configuration of landing gear fork which supports the axle on one end only, lies adjacent to the wheel on one side only, and attaches to the shock strut assembly.

FREE FALL (L/G): Descriptive term for a retractable landing gear configuration capable of moving from the stowed (up and locked) position to the extended (down and locked) position by means of gravitational forces and air loads. Generally may include also bungee assist for operation of downlock and/or overcoming specific points of resistance in the system.

FREE ROLLING (Whl, Tire): A free rolling wheel/tire is one that is neither powered (driven) nor braked. The peripheral velocity in the contact zone then is the same as ground velocity.

3. (Continued):

FREQUENCY RESPONSE (S/C, etc.): (1) The portion of the frequency spectrum which can be sensed by a device within specified limits of amplitude error. (2) Response of a system as a function of the frequency of excitation.

FRICTION UNIT FORCE (Brk): A measure of the shearing force on the brake friction material. Equals brake torque divided by the product of brake radius times lining area.

FUSE, HYDRAULIC (A/V): A hydraulic device, designed to shut off flow of fluid if the flow exceeds a specified value. Used in brake systems to stop flow and depletion of the A/V fluid system if a line rupture or similar failure occurs.

FUSIBLE PLUG (Whl): A thermal sensitive pressure release device used to prevent tubeless tire or wheel assembly failure when an overheat condition occurs which would cause degradation of wheel and/or tire structural properties.

GEAR CONFIGURATION, BICYCLE (L/G): Configuration in which there are two gear assemblies, arranged in tandem design, one behind the other. Generally includes outrigger gears also for ground stability, i.e., B-47 aircraft.

GEAR CONFIGURATION, DUAL TWIN (L/G): Configuration in which the axle arrangement is such that two wheel/tire assemblies are located on either side of the shock strut or supporting member, i.e., C5A nose gear.

GEAR CONFIGURATION, DUAL TWIN TANDEM (L/G): Configuration in which there are two axles, one behind the other, connected by an axle beam, and each of which is a dual twin wheel/tire arrangement, i.e., B-58 main gears.

GEAR CONFIGURATION, QUADRACYCLE (L/G): Configuration in which four main landing gear assemblies are located, one in each aircraft quadrant. An arrangement of main gear two, side by side, with one set behind or in tandem with the first set. May also include outrigger gears for ground stability, i.e., B-52 aircraft.

GEAR CONFIGURATION, SINGLE WHEEL (L/G): Configuration utilizing only one wheel/tire assembly on the gear assembly.

GEAR CONFIGURATION, TANDEM (L/G) (ALSO SINGLE TANDEM): Configuration on which the two wheel/tire assemblies are mounted on separate axles one behind the other or "in tandem", i.e., Avro Arrow.

GEAR CONFIGURATION, TRICYCLE (A/V): General descriptive term for an arrangement with three gear assemblies, one in front and two main gears located aft, in a tricycle arrangement. Each gear may have its own configuration depending upon the number of wheel/tire assemblies and the individual arrangement, i.e., B-707, DC8, DC10.

GEAR CONFIGURATION, TRI-TANDEM (L/G): Configuration in which three wheel/tire assemblies are arranged one behind the other or "in tandem" on a single gear assembly.

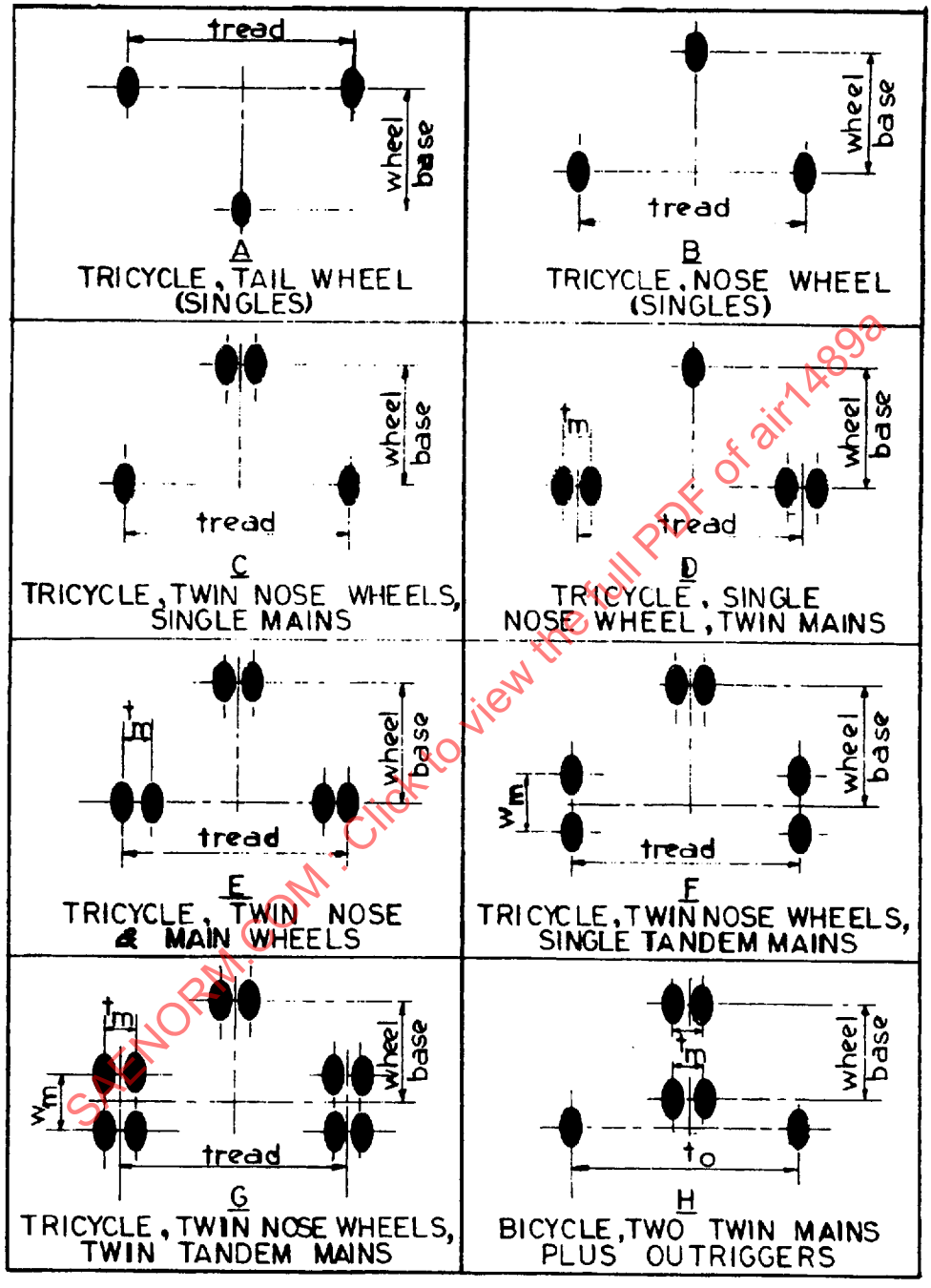

FIGURE 2 - Aircraft Gear Configurations

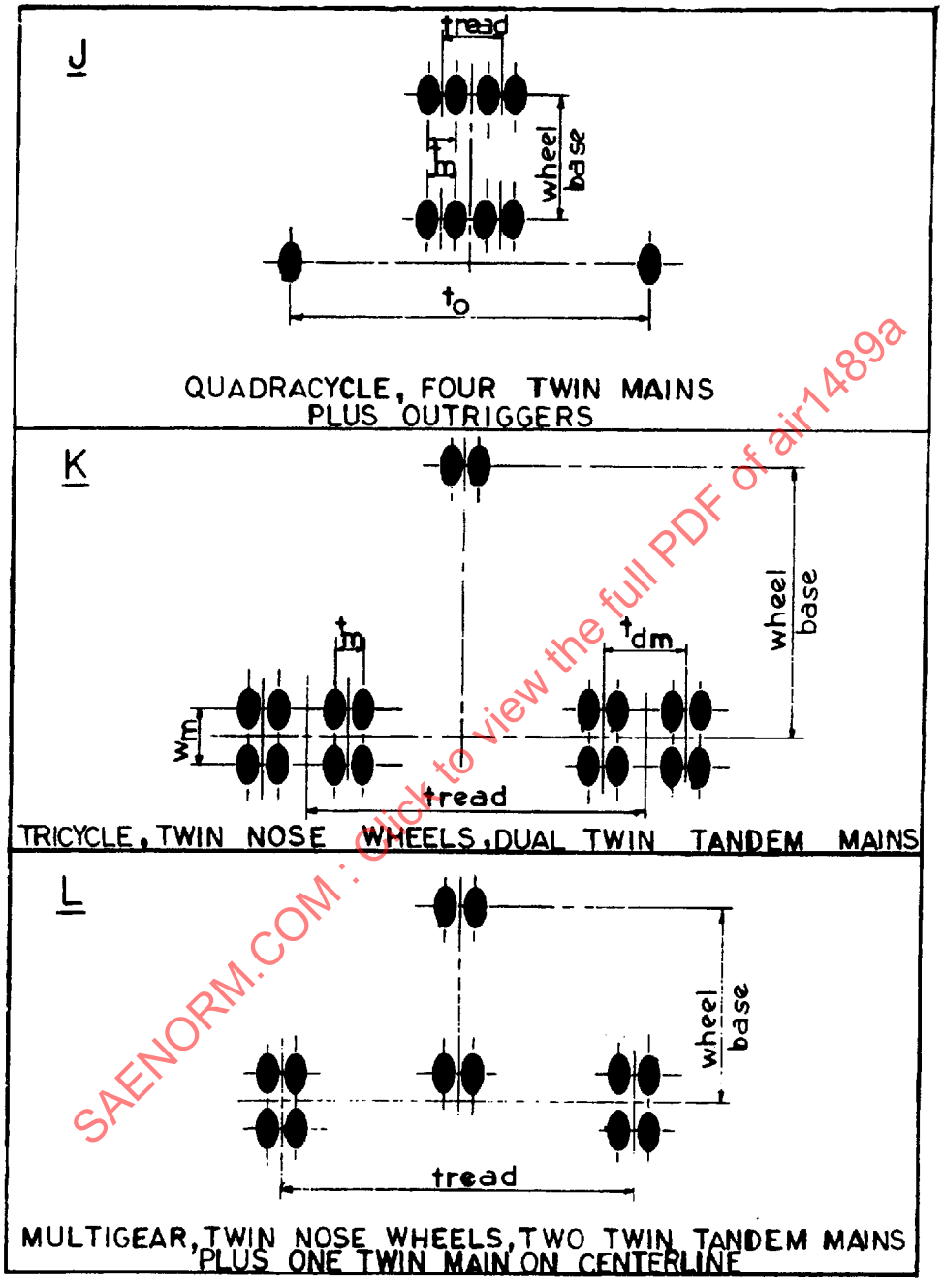

FIGURE 3 - Aircraft Gear Configurations

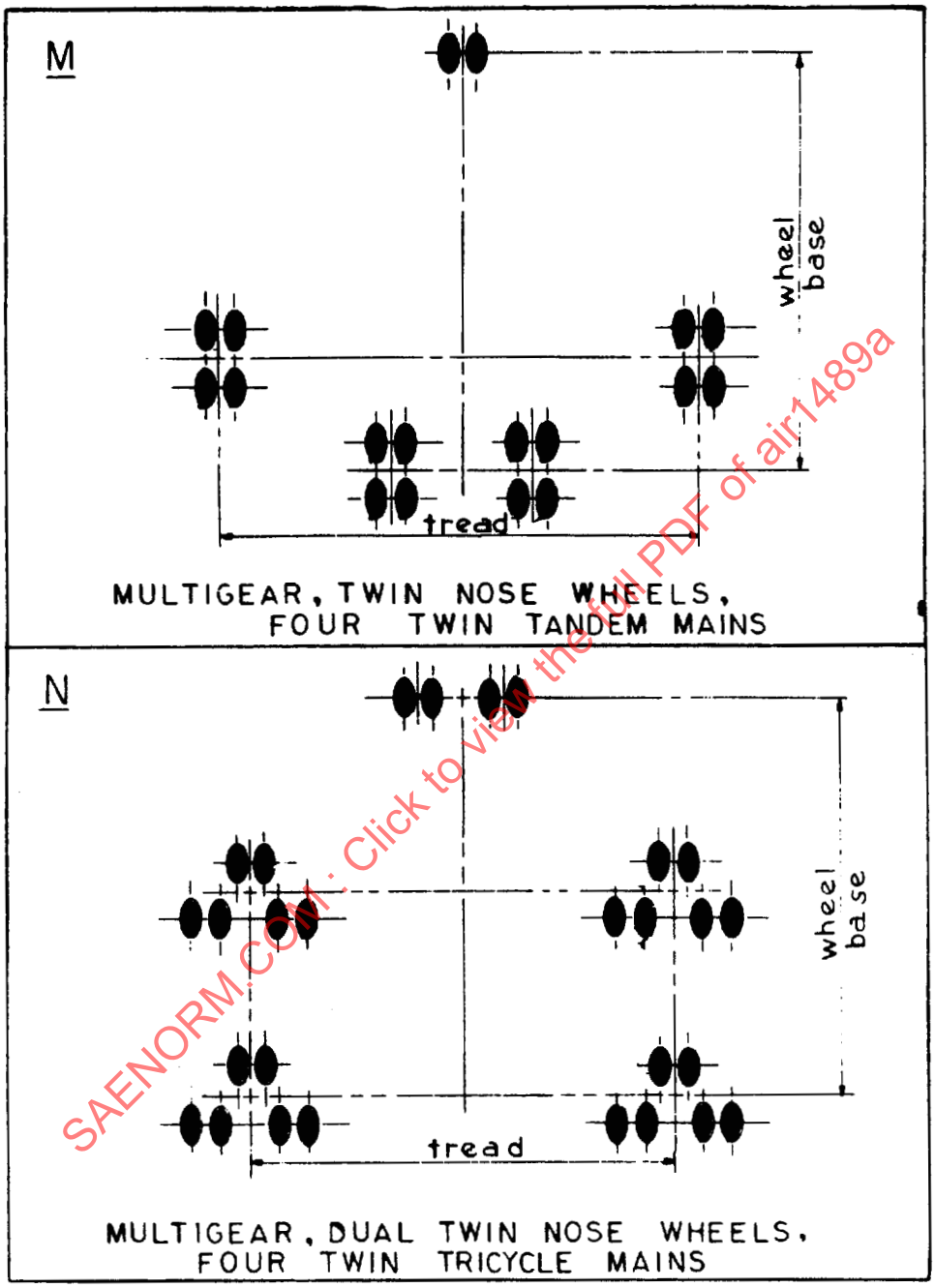

FIGURE 4 - Aircraft Gear Configurations

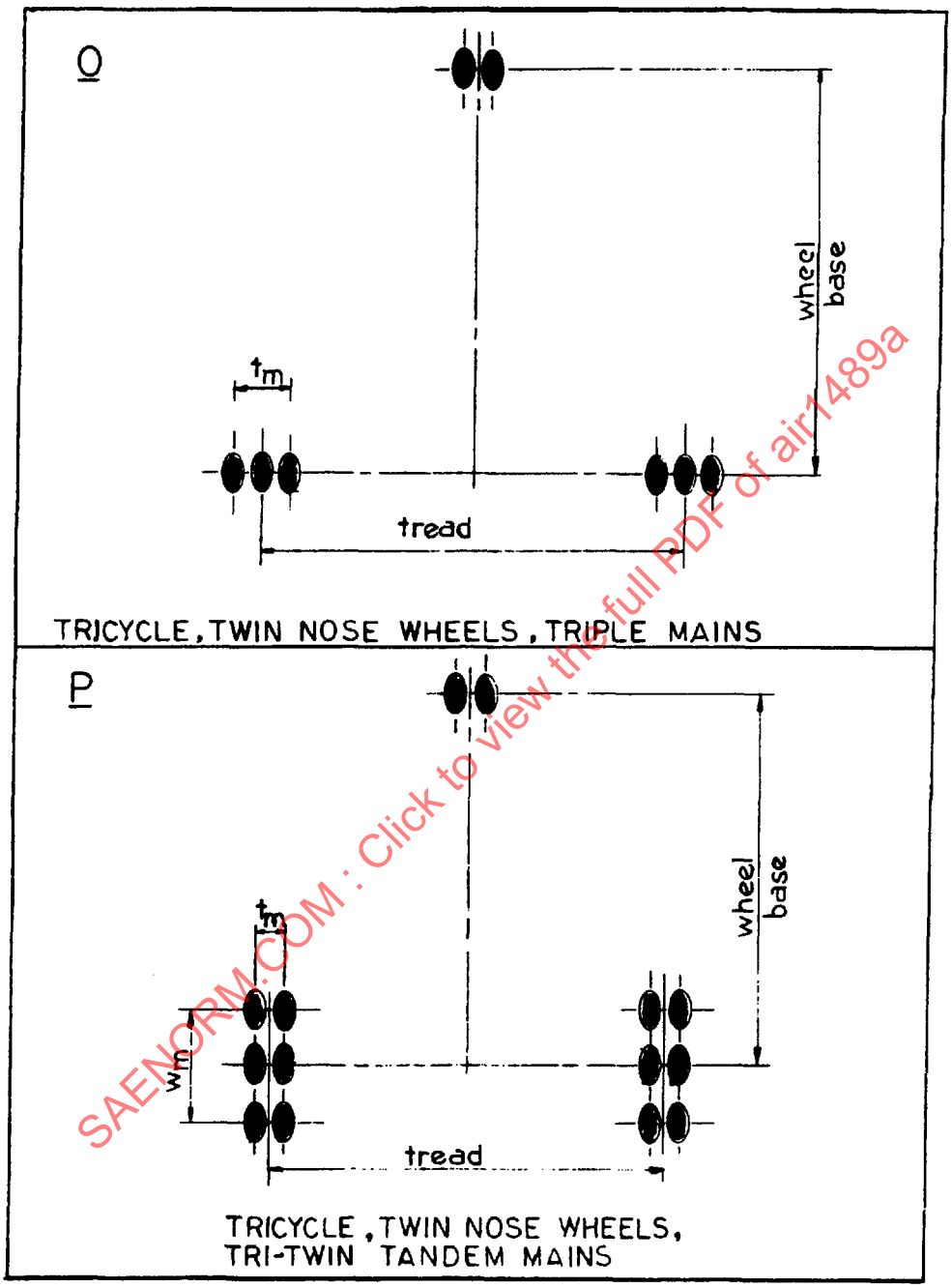

FIGURE 5 - Aircraft Gear Configurations

3. (Continued):

GEAR CONFIGURATION, TRI-TWIN TANDEM (L/G): Configuration in which there are three axles, one behind the other, connected by means of an axle beam, and each of which carries two wheel/tire assemblies, i.e., Tupolev TU-144 main gear.

GEAR CONFIGURATION, TRIPLE WHEEL (L/G): Configuration in which there is one axle on which are located three wheel/tire assemblies, i.e., RS-71 Aircraft main gear.

GEAR CONFIGURATION, TWIN TANDEM (L/G): Configuration in which there are two axles, one behind the other, connected by an axle beam, and each axle having two wheel/tire assemblies, i.e., DC8, DC10, B-707, L1011 main gears.

GEAR CONFIGURATION, TWIN TRICYCLE (L/G): Configuration of an individual landing gear assembly on which there are three axles, each mounting two wheel/tire assemblies. The axle arrangement is one in front, and two aft in a tricycle arrangement, i.e., C5A main gears.

GEAR CONFIGURATION, TWIN WHEEL (L/G): Configuration in which there is one axle on which is mounted two wheel/tire assemblies.

GEAR, LEVER SUSPENSION (L/G): A gear arrangement in which the axle is mounted at the aft end of a lever (structural member) which is pivoted at the forward end to permit freedom for the wheels to ride up and over bumps and/or obstructions. The lever motion is controlled by a shock absorber connected between the lever and the strut or other fixed structure.

GEAR, MAIN (L/G): The main gear forms the principle support of the aircraft on land or water. It may include any combination of wheels, tires, floats, skis, shock absorbing mechanisms, brakes, retracting mechanisms, and structural provisions necessary for attachment and operation. The combination may be in varied configurations.

GEAR, NEUTRAL (L/G): A gear assembly which may be utilized on either right hand or left hand positions on the aircraft.

GEAR, NOSE (L/G): The nose gear is an auxiliary landing gear unit. In addition to supporting some weight of the aircraft, it provides balance, controls the aircraft attitude and gives ground stability. In many instances, it includes provisions for steering the aircraft. It is located forward on the aircraft or at the nose.

GEAR, OUTRIGGER (L/G): The outrigger is an auxiliary gear which supports some weight of the aircraft under some conditions. It is located at the outer extremities (i.e., wing tip, etc.) of the airplane and is designed to alleviate overturning and to provide stability during ground operations, i.e., B-52 outrigger or wing tip gear.

3. (Continued):

GEAR, SCOOTER (L/G): A gear arrangement in which there are usually two axles located one behind the other and connected by an axle beam. Main support for the bogie assembly is a pin ended shock absorber attached between the axles and connected to the gear structure at the upper end. The forward end of the axle beam is pin jointed to a post which is free to slide within a structural cylinder assembly. The post assembly carries drag, side and torque loads. Vertical load is carried basically by the shock absorber. In the side view the forward located post with one axle under the post and the other aft, gives the appearance of a "scooter."

GEAR, TAIL (L/G): The tail gear is an auxiliary gear which supports a small portion of the aircraft weight, and usually consists of a shock strut, wheel/tire assembly, (or skid) and controlling devices. It is sometimes steerable. The tail gear is located in the aft or tail portion of the aircraft.

GEAR WALK (L/G): Cyclic fore and aft motion of the landing gear strut assembly about a normally static vertical strut centerline. Caused by drag loads applied at the tire/ground interface and the natural spring rate of the gear structure. Sometimes aggravated by anti-skid braking action (cycling) and resonant frequency of vibration of the strut.

GREAVES (L/G): (1) Armor to protect the legs. (2) In landing gear usage, armor to protect the struts or equipment mounted thereon from arresting cables, barrier straps, etc.

GROUND FLOTATION (L/G, Base): Characteristic definition used in describing the capability of an aircraft to operate satisfactorily on or from a specific airfield with respect to bearing and support parameters of that airfield.

GROUND LOADS (L/G): Any load imposed on the landing gear assembly by contact with the ground during any ground operation, i.e., drag, side, vertical, torsion, spin up, springback, towing, turning, etc.

GROUND SAFETY LOCK (L/G): A device designed to prevent inadvertent retraction of the gear when the aircraft is on the ground and supported by the gear. Generally installed manually after landing and removed prior to flight. Also used on landing gear doors and arresting hooks to provide safety for ground maintenance personnel.

GROUND SPOILERS (A/V): A device or system designed to "spoil" or reduce the aerodynamic lift on the aircraft quickly after touchdown, thus applying weight to the gears and enabling braking action for deceleration of the aircraft. See also Speed Brake.

HEAT PACK (Brk): See Heat Sink.

HEAT SINK (Brk): The portion of the brake which provides the primary storage medium for the heat generated in deceleration of the aircraft. (Aircraft kinetic energy converted to heat energy.) Generally includes the rotors, stators, and sometimes portions of the back plate pressure plate, etc.

3. (Continued):

HEAT SINK LOADING (Brk): A measure of the energy absorbed per unit weight by the brake heat sink during a single stop. Equals the total kinetic energy divided by the heat sink weight (foot pounds per pound or joules per kilogram).

HOLDBACK (A/C): A device or assembly designed for restraining the aircraft during engine run up.

HOLDBACK BAR (A/C): A rigid holdback and release assembly used to restrain the aircraft prior to launch specifically from a nose gear launch catapult system.

HOLDBACK, ENGINE RUN UP (Base): A device or assembly designed to restrain the aircraft during engine trim procedures and full power checkouts.

HOLDBACK FITTING, AIRCRAFT (A/C): The attachment point or device on the aircraft to which the holdback is coupled for engine runup or for catapulting.

HOLDBACK AND RELEASE ASSEMBLY (Base): A device or assembly designed to restrain the aircraft against engine thrust, ship motion and tensioning forces prior to catapulting. Once the catapult is fired, the holdback and release assembly is designed to release at a specific load, usually by means of a frangible link (tension bar), thus permitting the aircraft to be accelerated by the catapult.

HOLDBACK, REPEATABLE (Base): A device or assembly designed for catapult holdback, and release which may be used repeatedly without dependence on or replacing a frangible link.

HOLD DOWN (A/G): A device or assembly; part of the arresting hook installation of an aircraft, designed to hold down the hook after deployment and contact with the deck (runway) to prevent hook bounce and insure engagement with the arresting gear cable. (See also "Dashpot" and Snubber.)

HOOK, DOWNLOCK (L/G): A hook designed to engage a roller or restraining device and lock the gear assembly in the down position, ready for touchdown and ready to resist applied ground loads.

HOOK POINT (L/G, A/G, etc.): The point of a hook as designed for proper engagement of operation in a mechanism. In an arresting hook installation, that portion of the arresting hook assembly which engages the arresting gear cable. Usually detachable from the arresting hook shank for wear replacement purposes.

HOOK, UPLOCK (L/G): A hook designed to engage a roller or restraining device and lock the gear and/or door assembly in the up or stowed position in a safe condition for all modes of flight maneuvering of the aircraft.

HOOKUP (Cat): The process or operation of preparation of the aircraft for launch from a catapult. Includes engagement of the holdback and attachment of the catapult bridle or launch bar. The condition in which the aircraft is spotted on the catapult ready for tensioning.

3. (Continued):

HYDROBURST (Tire): The procedure used for burst testing of tires in which water is used as the pressurizing medium rather than air. Avoids the explosive decompression effect of air.

HYDROPLANE (A/V, Tire, etc.): Tire Hydroplaning is the name given to a pneumatic tire operating condition in which the water on a wet runway or surface is not displaced from the nominal tire-ground contact area by a rolling tire or by a moving but non-rotating (full skidding) tire at a rate fast enough to allow the tire to make contact with the ground surface over its complete nominal footprint area, as would be the case of operation on a dry ground surface. When hydroplaning occurs, the tire rides on a wedge or film of water over a part or all of its footprint area, depending upon conditions.

HYDROPLANING, DYNAMIC (A/V, Tire): See Hydroplane. The process of hydroplaning associated with movement of a body over water. To skim over water at high speed.

HYDROPLANING SPEED (A/V, Tire): Tire hydroplaning develops progressively from low speed through an intermediate range where the tire progressively loses contact with the runway and, finally, at sufficient forward speed, total hydroplaning develops.

HYDROPLANING, TOTAL (A/V, Tire): A hydroplaning situation in which the total tire footprint (contact area) is supported by a film of water.

HYDROPLANING, VISCOUS (Tires): Another term for total hydroplaning, i.e., the tire contact footprint is supported by a film of viscous fluid (water).

HYDRO SKI (L/G): A type of landing gear designed to enable an aircraft to takeoff and land on water (i.e., water ski).

INCIPIENT SKID (A/V, S/C): The point of wheel instability where brake torque exceeds resisting tire-runway friction torque and the wheel, therefore, begins a deceleration condition, which if continued, would result in abrupt wheel lock-up.

INDICATOR, GEAR POSITION (A/V): An instrument or indicator for the purpose of providing information to the pilot or crew regarding position of the landing gear. May be located at the pilot or crew station or remotely (i.e., pop up indicator projecting above upper surface of wing above the gear). Green lights are used for safe configurations and red lights for unsafe or in transition conditions and "up" and "down" to indicate up and locked or down and locked.

INDIVIDUAL WHEEL CONTROL (A/S): One type of control used in antiskid system where each wheel utilizes its own valve and control circuit.

INERTIA: Resistance to acceleration or deceleration.

INERTIA EQUIVALENT (Brk): In brake testing; the equivalent amount of the total air vehicle energy which goes to a single brake assembly. This equivalent energy is translated into dynamometer energy which is absorbed by the brake in the test process.

3. (Continued):

INERTIA, MOMENT OF (Tire, Wheel, etc.): (Symbol "I") of a body about an axis, ΣMR^2, where M is the mass of a particle of the body and R is its distance from the axis.

INFLATION PRESSURE (Tire, etc.): The pressure (gage) to which the tire is to be inflated for a specific load and deflection, usually the rated pressure for a given service application.

INLET FILTER (S/C): A fluid contamination filter located upstream of the skid control valve (or other hydraulic unit).

INNER TUBE (Tire): A rubber tube located within a pneumatic tire for the purpose of sealing in the air.

INTEGRATOR (S/C, etc.): (1) A device whose output is proportional to the integral of an input signal. (2) In digital computers, a device for accomplishing a numeric approximation of the mathematical process of integration.

JACK (Hydraulic Actuator): See Actuator.

JACK (A/C): A device usually hydraulic (but may be pneumatic or mechanical), for the purpose of lifting or raising heavy weights such as aircraft. Various types and configurations are used such as axle jacks, fuselage jacks, etc.

JACK PAD (L/G): A pad or surface built on a landing gear for the purpose of accepting jacking loads or a separate attachable jack fitting.

JACK POINT (L/G): A raised point usually spherical on a landing gear for the purpose of accepting the lifting forces imposed by a jack.

JUDDER (L/G): A mode of vibration - the oscillation of the landing gear leg due to externally applied forces, and the inertia forces due to the combined inertia of the wheel, brake, axle, and the leg.

JURY STRUT (OR BRACE) (L/G): A secondary toggle kinematic arrangement to provide a lock for the gear assembly in a specific configuration. A secondary brace which locks the primary brace in position, both of which are "on center" or near "on center" condition. Also, a piece of ground support equipment used to provide extra bracing for movable or folded assemblies against abnormally high loads; i.e., to brace folded wings on carrier-based aircraft against heavy weather conditions.

"K" MODULUS (MODULUS OF SOIL REACTION) (Base): (1) The load in psi on a loaded area of the subgrade divided by the deflection in inches of the subgrade under that load. (2) The total load in pounds divided by the total volume displaced in cubic inches.

3. (Continued):

KNEELING GEAR (L/G): A landing gear assembly or installation designed to "kneel" the aircraft for ground handling purposes, such as parking, loading, maintenance, catapulting, etc. The gear may retract to an intermediate position or fold in a manner different from normal retraction. A mechanism for raising or lowering the aircraft while parked on the ground.

LAG (S/C, etc.): (1) The delay between change of conditions and the indication of the change on an instrument. (2) Delay in human reaction. (3) The amount one cyclic motion is behind another, expressed in degrees. The opposite is lead.

LANDING GEAR (L/G): The apparatus comprising those components of an aircraft or spacecraft that support and provide mobility for the craft on land, water, or other surfaces. The landing gear consists of wheels, floats, skids, bogies, and treads, or other devices, together with all associated struts, bracing, shock absorbers, etc. Landing gear includes all supporting components, such as the tail wheel or tail skid, outrigger wheels or pontoons, etc., but the term is often conceived to apply only to the principal components, i.e., to the main wheels, floats, etc., and the nose gear if any. For military aircraft, catapulting provisions and the arresting hook installation are often considered an ancillary component of the landing gear.

LANDING MAT (Base): A ground cover laid down for the purpose of supporting aircraft operations, i.e., parking, taxi, takeoff, landing. Several types are used such as pierced metal strips or aluminum planks.

LATERAL SPRING CONSTANT (Tire) (ALSO LATERAL SPRING RATE): The number of unit load required to produce a unit deflection in a lateral direction (normal to plane of the wheel).

LAUNCH BAR (Cat): In a nose gear launch system, the link which provides means of steering the nose gear during tracking and couples the aircraft to the catapult during the power run; part of the nose gear assembly.

LAUNCHER (Base): (1) Specifically, a structure or device often incorporating a tube, a group of tubes, or a set of tracks, from which self-propelled missiles or aircraft are sent forth and by means of which the missiles or aircraft are aimed or imparted inertial guidance - distinguished in this specific sense from a catapult. (2) Broadly, a structure, machine, or device including the catapult, by means of which airplanes, rockets, or other vehicles are directed, hurled or sent forth.

LAUNCHING RUN (Cat): During catapulting, the extent of aircraft travel from "Release" to the end of "Deck Run". It is the sum of the power run or power stroke and the deck run.

LEAD (S/C): The amount one cyclic motion is ahead of another, expressed in degrees. The opposite is lag.

LEG (L/G): A single landing gear structure or assembly.

3. (Continued):

LEVERED SUSPENSION (L/G): A type of landing gear arrangement in which an axle is supported on a trailing arm from a structural post or support. The trailing arm rotates about the pivot as a lever to provide the vertical wheel motion for shock absorption.

LIFT DAMPERS (A/C): See Ground Spoilers.

LIFT RATIO (Tires): The ratio of the tire outside diameter to the rim diameter of the wheel (bead seat diameters).

LIMIT CYCLING (S/C, etc.): A repetitive on-off cycling of brake pressure by the locked wheel circuit.

LINING, BRAKE (Brk): A specially compounded material applied to rotor and/or stator to create a predictable coefficient of friction and act as a wear surface in the brake assembly.

LINING LOADING (Brk): A measurement of the total amount of energy absorbed through the interface of each square unit of lining and its mating surface over a short period of time or a single stop.

$$\text{Lining Loading (LL)} = \frac{\text{Kinetic Energy}}{\text{Lining area (A)}} \text{(KE)} = \frac{\text{ft} - \text{lb}}{\text{in}^2}$$

$$2.102 \times \frac{\text{ft} - \text{lb}}{\text{in}^2} = \frac{\text{Kilojoules}}{\text{square meter}} = \frac{\text{kJ}}{\text{m}^2} \qquad \text{(Eq.1)}$$

LINING POWER (Brk): A measure of the average amount of energy absorbed by a square unit of lining area and its mating surface during each second.

$$\text{Lining Power (LP)} = \frac{\text{Lining Loading}}{\text{Stop time}} = \frac{\text{ft} - \text{lb}}{\text{in}^2 - \text{second}} \times 2.102 = \frac{\text{Kw}}{\text{m}^2} = \frac{\text{Kilowatts}}{\text{square meter}} \qquad \text{(Eq.2)}$$

LIQUID SPRING (S/A): A type of shock absorber which is completely filled with fluid and which utilizes the compressibility of the fluid for the shock absorption function. It provides a relatively high spring rate compared to an air-oil type shock absorber.

LOAD, ASSEMBLY (L/G): The total load imposed on a landing gear assembly or leg. May be further broken down to individual wheel loads.

LOAD CLASSIFICATION NUMBER (LCN) (Base): A rating number which indicates the capability of an aircraft with specific tire/wheel equipment to operate from a given type of airbase. Intercontinental express = 100, light service = less than 14

LOAD DEFLECTION CURVE (Tire, etc.): For a tire, a plot of applied load (usually the abscissa) versus the deflection (usually the ordinate) also, usually provided for a given (or multiple) inflation pressure.

3. (Continued):

LOAD, DYNAMIC (L/G): A load imposed by dynamic action as distinguished from a static load. Specifically with respect to aircraft, rockets, or spacecraft, a load due to an acceleration of the craft, as imposed by gusts, by maneuvering, by landing, taxiing, take off turning, etc.

LOAD FACTOR (L/G): (1) A number which yields the inertial load (g load) when multiplied by the weight of the object. (2) The ratio of two loads (basic load is the denominator). The load factor for a landing gear assembly is obtained by dividing the sum of the external forces acting upon it by the static load. For example, the vertical load factor "N" is:

$$N = \frac{\text{Maximum Dynamic Load}}{\text{Static Load}} \qquad \text{(Eq.3)}$$

The force of gravity does not appear in the sum of external forces because on each particle of mass, the gravity force is canceled by the inertial force of free-fall acceleration.

LOAD, HOLDBACK: The load applied to the aircraft holdback fitting. The load results from the buffing force during deceleration of the aircraft from taxi-in velocity, or from the simultaneous application of catapult tensioning force, aircraft full takeoff power, and ship motion before firing the catapult.

LOAD RANGE (Tire, etc.): The range of load over which a tire is capable of operating. For a tire, variation of loads would usually be accompanied by a proportional increase or decrease of inflation pressure within design limitations.

LOAD, RATED (Tire, wheel, etc.): The specific load at which a tire (or wheel, etc.) is rated or qualified. For a tire, the rated load would be at a specific inflation pressure and tire deflection.

LOAD, RELEASE (A/C, Cat): The maximum load applied to the aircraft holdback fitting by application of the catapult firing force in addition to the existing holdback load. The release load of predetermined magnitude ruptures a release element or disengages a repeatable release fitting, thereby allowing the aircraft to be released.

LOAD REPETITION FACTOR (A/C Base): Sufficient passes of load carrying tires in adjacent tire paths to just cover a given width of pavement one time. The term is identical with "coverage" as used in pavement design.

LOAD, EQUIVALENT SINGLE WHEEL (A/C, Base): The calculated load which, if applied to a single tire, would produce the same effect on the airfield as does the multiple wheel installation under consideration.

LOAD, SPEED, TIME CURVES (Tire): Curves plotted against time as the abscissa which show the relationships of load and speed vs. time.

3. (Continued):

LOCKED WHEEL PROTECTION (S/C): The temporary removal of brake pressure by a secondary control circuit when the controlled wheel(s) reaches a low predetermined wheel velocity when the aircraft is at a significantly higher velocity.

MAIN GEAR (L/G): See Gear, Main.

MAT, LANDING (Base): See Landing Mat.

METERED BRAKE PRESSURE (A/V, Brk): The fluid pressure (usually hydraulic) which is metered to the brakes by pilot demand and control to provide the desired decelerating force for the aircraft.

METERING PIN (S/A): A pin within the shock absorber which operates through the fluid metering orifice as stroking occurs. Variation of the diameter of the pin provides a preprogrammed metering of the fluid through the orifice to obtain maximum efficiency for a given landing condition and optimum balance of efficiency for all conditions.

METERING TUBE (S/A): An arrangement within the shock absorber for metering fluid for control of energy absorption. The metering tube has drilled passages through the wall to program the metering of fluid as stroking occurs.

MODULATED BRAKE PRESSURE (A/V, S/C): Metered brake pressure modulated by a skid control valve and control system.

MOLD SKID DEPTH (Tire): The depth of the grooves in a tire (mold), or conversely, the height of the tread on the tire. Variation in this parameter increases or decreases wear life of the tire. Tread depth may be limited by speed requirement and centrifugal force/stresses.

MOMENT OF INERTIA: See Inertia.

MONO WHEEL (A/C): An aircraft landing gear configuration in which there is a single wheel.

MOORING (Base) (A/C): Tie-down or securing of the aircraft by cables, ropes, straps or chains for protection against wind, propeller or rotor wash, jet blast, ship motion, etc. Also sometimes called picketing.

MULTIPLE WHEEL CONTROL (S/C): Control of two or more braked wheels utilizing one valve and control circuit.

MULTI WHEEL (L/G): Any landing gear assembly which utilizes two or more wheel assemblies. More appropriate for description of an aircraft or assembly with many wheels.

"MU" METER (Base): An instrument, device, or apparatus for measuring the coefficient of friction of a runway surface at various conditions of damp, wet, flooded, icy, etc.

NATURAL CONTOUR OF TIRE (Tire): The uninflated tire cross sectional contour.

3. (Continued):

NATURAL FREQUENCY (L/G): The frequency at which the free landing gear assembly will vibrate if disturbed from the normal position by external and upsetting forces.

NEGATIVE DAMPING (L/G): (1) The opposite of damping, i.e.: The propagation of oscillations or disturbances; a build up of energy with time. (2) Landing gear vibrations induced by the sensitivity of the torque developed between the rotating and nonrotating brake parts to slip velocity.

NEGATIVE FEEDBACK (S/C, etc.): Feedback which results in decreasing the amplification.

NOISE AND VIBRATION (Tire): General term which covers such conditions as tire, and wheel unbalanced vibration, tire tread pattern resonance and noise, etc.

NOSE GEAR (L/G): See Gear.

NOSE GEAR LAUNCH (A/V): Launch of an aircraft by means of an apparatus including a launch bar attached to the nose gear and imparting tow loads to the aircraft through the nose gear system.

NOSE WHEEL (L/G): The wheel(s) designed for use on nose gears. They differ from main wheels in that they usually make no provision for brakes within the wheel. They are also designed to take the dynamic vertical loads resulting from brake drag loads applied at the main wheels.

NOSE WHEEL STEERING (A/V): The system, apparatus, and/or controls for maneuvering the aircraft on the ground by rotating the nose wheels about an axis normal to the ground.

OLEO (S/A) (OR OLEO STRUT): A telescoping landing gear strut consisting essentially of a piston that travels in an air-oil filled cylinder. The oil, upon compression of the strut, is forced through an orifice to provide a shock absorbing effect.

OLEO-PNEUMATIC: See Shock Absorber, Air-Oil.

ON-OFF SYSTEM (S/C): A type of skid control system which utilizes a valve which opens or closes when input signal exceeds or reduces below specific threshold levels. Sometimes called a "bang-bang" system.

OPEN LOOP (S/C, etc.): A system operating without feedback, or with only partial feedback. See Closed Loop.

ORIFICE (S/A): An opening; mouth; vent; in a shock absorber, a hole through which oil is forced in the energy dissipation process.

ORIFICE COEFFICIENT (S/A): A numerical constant defining the characteristic of a specific orifice.

ORIFICE CONTROL (S/A): The method or the process by which flow of oil through an orifice is controlled, i.e., variation of orifice area by metering pin, variation of orifice shape, etc.

3. (Continued):

OUTRIGGER GEAR (L/G): See Gear, Outrigger.

OVERLAY PAVEMENT (Base): A pavement which is laid on top of an existing pavement to increase the load carrying capability or repair or seal the existing pavement. For instance, asphaltic pavement laid on top of concrete or old asphalt.

OVERRUN (Base): Extended clear area located at the end of a runway for the purpose of run out of an aircraft in an abort or emergency situation.

OVERRUN BARRIER (Base): See Barrier Overrun.

PAIRED WHEEL CONTROL (S/C): Control of two brakes/wheels utilizing one hydraulic antiskid valve and one control circuit.

PARABRAKE (A/V): See Drag Chute.

PARKING BRAKE (A/V): The system and/or apparatus for applying brakes for parking the aircraft for an extended length of time. Usually utilizes the same brake assemblies as for normal braking but with a different control and power source.

PARKING VALVE (A/V Brk): The hydraulic valve which applies or blocks pressure to or from the brake assembly to maintain pressure for parking the aircraft.

PASS, AIRCRAFT (Base): An aircraft passing a given station on a runway or taxiway; a takeoff and a landing constitute one pass for determining ground flotation capabilities.

PASS, GEAR (L/G, Base): One movement of a gear assembly past a specific point on the runway or taxiway under consideration. (One aircraft pass may include more than one gear pass.)

PAVEMENT, FLEXIBLE (Base): Pavement of flexible construction such as asphaltic pavement.

PAVEMENT, RIGID (Base): Pavement of rigid construction such as concrete or steel reinforced concrete.

PEAK TO PEAK VALUE (S/C, etc.): Of an oscillating quantity, the algebraic difference between the extremes of the quantity.

PENDANT, CATAPULT (Base): A wire rope or synthetic fiber assembly designed to connect an aircraft to a catapult for the purpose of accelerating the aircraft for takeoff. The pendant connects to catapult hook(s) on the aircraft and to the catapult shuttle spreader. The pendant falls off the aircraft (sheds) as it overtakes the shuttle and is generally restrained by a bridle arrester system on the deck. See also Bridle, Catapult.

PENDANT, CROSS DECK (Base): See Arresting Cable.

3. (Continued):

PENDANT, HOLDBACK (Base): A line or link assembly suspended from the aircraft to the deck fitting for holdback of the aircraft until the specified time for release for catapult or to restrain the aircraft for engine runup.

PERCENT SLIP (Tire): Percentage representing the ratio of reduction in wheel rotational velocity under the influence of braking force to the equivalent free rolling rotational velocity of an unbraked wheel.

PERFORMANCE INDEX (S/C): Ratio in percent of time integral of instantaneous brake pressure divided by the time integral of a series of straight lines connecting the peak brake pressure levels during which skidding initiates.

PERIOD, NATURAL (L/G): The reciprocal of the natural frequency of a landing gear. The time for one complete vibrational cycle in seconds.

PHOTOELASTIC STRESS ANALYSIS (L/G): A visual full field technique for measuring stresses in parts and structures. When a photoelastic material is subjected to forces and viewed under polarized light, the resulting stresses are seen as color fringe patterns. Interpretation of the colorful pattern will reveal the overall stress distribution, and accurate measurements can be made of the stress directions and magnitudes at any point. Three broad categories are embraced: (1) 2-dimensional model analysis. (2) 3-dimensional model analysis and 3) photoelastic coating analysis.

PICKETING (A/V): See Mooring.

PISTON (S/A): A solid cylinder or disc that fits snugly into a larger cylinder and moves back and forth under fluid pressure.

PIVOTING (A/V): The procedure or technique of turning or pivoting an aircraft about a point such as to pivot about one main gear.

PLY RATING (Tire): A rating number which indicates the relative strength of a tire carcass. It is proportional to, but not necessarily the same as, the number of structural plies in the carcass.

PNEUDRAULIC (S/A): See Shock Absorber, Air-Oil.

PNEUMATIC CASTER (S/A): See Trail, Pneumatic.

POSITIVE FEEDBACK (S/C, etc.): Feedback which results in increasing the amplification.

POST (S/A): A structural brace or member which supports the pivot point for the trailing arm of a levered suspension gear system.

POWER ABSORPTION (Tire): The amount of power which is absorbed by the tire in the rolling process. It results in a temperature rise in the tire carcass.

3. (Continued):

POWER LOSS (Tire) (SEE ALSO POWER ABSORPTION): Power absorbed by the tires is a loss as far as useful work is concerned.

POWER RUN (Cat): That part of the launching run after release in which the applied catapult towing force is accelerating the aircraft.

PRE-RETRACTED GEAR (L/G): A gear system which is not utilized in a takeoff mode and therefore is pre-retracted or placed in the stowed position. It is extended prior to landing the aircraft.

PRE-ROTATION (Tire): The process of imparting rotation to the tires (wheels) prior to the landing touchdown to avoid the inertia loads on the gear imposed by rapid spin up and the wear on the tires caused by initial impact skidding.

PRESSURE EFFICIENCY (S/C): The ratio of the measured brake pressure integral to peak to peak straight line integral between the skid pressure levels from brake pressure time history instrumentation.

PRESSURE RISE (Tire): The rise of inflation pressure in a tire due to the rolling process and the energy absorption and temperature rise associated with the process.

PRESSURE TRANSDUCER (S/C, etc.): A transducer which produces an output proportional to the imparted pressure.

PROOF TEST (L/G, etc.): A high pressure test over a specific period of time for a shock absorber or other oil or air oil unit to insure against seal leakage or structural weakness.

PROPORTIONAL CONTROL (S/C, etc.): (1) Control of an aircraft, etc., in which control surface deflection (or output) is proportional to the movement of the remote control (or input). (2) A skid control type utilizing a valve which controls pressure in direct proportion to input current.

PUCK (Prk): A pad or cup which carries brake lining and is attached to the rotors and/or stators of the brake assembly.

QUADRILATERAL MECHANISM (L/G, etc.) (ALSO 4 BAR LINKAGE): A mechanical linkage composed of four elements or links, one of which may be the fixed base of the mechanism. Widely used in landing gear retraction and folding systems.

QUIESCENT FLOW (S/C, etc.): A continuous leakage flow to return through hydraulic control interfaces.

3. (Continued):

RADIUS OF GYRATION (Tire, etc.) (ALSO RADIUS OF INERTIA): If the moment of inertia of a solid body with respect to a given axis is the limit of the sum of the products of the masses of each of the elementary particles into which the body may be conceived to be divided and the square of their distance from the given axis.

If $I = K^2_m$, the quantity K is called the radius of gyration or radius of inertia.

RADIUS ROD (L/G, etc.): A rod or link in a mechanical system which serves to maintain a point in locus, equidistant from a given point. Used in landing gear retraction/extension system to predetermine and maintain the path of motion of the gear during the cycle.

RAM (L/G): See Actuator.

R.A.T.O. (A/V) (ROCKET ASSISTED TAKEOFF): A system and/or installation on an air vehicle or missile which utilizes a rocket motor assist during the launch or takeoff phase.

REACTION FACTOR (L/G): See Load Factor.

REBOUND (S/A) (ALSO RECOIL): The phase of operation of a shock absorber after the compression and storing of energy within the unit. The stored energy forces the extension or rebound of the piston to release the energy. Sometimes causes the aircraft to bounce back into the air after initial impact unless the rebound is snubbed properly.

RECOIL (S/A): See Rebound.

RECOIL CONTROL (S/A): The process of control of the energy stored in a shock absorber after impact. The energy is dissipated in the extension phase usually by forcing hydraulic oil through orifices or passages.

RECOIL SNUBBER (S/A): The valve, orifice(s), or snubbing device within a shock absorber which controls impact forces within the shock absorber upon extension of the landing gear after takeoff or catapulting.

(RAST) RECOVERY, ASSIST, SECURE, AND TRAVERSE: A system, installed in the helicopter landing area of small ships, used to guide the helicopter to the landing area by means of a tensioned cable. Once landed, the helicopter is automatically secured to the deck. Further, the system assists in traversing the helicopter between the landing area and the hangar.

RELEASE (Cat): A device or catch for locking or releasing a mechanism. The point in the launching operation at which the final tensioning process has been completed, the catapult fired and the catapult tow force increased to such a magnitude as to rupture the release element or disengage the repeatable release holdback bar and effect release of the aircraft.

3. (Continued):

RELEASE ELEMENT (Cat): The member in a catapult holdback which initiates the release process. Several types are (1) tension bar or frangible link (tension bar or ring) which fails at a predetermined load, (2) hydromechanical device (repeatable release holdback bar) which releases at a given load and is reusable.

REPEATABLE RELEASE HOLDBACK BAR (Cat): A type of catapult holdback which is designed to restrain the aircraft until a predetermined load is built up in the towing mechanism, then release the aircraft automatically, allowing the aircraft to be launched. The reusable release element may then be reset for the next launch.

RESERVE ENERGY (S/A): The capacity of a shock absorber to accept energy inputs over and above the design conditions; i.e., reserve for overload or over design landing conditions.

RESPONSE (L/G, S/C, etc.): Of a device or system, the motion (or other output) resulting from an excitation or input under specified conditions. Response characteristics often presented graphically give the response as a function of some independent variable such as frequency or direction. For such purposes it is customary to assume the other characteristics of the input are held constant.

RESPONSE TIME (L/G, S/C, etc.): The time delay between the application of an input signal and the resulting output signal.

RETRACTION (L/G): (1) To draw back or in. (2) The process of retracting, lifting, or folding a landing gear within the confines of the mold lines of the air vehicle to a stowed position for high speed, low aerodynamic drag configuration of the air vehicle.

RETRACTION CURVE (L/G): A type of load-stroke curve which presents power requirements for the retraction cycle of operation for a landing gear.

RETRACTION GEOMETRY (L/G): The geometric representation (mathematics) of the properties, measurement, and relationship of points, lines, angles, surfaces, and solids, of component parts of a landing gear system in the retraction process.

REVERSE THRUST (A/V): The force developed by an air vehicle or a rocket engine in a reverse direction. This reverse thrust is utilized for deceleration of the air vehicle in ground operations such as landing rollout or rejected takeoff to assist the wheel brakes and/or other systems of the air vehicle.

RIGID PAVEMENT: See Pavement.

RIM WIDTH (Wheel): The lateral dimension between the inside of the rim flanges of a wheel which restrain the installed tire in a lateral direction. Therefore, the rim width of the wheel is equal to the installed width between tire beads.

3. (Continued):

RING SPRING (S/A, etc.): A type of spring used in shock absorber design; circular rings with a double trapezoidal cross section. The springs are utilized in stacks and absorb energy by friction of the adjacent ring surfaces.

RISE TIME (S/C, etc.): The time required for the leading edge of a pulse to rise from one-tenth of its final value to nine-tenths of its final value. Rise Time is proportional to time constant (see Decay Time).

ROLL-OUT (A/V): (1) In the process of landing an aircraft, the time from touchdown through deceleration and stop: i.e., roll-out time, roll-out distance, etc., also other applications such as rejected take off from brake application to stop. (2) The first showing of a prototype.

ROLL TEST (Wheel, Tire): A type of test for a wheel and/or tire which consists of a series of landings, takeoffs, taxis or a continuous roll of the tire/wheel assembly against a rotating flywheel. The test is intended to be an index of the anticipated service fatigue life of the wheel or tire.

ROLLING RADIUS: See Tire Rolling Radius.

ROLLING RESISTANCE: See Tire Rolling Resistance.

REJECTED TAKEOFF (RTO) (A/V) (SEE ALSO ABORT): The process of rejecting or aborting a takeoff of an aircraft because of engine or any other failure or command decision. This is one of the critical design conditions for aircraft brakes.

RUNWAY (Base): (1) A path, channel, or track over which something runs. (2) A long and narrow prepared strip or piece of ground, usually hard surfaced, for the takeoff and landing of aircraft. The term "runway" is rarely applied to the flight deck of an aircraft carrier. The term is applied to water area or strips only in a general sense, as, the natural runway provided by a river. See also "Water Lane".

RUNWAY, CONCRETE (Base): A runway surfaced with concrete, usually with steel reinforcement and gravel and/or broken rock sub layers.

RUNWAY, POROUS ASPHALT (Base): A runway surfaced with porous asphaltic materials, usually utilizing gravel and/or broken rock sub layers.

RUNWAY, GROOVED (Base): A runway which has lateral grooves cut in the surface to provide for water drainage, and the prevention of aircraft skids or hydroplaning.

RUNWAY LOADING INDEX (RLI) (Base): A factor which takes into account the runway load in terms of variations of pressure and single wheel load; it can be given with reasonable accuracy by the expression: $RLI = \sqrt{PW}$ where P = Tire pressure and W = single wheel load.

3. (Continued):

"SATS" (SHORT AIRFIELD FOR TACTICAL SUPPORT) (Base): A portable airfield design for use by one high-performance jet squadron. The field consists of a surfaced runway 2210 feet long and 96 feet wide, turn off areas at either end, a hot pad, and parking and maintenance. It also includes a CE1-3 catapult, two M-21 primary recovery systems, two Fresnel Lens Optical Landing Systems (FLOLS), and extensive field lighting and audio visual communications systems necessary to operate (launch and recovery) high performance jet aircraft. A SATS field has the capability of being readily expanded to an Expeditionary Airfield.

SELF BREAKING STRUT (L/G): A folding brace or strut in a landing gear system which carries its own actuator.

SEMI-ARTICULATED (L/G): A variation on the articulated shock strut configuration. The wheel is mounted on a lever which pivots about the lower end of the piston of a telescoping shock absorber. The front end of the lever is restrained by a link to the outer cylinder of the shock absorber.

SENSOR (S/C, etc.): The component of a system that converts an input signal into a quantity which is measured by another part of the system. Also called sensing element.

SEQUENCING (L/G, etc.): (1) A following of one thing after another; an order of succession; a related or continuous series. (2) In landing gear system, the process of control of the gear retraction or extension in the proper order of succession. For example, the gear control is placed in the gear "up" position; (a) wheel doors open, (b) gear retracts within the wheel well and locks in the stowed position, (c) doors close and lock, and (d) system hydraulic pressure is deenergized, thus leaving the gear in position for high speed flight.

SHIMMY (Wheel): (1) Abnormal vibration or wobbling. (2) A self-sustained vibration of a rolling wheel(s) about a real or theoretical swiveling axis. Sometimes classified as large angle and small angle, in which large angle consists of more or less violent oscillations of the wheel assembly about its caster axis; the tire contact area is sliding bodily sideways at each swing and derives energy to maintain the oscillation from the forward motion of the vehicle. Small angle or Kinematic Shimmy is a high frequency oscillation within the adhesion range of the tire.

SHIMMY DAMPER (A/V, S/A): Any of various devices attached to a castering wheel to damp oscillations about the castering axis. (See also Damper.)

SHOCK ABSORBER (A/V): A device for absorbing the energy from impact of a mass or force input.

SHOCK ABSORBER, AIR-OIL (A/V): A shock absorber which utilizes the principle of forcing oil through an orifice for absorption of energy, and also provides a chamber with gas (air or more usually dry nitrogen) under pressure for the purpose of supporting the static load on the unit and by the gas pressure, extension of the shock absorber when the load is removed.

3. (Continued):

SHOCK ABSORBER, CONSTANT ORIFICE (A/V): A shock absorber which utilizes a fixed or constant orifice in metering the fluid.

SHOCK ABSORBER, DASH POT (A/V): A shock absorber which utilizes fluid metering for shock absorption, and does not provide a gas charge for maintaining a static load.

SHOCK ABSORBER, DUAL CHAMBER (A/V): A shock absorber which provides two separate chambers for gas charge and thereby a two stage spring rate as the shock absorber is compressed.

SHOCK ABSORBER, FRANGIBLE (A/V): A shock absorber which utilizes material failure as a shock absorption medium, i.e., (a) buckling collapse of tubing, (b) fragmenting of tubing, (c) compression of honey comb material, (d) compression of a fluid filled device, (e) compression of a solid thermoplastic. These devices are "one shot" devices and must be replaced after each use.

SHOCK ABSORBER, FRICTION (A/V): A shock absorber which utilizes friction as the energy absorption medium such as a ring spring configuration.

SHOCK ABSORBER, HONEYCOMB (A/V): A shock absorber which utilizes a crushable honeycomb core material as the shock absorbing element.

SHOCK ABSORBER, LEAF SPRING (A/V): A shock absorber which utilizes the deflection of a leaf spring for energy absorption capability. Common on light aircraft.

SHOCK ABSORBER, LIQUID SPRING (A/V): A shock absorber which utilizes the compressibility property of a liquid for the shock absorption medium. Generally provides a high spring rate short stroke, and requires special high pressure sealing techniques.

SHOCK ABSORBER, PNEUMATIC (A/V): A shock absorber which utilizes air as the shock absorbing medium. Unusual on present day aircraft.

SHOCK ABSORBER, RUBBER (A/V): A shock absorber which utilizes rubber as the shock absorption medium. May be used with or without oil dampening.

SHOCK ABSORBER, SPRING (A/V): A shock absorber which utilizes helical coil springs as shock absorbing elements. May be used with or without oil damping.

SHOCK ABSORBER, VARIABLE ORIFICE (A/V): A shock absorber which utilizes a variable orifice for metering fluid which provides the shock absorption medium. The resistance or load on the unit can therefore be programmed versus stroke. A metering pin of variable diameter operating through the orifice is the most common method used for control. See also Metering Pin and Metering Tube.

SHOCK CORD (S/A): A strong, many stranded, rubber cord encased in a braided fabric sheath, used as a shock absorber element on lightplanes or as a launching element for gliders. Also known as bungee cord.

3. (Continued):

SHOCK STRUT (A/V, L/G): A structural strut or link which embodies a shock absorbing element.

SHRINK LINK (L/G): A link or rod element of a landing gear system which during retraction provides a kinematic constraint and shrinks or shortens a shock strut to reduce the required stowage volume within the aircraft or vehicle.

SHRINK STRUT (L/G): A strut which is shrunk or shortened before or during the retraction process to reduce the required stowage volume within the aircraft or vehicle. The shortening may be accomplished by means of a shrink link (kinematically) or hydraulically, electrically, mechanically or other methods.

SHUT OFF VALVE (S/C, etc.): A device which is used to shut off or close down flow or pressure in a hydraulic or fluid system. Used in many landing gear system applications such as parking brake, skid control, etc.

SHUTTLE (Cat): A device which moves back and forth. See also Catapult Shuttle.

SHUTTLE VALVE (Brake, etc.): A valve used in a brake or other fluid power system which serves to shift from one power source to an alternate source or other similar applications.

SIDE BRAKE (L/G): A brake which is mounted at the side of the wheel.

SIDE FORCE COEFFICIENT (Tire): A mathematical (numerical) measure of the physical force property that is constant in determination of side force on a tire.

SINGLE WHEEL LOAD (SWL) (L/G): The share of aircraft (or vehicle) or gear load as geometrically broken down and carried by a given wheel.

SINK SPEED (A/V, L/G): (1) The rate at which an aircraft loses altitude; especially the rate at which a heavier-than-air aircraft descends in a glide in still air under given conditions of equilibrium. (2) The vertical sink rate at which an aircraft (i.e., landing gear) contacts the ground.

SIPES (Tire): Lateral cuts in the tread of a tire. Under braking loads the tread sections deflect, thus exposing the cut edges and increase traction.

SIZE FACTOR (Tire): A factor used in tire design to compensate for variation in characteristics due to size of the tire.

SKID (L/G): A runner or slide used as an element of a landing gear of certain aircraft. See also Wing Skid, Tail Skid.

SKID (Tire): (1) The act of sliding or slipping over a surface. (2) To slide without revolving, as a wheel. (3) Sometimes used to designate the portion of a tire tread which wears away in the normal service life of the tire; i.e., skid depth.

3. (Continued):

SKID CONTROL BOX (A/S): A component of the skid control system containing the electrical and electronic components (black box).

SKID CONTROL SYSTEM (A/V): A group of interconnected components which interact to control excessive brake pressure and thus prevent inadvertent tire skidding and contribute to shorter aircraft stopping distances. Also called Antiskid System.

SKID CONTROL VALVE (S/C): A component of the skid control system which controls or modulates brake pressure in response to an electrical (or mechanical) signal from the skid control box.

SKID DEPTH (Tire): The depth dimension of that part of a tire tread which wears away in the normal service life of a tire.

SKID RESISTANCE (Tire): The physical characteristic of a tire to resist or oppose skidding. The characteristic is affected by inflation pressure, tire shape, tread pattern, degree of wear, and other factors.

SKIS (A/V, L/G): Long, flat runners attached to the landing gear of an aircraft for takeoff, landing, and operation over snow or ice; also in special cases, over water.

SLIP: See Tire.

SLIP RATIO: See Tire.

SLUSH DRAG (Tire): The drag or resistance to forward motion of a tire(s) and the aircraft which is generated as it moves through melting snow, slush and water.

SNUBBER (L/G, A/G): A device which provides a resisting force to "snub" or damp an imposed load; i.e., arresting hook snubber which resists the upward force imposed by the carrier deck or ground, prevents hook bounce, and maintains point contact with the deck.

SNUBBER VALVE (L/G, A/G): A device within a snubber which provides resistance to fluid motion and thereby snubs or damps the force imposed.

SPEED BRAKE (A/V): An air brake in the form of a flap or plate, which when exposed to the airstream provides a decelerating force. Also Drag Brake.

SPEED, CRITICAL ENGINE FAILURE (A/V): For a multiengine aircraft, that speed at which during takeoff, the aircraft can fail the critical engine and (a) elect to continue takeoff and just clear the ground at the end of the runway or (b) elect to abort the takeoff and just stop the aircraft within the limit of the remaining runway.

SPEED, DYNAMIC HYDROPLANING (A/V) (Tire): That speed at which dynamic hydroplaning of a tire or complete air vehicle occurs.

3. (Continued):

SPEED, LANDING GEAR OPERATIONAL LIMIT (A/V): The maximum airspeed of the aircraft at which the landing gear is designed to retract and/or extend.

SPEED, LANDING GEAR STRUCTURAL DESIGN (A/V): The maximum airspeed of the aircraft at which the landing gear may be exposed to the airstream without danger of structural damage.

SPINDLE (L/G, etc.): An element of a landing gear which provides an axis for larger revolving parts.

SPIN DOWN (Wheel, S/C, etc.): (1) The process of angular deceleration of the wheels of an aircraft after takeoff. (2) The decrease in angular velocity of a wheel as measured by the Skid Control System. (Also increase in Slip Ratio.)

SPIN UP (L/G, S/C): (1) The process of accelerating the wheel of an aircraft from zero to high angular velocity in a very small increment of time at touchdown and contact with the runway which induces high drag loads in the landing gear structure. (2) Increase in angular velocity of a wheel (decrease in slip ratio) as measured by the Skid Control System.

SPOILERS, GROUND (A/V): A type of drag brake and lift killing device designed to be operated after the aircraft has touched down on the runway. The intended purpose is to transfer the aircraft weight to the wheels as quickly as possible to enable braking and produce drag forces to decelerate the aircraft.

SPRING BACK (L/G): A structural reaction in the landing gear system which follows "Spin Up". The energy stored in the gear structure by "Spin Up" causes a cyclic reaction to produce forward drag forces in the system.

SPRING RATE (L/G) (Tire, etc.): The force required to deflect a member a specified amount. Also Fore and Aft Spring Rate, Lateral Spring Rate, Torsional Spring Rate, etc.

SPRUNG MASS (L/G): The portion of a landing gear which is attached to fixed air vehicle structure as opposed to the unsprung mass (tires, wheels, brakes, axle, etc.) separated from the A/V by means of the shock absorber.

SQUAT SWITCH (L/G): An electrical switch which is activated by virtue of presence of a load on the landing gear. This signal provides intelligence to many aircraft systems as to whether the A/C is airborne.

SQUEAL (Brake): See Brake Squeal.

3. (Continued):

STANDING WAVE (Tire): When a tire is operated at high speeds, the centrifugal forces, internal stresses, external loads, and deflections imposed result in a departure from a round shape. A "Standing Wave" builds up in front of and behind the contact area. This condition represents a dangerous mode of operation for the tire.

STATIC LOAD (L/G, Tire, etc.): That load which is imposed on a member when in a static state or 1 g condition.

STATIC POSITION (L/G): The state of deflection or compression of a landing gear when the aircraft is in a static or 1 g condition. Usually, further compression of the strut (taxi stroke) is available for dynamic taxi conditions. Decrease of the 1 g static load permits extension of the strut (landing stroke region) to the free flight or full extended position.

STATIC STEERING TORQUE (Steer): The torque required to turn the nose wheel(s) of an aircraft as it sits static on the runway surface (without the benefit of engine thrust or forward motion of the aircraft).

STATIC TORQUE (Brake): The torque which a brake is capable of resisting in a static (non rotating) state as opposed to dynamic torque.

STAY: See Brace.

STEADY STATE RESPONSE TO STEERING (Tire): The stable operating condition of a tire under lateral load inputs from the steering system.

STEER DAMPER (L/G): A device which provides power for steering (usually on a nose gear) and also damping to resist shimmy.

STEERING ANGLE (L/G, Wheel): The angle through which the landing gear or wheel(s) may be steered. Usually expressed as degrees Left and Right (one half the total angle).

STRAIN IN CONTACT AREA (Tire): The internal strain within the tire carcass in the contact area which is deflected from a normal state.

STRUT (L/G): A structural support member for an aircraft for ground operation. Usually includes provisions for wheels, tires, axles, and shock absorber. Also, a bar or rod used to strengthen a framework by resisting longitudinal thrust.

SURGE (A/C, etc.): A transient rise in power, pressure, etc., such as a brief rise in return pressure in a hydraulic system.

SWIVEL ANGLE (L/G, Wheel): The angle through which a gear or wheel is free to swivel or caster.