AAE 190
Glossary of Terms from
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Angle of Attack - angle of attack is the angle at which the air hits the wing of an airplane.
Atmospheric Turbulence - a form of fluid flow where particles move in a disoriented matter in a irregular path resulting in an exchange of momentum.
Atmospheric Turbulence – variations in atmospheric pressure from spot to spot in the air that cause turbulence in an aircraft's ride.
Boundary Layer Flow - noise created when a fluid moves over a solid surface.
Boundary-Layer - a thin layer of air next to an airfoil of an aircraft in flight
Laminar Flow - parallel flow of air in the boundary layer to the surface of an airplane
Laminar Flow - stream line flow of a fluid in which the fluid moves in layers without fluctuation of turbulence.
Tail-Cone - the cone shaped assembly behind a turbojet engine through which the exhaust gases are discharged
AAF - Air Forces
AAF Bell Project - a project supported by the air forces and Bell designed to gather data at transonic speeds.
Ablative - something which can be removed, esprcially through abrasion, cutting, or evaporation.
Ablator - The dissipation of heat generated by atmospheric friction, especially in the atmospheric reentry of a spacecraft or missile, by means of a melting heat shield.
Ablator - a melting heat shield meant to dissipate heat
Acetylene - A colorless, highly flammable or explosive gas, C2H2, used for metal welding and cutting and as an illuminant.
Actuator - a mechanism that puts something into automatic action
Advanced Fighter Technology Integration (AFTI) - integration of the most up to date technology for the use in fighter planes, allowing better maneuverability and detection capability
Aerial Towing - pulling a glider or other object through the air by means of an aircraft
Aerodynamic - Designed with rounded edges so as to reduce wind drag and thereby increase fuel efficiency
Aerodynamic - Designed with rounded edges so as to reduce wind drag and thereby increase fuel efficiency. Used especially of motor vehicles.
Aerodynamic heating - the process by which a body is heated by air or other gases passing over its surface, due to friction and compression; this process is dominant mainly at high velocities.
Aerodynamic Heating Boundaries - the level of friction at high speeds due to air flow which causes an increase in airframe temperature to the point that the frame melts. So aircrafts can no exceed it.
Aerodynamic Heating - Heating of the aircraft or parts of the craft due to friction caused by aerodynamic drag.
Aeroelastic Effect - flexibility of a lifting body

AGARD - Advisory Group for Aerospace Research and Development.
Aileron - a movable airfoil at the trailing edge of an airplane wing that is used for imparting a rolling motion especially in banking for turns
Aileron - a movable flap on the wing of an airplane that can be used to control the plane's rolling and banking movements
Aileron – Either of two movable flaps on the wings of an airplane that can be used to control the plan's rolling and banking movements.
Aileron – one of a pair of hinged control surfaces located near the trailing edge of each wing of an aircraft. Ailerons work as differential pairs, creating opposing lifting forces on opposite sides of the aircraft to produce a rolling motion about the craft's longitudinal axis.
Aileron Yawing-Moment Derivative – change in the yawing-moment of an aircraft caused by the aerodynamic characteristics of the ailerons at various velocities and angles of attack
Aileron - a movable surface, usually near the trailing edge of a wing, that controls the roll of the airframe or effects maneuvers, as banks and the like
Air flow - The motion of air currents around an object as it moves through the air, especially the motion of air about a moving airplane
Airborne Performance Analyzer – a device that monitors various aircraft systems, detects problems and provides that data to the pilot, as well as to engineers and maintenance personnel on the ground; the analyzer became the forerunner of vehicle health monitoring systems used on the space shuttles and a variety of today's aircraft
Aircraft – machine or structure capable of flight in air and regarded as a vehicle
Aircraft Attitude - The primary aircraft angles in the state vector; pitch, roll, and yaw.
Aircraft Fighter Technology Integration - Program sponsored by Air Force Systems Command in which F-16 fighters were fitted with canard wings and digital flight control systems for in-flight testing.
Airfoil - a body (as an airplane wing or propeller blade) designed to provide a desired reaction force when in motion relative to the surrounding air
Airfoil – A part or surface, such as a wing, propeller blade, or rudder, whose shape and orientation control stability, direction, lift, thrust, or propulsion.
Airfoil - A part or surface, such as a wing, whose shape and orientation control stability, direction, lift, thrust, or propulsion
Altitude – the vertical distance between an aircraft and mean sea level
Altitude Envelope - Maximum altitude an aircraft is predicted to reach
Angle of Attack - The angle between the chord of the wing and the relative wind.
Angle of attack – the angle of the wings
Angle of attack – the angle produced by the direction of flight and the angle of the wings
Angle of attack - angle between aircraft and direction of flight
Angle of attack - angle between wing and airflow: the acute angle between the direction of airflow and the line linking the leading and trailing edges of an aircraft wing
Angle of Attack - the acute angle between the chord of an aircraft wing or other airfoil and the direction of the relative wind
Angle of attack - The angle formed by the chord of the wing and the vector of air moving over the wing (opposite the planes forward direction)
Angle-of-attack - the acute angle between the chord of an airfoil and a line representing the undisturbed relative airflow
Anticipate – to predict a future result

APU - Auxiliary-Power-Unit
Armed service discards - aircraft once used by the military that are now used for testing
Atmospheric turbulence – an instability in the atmosphere which disrupts the flow of the wind, causing gusty, unpredictable air currents
Atmospheric turbulence - apparently random fluctuations of the atmosphere often causing deformations of its fluid flow.
Atmospheric turbulence – variations in atmospheric pressure from spot to spot in
Augment – to add to
Augmentation - The act or process of augmenting, or making larger, by addition, expansion, or dilation; increase.
Augmentation - an increase in, an amplification of
Auxiliary-Power-Unit - the primary power unit of the aircraft.
Axial - Flow Turbojet - a turbine jet engine that revolves around an axis sucking in air and pushing it out the back.
Axial flow compressor - Refers a to a rotating compressor through which air travels along the axis of rotation.
Axial-flow - extending in a direction essentially perpendicular to the plane of a cyclic structure
Barometer - An instrument for measuring atmospheric pressure, used especially in weather forecasting.
Base drag – Component of aerodynamic drag caused by a low-pressure region behind the vehicle.
Biplane - an airplane having two pairs of wings fixed at different levels, especially one above and one below the fuselage.
Biplane - a double winged aircraft in which the two wings are situated on top of each other with a small distance between.
Boundary layer - The thin layer of air close the surface of an aircraft.
Boundary layer - layer of slower flow of a fluid past a surface
Boundary Layer Noise – the noise occurring at high speeds due to oscillations in the turbulent boundary layer at many frequencies and heard in both the cockpit and the cabin
Boundary layer noise - noise created where air crosses the solid surface of the plane
Buildup - type test- test of environmental-type problems
Bulkhead - One of the upright partitions dividing a ship into compartments and serving to add structural rigidity and to prevent the spread of leakage or fire.
Bulkhead - structure or partition to resist pressure with a sloping door to give access
Cabin pressure - The atmospheric pressure within the cabin, controlled to reduce physical strain on the pilot.
Canopy - the transparent enclosure over an airplane cockpit
Canopy - The transparent enclosure over the cockpit of an aircraft.
Canopy - Glass covering over the cockpit of many high-speed, and fighter aircraft.
Canopy seals - Seals which hold the canopy in place and keep set cabin pressure.
Carte Blanche - Complete freedom.
Carte Blanche - Unrestricted power to act at one's own discretion; unconditional authority.
Characteristics – properties of something
Climbout profile – the path of an airplane as the pilot executes climbing maneuvers
Cockpit - the compartment for the pilot and crew of an airplane

Combustion - A chemical change, especially oxidation, accompanied by the production of heat and light.
Command control signals - Signals sent from command to the aircraft for control
Compressibility - as higher speeds are achieved in an aircraft, the density of air increases. This leads to increased drag on an aircraft, making it more difficult to maneuver the aircraft.
Compressibility - the ability of a gas to have its volume shrunk.
Compressible - that can be compressed: compressible packing materials; a compressible box.
Computational Fluid Dynamics – Computational Fluid Dynamics (CFD) is a method in which fluid flows are modeled by a set of partial differential equations, the Navier-Stokes equations
Concept – an idea
Configuration - a method of arrangement
Continuity - uninterrupted connection or communication
Contract standards - requirements an aircraft must fulfill in order to get a contract to produce it
Control loop - A loop in which data flows through in order to control an aircraft, consisting of a downlink, display variables, pilot inputs, a digital computer, control signals, and an uplink
Control System – The system that allows the pilot to fly the vehicle.
Control-system - System which operates many of the aircrafts computer controlled systems.
Conventional – traditional
Coupling Dynamics - The movement regarding: 1. something that joins two things: something that joins two things, especially a device for connecting two pieces of pipe, hose, or tube. 4. MECHANICAL ENGINEERING link that transfers power: a part of a mechanical system by which power is transmitted from one rotating part to another part.
D-558-1 Skystreak - an experimental aircraft used by the US navy and NACA to explore stability and control problems associated with flight at speeds of Mach 0.75 and above. Nicknamed the flying red test tubes due to their appearance. D-558-1 Skystreak--- an experimental aircraft used by the US navy and NACA to explore stability and control problems associated with flight at speeds of Mach 0.75 and above. Nicknamed the flying red test tubes due to their appearance.
D-558-2 (skyrocket) - a 1947-1948 experimental aircraft, which penetrated the sonic barrier Reached 651 mph. The jet-and-rocket-powered Skyrocket was flown at 1,327 mph (Mach 2.01)
Data – set of information
Data Maneuvers – maneuvers used to gather and obtain data
Data maneuvers - Maneuvers in flight that are controlled by data sent from the command
Deflection - The deviation of an indicator of a measuring instrument from zero or from its normal position.
Degraded - having completely fallen apart
DFBW – Digital Fly-by-Wire
Dihedral - The upward or downward inclination of an aircraft wing from true horizontal.
Dihedral Effect – is a rolling motion in aircraft
Dihedral - AEROSPACE angle of an aircraft wing: the angle between an upwardly inclined aircraft wing and a horizontal line
Dirigibles (balloon) - a lighter-than-air aircraft having propulsion and steering systems
Discrepancies - disagreements between different sets of information

Dispersion - the separation or disassociation into smaller parts
Divergent - differing from each other or from a standard; deviant
Document – paper giving information or evidence on something
Downlink – method of communication from aircraft to the ground
Downlink - Information that is sent to control from the aircraft
Drag - the retarding force acting on a body (as an airplane) moving through a fluid (as air) parallel and opposite to the direction of motion.
Drag - force opposite direction of flight that results from moving through air
Dryden Research Facility - located at Edwards, California, is NASA's primary installation for flight research. Projects here over the past 50 years have lead to major advancements in the design and capabilities of many civilian and military aircraft.
Dynamic - Of or relating to energy or to objects in motion.
dynamic pressure - Fluid Mechanics: an expression of the pressure of a flowing fluid, equal to one-half the fluid density, multiplied by the fluid velocity squared
Electrical noise - Any unwanted electrical signals in a circuit
Electrical transient - alternating magnetic currents which reduces the loss of efficiency
Electrical Transient - brief disturbance in electrical circuit: an oscillation or brief disturbance in a system, for example, a sudden pulse of current or voltage in an electrical circuit
Elevator - a movable auxiliary airfoil usually attached to the tail plane of an airplane for controlling pitch
Elevator - a movable airfoil that used to control pitch of the plane
Elevon – A control surface on an airplane that combines the functions of an elevator and an aileron.
Elevon - A control surface on delta wing aircraft that combines the functions of an elevator and an aileron
Engine Thrust - the forward propulsion given to an aircraft by its jet exhaust engines.
Envelope – The maximum a vehicle can perform at.
Envelope expansion – extending the limits of a certain vehicle
Envelope expansion - is the process of expanding the flyable zone for each aircraft's airframe. The flight envelope is an area in which an aircraft can fly in. the major factors affecting are speed and altitude.
F-100 - the first plane used by the Air Force that could go faster than the speed of sound.
F-100 (super sabre) - swept-back-wing fighter that gave the United States a supersonic Air Force. First version produced prior to 1950.
F-111 Transonic Aircraft Technology - To give some idea of the practical benefit of the supercritical airfoil, Air Force and NASA researchers under the auspices of the Transonic Aircraft Technology (TACT) program modified a basic F-111 bomber and replaced the existing NACA 64-210 wing airfoil with a supercritical shape of equal thickness. In so doing, they managed to increase the drag divergence Mach number by 16%, from Mach 0.76 to Mach 0.88. This example illustrates how significant the use of supercritical airfoils can be in improving the performance of aircraft cruising in the transonic regime. (directly from Aerospaceweb.org)
F-15 - Plane reaching speeds above mach-2.5 and a ceiling of 65,000 ft.
F-15 - Remotely Piloted Research Vehicle - During the flight test program of the F-15, the F-15 RPRV was used to perform dangerous flight maneuvers, particularly spins, without putting

a human pilot at risk since it was unmanned. It was a 3/8ths scale version of an f-15. Initially the drone was recovered by helicopter, and a few failures caused the design to be changed.
F-8 Supercritical Wing - The F-8 Supercritical Wing was a flight research project designed to test a new wing concept designed by Dr. Richard Whitcomb. This wing is stronger than conventional wings of the day and is much thinner to reduce drag. This design allowed better fuel efficiency, more maneuverability, and better transonic efficiency. F-8 Digital Fly-By-**Wire** - The digital fly-by-wire system (fly by wire is where there is a computer making many minor control surface adjustments every second to allow aerodynamically unstable aircraft to be controlled) that operated without mechanical back-up on the F-8 aircraft. This successful project gave industry the confidence to develop similar digital systems on a number of military and commercial airplanes such as the F-16, F-18, and the Boeing 777. The F-8 digital fly-by-wire program contributed a solid base of techniques, as well as strong evidence that such a digital system could overcome real faults and continues to fly successfully.
Fairing - An auxiliary structure or the external structure of a vehicle, such as an aircraft, that reduces drag.
Fatigue Problems - systems failure due to over-use
Fatigue - The factors by which different metals weaken and break.
Fidelity - adherence to fact or detail; accuracy; exactness
Fin - Prevents aircraft yawing back and forth.
Final Approach - drawing near to the landing sight
Fixed-base simulator - A flight simulator that remains on the ground
Flap - a movable airfoil usually attached top the trailing edge of a wing to increase lift or drag
Flaps - a movable auxiliary airfoil usually attached to an airplane wing's trailing edge to increase lift or drag
Flight Control System - The electronic system that controls the functionality of the different part of the planes.
Flight dynamics - the study or monitoring of a flight vehicle's short-term motion, focusing on transient or steady maneuvers involving stability and control.
Flight Dynamics – The study/description of the motions and movements of flight.
Flight dynamics - the effects of forces on a plane in flight
Flight envelope - the maximum flight performance of any vehicle.
Flight envelope – a range of flight conditions in which an aircraft can be operated with safety.
Flight Envelope - Defines the limit at which an aircraft could fly.
Flight envelope – parameters of flight speeds, ranges, and altitudes (i.e. “pushing the envelope”, going for the maximum flight speeds, ranges and altitudes)
Flight Readiness Review Board - The board that checks over the aircraft saying whether it is fit to fly.
Flight Readiness Review Board - A board of people that decide whether or not a particular aircraft is ready for flight
Flight research - flights to gather information on aeronautics
Flight test - flights of a specific aircraft to see if it works
Flight-envelope -the flight envelope helps determine the minimum speeds and weight an airplane is able to fly at. A large flight envelope allows an airplane to fly at many different combinations.
Flow separation – condition where air traveling over a surface no longer remains attached to that surface. Flow separation creates a type of drag known as pressure drag.

Flow separation - air stream becoming detached from the aircrafts surface, resulting in swirls that cause increased drag and less lift
Flutter-suppression – to eliminate or suppress vibrating objects
Flutter-suppression systems - systems that help a plane maintain control
Fly-by-Wire – Flight control system that uses electronic digital signaling
Fly-By-Wire - To fly an aircraft electronically without the assistance of a pilot
Fly-By-Wire - computer aided flying. Computer interprets desired movements from flight controls them performs the actions necessary.
Fly-by-wire - flight control system where controls are operated electrically rather than mechanically
Foxbat - the USSR's answer to the design in the US of fast, high- flying aircraft as the B-70, F-108 and SR-71
Foxbat - MiG-25, capable of climbing over 123,000 ft.
Foxbat - name for the soviet MiG-25
Free flights - test flights designed to research maneuverability and aerodynamic aspects of the aircraft without a specific schedule; planned as tests proceed.
Friction - the force of the air on the aircraft changing the way the craft performs.
FRR - Flight Readiness Review
Fuselage – the central body of an aircraft, to which the wings and tail assembly are attached and which accommodates the crew, passengers, and cargo.
Fuselage skin - Outer covering of the air-frame.
Fuselage - the central body or portion of an aircraft designed to accomadate the crew and the passengers or cargo.
Gain - The multiplying factor when amplifying an electrical signal
Gear Up Landing - landing gear is locked up and does not open for landing
Glider - a lightweight, engineless aircraft that glides after being towed/launched
Ground checkouts - manually inspecting an aircraft while it is on the ground
Hangar - a shelter especially for housing or repairing aircraft.
Heat transfer - the exchange of heat energy between a system and its surrounding environment, which results from a temperature difference and takes place by means of a process of thermal conduction, mechanical convection, or electromagnetic radiation.
Heat transfer - the surface of high speed aircraft being heated by convection.
Highly Maneuverable Aircraft Technology (HiMAT) - Aircraft technology designed for excellent maneuverability at supersonic speeds.
Hinge-moment – is when the surface pressure is distributed and altered, (a hinge moment coefficient)
Horizontal stabilizer – the tail piece that keeps the plane level and allows it to climb or descend.
Horizontal Stabilizer - an airfoil providing stability for an airplane; specifically : the fixed horizontal member of the tail assembly
Horizontal stabilizers - help to keep the plane horizontal, are able to move up or down.
Hypersonic – Faster than Mach 4.
Hypersonic – relating to speeds above that of sound
Hypersonic - speeds at or above mach 5
Hypersonic - flight of speeds at or over 5 times the speed of sound in air
Hypersonic - at or above mach 5 (5 times the speed of sound), usually referring to aircraft

Hypersonic flight - flying at more than 5 times the speed of sound.
Hypersonic - relating to speed five or more times that of sound in air
Hypersonic turbulent boundary layer - the fluid particles in the boundary layer as you approach hypersonic speeds that move in random paths but in which viscous stresses are dominant.
Hypersonic Turbulent Boundary Layer – The great turbulence that affects an aircraft as it attempts to break the sound barrier.
Hypersonic Turbulent Boundary Layer - As you get up to certain speeds and you hit the hypersonic range the airflow dynamics change drastically and much like there is the sound barrier there exists this thermal barrier, and there is a rapid increase in temperatures as the airflow along the surface of the aircraft.
Impinging - To fall or dash against; to touch upon; to strike; to hit; to crash with.
Impinging - to strike or dash especially with a sharp collision
Impulse - An impelling force; an impetus or the motion produced by such a force.
Impulse - Physics: a vector quantity given by the integral over time of the force acting on a body, usually in a collision in which the time interval is very brief, it is equal to the change in the momentum of the body.
Inconel ventral fin - a nickel-based alloy fin in the rear of the airplane that contains chromium and iron
Inconel Ventral Fin - wing near the main body of an aircraft and made of a nickel-base alloy with chromium and iron
Indicative - serving to point out, a sign or symptom of a serious condition
Inertia – property of matter that tends to remain at rest
Inertia - The tendency of a body to remain at rest or to stay in motion unless acted upon by an external force; resistance to motion or change.
Inertial coupling - when two forces are acting parallel to one another but in opposite direction, causing rotation. It is capable of causing aircraft to spin out of control.
Inertial Coupling - Fighter aircraft with high roll rate capability often experience another coupling phenomenon known as "inertial coupling". Inertial coupling may occur if there is a large difference between the roll moment of inertia and the yaw or pitch moments of inertia for the airplane. This is often the case for fighters which have short stubby wings (low roll inertia) and long fuselages with heavy engines, electronics, fuel, etc. (high pitch and yaw inertia). When such an airplane is exposed to high roll rates along the fuselage axis, the high mass concentration along the fuselage may cause it to behave like a "dumbbell". The centrifugal force due to the roll will cause the nose and tail to try to swing out perpendicular to the rotation axis.
Inertial System - A system of inertia-measuring detectors on an aircraft.
Inertial system - A reference system where Newton’s second law is exactly valid.
Inhibit – to restrain
Interconnect ratio – To enhance the roll control, the M2-F2 was equipped with a roll-yaw interconnect. This system mechanically linked aileron commands to the rudder through a ratio changer that was controlled by the pilot. The pilot could vary the amount of rudder created by an aileron command from 0 to 100 percent (that is, from no rudder, to equal amounts of rudder and aileron). The interconnect ratio was referred to as the "KRA" setting. The rudders could also be operated by the pilot's rudder pedals. (directly from http://www.dfrc.nasa.gov)

Invariant - used to describe a quantity or set of quantities that is not changed by a designated mathematical operation such as the transformation of coordinates
Invert – to flip vertically
Jet Wake Dispersion – the spread of a jet engines exhaust wake following ejection from the jet manifold
Jet wake dispersion - the spreading of the air moved by jet's passage through the air
Jettison - Throwing cargo overboard to lighten the load when in distress.
Jettison - To cast overboard or off.
Jettison - To discard (something) as unwanted or burdensome
Jettison - To discard or throw out at a high speed.
Jettison - throwing cargo off an aircraft
Knot - A unit of speed, also called a nautical mile, which equals approximately 1.15 statute miles per hour.
Lakebed Landings - Landing on one of the four lakebed runways at Edwards Air Force. Called Lakebed because they are in the ruminates of what used to be a lake and is now just a dry flat deserted area.
Laminar - in or consisting of, thin plates or layers; having the form of a thin plate or lamina
Laminar - smooth
Laminar flow - A type of flow in a liquid or gas in which neighboring layers do not mix and flow at different velocities.
Laminar flow - Streamline flow of a fluid in which the fluid moves in layers without fluctuations or turbulence so that successive particles passing the same point have the same velocity. It occurs at low Reynolds numbers, i.e. low velocities, high viscosities, low densities or small dimensions. The flow of lubricating oil in bearings is normally laminar because of the thinness of the lubricant layer
Laminar flow - When fluid flows smoothly without vortices or other turbulence.
Laminar - streamline flow in a fluid body near a solid boundary
Landing flaps - Control surfaces on the craft manipulated to slow the crafts air-speed when approaching landing.
Landing Flare - Navigation: the adoption by an aircraft of a nose-up attitude immediately before landing, so that the main landing gear touches down before the nose gear
Landing flare – Landing flare describes the pitch up step of the nose right before landing an aircraft to allow the rear wheels to contact first and the nose wheel to touch afterwards.
Lateral - directional handling-How well an aircraft can turn
Latitude - The angular distance north or south of the earth's equator, measured in degrees along a meridian, as on a map or globe.
Lift – a component of the total aerodynamic force acting on an airfoil which causes an aircraft to fly
Lifting Bodies – wingless vehicle that generates aerodynamic lift from the shape of the vehicle rather than wings. Examples of these lifting bodies are HL-10,the X-24, and more recently the Space Shuttle.
Lifting body - The concept of lifting body aircraft is all about generating lift from it's body itself without the aid of wings. Such airplanes use wings only for their stabilizing and steering effects. There are other concepts which fly using wings with the body contributing a smaller but significant amount of lift. At NASA ,lifting bodies started off as a more efficient shape for missile warheads(such a warhead could fly and guide itself rather than simply falling on

it's target). The scientists originally wanted a shape that could survive the atmospheric reentry more easily. The first fruit of the initial studies was the M2. It was tested by towing it behind a car, and later by an airplane (R4D / C-47) to allow free fall flights from 12,000 ft. Max speeds reached were 100 to 120 mph. A total of 400 ground tows and 77 flights were conducted. The M2-F1 was made of plywood. The highly successful M2-F1 was followed by M2-F2,M2-F3,HL-10,X-24A and lastly the X-24B. These were all made of metal. They were dropped from the same B-52 that was used in the X-15 program. M2-F3 reached an altitude of 71,500 ft and a speed of Mach 1.6. The HL-10 was the fastest and highest of all and reached Mach 1.86 and +90,000 ft. Power was derived from a rocket engine. After more or less being forgotten, the lifting body has staged a comeback in the form of viable space transport like the Venture Star, ISS Crew Return Vehicle (CRV) and the Russian EKIP. The Venture Star, in concept as the X-33 was however cancelled in March 2001. The X-38 program continues.

LLRV - Lunar Landing Research Vehicle

Longitude - Angular distance on the earth's surface, measured east or west from the prime meridian at Greenwich, England, to the meridian passing through a position, expressed in degrees (or hours), minutes, and seconds

Longitudinal-Control-System Limit-Cycle - A continuing cycle initiated from vibration, oscillation, or without decay of the control pitch about the lateral axis of the aircraft.

Low lift-over-drag vehicle – A vehicle with a low lift-over-drag ratio such as the M2-F1, HL-10, and X-24A

Lunar Landing Research Vehicle (LLRV) - The two LLRVs were shipped disassembled from Bell to the FRC in April 1964. Built of tubular aluminum like a giant four-legged bedstead, the vehicle was to simulate a lunar landing profile from around 1500 feet to the moon's surface. To do this, the LLRV had a General Electric CF-700-2V turbofan engine mounted vertically in gimbals, with 4200 pounds of thrust. The engine, using JP-4 fuel, got the vehicle up to the test altitude and was then throttled back to support five-sixths of the vehicle's weight, simulating the reduced gravity of the moon. Two hydrogen-peroxide lift rockets with thrust that could be varied from 100 to 500 pounds handled the LLRV's rate of descent and horizontal translations. Sixteen smaller hydrogen-peroxide rockets, mounted in pairs, gave the pilot control in pitch, yaw, and roll.

Lunar Landing Research Vehicles - A NASA simulator during the Apollo missions to profile the descent to the moon's surface.

Lunar Landing Training Vehicles (LLTVs) - This free-flying lunar landing training vehicle (LLTV), developed at the Flight Research Center in California and built by Bell Aerosystems, was a skeleton framework of tubing supporting a control station, fitted in the center with a downward-thrusting jet engine to offset five-sixths of its weight and on the periphery of the structure with a group of small thrusters to provide attitude and directional control. It was a skittish and somewhat unstable vehicle; on two occasions in 1968 pilots had to eject from it. Nonetheless, it was the only device that could accurately simulate the last few hundred feet of the lunar landing approach and commanders of lunar landing missions and their backups were required to perform as many landings in the LLTV as time permitted.

Mach - The ratio of the speed of an object to the speed of sound in the surrounding medium; for example, an aircraft moving twice as fast as the speed of sound is said to be traveling at Mach 2

Mach - unit used to measure the speed of an aircraft; found by taking the speed of the aircraft and dividing it by the speed of sound.

Mach - the speed of sound at sea level (760 ft/s).
Mach - one mach equals the speed of sound where the aircraft is flying
Mach - The ratio of the speed of an object to the speed of sound in the surrounding medium.
Mach number - The number of times the speed of sound.
Mach number envelope – The fastest a vehicle can reach
Mach Number - the ratio of the speed of an object to the speed of sound in the surroundings
Malfunction - a failure to function normally v : fail to function or function improperly
Maneuver Control - The ability to control the aircraft with respect to handling turns and flight. The higher the maneuverability, the easier the plane is to control in smaller amounts of space.
MH-96 - Minneapolis-Honeywell flight-control system
MIL specs - Military specifications
Model Fidelity - how accurate the model is in representing the actual design
Modify – to change
Monoplane - An airplane with only one pair of wings.
Monoplane - a single winged aircraft.
Muroc Army Air Field - established June 25, 1951, installed on a dry lake in a remote area to test classified aircraft.
NACA - the National Advisory Committee for Aeronautics transonic speeds--- relating to speeds near or around that of sound in air or around 741 miles per hour.
NACA - National Advisory Committee for Aeronautics. This organization worked on airfoils, engine cowls, etc. through WWI and WWII, working with the military regularly. After Bureaucratic R&D problems and other complications, Eisenhower formed NASA to replace NACA.
NASA FRC – The NASA Flight Research Center. Now called NASA Dryden, it is the smallest of all NASA field centers. It has been a part of Langley from 1945 through to about 1956. From 1956 to 1982, it was separate as a Center unto NASA. First as the "NASA Flight Research Center" (you'll see this in old documents as "NASA FRC" or "NACA FRC") up to 1976, when it was renamed the NASA Dryden Flight Research Center. M2-F1, M2-F2, M2-F3, HL-10, X-24A, X-24B – These aircraft, as explained in earlier sections of this handout, are NASA's low cost lifting bodies that preceded research for the shuttle.
NASA - National Aeronautics and Space Agency
Nose chute - a parachute that ejects from the nose of the plane to save control in spins
Nose Gear - front landing gear
Nose gear scoop door – small door meant to help the extension of the nose gear in an aerodynamic fashion
Nose strake - system designed to control the vortices shed by the nose of an aircraft at high angles of attack
Nose strake - a continuous band of hull planking or plates along the nose
Nose-down pitching moment - Occurs when the angle of attack becomes too great and the nose is pulled down.
Nose-up elevator - A force that pushes the tail of the craft down causing the nose to come up.
Notch Filter - a device designed to reduce the resonance exhibited by landing gear when and aircraft lands.
On-board diagnostic system – an onboard system that runs checks on the parts of the aircraft
Optimize - to make as effective, perfect, or useful as possible

Oscillation – periodic motion of a particle moving forward and backward continuously over the same path
Oscillation - repeated motion back and forth past a central neutral position, or position of equilibrium.
Oscillation - The act of oscillating; a swinging or moving backward and forward, like a pendulum; vibration.
Oscillation - the act of swinging back and forward, much like the movement of a pendulum.
Panacea – remedy for diseases and troubles
Paragliders – Personal backpack-style aircraft engine with a parachute for powered gliding, also called paramotor.
Paraglider - usually recreational aircraft containing a large parafoil and a harness from which a rider hangs while gliding through the air
Periodic Motion – any motion that repeats itself over a period of time in equal intervals
Pilot – person who operates the flying controls of an aircraft
Pilot Induced Oscillation (PIO) – An unwanted flight path caused by the pilot over-controlling the vehicle
Pilot-induced oscillation – a series of up and down movements resulting from pilot error
Pilot-induced oscillation - a swinging of the plane from one direction to another repeatedly
PIO – Pilot Induced Oscillations. This is what happened to the M2-F2 where the pilot comes in at a certain angle of attack to land and the aircraft begins to suddenly shake and go into violent rolling motions where the pilot loses control.
PIO - pilot induced oscillation-spinning out of control due to something in the pilot's control
Pitch – Degree of deviation from a horizontal plane.
Pitch - the angle between the plane passing through a propeller blade and the plane of rotation of the propeller
Pitch - The degree of slope of an inclination
Pitch - The alternate lift and descent of the nose and tail of an airplane
Pitch - To oscillate about a lateral axis so that the nose lifts or descends in relation to the tail. Used of an aircraft. To oscillate about a lateral axis that is both perpendicular to the longitudinal axis and horizontal to the earth. Used of a missile or spacecraft.
Porpoised -Wavered back and forth, or up and down
Powerplant - an engine and related parts supplying the motive power of a self-propelled object
Predictive capability - ability to declare or foretell on the basis of observation, experience, or scientific reason
Pressurize - to maintain near-normal atmospheric pressure in during high-altitude or space flight
Primary control mode - the main control mode that is used on an aircraft
Proof loading - Testing materials for strength under pressure by weight, g-forces, etc. Applied to aircraft, it is where structures such as wings are tested to see if they can withstand flight conditions.
Propellant - Something, such as an explosive charge or a rocket fuel, that propels or provides thrust
Propellant tanks - tanks that hold aviation fuel
Proprietary - owning the exclusive rights towards information preventing exchange of information

Propulsion - The act driving forward or away; the act or process of propelling
Propulsion - The system on an aircraft that enables the plane to move in the desired direction, which in most case is in the forward direction.
Propulsion - The act or process of to drive forward or onward by or as if by means of a force that imparts motion
Prototype - a full-scale working model of an aircraft, used in testing to determine actual performance.
Prototype - the first full-scale and functional form of a new type of design or construction
Ram air - Air that is compressed by the craft as it approaches the combustion chamber.
RAM JET - There are several different types of jet engines. The simplest is the ramjet, which takes advantage of high speed to ram or force the air into the engine, eliminating the need for the spinning compressor section. This elegant simplicity is offset by the need to boost a ramjet to several hundred miles an hour before ram-air compression is sufficient to operate the engine.
Ramjet - A jet engine that propels aircraft by igniting fuel mixed with air taken and compressed by the engine in a fashion that produces greater exhaust than intake velocity.
Ramjet - The simplest form of all jet engines.
Ramjet - a jet engine that propels aircraft by igniting fuel mixed with air taken and compressed by the engine in a fashion that produces greater exhaust than intake velocity.
Ramjet - simple type of jet engine launched at high speeds which ignites fuel with compressed air from the engine
Ratio – relationship between two amounts
Reaction Control System - System that distributes propellant to engines.
Reconnaissance – the exploration or examination of an area, especially to gather information about the strength and positioning of enemy forces
Reference - a point of view
Remote measuring device - a device used to record information about a remote object or event and transmit it to an observer
Remotely Piloted Research Vehicles - Unmanned aircraft that are used to collect scientific data
Resonance - The increase in amplitude of oscillation of an electric or mechanical system exposed to a periodic force whose frequency is equal or very close to the natural undamped frequency of the system.
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Resonance - The increase in amplitude of oscillation of an electric or mechanical system exposed to a periodic force whose frequency is equal or very close to the natural undamped frequency of the system.
Resonance - large oscillation at a natural frequency: increased amplitude of oscillation of a mechanical system when it is subjected to vibration from another source at or near its own natural frequency
Reynold's Number Range - A parameter equal to the product of the velocity of an airplane passing through air and length divided by air viscosity. It serves to compare the wind tunnel data of smaller aircraft models and the actual full-size airplanes
Reynold's Number - a non dimensional parameter equal to the product of the velocity of an

airplane passing through a fluid, the density of the fluid and a representative length, divided by the fluid's viscosity. It is used to compare data from wind-tunnel models with that from full-sized airplanes or components.
Rocket-plume induced flow separation – a type of flow separation caused by the exhaust of a rocket motor.
Roll - A maneuver in which an airplane makes a single complete rotation about its longitudinal axis without changing direction or losing altitude.
Roll - a midair flight maneuver in which an aircraft maintains the same height and direction while doing a single complete rotation about its lengthwise axis
Roll coupling - pair of forces of equal magnitude acting in parallel but opposite directions, capable of causing rotation but not translation.
Roll Coupling - Roll coupling is the relationship of the roll resistance of the front and the roll resistance of the rear.
Roll - To sway or rock from side to side
Rudder - a movable auxiliary airfoil on an airplane usually attached at the rear end that serves to control direction of flight in the horizontal plane
Rudder - a movable airfoil usually attached at the rear end that serves to control direction of flight in the horizontal plane.
Rudder - aileron interconnect ratio – a ratio that keeps the aircraft in lateral control
Sagebrush - a bush-like plant
Sailplane - a light glider used especially for soaring
SAS - Stability Augmentation System
Servo-actuator – In a helicopter the pedal motion positions the tail rotor blade angle.
Servo-actuator - positions elevons located on the trailing edges by being supplied with hydraulic pressure
Shock Impingement - the collision of shock waves with something
Shock Wave - a high amplitude compression wave due to an explosion or supersonic motion of an object
Shock wave - large-amplitude compression wave produced by supersonic motion of body in a medium
Shuttle Carrier Aircraft (SCA) – one of two modified Boeing 747 jetliners used to ferry space shuttle orbiters from landing sites back to the launch complex at the Kennedy Space Center and also to and from other locations too distant for the orbiters to be delivered by ground transportation
Sidearm Controller - A type of aircraft control mechanism by which the pilot controls the plane with only his wrist, precluding any input from his arms caused by strong outside forces.
Sideslip - To slide sideways through the air in a downward direction in an airplane along an inclined lateral axis.
Sideslip - To fly sideways and downward in an airplane along the lateral axis to reduce altitude without gaining speed or as the result of banking too deeply
Simulator – to reproduce the results of a test through a model
Simulator – a device or computer program which allows the user to show realistic scenarios that can occur while operating a system
Simulator - one that simulates, especially an apparatus that generates test conditions approximating actual or operational conditions.
Skin Friction – The force created by air traveling over the surfaces of an aircraft during high

speed flight.
Sound Barrier - the point when an aircraft approaches the speed of sound. If broken a "boom" is heard.
Spad - built in France at the end of WWI. This fighter (Spad XIII) served well into the 1920's in seven countries. Flown by famous people like Capt. "Eddie" Rickenbacker.
Spad - airplane built at the end of World War I and flown by the French, Italian, and Belgian forces
Spin testing – exploring the characteristics of the aircraft while in a spin and coming out of the maneuver
Spin testing - Used to test the visual accuracy of a craft while it is spun in increments of 5 degrees through an approximately 180 degree turn
Squat Switch - switch that deactivates SAS on main-gear touchdown
Squat Switch - a device used to control the landing gear
Stability - A concept that describes the smoothness in flight of an aircraft.
Stability – being stable
Stability Augmentation System – A System that provides more pitch stability through the use of the control surfaces.
Stability Augmentation System (SAS) - Aids the pilot in controlling an unstable craft through computer augmentation of the control systems.
Stability Augmentation System - (SAS) self-sustaining control system
Stability - and control derivatives-a model of how and aircraft handles
Stabilizer - An airfoil that stabilizes an aircraft or a missile in flight.
Stabilizer - an airfoil that stabilizes an aircraft or missile in flight.
Stabilizers - an airfoil or combination of airfoils that keeps an aircraft or missile aligned with the direction of flight
Stall - loss of lift due to an acute wing angle, often caused by insufficient speed
Stall - loss of lift due to an acute wing angle, often caused by insufficient speed.
stall - A condition in which an aircraft or airfoil experiences an interruption of airflow resulting in loss of lift and a tendency to drop.
Stall-inhibitor - a computer system that prohibits an aircraft from reaching stalling speeds.
Stick pusher - a device used to prevent and airplane from pitching up
Straight-wing - wings that are not angled, most often found in old fashion airplanes.
Strake – A single continuous line of metal plating extending on a vessel's hull from stem to stern, for stability purposes
Structural - A part of a structure that bears a weight, or the structural piece used for such a part
Structural Resonance - The resonance that is incurred on the structure of an aircraft
Structural Resonance – Vibrating of the vehicle's body.
Structural resonance - Vibration within the actual structure, results in fatigue over time.
Strut - a structural piece designed to resist pressure in the direction of it's length
Subsystem – a small circuit which is a part of a large whole
Subsystem - a system that is part of some larger system
Subsystem - partial components of a specific system
Supercritical - able to sustain a chain reaction in such a manner that the rate of reaction increases
Supercritical - Able to sustain a chain reaction in such a manner that the rate of reaction

increases.
Supercritical Wing - a wing which reduces the effect of shock waves on the upper surface near Mach 1, which in turn reduces drag
Supercritical wing - Even though an aircraft might not be flying at supersonic speeds, it is possible that the airflow over the aircraft, especially over the wings, can reach the point where it reaches supersonic speed and there is a sudden and dramatic increase in drag. The airspeed at which this occurs is called the critical Mach number. On a typical wing, the location where the airflow speed exceeds Mach 1 is usually near the wings midpoint. Here the typical wing has its greatest curvature and the air is moving at its fastest velocity. In the mid-1960s, Dr. Richard Whitcomb of NASA began his research on the supercritical wing. The supercritical wing has a special design that delays formation of a shock wave until a higher critical speed. The resultant drag rise is also delayed. Surprisingly, the supercritical wing is considerably thicker and reduce the same lift-to-drag ratio. Thus, the designer can either keep the same thickness and reduce the drag, or maintain the same drag and have a thicker wing. Actually, supercritical wings are not only of use on high-speed aircraft, but also are of benefit to commercial and general aviation aircraft, which fly much slower.
Supercritical Wings - wings able to sustain a chain reaction in such a manner that the rate of reaction increases.
Supercritical wings - wings that instead of being perpendicular to the body of the airplane, are angled back
Supersonic - Having, caused by, or relating to a speed greater than the speed of sound in a given medium, especially air.
Supersonic – produced by, capable of reaching, or relating to a speed that is faster than the speed at which sound travels through air
Supersonic - speeds greater than that of sound in a medium, especially air.
Supersonic Speed - reaching speeds from one to five times the speed of sound in air.
Supersonic - moving at speeds greater than the speed of sound.
Supersonic - flight of speeds from 1 to 5 times the speed of sound in air.
Supersonic - reaching a speed great than the speed of sound in a certain medium
Suppression - Prohibit, restrain, not allow
Suppression - the prevention of the development of a technology or device
Swept-wing - the wings are angled backwards, or sometimes forward; this allows for better aerodynamics, especially during supersonic transition.
System cycles - testing all of the systems of an aircraft by running them
Tail chute - a parachute that ejects from the tail of the plane to save control in spins
Tail-cone – a cone shaped object extending from the tail of the shuttle that houses the majority of the shuttle's avionics
Tail-cone fairing – rear covering of the main engines that reduces aerodynamic drag and turbulence
Tare – deduction from the gross weight of a substance and its container in allowance for the weight of the container
Tares – counterweight
Tares - pressure tares or misalignments
Technique - a method of doing something
Telemeter – apparatus to record an instrument that is at a distance by radio
Telemetry - The science and technology of automatic measurement and transmission of data

by wire, radio, or other means from remote sources, as from space vehicles, to receiving stations for recording and analysis.
Telemetry - The science and technology of automatic measurement and transmission of data by wire, radio, or other means from remote sources, as from space vehicles, to receiving stations for recording and analysis.
Telemetry - a process by which information is sent using special equipment. A typical telemetering system consists of an input device called a transducer, a medium of transmission (usually radio waves), equipment for receiving and processing the signal, and recording or display equipment.
Telemetry - receiving data from sensors at a remote location
Theoretical - speculations often in contrast to practical applications, abstract or unproven
Thermal - Relating to or associated with heat; "thermal movements of molecules"; "thermal capacity"; "thermal energy"
Thrust - A driving force or pressure. The forward-directed force developed in a jet or rocket engine as a reaction to the high-velocity rearward ejection of exhaust gases.
Thrust – force produce by a propeller, jet engine, or rocket
Thrust Chambers – The part of a rocket engine that takes in propellant burns it and sends the exhaust gasses out of the chamber to accelerate the rocket.
Thrust chambers - Changes exhaust volume to provide thrust.
Thrust - the force that is produced by a rocket or propeller that drives a plane forward.
Total Impulse – a measure of the overall total energy contained in a motor.
Tow-Line - TOWROPE; A LINE USED IN TOWING SOMETHING.
Towplane - plane used for towing a glider through the air
Transient - A short-lived oscillation in a system caused by a sudden change of voltage or current or load.
Transient - Not lasting long; short-lived; passing through a place with only a brief stay .
Transient - a temporary oscillation that occurs in a circuit because of a sudden change of voltage or of load
Transonic – close to the speed of sound; moving at a speed that is between subsonic and supersonic.
Transonic - Of or relating to aerodynamic flow or flight conditions at speeds near the speed of sound
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Transonic - Of or relating to aerodynamic flow or flight conditions at speeds near the speed of sound.
Transonic - of or relating to aerodynamic flow or flight conditions at speeds near the speed of sound.
Transonic - super sonic speeds
Transonic Aerodynamics - Aerodynamics of an aircraft which allow it to achieve and maintain transonic flight.
Transonic efficiency -The efficiency of an airplane when passing from subsonic to supersonic speed
Transonic flight regime - the flight speed directly before the speed of sound
Transonic- of or relating to aerodynamic flow or flight conditions at speeds near the speed of sound.

Transonic region - characterized by unsteady flow as local waves of subsonic flow and supersonic flow vie for supremacy.
Transonic Speed - The range of velocity from approximately Mach 0.8 to Mach 1.2.
Transonic Speed - relating to the speeds near that of sound in air, especially with the speeds slightly below the speed of sound in which speed of airflow varies from subsonic to supersonic at different points of the body of motion.
Transonic - speeds near the speed of sound transitioning between subsonic and supersonic
Transonic - being or relating to speeds near that of sound in air or about 741 miles (1185 kilometers) per hour at sea level and especially to speeds slightly below the speed of sound at which the speed of airflow varies from subsonic to supersonic at different points along the surface of a body in motion relative to the surrounding air
Transonic - being or relating to speeds near that of sound in air or about 741 mph
Triple-sonic fighter - a fighter that is capable of traveling Mach 3.
T-tail deep - this term refers to "deep stall" on an aircraft that has a t shaped tail and is an almost unrecoverable stall
Turbojet - a jet engine in which a turbine drives a compressor that supplies air to a burner and hot gases from the burner drive the turbine before being discharged rearward
Turbulence - the flow of a fluid (such as air) in which the velocity at a given point changes rapidly in magnitude and direction.
Turbulent boundary layer - the point where the structure of an aircraft can no longer stay in tact due to the effect of the turbulence.
Turbulent flow - a fluid flow in which the velocity at a given point varies erratically in magnitude and direction
Unconventional - irregular, deviating from traditional methods
Uplink – method of communication from ground to the aircraft
Uplink - Information that is sent from control to the aircraft
Validate – to put into effect
Variable - stability aircraft-An aircraft that is able to change certain variables to simulate other types of aircraft
Vehicle – a device of transport
Ventral - having a position located on the underside of something
Vertigo - a disordered state in which the individual or individual's surroundings seem to whirl dizzily.
Viability - Having the capability of succeeding, living
Viscid - Sticky, having an adhesive quality.
Wind gust - A sudden squall; a violent blast of wind; a sudden and brief rushing or driving of the wind
Wind Tunnel - a chamber through which air is forced at controlled velocities in order to study the effects of aerodynamic flow around airfoils, scale models, or other objects.
Wind Tunnel - a chamber in which air is forced at controlled speeds, used to study the effect of aerodynamic flow around objects
X-15 - Plane that almost goes to the edge of the atmosphere and almost into space.
XS-1 - was the first aircraft to travel faster than sound, with the pilot charles yeager, had a wingspan of 8.53 meters, length of 9.41 meters, height of 3.31 meters, and had a weight of 7000 pounds when empty.
Yaw - to turn about the vertical axis or move unsteadily