



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

AERONAUTICAL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	AIRCRAFT PERFORMANCE
Course Code	:	AAE011
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Semester	:	V
Branch	:	Aeronautical Engineering
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Course Faculty	:	Dr. Yagya Dutta Dwivedi, Dr. Prasanta Kumar mohanta

OBJECTIVES:

I	To help the students to remember terminologies and nomenclatures used in the syllabus.
II	To define few new words / terminology/nomenclature related to aircraft performance.

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CLO	CO	CLO Code
UNIT-I						
1	Define standard Atmosphere	The International Standard atmosphere (ISA) is a static atmospheric model of how the pressure, temperature, density, and viscosity of the Earth's atmosphere change over a wide range of altitudes or elevations. It has been established to provide a common reference for temperature and pressure and consists of tables of values at various altitudes, plus some formulas by which those values were derived.	Remember	CLO1	CO1	AAE011.01
2	Define off standard atmosphere	The non standard atmosphere is known as off standard atmosphere.	Remember	CLO1	CO1	AAE011.01
3	Define Air-data.	The data which gives airspeed, Mach number, altitude and its trends are known as air data.	Remember	CLO1	CO1	AAE011.01
4	Define Air-data computers	An air data computer (ADC) is an essential avionics component found in modern glass cockpits. This computer, rather than individual instruments, can determine the calibrated airspeed, Mach	Remember	CLO1	CO1	AAE011.01

S.No	QUESTION	ANSWER	Blooms Level	CLO	CO	CLO Code
		number, altitude, and altitude trend data from an aircraft's Pitot-static system				
5	Define lift	Lift is the force acting perpendicular to the direction of the relative velocity. This force makes the aircraft to airborne.	Remember	CLO1	CO1	AAE011.01
6	Define drag	Drag is the force which tries to oppose the motion, act parallel to the relative speed.	Remember	CLO1	CO1	AAE011.01
7	Define pitching moments	The moment which try to make nose up or down called pitching moments	Remember	CLO1	CO1	AAE014.01
8	Define center of pressure	Center of Pressure The center of pressure is the point where the total sum of a pressure field acts on a body. In aerospace, this is the point on the airfoil (or wing) where the resultant vector (of lift and drag) acts.	Remember	CLO1	CO1	AAE011.01
9	Define aerodynamic center	Aerodynamic Center The resultant (or the pressure forces) also cause a moment on the airfoil. As the angle of attack increases, the pitching moment at a point (for example, the center of gravity) also changes. However, the pitching moment remains constant at a particular point, which is called the aerodynamic center	Remember	CLO1	CO1	AAE011.01
10	What is propulsive force	The force which acts opposite to the drag and pulls the aircraft and give motion.	Remember	CLO2	CO1	AAE011.02
11	What is EOM	EOM is Equations of the Motion, and are useful to find performance of the aircraft.	Remember	CLO2	CO1	AAE011.02
12	Define aerodynamic characteristic	The performance of a given airfoil profile as related to lift and drag, to angle of attack, and to velocity, density, viscosity, compressibility, and so on.	Remember	CLO2	CO1	AAE011.02
13	Define minimum drag speed	Minimum Drag Speed. For level flight Lift = Weight, so the required lift at the various airspeeds should be constant. The speed at which minimum drag occurs is the same as the point at which max L/D or minimum D/L occur.	Remember	CLO2	CO1	AAE011.02
14	Define thrust specific fuel consumption	Thrust-specific fuel consumption is the fuel efficiency of an engine design with respect to thrust output. TSFC may also be thought of as fuel consumption per unit of thrust. It is thus thrust-specific, meaning that the fuel consumption is divided by the thrust.	Remember	CLO2	CO1	AAE011.02
15	Define mach number.	A number representing the ratio of the speed of an object to the speed of sound in the surrounding air or medium in which it is moving.	Remember	CLO2	CO1	AAE011.02
16	Define specific power	The power-to-weight ratio (Specific Power) formula for an engine (power plant) is the power generated by the engine divided by the mass.	Remember	CLO3	CO1	AAE011.03
17	Name drag reduction methods	1. Winglet, 2. Vortex generator, 3. Smoothness of the body.	Remember	CLO3	CO1	AAE011.03
18	Define wave drag	Wave Drag is a force, or drag, that retards the forward movement of an airplane, in	Remember	CLO3	CO1	AAE011.03

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		both supersonic and Transonic Flight, as a consequence of the formation of shockwaves				
19	Define airfoil camber	Camber is the asymmetry between the two acting surfaces of an aerofoil, with the top surface of a wing commonly being more convex. An aerofoil that is not cambered is called a symmetric aerofoil	Remember	CLO3	CO1	AAE011.03
20	Define chord	Chord is airfoil length while joining leading edge to trailing edge.	Remember	CLO3	CO1	AAE011.03
UNIT-II						
1	Define range	The maximum distance travelled by an aircraft in given full fuel capacity.	Remember	CLO5	CO2	AAE011.05
2	Define endurance	The maximum time sustained in air by an aircraft in given full fuel capacity.	Remember	CLO5	CO2	AAE011.05
3	Define thrust	Thrust is the force produced by the engine to counter the airplane drag.	Remember	CLO5	CO2	AAE011.05
4	Define cruise	Cruise is a flight phase that occurs when the aircraft levels after a climb to a set altitude and before it begins to descend. Cruising usually consumes the majority of a flight, and it may include changes in heading (direction of flight) at a constant airspeed and altitude.	Remember	CLO5	CO2	AAE011.05
5	Define angle of attack	The angle between the line of the chord of an aerofoil and the relative airflow.	Remember	CLO5	CO2	AAE011.05
6	Define aircraft performance	Airplane performance can be defined as the capability of an airplane to operate effectively while serving a specific purpose. Among the elements of performance are takeoff and landing distances, rate of climb, ceiling, speed, payload, and fuel economy.	Remember	CLO5	CO2	AAE011.05
7	Define wing loading	The lift produced by the wing per unit area is called wing loading.	Remember	CLO5	CO2	AAE011.05
8	Define drag polar	The drag polar is the relationship between the lift on an aircraft and its drag, expressed in terms of the dependence of the drag coefficient on the lift coefficient. It may be described by an equation or displayed in a diagram called a polar plot.	Remember	CLO5	CO2	AAE011.05
9	Define stall	The angle at which maximum lift is produced.	Remember	CLO6	CO2	AAE011.06
10	Define flow separation	All solid objects traveling through a fluid acquire a boundary layer of fluid around them where viscous forces occur in the layer of fluid close to the solid surface.	Remember	CLO6	CO2	AAE011.06
11	Define L/D Ratio	The ratio between the lift produced by the wing and the drag is called L/D ratio and is primary performance parameter.	Remember	CLO6	CO2	AAE011.06
12	Define V-speed	V-speeds are standard terms used to define airspeeds important or useful to the (In discussions of the takeoff performance of military aircraft, the term V ref stands for refusal speed	Remember	CLO7	CO2	AAE011.07

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13	Define cruise ceiling	The cruise ceiling, on the other hand, is the altitude at which the maximum climb rate is 300 fpm, though I've not seen it used much	Remember	CLO7	CO2	AAE011.07
14	Define service ceiling	The service ceiling is the altitude at which the aircraft is unable to climb at a rate greater than 100 feet per minute	Remember	CLO7	CO2	AAE011.07
15	Define absolute ceiling	At the absolute ceiling, there is no excess of power and only one speed will allow steady, level flight.	Remember	CLO7	CO2	AAE011.07
16	Define glide distance	The distance travelled by the airplane when engine is cut off.	Remember	CLO7	CO2	AAE011.07
17	Define density altitude	The density altitude is the altitude relative to standard atmospheric conditions at which the air density would be equal to the indicated air density at the place of observation. In other words, the density altitude is the air density given as a height above mean sea level.	Remember	CLO7	CO2	AAE011.07
18	Define VS	Stall speed or minimum steady flight speed for which the aircraft is still controllable	Remember	CLO7	CO2	AAE011.07
19	Define VS0	Stall speed or minimum flight speed in landing configuration	Remember	CLO7	CO2	AAE011.07
20	Define VS1	Stall speed or minimum steady flight speed for which the aircraft is still controllable in a specific configuration]	Remember	CLO7	CO2	AAE011.07
UNIT-III						
1	Define climb	A climb is the operation of increasing the altitude of an aircraft. It is also the logical phase of a typical flight (the climb phase or climb out) following takeoff and preceding the cruise. During the climb phase there is an increase in altitude to a predetermined level.	Remember	CLO9	CO3	AAE011.09
2	Define descent	A descent during air travel is any portion where an aircraft decreases altitude, and is the opposite of an ascent or climb	Remember	CLO9	CO3	AAE011.09
3	Define pitch power table	Angle of attack required for certain climb and descent rates are dependent on variables such as gross weight, C.G. location and indicated airspeed. In relation to the produce a certain pitch attitude. Conversely, to facilitate a desired climb or descent rate we set power and approximate a pitch attitude to arrive at the desired airspeed.	Remember	CLO9	CO3	AAE011.09
4	How to decide ROCI ?	The higher you are the better your fuel efficiency, so you will want to climb quickly and then stay as high as you can until you need to start your descent in order to land	Remember	CLO9	CO3	AAE011.09
5	Define climb and descent angle.	The flight path angle, also referred to as the climb or descent angle, is calculated as the vertical angle between the velocity vector (i.e., where the airplane is going) and the Earth's horizon.	Remember	CLO9	CO3	AAE011.09

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6	Define best L/D	L/D max results in the lowest energy required per distance travelled and, disregarding propulsion efficiency, will give the most economical fuel consumption for long range travel. This will also give the best glide distance in unpowered flight.	Remember	CLO9	CO3	AAE011.09
7	Define descent rate	Rate of descent is the vertical component of the aircraft's velocity, normally expressed in feet per minute. Factors affecting the descent gradient.	Remember	CLO9	CO3	AAE011.09
8	Define rule of three	In aviation, the rule of three or "3:1 rule of descent" is that 3 miles of travel should be allowed for every 1,000 feet (300 m) of descent	Remember	CLO10	CO3	AAE011.10
9	Best ROCI	The best ROCI is predicted to be at airspeed greater than the minimum drag speed.	Remember	CLO10	CO3	AAE011.10
10	Define steepest gradient	The steepest gradient occurs when $u=1$.	Remember	CLO10	CO3	AAE011.10
11	Define minimum sink rate	Minimum sink rate is achieved by flying at minimum power speed of the aircraft. Flying at this speed will maximize the time of glide flight.	Remember	CLO10	CO3	AAE011.10
12	Define minimum fuel climb	The minimum fuel climb will occur at the airspeed for best rate of climb.	Remember	CLO11	CO3	AAE014.11
13	Phases of descending flight	Cruise flight, TMA descent, final approach.	Remember	CLO11	CO3	AAE011.11
14	Define specific total energy	The combination of the potential and kinetic energies of aircraft, per unit mass, is known as the specific total energy	Remember	CLO11	CO3	AAE011.11
15	Define Energy height	The above is sometimes called the energy height since it represents the height the aircraft would attain if all its kinetic energy were to be converted into [potential energy.	Remember	CLO11	CO3	AAE011.11
16	Define minimum power to takeoff.	To conform to the airworthiness, a multi engine aircraft needs to be able to climb with one engine inoperative in the takeoff configuration and exceed a minimum climb gradient requirement.	Remember	CLO11	CO3	AAE011.11
17	Define constraint of climb performance	The safety parameters like stalling speed, minimum control speed, noise limitations, aircraft altitudes, change of cabin pressure.	Remember	CLO11	CO3	AAE011.11
18	Define Excess power	The difference between total available power and required power is called excess power. For having a good climb this different should be maximum.	Remember	CLO11	CO3	AAE011.11
19	Define Descent	A descent can be produced by flying at airspeed less than the minimum drag speed.	Remember	CLO11	CO3	AAE011.11
20	Limitation of the descent	In transport aircraft it will be undesirable to make a very steep, high airspeed descent, steep descent.	Understand	CLO11	CO3	AAE011.11

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UNIT-IV						
1	Define maneuver	Maneuver is an essential part of the mission profile, aircraft need to turn, pitch and change its airspeed to carry out its mission.	Remember	CLO13	CO4	AAE011.13
2	Maneuver Flight	An aircraft can be said to be in maneuvering flight when its flight path is in a continuous change in state and in which there is an inertial force due to acceleration,	Remember	CLO13	CO4	AAE011.13
3	Define linear acceleration	The linear acceleration arises from an imbalance of the forces in the direction of the flight: this may be due to excess of thrust or drag.	Remember	CLO13	CO4	AAE011.13
4	Need of linear acceleration	The linear acceleration is employed to control the airspeed in which thrust is increased or decreased.	Remember	CLO13	CO4	AAE011.13
5	Define maneuver envelope	The plot between load factor and EAS is known as maneuver envelope. It gives the structural limits of the airplane.	Remember	CLO13	CO4	AAE011.13
6	Structural boundaries	There are positive and negative structural boundaries. First occurs for +ve load factor and later due to -ve load factors.	Remember	CLO13	CO4	AAE011.13
7	Air speed boundaries	The airspeed limits, which are defined as equivalent airspeeds, are determined by the stall boundaries.	Remember	CLO13	CO4	AAE011.13
8	Low speed boundary	The stalling speed at which the aircraft can maintain steady state flight in a specified configuration forms low speed boundary.	Remember	CLO13	CO4	AAE011.13
9	Stall buffet	The warning of the impending stall is provided solely by aerodynamic buffet. As the aircraft approaches the stall, the airflow across the upper cambered surface of the wing ceases to flow smoothly, it loses contact with the wing surface and it becomes turbulent. If the turbulent air then flows across the horizontal stabilizer, buffet results.	Remember	CLO13	CO4	AAE011.13
10	High speed boundary	The high speed boundary is determined by the maximum structural dynamic pressure loading.	Remember	CLO13	CO4	AAE011.13
11	The longitudinal maneuver	The longitudinal maneuver is the result of an imbalance of thrust and drag, which results in either a linear acceleration or a steady rate of climb.	Remember	CLO13	CO4	AAE011.13
12	Specific excess power	The product of the excess thrust and the TAS per unit weight is known as Specific excess power.	Remember	CLO13	CO4	AAE011.13
13	Use of excess power	Excess power can be used to increase potential energy (climb), or to increase kinetic energy (acceleration) of the aircraft.	Remember	CLO14	CO4	AAE011.14
14	The lateral maneuver	The lateral maneuver is also known as the level turn.	Remember	CLO14	CO4	AAE011.14

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15	Stall boundary	The maximum angle of attack at which the aircraft can be flown in steady flight is limited by the stall (or stall buffet) boundary.	Remember	CLO14	CO4	AAE011.14
16	Pull up maneuver	The pull up maneuver is a coordinated maneuver in the vertical, or pitching, plane with no rate of turn or side slip.	Remember	CLO14	CO4	AAE011.14
17	Condition for Pull up maneuver	The load factor in the loop is not uniform and will vary with airspeed and flight path angle as the aircraft progresses around the loop.	Remember	CLO14	CO4	AAE011.14
18	Most sustained turn	The most sustained turn that the aircraft will require to carry out in normal operations and will be flown at a speed commensurate with flight safety.	Remember	CLO14	CO4	AAE011.14
19	Pop-up maneuver	Pop-up maneuver from low-level flight that would demand a higher rate of pitch than simple gradient changing maneuver.	Remember	CLO14	CO4	AAE011.14
20	High 'g' turn maneuver	The High-G Turn is a maneuver that allows the player to make a sharper turn than normal. While the aircraft will lose a substantial amount of speed, High-G Turns can be used to effectively evade incoming missiles or enemy aircraft, or to continue pursuing an advanced enemy.	Remember	CLO14	CO4	AAE011.14
UNIT-V						
1	Terminal phases	All conventional aircraft flight starts with the point of departure with a takeoff and end at the destination with a landing; these are known as the terminal phases.	Remember	CLO17	CO5	AAE011.17
2	Take off phase	In the take off phase, aircraft of transferred from its stationary, ground borne state into a safe airborne state.	Remember	CLO17	CO5	AAE011.17
3	Landing Phase	In the landing phase, the aircraft is transferred back from the airborne state.	Remember	CLO17	CO5	AAE011.17
4	Ground run distance	The aircraft is in contact with the ground and its weight is supported by landing gear.	Remember	CLO17	CO5	AAE011.17
5	Airborne distance	The aircraft is in transition between the ground borne state and safe air borne flight.	Memorize	CLO17	CO5	AAE011.17
6	Engine failure accountability	The aircraft performance should be such that, at whatever time an engine fails, including during takeoff, forced landing should not be necessary. This is known as Engine failure accountability.	Remember	CLO17	CO5	AAE011.17
7	CTO	Conventional takeoff and landing.	Remember	CLO17	CO5	AAE011.17
8	RTOL	Reduced takeoff and landing.	Remember	CLO17	CO5	AAE011.17
9	STOL	Short takeoff and landing.	Remember	CLO17	CO5	AAE011.17
10	VTOL	Vertical takeoff and landing.	Remember	CLO17	CO5	AAE011.17

S.No	QUESTION	ANSWER	Blooms Level	CLO	CO	CLO Code
11	STOVL	Short takeoff and vertical landing.	Remember	CLO17	CO5	AAE011.17
12	Minimum control speed	An air speed below which the rudder will not be capable of producing a yawing moment large enough to provide directional control.	Remember	CLO17	CO5	AAE011.17
13	lift off speed	The speed at which aircraft is about to leave the ground.	Remember	CLO18	CO5	AAE011.18
14	Rotation speed	The rotation speed must allow time for the aircraft to rotate into the lift-off attitude before the lift of speed is achieved.	Remember	CLO18	CO5	AAE011.18
15	CL at liftoff	It's the CL of lift of which is 0.7 of CL_{max} .	Remember	CLO18	CO5	AAE011.18
16	Minimum unstick speed	The minimum speed at which the aircraft can become airborne is known as the minimum unstick speed.	Remember	CLO18	CO5	AAE011.18
17	Takeoff safety speed	This is the airspeed at which both a safe climb gradient and directional control can be achieved.	Remember	CLO18	CO5	AAE011.18
18	Airborne distance	After lift-off, the aircraft is accelerated to the safe climbing speed as it is rotated into the climb.	Remember	CLO18	CO5	AAE011.18
19	Braking distance	Once the nose wheel is on ground, the aircraft can be decelerated to a halt in the raking distance.	Remember	CLO18	CO5	AAE011.18
20	Runway conditions	The effect of runway slope and the runway friction coefficient on the ground run distance can be accounted for by considering them as equivalent to an increase in the breaking force.	Remember	CLO18	CO5	AAE011.18

Signature of the Faculty
Dr. Yagya Dutta Dwivedi

HOD, AE