



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## Aeronautical Engineering

### DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	<b>FLIGHT VEHICLES DESIGN</b>
Course Code	:	<b>AAE017</b>
Program	:	<b>B.Tech</b>
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#### OBJECTIVES:

I	To help students to consider in depth the terminology and nomenclature used in the syllabus.
II	To focus on the meaning of new words / terminology/nomenclature

### DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
<b>UNIT-I</b>						
<b>OVERVIEW OF THE DESIGN PROCESS</b>						
1	Define Angle of attack	The angle between a reference line on a body (often the chord line of an airfoil) and the vector representing the relative motion between the body and the fluid through which it is moving. Angle of attack is the angle between the body's reference line and the oncoming flow.	Remember	CO 1	CLO 1	AAE017.01
2	Define Weight Payload	Payload is the carrying capacity of an aircraft. Payload could include cargo, passengers, munitions or extra fuel in the case of an airborne tanker.	Remember	CO 1	CLO 1	AAE017.01
3	What is Weight Aircraft Gross (UAW)?	Also known as All-up Weight (UAW), it is the total weight of an aircraft at any moment during flight or ground operation. The aircraft gross weight will decrease during the course of a flight as fuel and oil is consumed.	Understand	CO 1	CLO 1	AAE017.01
4	Define Weight Usable Fuel	The weight of the fuel on board an aircraft that can be consumed by the engines during flight.	Remember	CO 1	CLO 2	AAE017.02
5	What is Weight Operational Empty (OEW)?	The basic weight of an aircraft including the crew, all fluids necessary for operation (water, engine oil, coolant), unusable fuel, and any items required for standard operations. OEW excludes	Remember	CO 1	CLO 3	AAE017.03

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		usable fuel and payload.				
6	Define Ultimate load factor	Limit load multiplied by a prescribed factor of safety (generally 1.5 in aeronautics). An aircraft structure must be able to support an Ultimate loading for a minimum of 3 seconds without structural failure (FAR 25.307).	Remember	CO 1	CLO 3	AAE017.03
7	Define taper ratio	The ratio of the wing tip to wing root.	Remember	CO 1	CLO 2	AAE017.02
8	Define pitch angle	The angle between the horizontal axis and the longitudinal axis of the aircraft. An aircraft will pitch up to climb and pitch down to descend. Pitch angle can also refer to tuning the angle of attack of a propeller blade to control the production of power.	Remember	CO 1	CLO 2	AAE017.02
9	Define Limit load	This is the maximum load factor authorized during flight. This is the loading that should only occur once (or very seldom) during the lifespan of an aircraft. Aircraft are designed support limit loads without any detrimental permanent deformation.	Remember	CO 1	CLO 2	AAE017.02
10	What Lift-to-drag ratio?	The ratio of the lifting force to drag force produced by an aircraft. This is an indicator of aerodynamic efficiency.	Remember	CO 1	CLO 3	AAE017.03
11	Define Lift slope	Defines the change in lift coefficient with angle of attack. The lift slope is constant over a range of angle of attack away from stall	Remember	CO 1	CLO 3	AAE017.03
12	What is Lift coefficient?	A dimensionless coefficient that relates the lift generated by a lifting surface to the dynamic pressure and an associated reference area (typically wing area).	Remember	CO 1	CLO 2	AAE017.02
13	Define Drag polar	A graphical plot showing the relationship between an aircraft's lift and drag by plotting the dependence of lift (Y-axis) on drag (x-axis). A tangent line drawn from the origin to the polar plot gives the point of maximum aerodynamic efficiency (highest lift-to-drag ratio).	Remember	CO 1	CLO 3	AAE017.03
14	Define Boundary layer	This is a fluid mechanics term that refers to the region of fluid (air) in the immediate vicinity of a body where the viscous effects of the body causes the fluid in this region to attain a velocity less than that of the free-stream.	Remember	CO 1	CLO 3	AAE017.03
15	Define Aspect ratio	This is a measure of the spanwise area distribution of a wing. It is calculated as the ratio of wing span to chord. In cases where the wing is tapered, it is convenient to define the aspect ratio as the square of the wing span divided by the total plan form wing area.	Remember	CO 1	CLO 2	AAE017.02
16	What is Area rule?	This is a design technique used to reduce the total aircraft drag particularly at transonic and supersonic speeds by a narrowing or 'waisting' of the fuselage in	Remember	CO 1	CLO 2	AAE017.02

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		the region of the wings.				
<b>UNIT - II</b>						
<b>INITIAL SIZING &amp; CONFIGURATION LAYOUT</b>						
1	What is rubber engine?	A rubber engine is an engine deck (tables of engine data) which can be scaled according to your needs. In a way, you stretch one parameter of the data like a rubber band, and all other parameters change accordingly. In most cases, you adjust thrust to your needs and the scaled engine deck will produce mass, size and fuel consumption for the most likely actual engine with the given thrust.	Remember	CO 2	CLO 4	AAE017.04
2	Define Lift curve slop	The lift curve slope gives the increase in the lift coefficient with the angle of attack	Remember	CO 2	CLO 4	AAE017.04
3	What is Flight Level (FL)?	A level of constant atmospheric pressure related to a reference datum of 29.92 inches of mercury. Each is stated in three digits that represent hundreds of feet—flight level 250 represents a barometric altimeter indication of 25,000', flight level 255 as 25,500'.	Remember	CO 2	CLO 4	AAE017.04
4	Define Monocoque	Type of fuselage design with little or no internal bracing other than bulkheads, where the outer skin bears the main stresses; usually round or oval in cross-section. Additional classifications are (1) Semi-Monocoque, where the skin is reinforced by longerons or bulkheads, but with no diagonal web members, and (2) Reinforced Shell, in which the skin is supported by a complete framework or structural members	Remember	CO 2	CLO 5	AAE017.05
5	What is Sweepback?	A backward inclination of an airfoil from root to tip in a way that causes the leading edge and often the trailing edge to meet relative wind obliquely, as wingforms that are swept back	Remember	CO 2	CLO 5	AAE017.05
6	Define Wash-In, Wash-Out	A method of increasing lift by increasing (Wash-In) or decreasing (Wash-Out) the ANGLE OF INCIDENCE on the outer part of an airplane wing to counteract the effects of engine TORQUE.	Remember	CO 2	CLO 5	AAE017.05
7	What is Wing Loading?	The maximum take-off gross weight of an aircraft divided by its wing area.	Understand	CO 2	CLO 5	AAE017.05
8	Define winglet?	A small, stabilizing, rudderlike addition to the tips of a wing to control or employ air movement.	Remember	CO 2	CLO 5	AAE017.05
9	What is Monoplane?	One wing plane. Since the 1930s most aero planes have been monoplanes. The wing may be mounted at various positions relative to the fuselage:	Remember	CO 2	CLO 6	AAE017.06
10	Define Empty weight fraction	an aircraft's fuel fraction, fuel weight fraction, or a spacecraft's propellant fraction, is the weight of the fuel or propellant divided by the gross take-off weight of the craft	Remember	CO 2	CLO 6	AAE017.06

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11	What is fuel-fraction?	Fuel fraction is a key parameter in determining an aircraft's range, the distance it can fly without refueling	Remember	CO 2	CLO 06	AAE017.06
12	What is Loiter?	Loiter is a phase of flight. The phase consists of cruising for a certain amount of time over a small region. The loiter phase occurs, for general aviation, generally at the end of the flight plan, normally when the plane is waiting for clearance to land.	Remember	CO 2	CLO 07	AAE017.07
13	Define Specific Fuel Consumption	The rate of fuel consumption divided by the resulting thrust. For jet engines, specific fuel consumption is usually measured in pounds of fuel per hour per pound of thrust	Remember	CO 2	CLO 06	AAE017.06
14	What is Sizing mission?	preliminary sizing of an aircraft is carried out by taking into account requirements and constraints	Remember	CO 2	CLO 06	AAE017.06
15	Define airfoil	An airfoil is the cross-sectional shape of a wing, blade	Remember	CO 2	CLO 07	AAE017.07
<b>UNIT-III</b>						
<b>PROPULSION, FUEL SYSTEM INTEGRATION, LANDING GEAR AND BASELINE DESIGN ANALYSIS - I</b>						
1	What is propulsion?	The action of driving or pushing forwards.	Remember	CO 3	CLO 09	AAE017.09
2	Define Rocket Propulsion	A means of locomotion whereby thrust is produced by ejecting matter, which is stored in the vehicle being propelled.	Remember	CO 3	CLO 09	AAE017.09
3	Define Chamber Pressure	The pressure in the combustion chamber of an operating rocket propulsion system	Remember	CO 3	CLO 10	AAE017.10
4	What is Propellant?	This is the stored matter that is energized and ejected	Understand	CO 3	CLO 10	AAE017.10
5	Define Mixture Ratio	It is the ratio of the liquid oxidizer flow rate divided by the liquid fuel flow rate. The best performance (highest specific impulse) is obtained at a specific optimum mixture ratio.	Remember	CO 3	CLO 10	AAE017.10
6	What is Attitude Control?	(Vehicle rotation) and a limited amount of Flight Velocity Change can also be achieved by a series of small thrusters, which are located in various locations on the vehicle.	Remember	CO 3	CLO 08	AAE017.08
7	Define Igniters	Burn igniter propellants, which then form hot gas at an elevated pressure and they in turn initiate the combustion of the main propellant, either a solid propellant or a non-hypergolic liquid bipropellant. The igniter is started by a small amount of electrical energy	Remember	CO 3	CLO 09	AAE017.09
8	Define Binder	The Binder is a thin layer of sticky rubbery material that promotes the adhesion of the grain to the case.	Remember	CO 3	CLO 08	AAE017.08
9	What is Ablative Chamber or Nozzle Well?	Absorbs heat (from the hot gases) by having some of the heated ablative well material	Understand	CO 3	CLO 08	AAE017.08
10	What is landing gear?	The wheels, floats, etc., of an aircraft, upon which it lands and moves on ground or water.	Remember	CO 3	CLO 09	AAE017.09

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11	Define Multiple-baseline design	A single-case experimental design that involves recording two or more observations across time, but staggering the baselines. Baseline measures are established and treatment then is introduced at different times. There are three variations of a multiple baseline design. Multiple baseline across behaviors (different behaviors are observed), across participants (different participants are observed), or across settings (different settings are used).	Remember	CO 3	CLO 10	AAE017.10
12	Define Reliability	Requirement that a measure be consistent and reproducible.	Remember	CO 3	CLO 10	AAE017.10
13	Define momentum	Force or speed of movement; impetus, as of a physical object or course of events:	Remember	CO 3	CLO 08	AAE017.08
14	Define impulse	sudden, involuntary inclination prompting to action	Remember	CO 3	CLO 9	AAE017.09
15	What is horsepower?	A foot-pound second unit of power, equivalent to 550 foot-pounds per second, or 745.7 watts	Remember	CO 3	CLO10	AAE017.10
<b>UNIT-IV BASELINE DESIGN ANALYSIS - II</b>						
1	Define Pitch stability	determined from software simulations are used to model the longitudinal pitch behavior of a flying wing type aircraft	Remember	CO 4	CLO11	AAE017.11
2	Define velocity stability	Velocity is a metric for work done, which is often used in agile software development	Remember	CO 4	CLO12	AAE017.12
3	Define trim	make (something) neat or of the required size or form by cutting away irregular or unwanted parts	Remember	CO 4	CLO12	AAE017.12
4	Define control derivatives	A situation that neither proportional nor integral control really deal with. It's rapid changes to the system that come from an external source	Remember	CO 4	CLO12	AAE017.12
5	Define Cooper-Harper rating scale?	It is a set of criteria used by test pilots and flight test engineers to evaluate the handling qualities of aircraft during flight test.	Remember	CO 4	CLO11	AAE017.11
6	What is air defense identification zone?	The area of airspace over land or water, extending upward from the surface, within which the ready identification, the location, and the control of aircraft are required in the interest of national security.	Remember	CO 4	CLO13	AAE017.13
7	Define bleed air	Hot air at high pressure, usually from the bypass section of a gas turbine engine, for de-icing, heating, and other uses.	Remember	CO 4	CLO12	AAE017.12
8	Define chord	The measurable distance between the leading and trailing edges of a wing form.	Remember	CO 4	CLO11	AAE017.11
9	What is empennage?	An aircraft's tail group, includes rudder and fin, and stabilizer and elevator	Remember	CO 4	CLO11	AAE017.11
10	What is flap?	A movable, usually hinged airfoil set in the trailing edge of an aircraft wing, designed to increase lift or drag by changing the camber of the wing or used to slow an aircraft during landing by increasing lift	Remember	CO 4	CLO11	AAE017.11

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11	Define lofting	Design or fabrication of a complex aircraft component, as with sheet metal, using actual-size patterns or plans, generally laid out on a floor. The term was borrowed from boat builders	Remember	CO 4	CLO13	AAE017.13
12	Define scramjet	Acronym for supersonic combustion ramjet, in which combustion occurs at supersonic air velocities through the engine.	Remember	CO 4	CLO12	AAE017.12
13	What is transponder?	An airborne transmitter that responds to ground-based interrogation signals to provide air traffic controllers with more accurate and reliable position information than would be possible with "passive" radar; may also provide air traffic control with an aircraft's altitude.	Remember	CO 4	CLO13	AAE017.13
14	Define yoke	The control wheel of an aircraft, akin to a automobile steering wheel.	Remember	CO 4	CLO12	AAE017.12
15	Define yaw	Of the three axes in flight, this specifies the side-to-side movement of an aircraft on its vertical axis, as in skewing. Compare PITCH and ROLL	Remember	CO 4	CLO13	AAE017.13
16	What is VFR?	Flight in which a cloud ceiling exists but modified Visual Flight Rules are in effect if the aircraft travels above the cloud layer	Remember	CO 4	CLO13	AAE017.13

#### UNIT-V

#### COST ESTIMATION, PARAMETRIC ANALYSIS, OPTIMISATION, REFINED SIZING AND TRADE STUDIES, PARAMETRIC ANALYSIS, OPTIMISATION, REFINED SIZING AND TRADE STUDIES

1	Define Flight Data Recorder (FDR)	Records pertinent technical information about a flight. An FDR will record information about the performance of various aircraft systems, as well as the aircraft's speed, altitude, heading and other flight parameters.	Remember	CO 5	CLO14	AAE017.14
2	What is Rudder?	A control surface, usually installed on the trailing edge of the vertical stabilizer, which controls the yaw motion of the aircraft - that is, the motion of the nose of the aircraft left and right.	Remember	CO 5	CLO14	AAE017.14
3	Define Wide body Aircraft	Generally considered to be any airliner with more than one aisle in the passenger cabin. Examples of wide body aircraft include the Boeing 747 767.	Remember	CO 5	CLO14	AAE017.14
4	What is Yield Management?	Also known as revenue management, the process airlines use to set prices for a flight. The goal is to find the mix of seat prices that produces the most revenue	Remember	CO 5	CLO14	AAE017.14
5	Define Speed Brakes	Also known as air brakes, they are surfaces that are normally flush with the wing or fuselage in which they are mounted, but which can be extended into the airflow to create more drag and slow the aircraft.	Remember	CO 5	CLO14	AAE017.14
6	Define Revenue Passenger Mile (RPM)	One paying passenger flown one mile. It is the principal measure of airline passenger traffic	Remember	CO 5	CLO14	AAE017.14
7	What is Pylon?	The part of an aircraft's structure which connects an engine to either a wing or the fuselage.	Remember	CO 5	CLO14	AAE017.14

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
8	What is Minimum Equipment List (MEL)?	A list of aircraft equipment that must be in good working order before an aircraft may legally take off with passengers. Repairs to some items not essential to an aircraft's airworthiness may be deferred for limited periods of time approved by the FAA	Remember	CO 5	CLO14	AAE017.14
9	What is Hub and Spoke?	A system for deploying aircraft that enables a carrier to increase service options at all airports encompassed by the system. It entails the use of a strategically located airport (the hub) as a passenger exchange point for flights to and from outlying towns and cities (the spokes).	Remember	CO 5	CLO15	AAE017.15
10	What is Flight Plan?	A required planning document that covers the expected operational details of a flight such as destination, route, fuel on board, etc. It is filed with the appropriate FAA air traffic control facility. There are both VFR and IFR flight plans. VFR plans are not mandatory.	Remember	CO 5	CLO15	AAE017.15
11	What is Flight Deck?	Also called the cockpit, it the section of an aircraft where pilots sit and control the aircraft.	Remember	CO 5	CLO15	AAE017.15
12	What is Cockpit Voice Recorder (CVR)?	A device that records the sounds audible in the cockpit, as well as all radio transmissions made and received by the aircraft, and all intercom and public address announcements made in the aircraft. It generally is a continuous loop recorder that retains the sounds of the last 30 minutes.	Remember	CO 5	CLO15	AAE017.15
13	Define Airworthiness	A term used to describe both the legal and mechanical status of an aircraft with regard to its readiness for flight.	Remember	CO 5	CLO15	AAE017.15
14	What is Enplanements?	The number of passengers boarding a flight, including origination, stopovers and connections	Remember	CO 5	CLO15	AAE017.15
15	Define Dispatcher	An airline employee who is responsible for authorizing the departure of an aircraft. The dispatcher must ensure, among other things, that the aircraft's crew have all the proper information necessary for their flight and that the aircraft is in proper mechanical condition	Remember	CO 5	CLO15	AAE017.15

Signature of the Faculty

Signature of HOD