Glossary

General Aviation Manufacturers Association **(GAMA)**

14 CFR, Part 121. The Federal regulations governing domestic, flag, and supplemental operations.

14 CFR, Part 135. The Federal regulations governing Commuter and On-Demand Operations.

adverse loaded CG check. A weight and balance check to determine that no condition of legal loading of an aircraft can move the CG outside of its allowable limits.

Aircraft Specifications. Documentation containing the pertinent specifications for aircraft certificated under the CARs.

Airplane Flight Manual (AFM). An FAA-approved document, prepared by the holder of a Type Certificate for an airplane or rotorcraft, that specifies the operating limitations and contains the required markings and placards and other information applicable to the regulations under which the aircraft was certificated.

Approved Type Certificate. A certificate of approval issued by the FAA for the design of an airplane, engine, or propeller.

arm (GAMA). The horizontal distance from the reference datum to the center of gravity (CG) of an item.

balanced laterally. Balanced in such a way that the wings tend to remain level.

ballast. A weight installed or carried in an aircraft to move the center of gravity to a location within its allowable limits.

permanent ballast (fixed ballast). A weight permanently installed in an aircraft to bring its center of gravity into allowable limits. Permanent ballast is part of the aircraft empty weight.

temporary ballast. Weights that can be carried in a cargo compartment of an aircraft to move the location of the CG for a specific flight condition. Temporary ballast must be removed when the aircraft is weighed.

basic empty weight (GAMA). Standard empty weight plus optional equipment.

basic operating index. The moment of the airplane at its basic operating weight divided by the appropriate reduction factor.

basic operating weight (BOW). The empty weight of the aircraft plus the weight of the required crew, their baggage and other standard items such as meals and potable water.

bilge area. The lowest part of an aircraft structure in which water and contaminants collect.

butt (or buttock) line zero. A line through the symmetrical center of an aircraft from nose to tail. It serves as the datum for measuring the arms used to determine the lateral CG. Lateral moments that cause the aircraft to rotate clockwise are positive (+), and those that cause it to rotate counterclockwise are negative (–).

calendar month. A time period used by the FAA for certification and currency purposes. A calendar month extends from a given day until midnight of the last day of that month.

center of gravity (CG) (GAMA). The point at which an airplane would balance if suspended. Its distance from the reference datum is determined by dividing the total moment by the total weight of the airplane.

center of lift. The location along the chord line of an airfoil at which all the lift forces produced by the airfoil are considered to be concentrated.

centroid. The distance in inches aft of the datum of the center of a compartment or a fuel tank for weight and balance purposes.

CG arm (GAMA). The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.

CG limits (GAMA). The extreme center of gravity locations within which the airplane must be operated at a given weight.

CG limits envelope. An enclosed area on a graph of the airplane loaded weight and the CG location. If lines drawn from the weight and CG cross within this envelope, the airplane is properly loaded.

CG moment envelope. An enclosed area on a graph of the airplane loaded weight and loaded moment. If lines drawn from the weight and loaded moment cross within this envelope, the airplane is properly loaded.

chord. A straight-line distance across a wing from leading edge to trailing edge.

delta (?). This symbol, Ð, means a change in something. ÐCG means a change in the center of gravity location.

dynamic load. The actual weight of the aircraft multiplied by the load factor, or the increase in weight caused by acceleration.

empty weight. The weight of the airframe, engines, all permanently installed equipment and unusable fuel. Depending upon the part of the Federal regulations under which the aircraft was certificated, either the undrainable oil or full reservoir of oil is included.

empty-weight center of gravity (EWCG). The center of gravity of an aircraft when it contains only the items specified in the aircraft empty weight.

empty-weight center of gravity range. The distance between the allowable forward and aft empty-weight CG limits.

equipment list. A list of items approved by the FAA for installation in a particular aircraft. The list includes the name, part number, weight, and arm of the component. Installation or removal of an item in the equipment list is considered to be a minor alteration.

fleet weight. An average weight accepted by the FAA for aircraft of identical make and model that have the same equipment installed. When a fleet weight control program is in effect, the fleet weight of the aircraft can be used rather than every individual aircraft having to be weighed.

fuel jettison system. A fuel subsystem that allows the flight crew to dump fuel in an emergency to lower the weight of an aircraft to the maximum landing weight if a return to landing is required before sufficient fuel is burned off. This system must allow enough fuel to be jettisoned that the aircraft can still meet the climb requirements specified in 14 CFR, Part 25.

fulcrum. The point about which a lever balances.

index point. A location specified by the aircraft manufacturer from which arms used in weight and balance computations are measured. Arms measured from the index point are called index arms.

interpolate. To determine a value in a series between two known values.

landing weight. The takeoff weight of an aircraft less the fuel burned and/or dumped en route.

large aircraft (14 CFR, Part 1). An aircraft of more than 12,500 pounds, maximum certificated takeoff weight.

lateral balance. Balance around the roll, or longitudinal, axis.

lateral offset moment. The moment, in lb-in, of a force that tends to rotate a helicopter about its longitudinal axis. The lateral offset moment is the product of the weight of the object and its distance from butt line zero. Lateral offset moments that tend to rotate the aircraft clockwise are positive, and those that tend to rotate it counterclockwise are negative.

LEMAC. Leading Edge of the Mean Aerodynamic Chord.

load cell. A component in an electronic weighing system that is placed between the jack and the jack pad on the aircraft. The load cell contains strain gauges whose resistance changes with the weight on the cell.

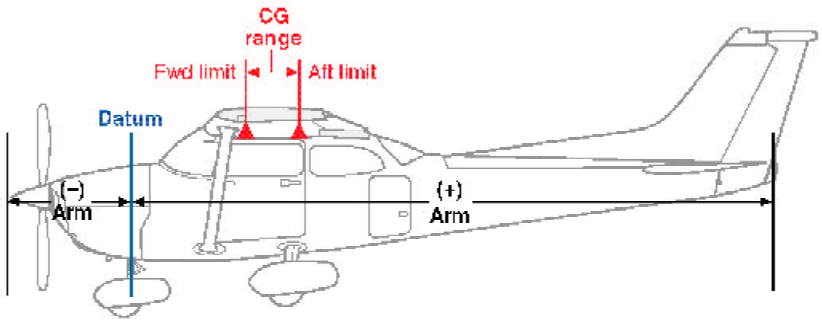
load factor. The ratio of the maximum load an aircraft can sustain to the total weight of the aircraft. Normal category aircraft must have a load factor of at least 3.8, utility category aircraft 4.4, and acrobatic category aircraft, 6.0.

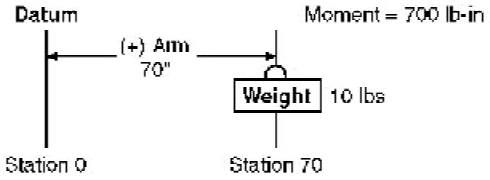
loading graph. A graph of load weight and load moment indexes. Diagonal lines for each item relate the weight to the moment index without having to use mathematics.

loading schedule. A method and procedure used to show that an aircraft is properly loaded and will not exceed approved weight and balance limitations during operation.

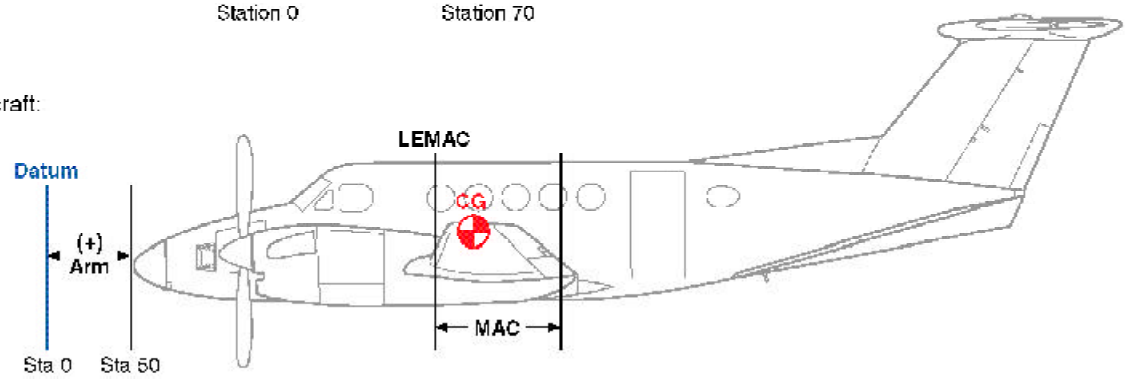
Weight and Balance Definitions

Single-engine aircraft:





Multiengine aircraft:



longitudinal axis. An imaginary line through an aircraft from nose to tail, passing through its center of gravity.

longitudinal balance. Balance around the pitch, or lateral, axis.

MAC. Mean Aerodynamic Chord.

major alteration. An alteration not listed in the aircraft, aircraft engine, or propeller specifications, (1) that might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness; or (2) that is not done according to accepted practices or cannot be done by elementary operations.

maximum landing weight (GAMA). Maximum weight approved for the landing touchdown.

maximum permissible hoist load. The maximum external load that is permitted for a helicopter to carry. This load is specified in the POH.

maximum ramp weight (GAMA). Maximum weight approved for ground maneuver. It includes weight of start, taxi, and runup fuel.

maximum takeoff weight (GAMA). Maximum weight approved for the start of the takeoff run.

maximum taxi weight. Maximum weight approved for ground maneuvers. This is the same as maximum ramp weight.

maximum weight. The maximum authorized weight of the aircraft and all of its equipment as specified in the Type Certificate Data Sheets (TCDS) for the aircraft.

maximum zero fuel weight. The maximum authorized weight of an aircraft without fuel. This is the sum of the BOW and payload.

maximum zero fuel weight (GAMA). Maximum weight, exclusive of usable fuel.

METO horsepower (maximum except takeoff). The maximum power allowed to be continuously produced by an engine. Takeoff power is usually limited to a given amount of time, such as 1 minute or 5 minutes.

minimum fuel. The amount of fuel necessary for one-half hour of operation at the rated maximum-continuous power setting of the engine, which, for weight and balance purposes, is $^{1}|_{i12}$ gallon per maximum-except-takeoff (METO) horsepower. It is the maximum amount of fuel that could be used in weight and balance computations when low fuel might adversely affect the most critical balance conditions. To determine the weight of the minimum fuel in pounds, divide the METO horsepower by 2.

minor alteration. An alteration other than a major alteration. This includes alterations that are listed in the aircraft, aircraft engine, or propeller specifications.

moment. A force that causes or tries to cause an object to rotate.

moment (GAMA). The product of the weight of an item multiplied by its arm. (Moment divided by a constant is used to simplify balance calculations by reducing the number of digits; *see* reduction factor.)

moment index. The moment (weight times arm) divided by a reduction factor such as 100 or 1,000 to make the number smaller and reduce the chance of mathematical errors in computing the center of gravity.

moment limits vs. weight envelope. An enclosed area on a graph of three parameters. The diagonal line representing the moment/100 crosses the horizontal line representing the weight at the vertical line representing the CG location in inches aft of the datum. When the lines cross inside the envelope, the aircraft is loaded within its weight and CG limits.

net weight. The weight of the aircraft less the weight of any chocks or other devices used to hold the aircraft on the scales.

normal category. A category of aircraft certificated under 14 CFR, Part 23 and CAR, Part 3 that allows the maximum weight and CG range while restricting the maneuvers that are permitted.

PAX. Passengers.

payload (GAMA). Weight of occupants, cargo, and baggage.

Pilot's Operating Handbook (POH). An FAA-approved document published by the airframe manufacturer that lists the operating conditions for a particular model of aircraft and its engines.

potable water. Water carried in an aircraft for the purpose of drinking.

ramp weight. The zero fuel weight plus all of the usable fuel on board.

reference datum (GAMA). An imaginary vertical plane from which all horizontal distances are measured for balance purposes.

reduction factor. A number, usually 100 or 1,000 by which a moment is divided to produce a smaller number that is less likely to cause mathematical errors when computing the center of gravity.

residual fuel. Fuel that remains in the sumps and fuel lines when the fuel system is drained from the inlet to the fuel metering system, with the aircraft in level flight attitude. The weight of the residual fuel is part of the empty weight of the aircraft.

service ceiling. The highest altitude at which an aircraft can maintain a steady rate of climb of 100 feet per minute.

small aircraft (14 CFR, Part 1). An aircraft of 12,500 pounds or less, maximum certificated takeoff weight.

standard average passenger weight. This includes 20 pounds of carry-on baggage for adult passengers.

summer (May 1 through October 31)
- average (60% M, 40% F) ..... 180 lbs
- male ..... 195 lbs
- female ..... 155 lbs

winter (November 1 through April 30)
- average (60% M, 40% F) ..... 185 lbs
- male ..... 200 lbs
- female ..... 160 lbs

children between ages 2 and 12 years
- summer and winter ..... 80 lbs

(Children under 2 are considered "babes in arms" and their weight has been factored into the weight of the adult passengers.)

standard empty weight (GAMA). Weight of a standard airplane including unusable fuel, full operating fluids, and full oil.

static load. The load imposed on an aircraft structure due to the weight of the aircraft and its contents.

station (GAMA). A location along the airplane fuselage usually given in terms of distance from the reference datum.

strain sensor. A device that converts a physical phenomenon into an electrical signal. Strain sensors in a wheel axle sense the amount the axle deflects and create an electrical signal that is proportional to the force that caused the deflection.

takeoff weight. The weight of an aircraft just before brake release. It is the ramp weight less the weight of the fuel burned during start and taxi.

tare weight. The weight of any chocks or devices that are used to hold an aircraft on the scales when it is weighed. The tare weight must be subtracted from the scale reading to get the net weight of the aircraft.

TEMAC. Trailing Edge of the Mean Aerodynamic Chord.

Type Certificate Data Sheets (TCDS). The official specifications issued by the FAA for an aircraft, engine, or propeller.

undrainable oil. Oil that does not drain from an engine lubricating system when the aircraft is in the normal ground attitude and the drain valve is left open. The weight of the undrainable oil is part of the empty weight of the aircraft.

unusable fuel (GAMA). Fuel remaining after a runout test has been completed in accordance with governmental regulations.

usable fuel (GAMA). Fuel available for flight planning.

useful load (GAMA). Difference between takeoff weight, or ramp weight if applicable, and basic empty weight.

utility category. A category of aircraft certificated under 14 CFR, Part 23 and CAR, Part 3 that permits limited acrobatic maneuvers but restricts the weight and the CG range.

wing chord. A straight-line distance across a wing from leading edge to trailing edge.

zero fuel weight. The weight of an aircraft without fuel.

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