§ 23.729 Landing gear extension and retraction system.

(a) General. For airplanes with retractable landing gear, the following apply:

(1) Each landing gear retracting mechanism and its supporting structure must be designed for maximum flight load factors with the gear retracted and must be designed for the combination of friction, inertia, brake torque, and air loads, occurring during retraction at any airspeed up to 1.6 \( V_{S1} \) with flaps retracted, and for any load factor up to those specified in § 23.345 for the flaps-extended condition.

(2) The landing gear and retracting mechanism, including the wheel well doors, must withstand flight loads, including loads resulting from all yawing conditions specified in § 23.351, with the landing gear extended at any speed up to at least 1.6 \( V_{S1} \) with the flaps retracted.

(b) Landing gear lock. There must be positive means (other than the use of hydraulic pressure) to keep the landing gear extended.

(c) Emergency operation. For a landplane having retractable landing gear that cannot be extended manually, there must be means to extend the landing gear in the event of either—

(1) Any reasonably probable failure in the normal landing gear operation system; or

(2) Any reasonably probable failure in a power source that would prevent the operation of the normal landing gear operation system.

(d) Operation test. The proper functioning of the retracting mechanism must be shown by operation tests.

(e) Position indicator. If a retractable landing gear is used, there must be a landing gear position indicator (as well as necessary switches to actuate the indicator) or other means to inform the pilot that each gear is secured in the extended (or retracted) position. If switches are used, they must be located and coupled to the landing gear mechanical system in a manner that prevents an erroneous indication of either “down and locked” if each gear is not in the fully extended position, or “up and locked” if each landing gear is not in the fully retracted position.

(f) Landing gear warning. For landplanes, the following aural or equally effective landing gear warning devices must be provided:

(1) A device that functions continuously when one or more throttles are closed beyond the power settings normally used for landing approach if the landing gear is not fully extended and locked. A throttle stop may not be used in place of an aural device. If
§ 23.731 Wheels.

(a) The maximum static load rating of each wheel may not be less than the corresponding static ground reaction with—

(1) Design maximum weight; and
(2) Critical center of gravity.

(b) The maximum limit load rating of each wheel must equal or exceed the maximum radial limit load determined under the applicable ground load requirements of this part.


§ 23.733 Tires.

(a) Each landing gear wheel must have a tire whose approved tire ratings (static and dynamic) are not exceeded—

(1) By a load on each main wheel tire (to be compared with the static rating approved for such tires) equal to the corresponding static ground reaction under the design maximum weight and critical center of gravity; and
(2) By a load on nose wheel tires (to be compared with the dynamic rating approved for such tires) equal to the reaction obtained at the nose wheel, assuming the mass of the airplane to be concentrated at the most critical center of gravity and exerting a force of 1.0 \( \text{W} \) downward and 0.31 \( \text{W} \) forward (where \( \text{W} \) is the design maximum weight), with the reactions distributed to the nose and main wheels by the principles of statics and with the drag reaction at the ground applied only at wheels with brakes.

(b) If specially constructed tires are used, the wheels must be plainly and conspicuously marked to that effect. The markings must include the make, size, number of plies, and identification marking of the proper tire.

(c) Each tire installed on a retractable landing gear system must, at the maximum size of the tire type expected in service, have a clearance to surrounding structure and systems that is adequate to prevent contact between the tire and any part of the structure of systems.


§ 23.735 Brakes.

(a) Brakes must be provided. The landing brake kinetic energy capacity rating of each main wheel brake assembly must not be less than the kinetic energy absorption requirements determined under either of the following methods:

(1) The brake kinetic energy absorption requirements must be based on a conservative rational analysis of the sequence of events expected during landing at the design landing weight.
(2) Instead of a rational analysis, the kinetic energy absorption requirements for each main wheel brake assembly may be derived from the following formula:

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KE = 0.0443 W V^2 / N
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