of this section, a limit engine torque corresponding to takeoff power and propeller speed, multiplied by a factor accounting for propeller control system malfunction, including quick feathering, acting simultaneously with 1g level flight loads. In the absence of a rational analysis, a factor of 1.6 must be used.

(2) The limit engine torque to be considered under paragraph (a)(1) of this section must be obtained by—

(i) For turbopropeller installations, multiplying mean engine torque for the specified power/thrust and speed by a factor of 1.25;

(ii) For other turbine engines, the limit engine torque must be equal to the maximum accelerating torque for the case considered.

(3) The engine mounts, pylons, and adjacent supporting airframe structure must be designed to withstand 1g level flight loads acting simultaneously with the limit engine torque loads imposed by each of the following conditions to be considered separately:

(i) Sudden maximum engine deceleration due to malfunction or abnormal condition; and

(ii) The maximum acceleration of engine.

(b) For auxiliary power unit installations, the power unit mounts and adjacent supporting airframe structure must be designed to withstand 1g level flight loads acting simultaneously with the limit torque loads imposed by each of the following conditions to be considered separately:

(1) Sudden maximum auxiliary power unit deceleration due to malfunction, abnormal condition, or structural failure; and

(2) The maximum acceleration of the auxiliary power unit.

[Amdt. 25–141, 79 FR 73468, Dec. 11, 2014]

§ 25.362 Engine failure loads.

(a) For engine mounts, pylons, and adjacent supporting airframe structure, an ultimate loading condition must be considered that combines 1g flight loads with the most critical transient dynamic loads and vibrations, as determined by dynamic analysis, resulting from failure of a blade, shaft, bearing or bearing support, or bird strike event. Any permanent de-

formation from these ultimate load conditions must not prevent continued safe flight and landing.

(b) The ultimate loads developed from the conditions specified in paragraph (a) of this section are to be—

(1) Multiplied by a factor of 1.0 when applied to engine mounts and pylons; and

(2) Multiplied by a factor of 1.25 when applied to adjacent supporting airframe structure.

[Amdt. 25–141, 79 FR 73468, Dec. 11, 2014]

§ 25.363 Side load on engine and auxiliary power unit mounts.

(a) Each engine and auxiliary power unit mount and its supporting structure must be designed for a limit load factor in lateral direction, for the side load on the engine and auxiliary power unit mount, at least equal to the maximum load factor obtained in the yawing conditions but not less than—

(1) 1.33; or

(2) One-third of the limit load factor for flight condition A as prescribed in § 25.333(b).

(b) The side load prescribed in paragraph (a) of this section may be assumed to be independent of other flight conditions.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25–23, 35 FR 5672, Apr. 8, 1970; Amdt. 25–91, 62 FR 40704, July 29, 1997]

§ 25.365 Pressurized compartment loads.

For airplanes with one or more pressurized compartments the following apply:

(a) The airplane structure must be strong enough to withstand the flight loads combined with pressure differential loads from zero up to the maximum relief valve setting.

(b) The external pressure distribution in flight, and stress concentrations and fatigue effects must be accounted for.

(c) If landings may be made with the compartment pressurized, landing loads must be combined with pressure differential loads from zero up to the maximum allowed during landing.

(d) The airplane structure must be designed to be able to withstand the pressure differential loads corresponding to the maximum relief valve setting multiplied by a factor of

1.33 for airplanes to be approved for operation to 45,000 feet or by a factor of 1.67 for airplanes to be approved for operation above 45,000 feet, omitting other loads.

(e) Any structure, component or part, inside or outside a pressurized compartment, the failure of which could interfere with continued safe flight and landing, must be designed to withstand the effects of a sudden release of pressure through an opening in any compartment at any operating altitude resulting from each of the following conditions:

(1) The penetration of the compartment by a portion of an engine following an engine disintegration;

(2) Any opening in any pressurized compartment up to the size H_o in square feet; however, small compartments may be combined with an adjacent pressurized compartment and both considered as a single compartment for openings that cannot reasonably be expected to be confined to the small compartment. The size H_o must be computed by the following formula:

$$H_o = PA_s$$

where,

H_o = Maximum opening in square feet, need not exceed 20 square feet.
$P = (A_s/6240) + .024$
A_s = Maximum cross-sectional area of the pressurized shell normal to the longitudinal axis, in square feet; and

(3) The maximum opening caused by airplane or equipment failures not shown to be extremely improbable.

(f) In complying with paragraph (e) of this section, the fail-safe features of the design may be considered in determining the probability of failure or penetration and probable size of openings, provided that possible improper operation of closure devices and inadvertent door openings are also considered. Furthermore, the resulting differential pressure loads must be combined in a rational and conservative manner with 1–g level flight loads and any loads arising from emergency depressurization conditions. These loads may be considered as ultimate conditions; however, any deformations associated with these conditions must not interfere with continued safe flight and landing. The pressure relief provided by intercompartment venting may also be considered.

(g) Bulkheads, floors, and partitions in pressurized compartments for occupants must be designed to withstand the conditions specified in paragraph (e) of this section. In addition, reasonable design precautions must be taken to minimize the probability of parts becoming detached and injuring occupants while in their seats.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25–54, 45 FR 60172, Sept. 11, 1980; Amdt. 25–71, 55 FR 13477, Apr. 10, 1990; Amdt. 25–72, 55 FR 29776, July 20, 1990; Amdt. 25–87, 61 FR 28695, June 5, 1996]

§ 25.367 Unsymmetrical loads due to engine failure.

(a) The airplane must be designed for the unsymmetrical loads resulting from the failure of the critical engine. Turbopropeller airplanes must be designed for the following conditions in combination with a single malfunction of the propeller drag limiting system, considering the probable pilot corrective action on the flight controls:

(1) At speeds between V_{MC} and V_D, the loads resulting from power failure because of fuel flow interruption are considered to be limit loads.

(2) At speeds between V_{MC} and V_C, the loads resulting from the disconnection of the engine compressor from the turbine or from loss of the turbine blades are considered to be ultimate loads.

(3) The time history of the thrust decay and drag build-up occurring as a result of the prescribed engine failures must be substantiated by test or other data applicable to the particular engine-propeller combination.

(4) The timing and magnitude of the probable pilot corrective action must be conservatively estimated, considering the characteristics of the particular engine-propeller-airplane combination.

(b) Pilot corrective action may be assumed to be initiated at the time maximum yawing velocity is reached, but not earlier than two seconds after the engine failure. The magnitude of the corrective action may be based on the control forces specified in § 25.397(b) except that lower forces may be assumed where it is shown by anaylsis or test that these forces can control the yaw