by the maximum pilot force specified in §27.397(a); 
(2) Attain a resulting sideslip angle or 15°, whichever is less, at the lesser 
speed of \(V_{\text{NE}}\) or \(V_h\); 
(3) Vary the sideslip angles of para-
graphs (b)(2) and (c)(2) of this section 
directly with speed; and 
(4) Return the directional control 
suddenly to neutral.

[Amdt. 27–26, 55 FR 7999, Mar. 6, 1990, as 
amended by Amdt. 27–34, 62 FR 46173, Aug. 29, 
1997]

§ 27.361 Engine torque.

(a) For turbine engines, the limit 
torque may not be less than the high-
est of—
(1) The mean torque for maximum 
continuous power multiplied by 1.25; 
(2) The torque required by §27.923; 
(3) The torque required by §27.927; or 
(4) The torque imposed by sudden en-
gine stoppage due to malfunction or 
structural failure (such as compressor 
jamming).

(b) For reciprocating engines, the 
limit torque may not be less than the 
mean torque for maximum continuous 
power multiplied by—
(1) 1.33, for engines with five or more 
cylinders; and 
(2) Two, three, and four, for engines 
with four, three, and two cylinders, re-
spectively.


CONTROL SURFACE AND SYSTEM LOADS

§ 27.391 General.

Each auxiliary rotor, each fixed or 
movable stabilizing or control surface, 
and each system operating any flight 
control must meet the requirements of 
§§27.395, 27.397, 27.399, 27.411, and 27.427.

[Amdt. 27–26, 55 FR 7999, Mar. 6, 1990, as 
amended by Amdt. 27–34, 62 FR 46173, Aug. 29, 
1997]

§ 27.395 Control system.

(a) The part of each control system 
from the pilot’s controls to the control 
stops must be designed to withstand 
pilot forces of not less than—
(1) The forces specified in §27.397; or 
(2) If the system prevents the pilot 
from applying the limit pilot forces 
to the system, the maximum forces that 
the system allows the pilot to apply, 
but not less than 0.60 times the forces 
specified in §27.397. 
(b) Each primary control system, in-
cluding its supporting structure, must 
be designed as follows:
(1) The system must withstand loads 
resulting from the limit pilot forces 
prescribed in §27.397.
(2) Notwithstanding paragraph (b)(3) 
of this section, when power-operated 
actuator controls or power boost con-
trols are used, the system must also 
withstand the loads resulting from the 
force output of each normally ener-
gized power device, including any sin-
gle power boost or actuator system 
failure.
(3) If the system design or the normal 
operating loads are such that a part of 
the system cannot react to the limit 
pilot forces prescribed in §27.397, that 
part of the system must be designed to 
withstand the maximum loads that can 
be obtained in normal operation. The 
minimum design loads must, in any 
case, provide a rugged system for serv-
cice use, including consideration of fa-
tigue, jamming, ground gusts, control 
inertia, and friction loads. In the ab-
sence of rational analysis, the design 
loads resulting from 0.60 of the speci-
fied limit pilot forces are acceptable 
minimum design loads.
(4) If operational loads may be ex-
ceeded through jamming, ground gusts, 
control inertia, or friction, the system 
must withstand the limit pilot forces 
prescribed in §27.397, without yielding.

[Doc. No. 5074, 29 FR 15695, Nov. 24, 1964, as 
amended by Amdt. 27–26, 55 FR 7999, Mar. 6, 1990]

§ 27.397 Limit pilot forces and torques.

(a) Except as provided in paragraph 
(b) of this section, the limit pilot 
forces are as follows:
(1) For foot controls, 130 pounds.
(2) For stick controls, 100 pounds fore 
and aft, and 67 pounds laterally.
(b) For flap, tab, stabilizer, rotor 
brake, and landing gear operating con-
trols, the follows apply (\(R=\)radius in 
ounces):
(1) Crank, wheel, and lever controls, 
\([1+R]/3 \times 50 \text{ pounds}, \text{ but not less than } 50 \) 
pounds nor more than 100 pounds for 
hand operated controls or 130 pounds 
for foot operated controls, applied at 
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any angle within 20 degrees of the plane of motion of the control.

(2) Twist controls, 80R inch-pounds.

[Amdt. 27–11, 41 FR 55469, Dec. 20, 1976, as amended by Amdt. 27–40, 66 FR 23538, May 9, 2001]

§ 27.399 Dual control system.

Each dual primary flight control system must be designed to withstand the loads that result when pilot forces of 0.75 times those obtained under §27.395 are applied—

(a) In opposition; and

(b) In the same direction.

§ 27.411 Ground clearance: tail rotor guard.

(a) It must be impossible for the tail rotor to contact the landing surface during a normal landing.

(b) If a tail rotor guard is required to show compliance with paragraph (a) of this section—

(1) Suitable design loads must be established for the guard; and

(2) The guard and its supporting structure must be designed to withstand those loads.

§ 27.427 Unsymmetrical loads.

(a) Horizontal tail surfaces and their supporting structure must be designed for unsymmetrical loads arising from yawing and rotor wake effects in combination with the prescribed flight conditions.

(b) To meet the design criteria of paragraph (a) of this section, in the absence of more rational data, both of the following must be met:

(1) One hundred percent of the maximum loading from the symmetrical flight conditions acts on the surface on one side of the plane of symmetry, and no loading acts on the other side.

(2) Fifty percent of the maximum loading from the symmetrical flight conditions acts on the surface on each side of the plane of symmetry but in opposite directions.

(c) For empennage arrangements where the horizontal tail surfaces are supported by the vertical tail surfaces, the vertical tail surfaces and supporting structure must be designed for the combined vertical and horizontal surface loads resulting from each prescribed flight condition, considered separately. The flight conditions must be selected so the maximum design loads are obtained on each surface. In the absence of more rational data, the unsymmetrical horizontal tail surface loading distributions described in this section must be assumed.

[Adm’t 27–26, 55 FR 7999, Mar. 6, 1990, as amended by Adm’t 27–27, 55 FR 38966, Sept. 21, 1990]

Ground Loads

§ 27.471 General.

(a) Loads and equilibrium. For limit ground loads—

(1) The limit ground loads obtained in the landing conditions in this part must be considered to be external loads that would occur in the rotorcraft structure if it were acting as a rigid body; and

(2) In each specified landing condition, the external loads must be placed in equilibrium with linear and angular inertia loads in a rational or conservative manner.

(b) Critical centers of gravity. The critical centers of gravity within the range for which certification is requested must be selected so that the maximum design loads are obtained in each landing gear element.

§ 27.473 Ground loading conditions and assumptions.

(a) For specified landing conditions, a design maximum weight must be used that is not less than the maximum weight. A rotor lift may be assumed to act through the center of gravity throughout the landing impact. This lift may not exceed two-thirds of the design maximum weight.

(b) Unless otherwise prescribed, for each specified landing condition, the rotorcraft must be designed for a limit load factor of not less than the limit inertia load factor substantiated under §27.725.

[Adm’t. 27–2, 33 FR 963, Jan. 26, 1968]

§ 27.475 Tires and shock absorbers.

Unless otherwise prescribed, for each specified landing condition, the tires must be assumed to be in their static position and the shock absorbers to be in their most critical position.