

## Subpart E—Design and Construction; Turbine Aircraft Engines

### § 33.61 Applicability.

This subpart prescribes additional design and construction requirements for turbine aircraft engines.

### § 33.62 Stress analysis.

A stress analysis must be performed on each turbine engine showing the design safety margin of each turbine engine rotor, spacer, and rotor shaft.

[Amdt. 33-6, 39 FR 35466, Oct. 1, 1974]

### § 33.63 Vibration.

Each engine must be designed and constructed to function throughout its declared flight envelope and operating range of rotational speeds and power/thrust, without inducing excessive stress in any engine part because of vibration and without imparting excessive vibration forces to the aircraft structure.

[Doc. No. 28107, 61 FR 28433, June 4, 1996]

### § 33.64 Pressurized engine static parts.

(a) Strength. The applicant must establish by test, validated analysis, or a combination of both, that all static parts subject to significant gas or liquid pressure loads for a stabilized period of one minute will not:

(1) Exhibit permanent distortion beyond serviceable limits or exhibit leakage that could create a hazardous condition when subjected to the greater of the following pressures:

- (i) 1.1 times the maximum working pressure;
- (ii) 1.33 times the normal working pressure; or
- (iii) 35 kPa (5 p.s.i.) above the normal working pressure.

(2) Exhibit fracture or burst when subjected to the greater of the following pressures:

- (i) 1.15 times the maximum possible pressure;
- (ii) 1.5 times the maximum working pressure; or
- (iii) 35 kPa (5 p.s.i.) above the maximum possible pressure.

(b) Compliance with this section must take into account:

(1) The operating temperature of the part;

(2) Any other significant static loads in addition to pressure loads;

(3) Minimum properties representative of both the material and the processes used in the construction of the part; and

(4) Any adverse geometry conditions allowed by the type design.

[Amdt. 33-27, 73 FR 55437, Sept. 25, 2008; Amdt. 33-27, 73 FR 57235, Oct. 2, 2008]

### § 33.65 Surge and stall characteristics.

When the engine is operated in accordance with operating instructions required by § 33.5(b), starting, a change of power or thrust, power or thrust augmentation, limiting inlet air distortion, or inlet air temperature may not cause surge or stall to the extent that flameout, structural failure, over-temperature, or failure of the engine to recover power or thrust will occur at any point in the operating envelope.

[Amdt. 33-6, 39 FR 35466, Oct. 1, 1974]

### § 33.66 Bleed air system.

The engine must supply bleed air without adverse effect on the engine, excluding reduced thrust or power output, at all conditions up to the discharge flow conditions established as a limitation under § 33.7(c)(11). If bleed air used for engine anti-icing can be controlled, provision must be made for a means to indicate the functioning of the engine ice protection system.

[Amdt. 33-10, 49 FR 6851, Feb. 23, 1984]

### § 33.67 Fuel system.

(a) With fuel supplied to the engine at the flow and pressure specified by the applicant, the engine must function properly under each operating condition required by this part. Each fuel control adjusting means that may not be manipulated while the fuel control device is mounted on the engine must be secured by a locking device and sealed, or otherwise be inaccessible. All other fuel control adjusting means must be accessible and marked to indicate the function of the adjustment unless the function is obvious.

(b) There must be a fuel strainer or filter between the engine fuel inlet opening and the inlet of either the fuel metering device or the engine-driven positive displacement pump whichever