9. Discrete Source Damage.

a. General. The purpose of this section is to establish FAA guidelines for consistent selection of load conditions for residual-strength substantiation in showing compliance with § 25.571(e), *Damage-tolerance (discrete source) evaluation*. The intent of these guidelines is to define, with a satisfactory level of confidence, load conditions that will not be exceeded on the flight during which the specified incident of § 25.571(e) occurs. In defining these load conditions, consideration has been given to the expected damage to the airplane, the anticipated response of the pilot at the time of the incident, and the actions of the pilot to avoid severe load environments for the remainder of the flight consistent with pilot knowledge that the airplane may be in a damaged state. With these considerations in mind, use the following ultimate loading conditions to establish residual strength of the damaged structure.

b. The maximum extent of immediately obvious damage from discrete sources (§ 25.571(e)) should be determined, and the remaining structure shown with an acceptable level of confidence, to have static strength for the maximum load (considered as ultimate load) expected during completion of the flight.

c. The ultimate loading conditions should not be less than those developed from the following conditions:

(1) At the time of the incident:

(a) The maximum, normal, operating differential pressure, multiplied by a 1.1 factor, plus the expected external aerodynamic pressures during 1g level flight combined with 1g flight loads.

(b) The airplane, assumed to be in 1g level flight, should be shown to be able to survive any maneuver or any other flight-path deviation caused by the specified incident of § 25.57l(e), taking into account any likely damage to the flight controls and pilot normal corrective action.

(2) Following the incident:

(a) Seventy percent (70%) limit flight-maneuver loads and, separately, 40% of the limit gust velocity (vertical and lateral) at the specified speeds, each combined with the maximum appropriate cabin differential pressure (including the expected external aerodynamic pressure).

(b) The airplane must be shown by analysis to be free from flutter up to V_D/M_D with any change in structural stiffness resulting from the incident.

*** ADD THE FOLLOWING TEXT ***

d. It is recognized that there may be rotor segment trajectories in an uncontained engine failure event for which continued safe flight and landing cannot be guaranteed due to structural damage. The intent of 25.571(e)(2) and (e)(3) is to ensure survival of the airplane with any likely damage resulting from an uncontained engine failure. In order to show that the

airplane is capable of successfully completing a flight during which likely structural damage occurs from an uncontained engine failure, the applicant should include the structural risk in the airplane level risk analysis, which should include the following:

The applicant should evaluate all structural damage scenarios resulting from the engine failure model given in AC 20-128B Paragraph 9. Based on the results of that evaluation, the applicant should include the catastrophic structural damage scenarios within the airplane level risk calculations that support compliance with section 25.903(d)(1), as performed per AC 20-128B Paragraph 10.c.(3). Inclusion of structural risk as part of the airplane level risk used for compliance with 25.903(d)(1) demonstrates that likely damage has been addressed and that the design meets the airworthiness requirements of 25.571(e)(2) and (e)(3) when the following are considered:

(1) The consequence of structural damage is determined per the criteria in Paragraph 9.c above, which may consider phase of flight aspects as described in AC 20-128B Paragraph 10 and detailed in Appendix 1 Paragraph 6.8.

(2) Catastrophic structural scenarios are included in both the mean risk calculation (which allows for averaging all rotors on all engines of a given airplane), and the per stage risk calculation per AC 20-128B Paragraph 10.e and detailed in Appendix 1 Paragraph 6.11.