



U.S. Department
of Transportation

**Federal Aviation
Administration**

Memorandum

Subject: ACTION: Review and Concurrence, Equivalent Level of Safety (ELOS) for Federal Aviation Regulation (FAR) 23.33(d)(2); ACE-99-01

Date: January 28, 1999

From: Manager, Airplane Certification Office, ASW-150

**Reply to
Attn. of:** CP, 817-222-5148 or
ARH, 817-222-5147

To: Manager, Project Support Section, ACE-112

Background: Mooney Aircraft Corporation (MAC) is in the process of certifying a new airplane, which is a derivative of the Mooney M20 Series aircraft. The takeoff RPM for the Mooney M20S engine is set at 2400. With the governor inoperative, the maximum allowable RPM, per FAR Part 23.33(d)(2), is 2472, or 103 percent times 2400. During governor inoperative Type Inspection Authorization (TIA) testing, the maximum observed RPM was 2540. This is considered non-compliance with Part 23.33(d)(2).

Applicable regulations: The M20S certification basis is documented in the G-1 Issue Paper dated January 14, 1999. The certification basis includes FAR Part 23.33, dated September 14, 1969.

Regulation requiring an ELOS: FAR Part 23.33(d)(2), requires that "with the propeller governor inoperative, a means to limit the maximum engine speed to 103 percent of the maximum allowable takeoff Revolutions Per Minute (RPM) with the propeller blades at the lowest possible pitch and with the takeoff manifold pressure, the airplane stationary, and no wind."

Compensating features: The propeller/engine/airframe vibration substantiating data for the M20S, per FAR Part 23.907, covers the engine for an RPM up to 2500.

Explanation of compensating features: The intent of FAR Part 23.33 is to limit the engine RPM to no more than 103 percent of the RPM used in substantiating the propeller/engine/airframe installation. Mooney substantiated the M20S propeller/engine/airframe installation, per 23.907, for an engine RPM up to 2500 but established a maximum takeoff RPM of 2400. We believe this compensating feature does not affect the safety of the airplane based on the engineering data from the propeller, engine, and airplane certification tests.

Recommendation: Although the M20S selected engine RPM, literally, does not meet the governor inoperative requirements of FAR 23.33(d)(2), we find that the maximum governor inoperative RPM (2540) is less than 103 percent of the RPM

(2500) used to substantiate the propeller/engine/airframe installation. Therefore, we recommend that an equivalent level of safety finding be granted.

For further questions or comments, please contact Ms. Alma Ramirez-Hodge at (817) 222-5147.


for Michele M. Owsley

Concurrence:



Michael Dahl
Manager, Standards Office, ACE-110



Mike Gallagher
Manager, Small Airplane Directorate, ACE-100