U.S. Department of Transportation
Federal Aviation Administration

Memorandum

Subject: ACTION: Equivalent Level of Safety, Cessna 526, FAR 23.562, Emergency Landing Dynamic Conditions; Finding No. ACE-94-5

Date:

From: Manager, Standards Office, ACE-110

Reply to Attn. of:

To: Manager, Small Airplane Directorate, ACE-100

This memorandum requests your office to review and provide concurrence to the proposed finding of equivalent level of safety to the emergency landing dynamic conditions of FAR 23.562 by permitting the use of ejection seats.

Background: See attached Issue Paper AG-1.

Applicable Regulations: Federal Aviation Regulation (FAR) Section 23.562, emergency landing dynamic conditions.

Applicant's Position: See attached Issue Paper AG-1.

FAA's Position: See attached Issue Paper AG-1.

Compensating Features: See attached Issue Paper AG-1.

Recommendation: We concur with Cessna's position as stated in Issue Paper AG-1. The certification basis for the Model 526 will include an equivalent safety finding for Section 23.562 that endorses the use of ejection seats.

Concurred by:

Manager, Standards Office, ACE-110 — Date 3/15/94

Manager, Small Airplane Directorate
Aircraft Certification Service, ACE-100 — Date 3/15/94

ISSUE PAPER

Project: Cessna Aircraft Company Cessna Model 526 Project No. TC0155WI-A	Item: AG-1 Stage: 1
Reg.Ref.: FAR 21.16, 21.21 & 21.101	Date: 12/13/93 Issue Status: Open
Policy Ref: None	Branch Action: ACE-115W ACE-120W ACE-130W ACE-140W ACE-160W
Subject: Ejection Seat Certification	Compliance Target: Pre-TC.

Statement of Issue:
The Cessna Model 526 cannot comply literally with FAR 23.562, Emergency Landing Dynamic Conditions.

Discussion:
Certification of ejection seats as a means of crew escape became an issue about a year ago for the "JPATS" type of airplane. Discussions with Cessna were conducted concerning the alleged inappropriateness of some of the related sections of FAR 23. Issue Paper SE-1 was proposed for the purpose of processing Special Conditions, but later cancelled.

FAA Position: Wichita ACO letter dated November 16, 1993, informed Cessna that they would have to comply with FAR 23.562, as well as other parts of the FAR.

Applicant's Position: By letter dated December 2, 1993, Cessna requested a finding of equivalent safety in lieu of compliance with 23.562. The following is their justification for the equivalency.

The Model 526, an acrobatic category multi-engine turbofan aircraft, requires ejection seats to be fitted as the only means of compliance with the requirement for bailout at speeds up to V-Dive as specified in 23.807(b)(5). Cessna has selected a seat with zero-zero capability to meet this objective.

Cessna is advised by the ejection seat supplier that an incompatibility exists between the 60-deg vertical test case in 23.562 and the pulse applied to the occupant during seat actuation. The occupant pulse from seat actuation has been

carefully chosen to minimize spine injury. Yet providing the occupant with a means to survive the pulse of 23.562 would compel provision of additional stroking in the vertical mode. We are advised that such a departure from the known dynamics of rigid seat ejection imposes a high probability of spine damage, possibly resulting in fatal injury.

In the history of 23.562 and 23.807 development, it is clear that the Administrator has not considered the installation of ejection seats. In view of the FAA's cancelling consideration of the special conditions that would normally be developed in such circumstances, it is Cessna's belief that a means for resolution is still incomplete. It is further clear that the criteria of 23.562 and dynamic characteristics developed for successful operation of the ejection seats are mutually incompatible. Therefore, Cessna herewith requests that fitting of ejection seats, with zero-zero capability, be considered as providing equivalent safety, per 21.21(b)(1), to the occupant protection that would be provided by compliance with 23.562. Rationale in support of such an equivalent safety finding are provided below.

(a) In the Military training role, in which the Model 526 will be operated, pilots will be expected to abandon the aircraft (via ejection seats) rather than be exposed to the emergency landing inertia forces of 23.562.

(b) After abandoning the aircraft, pilots are immune from 23.562, i.e., they are no longer subject to injury from those forces. Since at the time of the crash, there are no occupants, one could say that 23.562 is no longer relevant.

(c) Availability of zero-zero capability in the ejection seat means that escape is possible at all altitudes from the ground up and at any speed from standstill to maximum dive speed. In our view, this capability will envelope the conditions contemplated in 23.562.

(d) In the unlikely event of emergency conditions where the pilots may elect not to eject, significant occupant protection is still provided. Such incidents occuring within the envelope of 23.562 velocity changes would include undershoots, overshoots, and wheels-up landings for which the inertia forces are primarily longitudinal. For such cases, we are advised that ejection seat restraint systems have sufficient dynamic capability to exceed the forward load case of 23.562.

Considering the preceding, Cessna asserts that the proposed equivalent safety finding is well justified and appropriate for compliance in the referenced certification project.

Conclusion: The FAA concurs with the applicant's position as stated above. The certification basis for the Model 526 will include an equivalent safety finding for 23.562 that endorses the use of ejection seats.

Board Coordination

ACE-120W	ACE-130W	ACE-140W	ACE-160W	ACE-115W
12/14/93 12/15/93	12/15/93	12-15-93 12-15-93	12-15-93 12/17/93	Ronald K Rathgeber 12-16-93

ACE-270	ACE-107
12/22/93	3/11/94