



U.S. Department
of Transportation
**Federal Aviation
Administration**

Memorandum

Subject: **ACTION:** Request for Review and Concurrence with an Equivalent Level of Safety (ELOS) ACE-03 -04 , to 14 CFR part 23, § 23.1505(c), Airspeed Limitations for the Pacific Aerospace Corporation (PAC) PAC 750XL Airplane

Date: January 10, 2004

From: Pacific Aerospace Corporation Project Officer, Project Support Branch, ACE-112

Reply to Karl Schletzbaum
Attn. of: (816) 329-4146

To: Manager, Small Airplane Directorate, ACE-100

This memorandum documents concurrence for the subject finding of Equivalent Level of Safety (ELOS). We request your office to review and concur with the proposed ELOS finding to 14 CFR part 23, § 23.1505(c), Airspeed Limitations. The proposed ELOS would allow the Pacific Aerospace Corporation (PAC) to use V_{NO}/V_{NE} airspeed limitations in lieu of the V_{MO} airspeed limitation normally required for turbine powered airplanes.

Background: The PAC 750XL is a conventional configuration, single engine turboprop, conventional empennage, low wing airplane with tricycle fixed landing gear. The airplane is of conventional metal construction. The airplane will be certificated with a certification basis of 14 CFR part 23 at Amendment 53. The applicant has requested, through the Civil Aviation Authority (CAA) of New Zealand, an Equivalent Level of Safety (ELOS) for the provisions of 14 CFR part 23, § 23.1505(c) at Amendment 53. A similar ELOS has been issued by the New Zealand CAA.

The PAC 750XL is a direct development of the Pacific Aerospace Cresco 08-600 aircraft, which itself is a development of the Fletcher FU24 aircraft of early 1950's vintage. Although having significant structural commonality with later versions of the FU24, the Cresco 08-600 used a turboprop engine with a lengthened fuselage and increased weight, and it was type certificated in New Zealand as a new aircraft type with a new type certificate. At the time of certification of the Cresco 08-600, the CAA reviewed the airspeed limitation requirements of § 23.1505 and concluded that the performance of the airplane was such that the application of § 23.1505(c) would be unduly restrictive for the airplane, so airspeed limitations were based on the requirements of § 23.1505(a) and (b) under an Equivalent Level of Safety decision issued by the CAA.

For certification of the PAC 750XL, Pacific Aerospace initially applied to add a new model to the Cresco 08-600 type certificate, with the intent of maintaining the same certification basis. The CAA requested that PAC review this proposal in light of the intent of the “changed product rule” and PAC, therefore, voluntarily elected to comply with the certification requirements current at the date of application, 14 CFR part 23 at Amendment 53. However, they requested that the Equivalent Level of Safety decision relating to § 23.1505(c) be carried over as design and development work had proceeded on that basis.

Applicable Regulations: The applicable regulations are 14 CFR part 23, § 23.1505(c), which states:

§ 23.1505(c) Airspeed Limitations

(c) Paragraphs (a) and (b) of this section do not apply to turbine airplanes or the airplanes for which a design diving speed V_D/M_D is established under Sec. 23.335(b)(4). For those airplanes, a maximum operating limit speed (V_{MO}/M_{MO} airspeed or Mach number, whichever is critical at a particular altitude) must be established as a speed that may not be deliberately exceeded in any regime of flight (climb, cruise, or descent) unless a higher speed is authorized for flight test or pilot training operations. V_{MO}/M_{MO} must be established so that it is not greater than the design cruising speed V_C/M_C and so that it is sufficiently below V_D/M_D and the maximum speed shown under Sec. 23.251 to make it highly improbable that the latter speeds will be inadvertently exceeded in operations. The speed margin between V_{MO}/M_{MO} and V_D/M_D or the maximum speed shown under Sec. 23.251 may not be less than the speed margin established between V_C/M_C and V_D/M_D under Sec. 23.335(b), or the speed margin found necessary in the flight tests conducted under Sec. 23.253.

The maximum operating airspeed, V_{MO} , was introduced to § 23.1505(c) at Amendment 23-7. The intent of V_{MO} is to provide relief to high performance airplanes, that is airplanes with a selected high structural design cruise speed, V_C , by reducing the margin between V_C and the design dive speed, V_D . As first proposed, the amended rule applied to all high-performance airplanes. However, when the final rule was adopted, only turbine powered airplanes were included in § 23.1505(c). Low performance turbine powered airplanes were not specifically identified, but the regulatory development indicates that the intent was that the regulation was to apply to high performance airplanes. As turbopropeller powered airplanes were identified as the only airplanes affected at the time of writing, the regulation was stated to apply to these airplanes rather than high performance airplanes.

For the PAC 750XL:

The structural design cruising speed is $V_C = 141$ KEAS ($V_H = 156$ KEAS) per § 23.335(a)(3). If PAC had chosen to select V_C based on § 23.335(a)(1)(i), then $V_C = 163$ KEAS.

The design dive speed is $V_D = 197$ KEAS per § 23.335(b)(2)(i).

The maximum operating speed is $V_{MO} = 141$ KEAS per § 23.1505(c).

Compensating Features:

The PAC 750XL is not a high performance airplane as evidenced by its airspeed in level flight with maximum continuous power. This speed, V_H , is 7 knots less than the § 23.335(a)(1)(i) formula for structural design cruising airspeed, V_C . By comparison, a typical twin-engine turboprop airplane has a V_H speed more than 70 knots greater than the § 23.335(a)(1)(i) formula for V_C . Although the turbopropeller installation on the PAC 750XL would normally require the use of a V_{MO} airspeed limitation, the original proposed rulemaking would not have required a V_{MO} limitation for the PAC 750XL.

The applicant has performed flight testing to ensure an adequate margin between a proposed V_{NE} speed and V_D . The flight test results and proposed V_{NO} and V_{NE} airspeeds are described below.

(1) The upset maneuver described in § 23.335(b)(4)(i) was performed. The resulting speed margin was used to establish a differential velocity (V) between the current V_D (14 CFR part 23, § 23.1505(c), requirement) and a new ' V_{NE} .'

(2) Based on the results of this testing, a new red arc was marked on the airspeed indicator and this will be the new ' V_{NE} .' The yellow arc will run from V_{NO} up to the new ' V_{NE} .' Of course, V_{NO} is less than or equal to V_C determined from § 23.335(a)(3).

Recommendation: We concur that PAC's substitution of V_{NO}/V_{NE} airspeed limitations for the PAC 750XL provides an Equivalent Level of Safety (ELOS) to the V_{MO} airspeed limitation requirement in 14 CFR part 23, § 23.1505(c). The proposed compensating features are acceptable because the PAC 750XL, while a turboprop airplane, is essentially a low performance, utility type airplane which has evolved from airplanes designed for low speed work; the PAC 750XL essentially carries on the same design features inherent in the predecessor designs.

Concurred by:

Manager, Project Support Branch, ACE-112

Date

Manager, Standards Office, ACE-110

Date

Manager, Small Airplane Directorate, ACE-100

Date

