



Federal Aviation Administration

Memorandum

Date: JUL 26 2007
To: Manager, Small Airplane Directorate, ACE-100
From: Manager, Fort Worth Aircraft Certification Office, ASW-150
Prepared by: Eric Kinney, Flight Test Pilot, ASW-150
Subject: Review and Concurrence, Equivalent Level of Safety for 14 CFR part 23
§ 23.1545(b)(4), Airspeed Indicator, on Eclipse Model 500, Project TD2066AC-A
(ELOS) ACE-07-04

This memorandum requests that your office review and provide concurrence with the proposed finding of equivalent level of safety in accordance with § 21.21(b)(1) to the requirements of § 23.1545(b)(4) for the marking of the stall speeds on the airspeed indicator.

BACKGROUND:

The low airspeed awareness warning approved under type design (TD) indicates a predicted stick pusher speed, which is corrected for weight based upon the weight entry on the Operations page. If no entry is made it defaults to the maximum gross weight of the aircraft. The low speed redline is static as the aircraft maneuvers.

Eclipse Aviation (EAC) has proposed a change in type design to be certified under the Performance Enhancements project # TD2066AC-A, which would indicate stall warning airspeed based upon the angle of attack, current airspeed and an angle of attack rate term. It therefore, changes dynamically as the aircraft maneuvers. The tape display has some filtering added to reduce the activity of the red tape indication; therefore, "STALL" visual and aural warnings may appear slightly before the red tape indication. The same Aircraft Computer System (ACS) command is given to each Primary Flight Display (PFD); therefore, the red tape indication should be the same on both PFDs.

APPLICABLE REGULATION:

The pertinent part of the regulation is 14 CFR § 23.1545(b)(4), and it states:

Section 23.1545 Airspeed indicator.

(b) The following markings must be made:

(4) For the flap operating range, a white arc with the lower limit at V_{SO} at the maximum weight, and the upper limit at the flaps extended speed V_{FE} established under § 23.1511.

STATEMENT OF ISSUE:

14 CFR § 23.1545(b)(4), states that a white arc must be used to display the operating range of the flaps with the upper end defined per § 23.1511, and the lower end as V_{SO} at maximum weight. EAC currently displays a label of V_{FE} for each flap setting on the airspeed display, with no white arc shown. In addition, when a flap position other than UP is selected, the overspeed warning indications are reset to the appropriate V_{FE} for that configuration.

With the software change described above, the top of the red tape indication on the airspeed display will no longer correspond to the activation of aircraft stick pusher system (stall speed); it will now correspond to stall warning based on flap position, angle of attack (AOA) and AOA rate of change.

APPLICANT'S POSITION:

EAC requests that the Federal Aviation Administration (FAA) grant an equivalent level of safety finding from § 23.1545(b)(4), based on the proposed design providing a higher level of safety. A higher level of safety is provided by additional low airspeed awareness at a greater margin above stall, allowing pilots to take corrective action prior to pusher activation.

FAA POSITION:

The certification basis approved for this airplane at the time of application is 14 CFR part 23 (through Amendment 23-55). This approved certification basis included § 23.1545 and ELOS ACE-06-01, "Equivalent Level of Safety for 14 CFR § 23.1545 (b)(4), Airspeed Indicator, on Eclipse Model 500." With the software change described, the airspeed red tape now alerts the pilot to the approach to stall at a greater margin than previously certified in addition to the aural and visual "*STALL*" warnings. This is considered to be a more conservative approach and addition to safety on the Eclipse Model 500.

COMPENSATING FEATURES:

The Eclipse Model 500 is a turbine aircraft that requires the pilot to be Type Rated in the same manner as required for operation of Transport Category airplanes. This issue has been addressed in Small and Transport Category airplanes with placards in the cockpit, and with the limitations section of the Approved Airplane Flight Manual (AFM).

Section 23.1545(b)(4) is targeted for small single engine airplanes, reciprocating twin-engine airplanes, and turbo-prop twin-engine aircraft. Electronic displays incorporating the airspeed historically do not address the flap operating range, either with a white arc, or any other form of flap speed limitation indication. However, ELOS ACE-06-03, "Equivalent Level of Safety for 14 CFR § 23.1545 (b)(4), Airspeed Indicator, on Cessna Model 510, Citation Mustang," does address this rule in a similar fashion, and was subsequently approved. The white arc for flap operating speeds is a requirement from the round-dial airspeed indicator era, and is inappropriate for the electronic displays in this class of airplane.

The Eclipse 500 training requirements and operational procedures are basically identical to those of Transport Category airplanes and other 14 CFR part 23 turbojets. An equivalent level of safety finding should be applied in this case, with respect to the markings prescribed in § 23.1545(b)(4). These speeds are available via the use of the top of the proposed red tape for stall warning and the Approved Airplane Flight Manual for actual stall speeds (activation of aircraft stick pusher system). This should be considered sufficient, as similarly configured airplanes with electronic instruments and integral airspeed displays are operated in a comparable manner.

RECOMMENDATION:

Based on the EAC showing of the compensating features of their design, and the requirement for a type rating for the airplane pilot, we recommend the issuance of this equivalent level of safety finding to § 23.1545(b)(4) for the airplane Model EA-500.

CONCURRENCES:

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7-24-07

Manager, Airplane Certification Office, ASW-150

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7-26-2007
Date