Federal Aviation Administration

Memorandum

Date: January 23, 2006

From: Manager, Wichita, ACO, ACE-115W

To: Manager, Small Airplane Directorate, ACE-110

Prepared by: Grant Youngdahl, ASE (Flight Test), ACE-117W

Subject: **ACTION**: ELOS for Passenger Oxygen Dispensing Units for Cessna Model 510 ACE-05-23

Background: Cessna letter L390-05-4069-0725, dated December 22, 2005, requested a finding of Equivalent Level of Safety (ELOS) for the Cessna Model 510 with respect to 14 CFR § 23.1447(e), to provide easily accessible emergency oxygen to passengers. The ELOS is being requested because at cold cabin temperatures, the passenger oxygen masks become stiff and will not unfold, and fall from the dispensing unit stowage box for presentation to the passengers. Cessna is proposing that a streamer be attached to the oxygen mask. The streamer would fall and be presented to the passengers, who would then be able to pull the lodged oxygen mask from the dispensing unit box using the streamer and don the mask. Cessna Model 510 aircraft are expected to operate from climates, where winter temperatures are often very cold.

This request was coordinated within the Federal Aviation Administration (FAA) by Issue Paper (IP) ME-5.

Applicable Regulations: The Model 510 certification basis is 14 CFR part 23 as amended through Amendment 54.

Regulation Requiring an ELOS: 14 CFR § 23.1447(e) requires that; "If certification for operation above 30,000 feet is requested, the dispensing units for passengers must be automatically presented to each occupant before the cabin altitude exceeds 15,000 feet."

Just before the cabin pressure altitude exceeds 15,000 feet, the oxygen mask should fall down automatically and present itself to a 95th percentile human occupant at mouth level within the visual periphery. All the occupant should have to do is pull the mask from the hanging position, don the mask, and start breathing.

Compensating features which allow the granting of the ELOS: The Model 510 passenger oxygen dispensing units have been designed to incorporate a 6 inch long mask lanyard attached to the shutoff pin on the oxygen flow valve, with a 6.6 inch long webbing streamer attached to the mask by a 12 inch lanyard. This design does not require the mask to be presented at face

height, since it provides an equivalent means for the mask to be pulled down and donned by a seated, belted passenger, and to insure flow of oxygen to the passenger.

Compensating factors, which provide an equivalent level of safety to the requirements of 14 CFR § 23.1447(e), as required by 14 CFR § 21.21(b)(1), for Model 510 are outlined in the following:

1) AC 23-17A specifies that "…For such as sleeper seats, bunks, or lavatories, a streamer of webbing attached to the mask is acceptable to enable the person to pull the mask down to them." The effort required to pull a passenger oxygen mask within reach via a streamer from a sleeper seat, bunk, or lavatory seat is no greater than the effort required to pull a passenger oxygen mask within reach from a standard passenger seat, whatever the position of the seat.

2) The lanyard between the oxygen mask and the shutoff pin on the oxygen flow valve is short enough that the ninety-fifth percentile male specified in AC 23-17A, would be unable to don the mask without first pulling the shutoff pin, and initiating oxygen flow whether the mask was brought to the face by pulling on the mask, or the steamer.

3) The combined lengths of the lanyard between the oxygen mask and the shutoff pin, and the lanyard between the mask and the streamer, are sufficient that the fifth percentile female specified in AC 23-17A, would be able to bring the mask within reach to don the mask whether the mask fell unhindered from the passenger oxygen dispensing unit, or if it remained in, or near the box due to material stiffness, when used in a cold environment.

Explanation of how these features provide an ELOS: The intent of 14 CFR § 23.1447(e) is to provide easily accessible emergency oxygen to passengers in case of cabin decompression. The system features described previously are designed to meet this intent. Therefore, the features provided by the Cessna Model 510 passenger Oxygen Dispensing Units provide an equivalent level of operational safety to meet the intent of 14 CFR § 23.1447(e), if the following stipulations are met.

1) If streamers are required to aid in the deployment of oxygen masks the streamer needs to be presented at face height, when the person's head is resting on the seat back cushion with the seat in any position, such as upright, reclined, swiveled or tracked. The streamer must be easily reachable with the seat belts fastened.

2) Pre-flight briefings must contain information on the meaning of the streamer, and how to use the streamer to pull the oxygen mask form the stowage box.

3) When carrying passengers, the aircraft shall be limited to operation below 15,000 feet, until the cabin has warmed sufficiently to allow the passenger oxygen masks boxes to open, the streamers to drop, and the masks to be pulled from the

stowage boxes by the streamers without damaging the masks. Cessna shall determine this temperature through appropriate FAA tests.

ACO Recommendation: The compensating features and procedures noted in this memo will provide an equivalent level of safety to the requirements of 14 CFR § 23.1447(e) at Amendment 23-54, upon meeting the requirements stipulated in the explanation section, successful completion of required tests, and completing a compliance inspection and compliance substantiation documentation.

Margaret M. Kline *3/9/06*
Margaret M. Kline, ACE-115W Date
Manager, Wichita Aircraft Certification Office

Concurrence:

John Colomy *3/21/06*
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David R. Showers *3/28/06*
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