Federal Aviation Administration

Memorandum

Date: June 8, 2016

To: Manager, Chicago Aircraft Certification Office, ACE-115C

From: Manager, Small Airplane Directorate, ACE-100

Prepared by: Wess Rouse, Propulsion and Program Management Branch, ACE-118C

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Kestrel Aircraft Company, Model K-350 Airplane, FAA Project TC7859CH-A.

ELOS Memo#: TC7859CH-A-F-1

Regulatory Ref: 14 CFR 23.221

This memorandum informs the certificate management aircraft certification office of an evaluation made by the Accountable Directorate on the establishment of an equivalent level of safety finding for the Kestrel model K-350 airplane.

Background:

The Federal Aviation Administration (FAA) did not envision in the current regulations artificial stall barriers as a possible method of compliance. Artificial stall barriers have a successful history of tailoring an aircraft's stall characteristics to provide the aircraft with improved spin/departure resistance. The FAA has granted ELOS findings to § 23.221 spin requirements for stick shaker and stick pusher installations to at least two other Type Certificate holders. Kestrel proposes a stick shaker, stick pusher installation for its model K-350.

Applicable regulations:

14 CFR 23.201, 23.203, 23.207, and 23.221.

Regulations requiring an ELOS finding:

14 CFR 23.221

Description of compensating design features or alternative Methods of Compliance (MoC) which allow the granting of the ELOS (including changes, limitations, or equipment needed for equivalency)

The Kestrel model K-350 airplane stick shaker, stick pusher and low speed awareness display design and operation will be conventional for angle of attack (AOA) based systems. Additionally, these design features will follow current regulatory guidance and meet or exceed all applicable regulations.

The system is comprised of two angle of attack sensors (one on each wing), two independent, Garmin-activated stick shakers, and the Garmin G3000 system, which includes a built-in stick pusher function. Kestrel will normalize the AOA to the stall angle of attack (unit-less 0 to 1 scale) for all functions and indications. Kestrel will account for both landing gear positions and operations in and out of icing condition configurations in all flap positions.

Kestrel will demonstrate compliance to § 23.207, stall warning requirements using a normalized AOA based stick shaker calculation via the G3000 system. Both AOA sensors will be capable of activating both stick shakers. In other words, if either normalized AOA value is above the stall warning value, both stick shakers will activate. Stick shaker activation will occur at or before 5 knots of the stall speeds published in the Airplane Flight Manual (AFM). Since normalized AOA values are percentage based, actual activation will be a percentage above the AFM published stall speeds in all configurations.

If all aerodynamic stall characteristics, without stick pusher, meet the requirements of §§ 23.201 and 23.203, the stick pusher will be set to activate at least 2 knots before aerodynamic stall. Kestrel will determine the actual value during the development program and may be based upon aircraft center of gravity location or other factors. If stall characteristics are poor beyond a 60° roll, the stick pusher will be set to activate at least 5 knots prior to the aerodynamic stall. Additionally, for airplanes with a stall barrier system, the stick pusher speed is considered the stall speed.

Explanation of how design features or alternative Methods of Compliance (MoC) provide an equivalent level of safety intended by the regulation:

The stick pusher installation will not allow a full aerodynamic stall to occur. Therefore, a spin cannot occur because an aerodynamic stall is required prior to a possible spin entry.

FAA approval and documentation of the ELOS finding:

The FAA has approved the aforementioned equivalent level of safety finding in project number TC7859CH-A issue paper F-1. This memorandum provides standardized documentation of the ELOS finding that is non-proprietary and can be made available to the public. The Accountable Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number must be listed in the Type Certificate Data Sheet under the Certification Basis section (TCs & ATCs) or in the Limitations and Conditions section of the STC. An example of an appropriate statement is provided below.

Equivalent Level of Safety Findings has been made for the following regulation:

14 CFR 23.221, Spinning

(Documented in ELOS Memo TC7859CH-A-F-1)

//SIGNED// June 6, 2016

Mel Johnson, Acting Manager, Date
Small Airplane Directorate
Aircraft Certification Service

ELOS Originated by: Chicago ACO	Manager, Chicago Aircraft Certification Office: Timothy P. Smyth	Routing Symbol: ACE-115C

cc:
ACE-118C R/F

ACE-118C:WRouse:x8113:wdr:01/12/15:K;\ACE117\COMMON\TC\KESTREL\CORRES\ 145-0112 (23.221 Spinning ELOS).doc

8110.1.a(1)

ASTARS N/A