Federal Aviation Administration

Memorandum

Date: June 8, 2016

To: Manager, Seattle Aircraft Certification Office, ANM-100S

From: Manager, Small Airplane Directorate, ACE-100

Prepared by: Jeffrey A. Morfitt, Small Airplanes Program Manager, Seattle Aircraft Certification Office, ANM-100S

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Epic Aircraft, LLC., Model E1000 Airplane, Use of Stick Pusher/Shaker System in lieu of compliance with Spin Recovery Requirements, FAA Project # TC11773SE-A

ELOS Memo#: TC11773SE-A-F-1

Regulatory Ref: 14 CFR 23.201, 23.203, 23.207, 23.221, 23.691, 23.1301, 23.1306, 23.1308, and 23.1309

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 (ELOS) finding for the Epic Aircraft (Epic) Model E1000 airplane.

Background:

Epic E1000 Airplane Configuration—The E1000 airplane is a single engine, pressurized, six-passenger airplane. Its airframe is constructed primarily of composite materials, and is powered by a Pratt and Whitney PT6-67A turboprop engine with four-bladed Hartzell propeller. The maximum gross weight will be less than 8,001 pounds. The proposed cockpit design will use three Garmin G1000 displays or similar glass cockpit.

Epic has installed a stall warning with stick-shaker and a stick-pusher system that meets the requirements of Title 14, Code of Federal Regulations (14 CFR) 23.691. The stick-pusher system will define the stall per §§ 23.201 and 23.203. Epic has elected to show, with the stick-shaker and stick pusher systems installed and without conducting spin flight tests, the airplane has the same or greater safety level intended by § 23.221. This action requires the FAA to make an ELOS finding since such a method of compliance is not addressed in part 23.

Applicable regulation:

14 CFR 23.201, 23.203, 23.207, 23.221, 23.691, 23.1301, 23.1306, 23.1308, and 23.1309

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 stick shaker/pusher system functions to prevent the airplane from entering a stall condition primarily during low-speed flight. Major components of the system include a stick-shaker actuator, audible stall warning device, stick pusher servo, redundant shaker and pusher computers (2), and heated left and right lift transducers. 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:

An airplane incapable of stalling is also incapable of spinning. Spins are avoided by preventing the airplane from achieving an angle of attack that would cause a stall. Preventing a spin provides a ELOS or better than that provided by the spin recovery characteristics required by § 23.221.

To demonstrate a level of safety equivalent to that provided by § 23.221 Epic will accomplish the following for the stick-shaker and stick-pusher system in addition to any other applicable requirements:

1. The system will meet § 23.691 requirements.

2. The system will meet § 23.1301 requirements while requiring no exceptional pilot skill.

3. The system will meet §§ 23.1306, 23.1308, and 23.1309 requirements. If Epic demonstrates that the airplane meets §§ 23.201 and 23.203 requirements without the stall stick-shaker and stick-pusher system, this may be considered as a mitigating factor in lowering the functional hazard classification for failure of the system to activate. There are other functional hazards that may not be mitigated by aerodynamic stall characteristics, such as inappropriate activation of the stick pusher.

4. The stick pusher will prevent the airplane from stalling in all conditions for which compliance to §§ 23.201 and 23.203 would otherwise have been required. Epic may also choose to demonstrate direct compliance to §§ 23.201 and 23.203 with the stick pusher deactivated to justify lower functional hazard classifications as discussed in item 3 of this list.

5. The speed margin normally required by § 23.207 between stall warning and stall shall be applied to the difference between stick shaker and stick pusher activation.

6. The system will include a yoke mounted disconnect switch. Epic must provide the details of the operation and location of the switch to the FAA for review and acceptance.

7. Epic must provide details of the disconnect switch annunciations (visual and audible) to the FAA for review and the acceptance.

8. Epic will demonstrate safe landings within a tolerance band around the nominal speeds recommended for landing in the airplane flight manual. The tolerance band will ensure inadvertent exceedance of the tolerance is unlikely, exceptional pilot skill is not required, and the FAA finds behavior within the band acceptable.

FAA approval and documentation of the ELOS finding:

The FAA has approved the aforementioned equivalent level of safety finding in project issue paper F-1 for FAA Project Number TC11773SE-A. 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 have been made for the following regulation(s):

14 CFR 23.221, Spinning

//SIGNED// June 8, 2016

Melvin Johnson, Acting Manager, Small Airplane Directorate, Aircraft Certification Service — Date

ELOS Originated by: Seattle ACO	Manager, Seattle ACO: Ross Landes	Routing Symbol: ANM-100S

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ACE-111:TTompkins:05/9/16
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