



# Federal Aviation Administration

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## Memorandum

Date: November 25, 2014

To: Manager, Small Airplane Directorate, ACE-100

From: Manager, Project Support Branch, ACE-112

Prepared by: Doug Rudolph, Project Support Branch, ACE-112

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Aircraft Industries (AI), Models L 410 UVP-E20 and L 410 UVP-E20 CARGO

ELOS Memo#: ACE-14-14

Regulatory Ref: 14 CFR 23.1545(b)(4), (b)(5), and (d), Amendment 23-50

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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 Aircraft Industries (AI) Model L 410 UVP-E20 and L 410 UVP-E20 CARGO airplanes. The ELOS finding pertains to the method of airspeed presentation required by 14 CFR 23.1545(b)(4), (b)(5), and (d).

### **Background:**

The Universal EFI-890R Electronic Flight Information System (EFIS) is used as the Primary Flight Display (PFD) on Model L 410 UVP-E20 and L 410 UVP-E20 CARGO airplanes to indicate airspeed information using linear airspeed tape with airspeed awareness cues instead of using colored arcs and lines required in § 23.1545, Amendment 23-50.

### Airplane Certification Basis:

The AI Model L 410 UVP-E20 and L 410 UVP-E20 CARGO airplanes are being validated through the *Technical Implementation Procedures For Airworthiness and Environmental Certification Between The Federal Aviation Administration of the United States of America And The European Aviation Safety Agency Of The European Union*, Revision 3, dated April 23, 2013. The European Aviation Safety Agency (EASA) is the certifying authority.

The Federal Aviation Administration (FAA) type certification basis for this amended FAA Type Certificate (TC) to add these two airplane models to FAA TC A42CE is part 23 at Amendment 23-41. EASA's type design changes for the General Electric (GE) H80-200 engines and Avia AV 725 propeller are at Amendment 23-59 while their type design changes for the semi-glass avionics is at Amendment 23-57. Additionally, regulations were later added to the Model

L 410 UVP-E20 CARGO. The certification basis for both models includes 14 CFR part 36, as amended by Amendment 36-1 through Amendment 36-30 and 14 CFR part 34, as amended through Amendment 34-5A.

#### Airplane Description:

The L 410 UVP-E20 is an aluminum, high wing, commuter category, twin turboprop airplane. The airplane is powered by GE Aviation Czech Model GE H80-200 engines with maximum take-off power of 597 kilowatt (kW)/800 Shaft Horsepower (SHP) and maximum continuous power 522 kW/700 SHP. The GE engine has an FAA TC and the number is E00048EN. The propellers are Avia Propellers Model AV-725-1-E-C-F-R(W)/CFR230-433, which are five bladed aluminum propellers. The FAA validated this propeller under TC P34BO.

The L 410 UVP-E20 has a maximum take-off weight of 6,600 kilograms (kg) [14,550 pounds (lbs.)] and a maximum landing weight of 6,400 kg (14,109 lbs.). The airplane has a maximum zero fuel weight of 6,000 kg (13,228 lbs.) without wing tip tanks and 6,400 kg (13,360 lbs.) with wing tip tanks and a maximum payload of 1,800 kg (3,968 lbs.). It has a maximum seating capacity of up to 19 passengers and 2 pilots with a two-crew flight deck. This airplane is not approved for single pilot operations. These airplanes will be approved for day and night visual flight rules, instrument flight rules, and flight into known icing.

#### Airplane Cockpit Flight Display:

The EFIS for Model L 410 UVP-E20 and L 410 UVP-E20 CARGO airplanes cockpit suite is the Universal EFI-890R used as the PFD (see Figures 1 and 2). This display does not meet compliance to regulations § 23.1545(b)(4), (b)(5), and (d).

Section 23.1545, Amendment 23-50, requires certain airspeed to be marked using specific colored arcs and lines. The Universal EFI-890R displays the airspeed using a moving vertical tape in combination with a rolling digit indicator on the Models L 410 UVP-E20 and L 410 UVP-E20 CARGO airplanes and does not comply with the regulation.

AI has requested an ELOS finding based on guidance provided in FAA Advisory Circular AC 23.1311-1B because the linear airspeed tape indicator includes airspeed awareness cues that are equivalent or superior to the cues provided by traditional round dial indicators. In addition, AI wants to include a best rate of climb, one-engine inoperative speed ( $V_{YSE}$ ) to its crew for capability awareness, although § 23.1545(b)(5) is not required for their airplanes.

#### **Applicable regulation:**

Section 23.1545, Amendment 23-50

#### **Regulations requiring an ELOS finding:**

Section 23.1545(b)(4), (b)(5), and (d), Amendment 23-50, addressing airspeed indicator, states the following:

“(b) The following markings must be made:

(b)(4) For the flap operating range, a white arc with the lower limit at  $V_{S0}$  at the maximum weight, and the upper limit at the flaps-extended speed  $V_{FE}$  established under §23.1511.”

(b)(5) For reciprocating multiengine-powered airplanes of 6,000 pounds or less maximum weight, for the speed at which compliance has been shown with §23.69(b) relating to rate of climb at maximum weight and at sea level, a blue radial line.”

“(d) Paragraphs (b)(1) through (b)(4) and paragraph (c) of this section do not apply to airplanes for which a maximum operating speed  $V_{MO}/M_{MO}$  is established under §23.1505(c). For those airplanes, there must either be a maximum allowable airspeed indication showing the variation of  $V_{MO}/M_{MO}$  with altitude or compressibility limitations (as appropriate), or a radial red line marking for  $V_{MO}/M_{MO}$  must be made at lowest value of  $V_{MO}/M_{MO}$  established for any altitude up to the maximum operating altitude for the airplane.”

**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 AI Model L 410 UVP-E20 and L 410 UVP-E20 CARGO airplanes cockpit suites include the Universal EFI-890R as the PFD. Historically, section 23.1545 was developed for traditional round dial indicators. In accordance with guidance provided in FAA Advisory Circular (AC) 23.1311-1B, the linear airspeed tape indicator includes airspeed awareness cues that are equivalent, or superior to the cues provided by traditional round dial type indicators. These awareness cues include:

a. The airplane’s flap operating range is a white band with the bottom being the stall speed in the landing configuration at maximum landing weight ( $V_{S0}$ ) and the top is defined as the flaps extended speed ( $V_{FE}$ ) for full landing flaps ( $42^\circ$ ). In addition, a white line with the label  $V_{FE1}$  marks the takeoff/approach flaps ( $18^\circ$ ). This  $V_{FE1}$  indication is more practical from a pilot’s point of view since the particular flap setting is distinguished (see Figure 1).



**Figure 1: PFD Low Speed View**

b. The  $V_{MO}$  airspeed limitation indication (interlaced, red, barber pole bar) is the minimum value of  $V_{MO}$  established for any altitude in the airplane's flight envelope (see Figure 2).

c. Though not required for this class of airplane, AI marks the best climb rate with critical engine inoperative in cruise configuration for the maximum takeoff weight with a blue line and  $V_{YSE}$  label as depicted in Figures 1 and 2.

d. The crew can set  $V_1$ ,  $V_R$ , and  $V_2$  values before takeoff. The crew can set the  $V_{REF}$  value before landing approach. These speeds are determined based on the performance data in the *Airplane Flight Manual* and displayed as labeled pointers on the airspeed tape. Figure 1 shows an example of a  $V_{REF}$  indicator.

e. Display of a low-speed awareness indication (black and white barber pole bar). The low-speed awareness band extends from  $V_2$  at takeoff or from  $V_{REF}$  at approach to the bottom of the airspeed scale. (If the crew does not set  $V_2$  and  $V_{REF}$ , then the band starts at  $V_{S0}$ .) After takeoff, when the current airspeed exceeds  $V_2 + 50$  knots or  $V_{S0} + 50$  knots, whichever condition occurs

first, the low-speed awareness band appears bounded at the top by the configured  $V_{S0}$  automatically.



**Figure 2: PFD High Speed View**

AI concluded the airspeed indication and airspeed awareness cues implemented in both the AI L 410 UVP-E20 and L 410 UVP-E20 CARGO airplane models utilizing the Universal EFI-890R PFD, provide an ELOS to § 23.1545(b)(4), (b)(5), and (d) for the following reasons:

- a. The intent of § 23.1545(b)(4) is to provide awareness to the crew of the airspeed range (relative to the present airspeed) within which the flaps can be safely fully extended.
- b. The intent of § 23.1545(b)(5), though not required for this airplane, is to provide awareness to the crew of the airspeed at the best rate of climb with the critical engine inoperative in cruise condition at maximum takeoff weight.

c. The intent of § 23.1545(d) is to provide awareness to the crew of the maximum operating airspeed of the airplane.

d. The implementation of the AI L 410 UVP-E20 Series Universal EFI-890R PFD airspeed indicator follows the guidance provided in AC 23.1311-1B and provides airspeed awareness cues that are equivalent, or superior to the traditional round dial type indicator.

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

After reviewing the data submitted for this project and performing a validation flight test program on the L 410 UVP-E20 airplane, the FAA believes the applicant has provided a design analysis that demonstrates that the airspeed indication and airspeed awareness cues are equivalent in safety to a traditional indication that complies with § 23.1545(b)(4), (b)(5), and (d).

**FAA approval and documentation of the ELOS finding:**

The FAA has approved the aforementioned equivalent level of safety finding in project issue paper S-5, Stage 4, § 23.1545, Airspeed Indicator ELOS, dated September 28, 2014. 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 23.1545(b)(4), (b)(5) and (d), Amendment 23-50, Airspeed indicator.

(Documented in ELOS Memo ACE-14-14.)

*Earl Lawrence*

*November 25, 2014*

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Manager, Small Airplane Directorate,  
Aircraft Certification Service

Date

ELOS Originated by: Project Support Branch	Manager, Project Support Branch: Jacqueline Jambor	Routing Symbol: ACE-112
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