



# Federal Aviation Administration

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## Memorandum

Date: December 4, 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-14-13

Regulatory Ref: 14 CFR 23.777(d), Amendment 23-33, Effective 08/11/86

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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 (ELOS) finding for the cockpit control layout on the Aircraft Industries (AI) Model L 410 UVP-E20 and L 410 UVP-E20 CARGO airplanes. The ELOS finding pertains to the Fuel Stop Cock/Emergency Throttle Levers location in cockpit as required by § 23.777(d).

### **Background:**

The cockpit control layout on the Model L 410 UVP-E20 and L 410 UVP-E20 CARGO airplanes does not meet compliance with § 23.777(d), Amendment 23-33. However, these airplanes have proven to be adequately safe by several means including the airplane's required type rating program and the large fleet (over 1,000) of the Model L 410 series flying safely without accidents/incidents associated with the fuel stop cock/emergency throttle levers locations. The Federal Aviation Administration (FAA) conducted a human factors evaluation during the FAA validation flights and found that the layout meets the intent of § 23.777(d).

### Airplane Certification Basis:

The Aircraft Industries (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 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, effective December 1, 1969, as amended through Amendment 36-1 through Amendment 36-30 and 14 CFR part 34, dated September 10, 1990, as amended through Amendment 34-5A, effective October 23, 2014.

#### 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 Horse Power (SHP) and maximum continuous power 522 kW/700 SHP. The GE engine is certified under FAA TC number 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 kg (14,550 lbs.) and a maximum landing weight of 6,400 kilograms (kg) [14,109 pounds (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. The 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.

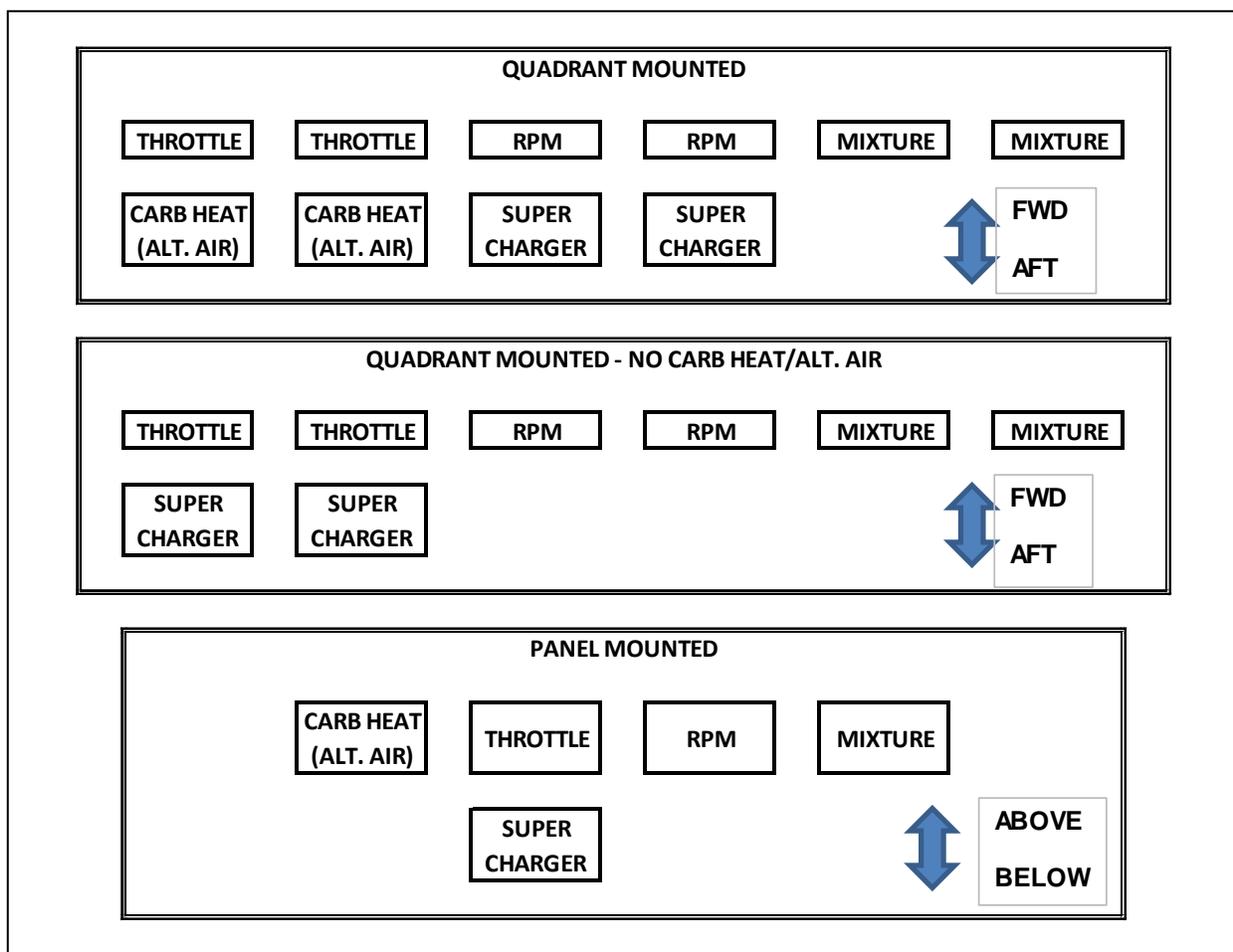
#### Airplane Cockpit Controls:

The AI L 410 UVP-E20 and L 410 UVP-E20 CARGO airplanes have a non-compliant cockpit control layout concerning the location of several of the powerplant control levers (refer to Figure 1). The Fuel Stop Cock/Emergency Throttle Levers (item 2) and Fuel Fire Cocks (item 3) are located in a different location than what is prescribed in § 23.777(d).



and fuel cut-off for turbine-powered airplanes). Power (thrust) levers must be easily distinguishable from other controls, and provide for accurate, consistent operation. Carburetor heat or alternate air control must be to the left of the throttle or at least eight inches from the mixture control when located other than on a pedestal. Carburetor heat or alternate air control, when located on a pedestal, must be aft or below the power (thrust) lever. Supercharger controls must be located below or aft of the propeller controls. Airplanes with tandem seating or single-place airplanes may utilize control locations on the left side of the cabin compartment; however, location order from left to right must be power (thrust) lever, propeller (rpm control), and mixture control.”

For visual clarification of the cockpit control layout described in § 23.777(d), refer to Figure 2.



**Figure 2: Section 23.777(d) Cockpit Control Layout**

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

Aircraft Industries provided the following relative description:

With regard to emergency throttle control function, the current location of fuel stop cock/emergency throttle levers is advantageous because these levers are more accessible for both

pilots (shorter distance, no overcoming other levers from the pilot in command position, availability of more accurate emergency control). Figure 3 shows the current arrangement of the cockpit center section.



**Figure 3: L 410 UVP-E20 Cockpit Center Section**

The fuel stop cock/emergency throttle levers handles are modified and the fuel fire cock lever handles are red. The distance between the fuel stop cocks/emergency throttle lever and the fuel fire cock lever is adequate.

Figure 3 depicts that the shapes of the fuel stop cocks/emergency throttle lever and the fuel fire cock lever handles are different. The fuel stop cocks/emergency throttle levers are used during the following procedures:

- Normal procedures, for cutting-off a fuel supply to shut down the engine
- Emergency/abnormal procedures, for cutting-off a fuel supply to the failed engine
- Emergency/abnormal procedures, for emergency throttle control in case of fuel control unit (FCU) failure
- Unsuccessful normal in-flight engine starting

With the fuel stop cocks/emergency throttle levers in the rear position, the fuel supply to the engine is cut-off, whereas, in the middle position (on the gate step) it is open. By tilting the control levers to the right and shifting them forward, an emergency engine control mode is established. The emergency engine control mode can be employed in case of FCU failure (during

the flight) after switching on the isolation valve (LH, RH) circuit breakers on the overhead panel. In such a case, the isolation valve signaling cell on the central warning display illuminates.

The emergency engine control allows for throttling the fuel supply to the engines directly by means of a shaped needle in the fuel shut-off valve (part of FCU).

The initial position of the fuel stop cocks/emergency throttle levers for in-flight starting the engines in the emergency control mode is marked by a red line on the control levers and the gate.

The fuel fire cock levers are used in case of engine fire only.

In summary, an unintentional shutting-off an engine instead of retarding the throttle is practically improbable because a pilot should overcome a lock (stop) by tilting a fuel stop cocks/emergency throttle lever to the left first.

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

Pilots are familiarized with the Fuel Stop Cock/Emergency Throttle Levers and Fuel Fire Cocks locations during the type rating training and they get accustomed with them by frequent usage of these levers during each flight. As previously explained, a misuse of these controls is improbable.

This fuel stop cock/emergency throttle levers location is used on more than 1,000 models of L 410 airplanes without any operation problems reported.

**FAA Approval and Documentation of the ELOS Finding:**

The FAA has approved the aforementioned equivalent level of safety finding in project issue paper S-4, Stage 4, 14 CFR 23.777(d), Cockpit Controls - possible ELOS, dated September 8, 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.

The ELOS Findings have been made for the following regulations of 14 CFR part 23:

§ 23.777(d), Amendment 23-33, Cockpit controls.

(Documented in ELOS Memo ACE-14-13.)

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12/4/2014

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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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