



# Federal Aviation Administration

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## Memorandum

Date: MAY 15 2009

To: Manager, Small Airplane Directorate, ACE-100

From: Manager, Wichita Aircraft Certification Office, ACE-115W

Prepared by: Daniel Hilton, ASE (Electrical and Avionics), ACE-119W

Subject: Equivalent Level of Safety (ELOS) with respect to 14 CFR, part 23, § 23.1303(c) for a Direction Indicator, (Non-Stabilized Magnetic Compass)

ELOS Memo#: ACE-09-07

Regulatory ref: §§ 23.1301(a)(d), 23.1303(c), 23.1309(a)(b)(c)(e), 23.1321, 23.1327, 23.1331, 23.1547, 23.1351(d)(g), 23.1353

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This memorandum requests your office to review and provide concurrence with the proposed equivalent level of safety for the Model 525C Whiskey Compass.

### REFERENCES

- 1) Cessna letter L390-08-4483, dated November 26, 2008, requesting an Equivalent Level of Safety (ELOS) with respect to 14 CFR, part 23, § 23.1303(c) for a Direction Indicator, (Non-Stabilized Magnetic Compass).

### BACKGROUND

Cessna Aircraft Company has requested an Equivalent Level of Safety finding to 14 CFR, part 23, § 23.1303(c). This memo addresses the Cessna request. In a letter to the Federal Aviation Administration (FAA), Cessna requested an Equivalent Level of Safety finding to be made with respect to 14 CFR, part 23, § 23.1303(c), Amendment 23-55 (ref. Cessna Letter L390-07-2472, dated August 8, 2007). Cessna proposes to eliminate the non-stabilized magnetic compass literally referred to in § 23.1303(c), and replace it with a standby electronic display, which utilizes a remote-mounted magnetic flux detector and gyroscopic stabilization internal to the standby suite.

14 CFR, part 23, § 23.1303(c) requires a non-stabilized magnetic compass to provide a direction function. Traditionally, a non-stabilized compass used for direction indication requires no electrical power. The use of an electric-only direction indicator places a premium on availability of electrical power.

It is appropriate that Cessna requests an Equivalent Level of Safety to 14 CFR, part 23, § 23.1303(c), Amendment 23-55, as required by 14 CFR, part 21, § 21.21(b), so that this ELOS can be included on the Type Certificate Data Sheet (TCDS).

### **APPLICABLE REGULATION(S)**

The Cessna Model 525C will be certified in the Commuter Category to the certification basis of 14 CFR part 23 as amended through Amendment 23-57.

### **REGULATION(S) REQUIRING AN ELOS FINDING**

14 CFR, part 23, § 23.1303(c)

#### **Description of compensating design features or alternate Methods of Compliance (AMOC) which allow the granting of the ELOS (include design changes, limitations or equipment need for equivalency)**

The Cessna Model 525C "CJ4" will contain an all-electric full time 4 in1 standby consisting of a Secondary Flight Display (SFD) that displays a third source for attitude, airspeed, altitude, and heading information. The SFD heading will utilize a remotely mounted magnetic flux detector with gyroscopic stabilization provided by the SFD attitude source.

#### **Explanation of how design features or Alternative Methods of Compliance (AMOC) provide an Equivalent Level of Safety to the level of safety intended by the Regulation**

The safety principle behind the rule, 14 CFR, part 23, § 23.1303(c), which requires a magnetic, non-stabilized direction indicator is to ensure the availability of direction information which is essential to flight safety. Typical magnetic, non-stabilized (and non-powered) direction indicators are totally independent of the primary, gyro-stabilized direction indicators and not subject to the same failure modes. All sensors used by the standby will be independent from the primary sensors used by the two primary display systems. All functions associated with the standby direction indicating system will be independent of the main aircraft systems, including lighting, power, stabilization, and magnetic direction sensing. The standby direction indicating system, consisting of the L3 GH-3000, ADC-4000 remote ADC, and the MAG-3000A magnetometer, will be powered by the standby battery pack located in the nose of the aircraft.

The FAA requires compliance to be shown to the referenced regulations. The FAA policy regarding § 23.1547 is that it applies only to the non-stabilized magnetic direction indicator required by §§ 23.1327 and 23.1303(c). In addition, the installation should meet §§ 23.1309,

23.1311, and 23.1353(h). AC 23.1309-1C, AC 23.17B and AC 23.1311-1B provide guidance. The stabilized direction indicator, required by § 23.1303(c) should have errors small enough that placarding is unnecessary. Unlike the typical non-stabilized magnetic direction indicator (AKA "whiskey compass"), the standby electronic display, which utilizes a remote-mounted magnetic flux detector and gyroscopic stabilization should have residual, uncompensated errors so small that a calibration placard would provide insignificant value to the flight crew.

Therefore, consistent with the principles of the FAA policy on § 23.1547, a stabilized standby magnetic direction indicator installed without a calibration placard may be considered equivalently safe to a non-stabilized magnetic direction indicator with a calibration card if the errors of the installed standby indicator are shown to be equivalent to those of the primary stabilized indicators (i.e., less than  $\pm 10$  degrees).

The standby heading function has been shown to meet the minimum accuracy requirements prescribed in 14 CFR, part 23, § 23.1327 (10 degrees), for all flight conditions. Loss of heading function in the Cessna Model 525C has been shown to be no less than major for the minimum time duration determined for "Operation Without Normal Electric Power."

#### ACO RECOMMENDATION

The FAA has approved the aforementioned equivalent level of safety finding in project issue paper SE-1, titled Electric Standby Direction Indicator (Compass) – Proposed Equivalent Level of Safety. This memorandum provides standardized documentation of the ELOS finding that is non-proprietary and can be made available to the public. The Small Airplane Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number should be listed in the Type Certificate Data Sheet under the Certification Basis section (TC's & ATC's) or in the Limitations and Conditions Section of the STC Certificate. An example of an appropriate statement is provided below.

Equivalent Level of Safety Finding has been made for the following regulation(s): 14 CFR, part 23, § 23.1303(c), Magnetic Direction Indicator.

*Kim Smith*  
 FDR Kim Smith, Manager, Small Airplane Directorate  
 Aircraft Certification Service

*5-15-09*  
 Date

ELOS Originated by Wichita ACO:	Margaret Kline Manager, Wichita ACO	Routing Symbol ACE-115W
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