

Date: April 14, 2009

To: Manager, Small Airplane Directorate, ACE-100

From: Manager, Boston Aircraft Certification Office

Prepared by: Solomon Hecht, ANE-150

Subject: **ACTION:** Equivalent Level of Safety (ELOS) Finding for the Pitot Heat Indication System of the Avidyne Corporation Entegra II/Entegra Release 9.0 Integrated Flight Display System installation in Cirrus Design Corporation Models SR20 and SR22, FAA Project ST1213BO-A

ELOS #: ACE-09-05

Regulatory Reference: 14 CFR, part 23, § 23.1326(b)(1)

This memorandum requests your office to review and concur with the proposed Equivalent Level of Safety (ELOS) finding for the Pitot Heat Indication System requirements of 14 CFR, part 23, § 23.1326(b)(1). The proposed ELOS will allow for the elimination of the continuous amber caution indication whenever the pitot heat is turned off.

**BACKGROUND:**

14 CFR, part 23, § 23.1326 states that:

“If a flight instrument pitot heating system is installed to meet the requirements specified in 14 CFR, part 23, § 23.1323(d), an indication system must be provided to indicate to the flight crew when that pitot heating system is not operating. The indication system must comply with the following requirements:

- (a) The indication provided must incorporate an amber light that is in clear view of a flight crew member.
- (b) The indication provided must be designed to alert the flight crew if either of the following conditions exist:

- (1) The pitot heating system is switched "off."
- (2) The pitot heating system is switched "on" and any pitot tube heating element is inoperative.

Avidyne Corporation proposes to employ a pitot heat indicating system that provides an amber “Pitot Heat Inop” annunciation when the pitot tube heat switch is placed in the “on” position and the pitot heater is not using power. Also, a caution message, “Pitot Heat Required” will appear on both Avidyne Integrated Flight Displays (Primary & Multi-Function), when the Outside Air Temperature (OAT) is less than five degrees Centigrade and the pitot heat switch is in the “off” position. A master caution indication will also appear on the PFD.

With the technology incorporated in this modification to the Cirrus Design Corporation SR20 and SR22 aircraft, the capability exists to eliminate the continuous amber caution indication by providing an obvious indication that pitot heat is required (when outside air temperature is five degrees Centigrade or below). The current requirement necessitates a continuous

amber indication that becomes an annoyance during normal VFR or non-icing IFR flight and is in conflict with the “dark cockpit” concept used to enhance pilot awareness and safety. This continuous indication may also desensitize the pilot to additional caution messages that may arise in flight.

Guidance for an Equivalent Level of Safety for part 23 certified aircraft is contained in Advisory Circular 23-17B, Systems and Equipment Guide for Certification of Small Airplanes. AC 23-17B states, “An aircraft design that does not include a caution annunciation when the pitot heat is off may be eligible for an ELOS finding that preserves a “dark cockpit” provided a placard or flight manual prescribes when to operate the pitot heat.”

Additionally, the Emergency Checklists for this aircraft; Inadvertent Icing Encounter, Pitot Tube Blocked, and Normal Checklists; Before Takeoff and Balked Landing/Go-Around, specify proper pitot heat operation. The Preflight Checklist contains a pitot heat operational check.

To further support an ELOS to 14 CFR, part 23, § 23.1326, the FAA Memorandum, Final Policy for Pitot Heat Indication Systems for 14 CFR, part 23, § 23.1326(b)(1) (Policy Number: PS-ACE100-2002-007) defines the qualifier “may be eligible” referenced in AC 23-17B’s statement, “An aircraft design that does not include a caution annunciation when the pitot heat is off **may be eligible** for an ELOS finding that preserves a “dark cockpit” provided a placard or flight manual prescribes when to operate pitot heat” as follows:

1. Commuter category airplanes are not eligible.

The Cirrus Design SR20 and SR22 are not commuter category aircraft; they are class I aircraft.

2. Airplanes approved for Flight Into Known Icing per 14 CFR, part 23, § 23.1419 are not eligible. The Cirrus Design SR20 and SR22 aircraft eligible for modification by the subject STC are not approved for Flight Into Known Icing.

3. Airplanes with service ceilings or maximum operating altitudes above 18,000 feet are not eligible because 18,000 feet represents the bottom of controlled airspace. If a plane can fly at or above 18,000 feet, it must be certified for Instrument Flight Rules (IFR) operation.

The Cirrus Design SR20 and SR22 aircraft are normally aspirated and are certified as IFR airplanes with a 17,500 feet maximum operating altitude.

4. The eligibility of other IFR approved airplanes, including those with the service ceilings below 18,000 feet, is determined jointly by the ACOs and the Small Airplane Standards Office.

Some later model SR22 aircraft are equipped with a turbo-normalizer via STC and are certified to 25,000 feet. The policy memo goes on to state:

“Aircraft that are not eligible for an ELOS in AC 23-17A may be eligible for a different ELOS, if their design has compensating features other than placards or Aircraft Flight Manual (AFM) limitations. For instance, a design with retractable landing gear could hardwire pitot heat to power through a weight-on-wheels switch. There would be no need for an ON/OFF switch, so there would be no need for a caution annunciation of switch position.”

The Avidyne caution and warning system for pitot heat includes the amber caution message "Pitot Heat Required" when OAT falls within 5 degrees C of freezing as described above. This message must be acknowledged. Avidyne believes that implementation of this feature makes the ELOS eligible for dark cockpit presentation of pitot heat above 18,000 feet.

#### **APPLICABLE REGULATIONS:**

14 CFR, part 23, § 23.1326 states that:

"If a flight instrument pitot heating system is installed to meet the requirements specified in 14 CFR, part 23, § 23.1323(d), an indication system must be provided to indicate to the flight crew when that pitot heating system is not operating. The indication system must comply with the following requirements:

- (a) The indication provided must incorporate an amber light that is in clear view of a flight crew member.
- (b) The indication provided must be designed to alert the flight crew if either of the following conditions exist:
  - (1) The pitot heating system is switched "off."
  - (2) The pitot heating system is switched "on" and any pitot tube heating element is inoperative."

#### **REGULATIONS REQUIRING AN ELOS:**

In considering the current design, the applicant has requested an ELOS for 14 CFR, part 23, § 23.1326(b)(1), Pitot Heat Indication System, and the FAA has determined that an appropriate level of safety can be provided by the issuance of an ELOS, in accordance with the provisions of 14 CFR, part 21, § 21.21.

As discussed above, this ELOS is applicable to the Cirrus Design SR20 and SR22 airplanes. Should Cirrus Design at a later date apply for a follow-on model aircraft on the same type certificate, Cirrus may request an extension of this ELOS to the later model.

#### **RECOMMENDATION:**

The FAA has approved the aforementioned equivalent level of safety finding in STC Project ST1213BO-A Issue Paper SE-2. 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 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. An example of an appropriate statement is provided below.

Equivalent Level of Safety Findings has been made for the following regulation(s):  
14 CFR § 23.1326(b)(1) Section Title (documented in ELOS Memo ACE-09-05)]

*Kim Smith* 4-14-09  
Manager, Small Airplane Directorate, ACE-100 Date

ELOS originated by:

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Robert G. Mann, Manager Date  
Boston Aircraft Certification Office, ANE-150