



Memorandum

U.S. Department
of Transportation
**Federal Aviation
Administration**

Subject: **ACTION:** ELOS for FAR §23.1435(a)(2) –Hydraulic
Pressure Indication. ACE-05-12

Date: August 17, 2005

From: Manager, Wichita ACO

Reply to: Mr. Grant Youngdahl
Attn. of: ACE-117W

To: Manager, Small Airplane Directorate, ACE-100

Attn:

Background: Cessna requests a finding of equivalent level of safety be made with respect to 14 CFR §23.1435(a)(2), which requires a means of hydraulic pressure indication be provided to the flight crew. Cessna Aircraft Company intends to certify the Model 510 Mustang using EICAS messages to provide appropriate indication of hydraulic pressure in place of a pressure gauge. Cessna's position is the Engine Indication and Crew Alerting System (EICAS) messages are equivalent to the use of a pressure gauge for the Model 510 application.

This request was coordinated within the FAA by Issue Paper ME-2.

Applicable regulations: The Cessna Model 510 Mustang will be certified to the certification basis shown in Stage 4 of Issue Paper G-1, which is:

Federal Aviation Regulations (FAR) Part 23 effective February 1, 1965 as amended by Amendments 23-1 through 23-54, with Special Conditions as identified below. Additional Special Conditions, ELOS and Exemptions may be incorporated during the project.

Summary of Special Conditions:

Special Condition	Title
23.45	General
23.51	Takeoff Speeds
23.53	Takeoff performance
23.55	Accelerate-stop distance
23.57	Takeoff path
23.59	Takeoff distance and takeoff run
23.61	Takeoff Flight Path
23.63	Climb: General
23.66	Takeoff climb: One-engine inoperative
23.67	Climb: one engine inoperative
23.73	Reference Landing approach speed
23.75	Landing distance

Special Condition	Title
23.77	Balked landing
23.177	Static directional and lateral stability
23.201(e)	Wings level stall
23.203 (c)	Turning flight and accelerated turning stalls
23.251	Vibration and buffeting
23.253	High speed characteristics
23.735	Brakes
23.1195	Fire Extinguishing Systems
23.1197	Fire Extinguishing Agents
23.1199	Extinguishing Agent Containers
23.1201	Fire Extinguishing Systems Materials
23.1323	Airspeed indicating system
23.1505	Airspeed limitations
23.1583	Operating Limitations
23.1585	Operating procedures
23.1587	Performance information
23-XXX-SC	HIRF Special Condition
23-XXX-SC	HIRF SC for FADEC

FAR Part 34 as amended by the Amendment in effect on the date of certification;

FAR Part 36 as amended by the Amendment in effect on the day of application.

Regulation Requiring an ELOS:

14 CFR §23.1435(a)(2) requirements are as follows:

Hydraulic systems.

(a) Design. Each hydraulic system must be designed as follows:

(2) A means to indicate the pressure in each hydraulic system which supplies two or more primary functions must be provided to the flight crew.

Compensating features which allow the granting of the ELOS:

Cessna proposes to utilize two EICAS messages to provide information to the crew about the hydraulic system in place of a pressure gauge. “HYD PUMP ON” and “HYD PRESS LO” are both amber messages with inhibits and de-bounce designed to prevent nuisance indications.

Compensating factors, which Cessna believes would provide an equivalent level of safety to a pressure gauge being used to satisfy the requirements of 14 CFR 23.1435(a)(2), as required by 14 CFR 21.21(b)(1), for the Model 510 are as follows:

1) A “HYD PRESS LO” message is provided to alert the pilot to an abnormal operating condition in the hydraulic system. The de-bounce on the message allows for normal operations without annunciation. In response to this message the AFM will advise the pilot to prepare to use the emergency gear extension and emergency wheel brake systems.

When the aircraft is on the ground, the Master Caution accompanying the HYD PRESS LO message cannot be acknowledged unless hydraulic pressure has been restored. This protects against dispatch with power removed from the hydraulic motor-pump assembly.

2) A “HYD PUMP ON” message is provided to alert the pilot to an abnormal operating condition in the hydraulic system. The de-bounce on the message allows for normal operations without annunciation. In response to this message the AFM will advise the pilot to remove power from the auxiliary hydraulic motor-pump assembly to prevent overheating of the motor-pump and/or hydraulic fluid.

Explanation of how these features provide an ELOS:

The intent of 14 CFR 23.1435(a)(2) is to provide the crew with an indication of the pressure in the hydraulic system. The system features and compensating factors described previously are designed to meet this intent. Therefore, it is Cessna’s belief that the Model 510 EICAS messages provide an equivalent level of operational safety to meet the intent of 14 CFR 23.1435(a)(2).

ACO Recommendation:

The FAA concurs with the applicant’s position that the intent of 14 CFR 23.1435(a)(2) is to provide the crew with an indication of the pressure in the hydraulic system, and the system features described above are designed to meet this intent.

Although 14 CFR Part 25 regulations are not applicable in this case, the preamble to the final rule for Amendment 25-13 provides the following information for a similar requirement to provide flight crewmember station indication for hydraulic pressure.

“Numerous comments suggested that the pressure indication means should be gages, or warning lights, or both. However, the FAA does not consider that it is necessary to specify the means. While either a gage or a light would be satisfactory, the applicant should be allowed to show that some other means is also adequate”.

The FAA Approved Airplane Flight Manual (AFM) must include the noted advisories to prepare to use the emergency gear extension and emergency wheel brake systems if an amber HYD PRESS LO message is posted, or to remove power from the hydraulic motor-pump assembly if the amber HYD PUMP ON message is posted.

The compensating features and procedures noted in this memorandum will provide an equivalent level of safety to the requirements of 14 CFR 23.1435(a)(2) at Amendment 23-54, upon meeting the requirements stipulated in this memorandum, including the required

AFM advisories and procedures, successful completion of all testing and inspections required to show compliance, and completion of the required compliance substantiation documentation.

<u>C.D. Riddle</u>	<u>8/15/05</u>
for Margaret Kline, ACE-115W Manager, Wichita Aircraft Certification Office	Date

Concurrence:

<u>Patrick R. Mullen</u>	<u>8/26/05</u>
for Manager, Standards Office, ACE-110	Date

<u>John Colomy</u>	<u>8/31/05</u>
Acting Manager, Small Airplane Directorate, ACE-100	Date