

Exemption No. 9998

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, DC 20591

In the matter of the petition of

CESSNA AIRCRAFT COMPANY

for an exemption from §§ 23.1321(b),
23.1549(a), (b), and (c)
of Title 14, Code of
Federal Regulations

Regulatory Docket No. 2009-1064

GRANT OF EXEMPTION

By letter dated November 04, 2009, Mr. Kim Hackett, Cessna Aircraft Company, One Cessna Boulevard, P.O. Box 7704, Wichita, Kansas 67277-7704 petitioned for an exemption with time-limited conditions from §§ 23.1321(b), 23.1549(a), (b), and (c) of Title 14 of the Code of Federal Regulations (CFR) to permit type certification of the Cessna model 525C airplanes without oil pressure and temperature indications specified in the rule. The proposed exemption would permit relief from the requirements for arrangement, visibility and colors for the engine oil temperature and pressure indications for the model 525C airplanes. The current design of the engine oil temperature and pressure indications of the model 525C airplanes provides conflicting color indications in certain operational regimes. The proposed exemption, if granted, would permit type certification approval of the model 525C airplanes with this non-compliant type design for a limited time.

The petitioner requests relief from the following regulation[s]:

Sections 23.1321(b), 23.1549(a), (b), and (c), in pertinent part, requires certain arrangement, visibility and colors for the engine oil temperature and pressure indications.

The petitioner supports its request with the following information:

Cessna Aircraft Company requests an exemption with time-limited conditions from the requirements of 14 CFR § 23.1321(b) and 14 CFR § 23.1549(a), (b), and (c) for the model 525C to the extent necessary to allow type certification of the Cessna model 525C airplanes with the current engine oil pressure and temperature displays. As a condition for granting the requested time-limited exemption, Cessna Aircraft will design and certify dual scale engine oil pressure and temperature displays that are

compliant with the current FAA interpretation of 14 CFR § 23.1321(b) and 14 CFR § 23.1549(a), (b), and (c) within 15 months of the granting of this exemption. Cessna Aircraft will provide a service bulletin to all field aircraft after certifying the new display.

Cessna acknowledges that this petition was not submitted in accordance with the 120-day requirement of 14 CFR § 11.63(d). The reason for this delayed request is that the applicable design review and discussion that revealed the airplane was not in direct compliance with requirements of the rule was not conducted until late in the certification program. Cessna Aircraft Company consequently requests that the publication and comment period requirements of 14 CFR § 11.85 be waived.

14 CFR Reference

14 CFR § 23.1321: Arrangement and visibility.

(b) For each multiengine airplane, identical powerplant instruments must be located so as to prevent confusion as to which engine each instrument relates.

14 CFR § 23.1549: Powerplant and auxiliary power unit instruments.

For each required powerplant and auxiliary power unit instrument, as appropriate to the type of instruments--

- (a) Each maximum and, if applicable, minimum safe operating limit must be marked with a red radial or a red line;
- (b) Each normal operating range must be marked with a green arc or green line, not extending beyond the maximum and minimum safe limits;
- (c) Each takeoff and precautionary range must be marked with a yellow arc or a yellow line

Background

The current installation of the Rockwell Collins Proline 21 system on the model 525C airplane consists of a single scale display for LH and RH oil pressure and a single scale display for LH and RH oil temperature. Similar installations are installed and certified on other part 23 Cessna aircraft including the models 525, 525A, and 525B that have incorporated the Collins Proline 21.

The single scale display for the engine oil pressure and temperature has considerable field experience; the model 525 airplane, which incorporates the Proline 21 system, has over 426,000 flight hours, the model 525A has over 517,000 flight hours, and the model 525B has over 250,000 flight hours. This is approximately 1.2 million flight hours for this type of display. There have been no reports of issues in the field related to how the engine oil pressures or temperatures are displayed.

Current Design: Single Scale Oil Pressure Display:

The current model 525C oil pressure indication is displayed on the Multifunction Display (MFD), which is centrally located on the instrument panel. The visibility and location of the oil pressure display is similar to other previously certified Citation aircraft, and has been evaluated during flight testing of the model 525C. The primary display provides a single analog scale for both the LH and RH engines, with a pointer indicating the respective engine oil pressure. This is the primary indication of oil pressure to the crew. When the “OIL DISPLAY ENABLE” discrete is selected via the maintenance panel, a digital readout is displayed for each engine, below the analog scale, with a resolution of 1 PSI (refer to Figure 1).

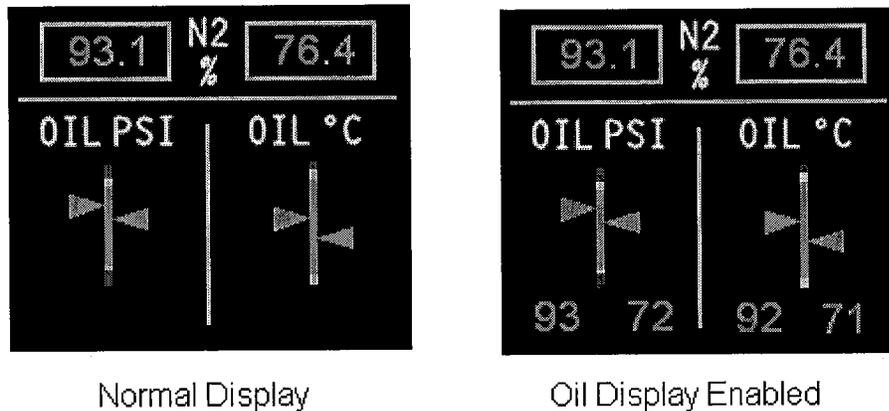


Figure 1: Current Engine Oil Displays

When the “OIL DISPLAY ENABLE” discrete is not selected, the digits are not displayed on the MFD, unless a limit is exceeded. Regardless of the “OIL DISPLAY ENABLE” discrete setting, if a caution limit is reached, the digits will be displayed and the digits and pointer will be yellow, and will flash for five seconds. If a warning limit is reached, the digits will be displayed and the digits and pointer will be red and flash for five seconds (refer to Figure 2).

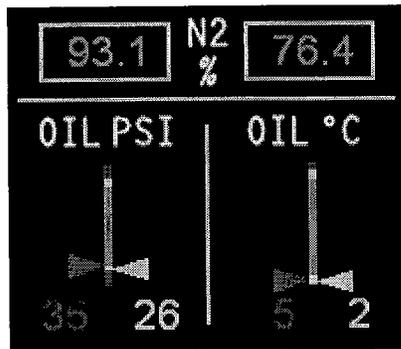


Figure 2: Oil Display with limits exceeded

The oil pressure analog scale has a range of 0 to 150 PSI. The caution and warning oil pressure limits are transmitted by the Full Authority Digital Electronic Control (FADEC), and are as follows:

Upper Warning Limit: 130 PSI

Upper Caution Limit: 120 PSI (5 minute operational limit)

For N2 > 80 percent:

- Lower Warning Limit: 40 PSI
 - If this limit is reached, N2 should be reduced below 80 percent per AFM

For N2 < 80 percent

- Lower Caution Limit: 30 PSI (5 minute operational limit)
- Lower Warning Limit: 23 PSI

As discussed above, the scale limits for oil pressure are dependent on engine N2 speed. The analog scale is a static display with color bands representing the limits for N2 < 80 percent, however, the pointers and digits reflect the limits for the current N2 speed. Per the model 525C Aircraft Flight Manual (AFM), pilot actions are based on the pointer and digit color and indication, not the color of the oil pressure scale. If N2 > 80 percent, and the low limit is reached, per AFM procedures, the crew is instructed to reduce N2 to < 80 percent.

In addition to the oil pressure display, a red “OIL PRESSURE LOW L-R” Crew Alert System (CAS) message is displayed accompanied by a Master Warning and Aural Tone whenever the oil pressure exceeds the low oil pressure limits as transmitted by the FADEC.

Current Design: Single Band Oil Temperature Display:

The current model 525C oil temperature indication is displayed on the MFD, which is centrally located on the instrument panel. The visibility and location of the oil temperature display is similar to other previously certified Citation aircraft, and has been evaluated during flight testing of the model 525C. The primary display provides a single analog band for both the LH and RH engines, with a pointer indicating the respective engine oil temperature. This is the primary indication of oil temperature to the crew. When the "OIL DISPLAY ENABLE" discrete is selected via the maintenance panel, a digital readout is displayed for each engine, below the analog band, with a resolution of 1 °C (refer to Figure 1).

When the "OIL DISPLAY ENABLE" discrete is not selected, the digits are not displayed on the MFD, unless a limit is reached. Regardless of the "OIL DISPLAY ENABLE" discrete setting, if a caution limit is reached, the digits will be displayed and the digits and pointer will be amber, and will flash for five seconds. If a warning limit is reached, the digits will be displayed and the digits and pointer will be red and flash for five seconds (refer to Figure 2).

The oil temperature analog scale has a range of 0 to 160 °C. The caution and warning oil temperature limits are defined by the FADEC, and are as follows:

For $N2 < 80$ percent:

- Upper Warning Limit: 149 °C
- Upper Caution Limit: 135 °C (5 minute operational limit)
- Lower Caution Limit: 10 °C

For $N2 \geq 80$ percent:

Upper Warning Limit: 135 °C
Lower Warning Limit: 10 °C

As discussed above, the scale limits for oil temperature are dependent on engine N2 speed. The analog band is a static display with color bands representing the limits for $N2 < 80$ percent; however, the pointers and digits reflect the FADEC limits for the current N2 speed. Per the model 525C AFM, pilot actions are based on the pointer and digit color and indication, not the color of the oil temperature band. For oil temperatures < 10 °C, per the AFM, the crew is instructed to not advance the throttles above 80 percent N2 until the oil temperature has increased above 10 °C.

Proposed Design: Dual Scale Oil Displays:

The proposed model 525C engine oil pressure and temperature displays will include a dual scale indication for the engine oil pressure and oil temperature (refer to Figure 3).

The left and right scales will be dynamic and updated based on the engine N2 speed at the limits as transmitted by the FADEC and defined by the engine manufacture. Besides separate dynamic scales for LH and RH engines, the operation of the system will be the same as described above for the current system.

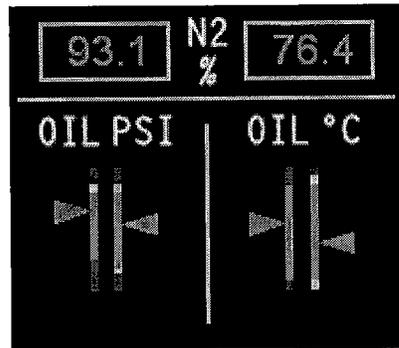


Figure 3: Proposed Dual Scale Oil Display

Petition

Cessna Aircraft Company requests an exemption with time-limited conditions from the requirements of 14 CFR § 23.1321(b) and 14 CFR § 23.1549(a), (b) and (c) for the model 525C for the engine oil pressure and temperature displays on the model 525C. This exemption would allow type certification of the Cessna model 525C airplanes with the current engine oil pressure and temperature displays, while permitting adequate time to design and certify the proposed dual scale display in order to establish full compliance with the latest interpretation of the requirements of 14 CFR § 23.1321(b) and 14 CFR § 23.1549(a), (b), and (c).

As a condition for granting the requested exemption, Cessna Aircraft will design and certify engine oil pressure and temperature displays that are fully compliant with the latest interpretation of 14 CFR § 23.1321(b) and 14 CFR § 23.1549(a), (b), and (c) within 15 months of the granting of this exemption.

The next scheduled version of the display software from Collins (v2.0) has a certification schedule for TSO receipt by end of year 2010. Due to current manpower constraints at Collins it is not feasible to incorporate the new oil displays prior to v2.0 without significantly delaying v2.0. Collins display software v2.0 is required for EASA certification and any delay in EASA certification could result in significant financial penalties for Cessna Aircraft Company.

Cessna Aircraft will provide a service bulletin to all model 525C field aircraft after certifying the new display.

Further, prior to the installation of the service bulletin to install the new engine oil pressure and temperature displays, Cessna Aircraft will include notes in the Airplane Flight Manual (AFM) to help clarify the band and pointer colors. The notes will be removed once the service bulletin is installed. The essence of the note will be to address the following items; the specific wording is to be agreed upon between Cessna and FAA as part of the AFM approval process.

- The color bands on the vertical tape for oil temperature and pressure are for engine setting below 80 percent N2.
- For throttle settings at or above 80 percent N2 the engine oil pressure indication will turn red below 40 psi indicating that the engine has exceeded its operational limits even though the pointer is not in the red band of the vertical tape. There is no low pressure cautionary (yellow) band for N2 speeds above 80 percent.
- For throttle settings at or above 80 percent N2 the engine oil temperature indication will turn red above 135 °C and below 10 °C indicating that the engine has exceeded its operational limits even though the pointer is not in the red band of the vertical tape. There is no oil temperature cautionary (yellow) band for N2 speeds above 80 percent.

Petitioner's Public Interest Statement

Cessna Aircraft Company states that granting this exemption would be in the public interest for the following reasons:

1. The current engine oil pressure display allows for safe operation of the engine within its operational limits as shown by the 1.2 million flight hours of similar displays on other model 525 series aircraft. The current display provides four visual cues and one auditory cue that will alert the pilots that an engine oil pressure limit has been exceeded.
 - The pointer for that engine will turn the appropriate warning color.
 - The digital readout for that engine will be displayed in the appropriate color, flashing for five seconds.
 - For low oil pressure a CAS message "OIL PRESSURE LOW L-R" will be displayed.
 - For low oil pressure the Master Warning annunciator will be illuminated with an associated aural warning tone.
2. The current engine oil temperature display allows for safe operation of the engine within its operational limits as shown by the 1.2 million flight hours of similar displays on other model 525 series aircraft. The current display

provides two visual cues that will alert the pilots that an engine oil temperature limit has been exceeded.

- The pointer for that engine will turn the appropriate warning color.
 - The digital readout for that engine will be displayed in the appropriate color, flashing for five seconds.
3. Similar engine oil pressure and temperature displays are currently in use on other model 525 series aircraft models with over 1.2 million flight hours of field service experience. There have been no reports by the pilots of confusion in reading and understanding the engine oil pressure or temperature displays and no reports of engine damage caused by misinterpreting the engine oil displays. Therefore field experience has shown that the current engine oil displays do not cause a hazard to the aircraft.
 4. The denial of this petition for exemption would result in the delay of the certification of model 525C airplanes for approximately 15 months. Cessna would experience a loss of revenue of at least \$140 million in 2010 and \$120 million in 2011 due to this delay. This could also result in numerous aircraft order cancellations increasing the financial loss significantly. This would also result in the loss of revenue for partners and suppliers and the potential need for workforce reductions, all of which would be counter to the public interest.

Cessna's customers have made utilization plans based on the agreed upon delivery schedule of these airplanes. Delay in the delivery date due to the redesign and retrofit of the engine oil displays would impose significant financial penalties upon our customers and their businesses without a commensurate safety benefit, which is also counter to the public interest.

Notice and Public Procedure Provided

A summary of the petition was published on December 29, 2009 (74 FR 68914). No comments were received.

The FAA's analysis is as follows:

To obtain this exemption, the petitioner must show, as required by 14 CFR part 11, §§ 11.81(d) and 11.81(e): “(1) the reasons why granting your request would be in the public interest; that is, how it would benefit the public as a whole, and (2) the reasons why granting the exemption would not adversely affect safety, or how the exemption would provide a level of safety at least equal to that provided by the rule from which you seek the exemption.”

The FAA has carefully reviewed the information contained in the petitioner's request for exemption.

The FAA agrees with the petitioner's request for the following reasons:

1. The current engine oil pressure display allows for safe operation of the engine within its operational limits as shown by the 1.2 million flight hours of similar displays on other model 525 series aircraft. The current display provides four visual cues and one auditory cue that will alert the pilots that an engine oil pressure limit has been exceeded.
 - The pointer for that engine will turn the appropriate warning color.
 - The digital readout for that engine will be displayed in the appropriate color, flashing for five seconds.
 - For low oil pressure a CAS message "OIL PRESSURE LOW L-R" will be displayed.
 - For low oil pressure the Master Warning annunciator will be illuminated with an associated aural warning tone.
2. The current engine oil temperature display allows for safe operation of the engine within its operational limits as shown by the 1.2 million flight hours of similar displays on other model 525 series aircraft. The current display provides two visual cues that will alert the pilots that an engine oil temperature limit has been exceeded.
 - The pointer for that engine will turn the appropriate warning color.
 - The digital readout for that engine will be displayed in the appropriate color, flashing for five seconds.
3. Similar engine oil pressure and temperature displays are currently in use on other model 525 series aircraft models with over 1.2 million flight hours of field service experience. There have been no reports by the pilots of confusion in reading and understanding the engine oil pressure or temperature displays and no reports of engine damage caused by misinterpreting the engine oil displays. Therefore field experience has shown that the current engine oil displays do not cause a hazard to the aircraft.
4. The denial of this petition for exemption would result in the delay of the certification of model 525C airplanes for approximately 15 months. The economic impact to Cessna Aircraft Corporation would be severe and result in significant reductions in Cessna's workforce. Additionally, the economic impact to Cessna's suppliers and customers would also be significant.

The FAA's Decision

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. §§ 40113 and 44701, delegated to me by the Administrator, Cessna Aircraft Company is granted an exemption with time-limited conditions from §§ 23.1321(b), 23.1549(a), (b), and (c) to the extent necessary to allow type

certification of the Cessna model 525C airplanes with engine oil temperature and pressure indications not in compliance with the requirements of §§ 23.1321(b), 23.1549(a), (b), and (c) as they relate to the arrangement, visibility and colors. For the model 525C airplanes, this exemption is subject to the following conditions and limitations:

Conditions and Limitations

1. Cessna Aircraft Company must certify and incorporate into the production line requirements engine oil temperature and pressure indications fully compliant with the requirements of §§ 23.1321(b), 23.1549(a), (b), and (c), into the model 525C airplanes no later than April 30, 2011.
2. Cessna Aircraft Company must retrofit the model 525C airplanes delivered under the terms of the exemption with the new engine oil temperature and pressure indications described in Condition 1 above no later than April 30, 2012.
3. Until the incorporation of the changes required in the above Conditions 1 and 2 of this exemption have been completed, Cessna Aircraft Company add to the airplane flight manual (AFM) a description of the indications and their conflicting color guidance, and the necessary instructions for properly interpreting the oil pressure and temperature indications.
4. For airplanes subject to Condition 2 of this exemption, the operating limitations section of the airplane flight manual (AFM) must include the following statement:

“No person may operate this airplane after April 30, 2012, unless the oil pressure and temperature indications have been modified in accordance with the terms of Exemption No. 9998.”

This statement may be removed from the AFM after the required modification has been made.

This exemption terminates on April 30, 2011, unless sooner superseded or rescinded.

Issued in Kansas City, Missouri on January 26, 2010.



John Colomy
Acting Manager, Small Airplane Directorate
Aircraft Certification Service