

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

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In the matter of the petition of  
BAPCO ENGINEERING  
for an exemption from § 3.430  
of the Civil Air Regulations

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Regulatory Docket No. 010CE

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DENIAL OF EXEMPTION

By letter dated December 27, 1985, Mr. Bernard A. Pepin, Post Office Box 236, North Land O'Lakes, Michigan 54540, on behalf of BAPCO ENGINEERING, petitioned for an exemption from § 3.430 of the Civil Air Regulations (CAR) to permit Supplemental Type Certification (STC) of the Cessna Model 100 and 200 Series airplanes without an interconnecting vent line between the air spaces of fuel tanks supplying fuel to any one engine at the same time.

Sections of the CAR affected:

Section 3.430 requires that fuel systems shall be so arranged as to permit any one fuel pump to draw fuel from only one tank at a time. Gravity feed systems shall not supply fuel to any one engine from more than one tank at a time unless the tank air spaces are interconnected in such a manner as to assure that all interconnected tanks will feed equally.

Section 3.439 requires that, in the case of gravity feed systems with tanks whose outlets are interconnected, it shall not be possible for fuel to flow between tanks in quantities sufficient to cause an overflow of fuel from the tank vent when the airplane is operated as specified in § 3.437(a) and the tanks are full.

Section 3.445 requires, in pertinent part, that the filler cap shall provide a fuel-tight seal for the main filler opening. However, small openings in the fuel tank cap for venting purposes or to permit passage of a fuel gauge through the cap shall be permissible.

Section 3.446 requires, in pertinent part, that fuel tanks shall be vented from the top portion of the expansion space. Vent outlets shall be so located and constructed as to minimize the possibility of their being obstructed by ice or other foreign matter. The vent shall be constructed as to preclude the possibility of siphoning fuel during normal operation. The vent shall be of sufficient size to permit the rapid relief of excessive differences of

pressure between the interior and exterior of the tank. Air spaces of tanks the outlets of which are interconnected shall also be interconnected. There shall be no undrainable points in the vent line where moisture is apt to accumulate with the airplane in either the ground or level flight attitude. Vents shall not terminate at points where the discharge of fuel from the vent outlet will constitute a fire hazard or from which fumes may enter personnel compartments.

The petitioner's supportive information is as follows:

The petitioner proposes to modify all single vented fuel systems on the Cessna Model 100 and 200 series airplanes as well as those with two vents that have the cross vent line. The petitioner contends that this is to improve fuel management and safety. It is further contended that these series of airplanes, until 1978, have but one fuel vent that is located behind the left strut that pressurizes the left tank and then passes air through an overhead line to issue air into the right tank. The statement is made that the overhead line allows crossfeed of fuel because of dihedral and mistrim and this allows for mismanagement of fuel location.

The petition contends that granting the exemption will be in the public interest in that providing separate vents for each tank and eliminating the cross vent line now required by the airworthiness standards of Part 3 of the CAR. It is further contended that flight safety of the affected series of airplanes will be improved and that the possibility of uneven fuel burn will be eliminated, still depending on trim accuracy.

The petitioner states the current rule, by specifically calling for a common vent, can lead to an unsafe condition when flying in icing conditions whereby interruption of fuel feed can occur from either tank if the single vent becomes obstructed. Furthermore, it is contended that experience has shown that a separate vent for each tank will allow the use of all usable fuel.

The petitioner contends the overhead vent line allows fuel to transfer from one tank to the other when "ground parked", even with the fuel selector turned to the "both off" position. In cruise, even selected to the right tank, for fuel burn because of a heavy wing, the right fuel gauge will gain in quantity because of fuel transfer across the vent line overhead. It is further contended that the fuel gauges in these airplanes are very undependable and the pilot doesn't know what value exists.

The petitioner states his modification proposal is the installation of a second vent located at the exact location at the right wing as that of the vent located on the left strut, and to eliminate the overhead cross vent line in the cabin. This divorces the two fuel tanks, allows vent air to at least one tank in the event of vent icing, and allows burn off to be commanded by the pilot. In the event of an unsealed fuel cap, all fuel could be stolen from both tanks by venturi action, and the petitioner states his system allows isolation and one tank can be saved. The proposed exemption will improve safety by preventing unequal fuel feeding from the left tank to the right or the right to the left and prevent "vent ice" starvation, by at least two-fold and will, also,

disallow unvented "ground parked" fuel transfer when parked with the selector to "both off".

Comments on published petition:

A summary of this petition for exemption was published in the FEDERAL REGISTER on February 7, 1986 (51 FR 4837), and no comments were received.

The Federal Aviation Administration's (FAA) analysis is as follows:

To obtain the exemption, the petitioner must show, as required by § 11.29(b)(5) of the Federal Aviation Regulations, that: (1) granting the request is in the public interest, and (2) the exemption would not adversely affect safety, or that a level of safety will be provided which is equal to that provided by the rule from which the exemption is sought.

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

The petitioner presented no information or data to support the contention that the overhead line allows crossfeed of fuel because of dihedral and mistrim, since the overhead line is required to interconnect the air spaces of the affected fuel tanks.

Contrary to the petitioner's contention, the airworthiness standards of Part 3 of the CAR do not require a common vent. Individual vents for each fuel tank, when shown to comply with the airworthiness standards, are acceptable. However, when the outlets of the individual tanks are interconnected prior to fuel entry into the engine, the air spaces must be interconnected. In part, this is required to maintain equal pressures above the fuel to assure uniform feeding to the engine in gravity feed fuel systems with the fuel selector capable of feeding from both tanks simultaneously.

The petitioner's contention that granting of the exemption will be in the public interest because flight safety will be improved by the fact that the possibility of uneven fuel burn will be eliminated, depending on trim accuracy, is not supported. The fuel selectors in most of the airplanes proposed for modification have the capability of selecting either the right tank or left tank and an additional position to feed from both tanks. Section 3.439 of the CAR requires interconnection of air spaces in such a manner that all interconnected tanks will feed equally.

The petitioner's contention that an unsealed fuel cap allows fuel to be siphoned by venturi action may be true. However, elimination of the required venting between airspaces of fuel tanks with interconnected outlets, as petitioner requests, would increase the probability of losing all fuel from the interconnected tanks, and, thus, increase the level of hazard. Elimination of the required tank airspace interconnect would result in a differential pressure between the two tank airspaces when the fuel cap became unsealed or the individual tank vents encountered differential pressure for any reason. This differential pressure in the tank airspace would cause flow through the interconnected tank outlets such that the tank with the lower pressure in its airspace would receive all of the fuel from other tanks with which its outlet was

interconnected. This would result in unsafe features and not be approvable in accordance with § 21.21(b)(2) of the Federal Aviation Regulations. Petitioner's contention that icing of the single vent on his airplane could prevent venting of fuel tank airspaces to ambient pressures does not support removal of the required venting between airspaces of interconnect tanks. Removal of the interconnect, combined with individual tank vents, would cause differential pressures, as previously cited. Further, we have no reason to assume that one vent would become blocked by ice without all other similarly located vents also becoming blocked by ice.

The petitioner presented no information as to reasons for not complying with the airworthiness standards of Part 3 of the CAR which clearly permit the use of separate tanks without the interconnected vent line between the air spaces by removing any feature in which the outlets of the fuel tanks are interconnected.

In consideration of the foregoing, I find that a grant of exemption, as requested, would not be in the public interest nor maintain the level of safety required by the rule from which the exemption is sought. Therefore, pursuant to the authority of Sections 313(a) and 601(c) of the Federal Aviation Act of 1958, as amended, delegated to me by the Administrator (14 CFR 11.53), the petition of BAPCO ENGINEERING for exemption from § 3.430 of the Civil Air Regulations is hereby denied.

Issued in Kansas City, Missouri on March 25, 1986.

  
Edwin S. Harris, Director  
Central Region