



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

Memorandum

Subject: ACTION: Equivalent Level of Safety of
Exhaust Heat Exchanger; Finding No. ACE-94-4

Date: FEB 08 1994

From: Manager, Airplane Certification Office, ASW-150
Reply to
Attn. of:

To: Manager, Small Airplane Directorate,
ACE-100

Background: ASW-150 has denied the request of the applicant, Commander Aircraft Company (CAC), for the approval of a change in the design of the Model 114B airplane cabin heating system. The presently approved system uses a continuous flow of fresh air through the heat exchanger to cool that part of the exchanger in contact with the exhaust gasses. The applicant has proposed to remove the Part Number (P/N) 885012-1 Dump Valve Assembly from the fresh-air duct. This dump valve routes the flow of air overboard when the cabin heat is off. Therefore, this proposed design will not provide a continuous flow of cooling air through the heat exchanger when the cabin heat system is off. ASW-150 has found that the proposed change was not in compliance with Federal Aviation Regulation (FAR) 23.1125(a)(3).

Applicable Regulations:

The applicable FAR paragraph states:

23.1125(a)(3). For reciprocating engine-powered airplanes the following apply: (a) Each exhaust heat exchanger must be constructed and installed to withstand the vibration, inertia, and other loads that it may be subjected to in normal operation. In addition: (3) Each exchanger must have cooling provisions wherever it is subject to contact with exhaust gasses. The applicant disagrees with this finding; however, he desires the approval of this system by some means.

FAA Position:

CAC has asked for approval of modifications to the Model 114B cabin heating system. The request is to increase the cabin heating capability of the airplane's environmental system. The proposed design changes will accomplish the desired goal by using slightly more of the engine cooling air to increase the environmental airflow in the cabin and by eliminating system pressure losses caused by the CAC P/N 885012-1 Environmental System Air Dump Valve Assembly. Cooling flight tests by the company show that cooling characteristics of the

engine are not degraded by this loss of fresh cooling air. ASW-150 has determined that removal of the dump valve, as proposed, would place the Model 114B in a state of non-compliance with FAR 23.1125(a)(3). A cooling source within a heat exchanger logically has to have a constant air flow to exist. Elimination of the dump valve will eliminate the continuous cooling air flow through the heat exchanger when the cabin heater is not in use. Temperature measurements, by the applicant, of air temperatures inside the exchanger were not over 307 degrees Fahrenheit for the as proposed design. The temperature of the fresh air side of the exchanger tube in contact with exhaust gases was measured by the applicant as also being 307 degrees Fahrenheit.

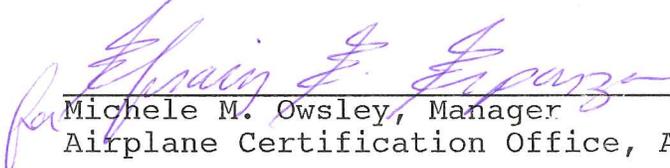
Applicant's Position:

It is the applicant's opinion that FAR 23.1125(a)(3) is not violated if the continuous flow of cool air is interrupted for extended periods of time. He does not agree with ASW-150's interpretation of the regulation; he, in fact, insists that the engine compartment, lower plenum air flow around the exterior of the exchanger meets the regulatory cooling requirements. The applicant's opinion is that the rule does not specify how cooling is to take place but merely that cooling occurs. The 112 and 114 model series were designed and built without continuous fresh air cooling through the exchanger. The applicant has documented that these models have accumulated many years of service experience without significant service difficulties with the heat exchanger system.

Recommendation:

As documented in the SM 1 Issue Paper for Project SW-150-570, the Airplane Certification Office, ASW-150, requested on December 10, 1993 approval of this finding of equivalent safety. The CAC project officer in the Project Support Section, ACE-107, approved the SM 1 Issue Paper on December 28, 1993. It is, therefore, the recommendation of the Airplane Certification Office that this equivalent level of safety to compliance with FAR 23.1125(a)(3) be granted based on acceptable design substantiation by CAC.

Concurred by:



Michele M. Owsley, Manager
Airplane Certification Office, ASW-150

2/7/94
Date

Concurred by (cont'd):

John Colomy

bc

John Colomy, Manager
Standards Office, ACE-110

2/18/94

Date

Barry D. Clements

Barry D. Clements, Manager
Small Airplane Directorate, ACE-100

2/18/94

Date

Attachment