

100-1227

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 5, 1980

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-80-80 and -81

On April 9, 1980, the Safety Board made three safety recommendations (A-80-27 through -29) to the Federal Aviation Administration regarding leaking motive flow valves, PN AV16E1182, in Learjet aircraft. We have continued to investigate this problem after receiving subsequent reports of leaking motive flow valves.

As part of our continuing investigation, the Safety Board assembled a group of interested parties, including personnel from the Learjet Corporation, the FAA, and ITT General Controls/Aerospace Products, at the ITT plant in Glendale, California, to examine and test motive flow valves which had been removed from Learjet aircraft after leaks were found. Other motive flow valves were also examined and disassembled in an effort to determine the cause of the leaks. The group was advised during this study that no motive flow valve had ever leaked under test pressures at the manufacturer's (ITT) facility unless one or more of the O-rings installed on the valve core were broken. ITT also reported that, in its experience, O-ring failures are extremely rare.

Disassembly and examination of motive flow valves that leaked on the test stand showed that one or both of the O-rings were broken into four pieces. The valve that the Safety Board tested during the investigation which led to Recommendations A-80-27 through -29 was disassembled after the pressure test revealed a leak, and one O-ring was found broken; three pieces of the O-ring were in the valve but another piece or pieces were missing. A demonstration teardown of a new motive flow valve showed that, if the valve was disassembled improperly, removal of the valve core caused one O-ring to be broken into four pieces. When the broken O-rings were compared, it was found that all the breaks had similar characteristics, and the fragments were of similar size. It was determined that if the valve was disassembled by pushing the valve core out so that an O-ring was forced past the ports within the valve body, portions of the O-ring protruded into the ports and were cut off by the edge of the port as the valve core was forced out of the valve body. The O-ring broken in this demonstration had the same characteristics as the ones removed from some of the tested valves which leaked. None of the broken O-rings showed evidence of failure or distress other than that which appeared to have been caused by improper assembly/disassembly of the valve.

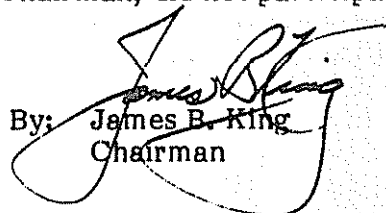
It is the opinion of ITT that unauthorized disassembly/assembly had been performed on some motive flow valves which resulted in cutting one or both of the O-rings. ITT pointed out that only ITT is authorized to perform any disassembly or repair on ITT motive flow valves that are installed in Learjet aircraft. The Safety Board is aware that from September to December 1979 there was an amendment to the Learjet Maintenance Manual which authorized field maintenance on these valves. This amendment to the manual was withdrawn when Learjet realized that it could not authorize such maintenance. It is possible that during the time this amendment was in the manual some maintenance personnel may have attempted to perform field repair of motive flow valves and, as a result, may have damaged one or both of the O-rings when they reinstalled the valve core in the valve body. This damage may have led to the leaks that were observed on some aircraft and to the leak that resulted in safety recommendations A-80-27 through -29. Our investigation to date has not revealed any case where field maintenance was performed nor do we believe that evidence of this type of maintenance work is likely to be found. The changing of O-rings in various aircraft components under the provisions of 14 CFR 43 is such a routine matter that it is not likely to be documented.

ITT has proposed that all concerned personnel should be advised that field service or maintenance on the motive flow valve is not authorized. In view of the hazard associated with a fuel leak in the aft section of Learjet aircraft, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Issue a Telegraphic Maintenance Alert to all owners/operators of Learjet aircraft and Federal Aviation Maintenance Inspectors advising them that under no circumstance is any field service to be performed on any ITT General Controls/Aerospace Products motive flow valve installed on a Learjet aircraft. (Class I, Urgent Action) (A-80-80)

In the next issue of the General Aviation Airworthiness Alerts, emphasize that field service is not authorized and describe the risks and hazards associated with unauthorized field service of ITT General Controls/Aerospace Products motive flow valves installed on Learjet aircraft. (Class II, Priority Action) (A-80-81)

KING, Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations. DRIVER, Vice Chairman, did not participate.

By: 
James B. King
Chairman