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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: June 27, 1980

Forwarded to:

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

SAFETY RECOMMENDATION(S)

A-80-53 through -55

On May 6, 1980, a Learjet model 23 aircraft crashed while attempting a night landing on runway 33 at Byrd Field, Richmond, Virginia. The skies were clear, visibility was 10 mi, and the wind was calm. Although the Learjet was slightly high on the approach, it descended normally in a landing attitude. But before touching down, the aircraft yawed and rolled, and first the right wingtip fuel tank and then the left tiptank struck the runway. Thereafter, the nose of the aircraft pitched up, the engine thrust increased, the aircraft rolled to the right, and it crashed in a nearly inverted attitude. A fire erupted after impact, and both pilots, the only persons aboard, were killed. The aircraft had been manufactured in 1964. Available optional slow-flight modifications installed on many Learjets had not been installed on this aircraft.

During the past 2 years, the Safety Board has investigated several Learjet accidents in which the aircraft while on the landing approach exhibited similar roll and yaw maneuvers followed by a loss of control and a crash. The other Learjets involved were models 24, and 25 aircraft, with the Century III and Raisbeck slow-flight modifications. The investigation revealed that in each landing accident, the aircraft apparently was flown, as specified, with the yaw damper disengaged, although the altitude at which the yaw damper was disengaged could not be verified. The accident records indicate that turbulence, crosswinds, wing icing, pilot technique, or other conditions had disturbed the aircraft's equilibrium during a flare or go-around maneuver and that erratic roll and yaw maneuvers and a loss of aircraft control ensued. Subsequent flight tests indicated that an increase in engine thrust during an attempt to recover the aircraft may cause roll oscillations to become more pronounced and may reduce the likelihood of recovery.

In February 1979, the National Transportation Safety Board, the Federal Aviation Administration, the Gates Learjet Corporation, the National Aeronautics and Space Administration, and other interested parties participated in a "Study of Selected Performance Characteristics of Modified Learjet Aircraft." The objectives of the study were to examine the operation of the stall warning system, to determine the most probable effect of small amounts of ice on stall characteristics, and to study the low-speed handling qualities of the modified aircraft in a landing configuration. The study found some limitations in the effectiveness of the anti-ice system and potential problems with premature ice-induced stalls.

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Although icing conditions and turbulence were not evident in the Richmond accident, the influences of turbulence and ground effect may have been significant factors in some of the Learjet accidents. Since the accident history of the aircraft indicates that the flight behavior may be unpredictable under certain conditions and loss of control may occur unexpectedly, the Safety Board is concerned that the 1979 study may not have identified all of the factors which can lead to erratic rolling of the Learjet in the landing phase. We also believe that the reasons for the ensuing loss of control have not yet been fully explored.

The Safety Board is also investigating three Learjet accidents which have involved loss of control at high altitude and which terminated in high-speed descents into the ground. One aircraft was on a training flight at 17,000 ft, and another aircraft was cruising en route at 41,000 ft. Both aircraft departed from level flight and entered steep descents from which the crews did not recover. The descents apparently were unexpected and occurred without warning. In the training accident, we believe that the pilots may have been practicing an emergency procedure for runaway stabilizer trim when the aircraft became uncontrollable. In the third accident, which occurred on May 19, 1980, a Learjet crashed into the Gulf of Mexico following an unplanned departure and high-speed descent from the aircraft's cruise altitude of 43,000 ft. The preliminary investigation of this accident disclosed that a cutout switch had been installed which could be used to silence the Mach overspeed warning horn. Similar horn warning cutout switch installations were found in other Learjet aircraft during inspections required following the May 19, 1980, accident.

In the high altitude loss of control situations, the possibilities under consideration are that a malfunction in the flight control system, turbulence, aerodynamic characteristics, or flightcrew action could lead to an upset and further loss of control. Accident records indicate that once high speeds and steep descents have been established, complete loss of control may result and recovery may be impossible.

For the foregoing reasons, we believe that the the flight characteristics of the Learjet aircraft in both the low-speed landing environment and the high-speed, high-altitude cruise environment should be thoroughly examined to gain a better understanding of the aerodynamic factors associated with these accidents. Without this information, we believe that measures to assure safe flight cannot be developed.

In addition, the Board is aware that Gates Learjet Service issued News Letter 49 dated May 1980 pertaining to procedures to be followed if the aircraft inadvertently exceeds V_{mo}/M_{mo} . These procedures specify that the spoilers should not be extended if a pitch axis malfunction or a runaway trim situation is apparent. The reason stated is that the nosedown pitch change that the spoilers produce may aggravate a nosedown pitch problem. The Board is concerned that this information is not included in the aircraft flight manual and that operators may not be aware of the consequences of spoiler extension in these situations. Furthermore, the procedures for slowing the aircraft from excess speed, as specified in the newsletter, include the extension of the landing gear. It is the Board's understanding that this procedure has not been evaluated during actual flight conditions. The Board believes that it would be appropriate for the FAA to evaluate these procedures and if they are deemed to be effective they should be incorporated immediately in the aircraft flight manual.

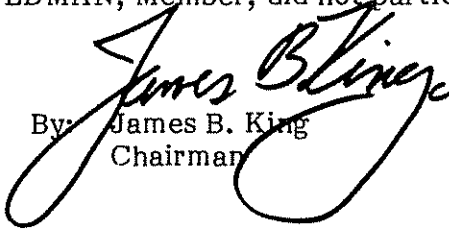
Accordingly, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Convene a Multiple Expert Opinion Team to evaluate the flight characteristics and handling qualities of Series 20 Learjet aircraft, with and without slow flight modification, at both low- and high-speed extremes of the operational flight envelope under the most critical conditions of weight and balance (and other variable factors) and to establish the acceptability of the control and airspeed margins of the aircraft at these extremes. (Class I, Urgent Action) (A-80-53)

Advise all Learjet operators of the circumstances of recent accidents and emphasize the prudence of rigid adherence to the specified operational limits and recommended operational procedures. (Class I, Urgent Action) (A-80-54)

Evaluate information contained in the Gates Learjet Service News Letter 49 dated May 1980 pertaining to procedures to be followed if the aircraft inadvertently exceeds V_{mo}/M_{mo} and, based on this evaluation, require appropriate revisions to the aircraft flight manual. (Class I, Urgent Action) (A-80-55)

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

By: 
James B. King
Chairman