



National Transportation Safety Board
Washington, D.C. 20594

Safety Recommendation

Date: August 20, 1998

In reply refer to: A-98-83

Honorable Jane F. Garvey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On February 20, 1997, Mesaba Airlines flight 3098, a de Havilland DHC-8-102, N828MA, operated as a Title 14 Code of Federal Regulations Part 121 flight, experienced an uncommanded left roll after departure from Detroit Wayne County Metropolitan Airport (DTW), Michigan. The flightcrew maintained control of the airplane with opposite aileron and aileron trim input. The captain reported that excessive right-wing-down trim was necessary to maintain a wings-level attitude and that the powered flight control surfaces (PFCS) display in the cockpit indicated that the left, outboard spoiler was deployed approximately 50 percent. The flightcrew depressurized the affected roll spoiler hydraulic circuit, but the spoiler remained in the partially extended position. The flightcrew declared an emergency, but the airplane landed at DTW without further incident. There were no injuries to the 3 crewmembers or 23 passengers on the airplane. Visual meteorological conditions prevailed at the time of the incident.

Postflight examination of the airplane confirmed that the left, outboard roll spoiler¹ remained partially deployed. The spoiler actuator was disassembled and examined by Dowty Aerospace (Dowty), the manufacturer of the actuator, and the National Transportation Safety Board. The examination revealed that the welded plug at the base of the actuator piston had separated and lodged between the piston and the housing. This restricted the piston's travel and prevented its full retraction.

The Safety Board has investigated two other incidents in which DHC-8 roll spoiler actuators became jammed in an extended position during flight. On January 22, 1997, a

¹ Each wing contains inboard and outboard roll spoilers that deploy proportionally with upward travel of the aileron.

Mesaba Airlines DHC-8, N852MA, experienced an uncommanded left roll during takeoff rotation at Charleston, West Virginia. The captain reported that he applied full left control wheel input to counter heavy left crosswinds experienced on the runway. The captain stated that the airplane rolled left during rotation and that substantial right aileron and rudder inputs were necessary to arrest the roll rate. The crew maintained aileron and rudder inputs to stabilize the roll and continued climbing while they performed the emergency checklist procedure for "airplane rolls with no control wheel input." The flightcrew declared an emergency, but the landing was executed without further incident. The PFCS display and postflight inspection indicated that the left, inboard roll spoiler was extended approximately 50 percent. Examination of the spoiler actuator revealed failure of the welded plug at the base of the actuator piston that prevented full retraction of the piston.

The other incident involved a Mesaba Airlines DHC-8, N828MA, that experienced an uncommanded left roll during the approach to land at Moline, Illinois, on April 3, 1995. The flightcrew reported that right aileron was required to maintain wings-level flight. The flightcrew declared an emergency, but the airplane landed without further incident. The PFCS display and postflight inspection indicated that the left, inboard roll spoiler was extended approximately 50 percent. Examination of the spoiler actuators revealed a similar failure of the welded plug at the base of the actuator piston.

In addition to the three incidents investigated by the Safety Board, Dowty reported that it is aware of seven additional actuators that experienced similar failure of the welded plug and jamming of the piston. All of the failures have been attributed to improper welds of the plug at the base of the piston. Failure of the piston plug allows hydraulic fluid to fill the interior chamber of the piston yet continue to actuate the piston. Failure of the piston plug does not affect hydraulic system integrity or operation of the actuator piston in the extended direction; however, it does prevent the actuator piston from fully retracting from an extended position.

Dowty decided to discontinue manufacturing the welded-plug piston assemblies (part number (P/N) A50991-2) for the DHC-8 roll spoiler actuator and to purge its stock after the April 3, 1995, incident involving N828MA. A new piston assembly (P/N A44714-2) was introduced that incorporates a swaged piston blank in lieu of the welded-plug design. There have been no reported failures of the new piston assembly, which has been incorporated on all DHC-8 roll spoiler actuators manufactured or repaired by Dowty since April 1995. However, Dowty and de Havilland stated that most of the 516 actuators that were manufactured with the welded-plug design (only for DHC-8 airplanes) remain in service.

On July 15, 1997, de Havilland issued an In-Service Activities Report (ISAR) to inform DHC-8 operators about this roll spoiler problem. The ISAR also referenced a pending Dowty service letter (subsequently issued on September 26, 1997), which provided details about modifying in-service actuators with the new piston assembly. The ISAR further stated that the problem involving the roll spoiler actuators "is not considered to be a safety issue" because it only affects operation of the roll spoiler through part of its stroke and is readily detectable. However, the Safety Board is concerned that the lateral asymmetry resulting from a jammed roll spoiler could be hazardous during certain operations that are frequently

encountered, such as flight at low airspeeds or during heavy crosswinds or turbulence. Accordingly, the Safety Board believes that the Federal Aviation Administration should require that operators of de Havilland DHC-8 airplanes replace the welded-plug piston assembly (P/N A50991-2) on Dowty roll spoiler actuators with a piston assembly using a swaged piston blank.

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

Require that operators of de Havilland DHC-8 airplanes replace the welded-plug piston assembly (part number A50991-2) on Dowty Aerospace roll spoiler actuators with a piston assembly using a swaged piston blank. (A-98-83)

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in this recommendation.

By:


Jim Hall
Chairman