



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Log 1857

Date: January 9, 1986

In reply refer to: A-86-1 through -3

Honorable Donald D. Engen
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On December 15, 1985, a British Airways Boeing 747-136 was on approach to Logan International Airport in Boston, Massachusetts, when, shortly after the flightcrew selected the "flaps 30" position, a loud noise was heard and the airplane started to roll to the left. Significant aileron deflections were needed to stabilize the airplane, but the landing was made without further incident.

Inspection of the airplane after landing revealed that about 16 feet of the left inboard trailing edge fore-flap had separated completely from the airplane and that the mid-flap and the Nos. 5 and 6 spoilers were damaged. The bolts attaching the forward attachment fitting of the No. 3 flap track (for the left inboard flap) to the underside of the wing were fractured. At the No. 3 flap track aft mount position, a nut was found separated from one of the two mount bolts. The threads on this nut had been stripped. Both of the two aft mount bolts were deformed severely. At the time of the accident the airplane had accumulated 55,667 hours and 13,771 takeoff/landing cycles.

The No. 3 flap track forward attachment fitting and the fitting attachment bolts were examined at the National Transportation Safety Board's materials laboratory. Fractures in five of the eight attachment bolts stemmed from fatigue cracks in the shank-to-head radius. Also, areas of fretting were found on the surface of the fitting which contacts the underside of the wing. The fatigue cracks were located in areas which cannot be inspected unless the bolts are removed from the airplane. In order to remove these bolts, access must be gained into the wing fuel tank, which requires that the airplane be taken out of service for a significant period of time.

As a result of the accident, the Boeing Aircraft Company (Boeing) issued Service Letter No. 747-SL-57-44A on December 20, 1985. This letter recommends a torque check of the flap track forward attachment fitting bolts at 25 to 50 percent of the installation torque. The service letter allows revenue flight with up to two broken bolts per fitting, but does not specify what action to take should an inspection reveal bolts that are undertorqued. The Safety Board believes that the Boeing service letter does not fully address the problem because it is not mandatory and because it does not specify an action to take in regard to undertorqued bolts.

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Since the accident, British Airways personnel have performed inspections in accordance with the Boeing service letter on the attachment bolts for the Nos. 1 through 3 and Nos. 6 through 8 flap track forward attachment fittings on six other high-time/high-cycle Boeing 747 airplanes. The bolts on five of the airplanes met torque values specified in the service letter. However, on the sixth airplane, four of the No. 3 flap track forward attachment fitting bolts were found to have less torque than specified in the service letter. This aircraft had accumulated approximately 56,995 hours and 13,718 cycles.

The Safety Board is concerned that there may be other Boeing 747 airplanes with undertorqued bolts in flap track forward attachment fittings, that the lack of adequate torque on these bolts may lead to fretting of the fitting and fatigue cracking of the attachment bolts, and that fracture of these bolts may result in in-flight loss of flap(s). Such loss could result in a serious accident. Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Issue an Airworthiness Directive to require an immediate inspection of all Boeing 747 airplanes having an appropriate minimum number of operating cycles to verify that all bolts for the Nos. 1 through 3 and Nos. 6 through 8 flap track forward attachment fittings are torqued adequately. If any of the bolts are broken or are not torqued adequately, all of the bolts from the forward attachment fitting with the broken or undertorqued bolt should be removed and inspected by an FAA-approved method and the bolts for the other attachments of the affected flap track should be inspected for adequate torque before further flight. (Class I, Urgent Action) (A-86-1)

Based on information gained by the inspection program detailed in Safety Recommendation A-86-1, determine an appropriate interval for checking the bolt torque, and define periodic reinspection requirements in an Airworthiness Directive. (Class II, Priority Action) (A-86-2)

Notify foreign governments with operators of Boeing 747 airplanes of the circumstances of the accident involving the British Airways Boeing 747-136 on December 15, 1985, in Boston, Massachusetts, and of any action taken as a result of the accident. (Class I, Urgent Action) (A-86-3)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER, Member, concurred in these recommendations.

Catricia R. Goldman
By: Jim Burnett
Chairman *jr.*