



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: January 19, 1999

In reply refer to: A-99-4

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

On August 31, 1998, the right main landing gear (MLG) of a Boeing 727-200 airplane, operated by DHL Worldwide Express, collapsed after an emergency landing at John F. Kennedy International Airport in Jamaica, New York. The emergency was declared after an unrelated No. 2 engine failure. The flight was an intended scheduled Title 14 Code of Federal Regulation Part 121 cargo flight from New York to Cincinnati, Ohio. None of the three flightcrew members or the two jumpseat passengers were injured, and the airplane sustained substantial damage as a result of the accident.

The right MLG was original equipment that had accumulated 44,554 flight cycles and 50,861 flight hours in 28 years and 6 months of service. Postaccident examination of the airplane by the National Transportation Safety Board revealed that the right MLG forward trunnion bearing support fitting lug had fractured and that postfracture loads on the fitting had spread the fracture faces apart by bending the outboard side of the lug.

The right MLG of the B-727 is a conventional, two-wheel landing gear with three support points: the forward trunnion, the aft trunnion, and the side strut (see figure 1). A trunnion link is mounted between the shock strut and the rear spar. The aft end of the trunnion link is pinned to the shock strut, and the forward end pivots in a spherical bearing mounted in the forward trunnion bearing support fitting.¹ The spherical bearing has external splines that are used for locking the bearing assembly and retaining it within the support fitting lug. The splines contact a portion of the inner surface of the lug, leaving the gaps between the splines exposed to possible corrosion. The trunnion bearing support fitting is a round housing made from 4330M steel. The inner bore of the housing has chrome electroplating, which is the bore's primary means for corrosion protection. The fitting is mounted on the rear spar of the wing with high-strength bolts.

¹ The design and location of the forward trunnion bearing support fitting are similar for all B-727 series airplanes.

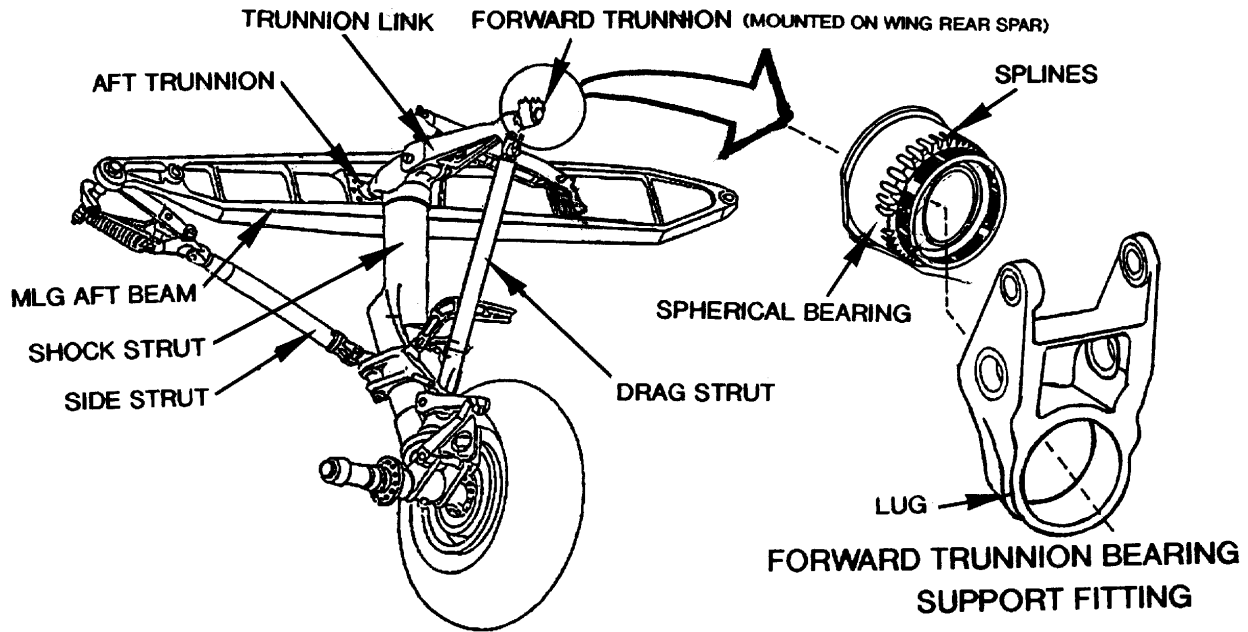


Figure 1. Boeing 727 Main Landing Gear Assembly

Examination of the trunnion bearing support fitting at the Safety Board's materials laboratory revealed corrosion at the forward edge of the fitting's lug in many of the exposed areas between the bearing splines. Fatigue cracking emanated from two locations within a severely corroded area, and intergranular stress corrosion cracking (SCC) stemmed from the fatigue cracking. This corroded area was 0.15-inch wide by 0.37-inch long by 0.07-inch deep. The fracture was caused by a combination of fatigue cracking and SCC.

According to Boeing's records, three other B-727 series airplane events involving the failure of a MLG forward trunnion bearing support fitting have occurred. The first of these failures, which involved a B-727 owned by Air Portugal, occurred in Frankfurt, Germany, in July 1988. Heavy corrosion was found at the forward edge of the forward trunnion bearing support fitting lug and bore, and the fracture was caused by intergranular SCC. The other two failures, which involved B-727s owned by Delta Air Lines, occurred in Denver, Colorado, in May 1989 and Albuquerque, New Mexico, in July 1997. The Safety Board investigated both of these cases and found that heavy surface corrosion on the forward trunnion bearing support fitting lug had caused either multiple fatigue regions or SCC.

On March 8, 1990, Boeing issued Service Bulletin (SB) 727-57-0179 (revised on June 13, 1991, and April 30, 1992), recommending (1) ultrasonic inspection of the forward trunnion bearing support fitting for SCC at least every 6 months or 1,500 flight cycles, whichever occurs first, and (2) magnetic particle inspection at 12,000 cycle intervals. The SB states that the inspections should continue until the fitting is replaced or the specified preventive modification of

the fitting is performed.² The preventive modification includes removing the fitting from the airplane, performing magnetic particle inspection, cleaning, and installing a moisture barrier Boeing Material Specification 5-95 sealant. The recommended actions of the SB are not currently mandated by a Federal Aviation Administration (FAA) airworthiness directive. As a result, some operators have developed their own visual and ultrasonic inspections that are performed at intervals up to every 30 months, but other operators do not perform the inspection at all. DHL did not inspect the fitting from the accident airplane.

The Safety Board is concerned that additional B-727 forward trunnion bearing support fittings may fail because of corrosion, fatigue, and SCC, which could jeopardize safety. The Safety Board is also concerned that no requirement exists for recurrent inspection and protection of the fitting with a moisture barrier. Periodic ultrasonic inspection is necessary to detect corrosion, cracks, and SCC in the trunnion fitting so that the part can be repaired or replaced or have the preventive modification performed. Also, the application of a proper moisture barrier is important to minimize the possibility of corrosion on new or existing fittings. Therefore, the Safety Board believes the FAA should require operators of all B-727 series airplanes to (1) conduct periodic ultrasonic inspections of the MLG forward trunnion bearing support fittings for corrosion, cracks, and SCC; (2) repair or replace these fittings if they are cracked or corroded; and (3) ensure that a proper moisture barrier is applied on new or existing MLG forward trunnion bearing support fittings to minimize corrosion.

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

Require operators of all Boeing 727 series airplanes to (1) conduct periodic ultrasonic inspections of the main landing gear (MLG) forward trunnion bearing support fittings for corrosion, cracks, and stress corrosion cracking; (2) repair or replace these fittings if they are cracked or corroded; and (3) ensure that a proper moisture barrier is applied on new or existing MLG forward trunnion bearing support fittings to minimize corrosion. (A-99-4)

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

By: Jim Hall
Chairman

² If cracked or corroded fittings are repaired, the SB states that the inspections may need to continue depending on the type of repair performed.