



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: July 12, 2004

In reply refer to: A-04-51 and -52

Honorable Marion C. Blakey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On August 12, 2003, a Boeing 737-500, registration EI-CDD, operating as an Aer Lingus flight en route from Amsterdam to Dublin, suffered a fracture of the left main landing gear (MLG) retract actuator beam, commonly known as the “walking beam” (see figure 1). The pilot reported hearing a loud noise when the landing gear was retracted on takeoff but, because there were no abnormal indications in the cockpit, proceeded with the flight to its destination. In preparation for landing, the landing gear was extended and again a loud noise was heard. The flight landed safely with no injuries to the crew or passengers.¹

During postflight examination, it was discovered that the left MLG retract actuator beam was fractured into two pieces and several nearby cables and components were damaged. Specifically, the spoiler cables were severed, the rear spar and landing gear beam were damaged, the aileron pulley bracket was dislocated, and the aileron cables were pinched. During the course of the investigation, Boeing informed the Safety Board of three similar incidents in which an MLG retract actuator beam had failed. In all four cases, the MLG had been previously overhauled.²

¹ The Air Accident Investigation Unit, Ireland, conducted the investigation of this incident. Under the provisions of Annex 13 to the Convention on International Civil Aviation, the National Transportation Safety Board participated in the investigation as an Accredited Representative for the State of Manufacture.

² The MLG retract actuator beam overhauls were performed by four separate facilities — two domestic air carrier maintenance operations, one contract maintenance facility and one foreign maintenance shop.

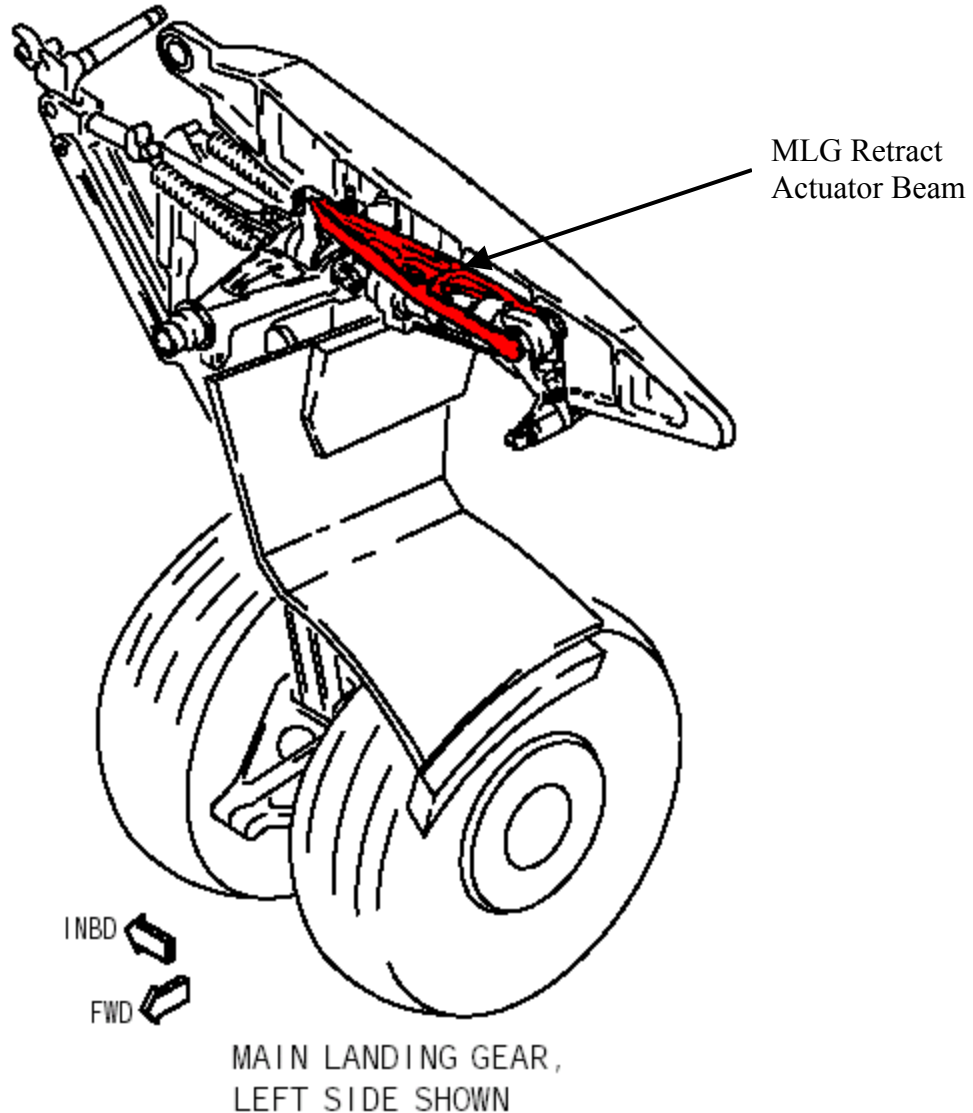


Figure 1. 737 MLG Retract Actuator Beam

Boeing's examination of the failed retract actuator beams from all four incidents revealed that proper overhaul procedures were not followed. The Aer Lingus retract actuator beam failure was caused by stress corrosion cracking initiating at embedded aluminum oxide particles that were not removed after an abrasive grit blasting procedure during the previous overhaul, which took place in January 1998, more than 5 years (10,304 cycles/14,011 flight hours) prior to the MLG failure. The cause of two of the other failures³ was stress corrosion cracking initiating from small corrosion pits that were not entirely removed during the previous overhaul. In the fourth case,⁴ the cracking initiated in an area of heat damage/burning determined to have been

³ One failure occurred about 7 years (cycles/hours unknown) after overhaul and the other occurred about 8 years (19,400 cycles/23,900 hours) after overhaul.

⁴ The failure occurred about 4 years (11,600 cycles/16,100 hours) after overhaul.

caused by incorrect stylus cadmium plating.⁵ After the first three incidents, on January 30, 2003, Boeing issued Service Bulletin (SB) 737-32A1355⁶ recommending inspection of the retract actuator beam for damage and rework of the retract actuator beam with an organic finish (paint) that provides increased durability. The new finish gives better protection from in-service damage and corrosion. This SB was not accomplished on any of the four incident MLG retract actuator beams and was not applicable based on their in-service times.⁷

According to the Boeing SB, “if the MLG retract actuator beam breaks, there can be damage to the beam arm, hydraulic tubing and flight control cables. Damage to the flight control cables can cause loss of control of the airplane.” The Safety Board is concerned about these significant safety risks associated with a failed retract actuator beam—in particular, the possibility of loss of control from damage to the flight control systems.

The FAA has taken no action to mandate compliance with the SB. Because experience has shown that, unless an SB is required by the FAA, some operators likely will choose not to take the specified action, the Safety Board is concerned that unless the recommended actions of the SB are mandated, some 737 airplanes will continue to be at risk of MLG retract actuator beam failure. Therefore, the Safety Board believes that the FAA should expedite the issuance of an airworthiness directive requiring compliance with Boeing SB 737-32A1355 for the inspection and rework of the Boeing 737 MLG retract actuator beam.

All four incidents can be traced to improper overhaul procedures and occurred within the 10-year overhaul window specified in the SB. Because the nature of stress corrosion cracking is such that a time-to-failure cannot be accurately predicted and the current condition of any retract actuator beam, overhauled or not, cannot be determined without inspection, the Safety Board believes the FAA should require a detailed inspection, as soon as possible, of those Boeing 737 MLG retract actuator beams specified in Boeing SB 737-32A1355 for nicks, gouges, corrosion and cracking and, if necessary, require rework in accordance with the procedures in Boeing SB 737-32A1355.

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

Expedite the issuance of an airworthiness directive requiring compliance with Boeing Service Bulletin 737-32A1355 for the inspection and rework of the Boeing 737 main landing gear retract actuator beam. (A-04-51)

Require a detailed inspection, as soon as possible, of those Boeing 737 main landing gear retract actuator beams specified in Boeing Service Bulletin 737-32A1355 for nicks, gouges, corrosion and cracking and, if necessary, require

⁵ Stylus cadmium plating is a process by which a localized area can be re-plated after rework.

⁶ The SB is applicable to airplanes with manufacturing line numbers 1 through 3132, which includes all of the 737 “classic” (that is, the -100/-200/-300/-400/-500 series) airplanes.

⁷ The SB specifies a compliance deadline of June 6, 2004, for retract actuator beams that have been in service for more than 10 years since their last overhaul. For all others, the SB calls for compliance at the next overhaul or whenever the beam reaches 10 years of service since the last overhaul, whichever comes first.

rework in accordance with the procedures in Boeing Service Bulletin 737-32A1355. (A-04-52)

Chairman ENGLEMAN CONNERS, Vice Chairman ROSENKER, and Members CARMODY, GOGLIA, and HEALING concurred with these safety recommendations.

By: Ellen Engleman Connors
Chairman