LOG 2400

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: February 8, 1993
In reply refer to: A-93-6 and -7

Honorable Joseph M. Del Balzo
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

On August 21, 1992, at 10:30 p.m. eastern daylight time, a McDonnell Douglas DC-8-71F, N748UP, registered to and operated by United Parcel Service (UPS), experienced failure of the swivel bogie beam assembly of the left main landing gear bogie beam while taxiing for takeoff at Miami International Airport, Miami, Florida. The three crewmembers were not injured; however, the main landing gear was severely damaged.

The swiveling bogie beam assembly is incorporated in the design of main landing gears of DC-8 Series 20, 30, 40, 50, 60, and 70 airplanes. The swiveling bogie beams connect the forward set of wheels to the aft set of wheels, permitting sharper turn angles during taxiing than the angles that can be achieved by landing gears with an integral bogie beam configuration. The primary components of the swivel bogie beam assembly are the aft and the forward bogie beams, which are assembled together by a swivel pin through two lugs on the forward beam and two lugs on the aft beam. Thin copper alloy gaskets acting as bearings are sandwiched between the mating lugs. The lugs are protected by paint, except for the portions that contact the gaskets.

The Safety Board investigation of this incident disclosed that a separation of the bogie beam assembly occurred in the upper and lower swivel pin lugs of the forward bogie beam. Metallurgical examinations of the swivel pin lugs were conducted at the Safety Board materials laboratory. Fractures through the upper lug of the forward bogie beam were produced by overstress. Fractures of the lower lug stemmed from two, small (about 0.2 inch long and 0.15 inch deep) areas of stress corrosion cracking: one area located on the bottom land (surface contacting the gasket) of the lug; and another in the corner between the bottom land and the inner diameter surface. Extensive pitting corrosion was found in both origin areas.

Review of the McDonnell Douglas DC-8 maintenance manual indicated that the swivel joints are equipped with two grease fittings. Examination of the landing gear in the incident airplane disclosed little, if any, lubrication of the swivel joint. Lack of lubrication can cause wear of mating parts and allow penetration of moisture into the interface between the gasket and the lug, resulting in excessive wear and pitting corrosion of the unprotected areas of the lug.

Since 1969, there have been 22 Service Difficulty Reports of swivel bogie beam failures that occurred in the swivel pin lugs. All of these failures were attributed to stress corrosion or excessive wear from a lack of or insufficient lubrication. In two of the reported cases, the lack of lubrication generated friction heat that initiated fires and caused an emergency evacuation of personnel.

The McDonnell Douglas DC-8 maintenance manual for the series 60 and 70 airplanes recommends lubrication of the bogie beam swivel joint every 350 to 400 flight hours. However, review of the current UPS task card for maintenance of landing gear/wheel well components in DC-8 Series 70 airplanes (TC No. 0103) revealed no requirements for lubrication of the bogie beam swivel joints. Further, the On Aircraft Maintenance Planning document (OAMP) does not contain a task requirement to lubricate the bogie beam swivel joint. The OAMP, developed by the aircraft manufacturer for an aircraft operator, is the primary basis of an operator's maintenance program for various components of the airplane. Consequently, the absence of a specific task requirement in the OAMP could result in the absence of the task on the operator's maintenance task card.

On May 17, 1990, as a result of a failure in the swivel joint, McDonnell Douglas published an All Operator Letter, AOL 8-1115, alerting the operators of DC-8 Series 50, 60, and 70 airplanes to the importance of proper lubrication of main landing gear bogie beams and recommending lubrication of the swivel joints every 350 to 400 hours. On May 9, 1991, as the result of another bogie beam failure, McDonnell Douglas issued a revised letter AOL 8-1115A to recommend a lubrication period of 75 flight hours. However, no action was taken to require that a lubrication period be included in the airplane operator's maintenance programs. During the investigation of the incident that occurred on August 21, 1992, Safety Board staff alerted McDonnell Douglas to the omission of the swivel joint lubrication task from the OAMP. McDonnell Douglas subsequently proposed a change in the OAMP to include a task to lubricate the swivel joint every 75 service hours. The Safety Board supports AOL 8-1115A and the proposed change in the OAMP and believes that the FAA should require all operators of DC-8 airplanes to lubricate the bogie beam swivel joint at an appropriate interval.

Because lubrication of the swivel pin joint in the bogie beam assembly has not been included in the OAMP document, the Safety Board is concerned that operators of the DC-8 airplane may not have lubricated the swivel joints on a regular or sufficiently frequent basis. Thus, swivel pin lugs in the DC-8 fleets may have corrosion pitting and stress corrosion cracks that could jeopardize the structural integrity of the main landing gear. Consequently, the Safety Board believes that the FAA should require operators to conduct a one-time inspection of swivel joints of bogie beams in main landing gears of DC-8 airplanes for evidence of excessive wear, pitting corrosion, and stress corrosion cracking.

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

Require operators of DC-8 airplanes to lubricate the main landing gear bogie beam swivel joints at an appropriate interval. (Class II, Priority Action) (A-93-6).

Issue an Airworthiness Directive to require, within a reasonable time, a one-time inspection for evidence of excessive wear, pitting corrosion, and stress corrosion cracking in the swivel joints of bogie beams of all main landing gears of DC-8 airplanes that incorporate a swivel bogie beam configuration. During this inspection, special attention should be given to examination of inside diameter surface and unpainted areas of the upper and the lower swivel pin lugs in the forward and aft bogie beams. (Class II, Priority Action) (A-93-7).

Chairman VOGT, Vice Chairman COUGHLIN, and Members LAUBER, HART, and HAMMERSCHMIDT concurred in these recommendations.

By: Carl W. Vogt
Chairman