



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: November 4, 1998

In reply refer to: A-98-112

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

On March 15, 1997, a Piper PA-31 airplane, operated by Cape Smythe Air Service as a scheduled commuter flight from Kivalina, Alaska, to Kotzebue, Alaska, landed with the left main landing gear (MLG) partially retracted at the Kotzebue Airport. None of the occupants was injured, and the airplane sustained minor damage.

Before landing, the pilot attempted to lower the landing gear; however, the landing gear did not extend normally, and the landing gear unsafe light illuminated in the cockpit. During a subsequent low pass over the airfield, ground personnel confirmed that the left MLG was not extended. Postincident examination revealed that a forward hinge on the left MLG inboard door had broken and disabled the door, preventing the gear from extending fully.

The PA-31 MLG inboard door is configured with two hinge assemblies that attach the door to the airplane, allowing the door to open during gear extension. There are two MLG inboard door hinge assemblies made for the PA-31: the original equipment hinge assembly (Piper part number (P/N) 46653-00) and an improved (thicker) hinge assembly (Piper P/N 47529-32). The improved hinge assembly consists of a 0.44-inch-thick, aluminum-forged hinge with two attachment angles.

The airplane had been operated for 13,988 hours in 17 years and 6 months of service and had been retrofitted with the improved hinge assemblies in 1988. The airplane had operated approximately 9,938 hours with the improved hinge assemblies before the hinge failure.

The National Transportation Safety Board's materials laboratory examined the fracture surfaces of the broken hinge. The examination revealed a fatigue crack that had emanated from multiple origins at the tip of the forged flash¹ on the inside curve portion of the hinge arm (see

¹ Excess metal that is forced out during the forging operation, between the upper and lower forging dies.

figure 1). The arm is subjected to cyclic loading during service, and the forging flash is a high-stress region of the hinge.

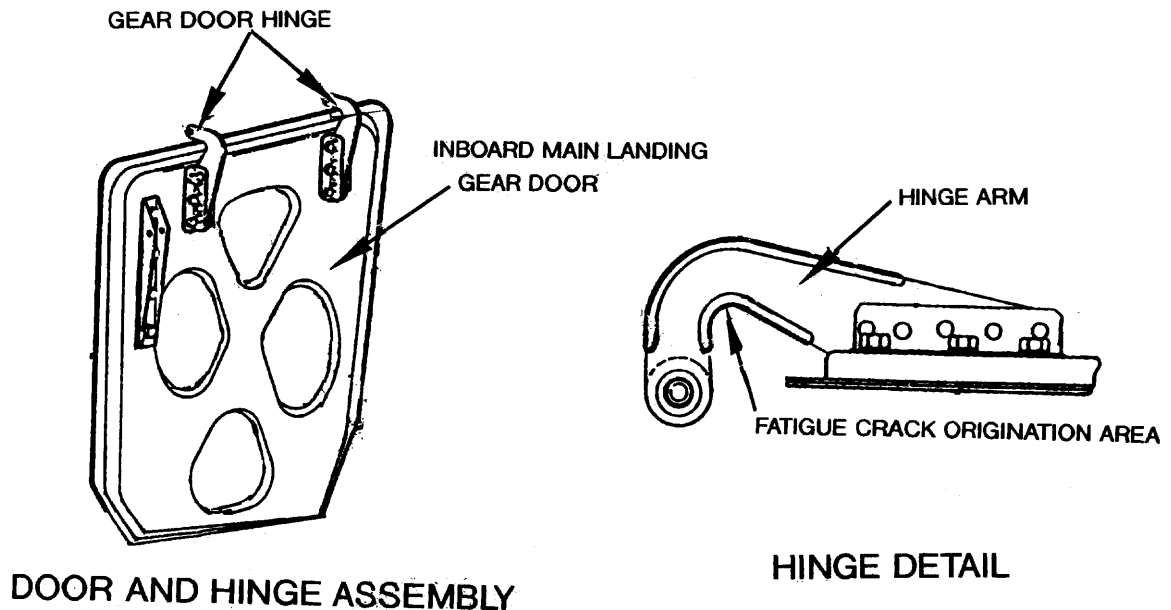


Figure 1. Piper PA-31 Main Landing Gear Door Assembly

In 1980, following several incidents of fatigue cracks in the original hinge, Piper Aircraft Corporation (now New Piper Aircraft, Inc.) issued Service Bulletin (SB) 682, which recommends inspection of the PA-31 MLG inboard door hinge assemblies and hinge attachment angles for cracks within the first 100 hours of operation or during the next scheduled inspection, whichever occurs first, and every 100 hours thereafter unless/until an acceptable replacement part is installed. The SB recommends that all cracked door hinges be replaced with the improved P/N 47529-32 hinge assemblies before further flight. Upon installation of the improved hinge assembly, repetitive inspection of the hinge assembly is not required. On December 19, 1980, the Federal Aviation Administration (FAA) issued Airworthiness Directive 80-26-05, mandating the actions specified in this SB.

However, despite these inspection and replacement procedures, service difficulty reports (SDR) indicate that since 1980 there have been at least 17 cracked or failed P/N 47529-32 hinge assemblies. Because experience has shown that the SDR system frequently underreports service failures, it is very likely that there have been other unreported events involving P/N 47529-32 hinge assembly failures. For example, the Safety Board's materials laboratory has examined another P/N 47529-32 hinge that separated because of fatigue cracking but there was no SDR report of the incident.

The Safety Board is concerned that the improved P/N 47529-32, PA-31 MLG inboard door hinge assemblies are failing and that no requirement exists for their recurrent inspection. Piper has indicated its intent to design a new sheet-metal hinge assembly that will replace the P/N

47529-32 hinge assembly to preclude further failures. Therefore, the Safety Board believes that the FAA should require PA-31 operators to conduct repetitive inspections for cracks of all Piper P/N 47529-32 MLG inboard door hinge assemblies until they are replaced by an improved MLG inboard door hinge assembly that is not prone to similar failures.

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

Require Piper PA-31 operators to conduct repetitive inspections for cracks of all Piper part number 47529-32 main landing gear (MLG) inboard door hinge assemblies until they are replaced by an improved MLG inboard door hinge assembly that is not prone to similar failures. (A-98-112)

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

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By: Jim Hall
Chairman