Log 2670

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: November 4, 1997

In reply refer to: A-97-111

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

The National Transportation Safety Board is investigating an accident involving the separation of the entire propeller and a portion of the propeller mounting flange of the crankshaft from a Lancair 320, N320L, airplane. The accident occurred on August 8, 1996, near Fond du Lac, Wisconsin. The airplane entered a flat spin, and the commercially rated pilot sustained fatal injuries upon ground impact. Separation of the propeller from the airplane would cause an obvious loss of all thrust capability, and would be expected to cause controllability problems as a result of changes in the center of gravity. The Lancair 320 is a high performance, home-built experimental airplane. It uses a Textron Lycoming IO-320-B1A engine, an engine typically used on Piper PA-30 airplanes. The accident airplane also used a recommended constant speed propeller that is heavier than a fixed pitch propeller that can also be used with this engine. The Pilot's Operating Handbook for the airplane allows certain aerobatic maneuvers.

The Safety Board's materials laboratory examined the broken propeller mounting flange from the forward end of the crankshaft as well as the remainder of the crankshaft (P/N 74780) from the airplane's engine. The cause of the flange fracture was determined to be fatigue cracking that initiated between the lightening holes in the flange. The separated crankshaft is an older design and has not been produced by Textron Lycoming for over 20 years. The replacement crankshaft currently produced for the IO-320-B1A engine has a propeller mounting flange that is specified to be substantially thicker than the flange on the older style crankshaft.

Federal Aviation Administration (FAA) Airworthiness Directive (AD) 65-03-03 (effective January 30, 1965) is applicable to the crankshaft of the IO-320-B1A engine when the engine is installed on Piper PA-30 aircraft using a certain constant speed propeller. This AD cites Lycoming Service Bulletin (SB) No. 300 (revision B issued October 6, 1967). The AD requires magnified visual or magnetic particle inspection of the crankshaft's propeller mounting flange before the next flight that follows any flight involving prohibited maneuvers. The prohibited maneuvers include power-on stalls at engine speeds above 2,150 rpm and certain aerobatic maneuvers prohibited by the flight manual or by placard.

The Safety Board believes that the fatigue cracking in the propeller mounting flange on the accident airplane may have been initiated by stresses generated during aerobatic maneuvers allowed by the Operating Handbook for the Lancair 320. These maneuvers were not necessarily frequent, but may have been sufficient to generate gyroscopic bending loads that caused repeated cycles of relatively high stress as the propeller rotated during these maneuvers. The heavier constant speed propeller would also increase the gyroscopic bending loads on the crankshaft flange during these maneuvers. Although SB 300B and AD 65-03-03 do not differentiate between engines with the older style crankshaft incorporating a thinner flange and engines whose crankshafts have thicker flanges, the Safety Board has no information to indicate that the crankshafts with thicker flanges are also susceptible to cracking when used on the Lancair 320 or other experimental type airplanes.

About 200 Lancair 320 airplanes have been built, and about 1,000 additional airplanes of this model are under production by kit purchasers. Because kit purchasers are responsible for locating and installing the engine, there has been no method of determining how many of these airplanes have the crankshaft with the thinner flange. Many of the used engines available for kit purchasers could be from older airplanes, thus a substantial percentage of engines used in Lancair 320 airplanes may have crankshafts with the thinner flange.

The Safety Board is concerned that any airplane, including a Lancair 320, that uses or could use a Textron Lycoming IO-320-B1A engine with a crankshaft having a thinner propeller mounting flange may be flown in a manner that could initiate cracking of the flange. Because a similar fracture could lead to another fatal accident, the Safety Board believes that the FAA should take appropriate action to require that these crankshafts receive inspections following aerobatic maneuvers regardless of the airplane on which they are installed.

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

> Issue a new or revised Airworthiness Directive, addressing all Textron Lycoming IO-320-B1A engines whose crankshafts have the older style thinner propeller mounting flange (regardless of the airplane on which the engine is installed), to require appropriate inspection of the propeller mounting flange following performance of specified maneuvers that can generate high stresses in the flange area. (A-97-111)

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

By: Jim Hall
Chairman