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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: March 2, 1994

In reply refer to: A-94-40 and -41

Honorable David R. Hinson
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On April 18, 1968, the Piper Aircraft Corporation issued Service Letter (SL) No. 503, "Inspection of Oil Cooler Hose," the first of a series of service advisories affecting oil cooler hoses on Piper PA-28-140 Cherokee airplanes. The SL recommended an inspection, and corrective action as necessary, to ensure that a minimum clearance of 2.5 inches existed between the oil cooler hoses and the front exhaust stack. The intent was to prevent the hoses from becoming hard and brittle due to high temperatures and subsequently leaking or rupturing.

On February 10, 1972, Piper issued SL No. 604, "Inspection of Engine Oil Hose," indicating that SL 503 had either not been complied with or that during compliance, the oil hoses were inadvertently moved too close to the rear exhaust stack while increasing the clearance from the front exhaust stack. SL No. 604 provided instructions for: 1) estimating the residual flexibility of the oil hoses; 2) adjusting the oil hoses to ensure minimum clearances of 1 3/4 inches and 2 inches, respectively, between the hoses and the front and rear exhaust stacks, and 3) inspecting the oil hose/fire sleeve to ensure that the fire sleeve was not soaked with oil or baked to a brown or whitish color. The SL indicated that there must be no evidence of localized deterioration resulting from heat or brittleness, or of oil seepage. It was recommended that these instructions be complied with every 100 hours time-in-service. The SL further stated, "Since oil hoses are primarily rubber products and have a tendency to gradually deteriorate with age, high operating temperatures, and infra red radiation, it is advisable to replace all flexible oil hoses at approximately 1,000 hours total time in operation."

On January 10, 1977, Piper issued Service Bulletin (SB) No. 531, "Engine Oil Hose Replacement," indicating that the 100-hour repetitive inspection referred to in SL No. 604 had not been effective in removing from service those hardened or inflexible hoses that are subject to failure. The bulletin replicated the previous instructions to ensure adequate hose-to-exhaust stack clearances and stated that the existing oil hoses should be removed and replaced with new hoses, Piper Part No. 63901-72V. Again, it was recommended that all flexible oil hoses be replaced at

1,000 hours total time in operation. Airworthiness Directive (AD) No. 76-25-06, applicable to PA-28-140 airplanes, serial Nos. 28-20000 through 28-7125471, was issued requiring compliance with SB No. 531. However, the AD does not provide for ensuring continued flexibility and serviceability of the hoses, which first take a permanent set and then progress toward eventual termination of service life by gradual loss of flexibility, nor does it require routine subsequent replacement of the oil hoses as recommended by Piper.

Since 1985, there have been 26 accidents/incidents involving ruptured or failed oil cooler hoses in Piper PA-28 and PA-32 series airplanes. Almost all of these occurrences required the performance of emergency landings, some of which were made particularly hazardous because of escaping oil being sprayed on the windshield or smoke in the cockpit due to the oil's contact with the hot engine. Apparently, the oil cooler hoses installed in these airplanes, in many cases, simply remain in service until they fail (rupture) as evidenced by the following excerpts from the accident reports:

PA-28-140 (02/26/92)
An inspection of the engine revealed that an engine oil cooler line had ruptured. Maintenance records indicated that the oil line had been installed on the airplane for the last 1,600 hours and a 100-hour inspection was performed 50 hours before the accident flight.

PA-28-140 (09/05/91)
Postaccident investigation disclosed that the engine oil line, with 1,949 hours on it, had ruptured. A 100-hour inspection of the airplane was performed 16 hours prior to the accident.

PA-32-300 (05/09/91)
The fire sleeves protecting the three oil lines attached to the left and right oil coolers were oil soaked. During removal of the fire sleeves, one line broke due to deterioration. The other two lines were examined and found to be deteriorated. The data tags attached to each line indicated that they were manufactured in April 1972.

PA-28R-200 (04/20/91)
Examination of the airplane disclosed that a rubber oil cooler hose had ruptured. The maintenance records indicated that the failed hose had been in service for 3,141 hours since installation.

PA-32-300 (09/05/88)
An examination of the engine revealed that the No. 6 connecting rod cap had failed followed by a progressive and massive internal failure of the engine due to oil starvation. Further examination revealed that the oil starvation was due to a broken oil supply hose that runs from the oil cooler to the accessory drive section of the engine. The hose was 12 years old and had accumulated 802 hours since being installed in 1978.

PA-28-140 (09/02/87)
A postaccident examination revealed that the oil line between the engine and oil cooler had failed. Subsequently, the No. 2 connecting rod failed due to oil starvation. The oil line had 1,613 hours of operation.

PA-32-300 (04/10/86)
Engine oil cooler line burst due to aging. Line was fabricated in the 1st quarter of 1972.

PA-32-260 (09/12/85)
A postcrash examination disclosed a ruptured oil hose, PN 63901-26, that led from the oil pump to the oil cooler. The hose had a life expectancy of 8 years and had been manufactured in 1974. No record was found to indicate the hose had been replaced since its original installation on the engine.

Additionally, since 1987, 24 Service Difficulty Reports (SDRs) have been submitted to the Federal Aviation Administration regarding ruptured or failed oil cooler hoses in PA-28 and PA-32 series airplanes. These reports disclose failure or imminent failure due to aging of a variety of oil cooler hoses, including Piper Part No. 63901-72V.

Despite AD 76-25-06 and the aforementioned Piper service advisories, accidents/incidents involving in-flight rupture of oil cooler hoses in PA-28-140 airplanes (including PA-28-140 airplanes with serial numbers unaffected by the AD), as well as in other PA-28 and PA-32 series airplanes, continue to occur. Because inspection of the hoses to determine residual service life (flexiblility) has not been effective and there are no mandatory requirements limiting their service life, the Safety Board believes that these accidents/incidents are perpetuated by fundamental oversight regarding the serviceability/durability of these oil hoses.

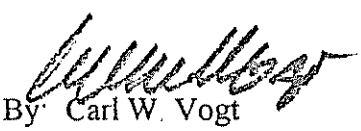
Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Issue an airworthiness directive applicable to Piper PA-28 and PA-32 series airplanes requiring: 1) at each annual or 100-hour inspection, a check, and

adjustment as necessary, to ensure that adequate clearances are maintained between the engine oil cooler hoses and exhaust stacks; and 2) replacement of flexible oil cooler hoses every 8 years or 1,000 hours of operation, whichever occurs first. (Class II, Priority Action)(A-94-40)

Publish an article in Advisory Circular No. 43-16, General Aviation Airworthiness Alerts, emphasizing the need to inspect, adjust, and periodically replace flexible oil cooler hoses on all airplanes in accordance with the manufacturer's maintenance and service instructions. (Class II, Priority Action)(A-94-41)

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



By: Carl W. Vogt
Chairman