



Office of Member

National Transportation Safety Board

Washington, D.C. 20594

February 15, 2019

US Department of Transportation
Docket Operations, M-30
West Building Ground Floor
Room W12-140
1200 New Jersey Avenue, SE
Washington, DC 20590

Attention: Docket No.: FAA-2018-1046; Product Identifier: 2018-CE-049-AD

Dear Sir or Madam:

The National Transportation Safety Board (NTSB) has reviewed the Federal Aviation Administration's (FAA) notice of proposed rulemaking (NPRM), titled "Airworthiness Directives; Piper Aircraft, Inc. Airplanes," which was published at 83 *Federal Register* 65592 on December 21, 2018. The proposed AD affects all Piper PA-28 series airplanes, except the PA-28-201T and PA-28-236 models; all Piper PA-28R series airplanes; and all Piper PA-32-260 and PA-32-300 model airplanes. It would require calculating the factored service hours for each main wing spar to determine when an inspection is required, inspecting the wing main spar lower cap outboard bolt holes for cracks, and replacing any cracked wing main spar.

The proposed AD was prompted by the preliminary accident investigation findings of fatigue cracking in the left wing main spar lower cap on a PA-28R-201 airplane that experienced a wing separation while maneuvering during flight instruction on April 4, 2018.¹ Preliminary examination also found fatigue cracking in the right wing main spar lower cap on the accident airplane and in the left wing main spar lower cap on another PA-28R-201 airplane from the same operator and manufactured around the same time as the accident airplane.

To date in the NTSB's ongoing investigation of the April 4, 2018, accident, no factors such as abnormal operation, maintenance issues, environmental exposure, or manufacturing anomalies have been found to explain the initiation of the fatigue cracking observed on the accident airplane or the operator's other airplane. The investigative team has examined the wing main spar lower cap attach holes on 15 additional PA-28R airplanes that were operated in the flight training environment for a portion or all their operational lives, 8 of which had accumulated more hours

¹ The NTSB's investigation of this accident, with participation from the FAA, Piper, and the accident airplane operator, is ongoing. More information about this accident, NTSB case number ERA18FA120, is available at <https://ntsb.gov/layouts/ntsb.aviation/index.aspx>.

than the first 2 airplanes observed to have fatigue cracking. No evidence of cracking in the wing main spar lower cap was found using a bolt hole eddy current inspection procedure on these 15 airplanes.

While the affected airplanes all have a similar main spar design in the wing attach-point area where the fatigue cracking was found, engineering data presented by Piper separately to the FAA and the NTSB showed that the localized stress level can vary significantly depending on airplane gross weight, cruising speed, and amount and location of fuel in the wings. The data also showed that the airplanes at greatest risk for fatigue cracking are the PA-28-235 model airplanes, all PA-28R series airplanes, and the PA-32-260 and PA-32-300 model airplanes. The NTSB supports the inspection requirements of the proposed AD for these airplanes.

However, the NTSB notes that the data showed that the risk of fatigue cracking on all affected PA-28 series airplanes other than the PA-28-235 is significantly lower over their assumed useful life. We are concerned that the risks associated with disturbing the joint to complete the inspection may outweigh the risk of fatigue cracking in all affected PA-28 series airplanes other than the PA-28-235 and urge the FAA to reexamine the applicability of the proposed AD.

Both airplanes found to have fatigue cracking were operated in the flight training environment for their entire operational life. It is well documented in FAA Advisory Circular (AC) 23-13A that the maneuver loads in the instructional usage category are more severe than the maneuver loads in the personal usage category. The service history of the two airplanes with fatigue cracking is well known and shows that each accumulated more than four landing cycles for each hour of operation. This means that the two airplanes spent much of their flight time at lower altitudes where the gust loads are also higher, as documented in the AC. The engineering data presented by Piper further confirmed these facts and showed that airplanes operated in instructional usage have a shorter fatigue life compared with airplanes operated for personal use.

The proposed AD aims to account for differences in fatigue life by using a factored service hours calculation that includes the airplane total hours time in service (TIS), as well as those hours operated in instructional usage or commercial operations.² The proposed AD would require a bolt hole eddy current inspection of the affected airplanes once they accumulate 5,000 or more factored service hours or inspection of those airplanes where factored service hours cannot be calculated or confirmed. Examination of the formula presented in the proposed AD shows that an airplane operated in instructional usage for its entire life would accumulate 5,000 factored service hours at or about the same time it reaches 5,000 hours of total hours TIS, while an airplane never operated in instructional usage would accumulate 5,000 factored service hours when it reaches 85,000 hours of total hours TIS. The NTSB believes that the formula is a reasonable approach to account for the additional loads involved in instructional use without unfairly penalizing those airplanes operated for personal use.

However, we believe that the use of 100-hour inspections to calculate the factored service hours may not be appropriate for all airplanes. Title 14 *Code of Federal Regulations* 91.409, "Inspections," requires that airplanes have an annual inspection if they are operated for private

² The formula is as follows: $(N \times 100) + [T - (N \times 100)] / 17 = \text{Factored Service Hours}$, where N is the number of 100-hour inspections and T is the total hours TIS of the airplane.

use. For those airplanes that are carrying passengers for hire or are operated for flight instruction, an annual or 100-hour inspection each 100 hours TIS is required. The accident airplane, operated for flight instruction for its entire life, had an annual inspection performed within each 100 hours, as required. There were no documented "100-hour inspections" identified in the maintenance logbooks.

The proposed AD, as written, could be confusing for an airplane operator such as the accident airplane operator when it comes to determining the factored service life since the accident airplane had no documented "100-hour inspections" but was in compliance with the regulation through the performance of an annual inspection each 100 hours TIS. The NTSB believes the FAA should reexamine the formula's reliance on just 100-hour inspections to calculate the factored service hours and consider also using annual inspections in the calculation so that the appropriate high-time or high-cycle at-risk airplanes will be inspected at the prescribed time without undue burden on operators of airplanes that are operated for personal use.

The FAA considers the proposed AD as an interim action and has included a requirement for each operator to notify the FAA of the results of all eddy current inspections performed on all inspected airplanes. The inspection results will be essential to determining the prevalence of fatigue cracking in the fleet and to determining the necessary follow-up actions warranted. The NTSB supports the data-gathering effort.

In summary, the NTSB supports the AD inspection of the wing main spar lower cap outboard bolt holes for the PA-28-235 (versus all PA-28 series airplanes), PA-28R series airplanes, and PA-32-260 and PA-32-300 model airplanes that are or have been used in flight training, commercial, or other high-time or high-cycle operations. However, we believe the formula for determining factored service hours should be revised to account for either 100-hour inspections or annual inspections that are conducted at 100-hour intervals.

Thank you for the opportunity to comment on this NPRM.

Sincerely,

A handwritten signature in black ink, appearing to read "Earl F. Weener", with a stylized, flowing script.

Earl F. Weener, PhD
Member