



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Greg 13/4A

Date: July 22, 1987

In reply refer to: A-87-100

Mr. Harold Collins
World of Agricultural Aviation
National Agricultural Aviation Association
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The National Transportation Safety Board has reviewed all Piper Pawnee PA-25 airplane accidents that have occurred since March 1983 to determine the relationship of postcrash fires and fatalities. The Safety Board's records indicate there has been a total of 102 accidents involving Piper Pawnee (PA-25) aerial application airplanes during this time—30 of which (29 percent) involved postcrash fires.

The Piper Pawnees involved in these accidents have one of three types of fuel tank systems. The first series of airplanes from PA25-1 through PA25-3884 have a fiberglass fuel tank located immediately aft of the engine and forward of the main dispensing hopper that is just forward of the cockpit. The second series of airplanes (PA25-3885 to PA25-7405572) have a fuel tank system in the same location as the first series but with a rubber fuel cell liner installed, rather than a fiberglass tank. The third fuel tank system consists of metal tanks in the outboard portion of the wings (PA25-7405573 and later).

The 102 PA-25 accidents involved 50 airplanes with the fiberglass fuselage tank, 36 with the rubber fuel cell liner, and 16 with the metal wing tanks. These numbers are based on serial numbers of airplanes involved in accidents investigated by the Safety Board and do not account for the possibility of field modifications from fiberglass tank to rubber fuel cell liners following the initial sale of the airplane. However, as of February 1987, the Safety Board is aware of only 10 modification kits sold since 1967.

The correlation of fuel tank type with the incidence of postcrash fire indicates that a postcrash fire occurred in 32 percent of the accidents involving airplanes with the fiberglass fuselage tank, 28 percent with the rubber fuel cell liner, and 25 percent with the metal wing tanks.

The 102 accidents resulted in a total of 11 fatalities. A review of the fatalities indicated that seven were directly related to postcrash fires and four were related to impact trauma. Six of the seven fire related fatalities involved airplanes with fiberglass fuel tanks; the other fatality involved an airplane with the rubber fuel cell liner.

An important consideration in this review is the fact that the accidents that involved airplanes with fiberglass fuel tanks resulted in 16 postcrash fires and 6 fire-related fatalities. Accidents that involved airplanes with fuselage rubber fuel cell liners resulted in 10 postcrash fires and 1 fire-related fatality. Accidents that involved airplanes with metal wing tanks resulted in four postcrash fires and no fire-related fatalities. Two of the four postcrash fires that involved airplanes with metal wing tanks were reported to have had in-flight fires that resulted in postcrash fires.

Eleven of the 102 accidents involved serious injuries; the serious injuries in 6 of the 11 accidents were attributed to burns. Five of the six accidents that resulted in burn injuries were in airplanes with fiberglass fuel tanks; the remaining airplane that involved burn injuries was equipped with a fuselage rubber fuel cell liner.

The accident severity was reviewed to determine if it was a factor in the poorer performance of the fiberglass fuel tanks. Accident severity, based on aircraft damage, showed that the airplanes with rubber fuel cell liners were involved in more severe impacts than those with fiberglass fuel tanks. Fifty-three percent of the airplanes with rubber fuel cells were destroyed versus 36 percent of the airplanes with fiberglass fuel tanks. Fifty-six percent of the airplanes with metal tanks were destroyed in the accident. The relationships of these data are also shown in the following table.

<u>Description</u>	<u>Fuel Tank Configurations</u>		
	<u>Fuselage Fiberglass Tank</u>	<u>Fuselage Rubber Fuel Cell</u>	<u>Wing Tanks</u>
Number of accidents	50	36	16
Percentage of airplanes destroyed	36	53	56
Number of accidents with postcrash fires	16	10	4*
Percentage of accidents with postcrash fires	32	28	25
Serious nonfatal burn injuries	5	1	0
Number of fire-related fatalities	6	1	0
Number of nonfire-related fatalities	3	0	1
Total number of fatalities	9	1	1

*Includes two in-flight fires that resulted in postcrash fires.

From a crashworthiness standpoint, the fiberglass fuel tank is more susceptible to catastrophic failure than is a rubber fuel cell. Fuselage distortion during a crash would more typically result in a massive failure in the rigid fiberglass tank and the rapid escape of a larger volume of fuel than would a puncture or tear in a flexible rubber fuel cell. In the event of a postcrash fire this slower spill rate from a flexible rubber fuel cell probably would result in more time for evacuation and, therefore, reduce fire-related fatalities.

A rubber fuel cell liner has been available for retrofit on the early Piper Pawnee airplane Models PA25-150 and PA25-235 (serial Nos. 25 -1 through 25-3884) in the form of a modification kit that is the subject of Piper Aircraft's Service Spares Letter No. SP-236A. The Service Spares Letter was last issued on August 18, 1971, and according to Piper representatives, only 10 modification kits have been sold. The poor response can be attributed partially to the fact that the Service Spares Letter does not relate the crashworthiness benefits of the bladder-type fuel cell liners and does not encourage strongly the incorporation of this modification.

The Safety Board believes that the hazardous flight environment in which these aerial application airplanes operate on a daily basis, involving low-speed and low-altitude flight and proximity to irregular terrain, power lines, and other ground obstacles, warrants special efforts to make these airplanes as crashworthy as possible. The Safety Board recognizes the costs involved, but believes that the operators should be aware of this fuel tank modification so that they can make the decision to install the kit on an individual basis.

Therefore, the National Transportation Safety Board recommends that the National Agricultural Aviation Association:

Make available to the readers of its publication "World of Agricultural Aviation" information regarding Piper Aircraft Service Spares Letter SP-236A and include discussion of the safety benefits of the rubber fuel cell liner on PA-25 airplanes with fiberglass fuel tanks. (Class II, Priority Action) (A-87-100)

Also as a result of its investigation, the Safety Board issued Safety Recommendations A-87-99 to Piper Aircraft Corporation and A-87-101 to Ag Pilot International.

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility ". . . to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendation in this letter. Please refer to Safety Recommendation A-87-100 in your reply.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER, NALL, and KOLSTAD, Members concurred, in this recommendation.

By: 
Chairman