

Example of research paper on causes of the accident

[Engineering](#), [Aviation](#)



Aloha Airlines Flight 243 dating back to April 28, 1988 was a scheduled flight conducted by Boeing 737-297 and operated by Aloha Airlines Inc., which resulted in a drastic and abrupt loss of the extensive fuselage unit, what, in turn, stipulated passengers and the cabin crew members' being exposed to incident flow effect and oxygen starvation (hypoxia), one of the flight attendants perished.

Probable causes of the accident are considered to comprise the following items: corrosion, poor epoxy of the fuselage units, metal fatigue (namely, rivets' deterioration) and extensive damage of fuselage metal and skin (apparently, due to multiple takeoff-and-landing cycles since an aircraft was utilized for short-haul flights only). However, it appeared to be impossible to find out what exactly happened on board and reliably restore and recollect the chain of events.

One of the participants of the investigation advanced a hypothesis of so-called 'Liquid Hammer' (put simply, hydraulic shock). The theory implied the following: initially, an upper hatch opened, which was later stopped up with a flight attendant's head, thus due to the abrupt pressure surge the fuselage was torn away thereafter. However, this theory's terminology itself is fundamentally wrong, since hydraulic shock occurs solely in liquid-filled systems. Therefore the reason for the tragic instance can rather be referred to as pneumatic hammer than hydraulic shock – the former (i. e. percussion air pressure surge) could have occurred due to instant clogging of the opened hatch (or destroyed side window) at the height of above 7000 m (approximately 23, 000 ft) with a flight attendant's body. This pneumatic hammer could truly have stipulated the extensive damage an aircraft had

suffered; moreover its fuselage strength was weakened with ageing and material defect.

Structural and Mechanical Factors

Structural and mechanical factors involved into the accident imply significant disbanding and fatigue-stipulated damage alongside with the deterioration of aircraft's components in a view of multiple takeoff-and-landing cycles.

Contributing Factors

Contributing factors are considered to comprise the following items:

- Aloha Airlines management's complete failure to ensure and provide appropriate supervision and oversight to the maintenance crew;
- FAA inconsistency to duly evaluate the Aloha Airlines maintenance routine and accomplish profound assessment of airline's quality deficiencies;
- Maintenance program offered significantly depreciated the necessity for inspections in the presence of pressurizations/depressurizations and humid salt air climate – conditions which the aircraft was operated in.

Investigation Board Findings

Investigation Board has estimated the causes of a tragedy as substandard epoxy and metal fatigue alongside with the extensive operation and expired service term of the aircraft.

It has also been revealed that Aloha Airlines' maintenance program appeared to be insufficient and incapable of detecting the loss of bond strength and substantial metal fatigue what subsequently stipulated fuselage upper lobe separation.

Recommendations

The Safety issues raised in this report include:

- The quality of air carrier maintenance programs and the FAA surveillance of those programs (National Transportation Safety Board, 1989)
- The engineering design, certification, and continuing airworthiness of the B-737 with particular emphasis on multiple site fatigue cracking of the fuselage lap joints (National Transportation Safety Board, 1989)
- Human factors' possible minimization, advanced training and certification provision to the personnel, particularly mechanics and inspectors.

Recommendations concerning these issues were addressed to the Federal Aviation Administration, Aloha Airlines, and the Air Transport Association (National Transportation Safety Board, 1989).

Outcomes

The investigation debunked the hypothesis implying weather complicity in the accident; still inspection quality and maintenance programs' content were rather questionable. The fuselage and mechanism failure were recognized as aftereffects of multiple site fatigue cracking of the aircraft skin. According to the National Transportation Safety Board the aircraft was written off (1989).

References

Aircraft Accident and Incident Investigation (July 2001). Chapter 5 and Chapter 6. Annex 13 to the Convention on International Civil Aviation 9th Edition, 19-25.

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