

# A Study on Aircraft Accident: The United Airlines flight 173

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## Abstract

Numerous tragic air crashes have been recorded throughout time. Commercial planes, private planes, freight planes, military planes, planes used for teaching pilots, and so on are all included. These incidents first appeared in 1919 and have continued right up to the present day. While the aviation industry has come a long way since the wright brothers' first flight in 1903, it still has ways to go.

**Index terms:** Aircraft Accident, McDonnell Douglas, NTSB, Accident Investigation.

## I. Introduction

What do we mean when we talk about flying an aero plane or when we talk about flight in general? It refers to travelling through the air with the use of wings, much like a butterfly does. But in this situation, we need a whole bunch more components in addition to the human brain to accomplish this. It's possible that a lot of people think it's simple to make an airplane fly, but in reality, it's not. Even during flight, just like in our day-to-day lives, there are bound to be several challenges along the route, some of which can be easily overcome while others are beyond a person's ability to influence in any manner. In this study, we will be discussing some of the more significant aviation mishaps that have occurred as a result of various technical faults and other such things.

## II. Accident details

The United Airlines flight 173 met with an accident on the 28<sup>th</sup> of December in 1978. The flight had to leave from John F Kennedy International Airport which is located in New York City to Portland International Airport which is located in Portland Oregon with the layover in Denver Colorado. At least ten of the passengers who were on board the flight were killed as a result of this incident, which led to a crash that occurred in a neighborhood close to 157th Avenue and an eastbound side street in the suburbs of Portland. It was a McDonnell Douglas DC 861 airplane; in case you were wondering.



**Fig 1: United flight 173<sup>[6]</sup>**

Obviously, the pilot who flew the aircraft were highly experienced. The flight left the Denver Stapleton International Airport and consisted of 8 crew members and 181 passengers. It was anticipated that the flight would take two hours and twenty-six minutes, and the scheduled arrival time in Portland was at 17:13 local time, which was around forty minutes after it had been dark. According to the calculations made by the automated flight plan and monitoring system, the aircraft would require 31,900 lb. of fuel in order to make it all the way to Portland. The airplane had roughly 46,700 pounds worth of fuel on board when it took off from the gate in Denver.

	lbs
Zero fuel weight from weight manifest	201,927
Total fuel on board from fuel service form	+46,700
Aircraft weight before departure from gate at denver	248,627
Fuel consumption on taxi	-1000
Takeoff gross weight	247,627
Fuel consumption enroute to Portland, based on flight plan	-31900
Landing weight at portland	215,727
Zero fuel weight from weight manifest	201,927
Fuel remaining at portland	13,800

Fig 2: Aircraft fuel Information [2]

As the plane was approaching Portland International Airport, the crew reported feeling a vibration and a jolt, and there was no light indicating that the landing gear had been securely deployed. On top of that, there was no sign that the landing gear had been safely lowered. The pilots requested a holding pattern to investigate the problem, and they circled southeast Portland for the next hour in preparation for a probable emergency landing as they did so. As a result, none of the three pilots in the cockpit paid close attention to the fuel gauge at this time. This problem was compounded by the fact that the gear was down and the flaps were set at 15 degrees for the entirety of the holding maneuver that lasted an hour, which significantly increased the rate at which fuel was consumed. As a direct consequence of this, engines 3 and 4 caught fire and failed.

When the crew found out that the number one and number two engines had caught fire, they were making ready to make an emergency landing on the runway that was marked as 28L. During that time, they decided to issue a mayday because both of their engines had stopped working. This was the last radio communication that United flight 173 made to the air traffic control before it crashed into a forest that was in the heart of a populated area in the suburbs of Portland. The crash occurred shortly after this transmission. Around six nautical miles to the southeast of the airport is where the collision took place. As a direct result of the disaster, three people on board the aircraft were taken from their loved ones: two crew members and the chief flight attendant. [3],[4]

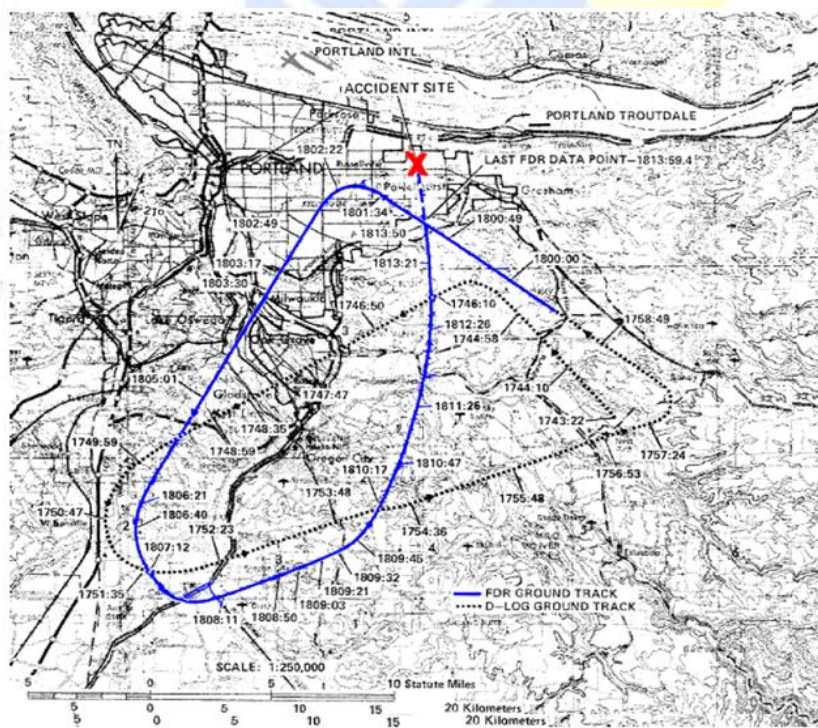


Fig 3: Map for flight 173 [8]

### III. Accident Investigation

According to the NTSB report, there was a significant thump when the landing gear was lowered. The airplane began to vibrate and yaw in addition to making that strange noise. Corrosion had broken down the primary landing gear retract cylinder assembly on the right side, allowing the right gear to drop. Because of the abnormally fast free fall of the gear, a microswitch was destroyed to the point that the green light in the pilot's cockpit, indicating that the gear was down and locked, did not illuminate. The captain called off the landing so that they could investigate the strange noise, vibration, yaw, and lack of green light and get the passengers ready for an emergency landing. The crew's choice to abandon the landing was wise, but the accident happened because they were preoccupied with finding the source of the problem rather than keeping track of their fuel level and the time they had left until they would run out of gas if they didn't return to the airport.<sup>[5]</sup> The pilot had not been keeping a close enough eye on the fuel levels, and he had not responded appropriately to warnings from his crew. That caused all the engines to run out of gas. His lack of focus was the result of his worrying about a landing gear failure and getting ready for an emergency landing. The other two crew members didn't realize how dire the fuel situation was or express their worries to the captain. It was common knowledge that the fuel problem was occupying at least some of the pilots and the crews thought this is supported by the transcripts of the cockpit recordings which will be shown in some pictures below also report from the media at that time revealed that there was a problem with the fuel state gauges on that model of the aircraft existed although it was not well known about the issue the problem was not generally understood in part because it is expected that commercial aircraft will fly with the fuel reserve of at least 45 minutes at all the times the issue with the gauge is mentioned, albeit in a roundabout way in one of the suggestions made by the Safety Board: "it is recommended that an operations alert bulletin be issued in order to direct the FAA inspectors to make sure that the crew training emphasizes differences in fuel quantity measuring instruments and that cruise flying with the new system are made aware of the possibility of the misinterpreting gauge readings". The challenge with the totalizer fuel gauge may have been one of the things that made the crew confused near the end of the flight. However, the NTSB report stressed that the captain should not have let this happen in the first place and should have stopped it from happening.<sup>[1]</sup>

#### Main error in the fuel Quantity system

United Airlines analyzed the fuel quantity indicating system's mistake history and submitted the findings to the Safety Board. It was looked at in three different ways. The first investigation was done with the idea that all the mistakes were small and pointed toward the same direction. The second look at the data was based on the assumption that all errors would be limited and evenly spread out in terms of sign. The third evaluation was a study of the chances of making a mistake. All of the mistakes in this analysis were caused by tanks that were either completely or nearly depleted of fuel.

#### Flight Data Recorder

The flight had a Fairchild model of the FDR – 5424 with the sl.no. 6043. There were no obvious signs of damage on the recorder's exterior. There was no evidence of a recorder malfunction on the foil recording media, and all parameter and binary traces were present and operational. About 44 seconds before the airplane went down, the electrical power that was being supplied to the recorder was cut off. The remaining 15 minutes and 44.7 seconds of the recorded traces were read out in their entirety. After the crash, the FDR was taken out and the entire recording as well as the data was acquired.

#### Information about the survival

There was a chance that some people would survive the accident. It was established that the 10 people who passed away as a result of the accident were located between the control and maintenance stations in the cockpit and the roof of the fifth row in the passenger compartment. When the emergency was declared, all of the bodies of the people who had passed away were located on the right side of the passenger cabin. The section of the airplane was completely destroyed as a result of the accident, which occurred earlier. The passengers who were located in the right upwards segment of the cabin, which was situated near to a section of the fuselage that appeared to have been pierced by a large tree, were the ones who suffered the most severe injuries. The passengers who were located in the left rear portion of the cabin also suffered serious injuries. These folks were seated in quite close proximity to the ones who ultimately passed away as a consequence of the injuries they sustained. A number of passengers who suffered significant injuries were sat in the rear cabin, which is located close to the leading edge of the wings. In this region of the aircraft, the fuselage had been breached, and both the floor and the seats had been damaged.

No one was killed on the ground, and there was no fire after the crash; those who were hurt were taken to neighboring hospitals by helicopter and ambulance.

In under two minutes, everyone was safely out of the plane. Behind row 6, there was minimal damage to the cabin's furnishings, with the exception of a few seats that had been pulled free from their floor attachments. During the necessary evacuation, the emergency lights provided sufficient illumination.



Fig 4 [7]

#### IV. Conclusion

Finally, all the investigation was completed and these were some of the safety recommendations issued to the FDA: "Emphasize to engineering personnel who approve aircraft engineering changes or issuance of Supplemental Type Certificates the need to consider cockpit configuration and instrumentation factors which can contribute to pilot confusion, such as the use of similar-appearing instruments with different scale factors. (Class II--Priority Action) (A-79-33)".

"Audit Supplemental Type Certificate SA3357WE-D for completeness, especially in the area of system calibration after installation. (Class II--Priority Action) (A-79-34)".<sup>[2]</sup>

So, in this report all the finding of the accident, how and why the accident happened has been discussed with all the required information.

#### V. References

- [1] National Transportation Safety Board, "Aircraft Accident Report," UNITED AIRLINES, INC. MCDONNELL-DOUGLAS, DC-8-61, N8082U PORTLAND, OREGON. December 28, 1978.
- [2] Alexa Crawls, "Investigation: United Airlines Flight 173", Mar 4, 2009.
- [3] Eugene Register Guard, "10 dead in Portland jetliner crash", Dec 29, 1978.
- [4] Eugene Register Guard, "Lack of fuel suspected in DC-8 crash", Dec 30, 1978.
- [5] Wikipedia, "United Airlines Flight 173", Mar 22, 2023
- [6] Clint Groves, "United Airlines Douglas DC-8-61 aircraft", May, 1972.
- [7] Douglas Perry, "1978 plane crash into Portland neighbourhood killed 10, allowed a prisoner escape -- and haunted pilot", The Oregonian, Dec 31, 2018.
- [8] Code 770, "Case Study- United Airlines 173", Aug 3, 2016.