

How weather impacts the aviation industry engineering essay



**ASSIGN
BUSTER**

Weather caused airline mishaps are being reported happening now more often than ever. It can be argued that most aircraft accidents are out of human error although almost half of human error related cases have a facet of natural weather causes. The weather is a natural phenomenon and cannot be controlled but measures can be put in place to try and make the best of it and avoid disastrous mishaps in the aviation industry. This paper intends to look into case studies of accidents caused by changes in weather patterns during flight and whether the pilots could have been able to take different actions and avert the tragedies that occurred. Mahapatra et al (1999) notes that "...weather factors influence aviation in many more subtle but profound ways and on a continuous basis other than just fatal air crashes occurring periodically..."

The adverse effects of weather on the industry can be avoided if only, airlines and the industry as a whole work together to demystify this natural phenomena. Winds, fogs, thunderstorms, fogs, snowstorms are some of these factors that should be put into consideration in combating weather (Hutter 2010).

Numerous agencies both state and private are working on gaining reports and material on different weather patterns and creating databases on this. This should now be updated frequently and shared or made available across the industry so as to minimize weather-related accident mishaps in the future. Emphasis on preflight briefings and constant training provided for pilots, to be able to deal with any eventualities. Accurate forecasts are principal and cannot be overlooked due to priority on passenger safety in commercial aviation and also military aviation because weather affects all.

Against this background, this paper focuses on how to determine the actual or dominant aspects of weather that have an impact on the aviation industry and find solutions to deal with them.

Aviation: Over View of Weather Related Aviation Accidents;

Introduction:

Numerous cases are constantly emerging on weather related aviation accidents overshadowing other factors such as human error, air traffic control and maintenance issues. Despite air transport being regarded as one of the safest modes of transport today, accidents still occur and weather related ones are increasing at an alarming rate. It is perhaps the industry significantly affected by weather conditions than any other transportation mode. Winds, fogs, thunderstorms, fogs, snowstorms all play a part in how the weather affects the industry. This is a burden that the industry faces regularly and mostly results to a very huge financial burden especially for commercial aviation (Lankford 2000).

The aviation industry takes pride in its ability to having high safety levels through a revolution of inventions of safety features as far back as four decades ago due to its emphasis on its commercial operations. Natural causes are becoming more and more worrisome than human caused mistakes in the industry as we do not have any control over them. Impact of weather in the aviation industry cannot be overlooked as weather is an uncontrollable factor therefore we should put in place maximum and effective measures to avoid any mishaps. Reports by the national safety and transport board commonly argue human error to be cause of most airline

<https://assignbuster.com/how-weather-impacts-the-aviation-industry-engineering-essay/>

accidents, weather still plays a primary role in aviation accidents contributing to about 23 percent of total accidents.

Mahapatra et al (1999) notes that atmospheric state, which is very diverse in terms of “ physical nature, origin, temporal scales and intensity”, greatly affects the aviation industry. This just shows why weather can no longer be ignored in terms of safety precautions being undertaken. Various authorities and agencies are working on ways and measures to determine early warning signs and also keeping database of weather reports and weather patterns of particular places to aid pilots and air traffic controllers avoid such accidents. Some of the causes that result to accidents include turbulence, low ceiling and reduced visibility, thunderstorms, snowstorms and ice, blustery weather, thunderstorms, icy and wet runways can lead to crash landings. Various airlines have gathered weather reports and are constantly updating them on the changes in weather patterns. These reports are made available to pilots before a flight is undertaken and also pre-flight briefings on how to react and solutions to take in case of any eventuality that may occur are conducted (Baum 2007).

Some of the factors that are a concern in the weather to airlines, passengers, workers and the industry as a whole are explained below in brief so as to get a picture of the impact of weather on the aviation industry.

Turbulence:

A major weather related aviation hazard. This is termed as instability in the atmosphere causing major violent disturbances and unsuitable for planes.

Reports and tests carried out find smaller aircrafts more prone to damage
<https://assignbuster.com/how-weather-impacts-the-aviation-industry-engineering-essay/>

than larger ones at lower levels of turbulence. Any airplane entering into turbulence is exposed to damage and can be felt through the jostling and shaking of the aircraft.

Low ceiling and reduced visibility:

The farthest someone can see and make out objects is termed as visibility while ceiling is termed as altitude to the nearest cloud that obscures at least half of the sky. These two conditions are safety hazards and critical to the aviation industry. They not only pose danger to air flights and planes, but also reduce the capacity of airports to function at maximum leading to grounding of planes and delays. Both commercial and military aviation is adversely affected by these conditions.

In-flight icing:

Occurs in different conditions but mostly in clouds that are near or below freezing point and clouds containing super cooled water droplets during the winter season and pose great hazards to airplanes in flight. The NTSB attributes approximately 11 percent of all weather related accidents to icing as a causing factor. It has a major impact on effectiveness of flight operations and is also dangerous. It poses a danger to aircraft in that aircraft weight is increased as the icing has occurred on the structure of the plane, compromise control of aircraft and false instrument readings are generated. It also affects the proper working of engines leading to performance impairment.

Thunderstorms:

<https://assignbuster.com/how-weather-impacts-the-aviation-industry-engineering-essay/>

This may lead to closure of airports due to the degradation of airport facilities. Also ground all ground operations to a halt. Thunderstorms are dangerous and disastrous especially when accompanied with severe turbulence and powerful downdrafts. Airlines may experience lost revenues due to planes being removed from operation as a result of thunderstorms accompanied by lightening and hail damage.

Effects of Weather on Aviation:

Delay in departure and arrival times of aircraft are constantly experienced when cloud ceilings are low or visibility is low. Deicing of aircrafts due to ice buildup on planes on the ground before flight, may lead to delays.

Sometimes planes have to be coated with a fluid that prevents ice buildup, this can turn to be expensive. Plowing and treating runways to make them suitable for landing and taking off of planes. Lighting low temperatures, and wind chills prevent workers, ground handlers and fuelers from doing their work due to rules and regulations put in place that allow them outside for short periods of time. Volcanic ash and thunderstorms can result to routes being closed or costly re-routes.

Discussion/Analysis:

Case study 1: De Havilland DHC-3 Otter C-FLGA (floatplane) – flight in reduced visibility conditions resulting to collision with terrain.

Plane type: De Havilland DHC-3 Otter C-FLGA

Operator: Deraps Aviation Inc.

Date: 28 September 2002

Passengers: 3

Crew: 1(pilot)

Casualties: 4

Airplane damage: written off (damage beyond repair)

Area: Natashquan, Quebec, Canada

The De Havilland DHC-3 Otter C-FLGA is a single engine, high wing aircraft. It is a propeller-driven STOL aircraft capable of carrying a maximum of 6 passengers. The flight plan was for a hunting camp 57 miles north of the Aguanish River. Although, weather conditions were favorable when it took off during the first 40 nautical miles but clouds soon started forming over the mountain tops forcing the pilot to make detours. According to the Transportation Safety Board of Canada (2007), the pilot had a commercial pilot license obtained in 1990 and had logged about 7980 hours of fly time with 7800 hours on planes mounted with floats. He was the company's chief pilot and in-charge of his crew team and was well skilled and qualified for that flight.

There were no hitches during takeoff at around 1050 Eastern Time and upon arriving to the destination at about 1135. The crash happened when the plane flew over part of the forest, upside down. Reports from Environment Canada show that cloud base had risen from 600 feet -5500feet from ground level, calm and light winds between 4 and 6 knots, visibility did not drop

<https://assignbuster.com/how-weather-impacts-the-aviation-industry-engineering-essay/>

below 8 statute miles. There is strong evidence showing that the crash was weather related. Nothing shows of any system malfunction before or during the flight. As the plane advanced into its final destination, the pilot chose to follow the Aguanish River due to a drop in the ceiling in the last 25nm of his flight plan. The low ceiling and angle of the mountain (sloped at 400) masked the mountain and the pilot could not approximately calculate distance between the plane and the mountain. The plane crashed into the trees at a speed of over 95mpn with the left wing being torn off. Due to this the plane was flipped over and there was little damage to the right wing. Due to the geographic and weather conditions, the pilot' judgment on both vertical and horizontal distance from the mountain was impaired resulting to the crash.

Despite the weather being the main cause of the accident the pilot too could be faulted to some extent for not being able to respond to the situation effectively. The pilot flew in a reduced visibility and low ceiling condition close to a steep slope mountain and not being able to accurately judge the distances between mountain and plane, the aircraft crashed into the trees at a speed of over 95mpn.

Case study 2: Cessna 172P flight in into unforecast snowstorm conditions resulting to Lost in a snowstorm and crash landing.

Plane type: Cessna 172P Skyhawk

Operator: –

Date: March 31, 2003

Passengers: 1

<https://assignbuster.com/how-weather-impacts-the-aviation-industry-engineering-essay/>

Crew: 1

Casualties: none

Airplane damage: considerably damaged

Area: Syracuse Hancock International Airport in Syracuse, N. Y

A Cessna 172 P Skyhawk is a single engine, high-winged plane, with a capability of carrying a maximum of four passengers. The plane was bound for Piedmont Triad International Airport in Greensboro and had taken off from Syracuse Hancock International Airport in Syracuse, New York but encountered a snowstorm along the way near Shenandoah. It flew into sudden snow squalls which greatly reduced visibility to near zero.

The pilot was cruising at 4, 500 feet when he encountered the snow showers and attempted to divert and land at a Shenandoah Valley Regional Airport that was not his final destination but due to poor visibility he could not place it. This led him to make deterrent landing at a field nearby but the aircraft flipped over when the landing gear struck a rut in the field. There was considerable damage to the nose gear, propeller, vertical stabilizer and both wings, but no injuries were recorded by both the pilot and passengers. The pilot's decision to land in the field was due to the increasing snowstorm. The squall was blinding and visibility continued to decrease rapidly.

The pilot was a non-instrumented rated pilot and could not operate the aircraft when it reverted to instrument conditions on encountering the sudden snowstorm. His decision to set it down was a wise one as it saved lives and there was no extensive damage to the aircraft. The NTSB noted <https://assignbuster.com/how-weather-impacts-the-aviation-industry-engineering-essay/>

that the unintended flight into snow storms was the cause of the accidents due to the increased harsh conditions and reduced visibility. Weather during the winter season can be hard to predict as the pilot had requested for a briefing and was told of early afternoon showers in southern Pennsylvania but there was no mention of shower storms. Sleet and snow do not usually stick to aircraft but can reduce visibility radically and quickly disorient a pilot relying on visual references. Ice quickly builds up on the airframe, frequently resulting in disastrous consequences.

The weather in this case despite being horrible, no fatalities or injuries were obtained due to the wise decision of the pilot. The pilot chose to land the plane and not continue in a snowstorm with rapidly diminishing visibility as he was a non-instrument rated pilot. Pilots who are Non-instrument-rated should instantly reverse course and return to VFR setting when they come across fair to grave snow during flight.

Conclusions:

Weather briefing and the provision of weather reports is very crucial if the aspect of weather impacts on the aviation industry is anything to go by. Numerous reports and investigations of airline accidents show that to be a major contributor to air related accidents. A study done by Zschau and Küppers (2003) show that weather is the main cause or a strong factor in many aircraft accidents.

The above case studies show how changing weather patterns can affect the decision of pilots resulting in accidents. Based on the two cases it is paramount to note that weather cannot be ignored any longer as it has huge

repercussions on even highly trained and skilled pilots and aircraft personnel. In addition, visibility and low ceiling is very common in weather-related air mishaps, despite there being other natural causes. The National Transportation Safety Board reviewed weather-related accidents and found out that between 1994 and 2003, 21.3% of accidents were weather related out of which 48.1% and 20.5% were caused by winds and low ceiling & reduced visibility respectively. Many cases show that accidents have happened due to more than two weather factors in play as the second case shows reduced visibility was as a result of the blinding squalls from the snowstorm. Though the above cases show that weather can be dangerous to the aviation industry especially commercial aviation, it is a phenomenon that we can learn and be able to avoid.

Recommendations:

Ensuring passenger safety is every airline's priority, thus the aviation industry should put more resources in establishing agencies that can keep tabs on changing weather patterns and offering solutions. Studies show that despite a large percentage of aircraft accidents being human error-related, over half of these have some aspects of weather causes in them. Thus pilots have to also take the initiative and be more proactive in gaining the most from weather briefings in order to be able to file their flight plans. They should also be constantly enquiring on weather changes during the flight.

Organizations such as the National Weather Service for Forecasters and National Aeronautics and Space Administration for Pilots, with knowledge in training should take up the role as lead agencies in the consolidation of aviation weather training that cuts across the industry. Training should be <https://assignbuster.com/how-weather-impacts-the-aviation-industry-engineering-essay/>

constantly reviewed and undertaken to ensure that there is no gap in skill levels across agencies. This is because of the ever changing and diverse weather phenomenon.

The government should come up with policies that enhance passenger safety and also safety in general for the aviation industry by requiring agencies both government and private to consolidate their work on weather reports and make them available to other stakeholders in the industry.

Accurate weather forecasts are paramount in planning on how to cope with weather disrupted flights causing major delays and backlogs. The industry should be able to rectify this by updating weather databases frequently.

Pilots should also fill in weather in flight reports clearly. This will help shed light on how the weather changes and how different pilots reacted thus the industry is able to come up with new ways to avert looming disasters.