

Air crash Investigation report, happened between two Boeing 747 at Los Rodeos Airport, Tenerife, Spain.

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Abstract: This study has been undertaken to investigate the Air-crash between the two Aircrafts and to find out the possible outcomes to prevent the accidents caused by human errors, instrument errors or by bird strike. The main focus of this paper is to investigate how KLM flight 4805 collided with the Pan American flight 1736 on the runway and summarizes different speculations. From the investigation it has been concluded that various safety measures need to be adopted in the future in order to avoid any emergency situations and the same has been discussed in the paper.

Keywords - KLM, PAA, Aircraft Safety, Air-Crash, Air Safety.

I. INTRODUCTION

Aviation is considered to be one of Ultra Safe, High Risk industry (USHRI). But still a very big question arises in everyone's mind that, how did the accidents occurred even after Ultra safety precautions taken by us, airlines, and manufacturers? what is an Accident? Is there any chance to avoid such Accidents? Difference between Accident and Incident? Let us discuss about such topics in detail. There are various factors that leads to Accidents, the most common factors are Instrument Failure, Human Error, Communication differences, bad health, negligence, etc. Accidents are defined as the events that lead to the serious injury or death of an individual and also result in the damage of the property. The accidents occurred because of human error, communication difference, there is a chance to avoid such accidents. No-one can predict accidents that may occur from the instrument failure, but if instruments fail because of human negligence (which could have prevented). Incident referred to as damage to the property but with little or no damage to the life of an individual. The reason why, aviation is considered to be USHRI because of the ability to co-operate with the great degree of safety with the high-risk environment. Being an airline management, safety may not be there to priority, but earning profit is, so that's the reason Airline never compensate for the aircraft maintenance part because one small accident may lead the airline to fail, as the passengers will not feel safe to travel with such airline which don't maintain their aircraft from time to time to check for failure's.

Let us jump to the main topic, summary for Aircraft Crash Investigation occurred in March 27, 1977, between 2 Boeing 747 i.e., B747-206B (KLM Flight 4805) and B747-121 (PH-BUF Pan American Flight 1736) at Tenerife, Los Rodeos Airport, Canary Islands, Spain.

II. BRIEF HISTORY ABOUT BOTH THE FLIGHTS

Pan American Flight 1736- On March 26, 1977, Boeing 747 flight number 1736 took off at 1292 hour from LA International Airport California and with an intermediate halt at John F. Kennedy International Airport, New York, where Captain Victor Grubbs (age 56), First Officer Robert Bragg (39), Flight Engineer George Warns (46) and 13 flight attendants took over the flight from the previous pilots and crew members, having 380 passengers including 2 children on board was en route to Las Palmas de Gran Canaria, Spain.

Captain Grubbs was having 564 hours on B747 and total of 21,043 hours of flight time, First Officer Bragg having 2,796 hours on B747 out of 10,800 flight hours, Flight Engineer George Warns was having 15,210 hours of flight, and 559 hours on B747.

Total number of flying hours- 25,725 hours

Engine's number of cycles: -

- | | |
|---------------------------|---------------------------|
| a. Engine 1- 4,234 cycles | b. Engine 2- 2,824 cycles |
| c. Engine 3- 6,666 cycles | d. Engine 4- 4,838 cycles |

KLM Flight 4805- From Schiphol Airport Boeing 747 flight number 4805 took off at 0900 hour on 27th march, 1977 en route to Las Palmas de Gran Canaria, Spain. Captain Jacob Veldhuyzen van Zanten (age 50), First Officer Klaas Meurs (42), and Flight Engineer Willem Schreuder (48) and 14 crew members and 235 passengers including 52 children.

Captain Jacob Veldhuyzen van Zanten having 1,545 hours on B747 out of 11,700 flight hours and was also a KLM's Chief Flight Instructor, First Officer Klaas Meurs was having 9,200 hours of flight, and 95 hours on B747, and Flight Engineer Willem



Wreckage of the KLM aircraft on the runway

Accident	
Date	March 27, 1977
Summary	Runway collision in fog
Site	Los Rodeos Airport (now Tenerife North Airport) Tenerife, Canary Islands
Total fatalities	583
Total injuries	61
Total survivors	61

Schreuder was having 543 hours on B747 and total of 17,031 flight hours.

Total number of flying hours- 21,195 hours

Engines number of cycles: -

- a. Engine 1- 3,340 cycles
- b. Engine 2- 3,337 cycles
- c. Engine 3- 1,637 cycles
- d. Engine 4- 3,399 cycles



N736PA, the Pan Am Boeing 747-121 involved in the accident

Type	Boeing 747-121
Name	<i>Clipper Victor</i>
Operator	Pan American World Airways
IATA flight No.	PA1736
ICAO flight No.	PAA1736
Call sign	CLIPPER 1736
Registration	N736PA
Flight origin	Los Angeles International Airport Los Angeles, United States
Stopover	John F. Kennedy International Airport, New York City, U.S.
Destination	Gran Canaria Airport Gran Canaria, Canary Islands
Occupants	396
Passengers	380
Crew	16
Fatalities	335
Injuries	61
Survivors	61



PH-BUF, the KLM Boeing 747-206B involved in the accident

Type	Boeing 747-206B
Name	<i>Rijn ("Rhine")</i>
Operator	KLM Royal Dutch Airlines
IATA flight No.	KL4805
ICAO flight No.	KLM4805
Call sign	KLM 4805
Registration	PH-BUF
Flight origin	Schiphol Airport Amsterdam, Netherlands
Destination	Gran Canaria Airport Gran Canaria, Canary Islands
Occupants	248
Passengers	234
Crew	14
Fatalities	248
Survivors	0

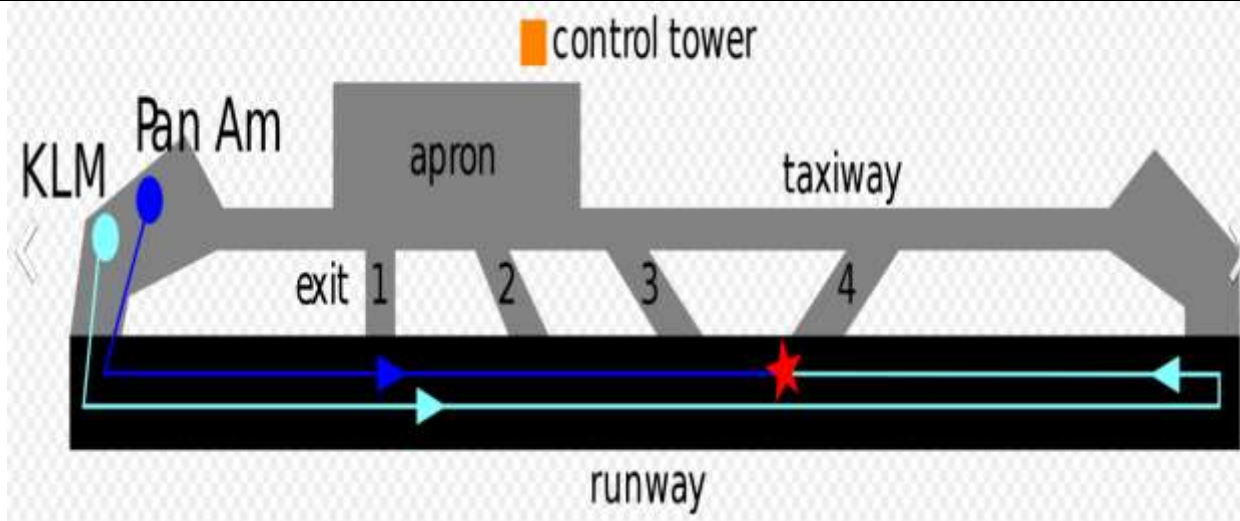
III. DISASTER

At around 1315 hour there was a bomb explosion in Las Palmas de Gran Canaria airport, and 8 people were injured. Having possibility of second bomb inside the airport all the flights in route to Las Palma Airport were diverted to Los Rodeos, where PAA Flight 1736 landed at 1415 hour and KLM Flight 4805 at 1338 hour i.e., 77min before 1736 along with all the aircrafts that were diverted to the same airport. Las Palma's Airport was not so big enough to accommodate this much of traffic, as there were 5 major airlines big aircraft. And even the airport was only having a single runway with a single parallel taxiway. All the aircraft were parked on the taxiway itself which effected the normal aircraft to take-off, Backtaxi or Backtrack means that the aircraft ready for take-off must taxi along the runway to position themselves for the take-off.

KLM 4805 passengers were allowed to deboard from the aircraft and were transported through the bus to the terminal building, where one passenger went missing and the have put on another flight, she was the only survive without any injuries that survived the whole accident (we can call that as luck). Even KLM caption requested for re-fuelling the aircraft. After getting permission from Air-Traffic control that the Las Palma airport is opened so there was a rush for every aircraft to get airborne as soon as possible and reach the destination. PAA 1736 was ready to take off, but due to standing behind KLM aircraft and having only 3.7m of clearance between the two aircraft it was difficult for the aircraft to take-off first, they have to wait until the KLM re-fuelling and boarding was done.

At 1656, KLM requested tower for taxi, after 2min KLM got approval to backtrack on runway 12 for take-off on runway 30. After getting on the runway KLM asked the tower to take left turn to taxiway-1 but the tower said negative and to continue to the end of the runway and then backtrack i.e., turn 180-degree and get in the position for take-off and also said to inform the ATC after clearing the checklist.

Then tower informed the PAA aircraft to continue on the runway 30 and then take 3rd exit to the taxiway, parallel to the runway. As PAA pilots were unclear about the 1st or 3rd exit, they asked again, and the 3rd exit C-3 was confirmed by the pilots. The pilots identified the first 2 exits (C-1 & C-2), but missed the 3rd exit as there was no clear indications about the C-3 location and also to, turn the aircraft on C-3 exit the aircraft have to make a 148-degree turn and come on the crowded taxiway and then again 148° degree turn to continue taxing towards the starting point of the runway, but C-4 was only having 35-degree turn. Due to the KLM aircraft, which was ready to take off tower requested PAA to take C-3 exit as it was the earliest exit.



Los Rodeos airport is at 2077 ft above sea level. The clouds in that area were very close to the ground. PAA pilots found their aircraft in poor and rapid deteriorating visibility along the runway. First the visibility was 500m but after PAA turned on the runway it was reduced to 100m as per the reports from the ALPA. Meanwhile, KLM aircraft was having a clear visibility, but a next cloud was down the runway and was moving towards the end of the runway at a speed of 12knots.

After completing the checklist on the KLM aircraft, the first officer contacted the ATC and the ATC gave them the clearance, it was not the departure clearance, this clearance was for the route clearance (the instructions to be followed by the pilots after the take-off and to reach the destination safely). The pilots on the KLM aircraft were losing their patience as they were far away from their home and wanted to take-off as soon as possible. The voice of KLM aircraft captain was so irritated on the RT (Radio Transmission), which was noticed by Air Traffic Controller and the other pilots listening to the conversation. The first officer reads back the route clearance to the caption and the flight engineer as given by the ATC.

This was not the clearance for the departure, but still the caption pushed the throttle forward, and the aircraft starts accelerating, and the first officer informed the ATC, "we are now at take-off", to which the captain accelerated the engine, setting take off thrust and said "We're going". "We are now at take-off" this is not an appropriate conversation that happens on RT. After this the ATC clearly mentioned "Stand by for take-off, I will call you", but it was too late, the aircraft was already in motion.

There was very much interference over the radio of PAA aircraft, after listening to KLM "we are now at take-off", the PAA pilots informed the ATC "We're still taxiing down the runway, the Clipper 1736!", which was blocked by the interference and the ATC did not hear. Due to the less visibility neither of the aircraft was able to see each other, and even the ATC was unable to see that the runway was not clear for KLM aircraft to take-off, and even the airport was not having ground- radar, to detect the aircraft's locations.

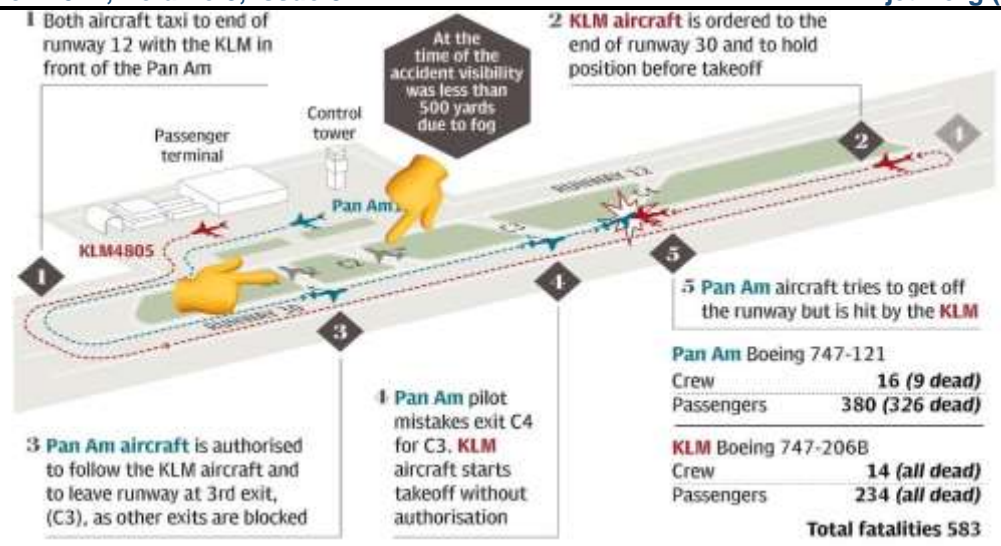
After KLM have started the take-off roll, the ATC asked PAA to "report when runway clear", and PAA replied "Ok, will report when we're clear". After listening to this conversation between PAA aircraft and ATC, the KLM flight engineer raised his concern towards his pilots and said, "is he not clear, that PAA?", the caption heard and said "Oh yes", but still continue to take off.

IV. COLLISION

When PAA was approaching the C-4 exit, the caption saw the KLM's landing light and said, "there he is!", then suddenly they realized that KLM was approaching at take-off speed, and the caption exclaimed and said "Goddamn, that son-of-a-bitch is coming!", to which the first officer shouted, "Get off! Get off! Get off!", the caption applied full throttles and made a sharp left turn, to prevent the collision.

The movement KLM pilots saw the PAA aircraft is still on runway, the aircraft was already moving too fast to stop on time, on contrary the pilots tried to take-off, but the take-off speed was not achieved so even after pilots managed to keep the nose up, there was a tail strike for around 22m, and the aircraft was unable to climb (There were 2 reasons for not able to climb, 1-the speed was not enough to generate enough thrust for the aircraft to get airborne, 2- due to the over fueling, the aircraft requires more distance to generate sufficient thrust to take-off).

KLM aircraft's nose was up so it crossed the PAA fuselage, but the engines, the lower fuselage and the main landing gear struck on the upper side of PAA fuselage and ripped the entire top portion of the fuselage. The right engine crashed into the PAA's upper deck, just behind the cockpit. KLM was slightly Airborne, due to the impact on the engines, which leads to the damage on the wings also, leads the aircraft to stall at a speed of 140 knots, it rolled sharply, and hit the ground at about 150m from the collision, and slides down the runway for around 300m. due to the full load of fuel, it gets ignited immediately and started burning, and remained burning for several hours.



Due to the collision both the Airplanes were destroyed. Passengers and crew on board KLM plane was dead, i.e., all 248 passengers, and 335 passengers and crew on board PAA plane, due to the fire and the impact. Luckily, 61 passengers including, both pilots and flight engineer from PAA Aircraft survived the crash. The engines of PAA were running so the first officer tried to shut them, and extended his arm towards the roof the cockpit to turn them off, but there was no roof and the pilots were able to see the tail of the aircraft 200ft from the cockpit, so they were unable to turn the engines off which eventually blow off. One of the 61 survivors on PAA said “sitting near the nose part of the aircraft saved my life”, “we all settled back, and the next thing an explosion took place and the whole Port side was just torn wide open”.

V. INVESTIGATION

After the crash the airport was closed for any incoming or outgoing flights. The first crash investigation team reached the location after three hours of boat ride from Las Palmas. The First aircraft to land after the accident was United States Air Force C-130 transporter landed on the taxiway beside the runway, which was used to carry the injured passengers to the Airforce Base for their treatment. Army soldiers were given the task to clear the debris of the broken aircraft from runway and the taxiway.

Civil Aviation Accident and Incident Investigation Commission (CIAIAC) {It investigates all the accidents and incidents that occur in the territory of Spain} was deployed to investigate the accident, and to search for the cause of accident and to prevent it from happening in future. A total of 70 people team was made having representatives from United States, and the two Airline companies. After analyzing the data from the Cockpit Voice Recorder (CVR) transcript showed that the KLM pilots thought that they are given clearance for the take-off, while the ATC thought the KLM is still waiting for the runway to be clear. And also, the Co-pilot of KLM was not as Shure about the take-off clearance as the captain.

Dutch Response pointed out that: -

- 1- The over-crowding of the airport, that leads to the additional pressure over all the parties, including crew of both PAA and KLM aircraft and on the controller.
- 2- Investigation suggested that Control Tower crew were listening to soccer match, which leads to the distraction, as per the voices head on the CVR.
- 3- Due to the simultaneous cross- communication between the KLM crew and control tower, they were unable to listen to the PAA message “We are still taxing down the runway, the clipper 1736!”
- 4- Missing the C-3 exit by PAA aircraft as per the instructions given by the Control Tower.

VI. CAUSE OF ACCIDENT

Critical Reasons: -

- 1- v The major reason for the cause of such accident was because of the KLM Captain, Jacob Veldhuyzen van Zanten, for attempting to take-off without the ATC clearance.
- 2- Limited visibility due to the bad weather condition i.e., FOG. Both aircraft pilots and the ATC were unable to see weather runway was clear or was occupied.
- 3- Huge amount of interference on the radio transmission, which lead to difficulty in hearing the messages delivered from Aircraft to ATC and vice-versa.

Non-Critical Reasons may include: -

- 1- Usage of Non-standard phrases (ambiguous phrases) by the KLM co-pilots “We’re at take-off”.
- 2- Missing the C-3 exit by PAA 1736 aircraft as directed by the ground controller.
- 3- Overcrowding of the airport, due to the terrorist incident on another airport, which made the airport authorities to manage such a huge crowd of aircraft with such a limited resource available, leading to the rush on the taxiway.

VII. SPECULATIONS

This was one of the first accident investigation, which included the study of “Human Factor”, which were taken into consideration. Which Include: -

- 1- KLM Captain, Jacob Veldhuyzen van Zanten and instructor, have not gone on a regular route from the past twelve week. 2- Veldhuyzen van Zanten being a senior caption and instructor, working for the airline have made the co-pilot and flight engineer to Hesitate to question the decisions made by the caption. The co-pilot has clearly challenged the captain’s decision but was unable to convince him to abort the take-off. And even Flight Engineer pointed about the conversation between PAA and Tower control that they have not left the runway, but still the captain felt to go for it.

- 3- Flight Engineer was the only member of KLM flight crew who heard the conversation between Control Tower and PAA “report when clear”, because he may be the only one who have completed his pre-flight checks, while both the pilots were busy with the overloaded workload.
- 4- ALPA group also said that the control tower was refereeing PAA as “clipper” before and the “Papa Alpha one seven three six report when runway clear” was not understood by the KLM crew as they thought they were referring to some other aircraft.

Carrying extra fuel by KLM added many other factors:

- 1- Delaying of Take-off by 35min, which allowed the fog to settle in.
- 2- Additional means increase in take-off distance, which leads to difficult to clear PAA during Take-off.
- 3- Due to the crash, Increased severity by fire, leads to death of all people on board.

VIII. RECOMMENDATIONS

- 1- Putting great emphasis on listening to the clearances and instructions.
- 2- Use of standard, concise and unequivocal Aeronautical terms.
- 3- Excluding the word “take-off” in ATC clearance.
- 4- Adding time separation between ATC clearance and take-off clearance.

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