Quest Journals
Journal of Research in Applied Mathematics
Volume 7 ~ Issue 2 (2021) pp: 05-08
ISSN(Online) : 2394-0743 ISSN (Print): 2394-0735
www.questjournals.org

Research Paper

Tenerife Airport Disaster

Kehinde David Folarin
LMOL 607 Leadership, Technology, Job Design, Socio-Technical Systems & Innovation

Received 10 Feb, 2021; Revised: 23 Feb, 2021; Accepted 25 Feb © The author(s) 2021.
***P**ublished with open access at www.questjournals.org*

I. INTRODUCTION

In 1977, two 707 aircrafts Pan Am and KLM which were both bound for Las Palmas in the Canary highlands were scheduled for a temporary diversion to Tenerife Airport mainly because of safety reasons that made Las Palmas airport to be closed because of the aftermath of a terrorist bomb explosion. The KLM aircraft landed first at Tenerife and its passenger deplaned while the Boeing Pan Am landed fort five minutes later but its passenger's were requested to remain on board. The Las Palmas airport was confirmed operational fifteen minutes later and the Pan Am aircraft was ready to proceed on its journey to Las Palmas but could not depart immediately because it had been parked behind the KLM aircraft which needed to be taxied for takeoff. The KLM aircraft took more than two hours to get refueled and to re-board its passenger ready for takeoff[1].

Within the few hours that the aircraft prepared for take off, the weather had drastically changed as fog and clouds hindered the visibility to less than three hundred meters a situation that made air traffic controllers at the tower as well as the crew of both aircrafts to solely dependent on radios to get information regarding to their runway positions. The KLM aircraft was given instruction from the tower to taxi down the takeoff runway and turn around waiting to be given further instructions while the Pan Am was next after the KLM on the runway and was instructed to turn of at taxiway and take the parallel runway for its remaining taxi[2].

After the KLM completed its turn around it requested for takeoff clearance from the air traffic control and its first officer radioed that the aircraft was ready for takeoff and was awaiting clearance from air traffic control and immediately radio message from the tower confirmed that the plane was cleared to line in the P beacon. While the KLM's first officer was still reading back to the tower regarding the ATC's clearance the captain released the brakes saying 'We Gaan ' meaning 'we go' and the plane started to take a takeoff roll. In response, the first officer after finishing reading back to ATC said ''We are now eh taking off'' or ''We are now at takeoff'' a statement that was claimed by the tower control to have been taken to mean 'we are at takeoff position', after which he replied that it was okay, paused and informed the officer that their aircraft to standby for take preceding a confirmation[3].

Immediately after the controller informed KLM that it was okay in confirmation of their standby position, the same message coincided with the Pan Am's message informing that they were still taxing down the runway, a response that caused a strong squeal in the KLM's cockpit as both messages were hardly intelligible. The Pan Am was expected to report to the controller when it was clear of the runway and the engineer in the KLMs cockpit did not clear apprehend the whole message leading to a misunderstanding with the captain disastrously leading to a collision thirteen seconds later.

II. CASE ANALYSIS AND APPLICATION

The Tenerife disaster is considered as one the worst aviation accidents in the aviation industry till today as the collision completely destroyed the two aircrafts killing 583 passengers who were onboard the two aircrafts. Despite the relatively safer and easy ways to determine the best cause of action that it should have been taken or not, the case provides an infinite value as it pertains to studying the mistakes that occurred during the tragedy. Although tragedies have continued to happen in the aviation industry, the changes made on

1 Tichy, Noel. Review of "The Leadership Challenge: A Call for the Transformational Leader. (2008):467

2 Cate, Betty. Ames research center. *Aerospace America.* (2000), 10:8
3 Squires, Susan. The glass cockpit syndrome: How high technology and information overloads contribute to fatal mistakes. London: Macmillan, (2004): 283

operations as well as on the safety protocols have played a fundamental role in making air travel safer. The main cause of the tragedy is attributed to a communication failure before the collision as well as the bad weather and tension that resulted from the great number of aircrafts diverted to the airport following the terrorist bomb threats at Las Palmas airport that the planes were initially scheduled to land[4].

The case of the Tenerife airport disaster was mainly caused by the language problems that existed between the ground flight controllers and the pilots, maintenance issues at the airport such as ignoring vital steps in an attempt to save time. In this case the pilot ignores some of the protocols later leading to the tragedy[5]. The Tenerife airport tragedy case can be applied to an organizational context where in many cases prior to crises basic fundamental set of steps are constantly ignored. As evident in the investigation of the crash no single error can lead to a disaster of such magnitude as there are series of events and errors that in a perfect timing came together leading to the its occurrence and in many cases these events and errors are avoidable[6].

The Tenerife aircraft collision can be used as an example of how disasters and crises emanate from human errors done during serious circumstances and it is an illustration of the potential of the destructive consequences resulting from ineffective organizational and human behavior. The main contributing factors to the Tenerife disaster include communications of a small group under stress, stress and small group's dynamics.

Stress

In the Tenerife disaster stress and its effects on organization and human behavior played a vital role. According to Holroyd and Lazurus[7] stress comprises of a judgment where the internal taxor and environmental needs exceeds a person's resources required to manage them. Some of the demands that faced the KLM crew included delays that had been caused by the terrorist bomb at Las Palmas airport, uncertain and bad weather conditions as well as the their flight and time limits that were strictly enforced. Also, the Pan Am crew faced the bad weather conditions and was being delayed unnecessarily by KLM after having worked more than eleven hours. The Spanish crew at the Tenerife airport were handling many and huge aircrafts that had been diverted in addition to them operating using the English language which they were less familiar with.

The high stress levels arising from the high demands disrupted their cognitive processes, diminishing their judgment and alertness leading to a limited scrutiny of crucial aspect, impaired attention and perception, narrowed range of perceived alternatives and conflicting interests and values. The high stress levels also led to increased cognitive rigidity, narrow and shortened perception and triggered shifting of burden to another as evident by the copilot who assumed that the captain was in-charge of the situation.

Regression

According to Weick[8] the Tenerife disaster was caused by the role which stress played in causing regression to responses that are taught first making individuals under stressful situations to behave or regress in patterns and ways the learned first. For example, in the Tenerife disaster the issue of regression is evident when the KLM captain who previously had worked as instructor for more than ten years and with limited flight time assumes the controller roles where they are often tasked with issuing of takeoff instructions by releasing the aircraft's breaks without waiting for clearance. Also, the copilot and the flight engineer get intimated by the captain's prestige and seniority making them act subordinately without challenging his decision to takeoff without clearance. Moreover, the Pan Am pilot portrays a regression behavior when he prefers to stay off the active runway as instructed by the Spanish controllers without attempting to initiate any negotiation.

Performance

According to[9] the relationship between stress and performance is an inverted U where increasing levels of stress leads to increased performance but there is a level beyond which increased levels leads to diminishing of performance and varies in individuals and tasks[10]. The curve-linear shape is often evident in individuals but research reveals that groups that are effectively functional perform better when stress levels increase.

Communication under stress by small groups

A communication challenge in crisis prone, stress situations by highly mechanistic groups is evident in the Tenerife airport disaster. For example, despite knowing that the aircraft had not been given the clearance to takeoff, the KLMs copilot does nothing to revert the captain's decision to release the breaks. Also, the flight

4 Granovetter, Mark. The Strength of Weak Ties. *American Journal of Sociology*, (1973), 78 (6): 1370
5 Weick, Karl. The vulnerable system: An analysis of the Tenerife air disaster. New York, NY: Macmillan. (1996):364
66 George, Lin. The impact of crisis induced stress on decision making. Washington, DC: National Academy of Science Press, (2008): 529.
77 Holroyd, Kim. & Lazarus, Ronald. Stress, coping and somatic adaptation. New York, NY: York Free Press, (2010): 25
8 Weick, Karl. The Vulnerable System: An Analysis of the Tenerife Air Disaster. *Journal of Management*, (1993), 16(3): 571
9 Weick, Karl. The collapse of sense making in organizations: Mann gulch disaster. Michigan: University of Michigan Publishers.(1993): 56
1010 Raffi Duymedjian and Charles-Clemens Rüling. Towards a foundation of bricolage in organization and management theory. *Organization Studies*, (2010), 31:133

engineer did not make clear to the captain of his suspicions regarding the possibility of Pan Am still taxing on the active runway. The failure in communication in such situations is not uncommon as there are reports where even the most experienced flight officers are unwilling to act or speak out some concerns.

According to a survey on organization behavior pertaining to problems in decision-making reveals that members of a mechanistic group structure work very well until it is forced to take actions against external forces. In a crisis situation, there are three communication patterns that develop in mechanistic groups such as decision-making becoming highly centralized as evident when the KLM captain who responded to stress caused by weather and time by ignoring contributions by made by other group members like the flight engineer and co-pilot[11].

Ways for Improvement

In an attempt to foster improvement of the aviation industry the NTSB has made recommendations to the federal aviation administration regarding establishment of regulations that requires captains to be receptive to decisions made by their copilots and rules that mandate that copilots must carry enough experience that enables them challenge decisions made by their captains. The regulations takes along period of time to impact on the effects played by the human factors, thus, other alternatives have been explored including improved technology and cockpit resource management training[12]. The two ways have been shown to be effective in reducing the number of human factors that cause accidents despite having maintained the mechanistic group structure for the cockpit crew which is a fundamental flaw. There are various ways that are expected to reduce the effects of human factors in causing aviation accidents and they include the following:

Crew resource management training of pilots which many aircraft manufactures and airlines have adopted as part of their corporate culture as a way of minimizing failures related to human factors. Also communication training is vital especially in cultures where obedience and order is very important in day to day activities and it entails establishment of a precise crew co-ordination, clear distribution of tasks, promotion of equal workload as well as ensuring that strict adherence is maintained both inside and outside the cockpit. In addition technology is a potential option where investment human-system interfaces and in cognitive science is vital in fostering use of machines in helping solve human problems[13]. Also, technology is useful in fostering the restructuring of the cockpit crew a term called remote cockpit management.

Stress training: the air industry practices communication and resource training as part of the cockpit resource management because making the crew conscious of their vulnerability to stress plays an important role in enabling them overcome it especially by ensuring that information and decisions are verified to help reduce chances of error. The training on stress assists crew to recognize the effects caused by stress in the cockpit helps them appreciate the nature of the way to respond to human stress and equips them with strategies critical in stress management[14].

Finally, remote cockpit management is another alternative of minimizing the effects of human factors especially considering that technology has advanced such that the aircraft's real time digital data links are readily available and can be utilized by airlines to foster establishment of ground management sites fundamental in offering assistance to the crew and the pilot as they undertake their routine duties in aircraft management. Introduction of the ground control stations as another layer of management reduces the bossy position of the pilot rendering him a team player in a greater management system. Therefore, despite the fact that the mechanistic flight dynamics still exist, they are greatly minimized as the pilot is mandated to maintain a bureaucratic support system that is multi-layered and do not have the authority to override the ground control.

III. CONCLUSION

Considering that aircraft crews are highly structured and comprise of mechanistic groups implies that it is prone to communication and decision making failures as exemplified by the case of the Tenerife air disaster. Often, mechanistic group structure is known to function effectively given that task given are on routine and predictable but when crisis strikes it leads to a breakdown of the trained responses of the crew especially in the aviation industry. Based on research findings about three to five percent of all aviation accidents are attributed to mechanical or equipment failure but majorities of them are caused as by human error particularly due to poor communication[15]. The problem is yet to be addressed by the industry as many of the accidents that happened in the recent years are as a result of human factors including absence of adequate coordination or failure to optimally use the resources available, thus, efforts must be increased in seeking ways to address the problem of

11 Hart, Paul. Crisis decision making: The centralization thesis. New York, NY: Wiley, (2006): 743

121212 Davis, Lewis. Complacency: Almost dangerous state. *Air Transport World.* (1990), 27(3):130

1313 Tichy, Noel. & Ulrich, Dan. Classical Readings of Organizational Behavior (2008). Belmont, CA: Thomson-Wadsworth. (2008): 564

1414 Weick, Karl. The Vulnerable System: An Analysis of the Tenerife Air Disaster. *Journal of Management, (*2003), 16(3): 571-593

15 Schneider, Reinhard. Cognition in organizational analysis: Who's minding the store? *Organizational studies*, (2007), 14 (3):445

the effects of human factors by adopting a systems which are flexible and rigid. Continued research, learning form past accidents and applying the knowledge gained will play a fundamental role in helping minimize chances of another Tenerife disaster occurring in the future.

BIBLIOGRAPHY

[1]. Weick, Karl. The Vulnerable System: An Analysis of the Tenerife Air Disaster. *Journal of Management*, (1993), 16(3): 571
[2]. Raffi Duymedjian and Charles-Clemens Rüling. Towards a foundation of bricolage in organization and management theory. *Organization Studies*, (2010), 31:133
[3]. Weick, Karl. The collapse of sense making in organizations: Mann gulch disaster. Michigan: University of Michigan Publishers.(1993): 56
[4]. Tichy, Noel. Review of "The Leadership Challenge:A Call for the Transformational Leader. (2008):467
[5]. Tichy, Noel. & Ulrich, Dan. Classical Readings of Organizational Behavior (2008). Belmont, CA: Thomson-Wadsworth. (2008): 564
[6]. Granovetter, Mark. The Strength of Weak Ties. *American Journal of Sociology*, (1973), 78 (6): 1360-1380
[7]. Weick, Karl. The Vulnerable System: An Analysis of the Tenerife Air Disaster. *Journal of Management, (*2003), 16(3): 571-593
[8]. Cate, Betty. Ames research center. *Aerospace America.* (2000), 10:8
[9]. Davis, Lewis. Complacency: Almost dangerous state. *Air Transport World.* (1990), 27(3):130
[10]. Holroyd, Kim. & Lazarus, Ronald. Stress, coping and somatic adaptation. New York, NY: York Free Press, (2010): 21-25.
[11]. Schneider, Reinhard. Cognition in organizational analysis: Who's minding the store? *Organizational studies*, (2007), 14 (3):445
[12]. Squires, Susan. The glass cockpit syndrome: How high technology and information overloads contribute to fatal mistakes. London: Macmillan, (2004): 283
[13]. Hart, Paul. Crisis decision making: The centralization thesis. New York, NY: Wiley, (2006): 743
[14]. French, Jones. & Raven, Pink. The base of social power in group dynamics: Research and theory. New York, NY: Harper & Row, (2004): 65
[15]. George, Lin. The impact of crisis induced stress on decision making. Washington, DC: National Academy of Science Press, (2008): 529.
[16]. Weick, Karl. The vulnerable system: An analysis of the Tenerife air disaster. New York, NY: Macmillan. (1996):364

About the Author

Kenny Folarin is a Success Coach, Conference Speaker and Leadership Consultant. He is a doctoral Candidate at Regent University, Virginia Beach, USA, for a Ph.D. in Strategic Leadership. He is also currently the Chief Operating Officer(COO) of Daystar Christian Centre, and the Principal Consultant at Aldridge Consulting Limited, Lagos, Nigeria. He can be reached through