

Challenger accident essay sample



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Introduction

Space Shuttle Challenger accidents was one of the dark moments in the united state's trial to conquer the universe. The challenger acceded occurred on January 28th 1986. In the accident, Challenger which was a space shuttle operated by NASA exploded moments after taking off from the launch center. The spaces shuttle was made of challenger orbiter, a designated OV-099, External Tank which contained liquid hydrogen fuel and oxygen oxidizer, and Solid Rocket Boosters. The space shuttle broke apart less than 74 seconds after taking off the ground leading to the death of seven crew members and loss of the entire space shuttle (Lewis, 1998). According to the technical description, the shuttle disintegrated due to the failure by the O-ring seal in the solid rocket booster to lift off. This in turn caused a breach of the solid rocket booster joint which allowed a flare to extrude outside and impinge upon solid rocket booster and the external fuel tank. The mechanical failure lead to the separation of the right hand solid rocket booster attachment and the external tanks which dumped hydrogen liquid fuel at once and caused an explosion since the fuel was ignited by the flame.

This even led to the break up of the orbiter due to the aero dynamic forces causing control of the attitude. After the explosion, the crew compartment and other debris were recovered from the flow of the ocean after a very painful and lengthy search. The crew died from the impact of the forces of explosion or from the impact of the crew cabin with the ocean.

The accident caused a major hiatus in the shuttle program and immediately Rogers's commission was formed to look into the issue deeply. The commission which was headed by the then president of the United States Ronald Reagan found out that there were multiple causes which could be attributed to the disaster including mechanical and environmental failure but most important was the finding that NASA's organization culture and the decision making process was a major factor contributing to the accident. NASA managers had ignored prior warning about the dangers associated with the launch of the project including the flaw in the O-rings but this had not been well addressed. The managers had also not taken into consideration the warnings that had been given by the engineers on the associated weathers which posed a particular danger to the shuttle. However the breakdown in the communication process made it difficult to pass these warnings to the superiors.

Description of the project

Due to the success of the Apollo missions, there was increased pressure from the American government that led NASA to develop a number of space missions that had gone very successful. There were more than 20 missions that NASA had carried out successfully but when it came to Challenger, there was a kind of nervousness which reflected the organizational challenges that the mission was facing (Lewis, 1998).

Unlike other mission that had been carried out earlier, the Challenger was different in that it brought together four different organizations that had to oversee the success of the mission. The four organizations included Morton

Thiokol, Marshall Space Flight Center, Johnson Space Center and the NASA headquarters. All these organizations had different roles to play in the course of the success of the mission. There were respective roles that all the organizations had to oversee but which were all administered by NASA. Apart from the four organizations, the government and media also played a crucial role in the success and failure of the mission. These two acted as the link between the public and the happenings at the closed walls of the four major players in the challenger shuttle mission. Let us look at the roles that these organizations played.

National Aeronautics and Space Administration (NASA) was the main agency of the government which was entrusted with organizing the mission. NASA was entrusted with giving out and supervising the whole mission. Unlike the other missions that had been carried out by NASA, this was the first mission that was to take citizens to the space. (Vaughan, 1996) Therefore NASA had been entrusted with finding the respective individuals who would look into teachers who would be carried to the space. The course of the accident is squarely placed on the NASA for pushing Morton Thiokol to continue with the launch even when there was clear evidence that the launch was likely to be a disaster. Top NASA executives had been blamed for lack of observance on organizational ethics which led to the eventual failure of the mission and loss of crews. NASA was also working in the Johnson Space center from where all the activities which were related to the project were taking place. Johnson space center was responsible for the building of the orbiter project (Vaughan, 1996).

Morton Thiokol was the main contractor who had got a big deal from NASA to complete the space shuttle. Morton Thiokol had been an important foundation in the formation of NASA since it had produced most of the top brass who presided at the helm of NASA. Morton Thiokol was an aerospace company that had been contracted by NASA to build up the Challenger shuttle and oversee its successful launch. This means that the Morton Thiokol was the main player in the challenger project. Morton Thiokol was responsible for all the engineering aspects of the project. The company had been selected owing to its successful record on the making of rocket motors for SRBS.

In the cause of the accident, Morton Thiokol is blamed for having accented the launch of the space shuttle. However two engineers at Morton Thiokol, Allan McDonald and Roger Boisjoly argued that they have opposed the launch of the space shuttle due to the temperature conditions (Corrigan, 1993). However their superiors at Morton Thiokol had ignored their recommendations to launch the flight in the low temperature. Morton Thiokol is said to have change its mind and recommended the launching of the Challenger at the urge of NASA contrary to the view of the engineers for the need to accommodate the require of their major customer.

Marshall Space Flight Center was the center at which the launch was to take place. Marshal Space Flight center had bee given the overall responsibility for the development of the booster rocket. In conjugation with engineers form the Kennedy Space Center, the managers from the Marshall Space Flight Center in Alabama were also responsible for determining environmental temperature which would give a go ahead for the launch of <https://assignbuster.com/challenger-accident-essay-sample/>

the Challenger. Their contribution to the overall failure of the project is considered the boosters were one of the causes of the explosion in the O-rings (Vaughan, 1996).

Apart from these four organizations, there were individual players who contributed to the project in various ways. Among those individuals who were given the overall responsibility of overseeing the development of the project, the following are considered to have contributed in various ways;

1. Larry Mulloy who had challenged the decision of the engineers to launch the challenger
2. Allan McDonald who was the director of the Solid Rocket Motors Project
3. Lund Bob who was the engineering vice President
4. Robert Ebeling and Roger Boisjoly who were engineers working under MacDonald
5. Kilminster Joe who as an engineer in a management position
6. Jerald Mason who was a senior executive who encouraged Lund to reconsider the decision not to launch the Challenger. Therefore he was one of those who supported the launch of the project.

Therefore we can say the success and failure of the program depended on the contribution of all these organizations and individuals. One of the most important factors that were needed for the success of the project was effective communication that would bring all the concerned parties together for the success of the project. In such a situation, there has to be an effective coordination of all the activities and NASA which was given the

overall mandate of overseeing the success of the project was in a position to do all it could in order to ensure the success of the project (Vaughan, 1996).

The failure of the project was not contemplated since NASA had hoped for a successful taking of the citizens to the space for the first time in order to boost the confidence of the citizens on the project. This confidence was to be built on the confidence that NASA had gained on its previous mission. It was perhaps this earlier confidence and the desire to win public trust that NASA eventually failed in its mission culminating in the Challenger Accident. Let us look at the factors that led to Challenger accident.

Events that led to the challenger accident

The launch of the Challenger had been anticipated several times. However it had been delayed due to technical problems and bad weather. The launch was the first one to be carried out in Pad B of Kennedy Space Center launch complex 39. After NASA had concurred with Morton Thiokol to launch the challenger despite the resistance from the engineers, the launch took place at 11: 38 am Eastern time on January 28 1986. However just thirteen seconds after the lift off, the challenger was engulfed in an explosion that destroyed it and killed all the server member crew inside (Lewis, 1998).

What were the major factors that lead to the explosion of the challenger?

There are two main problems that have been highlighted as the main cause of the accident. These included engineering factors and the decision making procedures which were related to the launch of the problem

The physical evidence that has been gathered supporting the challenger disaster show that there was a photographic evidence that showed a puff of grey smoke that was that aft field joint on the right solid rocket booster (Riffe and Glen, 1989). This puff or smoke showed that there was no complete sealing between the joints. In a few seconds time, the smoke changed from gray to black which indicated the deterioration of the condition. The following picture shows the grey smoke from right SRB

Gray smoke from right SRB

The black smoke was clear evidence that great joining insulation rubber and the O-ring which was very crucial for the overall success of the mission was being burned and eroded very fast by the hot propellant gas. The following picture shows the plume on the right SRB.

Plume on the right SRB

In the course of the launch the main engines had been throttled to more than 104 percent thrust and at the same time it was evident that the solid rocket booster were peaking in their thrust when the first signs of a flame appeared. The flame was noted on the right solid rocket booster just 59 seconds into the space. Few seconds later, the flame was visible even without an image enhancer and it grew rapidly into a well defined flame

When the shuttle was about a minute into the flight, there was a pressure differential that was notable between the chamber pressure for the right and the left boosters which were meant to provide balance for the flight (Forrst, 2008; Elix, 2008). The right booster was seeing lower than the left booster

which could be attributed to the leak in the field joint. When the flight was 64 seconds into the flight, the flame was growing rapidly and had reached the external tanks and the flame changed its shape and color. The change in shape and color had been attributed to a leak in hydrogen flame which was coming from the external tank. Within 73 seconds, there were series of events which eventually led to the explosion of the challenger shuttle terminated the challenger mission. This happened when all Americans were watching in shock and awe at the failure of the mission that had been so much publicized and anticipated. The following picture shows the Challenger disintegrating

Disintegration of the challenger

The commission investigating the accident had clearly indicated that the failure of the mission could be attributed to the joint failure between the lower segments of the solid rocket motor which led to the destruction of the seals which were meant to prevent hot gases from leaking. This failure was attributed to the faulty design which buckled under the pressure from temperature, physical dimension, material that were used, reusability effects, and the processing and reaction of the joint (Riffe and Glen, 1989).

The above factors were engineering factors which were well known not only by Morton Thiokol but also by NASA. However there were some human factors in NASA that attributed to the failure of mission. First there was the process of selling the concept of re-usable space transportation system which had started back in 1960s after the success of the Apollo mission. In order to gain the support of the majority, the project was therefore sold with

a very promising prospect of further development of the industries which would support the growth of the space mission. There was so much publicity of the project which was dubbed as American Voyage (Forrst, 2008). Due to the need from the political, commercial, military, and the scientific societies, there was so much pressure that had been placed on NASA management which finally influenced their decision to launch the shuttle. There was a constant push from the Regan administration which called for the declaration of the shuttle as operational even before the development state had been completed. At the same time, the congress was looking into the project to be self financing and therefore NASA was forced to operate it on commercial basis.

This shows that environment which preceded the NASA launch mission can be described as marked by conflicts, stress and short cuts. Furthermore the last 24 mission that NASA had carried through had been very successful but they had created a false confidence on the officials (Elix, 2008).

On making the decision to launch the space shuttle, it was very clear that there was no Group Decision Support System (GDSS). NASA and its developers like Morton Thiokol who made the solid rocket boosters were supposed to have a very consultative decision making process before the launch. On the evening before the launch, engineers at Thiokol had provided NASA with information which showed their concern on the effect of the cold weather condition and how it would affect O-ring and its performance.

However NASA understood that the mission had been cancelled on several conditions due to weather and it did not want it to be cancelled again.

Although Thiokol showed a data that did not support the launch, NASA was

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looking for GDSS data that would support the launch (Corrigan, 1993). There was a constant pressure from NASA's level III manager Lawrence Mulloy on Thiokol to allow for the launch. When Thiokol requested for the 5 minutes offline in order to come up with a conclusive decision, the engineers who had raised issues regarding the safety of the flight were excluded and immediately they decide to okay the launch in order to maintain good relationship with their clients.

However one of the key factor that eventually led to the failure of the mission was the organizational culture of NASA and Morton Thiokol which were two major players in this case (Forrst, 2008; Elix, 2008). One year before the launch of the mission, there are memos which showed a number warning which were sent to the top managements by the employee of the two companies which called for the cancellation of the mission based on technical failures. However the organization behavior of the two organizations showed that there was a higher control of the organization decision making process by the top management. Even after receiving a number of warnings from their junior teams, the top management in NASA and Morton Thiokol had decided that this was not a technical decision making but rather a management decision making. The top management wielded too much power and they were willing to risk life of the crew in order to save their reputation (Riffe and Glen, 1989).

The main problem that can be identified in these two organizations was that the top management was making very poor decisions which were based on poor ethical standards. This behavior was evident throughout these organizations. The relationship between the lower and the upper

management was a bad relationship if to mentions. The top management had set their focus on fame and fortune instead of looking at the safety of the crew (Forrst, 2008).

Apart form NASA Morton Thiokol should also be baled although they can argue against the case on the ground that they were pressured to okay the launch by NASA. However it is not well understood why Morton Thiokol had to ask for five minutes offline which gave room for executive pressure to okay the launch and the exclusion of the engineers who were against the launch (Boisjoy, 2008). This was despite the fact that Morton Thiokol had known of the O-ring problems seven months before the launch but they did not make any effort to upgrade it.

One of the greatest problems that could be attributed to the accident was the flawed communication in the whole process (Elix, 2008). There is a high probability that those who launched the Challenger were not aware of the history of possible failure of the O-ring since it had not been communicated to them. It is also possible that they could not have known the decision by Morton Thiokol of not launching the Challenger in light of the probable problems since it had not been communicated by NASA. This shows that the accident was a grave consequence of communication failure between those who launched the Challenger, NASA management, Thiokol executives and Thiokol manages.

Therefore there was a probability that this accident would have evaded (Corrigan, 1993; Forrst, 2008). Had there bee a very effective management

between Thiokol engineers, NASA management, and the different stakeholders, there was a high probability that this would have been avoided.

The whole process starts with the initial concerns that had been raised by Thiokol engineers that there was a probability of failure of the O-rings. If NASA management had not ignored this assertion, there was a high probability that the launch would not have taken place and therefore the accident would have been avoided (Forrest, 2008).

Although a lot of blame had been heaped on the engineering mistakes, it is clear that these mistakes were very clear to the engineers and the managers and therefore there was a clear way that they would have worked around and avoided it. Seven months before the launch, it was very clear that the O-rings would pose a problem and therefore the issue would have been solved out. We can therefore say that the larger blame for the accident goes out to the human factor and could have been avoided if the NASA management was not led by desire for fame and Morton Thiokol management was not led by desire to fulfill the desire of their clients despite the obvious problem that had been expressed by the engineers (McConnell, 1987).

Options for implementing organizational change

The obvious problem that can be diagnosed in the organization structure of NASA is that the top management has a lot of powers and to an extent that they can ignore the input of other staff. The top management has so much power which breaks the complete cycle of communication between the senior and junior staff. The decision making process is also very rigid and left to the top management alone. Therefore in implementing change to the

organization behavior of NASA I would target to have a more inclusive decision making process in which the view of different individuals in the organization is considered. This would mean having a more consultative process before arriving at any decision.

The organization structure matrix is also uneven which makes the communication process very rigid such that there is a difficulty in the communication process between different managers. Communication in the organization is very important it affects the flow of information between different individuals in the organization and at the same time it affects the performance of the whole organization. Organization behavior change in the organization would be aimed at improving vertical communication such that there is effective flow of information from the top management to the junior staff. In the case of challenger accident it is very clear that NASA management did not communicate to its junior staff of the concerns raised by Thiokol and therefore they continued to launch the Challenger. Improving the vertical communication process would ensure that there is a clear flow of information from department to department and from management to management. This would also break the evident dictatorial relationship between management and its employees which has perpetuated a culture of "do as I say" which forces the junior staff to obey what their superiors say without questioning.

Another important behavior in NASA that needs to be changed is the lack of ethical decision making process. NASA management was overwhelmed by its desire to fulfill their personal reputation record at the expense of crew member. The decision made was unethical since NASA management

understood the danger they exposing their crew to (Boisjoy, 2008). NASA needs to change this self gratification culture to have an ethical culture in place the respects the rights of the employees. The process of decision making must be made more consultative among the senior and junior management in order to make it more ethical.

Conclusion

The Challenger Space Shuttle was one of the projects that were undertaken by NASA in the 1980s and unlike the other mission, this was supposed to be the first that would take citizens to the moon and raise their confidence over the space mission. However the Challenger burst into flames and disintegrated just 73 seconds after the launch. There were a number of engineering factors that lead to the failure including the failure of O-rings which eventually led to the explosion. However human factors like self gratification of the NASA management, ignorance of the fears of failure of O-ring that have been raised by Morton Thiokol engineers and many other lead to the Challenger accident. In order to change the organization behavior of NASA, there is need to change the communication process and decision making process to make them more consultative.

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