

# Risks in the Space Exploration in Andy Weir's *The Martian*

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## Abstract

This paper depicts the risks faced by the astronauts in space exploration in the novel *The Martian* which was written by Andy Weir. Andy Weir is an American novelist who was a son of a particle physicist. He uses his tremendous knowledge in science to write the book to be as scientifically accurate as possible. He has written a number of works including *The Martian* and *Artemis*. The novel *The Martian* is a science fiction novel. The novel is speaks about the risks faced by the astronauts in the space travel in a unexpected situation. Andy Weir explores the survival methods by using his scientific background.

Space exploration is an intrinsical risk endeavor. Apart from the massive engineering challenges in launching and returning spaceman's safely to Earth, astronauts living in space experience a range of psychological and physical changes that can affect their ability to perform required mission function, and, in the long term, increased risk of developing various physical illness including tumour, damaged vision, reduced bone strength, and other damages to health and wealth being.

Andy Weir, is the son of the particle physicist, has some background in computer science. He begins writing the novel *The Martian* in the year 2009. He researches related material so that it would be pragmatic as possible and based on existing technology. Andy Weir studied Orbital mechanics, astronomy and the history of manned spaceflight.

The novel opens with a crew traveling on Mars to discover the planet but all of a sudden, a dust storm shows up and the crew of the mission is forced to leave the red planet to survive. Unfortunately, the crew accidentally left Mark Watney, who was on the crew member going on the mission. Now the situation is that Mark Watney is stranded on Martian surface, he has no other way expecting he will have to use his skills in botany and engineering, to survive Mars hazardous environment until the day he rescued.

The writer Andy Weir shows up the character of Mark Watney to be an exceptionally intellectual character who can use his intelligence to easily adopt the dangerous atmosphere of Mars by using his knowledge in both engineering and botany. Mark uses his competence in this subject to study the environment of the Martian surface and try his level best to stay alive in such an atmosphere. Mark Watney, who is a botanist and mechanical engineer, make use of his botanical knowledge in order to grow food to survive and uses his engineering knowledge in order to customize the equipment he uses.

The whole story covers up nearly two years, and the whole time Watney fights for his survival against the harsh Martian atmosphere.

The novel *The Martian* largely speaks about the risks faced by the astronauts in the outer space. When one read the novel *The Martian*, they get a solid idea of just how someone could survive on the Martian surface. Stuck all alone in the surface of Mars for far longer than planned, Mark Watney finds himself completely in a different inhospitable environment which is completely opposite to the atmosphere of Earth. Unlike Earth, his body is not suitable for the situation and atmosphere of Mars.

Unsurprisingly, Mark Watney comes to rely upon technology to keep himself alive, such as the Hab, the rovers and his EVA suits which keep him all alive. Though these technologies keep himself alive, its very strength conceals many dangers. On the one hand, this technology is very much helpful, it is also simple for Mark Watney to underrate how vulnerable the technology is to harm.

Mark Watney faces many challenges when he fails to account for the difference between the atmosphere between Earth and Mars, or when an apparently slight error damages his equipment. It is better illustrated in a situation when Watney's nearby unsuccessful attempt to make water by separating hydrogen gas out from hydrazine fuel. During this process of making water, Watney by accident leaves sufficient hydrogen in the air to risk an explosion. Watney almost suffocates a lot while removing the hydrogen from the air by inhaling too much of nitrogen. He then pulls on an oxygen mask without understanding the situation, but when the moment he exhales, he adds enough oxygen into the air to cause an explosion inside the Hab. Exhaling a combination of oxygen and carbon dioxide and also breathing oxygen is, on Earth is the most natural thing. But in the Hab oxygen is dangerous the very exact thing that Watney needs to survive could kill his life.

The novels start off with dust storm which leads Mark Watney to struggle all alone in the Martian surface. After the dust storm other crewmembers leaves Mark Watney in the red planet consider him as dead but Watney wakes up by the alarm sound from his suit, he is bleeding but that actually turns out to be a good thing. Because the dried blood has pooled and is sealed up the hole in his suit. When he found himself all alone in the Martian Surface, even not had a way to communicate with NASA, Mark says:

For the record ... I didn't do on Sol 6. Certainly, the rest of the crew thought did, and I can't blame them. Maybe there'll be a day of national mourning for me, and my Wikipedia page will say, "Mark Watney is the only human being to have died on Mars. (1)

The novel *The Martian* speaks about the problems faced by the astronauts, especially when Mark was all alone in the Martian surface, his first problem was food. When Mark was calculating the food amount in the Hab, he found it was lost only for three hundred days. Mark has no way to communicate with Earth, so no one knows the truth about Mark Watney, and he has no way live after

300 days. The only hope of Mark was the next mission of NASA namely Ares 4. At first Mark Watney loses his hope, and says:

So that's the situation. I'm stranded on Mars. I have no way to communicate with Hermes or Earth. Everyone thinks I'm dead. I'm in a Hab designed to last thirty-one days. If the Oxygenator breaks down, I'll suffocate. If the Water Reclaimer breaks down, I'll die of thirst. If the Hab breaches, I'll just kind of explode. If none of those things happen, I'll eventually run out of food and starve to death. ( 7)

In space travel astronauts face many problems, including, "Behavioural Health, and performance, Inadequate Food and Nutrition, Space Radiation, and Vision Impairment and Intracranial Pressure" ( National, 15). In the novel *Martian*, Mark Watney faces many health issues from the beginning to the end of the novel. He not only face physical issues, but he also faces mental problems. Even his crewmates and the employs of NASA filled with mental pressure after they lose Watney in the Martian surface, and once they found Mark Watney was still alive, many of them lost their sleep in order to bring him Earth safely.

Even four months after the incident, the crew members remind the loss of Watney, Everyone remembers the day, they left Watney all alone in the Martian Surface, even they were not aware of his survival. "Beck tried not to think about the painful reason he was doing zero-g plant growth experiment" ( 143). For that experiment, they travel to Mars, but unfortunately loss Watney there. From that passage, one could easily understand the feelings of the astronauts after their crewmate's loss. They were not in good condition after they met with the dust storm. After four months the crew receives a message from Mitch Henderson, The flight director of Ares 3, informing them, "I have some news", Mitch's voice continued, "There's no subtle way to put this: Mark Watney's still alive" ( 144).

On hearing this first the crew mates get stunned until then they thought Watney was dead, but now the news about him make them happy. But Lewis, the commander of Ares 3 was the one who takes the message seriously. After hearing the message, Lewis hastily said she left him behind. Beck tried to convince her by saying that they were altogether left him. But Lewis crosses their conversation and says, "I left him behind. In a barren, unreachable, godforsaken wasteland" ( 145 ).

Lewis used to make tough decisions such as the order to evacuate Mars during a dust storm. But she suffers extreme to regret at losing a subordinate. When Lewis learns Watney is alive, she feels guilt at having left him behind. On the other hand, Mark Watney's story, which is told in episodic construction focuses on Mark Watney's labors and innovations as he struggles to stay alive despite lack of food and resources. Once Mark Watney found he was lack of food, he found an alternative idea to grow up potato plants in Martian surface.

Mark Watney, a botanist, and mechanical engineer make extensive use of his knowledge in order to grow potatoes in the Martian surface for his survival and to repair and modify the equipment he uses. At first, everything went efficiently but when the Airlock which he has been using frequently breaks, and is thrown from the HAB. Mark was injured, but at the same time, that explosion brings major drawback to Watney's form idea. It destroyed the whole crop of potatoes and fundamentally end up his crop growing idea in Mars. After that incident, he has no way to survive and to wait for Ares 4 without food. Food is very much important for survival. According to A. P. J Abdulkalam:

Food is the sustainer of life. For all living organisms there are four essential aspects of life: to be born, to eat, to reproduce, and to die. Food is what provides energy to living beings, so it is essential for survival and growth. Accordingly, all life form spend a large part of their lives on the acquisition of food. (Kalam 109)

Ares 4 arrive at Mars on Sol 1425 but after the explosion of the airlock, Mark was left with food that long-lasting till sol 600, and Mark Watney has no other way to grow up potato plants in the HAB. Before the accident, Watney grew food that lasts for sol 900 and NASA plans to send the probe to Watney on Sol 856. But after the blast, everything went wrong. So NASA started to work on to send the probe before Watney starve to death. But they only have a very short amount of time to invent the probe. Because the trip of the probe in the space was taken four hundred and fourteen days.

Teddy Sander, the administrator of NASA, hurry up the construction of the probe. They found out that the probe reaches Mars after some days Watney runs out of food but, Teddy asked, Dr.Keller to reduce the intake of Watney's ration in order to last the food for some more days. But Dr. Keller was not satisfied with the idea of Teddy. Because Mark Watney was already at a minimum calorie count and comparing to his physical labor Watney eating far less than he could.

Teddy Sander enquires Dr. Keller out the lifespan of a human without food. For this question the doctor replied:

Presuming an ample water supply, he might last three weeks. Shorter than a typical hunger strike, but remember he'll be malnourished and thin to begin with. Within 4 days of running out of food, he'll barely be able to stand up, let alone control a rover Plus, his mental faculties will rapidly decline. He'd have a hard time even staying awake. (179)

It leads Mark Watney's life to danger. Teddy in most of the time doesn't want to take any risks for the life of the other crew members and the Hermes. But at the same time, he has the authority to decide anything according to the rules of NASA, which says:

The PRR summarizes the Agency's ability to control the risks and concerns based on current understanding and identification and validation of potential countermeasures. NASA updated the PRR in June 2015. According to the 2015 version of the document,

the Agency will lack validated countermeasures for 11 of the 23 identified risks and both of the 2 concerns in time for a Mars mission in the 2030s. ( National 7)

So that Teddy sander took the low risk for the life of the crewmates than Watney. Humans journey into the environment of space can have pessimistic effects on the body. Significant difficult effects of long term weightlessness include muscle atrophy and deterioration of the skeleton. Other major effects include a slowing of cardiovascular system functions, decreased production of red blood cells, eyesight disorder, balance disorders and a weakening of the immune system. Additional symptoms include fluid redistribution, loss of body weight, nasal blocking, a disorder during sleep and excess flatulence.

Malnutrition is the very big barrier in the outer space. Mark Watney lived in the Martian surface for 549 days. For half of the days, his only food was potatoes and nutrition tablets, and he consumes low calories than his physical labor. In space travel, most of the astronauts lost their sleep. The sum and value of sleep experienced in space are reduced due to extremely uneven light and dark cycles on flight decks and deprived illumination during daytime hours in the spacecraft. Even the habit of looking outside of the window before the time of retiring can send the wrong message to the brain, that resulting in poor sleep patterns. These types of turbulence made an effect on the cardiac rhythm that has deep effects on the neurobehavioral responses of the crew and worsens the psychological stresses they previously experienced.

More interrupted sleep can negatively affect astronauts physical and mental health during the time of the mission and it also reflected in their lifetime after the mission. Long term sleep loss can lead to some negative effects such as obesity, stroke, hypertension, diabetes and lead to a psychological disorder such as depression and severe anxiety. Mark Watney loss his sleep in many times after he was all alone in the Martian surface.

The airlock that Mark Watney has been using the most often breaks all in a sudden, and is thrown from the HAB, not only destroyed the entire crop of potatoes, it also breaks the face plate of Mark Watney's space suit, and leads him to run out of oxygen. When one was run out of oxygen in the outer space, it will lead him to death. But fortunately, Watney found out the duct tape and seal the break in his faceplate by using the duct tape. Without his wit, and the help of the duct tape, Mark Watney would not have survived.

In the last, the crew members of Ares 3 returns back to Mars in order to save Mark Watney, once they get the news about the maneuver. Even NASA higher authority member Teddy Sandar opposed the idea, but the crew members disabled the communication with NASA in order to save their subordinate. Their travel contains so much risk, and they spend more time in the outer space than their exact schedule, and they take the risk in the life of five crew members in order to save one. But Lewis took the risk, because of her guilt conscious of leaving Mark Watney in a barren Wasteland like Mars.

On the other hand, Mark Watney was got excited to know that his crew members came back for him. On hearing the message of his crew's return to Mars Mark Watney says,

"Holy shit! They're coming back for me! I don't even know how to react. I'm choked up! And I've got a shitload of work to do before I catch that bus home. They can't orbit. If I'm not in space when they pass by, all they can do is wave" (216).

After about almost a year of starving himself, Mark prepares for several thousand miles long journeys in order to reach his crew members. Mark Watney took so much risk in the final episode in order to rescue himself. Because he has no way to live without taking any risks. He took a rocket from Ares 4 where he travels for such long journey in order to rescue himself and reduced many parts from the rocket as the guidance of NASA to reduce its weight in order to take off, which he does. But he does not reach the height that he needed to reach his crew because he had taken off the nose of the rocket and put the canvas over it, and that canvas had come off once he takes off the rocket.

This lack of elevation causes Mark to be far too slowly from the vehicle of Ares 3 and lead a situation for them to be able to grab him. Another one drawback is, he is moving too slowly and they are going too fast. But Lewis got another alternative idea that risks her own life and also the crew members. They blast a part of the ship to slow down it. Even though they never reach Watney but Watney accomplish them by cutting his astronaut suit.

The novel *The Martian* contains many risk factor in outer space. It speaks about the risks in the outer space in an unexpected situation. The overpowering message of the novel is positive. Even though some of the characters are presented in an unappealing way and there are moments where character are in danger, the story is eventually one about human originality, survival and risk rate in space travel In the closing pages of the novel, *The Martian*, Watney declares that, to the public, his story of survival represents, "progress, science, and the interplanetary future" (368).

## Conclusion

This novel was a message to the future astronauts to cultivate the risks in inter-planetary travel. Mainly it gives guidance to the astronauts to work out in an unexpected situation in space. The environment in the space is mostly unknown, and there will likely be as yet unknown hazards. In the intervening time, future technologies such as artificial gravity and more complex generative life support systems may someday will capable of reducing some risks.

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