

The Future of Space Exploration

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On July 8th, 2011, STS-135, the final space shuttle mission, launched from the Kennedy Space Center in Cape Canaveral. Space shuttle *Atlantis* took off into the Floridian sky, and after eight minutes, reached orbit. The crew of four would carry out multiple experiments, link up with the international space station, and resupply the ISS, all over the course of fourteen days. On July 21st, *Atlantis* maneuvered away from the ISS to make it's speedy return to earth. This spaceflight marked the end of the space shuttle era.

Space shuttles were the first reusable spacecraft, marking the beginning of a new technological achievement for the United States in the early eighties when they were first sent into space. The five spacecraft that reached orbit are considered some of the most technologically advanced pieces of machinery known to man so far. While the end of the shuttle program brought great pride to the United States, it also marked the beginning of a time of uncertainty for NASA, the National Aeronautics and Space Administration. Massive funding cuts were applied to NASA prior to the shuttle's final flight (Space Program), causing doors to open for private companies, not only governments, for space exploration.

One thing that is certain about the future of space exploration, as it stands now, is that private companies will be playing a bigger role in getting people into space than ever before. The creator of PayPal, who also happens to be the CEO of Tesla Motors, Elon Musk, started the company SpaceX (Space Exploration Technologies) in 2002. According to the company's website, "SpaceX designs, manufactures and launches advanced rockets and spacecraft... with the ultimate goal of enabling people to live on other planets." (SpaceX). SpaceX recently

sent its spacecraft *Dragon* to the International Space Station to resupply the crew off the ISS and to deliver science experiments into space. These unmanned resupply ships are being sent to the ISS due to the crew's demand for supplies. The United States no longer has a shuttle to deliver those supplies into space because of the space shuttle's retirement.

Therefore, the US has to rely on companies to carry out the job that the shuttle was once able to complete. Because SpaceX is a company, it needs to make a profit from each mission.

According to SpaceX's website, a single launch of a Falcon 9 rocket (its smallest rocket) costs 61.2 million dollars (SpaceX). This means that each time SpaceX sends a resupply ship to the ISS, it costs taxpayers a huge 61.2 million dollars, because NASA has to pay SpaceX for each launch due to their contract. Compared to the estimated 450 million dollars per flight (NASA) of the space shuttle, 62 million is not nearly as much, but the Space Shuttle had much more storage capacity, weighed more, and had a crew all of which SpaceX's Dragon lacks.

While the space shuttle cost more per flight than dragon overall, it had a lower cost per pound to reach orbit, which is what really matters in space flight, because each launch of rocket is limited to its mass. Having a lower cost per pound to reach orbit means that each launch will be cheaper overall to get more supplies into space. SpaceX's Falcon rocket brings supplies into low earth orbit at a cost of around two-thousand dollars per pound (SpaceX). According to a 1972 report to congress by the Comptroller General of the United States Elmer Staats, NASA had reported to him that after eventual re-use of the space shuttle, the cost per pound of bringing supplies into orbit would end up being the hundred dollar range (Cost Benefit Analysis, 49). With massive budget cuts, NASA had to do as much as possible with limited funding. Because of the space shuttle's retirement, NASA can now only do so much with the little money and resources it has.

A younger company from the Netherlands, Mars One, is aiming farther than just low earth orbit. Mars One aims to send astronauts to Mars by 2024 (Mars One), but with one giant catch: the astronauts will not be allowed to return to earth. Mars One was very clear on its website that the astronauts won't return from their trip to Mars, but the company has already received applications from people wanting to be the first humans to step foot (and live) on Mars, despite that these people know that they'll leave earth forever. This one way trip is because it would cost so much more to bring supplies like oxygen and food for the long journey home. What the company isn't clear about, however, is how exactly it will go about sending people to the red planet. The wording on the company's website is very vague for the audacious plans it has, especially with a sentence that states "the science and technology to place humans on Mars exists today" (Mars One). Mars One never specifies what that technology is. Humankind has actually had the capability to land on terrestrial planets since 1969, when Neil Armstrong and Buzz Aldrin landed on the moon. The technology required to land on other terrestrial planets is essentially the same, but there are other logistics to consider; the duration of the trip, long term resupply missions, and expanding the colony that Mars One proposed. In addition to a lack of specificity, Mars One only lists eight members of its team on its website that are working to make a colony on Mars a reality. A team of eight does not sound sufficient to successfully land humans on Mars and support them for years to come. A lack of engineers would definitely limit the missions success. NASA had thousands of engineers working on the Apollo program, and it still took them ten tries before successfully landing a man on the moon.

These trips to Mars to resupply take not only a lot of time, but a lot of money. Mars One plans to fund all of this by asking for donations from sponsors, as well as filming the mission as a reality show (Purdue Review), but this will only succeed if there is enough public

interest to fund all of the spaceflights to Mars. A colony on Mars, as well as the lives of the astronauts living there, should not depend on view counts of those watching the mission on television. On top of that, Mars One was expecting one million people to apply to become astronauts to go to Mars. However, unfortunately for the company, “that number was more like 165,000” (Purdue Review). With a smaller applicant pool, there are fewer applicants that can successfully be trained to carry out the mission. With all of these factors in play, along with Mars One being only two years old, the company will most likely not be able to land on Mars with such a limited knowledge of spaceflight, life on other planets, and a lack of concrete long term funding.

Today space exploration is in a state of uncertainty. NASA is limited to only sending unmanned rockets into space, and private companies are on the brink of successful continuous space flight. In a perfect world, NASA would get more funding, because it was the first organization in the history of humankind to send humans into space and onto the moon. Unfortunately, the public is more interested in private companies than NASA. NASA is still the only organization to send a man made object out of our solar system (Voyager 1, which just entered interstellar space). Our space administration has accomplished more in its existence than all of mankind prior to its inception in 1958. In the future of space exploration, NASA should be given more funding but it should also work alongside private companies as it is doing now. Companies should provide money and equipment that NASA doesn't have anymore, and in return NASA could provide the insight which it has developed in its 58 year history that no company would have. Both NASA and its corporate allies could accomplish revolutionary feats in aerospace engineering, which could also provide humankind with plenty of technological breakthroughs to make life on earth better. NASA just needs the funding it deserves to be able to take the lead in the future of space.

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