

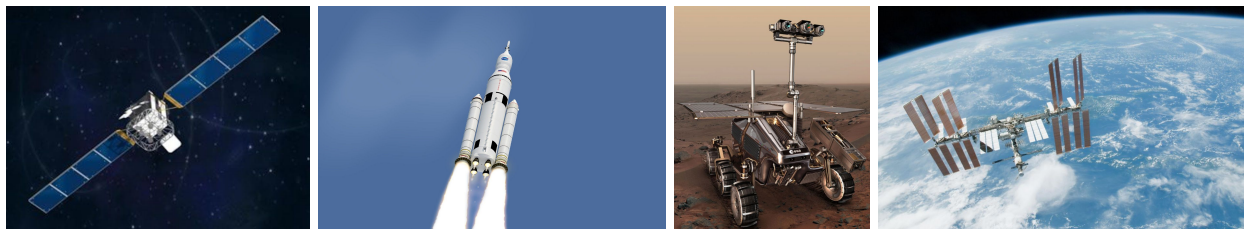
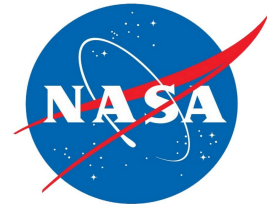
# Stem Career Exploration Online Challenge

## Spacecraft designing

Team: 9007X

### What is Spacecraft Designing?

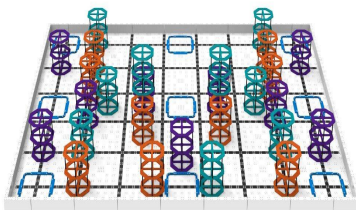
Within Aerospace Engineering, many fields combine to make our space travel and discoveries possible. One specific career from this path is Spacecraft Designing. As the name suggests, spacecraft designing is a career related to designing various forms of spacecraft, including rovers, satellites, rockets, and much more. In general, a spacecraft is any type of machine or vehicle that operates in space. There are many different types of them, made for many different purposes, explained further in the text. There are also many companies involved in this, such as NASA, Lockheed Martin, Space-X, as well as independent teams. For the past century, this career has played a significant role in our space discoveries and achievements, pushing the boundaries of what is possible in aeronautics. Since the Apollo 11 mission and even before, spacecraft design has been a foundational part of our space explorations, and will continue to be for decades to come. After decades of evolution, this career continues to push STEM forward and fuel our desire to gain knowledge and explore.



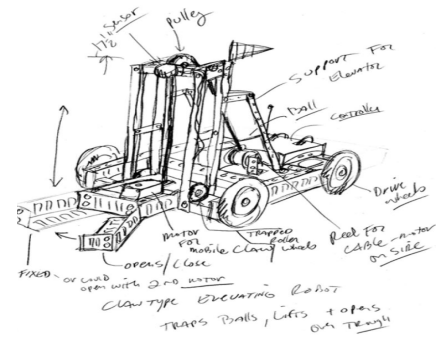
On a daily basis, spacecraft designers design various forms of spacecraft, a few of which are shown above. A major part of their use is data collection, as it is more important than ever. Each one of them have a different

### What relation does it have to Robotics?

Spacecraft designing and robotics are substantially similar as they both use design and construction skills. Spacecraft designers design spacecraft, such as rockets and rovers, on a daily basis. These spacecraft have very complicated designs and are extensively tested before they can be put to use. Although Vex robotics may not be as complicated to design or build, they too require these concepts. Afterwards, the designs that spacecraft designers develop are put towards achieving certain goals, for example, creating a rover



that can land on Mars and collect material samples. This is also similar to vex robotics, as we design are built to play the game “Rise Above.” The robotics that we are competing in today is preparing us for potential future careers, as we are learning many of the same skills and applying them to reach similar goals. In addition, research shows that robotics students are much more likely to do a STEM career in the future (NASA 2020). This shows as math, science, and technology are becoming more widely used, students who have an early exposure to them are becoming more aware of the STEM opportunities that lie before them. In addition, robotics students are also learning general skills such as teamwork, collaboration, and problem solving, which are also very important in today’s constantly evolving world (stem.org 2020).



## Work & Work Environment

Spacecraft designers use sophisticated software development tools to design various forms of spacecraft (like CAD, Ansys, and more). This includes coordinating and manufacturing spacecraft or just certain parts required for them. They moreover have to analyze design plans and proposals, to determine whether they are logical or not. This isn't as simple as it sounds, however, as it

requires lots of analysis and testing. Their



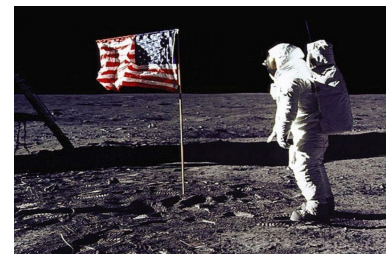
general work environment is in design and manufacturing facilities, where many designs are created and tested for quality control. With modern software and equipment, many are not required to stay within the facility at all times. This is because a large part of it is becoming computerized, and softwares such as CAD (computer aided design) are becoming more popular. In addition, they work in many large and small and large overlapping teams, working towards a specific

goal. Overall, spacecraft designers use teamwork, design, and construction skills to build many of the spacecraft that are in space today.



## History & Impact on STEM

Spacecraft designing is an important foundation for our discoveries and accomplishments in space, which explains the profound impact it has had on humans and STEM in general. From the early 1900s, which is the beginning of the modern spacecraft, humans have come a long way. In approximately 1903, mathematical



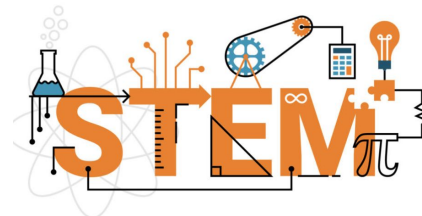
demonstrations and formulas were generated to show jet propulsion. In other words, this means liftoff from a fuel-bearing spacecraft. Many countries and governments quickly caught onto the concept, started companies, and funded them heavily. Within no time, USSR had their Sputnik rocket up in space, which was an important iteration after a few decades of just testing. The United States also joined the race and created the first satellite that made it to space, as well as being the first to send a man to the moon. In the present time, many types of spacecraft are being planned, designed, launched, and up in space right now. In addition, there is a more diverse set of companies involved in AeroSpace Engineering and Spacecraft Design today.



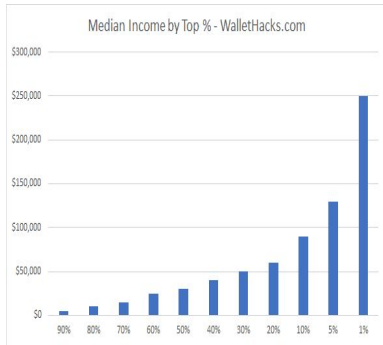
From the first theoretical representation of a rocket, to our achievements in space exploration today, Spacecraft Designers have brought the STEM field a long way. Organizations and companies like NASA are always trying to push boundaries, designing more and more sophisticated technology that helps humans do more, which would not be possible without spacecraft designers. In 1969, the Saturn V Rocket with Neil Armstrong blasted into space, and everyone remembered it as the first time man-kind went to the moon. But, the more important part of the mission was the Saturn V rocket itself. It was an incredible machine that symbolized years of designing and testing, which was done by spacecraft designers and other aerospace engineers of course. This event was just the beginning of many more achievements to come, and spacecraft designers are at the foundation of them. Many of the more recent discoveries humans have made are based on previous knowledge that they have, like all of the rocket launches that have occurred after. For aerospace engineering in general, the design of the Saturn V rocket is the previous knowledge that scientists have applied to creating more. Without spacecraft designers, they would be observing Outer Space from a glorified telescope.

## Education, Salary & Potential Workforce

In general, STEM careers are for those who have a good understanding of Science, Technology, Engineering, and Math (which is what it stands for). Aerospace engineering consists of two major branches, aeronautical engineering and astronautical engineering, but both are similar education and salary-wise. Spacecraft designers typically require a bachelor's degree in Aerospace engineering for approximately 4-5 years, as well as taking high school courses in chemistry, mathematics, and physics. Spacecraft engineers need strong analytical and critical thinking skills in order to succeed. Many colleges offer



five-year program offerings to enable students to earn both a bachelor's and a master's degree at the same time. Their primary focus is to design spacecraft, such as satellites, rockets, missiles, and orbiters. They also evaluate other engineer's designs, to make sure they meet standards in safety. Engineers who would embrace the spacecraft designing field have a passion for math and science, enjoy problem-solving, creating ideas, and working with computers. Additionally, those



who enjoy STEM activities, such as robotics, coding, and science olympiad will also like the spacecraft engineering field. On average, spacecraft designers earn around \$80k annually. This job's salary is most usually, higher, than the average salary. In addition, the future outlook is very bright, as companies like NASA continue to research beyond just our home planet. To be specific, it is said that spacecraft designing and engineering will be up 114% within the next 10 years, with an even greater increase of job opportunities, which is a result of the greater amount of companies involved in this research.

## Conclusion

Overall, spacecraft designing, a field within aerospace engineering, is important to STEM and the future of our space travel. It applies the principles of design, construction, and testing in order to design various forms of spacecraft. Many of the spacecraft they design make it to outer space, helping us discover many concepts we never thought was possible. For this reason, it fuels our reason to discover more, and has a bright future outlook for developing companies. The future of our spacecraft is going to be exciting and full of advancements, and spacecraft designers play a significant role in spacecraft engineering in all.

## **Citations**

Team 9007X

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