#### VIQC Middle School – Career Readiness Online Challenge

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#### Introduction:

In my opinion, one of the most fascinating aspects of science is space due to the endless possibilities of the unknown. Since a young age, I have been intrigued by how spacecrafts are designed, tested and built due to the differences in a vacuum compared to on Earth. These are all some of the challenges that astronautical engineers face on a daily basis. Due to my interest in space and its relevance with space travel, as it becomes closer to reality, I decided to choose the career of an astronautical engineer for this challenge.



### What is Astronautical Engineering?



Astronautical engineering is a field in engineering concerned with the development of spacecrafts, satellites and rockets. This includes optimising designs so they are precise by not only using innovative thinking but also applying laws of physics into their work. Due to the small error of margin, this particular field in STEM requires a lot of precision and resilience.

# The Design Process

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### Brainstorming and Planning

The design engineering process is fundamental to all jobs in the field of STEM as it is essential to an object's creation. In aeronautical engineering this is no different, with steps such as planning being key. However, aeronautical engineers sometimes only adapt previous designs instead of coming up with more of an original idea. This differs from the standard process of designing. Furthermore, there is more emphasis on planning, because of the high cost of failure. As a result, aeronautical engineers often spend most of their time analysing other designs and drawing blueprints of potential spacecrafts. This focus upon planning is similar in our team environment as we believe it is useful for our designs to progress. Not only is it useful, as our designs are more progressive, but it also helps us to use parts effectively so that we don't run out.



### Building the Rocket

Due to the nature of our team's budgeting, buying parts can be expensive. Hence, we try to use them effectively and where they are needed. Despite some of the similarities between our processes, there are also multiple differences. For example, in the 'building' phase of the design process, we often can test out our robot and then attempt to fix any issues. However, in the field of aeronautical engineering, it is much more expensive for companies to test and fix rockets all the time. Therefore, they prefer to use mathematical calculations more frequently. The aim of VEX VIQC's teamwork challenges is to perform well at competitions by building a good robot. Even if this means that the robot isn't completely accurate, we try to compensate instead of fixing the issue. For example, if our drive-base is not moving exactly forward when it is operated, then our drivers would compensate by operating it to move at an angle. Due to the error, the robot would move forwards. However, in a professional setting such as in aeronautical engineering, if a rocket veered off course by less than a few degrees, it could be the difference between life or death for the astronauts. Our 'makeshift solutions' might not be exact, but if it serves its purpose, we would consider it a solution even if it isn't fixing the problem, unlike in a professional setting.



Three modes of rocket flight stability are illustrated.

### How VEX VIQC prepares you for Astronautical Engineering?



Figure 6

Figure 7

#### What does VEX VIQC offer in terms of qualities?

One of the main benefits of VIQC is the number of STEM careers it prepares you for. This is no different in astronautical engineering, as VEX robotics develops many skills you will require in a workplace environment. Not only will this stand out on a CV, but also skills such as leadership, teamwork and taking responsibility are encouraged. These are all essential in the fields of STEM, but especially astronautical engineering. This is because of the small error of margin in this field, and the need to take responsibility for mistakes due to the high cost of failure. Our VIQC team has a similar setting as we need to understand what went wrong, before fixing the error.

![](_page_8_Picture_3.jpeg)

#### What does VEX VIQC offer in terms of qualities? (continued)

VIQC also develops creative thinking and building skills. Many could argue that other companies such as LEGO also do this, but they provide instructions. These instructions don't boost creative thinking nearly as much as VEX robotics. In addition, VEX robotics prepares you for a future career in astronautical engineering due to the innovation required. With a major field in astronautical engineering, becoming space travel and space settlements, innovation cultivated from VEX robotics puts VIQC competitors in a better position to successfully work in this industry.

![](_page_9_Picture_2.jpeg)

#### How can VEX VIQC help in your future careers?

For me, I believe that VIQC can be a highlight of my early STEM opportunities as I will be able to develop key transferable skills in my robotics journey. Being interested in the concept of aircrafts and flight, I believe that being part of a VIQC team has been a great experience so far, in order to pursue a career in STEM, such as in the fields of aerospace or astronautical engineering. I believe that robotics with VEX has greatly influenced my enjoyment of STEM and has encouraged me and others on my team to believe that we can pursue STEM related careers to a high level. Before competing in VEX, careers in fields such as medicine and engineering seemed daunting, but now for my team and I they seem tangible. This is because of the self-confidence that VEX robotics builds.

![](_page_10_Figure_2.jpeg)

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