



Career readiness VIQC Middle school: Aerospace engineering, NASA, and Northrop Grumman.

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## What Is The Engineering Design Process?

The engineering design process is a process that helps engineers and people in the STEM field find a solution to the problems presented to them in their specific careers. The engineering design process has many different versions, respective to their careers and what problems presented to them however the general steps of the engineering design process are as follows;

- 1. <u>Identify the problem</u>: This step is where the engineers will list out the problems that they have for their situation, generally boiling down to what you need to be successful. The main purpose of this step is to have a clear idea of what needs to be done in order to fix the problem at hand.
- 2. <u>Research and brainstorm</u>: This is when the engineers will record different ideas that they have to fix the problem. It's not necessary to put the best ideas down but instead to list all the possible solutions the engineer thinks will solve the problem. The overall goal of this is to act as a starting place for your ideas so that they can be tested and proved to be the best solution overall.
- 3. <u>Build</u>: Now it's time to build the prototype of the solution. The build stage is primarily so that you can try each of the ideas listed after the culmination of the research and brainstorm phase. The main objective is to narrow it down to just one idea and prototype so that it can be tested, improved, and eventually presented.
- 4. <u>Test</u>: this is when the idea and now prototype will be tested to see if it can solve the problem that was presented earlier. The tests should include but not be limited to; an efficiency test to prove that the prototype can work efficiently to solve the problem and a strength test in order to prove that the prototype can withstand the conditions of the weight/tension that it might be put under.
- 5. <u>Improve</u>: If the tests that were conducted prove to show flaws in the design then the engineer must go back and improve the prototype. This may result in the engineer going through the engineering design process again. Commonly, engineers will have to go through the engineering design process many times to ensure that they have the best solution to the problem. The goal is to get rid of all the flaws presented to the engineer at the testing stage.
- 6. <u>Present the solution</u>: Once the entire process is complete then the engineers must present the solution whether it be to the public or their colleagues. This is the culmination of all of the previous steps so the engineers must be very certain that their solution works. The main objective of this goal is to let the people know that the engineers have a solution to the problem.



robotics

## What is an aerospace engineer?

An Aerospace engineer is an occupation in the field of engineering and STEM concerned with the development of spacecraft and aircraft. We decided to choose this occupation, NASA and Northrop Grumman because as technology advances, this occupation will begin to be used for international space travel and is at the forefront of the development of these ideas.



## How are the ideas of the engineering design process used in aerospace engineering

The engineering design process is quite similar to the engineering design process for aerospace engineers however it is more catered toward the design of specialty and high-tech air and spacecraft. The steps are as follows:

- 1. <u>Define the problem</u>: This is the same as the basic engineering design process, a new demand has been found on the market for a particular aircraft and the engineer needs to figure out what problems he needs to solve to create the air or spacecraft.
- 2. <u>Conceptual design</u>: This stage is similar to the research and brainstorm concept, this is where most of the brain storming happens. As the design continues to be revised it will undergo many transformations in order to conform to the regulations that are desired by the purchaser. These basic functions are brought together to make the starting design of the aircraft or spacecraft which is used to discuss different possibilities with the purchaser during a conceptual design review.
- 3. <u>Preliminary design:</u> After everything has been chosen by the purchaser during the conceptual design review, the engineer must go further into the design process by figuring out whether the ideas will work or not. The engineering will calculate the requirement necessary for the space or aircraft to fly. These calculations include aerodynamics, Flight mechanics, and durability. Following these is a preliminary design review to make sure that the concept can become a reality.

- 4. <u>Detail design</u>: This is a highly complex and critical stage of the process where the main parts of the air/ spacecraft are built such as the Wing, tail, fuselage, propulsion system, landing gear, etc.
- 5. <u>Flight testing</u>: This is where the prototype will go through rigorous flight tests in order to ensure the safety of the aircraft, this can often take years to complete.
- 6. <u>Critical design review</u>: This is where the design is reviewed and small changes are needed to adjust to the needs found in the flight testing
- 7. <u>Certification</u>: Here the air/spacecraft is certified and can now be allowed into commercial airspace.



## How Will VEX Robotics prepare you for a career in aerospace engineering?

Vex robotics will prepare you for a career in aerospace engineering by incorporating ideas and core concepts of engineering while simultaneously teaching users problem-solving skills. VEX Robotics does this by using STEM and putting an emphasis on the engineering design process and many other core principles of engineering. Overall by participating in VEX robotics you can get a better understanding of designing, programming, and problem-solving while simultaneously making it fun and engaging for the learner.

