

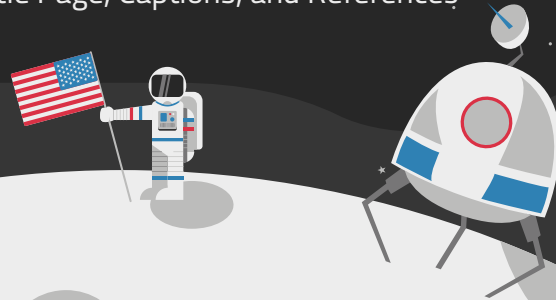
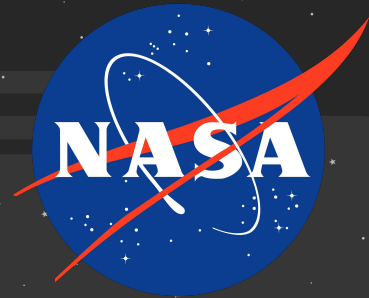
NASA's Design Process, The Space Shuttle, and How It Compares to Ours

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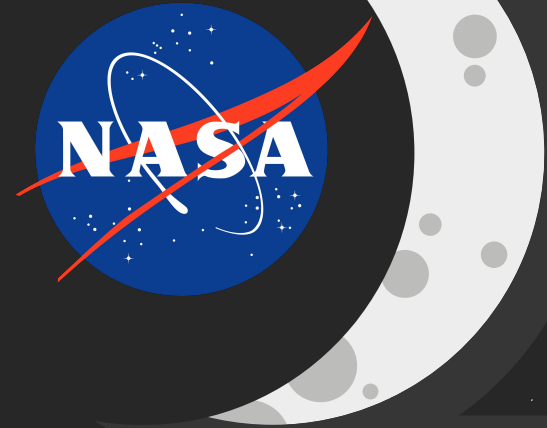
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Not Including Title Page, Captions, and References



Why NASA?

We chose NASA for this online challenge because they are one of our greatest inspirations. They have completed many incredible feats of humankind, and we are forever in awe of their accomplishments. NASA has launched many successful missions, and their research today will inspire many generations to come.

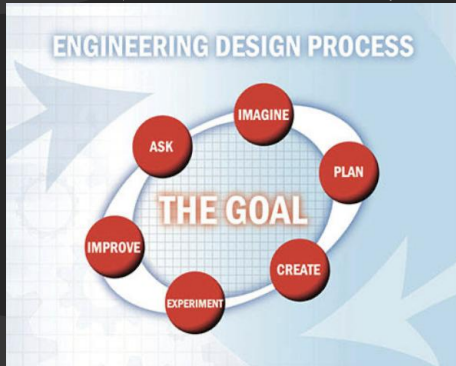




Design Process Overview

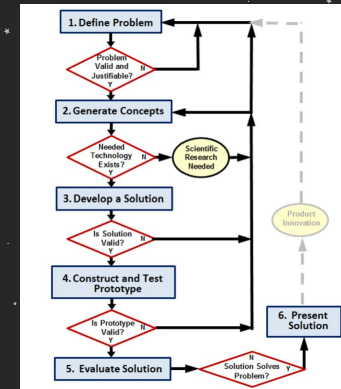


NASA



Our processes are very similar, except NASA's sixth step is to improve, while ours is to present our solution. Instead of improving, we go through our design process again if our robot needs work, and present the solution in the engineering notebook.

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Our design process includes six steps: define problem, generate concepts, develop a solution, construct and test prototype, evaluate solution, and present solution.

NASA's design process includes six steps: ask, imagine, plan, create, experiment, and improve.



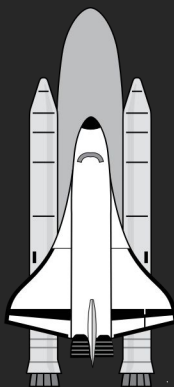
ASK



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In this step, NASA identifies the problem.

In the case of the space shuttle, their problem was that they needed a way to lower the costs of future space missions.



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This step is similar to our define problem step, where we ask the question, "What is the problem?"



IMAGINE

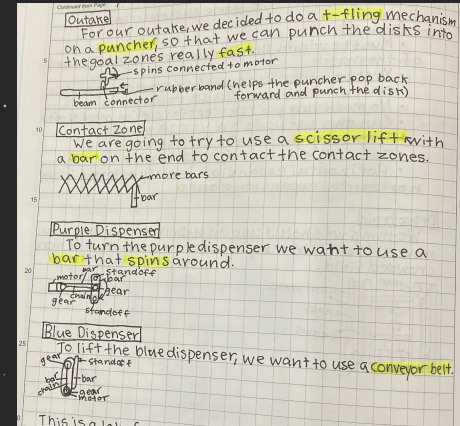


NASA

Here, NASA brainstorms solutions to prototype. When they were building the space shuttle, they conducted a study with the Air Force that concluded they needed a new vehicle to go to space, and that a partially reusable vehicle would be the most cost-effective. They then brainstormed ideas for these vehicles, such as vehicles that had expendable boosters, and two-stage vehicles where not only the orbiter was fully reusable, but also the booster.

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Similar to NASA, we brainstorm ideas in this step of our design process.





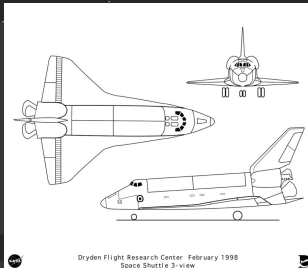
PLAN



NASA

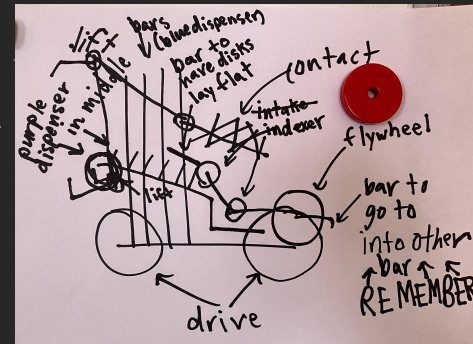
NASA sketches out a few of its best ideas and chooses one to prototype.

In the process of designing the space shuttle, NASA determined that a vehicle with a reusable orbiter and boosters was best. Next, they looked at over 29 possible designs, before deciding on one with two boosters.



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Just like NASA, next, we develop a solution and draw it out.





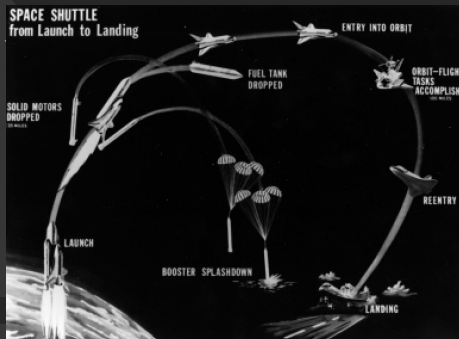
CREATE



NASA

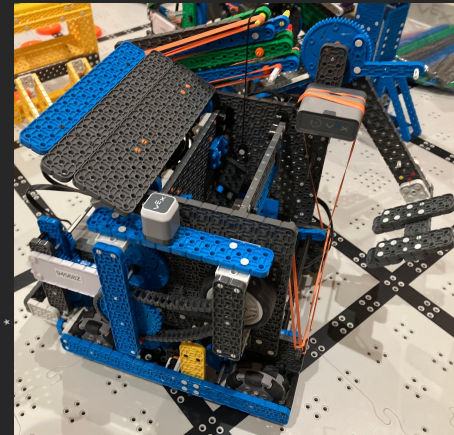
In this step, NASA builds a prototype of their chosen design that fulfills their design requirements and constraints.

When they were designing the space shuttle, NASA got their plan approved and awarded a contract to another company to build it.



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Per our design process, we build a prototype of our chosen design.





EXPERIMENT



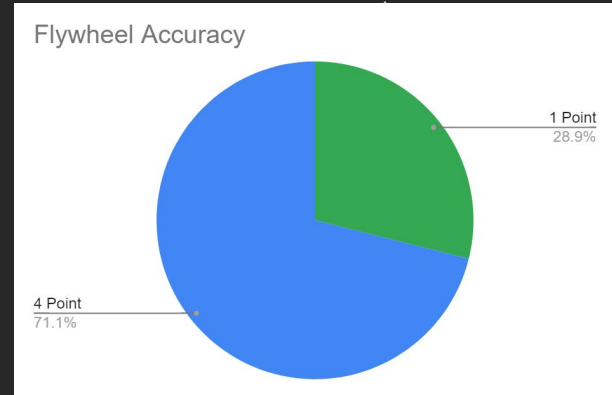
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Here, NASA tests out its design to find its strengths and weaknesses by collecting data.

In the case of the space shuttle, NASA tested its design numerous times to ensure it met all the needed criteria and would not fail.

We test and evaluate our design to make sure it meets all our criteria and doesn't have any failure points.





IMPROVE



NASA

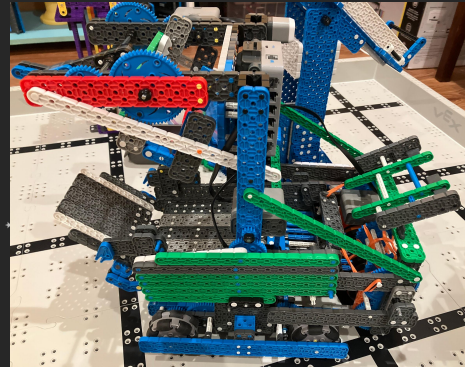
NASA uses its test results to make its design better.

With the space shuttle, they did this by making their design more reusable. To do this, they replaced their non-reusable heat shields with reusable ceramic tiles.



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If we find a big flaw during testing, instead of having a separate step in our design process to improve it, we repeat our design process to solve the issue.





PRESENT SOLUTION



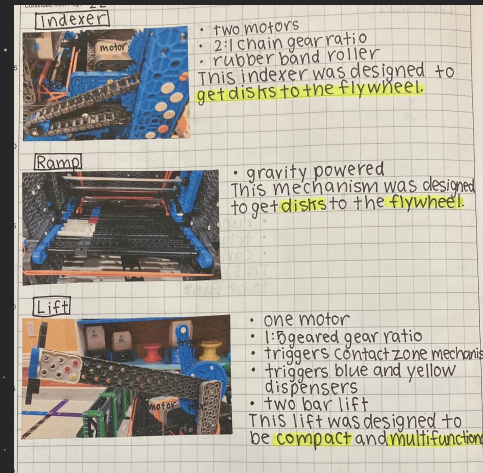
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NASA doesn't have a step in their design process to present and document their solution, but they store all of their past projects and ideas in a database.



We write our solution in the engineering notebook to document it and use it for future reference.



How Will VEX Help Us in the Future?

VEX has prepared us for a future career with NASA because it empowers us to become engineers and learn the technical skills that go along with that, such as CAD, building, documentation, teamwork, and programming. It has taught us a different way of thinking to solve problems and taught us valuable lessons about engineering. It has also taught us an effective way to use the design process, making us more thoroughly versed in it and a valuable asset to companies in the future. Doing VEX has given us hands-on experience in how engineering and the design process work in the real world, and how you can always find a solution if you just think like an engineer.



References

Website Citations

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