NAF FUTURE READY PASSPORT

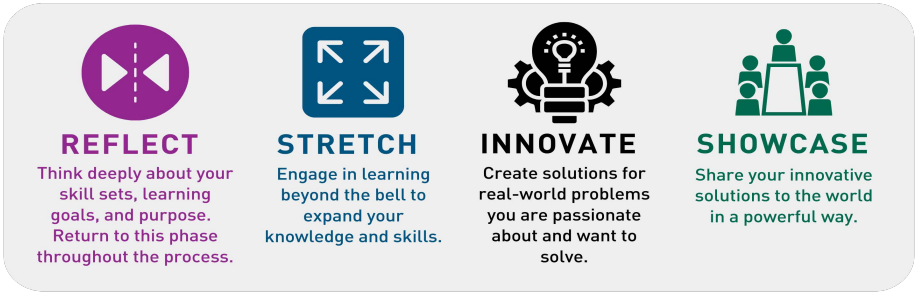
TO SPACE: AEROSPACE ENGINEERING EXPEDITION

With the creation of the sixth military branch, Space Force, and more than 100 rockets being launched into space each year, companies such as SpaceX, Blue Origin and Virgin Galactic, the future growth in the aerospace industry will be robust. If you watched any lift-offs on TV and thought you would like to be on a future flight or collaborate with NASA, then becoming an aerospace engineer may be just the ticket.

In this field, you might work on a new spacecraft that will launch a staffed crew to Mars, develop advanced space telescopes, or create living quarters for pioneers on the moon. Aerospace engineers also develop commercial airliners, military jets, and helicopters for Earth.

Introducing the Passion Project -- your chance to ask questions, research, and create! Passion Projects provide opportunities to take an intense, deep dive into a topic that interests YOU! Then, you mix your knowledge with a massive dose of creative thinking to solve a real-world problem.

In this expedition, you will learn about aerospace engineering and develop a passion project of your choosing. You will further develop your technical abilities and add to your portfolio to share with employers or for college admissions.



Feel free to refer to the For Learners guide as you navigate through this expedition.

REFLECT

Here is a peek at what your future workplace could look like in this video from Raytheon Technologies, a NAF Industry Partner.

As you reflect on the video, think deeply on these questions:

- What is about aerospace that excites you?
- What skills or traits do you possess that would help you succeed in this industry?
- Is there a company like this that you can imagine yourself working? If so, why...and what kind of products or services does it deliver?
- What about the industry are you most passionate, or what is a gap in the industry you would like to explore?

STRETCH

Dive into these resources to expand your learning in Aerospace Engineering:

CONSIDER THIS:

- What is Aerospace Engineering?
- How things fly by the Smithsonian National Air and Space Museum

TOUR NASA:

- NASA's Commercial Crew Program VR 360
- Join the Artemis Mission to the Moon

EXPLORE SPACE:

- Travel through an exploding star
- Explore the universe through these space telescopes you can control over the Internet
- See the International Space Station
- Build your own satellite

MEET SOME REAL ROCKET SCIENTISTS:

- People of NASA
- Meet these amazing female aerospace engineers
- Meet the Artemis team
- What is it like to work at NASA's Jet Propulsion Lab?

EXPLORE UNMANNED AERIAL VEHICLES (UAVs)/DRONES:

- United Nations Emergency Response
- Careers in Aerospace: UAVs
- EdX Courses in Drone Engineering
- Drone Flight Dynamics

INNOVATE

On the next two pages, there are ideas for passion projects, but let's first learn about the Engineering Design Process.

ASK

1
- What about aerospace excites you?
- About what would you like to learn more?
- What is a problem you want to solve?

IMAGINE

2
- What ideas do you have that could address a gap in aerospace engineering?
- What is an innovation that could solve a real-world problem?
- How could you collaborate with someone to brainstorm or discuss ideas?

PLAN

3
- How can you empathize with end users as you ideate?
- What strategies do you need to consider as you innovate?
- How can you map out your plan?
- What materials will you need?

CREATE

4
- How will you use prototyping in the design process?
- How can you use iteration to address potential pain points?

TEST

5
- What data are you collecting and analyzing to ensure your design works?
- Does the model or solution address the problem you are trying to solve?

IMPROVE

6
- How can you improve your design to solve the problem?
- How will you showcase your design? (See the last page for showcase ideas.)

INNOVATION

Select what you want to design from the following choices *, but be sure to use the Engineering Design Process.

DESIGN AN AIRCRAFT OF THE FUTURE

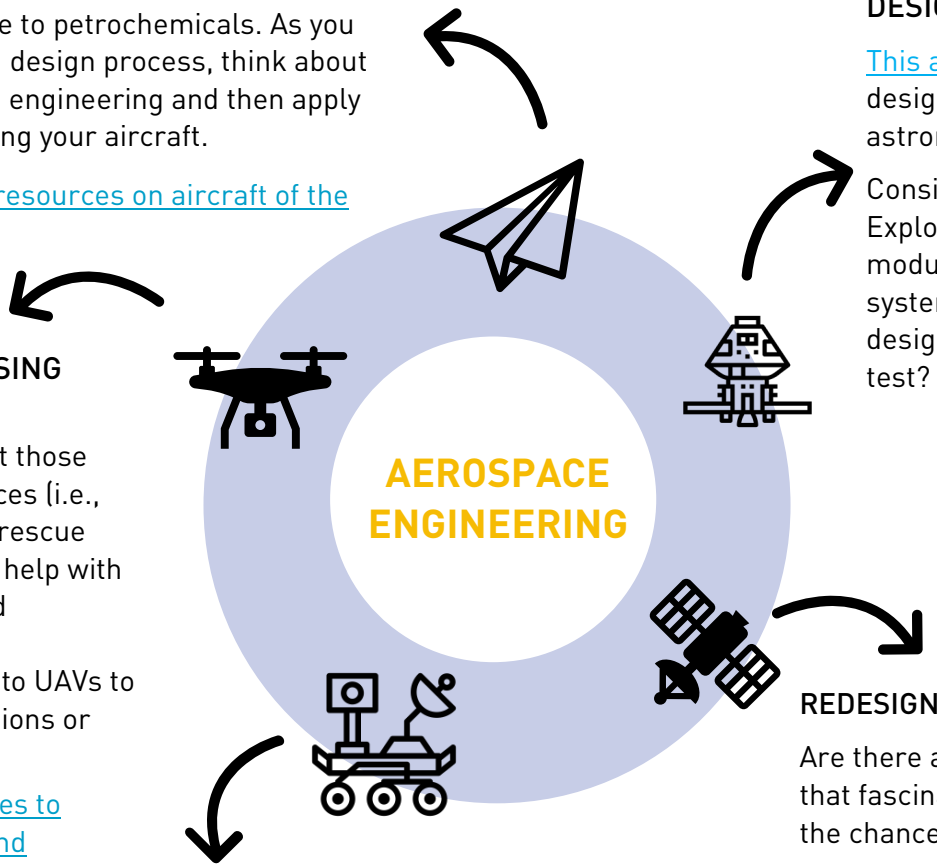
Create a sustainably powered aircraft of the future that is powered by an alternative to petrochemicals. As you go through the engineering design process, think about why sustainability is vital in engineering and then apply your learning when designing your aircraft.

Take a look at STEM.org's resources on aircraft of the future!

DESIGN A CREW MODULE

This activity from NASA encourages you to design a crew module that will secure two astronaut figures during a drop test.

Consider a more in-depth experience! Explore the math behind the Orion space module then create a model, docking system, and heat shield. Is there another design or materials you want to use and test? Go for it!



DEVELOP A RELIEF PROJECT USING UAVs (DRONES)

How can drones be used to benefit those who do not have access to resources (i.e., medicine, food, or for search and rescue efforts)? What about resources to help with natural events like hurricanes and wildfires? Develop a civilian or humanitarian project, which uses to UAVs to provide resources to remote locations or underserved communities.

Check out how UNICEF uses drones to address transport, connectivity, and emergency preparedness!

REDESIGN A SPACECRAFT OR SATELLITE

Are there any rockets, spacecrafts, or satellites that fascinate you...or is there one that, if given the chance, you would improve?

Now is your chance to take an existing design and add your engineering design touch! Use Tinkercad, SolidWorks, or any other 3D modeling software you already use to improve an existing aerospace design.

CODE A MARS LANDING

You can model the process of entry, decent, and landing (EDL) using coding language such as Python, and land a spacecraft on Mars.

Visit Cal Tech's Jet Propulsion Lab for details!

** If there is a passion project that does not fit any of these choices, that's OK! We want you to choose something that excites you!*

SHOWCASE

Showcase your passion product in one or more of these ways:

CREATE A BLOG OR WEBPAGE THAT HIGHLIGHTS THE DESIGN PROCESS OF YOUR PROJECT Wix, Google Sites, or GitHub pages	HOST AN ENGINEERING DESIGN COMPETITION AT YOUR SCHOOL	HOST AN ACTIVITY FOR LOCAL MIDDLE SCHOOL STUDENTS, AND HAVE THEM COMPLETE A SIMILAR PROJECT USING THE ENGINEERING DESIGN PROCESS
HOST AN ENGINEERING DESIGN PROCESS WORKSHOP IN YOUR SCHOOL OR COMMUNITY	SHARE YOUR PROJECT WITH A MENTOR OR LOCAL BUSINESS PARTNER	CREATE AN ONLINE PORTFOLIO TO SHARE YOUR PROJECT FOR COLLEGE ADMISSIONS OR WITH AN EMPLOYER Bulb, Equedi or Google Sites
ENTER A COMPETITION OR DESIGN CHALLENGE NASA Rover Challenge or National Space Society	CREATE A YOUTUBE VIDEO THAT DOCUMENTS YOUR PROJECT AND YOUR DESIGN PROCESS Get started Best practices	CREATE AN AR/VR EXPERIENCE WITH YOUR DESIGN AND SHARE WITH A LARGER AUDIENCE CoSpaces or Aero