INTRODUCTION

Founded by Blue Origin, Club for the Future is a nonprofit with the mission to inspire and mobilize future generations to pursue careers in STEAM (science, technology, engineering, arts, and math) for the benefit of Earth. Club and its partners are doing this through the Postcards to Space program, providing space-focused lessons and events, and activating ambassadors around the world.

This free CAD Design packet is a collection of New Shepard inspired design challenges created by our very own Blue Astronaut/ STEM teacher Aymette Medina Jorge.

Interested in more lessons and activities? Visit https://www.clubforfuture.org/lessons to find free standards aligned lessons and more!

BACKGROUND

All rockets take off; not all rockets land. Named after astronaut Alan Shepard, the first American in space, New Shepard is Blue Origin's fully reusable, suborbital rocket system built for human flight from the beginning. During the 11-minute journey, astronauts soar past the Kármán line (100 km/62 miles), the internationally recognized boundary of space, experiencing several minutes of weightlessness and witnessing life-changing views of Earth. The vehicle is fully autonomous—there are no pilots. It features a pressurized Crew Capsule with six windows, Ring & Wedge Fins for stabilization, Drag Brakes to slow descent, and the BE-3 engine for controlled ascent and landing. Aft Fins assist with stabilization and steering, and Landing Gear is deployed for touchdown. Info: BlueOrigin.com

TABLE OF CONTENTS

BOOSTER CAD DESIGN CHALLENGE

YOUR CHALLENGE

Mission: Use CAD to create a rocket booster.

CRITERIA AND CONSTRAINTS

Your mission is to design a rocket booster that can launch into space and safely return to Earth. Start with a cylindrical shape for the booster. Add the Ring and Wedge Fins near the top to keep it stable and reduce fuel use on its way back. Include the drag brakes to slow the booster down by half during its descent.

The booster must include the engine. The BE-3 (Blue Engine-3) will power your rocket into space, restart for a precise landing, and slow the booster to about 8 km/h (5 mph) just before touchdown. At the bottom, add the aft fins to keep the rocket steady during liftoff, steer it back to the landing pad on the way down, and help it glide through the air. Finally, design landing gear that can deploy for a soft, safe landing.

Your design must be created using basic shapes available only in the CAD software you are using.

ASK AND IMAGINE

Imagine what your booster could look like! Think about all the essential features it needs, and explore the shapes, colors, and fonts you could use to bring it to life.

PLAN

Create a 2D sketch of your booster! Think about the shapes you want to use for each part of your design and start planning how everything will fit together.

IMPROVE

How would you level up your design to make it flight operations team-approved?

CREATE

Bring Your Booster to Life! Use CAD software to design your booster. Explain how you built it and the techniques you used to keep parts from moving or separating by mistake.

SHARE

Show off your masterpiece and your awesome upgrades.

BOOSTER CAD DESIGN CHALLENGE

OBJECTIVES

- Demonstrate the Engineering Design Process.
- Evaluate the functionality of the design.

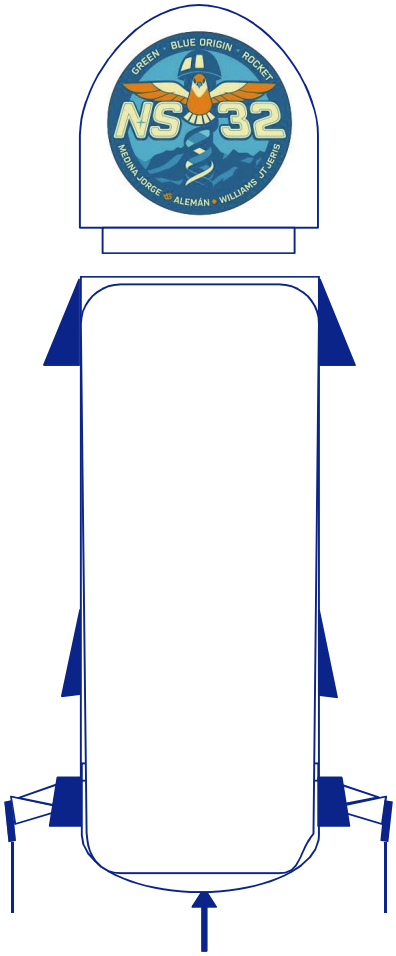
STANDARD

MS-ETS1-4 - Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

HS-ETS1-4. - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

PROCEDURE

1. Discuss the Engineering Design Process.
2. Introduce the challenge with the video "The New Shepard Design" from Blue Origin or use the picture as reference of the actual booster.
3. Explain the Student Activity Worksheet to the students.
4. Share the class code for TinkerCAD or any other CAD software with the students.
5. Allow students to work on their designs.
6. Allow time for students to complete the remainder of the Student Activity Worksheet.
7. Encourage your students to present their designs and discuss how the capsule can be improved.
8. **Bonus Mission!** If there's time, challenge students to design the crew capsule. If materials like LEGO, cardboard, or other supplies are available, encourage them to build a real-life prototype of their booster!



Aymette Medina in front of NS Booster

AEROSPACE INDUSTRY CAREERS

MANUFACTURING & TECHNICAL OPERATIONS

- Aerospace Technician
- Welder
- Crane Operator
- Quality Assurance Specialist
- Robotics Technician

FLIGHT & MISSION

- Astronaut Trainer
- Astronaut (Commercial or Government)
- Pilot (Test or Commercial)
- Flight Operations Specialist

FUTURE-FOCUSED & EMERGING

- Space Tourism Guide
- Space Habitat Designer
- Planetary Defense Specialist
- Space Lawyer

ENGINEER & TECHNICAL

- Electrical Engineer
- Mechanical Engineer
- Avionics Engineer
- Propulsion Engineer
- Structural Engineer
- Systems Engineer
- Software Engineer
- Test Engineer
- Researcher
- Aerospace Research Scientist
- Material Engineer

BUSINESS, MANAGEMENT & SUPPORT

- Program Manager
- Logistics Specialist
- Technical Writer
- Hospitality

Student name or Team name:
School or organization:
Grade:
City and State or Country:

STUDENT ACTIVITY WORKSHEET

ASK

IMAGINE

CREATE

IMPROVE

Student name or Team name:
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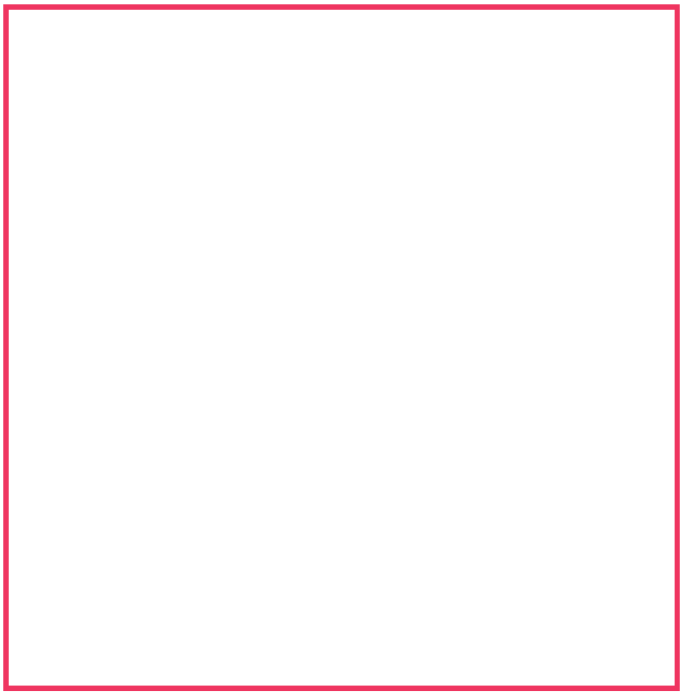
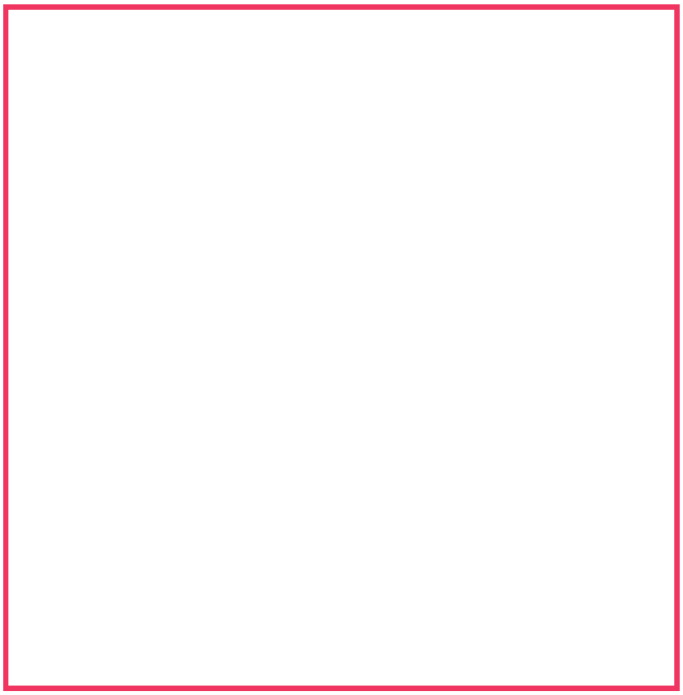
STUDENT ACTIVITY WORKSHEET

FRONT VIEW



TOP VIEW



SIDE VIEW

BACK VIEW

Student name or Team name:
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STUDENT ACTIVITY WORKSHEET

PICTURE (FINAL PRODUCT)

CRANE CAD DESIGN CHALLENGE

YOUR CHALLENGE

Mission: Use CAD to design a crane capable of lifting the crew capsule.

CRITERIA AND CONSTRAINTS

Design a crane that can lift the capsule from the ground and position it onto the transport platform for delivery to the barn. Your crane must include the following:

- Operator cabin
- Wheels
- Counterweight
- Outrigger cylinders, beam, and pads
- At least one boom
- Hoist line for each boom and joint if there are two booms
- Boom head
- Main load line
- Hook latch
- Hook

Your design must be created using basic shapes available only in the CAD software you are using.

ASK AND IMAGINE

Imagine what your crane could look like! Think about all the essential features it needs and explore the shapes and colors you could use to bring it to life.

PLAN

Create a 2D sketch of your crane! Think about the shapes you want to use for each part of your design and start planning how everything will fit together.

IMPROVE

How would you level up your design to make it recovery operations team – approved?

CREATE

Bring Your Crane to Life! Use CAD software to design your crane. Explain how you built it and the techniques you used to keep parts from moving or separating by mistake.

SHARE

Show off your masterpiece and your awesome upgrades.

CRANE CAD DESIGN CHALLENGE

OBJECTIVES

- Demonstrate the Engineering Design Process.
- Evaluate the functionality of the design.

STANDARD

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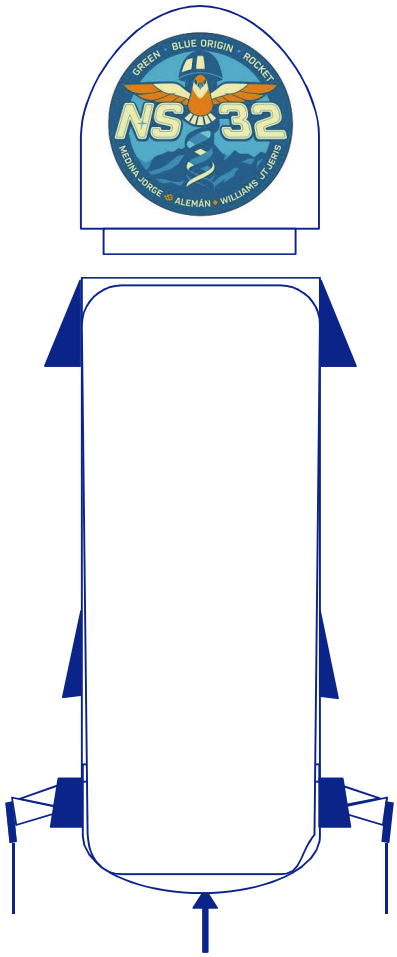

PROCEDURE

1. Discuss the Engineering Design Process.
2. Introduce the challenge with the video "The New Shepard Design" from Blue Origin or use the picture as reference of the actual crane.
3. Explain the Student Activity Worksheet to the students.
4. Share the class code for TinkerCAD or any other CAD software with the students.
5. Allow students to work on their designs.
6. Allow time for students to complete the remainder of the Student Activity Worksheet.
7. Encourage your students to present their designs and discuss how the crane can be improved.
8. **Bonus Mission!** If there's time, challenge students to design a capsule connector that can safely and securely attach to the crane's hook for lifting and transport. If materials like LEGO, cardboard, or other supplies are available, encourage them to build a real-life prototype of their crane!

Blue Origin's crane ready to lift the NS capsule.

AEROSPACE INDUSTRY CAREERS

MANUFACTURING & TECHNICAL OPERATIONS

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FLIGHT & MISSION

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- Logistics Specialist
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Student name or Team name:
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STUDENT ACTIVITY WORKSHEET

ASK

IMAGINE

CREATE

IMPROVE

Student name or Team name:
School or organization:
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City and State or Country:

STUDENT ACTIVITY WORKSHEET

FRONT VIEW

TOP VIEW

SIDE VIEW

BACK VIEW

Student name or Team name:
School or organization:
Grade:
City and State or Country:

STUDENT ACTIVITY WORKSHEET

PICTURE (FINAL PRODUCT)

CRAWLER CAD DESIGN CHALLENGE

YOUR CHALLENGE

Mission: Use CAD to create the New Shepard crawler.

CRITERIA AND CONSTRAINTS

Design a crawler platform that can attach to a truck and safely carry the New Shepard rocket!

- At the front, create a semi-circular section to cradle and support the capsule.
- In the middle, add strong poles or support structures to hold the booster securely.
- At the back, build a sturdy frame to support a square base where the bottom of the rocket rests.

The crawler platform must be integrated into the transport system. This system will include:

- A front section designed to connect securely to the truck.
- A middle section that links to the crawler platform to support the rocket structure.
- A rear section with two rows of wheels, each row having four wheels, to ensure stability and smooth movement during transport.

Your design must be created using basic shapes available only in the CAD software you are using.

ASK AND IMAGINE

Imagine what your crawler could look like! Think about all the essential features it needs and explore the shapes, colors, and fonts you could use to bring it to life.

PLAN

Create a 2D sketch of your crawler! Think about the shapes you want to use for each part of your design and start planning how everything will fit together.

IMPROVE

How would you level up your design to make it flight operations team – approved?

CREATE

Bring Your Crawler to Life! Use CAD software to design your crawler. Explain how you built it and the techniques you used to keep parts from moving or separating by mistake.

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CRAWLER CAD DESIGN CHALLENGE

OBJECTIVES

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- Evaluate the functionality of the design.

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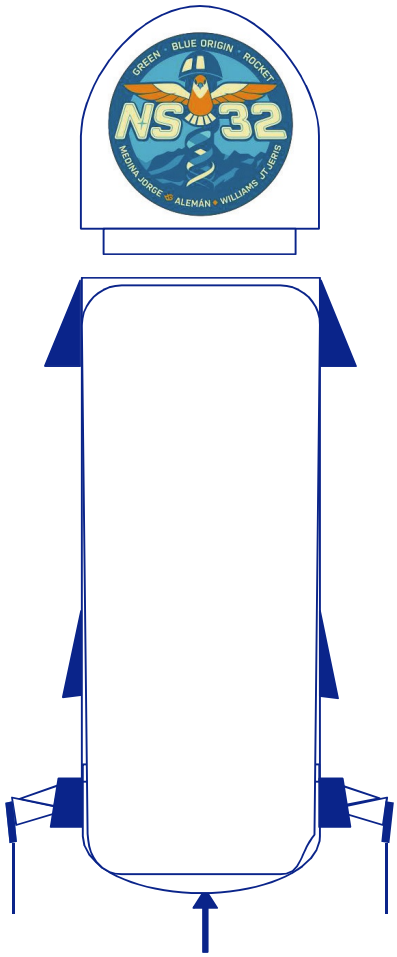

PROCEDURE

1. Discuss the Engineering Design Process.
2. Introduce the challenge with the video "Building the New Shepard Fleet" from Blue Origin or use the picture taken from the video as reference of the actual crawler.
3. Explain the Student Activity Worksheet to the students.
4. Share the class code for TinkerCAD or any other CAD software with the students.
5. Allow students to work on their designs.
6. Allow time for students to complete the remainder of the Student Activity Worksheet.
7. Encourage your students to present their designs and discuss how the crawler can be improved.
8. **Bonus Mission!** If there's time, challenge students design the truck and connect it to the crawler and/or to refine their design for a new and improved version of the crawler. If materials like LEGO, cardboard, or other supplies are available, encourage them to build a real-life prototype of their crawler!

Crawler platform holding New Shepard in the Barn

AEROSPACE INDUSTRY CAREERS

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STUDENT ACTIVITY WORKSHEET

ASK

IMAGINE

CREATE

IMPROVE

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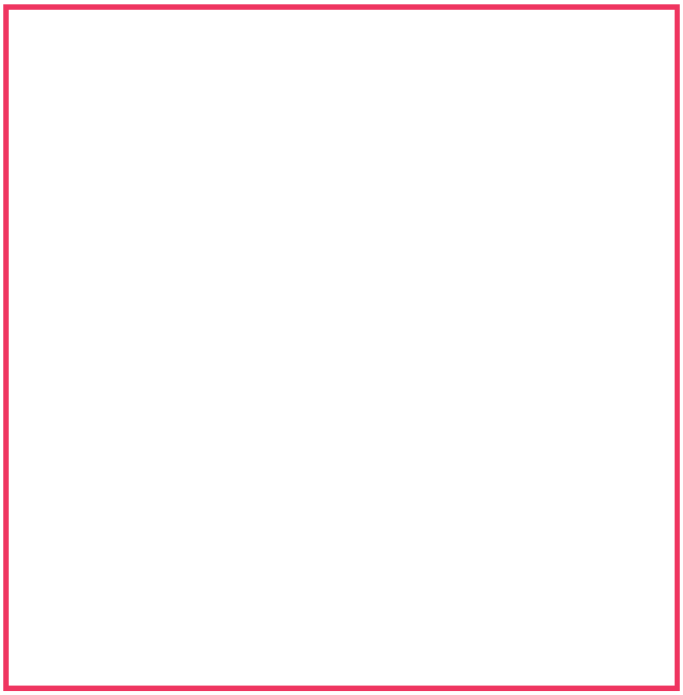
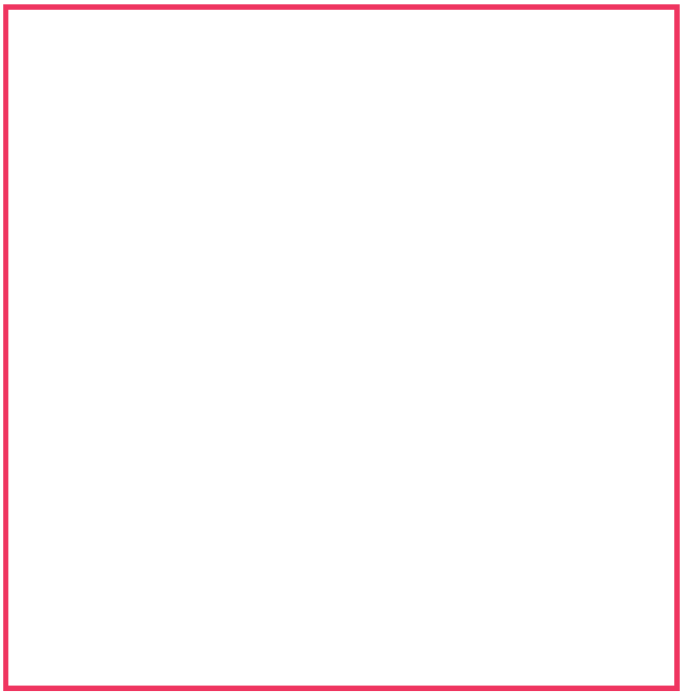
STUDENT ACTIVITY WORKSHEET

FRONT VIEW



TOP VIEW



SIDE VIEW

BACK VIEW

Student name or Team name:
School or organization:
Grade:
City and State or Country:

STUDENT ACTIVITY WORKSHEET

PICTURE (FINAL PRODUCT)

THE AIRSTREAM CAD DESIGN CHALLENGE

YOUR CHALLENGE

Mission: Design & Upgrade! Use CAD to create the astronaut's Airstream and make it even more amazing.

CRITERIA AND CONSTRAINTS

Major changes are ahead for the astronaut's space—let's dream up the ultimate design! Your mission: create the new Airstream or the astronaut's studio or apartment. It should include a bedroom with at least one window, a common area featuring a kitchenette, a closet, a couch with a coffee table, at least one window, and a bathroom with one window. You can choose whether to add the exterior details of the Airstream, such as a small balcony and a walkway connecting it to the village. Plus, here comes the fun part: add your own special feature to make the astronaut's stay in the Airstream seem even more out of this world!

Your design must be created using basic shapes available only in the CAD software you are using.

ASK AND IMAGINE

Imagine what your airstream could look like! Think about all the essential features it needs and explore the shapes, colors, and fonts you could use to bring it to life.

PLAN

Create a 2D sketch of your airstream! Think about the shapes you want to use for each part of your design and start planning how everything will fit together.

IMPROVE

How would you level up your design to make it astronaut – approved?

CREATE

Bring Your Airstream to Life! Use CAD software to design your airstream. Explain how you built it and the techniques you used to keep parts from moving or separating by mistake.

SHARE

Show off your masterpiece and your awesome upgrades!

THE AIRSTREAM CAD DESIGN CHALLENGE

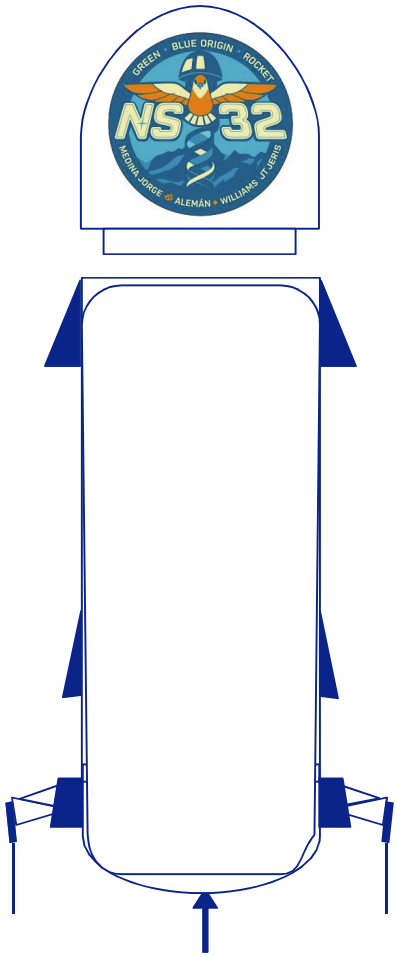
OBJECTIVES

- Demonstrate the Engineering Design Process.
- Evaluate the functionality of the design.

STANDARD

MS-ETS1-4 - Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

HS-ETS1-4. - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.



PROCEDURE

1. Discuss the Engineering Design Process.
2. Introduce the challenge with the video "New Shepard Astronaut Experience" from Blue Origin or use the picture taken from the video as reference of the actual Airstream.
3. Explain the Student Activity Worksheet to the students.
4. Share the class code for TinkerCAD or any other CAD software with the students.
5. Allow students to work on their designs.
6. Allow time for students to complete the remainder of the Student Activity Worksheet.
7. Encourage your students to present their designs and discuss how the Airstream can be improved.
8. **Bonus Mission!** If there's time, challenge students to refine their design for a new and improved version of the Airstream. If materials like LEGO, cardboard, or other supplies are available, encourage them to build a real-life prototype of their Airstream!

Crawler platform holding New Shepard in the Barn

ASTRONAUT VILLAGE JOBS

CIVIL ENGINEER
Plans and builds structures that can withstand extreme conditions

ENVIRONMENTAL ENGINEER
Ensures clean water, air, and waste systems for the village

ELECTRICS SPECIALIST
Coordinates supplies, materials, and transportation to keep the village running

SYSTEMS ENGINEER
Makes sure all the pieces (housing, power, water, transport) work together perfectly

ARCHITECT
Designs astronaut-friendly living spaces that are safe and efficient

SUSTAINABLE ENERGY SPECIALIST
Designs renewable energy systems for the village (solar, wind, hybrid)

PROJECT MANAGER
Leads the building process and ensures safety in every step

PLANNING SPECIALIST
Plans daily activities, schedules, and resource use to keep the village

TECHNICIAN AND VOCATIONAL JOBS

CONSTRUCTION TECHNICIAN
Helps build and maintain the structures of the village

HVAC TECHNICIAN
Keeps air systems working so astronauts have the right temperature and oxygen

ELECTRICAL TECHNICIAN
Installs and repairs power systems, lighting, and charging stations

HEAVY EQUIPMENT OPERATOR
Runs machinery to prepare and construct the village site

PLUMBING TECHNICIAN
Ensures water and waste systems work safely and efficiently

LOGISTICS COORDINATOR
Manages supplies, vehicles, and materials to keep operations running smoothly

ENERGY SYSTEMS TECHNICIAN
Monitors and repairs solar panels, batteries, and hybrid charging stations

KITCHEN
Prepares meals for astronauts and village staff

HOUSEKEEPING STAFF
Performs cleaning and laundry services in the village

DRIVERS
Operates hybrid vehicles to transport crew, staff, and supplies

Student name or Team name:
School or organization:
Grade:
City and State or Country:

STUDENT ACTIVITY WORKSHEET

ASK

IMAGINE

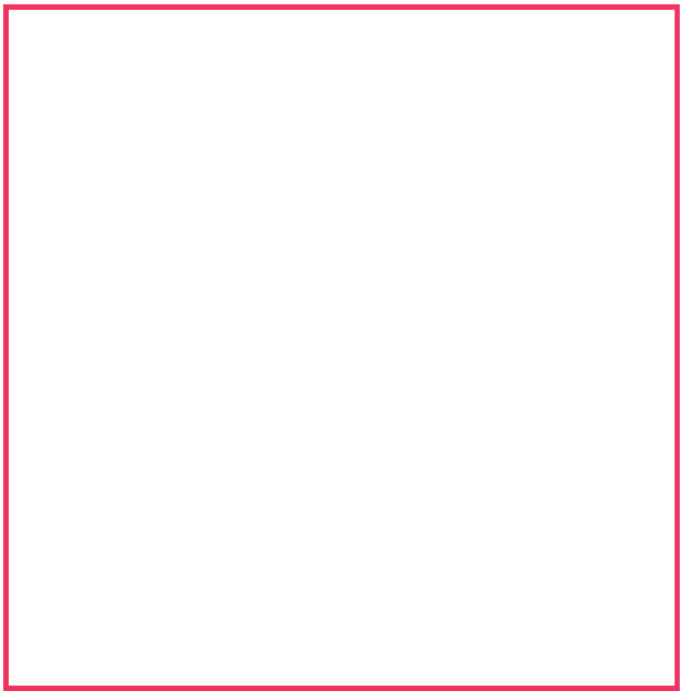
CREATE

IMPROVE

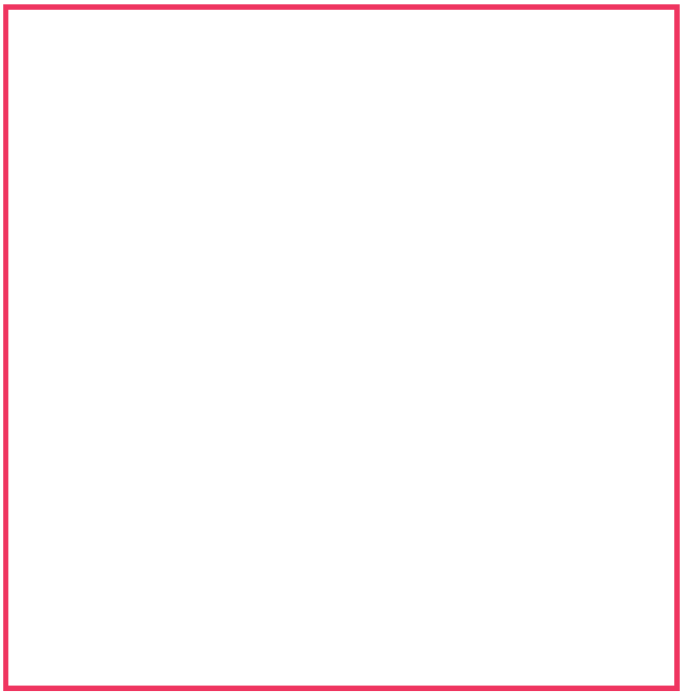
Student name or Team name:
School or organization:
Grade:
City and State or Country:

STUDENT ACTIVITY WORKSHEET

FRONT VIEW



TOP VIEW



SIDE VIEW

BACK VIEW

Student name or Team name:
School or organization:
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City and State or Country:

STUDENT ACTIVITY WORKSHEET

PICTURE OR SCREENSHOT (FINAL PRODUCT)

THE ASTRONAUT VILLAGE CAD DESIGN CHALLENGE

YOUR CHALLENGE

Mission: Design & Upgrade! Use CAD to create the astronaut village and make it even more amazing.

CRITERIA AND CONSTRAINTS

Big changes are coming to the astronaut village, let's dream up the perfect design! Your mission: create a village that includes six cozy Airstreams for the astronauts, a dining hall with a kitchen, a welcoming outdoor common area with plenty of seating, a staff building to house and support the crew, a storage building, a housekeeping hub with workspace and supplies, a secure entry gate, a charging station for hybrid vehicles to zip staff and astronauts around, a fitness center to keep everyone in top shape, and trails or walkways that connect all the buildings and Airstreams. And here's the fun part: add your own special feature to make the astronaut experience even more out of this world!

Your design must be created using basic shapes available only in the CAD software you are using.

ASK AND IMAGINE

Imagine what your astronaut village could look like! Think about all the essential features it needs and explore the shapes, colors, and fonts you could use to bring it to life.

PLAN

Create a 2D sketch of your astronaut village! Think about the shapes you want to use for each part of your design and start planning how everything will fit together.

IMPROVE

How would you level up your design to make it astronaut – approved?

CREATE

Bring Your Village to Life! Use CAD software to design your astronaut village. Explain how you built it and the techniques you used to keep parts from moving or separating by mistake.

SHARE

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THE ASTRONAUT VILLAGE CAD DESIGN CHALLENGE

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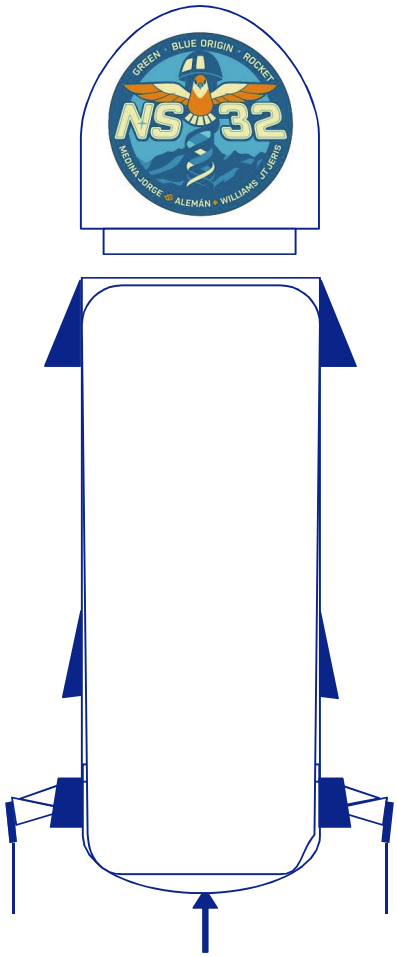

PROCEDURE

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4. Share the class code for TinkerCAD or any other CAD software with the students.
5. Allow students to work on their designs.
6. Allow time for students to complete the remainder of the Student Activity Worksheet.
7. Encourage your students to present their designs and discuss how the village can be improved.
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Astronaut Village

ASTRONAUT VILLAGE JOBS

CIVIL ENGINEER
Plans and builds structures that can withstand extreme conditions

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Ensures clean water, air, and waste systems for the village

ELECTRICAL SPECIALIST
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STUDENT ACTIVITY WORKSHEET

ASK

IMAGINE

CREATE

IMPROVE

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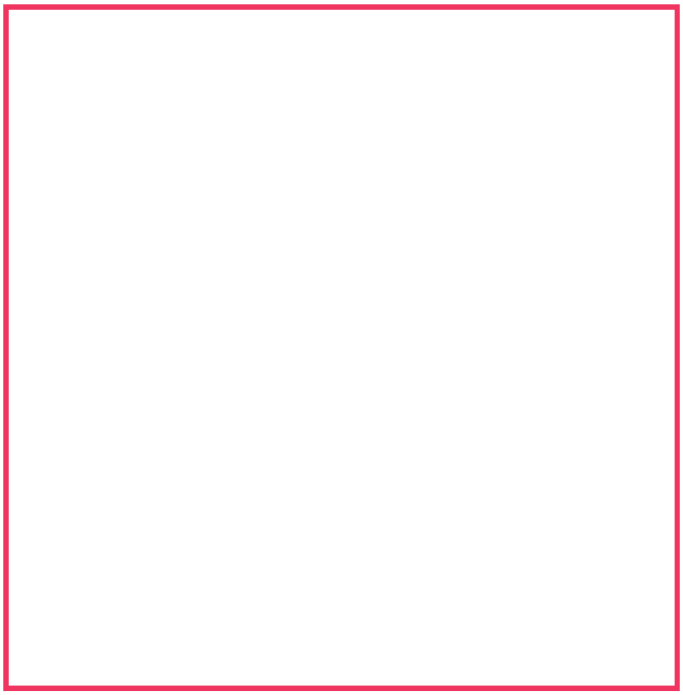
STUDENT ACTIVITY WORKSHEET

FRONT VIEW



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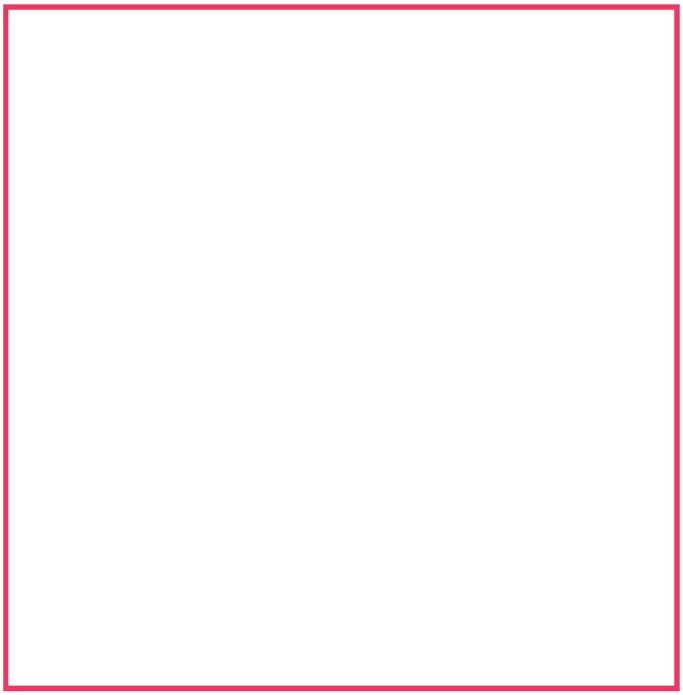

SIDE VIEW

BACK VIEW

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STUDENT ACTIVITY WORKSHEET

PICTURE OR SCREENSHOT (FINAL PRODUCT)

CREW CAPSULE EXTERIOR CAD DESIGN CHALLENGE

YOUR CHALLENGE

Mission: Use CAD to design the exterior of New Shepard's Crew Capsule.

CRITERIA AND CONSTRAINTS

Your capsule needs to have six big windows and a door, the words Blue Origin, and a feather. Other components highlighted in the exterior of the capsule are allowed to be included in the design.

Your design must be created using basic shapes available only in the CAD software you are using.

ASK AND IMAGINE

Think of ways to design the exterior of the capsule. Consider the shapes available, fonts, and size of the capsule. Select the best ideas among them.

PLAN

Create a 2D sketch of your capsule and make a list of possible shapes to create the capsule.

IMPROVE

What changes would you make to your capsule design to improve it?

CREATE

Design. Use Computer Aided Design (CAD) software to create your capsule. Describe how you built the exterior in detail.

SHARE

Share your designs and improvements!

CREW CAPSULE EXTERIOR CAD DESIGN CHALLENGE

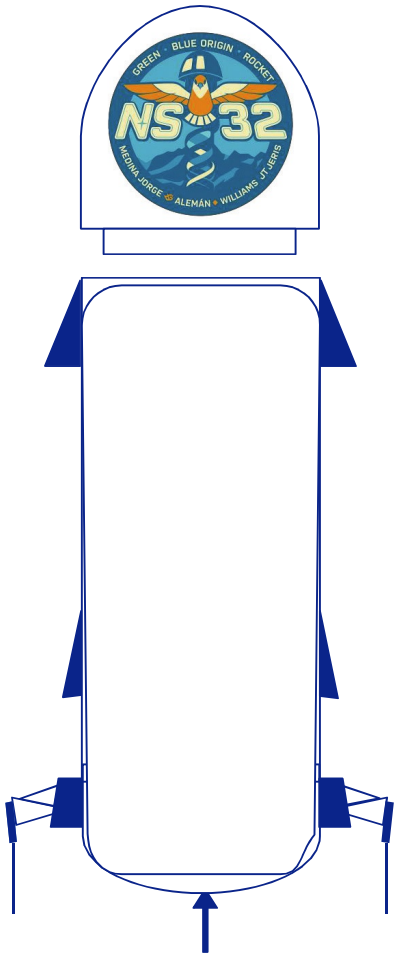
OBJECTIVES

- Demonstrate the Engineering Design Process.
- Explain how the capsule functions
- Evaluate the functionality of the design.

STANDARD

MS-ETS1-4 - Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

HS-ETS1-4. - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.



PROCEDURE

1. Discuss the Engineering Design Process.
2. Introduce the challenge with the video "Tour Blue Origin's crew capsule – Everyone gets a window seat" from Space.com.
3. Explain the Student Activity Worksheet to the students.
4. Share the class code for TinkerCAD or any other CAD software with the students.
5. Allow students to work on their designs.
6. Allow time for students to complete the remainder of the Student Activity Worksheet.
7. Encourage your students to present their designs and discuss how the capsule can be improved.
8. **Optional Extension:** If time allows, have students refine their design for another iteration of the capsule. If a 3D printer is available, encourage your students to print the design. Explain how to export, import, and slice with slicing software before print.

Exterior of the capsule.

Student name or Team name:
School or organization:
Grade:
City and State or Country:

STUDENT ACTIVITY WORKSHEET

ASK

IMAGINE

CREATE

IMPROVE

Student name or Team name:
School or organization:
Grade:
City and State or Country:

STUDENT ACTIVITY WORKSHEET

FRONT VIEW

TOP VIEW

SIDE VIEW

BACK VIEW

Student name or Team name:
School or organization:
Grade:
City and State or Country:

STUDENT ACTIVITY WORKSHEET

PICTURE OR SCREENSHOT (FINAL PRODUCT)

CREW CAPSULE INTERIOR CAD DESIGN CHALLENGE

YOUR CHALLENGE

Mission: Use CAD to design the interior of New Shepard's Crew Capsule.

CRITERIA AND CONSTRAINTS

Your capsule needs to have six reclining seats close to each window. It must be with a small personal view screen attached to the window and able to be watched from the seat. The capsule must contain handles in the top part. It must be with a crew escape system.

Your design must be created using basic shapes available only in the CAD software you are using.

ASK AND IMAGINE

Think of ways to design the interior of the capsule. Consider the shapes available, pre-designs available, and size of the capsule. Select the best ideas among them..

PLAN

Create a 2D sketch of your capsule and make a list of possible shapes to create the capsule.

IMPROVE

What changes would you make to your capsule design to improve it?

CREATE

Design. Use Computer Aided Design (CAD) software to create your capsule. Describe how you built the interior in detail.

SHARE

Share your designs and improvements!

CREW CAPSULE INTERIOR CAD DESIGN CHALLENGE

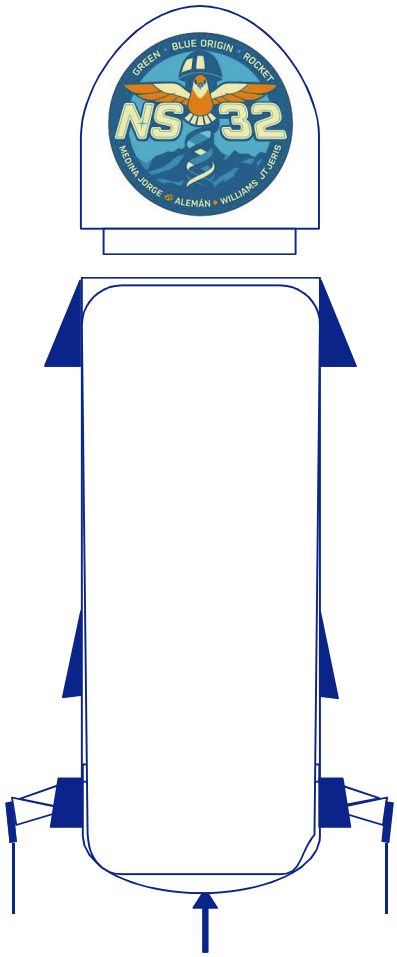
OBJECTIVES

- Demonstrate the Engineering Design Process.
- Explain how the capsule functions
- Evaluate the functionality of the design.

STANDARD

MS-ETS1-4 - Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

HS-ETS1-4. - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.



PROCEDURE

1. Discuss the Engineering Design Process.
2. Introduce the challenge with the video "Tour Blue Origin's crew capsule – Everyone gets a window seat" from Space.com.
3. Explain the Student Activity Worksheet to the students.
4. Share the class code for TinkerCAD or any other CAD software with the students.
5. Allow students to work on their designs.
6. Allow time for students to complete the remainder of the Student Activity Worksheet.
7. Encourage your students to present their designs and discuss how the capsule can be improved.
8. **Optional Extension:** If time allows, have students refine their design for another iteration of the capsule.

Interior of the New Shepard capsule.

Student name or Team name:
School or organization:
Grade:
City and State or Country:

STUDENT ACTIVITY WORKSHEET

ASK

IMAGINE

CREATE

IMPROVE

Student name or Team name:
School or organization:
Grade:
City and State or Country:

STUDENT ACTIVITY WORKSHEET

FRONT VIEW

TOP VIEW

SIDE VIEW

BACK VIEW

Student name or Team name:
School or organization:
Grade:
City and State or Country:

STUDENT ACTIVITY WORKSHEET

PICTURE OR SCREENSHOT (FINAL PRODUCT)