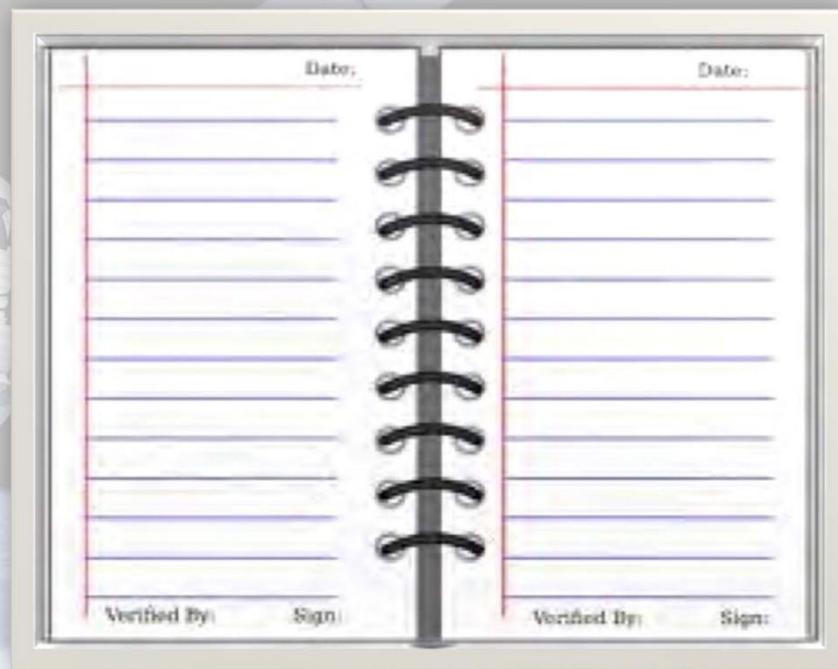


Design a Multi-Purpose Crew Vehicle Challenge



Student Team Challenge Journal

Keep your notes and drawings in here!



Design a Multi-Purpose Crew Vehicle Challenge



Engineering Design Process

The steps that scientists and engineers take to create something to solve a problem is called the Engineering Design Process.

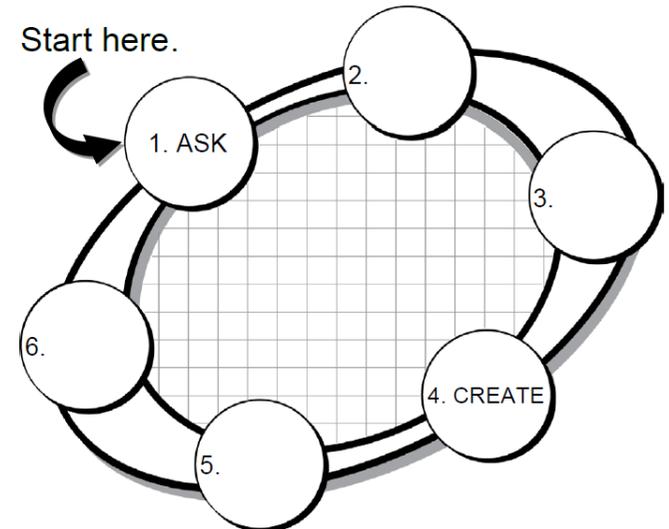
Can you figure out the order of steps?

ENGINEERING DESIGN PROCESS

The steps that scientists and engineers take to create something to solve a problem is called the **Engineering Design Process**. Can you figure out the order of steps? Starting from "Step 1: ASK", fill in the other steps.

ASK
EXPERIMENT
IMPROVE

CREATE
IMAGINE
PLAN



Design a Multi-Purpose Crew Vehicle Challenge



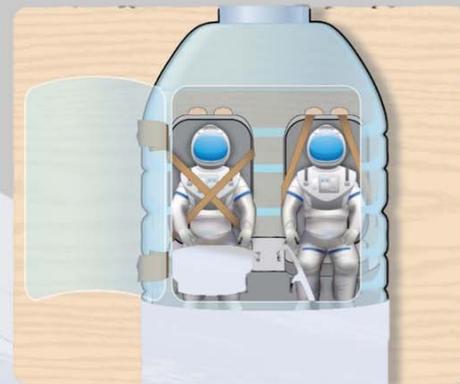
Challenge Story

NASA wants you to design and build a spacecraft.

Challenge Criteria and Constraints

Your spacecraft **must**:

1. Stay together after a one meter drop.
2. Keep two toy “astronauts” in their seats and not stop them from getting out of the spacecraft.



Design a Multi-Purpose Crew Vehicle Challenge



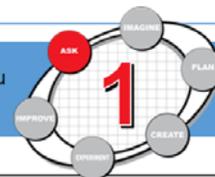
Engineering Design Process

Step 1: ASK



STEP 1: ASK

Based on the challenge story, write down what you will be doing in this challenge in the blanks below.



- I am going to build a

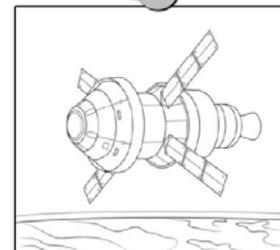
that can carry _____

astronauts.

- The spacecraft must have

_____ that can _____

- One question I need to answer to solve this problem is:



Design a Multi-Purpose Crew Vehicle Challenge



Engineering Design Process

Step 2: IMAGINE

What will your spacecraft look like?

Does it do all you need to do?



STEP 2: IMAGINE

Make a drawing of your spacecraft. Use arrows and words to label all important parts.



Use a blank sheet of paper if you need more space.

Design a Multi-Purpose Crew Vehicle Challenge



Engineering Design Process

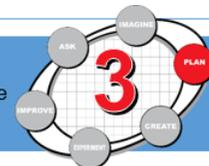
Step 3: PLAN

Work with your team to compare everyone's designs. Then combine the best parts of everyone's design and make a final team plan.



STEP 3: PLAN

As a team, share your designs to the rest of the group. After each person is done sharing, determine one thing that is the best about their design.



Team Member #1's Name:

The best part of their design:

Team Member #2's Name:

The best part of their design:

Team Member #3's Name:

The best part of their design:

Team Member 4's Name:

The best part of their design:

Now combine the best parts of everyone's design to make a final team plan. You may use a blank sheet of paper if you need more space.

Design a Multi-Purpose Crew Vehicle Challenge



Engineering Design Process

Step 4: CREATE

Build your spacecraft based on your team's plan.

Take a picture of your finished model.



STEP 4: CREATE

Build your model. What materials will you use to turn your design into a real model spacecraft?



First Team Member's Name:

What did they build?

Second Team Member's Name:

What did they build?

Third Team Member's Name:

What did they build?

Fourth Team Member's Name:

What did they build?

Take a photo of your team's model and attach it here.

Design a Multi-Purpose Crew Vehicle Challenge



Engineering Design Process

Step 5: EXPERIMENT

Now we will put our spacecraft to the test.

Does the spacecraft stay together?

Do the astronauts stay in their seats?



STEP 5: EXPERIMENT

First, answer the questions below about the completed spacecraft. Then, conduct drop tests and answer the questions about test observations.



What materials did you use?

Would you say these materials are...? (Circle one) Strong or Weak

Would you say these materials are...? (Circle one) Rigid or Flexible

Drop your model three times from a height of one meter. Record your results below.

Did the spacecraft stay together? (Circle one) Yes or No

Did the astronauts stay in their seats? (Circle one) Yes or No

What else did you observe (see, hear, or feel) during the tests?

Design a Multi-Purpose Crew Vehicle Challenge



Engineering Design Process

Step 6: IMPROVE

Did your spacecraft design work?

Do you need to fix anything?

Can you make it better?



STEP 6: IMPROVE

What could you do to make the design better?

- Should you change the material?
- Should you change how it is assembled?



Plan for improving our spacecraft:

Why we think these changes will improve the design:

Design a Multi-Purpose Crew Vehicle Challenge



Student Debriefing

What was the biggest problem your team had?

What improvements did your team make?

How did your team keep the spacecraft together?

How did your team keep the astronauts in their seats?

Was it better for your materials to be strong or weak?

Rigid or flexible?

Would you like to be an astronaut in your spacecraft?

Why or why not?



Design a Multi-Purpose Crew Vehicle Challenge

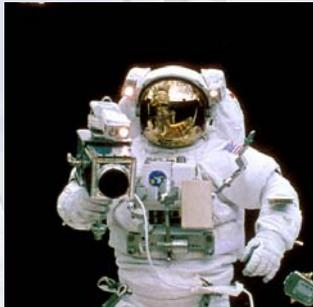


Student Presentation

Make your video using the student presentation script.

Write down what the audience needs to see (pictures, models, and videos)

Write down what you will say to the audience.



STUDENT PRESENTATION SCRIPT

Segment	Video What the viewer sees (pictures, models, videos)	Audio What you will say
Welcome	Your team Final spacecraft model	"Hello our team name is _____. We completed the _____ challenge. Our video title is _____."
ASK		
IMAGINE		
PLAN		
CREATE		
EXPERIMENT		
IMPROVE		
Wrap Up		

Design a Multi-Purpose Crew Vehicle Challenge



GREAT JOB!



This material was produced under an Interagency Agreement (IAA) between the U.S. Department of Education and the National Aeronautics and Space Administration (NASA), IAA ED-ESE-14-J-0013. The contents of this publication do not necessarily represent the policies or views of the U.S. Department of Education, nor do they imply endorsement by the U.S. Department of Education of any product, service, or enterprise mentioned herein.