# Design Packet
# for OPSPARC Missions

**Be the spark to a new NASA spinoff!**



https://opsparc.gsfc.nasa.gov/

# Thanks to our collaborators:

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# Design Process Steps

## 1. ASK

- What is the problem?
- What have others done?
- What are the criteria and constraints?
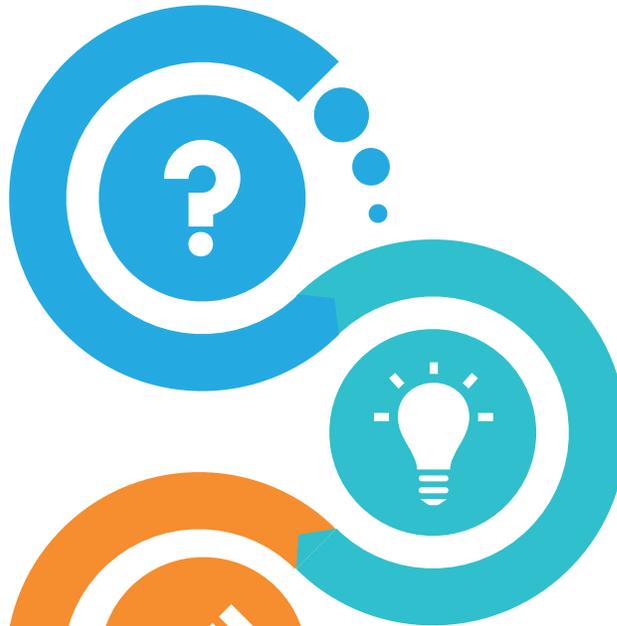
## 2. IMAGINE

- What are some solutions?
- Brainstorm ideas.
- Choose the best.

## 3. PLAN

- Make a plan or draw a diagram.
- Make a list of materials you will need.

## A. BUILD/CREATE

- Follow your plan and build it.

## 4. CREATE

## C. REFINE DESIGN

- If necessary, make changes to improve it.

## 5. SHARE

- Explain your ideas to others.

## B. TEST AND EVALUATE

- Test it out!
- Record results.

**OPSPARC Mission Scenario**
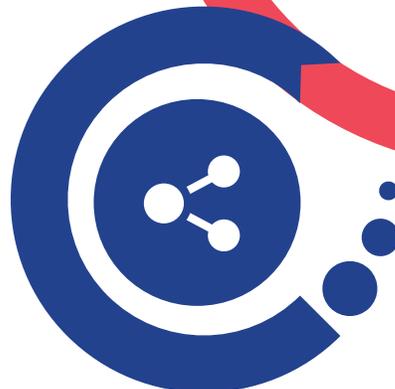
## Your Mission:

OPTIMUS PRIME wants you to search for NASA spinoff technology in your world and test your skills at changing an everyday object into something that will make your world a better place!
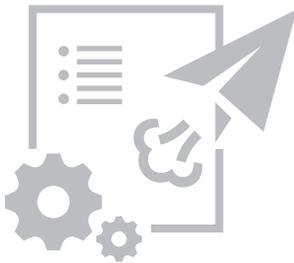
Just like an engineer, you will use an Engineering Design Process to take an everyday object and creatively use it in new ways to solve a problem.
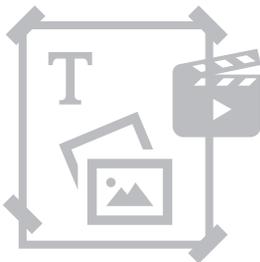
You will need to use text, images, and videos to create an Adobe Spark Page to help explain your ideas. The final product will be shared with NASA.

## TEAM BUILDING TASK

## Design Team Mission Patch

This is the Space Transportation System (STS) - 114 crew's mission patch.

Each crew member is named on this patch. Symbols on the patch honor aspects of the mission.

You and your team will use an Engineering Design Process to create your own team mission patch that symbolizes your individual strengths AND aspects of this challenge.

### ❓ ASK

What are mission patches?

What is the purpose in having a mission patch?

What must we include in my team's mission patch?

## IMAGINE

What have others included in their mission patches?

Individually, brainstorm ideas to represent your interests and talents.  Record your ideas and sketches here.

## PLAN

Share your ideas with your team.

Work to develop a rough draft of ONE mission patch.  Be sure everyone's ideas are somehow represented in the patch.

# ✂ CREATE

Create a final copy of your team's mission patch.

# ✈ IMPROVE

Does your mission patch include all required criteria?  Are there ways to improve it?

# ⤳ SHARE

Use the mission patch to introduce your team to others.  Record your introduction and description in writing, audio, or video.

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**Sp** If you and your team are happy with your mission patch and introduction/description, post this work in your Adobe Spark Page:

- An image of the team mission patch; and
- A written, audio, or video description and introduction for the team.

## TASK    NASA Spinoff Scavenger Hunt²

*Let's find out more about NASA spinoffs.*

# NASA Spinoff Scavenger Hunt[2]

NASA technology, re-designed, solves problems and improves life in your home, neighborhood and community.

## 🔍 RESEARCH - Spinoff Scavenger Hunt #1

*Task:*
- Explore spinoff resources found in the Resource Section of the website. In particular, travel through the NASA Home & City website searching for NASA Spinoffs.
- Jot down 8 - 10 spinoffs you think you may find in your home, neighborhood or community.

## 👀 SEEK - Spinoff Scavenger Hunt #2

*Task:*
- ▸ Search for these NASA Spinoffs in YOUR home, neighborhood or community.
- ▸ Capture your discoveries by photos or sketches.
  - Consider ways to PROVE that your photos were taken IN your home or community. *No images taken from the Internet.*

## ✂ DESIGN - Create a Spinoff Collage

*Task:*
- ▸ Share your findings in an image collage. Your collage must:
  - Include 8 - 10 images of spinoffs you've found in your home or community.
  - Be saved as a PDF or JPEG. You may use Adobe Spark Post or any other tool to create the PDF or JPEG.
  - Indicate how many people collaborated in this mission.

**\*\*\*Do NOT include any photos that include YOU or YOUR friends.**

**Sp** Post the collage in your Adobe Spark Page. Be sure you label the post and provide a brief explanation of what is represented in the image.

# TASK    **Engineering a New Innovation**

Choose an everyday object that may be used in a new way to make the world a better place.  Use these steps of the Engineering Design Process to create a spinoff using the object you choose.

## ? ASK

What problem will the spinoff design solve?

What everyday object will be used?

What criteria (requirements) must be followed in the design of the spinoff?

What constraints (limitations) may need to be followed?

# 💡 IMAGINE

What are some solutions? (Brainstorm ideas)

What part of my ideas may be used WITH ideas from my teammates?

# ✏️ PLAN

Make a plan and draw a diagram of your spinoff idea.

List materials needed to make a prototype.

# ✂ CREATE

Build a prototype.

# ✈ IMPROVE

Demonstrate your model to others.  Did it do what you expected?

Explain why you selected the materials for your model.  What other materials might be better?

What changes might improve the model?  Make as many improvements as possible.

## TASK    **Share the Innovation**

Create a short video (<3 minutes) to describe your spinoff to others.  Include these items in your team video:

- An explanation of the problem and why it needs to be solved.

- A description of how the spinoff works and how it will solve the problem.

- A discussion of the strengths and weaknesses of the spinoff model.

- A description of how the design has been improved from the original prototype.

- A description of what the team has learned through trial and error.

Sp  You may use Adobe Spark Video to create the video.
Once completed, be sure to post the video in your Adobe Spark Page.

Beside your video, also post:
- The problem statement; and
- A brief introduction to the video, in text.

# RUBRIC  **Elementary Level**

| NASA OPSPARC Final Product | |
| --- | --- |
| **Category** | **Score** |
| **Team Building Task:  Mission Patch (8 pts)**<br>• Image of an original mission patch.<br>• Introduction of each team member and description explaining the mission patch in text, audio, or video. | ( __ /4 )<br><br>( __ /4 ) |
| **Spinoff Scavenger Hunt[2]  (8 pts)**<br>• Collage includes 8 - 10 spinoffs<br>• The images are real (not from the Internet) | ( __ /4 )<br>( __ /4 ) |
| **Share Your Designs (20 pts)**<br>• A video (<3 min) includes these components:<br>　• The problem and why it needs to be solved.<br>　• How the spinoff invention works.<br>　• Strengths and weaknesses of the spinoff.<br>　• Ways to improve the design.<br>　• What was learned through trial and error. | <br><br>( __ /4 )<br>( __ /4 )<br>( __ /4 )<br>( __ /4 )<br>( __ /4 )<br><br>_____ /36 |
| ***Note:  Judges may award up to 8 additional points for unique and exceptional work. (__/8) | Total:  _____ /44 |

**Assessment**
4 (Excellent) = All criteria (procedures, steps, and details) are met or followed.
3 (Good) = Most criteria are met with only a few errors.
2 (Fair) = Many criteria are met, but work has significant errors.
1 (Poor) = Most criteria are not met.
0 (No effort) = No effort to meet criteria.

**Semifinalists Selected for "Live" Presentations**

Using the rubric included in this packet, three individuals or teams will be selected as semifinalists. TWO of the THREE will have the chance to work with a scientist from the Mad Science Research and Development team to design and practice a 5-minute presentation showcasing and selling their spinoff to a panel of NASA and industry partners.

If your team is selected, the Mad Science scientist will contact your coach to arrange a time to virtually meet with you and your team to begin this work.