Dynamic Design: A Collection Process

All Cracked Up

STUDENT ACTIVITY

BACKGROUND INFORMATION

After two years of collecting solar wind particles the sample return capsule (SRC), which consists of the canister containing the collector wafers and concentrator, will be captured in the air via helicopter. In the event that this does not happen as planned, the SRC has been designed to survive a land impact of 50 G. In this assessment activity, your group will use crackers to model the wafers and design a method for protecting the wafers from breaking up during impact. You will complete a drop test of their SRC and results will be compared with the drop test results of the Genesis scientists. Students will complete a written report and a presentation that includes the design process completed during the Development section of this module.

Canister restrictions :

- The canister must conform to specific outside dimensions; it may not exceed specified mass limits.
- Any materials may be used to cushion the fall and keep the wafer/frame intact, as long as basic safety rules are observed.
- The wafer/frame collection system must be contained in the canister.

PROCEDURE

1. Begin the design phase of this assignment in the PDT. The first step should be setting up your designer's notebook as you did in the activity "Enough is Enough."

2. Collect materials when you have completed the design phase. The PDT should first make a prototype canister and do some trial runs. You may modify your design before constructing the wafer/frame collectors.

3. After the PDT members are satisfied with the design, you may construct the wafer/frame collectors to be placed into the canister. Remember that the assessment for "All Cracked Up" will not be whether the wafer/frame collectors were broken, rather how the PDT would be able to communicate their design process.

4. Once you have had had adequate time to prepare your canisters, the testing phase may begin.

5. To analyze the results, consider what worked, what didn't, why and what you would do differently next time. Crackers should be analyzed and the amount of breakage should be recorded.

6. Develop a presentation to communicate the design processes and test results. It may take many forms including:

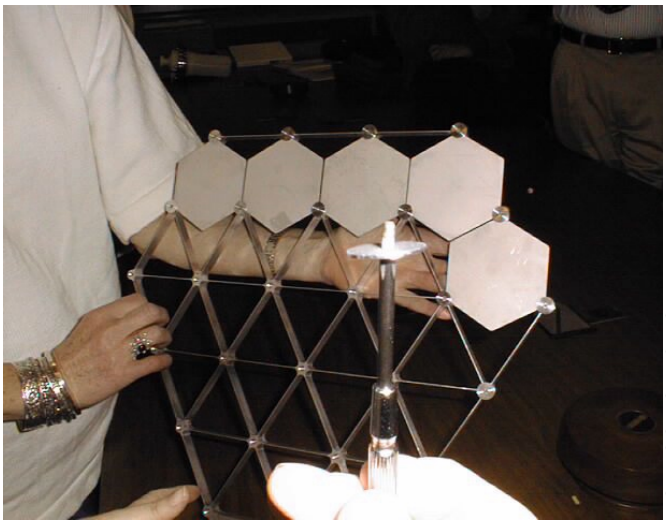
   - Video: A pre-recorded presentation showing all the steps of the design process
   - Computer: Presentation using PowerPoint or other software presentation program to show the process
   - Audio: Live presentation where students speak from note cards or a script that shows the process with visual aids.

7. The following outline shows requirements for this assessment. Your presentation should include the following components:

   Design:
   - Diagrams showing the anticipated product.
   - Diagrams should be labeled and contain measurements.
   - Diagrams may include 2D or 3D drawings or computer modeling.
   - Properties of materials should be included such as mass, durability and cost.

Production:

- Show how the wafer/frames were assembled.
- Show how the wafer/frames were put into the canister.
- Show how the assemblies were “cushioned” to prevent breakage.
- Show any changes that were made to the design during production.



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Testing:

- Describe how the prototypes were tested.
- Describe the results of the testing.
- Describe any changes that were made to the design because of testing.
- Describe the procedure for final drop test and include the results from this test.
- Describe any recommendation that might be implemented next time.

Presentation:

- Everyone in the PDT should participate.
- Everyone should speak clearly.
- Each presentation should have visuals to support the discussion.