Problem 1.5 Glider Design

Introduction

When natural disasters such as tornadoes, typhoons, hurricanes, earthquakes, and forest fires strike an area, the people impacted by the disaster often need help getting basic supplies to survive. These basic supplies may include food, water, medical supplies, and materials for creating shelter. Relief agencies around the world often work quickly to meet these needs. They send supplies in any way they can—by ships, airplanes, on foot—to reach the people in need. One example of a natural disaster occurred in the Philippines in November of 2013. Super Typhoon Yolanda, one of the strongest storms ever recorded, caused great damage to this island country. While many nations around the world sent aid on ships and by airplanes, it was difficult to reach very rural areas. Trying to get to these areas is difficult because roads have been destroyed and the areas are in the mountains where planes cannot land. Disaster relief has often been dropped from airplanes when relief workers are unable to reach the people in these remote areas.

In this module you used your skills and knowledge to design and test a glider. The design problem you will now face is to design a glider model that could be used to bring basic supplies to an area hit by a natural disaster. In this problem you will work with a team to design a glider that can carry the most cargo possible to a remote area. In solving design problems, many groups of engineers may work toward a solution. Your part of the design problem is to find a way to carry the most cargo. You will not need to solve the problem of how to drop the cargo from the glider.

Equipment

- Glider fuselage and wing parts
- Cardboard sheets
- Rubber bands
- Binder clips (small and mini)
- Paper clips
- String
- Launch pad for gliders
- iPad® tablet

Procedure

1. Work with your team to design, sketch, and build a model of a glider that can deliver the greatest amount of basic supplies to a remote area facing a natural disaster. Your group will decide how to carry the cargo, but you will not design a way to drop the supplies to the ground. Follow these criteria and constraints for your design:

Criteria	Constraints

Criteria are guidelines or rules for your design.	Constraints are limitations or restrictions on your design.
• The group will design a wing and horizontal stabilizer based on results of testing in the glider activity. • Binder clips representing boxes of basic supplies must be attached to the glider in some way. • You may use the materials made available by your teacher for your design. • You must transport as much cargo (binder clips) as possible a minimum distance as determined by your teacher.	• Your teacher will determine the amount of time you have to design, sketch, and build your glider model. • The glider's fuselage must be the model provided in the glider project.

2. **Ask**
    a. Respond to the following questions in your Launch Log:
        - What is the need or want that we are trying to fulfill?
        - What will make the design solution successful?
    b. List the criteria and constraints for the design problem in the Ask section of the Launch Log.
    c. Follow your teacher's directions to complete the self-assessment at the end of the Ask section.
3. **Explore**
    a. Write or sketch in the Explore section of your Launch Log how others have tried to solve a similar problem.
    b. You may use the skills and knowledge your team gained from the activities and project in this module as well as any outside information you have to help your group design the best solution.
    c. Brainstorm several ideas that may solve the problem. Create sketches of your ideas in the Explore section.
    d. Talk to your team and share ideas. Add any additional ideas by writing or sketching in your Launch Log.
    e. Follow your teacher's directions to complete the self-assessment at the end of the Explore section.
4. **Model**
    a. In this step you will compare the solutions that your team generated during the Explore step.
    b. Work collaboratively to choose the best idea for your model.
    c. Follow your teacher's directions to build a model of your design.

d. Document your model by sketching the final design or taking photographs with your iPad® tablet before you begin testing.

e. Follow your teacher's directions to complete the self-assessment at the end of the Model section.

5. **Evaluate**

   a. Follow your teacher's directions to conduct a fair test to determine how well your model solves the design problem:

      - Create a chart to record the results of three trials.
      - Conduct three trials.
      - Use the tablet camera to videotape the trials.
      - Record the results of your test in your Launch Log.
      - Discuss the results of the trials with your team to determine if your model was able to successfully complete the task.
      - Follow your teacher's directions to complete the self-assessment at the end of the Evaluate section.

6. **Explain**

   a. Present your design, evaluation, and suggestions for improvement for your glider model. You may use iPad applications in your presentation.

   b. Complete the Explain section of your Launch Log by evaluating how the glider solved (or didn't solve) the problem. Include the data you collected to support your conclusions.

   c. Follow your teacher's directions to complete the self-assessment at the end of the Explain section.

Conclusion Questions

1. Was your glider model able to successfully solve the problem of carrying cargo? Support your answer with the evidence you recorded in your Launch Log.

2. List two changes you would make to improve the design. Why do you think these changes would improve your glider?

3. In this problem you designed a glider to carry cargo to a remote area. What ideas do you have for designing a way to drop the cargo into the remote area? Sketch or explain your design.