**Project 1.2.13 Glider Design: Flight Data**

Introduction

When designing an aircraft or other vehicle for flight, aerospace engineers must test their designs, gather data, analyze the data, and then determine what revisions must be done to the design in order to enhance the design and improve performance.

In this project, you will begin to test your glider and analyze what the data are telling you. Based on the information, you will then determine what revisions you will need to do to your project.

Equipment

* Engineering notebook
* AERY Glider Design Software printout of plans for your custom glider design
* Wood to Construct Glider
* Glue
* Modeling Clay
* Glider Catapult
* Measuring Tape
* Stopwatch
* Project 1.2.14b Glider Design: Competitive Flights Rubric

Procedure

1. Construct a glider using the plans developed in the previous project.
2. All flight test data should be collected under the same conditions as will be experienced in the competitive flights. Use the same catapult, facility, tape measures and stopwatches, etc.
3. Prior to the first test flights, be certain to estimate the point value of your design and construction. Use the Project 1.2.14b Glider Design: Competitive Flights Rubric as a guide for assigning point values to the glider’s attributes.
4. Flight tests should include at least two trials prior to making adjustments to the glider. The exception to this rule is when a test flight results in flight characteristics that may cause irreparable harm to the glider.
5. For each test flight, record appropriate data and estimate the point value of the flight.
6. After each test flight series, make adjustments to the glider to improve flight performance.
7. Record all flight data and complete the analysis for the three competitive flights.

|  |
| --- |
| **Glider Design: Flight Data Recording Form**  |

|  |  |  |  |
| --- | --- | --- | --- |
| Team Number |  | Team Member 1 |  |
|  |  | Team Member 2 |  |
|  |  | Team Member 3 |  |

**Summary Data: Glider Design and Construction**

|  |  |  |
| --- | --- | --- |
| Aerodynamic Characteristics |   | *Enter a rubric score* |
|  | Main Wing and Stabilizer (shape, symmetry, alignment) |  |
|  | Leading and Trailing Edges (rounding, taper, straight) |  |
|  | Angles of Incidence (match to plans) |  |
|  |  | 2/3 are 4's (Bonus of 1) |  |
|  |  | 2/3 are 5's (Bonus of 2) |  |
|  |  |  |  |   |
| Appearance and Durability |  | *Enter a rubric score* |
|  | Construction (neatness, accuracy, gaps) |  |
|  | Decorations (neatness, creativity, appropriateness) |  |
|  | Durability (due to construction quality) |  |
|  |  | 2/3 are 4's (Bonus of 1) |  |
|  |  | 2/3 are 5's (Bonus of 2) |  |
|  |  |  |  |   |
|  |  | **Sub-Total:** (34 possible) |  |
|   |   |   |   |   |

**Individual Event Data: Flight Performance**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Flight | Time Aloft (seconds) | Distance (feet) | Velocity (feet/second) | Pitch Stability | Directional Stability |
|  | 1 |  |  |  |  |  |
|  | 2 |  |  |  |  |  |
|  | 3 |  |  |  |  |  |
|  | 4 |  |  |  |  |  |
|  | 5 |  |  |  |  |  |
|  | 6 |  |  |  |  |  |
|  | 7 |  |  |  |  |  |
|  | 8 |  |  |  |  |  |
|  | 9 |  |  |  |  |  |
|  | 10 |  |  |  |  |  |
|  | 11 |  |  |  |  |  |
|  | 12 |  |  |  |  |  |
|  | 13 |  |  |  |  |  |
|  | 14 |  |  |  |  |  |
|  | 15 |  |  |  |  |  |
|  | 16 |  |  |  |  |  |
|  | 17 |  |  |  |  |  |
|  | 18 |  |  |  |  |  |
|  | 19 |  |  |  |  |  |
|  | 20 |  |  |  |  |  |
|  | 21 |  |  |  |  |  |
|  | 22 |  |  |  |  |  |
|  | 23 |  |  |  |  |  |
|  | 24 |  |  |  |  |  |
|  | 25 |  |  |  |  |  |

**Competition Data: Flight Performance**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Flight Number | Distance (feet) | Pitch Stability | Directional Stability |
|  | 1 |  |  |  |
|  | 2 |  |  |  |
|  | 3 |  |  |  |
|  |  |  |  |   |
|  |  | *Ave Distance* | *Ave Pitch* | *Ave Directional* |
|  |  |  |  |  |
|  |  |  |  |   |
| Flight Characteristics |  |  | *Enter a rubric score* |
|  | Distance (Straight line, <24', 24-36', >36') |  |
|  | Pitch Stability (Uniform descent, gentle pitching, drastic) |  |
|  | Directional Stability (Straight, gentle turn, sharp curve) |  |
|  |  | 2/3 are 4's (Bonus of 1) |  |
|  |  | 2/3 are 5's (Bonus of 2) |  |
|  |  |  |  |   |
|  |  | Total Score:(17 Possible) |  |
|   |   |   |   |   |

Conclusion

1. Was the glider as stable as you expected? Why or why not might this be so?
2. What techniques did you use to “trim” the glider for straight and gently descending flight?
3. How many test flights were required to get the glider trimmed for long distance, straight-line flight? Was this expected? Why or why not?