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## **Space Plane Competition**

March 7th, 2020

J.B. Speed School of Engineering

Belknap Academic Building

**Contact Information:**

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**TO PARTICIPATE IN THE SPACE PLANE CONTEST:**

1. Start a team or participate individually
2. Register for the competition

* Go tospeedcouncil.org
* Hover over the “E-Days” tab to see the drop down
* Click on the “E-Expo” tab
* Hit the “Register” button
* Complete the google form for a “K-12 attendee”
* Complete the registration for your team, noting the amount of people participating per submission, the primary contact for each submission, and the name of the submission.

1. Design and build a Space Plane

* Guidelines for the competition is below

1. Compete!

* E-Expo will be held on **March 7, 2020 at the J.B. Speed School of Engineering**
* Teams/individuals will be notified of their assigned judging time closer to the event

*Design a spacecraft to meet the specifications listed below.*

* The design should focus on structural and flight stability along with aerodynamic efficiency.
* The design should be able to pass at least one of three test runs in which it must fulfill the requirements listed below.
* A poster explaining the research and testing process of the design and arguing the effectiveness of their design compared to other craft currently in use is also required.

### Success Criteria:

* (15 points) The space plane needs to be able to travel at least 5 meters. More points will be awarded for distances greater than 5 meters.
* (15 points) The space plane must remain in flight for at least three seconds. More points will be awarded for times greater than three seconds.
* (5 points) The space plane must be able to maintain course in inclement conditions. The design should not be blown more than 2 meters from the designated course. More points will be awarded for greater precision of the plane’s path. A small fan will be used to simulate inclement weather conditions.
* (15 points) The space plane must be able to resist the forces imparted upon it during regular flight. The space plane may not sustain enough damage during the tests to be rendered unable to perform another successful flight. More points will be awarded for designs that sustain minimal damage throughout all the test flights.

### Constraints:

* No electric motors or fuel based propulsion systems may be attached to the Space Plane.
* (10 points) Any materials available may be used to construct the space plane. More Points will be awarded to designs that utilize more dense or rigid materials. Materials can range from paper to cardboard to plastics.
* The Spaceplane must have a minimum wing area of 5 square inches, and must also fit within a 1 cubic foot.
* The space plane may be thrown by hand, but additional points will be awarded for the use of a launching mechanism based upon the complexity of the mechanism (eg. rubberband, mousetrap, bike pump, etc.).
* Each space plane must perform three test flights. Each contestant will be given three chances to fly the plane in front of the judges. The more successful flights, the better the score.

### Justification (Poster Presentation):

* (10 points) What steps were taken in developing the design of the space plane?
* (10 points) Explain why the materials used were chosen and what advantage they provide
* (10 points) What are the advantages of the design of the space plane that set it apart from others?
* (10 points) Why is the design important for the future of space travel? What effect would this design have on how space travel is carried out? Imagine the plane in another environment, on another planet, or in zero-gravity. How would the plane work then?
* Be sure to provide pictures and plenty of creativity with the poster. Contestants will be asked to tell the judges about the Space Plane using the above criteria.

Space Plane Judging Form

Judge use only

**Group/Individual Student Name:**

**Group: Elementary Middle High**

# Success Criteria:

**Distance Traveled:**

**\_\_\_\_\_\_\_ meters (two decimal places)**

**(Any plane that travels the required 5 meters will be awarded 10 points with additional points awarded relative to the longest distance traveled. Planes that do not achieve the minimum distance will receive points equal to the distance traveled multiplied by 3/2 and rounded down)**

**1 2 3 4 5 6 7 8 9 10 11 12 13 14 15**

**\_\_\_\_\_\_\_ points**

**Flight Time:**

**\_\_\_\_\_\_\_ seconds (two decimal places)**

**(Any plane that flies for the required 3 seconds will be awarded 10 points with additional points awarded relative to the longest flight time. Planes that do not meet the minimum time will receive points equal to the flight time multiplied by 5/2 and rounded rown)**

**1 2 3 4 5 6 7 8 9 10 11 12 13 14 15**

**\_\_\_\_\_\_\_ points**

**Flight Path:**

**\_\_\_\_\_\_\_ meters (two decimal places)**

**(Any plane that lands within 2 meters of the designated flight path will be awarded points equal to 2 / distance away from designated flight path, rounded down)**

**1 2 3 4 5**

**\_\_\_\_\_\_\_ points**

**Structural Stability:**

**\_\_\_\_\_\_\_ tests survived**

**(Any plane that survives all trial tests will be awarded 10 points with more points being awarded relative to the plane in seemingly the best condition. Planes to do not survive all three tests will we awarded points equal to the number of tests survived multiplied by 5/2)**

**1 2 3 4 5 6 7 8 9 10 11 12 13 14 15**

**\_\_\_\_\_\_\_ points**

# Features:

**Materials:**

**Materials used:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**(Points will be awarded by judges’ discretion, awarding more points to designs using denser or more rigid materials)**

**1 2 3 4 5 6 7 8 9 10**

**\_\_\_\_\_\_\_ points**

**Launching Mechanism:**

**Notes on Mechanism: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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**(This is an optional requirement but up to 15 points may be awarded to a design that uses a launching apparatus for their tests. This category is very broad and points are completely up to judges’ discretion)**

# Presentation:

**Design Process:**

**1 2 3 4 5 6 7 8 9 10**

**\_\_\_\_\_\_\_ points**

**Materials Justification:**

**1 2 3 4 5 6 7 8 9 10**

**\_\_\_\_\_\_\_ points**

**Advantages of Design:**

**1 2 3 4 5 6 7 8 9 10**

**\_\_\_\_\_\_\_ points**

**Future Importance of Design:**

**1 2 3 4 5 6 7 8 9 10**

**\_\_\_\_\_\_\_ points**