NATIONAL YOUTH ENGINEERING CHALLENGE

Aerospace Engineering Challenge

September 24-26, 2017
Tippecanoe County Fairgrounds, Lafayette, IN

To the Space and Beyond!

Can you imagine what the world would be like today if aerospace pioneers like George Cayley and Orville and Wilbur Wright had not discovered the key principles that make flight possible? If so, it would take weeks if not months to get to countries in Africa, Europe and Asia.

Although the Wright brothers may not have "technically" been engineers, they most likely used various engineering principles during their experimentation with the creation of the world's first "powered flying machine." They could not go to a catalog or the internet to get plans for the construction of their flying machine. They had to be creative and innovative. And just like today's engineers, they theorized an idea, drew plans, constructed their device and tested it, noting what went wrong. It was then back to the "design board" for changes and adaptations before starting testing again.

For the aerospace contest, you will have the same opportunity that Orville and Wilbur had to theorize a design, draw plans, construct based on your theory and plans and then test to see if your idea works. In short, you get to be an aeronautical engineer!

GOAL

To challenge 4-Hers to develop and exhibit the skills necessary to design a rocket using common everyday items found around your home.

CORE ASSUMPTIONS

1. The event must be structured such that the focus is on engineering design
2. The event must be challenge/problem-focused

CHALLENGE COMPONENTS

1. Written examination
2. Parts identification
3. Rocket evaluation
   - Pre-flight evaluation
   - Flight evaluation
   - Post-flight evaluation
   - Other

REFERENCES

- 4-H Aerospace publications, 1-4 and Helper's Guide
- Other 4-H literature
- Additional aerospace literature

SCORING

A postive scoring system will be used. Correct answers and actions will results in points being awarded .The team with the highest total score will be named the winner.

OTHER PARAMETERS

- The event will be team-based, composed of two members per team.
- Contestants must have reached their 14th but not 19th birthday as of January 1 of the current year.

Aerospace Engineering Challenge

Model Rocket Design and Construction:

General details:

- Challenge revealed on at the beginning of the event.
- Solution will be judged on functionality, user-friendliness, etc..
- The rocket, if determined safe to fly, must obtain a minimum height of 200 feet

Construction details:

- Design and construction will be conducted by team members only without any other assistance.
- Only materials provided by contest officials may be utilized.
- No outside or pre-manufactured parts (i.e. from a kit) may be used.
- All parts provided will be common items found around you home.
- An A8-3 model rocket engine will be provided. Other engines must be supplied by the design team.

Electronic devices:

- Laptops or other electronic devices capable of connecting to the internet through a WiFi connection may be used.
- Contestants must provide their own electronic device.
- Laptop computers may be used for construction information only.
- Team members may not use a laptop or other electronic device to communicate with individuals or experts.

Time limit:

- All construction and testing will be done during the designated time frame.

Materials:

Each aerospace engineering challenge team will be provided with a complete set of the following: materials. Other materials (to be determined) may be also be provided.

20 Mule Team Borax
Balsa wood dowel rods
Boric Acid Power
Card stock
Coat hangers - wire
Copy paper
Craft knife
Dixie cups
Duct tape
Elastic
Fabric
Floral wire
Foil
Garbage bags
Markers
Masking tape
Measuring cups
Newspaper
Paper clips – large
Paper clips – small
Paper dinner plates
Paper towels
Paper towel tubes
Pencils
Pipe cleaners
Plastic dinner plates
Plastic juice jugs
Plastic milk jugs
Plastic straws
Pliers
Poster board
Rubber Bands
Rubber cement
Rulers
Sandpaper
Scissors
Scotch tape
Screwdriver
String
Super glue (cyano-acrylic)
Toilet paper
Toilet paper tubes
Tooth picks
Twine
White glue (Elmers)
Wood putty

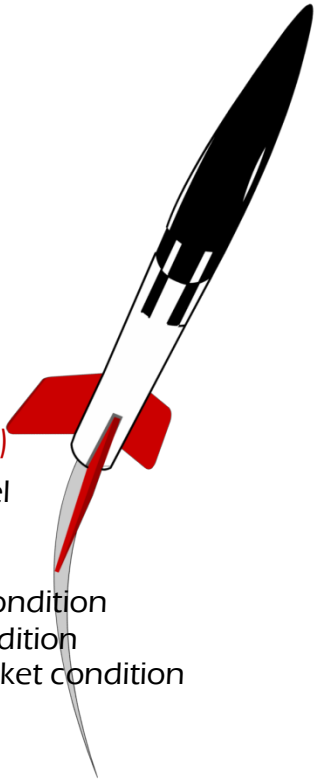
Aerospace Engineering Challenge

Written Examination:

Exam questions may encompass model rocketry, aerospace, outer space, physics, safety and other related areas. The question formats may be true/false, multiple choice, fill in the blank, and/or short essay. Essay questions are worth 20 points and all other questions are worth 10 points. Team score is the average of the individual scores.

Parts Identification:

Ten to 20 model rocket parts will be provided for identification and description of its function. Identification of each part will have a point value of FIVE (5) and description of its function will have a point value of FIVE (5). Each participant will complete the Parts ID component individually. The team score will be the average of the individual scores.



Evaluation:

The evaluative process will focuses on several components that include:

Pre-flight evaluation (maximum 30 points)

1. Use of engineering principals:
   a. Center of balance
   b. Center of pressure
2. Use of a pre-construction plan
3. Parts/components securely fastened
4. Stability

Flight evaluation (maximum 50 points)

1. Safety during the launch process
   - Stability
   - Smoothness of the flight
   - Recovery system deployment
2. Launch a minimum of 200 feet in height.
3. Functionality

Post-flight evaluation (maximum 40 points)

1. Sustainability of the model rocket post-launch
   - Fins condition
   - Recovery system condition
   - Engine mount condition
   - General overall rocket condition

Other (maximum 100 points)

1. Demonstration explaining to other participants how and why you used the components you used for your model rocket.
2. Creativity
3. User Friendliness