

Connect Tri-Cities
STEM Challenge
October 2018
Mission Support Alliance, LLC

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Section 1 – Guidelines and Background

The objective of the competition is to stimulate interest in Science, Technology, Engineering, and Math (more commonly referred to as “STEM”). The competition will allow teams to demonstrate essential problem solving skills.

The competition is among student teams, each representing a high school, to develop new concepts for solving a problem or addressing a basic need of general interest to society or of particular relevance to their state or region. Each team will be comprised of five students and a faculty coach, all selected by the participating high school. All teams will work on the same STEM problem as described in Section 2.

The competition’s prizes and awards are as follows:

- a. 1st place – \$2,000 scholarship for each student team member and \$1,000 for the faculty coach
- b. 2nd place – \$1,000 scholarship for each student team member and \$750 for the faculty coach
- c. 3rd place – \$500 scholarship for each student team member and \$500 for the faculty coach

Each team will receive \$100 for material expenses necessary to complete the challenge.

Judging and selection of challenge winners will be performed as part of the Connect Tri-Cities event that will be held in Kennewick, WA in October 2018.

Each team shall submit a written project summary, which will be provided to the competition’s judges in advance of the Connect Tri-Cities event. Requirements associated with the project summary are provided in Section 3.

At the Connect Tri-Cities event, each team will be scheduled to make a presentation of their work to the judges. The rules and competition schedule are provided in Section 4.

Using the written project summary and results of the presentation, the judges will evaluate each team’s effort according to the criteria presented in Section 5.

Section 6 includes answers to some common questions regarding this competition.

Section 2 – Problem Statement

Escape the Island.

You've retired to your dream home in paradise. Paradise in this case is an island with a volcano that has been dormant for the last 100 years. You've lived on the island for the past five years in an isolated community of 50 residents. Last week the volcano rumbled to life. Uh oh! It started with a little ground shaking but it's gotten progressively worse with fissures opening up and spewing lava across the island cutting off roads and basic utilities. With the growing dangers from the volcano (e.g., molten lava, laze, lava bombs, ash, smoke, noxious gases) you need to get yourself and the residents of your local, isolated community off the island.

In the center of your community is an unused electrical distribution tower (100 ft. high) that is still connected by high tension wires to a similar tower on the west side of the island. The electrical distribution lines are no longer in service but were never removed when the new modular nuclear reactor commenced operation on the east side of the island. The only point of exit from the island is a waiting humanitarian aid ship on the west side of the island. It will only be there for the next 3 days so you'll need to work quickly.

The map below shows an aerial view of the island with key topographical features and other items of interest.



Interesting Information.

- There are no seaworthy boats or other watercraft located on the east side of the island.
- All helicopters available on the island have been grounded and are not expected to be allowed to fly until the volcano has stopped erupting (and that isn't expected to occur for many days).

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- In the center of the island there is a large natural lake with two outlets to the ocean to the south. Many years ago, the lake became home to a large population of piranha. These are a protected species on the island.
- The prevailing winds on the island originate from the southeast.
- The southern coast of the island is mostly comprised of razor-sharp coral, basalt and other rock and mineral deposits from previous eruptions that make this potential escape path unusable.
- Of the 50 residents on the island there are three infants, several elderly residents, one visually impaired man with a service animal (German Shepard), and a paraplegic who cannot use their legs.

Challenge Outcomes:

1. Devise a way to use the abandoned electrical distribution system as a means of transport to get yourself and the other members of your community off the island and develop a 1/32 scale prototype of the transport system using 4.5 inch wooden craft popsicle sticks, plastic drinking straws, cotton string, and glue.
2. Answer these questions following the guidelines in Section 3:
 - a. What assumptions did you need to make to solve the problem?
 - b. What hazards would the residents of the island face building and using the means of transport?
 - c. How did you address those hazards? Use the following hierarchy of hazard controls to describe your response:
 - i. Elimination – Physically removing the hazard (e.g., removing the blade from the cutter to ensure that it cannot be used to cut)
 - ii. Substitution – Replace the hazard (e.g., replace a lead-based paint with a non-lead based paint)
 - iii. Engineering Controls – Adding physical barrier to prevent contact with the hazard (e.g., putting a guard over the cutting blade to prevent human contact)
 - iv. Administrative Controls – Change the rules for the way people work (e.g., procedures, training, signs and postings)
 - v. Personal Protective Equipment – Protect the worker with personal protective equipment (e.g., hard hat, safety glasses, steel-toe boots)
 - d. How did the application of Science, Technology, Engineering, and Math help you solve this problem?
 - e. What additional information would you have liked to have in solving this problem?
 - f. What are two other creative ideas your team had to evacuate the residents of your community to the other side of the island?

Section 3 – Requirements for Written Project Summary

The written project summary should conform to the following format and content requirements.

Format specifics:

1. Software – Microsoft Office Word
2. Page size – Letter (8.5” x 11”)
3. Margins – 1” top and bottom, 1.25” left and right
4. Text Alignment – Left justified
5. Font and Size – Times New Roman, 12 point
6. Line Spacing – Single
7. Document Length – 10 pages maximum, including tables, figures, and illustrations, but not including cover page

Content specifics:

Project Summary Outline	
1. Cover Page	The project summary cover page should list the project title, team members, faculty coach, and school.
2. Abstract	Provide a brief summary of the background, objective, and the desired outcome of the challenge.
3. Technical Details	This section should answer the questions posed in the problem and provide the information requested in the problem (Section 2). Describe the solution that your team developed to help the residents escape the island.
4. Team	Identify members of the team and delineate their contributions to the project. Explain how the team members worked together in terms of communication, scheduling, assignments, conflict resolution, etc.
5. Expense Report	Provide an itemized list of any materials that were purchased to support this project. Remember that the total value of procured items cannot exceed \$100.
6. References	List all sources of information (websites, books, journals, community resources, subject matter experts, etc.) that were consulted to complete the project. References shall be documented in accordance with the American Psychological Association (APA) citation and format (https://owl.english.purdue.edu/owl/section/2/10/).

Additional considerations:

1. The written project summary should be structured for readability by the judges. Each judge will have up to 15 documents to review so please try to use graphics as well as text to communicate your important messages. A well-illustrated short document is more likely to be understood than 10 pages of dense text.
2. Pay attention to syntax as well as spelling and punctuation. Minimize the passive voice and maximize the active.
3. The written project summary and team presentation should be consistent and reinforce each other. Although the written project summary will be given to the judges in advance, a team should not assume that every judge will be intimately familiar with its content during the presentation. Points considered important by the team should be emphasized during the presentation.
4. Each team's written project summary is due by 12 a.m. (midnight) on September 24, 2018. It should be transmitted electronically to Tracy_Hale@rl.gov. All summaries should be transmitted as a single file.

Section 4 – Rules and Competition Schedule for Team Presentations

When: Tuesday, October 2, 2018

Where: Three Rivers Convention Center, Kennewick, WA

Rules and Schedule:

- a. Each team will bring their presentation on a marked USB thumb drive. Teams will not be allowed to use their own laptops or other audio/visual equipment. The following equipment/software will be available in the presentation room:
 - Microsoft Windows-based computing resource (laptop or desktop)
 - Standard Microsoft Office programs (e.g., PowerPoint, MediaPlayer, etc.)
 - Adobe Acrobat/Reader
 - Projector and screen
 - Pointing device (e.g., laser pointer)
- b. Teams that plan to use video or animation in their presentation should ensure that their USB thumb drive contains the necessary software application(s).
- c. Each team will have 5 minutes to set-up their prototype, 10 minutes for their presentation, and 5 minutes for questions from the judges.
- d. The faculty coach is expected to introduce themselves and their team members at the start of the presentation. Presentations will be made by student members of the team only.
- e. Only one team is permitted in the presentation room. Teams will not be allowed to listen or observe other team's presentations. No member of a team, school representative, friend, or affiliate is allowed to hear or observe a competing team's presentation.
- f. The presentation schedule will be communicated via the website at a later date.

Section 5 – Judging Criteria

The judges will evaluate each team's efforts against the following criteria:

1. Written Project Summary (30 points total):
 - a. Format follows requirements in Section 3 (15 points)
 - b. Clarity/use of visual aids such as charts, graphs, pictures, etc. (5 points)
 - c. Demonstration of critical thinking/problem solving skills (10 points)
2. Oral Presentation (30 points total):
 - a. Organization and presentation of content (10 points)
 - b. Clarity/use of visual aids (10 points)
 - c. Staying within allotted time (5 points)
 - d. Quality of responses to questions (5 points)
3. Meeting the overall intent of the competition (40 points total)
 - a. Understanding of STEM subjects (10 points)
 - b. Innovation and creativity in addressing the competition problem (10 points)
 - c. Quality and functionality of the prototype (10 points)
 - d. Quality and persuasiveness in both the written project summary and oral presentation (10 points)

A total of 100 points is the highest possible score.

Section 6 – Common Questions

1. What are the team requirements?
 - a. The only requirements is that each team has five student members and a faculty coach from the sponsoring high school. The members can be from any grade level. The competition encourages creativity and “out of the box” thinking as well as some proficiency in STEM-related subjects. These qualities will be assessed at the team level, not at the individual level.
2. Can team membership change during the competition?
 - a. Once a team is formed, membership changes should be discouraged except in unavoidable circumstances. Each such request will be considered by the sponsoring school on a case-by-case basis.
3. Can teams use “outside” help?
 - a. Teams are encouraged to seek outside help for technical information and education, especially in the early stages of their activities, but are strongly discouraged from using such assistance to accomplish resolution of the problem. Teams shall not solicit or accept expense assistance beyond the funds provided, regardless of the form such assistance might take. Teams are on the honor system to comply with the spirit and intent of the competition, which is to encourage creative, independent thinking with a sound basis in STEM-related subjects on a level playing field.
4. Can teams ask for more information or clarification on the details of the challenge?
 - a. No. Teams should carefully consider the details of the challenge and when necessary, make assumptions to move forward. Any assumptions that the team considers important to addressing the Challenge Outcomes should be identified in the written paper and oral presentation.