Sponsored by:

GENERAL DYNAMICS
Mission Systems

Organized by:

STEAM Labs Center™
FOR K-12 RESEARCH & ENGAGEMENT
steamlabs.asu.edu
Welcome to STEAMhack, a 1-day event where teams try to accomplish what would be a really simple action in as complex a manner as possible; this is done by hacking together a deliberately complex chain-reaction machine! You and your team will have four hours to use your Science, Technology, Engineering, Art, and Math (STEAM) skills to put together a unique, elaborate machine that complete this year’s desired task. Are you up to the challenge?

What is a Chain-Reaction Machine?
A chain-reaction machine is a purposefully complex contraption that consists of a series of sequential steps, each initiating the next on its own. The steps will conclude by performing an otherwise simple task. They are often crafted from miscellaneous household items – all set in motion by a single human action.

The Task for 2018: Grow A Cactus
Your team is being tasked to build a chain-reaction machine that accomplishes the given task: “Grow a Cactus.” How you and your team use the given materials to create a chain-reaction machine to complete the task is up to you. In addition, we encourage you to design your machine to tell a story by providing a storytelling element to each step of your machine. In the end, you will have created a chronological series of storytelling elements leading up to the “Grow a Cactus” theme and goal.

Materials List

- Balloon
- Baseball
- Binder Clips
- Bouncy balls
- Car track
- Cardboard tube
- Clamp
- Clothespins
- Craft/popsicle sticks
- Cups
- Dominoes
- Dowel rods
- Drinking Straws
- Fluorescent tube guards
- Golf balls
- Ice cream scoop
- Ladle
- Marbles
- Marker
- Metal bucket
- Paper
- Paper clips
- Pencils
- Pipe cleaners
- Plastic bowls
- Popsicle sticks
- Pulley
- PVC Pipes
- Rubber bands
- Ruler
- Scissors
- Sealable bag
- Steel ball
- String
- Tape
- Tongs
- Toothpicks
- Toy cars
- Washers
- Wind-up toy
- Wood
- Zip ties

*Please note: All necessary materials will be provided the day of the event. Usage of outside materials is prohibited.*
STEAMhack Rules

1. Teams are given 4 hours to build a chain-reaction machine that achieves the given task.
2. All materials will be provided; therefore, teams are not permitted to bring outside materials.
3. Teams are expected to keep their construction within their allotted, taped-off, spaces. Additionally, contraptions are not to exceed a height of 4 feet above the provided table.
4. At the end of the allotted build time, teams will present their chain-reaction machines to a panel of judges who will come to their table.
5. During the judging phase, team members will have up to 5 minutes to:
   a. Introduce themselves and their machine
   b. Explain the steps of their machine
   c. Articulate any story or theme associated with the machine’s steps
6. The judges will then signal the team to begin their machine’s first run; each team’s machine is allotted 5 minutes to complete the given task.
7. Step 6 will be repeated two more times. In between runs, teams will be allotted 5 minutes to reset their contraptions.
8. Following the judging phase, each team will be instructed to break down their machines and clean up their area; place all the reusable parts back in the totes as they were when the event started and put any trash in the trash bins.*

* Should your team need to leave early please break down your machine and alert a volunteer or organizer.
Schedule

Sign-In
9:00 - 9:30a

Activities and Welcome Ceremony
9:30 - 10:15a

Build
10:15a - 12:15p

Lunch Break*
12:15 - 1:15p

Build
1:15 - 3:15p

Judging
3:15 - 4:30p

Awards Ceremony
4:30 - 5:00p

*Please note that STEAMhack will not be providing food for the participants. Thus, participants are responsible for providing themselves with meals, so we encourage participants to either bring their own lunches/snacks/etc. or to buy food from the nearby options on or off campus during the lunch break. The time is yours to use. You may use it to continue to build or go eat lunch. You may also come back early if you finish eating before the lunch break ends.

Information and Questions

For questions prior to the event, please contact Mr. Brandon Dunn at brandon.c.dunn@asu.edu
For questions during the event, please approach one of our volunteers or organizers; they will all be wearing brightly colored bow ties.

Volunteers, please reach out to Grady at ggaugler@asu.edu for any further questions.
### Machine Build Criteria

<table>
<thead>
<tr>
<th>Input</th>
<th>Point Total (x)</th>
<th>Weight</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total machine steps</strong></td>
<td>Total #</td>
<td>5x</td>
<td></td>
</tr>
<tr>
<td><strong>Repeated machine steps</strong></td>
<td>Total #</td>
<td>-2x</td>
<td></td>
</tr>
</tbody>
</table>

### Machine Run Criteria

<table>
<thead>
<tr>
<th>Input</th>
<th>Run 1</th>
<th>Run 2</th>
<th>Run 3</th>
<th>Point Total (x)</th>
<th>Weight</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Machine completes the task</strong></td>
<td>Yes = 1</td>
<td>No = 0</td>
<td></td>
<td></td>
<td>50x</td>
<td></td>
</tr>
<tr>
<td><strong>Boundary violations</strong></td>
<td># of</td>
<td></td>
<td></td>
<td></td>
<td>-3x</td>
<td></td>
</tr>
<tr>
<td><strong>Human interventions</strong></td>
<td># of</td>
<td></td>
<td></td>
<td></td>
<td>-2x</td>
<td></td>
</tr>
<tr>
<td><strong>Machine run time</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-x</td>
<td></td>
</tr>
<tr>
<td><strong>Machine reset time</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-x</td>
<td></td>
</tr>
</tbody>
</table>

### Teamwork Criteria

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Team member attitudes</strong></td>
<td></td>
</tr>
<tr>
<td>Scale of 1 – 10:</td>
<td></td>
</tr>
<tr>
<td>1 for least positive, 10 for the highest positivity</td>
<td></td>
</tr>
<tr>
<td><strong>Group contribution</strong></td>
<td></td>
</tr>
<tr>
<td>Scale of 1 – 10:</td>
<td></td>
</tr>
<tr>
<td>1 for no team collaboration, 10 for whole-team participation</td>
<td></td>
</tr>
<tr>
<td><strong>Encouraging/Supporting environment</strong></td>
<td></td>
</tr>
<tr>
<td>Scale of 1 – 10:</td>
<td></td>
</tr>
<tr>
<td>1 for non-supportive effort, 10 for a highly encouraging team effort</td>
<td></td>
</tr>
</tbody>
</table>

### Story/Theme Criteria

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Machine Storyline</strong></td>
<td></td>
</tr>
<tr>
<td>Scale of 1 – 10:</td>
<td></td>
</tr>
<tr>
<td>1 for lacking in detail and cohesion, 10 for detailed, well integrated</td>
<td></td>
</tr>
<tr>
<td><strong>Theme</strong></td>
<td></td>
</tr>
<tr>
<td>Scale of 1 – 10:</td>
<td></td>
</tr>
<tr>
<td>1 for minimal effort, 10 for well-defined and engaging</td>
<td></td>
</tr>
</tbody>
</table>

### Grand Total

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>