**Von Karman Challenge**

**Crash Landing on Mars Hack-a-thon**

**Rules and Schedule**

**\*\*DRAFT\*\***

**Project Challenge:**

*Help me, R2D2! {ok, so Princess Leia entreated OB1 Kenobe for help via R2D2. I’m taking poetic license here.}*

While on a routine mission to check on the mining operation on Mars, a surprise storm caused an astronaut to crash land on the surface. Her leg is broken and she can’t move. The first vessel of colonists is due to arrive in 3 weeks; she has to move before that or she’ll starve to death. Her small vessel was the only landing craft on the larger spaceship which is in orbit with the rest of her crew.

You are a part of that crew. You know that it is too dangerous for the mothership to try to land; the ship is too large and the terrain is too rocky. Plus, landing and taking off again would burn precious fuel which is needed to return home to Earth. Luckily, there is a research rover in the shuttle with the astronaut on the surface, which has a limited number of configurations. Design and program the rover to perform a series of tasks to help her return to the mothership safely.

1. Check the integrity of the shuttle by scanning the QR codes. Be sure to scan them in order, so that you know that you’re checking the entire perimeter of the hull.
   1. At least one QR code is 3’ off the ground, so you may need a longer arm to reach it.
   2. Codes will tell the rover which direction to go next.
   3. One code is in infrared.
   4. Code may tell Rover to perform an action:
      1. Ring bell.
      2. Return to base.
      3. Extinguish fire by pushing the Fire Alarm button / pulling the lever.
   5. Another code is on a dark wall, so you’ll need illumination to see it.
2. Retrieve the steel patch so that she can repair the escape pod. Aluminum will melt during re-entry and brass won’t weld properly, so be sure that you grab the steel. Patches are roughly 3” x 3” x .125”.
3. Find an object that is approximately 1” wide, .25” thick, and 5” long so that the astronaut can splint her leg.
4. Transport Martian soil from the failed crop site (garden) to the astronaut, to save it for the settlers. (Estimate 4 oz.)
5. Return to the astronaut.
6. Send a transmission to the mothership (home base) with a map of the perimeter and a message that the astronaut is well.
   1. This step can be done after the rover has left the obstacle course (after the shuttle has taken off).
   2. This time does not count toward the 10 minute limit.

After she binds her wound and welds the hull, the astronaut will thank you profusely for saving her life!

**Administrators**

This hack-a-thon is hosted by the Azusa site of Northrop Grumman Corporation. It is a collaboration between management, the Universal Maker’s Space, the Tech Underground, and the ERGs. Point of contact: Julie N. Strickland, [Julie.strickland@ngc.com](mailto:Julie.strickland@ngc.com), 626-812-1495.

**Judges**

TBD.

**Rules**

The team must start with the kit provided. **At the end of the competition, the robot will be returned to and become the property of the administrators with all attachments, parts, etc.**

1. The robot must be built with the parts provided.
   1. Additional parts may be added, but they become part of the robot that must be returned at the end of the competition.
   2. Parts may be modified.
2. Autonomous tasks required for NGC employees. Autonomous tasks will earn bonus points for high school and collegiate teams.
3. The robot must fit within the dimensions [TBD] in the stowed position. Arm, solar cells, etc. can stretch outside that dimension when deployed
4. Extra points for integrating a solar cell into the design.
5. The robot will have 10 minutes to run the course.
   1. Scan the QR codes in order.
   2. Find the splint and pick it up.
   3. Evaluate the metals and pick up the steel.
   4. Transmit the map of the QR codes to home base (the astronaut / Team Lead)
   5. Return the splint and steel patch to the astronaut.

**Scoring**

See attached rubric for judging criteria.

If teams are tied for points, the time used to complete the course will be considered.

**Details**

*Team Registration*

Teams of up to 5 people can be formed. It is encouraged to have team members of all different engineering disciplines for collaboration purposes. Teams should register for the hack-a-thon by submitting the team members’ names as well as a creative team name.

Employees will not receive a charge number for this event. This activity is voluntary and optional.

***To register: Submit your team name and team members’ names to Julie N. Strickland (***[***Julie.Strickland@ngc.com***](mailto:Julie.Strickland@ngc.com)***) with ‘Tech Expo Hack-a-thon Team’ in the subject line.***

Teams are invited from

Azusa

Palmdale

Rancho Bernardo

Space Park

Woodland Hills

Any other NGC site willing to send a team to the Midpoint Review and Competition

A maximum of 8 NGC teams and 3 high school plus 4 college teams will be accepted. Teams entered after that number have been recorded, will be added to a waiting list. If a team doesn’t meet the deadlines, their kits may be returned and allocated to the first team on the waiting list.

**Preliminary PowerPoint**

Once teams have been formed, each team will submit a preliminary PowerPoint with the team name, team members’ names, and a brief summary of their initial idea (3-5 sentences) and images to support, if desired. This idea CAN be changed later on if the team so chooses. Once these PowerPoints have been submitted and accepted, teams can pick up their box of parts or have their parts shipped to them (if they are out of town).

**Team Meetings – Academic (HS & College)**

Meeting times should be reported in advance to NGC so that representatives can attend to guide the teams as needed. Mentor(s) or coordinator will be assigned for each team.

**Progress Reports**

Progress reports will be due biweekly. One paragraph, or 5 bullet points, with the progress completed during the prior two weeks will be submitted to [Julie.Strickland@ngc.com](mailto:Julie.Strickland@ngc.com) with the subject, “Team {team name} Status Report.” Pictures are optional but encouraged.

Any team who fails to submit a progress report or fails to make significant progress within a two-week period will risk being disqualified. Reminders will be sent. If the team is unresponsive, then the administrators will request that the kit be returned. It will be reassigned to the next team on the waiting list.

**Dry Run**

There will be a midpoint review day, where all teams will present their current progress. Instructions about expectations will be forthcoming. Managers and other interested parties will be invited to attend this review. This review will allow teams to receive feedback and test their prototypes on a sample course. Note that the course will change after this review and will have more obstacles on the day of the competition.

**Feedback**

Provide ideas for how to use the rovers throughout the year. Categories include but are not limited to:

* STEM
  + Visits to schools
  + ComiCons
  + Public events
* Customer demonstrations
* Future Hack-a-thons
  + What would you like to add?
  + What additional functionality should be designed?

Specific scenarios with agendas or instructions are encouraged.

**Prizes:**

* Prizes for First Prize!
* A one-of-a-kind trophy created by Bill Gaines!
* Awards for runner’s up and academic winners.

**Schedule**

Aug 3: deadline to sign up

Aug 10, off Friday: Kick off & Hand out Box o’ Parts, Part A

Rasp Pi

Arms

Motors

Batteries

Sept 1: Box o’ Parts, Part B

Chassis, Batteries

TBD Workshop day at NGC

Aug 30 Progress Report 1 Due

Sept 14 Progress Report 2 Due

September 21 (off Friday): Midpoint Review & Dry Run

Sept 30 Progress Report 3 Due

Oct 15 Progress Report 4 Due

Oct 18 Optional Test Run

**October 19 (off Friday): Von Karman Challenge**

**Tentative Schedule, subject to change.**

\*Alternate schedule: 1st run in the morning for all teams, 2nd run after lunch

8:30 a.m. Teams must be present

8:30-9 a.m. Continental breakfast and opening remarks

8:30-9:30 a.m. Teams can visual assess the course. Vehicles can be powered on and warmed up.

9:30 a.m.-3:30 p.m. Competition

9:30 Team 1

9:50 Team 2

10:10 Check, reset the course

10:20 Team 3

10:40 Team 4

11:00 Check, reset the course

11 a.m. to 1 p.m. Lunch line is open

11:10 Team 5

11:30 Team 6

11:50 Check, reset the course

12:00 Team 7

12:20 Team 8

12:40 Check, reset the course

1:00 Team 9

1:20 Team 10

1:40 Check, reset the course

1:50 Team 11

2:00 Team 12

2:20 Check, reset the course

2:40 Team 13

3:00 Team 14

3:20 Team 15

3:00 – 3:30 Scores are tallied

3:30 Winners announced