

Space Junkies - Navigation

BACKGROUND - WHY WE NEED SPACE JUNKIES



According to NASA, “More than 500,000 pieces of debris, or “space junk,” are tracked as they orbit the Earth. They all travel at speeds up to 17,500 mph, fast enough for a relatively small piece of orbital debris to damage a satellite or a spacecraft.

The rising population of space debris increases the potential danger to all space vehicles, but especially to the International Space Station, space shuttles and other spacecraft with humans aboard.”

https://www.nasa.gov/mission_pages/station/news/orbital_debris.html

MISSION OBJECTIVE

The teams mission is to design an efficient way to clean-up space junk using a CEENBoT(s). The teams design, strategies, and skills will be tested on a course at the Nebraska Robotics Expo. The goal is to complete as many tasks as possible - the more tasks completed, the more points earned.

DESCRIPTION

The goal is to complete as many tasks as possible within five minutes.

Teams may have up to five members. Teams members can work on the tasks as they see fit. Up to two CEENBoTs will be permitted on the field. Additional BoTs will not be allowed. All BoTs, including modifications, need to fit inside the 18” X 18” X 18” start zone. The course will be inside a 20’ X 15’ area.

RULES

1. The team will have 5 minutes to complete the course.
2. The area of the playing field that is “Space” will be curtained off and team members will view the course from video camera feeds on monitors.
3. Some tasks are optional. Additional points will be assigned to some tasks completed using a claw/grabber attachment.
4. Some point objectives are only available when the right conditions are met. Look at Stage 1 task for more clarification on this rule.
5. Each piece or Space Junk placed in the “SpaceNet” will earn 1 point. An additional point will be earned for each Space Junk item that is transported to the De-orbiting Zone in the “SpaceNet.” Junk that falls out of the Net will not receive a point.

6. At the end of the time limit, if the BoT(s) are touching any part of the starting zones, additional points will be awarded per BoT.

7. If there is a tie, the team with the lesser time will win. If times are the same, one team will become Team A the other Team B. Equal number of sticks/paper labeled A and B will be placed in a "can." Ask a random person to draw a stick/paper - the letter on the stick/paper determines the winner.

8. All judges decisions are final.

Stage 1 Tasks: 2 minutes to complete

Completing the launch tasks is the main objective for Stage 1. Gathering the astronauts and moving the shuttle to the launch platform are both optional tasks. Optional points are only available while the launch tasks are NOT finished.

The time limit for stage one is 2 minutes. When the 2 minute mark has been reached points will be tallied and all other points in stage one will become unavailable. At this point the team will be able to move onto Stage 2 even without completing **Launch**. If Stage 1 is completed before the 2 minutes are up, participants can proceed Stage 2.

Launch (required) — Three buttons will be on the field. CEENBoT(s) must navigate through the passage in order to press the buttons for this task. Each button pressed is worth 1 point. While all launch buttons have not been pressed, optional points from astronauts and the shuttle are available to be earned.

Gather the Astronauts (optional points) — The Astronauts are scattered across the country. BoT(s) must drive to the Astronauts and bring them to the launch area. Each Astronaut brought to the launch area is worth 1 point. Points for Astronauts are only available if **Launch** has NOT yet been completed and 2 minutes have not elapsed.

Move Shuttle to Launch Platform (optional points) — The Shuttle may be brought to the Launch Platform by using a claw or pushing. If the Shuttle is pushed, 1 point will be awarded. If a claw is used, 2 points will be awarded. Points for the Shuttle are only available if **Launch** has NOT yet been completed and 2 minutes have not elapsed.

STAGE 1 ADDITIONAL DIRECTIONS/CLARIFICATIONS:

The only task required for this stage is **Launch**. All other points are optional. In order to move on to the next set of tasks **Launch** must be completed.

Stage 2 Tasks:

The International Space Station (ISS) has been damaged by Space Junk! The main objective for Stage 2 is **Collecting Space Junk**. **Repairing the ISS**, **Moving Space Junk**, and **Return Trip** are optional tasks. Optional points are available until the games completion.

Collecting Space Junk — Six pieces of Space Junk need to be collected. Teams must move the Space Junk into the “SpaceNet.” Each piece of Space Junk moved into the “SpaceNet” is worth 1 point. This task must be completed in order to make the **Return Trip**.

Repairing the ISS (optional points) — The ISS has been damaged by Space Junk. In order to fix the ISS, parts must be brought to the repair locations. There are two ways to earn points for this task, pushing or using the gripper (claw) to move the parts to the repair locations. Pushing the parts to the locations will earn 1 point each. Using the gripper to bring the parts to the location will earn 2 points each. Points for repairing the ISS are available until the games completion.

Moving Space Junk (optional points) — In order to truly clean up space, Space Junk needs to be destroyed. “De-orbiting” the Space Junk is one of the ways to do this. Collect as many pieces of Space Junk in the “SpaceNet” as possible then move the “SpaceNet” to the De-orbiting Zone. When the “SpaceNet” is moved to the De-orbiting Zone, no more pieces of Space Junk can be collected. Each piece of Space Junk in the De-orbiting Zone will earn 1 point.

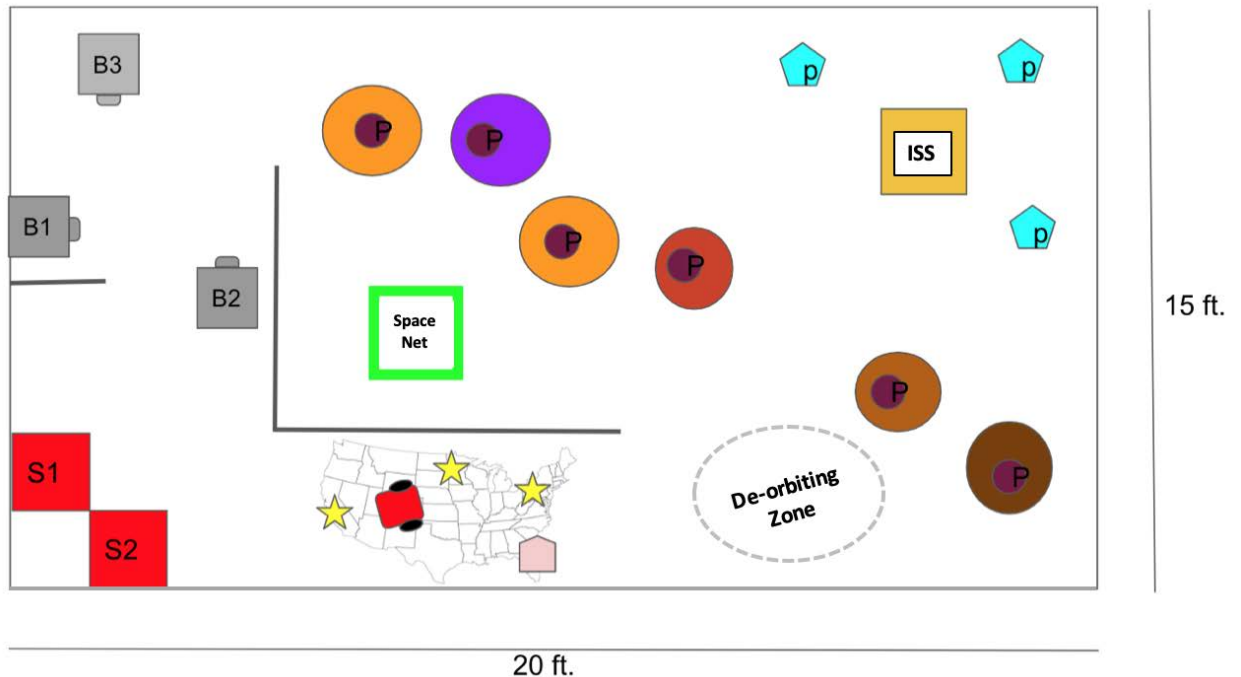
Return Trip (optional points) — The final optional task is returning to “Earth” (Starting Zone, S1-S2). This tasks becomes available after **Collecting Space Junk** has been completed or 30 seconds are left in the game (4min 30sec elapsed time). While this task is optional, it is the final state. If both BoTs return to “Earth” the game will conclude, the final time will be recorded, and points will be tallied. Each BoT that returned earns 2 points.

STAGE 2 ADDITIONAL DIRECTIONS/CLARIFICATIONS:

The only task required for this stage is **Collecting Space Junk**. All other tasks are optional.

The game will be complete when **Return Trip** has been completed or 5 minutes total have elapsed.

Space Junkies Layout



*S1, S2 - 18"x18"x18" area (start BOX)

*Astronauts - stress toy material placed on a furniture glide ... approx. 5" tall

*Shuttle - paper towel tube

<http://www.pinkstripeysocks.com/2014/03/cardboard-space-shuttle-craft-template.html>

*Launch Location - 14"x14" - taped off using gaffer tape

*B1, B2, B3 will have puck lights centred on a 12" high x 16" wide cardboard box

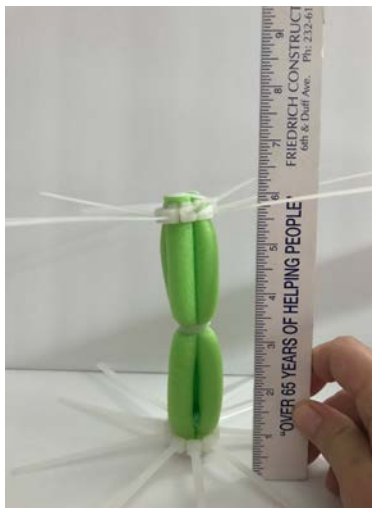
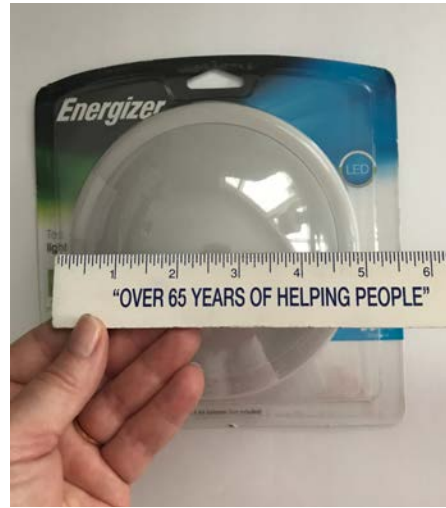
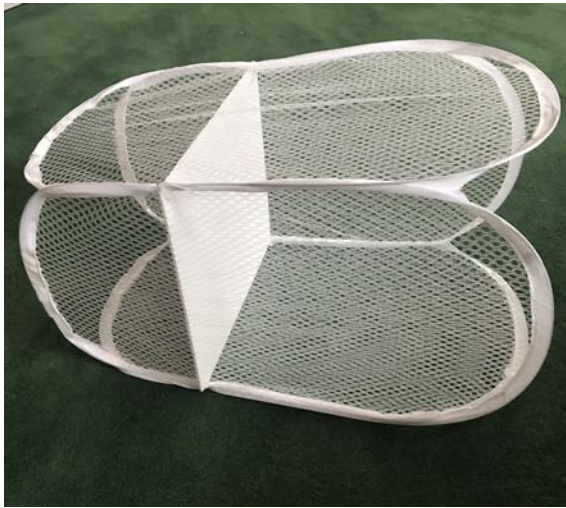
*SpaceNet - 12"x12"x~20" deep netted area (pop up hamper)

*Space Junk is represented by foam cylinders (1.5" dia.) placed on a furniture glide

*De-orbiting Zone - taped off using gaffer tape

*ISS Repair Location - 18"x18" - taped off using gaffer tape

*ISS Parts - probe, disc/satellite, rocket fuselage with fins



How to construct the tripod with LED on top.

Made it out of leftover stuff - cut legs from plastic hanger, tie into tripod (reinforce with hot glue), make circle on foam board (cut out), hot glue/wire LED puck light onto foam board circle, make ~2" strip out of foam board, cut slits in strip about 1/4" apart, form a circle and adjust size to fit around tripod legs, angled circle, hot glue LED circle onto angled circle, attach to tripod

SPACE JUNKIES SCORING SHEET ... 5 minutes to complete the course

Team Name:

Number of Team Members: 1 2 3 4 5

Levels	Elementary	Middle School	High School	Multiplier	Total
Number of Buttons Pushed				x1	
Number of Astronauts Placed at Launch Site				x1	
Shuttle place in Launch Site by PUSH				x1	
Shuttle place in Launch Site with CLAW				x2	
Number of Space Junk Pieces Collected in SpaceNet				x1	
SpaceNet Moved to De-orbiting Zone - one point per Space Junk item				x1	
Number of ISS parts PUSHED to repair location				x1	
Number of ISS parts GRABBED (claw) and moved to repair location				x2	
Number of BoTs Returned to Earth (Starting Zone S1,S2)				x2	
				Final Score:	
				*Final Time:	

*Ties will be broken by the lowest time

Tie breaker 2: one team will become Team A the other Team B

This is Team (circle one): Team A Team B

random person to draw a stick - the letter on the stick determines the