STAGE MACHINE DESIGN COMPETITION

2021 STAGE MACHINE DESIGN COMPETITION
CHALLENGE DESCRIPTION

WISCONSIN JOHNSON and the POP UP DART TRAP

Your team has been hired to develop some moving elements for a new, immersive escape room experience opening up in your hometown. One of the escape room themes has participants following the footsteps of Wisconsin Johnson, famed archeologist-explorer, through an ancient hidden temple avoiding the various traps set up to prevent looters from pillaging the temple.

Within the narrative of the escape room, Wisconsin Johnson (and other explorers) must be careful when walking through a particular passage of the temple; one misstep will cause the statuary heads along the walls of the passage to rapidly rise upwards off the floor (as if the statues suddenly grow taller), propel a poison dart from their mouths, and then slowly descend back to the floor.

For this challenge, you will design the mechanism behind this pop-up dart trap effect. This challenge has two elements: a mechanism to lift the "head," and a mechanism to propel the "dart." Additionally, you must design the method for triggering the dart to launch once the "head" has reached its maximum height.

For the purposes of this challenge:

- The head should be a cylinder 18 inches in diameter and 18 inches tall, with the mouth 6 inches from the bottom of the cylinder.*
- The pop-up, launch, and drop-down sequence should be triggered as one sequence. This can be using any method the team chooses.
- The head must rise a total of 18 inches in less than 2 seconds.
- When (and only when) the head has reached its maximum height, the dart should launch from the mouth.

- Once the dart has been launched, the head must return to its lowest position in no less than 10 seconds.
- Your design must include safety interlocks for loading and unloading of darts, including interlocks, pressure release valves, switches or other safeties to ensure that the dart will not launch during loading and can be safely unloaded without launching.
- Darts identical to those used for testing will be provided for each team once they have registered to facilitate their design process and cannot be altered or changed in any way.
- Special consideration will be given to designs which approach this problem using only mechanical means (i.e., without the use of pneumatics or electronic sensors)
- To be considered "effective," devices
    - Should be able to consistently repeat the raise/shoot/lower sequence ten (10) times without failure. (Devices can be reloaded between each sequence.)
    - Should propel darts at least five (5) feet, but not more than ten (10) feet when fired from the device, and be consistent in distance travelled.
    - Should complete the raise and lower portions of the move consistently at the required speeds
    - Should require only a single "trigger" to cause the sequence of raising, launching, and lowering to occur (the actual trigger mechanism is for the team to determine).

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[*] Out of respect for indigenous cultures around the world, we ask that participants refrain from attempting to boost the aesthetic appeal of their machine by adding any "hidden temple" patterns, designs, shapes, or artwork. Often, pop culture references to "hidden" or "lost" temples or civilizations borrow from artwork of indigenous cultures in ways that ignore traditional meanings and beliefs. The SMDC does not support this kind of cultural appropriation. We encourage participants to focus their efforts on designing the best machine, not on researching appropriate uses of cultural imagery.