

Mission Possible B

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Overview

Participants design, build, test, and document a Rube Goldberg-like Device that completes required Start and Final Actions through a series of specific actions.



Team of Up to 2



Can Bring: Device, Tools, Data, Tools, Eye Protection



Impound Required for States and Nationals



Eye Protection C Required (Chemical/Splash Protection)



~30 minutes

Event Basics

- Bring:
 - Device
 - Extra Tools/Parts
 - Eye Protection (Z87)
 - Action Sequence Log (ASL)



| No. | Starting Simple Machine | Action/Transfer Description | Ending Simple Machine | Transfer | Pts. |
|-----|-------------------------|---|-----------------------|----------|---------|
| 1 | - | Plunger is pulled and released, pushing a weight to fall down and pull a 3d printed screw | screw | - | 100 |
| 2 | screw | Screw spins and extends, pushing weight off platform. This weight pulls a red object across the inclined plane | Inclined plane | S-IP | 50 |
| 3 | inclined plane | Container hits class 3 lever, the lever falls down. | class 3 lever | IP to L3 | 50 |
| 4 | class 3 lever | Triangle on the class 3 lever hits wedge. | wedge | L3 to W | 50 |
| 5 | wedge | One of the two blocks of the wedge fall off, it pulls a pulley down. | pulley | W to P | 50 |
| 6 | pulley | One side of the pulley falls down, pulls object at the end of the string up. The object, after 10 cm, pulls the lever up. | class 2 lever | P to L2 | 50 |
| 7 | class 2 lever | The tip of the lever is pulled upwards, which pulls on a screw. | screw | L2 to S | 50 |
| 8 | screw | The marble in the screw is pushed, thus falling down hitting a weight hooked on a pin. The weight falls into a basket on one side of the lever. | class 1 lever | S to L1 | 50 (50) |
| 9 | class 1 lever | One side of the lever falls down, while the other pulls a string which pulls a container up an inclined plane. | inclined plane | L1 to IP | 50 |
| 10 | inclined plane | The container hits a nut/bolt, which falls on the edge of the inclined plane, | pulley | IP to P | 50 |

Event Basics

- Device:
 - 60cm x 60cm x 100cm
 - More points for a smaller device
 - All actions must be visible (top/2 sides transparent)
 - No electricity
 - No hazardous materials—no candles, flames, matches, lead objects, gasses, etc.



Event Basics

- Start Action:
 - Participants drop a golf ball into the device
- Final Action:
 - The device releases a golf ball attached to the end of a string that forms a pendulum. The golf ball then 1) swings, 2) strikes a release button/mechanism, that 3) raises a STOP sign completely above the device.



12 Actions and Sand Timer

- Mostly based around **simple machines!** Examples:
 - Rotate a **wheel and axle** to raise an object 10 cm.
 - Push a **wedge** to separate two touching marbles.
 - Use a **pulley system** with $IMA = 3$ to raise an object 10 cm.
- Each action is 50 points—if it gets stuck and you use an “adjustment,” the action doesn’t count!
- One “Sand Timer” for bonus points
 - 1 point for every full second the sand timer runs.

During Competition...

- Target Time: 60 at regionals/invitationals, 61-90 at state, 91-120 at nationals.
- Set Up Time: 30 minutes (for bonus points) - use this time to set up actions and sand timer.
- Up to three “adjustments,” which may consist of multiple touches.
 - Cannot be used to stall time
 - After the third time, no adjustments can be made.
- Device must follow ASL order for ASL points!

Coaching Advice

- Read the rules carefully!
 - 4.f.i. “To count, the pendulum must swing from the release point, **swing, and strike a release button/mechanism** that raises a STOP Sign **completely above the Device**. The STOP Sign must be **cardboard or poster board, oriented vertically, red and square or octagonal**. It must be **at least 15 cm high and 15 cm wide**.”
 - 4.f.iii. “No part of the sign will be allowed to be the outer boundary of the Device prior to the release button being activated.”

If you are missing any one of these criteria, you won't get the points!

Coaching Advice

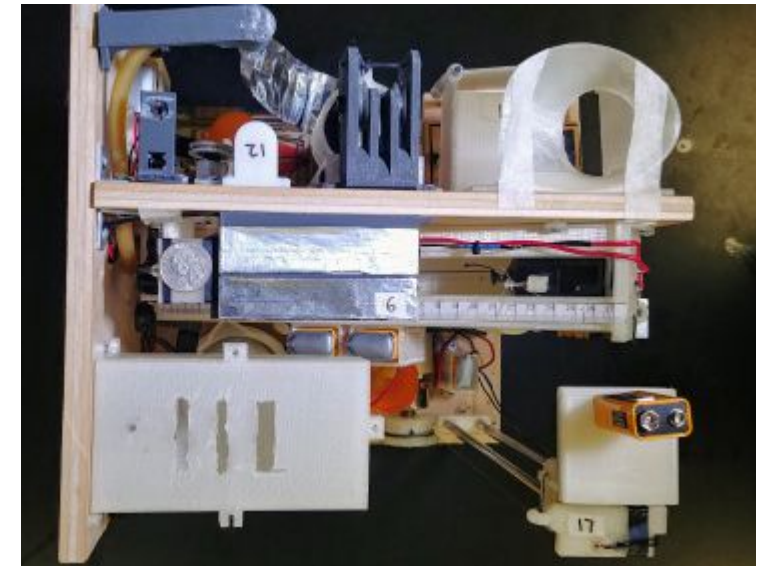
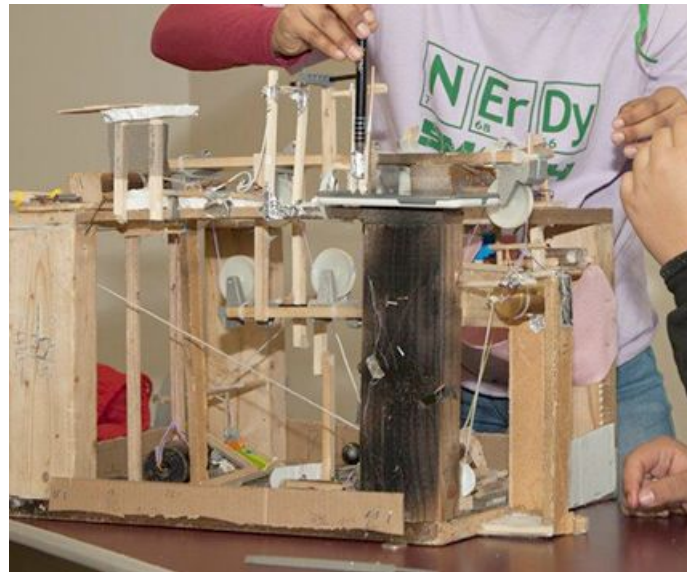
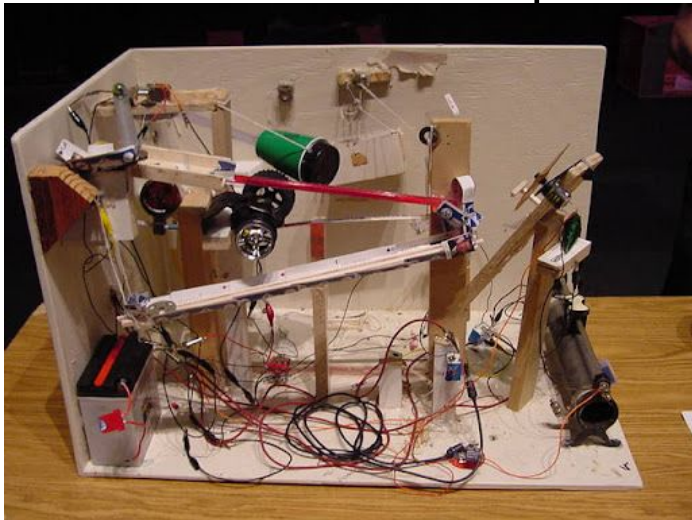
- Practice Set-Up!
 - Participants get 50 points if they use no more than 30 minutes to set up their Device.
 - Account for transportation issues—sometimes, packing the device so it won't break is just as hard as building the device itself!
 - Don't replace untested materials before competition!
 - “New” isn't always better

Coaching Advice

- Aim for consistency!
 - Remember - if an action gets stuck and you make an adjustment, you don't get the points
 - If each action works 90% of the time, after 12 actions, the device only has a ~28% chance of working. Takeaway: 90% isn't good enough.
 - Set-up the device in the same way, every single time.
 - Mark where objects go
 - Label all your components
 - Make sure things stay in place—don't use hot glue in areas where it might melt!

Coaching Advice

- Reread the event description:
 - Participants **design, build, test, and document** a Rube Goldberg-like Device that completes required Start and Final Actions through a series of specific actions.
 - Actually design the device—plan where each action will take place before you build.
 - Testing is just as important as building the device itself!
 - Document anything that works or doesn't work - a design log isn't required, but notes are still helpful.



Design Tips - Base

- Have a rigid base so that you have a good “reference” for the device.
- The base should have built-in bubble levels and adjustable legs.



Common Pitfalls

- Not leveling the device before the run - any small inconsistencies can change how your device behaves
- All actions should be labelled for +25 points
- Two ASLs are printed, formatted properly, and presented at impound/check-in.
- Making the device too big/too small
 - If the device is too big, you'll end up with an empty box with actions in the corner
 - If the device is too small, you won't be able to fit all the actions!
- In General: Build within dimensions
 - Don't build to the limit - leave room for error

Resources

- https://scioly.org/wiki/index.php/Mission_Possible
- Rules Clarifications/FAQs: [Mailing list to get updates](#)
- <https://www.soinc.org/mission-possible-b>
 - Coaching tips, ASL Templates
- <https://soinc.org/scoresheets>
 - Scoresheets to calculate scores - available soon!