

King of the Hill

Each year, engineering students at MIT are given a kit of assorted materials that may include such unrelated items as a solenoid, a music-box mechanism and a constant force spring. The students' challenge is to design and build a device that will do something better than any of their classmates'. As you saw on SCIENTIFIC AMERICAN FRONTIERS, students this year built machines to capture tennis balls.

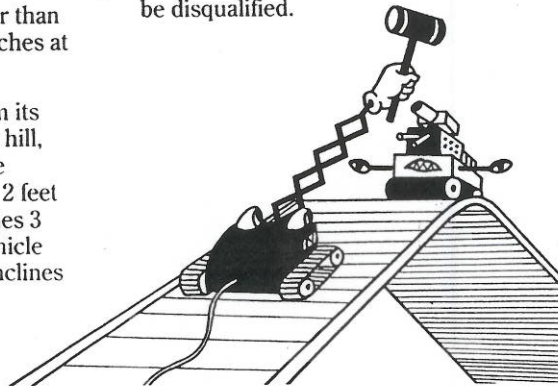
Now it's your turn . . .

THE PROBLEM

Your mission, should you choose to accept it, is to design and build a vehicle that will climb a hill, cross the crest, and prevent your opponent from crossing in the opposite direction. The objective is to end the match with your vehicle *and* your opponent's on the other side of the hill.

THE RULES

1. You may use only the materials listed to build your vehicle. It is not necessary to use all of them.
2. Your vehicle may use any means you can devise for reaching the other side of the hill and for preventing your opponent from reaching your side.
3. Your vehicle must be self-propelled. You may touch it to start, but you may not give it a push. You may not touch it after the match has begun. It may leave nothing at the starting line.
4. Your vehicle may be no longer than 12 inches and no wider than 8 inches at the moment it starts.
5. The hill will rise 3 inches from its base. The base, each side of the hill, will be 3 feet from the crest. The starting line on each side will be 2 feet from the crest. There will be sides 3 inches high to prevent either vehicle from falling off the hill and the inclines will be 10 inches wide.
6. Vehicles will compete two at a time. The winner will advance to the next round with other winners. The competition will continue to a championship round.
7. After 15 seconds or when all motion has stopped, whichever comes first, the vehicle that remains on the opposite side of the hill from its start will be declared the winner. If neither vehicle has crossed the crest or both finish on the sides opposite their starts, a draw will be declared and both vehicles will be disqualified.



MATERIALS

- 2 coffee cans with plastic lids
- 4 plastic soda bottles (1 or 2L)
- 8 rubber bands
- 2 mouse traps
- 4 4-ounce lead sinkers
- 1 12 x 24 x 1/4 -inch piece of plywood
- 4 jar lids
- 2 wire coat hangers
- 1 3-foot wooden dowel (any diameter)
- 1 12 x 12-inch piece of cardboard
- 1 3-foot piece of string
- any metal fasteners (paperclips, screws, bolts, nails, etc.)
- any glue or cement

Questions to Consider

1. How can I design my vehicle to move up the hill and cross the crest?
2. What can I design and build into my vehicle to prevent my opponent from reaching my side of the hill first or pushing my vehicle backward?
3. What mechanism can I use to start my vehicle at the beginning of the contest?
4. How can I use energy stored in rubber bands and/or mouse traps to power my vehicle?